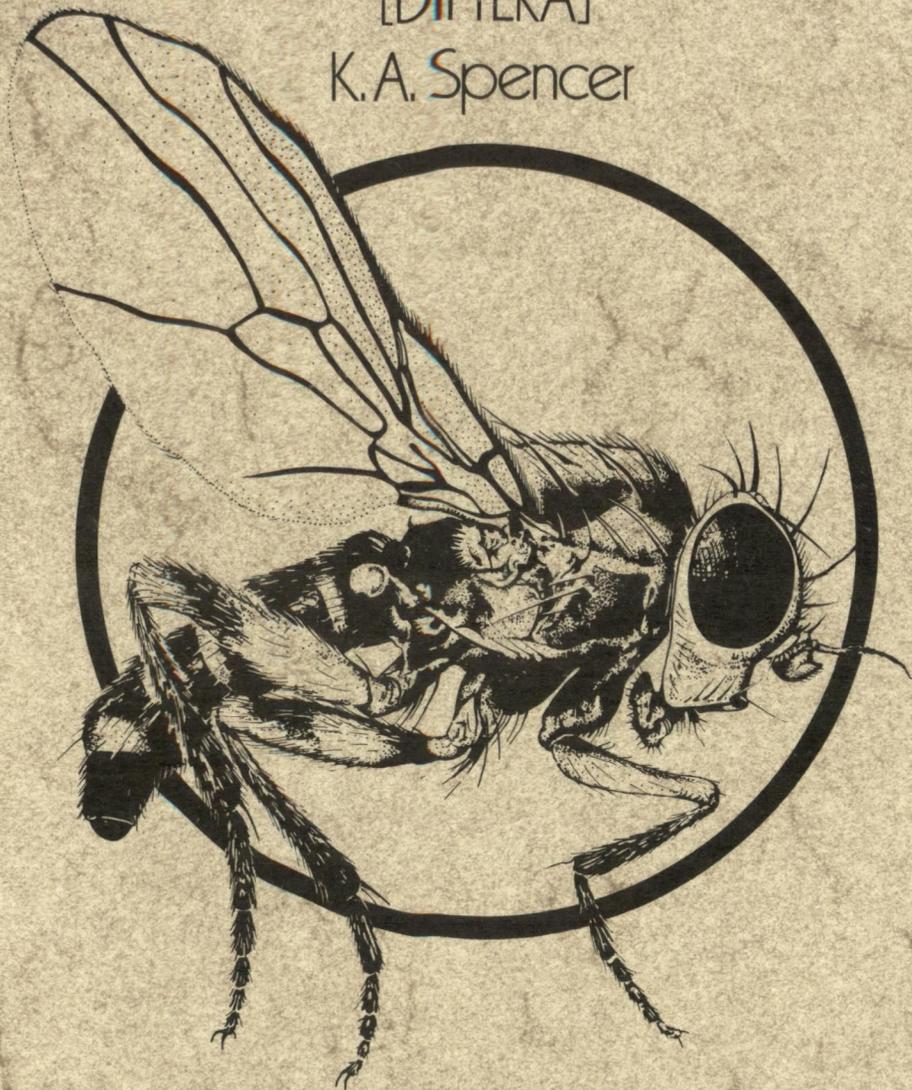


A REVISION OF THE
AUSTRALIAN AGROMYZIDAE
[DIPTERA]

K.A. Spencer



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A REVISION OF THE AUSTRALIAN
AGROMYZIDAE (DIPTERA)

by

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ABSTRACT

The 57 species of Agromyzidae hitherto known in Australia have been revised, additional available material has been examined and 84 new species are described. Nine species known from the Oriental region are now recorded as new to Australia and three new synonymies are established.

Of the 150 species now identified, 120 (80%) are endemic, 25 (16%) are present elsewhere in the Oriental region, in the Pacific area or in New Zealand. Only 5 species are considered as introductions.

The origin and distribution within Australia are discussed, and reasons are suggested for the relatively poor representation of the family in Australia, with only 8% of the total of known world species.

INTRODUCTION

In my earlier revision of Australian Agromyzidae (Spencer, 1963a) 57 species were recorded. That paper covered the 21 species previously known and included unidentified material from the Australian National Insect Collection, Canberra, the Australian Museum, Sydney and the results of my own collecting in 1961 when I visited Darwin, Brisbane, Sydney, Canberra, Melbourne, Adelaide and Hobart. During the past 12 years nearly 1,500 further specimens have been collected, mainly by Dr D.H. Colless, Dr D.K. McAlpine and Zenta Liepa. In addition I collected over 400 specimens in Western Australia during a 2½ months' visit from the end of September to early December, 1975.

Following intensive study of the family by a number of workers during the past 15 years the world Agromyzidae are now reasonably well understood and in consequence the systematics, evolution and distribution of the Australian fauna can be further clarified.

In the present paper 150 species are confirmed, of which 84 are described as new and 9 are recorded as new to Australia. Three new synonymies are established (*Agromyza*

testacea Sp. = *Phytobia incerta* Sp.; *Ophiomyia goodeniae* Sp. = *O. cornuta* de Meij.; *Liriomyza singularis* Sp. = *L. pallidicentralis* Mall., the invalid junior synonym placed first) and two species, *Melanagromyza alternata* Sp. and *M. piliseta* Mall., are deleted from the Australian list.

Despite the considerable number of additional species now recorded, the conclusion reached previously that the Agromyzidae are poorly represented in Australia remains essentially true. Slightly over 1,900 species are now known in the world, of which only 8% are in Australia. The dominance of the family in the northern hemisphere is indicated by the number of species in three areas which have been recently studied:

Canada and Alaska	: 257
Britain	: 316
Fennoscandia and Denmark	: 385

Only 13 genera of the world total of 26 are represented in Australia.

Origin and Distribution

While it is now fully accepted that older groups in many Orders had a southern origin from South America via Antarctica prior to the final separation of Australia and Antarctica some 50 million years ago, there is no evidence to suggest that any ancestral Agromyzidae reached Australia by this route. Although a number of families of Acalyprates had probably evolved at this time, in no case has a direct relationship with South America been established. McAlpine (1963: 67) considered that the genus *Tetrameringia* of the Clusiidae is of southern origin but recently in a personal conversation he agreed that this is in fact not so. The Australian Agromyzidae therefore, apart from five introductions—one deliberate, one from New Zealand and three by British settlers—are exclusively of Oriental origin.

The generic pattern (Table 1) shows some divergence from that found elsewhere. *Ophiomyia* is the largest genus with 35 species and now includes 10 additional species originally described in *Melanagromyza*, among which are the 7 leaf-mining species of the *pisi* group. *Melanagromyza* remains well represented with 28 species. The presence of only 3 species in *Agromyza* is noteworthy and could indicate a relatively recent origin of this genus in the northern hemisphere, with only limited dispersal to the south. Confirmation of 9 species in *Phytobia* is consistent with its ancient origin and good representation in S.E. Asia.

Only a single species was previously known in *Phytoliriomyza* but with the discovery of 15 new species and the transfer of 5 from other genera, this is now the third largest genus, with 21 species. Only 33 species were previously known throughout the world and Australia is thus the area of the greatest radiation of this genus. There has also been considerable radiation in *Liriomyza* which now has 18 species, of which 12 are new. This is remarkable in view of the poor representation of the genus in New Guinea where only

TABLE 1

Genus	Queensland	Northern Territory	New South Wales	Australian Capital Territory	Victoria	South Australia	Western Australia	Tasmania	Lord Howe Is.	New	Endemic	Total
<i>Melanagromyza</i>	13	3	14	1	1	4	8	1	1	18	23	28
<i>Ophiomyia</i>	15	10	25	5	2	2	5	1	2	15	25	35
<i>Tropicomyia</i>	1	1	1	-	-	-	-	-	-	-	1	1
<i>Japanagromyza</i>	2	1	2	-	-	-	-	-	1	3	4	5
<i>Agromyza</i>	2	-	1	-	-	-	-	-	-	3	3	3
<i>Phytobia</i>	2	1	1	1	-	1	1	-	4	8	9	9
<i>Amauromyza</i>	1	-	1	-	-	-	-	-	-	1	2	2
<i>Cerodontha</i>												
(<i>Icteromyza</i>)	2	1	2	1	-	-	1	-	-	-	-	2
(<i>Cerodontha s.s.</i>)	1	-	7	3	1	-	2	1	-	4	7	8
<i>Butomomyza</i>	1	-	1	1	-	-	1	1	-	-	1	1
<i>Phytoliriomyza</i>	6	1	13	5	3	5	5	-	-	15	19	21
<i>Calycomyza</i>	1	-	1	-	1	-	-	-	1	-	-	1
<i>Liriomyza</i>	1	2	10	3	3	7	8	1	1	12	14	18
<i>Pseudonapomyza</i>	4	2	4	1	-	1	1	-	-	6	6	7
<i>Phytomyza</i>	3	1	4	5	4	4	6	3	2	5	6	9
Total	55	22	87	26	15	24	38	8	12	88*	122	152*

* 4 not formally described.

3 species are known. The small genus *Pseudonapomyza* is well represented with 7 species but the dominant northern genus *Phytomyza* remains small, with only 9 species.

Agromyzidae in the Oriental region show a considerable reduction in species in comparison with the temperate areas of the northern hemisphere. This has been fully confirmed by personal collecting in India, Sri Lanka, Thailand, Malaysia, the Philippines and New Guinea. This is largely accounted for by the striking reduction in number of the two largest world genera, *Liriomyza* and *Phytomyza*. At the present time only 240 species in 18 genera are known in the Oriental region. In New Guinea, which is clearly the

immediate source area of the Australian Agromyzidae, the reduction in species is even more dramatic, with only 57 species known (Spencer, 1962a, 1977b; Sasakawa, 1963d), although certainly many more await discovery.

The affiliations and relationships of Australian species are discussed in greater detail later in the paper under each genus. Nevertheless it will be useful to summarize here some general conclusions which have become apparent regarding their origin, speciation and distribution within Australia.

There was certainly contact between Australia and New Guinea 30 to 35 million years B.P. and perhaps even earlier, and analysis of the relationships of the Australian Agromyzidae clearly indicates the differing times of their arrival or of their speciation from ancestral immigrants. Most of the northern species are found in rain forest habitats which only developed following contact with New Guinea (Melville, 1975).

Apart from introductions and species common to Australia and New Zealand, the remainder can be divided into three broad groups (Table 2):

1. Isolated species with unclear affiliations, possibly representing the oldest elements in the fauna.
2. Species showing clear relationships with others in the Oriental region, in some cases as detectable sister-species.
3. Species with virtually identical populations, either known from single localities or of wide occurrence in the Oriental region or the Pacific area.

Group 1: It is impossible to date accurately the arrival of species in this group or, more precisely, of their ancestors, as almost certainly speciation will have occurred since the arrival of the ancestral immigrants. It can only be postulated that they reached Australia from New Guinea at varying times between 30 million years B.P. (the earliest probable date) and the end of the Tertiary. Over 30 species can be included in this group.

Melanagromyza. M. avicenniae sp.n. feeding on mangroves is an exceptionally large species (in the Agromyzidae large size is generally accepted as a plesiomorphous character) and the genitalia reveal its isolated position. This (or its immediate ancestor) is believed to represent a pre-Pleistocene immigrant. *M. anceps* sp.n., a very much smaller species, but with similar genitalia, has probably evolved more recently in Australia.

Both *multiformis* and *praesignis* have genitalia showing a high degree of differentiation, suggesting that they may be ancient species. *M. variegata* sp.n. is an isolated species which is widely distributed in the south and is the only representative of the genus known in Tasmania. I suspect that this is of early origin.

Ophiomyia. The *pisi* group of leaf-miners, now including 7 species, lack the obvious external characters of the genus, but unless given separate generic status, can only be placed here. Only a single species is known in the Oriental region and it seems certain

Table 2

	Group 1. Isolated species	Group 2. Sister-species or close relatives in Oriental region	Group 3. Present in Oriental region/ Pacific area	Introductions	Present in New Zealand	Sister-species present in New Zealand
<i>Melanagromyza</i>	3	8	5	—	—	1
<i>Ophiomyia</i>	11	3	9	1	—	—
<i>Tropicomyia</i>	—	1	—	—	—	—
<i>Japanagromyza</i>	3	2	1	—	—	—
<i>Agromyza</i>	1	2	—	—	—	—
<i>Phytobia</i>	5	1	—	—	—	—
<i>Amauromyza</i>	—	2	—	—	—	—
<i>Cerodontha</i>						
<i>Icteromyza</i>	—	1	1	—	1	—
<i>Cerodontha</i>	6	2	—	1	1	1
<i>Butomomyza</i>	—	1	—	—	—	—
<i>Phytoliriomyza</i>	3	5	1	—	1	1
<i>Calycomyza</i>	—	—	1	—	—	—
<i>Liriomyza</i>	2	?	3	—	1	?
<i>Pseudonapomyza</i>	—	2	1	—	—	—
<i>Phytomyza</i>	—	2	—	3	2	2
	34	32*	22	5	6*	5

* 3 representing introductions.

that this group has evolved in Australia. *O. nuginiensis* (Sp.) was described from New Guinea and is now recorded from widely separated localities in northern Queensland and to the west of Alice Springs, Northern Territory. It is suggested that this represents a case of dispersal from Australia into New Guinea.

Agromyza. *A. illustris* sp.n. appears to be a relict species with no detectable affiliations. It has either undergone substantial evolutionary change which obscures its relationships or a living relative may await discovery, possibly in an uncollected area, such as southern China.

Phytobia. This is considered to be one of the most primitive genera in the family, with the larvae boring internally in trees. Among the nine species now confirmed in *Phytobia*, four are from Lord Howe Is. The largest, *liepae* sp.n., is known from a single female and its relationship cannot be established but it is certainly an ancient species. The three others, *insulana* sp.n., *macalpinei* sp.n. and *malabarensis* sp.n., are closely related and have clearly evolved in isolation on Lord Howe Is., presumably from an ancestral immigrant from eastern Australia. All have the costa reduced to vein R 4+5 and the second cross-vein is displaced basally, being either in continuation of the first (Fig. 197) or even basad of it (Fig. 204). The aedeagus of these three species could indicate distant relationship with *incerta* known from northern Queensland but this has entirely normal wing venation. *P. liepae* is probably not related to the *insulana* group and there have thus been two separate immigrations into Lord Howe Is. of this small genus. It is improbable that the three species in the *insulana* group would have evolved on an island as small as Lord Howe is today, measuring 9 x 1.25 km, and this is clear evidence that it is a remnant of a larger land mass, as postulated by Paramonov (1963). Mt Lidgbird, the oldest of the volcanic peaks, is considered to be at least of early Tertiary age (Standard, 1963) and the four *Phytobia* species can be accepted as mid-or late Tertiary relicts.

Cerodontha. The *robusta* group is unique to Australia. The male genitalia are known of *delectabilis* sp.n., *robusta*, *vittigera*, and *voluptabilis* sp.n. The general similarity in these four species suggests relatively recent speciation, but the basic form (Figs 225, 230) is not known elsewhere and it is considered that this group has evolved from an ancestral immigrant of pre-Pleistocene age.

Phytoliriomyza. The most primitive species included here is probably *pallidicentralis*. The strongly projecting frons (Fig. 254) is a plesiomorphous character: the form of the aedeagus (Figs 255, 256) is distinctive; and the presence of a well-developed group of bristles at the hind-corner of the epandrium suggests an ancestral relationship with *Calycomyza*.

Liriomyza. *L. primitiva* sp.n., known only from a high altitude in the Snowy Mts, New South Wales has retained the plesiomorphous character of a strongly projecting frons and I consider that its dark colour is primitive rather than due to secondary melanism. This probably represents a pre-Pleistocene species.

L. caulophaga is accepted as a primitive species but with speciation now occurring, reflected so far only in the male genitalia. The presence of the paired, strongly chitinized, hook-like process within the epandrium (Fig. 300) has hitherto been associated only with the genus *Cerodontha* which feeds exclusively on monocots. This species could represent a relict, morphologically near the ancestry of both *Cerodontha* and *Liriomyza*. Further detailed study and, in particular, the discovery of further host-plants is necessary for the further clarification of this extremely interesting species.

L. tenera sp.n. is an isolated species, probably of ancient origin.

Group 2: Species with clear relationships with others in the Oriental region or elsewhere in the north.

Numerous species, in several genera, can be directly associated with relatives in the Oriental region, in the Pacific area or further afield in the Palearctic or Nearctic regions. In some cases speciation is slight, in others speciation has developed further but relationships are clearly detectable. Keast (1959) has suggested that Australia was connected to New Guinea twice during the Pleistocene, but certainly there were other land connections during the Tertiary. If it is assumed—and it is a reasonable assumption—that the species in my Group 3 which are essentially identical in Australia and in areas to the north reached Australia during the last, recent land connection with New Guinea, it can then be postulated that pairs of sister-species now on either side of the Torres Straits have speciated following the break in the penultimate land connection, sometime during mid-Pleistocene. In cases where relationships are more remote but still detectable, with the speciation process further developed, it is suggested that populations reached Australia during an earlier, third land connection, either early in the Pleistocene or in late Tertiary. Species identified as belonging to this general group are briefly described below.

Melanagromyza. Many species, such as *humida* sp.n., *placata* sp.n., *proboscidea* sp.n. have genitalia which are individually distinct but entirely characteristic of the genus, indicating recent speciation. There are many close relatives in the Oriental region such as *M. cleomae* Spencer, 1961a and *M. hibisci* Spencer, 1961a. The genitalia of *trifilis* sp. n. and *trispina* Mall., both of which have 3 dorso-centrals, and of *dipodii* sp.n. feeding on an unusual host—*Dipodium punctatum* (Orchidaceae)—are not significantly differentiated. In two species, *grata* sp.n. and *hastata* sp.n., the aedeagus is typical but the form of the epandrium (Figs 26, 29) is apomorphous.

Ophiomyia. Several pairs of sister-species, one in Australia, the other in the north are detectable. *O. solanicola* feeding on *Solanum prinophyllum* in N.S.W. is not differentiated on external characters from *O. ferox* Spencer, 1977b in New Guinea, where the host is *Solanum ferox* L. There are slight differences in the aedeagus of the two species but in the larvae the posterior spiracles of *ferox* each have 3 bulbs, while in *solanicola* there are 5. *O. cymbonoti* sp.n. appears to be the sister-species of *nasuta* (Melander), a holarctic species feeding on *Taraxacum*. *O. cassiae* from Careel Bay, north of Sydney is closely related to *tremenda* Sp. from New Ireland.

Other species, such as *otfordensis* sp.n., *parvula* sp.n. and *subtilis* sp.n. are entirely typical of the genus and certainly closely related to others in the Oriental region.

Tropicomyia. *T. polyphyta* is closely related to *coffea* (Koningsberger) which is not uncommon in New Guinea and is widespread in the Oriental region. This species might have reached Australia during the last land connection but more probably earlier in the Pleistocene.

Japanagromyza. *J. fortis* from northern Queensland is without question the sister-species of *involuta* Sp. from New Guinea.

Both *badia* sp.n. and *howensis* sp.n. have enlarged cerci and the hypandrial apodeme greatly extended (Figs 170, 180) and are possibly derived from a single ancestral immigrant. *J. eucalypti* lacks these characters and has speciated from a separate immigrant. There are close relatives among the many species present in the Oriental region.

Agromyza. *A. mellita* sp.n. is accepted as the sister-species of *papuensis* Sasakawa from New Guinea.

Phytobia. *P. optabilis* is clearly related to a group of species known in Canada which includes *amelanchieris* (Greene), *betulivora* Sp. and *setosa* (Loew), cf. Spencer, 1969. The male genitalia of species present in intervening areas in the Oriental region have not been fully studied but a direct relative of *optabilis* can be expected there.

Cerodontha. *C. australis* and *milleri* have certainly speciated in Australia and can only be of Oriental ancestry which remains to be discovered (or may now be extinct). The nearest close relatives are *gracilis* Sp. (Alaska) and *occidentalis* Sehgal in Canada (cf. Spencer, 1969: Figs 241, 243).

Amauromyza. *A. queenslandica* sp.n. is accepted as the sister-species of *papuensis* Sp. from New Ireland and New Guinea.

Phytoliriomyza. Close relationships are detectable between Australian species and the three known in New Guinea. *P. cognata* sp.n. from Queensland is the sister-species of *spectata* Spencer; *polita* sp.n. from N.S.W. and Victoria, and *variana* sp.n. from N.S.W. and Western Australia are themselves sister-species and clearly related to *bidensiphoeta* Sp. and *sublima* Sp. from New Guinea. *P. striatella* sp.n. and *tricolor* Mall. are in an entirely different group and their nearest known relative is *P. nepalensis*, recently described from Nepal (Spencer, 1977a).

Liriomyza. No positive relationships of Australian species with those to the north are detectable but the Oriental/Holarctic origin is apparent in such typical species as *electa* sp.n., *inopinata* sp.n. and *lepida* sp.n.

L. meracula sp.n. has genitalia closely resembling those of the holarctic species *virgo* Zett. (cf. Spencer, 1976a: Figs 496, 497). If this does indicate relationship, there is a surprising gap in the now disjunct populations of the two species and a jump in host has also occurred, as *virgo* feeds exclusively on *Equisetum* which is not present in Australia.

Pseudonapomyza. *Ps. parilis* sp.n. is only known from rain forest at Otford, N.S.W. but is certainly the sister-species of *multimoda* Sp. recorded from four islands in the Bismarck Archipelago. *Ps. probata* sp.n. is related to *dilatata* Sasakawa, 1963c from Fiji and to the widespread Oriental species, *asiatica* Spencer, 1961a.

Phytomyza. The three species *clematidicola*, *pulchella* sp.n. and *placita* sp.n. are clearly related; the latter shows a striking relationship with *ranunculella* Sp. (incorrectly described in *Napomyza*) known from Israel and Turkey, feeding in the receptacle and young seeds of *Ranunculus* (Spencer, 1974: Figs 11,12). Related species are almost certainly present in intermediate areas, such as the Himalayas and the mountains of South East Asia. *P. ranunculicaulis* sp.n., known only from the south-west corner of Western Australia, is less obviously related to these species and appears to be derived from a separate immigrant from the north.

P. anthocercidis is a remarkable species, with genitalia clearly showing its relationship with leaf-miners on Ranunculaceae, such as *vitalbae* Kalt. (Fig. 377), and *orientalis* Spencer (cf. Spencer, 1977b: Fig. 48) known in New Guinea and Flores, both feeding on *Clematis*; and with *ranunculi* (Schrank), a common holarctic leaf-miner on *Ranunculus*. No leaf-miner is known on *Ranunculus* in Australia and *anthocercidis* has clearly made a jump in host to *Anthocercis* (Solanaceae) from an ancestral immigrant from the north, originally feeding either on *Clematis* or *Ranunculus* which has now become extinct.

Group 3: Species present in the Oriental region or Pacific area.

Twenty-two species are now confirmed in Australia and also elsewhere to the north (Table 2). Of these, 12—*Melanagromyza albisquama*, *M. metallica*, *M. sojiae*; *Ophiomyia atralis*, *O. centrosematis*, *O. conspicua*, *O. cornuta*, *O. phaseoli*; *Cerodontha (Icteromyza) piliseta*; *Calycomyza humeralis*; *Liriomyza brassicae* and *Pseudonapomyza spinosa*—are of wide occurrence and call for no special comment. The remaining ten are in five genera.

Melanagromyza. *M. declinata* is known from Bowral and the Snowy Mts, N.S.W. and also in Formosa. This apparently disjunct distribution almost certainly reflects inadequate collecting and the species will no doubt in due course be discovered in New Guinea and also in Queensland.

M. obtusa is of fairly wide distribution in the Oriental region and is known from India, Sri Lanka, Malaysia and New Guinea. Its present confirmation as new to Australia represents an interesting extension of its range.

Ophiomyia. *O. alysicarpi* was described from Fiji and there are records of leaf-mines in India; in Australia it is only known from Darwin. As this paper was being completed, it was realized that *O. papuana* Spencer (1977b) from New Guinea is possibly synonymous with *alysicarpi*. The species could certainly be expected in New Guinea.

O. mussauensis has previously only been known from islands of the Bismarck Archipelago and its confirmation in northern Queensland and at four localities in Arnhem Land, N.T. suggests that it will also be present in New Guinea.

O. nuginiensis was discovered in New Guinea in 1973 and has now been found in northern Queensland and the Alice Springs area, N.T. This is the only species in the *pisi* group known outside Australia and it represents a probable case of dispersal northwards from Australia during the most recent land connection with New Guinea.

O. rotata has hitherto only been known from Mindanao, Philippines. It is now confirmed in northern Queensland and at Millstream, W.A. This is a further interesting case illustrating the wide powers of dispersal of the Agromyzidae.

Japanagromyza. *J. kalshoveni* has previously only been known from Java and is now tentatively identified in both Queensland and the N.T.

Phytoliriomyza. *P. australensis* appears to be widespread in eastern Australia, although uncommon, and has been recorded as far south as Clyde Mt, N.S.W. It has recently been confirmed in Sri Lanka, is present in Nepal and in the Pacific has reached Tahiti. It may well be the sister-species of *arctica* Lundbeck (cf. Spencer, 1969: 202) which is widely distributed in the Holarctic region.

Liriomyza. *L. caulophaga* s.l. is widely distributed in Australia and is elsewhere only known in Lombok, Indonesia. In view of the primitive, possibly relict status of *caulophaga*, this could be another possible case of dispersal northwards from Australia.

L. compositella is widely distributed in the Oriental region from India and Sri Lanka to Hong Kong and New Guinea. The only record in Australia is from Lord Howe Is.

Only five species are accepted as introductions into Australia. Three *Phytomyza* species came with early settlers. *P. syngenesiae* and *P. plantaginis* are widespread and locally abundant in the temperate southern areas including Tasmania; *P. vitalbae*, feeding on several *Clematis* species, is equally common but has apparently not reached Tasmania. *Cerodontha australis* is a more complicated case. This appears to be restricted to the Sydney area but in the past has been confused with *milleri* which occurs widely from the east to the extreme south-west. *C. australis* is the commonest species in New Zealand, with enormous populations, from the north of North Is. to Stewart Is. and is also present on Norfolk Is., Chatham Is. and Snares Is. It is now suggested that *australis* speciated in New Zealand from an early immigrant from Australia from which *milleri* has also evolved and in recent times has been re-introduced to Sydney. *Ophiomyia lantanae* occurs widely with its food-plant and was introduced into Queensland in 1914 in an attempt to control the spread of *Lantana*.

Recent study of the Agromyzidae of New Zealand (Spencer, 1976b) has revealed that with the possible exception of one species and of *Phytomyza plantaginis* and *syngenesiae* introduced from Britain all are derived from ancestors from Australia or have arrived from Australia in recent times by aerial dispersal across the Tasman Sea. Only two modern Australian species, *Cerodontha (Icteromyza) triplicata* and *Liriomyza chenopodii*, are also present in New Zealand; in addition, *Phytoliriomyza variana* is present on Auckland Is. to the south. A further comparable case of long-distance dispersal is possibly represented by *Liriomyza antipoda* Harrison, 1976 which it is now considered may be synonymous with *obscurata* from N.S.W. Recent speciation is detectable in *Melanagromyza senecionella* Spencer, 1976b, closely related to *M. seneciophila*, and in two feeders on Ranunculaceae—*Phytomyza costata* Harrison, a leaf-

miner on *Ranunculus verticillaris* related to *P. clematidicola*, and *P. lyalli* feeding in stems of *R. lyallii*, related to *P. ranunculicola*.

Surprisingly, the present detailed study of the Australian Agromyzidae has failed to confirm the exact ancestral relationships of many other New Zealand species. This, it is believed, is the result of the relatively rapid speciation which has occurred in New Zealand. Only *Liriomyza primitiva*, a species known from a high altitude in the Snowy Mts, N.S.W., has genitalia definitely suggesting relationship with species such as *L. cianthi* Watt (Spencer, 1976b: Figs 22, 23), *L. vicina* Sp. (Spencer, 1976b: Figs 31, 32) or *L. urticae* Watt (Spencer, 1976b: Fig. 36).

Direct relationships between Agromyzidae in Australia and South Africa are obviously highly improbable. It is therefore interesting to note the clear relationship detectable between *Phytomyza clematidicola* (Figs 359, 360), *P. placita* (Figs 364, 365) and *P. pulchella* (Figs 368, 369) with the two South African species *P. renovata* (Spencer, 1963d: Figs 31a, b) and *P. eximia* (Spencer, 1964a: Figs 39, 40). Incidentally this provides interesting additional evidence that *eximia* and *renovata* feed on *Ranunculus* which had previously been suspected. A comparable case has been noted with *Amauromyza trisetata* (Spencer, 1959) from South Africa. It seems clear that these relationships are the result of parallel dispersal to the south into South Africa and Australia from common ancestral species which were probably present in the general area of the Himalayas—Western Asia.

In this context it is worth recording here the high proportion of *Ophiomyia* species with the squamal fringe white which is common to Australia and the Ethiopian region, mainly South Africa (Spencer, 1960), while this character is unusual in the northern hemisphere. The actual figures are as follows:

Australia	:	11 of 35 species
Africa	:	8 of 20
Europe	:	1 of 36
Canada	:	2 of 26

Admittedly, species with the squamal fringe white are not necessarily monophyletic but the disparity in species with this character between those in the southern and northern hemispheres must be based on more than coincidence. However, I am unable to offer a plausible explanation at the present time.

Knowledge of the Australian Agromyzidae, despite the considerable amount of collecting undertaken in recent years, is still so incomplete that caution is required when attempting to analyse distribution within Australia. Available information on the distribution of genera by States is shown in Table 1. Despite some obvious distortions due to inadequate collecting, particularly in the Northern Territory and Victoria, a general pattern is now apparent which will change in detail with further collecting but which reflects reasonably accurately a number of aspects of the distribution of the family.

N.S.W. has by far the largest number of species, with almost 60% of the total known in Australia. This may in part be due to the more intensive collecting carried out here but is probably the natural result of the State having such a wide range of environment, including patches of rain forest, wet and dry sclerophyll forest, the highest mountains in the country and semi-arid areas. Most Agromyzidae in Australia could find a suitable habitat in N.S.W.

Queensland is the State with the next best representation but the proportion is significantly less, only 37%. The reduction in *Liriomyza* to only a single species out of the total of 18 is not entirely surprising, as this is well known as an essentially temperate genus.

The paucity of species in the N.T., with only 15% of the total, must be in part due to lack of collecting but also accurately reflects the limited rain forest similar to that in Queensland and the lack of any truly temperate areas. The small number of species in Victoria and South Australia is due to the dramatic reduction in the more tropical genera—*Melanagromyza* and *Ophiomyia* (*Tropicomyia* is of course also absent) but some additional species will certainly be discovered with further collecting.

The reduction in species southwards is most clearly seen in Tasmania where eight species are known, a mere 5% of the total. Further species must be present but during two days' collecting on Mt Wellington and in the Mt Field National Park in January, 1961, I was able to find only the two common species, *Liriomyza brassicae* and *Phytomyza syngenesiae*. With both Tasmania and New Zealand having continental Australia as the source area for their Agromyzidae and Tasmania being connected to the mainland as recently as late Pleistocene, it is remarkable that New Zealand should have a much larger fauna, with 43 species.

Recent collecting in Western Australia by Dr Colless in 1971 and by myself in 1975 has provided a reasonably clear picture of the Agromyzidae. With 38 species, or 25% of the total, representation is relatively poor. No specialist collecting has been undertaken in the north, and the Kimberleys and the Wyndham area remain uninvestigated. Even in the south-west, considering the richness of the flora, where over 3,600 species of ferns, Gymnosperms and Angiosperms are known compared with 2,500 for the whole of South Australia and 2,700 for the N.T. (Marchant, 1973), surprisingly few Agromyzidae could be found. The more arid agricultural areas east and north of Perth predictably have even fewer species. The great majority of Western Australian species are of wide distribution, with only nine being endemic (based on existing knowledge!).

Twelve species have been confirmed on Lord Howe Is., of which five are new and endemic. The widespread species *Melanagromyza metallica*, *Ophiomyia conspicua* and *Calycomyza humeralis* call for no special comment. *Ophiomyia pisi* is now known to be widely distributed in Australia with records from Queensland and Western Australia. The

Phytomyza sp. known only from leaf-mines on *Clematis* is possibly *vitalbae* which is abundant and almost equally widely distributed. Both could be introductions or may well have reached the island by aerial dispersal. *Japanagromyza howensis* appears to be an ancient species derived from an early ancestral immigrant. The four *Phytobia* species are of the greatest interest and can only be explained in the light of the geological history of the island. *P. liepae* is in a separate evolutionary line from *insulana*, *macalpinei* and *malabarensis* which themselves form a compact monophyletic group. Speciation of the *insulana* group must have occurred when the land area was substantially larger sometime in the Tertiary and *liepae* is probably of similar age.

The basic reason for the limited number of genera and species present in Australia is the impoverishment of the family in the primary source area. With relatively few species available in New Guinea to colonize Australia from Tertiary to recent time, even the considerable speciation and radiation which has occurred has inevitably sufficed only to produce a relatively sparse fauna.

For successful radiation Agromyzidae require three essential conditions—suitable host-plants in adequate numbers, a relatively high humidity and moderate temperatures. Excessive humidity can be tolerated better than great aridity and cold can be tolerated far better than heat. The Australian flora is without question sufficiently varied to provide the base for a far larger Agromyzid fauna. The main limiting factors must therefore be aridity and high temperatures. Despite the enormous size of the continent, only restricted areas at the present time offer optimum conditions for Agromyzidae to flourish.

During much of the Pleistocene the Australian climate was far more humid than at present. The ranges of many plants, including hosts of Agromyzidae, would have been far more extensive until the onset of the present arid conditions at the end of the Pleistocene. I believe it could only have been during this period that most ancestral species were able to achieve the extensive dispersal which has taken place and which accounts for modern patterns of distribution. With increasing aridity small relict patches of the formerly more widely distributed flora have remained in 'oases' or 'islands' where water is present or humidity is retained by suitable soil conditions, and these frequently widely isolated areas maintain a rich insect fauna. In Western Australia Agromyzidae were found in three such areas—at Ninghan Station north of Wubin where springs from Mt Singleton provide water throughout the year; a small damp area at Coolgardie near the road to the station and a larger isolated area represented by the Porongurups. Millstream, further north in the Pilbara district, appears to be a similar area. These now disjunct islands support numerous species scattered throughout the more arid regions and now split into isolated, fragmented populations.

An interesting adaptation to facilitate survival through the hot summers when the temperature can exceed 45 C (112°F) even in the south of Western Australia was noted in

Liriomyza oleariana and *L. scaevolae*. The summer is passed in the pupal stage, with the puparia remaining deep in the leaf and thus within a humid micro-environment and fully protected from the extreme external temperature. It is interesting to note that a comparable adaptation is found in some Mediterranean species, though not in the genus *Liriomyza*.

The dispersal of temperate genera such as *Liriomyza* and *Phytomyza* from the extreme north through the tropics and at least some arid areas is difficult to comprehend but it has clearly taken place. Paramonov (1959: 165) suggests that Diptera are able to disperse easily because they are strong flyers. This is not the case in the Agromyzidae which are weak flyers and their extraordinary mobility is due to their passive aerial dispersal. However, it must be stressed that the prior condition for successful long-distance dispersal is the availability of suitable hosts at successive points of landfall. In general, plants are able to disperse less readily than highly mobile insects and, with greater isolation, speciate more frequently. It was found, for example, that a number of Western Australian endemics, such as *Clematis pubescens*, *Helichrysum cordatum* and *Senecio ramosissimus*, serve as hosts for identical Agromyzidae on *Clematis aristata*, *Helichrysum bracteatum* and other *Senecio* spp. in the east. Paramonov (1959: 166) emphasizes the general distinctness of the fauna of the south-west corner of W.A. from that of the south-east but comments "There is no marked distinction between their dipterofaunas". This is fully confirmed in the Agromyzidae.

The wide east-west range of many Agromyzidae is matched by a comparably wide range of a number of species from north to south. One of the most southerly patches of rain forest, on Clyde Mt, N.S.W. has been colonized, for example, by *Tropicomyia polyphyta*, and *Pseudonapomyza spinosa* is present at Darwin and at Alice Springs, N.T., and has recently been discovered north of Adelaide, S.A. There are many examples of such wide east-west and north-south ranges but other species are rigidly restricted by their host association either to the tropical north (*Japanagromyza kalshoveni* on *Antidesma bunius*) or the temperate south (*Phytomyza anthocercidis* on *Anthocercis littorea*).

The general aspects of the zoogeography of Australian Diptera have been discussed by Mackerras (1950) and Paramonov (1959), and of Australian insects in general but with special reference to the Homoptera by Evans (1959). The analysis of the Agromyzidae given above provides detailed supporting evidence for the postulates of these three workers. It seems pointless to attempt to group the Agromyzidae into faunal provinces (Torresian, Bassian) as these are merely self-evident reflections of differing geographical and climatic conditions, and with their great mobility and tolerance of varying environments which can always equal that of their hosts, they cannot easily be classified by clear-cut geographical areas.

Host-plants of Australian Agromyzidae (see list p.239)

Of the 150 Australian Agromyzids the host is known of 44 (30%). As in other parts of the world, the greatest number of species (in Australia 13) feed on Compositae.

There is a high degree of host specificity in the Agromyzidae, most species feeding on only a single plant genus or family but a number feed also on related families, such as *Liriomyza chenopodii* on the Caryophyllaceae and Chenopodiaceae (both in the Order Caryophyllales of the subclass Caryophyllidae, cf. Cronquist, 1968) or *Liriomyza brassicae* on the Capparaceae and Cruciferae (both in Order Capparales of the subclass Dilleniidae). Polyphagy is rare, with only ten species in the world feeding on a wide range of unrelated hosts. *Tropicomyia polyphyta* is a striking example of a polyphagous species, feeding on 25 families but never on the Compositae.

Jumps in host selection from one host to an unrelated one are obviously highly exceptional; if this were not so, the rigid host specificity of the great majority of species would not be maintained. Nevertheless, three clear examples are apparent in Australia. *Liriomyza chenopodii* (hosts: Chenopodiaceae, Caryophyllaceae) is clearly related to *L. oleariana* (only known host: *Olearia axillaris*); *Liriomyza meracula* (host unknown) appears to be related to *L. virgo* in the northern hemisphere (host: *Equisetum*, not present in Australia); and *Phytomyza anthocercidis* (host: *Anthocercis littorea*) is closely related to *P. ranunculi* and *P. vitalbae* (hosts: *Ranunculus* and *Clematis* respectively).

Speciation of the Agromyzidae has frequently occurred on closely related plant species or genera. Examples are *Melanagromyza seneciophila* on many *Senecio* spp. in Australia and *M. senecionella* on *S. minimus* and the introduced *S. jacobaea* in New Zealand; *Ophiomyia solanicola* on *Solanum prinophyllum* and *O. ferox* on *S. ferox* in New Guinea; *O. pisi* on *Pisum* and *Trifolium* and *O. indigoferae* on *Indigofera*; *Phytomyza ranunculicaulis* on *Ranunculus colonorum* in Australia and *P. lyalli* on *R. lyallii* in New Zealand. In some cases this may represent normal allopatric speciation but in others the speciation process may have resulted directly from the change in host.

A wide range of endemic plants have not been colonized by Agromyzidae. This applies particularly to the numerous species present in arid habitats such as the Stirling Ranges in W.A. Even *Eucalyptus*, with over 600 species, serves as host only to a single species, *Japanagromyza eucalypti*, known only on *E. camaldulensis*. *Eucalyptus* has been present in Australia since mid-Tertiary and there has thus been ample time for radiation to have occurred on this genus. It is puzzling that this has not taken place. The Papilionaceae is a favourite host family in the northern hemisphere. Many endemics were examined in W.A. Leaf-mines of Micro-Lepidoptera were found on a number of species, such as *Oxylobium atropurpureum* Turez (Stirlings), *Kennedia coccinia* Vent. (Pemberton) and *Banksia speciosa* R. Br. (Hopetoun) but no Agromyzid mines were found. The most probable explanation seems to be that the Agromyzidae are relatively recent arrivals in Australia—early Pleistocene or late Tertiary—and this period has not been sufficiently long for the colonization of unfamiliar hosts to have developed.

Definitions & Abbreviations

1. Under 'Material seen' only new material has been listed which has become available since my earlier paper (Spencer, 1963a).

2. For-convenience species have normally been discussed in alphabetical sequence and I have not attempted groupings by relationship, as there are still too many species where affinities have not been established or clarified.

3. In discussion of external morphology the following terms and abbreviations have been used:

chaetotaxy (see Colless and McAlpine, 1970: Figs 34.1, 34.5)

ori lower orbital bristle(s)

ors upper orbital bristle(s)

acr acrostichal hairs

dc dorso-central bristle(s), the strongest considered as the first

prsc pre-scutellar bristles

wing (see Colless and McAlpine, 1970: Fig. 34.34 but cross-veins without designation)

second costal section costal section between the ends of veins R1 and R2+3

third costal section costal section between the ends R2+3 and R4+5

fourth costal section costal section between the ends of R4+5 and M1+2.

first cross-vein radio-medial vein (r-m), the shorter, inner cross-vein (Fig. 53)

second cross-vein medial vein (m-m), the longer, outer cross-vein (Fig.53)

4. The following abbreviations have been used for museums or collections where types are deposited:

AC	—	Author's collection
AM	—	Australian Museum, Sydney
ANIC	—	Australian National Insect Collection, Canberra
BM	—	British Museum (Natural History)
QM	—	Queensland Museum, Brisbane
SPHTM	—	School of Public Health & Tropical Medicine, Sydney
W.A.M.	—	Western Australian Museum

5. Fifty-three collectors have provided material examined in the present study; the most frequent have been abbreviated in the text as follows:

D.H. Colless	—	D.H.C.	A.O. Nicholls	—	A.O.N.
I.F.B. Common	—	I.F.B.C.	K.R. Norris	—	K.R.N.
G.A. Holloway	—	G.A.H.	S.J. Paramonov	—	S.J.P.
Z. Liepa	—	Z.L.	E.F. Riek	—	E.F.R.
D.K. McAlpine	—	D.K.M.	K.A. Spencer	—	K.A.S.

6. States and territories of Australia, where abbreviated, are:

A.C.T.	—	Australian Capital Territory
N.S.W.	—	New South Wales
N.T.	—	Northern Territory
Qld.	—	Queensland

S.A.	— South Australia
Tas.	— Tasmania
Vic.	— Victoria
W.A.	— Western Australia

Key to genera of Australian Agromyzidae

1.	Sub-costa developed throughout its length (Fig. 1), coalescing with R1 before reaching costa (sub-family Agromyzinae)	...	...	...	...	...	...	...	...	2
—	Sub-costa becoming a fold distally (Fig. 2) and ending in costa separately and basad of R1 (sub- family Phytomyzinae)	...	...	...	...	...	...	...	...	6
2.	Prsc lacking	...	...	...	...	...	...	...	...	3
—	Prsc present	...	...	...	...	...	...	...	...	5
3.	Male without vibrissal fasciculus; raised facial keel lacking; jowls deepest in centre	...	...	...	...	...	...	...	...	4
—	Male frequently with vibrissal fasciculus (Fig. 111); raised facial keel frequently present; jowls normally deepest in front (Fig. 110); male genitalia; aedeagus asymmetrical, spinulose (Fig. 121) or ending in long, paired tubules (Fig. 138); larva forming stem-or leaf- mines (in <i>lantanae</i> feeding in receptacle and seeds)	...	...	...	...	...	...	...	...	<i>Ophiomyia</i> Braschnikov
4.	Minute species, wing length 1.4-1.6 mm; male genitalia: aedeagus as in Figs 164, 165; larva forming epidermal mines	...	...	...	...	...	...	...	...	<i>Tropicomyia</i> Spencer
—	Larger species; larva feeding internally in stems, flower-heads or pods	...	...	...	...	...	...	...	...	<i>Melanagromyza</i> Hendel
5.	2 pairs of dc	...	...	...	...	...	...	...	...	<i>Japanagromyza</i> Sasakawa
—	At least 3 pairs of dc	...	...	...	...	...	...	...	...	<i>Agromyza</i> Fallén
6.	Orbital setulae erect, reclinate or absent	...	...	...	...	...	...	...	...	7
—	Orbital setulae proclinate	...	...	...	...	...	...	...	...	16
7.	Halteres black	...	...	...	...	...	...	...	...	8
—	Halteres white, yellow or at most partially darkened	...	...	...	...	...	...	...	...	9
8.	Entirely black species	...	...	...	...	...	...	...	...	<i>Amauromyza</i> Hendel
—	Not so	...	...	...	...	...	...	...	...	<i>Phytoliriomyza</i> Hendel (p.p.)

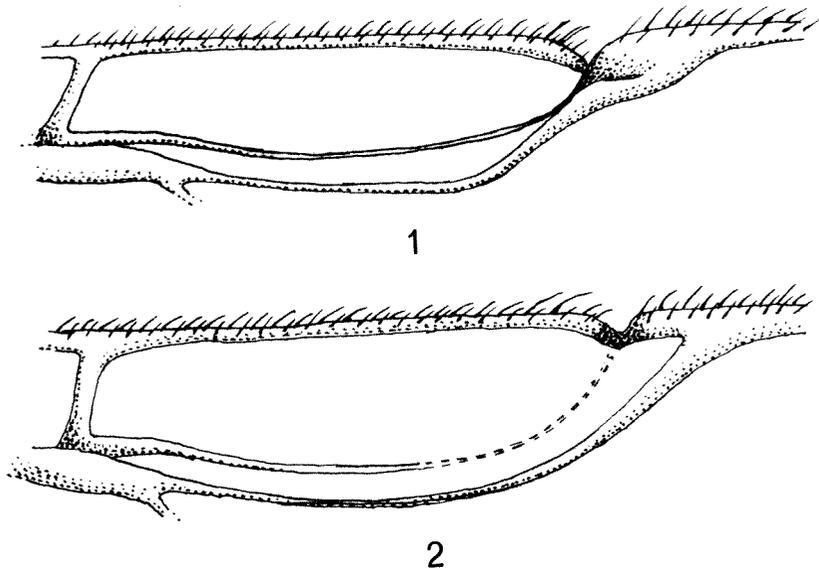
9. Third antennal segment with a spine or at least angular at upper corner, scutellum with only 2 bristles; or lunule conspicuously higher than a semi-circle, approximately triangular; or lunule large and broad and antennal bases widely separated *Cerodontha* Rondani
- Not so 10
10. Costa ending at vein R4+5 11
- Costa extending to vein M1+2 12
11. 3+1 dc *Phytobia* Lioy (p.p.)
- 3+0 dc; if presutural dc present, third antennal segment angulate (*pudica* sp.n.) *Pseudonapomyza* Hendel
12. Scutellum entirely dark, black or grey 13
- Scutellum yellow or at least partially paler 15
13. Vein R4+5 ending nearest wing tip *Phytobia* Lioy (p.p.)
- Vein M1+2 ending nearest wing tip 14
14. Pre-sutural dc present; second cross-vein present or lacking *Phytoliriomyza* Hendel (p.p.)
- Pre-sutural dc lacking; second cross-vein present *Calycomyza* Hendel
15. Scutellum normally bright yellow, at least centrally, rarely only slightly paler (in *helichrysi* and *primitiva*); male genitalia: surstyli always discrete, with at most 1 or 2 bristles (Fig. 310), epandrium never with strong bristles internally (cf. Fig. 243) *Liriomyza* Mik
- Scutellum dark or slightly yellowish centrally; halteres sometimes distinctly darkened; male genitalia: surstyli either discrete or fused with epandrium (Figs 261, 264), frequently with numerous strong bristles (Fig. 274), epandrium frequently with strong bristles internally (Figs 243, 253) *Phytoliriomyza* Hendel (p.p.)
16. Costa extending to vein M1+2 *Phytoliriomyza* Hendel (p.p.)
- Costa ending at vein R4+5 *Phytomyza* Fallén

SUB-FAMILY AGROMYZINAE
Genus *Melanagromyza* Hendel, 1920

Melanagromyza Hendel, 1920: 120

Type species: *Agromyza aeneoventris* Fallén, 1823a.

Hendel erected this genus for species having black halteres, which had previously been included in *Agromyza*. This concept has remained essentially valid but more recent genitalia studies have shown that a number of species, such as *alysicarpi* (Bezzi) and *conspicua* Spencer, correctly belong in *Ophiomyia*, although they lack the distinctive external characters of this genus—the raised keel dividing the base of the antennae and the male vibrissal fasciculus. *Melanagromyza* also has a well-defined biological basis.



Figs 1, 2: 1, subcosta of sub-family Agromyzinae; 2 subcosta of sub-family Phytomyzinae.

The great majority of species are internal stem-borers. This feeding habit is slightly modified in a few species; examples in Australia are *albisquama* (Mall.) feeding in seed-pods and *dipodii* sp.n. in the flowers. In the larvae the mandibles and cephalo-pharyngeal skeleton of *Melanagromyza* species are not differentiated from those of *Ophiomyia* but the distinctive posterior spiracles, with an ellipse of pores or 'bulbs' surrounding a chitinized horn-like structure (Figs 9, 58), represent a valid generic character.

Melanagromyza can be recognized by the following combination of characters: subcosta well-developed and joining vein R₁; normally only 2 pairs of strong dc (rarely 3 or

even 4), costa extending to M1+2, second cross-vein always present; head, all antennal segments and legs black; halteres normally black or dark brown, rarely variegated (in Australia *decapitata* sp.n., *variegata* sp.n.). The mesonotum and abdomen are frequently greenish but some species are entirely black. The colour of the squamal fringe, which may be either white or black, is an important differentiating character. In Australia, 28 species are now recorded, of which 18 are new.

Twenty-four species were previously included in *Melanagromyza* (Spencer, 1963a). Eleven of these have been or are now transferred to *Ophiomyia*: *alysicarp*, *cassiae*, *centrosemat*, *conspicua*, *dianellae*, *indigoferae*, *paramonovi*, *phaseoli*, *pisi*, *placida* and *wikstroemiae*; *polyphyta* was transferred to *Tropicomyia* by Spencer (1973a). Two species—*alternata* Sp. and *piliseta* (Mall.)—previously recorded are now considered to represent misidentifications.

The illustrations of the male genitalia given below clearly indicate the close relationship and presumably recent speciation of many of the Australian species. Pairs of probable sister-species are *grata* and *pseudograta*; *placata* and *pseudoplacata*; *proboscidella* and *prodigiosa*; *anceps* and *avicenniae*. The form of aedeagus in the latter pair has diverged considerably from the structure typical of the genus, probably reflecting long isolation on mangroves.

Only 4 Australian species—*albisquama*, *declinata*, *metallica* and *obtusa*—are also present elsewhere in the Oriental region to the north. *M. metallica* now recorded on Lord Howe Is. has doubtless reached the island by aerial dispersal from New South Wales or Queensland. Only a single species, *senecionella* Spencer, 1976b, is present in New Zealand; this has only slightly diverged from its sister-species, *seneciophila*, which has large but local populations in Western Australia and South Australia.

The distribution of *Melanagromyza* is essentially tropical. It is the second largest genus in the family and is the dominant genus in the tropics of Africa, Asia, northern Australia and South America. Over 300 species have now been described and it is certain that many more await description. In the temperate areas of Europe and North America the genus is greatly reduced and the number of species declines rapidly northwards. In Australia 13 species are known in Queensland compared with only one in Tasmania.

On external characters the 11 species previously included in *Melanagromyza* and now transferred to *Ophiomyia* cannot in all cases be reliably placed generically and for convenience they are therefore included in the key given below.

Key to Australian *Melanagromyza* species
(including also species in the genera *Ophiomyia* and *Tropicomyia*)

- | | | |
|----|--|----|
| 1. | Squamal fringe pale, white or ochrous | 2 |
| — | Squamal fringe dark, black or brown | 22 |

2.	3 dc	...	...	...	...	...	...	...	...	3
—	2 dc	...	...	...	...	...	...	...	...	4
3.	Large species, wing length 3 mm	...	...	...	...	...	...	...	<i>trispina</i> (Malloch)	
—	Small species, wing length 2.1 mm	...	...	...	...	...	...	...	<i>trifilis</i> sp.n.	
4.	Orbital setulae numerous, all proclinate	...	...	...	...	...	...	...	<i>declinata</i> Sasakawa	
—	Orbital setulae mainly reclinate or upright, at most a few below proclinate	...	...	...	...	...	...	...		5
5.	Broad, U-shaped epistoma above mouth margin; 6 orbital bristles; large species, wing length 2.5-3.2 mm	...	...	...	...	...	...	...	<i>epistomella</i> sp.n.	
—	Mouth margin normal, without conspicuous epistoma	...	...	...	...	...	...	...		6
6.	Mesonotum largely black	...	...	...	...	...	...	...		7
—	Mesonotum distinctly greenish	...	...	...	...	...	...	...		10
7.	Abdomen distinctly greenish	...	...	...	...	...	...	...		8
—	Abdomen black, similar to mesonotum	...	...	...	...	...	...	...		9
8.	Mesonotum conspicuously shining	...	...	...	...	...	...	...	<i>sojae</i> (Zehntner)	
—	Mesonotum distinctly mat	...	...	...	...	...	...	...	<i>seneciophila</i> Spencer	
9.	Large species, wing length 2.4-2.5 mm	...	...	...	...	...	...	...	<i>dipodii</i> sp.n.	
—	Smaller species, wing length 1.5-2 mm	...	...	...	...	...	...	...	<i>Ophiomyia atralis</i> (Spencer)	
		...	...	...	...	...	...	...	<i>Ophiomyia dianellae</i> , (Kleinschmidt)	
10.	Arista appearing bare (at binocular magnification x 40)	...	...	...	...	...	...	...		11
—	Arista pubescent	...	...	...	...	...	...	...		14
11.	Large species, wing length 2.2-2.7 mm	...	...	...	...	...	...	...	<i>apii</i> Hering	
—	Smaller species, wing length 1.6-2.1 mm	...	...	...	...	...	...	...		12
12.	Eye in male bare	...	...	...	...	...	...	...		13
—	Eye in male pilose	...	...	...	...	...	...	...	<i>specifica</i> Spencer	
13.	Frons equal to width of eye; jowls 1/6 eye height; wing length 1.6-2 mm	...	...	...	...	...	...	...	<i>verdescens</i> Spencer	
—	Frons broader, 1½ times width of eye; jowls ¼ height of eye; wing length 2-2.1 mm	...	...	...	...	...	...	...	<i>hastata</i> sp.n.	
14.	Ocellar triangle large, broad, apex almost at margin of lunule, shining greenish	...	...	...	...	...	...	...	<i>obtusa</i> (Malloch)	
—	Ocellar triangle smaller, not green	...	...	...	...	...	...	...		15

15.	Eye in male bare	...	...	...	...	...	...	...	...	16
—	Eye in male pilose	...	...	...	...	...	...	...	...	19
16.	Ocellar triangle and orbits conspicuously shining; arista long, equal to height of eye, strongly pubescent	...	...	...	...	...	...	...	<i>grata</i> sp.n.	
—	Ocellar triangle and orbits less shining; arista less pubescent, shorter, at most $\frac{3}{4}$ height of eye	...	...	...	...	...	...	...	...	17
17.	Small species, wing length 1.7-2 mm	...	...	...	...	...	...	...	...	18
—	Larger species, wing length 2-2.5 mm	...	...	...	...	...	...	...	<i>pseudograta</i> sp.n.	
18.	Aedeagus as in Figs 3, 4	...	...	...	...	...	...	...	<i>albisquama</i> Malloch	
—	Aedeagus as in Figs 35, 36	...	...	...	...	...	...	...	<i>multiformis</i> sp.n.	
19.	Eye in female bare; jowls narrow, $\frac{1}{10}$ height of eye	...	...	...	...	...	...	...	...	20
—	Eye in female pilose; jowls broader, $\frac{1}{7}$ height of eye	...	...	...	...	...	...	...	<i>humida</i> sp.n.	
20.	Frons narrow, equal to width of eye	...	...	...	...	...	...	...	...	21
—	Frons broader, $1\frac{1}{2}$ times width of eye; mesonotum distinctly mat, greenish	...	...	...	...	...	...	...	<i>placata</i> sp.n.	
21.	Mesonotum moderately shining; aedeagus as in Figs 32, 33	...	...	...	...	...	...	...	<i>metallica</i> (Thomson)	
—	Mesonotum brilliantly shining; aedeagus as in Figs 51, 52	...	...	...	...	...	...	...	<i>pseudoplacata</i> sp.n.	
22.	Halteres partially pale, white or yellow	...	...	...	...	...	...	...	...	23
—	Halteres uniformly dark, brown or black	...	...	...	...	...	...	...	...	24
23.	Halteres white above, black below; last section of vein M3+4 $\frac{1}{2}$ penultimate	...	...	...	...	...	...	...	<i>decapitata</i> sp.n.	
—	Halteres yellowish in area of suture; last section of M3+4 longer, $\frac{3}{4}$ penultimate	...	...	...	...	...	...	...	<i>variegata</i> sp.n.	
24.	Mesonotum and abdomen distinctly greenish	...	...	...	...	...	...	...	<i>blanda</i> sp.n.	
—	Mesonotum and abdomen black	...	...	...	...	...	...	...	...	25
25.	3 dc	...	...	...	...	...	...	...	...	26
—	2 dc	...	...	...	...	...	...	...	...	28
26.	Proboscis elongate	...	...	...	...	...	...	...	<i>proboscidella</i> sp.n.	
—	Proboscis short, normal	...	...	...	...	...	...	...	...	27
27.	Exceptionally large species, wing length 3.2-4 mm	...	...	...	...	...	...	...	<i>avicenniae</i> sp.n.	
—	Smaller species, wing length in male 2.1 mm	...	...	...	...	...	...	...	<i>prodigiosa</i> sp.n.	

28. Third antennal segment with fringe of whitish pubescence 29
 — Third antennal segment with normal pubescence 30
 29. Aedeagus as in Figs 5, 6 *anceps* sp.n.
 — Aedeagus as in Figs 89, 90 *Ophiomyia conspicua* (Spencer)
 30. Large species, wing length in male 2.7-2.8 mm *praesignis* sp.n.
 — Smaller species, wing length at most 2.4 mm 31
 31. Ocellar triangle long, narrow, brilliantly shining *Ophiomyia phaseoli* (Tryon)
 — Ocellar triangle shorter, normal 32
 32. Arista conspicuously plumose (Fig. 97) *Ophiomyia deceptiva* sp.n.
 — Arista bare or with shorter pubescence 33
 33. Jowls broad, 1/3 height of eye; wing length 2-2.3 mm *Ophiomyia pullata* sp.n.
 — Jowls at most 1/5 height of eye 34
 34. Mesonotum conspicuously mat *Ophiomyia wikstroemiae* (Kleinschmidt)
 — Mesonotum at least moderately shining black 35
 35. Last and penultimate sections of vein M3+4 equal *Ophiomyia* species (couplet 18)
 — Last section of M3+4 distinctly shorter than penultimate 36
 36. Aedeagus as in Figs 164, 165 *Tropicomyia polyphyta* (Kleinschmidt)
 — Not so *Ophiomyia* species (couplet 21)

Melanagromyza albisquama (Malloch, 1927)

(Figs 3, 4)

Agromyza (*Melanagromyza*) *albisquama* Malloch, 1927: 425.

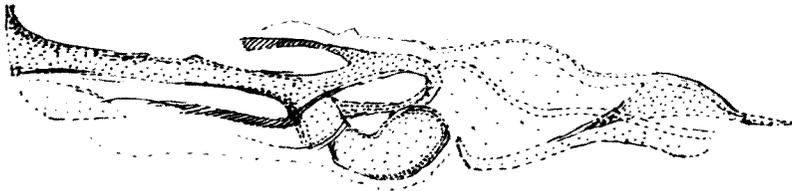
Melanagromyza albisquama, Spencer, 1963a: 311.

Melanagromyza leguminum Bezzi, 1928 (synonymy established by Spencer, 1963a: 311).

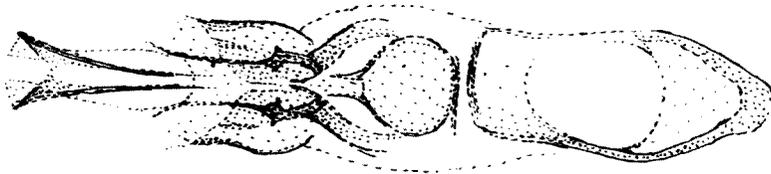
Holotype ♂ from Eccleston, N.S.W. in SPHTM.

Important characters of this shining green species are the bare eyes, pubescent arista and small size, with the wing length ranging from 1.6 mm in the male to 2.2 mm in the female. The aedeagus is shown in Figs 3, 4.

M. leguminum from Fiji was bred from 'pods of No. 51 C.T.W.' C.T. White was a botanist at the Queensland Herbarium, Indooroopilly. It was hoped that records of



3



4

Figs 3, 4: *Melanagromyza albisquama*: 3, aedeagus, side view; 4, same, ventral view.

White's collecting might have been preserved, indicating the actual host of *leguminum*. However, Dr S.L. Everist, the present Director of the Herbarium, has informed me in correspondence that no reference to 'No. 51' can be found. In Mauritius *albisquama* (as *desmodii* Spencer) has been bred from pods of *Desmodium frutescens* Walp. (Spencer, 1965c: 241).

M. albisquama is widespread in northern Australia. The synonymy with *leguminum* establishes that the host or hosts are in the Papilionaceae but the actual species remain to be discovered. The closest relative appears to be *pseudograta* sp.n. (if it is accepted that the host of this species is *Glycine clandestina*, cf. p. 53). Distribution of *albisquama* extends throughout the Old World tropics from Micronesia to the Cape Verde Islands.

Material seen

Qld: Junction of Goldmine & Davies Creeks, Kuranda-Mareeba Rd., 1♂, 1♀, 3.v.67 (D.H.C.); 14.4 km. N.E. of Ingham, 1♂, 8.vii.71 (Z.L.); Big Mitchell Creek, Mareeba-Molloy Rd., 3♂, 4.v.67 (D.H.C.); Tinaroo Falls Dam, 1♂, 8.vii.71 (Z.L.); CSIRO Farm, Woodstock, near Townsville, 2♂, 1♀, 17.vi.63 (N.E. Grylls). N.T: Berry Springs, 1♂, 15.vi.64 (K.R. Norris). N.S.W: Kororo Basin, near Coffs Harbour, 1♂, 22.v.66 (Z.L.).

Melanagromyza anceps sp.n.

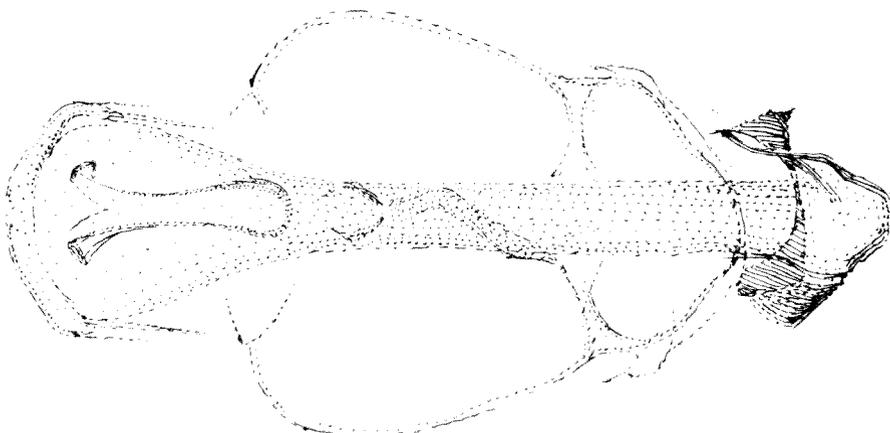
(Figs 5, 6)

Small black species, with black squamal fringe.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae slender, reclinate; ocellar triangle narrow, finely extending below level



5



6

Figs 5, 6: *Melanagromyza anceps*: 5, aedeagus, side view; 6, same, ventral view.

of lower ors, lunule semicircular; jowls narrow, 1/10 height of eye; third antennal segment rounded above, flatter below, with conspicuous fringe of white pubescence; arista minutely pubescent, 3/4 height of eye.

Mesonotum: 2 dc; acr irregularly in 6 rows, isolated hairs extending behind level of first dc.

Wing: length in male 1.9 mm, last section of M3+4 $2/3$ penultimate, first cross-vein distinctly beyond midpoint of discal cell.

Legs: mid-tibiae apparently without lateral bristles.

Colour: frons sooty black, ocellar triangle distinctly shining; mesonotum and abdomen moderately shining; squamae grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 5, 6; ninth sternite broad at base, triangular, fused at apex, without extended hypandrial apodeme; ejaculatory apodeme long, only slightly shorter than aedeagus; surstyli rounded, extending inwards, with a fringe of very short bristles.

Holotype ♂, Qld: W. Garnet River, 19 km S. of Proserpine, 18.xii.61 (D.K.M. and R. Lossin), in AM.

Remarks

The aedeagus of this species is of the same general form as in *avicenniae* sp.n. (Figs 10, 11) and the two are certainly closely related. This is a striking example of the significance of the male genitalia in indicating relationships which would not otherwise have been suspected.

Melanagromyza apii Hering, 1951

(Figs 7-9)

Melanagromyza apii Hering, 1951: 736.

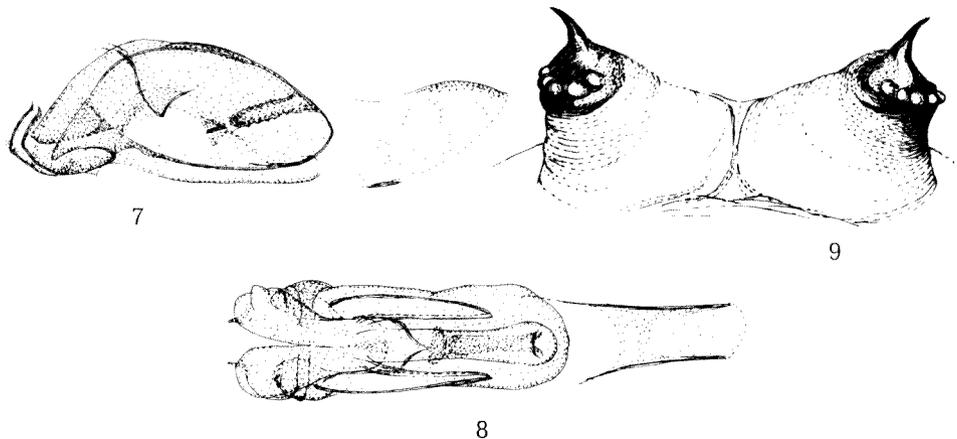
Holotype ♂ from Mascot, N.S.W. in BM.

Large greenish species with bare arista and small round third antennal segment.

M. apii belongs to the large complex of greenish species and to permit reliable identification the aedeagus is shown in Figs 7, 8. No records are known additional to those already given from N.S.W. and S.A. (Spencer, 1963a: 312).

This is the only species known to feed on celery in Australia. Larval feeding in the petioles causes some damage but this has not so far proved significant. The posterior spiracles of the puparium are shown in Fig. 9.

Celery was presumably introduced into Australia by early settlers and it is suggested that it has been colonized from *Apium australe* which is doubtless the original host of *apii*.



Figs 7-9: *Melanagromyza apii*: 7, aedeagus, side view; 8, same, ventral view; 9, posterior spiracles of puparium.

Melanagromyza avicenniae sp.n.

(Figs 10, 11)

Exceptionally large black species, with black squamal fringe.

Head: frons broad, almost twice width of eye, orbits distinctly projecting above eye in profile; orbital bristles varying in number, even on the 2 sides in the same specimen, normally 6, more rarely 5 but not infrequently 8 or 9, the upper 2 reclinate, the lowest incurved, those between partially incurved; orbital setulae strong, numerous, in several rows, reclinate; ocellar triangle large but ill-defined, apex extending to centre of frons; lunule higher than a semicircle; jowls extended at rear, 1/4 height of eye; third antennal segment small, round; arista unusually fine, bare but swollen at base, short, about 2/3 height of eye.

Mesonotum: 2 strong dc, with invariably a short third near second; acr in some 10 rows.

Wing: length from 3.25 mm in male to 4 mm in female; last section of M3+4 2/3 penultimate, first cross-vein just beyond midpoint of discal cell.

Legs: mid-tibiae with 1 strong lateral bristle.

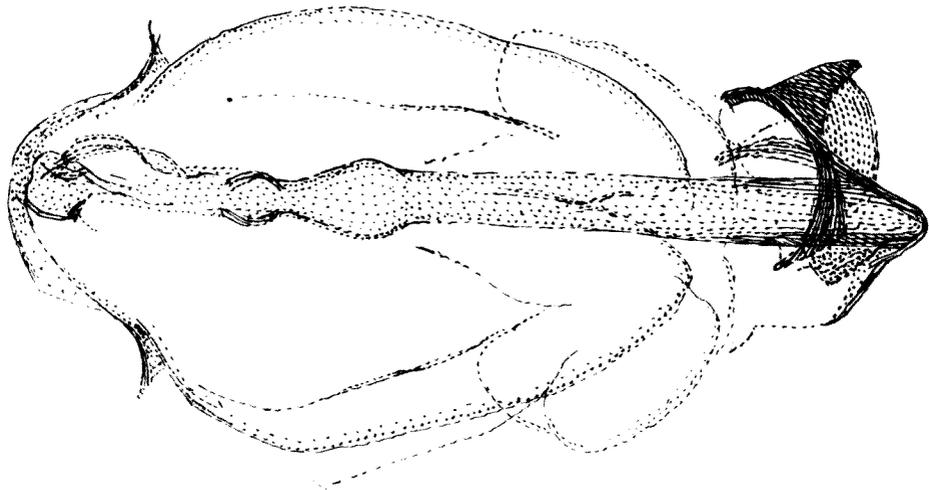
Colour: frons sooty black, ocellar triangle only weakly shining; mesonotum greyish-black, mat but with some subshine; abdomen shining black; squamae whitish-grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 10,11; ninth sternite short, with broad sidearms, without hypandrial apodeme; ejaculatory apodeme long, equal to aedeagus.

Holotype ♂, N.S.W: Careel Bay, Avalon, 14.iii.63; paratypes: 2♂, 3♀, same data; 2♂, 2♀, 11.ii.54; 1♂, 4♀, 27.x.62; 1♂, 1♀, 15.xii.64; 1♀, 3.ii.73; N. Cronulla, 3♂, 2♀, 3.iv.62, all on mangroves (D.K.M.). Holotype and paratypes in AM, 2♂, 3♀ in AC.



10



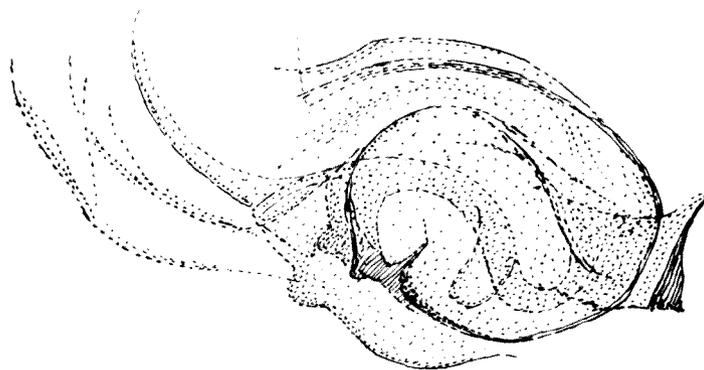
11

Figs 10, 11: *Melanagromyza avicenniae*: 10, aedeagus, side view; 11, same, ventral view.

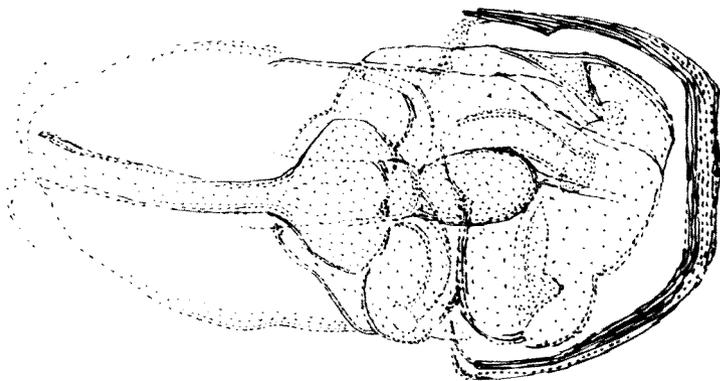
Remarks

This is the largest *Melanagromyza* known in Australia. The aedeagus closely resembles that of *anceps* sp.n. (Figs 5, 6) and the characteristic general form is known only in these 2 species.

The 23 specimens included in the type series were all caught on the grey mangrove, *Avicennia marina*. Dr McAlpine had noticed that leaves of this plant commonly show mines and considered that these might be produced by this species. However, I visited the type locality on 8.xi.75 with Dr McAlpine and it was clear that the mines in question are caused by a Micro-lepidopteron. No other possible host grows in the immediate vicinity of the mangroves and I am satisfied that this is the host. The larva almost certainly feeds in freshly growing stems, although a brief search failed to show any evidence of larval feeding.



12



13

Figs 12, 13: *Melanagromyza blanda*: 12, aedeagus, side view; 13, same, ventral view.

Melanagromyza blanda sp.n.

(Figs 12, 13)

Small, greenish species with dark squamal fringe.

Head: frons narrow, equal to width of eye, not projecting above eye in profile; 2 reclinate ors, the lower slightly weaker; 2 equal, partially incurved ori; orbital setulae sparse, reclinate; ocellar triangle small, finely pointed, apex extending to level of lower ori; lunule higher than a semicircle, upper margin just below level of upper ori; jowls narrow, about 1/12 height of eye, eye bare in both sexes; third antennal segment small, round, with a distinct fringe of short pubescence, arista long, only finely pubescent, 4/5 height of eye.

Mesonotum: 2 dc, acr in some 8 rows.

Wing: length from 2.2 mm in male to 2.4 mm in female; last section of vein M3+4 short, in ratio 15:25 with penultimate, first cross-vein at midpoint of discal cell.

Colour: frons mat black, ocellar triangle and orbits weakly shining; mesonotum moderately shining, blackish-green, abdomen coppery green; squamae whitish-grey, margin dark brown, fringe black; halteres black.

Male genitalia: aedeagus as in Figs 12, 13; ninth sternite long, curving ventrally, with short, flattened, hypandrial apodeme; ejaculatory apodeme large, slightly longer than aedeagus; epiphallus with unusually large, paired rectangular flaps; surstyli angular, projecting downwards rather than inwards, with a group of hairs or weak bristles at end.

Holotype ♂, N. Qld: Bramston Beach, near Innisfail, 10.iv.67 (open savannah); paratypes 1♂, 1♀, same data (D.H.C.), in ANIC.

Remarks

This is the only greenish species known in Australia with the squamal fringe dark. Only 2 species are known in the world with comparable coloration, *M. cuscatae* Hering from Europe and Pakistan and *M. mixta* from the Philippines (Spencer, 1962b).

Melanagromyza decapitata sp.n.

(Figs 14, 15)

Head: missing.

Mesonotum: 2 strong dc, acr in some 10 rows; prsc lacking.

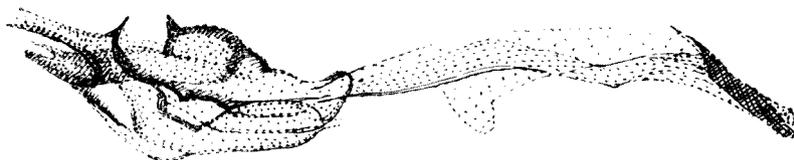
Wing: length in male 2.3 mm, last section of M3+4 short, 1/2 length of penultimate, first cross-vein just beyond midpoint of discal cell.

Legs: fore-and mid-tibiae each with 1 lateral bristle.

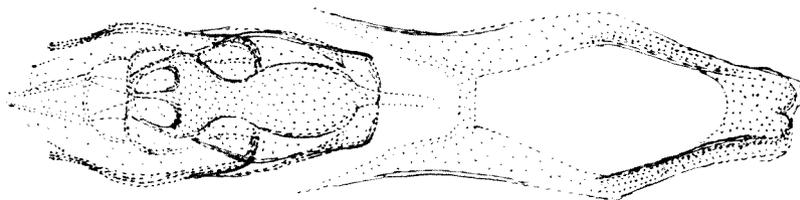
Colour: mesonotum and abdomen moderately shining black; squamae grey, margin and fringe black; halteres white above, black below.

Male genitalia: aedeagus as in Figs 14, 15; ninth sternite triangular, apex finely pointed, but no hypandrial apodeme; ejaculatory apodeme long, only slightly shorter than aedeagus, with strong central 'vein' but weak, narrow blade.

Holotype ♂, N. Qld: N. Maria Creek, near Silkwood, 14.xii.61 (D.K.M.), in AM.



14



15

Figs 14, 15: *Melanagromyza decapitata*: 14, aedeagus, side view; 15, same ventral view.

Remarks

Although the head is missing in the unique holotype, the genitalia are distinctive and the variegated halteres are a conspicuous character found only in *variegata* sp.n. among Australian species. However, the two are not related.

Melanagromyza declinata Sasakawa, 1963

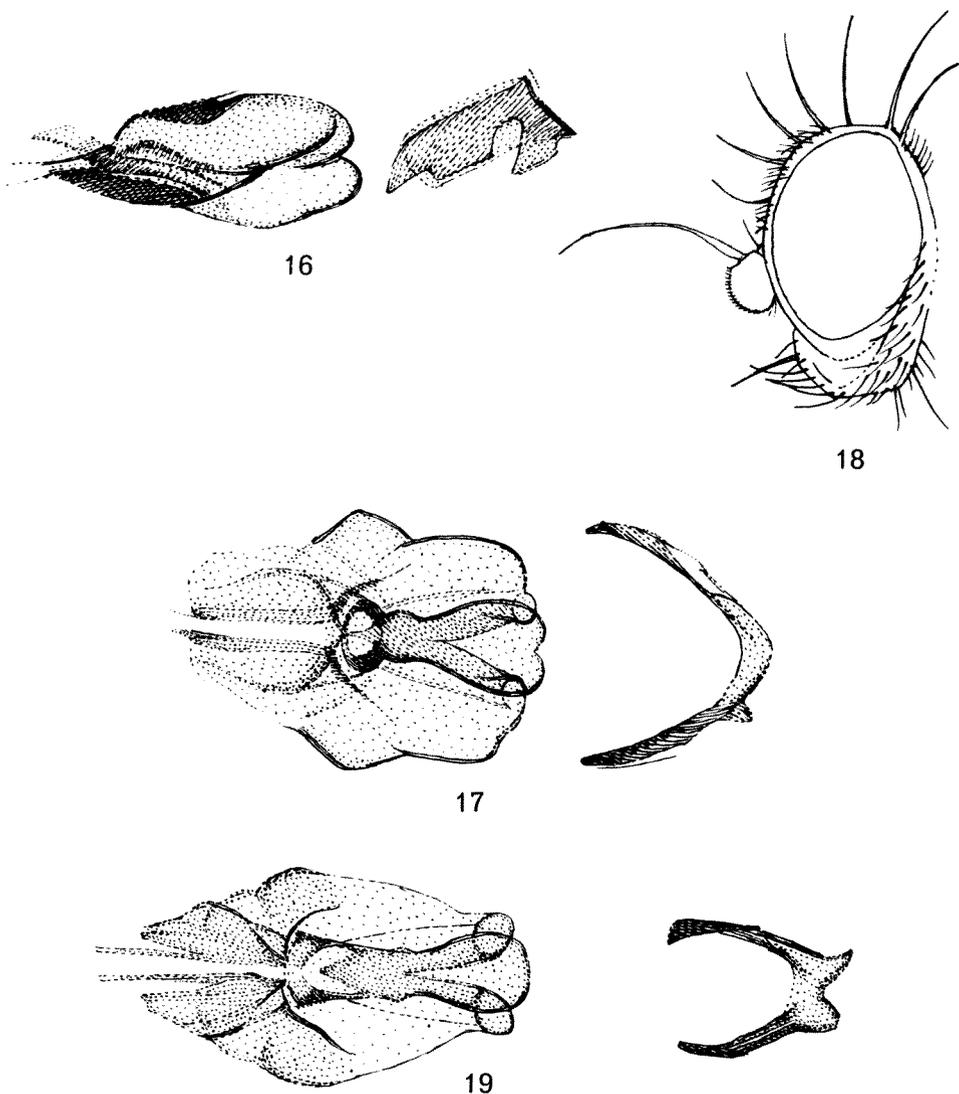
(Figs 16-19)

Melanagromyza declinata Sasakawa, 1963a: 32; 1972: 52.

Melanagromyza bowralensis Spencer, 1963a: 34.

Sasakawa's description of *declinata* was based on a single female from Taipei, north Taiwan and was published in April, 1963. The description of *bowralensis* from Bowral, N.S.W. was also based on a single female and was published in July, 1963. In 1972

Sasakawa recorded 9 further specimens from 5 localities in Taiwan and synonymised *bowralensis* with *declinata*, giving illustrations of the male genitalia. I have now seen 6 further specimens from A.C.T. and N.S.W. which can definitely be associated with the female holotype of *bowralensis* and the male genitalia (Figs 16, 17) confirm the identity with *declinata*.



Figs 16-19: *Melanagromyza declinata*: 16, aedeagus, side view; 17, same, ventral view (A.C.T., Mt Gingera); 18, head; 19, aedeagus (N.S.W., Snowy Mts).

M. declinata is distinctive in having the numerous orbital setulae entirely proclinate (Fig 18). No other species is known either in Australia or the Oriental region with the orbital setulae arranged in this way.

The male is distinctly smaller than the female, normally with wing length of 2.5 mm but in one specimen it is as small as 2.1 mm; the eye is distinctly pilose in the area of the ors.

The 2 specimens from Snowy River agree exactly with typical *bowralensis* but the aedeagus (Fig. 19) is distinctly narrower, although agreeing closely in the general structure. This indicates some slight degree of differentiation in the high altitude population in the Snowy River area.

The range of this species, extending from Taiwan to N.S.W., is unusual. It is not known in New Guinea but will almost certainly be present there, and also in Qld.

Material seen

A.C.T: Mt Gingera, 1♂, 4.ii.65; 5♂, 4♀, 11.i.67 (all D.H.C.). N.S.W: Snowy River, 2000 metres, 1♂, 1♀, 12.i.67 (D.H.C.).

Melanagromyza dipodii sp.n.

(Figs 20, 21)

Large black species with white squamae and fringe.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, the upper shorter and directed slightly outwards, the lower directed slightly inwards; 2 ori, the upper mainly incurved, the lower largely reclinate; orbital setulae reclinate, numerous, in several rows; ocellar triangle large, broad, apex extending almost to level of upper ori; lunule distinctly higher than a semicircle; jowls narrow, about 1/12 height of eye; eye pilose at level of ors in both sexes, but more so in male; third antennal segment small, round, arista finely pubescent, long, about 2/3 eye height.

Mesonotum: 2 strong dc, acr in 10 rows.

Wing: length 2.4-2.5 mm, last section of M3+4 about 2/3 penultimate, first cross-vein slightly beyond midpoint of discal cell.

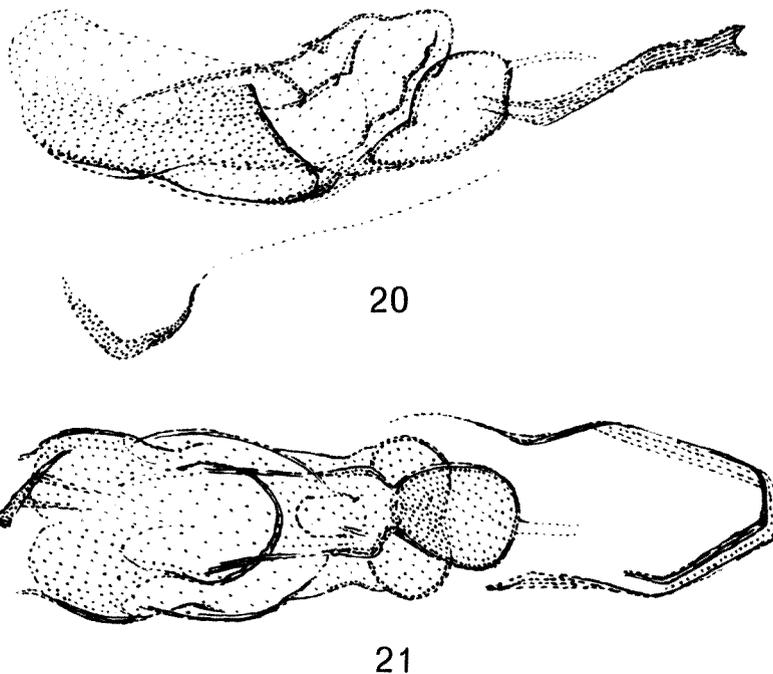
Legs: mid-tibiae with 2 strong lateral bristles.

Colour: frons sooty black, orbits weakly, ocellar triangle strongly shining; mesonotum mat viewed from front, more shining from rear, abdomen brilliantly shining, both without any metallic coloration; squamae and fringe white, margin only slightly differentiated, pale yellowish; halteres black.

Male genitalia: aedeagus as in Figs 20, 21; ninth sternite triangular, broadly fused at apex, with short, blunt extension; ejaculatory apodeme large, slightly longer than aedeagus, with rounded blade; surstyli rounded, curving inwards, with short fringe of hairs.

Host-plant: *Dipodium punctatum* (Orchidaceae); larva feeding in flowers, posterior spiracles only slightly separated, each on a stout, heavily chitinized, conical projection, with an ellipse of some 12 bulbs, without any central horn.

Holotype ♂, N.S.W: Pennant Hills, bred from *Dipodium punctatum*, 30.xi.60 (G.A. Chilvers); paratypes: 3♂, 3♀, same data; Otford, 1♂, 26.i.51 (D.K.M.). Holotype and paratypes in AM; 2 paratypes in AC.



Figs 20, 21: *Melanagromyza dipodii*: 20, aedeagus, side view; 21, same, ventral view.

Remarks

This species was previously (Spencer, 1963a: 311) considered to represent *alternata* Spencer, 1961a described from Taiwan. However, now that its host has been established it must clearly be treated as distinct, as *Dipodium* is restricted to Australia, New Guinea and Malaysia and is absent from Taiwan.

The larva and the part of the plant in which it feeds has not hitherto been known. Dr McAlpine took me to an area of bush at Castlecrag 8 km north of Sydney on 8.xi.75 where *Dipodium* was growing in small numbers. It seemed improbable that the larvae would feed in the slender stems of the plant and they were in fact found in the flowers. Their presence could be detected by the flowers wilting before fully maturing.

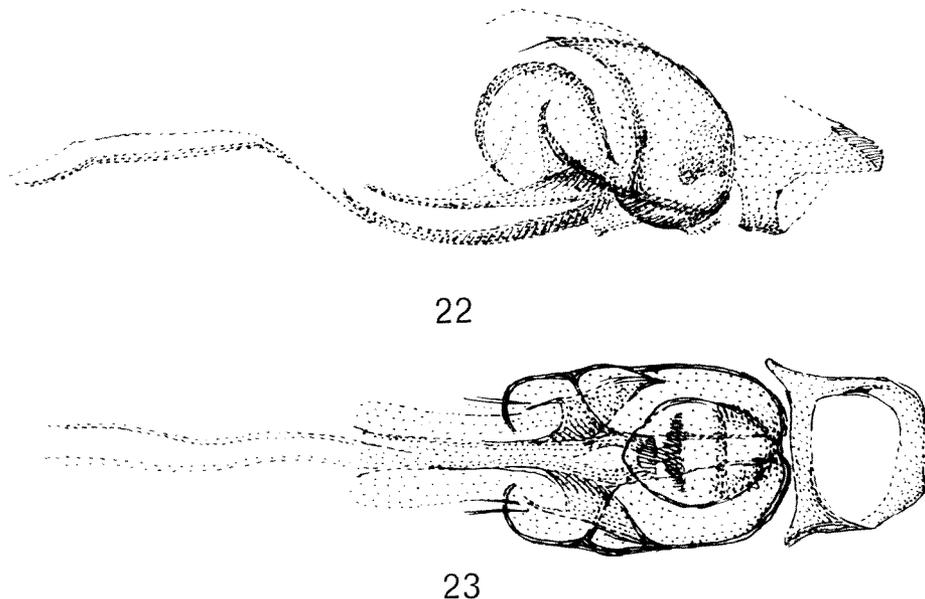
Only 1 other *Melanagromyza* is known to feed in orchids, *M. orchidearum* Costa Lima, 1950 feeding in the roots of species in the genera *Cattleya* and *Laelia* in Brazil.

Melanagromyza epistomella sp.n.

(Figs 22,23)

Largely black species with pale squamal fringe and conspicuous epistoma.

Head: frons little wider than eye, distinctly projecting above eye towards base of antennae; 2 ors, at least lower directed partially inwards; 4 largely inclined ori; orbital setulae slightly reclinate above, upright in centre, more proclinate below; lunule higher than a semicircle; jowls deepest at rear, almost 1/3 height of eye, cheeks forming conspicuous ring below eye; eye virtually bare in both sexes; third antennal segment small, round, arista fine, slightly swollen at base, short, equal to width of frons at upper margin of lunule; broad, U-shaped epistoma above mouth margin, only slightly shorter than depth of jowls.



Figs 22, 23: *Melanagromyza epistomella*: 22, aedeagus, side view; 23, same, ventral view.

Mesonotum: 2 dc, acr in some 8 rows.

Wing: length from 2.5 mm in male to 3.3 mm in female, last section of vein M3+4 2/3 penultimate, first cross-vein at midpoint of discal cell.

Legs: fore-tibiae in female with 1 or 2 bristles, mid-tibiae with 2, in male apparently none.

Colour: frons sooty black, ocellar triangle, orbits and cheeks weakly shining; mesonotum moderately shining black, with very weak coppery reflections; abdomen shining blackish-coppery in centre, conspicuously green at sides; squamae and fringe white, margin pale brown; halteres black.

Male genitalia: aedeagus as in Figs 22, 23, enclosed in conspicuously strong spinular membrane; ninth sternite narrow but with broad side-arms; hypandrial apodeme extended, flattened dorso-ventrally at apex; ejaculatory apodeme with large, rounded blade; surstyli broad, projecting inwards, with a strong fringe of short bristles and longer hairs, internal flap with a few hairs on hind-corner.

Holotype ♂, Qld: 4.8 km N.W. of Mt Mowbullan, Bunya Mts, 1,020 m, 7-8.i.70, MV lamp (G.A.H.); paratype ♀, same data, both in AM.

Remarks

This large, stout species is immediately distinguishable by the numerous orbital bristles and high epistoma. Although the form of the epandrium is typical of most species in the genus, the aedeagus shows a high degree of differentiation, particularly in the long, narrow distal tubules.

Melanagromyza grata sp.n.

(Figs 24-26)

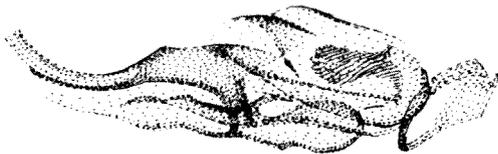
Small green species, with shining ocellar triangle and long pubescent arista.

Head: frons narrow, equal to width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae sparse, reclinate; ocellar triangle long, narrow, apex below level of lower ori; jowls narrow, little more than 1/20 height of eye; eye bare; third antennal segment small, round; arista long, equal to height of eye, unusually strong, conspicuously pubescent.

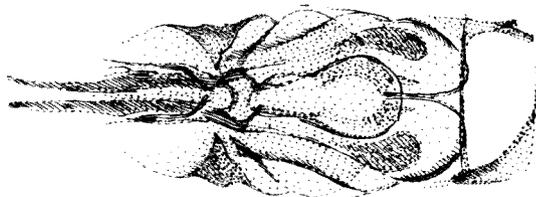
Mesonotum: 2 dc, acr in 8 rows.

Wing: length in male 1.7-1.8 mm, in female 2.1 mm; last section of vein M3+4 short, 1/2 length of penultimate.

Colour: ocellar triangle and orbits brilliantly shining black, head otherwise mat black; mesonotum shining greenish, abdomen green or coppery; squamae and fringe white, margin only slightly differentiated, pale brown; in female ovipositor sheath entirely shining black.



24



25



26

Figs 24-26: *Melanagromyza grata*: 24, aedeagus, side view; 25, same, ventral view; 26, epandrium.

Male genitalia: aedeagus as in Figs 24, 25; ninth sternite triangular, hypandrial apodeme only slightly extended; ejaculatory apodeme with central 'vein' strong but blade weakly chitinized; surstyli curving inwards, conspicuously narrow, with a fringe of fine hairs at end, inner margin of epandrium with a group of bristles midway between surstyli and lower corner (Fig. 26).

Holotype ♂, N. Qld: Mt Garnet Rd., 20.93 km W. of Ravenshoe, 2.v.67; paratypes: 1♀, same data (D.H.C.); Emu Park, N.E. of Rockhampton, 1♂, 7.v.70 (Z.L.); N.T: 54-74 km N.W. of Dorisvale HS, 14° 13'S, 130° 55'E, 1♂, 14.viii.68 (M. Mendum), all in ANIC.

Remarks

This species closely resembles *pseudograta* sp.n. but small differences in the aedeagus and in external morphology are constant. *M. grata* is distinguishable both from *pseudograta* and from *albisquama* by the brilliantly shining ocellar triangle and orbits and by the longer, more pubescent, arista. Its distribution appears to be more restricted than that of the other 2 species.

Melanagromyza hastata sp.n.

(Figs 27-29)

Small greenish species with eye in male bare.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 strong ors, the lower distinctly incurved; 2 partially incurved ori; orbital setulae upright or reclinate,

a few in front proclinate; lunule higher than a semicircle; jowls broad, 1/4 height of eye, cheeks forming shining ring below eye; eye upright, bare in both sexes; third antennal segment small, round, arista fine, bare, swollen at base.

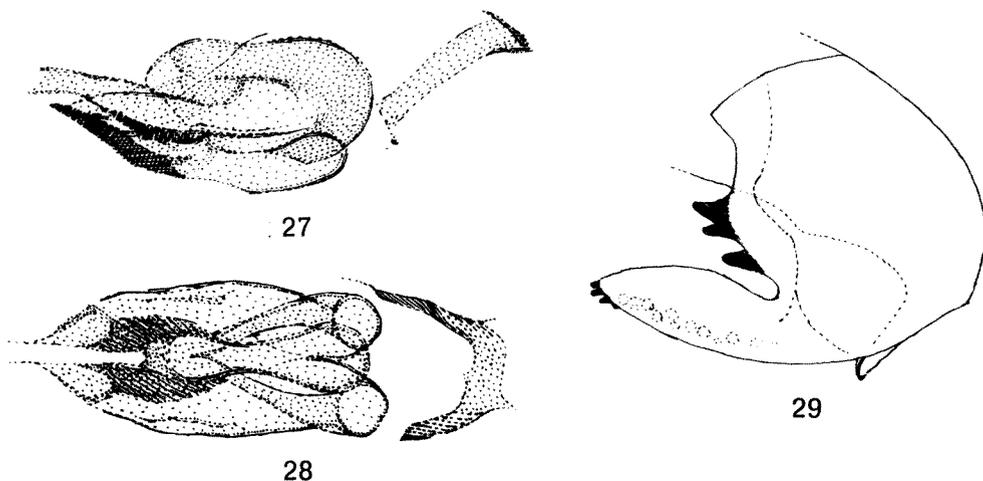
Mesonotum: 2 + 0 dc, acr in 8 rows.

Wing: length from 2 mm in male to 2.1 in female, last section of vein M3+4 shorter than penultimate, in ratio 15:25.

Colour: frons sooty black, ocellar triangle, orbits and cheeks conspicuously shining; mesonotum and abdomen brilliantly shining green; squamae and fringe white, margin scarcely differentiated, halteres black.

Male genitalia: aedeagus as in Figs 27, 28; ninth sternite with widely separated, narrow sidearms and short hypandrial apodeme; ejaculatory apodeme slightly longer than aedeagus, with narrow blade; surstyli conspicuously developed, with 3 stout bristles on inner margin of epandrium (Fig. 29).

Holotype ♂, N.S.W: 16 km W. of Wilcannia, 22.xi.49; paratype ♀, same data (both S.J.P.); S.A: Allandale, 16 km S.E. of Oodnadatta, 1♂, 24.ix.72 (Z.L.). Holotype and paratypes in ANIC.



Figs 27-29: *Melanagromyza hastata*: 27, aedeagus, side view; 28, same, ventral view; 29, epandrium.

Remarks

The fine, bare arista and bare eyes are characters of this species in common with *verdescens*. However, *hastata* is generally stouter, the frons and jowls are broader, the orbits, jowls and mesonotum are more shining. The aedeagus and particularly the surstyli are significantly differentiated.

Melanagromyza humida sp.n.

(Figs 30, 31)

Medium-sized, greenish species with broad frons and orbits.

Head: frons broad, from 2 to 1 1/2 times width of eye, not projecting above eye in profile; orbits broad, conspicuously differentiated; 2 strong equal ors, 2 partially incurved ori; orbital setulae minute, reclinate, in several rows in front; ocellar triangle large, apex extending to level of upper ori; jowls deepest in centre, about 1/7 height of eye; in male eye with patch of distinct pilosity at level of ors, in female pilosity more scattered; arista long, only slightly shorter than height of eye, distinctly pubescent.

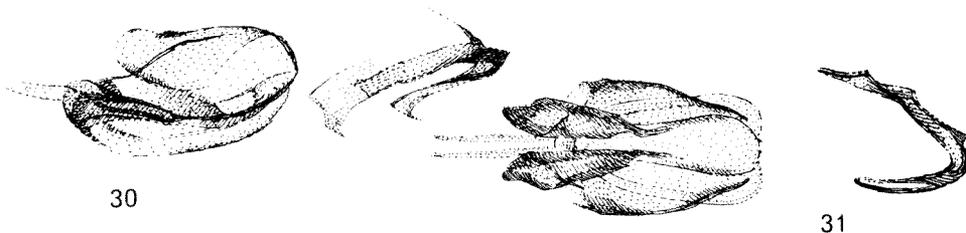
Mesonotum: 2 dc, acr in some 8 rows.

Wing: length from 2.2 mm in male to 2.5 mm in female; last section of vein M3+4 in ratio 15:25 with penultimate.

Colour: head black, ocellar triangle distinctly though not conspicuously shining; orbits scarcely shining; mesonotum conspicuously shining, greenish-black; abdomen moderately shining; squamae and fringe white, margin pale brown.

Male genitalia: aedeagus as in **Figs 30, 31**; ninth sternite triangular, with sidearms becoming membranous and broadly fused towards apex; ejaculatory apodeme long, equal to length of aedeagus but blade narrow; surstyli curving inwards, broad, with hairs and short, stout bristles at end; inner margin of epandrium with an irregular line of bristles, somewhat bunched at midpoint.

Holotype ♂, N. Qld: Big Mitchell Creek, Mareeba—Molloy Rd., 4.v.67 (D.H.C.); paratype ♀, same data, both in ANIC.



Figs 30, 31: *Melanagromyza humida*: 30, aedeagus; 31, same, ventral view.

Remarks

The distinguishing characters of this species are the broad frons and orbits, with which it may be separated from both *metallica* and *placata* which have the arista pubescent and the eye in the male pilose.

It is now believed that the species recorded as *piliseta* (Mall.) from Townsville, Qld. (Spencer, 1963a: 318) may represent this species.

Melanagromyza metallica (Thomson, 1869)

(Figs 32-34)

Agromyza metallica Thomson, 1869: 609.

Melanagromyza metallica, Spencer, 1961a: 74; 1966a: 7; 1977b: 348.

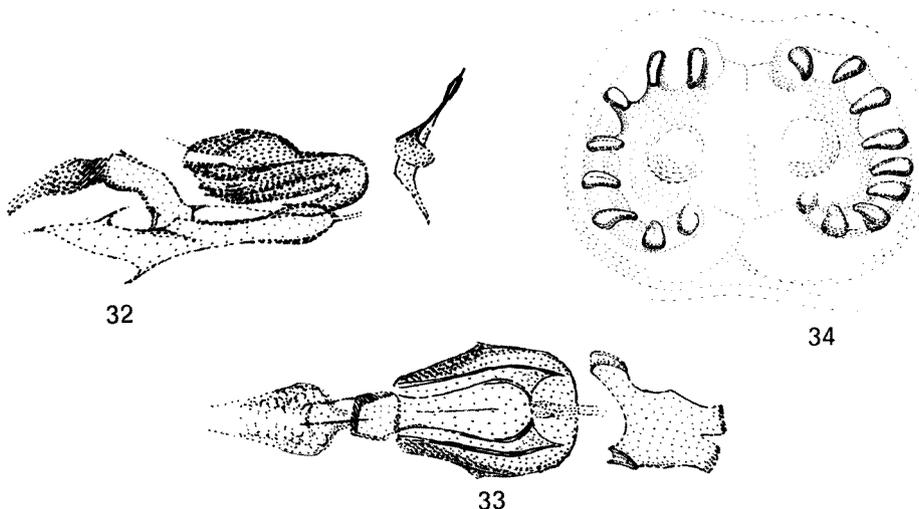
Holotype ♂ from Mauritius in Naturhistoriska Riksmuseum, Stockholm.

This is a medium-sized, shining greenish species, with wing length of 2.2-2.6 mm; the frons is narrow, equal to the eye width and the jowls are narrow, about 1/10 the eye height; the arista is distinctly pubescent; an important character in the male is the patch of white pilosity on the eyes at the level of the ors. The distinctive aedeagus is shown in Figs 32, 33.

Confirmed hosts are *Ageratum conyzoides* and *Bidens pilosa*, the larva feeding and pupating in the stem. The posterior spiracles, each with an ellipse of 8 well-defined bulbs around a central scar, are shown in Fig. 34.

M. metallica is widespread in Qld., extending south to N.S.W. but is less common than was previously believed. It can easily be confused with 4 other species now known in Australia with pilose eyes. However, in *specifica* the arista is essentially bare, in *humida* sp.n. and *placata* sp.n. the frons is broader; *metallica* most closely resembles *pseudoplacata* sp.n. but the mesonotum is less brilliantly shining.

Recent collecting in Papua New Guinea showed that *metallica* is by far the most common species there, with large populations present with *Bidens pilosa* as the main host. It is widely distributed in the 'Old World' tropics from Micronesia to Africa.



Figs 32-34: *Melanagromyza metallica*: 32, aedeagus, side view; 33, same, ventral view; 34, posterior spiracles of puparium.

Material seen

Qld: 7-14 km W. of Herberton, via Watsonville, 1♂, 1.v.67 (D.H.C.); Bramston Beach, near Innisfail, 1♂, 30.iv.67 (open savannah) (D.H.C.); Iron Range, 3♂, 6♀, 16.viii.71 (R. Jenkins); Kuranda, 1♂, 20.viii.51 (A.H. Wetherly); Woombye, near Nambour, 5♂, 3♀, 11-16.x.65 (D.H.C.). N.S.W: 8 km N.W. of Bruxner Park, 1♂, 16.ix.70; Manly Reservoir, Sydney, 1♂, 29.vii.61 (both D.H.C.).

Melanagromyza multiformis sp.n.

(Figs 35, 36)

Small green species, with pubescent arista and eye in male bare.

Head: frons narrow, equal to width of eye; 2 reclinate ors, 2 ori, the lower incurved; orbital setulae sparse, reclinate; ocellar triangle narrow, apex extending to level of lower ors; lunule higher than a semicircle; jowls narrow, 1/6 height of eye; eye bare in male, third antennal segment small, round, arista finely pubescent, 3/4 height of eye.

Mesonotum: 2 dc, acr in 8 rows.

Wing: length in male 1.7-1.8 mm, last section of vein M3+4 2/3 penultimate, first cross-vein at midpoint of discal cell.

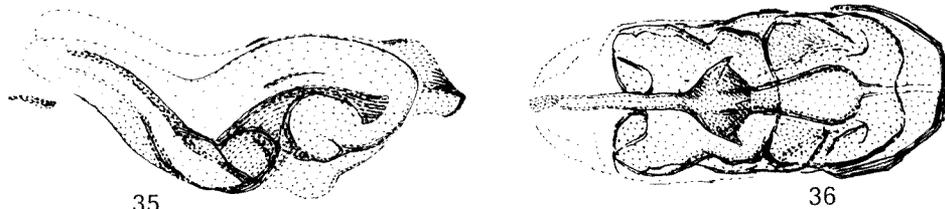
Colour: frons mat black, ocellar triangle and orbits moderately shining, mesonotum and abdomen shining greenish; squamae and fringe white.

Male genitalia: aedeagus as in Figs 35, 36; ninth sternite with narrow sidearms and short hypandrial apodeme; ejaculatory apodeme large, as long as aedeagus, blade as wide as long; surstyli rounded, only projecting slightly inwards with a fringe of slender bristles.

Holotype ♂, N. Qld: Claudie River, near Mt Lamond, 29.v.66 (D.K.M.), in AM.

Remarks

The holotype is in poor condition and with only this single specimen available, it is not possible to differentiate it from *albiquama* on external characters. However, the genitalia show that the 2 species are not closely related.



Figs 35, 36: *Melanagromyza multiformis*: 35, aedeagus, side view; 36, same, ventral view.

Melanagromyza obtusa (Malloch, 1914)

(Figs 37-39)

Agromyza obtusa Malloch, 1914: 323.

Melanagromyza obtusa, Hennig, 1941: 174; Spencer, 1966a: 7; 1973a: 46-50.

Melanagromyza weberi de Meijere, 1922: 20.

Holotype ♂ from Formosa in Hungarian Natural History Museum, Budapest.

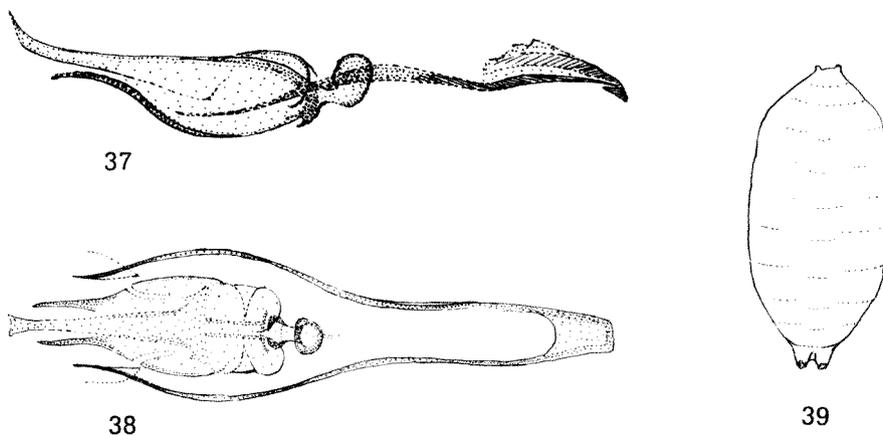
Large shining green species with broad, long greenish ocellar triangle.

Significant characters are as follows: frons narrow, equal to width of eye, ocellar triangle conspicuously large, with apex extending almost to margin of lunule, shining green; jowls exceptionally narrow, 1/15 height of eye; arista pubescent; mesonotum and abdomen shining green; squamae and fringe white; wing length from 2.4-2.8 mm. The aedeagus is shown in Figs 37, 38; this is distinctive in having the basiphallus greatly extended.

Known hosts are *Cajanus indicus* Spreng. (India, Malaysia), *Flemingia* sp. (Java) and *Phaseolus radiatus* L. (Sri Lanka). The larva feeds internally in young seed pods and the reddish puparium (Fig. 39) remains free within the pod. In India *obtusa* is considered a serious pest on *Cajanus*. The economic importance and biology are discussed in some detail by Spencer (1973a: 46-50).

Material seen

Qld: Speewah Rd., 8 km S. of Kuranda, 1♂, 12.i.67 (D.K.M. and G.A.H.); Claudie River, near Mt Lamond, 2♀, 13.xii.71 (D.K.M., G.A.H. and D.P. Sands).



Figs 37-39: *Melanagromyza obtusa*: 37, aedeagus, side view; 38, same, ventral view; 39, puparium.

Melanagromyza placata sp.n.

(Figs 40,41)

Medium-sized greenish species with pilose eye in male.

Head: frons 1 1/2 times width of eye not projecting above eye in profile; 2 strong, reclinate ors, 2 strong ori, the upper directed inwards and upwards, the lower inwards; orbital setulae numerous, in 2 rows below, those nearest eye margin reclinate, the inner row proclinate; ocellar triangle large, apex at level of lower ors; lunule narrowing centrally, higher than a semicircle; jowls narrow, 1/10 height of eye; eye with conspicuous patch of white pubescence in area of ors; third antennal segment small, round, arista long, equal to height of eye, distinctly pubescent.

Mesonotum: 2 strong dc, acr in 8 rows.

Wing: length in male 2.4 mm, last section of vein M3+4 shorter than penultimate, in ratio 15: 25.

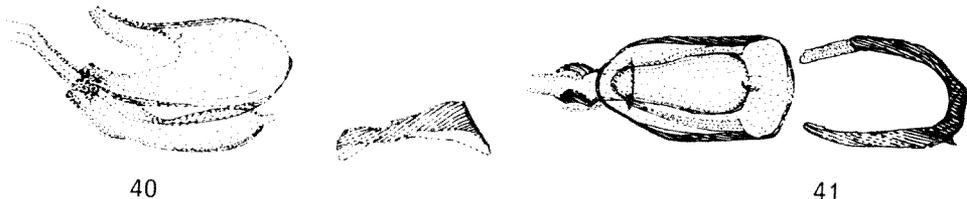
Colour: frons mat black, ocellar triangle and orbits only weakly shining; mesonotum moderately shining greenish from rear, distinctly mat viewed from front; abdomen weakly shining green; squamae and fringe white, margin only slightly differentiated, slightly yellowish.

Male genitalia: aedeagus as in **Figs 40, 41**, ninth sternite triangular, slightly fused at apex, with only short hypandrial apodeme; ejaculatory apodeme large, slightly longer than aedeagus; surstyli rounded, extending inwards, with a fringe of short bristles, none on inner margin of epandrium.

Holotype ♂, N.S.W: Cabbage Tree Creek, 22.ii.65 (D.H.C.), in ANIC.

Remarks

This species is only slightly divergent from *pseudoplacata* sp.n. but the frons is narrower and the mesonotum is less shining; it also closely resembles *metallica* but the orbital setulae are more numerous and the arrangement in 2 rows, with the inner row proclinate, is distinctive, the lunule is also narrower. A reliable identification may only be possible from the male genitalia.



Figs 40, 41: *Melanagromyza placata*: 40, aedeagus, side view; 41, same, ventral view.

Melanagromyza praesignis sp.n.

(Figs 42, 43)

Large species with black squamal fringe and projecting frons.

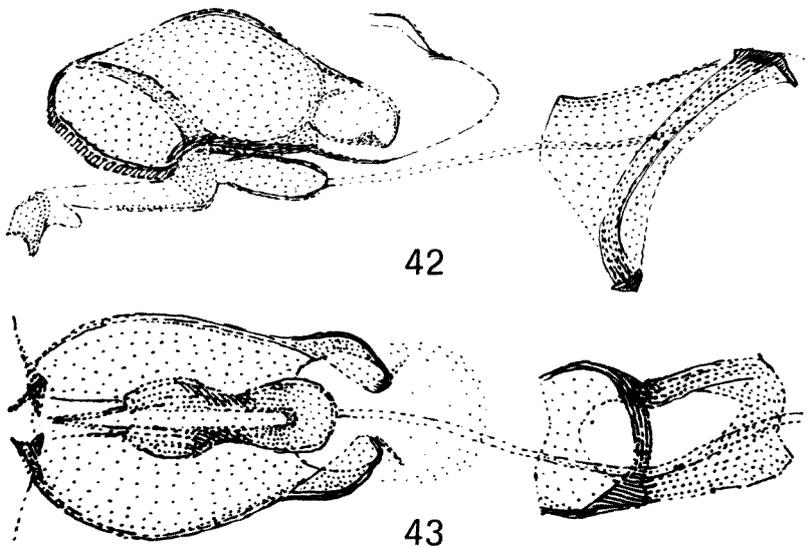
Head: frons broad, twice width of eye, conspicuously projecting above eye in profile; orbital bristles long, 2 ors, 3 ori; orbital setulae sparse, mainly reclinate, with a few in front proclinate; ocellar triangle small, ill-defined, not reaching level of lower ors; lunule semicircular, jowls deepest at rear, just less than 1/3 height of eye; third antennal segment small, round, arista fine, long, only slightly less than height of eye; broad, oval epistoma above mouth-margin.

Mesonotum: 2 strong dc, acr numerous in 8-10 rows.

Wing: length in male 2.7-2.8 mm, last section of M3+4 short, little more than 1/2 penultimate, first cross-vein slightly beyond midpoint of discal cell.

Legs: mid-tibiae with 2 (on one side 3) lateral bristles.

Colour: frons sooty black, ocellar triangle and orbits not shining; mesonotum and abdomen moderately shining black; squamae grey, margin and fringe black; halteres black.



Figs 42, 43: *Melanagromyza praesignis*: 42, aedeagus, side view; 43, same, ventral view.

Male genitalia: aedeagus as in Figs 42, 43; ejaculatory apodeme long, equal to aedeagus; ninth sternite narrow but with broad sidearms and short, fine hypandrial apodeme; surstyli rounded, with fringe of short, strong bristles.

Holotype ♂, N.S.W: Macquarie Pass, 3.ii.71 (R.W.G.Jenkins), in ANIC.

Remarks

Among species with the squamal fringe black, *praesignis* is immediately recognizable by the large size and broad epistoma. A similar epistoma is present in *epistomella* sp.n. but this has the squamal fringe pale and the genitalia show that the 2 are not closely related.

Melanagromyza proboscidella sp.n.

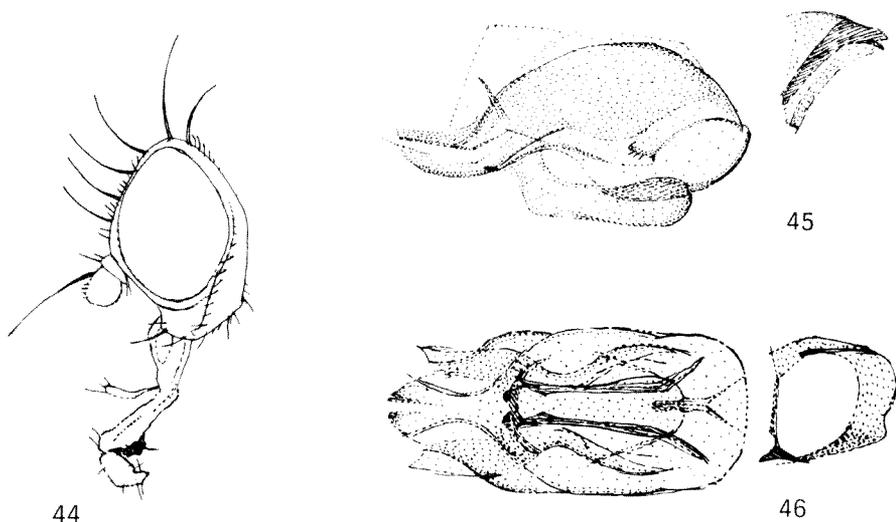
(Figs 44-46)

Small black species with 3 dc and elongate proboscis.

Head: (Fig. 44): frons 1 1/2 times width of eye, not significantly projecting above eye; orbital bristles long, 2 ors, 2 partially incurved ori; orbital setulae numerous, mainly reclinate but a few in front incurved or proclinate; jowls about 1/6 height of eye; third antennal segment small, round, arista fine, distinctly swollen at base; proboscis elongate, fully extended equal to height of eye.

Mesonotum: normally 3 strong post-sutural dc but arrangement apparently unstable, in 2 of 3 specimens an additional strong pre-sutural; acr in some 10 rows.

Wing: length in male 1.9-2.1 mm, last section of M3+4 2/3 penultimate, first cross-vein well beyond midpoint of discal cell.



Figs 44-46: *Melanagromyza proboscidella*: 44, head; 45, aedeagus, isde view; 46, same, ventral view.

Colour: entirely black, frons sooty, ocellar triangle and orbits weakly shining; mesonotum mat viewed from front, more shining from rear; abdomen moderately shining; squamae pale grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 45, 46; ninth sternite with broad sidearms, fused at apex, and distinctly extended hypandrial apodeme; ejaculatory apodeme with blade longer than broad, equal in length to aedeagus; surstyli rounded, curving inwards, with a strong fringe of stout hairs.

Holotype ♂, W.A: Porongurup National Park, site 3, 11.x.70; paratype: 1♂, same data (D.H.C.), in ANIC.

Remarks

This species agrees with *prodigiosa* sp.n. in having 3 (or 4) dc but differs in wing venation; it also agrees with *trispina* (Mall.) in having 3 dc but this has the squamae and fringe white and the proboscis is normal. The genitalia confirm the close relationship of *proboscidella* and *prodigiosa*.

Melanagromyza prodigiosa sp.n.

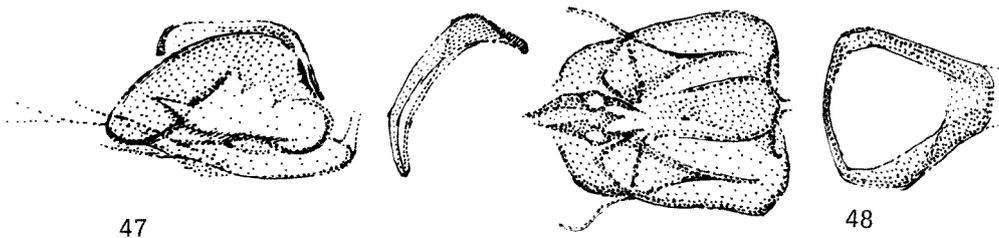
(Figs 47, 48)

Small black species, with 3 or 4 dc and squamal fringe black.

Adult: agreeing closely with *proboscidella* with following differences: arista not conspicuously swollen at base, thickening gradually, mesonotum with a distinct fourth, presutural dc on one side, possibly also on other but damaged at this point and not detectable; last and penultimate sections of vein M3+4 equal; wing length in male 2 mm.

Male genitalia: aedeagus as in Figs 47, 48.

Holotype ♂, W.A: Eagle Bay, Dunsborough, 27.ix.75 (K.A.S.), in WAM.



Figs 47, 48: *Melanagromyza prodigiosa*: 47, aedeagus, side view; 48, same, ventral view.

Remarks

Although closely agreeing with *proboscidella* and both having 3 (or 4) dc, *prodigiosa* is distinguishable by small differences in external morphology and distinct differences in genitalia. The 2 are clearly sister-species.

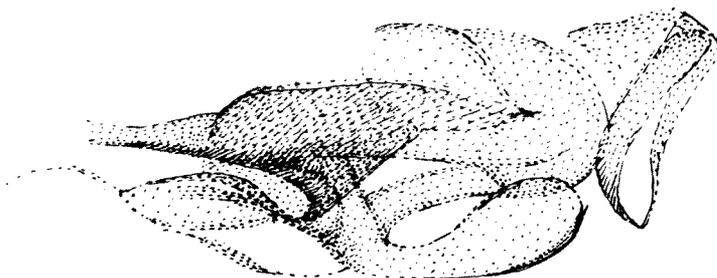
Melanagromyza pseudograta sp.n.

(Figs 49, 50)

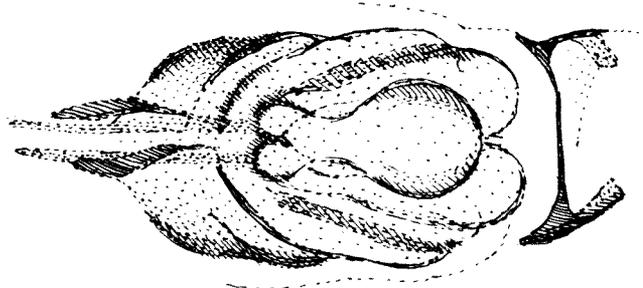
Small green species with moderately shining ocellar triangle and slightly pubescent arista.

Closely resembling *M. grata* sp.n., with following points of difference: ocellar triangle shorter, extending only to level of lower ors, less shining; arista shorter, equal to only $3/4$ height of eye, less pubescent; last section of vein M3+4 longer, slightly more than $1/2$ length of penultimate; wing length 2-2.4 mm in male, 2-2.5 mm in female; male genitalia: aedeagus with less extended distal tubule (Figs 49, 50), generally similar.

Holotype ♂, N. Qld: Mt Garnet Rd., 20.93 km W. of Ravenshoe, 2.v.67; paratypes: 5♀, same data (D.H.C.). Qld: 14.49 km N. of Dayboro, 1♂, 23.v.66 (Z.L.); near Rosewood (pine forest), 1♂, 29.xii.61 (R. Lindsay); 40.25 km N.W. of Bowen, 1♂, 1.x.50 (E.R.). N.T: Charley Creek, Milton Park, 23°23'S, 132°57', 1♂, 2♀, 7.xi.68 (A.O.N.); W.A: 1♂, 6.44 km S.E. by S. of Minilga, 17.x.70 (D.H.C.). N.S.W: 3.5 km S. of Bermagui, 1♂, 25.ii.74 (Z.L.); Lower Boro, near Tarago, 1♂, 20.iii.66 (Z.L.); Coolabah, Brunswick Heads, 1♂, 12.x.63 (D.H.C.); 1♂, 22.v.66 (Z.L.); Glenbrook, 1♂, 27.xii.64 (D.H.C.); Minyon Falls, 16 km W. of Rosebank, 1♂, 9.ix.65 (E.F.R.). Holotype and paratypes in ANIC, 4 paratypes in AC.



49



50

Figs 49, 50: *Melanagromyza pseudograta*: 49, aedeagus, side view; 50, same, ventral view.

Remarks

This species is only slightly divergent from *grata* sp.n. but superficially resembles even more closely *albisquama* but it appears to be consistently larger. It also largely overlaps in distribution with *albisquama*.

I have examined a series of 4 females bred from pods of *Glycine clandestina* from Uriarra Forest, A.C.T., 13.i.75 (P. Broué). Two unemerged specimens were extracted from their puparia but unfortunately these were also both females. An element of doubt must remain over the identity of this species without confirmation from male genitalia but it is tentatively accepted as *pseudograta*, with which it agrees completely on external characters.

The larva feeds on one or more seeds and pupates within the pod, showing a modification on pupation not previously known in this genus. Behind, the puparium, which is reddish or dark-brown, is normal, with the black posterior spiracular plates separated by slightly more than their own diameter, each with an ellipse of 6 or 7 bulbs around the truncate horn. In the area of the head the puparium curves dorsally and the front segments are flattened, lying contiguous to the epidermis of the pod. A circular exit hole is prepared by the larva prior to pupation but this remains covered by the epidermis until actual emergence, when both a circular plate at the front of the puparium and the circular disc of epidermis are broken through by the emerging adult. A comparable modification in the structure of the larva and puparium is found in the European gall-causer, *simplicoides* (Hendel) in the genus *Hexomyza* (cf. Spencer, 1966b: Fig. 76).

Melanagromyza pseudoplacata sp.n.

(Figs. 51, 52)

Medium-sized greenish species with pilose eyes in male and pubescent arista.

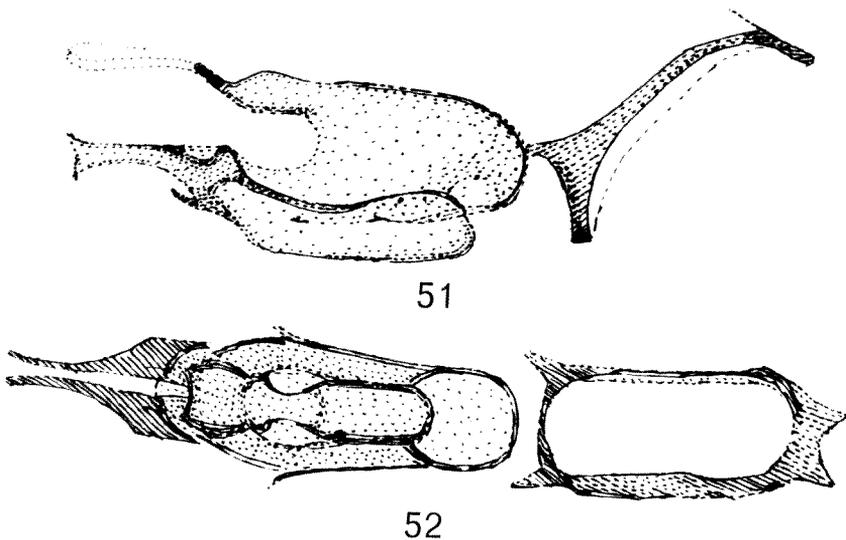
Adult: closely resembling both *metallica* and *placata* sp.n., differentiated by following characters: from *metallica* by the more brilliantly shining green mesonotum, from *placata* by the narrower frons and more shining mesonotum; wing length in male 2.2-2.3 mm.

Male genitalia: aedeagus as in Figs 51, 52 basiphallus forming a closed loop; other characters as in *placata*.

Holotype ♂, Qld: Claudie River, 1.6 km W. of Mt Lamond, 17.xii.71 (D.K.M., G.A.H. and D.P. Sands) in AM.

Remarks

Although most closely resembling *metallica* on external characters, the genitalia of this species show that it is clearly the sister-species of *placata*. These 2 are closely related to *specifica*, which also has pilose eyes in the male but is smaller and with the arista shorter and bare.



Figs 51, 52: *Melanagromyza pseudoplacata*: 51, aedeagus, side view; 52, same, ventral view.

Melanagromyza seneciophila Spencer, 1963

(Figs 53-55)

Melanagromyza seneciophila Spencer, 1963a: 319

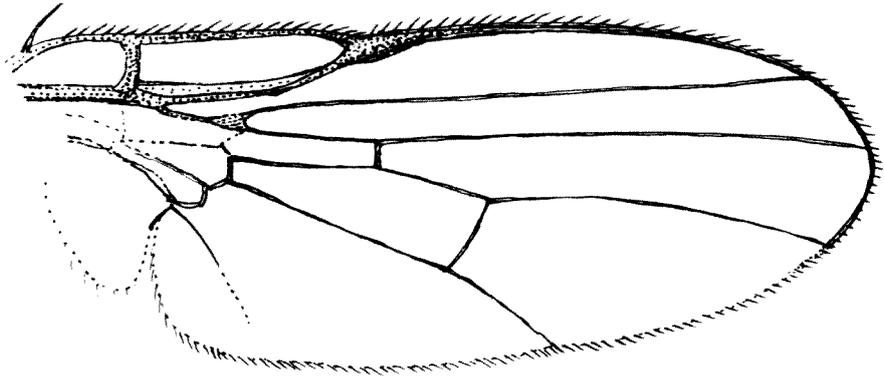
Holotype ♂ from Sydney, N.S.W. in ANIC.

This is a medium-size to large species, with the wing length in the female up to 2.7 mm (Fig. 53). The abdomen is shining green and the squamal fringe is white. The mesonotum can appear largely black but may also have a distinct greenish sheen. In the latter case it is indistinguishable on external characters from *apii* and the 2 species will then only be separable by the male genitalia. The aedeagus of *seneciophila* is unusual in this genus in being asymmetrical (Figs 54, 55). The ninth sternite has a greatly extended hypandrial apodeme (Spencer, 1963a: Fig. 24).

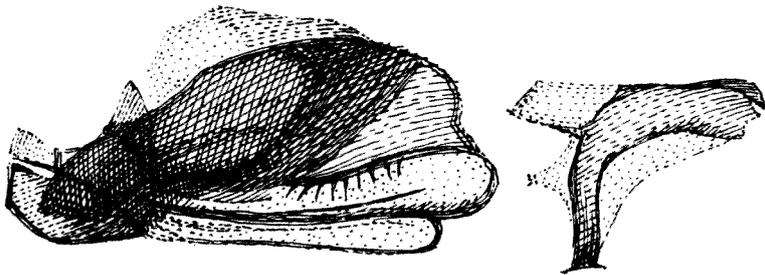
Hitherto *seneciophila* has only been known from N.S.W., south of Sydney, feeding in stems of *Senecio vagus*. My recent collecting has shown that it is widespread in the south west corner of W.A., with a particularly large population in the Porongurups; I also found that it is well represented in the Mt Lofty Ranges, east of Adelaide, S.A. Additional material from Vic. and S.A. is also recorded below.

Adults have now been found in association with 3 further *Senecio* spp. (Senecioneae). It is believed that additional hosts are *Chrysanthemum* (Anthemideae), *Gnaphalium luteoalbum* and *Helichrysum ramosum* (Inuleae), on which specimens were obtained and probably breeding. The species thus appears to feed on 3 separate sections of the Compositae.

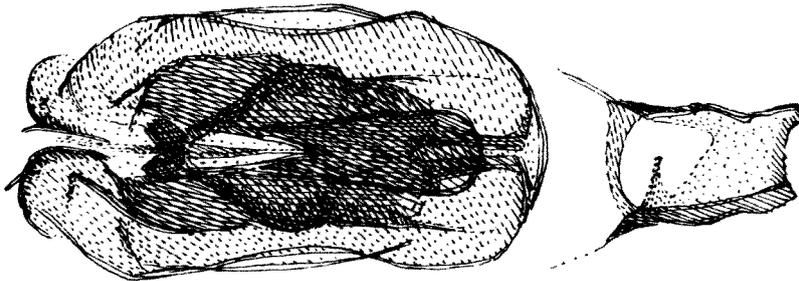
The closest known relative of *seneciophila* is *senecionella* Spencer, 1976b in New Zealand where it is abundant in stems of ragwort, *Senecio jacobaea*. It has not been possible to establish whether *seneciophila* has also colonized ragwort in Australia but this can be expected.



53



54



55

Figs 53-55: *Melanagromyza seneciophila*: 53, wing; 54, aedeagus, side view; 55, same, ventral view.

Material seen

N.S.W: 14 km N.W. of Braidwood, 2♂, 4.xi.75 (K.A.S. and D.H.C.). S.A: Old Alton Downs, Simpson Desert, 1♂, 2♀, 19.ix.72; 25 km N. by E. of Etadunna H.S., Birdsville Track, 2♀, 17.ix.72 (all Z.L.); Mt Lofty, E. of Adelaide, many ♀ seen on *Senecio hypoleucus*, 12.xi.75; Scott Creek Rd., S. of Stirling, 1♀, on *S. quadridentatus*, 12.xi.75 (K.A.S.). Vic: 47 km N.W. of Hopetoun, 1♂, 2♀, 6.ix.74; Wyperfeld National Park, 2♂, 1♀, 4-7.ix.74 (all Z.L.). W.A: Perth, Botanical Gardens, 1♀ on *Chrysanthemum* sp. (Mediterranean), 24.ix.75; Bridgetown, 1♀, 3.x.75; Porongurups, 17♀, 12-13.xi.74 on *Senecio ramosissimus*, many others seen: 2♂, 10♀, 25.xi.75, on *Helichrysum ramosum* and *S. ramosissimus* (destroyed by the ant *Monomorium pharaonis* L.), many others seen; Coolgardie, 1♂, 4♀, 21.x.75, possibly associated with *Gnaphalium luteoalbum* (all K.A.S.).

Melanagromyza sojae (Zehntner, 1900)

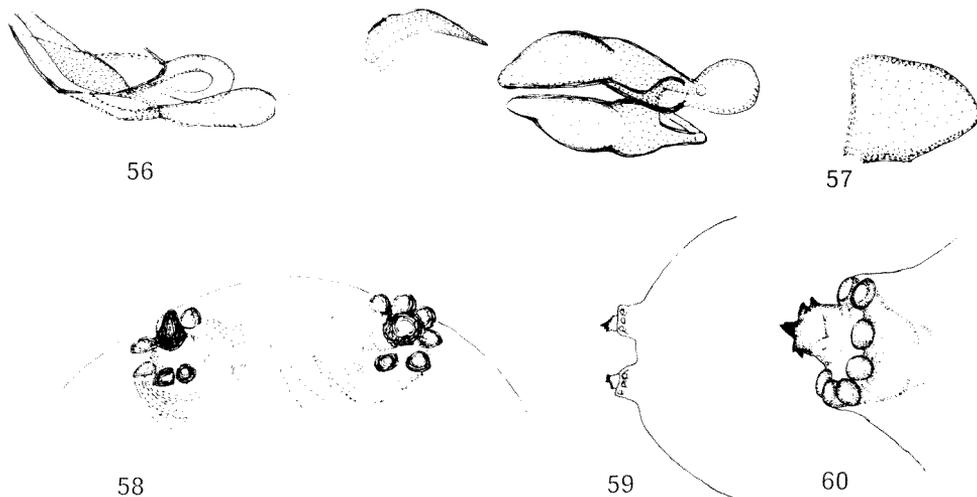
(Figs 56-60)

Agromyza sojae Zehntner, 1900: 113.

Melanagromyza sojae de Meijere, 1922: 18.

Holotype from Java in Zoological Museum, Amsterdam.

Small species with black mesonotum and green abdomen.



Figs 56-60: *Melanagromyza sojae*: 56, aedeagus, side view; 57, same, ventral view; 58-60, posterior spiracles of puparium.

There has previously (Spencer, 1963a: 320) only been a single record of this species in Australia, from Grafton, N.S.W. The additional material now recorded below indicates that *sojae* is widespread but apparently local and is certainly more common in northern tropical areas. Distribution outside Australia extends from Japan through Indonesia and India to Egypt and South Africa.

The aedeagus (Figs 56, 57) is distinctive in having a large membranous gap between the basiphallus and the distiphallus complex and the ventral bladder is characteristically asymmetrical, curving to the right (in rest position).

Hosts include many genera of the Papilionaceae, particularly cultivated *Cajanus*, *Glycine*, *Medicago* and *Phaseolus*. Damage caused by larval feeding is normally slight, as young plants are rarely attacked, in contrast to *Ophiomyia phaseoli*. Oviposition takes place in leaves but the larva feeds primarily in the stem where pupation takes place. The posterior spiracles of the puparium have 6 bulbs around a short truncate horn (Figs 58-60). The biology and economic importance have been discussed in some detail by Spencer (1973a: 52-5).

Material seen

Qld: Mt Garnet Rd., 20.93 km W. of Ravenshoe, 4♂, 5♀, 2.v.67 (D.H.C.); Junction of Goldmine and Davies Creeks, Kuranda-Mareeba Rd., 2♂, 3.v.67 (D.H.C.); Oonoonba, Townsville, 1♂, 5.viii.68 (P. Ferrar). W.A.: Millstream, 1♂, 21.x.70, 1♀, 12.iv.71 (D.H.C.). N.S.W.: New England National Park, rain forest, 1♂, 11.ii.68 (D.H.C.).

Melanagromyza specifica Spencer, 1963

(Figs 61-63)

Melanagromyza specifica Spencer, 1963a: 320.

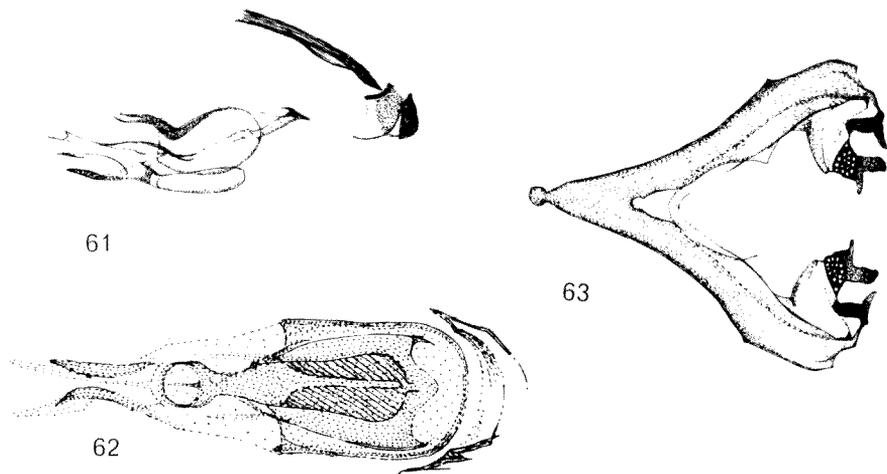
Holotype ♂ from Brisbane, Qld. in ANIC.

Among the group of closely related greenish species, *specifica* is characterized by its small size, bare arista and pilose eye in the male. The wing length is about 2 mm. The aedeagus is shown in Figs 61, 62 and the ninth sternite in Fig. 63. Its nearest relatives are *placata* sp.n. from Cabbage Tree Creek, N.S.W. and *pseudoplacata* sp.n. from Claudie River, N. Qld. The host is unknown.

The new records given below indicate the unusually wide distribution of this species.

Material seen

N.S.W.: Mt Packsaddle, 2♂, 1♀, 18.xi.49 (S.J.P.). S.A.: 25 km N. of Etadunna HS., Birdsville Track, 1♂, 17.ix.72; The Warburton, 2 km N.E. of Kalamurina HS., 1♂, 1♀, 17.ix.72, Old Alton Downs, Simpson Desert, 1♂, 19.ix.72 (all Z.L.). W.A.: Wyndham, 1♂, 15.v.53 (R. Lukins); Millstream, 1♀, 25.x.70; 59 km N. of Ajana, 1♂, 16.x.70 (both D.H.C.).



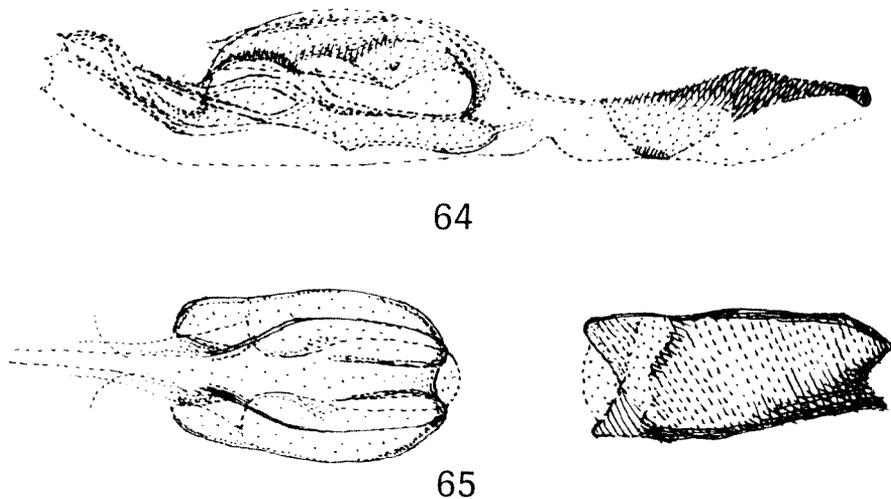
Figs 61-63: *Melanagromyza specifica*: 61, aedeagus, side view; 62, same, ventral view; 63, ninth sternite.

Melanagromyza trifilis sp.n.

(Figs 64, 65)

Head: (eyes collapsed, measurements not possible) 2 ors, 2 ori, orbital setulae sparse, reclinate; jowls appearing relatively broad, about 1/6 height of eye.

Mesonotum: 3+0 dc, third well-developed. immediately before suture.



Figs 64, 65: *Melanagromyza trifilis*: 64, aedeagus, side view; 65, same, ventral view.

Wing: length in male 2.1 mm, last section of vein M3+4 only slightly shorter than penultimate, in ratio 13: 16, first cross-vein just beyond midpoint of discal cell.

Colour: black, mesonotum and abdomen moderately shining; veins all dark; squamae whitish, margin pale brown, fringe ochrous.

Male genitalia: aedeagus as in Figs 64, 65; ninth sternite with broad sidearms, fused at apex, without extended hypandrial apodeme (cf. Figs 63, 161), surstyli broadly rounded, with a fringe of short weak bristles.

Holotype ♂, N.S.W: Northmead. 26.i.63 (D.K.M.), in AM.

Remarks

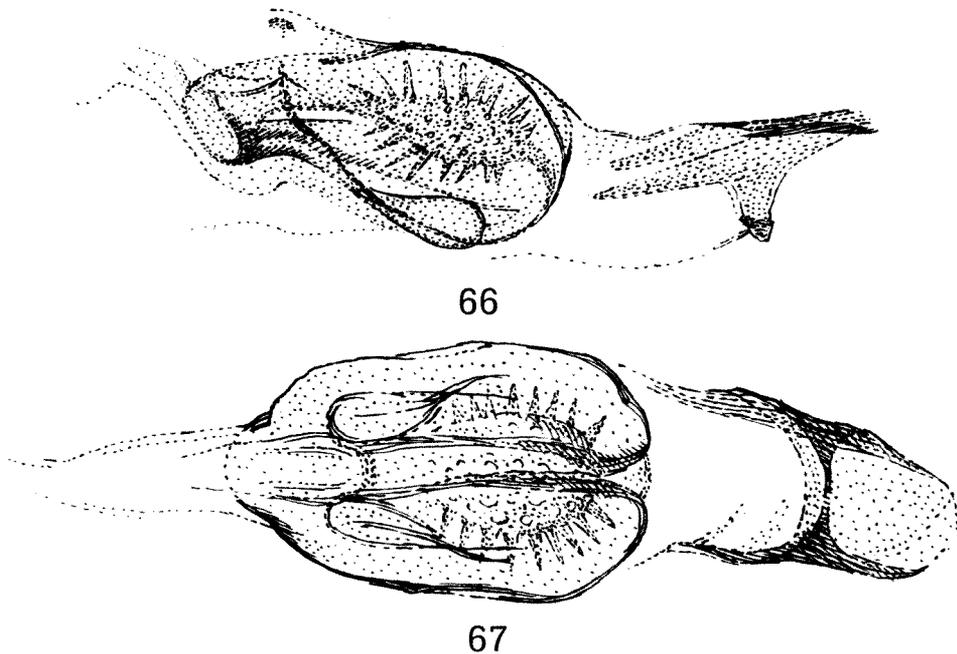
With 3 dc and the squamal fringe pale this species can only be compared with *trispina*; however, it is substantially smaller and the jowls appear to be broader. The male genitalia do not suggest that the 2 species are closely related.

Melanagromyza trispina (Malloch, 1927)
(Figs 66, 67)

Agromyza (*Melanagromyza*) *trispina* Malloch, 1927: 425.

Melanagromyza trispina, Spencer, 1963a: 320.

Holotype ♂ from Merredin, W.A. in SPHTM.



Figs 66, 67: *Melanagromyza trispina*: 66, aedeagus, side view; 67, same, ventral view.

I have recently re-examined the unique holotype. It is readily distinguishable by the presence of a strong third pair of dc; other important characters are: orbits raised, slightly shining; third antennal segment rounded, slightly longer than broad; mesonotum black, mat viewed from front, more shining from rear; squamal fringe white, margin pale brown; abdomen black; wing length 3 mm, first cross-vein distinctly beyond centre of discal cell.

Male genitalia: aedeagus as in Figs 66, 67.

This specimen was caught on 31.viii.26 (E.W. Ferguson). I visited Merredin on 22.x.75, hoping that I might obtain additional specimens of this uncommon species. However, the vegetation was already brown and dry and it is now clear that adults will only be found at the end of winter or early in the spring.

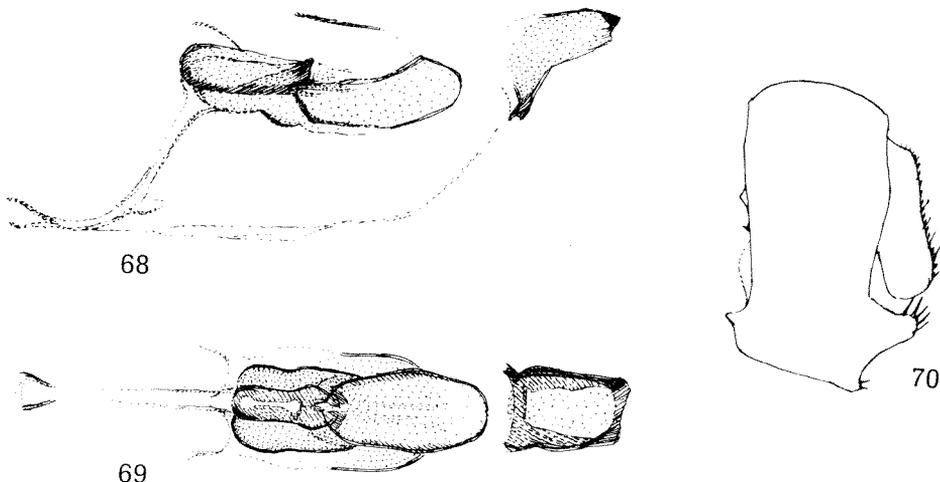
Melanagromyza variegata sp.n.

(Figs 68-70)

Medium-size black species with dark squamal fringe and halteres frequently variegated.

Head: frons broad, from 1 1/2 to 2 times width of eye, slightly projecting above eye on lower half; 2 reclinate ors, the lower slightly weaker, 3 ori, the lower incurved; orbital setulae sparse, reclinate; ocellar triangle only faintly extended to level of lower ors; lunule higher than a semicircle, upper margin at level of upper ori; jowls deepest in centre below eye, 1/6 height of eye; eye upright, virtually bare; third antennal segment small, rounded, arista bare.

Mesonotum: 2 dc, acr in 8 rows.



Figs 68-70: *Melanagromyza variegata*: 68, aedeagus, side view; 69, same, ventral view; 70, epandrium, side view.

Wing: length in male 2-2.3 mm, in female 2.3-2.4 mm, last section of vein M3+4 shorter than penultimate, in ratio 15: 22, first cross-vein beyond midpoint of discal cell.

Legs: mid-tibiae with 1 lateral bristle.

Colour: entirely black species; ocellar triangle and orbits entirely without shine; mesonotum mat viewed from front, distinctly shining from rear; abdomen moderately shining; basal cone of ovipositor brilliantly shining in lower half, grey dusted apically; squamae whitish-grey, margin and fringe black; halteres dark brown but normally paler brown or almost whitish around suture, more rarely appearing entirely dark brown.

Male genitalia: aedeagus as in Figs 68, 69; ninth sternite with broad sidearms and conspicuous vertical knob-like extension at apex; surstyli broadly rounded, epandrium (Fig. 70) with an extension to rear with a group of slender spines and hairs.

Holotype ♂, W.A. Augusta, 1.6 km E. of Jewel Cave, 3.x.70; paratypes; 2♂, Porongurup National Park, Site 1, 11.x.70; 1♂, Mt Chudalup, S. of Northcliffe, 6.x.70 (all D.H.C.). N.S.W: Coolabah, 1♂, 6♀, 12.x.63 (D.H.C.); 1♂, Colo Heights, Putty Rd., 6.ii.68; 1♂, 6 km E. of Nimmitabel, 8.iii.63; 1♂, Royalla, 29.iii.61; Snowy River, 1.6 km, 12.i.67 (all D.H.C.), Snowy Mts, Wilson's Valley, 3♂, 16.ii.63 (D.K.M.). A.C.T: 4♂, Mt Coree, 20.i.64 (D.H.C.). Tas. 1♂, 1♀, Cradle Mt, 15.i.23 (A.L. Tonnoir). Holotype and paratypes in ANIC, 3 paratypes in AM, 3 in AC.

Remarks

This species was originally described from the 3 specimens from W.A., in which the halteres are conspicuously paler in the area of the suture. Examination of the genitalia of some of the other specimens now included as paratypes, in which the halteres are uniformly dark, show that they without question represent the same species.

This is the only *Melanagromyza* recorded in Tas. Although this must in part be due to undercollecting, it nevertheless indicates the progressive reduction in this genus southwards. Only a single species is present in New Zealand (Spencer, 1976b).

Melanagromyza verdescens Spencer, 1963

(Figs 71-74)

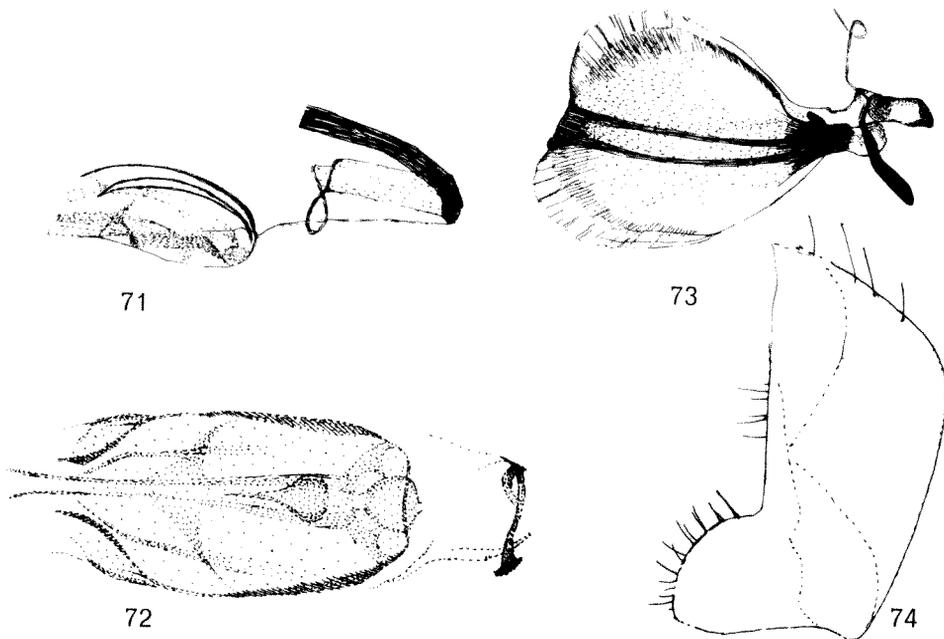
Melanagromyza verdescens Spencer, 1963a: 320.

Holotype ♂ from Wilcannia, N.S.W. in ANIC.

Very small green species with eyes and arista bare.

This species has previously only been known from N.S.W: Wilcannia and Mt Packsaddle. Two further specimens are now recorded from N.T. and S.A. Distribution appears to be restricted to a belt running S.E. from the MacDonnell Ranges to the Broken Hill area.

The aedeagus is shown in Figs 71, 72, the ejaculatory apodeme in Fig. 73, and the epandrium and surstylus in Fig. 74.



Figs 71-74: *Melanagromyza verdescens*: 71, aedeagus, side view; 72, same, ventral view; 73, ejaculatory apodeme; 74, epandrium and surstylus, ventral view.

Examination of 2 specimens with the same data as the holotype of *verdescens* and closely resembling it nevertheless showed them to represent a distinct species, described above as *hastata* sp.n.

Material seen

N.T. Milton Park HS., 23°22'S, 133°00'E, 1♂, 5.xii.68 (A.O.N.). S.A. 33 km S.E. by S. of Oodnadatta, 1♂, 23.ix.72 (Z.L.).

Genus *Ophiomyia* Braschnikov, 1897

Agromyza Fallén, subgenus *Ophiomyia* Braschnikov, 1897: 19.

Ophiomyia Braschnikov, Hendel, 1920.

Type species: *Agromyza maura* Meigen, 1830 (misidentified as *curvipalpis* Zetterstedt).

When raising *Ophiomyia* to full generic status Hendel (1920) differentiated it from *Melanagromyza* by the conspicuous facial keel dividing the antennae and the presence in the male of a well-developed vibrissal fasciculus (Figs 78, 158). Studies of this genus throughout the world since have shown that one or both of these characters may be lack-

ing in species which are clearly confirmed by the male genitalia or larval characters as belonging in *Ophiomyia*.

Ophiomyia species are uniformly black, without any metallic coloration even of the abdomen, and the halteres are also black (with only 2 exceptions, 1 in Europe and 1 in South Africa and Sri Lanka). In the male genitalia the aedeagus is characteristically asymmetrical (Figs 82, 121) and the basal sclerites are invariably elongate (normally short in *Melanagromyza*). The larval posterior spiracles are on distinct stalks with 3 to numerous bulbs (Figs 86, 136), never with the spiracular horn found in *Melanagromyza* (Fig. 8).

In Europe the great majority of species form external stem-mines (Spencer, 1964b), with only a single true leaf-miner, *maura* (Meigen). The *pulicaria* (Meigen) group, now included in *Ophiomyia*, form mines rigidly associated with the midrib.

Six species have previously been known in Australia (Spencer, 1963a). With 35 species *Ophiomyia* has now become recognized as the largest Australian genus. Of these, 14 have the traditional characters of the genus—facial keel and vibrissal fasciculus in the male; 2—*paramonovi* (Spencer) and *compositicaulis* sp.n.—have a conspicuous keel but no fasciculus; 3 lack both characters but are now included in *Ophiomyia* on the basis of the typical genitalia—*alysicarp*i (Bezzi), *conspicua* (Spencer) and *placida* (Spencer).

The status of what has been referred to as the *pisi* group has hitherto been unclear. Kleinschmidt (1960) described *pisi* as a *Melanagromyza* but this genus has since been restricted to internal stem-boring species with characteristic larval spiracles (p. 25) and *pisi*, together with others in the group, was tentatively transferred to *Tropicomyia* by Spencer (1973a). However, with the further restriction of *Tropicomyia* to the true epidermal miners (p. 108) it is now considered that the *pisi* group correctly belongs in *Ophiomyia*. Their black colour, the leaf-mining habit of the larvae, the arrangement of the posterior larval spiracles and the form of the male genitalia (Figs 137, 138) makes this a compact, clearly monophyletic group which might justify separate generic status. However, this would lead to great practical difficulties, with the impossibility of deciding on the generic position of females. Without more detailed revisionary studies on a world basis, particularly of comparably small leaf-mining species in the Neotropical region, it seems sensible to treat *pisi* and its relatives merely as a well-defined species group. Seven species can now be included in this group—*pisi*, *dianellae* (Kleinschmidt), *indigoferae* (Kleinschmidt), *wikstroemiae* (Kleinschmidt), *paramonovi* (Sp.), *nuginiensis* (Sp.) and *gemina* sp.n.

Of the 35 Australian species, 25 are endemic, 15 are recorded below as new (1 undescribed) and 4 are new to Australia—*cornuta* de Meij., *mussauensis* Sp., *nuginiensis* (Sp.) and *rotata* (Sp.).

The host is known of 13 species. Of these, 7 are leaf-miners, 5 stem-miners and 1 feeds in the seeds and receptacle below.

—	Last section of M3+4 longer than penultimate; facial keel lacking, smaller species, wing length in male 2.8 mm	... ..	<i>vegeta</i> sp.n.
9.	Minute species, wing length in male 1.5 mm	... ..	<i>parvula</i> sp.n.
—	Larger species, wing length 1.9-2.6 mm	... ..	10
10.	Facial keel low, narrow	... ..	11
—	Facial keel broad, conspicuously raised below base of antennae; vibrissal fasciculus long, regularly curving (Fig. 111)	... ..	<i>lantanae</i> (Froggatt)
11.	Last and penultimate sections of vein M3+4 equal; vibrissal fasciculus in male with characteristic curvature at end (Fig. 148); wing length 1.9-2.2 mm	... ..	<i>solanicola</i> Spencer
—	Last section of M3+4 shorter than penultimate, in ratio 3:2; vibrissal fasciculus in male incompletely fused; wing length 1.4-2.6 mm	... ..	<i>otfordensis</i> sp.n.
12.	Ocellar triangle long, narrow, brilliantly shining	... ..	<i>phaseoli</i> (Tryon)
—	Ocellar triangle shorter, normal	... ..	13
13.	Arista conspicuously plumose (Fig. 97)	... ..	<i>deceptiva</i> sp.n.
—	Arista bare or with normal pubescence	... ..	14
14.	Jowls broad, 1/3 height of eye	... ..	<i>pullata</i> sp.n.
—	Jowls at most 1/5 height of eye	... ..	15
15.	Third antennal segment distinctly pubescent	... ..	<i>conspicua</i> (Spencer)
—	Third antennal segment with normal pubescence	... ..	16
16.	Mesonotum conspicuously mat	... ..	<i>wikstroemiae</i> (Kleinschmidt)
—	Mesonotum at least moderately shining black	... ..	17
17.	Last and penultimate sections of vein M3+4 equal	... ..	18
—	Last section of M3+4 distinctly shorter than penultimate	... ..	21
18.	Jowls deepest in centre	... ..	<i>alysicarp</i> (Bezzi)
—	Jowls projecting forwards, deepest in front	... ..	19
19.	Jowls broad, 1/5 height of eye	... ..	<i>pisi</i> (Kleinschmidt)
—	Jowls narrow, at most 1/10 height of eye	... ..	20
20.	Jowls projecting forwards; male genitalia: aedeagus as in Figs 107, 108	... ..	<i>indigoferae</i> (Kleinschmidt)

—	Jowls deepest in centre; male genitalia: aedeagus as in Figs 118, 119	... ..	<i>nuginiensis</i> (Spencer)
21.	Minute species, wing length less than 2 mm	... ..	22
—	Larger species, wing length 2.2-2.4 mm in male	... ..	<i>placida</i> (Spencer)
22.	Jowls relatively broad, 1/6 height of eye	... ..	<i>centrosematidis</i> (de Meijere)
—	Jowls narrow, little more than linear	... ..	23
23.	Arista bare (at highest binocular magnification)	... ..	<i>cassiae</i> (Spencer)
—	Arista finely pubescent	... ..	24
24.	Male genitalia: distal section of aedeagus asymmetrical, bearing spinules (Figs 146, 147)	... ..	<i>rotata</i> (Spencer)
—	Male genitalia: distal section of aedeagus symmetrical, without spinules (Figs 116, 117)	... ..	<i>mussauensis</i> (Spencer)
25.	Costa extending to vein M1+2	... ..	26
—	Costa ending at vein R4+5	... ..	<i>dulcis</i> sp.n.
26.	Distinct keel dividing antennae	... ..	27
—	Antennal bases not divided; male without vibrissal fasciculus	... ..	34
27.	Male with vibrissal fasciculus	... ..	28
—	Male with normal vibrissa	... ..	32
28.	Vibrissal angle acute, at most 45°	... ..	<i>cornuta</i> de Meijere
—	Vibrissal angle 60°-90°	... ..	29
29.	Lunule conspicuously shining; the 2 ors widely spaced	... ..	<i>lucidella</i> sp.n.
—	Lunule not shining; ors and ori approximately equidistant	... ..	30
30.	First cross-vein only own length removed from second (Fig 79); wing conspicuously whitish, veins pale	... ..	<i>angustihunula</i> Spencer
—	First cross-vein at least twice own length removed from second (Fig. 114); wing hyaline, normal, veins dark brown	... ..	31
31.	First cross-vein near midpoint of discal cell	... ..	<i>micra</i> Spencer
—	First cross-vein at distal third of discal cell	... ..	<i>tenax</i> sp.n.

32. Squamal fringe white 33
 — Squamal fringe darker, ochrous *gemina* sp.n.
 33. Male genitalia: aedeagus as in Figs 123, 124 *paramonovi* (Spencer)
 — Male genitalia: aedeagus as in Figs 87, 88 *compositicaulis* sp.n.
 34. Jowls distinct but narrow, 1/10 height of eye *dianellae* (Kleinschmidt)
 — Jowls exceptionally narrow, 1/20 height of eye *atralis* (Spencer)

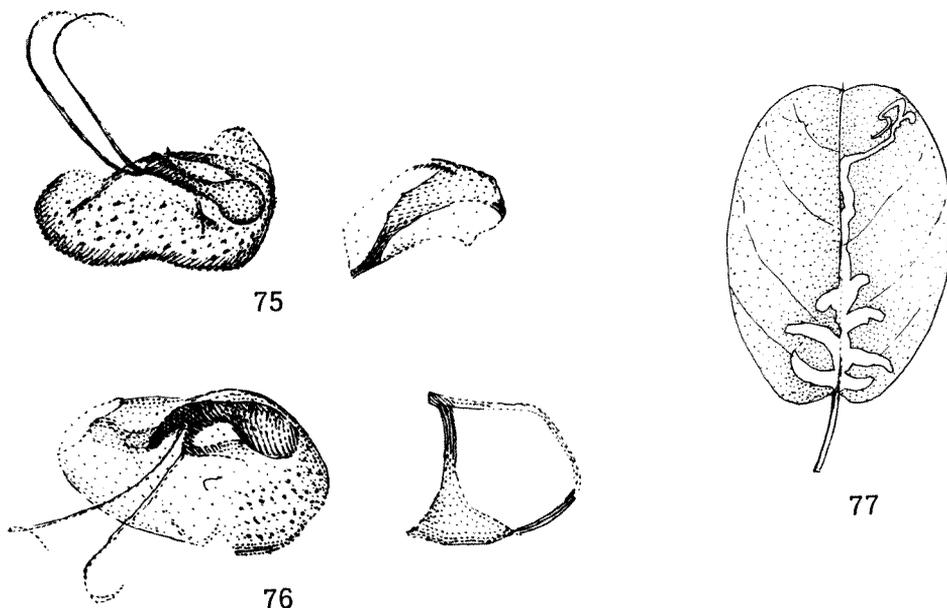
Ophiomyia alysicarpi (Bezzi, 1928), comb. nov.
 (Figs 75-77)

Melanagromyza alysicarpi Bezzi, 1928: 165; Spencer, 1963a: 311.

Holotype ♂ from Fiji in BM.

Minute leaf-mining species, with wing length about 1.6 mm. Essential characters are: jowls narrow, not projecting forwards, 1/8 height of eye; male without vibrissal fasciculus, no facial keel present; mesonotum shining black, squamal margin and fringe dark; costa weak between R4+5 and M1+2, last and penultimate sections of M3+4 equal.

Male genitalia: aedeagus as in Figs 75, 76.



Figs 75-77: *Ophiomyia alysicarpi*: 75, aedeagus, side view; 76, same, ventral view; 77, leaf-mine on *Alysicarpus vaginalis*, Darwin, N.T.

The only host is *Alysicarpus vaginalis* (Papilionaceae), the larva forming a whitish mine above the midrib with offshoots into the leaf-blade (Fig. 77). The white puparium remains in the mine; the long anterior spiracles project through the epidermis; the posterior spiracles are on short stalks, each with 3 bulbs.

The male genitalia, biology and larval characters confirm that this species correctly belongs in *Ophiomyia*, to which it is now transferred.

In Australia the only record is from Darwin, N.T. where I found many mines on 22.i. and 16.ii.62, breeding 8 adults. The species is also known from Java and India (leaf-mines only).

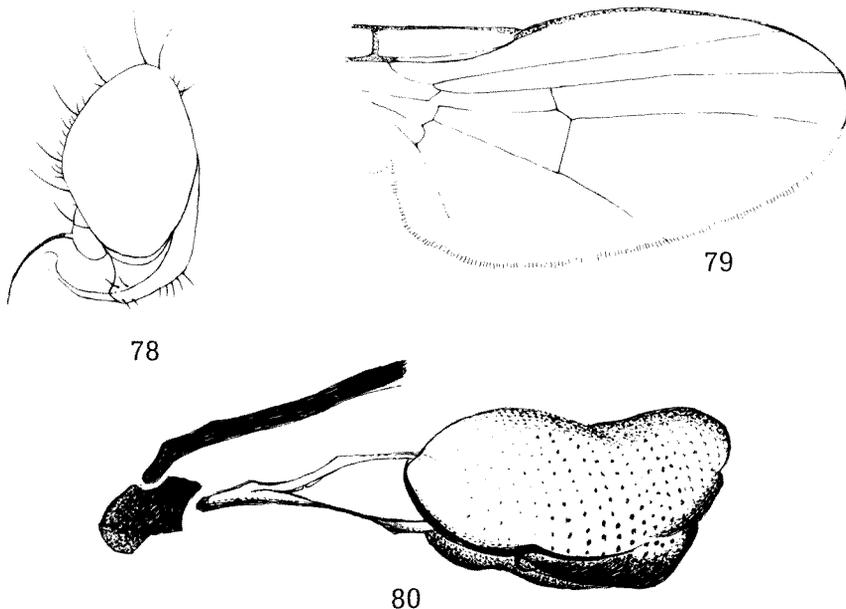
O. papuana Spencer, 1977b was described from the Port Moresby area of New Guinea before the status of *alysicarpus* in *Ophiomyia* had been established. It now seems probable that *papuana* is synonymous with *alysicarpus* but in view of minor differences in the genitalia (cf. Spencer, 1977b: Figs 17, 18) this synonymy is not formally proposed at the present time.

Ophiomyia angustilunula Spencer, 1963

(Figs 78-80)

Ophiomyia angustilunula Spencer, 1963a: 322.

Holotype ♂ from near Wilcannia, N.S.W. in ANIC.



Figs 78-80: *Ophiomyia angustilunula*: 78, head; 79, wing; 80, aedeagus.

This species belongs to the group of small species with the squamal fringe white, a well-defined vibrissal fasciculus in the male (Fig. 78), and the antennae separated by a narrow keel. Distinctive characters are the high lunule, pale wings and the close proximity of the cross-veins (Fig. 79). The conspicuously spinulose aedeagus is shown in Fig. 80.

Only the holotype is known of this uncommon species. The genitalia indicate a close relationship with *micra* (Fig. 115) and with *tenax* sp.n. (Fig. 156), both of which have a similarly white squamal fringe, but also with *conspicua* (Fig. 89), in which the squamal fringe is dark.

The larva almost certainly feeds as a stem-miner but there is no indication of the host.

Ophiomyia atralis (Spencer, 1961)

(Figs 81, 82)

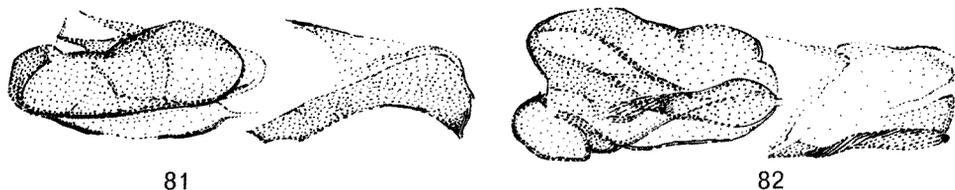
Melanagromyza atralis Spencer, 1961a: 69.

Ophiomyia atralis, Spencer, 1962b: 674; Spencer, 1963a: 323; 1963b: 153.

Holotype ♂ from Indonesia: Flores in Institut für Pflanzenschutzforschung, Eberswalde, G.D.R.

Small, black species, with white squamae and fringe, lacking a vibrissal fasciculus in the male and without a keel dividing the antennae; jowls exceptionally narrow; wing length about 2 mm, first cross-vein only slightly beyond midpoint of discal cell.

Male genitalia: aedeagus as in Figs 81, 82.



Figs 81, 82: *Ophiomyia atralis*: 81, aedeagus, side view; 82, same, ventral view.

O. atralis is clearly related to *compositicaulis* sp.n. but the jowls are substantially narrower.

The only known host is *Vernonia cinerea*, on which the larva forms a long, external stem-mine, pupating at the end of the mine. The puparium is whitish-yellow (black if parasitized), with the posterior spiracles with very short stalks, arising from a common protuberance, each with 3 bulbs.

The only previous record of this species in Australia is from the Botanical Gardens, Darwin where stem-mines were found on 16.i.60 (K.A.S.) but no adults were obtained. Two females from Qld. tentatively identified as *atralis* are now recorded below. It is also known from Calcutta and Bangkok (K.A.S.), is widespread in Micronesia (Spencer, 1963b) and is also present in New Caledonia (Sasakawa, 1963b) and South Africa (Spencer, 1964a: 29).

Material seen

N. Qld. Junction of Goldmine and Davies Creeks, Kuranda–Mareeba Rd., 1♀, 3.v.67; 7-14 km W. of Herberton, via Watsonville, 1♀, 1.v.67 (both D.H.C.).

Ophiomyia cassiae (Spencer, 1963), comb. nov.

(Fig. 83)

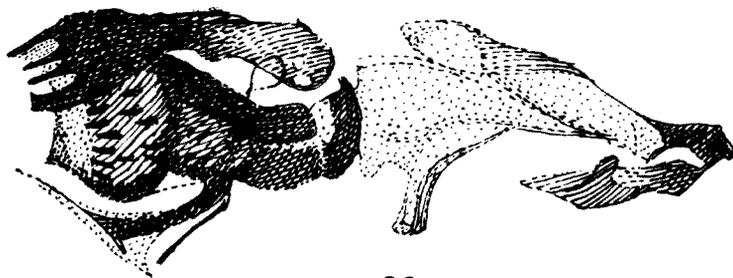
Melanagromyza cassiae Spencer, 1963a: 314.

Holotype ♂ from Careel Bay, N.S.W. in ANIC.

Small black species with no facial keel or vibrissal fasciculus in the male.

Wing: length in the male is 1.9 mm and the last section of vein M3+4 is distinctly shorter than the penultimate.

Two illustrations of the aedeagus were given by Spencer, 1963a: Fig. 11a, b; a further illustration is given in Fig. 83. The ejaculatory apodeme is long but with a rather narrow blade, similar to the type found in a number of *Ophiomyia* species.



83

Fig. 83: *Ophiomyia cassiae*: aedeagus.

The male holotype of this species was caught on *Cassia bicapsularis* north of Sydney and it was believed at the time that epidermal mines on the plant could be associated with it.

The only species in Australia definitely known to produce epidermal mines is *Tropicomyia polyphyta* and *Cassia* has been recorded as one of its many hosts. I now think it is more probable that the specimen on *Cassia* was merely resting on the plant and

not directly associated with it. Two specimens caught on *Erythrina* sp. near Brisbane also almost certainly represent *T. polyphyta* and not *cassiae*, as was previously suggested.

The species clearly does not belong in *Melanagromyza* as now understood. The genitalia show that it also does not belong in *Tropicomyia*. The aedeagus is highly asymmetrical and unique in form but shows some links with *Ophiomyia*, and *cassiae* is therefore now transferred to this genus herewith. *O. tremenda* from New Ireland has the aedeagus with comparable, strong sclerotization and with a somewhat similar arrangement of spines and this could represent synapomorphy (Spencer, 1966c: Figs 9, 10).

Ophiomyia centrosematis (de Meijere, 1940)

(Figs 84-86)

Melanagromyza centrosematis de Meijere, 1940: 128.

Ophiomyia centrosematis, Spencer, 1966a: 3.

Lectotype ♀ from Java designated by Spencer, 1962b, in Zoological Museum, Amsterdam.

Small black species lacking facial keel and vibrissal fasciculus in male. Other important characters are: jowls deepest in centre, not projecting forwards, 1/6 height of eye.

Mesonotum: brilliantly shining; squamal margin and fringe black.

Wing: length 1.7-1.9 mm, last section of vein M3+4 consistently shorter than penultimate.

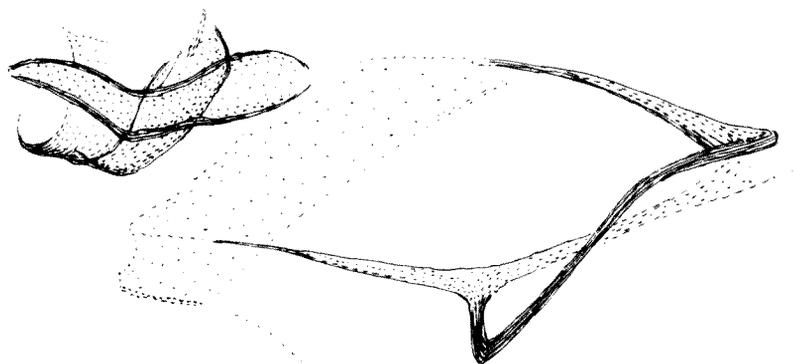
Male genitalia: aedeagus (Figs 84, 85) with basal sclerites characteristically fused, the two joined by a strong arm of sclerotization extending across from midpoint of the left towards the base of the right; bladder of mesophallus distinctly bending to right (viewed ventrally), distiphallus complex symmetrical, spinulose.

This species is known as a stem-miner on a number of genera of cultivated Papilionaceae, including *Glycine*, *Phaseolus* and *Vigna*; also on the cover crops *Calopogonium mucunoides* Desv. (Malaysia) and *Centrosema pubescens* Benth. (Java, Malaysia), and the wild hosts *Tephrosia candida* DC (India) and *Crotalaria mucronata* Desv. (East Africa). No hosts are known in Australia. The larva forms an external stem-mine, pupating in the stem. The puparium is whitish-yellow, with the posterior spiracles on short horizontal stalks, each with 3 bulbs (Figs. 86).

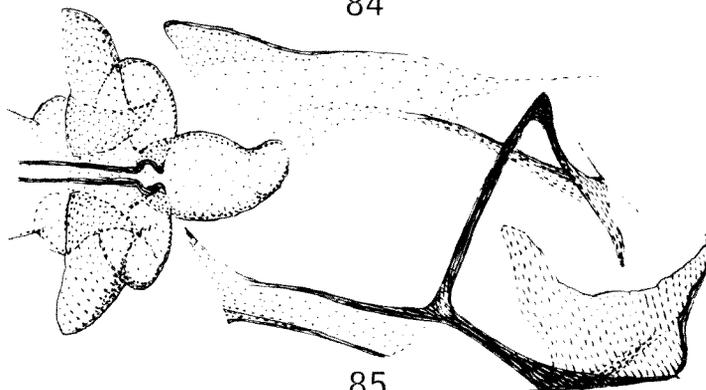
The male genitalia clearly indicate the close relationship of *centrosematis* to *mussauensis* and *rotata* (the 2 latter new to Australia) and the only apparent difference between the 3 species on external characters is the greater depth of the jowls in *centrosematis*.

Its economic importance has been discussed by Spencer (1973a) and in East Africa by Greathead (1969). *O. centrosematis* occurs widely throughout Asia to East Africa. It has

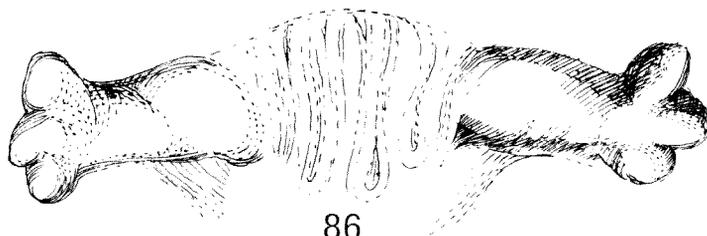
not been recorded in New Guinea but is almost certainly present there. It has previously been known from a single specimen from Wilcannia, N.S.W. New records are now given for Qld. and N.T.



84



85



86

Figs 84-86: *Ophiomyia centrosematis*: 84, aedeagus, side view; 85, same, ventral view; 86, posterior spiracles of puparium.

Material seen

Qld: near Noccundra, 4♂, 2♀, 13.xi.49 (S.J.P.). N.T: 6.4 km W. of Coolibah, 15° 34'S, 130° 54'E, 1♂, 8.vii.68 (M. Mendum).

Ophiomyia compositicaulis sp.n.

(Figs 87, 88)

Small black species with white squamae and fringe.

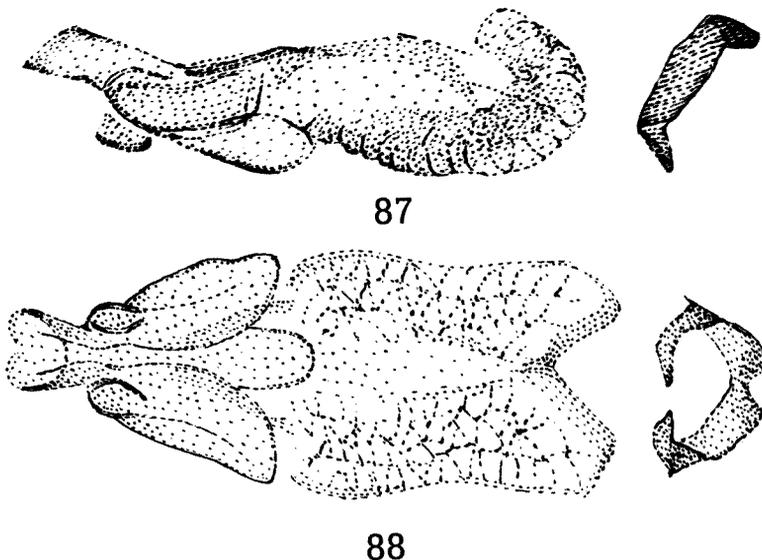
Head: frons broad, nearly twice width of eye, not projecting above eye in profile; 2 reclinate ors, the upper slightly larger; 2 equal ori, the upper reclinate, the lower incurved; orbital setulae sparse, reclinate; ocellar triangle broad but short, apex not reaching level of lower ors; jowls deepest in front, about 1/6 height of eye, in male only a single strong vibrissa, no fasciculus; antennae distinctly divided by a narrow facial keel, third segment small, round; arista virtually bare, fine, swollen at base.

Mesonotum: 2 dc, acr in 8 rows.

Wing: length from 1.6 mm in male to 2.1 mm in female; last and penultimate section of vein M3+4 normally equal, last section rarely slightly shorter.

Colour: head black, ocellar triangle distinctly shining; mesonotum and abdomen brilliantly shining; wing hyaline, veins dark brown; squamae and fringe silvery-white, margin scarcely differentiated; halteres black.

Male genitalia: aedeagus as in Figs 87, 88; ninth sternite with sidearms broadly fused at apex and with extended hypandrial apodeme; ejaculatory apodeme slightly shorter than aedeagus; surstyli broadly rounded, with a fringe of hairs and weak bristles.



Figs 87, 88: *Ophiomyia compositicaulis*: 87, aedeagus, side view; 88, same, ventral view.

Holotype ♂, W.A. 4.83 km N. of Ajana, 16.x.70; paratypes: 1♂, 59 km N. of Ajana, 16.x.70; 1♂, 25 km S.E. by S. of Carnarvon, 16.x.70; 1♂, 1♀, 6 km S.E. by S. of Minilya,

17.x.70; 1♀, Millstream, Crossing Pool, 21.x.70 (all D.H.C.); Cape Le Grande Nat. Park, E. of Esperance, 4♀, 17.x.75 (K.A.S.); N.S.W. 1♂, Caragabal, 13.x.66 (Z.L.); S.A. Old Alton Downs, Simpson Desert, 1♂, 19.ix.72 (Z.L.); Adelaide, Waterfall Gully, 2♀, 12 and 13.xi.75, on *Chrysanthemum atratum* (K.A.S.). Holotype and paratypes in ANIC, further paratypes in WAM and AC.

Remarks

With the squamal fringe white, a well-developed facial keel and no vibrissal fasciculus in the male, this species can only be compared to *paramonovi*. The 2 species cannot be reliably separated on external characters but the male genitalia show that they are not related.

This species was originally described from the 6 specimens caught in W.A. by Dr Colless before there was any indication of the host. In addition to the 2 females recorded above on *Chrysanthemum atratum*, I caught 2 males and 6 further females and saw others. Unfortunately the 2 males were destroyed by ants but I am satisfied that all specimens now included in the type series are conspecific. The introduced *Chrysanthemum* is certainly one host and, with the wide distribution of this species, there seems little doubt that other members of Compositae serve as hosts.

Ophiomyia conspicua (Spencer, 1961)

(Figs 89, 90)

Melanagromyza conspicua Spencer, 1961a: 71.

Ophiomyia conspicua, Spencer, 1977b: 349.

Holotype ♂ from Singapore in BM.

Externally this species has no characters indicating its correct generic position in *Ophiomyia*—it lacks a facial keel and a vibrissal fasciculus in the male. However, the male genitalia (Figs 89, 90) and clarification of its biology as a stem-feeder on *Eclipta alba* in India (Spencer, 1966a: 5) confirms that it belongs in *Ophiomyia*. Unfortunately the larva and puparium are still not known.

Essential characters are jowls broad, 1/5 height of eye, third antennal segment distinctly pubescent.

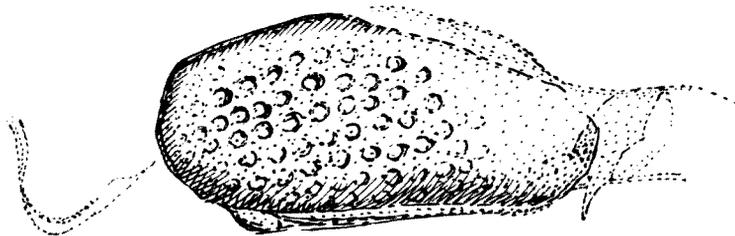
Mesonotum, abdomen and squamal fringe black.

Wing length: 1.9-2.3 mm, last section of vein M3+4 shorter than penultimate, in ratio 15: 21.

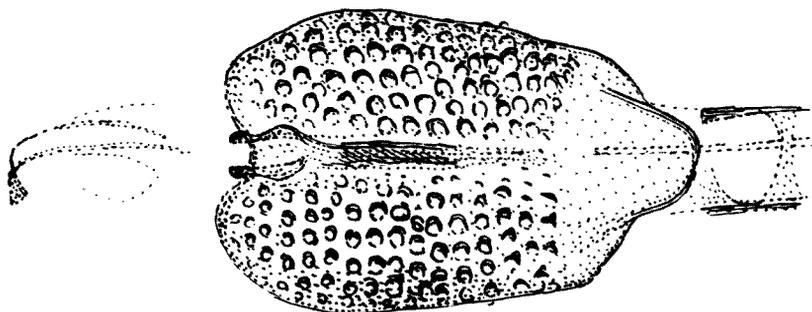
Although no hosts have been confirmed in Australia, a series was caught on *Siegesbeckia orientalis* at Cabbage Tree Creek, Clyde Mt, N.S.W., 5.ii.61 (K.A.S.) and it seems reasonably certain that this was the host. I also caught a specimen on *Tithonia diversifolia*

A. Gray in Sri Lanka and recent collecting in Papua New Guinea indicated an association with *Bidens pilosa* (Spencer, 1977b: 349). It thus seems probable that the larvae feed on many genera of Compositae.

This is essentially a tropical species and it is of interest to find it as far south as Clyde Mt, N.S.W. It occurs widely in Asia from Sri Lanka and India to the Pacific.



89



90

Figs 89, 90: *Ophiomyia conspiciua*: 89, aedeagus, side view; 90, same, ventral view.

Material seen

N.T. 77 km S.W. of Daly River, 14°11'S, 130°08' E, 1♂, 25.viii.68 (M. Mendum). Qld: Crediton Creek, near Eungella, 1♀, 12.xii.61 (D.K.M.); 11-23 km W. of Herberton, via Watsonville, 1♂, 1.v.67 (D.H.C.). N.S.W. Cabbage Tree Creek, Clyde Mt, 1♂, 22.ii.65 (D.H.C.); Mt Gibraltar National Park, 103 km W. of Grafton, 1♂, 24.ii.65; 115.85 km W. of Grafton, 2♀, 13.xi.64; Iluka, Clarence River, rain forest, 1♂, 2♀, 24 and 25.xi.70 (all D.K.M.). Lord Howe Is: 1♂, 24.xi.55 (S.J.P. and Z.L.).

Ophiomyia cornuta de Meijere, 1910

(Figs 91-93)

Ophiomyia cornuta de Meijere, 1910: 161.

Agromyza sp., Lamb, 1912: 346 (Chagos Is.).

Ophiomyia leucolepis Bezzi, 1928: 164 (Fiji).

Ophiomyia scaevolae Frick, 1953: 209 (Canton Is.)

Holotype of *cornuta* from Krakatau, Indonesia in Zoological Museum, Amsterdam.

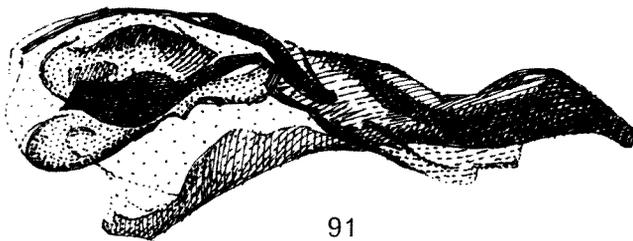
Ophiomyia goodeniae Spencer, 1963a: 323, syn. nov.

Holotype ♀, from National Park, N.S.W. in ANIC.

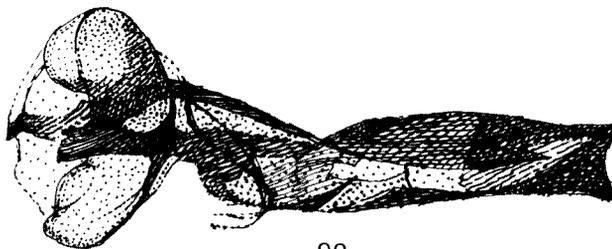
Specimens referable to *cornuta* are recorded below from coastal areas of N.S.W. north of Sydney. It has hitherto been believed that *cornuta* was exclusively a coastal species feeding only on *Scaevola*. However, it is now clear that *goodeniae* Spencer described from *Goodenia ovata* in the National Park south of Sydney is synonymous with *cornuta* and this new synonymy is established herewith.

This species is readily recognizable by the following distinctive characters: ocellar triangle brilliantly shining; vibrissal angle projecting forwards, acute, 45°, in male long, curving fasciculus; distinct narrow keel separating antennae; squamae and fringe white.

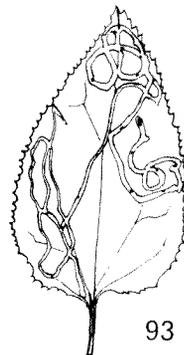
Wing: length 1.8-2 mm.



91



92



93

Figs 91-93: *Ophiomyia cornuta*: 91, aedeagus, side view; 92, same, ventral view; 93, leaf-mine on *Goodenia ovata*.

The male genitalia have not previously been illustrated and the aedeagus is shown in Figs 91, 92.

The larva forms a narrow, winding leaf-mine on *Scaevola* and *Goodenia* (Fig. 93) and known hosts are *S. frutescens* (Mill.) Krause (Indonesia), *S. koenigii* Vahl (Chagos Is.) and *Goodenia ovata* (N.S.W.). The pale white puparium remains in the leaf; the posterior spiracles are unusual in lying horizontally immediately above the brown anal projection and each have 3 circular bulbs.

I previously suggested (Spencer, 1963a: 322) that *cornuta* should be present in Qld. and its confirmation now in N.S.W. shows that it is not restricted to exclusively tropical areas. Elsewhere it occurs widely throughout the Indian and Pacific Ocean areas (Spencer, 1962a: 658; 1963b: 154).

Material seen

N.S.W. Sand Hills, Dee Why, 2♂, 2♀, 31.iii.62; Careel Bay, 1♀, 27.x.62 (all D.K.M.); Sassafras, 1♀, 5.xi.68 (Z.L.).

Ophiomyia cymbonoti sp.n.

(Figs 94-96)

Large species with elongate proboscis and broad facial keel but no vibrissal fasciculus.

Head: (Fig. 94) frons broad, from 1 1/2 to 2 times width of eye, not projecting above eye in profile; in male no ors, 1 ori at base of frons, orbital setulae thick, in several rows, slightly curving; in female 1 strong reclinate ors, 3 incurved ori, orbital setulae sparse, proclinate; ocellar triangle narrow, long, apex almost reaching margin of lunule; jowls projecting forwards, 1/3 height of eye, vibrissa normal in both sexes; facial keel broad, bulbous, shining; proboscis conspicuously elongate, fully extended 1 3/4 times height of eye (Fig. 94); third antennal segment rounded, slightly longer than broad, arista only finely pubescent.

Mesonotum: 2 dc, acr in some 10 rows.

Wing: length 2.6-3.1 mm, last section of M3+4 shorter than penultimate but slightly variable, in ratios from 20: 30 to 20: 35, first cross-vein well beyond midpoint of discal cell.

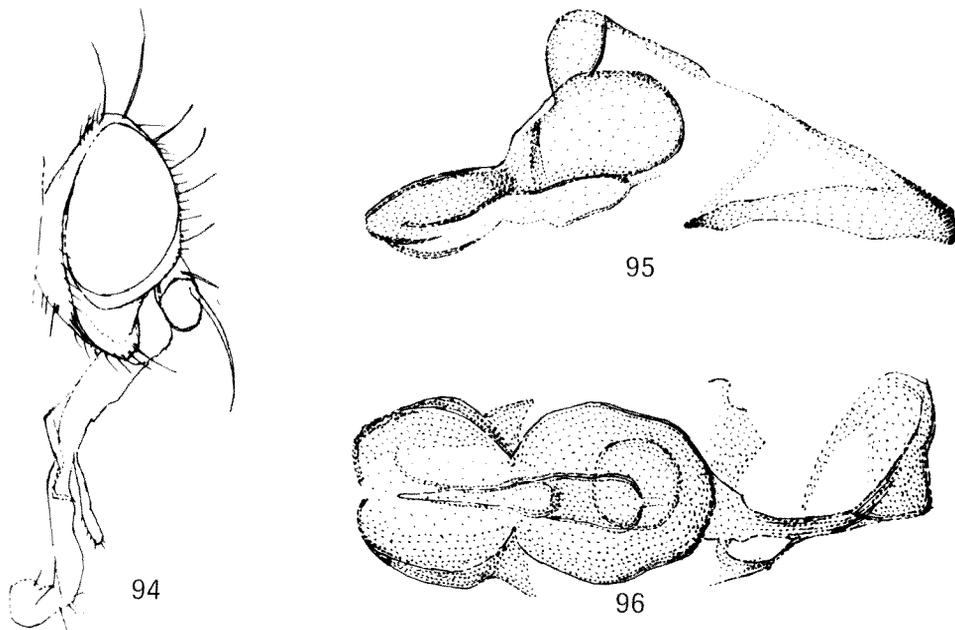
Legs: mid-tibiae without lateral bristles.

Colour: black, ocellar triangle and facial keel brilliantly shining, orbits moderately so; mesonotum brilliantly, abdomen moderately shining; squamae whitish-grey. margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 95, 96; ejaculatory apodeme with narrow stalk and blade; ninth sternite broadly fused at apex, without hypandrial apodeme; surstyli curving inwards, with some 15 stout bristles around margin.

Host-plant/Biology: leaf-miner on *Cymbonotus lawsonianus* (details of mine and puparium not recorded).

Holotype ♂, N.S.W. Barrington Tops, 7.iv.49; paratypes: 1♂, 2♀, same date (all E.F.R.), in ANIC; Vic. Mitta Mitta River, near Mitta Mitta, 1♀, 3.i.60 (D.K.M.), in AM.



Figs 94-96: *Ophiomyia cybonoti*: 94, head (female); 95, aedeagus, side view; 96, same, ventral view.

Remarks

Among Australian species *cybonoti* is distinguishable by the proclinate orbital setulae and the sexual dimorphism with the orbital bristles reduced to a single ori and replaced by unusually numerous orbital setulae in the male. A virtually identical species, *pinguis* (Fallén), cf. Spencer, 1964b: 801 (hosts: *Cichorium*, *Leontodon*) is widespread in Europe and a third species in this group, *nasuta* (Melander), cf. Spencer, 1964b: 798 and 1969: 91 is holarctic and particularly common in Canada. *O. nasuta* (host: *Taraxacum*) differs in having 3 dc. Differences between *cybonoti* and *pinguis*, apart from the genitalia, are slight; in the former the orbital setulae are characteristically curved and the mesonotum is more brilliantly shining black.

Ophiomyia deceptiva sp.n.

(Figs 97-99)

Medium-sized species with short, conspicuously pubescent arista.

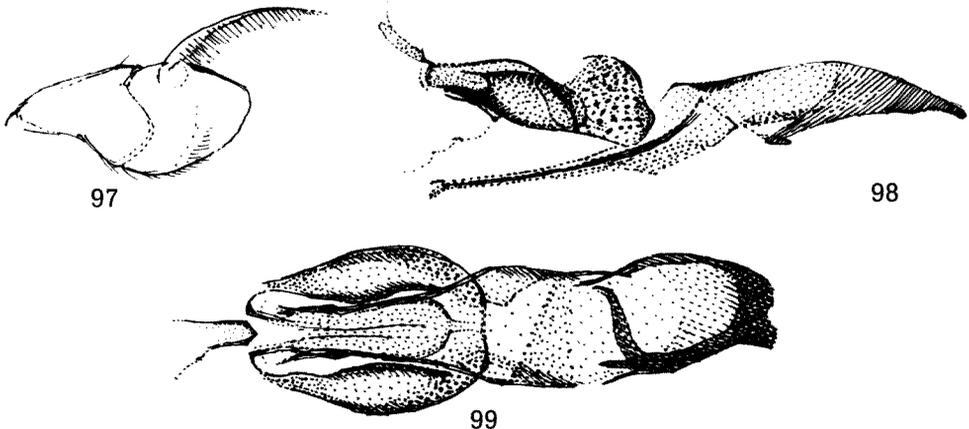
Head: frons broad, twice width of eye, not significantly projecting above eye in profile; orbits well differentiated, with 4 orbital bristles, the lower 3 partially incurved; orbital setulae reclinate; ocellar triangle short, extending at most to midpoint of frons; jowls narrow, deepest in centre below eye, 1/6 height of eye; vibrissa not differentiated from hairs on lower margin of jowl, even in male; antennae divided by low, narrow, inconspicuous keel, third segment rounded, longer than broad, second segment unusually long, longer than third; arista short, 1/2 height of eye, swollen at base, with exceptionally long hairs, increasing in length towards base, particularly on lower inner margin (Fig. 97).

Mesonotum: 2 strong dc, acr in some 8 rows.

Wing: length in male from 1.7-2.1 mm, costa extending strongly to vein M1+2, last section of M3+4 3/4 penultimate, first cross-vein slightly beyond distal third of discal cell.

Colour: entirely black; ocellar triangle moderately, mesonotum and abdomen conspicuously shining; squamae pale grey, margin and fringe black.

Male genitalia: aedeagus as in Figs 98, 99; basal sclerites long, fully fused, with a long, paired extension lying below and to the side of the distal section; ventral bladder within chitinized lobes which are finely spinulose; paired sclerites extending distally upwards; ninth sternite with narrow sidearms and finely extended hypandrial apodeme; surstyli and inner margin of epandrium with unusually strong bristles; ejaculatory apodeme large, slightly longer than aedeagus.



Figs 97-99: *Ophiomyia deceptiva*: 97, third antennal segment; 98, aedeagus, side view; 99, same, ventral view.

Holotype ♂, Qld. Mt Walsh National Park, Biggenden, Aug. 72; paratype ♂, same data (both H. Frauca), in ANIC.

Remarks

The short, exceptionally pilose arista distinguishes this species from all others in the genus, and also in *Melanagromyza*.

Superficially, *deceptiva* could be mistaken for a *Melanagromyza*. The facial keel is less developed than normal in *Ophiomyia* (although a number of species have no keel at all) and there is no vibrissal fasciculus or even a developed vibrissa. However, the male genitalia clearly indicate its correct generic position in *Ophiomyia*; the elongate, fused basal sclerites and the spinulose areas of the distiphallus are typical of many species in the genus (cf. *vegeta*, Fig. 159; *centrosematidis* and *rotata*, Figs 85, 147). The enlarged second antennal segment and unusual form of the arista, and the complex aedeagus indicate that this is an isolated species, although a relationship with *centrosematidis* seems probable.

Ophiomyia dianellae (Kleinschmidt, 1960)

(Figs 100, 101)

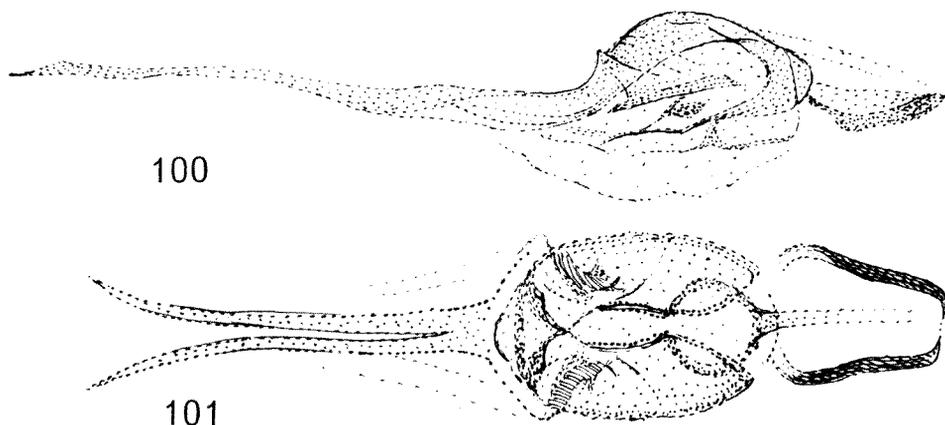
Melanagromyza dianellae Kleinschmidt, 1960: 11.

Ophiomyia dianellae, Spencer, 1966b: 49.

Tropicomyia dianellae, Spencer, 1973a: 200.

Holotype ♀ from Coolangatta, Qld. in QM.

Small black species with white squamae and fringe, lacking a vibrissal fasciculus in the male and without a facial keel dividing the antennae; the jowls are narrow; slightly projecting forwards.



Figs 100, 101: *Ophiomyia dianellae*: 100, aedeagus, side view (Dartmoor, Vic.); 101, same, ventral view (Black Mt, A.C.T.).

Wing: length 1.5-1.7 mm, last and penultimate sections of vein M3+4 approximately equal, first cross-vein well beyond midpoint of discal cell.

Male genitalia: aedeagus with conspicuously long distal tubules (Figs 100, 101).

As a leaf-miner it was earlier clear that this species could not be retained in *Melanagromyza*. It was transferred to *Ophiomyia* by Spencer (1966b) and later to *Tropicomyia* by Spencer (1973a: 200). However, as a member of the *pisi* group it is now retained in *Ophiomyia*.

The only known host-plant is *Dianella caerulea*. The larva forms a conspicuous white mine pupating in the leaf which develops a reddish discoloration around the site of pupation. The puparium is black, elongate, with the posterior spiracles each having 3 bulbs. The larval behaviour and morphology is discussed by Kleinschmidt (1970: 344-7).

It was previously believed that mines found on *Eustrephus latifolius* var. *angustifolius* at Brisbane, 22.i.61 (K.A.S.) represented *dianellae* (Spencer, 1963a: 316). No adults were bred but re-examination of 4 puparia shows that the species is in fact *Tropicomyia polyphyta*.

Although *dianellae* belongs to the *pisi* group it most closely resembles *atralis* (both with the squamal fringe white) which is in a different group (cf. Figs 81, 82). If the facial keel is not apparent in *atralis*, the 2 species can be confused and a reliable identification will only be possible from the male genitalia.

This species has previously been recorded from Qld. and N.S.W. The records given below show that it is widely distributed southwards to Vic.

Material seen

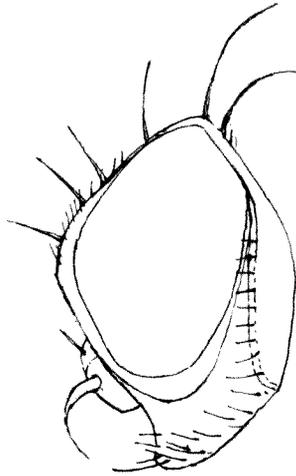
N.S.W. 16 km E. of Bungendore, 1♂, 1♀, 25.ii.61 (D.K.M.); Sassafras, 1♀, 5.xi.68 (D.H.C.); Betts Creek, Snowy Mts, 1♀, 17.ii.63 (D.K.M.); Summit of Jenolan Rd., Blue Mts, c. 1.27 km, 1♀, 10.xii.56 (D.K.M.); Thredbo River, Kosciusko Rd., 1♀, 13.i.67 (D.H.C.); Jerrawa Creek, E.N.E. of Yass, 1♂, 27.ii.66 (Z.L.); 35 km S. of Bermagui, 2♂, 24.ii.74 (Z.L.). A.C.T. Black Mt, Light Trap, 2♂, 4.iii. and 20.xi.64 (I.F.B.C.). Vic. Glenelg River, Dartmoor, 1♂, 3.xii.66; Pirron Yallock, 12 km W. of Colac, 1♂, 1.i.67 (both Z.L.).

Ophiomyia dulcis sp.n.

(Fig. 102)

Species with white squamal fringe and costa ending at vein R4+5.

Head: (Fig. 102): frons 1 1/2 times width of eye; orbits pronounced, rounded above eye below, with 2 ors and 2 ori; orbital setulae reclinate; lunule high and narrow, almost U-shaped; jowls broad, 1/4 height of eye, forming angle of 90° in front; antennae divided by a narrow facial keel which distinctly widens below.



102

Fig. 102: *Ophiomyia dulcis*: head (female).

Mesonotum: 2 strong dc, acr in some 8 rows.

Wing: length in female 1.8 mm, costa extending only to vein R4+5; last and penultimate sections of M3+4 equal, first cross-vein at distal third of discal cell.

Colour: black; ocellar triangle distinctly, orbits moderately shining; mesonotum brilliantly shining; wings whitish, veins pale; squamae and fringe white.

Holotype ♀, N.T. 47 km S.W. of W. of Finke, 1.x.72 (Z.L.), in ANIC.

Remarks

This is the only species in Australia with the costa ending at vein R4+5.

Ophiomyia fera sp.n.

(Figs 103, 104)

Small species with 3 dc.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori; orbital setulae sparse, reclinate; jowls narrow, about 1/8 height of eye, distinctly projecting forwards; facial keel lacking; third antennal segment small, round, arista short, bare; proboscis conspicuously elongate (cf. Fig. 94).

Mesonotum: 3 post-sutural dc, third close behind suture, little more than half length of second; acr in some 6 rows.

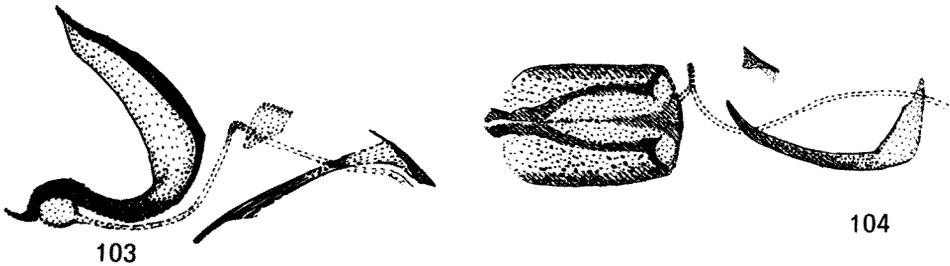
Wing: length in male 1.5-1.7 mm, in female 1.6-1.9 mm; last and penultimate sections of M3+4 equal, first cross-vein just beyond midpoint of discal cell.

Legs: mid-tibiae with 1 slender lateral bristle.

Colour: black, ocellar triangle and orbits scarcely shining; mesonotum and abdomen strongly shining; squamae grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 103, 104; ninth sternite triangular, with slender sidearms, apex only slightly produced; ejaculatory apodeme without stalk and with conspicuously broad blade.

Holotype ♂, W.A. N. of Lake Cooloongup, 26 km N. of Mandurah, 20.ix.75; paratypes: 6♂, 1♀, same data (K.A.S.); 1♂, William Bay, W. of Denmark, 10.x.70; 3♂, Nornalup, 8 and 9.x.70; 1♂, Circular Pool, Nornalup National Park, 9.x.70; 1♀, Cape Naturaliste, 1.x.70; 1♀, Mt Chudalup, S. of Northcliffe, 6.x.70; 1♂, Rest Point, Walpole, 9.x.70 (all D.H.C.). Holotype and 5 paratypes in WAM, further paratypes in ANIC and AC.



Figs 103, 104: *Ophiomyia fera*: 103, aedeagus, side view; 104, same, ventral view.

Remarks

Although this species lacks the 2 main generic characters—vibrissal fasciculus in male and raised facial keel—its generic position is apparent from the forwardly projecting jowls and equal sections of vein M3+4. It is the only Australian *Ophiomyia* with 3 dc but has the elongate proboscis in common with *cymbonoti* and sp. (*Temora*) but this is not always apparent when the proboscis is completely folded back.

In addition to the 8 specimens caught north of Mandurah, I obtained further long series at Mt Chudalup, Pemberton and the Porongurups but all were destroyed by ants. One possible host is *Kennedia coccinea* (Papilionaceae) which was present at all localities where I found this species.

Ophiomyia gemina sp.n.

(Figs 105, 106)

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; jowls deepest in front, 1/6 height of eye, forming angle of 90°, male without vibrissal fasciculus; distinct low keel dividing base of antennae.

Wing: length in male 1.6 mm, costa extending to vein M1+2, last and penultimate sections of M3+4 equal, first cross-vein well beyond midpoint of discal cell.

Colour: frons mat black, orbits and lunule scarcely shining; mesonotum and abdomen moderately shining black; squamae white, fringe ochrous.

Male genitalia: aedeagus as in Figs 105, 106, paired distal tubules broad, separated by a membranous gap from basal section; ninth sternite with elongate hypandrial apodeme.

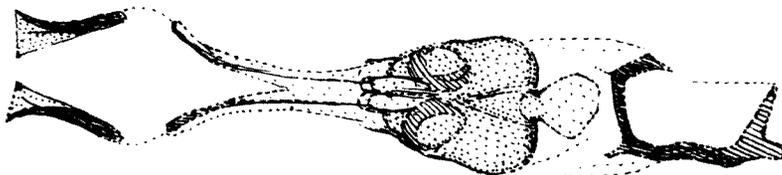
Holotype ♂, N.S.W. 16 km W. of Wilcannia, 22.xi.49 (S.J.P.) (paratype of *paramonovi*); paratype: N.T. Anburla HS, Limestone Bore, 23° 21'S, 133° 05'E, 1♂, 6.xii.68 (A.O.N.). Holotype and paratype in ANIC.

Remarks

This species is obviously closely related to *paramonovi* but is distinguishable by the darker squamal fringe. The aedeagus is even more conspicuously differentiated.



105



106

Figs 105, 106: *Ophiomyia gemina*: 105, aedeagus, side view; 106, same, ventral view.

Ophiomyia indigoferae (Kleinschmidt, 1960), comb. nov.

(Figs 107-109)

Melanagromyza indigoferae Kleinschmidt, 1960: 9.

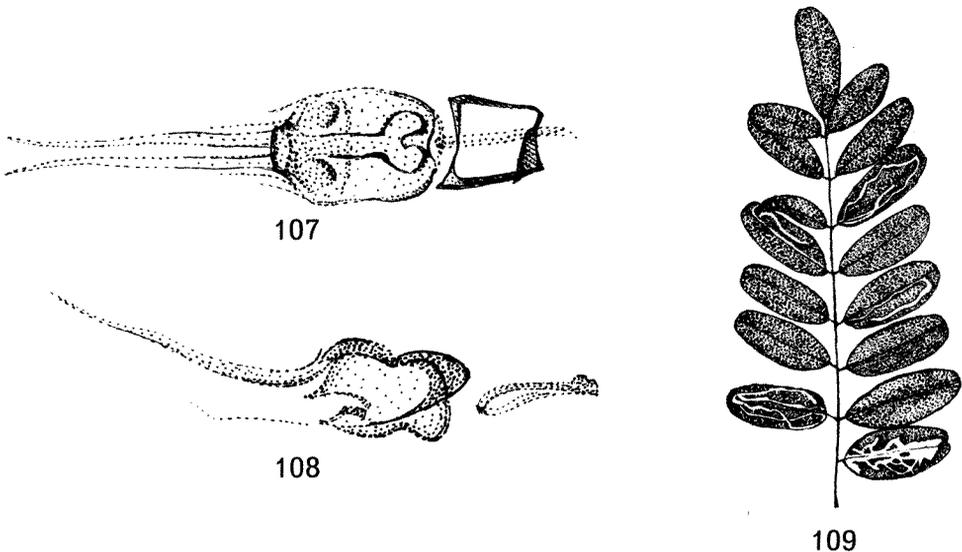
Tropicomyia indigoferae, Spencer, 1973a: 200.

Holotype ♂ from near Brisbane, Qld. in QM.

This leaf-mining species belongs to the *pisi* group and was transferred to *Tropicomyia* s. lat. by Spencer, (1973a: 200). However, with *Tropicomyia* now restricted to the true epidermal miners, *indigoferae* is transferred to *Ophiomyia* herewith (see p. 98). It is entirely black, including the squamal fringe.

Wing: length is 1.3-1.5 mm, with the last and penultimate sections of vein M3+4 equal. The jowls distinctly project forwards but are narrow, little more than linear. The pubescence of the third antennal segment was previously thought to be a distinguishing character but this is not apparent in the further specimens seen. The aedeagus is shown in Figs 107, 108.

O. indigoferae is distinguishable from *pisi* (hosts: *Pisum*, *Trifolium*) by the narrower jowls. On external characters *indigoferae* may be separated from *nuginiensis* by the more forwardly projecting jowls but a more reliable identification may only be possible from the male genitalia.



Figs 107-109: *Ophiomyia indigoferae*: 107, aedeagus, side view; 108, same, ventral view; 109, leaf-mine on *Indigofera* sp., Clyde Mt, N.S.W.

The known hosts are *Indigofera suffruticosa* and *I. australis*. The larva forms a narrow, whitish linear mine (Fig. 109) pupating in the leaf. The puparium is black, firmly glued to the leaf and with the anterior spiracles projecting through the leaf epidermis. The leaf-mines recorded below on *Swainsona* are tentatively identified as of *indigoferae* rather than *pisi*.

The only recorded localities are Qld. Eight Mile Plains and N.S.W. Colo Vale and Cabbage Tree Creek, Clyde Mt (Spencer, 1963a: 316). Two further localities are recorded below.

Material seen

N.S.W. Cabbage Tree Creek, Clyde Mt, 1♂, 12.ii.65; New England National Park, rain forest, 1♂, 11.ii.68 (both D.H.C.). A.C.T. Canberra, Botanical Gardens, leaf-mines on *Swainsona galegifolia*, 7.ii.75 (K.A.S.).

Ophiomyia kaputarensis sp.n.

(Fig. 110)

Large species with narrow facial keel (male unknown).

Head (Fig. 110): frons broad, twice width of eye, slightly but distinctly projecting above eye in profile; 2 ors, 3 ori, orbital setulae sparse, reclinate; ocellar triangle unusually short, apex scarcely extending below level of upper ors; jowls projecting forwards, forming angle of about 80° , broad, just less than $1/3$ height of eye; facial keel low, narrow, virtually linear; third antennal segment small, round, arista bare.

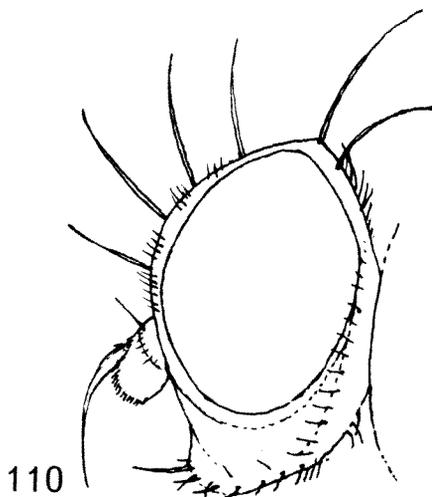


Fig. 110: *Ophiomyia kaputarensis*: head.

Mesonotum: 2 strong dc, acr in some 10 rows.

Wing: length in female 2.4-2.7 mm, last section of M3+4 only marginally shorter than penultimate, first cross-vein slightly beyond midpoint of discal cell.

Legs: mid-tibiae without lateral bristles.

Colour: black, ocellar triangle and orbits only weakly shining, mesonotum only moderately shining, abdomen slightly more so; squamae pale grey, margin and fringe black.

Holotype ♀, N.S.W. Mt Kaputar, 609 m, 7.x.63; paratypes: 1♀, same data (both D.H.C.), in ANIC; Timor Rock, Warrumbungle Range, 1♀, 27.iii.71 (D.K.M.), in AM.

Remarks

It is with some hesitation that I formally describe this species in the absence of males but the large size, short ocellar triangle, broad jowls and narrow facial keel are characters which will enable it to be re-identified.

Ophiomyia lantanae (Froggatt, 1919)

(Figs 111-113)

Agromyza lantanae Froggatt, 1919: 665.

Ophiomyia lantanae, de Meijere, 1925: 253; Spencer, 1963a: 324.

Types believed lost.

Medium-sized species with broad facial keel and long, curving vibrissal fasciculus in male (Fig. 111).

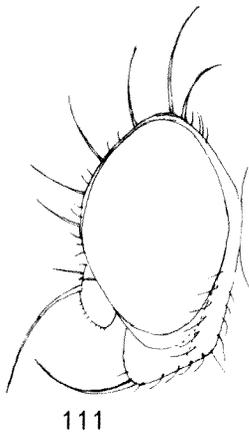
Among Australian species *O. lantanae* is recognizable by the following combination of characters: jowls 1/5 height of eye; vibrissal fasciculus in male present, long, curving (Fig. 111); facial keel broad, conspicuously raised below base of antennae; last and penultimate sections of vein M3+4 equal, wing length 1.9-2.3 mm; aedeagus as in Figs 112, 113.

O. lantanae is well-known in Australia where it was introduced in various parts of Qld. in 1917 in an attempt to control the spread of *Lantana* (Veitch, 1935). It is now considered that *lantanae* has little real effectiveness as a control agent of *Lantana*. The history of the various introductions made in many places from South and East Africa to Hong Kong, New Caledonia and Fiji is given by Spencer (1973a: 358-63).

O. lantanae is now probably present in all areas where *Lantana* occurs but the only states from which definite records are known to me are Qld. and N.S.W. I could not find it on *Lantana* in a garden in Perth.

Material seen

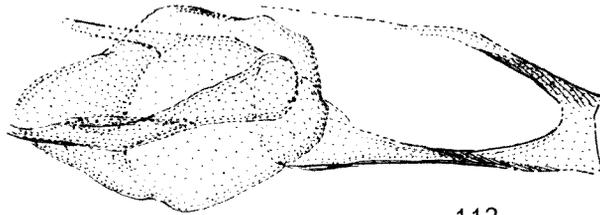
Qld. Speewah Rd., 3♂, 1♀, 12.vi.67 (D.K.M. and G.H.). N.S.W. Bronte, near Sydney, 1♀, 18.vi.72; Mt Keira, near Wollongong, 1♂, 2♀, 9.v.70 (all D.K.M.).



111



112



113

Figs 111-113: *Ophiomyia lantanae*: 111, head (male); 112, aedeagus, side view; 113, same, ventral view.

Ophiomyia lucidella sp.n.

Head: frons narrow, little wider than eye, not projecting above eye in profile; 2 widely spaced ors, the upper reclinate, the lower incurved; 2 closely spaced ori, distance between the ors twice that between the ori; orbital setulae reclinate; lunule large, higher than a semicircle, upper margin at level of lower ors, sub-divided at level of lower ori; jowls broadest in front, almost 1/4 height of eye, forming angle of 80° , vibrissa strong; conspicuous raised keel dividing antennae.

Mesonotum: 2 dc, acr coarse, in some 8 rows.

Wing: length in female 1.7 mm; costa extending strongly to vein M1+2, last section of M3+4 distinctly longer than penultimate, in ratio 20: 14; first cross-vein only slightly beyond midpoint of discal cell.

Colour: frons mat black, ocellar triangle, lunule and orbits brilliantly shining; mesonotum and abdomen shining black; squamae and fringe white.

Holotype ♀, N.S.W. Grogan, W. of Young, 12.xi.66 (Z.L.), in ANIC.

Remarks

Distinctive characters of this species are the shining, divided lunule and the conspicuously widely-spaced ors. The strong vibrissa indicates that a vibrissal fasciculus will be present in the male. The species thus belongs to the *angustilunula-micra* group. It has the lunule characteristic of *angustilunula* but the venation is as in *micra*. Discovery of a male will be of great interest in order to establish its exact affiliations.

Ophiomyia micra Spencer, 1963

(Figs 114, 115)

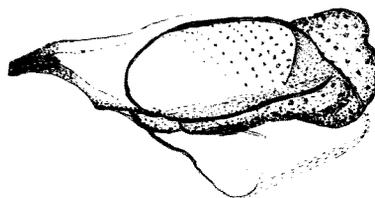
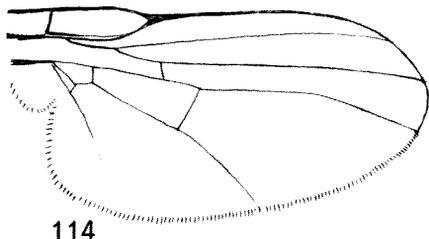
Ophiomyia micra Spencer, 1963a: 324.

Holotype ♂ (not ♀ as published) from beyond Wilcannia, N.S.W. in ANIC.

Distinctive characters of this species are the white squamal fringe, the second cross-vein near the midpoint of the discal cell (Fig. 114) and the small size, with wing length in the male of 1.6 mm.

O. micra closely resembles both *angustilunula* and *tenax* sp.n. It is distinguishable from *angustilunula* by the darker wings and differing venation. Differences between *micra* and *tenax* are slight but the aedeagus (Fig. 115), although of the same general form, differs considerably in detail.

Only the holotype is known and there is no indication of the host-plant.



114

115

Figs 114, 115: *Ophiomyia micra*: 114, wing; 115, aedeagus.

Ophiomyia mussauensis Spencer, 1966, stat. nov.

(Figs 116, 117)

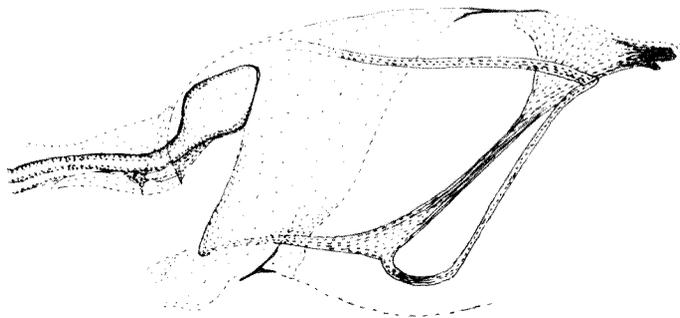
Ophiomyia centrosematis mussauensis Spencer, 1966c: 495.

Holotype ♂ of sub-species from Mussau, Bismarck Archipelago in Zoological Museum, Copenhagen.

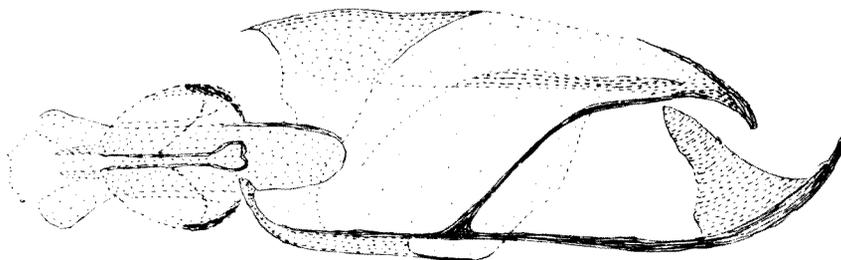
Small black species not distinguishable on external characters from *rotata* (p. 101). Male genitalia: distal section symmetrical, without spinules (Figs 116, 117).

This species was described as a sub-species of *centrosematis* with which it is clearly related. Both have the characteristic form of basal sclerites in the aedeagus (Figs 84, 116). The sub-species was originally known from Mussau, New Britain, New Ireland and Dyaul. Its discovery in 2 widely separated areas in northern Australia justifies raising it to full specific rank.

No host is known but it seems highly probable that the larvae feed on one or more genera of the Papilionaceae.



116



117

Figs 116, 117: *Ophiomyia mussauensis*: 116, aedeagus, side view; 117, same, ventral view.

Material seen

N.Qld: Mt Garnet Rd., 21 km W. of Ravenshoe, 1♂, 2.v.67 (D.H.C.). N.T: Cooper Creek, 11 km S. by W. of Nimbuwah Rock, 2♂, 3.vi.73; Birraduk Creek, 17 km W.S.W. of Nimbuwah Rock, 1♂, 5.vi.73; 8 km S.W. by S. of Oenpelli Mission, 1♂, 6.vi.73; 5 km N.N.W. of Cahills Crossing, East Alligator River, 2♂, 1♀, 8 and 9.vi.73 (all D.H.C.).

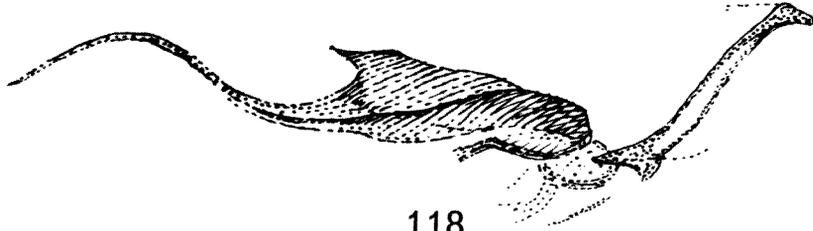
Ophiomyia nuginiensis (Spencer, 1977), comb. nov.

(Figs 118, 119)

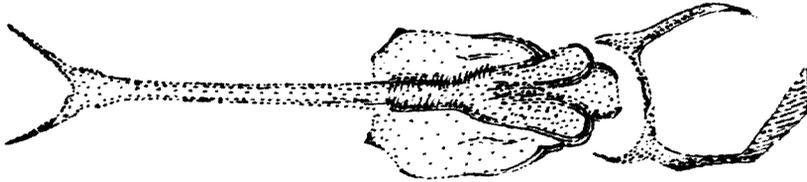
Tropicomyia nuginiensis Spencer, 1977b: 355.

Holotype ♂ from Papua New Guinea in BM.

Minute black species with wing length of 1.5 to 1.6 mm. There is no facial keel dividing the antennae and no vibrissal fasciculus in the male. The jowls are narrow, about 1/12 the eye height, not projecting forwards. Both mesonotum and abdomen are shining black, the squamal fringe is black. The 2 sections of vein M3+4 are equal or the last section at most marginally shorter. The distinctive aedeagus is shown in Figs 118. 119.



118



119

Figs 118, 119: *Ophiomyia nuginiensis*: 118, aedeagus, side view; 119, same, ventral view.

This species was associated with the *pisi* group when it was described and was thus placed in *Tropicomyia*. The host and early stages are not known but for the reasons given for *pisi*, *nuginiensis* is now transferred to *Ophiomyia* herewith.

The male and female types were caught on waste ground at Lae, Papua New Guinea. Confirmation of this species in both N. Qld. and to the west of Alice Springs, N.T. is of considerable interest. With no other species in this group known in New Guinea, it seems probable that this represents a case of dispersal to New Guinea from Australia during the last Pleistocene land connection.

Material seen

N. Qld: Rocky Creek, 11 km N. of Atherton, 1♂, 3.v.67; Tinaroo Falls Dam, 1♂, 27.iv.67 (both D.H.C.). N.T: Charley Creek, Milton Park, 23°23'S., 132°57'E., 1♂, 7.xi.68 (A.O.N.).

Ophiomyia otfordensis sp.n.

(Figs 120, 121)

Medium-sized species with narrow facial keel.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 strong, reclinate ors, 2 weaker ori, the lower incurved; orbital setulae sparse; ocellar triangle with apex clearly-defined to lower ors, with an indication extending almost to margin of lunule; jowls 1/6 height of eye, in male either a single strong vibrissa or several bristles incompletely fused; facial keel distinct but linear, with a distinct central furrow, scarcely raised.

Mesonotum: 2 strong dc, acr in some 10 rows.

Wing: length in male 2.4 mm, in female up to 2.6 mm; last section of M3+4 shorter than penultimate, approximately in ratio 2: 3, first cross-vein near midpoint of discal cell.

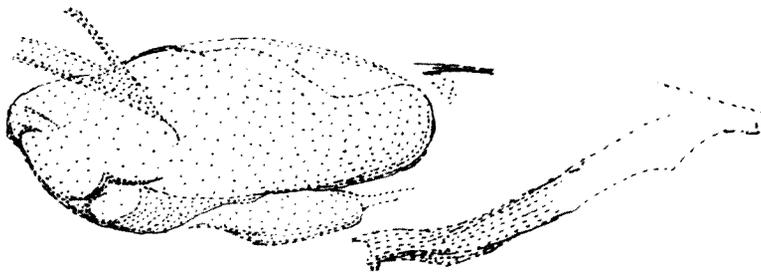
Colour: black, orbits and ocellar triangle only weakly shining; mesonotum largely mat, abdomen distinctly shining; squamae grey, margin and fringe black.

Male genitalia: aedeagus as in **Figs 120, 121**; ninth sternite pointed at apex but without extended hypandrial apodeme.

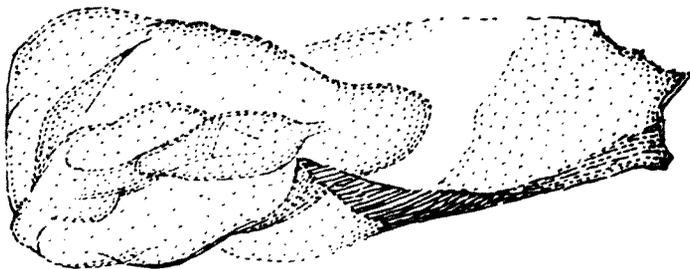
Holotype ♂, N.S.W: Otford, 1.xii.62; paratypes: 1♀, same data; 2♀, 3.xii.62 (D.K.M.). Holotype and 2 paratypes in AM, 1 in AC.

Remarks

This species is named in memory of the small patch of rain forest 51 km south of Sydney which was destroyed by fire in 1968-9 and which has unfortunately not regenerated.



120



121

Figs 120, 121: *Ophiomyia otfordensis*: 120, aedeagus, side view; 121, same, ventral view.

Ophiomyia paramonovi (Spencer, 1963)

(Figs 122-127)

Melanagromyza paramonovi Spencer, 1963a: 317.

Ophiomyia paramonovi, Spencer, 1966b: 49.

Holotype ♂ from Wilcannia, N.S.W. in ANIC.

This species resembles and is closely related to *dianellae*, having the squamae and fringe white and lacking a vibrissal fasciculus in the male; however, it is distinguishable by the deeper jowls (Fig. 122) and the distinct keel dividing the antennae. The aedeagus of the holotype is shown in Figs 123, 124. A male from Erldunda, N.T. is slightly differentiated in the genitalia (Figs 125, 126), indicating incipient speciation, but is accepted as *paramonovi*. A distinctive feature of the genitalia is the unusually elongated hypandrial apodeme (Fig. 127).

In view of the close relationship of *paramonovi* with *dianellae*, it seems certain that the larva and biology will be similar and *paramonovi* was correctly transferred to *Ophiomyia* by Spencer (1966b).

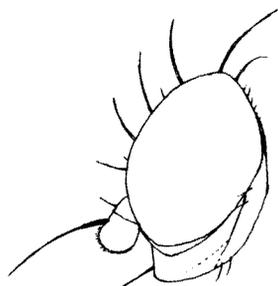
A paratype from Wilcannia has the squamal fringe darker and the aedeagus is distinctly different (Figs 105, 106). This is described above as *gemina* sp.n.

The host of *paramonovi* remains unknown.

The confirmation of *paramonovi* at Erldunda,, N.T. significantly extends the range of this species which has hitherto been known only from the general area of Broken Hill, N.S.W.

Material seen

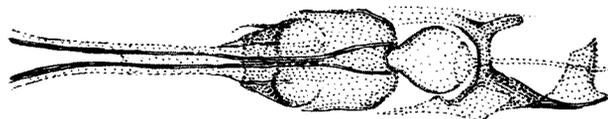
N.T. 29 km N. of Erldunda HS, Stuart Highway, 1♂, 2.x.72 (Z.L.).



122



123



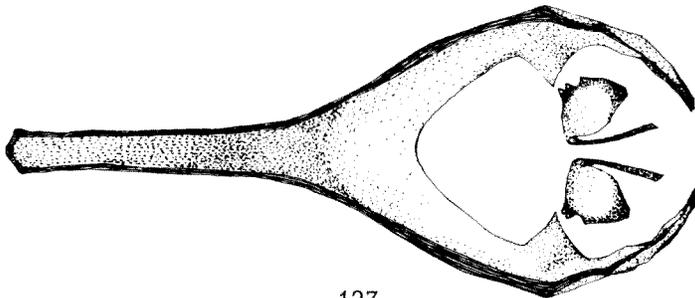
124



125



126



127

Figs 122-127: *Ophiomyia paramonovi*: 122, head; 123, aedeagus, side view; 124, same, ventral view (both holotype); 125, aedeagus, side view; 126, same, ventral view (both Erldunda, N.T.); 127, ninth sternite.

Ophiomyia parvula sp.n.

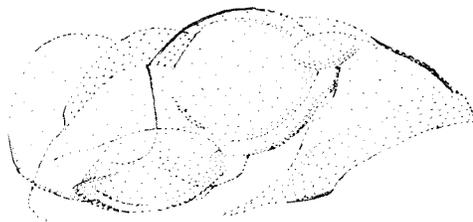
(Figs 128, 129)

Minute species with narrow facial keel.

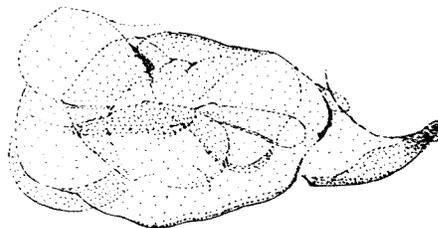
Head: frons broad, almost twice width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae sparse, reclinate; ocellar triangle with apex extending to level of lower ors; jowls projecting forwards, forming angle of 60° , $1/7$ height of eye; vibrissal fasciculus in male with distinct bend towards end; facial keel low, narrow.

Mesonotum: 2 dc, acr in 8 rows.

Wing: length in male 1.6 mm, last and penultimate sections of M3+4 equal.



128



129

Figs 128, 129: *Ophiomyia parvula*: 128, aedeagus, side view; 129, same, ventral view.

Colour: black, ocellar triangle and orbits weakly shining; mesonotum largely mat, abdomen moderately shining; squamae grey, margin and fringe black.

Male genitalia: aedeagus highly asymmetrical, as in Figs 128, 129.

Holotype ♂, Qld: near Rosewood (Brigalow scrub), 29.xii.61 (R. Lindsay), in ANIC.

Remarks

This is a typical *Ophiomyia*, with vibrissal fasciculus and facial keel, and is the smallest species in the genus with these characters known in Australia.

Ophiomyia phaseoli (Tryon, 1895)

(Figs 130-136)

Oscinis phaseoli Tryon, 1895.

Agromyza phaseoli Coquillett, 1899.

Melanagromyza phaseoli, Spencer, 1959: 283; 1963a: 318.

Ophiomyia phaseoli, Spencer, 1973a: 61.

This species is well known in Australia as the Bean Fly. It has the appearance of a small, shining black *Melanagromyza* but the larval characters and biology clearly indicate its correct generic position in *Ophiomyia*, to which it was transferred by Spencer (1973a).

The head is shown in Fig. 130 and the wing in Fig. 131; it is immediately recognizable by the elongated, brilliantly shining ocellar triangle. The male genitalia indicate its isolated position and the aedeagus is shown in Figs 132, 133. The larva (Fig. 134) has a conspicuous 'frontal projection' ('Stirnfortsatz') above the mouth-parts (Fig. 135) and the posterior spiracles are on distinct stalks with the spiracular bulbs arranged in 2 groups of 3 (4) and 4(5) (Fig. 136).

Host-plants are exclusively in the Papilionaceae and the following genera have been recorded: *Cajanus*, *Crotalaria*, *Dolichos*, *Glycine*, *Phaseolus* and *Vigna*. Wild hosts, particularly *Phaseolus* spp. can be heavily infested, thus providing alternate population reservoirs. At Brisbane I found numerous larvae on *Phaseolus lathyroides* at the end of January, 1961.

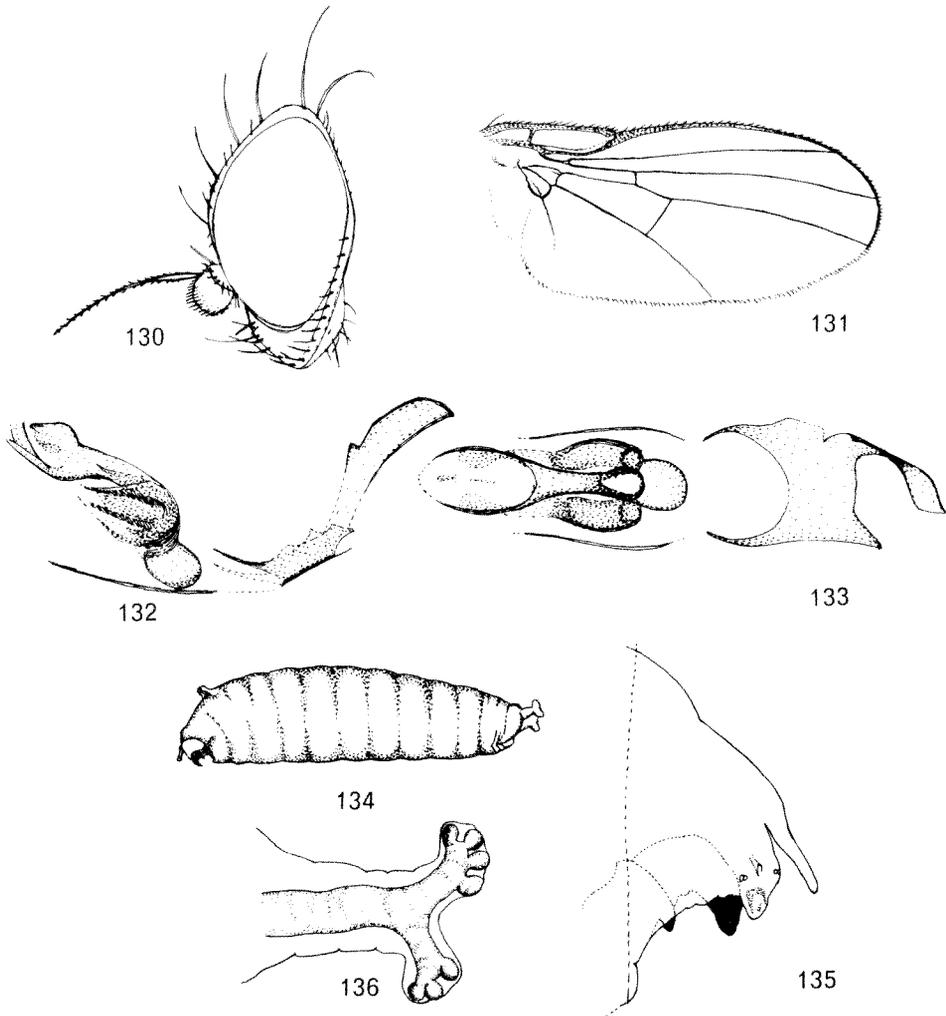
O. phaseoli is a serious pest on cultivated leguminous crops and in Qld. and N.S.W. beans are difficult to grow successfully without chemical control. Attack by this species is particularly damaging because eggs are normally laid in seedling plants and with several larvae frequently present in a single plant the lower stem and root can be largely destroyed. A recent and valuable study of the biology has been undertaken in East Africa by Greathead (1969). Kleinschmidt (1970) gives a useful account of the species in Qld.

I am not aware of any detailed information on the exact distribution in Australia. It is essentially a tropical species and its penetration southwards in N.S.W. will certainly be

limited by climate. It has been recorded in the N.T. (Helson, 1947) and the new records given below show that *phaseoli* is present in W.A. but there is no information as to its southern limit. It occurs widely throughout the Pacific and Asia to Africa and reaches the Jordan Valley in Israel.

Material seen

N.T. Darwin, 1♂, 1♀, no date, (G.F. Hill). W.A. Wyndham, K.R.S., 1♂, 2♀, 3.vii.53, ex stems of 'butter beans' (*Phaseolus vulgaris*) (R. Lukins).



Figs 130-136: *Ophiomyia phaseoli*: 130, head; 131, wing; 132, aedeagus, side view; 133, same, ventral view; 134, larva; 135, frontal projection and mouth-parts of larva; 136, posterior spiracles of larva (one side).

Ophiomyia pisi (Kleinschmidt, 1960), comb. nov.

(Figs 137-140)

Melanagromyza pisi Kleinschmidt, 1960: 4.

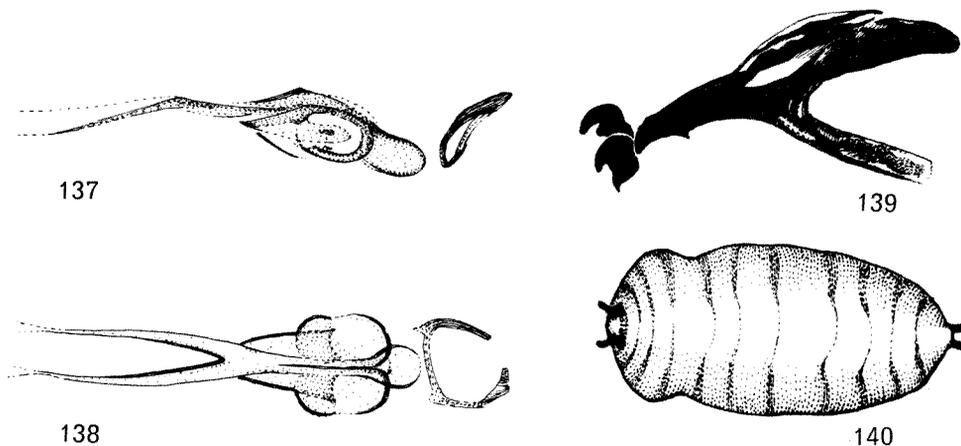
Tropicomyia pisi, Spencer, 1973a: 188.

Holotype ♀ from Toowong, Qld. in QM.

This is a minute black species, with wing length of 1.2-1.6 mm. There is no facial keel and no vibrissal fasciculus in the male. The last and penultimate sections of vein M3+4 are equal or the last section may be slightly longer. The jowls are conspicuously forward-projecting and relatively broad, 1/5 height of the eye. The aedeagus is shown in Figs 137, 138.

When discussing species of economic importance (Spencer, 1973a), it became clear that as a leaf-miner and in view of the larval characters with the posterior spiracles on distinct stalks and with the puparium black, *pisi* could not be retained in *Melanagromyza*. Together with 3 other Australian species with which it is clearly monophyletic—*dianellae*, *indigoferae* and *wikstroemiae*—it was tentatively transferred to *Tropicomyia*. With the further material in this group now seen, I am satisfied that these species more correctly belong in *Ophiomyia*.

Known hosts are *Pisum sativum* and *Trifolium repens*. The larva forms an irregular, whitish upper surface mine, pupating in the leaf with the anterior spiracles projecting through the epidermis. Frass is deposited in 3 distinct pellets associated with each moult (Kleinschmidt, 1970). The larval mouth-parts and cephalo-pharyngeal skeleton are shown in Fig. 139 and the black puparium, with a distinctive constriction anteriorly, in Fig. 140. The posterior spiracles each have 3 bulbs on a short stalk.



Figs 137-140: *Ophiomyia pisi*: 137, aedeagus, side view; 138, same, ventral view; 139, cephalo-pharyngeal sketch of larva; 140, puparium.

With new records given below from A.C.T., S.A., W.A. and Lord Howe Island, this species is far more widely distributed than had previously been believed.

Material seen

N.S.W. Grafton Highway, 32 km from Glen Innes towards Grafton, 1♂, 20.iv.70 (D.H.C.); Greenhills, 1♂, 2♀, 29.i.64, 'mining leaves of white clover' (B.M. Braithwaite). A.C.T. Mt Gingera, 1♀, 13.i.69 (Z.L.) S.A.: 23 km S.W. by S. of Etadunna H.S., Birdsville Track (Green Valley), 4♂, 3♀, 16.ix.72 (Z.L.). W.A. Windy Harbour, S. of Northcliffe, 1♂, 22.ix.75 (K.A.S.). Lord Howe Island: Old Settlement Beach, 1♂, 20.ii.71 (D.K.M.).

Ophiomyia placida (Spencer, 1963), comb. nov.

(Figs 141, 142)

Melanagromyza placida Spencer, 1963a: 319.

Holotype ♂ from Lake Placid, Qld. in AM.

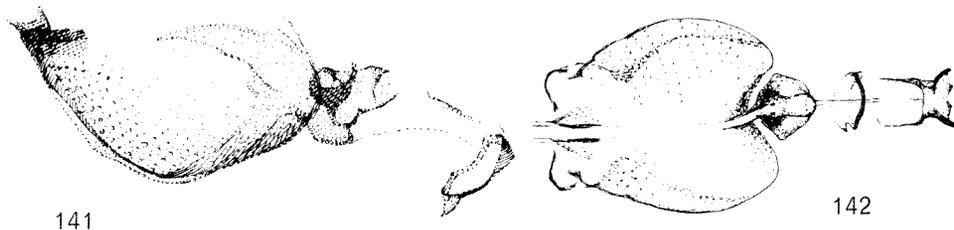
This small black species is now transferred to *Ophiomyia*, in view of the clear affinity in the genitalia (Figs 141, 142) with *conspicua* (cf. Figs 89, 90). It lacks a facial keel and a vibrissal fasciculus in the male. Wing length is 2.2-2.4 mm, with the last section of vein M3+4 distinctly shorter than the penultimate.

Only the unique holotype has hitherto been known, from Lake Placid, near Cairns. The 2 further specimens now seen from Qld. and N.S.W. suggest that the species may be widespread in rain forest but it is clearly uncommon.

In the holotype 4 ors are present. However, it is now believed that this is an aberration, as both the additional specimens have the normal arrangement of 2 ors.

Material seen

Qld. Claudie River, near Mt Lamond, 1♂, 31.v.66 (D.K.M.). N.S.W. Otford, 1♂, 24.xi.62 (D.K.M.).



Figs 141, 142: *Ophiomyia placida*: 141, aedeagus, side view; 142, same, ventral view.

Ophiomyia pullata sp.n.

(Figs 143-145)

Medium-sized species with broad jowls but without vibrissal fasciculus.

Head (Fig. 143): frons broad, twice width of eye; orbits raised in lower half, projecting above eye; ocellar triangle short, apex not reaching level of lower ors; 2 ors, 3 ori, only the lowest ori slightly incurved; orbital setulae sparse, reclinate; jowls broad, deepest at rear, 1/3 height of eye, cheeks forming distinct ring below eye; third antennal segment small, rounded, arista fine, virtually bare, 3/4 height of eye.

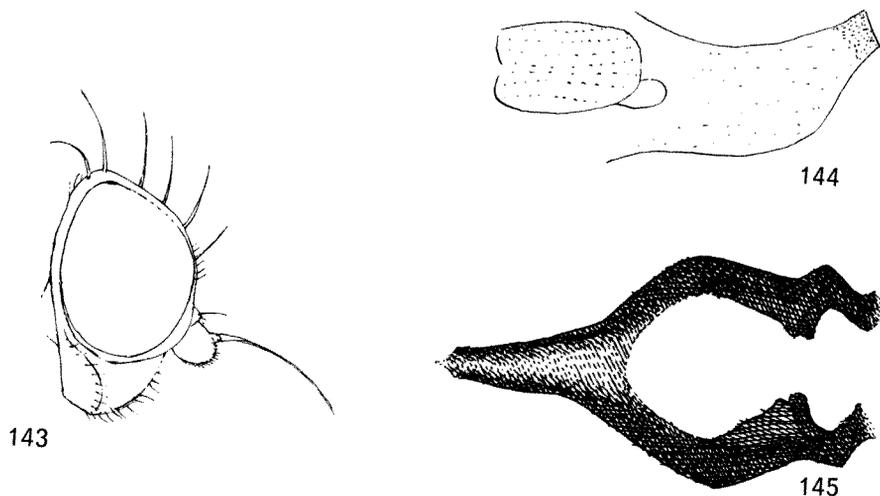
Mesonotum: 2 dc, acr irregularly in 6 rows.

Wing: length in male 2.2 mm, last section of M3+4 only slightly shorter than penultimate, in ratio 19: 21, first cross-vein little more than own length from second.

Colour: frons sooty black, ocellar triangle and upper orbits conspicuously shining; mesonotum and abdomen strongly shining; squamae grey, margin and fringe black; halteres black.

Male genitalia: aedeagus generally as in Fig. 144 (sketch from memory); arms of basal sclerites only lightly chitinized, largely membranous, basal bladder extending far behind distiphallus complex, this symmetrical, slightly divided centrally; ninth sternite conspicuously angular (Fig. 145); surstyli broadly rounded, projecting inwards, with a fringe of short hairs.

Holotype ♂, N.S.W: Vacluse, near Sydney, 3.xi.71 (D.K.M.), in AM.



Figs 143-145: *Ophiomyia pullata*: 143, head; 144, sketch of aedeagus; 145, ninth sternite.

Remarks

The generic position of this species is not wholly clear. Unfortunately the aedeagus was lost and the sketch and description are based on a brief view during dissection. The ninth sternite is characteristic of some *Ophiomyia* species and the almost equal sections of vein M3+4 also indicate this genus rather than *Melanagromyza*. The facial keel dividing the antennae is not pronounced, but is definitely present. The extended arms of the basiphallus are also more typical of *Ophiomyia* and the species is therefore tentatively placed in this genus. The sketch of the aedeagus is not accurate in detail but is sufficiently representative to permit recognition when further specimens become available.

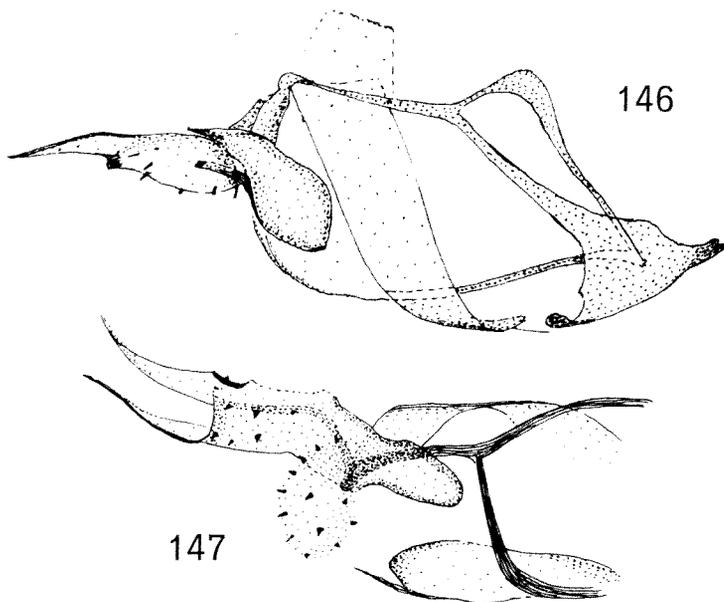
Ophiomyia rotata (Spencer, 1965), comb. nov.

(Figs 146, 147)

Melanagromyza rotata Spencer, 1965b: 4.

Holotype ♂ from the Philippines, Mindanao in Zoological Museum, Copenhagen.

Small black species without facial keel or vibrissal fasciculus in male. Important characters are the narrow jowls which do not project forwards and the dark squamal margin and fringe. Wing length is 1.6-1.8 mm, with the last section of vein M3+4 distinctly shorter than the penultimate. Male genitalia: aedeagus as in Figs 146, 147; basal sclerites connected by arm of strong sclerotization (as in *centrosematidis*), distiphallus asymmetrical, with a spinulose flap on one side only.



Figs 146, 147: *Ophiomyia rotata*: 146, aedeagus, side view; 147, same, ventral view.

The genitalia clearly indicate the close relationship of this species to *centrosematis* (Figs 84, 85).

It has previously only been known from the 3 types specimens from the Philippines. With records from N. Qld. and W.A. it appears to be widespread in northern tropical areas of Australia.

Material seen

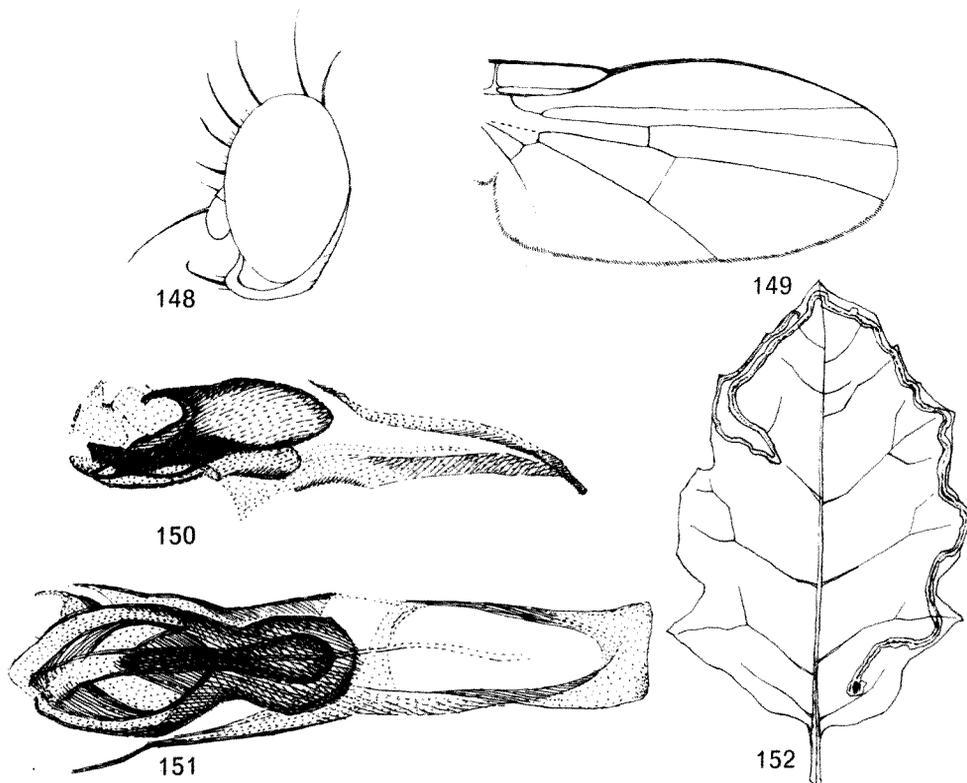
N.Qld. Big Mitchell Creek, Mareeba-Molloy Rd., 1♂, 4.v.67 (D.H.C.). W.A. Millstream, 1♂, 25.x.70 (D.H.C.).

Ophiomyia solanicola Spencer, 1963

(Figs 148-152)

Ophiomyia solanicola Spencer, 1963a: 324.

Holotype ♂ from Clyde Mt, N.S.W. in ANIC.



Figs 148-152: *Ophiomyia solanicola*: 148, head; 149, wing; 150, aedeagus, side view; 151, same, ventral view; 152, leaf-mine on *Solanum prinophyllum*, Clyde Mt, N.S.W.

Significant characters are the narrow jowls and facial keel, and, the characteristically curving vibrissal fasciculus in the male (Fig. 148); wing length is 1.9-2.2 mm, with the last and penultimate sections of vein M3+4 equal (Fig. 149). Two new drawings of the aedeagus are shown in Figs 150, 151.

No additional specimens of this species have been seen and it remains known only from 3 types bred from leaf-mines (Fig. 152) on *Solanum prinophyllum* at Clyde Mt, N.S.W.

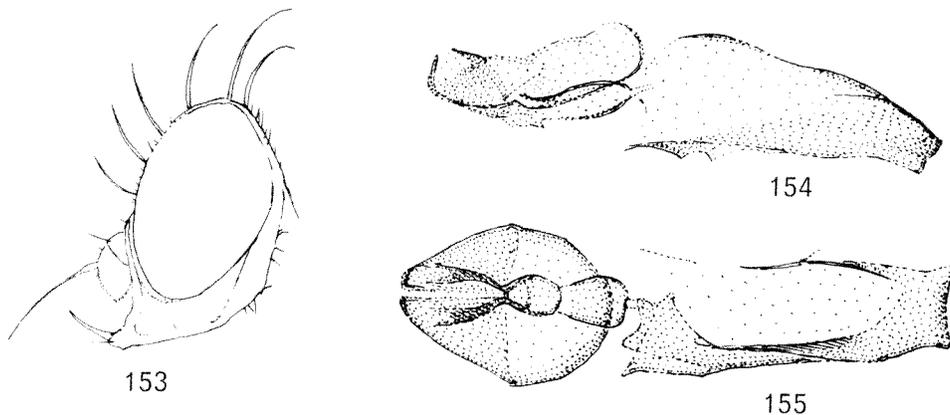
The discovery of the sister-species in New Guinea, *O. ferox* Spencer, 1977b, forming leaf-mines on *Solanum ferox*, was of considerable interest. The aedeagus of *O. ferox* Spencer, 1977b: Figs 8, 9) is of the same general form as in *solanicola* but differs in detail. There is also a clear differentiation between the larvae of the 2 species, with the posterior spiracles in *solanicola* each having 3 bulbs, while in *ferox* there are 5. This suggests that *ferox* is the more recently derived species.

Ophiomyia subtilis sp.n.

(Figs 153-155)

Medium-sized species with projecting jowls and broad facial keel.

Head (Fig. 153): frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 weaker ori, orbital setulae sparse, reclinate; ocellar triangle not extended, only reaching level of upper ors; jowls conspicuously projecting forwards, forming angle of 60°, broad at front, 1/4 height of eye; vibrissal fasciculus in male short, slightly curving; facial keel broadly dividing antennae, conspicuously raised; third antennal segment small, arista bare.



Figs 153-155: *Ophiomyia subtilis*: 153, head (male); 154, aedeagus, side view; 155, same, ventral view.

Mesonotum: 2 dc, acr in 8 rows.

Wing: length in male 2.2 mm, last and penultimate sections of M3+4 equal.

Colour: black; orbits distinctly shining, mesonotum and abdomen only moderately so; squamae grey, margin and fringe black.

Male genitalia: aedeagus as in Figs 154, 155.

Holotype ♂, A.C.T. Uriarra Forest, 10.ii.72 (Z.L.), in ANIC.

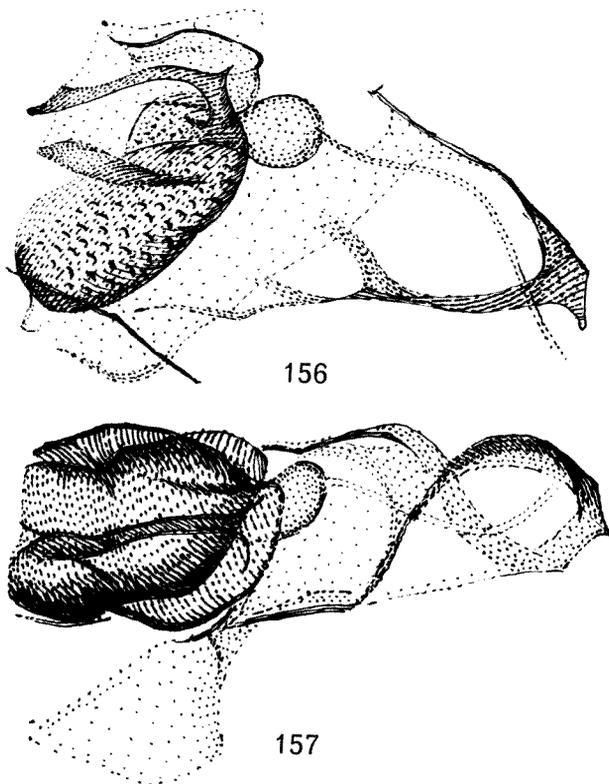
Remarks

This is a typical *Ophiomyia*, with a vibrissal fasciculus in the male and a conspicuous facial keel. The male genitalia are characteristic of the genus.

Ophiomyia tenax sp.n.

(Figs 156, 157)

Small species with white squamal fringe and vibrissal fasciculus in male.



Figs 156, 157: *Ophiomyia tenax*: 156, aedeagus, side view; 157, same, ventral view.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae reclinate; ocellar triangle small, apex finely extended to lower ors; jowls narrow, 1/7 height of eye, projecting forwards forming angle of about 70°; vibrissal fasciculus in male distinct but short; facial keel narrow, not greatly raised; arista fine, appearing bare.

Mesonotum: 2 strong dc, acr irregularly in 8 rows.

Wing: length in male 1.7-1.8 mm; last and penultimate sections of M3+4 equal; first cross-vein at distal third of discal cell; veins dark.

Colour: black; ocellar triangle and orbits weakly shining; mesonotum distinctly shining viewed from rear, abdomen moderately shining; squamae and fringe white.

Male genitalia: aedeagus highly asymmetrical (Figs 156, 157), distal bladder minutely spinulose; ninth sternite rounded and broadly fused at apex; ejaculatory apodeme large, broad, equal in length to aedeagus; surstyli projecting inwards, with a group of some 10 strong bristles and several longer hairs.

Holotype ♂, N.S.W., Coolabah, 12.x.63 (D.H.C.), in ANIC.

Remarks

This species closely resembles *micra* but the first cross-vein is further towards the distal end of the discal cell. The male genitalia confirm the distinctness of the two.

Ophiomyia vegeta sp.n.

(Figs 158-160)

Species with broad jowls, vibrissal fasciculus in male and last section of vein M3+4 longer than penultimate.

Head (Fig. 158): frons broad, almost twice width of eye, not projecting above eye in profile; 2 ors, 3 ori which are little weaker than ors; orbital setulae sparse, reclinate; ocellar triangle short, apex not extending below level of upper ors; jowls forming angle of 80° in front, broad, 1/3 height of eye; vibrissal fasciculus in male short, only slightly curving; facial keel undeveloped; third antennal segment finely pubescent, arista virtually bare.

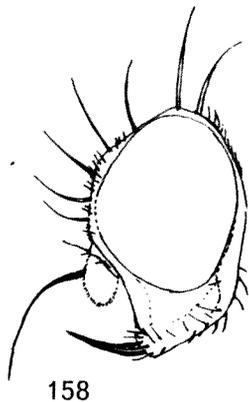
Mesonotum: 2 dc, acr in 10 rows.

Wing: length in male 2.2 mm, last section of M3+4 longer than penultimate, in ratio 25: 19.

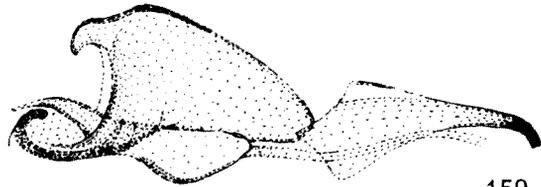
Colour: black; ocellar triangle and orbits scarcely shining; mesonotum and abdomen moderately shining; squamae pale grey, margin and fringe black.

Male genitalia: aedeagus as in Figs 159, 160.

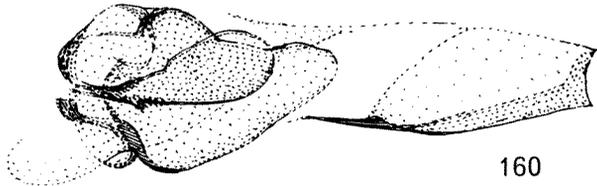
Holotype ♂, N.S.W. 6 km S.W. of Tarago, 20.iii.66 (Z.L.), in ANIC.



158



159



160

Figs 158-160: *Ophiomyia vejeta*: 158, head (male); 159, aedeagus, side view; 160, same, ventral view.

Remarks

This species is unusual in having the last section of vein M3+4 longer than the penultimate and in lacking a developed facial keel.

Ophiomyia wikstroemiae (Kleinschmidt, 1960), comb. nov.

(Figs 161-163)

Ophiomyia wikstroemiae Kleinschmidt, 1960: 1; Spencer, 1963a: 321.

Tropicomyia wikstroemiae, Spencer, 1973a: 200.

Holotype ♂ from Kenmore, Qld. in QM.

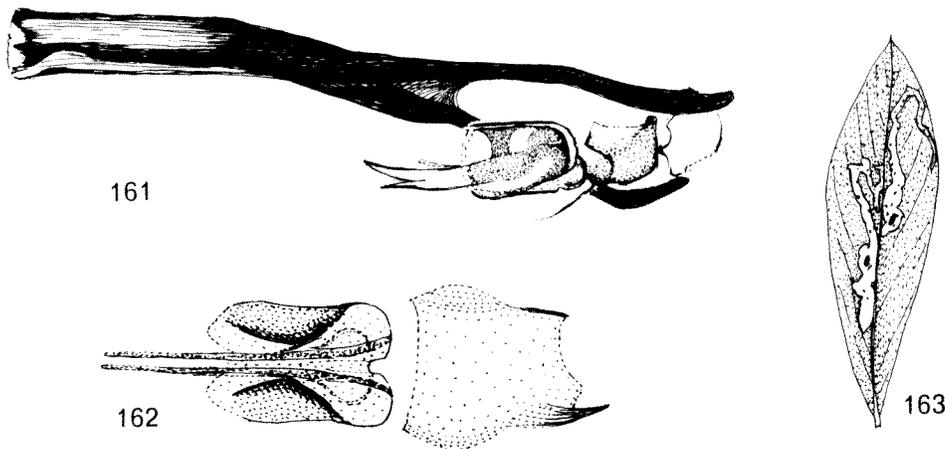
This leaf-mining species belongs to the *pisi* group and for the reasons given on p. 98 is transferred to *Ophiomyia* herewith. It is the largest species in the group, with wing length of 1.7-1.8 mm in the male to 2.1 mm in the female. The most important character is the conspicuously mat, almost brownish mesonotum; the jowls are broad, up to 1/6 the eye height. There is a distinct, low facial keel and the last section of vein M3+4 is consistently shorter than the penultimate. The aedeagus is shown in Figs 161, 162.

Two hosts are known, both in the Thymeleaceae. The type series was bred from *Wikstroemia indica* and I found the mines to be common on *Pimelea ligustrina*, south of Sydney. The larva forms an irregular, upper surface linear mine (Fig. 163), pupating in the mine. The puparium is shining black. Larval characters and biology are discussed by Kleinschmidt (1970: 359.).

Additional records are given below and this species is now known in Qld., N.S.W., A.C.T. and Tas.

Material seen

N.S.W: Kangaroo Valley, 17 exx., 5.ix.49 (E.F.R.); Snowy River, 1.6 km, 2♂, 1♀, 12.i.67 (D.H.C.). A.C.T. Mt Gingera, 1♂, 11.i.67 (D.H.C.). Tas. Helyer Gorge, 1♂, 2♀, 30.i.49 (E.F.R.).



Figs 161-163: *Ophiomyia wikstroemiae*: 161, aedeagus, side view (with ninth sternite); 162, aedeagus, ventral view; 163, leaf-mine on *Pimelea ligustrina*.

Ophiomyia sp. (Temora, N.S.W.)

Small species with elongate proboscis.

This species is clearly distinct from any described from Australia and can be included in the key at couplet 4. However, there may well be other closely related species still undiscovered and, with reliable identification only possible from characters of the head in the male and the male genitalia, formal description seems undesirable. Essential characters are as follow:

frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae sparse, reclinate; ocellar triangle moderately shining; jowls projecting forwards, about 1/8 height of eye; facial keel raised but narrow; proboscis conspicuously elongate; mesonotum with 2 dc, distinctly shining, particularly from rear; wing length in female 1.8 mm, last and penultimate sections of M3+4 equal, first cross-vein only slightly beyond midpoint of discal cell.

Material seen

N.S.W. 16 km S.E. of Temora, 1♀, 12.xi.66 (Z.L.), in ANIC.

Genus *Tropicomyia* Spencer, 1973

Tropicomyia Spencer, 1973a: 180.

Type: *Melanagromyza flacourtae* Séguy, 1951 from Madagascar and Africa.

This genus was erected primarily for the group of minute black epidermal miners which have characteristic genitalia and modified, 'serrated' larval mouth-hooks (Fig. 168). These species agree in essential characters with *Melanagromyza*, apart from their smaller size, and in recent years have been included in this genus but the differing genitalia, larval characters and biology clearly indicated the justification for treating them as generically distinct. Other small leaf-mining species which form normal upper surface mines but without the specialized mouth-hooks modified for epidermal feeding were also not correctly included in *Melanagromyza* and they were tentatively transferred to *Tropicomyia* (Spencer, 1973a).

The genitalia of 20 further small black males have now been examined from all states except Tas. Surprisingly not one represented *Tropicomyia* s.s. Study of this additional material satisfies me that the Australian leaf-mining species in this group properly belong in *Ophiomyia* (see above). The status of non-epidermal leaf-mining species still retained in *Melanagromyza* in other parts of the world, particularly in the Neotropical Region, requires further clarification.

Only the single species, *polyphyta* (Kleinschmidt), belongs in *Tropicomyia* in Australia. Five species were recently recorded in New Guinea (Spencer, 1977b), a similar number is present in Africa and one species reaches southern Japan.

Tropicomyia polyphyta (Kleinschmidt, 1960)

(Figs 164-168)

Melanagromyza polyphyta Kleinschmidt, 1960: 6; 1970: 353.

Tropicomyia polyphyta, Spencer, 1973a: 191.

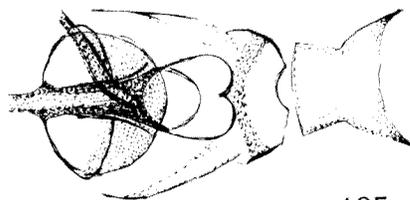
Holotype ♀ from Kenmore, Qld. in QM.

This is a minute, shining black species, with wing length of 1.4-1.6 mm; the squamae and fringe, and also the halteres, are black. The costa extends to vein M1+2 and the last section of M3+4 is distinctly shorter than the penultimate. The distinctive aedeagus is shown in Figs 164, 165.

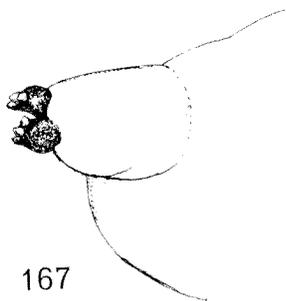
The larva forms a shallow, silvery epidermal mine (Fig. 166), pupating in the leaf at the end of the mine, with the anterior spiracles projecting through the epidermis. The puparium is yellowish-brown, broad at the front and tapering to the rear, with the posterior spiracles on a conspicuous projection, each with 3 bulbs (Fig. 167). The serrated mouth-hooks are shown in Fig. 168.



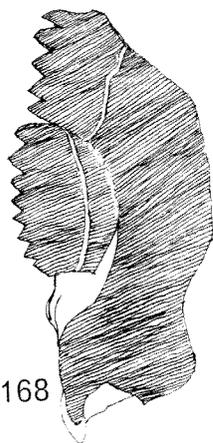
164



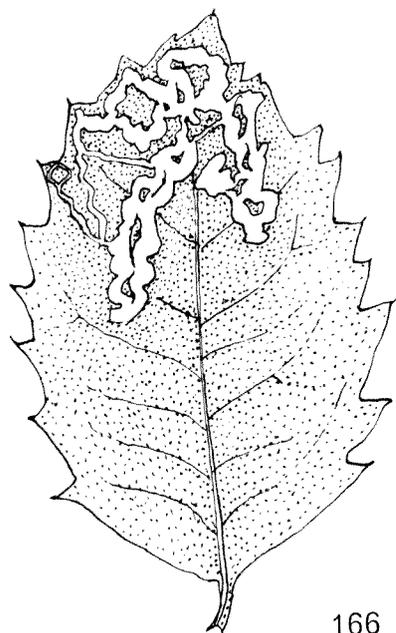
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168



166

Figs 164-168: *Tropicomyia polyphyta*: 164, aedeagus, side view (ex *Tylophora barbata*); 165, same, ventral view; 166, leaf-mine on *Doryphora sassafras*, Clyde Mt, N.S.W; 167, posterior spiracles of puparium; 168, larval mouth-hooks.

This is a highly polyphagous species and the following hosts are known in Australia:

- | | |
|----------------|--|
| Apocynaceae | : <i>Plumeria rubra</i> |
| Asclepiadaceae | : <i>Marsdenia rostrata</i> , <i>Tylophora barbata</i> |
| Bignoniaceae | : <i>Kigelia pinnata</i> |

Caprifoliaceae	: <i>Lonicera periclymenum</i>
Celastraceae	: <i>Celastrus subspicatus</i>
Combretaceae	: <i>Quisqualis indica</i>
Euphorbiaceae	: <i>Acalypha wilkesiana</i> , <i>Breynia oblongifolia</i> , <i>Euphorbia pulcherrima</i>
Lecythidaceae	: <i>Barringtonia gracilis</i>
Liliaceae	: <i>Eustrephus latifolius</i> , <i>Smilax australis</i>
Malpighiaceae	: <i>Heteropteris nitida</i>
Meliaceae	: <i>Melia azedarach</i>
Menispermaceae	: <i>Stephania japonica</i>
Monimiaceae	: <i>Doryphora sassafras</i>
Moraceae	: <i>Cudrania javanensis</i>
Myrtaceae	: <i>Angophora</i> sp.
Papilionaceae	: <i>Cassia coluteoides</i> , <i>Erythrina crista-galli</i> , <i>Phaseolus lathyroides</i> , <i>Vigna sesquipedalis</i>
Passifloraceae	: <i>Passiflora caerulea</i> , <i>P. cinnabarina</i> , <i>P. edulis</i> , <i>P. foetida</i> , <i>P. suberosa</i>
Rhamnaceae	: <i>Alphitonia excelsa</i>
Rubiaceae	: <i>Coffea arabica</i> , <i>Gardenia jasminoides</i>
Rutaceae	: <i>Citrus aurantifolia</i> , <i>Murraya exotica</i> , <i>M. paniculata</i>
Salicaceae	: <i>Salix babylonica</i>
Saxifragaceae	: <i>Hydrangea macrophylla</i>
Solanaceae	: <i>Capsicum annuum</i> , <i>Cestrum parqui</i>
Sterculiaceae	: <i>Brachychiton</i> sp.
Theaceae	: <i>Camellia japonica</i>

The only areas where this species is known are around Sydney and southwards to Waterfall and Clyde Mt, around Brisbane and at Darwin. This, however, in no way reflects its true distribution but mainly indicates where collecting has been undertaken—around Brisbane by Kleinschmidt and at the other localities by myself.

On external characters *polyphyta* is not distinguishable from the widespread Oriental species, *coffea* (Koningsberger); the genitalia of the 2 species indicate their close relationship but they are consistently distinct (Spencer, 1977b: Figs 20, 21). A further undescribed species in this genus has recently been discovered on Rarotonga, Cook Islands (southern group). Its genitalia differ only marginally from those of *polyphyta* but confirm the close relationship of the 2 species.

Genus *Japanagromyza* Sasakawa, 1958

Japanagromyza Sasakawa, 1958: 140.

Type of genus: *Agromyza duchesneae* Sasakawa, 1954.

This genus is intermediate between *Melanagromyza* and *Agromyza*. There are 2 strong dc as in *Melanagromyza* and normally a pair of strong prsc, which are never present in

Melanagromyza but are well-developed in *Agromyza*. Characters which cannot be considered as delimiting the genus but which are typical of many species are the unusually strong orbital bristles which can be thickest at the centre, narrowing to the base; narrow jowls which are often little more than linear; frequently a lateral bristle (rarely 2) on the fore-tibia (this is also present in some, normally the larger, *Melanagromyza* species); finally, the halteres are usually at least partially pale but can be dark as in *Melanagromyza*. There is considerable variation in the form of the male genitalia which has not yet been fully analysed.

The genus was described for 5 species from Japan. Sasakawa (1963a) recorded 16 species in the Oriental region and 4 species are now known in New Guinea (Spencer, 1977b). Only a single species, *salicifolii* (Collin, 1911), extends across Asia into southern Europe. However, the genus is well represented in the Caribbean and South America (Spencer and Stegmaier, 1973).

Only one species, *eucalypti* has hitherto been known in Australia. Four further species are now recorded, 3 of which are undescribed; one of these is from Lord Howe Island.

Key to Australian *Japanagromyza* species

- | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|-----|--------------------------------|
| 1. Halteres entirely black | ... | ... | ... | ... | ... | ... | ... | <i>fortis</i> sp.n. |
| — Halteres at least partially pale, white or yellow | ... | ... | ... | ... | ... | ... | ... | 2 |
| 2. Halteres variegated, white above, brown below | ... | ... | ... | ... | ... | ... | ... | 3 |
| — Halteres entirely yellow, fore-tibiae with 1 bristle | ... | ... | ... | ... | ... | ... | ... | 4 |
| 3. Frons brown; fore-tibiae with 1 lateral bristle | ... | ... | ... | ... | ... | ... | ... | <i>badia</i> sp.n. |
| — Frons black; fore-tibiae with 2 lateral bristles | ... | ... | ... | ... | ... | ... | ... | <i>kalshoveni</i> (de Meijere) |
| 4. Small species, wing length 1.9-2.2 mm | ... | ... | ... | ... | ... | ... | ... | <i>eucalypti</i> Spencer |
| — Larger species, wing length 2.3-2.4 mm | ... | ... | ... | ... | ... | ... | ... | <i>howensis</i> sp.n. |

Japanagromyza badia sp.n.

(Figs 169-171)

Head: frons little wider than eye, not projecting above eye in profile; 2 ors, the upper slightly weaker, 2 ori; orbital setulae sparse, reclinate; jowls narrow, 1/10 height of eye; third antennal segment small, rounded, arista long, fine, equal to eye height.

Mesonotum: 2+0 dc, prsc strong, little shorter than second dc.

Wing: length in male 2 mm, last section of vein M3+4 3/5 penultimate.

Legs: fore-tibiae with 1, mid-tibiae with 2 strong lateral bristles.

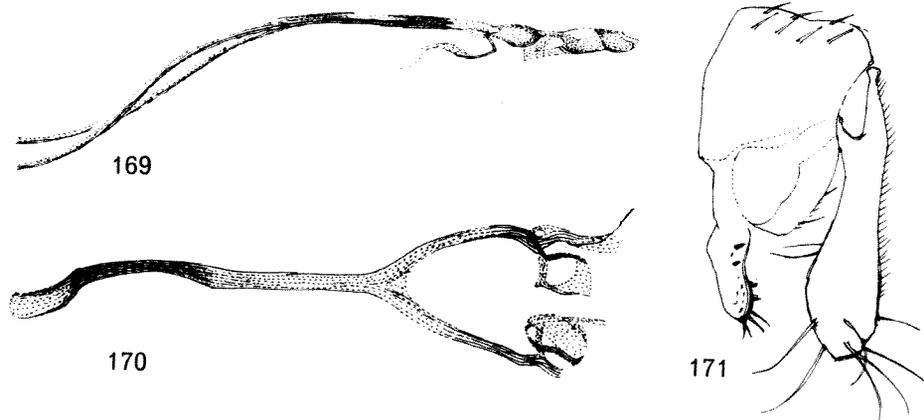
Colour: frons blackish behind adjoining ocellar triangle, increasingly paler, brown towards lunule; orbits black, lunule silvery-grey; antennae black; mesonotum black, with faint brownish tinge, only weakly shining; abdomen faintly greenish; squamae grey, margin black, fringe dark ochrous; halteres variegated, predominantly white but distinctly brownish on lower half.

Male genitalia: aedeagus exceptionally long, distiphallus with paired tubules fused only at base (Fig. 169); ninth sternite (Fig. 170) with short sidearms but exceptionally long hypandrial apodeme; ejaculatory apodeme long, with narrow blade; epandrium (Fig. 171) with enlarged cerci and surstyli directed downwards with 5 or 6 bristles on inner margin and a group of longer hairs at end.

Holotype ♂, N.S.W. Whian Whian State Forest, near Lismore, 26.ii.65 (D.K.M., R. Lossin), in AM.

Remarks

Among Australian species *J. badia* is instantly recognizable by the brown frons. The aedeagus is highly differentiated, but the extended hypandrial apodeme and enlarged cerci indicate probable relationship with *kalshoveni*.



Figs 169-171: *Japanagromyza badia*: 169, aedeagus; 170, ninth sternite; 171, epandrium.

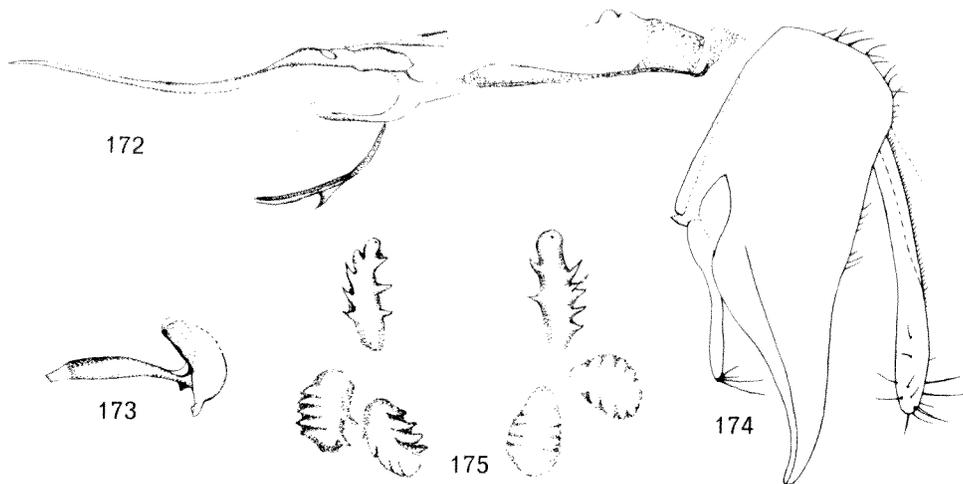
Japanagromyza eucalypti Spencer, 1963

(Figs 172-175)

Japanagromyza eucalypti Spencer, 1963a: 309.

Holotype ♂ from Lisarow, N.S.W. in AM.

Adult: small shining black species, wing length 1.9-2.2 mm; halteres white; male genitalia: aedeagus as in Fig. 172, distiphallus a single tubule; ejaculatory apodeme (Fig. 173) small, with bowl-shaped base. The distinctive epandrium and elongated cerci are shown in Fig. 174.



Figs 172-175: *Japanagromyza eucalypti*: 172, aedeagus; 173, ejaculatory apodeme; 174, epandrium; 175, posterior spiracles of puparium.

Host-plant biology: *Eucalyptus camaldulensis*, larva forming leaf-mine, details unrecorded; the puparium is reddish-brown, with posterior spiracles (Fig. 175) each with 3 elongate bulbs, showing tendency to development of subsidiary bulbs along the margins.

With its pale halteres this species can only be compared with *howensis* sp.n. from Lord Howe Is. However, differences in the aedeagus and in the form of the epandrium show that the 2 are not closely related.

Although the only known food-plant of *eucalypti* is *E. camaldulensis*, it is believed that this eucalypt does not occur at the 3 localities recorded below and it thus seems probable that *J. eucalypti* must feed on other *Eucalyptus* species.

Material seen

Qld: Claudie River, near Mt Lamond, 1♀, 18.xii.71 (D.K.M. and G.A.H.); N.S.W. Iluka rain forest, Clarence River, 1♂, 22.ii.65 (D.K.M.); 16 km S. of Forster on east bank of Wallis Lake, 1♂, 3.iii.68 (G.A.H.).

Japanagromyza fortis sp.n.

(Figs 176, 177)

Large species with black halteres and no fore-tibial bristle.

Head: frons unusually narrow, slightly less than width of eye, not projecting above eye in profile; orbital bristles strong, 2 ors, 2 ori, all reclinate in male, lower ori slightly inclined in female; orbital setulae lacking; frons with a row of short hairs above lunule; jowls little more than linear, 1/30 height of eye; third antennal segment rounded, with fringe of short pubescence.

Mesonotum: 2 dc, prsc strong, equal to second dc, acr in 6 rows.

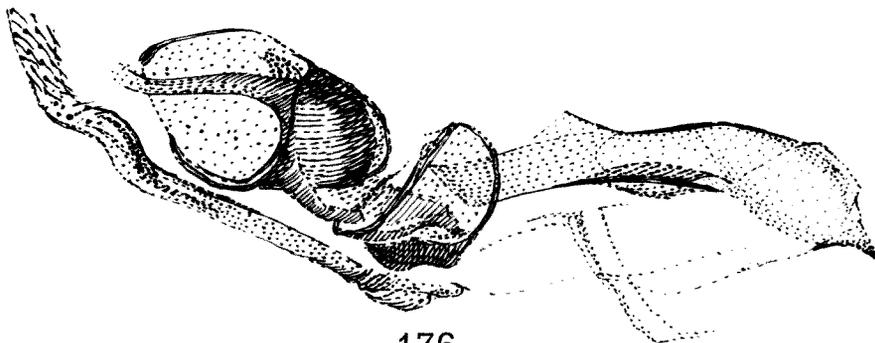
Wing: length in male and female 2.4 mm, last section of M3+4 short, in ratio 12: 33 with penultimate, first cross-vein slightly before midpoint of discal cell.

Legs: fore-tibia without lateral bristle, mid-tibia with 1 or 2 strong bristles (1+1 in male, 1+2 in female).

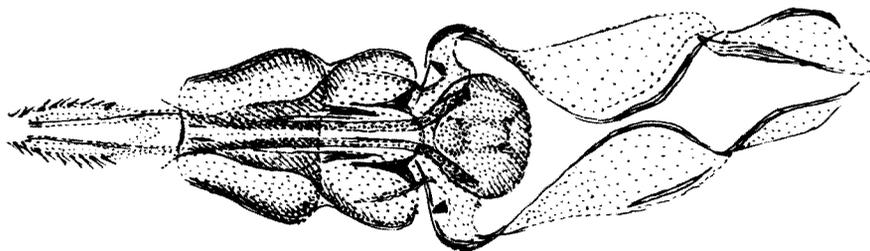
Colour: frons mat black, ocellar triangle scarcely shining, bases of orbital bristles distinctly so; lunule black; mesonotum brilliantly shining black, abdomen only slightly duller; squamae grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 176, 177, distal tubule conspicuously spinulose; ninth sternite with narrow siderarms and somewhat extended hypandrial apodeme; ejaculatory apodeme greatly enlarged but shorter than aedeagus; surstyli undeveloped, cerci broad, large, extending below margin of epandrium, with a fringe of hairs but no bristles.

Holotype ♂, Qld. Earl Hill, N. of Cairns, 8.v.67; paratypes: 1♂, Gillies Highway, 2 km W. of Little Mulgrave, 18.iv.67 (both D.H.C.); 1♀, Palm Is., 20.xii.-6.i.1930-1 (I.M. Mackerras), all in ANIC.



176



177

Figs 176, 177: *Japanagromyza fortis*: 176, aedeagus, side view; 177, same, ventral view.

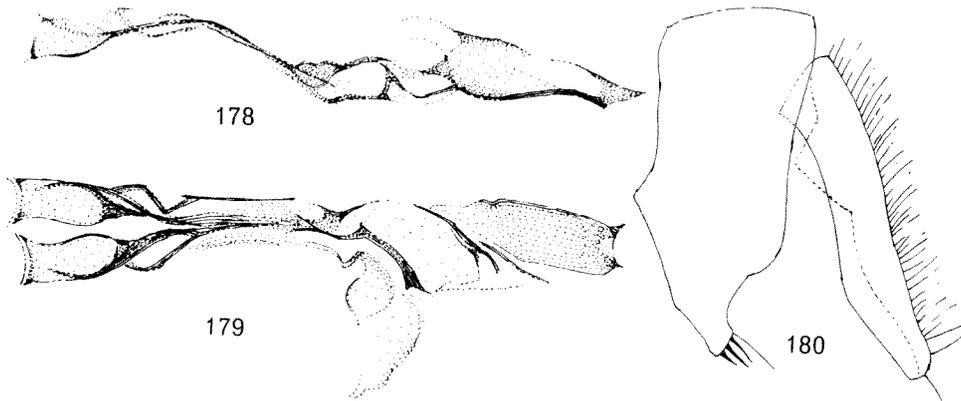
Remarks

Among Australian species, *J. fortis* is the only one known with the halteres entirely dark. It is clearly very closely related to *J. involuta* Spencer, 1977b from New Guinea; on external characters it is distinguishable by the even narrower frons and the black rather than grey lunule. The genitalia of the 2 species are of the same general form and indicate beyond doubt their common ancestry; however, evolutionary differentiation has gone further here than in the external morphology (cf. Spencer, 1977b: Figs 30, 31).

Japanagromyza howensis sp.n.

(Figs 178-180)

Head: frons only slightly wider than eye, not projecting above eye in profile; 2 strong, equal ors; 2 ori; the upper reclinate and slightly shorter than ors, the lower weaker and largely incurved; orbital setulae sparse, reclinate; jowls narrow, 1/12 height of eye; third antennal segment round, arista long, equal to height of eye, exceptionally fine.



Figs 178-180: *Japanagromyza howensis*: 178, aedeagus, side view; 179, same, ventral view; 180, epandrium.

Mesonotum: 2+0 dc, prsc well-developed but weaker than second dc.

Wing: length 2.3-2.4 mm in both sexes, last section of vein M3+4 only slightly shorter than penultimate, in ratio 20: 25.

Legs: fore-tibiae with 1, mid-tibiae with 2 strong lateral bristles.

Colour: frons uniformly sooty-black, orbits weakly shining; lunule silvery-grey; antennae entirely black; mesonotum dull black, with slightly greyish tone, only weakly shining; abdomen largely dull black; halteres yellow.

Male genitalia: aedeagus as in Figs 178, 179; ninth sternite with elongated hypandrial apodeme, equal in length to sidearms; ejaculatory apodeme with blade almost linear;

epandrium (Fig. 180) with cerci conspicuously long, surstyli with 3 or 4 hairs or weak bristles at lower corner.

Holotype ♂, Lord Howe Is: near Ned's Beach, 25.ii.71; paratypes: 14♂, 6♀, 20-25.ii.71; Blue Lagoon, 1♂, 24.ii.71; Erskine Valley, 4♂, 19.ii.71; Forest behind Mountain Inn, 2♂, 22.ii.71 (all D.K.M.); Blinky Beach, 1♀, Middle Beach, 1♀, both Dec. 72 (Z.L.); Malabar, 1♂, 2♀, 2.iii.74 (G.A.H.). Holotype and paratypes in AM, 2 in ANIC, 3 in AC.

Remarks

The aedeagus of this species shows a high degree of differentiation, but the enlarged cerci and extended hypandrial apodeme probably indicate relationship with both *badia* sp.n. and *kalshoveni* (de Meij).

This species appears to be the most widespread of the 12 now known on Lord Howe Is. and with further collecting it should not prove difficult to establish its host-plant.

Japanagromyza kalshoveni (de Meijere, 1934)

(Figs 181-183)

Melanagromyza kalshoveni de Meijere, 1934: 254.

Japanagromyza kalshoveni, Spencer, 1961a: 64.

Holotype ♀ from Java in Zoological Museum, Amsterdam.

This species was described from Java, as a leaf-miner on *Antidesma bunius*, and has also been recorded from the Bismarck Archipelago: Dyaul (Spencer, 1966c). The male has not been hitherto known; the species can be redescribed as follows:

Head: frons narrow, equal to width of eye, not projecting above eye in profile; 4 strong orbital bristles, all approximately equal, the upper 3 reclinate, lower one incurved; orbital setulae minute, sparse, reclinate; jowls narrow, 1/20 height of eye; third antennal segment rounded but slightly longer below, finely pubescent; arista fine, bare, long, little shorter than height of eye.

Mesonotum: 2 strong dc, prsc well-developed, only slightly shorter than second dc; acr in 6 rows.

Wing: length in male 2.1 mm; last section of vein M3+4 only slightly shorter than penultimate, in ratio 17: 20; first cross-vein well before midpoint of discal cell.

Legs: both fore- and mid-tibiae with 2 lateral bristles.

Colour: entirely dark species; frons sooty black, orbits weakly shining; lunule grey; mesonotum deep black, moderately shining, abdomen more mat; squamae grey, margin and fringe black; halteres with knob black at sides, white above.

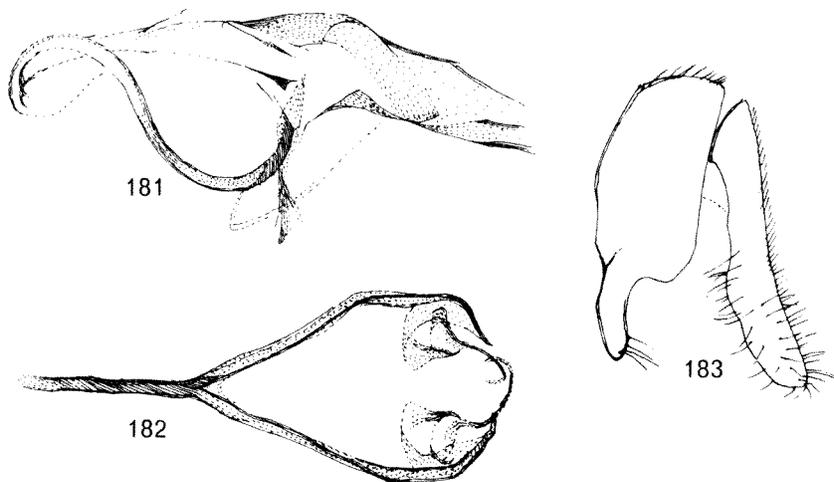
Male genitalia: aedeagus (Fig. 181) with distiphallus S-shaped, dividing into 2 tubules at apex; ninth sternite (Fig. 182) with narrow sidearms and finely extended hypandrial apodeme; epandrium (Fig. 183) with surstyli bearing several long hairs; cerci greatly enlarged; ejaculatory apodeme with blade reduced to a mere central stalk, base small but bowl-shaped.

In the female holotype (which is the only type specimen in the Amsterdam Museum) the halteres are deformed and not fully pigmented, and I am satisfied that my reference to them (Spencer, 1961a: 64), as: 'largely dark brown, but distinctly paler on the lower, inner side', is misleading. In the Australian specimens they are characteristically variegated and distinctly white above.

Although there seems little reasonable doubt that the specimens seen do represent *kalshoveni*, it is to be hoped that confirmation can in due course be obtained from examination of the genitalia of a male from Java, or alternatively that leaf-mines can be found in Australia on the host, *Antidesma bunius*.

Material seen

Qld. Claudie River, near Mt Lamond, 1♀, 18.xii.71 (G.A.H.); N.T. Katherine, Manbulloo Station, 1♂, 19.vii.29 (I.M. Mackerras and T.G. Campbell).



Figs 181-183: *Japanagromyza kalshoveni*: 181, aedeagus; 182, ninth sternite; 183, epandrium.

Genus *Agromyza* Fallén, 1810

Agromyza Fallén, 1810: 21.

Type species: *Agromyza nigripes* Meigen, 1830.

No complete revision of *Agromyza* has been undertaken by modern workers but the

current concept can be defined with the following combination of characters: subcosta complete, joining R1 before reaching costa (Fig. 1); halteres normally white or yellow; orbital setulae reclinate; either 3+1 strong dc or 3 or more post-sutural dc, greatly decreasing in size, with any pre-sutural dc small and weak; prsc present; costa ending at R4+5 or continuing to M1+2, in most species second cross-vein present; the wing length ranges from 1.4 to 3.5 mm.

This is a large genus, with over 160 species known throughout the world, of which 130 occur in the northern hemisphere. Only 8 species are recorded in India (Singh & Ipe, 1973) and 2 in New Guinea (Sasakawa, 1963d). The genus has not reached New Zealand.

In Australia hitherto only the single species, *testacea* Spencer, 1963a has been known; however, study of additional material has shown that *testacea* correctly belongs in *Phytobia* and is synonymous with *incerta* Spencer (see below).

Three undescribed species are now recorded. Of these, 2 are entirely typical of the genus, while the third, *illustris* sp.n., is clearly an isolated species, with no known close relative. *A. mellita* sp.n. can be accepted as the sister-species of *papuensis* Sasakawa, 1963d from New Guinea.

Key to Australian *Agromyza* species

1. Frons and all antennal segments bright orange; large species, wing length 3-3.2 mm *illustris* sp.n.
- Frons black or dark brown; smaller species 2
2. Squamae whitish-yellow, fringe ochrous; mesonotum brilliantly shining black; fore-knees yellow *mellita* sp.n.
- Squamae darker, grey, fringe black; mesonotum only moderately shining; legs entirely black *venusta* sp.n.

Agromyza illustris sp.n.

(Figs. 184, 185)

Head: frons not projecting above eye, only slightly wider than eye; 5 strong orbital bristles, the upper ones directed upwards and outwards, the lower ones largely incurved, orbital setulae short, sparse, upright or more reclinate above; eye large, upright, jowls 1/6 height of eye; third antennal segment large, round, arista appearing bare.

Mesonotum: 4 or 5 post-sutural dc, greatly decreasing in size; prsc equal to third dc; acr numerous, in 8 rows.

Wing: length from 3 mm in male to 3.3 mm in female; costa extending to vein M1+2, last section of M3+4 only slightly shorter than penultimate, first cross-vein at or just beyond midpoint of discal cell.

Legs: mid-tibiae with 2 strong lateral bristles.

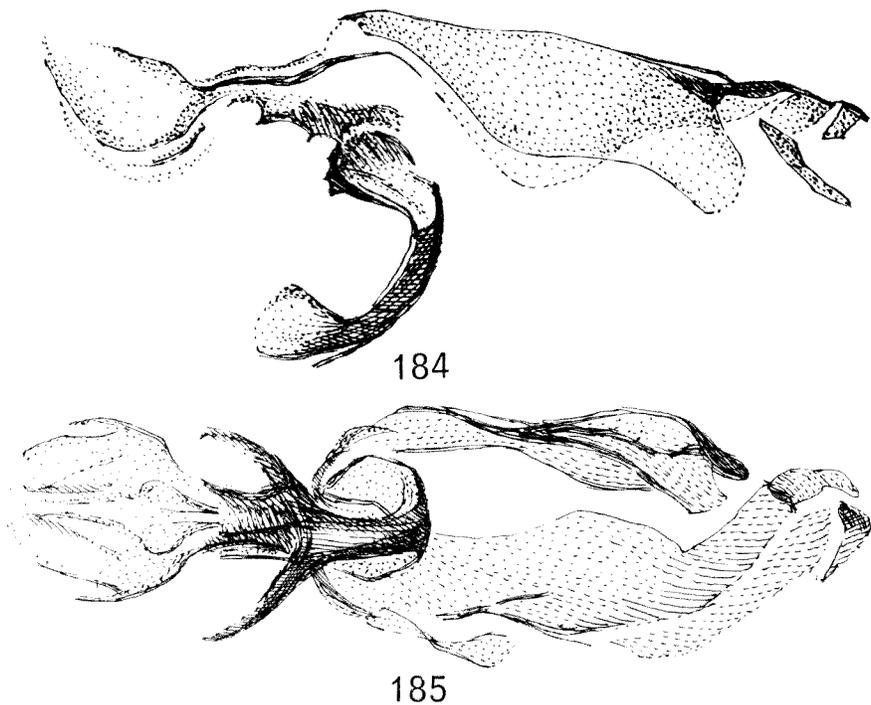
Colour: frons bright orange in front, slightly darker towards ocellar triangle; all antennal segments, jowls, face and palps orange; mesonotum black, moderately shining; humerus and centre of notopleural triangle dull yellowish; upper margin of mesopleura narrowly yellow, pleura otherwise black; legs largely black but tibiae and tarsi slightly more brownish; abdomen black, tergites at most very narrowly yellow-bordered; in male, epandrium yellowish; wing base and halteres yellow; squamae yellowish-grey, margin and fringe black.

Male genitalia: aedeagus as in Figs 184, 185; postgonites with conspicuous hook at end; surstyli with numerous short hairs and 5 or 6 longer ones; inner margin of epandrium with numerous short, stout bristles along inner margin.

Holotype ♂, N.S.W. Tooloom, 30.x.61; paratype: 1♀, same data (I.F.B.C. & M.S. Upton), both in ANIC.

Remarks

The orange colour of the head makes this a striking species, immediately distinguishable on this character from all others known in Australia and the Oriental region. The highly evolved aedeagus confirms its isolated position.



Figs 184, 185: *Agromyza illustris*: 184, aedeagus, side view; 185, same, ventral view.

Agromyza mellita sp.n.

(Figs 186-188)

Head: frons 1 1/2 times width of eye, distinctly projecting above eye in profile; 2 ors and 2 ori; orbital setulae sparse, reclinate; jowls deeply extended at rear, in male 1/4, in female 1/3 height of eye; third antennal segment small, rounded; broad epistoma present, only slightly narrower than depth of jowls.

Mesonotum: only 3 developed dc; prsc strong, equal to second dc.

Wing: length in male 2.2-2.3 mm, in female 2.6 mm; costa extending to vein M1+2, last section of M3+4 2/3 penultimate, first cross-vein at midpoint of discal cell.

Colour: frons, jowls, face and palps dark brown, all antennal segments paler brown; mesonotum brilliantly shining black; legs: femora black, only fore-knees narrowly yellow, tibiae and tarsi brownish; squamae and margin yellowish, fringe ochrous to brown.

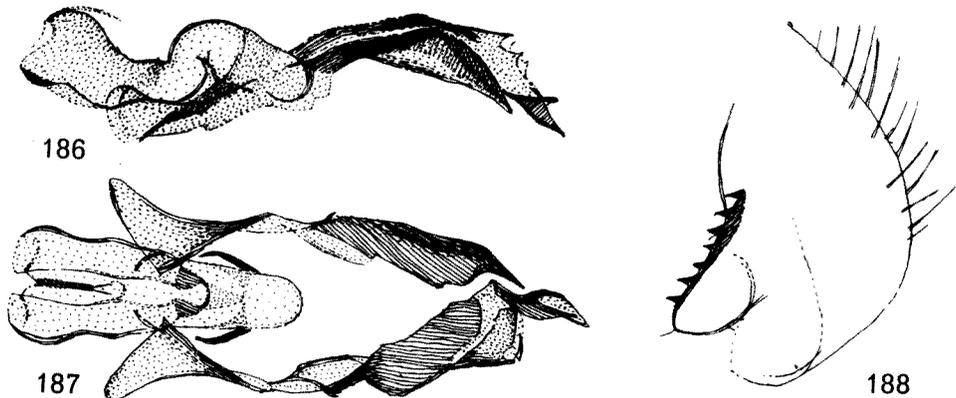
Male genitalia: aedeagus as in Figs 186, 187; ninth sternite with short hypandrial apodeme; surstyli with about 10 short, stout bristles along inner margin (Fig. 188).

Holotype ♂, Qld. Ingham, Light Trap, 15.iii.61 (K.L. Harley); paratype ♀, Dawson River, near Duaringa, 8.v.70 (Z.L.), both in ANIC.

Remarks

This species closely resembles *papuensis* Sasakawa, 1963d from the Southern Highlands, Papua New Guinea. However, the frons and antennae are paler and the epistoma is significantly broader (little more than linear in *papuensis*). The male genitalia of the 2 species seem to be little differentiated, but exact comparison is not possible, owing to crushing and distortion in the slide preparation of the holotype of *papuensis*.

It is believed that the host of *papuensis* is *Setaria palmifolia* (Koen.) Stapf on which leaf-mines were not uncommon in the New Guinea Highlands in October/November, 1973 (Spencer, 1977b). The host of *mellita* may well prove also to be *Setaria*.



Figs 186-188: *Agromyza mellita*: 186, aedeagus, side view; 187, same, ventral view; 188, surstylus.

Agromyza venusta sp.n.

(Figs 189, 190)

Head: frons not projecting above eye, equal to width of eye; 2 ors, 2 ori; orbital setulae sparse, reclinate; eye large, upright; jowls 1/4-1/5 height of eye; third antennal segment small, round, pubescence slight, normal.

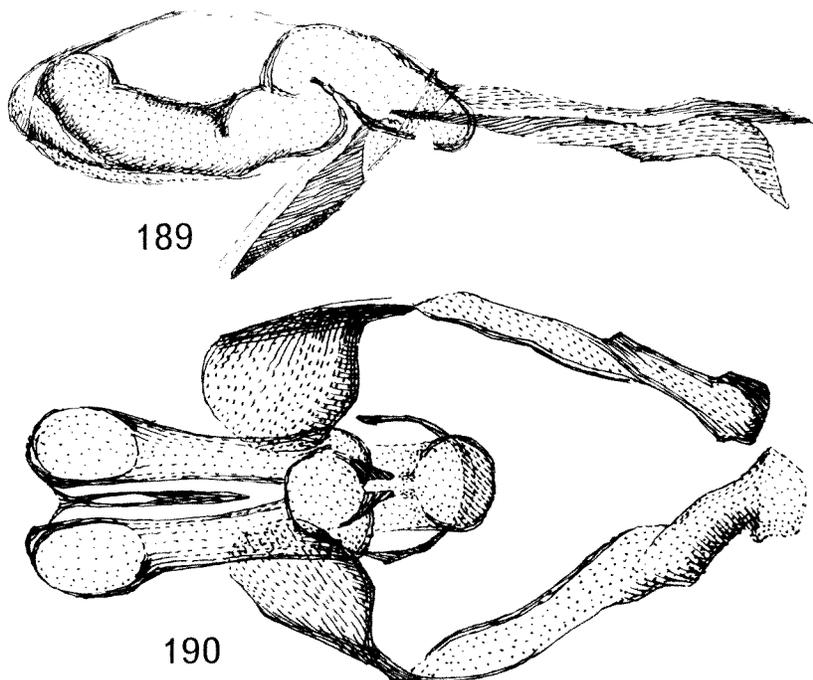
Mesonotum: 3 post-sutural dc, acr in 8 rows.

Wing: length in male 2-2.1 mm, costa extending to vein M1+2, last and penultimate section of M3+4 variable, equal or last section slightly shorter; first cross-vein at mid-point of discal cell.

Colour: head uniformly black, including all antennal segments; mesonotum shining black, more so viewed from rear; legs entirely black; abdomen shining black; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 189, 190; surstyli oval, strongly chitinized, with numerous very short, stout bristles around inner margin.

Holotype ♂, N. Qld. 3 km W. of Kuranda, 7.v.67; paratypes: 1♂, same data; 1♂, 4.8 km W. of Kuranda, Mareeba Rd., 3.v.67 (all D.H.C.), in ANIC.



Figs 189, 190: *Agromyza venusta*: 189, aedeagus, side view; 190, same, ventral view.

Remarks

This species generally resembles *mellita*, also from Qld., but is distinctly darker. The male genitalia are of the characteristic form of grass-feeders in the 2 species but with significant differences in detail.

SUB-FAMILY PHYTOMYZINAE

Genus *Phytobia* Lioy, 1864

Type species: *Agromyza errans* Meigen, 1830.

Dendromyza Hendel, 1931: 22. Type species: *Agromyza carbonaria* Zetterstedt, 1848.

Shizukoa Sasakawa, 1963a: 38. Type species: *Shizukoa seticopia* Sasakawa, 1963a.

In my earlier paper (Spencer, 1963a) this genus was treated in the sense of Frick (1952) to embrace the sub-genera included by Hendel (1931) in *Dizygomyza*. It is now accepted that *Phytobia* should be restricted to the tree-feeding species, whose larvae bore in the cambium of twigs, stems or the outer layer of trunks. In this restricted sense no species have hitherto been known in Australia, although the genus is well represented in the Oriental region and also in the Papuan sub-region with 8 species (Sasakawa, 1963d: 817, as *Shizukoa*). Forty-three species are known and the genus occurs in all faunal regions.

Phytobia species can normally be differentiated from *Agromyza* by the apparent continuation of the subcosta to the costa, not joining R1 (Fig. 2) but in this genus the subcosta more closely approaches vein R1 (Figs 197, 204) and this has led to several important misidentifications, including the erection by Sasakawa (1963a) of the genus *Shizukoa* (in the *Agromyzinae*) which was synonymized with *Phytobia* by Spencer (1965b). Four new species are now described below from continental Australia and also 4 from Lord Howe Is. In addition, *Agromyza testacea* Spencer, 1963a is synonymized with *incerta* which is now confirmed as a true *Phytobia*.

Of the 8 new species, unfortunately only females are known in 3 and their exact affiliations cannot be established. The male genitalia indicate relationship between *fausta* sp.n. (S.A. and W.A.) and *incerta* (Qld.); *optabilis* sp.n. (A.C.T.) is more remotely related to these 2 but is entirely typical of the genus. The aedeagus of the latter strikingly resembles species present in Canada (Spencer, 1969) and this resemblance is certainly based on relationship. A number of species are known in Papua New Guinea (Sasakawa, 1963d: 81, as *Shizukoa*) but the genitalia have not been fully illustrated; the specimens are not available for comparison at the present time.

It is remarkable that 4 species should be present on Lord Howe Is. Only a female is known of *liepae* sp.n. This is the largest species known in the material under consideration and this large size possibly represents a plesiomorphous character reflecting the

antiquity of the species itself. The other 3 form a compact group, all showing reduction of the costa to vein R4+5 (known elsewhere only in one species in Canada and one in Europe) and with significant displacement of the cross-vein towards the wing-base. This clearly represents synapomorphy but does not suggest recent arrival on Lord Howe Is.

The ejaculatory apodeme in this genus has 2 different types of base—in the one case bowl-shaped (Fig. 200) and in the other a 'handle-bar' type, with the 2 strong areas of chitinization linked by a narrow, more membranous connection (Fig. 196). The 3 species on Lord Howe Is. have the first type, the 3 in Australia the second. In Canada (the nearest area where material is available for comparison) most species have the first type and only one, *setosa* (Loew, 1869, cf. Spencer, 1969) the second. This suggests that the *insulana* group on Lord Howe have not evolved from an ancestral species related to the 3, of which males are now known in Australia. The ancestral affiliation either in Australia or S.E. Asia thus remains to be detected.

Key to Australian *Phytobia* species
(including 4 from Lord Howe Island)

- | | | |
|----|---|---------------------------|
| 1. | Scutellum and notopleural area bright yellow | <i>colorata</i> sp.n. |
| — | Scutellum and notopleural area black | 2 |
| 2. | Costa ending at vein R4+5 or midway between R4+5 and M1+2 | 3 |
| — | Costa extending strongly to vein M1+2... .. | 6 |
| 3. | Costa extending only to vein R4+5 | 4 |
| — | Costa ending midway between veins R4+5 and M1+2 | <i>optabilis</i> sp.n. |
| 4. | Second cross-vein close to first or in continuation of it (Fig. 197); wing length 2.2-2.5 mm (Lord Howe Is.) | <i>insulana</i> sp.n. |
| — | Second cross-vein either beyond first or basad of it; smaller species, wing length 1.7-1.9 mm in male | 5 |
| 5. | Discal cell small, last section of vein M3+4 four times length of penultimate (Lord Howe Is.) | <i>malabarensis</i> sp.n. |
| — | Discal cell larger; last section of vein M3+4 only 2½ times length of penultimate (Lord Howe Is.) | <i>macalpinei</i> sp.n. |
| 6. | Exceptionally large species, wing length in female 4 mm; wings distinctly infuscated, brownish (Lord Howe Is.) | <i>liepae</i> sp.n. |
| — | Smaller species, wing length at most 3.5 mm | 7 |

7. Mesonotum grey, mat; large species, wing length in female 3.5 mm; jowls 1/5 height of eye; ovipositor sheath shining in basal half, grey-dusted apically *manifesta* sp.n.
- Mesonotum black, with distinct subshine; smaller species, wing length 2.1-2.8 mm 8
8. 2 ors, 2 ori; third antennal segment rounded; arista long, equal to height of eye; last and penultimate sections of vein M3+4 equal *incerta* (Spencer)
- 3 ors, 3 ori, third antennal segment angular at upper corner, arista shorter, 3/5 height of eye; last section of M3+4 shorter than penultimate *fausta* sp.n.

Phytobia colorata sp.n.

(Fig. 191)

Head: frons slightly less than 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae sparse, extending to upper ors; eye large, upright, jowls exceptionally narrow, 1/18 height of eye; third antennal segment longer than broad, rounded at end; arista long, fine, only slightly shorter than height of eye.

Mesonotum: 3+1 dc, acr in 8 rows between third dc, prsc absent.

Wing: length in female 2.4 mm, costa extending to vein M1+2, last and penultimate sections of M3+4 equal, first cross-vein at midpoint of discal cell.

Legs: mid-tibiae with 1 strong lateral bristle.

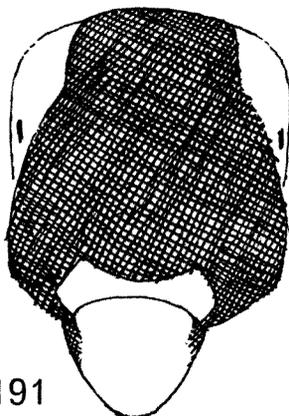


Fig. 191: *Phytobia colorata*: mesonotum.

Colour: frons sooty black, lunule silvery-yellow; all antennal segments black; mesonotum mat black, with weak subshine, but narrowly yellow adjoining scutellum (Fig. 191); rear of humerus, notopleural area and upper margin of mesopleura bright yellow; scutellum largely bright yellow, with small black patches below basal scutellars; legs entirely black; abdomen shining black but tergite 6 narrowly bright yellow on margin; ovipositor sheath moderately grey-dusted; squamae yellowish-grey, margin and fringe black; halteres whitish-yellow.

Holotype ♂, N. Qld. Claudie River, near Mt Lamond, 2.vi.66 (D.K.M.), in AM.

Remarks

Two species are known in the Oriental and Papuan sub-regions with yellow coloration. *P. diversata* Spencer, 1961a from Taiwan differs in having well-developed prsc and the black of the mesonotum extends centrally to the scutellum (Spencer, 1961a: Fig. 18). *P. millerae* Spencer, 1977b from Port Moresby, P.N.G. has the mesonotum yellow only at the hind-corners, the scutellum is largely black but the notopleural area is similarly yellow. It seems very probable that these 3 species represent a monophyletic group.

Phytobia fausta sp.n.

(Figs 192, 193)

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; orbital bristles somewhat irregular but normally 3 ors and 3 ori (one may be missing on one side); orbital setulae sparse, reclinate; jowls rounded, narrow, about 1/12 height of eye; third antennal segment small, almost quadrate, appearing slightly angular at upper corner, arista fine, bare.

Mesonotum: 3+1 dc, pre-sutural equal to third; acr irregularly in some 8 rows in front, extending almost to margin of scutellum; prsc well-developed.

Wing: length from 2.1 mm in male to 2.5 mm in female; costa extending strongly to vein M1+2, last section of M3+4 varying from 3/4 to only slightly less than length of penultimate.

Legs: fore-and mid-tibiae each with one small lateral bristle.

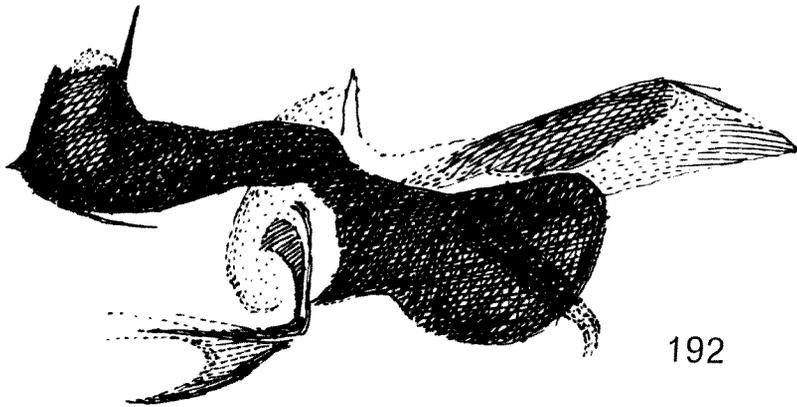
Colour: black; antennae entirely black; mesonotum largely mat; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 192, 193; the 2 lateral sclerites attached to the distiphallus probably symmetrical but the one on the right (in ventral view) appearing reduced but probably broken (the aedeagus was extruded in the only available male); ejaculatory apodeme with large blade and distinct stalk, base strongly chitinized, ninth sternite with broad sidearms, rounded at apex; surstyli discrete, angular, fringed with numerous hairs.

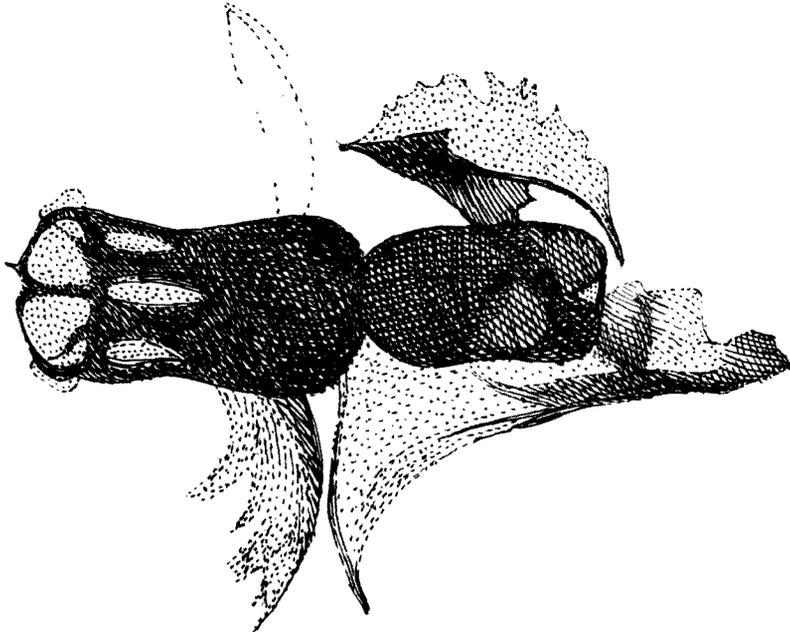
Holotype ♂, S.A. Antikootirrimna, 36 km S. of Abminga, 25.ix.72 (Z.L.); paratype: W.A. 1♀, 6.4 km S.E. by S. of Minilya, 17.x.70 (D.H.C.), both in ANIC.

Remarks

There are small but distinctive differences in external characters between this species and *incerta*. Although the aedeagus in the 2 species has considerably diverged, the structure of the ninth sternite, ejaculatory apodeme and surstyli is essentially similar and the two may well be sister-species.



192



193

Figs 192, 193: *Phytobia fausta*: 192, aedeagus, side view; 193, same, ventral view.

Phytobia incerta Spencer, 1963

(Figs 194-196)

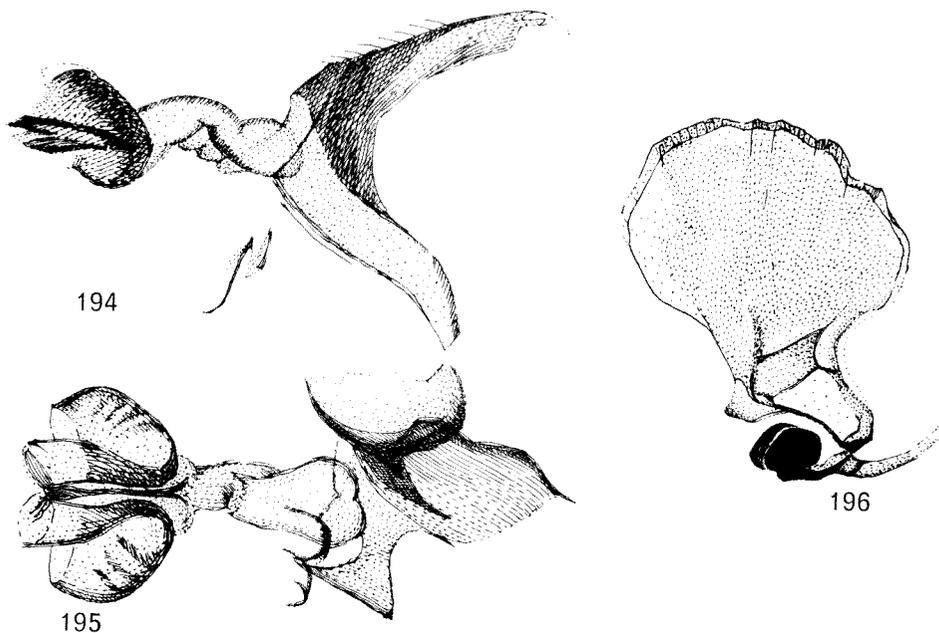
Phytobia (Praspedomyza) incerta Spencer, 1963a: 330.

Holotype ♂ from Mulgrave River, N. Qld. in AM.

Agromyza testacea Spencer, 1963a: 308, syn. nov.

Holotype ♀ from Kuranda, N. Qld. in AM.

Small, entirely dark species, with wing length from 2 mm in male to 2.8 mm in female; the last and penultimate sections of vein M3+4 are equal. The aedeagus of the male recorded below is shown in Figs 194, 195; the surstyli are discrete, rounded, with a fringe of some 15 hairs; the ninth sternite has broad sidearms and is U-shaped at the apex; the ejaculatory apodeme (Fig. 196) has a large blade and a strongly developed base.



Figs 194-196: *Phytobia incerta*: 194, aedeagus, side view; 195, same, ventral view; 196, ejaculatory apodeme.

When describing *incerta*, it was not appreciated that this is a true *Phytobia*. Following re-examination of the holotype and with the additional material seen, its generic position has now become clear. I am also satisfied that *Agromyza testacea* represents the same species and this new synonymy is established herewith. This is a further example illustrating the difficulties which have occurred in the past in segregating *Agromyza* and *Phytobia* species, with a number of resulting misidentifications (see p. 122).

P. incerta generally resembles *fausta* sp.n. described above from S.A. but the 2 can be readily separated by the key characters given in couplet 8.

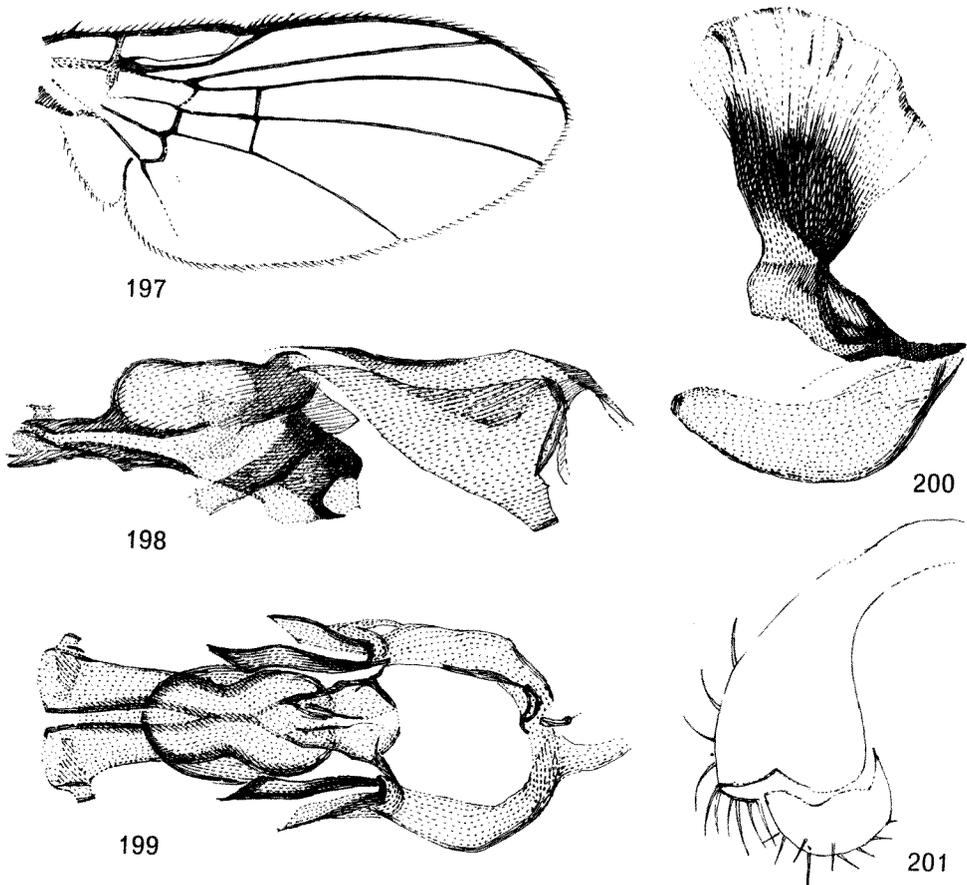
Material seen

N. Qld: Kuranda Range State Forest, 11.2-12.8 km Black Mt Rd., 1♂, 20.iv.67 (D.H.C.); Claudie River, near Mt Lamond, 2♀, 3.v. and 4.vi.66 (D.K.M.).

Phytobia insulana sp.n.

(Figs 197-201)

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 strong ors, 3 ori directed inwards and upwards; orbital setulae sparse, reclinate; jowls extended at rear, 1/5 eye height; eye large, upright; third antennal segment round, arista long, equal to height of eye.



Figs 197-201: *Phytobia insulana*: 197, wing; 198, aedeagus, side view; 199, same ventral view; 200, ejaculatory apodeme; 201, surstylus.

Mesonotum: 3 strong post-sutural dc, third only slightly before suture, fourth minute, only slightly beyond suture; acr irregularly in 6 rows, prsc present, but frequently weak.

Wing: length from 2.2-2.5 mm, costa ending at vein R4+5, second cross-vein at most slightly distad of first, frequently in continuation of it (Fig. 197), last section of M3+4 about 2 1/2 times length of penultimate.

Colour: frons sooty black, orbits weakly shining, lunule silvery; head otherwise black; mesonotum and scutellum largely mat black, with only weak subshine, pleura, legs and abdomen black; in female ovipositor sheath entirely shining; squamae grey, margin and fringe black, wing base brownish.

Male genitalia: aedeagus as in Figs 198, 199; ninth sternite with slender sidearms, U-shaped, ejaculatory apodeme with well-developed bowl-shaped base (Fig. 200); surstyli discrete, with a fringe of up to 10 hairs (Fig. 201).

Holotype ♂, Lord Howe Is: Mt Lidgbird foothills, xii.72; paratypes: 4♀, same data; Intermediate Hill, 1♂, 1♀, xii.72; Mt Malabar, 1♂, xii.72 (all Z.L.); Lord Howe Is. (no locality), 4♂, 1♀, 30.xi.55 (S.J.P. and Z.L.). Holotype and paratypes in ANIC, 3 in AC.

Remarks

There seems little doubt that *insulana* is closely related to *macalpinei* and *malabarensis* which are themselves sister-species. The venation of *insulana* with the second cross-vein in continuation of the first is unique in the genus.

Phytobia liepae sp.n.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 reclinate ors, 2 partially incurved ori, orbital setulae reclinate, extending midway between upper ors and vti; jowls 1/8 height of eye, this large, upright; third antennal segment longer than broad, arista fine, equal to width of eye.

Mesonotum: 3+1 strong dc, prsc present, acr in some 10 rows.

Wing: length in female 4 mm, costa extending strongly to vein M1+2, last section of M3+4 only slightly shorter than penultimate, first cross-vein well beyond centre of discal cell.

Legs: mid-tibiae probably normally with 2 lateral bristles (in only specimen seen on one leg 5!).

Colour: frons sooty black, base of orbital bristles distinctly shining; lunule grey with faint orange undertone; third antennal segment orange-brown; mesonotum black with weak subshine; pleura, scutellum and legs black; abdomen shining black; long basal cone of ovipositor sheath largely shining black but weakly grey-dusted on basal fifth; wings distinctly brownish, wing base brown; squamae yellowish-grey, margin and fringe black; halteres yellow.

Holotype ♀, Lord Howe Is., 5.xii.55 (S.J.P. and Z.L.), in ANIC.

Remarks

The only species of comparable size in Australia is *P. manifesta* described below; however, *manifesta* is smaller, with wing length of 3.5 mm, the third antennal segment is entirely black and the wings are hyaline. *P. terminalis* (Sasakawa, 1963d, as *Shizukoa*) from the Port Moresby area of New Guinea and *P. magna* (Sasakawa, 1963a, as *Shizukoa*) from Taiwan are both of similar size to *liepae* but are obviously distinct.

Phytobia macalpinei sp.n.

(Figs 202, 203)

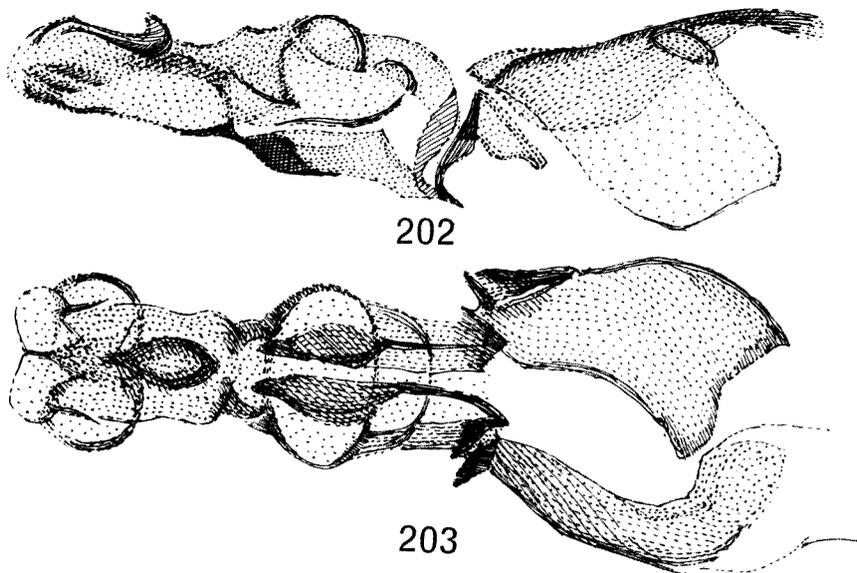
Adult: small, black species closely resembling *malabarensis*, with following points of difference: (head badly shrunk, most characters not detectable); 3+0 dc, acr irregularly in 6 rows, prsc present but weak; wing length 1.7-1.8 mm, second cross-vein just distad of first, discal cell larger, last section of M3+4 $2\frac{1}{2}$ times length of fourth; mesonotum only moderately shining.

Male genitalia: aedeagus as in Figs 202, 203; surstyli and ninth sternite little differentiated from those of *malabarensis*.

Holotype ♂, Lord Howe Is: Ned's Beach, Malaise trap, 22.ii.71 (D.K.M.), in AM.

Remarks

This species is readily distinguishable from *malabarensis* by the characters mentioned above and the aedeagi of the 2 species are well differentiated. The two can be accepted as sister-species.



Figs 202, 203: *Phytobia macalpinei*: 202, aedeagus, side view; 203, same, ventral view.

Phytobia malabarensis sp.n.

(Figs 204-206)

Head: frons slightly wider than eye, distinctly projecting above eye in lower half; 2 ors, 3 strong ori; orbital setulae reclinate; jowls 1/6 height of eye; third antennal segment round, large, arista only minutely pubescent, long, slightly longer than eye height.

Mesonotum: 3+1 dc, fourth only just beyond suture, prsc well-developed, equal to third dc; acr irregularly in 4 rows.

Wing (Fig. 204): length in male 1.7 mm; costa ending at vein R4+5, discal cell small, second cross-vein just basad of first, last section of M3+4 4 times length of penultimate.

Legs: mid-tibiae normally with one strong lateral bristle.

Colour: frons dark brownish-black, orbits more distinctly black, moderately shining, antennae entirely black; mesonotum strongly shining black; legs, including all knees, black; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 205, 206, left-hand sclerite (viewed from above) of basiphallus greatly enlarged, ventral lobe (hypophallus) strongly developed; ninth sternite with slender sidearms, U-shaped; surstyli discrete, rounded, with only fine hairs on inner margin; ejaculatory apodeme small, with well-developed bowl-shaped base.

Holotype ♂, Lord Howe Is: Malabar, 2.iii.74 (G.A.H.), in AM.

Remarks

This specimen is in poor condition but is certainly distinct from *macalpinei* (see above).

Phytobia manifesta sp.n.

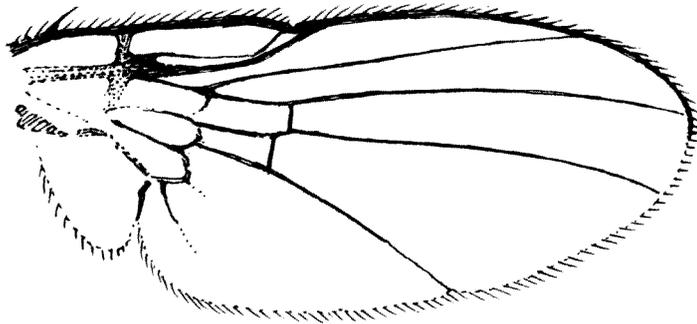
Head: frons broad, twice width of eye, not projecting above eye in profile; 2 strong ors, 2 partially incurved ori, orbital setulae sparse, not extending beyond upper ors; jowls 1/5 height of eye; third antennal segment small, round, arista long, fine, equal to height of eye.

Mesonotum: probably normally 3+1 dc but in only specimen seen an additional bristle present on both sides, equal to the pre-sutural on one side, weaker on the other; prsc present, acr in 8 rows.

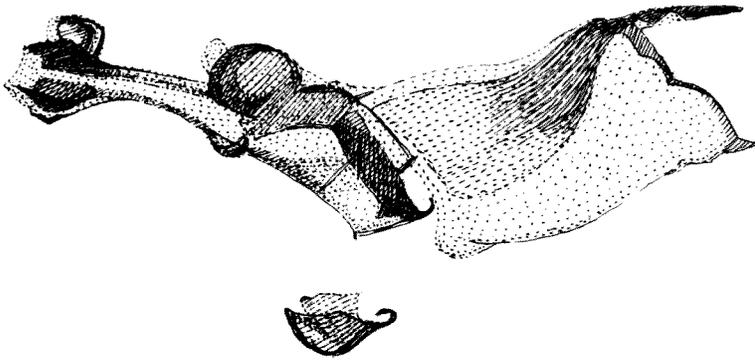
Wing: length in female 3.5 mm, costa extending to vein M1+2, last and penultimate sections of M3+4 equal, first cross-vein well beyond midpoint of discal cell.

Legs: mid-tibiae with 2 lateral bristles.

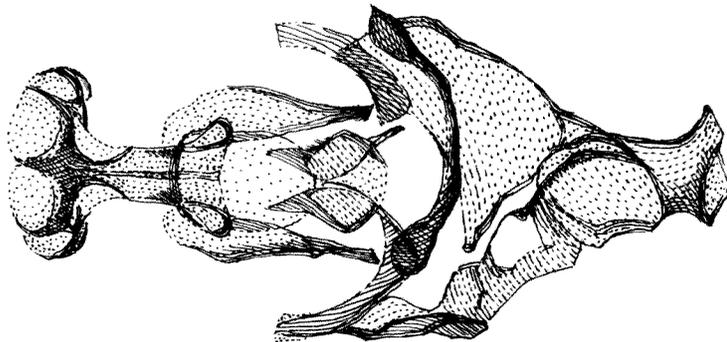
Colour: frons sooty black, basal pits of orbital bristles weakly shining, lunule dark grey; antennae essentially black but second and third segments indistinctly brownish on inside; mesonotum grey, scutellum more blackish; legs and sides of thorax black;



204



205



206

Figs 204-206: *Phytobia malabarensis*: 204, wing; 205, aedeagus, side view; 206, same, ventral view.

abdomen shining black, ovipositor sheath shining basally, grey-dusted in apical half; wings hyaline, base brown; squamae grey, margin and fringe black; halteres yellow.

Holotype ♀, N.S.W. Bellbird Creek, 3 km N. of Eden, 19.i.71 (R.W.G. Jenkins), in ANIC.

Remarks

P. manifesta is readily separable from other Australian species by the key characters given above.

In Sasakawa's (1963d) key to Oriental and Papuan species (as *Shizukoa*), *manifesta* runs to *terminalis* described from the Port Moresby area of Papua New Guinea. The 2 species are clearly similar but *terminalis* has 3 ori and significantly narrower jowls, which are 1/10 the eye height, and is larger, with wing length of 3.9 mm.

Phytobia optabilis sp.n.

(Figs 207, 208)

Head: frons broad, twice width of eye, not projecting above eye in profile; 2 ors, 3 ori; orbital setulae reclinate, extending just beyond upper ors; jowls 1/7 height of eye; third antennal segment small, round; arista distinctly swollen at base but then fine, bare, length just less than width of eye.

Mesonotum: 3+1 strong dc, third and fourth equal; prsc well-developed, equal to third dc; acr in 6 rows.

Wing: length in male 2.5 mm, costa ending midway between veins R4+5 and M1+2, last section of M3+4 slightly longer than penultimate, in ratio 25: 20, first cross-vein just beyond midpoint of discal cell.

Legs: mid-tibiae with 1 lateral bristle.

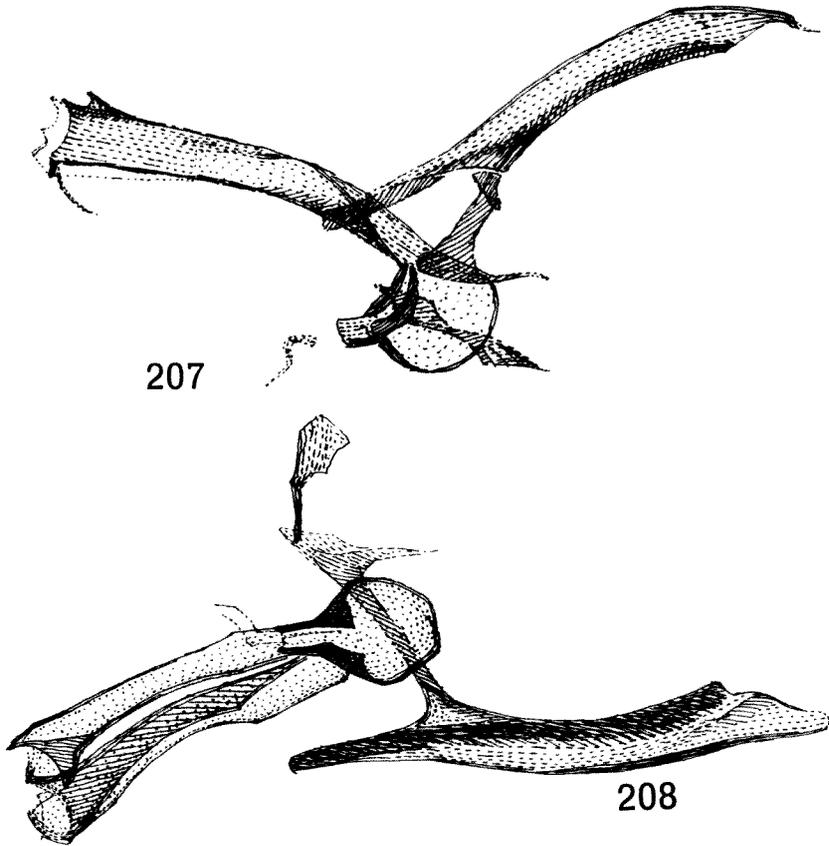
Colour: head entirely black; mesonotum black, with weak subshine; pleura, scutellum, legs and abdomen black; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 207, 208; ninth sternite with broad sidearms, rounded and broadly fused at apex; surstyli discrete, oval, with a row of long hairs along inner margin.

Holotype ♂, A.C.T. Black Mt, 7.xii.65 (I.F.B.C.), in ANIC.

Remarks

Distinctive characters of this species are the reduction of the costa and the displacement of the cross-veins towards the base of the wing, with the last section of vein M3+4 thus becoming longer than the penultimate. These characters immediately differentiate *optabilis* from *incerta* and *fausta*, and the isolation of *optabilis* from the other two is reflected in the differing form of aedeagus.



Figs 207, 208: *Phytobia optabilis*: 207, aedeagus, side view; 208, same, ventral view.

Genus *Amauromyza* Hendel, 1931

Dizygomyza, subgenus *Amauromyza* Hendel, 1931: 59.

Phytobia (*Amauromyza*), Frick, 1952: 393.

Amauromyza, Nowakowski, 1962: 97.

Type species: *Agromyza gyrans* Fallén, 1823a (Europe).

Hendel (1931) included *Amauromyza* as a subgenus of *Dizygomyza*, while Frick (1952) included it in his concept of *Phytobia*. It was treated thus in my previous paper on Australian Agromyzidae (Spencer, 1963a: 327). Nowakowski (1962) first proposed full generic rank for *Amauromyza* and this has been accepted in a number of subsequent revisionary papers (cf. Spencer, 1969: 157; 1976a: 156).

Most species, including those in Australia, have the halteres black. This can lead to confusion with *Melanagromyza* and *Ophiomyia* species but in *Amauromyza* the subcosta always distinctly continues to the costa as a fold (Fig. 2), not joining vein R1 as in *Melanagromyza* (Fig. 1).

This small genus of 30 world species is best represented in Europe where 16 species have been recorded. One species is known in Asia, one in New Guinea and one in South Africa. It is significant to note that the Australian and Oriental species are more closely related to *triseta* Spencer, 1959 in South Africa than to any known in the northern hemisphere (cf. Spencer, 1961b: Fig. 16).

In Europe and North America related species feed both as internal stem-borers and as leaf-miners.

Only the single species, *caliginosa* Spencer, 1963a has hitherto been known in Australia. A further species from northern Qld. is described below.

Key to Australian *Amauromyza* species

1. 3+1 dc; orbital setulae long *caliginosa* (Spencer)
— 3+0 dc; orbital setulae short *queenslandica* sp.n.

Amauromyza caliginosa (Spencer), comb. nov.

(Fig. 209)

Phytobia (Amauromyza) caliginosa Spencer, 1963a: 327.

Holotype ♀ from Blue Mts, N.S.W. in ANIC.

This small black species is only known from the female holotype. It closely resembles *queenslandica* sp.n. but has 3+1 dc, with the pre-sutural well-developed, and the mesonotum is distinctly mat. The wing (Fig. 209) has a length of 1.9 mm.

It will clearly be of the greatest interest to obtain a male and discover to what extent the genitalia have diverged from the form known in *queenslandica* and *papuensis* Spencer, 1966c (see below).

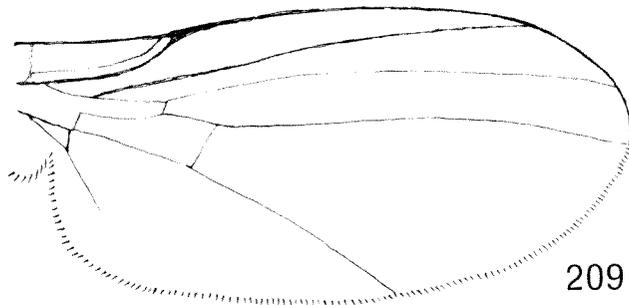


Fig. 209: *Amauromyza caliginosa*: wing.

Amauromyza queenslandica sp.n.

(Figs 210-212)

Small black species with black halteres.

Head: frons narrow, little wider than eye, not projecting above eye in profile; 2 ors, the upper stronger; 2 ori, the lower weaker and incurved; orbital setulae sparse, reclinate; jowls deepest at rear but relatively narrow, 1/7 height of eye; third antennal segment small, round, arista long, only slightly shorter than height of eye.

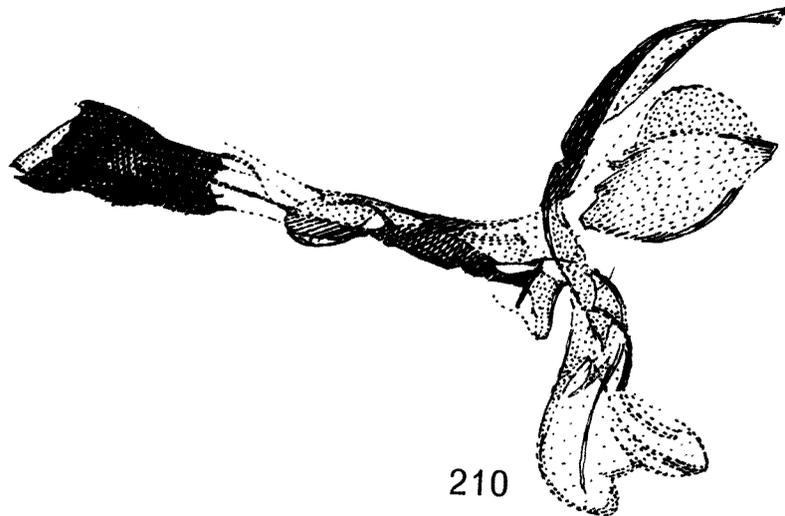
Mesonotum: 3+0 dc, third substantially shorter than second and well behind suture; acr in 4 rows.

Wing: length in male 2 mm, costa extending to vein M1+2, last section of M3+4 slightly less than twice length of penultimate.

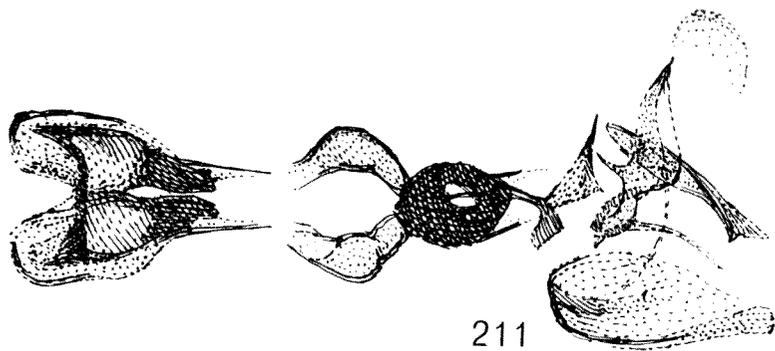
Colour: frons sooty-black towards orbits but slightly paler, dark-brown, centrally; orbits moderately shining black; lunule greyish, antennae black; mesonotum mat black, only weakly shining viewed from rear; pleura and legs entirely black; squamae dark grey, margin and fringe black; halteres black.

Male genitalia: aedeagus as in Figs 210, 211, enclosed in only light membrane; ninth sternite with broad sidearms, entirely rounded apically; ejaculatory apodeme with small blade and large, bowl-shaped base (Fig 212).

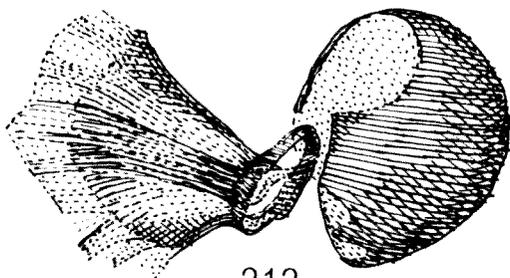
Holotype ♂, N. Qld: The Crater, near Herberton, 16.xii.61 (McAlpine & Lossin), in AM.



210



211



212

Figs 210-212: *Amauromyza queenslandica*: 210, aedeagus, side view; 211, same, ventral view; 212, ejaculatory apodeme.

Remarks

This species is separable from *caliginosa* Spencer, 1963a by having no pre-sutural dc. In this character it resembles *papuensis* Spencer, 1966c described from New Ireland and also recorded from north east New Guinea (Spencer, 1977b: 360). However, the mesonotum is mat as in *caliginosa* and conspicuously deep, shining black in *papuensis*. The male genitalia confirm the close relationship with *papuensis* (cf. Spencer, 1966c: Figs 26, 27).

Genus *Cerodontha* Rondani, 1861

Cerodontha Rondani, 1861: 10.

Type species: *Chlorops denticornis* Panzer, 1806.

Until recently this genus was restricted to the characteristic species having a spine or conspicuous angle on the third antennal segment (Figs 217, 224) and only a single pair of scutellar bristles. Nowakowski has made a detailed study of the genus in Europe, expanding the generic concept to embrace also species previously placed in Hendel's sub-

genera *Poemyza*, *Dizygomysza* and *Icteromyza* (Nowakowski, 1973). Seven subgenera are now recognized in Europe; of these only 3, *Icteromyza*, *Cerodontha* and *Butomomyza* are present in Australia. *Dizygomysza* and *Poemyza* are represented in New Guinea by one and 2 species respectively.

Larvae of this genus feed exclusively on Monocotyledoneae, in the families Cyperaceae, Poaceae, Iridaceae and Juncaceae.

Eleven species are now confirmed in Australia, of which 4 are described as new and one is a new record for the continent.

Key to Australian *Cerodontha* species

- | | | | | | | |
|----|---|-----|-----|-----|---------------------------|---|
| 1. | 2 scutellar bristles; third antennal segment with spine or distinct angle on upper corner (subgenus <i>Cerodontha</i>) | ... | ... | ... | ... | 2 |
| — | 4 scutellar bristles; third antennal segment rounded, without spine or angle | ... | ... | ... | ... | 9 |
| 2. | Mesonotum shining black, orange-yellow or divided into bands (Fig. 229) | ... | ... | ... | ... | 3 |
| — | Mesonotum uniformly mat grey | ... | ... | ... | ... | 8 |
| 3. | Scutellum largely yellow | ... | ... | ... | <i>vittigera</i> Malloch | |
| — | Scutellum black | ... | ... | ... | ... | 4 |
| 4. | Mesonotum yellow centrally adjoining scutellum (Fig. 229) | ... | ... | ... | <i>voluptabilis</i> sp.n. | |
| — | Mesonotum solidly black; at most narrowly yellow adjoining scutellum or with yellow patches at hind-corners; wings infuscated | ... | ... | ... | ... | 5 |
| 5. | Mesonotum entirely or largely black | ... | ... | ... | ... | 6 |
| — | Mesonotum orange-yellow, with or without darker bands (Fig. 221) | ... | ... | ... | ... | 7 |
| 6. | Mesonotum entirely black; notopleural area only indistinctly yellowish | ... | ... | ... | <i>delectabilis</i> sp.n. | |
| — | Mesonotum narrowly yellow adjoining scutellum or with yellow patches at hind-corners | ... | ... | ... | <i>robusta</i> Malloch | |
| 7. | Mesonotum orange-yellow; costa extending to vein M1+2 | ... | ... | ... | <i>fulva</i> sp.n. | |

- Mesonotum with 5 darker bands (Fig. 221); costa ending at vein R4+5 *augustensis* sp.n.
- 8. Curvature of distal section of aedeagus slight (Fig. 218); acrostichals occasionally present *australis* Malloch
- Curvature of aedeagus pronounced (Fig. 219); acrostichals rarely present *milleri* Spencer
- 9. Lunule higher than a semicircle; largely black species (subgenus *Butomoromyza*) *poemyzina* (Spencer)
- Lunule approximately in form of semicircle; frons normally yellowish at least in front; if largely dark, all knees bright yellow (subgenus *Icteromyza*) 10
- 10. Femora largely yellow *piliseta* (Becker)
- Femora black with yellow knees *triplicata* (Spencer)

Subgenus *Icteromyza* Hendel, 1931

Previously only a single species, *triplicata* (Spencer), was known in Australia; one additional species, *piliseta* (Becker), is now recorded below.

This is a small group of predominantly Holarctic distribution, with 15 species known throughout the world. A single species, *C. (Icteromyza) hardyi*, was described from New Guinea (Sasakawa, 1963d) and this has recently been recorded from Sri Lanka (Spencer, 1975). The male genitalia confirm the close relationship with *Cerodontha* s.s. but *Icteromyza* has 2 pairs of scutellar bristles and the third antennal segment lacks a spine or angle at the upper corner, characteristic of *Cerodontha*.

Cerodontha (Icteromyza) piliseta (Becker)

(Figs 213, 214)

Agromyza piliseta Becker, 1903: 190.

Holotype ♂ from Cairo in Zoological Museum, Berlin.

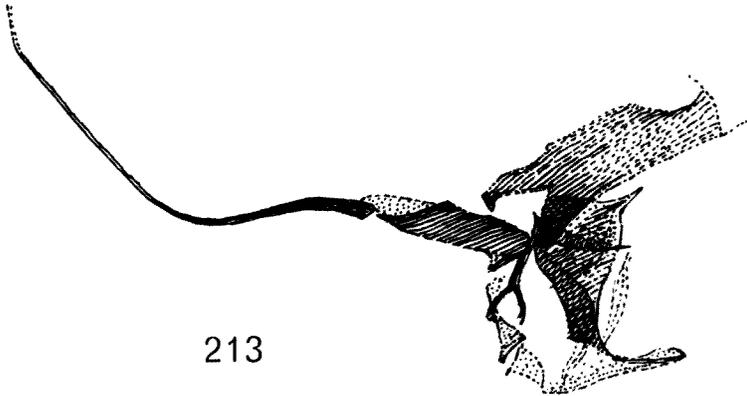
This is a distinctive species, with the femora predominantly yellow, black only at the base on the fore-legs and at most on basal third on mid- and hind-legs; the frons is yellowish-brown, lunule yellow; mesonotum black, moderately shining; wing length 1.7-2.2 mm.

The male genitalia have not been previously examined. The aedeagus (Fig. 213) is typical of the genus, with the distal tubules fused basally and at the apex but divided centrally; ejaculatory apodeme (Fig. 214) with enlarged blade and conspicuous 'wing' at base; arms of ninth sternite elongate, slender.

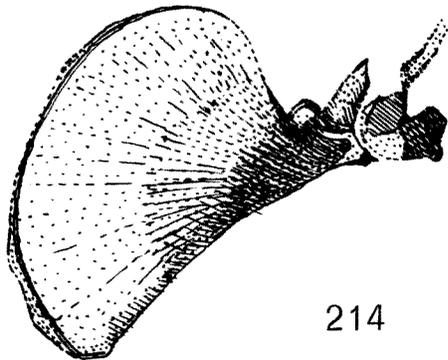
C. (Icteromyza) piliseta is immediately distinguishable from *triplicata* by the conspicuously yellow femora. It is widespread in the Old World tropics from the Cape Verde Is. to New Guinea and Micronesia. Recent study of material from Sri Lanka showed it to be one of the commonest species on the island (Spencer, 1975). The host is unconfirmed, but it has been suggested that a leaf-mine on *Fimbristylis dichotoma* (L.) Vahl found in the Botanical Gardens at Lae, Papua New Guinea, might be referable to this species (Spencer, 1977b).

Material seen

N. Qld: The Boulders, Babinda, 1♂, 10.v.67 (D.H.C.); The Boulders, 6.4 km N.W. of Babinda, 1♂, 8.vii.71 (Z.L.); 11-22 km W. of Herberton via Watsonville, 1♀, 1.v.67; Mt Garnet Rd., 20.9 km W. of Ravenshoe, 1♀, 2.v.67 (both D.H.C.). N.S.W. Brunswick Hds, 1♀, viii.63 (D.E. Havenstein).



213



214

Figs 213, 214: *Cerodontha (Ict.) piliseta*: 213, aedeagus; 214, ejaculatory apodeme.

Cerodontha (Icteromyza) triplicata (Spencer), comb. nov.

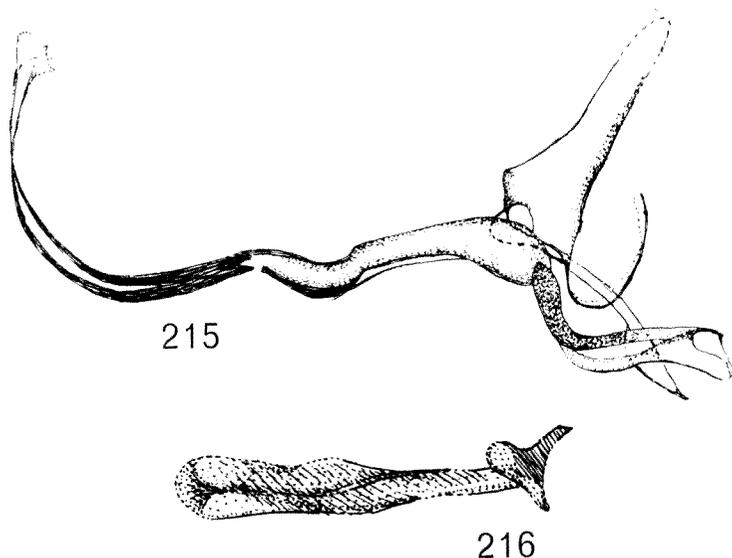
(Figs 215, 216)

Phytobia (Icteromyza) triplicata Spencer, 1963a: 328.

Holotype ♀ from Pacific Highway, south of Hawkesbury River, N.S.W. in AM.

Medium-sized species, wing length normally from 2 mm in male to 2.5 mm in female; males can rarely be as small as 1.7 mm; frons yellow below, but normally variably darkened above, rarely entirely brown; lunule conspicuously yellow; first antennal segment yellowish, second and third largely black but somewhat yellowish on inside; mesonotum greyish-black; legs: femora black but all knees bright yellow. Male genitalia: the aedeagus is shown in Fig. 215 and the ejaculatory apodeme in Fig. 216.

In the type series of 19 specimens the frons was always partially yellow, though variably darkened above; in 3 of the 25 additional specimens now seen the frons is entirely dark brown. Substantially smaller males also occur infrequently, with wing length of only 1.7 mm. On these 2 characters, dark frons and small size, *triplicata* overlaps with *floresensis* Spencer, 1961a which is now known from Indonesia: Flores, the Philippines and New Guinea (Spencer, 1977b) However, there is a small but consistent difference in curvature of the aedeagus, which is more pronounced in *floresensis* (Spencer, 1977b); no specimens of *floresensis* are known with the frons yellow. Differentiation between the populations in Australia and in the islands to the north is thus slight but it seems justifiable to treat these populations as distinct.



Figs 215, 216: *Cerodontha (Ict.) triplicata*: 215, aedeagus; 216, ejaculatory apodeme.

In colour and general morphology *triplicata* also closely resembles both *duplicata* Spencer, 1961a, known from Flores and Nepal (Spencer, 1965a), and *hardyi* Sasakawa, 1963c described from Papua New Guinea and now also known in Sri Lanka (Spencer, 1975). However, differences in the aedeagus of these 3 species are distinct and constant.

C. (Icteromyza) triplicata was previously known only in N.S.W. and A.C.T., but records are now given for 3 localities in Qld., 2 in N.T. and 2 in W.A. The species has also been recorded in New Zealand, in both North and South Islands (Spencer, 1976b).

The host of this species has not previously been known, although it was suggested by Spencer (1963a: 329) that it might be *Juncus* sp. The discovery of adults on stems of *Juncus pallidus* at Rest Point, Walpole, W.A. was therefore of considerable interest and a young larva was subsequently found feeding in the stem, thus confirming this as the host.

Material seen

Qld. Clayton Gully, 4 km E. of Cunningham's Gap, 1♀, 1.vi.66 (Z.L.); 8-12.8 km Mt Lewis Rd. off Mossman—Mt Molloy Rd., 1♂, 1♀, 22.iv.67; North Maria Creek, near Southwood, 1♀, 14.xii.61 (D.K.M.); Woombye, near Nambour, 1♂, 11-16.x.65 (D.H.C.). N.T. Amadeus Basin, 1♀, 20.viii.62 (P. Ranford); Standley Chasm, N.W. of Jay Creek, 2♂, 4.x.72 (Z.L.). N.S.W. 6.8 km N. of Bellata, 6♂, 11♀, 13.xii.74 (Z.L.); Collarenebri, 1♂, 9.x.63; Durras Lake, 1♀, 22.ii.65; Eugowra, 1♂, 15.xi.64 (all D.H.C.); 2.4 km N.E. of Eugowra, 1♀, 24.iv.71 (Z.L.); Goonoo State Forest, 27 km N.E. Dubbo, 1♂, 25.iii.71 (D.K.M.); 8 km S. Mendooran, 1♀, 3-5.x.70 (D.K.M. and G.A.H.); 40 km S. Mendooran, 1♀, 24.iii.71 (D.K.M.); Ooma Creek, Nag's Head Bridge, N.W. of Grenfell, 1♀, 23.iv.72 (Z.L.); Otford, 1♀, 10.ii.62; 1♂, 10.xii.62 (D.K.M.); 2♂, 1♀, 31.xii.62 (D.H.C.); Parkes, 2♂, 13.xi.64 (D.H.C.); Manly Reservoir, Sydney, 1♂, 21.vii.63 (D.H.C.); 6.4 km S.W. of Tarago, 1♀, 20.iii.66 (Z.L.); Lake Albert, near Wagga, 2♂, 10.vi.71 (Z.L.); Yass River, 1♀, 18.ii.63 (D.K.M.); Brookes Creek, 16.5 km S. of Bernagui, 1♂, 24-27.ii.74 (Z.L.). A.C.T. Black Mt, 1♀, 9.x.30 (A.L.T.); Ginninderra, 1♂, 28.ii.62; Mt Gingera, 1♀, 11.i.67; Mt Majura, 1♀, 2.iv.63 (all D.H.C.). W.A. Walpole, Rest Point, 1♂, 4♀, on *Juncus pallidus*, 7.x.75; 5 km N. of Hamelin Bay, W. of Augusta, 1♂, 1♀, on *Juncus pallidus*, 19.xi.75 (all K.A.S.).

Subgenus *Cerodontha* Rondani, 1861

All species in this subgenus have only a single pair of scutellar bristles and the third antennal segment either bears a fine spine (Fig. 217) or is conspicuously angulate (Fig. 224).

The 8 species now known in Australia are in 2 distinct groups:

- a) the *australis* group: *C. australis* and *milleri* are little differentiated from well-known species in the northern hemisphere, such as *denticornis* Pz. (Europe, Japan) and *dorsalis* Loew (North and South America, Mongolia). They are themselves separable

only by the male genitalia (Figs 218, 219). The ancestral forms presumably reached Australia relatively recently, probably during one or other of the Pleistocene land connections with New Guinea. The nearest comparable species known at the present time are in northern India (Singh and Ipe, 1973) but I believe that related species can be expected to occur at high altitudes in intervening areas such as Malaysia, Sabah or New Guinea.

- b) the *robusta* group: The remaining 6 species, which may be conveniently referred to as the *robusta* group, are shown by their genitalia to be closely related (cf. Figs 222, 227, 230), but are readily distinguishable by their distinctive coloration. The form of genitalia is distinct from any known elsewhere and suggests a longer period of isolation than in the *australis* group. Although only females are known of *augustensis* sp.n. and *fulva* sp.n. their external morphology places them without doubt in this group. Both *augustensis* and *vittigera* are unique in the subgenus in having the costa not fully extending to vein M1+2.

Cerodontha (Cerodontha) australis Malloch, 1925

(Figs 217, 218)

Cerodontha australis Malloch, 1925: 89.

Holotype ♀ from Sydney, N.S.W. in SPHTM.

It has hitherto been believed that this species is widespread in south east Australia. However, it has now been discovered that two closely related species are present, which can be reliably separated only by their male genitalia.

This species pair is immediately recognizable by the spine on the third antennal segment (Fig. 217) and the mat grey mesonotum and scutellum; in *australis* 1 to 3 pairs of acrostichals are frequently but not always present; wing length is 2.4-2.6 mm; the characteristic aedeagus, with only slight curvature, is shown in Fig. 218.

C. australis was described from 4 females from Sydney and Malloch mentions the presence of acrostichals. The only certain additional specimens I have been able to confirm in Australia are from the National Park, N.S.W.

Earlier (Spencer, 1963a), I misidentified as *australis* 2 males from Bowral, N.S.W. (K.A.S.) and the illustration given of the aedeagus in that paper was of one of these specimens. This species was subsequently described as *milleri* Spencer, 1973a. It is somewhat smaller and acrostichals are invariably entirely absent (though occasionally one or 2 isolated hairs may be present).

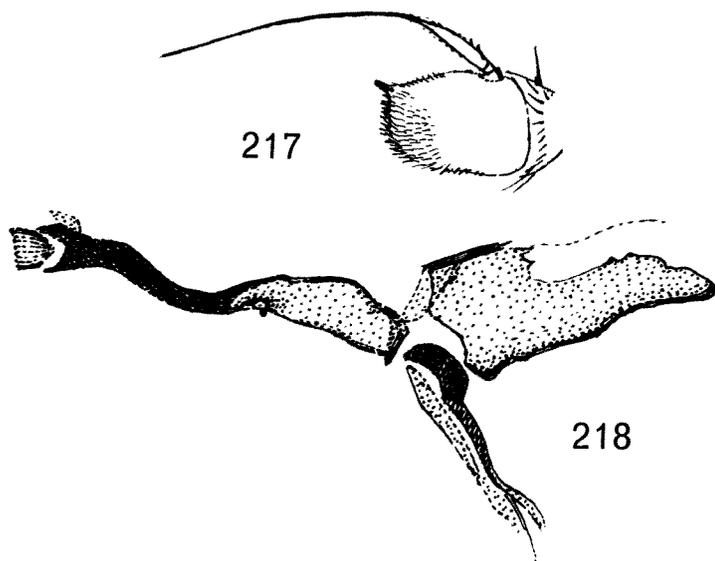
Among the material now before me, believed to represent *australis*, I have examined 150 specimens from numerous localities in N.S.W., A.C.T. and Vic. To my surprise examination of the genitalia of many males shows them all to represent *milleri* and it must be concluded that this is by far the commoner of the 2 species. The species present on

Lord Howe Is. is also *milleri*; however, in New Zealand and on Norfolk and Chatham Is, true *australis* occurs in large numbers and has been recorded from numerous localities (Spencer, 1976b).

C. australis is a grass-feeder but no actual hosts have been confirmed in Australia. In New Zealand puparia have been found in one endemic species, *Poa anceps* Forst., but the main population appears to be feeding on introduced European species, such as *Dactylis glomerata*, *Holcus lanatus* and *Lolium perenne*.

Material seen

N.S.W. National Park, 1♂, 19.iii.57; 1♀, 28.iv.56; 1♀, 24.vi.61; Otford, 2♀, 24.xi.62 (all D.K.M.). Probably *australis*: Blue Mts, Katoomba, 2♀, 5.xi. and 2.xii.57 (Hardy); 1♀, 22.x.64 (D.K.M.).



Figs 217, 218: *Cerodontha (Cer.) australis*: 217, third antennal segment; 218, aedeagus, side view.

Cerodontha (Cerodontha) milleri Spencer, 1973 (Fig. 219)

Cerodontha milleri Spencer, 1973a: 296.

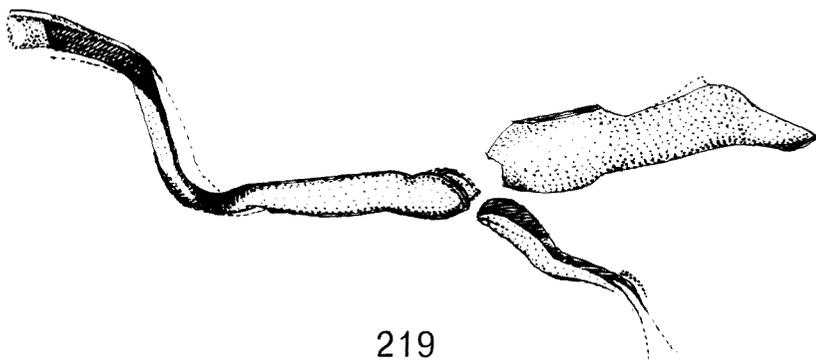
Holotype ♂ from Bowral, N.S.W. in ANIC.

On external characters this species is not wholly reliably separable from *australis* but is generally smaller, with wing length of 1.9-2.1 mm in the male to 2.3 mm in the female; acrostichals are normally entirely absent, with rarely isolated individual hairs present. The aedeagus, with conspicuous curvature, is shown in Fig. 219.

C. milleri was first collected by me when enjoying the hospitality of Mr J. Miller at his country home at Bowral, N.S.W. and was mistaken for *australis*. The aedeagus was illustrated, as *australis*, by Spencer (1963a: Fig. 42). Only later was it discovered that the true *australis* is apparently restricted to the Sydney area in Australia, although it is widespread and abundant in New Zealand and is also present on Norfolk Is. In W.A. *milleri* was found at 6 localities and is apparently widespread in the south-west but populations appear to be small.

Material seen

I refer to *milleri* 160 specimens from 60 localities in N.S.W., A.C.T., Vic., Tas. and W.A. Confirmation has been obtained from male genitalia of the following and all records are given for Tas. and W.A. N.S.W. Snowy River, 1,675 m, 4♂, 12.i.67 (D.H.C.); Spencer's Creek, Kosciusko, 3♂, 5♀, 6.xi.61 (D.H.C.); Lord Howe Is., 3♂, 5♀, 23.xi.55 (S.J.P.). A.C.T. Black Mt, 1♂, 30.xi.61; also 18 further specimens (all I.F.B.C., Light Trap). Tas: Corinna, 1♂, 8.i.60; Devonport, 1♂, 8.i.60; near Russell Falls, Mt Field National Park, 2♀, 13.i.60; Tyenna River, near National Park, 122 m, 1♂, 1♀, 12.i.60; Lake St Clair, 2♂, 3♀, 14.i.60; Mt Wellington, 974 m, 1♀; summit, 1♂, 2♀, 12.i.60 (all D.K.M.). W.A. 'Boat Harbour', W. of Denmark, 1♂, 8.x.75; Nannup, 2♂, 2.x.75; 24 km S.W. of Nannup, 2♀, 2.x.75; Pemberton, Rainbow Trail, 1♀, 4.x.75; Perth, Botanical Gardens, 1♀, 24.ix.75; Walpole, Rest Point, 1♀, 7.x.75 (all K.A.S.).



219

Fig. 219: *Cerodontha (Cer.) milleri*: aedeagus.

Cerodontha (Cerodontha) augustensis sp.n.

(Figs 220, 221)

Large, largely yellow species, with dark areas of mesonotum divided into bands (Fig. 221).

Head (Fig. 220): frons broad, twice width of eye, conspicuously projecting above eye in profile; 6 pairs of orbital bristles, all inclined somewhat inwards; orbital setulae sparse,

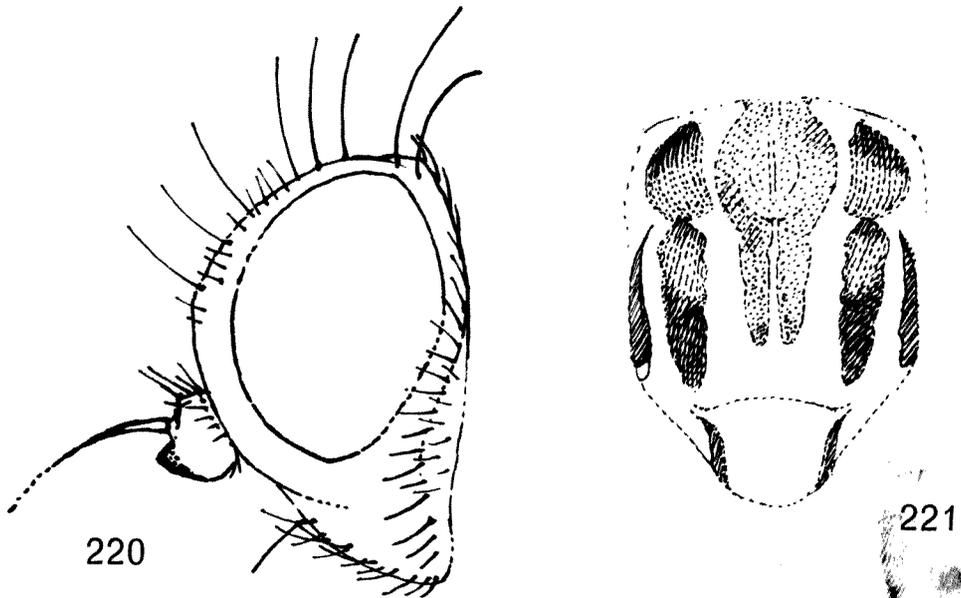
predominantly upright; ocellar triangle bearing 2 strong pairs of ocellar bristles; orbits prominent, widening below; lunule large, higher than a semicircle, with angle on upper margin; jowls deeply extended at rear, 1/3 height of eye, cheeks forming conspicuous ring below eye; third antennal segment angular at upper corner.

Mesonotum: 3+1 strong dc, second, third and fourth equal; acr completely irregular, in some 4 rows, extending from before fourth dc to level of first.

Wing: length in female 3.3 mm; costa ending shortly after termination of vein R4+5; last and penultimate sections of M3+4 equal, first cross-vein at distal quarter of discal cell.

Colour: head entirely orange-yellow, including hind-margin of eye; antennae yellow, only third segment blackish at upper corner; mesonotum (Fig. 221) basically orange-yellow, with dark area divided into 5 bands, the broad central one entirely brown, the inner pair largely brown in front, becoming black behind, the lateral pair brilliantly shining black; scutellum bright yellow centrally, with black patches outside the bristles; sides of thorax predominantly yellow, with small black patch at front of humerus, irregular blackish bands along front, rear and lower margins of mesopleura, and sternopleura black below, with broad yellow upper margin; legs; coxae and femora bright yellow, tibiae brownish-yellow, tarsi darker brown; abdomen with tergites black in front, broadly yellow behind; basal cone of ovipositor black, only moderately grey-dusted.

Holotype ♀, W.A. Augusta, roadside near Hilltop Lookout, 20.xi.75 (K.A.S.), in WAM.



Figs 220, 221: *Cerodontha (Cer.) augustensis*: 220, head; 221, mesonotum.

Remarks

Superficially this species resembles *fulva* but it has distinctive dark bands on the mesonotum and the costa ends shortly after vein R4+5.

The holotype was caught on the north side of the road about 2 km from Hilltop Lookout above Augusta in an area of varied flora dominated by the Composite *Podolepis gracilis* (Lehm.) R. Grah. Despite intensive collecting only the one female was obtained. As with all other species in this subgenus of which the host is known, it seems certain that the food-plant will be in the Poaceae.

Cerodontha (Cerodontha) delectabilis sp.n.

(Figs 222, 223)

Head: frons broad, nearly twice width of eye, completely covered with minute bristles; orbits pronounced, conspicuously projecting above eye; 3 ors, 3 ori; orbital setulae sparse; jowls 1/4 height of eye, cheeks forming broad ring below eye; third antennal segment with conspicuous angle at upper corner (cf. Fig. 224).

Mesonotum: 3+1 strong dc; acr long, in 4 rows.

Wing: length in male 2.4 mm, in female 3.1 mm; costa extending strongly to vein M1+2, last section of M3+4 slightly longer than penultimate, first cross-vein at anterior third of discal cell.

Legs: mid-tibiae without lateral bristles.

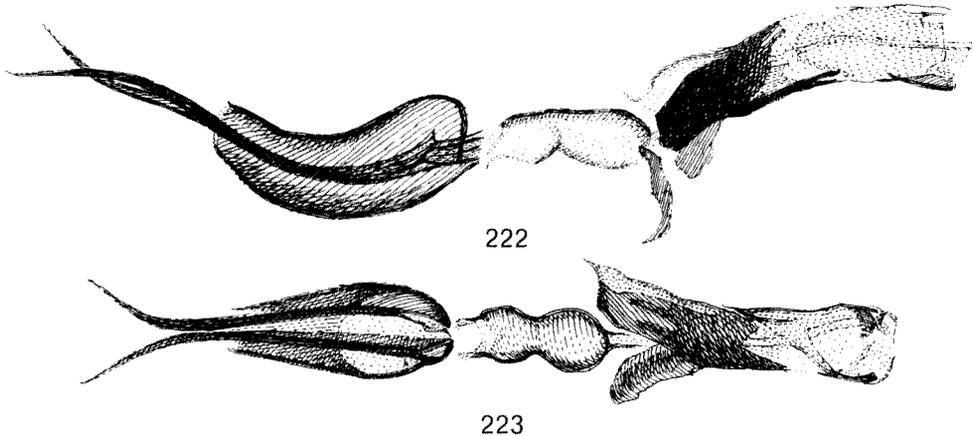
Colour: frons dark brown, orbits contrasting yellow; ocellar triangle shining black centrally, narrowly yellow around margin; lunule yellow above, brownish-black below, upper margin divided by small central brown bar; jowls yellow, face largely black; third antennal segment orange-brown, becoming black at upper angle; palps yellowish-brown; mesonotum and scutellum brilliantly shining black, pleura entirely black; legs: coxae largely black but on P1 yellow on inside; femora yellow with slight brownish striations on outside, tibiae and tarsi brownish-black; abdomen black, hind-tergites very narrowly yellow; in female ovipositor sheath largely shining black but grey-dusted basally; squamae grey, margin and fringe black; halteres yellow; wings strikingly infuscated, in darker of 2 specimens seen dark brown.

Male genitalia: aedeagus as in Figs 222, 223.

Holotype ♂, N.S.W. Heathcote, near Sydney, 21.x.70; paratype ♀, same data (both D.K.M.), in AM.

Remarks

This is the darkest species in the *robusta* group. Distinguishing characters are the brilliantly shining black mesonotum and the brownish wings.



Figs 222, 223: *Cerodontha (Cer.) delectabilis*: 222, aedeagus, side view; 223, same, ventral view.

Cerodontha (Cerodontha) fulva sp.n.

Head: frons about 1 1/2 times width of eye, orbits not greatly differentiated and not significantly projecting above eye in profile; 2 ors and 2 or 3 ori; orbital setulae sparse, reclinate; jowls 1/4 height of eye, cheeks forming distinct ring below eye; third antennal segment with distinct angle at upper corner (cf. Fig. 224).

Mesonotum: 3+1 strong dc, acr irregularly in 4 or 5 rows.

Wing: length in female 3.2 mm, last section of M3+4 slightly longer than penultimate, first cross-vein at midpoint of discal cell; costa extending strongly to vein M1+2.

Colour: head almost entirely orange, frons more reddish, upper angle of third antennal segment darkened, blackish; mesonotum predominantly orange, with a darker central band extending almost to margin of scutellum and a similar darker area extending across pre-sutural area to intra-alar, and a conspicuous circular black area centred on supra-alar; pleura entirely yellowish-orange; legs: coxae and femora bright yellow, tibiae and tarsi brown; abdomen with first tergite entirely yellow, others blackish centrally but yellow laterally and on hind-margin; basal cone of ovipositor shining black in basal half, grey-dusted apically; squamae yellowish-grey, margin and fringe black; wings hyaline; halteres yellow.

Holotype ♀, N.S.W: Wooton (North Coast), 10.x.62; paratype ♀, same data (both D.H.C.), in ANIC.

Remarks

There is little doubt that this species belongs to the *robusta* group. It is immediately distinguishable from the 5 other species by its conspicuous orange-yellow colour, with virtually no darkening of the mesonotum or sides of the thorax.

Cerodontha (Cerodontha) robusta Malloch, 1925

(Figs 224, 225)

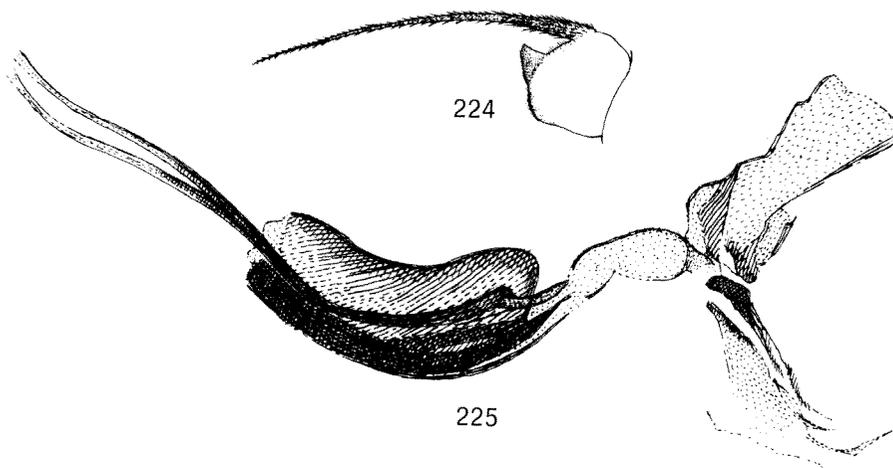
Cerodontha robusta Malloch, 1925: 90.

Holotype ♀ from Sydney, N.S.W. in SPHTM.

Large species with wing length from 2.4-3.2 mm. Frons basically yellow but darkened by microscopic hairs, appearing brownish; orbits, jowls and face yellow; third antennal segment with blunt angle at upper corner (Fig. 224), largely yellow; mesonotum shining black; legs: coxae and femora yellow, tibiae and tarsi brown. Male genitalia: aedeagus as in Fig. 225.

The male genitalia indicate a close relationship with *vittigera* Mall. and *voluptabilis* sp.n. described below, but the aedeagus is substantially larger, even than in *voluptabilis* which is by far the largest species in this group.

This species has previously only been recorded from N.S.W. where it is clearly widespread, but apart from 5 specimens from Cabbage Tree Creek, Clyde Mt, only single specimens have been seen from any one locality.



Figs 224, 225: *Cerodontha (Cer.) robusta*: 224, third antennal segment; 225, aedeagus.

Material seen

Qld. 11 km S.E. of Mt Nebo, c. 457 m, 1♀, 24.v.66 (Z.L.). N.S.W. Araluen, Sheepstation Creek, 1♂, 1♀, 24.xi.72 (Kelsey and Z.L.); 13 km E.S.E. of Braidwood, 5♂, 22.xi.72 (K.R.N.); Brockelos Creek, 16.5 km S. of Bernagui, 3♂, 24-27.ii.74 (Z.L.); Brown Mt, Bega District, 1♂, 15.iii.61 (D.H.C.); Childowla, Murrumbidgee River, 1♂, 27.xii.70 (G.A.H.); Clyde Mt, Cabbage Tree Creek, 5♂, 26.x.60 (D.H.C.); Clyde Mt,

Mongarlowe River, 1♂, 5.v.65 (D.H.C.); Colo Heights, Putty Rd., 1♂, 6.ii.68 (D.H.C.); French's Forest, 1♂, 17.xii.27 (B. Bertram); 41.8-43.4 km Glen Innes to Grafton Highway, 1♂, 20.iv.70 (D.H.C.); Heathcote, near Sydney, 1♂, 24.x.70 (D.H.C.); Karuah, 1♂, 25.xi.66 (D.K.M.); Katoomba, 1♂, 19.xi.56 (G. Hardy); Kurrajong, 1♂, 2.vi.68 (G.A.H.); Narooma, 1♂, 25.i.63 (Z.L.); 6.4 km E. of Nimmitabel, 1♂, 8.ii.63 (D.H.C.); Pond's Creek, E. of Armidale, 1♂, 13.x.62 (D.H.C.); Runnyford, Nelligan River, 1♂, 6.iv.66 (Z.L.); Sydney, Middle Creek, 1♂, 27.viii.60 (D.H.C.); Tumut, 1♂, 31.iii.61 (Z.L.); Mount Wilson, Blue Mts, 1♂, 1♀, 15-16.iv.71 (D.K.M.).

Cerodontha (Cerodontha) vittigera Malloch, 1927

(Figs 226-228)

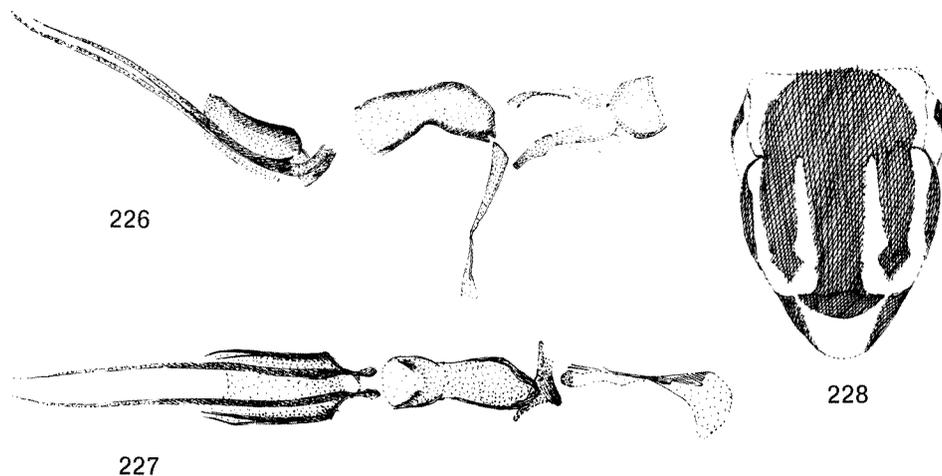
Cerodontha vittigera Malloch, 1927: 423.

Holotype ♂ from Koolanooka, W.A. in SPHTM.

This species closely resembles *voluptabilis* described below but is distinguishable by the yellow scutellum. The aedeagus of the specimen from N.S.W. is shown in Figs 226, 227.

In the one male from S.A. I have examined the black central band of the mesonotum extends onto the scutellum (Fig. 228); also the lunule is black, not yellow. The costa clearly ends well before vein M1+2 in 2 of the specimens seen, extending only weakly to M1+2 in the one from Royalla, N.S.W.

When discussing *vittigera* earlier (Spencer, 1963a: 326) I commented on the difference noted between the 2 specimens seen at that time and suggested that a second species



Figs 226-228: *Cerodontha (Cer.) vittigera*: 226, mesonotum (Ceduna, S.A.); 227, aedeagus, side view; 228, same, ventral view (both Royalla, N.S.W.).

might be involved. The additional specimens now seen, in which the colour differences are supported by differences in genitalia, satisfy me that a second species, *voluptabilis* sp.n. is indeed present which has comparable contrasting black and yellow coloration to *vittigera*.

It has not been possible to re-examine the holotype. As additional material becomes available, it seems possible that this species may be split even further.

C. vittigera is widespread but uncommon. Only the male holotype from W.A. Koolanooka is known in addition to the 4 specimens recorded below.

Material seen

N.S.W. Royalla, 1♂, 29.iii.61 (D.H.C.) A.C.T. Mt Majura, Canberra, 1♂, 29.ix.60 (D.H.C.) S.A. 33.8 km E. of Ceduna, 2♂, 10.ix.64 (G.L. Bush), one in AM, one in ANIC.

Cerodontha (Cerodontha) voluptabilis sp.n.

(Figs 229-231)

Head: frons broad, almost twice width of eye; orbits strongly differentiated, conspicuously projecting above eye in profile; 2 reclinate ors, 5 incurved ori; orbital setulae largely incurved; lunule high and narrow, upper margin raised above level of frons; jowls broad, 1/3 height of eye, cheeks forming broad ring below eye; third antennal segment concave on upper margin, with distinct angle at upper corner (cf. Fig. 224).

Mesonotum: 3+1 strong dc, acr sparse, irregularly in 4 rows in front, isolated hairs at level of first dc.

Wing: length in male 3-3.3 mm, in female 3.6-3.8 mm, last section of vein M3+4 equal to penultimate or slightly shorter, in ratio 25: 30, first cross-vein well beyond midpoint of discal cell.

Legs: mid-tibiae without lateral bristles.

Colour: frons, orbits, jowls and palps yellow; third antennal segment more orange, angle at upper corner black; mesonotum (Fig. 229) shining black centrally to level of second dc, then yellow adjoining scutellum, with broad black lateral bands between line of dc and supra-alar; scutellum entirely black; humerus with small black area before bristle, yellow behind, entire notopleural area and upper margin of mesopleura yellow, mesopleura and sternopleura below shining black; legs: coxae and femora bright yellow, tibiae and tarsi brown; abdomen largely black but tergites yellow laterally and hind-margins at most narrowly yellow; wings slightly infuscated, particularly along upper margin; squamae yellow, margin brownish-black, fringe ochrous; halteres yellow; in female basal cone of ovipositor shining basally, grey-dusted in apical third.

Male genitalia: aedeagus as in Figs 230, 231; ventral lobe (hypophallus) short.

Holotype ♂, N.S.W. Fitzroy Falls, 22.iii.61 (D.H.C.); paratypes: 2♂, 2♀, 13 km E.S.E. of Braidwood, N.S.W., 22.xi.72 (K.R.N.); 1♂, Blue Mts, Mt Wilson, 7.ii.51 (D.K.M.). Holotype and 3 paratypes in ANIC, one paratype in AM, one in AC.

Remarks

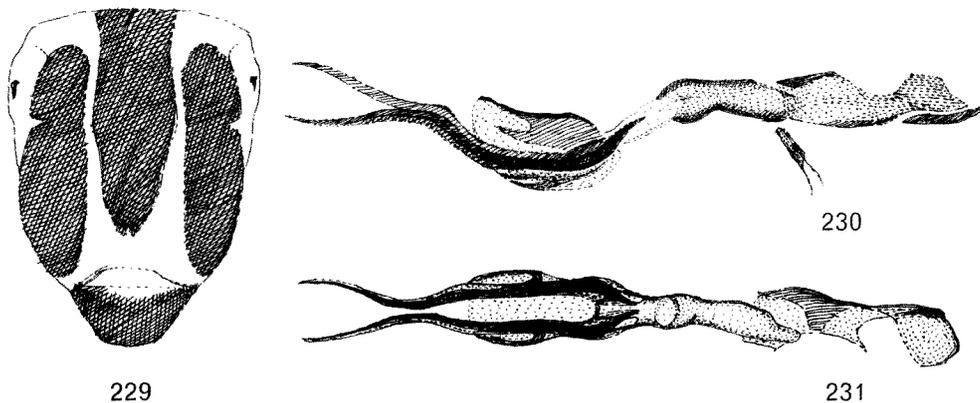
Superficially this species resembles *vittigera* but is readily distinguishable by the black scutellum and the yellow central area of the mesonotum adjoining the scutellum. The paratype from Mt Wilson is the specimen tentatively referred to *vittigera* earlier (Spencer, 1963a: 326).

Subgenus *Butomomyza* Nowakowski, 1967

Cerodontha, subgenus *Butomomyza* Nowakowski, 1967: 633; 1973: 141.

Differences between this subgenus and *Dizygomyza* are slight but are recognizable in the majority of species (though not all). Characteristically, the form of lunule is distinctly higher than a semicircle but broad at its base (Spencer, 1963a: Fig. 45A) and in the male the third antennal segment is not enlarged. There is no clear-cut difference in the aedeagus between the 2 subgenera.

In Australia the single species, *poemyzina* (Spencer, 1963a), falls within Nowakowski's concept of *Butomomyza*. Ten species are known in Europe; most are leaf-miners on *Carex*, though one feeds on *Scirpus* (Cyperaceae) and one on *Poa* (Poaceae).



Figs 229-231: *Cerodontha* (*Cer.*) *voluptabilis*: 229, mesonotum; 230, aedeagus, side view; 231, same, ventral view (all Wilson Falls, N.S.W.).

Butomomyza (*Cerodontha*) *poemyzina* (Spencer), comb. nov.

(Fig. 232)

Phytobia (*Dizygomyza*) *poemyzina* Spencer, 1963a: 328.

Holotype ♂ from Otford, N.S.W. in AM.

This is a medium-sized black species, with wing length ranging from 2.4 mm in the male to 2.7 mm in the female. The costa extends to vein M1+2 and the last section of M3+4 is 1 1/2 times the length of the penultimate. The legs are largely black, with only the fore-knees narrowly yellow. The wing base is conspicuously yellow. The aedeagus is shown in Fig. 232.

The host will probably prove to be a *Carex* sp.

Although no species in this subgenus are known in New Guinea, it can only be assumed that the ancestral form of *poemyzina* has reached Australia from Asia in relatively recent times; it shows no basic differentiation suggesting any long period of isolation.

A single female from Tas. is tentatively identified as *poemyzina* but it is slightly larger, the mesonotum is more shining, the wing base is less yellow and the squamal margin and fringe are more conspicuously black. Only when males are available will it be possible to decide whether a separate species is present in Tas.

Material seen

Qld: Claudie River, near Mt Lamond, 1♀, 18.xii.71 (G.A.H.); Woombye, near Nambour, 1♀, 11-16.x.65 (D.H.C.). N.S.W: Lawson, Blue Mts, 1♀, 16.xi.62 (D.K.M.); Macquarie Pass, light trap, 1♂, 9.x.69 (Common and Upton); Otford, 1♀, 1.xi.62; 1♂, 30.x.65 (both D.K.M.); Sassafras Gully, Springwood, 1♀, 23.ix.72 (D.K.M.). A.C.T: Black Mt, light trap, 1♀, 26.v.69 (I.F.B.C.); Bull's Head, 1♀, 19.xi.68 (D.H.C.); 3.2. km E. of Mt Coree, 2♀, 19.xi.68 (D.H.C.). W.A: Porongurup National Park, 1♀, 11.x.70 (D.H.C.); Tas: near Russel Falls, Mt Field National Park, 1♀, 13.i.60 (D.K.M.).

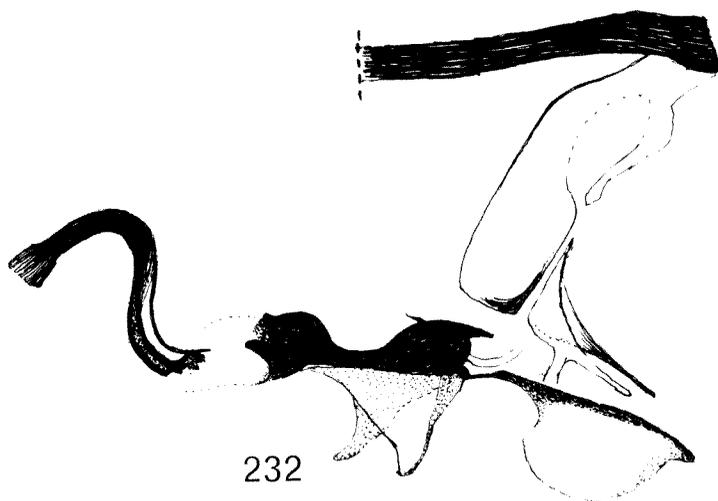


Fig. 232: *Cerodontha (But.) poemyzina*: aedeagus.

Liriomyza, subgenus *Phytoliriomyza* Hendel, 1931: 203.

Phytoliriomyza, Frey, 1941: 19.

Type of genus: *Agromyza perpusilla* Meigen, 1830 (Europe)

Lemurimyza Spencer, 1965a: 26.

Type of genus: *Liriomyza enormis* Spencer, 1963c (Madagascar).

Phytoliriomyza was erected as a subgenus of *Liriomyza*, the essential differentiating character being the entirely proclinate orbital setulae (reclinate in *Liriomyza*). However, recent studies have shown that many species belong in this genus with the orbital setulae upright or even lacking. The scutellum may be partially yellow as in most *Liriomyza* species but is more frequently grey or sometimes black. Also, the third antennal segment is not infrequently black or darkened. A further significant character is the partial or even complete darkening of the halteres. The second cross-vein may be present or lacking. A tabulation of 5 variable characters is given in Table 3.

Lemurimyza was erected for *enormis* from Madagascar with the halteres entirely black but later it was found that other species in Nepal, Europe, North America and Costa Rica with pale halteres belong in this group on the basis of the distinctive male genitalia. *Lemurimyza* was synonymized with *Phytoliriomyza* by von Tschirnhaus (1971). Most *Phytoliriomyza* species have a distinctive arrangement of bristles on the surstyli or within the epandrium but this arrangement shows considerable variation even in sister-species (see below). The stridulating mechanism present in the males of most *Liriomyza* species is always lacking in *Phytoliriomyza*.

Only the single species *australensis* has hitherto been known in Australia. Thirteen new species are now described and 5—*australina* Spencer; *pallidicentralis* Mall. and *tricolor* Mall.; *pittosporocaulis* Hering and *pittosporophylli* Hering—are transferred to *Phytoliriomyza* from *Liriomyza* and *Phytobia*. In addition, 2 further species are diagnosed but not formally described.

The Australian species can be divided into the 3 groups which are already known in Europe.

1. The *arctica* group

Species included here have the distal tubules of the aedeagus greatly extended, in extreme forms such as *arctica* Lundbeck (cf. Spencer, 1969: Fig. 364) and *australensis* (Fig. 233) becoming membranous and in the rest position coiled beneath the ninth sternite. Species which I include in this group are *collessi* sp.n., *lacunosa* sp.n., *pittosporocaulis* Her., *pittosporophylli* Her. and *queenslandica* sp.n. Only *australensis* and *lacunosa* lack strong spines within the postabdomen; both have the aedeagus membranous distally and the surstyli discrete (or nearly so). These 2 species are the most apomorphous in this

Table 3

Tabulation of 5 characters in Australian *Phytoliriomyza* species

Species	Colour			Venation second cross-vein	chaetotaxy orbital setulae
	3rd ant. segment	scutellum	halteres		
<i>australensis</i>	yellow/dark	grey	darkened	present	proclinate
<i>australina</i>	black	yellow	yellow	present	lacking
<i>cognata</i>	black	yellow/grey	yellow	present	lacking
<i>collessi</i>	yellow	black	yellow	present	reclinate
<i>flavopleuralis</i>	yellow	black	yellow	present	reclinate/proclinate
<i>lacunosa</i>	black	black	black	lacking	lacking
<i>mollis</i>	yellow	yellow	yellow	lacking	lacking/irregular
<i>monstruosa</i>	black	black	yellow	present	reclinate
<i>nigricans</i>	yellow	black	yellow	lacking	reclinate
<i>pallidicentralis</i>	brown	yellow	white	present	upright/lacking
<i>pittosporocaulis</i>	yellow	black	yellow	present	reclinate
<i>pittosporophylli</i>	black	black	yellow	present	reclinate
<i>polita</i>	brownish	black/yellowish	yellow	present	upright/reclinate
<i>praecellens</i>	yellow	yellow	darkened	lacking	lacking
<i>queenslandica</i>	black	black	yellow	lacking	reclinate
<i>rieki</i>	black	grey	yellow	present	reclinate
<i>striatella</i>	brownish	yellow	dark	present	proclinate
<i>tricolor</i>	brownish	grey	dark	present	proclinate
<i>variana</i>	black	black	yellow	present	upright/reclinate
sp. 1	black	black	yellow	present	reclinate
sp. 2	black	black	yellow	lacking	reclinate

group and on this interpretation the retention of strong spines on the surstyli or within the epandrium is treated as a plesiomorphous character present in most species in all the three groups.

2. The *enormis* group (*Lemurimyza*)

Here the aedeagus has the distal tubules broad, fully divided and relatively short, frequently with a membranous gap centrally (*polita*, Fig. 266; *variana*, Fig. 282). Three further species, *cognata*, sp.n., *mollis* sp.n. and *nigricans* sp.n. can be placed in this group, with varying degrees of evolutionary divergence. In New Guinea *bidensiphoeta* Spencer,

1977b and *sublima* Spencer, 1977b are closely associated with *polita* and *variana*; *spectata* Spencer, 1977b with *cognata*.

3. The *oasis* group

The characteristic feature of this group is the asymmetry of the distal tubules of the aedeagus, with the left always being shorter than the right (viewed ventrally). The first species known with this type of genitalia was *oasis* (Becker, 1907) which is not uncommon in the Mediterranean area and has now been recorded in southern Sweden (Spencer, 1976a: 300). Related species are known in South Africa and Nepal (Spencer, 1963d; 1977a). The discovery of 2 species belonging to this group in Australia, *striatella* sp.n. and *tricolor* (Malloch), represents a significant extension of its range.

The affiliations of *monstruosa* sp.n. (aedeagus deformed?), *rieki* sp.n. (aedeagus damaged?) and of *praecellens* sp.n., sp. 1 and sp. 2 (undescribed in absence of males) remain unclear. The position of *pallidicentralis* within the genus is also uncertain. It is clearly an isolated, possibly primitive species but it seems preferable to place it here until its relationships can be further clarified when larvae can be discovered.

A particularly interesting discovery is that in 2 pairs of sister-species the most rapid evolutionary change has occurred not in external morphology or in the aedeagus but in the shape and arrangement of bristles on the surstyli and within the epandrium. In *pittosporophylli* the surstyli are entirely fused with the epandrium (Fig. 264) but are separated by a conspicuous suture in *pittosporocaulis* (Fig. 261). In *striatella* and *tricolor* the epandrium shows a comparable degree of divergence (Figs 277, 281).

Of the 21 species known in Australia the feeding habit is known in only *pittosporocaulis* and *pittosporophylli*; both have *Pittosporum undulatum* as host, the former causing stem-galls, the latter leaf-galls. In the larvae the posterior spiracles each have 6 bulbs in *pittosporocaulis* and 10 in *pittosporophylli*. This indicates that the former is the more primitive species and that its stem-galls represent a more primitive feeding habit than the leaf-galls of *pittosporophylli*. It seems certain that the other species are not leaf-miners and the majority can be assumed to be internal feeders.

The close relationship of *Phytoliriomyza* and *Liriomyza* is certain and the additional species now seen clearly show that *Liriomyza* is the derived genus, lacking plesiomorphous characters such as dark halteres, strong bristles within the epandrium and normally with the scutellum, frons and antennae yellow. The majority of *Liriomyza* species are leaf-miners, a more highly evolved feeding habit than the internal feeding of *Phytoliriomyza*.

Key to Australian *Phytoliriomyza* species

- | | | | | | | | |
|------------------------------|-----|-----|-----|-----|-----|-----|---|
| 1. Second cross-vein lacking | ... | ... | ... | ... | ... | ... | 2 |
| — Second cross-vein present | ... | ... | ... | ... | ... | ... | 6 |

2. Mesonotum deep black	...	...	...	...	...	3
— Mesonotum grey or grey and yellow	...	...	...	...	...	4
3. Femora entirely black; squamal fringe black	...	...	...	...	<i>queenslandica</i> sp.n.	
— All knees yellow; squamal fringe yellow	...	...	...	...	sp. 2 (undescribed)	
4. Scutellum yellow; mesonotum yellow with grey bands	...	...	...	...	...	5
— Scutellum and mesonotum uniformly grey	...	...	...	...	<i>lacunosa</i> sp.n.	
5. Central dark area of mesonotum extending to midway between second and first dc; 2+1, or 2+2 orbital bristles; in female basal cone of ovipositor shining basally	...	...	...	...	<i>mollis</i> sp.n.	
— Central dark area of mesonotum extending only slightly beyond third dc; 1+3 orbital bristles; basal cone of ovipositor entirely grey-dusted	...	...	...	...	<i>praecellens</i> sp.n.	
6. Mesonotum yellow adjoining scutellum, with 5 conspicuous grey bands; third antennal segment black; minute species, wing length little over 1 mm	...	...	...	...	...	7
— Mesonotum dark adjoining scutellum, at most with faint yellow bands	...	...	...	...	...	8
7. Halteres yellow	...	...	...	...	<i>cognata</i> sp.n.	
— Halteres dark	...	...	...	...	<i>australina</i> (Spencer)	
8. Mesonotum either dark in centre, paler at sides; or with faint yellow bands along line of dc	...	...	...	...	...	9
— Mesonotum uniformly dark	...	...	...	...	...	10
9. Mesonotum brown in centre, grey along line of dc and yellowish laterally in female, uniformly grey in male	...	...	...	...	<i>tricolor</i> (Malloch)	
— Mesonotum with faint yellow bands along line of dc	...	...	...	...	<i>striatella</i> sp.n.	
10. Scutellum yellow centrally; frons strongly projecting	...	...	...	...	<i>pallidicentralis</i> (Malloch)	
— Scutellum uniformly dark, grey or black	...	...	...	...	...	11
11. Minute species, wing length 1-1.5 mm	...	...	...	...	...	12
— Larger species, wing length 1.5-2.3 mm	...	...	...	...	...	14
12. Legs largely black	...	...	...	...	<i>collessi</i> sp.n.	
— Legs largely yellow	...	...	...	...	...	14
13. Mesonotum grey	...	...	...	...	<i>australensis</i> Spencer	

— Mesonotum deep black	...	...	...	<i>flavopleuralis</i> sp.n.
14. Femora largely black	...	...	...	15
— Femora partially yellow, with darker striations	...	...	...	21
15. Femora entirely black	...	...	...	16
— Femora with at least fore-knees yellowish; acr in 4-5 rows	...	...	...	19
16. 2+1 dc; acr irregularly in 4 rows; last section of vein M3+4 twice penultimate	...	...	...	<i>rieki</i> sp.n.
— 3+1 dc	...	...	...	17
17. Last section of vein M3+4 only 1 1/2 times penultimate; third antennal segment angulate	...	...	...	sp.1 (undescribed)
— Last section of M3+4 longer, 2 to 3 times penultimate; third antennal segment rounded	...	...	...	18
18. Last section of M3+4 3 times penultimate; acr in 2 rows; mesonotum largely mat	...	...	...	<i>pittosporophylli</i> (Hering)
— Last section of M3+4 twice penultimate; acr in 4 rows; mesonotum distinctly shining	...	...	...	<i>monstruosa</i> sp.n.
19. Minute species, wing length in male 1.2-1.3 mm	...	...	...	<i>nigricans</i> sp.n.
— Larger species, wing length 2-2.5 mm	...	...	...	20
20. Frons brown; second antennal segment black, acr in 4-5 rows	...	...	...	<i>pittosporocaulis</i> (Hering)
— Frons blackish behind, reddish in front; second antennal segment yellowish; acr in 2 rows	...	...	...	<i>variana</i> sp.n.
21. Mesonotum entirely mat, brownish-grey	...	...	...	<i>tricolor</i> (Malloch)
— Mesonotum moderately shining black	...	...	...	<i>polita</i> sp.n.

Phytoliriomyza australensis Spencer, 1963

(Figs 233, 234)

Phytoliriomyza australensis Spencer, 1963a: 335.

Holotype ♂ from National Park, N.S.W. in AM.

Phytoliriomyza tahitiensis Sasakawa, 1963c: 503.

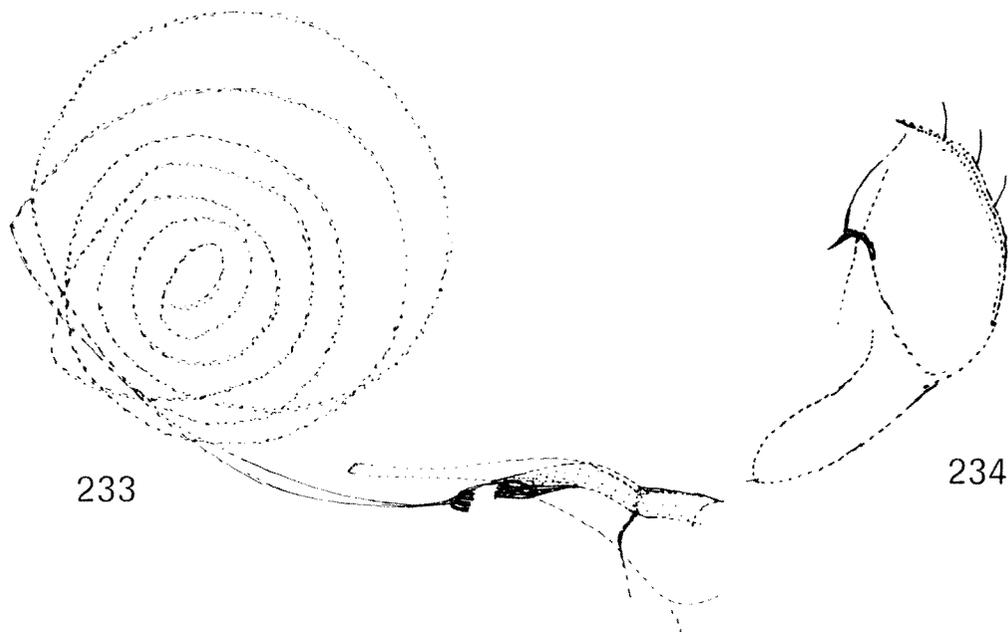
Holotype ♂ from Tahiti in Bishop Museum, Honolulu.

This minute species is distinguished by the long pubescence of the third antennal segment, which may be entirely yellow but is normally slightly brownish, the uniformly

grey mesonotum and scutellum, and the yellow legs; it shows unusual variation in having acrostichals either entirely lacking or present in 2 rows.

The illustration of the aedeagus given previously (Spencer, 1963a: Fig. 62) was inaccurate. The distal section is entirely membranous, in up to 4 to 7 coils beneath the ninth sternite when in the rest position. It can easily be overlooked or, being virtually invisible, become broken or lost during preparation. A further drawing is shown in Fig. 233. The surstyli are in the form of an elongate extension to the lower margin of the epandrium, without any suture, and fringed with at most a few weak hairs. (Fig. 234).

P. tahitiensis Sasakawa is shown as having only short distal tubules of the aedeagus (Sasakawa, 1963c: Fig. 5B); however, I believe the membranous, coiled section was overlooked. The synonymy of *tahitiensis* was established by Spencer, 1965a. It seems certain that *australensis* has reached Tahiti via New Caledonia, Fiji and Samoa and I predict that it will in due course be found on all these islands. This species was recorded from Nepal (1965a: 30), with males from 2 different localities. One of these, from the Arun Valley, has proved to be a distinct species related to *tricolor* (Mall.) and *striatella* sp.n. (see below) and has been described as *nepalensis* (Spencer, 1977a). The other, from Sangu, 1890 m, is accepted as *australensis*, although the terminal section of the aedeagus is also lacking in this specimen, lost I believe during preparation. A recent study of species in Sri Lanka confirmed that *australensis* is present there (Spencer, 1975).



Figs 233, 234: *Phytoliriomyza australensis*: 233, aedeagus; 234, epandrium and surstylus.

Three specimens from New Zealand have recently been described as *convoluta* (Spencer, 1976b). This species shows little differentiation from *australensis* but the aedeagus is strongly sclerotized throughout its length.

P. australensis has previously been known from Qld. and N.S.W; it is now recorded also from A.C.T.

Material seen

N.S.W. Cabbage Tree Creek, Clyde Mt, 1♂, 14.x.65 (Z.L.). A.C.T. Wombat Creek, Brindabella Rd., 1♂, 3.i.65 (Z.L.); Black Mt, 1♂, 1.xi.75 (K.A.S.).

Phytoliriomyza australina (Spencer, 1963), comb. nov. (Figs 235-238)

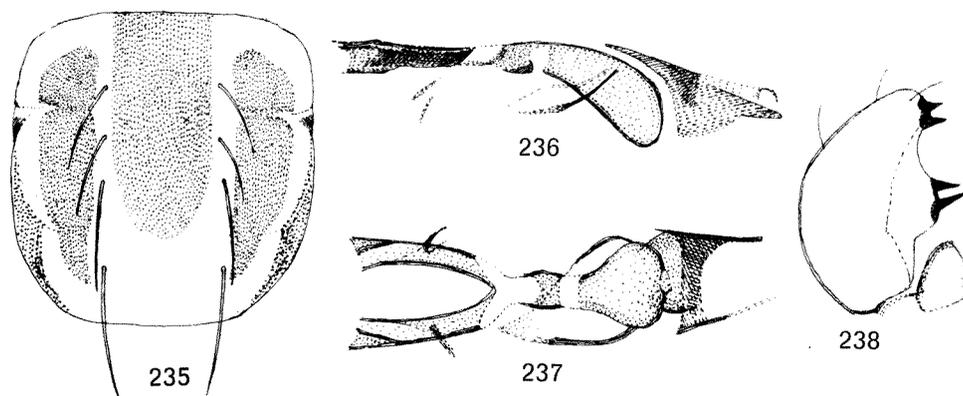
Liriomyza australina Spencer, 1963a: 331.

Holotype ♀ from Blue Mts, N.S.W. in AM.

This is a minute species with 3 grey central bands on the mesonotum (Fig. 235) and this is yellow adjoining the scutellum. The frons is bright yellow, the third antennal segment black. The knob of the halteres is dark grey.

Although the female holotype from Springwood has 3+1 dc, both the male paratype which has been re-examined and also the female now recorded below have only 2+1 dc and it appears that this is the normal arrangement. This reduction is clearly a result of the minute size of this species, with the wing length in both males and females normally little over 1 mm.

Examination of the male genitalia of a paratype from N.S.W. Blue Mts, Springwood, Sassafras Gully immediately showed that this species correctly belongs in *Phytoliriomyza* and is one of the group for which the genus *Lemurimyza* Spencer, 1965a was erected. The aedeagus is shown in Figs 236, 237 and the inner view of the epandrium and surstylus in Fig. 238.



Figs 235-238: *Phytoliriomyza australina*: 235, mesonotum; 236, aedeagus, side view; 237, same, ventral view; 238, epandrium and surstylus.

Lemurimyza was synonymized with *Phytoliriomyza* by von Tschirnhaus (1971), but the group is clearly monophyletic and certainly deserves at least subgeneric status. However, it does not seem desirable to establish this formally, until a detailed world revision of *Phytoliriomyza* can be undertaken.

The nearest known relatives of *australina* are *bidensiphoeta* Spencer, 1977b and *sublima* Spencer, 1977b both from the Highlands of Papua New Guinea. Although closely resembling *cognata* sp.n. described below, it is distinguishable by the darkened halteres. It was previously only known from N.S.W. and is now recorded from Qld.

Material seen

Qld. Coomera River, Lamington National Park, 365 m, 1♀, 28.v.66 (Z.L., Upper Mulgrave River, 16.1 km Goldsborough Rd., 1♀, 9.v.67 (D.H.C.). N.S.W. Otford, Royal National Park, 1♀, 31.xii.62 (D.H.C.)

Phytoliriomyza cognata sp.n.

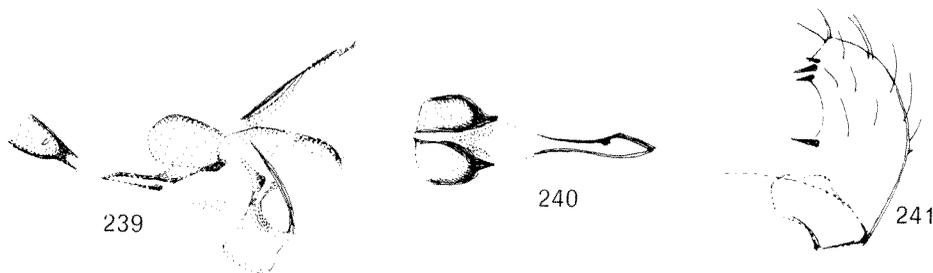
(Figs 239-241)

Head: (shrunk, measurement of frons not possible) 2 ors, 1 ori; orbital setulae lacking; jowls relatively narrow, 1/6 height of eye; eye conspicuously pilose; third antennal segment small, round, with conspicuously long pubescence.

Mesonotum: 2+1 dc, acr lacking.

Wing: length 1 mm; costa extending to vein M1+2, last section of M3+4 just less than twice length of penultimate.

Colour: frons, jowls, face and palps yellowish-orange; third antennal segment black, first and second yellow; mesonotum broadly yellow adjoining scutellum, with dark area mat grey, divided into 5 bands, the central ending just before, the intermediate ones just behind the first dc; the narrow, outer lateral bands extend almost to the margin of the scutellum, which is yellowish-grey; pleura entirely yellow, apart from black triangle on sternopleura; legs: largely yellow, only tibiae and tarsi more brownish; squamae, including fringe, yellowish; halteres entirely yellow.



Figs 239-241: *Phytoliriomyza cognata*: 239, aedeagus, side view; 240, distiphallus, ventral view; 241, epandrium and surstylus.

Male genitalia: aedeagus as in Figs 239, 240; surstyli oval, discrete, with at most a few fine hairs on margin, epandrium with a group of 3 stout spines on lower corner and one halfway along inner margin (Fig. 241).

Holotype ♂, Qld. Crediton Creek, near Eungella, 14.xii.61 (D.K.M.), in AM.

Remarks

On external characters this species resembles *australina* but it is distinguishable by the paler halteres. The male genitalia are entirely distinct. Its closest relative appears to be *spectata* Spencer, 1977b from the Highlands of Papua New Guinea.

Phytoliriomyza collessi sp.n.

(Figs 242, 243)

Head: frons slightly broader than eye, not projecting above eye in profile; 2 ors, 2 ori; orbital setulae sparse, reclinate; jowls extended at rear, 1/3 height of eye; third antennal segment small, rounded; arista long, equal to height of eye.

Mesonotum: 3+1 dc, third and fourth small, half length of second, 2 additional minute hairs beyond pre-sutural; acr sparse, in 2 rows in male, irregularly in 4 rows in female.

Wing: length in male 1.1-1.3 mm, in female up to 1.5 mm; costa extending strongly to vein M1+2, last section of M3+4 1 1/2 times length of penultimate.

Colour: frons yellowish-brown, upper orbits black; jowls yellowish, third antennal segment and palps yellow; mesonotum mat black, pleura entirely dark; scutellum black; legs: coxae yellowish-grey, knees faintly yellow, legs shining black; squamae grey, margin and fringe black; halteres entirely yellow.

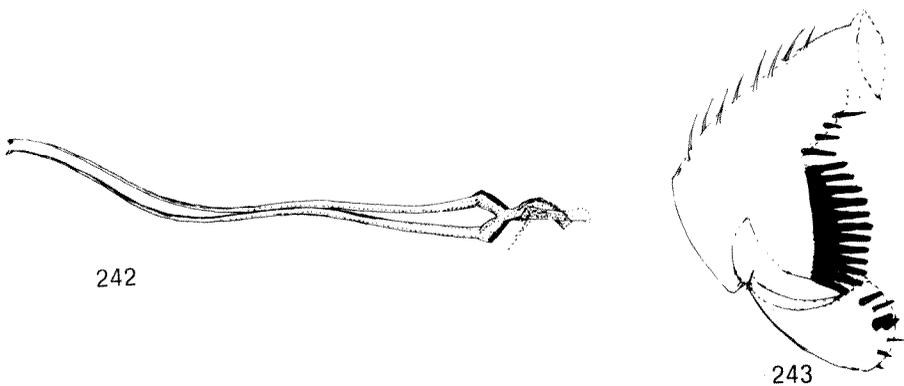
Male genitalia: aedeagus (Fig. 242) with paired tubules of distiphallus fused at mid-point; ninth sternite elongate, narrowing and rounded at end, sidearms slender; ejaculatory apodeme with relatively large, asymmetrical blade; epandrium with a row of conspicuous spines along inner margin, surstyli entirely separated by a suture, with several stout hairs or spines along margin (Fig. 243).

Holotype ♂, N.S.W: Colo Heights, Putty Rd., 6.ii.68; paratypes: 1♂, 2♀, 19.3 km N.W. of Milton, 487 m, 5.xi.68 (all D.H.C.), in ANIC.

Remarks

This is an unusually dark species, comparable in colour only with *queenslandica*. Both have a similar row of stout spines within the epandrium; however, in *collessi* the distal tubules are reduced and the ventral lobe is entirely lacking.

I have pleasure in dedicating this interesting species to Dr Don Colless, whose collecting has resulted in the discovery of 22 new species among the material currently studied.



Figs 242, 243: *Phytoliriomyza collessi*: 242, aedeagus; 243, epandrium and surstylus.

Phytoliriomyza flavopleuralis sp.n.

Minute species with contrasting black mesonotum and yellow pleura.

Head: frons broad, twice width of eye, not projecting above eye in profile; 2 equal, reclinate ors, 1 strong incurved ori; orbital setulae minute, irregular, a few reclinate above, those below proclinate; jowls broad, 1/3 height of eye at rear; third antennal segment large, somewhat narrowing distally but round at end.

Mesonotum: 3+1 dc, acr sparse, in 2 rows.

Wing: length in female, 1.2 mm; last section of vein M3+4 1 1/2 times length of penultimate, discal cell thus large.

Colour: frons orange-yellow in front, darker, greyish above; jowls and face pale yellow; all antennal segments bright orange-yellow; mesonotum and scutellum deep black, moderately shining; sides of thorax entirely yellow, apart from black triangle of sternopleura; legs largely yellow, femora with small, faint brownish striations; abdomen largely black but faintly yellowish laterally; squamae yellowish-grey, margin and fringe dark; halteres bright yellow; basal cone of ovipositor entirely shining black.

Holotype ♀, N. Qld. Big Mitchell Creek, Mareeba-Mt Molloy Rd., 4.v.67 (D.H.C.), in ANIC.

Remarks

The contrasting colour of the mesonotum and pleura makes this a distinctive species which cannot be confused with any others known in Australia. It is strongly reminiscent of *flavopleura* (Watt, 1923), a fern-feeder in New Zealand, but is substantially smaller. I suspect that the 2 may be related and that *flavopleuralis* will also prove to feed on ferns.

Phytoliriomyza lacunosa sp.n.

(Figs 244-246)

Head: frons broad, twice width of eye, orbits pronounced, conspicuously projecting above eye, increasingly so towards antennae; orbital bristles variable, 2 ors and probably normally 2 ori, but there may be 1 or 3; orbital setulae lacking; cheeks forming broad ring below eye; jowls deeply extended at rear, 1/2 vertical height of eye, eye bare; third antennal segment somewhat enlarged, slightly longer than broad, arista short.

Mesonotum: normal arrangement probably 3+1 dc (in one of 2 specimens examined, a row of 7 fully developed dc); acr lacking.

Wing: length in male 1.5 mm; costa extending to vein M1+2, second cross-vein lacking.

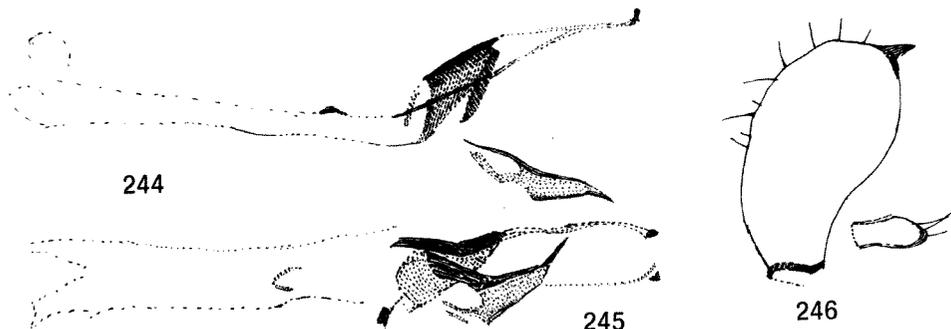
Colour: frons yellowish-brown, orbits and jowls paler yellow; face grey; palps brownish-black; first and second antennal segments brownish, third largely black, at most slightly paler on inside; mesonotum and scutellum uniformly brownish-black; sides of thorax dirty yellowish, mesopleura black along lower and front margins; legs predominantly dark, only femora appearing slightly yellowish below; abdomen uniformly mat black; halteres with knob brownish-black.

Male genitalia: aedeagus as in Figs 244, 245, connection with epiphallus and also distiphallus entirely membranous, ventral lobe well developed; surstyli discrete, with several fine hairs on inner margin (Fig. 246).

Holotype ♂, N.S.W. Careel Bay, 4.ix.62, *Casuarina* swamp (D.K.M.); paratype ♂, same data, both in AM.

Remarks

Distinctive characters of this species are the unusually deep jowls, black third antennal segment, lack of the second cross-vein and darkened halteres. The male genitalia indicate its isolated position, but the membranous distiphallus suggests that it is in the evolutionary line of the *arctica* group, although the aedeagus is here greatly reduced.



Figs 244-246: *Phytoliriomyza lacunosa*: 244, aedeagus, side view; 245, same, ventral view; 246, epandrium and surstylus.

Phytoliriomyza mollis sp.n.

(Figs 247, 248)

Head: frons not projecting above eye (width of frons to eye ratio not measurable as frons sunk in the 3 specimens seen); 2 ors, 2 ori in one male seen, 2+1 in both females; orbital setulae either lacking or sparse and irregular with one hair in front proclinate, 2 above upright, uppermost reclinate; eye conspicuously slanting; jowls extended at rear, about 1/2 vertical height of eye; third antennal segment small, round, with normal pubescence; arista short, equal to vertical height of eye.

Mesonotum: 3+1 dc, third and fourth small; acr present in 2 rows.

Wing: length 1.3 mm, second cross-vein lacking.

Colour: head entirely yellow, including hind-margin of eye; mesonotum mat grey, divided into bands, yellow centrally between levels of first and second dc, with small grey patch along margin of scutellum; pleura largely yellow, mesopleura narrowly black along front and lower margins, sternopleura with large black triangle, yellow above; legs entirely yellow; scutellum broadly yellow with only small dark patches at sides; abdomen with tergites predominantly grey, but all margins broadly yellow; squamae and fringe yellow, margin only slightly darker; halteres bright yellow.

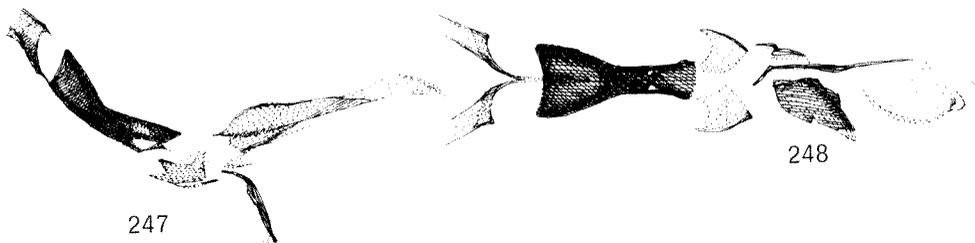
Male genitalia: aedeagus as in Figs 247, 248; ninth sternite U-shaped, with narrow but dark, strongly chitinized sidearms; surstyli oval, discrete, without hairs, lower corner of epandrium with one strong spine; ejaculatory apodeme with well-developed blade and narrow stalk.

Holotype ♂, S.A.: 8 km N. of Lyndhurst, 19.ix.72 (Z.L.); paratypes: 1♀, same data; N.S.W.: Lightning Ridge, 1♀, 10.x.63 (D.H.C.), all in ANIC.

Remarks

The aedeagus, although somewhat simplified, associates this species with the *Lemurimyza* group but the epandrium and surstyli lack all bristles invariably present in species in this group. *P. mollis* thus appears to occupy an intermediate position.

This species closely resembles *praecellens* sp.n. but the 2 are readily distinguishable by the key characters given above. It will be interesting to discover whether they are in fact related, when a male of *praecellens* is discovered.



Figs 247, 248: *Phytoliriomyza mollis*: 247, aedeagus, side view; 248, same, ventral view.

Phytoliriomyza monstruosa sp.n.

(Figs 249, 250)

Black species with second cross-vein present.

Head: frons 1 1/2 times width of eye, raised in front around lunule; 2 strong ors, 2 strong ori (on one side small additional ors and lower ors replaced by 2 weaker ones); orbital setulae sparse, reclinate; eye conspicuously slanting; jowls extended at rear, slightly more than 1/3 height of eye; third antennal segment round.

Mesonotum: 3+1 dc (on one side 2 additional bristles, each side of pre-sutural); acr coarse, irregularly in 4 rows.

Wing: length in male 1.7-1.8 mm, costa extending to vein M1+2, last section of M3+4 twice penultimate.

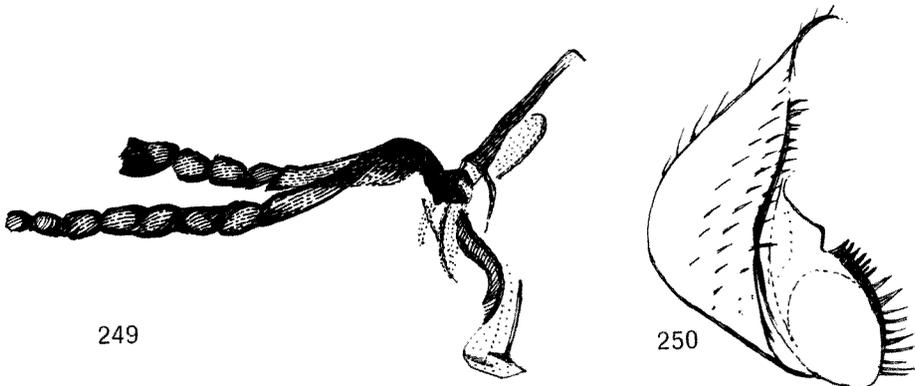
Colour: frons dark reddish-brown, orbits black above; jowls brownish-ochrous; all antennal segments black; mesonotum and scutellum moderately shining black; humerus distinctly yellowish above, notopleural area dark but with yellow undertone; mesopleura narrowly yellow on upper and hind-margins; legs entirely black; wing base yellowish; squamae yellowish-grey, margin and fringe black; halteres yellow.

Male genitalia: distal processes appearing segmented (Fig. 249); ninth sternite elongate, with narrow sidearms, rounded at end; ejaculatory apodeme with large, pale blade and weakly sclerotized, almost bowl-shaped base; surstyli discrete, fringed with hairs and weak bristles, further weak bristles along inner margin of epandrium (Fig. 250).

Holotype ♂, N.S.W. Iluka, Clarence River, 18.i.71 (D.K.M.), in AM.

Remarks

This species generally resembles *rieki* and *pittosporophylli* but is readily distinguishable by the differing venation and more shining mesonotum. The aedeagus is of a form not previously seen and the possibility that it is deformed cannot be excluded. The surstyli and epandrium (Fig. 250) are typical of the genus but the exact affiliations of this unusual species can only be clarified when additional material becomes available.



Figs 249, 250: *Phytoliriomyza monstruosa*: 249, aedeagus; 250, epandrium and surstylus.

Phytoliriomyza nigricans sp.n.

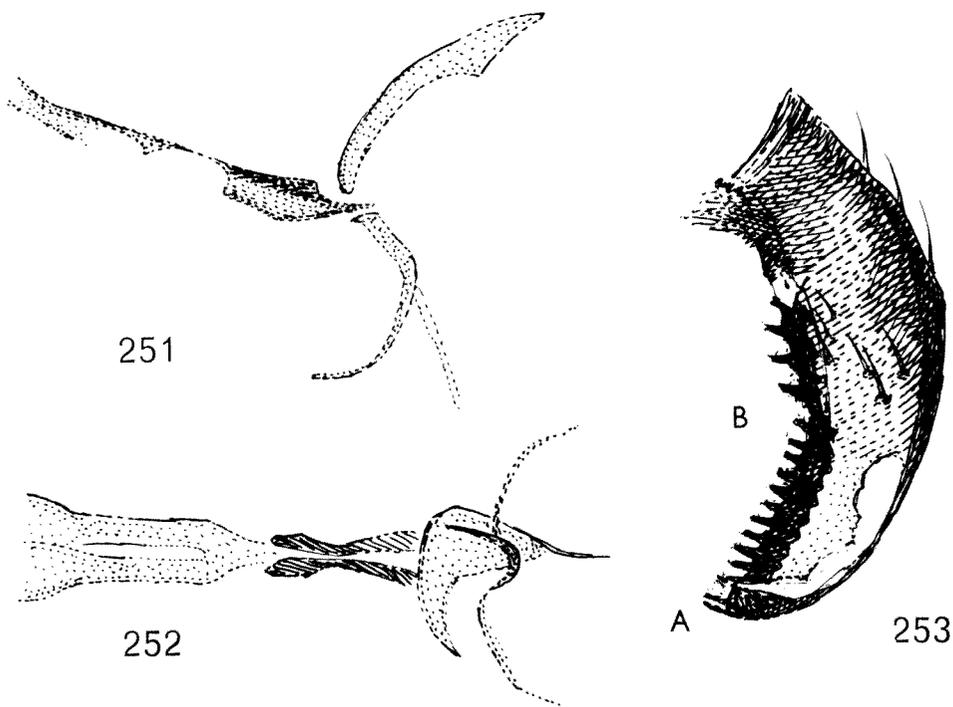
(Figs 251-253)

Minute species with yellow frons, black mesonotum and second cross-vein lacking.

Head: frons about equal to eye (eyes partially collapsed, exact measurement not possible), apparently slightly projecting above eye in lower half; 2 reclinate ors; 3 ori, all partially incurved, the upper strong, equal to ors, the lower 2 half length of upper; orbital setulae sparse, reclinate above, one or 2 in front incurved; jowls extended at rear, slightly less than 1/3 height of eye; third antennal segment round, with distinct fringe of whitish pubescence.

Mesonotum: dc greatly decreasing in size, first and second strong, third half length of second, fourth little stronger than acr, these in 4 rows.

Wing: length in male 1.2-1.3 mm, costa extending strongly to vein M1+2, second cross-vein lacking but rudiment present on one wing on M1+2, little more than length of first cross-vein.



Figs 251-253: *Phytoliriomyza nigricans*: 251, aedeagus, side view; 252, same, ventral view; 253, A, B, epandrium and surstylus.

Colour: frons dark orange, hind-margin of eye and upper orbits black; jowls orange, face more greyish; all antennal segments orange-yellow, the third distinctly darker; mesonotum and scutellum uniformly mat black; sides of thorax black, with only upper margin of mesopleura narrowly yellow; legs black but all knees yellow; abdomen entirely black; squamae grey, margin and fringe black; halteres entirely pale, whitish yellow.

Male genitalia: aedeagus as in Figs 251, 252; ejaculatory apodeme with narrow blade; ninth sternite slightly V-shaped but rounded at end; surstyli with low, narrow membranous connection to epandrium, with 2 or 3 bristles at end and a further flap below (Fig. 253A), inner margin of epandrium with a 'comb' of 8-19 bristles on lower margin and more irregular bristles displaced further inwards above (Fig. 253B).

Holotype ♂, W.A.: 1.6 km E. of Jewel Cave, Augusta, 3.x.70 (D.H.C.), in ANIC.

Remarks

This species belongs to the *Lemurimyza* group but has diverged considerably both in its dark colour and in its male genitalia.

Phytoliriomyza pallidicentralis (Malloch, 1927), comb. nov.

(Figs 254-259)

Agromyza (Liriomyza) pallidicentralis Malloch, 1927: 427.

Liriomyza pallidicentralis, Spencer, 1963a: 334.

Liriomyza singularis Spencer, 1963a: 334.

Liriomyza significans Spencer, 1966a: 300, nom. nov. for *singularis*, nec Frey, 1946, syn. nov.

Holotype ♀ from Sydney, N.S.W. in SPHTM.

This species was retained in *Liriomyza* after a cursory examination of the holotype in 1960 in view of the partially yellow scutellum. Only 3 specimens were known at that time, all females. Twenty-three further specimens have now been seen, including 3 males, and following study of the genitalia the species is now transferred to *Phytoliriomyza*.

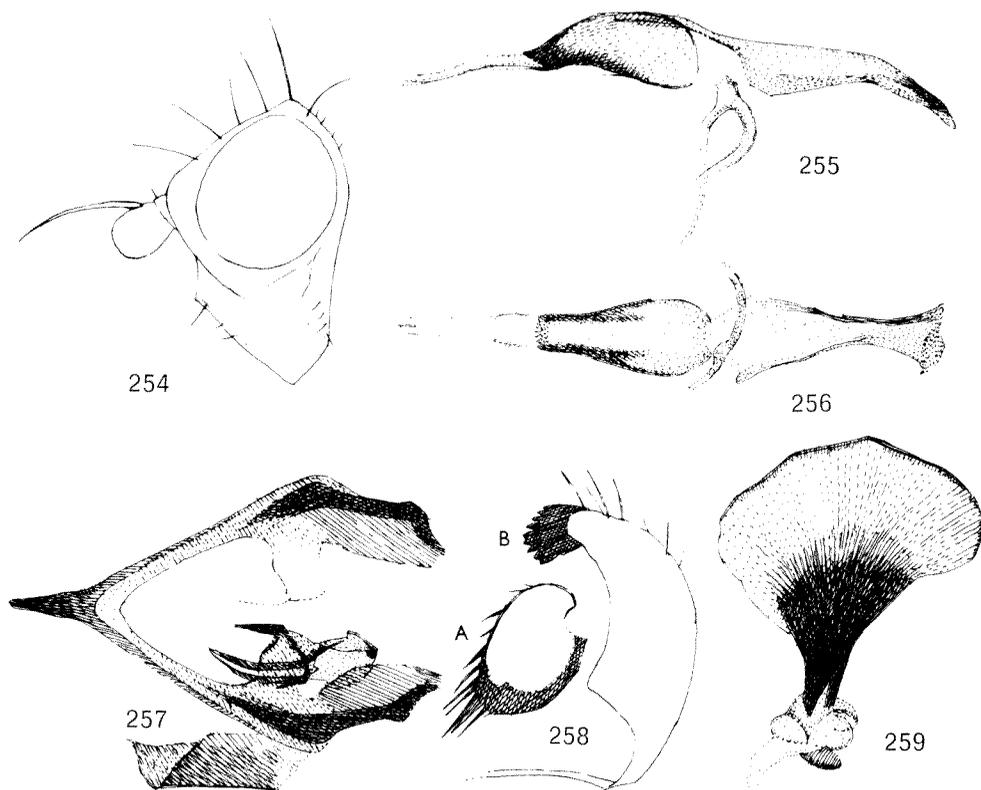
Liriomyza singularis was described from a single female (since renamed *significans* owing to the homonymy with *singularis* Frey). However, with the additional material of *pallidicentralis* now available, it is clear that *significans* is identical with *pallidicentralis* and this new synonymy is established herewith.

This is a distinctive species but is variable in a number of characters. The head (Fig. 254) has the frons greatly projecting in front, orbital setulae are normally lacking but some may be present on the lower half of the orbits; normally there are 2 forwardly inclined ori but I have seen specimens with one on each side and also with 2 on one side and none on the other; the third antennal segment is conspicuously elongate. The usual arrangement of dc is 3+1 with a small second pre-sutural but this can be almost as long as

the fourth; acr are usually entirely lacking, with occasionally 1 or 2 isolated hairs and rarely (including the holotype of *significans*) 2 pairs. The colour of the mesonotum is unusual and distinctive; it is entirely mat, appearing grey from behind, but brownish-yellow seen from the front and slightly darker along the lines of the dc.

Male genitalia: aedeagus as in Figs 255, 256, ninth sternite (Fig. 257) angular, with a prominent membranous flap at the base of each sidearm and extended hypandrial apodeme; pregonites ending in conspicuous spine-like hook; surstyli (Fig. 258A) divided by a suture from epandrium with a fringe of spines or stout hairs along inner margin; epandrium with a group of stout bristles on lower hind-corner (Fig. 258B); ejaculatory apodeme (Fig. 259) with narrow stalk and enlarged blade.

This is an isolated species, possibly deserving separate generic status, but until larval characters are known, it is best placed in *Phytoliriomyza*. The aedeagus and particularly



Figs 254-259: *Phytoliriomyza pallidicentralis*: 254, head; 255, aedeagus, side view; 256, same, ventral view; 257, ninth sternite; 258, A, B, epandrium and surstylus; 259, ejaculatory apodeme.

the bristles at the hind-corners of the epandrium indicate a relationship with *Calycomyza*, but the external morphology, venation and colour are more typical of *Phytoliriomyza*. It is almost certainly a stem-feeder.

Material seen

N.S.W: Fitzroy Falls, 1♂, 3.x.38 (A.L. Tonnoir); 9.6 km E. of Mendooran, 1♂, 6.v.70 (D.K.M.). A.C.T: Black Mt, light trap, 2♀, 8.ix.63 and 28.ix.64 (I.F.B.C.). Vic: Yatpool, Mallee Dist., 1♀, 3.ix.74 (Z.L.). S.A. Moorlands, 3♂, 19♀, 8.viii.68 (Colless and Liepa).

Phytoliriomyza pittosporocaulis (Hering, 1962), comb, nov.

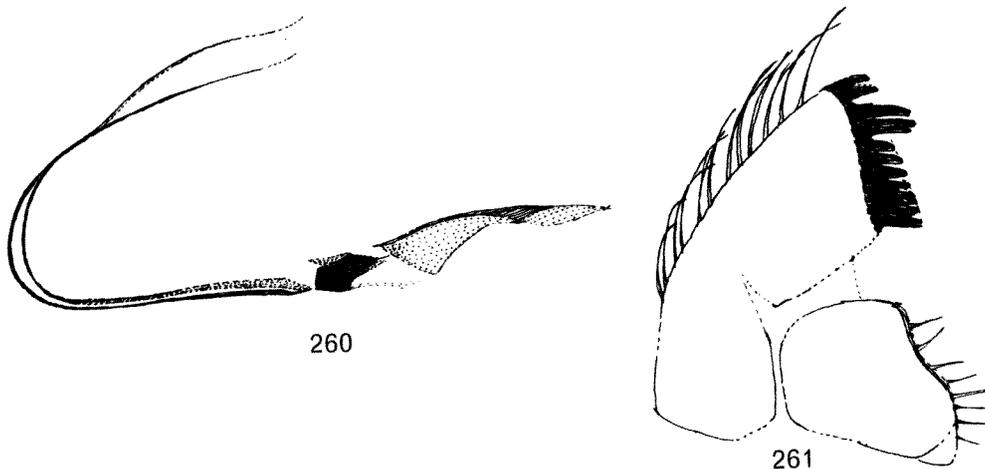
(Figs 260, 261)

Phytobia (*Praspedomyza*) *pittosporocaulis* Hering, 1962: 84; Spencer, 1963a: 330.

Holotype ♂ from Normanhurst, N.S.W. in Department of Agriculture, Sydney.

Re-examination of this species, particularly the genitalia, confirms that it correctly belongs in *Phytoliriomyza*, to which it is now transferred. It closely resembles *pittosporophylli* (Hering) which can be accepted as its sister-species but it is distinguishable by the paler fore-knees and the normally yellowish third antennal segment. Other essential characters are: frons brown, mesonotum mat grey, acr short, irregularly in 4-5 rows; legs largely black but fore-knees narrowly yellow; wing length 2.3-2.5 mm, second cross-vein close to first, discal cell thus small and last section on vein M3+4 three times length of penultimate; halteres uniformly yellow.

The aedeagus is shown in Fig. 260 (also Spencer, 1963a: Fig. 51) and the surstylus and epandrium in Fig. 261. The inner margin of the epandrium has some 12-14 stout bristles which are longer towards the rear; the surstylus is discrete, bearing a fringe of slender hairs.



Figs 260, 261: *Phytoliriomyza pittosporocaulis*: 260, aedeagus; 261, epandrium and surstylus.

The larva forms an oval twig-gall on *Pittosporum undulatum*. This is the only species in the genus known to form twig-galls—an interesting biological differentiation from *pittosporophylli* which forms leaf-galls. The gall and larva were described and illustrated by Hering (1962).

This species has previously only been known from the Sydney area of N.S.W. Two females are now identified from A.C.T.; one has the third antennal segment unusually dark but otherwise agrees exactly with typical specimens.

Material seen

A.C.T: Black Mt, light trap, 1♀, 22.xi.61 (I.F.B.C.); Black Mt, 1♀, 12.xi.65 (D.H.C.).

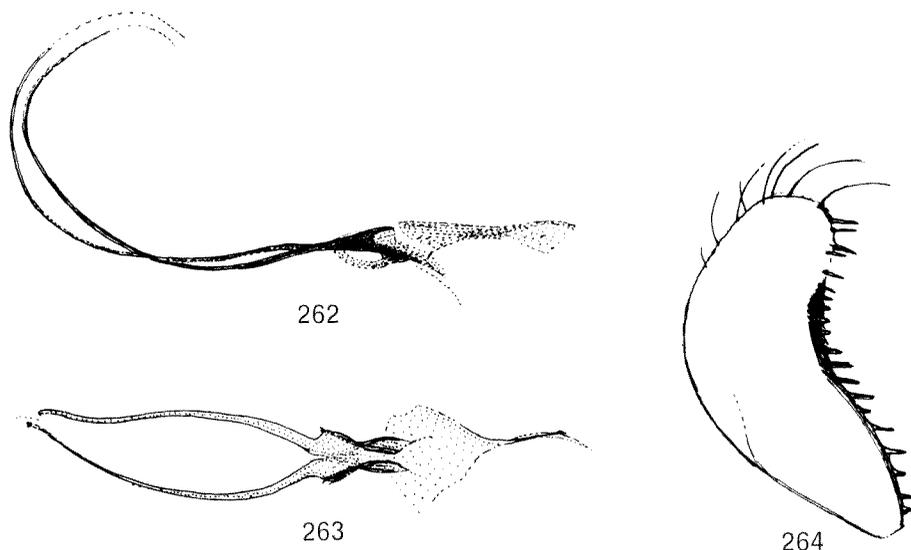
Phytoliriomyza pittosporophylli (Hering, 1962), comb. nov.

(Figs 262-264)

Phytobia (*Praspedomyza*) *pittosporophylli* Hering, 1962: 89; Spencer, 1963a: 330.

Holotype ♂ from Roseville, N.S.W. in Department of Agriculture, Sydney.

This species correctly belongs in *Phytoliriomyza*, to which it is now transferred. It closely resembles *pittosporocaulis* (Hering) but is immediately distinguishable by the consistently black third antennal segment and the sparser acrostichals, in 2 rows. The wing length is longer than stated by Hering in his description (1.7-2.2 mm) and in 10 specimens I have examined ranges from 2-2.4 mm in the male to 2.3-2.5 mm in the female.



Figs 262-264: *Phytoliriomyza pittosporophylli*: 262, aedeagus, side view; 263, same, ventral view; 264, epandrium and surstylus.

The aedeagus is shown in Figs 262, 263; at rest the paired tubules of the distiphallus curve back above the end of the ninth sternite. The surstyli are fused with the epandrium, the entire inner margin having a line of some 20 short, stout spines (Fig. 264).

The small circular galls formed by the larvae on leaves of *Pittosporum undulatum* are unique in the family. Hering fully describes and illustrates both the gall and larva.

This species is only known from N.S.W.

Material seen

N.S.W: Lane Cove, 1♀, 3.viii.49 (A. Dyce); Manly Reservoir, Sydney, 1♀, 29.vii.61 (D.H.C.); Mosman, 1♂, 1♀, 19.ix.33 (Mackerras).

Phytoliriomyza polita sp.n.

(Figs 265-267)

Head: frons broad, almost twice width of eye, not projecting above eye in profile; 2 reclinate ors, 1 incurved ori; orbital setulae sparse, reclinate or upright; jowls deeply extended at rear, 1/3 height of eye; eye upright, bare; third antennal segment rounded, slightly longer than broad; arista long, equal to height of eye.

Mesonotum: 3+2 dc, the pre-sutural fifth small; acr regularly in 2 rows.

Wing: length 1.7-1.8 mm, second cross-vein present, last section of vein M3+4 slightly less than twice length of penultimate.

Colour: frons darkened, brownish-orange, paler in front adjoining lunule; hind-margin of eye and orbits blackish; jowls, face and palps yellow; third antennal segment darkened, brownish on outside, more yellow on inside; mesonotum moderately shining black, scutellum either similar or faintly yellow centrally; sides of thorax bright yellow, mesopleura with black bar along lower margin; legs: fore-coxae bright yellow, more black on P2, P3; femora basically yellow but variably darkened with blackish striations; tibiae and tarsi brownish-black; abdomen black, scarcely shining, in female ovipositor sheath entirely shining; squamae grey, margin and fringe dark; halteres yellow.

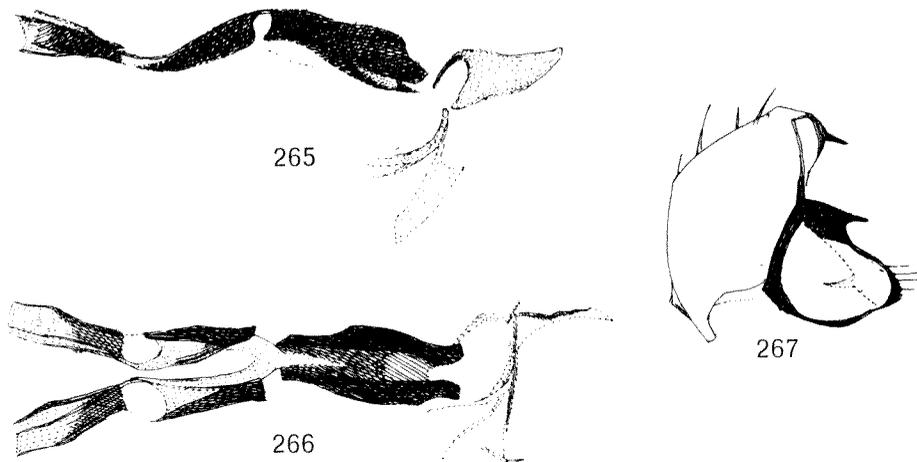
Male genitalia: aedeagus as in Figs 265, 266; surstyli (Fig. 267) attached to epandrium by a line of strong sclerotization, with a stout spine near lower point of attachment; ejaculatory apodeme with narrow stalk and small blade.

Holotype ♂, N.S.W. 3 km S. of Mendooran, 4-5.x.70 (D.K.M. and G.A.H.); paratypes: 1♂, 2♀, same data, all in AM; Vic: Wyperfeld National Park, 51 km N.W. of Hopetoun, 2♂, 4-7.ix.74 (Z.L.), in ANIC.

Remarks

Superficially this species closely resembles *tricolor* but is immediately recognizable by the darker frons and shining black mesonotum. The male genitalia show that *polita* be-

longs to the *Lemurimyza* group and is closely related to and almost certainly the sister-species of *variana* sp.n. It is smaller and substantially paler but differences in the genitalia are slight. The populations from N.S.W. and Vic. are virtually identical and it is thus considered justified to treat them as distinct from *variana* which also has 2 identical populations on Brown Mt, N.S.W. and Mt Singleton, W.A.



Figs 265-267: *Phytoliriomyza polita*: 265, aedeagus, side view; 266, same, ventral view; 267, epandrium and surstylus.

Phytoliriomyza praecellens sp.n.

(Fig. 268)

Head: frons almost twice width of eye, strongly projecting above eye in profile; 1 reclinate ors, 3 incurved ori; orbital setulae lacking; jowls deeply extended at rear, 1/2 height of eye; third antennal segment small, round, arista short, equal to depth of jowls.

Mesonotum: dc somewhat irregular, 4+1 or 3+2, acr in 2 rows.

Wing: length in female 1.4 mm; costa extending strongly to vein M1+2, second cross-vein lacking.

Colour: head entirely yellow, including hind-margin of eye; mesonotum (Fig. 268) with dark area pale ash-grey, divided into bands, broadly yellow adjoining scutellum, this largely yellow, only faintly darkened beyond basal scutellars; pleura largely yellow, mesopleura at most faintly greyish on lower margin; sternopleura dark on lower half; legs largely yellow, tibiae and tarsi slightly more brownish; abdomen grey, but all tergites broadly yellow-bordered; squamae and fringe yellow; halteres yellow, but knob appearing faintly darkened.

Holotype ♀, S.A. Port Clinton St Vincent Gulf, 27.xii.66 (Z.L.); paratype ♀, same data, both in ANIC.

Remarks

The distinctive colour of the mesonotum, the projecting frons, single ors and lack of the second cross-vein make this species readily recognizable and it appears justified to describe it, even in the absence of males. The tendency to darkening of the halteres indicates that the species belongs in *Phytoliriomyza* rather than *Liriomyza*. *P. praezellens* closely resembles *mollis* sp.n. and it is to be hoped that a male will in due course be discovered to confirm its affiliations.

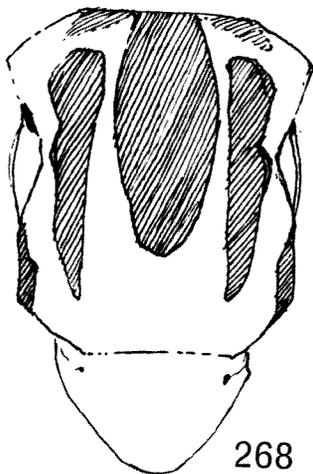


Fig. 268: *Phytoliriomyza praezellens*: mesonotum.

Phytoliriomyza queenslandica sp.n.

(Figs 269-271)

Head: frons twice width of eye, not projecting above eye in profile; 1 reclinate ors, 2 incurved ori, orbital setulae reclinate; jowls extended at rear, 1/3 height of eye; eye slanting, bare; third antennal segment slightly longer than broad, rounded at end, arista relatively short, equal to width of eye.

Mesonotum: 2 strong dc, third, fourth and fifth short, approximately equal, both fourth and fifth beyond suture; acr irregularly in 2 rows in front, isolated hairs extending to midway between first and second dc.

Wing: length 1.6 mm; costa extending strongly to vein M1+2, which is at wing tip; costal sections 2, 3, 4 in ratio 32: 10: 7; second cross-vein lacking.

Colour: a predominantly black species, only head paler; frons yellowish-orange, jowls yellowish-grey, palps brown; first and second antennal segments yellowish, third black; mesonotum deep black, entirely mat; pleura either entirely black or rear of humerus and notopleural area slightly paler, yellowish-grey; abdomen mat black; squamae grey, margin and fringe black, halteres yellow.

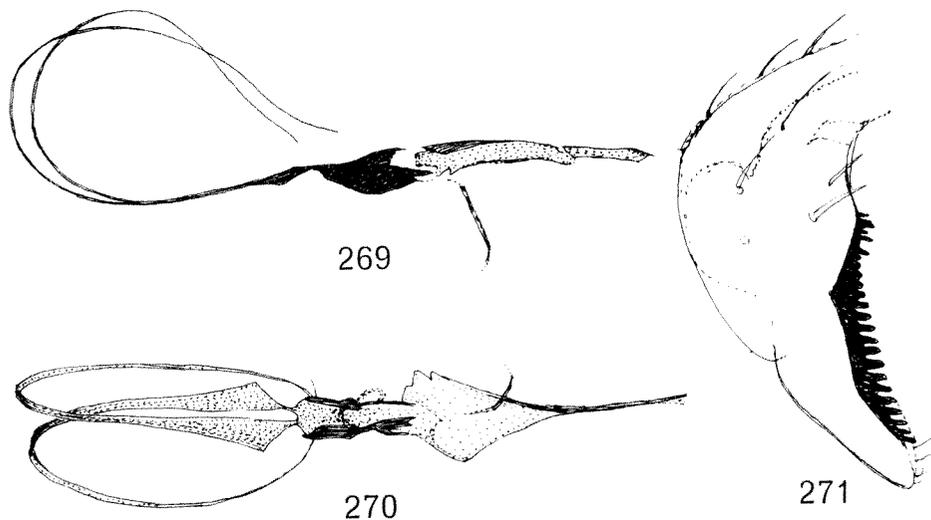
Male genitalia: aedeagus (Figs 269, 270) with paired distal tubules divided from base, recurved and forming almost one entire coil; epandrium (Fig. 271) with a row of stout, short spines along inner margin; surstyli fused, elongate, with a few fine hairs along margin; ninth sternite U-shaped, with slender sidearms; ejaculatory apodeme with triangular blade.

Holotype ♂, Qld. Lamington National Park, 914 m, 5.xi.61; paratypes: 1♂, 1♀, same data (I.F.B.C. and M.S. Upton), in ANIC.

Remarks

This is an isolated species, with the genitalia showing characters of both *Phytoliriomyza* and *Metopomyza* Enderlein, 1936, known in Europe and North America. However, all known species in *Metopomyza* have the scutellum yellow and the justification for retaining this as a genus distinct from *Phytoliriomyza* is in any case slender (cf. Spencer, 1976a: 285).

The aedeagus shows a clear affinity with species in the *arctica* group (cf. *australensis*, Fig. 233) and among Australian species most closely resembles that of *pittosporophylli* (Fig. 269).



Figs 269-271: *Phytoliriomyza queenslandica*: 269, aedeagus, side view; 270, same, ventral view; epandrium and surstylus.

Phytoliriomyza rieki sp.n.

(Figs 272-274)

Dark species with black femora and second cross-vein present.

Head: frons little wider than eye, not projecting above eye in profile; 2 equal ors, the lower slightly incurved; 2 incurved ori; the lower weak; orbital setulae sparse, reclinate, normally only 2 on each side; orbits well differentiated; jowls angular, deeply extended at rear, 1/3 height of eye; third antennal segment small, round.

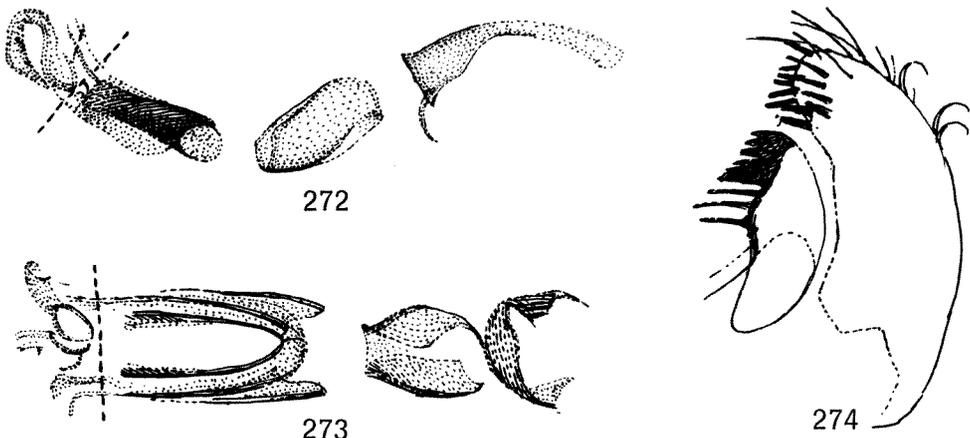
Mesonotum: 2+1 dc, pre-sutural strong, equal to or little shorter than second; acr sparse, irregularly in 4 rows between pre-sutural and second dc.

Wing: length from 1.9 mm in male to 2.3 mm in female, discal cell large, last section of M3+4 only twice length of penultimate.

Colour: frons brownish, orbits slightly paler, face and antennae black; mesonotum entirely mat, brownish-grey, scutellum similar, entirely dark; sides of thorax almost completely dark, brownish-black, at most rear of humerus faintly yellowish; legs uniformly black; abdomen black; halteres bright yellow.

Male genitalia: aedeagus as in Figs 272, 273 (distal section beyond dotted line either broken or deformed, true shape not apparent in only male available); surstyli discrete, with 9 or 10 strong bristles (Fig. 274), hind-corner of epandrium with a group of strong bristles (Fig. 274).

Host-plant/Biology: host not identified; the larva forms a narrow linear, upper surface mine, with the frass deposited in strips in 2 rows, towards the end in more irregular lumps. The dark brown puparium remains in the mine; the minute anterior spiracles do



Figs 272-274: *Phytoliriomyza rieki*: 272, aedeagus, side view; 273, same ventral view; 274, epandrium and surstylus.

not project through the epidermis, the posterior spiracles are on low projections, each with an ellipse of 9 bulbs.

Holotype ♂, N.S.W. Blundells, 7.x.48; paratypes, 3♀, same data (all E.F.R.), in ANIC. A single leaf-mine is preserved with the type series.

Remarks

Although this species superficially resembles *pittosporophylli*, the genitalia show that the two are not closely related.

No species in this genus has hitherto been known as a leaf-miner.

I have pleasure in naming this species after Dr Riek, who bred a number of Agromyzidae from their leaf-mines early in his career.

Phytoliriomyza striatella sp.n.

(Figs 275-277)

Adult: closely resembling *tricolor*, with following points of difference: grey of mesonotum with narrow bands of yellow along line of dc and between lower dc and inner post-alar and supra-alar; scutellum invariably yellowish centrally.

Male genitalia: aedeagus (Figs 275, 276) with distal tubules asymmetrical but stronger and more heavily sclerotized than in *tricolor*; surstyli divided from epandrium by a suture, broadly elongate, with a few fine hairs at end (Fig. 277A); inner face of epandrium with a group of hairs and weak bristles, lower corner with 2 short, stout bristles, the lowermost stronger (Fig. 277B); ejaculatory apodeme minute.

Holotype ♂, W.A: Millstream, 12.iv.71; paratypes: 2♂, 6♀, same data (all D.H.C.). N.T. Tempe Downs, 1♂, 4.xi.63 (P. Ranford); Charley Creek, Milton Park, 23° 23'S,



Figs 275-277: *Phytoliriomyza striatella*: 275, aedeagus, side view; 276, same, ventral view; 277, A, B, epandrium and surstylus.

132° 57'E, 1♀, 7.ii.68 (A.O.N.); 5.6 km W. of Coolibah HS., 15° 34'S, 130° 54'E, 1♀, 10.vi.68 (M. Mendum); 33.8 km S.S.W. of Napper by HS., N.W. of Alice Springs, 1♀, 22.vi.68 (K.J. McKie). N. Qld. 2♂, 2♀, junction of Goldmine and Davies Creeks, Kuranda-Mareeba Rd., 3.v.67; 2♀, 11.2-22.5 km W. of Herberton, via Watsonville, 1.v.67 (all D.H.C.); N.S.W. 2♂, 2♀, Coolabah, 12.x.63; 1♀, Pilliga Scrub, 16.1-19.3 km N. of Coonabarabran, 7.x.63 (all D.H.C.); 3.2 km S. of Mendooran, 1♀, 4-5.x.70 (D.K.M. and G.A.H.); S.A. 2♂, 3♀, Windy Creek, 35.4 km N. of Beltana, 14.ix.72 (Z.L.). Holotype and paratypes in ANIC, further paratypes in AM and AC.

Remarks

This species is typical of the *oasis*-group, with asymmetrical distal tubules of the aedeagus and the surstyli separated from the epandrium by a suture. The yellow bands on the mesonotum are the most characteristic feature of the adults.

Phytoliriomyza tricolor (Malloch, 1927), comb. nov.

(Figs 278-281)

Agromyza (Liriomyza) tricolor Malloch, 1927: 427.

Liriomyza tricolor, Spencer, 1963a: 335.

Holotype ♀ from Como, N.S.W. (not male as stated by Malloch) in U.S. National Museum.

This species was previously accepted in *Liriomyza* but following examination of the holotype it is now transferred to *Phytoliriomyza*. The correct generic position is in fact clearly indicated by Malloch who noted the darkened halteres, a character frequently found in *Phytoliriomyza*.

Head (Fig. 278): frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, the upper stronger, one incurved ori; orbital setulae sparse, proclinate; eye conspicuously slanting, bare; jowls 1/3 vertical height of eye, cheeks forming distinct ring below eye; third antennal segment slightly longer than broad, with only short pubescence.

Mesonotum: 3+1 strong dc; acr sparse, at most in 2 rows.

Wing: length from 1.5 mm in male to 2 mm in female; last section of vein M3+4 variable, from 1 1/2 to 2 times length of penultimate; first cross-vein well before mid-point of discal cell.

Colour: frons yellowish-brown, orbits normally paler yellow; lunule, jowls and face yellow; third antennal segment yellowish on inside, darker, brownish on outside; palps yellowish-brown; colour of mesonotum distinctly dimorphic: in male uniformly mat, grey, in female a broad central stripe between the dc faintly brownish, contrasting grey laterally; scutellum grey, at most faintly yellowish at apex; sides of thorax largely yellowish but mesopleura dark along lower margin and sternopleura dark below, yellow

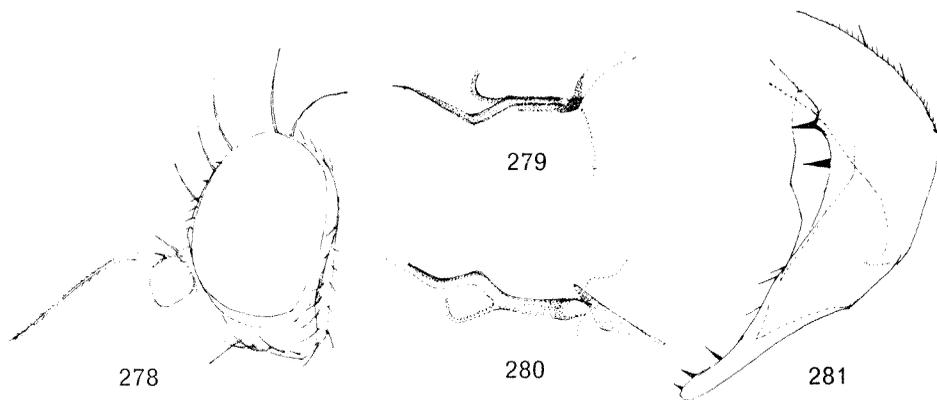
along upper margin; legs: coxae yellow, femora basically yellow, but with variable brownish striations, tibiae and tarsi more distinctly brown; abdomen largely greyish-black in male, more yellowish in female; knob of halteres blackish-brown above, yellow below.

Male genitalia: aedeagus with distal tubules asymmetrical, the left (viewed ventrally) shorter than right (Figs 279, 280); surstyli not divided from epandrium, conspicuously elongate, narrowing distally, with 3 or 4 hairs or weak bristles at end and 2 short, stout bristles at base on inner margin of epandrium (Fig. 281); ejaculatory apodeme minute.

This is a typical *Phytoliriomyza* but the male genitalia are differentiated by the reduction in size and sclerotization of the aedeagus and by the elongate surstyli which are undivided from the epandrium. The genitalia indicate a sister-species relationship with *striatella* sp.n. However, *tricolor* is distinguishable by the absence of narrow yellow bands along the line of the dc and by the less developed yellow of the scutellum. The two partially overlap in distribution.

Material seen

N.S.W: Coolabah, 5♂, 2♀, 12.x.63 (D.H.C.); Shoalhaven River, near Braidwood, 1♂, 1♀, 22.x.52 (S.J.P.); Sassafras, 2♂, 5.xi.68 (D.H.C.); Grogan, W. of Young, 1♂, 12.xi.66 (Z.L.); The Rock. 1♂, 14.ix.68 (Key, Upton and Balderson), 1♀, 11.iv.71 (Z.L.); Warrell Creek (North Coast), 1♀, 11.x.62 (D.H.C.); Back Yamma State Forest (near Forbes), 1♀, 11.xi.64 (D.H.C.); Forbes, 1♀, 14.xi.64 (D.H.C.); Lawson, Blue Mts, 1♂, 16.xi.62 (D.K.M.); 3 km S. of Mendooran, 1♂, 1♀, 4-5.x.70 (D.K.M. and G.A.H.); Willoughby, 1♀, 9.iii.74 (D.K.M.); 9.5 km N.E. of Bredbo, 1♀, 28.xii.73 (Z.L.); 6.8 km N. of Bellata, 1♀, 13.xii.74 (Z.L.). A.C.T: Black Mts, light trap, 1♀, 5.xii.64; 1♀, 1.xi.67; 1♂, 8.x.69 (all I.F.B.C.); Cotter-M'bidgee, 1♀, 29.xi.62 (D.H.C.); Cotter River, 2♀, 7.xii.62 (D.K.M.). Vic: Lake Cullulleraine, W. of Mildura, 1♀, 26.xii.66 (Z.L.); 6.4 km W. of Dimboola,



Figs 278-281: *Phytoliriomyza tricolor*: 278, head; 279, aedeagus, side view; 280, same, ventral view; 281, epandrium and surstylus.

1♂, 8.viii.68 (Colless and Liepa); S.A: Oodnadatta, 1♂, 23.ix.72 (Z.L.); Yumali, 1♂, 2♀, 8.viii.68; Moorlands, 2♀, 8.viii.68 (all D.H.C. and Z.L.). W.A: Stirlings, Bluff Knoll, near 'Waterfall', 1♂, 14.x.75 (K.A.S.).

Two females from N.S.W. 3.2 km S. of Mendooran, 4-5.x.70 (D.K.M. and G.A.H.) have the mesonotum distinctly black and moderately shining. The upper frons is darkened and the upper orbits are shining black. Almost certainly these specimens are distinct from *tricolor* but the formal description should best be delayed, until confirmation can be obtained from a male.

Phytoliriomyza variana sp.n.

(Figs 282, 283)

Distinctive species with third antennal segment black, second yellow and frons blackish, reddish in front.

Head: frons broad, almost twice width of eye, not projecting above eye in profile; 2 equal, reclinate ors, one inclined ori; orbital setulae minute, sparse, reclinate above, more upright below; jowls broad, 1/3 height of eye; third antennal segment prominent, round.

Mesonotum: 3+1 dc; acr sparse, irregularly in 2 rows, not reaching second dc.

Wing: length in both sexes 2-2.1 mm, last section of vein M3+4 little more than 1 1/2 times length of penultimate.

Colour: frons dark behind, brown to blackish, conspicuously reddish below centre; orbits brown to black; third antennal segment black, second yellow; lunule and jowls orange-yellow; face orange suffused with grey; palps black; mesonotum, scutellum and abdomen deep black, moderately shining; pleura largely black, only upper, hind-corner of mesopleura yellow; legs largely black, only knees of fore-femora narrowly and indistinctly yellowish; squamae grey, margin and fringe black; halteres bright yellow.

Male genitalia: aedeagus as in Figs 282, 283; ejaculatory apodeme with narrow blade and curving stalk, without developed base; surstyli round, divided from epandrium by a suture, with a single short, stout bristle; inner margin of epandrium with one or 2 short bristles.

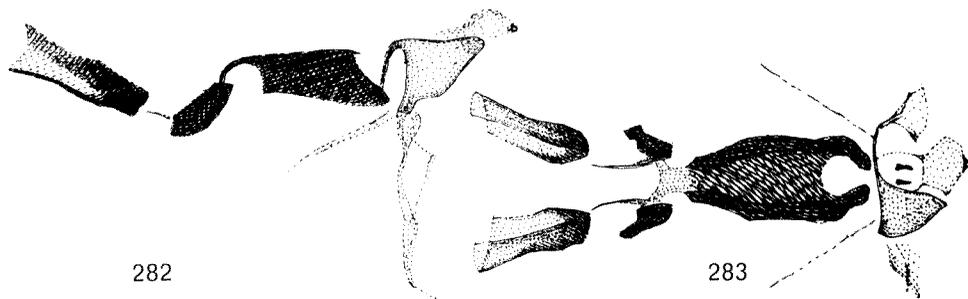
Holotype ♂, N.S.W. Rutherford Creek, Brown Mt, 15.i.69; paratypes: 1♂, same data (J.C. Cardale and S.R. Curtis); 1♀, W.A. Mt Singleton, 21.vii.66 (V. Williamson), all in ANIC.

Remarks

This species belongs to the *Lemurimyza* group and the genitalia indicate a close relationship with *polita* sp.n. Despite substantial colour differences the two are clearly sister-species.

A male has also been seen from the Auckland Is: Enderby Is., 18.i.63 (K.A.J. Wise), in the DSIR, Auckland. This specimen lacks its head but the dark pleura and legs, together with the distinctive genitalia, permit a reasonably certain identification; however, it is not included as a paratype. This species is not known in South Is., New Zealand. It may be present there but the possibility cannot be excluded that it has reached the Auckland Is. direct by long-distance dispersal from Australia.

I find in *variana* an unmistakable similarity, clearly based on relationship, with the European species, *pectoralis* (Becker, 1908).



Figs 282, 283: *Phytoliriomyza variana*: 282, aedeagus, side view; 283, same, ventral view.

Phytoliriomyza sp. 1

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 equal, reclinate ors, 2 partially incurved ori; orbital setulae reclinate; jowls narrow in centre, 1/4 height of eye at rear; third antennal segment longer than broad, rounded below, distinctly angular at upper corner, arista long, equal to height of eye.

Mesonotum: 3+1 dc, acr irregularly in 4 rows.

Wing: length in female 2.1 mm; last section of M3+4 only 1 1/2 times length of penultimate, discal cell thus large.

Colour: frons dark brown, orbits black; face, all antennal segments and palps black; mesonotum, scutellum and abdomen mat black; pleura almost completely black, yellow along upper margin of mesopleura linear; legs entirely black; squamae grey, margin and fringe black; halteres whitish-yellow.

Material seen

A.C.T. Mt Coree, 2♀, 20.i.64 (D.H.C.), in ANIC.

Phytoliriomyza sp. 2

Head: frons broad, almost twice width of eye, not projecting above eye in profile; orbits pronounced, with 2 reclinate ors and 2 partially incurved ori; orbital setulae sparse,

reclinate; jowls broad, 1/3 height of eye at rear; third antennal segment rounded but with distinct angle at upper corner.

Mesonotum: 3+1 dc; acr sparse, in 2 rows, extending to second dc.

Wing: length in female 2 mm, second cross-vein lacking.

Colour: frons dark brown, orbits conspicuously paler, yellowish; face, all antennal segments and palps black; mesonotum and scutellum black, largely mat but slightly shining seen from rear; pleura largely black but upper margin of mesopleura and notopleura faintly yellowish; legs black but all knees narrowly yellow; abdomen black, with all tergites narrowly yellow-bordered; squamae yellowish-grey, margin dark, fringe yellow; halteres whitish-yellow.

Material seen

W.A. Porongurup National Park, 1♀, 11.x.70 (D.H.C.), in ANIC.

Genus *Calycomyza* Hendel, 1931

Dizygomyza, subgenus *Calycomyza* Hendel, 1931: 65.

Type of subgenus: *Agromyza artemisiae* Kaltenbach, 1856. Types lost.

Characteristically the frons and notopleural area are bright yellow and the scutellum is black. Some exceptions are known, with the generic affiliation detectable only from the male genitalia.

This genus is particularly well represented in the New World, with all except 2 of the 58 known species occurring either in North or South America. Nine new species were recently discovered in Venezuela (Spencer, 1973b).

Only the single species *humeralis* (Roser) is known in Australia. This may well represent an introduction, although it does occur widely in the Oriental region.

Calycomyza humeralis (Roser, 1840)

(Figs 284, 285)

Agromyza humeralis von Roser, 1840: 63.

Holotype ♀, from Germany in Museum für Naturkunde, Stuttgart.

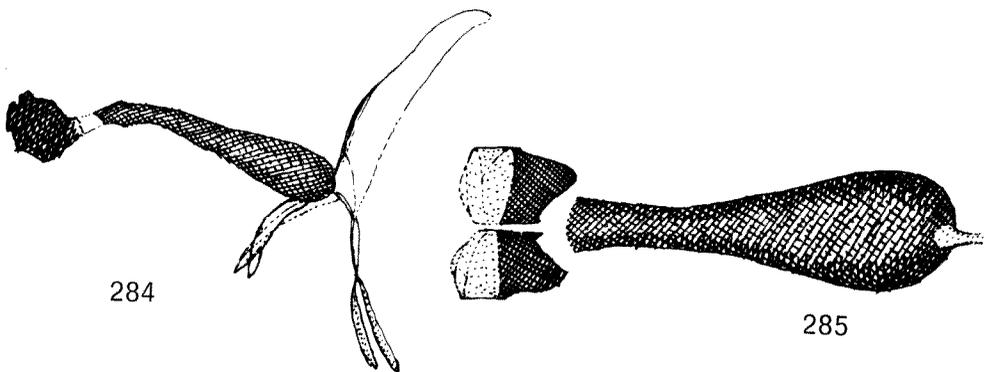
Frons bright yellow, orbits largely black; all antennal segments black, third wider than long, frequently with distinct angle at upper corner; notopleural area bright yellow; 3+0 dc; legs black, squamae and fringe yellow; wing length about 2 mm, discal cell small, last section of vein M3+4 three times length of penultimate.

The larva forms a yellowish blotch mine, pupating in the leaf. The main hosts are *Aster* and *Erigeron*. I have found the species to be common around Brisbane and Sydney and

noted mines there on *Aster subulatus* and *Erigeron bonariensis*. It is semi-cosmopolitan, occurring in Europe, North and South America, South Africa and much of the Oriental region. It has not previously been recorded in Vic.

Material seen

Qld. Junction of Goldmine and Davies Creeks, Kuranda-Mareeba Rd., 1♂, 3.v.67; Woombyee, near Nambour, 1♂, 11-16.x.65; 32.2 km Glen Innes to Grafton Highway, 1♂, 20.iv.70 (all D.H.C.). N.S.W. Blundells, 1♀, ex *Erigeron* sp., 12.v.49 (E.F.R.). Vic. Bright, 1♂, 24.ii.49 (E.F.R.). Lord Howe Is: Old Settlement Beach, 5♂, 20.ii.71 (D.K.M.); Salmon Beach, 1♀, 2.iii.74 (G.A.H.).



Figs 284, 285: *Calycomyza humeralis*: 284, aedeagus, side view; 285, distiphallus, ventral view.

Genus *Liriomyza* Mik, 1894

Liriomyza Mik, 1894: 284.

Type species: *Liriomyza urophorina* Mik, 1894.

This genus has until recently been defined by the combination of 3 characters: orbital setulae reclinate, scutellum yellow and costa extending to vein M1+2; when the second cross-vein is present, the discal cell is small (Fig. 313).

After the systematic study of the male genitalia of the Agromyzidae began some 15 years ago, it became clear that a number of species in Europe included in *Liriomyza* correctly belong in *Phytoliriomyza*. Conversely, it has been found that some species with the scutellum black are true *Liriomyzas*. A well-defined group of such species is present in New Zealand (Spencer, 1976b) but in Australia only *helichrysi* Sp. and *primitiva* sp.n. have the scutellum almost completely black. Von Tschirnhaus (1971) discovered that all European species of *Liriomyza* in the male have a well-defined stridulating mechanism consisting of a 'scraper'—a sharp, strong chitinized ridge—on the hind-femora and a 'file' along the connecting membrane between the abdominal tergites

composed of a line of sclerotized scales. He proposed that the presence of this mechanism should be treated as the diagnostic basis of the genus. Even if this is accepted, its secondary loss cannot be excluded and I therefore believe that some true *Liriomyza* species may lack this stridulating mechanism.

Liriomyza is predominantly a northern, temperate genus, with a world total of some 270 species. It is greatly reduced in the Ethiopian and Oriental regions, and only 3 species are known in New Guinea. Considerable radiation has occurred in New Zealand where 22 species have recently been recorded (Spencer, 1976b), representing slightly more than 50% of the total number of species known in the family. In Australia 9 species were included in *Liriomyza* by Spencer (1963a). Of these, 3—*australina*, *pallidicentralis* and *tricolor*—are now transferred to *Phytoliriomyza*; *singularis* is synonymized with *pallidicentralis*; and *caulophaga* is tentatively retained here pending further revision, although there is clear evidence that it represents a group of species deserving separate generic status (see p. 191).

Eleven new species are now described and one additional species is diagnosed as distinct but not formally described in the absence of a male; *L. compositella* which is widespread in the Oriental region and present in New Guinea has been identified from Lord Howe Is. The number of Australian species is thus now 18.

On external characters Australian species are entirely typical of the genus but an unusually high proportion—8 out of 18—lack the second cross-vein. Larvae (or puparia) are known in only 8 species. In 6 of these the primitive arrangement of the posterior spiracles is retained, with each process bearing only 3 bulbs (pores). These differ slightly from the normal form, in which one is greatly enlarged, hook-like, and are equal and circular (Fig. 315). In only one species, *scaevolae* sp.n., is the more derived condition present, where each process has an ellipse of 8 minute bulbs. It is interesting to note that in New Zealand the converse applies where all the endemic species of which larvae are known have the derived condition, with 6–15 bulbs.

The hosts are known of only 7 species, in the following families:

Asteraceae	3	(<i>cassinae</i> , <i>helichrysi</i> , <i>oleariana</i>)
Caryophyllaceae	1	(<i>chenopodii</i>)
Chenopodiaceae	2	(<i>caulophaga</i> , <i>chenopodii</i>)
Cruciferae)	1	(<i>brassicae</i>)
Capparaceae)		
Tropaeolaceae)		
Goodeniaceae	1	(<i>scaevolae</i>)

Of the 18 Australian species, 14 are endemic, one (*brassicae*) is widespread and common throughout the Oriental/Pacific area, one (*compositella*) is widespread in the Oriental region but more local and one (*chenopodii*) is also present in New Zealand.

Distribution within Australia (Table 1) clearly indicates the poor representation of the genus in the extreme north and extreme south, with only one species present in both Qld. and Tas.

Detailed analysis of the relationships of Australian species has not been possible in the time available but the male genitalia reveal the close relationship of some species, which might not otherwise have been suspected. One clear group comprises *cassiniae*, *helichrysi* and *impolita* (hosts: Asteraceae; second cross-vein present). A certain pair of sister-species is represented by *scaevolae* and *lepida* (host: *Scaevola*; second cross-vein absent). General relationship is indicated between *inopinata*, *obscurata* (second cross-vein present), *chenopodii* and *oleariana* (second cross-vein absent). *L. electa* is close to these 4 but somewhat more divergent. *L. compositella* is the only species also present in the Oriental region apart from *brassicae*. Its morphology, genitalia and larval feeding confirm its close relationship with *pusilla* (Meigen) (cf. Spencer, 1971: 173) which is common in Europe and Japan. It is not related to other Australian species and its host on Lord Howe Is. is unknown. *L. meracula* has genitalia distinct from all other Australian species but closely resembling the form found in *virgo* Zett. in Europe and Alaska (host: *Equisetum*). If this does reflect relationship, a jump in host must have occurred, as the Equisetaceae are not present in Australia. *L. brassicae* is semi-cosmopolitan. Frequently feeding on cultivated crops its distribution has probably been extended by commerce. Its area of origin and affiliations are not clear. Finally, *tenera* is an isolated species with no detectable affiliations.

With no obvious difference between the adults of *chenopodii* and *oleariana* and with general similarity in the male genitalia, it seems probable that these 2 species are directly related, despite the differing hosts. With the jump at some point in the past of part of the ancestral population to an unrelated host, there has been greater differentiation in the larval feeding habits than in the adults. There is also a small difference in the larval morphology of the 2 species, with the spiracular bulbs being distinctly smaller in *oleariana*.

L. oleariana is apparently not related to *L. oleariae* Spencer, 1976b feeding on *Olearia virgata* Hook, f. var. *lineata* Kirk in New Zealand. The affiliations of *oleariae* thus remain obscure.

For convenience, 6 *Phytoliriomyza* species with either the frons or scutellum at least partially yellow, which could lead to their being mistaken for *Liriomyzas*, are included in the key below. Their correct generic position is indicated by their male genitalia.

Key to Australian *Liriomyza* species

(including also 6 *Phytoliriomyza* species with frons or scutellum yellow)

- | | |
|-------------------------------------|----|
| 1. Second cross-vein lacking | 2 |
| — Second cross-vein present | 13 |

2. Mesonotum yellow centrally in front of scutellum	3
— Mesonotum dark to margin of scutellum	5
3. Mesonotum solidly dark before first dc, yellow behind adjoining scutellum (Fig. 337)	sp. (Coorong Lagoon)
— Mesonotum largely yellow centrally, dark area divided into 5 bands	4
4. Small grey patch on mesonotum at margin of scutellum, yellow centrally between levels of first and second dc; 2 ors, frons not projecting above eye	<i>Phytoliriomyza mollis</i> sp.n.
— Mesonotum entirely yellow centrally at margin of scutellum, 1 ors, frons strongly projecting above eye	<i>Phytoliriomyza praecellens</i> sp.n.
5. Acr lacking	<i>tenera</i> sp.n.
— Acr present, in from 2 to 4 rows	6
6. Hind-margin of eye entirely yellow	7
— Hind-margin of eye partially dark, black or grey	10
7. Minute species, wing length in male 1.0-1.1 mm; aedeagus as in Figs 322, 323	<i>lepida</i> sp.n.
— Larger species, wing length 1.1-2.3 mm	8
8. Small species, wing length in male 1.1-1.3 mm, in female 1.2-1.6 mm; aedeagus as in Figs 324, 325	<i>meracula</i> sp.n.
— Larger species, wing length in male 1.2-1.9 mm, in female 1.5-2.3 mm	9
9. Orbits not conspicuously projecting above eye; orbital setulae present; jowls 1/3 height of eye	<i>scaevolae</i> sp.n.
— Orbits conspicuously projecting above eye (Fig. 292); orbital setulae lacking; jowls unusually broad, about 1/2 height of eye	<i>caulophaga</i> (Kleinschmidt)
10. Mesonotum deep black	<i>caulophaga</i> (Kleinschmidt)
— Mesonotum greyish-black	11
11. Scutellum bright yellow	13
— Scutellum at most slightly yellow centrally	<i>scaevolae</i> sp.n.
12. Aedeagus as in Figs 302, 303; hosts: Caryophyllaceae, Chenopodiaceae	<i>chenopodii</i> (Watt)

- Mesonotum more shining black; large species, wing length 1.5-2 mm 25
- 25. Discal cell small, last section of vein M3+4 3 times length of penultimate *brassicae* (Riley)
- Discal cell larger, last section of M3+4 approximately twice length of penultimate 26
- 26. Mesopleura black on lower 3/4; first cross-vein well beyond midpoint of discal cell *inopinata* sp.n.
- Mesopleura black at most on lower half; first cross-vein at midpoint of discal cell *compositella* Spencer (Lord Howe Is.)

Liriomyza brassicae (Riley, 1884)

(Figs 286-288)

Oscinis brassicae Riley, 1884: 322.

Holotype ♀ from Missouri, U.S.A. in U.S. National Museum.

Small species, wing length 2 mm; discal cell small, last section of vein M3+4 3 times penultimate; frons and antennae bright yellow, orbits variable, either distinctly black or largely yellow, but both vertical bristles invariably on black ground; mesonotum shining black, acr in 4 rows; femora yellow, tibiae and tarsi darker, Male genitalia as in Figs 286, 287.

The variation in colour of this species was commented on by Spencer (1963a: 332). This is particularly marked in some of the additional specimens now seen, in which the orbits vary from deep black to entirely yellow. Among similar species, the deep black, shining mesonotum serves as a distinguishing character and the new species described below from N.S.W, *inopinata*, is recognizable by the larger discal cell and shorter last section of vein M3+4.

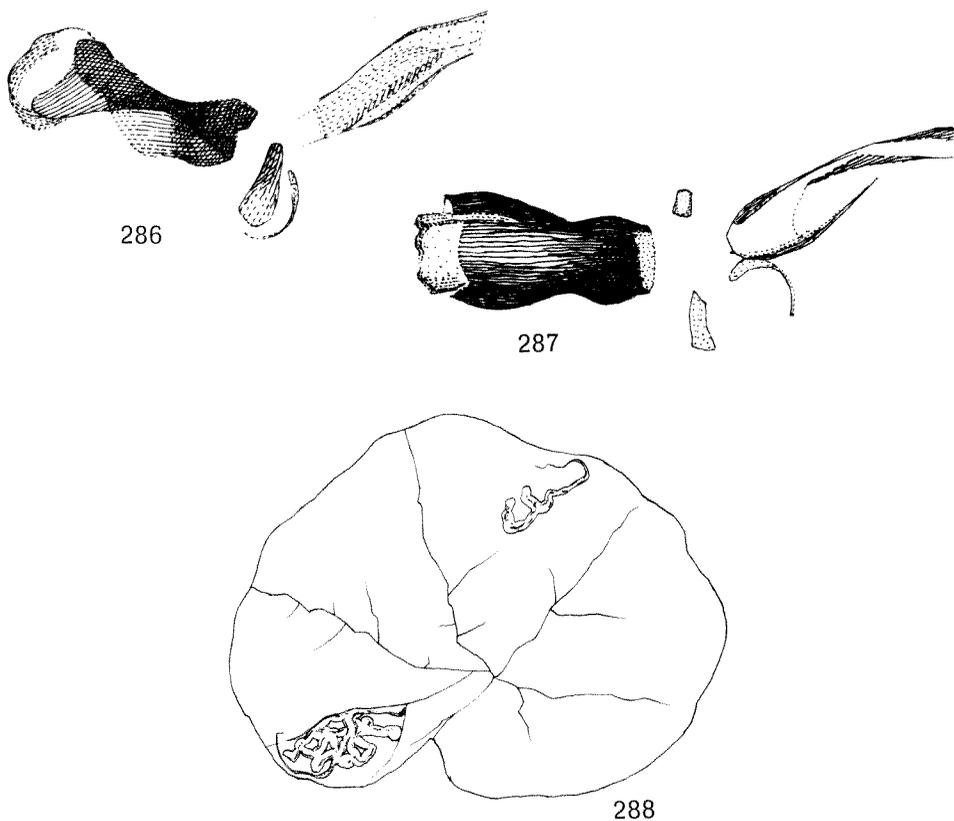
Host-plants are primarily in the Cruciferae and the closely related Capparaceae. A new host in the latter family was discovered in the Botanical Gardens, Perth, with a population feeding on *Isomeris arborea*, an introduction from California. The dominant host in Australia appears to be the ornamental, *Tropaeolum majus*, on which the conspicuous white mines (Fig. 288) can be found virtually wherever it is cultivated.

L. brassicae can be a minor pest on cultivated Brassicas (Spencer, 1973a: 153) and occasionally also attacks peas. A detailed list of hosts in Qld. is given by Kleinschmidt (1970: 371) and she also discusses the early stages and biology.

L. brassicae is new to W.A. and has previously been recorded only at Brisbane, Sydney and Hobart (Spencer, 1963a: 332). It is widely distributed in the Oriental/Pacific area and is one of the most nearly cosmopolitan species in the family.

Material seen

Qld. Woombye, near Nambour, 1♂, 2♀, 11-16.x.65 (D.H.C.) N.S.W. Back Yamma State Forest 1♂, 11.xi.64; Cooma, 2♀, 15.ii.63; Forbes, 1♀, 12.xi.64 (all D.H.C.); Mulwaree Ponds, Inveralochy Bridge, near Yass, 1♂, 27.ii.66 (Z.L.). Vic. Bright, 2♀, 24.ii.49, ex turnip; Kinmore, 1♂, 1.xii.48, ex wild mustard (all E.F.R.); Malacoota Inlet, S.E. of Genoa, 1♂, 4.viii.73; Yatpool, Mallee Dist., 1♂, 3.ix.74, 47 km N.W. of Hopetoun, 1♀, 6.ix.74 (all Z.L.). S.A. Moorlands, 1♂, 5♀, 8.viii.68 (Colless and Liepa); Sleaford Bay, 1♀, 20.iii.61; 1♂, 20.vii.61 (both J. Casanova); Kangaroo Is., 1♂, 28.xii.73 (C.P. Whittle). W.A. Perth, Botanical Gardens, 3♂, 2♀, 24.ix.75; 1♂, 2♀, 15.xi.75 on *Isomeris arborea*; Subiaco, 7♀, on *Tropaeolum majus*, 25.x.75; Denmark, 1♂, emerged 17.x.75 ex mine on *Tropaeolum majus* coll. 4.x.; Norseman, 2♂, emerged 1.xi.75 ex mines on same host coll. 19.x.; Kambalda, 2♂, 1♀, emerged 7.xi.75 ex mines on same host coll. 20.x.; 1♀, on host, 20.x.75 (all K.A.S.); Karragullen, 11 exx., 1.iii.47, mining cauliflower (Dep. Agric., Perth).



Figs 286-288: *Liriomyza brassicae*: 286, aedeagus, side view; 287, same, ventral view; 288, leaf-mines on *Tropaeolum*.

Liriomyza cassiniae sp.n.

(Figs 289, 290)

Head: frons broad, twice width of eye, narrowly projecting above eye in front; 2 reclinate ors, 2 incurved ori; orbital setulae sparse, reclinate; jowls extended at rear, about 1/4 height of eye; third antennal segment small, round.

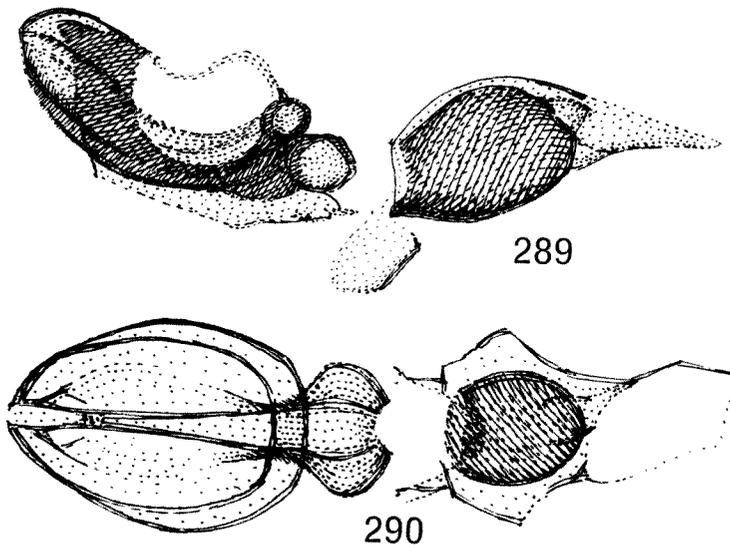
Mesonotum: 3+1 dc, acr sparse, irregularly in 2 rows.

Wing: length from 1.4-1.7 mm in male; last section of M3+4 about 3 times length of penultimate, first cross-vein beyond midpoint of discal cell.

Colour: frons, jowls, face and antennae bright yellow; hind-margin of eye black; vti just on yellow ground; mesonotum black, largely mat with only weak subshine; sides of thorax bright yellow, mesopleura black on lower and front margins; scutellum bright yellow centrally, black at sides; legs; femora bright yellow, tibiae and tarsi brownish-yellow; abdomen black, with all tergites narrowly yellow-bordered and yellow laterally; squamae yellowish-grey, margin and fringe dark; halteres yellow.

Male genitalia: aedeagus as in Figs 289, 290; surstyli narrow, with one strong spine at end; ejaculatory apodeme long, equal to or slightly longer than aedeagus, with symmetrical rounded blade and weakly chitinized bowl-shaped base.

Host-plant/Biology: *Cassinia quinquefaria*, larva forming short mine in the narrow leaves, pupating internally; the brownish puparium has posterior spiracles on stout conical projections, each with 3 equal bulbs.



Figs 289, 290: *Liriomyza cassiniae*: 289, aedeagus, side view; 290, same, ventral view.

Holotype ♂, A.C.T: Black Mt, 2.xi.75, on host; paratypes: 1♂, same data (K.A.S.). N.S.W: 6.4 km S. of Coolongalook, near Nabiac, 1♂, 21.v.66 (Z.L.). Holotype in WAM, one paratype in ANIC, one in AC.

Remarks

This species is closely related to both *impolita* sp.n. and *helichrysi* and the genitalia of the 3 are little differentiated. However, there are significant differences in external characters (see key), and in the leaf-mines of *cassiniae* on *Cassinia* and *helichrysi* on *Heli-chrysum*.

Only few mines appeared to be present on the *Cassinia* bushes examined at the summit of Black Mt early in November and they are difficult to detect. They are probably more numerous later in the season. The adults found had obviously just emerged and there must therefore be an even earlier first generation in the first half of October.

Liriomyza caulophaga (Kleinschmidt, 1960)

(Figs 291-301)

Haplomyza caulophaga Kleinschmidt, 1960: 14; 1970: 367.

Liriomyza caulophaga, Spencer, 1963a: 332.

Liriomyza haplomyzina Spencer, 1961: 89.

Holotype ♀ from Brisbane, Qld. in QM.

On external characters this species would be associated with others lacking the second cross-vein (Fig. 291), such as *chenopodii* and *scaevolae* sp.n. The head (Fig. 292) is distinctive in having strongly projecting orbits and no orbital setulae; frons, entire hind-margin of eye and antennae are bright lemon-yellow. The mesonotum is conspicuously ash-grey, almost silvery, the scutellum yellow. Average wing length is slightly less than 2 mm but in the material seen there is considerable variation, from 1.2-1.9 mm in male and 1.5-2.3 mm in females. The stridulating mechanism is lacking.

The male genitalia show significant variation in the aedeagus. The typical form of *caulophaga* s.s. is shown in Figs 293, 294 and the minute ejaculatory apodeme in Fig. 295. The aedeagus in sideview of further specimens from Antikootirimna, S.A. and Port Clinton, S.A. is shown in Figs 296, 297 and in side and ventral views of a specimen from Vaughan, N.T. in Figs 298, 299. Two specimens have been examined with the mesonotum not ash-grey but deep black. One, from Windy Creek, near Beltana, S.A. has the aedeagus exactly as in typical *caulophaga* s.s.; the other, from Etadunna, S.A. is again different. It thus seem probable that these obvious differences are not in fact true variation but reflect a group of closely related species.

In all 11 males examined there is one important character present which associates this species (or group of species) not with *Liriomyza* but with the genus *Cerodontha*. This is

a paired, rod-like structure within the epandrium (Fig. 300) referred to by Sasakawa (1961) as 'processus longus' and by Nowakowski (1973) as 'Langfortsatz'. However, hosts of *Cerodontha* species are restricted to the four monocot families Cyperaceae, Poaceae, Iridaceae and Juncaceae. The only known host of *caulophaga* is *Beta vulgaris* var. *cicla*, with the larva feeding and pupating internally in the midrib and petiole. The widespread occurrence of *caulophaga* recorded below strongly suggests that there must be other hosts but it is unlikely that these will be in the Monocotyledoneae. The larval mouth-hooks and cephalo-pharyngeal skeleton are shown in Fig. 301.

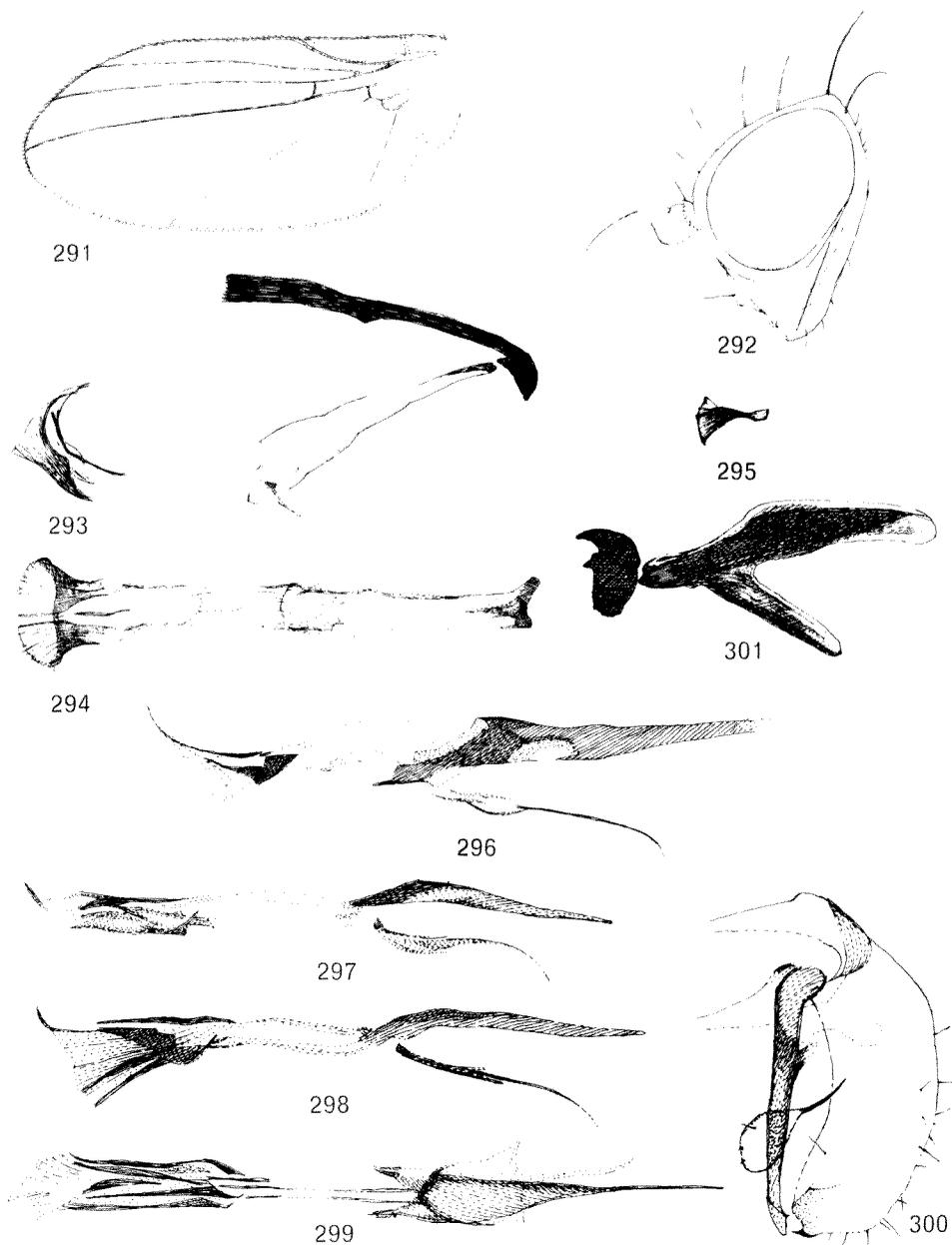
The presence of the 'Langfortsatz' seems to exclude *caulophaga* from *Liriomyza*; and the general habitus and host in the Chenopodiaceae excludes it from *Cerodontha* as at present understood. Erection of a monotypic genus which would provide a connecting link between *Cerodontha* and *Liriomyza* seems justified but more detailed study of all available males, additional information on early stages and host-plants and further revisionary studies on *Liriomyza* elsewhere in the world seem desirable before this is formally proposed. For the time being therefore I propose to retain *caulophaga* in *Liriomyza*.

L. caulophaga has previously been recorded only in Qld. and N.S.W., and outside Australia from Lombok, Indonesia. The additional material seen shows this species to be widespread throughout much of Australia and apparently not uncommon.

L. caulophaga is not in any way related to *chenopodii* which also feeds on *Beta* but as a leaf-miner, pupating externally.

Material seen

Qld: Near Rosewood (Brigalow scrub), 2♀, 29.xii.61 (R. Lindsey). N.T: Amadeus Basin, 1♀, 7.62 (P. Ranford); 39 km N.E. by N. of Andado H.S., Simpson Desert (Waddy Groves) 1♂, 1♀, 28.ix.72; 29 km N. of Erlando H.S., Stuart Highway, 1♀, 2.x.72 (all Z.L.); 29 km E. of Vaughan Spring, 1♂, 1♀, 2.vii.68 (K.J. McKie). N.S.W: Back Yamma State Forest, 1♀, 11.xi.64 (D.H.C.); 19.3 km S. of Mt Pack Saddle, 1♀, 18.xi.49 (S.J.P.); Parkes, 1♀, 13.xi.64 (D.H.C.); The Rock, 1♀, 14.ix.68 (Key, Upton and Balderson); Parkes, 1♀, 13.xi.64 (D.H.C.); 64.4 km E. of Wilcannia, 3♀, 23.xi.49 (S.J.P.). S.A: Antikootirimna W/H, 36 km S. of Abminga, 2♂, 8♀, 25.ix.72; 14 km S. of W. of Beltana, 1♂, 14.ix.72; Windy Creek, 22 km N. of Beltana, 1♀, 14.ix.72; Port Clinton, St Vincent Gulf, 1♂, 27.xii.66 (all Z.L.); S. of Mt Crawford State Forest, 1♂, 6.viii.68 (D.H.C. and Z.L.); 42 km E.S.E. of Curdimurka, W. of Maree, 1♀, 21.ix.72; 23 km S.W. by S. of Etadunna H.S., Birdsville Track (Green Valley), 6♂, 5♀, 16.ix.72; Leigh Creek, 2♀, 15.ix.72; Coorong Lagoon, S. of Meningie, 1♂, 1♀, 30.xii.66; Old Alton Downs, Simpson Desert, 1♀, 19.ix.72; 33 km S.E. of S. of Oodnadatta, 1♀, 23.ix.72 (all Z.L.). W.A: The Kimberleys, S.W. of Bedford Downs, 16 km S. of Landsdowne H.S. 1♀, 12-19.vii.64 (R. Plumb); Kununurra, Kimberley, 2♀, 18.vi.64 (K.R.N.); Millstream, 3♂, 2♀, 8.iv.71 (D.H.C.).



Figs 291-301: *Liriomyza caulophaga*: 291, wing; 292, head; 293, aedeagus, side view; 294, same, ventral view; 295, ejaculatory apodeme; 296, aedeagus (Antikootirimna, S.A.); 297, aedeagus, (Port Clinton, S.A.); 298, aedeagus, side view, 299, same, ventral view (both Vaughan, N.T.); 300, epandrium with 'Langfortsatz'; 301, cephalopharyngeal skeleton of larva.

Liriomyza chenopodii (Watt, 1924)

(Figs 302-305)

Haplomyza chenopodii Watt, 1924: 683.

Liriomyza chenopodii, Spencer, 1963a: 333.

Haplomyza imitans Malloch, 1934: 1.

Phytomyza betae Coquillett, 1900, primary homonym of *Phytomyza betae* Macquart, 1855.

Holotype ♀ from Wanganui, N.I., New Zealand in National Museum, Wellington.

Phytomyza betae Coquillett, 1900 was described from W.A. (no locality given) in a paper which has only recently come to my attention and which has not been referred to by any workers on the Agromyzidae since its publication. This species is certainly identical with *Liriomyza chenopodii*.

Macquart (1855: 258) gave an excessively brief description of *Phytomyza betae* in France, reading: '*Phytomyza betae* Macq. La larve mine les feuilles de la betterave'. Hendl (1936: 562) treated this name as a nomen nudum. However, Hering (1957: 170) accepted the name *betae* as valid, the description being based 'on the work of an insect'. I accept this under the terms of the 1961 International Code of Zoological Nomenclature, Article 16, paragraph (a) (viii). *Phytomyza betae* Coquillett is thus a homonym of *Phytomyza betae* Macquart and the next available name is *Haplomyza chenopodii* Watt, 1924.

L. chenopodii is not distinguishable on external characters from *oleariana* sp.n. described below. The frons, antennae, femora and scutellum are bright yellow, the mesonotum is mat blackish-grey and the second cross-vein is lacking. The aedeagus is shown in Figs 302, 303 and the distinctive ejaculatory apodeme with the blade unusually wide is shown in Fig. 304. Two males with the third antennal segment and frons partially darkened, brownish, have been seen from Araluen, N.S.W. and Wyperfeld Nat. Park, Vic. This possibly represents incipient melanism, as noted in *Phytomyza plantaginis* also from the Wyperfeld Nat. Park and Tas. (see below).

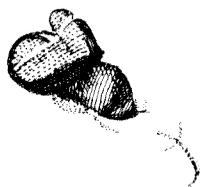
Host-plants are restricted to genera in the two closely related families Caryophyllaceae (*Cerastium*, *Silene*, *Stellaria*) and Chenopodiaceae (*Beta*, *Chenopodium* and *Spinacia*). The only hosts known are introduced species but the discovery of mines on *Silene gallica* at Perth suggests that the original host could be an endemic species of *Silene*. Records of larval feeding on *Cheiranthus* and *Coronopus* (Cruciferae) (Kleinschmidt, 1970: 369) probably refer to *L. brassicae*. The larva forms a white linear mine, pupating externally; the posterior spiracles of the larva (and puparium) each have 3 somewhat enlarged bulbs; the mouth-hooks are shown in Fig. 305.

L. chenopodii has previously only been known in N.S.W. and Qld., in addition to New

Zealand where it is widespread (Spencer, 1976b). New records are given below for A.C.T., Vic., S.A., W.A. and Tas.

Material seen

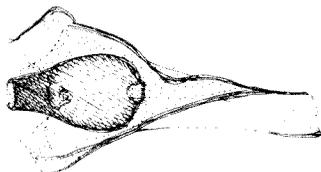
Qld. Woombye, near Namour, 1♂, 11-16.x.65 (D.H.C.). N.S.W. Careel Bay, 2♂, 2.ix.62; 2♀, 27.x.62; Minnamurra Falls, 1♂, 23.x.62 (all D.K.M.); 6.4 km S. of Coolongalook, near Nabiac, 1♀, 21.v.66 (Z.L.); New England National Park, 1♀, 13.x.62 (D.H.C.); Sheepstation Creek, Araluen, 1♂, 24.xi.73 (Kelsey and Liepa). A.C.T. Black Mt, 1♂, 12.xi.65 (D.H.C.); 1♀, 24.xi.65 (Z.L.). Vic. Wyperfeld Nat. Park, 51 km N.W. of Hope-toun, 1♂, 4-7.ix.74; Yatpool, Mallee Dist., 2♂, 3.ix.74 (all Z.L.). S.A. Moorlands, 1♂, 8.viii.68 (Colless and Liepa). W.A. Perth, Botanical Gardens, 1♀, 24.ix.75, on *Silene gallica*; also numerous mines on *Cerastium holosteoides* and *Silene gallica*, 24.ix.; Shenton Park, near Perth, mines on *Beta vulgaris* and *Stellaria media*, 23.ix.75; Dunsborough, mine on *Stellaria media*, 28.ix.75 (all K.A.S.). Tas. Lake St Clair, 1♂, 14.i.60 (D.K.M.).



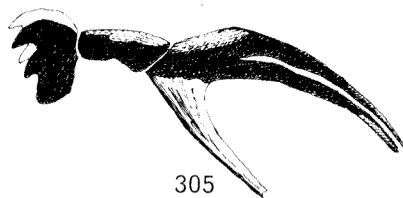
302



304



303



305

Figs 302-305: *Liriomyza chenopodii*: 302, aedeagus, side view; 303, same, ventral view (Qld.); 304, ejaculatory apodeme; 305, mouth-hooks and cephalopharyngeal skeleton of larva.

Liriomyza compositella Spencer, 1961

(Figs 306, 307)

Liriomyza compositella Spencer, 1961a: 87.

Nine syntypes from Formosa in Hungarian Natural History Museum Budapest and Institut für Pflanzenschutzforschung, Eberswalde, German Democratic Republic.

Frons, face and antennae bright yellow; pleura largely yellow, mesopleura with small black bar on lower margin; mesonotum shining black, with large yellow patches at hind-corners; scutellum yellow; legs: femora bright yellow, tibiae and tarsi brownish; wing

length 1.7-2 mm, second cross-vein present, last section of vein M3+4 twice length of penultimate. Male genitalia: aedeagus as in Figs 306, 307.

This species was named from the series from Formosa identified by Malloch, 1914: 314 as *pusilla* Meigen. In his revision of this material Hennig (1941: 173) stated that this species could not be *pusilla* as the genitalia were different from those of *pusilla* from Europe; he gave illustrations both of the Formosan species and of a European species, which is however, something quite different, possibly *flaveola* (Fallén).

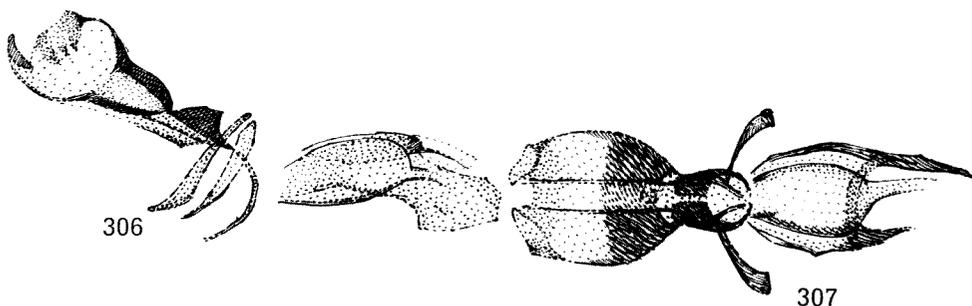
The name *pusilla* has been widely used in world literature and numerous misidentifications have led to much confusion. Hendel (1920) synonymized 9 species with *pusilla* but later (1931) restricted the name to the species in Europe feeding on *Hieracium*. After examining the male holotype in Paris I accepted *pusilla* as the species occurring commonly on *Bellis*, for which the name *fasciola* Meigen had previously been used (Spencer, 1971: 173). Malloch's (1925: 90) reference to *Agromyza pusilla* from Sydney is a misidentification of *brassicae*.

I have found *compositella* to be widespread in the Oriental region and have bred it from *Tithonia diversifolia* and *Gynura lycopersicifolia* in Sri Lanka; from *Solidago canadensis* at Bombay; from *Xanthium strumarium* at New Delhi; and also from *Tithonia* in Hong Kong. Sasakawa (1963d: 832) recorded a single female from Biak Is., N.W. New Guinea.

Re-examination of a specimen from India shows this to be identical to the specimens from Lord Howe Is. It is also now apparent that there is in fact no significant difference between the genitalia of European *pusilla* and *compositella*. I draw attention to this possible synonymy but, pending a more critical revision of this group, feel it is sensible to retain the name *compositella* for the tropical and sub-tropical species which has a wider host range than *pusilla* in Europe.

Material seen

Lord Howe Is: Blinky Beach, 2♂, 5-15.xii.72 (Z.L.).



Figs 306, 307: *Liriomyza compositella*: 306, aedeagus, side view; 307, same, ventral view.

Liriomyza electa sp.n.

(Figs 308-310)

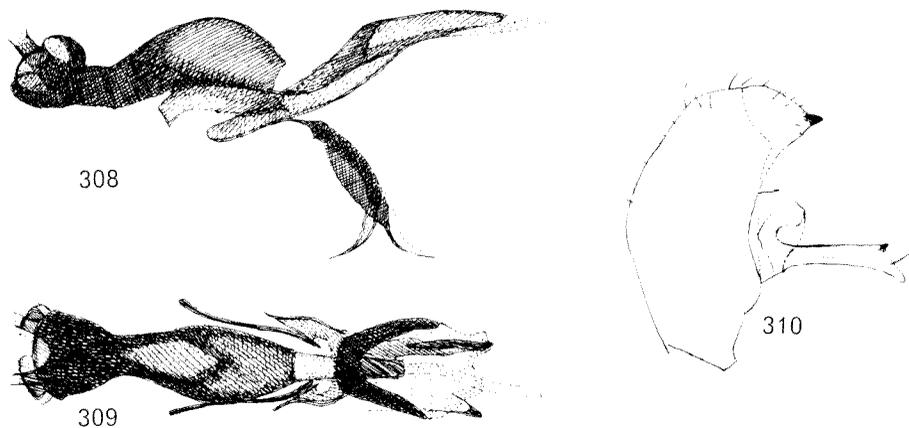
Head: frons $1\frac{1}{2}$ times width of eye, distinctly projecting above eye in profile; 2 reclinate ors, 2 largely incurved ori; orbital setulae reclinate in area of ors, incurved or even proclinate below; jowls deep, slightly more than $\frac{1}{3}$ height of eye; third antennal segment large, round.

Mesonotum: 3+1 strong dc, acr in 2 rows, isolated hairs extending to level of second dc.

Wing: length from 1.9 mm in male to 2.5 mm in female; discal cell small, last section of vein M3+4 from $3\frac{1}{2}$ to 5 times length of penultimate; first cross-vein well beyond midpoint of discal cell.

Colour: head yellowish-orange, including entire hind-margin of eye; mesonotum mat grey, with yellow patch centrally adjoining scutellum, which may extend forwards almost to level of second dc; pleura largely yellow, with small black patch on lower margin of mesopleura; scutellum largely yellow, only small grey patches by basal scutellars; legs: coxae and femora yellow, tibiae and tarsi yellowish-brown; abdomen black centrally but all tergites with yellow hind-margin; squamae yellowish-grey, margin black, fringe ochrous; halteres yellow.

Male genitalia: aedeagus as in **Figs 308, 309**; surstyli discrete, broad at base but extending inwards, narrow, finger-like, with a slender hair and a short, stout spine shortly before end (**Fig. 310**); ejaculatory apodeme heavily chitinized, greatly enlarged, equal in length to aedeagus, with almost enclosed base.



Figs 308-310: *Liriomyza electa*: 308, aedeagus, side view; 309, same, ventral view; 310, surstylus.

Holotype ♂, S.A: 4.8 km S.E. of Maree, 15.ix.72; paratypes: 3♂, (2 at light), 1♀, same data (Z.L.); 24 km W. of Nullarbor H.S., 1♂, 1♀, 12.ix.64 (G.L. Bush, 6456). Holotypes in ANIC, 2 paratypes in AM, one in AC.

Remarks

The distinctive coloration makes this species readily distinguishable. No stridulating mechanism is present, but in the male genitalia only the ejaculatory apodeme is significantly differentiated from the typical form of *Liriomyza* and there is little justification for erecting a monotypic genus for this admittedly isolated species.

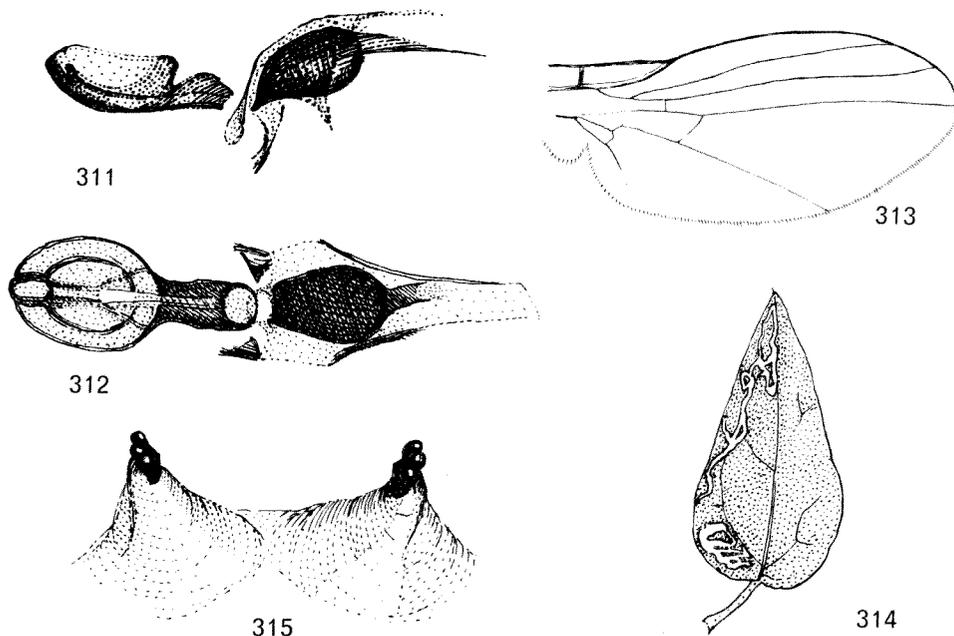
Liriomyza helichrysi Spencer, 1963

(Figs 311-315)

Liriomyza helichrysi Spencer, 1963a: 333.

Holotype ♂ from Bowral, N.S.W., in ANIC.

This species is distinctive in having the scutellum almost completely black, but the male genitalia (Figs 311, 312) confirm its correct generic position in *Liriomyza* and indicate its close relationship with *cassiniae* sp.n. on *Cassinia*. The wing (Fig. 313) has the second cross-vein conspicuously oblique.



Figs 311-315: *Liriomyza helichrysi*: 311, aedeagus, side view; 312, same, ventral view; 313, wing; 314, leaf-mines on *Helichrysum cordatum*; 315, posterior spiracles of puparium.

The only previous records are from N.S.W., where the host is *Helichrysum bracteatum*. *L. helichrysi* can now be recorded from W.A. where mines were found on *H. cordatum* at Cape Leeuwin and William Bay and also in the Botanical Gardens, Perth. The irregular leaf-mine is shown in Fig. 314. The pale puparium remains in the leaf at the end of the mine and the posterior spiracles each have 3 equal, circular bulbs (Fig. 315).

Material seen

Vic: Wyperfeld National Park, 51 km N.W. of Hopetoun, 1♂, 4-7.ix.74 (Z.L.). W.A. William Bay, W. of Denmark, 4♂, 2♀, emerged 2-4.xii.75 from leaf-mines on *Helichrysum cordatum* coll. 23.xi.75; Cape Leeuwin, Augusta, 1♂, emerged 4.xii.75 ex mine on same host coll. 24.xi; Perth, Botanical Gardens, on slope near War Memorial, leaf-mines on same host, 30.xi.75 (K.A.S.); 6.4 km S.E. by S. of Minilya, 1♂, 17.x.70 (D.H.C.).

Liriomyza impolita sp.n.

(Figs 316, 317)

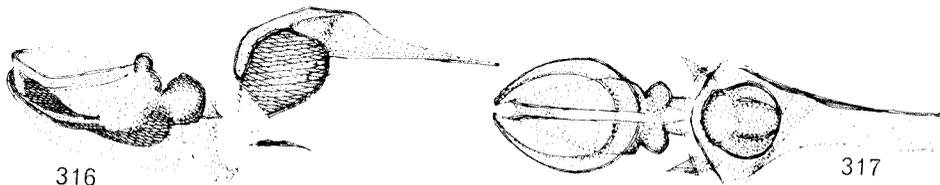
Head: frons broad, about twice width of eye, narrowly projecting above eye in profile; 2 reclinate ors, 2 incurved ori; orbital setulae sparse, reclinate; jowls extended at rear, about 1/4 height of eye; third antennal segment small, round.

Mesonotum: 3+1 dc, acr irregularly in 2 or 3 rows.

Wing: length from 1.5 mm in male to 1.8 mm in female; last section of M3+4 2 1/2 times length of penultimate, first cross-vein beyond midpoint of discal cell.

Colour: frons varying from yellow to brownish-orange, orbits slightly paler yellow; hind-margin of eye black, vti at border of black and yellow; jowls and palps yellow, face slightly darkened, greyish; first and second antennal segments yellow, third distinctly darkened, varying from brownish-orange to almost black; mesonotum deep black but largely mat, with only weak sub-shine; sides of thorax broadly yellow but mesopleura black on lower half; scutellum bright yellow centrally, black at sides; legs: femora largely yellow but with slight, variable, brownish striations, tibiae and tarsi darker brown; abdomen largely black; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 316, 317; surstyli long, with one strong spine at end; ejaculatory apodeme with large, dark blade and well-developed base, equal in length to aedeagus.



Figs 316, 317: *Liriomyza impolita*: 316, aedeagus, side view; 317, same, ventral view.

Holotype ♂, A.C.T. Black Mt, 12.xi.65 (D.H.C.); paratypes: 1♂, Gibraltar Creek, 18.x.67 (Z.L.); N.S.W. Mt Dromedary, near Narooma, 213 m, 1♀, 4.ii.69 (M.S. Upton & J. Cardale); S.A. Belair National Park, Adelaide, 1♂, 28.xii.66 (Z.L.). Holotype and paratypes in ANIC.

Remarks

Among species with the third antennal segment darkened, *impolita* is distinguishable by the deep black mesonotum. The genitalia indicate its close relationship with *cassiniæ* (see above), despite the latter having the third antennal segment entirely bright yellow.

Liriomyza inopinata sp.n.

(Figs 318-320)

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 reclinate ors, 2 incurved ori; orbital setulae reduced to single, isolated hairs, virtually absent; jowls 1/4 height of eye; third antennal segment small, round.

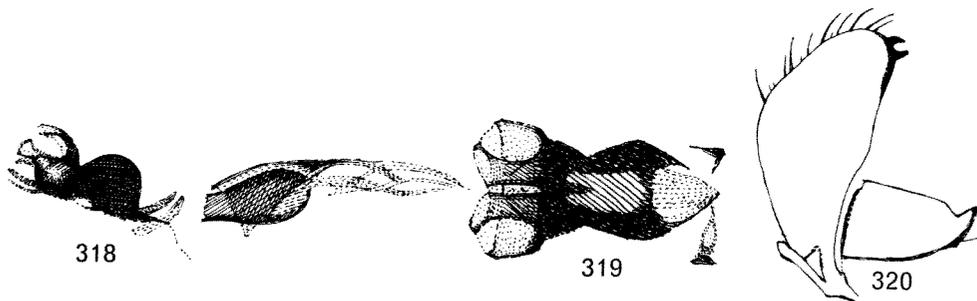
Mesonotum: 3+1 strong dc, acr irregularly in 4 rows.

Wing: length 2 mm; discal cell large, last section of M3+4 less than twice length of penultimate.

Colour: frons, jowls, antennae and palps yellow, face slightly greyish; sides of thorax bright yellow, mesopleura black on lower 3/4; mesonotum deep black, only moderately shining; scutellum bright yellow centrally; legs: femora predominantly yellow, with slight brownish striations, tibiae and tarsi dark brown; squamae yellow, margin and fringe black.

Male genitalia: aedeagus as in Figs 318, 319; surstyli (Fig. 320) large, triangular, with one stout spine on inner corner.

Holotype ♂, N.S.W. Mt Dromedary, 213 m, near Narooma, 4.ii.69 (M.S. Upton & J. Cardale), in ANIC.



Figs 318-320: *Liriomyza inopinata*: 318, aedeagus, side view; 319, distiphallus, ventral view; 320, surstylus.

Remarks

Although this species closely resembles *brassicae* in general colour, it is distinguishable by the slightly less shining mesonotum and the larger discal cell. The male genitalia of the 2 are entirely distinct. The genitalia of *inopinata* in fact closely resemble those of *oleariana* (cf. Figs 328, 329) and this must be due to relationship. The retention of the second cross-vein in *inopinata* suggests that this is the more primitive species.

Liriomyza languida sp.n.

(Fig. 321)

Head: frons little wider than eye, slightly projecting above eye near base of antennae; 2 reclinate ors, 2 largely incurved ori; orbital setulae virtually lacking, at most 1 or 2 hairs present, reclinate; eye conspicuously slanting; jowls deeply extended at rear, 1/4 height of eye; third antennal segment small, round, arista fine, bare.

Mesonotum: 3+1 dc; acr sparse, in 2 rows.

Wing: length in female 1.4 mm; second cross-vein in continuation of or even slightly basad of first; discal cell small, last section of vein M3+4 4 times length of penultimate.

Colour: head yellow, including entire hind-margin of eye; mesonotum (Fig. 321) silvery-grey but narrowly yellow adjoining scutellum, the yellow extending forwards centrally slightly beyond level of first dc; sides of thorax largely yellow, mesopleura with pale grey bar along lower margin; legs entirely yellow; abdomen black centrally, but tergites broadly yellow at margins and sides; in female, basal cone of ovipositor densely grey-dusted basally, shining black below; squamae, including margin and fringe, yellow; halteres yellow.

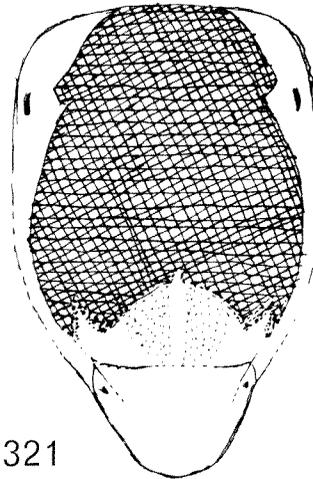


Fig. 321: *Liriomyza languida*: mesonotum.

Holotype ♀, W.A.: 26 km S.E. by S. of Carnarvon, 16.x.70; paratype ♀, same data (D.H.C.), in ANIC.

Remarks

Superficially this species resembles *electa*, but is smaller and is readily distinguishable by the paler squamae and the proximal position of the 2 cross-veins.

A female from N.T. Milton Park H.S., 23°22'S, 133°00'E, 5.xii.68 (A.O.N.) is possibly referable to *languida*, but differs in having the discal cell larger, with the second cross-vein almost its own length beyond the first. A positive identification cannot be made in the absence of males.

Liriomyza lepida sp.n.

(Figs 322, 323)

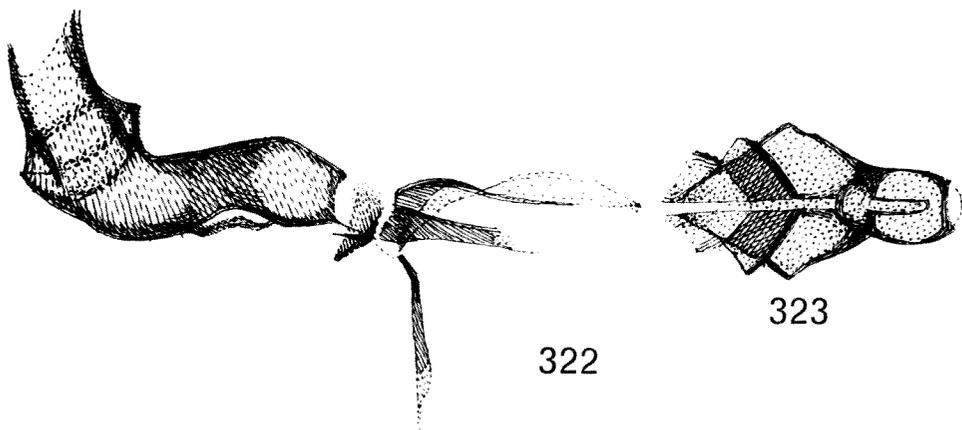
Head: orbits pronounced, slightly projecting above eye in profile; normally 1 (sometimes on one side 2) ors, 2 ori; orbital setulae lacking; jowls extended at rear, 1/3 height of eye; third antennal segment small, round.

Mesonotum: 3+1 dc; acr sparse, in 2 rows.

Wing: length 1-1.1 mm in male, second cross-vein lacking.

Colour: frons, hind-margin of eye, face, antennae and palps yellow; mesonotum ash-grey, scutellum dull yellow centrally; mesopleura black along front and hind margins; legs: femora yellow, tibiae and tarsi more brownish; squamae, including margin and fringe, yellow; halteres yellow.

Male genitalia: aedeagus as in Figs 322, 323; surstyli discrete, with one fine spine on inner corner; epandrium with a single stout spine at lower corner; ejaculatory apodeme with large blade and small, bowl-shaped base.



Figs 322, 323: *Liriomyza lepida*: 322, aedeagus, side view; 323, distiphallus, ventral view.

Holotype ♂, N.T. Milton Park H.S., 23° 22'S, 133° 00'E, 5.xii.68; paratype: 1♂, same data (both A.O.N.), in ANIC.

Remarks

This species is clearly related to *scaevolae* sp.n. but is distinguishable by the paler, ash-grey, mesonotum, the smaller size and the reduction of the acrostichals to 2 rows. The genitalia of the 2 species are only slightly differentiated (cf. Figs 332, 333).

The resemblance between *lepida* and both *meracula* sp.n. and *caulophaga* is superficial and these 3 species are not related.

Liriomyza meracula sp.n.

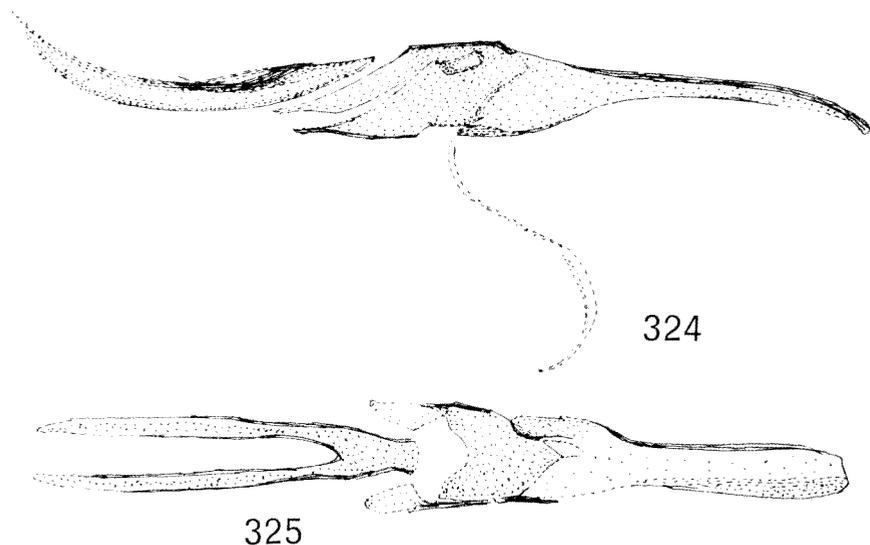
(Figs 324, 325)

Adult: closely resembling *lepida*, but 2 ors present and generally distinctly larger, wing length in male normally 1.2-1.3 mm (in 2 of 13 specimens seen, 1.1 mm), in female ranging from 1.2-1.6 mm. Male genitalia: aedeagus as in Figs 324, 325.

Holotype ♂, S.A. 8 km N. of Lyndhurst, 15.ix.72; paratypes: 7♂, 4♀, same data; 1♂, Allandale, 16 km S.E. of Oodnadatta, 24.ix.72 (all Z.L.). Holotype and paratypes in ANIC, 3 paratypes in AC.

Remarks

This species resembles both *lepida* and *caulophaga*. It will normally be distinguishable from *lepida* by the presence of 2 ors and the distinctly larger size, and from the



Figs 324, 325: *Liriomyza meracula*: 324, aedeagus, side view; 325, same, ventral view.

caulophaga group by the smaller size. Slight overlapping in size can occur with both these species; in cases of doubt, a positive identification will be possible only from the male genitalia.

The genitalia are of a form different to that of any of the species known in Australia but strikingly resemble *L. virgo* Zett. (cf. Spencer, 1976a: Figs 496, 497). This species feeds on *Equisetum* and is known from northern Europe and Alaska (as *arctica* Spencer, 1969). It seems improbable that this merely represents a case of convergence and clearly suggests direct relationship.

A female from W.A., 25.7 km S.E. by S. of Carnarvon, 16.x.70 (D.H.C.) appears to be referable to *meracula* but in view of its disjunct distribution it is not treated as a paratype.

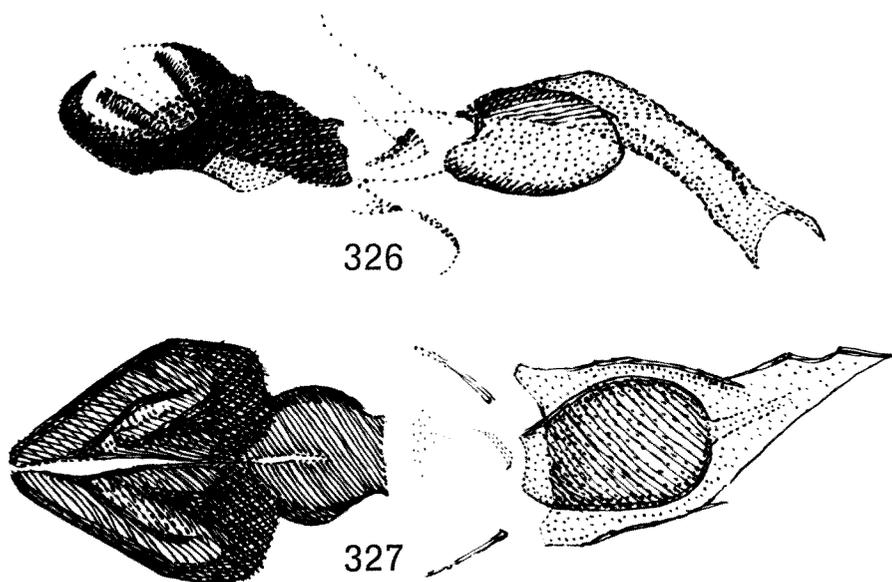
Liriomyza obscurata Spencer, 1963

(Figs 326, 327)

Liriomyza obscurata Spencer, 1963a: 334.

Holotype ♂ from N.S.W., Upper Hunter, in AM.

This is a distinctive species with the frons somewhat darkened, brownish, the third antennal segment yellow, the mesopleura entirely black, the femora and scutellum yellow; the second cross-vein is present and the wing length is from 1.7-2.3 mm. The male genitalia are shown in Figs 326, 327.



Figs 326, 327: *Liriomyza obscurata*: 326, aedeagus, side view; 327, same, ventral view.

L. obscurata has previously been recorded as widespread in N.S.W; additional records are now given showing that the distribution extends to Vic. The host is not known but it could be *Billardiera scandens*, on which unidentified mines (Fig. 379) are not uncommon in the Sydney area.

It now seems probable that *Liriomyza antipoda* Harrison from Antipodes Is. (cf. Spencer, 1976b: Figs 24, 25) may be synonymous with *obscurata*. If this is so, it represents a further remarkable case of long-distance dispersal, comparable to that of *Phytoliriomyza variana* which is known from 2 localities in Australia (p.180) and from Auckland Is. However, it is not proposed to establish this synonymy formally, pending study of additional material.

Material seen

N.S.W. 6.4 km N. of Bateman's Bay, 1♀, 14.x.65 (Z.L.); Clyde Mt, Landslip, 1♀, 22.ii.65; Durras Lake, 1♂, 22.ii.65 (both D.H.C.); Womboyno Lake, Disaster Bay, 1♂, 4.viii.73 (Z.L.); Sheepstation Creek, Araluen, 2♂, 24.xi.73 (Kelsey & Liepa). A.C.T. Black Mt, 1♀, 24.xi.65 (Z.L.). Vic. 16 km E. of Beech Forest, 1♀, 1.i.67 (Z.L.); Swan Reach, 1♂, 22.vii.64 (D.H.C.).

Liriomyza oleariana sp.n.

(Figs 328, 329)

Head: frons broad, twice width of eye, not projecting above eye in profile; 2 equal reclinate ors (an additional ors present in holotype), 2 inclined ori; orbital setulae minute or absent; jowls deeply extended at rear, between 1/3 and 1/2 height of eye; third antennal segment small, round, arista short.

Mesonotum: 3+1 dc, third and fourth equal, shorter than second; acr irregularly in 3 or 4 rows.

Wing: length from 1.4 mm in male to 1.6 mm in female, second cross-vein lacking.

Colour: frons, jowls, face and antennae bright yellow; hind-margin of eye faintly darkened up to vti; mesonotum grey rather than black, entirely mat viewed from front, with weak subshine seen from rear; large yellow patches at hind-corners adjoining scutellum, with some yellowish suffusion extending towards centre; sides of thorax bright yellow, humerus with only a small black patch in front, mesopleura with a black patch in lower front corner; scutellum almost completely yellow, with only small dark patches laterally; legs: femora bright yellow, tibiae and tarsi more brownish; abdomen blackish-grey, with all tergites narrowly yellow-bordered and yellowish laterally; squamae yellowish-grey, margin and fringe dark.

Male genitalia: aedeagus as in Figs 328, 329; ejaculatory apodeme with broad, dark blade; surstyli elongate, with only 2 fine hairs at end.

Host-plant/biology: *Olearia axillaris*, larva forming short mine in a single narrow leaf, pupating internally; the puparium is reddish-brown, with the posterior spiracles on short conical projections, each with 3 minute circular bulbs.

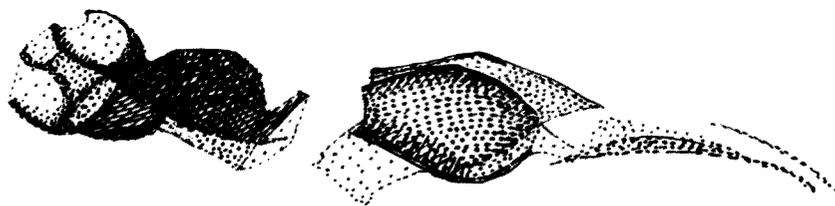
Holotype ♂, W.A. roadside 10 km S. of Busselton, 18.xi.75, on *Olearia axillaris*; paratypes: 2♂, 2♀, same data (1♂, both ♀ damaged by ants); Prevelly Park, W. of Margaret River, 1♂, 19.xi.75, on host (damaged by ants); Esperance, Twilight Bay, leaf-mines, 18.x.75 (all K.A.S.). Holotype and 2 paratypes in WAM, 2 paratypes in AC.

A female from W.A., 43.4 km N. of Bunbury (coast road), 1.x.70 (D.H.C.) is tentatively referred to this species but is not treated as a paratype, as it might possibly represent *chenopodii*.

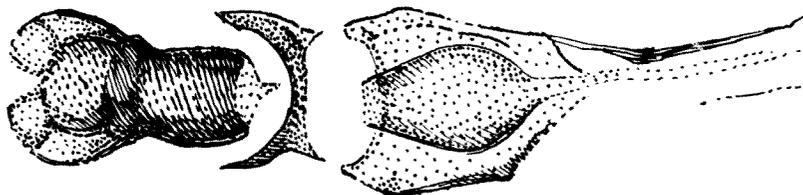
Remarks

On external characters this species cannot be distinguished from *chenopodii*. However, there are distinctive differences in the male genitalia and in the leaf-mines associated with the differing hosts. Females can therefore only be identified if they can be associated with the respective host-plants.

L. oleariana is probably widespread with its host but it will be of interest to discover whether its range extends eastwards into S.A. and how far north it extends in W.A.



328



329

Figs 328, 329: *Liriomyza oleariana*: 328, aedeagus, side view; 329, same, ventral view.

Liriomyza primitiva sp.n.

(Figs 330, 331)

Dark species with brown frons and black scutellum.

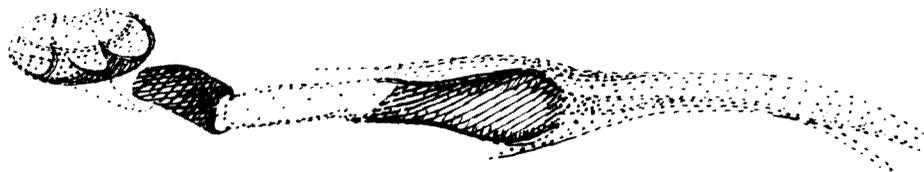
Head: frons equal to width of eye, orbits distinctly raised, projecting above eye in profile; 2 ors, 2 (or 3) ori, orbital setulae sparse, reclinate; jowls broad, 1/4 height of eye; narrow epistoma present above mouth margin; third antennal segment small, round.

Mesonotum: 3+1 dc; acr sparse, irregularly in 4 rows.

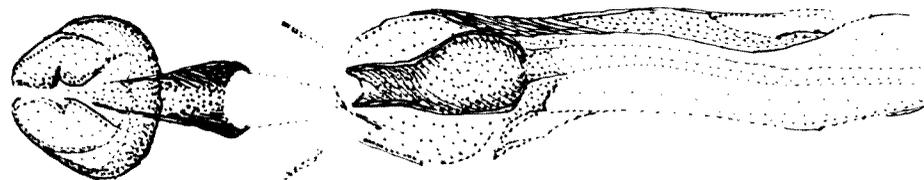
Wing: length 2.1-2.3 mm; second cross-vein present, last section of M3+4 twice length of penultimate.

Colour: frons dark brown with ochrous undertone, orbits distinctly darker, blackish; lunule more yellowish than frons, jowls brownish, black around lower margin; face black, epistoma contrasting yellow; palps and all antennal segments black; mesonotum deep black, mat viewed from front, distinctly shining from rear; humerus black centrally, narrowly ringed with yellow; pleura essentially black but notopleura variably paler, brownish-yellow, upper and hind-margins of mesopleura narrowly yellow; scutellum perceptibly paler, brownish, particularly from rear; legs: black but all knees faintly yellowish; squamae yellowish-grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 330, 331; ninth sternite elongate, with narrow, strongly chitinized sidearms, rounded at end; ejaculatory apodeme large, black, with distinct, membranous, bowl-shaped base; surstyli discrete, with single stout spine and several slender hairs.



330



331

Figs 330, 331: *Liriomyza primitiva*: 330, aedeagus, side view; 331, same, ventral view.

Holotype ♂, N.S.W. Lake Cootapatamba, Snowy Mts, 14.ii.63; paratypes ♀, same data (D.K.M.), in AM.

Remarks

The generic position of this dark species is not obviously apparent but is indicated by the male genitalia. The scutellum is in fact obviously brownish. I believe that the broad, raised orbits and dark colour can be accepted as plesiomorphous characters and that the species is a primitive relict. The alternative possibility is the secondary development of altitudinal melanism but this would not account for the primitive form of the orbits. Similarly prominent orbits are present in *caulophaga* (see above) which is also accepted as a primitive species.

Liriomyza scaevolae sp.n.

(Figs 332-334)

Head: frons almost 1 1/2 times width of eye, narrowly projecting above eye in front; 2 ors, 2 ori; orbital setulae sparse, reclinate; jowls deeply extended at rear, 1/3 height of eye; third antennal segment frequently appearing angular at upper corner, arista short.

Mesonotum: 3+1 dc, with a minute additional bristle beyond pre-sutural; acr irregular, in 3 or 4 rows.

Wing: length in male normally 1.5-1.6 mm (in one specimen seen 1.2 mm), in female up to 1.8 mm; second cross-vein lacking.

Colour: variable; frons, orbits, jowls, palps and all antennal segments yellow but third segment not infrequently darkened, though never deep black; hind-margin of eye varying from entirely yellow to black from base of vti; mesonotum uniformly mat grey; scutellum either faintly yellowish centrally or entirely grey; notopleura and rear of humerus ranging from bright yellow to dull ochrous; mesopleura black along lower and front margins, yellow above; sternopleura largely black, only narrowly yellow above bristle; legs: fore-coxae black at base, yellow above, all femora basically yellow but variably suffused and striated with black, in darkest specimens almost entirely black; tibiae and tarsi brownish-black; halteres yellow.

Male genitalia: aedeagus as in Figs 332, 333; surstyli discrete, with a single long spine at end and sometimes one hair on margin below; ejaculatory apodeme with large dark blade and fully-developed bowl-shaped base.

Host-plant/biology: *Scaevola nitida*, *S. crassifolia*; the larva forms a deep, short, irregular yellowish linear-blotch mine (Fig. 334), pupating loose in the mine; the puparium is pure white; the posterior spiracles are on very low projections, each with an ellipse of about 8 minute bulbs.

Holotype ♂, W.A. Cape Leeuwin, near Augusta, 30.ix.75, on *Scaevola nitida*; paratypes: 3♂, 2♀, same data; 7♂, 2♀, 1.x.75; 1♀, 19.xi.75; Yallingup, 2♀, 28 and 29.ix.75,

on host; near Jewel Cave, W. of Augusta, 1♂, 30.ix.75; Windy Harbour, S. of Northcliffe, 2♂, 5.x.75. on host; Ocean Beach, W. of Denmark, 1♀, 8.x.75; Prevelly Park, W. of Margaret River, 1♂, 19.xi.75; William Bay, W. of Denmark, 2♂, 23.xi.75 (all K.A.S.); William Bay, 1♂, 10.x.70 (D.H.C.); N.S.W. Broulee, 1♂, 2.xii.73 (Z.L.). Holotype and paratypes in WAM; 4 paratypes in ANIC, 4 in AC.

Two specimens were bred from puparia extracted from leaf-mines but were subsequently destroyed by ants; however, the puparia are preserved: Cape Leeuwin, emerged 5.x. from leaf-mine coll. 1.x.75; Mammoth Cave, S. of Yallingup, emerged 12.x. from mine coll. 29.ix.75.

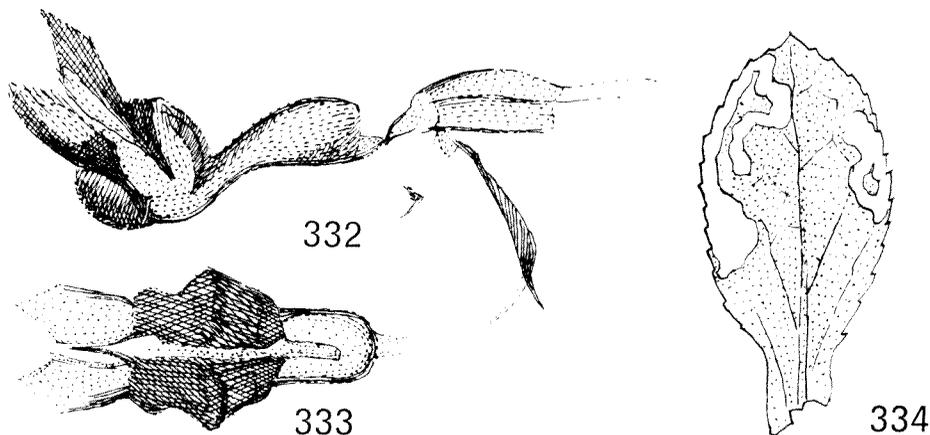
Mines were also seen on *S. crassifolia*, Hopetoun, W.A., 15.x.75 and in the South Australian Herbarium, Adelaide, from S. Yorke Peninsula, c. 3 km W. of Point Turton, 30 km S.W. of Minlaton, S.A., 10.xii.72 (W.L. Quinn).

Remarks

This is the only species in the genus known with a host in the Goodeniaceae. The white puparium is also unique within the genus; this is doubtless associated with the habit of pupating within the leaf, which is itself an adaptation to the hot, dry summers and clearly facilitates aestivation.

The colour variation is unusual and when catching the adults I believed that 2 species were represented. However, only one type of mine was present on *Scaevola* and the uniformity of the genitalia in the palest and darkest specimens confirms that all belong to a single species; both forms were caught at the same time at the same localities.

L. scaevolae is abundant on the S.W. coast of W.A. in association with its food-plants. The discovery of mines from Yorke Peninsula, S.A. suggests that the species is widely



Figs 332-334: *Liriomyza scaevolae*: 332, aedeagus, side view; 333, distiphallus, ventral view; 334, leaf-mines on *Scaevola nitida*.

distributed along the south coast and its occurrence on the east coast at Broulee, N.S.W. indicates an even wider distribution. Several *Scaevola* spp. occur in the Broulee area and one possible host is *S. aemula*.

The male genitalia confirm the close relationship of *scaevolae* with *lepida* sp.n. from the Macdonnell Ranges, N.T. *Scaevola* can be expected there and it will be interesting to discover if this is also its host.

Liriomyza tenera sp.n.

(Figs 335, 336)

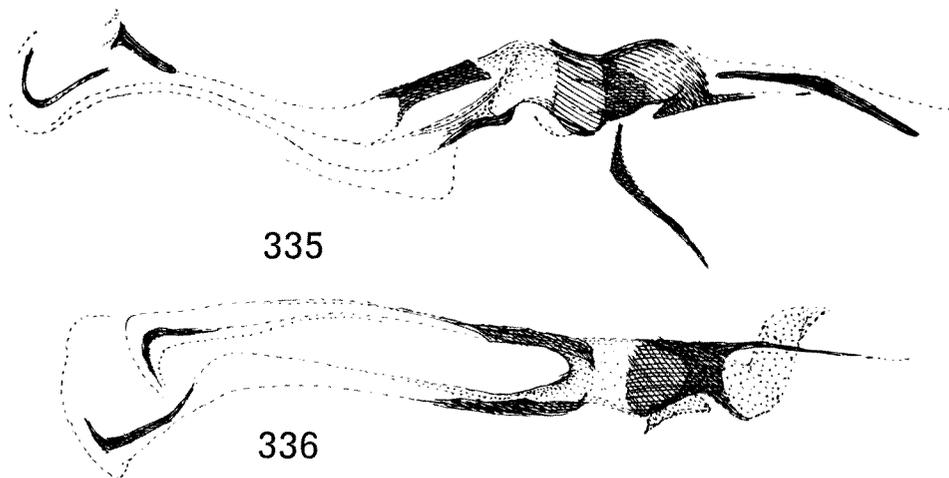
Head: frons narrow, equal to width of eye, narrowly projecting above eye in front; one ors, 2 ori, the upper directed inwards and upwards, the lower incurved; orbital setulae lacking; eye large, slanting; jowls extended at rear, $2/5$ height of eye; arista short, little longer than width of eye.

Mesonotum: 3+2 dc, the fifth minute; acr lacking.

Wing: length 1.1 mm, second cross-vein lacking.

Colour: frons, jowls, antennae and palps yellow; hind-margin of eye faintly grey beyond vte; face pale grey; mesonotum entirely mat, ash-grey to margin of scutellum, this dull yellow centrally, grey at sides; pleura largely yellow, mesopleura grey on front and lower margins; legs largely yellow, tibiae and tarsi slightly more brownish; squamae, including margin and fringe, yellow; halteres yellow.

Male genitalia: aedeagus as in Figs 335, 336; distiphallus with asymmetrical areas of chitinization at apex and a wide membranous gap before the 2 sclerites of the



Figs 335, 336: *Liriomyza tenera*: 335, aedeagus, side view; 336, same, ventral view.

mesophallus; surstyli discrete, rectangular and then with a finger-like projection bearing 4 fine hairs; epandrium with a single strong spine on lower corner.

Holotype ♂, S.A. Cooper Bore (Koppermanns No. 2), 11 km N.E. by N. of Etadunna H.S., 20.ix.72; paratype ♀, N.S.W. 11 km S.W. of Broken Hill, 24.iii.75 (both Z.L.), in ANIC.

Remarks

This minute species resembles both *lepida* and *meracula* in colour and the absence of the second cross-vein, but is distinguishable by the complete absence of acrostichals. The aberrant genitalia indicate its isolated position.

Liriomyza sp. (S.A., Coorong Lagoon)

(Fig. 337)

With only a single female available, it is not proposed formally to describe this species, although it can readily be included in the key. Essential characters are:

frons, antennae and legs entirely yellow; mesonotum (Fig. 337) blackish-grey but yellow adjoining scutellum behind first dc; acr sparse, only 4 isolated hairs present; wing length 1.5 mm, second cross-vein lacking.

S.A. Coorong Lagoon, S. of Meningie, 1♀, 30.xii.66 (Z.L.) in ANIC.

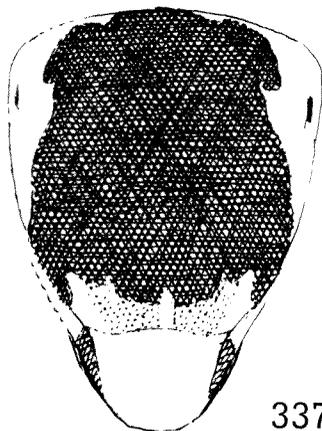


Fig. 337: *Liriomyza* sp. (Coorong Lagoon): mesonotum.

Genus *Pseudonapomyza* Hendel, 1920

Pseudonapomyza Hendel, 1920: 115.

Type species: *Phytomyza atra* Meigen, 1830.

This genus falls into 2 distinct groups. The first normally has the third antennal

segment conspicuously angulate (Fig. 351) and the host-plants are confined to the Gramineae; in the second, the third antennal segment is rounded and known hosts are all in the Acanthaceae. Both groups are known in Australia.

Recent examination of virtually all available material in the first group showed that in Europe a number of undescribed species had been misidentified as *atra* (Meigen) and in Asia and the Pacific area further undescribed species were present (Spencer, 1973a: 262). In Australia the species referred to as *spicata* (Spencer, 1963a: 336) was found to be the previously undescribed species *spinosa* Spencer, 1973a. Differences in external morphology between *spicata* and *spinosa* are slight, but there is distinctive differentiation in the male genitalia (Spencer, 1973a: 273-7).

An important generic character in the larva (and puparium) is the presence of a band of spinules around each segment (Fig. 355).

Relationships with species in the Oriental region are shown by *parilis* sp.n. and *probata* sp.n. (see below), and *spinosa* occurs widely across Asia to Africa.

Seven species are now recorded from Australia, of which 6 are described below. They can be separated by the following key:

Key to Australian *Pseudonapomyza* species

- | | | | | | |
|---|-----|-----|-----|-----|------------------------|
| 1. Third antennal segment round; second cross-vein present | ... | ... | ... | ... | 2 |
| – Third antennal segment angulate; second cross-vein lacking (except in <i>pudica</i>) | ... | ... | ... | ... | 3 |
| 2. Second costal section slightly less than twice length of fourth; small species, wing length 1.7 mm | ... | ... | ... | ... | <i>memorata</i> sp.n. |
| – Second costal section 4 times length of fourth; larger species, wing length from 2.1 mm to 2.2 mm | ... | ... | ... | ... | <i>parilis</i> sp.n. |
| 3. Squamal fringe pale, silvery-white | ... | ... | ... | ... | 4 |
| – Squamal fringe dark, brownish | ... | ... | ... | ... | 6 |
| 4. Mesonotum blackish rather than grey; third antennal segment finely angulate (Fig. 351) | ... | ... | ... | ... | <i>spinosa</i> Spencer |
| – Mesonotum distinctly grey | ... | ... | ... | ... | 5 |
| 5. Third antennal segment bluntly angulate (Fig. 342); aedeagus as in Figs 343, 344 | ... | ... | ... | ... | <i>probata</i> sp.n. |
| – Third antennal segment with only trace of angle at upper corner; aedeagus as in Figs 347, 348 | ... | ... | ... | ... | <i>rara</i> sp.n. |
| 6. Second cross-vein lacking; 3+0 dc | ... | ... | ... | ... | <i>salubris</i> sp.n. |
| – Second cross-vein present; 3+1 dc | ... | ... | ... | ... | <i>pudica</i> sp.n. |

Pseudonapomyza memorata sp.n.

(Figs 338, 339)

Head: frons narrow, only slightly wider than eye, not projecting above eye in profile; 2 ors, the upper slightly stronger, 2 equal, incurved ori; orbital setulae sparse, reclinate; jowls 1/6 height of eye, this large, upright; third antennal segment entirely rounded at end; arista long, only slightly shorter than eye height.

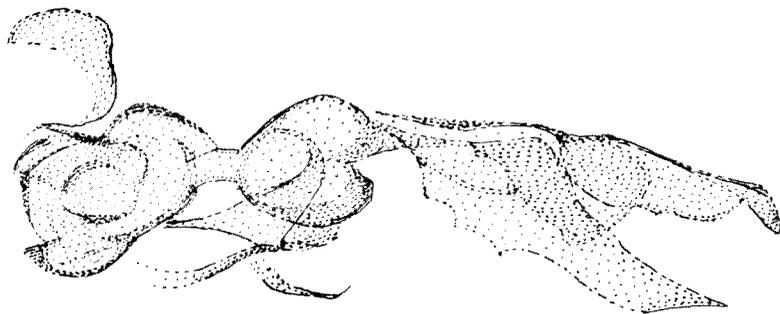
Mesonotum: 3+0 dc, acr in 8 rows; prsc lacking.

Wing: length in male 1.7 mm; second costal section short, sections 2, 3, 4 in ratio 20: 14: 11, second cross-vein present, just basad of first, discal cell small, last section of M3+4 9 times length of penultimate.

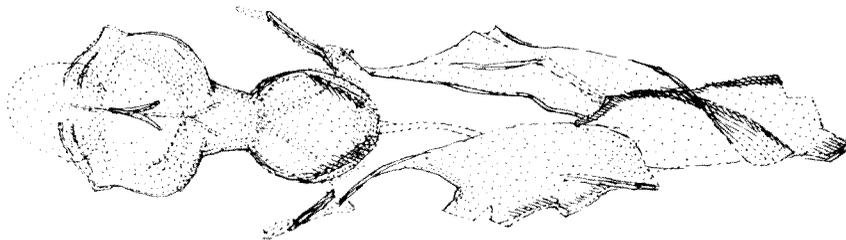
Legs: mid-tibiae with 2 (on one leg 3) slender lateral bristles.

Colour: entirely dark; frons mat black, orbits weakly shining; lunule grey, head otherwise black; mesonotum and abdomen shining black; pleura and legs black; squamae grey, margin and fringe black; halteres yellow.

Male genitalia: aedeagus as in Figs 338, 339, pale, weakly sclerotized, with distinctive membranous flap dorsally; ejaculatory apodeme large, equal in length to aedeagus, elongated; blade of surstyli extended downwards, not separated from epandrium, with 5 hairs on inner margin.



338



339

Figs 338, 339: *Pseudonapomyza memorata*: 338, aedeagus, side view; 339, same, ventral view.

Holotype ♂, N. Qld. Mt Garnet Rd., 20.9 km W. of Ravenshoe, 2.v.67 (D.H.C.) in ANIC.

Remarks

The close relationship of this species to *parilis* described below is immediately apparent from the distinctive male genitalia.

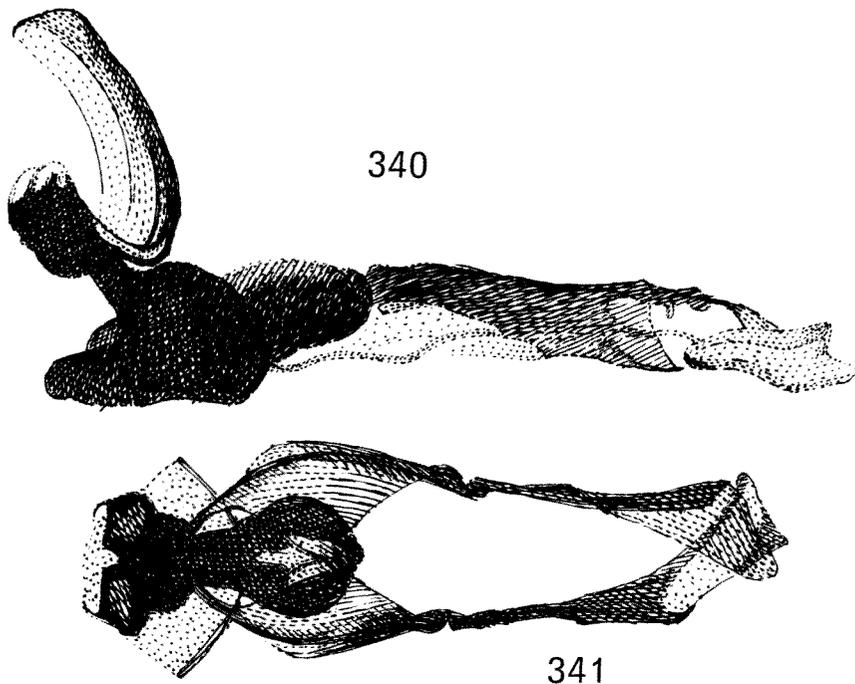
Pseudonapomyza parilis sp.n.

(Figs 340, 341)

Adult: closely resembling *memorata*, with following points of difference: larger, wing length in male 2.1, in female 2.2 mm; second costal section longer, sections 2, 3, 4 in ratio 33: 15: 8 (male), 39: 21: 10 (female); mesonotum less shining, predominantly mat but with some subshine.

Male genitalia: aedeagus as in Figs 340, 341, black, strongly sclerotized, with membranous flap dorsally.

Holotype ♂, N.S.W. Otford, 3.ii.62; paratype ♀, same locality, 30.x.65 (both D.K.M.), in AM.



Figs 340, 341: *Pseudonapomyza parilis*: 340, aedeagus, side view; 341, same, ventral view.

Remarks

The distinctive aedeagus indicates close relationship with *memorata* sp.n., but *parilis* is clearly the sister-species of *multimoda* Spencer, 1966c, which was described from 4 islands in the Bismarck Archipelago—Mussau, Larongai, New Ireland and Duke of York (cf. Spencer, 1966c: Figs 30, 31). *Ps. parilis* is slightly larger than *multimoda* and the mesonotum is less shining.

Pseudonapomyza probata sp.n.

(Figs 342-344)

Head (Fig. 342): frons 1 1/2 times width of eye, not projecting above eye in profile; 2 equal, reclinate ors, 2 weaker incurved ori; orbital setulae sparse, reclinate; jowls broad, extended at rear, almost 1/4 height of eye; third antennal segment bluntly angulate at upper corner.

Mesonotum: 3 post-sutural dc, second shorter than first, third weak, at most 1/2 length of second; acr irregularly in 4 rows.

Wing: length from 1.3 mm in male to 1.6 mm in female; second costal section short, only slightly longer than fourth.

Colour: frons largely black but sometimes distinctly brownish in centre; jowls dark brown, all antennal segments black; mesonotum greyish, with only slight subshine; legs entirely black; abdomen, including basal cone of ovipositor, shining black; squamae and fringe silvery-white; halteres white.

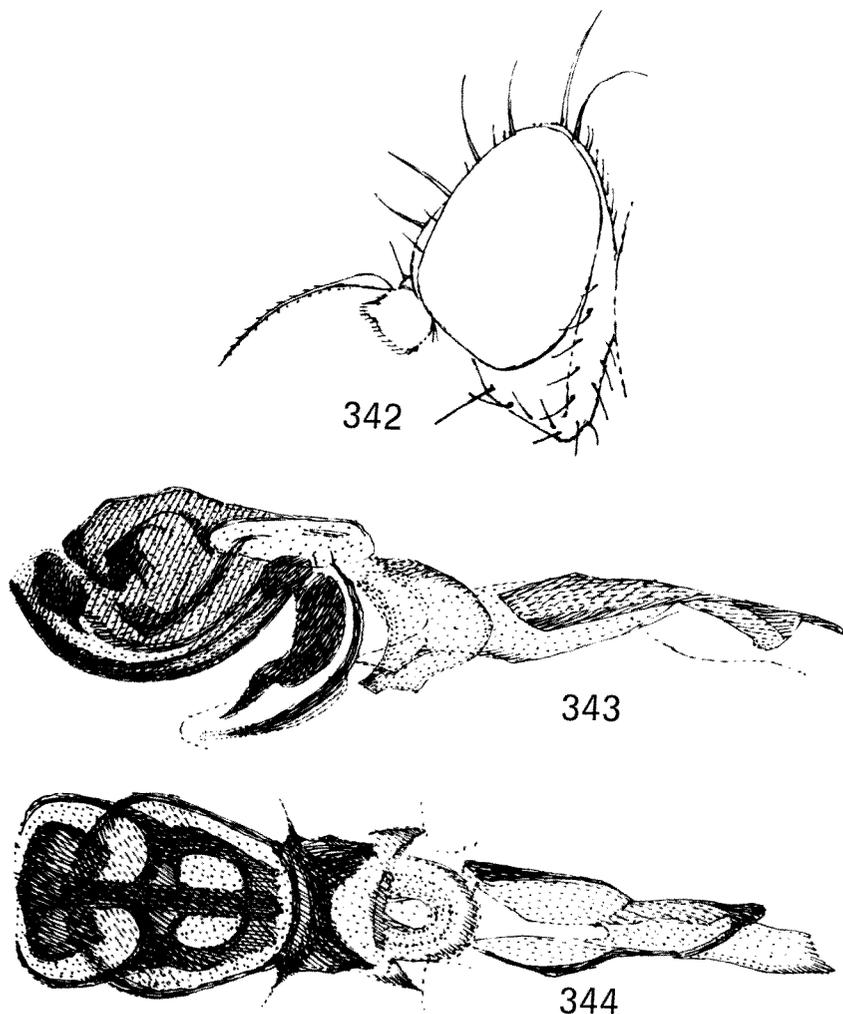
Male genitalia: aedeagus as in Figs 343, 344; ejaculatory apodeme large, equal in length to aedeagus, with well-defined stalk.

Holotype ♂, Qld: Gatton, 3.i.62 (R. Lindsay); paratypes: Qld. Bundaberg (mangroves), 1♂, 6.vi.72 (H. Frauca); 11-22 km W. of Herberton, via Watsonville, 1♂, 1♀, 1.v.67 (D.H.C.); Mackay, 1♂, 12.v.70 (Z.L.); Big Mitchell Creek, Mareeba-Molloy Rd., 1♀, 4.v.67; junction of Goldmine & Davies Creeks, Kuranda-Mareeba Rd., 4♀, 3.v.67; Mt Garnet Rd., 20.9 km W. of Ravenshoe, 2♂, 1♀, 2.v.67 (all D.H.C.); Emu Park, N.E. of Rockhampton, 1♀, 7.v.70 (Z.L.); Yeppon, N.E. of Rockhampton, 1♀, 7.v.70 (Z.L.); Tinaroo Falls Dam (open savannah), 1♂, 1♀, 27.iv.67 (D.H.C.); Woombye, near Nambour, 1♀, 11-16.x.65 (D.H.C.). N.T. Koongarra, 15 km E. of Mt Cahill, 1♀, 6-9.iii.73 (D.H.C.). Holotype and paratypes in ANIC, 4 paratypes in AC.

A female from Qld. Clonnel River, 19 km S. of Proserpine, 18.xii.61 (McAlpine & Lossin) probably represents *probata* but the head is badly shrunk and a positive differentiation between this species and *rara* is impossible.

Remarks

This species closely resembles both *asiatica* Spencer, 1961a, which is widespread in India and has also been recorded from Taiwan and the Philippines (Spencer, 1962a), and also *dilatata* Sasakawa, 1963c which was described from Samoa and has since been recorded in Fiji (Spencer, 1973a). All 3 species have in common the bluntly angulate third antennal segment and the greyish mesonotum; however, the second costal section is significantly shorter in *probata*. The male genitalia immediately confirm the distinctness of the 3 species.



Figs 342-344: *Pseudonapomyza probata*: 342, head; 343, aedeagus, side view; 344, same, ventral view.

Pseudonapomyza pudica sp.n.

(Figs 345, 346)

Species with angulate third antennal segment and second cross-vein present.

Head: frons 1 1/2 times width of eye, not projecting above eye in profile; 2 ors, 2 ori, orbital setulae sparse, reclinate; jowls deeply extended at rear, almost 1/4 height of eye; third antennal segment bluntly angulate (Fig. 345).

Mesonotum: 3+1 strong dc, pre-sutural equal to third; acr irregularly in 4 rows.

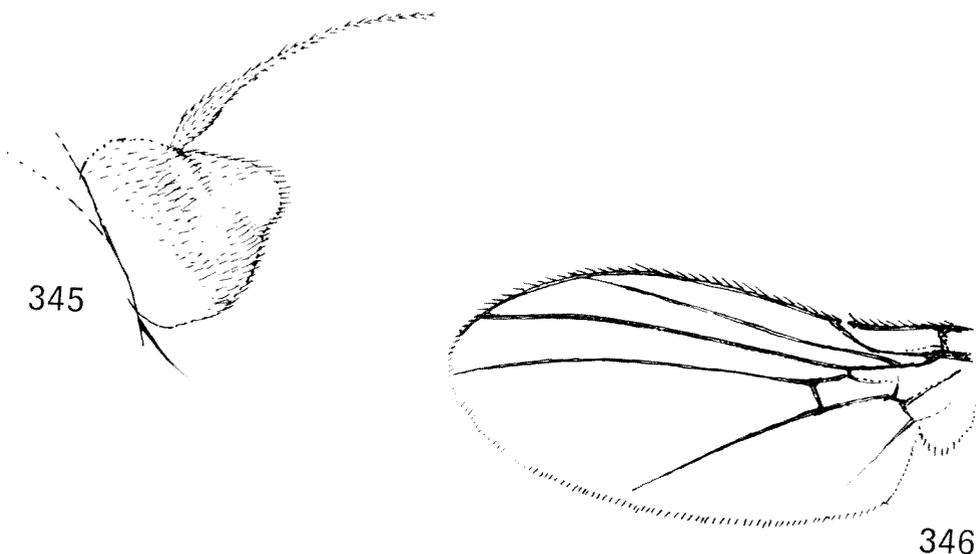
Wing (Fig. 346): length in female 1.6 mm, costa ending shortly after vein R4+5; second cross-vein present, discal cell small, last section of M3+4 2 1/2 times length of penultimate.

Colour: frons dark brownish, almost black, ocellar triangle and orbits not shining; mesonotum mat, blackish-grey, basal cone of ovipositor brilliantly shining in lower half, entirely grey-dusted apically, squamae grey, margin and fringe black; halteres white.

Holotype ♀, N.S.W. 4.8 km N. of Tomerong, Nowra District, 7.ii.70 (D.K.M.), in AM.

Remarks

Ps. pudica appears to be an isolated species. It is the first species known having the third antennal segment angulate, with the second cross-vein present. A further unusual character is the presence of a strong pre-sutural dc. It will be of considerable interest to establish its exact affiliations when a male can be discovered.



Figs 345, 346: *Pseudonapomyza pudica*: 345. third antennal segment; 346, wing.

Pseudonapomyza rara sp.n.

(Figs 347, 348)

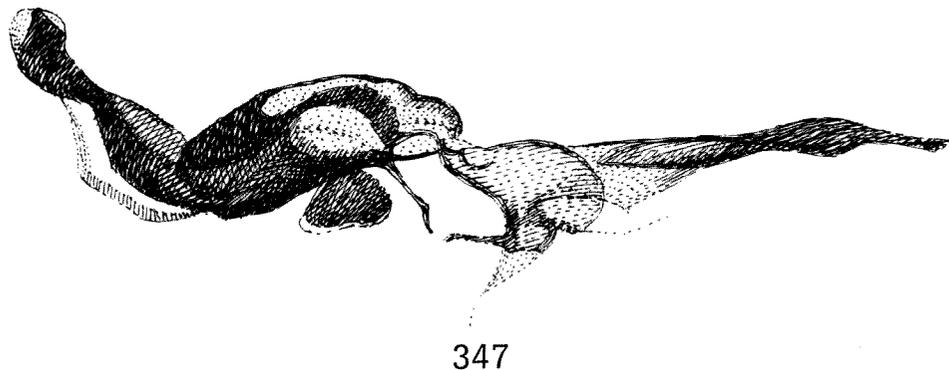
Adult: agreeing closely in external characters with *probata* but third antennal segment appearing slightly less angulate.

Male genitalia: aedeagus as in Figs 347, 348; ejaculatory apodeme long, equal in length to aedeagus, stalk narrow.

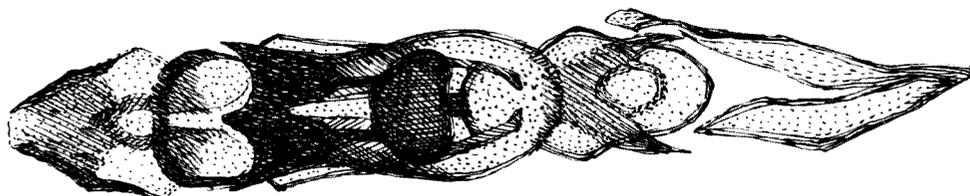
Holotype ♂, N. Qld. Tinaroo Falls Dam (open savannah) 27.iv.67; paratype ♀, same data (D.H.C.), in ANIC.

Remarks

This species can be reliably identified only by the male genitalia. The unusually long ejaculatory apodeme suggests a close relationship with *probata*.



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Figs 347, 348: *Pseudonapomyza rara*: 347, aedeagus, side view; 348, same, ventral view.

Pseudonapomyza salubris sp.n.

(Figs 349, 350)

Closely resembling *probata*, with following points of difference: 2 ors, but the lower distinctly incurved; (in one of the five specimens seen, a weak third ori on one side only); third antennal segment small, appearing almost rounded, but just detectably angulate at upper corner; acr numerous, in 8 rows; wing length 1.4-1.5 mm in male, 1.6 mm in

female; colour: mesonotum distinctly black rather than grey, moderately shining; veins R2+3 and R4+5 darker, black; squamae whitish-grey, fringe black.

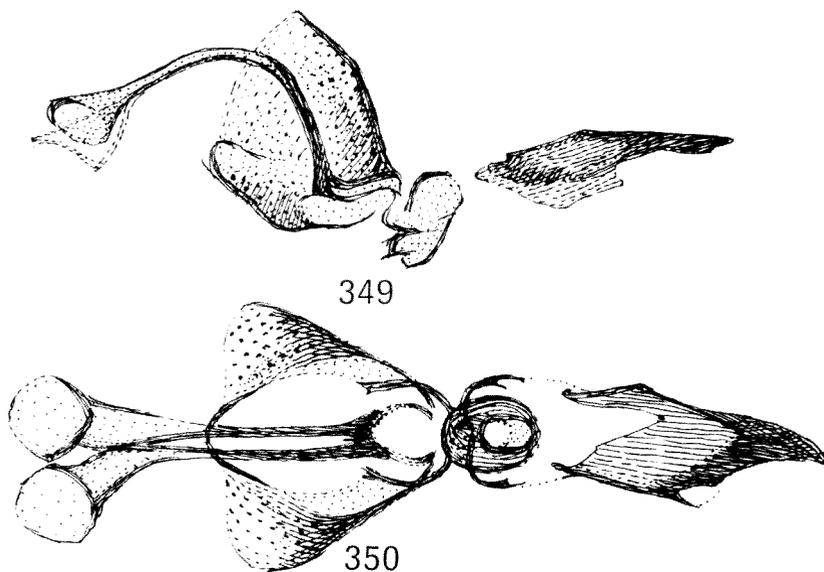
Male genitalia: aedeagus as in Figs 349, 350; ejaculatory apodeme shorter, little more than half length of aedeagus.

Holotype ♂, N.S.W. Cabbage Tree Creek, Clyde Mt, 22.ii.65 (D.H.C.); paratypes: 1♀, same data as holotype; 1♀, Coolabah, 12.x.63 (D.H.C.); 1♀, 4.8 km S. of Kioloa, N. of Durras, 3.x.71 (Z.L.); 1♂, Inverloch Bridge, near Yass, 27.ii.66 (Z.L.); Northmead, 1♂, 1♀, 26.i.63 (D.K.M). Holotype and paratypes in ANIC, 2 paratypes in AM.

Remarks

This species has the squamal fringe dark in common with *pudica* but the latter is distinguishable by the presence of the second cross-vein. The squamal fringe is pale in the 3 species with the third antennal segment angulate and lacking the second cross-vein.

Ps. cingulata Sasakawa, 1963d from New Guinea resembles *salubris*, particularly in the dark squamal fringe, but the male genitalia (Sasakawa, 1963d: Fig. 21) show that the two are not closely related.



Figs 349, 350: *Pseudonapomyza salubris*: 349, aedeagus, side view; 350, same, ventral view.

Pseudonapomyza spinosa Spencer 1973

(Figs 351-355)

Pseudonapomyza spinosa Spencer, 1973a: 275.

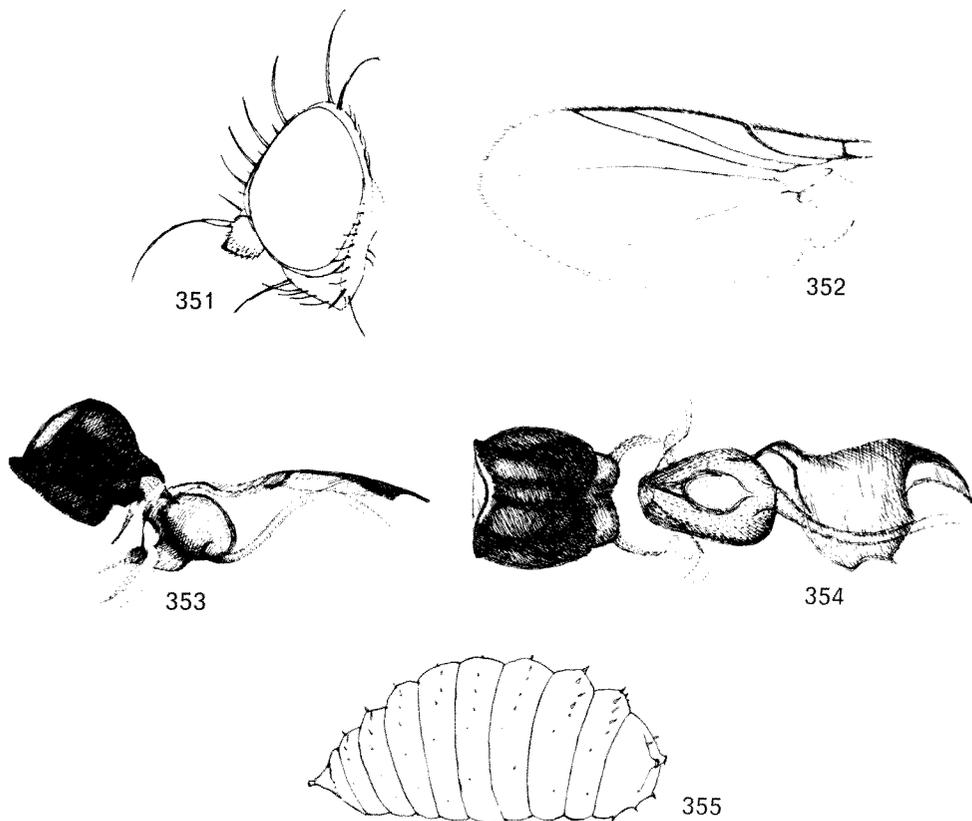
Holotype ♂ from Egypt in BM.

In Australia this species was previously (Spencer, 1963a: 336) misidentified as *spicata* (Malloch, 1914).

Ps. spinosa has a finely angulate third antennal segment (Fig. 351), the second costal section is short and is only slightly longer than the fourth (Fig. 352) and the mesonotum is shining, essentially blackish rather than grey. The distinctive aedeagus is shown in Figs 353, 354 and the puparium with spinules near the segment borders in Fig. 355.

The only confirmed host in Australia is *Eleusine indica* but damage due to this species has been caused to barley in Egypt and to wheat in Nigeria. Other wild grasses certainly serve as hosts. Mines found on *Brachiaria miliformis* at Darwin, N.T. on 22.i.61 (K.A.S.) probably represent this species.

Ps. spinosa is the most widespread species in the genus in Australia and is now known



Figs 351-355: *Pseudonapomyza spinosa*: 351, head; 352, wing; 353, aedeagus, side view; 354, same, ventral view; 355, puparium.

from all states except Vic. and Tas. It is widely distributed from Samoa and Micronesia to North, West and South Africa.

Material seen

Qld. Mt Garnet Rd., 20.9 km W. of Ravenshoe, 2♀, 2.v.67 (D.H.C.); Yeppoon, N.E. of Rockhampton, 1♂ (genitalia examined), 3♀, 7.v.70 (Z.L.). N.T. Tempe Downs, 1♂, 15.vi.63; 1♀, 29.vii.63; Illara Rock Hole, near Tempe Downs, 1♀, 3.viii.63 (all P. Ranford); 33.8 km S.S.W. of Napperby H.S., N.W. of Alice Springs, 5♀, 22.vi.68 (K.J. Mckie); Charley Creek, Milton Park, 23° 23'S, 132° 57'E, 1♀, 7.xi.68 (A.O.N.); Koongarra, 15 km E. of Mt Cahill, 1♀, 6-9.iii.73 (D.H.C.). N.S.W. Caragabal, 1♂, 13.xi.66; 41.8 km W. of Mullaloy, 1♂, 3.vi.66 (both Z.L.); Parkes, 2♀, 13.xi.64 (D.H.C.); Sydney, 2♂, 4♀, 4.ii.61, ex *Eleusine indica* (paratypes, cf. Spencer, 1973a: 276); also 27 km E. of Cobar, 22.xi.75; 9 and 20 km N.W. of Wilcannia, 23.ix.75 (Z.L.). A.C.T. Black Mt, light trap, 4♀, 25.iii.64; 21.i.66, 9.ii.66, 21.iii.66; 2♂, 29.ii.68 (all I.F.B.C.). S.A. Hahndorf, 1♂, (genitalia examined), 6.viii.68 (Colless & Liepa); Blanche Town, 1♀, 26.xii.66 (Z.L.); Mermerna Ruins, 38.6 km N. of Hawker, Flinders Range, 1♂, 30.ix.75; Winnininnie, 1♂, 17 km N. of Yunta, 1♂, both 29.ix.75 (Z.L.). W.A. Kimberley Res. Stn., light trap, 1♀, x.61 (K.T. Richards); The Kimberleys, S.W. of Bedford Downs, 16 km S. of Landsdowne H.S., 1♂ (genitalia examined), 12-19.vii.64 (R. Plumb); Millstream, 1♀, 25.x.70 (D.H.C.); Murchison River, 27° 49'S, 114° 41'E, 1♀, 27.iii.71 (Upton and Mitchell); Drummond's Cove, Geraldton, 1♀, 13.xi.72 (N.McFarland).

Genus *Phytomyza* Fallén, 1819

Phytomyza Fallén, 1810: 10.

Types species: *Musca ranunculi* Schrank, 1803 (as *flaveola* = *flava* Fallén, 1823b).

The essential characters defining this genus are the proclinate orbital setulae (Fig. 363), the termination of the costa at vein R4+5 and the lack of the second cross-vein. Some 450 world species fall within this concept, of which only 9 are found in Australia. Four of these are recorded for the first time in W.A.

In addition, there is one unidentified species present on Lord Howe Is., known only from a leaf-mine on *Clematis glycinoides* from Transit Hill, 17.ix.63 (A.C. Beaglehole) seen by the author in the Herbarium Australiense, Canberra (Sheet No. 168674). This possibly represents *vitalbae*.

Phytomyza is primarily a temperate, partially cold-adapted genus which is virtually absent from the tropics except at high altitudes, such as the Andes in South America and the highlands in East Africa; a single species is known from the highest area in Sri Lanka (Spencer, 1975). In Europe 103 species are known in Britain, and in Scandinavia 37 species are found north of the Arctic circle (Spencer, 1976c).

Of the 9 Australian species, 3—*plantaginis*, *syngenesiae* and *vitalbae*—are accepted as

introductions from Europe. Two—*clematidicola* and *ranunculicaulis* sp.n.—feed on *Clematis* and *Ranunculus* respectively and the genitalia indicate that 3 of the other new species—*placita* sp.n., *pulchella* sp.n. and *venerabilis* sp.n.—also probably have hosts in the Ranunculaceae. The position of *anthocercidis* sp.n., a leaf-miner on *Anthocercis* (Solanaceae), is puzzling, as the genitalia confirm beyond doubt its relationship with 2 feeders on Ranunculaceae—with *vitalbae* (Fig. 377) and with the common holarctic species *ranunculi* which is not known in Australia. The striking yellow and grey colour is also virtually identical with that of *ranunculi*. The relationship of these species is discussed further below.

Key to Australian *Phytomyza* species

- | | | | | | | | | |
|--|-----|-----|-----|-----|-----|------------------------|---------------|---|
| 1. Scutellum at least partially yellow | ... | ... | ... | ... | ... | ... | ... | 2 |
| — Scutellum entirely dark, grey or black | ... | ... | ... | ... | ... | ... | ... | 3 |
| 2. Scutellum narrowly yellowish centrally; second antennal segment black | ... | ... | ... | ... | ... | <i>vitalbae</i> | Kaltenbach | |
| — Scutellum entirely bright yellow; second antennal segment yellow | ... | ... | ... | ... | ... | <i>anthocercidis</i> | sp.n. | |
| 3. Femora entirely bright yellow | ... | ... | ... | ... | ... | <i>clematidicola</i> | Spencer | |
| — Femora yellow only at knees | ... | ... | ... | ... | ... | ... | ... | 4 |
| 4. Fore-coxae yellow | ... | ... | ... | ... | ... | ... | ... | 5 |
| — Fore-coxae black | ... | ... | ... | ... | ... | ... | ... | 8 |
| 5. Third antennal segment black | ... | ... | ... | ... | ... | ... | ... | 6 |
| — Third antennal segment orange; large species, wing length in male 2.7-2.8 mm | ... | ... | ... | ... | ... | <i>pulchella</i> | sp.n. | |
| 6. Acr virtually lacking | ... | ... | ... | ... | ... | ... | ... | 7 |
| — Acr in 2 rows; proboscis distinctly elongate (Fig. 363) | ... | ... | ... | ... | ... | <i>placita</i> | sp.n. | |
| 7. Third antennal segment quadrate | ... | ... | ... | ... | ... | <i>plantaginis</i> | Rob.-Desvoidy | |
| — Third antennal segment conspicuously elongate | ... | ... | ... | ... | ... | <i>venerabilis</i> | sp.n. | |
| 8. Third antennal segment small, round; acr lacking | ... | ... | ... | ... | ... | <i>syngenesiae</i> | (Hardy) | |
| — Third antennal segment large, elongate; acr present in 2 rows | ... | ... | ... | ... | ... | <i>ranunculicaulis</i> | sp.n. | |

Phytomyza anthocercidis sp.n.

(Figs 356, 357)

Yellow and grey species with bright yellow scutellum.

Head: frons broad, twice width of eye, not projecting above eye in profile; one reclinate ors, with no trace of second, one inclined ori; orbital setulae sparse, at most 4, frequently entirely lacking; jowls broad, 1/3 height of eye, cheeks well-defined; third antennal segment rounded, slightly longer than broad.

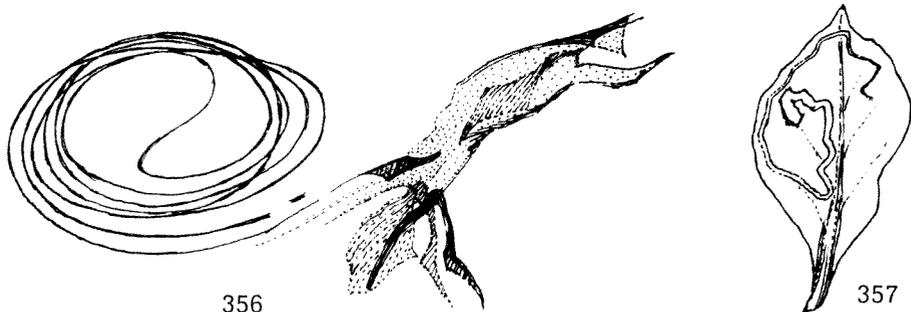
Mesonotum: 3+1 strong dc; acr sparse, in 2 rows.

Wing: length from 1.9 mm in male to 2.5 mm in female; costal ratio variable, with second costal section 2 1/2 times length of fourth in male to 3 times in female.

Colour: frons, orbits, jowls and face uniformly bright yellow, both vertical bristles on yellow ground; third antennal segment black, second yellowish, first bright yellow; palps yellow; mesonotum uniformly mat grey but with distinct yellowish patches at hind-corners; scutellum entirely yellow; humerus and notopleural area bright yellow, mesopleura largely yellow, with grey patch along front and lower margins; legs: coxae and femora entirely bright yellow, tibiae slightly darkened, tarsi more distinctly brownish; abdomen predominantly yellow but tergites variably darkened, greyish, on front margins.

Male genitalia: aedeagus as in Fig. 356, with 8 coils, changing direction at midpoint, minutely divided at end; ejaculatory apodeme with pale blade and enlarged base.

Host-plant/biology: *Anthocercis littorea* Labill. (Solanaceae), possibly other *Anthocercis* spp.; the leaf-mine (Fig. 357) is linear, upper surface, with only sparse black frass, visible in irregular lumps, particularly towards the end of the mine; pupation takes place externally through a conspicuous exit slit; the puparium is greyish, with the posterior spiracles each having about 8 bulbs, on conical projections which are close together and scarcely diverging.



Figs 356, 357: *Phytomyza anthocercidis*: 356, aedeagus; 357, leaf-mine on *Anthocercis littorea*.

Holotype ♂, W.A. Windy Harbour, south of Northcliffe, 5.x.75, on *Anthocercis littorea*; paratypes: 7♂, 4♀, same data; 2♀, William Bay and Ocean Beach, W. of Denmark, 8.x.75, both on same host; 1♀, 20 km N. of Mandurah, 26.ix.75 (all K.A.S.); 1♂, Mt Chudalup, S. of Northcliffe, 6.x.70 (D.H.C.); 1♀, Nedlands, light trap, 26.viii-2.ix.60 (E. Holm). Holotype and paratypes in WAM, 4 paratypes in ANIC, 4 in AC.

Remarks

This is a remarkable species, closely resembling the northern temperate *P. ranunculi* (Schrank) (cf. Spencer, 1976c) which feeds exclusively on species of *Ranunculus* (Ranunculaceae). There is a striking general similarity in the colour of the 2 but this could be coincidental. The genitalia of the 2 species also agree closely but the genitalia of *anthocercidis* suggest an even closer relationship with *vitalbae*, despite their conspicuous colour differences. The shape and colour of the puparium also resemble that of *ranunculi* and *vitalbae*. In view of this I believe it must be accepted that *anthocercidis* is directly related to these two Ranunculaceae feeders.

The small but distinct differences in the external morphology of the adults of *anthocercidis* and *ranunculi*, and in their puparia, preclude the possibility that *anthocercidis* is derived from an introduced population of *ranunculi*.

P. anthocercidis is substantially smaller than *ranunculi* (average wing length 2.6 mm in male, 2.8 mm in female), the orbital setulae are more sparse, there appears to be always only a single ors (normally a small, second present in *ranunculi*) and in *ranunculi* the second costal section is longer, normally about 3.3 times the fourth. In the larva (and puparium) the posterior spiracles are on widely diverging projections in *ranunculi*, close together and almost parallel in *anthocercidis*.

It seems certain that *anthocercidis* must have evolved from an ancestral population related to *ranunculi* but it is puzzling that no leaf-mining species on *Ranunculus* is known in Australia. I had originally identified as *ranunculi* the 2 specimens seen from Mt Chudalup and Nedlands, and also the further female I caught north of Mandurah on 26 September. After finding the long series at Windy Harbour I realized that my earlier identification must be incorrect. I then assumed that the only host was *Anthocercis littorea* and that the species would be restricted to coastal areas. It therefore seemed puzzling that a specimen should have been found some 26 km north of Mandurah in a patch of damp bush 15 km from the coast where *A. littorea* would not be expected to occur. I returned to the locality at the end of November and was pleased to discover several bushes of *Anthocercis littorea*, with numerous leaf-mines.

Ten *Anthocercis* species are known in Australia and it seems possible that *anthocercidis* feeds on all or most of them and will prove to be widespread in association with this genus.

Phytomyza clematidicola Spencer, 1963

(Figs 358-362)

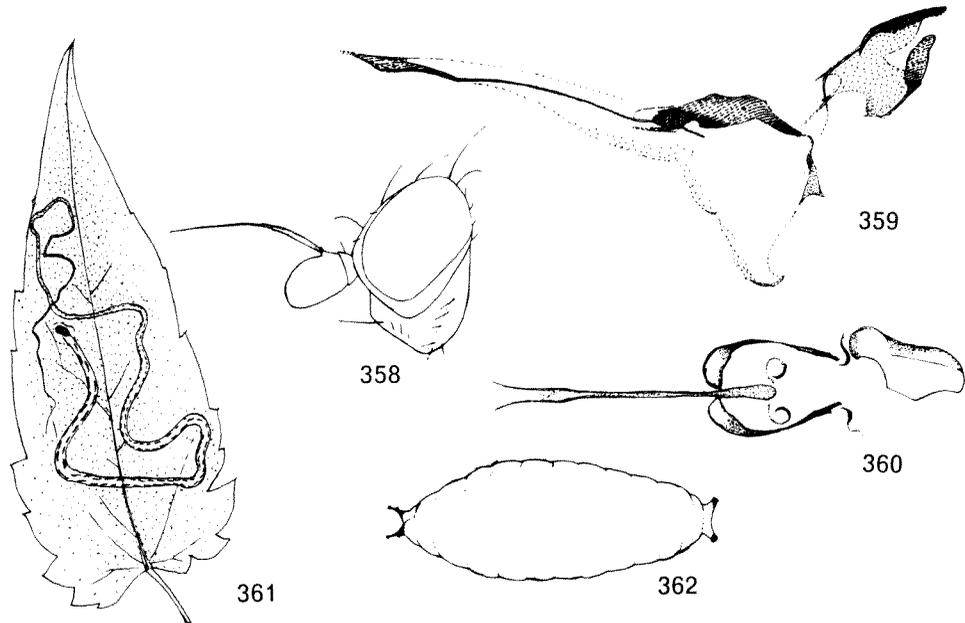
Phytomyza clematidicola Spencer, 1963a: 337.

Holotype ♂ from Bull's Head, A.C.T. bred from *Clematis aristata* in ANIC.

This is the only Australian species with the scutellum dark, having the femora entirely bright yellow. It is larger than was suggested by the 2 type specimens. The wing length ranges from 2.2-2.3 mm in the male to 2.8 mm in the female. The third antennal segment is conspicuously elongate (Fig. 358). The aedeagus is shown in Figs 359, 360. The larva forms an upper surface leaf-mine (Fig. 361), pupating in the leaf. The puparium (Fig. 362) is distinctly more elongate than that of *vitalbae* which occurs on the same host and pupates externally.

The male from Qld. varies from the typical form in having the mesopleura suffused with orange-yellow and not pale only along the upper margin. However, the genitalia indicate that there is no justification for giving this specimen specific status.

The wide range of this species throughout much of Australia is noteworthy and it is obviously able to follow its hosts in a variety of environmental conditions. Although it has only been found in association with *Clematis aristata* and *C. pubescens*, it will almost certainly feed on other *Clematis* spp. In W.A. *C. pubescens* is widespread in



Figs 358-362: *Phytomyza clematidicola*: 358, head; 359, aedeagus, side view; 360, same, ventral view; 361, leaf-mine on *Clematis aristata*; 362, puparium.

damp, shady areas in karri forests but also occurs in entirely open areas, including sand-dunes (Hopetoun). Records of *clematidicolla* are given below from 7 localities south of Perth; although it is thus present throughout the S.W. corner of W.A., more detailed information on its exact distribution is necessary. During my recent collecting it was confused with the even commoner *vitalbae* and I failed to realize that the 2 species were present. They frequently occur together, even on the same plant.

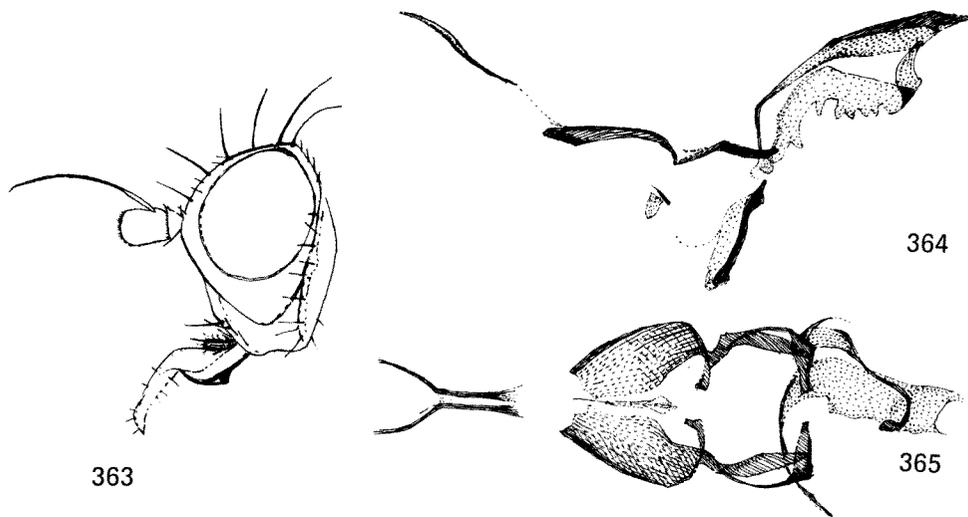
Material seen

Qld. Big Mitchell Creek, Mareeba—Molloy Rd., 1♂, 4.v.67 (D.H.C.). N.S.W. 44 km N.W. of Narrandera, 1♀, 2.iv.75 (Z.L.); Ulladulla Beach, 1♀, 1.x.71 (Z.L.). Vic. Bright, '*Clematis*', 3♂, 24.ii.49 (E.F.R.); 47 km N.W. of Hopetoun, 1♂, 6.ix.74 (Z.L.). S.A. Yumali, 2♂, 4♀, 8.viii.68 (Colless & Liepa). W.A. 4.8 km S.W. of Karridale, 1♀, 3.x.70; Mt Frankland, N. of Nornalup, 1♂, 7.x.70; Pimelia, near Pemberton, 2♂, 5.x.70; Porongurup National Park, 1♂, 11.x.70 (all D.H.C.); Bunker Bay, S. of Dunsborough, 1♂, 27.ix.75, on *Clematis pubescens*; Porongurup, 1♂, 13.x.75; Twilight Bay, Esperance, 2♂, 3♀, on same host, 18.x.75; Hamelin Bay, W. of Augusta, 2♂, on host, 19.xi.75 (all K.A.S.).

Phytomyza placita sp.n.

(Figs 363-365)

Head (Fig. 363): frons broad, slightly more than twice width of eye; orbits strongly differentiated, conspicuously projecting above eye; 2 equal, reclinate ors, 2 incurved ori, the lower weaker; orbital setulae sparse; jowls broad, 1/3 height of eye, cheeks forming broad ring below eye; third antennal segment elongate; proboscis elongate.



Figs 363-365: *Phytomyza placita*: 363, head; 364, aedeagus, side view; 365, same, ventral view.

Mesonotum: 3+1 strong dc, the fourth little shorter than third; acr irregularly in 2 rows, extending only midway between third and second dc.

Wing: length in male 2.2 mm, second costal section short, 1 1/2 times length of fourth.

Colour: frons pale brown, orbits entirely yellow, but black above upper ors; both vt on black; cheeks, jowls and face yellow, palps black; first and second antennal segments yellowish, third black; mesonotum and scutellum entirely mat, ash-grey; pleura greyish-black, only upper margin of mesopleura narrowly yellow; legs: fore-coxae and all knees yellow, otherwise black; squamae yellowish-grey, margin and fringe ochrous; abdomen black.

Male genitalia: aedeagus as in **Figs 364, 365**; postgonites ending in conspicuous hook; ejaculatory apodeme with large blade.

Holotype ♂, A.C.T. Peter's Camp, 3.2 km E. of Mt Coree, 13.i.69 (Z.L.), in ANIC.

Remarks

The genitalia indicate a close relationship between this species and *clematidicolla*. However, *placita* is immediately distinguishable by the long proboscis and unusually elongate third antennal segment.

Phytomyza plantaginis Robineau-Desvoidy, 1851

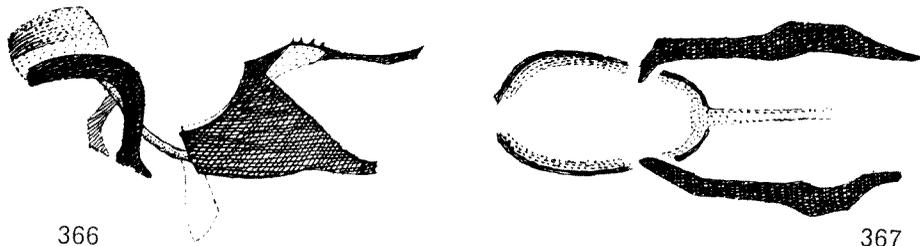
(Figs 366, 367)

Phytomyza plantaginis Robineau-Desvoidy, 1851: 404.

Types from France lost.

Distinctive characters of this species are the slightly enlarged, quadrate third antennal segment, the almost complete lack of acrostichals with at most one or 2 present, the ash-grey mesonotum and the yellow fore-coxae.

The frons is normally bright yellow. However, a unique, apparently melanic form has developed in Australia. This was first noted in the bred series from Apollo Bay, Tas; in 5 of the 7 specimens seen the frons is dark brown and both orbits and jowls are silvery-grey but the other 2 have the typical yellow frons and orbits. The specimen from



Figs 366, 367: *Phytomyza plantaginis*: 366, aedeagus, side view; 367, same, ventral view.

Bungendore, N.S.W., is identical with the dark Tas. form, while the one from Wyperfeld National Park, Vic. has the frons and orbits entirely black. All other specimens seen are the typical pale form.

Reproduction is frequently parthenogenetic (cf. Frick, 1951). Two bred series have been examined from Tas., consisting of 16 females, and the numerous specimens recently found in W.A. were also all females. The aedeagus of a male from Europe is shown in Figs 366, 367.

P. plantaginis closely resembles *P. venerabilis* described below from Qld. and S.A. and is distinguishable only by the less elongate third antennal segment. The male genitalia show that the 2 species belong in different groups, despite their superficial similarity.

P. plantaginis is common in Europe and has also been recorded from Japan, U.S.A. and New Zealand. It has presumably been introduced into Australia and New Zealand independently.

Material seen

N.S.W. 6.4 km S. of Coolongalook, near Nabiac, 1♀, 21.v.66 (Z.L.); 16 km E. of Bungendore, 1♀, 10.xi.73 (Z.L.); Cabbage Tree Creek, 1♀, 4.xi.75 (K.A.S.). A.C.T. Black Mt. light trap, 1♀, 13.ix.61 (I.F.B.C.); A.N.U. Campus, 2♀, 1.xi.75 (K.A.S.). Vic. Apollo Bay, 1♀, 1.i.67 (Z.L.); Melton, 1♀, 27.xi.48 (E.F.R.); Wyperfeld National Park, 51 km N.W. of Hopetoun, 1♀, 4-7.ix.74 (Z.L.). Tas: 9.6 km E. of Launceston, bred ex *Plantago*, 9♀, 8.i.49 (E.F.R.); Port Arthur, 7♀, bred ex *Plantago*, 20.i.49 (E.F.R.). W.A. 17 km N. of Augusta, 1♀, emerged 15.x. from leaf-mine on *Plantago lanceolata* coll. 1.x.75; Bridgetown, 1♀, 20.x. ex leaf-mine coll. 3.x.75; Porongurups, 1♀, 11.x.75 (destroyed by ants); Nannup, 1♀, 28.ix.75 (all K.A.S.).

Phytomyza pulchella sp.n.

(Figs 368, 369)

Large species with dark scutellum and black femora.

Head: frons broad, almost twice width of eye, narrowly projecting above eye in profile; 2 equal ors, 2 ori (lower on one side greatly reduced); orbital setulae well-developed, in single row; jowls deeply extended at rear, little less than 1/2 height of eye, cheeks broad; eye almost round; third antennal segment large, longer than broad; proboscis short, normal.

Mesonotum: 3+1 strong dc, acr sparse, in 2 rows, only present between third and fourth dc.

Wing: length in male 2.7-2.8 mm, second costal section short, little less than twice length of fourth.

Colour: frons dull orange-yellow; hind-margin of eye black to base of vti; first and second antennal segments orange, third orange-yellow on inside, more greyish on outside; mesonotum and scutellum uniformly mat grey; sides of thorax black, only upper margin of mesopleura narrowly bright yellow.

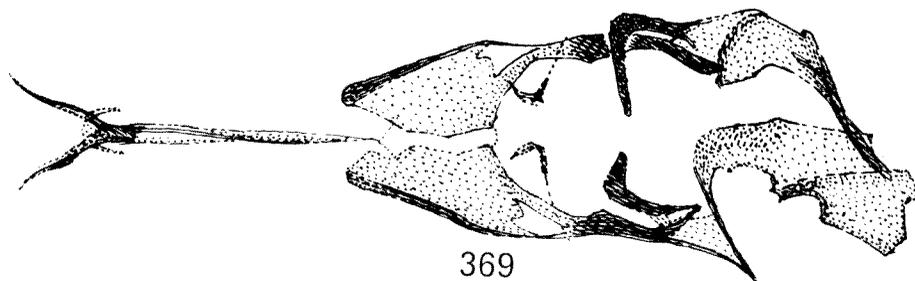
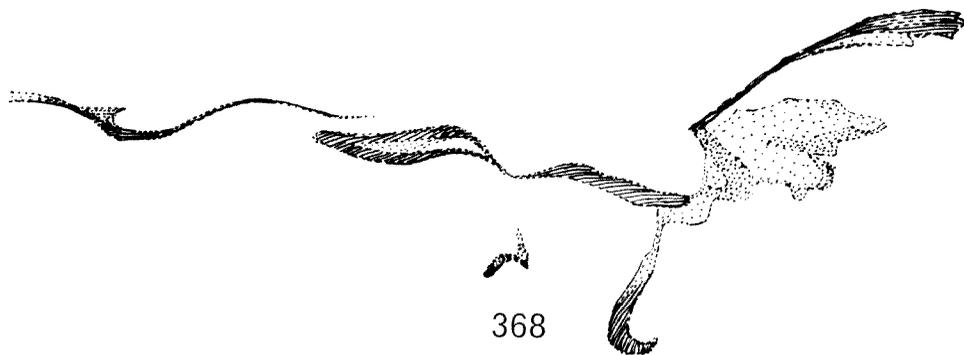
Legs: fore-coxae bright yellow, mid and hind-coxae more black; all femora black but knees broadly yellow on all legs, tibiae and tarsi largely black; abdomen with all tergites narrowly yellow-bordered, more broadly yellow at sides; wing base bright yellow; squamae and margin yellow, fringe dark; halteres yellow.

Male genitalia: aedeagus as in Figs 368, 369; ejaculatory apodeme with large, wide blade and small, bowl-shaped base.

Holotype ♂, S.A. Mt Bonython, near Mt Lofty, 12.iv.61 (D.K.M.), in AM.

Remarks

The male genitalia indicate the close relationship of this species with *clematidicolla* and *placita* sp.n. and its host will almost certainly be in the Ranunculaceae.



Figs 368, 369: *Phytomyza pulchella*: 368, aedeagus, side view; 369, same, ventral view.

Phytomyza ranunculicaulis sp.n.

(Figs 370-372)

Head (Fig. 370): frons broad, twice width of eye, narrowly but distinctly projecting above eye in lower half; 2 ors, equal or the upper slightly stronger, normally only a single inclined ori but in largest females sometimes 2; orbital setulae sparse, proclinate; jowls deeply extended at rear, little less than 1/2 height of eye; third antennal segment conspicuously longer than broad.

Mesonotum: 3+1 strong dc, third and fourth equal, little shorter than second; acr normally lacking, sometimes up to 3 hairs present.

Wing: length from 2.1 mm in male to 2.6 mm in female; second costal section short, 1 3/4 times length of fourth.

Colour: frons yellowish-orange in front, darker, brownish-orange above; orbits paler, yellow; jowls and face yellow; third antennal segment entirely black, first and second yellowish; palps black; mesonotum mat, ash-grey; sides of thorax grey, with only upper margin of mesopleura narrowly yellow; scutellum uniformly grey. Legs: fore-coxae largely bright yellow, greyish basally, on P₂, P₃ almost entirely grey; all femor black, with yellow knees; tibiae and tarsi black; abdomen largely greyish-black but all tergites narrowly yellow-bordered and yellow laterally; basal cone of ovipositor grey-dusted basally, more shining towards apex; squamae yellowish-grey, fringe dark. Male genitalia: aedeagus as in Figs 371, 372, basal sclerites asymmetrical, ventral lobes (hypophallus) equal, membranous where joining front ends of basal sclerites; medial lobes each narrowly divided near apex; distiphallus with small divided sclerotized section at apex and with a long membranous connection to the small basal section lying between the medial lobes; arms of ninth sternite narrow, somewhat elongate, eighth sternum represented by a narrow sclerotized strip adjoining the epandrium (cf. Griffiths, 1972:Fig. 120; Spencer, 1976c: Fig. 623).

Host-plant/Biology: *Ranunculus colonorum*, larva feeding and pupating within the stem; several puparia can be found together, normally immediately below a node; the slender puparium is brown, white after emergence; the posterior spiracles are on two conical projections each with an irregular ellipse of some 12 bulbs.

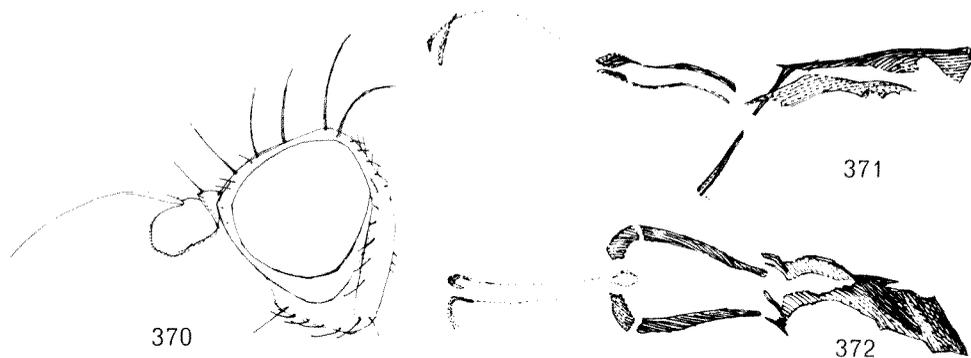
Holotype ♂, W.A: Mt Chudalup, S. of Northcliffe, 5.x.75, on *Ranunculus colonorum*; paratypes: 2♀, same data; Porongurups, 2♂, 2♀, 11 and 13.x.75, on same host; Yallingup, 4♀, 13.x.75; Mt Chudalup, 1♂ (damaged by ants), emerged 25.xi. from puparium coll. 22.x.75. Holotype and paratypes in WAM, 2 paratypes in ANIC, 2 in AC.

Remarks

It was previously thought that the presence of the vestigial eighth sternum was a diagnostic character of the genus *Napomyza* and this provided the justification for transferring the well-known holarctic species *nigritula* Zetterstedt (= *cineracea* Hendel,

1920) from *Phytomyza* to *Napomyza* (Spencer, 1976c: 341). *N. nigrifula* closely resembles *ranunculicaulis* and also feeds in stems of *Ranunculus* spp. However, the genitalia clearly associate *ranunculicaulis* with a group of *Phytomyza* species feeding on *Ranunculus* either as leaf-miners, in stems or in flower-heads. Three such species are known in New Zealand—*costata* Harrison, 1959, a leaf-miner; *lyalli* Spencer, 1976b, feeding primarily in the flower-stalks of *R. lyallii* but also occasionally causing leaf-mines; and *improvisa* Spencer, 1976b, which is certainly an internal feeder in *Ranunculus*, although the early stages have not been found.

It seems probable that *ranunculicaulis* or its ancestral population provided the ancestor of the stem-feeding species in New Zealand. No relative of *ranunculicaulis* is known in S.E. Asia but it is highly probable that such a species will be present on the mountains of Sumatra, Borneo or New Guinea.



Figs 370-372: *Phytomyza ranunculicaulis*: 370, head; 371, aedeagus, side view; 372, same, ventral view.

Phytomyza syngenesiae (Hardy, 1849)

(Figs 373, 374)

Chromatomyia syngenesiae Hardy, 1849; Griffiths, 1974: 37.

Phytomyza syngenesiae, Griffiths, 1967: 177.

Phytomyza atricornis Meigen, 1830 of auctt., p.p.

Neotype ♂ from Ireland, designated by Griffiths, 1967: 177; type locality Scotland.

Studies by Griffiths (1967) on this group led to the splitting of the species previously known as *atricornis* Mg. into a pair of sister-species, *syngenesiae* (Hardy) and *horticola* Goureaux. Only *syngenesiae* is known in Australia, certainly representing an introduction from Europe.

P. syngenesiae can be briefly described as follows: frons broad, twice width of eye, not significantly projecting above eye in profile; 2 short equal ors, one incurved ori; jowls

deep, up to 1/3 height of eye, cheeks forming distinct ring below eye; third antennal segment small, round; mesonotum with 3+1 strong dc; acr lacking, rarely 1 or 2 isolated hairs present; wing length 2.2-2.6 mm, second costal section short, 1 2/3-2 times length of fourth; colour: frons yellow or orange, orbits invariably paler; face greyish-black; third antennal segment black, first and second slightly yellowish; mesonotum conspicuously ash-grey, pleura blackish-grey, mesopleura with upper margin only narrowly yellow; legs: including fore-coxae, black, with all knees bright yellow; squamae yellow, margin and fringe black.

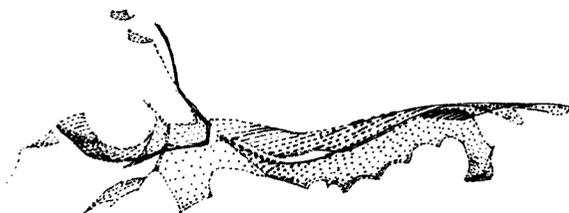
Male genitalia: distal section of aedeagus a single membranous tubule, supporting sclerites above, slender, diverging apically (Figs 373, 374).

P. syngenesiae occurs most frequently on Composite hosts and, although some records from other families are known, none have been confirmed in Australia. It is common in some parts of N.S.W. and A.C.T. and is known from Qld. to Tas. The first records for W.A. are given below. It is common in New Zealand and a single male has been seen from Lord Howe Is.

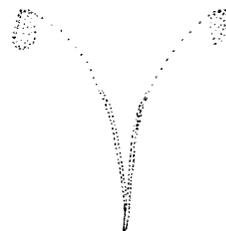
Griffiths (1974) has revived the generic name *Chromatomyia* to include *syngenesiae*. This is based primarily on characters of the male genitalia and partly also on the method of pupation within the leaf. If this process is continued and every group within *Phytomyza* showing a distinctive arrangement of the male genitalia is given generic status, it can only lead to great confusion, with the impossibility of giving females even a generic name. I therefore propose to retain *syngenesiae* in *Phytomyza* in this paper.

Material seen

Qld. Brisbane, 2♂, 2♀, 21.x.48, ex *Sonchus megalocarpus* Hook f. (E.F.R.); Catin, 'mining milk thistle', 3♂, 3♀, 22.x.48; Toowomba, ex same host, 2♂, 2♀, 21.x.48 (all E.F.R.). N.S.W. Bateman's Bay, leaf-mines on *Senecio linearifolius*, 3.xi.75 (K.A.S.). S.A. Old Alton Downs, Simpson Desert, 1♂, 19.ix.72 (Z.L.); Mt Lofty, near Adelaide, 2♀, also leaf-mines, on *Senecio hypoleucus*, 11.xi.75 (K.A.S.). W.A. Perth, 1♂, emerged 10.x.75 ex *Sonchus oleraceus* coll. 29.ix.75; Esperance, leaf-mines on *Sonchus*, 18.x.75; Cape Leeuwin, Augusta, leaf-mines on *Senecio ramosissimus*, 18.xi.75 (K.A.S.).



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374

Figs 373, 374: *Phytomyza syngenesiae*: 373, aedeagus, side view; 374, same, ventral view.

Phytomyza venerabilis sp.n.

(Figs 375, 376)

Head: frons broad, twice width of eye, narrowly projecting above eye in profile; 2 slender, equal ors, one similar incurved ori; orbital setulae all proclinate; eye conspicuously slanting; jowls extended at rear, 1/2 vertical height of eye, cheeks forming broad ring below eye; third antennal segment unusually elongate; proboscis short, normal.

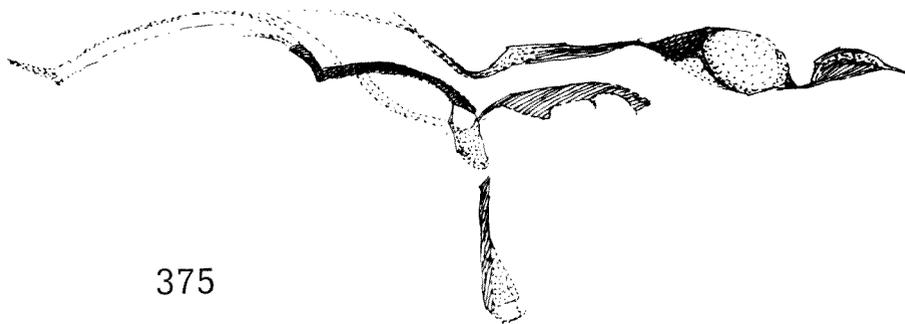
Mesonotum: 3+1 dc, acr lacking.

Wing: length in male from 1.7 to 1.9 mm, in female 2.5 mm, second costal section slightly more than 1 1/2 times length of fourth.

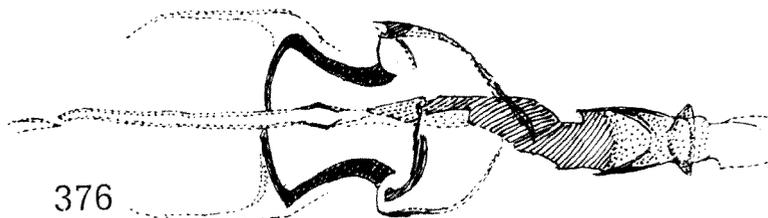
Colour: frons orange-yellow, orbits paler yellowish; jowls and face yellow but antennal pits may be faintly grey; first and second antennal segments yellowish, third black; palps black, mesonotum and scutellum ash-grey, pleura similar, but mesopleura narrowly yellow in upper, hind-corner.

Legs: only fore-coxae yellow, femora with all knees yellow, legs otherwise black; abdomen greyish-black, with all tergites narrowly yellow-bordered, squamae yellow, margin and fringe ochrous.

Male genitalia: aedeagus as in Figs 375, 376; distiphallus entirely membranous, projecting beyond 2 strongly chitinized lateral sclerites; ventral lobes (hypophallus) forming a complete loop.



375



376

Figs 375, 376: *Phytomyza venerabilis*: 375, aedeagus, side view; 376, same, ventral view.

Holotype ♂, Qld. Yeppoon, N.E. of Rockhampton, 7.v.70 (Z.L.); paratypes: Yumali, S.A., 1♂, 1♀, 8.viii.68 (Collless & Liepa), in ANIC.

Remarks

Among Australian species, *venerabilis* very closely resembles *plantaginis* and is only distinguishable by the more elongate third antennal segment. It will almost certainly prove to have a host in the Scrophulariaceae.

Phytomyza vitalbae Kaltenbach, 1874

(Figs 377, 378)

Phytomyza vitalbae Kaltenbach, 1874: 4.

Types from Germany auctioned in London in 1880, now lost.

This is a distinctive species, with the scutellum narrowly yellow centrally, the third antennal segment large and round, acr present in 2 rows and the femora striated, yellow and black. The aedeagus is shown in Fig. 377.

The larva forms a conspicuous white leaf-mine (Fig. 378) pupating externally and this enables *vitalbae* to be distinguished from *clematidicola* which pupates in the leaf.

Known distribution in Australia was previously limited to N.S.W. and A.C.T. The present records from Tas. and W.A. represent a significant extension of its range. In the northern hemisphere, *vitalbae* is common in Europe and also occurs in Japan and Canada. It can only have reached Australia as an introduction from Europe.



Figs 377, 378: *Phytomyza vitalbae*: 377, aedeagus; 378, leaf-mine on *Clematis pubescens*.

Material seen

N.S.W: Clyde Mt, landslip, 1♀, 22.ii.65 (D.H.C.); Mt Dromedary, 304 m, 1♀, 24.xi.65 (I.F.B. & M.S. Upton); Macquarie Pass, light trap, 1♀, 9.x.69 (Common & Upton). A.C.T: Black Mt, light trap, 1♀, 15.xi.63 (I.F.B.C.): Mt Franklin, 1♂, 2♀, 2.iii.49 (E.F.R.) Vic. Cape Bridgewater, 1♀, 25.vii.53 (A. Neboiss). Tas. Helyer Gorge, 3♂, 2♀, 30.i.49 ex *Clematis* sp. (E.F.R.). W.A. Channybearup, near Pemberton, 1♂, 5.x.70; 14 km of Pemberton, 2♀, 4.x.70; Pimelia, near Pemberton, 5.x.70 (all D.H.C.); Bunker Bay, S. of Dunsborough, 1♂, 27.ix.75; Yallingup, 2♂, emerged 20.x. ex mines on *Clematis pubescens* coll. 28.ix.75; 3♀, 28.ix., on host; Mammoth Cave, N. of Yallingup, 1♂, emerged 20.x. ex mine coll. 29.ix.; 17 km N. of Augusta, on host, 2♂, 1.x.75; William Bay, W. of Denmark, 1♂, 8.x.75; Twilight Cove, Esperance, 2♂, 1♀, on host, 18.x.75; 7 km N. of Hamelin Bay, W. of Augusta, on host, 1♀, 19.xi.75; Rainbow Trail, Pemberton, 1♂, 21.xi.75 (all K.A.S.).

Many other specimens were seen at most of these localities.

Unidentified species

1. Leaf-miner on *Billardiera scandens*.

Irregular linear mines (Fig. 379) have been found at National Park, south of Sydney, at Careel Bay, north of Sydney (K.A.S.) and at Hornsby, N.S.W. (A. Dyce). The larva leaves the mine to pupate and the puparium is brown. This is certainly a *Liriomyza*, possibly *obscurata* (see p. 204).

2. Leaf-miner on *Bursaria spinosa*.

Small, brownish blotch mines at the tips of the leaves were found in the Botanical Gardens, Canberra on 7.ii.75 (K.A.S.). The species is almost certainly a *Liriomyza*.

3. Stem-borer in *Cassinia aureonitens*.

A single empty puparium was found in this host at National Park, south of Sydney on 29.i.61 (K.A.S.). The posterior spiracles (Fig. 380) each have an ellipse of 4 or 5 bulbs and a small black horn is present. This is a *Melanagromyza* and the species has in all probability been described from caught specimens.

4. Leaf-miner on *Cassinia aureonitens* and *Helichrysum dendroideum*.

Empty mines were found on *Cassinia* on 29.i.61 at National Park, south of Sydney, N.S.W. The mine (Fig. 381) starts as a narrow channel with frass in distinct strips at alternate sides; in the second instar the mine greatly widens and the frass is deposited in larger black lumps.

Similar mines were found on *Helichrysum* on 9.ii.61 at Ferntree Gully, near Melbourne, Vic.

5. Leaf-miner on *Desmodium polycarpum*.

These linear-blotch mines (Fig. 382) were found at Mt Coot-tha, Brisbane on 22.i.61 (K.A.S.) and are distinctive, filled with bluish frass. The black puparium remains in the mine. The species can only be an *Ophiomyia* in the *pisi* group (see p.120).

6. Leaf-miner on *Oplismenus compositus*.

Mines with larvae were found at Cabbage Tree Creek, Clyde Mt, N.S.W. on 5.ii.61 (K.A.S.) The mines form a greenish blotch (Fig. 383), the larva pupates externally and the puparium (Fig. 384) is reddish-brown. This can only represent an *Agromyza* sp., possibly *mellita* sp.n. (p. 120).

7. Leaf-mines on *Senecio* sp.

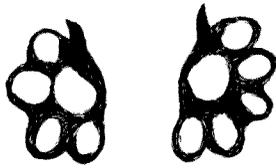
These (Fig. 385) were found at East Slope, Clyde Mt, N.S.W. on 5.ii.61 (K.A.S.). The puparium is shining reddish-brown, relatively short and broad, with distinct segmentation; one was found in the mine but other mines were empty. The genus of this species is uncertain.

8. Leaf-mines on *Sollya heterophylla*.

Empty leaf-mines were found at Mt Chudalup, south of Northcliffe, W.A. on 5.x.75 (K.A.S.). The mine (Fig. 386) is irregularly linear, with a central band of diffused black frass. Only a single plant was seen. This was revisited on 22.xi.75 but no fresh mines could be found.



Fig. 379: *Billardiera scandens*: leaf-mines, National Park, N.S.W.



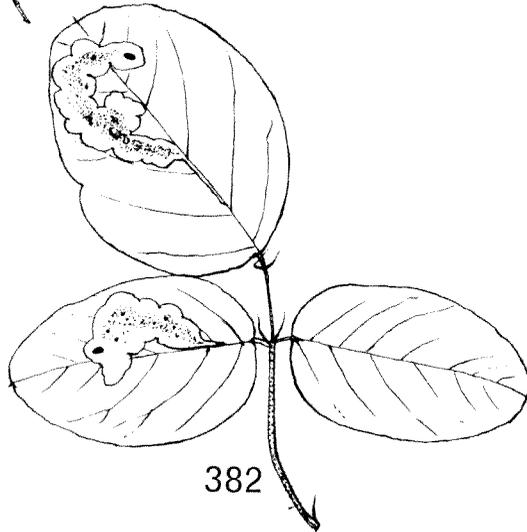
380

Fig. 380: *Cassinia aureonitens*: posterior spiracles of puparium from National Park, N.S.W.



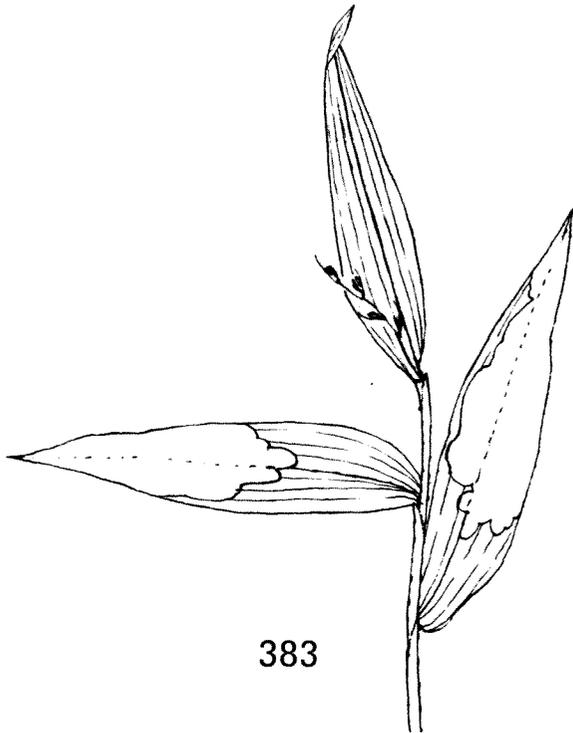
Fig. 381: *Cassinia aureonitens*: leaf-mine, National Park, N.S.W.

381

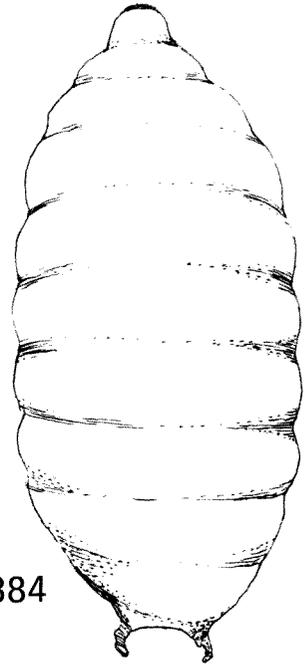


382

Fig. 382: *Desmodium polycarpum*: leaf-mines, Brisbane, Qld.

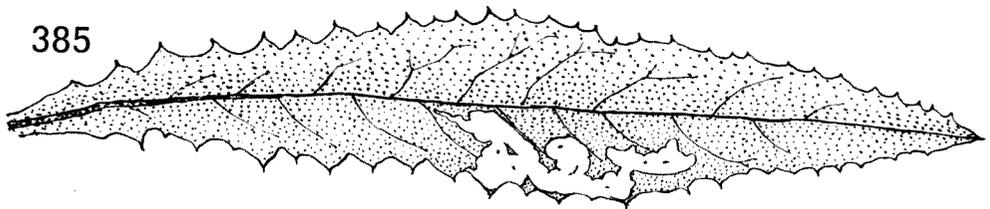


383



384

Figs 383, 384: *Oplismenus compositus*: 383, leaf-mines, Clyde Mt, N.S.W; 384, puparium.



385

Fig. 385: *Senecio* sp: leaf-mine, Clyde Mt, N.S.W.



386

Fig. 386: *Sollya heterophylla*: leaf-mine, Mt Chudalup, W.A.

Host-list of Australian Agromyzidae

Families and genera are arranged alphabetically rather than botanically within the Monocotyledones and Dicotyledones.

MONOCOTYLEDONES

Juncaceae

Juncus pallidus R. Br.

Cerodontha (*Icteromyza*)
triplicata

Liliaceae

Dianella caerulea Sims

Ophiomyia dianellae

Eustrephus latifolius R. Br.

var. *angustifolius* (R. Br.) Benth.

Tropicomyia polyphyta

Smilax australis L.

Tropicomyia polyphyta

Orchidaceae

Dipodium punctatum R. Br.

Melanagromyza dipodii

Poaceae

Brachiaria miliformis (Presl.) Chase

Pseudonapomyza ? *spinosa*

Eleusine indica (L.) Gaertn.

Pseudonapomyza spinosa

Oplismenus compositus (L.) Beauv.

Agromyza sp.

DICOTYLEDONES

Apocynaceae

Plumeria rubra L.

Tropicomyia polyphyta

Asclepiadaceae

Marsdenia rostrata R. Br.

Tropicomyia polyphyta

Tylophora barbata R. Br.

Tropicomyia polyphyta

Asteraceae

Ageratum conyzoides L.

Melanagromyza metallica

Aster subulatus Michx.

Calycomyza humeralis

Bidens pilosa L.

Melanagromyza metallica

Cassinia aculeata R. Br.

Liriomyza cassiniae

C. aureonitens N.A. Wakefield

? *Liriomyza* sp.

C. quinquefaria R. Br.

Liriomyza cassiniae

Cassinia sp.

? *Liriomyza* sp.

Chrysanthemum atratum L.

Ophiomyia compositicaulis

C. maximum Ramond

Phytomyza syngenesiae

Chrysanthemum sp.

Melanagromyza seneciophila

Cirsium vulgare (Savi) Ten.

Phytomyza syngenesiae

Coreopsis sp.

Phytomyza syngenesiae

Cymbonotus lawsonianus Gaudich.

Ophiomyia cymbonoti

Erigeron bonariensis L.

Calycomyza humeralis

E. floribundus Sch. Bip.

Calycomyza humeralis

Gnaphalium luteoalbum L.

Melanagromyza seneciophila

Helichrysum bracteatum (Vent.) Andr.

Liriomyza helichrysi

<i>H. cordatum</i> DC.	<i>? Liriomyza</i> sp.
<i>H. dendroideum</i> N.A. Wakefield	<i>Melanagromyza seneciophila</i>
<i>H. ramosum</i> DC.	<i>Phytomyza syngenesiae</i>
<i>H. rutidolepis</i> DC.	<i>Liriomyza oleariana</i>
<i>Olearia axillaris</i> F. Muell.	<i>Phytomyza syngenesiae</i>
<i>Senecio cruentis</i> DC.	<i>Phytomyza syngenesiae</i>
<i>S. dryadeus</i> Sieb. ex Spreng.	<i>Melanagromyza seneciophila</i>
<i>S. hypoleucus</i> F. Muell.	<i>Phytomyza syngenesiae</i>
 	<i>Phytomyza syngenesiae</i>
<i>S. lautus</i> Forst. f. ex Willd.	<i>Phytomyza syngenesiae</i>
<i>S. linearifolius</i> A. Rich.	<i>Phytomyza syngenesiae</i>
<i>S. minimus</i> Poir.	<i>Phytomyza syngenesiae</i>
<i>S. pterophorus</i> DC.	<i>Melanagromyza ? seneciophila</i>
 	<i>Phytomyza syngenesiae</i>
<i>S. quadridentatus</i> Labill.	<i>Melanagromyza seneciophila</i>
<i>S. ramosissimus</i> DC.	<i>Melanagromyza seneciophila</i>
 	<i>Phytomyza syngenesiae</i>
<i>S. vagus</i> F. Muell.	<i>Melanagromyza seneciophila</i>
<i>Siegesbeckia orientalis</i> A. Gray	<i>Ophiomyia conspicua</i>
<i>Sonchus asper</i> (L.) Hill	<i>Phytomyza syngenesiae</i>
<i>S. megalocarpus</i> Hook. f.	<i>Phytomyza syngenesiae</i>
<i>S. oleraceus</i> L.	<i>Phytomyza syngenesiae</i>
<i>Vernonia cinerea</i> Less.	<i>Ophiomyia atralis</i>
Bignoniaceae	
<i>Kigelia pinnata</i> DC.	<i>Tropicomyia polyphyta</i>
Capparaceae	
<i>Gynandropsis speciosa</i> L.	<i>Liriomyza brassicae</i>
<i>Isomeris arborea</i> Cav.	<i>Liriomyza brassicae</i>
Caprifoliaceae	
<i>Lonicera periclymenum</i> L.	<i>Tropicomyia polyphyta</i>
Caryophyllaceae	
<i>Cerastium holosteoides</i> Fries	<i>Liriomyza chenopodii</i>
<i>Silene gallica</i> L.	<i>Liriomyza chenopodii</i>
<i>Stellaria media</i> (L.) Vill.	<i>Liriomyza chenopodii</i>
Celastraceae	
<i>Celastrus subspicatus</i> Hook.	<i>Tropicomyia polyphyta</i>
Chenopodiaceae	
<i>Beta vulgaris</i> L.	<i>Liriomyza chenopodii</i>
<i>Chenopodium album</i> L.	<i>Liriomyza chenopodii</i>
<i>Spinacia oleracea</i> L.	<i>Liriomyza caulophaga</i>
Combretaceae	
<i>Quisqualis indica</i> L.	<i>Tropicomyia polyphyta</i>
Cruciferae	
<i>Brassica caulorapa</i> Pasq.	<i>Liriomyza brassicae</i>

<i>B. chinensis</i> L.	<i>Liriomyza brassicae</i>
<i>B. oleracea</i> L., var. <i>botrytis</i> L. var. <i>capitata</i> L.	<i>Liriomyza brassicae</i>
<i>B. rapa</i> L.	<i>Liriomyza brassicae</i>
<i>Cardamine hirsuta</i> L.	<i>Liriomyza brassicae</i>
<i>Cheiranthus cheiri</i> L.	<i>Liriomyza brassicae</i>
<i>Coronopus didymus</i> (L.) Sm.	<i>Liriomyza brassicae</i>
<i>Diplotaxis muralis</i> (L.) DC.	<i>Liriomyza brassicae</i>
<i>Lepidium hyssopifolium</i> L.	<i>Liriomyza brassicae</i>
<i>Lobularia maritima</i> Desv.	<i>Liriomyza brassicae</i>
<i>Matthiola incana</i> (L.) R. Br.	<i>Liriomyza brassicae</i>
<i>Raphanus raphanistrum</i> L.	<i>Liriomyza brassicae</i>
<i>R. sativus</i> L.	<i>Liriomyza brassicae</i>
<i>Sisymbrium orientale</i> L.	<i>Liriomyza brassicae</i>
Euphorbiaceae	
<i>Acalypha wilkesiana</i> Muell. Arg.	<i>Tropicomyia polyphyta</i>
<i>Antidesma bunius</i> (L.) Spreng.	<i>Japanagromyza kalshoveni</i>
<i>Breynia oblongifolia</i> Muell. Arg.	<i>Tropicomyia polyphyta</i>
<i>Euphorbia pulcherrima</i> Willd.	<i>Tropicomyia polyphyta</i>
Goodeniaceae	
<i>Goodenia ovata</i> Sm.	<i>Ophiomyia cornuta</i>
<i>Scaevola crassifolia</i> Labill.	<i>Liriomyza scaevolae</i>
<i>S. nitida</i> R. Br.	<i>Liriomyza scaevolae</i>
<i>Scaevola</i> spp.	<i>Ophiomyia cornuta</i>
Lecythidaceae	
<i>Barringtonia gracilis</i> (Miers.) Kunth	<i>Tropicomyia polyphyta</i>
Malpighiaceae	
<i>Heteropteris nitida</i> Kunth in H.B. & K.	<i>Tropicomyia polyphyta</i>
Meliaceae	
<i>Melia azedarach</i> L. var. <i>australasiaca</i> C.DC.	<i>Tropicomyia polyphyta</i>
Menispermaceae	
<i>Stephania japonica</i> (Thunb.) Miers.	<i>Tropicomyia polyphyta</i>
Monimiaceae	
<i>Doryphora sassafras</i> Endl.	<i>Tropicomyia polyphyta</i>
Moraceae	
<i>Cudrania javanensis</i> Trec.	<i>Tropicomyia polyphyta</i>
Myrtaceae	
<i>Angophora intermedia</i> DC.	<i>Tropicomyia polyphyta</i>
<i>Eucalyptus camaldulensis</i> Dehnhardt	<i>Japanagromyza eucalypti</i>
Papilionaceae	
<i>Alysicarpus vaginalis</i> DC.	<i>Ophiomyia alysicarpi</i>
<i>Cajanus indicus</i> Spreng.	<i>Melanagromyza obtusa</i>
	<i>Melanagromyza sojae</i>

<i>Cajanus</i> spp.	<i>Ophiomyia phaseoli</i>
<i>Cassia bicapsularis</i> L.	<i>Tropicomyia polyphyta</i>
<i>C. coluteoides</i> Collad.	<i>Tropicomyia polyphyta</i>
<i>Crotalaria</i> spp.	<i>Ophiomyia phaseoli</i>
<i>Desmodium polycarpum</i> DC.	<i>Ophiomyia</i> sp.
<i>Dolichos</i> spp.	<i>Ophiomyia phaseoli</i>
<i>Erythrina crista-galli</i> L.	<i>Tropicomyia polyphyta</i>
<i>Glycine clandestina</i> Wendl.	<i>Melanagromyza</i> ? <i>pseudograta</i>
<i>Glycine</i> spp.	<i>Melanagromyza sojae</i>
	<i>Ophiomyia centrosematis</i>
	<i>Ophiomyia phaseoli</i>
<i>Indigofera australis</i> Willd.	<i>Ophiomyia indigoferae</i>
<i>I. suffruticosa</i> Mill.	<i>Ophiomyia indigoferae</i>
<i>Phaseolus lathyroides</i> L.	<i>Ophiomyia phaseoli</i>
	<i>Tropicomyia polyphyta</i>
<i>P. vulgaris</i> L.	<i>Ophiomyia phaseoli</i>
<i>Phaseolus</i> spp.	<i>Melanagromyza obtusa</i>
	<i>Melanagromyza sojae</i>
	<i>Ophiomyia centrosematis</i>
<i>Pisum sativum</i> L.	<i>Ophiomyia pisi</i>
	<i>Liriomyza brassicae</i>
<i>Swainsona galegifolia</i> (Andr.) R. Br.	<i>Ophiomyia</i> ? <i>indigoferae</i>
<i>Trifolium repens</i> L.	<i>Ophiomyia pisi</i>
<i>Vigna sesquipedalis</i> Fruhwirth	<i>Tropicomyia polyphyta</i>
pods of unidentified sp.	<i>Melanagromyza albisquama</i>
Passifloraceae	
<i>Passiflora caerulea</i> L.	<i>Tropicomyia polyphyta</i>
<i>P. cinnabarina</i> Lindl.	<i>Tropicomyia polyphyta</i>
<i>P. edulis</i> L.	<i>Tropicomyia polyphyta</i>
<i>P. foetida</i> L.	<i>Tropicomyia polyphyta</i>
<i>P. suberosa</i> L.	<i>Tropicomyia polyphyta</i>
Pittosporaceae	
<i>Billardiera scandens</i> Sm.	? <i>Liriomyza obscurata</i>
<i>Bursaria spinosa</i> Cav.	? sp.
<i>Pittosporum undulatum</i> Andr.	<i>Phytoliriomyza pittosporocaulis</i>
	<i>Phytoliriomyza pittosporophylli</i>
<i>Sollya heterophylla</i> Lindl.	? sp.
Plantaginaceae	
<i>Plantago lanceolata</i> L.	<i>Phytomyza plantaginis</i>
Ranunculaceae	
<i>Clematis aristata</i> R. Br. ex DC.	<i>Phytomyza clematidicolla</i>
	<i>Phytomyza vitalbae</i>
<i>C. glycinoides</i> Eichl.	<i>Phytomyza</i> sp.
<i>C. pubescens</i> Benth.	<i>Phytomyza clematidicolla</i>
	<i>Phytomyza vitalbae</i>
<i>Ranunculus colonorum</i> Endl.	<i>Phytomyza ranunculicaulis</i>

Rhamnaceae	<i>Alphitonia excelsa</i> (Frenzl.) Benth.	<i>Tropicomyia polyphyta</i>
Rubiaceae	<i>Coffea arabica</i> L.	<i>Tropicomyia polyphyta</i>
	<i>Gardenia jasminoides</i> Ellis	<i>Tropicomyia polyphyta</i>
Rutaceae	<i>Citrus aurantifolia</i> Swingle	<i>Tropicomyia polyphyta</i>
	<i>Murraya exotica</i> L.	<i>Tropicomyia polyphyta</i>
	<i>M. paniculata</i> (L.) Jack	<i>Tropicomyia polyphyta</i>
Salicaceae	<i>Salix babylonica</i> L.	<i>Tropicomyia polyphyta</i>
Saxifragaceae	<i>Hydrangea macrophylla</i> (Thunb.) Ser.	<i>Tropicomyia polyphyta</i>
Solanaceae	<i>Anthocercis littorea</i> Labill.	<i>Phytomyza anthocercidis</i>
	<i>Capsicum annum</i> L.	<i>Tropicomyia polyphyta</i>
	<i>Cestrum parqui</i> L'Herit.	<i>Tropicomyia polyphyta</i>
	<i>Solanum prinophyllum</i> Dunal	<i>Ophiomyia solanicola</i>
Sterculiaceae	<i>Brachychiton</i> sp.	<i>Tropicomyia polyphyta</i>
Theaceae	<i>Camellia japonica</i> L.	<i>Tropicomyia polyphyta</i>
Thymeleaceae	<i>Pimelea ligustrina</i> Labill.	<i>Ophiomyia wikstroemiae</i>
	<i>Wikstroemia indica</i> Endl.	<i>Ophiomyia wikstroemiae</i>
Tropaeolaceae	<i>Tropaeolum majus</i> L.	<i>Liriomyza brassicae</i>
Umbelliferae	<i>Apium graveolens</i> L.	<i>Melanagromyza apii</i>
Verbenaceae	<i>Avicennia marina</i> Verh.	<i>Melanagromyza avicenniae</i>
	<i>Lantana camara</i> L.	<i>Ophiomyia lantanae</i>

LIST OF NEW SPECIES

<i>Melanagromyza</i>	<i>anceps</i>	<i>Amauromyza</i>	<i>queenslandica</i>
	<i>avicenniae</i>		
	<i>blanda</i>	<i>Cerodontha</i>	<i>augustensis</i>
	<i>decapitata</i>		<i>delectabilis</i>
	<i>dipodii</i>		<i>fulva</i>
	<i>epistomella</i>		<i>voluptabilis</i>
	<i>grata</i>		

	<i>hastata</i> <i>humida</i> <i>multiformis</i> <i>placata</i> <i>praesignis</i> <i>proboscidella</i> <i>prodigiosa</i> <i>pseudograta</i> <i>pseudoplacata</i> <i>trifilis</i> <i>variegata</i>	<i>Phytoliriomyza</i>	<i>cognata</i> <i>collessi</i> <i>flavopleuralis</i> <i>lacunosa</i> <i>mollis</i> <i>monstruosa</i> <i>nigricans</i> <i>polita</i> <i>praecellens</i> <i>queenslandica</i> <i>rieki</i> <i>striatella</i> <i>variana</i>
<i>Ophiomyia</i>	<i>compositicaulis</i> <i>cymbonoti</i> <i>deceptiva</i> <i>dulcis</i> <i>fera</i> <i>gemina</i> <i>kaputarensis</i> <i>lucidella</i> <i>otfordensis</i> <i>parvula</i> <i>pullata</i> <i>subtilis</i> <i>tenax</i> <i>vegeta</i>	<i>Liriomyza</i>	<i>cassiniae</i> <i>electa</i> <i>impolita</i> <i>inopinata</i> <i>languida</i> <i>lepida</i> <i>meracula</i> <i>oleariana</i> <i>primitiva</i> <i>scaevolae</i> <i>tenera</i>
<i>Japanagromyza</i>	<i>badia</i> <i>fortis</i> <i>howensis</i>	<i>Pseudonapomyza</i>	<i>memorata</i> <i>parilis</i> <i>probata</i> <i>pudica</i> <i>rara</i> <i>salubris</i>
<i>Agromyza</i>	<i>illustris</i> <i>mellita</i> <i>venusta</i>	<i>Phytomyza</i>	<i>anthocercidis</i> <i>placida</i> <i>pulchella</i> <i>ranunculicaulis</i> <i>venerabilis</i>
<i>Phytobia</i>	<i>colorata</i> <i>fausta</i> <i>insulana</i> <i>liepae</i> <i>macalpinei</i> <i>malabarensis</i> <i>manifesta</i> <i>optabilis</i>		

NEW SYNONYMS

1. *Phytobia incerta* Spencer, 1963
Agromyza testacea Spencer, 1963
2. *Ophiomyia cornuta* de Meijere, 1910
Ophiomyia goodeniae Spencer, 1963
3. *Phytoliriomyza pallidicentralis* (Malloch, 1927)
Liriomyza significans Spencer, 1966 (nom. nov. for *singularis* Spencer, 1963)

SPECIES NEW TO AUSTRALIA

1. *Melanagromyza obtusa* (Malloch, 1914)
2. *Ophiomyia cornuta* de Meijere, 1910
3. *Ophiomyia mussauensis* Spencer, 1966
4. *Ophiomyia nuginiensis* (Spencer, 1977)
5. *Ophiomyia rotata* (Spencer, 1965)
6. *Japanagromyza kalshoveni* (de Meijere, 1934)
7. *Cerodontha (Icteromyza) piliseta* (Becker, 1903)
8. *Liriomyza compositella* Spencer, 1961
9. *Pseudonapomyza spinosa* Spencer, 1973

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