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STUDIES ON AUSTRALIAN MUSCIDAE (DIPTERA) V. MUSCIDAE AND ANTHOMYIIDAE FROM LORD HOWE ISLAND AND NORFOLK ISLAND

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Abstract

30 Muscidae and 2 Anthomyiidae are recorded from Lord Howe Island and Norfolk Island. They are discussed from the point-of-view of their biology and distribution. Four new species are described: *Coenosia spumicola*, *Helina cryptohowei*, *Helina liepae* and *Spilogona ferrari*.

INTRODUCTION

This paper originated in a request from Dr D. K. McAlpine that I should identify a collection of Muscidae made by him on Lord Howe Island as part of a project to produce a list of Lord Howe insects in connection with possible conservation measures to be undertaken by the Lord Howe Island Board. In addition to Dr McAlpine's collection I took the opportunity of reviewing the material in the Australian National Insect Collection, Canberra, which was collected mainly by Dr S. J. Paramonov and Miss Z. Liepa in connection with an earlier study on the island (Paramonov 1958, 1960a, 1963). I also decided to include material from Norfolk Island, also located at Canberra with some additional specimens from the Australian Museum, Sydney, particularly as an extensive collection was made by Mr Paul Ferrar in April 1972 during a visit to assess the cattle dung fauna, quantitatively and qualititively, with a possible view to introducing dung beetles. Finally, after the first draft of this paper had been made, Miss Zenta Liepa visited Lord Howe Island in December 1972 and formed a collection of Muscidae which enabled me to resolve several of the outstanding taxonomic problems.

So far as I can trace there are few records of Muscidae from these islands, and none of Anthomyiidae. No Diptera were reported in the paper on Lord Howe insects by Olliff (Ramsay 1889). *Helina howei* (Malloch 1923, 1929) and *Pygophora howeana* (Paramonov 1960b; Crosskey 1962) have been described from Lord Howe Island; and *Prohardyia carinata* (Stein) has been recorded (Pont 1969) as has *Musca domestica* Linnaeus (Laird 1951). In addition, most material in the present collections from Lord Howe Island and Norfolk Island of *Orthellia australis* (Macquart), *Musca domestica* Linnaeus, *Australophyra rostrata* (Desvoidy) and *Stomoxys calcitrans* (Linnaeus) has been included in my revision of Australian Muscinae and Stomoxyinae (Pont, in press). Paramonov (1958, 1960a, 1963) has written a series of general articles on Lord Howe Island and has discussed the origin and composition of the fauna.

The present paper records 30 species of Muscidae and 2 of Anthomyiidae from these islands, but this is certainly not the final total. 23 species are present on Lord Howe Island and 17 on Norfolk Island, of which 8 are common to both islands. There is a moderate level of endemism, 9 species being confined to these islands of which 5 are from Lord Howe and 3 from Norfolk with a further one common to both. Four new species are described in this paper, and a further three are not described here but are being included in separate revisions of Australian Fanniinae and Atherigonini at present in preparation. Two species are recognised as probably undescribed, but as they are represented by females only they are not described for the present.

Table 1 summarises the distribution of the species, and emphasises two points. Firstly, the origin of the muscid and anthomyiid fauna on both islands clearly lies in Australia rather than in New Caledonia or New Zealand, though there may be a slight New Zealand influence (genus *Spilogona* Schnabl) and it should be remembered that knowledge of the New Caledonian muscids is virtually non-existent. Secondly,

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climatic conditions favour the co-existence of both tropical (Torresian) and temperate (Bassian) forms such as is found in northern New South Wales.

For almost half the species, 14 out of 32, the life-histories are known so that their mode of introduction is fairly obvious:

Breed in wild grasses and young cereal crops	*Atherigona* species
Breeds in vegetable compost	*Euryomma peregrinum*
Breed in cow dung	*Limnophora mesolissa*
	Orthellia australis
	Prohardyia carinata
Breeds in fresh water streams	*Limnophora nigriorbitalis*
Synanthropic or hemisynanthropic species	*Australophyra rostrata*
	Musca domestica
	Muscina stabulans
	Stomoxys calcitrans
	Synthesiomyia nudiseta

For the remaining 18 species, biologies are unknown and it is not possible to speculate on their mode of introduction. Larvae of *Lispe* and *Spilogona* are presumably aquatic, and those of *Fannia* scavengers possibly in birds' nests.

The Torresian and Bassian pattern of the introduced fauna (Table 1) is also reflected in the relationships of the endemic species. The endemics with Torresian affinities are:

Helina liepae (Lord Howe): affinities obscure, but probably related to *duplex* (Stein), a tropical northern species.

Helina sp. (Norfolk): obscure, but probably tropical.

Pygophora howeana (Lord Howe): belongs to a species-group that is almost exclusively Papuan and Pacific in distribution, and is closest to species in New Caledonia, Queensland and New Guinea.

The endemics with Bassian affinities are:

Coenosia sp. (Lord Howe): very close to the temperate Australian species *acuticornis* Stein and *imitatrix* Malloch, and possibly belonging to an undescribed mainland species.

Fannia sp. A (Lord Howe and Norfolk): very close to a species from Tasmania and South Australia. These two, *Fannia* sp. B. (Norfolk) and other new Australian species are all in the same species-group of *Fannia*, and are restricted to south-east Australia.

TABLE 1.
DISTRIBUTION OF MUSCIDAE AND ANTHOMYIIDAE FROM LORD HOWE AND NORFOLK ISLANDS

(S) = southern
"Australasian" is used in the broad sense, for the whole region in the Pacific east of Weber's Line.

	General Distribution					Australasian Distribution						
	Lord Howe Island	Norfolk Island	Oriental	Australasian	Regional Distribution	New Caledonia	New Zealand	New Guinea	Queensland	N.S.W. and A.C.T.	Victoria	Australian Distribution
MUSCIDAE												
Atherigona falcata	·	–	✓	×	Indo-Australasian	–	–	–	×	×	–	Torresian + Bassian
Atherigona oryzae	×	–	×	×	Indo-Australasian	–	–	×	×	×	–	Torresian + Bassian
Atherigona tibiseta	✓	✓	–	✓	Australasian	–	–	–	×	×	×	Torresian + Bassian
Atherigona sp.	–	✓	–	×	Australian	–	–	–	×	×	–	Torresian + Bassian
Australophyra rostrata	×	✓	–	×	Australasian	–	×	–	× (S)	×	✓	Bassian

	General Distribution					Australasian Distribution						
	Lord Howe Island	Norfolk Island	Oriental	Australasian	Regional Distribution	New Caledonia	New Zealand	New Guinea	Queensland	N.S.W. and A.C.T.	Victoria	Australian Distribution
Coenosia acuticornis	×	—	—	×	Australian	—	—	-	× (S)	×	×	Bassian
Coenosia spumicola	—	×	—	×	Australian	—	—	—	—	×	—	Bassian
Coenosia sp.	×	—	—	×	Lord Howe Island	—	—	—	—	—	—	?Endemic
Euryomma peregrinum	—	×	×	×	Tropicopolitan, Old World	—	×	—	×	—	×	Throughout
Fannia sp. n. *A*	×	×	—	×	Lord Howe and Norfolk Islands	—	—	—	—	—	—	Endemic
Fannia sp. n. *B*	—	×	-	×	Norfolk Island	—	—	—	—	—	—	Endemic
Helina cryptohowei	×	—	—	×	Lord Howe Island	—	—	—	—	—	—	Endemic
Helina howei	×	—	—	×	Lord Howe Island	—	—	—	—	—	—	Endemic
Helina liepae	×	—	—	×	Lord Howe Island	—	—	—	—	—	—	Endemic
Helina regina	—	×	—	×	Australian	—	—	—	× (S)	×	—	Bassian
Helina sp.	—	×	—	×	Norfolk Island	—	—	—	—	—	—	Endemic
Limnophora mesolissa	×	—	—	×	Australasian	×	—	×	×	—	—	Torresian
Limnophora nigriorbitalis	×	—	—	×	Australian	—	—	—	—	×	—	Bassian
Lispe ?albifacies	×	—	—	×	Australasian	—	—	—	—	—	—	?Torresian
Lispe cana	×	—	—	×	Australasian	—	—	—	—	×	—	Bassian
Lispe incerta	—	×	×	×	Indo-Australasian	×	—	—	×	—	—	Torresian
Musca domestica	×	×	×	×	Cosmopolitan	×	×	×	×	×	×	Throughout
Muscina stabulans	×	×	×	×	Cosmopolitan	×	×	×	× (S)	×	×	Throughout
Orthellia australis	×	—	—	×	Australasian	—	—	×	×	×	—	Torresian + Bassian
Prohardyia carinata	×	—	—	×	Australian	—	—	—	× (S)	×	×	Bassian
Pygophora howeana	×	—	—	×	Lord Howe Island	—	—	—	—	—	—	Endemic
Pygophora maculigera	—	×	—	×	Australasian	—	—	×	×	—	—	Torresian
Spilogona ferrari	—	×	—	×	Norfolk Island	—	—	—	—	—	—	Endemic
Stomoxys calcitrans	×	×	×	×	Cosmopolitan	×	×	×	×	×	×	Throughout
Synthesiomyia nudiseta	×	×	×	×	Tropicopolitan	—	—	—	×	—	—	Torresian
ANTHOMYIIDAE												
Craspedochoeta deceptiva	×	—	—	×	Australasian		×	—	× (S)	×	×	Bassian
Delia urbana	×	×	—	×	Australian	—	—	—	—	×	—	Bassian

Helina howei and *cryptohowei* (Lord Howe): related to the southern endemic group of Australian *Helina*; metallic *Helina* are known only from southern Australia, southern South America and Madagascar.

Spilogona ferrari (Norfolk): the genus is a southern temperate element in South America, South Africa and New Zealand where there are numerous species; there is one south-east Australian species, which is not particularly close to *ferrari; ferrari* may therefore have New Zealand affinities.

Equally striking is the absence of a number of common Australian species and large or important genera, of which should be mentioned *Dichaetomyia*, *Fannia canicularis* (lesser house fly), *Gymnodia* (dung breeders), *Haematobia irritans exigua* (buffalo fly), most *Helina* and *Lispe*, *Hydrotaea australis* (dung breeder), *Musca vetustissima* (bush fly), Mydaeinae (tropical dung breeders), and *Passeromyia* (bird parasites).

Paramonov (1963) states that from its fauna Lord Howe Island is not part of the Australian zoogeographical region, but is closer to the New Zealand subregion. This is not true on the evidence of the muscids, where the affinities are definitely Australian with equal tropical and temperate elements. But it should be borne in mind that Muscidae, like Calyptrate Diptera generally, are of comparatively recent origin and evolved after the disappearance of trans-Antarctic land connections between Australia, New Zealand and South America (cf Malloch 1934) and that it is not surprising that former land-bridges between Lord Howe and New Zealand, and Norfolk and New Caledonia, have not left any traces in the muscid fauna. Introductions, whether ancient or recent, must be the result of sea and air dispersal or the travels of man.

Collecting data are too sparse to corroborate Paramonov's (1963) contention that the ancient endemic species, relics from "Howeania", might be confined to high elevations whilst more recent tropical introductions fill the sea-level niches. But one endemic species at least, *Helina howei*, ranges from the summit of Mt. Gower to sea-level at Ned's Beach.

The material on which this study is based is located in the Australian National Insect Collection, CSIRO, Canberra (ANIC), the Australian Museum, Sydney (AM), and the British Museum (Natural History), London (BMNH). I am very grateful to Drs D. H. Colless and D. K. McAlpine, Mr Paul Ferrar and Miss Zenta Liepa for the loan of this material.

MUSCIDAE

Atherigona falcata (Thomson, 1869)

LORD HOWE ISLAND: Old Settlement, 20.xi.1956, Z. Liepa, 2♂ (ANIC).
Distribution: Oriental region and Australia (Queensland and New South Wales).

Atherigona oryzae Malloch, 1925

LORD HOWE ISLAND: near Ned's Beach, 22.ii.1971, D. K. McAlpine, 1♂, 1♀ (AM); 14.ii.1957, Z. Liepa, 1♂ (ANIC); 3.iii.1957, Z. Liepa, 1♂ (ANIC); 5.iii.1957, Z. Liepa, 3♂ (ANIC and BMNH).

Distribution: Oriental region, Papuan subregion and North-West Pacific. In Australia from Northern Territory, Queensland and New South Wales.

Atherigona tibiseta Malloch, 1924

LORD HOWE ISLAND: 23.xi.1955, S. J. Paramonov and Z. Liepa, 8♂, 4♀ (ANIC and BMNH); 24.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 30.xi. 1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 5.xii.1955, S. J. Paramonov and Z. Liepa, 3♂, 4♀ (ANIC and BMNH); Old Settlement, 20.ii.1957, Z. Liepa, 1♀ (ANIC); Blinky Beach, xii.1972, Z. Liepa, 1♀ (ANIC).

NORFOLK ISLAND: Kingston, 15.ii.1958, Z. Liepa, 3♂, 3♀ (ANIC and BMNH); Kingston, 16.ii.1958, Z. Liepa, 1♂ (ANIC); Bloody Bridge, 21.ii.1958, Z. Liepa, 1♂, 3♀ (ANIC).

Distribution: Australia, from northern Western Australia, Queensland and New South Wales.

Atherigona sp.

NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♂, 1♀ (ANIC).

Distribution: Australia, from northern Western Australia, Northern Territory, Queensland, New South Wales and Australian Capital Territory.

This species will be described in my revision of Australian Atherigonini, at present in preparation.

Australophyra rostrata (Robineau-Desvoidy, 1830)

LORD HOWE ISLAND: 27.xi.1955, S. J. Paramonov and Z. Liepa, 6♀ (ANIC and BMNH); 5.xii.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 5.iii.1957, Z. Liepa, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 2♀ (ANIC).

NORFOLK ISLAND: Kingston, 15.ii.1958, Z. Liepa, 1♂, 1♀ (ANIC); bred from pupae under litter bin, 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♀ (ANIC); Cascade, xii.1968, N. H. L. Krauss, 1♂, 1♀ (AM).

Distribution: Australia (all States) and New Zealand. For details, see Pont (in press).

Coenosia acuticornis Stein, 1910

LORD HOWE ISLAND: near Ned's Beach, 22 to 25.ii.1971, D. K. McAlpine, 2♂, 8♀ (AM and BMNH); near Ned's Beach, Malaise trap, 20-25.ii.1971, D. K. McAlpine, 1♀ (AM); 23.xi.1955, S. J. Paramonov and Z. Liepa, 10♂, 2♀ (ANIC and BMNH); 24.xi.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC); 30.xi.1955, S. J. Paramonov and Z. Liepa, 2♀ (ANIC and BMNH); 5.xii.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC); 14.ii.1957, Z. Liepa, 1♂ (ANIC); 20.ii.1957, Z. Liepa, 1♀ (ANIC); 5.iii.1957, Z. Liepa, 1♀ (ANIC); Middle Beach, xii.1972, Z. Liepa,2♂, 6♀ (ANIC and BMNH); Ned's Beach, xii.1972, Z. Liepa, 4♀ (ANIC and BMNH); Erskine Valley, xii.1972, Z. Liepa, 2♀ (ANIC); Boat Haven, xii.1972, Z. Liepa, 3♀ (ANIC); Blinky Beach, xii.1972, Z. Liepa, 2♂, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 2♂, 3♀ (ANIC and BMNH); Salmon Beach, at light, xii.1972, Z. Liepa, 6♀ (ANIC and BMNH); Mt. Lidgbird, foothills, xii.1972, Z. Liepa, 1♀ (ANIC); Mt. Malabar, 660 feet, xii.1972, Z. Liepa, 1♀ (ANIC).

Distribution: Australia, from Southern Queensland, New South Wales, Victoria and Tasmania.

Coenosia spumicola sp.n.

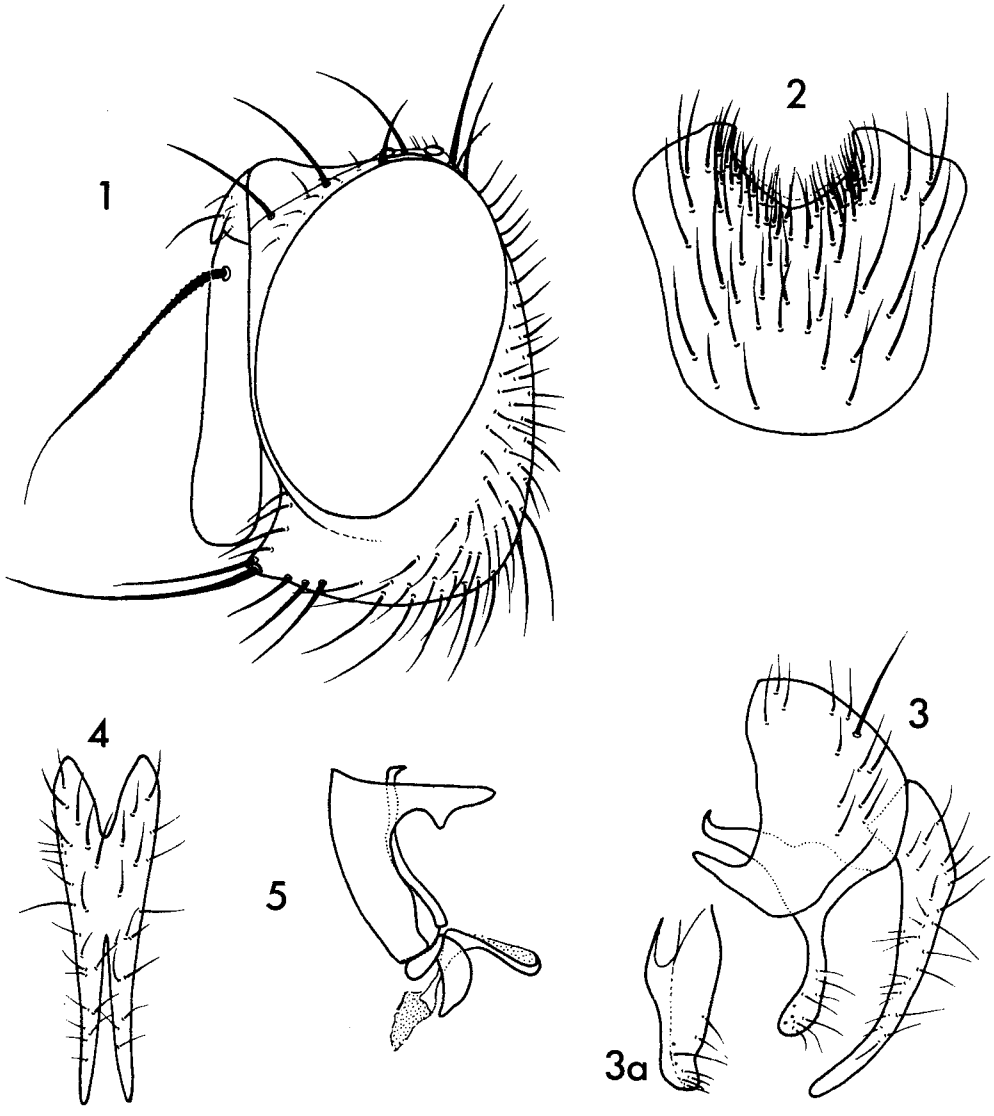
Types.—Holotype male (NORFOLK ISLAND, 13.iv.1972, A. L. Dyce, H. A. Standfast, P. Ferrar), in ANIC. *Paratypes*: NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast, P. Ferrar, 5♂, 1♀ (ANIC and BMNH). NEW SOUTH WALES: Vaucluse, on intertidal rocks, 25.i.1964, D. K. McAlpine, 2♂ (AM); Vaucluse, 6.xi.1961, D. K. McAlpine, 2♂ (AM and BMNH).

Male

Head (Fig. 1).—Frons short and broad, face and antennae very long. Ground-colour black. Eyes with a few short hairs, facets uniform in size. Frons short and broad, broadening gradually from vertex to lunula; at middle (by upper *ori*) almost twice as broad as an eye and 1½ times as broad as long (measured

from posterior ocelli to lunula). Parafrontalia light-grey pruinose on lower part, more dull above; parafacialia, genae and lower occiput light-grey, upper occiput dull grey, ocellar tubercle brownish to grey. Interfrontalia black; frontal triangle indistinct, but when viewed from below grey dusted and apparently extending to lunula. Ocellars, *vti* and *vte* strong. Post-ocular setulae short, in several rows. 2 pairs of moderate inclinate *ori*, with 1-2 pairs of short interstitials; 1 pair of short reclinate *ors*; parafrontalia outside *ori* with several short proclinate setulae. Parafrontalia narrow, by upper *ori* twice as broad as diameter of anterior ocellus and 1/6-1/5 width of interfrontalia. Antennae black, inserted very high; 3rd segment long, 4 times as long as broad, reaching to epistoma, the anterior edge rounded. Arista bare. Parafacialia tapering sharply from lunula, and linear from middle downwards. In lateral view, vibrissal angle well behind level of profrons. Genae moderate, the depth below lowest eye-margin subequal to width of 3rd antennal segment. Vibrissae long and strong. Peristomal setae quite long and dense. Palpi black, short. Mentum of proboscis glossy, black.

Thorax.—Ground-colour black. Mesonotum grey dusted, more brownish-grey dusted behind, with dark undusted or thinly dusted markings as follows: a broad median vitta between the *acr* rows and a pair of narrow *dc* vittae recognisable as enlarged and fused bristle-dots, beginning at neck and continuing



FIGS. 1-5.—*Coenosia spumicola* sp.n.: (1) male head, lateral view; (2) male 5th sternite, dorsal view; (3) male hypopygium, lateral view, and (a) surstylus, posterior view; (4) male cercal plate, dorsal view; (5) male aedeagus, lateral view.

virtually to suture, becoming broader behind and usually fused into a single patch at 2nd *post dc*; dusting more brownish around *ph* and *ia* setae, but no further vittae. Humeri and pleura grey dusted. Scutellum grey dusted on disc, the margins more dull, the tip usually brown. Anterior spiracle dull. Ground-setulae normal, no spinules at neck or on humeri. *Acr* setulose, even the *prsc* pair weak, usually biserial throughout but sometimes triserial after suture. *Dc* 2 + 3, the anterior *prst* seta half as long as the posterior *prst* seta. 2 *ia*. *Pra* absent. 2 setulae adjacent to the propleural. One of the lower prostigmatal setulae directed forwards and downwards. Notopleuron bare apart from the setae. Lower *stpl* slightly closer to posterior than to anterior one. Prosternum, pteropleuron and hypopleuron bare. Scutellum with the sub-basal lateral and apical setae strong; few discal setulae; lateral and ventral surfaces bare.

Legs.—Black, knees obscurely yellow. Tarsi of normal structure. Fore femur without *av* setae, with a complete *pv* row. Fore tibia with a submedian *p* seta. Mid femur with a few short *pv* towards base, otherwise bare ventrally; 0 *a* and 2 *p* preapical setae. Mid tibia with 0 *ad* and 1 *pd* seta, rarely with a second *pd*. Hind femur ventrally with a few short *pv* in basal third, and 3 *av* setae before apex; *ad* row complete; 1 *d* but 0 *pd* preapical seta. Hind tibia with 1 submedian *ad* seta and 1 shorter *av* apicad of it; *d* preapical strong, *ad* absent.

Wings.—Clear. Epaulet and basicosta dark. Costal spine inconspicuous. Costa continuing to the apex of vein 4. Veins bare apart from the costa. Small cross-vein placed basad of the point where vein 1 enters costa and just beyond middle of discal cell. Hind cross-vein almost straight, usually slightly longer than apical section of vein 5. Squamae and their fringes creamy to white; lower one well-developed and projecting beyond the upper one. Halteres dull yellow.

Abdomen.—Oval and rather cylindrical. Ground-colour black. Tergites and sternites grey dusted, the tergites with dark markings as follows: tergite 1 + 2 mainly dark, with some faint indications of grey dust around middle; tergites 3 and 4 each with a pair of triangular spots from fore- to hind-margin, reaching to edge of dorsum but not extending on to lateral surface of tergites, the median line between the spots mainly dark brown dusted; tergite 5 with a wedge-shaped median vitta, broadening posteriorly. Genital segments grey dusted. Tergites without remarkable setae, with the usual discal and marginal setae on the posterior segments. Sternite 1 bare. Sternites 2-4 short haired.

Genitalia (Figs. 2-5).—Two dissections, Norfolk Island and New South Wales. Post-gonite without setae, and distiphallus membraneous (Fig. 5).

Measurements.—Length of body, 3.0-3.5 mm. Length of wing, 2.5-3.0 mm.

Female

Differs from the male as follows:

Head.—Of normal shape, with face and antennae not elongated. Frons as broad as in male, but rather longer. Parafrontalia brown pruinose; parafacialia, genae and lower occiput grey; upper occiput yellowish-grey; ocellar tubercle and frontal triangle brown. Frontal triangle distinct, extending over halfway from anterior ocellus to lunula. Antennae not inserted as high; 3rd segment shorter, just under 3 times as long as broad, falling short of epistoma by half its width. Parafacialia nowhere as narrow as in male. Depth below lowest eye-margin greater than width of 3rd antennal segment. Palpi longer and larger, and mentum of proboscis fatter.

Thorax.—Mesonotum more evenly brownish-grey dusted, with the vittae better developed: *acr* vitta as in male, but *dc* vittae broader and separated throughout from the *acr* vitta; brown dusting around *ph* and *ia* more vitta-like. Chaetotaxy as in male.

Legs.—Mid tibia with 1 short *ad* and 3 *pd*. Hind tibia with 2 *ad* on one side.

Abdomen.—With dusting and dark markings as in male, but the dark markings on tergites 3 and 4 more extended so that only a pair of small antero-lateral triangles on each tergite remain dusted.

Ovipositor.—Not studied.

Measurements.—Length of body, 4.0 mm. Length of wing, 3.0 mm.

Comments

According to Paul Ferrar, this species was found resting on seashore rocks and pebbles immediately in front of the advancing tide, the flies briefly rising as water broke over the rocks and returning to their positions as soon as it retreated. They were extremely difficult to collect.

The New South Wales males are a little smaller and rather greyer than the Norfolk Island series, with head denser pruinose, thoracic vittae narrow and separated, abdominal spots smaller and less heavily marked; they also have the anterior *prst dc* a little over half as long as the posterior one. The genitalia have been compared, however, and prove to be identical.

This species is placed in the genus *Coenosia* Meigen although it differs from other species of the genus by having a short but well-developed anterior *prst dc* seta that is

half as long as the posterior one, there being only a single *prst dc* seta in *Coenosia*. In this character it agrees with the Palaearctic genus *Dexiopsis* Pokorny (5 species), which is differentiated from *Coenosia* solely by the presence of a short but well-developed anterior *prst dc*. It is interesting that *Dexiopsis* is a littoral group, but in spite of this similarity there is unlikely to be any relationship between *spumicola* and *Dexiopsis*. The two are very dissimilar in general appearance, and in particular the male head of *spumicola* is very different from that of *Dexiopsis*. It is difficult to see why close association with the littoral habitat in these Coenosiinae should be linked with an additional *dc* seta.

In general appearance, *spumicola* resembles species of Limnophorinae which are also aquatic in habitat and are found resting on stones and other objects near water. In particular, the trivittate mesonotum and the pattern of abdominal spots in the female are strikingly similar to the Limnophorinae. It differs from Australian Limnophorinae by the single reclinate *ors* and forwardly directed lower prostigmatal setula.

Coenosiinae, like Limnophorinae, are predacious in the adult stage and *spumicola* will probably be found to feed on adults of littoral Chironomidae.

C. spumicola differs from the other Australian species of *Coenosia* by the possession of a rounded tip to 3rd antennal segment, several setulae adjacent to the propleural seta, and absence of a true *a* seta next to the *ad* on hind tibia.

Coenosia sp.

LORD HOWE ISLAND: Ned's Beach, 15.xi.1956, Z. Liepa, 2♀ (ANIC and BMNH); 30.xi and 5.xii.1955, S. J. Paramonov and Z. Liepa, 2♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 1♀ (ANIC); Salmon Beach, at light, xii.1972, Z. Liepa, 10♀ (ANIC and BMNH).

This species resembles *acuticornis* Stein and *latitarsis* Malloch in having the anterior tip of 3rd antennal segment produced into a minute spine, and in having a single propleural seta. It differs from these two species by having fore femur with a dark streak above, mid and hind femora yellow, mesonotum paler dusted with less distinct dark vittae or dark suffusions, abdomen with only faint traces of spots which are limited to tergites 4 and 5.

Euryomma peregrinum (Meigen, 1826)

NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♂ (ANIC).

Distribution: Cosmopolitan. In the Australasian region from New Zealand, Hawaii, Fiji and Australia (Western Australia, Queensland and Victoria).

Fannia sp. n. A

LORD HOWE ISLAND: North Bay, 24.ii.1971, D. K. McAlpine, 1♂, 1♀ (AM); North Bay, on beach, 21.ii.1971, D. K. McAlpine, 1♀ (AM); Blinky Beach, 25.ii.1971, D. K. McAlpine, 2♀ (AM and BMNH); North Bay, 19.ii.1957, Z. Liepa, 2♂, 5♀ (ANIC and BMNH); 30.xi.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC); near Johnson's Beach, at light, xii.1966, E. Britton, 1♀ (ANIC); Ned's Beach, xii.1972, Z. Liepa, 2♀ (ANIC); Boat Haven, xii.1972, Z. Liepa, 11♂, 2♀ (ANIC and BMNH); Salmon Beach, xii.1972, Z. Liepa, 4♂, 9♀ (ANIC and BMNH); Salmon Beach, at light, xii.1972, Z. Liepa, 5♂, 5♀ (ANIC and BMNH).

NORFOLK ISLAND: Dunscombe Bay, 300 feet, 13.vii.1968, M. S. Upton, 1♂ (ANIC); Mt. Pitt, 850 feet, 12.vii.1968, M. S. Upton, 3♂ (ANIC and BMNH); 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 4♂, 18♀ (ANIC and BMNH).

Distribution: Known only from Lord Howe and Norfolk Islands.

This species and the following one will be described in a revision of Australian Fanniinae now in preparation.

Fannia sp. n. B

NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♂, 6♀ (ANIC and BMNH); iii.1971, K. L. S. Harley, 1♂ (ANIC).

Distribution: Known only from Norfolk Island.

This species will be described in a revision of Australian Fanniinae now in preparation.

Helina cryptohowei sp. n.

Types.—Holotype male (Lord Howe Island, Salmon Beach, xii.1972, Z. Liepa), in ANIC. *Paratypes*: LORD HOWE ISLAND: Salmon Beach, xii.1972, Z. Liepa, 1♀ (ANIC); Intermediate Hill, xii.1972, Z. Liepa, 2♂ (ANIC and BMNH); Old Settlement, 28.xi.1956, Z. Liepa, 1♀ (ANIC).

Male

Head.—Ground-colour black. Frons at narrowest point rather broader than width of 3rd antennal segment (slightly contracted in holotype). Eyes with long dense hairs, the hairs equal to at least twice diameter of anterior ocellus. Ocellar setae well-developed but not long. Vertical setae short, not clearly differentiated from the short post-ocular setulae. Post-ocular setulae rather long near vertex but thereafter short. Parafrontalia yellowish-grey pruinose below, more brownish above (holotype) or whitish-grey pruinose; parafacialia yellowish-grey (holotype) or whitish-grey pruinose; face brownish-grey, genae dark brown, occiput grey pruinose. Interfrontalia black, matt. Parafrontalia very narrow outside *ori*, at middle a parafrontale as broad as diameter of anterior ocellus, broadening suddenly to lunula where it is broader than width of 3rd antennal segment. Interfrontalia broad and distinct throughout, at middle of frons at least as broad as width of 3rd antennal segment. 9-10 pairs of inclinate *ori*, with several hair-like interstitials, extending from lunula almost to ocellar tubercle, the upper ones rather more reclinate; *ors* absent. Antennae and arista dark brown. 3rd antennal segment 2½ times as long as broad and in frontal view falling short of epistoma by half its width. Arista plumose, the longest plumes equal to width of 3rd antennal segment and the longest combined plumosity 2/3 length of this segment. Parafacialia broad, not tapering below, broader than width of 3rd antennal segment throughout. Parafacialia and genae bare. Vibrissae strong. Vibrissal angle below level of profrons. Facial ridges with rather numerous setulae ascending at least 1/3 distance from vibrissae to base of antennae. The depth below lowest eye-margin equal to twice width of 3rd antennal segment. Peristomal setae long and dense, all black including beard. Mentum of proboscis dark brown, dusted. Palpi black, little enlarged in apical part.

Thorax.—Ground-colour black; metallic; bronze-green. Mesonotum densely bronze-grey dusted, with a pair of narrow undusted vittae before suture mesad of the *dc*; and with undusted vittae between *prst dc* and *ph*, and between *post dc* and *ia*. Pleura very thinly grey dusted. Scutellum bronze-grey dusted in dorsal view, undusted in posterior view. Spiracles dark brown. *Acr* 0 + 1; the *prst* setulae in 4 rows with the outer rows as far from each other as from the *dc*; 1 pair of setulae quite strongly developed. *Dc* 2 + 4, all strong. 2 *h*. 2 *ph*. 2 *ia*, the anterior one well behind level of *pra* and 1st *dc*. 2 *sa*. *Pra* weak and hair-like, less than half length of 2nd *npl*. Prosternum and propleural depression bare. 2 strong prostigmatal setae. Notopleuron with numerous setulae around the 2nd seta. Mesopleuron with 1 strong setula in upper anterior corner. *Stpl* 1 + 2. Hypopleuron bare on beret and metepisternum, with some fine setulae below spiracle. Metathoracic spiracle with a few setulae on posterior margin. Scutellum with the usual pair of strong lateral and apical setae, and an additional moderate basal lateral and preapical pair. Disc evenly setulose all over, lateral margins and ventral surface bare.

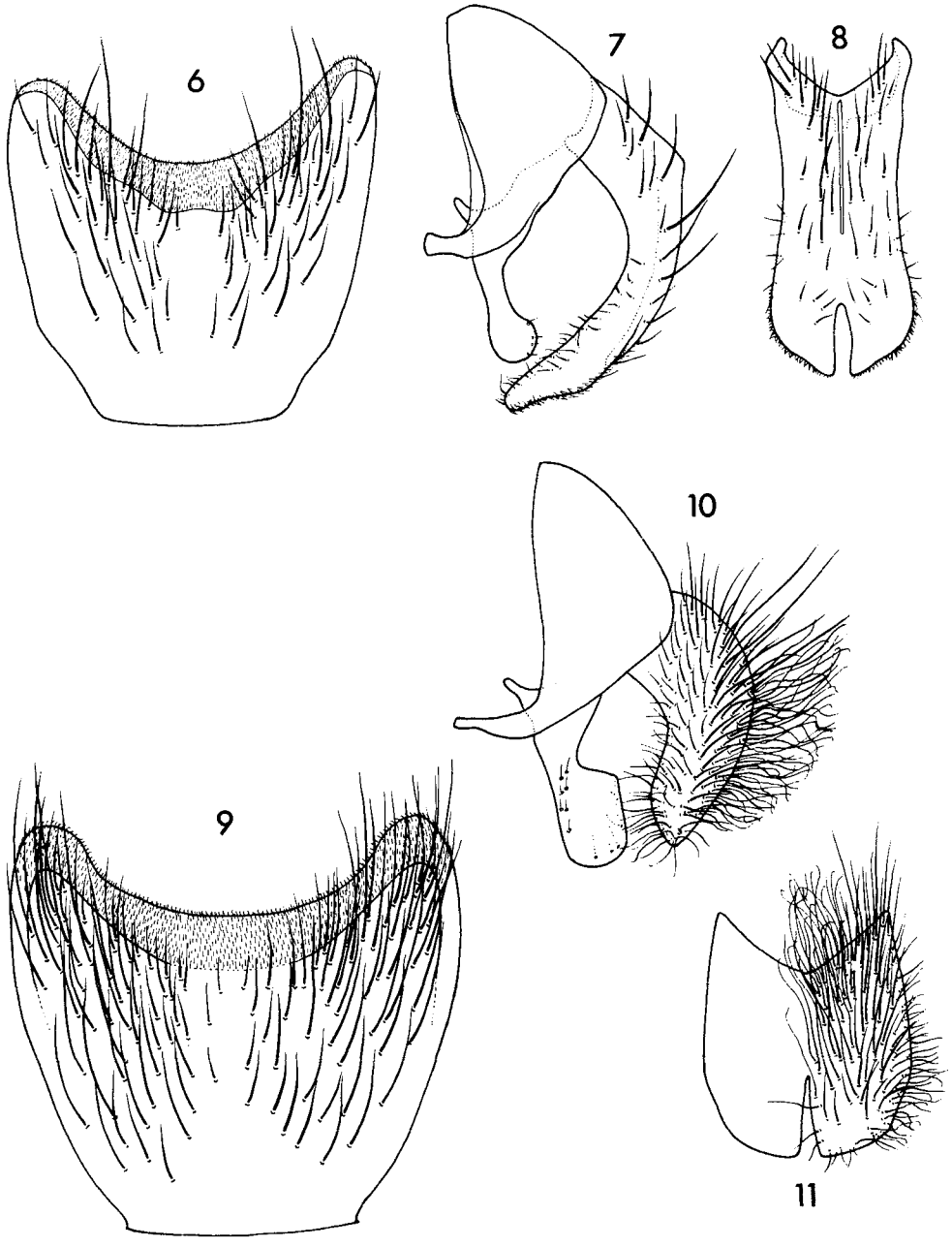
Legs.—Black, without metallic reflections. Femora and tarsi without modifications. Fore femur without *av* setae, with a complete *pv* row. Fore tibia without *p* or *ad* setae. Mid femur without setae on ventral surfaces, though the setulae are quite dense; a row of short *a* setae on basal half; 0 *a* and 3 *d-p* preapical setae. Mid tibia without setae except for 2-3 *p* setae. Hind femur with a row of 8-9 short *av* setae on apical half and a few short *pv* before apex, otherwise bare on ventral surfaces; *ad* row complete; 1 *d* preapical, the *pd* absent. Hind tibia without *pd* setae, 2 (-3) *ad* and 2-3 *av*; *d* and *ad* preapicals both strong.

Wings.—Rather smoky; without conspicuous clouds, but rather with dark seams to *sc*, veins 1-5, and both cross-veins. Epaulet and basicosta black. Costa setulose ventrally as far as the apex of vein 2; costal spine absent. Small cross-vein placed slightly basad of the point where vein 1 enters costa. Hind cross-vein oblique, strongly sinuate. Veins bare except for costa. Squamae white, margins creamy to dirty yellow. Knob of halteres black.

Abdomen.—Ground-colour black; metallic, bronze-green. Thinly grey dusted in dorsal view. Subshining in posterior view; tergite 5 mainly whitish-grey dusted, and tergites 3 and 4 with whitish-grey dust in anterolateral corners and along fore margins. Without dark spots or any other pattern. Setae weak, with a few lateral marginals on tergites 3 and 4 well-developed, and a lateral discal on tergite 5; marginal rows on tergites 4 and 5 short and weak. Sternite 1 bare, or with a few hairs at sides.

Genitalia (Figs. 9-11).—One dissection.

Measurements.—Length of body, 8.5-10.0 mm. Length of wing, 7.5-9.0 mm.



FIGS. **6-11.**—Male genitalia: **(6-8)** *Helina howei* Malloch—**(6)** 5th sternite, dorsal view, **(7)** hypopygium, lateral view, **(8)** cercal plate, dorsal view; **(9-11)** *H. cryptohowei* sp.n.—**(9)** 5th sternite, dorsal view, **(10)** hypopygium, lateral view, **(11)** cercal plate, dorsal view.

Female

Differs from the male as follows:

Head.—Frons broad, at middle a little less than one-third of head-width. Eyes with conspicuous short pubescence, the hairs subequal to diameter of anterior ocellus. Ocellar setae strong. *Vti* and *vte* strong, the *vte* shorter than *vti*. Post-ocular setulae short. Parafrontalia densely brownish-grey pruinose; parafacialia brownish-grey pruinose. Interfrontalia with the frontal triangle small and inconspicuous, hardly extending one-third distance from anterior ocellus to lunula. Parafrontalia moderate, at middle a parafrontale equal to almost 3 times diameter of anterior ocellus and at lunula broader than width of 3rd antennal segment. Interfrontalia broad, at middle 4 times the width of a parafrontale at this point. 5-6 pairs of inclinate *ori* and 2 pairs of reclinate *ors*; parafrontal setulae in 2 rows below, on all but upper quarter of frons. Palpi large, at tip almost as broad as base of fore tibia.

Thorax.—As in male.

Legs.—Hind femur with 3-4 *av* setae before apex, and without *pv*.

Wings.—Rather smoky, especially on outer anterior quarter, more so than in male. Margins of squamae creamy.

Abdomen.—Tergites 3 and 4 without any dust in posterior view. Without any really distinct setae except for a few weak marginals at extreme sides of tergites.

Ovipositor.—Not studied.

Measurements.—Length of body, 8.0-8.5 mm. Length of wing, 7.0-7.5 mm.

Comments

This species resembles *howei* Malloch very closely in general appearance, but differs in a number of ways of which the most striking are the following:

Eyes densely haired in male. Parafrontalia and parafacialia densely yellowish- to brownish-grey pruinose, face brownish-grey, genae dark brown. Parafrontalia at lunula broader than width of 3rd antennal segment, and parafacialia at middle equal to width of 3rd antennal segment. *Dc* 2+4. Disc of scutellum evenly setulose all over. Fore tibia without *p* setae. Wings without the conspicuous clouds of *howei*, but rather with dark seams to *sc*, veins 1-5, and both cross-veins. Costal spine absent.

Helina howei Malloch, 1923

LORD HOWE ISLAND: Forest behind Settlement Beach, 23.ii.1971, D. K. McAlpine, 2♀ (AM and BMNH); Blue Lagoon, 24.ii.1971, D. K. McAlpine, 1♀ (BMNH), and 25.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, 20.ii.1971, D. K. McAlpine, 1♀ (AM); Erskine Valley, 19.ii.1971, D. K. McAlpine, 1♀ (AM); summit of Mt. Gower, 19.ii.1971, D. K. McAlpine, 1♀ (AM); 25.xi.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC); 28.xi.1955, S. J. Paramonov and Z. Liepa, 2♂ (BMNH and ANIC); 1.xii.1955, S. J. Paramonov and Z. Liepa, 1♂, 1♀ (ANIC); 26.ix.1959, T. G. Campbell, 1♀ (ANIC); 29.ix.1959, T. G. Campbell, 1♀ (ANIC); 10.x.1959, T. G. Campbell, 1♀ (ANIC); 5.iii.1961, T. G. Campbell, 1♀ (ANIC); near Johnson's Beach, at light, xii.1966, E. B. Britton, 8♀ (ANIC and BMNH); North Bay, 19.ii.1957, Z. Liepa, 1♀ (ANIC); Ned's Beach, 25.ii.1957, Z. Liepa, 2♀ (ANIC and BMNH); Old Settlement Creek, 18.xi.1956, Z. Liepa, 2♀ (ANIC); Old Settlement, 28.xi.1956, Z. Liepa, 1♀ (ANIC); Old Settlement, 20.ii.1957, Z. Liepa, 2♀ (ANIC and BMNH); Mt. Lidgbird, foothills, xii.1972, Z. Liepa, 1♂, 3♀ (ANIC and BMNH); Ned's Beach, xii.1972, Z. Liepa, 1♂, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 6♀ (ANIC and BMNH); 14.vii.1914, R. D. Laurie, 2♀ (BMNH).

Distribution: Known only from Lord Howe Island.

The holotype ♀ is in the BMNH and is labelled simply "Lord Howe Is.". The species was subsequently recorded from Mt. Gower by Malloch (1929: 361), on the basis of a female in AM. The male genitalia (from a specimen collected on 1.xii.1955 by Paramonov and Liepa) are illustrated in Figs. 6-8 for the purposes of comparison with *cryptohowei* sp.n.

Helina liepae sp. n.

Types.—*Holotype* male (Lord Howe Island, near Ned's Beach, 20.ii.1971, D. K. McAlpine), in AM. *Paratypes*, 37♂, 41♀, LORD HOWE ISLAND: near Ned's

Beach, 20.ii.1971, D. K. McAlpine, 1♂, 4♀ (AM and BMNH); near Ned's Beach, 18.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, 24.ii.1971, D. K. McAlpine, 3♂ (AM and BMNH); Blinky Beach, 25.ii.1971, D. K. McAlpine, 2♀ (AM and BMNH); Old Settlement Beach, 20.ii.1971, D. K. McAlpine, 1♀ (AM); forest behind Old Settlement Beach, 21.ii.1971, D. K. McAlpine, 1♀ (AM); 22.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 2♀ (ANIC); 24.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 3♀ (ANIC and BMNH); 25.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 27.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 6♀ (ANIC and BMNH); 28.xi.1955, S. J. Paramonov and Z. Liepa, 2♂, 1♀ (ANIC and BMNH); 30.xi.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC); 1.xii.1955, S. J. Paramonov and Z. Liepa, 2♂, 4♀ (ANIC and BMNH); 18.xii.1955, S. J. Paramonov, 2♀ (ANIC); 5.iii.1957, Z. Liepa, 1♂, 2♀ (ANIC and BMNH); Ned's Beach, 15.xi.1956, Z. Liepa, 1♂ (ANIC); Ned's Beach, 25.ii.1957, Z. Liepa, 2♂ (ANIC and BMNH); Dawson Range, 20.xi.1956, Z. Liepa, 1♀ (ANIC); 6.x.1959, T. G. Campbell, 1♀ (ANIC); 6.iii.1961, T. G. Campbell, 1♀ (ANIC); captured "Pine Trees", 20.iii.1964, G. J. Snowball, 1♀ (ANIC); Ned's Beach, xii.1972, Z. Liepa, 1♂, 3♀ (ANIC and BMNH); Salmon Beach, xii.1972, Z. Liepa, 3♂, 1♀ (ANIC and BMNH); Salmon Beach, at light, xii.1972, Z. Liepa, 2♀ (ANIC); Blinky Beach, xii. 1972, Z. Liepa, 17♂, 1♀ (ANIC and BMNH).

Male

Head.—Frons at narrowest point slightly to distinctly broader than width of 3rd antennal segment, 3-4 times diameter of anterior ocellus. Eyes with a few short sparse hairs, rather more than the usual microscopic pubescence. Ocellars well-developed, moderate to strong. Verticals short, sometimes hardly differentiated from the short post-ocular setulae. Parafrontalia grey pruinose, sometimes tinged with yellow; parafacialia silvery-white; occiput grey to yellowish-grey, lighter below and on genae. Interfrontalia black, grey pruinose when viewed from below. Parafrontalia slender, at middle a parafrontale slightly less than diameter of anterior ocellus, broadening to lunula where it is almost as broad as width of 3rd antennal segment. Interfrontalia distinct throughout, at narrowest point broader than diameter of anterior ocellus and sometimes as broad as width of 3rd antennal segment. (4-) 6-8 pairs of inclinate *ori* on lower half of frons, the upper ones hair-like; *ors* absent. Antennae and arista dark brown, sometimes basal antennal segments much lighter brown. 3rd antennal segment 2½-3 times as long as broad. Arista plumose, the longest individual plumes subequal to width of 3rd antennal segment, or sometimes a little longer. Parafacialia rather broad, hardly tapering below, at middle over half width of 3rd antennal segment. Parafacialia and genae bare. Vibrissae strong. Vibrissal angle behind level of profrons. Depth below lowest eye-margin almost twice width of 3rd antennal segment. Peristomal setae moderately dense, all black including beard. Facial ridges bare except for the usual cluster around vibrissal angle. Mentum of proboscis dark brown, dusted. Palpi dark brown, sometimes paler near base; little enlarged in apical half.

Thorax.—Ground-colour black. Mesonotum densely yellowish-grey dusted, with a pair of thinly dusted narrow paramedian vittae from neck to 2nd *post dc*, and with thinly dusted markings between *prst dc* and *ph*, and between *post dc* and *ia*. Scutellum densely dusted, as mesonotum; pleura more thinly dusted. Spiracles dark brown to dirty yellow. Ground-setulae quite sparse. *Acr* 0 + 1, the *prsc* pair very weak; the *prst* setulae in 4 rows, the outer ones closer to *dc* than to each other. *Dc* 2 + 3 or 2 + 4, all strong; sometimes the 2nd of the 4 *post* setae reduced on one side, and most small males with it so weak that *dc* appear to be 2 + 3. 2 *h*. 2 *ph*. 2 *ia*, anterior one on or slightly behind a level between anterior *sa* and 1st *dc*. 2 *sa*. *Pra* short, hair-like, at most half length of 2nd *npl*. Prosternum and propleural depression bare. 1 strong prostigmatal seta, the auxiliary absent. Notopleuron bare apart from the setae. Mesopleuron with a strong setula in upper anterior corner. *Stpl* 2 + 2. Hypopleuron, including metepisternum, bare. Scutellum with the usual pair of strong lateral and apical setae, and an additional moderate basal lateral and preapical pair. Disc with numerous setulae covering most of disc; lateral margins and ventral surface bare.

Legs.—Coxae black; trochanters reddish to brown; femora black, with yellow apical rings; tibiae dull yellow, sometimes dark near base or tip or both; tarsi black. Tarsi normal, though fore tarsi with some long sensory hairs at tips of 1st and 2nd segments. Fore femur without *av* setae, with a complete *pv* row. Fore tibia with 1-2 (-3) strong *p* setae around middle, and several strong setulae along *ad* surface. Mid femur without *av* setae, with 1-3 short strong *pv* setae near base; a row of short *a* setae on basal half; 1 short *a* and 3 *d-p* preapical setae, the *a* sometimes absent. Mid tibia without setae except for 3-4 (-5) *p* setae. Hind femur bare on *pv* surface, sometimes with 1-2 longer setulae around middle; *av* row complete, the setae short and weak in basal half, 4-5 strong setae in apical half; *ad* row complete; 1 *d* and 1 *pd*

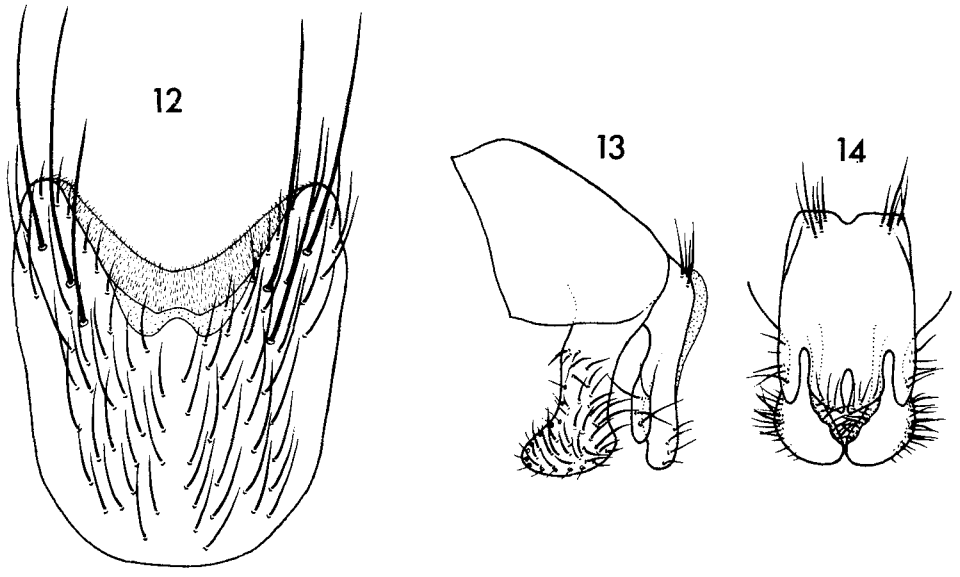
preapical setae. Hind tibia with a short *pd* in basal half; (3-) 4 *ad* and 2-3 *av* setae, without *pv*; *d* and *ad* preapicals both strong.

Wings.—Clear; yellowish costally, and strongly yellow at base. Basicosta and epaulet orange to brown. Costa setulose ventrally as far as the apex of vein 2; costal spine strong, equal to or longer than small cross-vein. Small cross-vein placed below or slightly basad of the point where vein 1 enters costa. Hind cross-vein almost upright, a little sinuate or almost straight. Veins bare except for costa. Squamae yellow to deep yellow, the margins always deep yellow. Halteres orange-yellow.

Abdomen.—Ground-colour black. Densely yellowish-grey dusted. Sometimes wholly unmarked; sometimes tergites 3 and 4 or only tergite 3 with a pair of dark brown oval or subquadrate spots on posterior half, at most one-third as long as tergite and only very rarely appearing longer than this; the smaller males with the spots largest and best marked. Tergites with the setae strong and erect, especially posteriorly: tergite 3 with a marginal row; tergites 4 and 5 each with marginal and discal rows. Sternite 1 bare. Sternites 2-5 yellowish-grey dusted.

Genitalia (Figs. 12-14).—Four dissections.

Measurements.—Length of body, 6.5-8.5 mm. Length of wing, 5.5-7.5 mm.



FIGS. **12-14.**—*Helina liepae* sp.n.: **(12)** male 5th sternite, dorsal view; **(13)** male hypopygium, lateral view; **(14)** male cercal plate, dorsal view.

Female

Differs from the male as follows:

Head.—Frons broad, at middle over one-third of head-width. Ocellars strong. *Vti* and *vte* strong, the *vti* considerably longer than *vte*. Parafrontalia, upper parafacialia and upper occiput yellowish-grey pruinose; rest of lower part of head lighter grey pruinose. Interfrontalia black in ground-colour, yellowish-grey pruinose when viewed from below; frontal triangle only differentiated when viewed from the side or from above, reaching to lunula. Parafrontalia rather broad, at middle a parafrontale equal to width of 3rd antennal segment and at this point 2/5 as broad as interfrontalia. 2-4 pairs of strong inclinate *ori*, with 1-2 interstitials; 2 pairs of strong reclinate *ors*; parafrontal setulae in 1-2 irregular rows, on median half of frons. Interfrontalia bare. Parafacialia broader, at middle almost equal to width of 3rd antennal segment. Palpi rather thicker.

Thorax.—The markings outside the *dc* setae sometimes not very distinct. *Dc* 2 + 4 in larger specimens, the 2nd *post* seta reduced or absent in smaller ones. *Pra* more distinct, up to half length of 2nd *npl*.

Legs.—Colour as in male, but tibiae sometimes rather duller red. Fore tibia with the *ad* setulae stronger, at least 1 developed into a short seta; usually only 1 *p*. Mid femur with 3-5 short *pv* on basal third, and usually 3-4 shorter *av* just opposite them; *a* preapical always present. Mid tibia with a short *ad* in basal half. Hind femur with fewer *av* setae, 2-3 strong ones in apical half. Hind tibia sometimes with 3 *ad* or 2 *av*.

Wings.—Costal spinules stronger, especially on the section preceding the spine.

Abdomen.—Dusting as in male or more brownish. Markings as in male, but dark spots usually present: on tergite 3 or on tergites 3 and 4, sometimes almost half as long as tergite. Setae reduced, though strong: tergite 3 with lateral marginals; tergite 4 with a marginal row and a partial discal row; tergite 5 with a discal row and some weak marginals.

Ovipositor.—Not studied.

Measurements.—Length of body, 5.5-9.0 mm. Length of wing, 4.5-8.0 mm.

Comments

This species is quite variable in size, and though this leads to some variations in structure it does not affect the essential characters of the species. In smaller specimens the 3rd antennal segment tends to be shorter and fatter, and in the male the parafacialia is narrower and there are fewer *ori*. There is also a little variation in the width of the male frontal vitta, and subsequently also in the length of the ocellar and vertical setae. Variation in the development of the *dc* setae and of the dark abdominal spots has been discussed in the description above. The genitalia of a small male (wing 5.5 mm) and of a large male (wing 7.0 mm), both collected on 24.ii.1971 near Ned's Beach, were dissected and compared. The small male is illustrated in Figs. 12-14, and the large male agrees exactly except that sternite 5 has rather stronger setae and surstylus has more numerous setulae. Two further males have been dissected to establish the uniformity of genital structure.

H. liepae is a comparatively slender species without any obvious affinity with any of the Australian species, and certainly not resembling any of the numerous southern species. It is probably closest to the northern tropical *duplex* (Stein) from Queensland, New Guinea and New Britain, which differs from *liepae* as follows: male frons narrow, thoracic spiracles pale, *dc* regularly 2+3, tibiae dark brown, and wing-base and squamae pale yellow.

Helina regina Malloch, 1922

NORFOLK ISLAND: Middlegate, 400 feet, 19.vii.1968, M. S. Upton, 1♀ (ANIC); no further data, 1♀ (ANIC); xi.1955, J. E. Friend, 1♀ (BMNH); 13-25.iv. 1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 7♂, 20♀ (ANIC and BMNH).

Distribution: Only known from Australia (southern Western Australia, southern Queensland, New South Wales and Australian Capital Territory). Reared from carrion and from cow-dung.

Helina sp. n.

NORFOLK ISLAND: 17.iv. 1972, no. 72.822, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♀ (ANIC).

This is a small (wing 5.0 mm) and a very characteristic species, in which the body is narrow and wholly yellowish-grey dusted, and all femora and tibiae are yellow.

Limnophora mesolissa Bezzi, 1928

LORD HOWE ISLAND: Blue Lagoon, 24.ii.1971, D. K. McAlpine, 1♂, 1♀ (AM); 29.xi.1955, S. J. Paramonov and Z. Liepa, 3♂, 2♀ (ANIC and BMNH); 5.xii.1955, S. J. Paramonov and Z. Liepa, 11♂, 27♀ (ANIC and BMNH); Salmon Beach, at light, xii.1972, Z. Liepa, 1♀ (ANIC).

Distribution: Australasian region, recorded from Fiji, Tahiti, Samoa, Tonga, New Caledonia, New Hebrides, Solomon Islands, Bismarck Archipelago, New Guinea and Australia (Northern Territory and Queensland). Reared from cow-dung, and also from other kinds of dung or manure (horse, poultry).

Limnophora nigriorbitalis Malloch, 1924

LORD HOWE ISLAND: Erskine Valley, xii.1972, Z. Liepa, 1♀ (ANIC).

Distribution: Known only from Australia (New South Wales). The larva is aquatic, living in moss-cushions or weeds in water or at the water's edge. The adult, immature stages, habits and life-history have been described by English (1940).

Lispe ?albifacies Malloch, 1929

LORD HOWE ISLAND: 23.xi.1955, S. J. Paramonov, 2♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 4♂, 5♀ (ANIC and BMNH).

Distribution: Recorded from Samoa and the Caroline Islands, but not known from the Australian mainland.

This series agrees quite well with Malloch's type which is, however, rather damp, and apparently differs only by having the male hind metatarsus rather less swollen than in the type. Dissection of the type would lead to confirmation or refutation of this identification, but it is deferred until more general revisionary work on Australian *Lispe* can be undertaken.

Lispe cana (Walker, 1849)

LORD HOWE ISLAND: 22.xi.1955, S. J. Paramonov and Z. Liepa, 2♂, 1♀ (ANIC); 24.xi.1955, S. J. Paramonov and Z. Liepa, 10♂, 8♀ (ANIC and BMNH); 25.xi.1955, S. J. Paramonov and Z. Liepa, 6♂, 5♀ (ANIC and BMNH); 26.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 1♀ (ANIC); 27.xi.1955, S. J. Paramonov and Z. Liepa, 23♂, 30♀ (ANIC and BMNH); 28.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 2♀ (ANIC); 3.iii.1957, Z. Liepa, 4♀ (ANIC); Ned's Beach, 15.xi.1956, Z. Liepa, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 4♂, 5♀ (ANIC and BMNH); Blinky Beach, xii.1972, Z. Liepa, 4♀ (ANIC and BMNH).

Distribution: A little-known species, at present known only from Buru Island and Australia (New South Wales).

Lispe incerta Malloch, 1925

NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♂, 1♀ (ANIC).

Distribution: Another little-known species, recorded from India, Philippines, Samoa, New Hebrides, New Caledonia, Caroline Islands, Solomon Islands and Australia (Queensland).

Musca domestica Linnaeus, 1758

LORD HOWE ISLAND: captured "Pine Trees", 21.iii.1964, G. J. Snowball, 8♂, 3♀ (ANIC and BMNH); captured "Pine Trees", 23.iii.1964, G. J. Snowball, 1♂ (ANIC); captured Pine Trees G.H., x.1964, G. J. Snowball, 5♂, 7♀ (ANIC and BMNH); near Johnson's Beach, at light, xii.1966, E. Britton, 1♂, 1♀ (ANIC).

NORFOLK ISLAND: no further data, 1♂, 1♀ (ANIC); 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 10♂, 4♀ (ANIC and BMNH); bred from imported horse crate, 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 9♂, 5♀ (ANIC and BMNH).

Distribution: Cosmopolitan, and known from every State in Australia. Previously recorded from these islands by Pont (in press), and intercepted by Laird (1951: 19) in New Zealand on an aircraft arriving from Norfolk Island.

Muscina stabulans (Fallén, 1817)

LORD HOWE ISLAND: 22.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 24.xi.1955, S. J. Paramonov and Z. Liepa, 8♂ (ANIC and BMNH); 25.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 1.xii.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 5.xii.1955, S. J. Paramonov and Z. Liepa, 3♂, 3♀ (ANIC and BMNH); 18.xii.1955, S. J. Paramonov, 1♂, 1♀ (ANIC); 24.ix.1959, T. G. Campbell, 1♂ (ANIC); near Johnson's Beach, at light, xii.1966, E. Britton, 1♂ (ANIC); Ned's Beach, xii.1972, Z. Liepa, 6♂ (ANIC and BMNH).

NORFOLK ISLAND: Kingston, 9.vii.1968, M. S. Upton, 1♀ (ANIC).

Distribution: Cosmopolitan. In the Australasian region from New Zealand, Hawaii, Fiji, New Hebrides, New Caledonia, New Guinea and Australia (every State).

Orthellia australis (Macquart, 1848)

LORD HOWE ISLAND: Old Settlement Beach, 20.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, 18.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, 20.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, 24.ii.1971, D. K. McAlpine, 2♂, 6♀ (AM and BMNH); near Ned's Beach, Malaise-trap, 20-25.ii.1971, D. K. McAlpine, 1♂, 1♀ (AM); 25.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 27.xi.1955, S. J. Paramonov and Z. Liepa, 2♀ (ANIC and BMNH); 3.iii.1957, Z. Liepa, 2♀ (ANIC); Ned's Beach, 25.ii.1957, Z. Liepa, 1♀ (ANIC); forest near Soldier Creek, at light, 1.xii.1966, E. Britton, 1♀ (ANIC); Blinky Beach, xii.1972, Z. Liepa, 1♂ (ANIC); Mt. Lidgbird, foothills, xii.1972, Z. Liepa, 1♂ (ANIC); Ned's Beach, xii.1972, Z. Liepa, 3♂, 7♀ (BMNH and ANIC).

Distribution: Known only from New Guinea, Ralum Island (Bismarck Archipelago) and Australia (Northern Territory, Queensland, New South Wales and Australian Capital Territory). See Pont (in press).

Prohardyia carinata (Stein, 1910)

LORD HOWE ISLAND: Summit of Mt. Gower, 19.ii.1971, D. K. McAlpine, 1♂ (AM); 22.xi.1955, S. J. Paramonov and Z. Liepa, 2♂ (ANIC); 23.xi.1955, S. J. Paramonov and Z. Liepa, 2♀ (ANIC and BMNH); 24.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 27.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 1♀ (ANIC); 1.xii.1955, S. J. Paramonov and Z. Liepa, 2♂, 1♀ (ANIC); 5.xii.1955, S. J. Paramonov and Z. Liepa, 3♂ (ANIC and BMNH); 18.xii.1955, S. J. Paramonov, 1♂ (ANIC); 25.ix.1959, T. G. Campbell, 1♀ (ANIC); Mt. Gower summit, 2800 feet, at light, E. Britton and R. W. Taylor, 1♀ (ANIC); forest near Soldier Creek, at light, 1.xii.1966, E. Britton, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 1♂, 2♀ (ANIC); Salmon Beach, at light, xii.1972, Z. Liepa, 2♀ (ANIC).

Distribution: Known only from Australia, where it is widespread (Western Australia, Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania). The larva breeds in cow-dung. Previously recorded from Lord Howe Island by Pont (1969: 947).

Pygophora howeana Paramonov, 1960

LORD HOWE ISLAND: Erskine Valley, 19.ii.1971, D. K. McAlpine, 1♀ (AM); near Ned's Beach, Malaise-trap, 20-25.ii.1971, D. K. McAlpine, 4♀ (AM and BMNH); near Ned's Beach, 23.ii.1971, D. K. McAlpine, 2♀ (AM and BMNH); near Ned's Beach, 24.ii.1971, D. K. McAlpine, 3♀ (AM and BMNH); Mt. Lidgbird,

foothills, xii.1972, Z. Liepa, 1♂, 1♀ (ANIC); Erskine Valley, xii.1972, Z. Liepa, 1♀ (ANIC); Ned's Beach, xii.1972, Z. Liepa, 4♀ (ANIC and BMNH).

Distribution: Known only from Lord Howe Island. Paramonov (1960b: 510-511) described the species from "Lord Howe Island", but also mentioned the localities Old Settlement and Dawson Range. Crosskey (1962: 449) studied two paratypes without any detailed locality data.

The series collected by Dr McAlpine shows considerable variation in the colour of the femora which, on all legs, range from wholly yellow to almost wholly dark. The normal colour in females of *howeana* is yellow.

Pygophora maculigera (Stein, 1920)

NORFOLK ISLAND: Middlegate, 400 feet, 19.vii.1968, M. S. Upton, 1♂ (ANIC); xi.1955, J. E. Friend, 1♀(ANIC); 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 3♂, 5♀ (ANIC and BMNH); xii.1968, N. L. H. Krauss, 2♀ (AM).

Distribution: Australasian region, and recorded from New Guinea, Buru, Celebes, New Britain, Solomon Islands and Australia (North Queensland).

Spilogona ferrari sp. n.

Types.—Holotype male (Norfolk Island, 13-25.iv.1972, A. L. Dyce, H. A. Standfast, P. Ferrar), in ANIC. *Paratypes*, NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast, P. Ferrar, 1♂, 14♀ (ANIC and BMNH); Ball Bay, xii.1968, N. L. H. Krauss, 1♂, 2♀ (AM).

Male

Head (Fig. 15).—Ground-colour black. Frons comparatively broad, at middle 3/4 of an eye-width at this point and 3 times as broad as width of 3rd antennal segment; broadening sharply after middle towards lunula. Eyes with moderately dense hairs. Ocellars and *vti* strong, *vte* weak and not much longer than the adjacent post-ocular setulae. Parafrontalia, parafacialia and genae silvery-white pruinose; interfrontalia black and matt, grey only when viewed from below; face and occiput light-grey, ocellar tubercle brownish-grey. At middle of frons a parafrontale slightly broader than diameter of anterior ocellus and 1/6 width of interfrontalia, becoming much broader towards lunula where it is as broad as width of 3rd antennal segment. Interfrontalia parallel-sided from vertex to lunula. 6 pairs of moderate inclinate *ori* with a few fine interstitials, on lower 3/4 of frons; above them with 2 pairs of short subequal reclinate *ors*; parafrontalia with a few short proclinate setulae outside the *ori*, especially towards lunula; interfrontalia bare. Profrons produced forwards (Fig. 15). Antennae black and long, 3rd segment 3 times as long as broad. Arista rather thickened towards base, pubescent, the longest hairs a little longer than its basal diameter. Parafacialia broad at lunula (Fig. 15), narrowing greatly below; bare. In lateral view vibrissal angle well behind level of profrons and epistoma concealed. Facial ridges with several setulae above vibrissa. Depth below lowest eye-margin slightly greater than width of 3rd antennal segment. Peristomal setae dense. Palpi black. Mentum of proboscis glossy, black.

Thorax.—Ground-colour black. Mesonotum densely yellowish-brown dusted, without undusted vittae but with weak traces of thinly dusted paramedian vittae between *dc* at neck, *prst* patches between *dc* and *ph*, and *post* vittae between *dc* and *ia*. Pleura yellowish-grey dusted; anterior spiracle dull. Scutellum grey to yellowish-grey dusted, thinly dusted on margins, with a median brownish spot. *Acr* 0 + 1, the *prst* setulae in 3-4 rows. *Dc* 2 + 4. *Pra* absent. Prosternum, propleural depression and pteropleuron bare. 1 propleural and 1 prostigmatal seta, each surrounded by several ground-setulae but without auxiliaries. Notopleuron with a setula adjacent to the posterior seta. Mesopleuron without a predorsal interspatial setula in posterior row ("Lückenborste"). *Stpl* 1 + 2, the anterior one fine, the lower one short and fine. Hypopleuron with a group of setulae on beret, otherwise bare. Scutellum with the disc uniformly setulose; lateral margins with several rows of setulae below the level of the strong setae, a few very short weak ones actually situated on ventral surface.

Legs.—Black; trochanters sometimes yellow; tibiae and tip of femora yellow; fore tarsus with segments 1-3 rather yellow at tips, and segments 2-3 wholly yellow ventrally. Tarsi without modifications. Fore femur without *av* setae, with a complete *pv* row. Fore tibia with a submedian *p* seta. Mid femur bare ventrally except for a row of erect *pv* setulae in basal half, half femoral depth; 0 *a* and 2 *p* preapical setae.

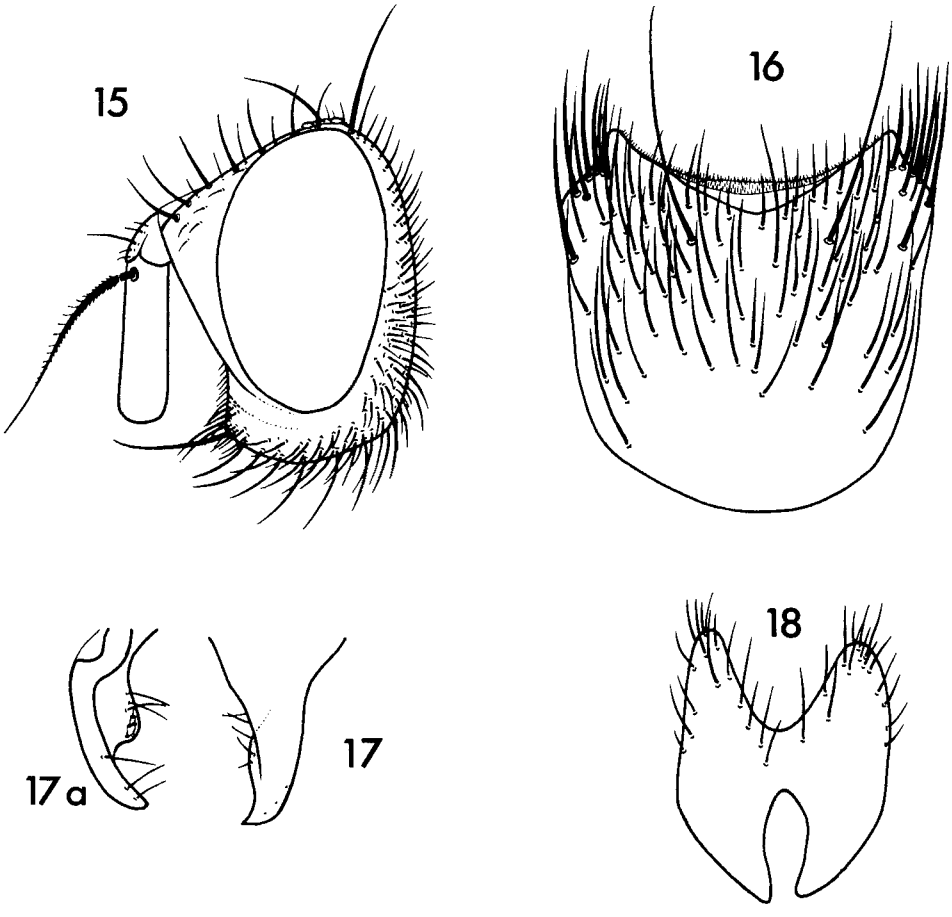
Mid tibia with or without a short *ad* at apical quarter, and with 3 *pd* setae. Hind femur on *pv* surface with 1 short seta and some setulae on basal third; *av* surface with 2-4 setae on apical half and usually some erect setulae on basal half. Hind tibia with 2-3 *ad* and 1-2 *av* setae; without *pd* or *pv* setae; *ad* apical distinct, equal to tibial depth.

Wings.—Clear, rather yellow anteriorly and basally. Basicosta yellow, epaulet brownish. Costal setulae of uniform length and strength, costal spine inconspicuous. Stem-vein with a few dark setulae on basal part of ventral surface; otherwise veins bare except for costa. Small cross-vein slightly basad of or below the point where vein 1 enters costa. Hind cross-vein rather sinuous. Veins 3 and 4 parallel at wing-margin. Squamae mainly deep yellow, upper one partly creamy. Halteres yellow.

Abdomen.—Ground-colour black. Tergites and sternites grey dusted, tinged with yellow. Tergites with dark markings as follows: tergite 1 + 2 with a pair of large black paramedian spots, from fore- to hind-margin, leaving only small dusted areas medially and laterally; tergites 3 and 4 each with a pair of paramedian black quadrate spots, from fore- to hind-margin, the inner edges parallel and the dusted space between them with a narrow black vitta, the outer edges diverging so that the spots are 1½ to 2 times as broad on hind-margin as on fore-margin; tergite 5 with a narrow black vitta and some dark brown dust around it. Tergites without striking setae, with the usual lateral discals and marginals on the posterior tergites. Sternites without special bristling; sternite 1 bare.

Genitalia (Figs. 16-18).—One dissection. Distiphallus membraneous.

Measurements.—Length of body, 4.5-5.0 mm. Length of wing, 3.5-4.0 mm.



FIGS. **15-18.**—*Spilogona ferrari* sp.n.: **(15)** male head, lateral view; **(16)** male 5th sternite, dorsal view; **(17)** male surstylus, lateral view, and (a) posterior view;**(18)** male cercal plate, dorsal view.

Female

Differs from the male as follows:

Head.—Frons broader, at middle broader than an eye, broadening evenly from vertex to lunula. Ocellars and *vti* stronger; *vte* stronger and twice as long as an adjacent post-ocular setula. Parafrontalia mainly dark brown pruinose, only narrowly and partially grey along eye-margin; parafacialia and face light-grey, genae and lower occiput grey to yellowish-grey, upper occiput yellowish- to brownish-grey pruinose. Interfrontalia mainly dark brown pruinose when viewed from below; frontal triangle conspicuous, broad, reaching halfway from anterior ocellus to lunula. Proportions of parafrontalia and interfrontalia as in male. 4-5 pairs of strong inclinate *ori*, with a few weak interstitials; 2 pairs of short reclinate *ors*, the upper one slightly longer than the lower; parafrontalia with more numerous proclinate setulae outside *ori* extending from upper part to lunula. Profrons not projecting so far.

Thorax.—The marks outside *dc* rows hardly discernible; *dc* bristle-dots rather large. Scutellum dusted as mesonotum with the sides also dusted, the dorsal dark spot weakly distinct. *Prst acr* setulae rarely in 5-7 rows. Bristling otherwise as in male, but rarely the notopleural setula absent.

Legs.—Trochanters yellow; femora more extensively pale at tips; fore tarsi dark. Mid femur with the *pv* weaker. Mid tibia with the *ad* usually present. Hind femur usually bare on basal half of *av* surface, and *pv* surface with only 1-2 short setae.

Wings.—As in male.

Abdomen.—Yellowish- to brownish-grey dusted. The dark spots variable, and sometimes very indistinct: tergite 1 + 2 immaculate or with dark hind-marginal spots; tergites 3 and 4 marked as in male but more weakly so, or with the marks reduced to 2 weak quadrate spots confined to posterior half of tergite and about as broad as long, the median vitta vestigial; tergite 5 with a weak median vitta.

Ovipositor.—Not studied. Post-genital plate bearing strong spinules.

Measurements.—Length of body, 5.0-6.0 mm. Length of wing, 4.0-5.0 mm.

Comments

The genus *Spilogona* Schnabl is mainly Holarctic in distribution, but has also spread to and proliferated in temperate South America and New Zealand. One undescribed species is known to me from south-eastern Australia, and that differs most obviously from *ferrari* by the entirely black legs.

Both *ferrari* and the mainland species belong to the group of species with parafacialia bare, hypopleuron setulose on beret, and bare sternite 1. Additional important characters in common are the glossy proboscis, 4 *post dc*, setulose notopleuron, absence of predorsal interspatial setula in posterior row of mesopleuron, and sides of scutellum with several rows of setulae below the strong setae.

Stomoxys calcitrans (Linnaeus, 1758)

LORD HOWE ISLAND: 23.xi.1955, S. J. Paramonov and Z. Liepa, 1♂, 1♀ (ANIC and BMNH); 24.xi.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); Ned's Beach, 25.ii.1957, Z. Liepa, 1♂ (ANIC); captured "Pine Trees", 21.iii.1964, G. J. Snowball, 1♂ (ANIC); near Johnson's beach, at light, xii.1966, E. Britton, 1♂ (ANIC); vii.1914, R. D. Laurie, 1♀ (BMNH); Mt. Lidgbird, foothills, xii.1972, Z. Liepa, 1♂ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 2♀ (ANIC); Salmon Beach, at light, xii.1972, Z. Liepa, 1♂, 2♀ (ANIC).

NORFOLK ISLAND: vi.1937, C.R.P., 1♀ (ANIC); xi.1955, J. E. Friend, 1♀ (ANIC); Cascades, 200 feet, 7.vii.1968, M. S. Upton, 4♀ (ANIC and BMNH); 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 24♂, 4♀ (ANIC and BMNH); bred from mulched grass, 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 1♂, 1♀ (ANIC); bred from cow pad, 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 6♂, 5♀ (ANIC and BMNH).

Distribution: Cosmopolitan, and known from every State in Australia. Previously recorded from these islands by Pont (in press).

Synthesiomyia nudiseta (Wulp, 1883)

LORD HOWE ISLAND: Forest behind Old Settlement Beach, 23.ii.1971, D. K. McAlpine, 1♀ (AM); 5.xii.1955, S. J. Paramonov and Z. Liepa, 1♀ (ANIC);

Ned's Beach, xii.1972, Z. Liepa, 1♂, 1♀ (ANIC); Boat Haven, xii.1972, Z. Liepa, 2♂ (BMNH and ANIC); Salmon Beach, xii.1972, Z. Liepa, 1♂ (ANIC); Salmon Beach, at light, xii.1972, Z. Liepa, 1♀ (ANIC).

NORFOLK ISLAND: 13-25.iv.1972, A. L. Dyce, H. A. Standfast and P. Ferrar, 7♀ (ANIC and BMNH).

Distribution: Tropicopolitan. Throughout the Pacific area, and in Australia known from Queensland.

ANTHOMYIIDAE

Craspedochoeta deceptiva (Malloch, 1921)

LORD HOWE ISLAND: 5.xii.1955, S. J. Paramonov and Z. Liepa, 1♂ (ANIC); 5.iii.1957, Z. Liepa, 1♀ (ANIC); Salmon Beach, xii.1972, Z. Liepa, 2♀ (ANIC).

Distribution: Known only from New Zealand and Australia (Queensland, New South Wales, Victoria, South Australia, and Tasmania).

Delia urbana (Malloch, 1924)

LORD HOWE ISLAND: Salmon Beach, xii.1972, Z. Liepa, 1♀ (ANIC).

NORFOLK ISLAND: Bloody Bridge, 21.ii.1958, Z. Liepa, 1♀ (ANIC).

Distribution: Known only from Australia (Western Australia, New South Wales and South Australia).

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