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INSECTS OF CAMPBELL ISLAND.
DIPTERA: PSYCHODIDAE[1]

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Abstract: Six species of Psychodidae, including 3 new ones, are recorded from Campbell I. in the subantarctic. All species belong to *Psychoda*. A key and illustrations are given.

As a result of the field work carried out on Campbell I. mainly by Dr. J. L. Gressitt and Mr. K. P. Rennell in 1961 and 1962, a large collection of Psychodidae has become available. Campbell I. is due S of New Zealand at 52° S latitude. A description of the island and its biota is given in a separate paper by Gressitt.

There are 6 species of psychodids on Campbell, all belonging to the genus *Psychoda*. Two species, *P. pulchrima* and *spatulata*, have been recorded from the island by Harrison (1955); *P. severini* and 3 new species are additions to the fauna, but it is doubtful if *severini* is established. *P. pulchrima* and a related new species are the most abundant ones on the island. A peculiar species with reduced wings and eyes, related to a similarly modified psychodid from Bounty Is., *P. acutipennis* Tonnoir, is the second example of brachyptery in the family and is the only psychodid on Campbell which shows an adaptive response to the rigorous environment.

The Campbell I. psychodids are related zoogeographically to those of New Zealand. Three of the 6 species also occur in New Zealand. Two of the new species have close Australasian relatives and eventually also may be found in New Zealand, since they show no unusual features which would indicate long isolation or endemicity. Only one species, as mentioned above, is an obvious endemic. None of the species are known elsewhere in the Pacific, beyond New Zealand and the subantarctic islands. (However, *inornata* of Hawaii may be the same as *severini*, but until males are known their status is uncertain. This complex has not been found in Polynesia or Micronesia.)

Key to Campbell Island species of Psychoda

1. Wing normal; eyes not reduced, bridges fully developed, separated by only 2–3 facet diameters 2
   Wing reduced to less than 1/2 normal size, narrow and acutely pointed; eyes reduced, bridges tapering and inner margins acute, separated by 5 or more facet diameters; antenna 16-segmented, ascoids Y-shaped but very small ..... **brachyptera**
2. Antenna 16-segmented, terminal 3 segments separated 3

1. Results of field work supported by National Science Foundation grants (G-18800, G-23720) from the U. S. Antarctic Research Program.

Antenna apparently 14-segmented 5

3. Median projection of hairs on frons extending to row 2 of facets from lower eye margin, hairs on vertex not below upper margin 4

Median projection of frons hairs not extending beyond row 1 of facets, often not reaching eye margin, vertex hairs extending to rows 2–3 of facets from upper margin; antennal internodes rather short and with a swelling near center; ♂ surstyle short and stocky, paramere symmetrically bilobed; vestiture of pinned specimens white on scutum with dark brown or black spot centrally and wing with 2 white bands beyond center ..... **campbellica**

4. Antennal internodes very long and slender, segment 4 of ♂ with internode 2.5× node, ♀ 1.5× node; ♂ eye bridge often with 5 rows of facets; ♂ paramere symmetrical, unilobed; ♀ subgenital plate with setose, bilobed structure on inner face by digit; vestiture of pinned specimen gray or brown with 2 white spots on posterior wing fringe ..... **pulchrima**

Antennal internodes shorter, segment 4 of ♂ with internode 1.5× node, ♀ subequal; ♂ eye bridge with only 4 rows of facets; ♂ paramere asymmetrically bilobed with deep notch off-center; ♀ subgenital plate with U-shaped setose lobe on inner face far basad of digit, but without lobes near digit ..... **eremita**

5. ♀ subgenital plate with truncated heart-shaped apical lobes, genital digit slender, longer than wide; ♂ aedeagus simple, apparently of 1 piece; vestiture of pinned specimen white with dark band across wing ..... **spatulata**

♀ subgenital plate with apical lobes parallel-sided, genital digit about as wide as long; ♂ unknown on Campbell I.; vestiture gray without markings ..... **severini**

Psychoda brachyptera Quate, n. sp. Figs. 1, 2.

♂: Eyes widely separated by distance equal to length of scape; bridge with 3 rows of facets but acute on median, connected with heavy suture; frons with rectangular patch of hairs without median projection. Labellum with 2 setae and 3 teeth, innermost tooth posterior of and well removed from others; cibarium short, 2× as long as wide; palpus rather short, extending to antennal segment 5, ratio of segments 15 : 21 : 22 : 23. Antenna 16-segmented, terminal 3 segments separated but pressed together and against 13, node of segment 3 large and pyriform and with short internode, other nodes globular and internodes short but progressively longer than 3; ascoids Y-shaped but small, especially posterior arm which is invisible unless seen from side.

Thorax smaller than other *Psychoda* compared to abdomen; halteres large with enlarged capitulum and short pedicel. Wing about 3× as long as wide, greatly reduced beyond fold and base of normal size except alula small, apex thinly acute; membrane uniformly brown beyond fold; veins thickened; forks on same level at apex of R_1. Legs thicker, with different ratio and larger apical tarsal segments and claws than usual in *Psychoda*, ratio of fore leg 28 : 29 : 14, mid leg 38 : 37 : 17, hind leg 37 : 39 : 17.

Genitalia as figured; aedeagus simple, straight, divided beyond foramen and ends in bilobed apex, paramere (lobe beneath aedeagus) setose and strongly bilobed; surstyle long and moderately slender with short tenaculum. Wing length 1.2–1.6 mm (M=1.4, SD=0.2, N=11); wing width 0.4–0.6 mm; antenna 1.0–1.2 mm.

♀: Similar to ♂. Eyes separated by 1.3× length of scape. Genitalia as figured; sub-

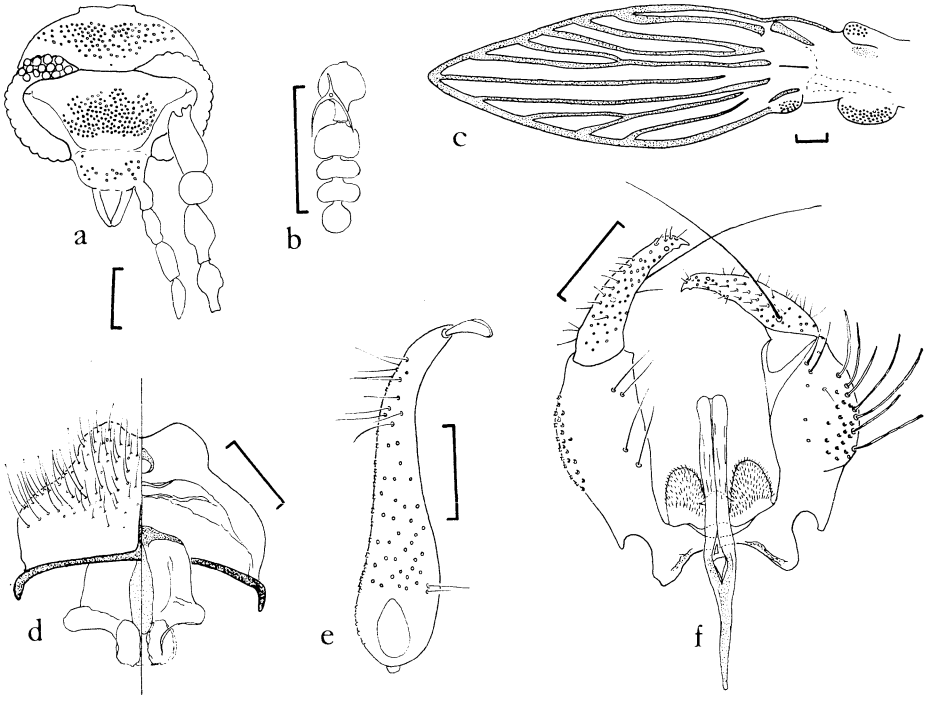

Fig. 1. *Psychoda brachyptera*. a, ♂ head; b, ♂ antennal segments 12–16; c, ♂ wing; d, ♀ genitalia; e, ♂ surstyle; f, ♂ genitalia, left coxite and aedeagus in dorsal view, right coxite in ventral view. Scale line=0.1 mm.

genital plate with shallow apical concavity, genital digit small and pointed, spermatheca small. Wing length 1.5 mm; wing width 0.5 mm; antenna 1.1 mm.

Pupa: Usual *Psychoda* appearance; respiratory horn and abdominal ornamentation as figured. Length 1.9–2.3 mm (slide-mounts).

Larva: Tergal plates present only on thorax and last 2 segments, pair of small, separated plates on segments 1 & 2 and metatergal plates[2] on segment 9, slender mesotergal and larger rectangular metatergal plate on segment 10; vestiture of thorax finely setose, setae with punctiform bases grouped in clusters of 2 or 3; vestiture of abdomen coarser, setal bases large and plaque-like, setae multifurcate. Other vestiture and details as figured.

Holotype ♂, allotype ♀, (D. S. I. R.) Rocky Bay, Campbell I., penguin nest, 28.XI.1961, 20. XII. 1961, Gressitt. Paratypes: 6♂♂, 2♀♀, 3 pupae, same data; 13♂♂, 4♀♀, same but 20. XII. 1961, 18. II. 1963, Gressitt, Wise, Rennell.

ADDITIONAL SPECIMENS: Numerous larvae from some locality as types; 2♀♀, same, but 25. VII–3. VIII. 1962, Rennell.

The reduced wings and eyes of *P. brachyptera* are striking features shared with *P. acuti-*

2. For terminology see Satchell, 1949, Trans. R. Ent. Soc. Lond. **100**: 414.

pennis Tonnoir (see Satchell, 1950a), but with no other known psychodid. These are probably adaptations to the wind-swept islands on which these flies live and have been discussed by Satchell (*l. c.*).

The morphological similarity of *brachyptera* and *acutipennis* strongly suggests that they

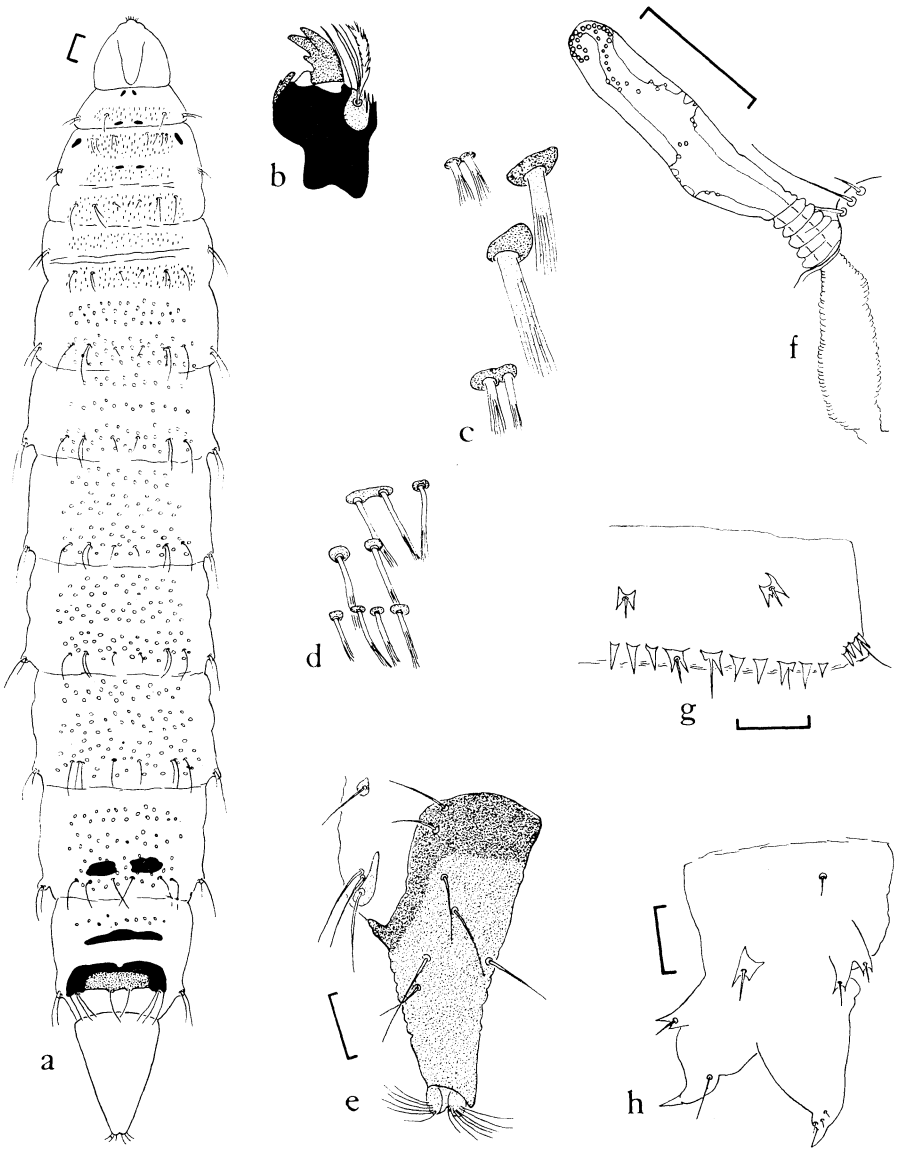

Fig. 2. *Psychoda brachyptera.* a-e, larva. a, dorsal view; b, mandible; c, dorsal elements, metatergal division of segment 5; d, ventral elements of segment 5: e, respiratory siphon, lateral view. f-h, pupa. f, respiratory horn; g, 1/2 of abdominal sternite 4; h, terminal segment, lateral view, Scale line=1.0 mm.

are of common stock and are not simply products of parallel evolution. In addition to the wings and eyes, antennae, ascoids, palpi, head shape, and ♂ genitalia point to a close relationship. It would seem quite certain that one of these species has evolved from the other after part of the parent population had become isolated on another island. There is no clear relationship between these species and other known ones.

The only observable differences between *brachyptera* and *acutipennis* are in the genitalia. The basistyle is more slender, dististyle tapering and aedeagus longer in *brachyptera*. (The ♀ of *acutipennis* is unknown.)

Psychoda pulchrima Satchell, 1954: 485.—Harrison, 1955: 210. Fig. 3 a, b.

The following is an addition to Satchell's description based on Campbell I. specimens:

♀: Eye bridge with 4 rows of facets, usually rounded on median margin; frons with rectangular patch of hairs with apically acute median band extending to about center of eye bridge, vertex hairs not extending below upper eye margin. Labellum with 2 setae and 4 or 5 teeth. Ratio of fore leg 26 : 29 : 14, mid leg 27 : 33 : 15, hind leg 30 : 41 : 17. Wing length 1.6–2.8 mm (M=2.2, SD=0.3, N=51); wing width 0.6–1.1 mm.

♂: Eye bridge with 4 (50 % of specimens) or 5 rows of facets, when with 5 rows, lower row usually consists of 1–3 facets. Wing length 1.6–2.5 mm (M=2.1, SD=0.3, N=28); wing width 0.6–1.1 mm.

DISTRIBUTION: New Zealand, Campbell I.

CAMPBELL I.: 548♂♂, ♀♀, Tucker Cove, Malaise trap, 21. XI–2. XII. 1961, Gressitt; in elephant seal wallow, 16. V. 1962, Rennell; ex *Dracophyllum* & sedge, 0–100 m, 7. VIII. 1962, Rennell; 206♂♂, ♀♀, Beeman Camp, air nets, in all months from XI. 1961–X. 1962, Gressitt & Rennell; ex *Coprosma* & sedge, 100–150 m, 3. VIII. 1962, Rennell; ♀, Beeman Hill, ex *Poa* & moss, 30–100 m, 2–6. XII. 1961, Gressitt; 7♂♂, ♀♀, Mt. Lyall, ex fern, 150 m, 3. XII. 1961, Gressitt; ♀, Moubray Hill, 200 m, 12. XII. 1961; 3♀♀, Shoal Pt., ex tussock, 20. VII. 1962, Rennell.

Psychoda campbellica Quate, n. sp. Fig. 3 c–g.

Vestiture white and brown; antenna cream colored; scutum chiefly with snow white hairs, dark brown or black spot surrounded by cream colored hairs between wing bases; wing chiefly brown, base before fold white, white band little beyond center and on about apical 1/4; usually 2 dark spots between white bands, 1 on R_4 and on M_1. Leg vestiture chiefly white, fore tibia, usually apical 1/2 of mid tibia and apical 1/2 of hind tibia brown; abdomen vestiture white.

♀: Body integument brown. Eyes separated by 2 facet diameters; eye bridge with 4 rows of facets, rounded on median margin; frons with rectangular patch of hairs and short, angular projection on midline extending to about lower edge of eye margin, hairs on vertex extending in truncate, angular projection to about center of eye bridge. Labellum with 2 setae and 4 or 5 teeth; palpus rather long, extending to antennal segment 6, ratio of segments 22 : 28 : 27 : 32. Antenna 16-segmented; terminal 3 segments subequal, clearly separated from each other and 13, node of segment 3 pyriform, remaining nodes globular, internodes rather stout and with a small swelling near center; ascoids Y-shaped.

Wing membrane pale brown, little darker in costal cell; forks complete but base of R_3

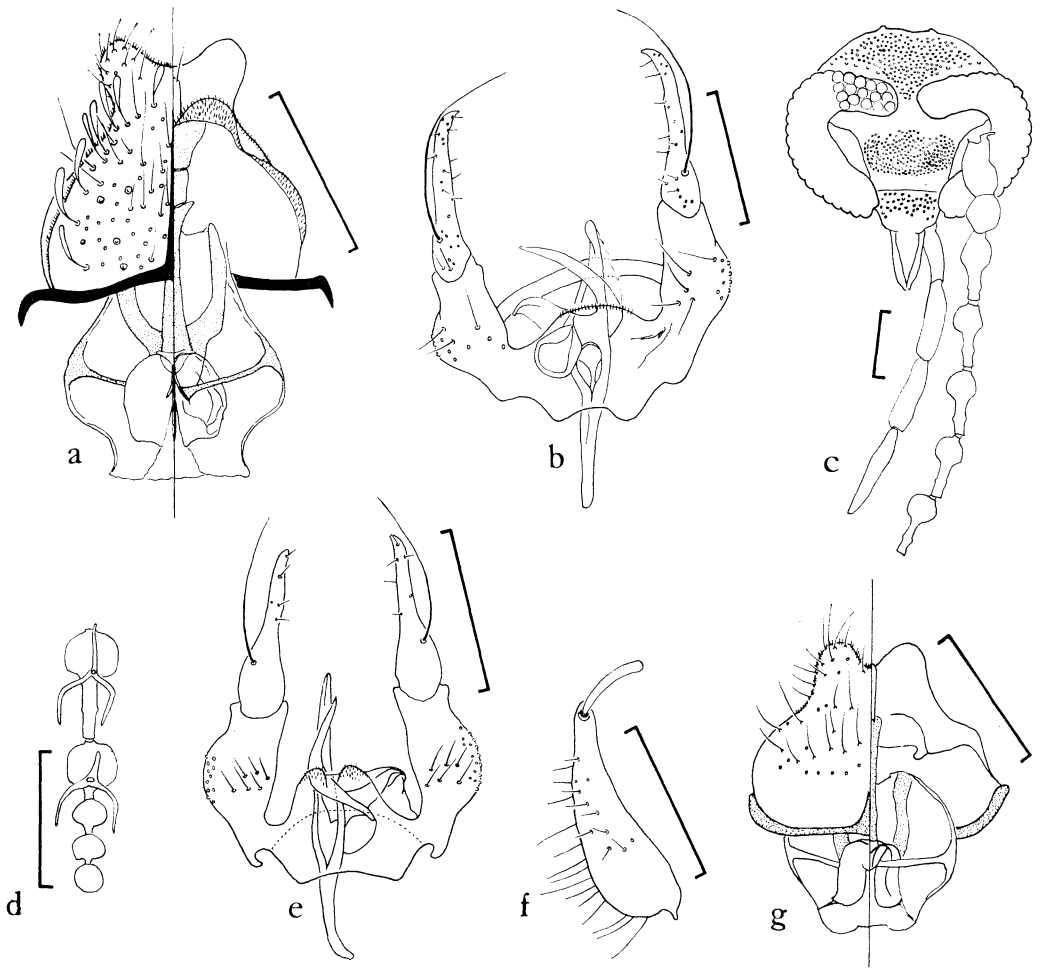

Fig. 3. a, b. *Psychoda pulchrima.* a, ♀ genitalia; b, ♂ genitalia, ventral view. c–g. *Psychoda campbellica.* c, ♀ head; d, ♀ antennal segments 12–16; e, ♂ genitalia, ventral view; f, ♂ surstyle; g, ♀ genitalia. Scale line=0.1 mm.

and M_2 usually weakened. Ratio of fore leg 24 : 24 : 12, mid leg 26 : 31 : 13, hind leg 30 : 36 : 13.

Genitalia as figured; apex bilobed, base before lobes shorter and broader than in *pulchrima*; inner face with pair of small rounded knobs projecting basally. Wing length 1.5–2.9 mm (M=2.3, SD=0.3, N=50); wing width 0.8–1.1 mm; antenna 1.0–1.5 mm.

♂: Similar to ♀; eyes separated by 1 facet diameter, bridge truncate on median margin, median projection of vertex hairs acute. Genitalia as figured; main shaft of aedeagus nearly straight, lateral shaft strongly curved at base, dististyle swollen basally and distal 2/3 slender, seta about as long as dististyle; paramere setose, bilobed; surstyle moderately short and stocky. Wing length 1.7–2.4 mm (M=2.2, SD=0.2, N=23); wing width 0.7–

1.0 mm; antenna 1.2–1.5 mm.

Holotype ♂, allotype ♀, (D. S. I. R.), 16–18. XII. 1961 and Tucker Cove, Campbell I., 4 m, Malaise trap, 20.XII.1961, Gressitt. Paratypes: 200♀♀, 21♂♂, Tucker Cove, Malaise trap and ex *Poa*, 27. XI–20. XII. 1961, 21–25. XI. 1961 & 12–17. XII. 1961; 3♂♂, 6♀♀, Beeman Camp, 2–50 m, 21–30. XI. 1961 & 1–3.XII.1961, all Campbell I., collected by Gressitt.

ADDITIONAL SPECIMENS: 15♂♂, 24♀♀, Beeman Camp, Campbell I., air nets, XI, XII. 1961, II–V, VIII, X. 1962, Rennell & Gressitt.

P. campbellica is closely related to *pulchrima*, but pinned specimens are easily separated; *campbellica* is distinctly marked with white hairs on the thorax and the brown spot between the wings and white bands on the wings, but *pulchrima* is gray or brown with 2 white spots on the posterior wing fringe. Slide mounts reveal the close relationship of the two; *campbellica* differs from *pulchrima* in having shorter antennal internodes, a broader and shorter ♀ subgenital plate without pair of hairy lobes on the inner face, which is characteristic of *pulchrima*, and shorter surstyli and large, bilobed paramere of the ♂ genitalia.

Psychoda eremita Quate, n. sp. Fig. 4 a–f.

♀: Eyes separated by 2 facet diameters; eye bridge with 4 rows of facets, rounded on median margin; frons with rectangular patch of hairs and median, triangular projection extending to nearly center of eyes, vertex hairs extending in short, truncate projection to little below upper eye margin. Labellum with 2 setae and 4 teeth; ratio of palpal segments 20 : 25 : 29 : 33. Antenna 19-segmented, terminal 3 segments subequal, clearly separated from each other and 13, node of segment 3 slightly pyriform, others globular; ascoids Y-shaped.

Wing membrane clear, pale brown in costal cell; forks complete; both costal nodes with dense patch of hair sockets, but without hairs or scales in slidemounts; ratio of fore leg 23 : 25 : 14, mid leg 29 : 33 : 15, hind leg 31 : 38 : 16.

Genitalia as figured; subgenital plate with apical concavity well marked, lobes well developed, inner face with marked folds extending in curve to digit and with U-shaped, setose lobe at base of digit, digit without apical seta. Wing length 1.9–2.0 mm; wing width 0.8 mm; antenna 1.2 mm.

♂: Similar to ♀; eyes separated by about 1/2 facet diameter, bridge truncate on median margin; wing with dense patch of small, spatulate, non-deciduous hairs on lower surface of 2nd (distal) costal node. Genitalia as figured; lateral shaft long and widely curving at base, paramere hairy, bilobed and with deep notch to side of midline making it asymmetrical; surstyle short and stocky. Wing length 1.9 mm; wing width 0.8 mm; antenna 1.3 mm.

Holotype ♀, allotype ♂, (D. S. I. R.), Tucker Cove, 4 m, Malaise trap, 27. XI–1. XII. 1961 & 18–21. XII. 1961. Paratypes: ♀, Tucker Cove, 1–50 m, ex *Poa*, 21–25. XI. 1961; 2♀♀, Lookout Bay Beach, ex *Poa*, 19. XII. 1961; ♀, Courrejolles Penin., 200 m, gray-headed mollymawk nest; all Campbell I., collected by Gressitt.

ADDITIONAL SPECIMEN: ♀, Beeman Camp, Campbell I., air nets, 24. VII. 1962, Rennell.

This species is related to *pulchrima* and *campbellica*, but is separable from them by the ridges and hairy lobe on the internal face of the ♀ subgenital plate and the long lateral shaft and notched paramere of the ♂ genitalia.

Psychoda spatulata Satchell, 1950b: 478. Fig. 4 g–h.

The following is an addition to Satchell's description based on Campbell I. specimens:

♀: Eyes separated by about 1 facet diameter, bridge with 3 or 4 rows of facets; frons with crown-shaped patch of hairs and median, triangular band extending nearly to upper eye margin. Labellum with 2 setae and 4 teeth.

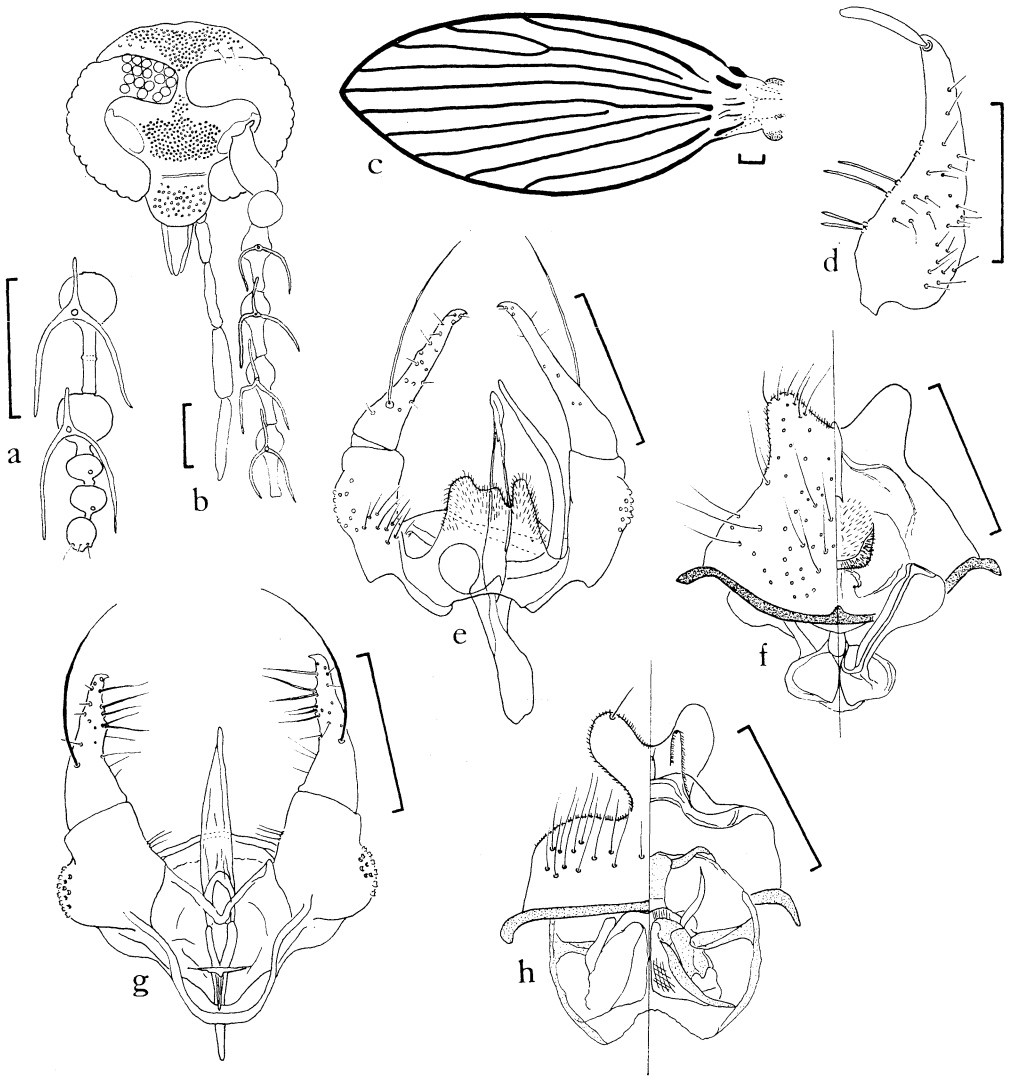

Fig. 4. a–f. *Psychoda eremita.* a, ♂ antennal segments 12–16; b, ♂ head; c, ♀ wing; d, ♂ surstyle; e, ♂ genitalia, left coxite and aedeagus in ventral view, right coxite in dorsal view; f, ♀ genitalia. g–h. *Psychoda spatulata.* g, ♂ genitalia, ventral view; h, ♀ genitalia. Scale line= 0.1 mm.

Wing length 1.6–2.5 mm (M=2.1, SD=0.2, N=12).

♂: Wing length 1.9–2.2 mm.

DISTRIBUTION: Australia, New Zealand, Antipodes, Macquarie I., Campbell I.

CAMPBELL I.: 10♂♂, ♀♀, Tucker Cove, Malaise trap, 1–5, 16–18. XII. 1961, Gressitt; 2♀♀, in elephant seal wallow, 16. V. 1962, Rennell; 245♂♂, ♀♀ Beeman Camp, air nets, in all months of I–X. 1962, except VIII, Rennell; 6♂♂, ♀♀, ex *Pleurophyllum criniferum*, *Poa* and on ground, 6–11, 21–30. XI. 1961, 12–17. XII. 1961, Gressitt; at light, 1–5.XII.1961, 2. II. 1963, Gressitt & Wise; ♂, Courrejolles Penin., on mollymawk nest, 200 m, 14. XII. 1961, Gressitt; 2♀♀, Monument Harbor, ex black-backed gull nest & tussock, 17.XII.1961, 4. II. 1962, Gressitt & Rennell; ♂, ♀, Northwest Bay, ex rocks & tussock, 29. XI. 1961, 30. XII. 1962, Gressitt & Rennell; 8♂♂, ♀♀, Shoal Pt., ex tussock, 29.VII.1962, Rennell; ♀, Lookout Bay, ex *Stilbocarpa*, 10.II.1962, Rennell; ♀, Davis Pt., Moubray Hill, ex *Poa*, 12. XI. 1961, Gressitt; 7♂♂, ♀♀, Mt. Azimuth, under dead albatross in nest, 250 m, 12. II. 1963, Wise; 5♂♂, ♀♀, Mt. Dumas, Berlese funnel, 150 m, 5. II. 1963, Wise.

Psychoda severini Tonnoir, 1922, Ann. Soc. Ent. Belg. **62**: 78.

DISTRIBUTION: Holarctic, Australia, New Zealand.

CAMPBELL I.: ♀, Beeman Camp, 2–50 m, chicken yard debris, Berlese funnel, 6–11. XII. 1961, Gressitt.

P. severini is probably not established on the island. It is "extremely common" in New Zealand (Satchell, 1950b) and if it were established, more than a single specimen would have been collected in the year. The record is considered adventitious.

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