# ENTOMOLOGY OF THE AUCKLANDS AND OTHER ISLANDS SOUTH OF NEW ZEALAND: DIPTERA: PSYCHODIDAE

# By D. A. Duckhouse<sup>1</sup>

Abstract: Two new and 4 previously described species of Psychodidae are recorded from the Auckland Is (5 in *Psychoda*, 1 in *Threticus*). The relationships of subantarctic island psychodids is discussed and a key is provided for their identification.

This report is based upon collections made in the Auckland Is by Dr J. L. Gressitt and Mr K. A. J. Wise of the Bishop Museum, and on Antipodes I by Dr G. Kuschel of the D.S.I.R., New Zealand.

The Psychodidae of the Auckland Is comprise six species, all but one in the enormous cosmopolitan genus *Psychoda* Latreille which, except in the tropics and subtropics, is normally the only genus represented on remote islands. The exception in this instance is a new species of *Threticus* Eaton, a small and rather rare genus hitherto known from continents or continental islands, including New Zealand. It does not show particular affinities with any known species. Of the *Psychoda* species, *surcoufi* Tonnoir is widely distributed in cooler latitudes and represented on many oceanic and other isolated islands; *solivaga* is a new species; *triaciculata* Satchell and *pulchrima* Satchell are New Zealand species, and *eremita* Quate is a species originally described from Campbell Island. I am not entirely sure that the Aucklands forms of the last three in this list are morphologically identical with those occurring elsewhere. There seems to be some variation, but I cannot evaluate this until an opportunity arises of studying proper series from New Zealand. At present I have only examined single paratype specimens.

The psychodid faunas of Campbell I (Quate 1964) and the Aucklands both include six species and both are richer than those of any other subantarctic island. Presumably this reflects the fact that no other subantarctic islands of comparable size are as close to a major land mass and separated from it by such shallow seas. However, I expected that more species would have been collected in the Aucklands than on Campbell I, for the Aucklands are little more than half as far as Campbell from the South Cape of Stewart I. They are also less windswept, more wooded and more diverse floristically (Chilton 1909).

The only psychodids recorded from other subantarctic islands are the following species of *Psychoda: surcoufi* (Macquarie, Antipodes); the cosmopolitan *alternata* Say (Macquarie); the widely distributed *parthenogenetica* Tonnoir (Macquarie, South Georgia, Kerguelen); *acutipennis* Satchell (Bounty, Antipodes) and *eremita* (Antipodes). I have also examined specimens of *parthenogenetica* from the Crozets, collected by Dr Lewis Davies in 1968.

## Origin of subantarctic island psychodids

There is no evidence to show that any of the normally-winged subantarctic island *Psychoda* species are endemic. Given the breeding habits and relatively high dispersal capacity of this genus, all could have been introduced or blown to the islands in comparatively recent times. *Psychoda* 

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occurs in the aerial plankton and many species are able to breed in transitory habitats, often in association with man. The three that are not recorded from elsewhere—*solivaga, eremita* and *campbellica* Quate—resemble species of New Zealand and southern Australia in the structure of the antenna,

Quate—resemble species of New Zealand and southern Australia in the structure of the antenna, which has the last three segments bead-like and well-separated, without conspicuous internodes; and agree with the endemic species of New Zealand but not with those of southern Australia in the structure of the labellum, which has two setae on each side. In total, these forms resemble New Zealand species more than those of any other region and are almost certainly derived from the New Zealand fauna. The fact that they have not been recorded there is no argument for endemicity because the *Psychoda* species of New Zealand are still poorly known. Satchell (1950, 1954) only described 15 species, leaving "thirteen species of males and twenty-two of females" undescribed, in a collection that was far from comprehensive.

The two brachypterous subantarctic island forms (*Psychoda acutipennis* in the Bounty and Antipodes Is and *P. brachyptera* Quate on Campbell I.) are closely similar in structure and clearly related to each other. Like *solivaga, eremita* and *campbellica* they have three well-separated bead-like segments at the tip of the antenna, and two labellar setae. They are almost certainly endemic forms, possibly derived from some coastal New Zealand species related to *simplex* Satchell. It is not true that the reduced wings and eyes of these species are unique features, as supposed by Quate (1964). The wings and eyes are in an almost identical general form in New World species of *Maruina* including *M. lanceolata* Kincaid. I am not suggesting that there is any particular relationship: the similarities are undoubtedly due to convergence and merely indicate that adults of *Maruina* are primarily adapted to similar physical factors in the environment, possibly to driving spray at the bases of waterfalls.

I am grateful to Dr J. L. Gressitt and to Dr G. Kuschel for the opportunity to examine their material, most of which they collected personally.

Type specimens will be deposited in the Entomology Division, D.S.I.R., Nelson, New Zealand.

# Keys to the Psychodidae of the Subantarctic Islands Key to Genera

1.	Labellum flattened, with row of 4-5 terminal rods on each side; ascoids Y-shaped, with 2	
	anterior branches <b>Psychoda</b> Latreil	le
	Labellum bulbous, with scattered rods and setae; ascoids with one anterior branch	
	(One species, T. tortuosus Duckhouse) Eato	m

### Key to Species of Psychoda

1.	Wing normal (similar to Fig. 13); R fork beyond M fork. Halteres small, racquet-shaped.	
	Eyes normal, eye-bridges separated by less than 5 facet diameters	2
	Wing reduced, narrow and acutely pointed with veins crowded together; R and M forks at	
	same level. Halteres large, spatulate. Eyes reduced, with bridges tapering, separated	
	by 5 or more facet diameters	11
2.	Antenna with fewer than 16 segments, terminal ones unequal in size and incompletely sepa-	
	rated by sutures	3
	Antenna with 16 segments, last 3 reduced, subequal, separated by distinct sutures	5
3.	Whitish species with darker head and dark zig-zag band across wing (thorax without dark	
	spot between wings). 15 antennal segments, 14th vestigial, without hairs or microsetae but	
	with 2 sensory setae on one sidesurcoufi	Fonnoir
	Coloration otherwise: 14th segment with hairs and microsetae	4

4.	Antenna with 15 segments. Black hair spots at tips of veins. Sexually reproducing species
	Antenna with 14 segments. No spots at tips of veins. Parthenogenetic females only
5.	Dorsal thoracic vestiture white with dark brown or black spot between wings; wings brown with white transverse bands
	bands
6.	Wing with 2 whitish interruptions in posterior fringe. Female with pair of inflated microsetose sacs at base of genital digit, which has 2 large setae at apex (Fig. 12). Male with ventral paramere a narrow shelf-like projection, not more than half as long as broad
	Wing with posterior fringe uniform. Genitalia otherwise
7.	Male (unknown for solivaga sp. n.)
	Female9
8.	Ventral paramere microsetose, divided asymmetrically by deep notch; style with one long ventral seta in basal half and series of fine sensory setae mainly in distal half; lateral shaft of aedeagus very long, slender and rounded at tiperemita Quate
	Ventral paramere almost naked, tongue-shaped; style with 3 enlarged needle-like sensory setae, additional to those in <i>eremita</i> , inserted in row on inner side; lateral shaft of aedeagus short and pointed at tip (Fig. 17)triaciculata Satchell
9.	Genitalia with undivided setose sac anterior to genital digit and pair of small thimble-shaped sclerotised structures anterior to sac (Fig. 9)eremita Quate
	No setose sac or thimble-shaped structures anterior to genital digit10
10.	Genital digit small with very fine apical setae; flanked by pair of lightly sclerotised cuticular sacs, microsetose medially (Fig. 7)solivaga Duckhouse
	Genital digit large, inflated at base, with about 5 apical setae; not flanked by cuticular sacs (Fig. 19)triaciculata Satchell
11.	Wing with M fork incomplete at base ( $M_2$ not connecting with $M_1$ ). Male with aedeagus terminating in a pair of acute points (sometimes appearing as one) <b>acutipennis</b> Tonnoir
	Wing with M fork complete ( $M_2$ connecting with $M_1$ ). Male with aedeagus terminating in a pair of rounded lobesbrachyptera Ouate

## Threticus tortuosus Duckhouse, new species Fig. 1-4.

A small species, differing from other members of the genus in the wing, which is lanceolate with radial fork basal to level of tip of Cu, and in the female genitalia which have a pair of dark twisted structures on either side of an enlarged genital digit.

 $\varphi$ . Head (Fig. 3) elongate, vertex more than twice width of eyebridges; clypeus broad. Eye-bridges with 3 rows of facets, separated by width of 3.7 facets; interocular suture faint, arched. Frons with bilobed patch of scars, narrow band extending back to level of anterior row of facets. Antennal insertion areas concave posteriorly. Palpi (1-1.8-2.0-2.1) 1.2 × length of head. Labellum bulbous. Antenna (Fig. 1) with scape short cylindrical, 1.8 × as long as broad; first flagellar segment amphora-shaped with long basal region (2.0 × length of neck); flagellar segments 2-9 flask-shaped, basal bulbs about as long as necks; last 3 segments small, bead-like, as in *Psychoda*. Ascoids with one slender posterior branch, and one stout anterior branch, flattened and twisted at base. Verticillar scars drop-shaped.

Wing (Fig. 4) 1.8 mm long, with tip acute; costal node enlarged, projecting; both forks basal to level of tip of Cu, which is long; forks incomplete; first basal cell longer than second.

Subgenital plate (Fig. 2) with distal lobes microspinose on inner face, separated by deep cleft; basal thickening weak; keel absent. Genital digit broad, sclerotised, with group of sensilla on dorsal surface; flanked by pair of sclerotised, twisted structures. Spermathecae a pair of capsules with faint honeycomb

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Fig. 1-4. Threticus tortuosus n. sp.,  $\mathcal{Q}$ . 1, base of antenna; 2, subgenital plate and associated structures; 3, head; 4, wing.

sculpturing ventrolaterally; supported by bars and plates as shown. Ovipositor  $1.6 \times$  length of subgenital plate.

Holotype 9, Auckland I, Crozier Pt, 1-20 m, under rotting kelp, 28.XII.1962 (Wise).

Psychoda solivaga Duckhouse, new species Fig. 5-7.

A small species with 2 labellar setae and widely separated eye-bridges consisting of 3 rows of facets.

 $\bigcirc$ . Head (Fig. 6) 0.93  $\times$  as long as broad; eye-bridges of 3 rows of well-spaced facets, separated by width of 3.6 facets; interocular suture indistinct. Frons with large undivided area of scars, slight median extension towards eye-bridges. Antennal insertion areas convex posteriorly, narrowing anteriorly to mouths of anterior tentorial pits. Labellum with 2 setae and 4 or 5 terminal rods. Antenna (Fig. 5) with scars faint; scape strongly inflated on inner side; 1st flagellar segment amphora shaped with neck 0.7  $\times$  length of basal bulb, second and third with necks 1.2–1.3  $\times$  lengths of bulbs.

Subgenital plate (Fig. 7) with shallow apical concavity; basal thickening produced into slight median keel. Genital digit small, with very fine sensilla at apex. Dorsal cuticle of plate thin, developed on either side of digit to form pair of lightly sclerotised evaginations that are microsetose medially. Spermathecae unsculptured; supports with anterior arms indistinctly spinose; flexible rod or duct running from dorsal U-shaped element to above base of genital digit. Ovipositor  $1.9 \times$  length of subgenital plate.

Holotype  $\mathcal{Q}$ , Ewing I, 1–10 m, swept ex Urtica, 1.I.1963 (Wise).

Psychoda triaciculataSatchellFig. 8, 13–19.Psychoda triaciculataSatchell, 1950: 172; fig. 19E—H (3 only).



Fig. 5-12. 5-7, Psychoda solivaga n. sp., ♀. 5, base of antenna; 6, head; 7, subgenital plate and associated structures. 8, Psychoda triaciculata Satchell, labellum. 9-10, Psychoda eremita Quate. 9, subgenital plate; 10, left apical lobe of labellum. 11-12, Psychoda pulchrima Satchell. 11, left apical lobe of labellum; 12, apex of subgenital plate.

Aucklands males differ from Satchell's description but agree with the paratype specimen I have examined in the following respects:- (i) the eye-bridges are separated by about 1/2 the width of one facet (Satchell says "eyes touching"); (ii) the ascoids have the posterior branch only reaching half way to the next bulb (Satchell says "posterior branch reaching to next bulb"). Other apparent differences in Aucklands specimens are due to the fact that Satchell's preparations were partly compressed so that the main shaft of the aedeagus is drawn in profile and the cercopod distorted. The following is an addition to the brief original description.

J. Vestiture pale greyish brown; cuticle light brown.

Head (Fig. 14) about  $0.9 \times$  as long as broad. Eye-bridges with 4 rows of compactly arranged facets, separated by  $0.3-0.6 \times$  width of one facet; interocular suture absent. Tapering band of scars extending backward from group on frons to level of second facet row. Palpi (1-1.4-1.6-1.9)  $1.3 \times$  length of head. Labellum (Fig. 8) with 4 tapering rods and 2 setae. Antennae (Fig. 15) 16-segmented, about  $0.8 \times$  length of wing; verticils compact, light grey, cupuliform; scape inflated on inner side; first flagellar segment amphora-shaped with neck  $1.0-1.1 \times$  length of basal region, second with neck about  $1.6 \times$  length of basal bulb, necks proportionately shorter towards tip of antenna.

Wing (Fig. 13) with both forks well basal to level of tip of Cu; lightly infuscated in costal cell, at apex

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Fig. 13-19. Psychoda triaciculata Satchell. 13, 3 wing; 14, 3 head; 15, 3 antenna, base; 16, ♀ antenna, tip; 17, 3 coxites, styles and aedeagus, dorsal view; 18, 3 cercopod; 19, ♀ subgenital plate and associated structures, inset showing genital digit in lateral view.

of first basal cell and at base of  $R_{2+3}$ . Wing length 1.9–2.4 mm.

Genitalia (Fig. 17–18) with scales ventrally at bases of cercopods and at apex of ninth tergite. Style about as long as coxite, bearing 3 stout needle-like sensilla on inner side, 1 long whip-lash sensilla on ventral side near base, and small patch of hair scars on outer side at base. Aedeagus with basal apodeme laterally flattened, roughly racquet-shaped in profile. Ninth sternite broad, microsetose along posterior margin. Ventral paramere (backwardly-directed process of intercoxital sclerite) tongue-shaped, microsetose centrally and transversely corrugated at base. Cercopod with distal quarter slender, parallel-sided.

2. Vestiture pale greyish-brown to honey-colored.

Eye-bridges separated by width of 0.5-1.2 facets, connected by interocular suture. Palpi, 1-1.6-1.7-2.0. Antenna with tip as in Fig. 16.

Subgenital plate (Fig. 19) narrowing rapidly from base towards distal lobes; keel poorly developed or absent; prostrate scales ventrally on basal half. Genital digit large, inflated at base, with 4–6 sensory setae

at tip. Spermathecae unsculptured; supports as shown, with flexible rod or duct running from dorsal U-shaped element to above base of digit. Ovipositor about  $1.9 \times$  length of subgenital plate.

9% of specimens in the Aucklands collections were triaciculata.

DISTRIBUTION: New Zealand, Auckland Is.

AUCKLAND I: 12  $\eth$  3  $\Diamond$ , 8  $\Diamond$ , Ranui Cove, Malaise trap, 31.XII.1962–12. I.1963 (Gressitt); 1  $\Diamond$ , Ranui Cove, light trap, 1–2.I.1963 (Gressitt); 8  $\eth$  5  $\Diamond$ , 5  $\Diamond$ , Ranui Cove Creek, 4 m, Malaise trap, 28–31.XII.1962 (Gressitt); 1  $\eth$ , 1  $\Diamond$ , Ranui Cove, 2 m, ex *Coprosma* and *Polystichum*, 27.XII. 1962 (Gressitt); 8  $\eth$  10  $\Diamond$ , 10  $\Diamond$ , Crozier Pt, 1–20 m, 28.XII.1962 (Gressitt); 2  $\eth$ , 2  $\Diamond$ , 2  $\Diamond$ , Crozier Pt, 1–20 m, ex *Polystichum*, 28.XII.1962 (Wise); 3  $\eth$  6  $\Diamond$ , Crozier-Webling Bay, 1–30 m, ex *Polystichum*, 30.XII.1962 (Gressitt); 1  $\Diamond$ , Laurie Hrbr, Grey Duck Creek, 9.I.1963 (Wise); 1  $\eth$ , Webling Bay, 13.I.1963 (Wise).

EWING I: 1 J, SE coast, ex Bulbinella, 4–5.I.1963 (Gressitt).

## Psychoda pulchrima Satchell

Satchell, 1954: 485–87; fig. 5A—F (♂ and ♀).

Quate, 1964: 284; fig. 3a, b.

Adults greyish-brown to grey with two indistinct pale spaces in the posterior wing fringe. The labellum (Fig. 11) is broad, with 4–5 short, stout, widely spaced terminal rods. Females are recognised by the presence of a pair of inflated, externally microsetose sacs at the base of the genital digit (Fig. 12); males by structure of aedeagus, poor development of the ventral paramere, elongation of the flagellar internodes and annulation of the ascoids.

Campbell and Aucklands specimens differ from Satchell's description in having a prominent median keel on the subgenital plate, but the paratype specimen from the type locality that I examined has a keel. Males differ from Quate's description in that 70% have 5 complete rows of facets in the eyebridges, the remainder 4 complete and 1 incomplete (Quate says 50% of Campbell specimens have 5 rows of facets, but the lower row is usually incomplete, consisting of only 1–3 facets).

54% of specimens in the Aucklands collections were pulchrima.

DISTRIBUTION: New Zealand, Campbell I, Auckland Is.

AUCKLAND I: 5 ♂♂, 94 ♀♀, Ranui Cove, Malaise trap, 31.XII.1962–19. I.1963 (Gressitt); 1 ♀, Ranui Cove, light trap, 1–2.I.1963 (Gressitt); 1 ♀, Ranui Cove, 2 m, light trap, 14.I.1963 (Gressitt); 8 ♂♂, 251 ♀♀, Ranui Cove Creek, 4 m, Malaise trap, 27–31.XII.1962 (Gressitt); 3 ♂♂, 4 ♀♀, Laurie Hrbr, Grey Duck Creek, 9.I.1963 (Wise); 2 ♂♂, 1 ♀, Webling Bay, 13.I.1963 (Wise); 1 ♂, 2 ♀♀, Crozier-Webling Bay, 1–30 m, ex *Polystichum*, and 1 ♀, same locality, ex *Nothopanax*, 30.XII.1962 (Gressitt); 2 ♀♀, Crozier Pt., 1–20 m, 28.XII.1962 (Gressitt); 1 ♂, Crozier Pt., 1–20 m, ex *Polystichum*, 28.XII.1962 (Wise); 1 ♀, Ranui Cove, 2 m, ex *Polystichum*, 27.XII.1962 (Gressitt).

ENDERBY I: 2 ♂♂, 1 ♀, 1–50 m, ex mat plants above small stream, 31.XII.1962 (Gressitt); 1 ♂, Pt Ross, Sandy Bay, 16.I.1963 (Wise); 4 ♂♂, 4 ♀♀, 1–50 m, 17–18.I.1963 (Wise).

EWING I:  $3 \Leftrightarrow 1, 1-10 \text{ m}$ , ex Urtica, 1.I.1963 (Wise);  $6 \notin 3$ , SE coast, ex Bulbinella, 4–5.I.1963 (Gressitt);  $2 \Leftrightarrow 1, 1-10 \text{ m}$ , ex Dracophyllum and Metrosideros, 6.I.1963 (Gressitt).

ADAMS I: 2 99, Magnetic Cove, 19.I.1966 (Wise).

OCEAN I: 1 9, 1-18 m, ex Coprosma, 29.XII.1962 (Gressitt).

# Psychoda eremita Quate

Quate, 1964: 286; fig. 4a—f (3 and 2).

Adults are uniformly brownish grey. The labellum (Fig. 10) has 4 closely grouped terminal rods. The antenna has 16 segments, not 19 as stated by Quate. The male genitalia resemble those

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of *P. novae-zealandicae* Satchell. Females are recognised by the presence of an undivided microsetose sac anterior to the genital digit (Fig. 9); males by the slender, elongate lateral shaft of the aedeagus and unequal division of the large and pilose ventral paramere.

Only 3% of specimens in the Aucklands collections were eremita.

DISTRIBUTION: Campbell I, Auckland Is, Antipodes I.

AUCKLAND I: 3 33, Ranui Cove, Malaise trap, 4.I.1963 (Gressitt); 3 33, 8  $\varphi\varphi$ , Ranui Cove Creek, 4 m, Malaise trap, 28–31.XII.1962 (Gressitt); 1  $\varphi$ , Webling Eay, 13.I.1963 (Wise); 2 33, 1  $\varphi$ , Ranui Cove, 2 m, light trap, 14.I.1963 (Gressitt).

EWING I: 2 33, 1–10 m, ex Urtica, 1.I.1963 (Wise); 1 9, SE coast, ex Bulbinella, 4–5.I.1963 (Gressitt); 1 9, 1–10 m, ex Stilbocarpa, 6.I.1963 (Gressitt).

Dr Kuschel collected the following specimens from Antipedes Is—1  $\Im$ , Lookout Bay, 14.I.1969, and 1  $\Im$ , Reef Pt, ex *Stilbocarpa* flowers, 6.II.1969.

#### Psychoda surcoufi Tonnoir

Tonnoir, 1922, Ann. Soc. ent. Belg. 62: 74.

Psychoda subimmeculata Tonnoir, 1929, Diptera of Patagonia and Scuth Chile. 2 (1): 6.

Psychoda spatulata Satchell, 1950: 166.

Psychoda surcoufi, Duckhouse, 1966, Trans. R. ent. Soc. Lond. 113: 211-13; fig. 216-8, 220-4 (3 and ♀).

Adults with vestiture white to yellowish-white, darker head and grey zigzag band across wing. Cuticle very thin and pale. Antenna 15-segmented; fourteenth segment vestigial, without verticillar hairs or microsetae.

The larva, described by Satchell (1947), has a complete set of dorsal plates: 2 on each of the first 4 segments and 3 on each of the remaining 6. It is distinguished from other known larvae in this category (including that of *parthenogenetica*) by having 2 oval sclerotised plates ventrally on segment 10.

*P. surcoufi* will breed in a wide range of moist materials, from cow dung to decaying leaves or potatoes. Dr Kuschel separated larvae and pupae from samples of *Stilbocarpa polaris* and other plant litter collected on Antipodes I in February 1969. They were most abundant in litter from under a large clump of *Stilbocarpa* where the ground was quite damp, and beneath the dead *Stilbocarpa* leaves he also found many adults. Watson (1967) records that on Macquarie I the larvae live in litter and soil of herbfield plants, especially *Stilbocarpa*, and that all stages are present throughout the year. He remarks that on cold and windy days adults keep to the ground under the *Stilbocarpa* leaves and within tussocks of *Poa*, only flying in sheltered positions. He also notes that large numbers may sometimes be seen flying over seal-wallow areas.

34% of specimens in the Aucklands collections were surcoufi.

DISTRIBUTION: Europe, southern Australia, New Zealand, Chile, Macquarie I, Campbell I, Auckland Is, Antipodes I.

AUCKLAND I: 1  $\[mu]$ , Ranui Cove, 2 m, at light in building, 27.XII.1962 (Wise); 36  $\[mu]$ , 156  $\[mu]$  $\[mu]$ , Ranui Cove, light trap, 28.XII.1962–15.I.1963 (Gressitt); 5  $\[mu]$  $\[mu]$ , 8  $\[mu]$  $\[mu]$ , 8  $\[mu]$ , 9  $\[mu]$  $\[mu]$ , 8  $\[mu]$ , 9  $\[mu]$ , 8  $\[mu]$ , 8  $\[mu]$ , 9  $\[mu]$ , 9  $\[mu]$ , 8  $\[mu]$ , 9  $\[mu]$ , 9  $\[mu]$ , 8  $\[mu]$ , 9  $\$ 

ENDERBY I: 1 9, Port Ross, Sandy Bay, at light, 18.I.1963 (Wise).

EWING I: 4 Gd, 4 QQ, 1-10 m, ex Urtica, 1.I.1963 (Wise); 1 d, 3 QQ, 1-10 m, ex Stilbocarpa, 1-6.I.1963 (Gressitt); 2 QQ, 1-10 m, light trap, 6.I.1963 (Gressitt).

ROSE I: 1 ざ, 8.I.1963 (Gressitt).

OCEAN I: 1 ♀, 1-18 m, ex Coprosma, 29.XII.1962 (Gressitt); 3 ざさ, 1 ♀, 1-18 m, light trap,

2.I.1963 (Gressitt).

FRENCH I: 1 , 1-5 m, ex Stilbocarpa and 1 , ex Poa, 2.I.1963 (Gressitt).

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