

THE TRIBE CALLIPHORINI FROM AUSTRALIAN AND ORIENTAL REGIONS

II. *CALLIPHORA*-GROUP (Diptera: Calliphoridae)¹

By Hiromu Kurahashi²

Abstract : The Australian and Oriental *Calliphora*-group consists of the following 5 genera: *Xenocalliphora* Malloch (6 spp.), *Aldrichina* Townsend (1 sp.), *Triceratopyga* Rohdendorf (1 sp.), *Eucalliphora* Townsend (1 sp.) and *Calliphora* Rob.-Desvoidy (37 spp.). The genus *Calliphora* Rob.-Desvoidy has a number of members with a greater diversity of form and coloration than do those known from any other faunal region, and it is subdivided into the 5 subgenera: *Neocalliphora* Brauer & Bergenstamm, *Calliphora* s. str., *Paracalliphora* Townsend, *Papuocalliphora* n. subgen. and *Australocalliphora* n. subgen. in the present paper. The following forms are described as new: *Calliphora pseudovomitorea*, *Paracalliphora papuensis*, *P. kermadeca*, *P. norfolka*, *P. augur neocaledonensis*, *P. espiritusanta*, *P. porphyrina*, *P. gressitti*, *P. rufipes kermadecensis*, *P. rufipes tasmanensis*, *P. rufipes tahitiensis*, *Australocalliphora onesioidea* and *A. tasmaniae*.

This second study in the series on Australian and Oriental Calliphorini presents a revision of the *Calliphora*-group based on a much greater amount of material than the early authors had. Most of the specimens examined were available in the Department of Entomology, Bernice P. Bishop Museum, Honolulu. I have raised the number of species to 46 which belong to 5 genera: *Xenocalliphora* Malloch, *Aldrichina* Townsend, *Triceratopyga* Rohdendorf, *Eucalliphora* Townsend and *Calliphora* Rob.-Desvoidy. The former 4 are either monobasic or with few species in contrast with the 38 species of the last genus. They have several plesiomorphous characters, i.e., dichoptic condition of eyes in ♂, in spite of a more or less high degree of specialization with respect to some features such as hypopygium. They are probably representatives of old *Calliphora*-group flies which have evolved in more or less different ways from that of *Calliphora*. In the Holarctic Realm there are several genera which have a certain affinity with these old calliphorid flies. They are *Cynomyia* Rob.-Desvoidy, *Cynomyiomima* Rohdendorf, *Cyanus* Hall, *Steringomyia* Pokorny, *Onesiomima* Rohdendorf and *Abago* Grunin.

Most species of the genus *Calliphora* seem to be comparatively new in relative evolutionary time, and are well adapted to their present environments. *Calliphora toxopeusi* Theowald and *C. nigrithorax* Malloch, however, have plesiomorphous characters as observed in the old *Calliphora*-group. These 2 forms are examples of the living ancestral stock of present-day *Calliphora*.

The genus *Calliphora* is subdivided into 5 subgenera: *Neocalliphora* Brauer & Bergen-

1. Partial results of a grant to Bishop Museum from the United States National Institute of Health (AI-01723) and a grant from the National Science Foundation (GB-13731).
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stamm, *Calliphora* s. str., *Paracalliphora* Townsend and 2 new ones, in the present study. The subdivision is based on comparative study of the general external and male genitalic morphology. This is similar to the natural grouping proposed by Patton (1935). He studied the terminalia of 15 species and classified them into 3 natural groups as follows: Augur Group, Canimicans Group and Erythrocephala Group. The Erythrocephala Group of Patton, which should be substituted for the name *vicina*-group, consists of the subgenera *Neocalliphora* and *Calliphora* s. str. The Augur Group may include *Paracalliphora* and a new subgenus from New Guinea. Another new subgenus, which is indigenous to Australia, agrees with the Canimicans Group of Patton. The dendrogram showing the probable generic and subgeneric relationships within the Australian and Oriental *Calliphora*-group is illustrated in fig. 1. The *augur*-group seems to be well established and most abundant in number of species throughout the faunal region treated here. The distribution of the *vicina*-group is obliterated in the equatorial region of the East Indies. *Neocalliphora* has a territory in the South Temperate Zone. On the other hand, *Calliphora* s. str. is considered to originate in the North Temperate Zone. This striking example of discontinuity in range is of particular interest in understanding the history of the blowfly. It remains to be proved whether the 2 subgenera are identical.

An effort to clarify the fauna of the Australian *Calliphora*-group started in 1923, when a synonymic list of some described flies was published by Johnston & Hardy. In 1925a, Patton published the results of his studies of types of Australian *Calliphora* which are situated in Europe. Hardy (1926) drew attention to discrepancies in Patton's view,

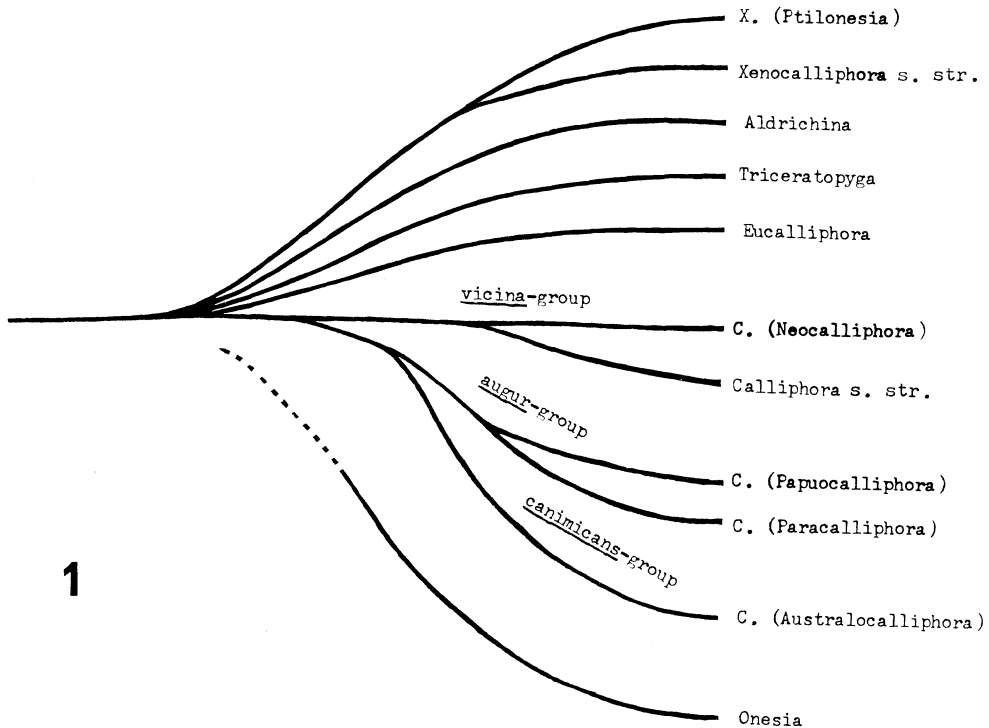


Fig. 1. A probable phylogeny of the *Calliphora*-group.

and gave further information concerning the identity of the species after examining many types.

On the whole, however, the *Calliphora*-group was first revised by Bezzi (1927) and Malloch (1927) independently. Bezzi reviewed many genera previously proposed, and covered all the Indo-Australian species over a wide area. He described several new species in his paper. Malloch offered the first complete revision of Australian Calliphoridae, in which we can find *Ptilonesia auronotata* (Macquart) and 23 species of *Calliphora*, of which 13 species seem to belong to the genus *Onesia*. Malloch used the single genus *Calliphora* without subdividing it, throughout a series of his works. He (1932a) later again revised the Australian *Calliphora*, especially the 10 species related to *Calliphora stygia* Fabricius. Seven species were described as new in his works. Some resident dipterists have tackled the elucidation of the closely allied species of the *Calliphora*-group. Hutton (1881, 1901, 1902) and Miller (1921, 1939a) have studied the group in New Zealand and its adjacent islands. Hardy (1926, 1930, 1932, 1940, 1947) has greatly contributed to the systematics of the group in New Zealand and Australia. He (1937) considered the phylogeny of the Australian *Calliphora* s. lat. and arranged the included species in 5 subgenera, namely *Adichosia* Surcouf, *Calliphora* s. str., *Neopollenia* Brauer, *Proekon* Surcouf and *Onesia* Rob.-Desvoidy. This subdivision was based on color character and such terminal characters which might run parallel to color were used to support it. Patton (1935) proposed another arrangement of the species within the *Calliphora* s. lat. He has 3 main species groups based upon the type of aedeagus the species exhibit, namely Augur Group, Canimicans Group and Erythrocephala Group. Hardy (1937) states that Patton's arrangement is not so very different from his own, the differences lying mainly in the position where the dividing lines are to be drawn. However these 2 systems appear to be distinguished from each other. Senior-White, Aubertin & Smart (1940) revised the Oriental *Calliphora*-group in the Fauna of British India, Diptera VI which dealt with 8 species known in the faunal region. A few species, which are members of a different genus, are incorrectly included in the single genus *Calliphora*. There are several recent papers to refer to in which new species have been described from the Marquesas Is. (Malloch 1932b), New Zealand (Murray 1954) and New Guinea (Theowald 1957). Hall (1948) reported *Eucalliphora lilaea* (Walker) from the Hawaiian Is. From Micronesia there is no new information after the exhaustive survey of Insects of Micronesia, which was carried out by B. P. Bishop Museum, and resulted in no discovery of *Calliphora* blowflies (James 1962).

SYSTEMATICS

Genus *Xenocalliphora* Malloch

Xenocalliphora Malloch, 1924, *Trans. N. Z. Inst.* 55: 639. Type-species: *Calliphora eudypti* Hutton, 1902.

Distinguished from the other Oriental and Australian genera of Calliphorini by the following characteristics :

Diagnosis: Thoracic squama completely hairy on upper surface ; subcostal sclerite with black setulose hairs ; eyes of ♂ as widely separated as those of ♀ or conspicuously dichoptic, not closely approximated ; mesothoracic spiracle light orange and swollen ; epaulet and basicosta

usually light orange-yellow; hypopygium large, prominent; aedeagus with primitive harpes which is distinctly separated from one another for a distance from harpes basis to apex; vesicae developed; ovipositor shorter than that of *Calliphora* s. str., but regularly segmented (fig. 13); ♀ internal genitalia not examined.

Bionomics: ? Viviparous.

DISTRIBUTION: New Zealand, Antipodes Is., Campbell Is., Auckland Is., and the east coastal region of Australia.

Subgenus *Ptilonesia* Bezzi

Calliphora (*Ptilonesia*) *Bezzi*, 1927, *Bull. Ent. Res.* **17**: 242. Type-species: *Pollenia auronotata* Macquart, 1855.

Distinguished from the nominate subgenus by the following characteristics:

Diagnosis: Eyes densely or sparsely but distinctly haired (easily visible), conspicuously dichoptic in ♂; no strong proclinate *ors* present in ♀; *ia* 1+2; *st* 2+1; epandrium with a stout curved hook on each side.

Xenocalliphora (*Ptilonesia*) *auronotata* (Macquart) Fig. 2-4.

Pollenia auronotata Macquart, 1855, *Mém. Soc. Sci. Lille* (1854): 135. — Macquart, 1855, *Dipt., Exot.*, suppl. **5**: 115.

Calliphora auronotata: Schiner, 1868, *Novara Reise*, *Dipt.*: 307. — Hutton, 1881, *Cat. Dipt. N. Z.*: 59. — Malloch, 1924, *Trans. N. Z. Inst.* **55**: 640.

Ptilonesia auronotata: Malloch, 1927, *Proc. Linn. Soc. N. S. W.* **52**: 303. — Malloch, 1930, *Rec. Cant. Mus.* **3**: 316.

Calliphora (*Ptilonesia*) *auronotata*: Bezzi, 1927, *Bull. Ent. Res.* **17**: 242. — Patton, 1935, *Ann. Trop. Med. Parasitol.* **29**: 32.

Calliphora hortona: Hutton, 1881, *Cat. Dipt. N. Z.*: 59 (misid.). — Hutton, 1901, *Trans. N. Z. Inst.* **33**: 65 (misid.). — Miller, 1921, *N. Z. J. Agr.* **22**: 325 (misid.).

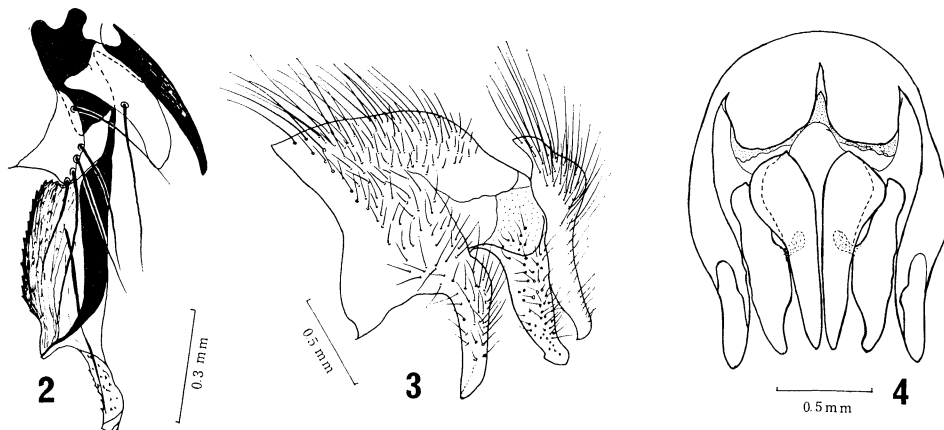


Fig. 2-4. Hypopygium of *Xenocalliphora* (*Ptilonesia*) *auronotata* (Macquart): 2, aedeagus and parameres, lateral view; 3, cerci and paralobi, lateral view; 4, cerci and paralobi, posterior view.

Type-locality: ? New Zealand. *Type*, ? in Paris.

Length: 8.0-9.5 mm.

SPECIMENS EXAMINED. AUSTRALIA: 30 ♂♂, 15 ♀♀, Sydney, 21.VIII.?, J. F. Illingworth; 1 ♂, Brisbane, ?, J. F. Illingworth (BISHOP).

Bionomics: *Ptilonesia auronotata* (Macquart) especially occurs on seashores where it breeds in decaying sea weed in New Zealand. The adults are to be found sometimes in houses and upon horse dung in the field. They reach their greatest abundance in the autumn (Miller 1921 & 1939a). The description and figures of the larval stage were given by Miller (1939a).

DISTRIBUTION: Australia (Sydney), New Zealand (Macquart 1855, Hutton 1881 & 1901) and Auckland Is. (Miller 1939a).

Subgenus **Xenocalliphora** s. str.

Xenocalliphora Malloch, 1924, *Trans. N. Z. Inst.* **55**: 639. Type-species: *Calliphora egypti* Hutton, 1902.

Diagnosis: Eyes very sparsely and indistinctly haired (magnification required) or bare, in ♂ as widely separated as those of ♀; 2 proclinate *ors* well developed in ♀; *ia* 1+1 or 1+2; epandrium without lateral lobe.

Xenocalliphora (**Xenocalliphora**) **neohortona** (Miller)

Calliphora neohortona Miller, 1939, Cawthron Inst. Monogr., no. 2: 51.

Xenocalliphora hortona: Malloch, 1924, *Trans. N. Z. Inst.* **55**: 639 (misid.).

Type-locality: Westland, New Zealand. *Type* in the Canterbury Museum.

No available material.

Length: 6.0 mm.

Bionomics: Nothing is known.

DISTRIBUTION: New Zealand.

Xenocalliphora (**Xenocalliphora**) **neozealandica** (Murray)

Calliphora neozealandica Murray, 1954, *Trans. R. Soc. N. Z.* **82**: 713.

Type-locality: Oringaronga, New Zealand. *Type* in the Entomology Division, D. S. I. R., Nelson.

No available material.

Length: 9.0 mm.

Bionomics: The description and figures of larval stage were given by Murray (1954). The adult specimens used for the original description were caught on a freshly-killed deer carcass or fresh liver in the native bush in New Zealand.

DISTRIBUTION: New Zealand.

Xenocalliphora (Xenocalliphora) antipodea (Hutton)

Calliphora antipodea Hutton, 1902, *Trans. N. Z. Inst.* 34: 171. — Miller, 1939, Cawthron Inst. Monogr., no. 2: 41.

Calliphora (Xenocalliphora) antipodea: Bezzi, 1927, *Bull. Ent. Res.* 17: 246.

Xenocalliphora antipodea: Malloch, 1930, *Rec. Cant. Mus.* 3: 317.

Type-locality: Antipodes Is., New Zealand. Type ?.

No available material.

Length: ?.

Bionomics: Nothing is known.

DISTRIBUTION: Antipodes Is.

Xenocalliphora (Xenocalliphora) viridiventris Malloch Fig. 5-8.

Xenocalliphora viridiventris Malloch, 1930, *Rec. Cant. Mus.* 3: 318.

Calliphora viridiventris: Miller, 1939, Cawthron Inst. Monogr., no. 2: 40.—Harrison, 1964, *Pacif. Ins. Monogr.* 7: 321.

Calliphora eudypti Hutton, 1902, *Trans. N. Z. Inst.* 34: 170 (preocc.).

Calliphora (Xenocalliphora) eudypti: Bezzi, 1927, *Bull. Ent. Res.* 17: 246.

Xenocalliphora eudypti: Malloch, 1930, *Rec. Cant. Mus.* 3: 318.

Type-locality: Campbell Is., New Zealand. Type, ? in the U. S. National Museum, Washington.

Length: 7.0-11.5 mm.

SPECIMENS EXAMINED. AUCKLAND IS.: 1 ♀, Ocean I., 1-18 m, 29.XII.1962, J. L. Gressitt; 1 ♂, Ewing I., 1-10 m, 6.I.1963, Gressitt; 16 ♂♂, 17 ♀♀, Ranui Cove, 2 m, 27.XII.1962, 30.XII.1962, 31.XII.1962, 5-7.I.1963, 9-11.I.1963, 16-18.I.1963, Gressitt; 8 ♂♂, 29 ♀♀,

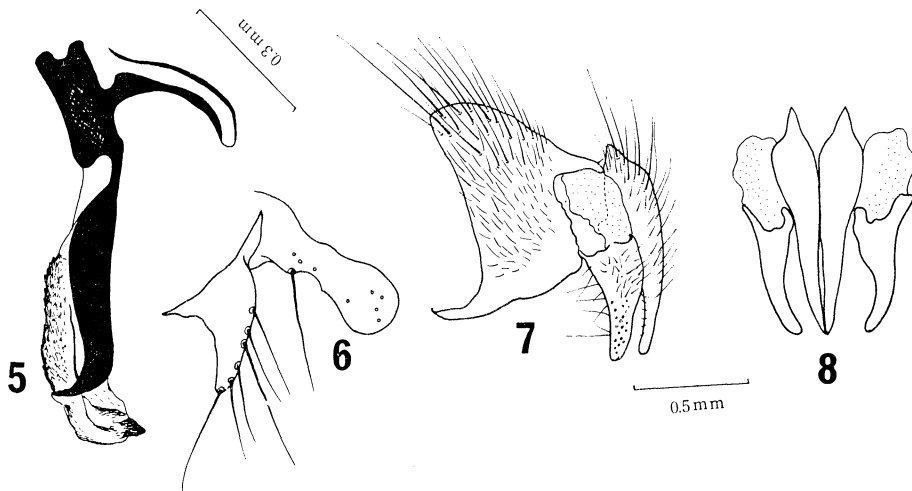


Fig. 5-8. Hypopygium of *X. (Xenocalliphora) viridiventris* Malloch: 5, aedeagus, lateral view; 6, parameres, lateral view; 7, cerci and paralobi, lateral view; 8, cerci and paralobi, posterior view.

Magnetic Cove, Adams I., 19.I.1966, 20.I.1966, 29.I.1966, 2.II.1966, 3.II.1966, K. A. J. Wise (BISHOP). CAMPBELL I.: 223 ♂♂ & ♀♀, Tucker Cove, 4 m, 26-30.XI.1961, 27.XI-1.XII.1961, 1-3.XII.1961, 3-5.XII.1961, 5-8.XII.1961, 16-18.XII.1961, 18-21.XII.1961, J. L. Gressitt; 1 ♀, Middle Bay, 29.XI.1961, Gressitt; 2 ♀♀, Lookout Bay, 3.XII.1961, Gressitt; 2 ♂♂, 1 ♀, Rocky Bay, 20.XII.1961, Gressitt; 1 ♂, 1 ♀, Beeman Camp, 1-5.XII.1961, 12-17.XII.1961, Gressitt; 2 ♂♂, Beeman Camp, 25.XII.1961, 15.X.1962, K. P. Rennell (BISHOP).

Bionomics : Nothing is known.

DISTRIBUTION : Auckland Is. and Campbell I.

Xenocalliphora (Xenocalliphora) hortona (Walker) Fig. 9-12, 13.

Musca hortona Walker, 1849, List. Spec. Dipt. Ins. Coll. Brit. Mus. 4: 894.

Calliphora (Xenocalliphora) hortona : Bezzi, 1927, *Bull. Ent. Res.* 17: 245. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* 53: 613.

Xenocalliphora hortona : Malloch, 1930, *Rec. Cant. Mus.* 3: 317.

Calliphora hortona : Miller, 1939, *Cawthron Inst. Monogr.*, no. 2: 46.

Musca icela Walker, 1849, List Spec. Dipt. Ins. Coll. Brit. Mus. 4: 897.

Onesia icela : Schiner, 1868, *Novara Reise, Dipt.*: 311.

Calliphora icela : Hutton, 1881, *Cat. Dipt. N. Z.*: 60. — Hutton, 1901, *Trans. N. Z. Inst.* 33: 65.

— Miller, 1921, *N. Z. J. Agr.* 22: 325. — Miller, 1939, *Cawthron Inst. Monogr.*, no. 2: 38. —

Harrison, 1964, *Pacif. Ins. Monogr.* 7: 320.

Calliphora aureopunctata Macquart, 1855, *Dipt. Exot.*, suppl. 5: 130. — Schiner, 1868, *Novara Reise, Dipt.*: 307. — Hutton, 1881, *Cat. Dipt. N. Z.*: 59. — Patton, 1925, *Philip. J. Sci.* 27: 194.

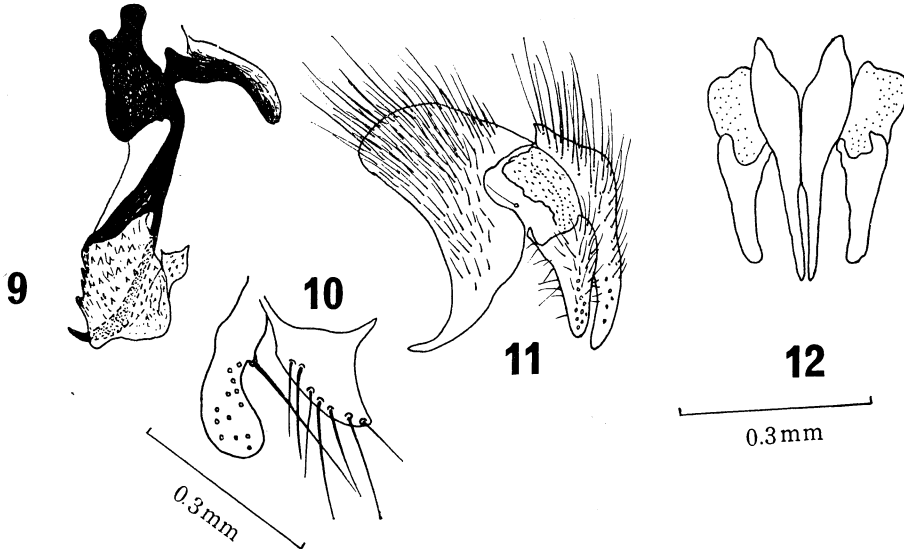


Fig. 9-12. Hypopygium of *X. (Xenocalliphora) hortona* (Walker): 9, aedeagus, lateral view; 10, parameres, lateral view; 11, cerci and paralobi, lateral view; 12, cerci and paralobi, posterior view.

Type-locality: New Zealand. *Type* in the British Museum (Nat. Hist), London.

Length: 5.5–8.0 mm.

SPECIMENS EXAMINED. NEW ZEALAND: 1 ♀, Invercargill, 11.III.1924, E. Richardson; 1 ♀, Auckland, ? date, ? (BISHOP). AUCKLAND IS.: 406 ♂♂ & ♀♀, Ranui Cove, 2 m, 27.XII.1962, 28.XII.1962, 30.XII.1962, 31.XII.1962, 2.I.1963, 3.I.1963, 5–7.I.1963, 9–11.I.1963, 12.I.1963, 16–18.I.1963, J. L. Gressitt; 1 ♂, Crozier Pt., 1–20 m, 28.XII.1962, Gressitt; 2 ♂♂, 1 ♀, Enderby I., 1–50 m, 31.XII.1962, J. L. Gressitt (BISHOP). CAMPBELL I.: 48 ♂♂ & ♀♀, Tucker Cove, 1–50 m, 26–30.XI.1961, 27.XI–1.XII.1961, 1–3.XII.1961, 5–8.XII.1961, 16–18.XII.1961, J. L. Gressitt; 1 ♂, 1 ♀, Beeman Camp, 2–50 m, 7.XII.1961, 12–17.XII.1961, Gressitt; 10 ♂♂ & ♀♀, Beeman, 2–50 m, 10.II.1962, 24.II.1962, 28.II.1962, 8–10.III.1962, 23.III.1962, K. P. Rennell (BISHOP).

Bionomics: *Xenocalliphora hortona* (Walker) seems to be very common throughout New Zealand and its southern islands. It reaches its maximum population during the autumn and early winter. This species seems to be occasionally viviparous. The larvae, which are found in decaying animal and vegetable matter, have not yet been reported to attack sheep's wool (Miller 1921). The description and figures of the larval stage were given by Miller (1939a).

DISTRIBUTION: New Zealand, Auckland Is. and Campbell Is.

KEY TO THE SPECIES OF XENOCALLIPHORA S. LAT.

1. Eyes densely or sparsely but distinctly haired; no strong proclinate *ors* present in ♀; *ia* 1+2; *st* 2+1 (Ptilonesia) **auronotata** (Macquart)
 Eyes very scantily and indistinctly haired; 2 proclinate *ors* developed in ♀; *ia* 1+1; *st* 1+1 2
2. Eyes bare; 2 proclinate *ors* developed in ♀; *ia* 1+1 or 1+2 3
2. Legs blackish gray; jowls about 1/5 the head-height; *ori* 8–10; *h* 4 (Xenocalliphora) **neozelandica** (Murray)
 Legs tawny to pale orange; jowls little less than 1/3 the head-height; *ori* 7; *h* 2 (Xenocalliphora) **neohortona** (Miller)
3. Legs at least partly reddish, but usually wholly testaceous yellow in the form from Auckland Is.; abdomen black with a purple or bronzy tinge above, sometimes metallic greenish; *ia* 1+1; *st* 1–2+1; postsutural *ac* 1–2 (Xenocalliphora) **viridiventris** (Malloch)
 Legs black; abdomen metallic bluish green or violet blue, slightly or not dusted; *st* 1+1; postsutural *ac* 3 4
4. Abdomen not dusted, sometimes slightly pruinose; *ia* 1+2; front tibia with 1 *p*; thoracic spiracles orange, swollen; basicosta orange; parafrotaia and parafacialia with golden-dusted spots; thoracic squama distinctly clothed with black hairs (Xenocalliphora) **hortona** (Walker)
 Abdomen distinctly dusted; *ia* 1+1; front tibia with 2 *p*; thoracic squama sparsely clothed with black hairs (Xenocalliphora) **antipodea** (Hutton)

Genus *Aldrichina* Townsend

Aldrichina Townsend, 1937, Man. Myiol. 5: 135. Type-species: *Calliphora grahami* Aldrich, 1930.
Aldrichiella Rohdendorf, 1931, Zool. Anz. 95: 177 (preocc.). Type-species: *Calliphora grahami* Aldrich, 1930.

Distinguished from the other Australian and Oriental genera of Calliphorini by the following characteristics:

Diagnosis: Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin; subcostal sclerite usually tawny pubescent, without distinct black setulae; eyes in neither sex with noticeable hairs, eyes in ♂ dichoptic; presutural *ac* 2, the arrangement of bristles usually represents *Onesia*-type, occasionally *Calliphora*-type (cf fig. 1a & b in Part I); presutural *ia* absent; basicosta black; abdomen entirely metallic blue and bluish green, whitish pruinose; ♂ genitalia remarkably large, with elongated paralobi; aedeagus with primitive harpes which is distinctly separated from one another for a distance from harpes basis to apex; vesicae developed; ovipositor elongate, regularly segmented, of typical *Calliphora*-type; 5th sternite in ♀ triangular; ♀ internal genitalia with straight, simple shaped uterovaginal tube observed in typical *Calliphora*.

Bionomics: Oviparous.

DISTRIBUTION: Far East and North America.

Aldrichina grahami (Aldrich)

Calliphora grahami Aldrich, 1930, *Proc. U. S. Nat. Mus.* 78, art. 1: 1. — Sen.-White et al., 1940, *Fa. Brit. India, Dipt.* 6: 35.

Aldrichina grahami: Fan, 1965, *Key Comm. Synanthr. Flies China*: 162. — Kano & Shinonaga, 1968, *Fauna Jap., Calliphoridae*: 22.

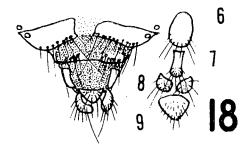
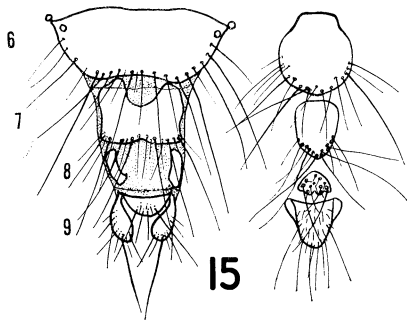
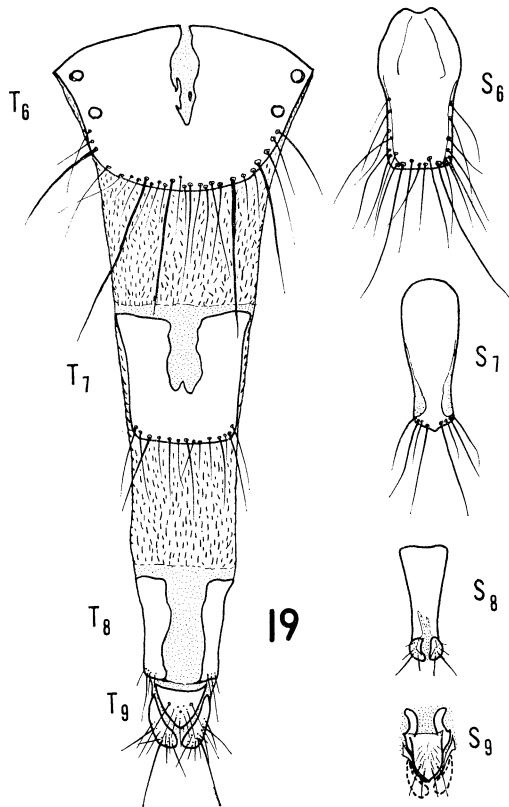
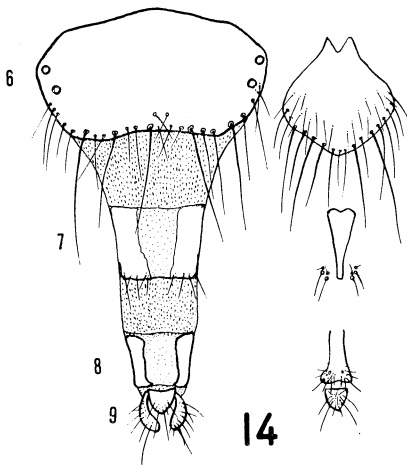
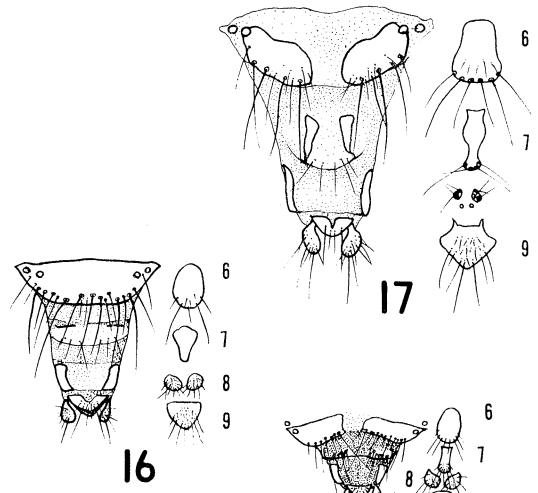
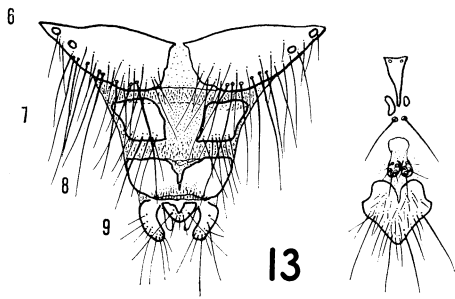
Type-locality: Szechuen, China. *Type* in the U. S. National Museum.

Length: 8.0–11.0 mm.

SPECIMENS EXAMINED. TAIWAN: 52 ♂♂, 30 ♀♀, Chiayi Hsien, 2400 m, Alishan, 12–16.V.1965, 8–9.IV.1965, 29–31.III.1965, T. C. Maa & K. S. Lin. S. CHINA: 1 ♂, Hangchow, Chekiang, 8.V.1924, J. F. Illingworth; 7 ♂♂, 6 ♀♀, YungAn, Fukien, 26.II.1940, 23.III.1940, 31.XII.1940, 2.I.1941, 6.III.1941, 22.XII.1941, T. C. Maa; 4 ♂♂, 6 ♀♀, Pushih, Luki, Fukien, 10.III.1930, 12.III.1939, 24.III.1939, 26.IV.1939, 4.III.1949, Maa; 1 ♀, Foochow, Fukien, 5.III.1940, Maa; 6 ♂♂, 3 ♀♀, Tachulan, 1000 m, Shaowu, Fukien, 15–20.IV.1942, 26.IV.1942, 3.V.1942, 3.II.1943, 25–27.II.1943, 16–20.V.1943, 21–27.IV.1945, Maa; 1 ♂, 1 ♀, Khasien-kai, Shaow, Fukien, 16.III.1945, Maa; 1 ♂, Tailichiao, 1000 m, Fukien, 21.I.1943, Maa; 22 ♂♂, 28 ♀♀, Bohea Hills, ChungAn, Fukien, 15.III.1940, 16.III.1940, 29.III.1940, 10.IV.1940, 20.IV.1940, 25.IV.1940, 23.XII.1940, Maa; 3 ♀♀, Kunming, Yunnan, 15.VII.1940, Maa (BISHOP).

Bionomics: Oviparous. The larva is a scavenger, and most frequently occurs in human feces, animal dung, carrion and other decaying animal matter. The descriptions and figures of the larval stage were given by Kano (1959) and Ishijima (1967). The adult is common around houses in spring and autumn, and occurs in high mountains in summer in Japan.

DISTRIBUTION: Taiwan, S. China (Chekiang, Fukien, Kwangtung: Fan 1965, Kwangsi: Fan 1965), Hong Kong (Sen.-White et al. 1940), Pakistan (Chitral: Sen.-White et al. 1940), [C. China, Korea, Japan, Manchuria, Siberia, and N. America (Washington to New Mexico: Hall 1965)]



Genus **Triceratopyga** Rohdendorf

Triceratopyga Rohdendorf, 1931, *Zool. Anz.* **95**: 175. Type-species : *Triceratopyga calliphoroides* Rohdendorf, 1931.

Diagnosis : Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin ; subcostal sclerite usually tawny pubescent, without distinct black setulae ; eyes without noticeable hairs, eyes in ♂ dichoptic ; presutural *ac* 2, the arrangement usually represents *Onesia*-type, occasionally *Calliphora*-type (cf fig. 1a & b in Part I) ; presutural *ia* absent ; basicosta black ; abdomen entirely metallic blue and bluish green, whitish pruinose ; ♂ genitalia not prominent, but epandrium with 3 processes specially modified ; cerci and paralobi fused with each other ; aedeagus with primitive harpes which is distinctly separated from one another for a distance from harpes basis to apex ; vesicae developed ; ovipositor elongate, regularly segmented ; 5th sternite in ♀ oval ; ♀ internal genitalia of *Calliphora*-type.

Bionomics : Oviparous.

DISTRIBUTION : Far East.

Triceratopyga calliphoroides Rohdendorf

Triceratopyga calliphoroides Rohdendorf, 1931, *Zool. Anz.* **95**: 175.

Type-locality : East Siberia. Type in the Zoological Museum of Academy of Sciences of USSR.

Length : 6.5-8.5 mm.

SPECIMENS EXAMINED. S. CHINA : 2 ♂♂, 1 ♀, Bohea Hills, ChungAn, Fukien, 24.IV.1940, 15.III.1940, 28.V.1940, T. C. Maa (BISHOP).

Bionomics : Oviparous. The larva breeds in human feces, animal dung, carrion, and other decaying animal matter. The adult emerges in early spring in Japan following hibernation in larval, prepupal or pupal stages (Kano & Shinonaga 1968). The descriptions and figures of the larval stage were given by Kano (1959) and Ishijima (1967).

DISTRIBUTION : S. China, [Central China, Korea, Japan, Manchuria, and Siberia].

Genus **Eucalliphora** Townsend

Eucalliphora Townsend, 1908, *Smithsn. Misc. Collect.* **51**: 118. Type-species : *Calliphora latifrons* Hough, 1899.

Diagnosis : Thoracic squama completely hairy on upper surface, but narrowly bare along apical margin ; subcostal sclerite usually tawny pubescent, without distinct black setulae ; eyes bare, dichoptic in both sexes, in ♂ separated by a distance more than 3× the width of ocellar triangle ; accessory ocellar bristle well developed (fig. 20) ; presutural *ac* 2-3, the arrangement usually

Fig. 13-19. Ovipositors : 13, *Xenocalliphora hortona* (Walker) ; 14, *Eucalliphora lilaea* (Walker) ; 15, *Calliphora (Papuocalliphora) toxopeusi* Theowald ; 16, *Calliphora (Australocalliphora) fuscofemorata* Malloch ; 17, *Calliphora (Paracalliphora) augur augur* (Fabricius) ; 18, *Onesia pusilla* (Meigen) ; 19, *Calliphora (Neocalliphora) stygia* (Fabricius). left (T₆-T₉) : 6-9th tergites, dorsal view. right (S₆-S₉) : 6-9th sternites, ventral view.

represents *Onesia*-type, occasionally *Calliphora*-type; presutural *ia* present; basicosta black; abdomen entirely metallic blue, with whitish pruinosity; ♂ genitalia moderately developed, but without any remarkable modification; aedeagus with primitive harpes which is distinctly separated from one another for a distance from harpes basis to apex; vesicae developed; ovipositor elongate, regularly segmented (fig. 14); 5th sternite in ♀ oval; ♀ internal genitalia not examined.

Bionomics: Oviparous, with occasional viviparity (Townsend 1937).

DISTRIBUTION: Western North America and Hawaiian Is.

***Eucalliphora lilaea* (Walker)**

Fig. 14, 20.

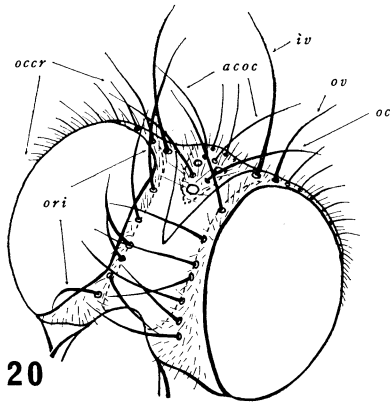


Fig. 20. ♂ frons of *Eucalliphora lilaea* (Walker). *acoc*: accessory ocellar bristles. *iv*: inner vertical bristles. *oc*: ocellar bristles. *occr*: occipital row of bristles. *ori*: frontal bristles.

Musca lilaea Walker, 1849, List Spec. Dipt. Ins. Coll. Brit. Mus. 2: 894.

Calliphora lilaea: Osten Sacken, 1878, *Smithsn. Misc. Collect.* 270: 160. — Aubertin, 1931, *Ann. Mag. Nat. Hist.* (10) 8: 616.

Eucalliphora lilaea: Townsend, 1935, *Man. Myiol.* 2: 170. — Townsend, 1937, *Man. Myiol.* 5: 148. — Hall, 1948, *Blowflies N. Amer.*: 284.

Musca ilerda Walker, 1849, List Spec. Dipt. Ins. Coll. Brit. Mus. 4: 895. — Osten Sacken, 1878, *Smithsn. Misc. Collect.* 270: 160. — Aubertin, 1931, *Ann. Mag. Nat. Hist.* (10) 8: 616.

Calliphora latifrons Hough, 1899, *Zool. Bull.* 2: 286. — Townsend, 1908, *Smithsn. Misc. Collect.* 51: 118. — Parker, 1914, *Mont. State Bd. Ent. Bien. Rpt.* 1914: 44. — Parker, 1917, *Ent. News* 28: 281. — Shannon, 1923, *Insec. Insc. Mens.* 11: 109.

Type-locality: Albany River, Canada. *Type* in the British Museum (Nat. Hist.).

Length: 5.0–9.0 mm.

SPECIMENS EXAMINED. HAWAIIAN IS.: 1 ♀, Kumuwela, Kauai I., 25.VII.1940, E. H. Bryan, Jr.; 1 ♂, Makaha Valley, Oahu I., ?.V.1952, E. J. Ford; 1 ♀, Honolulu, Oahu I., 26.I.?, Bryan; 2 ♀♀, Kaunakakai, 2400 ft., Molokai I., 23.XII.1925, Bryan; 1 ♀, Kawela, 3700 ft., Molokai I., 23.XII.1925, Bryan; 2 ♀♀, McVeigh Cabin, Molokai I., 24.XII.1925, O. H. Swezey; 1 ♀, Wailua, Maui I., 2.VII.1920, Bryan; 5 ♀♀, Haelaau, 3000–3300 ft., Maui I., 21.XII.1928, Bryan, 19.XII.1928, Swezey; 2 ♂♂, 4 ♀♀, Olinda, 4500–5000 ft., Maui I., 15.III.1932, 8.IV.1932, O. Bryant; 4 ♂♂, 15 ♀♀, Kula, 4500 ft., Maui I., 3.IV.1932, O. Bryant; 2 ♀♀, Holua, ca 6000 ft., 26.X.1956, J. L. Gressitt; 2 ♀♀, Mt Haleakala, Maui I., 30.III.1959, J. L. Gressitt; 3 ♀♀, Hawaii Nat. Park, 1200 m, Kilauea, Hawaii I., 24.II.1919, O. H. Swezey, 25.III.1961, L. W. Quate; 1 ♂, Waimea, Hawaii I., 19.VI.1922, J. F. Illingworth; 1 ♂, 3 ♀♀, Huluhulu, 1980 m, Puu, N of Mauna Loa, Hawaii I., 24.III.1961, L. W. Quate; 2 ♀♀, Mauka, Keokeo, N. Kona, Hawaii I., 23.I.?, G. P. Wilder; 1 ♀, Olaa, Hawaii I., 22.VII.?, W. M. Gifford (BISHOP).

Bionomics: Oviparous, occasionally viviparous (Townsend 1937), but the uterus is similar in most respect to that of *Calliphora* (Hall 1948). The descriptions and figures

of the immature stages were given by Hall (1948). The adult is often found on excrement of carnivorous animals and decaying substances, particularly meat in the mountainous regions in Hawaii. It has been noted by Hall (1948) that this species is one of the most abundant of blowflies in the Rocky Mountain section of the U.S.A. where it appears early in spring and remains until late in September.

DISTRIBUTION: Hawaiian Is., and [North America (Hall 1948 & 1965)].

Genus *Calliphora* Rob.-Desvoidy

Calliphora Rob.-Desvoidy, 1830, Essai Myod.: 433. Type-species: *Musca vomitoria* Linné, 1758.

Divided into 5 subgenera which are distinguished from each other and also from the other genera of the Australian and Oriental Calliphorini by the special characteristics given in the diagnosis.

Bionomics: Either oviparous or viviparous, and sometimes eggs and larvae may be deposited on the same occasion.

DISTRIBUTION: Cosmopolitan.

Subgenus *Neocalliphora* Brauer & Bergenstamm

Neocalliphora Brauer & Bergenstamm, 1891, *Musc. Schiz.* 2: 87. Type-species: *Calliphora dasyophthalma* Macquart, 1843.

Trichocalliphora Townsend, 1915, *Proc. Biol. Soc. Wash.* 28: 20. Type-species: *Calliphora villosa* Rob.-Desvoidy, 1830.

Adichosia Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* 6: 85. Type-species: *Ochromyia hyalipennis* Macquart, 1851.

Amphibolosia Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* 6: 109. Type-species: *Ochromyia flavipennis* Macquart, 1851.

Adichosiops Townsend, 1932, *J. N. Y. Ent. Soc.* 40: 441. Type-species: *Musca quadrimaculata* Swederus, 1787.

Neopollenia stygia-group: Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 18.—Hardy, 1947, *Proc. R. Soc. Qld* 57: 55.

Diagnosis: Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin; subcostal sclerite tawny pubescent, without black setulae; eyes in both sexes with quite dense, erect yellow hairs or very sparsely and indistinctly haired, but quite bare in some cases of the flies having abdomen tessellated, clothed with yellow hairs, presutural *ac* 3, front coxa distinctly blackened at least in front, and femora of at least the mid and hind legs fulvous yellow and not darker than tibiae; mesothoracic spiracle light orange, rather large; epaulet and basicosta orange-yellow or brown; ♂ genitalia as normal in size and shape as that of *Calliphora* s. str.; harpes slender and free at apex, distinctly separated from one another for a distance from harpes basis to apex; vesicae developed, with cornu; ovipositor and ♀ internal genitalia of *Calliphora*-type (fig. 19).

Bionomics: Oviparous, with occasional viviparity.

DISTRIBUTION: New Zealand including the islands of Auckland, Campbell and Kermadec, Australia and Tasmania.

Calliphora (Neocalliphora) nigrithorax Malloch Fig. 21-23.

Calliphora ochracea, form *nigrithorax* Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 308.

Ochromyia hyalipennis Macquart, 1851, *Dipt. Exot.*, suppl. 4: 245 (preocc.).

Adichosia hyalipennis: Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* 6: 85.

Calliphora hyalipennis: Hardy, 1926, *Proc. R. Soc. Qld* 37: 170.

Calliphora (Adichosia) hyalipennis: Bezzi, 1927, *Bull. Ent. Res.* 17: 241.

? *Calliphora quadrimaculata*: Patton, 1925, *Philip. J. Sci.* 27: 399 (misid.).

Type-locality: Mangalore, Tasmania. Type, ?.

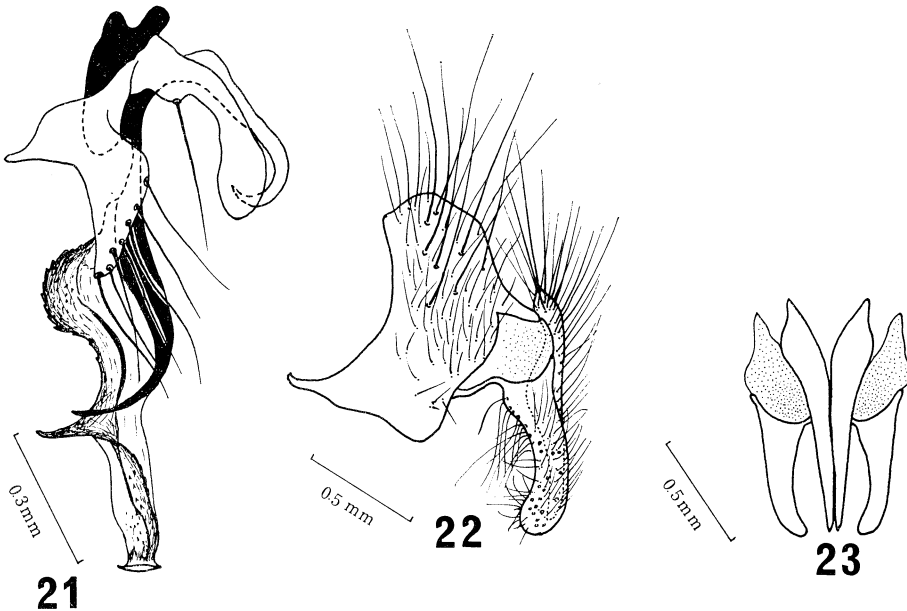


Fig. 21-23. Hypopygium of *Calliphora (Neocalliphora) nigrithorax* Malloch: 21, aedeagus and parameres, lateral view; 22, cerci and paralobi, lateral view; 23, cerci and paralobi, posterior view.

Length: 10.0-12.5 mm.

SPECIMENS EXAMINED. TASMANIA: 4 ♂♂, 19 ♀♀, Nothofagus forest, Mt Wellington, 400 m, 23-27. XII. 1960, J. L. Gressitt (BISHOP).

Bionomics: Apparently *Neocalliphora nigrithorax* Malloch is a rare species on the eastern side of Tasmania and breeds more abundantly in the dense scrubs of the western side (Hardy 1926).

DISTRIBUTION: Tasmania.

Calliphora (Neocalliphora) ochracea Schiner Fig. 24-27.

Calliphora ochracea Schiner, 1868, *Novara Reise, Dipt.*: 307. — Hardy, 1926, *Proc. R. Soc. Qld* 37: 171. — Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 308. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* 53: 613.

Neocalliphora ochracea: Brauer & Bergenstamm, 1891, *Musc. Schiz.* 2: 87. — Froggatt, 1914, *Agric.*

Gazette N. S. W. 15, misc. pub. no. 1764: 756. — Froggatt, 1915, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 95: 21. — Froggatt, 1916, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 110: 21.
 ?*Calliphora hyalipennis*: Patton, 1925, *Philip. J. Sci.* 27: 399 (misid.).

Type-locality: Sydney, Australia. Type in Vienna.

Length: 7.5–11.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 1 ♂, 1 ♀, Sydney, 3.XI.1909, Helms Collection, 2 ♀♀, Sydney, 21.VIII.? (?); 1 ♀, Brisbane, 18.IX.1914, H. Hacker (BISHOP).

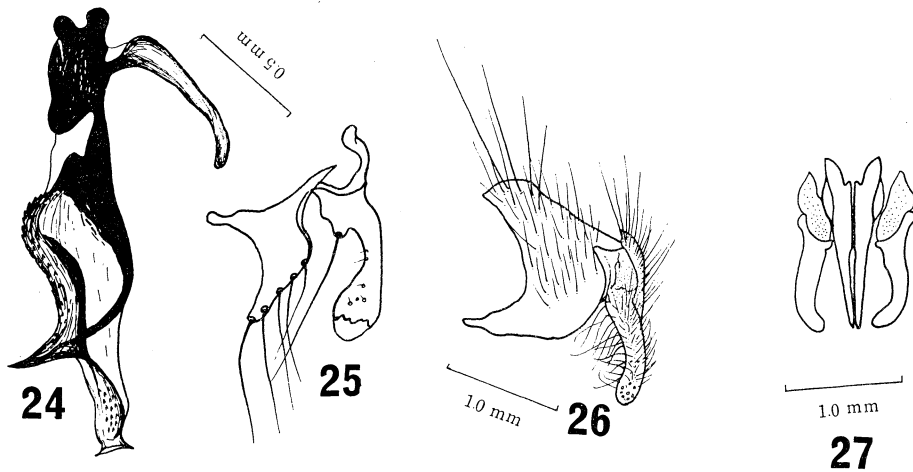


Fig. 24–27. Hypopygium of *C. (Neocalliphora) ochracea* Schiner: 24, aedeagus, lateral view; 25, parameres, lateral view; 26, cerci and paralobi, lateral view; 27, cerci and paralobi, posterior view.

Bionomics: *Neocalliphora ochracea* Schiner, known as the Reddish-brown blowfly in Australia, is a somewhat rare species and has never been found breeding in carcasses or live wool. It appears to frequent shaded gullies and timbered country (W. W. Froggatt 1914 & 1915). Fuller (1931) reared the larva on meat such as fresh beef in 1929 and 1930. The eggs, he mentioned, were deposited on rabbit fur in his rearing jar. On the basis of the rearing experiment, he briefly stated the life history of the species. This species has an early spring and autumn cycle, occurring along the coast and table lands of New South Wales and Queensland. It does not appear to extend west of the Main Divide, and there are no records of it from Victoria. The most northern record noted is near Mackay, N. Queensland. The record from Pambula which is not far distant from the Victoria border is a southern one. The figures and descriptions of the early stages were also given by Fuller.

DISTRIBUTION: Australia (New South Wales, Queensland).

***Calliphora (Neocalliphora) quadrimaculata* (Swederus) Fig. 28–31.**

Musca quadrimaculata Swederus, 1787, *Stock. Nya Handl.* 8: 289.

Calliphora quadrimaculata: Hudson, 1892, *Man. N. Z. Ent.* : 60. — Hutton, 1901, *Trans. N. Z. Inst.*

33: 64. — Miller, 1921, *N. Z. J. Agric.* **22**: 325. — Malloch, 1924, *Trans. N. Z. Inst.* **55**: 640. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* **53**: 613. — Miller, 1939, *Cawthron Inst. Monogr.*, no. 2: 43. — Harrison, 1964, *Pacif. Ins. Monogr.* **7**: 321.

Calliphora (Neocalliphora) quadrimaculata: Bezzi, 1927, *Bull. Ent. Res.* **17**: 241.

Calliphora dasyophthalma Macquart, 1843, *Dipt. Exot.*, pt. 5: 287. — Hutton, 1881, *Cat. Dipt. N. Z.*: 58.

Musca violacea: Walker, 1856, *Insecta Saundersiana*, *Dipt.*: 335.

Calliphora violacea: Hutton, 1881, *Cat. Dipt. N. Z.*: 61.

Calliphora cockaynei Hutton, 1904, *Trans. N. Z. Inst.* **36**: 155.

Musca sacra: Patton, 1925, *Philip. J. Sci.* **27**: 182.

Calliphora sacra: Malloch, 1930, *Rec. Cant. Mus.* **3**: 316.

Type-locality: New Zealand. *Type* ?.

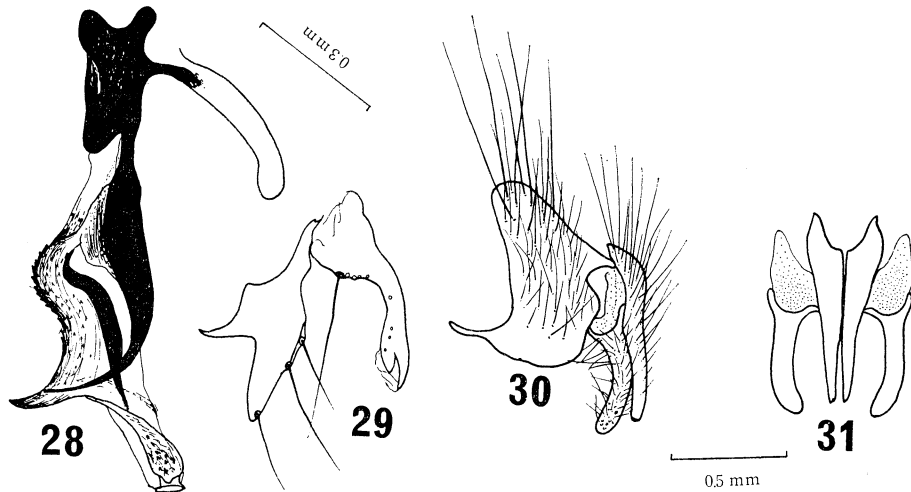


Fig. 28-31. Hypopygium of *C. (Neocalliphora) quadrimaculata* (Swederus): 28, aedeagus, lateral view; 29, parameres, lateral view; 30, cerci and paralobi, lateral view; 31, cerci and paralobi, posterior view.

Length: 7.5-13.0 mm.

SPECIMENS EXAMINED. NEW ZEALAND: 2 ♀♀, Rotorua Springs, 23.VII.1923, G. P. Wilder; 2 ♀♀, Rotorua, 24.VII.1923, O. H. Swezey; 1 ♀, Waipoua Forest, 5-10.XII.1937, J. M. Valentine (BISHOP). AUCKLAND IS.: 4 ♂♂, 3 ♀♀, Ranui Cove, 2 m, 28.XII.1962, 2.I.1963, 5-7.I.1963, 9-11.I.1963, 18.I.1963, J. L. Gressitt; 3 ♀♀, Magnetic Cove, Adams I., 18. I.1966, 20.I.1966, 29.I.1966, 3.II.1966, K. A. J. Wise (BISHOP). CAMPBELL I.: 15 ♂♂, 15 ♀♀, Tucker Cove, 4 m, 27.XI-1.XII.1961, 1-3.XII.1961, 3-5.XII.1961, 5-8.XII.1961, 6-11. XII.1961, 16-18.XII.1961, Gressitt; 3 ♂♂, Tucker Cove, 6.VIII.1962, K. P. Rennell; 1 ♂, Lookout Bay, 3.XII.1961, Gressitt; 5 ♀♀, Beeman Camp, 7.I.1962, 28-29.I.1962, 9.II.1962, 10.II.1962, Rennell (BISHOP).

Bionomics: *Neocalliphora quadrimaculata* (Swederus) occurs throughout New Zealand, the Auckland and Campbell Islands, being extremely common in human dwellings throughout summer and autumn; occasionally numerous individuals are to be seen dur-

ing sunny and abnormally warm wheather in winter and early spring. Miller (1921) observed that this bluebottle fly is notorious for seeking out man even in the remotest parts and depositing eggs on blankets, clothes and meat. The larvae of this species live on various kinds of substances besides decaying animal matter. The description and figures of the larval stage were given by Miller (1939a). *N. quadrimaculata* is one of the secondary sheep maggot flies in New Zealand.

DISTRIBUTION : New Zealand, Auckland Is., and Campbell Is.

***Calliphora* (*Neocalliphora*) *nothocalliphoralis* Miller**

Calliphora nothocalliphoralis Miller, 1939, Cawthron Inst. Monogr., no. 2 : 49.

Type-locality : Nelson, New Zealand. *Type* in the Cawthron Institute, Nelson.

No available material.

Length : 10.0 mm.

Bionomics : A ♂ and a ♀ reared from "Struck" sheep (Miller, 1939a).

DISTRIBUTION : New Zealand.

***Calliphora* (*Neocalliphora*) *maryfulleri* Hardy** Fig. 32-35.

Calliphora (*Neopollenia*) *maryfulleri* Hardy, 1947, *Proc. R. Soc. Qld* 57 : 56.

Musca australis Boisduval, 1835, *Voy. l'Astrobe*, Ent. 2 : 669 (preocc.).

Calliphora (*Neopollenia*) *australis* : Hardy, 1930, *Bull. Ent. Res.* 21 : 442 & 444. — Hardy, 1932,

Bull. Ent. Res. 23 : 551. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62 : 21.

Calliphora australis : Malloch, 1932, *Proc. Linn. Soc. N. S. W.* 57 : 66.

Type-locality : W. Australia. *Type* ?.

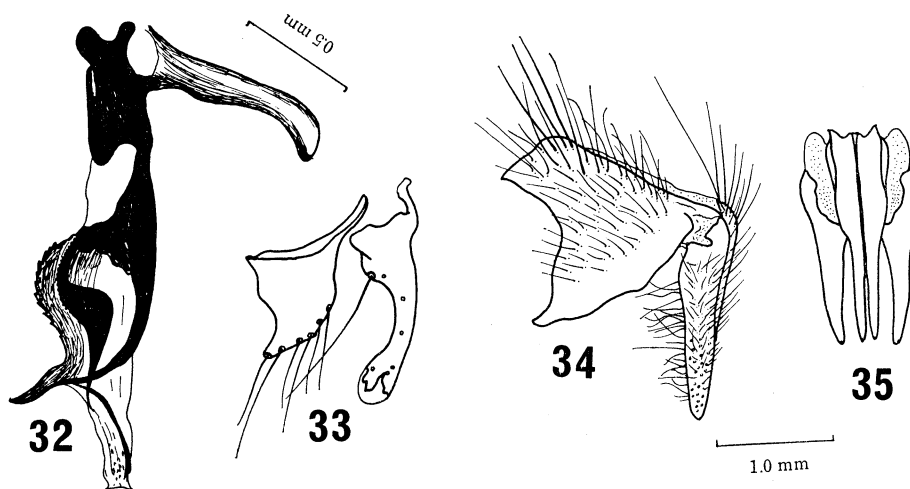


Fig. 32-35. Hypopygium of *C. (Neocalliphora) maryfulleri* Hardy : 32, aedeagus, lateral view ; 33, parameres, lateral view ; 34, cerci and paralobi, lateral view ; 35, cerci and paralobi, posterior view.

Length : 8.0–10.5 mm.

SPECIMENS EXAMINED. AUSTRALIA : 1 ♂, 1 ♀, Pemberton, 100 m, W. Australia, 5.I.1961, 5–6.I.1961, J. L. Gressitt; 1 ♀, Mt William, 200 m, W. Australia, 5.XI.1963, J. Sedlacek (BISHOP).

Bionomics: *Neocalliphora maryfulleri* Hardy is one of the active sheep maggot-flies in Western Australia (Fuller 1934b). The species seems to be commonly found during spring and fall.

DISTRIBUTION : W. Australia.

Calliphora (Neocalliphora) stygia (Fabricius) Fig. 19, 36–47.

Musca stygia Fabricius, 1781, *Spec. Ins.* 2: 438. — Wiedemann, 1830, *Auss. Zweifl. Ins.* 2: 393. — Patton, 1925, *Philip. J. Sci.* 27: 183.

Calliphora stygia: Schiner, 1868, *Novara Reise, Dipt.*: 309. — Patton, 1925, *Philip. J. Sci.* 27: 399. — Hardy, 1926, *Proc. R. Soc. Qld* 37: 172. — Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 308. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* 53: 613. — Hardy, 1930, *Bull. Ent. Res.* 21: 444. — Malloch, 1930, *Rec. Cant. Mus.* 3: 316. — Hardy, 1932, *Bull. Ent. Res.* 23: 550. — Malloch, 1932, *Proc. Linn. Soc. N. S. W.* 57: 65. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 21.

Neopollenia stygia: Brauer, 1889, *Sitz. Ak. Wiss.* 108: 496. — Johnston & Tieggs, 1923, *Proc. R. Soc. Qld* 34: 85. — Froggatt, 1922, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 144: 29.

Pollenia stygia: Miller, 1921, *N. Z. J. Agric.* 22: 327. — Patton, 1921, *Bull. Ent. Res.* 12: 251.

Anastellorhina stygia: Johnston & Hardy, 1923, *Proc. R. Soc. Qld* 34: 192.

Calliphora (Neopollenia) stygia: Bezzi, 1927, *Bull. Ent. Res.* 17: 245.

Calliphora villosa Rob.-Desvoidy, 1830, *Essai Myod.*: 437. — Froggatt, 1905, *Agric. Gazette N. S. W.* 16: 22. — Froggatt, 1913, *Sheep Magg.-Fly Pest Austr.*: 23. — Froggatt, 1914, *Agric. Gazette N. S. W.*, misc. pub. no. 1764; 757. — Froggatt, 1915, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 95: 19. — Froggatt & Froggatt, 1916, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 110: 21. — Malloch, 1924, *Trans. N. Z. Inst.* 55: 640.

Trichocalliphora villosa: Townsend, 1915, *Proc. Biol. Soc. Wash.* 28: 20.

Pollenia villosa: Froggatt & Froggatt, 1917, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 113: 35.

Musca laemica White, 1843, *Dieff., New Zealand* 2: 291. — Walker, 1849, *List Spec. Dipt. Ins. Coll. Brit. Mus.* 4: 906.

Pollenia laemica: Hutton, 1881, *Cat. Dipt. N. Z.*: 62.

Sarcophaga laemica: Hudson, 1892, *Man. N. Z. Ent.*: 61.

Calliphora laemica: Hutton, 1901, *Trans. N. Z. Inst.* 33: 66. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 21. — Miller, 1939, *Cawthron Inst. Monogr.*, no. 2: 32.

Type-locality: Australia. Type in the Zoological Museum of University of Copenhagen.

The present species is common in houses and familiar to people in New Zealand and Australia on account of its habit of depositing eggs on meat and blankets. Hardy (1937) regarded the form collected in New Zealand as a distinct species, *laemica*, because of the difference in the anterior paramere. Miller (1939a) followed his view. Miller (1921), however, gives us an interesting historical review of the New Zealand form as follows:

“Apparently it was introduced into the North Island in the early days of colonization, Hutton (1901) observed that this fly appeared in Christchurch in 1874, though it was not then common, but it was not until 1900 that he first noted it at Queenstown. Prior to 1879 he had never seen this species in Otago. *P. stygia* is now one of the most ab-

undant of flies throughout New Zealand." According to his observations, it appears to have come down from Australia or some islands near the continent. The New Zealand form of *laemica* thus may be quite identical with the Australian *stygia*. Murray (1954) also stated that these 2 forms are conspecific. I examined the ♂ genitalia of both forms, which indicate that there is nothing more than intraspecific variation between them (fig. 36-39, 40-43, 44-47).

Length: 8.0-11.5 mm, 6.5-11.0 mm in the specimens from Kermadec Is.

SPECIMENS EXAMINED. AUSTRALIA: 1 ♀, Brisbane, Queensland, 26.IX.1916, H. Hacker; 1 ♂, 5 ♀♀, Sydney, New South Wales, 21.VIII.?, J. F. Illingworth; 2 ♀♀, Cooma, 850 m, New South Wales, 18.X.1963, J. Sedlacek; 2 ♀♀, 19 km W of Jindabyne, New South Wales, 19.X.1963, Sedlacek; 2 ♀♀, Jenolan Caves, 23.IX.1935, O. H. Swezey; 1 ♀, Victoria, 19.XI.?, E. Jarvis; 2 ♂♂, 8 ♀♀, Aldgate, 400 m, 20 km E of Adelaide, South Australia, 29-31.XII.1960, 31.XII.1960-1.I.1961, J. L. Gressitt (BISHOP). TASMANIA: 3 ♂♂, 14 ♀♀, Nothofagus Forest, 400 m, Mt Wellington, 23-27.XII.1960, J. L. Gressitt; 1 ♂, 3 ♀♀, Dobson Lake, 1000 m, Mt Field Nat. Park, 25.XII.1960, J. L. Gressitt; 3 ♀♀, ? locality, ?.?.1937, E. Overstreet (BISHOP). NEW ZEALAND: 2 ♂♂, 5 ♀♀, Rotorua, 23-24.VII.1923, Swezey; 1 ♀, Rangitoto, 29.VII.1923, Swezey; 2 ♀♀, Waipoua Forest, North Island, 5-10.XII.1937, J. M. Valentine (BISHOP). KERMADEC IS.: 2 ♂♂, Station, 75 m, Raoul I., 3.IX.1962, G. A. Samuelson; 2 ♂♂, 23 ♀♀, Bell's Ravine, 75 m, Raoul I., 12.IX.1962, 13-22.IX.1962, Samuelson; 10 ♂♂, 7 ♀♀, North Slopes Ravine Paddock 8, 75 m, Raoul I., 11.IX.1962, 20-22.IX.1962, Samuelson; 1 ♀, Denham Bay, 2 m, Raoul I., 19-21.X.1962, Samuelson; 2 ♂♂, 1 ♀, N. Slopes Ridge, 200 m, Raoul I., 22-30.IX.1962, Samuelson; 2 ♂♂, 123 ♀♀, Low Flat, 30 m, Raoul I., 23.IX-8.X.1962, Samuelson (BISHOP).

Bionomics: *Neocalliphora stygia* (Fabricius), known as the Golden-haired blowfly, is a

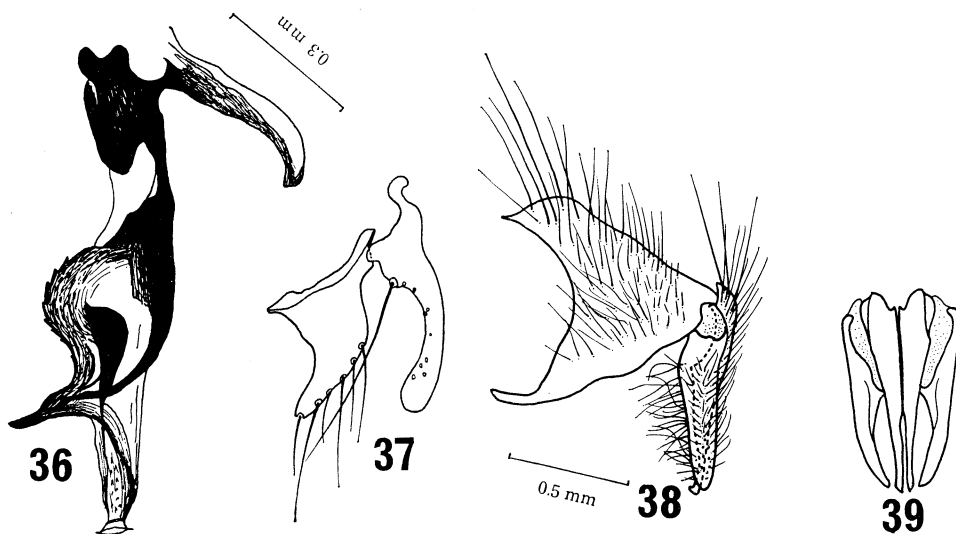


Fig. 36-39. Hypopygium of *C. (Neocalliphora) stygia* Fabricius from Tasmania: 36, aedeagus, lateral view; 37, parameres, lateral view; 38, cerci and paralobi, lateral view; 39, cerci and paralobi, posterior view.

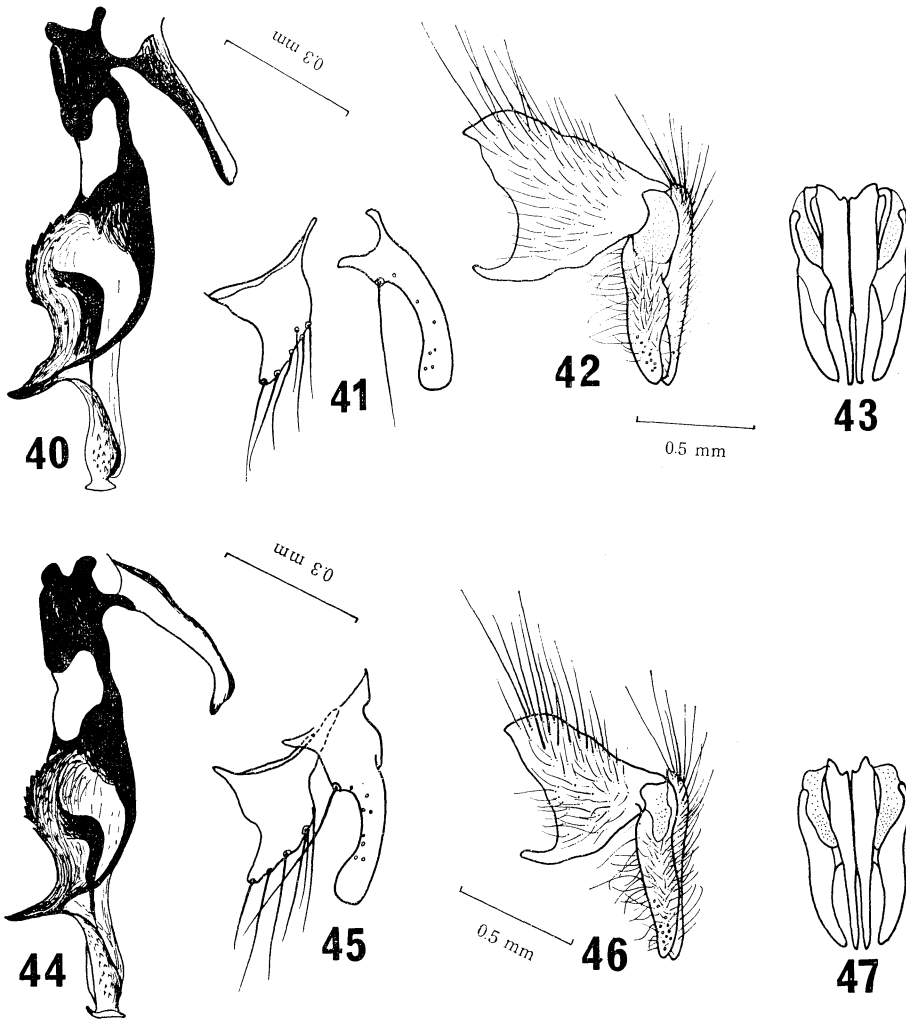


Fig. 40-43. Hypopygium of *C. (Neocalliphora) stygia* Fabricius from New Zealand : 40, aedeagus, lateral view ; 41, parameres, lateral view ; 42, cerci and paralobi, lateral view ; 43, cerci and paralobi, posterior view. Fig. 44-47. Hypopygium of *C. (Neocalliphora) stygia* Fabricius from Kermadec Is. : 44, aedeagus, lateral view ; 45, parameres, lateral view ; 46, cerci and paralobi, lateral view ; 47, cerci and paralobi, posterior view.

primary sheep-maggot fly in eastern Australia and New Zealand. It seems the adults occur very commonly during the winter months in Queensland and New South Wales. They become less abundant in September and diminish in number as summer approaches (Johnston & Tiegs 1923). In the early summer they swarm out, and enter houses, particularly before rain (W. W. Froggatt 1905, 1922). W. W. Froggatt (1913, 1914, 1915)

reported that in Sydney the adults are found commonly throughout the year. The time required for the egg to develop into a fly in summer in New South Wales averages a fortnight. This species also occurs throughout New Zealand and the adjacent islands from spring to autumn and in some places is to be found during winter. The seasonal occurrence of this fly reaches its peak in early midsummer in New Zealand. Based on the percentages of the number of cases of strike, this species is most abundant in the North Island, a region of higher rainfall which lies north of a line running approximately from Cape Egmont on the west to Mahia Peninsula on the east. Another famous sheep-maggot fly, *Lucilia sericata* (Meigen), most dominantly strikes sheep on the east coastal side of the South Island, a region of lower rainfall (Miller 1939b). The adult females have the interesting habit of depositing eggs in mild seasons and living larvae in hot weather as they do in Australia. They often larviposit when on the wing (Miller 1921, 1939a & b). The detailed description and drawing of the larva were given by J. L. Froggatt (1918) and Fuller (1932b), and it is possible with the aid of his key and descriptions to separate the maggot of *N. stygia* from those of the other sheep blow-flies in Australia and New Zealand. Miller (1939a) also described and figured the larval stage of this species based on material from New Zealand.

DISTRIBUTION: Australia (Queensland, New South Wales, Victoria, South Australia), Tasmania, New Zealand, and Kermadec Is.

KEY TO THE SPECIES OF NEOCALLIPHORA

1. Eyes with quite dense, erect yellow hairs; abdomen wholly reddish or metallic violet blue, without tessellation 2
 Eyes bare, sometimes scantily and indistinctly haired; abdomen with silver or golden tessellation and golden hairs..... 4
2. Abdomen wholly reddish, with yellow hairs 3
 Abdomen metallic violet blue, without yellow hairs **quadrimaculata** (Swederus)
3. Thoracic dorsum densely yellowish dusted so that the ground color is entirely or almost entirely obscured and the thorax appears entirely ochreous; eyes in ♂ holoptic, densely haired in both sexes..... **ochracea** Schiner
 Thoracic dorsum black, with whitish dusting which does not at all obscure the ground color; eyes in ♂ dichoptic, densely haired in both sexes..... **nigrithorax** Malloch
4. Abdomen metallic violet blue, with silver tessellation; eyes scantily and indistinctly haired **nothocalliphoralis** Miller
 Abdomen bronzy, densely golden dusted, conspicuously tessellated; eyes bare 5
5. Parafacialia densely silver white-dusted. ♂: facets on the upper half of eyes not much larger than those of the lower one. Western Australia **maryfulleri** Hardy
 Parafacialia yellowish gray-dusted. ♂: facets on the upper half of eyes strikingly larger than those of the lower one. Eastern Australia, New Zealand & Kermadec Is.
 **stygia** (Fabricius)

Subgenus *Calliphora* s. str.

- Calliphora* Rob. - Desvoidy, 1830, Essai Myod.: 433. Type-species: *Musca vomitoria* Linné, 1758.
Mufetia Rob. - Desvoidy, 1830, Essai Myod.: 431. Type-species: *Musca autissiodorensis* Rob. - Desvoidy, 1830.
Acrophaga Brauer & Bergenstamm, 1891, *Musc. Schiz.* 2: 63. Type-species: *Acrophaga stelviana*

Brauer & Bergenstamm, 1891.

Abonesia Villeneuve, 1927, *Bull. Ann. Soc. Ent. Belg.* 66: 357. Type-species: *Sarcophaga genarum* Zetterstedt, 1845.

Stobbeola Enderlein, 1933, *Mitt. Deut. Ent. Ges.* 4: 126. Type-species: *Stobbeola norwegica* Enderlein, 1933.

Acronesia Hall, 1948, *Blowflies N. Amer.*: 272. Type-species: *Steringomyia aldrichina* Shannon.

Diagnosis: Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin; subcostal sclerite pubescent; eyes bare, subholoptic to holoptic, not widely separated in ♂, in ♀ widely separated; accessory *oc* not remarkable; presutural *ac* 2, the arrangement represented by *Calliphora*-type (cf fig. 1a in Part I); presutural *ia* present; abdomen entirely metallic blue to bluish green, sometimes with purple or coppery tinge, more or less entirely whitish pruinose, slightly tessellated in some species; legs entirely black; epistome not remarkably projecting forward; ♂ genitalia normal in size and shape; harpes slender, free at apex, distinctly separated from one another for a distance from harpes basis to apex; vesicae developed, with cornu; ovipositor can be fully extended, regularly segmented, of typical *Calliphora*-type; ♀ internal genitalia with straight, simple shaped uterovaginal tube, of typical *Calliphora*-type.

The aedeagus in the species, which is newly described below from Lord Howe I., Australia, has its exception whose vesicae are not cornute and somewhat resemble those of *Paracalliphora* and *Australocalliphora*, especially *P. fulviceps* van der Wulp. The morphology of the posterior paramere and harpes is suggestive of it belonging to *Calliphora* s. str.

Bionomics: Oviparous, with occasional viviparity (Sen.-White et al. 1940).

DISTRIBUTION: Almost cosmopolitan.

***Calliphora* (*Calliphora*) *vicina* Rob.-Desvoidy**

Calliphora vicina Rob.-Desvoidy, 1830, *Essai Myod.*: 435.—Zumpt, 1956, *Lind., Fliegen Pal. Reg.* 64i: 22. — Fan, 1965, *Key Common Synathr. Flies China*: 165.

Calliphora erythrocephala Meigen, 1826, *Syst. Besch.* 5: 62 (preocc.). — Hutton, 1901, *Trans. N. Z. Inst.* 33: 64. — Froggatt, 1914, *Agric. Gazette N. S. W.*, misc. pub. no. 1764: 758. — Froggatt, 1915, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 95: 21. — Johnston & Tiegs, 1923, *Proc. R. Soc. Qld* 34: 86. — Malloch, 1924, *Trans. N. Z. Inst.* 55: 640. — Patton, 1925, *Philip. J. Sci.* 27: 398. — Hardy, 1926, *Proc. R. Soc. Qld* 37: 173. — Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 314. — Bezzi, 1927, *Bull. Ent. Res.* 17: 242. — Malloch, 1930, *Rec. Cant. Mus.* 3: 316. — Miller, 1939, *Cawthron Inst. Monogr.*, no. 2: 35. — Sen.-White et al., 1940, *Fa. Brit. India, Dipt.* 6: 33.

Calliphora vomitoria: Hudson, 1890, *Trans. N. Z. Inst.* 22: 187 (misid.). — Froggatt, 1908, *Austr. Ins.*: 316 (misid.).

Type-locality: Philadelphia, U. S. A. Type possibly lost.

Length: 8.0–11.5 mm.

SPECIMENS EXAMINED. NEPAL: 3 ♀♀, Langtang Val., 2700–3400 m, ca 60 km N of Kathmandu, 13–25.X.1965, L. W. Quate (BISHOP). N. INDIA: 1 ♂, Darjeeling, Bengal, 16.IV.1938, T. C. Maa (BISHOP). AUSTRALIA: 11 ♂♂, 12 ♀♀, Sydney, 21.VIII.?, J. F. Illingworth (BISHOP). NEW ZEALAND: 2 ♂♂, Rotorua Springs, 23.VII.1923, G. P. Wilder; 3 ♀♀, Auckland, 28.VII.1923, O. H. Swezey (BISHOP).

Bionomics: It is well known that *Calliphora vicina* Rob.-Desvoidy has been introduced into Australia and New Zealand, but its distribution is chiefly confined to the coastal

areas. In Sydney this species is common around houses and accumulations of decaying fruit, but it is very rare in other countries (W. W. Froggatt 1914 & 1915, Johnston & Tieggs 1923). No data regarding its biology in Australia have been published. Miller (1939a) recorded the life history of this introduced European bluebottle fly in New Zealand. *Calliphora vicina* occurs throughout New Zealand and is one of the first blow-flies to appear in the early spring. It reaches its maximum in summer and early autumn, though it may be seen occasionally during an abnormally warm winter. The description and figures of the larval stage were given by Miller (1939a).

DISTRIBUTION: Pakistan (Sen. - White et al. 1940), N. India, S. China (Yunnan: Fan 1965), Australia (New South Wales, Victoria, S. Australia: Hardy 1926), Tasmania (Hardy 1926), New Zealand, [Egypt, Ethiopia, Europe, N. America, S. America (Chile Argentina, Uruguay: Mello 1962), Japan, Korea, Manchuria, and Siberia].

Calliphora (Calliphora) antarctica Schiner

Calliphora vomitoria var. *antarctica* Schiner, 1868, Novara Reise, Dipt.: 308. — Enderlein, 1903, *Wiss. Ergeb. Deutsch. Tiefsee Exped.* 3: 253. — Enderlein, 1908, *Deutsche Sudpolar-Exped.* 10, zool. 2: 483.

Calliphora antarctica: Séguy, 1940, *Mém. Mus. Nat. Hist. Nat.*, new ser. (A) 14: 266. — Séguy, 1959, *Mém. Mus. Nat. Hist. Nat.*, new ser. (A) 17: 150.

Type-locality: Saint Paul I. *Type?*

No available material.

Length: 8.0–10.0 mm.

Bionomics: Nothing is known.

DISTRIBUTION: Saint Paul I. and Amsterdam I. (Séguy 1959).

Calliphora (Calliphora) vomitoria (Linné)

Musca vomitoria Linné, 1758, *Syst. Nat.*, ed. 10 (1): 595.

Calliphora vomitoria: Patton, 1925, *Philip. J. Sci.* 27: 398. — Sen. - White et al., 1940, Fa. Brit. India, Dipt. 6: 39. — Zumpt, 1956, *Lind., Fliegen Pal. Reg.* 64i: 23. — James, 1964, *Bull. Brit. Mus. (Nat. Hist.)*, ent. 15: 171. — Fan, 1965, *Key Common Synanthr. Flies China*: 167. — Kano & Shinonaga, 1968, *Fauna Jap., Calliphoridae*: 12.

Type-locality: Sweden. *Type* in Uppsala or lost.

Length: 9.0–13.5 mm.

SPECIMENS EXAMINED. TAIWAN: 1 ♀, Tung-pu, near Puli, 8.XII.1963, T. C. Maa (BISHOP). S. CHINA: 12 ♂♂, 10 ♀♀, Bohea Hills, ChungAn, Fukien, 15.IV.1938, 11.VIII.1939, 16.III.1940, Maa; 1 ♀, upper Kuantun, 1400 m, ChungAn, Fukien, 14.X.1941, Maa; 1 ♂, 5 ♀♀, Shangkuatun, Tungmu ling, ChungAn, Fukien, 16.IX.1941, Maa (BISHOP). PHILIPPINES: 3 ♀♀, Mt Canlaon, 2100 m, Negros Occ., 21–25.XII.1959, Quate; 1 ♂, 2 ♀♀, 60 km S of Bontac, 1800–2000 m, 28–29.V.1964, H. M. Torre Villas (BISHOP). HAWAIIAN IS.: 2 ♀♀, Kokee, Kauai I., 16.VIII.1925, O. H. Swezey, 25.VII.1940, E. H. Bryan, Jr.; 3 ♀♀, Alakai Swamp, Kauai I., 10.VII.1928, Bryan, A. M. Adamson & H. Taniguchi; 5 ♀♀, Mohihi Ridge, Kauai I., 8.VII.1937, E. C. Zimmerman, ?VII.1940, Bryan; 2 ♀♀, Waikane (1500–2200 ft.), Oahu I., 4.IX.1927 (?); 1 ♀, Waianae Mts, Oahu I., 1.V.1952, Ford;

1 ♂, Kawela, 3700 ft., Molokai I., 23.XII.1925, Bryan; 2 ♂♂, 1 ♀, Haleakala, 8000-9300 ft., Maui I., 1.I.1915, J. F. Illingworth; 19.III.1932, 23.III.1932, O. Bryant; 2 ♀♀, Olinda, 4500 ft., Maui I., 15.III.1932, Bryant; 1 ♂, Kula, Maui I., 19.III.1932, Bryant; 2 ♀♀, Kilauea, Hawaii I., 4.VIII.1919, O. H. Swezey, 22.V.1952, Bryan; 3 ♀♀, Olaa, Hawaii I., 21.VII.1927, W. W. Giffard; 3 ♀♀, Pohakuloa Humuula, Hawaii I., 31.VII.1935 (?); 1 ♂, 4 ♀♀, Puu, Huluhulu, 1980 m, N. of Mauna Loa, Hawaii I., 24.III.1961, L. W. Quate; 2 ♀♀, Keokeo, Mauka, N. Kona, Hawaii I., ?, G. P. Wilder (BISHOP).

Bionomics: No data regarding the biology have been published in the Australian and Oriental Regions.

DISTRIBUTION: India (Western Himalayas, Darjeeling, Sikkim: Sen.-White et al. 1940), Nepal (James 1964, Kano & Shinonaga 1968), S. China (Hong Kong: Sen.-White et al. 1940, Fukien), Philippines, Taiwan, Hawaiian Is., [Japan, Korea, Manchuria, C. China, Morocco, Europe, Sweden, Lapland, and North America].

Calliphora (Calliphora) lata Coquillett

Calliphora lata Coquillett, 1898, *Proc. U. S. Nat. Mus.* **21**: 334. — Kano & Shinonaga, 1968, *Fauna Jap.*, Calliphoridae: 10.

Type-locality: Japan. Type in the U. S. National Museum.

Length: 11.0-14.0 mm.

SPECIMENS EXAMINED. TAIWAN: 1 ♀, Alishan, 1200 m, 23.V.1948 (?); 1 ♂, Alishan, 2270 m, 8-9.IV.1965, C. M. Yoshimoto & P. D. Perkins (BISHOP).

Bionomics: Nothing appears to be known of its life history in the Oriental Region. This species, which has obviously entered Taiwan from the north, seems to be established there in the higher mountains, but as yet not elsewhere in the Oriental Region. *C. lata* is very commonly found around houses in spring and autumn, and occurs in midsummer in mountainous regions of Japan. The adults are attracted by human feces and dead animals, on which the larvae also feed. The descriptions and figures of the larval stage were given by Kano (1959) and Ishijima (1967).

DISTRIBUTION: Taiwan, [Japan, Korea, N. China and Siberia].

Calliphora (Calliphora) pattoni Aubertin

Calliphora pattoni Aubertin, 1931, *Ann. Mag. Nat. Hist.* (10) **8**: 615. — Sen.-White et al., 1940, *Fa. Brit. India*, Dipt. **6**: 38.

Calliphora aucta Patton, 1922, *Bull. Ent. Res.* **13**: 113. — Sen.-White, 1922, *Mem. Dep. Agric. Ind.*, ent. ser. **7**: 99. — Patton, 1925, *Philip. J. Sci.* **27**: 398. — Sen.-White, 1926, *Rec. Ind. Mus.* **28**: 129.

Type-locality: Darjeeling, India. Type in the British Museum (Nat. Hist.).

Length: 8.5-10.5 mm.

SPECIMENS EXAMINED. NEPAL: 4 ♀♀, Langtang Val., ca 2700-3400 m, ca 60 km N of Kathmandu, 13-25.X.1965, L. W. Quate (BISHOP). TAIWAN: 1 ♀, Alishan, 2270 m, Chiayi Hsien, 8-9.IV.1965, C. M. Yoshimoto (BISHOP).

Bionomics: *Calliphora pattoni* Aubertin seems to be larviparous. Nothing else appears

to be known of its life history (Sen.-White et al. 1940).

DISTRIBUTION: India (Kashmir, Darjeeling, Khasi Hills, Mishmi Hills, Dalai Val.: Sen.-White et al. 1940), Nepal, Burma (Patton 1925, Sen.-White et al. 1940) and Taiwan.

Calliphora (Calliphora) atripalpis Malloch

Calliphora atripalpis Malloch, 1935, *J. Federated Malay States Mus.* 17: 669.

Type-locality: Mt Kinabalu, Borneo. Type in the British Museum (Nat. Hist.).

No available material.

Length: 7.0 mm.

Bionomics: Nothing is known.

DISTRIBUTION: Borneo.

Calliphora (Calliphora) pseudovomitorea Kurahashi, new species Fig. 48-50.

♂. Head: eyes bare, separated at point of closest approximation by a distance slightly less than $2 \times$ width of anterior ocellus; frontal stripe more or less obliterated at narrowest point, dark red to black; parafrontalia narrow, gray-dusted; parafacialia gray-dusted, black setulose above; face dark, brownish-gray dusted, without median carina; facialia reddish, with black setulae on half way from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria and medianae reddish to blackish brown; jowls black, densely silver-dusted, covered with fine black hairs; post-jowls covered with pale yellow hairs; antennae blackish, slightly reddish along joints of 3rd and 2nd segments, the 3rd segment slightly more than $3 \times$ as long as 2nd; arista blackish brown, plumose, the plumose hairs never so long as those of *C. vomitorea*; palpi brown.

Thorax: dull bluish black, very lightly silver-dusted anteriorly; 2 narrow median and 2 broad lateral longitudinal dark stripes indicated on anterior extremity of dorsum; scutellum concolorous with thoracic dorsum; propleura brownish hairy, the other pleura covered with black hairs; prosternum hairy; supraspiracular convexity pubescent; post-alar declivity with both brown and black hairs; suprasquamal ridge with a few black setulae on anterior narrow part of it; pleurotergite black setulose; thoracic spiracles blackish brown. Chaetotaxy: *ac* 2+3, *dc* 3+3, *ia* 1+2, *h* 3-4, *ph* 3, *prs* 1, *sa* 3, *pa* 2, *n* 2, *sc* 4+1, *st* 2+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly infuscated at the base; epaulet and basicosta black; subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish brown, thoracic one hairy. Halteres blackish brown.

Legs: black, occasionally reddish on tibiae; front tibia with 1 *p* and a row of short *ad*; mid tibia with 1 *ad*, 1 *v* and 2-3 *pd*; hind tibia with 2 *ad* and a few *pd*.

Abdomen: shining bronzy, sometimes with strong bluish tinge, covered with whitish dusting, more or less tessellated; 1st and 2nd combined and 3rd tergites dark marginal banded; 1st and 2nd combined to 5th tergites with marginal bristles; hypopygium inconspicuous; aedeagus without cornu vesica (fig. 48).

♀. Head: eyes separated at vertex by a distance equal to $1/4$ the head-width; frontal stripe black, parallel-sided; parafrontalia and parafacialia yellowish-gray dusted, setulose; parafrontalia with about 10 pairs of *ori*; *ors* 2+1; *oc* well developed; *ov* and *iv* developed; *poc* convergent; 1 rather long *occ* present. Otherwise as described for ♂ except for genitalia.

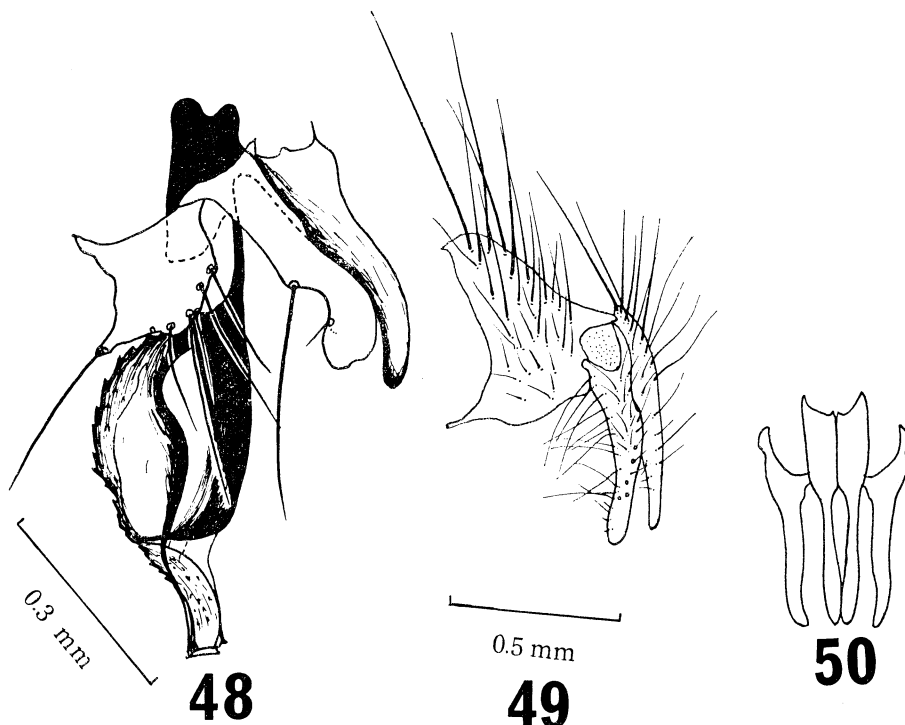


Fig. 48-50. Hypopygium of *C. (Calliphora) pseudovomitorea* n. sp.: 48, aedeagus and parameres, lateral view; 49, cerci and paralobi, lateral view; 50, cerci and paralobi, posterior view.

Length : 5.5-10.0 mm.

Holotype ♂ (BISHOP 9306), Lord Howe I., east of Australia, 20.II-6.III. 1957, Z. R. Liepa. Paratypes: 7 ♂♂, 7 ♀♀, Lord Howe Is., Australia, 20.II-6.III.1957, Z. R. Liepa. The type-specimens are in Bishop Museum, Honolulu and Australian Museum, Sydney.

Bionomics: Unknown.

DISTRIBUTION: Lord Howe Is.

Relationships: *Calliphora pseudovomitorea* Kurahashi n. sp. closely resembles *C. vomitoria* (Linné), but differs from it in the ♂ genitalic characters and the chaetotaxy of mid tibia. The size and coloration of the body are also different from those of *C. vomitoria*. The new species is tentatively included in the subgenus *Calliphora* s. str. It may be possible that it belongs to the other subgenus which agrees with the Canimicans Group of Patton.

KEY TO THE SPECIES OF CALLIPHORA S. STR.

1. Facialia, medianae and jowls obviously orange or red; eyes in ♂ subholoptic, separated by a distance equal to 2× the width of ocellar triangle; abdomen blue, conspicuously tessellated 2

- Facialia, medianae and jowls black, sometimes slightly reddish on facialia and medianae, jowls gray-dusted; eyes in ♂ closely approximated, but eyes subholoptic in the case of *C. antarctica* 3
2. Presutural *ia* present; metathoracic spiracle blackish-brown; antennae blackish *vicina* Rob. - Desvoidy
 Presutural *ia* absent; metathoracic spiracle bright yellow; antennae reddish *Paracalliphora mumfordi* Malloch
3. Basicosta brown; eyes in ♂ subholoptic, separated by the width of 3rd antennal segment; prothoracic spiracle yellow *antarctica* Schiner
 Basicosta black; eyes in ♂ closely approximated; prothoracic spiracle brown to black 4
4. Hairs on post-jowls reddish or pale brown, sometimes intermixed with black ones 5
 Hairs on post-jowls all black 6
5. Mid tibia with 2-3 *ad*, 1 *pd*, 2 *p* and 2 *v* *vomitioria* (Linné)
 Mid tibia with 1 *ad*, 2-3 *pd* and 1 *v* *pseudovomitioria* Kurahashi n. sp.
6. Palpi dark brown to black *atripalpis* Malloch
 Palpi orange 7
7. Facialia and medianae reddish; prothoracic spiracle brown *lata* Coquillett
 Facialia and medianae black; prothoracic spiracle blackish brown or black *pattoni* Aubertin

Subgenus *Papuocalliphora* Kurahashi, new subgenus

Type-species : *Calliphora toxopeusi* Theowald, 1957.

Distinguished from the nominate subgenus and the other genera of Calliphorini by the following characteristics :

Diagnosis : Thoracic squama almost completely haired, but narrowly bare along apical margin; subcostal sclerite pubescent; eyes densely haired, dichoptic in ♂, widely separated in ♀; accessory *oc* indistinct; mesothoracic spiracle blackish; epaulet and basicosta black; epistome remarkably protruding; hypopygium as normal in size and shape as that of *Calliphora* s. str.; harpes normally broadened, curved at least at the apex, fused for their full length with phallic tube, and distinctly separated from one another for a distance from harpes basis to apex; vesicae well developed, but without cornu, vesicae and posterior paramere of *Paracalliphora*-type; ovipositor intermediate between both types of *Calliphora* and *Onesia* (fig. 15); ♀ internal genitalia not examined.

Bionomics : Viviparous.

DISTRIBUTION : New Guinea.

***Calliphora (Papuocalliphora) toxopeusi* Theowald** Fig. 15, 51-53.

Calliphora toxopeusi Theowald, 1957, *Nova Guinea*, new ser. 8: 158.

Type-locality : Lake Habbema, Central New Guinea. Type in the Rijksmuseum van Natuurlijke Historie, Leiden.

Length : 7.5-11.0 mm.

SPECIMENS EXAMINED. NEW GUINEA : 4 ♂♂, Mt Giluwe, 2500-2750 m, 30.V.1963, J. Sedlacek; 48 ♀♀, 20 km SSW of Kabwum, 2550 m, E end of Saruwaged Ra., 5-12.VIII.1966, G. A. Samuelson; 3 ♀♀, Bulldog Rd., 2405 m, c. 14 km S of Edie Ck, 4-10.VII.1966, G.

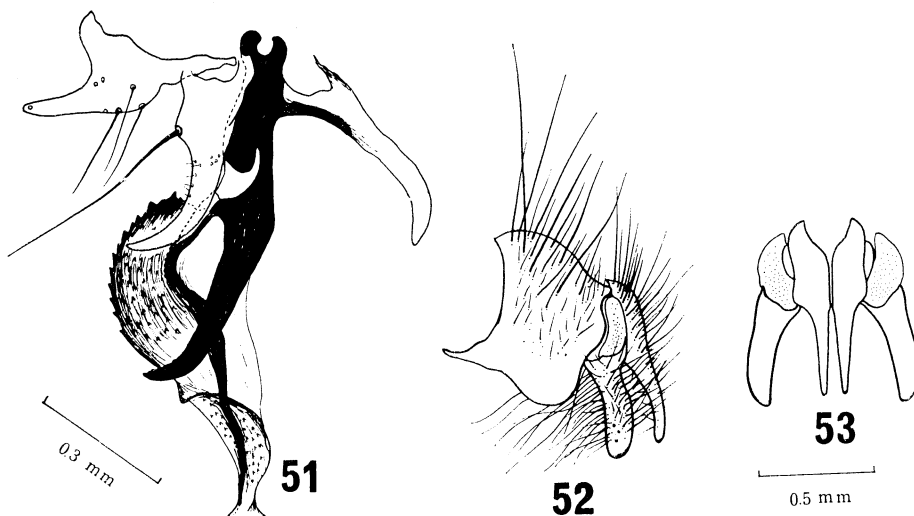


Fig. 51-53. Hypopygium of *C. (Papuocalliphora) toxopeusi* Theowald: 51, aedeagus and parameres, lateral view; 52, cerci and paralobi, lateral view; 53, cerci and paralobi, posterior view.

A. Samuelson & O. R. Wilkes; 1 ♀, Bulldog Rd., 2350 m, 32 km S of Wau, 29-30.V. 1962, J. Sedlacek; 6 ♀♀, W shore of Lake Anggi Giji, 1850 m, Sururai Vill. area, Vogelkop, 25.VII.1957, D. Elmo Hardy; 27.II.1963, R. Straatman; 3 ♀♀, Kubor Range, 2600-2950 m, W. Highlands, 22.V.1966, J. L. Gressitt; 2 ♀♀, Mt Hagen, 5°43' S, 143°57' E, 3000 m, 6.VI.1966, Gressitt; 2 ♀♀, Mt Wilhelm, 3200-3450 m, 18.V.1966, 20.V.1966, Gressitt; 2 ♀♀, Kubor Ra., 2950 m, 23.V.1966, Gressitt (BISHOP).

Bionomics: Viviparous.

DISTRIBUTION: New Guinea.

Subgenus *Paracalliphora* Townsend

Paracalliphora Townsend, 1916, *Canad. Ent.* **48**: 151. Type-species: *Calliphora oceaniae* Rob.-Desvoidy, 1830.

Proekon Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* **6**: 112. Type-species: *Ochromyia lateralis* Macquart, 1843.

Neopollenia rufipes-group: Hardy, 1937, *Proc. Linn. Soc. N. S. W.* **62**: 18.—Hardy, 1947, *Proc. R. Soc. Qld* **57**: 55.

? *Anastellorhina* Bigot, 1885, *Bull. Soc. Ent. Fr.* (6) **5**: 25. Type-species: *Anastellorhina bicolor* Bigot, 1885.

Hardy (1926) mentioned that *Anastellorhina bicolor* Bigot, which is the type-species of the genus *Anastellorhina*, is not a calliphorine, according to the information of the type supplied by Aldrich. Hardy (1947) noted, however, that *A. bicolor* is said to be *C. augur* Fabricius, but Townsend, who saw the type only through the glass of the cabinet drawer, may have seen *Lucilia fergusonii* Patton which needs closer examination to distinguish it from *C. augur*.

Diagnosis: Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin; subcostal sclerite pubescent; eyes bare, subholoptic or holoptic, not widely separated in ♂, in ♀ widely separated; accessory *oc* not developed; presutural *ac* usually 2, the arrangement of *Calliphora*-type (fig. 1a in Part I), if presutural *ac* 1, abdomen metallic bluish green and facial carina not developed, also in the cases of presutural *ac* 3, the posterior pair just in front of transverse suture, and much behind posterior presutural *dc*; presutural *ia* present, sometimes absent; abdomen variable in color, usually honey yellow on at least the sides and venter, always with a large part of central section of disc metallic blue or violet or green colored, or wholly dark bronzy with a submetallic blue, purple or green tinge and having dense yellow dusting which is conspicuously tessellated and yellow hairs, if abdomen metallic bluish green entirely, at most only 5th tergite covered with pruinosity; legs entirely reddish or brownish, sometimes fuscous to black partly or entirely; epistome conspicuously projecting forward; hypopygium normal in size and shape; harpes normally broadened, curved at least at the apex, fused with phallic tube for their full length, and distinctly separated from one another for a distance from harpes basis to apex; vesicae well developed, but without cornu; posterior paramere sickle-shaped; ovipositor intermediate between the types of *Calliphora* and *Onesia*, regularly segmented (fig. 17); ♀ internal genitalia of *Onesia*-type.

Bionomics: It seems that the females have the capability to deposit either eggs or larvae and sometimes both may be deposited at the same time (Johnston & Tiegs 1923).

DISTRIBUTION: Throughout the Oriental and Australian Regions.

***Calliphora* (Paracalliphora) leucosticta** Bezzi

Calliphora (*Calliphora*) *leucosticta* Bezzi, 1927, *Bull. Ent. Res.* 17: 243.

Calliphora leucosticta: Malloch, 1930, *Ins. Samoa*, pt. 4: 234.

Type-locality: Malololelei, Samoa. Type in the British Museum (Nat. Hist.).

No available material.

Length: 8.0-20.0 mm.

Bionomics: Unknown.

DISTRIBUTION: Samoa (Upolu I., Savaii I.).

***Calliphora* (Paracalliphora) simulata** Malloch Fig. 54-56.

Calliphora simulata Malloch, 1932, *B. P. Bishop Mus. Bull.* 98: 16.

Type-locality: Ha Pou, Marquesas Is. Type in the B. P. Bishop Museum.

Length: 8.0-10.0 mm.

SPECIMENS EXAMINED. MARQUESAS IS.: Holotype ♂ and allotype ♀, Hakahetau Valley, 1000-2000 ft., Ha Pou, 31.I.1930, R. R. Whitten; 4 ♀♀, Hakahetau Valley, 3020 ft., Ua Pou, 18.XI.1931, Le Bronnec; 1 ♀, Tekohepu Summit, 3200 ft., Ua Pou, 28.XI.1931, Le Bronnec; 1 ♀, Mt Temetiu, 3900 ft., Hivaoa, 14.I.1932, Le Bronnec (BISHOP). TONGA IS.: 2 ♂♂, Haamonga, Tongatabu I., ?II.1956, N. L. H. Krauss (BISHOP).

Bionomics: Nothing is on record.

DISTRIBUTION: Marquesas Is. and Tonga Is.

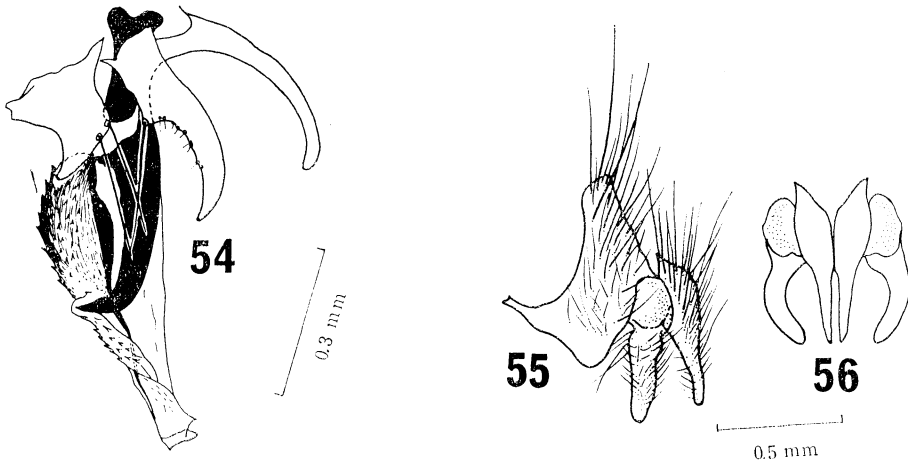


Fig. 54-56. Hypopygium of *C. (Paracalliphora) simulata* Malloch: 54, aedeagus and parameres, lateral view; 55, cerci and paralobi, lateral view; 56, cerci and paralobi, posterior view.

***Calliphora (Paracalliphora) salvage* Bezzi** Fig. 57-59.

Calliphora (Calliphora) salvage Bezzi, 1927, *Bull. Ent. Res.* 17: 242.

Calliphora salvage: Bezzi, 1928, *Dipt. Brach. Ather. Fiji Is.*: 188.

Type-locality: Cuvu, Fiji Is. *Type* in the British Museum (Nat. Hist.).

Length: 7.0-10.0 mm.

SPECIMENS EXAMINED. FIJI IS.: 22 ♂♂, 16 ♀♀, Lau, VI-X.1924, E. H. Bryan, Jr.; 1 ♂, 3 ♀♀, Moala I., 9-13.VII.1924, E. H. Bryan, Jr.; 3 ♂♂, Kimbombo, 28.IX.1924, Bryan; 4 ♂♂, 5 ♀♀, Matuku I., 3-7.VII.1924, Bryan; 1 ♂, Naitaumba, 30.IX.1924, Bryan; 1 ♂, Totoya I., 15.VII.1924, Bryan; 1 ♀, Wakaya, 11.X.1924, Bryan; 1 ♂, Thikombia, 26.IX.1924, Bryan;

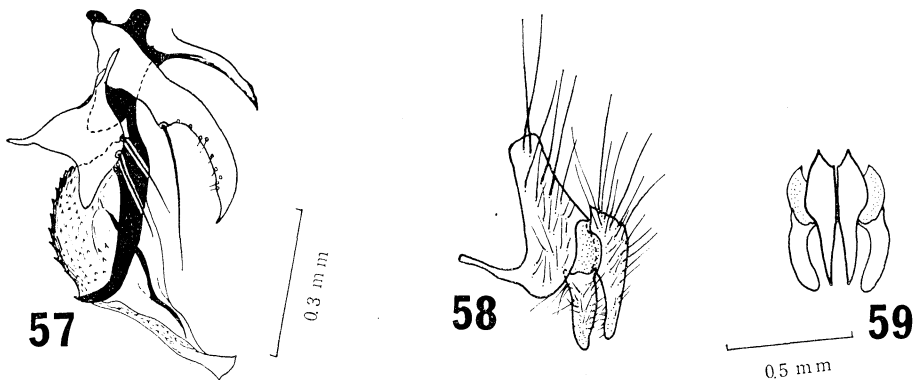


Fig. 57-59. Hypopygium of *C. (Paracalliphora) salvage* Bezzi: 57, aedeagus and parameres, lateral view; 58, cerci and paralobi, lateral view; 59, cerci and paralobi, posterior view.

8 ♂♂, 4 ♀♀, Nadarivatu, 850 m, Viti Levu, 8-13.III.1963, C. M. Yoshimoto, 23.XII.1963, J. L. Gressitt, ?V.1951, N. L. H. Krauss, 28-29.VI.1958, Borys Malkin; 1 ♀, Makura, S of Suva, 19.VII.1923, O. H. Swezey; 1 ♀, Lautoka, 9.VII.1931, H. Phillips (BISHOP).

Bionomics : Unknown.

DISTRIBUTION : Fiji Is.

Calliphora (Paracalliphora) papuensis Kurahashi, new species Fig. 60-62.

The present new species is closely allied to *Paracalliphora fulviceps fulviceps* van der Wulp and *P. fulviceps javanica* de Meijere, but can be easily distinguished from them by the following characteristics: thoracic spiracles blackish brown to black; *st* constantly 2+1; 5th tergite without dusting as well as the other tergites; body length 7.0-8.5 mm.

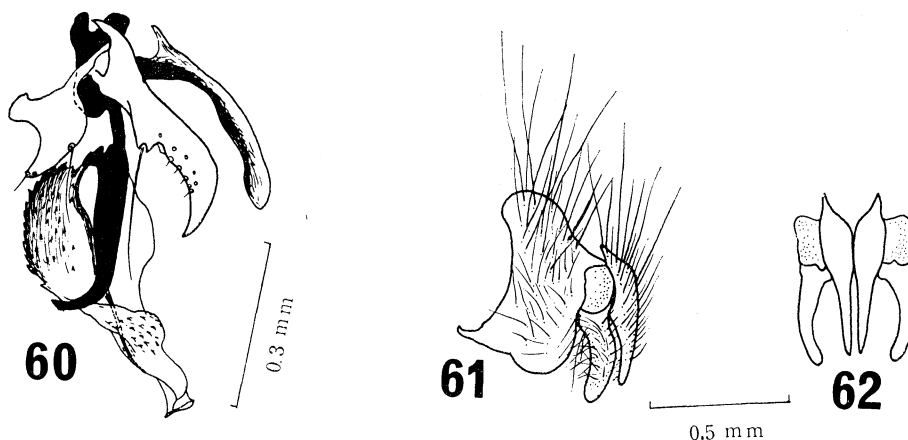


Fig. 60-62. Hypopygium of *C. (Paracalliphora) papuensis* n. sp.: 60, aedeagus and parameres, lateral view; 61, cerci and paralobi, lateral view; 62, cerci and paralobi, posterior view.

Holotype ♂ (BISHOP 9307), Mt Giluwe, 2550 m, New Guinea, 27.V-6.VI.1963, J. Sedlacek. Paratypes: 8 ♂♂, 4 ♀♀, Mt Giluwe, 2500-2550 m, New Guinea, 25-30.V.1961, J. L. Gressitt, 27.V-6.VI.1963, 30.V.1963, J. Sedlacek. The type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

SPECIMENS EXAMINED. NEW GUINEA: 2 ♂♂, 2 ♀♀, N side Malgi, 2500 m, Mt Giluwe, 25-30.V.1961, 3700-4300 m, 29.V.1961, J. L. Gressitt; 1 ♀, SE slope of Mt Giluwe, 2450 m, S. Highlands, Papua, 12.X.1958, Gressitt; 2 ♂♂, Mendi, 1066 m, S. Highlands, Papua, 13.X.1958, Gressitt; 2 ♂♂, 9 ♀♀, SE of Mt Giluwe, 2200 m, Dimifa, S. Highlands, 11-12.X.1958, Gressitt; 1 ♀, Lake Sirunki, 2550 m, 17.VI.1963, J. Sedlacek; 3 ♀♀, Yaibos, 2030-2180 m, 11-12.VI.1963, J. Sedlacek; 1 ♂, 3 ♀♀, Edie Creek, 2500 m, 22.XI.1963, 2050-2300 m, 31.III.1966, 1200-2200 m, 23.XI.1963, 1500 m, 28-30.V.1963, Gressitt; 1 ♂, 2 ♀♀, Matoko, Saidor, Finisterre Range, 28.VIII-5.IX.1958, W. W. Brandt; 3 ♀♀, Nondugl, 2200-2700 m, 28.V.1959, C. D. Michener; 1 ♂, 1 ♀, Mt Wilhelm, 3000 m, 4.VII.1955, Gressitt; 3 ♀♀, Morobe Distr., 1600-1700 m, Wau, 28.XII.1961, 1200 m, 15-16.I.1963, J. & M. Sedlacek; 1 ♀, Wau, 2400 m, 9-12.I.1962, J. & M. Sedlacek; 1 ♂, Bulldog Rd., 2200-2500 m, 19-29 km S

of Wau, 28.V.1962, Gressitt; 1 ♀, Salawaket Range, 1530 m, Gewak, 6.IX.1956, E. J. Ford; 1 ♀, Salawaket Range, 1920 m, Sepalakambang, 11-14.IX.1956, Ford; 1 ♀, Sinofi, 1590 m, 30 km S of Kainantu, 30.IX.1955, T. C. Maa; 1 ♂, Tapo (=Tapu), 1650 m, 3 km NW of Kainantu, 22.X.1959, T. C. Maa; 1 ♂, Okaitadi, 1800 m, Wisselmeren, 7.VIII.1955, Gressitt; 1 ♀, W ridge, 1800-2000 m, Swart Valley, 19.XI.1958, Gressitt; 2 ♀♀, Bismark Range, 1850 m, 27-28.V.1966, Gressitt; 2 ♂♂, 5 ♀♀, Laiagam, 2100 m, 20.VI.1963, M. Sedlacek; 1 ♂, 1 ♀, Mt Picra, 2100-2800 m, 6°45' S, 146° E, 1-14.VI.1966, Gressitt; 4 ♀♀, E end Saruwaged Ra., 2550 m, 20 km SSW of Kabwum, 2550 m, 5-12.VIII.1966, Samuelson; 1 ♂, Wapenamunda, 1750 m, 25.VI.1963, J. Sedlacek; 1 ♀, Mt Kaindi, 2350 m, 23.III.1966, Gressitt; 1 ♂, Moife, 2100 m, 15 km NW of Okapa, 11-13.X.1959, Maa; 2 ♀♀, Kubor Ra., 2950 m, 23.V.1966, Gressitt; 1 ♂, Lake Anggi Giji, 2000-2100 m, Vogelkop, 1-3.III.1963, Straatman; 1 ♂, Purosa, 1700 m, E. Highlands, 17-25.V.1966, Gressitt (BISHOP).

Bionomics: Unknown.

DISTRIBUTION: New Guinea.

Calliphora (Paracalliphora) fulviceps fulviceps van der Wulp Fig. 63-65.

Calliphora fulviceps van der Wulp, 1892, Midden Sumatra 4, N. H. Fauna, pt. 2: 44. — Patton, 1925, *Philip. J. Sci.* 27: 398. — Theowald, 1957, *Nova Guinea*, new ser. 8: 157.

Calliphora malayana Malloch, 1927, *Ann. Mag. Nat. Hist.* (9) 20: 415. — Sen.-White et al., 1940, Fa. Brit. India, Dipt. 6: 36.

Type-locality: Sumatra. *Type* in the Rijksmuseum van Natuurlijke Historie, Leiden. Length: 8.0-12.0 mm.

SPECIMENS EXAMINED. PHILIPPINES: 1 ♂, 1 ♀, Buguias, 1800-2000 m, Abatan, Mountain Prov., 1.V.1964, H. M. Torre Villas (BISHOP). BORNEO: 46 ♂♂, 43 ♀♀, Mt Kinabalu, 2140 m, 22-30.X.1958, T. C. Maa (BISHOP).

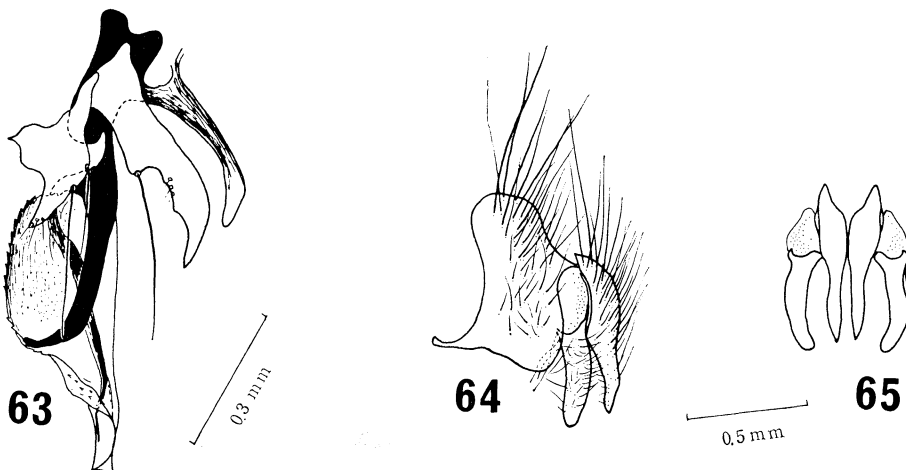


Fig. 63-65. Hypopygium of *C. (Paracalliphora) fulviceps fulviceps* van der Wulp: 63, aedeagus and parameres, lateral view; 64, cerci and paralobi, lateral view; 65, cerci and paralobi, posterior view.

Bionomics: Nothing is known.

DISTRIBUTION: Malay (Pahang, Gunong Benom: Sen.-White et al. 1940), Sumatra (Mt Dempo, Korinchi Peak: Sen.-White et al. 1940), Java (Mt Adjoeno: Sen.-White et al. 1940), Borneo and Philippines.

Calliphora (Paracalliphora) fulviceps javanica de Meijere

Calliphora fulviceps var. *javanica* de Meijère, 1914, *Tijdschr. Ent.* 57: 174.

Calliphora fulviceps: Malloch, 1927, *Ann. Mag. Nat. Hist.* (9) 20: 415. — Malloch, 1927, *Suppl. Ent.* 16: 54. — Sen.-White et al., 1940, *Fa. Brit. India, Dipt.* 6: 34.

Calliphora javanica: Theowald, 1957, *Nova Guinea*, new ser. 8: 157.

Type-locality: Java. Type in the Zoölogisch Museum, Amsterdam.

Length: 7.0–8.5 mm.

SPECIMEN EXAMINED. JAVA: 1 ♀, Tasari, 6000–8000 ft., ?, Terry (BISHOP).

Bionomics: Nothing is known.

DISTRIBUTION: ? Sumatra (Sen.-White et al. 1940), Java, Borneo (Sen.-White et al. 1940).

Calliphora (Paracalliphora) kermadeca Kurahashi, new species Fig. 66–69.

♂. Head: eyes bare, subholoptic, separated at narrowest point by a distance slightly more than the width of ocellar triangle; frontal stripe dark red to black, the width at narrowest point equal to that of anterior ocelli; parafrontalia and parafacialia dark yellowish-gray dusted, blackish setulose, about 7 pairs of *ori* developed; face dark, slightly brownish-gray dusted, without median carina; facialia, vibrissaria and medianae brown, sometimes darkened, facialia with black fine setulae on half way from vibrissae to antennal bases; vibrissae well developed; epistome dark red, rather remarkably projecting forward; jowls dark red to black, brownish-gray dusted, covered with fine black hairs, yellowish golden hairs present on and around post-

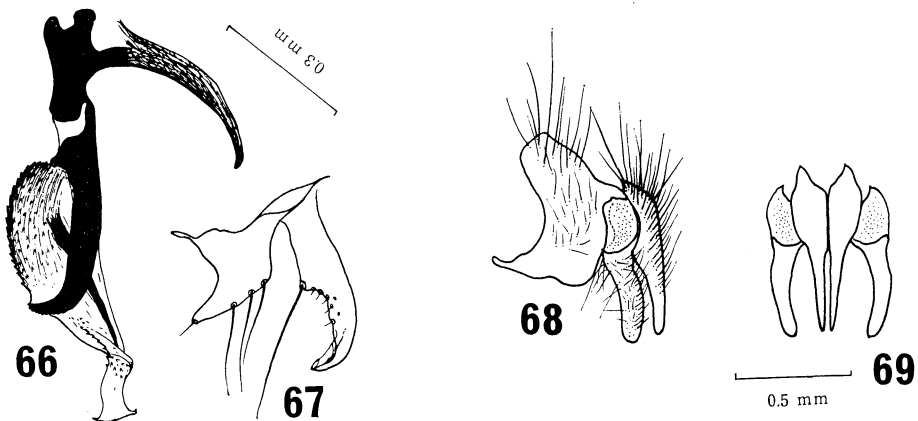


Fig. 66–69. Hypopygium of *C. (Paracalliphora) kermadeca* n. sp.: 66, aedeagus, lateral view; 67, parameres, lateral view; 68, cerci and paralobi, lateral view; 69, cerci and paralobi, posterior view.

jowls and on occiput; 1st and 2nd antennal segment red, the 3rd antennal segment blackish, about $3 \times$ as long as 2nd; arista blackish-brown, long-plumose; palpi orange.

Thorax: dark bronzy, slightly silver-dusted entirely, without obvious dark stripes on dorsum; scutellum concolorous with the thoracic dorsum; propleura brownish hairy, the other pleura covered with yellow and black fine hairs, black bristly hairs also present; prosternum brownish hairy; supraspiracular convexity pubescent; pleurotergite black setulose above; suprasquamal ridge with a tuft of fine brown hairs on anterior narrow part of it; post-alar declivity with brownish hairs; thoracic spiracles dark brown. Chaetotaxy: *ac* 2+2-3, *dc* 3+3, *ia* 1+2, *h* 4, *ph* 3, *prs* 1, *sa* 3-4, *pa* 2, *n* 2, *sc* 3+1, *st* 1-2+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly infuscated at base; epaulet and basicosta dark brown to red; subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish-brown, thoracic one hairy. Halteres blackish brown.

Legs: black, slightly paler on knees; front tibia with 1 *p* and some short *ad*; mid tibia with 2 *ad*, 1 *v*, 2 *p* and 2 *pd*; hind tibia with 1 *av* and incomplete rows of short *ad* and *pd*; coxae with fine golden hairs on anterior surface.

Abdomen: largely bronzy shining, reddish on both lateral sides, gray-dusted especially on 5th tergite; 3rd to 5th tergites with fine long marginal bristles; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 66).

♀. Head: eyes separated at vertex by a distance slightly less than $1/3$ of head-width; frontal stripe black, reddish towards lunule, narrowed towards vertex; parafrontalia and parafacialia darkened, brownish to golden-dusted, setulose; parafrontalia with approximately 7 pairs of *ori*; *ors* 2+1; *oc* well developed; *ov* and *iv* strongly developed; *poc* divergent; 2 *occ* present. Otherwise as described for ♂ except for genitalia.

Length: 6.5-10.0 mm.

Holotype ♂ (Auckland Mus.), Low Flat, 30 m, Raoul I., Kermadec Is., New Zealand, 23.IX.-8.X.1962, G. A. Samuelson. Paratypes: 4 ♂♂, 79 ♀♀, Raoul I., Kermadec Is., New Zealand, 7-12.IX.1962, 13-22.IX.1962, 22-30.IX.1962, 23.IX.-8.X.1962, Samuelson; 1 ♂, Summit, 100 m, S. Meyer I., Kermadec Is., ?, Samuelson. The type-specimens are preserved in the Auckland Museum and in Bishop Museum, Honolulu.

Bionomics: Unknown.

DISTRIBUTION: Kermadec Is.

Relationships: *Paracalliphora kermadeca* Kurahashi n. sp. resembles *Australocalliphora fuscofemorata* Malloch in general appearance, but differs from it in the following characteristics: eyes subholoptic in ♂; 3rd antennal segment wholly blackish; presutural *ia* present; basicosta reddish or brownish, not fuscous; tibiae black; 5th tergite not reddish, but bronzy, covered with gray dusting.

Calliphora (Paracalliphora) norfolka Kurahashi, new species Fig. 70-73.

♂. Head: eyes bare, separated at narrowest point of frons by a distance equal to the width of ocellar triangle; frontal stripe red, more or less reduced to a fine line at narrowest point of frons; parafrontalia and parafacialia gray-dusted, blackish setulose; face darkened, slightly brownish gray-dusted, without median carina; facialia dark brown, with black setulae on half way from vibrissae to antennal bases; vibrissae strongly developed; epistome rather remarkably projecting forward, dark brown; vibrissaria and medianae orange; jowls

brown, slightly darkened in part, thinly covered with yellowish dusting, clothed with black fine hairs, yellowish hairs present on and around post-jowls and on occiput; post-jowls orange; 1st and 2nd antennal segments red, the 3rd antennal segment blackish brown, about $3.5 \times$ as long as 2nd; arista blackish brown, long-plumose; palpi brown.

Thorax: dull bluish black, with thin covering of silver dusting, no obvious stripes indicated on dorsum; scutellum concolorous with thoracic dorsum; propleura yellowish hairy, the other pleura with yellowish fine hairs and black bristly hairs; prosternum yellowish hairy; supra-spiracular convexity pubescent; pleurotergite black setulose; post-alar declivity with fine yellow hairs on anterior 1/2, blackish setulose on posterior 1/2; suprasquamal ridge with a tuft of fine yellow hairs on anterior narrow part of it; thoracic spiracles yellow. Chaetotaxy: *ac* 2+3, *dc* 3+3, *ia* 1+2, *h* 4, *ph* 3, *prs* 1, *pa* 3-4, *pa* 2, *n* 2, *sc* 3+1, *st* 2+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly infuscated at base; epaulet and basicosta brown; subcostal sclerite with yellow pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish brown, thoracic one hairy. Halteres blackish brown on stem, brownish on apical knob.

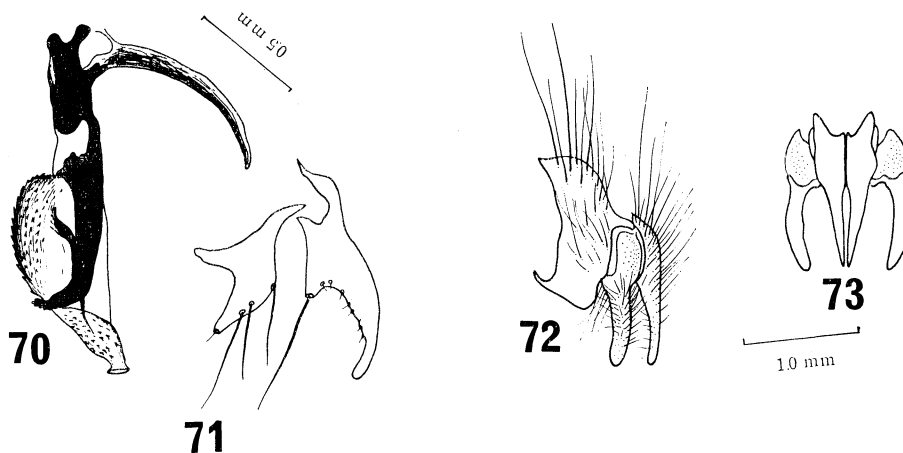


Fig. 70-73. Hypopygium of *C. (Paracalliphora) norfolka* n. sp.: 70, aedeagus, lateral view; 71, parameres, lateral view; 72, cerci and paralobi, lateral view; 73, cerci and paralobi, posterior view.

Legs: blackish, knees and coxae paler; front tibia with 1 *p* and a row of short *ad*; mid tibia with 2 *ad*, 1 *v* and 2 *pd*; hind tibia with 1-2 *av* and incomplete rows of *ad* and *pd*.

Abdomen: metallic dark blue, more or less reddish on both lateral sides of 3rd segment, silver-dusted, especially on 5th tergite; 3rd tergite with fine marginal bristles, 4th and 5th tergites with well-developed marginal bristles; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 70).

♀. Head: eyes separated at vertex by a distance equal to 1/4 of the head-width; frontal stripe narrowed towards vertex, reddish, darkened towards vertex; *ori* approximately 7; *ors* 2 +1; *oc* well developed; *ov* and *iv* developed; *poc* divergent; 2 *occ* present. Otherwise as described for ♂ except for genitalia.

Length: 7.5-8.0 mm.

Holotype ♂ (BISHOP 9308), Kingston, Norfolk I., 25.II.1958, Z. R. Liepa. Paratype ♀, same data as the holotype, in A.N.I.C., C.S.I.R.O., Canberra.

Bionomics: Unknown.

DISTRIBUTION: Norfolk I.

Relationships: This new species can be easily distinguished from the closely related *C. (Paracalliphora) kermadeca* n. sp. by the light orange jowls and post-jowls, the blue coloration of body and the light yellow coloration of thoracic spiracles.

Calliphora (Paracalliphora) dichromata (Bigot) Fig. 74-77.

Phumosia dichromata Bigot, 1887, *Bull. Soc. Z. Fr.* 12: 612.

Calliphora (Neopollenia) dichromata: Bezzi, 1927, *Bull. Ent. Res.* 17: 244.

Type-locality: New Caledonia. Type ?.

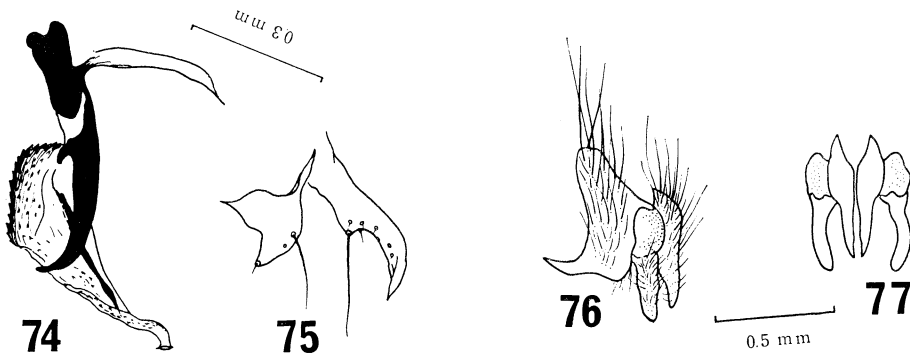


Fig. 74-77. Hypopygium of *C. (Paracalliphora) dichromata* (Bigot): 74, aedeagus, lateral view; 75, parameres, lateral view; 76, cerci and parolobi, lateral view; 77, cerci and parolobi, posterior view.

Length: 7.5-9.5 mm.

SPECIMENS EXAMINED. NEW CALEDONIA: 1 ♀, Neboui, ?VIII.1940, F. X. Williams; 1 ♀, Dzumao Mt, 4.IX.1940, Williams; 1 ♀, Thi River Valley, 1.XI.1940, Williams; 1 ♀, Noumea, I. F. O., Anse Vata, 1.IV.1958, J. Rageau; 2 ♀♀, in Mts above Ouaco, 20.X.1958, C. R. Joyce; 3 ♂♂, 2 ♀♀, Headwaters of Houailou R., 26.X.1958, Joyce; 1 ♂, 36 ♀♀, Plaine des Lacs, 30.X.1958, Joyce; 1 ♀, Mt stream up Boulari R., 3.XI.1958, Joyce; 1 ♂, 10 ♀♀, in Mts up Boulari R., 3-4.XI.1958, Joyce; 3 ♂♂, 45 ♀♀, Plaine des Lacs area, 5-6.XI.1958, Joyce; 2 ♂♂, 2 ♀♀, Thio, 11.XI.1958, Joyce; 1 ♀, Ouano Beach, 12.XI.1958, Joyce; 2 ♀♀, Up Boulari R., 17.XI.1958, Joyce; 12 ♀♀, Plateau de Dogny, 20.XI.1958, Joyce; 2 ♂♂, 5 ♀♀, Poindimie, 26.XI.1958, Joyce; 2 ♂♂, 4 ♀♀, Beach nr. La Foa, 28.XI.1958, Joyce; 1 ♂, Mt Koghi, ?III.1959, N. L. H. Krauss; 1 ♀, Col d'Amieu, 750 m, 3.III.1960, J. L. Gressitt; 1 ♀, La Crouen, 12.III.1961, J. Sedlacek; 1 ♂, Mouriance Pass, ?I.1962, Krauss; 2 ♂♂, Mt Mou, 11.II.1962, Krauss; 4 ♂♂, Yahoue, 22.I.1963, C. M. Yoshimoto; 1 ♂, Mt Koghi, 500 m, 26-30.I.1963, Krauss; 2 ♂♂, 1 ♀, Col des Roussettes, 450-550 m, 4-6.II.1963, Gressitt; 1 ♂, 25 km from Col des Roussettes, 6.II.1963, Krauss; 1 ♂, 1 ♀, Tao, 8-10.II.1963,

C. Yoshimoto & Krauss; 2 ♂♂, Col des Pirogue, 14.II.1963, Yoshimoto; 2 ♂♂, Mt Koghi, 15.II.1963, Yoshimoto; 4 ♀♀, Junction of Humboldt & Kalouchola Riv., 100 m, 14. XII.1963, R. Straatman; 1 ♂, Yiambi, 1-50 m, 15.X.1967, J. & M. Sedlacek (BISHOP).

Bionomics: Nothing is on record.

DISTRIBUTION: New Caledonia.

***Calliphora (Paracalliphora) augur augur* (Fabricius)** Fig. 17, 78-81.

Musca augur Fabricius, 1775, *Syst. Ent.* 2: 777.

Anastellorhina augur: Froggatt & Froggatt, 1917, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 113: 35. — Johnston & Bancroft, 1920, *Mem. Qld Mus.* 7: 33. — Patton, 1921, *Bull. Ent. Res.* 12: 251.

Paracalliphora augur: Johnston & Tiegs, 1923, *Proc. R. Soc. Qld* 34: 85.

Calliphora augur: Patton, 1925, *Philip. J. Sci.* 27: 400. — Hardy, 1926, *Proc. R. Soc. Qld* 37: 171. — Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 310. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* 53: 613. — Patton, 1935, *Ann. Trop. Med. Parasitol.* 29: 21.

Calliphora (Proekon) augur: Bezzi, 1927, *Bull. Ent. Res.* 17: 243. — Hardy, 1932, *Bull. Ent. Res.* 23: 555. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 23.

Calliphora oceaniae Rob.-Desvoidy, 1830, *Essai Myod.*: 438. — Schiner, 1868, *Novara Reise, Dipt.*: 309. — Froggatt, 1905, *Agric. Gazette N. S. W.* 16, misc. pub. no. 809: 20. — Froggatt, 1913, *Sheep Magg.-Fly Pest Austr.*: 20. — Froggatt, 1914, *Agric. Gazette N. S. W.* 15, misc. pub. no. 1764: 757. — Froggatt, 1915, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 95: 18. — Froggatt & Froggatt, 1916, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 110: 21.

Paracalliphora oceaniae: Froggatt, 1922, *Farmers' Bull. Dept. Agric. N. S. W.*, no. 144: 30.

Ochromyia lateralis Macquart, 1843, *Mém. Soc. Sci. Lille* (1842): 291. — Macquart, 1843, *Dipt. Exot.* 2, pt. 3: 143.

Proekon lateralis: Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* 6: 112.

Calliphora rufiventris Macquart, 1847, *Mém. Soc. Sci. Lille* (1846): 98. — Macquart, 1847, *Dipt. Exot.*, suppl. 2: 82.

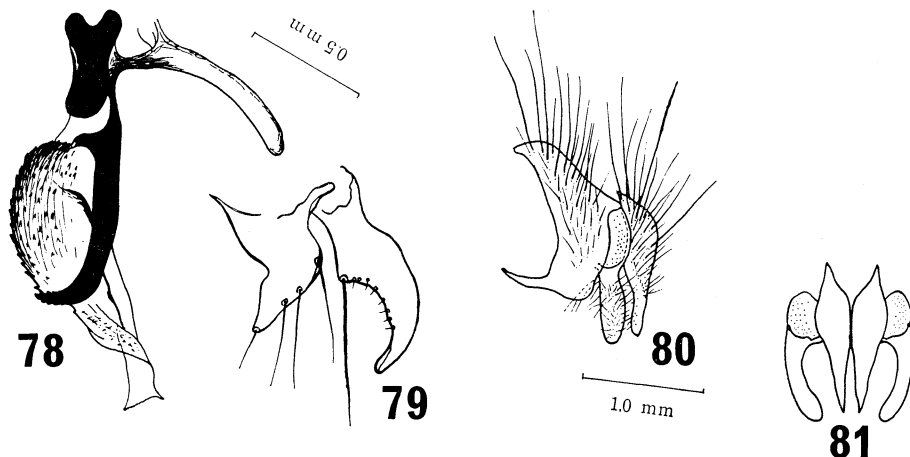


Fig. 78-81. Hypopygium of *C. (Paracalliphora) augur augur* (Fabricius): 78, aedeagus, lateral view; 79, parameres, lateral view; 80, cerci and paralobi, lateral view; 81, cerci and paralobi, posterior view.

Ochromyia nigricornis Macquart, 1849, Dipt. Exot., suppl. 4: 245.

Proekon nigricornis: Surcouf, 1919, *Arch. Mus. Hist. Nat. Paris* 6: 114.

Musca dorsalis Walker, 1849, List Spec. Dipt. Ins. Brit. Mus. 4: 907.

Phumosa xanthurea Bigot, 1887, *Bull. Soc. Z. Fr.* 12: 611.

Type-locality: ?. Type ?.

Length: 6.0-10.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 2 ♂♂, 4 ♀♀, Moggill Farm, 25 m, W of Brisbane, SE Qld, 27.I-1.II.1961, J. L. Gressitt; 1 ♀, 85 km W of Coolgardie, 31.X.1963, J. Sedlacek; 1 ♀, 5 km W of Lake Cave, 1-40 m, 7-8.XI.1963, Sedlacek; 6 ♂♂, 7 ♀♀, Sydney, 5.III.1919, F. X. Williams, date ?, J. F. Illingworth, ?. XII.1902, Helms coll.; 1 ♀, 150 m E of Lilydale, Woori Yalock, Victoria, 20.XII.1960, J. L. Gressitt (BISHOP).

Bionomics: *Paracalliphora augur augur* (Fabricius), known as the Smaller yellow house blowfly, is a primary sheep-maggot fly in eastern Australia and infests the sheep (Patton 1921). The eggs are laid upon the solid wool, which produces the maggots that do so much damage to both wool and sheep. The adults are commonly found around the houses about Sydney and Brisbane and all inland towns, especially during winter, increasing as *Neocalliphora stygia* (Fabricius) begins to diminish, but they are not abundant in summer. It was observed by W. W. Froggatt (1905) that this blowfly often swarms in great numbers on all the Australian Alps. The females have the capability to deposit either eggs or larvae and at times both may be deposited at the same time (Johnston & Tiegs 1923). W. W. Froggatt (1913, 1914, 1915) reported breeding of the present species from carrion all the year round though it often infests sheep during winter. During summer, 14 to 18 days intervene between the egg and the emergence of the adult fly. The description and drawings of the maggot were given by W. W. Froggatt (1905, 1913, 1915), J. L. Froggatt (1918) and Fuller (1932b).

DISTRIBUTION: Australia (Queensland, New South Wales, Victoria) and Tasmania (Hardy 1932).

Calliphora (Paracalliphora) augur nociva Hardy Fig. 82-85.

Calliphora nociva Hardy, 1932, *Bull. Ent. Res.* 23: 556.

Type-locality: South Australia. Type ?.

Length: 8.5-10.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 2 ♂♂, 6 ♀♀, Aldgate, 400 m, 20 km E of Adelaide, 31.XII.1960-1.I.1961, Gressitt, 29-31.XII.1960, Gressitt; 1 ♀, Kebele, ?, ?; 1 ♀, Victoria, ?.XI.1919, E. Jarvis (BISHOP).

Bionomics: *Paracalliphora augur nociva* Hardy is a famous sheep blowfly in western Australia. Some observations on the life-history responsible for striking sheep in the region were reported by Fuller (1934b). Much of the early spring strike is due to this subspecies, which is the most dominant blowfly at this season. This subspecies seems to favor the mallee areas, whereas *P. augur augur* (Fabricius) occurs in the other wooded districts, the 2 meeting in the open plains (Hardy 1937).

DISTRIBUTION: Australia (New South Wales; Hardy 1932, Victoria, South Australia).

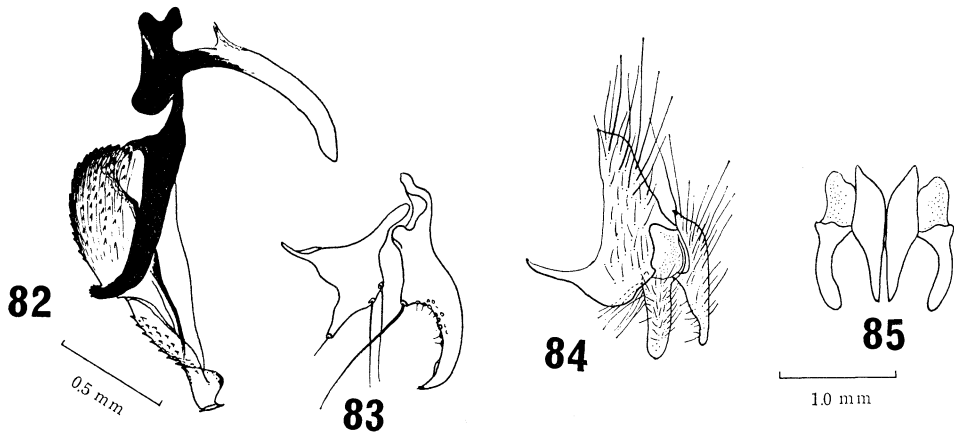


Fig. 82-85. Hypopygium of *C. (Paracalliphora) augur nociva* Hardy: 82, aedeagus, lateral view; 83, parameres, lateral view; 84, cerci and paralobi, lateral view; 85, cerci and paralobi, posterior view.

***Calliphora (Paracalliphora) augur neocaledonensis* Kurahashi, new subspecies**

Fig. 86-89.

Calliphora centralis: Curran, 1929, Amer. Mus. Nov., no. 375: 7 (misid.).

This subspecies can be distinguished from *P. augur augur* and *P. augur nociva* by the wholly brownish 5th tergite and the shape of the aedeagus. The ♂ specimens have the sternopleura clothed with yellow and black hairs.

Length: 7.0-9.0 mm.

Holotype ♂ (BISHOP 9309), up Boulari R., New Caledonia, 17.XI.1958, C. R. Joyce. Paratypes: 3 ♀♀, same data as holotype; 1 ♂, 10 ♀♀, Plaine des Lacs, 30.X.1958, C. R.

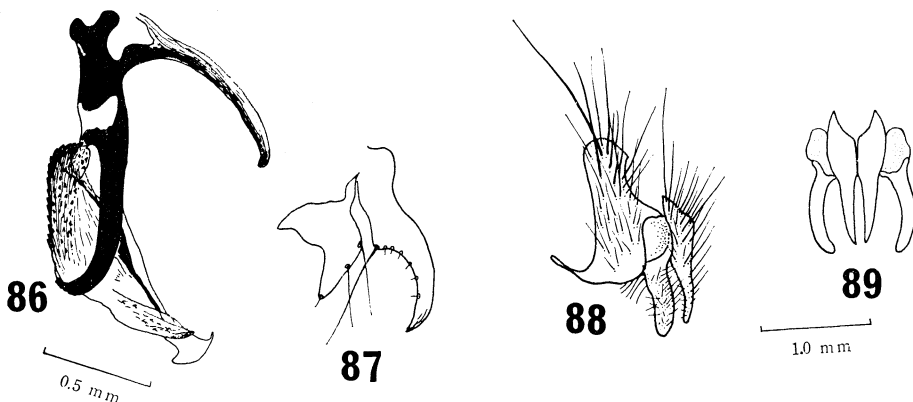


Fig. 86-89. Hypopygium of *C. (Paracalliphora) augur neocaledonensis* n. subsp.: 86, aedeagus, lateral view; 87, parameres, lateral view; 88, cerci and paralobi, lateral view; 89, cerci and paralobi, posterior view.

Joyce. The type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

SPECIMENS EXAMINED. NEW CALEDONIA: 1 ♀, Noumea, 30.X.1940, F X. Williams; 1 ♀, Mt. stream up Boulari R., 3.XI.1958, Joyce; 1 ♀, in Mts up Bculari R., 3-4.XI.1958, Joyce; 4 ♀♀, Plaine des Lacs area, 6.XI.1958, Joyce; 2 ♀♀, Thio, 11.XI.1958, Joyce; 1 ♀, Ouano Beach, 12.XI.1958, Joyce; 1 ♀, Anse Vata, 15.XI.1958, Joyce; 4 ♀♀, Tiwaka River, 27.XI.1958, Joyce; 1 ♀, Beach nr. La Foa, ?, (BISHOP).

Bionomics: Unknown.

DISTRIBUTION: New Caledonia.

Calliphora (Paracalliphora) espiritusanta Kurahashi, new species Fig. 90-92.

♂. Head: eyes bare, separated at narrowest point of frons by a distance slightly less than the width of ocellar triangle; frontal stripe dark red posteriorly, reddish brown anteriorly, more or less obliterated at narrowest point; parafrontalia and parafacialia yellowish gray to golden-dusted, blackish setulose; face dark brown, without carina; facialia reddish, with black setulae on lower 2/3 from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria, medianae and jowls brown, jowls with black fine hairs on anterior parts, yellowish hairs present on large parts of jowls, post-jowls and occiput; 1st and 2nd antennal segments red, the 3rd largely blackish on external portion, about $3.5 \times$ as long as 2nd; arista blackish brown, long-plumose; palpi brown.

Thorax: dull bluish black, silver-dusted, especially on anterior parts of dorsum and pleura, no obvious stripes indicated on dorsum; humeri dark red; scutellum concolorous with thoracic dorsum; propleura yellowish hairy, the other pleura covered with both yellow and black hairs; hypopleural bristles black; prostigmatic and propleural bristles developed; prosternum yellowish hairy; supraspiracular convexity pubescent; pleurotergite with fine upstanding long hairs; postalar declivity with both brown and black hairs; suprasquamal ridge with a tuft of yellow fine long hairs on anterior narrow part of it; thoracic spiracles light yellow. Chaetotaxy: *ac* 2+3, *dc* 3+3, *ia* 0-1+2, *h* 3-4, *ph* 3, *prs* 1, *sa* 3-4, *pa* 2, *n* 2, *sc* 3+1, *st* 1+1.

Wings: hyaline, slightly infuscated at the base; veins dark brown; epaulet and basicosta

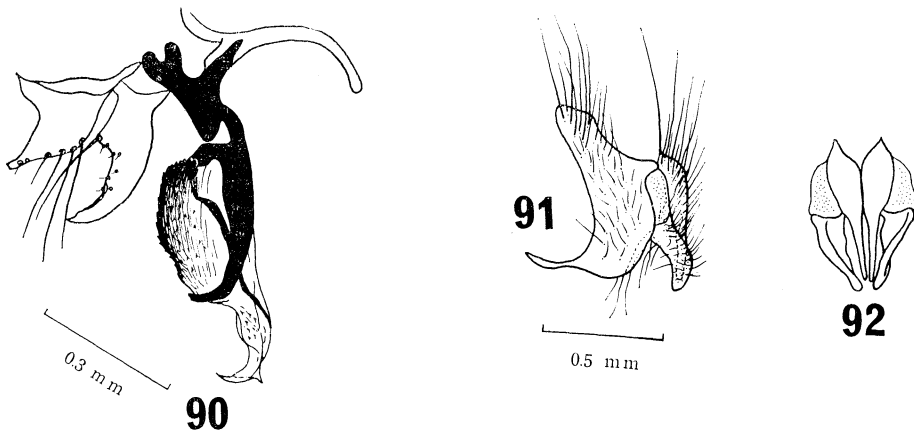


Fig. 90-92. Hypopygium of *C. (Paracalliphora) espiritusanta* n. sp.: 90, aedeagus and parameres; 91, cerci and paralobi, lateral view; 92, cerci and paralobi, posterior view.

brown; subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish brown, thoracic one blackish hairy. Halteres orange.

Legs: brown except for dark tarsal segments; front tibia with 1 *p*; mid tibia with 1 *ad*, 1 *av* and 2 *p*; hind tibia with 1 *av* and rows of *ad* and *pd*.

Abdomen: largely testaceous on both lateral sides except for metallic bluish green discal portion; 5th tergite entirely metallic bluish green, conspicuously whitish-silver dusted; 1st and 2nd combined to 4th tergites more or less dark marginal banded; marginal bristles poorly developed on the lateral sides of 3rd and on the 4th and 5th tergites; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 90).

♀. Head: eyes separated at vertex by a distance slightly narrower than 1/4 of the head-width; frontal stripe red, slightly narrowed towards vertex, the width equal to 2× that of one of parafrontalia at the level of anterior ocellus; parafrontalia with approximately 10 pairs of *ori*; *ors* 2+1; *oc* strongly developed; *iv* and *ov* well developed; *poc* almost parallel; 2 *occ* present. Abdomen: 4th tergite largely metallic green as well as 5th. Otherwise as described for ♂ except for genitalia.

Length: 8.0–9.5 mm.

Holotype ♂ (BISHOP 9310), Above Namatasopa, 400 m, Espiritu Santo I., New Hebrides, 30–31.VIII.1957, J. L. Gressitt. Paratypes: 3 ♂♂, 1 ♀, same data as holotype. The type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

Bionomics: Unknown.

DISTRIBUTION: Espiritu Santo I.

Relationships: *Paracalliphora espiritusanta* Kurahashi n. sp. differs from each subspecies of *Paracalliphora augur* (Fabricius) in having dark red humeri and wholly metallic 5th tergite.

Calliphora (Paracalliphora) porphyrina Kurahashi, new species Fig. 93–96.

♂. Head: eyes bare, separated at narrowest point of frons by a distance less than the width of ocellar triangle; frontal stripe reddish brown anteriorly, obliterated at narrowest point; parafrontalia and parafacialia yellowish gray-dusted or often golden-dusted, blackish setulose; face dark brown, without median carina; facialia testaceous, with black setulae on lower 2/3 the distance from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria, medianae and jowls brown, jowls with black fine hairs on anterior parts, yellowish hairs present on large parts of jowls, post-jowls and occiput; 1st and 2nd antennal segment reddish, the 3rd blackish, about 3.5 × as long as 2nd; arista black, long-plumose; palpi brown.

Thorax: dull bluish black, with conspicuous metallic purple tinge, silver gray-dusted, especially on anterior parts of dorsum, no obvious stripes indicated on dorsum; pleura yellowish gray-dusted, covered with yellowish hairs, but mesopleura with both yellow and black hairs; humeri brown; scutellum concolorous with the thoracic dorsum; hypopleural bristles black; prosternum yellowish hairs; supraspiracular convexity pubescent; pleurotergite with fine black upstanding hairs; post-alar declivity with both brown and black hairs; suprasquamal ridge with anterior parasquamal tuft of yellow hairs, tympanic tuft also consists of yellow fine hairs; mesothoracic spiracle light yellow, metathoracic one dark brown. Chaetotaxy: *ac* 2+3, *dc* 3+3, *ia* 0-1+2, *h* 3-4, *ph* 3, *prs* 1, *sa* 3-4, *pa* 2, *n* 2, *sc* 3+1, *st* 2-3+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly infuscated at base; veins blackish; epaulet brown; basicosta yellow;

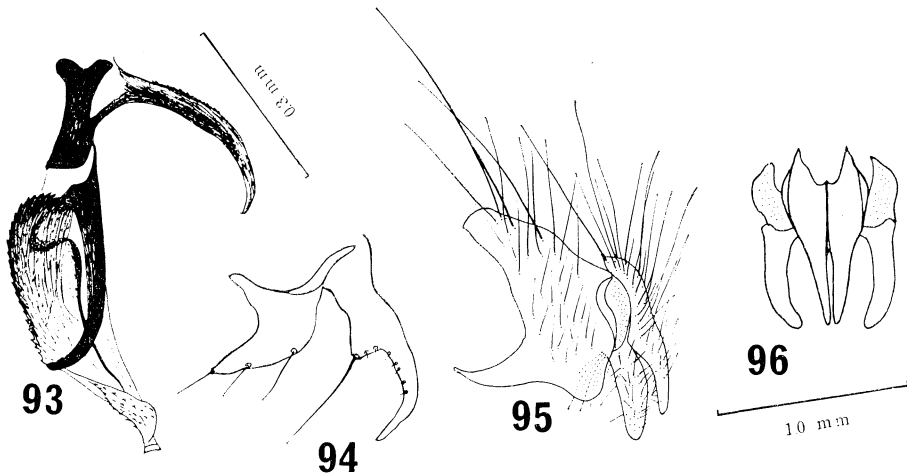


Fig. 93-96. Hypopygium of *C. (Paracalliphora) porphyrina* n. sp.: 93, aedeagus, lateral view; 94, parameres, lateral view; 95, cerci and paralobi, lateral view; 96, cerci and paralobi, posterior view.

subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish brown, thoracic one blackish hairy, hairs on basal part paler than those on marginal one. Halteres brown.

Legs: bright brown except for dark tarsal segments; front tibia with 1 *p*; mid tibia with 2 *ad*, 1 *v*, 2 *pd* and 1 *p*; hind tibia with 2 *av* and rows of *ad* and *pd*.

Abdomen: metallic bluish green, brown to dark brown on lateral sides of 3rd and 4th tergites, ventral side also more or less brownish; 5th tergite entirely metallic bluish green, conspicuously whitish silver-dusted; marginal bristles poorly developed on lateral sides of 3rd tergite, the 4th and 5th tergites with a row of fine marginal bristles; hypopygium not prominent; aedeagus without cornu of vesica (fig. 93).

♀. Head: eyes separated at vertex by a distance about 1/4 of the head-width; frontal stripe reddish brown, darkened posteriorly, slightly narrowed towards vertex, the width equal to $2 \times$ that of one of parafrontalia at the level of anterior ocellus; parafrontalia golden-dusted, with approximately 8 pairs of *ori*; *ors* 2+1; *oc* strongly developed; *iv* and *ov* well developed; *poc* almost parallel; 1 *occ* present. Wings: thoracic squama covered with brownish hairs. Otherwise as described for ♂ except genitalic characters.

Length: 5.0-8.5 mm.

Holotype ♂ (BISHOP 9311), Wau, 1200 m, NE New Guinea, 2.IV.1968, J. & M. Sedlacek. Paratypes: 1 ♂, Mt Missim, 2040-2400 m, 22-30.IV.1968, J. L. Gressitt, R. C. A. Rice & J. Sedlacek; 4 ♀♀, Mt Kaindi, 2320 m, 30.IV.1968, 26.V.1968, Rice. The type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

Bionomics: According to the label on the specimens, 4 females were collected by Rice on human feces and dead rats.

DISTRIBUTION: NE New Guinea.

Relationships: *Paracalliphora porphyrina* Kurahashi n. sp. is closely similar to *P. espi-*

tusanta n. sp., but differs from it in the abdominal pattern and the coloration of the metathoracic spiracle. The present species is also clearly distinguished from other allied species in the purple coloration of the thoracic dorsum and scutellum.

Calliphora (Paracalliphora) gressitti Kurahashi, new species Fig. 97-99.

♂. Head: eyes bare, closely approximated, separated at narrowest point of frons by a distance slightly less than the width of ocellar triangle; frontal stripe red, reduced to a fine line at narrowest point; parafrontalia and parafacialia yellowish gray to golden-dusted: parafrontalia with approximately 5 pairs of *ori*, some fine bristles of *ori* arranged on upper parafrontalia; face brown, without median carina; facialia brown, with black setulae on half way from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria, medianae, lower part of parafacialia and anterior 2/3 of jowls brown; jowls slightly brownish gray-dusted, clothed with black and yellow hairs, post-jowls and posterior 1/3 of jowls darkened, covered with yellow hairs; 1st and 2nd antennal segment red, the 3rd largely blackish, especially on external portion, about $3.5 \times$ as long as 2nd; arista blackish brown, long-plumose; palpi orange.

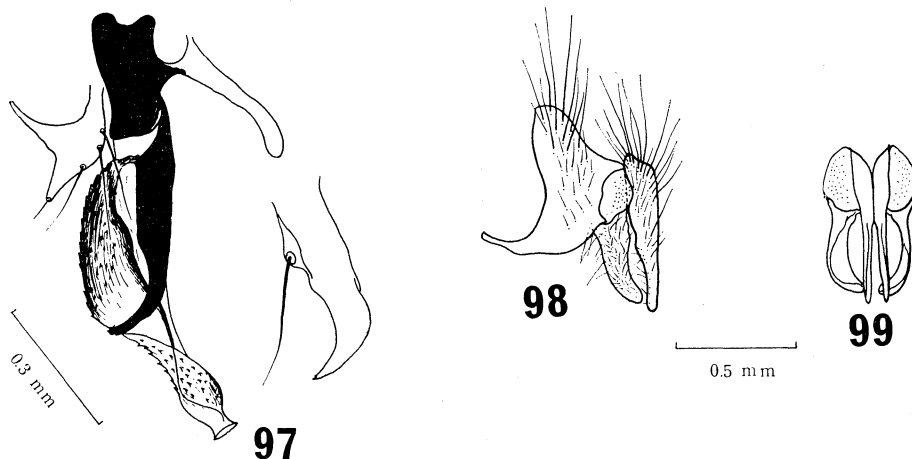


Fig. 97-99. Hypopygium of *C. (Paracalliphora) gressitti* n. sp.: 97, aedeagus and parameres, lateral view; 98, cerci and paralobi, lateral view; 99, cerci and paralobi, posterior view.

Thorax: dull bluish black, very slightly silver-dusted, no remarkable stripe indicated on dorsum; humeri darkened, never paler than dorsum; scutellum concolorous with thoracic dorsum; propleura, sternopleura and pteropleura covered with yellow hairs; hypopleura with yellow hairs and yellow hypopleural bristles; mesopleura with both yellow and black hairs; prosternum yellowish hairy; supraspiracular convexity pubescent; pleurotergite with both brown and black hairs; post-alar declivity with both brown and black hairs; suprasquamal ridge with a tuft of yellow hairs on anterior narrow part of it; thoracic spiracles light yellow. Chaetotaxy: *ac* 2+3, *dc* 3+3, *ia* 1+2, *h* 3-4, *ph* 3, *prs* 1, *sa* 3-4, *pa* 2, *n* 2, *sc* 3+1, *st* 1+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly brownish at base; epaulet and basicosta brown; subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal vein with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae blackish brown,

thoracic one brownish hairy. Halteres brown.

Legs: brown except for tarsi and front coxa slightly darkened; front tibia with 1 *p*; mid tibia 1 *ad*, 1 *v*, 1 *pd* and 1 *p*; hind tibia with both row of short *ad* and *pd*, 2 *ad*, 2 *pd* and 2 *av* each bristle poorly developed.

Abdomen: testaceous on both lateral sides, with metallic portion sharply limited, covered with whitish gray dusting, especially on 5th tergite; each tergite more or less dark marginal banded; 3rd tergite with fine marginal bristles not erected; 4th and 5th tergites with marginal bristles erected; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 97).

♀. Unknown.

Length: 8.5 mm.

Holotype ♂, Rain Forest, 600 m, Mt Glorious, SE Queensland, Australia, 28.II-6.III. 1961, L. & M. Gressitt. Type-specimen is in the Australian National Insect Collection, C.S.I.R.O.

Bionomics: Unknown.

DISTRIBUTION: Australia.

Relationships: *Paracalliphora gressitti* Kurahashi n. sp. is closely related to *Paracalliphora macleayi* Malloch except for the number of the presutural *ac* and ♂ genitalic characters. The new species also resembles the 3 subspecies of *Paracalliphora augur* (Fabricius) and *P. espritusanta* Kurahashi, but differs from them in having dark metallic humeri and yellowish hypopleural bristles.

Calliphora (Paracalliphora) aruspex Bezzi Fig. 100-103.

Calliphora (Proekon) aruspex Bezzi, 1927, *Bull. Ent. Res.* 17: 244.

Type-locality: Tanna, New Hebrides. Type in the British Museum (Nat. Hist.), London.

Length: 7.0-9.5 mm.

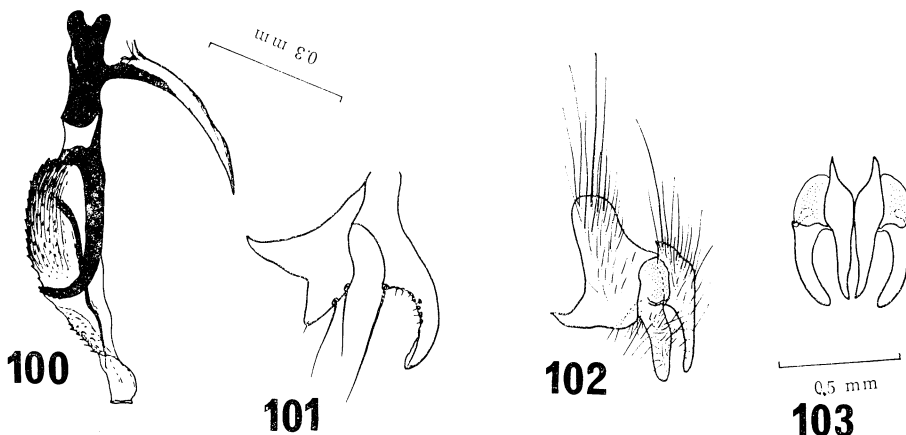


Fig. 100-103. Hypopygium of *C. (Paracalliphora) aruspex* Bezzi: 100, aedeagus, lateral view; 101, parameres, lateral view; 102, cerci and paralobi, lateral view; 103, cerci and paralobi, posterior view.

SPECIMENS EXAMINED. NEW HEBRIDES: 10 ♂♂, 8 ♀♀, Tanna, 23.I.1923, E. Robertson, (BISHOP).

Bionomics: Nothing is known.

DISTRIBUTION: New Hebrides.

Calliphora (Paracalliphora) macleayi Malloch Fig. 104-107.

Calliphora macleayi Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 310.

Calliphora falciformis Hardy, 1932, *Bull. Ent. Res.* 23: 558. **New Synonymy.**

Type-locality: Queensland, Australia. *Type ?*.

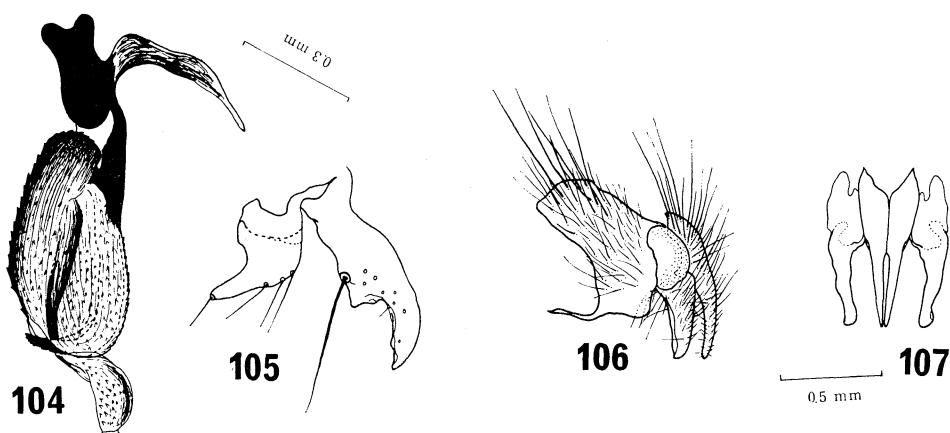


Fig. 104-107. Hypopygium of *C. (Paracalliphora) macleayi* Malloch: 104, aedeagus, lateral view; 105, parameres, lateral view; 106, cerci and paralobi, lateral view; 107, cerci and paralobi, posterior view.

Length: 6.0-10.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 3 ♂♂, 10 ♀♀, Mt Glorious, SE Queensland, 5-8.II.1961, 13-16.II.1961, 24-28.II.1961, 28.II-6.III.1961, J. L. & M. Gressitt (BISHOP).

Bionomics: *Paracalliphora macleayi* Malloch is a rain forest-frequenting species (Hardy 1932).

DISTRIBUTION: Australia (Queensland).

Calliphora (Paracalliphora) centralis Malloch

Calliphora centralis Malloch, 1927, *Proc. Linn. Soc. N. S. W.* 52: 311. — Malloch, 1928, *Proc. Linn. Soc. N. S. W.* 53: 613. — Hardy, 1932, *Bull. Ent. Res.* 23: 557. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 24.

Type-locality: Eungella, Queensland. *Type ?*.

Length: 9.0-10.5 mm.

SPECIMENS EXAMINED. AUSTRALIA: 8 ♀♀, Mt Glorious, SE Queensland, 5-8.II.1961, 13,

II.1961, 13-16.II.1961, 24-28.II.1961, J. L. & M. Gressitt (BISHOP).

Bionomics: *Paracalliphora centralis* Malloch is an open forest species and confined to timber country of the plains and low hills. The adult flies are easily discovered on twigs and on the ground at about sunset, occasionally visiting flowering shrubs. They are not attracted by carrion, nor are they caught in traps, as far as Hardy (1932, 1937) reported.

DISTRIBUTION: Australia (Queensland).

Calliphora (Paracalliphora) fulvicoxa Hardy Fig. 108-111.

Calliphora fulvicoxa Hardy, 1930, *Bull. Ent. Res.* **21**: 445.—Hardy, 1932, *Bull. Ent. Res.* **23**: 551.—Malloch, 1932, *Proc. Linn. Soc. N. S. W.* **57**: 64.

Calliphora albifrontalis Malloch, 1932, *Proc. Linn. Soc. N. S. W.* **57**: 67.

Type-locality: Brisbane, Queensland. Type ?.

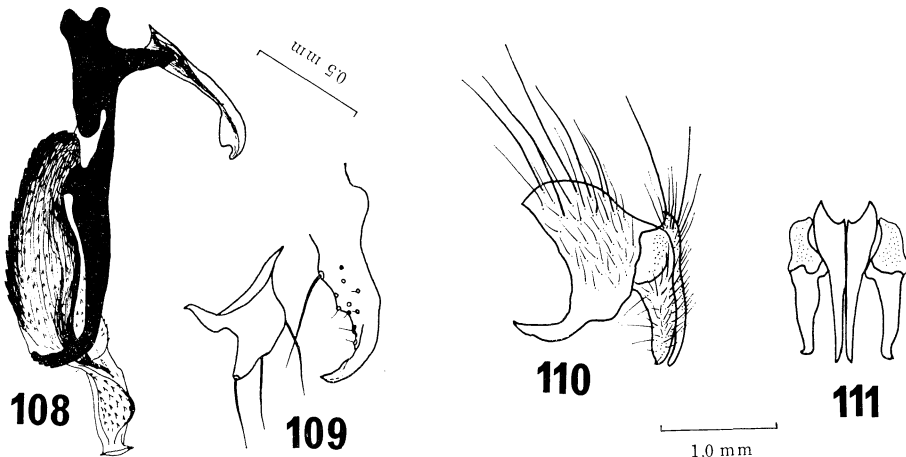


Fig. 108-111. Hypopygium of *C. (Paracalliphora) fulvicoxa* Hardy: 108, aedeagus, lateral view; 109, parameres, lateral view; 110, cerci and paralobi, lateral view; 111, cerci and paralobi, posterior view.

Length: 7.0-10.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 6 ♂♂, 2 ♀♀, Mt Glorious, SE Queensland, 13.II.1961, 13-16.II.1961, 24-28.II.1961, 28.II-6.III.1961, 16-20.II.1961, J. L. & M. Gressitt; 1 ♀, Moggill Farm, 25 m, W of Brisbane, SE Queensland, 27.I-1.II.1961, J. L. Gressitt; 3 ♂♂, 5 ♀♀, Aldgate, 400 m, 20 km E of Adelaide, 29-31.XII.1960, 31.XII.1960-1.I.1961, J. L. Gressitt (BISHOP). TASMANIA: 3 ♂♂, Nothofagus forest, 400 m, Mt Wellington, 23.XII.1960, 23-27.XII.1960, J. L. Gressitt; 1 ♀, Dobson Lake, 1000 m, Mt Field Nat. Park, 25.XII.1960, J. L. Gressitt (BISHOP).

Bionomics: It is unlikely that this fly will be found associated with myiasis, as it is not normally reared from carrion and does not seem to be attracted to traps. In laboratory it will oviposit on carrion that has been retained several days, whereas *Paracalliphora fallax* only oviposits in fresh carrion (Hardy 1937).

DISTRIBUTION: Australia (Queensland, S. Australia, W. Australia : Malloch 1932a) and Tasmania.

Calliphora (Paracalliphora) rufipes varifrons Malloch Fig. 112-115.

Calliphora varifrons Malloch, 1932, *Proc. Linn. Soc. N. S. W.* 57: 66.

Type-locality: Mundaring, Western Australia. Type in Dr Mackerras' collection, in Australia.

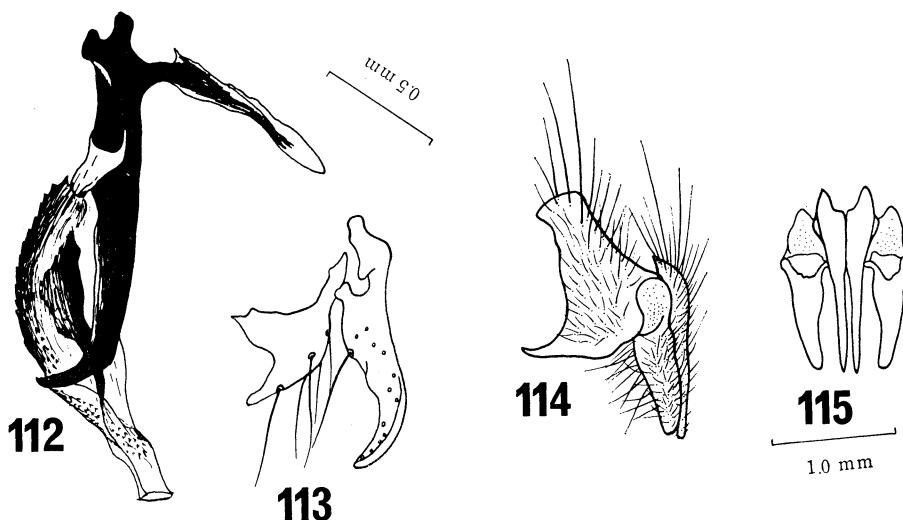


Fig. 112-115. Hypopygium of *C. (Paracalliphora) rufipes varifrons* Malloch: 112, aedeagus, lateral view; 113, parameres, lateral view; 114, cerci and paralobi, lateral view; 115, cerci and paralobi, posterior view.

Length: 6.5-10.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 7 ♂♂, 14 ♀♀, Karri Forest, E. Brook, Pemberton, 100 m, W. Australia, 4.I.1961, 4-5.I.1961, 5-6.I.1961, J. L. Gressitt (BISHOP).

Bionomics: Nothing is known.

DISTRIBUTION: Australia (W. Australia).

Remarks: Patton (1935) sunk the present species as a synonym of *Paracalliphora rufipes* (Macquart). Both forms are actually almost identical except for a few points, which are rather distinguishable. The identity of the present form is yet to be ascertained and requires much more detailed examination of the comparative morphology and the experimental biology.

Calliphora (Paracalliphora) rufipes rufipes (Macquart) Fig. 116-119.

Pollenia rufipes Macquart, 1835, *Suites à Buff.* 2: 271.

Calliphora rufipes: Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 22.

Calliphora hilli Patton, 1925, *Philip. J. Sci.* 27: 400. — Malloch, 1932, *Proc. Linn. Soc. N. S. W.*

57: 64.

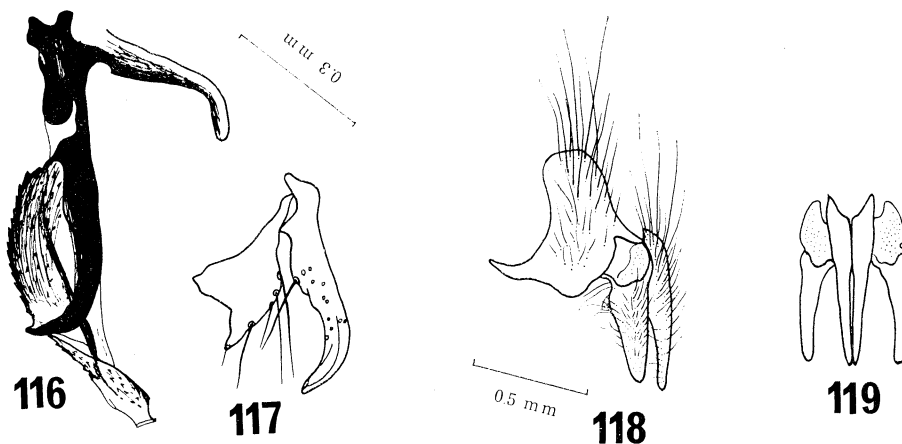
Calliphora (Neopollenia) hilli: Bezzi, 1927, *Bull. Ent. Res.* 17: 245.Type-locality: ?, the type-locality of *C. hilli* Patton is Bamawm, Victoria. Type ?.

Fig. 116-119. Hypopygium of *C. (Paracalliphora) rufipes rufipes* (Macquart): 116, aedeagus, lateral view; 117, parameres, lateral view; 118, cerci and paralobi, lateral view; 119, cerci and paralobi, posterior view.

Length: 8.5-10.5 mm.

SPECIMENS EXAMINED. AUSTRALIA: 2 ♂♂, 1 ♀, 150 m E of Lilydale, Wocri Yalock, Victoria, 20.XII.1960, J. L. Gressitt; 7 ♀♀, 20 km E of Adelaide, Aldgate, S. Australia, 29-31.XII.1960, 31.XII.1960-1.I.1961, Gressitt (BISHOP).

Bionomics: Probably *Paracalliphora rufipes rufipes* (Macquart) is capable of association with myiasis, and seems strictly limited to the coastal region. On the other hand, *Paracalliphora rufipes fallax* Hardy is likely to be found in the interior of the mainland of Australia where *P. rufipes rufipes* is found only as an occasional migrant (Hardy 1937).

DISTRIBUTION: Australia (Victoria, S. Australia).

***Calliphora (Paracalliphora) rufipes tasmanensis* Kurahashi, new subspecies** Fig. 120-123.

This new subspecies is very closely allied to *P. rufipes rufipes* (Macquart), being distinguished from it only by the ♂ genitalic character as shown in fig. 120.

Length: 9.0-11.0 mm.

Holotype ♂ (A.N.I.C., C.S.I.R.O.), Nothofagus Forest, 400 m, Mt Wellington, Tasmania, 23-27.XII.1960, J. L. Gressitt. **Paratypes:** 3 ♂♂, 58 ♀♀, Nothofagus Forest, 400 m, Mt Wellington, 23-27. XII.1960, Gressitt; 1 ♀, Dobson Lake, 1000 m, Mt Field Nat. Park, 25. XII.1960, Gressitt. The type-specimens are preserved in the A.N.I.C., C.S.I.R.O. and B. P. Bishop Museum, Honolulu.

Bionomics: Unknown.

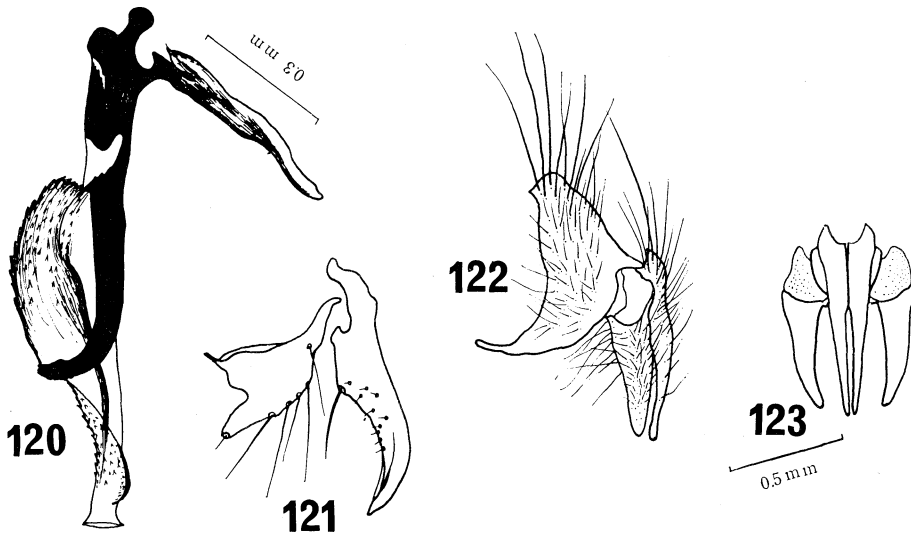


Fig. 120-123. Hypopygium of *C. (Paracalliphora) rufipes tasmanensis* n. subsp.: 120, aedeagus, lateral view; 121, parameres, lateral view; 122, cerci and paralobi, lateral view; 123, cerci and paralobi, posterior view.

DISTRIBUTION: Tasmania.

Calliphora (Paracalliphora) rufipes fallax Hardy Fig. 124-127.

Calliphora (Neopollenia) fallax Hardy, 1930, *Bull. Ent. Res.* 21: 446. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62: 22.

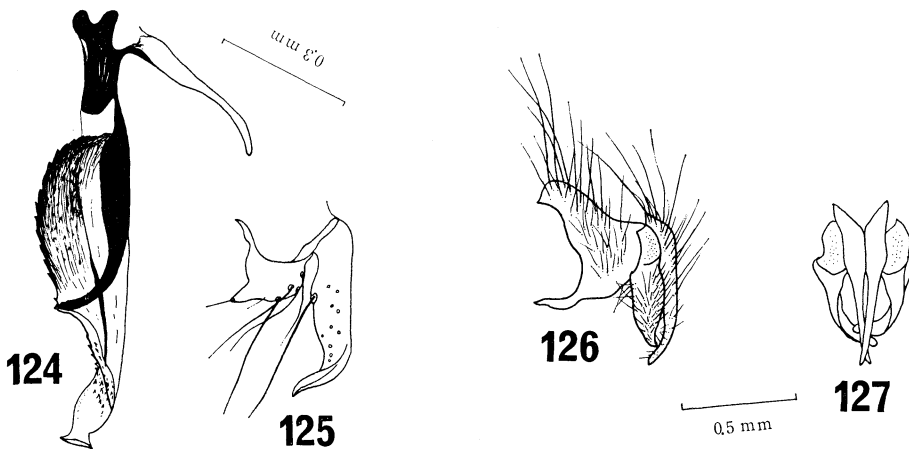


Fig. 124-127. Hypopygium of *C. (Paracalliphora) rufipes fallax* Hardy: 124, aedeagus, lateral view; 125, parameres, lateral view; 126, cerci and paralobi, lateral view; 127, cerci and paralobi, posterior view.

Type-locality : Brisbane, Queensland. *Type?*

This subspecies is very similar to *P. rufipes rufipes* (Macquart). The ♂ differs slightly from it in the width of frons, but the ♀ is not distinguishable from that of the nominate subspecies.

Length : 6.5–10.5 mm.

SPECIMENS EXAMINED. AUSTRALIA : 11 ♀♀, Rain Forest, Mt Glorious, 600 m, SE Queensland, 16–20.II.1961, 24–28.II.1961, 28.II–6.III.1961, J. L. & M. Gressitt ; 6 ♀♀, Sydney, New South Wales, 21.VIII.?, J. F. Illingworth, 17.IV.1909, (BISHOP).

Bionomics ; Fuller (1932b) reported that the maggots of *P. rufipes fallax* Hardy were obtained from sheep and are believed to be the first record from the living animal. The description and drawings of the larval stage are also given in his work.

DISTRIBUTION : Australia (Queensland, New South Wales).

***Calliphora* (*Paracalliphora*) *rufipes milleri* Hardy** Fig. 128–131.

Calliphora milleri Hardy, 1937, *Proc. Linn. Soc. N. S. W.* 62 : 22.

Calliphora rufipes : Miller, 1939, Cawthron Inst. Monogr., no. 2 : 30.

Type-locality : New Zealand. *Type?*

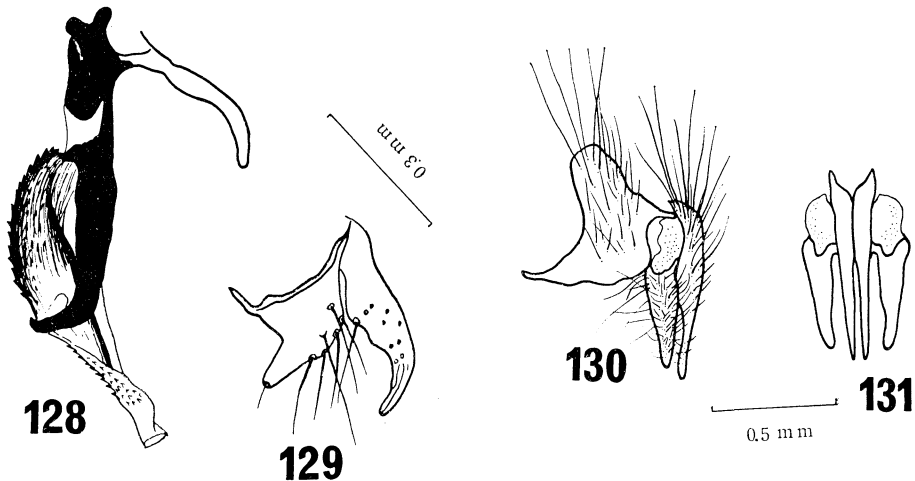


Fig. 128–131. Hypopygium of *C. (Paracalliphora) rufipes milleri* Hardy : 128, aedeagus, lateral view ; 129, parameres, lateral view ; 130, cerci and paralobi, lateral view ; 131, cerci and paralobi, posterior view.

Length : 6.5–9.0 mm.

SPECIMENS EXAMINED. NEW ZEALAND : 1 ♀, Rotorua, North Island, 14.VII.1923, O. H. Swezey ; 1 ♂, 1 ♀, Auckland, North Island, 28.VII.1923, Swezey ; 1 ♂, 1 ♀, Rotorua Springs, 23.VII.1923, 19.IV.1924, G. P. Wilder (BISHOP).

Bionomics : Miller (1939a) observed that *P. rufipes milleri* Hardy occurs with *Neocalliphora stygia* (Fabricius) on sheep though not abundantly. The habits in relation to sheep are,

however, not definitely known. He also described and figured the larval stage of the present subspecies.

DISTRIBUTION : New Zealand.

Calliphora (Paracalliphora) rufipes kermadecensis Kurahashi, new subspecies

Fig. 132-135.

The aedeagus of this new subspecies is rather characteristic, differing from typical *P. rufipes rufipes* (Macquart). The general external appearances are almost identical with those of the other subspecies. The frontal stripe in ♀ is covered with numerous black hairs as well as yellow hairs.

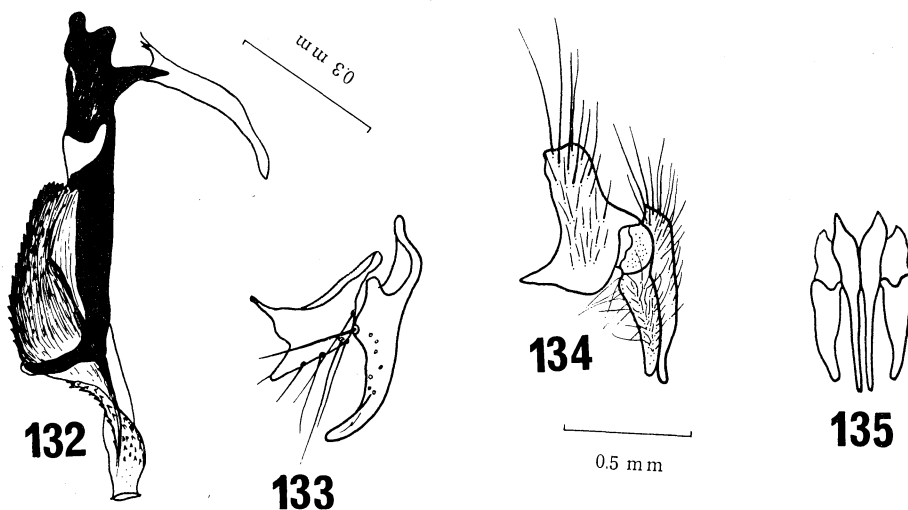


Fig. 132-135. Hypopygium of *C. (Paracalliphora) rufipes kermadecensis* n. subsp.: 132, aedeagus, lateral view; 133, parameres, lateral view; 134, cerci and paralobi, lateral view; 135, cerci and paralobi, posterior view.

Length : 5.5-11.0 mm.

Holotype ♂ (Auckland Mus.), Mt Moumoukai, 530 m, Raoul I., Kermadec Is., 4.IX.1962, G. A. Samuelson. Paratypes : 1 ♂, Station, 75 m, Raoul I., Kermadec Is., 3.IX.1962, Samuelson; 1 ♂, 3 ♀♀, Bell's Ravine, 75 m, Raoul I., 7-12.IX.1962, 13-30.IX.1962, Samuelson; 1 ♀, N. Terrace, 75 m, Raoul I., 13.IX.1962, Samuelson; 1 ♂, 13 ♀♀, N. Slopes Ridge, 200 m, Raoul I., 22-30.IX.1962, 3-11.IX.1962, Samuelson; 3 ♂♂, 96 ♀♀, Low Flat, 30 m, Raoul I., 23.IX-8.X.1962, Samuelson. The type-specimens are in Auckland Museum and Bishop Museum.

Bionomics : Unknown.

DISTRIBUTION : Kermadec Is. (Raoul I.).

Calliphora (Paracalliphora) rufipes tahitiensis Kurahashi, new subspecies Fig. 136-139.

The cerci of this new subspecies are not as long as those of the other subspecies. The width of the frons in the ♂ is at the narrowest point equal to that of *P. rufipes rufipes* (Macquart). *P. rufipes tahitiensis* Kurahashi n. subsp. also differs from the others in the chaetotaxy of the mid tibia.

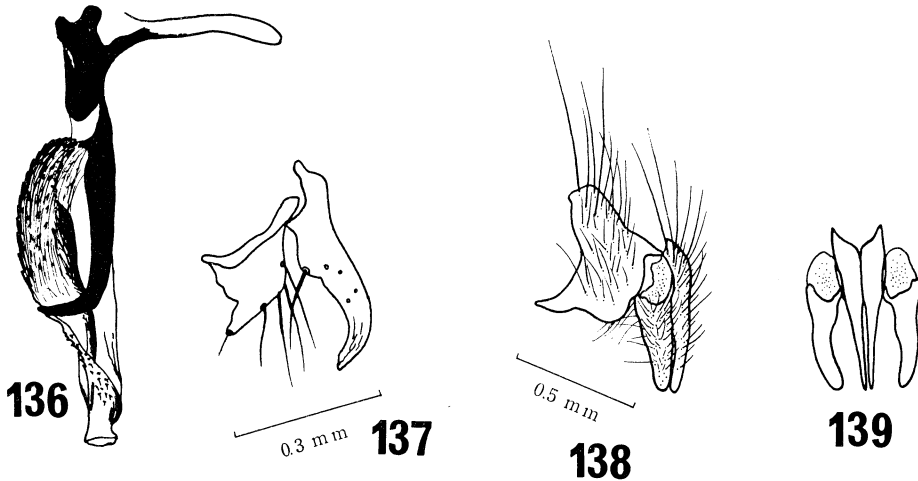


Fig. 136-139. Hypopygium of *C. (Paracalliphora) rufipes tahitiensis* n. subsp.: 136, aedeagus, lateral view; 137, parameres, lateral view; 138, cerci and paralobi, lateral view; 139, cerci and paralobi, posterior view.

Length: 5.5-11.0 mm.

Holotype ♂ (BISHOP 9312), Mt Aorai, 4000-6300 ft., Tahiti, 14-22.IX.1934, E. C. Zimmerman. Paratypes: 1 ♂, 2 ♀♀, same data as holotype; 3 ♀♀, Mt Orofena, 4000-4500 ft., 20-22.IX.1934, F. R. Fosberg; 1 ♀, Fautaua Gorge, 1500-2000 ft., 13.III.1934, Zimmerman; 3 ♂♂, 6 ♀♀, Fautaua Val., 1500 ft., 11-12.IX.1928, A. M. Adamson. All the type-specimens are preserved in the B. P. Bishop Museum, Honolulu.

Bionomics: Unknown.

DISTRIBUTION: Tahiti.

KEY TO 7 SUBSPECIES OF *P. RUFIPES* (MACQUART), ♂♂

1. Narrowest part of frons about 2 × as wide as distance from the outer side of 1 ocellus to the outer side of the other between posterior ocelli; parafrontalia and upper part 1/2 or more of parafacialia and occiput densely silver white-dusted and quite noticeably tessellated **rufipes varifrons** Malloch
- Narrowest part of frons about 1.5 × as wide as a distance from the outer side of 1 ocellus to the outer side of the other between posterior ocelli; parafrontalia and parafacialia yellowish gray-dusted 2
- Narrowest part of frons about as wide as distance across the outer side of 1 ocellus

- and the outer side of the other between posterior ocelli; parafrontalia and parafacialia strongly silver, the latter often with yellowish tinge 3
 Narrowest part of frons narrower than distance across posterior ocelli, about 2 × as wide as the diameter of anterior ocellus; parafrontalia and parafacialia golden-dusted ... 4
2. Genitalia as shown in fig. 128-131. New Zealand **rufipes milleri** Hardy
 Genitalia as shown in fig. 132-135. Kermadec Is.
 **rufipes kermadecensis** Kurahashi, n. subsp.
 3. Genitalia as shown in fig. 120-123. Tasmania **rufipes tasmanensis** Kurahashi, n. subsp.
 Genitalia as shown in fig. 116-119. Victoria & S. Australia **rufipes rufipes** (Macquart)
 4. Mid tibia usually with 2 *ad*; genitalia as shown in fig. 124-127. Queensland & New South Wales **rufipes fallax** Hardy
 Mid tibia with 1 *ad*; genitalia as shown in fig. 136-139. Tahiti
 **rufipes tahitiensis** Kurahashi, n. subsp.

Calliphora (Paracalliphora) mumfordi Malloch Fig. 140-143.

Calliphora mumfordi Malloch, 1932, *Bull. B. P. Bishop Mus.* 98: 15.

Type-locality: Nukuhiva, Marquesas Is. Type in the B. P. Bishop Museum, Honolulu.

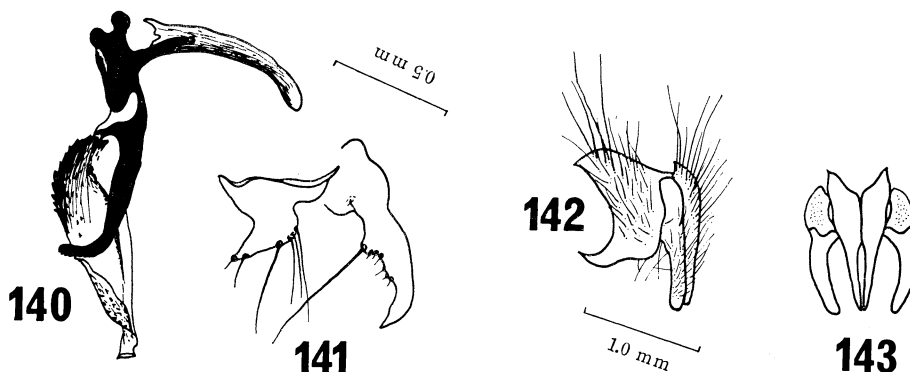


Fig. 140-143. Hypopygium of *C. (Paracalliphora) mumfordi* Malloch: 140, aedeagus, lateral view; 141, parameres, lateral view; 142, cerci and paralobi, lateral view; 143, cerci and paralobi, posterior view.

Length: 7.0 mm.

SPECIMENS EXAMINED. MARQUESAS IS.: Holotype ♂, Ooumu, Nukuhiva, 4050 ft., 13. XI.1929, Mumford & Adamson; 1 ♀, Tapuaooa, Nukuhiva, ca. 3000 ft., 16.VI.1931, Le Bronnec & H. Tauraa (BISHOP).

Bionomics: Nothing is known.

DISTRIBUTION: Marquesas Is.

KEY TO THE SPECIES OF PARACALLIPHORA

1. Abdomen submetallic bronzy or metallic blue, covered with dense yellow or white dusting which is conspicuously tessellated, usually having yellowish hairs 20

- Abdomen honey yellow on at least sides and venter, always with a large part of central section of disc metallic blue or violet colored, if abdomen metallic bluish green entirely, no conspicuous dusting or only 5th tergite pruinose, and abdominal hairs usually black 2
2. Basicosta fuscous to black, usually metallic; abdomen entirely metallic bluish green, no conspicuous dusting or only 5th tergite whitish pruinose..... 3
- Basicosta yellow, brown, sometimes fuscous in species having darker body coloration; abdomen honey yellow on at least the sides and venter, always with a large part of central section of disc metallic blue, violet or bronzy colored 7
- Basicosta light yellow, silvery pubescent; abdomen metallic bluish green entirely; 5th tergite whitish pruinose **leucosticta** Bezzi
3. Jowls and post-jowls darkened, with blackish hairs, yellowish hairs present on occiput and posterior parts of post-jowls; presutural *ia* present in both sexes **simulata** Malloch
- Jowls and post-jowls orange, with yellowish hairs, blackish hairs present on upper parts of jowls anteriorly; presutural *ia* absent or present 4
4. Thoracic spiracles blackish brown; 5th tergite without dusting or almost so; *st* 2+1 ... **papuensis** Kurahashi, n. sp.
- Thoracic spiracles light orange; 5th tergite more or less covered with dusting; *st* 1-2+1...5
5. Presutural *ia* present in both sexes, occasionally absent in ♀ **salivage** Bezzi
- Presutural *ia* absent in both sexes 6
6. Presutural *ac* 2; 3rd antennal segment basally bright orange, 2nd reddish **fulviceps fulviceps** van der Wulp
- Presutural *ac* 1; 3rd antennal segment entirely blackish **fulviceps javanica** de Meijere
7. Coxae, femora and bases of tibiae dark brown or fuscous 8
- Coxae, femora and tibiae bright honey yellow.....10
8. Presutural *ia* absent; thoracic dorsum when seen from behind with a narrow postsutural stripe between *ac*, and a spot between these and *dc* midway between suture and posterior margin, black; dorsum of abdomen with most of disc of basal 3 visible tergites glossy purplish or violet colored, 5th tergite honey yellow, densely golden-dusted, slightly tessellated; antennae red **Australocaliphora fuscofemorata** Malloch
- Presutural *ia* present; dorsum of thorax and abdomen not marked as above, disc of basal 3 visible tergites bluish or bronzy colored, 5th tergite metallic, gray-dusted; 3rd antennal segment wholly blackish 9
9. Jowls black or fuscous; large part of central section of abdominal disc bronzy..... **kermadeca** Kurahashi, n. sp.
- Jowls bright orange or red; abdominal disc dark blue **norfolka** Kurahashi, n. sp.
10. Scutellum reddish; abdomen almost entirely reddish, not tessellated, usually with metallic disc narrow **dichromata** (Bigot)
- Scutellum metallic; abdomen largely metallic on disc..... 11
11. Presutural *ac* 2, the posterior pair distinctly proximad of a transverse line drawn between the posterior pair of *dc*; presutural *ia* poorly developed, sometimes absent..... 12
- Presutural *ac* 3, the posterior pair just in front of suture, and much behind posterior presutural *dc*; presutural *ia* well-developed 18
12. Fifth tergite at least in part distinctly brown, with yellow or white dusting 13
- Fifth tergite entirely metallic dark blue, with white dusting 15
13. Fifth tergite entirely brown or almost so; sternopleura in ♂ clothed with both yellow and black hairs **augur neocaledonensis** Kurahashi, n. subsp.
- Fifth tergite with rather trapezoidal metallic marking; sternopleura in both sexes clothed with yellow hairs 14
14. Narrowest part of frons more than the width of ocellar triangle in ♂, length of

- frons to breadth in ♀ as 3:5; abdominal stripe vivid blue to purple with white dusting on 5th tergite **augur nociva** Hardy
- Narrowest part of frons not as wide as distance across posterior ocelli inclusive, about 2 × as wide as diameter of anterior ocellus in ♂, frons length to breadth in ♀ as 4:5; abdominal stripe bluish green with yellow dusting on 5th tergite.....
- **augur augur** (Fabricius)
15. Humeri reddish 16
- Humeri metallic dark colored, usually concolorous with thoracic dorsum 17
16. Metathoracic spiracle light orange; sternopleura black-haired, with some yellow hairs; *st* 1+1 **espíritusanta** Kurahashi, n. sp.
- Metathoracic spiracle dark brown; sternopleura yellow-haired; *st* usually 2-3+1 **porphyrina** Kurahashi, n. sp.
17. Sternopleura clothed with yellow fine hairs only; femora remarkably light brown; abdomen with metallic portion sharply limited; hypopleural bristles yellow **gressitti** Kurahashi, n. sp.
- Sternopleura clothed with both yellow and black hairs; femora usually darkened; abdomen largely metallic dark on disc, the dark portion not sharply limited; hypopleural bristles black **aruspex** Bezzi
18. Humeri bluish black, concolorous with dorsum of thorax; dorsum of abdomen broadly purple on all tergites, the dark color of 5th tergite conspicuous because of the presence of but thin whitish dusting; *st* 1+1; hypopleural bristles yellow **macleayi** Malloch
- Humeri testaceous, very noticeably paler than dorsum of thorax; dorsum of abdomen partly metallic green or bluish green; 5th tergite with more conspicuous dusting; *st* 2+1; hypopleural bristles black..... 19
19. Fifth tergite wholly brown or almost so; sternopleura in ♂ clothed with both yellow and black hairs **augur neocaledonensis** Kurahashi, n. subsp.
- Fifth tergite with rather trapezoidal metallic marking or wholly metallic; sternopleura in both sexes clothed with yellow hairs only..... **centralis** Malloch
20. Front coxa entirely yellow; *ac* 3+3; parafrontalia yellow-dusted **fulvicoxa** Hardy
- Front coxa entirely dark or distinctly blackened at least in front..... 21
21. Femora of all legs largely or wholly black 22
- Femora of at least the mid and hind legs fulvous yellow and not darker than the tibiae; presutural *ac* 2 **rufipes** (Macquart)
22. Abdomen metallic light blue, covered with dense white dusting which is conspicuously tessellated; metathoracic spiracle bright yellow; antennae reddish **mumfordi** Malloch
- Abdomen submetallic bronzy, usually covered with gray or yellow dusting Subgenus **Australocalliphora**

Subgenus **Australocalliphora**, new subgenus

Type-species: *Calliphora (Australocalliphora) onesioidea* Kurahashi, n. sp.

Distinguished from the nominate subgenus and the other genera of Calliphorini by the following characteristics:

Diagnosis: Thoracic squama almost completely covered with hairs, but narrowly bare along apical margin; subcostal sclerite pubescent; eyes bare, closely approximated in ♂, widely separated in ♀; accessory *oc* not developed; presutural *ac* usually 2, the arrangement of *Onesia*-type (cf. fig. 1b in Part I); presutural *ia* present or absent; basicosta yellow to fuscous brown; abdomen submetallic bronzy, usually covered with dense yellow dusting which is more or

less conspicuously tessellated, or glossy purplish on disc, reddish on lateral sides and venter; legs black, sometimes brownish partly or largely; epistome more or less projecting forward; hypopygium in size and shape; harpes slender, or abnormally broad and straight, fused with phallic tube throughout its length, and distinctly separated from one another for a distance from harpes basis to apex; vesica well developed, not without cornu; posterior paramere finger-shaped; ovipositor intermediate between both types of *Calliphora* and *Onesia*, but regularly segmented (fig. 16); ♀ internal genitalia not examined.

Bionomics: Probably viviparous.

DISTRIBUTION: Australia and Tasmania.

***Calliphora (Australocalliphora) fuscofemorata* Malloch** Fig. 16, 144-147.

Calliphora fuscofemorata Malloch, 1927, *Proc. Linn. Soc. N. S. W.* **52**: 309. — Hardy, 1937, *Proc. Linn. Soc. N. S. W.* **62**: 24.

Type-locality: Kuranda, Queensland. *Type* ?.

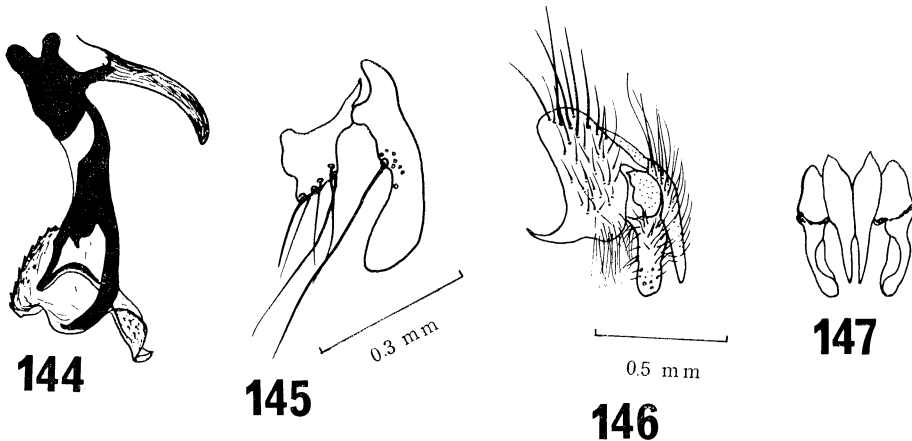


Fig. 144-147. Hypopygium of *C. (Australocalliphora) fuscofemorata* Malloch: 144, aedeagus, lateral view; 145, parameres, lateral view; 146, cerci and paralobi, lateral view; 147, cerci and paralobi, posterior view.

Length: 5.5-9.0 mm.

SPECIMENS EXAMINED. AUSTRALIA: 16 ♂♂, 14 ♀♀, Kuranda, NE Queensland, 6-8.V. 1961, L. & M. Gressitt, 13-14.III.1956, J. L. Gressitt (BISHOP).

Bionomics: *Australocalliphora fuscofemorata* Malloch is known only from the northern parts of Queensland, probably confined to the rain-forest areas (Hardy 1937).

DISTRIBUTION: Australia (Queensland).

***Calliphora (Australocalliphora) sternalis sternalis* Malloch** Fig. 148, 149.

Calliphora sternalis Malloch, 1932, *Proc. Linn. Soc. N. S. W.* **57**: 65. — Hardy, 1932, *Bull. Ent. Res.* **23**: 553.

Type-locality : Barrington Tops, New South Wales. *Type ?*.

Length : 8.0–10.0 mm.

SPECIMEN EXAMINED. AUSTRALIA : 1 ♀, 150 m E of Lilydale, Woori Yalock, Victoria, 20.XII.1960, J. L. Gressitt (BISHOP).

Bionomics : Nothing is known.

DISTRIBUTION : Australia (New South Wales : Malloch 1932a, Victoria).

Calliphora (Australocalliphora) sternalis deflexa Hardy Fig. 150–154.

Calliphora (Neopollenia) deflexa Hardy, 1932, *Bull. Ent. Res.* 23 : 552.

Type-locality : Brisbane, Queensland. *Type ?*.

No available material.

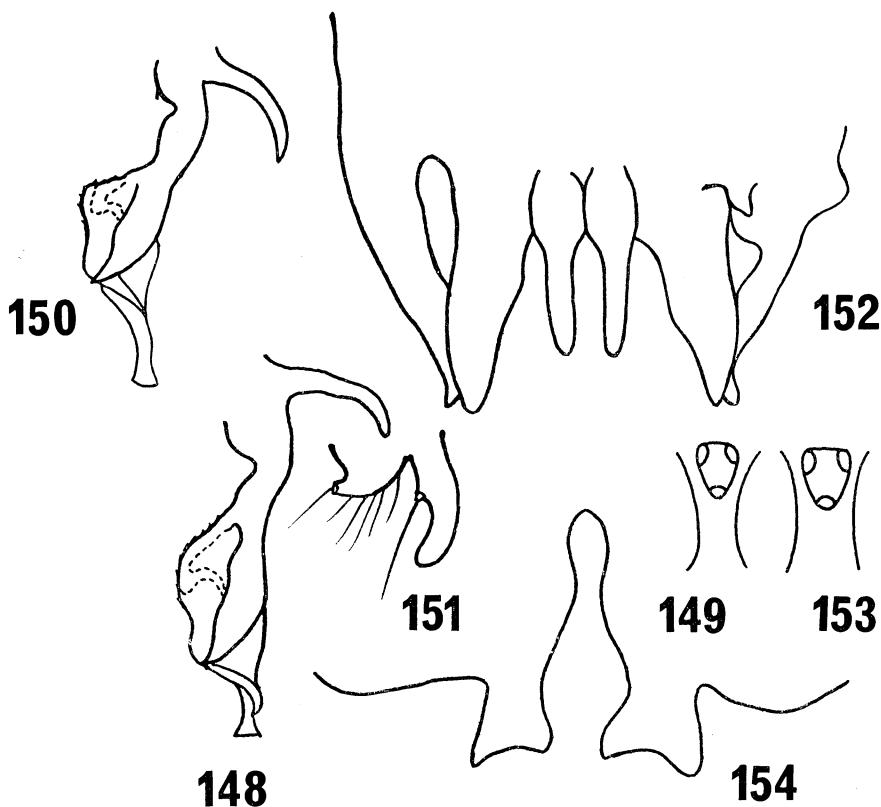


Fig. 148–154. Hypopygium of *C. (Australocalliphora) sternalis sternalis* Malloch and *C. (A.) sternalis deflexa* Hardy : 148, aedeagus of *sternalis*, lateral view ; 149, frons of *sternalis* ; 150, aedeagus of *deflexa*, lateral view ; 151, parameres of *deflexa*, lateral view ; 152, cerci, paralobi and secondary plates of *deflexa*, posterior view ; 153, frons of *deflexa* ; 154, fifth sternite of *deflexa* (after Hardy 1932).

Length : ?.

Bionomics : Nothing is known.

DISTRIBUTION : Australia (Queensland).

Calliphora (Australocalliphora) canimicans canimicans Hardy Fig. 158-160.

Calliphora (Neopollenia) canimicans Hardy, 1930, *Bull. Ent. Res.* **21** : 447.

Type-locality : Brisbane, Queensland. *Type* ?.

No available material.

Length : ?.

Bionomics : According to Hardy (1930), the adult flies become plentiful in May, persist throughout the winter, and become very numerous in September, and disappear towards the end of the month. In Brisbane they are most easily found after cold nights frequenting warm spots, sheltered from the freeze, sporting in the sunshine in the morning.

DISTRIBUTION : Australia (Queensland).

Calliphora (Australocalliphora) canimicans bezzii Hardy Fig. 155-157.

Calliphora (Neopollenia) bezzii Hardy, 1932, *Bull. Ent. Res.* **23** : 551.

Calliphora (Neopollenia) tessellata : Bezzi, 1927, *Bull. Ent. Res.* **17** : 245 (misid.).

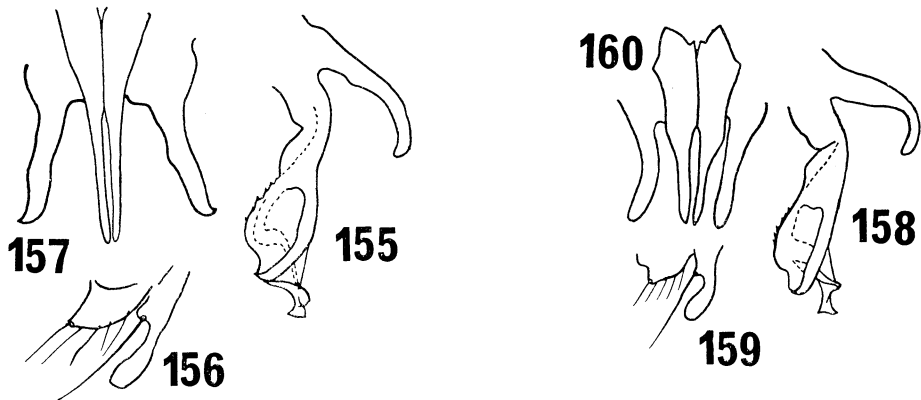


Fig. 155-160. Hypopygium of *C. (Australocalliphora) canimicans bezzii* Hardy and *C. (A.) canimicans canimicans* Hardy : 155, aedeagus of *bezzii*, lateral view ; 156, parameres of *bezzii*, lateral view ; 157, cerci and paralobi of *bezzii*, posterior view ; 158, aedeagus of *canimicans*, lateral view ; 159, parameres of *canimicans*, lateral view ; 160, cerci and paralobi of *canimicans*, posterior view (after Hardy 1930).

Type-locality : Seaford, Victoria. *Type* ?.

Length : 9.0 mm.

SPECIMEN EXAMINED. AUSTRALIA : 1 ♀, Cape Liptrap, Victoria, 30.XII.1965, S. A. Thomson (Author's Coll.).

Bionomics : Nothing is known.

DISTRIBUTION : Australia (Victoria).

Calliphora (Australocalliphora) tasmaniae Kurahashi, new species Fig. 161-164.

♂. Head: eyes bare, closely approximated, separated at narrowest point of frons by a distance slightly less than $2 \times$ the width of anterior ocellus; frontal stripe blackish, more or less obliterated at narrowest point; parafrota and parafacialia yellowish gray-dusted, blackish setulose, the setulose hairs rather fine, long; face dark, without median carina; facialia dark red, with black setulae on lower 1/2 or more way from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria and medianae dark red; epistome rather projecting forward, dark red; jowls black, covered with yellowish gray dusting, clothed with yellow fine hairs, some black fine hairs present on anterior parts; post-jowls concolorous with jowls, covered with yellowish gray dusting and fine yellow hairs; occiput covered with fine yellow hairs; antennae reddish, slightly darkened externally on 3rd segment, the 3rd segment $3 \times$ as long as 2nd; arista blackish, long-plumose; palpi brown, with yellow and black hairs.

Thorax: dull bluish black, silver-dusted, especially on anterior parts of dorsum and pleura, 4 longitudinal dark stripes indicated on anterior parts of dorsum; humeri and scutellum concolorous with thoracic dorsum; pleura covered with fine yellowish hairs, mesopleura with black hairs as well as yellow ones; hypopleural bristles yellow; prosternum yellowish hairy; supra-spiracular convexity pubescent; pleurotergite yellowish setulose; post-alar declivity with yellow hairs; suprasquamal ridge with anterior parasquamal tuft of yellow fine long hairs, tympanic tuft also consists of yellow hairs; thoracic spiracles orange. Chaetotaxy: *ac* 2-3+3, *dc* 3+3, *ia* 1+2, *h* 3, *ph* 3, *prs* 1, *sa* 3-4, *pa* 2, *n* 2, *sc* 5+1, *st* 1-2+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly brownish at base; epaulet dark red; basicosta brown; subcostal sclerite covered with tawny pubescence; node of 2nd and 3rd longitudinal veins with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae dark brown, thoracic one brownish hairy. Halteres orange.

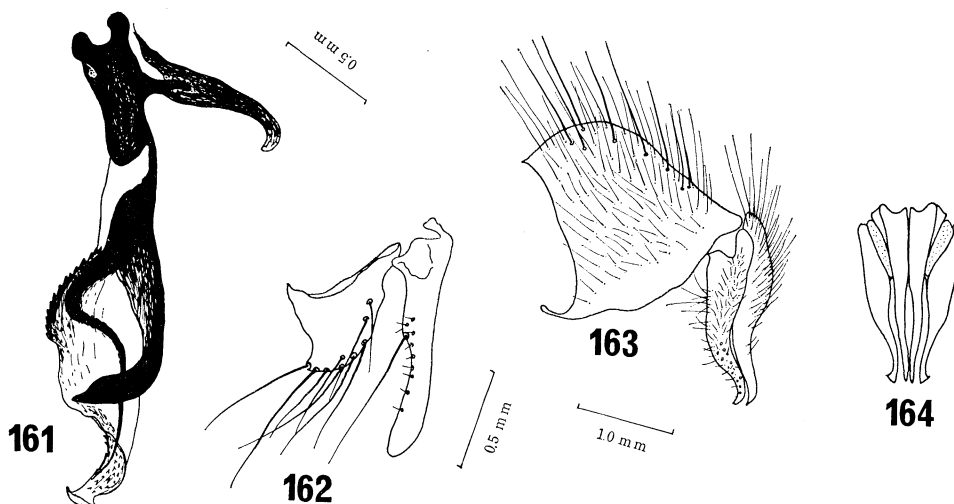


Fig. 161-164. Hypopygium of *C. (Australocalliphora) tasmaniae* n. sp.: 161, aedeagus, lateral view; 162, parameres, lateral view; 163, cerci and paralobi, lateral view; 164, cerci and paralobi, posterior view.

Legs: black, coxae and femora covered with yellow fine long hairs in addition to black bristles; front tibia with 1 *p*; mid tibia with 3 *ad*, 1 *pd*, 2 *p* and 1 *av*; hind tibia with 2 *av* and row of rather long *ad* and *pd*.

Abdomen: entirely bronzy, covered with yellowish gray or golden dusting which is conspicuously tessellated, clothed with yellow hairs, some blackish hairs present on the discs of 3rd and 4th tergites; marginal bristles present on 4th tergite, the lateral sides of 3rd tergite with poorly developed marginal bristles; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 161).

♀. Head: eyes separated at vertex by a distance slightly narrower than 1/3 of the head-width; frontal stripe dark red, blackish posteriorly, parallel-sided, the width equal to 3 × that of 1 of parafrontalia at the level of anterior ocellus; parafrontalia with approximately 10 pairs of *ori*; *ors* 2+1; *oc* strongly developed; *iv* and *ov* well developed; *poc* divergent; 1 *occ* present. Otherwise as described for ♂ except for genitalic character.

Length: 8.0 mm.

Holotype ♂ (A.N.I.C., C.S.I.R.O.), Nothofagus forest, 400 m, Mt Wellington, Tasmania, 23-27. XII.1960, J. L. Gressitt. Paratype: ♀, same data as holotype. The type-specimens are preserved in Canberra and in Bishop Museum, Honolulu.

Bionomics: Unknown.

DISTRIBUTION: Tasmania.

Relationships: *Australocalliphora tasmaniae* Kurahashi n. sp. closely resembles *A. onesioidea* Kurahashi n. sp. but it differs from the latter in the yellow hypopleural bristles and the morphology of the ♂ genitalia. The ♂ genitalia also distinguishes the present new species from *A. canimicans* Hardy.

Calliphora (Australocalliphora) onesioidea Kurahashi, new species Fig. 165-168.

♂. Head: eyes bare, closely approximated, separated at narrowest point of frons by a distance slightly less than 2 × the width of anterior ocellus; frontal stripe blackish, not obliterated at narrowest point; parafrontalia gray-dusted, with rather long, fine setulae; parafacialia gray-dusted, slightly yellowish brown-dusted on lower parts, with rather long, fine black setulae; frontal bristles fine, long; face blackish, without median carina; facialia dark brown, with black setulae on lower 1/2 from vibrissae to antennal bases; vibrissae strongly developed; vibrissaria and medianae dark red; epistome dark red; rather projecting forward; jowls black, gray-dusted, clothed with black hairs, yellowish hairs present on post-jowls, posterior parts of jowls and occiput; post-jowls concolorous with jowls; antennae red, the 2nd segment fuscous, external and apical parts of 3rd segment also slightly darkened, the 3rd segment 3 × as long as 2nd; arista black, long-plumose; palpi light brown, with black hairs, some short brown hairs present among black ones.

Thorax: dull bluish black, silver-dusted on anterior parts of dorsum and pleura, 4 longitudinal dark stripes indistinctly indicated on just anterior parts of dorsum; humeri and scutellum concolorous with thoracic dorsum; prealar knob brown; pleura covered with fine black hairs only; hypopleural bristles black; prosternum blackish hairy; supraspiracular convexity pubescent; pleurotergite blackish setulose; post-alar declivity only with black hairs; suprasquamal ridge with anterior parasquamal tuft of yellow fine hairs, tympanic tuft also consists of yellow hairs; thoracic spiracles dark brown. Chaetotaxy: *ac* 2+3, *dc* 5+3, *ia* 1+2, *h* 3-4, *ph* 3, *prs* 1, *sa* 4, *pa* 2, *n* 2, *st* 2+1, propleural and prostigmatic bristles present.

Wings: hyaline, slightly brownish at base; epaulet fuscous; basicosta dark brown; subcostal

sclerite brown, covered with tawny pubescence; node of 2nd and 3rd longitudinal veins with some black setulae above and below; 4th longitudinal vein bent with a right angle; squamae dark brown, thoracic one brownish hairy. Halteres orange.

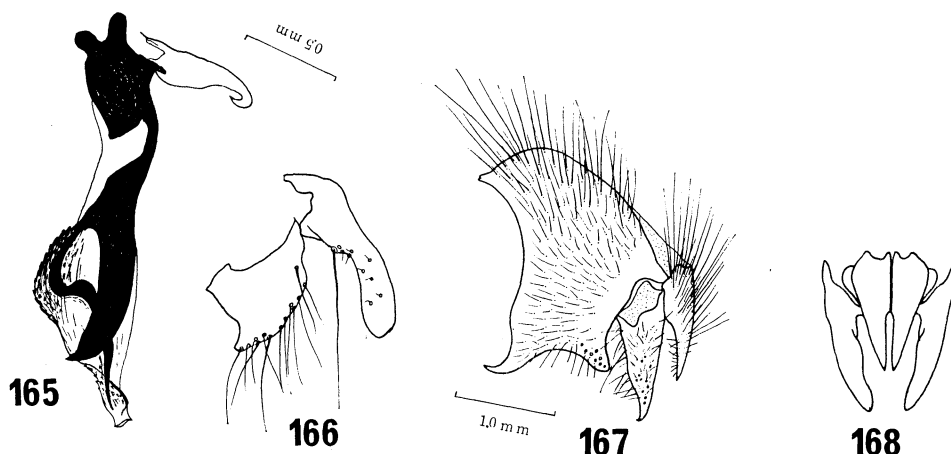


Fig. 165-168. Hypopygium of *C. (Australocalliphora) onesioidea* n. sp.: 165, aedeagus, lateral view; 166, parameres, lateral view; 167, cerci and paralobi, lateral view; 168, cerci and paralobi, posterior view.

Legs: black, black haired, some brownish hairs present only on hind coxa; front tibia with 2 *p* and incomplete row of short *ad*; mid tibia with 2-3 *ad*, 2 *pd*, 1-2 *p* and 1 *v*; hind tibia with 2 *av* and row of rather long *ad* and *pd*.

Abdomen: entirely bronzy, thinly covered with silver and gray dusting, especially on venter and lateral sides, clothed with only black hairs, the hairs rather long; marginal bristles fine, long, developed on 4th and 5th tergites, some marginal bristles present on lateral sides of 3rd tergite; hypopygium inconspicuous; aedeagus without cornu of vesica (fig. 165).

♀. Head: eyes separated at vertex by a distance slightly narrower than 1/3 the head-width; frontal stripe blackish, parallel-sided, the width equal to $2.5 \times$ that of one of parafrontalia at the level of anterior ocellus; parafrontalia with approximately 10 pairs of *ori*; *ors* 2+1; *oc* very strong; *iv* and *ov* strongly developed; *poc* parallel; 1 *occ* present. Thorax: *dc* 3+3, *st* 1+1. Legs: mid tibia with 1 *a*, 3 *ad*, 3 *pd*, 1 *p* and 1 *v*; hind tibia with 2-3 *av*, row of strong *ad* and *pd* present. Abdomen: 5th tergite densely covered with yellowish golden dusting. Otherwise as described for ♂ except for genitalic character.

Length: 9.0-9.5 mm.

Holotype ♂ (A.N.I.C., C.S.I.R.O.), Nothofagus forest, 400 m, Mt Wellington, Tasmania, 23-27.XII.1960, J. L. Gressitt. Paratype: ♀, same data as holotype, in the B. P. Bishop Museum, Honolulu.

Bionomics: Unknown.

DISTRIBUTION: Tasmania.

KEY TO THE SPECIES OF AUSTRALOCALLIPHORA

1. Abdomen honey yellow on lateral sides and venter, with most of disc of basal 3 tergites glossy purplish or violet colored; 5th tergite densely golden-dusted, slightly tessellated...
..... **fuscifemorata** Malloch
Abdomen entirely black or fuscous, with a metallic bronzy tinge, more or less densely yellow- or gray-dusted, often conspicuously tessellated 2
2. Abdomen with yellow hairs 3
Abdomen without yellow hairs **onesioidea** Kurahashi, n. sp.
3. Tibiae always distinctly paler than the basal halves of femora; *st* 2+1..... 4
Tibiae not noticeably paler than the femora, legs wholly fuscous or black 5
4. Frons in ♂ 1/7 the width of an eye; legs with black coxae and femora, tibia brown, the extreme apex of the femora usually brown **sternalis sternalis** Malloch
Frons in ♂ 1/8 the width of an eye; legs yellow brown with the coxae more or less, and the anterior femora sometimes slightly stained with black.....**sternalis deflexa** Hardy
5. Male genitalia as shown in fig. 158-160.....**canimicans canimicans** Hardy
Male genitalia as shown in fig. 155-157..... **canimicans bezzii** Hardy
Male genitalia as shown in fig. 161-164..... **tasmaniae** Kurahashi, n. sp.

Acknowledgments: I wish to express my sincere thanks to Prof. Dr Maurice T. James of the Department of Entomology, Washington State University; Adrian C. Pont of the Department of Entomology, British Museum (Nat. Hist.) ; and Dr N. V. Dobrotworsky of the Department of Zoology, University of Melbourne for their valuable suggestions and materials given during the preparation of this part of the series.

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NOTICE

As a result of unexpected circumstances, vol. 12, no. 4 of this journal was unfortunately delayed in publication for one month, so that it appeared on 30 January 1971, instead of 25 December 1970, as indicated at commencement of each article. We deeply regret this confusion.