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Bibionidae and Pipunculidae of the Philippines and Bismarck Islands (Diptera)¹

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This study is based largely upon collections from the Danish Noona Dan Expedition to the southern Philippines and the Bismarck Islands (Petersen, 1966), supplemented with collections from the B. P. Bishop Museum, British Museum (Natural History), U. S. National Museum, California Academy of Science, Zoologisches Museum der Humboldt Universität zu Berlin, and the Chicago Natural History Museum. I greatly appreciate having had the privilege of studying these valuable collections.

The family Bibionidae is not well represented in the Bismarck Islands; only five species are presently known. These are being discussed in this paper. By comparison 27 species are now known from the Philippines (Hardy and Delfinado, in press) and 49 species are now known from New Guinea (Hardy, in press). Since all of the Philippine species are treated in detail in the above monograph only the Bismarck Islands records from the Noona Dan expedition are cited in this paper.

A key is presented to the known Pipunculidae of the Pacific region, including Taiwan, Japan, Southeast Asia to Malaysia and excluding Australia (ref. Hardy, 1964) and New Zealand (ref. Tonnoir, 1925).

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BIBIONIDAE

Plecia amplipennis Skuse (figs. 1a-d)

Plecia amplipennis Skuse, 1888, Proc. Linn. Soc. N. S. Wales, Ser. 2, 3:1372; Edwards, 1925, Treubia 6(2):158, fig. 1; Malloch, 1928, Proc. Linn. Soc. N. S. Wales 53(5):604, fig. 5 (as *ornaticornis* Skuse); Hennig, 1940, Arb. u. Morph., Tax. Ent. 7(3):355, figs. 20-22; Hardy, 1958, Pacif. Ins. 12(3):190, figs. 1a-c.

A large species with the thorax entirely opaque orange, readily differentiated by the characteristic male genitalia. It is differentiated by the short, densely hairy ventroposterior margin of the ninth tergum (fig. 1a); by the short broad ninth sternum, approximately two times wider than long; and by the very large conspicuous claspers which are equal in length to the sternum, distinctly pointed apically and joined on inner bases by a narrow sclerotized bridge. For figures refer to Hardy (1958:190, figs. 1a-c). It should be noted that the shape of the clasper and possibly also the shape of the hind margin of the ninth tergum varies somewhat in this species. Typical *amplipennis* (from Queensland, Australia) have the clasper with a much longer point at the apex and more broadly curved on the inner margin (fig. 1d), specimens from New Guinea, from New Britain and some other areas have the point shorter as in figure 1b, while those from the Solomon Islands have just a slight point developed (fig. 1c). At first examination these were considered distinct species, but I now feel that these are variations. Also the ninth tergum of specimens from New Britain and New Guinea appear more broadly rounded at the apices of the lobes than do typical specimens from Australia.

It should be noted that the species recorded from Townsville, Queensland, as *Plecia ornaticornis* Skuse, by Edwards (*loc. cit.*) was very probably *amplipennis*. The species he illustrated is quite different from *ornaticornis* refer to Hardy (1958:210, figs. 21a-b).

Length: body, 6.0—8.5 mm.; wings, 7.0—9.5 mm.

Type locality, Queensland, Australia.

Type in the Macleay Museum, Sydney.

The species has been recorded from numerous localities in Queensland, New Hebrides, Java, New Guinea (both Papua and Australian New Guinea, and West Irian), and the Solomon Islands. Specimens are in the University of Hawaii collection from Eastern Indonesia, Timor, Sumba (Soemba) and Lombok.

Fourteen specimens are in the Noona Dan Expedition collection from NEW BRITAIN: Valoka, July 4—11, 1962, and Rabaul, July 25, 1962. The following are in the B. P. Bishop Museum from NEW BRITAIN: Lundenhafen 2 m. S. Coast, April 25—26, 1956 (J. L. Gressitt), and Linga Linga Pl. N. W. of Willaumez Pen. Im. April 9, 1956, „Poincettia“ (J. L. Gressitt). Also six specimens are in the Zoologisches Museum Berlin collection from „Bismarck Arch. Ralum, 1896—97 (Dahl).“

***Plecia aruensis* Edwards**

Plecia aruensis Edwards, 1925, Treubia 6(2):159, fig. 1; Hardy, 1958, Pacif. Sci. 12(3):191, figs. 2a-c; Hardy and Delfinado, in press.

This species belongs in the group which has the thorax entirely opaque orange and shows relationship to *bakeri* Malloch because of the development of the lobes on the hind margin of the ninth sternum of the male. The genitalia are very different in the two and *aruensis* is differentiated by the very tiny claspers which are hidden above the projections which extend from the hind margin of the ninth sternum, as seen in ventral view. Also, other details of the genitalia are different in the two species. This is being discussed and figured in a monograph on the Bibionidae of the Philippines by Hardy and Delfinado, in press.

Type locality, Aru Islands (Aroe).

Type in the British Museum (Natural History).

This species has been recorded from a number of localities in New Guinea; Aru and Baru Islands; New Britain; and from Mindanao, Philippines.

Thirty-one specimens are in the Noona Dan Expedition collection from the Bismarck Islands, NEW BRITAIN: Yalom, 1000 m., May 10—22, 1962; Bitu Paka, 15 km. S. E. of Kokopo, July 10, 1962; DYAL: Sumuna, March 7—13, 1962; Kollepine, March 12, 1962; LAVONGAI: Banatam, March 18, 1962. About thirty are in the B. P. Bishop Museum, NEW BRITAIN: Vudal, S. W. of Kerauat, December 13, 1959 (T. C. Maa); Malmalwan-Vunaka-nau, Gazelle Pen. May 8—15, 1956 (J. L. Gressitt); Kerauat, Gazelle Pen. 30—135 m., August 29, 1955, May 29, 1956—November 20—25, 1959 (J. L. Gressitt, G. Dun, T. C. Maa). Also one specimen is in the Zoologisches Museum, Berlin from „Bismarck Arch. Ralum, 1896—97 (Dahl).“

***Plecia diversa* Hardy**

Plecia fumidula diversa Hardy, 1958, Pacif. Sci. 12(3):202, fig. 14a-b.

As discussed in the paper by Hardy and Delfinado on the Bibionidae of the Philippines and the paper by Hardy on the Bibionidae of New Guinea (both in press), this species fits very near to *malayaensis* Hardy and to *inconspicua* Hardy. It differs principally by having the thorax entirely rufous rather than having the pleura discolored brown to black. The genitalia appear to show some variation in a series of specimens from a wide range of localities. It is possible that this may be a complex of species but at present it appears to be most logical to include those from the Philippines through New Guinea and the Bismarcks as one species. The genitalia are similar to those of *inconspicua* and are being figured in the monograph on the Bibionidae of New Guinea. The posterolateral lobes of the ninth sternum vary somewhat in length in typical *diversa* from the Bismarcks. These lobes are approximately two-thirds the remainder of the sternum; in specimens from the Philippines these lobes are often equal in length to the remainder of the sternum.

Type locality Kerawat, New Britain.

Type in the B. P. Bishop Museum.

This species extends from New Britain through New Guinea and the Philippine Islands.

Three specimens are on hand in the B. P. Bishop Museum from NEW BRITAIN: Vunabakan, 180 m., 10 km. East of Kerawat, November 16—20, 1959 (T. C. Maa); Warongoi Val. Gazelle Penn., 100 m., May 25, 1956 (J. L. Gressitt) and Gazelle Penn. Upper Warangoi Illugi, 220 m., December 15, 1962, Malaise trap (J. Sedlacek).

***Plecia pudica* n. sp. (figs. 2a-e)**

A very tiny species which runs near *fumidula* Edwards in my key to the *Plecia* of the Pacific Region and Southeast Asia (1958: 186). It is readily distinguished by its much smaller size, 2.0 mm. for the body rather than 3.5—5.5 mm. as in *fumidula*; by having the ninth sternum very broad, about two times wider than long and the posterolateral lobes of the sternum broadly rounded at apices not slenderly pointed; also the strong dorsal lobe on the clasper will readily differentiate this species (fig. 2c).

M a l e. Entirely dark colored. Thorax opaque, dark brown to black with very faint tinge of rufous in ground color of sterno-

pleuron. Antennae dark brown, tinged with yellow and appear to have six or possibly seven flagellomeres; these are so closely joined on the specimen at hand that the sections cannot be clearly differentiated. Legs dark brown to black with a tinge of rufous in ground color of femora. I see nothing distinctive about the legs. Wings rather faintly infuscated. Vein R_{2+3} straight and enters costa at about an 80° angle to vein R_{4+5} . Ninth sternum comparatively broad and posterolateral lobes thick and obtuse at apices; each has a slight point on inner margin. Claspers rather small, as seen from direct ventral view, but as seen from dorsal or lateral views, a large dorsobasal lobe present extending into the genital chamber (fig. 2b). A small median lobe developed on hind margin of sternum (figs. 2a-b). Dorsal aspects of tergum and lateral view of the claspers as in figures 2d and 2c. Tergum densely hairy on sides and each lobe with a very dense clump of short thick black setae on inner margin (fig. 2e).

Length: body, 2.0 mm.; wings, 2.5 mm.

Female unknown.

Type male, Bismarck Islands, NEW BRITAIN: Yalom, 1000 m., May 13, 1962, Noona Dan Expedition. — In the Zoological Museum, Copenhagen, Denmark.

***Dilophus gracilis* n. sp. (figs. 3a-d)**

In my key to the known Pacific *Dilophus* (1951:258) this runs near *quintanus* Hardy. The two are not related, *gracilis* is a much smaller (body, 2.8 mm. compared to 4.0 mm. for *quintanus*), more slenderly built species; the arrangement of the spines on the front tibiae, the wing venation and genitalia are also different in the two. *D. gracilis* has two closely placed dorsal spines situated at basal third of segment, two posterodorsal spines arranged longitudinally at middle of segment, and one anterodorsal spine at apical two-thirds of tibia (fig. 3a). *D. quintanus* has two closely placed dorsal spines near basal third, one anterodorsal and one posterodorsal at the middle and one anterodorsal at apical two-third (refer to Hardy, 1951:267, fig. 9a). In *gracilis* the basal portion of vein M_{1+2} and the m crossvein are completely lacking (fig. 3b); these are present in *quintanus*. The claspers are distinctly pointed at apices in *gracilis* (fig. 3c), they are broadly rounded, obtuse in *quintanus*. The lack of the base of M_{1+2} relates this to *exiguus* (Hardy) from New Guinea but that species differs by having the thorax largely yellow

to brownish red; also the claspers appear to be short, broad and rounded at apices.

Male. Head: Lower portion of compound eyes rather conspicuously bulged and protrudes slightly as seen from direct dorsal view. Front portion of head very poorly developed, rostrum hardly visible beyond the margins of the eyes. Lower portion of eyes very dark colored, almost black, upper portion red. Palpi small and inconspicuous, only three segments visible, apical segment about one-half longer than wide. Scape and pedicel yellow, flagellum yellow-brown and with ten flagellomeres. **Thorax:** Polished dark brown to black except for yellow humeral ridges, sternopleura yellow, tinged deeply with brown. Bases of halteres yellow, knobs dark brown to black. Mesonotum almost bare, a few rather long pale hairs extend longitudinally behind thoracic combs. Anterior comb made up of about ten prominent teeth, there is no separation in the middle. Posterior comb with approximately ten small teeth arranged in a slight arc. **Legs:** Yellow except for brown apical tarsomeres. Hind legs slender, basitarsus almost one-half as long as tibia, and two times longer than second tarsomere. Tarsi not at all swollen. Spines on front tibiae as discussed above and as in figure 3a. **Wings:** Very faintly infuscated, brown on stigma. Basal two-fifths to one-half of vein M_{1+2} and m crossvein lacking. Posterior lobe of wing rather acutely pointed (fig. 3b). **Abdomen:** Brown to black, tinged with yellow in ground color, especially on venter. Abdomen long and slender, over two times longer than combined length of head and thorax. Ninth tergum about as wide as long, very slightly concave in middle of hind margin (fig. 3d). Claspers are sharp pointed as seen in direct ventral view (fig. 3c). Postero-median margin of sternum raised into a mound-like, pointed projection which fits ventral to the aedeagus.

Length: body of type, 3.2 mm.; wings, 3.5 mm. Specimens in fluid have the body up to 4.0 mm. in length.

Female unknown.

Type male and 24 paratypes from Bismarck Islands, NEW BRITAIN: Yalom, 1000 m., May 9—16, 1962, and 11 paratypes from LAVONGAI: Banatam, March 22—24, 1962. — Type and 20 paratypes returned to the Zoological Museum, Copenhagen, Denmark. The other paratypes are being deposited in the collections of the B. P. Bishop Museum, British Museum (Natural History), and the University of Hawaii.

PIPUNCULIDAE

As noted above the following key includes all of the known Pacific species. Only two species cannot be placed: *Pipunculus parvulus* van der Wulp (1898), from New Guinea, and *P. hepaticolor* Becker (1900:247), from Singapore; these were both described from females and cannot be recognized from the original descriptions. Male specimens in the Zoological Museum, Amsterdam, from Java, which were determined „*hepaticolor*“ by de Meijere belong in the *cruciator* complex of species and may be *mutillatus* Loew (refer to discussion under *mutillatus*.) Kertész (1921:286, 297) recorded *P. eucalypti* Perkins with a query from Formosa. His description does not fit *eucalypti* (an Australian species) and I cannot be sure what he had.

Key to Pacific Pipunculidae, Including Taiwan, Japan and Malaysia and Excluding Australia and New Zealand

- 1 Wing venation complete. Ocellar bristles lacking; head nearly spherical; occiput swollen, plainly visible from lateral view 2
 - Major portion of vein M_{1+2} and the m crossvein lacking; ocellar bristles present; head hemispherical; occiput narrow, scarcely visible from lateral view. Only one genus and species Chalarinae ... *Chalarus spurius* Fallén
- 2(1) Vein M_{1+2} with an appendix (fig. 5b) 3
 - Vein M_{1+2} simple, lacking an appendix 7
- 3(2) Propleural fan present *Pipunculus (Cephalosphaera)* Aczél ... 4
 - Propleural fan absent ... *Pipunculus (Clareola)* Aczél New Combination. One known species — a very large sp.; body, 7.9-8.3 mm.; wings, 8.7-9.0 mm .. Formosa ... *adventitius* (Kertész) (For description and figures ref. Aczél, 1940:154)
- 4(3) Legs entirely yellow except for brown coxae. Sides of mesonotum and the sterna largely yellow New Britain ... *xanthosternum* n. sp. Femora mostly black. Thorax black 5
- 5(4) Third antennal segment yellow, short, rounded at apex (fig. 5a). Male hypopygium with an apicoventral membranous area which is not visible from direct dorsal view. Female ovipositor with broad thick base and short upcurved piercer New Britain ... *anorhaebus* n. sp.
 - Third antennal segment brown to black, acute or short acuminate. Genitalia not as above 6
- 6(5) Third costal section over two times fourth, r-m crossvein at basal two-fifths. Fourth and fifth terga polished black at apex.

- Male genitalia with a large membranous area extending entire length of eighth segment (fig. 6) .. Malaya ... *sylvanus* Brunetti
- Third section about equal to fourth, r-m crossvein just beyond middle of 1st M₂. Abdomen opaque, rather velvety black. Female ovipositor slender, curved upward, piercer longer than base, extending to about apex of 2nd abdominal segment (fig. 4) Amboina ... *amboinalis* Walker
- 7(2) Stigma present 8
- Stigma absent *Tomosvaryella* Aczél ... 72
- 8(7) Propleura bare (*Eudorylas*) ... 9
- Propleura each with a fan of hairs (*Pipunculus*) ... 51
- 9(8) Abdomen all black in ground color 10
- Abdomen brownish yellow, yellow on sides. Genitalia, legs and antennae yellow. Male genitalia with membranous area at apex (fig. 27) Java, Formosa *Pipunculus* (*Eudorylas*) *pallidiventris* de Meijere (*bicolor* Becker, 1924, Formosa = new synonym)
- 10(9) Eyes of male distinctly separated on the front; at narrowest point about width of one ocellus. Hypopygium with large dorsal membranous area (fig. 28b). Body, 5.5 mm. Philippine Islands ... *phatnomus* n. sp.
- Not as above 11
- 11(10) Very large species, body, 6.75-7.6 mm.; wings, 7.0-8.6 mm. Tarsal claws normal in size, scarcely longer than last tarsomere 12
- Smaller species, body, 2.5-4.0 mm. Species approaching 4.0 mm. in body length may have elongate tarsal claws, about two times longer than last tarsomeres 13
- 12(11) Wings hyaline. Disc of scutellum rather densely pilose. Each dorsocentral line with 2-4 irregular rows of pale setae. Legs yellow, tinged with brown on the femora. Female ovipositor reaching base of abdomen and strongly curved upward. Last section of M₃₊₄ much longer than m crossvein Philippine Islands ... n. sp. related to *gigas*
- Wings tinged with brown. Not as above (scutellum with hairs on the hind margin; disc?), femora mostly black. Female ovipositor extending to about base of third abdominal segment. Male hypopygium with membranous area to right of apex Formosa ... *gigas* (Kertész) (ref. Aczél, 1940:158 for description and figures)
- 13(11) First tergum of abdomen lacking bristles or prominent setae on the sides. Male genitalia globose, evenly rounded, lacking a membranous area. Ninth segment visible from dorsal view ... 14
- First tergum with a row of bristles or prominent hairs on each side, or at least 1-2 prominent black bristles on each side. Male genitalia not as above 15

- 14(13) Genitalia distinctly broader than fifth segment and nearly two times longer (fig. 21c). Base of hypopygium polished black on left side. Inner clasper broad, almost square tipped, as seen in direct ventral view (fig. 21d). Abdomen shining black, grey on the sides . . . Java, Philippine Islands . . . *macropygus* de Meijere
- Hypopygium entirely brown pubescent, not wider than fifth segment and not much longer than that segment (fig. 29b). Inner clasper tapered at apex (fig. 29c). Abdomen predominantly opaque grey in male; subshining in middle of terga 3-5 in female Formosa, Philippine Islands . . . *roralis* (Kertész)
- 15(13) Third antennal segment obtuse, or short acute at apex, not sharply pointed 16
- Third antennal segment sharp pointed, acuminate, rostrate or bristle-like, at apex 23
- 16(15) Abdomen opaque brown to black, grey or faintly subshining on apices of terga 17
- At least apices of terga 2-5 polished black 19
- 17(16) Male hypopygium approximately as long as fifth segment and with a large apical or apicodorsal membranous area. Apices of terga grey 18
- Male hypopygium rather small, one-half or less as long as fifth and with an inconspicuous membranous area which is not visible from dorsal view 22
- 18(17) Third costal section in male two times fourth. Last section of M_{1+2} strongly curved. Middle tibia with row of posterior bristles on basal half (fig. 31b). Legs almost entirely black. Female ovipositor thickened, gradually tapered, curved upward Bismarck Islands . . . *toniger* n. sp.
- Third costal section about equal to fourth, last section of M_{1+2} straight. Lacking such bristles on middle tibiae. Bases of tibiae broadly yellow. Male hypopygium as in figure 16d Formosa, Philippine Islands? . . . *formosanus* Kertész
- 19(16) At least terga 3-5 polished black on the dorsum, except possibly for a very narrow pollinose line along bases of segments in *fumipennis* 20
- Only apices of terga 2-5 polished. Eighth segment of male about two-thirds as long as fifth and with a membranous area at apex 21
- 20(19) Wings brown. Third costal section one-fourth shorter than fourth. The two sections combined are one-fourth shorter than fifth. Crossvein r-m at base of cell 1st M_2 . Mesonotum and scutellum shining black. Only male known New Guinea . . . *fumipennis* Kertész
- Wings tinged pale brown. Third section longer than fourth and the two combined distinctly longer than fifth. Crossvein r-m at middle of cell 1st M_2 . Mesonotum subshining, densely grey pol-

- linose on margins (except anterior median), hind margin of scutellum grey; only female known. Ovipositor long, curved upward, extending to apex of 2nd segment New Britain ... n. sp. "runs near *totoniger*"
- 21(19) Third costal section about two times longer than fourth. Male hypopygium not compressed to right and with a large membranous area over apex (fig. 12). Larger species, wing, 4.5 mm. Java ... *atratus* de Meijere
- Third costal section equal to or slightly shorter than fourth. Hypopygium strongly compressed to right and with a membranous area on right side of apex (fig. 25b). Length of wing, 3.0 mm. New Ireland ... *mutuus* n. sp.
- 22(17) Wings brownish. Eighth segment of male very small, one-third as long as fifth, nearly symmetrical, only slightly compressed to right (fig. 20a). As seen from end view a large oblong membranous area occupies right side of eighth segment (fig. 20b) Formosa ... *lentiger* (Kertész)
(=c.n. for *mutillatus* Kertész, nec. Loew.)
- Wings not so darkly tinged. Eighth segment one-half as long as fifth and compressed to right (fig. 30a). From end view with a small round membranous area on left side (fig. 30b) Formosa ... *separatus* (Kertész)
(*P. fuscipennis* Brunetti from Malaya, would run here and is evidently a synonym. I have studied the type in the British Museum.)
- 23(15) Legs chiefly yellow. Femora may be tinged with brown medianly or toward the bases but broadly yellow at apices and bases. Humeri yellow 24
- At least femora predominantly black, yellow only at extreme apices 27
- 24(23) Tarsal claws greatly enlarged, almost two times longer than last tarsomere. Female with r-m crossvein just before middle of cell 1st M₂. Ovipositor curved upward and two times longer than short rounded base. Basal part of piercer thickened Philippine Islands ... n. sp. "resembles *pulvillatus*"
- Not as above 25
- 25(24) Third costal section two times longer than fourth. Abdomen chiefly shining black above, grey on the sides. Male hypopygium rounded, wider than long and with a narrow membranous area extending obliquely over the dorsoapical portion of the eighth segment (fig. 23) Java ... *montanus* de Meijere
- Third costal section about equal or shorter than fourth. Abdomen opaque brown to black with prominent grey fasciae at apices or posterolateral margins of terga. Known male hypopygia with an apical membranous area as in figure 26b 26

- 26(25) Margin of scutellum with tiny inconspicuous setae. Third costal section distinctly shorter than fourth. Third and fourth combined are one-third longer than fifth. Vein $cu_1 + 1st\ A$ short, not much longer than r-m crossvein. Abdominal terga with almost complete grey fasciae on apices. Female ovipositor base large, rather globose, piercer shorter than base. Male with an apical membranous area as in figure 26b New Ireland ... *albucus* n. sp.
- Scutellum with long black bristles on hind margin. Third section equal or very slightly longer than fourth, the two combined are distinctly shorter than fifth. Vein $cu_1 + 1st\ A$ elongate, almost as long as m crossvein. Terga 3-5, brown on the dorsum, grey on the sides. Female ovipositor base oblong with a swelling on the underside, piercer longer than base. Male not known Luzon: Philippine Islands ... ♀ n. sp. "resembles *albucus*"
- 27(23) Third antennal segment produced into a long bristle-like apex which is two times longer than remainder of the segment, about two-thirds as long as the arista (fig. 9a). Only female known. Ovipositor long and straight (fig. 9b) New Ireland ... *acroacanthus* n. sp.
- Third antennal segment not as above, the point is not longer than the remainder of the segment 28
- 28(27) Eighth segment of male large, asymmetrical, wider than abdomen and longer than fifth, divided into two unequal parts by a groove extending longitudinally down the right side. Abdomen shining black, grey on posterolateral margins of terga 3-5. Wings fumose, third section shorter than fourth, sections 3 + 4 equals one-half times longer than fifth. Scutellum bare Formosa ... *sauteri* Kertész
- Not fitting all of the above characters 29
- 29(28) Abdomen polished black, very lightly grey-brown dusted. Front tibia with a prominent posterior bristle near middle, or hind tarsi broad and flattened 30
- Abdomen opaque, ground color obscured by brown or grey pollen. Front tibia not as above 31
- 30(29) Hind tarsi unusually broad and flat, especially the basitarsus. Upper portion of female front subshining, lightly pollinose Formosa ... *platytarsis* (Kertész)
- Front tibia with a prominent posterior bristle near middle. Hind tarsi not as above. Upper half of female front polished black, bare of pollen Bismarck Islands ... *monothrix* n. sp.
- 31(29) Females 32
- Males 40
- 32(31) Ovipositor straight 33
- Ovipositor curved 36
- 33(32) A row of 5-6 black bristles on each side of 1st tergum 34

- Only 1-2 bristles on each side of 1st tergum Formosa ... *nudus* (Kertesz)
- 34(33) Piercer of ovipositor distinctly longer than base, front entirely opaque 35
 - Piercer shorter than base and extending only to about base of fourth abdominal segment. Upper front polished black. Abdomen grey-brown, not fasciated. Small species, body 2.7 mm. ... Bismarck Islands ... n. sp. "runs near *deceptor*"
- 35(34) Ovipositor elongate, extending to base of abdomen. Third costal section about equal to fourth and vein R_{2+3} ends well beyond a level with m crossvein. Larger sp., body, 4.3 mm. Philippine Islands ... *deceptor* n. sp.
 - Ovipositor extends to about base of third segment. Third section two times fourth and R_{2+3} ends well before a level with m crossvein. Small species, body 2.5-2.8 mm. Japan and New Britain ... *orientalis* (Koizumi)
- 36(32) Apex of third antennal segment long and slender, about equal to length of remainder of segment (fig. 18b). Ovipositor gently curved upward .. Bismarck Islands, Lavongai ... *infissus* n. sp.
 - Apex not drawn out as above. Ovipositor strongly curved upward 37
- 37(36) Third antennal segment acute. Base of ovipositor elongate and slender, piercer thickened, gradually tapered from base and extending to the hind pair of legs Formosa, Philippine Islands? ... *formosanus* Kertesz?
 - Third antennal segment moderately acuminate. Ovipositor not as above 38
- 38(37) Third antennal segment yellow 39
 - Antennae dark brown to black. Legs almost entirely black. Ovipositor as in figure 19d. Java, Japan, Philippine Islands, Bismarck Islands ... *javanensis* de Meijere (*P. tsuboi* (Koizumi), from Japan is a new synonym.)
- 39(38) Bases and apices of femora broadly yellow, median portion yellow-brown; tibiae all yellow. Ovipositor base globose, entirely opaque; piercer extending to about base of fourth segment. Africa, Pacific, Orient ... *mutillatus* Loew and *cruciator* Perkins
 - Femora black except for narrow yellow apices; tibiae discolored with brown medianly. Ovipositor base elongate, mostly polished; piercer extending to about middle of second segment (fig. 11c) Philippine Islands ... *anomalus* n. sp.
- 40(31) Hind femur of male densely villose on posteroventral surfaces; base of hind femur greatly narrowed (fig. 13b). Hypopygium as in figures 13c and 13d Java and Philippine Islands ... *ciliatus* de Meijere
 - Not as above 41

- 41(40) Head normal in size, not longer than thorax and much shorter than abdomen 42
- Head abnormally large, equaling one-third of the body length. Hind margin of scutellum bare. Wings tinged with brown. Length, body, 4.1 mm.; wings, 4.6 mm. Formosa ... *megacephalus* (Kertész)
- 42(41) Male hypopygium short, symmetrical, scarcely one-third as long as the fifth segment and with a narrow membranous area extending over apex (fig. 17d); scarcely if at all visible from dorsal view (fig. 17c) Europe, Formosa? Philippine Islands ... *holosericeus* Becker
- Not as above 43
- 43(42) Male genitalia with a membranous area or cleft extending longitudinally, partly or completely bisecting eighth segment as seen in dorsal view 44
- Male genitalia with large apical membranous area. Ventral aspects of genitalia as in figure 19c. Hind tibia with 1-2 erect bristles on outside surface. Java, Philippine Islands, Japan, Bismarck Islands ... *Pipunculus* (*Eudorylas*) *javanensis* de Meijere (*P. tsuboti* (Koizumi), from Japan is a new synonym.)
- 44(43) Male hypopygium with an apical membranous area which extends onto the dorsum partially bisecting the eighth segment (fig. 26b). Third antennal segment moderately to long acuminate (figs. 26a, 18a) 45
- Eighth segment completely bisected by a cleft running the entire length of the right side of dorsum. Third antennal segment short, acuminate 48
- 45(44) Third antennal segment yellow or with but a faint tinge of brown. Larger spp. body, 3.5-4.5 mm.; wings, 4.0-5.0 mm. Genitalia as in figures 15b-c, 18d-e 46
- Third antennal segment black. Vein R_{2+3} ends well before a level with m crossvein. Small species, body, 2.2 mm.; wing, 2.6 mm.; hypopygium with a narrow membranous area over apex which extends almost to base of eighth on dorsum. Claspers as in figure 26c Japan and New Britain ... *orientalis* (Koizumi)
- 46(45) Eighth segment with large membranous area which almost completely bisects it dorsomedianly (ref. fig. 5b, Hardy 1956:8). Crossvein r-m situated near basal one-fifth of cell 1st M_2 Mariana Islands ... *gressitti* (Hardy)
- Genitalia not as above. Crossvein r-m at or beyond basal third of cell 1st M_2 47
- 47(46) Legs entirely black except for very narrow apices of femora and bases of tibiae. Third antennal segment moderately acuminate

- inate (fig. 15a). Hypopygium with narrow membranous area over right side of apex. Ventral aspects of genitalia as in figure 15c Philippine Islands ... *deceptor* n. sp.
- The apices of femora, apices and bases of tibiae broadly yellow; basal tarsomeres also yellow. Third antennal segment long acuminate (fig. 18a). Hypopygium with large membranous area over apex. Ventral aspects of genitalia as in figure 18e Bismarck Islands, Lavongai ... *infissus* n. sp.
- 48(44) Legs largely yellow, femora brown medianly, apices and bases broadly yellow 49
- Femora black except for narrow yellow apices. Tibiae tinged with brown medianly. As seen from ventral view, the membranous area is very large and covers entire apex of eighth segment Philippine Islands ... *anomalus* n. sp.
- 49(48) Fifth sternum deeply cleft on hind margin, the concavity extending almost to base (fig. 14b) 50
- Fifth sternum only slightly concave or almost straight on hind margin Africa, Pacific, Japan, Nepal ... *mutillatus* Loew
(*matema* Curran, *aequalis* Becker, *hiatus* Hardy and *distocruciator* Hardy are new synonyms.)
- 50(49) Claspers at least one-half longer than wide, tapered apically, especially on the outer clasper (fig. 14a)
..... Queensland, Australia ... *cruciator* Perkins
- Claspers as wide as long, not tapered
..... Hong Kong ... sp. ? close to *cruciator*
- 51(8) Third costal section with a distinct crossvein at the base of the stigma. Apex of cell R_5 broad, at least one-half longer than the r-m crossvein "Collinias" complex ... 52
- Third vein lacking such a crossvein. Apex of cell R_5 much narrower than length of r-m crossvein 58
- 52(51) Males 53
- Females ... (*limitarius* Collin, Samoa, not known) 56
- 53(52) Face strongly narrowed, at narrowest point it is less than the width of one ocellus. Apices of abdominal terga and median portion of mesonotum polished black
..... Fiji ... *vitiensis* (Muir)
- Face comparatively broad, about one-half as wide as lower front. Thorax and abdomen opaque, grey-brown pollinose .. 54
- 54(53) Stigma short, about one-half as long as fourth costal section; wings tinged with brown. Claspers at least four times longer than wide, shaped as in figure 38b. Sixth tergum greatly enlarged; as seen from left side view it is three times longer than seventh and distinctly longer than eighth (fig. 38a). First three abdominal segments clear yellow; legs, third antennal segment, all yellow Samoa ... *limitarius* Collin

- Stigma subequal to slightly longer than fourth, wings nearly hyaline. Claspers almost as wide as long. Other aspects of genitalia as in figures 36c and 37e. Abdomen all brown to black, slightly tinged with rufous in ground color of 1st three segments. Femora and antennae brownish 55
- 55(54) Seventh tergum (extra plate adjoining seventh?) well-developed on dorsum, occupying most of left side as seen from above (fig. 37d). Membranous area on eighth comparatively small (fig. 37c) Bismarck Islands ... *imparilis* n. sp.
- No such plate developed, seventh tergum confined to venter. Membranous area large occupying all of apex of eighth (fig. 36c) Australia ... *heterostigmus* Perkins
- 56(52) Face very greatly narrowed, at narrowest point less than half width of an ocellus. Front polished black on upper half. Basal 2-3 abdominal segments yellow 57
- Face narrowed to about width of one ocellus. Front grey on sides (fig. 36a). Base of abdomen brown, yellowish in ground color. Femora at least tinged with brown medianly Australia ... *heterostigmus* Perkins
- 57(56) Apex of cell R₅ two times wider than length of r-m (ref. fig. 5, Collin, 1929:186). Wings brownish tinged. Legs all yellow Fiji ... *vitiensis* Muir
- Apex of cell R₅ not much wider than length of r-m. Wings nearly hyaline. Femora faintly tinged with brown Bismarck Islands ... *imparilis* n. sp.
- 58(51) Anal vein present; legs yellow in most species 59
- Anal vein lacking (fig. 32b). Femora predominantly black, yellow on extreme apices and bases. Third antennal segment acuminate (fig. 32a). Abdomen predominantly polished black. Hypopygium with a large membranous area over apex (fig. 32c). Crossvein r-m near middle of cell 1st M₂ Bismarck Islands ... *argulus* n. sp.
- 59(58) Femora yellow or with not more than median discolorations of brown 60
- Femora almost all black. Terga 3-5 subshining to polished black 62
- 60(59) Abdomen largely yellow, especially on sides of first four terga 61
- Abdomen entirely black in ground color 63
- 61(60) Third costal section short, one-half or less as long as fourth section. Crossvein r-m situated near basal one-sixth of cell 1st M₂. Third antennal segment short acute (fig. 40a). Tarsal claws large, two or more times longer than last tarsomere. Only female known: front strongly narrowed dorsally. Ovipositor short, piercer shorter than base (fig. 40c) Malaya and Philippine Islands ... *maculiventris* Brunetti

- Third section elongate over two times longer than fourth. Cross-vein r-m at basal third of cell 1st M_2 . Third antennal segment rounded at apex. Only male known. Hypopygium very asymmetrical, divided into two parts by a longitudinal furrow. Large species, body, 6.7 mm.; wings, 8.4 mm. Formosa ... *excellens* (Kertesz)
- 62(59) Wings short and broad. Third and fourth costal sections combined about one-half as long as fifth section. Penultimate section of M_{1+2} curved sharply upward, arcuate; last section rather strongly curved Formosa ... *costalis* Becker
- Wings normal in shape. Third and fourth costal sections one-third longer than fifth. Penultimate section of M_{1+2} only slightly convex and last section gently curved. Male hypopygium with an apical membranous area on right side. Face of female strongly narrowed. Female ovipositor short, straight; piercer not longer than base Australia, Philippine Islands? ... *microdes* Perkins
- 63(60) Third antennal segment moderately long acuminate. Only females known 64
- Third segment acute to obtuse at apex (figs. 40a and 42a) .. 65
- 64(63) Front narrow, in the middle it is scarcely wider than one ocellus and about one-fourth as wide as face. Tarsal claws normal in size. Female ovipositor as in figure 33b New Britain ... *artifrons* n. sp.
- Front expanded in middle and equal or slightly broader than face. Tarsal claws unusually long and slender (fig. 34b), about one-half longer than last tarsomere or the pulvilli. Ovipositor as in figure 34c New Britain ... *buclavus* n. sp.
- 65(63) Tarsal claws normal in development, about equal in length to apical tarsomeres 67
- Tarsal claws strong, 2-3 times longer than apical tarsomeres. Third costal section about two times fourth and about equal to fifth. Scutellum with strong bristle-like hairs on margin 66
- 66(65) Abdomen with greyish white bands on apices of terga. Male with an apical membranous area, not visible from direct dorsal view (ref. figs. 2b, c, Kertesz, 1915:388 and figs. 1, 3, Aczél, 1940:162). Length, body, 6.1 mm.; wings, 8.1 mm. Formosa ... *pulvillatus* (Kertesz)
- Abdomen subshining brown at apices of terga. Male with large membranous area extending onto dorsum (fig. 42b). Length, body, 4.3; wings, 5.3 mm. Philippine Islands ... *mundulus* n. sp.
- 67(65) Hypopygium with an apical membranous area scarcely, if at all, visible from direct dorsal view 68
- Membranous area of male hypopygium extending onto dorsum of eighth segment 71

- 68(67) Large species, body, 6.0-7.0 mm.; wings, 8.0-9.0 mm. Abdomen opaque black, narrow apices of terga grey. Third antennal segment short acute; wings tinged light brown. Male hypopygium about one-half as long as fifth with a large membranous area covering all of apex, not visible from direct dorsal view (fig. 43) Malaya ... *pendleburyi* Brunetti
- Body not over 5.5 mm., abdomen submetallic, lightly pollinose to polished black on terga 3-5. Third antennal segment obtuse. 69
- 69(68) Third costal section two times longer than fourth. Crossvein r-m at basal third of cell 1st M₂. Larger species, body, 5.5 mm.; wing, 6.2 mm. Hypopygium as in figures 44a-b Philippine Islands ... *philippinensis* (Hardy)
- Third costal section about equal to or shorter than fourth. Crossvein r-m just before middle of 1st M₂. Smaller species, body, 3.0-3.5 mm.; wings, 3.5-4.0 mm. 70
- 70(69) Wings tinged with brown. Third costal section equal to fourth and the two combined are equal to the fifth. Hypopygium as in figures 35a-c Formosa, New Ireland? ... *fraternus* Kertész
- Wings hyaline. Third costal section shorter than fourth, the two combined distinctly shorter than fifth Philippine Islands ... n. sp. ♀ runs near *philippinensis*
- 71(67) Abdomen opaque, black on basal two-thirds of terga, grey on apices and sides. Third costal section one-half longer than fourth. Crossvein r-m set at basal two-fifths of cell 1st M₂. Hypopygium of male as in figure 39 Malaya ... *longipennis* Brunetti
- Abdomen largely shining black, sides of terga 2-4 yellow in ground color. Third costal section one-half as long as fourth, crossvein r-m at about basal one-sixth of cell 1st M₂. Female ovipositor short, piercer about equal to base (fig. 40c) Malaya ... *maculiventris* Brunetti
- 72(7) Abdomen entirely black 73
- Sides of abdomen yellow. Hypopygium as in figure 62 Java ... *translucens* (de Meijere)
- 73(72) At least femora predominantly black 74
- Legs entirely yellow, except for brown coxae Philippine Islands ... *flavicrus* n. sp.
- 74(73) Crossvein r-m situated at or slightly beyond middle of cell 1st M₂. Upper portion of front, above junction of eye, very short compared to lower. Submetallic black, lightly pollinose species 76
- Crossvein r-m situated near basal one-fourth to one-third of cell 1st M₂. Upper portion of front about as long as lower. Abdomen metallic black, lacking distinct pollinosity on dorsum 75

- 75(74) Claspers enlarged, boot-like at apices. (Fig. 47c). Third antennal segment very long acuminate (fig. 47a) Philippine Islands ... *caligata* n. sp.
- Claspers not enlarged, slightly pointed on inner apices (fig. 57c). Third antennal segment moderately acuminate (fig. 57a) Australia, Philippine Islands, Bismarek Islands ... *nyctias* (Perkins)
(Note: *T. pernitida* (Becker), 1924, from Formosa, would run into this couplet but cannot be placed until male genitalia are studied. Crossvein r-m is just beyond basal third, not near basal one-fourth.)
- 76(74) First tergum with a row of prominent black bristles on each side 77
- First tergum lacking bristles on the sides. Genitalia as in figures 57b and c Philippine Islands ... *robusta* n. sp.
- 77(76) Male hypopygium symmetrical, evenly rounded. Hind trochanter with a prominent trapezoid, densely white pubescent, process extending along the ventral surface Cosmopolitan ... *subvivescens* (Loew)
(*aeneiventris* (Kertész, 1912), Formosa, *similans* (Becker, 1924), Formosa, are new synonyms.)
- Not as above. If hypopygium is evenly rounded, no such process is present on the trochanter 78
- 78(77) Hind trochanter unarmed except for small black setae in some cases, or a mound-like gibbosity 79
(Note: *T. pernitida* (Becker, 1924), from Formosa, would run here and is supposedly characterized by being slenderly built with the tibiae yellow with broad blackish brown ring medially. It cannot be placed.)
- Hind trochanter with a prominent subbasal spine on venter. Genitalia as in figures 58b-c New Britain ... *sentis* n. sp.
- 79(78) Humeri black 80
- Humeri yellow 81
- 80(79) Abdomen lightly pollinose on the dorsum, grey on the sides. Wings lightly but distinctly fumose. Eighth segment small, about one-third as long as fifth and with an apical membranous area (fig. 55a). Clasper obtuse at apices (fig. 55b) Japan ... *oryzaetora* (Koizumi)
- Abdomen metallic black, lacking grey pollen on sides. Wings hyaline. Eighth segment one-half as long as fifth with the apical membranous area extending dorsad and bisecting the eighth segment (fig. 51a). Claspers truncate at apices (fig. 51b) Japan ... *inazumae* (Koizumi)
- 81(79) Male with a large membranous area at apex of eighth segment, not completely bisecting segment (fig. 46a) 82

- Male with the membrane, or a longitudinal furrow, completely dividing the eighth segment down the middle of the dorsum (fig. 53a) 87
- 82(81) Hind femora with prominent posteroventral cilia. Tarsi black. Male claspers rather triangular, broad at bases, sharp pointed at apices (fig. 52b) Japan ... *itoi* (Koizumi)
- Not as above 83
- 83(82) Claspers rather short and thick, two times wider at bases than at apices (fig. 49) Australia, Formosa? ... *epichalca* (Perkins)
(Note recorded from Formosa with a ? by Kertész, 1912:287).
- Claspers slender, not strongly thickened at bases 84
- 84(83) Each clasper with a small inwardly directed lobe at about the apical two-thirds to three-fourths (fig. 46b) Philippine Islands ... *calcarata* n. sp.
- Claspers lacking such lobes 85
- 85(84) Ninth segment elongate, two times longer than wide, with a longitudinal groove down the middle and at least three times longer than the sclerotized portion of the eighth segment on the right side as seen from ventral view (fig. 48) ... Cosmopolitan?, Nearctic, Palaearctic and Oriental regions *coquilletti* (Kertész)
- Not as above. Ninth segment usually not much longer than wide and not extending over half way to apex of eighth segment 86
- 86(85) Claspers long and slender, sides nearly straight, at least five times longer than wide, only very slightly incurved, and blunt at apices Philippine Islands ... n. sp. *Epichalca* complex
- Margins of claspers curved, only about three times longer than wide, incurved and subacutely pointed at apices (fig. 61) Java, Philippine Islands? ... *synadelphoides* (de Meijere)
- 87(81) Membranous area of eighth segment not bisecting the segment on the venter (fig. 53b) 88
- Membranous area completely bisecting eighth segment on the venter. Claspers as in figure 60b Australia, Philippine Islands, Bismarck Islands ... *synadelpha* (Perkins)
- 88(87) Hind trochanter of male with a densely grey pubescent mound-like gibbosity beneath and lacking black setae; claspers asymmetrical, comparatively short, the outer thickened and somewhat curved, the inner slightly enlarged at the apex (fig. 53b) Mariana and Caroline Islands ... *micronesiae* Hardy
- Hind trochanter not shaped as above and with short black setae ventrally. Claspers nearly symmetrical, elongate and slender, almost straight-sided (fig. 59) Nearctic, Palaearctic, Ethiopian and Oriental regions ... *sylvatica* (Meigen)

Chalarus spurius (Fallén)

Cephalops spurius Fallén, 1816, *Syrphici Sveciae*, p. 269.

Female specimens on hand from the Philippines appear to be this species although they do not exactly fit Coe's concept of *spurius* (1966a:27 and 1966b:27), and it is probably that when this group is studied from a world standpoint a complex of species may be involved. This is the first record of this genus for the entire Pacific region and the only record from the Orient is that of Brunetti's (1912:495 and 1923:3) of „*Chalarus spurius*“ from Northern India.

This species is readily differentiated by the generic characters. These are primitive flies which have ocellar bristles and the occiput poorly developed, scarcely visible in profile view, also vein M_{1+2} is lacking beyond the r-m crossvein and the m crossvein is lacking. According to Coe's recent classification, *spurius* is differentiated by having a posteroventral fringe of black or brownish, long, curved bristly hairs on the middle femur. The male as viewed from above with the "thorax and scutellum intense black, moderately shining, tergites dull greyish or blackish brown; mid femoral fringe composed of about 18—22 bristly hairs;" clasper rather sharp pointed on inner apex and aedeagus with five long preapical filaments on the upper portion (the latter taken from his figures 33 and 34). The female viewed from above with the "thorax and scutellum greyish-black, shining, tergites lighter brownish-grey, less shining." With the mid femoral fringe composed of about 12—16 bristly hairs, which are finer, slightly shorter and inclined to be brownish rather than black, the ovipositor is short and thick, the piercer is distinctly curved upwards, refer to Coe's figures 41—42.

Length: body, 2.0 mm.; wings, 2.5 mm.

One female, PALAWAN: Pinigisan, 600 m., September 11, 1961, Noona Dan Expedition, caught in Malaise trap outside forest; also one female, LUZON: Camarines Sur, Mt. Isarog, 500 m., April 4, 1963 (H. M. Torrevillas). In B. P. Bishop Museum.

Pipunculus (Cephalosphaera) anorhaebus n. sp. (figs. 5a-e)

This species is readily differentiated from other known *Cephalosphaera* from the Pacific and Southeast Asia (*sylvanus* Brunetti from Malaya and *amboinalis* Walker from Amboina) by having the third antennal segment yellow, short and rounded at apex; by having an apicoventral membranous area on the eighth abdominal

segment of the male which is not visible from direct dorsal view (fig. 5c); and the female ovipositor with a broad thick base and short upcurved piercer (fig. 5e).

Male. Head: Approximately as long as high as seen in direct lateral view. Eye facets uniform in size, not enlarged on anterior portion of head. Eyes joined on about upper third of front leaving just a tiny shining black triangle immediately below the median ocellus to represent upper portion of front. Face equal in width to the portion of front immediately above antennae. Occiput not strongly swollen, comparatively narrow for *Pipunculus*, as seen in direct lateral view about equal in width to the length of five to six rows of eye facets. First two segments of antennae brown to black, third segment bright yellow, short, rounded at apex (fig. 5a). Second segment with strong dorsal and ventral hairs. **Thorax:** Entirely dull black in ground color, grey-brown pollinose on sides. Dorsum greased in male, and the description of the pollinose covering will be based upon the female. Brown pollinosity visible over scutellum. Humeri and halteres dark brown to black. Scutellum with about ten scattered black setae around hind margin. **Legs:** Predominantly dark brown to black with apices of femora and broad bases of tibiae yellow, also with tarsi yellow, tinged with brown. Front tibiae lacking apicoventral bristles. About four erect anterior setae are present at middle of hind tibia. **Wings:** Rather intensely brownish fumose with stigma dark brown and filling all of third costal section and apical part of second costal section. Third costal section about two times longer than fourth and r-m crossvein situated at middle of cell 1st M_2 (fig. 5b). **Abdomen:** Greased on male specimen. It appears to be entirely opaque black with indications of grey vittae at apices of terga. As seen from direct dorsal view the eighth segment is slightly longer than fifth segment and is compressed to the right, no membranous area visible from this view. Sixth tergum slightly visible from above (fig. 5c). As seen from end or ventral view a large ventroapical membranous area covers the entire apex. Ventral aspects of genitalia as in figure 5d. Claspers about two times longer than wide and slightly tapered at apices.

Length: body, 4.3 mm.; wings, 5.5 mm.

Female. Head and antenna as in male except that the facets in front are enlarged about three times larger than the facets of the hind part of the head. Front entirely opaque, grey pollinose and

face entirely grey. Face rather narrow, slightly wider than two rows of anterior eye facets and distinctly narrower than lower portion of front. Front rather sharply narrowed on upper one-fifth, the portion immediately in front of the ocelli about equal in length to median ocellus. Dorsal portion of thorax entirely opaque, grey-brown pollinose. Erect anterior setae are lacking on hind tibiae. Wings less intensely fumose than in the male and third costal section about equal in length to fourth. Abdomen velvety black, with a light grey fascia over posterior margin of each tergum. Sixth segment about equal in length to fifth. Ovipositor base large and thickened, piercer shorter than base and curved upward (fig. 5e). Piercer extends to about the apex of second abdominal segment.

Length: body, 4.0 mm.; wings, 5.0 mm.

Holotype male NEW BRITAIN: Komgi, 1000 m., May 14, 1962, Noona Dan Expedition 61—62. Allotype female NEW BRITAIN: Vaisisi, July 9, 1962, Noona Dan Expedition. — In Zoological Museum, Copenhagen.

***Pipunculus (Cephalosphaera) xanthosternum* n. sp. (figs. 7a-c)**

This species differs from other known *Cephalosphaera* from the south Pacific by having the legs entirely yellow, except for the brown coxae, and by having the sternopleura predominantly yellow.

Male. A large brown winged species. **Head:** Eyes joined for about half the length of front, junction approximately equal in length to lower part of front and front above junction of compound eyes reduced to a tiny triangle immediately below ocelli. Face approximately equal in width to lower portion of front. Antennae entirely yellow, third section short acuminate at apex (fig. 7a). **Thorax:** Shining black, covered with brown pollen over dorsum, with lateral margins of mesonotum, scutellum, most of pleura and humeri yellow in ground color, lightly tinged with brown and covered with yellow-brown to greyish pollen. Sternopleura and hypopleura mostly yellow. Halteres entirely yellow. Metanotum brown, tinged with red in ground color, densely grey pollinose. Propleural fan welldeveloped, made up of about ten long yellow hairs. Scutellum with scattered pale, inconspicuous hairs around hind margin. **Legs:** Coxae brown, tinged with yellow in ground color and covered with grey pubescence. Legs otherwise

entirely yellow, ventral bristles lacking at apices of front tibiae and each hind tibia with two or three rather long brownish yellow anterior bristles at middle. Ventral spines moderately developed near apices of all femora. *Wings*: Predominantly pale brown fumose, hyaline in costal and some of basal cells. Stigma just slightly darker than wing membrane and fills all of third costal section. Third slightly longer than fourth and the two sections combined nearly two times longer than fifth costal section. Appendage on vein M_{1+2} well developed over half length of crossvein and situated about two-fifths the distance from the m crossvein to wing margin, portion of vein beyond appendix curves sharply upward. Crossvein r-m situated near basal third of cell 1st M_2 . *Abdomen*: Predominantly black with a tinge of rufous in ground color of first two segments. Dorsum largely opaque brown, grey on sides and posterolateral margins of terga, and with apical portions of terga subshining (the specimen is slightly greased and it appears probable that the apex of each tergum is broadly grey fasciated). Eighth segment short, approximately one-half as long as fifth segment and with a large membranous area which covers entire apex (fig. 7b). Ventral aspects of male genitalia as in figure 7c. Inner clasper flattened on side.

Length: body, 6.0 mm.; wings, 7.5 mm.

Female unknown.

Holotype male NEW BRITAIN: Silanga, Nakanai Mts., 150 m., July 30, 1956 (E. J. Ford, Jr.). — In the B. P. Bishop Museum.

***Pipunculus (Eudorylas) acroacanthus* n. sp. (figs. 9a-b)**

This species is readily differentiated from all known *Pipunculus* from the Pacific or Southeast Asia by the long bristle-like development of the apex of the third antennal segment (fig. 9a). It would more nearly approach *infissus* n. sp. from the Bismarck Islands but that species has a much shorter point on the third antennal segment, the ovipositors are different in shape (figs. 9b and 18f), the abdomen is distinctly grey fasciated in *infissus* and it also differs in many other respects. This appears to be related to *cinere-scens* Perkins from Queensland, Australia, but differs by lacking the dense covering of grey pubescence over the dorsum of thorax and abdomen which is characteristic of that species; by having the front of the female predominantly polished black rather than entirely grey; by having prominent black hairs or bristles on hind

margin of scutellum, rather than inconspicuous short pale hairs; also the wing venation differs and the ovipositors are different. One notable difference in the venation is that vein Cu_1 plus 1st A is equal in length to the m-cu crossvein and extends to the wing margin. In *cinerescens* this vein is represented by just a short stub beyond the apex of the cubital cell and does not extend to the wing margin.

Female. Front polished black on upper two-thirds, silvery pubescent below. Front comparatively broad, widest in median portion and not strongly narrowed above, at narrowest part approximately equal in width to ocellar triangle. Face just slightly wider than lower portion of front. Facets on anterior portion of head greatly enlarged. Antennae dark brown to black, apex of the third segment nearly two times longer than remainder of segment and about two-thirds as long as arista (fig. 9a). **Thorax:** Grey-brown pollinose on dorsum, grey on sides. Humeri brown to black in ground color. Knobs of halteres yellow-brown. Scutellum with four prominent bristles on hind margin, approximately equal in size to bristles on lateral margins of first abdominal tergum and much larger than I have seen in any other *Pipunculus*. **Legs:** Predominantly black, extreme apices of femora and tibiae and broad bases of tibiae yellow, also first two or three tarsomeres of each leg yellow, tinged with brown. No ventral bristles present at apices of front tibiae. About three prominent, suberect, anterior setae are present on middle of each hind tibia. **Wings:** Hyaline, third costal section equal to fourth and stigma fills almost all of third section. Crossvein r-m situated at basal third of cell 1st M_2 and last section of vein M_{1+2} straight. Third and fourth costal sections comparatively short, two sections combined distinctly shorter than fifth section. **Abdomen:** Entirely opaque, predominantly brown pollinose on dorsum, grey on sides and over first two terga, except for posteromedian portion of second tergum. Sixth segment about equal in length to fifth. Ovipositor base comparatively small, black in ground color covered with grey pollen. Piercer elongate and straight, approximately two times longer than base (fig. 9b) and extending to between second pair of legs.

Length: body, 3.2 mm.; wings, 3.8 mm.

Male unknown.

Holotype female NEW IRELAND: Lemkamin, 900 m., April 13, 1962, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

Pipunculus (Eudorylas) albucus n. sp. (figs. 10a-f)

This species appears to fit near *montanus* de Meijere, from Java, but differs strikingly by having the third costal section shorter than the fourth, rather than two times longer; by having the abdomen entirely opaque brown, slightly grey on the apices of the terga of the male and with incomplete grey fasciae on the terga of the female (fig. 10d), rather than the abdomen being shining black above, grey on the sides. Also the male hypopygium appears to be different in development. In *albucus* the membranous area is apical and does not extend onto the dorsum as in *montanus*.

Male. **Head:** Eyes joined for a distance about equal to the lower portion of front. Lower front subshining black on the specimen at hand; this may be slightly greased and probably the lower front should be grey pollinose as is the face. Face approximately equal in width to lower portion of front. Two basal segments of antennae brown, tinged with yellow. Third segment and bases of arista pale yellow, third is long acuminate (fig. 10a). **Thorax:** Brown pollinose on dorsum, grey on sides. Humeri and stems of halteres yellow, knobs of halteres yellow, tinged lightly with brown. Scutellum with short, inconspicuous pale brown setae around margin. **Legs:** Coxae brown, tinged faintly with yellow, legs otherwise yellow except for discolorations of brown on dorsobasal portions of femora. A prominent yellow ventral bristle is present at middle of each hind tibia. The tarsal claws are normal in development. **Wings:** Hyaline, with stigma very dark brown and filling all of third costal section. Third section just slightly shorter than fourth and r-m crossvein situated near basal third of cell 1st M_2 . Last section of M_{1+2} gently curved (fig. 10f). **Abdomen:** Rounded on sides, broadest at junction of segments 3 and 4. Terga entirely opaque brown on dorsum with faint indications of grey along apices. Lateral margins of terga grey. Eighth segment entirely gray-brown pollinose, compressed to right, about two-thirds as long as fifth abdominal segment and with an apical membranous area on right side (fig. 10b). Sixth tergum not visible from a dorsal view. Ventral aspects of male genitalia as in figure 10c. Claspers long and slender, curved slightly upward and enlarged at apices.

Length: body, 5.0 mm.; wings, 5.9 mm.

Female. Fitting most of the male description. Front comparatively narrow, distinctly narrower than face and at upper portion narrowed to about the width of median ocellus. Front entirely grey

pubescent. Eye facets at anterior portion of head greatly enlarged. Third costal section of wing just slightly shorter than in male. Abdomen predominantly grey. First tergum entirely grey, second grey except for brown pollinose median spot extending to posterior margin. Terga 3—6 brown pollinose through anteromedian portions and with brown pollen extending to posterior margins at middle of each tergum, as in figure 10d. Sixth segment distinctly shorter than fifth, about two-thirds its length. Base of ovipositor black in ground color densely grey pollinose and enlarged, almost globose in shape and nearly equal in size to abdominal segments 5—6, as seen in direct lateral view. Piercer yellow, short and straight, shorter than base, and extends to about apex of second abdominal segment (fig. 10e).

Length: body, 4.3 mm.; wings, 5.0 mm.

Holotype male and allotype female, NEW IRELAND: Lemkamin, 900 m., April 19—20, 1962, caught in Malaise trap, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

***Pipunculus (Eudorylas) anomalus* n. sp. (figs. 11a-c)**

This species fits very close to *cruciator* Perkins from Australia. The male genitalia are quite similar in the two and I had previously treated them as variations of *cruciator*. *P. anomalus* can be differentiated by the very large membranous area covering the entire apex of the eighth segment and almost bisecting that segment in the middle, with the remaining sclerotized bridge of the eighth less than a third as wide as the membranous area (fig. 11a). It also differs by having the femora black except for narrow yellow apices and the tibiae discolored with brown medianly. The ovipositor of the female is distinctly different in *anomalus*. The base is elongate, mostly polished brown to black and the piercer is longer, extending to about the middle of the second abdominal segment (fig. 11c). In *cruciator* the ovipositor base is globose, short, entirely opaque and the piercer extends to about the base of the fourth segment. In other respects fitting the description of *cruciator*, with a deep U-shaped concavity in middle of hind margin of fifth sternum of male, almost completely bisecting the sclerite. The ventral aspects of the genitalia are as in figure 11b. I see no differences in the external genitalia of any of this complex of species, all are characterized by having a suture completely dividing the eighth segment on the right side of the dorsum. In other details it would

fit the description of *cruciator* (Hardy 1964: 98), also *mutillatus* Loew (refer to Hardy 1966:441, as *distocruciator* and to Koizumi 1958:41, as *cruciator*).

Holotype male LUZON: Albay Prov., Mt. Mayon, 16 km. N. W. of Lagaspi, 900—1000 m., May 18, 1962 (H. M. Torre Villas). Allotype female LUZON: Los Banos, September 19—20, 1959, at light (L. W. Quate). Five paratypes, three males, two females from the following localities in the Philippines: LUZON: Mt. Makiling, no date (Baker); Mt. Prov. Abatan, Buguias, 60 S. of Bontoc, 1800—2000 m., May 22—31, 1964 (H. M. Torre Villas); same as type, May 10, 1962, and MINDANAO: Bukidnon, Malaybalay, Alanib, 910 m., October 25, 1959 (L. W. Quate). Also one paratype male LAYTE: Tacaloban, May 6, 1945 (E. S. Ross). — Type, allotype, and one paratype in the B. P. Bishop Museum. Other paratypes in the collections of the U. S. National Museum, California Academy of Sciences, and the University of Hawaii.

***Pipunculus (Eudorylas) ciliatus* de Meijere (figs. 13a-d)**

Pipunculus ciliatus de Meijere, 1907, Tijds. v. Ent. 50:260.

One male specimen on hand from the Philippines fits perfectly the original description and also the description and figure which I made of the type in Amsterdam. The species is very readily recognized by the densely villose posteroventral surfaces of the hind femora, also by the rather strongly narrowed femur base and curved hind tibia (fig. 13b).

Eyes joined for a distance almost equal to length of lower portion of front. Lower front densely grey pubescent and approximately equal in width to face. Upper portion of front polished black and extends for a distance equal to about twelve rows of eye facets. Two basal segments of antenna dark brown, third segment yellow, tinged with brown in ground color and densely silvery pubescent; third moderately acuminate (fig. 13a). Thorax black, covered with brown pollen on dorsum, grey on sides. Humeri yellow, halteres yellow-brown. Very short inconspicuous setae present on hind margin of scutellum. Femora black in ground color, except for narrow apices, and narrow yellow bases of hind pair, rather densely silvery pubescent. Tibiae yellow, tinged with brown medianly and the tarsi brownish yellow. No prominent apical bristles present on front and middle tibiae. Hind coxa with a row of long yellow posterior hairs extending full length of segment and

each hind femur with dense long yellow hairs extending down posteroventral surface. Hind femur rather strongly narrowed basally and tibia arcuate (fig. 13b). Wings subhyaline, stigma brown and filling almost all of third costal section. Third costal section slightly longer than fourth, the two combined one-fifth longer than fifth. Crossvein r-m situated near basal third of cell 1st m_2 and last section of vein M_{1+2} moderately curved. **A b d o m e n** : Predominantly opaque brown pollinose, grey over first tergum, across apex of fifth and with sides narrowly grey. Eighth segment about three-fourths as long as the fifth, with a small membranous area at apex which is not visible from direct dorsal view (fig. 13c). Seventh tergum plainly seen from above. As seen from ventral view genitalia as in figure 13d. Membranous area almost completely bisects eighth segment on venter. Claspers curved upward at apices, shaped as in figure 13d.

Length: body, 4.0 mm.; wings, 4.5 mm.

Female unknown.

Type locality Semarang, Java.

Type in the Zoological Museum, Amsterdam.

One male specimen on hand from NEGROS: Cuernos Mts., no date (Baker). — In the U. S. National Museum collection.

Pipunculus (Eudorylas) cruciator Complex of Species (figs. 14a-b)

Many species have been described which are characterized by having the eighth abdominal segment of the male with a longitudinal division, cleft, extending down the right side on the dorsum and with an apicoventral membranous area which is not visible from dorsal view; the femora brown to blackish medianly, broadly yellow on apices of bases; the third antennal segment short acuminate and yellow to brownish yellow; and the body opaque with the abdominal terga grey and brown. Four such species have been described from the Pacific and Orient. I find no external characters which will differentiate these and am not yet sure how reliable the characters of the ventral aspects of the genitalia are. These need to be studied in much more detail. It appears that some of the genital characters may be somewhat variable; the size of the membranous area on the eighth segment and the shapes of the claspers may vary slightly. The females of this complex have the ovipositor distinctly curved upward.

Typical *crucigera* Perkins, from Queensland, Australia, seems to

differ by having a prominent concavity on the hind margin of the fifth sternum extending almost to the base of the sclerite (fig. 14b) and the claspers distinctly wider than long with the outer clasper lobate at apex and the inner tapered (fig. 14a). The size of the membranous area on the eighth segment either varies in this species or two or more species may be present in this complex in Australia. One on hand has a rather tiny membranous area, its length is equal to the length of the sclerotized portion of the eighth, from the membrane to base of the ninth segment; also in this specimen the tenth segment is pointed on its anterior margins. In other specimens the membranous area is larger, about two times longer than the eighth segment, measured on the mid-line from the membrane to the base of the ninth and the apices of the tenth segment are blunt. Both of these are from Cairns and were collected on the same day, and I suspect they are variations.

The complex in the Pacific and Asia apparently includes the following species: *P. cruciator* Perkins, from Australia; *P. anomalous* n. sp., from the Philippines; and *P. mutillatus* Loew, from Africa, Asia and the Pacific.

***Pipunculus (Eudorylas) deceptor* n. sp. (figs. 15a-d)**

This fits near *infissus* n. sp. but differs by having the third antennal segment less acuminate (figs. 15a and 18a); the female ovipositor straight (fig. 15d); and by the differences in the male genitalia as shown in figures 15c and 18e.

Male. **Head:** Compound eyes joined on front for a distance almost equal to lower portion of front. Lower front and face silvery pubescent and face approximately equal in width to lower front. Basal segment of the antenna dark brown, the third yellow, tinged faintly with brown, apex of third drawn out into a long, slender, bristle-like point (fig. 15a). **Thorax:** Entirely black in ground color including humeri, brown pollinose on dorsum, grey on sides. Scutellum with a row of short black setae around apex. Knobs of halteres brown, stems yellow, tinged with brown. **Legs:** Entirely black, except for extreme apices of femora and bases of tibiae. Femora rather densely grey pollinose. A row of rather long yellow cilia present on each posterior surface of mid and hind femora. Hind tibiae each have about five erect, black, anterior setae in middle. **Wings:** Hyaline, third costal section just slightly longer than fourth and stigma fills almost all of third section. Crossvein

r-m situated near basal two-fifths of cell 1st M_2 and last section of vein M_{1+2} almost straight. **A b d o m e n** : Short, broad, rounded on sides, widest at junction of segments 3 and 4. First two terga entirely grey pollinose. Terga 3—5 opaque brown on dorsum, grey on extreme lateral margins. Sides of abdomen rather sparsely yellow pilose. Eighth segment rather short, rounded, about equal in length to fifth and with a longitudinal membranous area extending over apex (fig. 15b). Ninth segment just slightly visible as seen in direct dorsal view but plainly visible as seen from right side of abdomen. Seventh tergum slightly visible from dorsal view. Ventral aspects of genitalia as in figure 15c; both claspers tapered but blunt at apices.

Length: body, 4.0 mm.; wings, 4.3 mm.

F e m a l e : Fitting most of the details of the male. Front entirely opaque, silvery-grey over lower one-third, yellow-grey in median portion and dull black on upper one-third, slightly expanded in median portion. Face comparatively narrow, equal in width to two rows of enlarged median eye facets and just slightly narrower than lower part of front just above the antennae. Facets at anterior portion of the head, surrounding antennae greatly enlarged compared to those of remainder of eyes, four to five times larger. Antennae shaped as in male. Last section of vein M_{1+2} rather strongly bent beyond basal one-third. Apical portion of cell R_5 very narrow, the width equal to scarcely half the length of r-m crossvein. Crossvein m distinctly concave in middle. Abdomen grey on first tergum and on sides, opaque brownish pollinose on dorsum. Sixth abdominal segment one-half longer than fifth, as seen in direct dorsal view. Ovipositor rather elongate, piercer straight and extends almost to base of abdomen (fig. 15d). Base of ovipositor brown, tinged with yellow and rather densely grey pubescent; the piercer is yellow.

Length: body, 4.25 mm.; wings, 4.7 mm.

Holotype male and allotype female, TAWI TAWI: Tarawakan, October 31—November 3, 1961, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

Pipunculus (Eudorylas) formosanus Kertész (figs. 16a-e)

Pipunculus formosanus Kertész, 1912, Ann. Mus. Nat. Hung. 10:298; Becker, T. 1924, Ent. Mitteil. 13(1):17.

One male specimen on hand from the Philippines fits the orig-

inal description of *formosanus* and also the description and figure which I made based upon two males from Formosa in the Deutsches Entomologisches Institut collection which had been determined by Hennig. The external characters appear to be identical with *formosanus*. This species fits close to *totoniger* n. sp. from the Bismarck Islands, but is differentiated by the third costal section being about equal to the fourth, rather than two times longer than the fourth; by having the last section of vein M_{1+2} straight, rather than strongly curved; the middle tibiae lacking the row of posterior bristles on the basal portion, which is characteristic of *totoniger*; also the claspers are very differently developed in the two species (figs. 16d and 31d).

The following notes are based on the specimen from the Philippines. Eyes joined for a distance equal to lower portion of front. Lower front grey pubescent, it has been rubbed in the upper portion on specimen at hand. Face about equal in width to lower front. First two antennal segments dark brown, third yellow, tinged with brown, and short acute to obtuse at apex (fig. 16a) (the specimens from Formosa which I have studied have the third antennal segment brown). **T h o r a x** : Densely brown pollinose on dorsum, grey on sides. Humeri yellow, tinged slightly with brown. Knobs of halteres dark brown (note: the specimens from Formosa have the halteres yellow). Scutellum with a row of black setae around apex. **L e g s** : Predominantly black, narrow apices and rather broad bases of tibiae yellow. Front and middle tibiae lack ventral bristles at apices and a row of four or more short, black, suberect setae present on the anterior surface of each hind tibia. **W i n g s** : Subhyaline, tinged with brown on distal two-thirds to three-fourths. Stigma dark brown and fills all of third costal section. Third section equal in length to fourth and two sections combined distinctly longer than fifth. Crossvein r-m situated near basal third of cell 1st M_2 and last section of vein M_{1+2} straight. **A b d o m e n** : Opaque. Predomenantly brownish pollinose, grey over first tergum and over apices of terga 2—5. Eighth segment grey-brown pollinose, almost as long as fifth segment and with a large membranous area at apex which is not visible from direct dorsal view (fig. 16c). Seventh tergum visible from above. As seen from ventral view genitalia as in figure 16d; membranous area covers entire apex of eighth segment, and claspers short and thick, scarcely over one-half longer than wide and broadly rounded at apices.

Length: body, 4.0 mm.

One female specimen on hand which appears to fit the description of that sex given by Becker (*loc. cit.*). It would differ from the male by having the third antennal segment acutely pointed (fig. 16b). The front almost parallel-sided, just slightly narrowed on upper portion before ocellar triangle. Face about equal in width to front. Legs with more yellow markings than in male, basal halves of tibiae and also apices yellow and tarsi predominantly yellow. Third and fourth costal sections combined scarcely longer than fifth. Sixth abdominal segment about two times longer than fifth, and ovipositor base rather elongate with piercer evenly tapered from base, no distinct separation present. Piercer curves upward rather strongly and extends almost to base of abdomen (fig. 16e).

Type locality: Takao, Formosa.

Type probably was in the Hungarian National Museum and has been lost.

The male specimen is in the B. P. Bishop Museum from LUZON: Camarines Sur, Mt. Isarog, 750—800 m., April 18, 1963 (H. M. Torrevillas). The female specimen is in the Noona Dan Expedition collection from TAWI TAWI: Tarawakan, October 24, 1961. — The male in the B. P. Bishop Museum, the female in the Zoological Museum, Copenhagen.

***Pipunculus (Eudorylas) holosericeus* Becker (figs. 17a-e)**

Pipunculus holosericeus Becker, 1897, Berl. Ent. Zeits. 42:55; Sack, P., 1935, Dorylaidae, Fam. 32, in Lindner Die Fliegen der Pal. Reg. 4 (5):33, fig. 28.

One specimen on hand from the Philippines appears to fit the original description of *holosericeus* (from Europe) and fits in almost all details the description I made of specimens in the Deutsches Entomologisches Institut, from Formosa, which had been determined as *holosericeus*. The only differences I find in the specimen at hand and the one I studied from Formosa is that the humerus is black, not yellow, and the r-m is situated near the basal one-third to one-fourth of cell 1st M_2 , not just before the middle of that cell. The original description says the humerus of *holosericeus* is coffee-brown and the r-m crossvein is at the basal third of cell 1st M_2 . The antennae were missing from the Formosan specimens; the original description gives these as short acuminate. This would fit the species at hand. I did not make careful notes on the leg

characteristics. The species on hand has a prominent row of erect anterior setae (small bristles extending over the basal half of the segment), this is not noted in the original description of *holosericeus* and the specimen at hand may represent a new species.

This species is differentiated by its very short rounded hypopygium, with a vertical membranous area extending over the apex (not visible from dorsal view) (figs. 17c-e).

The following notes are based on the specimen at hand.

M a l e. Eyes joined for a distance almost equal in length to lower portion of front, lower front dull grey. Face approximately equal in width to lower front. Antennae black, third segment short acuminate (fig. 17a). Thorax rather densely brownish pollinose over dorsum, grey on sides. Humeri black, tinged with rufous around anterior margin. Knobs of halteres black. Scutellum with conspicuous, rather long, black hairs around margin. **L e g s :** Almost entirely black, yellow at narrow apices of femora and bases of tibiae. Ventral spines or bristles lacking at apices of front and middle tibiae. Each middle tibia with a prominent row of erect black posterior setae (bristles) on basal half of segment (fig. 17b). Hind tibiae lack prominent erect bristles on the anterior surfaces. **W i n g s :** Subhyaline, faintly tinged on outer two-thirds (the original description says the wings are hyaline). Third costal section about one-half longer than fourth and stigma fills almost all of third section. Third and fourth sections combined just slightly longer than fifth. Crossvein r-m situated near basal third of cell 1st M_2 and last section of vein M_{1+2} gently curved. **A b d o m e n :** Opaque, slightly rounded on sides, widest at segment three. First tergum grey, other terga velvety black on bases, dull faintly subshining greyish on apices. Eighth segment very short, about one-third as long as fifth and the membranous area is scarcely visible from direct dorsal view (fig. 17c). As seen from end the membrane is narrow and extends diagonally over segment (fig. 17d). Eighth segment very densely setose. As seen from ventral view genitalia are most characteristic; claspers strongly flattened laterally, outer greatly enlarged, rather plate-like, about equal in size to right-hand lobe of ninth segment (fig. 17e).

Length: body, 3.5 mm.

Sack (1935: plate 3, figure 28) illustrates the female of *holosericeus*. The ovipositor is strongly curved, the base and piercer are not clearly differentiated and are evenly tapered. The base of the piercer is rather thickened.

Type locality: two localities were given in the original description: "Mori," listed as being in Professor Bezzi's collection and "Sievenburgen," listed as being in Dr. Becker's collection. The type may be in the Zoological Museum of the Humboldt University, Berlin.

The specimen on hand is from MINDANAO: Bukidnon, 1250 m., Mt. Katanglad, December 4—9, 1959 (L. W. Quate). — In the B. P. Bishop Museum.

Pipunculus (Eudorylas) infissus n. sp. (figs. 18a-f)

This species fits near *acroacanthus* n. sp. from New Ireland but is differentiated by lacking the bristle-like development at apex of third antennal segment (figs. 9a and 18a); by having the abdomen distinctly grey fasciated; the antennae yellow and the female ovipositors different in shape (figs. 9b and 18f).

Male. Head: Compound eyes joined for a distance almost equal to twice the length of lower front. Lower portion of front comparatively short, equal in length to fourteen rows of eye facets and densely grey pubescent. Face almost equal in width to lower portion of front. Antennae entirely yellow, third segment long acuminate (fig. 18a). **Thorax:** Entirely opaque, brown on dorsum, grey-brown on sides. Scutellum subshining around margin and with about eight short brown marginal setae on each side. Humeri dark brown to black in ground color. Halteres yellow on stems, yellow-brown on knobs. **Legs:** Femora black, broadly yellow at apices and covered with grey pollen. Tibiae brown to black in median portions. Front tibiae lack ventroapical bristles, and only one or two rather prominent suberect anterior setae are present at middle of hind tibia. Tarsal claws are normal in development. **Wings:** Hyaline. Third costal section almost two times longer than fourth and stigma fills all of third section; third and fourth sections combined are slightly longer than the fifth costal section. Crossvein r-m situated near basal two-fifths of cell 1st M_2 and last section of vein M_{1+2} straight or nearly so (fig. 18c). **Abdomen:** Opaque black at bases of terga, conspicuously grey fasciated at apices of segments. Abdomen rounded on sides, widest at about third segment. Eighth segment entirely grey pollinose, about equal in length to fifth and with a large membranous area extending across apex, partially bisecting segment as seen in dorsal view (fig. 18d). As seen from above the seventh tergum is partially

visible. Ventral aspects of genitalia as in figure 18e. Claspers broad, concave at apices, each with a prominent lobe developed on inner apex.

Length: body, 4.3 mm.; wings, 5.0 mm.

Female: Similar to male, with the third antennal segment even more acuminate below (fig. 18b). Front entirely grey pollinose, slightly narrower than face and gradually narrowed on upper two-thirds until it is scarcely wider than median ocellus. Grey fasciae on posterior halves of terga very prominent as in the male but indistinctly divided by a longitudinal brown fascia down median portions of terga 3—6. Sixth tergum about equal in length to fifth. Ovipositor base small, rounded, reddish-brown in ground color, covered with grey pubescence. Piercer yellow, about two times longer than base and extending up between hind legs, almost to base of second abdominal segment (fig. 18f).

Length: body, 4.0 mm.; wings, 4.8 mm.

Holotype male and allotype female Bismarck Islands, LAVONGAI (New Hanover): Banatam, March 23, 1962, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

***Pipunculus (Eudorylas) javanensis* de Meijere (figs. 19a-d)**

Pipunculus javanensis de Meijere, 1907, Tijds. v. Ent. 50:262.

Dorilas (Eudorylas) tsuboi Koizumi, 1959, Sci. Rep. Fac. Agric. Okayama University 13:40, is a new synonym.

One male specimen is on hand from the Philippines which fits the original description and my redescription and figure of the type which was made at the Zoological Museum, Amsterdam.

This species is differentiated by the large apical membranous area on the hypopygium (fig. 19b) in combination with the opaque body, acuminate third antennal segment (fig. 19a), brown to black femora and by the wing venation.

Junction of compound eyes very short, about equal in length to five or six rows of eye facets. Upper portion of front almost as long as lower, entirely subshining black; lower front dull grey pubescent on upper half, silvery on lower portion. Face about equal in width to lower portion of front. Antennae brown, tinged with yellow, third segment acuminate (fig. 19a), rather densely silvery grey pubescent. Thorax brown pollinose on dorsum, grey on sides. Humeri and halteres yellow; hairs in row on hind margin of scutellum short and inconspicuous. Coxae dark brown to black, covered

with grey pubescence. Femora predominantly dark brown to black, grey pubescent, yellow on narrow apices. Tibiae yellow, discolored with brown medianly. Tarsi yellow, except for the brown apical tarsomeres. Ventral bristles at apices of front and middle tibiae short, rather inconspicuous. One or two prominent black setae present on the anterior surface of each hind tibia. Wings: Subhyaline, stigma pale brown and not quite filling all of third costal section. Third section one-third to one-half longer than fourth and two sections combined distinctly longer than fifth. Crossvein r-m situated just beyond basal third of cell 1st M_2 and last section of vein M_{1+2} gently curved. First tergum of abdomen with five or six strong black bristles on each side and entirely grey. Second pre-eminently grey, brown pollinose at apex. Terga 3—5 mostly brown pollinose, grey on sides and posterolateral margins. Eighth segment brown pollinose, nearly equal in length to fifth segment and with a large apical membranous area (fig. 19b). As seen from ventral view the membranous area covers apex of eighth segment. Claspers rather broad, slightly pointed at inner apices (fig. 19c).

Length: body, 3.2 mm.; wings, 3.5 mm.

The females fit near *cruciator* and *anomalus* but are differentiated by having the antennae entirely dark brown to black, also the ovipositor is different in development and the legs are predominantly black.

The front is entirely opaque grey and the sides are almost parallel. The face is about equal in width to the front. The third antennal segment is slightly more acuminate than in the male. Abdomen: Entirely opaque, chiefly brownish on the dorsum, grey on sides and posterolateral margins of terga. The sixth segment is at least one-half longer than the fifth. The base of the ovipositor is predominantly polished black, elongate oval and almost two times longer than wide. The piercer is yellow, strongly curved upward and just slightly longer than the base (fig. 19d). The piercer extends about to the middle of the second abdominal segment.

Length: body, 3.0 mm.; wings, 3.5 mm. Koizumi recorded the length of the female body as 3.0—3.5 mm., wings, 4.0—4.2 mm.

Type locality Semarang, Java.

Type in the Zoological Museum, Amsterdam.

One male LUZON: Mt. Makiling, no date (Baker), in U. S. National Museum collection; and one male from PALAWAN: Brooke's Point, Uring Uring, September 24, 1961, Noona Dan Expedition;

also two female specimens from the Bismarck Islands, LAVONGAI: Banatam, March 20—23, 1962, Noona Dan Expedition.

Pipunculus (Eudorylas) macropygus de Meijere (figs. 21a-e)

Pipunculus macropygus de Meijere, 1941, Tijds. v. Ent. 57:167, figs. 4-5.

Pipunculus chalybeus Brunetti, 1923, Fauna Brit. India. Dipt. 3:15. Apparently a new synonym, I have studied the type in the British Museum (Natural History) and see no way to separate these. The ventral aspects of the male genitalia of *chalybeus* have not been studied.

Specimens on hand from the Philippines and Bismarck Islands appear to belong here. They fit the original description and the description and figure of the external genitalia which I made of the type in the Zoological Museum, Amsterdam. The ventral aspects of the genitalia of the type (or specimens from Java) have not been studied and it is possible that the one from the Philippines may prove to be a distinct species. This species, along with *roralis* (Kertész), belongs in a complex which is characterized by lacking bristles or strong hairs on the sides of the first abdominal tergum and having the male hypopygium globose with the ninth segment plainly visible from dorsal view. This complex appears to be best developed in Australia where five species are known (refer to Hardy, 1964:86). The two known species from the Pacific and from Formosa show close relationship to Australian species but exhibit distinctive differences. *P. macropygus* fits near *beneficiens* Perkins from Australia, but differs by having the junction of the eyes in the male very short, about one-fourth as long as the lower portion of the front, rather than having the junction of the eyes equal in length to the lower front. The male genitalia are differently shaped. The eighth segment is much larger, two times longer than the fifth segment, rather than about equal to it and when viewed from the right side the eighth segment is longer than the ninth rather than vice-versa. Also, the left side of the eighth segment is bare of pollen (polished black) only on the anterior portion, rather than the entire left side being polished. From dorsal view the hypopygium is similar to that of *koebelei* Perkins but the junction of the compound eyes is much shorter; the abdomen is submetallic black, rather than opaque brown; as seen from right side the ninth segment is much larger, one-half to two-thirds longer than fifth segment and two-thirds to three-fourths as long as the eighth segment rather than the ninth being about equal in length to the fifth and about

one-half as long as the eighth as in *koebeleri* (refer to Hardy 1964, figure 15d:110). The ovipositor is shorter in *macropygus*, extending to about the base of the fourth segment rather than the base of the third. The following description is based on specimens from Mindanao.

Male. Junction of compound eyes short, slightly less than length of front above junction. Lower front and base silvery-grey pubescent. Face approximately equal in width to lower portion of front. Antennae brown to black densely grey pubescent on third segment. Third antennal segment moderately acuminate (fig. 21a). Palpi dark brown to black. Labella yellow. Occiput grey on sides, subshining black on upper portion. Thorax shining black on dorsum, rather thinly covered with brown pollen and densely grey pollinose on sides. Humeri dark brown to black. Legs mostly dark brown to black, tibiae yellow at bases and apices, discolored with brown medianly and basal tarsomeres yellow, tinged with brown. Apical spur of front tibia yellow and extends about one-third length of basitarsus. No prominent erect bristles present on the anterior median surface of hind tibia but with two suberect short setae. Hind trochanters thickly setose ventrally (fig. 21b). Wings hyaline. Third costal section about equal to fourth and stigma fills most of third section. Crossvein r-m situated near basal third of cell 1st M_2 . Abdomen shining black, grey on sides of segments. Eighth segment symmetrical as seen from dorsal view, distinctly broader and almost two times longer than fifth abdominal. No membranous area developed on eighth segment and ninth segment plainly visible from dorsal view (fig. 21c). Ninth segment occupies most of right side of hypopygium as seen from dorsal view. From ventral view genitalia as in figure 21d, outer clasper tapered to a rather blunt point, inner almost square, nearly truncate at apex, slightly pointed on inner and outer apices.

Length: body, 3.2 mm.; wings, 3.7 mm.

Female. The female specimen which appears to belong here is headless. It fits the description of the male except for sexual differences. Ventral bristle at apex of front tibia more strongly developed in female, extending half the length of basitarsus. Abdomen polished black in ground color, lightly grey pollinose on dorsum, more distinctly greyed on sides. As seen from above sixth tergum approximately equal in length to fifth. Base of female ovipositor globose, piercer short and straight, just slightly longer than base (fig. 21e).

Type locality, Wonosobo, Java.

Type in Zoological Museum, Amsterdam.

Eleven specimens are on hand, from the following locations in the Philippines. MINDANAO: Sapamoro, Curuan District, December 21, 1961, Noona Dan Expedition; LUZON: Mt. Makiling, no date (Baker) (U. S. National Museum); CULION: 6 km W. Culion, June 6, 1962, Malaise trap (H. Holtmann); LUZON: Camarines Sur, Mt. Isarog, 600 m., September 20, 1964 (M. D. Delfinado); Albay Prov., Mt. Mayon, 16 km. N. W. of Lagaspi, 900—1000 m., May 6—10, 1962 (H. M. Torrevillas); NEGROS ORIENTAL: Mt. Talinas, 1000 m., December 29—31, 1960 (H. M. Torrevillas) (The latter four localities in B. P. Bishop Museum). Also 30 specimens are in the Noona Dan Expedition collection from the Bismarck Islands, NEW IRELAND: Lemkamin, 900 m., April 7—23, 1962; and NEW BRITAIN: Yalom, 1000 m., May 13—14, 1962.

Pipunculus (Eudorylas) monothrix n. sp. (figs. 22a-d)

This species is differentiated from other known *Eudorylas* from the Pacific by having the abdomen polished black, very lightly dusted with grey-brown, and the front tibiae each with a prominent posterior bristle near the middle. Also, the genitalia of both sexes are distinctive (figs. 22b-d).

Male. **Head:** Eyes joined over most of length of upper portion of front, just a narrow triangular space present immediately below median ocellus. Lower front entirely grey pubescent and just above the antennae about equal in width to face. First two antennal segments dark brown, third segment yellow, rather long acuminate at apex (fig. 22a). **Thorax:** polished black in ground color, brownish grey pollinose on dorsum but with ground color shining through. Sides entirely opaque grey. Humeri yellow. Stems of halteres yellow, knobs brown, tinged with yellow. Scutellum with scattered short hairs around margin and a few hairs on disc near the lateral margins. **Legs:** Femora predominantly black, front and middle pair very narrowly yellowed at bases, rather broadly so at apices; hind femur rather broadly yellowed at base, more narrowly at apex. Tibiae mostly yellow, tinged with brown medianly. A rather prominent posterior bristle present at about apical three-fifths of each front tibia and a rather prominent ventral bristle present at apex. Each hind tibia also with a prominent anterior seta in middle and each middle tibia sometimes has a

rather prominent posterior seta in middle of segment. Wings: Faintly infuscated. Stigma pale brown and fills all of third costal section. Third section about one-half longer than fourth and two sections combined equal in length to fifth. Crossvein r-m situated near basal third of cell 1st M_2 and last section of vein M_{1+2} straight or nearly so. Vein Cu_1 plus 1st A rather elongate, one-half to nearly two times longer than m-cu crossvein. Abdomen: First tergum entirely grey, base of second tergum brown pollinose; abdomen otherwise polished black, very lightly dusted with grey-brown pollen but with ground color clearly shining through. Eighth segment about two-thirds as long as fifth and with a large membranous area covering entire apex, also a basal cleft present (fig. 22b). Ventral aspects of genitalia as in figure 22c. Claspers rounded, blunt at apices.

Female. Fitting the description of the male in most respects. Front rather broad, almost parallel sided, not at all narrowed on upper portion. Upper two-fifths to one-half of front polished black. Sixth abdominal segment approximately equal in length to fifth. Base of ovipositor dark brown to black, rather small and globose, piercer just slightly longer than base (fig. 22d). The females resemble those of *macropygus* but can be differentiated by the row of prominent bristles on the sides of the first abdominal tergum.

Length: as in the male.

Holotype male and allotype female Bismarck Islands, NEW BRITAIN: Yalom, 1000 m., May 12—13, 1962, caught in Malaise trap, Noona Dan Expedition. Five paratypes, three males, two females. Three same data as type, May 10—24, 1962; one NEW IRELAND: Lemkamin, 900 m., April 15, 1962, caught in Malaise trap, and one LAVONGAI: Banatam, March 18, 1962. — Type, allotype, and two paratypes returned to the Zoological Museum, Copenhagen. The remainder of the paratypes in the collections of the B. P. Bishop Museum and the University of Hawaii.

***Pipunculus (Eudorylas) mutillatus* Loew (figs. 24a-b)**

Pipunculus mutillatus Loew, 1857, K. Svenska Vetensk. Akad. öfversigt af . . . Förhandl. 14:374 (misspelled *mutillatus* by Loew, 1860 Dipterenfauna Südafrikas 1:283 and by Kertész, 1909, Cat. Dipt. VI:377); Hardy, 1949, Mem. Inst. Roy. des Sci. Nat. de Belgique 2nd ser. fasc. 36:44, figs. 29a-c.

Pipunculus aequalis Becker, 1924, Ent. Mitt. 13:16. New synonym. Type locality: Formosa.

Pipunculus matema Curran 1936, Proc. Calif. Acad. Sci. Ser. 4, 22:22. New synonymy. Type locality: Matema Island, Santa Cruz group.

Pipunculus (Eudorylas) hiatus Hardy, 1956, Ins. of Micronesia 13(1):5 figs. 3a-b. New synonymy. Type locality: Caroline Islands, Yap.

Pipunculus (Eudorylas) distocruciator Hardy, 1966, Bul. Brit. Mus. (Nat. Hist.), Ent., 17(10):441, figs. 4-7. New synonymy. Type locality: E. Nepal.

Pipunculus (Eudorylas) cruciator Koizumi, nec Perkins, 1959, Sci. Reports Fac. Agric. Okayama Univ. 13:41.

The above synonymies are based upon a study of types or paratypes compared with specimens of *mutillatus* from Africa.

Pipunculus hepaticolor de Meijere nec Becker, 1907, Tijds. v. Ent. 50:259. Recorded what he considered to be the males of *hepaticolor* from Java. I have studied de Meijere specimens in the Zoological Museum, Amsterdam, and they probably are *mutillatus* although the ventral aspects of the genitalia were not studied and its position is not certain.

Pipunculus aequalis Becker (1924:16), from Formosa, is a new synonym of *mutillatus*. I have studied the type male in the Deutsches Entomologisches Inst. Eberswalde, and the genitalia differ from typical *mutillatus* only in having the inner clasper longer, more pointed. I do not consider this to be of significance. This is no doubt the species recorded as *cruciator* Perkins, from Formosa, by Kertész (1912:296). Specimens on hand from Hong Kong had been assumed to be *aequalis* but they differ by having the fifth sternum deeply cleft on hind margin, as in *cruciator* Perkins. They differ from *cruciator* by having the claspers short and broad, as wide as long and not tapered.

Type locality: Caffraria.

Type in the Deutsches Entomologisches Institut.

Distribution: widespread over Africa and evidently over Asia and the southwest Pacific.

This species is evidently an important parasite of rice leafhoppers. In Japan it has been reared from the green rice leafhopper, *Nephotettix cincticeps* Uhler.

Two specimens on hand from the Philippines: Mt. Prov. Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., April 30—May 31, 1964 (H. M. Torre Villas—Bishop Museum coll.). Also two specimens, one male, one female from NEW BRITAIN: Vunabakan,

180 m., 10 km. east of Keravat, November 16—20, 1959 (T. C. Maa—B. P. Bishop Museum), and Yalom, 1000 m., May 18, 1962, Noona Dan Expedition.

Pipunculus (Eudorylas) mutuus n. sp. (figs. 25a-c)

This species fits near *atratus* de Meijere, from Java, but is differentiated by having the third costal section equal or slightly shorter than the fourth, rather than two times longer than the fourth; by having the male hypopygium rather strongly compressed to the right and with a membranous area on the right side of the apex (fig. 25b), rather than the hypopygium not compressed and with a large membranous covering the apex. Also, *atratus* is apparently a larger species, de Meijere measured the wing as 4.5 mm.; the wing of *mutuus* is 3.0 mm. in length.

Male Head: Lower portion of front rather broad, distinctly wider than face, raised down the middle and with a polished black spot in middle of raised area. Front otherwise opaque black with a line of grey pubescence on each side of polished spot. Face entirely grey pubescent and equal in width to about three rows of eye facets. Eyes joined for about three-fifths distance from lower ocellus to antenna and junction extends almost to ocelli; a very tiny triangle of black present immediately below lower ocellus. Antennae brown to black, third segment short, obtuse at apex (fig. 25a). Palpi and mouthparts brown. **Thorax:** Shining black in ground color, grey-brown pollinose, faintly subshining on dorsum, grey on sides. Humeri dark brown to black, knobs of halteres brownish yellow. Scutellum with just a few short inconspicuous black setae around the margin. **Legs:** Predominantly black, yellow at apices of femora and broad bases of tibiae, and with basal tarsomeres yellow-brown. **Wings:** Subhyaline, very faintly infuscated. Third costal section just slightly shorter than fourth and stigma pale brown and fills almost all of third section. Crossvein r-m situated near basal one-third of cell 1st M_2 and last section of vein M_{1+2} gently curved. Apex of cell R_5 about equal in length to r-m crossvein. **Abdomen:** Predominantly opaque black covered with brown pollen on dorsum, greyish on sides and on first tergum; with extreme apex of second tergum subshining and narrow apex of third tergum and broad apices of terga four and five polished black; the polished area extends over apical half of fifth tergum. Eighth segment rather strongly compressed to right and

membranous area situated on right side of apex. As seen from dorsal view tergum plainly visible and genitalia are approximately two-thirds as long as fifth segment (fig. 25b). As seen from ventral view genitalia are as in figure 25c. Membranous area confined to the apex of eighth segment. Claspers incurved, rather sharply pointed at apices.

Length: body, 2.5 mm.; wings, 3.0 mm.

Female unknown.

Holotype male NEW IRELAND: Lemkamin, 900 m., April 7, 1962, Noona Dan Expedition. — In Zoological Museum, Copenhagen.

Pipunculus (Eudorylas) orientalis (Koizumi) (figs. 26a-c)

Dorilas (Eudorylas) orientalis Koizumi, 1959, Sci. Rep. Fac. Agric. Okayama Univ., 13:43, figs. 4a-c.

Eudorylas orientalis Koizumi, 1960, Sci. Rep. Fac. Agric. Okayama Univ., 16:41, figs. 5a-e.

One male specimen on hand from New Britain fits the very excellent description and figures given by Koizumi. These are obviously the same species.

This species is readily differentiated by the large membranous area over the apex of the eighth segment of the male which extends onto the dorsum almost completely bisecting the segment down the middle from both dorsal and ventral views (figs. 26b-c). Also by the very characteristic shapes of the claspers.

Rather small opaque brown to black species. Eyes of male joined for about length of lower portion of front. Antennae black, third segment rather long acuminate (fig. 26a). *Legs*: Chiefly black, extreme apices of femora and bases of tibiae yellow, apicoventral bristles on front and middle tibiae rather small, their length less than width of tibia. *Wings*: Hyaline, stigma filling all of third costal section. Third section approximately two times longer than fourth and fifth section at least one-third longer than section three plus four. Crossvein r-m situated at basal third of cell 1st M_2 . *Abdomen*: opaque black, grey on sides and with rather faint grey fasciae along posterior margins of segments 2—5. These are interrupted in middle of terga 2—4. Eighth segment about three-fourths as long as fifth as seen in dorsal view and with a prominent membranous depression extending over apex, almost bisecting the segment (fig. 26b). As seen from ventral view claspers curved outward at apices and sharply pointed (fig. 26c).

Length: body, 2.5—2.8 mm.; wings, 3.0—3.3 mm.

From Koizumi's description the female has the front shining black on the upper two-thirds, is widest at about the middle and slightly narrowed toward the antennae and the vertex. The base of the ovipositor is globular, opaque black with grey pollen. Piercer reddish-yellow, straight and slender, reaching to base of third abdominal segment and approximately two times longer than the base.

Type locality Tsushima, Okayama, Japan.

Type in the collection of the Entomological Laboratory, Faculty of Agriculture, Okayama University.

Host. This species is apparently common in paddy fields in Japan and has been reared from the green rice leafhopper, *Nephotettix cincticeps*.

One male specimen on hand NEW BRITAIN: Valoka, July 8, 1962, caught in Malaise trap, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

Pipunculus (Eudorylas) phatnomus n. sp. (figs. 28a-c)

This species is differentiated from all other known *Eudorylas* from the Pacific by having the eyes of the male distinctly separated on the front, also by the unusual development of the male genitalia (figs. 28b-c).

Male. Head: At narrowest point front about equal in width to median ocellus and entirely grey pollinose or pubescent except for a short area on upper part below ocelli. Face approximately equal in width to lower portion of front. Antennae black, covered with silvery-grey pubescence, especially notable on third segment. Third segment short, obtuse at apex (fig. 28a). **Thorax:** Subshining black, rather lightly brown pollinose over most of dorsum, conspicuously grey on posterolateral margins, pleura and metanotum densely grey pubescent. Halteres and humeri yellow, latter faintly tinged with brown on knobs. Scutellum with just few short inconspicuous setae scattered along hind margin. **Legs:** Coxae black, covered with grey pollen. Trochanters yellow-brown, hind pair densely grey pubescent ventrally and with some short yellow pile. Femora predominantly dark brown to black, tinged faintly with red in ground color and covered with grey pubescence. Ventral spines well developed and posteroventral row extends almost full length of segment on middle pair. Posterior surface of each

mid and hind femur rather thickly covered with short, inconspicuous white hair. Tibiae yellow, tinged with brown medianly and with no ventral bristles at apices of front and middle pairs. Hind tibiae lacking erect setae on anterior surface. Tarsi yellow, tinged faintly with brown at apices. Claws small, not longer than last tarsomere. *Wings*: Hyaline, and short compared to length of body. Stigma brown and fills almost all of third costal section. Third section approximately equal in length to fourth and two sections combined about two-thirds to three-fourths as long as fifth. Crossvein r-m situated near basal third of cell 1st M_2 and last section of vein M_{1+2} moderately curved. *Abdomen*: Grey over first tergum, subshining brown over other terga, grey pollinose on posterolateral margins. First tergum with four black bristles in an irregular row on each side and with an abundance of yellow pile on sides. Eighth segment brown pubescent, almost equal in length to fifth and with the large membranous area covering most of dorsum (fig. 28b). Seventh tergum not visible from direct dorsal view. As seen from ventral view the membranous area completely bisects eighth segment. Claspers narrowed, rather strongly flattened laterally at apices and with a prominent tooth-like process developed on entire margin of outside clasper (fig. 28c).

Length: body, 5.5 mm.; wings, 4.75 mm.

Female unknown.

Holotype male LUZON: Mt. Makiling, no date (Baker). — In the U. S. National Museum.

***Pipunculus (Eudorylas) roralis* (Kertész) (figs. 29a-e)**

Dorilas roralis Kertész, 1915, Ann. Mus. Nat. Hung. 13:389, figs. 3a-c.

This species fits very close to *macropygus* de Meijere because of the symmetrical eighth segment of the male. It is differentiated by having the eighth broader than the fifth abdominal segment and just slightly longer than that segment (fig. 29b); and by having the inner clasper tapered at the apex (fig. 29c), rather than being almost square in shape (fig. 21d). This runs to *helluo* Perkins, from Australia, and differs by having the junction of the eyes of the male very short, not over half as long as the lower portion of the front, rather than equal to the front; by having the body subshining black, not entirely opaque brown and grey. The genitalia are very similar in the two species, the only differences I see are in the ventral aspects. In *roralis* the claspers are differently shaped, com-

pare figure 29c with figure 13c (Hardy 1964:107). *P. roralis* has a prominent process developed at the base of the outside surface of the inner clasper, also the anterior margin of the eighth segment has a prominent swelling as in figure 29c.

Male. Fitting the description of *macropygus* in most details. **Head:** Junction of compound eyes about equal to upper portion of front. Lower front and face silvery pubescent. Face approximately equal in width to lower part of front. Antennae brown, third segment grey pubescent and moderately acuminate (fig. 29a). **Thorax:** Shining black in ground color, rather densely brownish grey pubescent on dorsum, grey on sides. Humeri entirely brown. Halteres yellow brown. **Legs:** Predominantly black, yellow at apices and bases of tibiae and on basal tarsomeres. Ventral bristle at apex of front tibia short, its length subequal to width of tibia and approximately one-fourth as long as basitarsus. No prominent setae situated on anterior surface of hind tibia. **Wings:** Hyaline, with third costal section equal in length to fourth and stigma filling most of third section. Crossvein r-m situated near basal third of cell 1st M_2 and last section of vein M_{1+2} slightly curved. **Abdomen:** First tergum and basal three-fourths of second densely grey pollinose. Apical portion of second opaque brown; remainder of terga subshining black, covered with brown pollen on dorsum and densely grey on sides. Eighth segment symmetrical, evenly rounded, shining black in ground color, rather densely covered with brown pollen. Ninth segment plainly visible from dorsal view and occupies most of right side of hypopygium (fig. 29b). As seen in direct dorsal view eighth slightly longer than fifth abdominal segment, and abdomen almost straight-sided. Ventral aspects of genitalia as in figure 29c. Claspers both evenly tapered at apices.

Length: body, 2.5 mm.; wings, 3.2 mm.

Female. Fitting the description of the male in most details. Upper two-fifths to one-half of front polished black, lower portion grey pollinose; sides almost parallel, very slightly expanded in upper median portion. Ventral bristle at apex of front tibia elongate, almost equal in length to basitarsus. Abdomen predominantly grey pollinose, subshining black covered with grey-brown pollen in median portions of terga 3—5. Base of ovipositor elongate compared to that of *macropygus*. Piercer short, about equal in length to base and flattened dorsoventrally (figs. 29d-e).

Length: body, 2.75 mm.; wings, 3.4 mm.

Seven specimens are on hand from TAWI TAWI: Tarawakan, October 31—November 12, 1961, Noona Dan Expedition.

I have studied specimens determined *roralis*, from Formosa in the Deutsches Entomologisches Institut.

Type locality: Tainan, Formosa.

The type was probably in the Hungarian National Museum and was destroyed.

Pipunculus (Eudorylas) totoniger n. sp. (figs. 31a-e)

From the literature and from the descriptive notes and figures I have made of the type this species would appear to fit rather near *atratus* de Meijere, from Java, but it differs by having the abdomen opaque black with grey posterior borders on the terga rather than having abdominal terga 2—5 polished black at the apices. The ventral aspects of the genitalia of *atratus* have not been studied but these are probably distinctive.

Male. **Head** : Eyes joined over approximately the upper two-fifths to one-half of front leaving a very tiny black triangle below the median ocellus representing the upper portion of front. Lower front and face densely grey pubescent, face just slightly wider than lower portion of front. Antennae entirely black, third segment short acute at apex (fig. 31a). Black dorsal and ventral setae are prominent on second antennal segment. **Thorax** : Black in ground color, densely opaque brown on dorsum, grey on sides. Mesonotum almost bare except for a few very short inconspicuous setae down each dorsocentral line and except for an area of rather densely placed black setae on each side behind the humerus. Scutellum with about a dozen short brown setae on margin. Humeri black in ground color, covered with grey pollen. Stems of halteres brown, knobs black. **Legs** : Entirely black except for a very narrow coloring of yellow at junctions of tibiae and femora. Coxae, femora and tibiae rather densely grey pollinose. Front tibiae lack ventral spines or prominent setae at apices. Middle tibiae each with a row of posterior bristles on basal half (fig. 31b). Each hind tibia with a row of prominent suberect black setae extending entire length of segment; these are strongest over median portion. **Wings** : Subhyaline. Third costal section almost two times longer than fourth and stigma fills nearly all of third section. Crossvein r-m situated near basal one-third of cell 1st M_2 and last section of vein M_{1+2} .

rather strongly curved. *Abdomen*: Opaque black, grey on apices of terga; slightly rounded on sides, broadest at about segment three. Each tergum has a grey band across the posterior margin and the extreme lateral margins are grey. Eighth segment grey-brown pollinose, about equal in length to fifth, the membranous area is scarcely visible from direct dorsal view, with a prominent apical membranous area and with a basal cleft on right side as seen from dorsal view (fig. 31c). Claspers rather elongate, slender, curved upward and enlarged at apices (fig. 31d).

Length: body, 5.0 mm.; wings, 5.6 mm.

Female. Female specimens from New Britain appear to belong here. They fit the male in having the antennae and legs entirely black with the third antennal segment short, acute or obtuse at apex and the abdomen opaque black, grey on the apices of the terga. Since the specimens have not been definitely associated with the male, however, they are not being designated as part of the type series. The females at hand have the front comparatively broad, in the median portion it is distinctly wider than the face. Front entirely opaque grey except for a subshining median line extending down upper two-fifths and only slightly narrowed on upper portion, just below the ocellar triangle it is almost equal in width to ocellar triangle. Wings differ slightly from male in that the third costal section is about equal in length to fourth and r-m crossvein is situated near the basal two-fifths of cell 1st M_2 . Sixth abdominal segment elongate, three times longer than fifth. Hind tibiae lack prominent posterior setae. Ovipositor entirely polished, basal portion black, piercer rufous. Base rather slender and the piercer thickened, distinctly curved upward extending slightly longer than base and to the apex of third abdominal segment (fig. 31e).

Length: body, 4.0—4.5 mm.; wings, 4.5—5.0 mm.

Holotype male NEW IRELAND: Lemkamin, 900 m., April 21, 1962, Noona Dan Expedition. Two female specimens apparently belong here but are not being designated in the type series, from NEW BRITAIN: Yalom, 1000 m., May 27, 1962, and Komgi, 1000 m., May 14, 1962. — The type and one female are in to the Zoological Museum, Copenhagen, the other female is being retained in the University of Hawaii collection.

Pipunculus (Eudorylas) n. sp. ? female resembles *totoniger* n. sp.

One female specimen from NEW BRITAIN: Yalom, 1000 m., May 9, 1962, fits the characteristics of *totoniger* except that abdominal terga 3—6 are polished black on the dorsum, grey on the lateral margins; the sixth segment is only about two times longer than the fifth and the base of the ovipositor is not as elongated as in *totoniger* and the piercer is less thickened. The piercer in the species at hand extends to the apex of the second abdominal segment and is rather strongly curved upward similar in most respect to that of *totoniger*. The species is not being described until further specimens can be studied.

Pipunculus (Eudorylas) n. sp. resembles *albucus* n. sp.

One specimen on hand from the Philippines is similar to *albucus* but differs by having the third section of the costa equal or slightly longer than the fourth, the two sections combined distinctly shorter than the fifth section; vein Cu_1 plus 1st A elongate, almost as long as the m crossvein; terga 3—5 opaque brown on the dorsum, grey on the sides; and female ovipositor base oblong with a swelling on the underside and the piercer distinctly longer than the base. Also the front is broader and is polished black on the upper median portion.

Length: body, 3.0 mm.; wings, 3.5mm.

The one female specimen is from LUZON: Mt. Makiling, no date (Baker). — In the U. S. National Museum collection.

Pipunculus (Eudorylas) n. sp. female runs near *albucus* n. sp.

This species appears to fit near *albucus* n. sp. from New Ireland, but is much smaller, the ovipositor base is not enlarged, the third costal section is slightly longer than the fourth, and the two sections combined are about equal in length to the fifth costal section. In *albucus* the third section is shorter than the fourth and the two combined are distinctly longer than the fifth. Also the species at hand differs by having the front comparatively broad, equal in width to the ocellar triangle and not narrowed on the upper portion.

Length: body, 3.0 mm.; wings, 3.2 mm.

One female from CULION: 60 km. W. Culion, June 11, 1962 (H. Holtmann). — In the B. P. Bishop Museum.

Pipunculus (Eudorylas) n. sp. runs near *costalis* Becker

One male and one female, both in poor condition, are on hand from the Philippines which would fit near *costalis* Becker, from Formosa, but differs by having the wings normal in shape; the third and fourth costal sections one-third longer than the fifth; penultimate section of M_{1+2} only slightly convex and last section of that vein gently curved. In *costalis* the wings are short and broad; third and fourth costal sections combined are about one-half as long as the fifth section; penultimate section of M_{1+2} sharply curved upward, arcuate; and last section of vein M_{1+2} rather strongly curved.

P. costalis Becker is known only from the type female. I have studied the specimen in the Deutsches Entomologisches Institut.

The specimens are in such poor condition that they cannot be described except for the following details: Femora predominantly black. Wings (male) distinctly tinged with brown, stigma fills apical three-fourths of third costal section. Third section slightly longer than fourth and two sections combined one-half longer than fifth. Stigma situated at basal third of cell 1st M_2 and last section of vein M_{1+2} gently curved. Abdominal terga 3—5 polished black except for a patch of brown pollen at apicomedian portion of third tergum, and for a very narrow line of brown pollen along posterior border of each of these terga. Male hypopygium almost as long as fifth segment, compressed to right and with a membranous area situated on right side of apex. The male is headless. The female specimen which appears to fit with this male has the first two antennal segments yellow, tinged with brown. Third segment yellow and short acute. Face very strongly narrowed, at its narrowest point less than width of one eye facet. Front rather broad over most of its length, strongly narrowed above, immediately below ocellar triangle scarcely wider than one ocellus. Tarsal claws comparatively small, not at all enlarged. Wings of specimen completely crumpled. Abdomen appears to be predominantly polished black, rather lightly brown pollinose. Ovipositor short and straight, piercer about equal in length to base.

Length: body, 3.0 mm.; wings, 3.7 mm.

One male, one female from MINDANAO: Misamis Or., male from Mt. Empagatao, 1050—1200 m., April 19—30, 1961 (H. M. Torrevillas); female Mt. Balatukan, 15 km. S. W. of Gingoog, 1000

—2000 m., April 27—30, 1960 (H. M. Torrevillas). — Both specimens in the B. P. Bishop Museum.

Pipunculus (Eudorylas) n. sp. female runs near *deceptor* n. sp.

One female specimen on hand from the Bismarck Islands, NEW IRELAND: Lemkamin, 900 m., April 13, 1962, Noona Dan Expedition, would fit near *deceptor* n. sp. in the key but the two are obviously not related. This does not seem to fit with any of the known males from the Pacific region.

Body predominantly grey pollinose, subshining on mesonotum and faintly shining on abdomen with abdomen grey-brown on dorsum, grey on sides. Front almost parallel sided, polished black on upper one-fourth. Third antennal segment yellow, moderately acuminate at apex. Femora black except for extreme apices and tibiae largely dark brown to black, yellow on bases and apices. Front and middle tibiae each have a prominent ventral bristle at apex. Hind tibiae lack strong anterior setae. Wings hyaline. Third costal section about one-half longer than fourth and r-m crossvein situated at basal third of cell 1st M_2 . Last section of vein M_{1+2} gently curved. Piercer of ovipositor short, straight and rather thickened, distinctly shorter than base and extends almost to base of fourth abdominal tergum.

Length: body, 2.7 mm.; wings, 3.2 mm.

Pipunculus (Eudorylas) n. sp. related to *gigas* (Kertész)

This very distinctive species from the Philippines is not being described since the third antennal segment is missing. It differs from all other known *Pipunculus* from the Pacific because of its very large size, body and wings 6.75—7.0 mm. By having the disc of the scutellum rather densely pilose; each dorsocentral line with 2—4 irregular rows of pale setae and the anterior lateral portions of the mesonotum with scattered pale setae. The elongate, strongly curved ovipositor is probably also characteristic. This extends to the base of the abdomen. The abdominal terga are opaque brown at their bases, with broad grey fasciae on their apices. The abdomen is densely short setose, terga 1 and 2 are densely covered with rather long yellow pile on their lateral margins. No lateral bristles are differentiated on the first tergum. The wings are hyaline. The stigma is brown and fills all of the third costal section. The third section is about one-half longer than the fourth. The last section

of vein M_{1+2} is very strongly curved and the m crossvein is scarcely over two-thirds as long as the last section of vein M_{1+2} . The r-m crossvein is situated near the basal third of cell 1st M_2 . The costal and the basal cells are almost devoid of microchaetae, and the basal portion of cell 1st M_2 is prominently bare. The species appears closest to *gigas* (Kertész), refer to characters given in the key for separation of these.

One female specimen on hand from MINDANAO: Agusan, Los Arcos, November 19—23, 1959, in Malaise trap (L. W. Quate and C. Yoshimoto). The specimen has been returned to the B. P. Bishop Museum.

Pipunculus (Eudorylas) n. sp. female runs near *mutillatus* Loew

Two female specimens on hand from the Bismarck Islands, LAVONGAI: Banatam, March 20—23, 1962, caught in Malaise trap, Noona Dan Expedition, would run near *mutillatus* Loew and differ from this species by having the ovipositor base oblong, the piercer short and thick not longer than the base and by having the antennae black, not yellow. They probably differ in many other respects but it has not been possible to make comparisons.

The species at hand has the front entirely grey, almost parallel sided. Third antennal segment entirely dark brown to black and short acuminate. Thorax brown pollinose on dorsum very faintly subshining. Humeri yellow and knobs of halteres yellow, tinged faintly with brown. Front tibiae lack ventral bristles at apices and three or four suberect anterior setae present on each hind tibia. Wings hyaline, stigma pale brown and does not fill quite all of third costal section. Third and fourth costal sections equal in length but comparatively short and the two sections combined are shorter than fifth costal section. Crossvein r-m situated near basal two-fifths of cell 1st M_2 and last section of vein M_{1+2} very slightly curved. Abdomen opaque brown on dorsum, grey on sides and over the posterolateral margins of terga. First tergum and most of second entirely grey. Sixth segment nearly two times longer than fifth. Ovipositor base shining brown to black lightly pollinose and oblong in shape. Piercer broad, strongly curved upward, about equal in width to base and extended to apex of first abdominal segment.

Length: body, 3.0 mm.; wings, 3.4 mm.

The two specimens have been returned to the Zoological Museum, Copenhagen.

Pipunculus (Eudorylas) n. sp. resembles *pulvillatus* (Kertész)

One female specimen on hand from the Philippines appears to resemble *P. (Pipunculus) pulvillatus* (Kertész) because of the enlarged tarsal claws and most other characters but it is a *Pipunculus (Eudorylas)* and obviously is not related to *pulvillatus*. It should be noted that Kertész spelled this "*pullvillatus*" in the heading of the description and under the figures spelled it "*pulvillatus*." The latter is obviously correct.

First two antennal segments yellow, tinged faintly with brown, third yellow, moderately acuminate. Front rather broad, scarcely narrowed on upper portion and entirely dull-grey pollinose. Humeri and halteres yellow. Legs predominantly yellow, femora tinged with brown through median portions. Tarsal claws large, 2—3 times longer than the last tarsomere and pulvilli approximately two times longer than last joint of tarsus. Ventral bristles at apex of front and middle tibiae rather short, their length is less than width of tibia. Wings: Faintly tinged with brown, stigma pale brown and fills all of third costal section. Third section about equal in length to fourth, and two combined one-sixth longer than fifth. Crossvein r-m situated just before middle of cell 1st M_2 and last section of vein M_{1+2} straight. First tergum of abdomen entirely grey, second grey except for a brown pollinose mark in median portion. Other terga broadly grey on apices, opaque brown on bases. Sixth abdominal segment about equal in length to fifth. Base of ovipositor short, oval. Piercer yellow, rather strongly curved upward, two times longer than base and thickened on basal portion.

Length: body, 3.5 mm.; wings, 4.0 mm.

The single female specimen is from LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., April 28, 1964, in light trap (H. M. Torrevillas). The specimen is in the B. P. Bishop Museum.

A second species is on hand from LUZON: Mt. Makiling, no date (Baker) in the U. S. National Museum collection which fits the characteristics of the above species except that the wings are hyaline, the third costal section is distinctly shorter than the fourth and the two sections combined are very slightly longer than the fifth section. Also, the last section of vein M_{1+2} is gently curved and the apex of cell R_5 is not so narrow as in the above. The ovipositor is shaped approximately the same but the piercer appears slightly shorter. A complex of species obviously occurs in the Philippines

which has the greatly enlarged tarsal claws. This specimen is in the U. S. National Museum.

Pipunculus (Pipunculus) argutus n. sp. (figs. 32a-e)

This species is differentiated from other known members of this subgenus from the Pacific or Southeast Asia by lacking the anal vein (fig. 32b), also by the predominantly black femora, chiefly polished abdomen and acuminate third antennal segment. From external view the male hypopygium seems rather similar to that of *philippinensis* (Hardy), but that species differs by having the third antennal segment rounded at the apex, the third section of the costa about two times longer than the fourth, the abdomen subshining, also the claspers of the male genitalia are more blunt, rounded at apices in *philippinensis* and are sharply pointed, incurved at the tips in *argutus* (fig. 32e).

Male. **Head:** Eyes joined on front for a distance equal to approximately one-half the distance from lower ocellus to antennae, or approximately equal in length to lower portion of front. Lower front subshining black above and down upper median portion, otherwise densely grey pubescent. Face silvery grey and approximately equal in width to lower portion of front. First two antennal segments dark brown, third yellow and long acuminate below (fig. 32a). **Thorax:** Shining black in ground color, dusted with brown on dorsum, grey on sides. Humeri brown to black, halteres yellow, tinged faintly with brown at apices. Propleural fan made up of five or six pale yellow hairs. **Legs:** Coxae black covered with grey pollen. Trochanters and broad bases and narrow apices of femora yellow; remainder of each femur black covered with grey pollen. Front tibiae entirely yellow, middle and hind yellow at bases and apices, tinged with brown to black in median portions. No ventral bristles developed at apices of front tibiae, and hind tibiae lack prominent anterior setae. Tarsi mostly yellow, last tarsomere brown. **Wings:** Subhyaline, third costal section about equal in length to fourth and stigma fills most of third section. Crossvein r-m situated near middle of cell 1st M_2 and last section of vein M_{1+2} gently curved. Anal vein completely lacking (fig. 32b). **Abdomen:** First tergum grey, second opaque black on basal two-thirds; abdomen otherwise polished black on dorsum, the terga grey on extreme lateral margins. Eighth segment subshining, grey-brown pollinose and as seen from dorsal view about two-

thirds as long as fifth abdominal segment and with a large membranous area extending over apex; this almost completely bisects eighth in type (fig. 32c) and is more confined to apex in paratype (fig. 32d). This is probably due to position of eighth segment. As seen from ventral view the membranous area covers entire apex of eighth segment and claspers sharp pointed and incurved at apices, as in figure 32e.

Length: body, 3.5 mm.; wings, 4.75 mm.

Female unknown.

Holotype male, NEW IRELAND: Lemkamin, 900 m., April 9, 1962. Three male paratypes, one same data as type, one MANUS: Rossum, 6 km. S. E. of Lorengau, 180 m., December 23, 1959 (T. C. Maa), and one NEW BRITAIN: Yalom, 1000 m., May 16, 1962. — Type and one paratype in the Zoological Museum, Copenhagen, paratypes in the B. P. Bishop Museum and the University of Hawaii collections.

Pipunculus (Pipunculus) artifrons n. sp. (figs. 33a-b)

This species runs near *buclavis* n. sp., from New Britain, but the two are not related. *P. artifrons* is readily differentiated by the very narrow front of the female, by the normal tarsal claws, and by the development of the female ovipositor (fig. 33b).

F e m a l e . H e a d : Front rather strongly narrowed, in median portion scarcely wider than one eye facet and slightly expanded below and above; at its narrowest point front about one-fourth as wide as face. Front entirely grey pollinose. Antennae entirely yellow, third segment long acuminate (fig. 33a). **T h o r a x :** Grey-brown pollinose on dorsum, grey on sides. Humeri and halteres yellow. Scutellum with 6—8 rather prominent black setae around margin, largest of these almost equal in size to bristles on sides of first abdominal tergum. Propleural fan made up of about eight pale hairs. **L e g s :** Predominantly yellow, tinged with brown in median portions of femora, no ventral bristle present at apex of front tibia and erect setae are lacking on hind tibiae. **W i n g s :** Hyaline, stigma pale brown and filling all of third costal section. Third costal section about one-half longer than fourth. Crossvein r-m situated just before middle of cell 1st M₂. **A b d o m e n :** Entirely grey on first two terga; other terga grey-brown pollinose on dorsum, grey on sides, faintly subshining dorsally, more lightly pollinose on sixth segment. Sixth segment one-third longer than

fifth. Ovipositor base reddish brown in ground color, covered with grey pollen and almost globose in shape, with a small bump on underside just below base of piercer. Piercer yellow, slightly longer than base, straight and extending to approximately base of abdomen (fig. 33b).

Length: body, 3.5 mm.; wings, 4.25 mm.

Male unknown.

Holotype female NEW BRITAIN: Ti, Nakanai Mts., July 28—30, 1956 (E. J. Ford, Jr.). — In the B. P. Bishop Museum.

Pipunculus (Pipunculus) buclavus n. sp. (figs. 34a-c)

A moderately large species which because of the shape of the female ovipositor and the yellow legs would appear similar to *maculiventris* Brunetti, from Malaysia, but it differs by having the third costal section nearly two-thirds as long as the fourth, rather than about one-half as long; by having the r-m crossvein at the basal one-third of cell 1st M_2 , rather than at the basal one-sixth; and by having the abdomen entirely opaque black, rather than largely shining black, yellow on the sides of terga 2—4. Also, other details are probably distinctly different, the antennae cannot be compared since the third segment of the type of *maculiventris* is missing. It is probable that the strong development of the tarsal claws is the most important diagnostic character for *buclavis*, in this respect it is similar to *pulvillatus* Kertész, from Taiwan, but that species has the third antennal segment short obuse, and is considerably larger (6.6 mm. for the body and 7.7 mm. for the wing, compared to 4.6 mm. for the body and 5.7 mm. for the wing of *buclavis*).

Female. **Head:** Front entirely opaque, grey-black, slightly narrowed on the upper one-third. Face about equal in width to lower portion of front. First two antennal segments brown, third yellow and acuminate at apex (fig. 34a). **Thorax:** Entirely opaque grey-brown on dorsum, grey on sides. Humeri dark brown to black. Halteres yellow, tinged with brown on the knobs. **Legs:** Coxae black, legs otherwise yellow except for brown apical tarsomeres. Each front tibia with a series of yellow ventral setae at apex but no prominent bristle is developed. Each hind tibia with about four prominent, erect, brown, anterior setae at middle. Tarsal claws elongate, distinctly longer than last tarsomere and pulvilli (fig. 34b); claws yellow except for black tips. **Abdomen:** En-

tirely opaque black very faintly subshining, dusted with grey at apices of terga. Sixth abdominal segment about two-thirds as long as fifth. Base of ovipositor opaque black; piercer yellow, short and straight, shorter than base and extending approximately to base of fourth abdominal segment (fig. 34c).

Length: body, 4.6 mm.; wings, 5.7 mm.

Male unknown.

Holotype female NEW BRITAIN: Valoka, July 8, 1962, caught in Malaise trap, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

Pipunculus (Pipunculus) fraternus (Kertész) (figs. 35a-c)

Dorylas fraternus Kertész, 1912, Ann. Mus. Nat. Hung. 10:289.

One male specimen is on hand from New Ireland which would appear to fit the original description of *fraternus*, and also fit the notes which I made on a male specimen in the Deutsches Entomologisches Institut; the dorsal aspects of the male genitalia may differ, however. The rough sketch of *fraternus* which I made (fig. 35a) indicates a rather small apical membranous area and in the specimen at hand the membrane covers the entire apex (fig. 35b).

The specimen at hand is headless. Humeri black, halteres dark brown to black, tinged with yellow on knobs. Scutellum with rather conspicuous moderately long setae hind margin. Legs principally yellow with a tinge of brown on femora. No prominent apical bristles are present on front or middle tibiae and no prominent erect setae are present on the anterior surface of hind tibia. The wings are lightly tinged with brown. Stigma dark brown and fills all of third costal section. Third costal section equal to fourth and the two sections combined equal fifth section. Crossvein r-m situated just before 1st M_2 and last section of vein M_{1+2} gently curved. Vein Cu_1 plus 1st A just slightly longer than r-m crossvein. **A b d o m e n**: Polished black over terga 3—5. First tergum dull grey, second faintly grey-brown pollinose. Eighth segment about three-fourths as long as fifth and with a large membranous area extending over apex (fig. 35b). Ventral aspects of genitalia as in figure 35c. The membranous area completely bisects eighth segment on venter and inner clasper is developed into a pair of small lobes at apex.

Length: thorax and abdomen, 2.7 mm.; wings, 4.2 mm.

Female unknown.

Holotype male from Chip-chip, Formosa.

This is probably the specimen in the Deutsches Entomologisches Institut, Berlin. It was not indicated as the type.

The one male on hand is from NEW IRELAND: Lemkamin, 900 m., April 18, 1962, Noona Dan Expedition. — In the Zoological Museum, Copenhagen.

Pipunculus (Pipunculus) imparilis n. sp. (figs. 37a-f)

This species appears to fit near *heterostigmus* Perkins, from Australia. The superficial characteristics of the two are very much alike. *P. imparilis* differs strikingly from *heterostigmus* and other known species of this complex by having a large sclerite of the seventh segment developed on the dorsum, which is approximately equal in length to the left side of the fifth abdominal segment and almost equal in length to the eighth segment (fig. 37d). Also the membranous area at the apex of the eighth segment is small compared to that of *heterostigmus* (figs. 36c and 37e). The female of *heterostigmus* differs by having the face about equal in width to one eye facet and by having the sides of front grey almost to ocellar triangle (figs. 36a and 37a).

This species belongs in the "Collinias" complex which is characterized by having a crossvein at the base of the stigma in the subcostal cell and having cell R_5 comparatively broad at the apex. Aczél erected the genus *Collinias* for this group, with *heterostigmus* Perkins as the type. On the basis of a study of several African species in which the crossvein at the base of the stigma, the yellow base of abdomen and the width of the apex of cell R_5 have been found to be variable characters, I have placed this as a synonym of *Pipunculus (Pipunculus)* (Hardy 1950:6). Treating this just for the Pacific area it does make a very convenient grouping but I still doubt that it should be given generic or subgeneric rank. The types of all the Pacific species are in the B. P. Bishop Museum and for comparative purposes I am including figures of the male genitalia based upon the types (refer to figures 36b-c; 38a-b; and 45) and am including all the known species of this complex in the key.

Male. Fitting the description of *heterostigmus* in most respects (refer to Hardy 1964:89), short acute, shaped as in *heterostigmus*. First two antennal segments black, third segment yellow-brown. **Thorax:** Shining black in ground color covered with grey-brown pollinose on dorsum, grey on sides. Humeri black, halteres

yellow. Propleural fan made up of about six short pale hairs. Scutellum with a row of short indistinct hairs around margin. **Legs**: Femora largely brown to black, yellow on extreme apices and bases. Tibiae and tarsi yellow except for the brown apical tarsomeres. Tarsal claws short, scarcely longer than apical tarsomere and pulvilli less than two times longer than wide. **Wings**: Almost hyaline. Stigma brown and almost as long as fourth costal section. Crossvein r-m situated between basal one-fourth and one-third of cell 1st M_2 and last section of vein M_{1+2} gently curved. Apical portion of cell R_5 distinctly broader than length of r-m crossvein. Last section of vein M_{3+4} about one-half longer than m crossvein (fig. 37b). **Abdomen**: Largely black, brown with a yellow tinge in ground color on basal three segments; entire dorsum rather densely grey-brown pollinose. Male genitalia differ from all other *Pipunculus* which I have examined by having a strong plate developed on the left side just beyond the fifth segment. This evidently represents the seventh tergum although from the single specimen on hand it cannot be clearly ascertained as to whether or not the dorsal extension is a continuation of this tergum or whether it is a separate plate. At the lateral margin there does seem to be a line of overlapping and it appears as though a distinct plate is developed on the dorsum adjoining the seventh (figs. 37c-d). Ventral aspects of genitalia as in figure 37e. Membranous area at apex comparatively small. Claspers extended at apices into blunt inwardly directed lobes (fig. 37e).

Length: body, 2.5 mm.; wings, 2.75 mm.

Female. Similar to *heterostigmus* but the upper half of the front is polished black, not grey on the sides above the middle and the face is distinctly narrower, more like that of *vitiensis*, from Fiji. Third antennal segment yellow and two basal segments yellow-brown. Front largely polished black, grey on sides at lower half (fig. 37a). Legs with faint tinge of brown in median portions of femora. Basal segments of abdomen much more distinctly yellowed than in male. Ovipositor straight or nearly so and extends beyond apex of third abdominal segment. Piercer yellow, nearly two times longer than base (fig. 37f). The ovipositor of *heterostigmus* is as in figure 36d.

Length: As in male.

Holotype male NEW IRELAND: Lemkamin, 900 m., April 13, 1962, Noona Dan Expedition. Allotype female NEW BRITAIN:

Gazelle Pen., Kerawat, 60 m., August 31, 1955, in light trap (J. L. Gressitt). Two female paratypes same data as type collected April 6 and April 21, 1962; both of these are headless so the specimen from New Britain has been picked as the allotype. — Type and one paratype in the Zoological Museum, Copenhagen. Allotype returned to the B. P. Bishop Museum and one paratype in the University of Hawaii collection.

Pipunculus (Pipunculus) maculiventris Brunetti (figs. 40a-c)

Pipunculus maculiventris Brunetti, 1927, Jour. Fed. Malay States Mus., 13:304.

One female specimen on hand from the Philippines fits Brunetti's original description and also my redescription of the type which I made at the British Museum (Natural History). The species is known only from the female.

This species is characterized by having the sides of the first four terga yellow, dusted with grey pollen and by the very short third costal section and the basally placed r-m crossvein (fig. 40b).

The following description is based upon the specimen at hand. The front is entirely grey pubescent, slightly expanded in median portion, rather strongly narrowed above, just below ocellar triangle the width is scarcely greater than that of one ocellus. Face just slightly narrower than lower portion of front, about equal in width to two rows of enlarged facets. Antennae entirely yellow except for black arista. Third segment short acute to obtuse at apex (fig. 40a). (Note the third segment of the antenna was broken off the type.) Ventral bristles on second antennal segment yellow; those on dorsum yellow-brown. Thorax brown to black in ground color on dorsum, covered with brown pollen except for a grey patch behind each humerus. Pleura brownish yellow in ground color covered with grey-brown pollen. Humeri and halteres yellow. Scutellum with rather conspicuous, moderately long hairs around hind margin. Legs: Entirely yellow. Front and middle tibiae each with a long ventral bristle at apex. Hind tibiae lack erect setae on anterior surface (in my redescription of the type I state that the hind tibia has one or two rather strong suberect setae). Tarsal claws rather long and slender, at least two times longer than last tarsomere; pulvilli also well developed. Wings subhyaline, stigma dark brown and fills entire third costal section. Third section less than one-half as long as fourth and two sections combined about equal in length

to fifth. Crossvein r-m situated near basal one-sixth of cell 1st M_2 and last section of vein M_{1+2} almost straight (fig. 40b). Abdomen slender, almost straight sided. First four terga yellow on sides, dusted with grey pollen. Grey pollinosity covers almost entire first tergum, only apical margin brown pollinose. Terga 2—4 opaque brown basally and down median portion. Terga 2—4 subshining on apical halves. Fifth tergum almost entirely brown, subopaque faintly shining, grey on posterolateral margins. Sixth tergum about two-thirds to three-fourths as long as fifth and entirely shining black covered with brown pollinosity. Base of ovipositor brown to black, covered with grey-brown pollinosity and almost globose. Piercer yellow, short and straight, slightly shorter than base (fig. 40c).

Length: body, 4.0 mm. (Brunetti gave the length as 4.5 mm.); wings, 5.5 mm.

Male unknown.

Type in the British Museum (Natural History).

One female specimen on hand in the U. S. National Museum from LUZON: Mt. Makiling, no date (Baker), also one female from LUZON: Camarines Sur, Mt. Isarog, 1600 m., May 21, 1963 (H. M. Torrevillas). — In B. P. Bishop Museum.

Pipunculus (Pipunculus) microdes Perkins (figs. 41a-b)?

Pipunculus microdes Perkins, 1905, Bull. Div. Ent. Hawaiian Sug. Plrs' Ass. Ext. Stn. 1(4):147.

Pipunculus (Pipunculus) microdes Perkins, Hardy, 1964: Australian Jour. Zoo. 12(1):91, figs. 3c-d.

One male and one female from the Philippines appear to belong here. I see no way to differentiate these from *microdes*. It should be noted however that the ventral aspects of the genitalia have not been studied for this species and the specimens from the Philippines may be distinct. The following description is based on the specimens at hand.

Male. **Head:** Missing. **Thorax:** Polished black in ground color covered with brown pollen on dorsum, grey-brown on sides. Humeri brown, faintly tinged with yellow in ground color. Stems of halteres yellow, knobs brown. Propleural fan made up of six to eight fine yellow-brown hairs. Scutellum with short inconspicuous dark hairs around margin. **Wings:** Faintly tinged with brown. Stigma filling apical three-fourths of third costal section. Third section slightly longer than fourth and two sections combined two-

thirds longer than fifth section. Crossvein r-m situated near basal third of 1st M_2 and last section of vein M_{1+2} gently curved. Vein Cu_1 plus 1st A almost equal in length to m-cu crossvein and last section of M_{3+4} about three-fourths as long as m crossvein. *Legs*: Femora predominantly dark brown to black, yellow on apices. Tibiae yellow, tinged faintly with brown medianly. I see no evidence of ventral spurs at apices of front and middle tibiae and no strong setae on hind pair. *Abdomen*: First two terga opaque brownish grey. Terga 3—5 polished black, bare of pollen on apical portions of segments; fifth tergum predominantly polished. First tergum with three black bristles on each side (*microdes* from Australia have "two or three short pale bristles"). The eighth segment, as seen from dorsal view, appears slightly different from that of the type of *microdes*, compare figure 41a with Hardy 1964, figure 3d, p. 91; it is about three-fourths as long as fifth and with a prominent membranous area to right of apex. As seen from ventral view the genitalia are as in figure 41b. The membranous area is small and confined to apex of eighth segment. Claspers thickened at bases, tapered apically, but rounded at tips.

Length: body, 3.0 mm.; wings, 3.75 mm.

The female which appears to be associated with this male has the third antennal segment yellow, rather small, scarcely over half larger than the second and obtuse at apex, shaped somewhat like that figured for *microdes* (Hardy 1964:91, figure 3c). The front is rather broad on the lower half, at its widest point equal to about four or five rows of eye facets, strongly narrowed on the upper portion, just below the ocellar triangle. The front is narrowed to about the width of one ocellus. Face strongly narrowed, at narrowest point less than width of one ocellus. Wings completely crumpled on specimen at hand. Ovipositor short, the base dark brown to black and oval in shape. Piercer yellow, straight, not longer than base and extending to about the apex of third abdominal segment. Sixth segment about equal in length to fifth.

Type locality Kuranda, North Queensland, Australia.

Type in B. P. Bishop Museum.

The specimens on hand from MINDANAO: Misamis Or., male from Mt. Empagato, 1050—1200 m., April 19—30, 1961 (H. M. Torrevillas); female Mt. Balatukan, 15 km. S. W. of Gingoog, 1000—2000 m., April 27—30, 1960 (H. M. Torrevillas). — In the B. P. Bishop Museum.

Pipunculus (Pipunculus) mundulus n. sp. (figs. 42a-c)

This species fits near *pulvillatus* (Kertész) from Formosa; the two appear very closely related. *P. mundulus* is differentiated by being much smaller, body 3.4 mm. and wings 5.3 mm., compared to 6.1 mm. for the body of *pulvillatus* and 8.1 for the wings; by having the abdomen subshining brown at apices of terga rather than with greyish white bands at the apices of the segments. Also the eighth segment of male abdomen has a long large membranous area which extends onto the dorsum as seen from dorsal view (fig. 42b). In *pulvillatus* the membranous area is apical in position and is not visible from direct dorsal view (refer to figures 2b-c, Kertész, 1915:388).

Male. Eyes joined for almost half the distance of upper portion of head, approximately equal in length to lower portion of front. Portion of front above junction of eyes very short, scarcely extending below lower ocellus. Front and face dull grey pubescent, faintly subshining. Face about equal in width to lower portion of front. First two antennal segments yellow, tinged with brown. Third segment yellow, obtuse at apex (fig. 42a). **Thorax:** Shining dark brown to black in ground color, covered with brownish pollen. Humeri and halteres yellow. Propleural fan very large and conspicuous, made up of about eight long hairs. Scutellum has prominent bristle-like hairs around margin, these are equal in size to the smaller bristles on sides of first abdominal tergum. **Legs:** Entirely yellow except for black coxae. Ventral bristles at apices of front and middle tibiae small, scarcely larger than other setae at apex of segment. Each hind tibia has one prominent black bristle on anterior surface in middle, the length of this is greater than width of segment. Ventral spines well developed on apical portions of all femora. Tarsal claws about two times longer than last tarsomere. **Wings:** Subhyaline, very faintly tinged with brownish. Stigma dark brown and fills all of third costal section. Third section nearly two times longer than fourth and almost equal in length to fifth. Crossvein r-m situated at basal third of cell 1st M₂ and last section of vein M₁₊₂ gently curved. Cell R₅ narrow at apex, almost closed. **Abdomen:** First tergum grey. Other terga opaque on bases and subshining brown, rather lightly pollinose at apices of segments. Eighth segment almost as long as fifth segment and with a large membranous area over apex which extends onto dorsum as in figure 42b. As seen from ventral view

the genitalia as in figure 42c. Claspers large, broad, almost symmetrical, subacutely pointed on inner apices.

Length: body, 4.3 mm.; wings, 5.2 mm.

Female unknown.

Holotype male MINDANAO: Zamboanga del Norte, Masawan, Trail to Mt. Malinbang, 1290 m., July 16, 1958, in jungle (H. E. Milliron). — In the B. P. Bishop Museum.

Pipunculus (Pipunculus) n. sp., female near philippinensis

Specimens in the U. S. National Museum and the B. P. Bishop Museum collections fit near *philippinensis* but differs by having the third costal section slightly shorter than the fourth rather than about two times longer; by having the r-m crossvein near the basal two-fifths of cell 1st M₂ rather than at the basal third; also by being much smaller, body 2.8 mm. and wings 3.5 mm., rather than body 5.5 mm., and wings 6.2 mm. It is also similar to *fraternus* (Kertész) but differs by having the wings hyaline and by the shorter third and fourth costal sections of the wing.

Two basal segments of antennae brownish yellow, third clear yellow and short acute to slightly rounded at apex, as in *philippinensis*. Front almost parallel sided, just slightly narrowed on upper portion and polished black immediately below ocellar triangle and otherwise subopaque black. Face slightly narrower than lower part of front and subopaque to subshining black on upper three-fifths, sparsely grey pubescent below. Thorax polished black in ground color covered with brown pollen on dorsum, but with ground color shining through, densely grey on anterior lateral margins of mesonotum and over pleura. Humeri yellow with a very faint tinge of brown and halteres yellow. Legs entirely yellow except for black coxae and yellow-brown trochanters. Tips and front of middle tibiae completely covered by glue and I cannot see whether or not they have bristles at apices. Hind tibiae lack erect setae on anterior surface. Wings entirely hyaline, stigma pale brown and fills all of third costal section. Third section slightly shorter than fourth and two sections combined subequal to fifth section. Crossvein r-m situated at basal two-fifths of cell 1st M₂ and last section of vein M₁₊₂ gently curved. Abdomen polished black, lightly dusted with grey-brown pollen. Ovipositor short and straight, piercer equal in length to base.

Length: body, 2.8 mm.; wings, 3.5 mm.

One female LUZON: Mt. Makiling, no date (Baker), in U. S. National Museum collection and one male, MINDANAO: Bukidnon, 1250 m., Mt. Katanglad, December 4, 1959 (L. W. Quate); and one female LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., April 1, 1964 (H. M. Torrevillas. — The latter two in B. P. Bishop Museum.

Tomosvaryella calcarata n. sp. (figs. 46a-b)

This species from the Philippines would fit the description of *T. epichalca* and the only way I see of differentiating these would be by the male genitalia. As seen from dorsal view the hypopygium *in situ* is rather short, not much over one-third as long as the fifth segment and with a large membranous area covering the right side of the apex (fig. 46a). From ventral view the genitalia are as in figure 46b. The membranous area is very extensive over the eighth segment. The lobes of the ninth segment are short and rounded and the claspers are rather elongate, with conspicuous preapical inwardly directed lobes on their ventral margins (fig. 46b).

Length: body and wings, 3.9 mm.

Female unknown.

Holotype male LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., April 2, 1964 (H. M. Torrevillas). One male specimen from PALAWAN: 3 km. N. E. Tinabog, May 8, 1962 (H. Holtmann), appears to be this species but the claspers are broken and its identity is not certain. It is not being designated as a paratype. — Type and the one male specimen in the B. P. Bishop Museum.

Tomosvaryella caligata n. sp. (figs. 47a-c)

This species fits near *nyctias* (Perkins) but the genitalia are strikingly different in the two (compare figures 47c and 54c). *T. caligata* is readily differentiated by the enlarged boot-like claspers of the male and the elongate third antennal segment (fig. 47a).

Male Head: Compound eyes joined for a very short distance on front, junction equal to less than length of upper portion of occiput. Upper occiput and vertex polished black, lower portion grey pubescent, and just above antennae approximately equal in width to face. Third antennal segment brown, very long acuminate (fig. 47a) and covered with yellow-grey pubescence. **Thorax:** Polished black, lightly brown dusted on dorsum, grey on sides.

Humeri and halteres yellow. Hind margin of scutellum conspicuously haired and has three irregular rows of moderately long setae present over hind margin. *Legs* : Predominantly black, yellow at apices of femora and tibiae, and bases of tibiae, also on basal tarsomeres. Front and middle tibiae with short ventral bristles at apices. Hind trochanters not ornate. *Wings* : Hyaline. Third costal section one-half as long as fourth and two sections combined just slightly over half as long as fifth section. Crossvein r-m situated at basal third of cell 1st M₂ and last section of vein M₁₊₂ gently curved. *Abdomen* : First tergum grey, abdomen otherwise polished black, very lightly grey pollinose with ground color not obscured. Abdomen partially setose. Eighth segment subshining brown pollinose, about one-half to three-fifths as long as fifth segment and with a large apical membranous area (fig. 47b) and with seventh tergum not visible from above. From ventral view genitalia as in figure 47c. Membranous area over eighth segment very extensive and claspers strongly enlarged; boot-shaped at apices and each with a short spur-like preapical protuberance on inner margin; inner clasper also with a short subbasal protuberance on outer side (fig. 47c).

Length: body and wings, 2.5 mm.

Female unknown.

Holotype male Philippines, BUSUANGA: 4 km. N. San Nicolas, May 23—24, 1962, in Malaise trap (H. Holtmann). One paratype LUZON: Mt. Prov., Abatan, Buguias, 60 S. of Bontoc, 1800—2000 m., May 11, 1964, in light trap (H. M. Torre Villas). — In the B. P. Bishop Museum.

Tomosvaryella epichalca Complex of Species (fig. 49)

De Meijere (1907:259 and 1914:173) listed *epichalca* from Java with a query and Aczél (1948:31) listed it with a question from Formosa. I have not seen these specimens and doubt that these identifications are correct. *T. epichalca* (Perkins) (1905:150) was described from Cairns, Northern Queensland. It is characterized by having the r-m crossvein situated at or slightly beyond the middle of cell 1st M₂, by having a row of bristles on each side of the first abdominal tergum and the male hypopygium with a large apical membranous area. It is obvious that there are a number of Pacific and Asian species which would fit these characteristics and it is not possible to differentiate them without studying the ventral

aspects of the male genitalia. I redescribed the type of *epichalca* (Hardy, 1964:115, figures 18a-c) but at that time did not dissect the male. I have now done this (type in the B. P. Bishop Museum) and the following information should supplement my redescription of the type. As seen from ventral view the genitalia are as in figure 49. The membranous area almost completely bisects the eighth segment and the ninth segment is very deeply cleft, almost to its base down the median portion. The claspers are rather short and broad, thickened at bases, narrowed apically, but rounded at the tips (fig. 49).

This fits very close to the species which I have interpreted as *synadelphoides* ? (de Meijere) based on specimens from the Philippines. The two are differentiated by the characteristics of the claspers. In *synadelphoides* the claspers are rather slender, almost straight-sided, incurved near the tips and subacutely pointed on inner apices (fig. 61).

One specimen from LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., May 8, 1964, in light trap (H. M. Torrevillas) is externally like *epichalca* but the ventral aspects of the genitalia are very different. It would fit near *calcarata* n. sp. but lacks the lobes on the claspers, it would also fit near *synadelphoides* but differs from my concept of this species because of the very elongate slender claspers, about five times longer than wide, very slightly incurved and blunt at their apices.

***Tomosvaryella flavierus* n. sp. (figs. 50a-d)**

This species is readily differentiated from all *Tomosvaryella* known from the Pacific or Orient because of its all yellow legs. It is obviously closely related to *nyctias* (Perkins) because of the position of the r-m crossvein, the very short junction of the compound eyes on the front of the male and by the presence of an apical membranous area on the hypopygium.

Male. Head: Eyes joined for a very short distance on front (fig. 50b), very similar to *nyctias*. Upper front, also vertex and upper occiput polished black, lower front silvery pubescent with a slight golden sheen in some lights. Face about equal in length to lower front. Antennae entirely yellow, third segment short acuminate (fig. 50a). **Thorax:** Polished black in ground color, rather lightly brown pollinose on dorsum, grey on sides. Humeri and halteres yellow. Hind margin of scutellum with a row of scattered

short black setae. *Legs*: Entirely yellow except for reddish brown to blackish coxae. Ventral bristles at apices of front and middle tibiae short, their length about equal to width of tibia. No prominent setae present on anterior surface of tibia. Tarsal claws and pulvilli moderately small, normal in development. *Wings*: Entirely hyaline, third costal section about one-half as long as fourth, and two sections combined about half as long as fifth costal section. Crossvein r-m situated near basal one-third of cell 1st M₂ and last section of vein M₁₊₂ gently curved. *Abdomen*: Predominantly polished black, rather lightly brownish grey pollinose. As seen from direct dorsal view eighth segment about three-fifths as long as fifth and with a large membranous area at apex (fig. 50c). Seventh tergum visible from dorsal view. Ventral aspects of genitalia as in figure 50d. Claspers rather slender, slightly pointed on inner apices.

Length: body and wings, 2.5 mm.

Female unknown.

Holotype male Philippine Islands, CULION: 6 km. W. Culion, June 6, 1962, in Malaise trap (H. Holtmann). — In the B. P. Bishop Museum.

***Tomosvaryella nyctias* (Perkins) (figs. 54a-c)**

Pipunculus nyctias Perkins 1905, Bull. Div. Ent. Hawaiian Sugar Planters' Association Experiment Station 1(4):152.

Dorylomorpha nyctias (Perkins), Aczél, 1948, Acta Zool. Lilloana 6:28.

Tomosvaryella nyctias (Perkins), Hardy, Australian Journal of Zoology 12(1):118, figures 20a-f.

This species is differentiated from all known *Tomosvaryella* from the Pacific or Southeast Asia by having the r-m crossvein situated near the basal one-fourth of cell 1st M₂ and the upper portion of the front about as long as the lower, the junction of the compound eyes is very short. The species is predominantly metallic black or dark brown (probable teneral specimens), very lightly pollinose; the ground color is not obscured by the very faint pollen. The species has been adequately described and figured by Hardy *loc. cit.*, the male genitalia are as in figures 54b-c.

Length: body, 2.5 mm.

Type locality Bundaberg, Queensland, Australia.

Type in the B. P. Bishop Museum.

One male specimen is on hand from the Southern Philippines,

PALAWAN: Pinigisan, 600 m., September 9, 1961, caught in Malaise trap outside forest, Noona Dan Expedition. Eight specimens are also in the Noona Dan Expedition collection from the Bismarck Islands, NEW BRITAIN: South of Cape Hoskins Airodrome, July 6, 1962, and Yalom, 1000 m., May 13—20, 1962; MUSSAU: Boliu, June 3, 1962 and Schadel Bay, June 3, 1962; and LAVONGAI: Banatam, March 18, 1962. One specimen in the B. P. Bishop Museum collection from NEW BRITAIN: Lindenhafen, 2 mi. S. E. Cocos Grove, April 23, 1956 (J. L. Gressitt).

Tomosvaryella robusta n. sp. (figs. 57a-d)

This species fits near *T. pseudophenes* (Perkins), from Australia, and belongs in the group of species which is characterized by lacking prominent setae on the sides of the first abdominal tergum. The male genitalia differ in the two species: the eighth and ninth segments are broader, more rounded in *robusta* and the claspers are very differently shaped, compare figures 56 and 57c; in *robusta* the claspers are squared at the apices rather than rounded, etc.

A moderately large species. Male. Head: Compound eyes joined for just a short distance on front, this distance about equal in length to exposed portion of front from junction of eyes to ocellar triangle and about one-third length of lower portion of front. Lower front grey pollinose with a slight golden sheen as seen in some lights. Face comparatively broad, slightly wider than lower part of front. Antennae entirely black, densely grey pubescent and with third segment acuminate (fig. 57a). Thorax: Shining black in ground color, rather densely brown pollinose on dorsum, grey on sides. Humeri and halteres yellow. Very inconspicuous setae present on margin of scutellum. Legs: Almost entirely black, yellow at extreme apices and at bases of tibiae. Femora densely silvery pubescent except for polished posterior surface of each hind pair. Front and middle tibiae lack ventral spines at apices and the hind tibiae have no erect setae on the anterior surfaces. Wings: Hyaline. Third costal section scarcely over one-fourth as long as fourth section and two sections combined about three-fourths as long as fifth costal section. Crossvein r-m situated slightly beyond middle of cell 1st M_2 and last section of vein M_{1+2} straight or nearly so. Abdomen: Submetallic black, rather lightly grey-brown pollinose. Sides almost parallel. First tergum lacks bristles on sides but instead has scattered very short black

setae, not arranged in a line. As seen from direct dorsal view eighth segment rather short, about one-half as long as fifth segment and with an apical membranous area (fig. 57b). Ventral aspects of genitalia as in figure 57c. Lobes of ninth segment broad, rounded, scarcely longer than wide and claspers rather truncate at apices.

Length: body and wings, 4.0—4.25 mm.

F e m a l e : Fitting the description of the male in most respects. Upper one-fourth of front polished black except for scattered brownish grey pollinosity just beyond median ocellus. Lower three-fourths of front grey. Front almost straight sided, slightly expanded in median portion, and narrowed above to about width of ocellar triangle. Face densely silvery pubescent and slightly narrower than lower front. Abdomen not as elongate as in male. Sixth segment distinctly longer than fifth. Base of ovipositor short, globose and entirely black, rather lightly brownish grey pollinose. Piercer yellow, distinctly longer than base and slightly curved upward at apex and extending to about apical portion of third abdominal segment (fig. 57d).

Length: body and wings, 3.5 mm.

Holotype male and allotype female, LUZON: Mt. Prov., Abatan, Buguias, 60 S. of Bontoc, 1800—2000 m., April 28 and May 11, 1964, allotype in light trap (H. M. Torrevillas). Five paratypes, 4 males, one female, one same locality as type, May 17—19, 1964; one LUZON: Los Banos, September 19—20, 1959, in light trap (L. W. Quate and C. Yoshimoto); three from BUSUANGA: 4 km. N. of San Nicolas, May 23—26, 1962, one in light trap, two in Malaise trap (H. M. Holtmann). — Type, allotype and three paratypes in the B. P. Bishop Museum. Two paratypes in the University of Hawaii collection.

***Tomosvaryella sentis* n. sp. (figs. 58a-c)**

This species is readily differentiated from all other known *Tomosvaryella* from the Pacific and Oriental regions by the presence of a strong ventral spine near the base of each hind trochanter (fig. 58a). In this respect it is somewhat similar to some North American species but I am unable to see close relationship. It would superficially resemble *T. utahensis* (Hardy-Knowlton) but the cerci are not expanded as in that species and the genitalia are quite different; also the spine on the ventor of the trochanter is located near the base of the segment in *sentis*.

Male. Eyes joined on front for a very short distance near upper portion, leaving just a tiny triangle below median ocellus to represent upper portion of front. Lower front entirely grey pubescent as is face, face equal in width to lower front. Antennae broken off, third segment probably yellow and short acuminate as in most other members of this group. **Thorax:** Metallic black in ground color dusted with grey on sides and grey-brown on dorsum, with ground color lightly shining through. **Legs:** Entirely black except for narrow apices of femora and bases of tibiae and except for a tinge of yellow-brown on tarsi. Hind trochanter is as in figure 58a. **Wings:** Entirely hyaline. Third costal section about one-half to one-third as long as fourth and r-m crossvein situated at middle of cell 1st M_2 . Last section of vein M_{1+2} gently curved. **Abdomen:** Submetallic black, dusted with grey-brown pollen on dorsum but with ground color shining through. As seen from dorsal view a longitudinal suture divides the eighth tergum just to the left of mid line (fig. 58b). Apical portion of eighth segment membranous but this does not bisect segment on venter. Ventral aspects of genitalia as in figure 58c. Claspers slightly enlarged, pointed inward, and subacute at apices.

Length: body and wings, 2.7 mm.

Female unknown.

Holotype male NEW BRITAIN: Vunabakan, 180 m., 10 km. E. of Keravat, November 16—20, 1959 (T. C. Maa). — In the B. P. Bishop Museum.

***Tomosvaryella subvirescens* (Loew)**

Pipunculus subvirescens Loew, 1872, Berl. Ent. Zeitschr. 16:87.

Pipunculus similans Becker, 1924, Ent. Mitteil. 13(1):15. New synonym based upon a study of Becker's co-type series from Taihuku, Formosa, in the Deutsches Ent. Inst., Eberswalde. It should also be noted that one male specimen in the collection from Formosa, determined by Hennig as *aeneiventris* (Kertész), is a specimen of *subvirescens*. I have not seen the type of *aeneiventris*, it was described from Ceylon (1903:468) and recorded by Kertész from Formosa (1912:287). For more complete synonymy of this species refer to Hardy, 1956:4.

This very widely distributed species is readily recognized by the hemispherical, symmetrical hypopygium of the male and by the conspicuous trapezoid development on each hind trochanter; and by the presence of a pair of short, black, ventral setae near base of each front femur of both sexes. The species has been adequately

described and figured by Hardy (1956:4, figures 2a-c), and by Hardy (1943:178, figures 101a-e).

Type locality Belfrage, Texas.

Type in the Museum of Comparative Zoology, Cambridge, Massachusetts.

An almost cosmopolitan species, it has been recorded throughout the Nearctic, Neotropical, Ethiopian, Oriental and Pacific regions. This is the first record from the Philippines. Twenty specimens on hand in the B. P. Bishop Museum collection from the following localities: LUZON: Mt. Prov., Abatan, Buguias, 60 S. of Bontoc, 1800—2000 m., April 12—May 27, 1964 (H. M. Torrevillas) and CULION: 6 km W. of Culion, June 6, 1962 (H. Holtmann).

***Tomosvaryella synadelpha* (Perkins) (figs. 60a-b)**

Pipunculus synadelphus Perkins, 1905, Bull. Div. Ent. Hawaiian Sugar Planters' Assoc. Exp. Sta. 1(4):150.

Tomosvaryella synadelpha (Perkins), Hardy, 1964, Australian Jour. of Zoology 12(1):121, figures 22a-f.

One male specimen from the Bismarck Islands fits here and this species may be widespread throughout the South Pacific.

T. synadelpha is characterized by having the eighth tergum completely divided by a membranous area extending longitudinally over the entire segment both as seen from dorsal as well as ventral views (figs. 60a-b). The abdomen is submetallic with distinct grey-brown pollinosity and rather thickly covered with short black setae on the posterior portion. The first tergum has about six black bristles on each side. The species has been adequately described and figured by Hardy *loc. cit.*

Length: body, 2.5—2.7 mm.

Type locality Bundeberg, Queensland, Australia.

Type in the B. P. Bishop Museum.

One male specimen on hand from the Bismarck Islands, MANUS: Lorengau, June 24, 1962, Noona Dan Expedition; and five males and one female from the Philippines, LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., May 21—30, 1964 (H. M. Torrevillas). In B. P. Bishop Museum. Some in light trap.

***Tomosvaryella synadelphoides* ? (de Meijere) (fig. 61)**

Pipunculus synadelphoides de Meijere, 1914, Tijds. v. Ent. 57:172.

One specimen in the Bishop Museum collection from the Philip-

pinus appears to be this species. It fits de Meijere's original description and a brief description and a figure which I made of the type in the Zoological Museum Amsterdam. The ventral aspects of the genitalia of *synadelphoides* have not been studied however and there is a possibility that this is not that species. The following descriptive notes are based upon the specimen at hand.

Male. Junction of compound eyes very short, about equal in length to upper portion of front. Antennae dark brown to black, third segment moderately long acuminate. Thorax metallic black covered with grey-brown pollen on mesonotum, grey on sides. Halteres and humeri yellow. Legs predominantly black, apices of femora and bases of tibiae yellow. Front and middle tibiae with short ventral bristles at apices. Hind trochanters with short scattered black setae on ventral surfaces. Third costal section one-third to one-half as long as fourth and r-m crossvein situated at or slightly beyond middle of cell 1st M_2 . Abdomen metallic black in ground color, covered with grey-brown pollen. A prominent row of black bristles present on each side of first tergum. Eighth segment slightly compressed to right, slightly over half as long as fifth and with a large membranous area covering entire apex. As seen from ventral view membranous area not completely bisecting eighth segment. Ninth rather deeply cleft in middle, concavity extends to base of segment. Claspers rather slender, slightly curved inward at apices (fig. 61).

Length: body and wings, 3.0 mm.

Type locality Samarang, Java.

Type in the Zoological Museum, Amsterdam.

One male specimen from LUZON: Mt. Prov., Abatan, Buguias, 50 km. S. of Bontoc, 1800—2000 m., May 20, 1964 (H. M. Torre-villas).

***Tomosvaryella* sp. ? female**

One headless female from TAWI TAWI: Tarawakan, November 13, 1961, Noona Dan Expedition, cannot be placed. It may possibly be *subvirescens* (Loew) but without association with the male the identification cannot be certain. The front femur has the two short black ventral setae near the base. The third costal section is scarcely more than one-third as long as the fourth and the r-m crossvein is situated near the middle of cell 1st M_2 . The abdomen is submetallic black and the piercer of the ovipositor is straight and extends to about the base of the third abdominal segment.

Tomosvaryella n. sp. ? close to *nyctias* (Perkins)

Two specimens are on hand from the Philippines, BUSUANGA: 4 km. N. San Nicolas, May 30, 1962, in Malaise trap (H. Holtmann) and LUZON: Mt. Prov., Abatan, Buguias, 60 km. S. of Bontoc, 1800—2000 m., May 19, 1964 (H. M. Torrevillas). Both in the Bishop Museum collection, fit very near *nyctias* but the genitalia seem very different. The outer clasper is broken on the male at hand, however, and the species is not being described. The wing would differ in that the r-m crossvein is located near the basal two-fifths of cell 1st M₂, rather than near the basal one-fourth. The head characters and other characteristics appear to be the same as in *nyctias*. The membranous area over the eighth segment appears to be more extensive in the specimen on hand, extending two-thirds the length of the eighth segment on the mid-line. Also the claspers appear to be longer, more slender; the inner clasper is five to six times longer than wide, is almost straight sided; both are slightly curved at apices and pointed on inner apices.

Summary

Five species of Bibionidae are recorded from the Bismarck Islands; two of these are described as new. Twenty-three species of Pipunculidae are recorded from the Philippines; eight are described as new. Nineteen species are recorded from the Bismarck Islands; thirteen are new. Also, seven species from the Philippines and four from the Bismarcks are apparently undescribed but are not being named until further specimens can be studied.

A key is presented to all the known Pacific Pipunculidae, including Taiwan, Japan and Malaysia.

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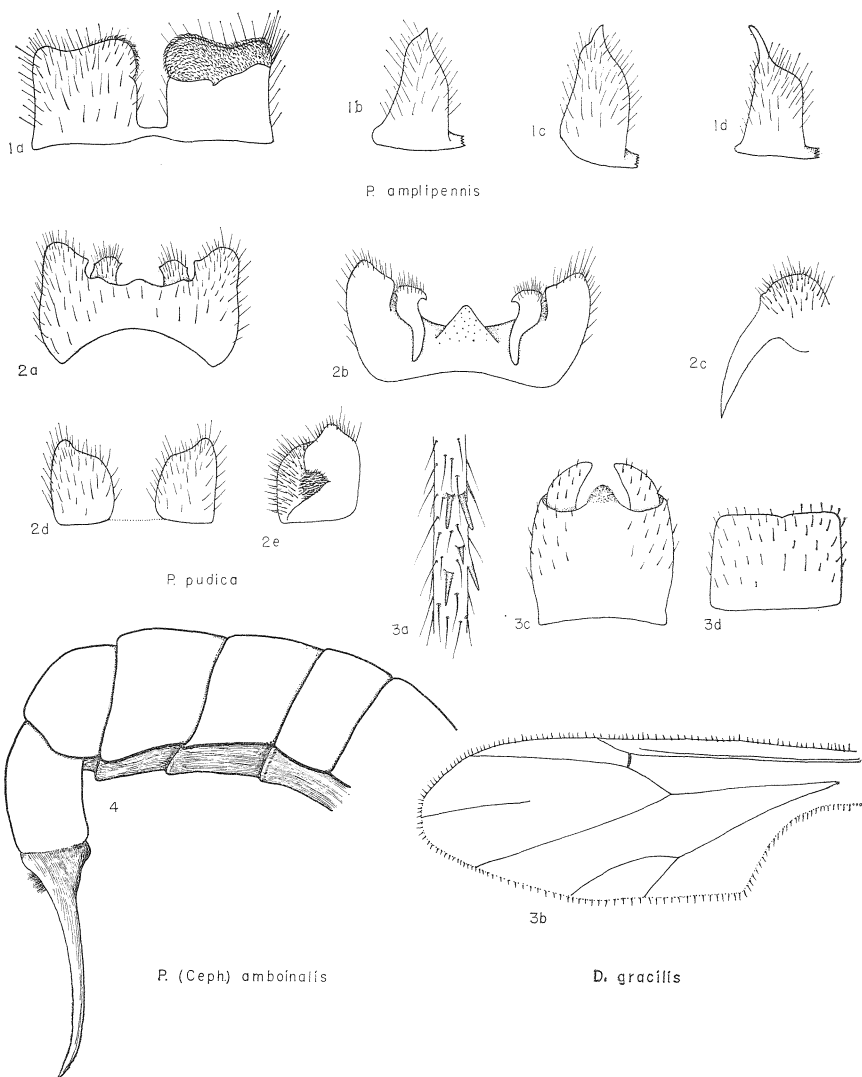


Fig. 1. *Plecia amplipennis* Skuse. a. Ninth tergum of male, dorsal and ventral views. b. Clasper of male from New Britain. c. Clasper of male from Solomon Islands. d. Clasper of male from Queensland, Australia.

Fig. 2. *Plecia pudica* n. sp. a. Ninth sternum of male, ventral. b. Ninth sternum of male, dorsal. c. Clasper, lateral. d. Ninth tergum, dorsal. e. Ventral view of right lobe of tergum.

Fig. 3. *Dilophus gracilis* n. sp. a. Front tibia of male. b. Wing. c. Male genitalia, ventral. d. Ninth tergum of male.

Fig. 4. *Pipunculus (Ceph.) amboinalis* Walker. Abdomen of female, lateral; from type in British Museum (Natural History).

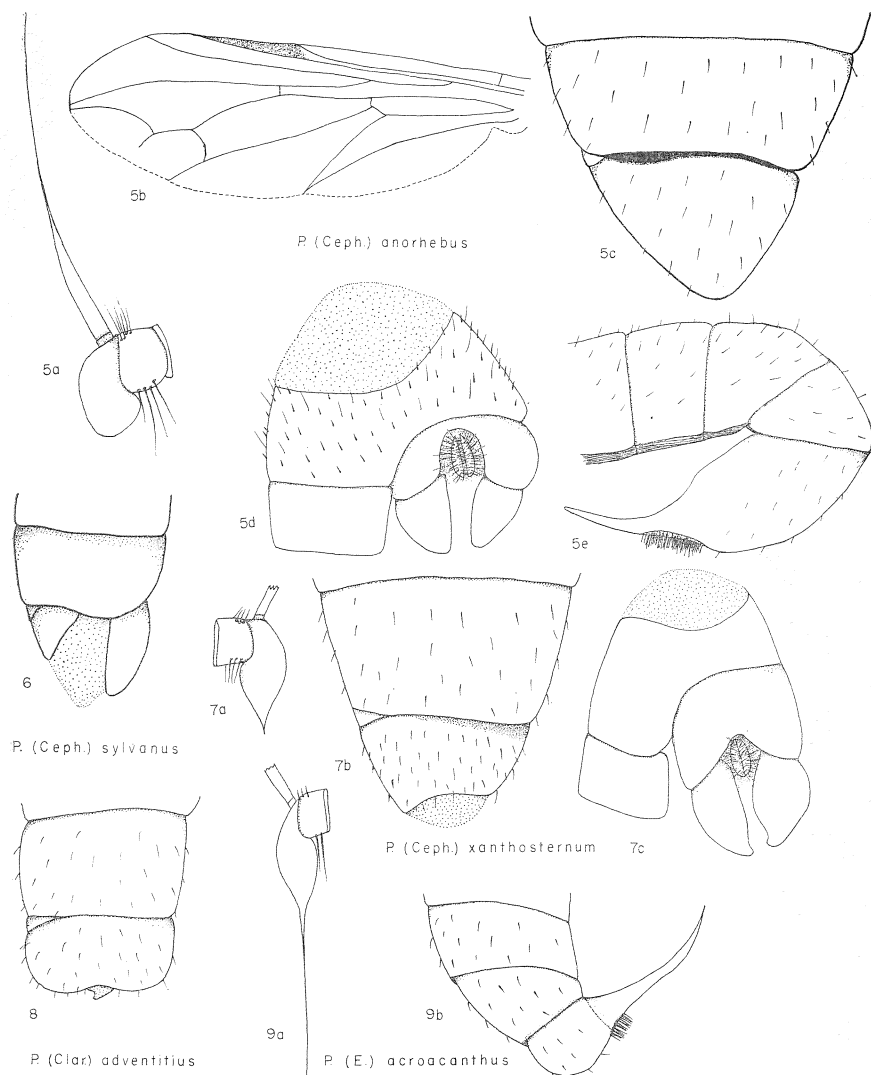


Fig. 5. *Pipunculus (Cephalosphaera) anorhaebus* n. sp. a. antenna. b. wing. c. male genitalia, dorsal. d. male genitalia, ventral. e. female ovipositor.

Fig. 6. *Pipunculus (Cephalosphaera) sylvanus* Brunetti. Male genitalia, dorsal; sketch from type in British Museum (Natural History).

Fig. 7. *Pipunculus (Cephalosphaera) xanthosternum* n. sp. a. Antenna. b. Male genitalia, dorsal c. Male genitalia, ventral.

Fig. 8. *Pipunculus (Clareola) adventitius* (Kertész). Male genitalia, dorsal; sketch from specimen in Deutsches Entomologisches Institut.

Fig. 9. *Pipunculus (Eudorylas) acroacanthus* n. sp. a. Antenna. b. Female ovipositor, lateral.

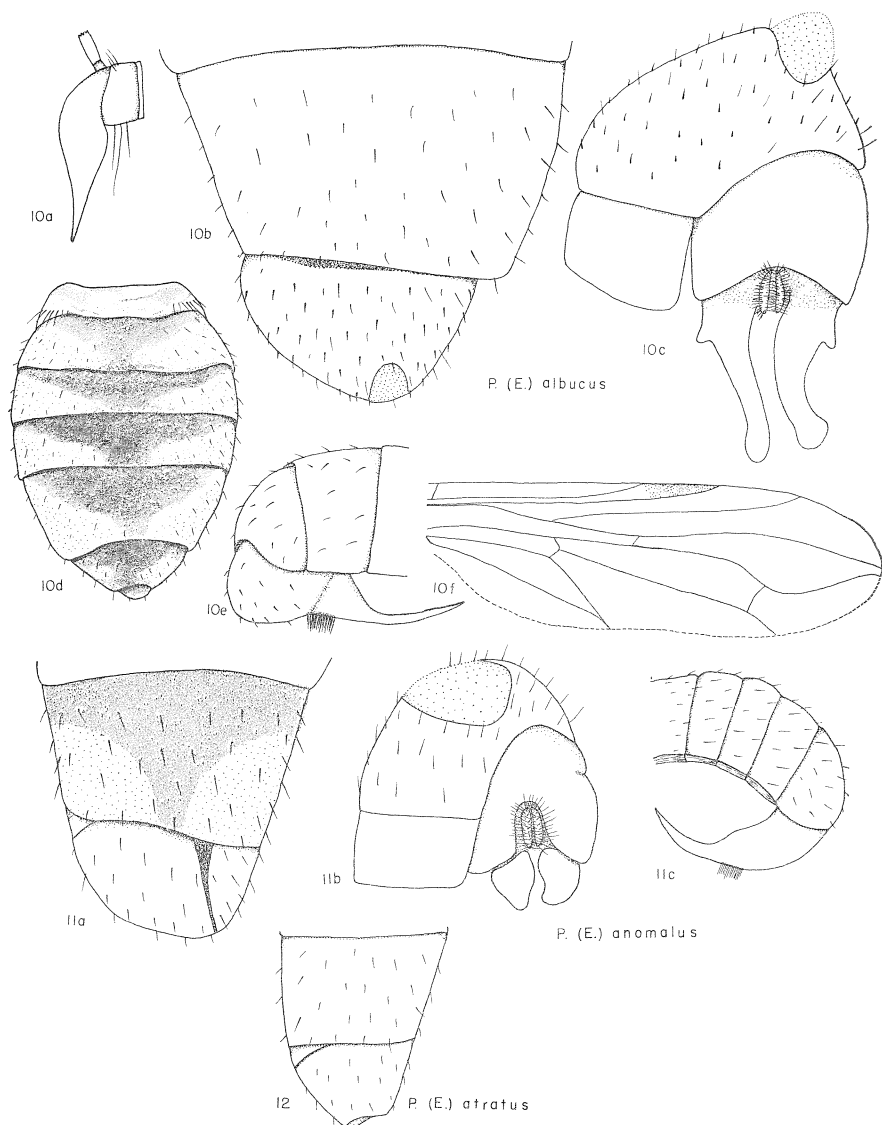


Fig. 10. *Pipunculus (Eudorylas) albucus* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female abdomen, dorsal. e. Female ovipositor, lateral. f. Wing.

Fig. 11. *Pipunculus (Eudorylas) anomalus* n. sp. a. Male genitalia, dorsal. b. Male genitalia, ventral. c. Female ovipositor, lateral.

Fig. 12. *Pipunculus (Eudorylas) atratus* de Meijere. Male genitalia, dorsal; sketch made of type in Zoological Museum, Amsterdam.

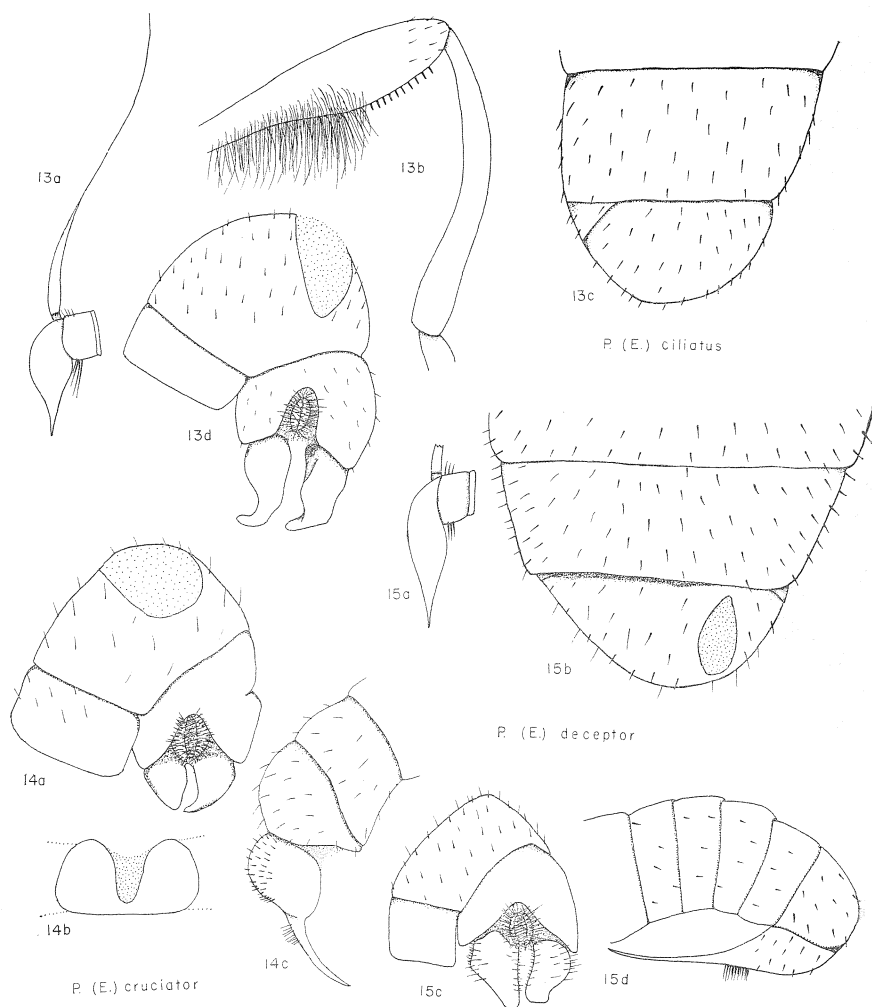


Fig. 13. *Pipunculus (Eudorylas) ciliatus* de Meijere. a. Antenna. b. Hind femur and tibia of male. c. Male genitalia, dorsal. d. Male genitalia, ventral.

Fig. 14. *Pipunculus (Eudorylas) cruciator* Perkins. a. Male genitalia, ventral. b. Fifth sternum of male. c. Female ovipositor, lateral.

Fig. 15. *Pipunculus (Eudorylas) deceptor* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral.

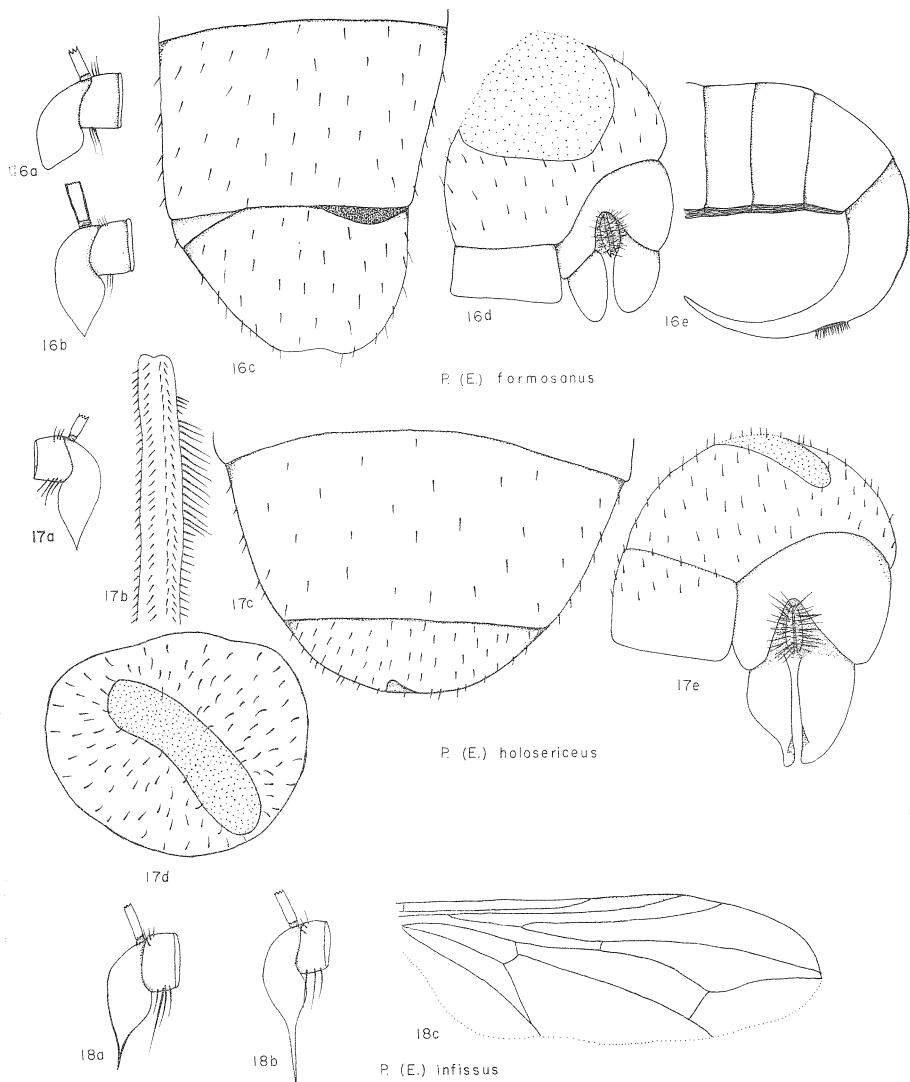


Fig. 16. *Pipunculus (Eudorylas) formosanus* Kertész. a. Antenna of male. b. Antenna of female. c. Male genitalia, dorsal. d. Male genitalia, ventral. e. Ovipositor of female, lateral.

Fig. 17. *Pipunculus (Eudorylas) holosericeus* Becker? a. Antenna. b. Middle tibia of male. c. Male genitalia, dorsal. d. Male genitalia, end view. e. Male genitalia, ventral.

Fig. 18. *Pipunculus (Eudorylas) infissus* n. sp. a. Antenna of male. b. Antenna of female. c. Wing. d. Male genitalia, dorsal. e. Male genitalia, ventral. f. Abdomen of female, lateral.

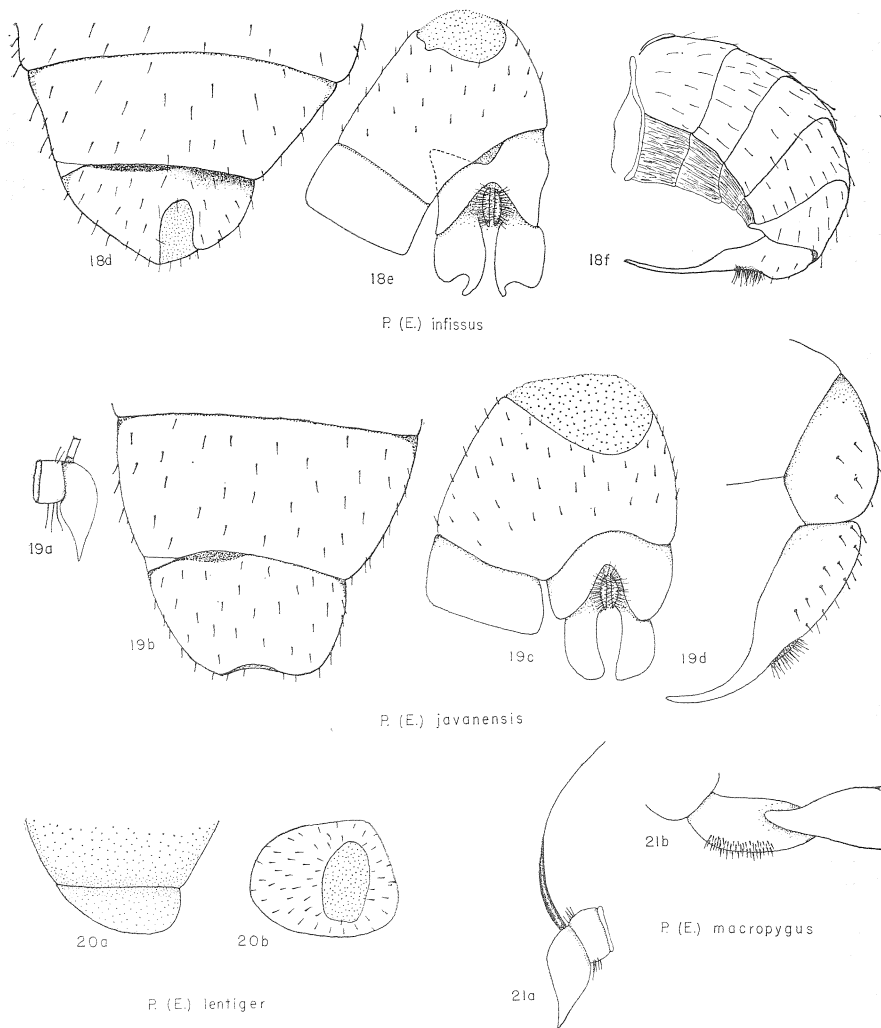


Fig. 19. *Pipunculus (Eudorylas) javanensis* de Meijere. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral.

Fig. 20. *Pipunculus (Eudorylas) lentiger* (Kertész). a. Male genitalia, dorsal. c. Male genitalia, end view (both copied from Kertész, 1915).

Fig. 21 a, b. *Pipunculus (Eudorylas) macropygus* de Meijere. a. Antenna. b. Hind trochanter of male.

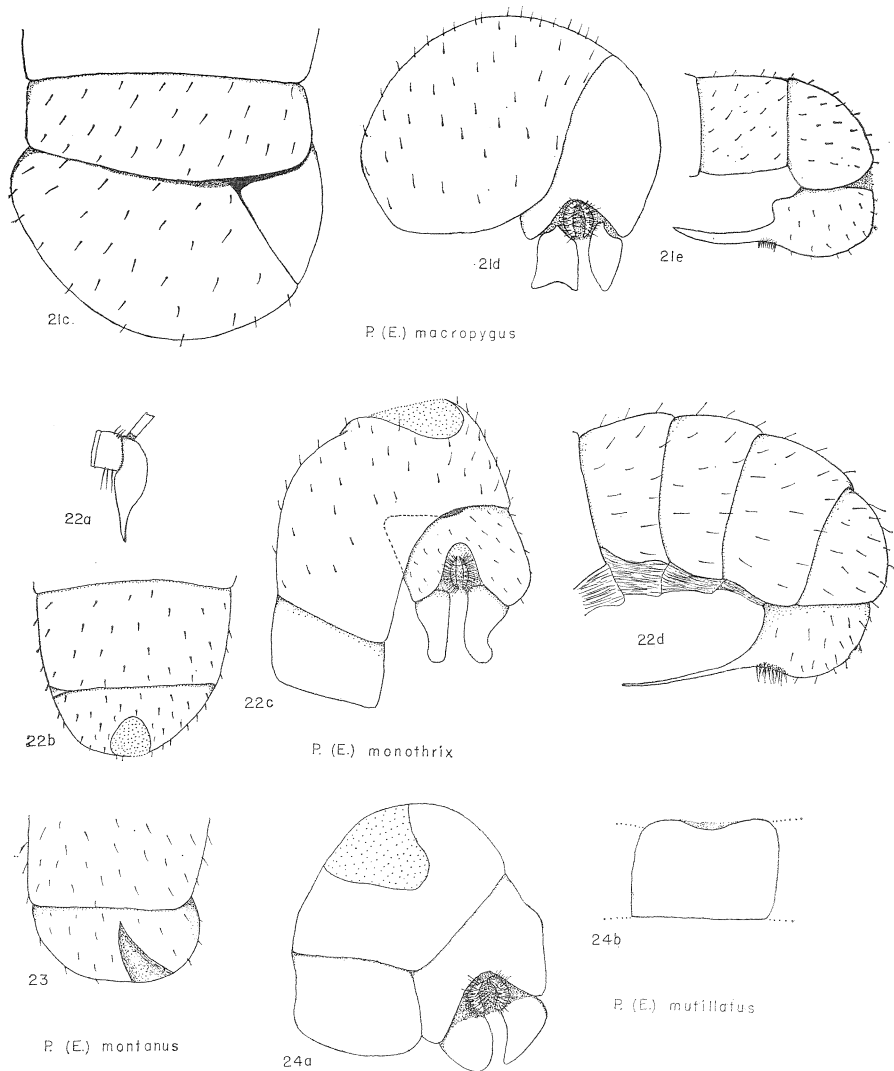


Fig. 21 c-e. *Pipunculus (Eudorylas) macropygus* de Meijere. c. Male genitalia, dorsal. d. Male genitalia, ventral. e. Ovipositor of female, lateral.

Fig. 22. *Pipunculus (Eudorylas) monothrix* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral.

Fig. 23. *Pipunculus (Eudorylas) montanus* de Meijere. Male genitalia, dorsal; from sketch made of type in Zoological Museum, Amsterdam.

Fig. 24. *Pipunculus (Eudorylas) mutillatus* Loew. a. Male genitalia, ventral. b. Fifth sternum of male.

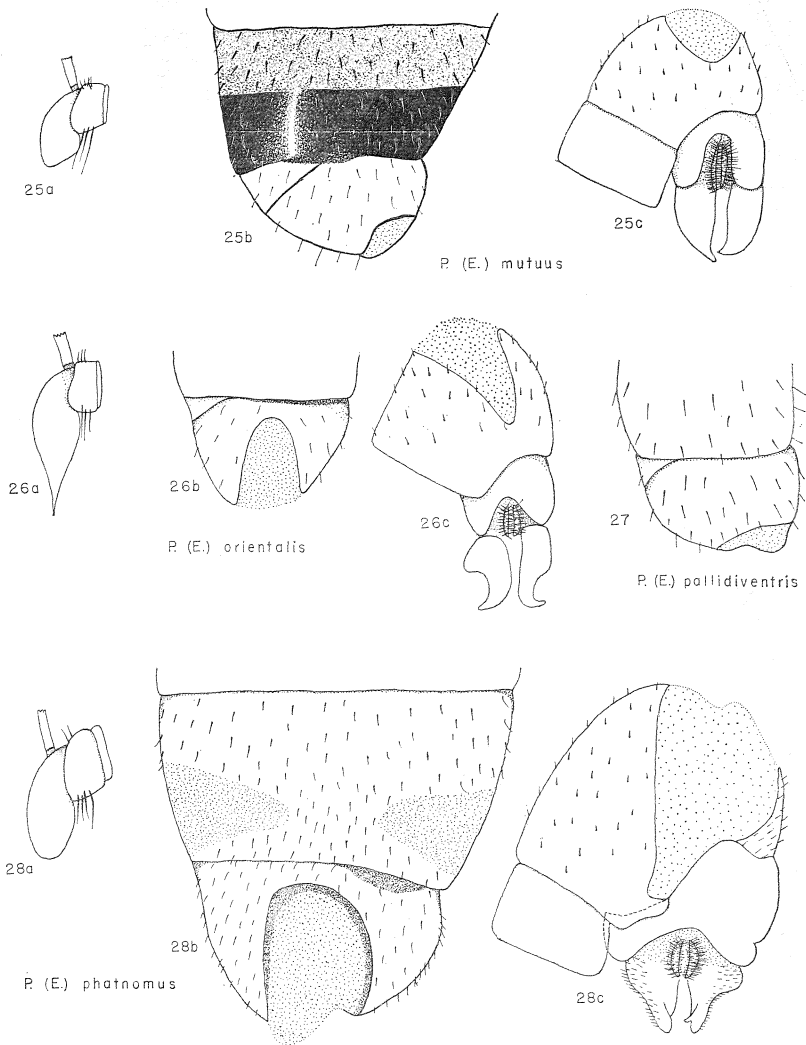


Fig. 25. *Pipunculus (Eudorylas) mutuus* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral.

Fig. 26. *Pipunculus (Eudorylas) orientalis* (Koizumi). a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral.

Fig. 27. *Pipunculus (Eudorylas) pallidiventris* de Meijere. Male genitalia, dorsal; from sketch made of type in the Zoological Museum, Amsterdam.

Fig. 28. *Pipunculus (Eudorylas) phatnomus* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral.

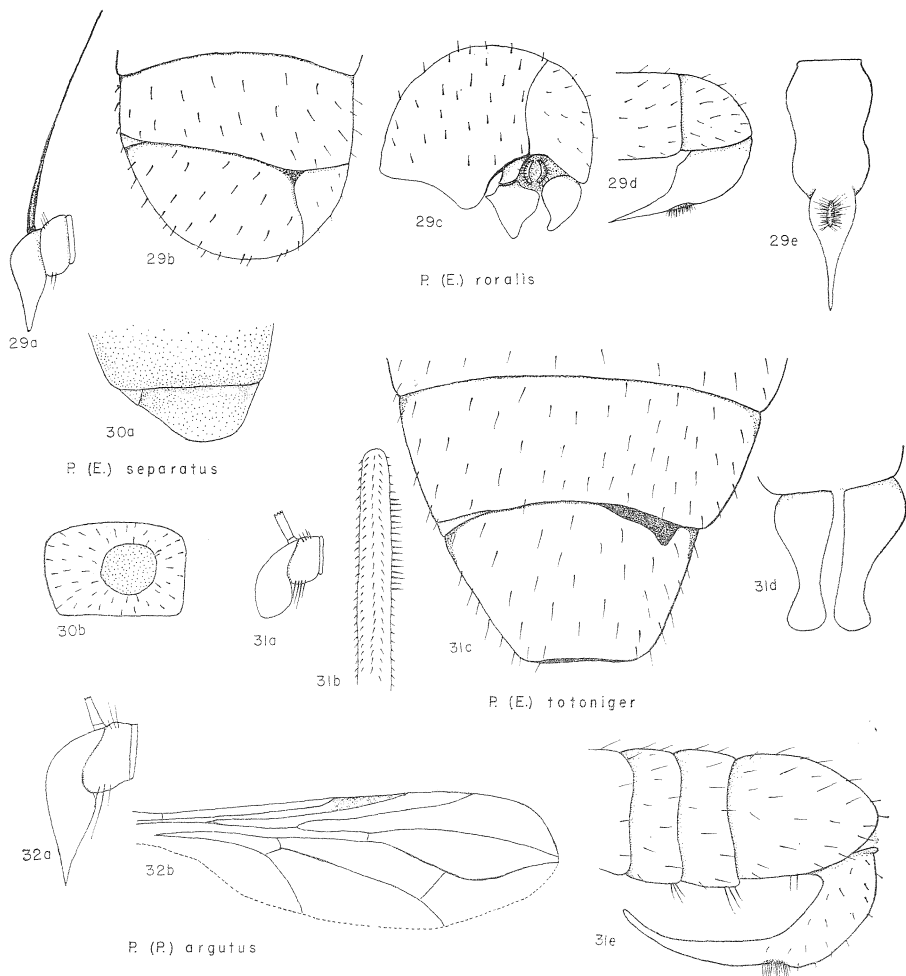


Fig. 29. *Pipunculus (Eudorylas) roralis* (Kertész). a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral. e. Female ovipositor, dorsal.

Fig. 30. *Pipunculus (Eudorylas) separatus* (Kertész). a. Male genitalia, dorsal. b. Male genitalia, end view (both copied from Kertész, 1915).

Fig. 31. *Pipunculus (Eudorylas) totoniger* n. sp. a. Antenna. b. Middle tibia, dorsal. c. Male genitalia, dorsal. d. Clasper, diagrammatic, in situ. e. Female ovipositor, lateral.

Fig. 32. *Pipunculus (Pipunculus) argutus* n. sp. a. Antenna. b. Wing. c. Male genitalia, dorsal of type. d. Male genitalia, dorsal of paratype. e. Male genitalia, ventral of type.

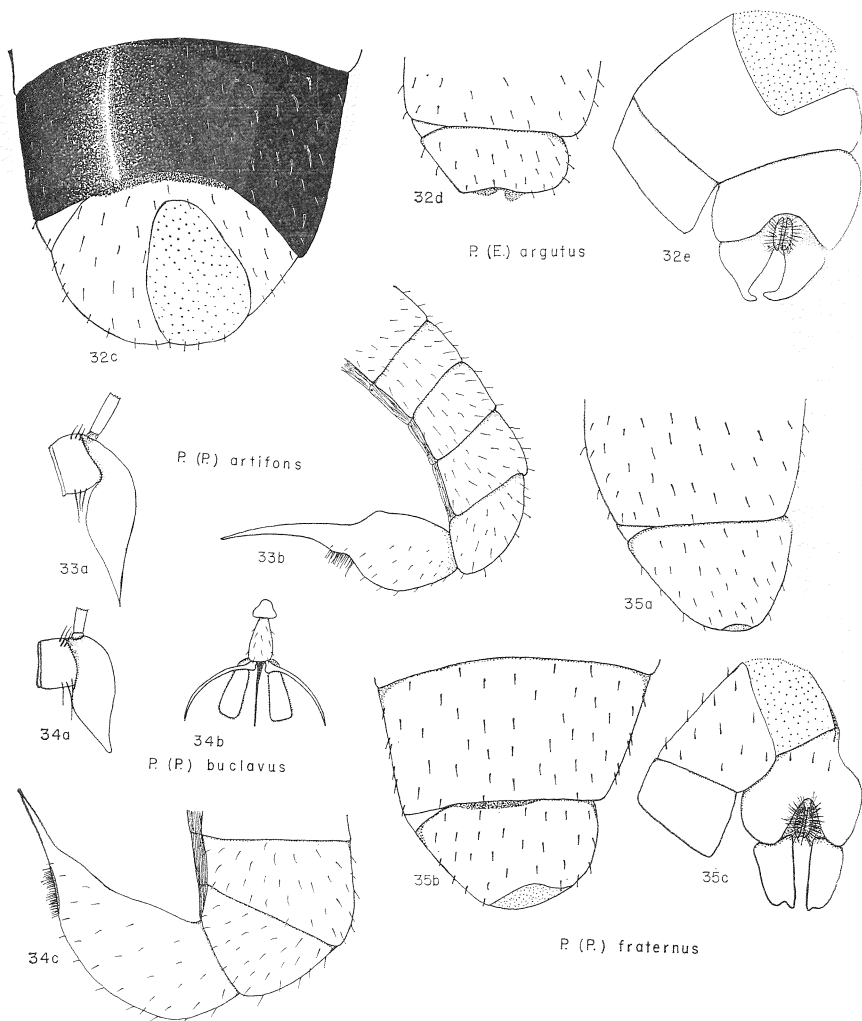


Fig. 33. *Pipunculus (Pipunculus) artifrons* n. sp. a. Antenna. b. Abdomen of female, lateral.

Fig. 34. *Pipunculus (Pipunculus) buclavus* n. sp. a. Antenna. b. Apex of female tarsus. c. Ovipositor, lateral.

Fig. 35. *Pipunculus (Pipunculus) fraternus* Kertész. a. Male genitalia, dorsal; from sketch made from specimen in Deutsches Entomologisches Inst. b. Male genitalia, dorsal; drawn from New Ireland specimen. c. Male genitalia, ventral.

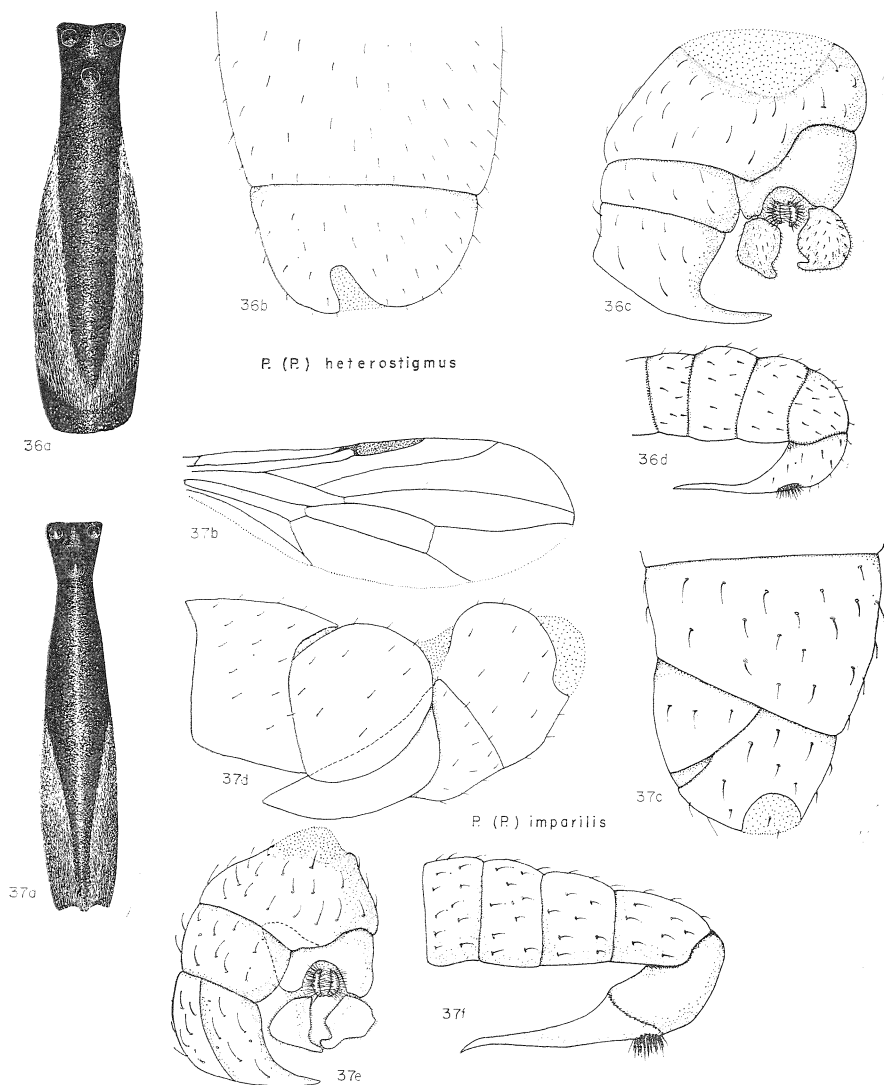


Fig. 36. *Pipunculus (Pipunculus) heterostigmus* Perkins. a. Front of female. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral.

Fig. 37. *Pipunculus (Pipunculus) imparilis* n. sp. a. Front of female. b. Wing. c. Male genitalia, dorsal. d. Male genitalia, lateral. e. Male genitalia, ventral. f. Female ovipositor, lateral.

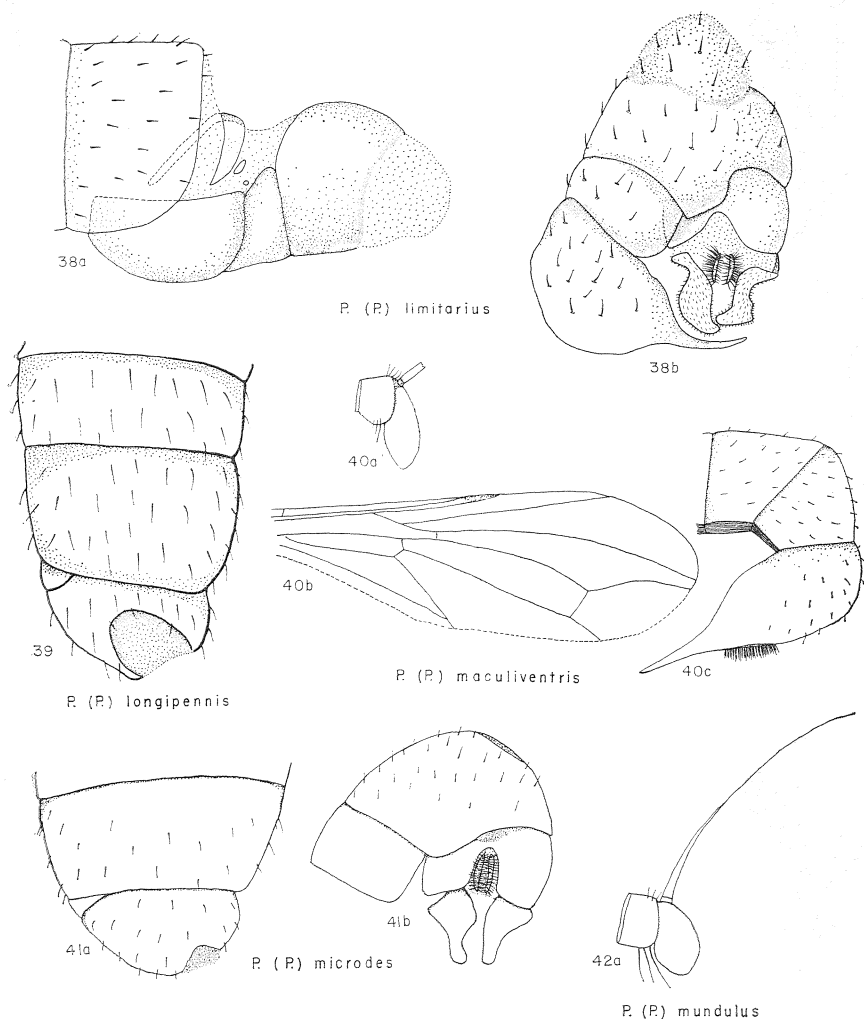


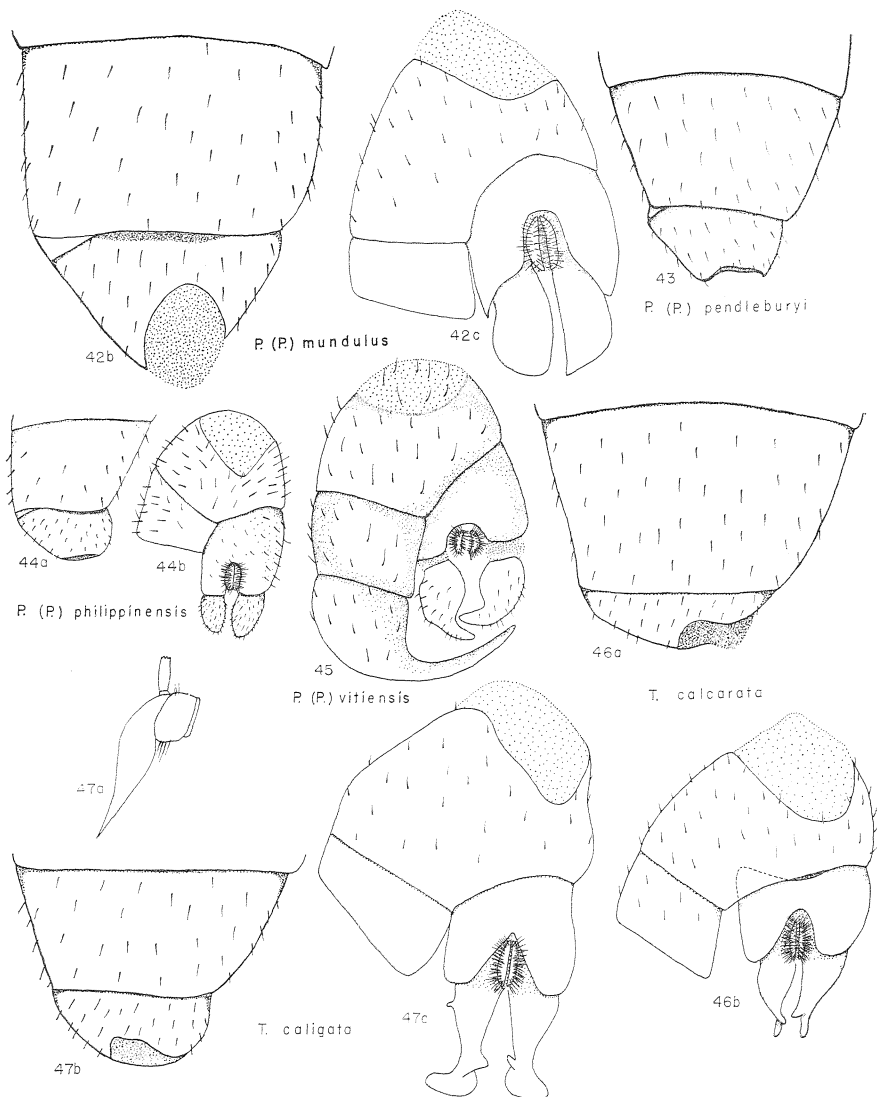
Fig. 38. *Pipunculus (Pipunculus) limitarsus* Collin. a. Male genitalia, left, lateral. b. Male genitalia, ventral.

Fig. 39. *Pipunculus (Pipunculus) longipennis* Brunetti. Male genitalia, dorsal; from type in British Museum (Natural History).

Fig. 40. *Pipunculus (Pipunculus) maculiventris* Brunetti. a. Antenna. b. Wing. c. Female ovipositor, lateral.

Fig. 41. *Pipunculus (Pipunculus) microdes* Perkins. a. Male genitalia, b. Male genitalia, ventral.

Fig. 42 a. *Pipunculus (Pipunculus) mundulus* n. sp. Antenna.



Figs. 42 b, c. *Pipunculus (Pipunculus) mundulus* n. sp. b. Male genitalia, dorsal. c. Male genitalia, ventral.

Fig. 43. *Pipunculus (Pipunculus) pendleburyi* Brunetti. Male genitalia, dorsal; from sketch made of type in British Museum (Natural History).

Fig. 44. *Pipunculus (Pipunculus) philippinensis* (Hardy). a. Male genitalia, dorsal. b. Male genitalia, ventral (both copied from Hardy, 1948).

Fig. 45. *Pipunculus (Pipunculus) vitiensis* (Muir). Male genitalia, ventral.

Fig. 46. *Tomosvaryella calcarata* n. sp. a. Male genitalia, dorsal. b. Male genitalia, ventral.

Fig. 47. *Tomosvaryella caligata* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral.

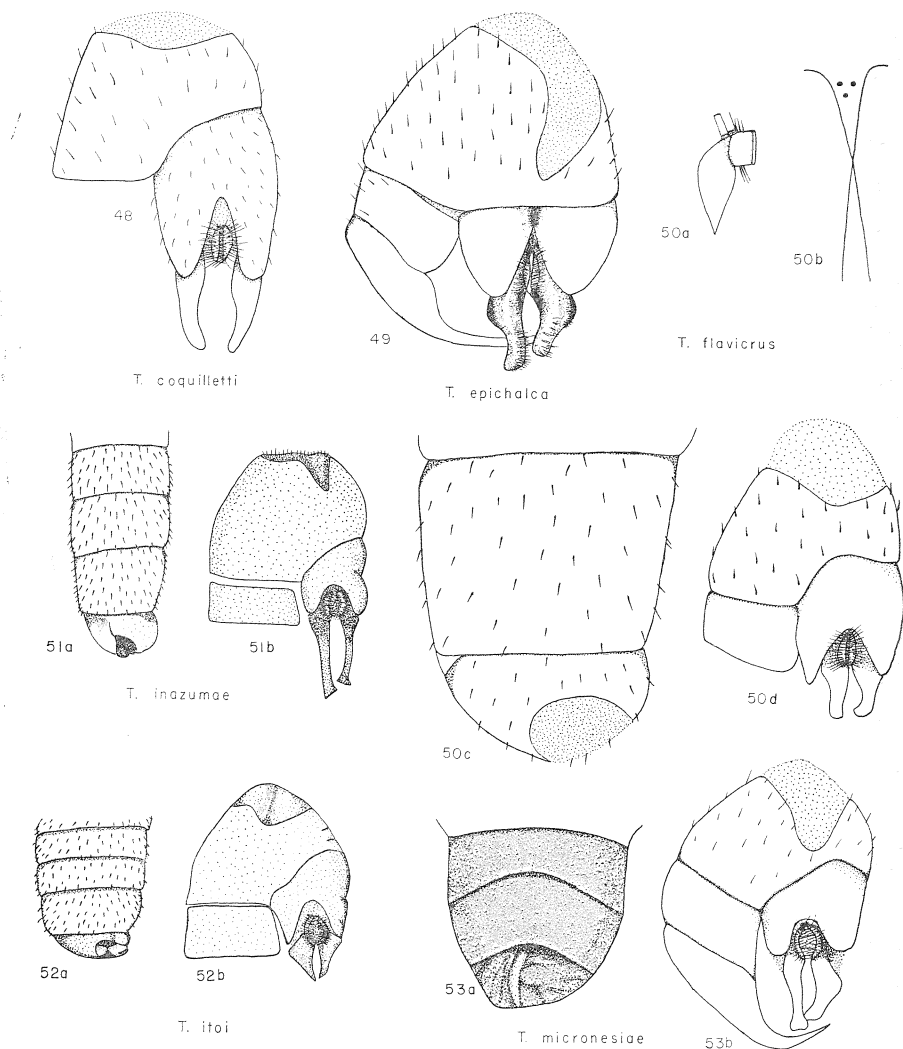


Fig. 48. *Tomosvaryella coquilletti* (Kertész). Male genitalia, ventral.

Fig. 49. *Tomosvaryella epichalca* (Perkins). Male genitalia, ventral.

Fig. 50. *Tomosvaryella flavicrus* n. sp. a. Antenna. b. Front of male. c. Male genitalia, dorsal. d. Male genitalia, ventral.

Fig. 51. *Tomosvaryella inazumae* (Koizumi). a. Male genitalia, dorsal (copied from Koizumi, 1960). b. Male genitalia, ventral (copied from Koizumi, 1960).

Fig. 52. *Tomosvaryella itoi* (Koizumi). a. Male genitalia, dorsal (copied from Koizumi, 1960). b. Male genitalia, ventral (copied from Koizumi, 1960).

Fig. 53. *Tomosvaryella micronesiae* Hardy. a. Male genitalia, dorsal. b. Male genitalia, ventral (both copied from Hardy, 1956).

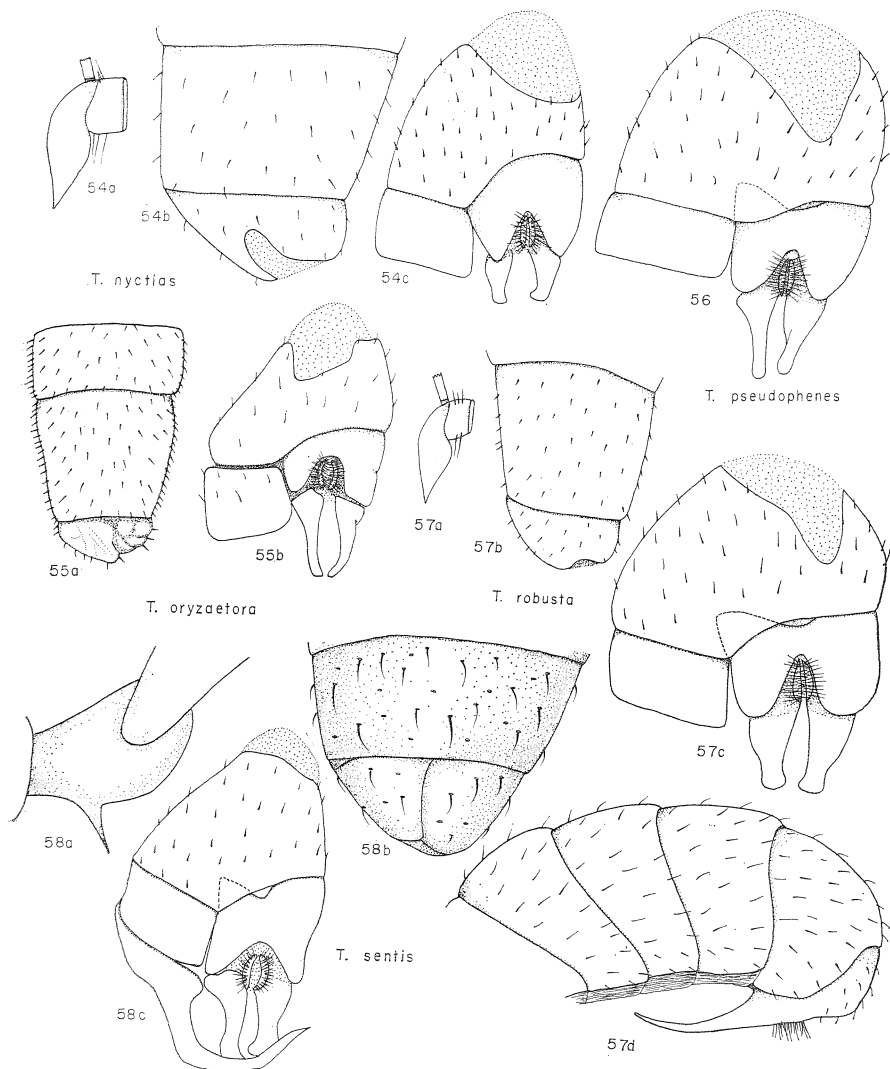


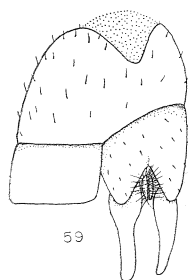
Fig. 54. *Tomosvaryella nyctias* (Perkins). a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral.

Fig. 55. *Tomosvaryella oryzaetora* (Koizumi). a. Male genitalia, dorsal (copied from Koizumi, 1959). b. Male genitalia, ventral (copied from Koizumi, 1959).

Fig. 56. *Tomosvaryella pseudophenes* (Perkins). Male genitalia, ventral.

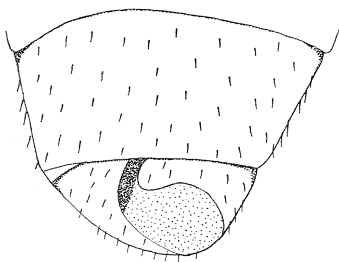
Fig. 57. *Tomosvaryella robusta* n. sp. a. Antenna. b. Male genitalia, dorsal. c. Male genitalia, ventral. d. Female ovipositor, lateral.

Fig. 58. *Tomosvaryella sentis* n. sp. a. Hind trochanter of male. b. Male genitalia, dorsal. c. Male genitalia, ventral.

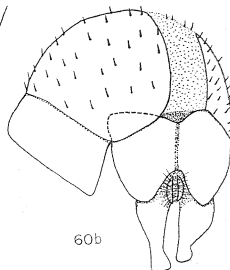


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T. sylvatica

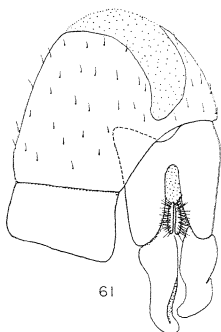


60a



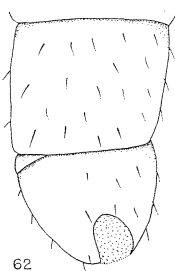
60b

T. synadelpha



61

T. synadelphoides



62

T. translucens

Fig. 59. *Tomosvaryella sylvatica* (Meigen). Male genitalia, ventral.

Fig. 60. *Tomosvaryella synadelpha* (Perkins). a. Male genitalia, dorsal. b. Male genitalia, ventral.

Fig. 61. *Tomosvaryella synadelphoides* (de Meijere). Male genitalia, ventral.

Fig. 62. *Tomosvaryella translucens* de Meijere. Male genitalia, dorsal; sketch made from specimen in Zoological Museum, Amsterdam.