Revision of the New Zealand Crambini (Lepidoptera: Pyralidae: Crambinae)

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The New Zealand species of Crambini trib. redef. are treated; 55 species (1 adventive) are considered valid.

Thirty-five species previously in *Chilo*, *Crambus*, *Hypochalcia*, or *Tauroscopa* are transferred to *Orocrambus* Purdie, 1884: *abditus*, *aethonellus*, *angustipennis*, *apicellus*, *callirrhous*, *clarkei eximia*, *corruptus*, *crenaeus*, *cyclopicus*, *dicrenellus*, *enchophorus*, *ephorus*, *flexuosellus*, *fugitivellus*, *haplotomus*, *harpophorus*, *heliotes*, *heteraulus*, *horistes*, *isochytus*, *lectus*, *melitastes*, *oppositus*, *ornatus*, *paraxenus*, *punctellus*, *ramosellus*, *scutatus*, *simplex*, *siriellus*, *sophronellus*, *tuhualis*, *vittellus*, *vulgaris*, and *xanthogrammus*.

Five new species are described under *Orocrambus: jansoni*, *lewisi*, *lindsayi*, *ordishi*, and *philpotti*.

Ten accepted species of *Orocrambus* are re-examined: *catacaustus*, *clarkei clarkei*, *cultus* (of which no specimens now exist), *machaeristes*, *melampetrus* (type species), *mylites*, *scoparioides*, *thymiastes*, *tritonellus*, and *ventosus*.

Sixteen new synonymies are made under *Orocrambus: Crambus antimorus*, *C. aulistes*, *C. heteranthes*, *C. meristes*, *C. meritus* (misspelling of *meristes*), and *C. saristes* with *O. aethonellus*; *C. schedias* with *O. callirrhous*; *Tauroscopa nebulosa* with *O. clarkei clarkei*; *C. diplorrhous* with *O. crenaeus*; *C. sophistes* with *O. cyclopicus*; *C. pedias* and *C. scitulus* with *O. enchophorus*; *C. corylana* with *O. ephorus*; *C. apselias* with *O. ramosellus*; *C. conopias* with *O. vittellus*; and *C. obstructus* with *O. vulgaris*.

A monotypic new genus, *Maoricrambus*, is erected for *Crambus oncobolus*. The monotypic *Kupea electilis* is re-examined. *Velasquez pentadactyla* is transferred to *Tawhitia*, of which genus *Velasquez* becomes a synonym. *Tawhitia leonina* is synonymised with *T. glaucophanes*. The presence of the adventitious species *Angustalius malacelloides* is discussed.

The tribe Crambini is redefined. It differs from all other Crambinae in having the ostiolar sclerites in intersegmental membrane 7–8 of the female abdomen evaginated dorsally and ventrally into a short, projecting tube, the sclerites fusing in the lateral midlines. The phylogeny of the tribe is discussed. Two subtribes are proposed: Crambina, in which forewing vein r_5 is stalked with r_4, the female anal papillae are free, and the male genitalia contain a pseudosaccus; and Corynophorina, in which forewing r_5 is free, the female anal papillae are fused into a characteristic 'Dutch clog' shape, and the male genitalia have a characteristic laminate flap ventral to the saccus but lack a pseudosaccus. The type-genus of both Crambini and Crambina is *Crambus*. Crambina includes the revised genera *Agriphila*, *Catoptria*, *Chrysocrambus*, *Chrysoteuchia*, *Crambus*, *Fernandocrambus*, *Fissicrambus*, *Flavocrambus*, *Kupea*, *Maoricrambus*, *Metacrambus*, *Microcrambus*, *Orocrambus*, *Pediasia*, and *Xanthocrambus*. *Corynophora* is designated the type-genus of Corynophorina, which subtribe includes *Tawhitia* from New Zealand.

The genus closest to New Zealand *Orocrambus* is the Palaearctic-Nearctic *Agriphila*. Apart from the probably adventitious *Angustalius malacelloides* Crambina are absent from Australia, and South America lacks unspecialised genera. Conflicting Gondwana rift sequence evidence must be explained if an Africa/India-Antarctic route to New Zealand is proposed for *Orocrambus* precursors. A route along the former Melanesian Arc islands, in the early Tertiary, seems more probable. The Eocene is considered likely, since *Orocrambus* is almost completely grass-feeding, and New Zealand grass fossils first appear in the Eocene. The absence of Crambina from Australia is discussed.

Reprints of this paper are held at Entomology Division, DSIR, Mt. Albert Research Centre, Private Bag, Auckland, New Zealand, as well as by the author.

Introduction

The *Crambus*-like genera have numerous species in the temperate zones, many species being of some economic importance as pests of grasslands. Their taxonomy and biogeography have been studied extensively, and significant papers—apart from those by Bleszynski, and excluding descriptions of new species and faunal lists of small areas—include those by Beirne (1952), Caradja (1910, 1916, 1925, 1926, 1928), Fernald (1896), Hampson (1895), Handlirsch (1925), Hasenfuss (1960), Hudson (1928, 1939), Klots (1968), de Lattin (1951, 1952), Marion (1949, 1950a, b), Martini (1916), Meyrick (1883, 1885, 1912, 1928), Moore (1888), Petersen (1925), Rebel (1901), Sowinskij (1935), Tutt (1887), Wahlgren (1915), and Zeller (1863). By far the greatest contributions to our knowledge of crambine taxonomy in recent years have been made by Bleszynski, who revised the Palaearctic Crambinae and many species and genera of tropical distribution (*see* Bleszynski, S. in References). Revisions up to 1961 were incorporated into a catalogue (Bleszynski & Collins 1962).

In the study described here I have relied heavily on the assistance of Dr Bleszynski, particularly as regards searches for type material, selection of lectotypes, and comparison of sketches and descriptions with museum types not readily available to me. Dr Bleszynski's death in a road accident in 1969 was a tragic loss, and in acknowledgment of my indebtedness to him I am pleased to be able to formalise here his unpublished lectotype selections. In the course of the study, I have examined the types of all New Zealand Crambinae described by Meyrick and now in the collection of the British Museum (Natural History), material in the various institutions and museums within New Zealand, and specimens newly collected from a number of North Island localities.

Several taxonomic changes, particularly new synonymies, are effected in this paper; for ease of reference they are summarised in Table 1.

TABLE 1—Reference list of taxa synonymised with *Orocrambus* and *Angustalius* in this work or (correctly) by other authors, and *taxa excluded from Crambinae

Crambus	*Crambus*
antimorus Meyrick: *O. aethonellus*	*rangona* Felder: *O. ramosellus*
apselias Meyrick: *O. ramosellus*	*saristes* Meyrick: *O. aethonellus*
aulistes Meyrick: *O. aethonellus*	*schedias* Meyrick: *O. callirrhous*
bisectellus Zeller: *O. vittellus*	*scitulus* Philpott: *O. enchophorus*
conopias Meyrick: *O. vittellus*	*sophistes* Meyrick: *O. cyclopicus*
corylana Clarke: *O. ephorus*	*sublicellus* Zeller: *O. vittellus*
diplorrhous Meyrick: *O. crenaeus*	*thrincodes* Meyrick: *O. tuhualis*
heteranthes Meyrick: *O. aethonellus*	*transcissalis* Walker: *O. vittellus*
incrassatellus Zeller: *O. vittellus*	*vapidus* Butler: *O. vittellus*
leucanialis Butler: *O. ramosellus*	
luridus Hudson: *O. corruptus*	*Orocrambus*
malacellus Duponchel: *A. malacelloides*	**caesius* Philpott = ?*Scoparia caesia*
meristes Meyrick: *O. aethonellus*	*pervius* Meyrick: *O. catacaustus*
nexalis Walker: *O. vittellus*	**subitus* Philpott = ?*Scoparia subita*
obstructus Meyrick: *O. vulgaris*	
pedias Meyrick: *O. enchophorus*	*Tauroscopa*
	nebulosa Philpott: *O. clarkei clarkei*

Text Conventions

Morphological terminology used in this paper was established for other groups of Lepidoptera by Diakonoff (1954), Klots (1956), and Dugdale (1961, 1966). The term 'apomorphic' is applied in the sense used by Hennig (1957, 1960, 1965) to specific characters considered to represent a condition more advanced than that of homologous characters in other species within the same monophyletic grouping. Use of the term does not imply total acceptance of the methods of systematic analysis described by Hennig.

To hold this paper within manageable proportions, it has been found necessary to curtail parts of the text and to adopt several abbreviated conventions. The following initialisms are used for Collections: AIM – Auckland Institute and Museum; CM – Canterbury Museum, Christchurch; DSIR – National Arthropod Collection, Mount Albert Research Centre, DSIR, Auckland; NM – National (formerly Dominion) Museum, Wellington. The term 'LMB ratio', in descriptions of male genitalia, refers to the length: median breadth ratio of the aedeagus. All other 3-letter combinations are codes for authors' genitalia preparations, a complete list of which appears as an appendix to my Ph.D. thesis "Systematics and Biogeography of the New Zealand Crambinae (Lepidoptera: Pyralidae)" in the Massey University library, Palmerston North. This thesis also contains full data on the material examined, which in the present paper are reduced to the numbers of each sex examined from each of the main islands/island groups of New Zealand. In genitalia descriptions, comparisons of size (and proportions) are given in decimal units to the nearest 0.1, and relate to lengths, unless otherwise specified. For instance, *for* "ductus bursae about 5× anal papillae, strong to junction with ductus seminalis at 0.8" *read* "ductus bursae about 5.0× as long as anal papillae, strong from ostium bursae to junction with ductus seminalis at eight-tenths ductus bursae length from ostium to corpus".

In all illustrations of genitalia, the scale line represents 0.5 mm; male genitalia are shown in left lateral aspect and female genitalia (with 2 noted exceptions) in right lateral aspect. For some of the species treated, illustrations are given also of the larval head capsule and prothoracic shield, larval segmental setation, and wing venation, of which the fine structure is explained diagramatically in Figs 18a (p. 310), 19a (p. 316), and 22e (p. 341) respectively. For a few species, the range of variation in forewing pattern is illustrated. Finally, monochrome plates of selected species are provided at the end of the text to clarify external morphology and markings not readily visualised or differentiated from written descriptions.

Crambini trib. redef.

Tetrachilae Hübner, 1816–[1826], Verzeichniss bekannter [sic], Augsburg (part).
Crambos sensu Zeller, 1863, Chilonidarum et Crambidarum genera et species, Berolinensis: 1 (part).
Not Crambini Handlirsch, 1925, Pyralididae *in* Schroder, Chr., Handbuch der Entomologie **3**: 900 (=Crambinae; Hampson 1895).
Not Crambini Hasenfuss, 1960, Abhandlungen zur Larvalsystematik der Insekten **5**: 152 (=Crambinae; Hampson 1895).
Crambini sensu Klots, 1968, Journal of the New York Entomological Society **76**: 9–10 (part).

COMMENTS ON TRIBAL SYNONYMY. The use of "Crambos" and "Chilones" by Zeller appears to be the first use of group terms below the subfamily level which might be equated with tribes. However, they are used very loosely. Use of the name Crambini as defined by Handlirsch and Hasenfuss is inapplicable, since they are merely substituting the name for Crambinae and downgrading the status of all major groups in the Pyralidae. Crambini are represented in the Tetrachilae of Hübner, but so are non-crambine Lepidoptera. Klots (1970) has used tribal names in his paper, but has so far defined only the Chiloini (=Chilonini; *see* Gaskin 1973). Other major workers on Crambinae, e.g., Bleszynski (1955–67), have either not attempted to group genera into tribes or have made temporary unnamed groupings of genera for working purposes.

DESCRIPTION

Antennae filiform to serrate; maxillary palpi triangular, with hair-like scales; labial palpi elongate, porrect, with hair-like scales; chaetosemata present; frons planoconvex or conical; ocelli present, relatively large in diurnal species; compound eye with nude circumorbital margin in many diurnal species; haustellum fully developed. Forewings with vein r_5 stalked

with r_4 (subtribe Crambina) or free (subtribe Corynophorina); hindwings with discal cell open and a well-developed cubital hair pecten on lower margin of cell; male frenulum single, female frenulum single, double, triple, or (in a few species) sextuple.

GENITALIA. **Male.** Pseudosaccus developed; saccus poorly developed (most genera of Crambina) or elongate with partially separated, flat, laminate posterior extension (Corynophorina); valva with distinct costal lobe, sacculus and valvula regions developed; valvula usually with strong hair brush on inner surface, very slender (Corynophorina) or generally broad (Crambina); costal portion of valva usually flanged, lobed, or pronged, sacculus also often thus; uncus and gnathos usually well developed, apically pointed, clubbed, or spatulate; juxta usually vestigial or absent (Crambina) or strong and plate-like or saddle-shaped (Corynophorina); aedeagus tubular and slightly curved ventrad or (more rarely) sigmoid, frequently with elaborate external apical spur or thorn-like ornamentation, cornuti present and fixed (rarely deciduous) or absent.

Female. Ostiolar sclerites evaginated and fused into a short, protruding tube, fused in lateral midline and strongly developed in dorsal and ventral positions, the limen so formed completely encircling ostium bursae; anterior margins of ostiolar sclerites remaining in intersegmental membrane 7–8, attached to anterior ventral angles of tergite 8 (Corynophorina), or sclerites fused into a tube not so attached (Crambina); tergite 8 fused to lateral lines of fusion of lamellae ante- and postvaginales (ostiolar sclerites), OR lamella antevaginalis in turn fused to sternite 8 (which is vestigial or absent in some genera), OR line of fusion of tergite 8 with ostiolar sclerites advanced posteriorly, becoming diagonal to anterior-posterior axis of genitalia in some species, in others of several genera tending to encircle ostium bursae, sometimes completely, OR tergite 8 free (very few genera); tergite 8 usually broad, but reduced to a narrow, strap-like structure in some species in a number of genera, sternite 8 usually fused with lamella antevaginalis, vestigial, or lost, sometimes a well developed lunate or oblong plate, anal papillae free, medially indentate, and setulose (Crambina); tergite 8 forming a broad tube, the ostium bursae forming a smaller strong tube at its ventral anterior base, sternite 8 vestigial or lost, anal papillae fused into characteristic 'Dutch clog' shape and strongly setulose (Corynophorina); posterior apophyses of tergite 8 usually shorter than anal papillae (Crambina), or much longer than papillae (Corynophorina), anterior apophyses usually lost or vestigial, but medium or short in a very few genera (both subtribes); ostiolar region of ductus bursae usually swollen anterior to limen, frequently sclerotised; corpus bursae either asignate or with 1 or 2 oval, diamond-shaped, or stellate signa.

DIAGNOSIS. Crambini are distinguished from Chilonini and Diptychophorini principally in having everted, laterally fused ostiolar sclerites forming a short, projecting tube.

CHARACTERS OF TAXONOMIC IMPORTANCE IN CRAMBINI

This reclassification of part of the Crambinae is based on my own studies of New Zealand and exotic genera and on drawings published by Bleszynski. To date approximately 40 genera of Crambinae have been revised by Bleszynski, Klots (1968, 1970), and myself; of these I consider 18 to be Crambini. Many more genera, especially from the Neotropical region and the tropics of the Ethiopian region, remain unrevised.

The ostiolar sclerites (collectively the sterigma) are structures in the intersegmental membrane of abdominal sternites 7–8 of female Lepidoptera. I consider that correct interpretation of the fate of these structures is essential to proper understanding of crambine phylogeny. Several quite distinct variants of sclerite structure occur among Crambinae; these will be discussed within the context of the phylogeny of the subfamily in a later paper.

In Crambini the 2 sterigmoid sclerites have become evaginated and fused laterally to form a limen about the ostium bursae in the form of a short, projecting tube. The dorsal sclerite is the lamella antevaginalis and the ventral sclerite is the lamella postvaginalis.

In 2 papers on the genus *Euchromius* Guenée, Bleszynski (1960b, 1961a) noted that ostiolar sclerites provide good characters for specific distinctions. However, in general he concentrated on other characters, especially in the male genitalia. This bias in part reflects the dearth of females in series in the European museums where most of his studies were made.

In Crambini the ostiolar sclerites are evaginated and fused in the lateral midlines to form a tube projecting through the intersegmental membrane of sternites 7 and 8 of the female. They are strongly fused in all Crambina; in Corynophorina they are completely fused in *Tawhitia* Philpott but only partially fused in the type genus *Corynophora* Berg, which is the least specialised genus of Crambini so far known. Crambina are unified by 2 apomorphic characters, the common stalk of forewing veins r_5 and r_4, and the development of a pseudosaccus in the male genitalia. Conversely, Corynophorina have r_5 and r_4 separate up to the cell, and are unified by other apomorphic characters—the typical coalescence of the anal papillae in the female, and the presence of a laminate ventral flange on the saccus in the male genitalia.

There is a general parallel tendency among genera of Crambina for sternite 8 to be greatly reduced or lost (*see* Table 2, p. 276). It is still present as a small, lunate plate in some species of *Orocrambus* Purdie; and in *Agriphila* Hübner, where tergite 8 is not always fused to the ostium bursae, sternite 8 retains a minor supporting function, sometimes acting as a "bridge" (Bleszynski 1957) between tergite 8 and the ostium bursae. *Orocrambus* and *Agriphila* belong to a relatively unspecialised group of genera of Crambina with little or no development or differentiation of the male valval sacculus. They share the apomorphic character of almost complete reduction of the anterior apophyses on abdominal tergite 8 of the female, but this could conceivably be a parallel development related to oviposition or method of copulation. Although of common ancestry, the 2 genera have speciated in isolation, showing parallelism in some characters and divergence in others. *Orocrambus* shows complete fusion of tergite 8 with the ostium bursae but retains 2 signa on the corpus bursae; in *Agriphila* the fusion is nearly always incomplete, and 1 signum has been lost in all species.

Crambus Fabricius, *Orocrambus*, *Catoptria* Hbn., and *Fernandocrambus* Aurivillius show a parallel tendency for the line of fusion of tergite 8 with the vaginal lamellae to advance diagonally posteriad, until in some species of each genus the tergite comes to encircle the ostium. Even within *Orocrambus* this has occurred several times in unrelated species in different species groups. There is no correlation between this process and progressive loss of sternite 8.

In the more specialised genera of Crambina there is a tendency for elaborate sclerotisation in the genitalia of both sexes, and especially in the male valvae. *Crambus*, *Fernandocrambus*, *Metacrambus* Blesz., *Catoptria*, *Chrysoteuchia* Hbn, *Xanthocrambus* Blesz., *Flavocrambus* Blesz., and *Angustalius* Marion have marked differentiation of the sacculus of the valva into a strong lobe or prong. Similarly in Corynophorina the sacculus and valval costa are ornate in the more specialised *Tawhitia* Philpott but not in the more primitive *Corynophora* Berg.

In the Neotropical genera *Microcrambus* Blesz. and *Parapediasia* Blesz. (Crambina), the ventral margin of sternite 7 of the female bears a dense brush of flattened scales (Klots 1968), an apomorphic character segregating these genera from other Crambina.

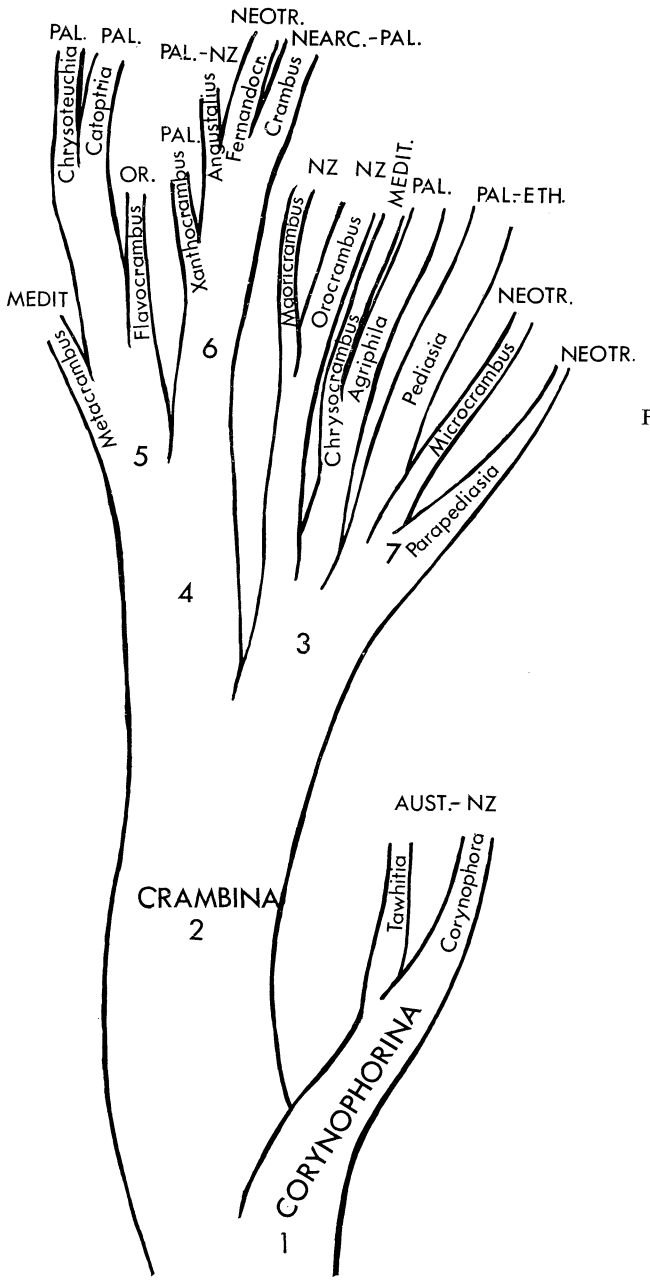

FIG. 1—Diagram of apparent evolutionary relationships of the major genera of Crambini (AUST., Australian; ETH., Ethiopian; MEDIT., Mediterranean; NEARC., Nearctic; NEOTR., Neotropical; NZ, New Zealand; OR., Oriental; PAL., Palaearctic). Important taxonomic characters: 1. Corynophorina distinguished by 'clog-like' fusion of ♀ anal papillae, laminate extension of floor of saccus in ♂, saddle-shaped juxta, and forewing r_5 free from r_4. 2. Crambina distinguished by anal papillae free in ♂, saccus lacking laminate ventral extension but with pseudosaccus present within saccus, juxta plate-like or reduced or absent, and forewing r_5 stalked with r_4. 3. Genera with relatively unspecialised ostiolar region in ♀♀, and with little differentiation of ♂ valval sacculus. 4. Genera with relatively complex ostiolar region development and strongly differentiated sacculus. 5. Genera with spinose development of sacculus. 6. Genera with lobate development of sacculus. 7. Two genera, *Microcrambus* and *Parapediasia*, with development of strong brush of scales on caudal margin of ♀ abdominal sternite.

DISTRIBUTION OF CRAMBINI (FIG. 1)

Of the 18 revised genera of Crambini, the subtribe Corynophorina at present contains only 2, *Corynophora* from Australia and *Tawhitai* from Australia and New Zealand. The remaining 16 revised genera constitute the subtribe Crambina. *Orocrambus* (48 spp.) and *Maoricrambus* n.gen. (monotypic) are endemic New Zealand genera. *Catoptria* (74 spp.) is a montane Palaearctic genus with a few representatives in the Nearctic; *Cambus* (about 280 spp.), *Agriphila* (35 spp.) and *Pediasia* (55 spp.) are widely distributed in the Holarctic.

In the far east of Asia *Crambus* appears to be partly replaced by *Flavocrambus* (3 spp.) and *Chrysoteuchia* (2 spp.). Other Palaearctic genera are *Angustalius* (2 spp., 1 of which reaches Tasmania and New Zealand), and *Metacrambus* (2 spp.) and *Xanthocrambus* (4 spp.), which are developed in the Mediterranean basin.

Crambus also extends into the Brazilian Shield region through Central America (Bleszynski 1967). It is said to be replaced in Patagonia and on Juan Fernandez by *Fernandocrambus* (48 spp.), but this genus is structurally so close to, e.g., *Crambus sapidus* Blesz. and *Crambus geleches* Blesz. (Bleszynski 1967) that I consider criteria for distinction to be weak. As listed by Bleszynski (1967), the characters separating the 2 genera are largely differences in the shape of the sacculus and the vinculum in the male genitalia. *Fernandocrambus* has a large, oblate sacculus lobe, whereas in Holarctic *Crambus* the sacculus lobe has a serrate margin. However, in the above 2 species of *Crambus* the '*Fernandocrambus*' condition is approached very closely.

Parapediasia Blesz. (9 spp.), *Microcrambus* (41 spp.), and *Fissicrambus* Blesz. (14 spp.) are Neotropical genera. The remaining genus is *Chrysocrambus* Blesz. (10 spp.), another rather aberrant and specialised Mediterranean basin genus close to *Agriphila* in genital structure but which looks like *Chrysoteuchia.*

Angustalius malacelloides (Blesz.) is the only member of the Crambina known to occur in Australia. Such unrevised species listed under *Crambus* by Bleszynski & Collins (1962) as have been examined among the Australian species described by Meyrick and Turner have proved to belong in *Culladia* Moore or *Hednota* Meyrick; *Hednota* is the dominant crambine genus in Australian grasslands (Koch 1965). Neither *Orocrambus* nor any genus conceivably of common ancestry occurs in Australia, yet in New Zealand *Orocrambus* has diverged in isolation into 48 known species, many of them alpine or subalpine. The paucity of Crambina in Australia is surprising, since they are important grassland insects on all other temperate or tropical land masses. Several possible explanations may be considered, all speculative because there is no crambine fossil record.

It is unlikely that Crambina genera, including the precursors of *Orocrambus*, might have colonised Australia and later become extinct, because present-day Crambina tolerate grassland conditions ranging from hot desert marginal grassland in Algeria and Arizona to alpine scree and fellfield in the Altai, the Alps, and New Zealand. Munroe (1958) suggested extinction to explain the absence of the scopariine genus *Eudoria* Chapman, 1912 (=*Eudenia* Billberg, 1820) in temperate South America.

A biotic barrier which may have prevented the spread of Crambina into Australia, or the spread of suitable food plants, cannot have been long sustained, as studies by Burbidge (1960) on plant distributions in Australia indicate that the Australian east coast has been a migration route for Indo-Malayan floristic elements since the Cretaceous. A relatively temporary physical barrier, in the form of a wide stretch of open sea, preventing the establishment of *Orocrambus* precursors in Australia at the critical time in the Tertiary when the group was experiencing a phase of explosive dispersal is possible. Most of present-day New Guinea was under water from the Cretaceous to the early Pliocene, and much remaining above the surface was probably covered with lowland forest (Gressitt 1961).

However, conditions for 'island-hopping' from eastern Asia to New Zealand were probably never more suitable than during the Eocene period (*see* Durham 1963, fig. 3; Menard & Hamilton 1963, fig. 4). The success of the Crambini (especially the Crambina) seems to be tied very closely with the ability of the genera to exploit grasses as food plants, even though they are not necessarily obligate grass feeders. Although the fossil record is scanty, the grasses did not show signs of successful global dispersal until the late Cretaceous,

even though they probably existed in the Middle and Upper Jurassic (Bews 1927, 1929). The first grasses appeared in the New Zealand fossil record in the Eocene (Fleming 1962). This correlates closely with the geological evidence cited earlier. We can thus guess that the period of arrival of the *Orocrambus* precursor in New Zealand was the Eocene, a time when dispersal to Australia from the north might have been restricted.

The Lower Oligocene was a relatively cool, dry period in New Zealand (Fleming 1962), and a savanna climate apparently extended over much of the country. Under such conditions *Orocrambus* could successfully have extended its range throughout the archipelago. Extensive speciation might not have occurred until later, when rigorous climatic changes took place, changes in relief were considerable, and areas were periodically isolated by the sea.

A third possibility for the non-establishment of Crambina in Australia is that they lost the race for the Australian grasslands to the chilonine *Hednota/Gadira* complex—it is noteworthy that Chilonini outnumber Crambini in the warmer grasslands of the world. The origin of the chilonine fauna of the Australian grasslands is conjectural (Gaskin 1973). On balance, I believe that a combination of physical and biotic barriers prevented the Crambini from becoming established in Australia at critical periods during the Tertiary.

Of the 3 "*Crambus*" species listed by Bleszynski & Collins (1962) from the islands of the tropical Pacific, I have examined only *C. paralyticus* Meyr. (Fiji), which proves to be a species of *Culladia* Moore (Chilonini). It appears unlikely that any Crambina (other than adventitious *Angustalius*) exist in these islands considered by Fleming (1962) and Gaskin (1970a) to be part of the former Melanesian Arcs.

A possible South American origin for *Orocrambus* is implausible. *Crambus* attains maximum species diversity in the Holarctic, especially North America (Bleszynski 1965). It also occurs in South America, but appears to be limited to the Brazilian Shield, being replaced further south by *Fernandocrambus*. Both *Crambus* and *Fernandocrambus* are relatable to the Palaearctic *Flavocrambus* and the Palaearctic/cosmopolitan *Angustalius*, but not to *Orocrambus*. A study of the 3 other important neotropical genera—*Fissicrambus*, *Microcrambus*, and *Parapediasia*—definitely shows no sister-group relationship with *Orocrambus* or *Maoricrambus;* the first-named genera appear to be relatively close to the Holarctic *Pediasia* (Bleszynski 1963a). The important genus *Agriphila*, which forms part of a monophyletic grouping with *Orocrambus* and *Maoricrambus*, is restricted to the Holarctic, and does not occur in South America. Therefore, to postulate that *Orocrambus* reached New Zealand via trans-Antarctic links from South America, the date of arrival must precede the breach of such links, apparently in the Cretaceous (Fleming 1962, 1963a; Gaskin 1970a), and the extinction of unspecialised Crambini (*Agriphila/Orocrambus*) in the huge South American land mass must be explained. It would be safer to assume that an *Orocrambus* precursor never occurred in South America.

If one accepts recent estimates for the sequence of rupture and dispersal of the continental elements of Gondwanaland in the late Mesozoic and Tertiary (Smith & Hallam 1970, Griffiths 1971, Keast 1971, Jardine & McKenzie 1972, Griffiths & Varne 1972), formidable difficulties attend any proposal of an Africa- or India-Antarctic migration route of *Orocrambus* into the south of New Zealand. The Endeavour fracture zone south of Australia and New Zealand opened from the east westwards (Griffiths & Varne 1972, fig. 3), so that the distance between New Zealand and Antarctica was always greater than that between Australia and Antarctica once the rifting and disruption started. The absence of Crambina from Australia still has to be explained, and it is necessary to accept over-water dispersal to account for movement of *Orocrambus* precursors from Antarctica to New Zealand, especially in the Eocene, though there is even evidence that New Zealand has not been

in direct contact with Antarctica since the late Palaeozoic (Gaskin 1975). The closely related genus *Agriphila* is today very poorly represented in central and southern Africa and India, although widespread in Holarctic lowlands. As in Australia, the grasslands of the Ethiopian region and India are dominated by Chilonini, not Crambini. Western Australia and India may have been adjacent during the Mesozoic, or at least closer than they are today (Smith & Hallam 1970). However, India appears not to have established contact with the Eurasian land mass until at least −35 Ma (Jardine & McKenzie 1972). The extent of Africa-Malagasy-India contact is still conjectural, but they appear to have been adjacent in the Upper Cretaceous (Smith & Hallam 1970).

Should evidence in future favour the Africa- or India-Antarctic route to New Zealand for *Orocrambus* precursors, we may have to radically reconsider the dispersal of Crambini. It would then be possible to propose a southern origin for the tribe as part of a large and diverse indigenous south-temperate/Antarctic biota which flourished in the early Caenozoic (E. Munroe, pers. comm.), with Corynophorina being isolated in Australia as it moved away from Antarctica, and Crambina radiating into New Zealand and India and perhaps also Africa and South America. Crambina could have reached Eurasia (and thence into the Nearctic via the Bering Strait route) by being carried northwards on the Indian land mass. The Indian flora strongly suggests that there was an extensive arid phase as the continent moved northwards (D. Axelrod, pers. comm.), so the Indian Crambina might have been physiologically pre-adapted to disperse into the relatively dry steppe grasslands of Eurasia when India made contact with the Tibetan region. Certainly this might explain the apparent isolation of Corynophorina in the Australian region, and the presence of most specialised Crambina in the Palaearctic (the Crambina in New Zealand are relatively unspecialised).

Trans-Pacific relationships, both northern and southern, cannot be fully explored until we know more about the rates and directions of Pacific plate spreading. However, if *Orocrambus* had a northern origin, the inner Melanesian Arc remains its most likely route into New Zealand. The possibility of extinction of *Orocrambus* precursors, through climatic and vegetational changes, on the relatively small islands of the Melanesian Arcs is much easier to envisage than total extinction in such huge and diverse regions as Australia or South America. Elsewhere (Gaskin 1974) I have indicated apparent relationships between New Zealand, Melanesian Arc, and Oriental diptychophorinid Crambinae.

Holarctic migration routes in the dispersal of some important genera of Crambina are therefore important; a few comments on such routes are relevant here. There is good geological evidence that Bering Strait was closed periodically during the Cretaceous and Tertiary (Durham 1963) and again during the Pleistocene (Lindroth 1963). Ball (1963) suggested that "Bering Land", at 60–70°N, had tundra-type vegetation in the Tertiary. This is presumably unlikely to have been a barrier to cool-adapted species of *Crambus*, *Agriphila*, and *Pediasia*. Munroe (1965), studying the Scopariinae, found that the Davis Strait barrier had functioned as a strong check to Holarctic dispersal, and the Bering Strait as only a weak one. Thus, I can see little or no objection to theories involving major dispersal, and although Atlantic links in the early Caenozoic cannot be excluded from consideration, the 'Bering Land' link was probably the most significant in the dispersal of Crambina.

The dispersal of Corynophorina is essentially less complex. One of 2 known species of *Tawhitia*, *T. pentadactyla* (Zell.), is known from marshy lowland habitats in both Tasmania and New Zealand, and is clearly a recent element in the New Zealand fauna (sensu Gaskin 1970a) resulting from trans-Tasman dispersal via the West Wind Drift.

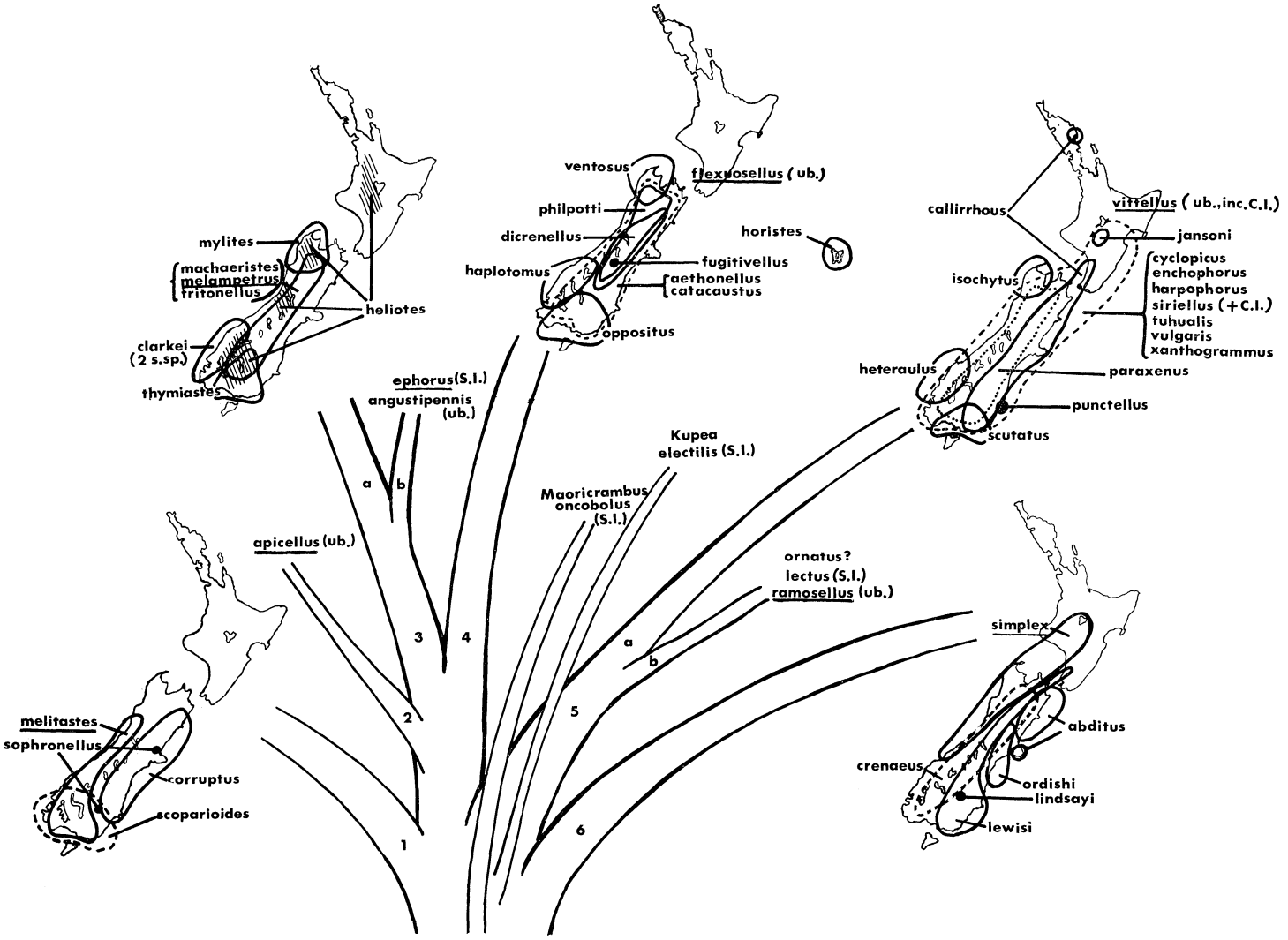

FIG. 2—Diagram of apparent evolutionary relationships of the genera *Orocrambus*, *Maoricrambus*, and *Kupea*. Zones on maps indicate the approximate distributions of species of *Orocrambus* in New Zealand (S.I., South Island; C.I., Chatham Islands; ub., ubiquitous). Question mark indicates systematic position uncertain. Numbers and letters on branches of dendrogram indicate species groups (*see* pp. 278–9 for diagnoses).

The New Zealand *T. glaucophanes* (Meyr.) is an alpine endemic, whose ancestor may have arrived in New Zealand from eastern Australia by West Wind Drift dispersal much earlier than *T. pentadactyla*. Further collecting in the poorly worked Tasmanian mountains may reveal undescribed members of the genus. Anomalous disjunctive distribution of alpine Tasmanian elements in the New Zealand flora was noted by Burbidge (1960) and interpreted by Fleming (1963a).

The relatively unmodified sister genus of *Tawhitia*, *Corynophora*, is distributed in lowland eastern Australia. Two or 3 species are known (Bleszynski & Collins 1962; Bleszynski 1962, 1963a). Further study of this interesting archaic crambine subtribe is required, and may reveal more members in as yet unrevised tropical Australian genera.

The success of a few very widespread species in New Zealand, notably *Orocrambus flexuosellus* and *O. vittellus*, which are found from North Cape to the Auckland Islands, is partly due to the readiness with which they have adapted to the exotic grasses introduced by European settlers. Bearing in mind the remarkable history of *Pieris rapae* Linnaeus in New Zealand (Hudson 1939), one need have no illusions that nationwide dispersal and establishment of a species is a phenomenon necessarily requiring time on the geological scale.

DISTRIBUTION WITHIN NEW ZEALAND. The available information is too scanty to advance beyond the broad generalisation that more species are restricted to the South Island than to the North, and that the Chatham Islands, alone of the outlying island groups, has an endemic species. The apparent endemicity of species by islands/island groups is enumerated below (*see also* Fig. 2).

North I. only	1 sp. (*O. jansoni*).
North and South Is	15 spp.
South I. only	29 spp., and genera *Maoricrambus*, *Kupea*.
Stewart I.	No known endemic sp.; poorly explored.
Auckland Is	3 spp., common to North, South, and Chatham Is.
Antipodes I.	1 sp., common to North, South, and Chatham Is.
Chatham Is	5 spp. common to North and South Is, 1 sp. endemic (related to *O. flexuosellus*).

KEY TO SUBTRIBES OF CRAMBINI

Forewing vein r_5 stalked with r_4; genitalia: ♂ – saccus without laminate ventral projection, pseudosaccus present, juxta a vestigial crescent or absent; ♀ – anal papillae free, tergite 8 often fused directly with ostium bursae or via sternite 8, but not forming a closed tube dorsal to ostium bursae..... **Crambina**

Forewing vein r_5 free; genitalia: ♂ – saccus with a ventral laminate posterior flap, pseudosaccus absent, juxta strongly developed and plate-like or saddle-shaped; ♀ – anal papillae fused into characteristic 'Dutch clog' shape, tergite 8 fused into a broad, closed tube with ostium bursae a smaller, flattened tube at its ventral base..... **Corynophorina**

Subtribe **Crambina**

TYPE OF SUBTRIBE: *Crambus* Fabricius, as for tribe.

Characters as for tribe Crambini, but with the following features not found in subtribe Corynophorina. Forewing vein r_5 stalked with r_4.

GENITALIA. **Male.** Saccus without laminate ventral projection; pseudosaccus present; juxta small and crescentic or vestigial. **Female.** Anal papillae free; tergite 8 not forming a closed tube dorsal to ostium bursae, but frequently fusing with lateral line of fusion of ostiolar sclerites or encircling ostium bursae.

TABLE 2—Comparison of morphological characters in genera of the subtribe Crambina in which parallel evolution has occurred

Genus	Condition of valval sacculus (♂)	Relationship of tergite 8 to ostium bursae (♀)	Sternite 8 (♀)	Anterior apophyses (♀)	No. of signa on corpus bursae (♀)	No. of frenulum elements (♀)
Agriphila	Undiff.	Free	Present	Lost	1	2
Chrysocrambus	Undiff.	Free	Present	Lost	0	1
Pediasia	Undiff.	Free	Absent	Retained	0	1
Fissicrambus	Undiff. to strongly lobed	Free or weakly fused	Present	Retained	0	1
Microcrambus	Undiff. to strongly lobed	Free or weakly fused	Absent or vestigial	Lost	0–2	2
Orocrambus	Undiff. to flanged	Fused	Present, vestigial, or absent	Lost or vestigial	2	3+
Maoricrambus	Undiff.	Fused	Absent	Lost	0	3
Catoptria	Spined	Fused	Present	Lost	1	2
Metacrambus	Spined	Fused	Present	Lost	0	1
Chrysoteuchia	Spined	Fused	Absent	Lost	1–2	2
Flavocrambus	Spined	Fused	Absent	Lost	0	2
Angustalius	Lobed	Fused	Absent	Lost	2	2
Xanthocrambus	Lobed	Fused	Absent	Lost	0	2
Crambus	Lobed, smooth, or serrate	Fused	Absent	Lost	2	2
Fernandocrambus	Lobed	Fused	Absent	Lost	2	2

Orocrambus Purdie

Purdie, 1884, N.Z. J. Sci. (Dunedin) **2**: 168. –Meyrick, 1885, Trans. N.Z. Inst. **17**: 133. Type-species: *Orocrambus melampetrus* Purdie, 1884 (by monotypy).

Labial palpi porrect, tapering, smooth-scaled or hair-scaled, 1.6–2.9× head. Forewings often with median white fascia; unicolorous in some species, in others with transverse or variegate markings; dotted subterminal line present in some species, but never a sharply angled metallic line (cf. *Crambus*); reniform stigma present in a few species. Hindwings unicolorous, occasionally with a dark margin; frenulum always single in male, usually triple in female (exceptions: *vulgaris* – double, 1 bristle apically bifid; *ephorus* and *oppositus* – quadrifid; *clarkei eximia* – 6 bristles). Venation: forewing r_4 and r_5 typically stalked (r_5 free in *clarkei eximia*), m_2 present in forewings and hindwings; hindwing discal cell open, $Sc+r_1$ fused with, or with cross connection to, rs (except in some specimens of *clarkei clarkei*). *See* Fig. 20a–c.

GENITALIA. **Male.** Valva rounded, oblongate, costal lobe developed with flange on posterior inner margin drawn in some species into an inwardly directed lobe; sacculus undeveloped or weakly differentiated into a flange on inner posterior margin; uncus tapered, pointed; gnathos pointed or clubbed; aedeagus with or without cornuti and external ornamentation; juxta often absent or vestigial, when present usually a weak crescentic plate or reduced to a pair of slender, curved arms; pseudosaccus present. **Female.** Two signa present on corpus bursae, often unequal in size; abdominal sternite 8 a small lunate, oval, or triangular plate, strong or weak, or (many species) absent; tergite 8 fused to ostium bursae; anterior apophyses absent or represented by very small triangular projections in lateral midlines of tergite 8.

Historical background. Purdie (1884) used details from an abstract of a manuscript prepared by Meyrick for publication at a later date, omitting to mention this in his brief note recording the capture of *O. melampetrus*. This unintentional pre-publication of a generic name has led to confusion in citation. Hampson (1895), citing priority correctly, listed the genus under Purdie's name, an action which provoked indignant comment from Meyrick (1912, p. 32). Hudson (1928) attributed the genus to Meyrick; Bleszynski & Collins (1962) re-attributed the genus to Purdie.

Neither the brief diagnosis by Purdie (1884) nor that by Meyrick (1885) satisfactorily distinguish *Orocrambus* from other New Zealand species placed by Meyrick in *Crambus*. Meyrick distinguished the new genus from *Crambus* on the basis of hindwing venation (Sc running into rs and then separating again in *Orocrambus*), but this character is inconstant within the type species. Meyrick abandoned the use of this character in his revision of the New Zealand Pyralidina (1912), and separated *Orocrambus* from *Crambus* by the former having a dense hair-scale covering on palpi, coxae, and the underside of the thorax. Comparison of *tritonellus*, which Meyrick placed in *Orocrambus*, and *heliotes*, which he assigned to *Crambus*, shows that this character too is unreliable. Nevertheless, the separation of the "pale long-winged" species into one genus, and the erection of a new genus for the "dark short-winged" species was satisfactory by the taxonomic standards of the day, although Meyrick was inconsistent in putting *heliotes* into *Crambus*. This scheme was followed by Hudson (1928).

Distinction of the revised genus *Orocrambus* from other genera of Crambina. *Orocrambus* and allied genera in the Crambina show a great deal of parallel evolution in many generic characters (Table 2). It is very difficult to delineate these genera such that one or more characters suffice to distinguish them. On balance of characters and in terms of geographic isolation *Orocrambus* is a distinct generic unit, yet parallel development in isolation obscures clear total distinction from such genera as, e.g., *Catoptria*. *Orocrambus* species (with a few exceptions) do possess 2 unique characters: the valval sacculus has a small flange on the inner posterior margin, compared with a smooth or serrate lobe in other genera, and the frenulum in *Orocrambus* females is composed of 3 or more elements, compared with a maximum of 2 in other genera. However, when a series of characters is compared for all the Crambina genera, their distinctness as units is more apparent. This will be discussed in a forthcoming paper. *Orocrambus* differs from the closely related monotypic *Maoricrambus* n.gen., described below, in its tapered and either pointed or clubbed gnathos (spatulate in *Maoricrambus*) and in the presence of signa on the corpus bursae.

Intrageneric relationships. With few exceptions, species of *Orocrambus* show considerable homogeneity of structure, and there is much convergence in forewing patterns. As a result application of phylogenetic analysis, and particularly the construction of keys based on species-group phylogeny, is a difficult exercise. Pronounced evolutionary 'shuffling' of morphological characters into a considerable number of the possible combinations has blurred interpretation of the lines of descent. A similar situation was found in some bee genera by Mayr *et al.* (1953). Intrageneric relationships of *Orocrambus* could be interpreted in a number of ways if the genus were examined in isolation. Since phylogeny cannot be observed but only inferred (Simpson 1945), the intrageneric phylogeny has been determined in this genus by a careful study of related genera, and this study has greatly influenced my selection of characters.

The male genitalia of *Orocrambus* have the most useful characters for determination of intrageneric systematics, although the relative position of the ductus seminalis in the

female is of some significance. Examination of allied genera such as *Crambus*, *Fernandocrambus*, and *Catoptria* shows considerable parallelism in the evolution of female genitalia. For example, shortening of the ductus bursae, loss of sternite 8, reduction or loss of one or more signa on the corpus bursae, and encirclement of the ostium bursae by tergite 8 occur in some species in each of these genera, as well as in *Orocrambus*.

Definitive characters unique to the genus can be found in the male genitalia. For example, in *Orocrambus* there is a tendency for great elongation of the saccus, whereas the sacculus of the valva is only weakly differentiated. In *Crambus* and *Fernandocrambus*, on the other hand, the saccus is little differentiated but the sacculus is very ornate, tending to separate into a distinct valvular lobe. In both *Crambus* and *Fernandocrambus* the valval costa tends to be separate from the valvula, and is often produced into a prong. In *Orocrambus* there is development of a dorsoventral flange on the inner margin of the costa, and although the costa may be pronged, as in *xanthogrammus* and *aethonellus*, the prong has developed from the dorsal end of the flange, which is still distinct.

Orocrambus, like several other large crambine genera showing prolific speciation, contains species with the frons either conical or planoconvex. The functional significance of the difference is not known. The conical frons predominates in a number of widely separate revised genera, e.g., *Acigona* Hübner, *Agriphila* Hbn., and *Chilo* Zincken (Bleszynski 1965), whereas a planoconvex frons is most common in others, such as *Calamotropha* Zeller, *Pseudocatharylla* Bleszynski, and *Fernandocrambus* (Bleszynski 1964, 1965, 1967). In yet other genera, e.g., *Orocrambus* and *Crambus*, frons types are mixed within the genus, and some species of *Orocrambus*, e.g., *aethonellus*, show differential development of the frons within the species. Hence, frons type does not plausibly represent a basic schism in the genus.

Apparent species groups within *Orocrambus*. Although it is possible to distinguish 6 fairly distinct groups or clusters of species in *Orocrambus*, 2 of which can conveniently be subdivided, a formal grouping is not attempted here. Eleven species are known only from one sex, a few are known from single specimens, and distributional and ecological data are scanty for most species. Characters roughly distinguishing the groups that 46 of the 50 known species fall into are listed briefly below, as a possible guide for future work; further information appears in Fig. 2.

1. *melitastes* group – 3, probably 4 spp.: known males with broad, blunt saccus, no saccular development on valva, and relatively short, scobinate aedeagus; females with simple ostium and characteristic spiral 'pleating' of anterior ductus bursae.

2. *apicellus* group – 1 sp.: male with elongate spinose development of valval costa; female (1) with serpentine, sclerotised elongation of ostiolar region.

3a. *melampetrus* group – 8 spp. and subspp., all in South I. areas: males much as in group 1, with broad, squat development of saccus and little or no saccular differentiation, but also lacking cornuti in aedeagus, which is strongly sclerotised apically, usually as a prominent, elongate spur; females with ductus seminalis joining ductus bursae closer to ostium than to corpus bursae (except in *mylites*).

3b. *ephorus* group – 2 spp.: forewings very narrow and elongate with dorsal side darker, i.e., 'reversed' coloration—not adaptive convergence because genitalia very similar, with subsidiary lateral aedeagal thorn as well as group 3a characters of aedeagal apex and ductus seminalis/ductus bursae junction.

4. *flexuosellus* group – 10 spp., *flexuosellus* distributed over both main islands, *horistes* (sister species of *flexuosellus*) confined to Chatham Is, remainder confined to South I. (this is a lowland-subalpine group in tussock grasslands, although the single ubiquitous

species has adapted successfully to feeding on introduced plant species): males with slender, elongate aedeagus lacking cornuti but generally with flattened, sclerotised, apical process, and (cf. groups 1 and 3) with saccus developed anteriorly and tubular, valval sacculus moderately differentiated; females with ductus seminalis generally joining ductus bursae considerably nearer corpus bursae than ostium (cf. group 3).

5a. *vittellus* group – the largest group, with 15 spp., 9 distributed in the lowlands and subalpine parts of both main islands, 5 restricted to the South I., and *jansoni* n.sp. restricted to the central North I. (*tuhualis* has general affinities with the group yet has somewhat aberrant genitalia, with relatively gigantic development of the ostiolar region of the female and of the cornuti in the male): males with characteristically elongate, splinter-shaped cornuti, tubular anterior saccus region with membranous 'keel', moderate flange-like differentation of posterior margin of valval sacculus, and elongate aedeagus with only weak sclerotisation and development of a weak lateral thorn; known females with ductus seminalis joining ductus bursae very near corpus bursae in most species.

5b. *ramosellus* group – 2, possibly 3 spp.: males with characteristic rose-thorn-shaped cornuti, aedeagus unsclerotised, saccus distinctly tubular anteriorly, and strong costal development of valva; known females with ductus seminalis joining ductus bursae very near corpus bursae.

5. *simplex* group – 6 spp., 5 of them almost impossible to distinguish on external characters, extensively radiated into lowland, subalpine, and (*crenaeus*) alpine grasslands, mainly in the South I., the females showing a distinct adaptive trend to open, windswept grassland conditions in the development of brachyptery, most markedly in *ordishi* n.sp. and *lindsayi* n.sp.: males with a clearly recognisable trend to reduction and loss of cornuti, saccus blunt or excavate anteriorly; females with ductus seminalis joining ductus bursae about half-way between ostium and corpus bursae.

Key to External Characters of *Orocrambus* spp. and *Maoricrambus oncobolus

(This key is overtly phenetic. It has been found impossible to present a workable key considering colour pattern and male and female genitalia together.)

1. Moth semi-apterous 2
   —Moth with normal wings 3

2(1) Forewings grey ..... ***lindsayi*** n.sp. ♀ (♂ unknown)
   —Forewings pale buff or yellow with median white streak ..... ***ordishi*** n.sp. ♀

3(1) Labial palpi 2.2–2.8 × as long as head; labial and maxillary palpi smooth-scaled 4
   —Labial palpi 1.6–2.1 × as long as head; labial and maxillary palpi with long, hair-like scales 37

4(3) Compound eye with complete or partial nude circumorbital strip 5
   —Compound eye without such margin 7

5(4) Frons evenly planoconvex; ocelli large; ♀ frenulum quadrifid, apex of forewing almost right-angled, forewing colour bronze with a median white streak ..... ***oppositus***
   —Frons conical, protruding; ocelli small; ♀ frenulum trifid; apex of forewing acute to very acute; forewings dull brown and white 6

6(5) Forewing pattern divided horizontally, creamy white anteriorly, dull brown posteriorly; apex of forewing very acute; wingspan 34–50 mm ..... ***angustipennis***
   —Forewings with whitish streaks on dorsum and costa, median white streak also present; wingspan 35–42 mm ..... ***isochytus***

7(4) Forewings without median white streak or, if present, very indistinct in subterminal region and not reaching termen 8
   —Forewings with distinct median white or creamy streak always reaching termen, though sometimes broken by line or row of dots in subterminal region 22

8(7) Forewings grey or pale brown, usually with incomplete black median streak from base not reaching termen, and cross-lines and/or an oval stigma in forewing disc 9
   —Forewings not thus 11

* Included because of convergent external resemblance to *O. harpophorus*; genitalia distinctive.

9(8) Forewings uniform grey (form *sophistes*) or with 1 or more waved cross-lines and oval stigma in forewing disc (typical form) ***cyclopicus***
—Forewings with white-edged black streak from base into disc 10

10(9) Forewings with termen sharply edged with black at base of terminal cilia; subterminal dotted line present ***harpophorus***
—Forewings not thus ***M. oncobolus***

11(8) Forewings grey, often with some brown, and a faint, pale median streak 12
—Forewings not thus 13

12(11) Forewings grey with an indistinct median streak reaching the termen ***vittellus*** "f. *vapidus*"
—Forewings grey or brownish, with an indistinct streak not reaching termen or just touching apex ***vulgaris*** "f. *obstructus*"

13(11) Forewings anteriorly white, posteriorly bright or dull yellow 14
—Forewings not thus 15

14(13) Forewings with saffron yellow band not covering dorsum ***ephorus***
—Forewings with dull yellowish band completely covering dorsum ***ephorus*** "f. *corylanus*"

15(13) Forewings buff or dull yellowish with black or dark brown median streak from base, often edged with white; subterminal cross lines or dots present or absent 16
—Forewings not thus 17

16(15) Forewings buff with a sharply defined black median streak from base to 0.8 apicad and an indistinct white streak anterior to this; hindwings pale brown, no trace of cross lines or terminal spots on forewings ***lectus***
—Forewings similar to above, but pale straw with black streak to only 0.6, white streak lacking, with subterminal and terminal forewing dots in many specimens ***ramosellus***

17(15) Forewings reflective buff with a median white streak ending abruptly at 0.8 apicad and breaking into several thin white streaks along veins in subterminal region ***heteraulus***
—Forewings not thus 18

18(17) Forewings with oval stigma edged posteriorly with black 19
—Forewings either lacking oval stigma or with stigma rectangular but not edged with black 20

19(18) Forewings lacking first line; with clear white, wavy subterminal line narrowly edged with dark brown and not sharply indented above tornus ***ornatus***
—Forewings with first line usually present; white subterminal line present but sharply indented above tornus ***tuhualis***

20(18) Forewings with 3 or (less often) 2 thick, brownish cross-lines, sharply indented medially; ground colour greenish grey with silvery reflections; main veins with reddish marks ***xanthogrammus***
—Forewings not thus 21

21(20) Forewings whitish with an ill-defined brownish, wedge-shaped mark in disc ***punctellus***
—Forewing with 2 distinct angled, white cross-lines at 0.3 and 0.7 apicad with a dark brown area between them containing a rectangular and often indistinct white stigma ***vulgaris***

22(7) Frons protruding, conical 23
—Frons evenly planoconvex 29

23(22) Forewings brown with incomplete but sharply defined white line on costa; incomplete, ill-defined white line on dorsum; distinct median white line from base to termen; subcostal areas darker brown than rest of wing, and broken by sharply defined white, triangular extension of median line just below apex ***apicellus***
Forewings not thus 24

24(23) Costal area of forewing dark brown with no trace of cross-lines; wingspan 22 mm or less ***jansoni*** n.sp.
—Forewings not thus 25

25(24) Median white streak of forewings with anterior spur or spike on margin, projecting into costal region just beyond half way, often small but rarely absent; one or more distinct or indistinct rows of subterminal cross-lines often present ***vittellus*** (typical form)
—Forewings not thus 26

26(25) Forewings yellowish with narrow, white median streak edged with brown posteriorly from base to 0.5, anteriorly to termen; veins frequently lightly marked with white in costal region ***haplotomus***
—Forewings not thus 27

27(26) Forewings creamy yellow, shining greyish yellow, or grey-brown; veins of costal area and dorsum heavily marked with white ***callirrhous***
—Forewings not thus 28

28(27) Forewings pale brown, veins picked out in white, interneural spaces marked with violet-grey, giving a 'corrugated' appearance because of contrast; edge of forewing costa narrowly marked with white on basal 0.3–0.5 ***enchophorus***
—Forewings very pale brown, veins, costa, and dorsum not marked with white ***paraxenus***

29(22) Wingspan less than 20 mm; forewings with costa and dorsum marked with white; white median streak present ..... ***fugitivellus***
—Wingspan 26 mm or more 30

30(29) Costal or subcostal area of forewing brown, much darker than subdorsum; subterminal lines completely or partially present 31
—Forewings not thus 32

31(30) Forewings with costa dark brown, a white median streak curving anteriorly so that margin just touches apex; dark brown mark just below median streak at 0.6, and complete or incomplete cross-line at 0.8 apicad; hindwings ochreous with wide brown margin ..... ***flexuosellus***
—Forewings as above, but mark at 0.6 small or totally absent, and cross-line a faint trace or absent; hindwings uniform creamy buff ..... ***horistes***

32(30) Forewings reddish brown, with a white streak on costa edged anteriorly and posteriorly with black; hindwings creamy yellow ..... ***siriellus***
—Forewings not thus 33

33(32) Forewings buff with white streak on costa, median white streak usually without black edging or, if present, only anteriorly; ill-defined pale streak on dorsum; hindwings khaki, cilia with ochreous bases ..... ***scutatus***
—Forewings not thus 34

34(33) Forewings plain, shining golden brown, termen sinuate, cilia white barred with yellowish, veins not marked with black, distinct white median streak present ..... ***philpotti*** n.sp.
—Forewings not thus 35

35(34) Forewings khaki, shining, median streak not edged with dark brown, veins picked out with blackish in subterminal region ..... ***dicrenellus***
—Forewings not thus 36

36(35) Forewings plain pale yellow or buff, veins not marked, white median streak edged narrowly with blackish brown, costa with ill-defined white streak, wingspan 34 mm or more ..... ***crenaeus***
—Forewings as above, but median streak edged with black anteriorly to termen, posteriorly to 0.3–0.5; main forewing veins often marked with white, wingspan 33 mm or less ..... ***"simplex"*** species group (*abditus*, *lewisi* n.sp., *ordishi* n.sp., and *simplex*; only the semi-apterous ♀ of *ordishi* can be identified without examination of genitalia).

37(3) Forewings uniformly greyish, thinly speckled with dark brown, wingspan about 18 mm ..... ***sophronellus*** (or a very rare form of *aethonellus*; identification should be checked on genital characters).
—Forewings not thus 38

38(37) Forewings plain blackish brown, almost always with thickly scattered bluish scales; hindwings dark ochreous or sable with white basal region 39
—Wings not thus 40

39(38) Hindwings muddy brown, paler in disc; forewing vein r_4 stalked with r_5 ..... ***clarkei clarkei***
—Hindwings sable with white basal and central region; forewing vein r_4 free to cell ..... ***clarkei eximia***

40(38) Forewings brown, with or without white markings; hindwings orange-yellow ..... ***heliotes***
—Wings not thus 41

41(40) Forewings lacking median streak 42
—Median white or grey forewing streak present, reaching or not reaching termen 44

42(41) Forewings reddish brown with white cross-lines ..... ***scoparioides***
—Forewings and hindwings dark brown 43

43(42) Forewings with whitish markings between veins from 0.3 to termen ..... ***ventosus***
—Forewings glossy dark brown with 1 or more faint cross-lines but no white markings ..... ***melampetrus***

44(41) Whitish median streak not reaching termen or, if reaching, grey and diffuse 45
—Clear whitish median streak reaching termen 46

45(44) Forewings golden reddish brown, with median streak from base to 0.8, curving posteriorly, and anterior to this similar streak from 0.8 to termen ..... ***thymiastes***
—Forewings not thus 47

46(44) Forewings dark brown with a diffuse median streak of grey expanding towards termen ..... ***mylites***
—Forewings greyish brown, thick white streak to 0.6, termen with a broad grey border ..... ***machaeristes***

47(45) Forewings brown with a whitish streak a little anterior to normal median position; most major veins picked out with dark brown ..... ***tritonellus***
—Forewings not thus 48

48(47) Forewings brown or buff with a median white streak indented at 0.6, another white streak on costa to half coastal length, and a third on subcosta thence to apex; black markings near base, 2 elongate black markings at 0.3, 2 more near 0.5; termen with broken black band ..... ***corruptus***
—Forewings brown, with distinct median white streak 49

49(48) Forewings with white mark on termen and adjacent cilia ..... ***melitastes***
—Forewings not thus 50

50(49) Forewings brown; hindwings greyish; wingspan 22 mm or more ..... ***catacaustus***
—Forewings golden brown; hindwings greyish, white, or mixed; wingspan 18 mm or less 51

51(50) Hindwings uniform grey ..... ***aethonellus***
—Hindwings with white or mixed grey-and-white scales ..... ***aethonellus*** "f. *antimorus*"

Key to Male Genitalia of *Orocrambus* spp.
(Males of *cultus*, *lindsayi* n.sp., *punctellus*, and *sophronellus* unknown.)

1. Aedeagus without ornamentation, cornuti, or surface scobination 2
—Aedeagus with ornamentation, cornuti, or surface scobination 3

2(1) Saccus less than half as long as uncus ..... ***scoparioides***
—Saccus longer than uncus ..... ***apicellus***

3(1) One or more cornuti present 4
—Cornuti absent 25

4(3) Aedeagus with 1 curved cornutus or similar structure at or near midlength ..... ***xanthogrammus***
—Aedeagus with more than 1 cornutus 5

5(4) Aedeagus (Fig. 6d) with dense, oval patch of small cornuti between 0.5 and 0.9 apicad ..... ***isochytus***
—Aedeagus not thus 6

6(5) Aedeagus with distinct thorn in ventral midline 7
—Aedeagus either without thorn or with thorn but not set in ventral midline 9

7(6) Sacculus with flange on posterior interior margin ..... ***enchophorus***
—Sacculus of valva not differentiated, lacking flange on posterior interior margin 8

8(7) Aedeagus (Fig. 6e) with ventral thorn at 0.8 apicad, saccus longer than uncus ..... ***jansoni*** n.sp.
—Aedeagus (Fig. 10c) with ventral thorn at 0.9 apicad, saccus shorter than uncus ..... ***vulgaris***

9(6) Gnathos clubbed at apex 10
—Gnathos pointed at apex 12

10(9) Costa of valva drawn into a truncate lobe posteriorly ..... ***tuhualis***
—Costa not thus 11

11(10) Arms of vinculum in lateral aspect 0.8× as wide as uncus is long; gnathos parallel-sided for about half length ..... ***heteraulus***
—Vinculum only half as wide as long, gnathos tapered ..... ***harpophorus***

12(9) Juxta present 13
—Juxta absent 15

13(12) Juxta platelike, costa of valva produced into a point posteriorly ..... ***ornatus***
—Juxta U-shaped or V-shaped, costa flanged posteriorly 14

14(13) Aedeagus with dorsal thorn and group of slender cornuti at midlength, not dilated apically ..... ***cyclopicus***
—Aedeagus without thorn, dilated apically, with double row of rose-thorn-shaped cornuti arranged in pairs, alternately spaced ..... ***lectus***

15(12) Sacculus without tooth or flange ..... ***corruptus***
—Sacculus differentiated, with tooth or flange on posterior margin 16

16(15) Valva with pointed projection on ventroposterior margin ..... ***ramosellus***
—Valva without such projection 17

17(16) Aedeagus with distinct thorn in lateral, dorsolateral, or lateral line 18
—Aedeagus without thorn 23

18(17) Aedeagus with cluster of very small, almost microscopic rose-thorn-shaped cornuti, and with serrated patch in dorsal midline ..... ***ordishi*** n.sp.
—Aedeagus with elongate, splinter-like cornuti, some at least as long as half median width of aedeagus 19

19(18) Aedeagus with a lateral thorn at midlength ..... ***vittellus***
—Aedeagus with thorn not so placed 20

20(19) Aperture of ductus ejaculatorius opening posteriorly in aedeagus as a dilated, membranous funnel more than half as wide again as median width of aedeagus; large spur or thorn on or near dorsal apex of aedeagus 21
—Aedeagus tubular or nearly so, ductus not dilated as above; thorn distant from apex of aedeagus, but at least 0.1× as long as it 22

21(20) Saccus as long as or longer than uncus in profile ..... ***scutatus***
—Saccus less than half as long as uncus in profile ..... ***crenaeus***
(pre-copulation; cornuti sometimes deciduous in this species).

22(21) Saccus straight, over 0.6× as long as uncus in profile; aedeagus nearly straight, with dorsal thorn near 0.9 apicad ..... ***callirrhous***
—Saccus upturned, half as long as uncus in profile or less; aedeagus rifle-shaped, with lateral or dorsolateral thorn at about 0.8 apicad ..... ***paraxenus***

23(17) Saccus longer than uncus in profile; aedeagus with rose-thorn-shaped cornuti ..... ***siriellus***
—Saccus half as long as uncus in profile; aedeagus with elongate, splinter-shaped cornuti 24

24(23) Apex of saccus truncate; aedeagus dilated into a cone-base shape towards apex; dorsal midline of aedeagus chitinised, 18–22 slender cornuti to midlength ..... ***abditus***
—Apex of saccus excavate; aedeagus nearly tubular, chitinised strongly in dorsal midline and with 4–7 slender cornuti to midlength ..... ***simplex***

25(3) Juxta present 26
—Juxta absent 32

26(25) Juxta U-shaped or V-shaped ..... ***heliotes***
—Juxta not thus 27

27(26) Sacculus differentiated, with flange on posterior inner margin ..... ***clarkei***
(2 subspecies; *see* pp. 306–7)
—Sacculus without flange 28

28(27) Aedeagus with apical spur 30
—Aedeagus with pointed thorn at or near apex 29

29(28) Juxta heart-shaped; aedeagus with ventrolateral thorn ..... ***ventosus***
—Juxta triangular; aedeagus with dorsal thorn ..... ***philpotti*** n.sp.

30(28) Aedeagus with apical spur curved ventrad 31
—Aedeagus with apical spur curved dorsad ..... ***thymiastes***

31(30) Dorsal margin of costa of valva longer than uncus; saccus walls convex in dorsal or lateral aspect; apical spur of aedeagus heavily chitinised ..... ***machaeristes***
—Dorsal margin of costa shorter than uncus; saccus walls concave in dorsal or lateral aspect; apical spur of aedeagus weak ..... ***tritonellus***

32(25) Aedeagus with apical spur 33
—Aedeagus without apical spur 38

33(32) Saccus longer than uncus 34
—Saccus less than half as long as uncus 36

34(33) Aedeagus with sickle-shaped apical spur curved ventrad ..... ***melampetrus***
—Aedeagus with slightly bowed apical spur curved dorsad 35

35(34) Apical spur flattened, spear-shaped, 0.3× as long as aedeagus; LMB ratio of aedeagus about 12:1 ..... ***dicrenellus***
—Apical spur circular in cross-section, about 0.6× as long as aedeagus; LMB ratio of aedeagus 18:1 ..... ***mylites***

36(33) Small dorsal or lateral thorn present on aedeagus in addition to apical spur; sacculus without flange 37
—No thorn on aedeagus; sacculus with flange on inner posterior margin ..... ***opposites***

37(36) Arms of vinculum half as wide in profile as uncus is long; apical spur of aedeagus curved ventrad, ventral inner costal margin toothed ..... ***angustipennis***
—Arms of vinculum as above, but apical spur curved sinistrad or dextrad, and costal flange of valva not toothed ..... ***ephorus***

38(32) Aedeagus tubular, scobinate, small lateral thorn often present ..... ***melitastes***
—Aedeagus not thus 39

39(38) Aedeagus with thorn near apex in ventral midline ..... ***lewisi*** n.sp.
—Aedeagus with thorn near apex in dorsal or dorsolateral midline 40

40(39) Sacculus with flange on posterior inner margin 41
—Sacculus without such flange 43

41(40) Saccus 0.8× as long as uncus in profile; LMB ratio of aedeagus about 11:1 ..... ***flexuosellus***
—Saccus less than half as long as uncus in profile; LMB ratio of aedeagus about 8:1 42

42(41) Arms of vinculum about 0.8× as wide as uncus is long; aedeagus with posterior aperture of ductus ejaculatorius greatly dilated, and large thorn in dorsal midline ..... ***crenaeus***
(post-copulation; cf. couplet 21)
—Arms of vinculum half as wide as uncus is long; aedeagus almost tubular, with large thorn in right dorsolateral midline ..... ***catacaustus***

43(40) Aedeagus curved ventrad, LMB ratio about 14:1 ..... ***haplotomus***
—Aedeagus nearly straight, LMB ratio less than 8:1 44

44(43) Saccus tapered, uncus about 0.3× longer than gnathos ..... *aethonellus*
—Saccus parallel-sided for most of length, apex bluntly rounded or truncate, uncus and gnathos about equal in length 45

45(44) Arms of vinculum about 0.3× as wide in profile as uncus is long; costa of valva without flange on inner posterior margin ..... *fugitivellus*
—Arms of vinculum 0.8× as wide in profile as uncus is long; costa of valva with toothed flange on posterior inner margin ..... *horistes*

Key to Female Genitalia of *Orocrambus* spp.

(Females of *crenaeus*, *cultus*, *dicrenellus*, *fugitivellus*, *ornatus*, *paraxenus*, and *scutatus* unknown.)

1. Ostium bursae very long and serpentine posterior to junction with tergite 8 ..... *apicellus*
—Ostium bursae not thus 2

2(1) Corpus bursae with pair of very elongate, diamond-shaped signa ..... *lectus*
—Corpus bursae with pair of oval signa, 1 often relatively reduced 3

3(2) Ostium bursae grossly swollen, strong, and irregularly corrugated and pleated 4
—Ostium bursae not grossly swollen, though sometimes with longitudinal pleats 5

4(3) Junction of tergite 8 with ostium bursae dorsal, narrow, less than half as wide as in dorsal midline; 1 signum about 0.3–0.5× as large as other ..... *tuhualis*
—Junction diagonal, broad, more than twice as wide as in dorsal midline; 1 signum 0.1× as large as other ..... *melampetrus*

5(3) Tergite 8 fusing diagonally with and almost encircling ostium bursae, drawn ventrolaterally into pairs of cupped 'wings' ..... *haplotomus*
—Tergite 8 not thus 6

6(5) Tergite 8 encircling ostium bursae 7
—Tergite 8 fusing dorsally or dorsolaterally with ostium bursae 14

7(6) Sternite 8 weak or absent 8
—Sternite 8 strong 10

8(7) Ductus bursae 9–10× as long as anal papillae ..... *cyclopicus*
—Ductus bursae 3.5–5.0× as long as anal papillae 9

9(8) Tergite 8 very sharply angled posteriorly; 2 large, oval signa; ductus seminalis joining ductus bursae at 0.8 bursad ..... *xanthogrammus*
—Tergite 8 not sharply angled anteriorly; 1 signum much reduced relative to other; ductus seminalis joining ductus bursae at midlength ..... *aethonellus*

10(7) Anterior apophyses represented as a small, distinct spur on anterior margin of tergites in lateral midline ..... *clarkei*
—No such spur, though anterior margin of tergite may have a broad, triangular, flap-like extension 11

11(10) Ductus bursae angled before midlength, where there is a swollen ostiolar pouch 12
—Ostiolar region tapering smoothly from ostium 13

12(11) Ductus seminalis joining ductus bursae at midlength; 1 or 2 strong spots on ostiolar pouch; signa very unequal ..... *machaeristes*
—Ductus seminalis joining ductus bursae at 0.4; strong spots on ostiolar pouch; signa subequal ..... *tritonellus*

13(17) Ostium bursae strong only in region of encirclement; signa very unequal ..... *ordishi* n.sp.
—Ostium bursae strong to about 0.3; signa subequal ..... *oppositus*

14(6) Sternite 8 a small, triangular plate; ductus bursae with large, pleated swelling at midlength ..... *ramosellus*
—Sternite 8 present or absent, but not triangular; ductus bursae without large, pleated swelling at midlength 15

15(14) Sternite 8 represented by 2 strong spots on membrane between lamella postvaginalis and anal papillae ..... *catacaustus*
—Sternite 8 present or absent, weak or strong, but not as above 16

16(15) Ductus bursae with weak but quite distinct spiral pleating on middle third 17
—Ductus bursae without such pleating 19

17(16) Ductus seminalis joining ductus bursae at midlength; signa very small, smaller than sternite 8 ..... *melitastes*
—Ductus seminalis joining ductus bursae beyond midlength 18

18(17) Sternite 8 strong ..... *corruptus*
—Sternite 8 weak ..... *sophronellus*

19(16) Sternite 8 clearly absent or fused to lamella postvaginalis as a lip 20
—Sternite 8 present as a strong lunate or weak lunate or oval plate 22

20(19) Ductus bursae 10–11 × as long as anal papillae ..... ***vittellus***
—Ductus bursae 7–8 × as long as anal papillae, or less 21

21(20) Ostium bursae flared; ductus bursae only about 4 × as long as anal papillae; signa very small, 1 nearly vestigial ..... ***scoparioides***
—Ostium bursae a narrow, compressed funnel; ductus bursae about 7–8 × as long as anal papillae; signa large, oval, subequal ..... ***lindsayi*** n.sp.

22(19) Sternite 8 a weak, lunate or oval plate 23
—Sternite 8 a strong lunate plate 29

23(22) Ductus seminalis joining ductus bursae near corpus; ostium bursae goblet-shaped ..... ***enchophorus***
—Ductus seminalis joining ductus bursae at 0.8; ostium not goblet shaped 24

24(23) Ductus bursae with reverse loop at about midlength; ostium bursae vase-shaped ..... ***flexuosellus***
—Ductus bursae without loop; ostium not vase-shaped 25

25(24) Ductus bursae sharply angled in ostiolar pouch region, which is abruptly swollen ..... ***callirrhous***
—Ductus bursae not thus 26

26(25) Signa markedly unequal, 1 at least 3 × as large as other 27
—Signa subequal 28

27(26) Ostium bursae a very even funnel with circular aperture, almost tubular to midlength ..... ***philpotti*** n.sp.
—Ostium with exaggerated ventral lip, ductus bursae narrowing sharply at about 0.3 ..... ***abditus***

28(26) Tergite 8 as wide at fusion as in dorsal midline ..... ***horistes***
—Tergite 8 2.5–3.0 × as wide at fusion as in dorsal midline ..... ***heliotes***

29(22) Ostium opening ventrad, dorsal lip very greatly exaggerated ..... ***ephorus***
—Ostium opening posteriorly 30

30(29) Ductus bursae very swollen to midlength, strong laterally to midlength but dorsally less so, hence a weak V appears dorsally in the sclerotised area ..... ***angustipennis***
—Ductus bursae not thus 31

31(30) Ostium bursae an abruptly formed goblet shape 32
—Ostium bursae not thus 33

32(31) Ductus bursae strong and pleated to midlength; 1 signum almost vestigial ..... ***lewisi*** n.sp.
—Ductus bursae strong to only about 0.3 ..... ***ventosus***

33(31) Tergite 8 only one-third as wide at fusion with ostium bursae as in dorsal midline, posterior margin characteristically angled ..... ***simplex***
—Tergite 8 not thus 34

34(33) Ductus seminalis joining ductus bursae at about 0.9 35
—Ductus seminalis joining ductus bursae at 0.5–0.8 36

35(34) Tergite 8 more than twice as wide at fusion as in dorsal midline; 1 signum nearly vestigial, less than 0.1 × as large as other ..... ***siriellus***
—Tergite 8 only half as wide again at fusion as in dorsal midline; 1 signum about 0.3 × as large as other ..... ***vulgaris***

36(34) Corpus bursae with very unequal signa, 1 about 8–10 × as large as other 37
—Corpus bursae with equal or unequal signa; if unequal, 1 no larger than 2–3 × other 38

37(36) Ductus bursae a very broad, pleated funnel; fusion of tergite 8 with ostium bursae very broad, taking up almost entire length of ductus bursae; ostium with even mouth ..... ***isochytus***
—Ductus bursae a relatively narrow, even funnel, slightly swollen in ostiolar pouch region; fusion of tergite 8 with ostium bursae taking up less than half total length of ductus bursae; ostium with dorsal lip exaggerated ..... ***harpophorus***

38(36) Anterior apophyses represented by distinct triangular projections on anterior margin of tergite 8 in lateral midlines; ductus bursae strong to 0.8 ..... ***mylites***
—No such projections; ductus bursae strong to 0.7 or less 39

39(38) Tergite 8 about 3 × as wide at fusion as in dorsal midline ..... ***punctellus***
—Tergite 8 about as wide at fusion as in dorsal midline 40

40(39) Ductus bursae strongly sclerotised to about 0.6, ductus seminalis joining at about 0.8 ..... ***jansoni*** n.sp.
—Ductus bursae strong to only about 0.3, ductus seminalis joining at 0.6 or less 41

41(40) Ductus bursae relatively broad, pleated on middle one-third; 1 signum 2–3 × as large as other ..... ***heteraulus***
—Ductus bursae relatively slender, not pleated; signa equal ..... ***thymiastes***

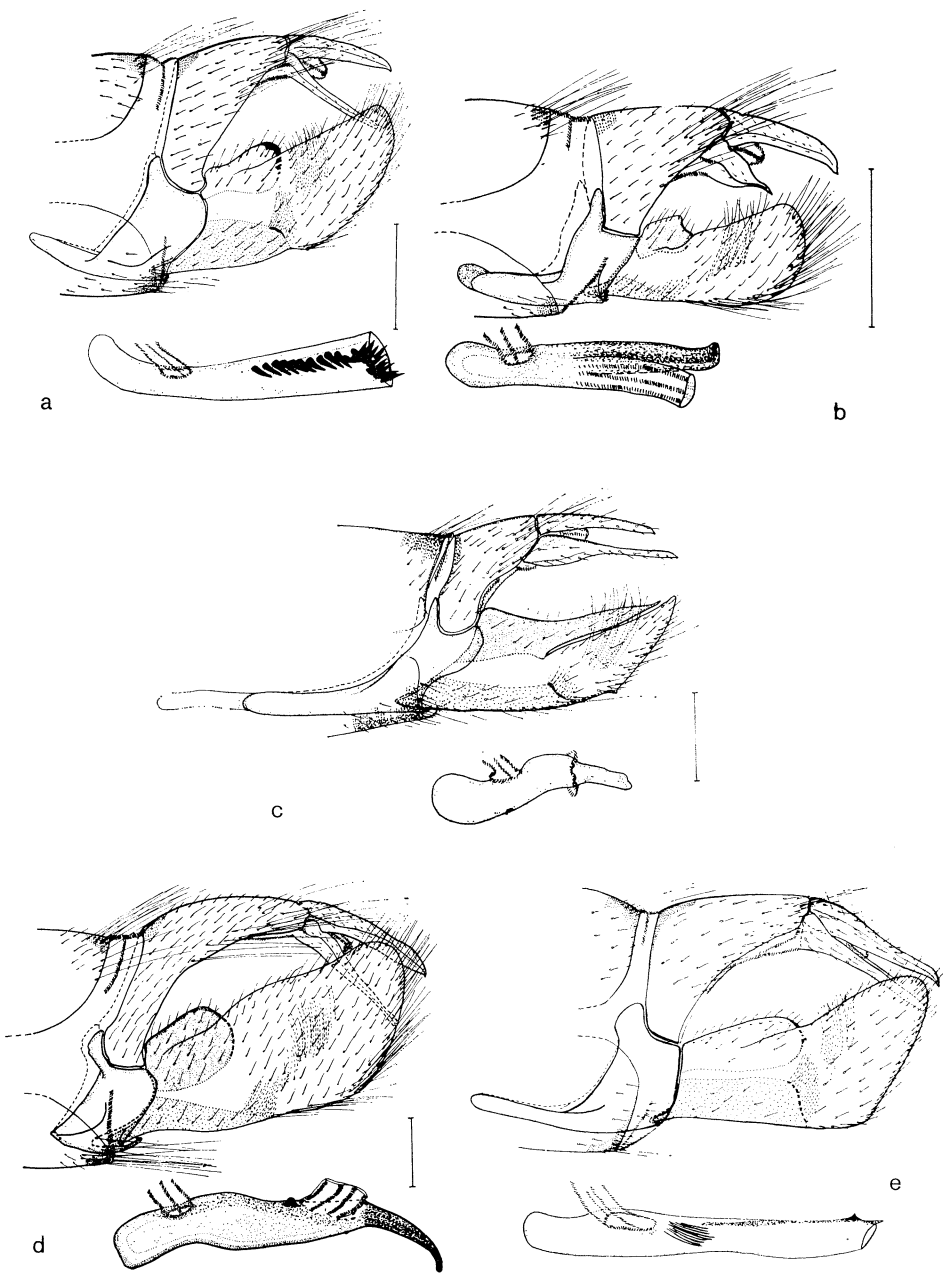

FIG. 3—*Orocrambus* spp. ♂ genitalia: (a) *abditus* (Springfield, Cant.); (b) *aethonellus* (Mt. Hutt, Cant.): (c) *angustipennis* (Palmerston N.); (d) *apicellus* (Palmerston N.); (e) *callirrhous* (Miramar, Wellington).

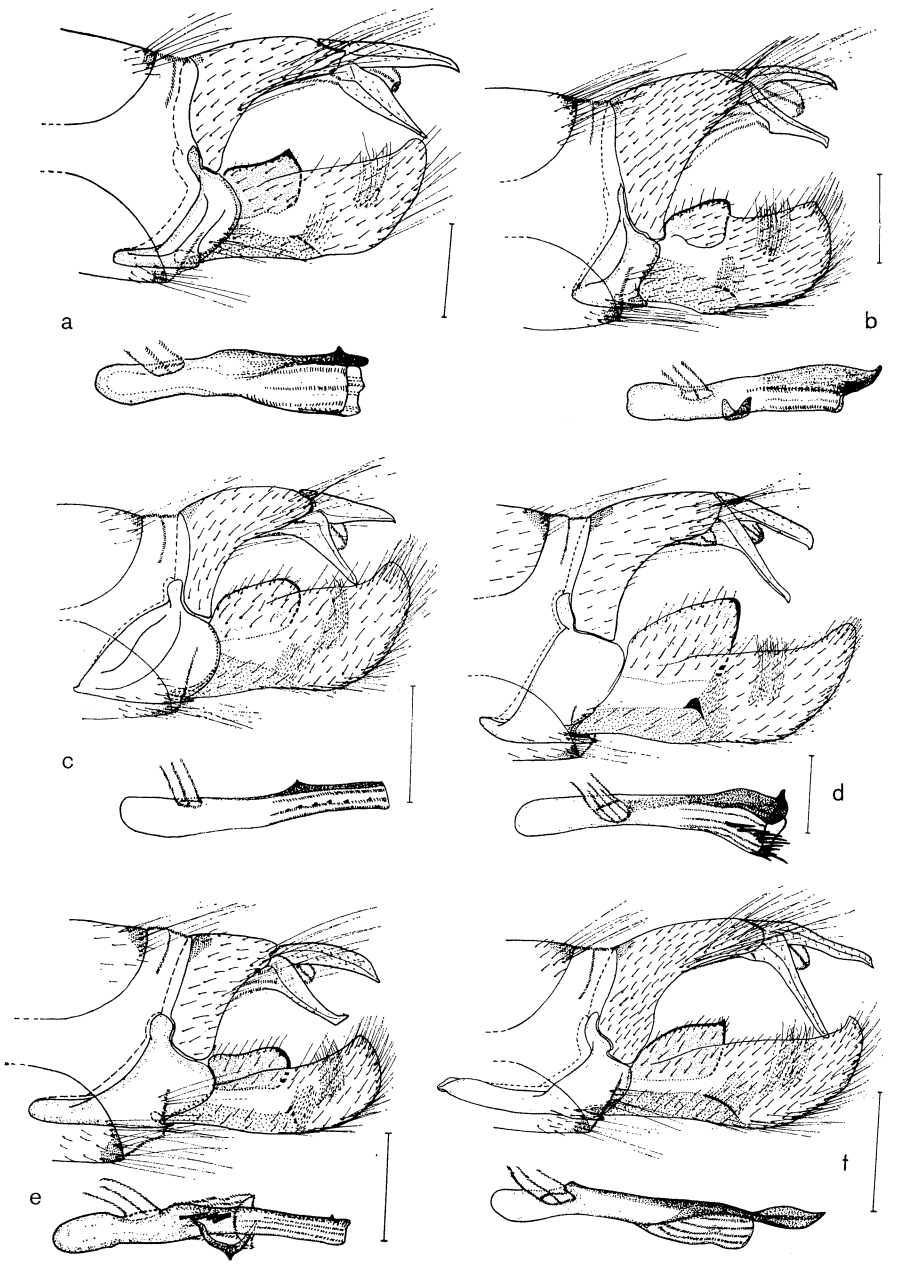

FIG. 4—*Orocrambus* spp. ♂ genitalia: (a) *catacaustus* (Arthurs Pass); (b) *clarkei clarkei* (Franz Josef); (c) *corruptus* (Winchmore, Cant.); (d) *crenaeus* (Mt. Peel, Nelson); (e) *cyclopicus* (Palmerston N.); (f) *dicrenellus* (Mt. Hutt, Cant.).

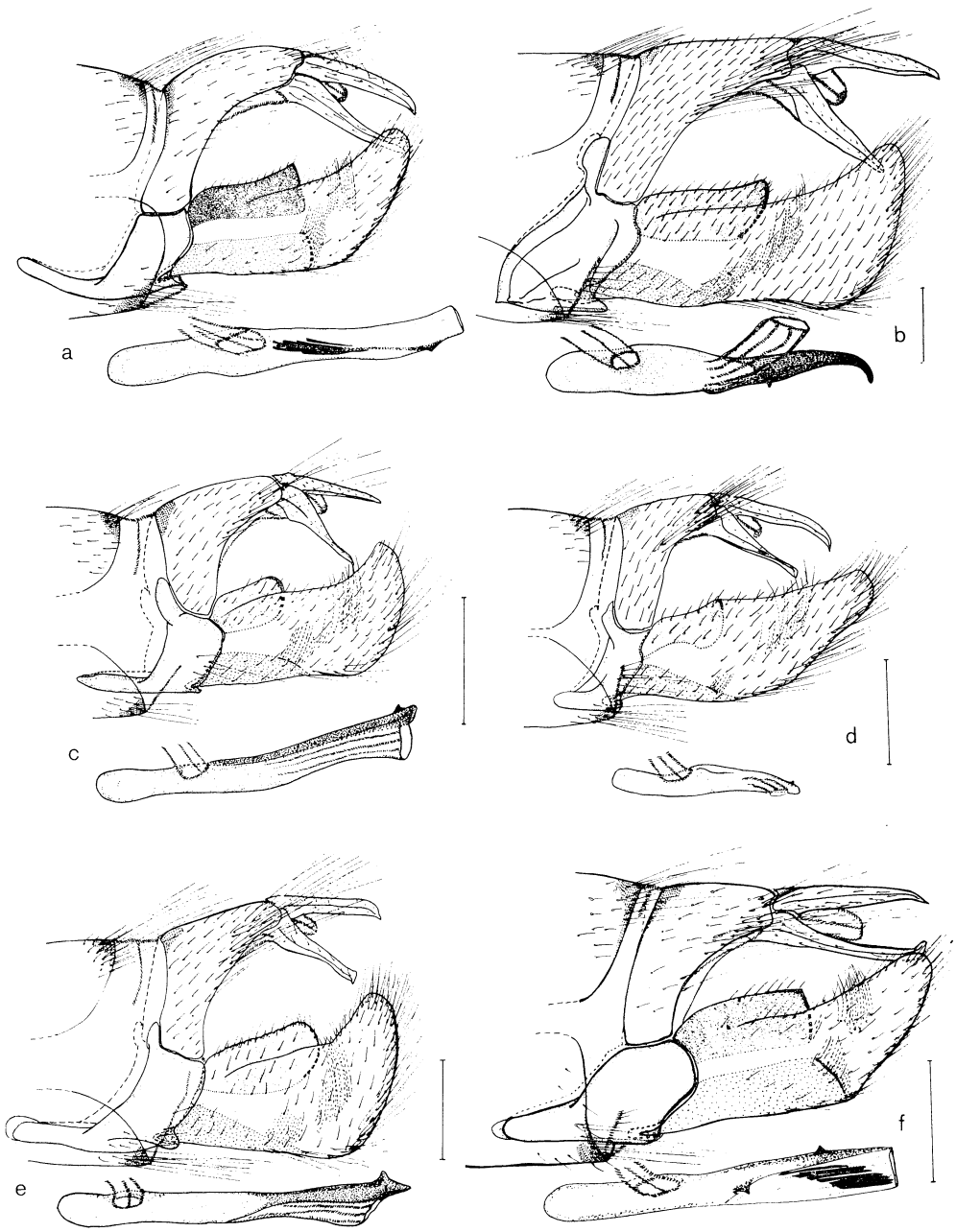

FIG. 5—*Orocrambus* spp. ♂ genitalia: (a) *enchophorus* (Palmerston N.); (b) *ephorus* (Arthurs Pass); (c) *flexuosellus* (Palmerston N.); (d) *fugitivellus* (McKenzie Country, Cant.); (e) *haplotomus* (Kinloch, L. Wakatipu); (f) *harpophorus* (Ben Lomond, Otago).

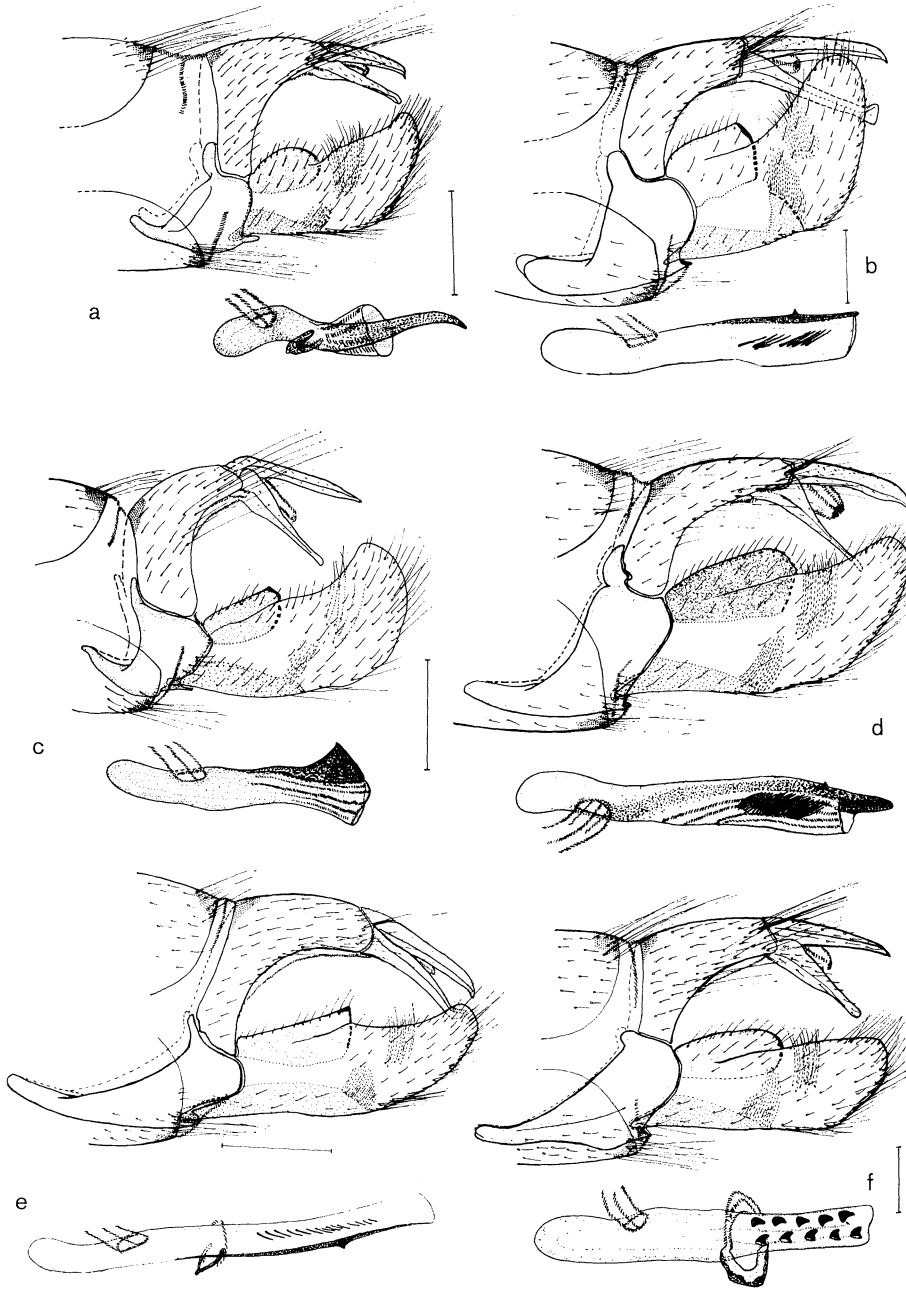

FIG. 6—*Orocrambus* spp. ♂ genitalia: (a) *heliotes* (National Park); (b) *heteraulus* (Humboldt Range, Otago); (c) *horistes* (Chatham Is); (d) *isochytus* (Mt. Arthur, Nelson); (e) *jansoni* (Waiouru); (f) *lectus* (L. Tekapo).

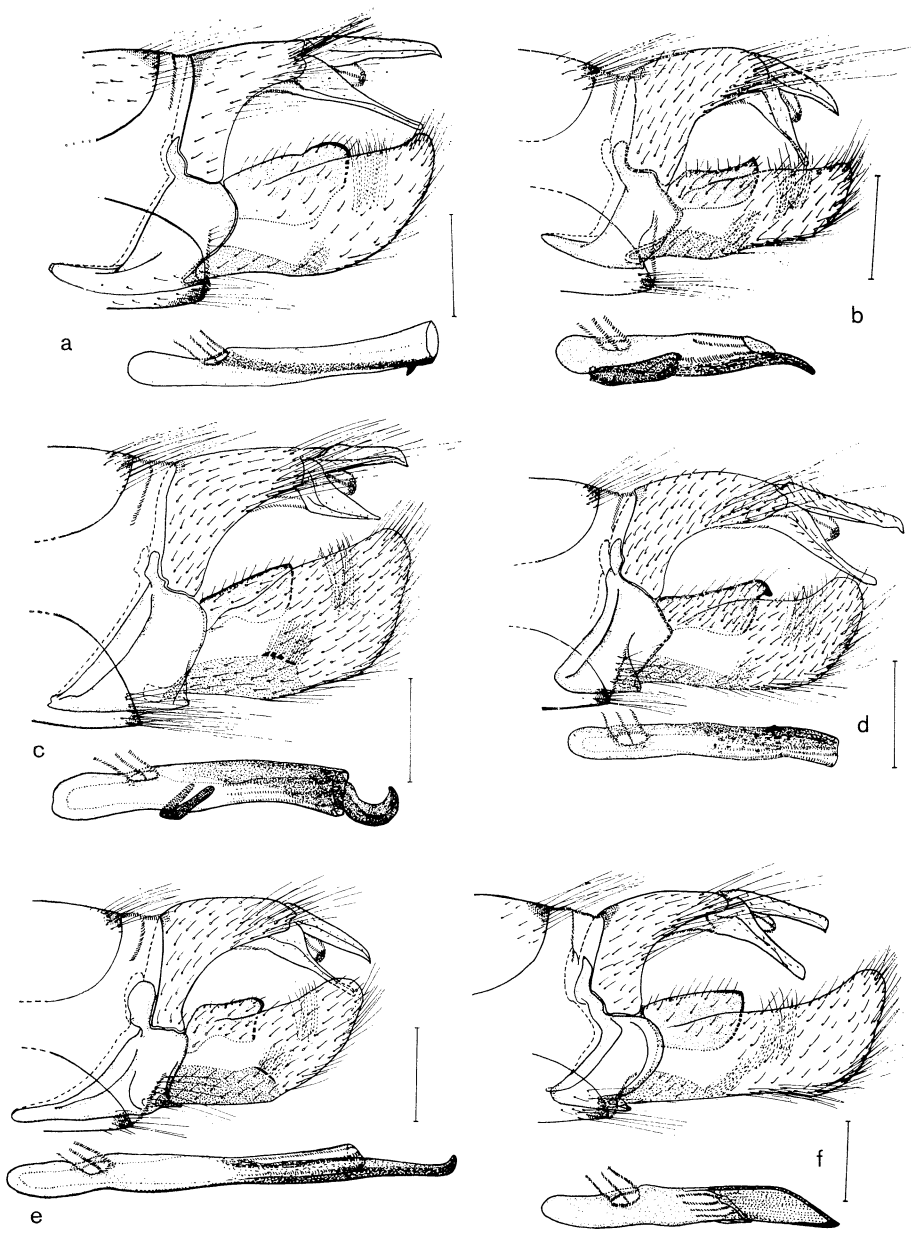

FIG. 7—*Orocrambus* spp. ♂ genitalia: (a) *lewisi* (Titahi Bay, Wellington); (b) *machaeristes* (Mt. Earnslaw, Otago): (c) *melampetrus* (Franz Josef Glacier); (d) *melitastes* (New River, Southland); (e) *mylites* (Island Lake, Nelson); (f) *oppositus* (Cleughearn, Fiordland).

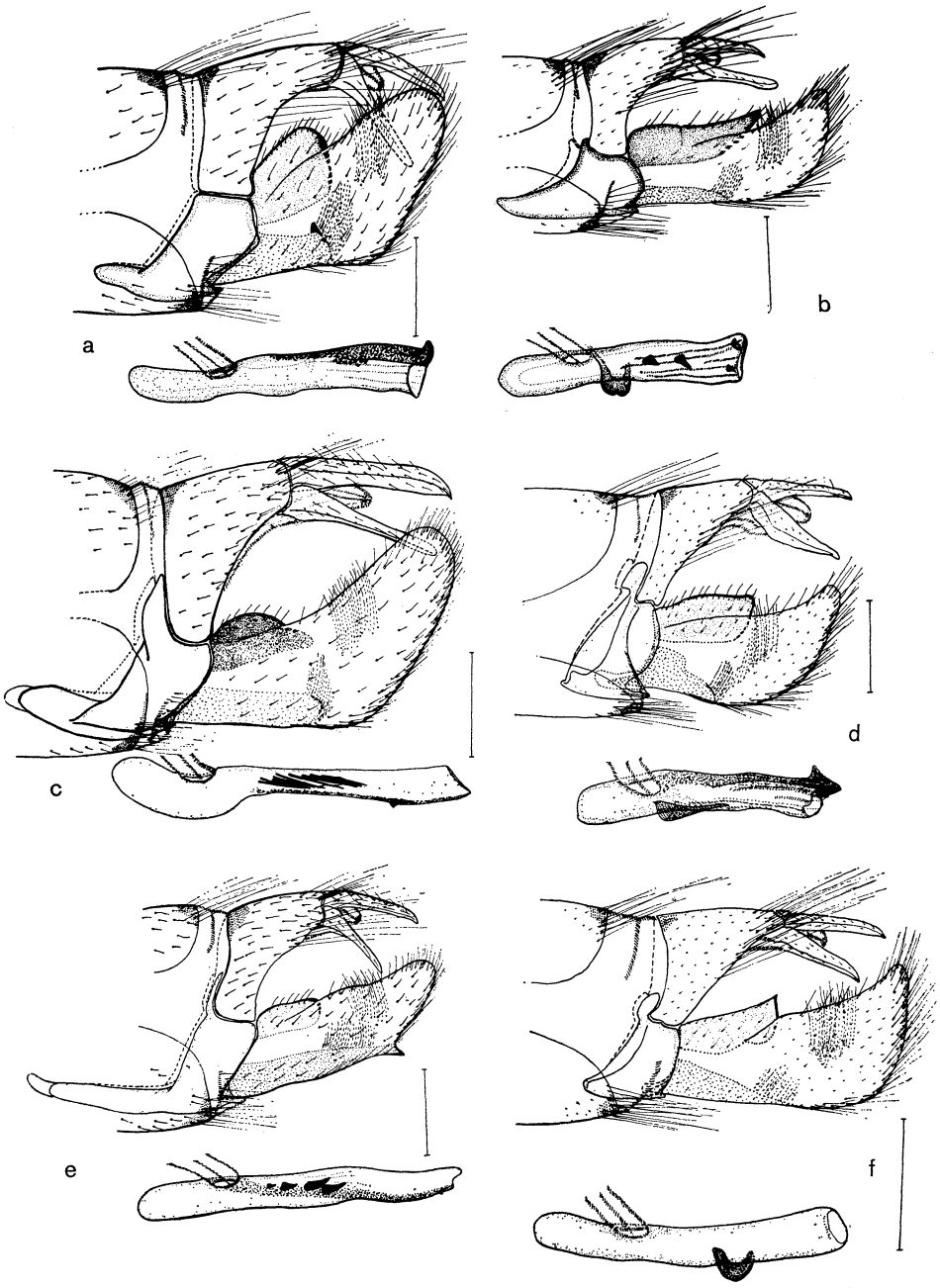

FIG. 8—*Orocrambus* spp. ♂ genitalia: (a) *ordishi* (Hinds, Cant.); (b) *ornatus* (Golden Downs, Nelson); (c) *paraxenus* (The Remarkables, Otago); (d) *philpotti* (Iron Hill, Nelson); (e) *ramosellus* (Palmerston N.); (f) *scoparioides* (Ben Lomond, Otago).

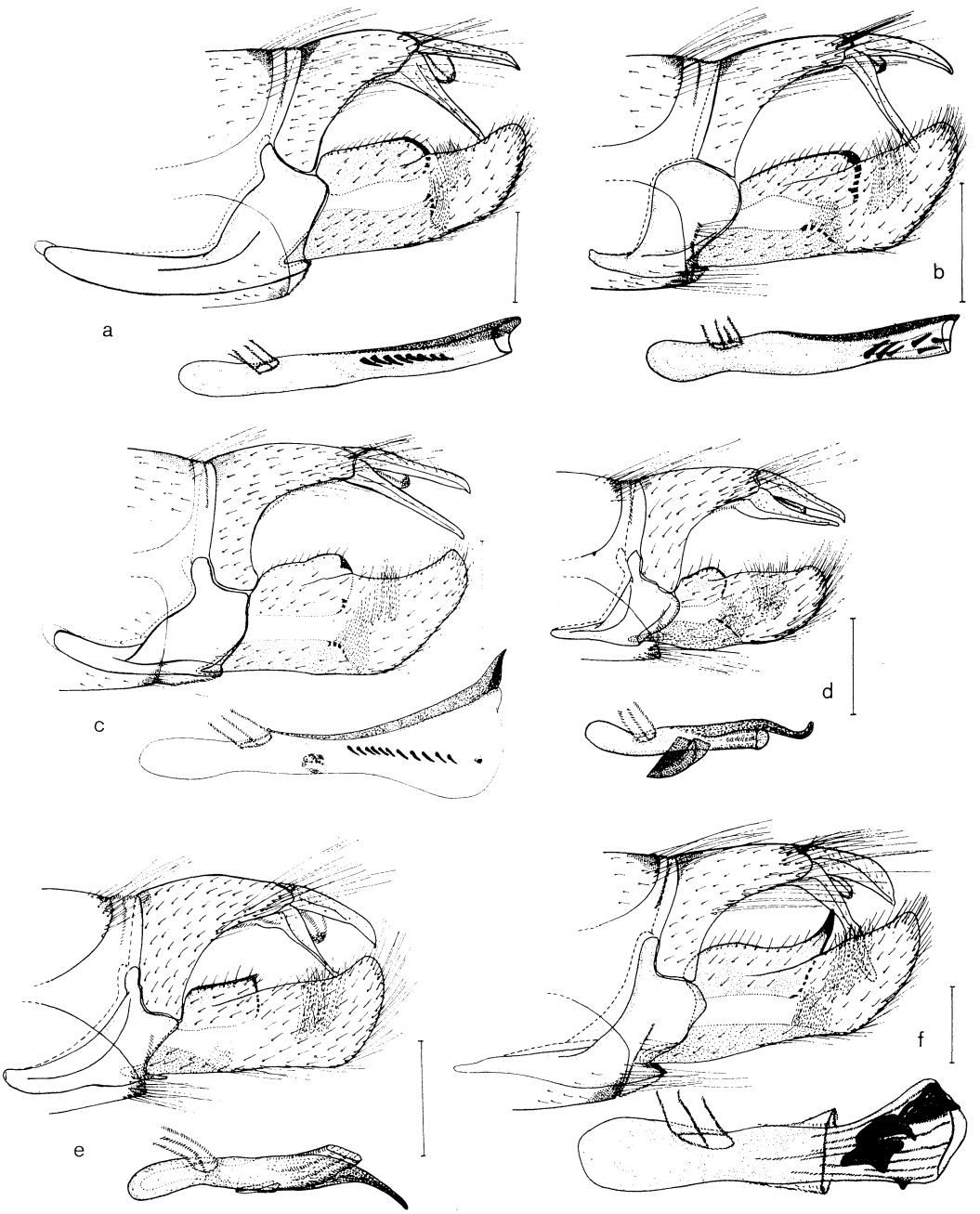

FIG. 9—*Orocrambus* spp. ♂ genitalia: (a) *scutatus* (Longwood, Southland); (b) *simplex* (Waiouru); (c) *siriellus* (Mt. Arthur, Nelson); (d) *thymiastes* (Seaward Moss, Invercargill); (e) *tritonellus* (Mt. Grey, Cant.); (f) *tuhualis* (Kaitoke, Wellington).

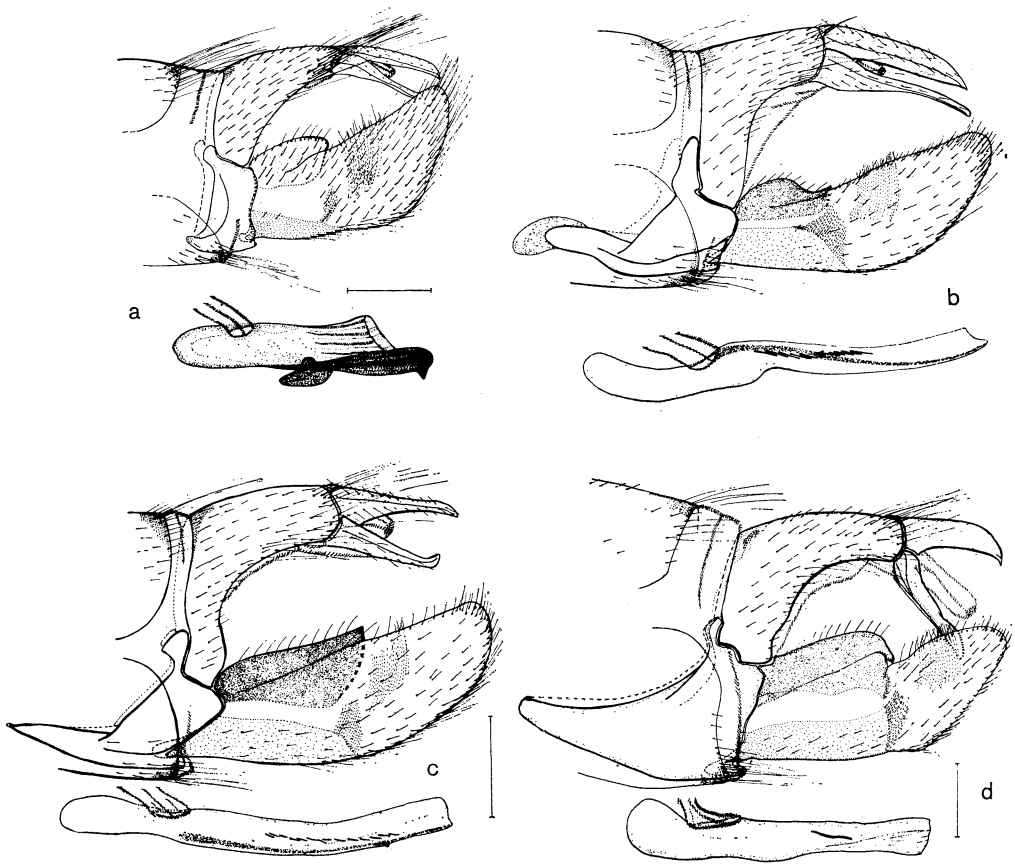

FIG. 10—*Orocrambus* spp. ♂ genitalia: (a) *ventosus* (Gordons Pyramid, Nelson); (b) *vittellus* (Palmerston N.); (e) *vulgaris* (Palmerston N.); (d) *xanthogrammus* (Kaikoura).

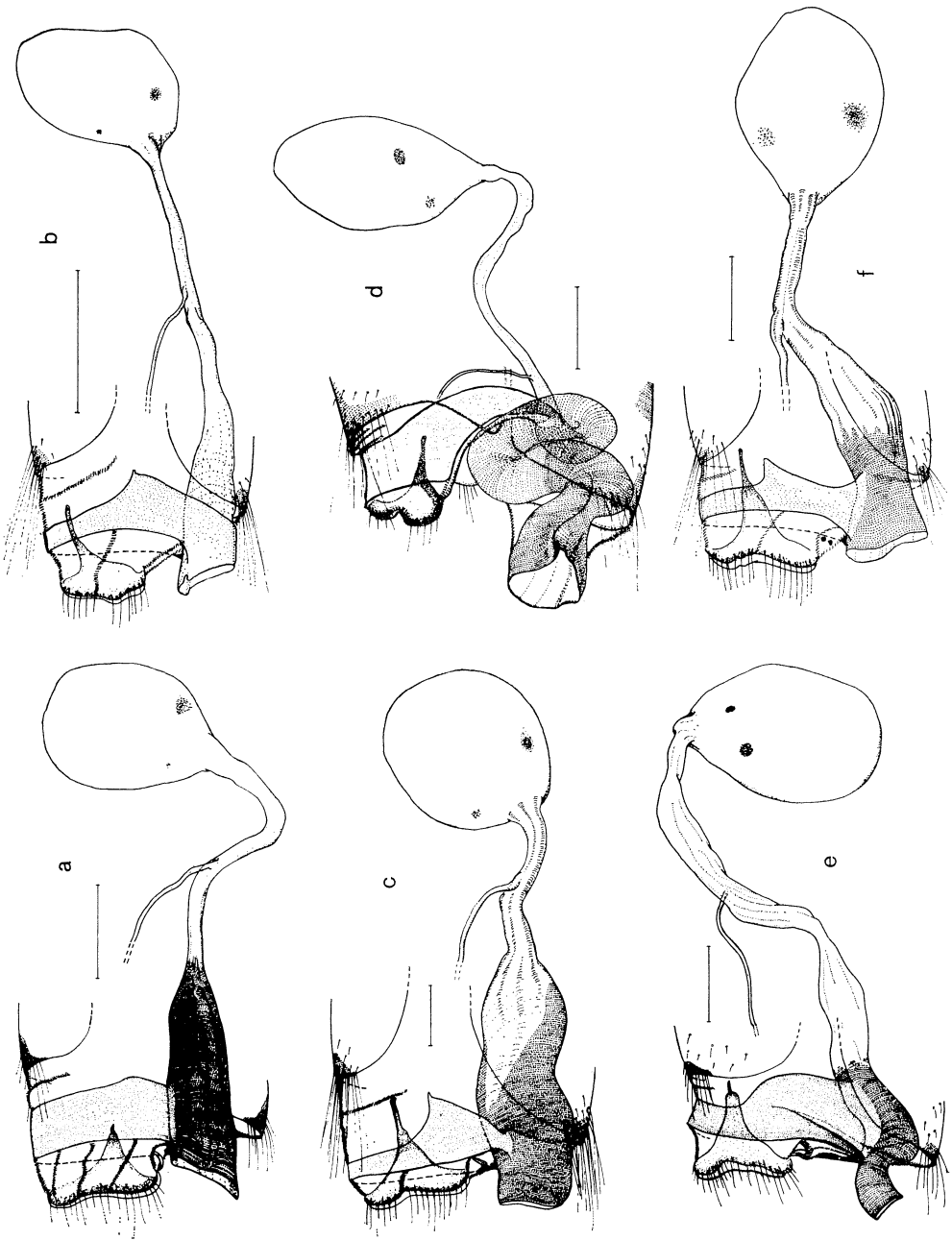

FIG. 11—*Orocrambus* spp. ♀ genitalia:
(a) *abditus* (Otarama, Cant.);
(b) *aethonellus* (Mt. Hutt, Cant.);
(c) *angustipennis* (Palmerston N.);
(d) *apicellus* (Palmerston N.);
(e) *callirrhous* (Wellington);
(f) *catacaustus* (Arthurs Pass).

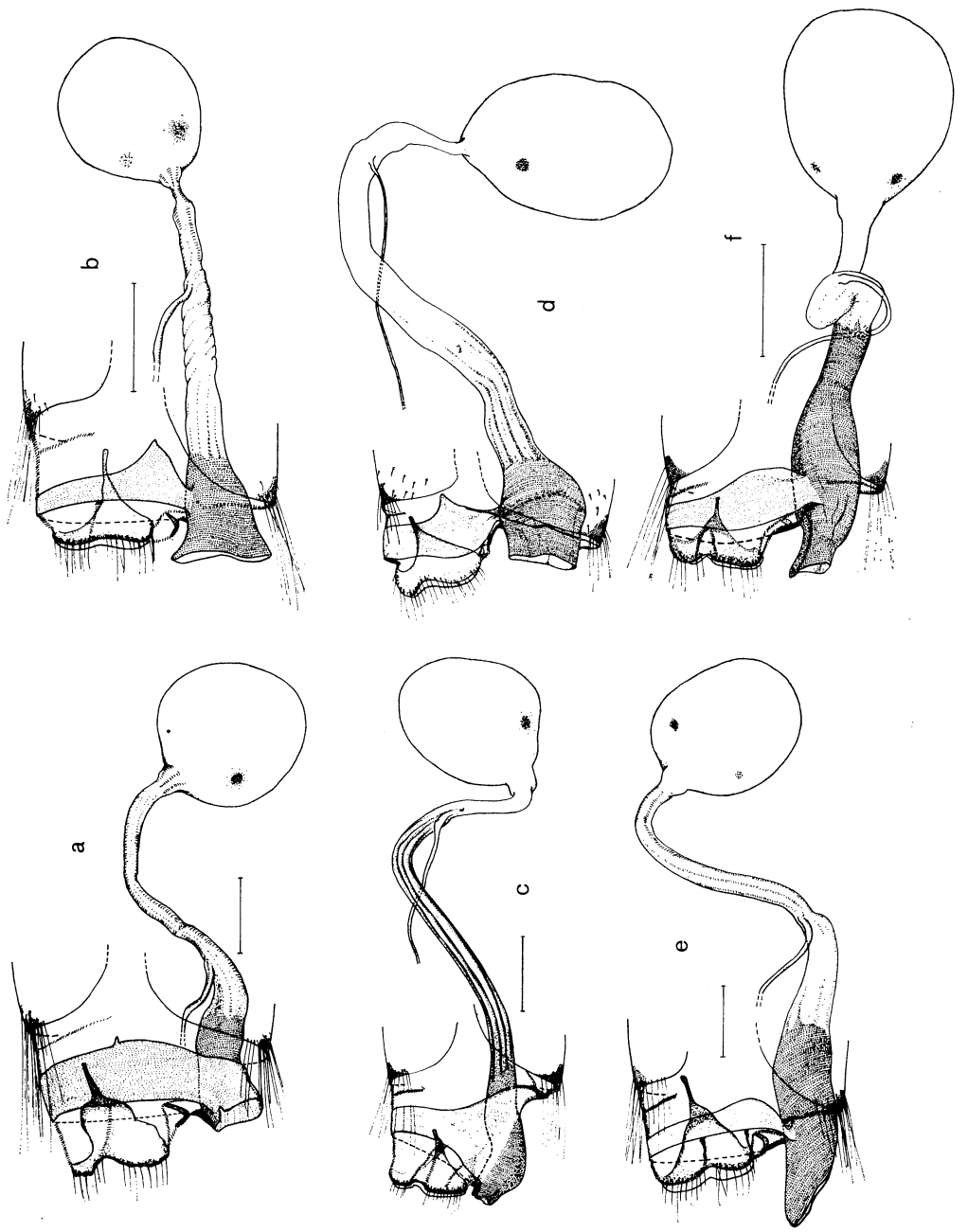

FIG. 12—*Orocrambus* spp. ♀ genitalia:
(a) *clarkei eximia* (Humboldt Mts, Otago);
(b) *corruptus* (Port Hills, Cant.);
(c) *cyclopicus* (Palmerston North);
(d) *enchophorus* (Palmerston N.);
(e) *ephorus* (Arthurs Pass);
(f) *flexuosellus* (Palmerston N.).

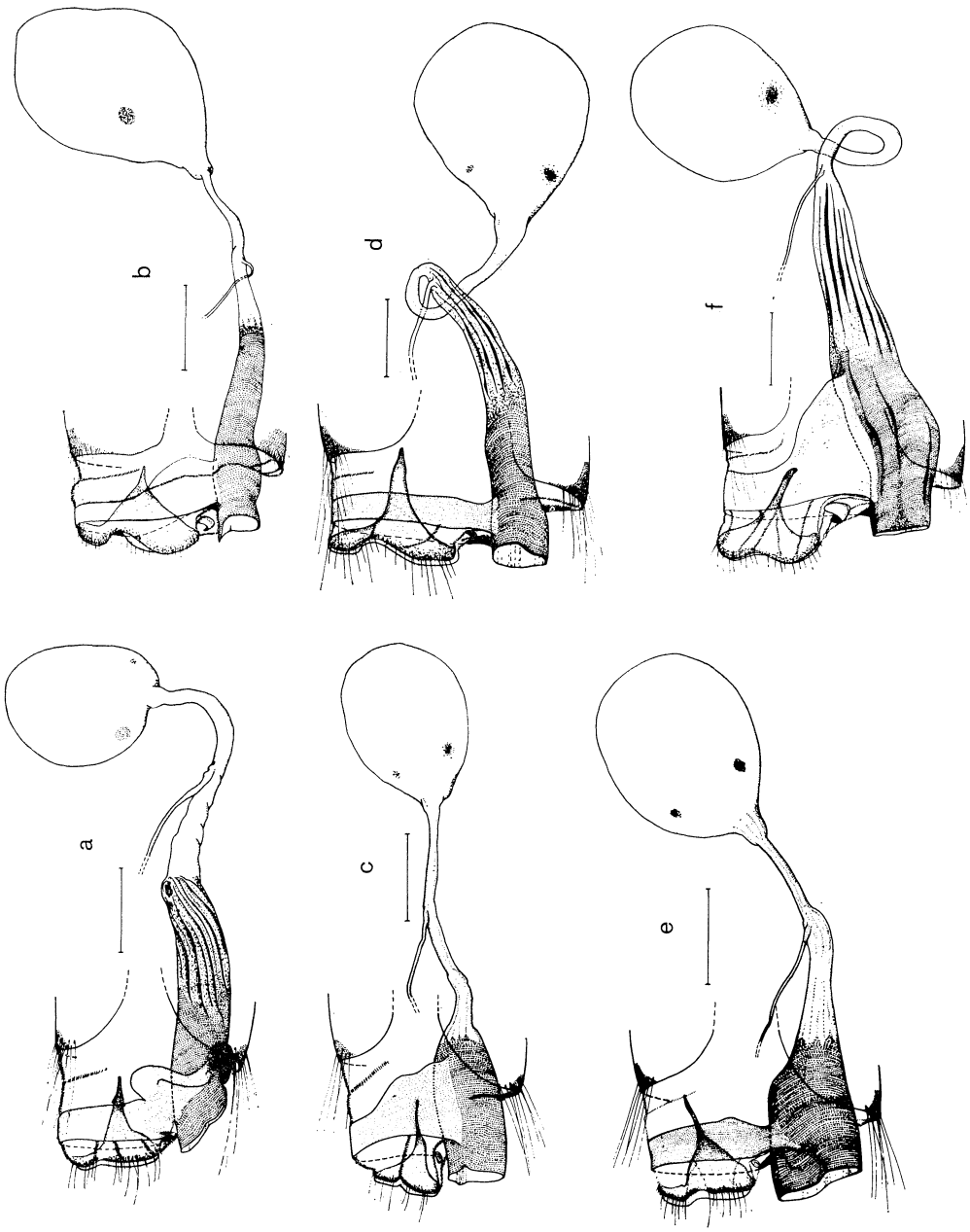

FIG. 13—*Orocrambus* spp. ♀ genitalia:
(a) *haplotomus* (Paradise, L. Wakatipu);
(b) *harpophorus* (Ben Lomond, Otago);
(c) *heliotes* (Waiouru);
(d) *heteraulus* (Humboldt Range, Otago);
(e) *horistes* (Chatham Is);
(f) *isochytus* (Mt. Arthur, Nelson).

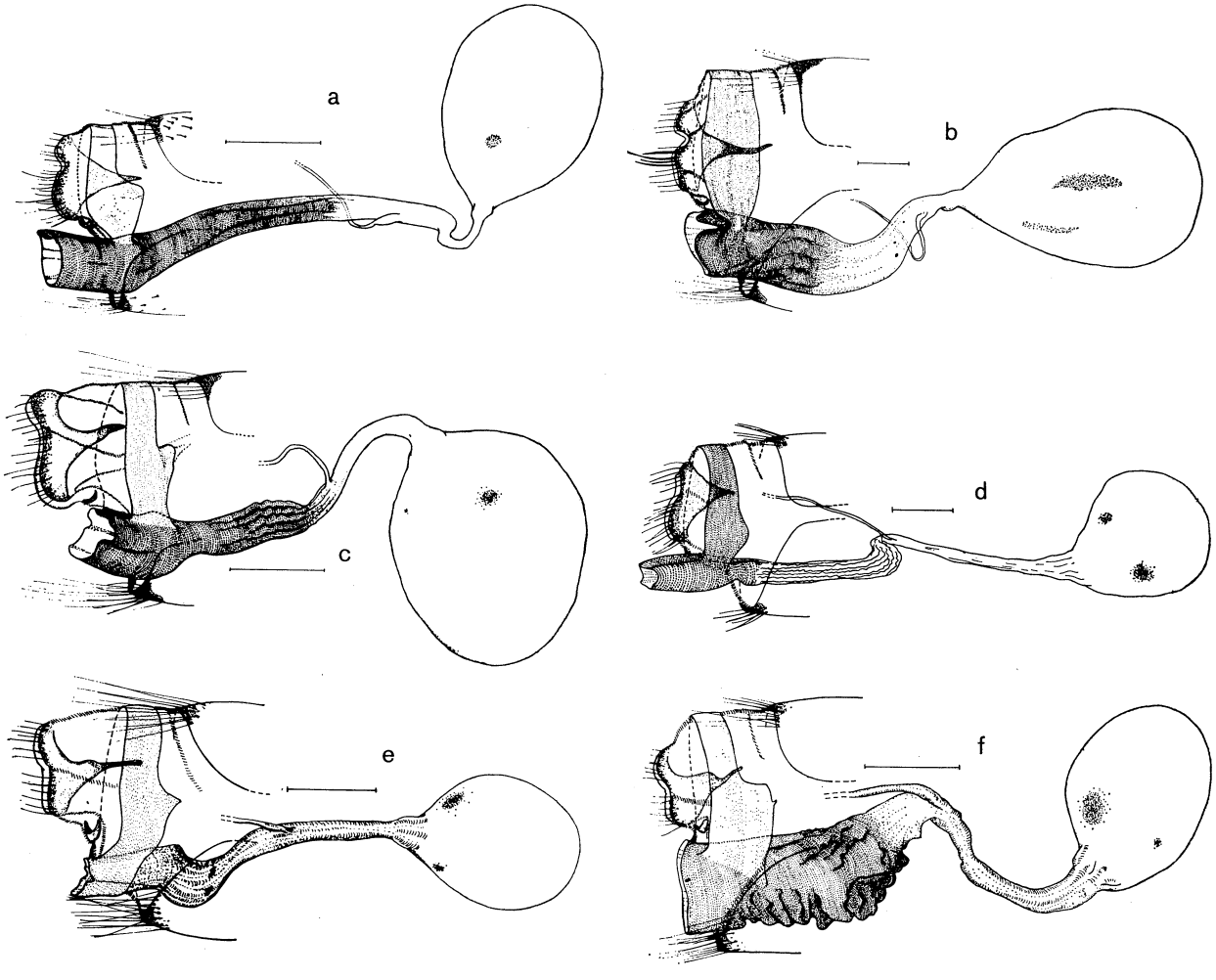

FIG. 14—*Orocrambus* spp. ♀ genitalia:
(a) *jansoni* (Waiouru);
(b) *lectus* (L. Tekapo);
(c) *lewisi* (Stephens I.);
(d) *lindsayi* (Mt. Ida, Otago);
(e) *machaeristes* (Mt. Earnslaw, Otago);
(f) *melampetrus* (Mt. Hutt, Cant.).

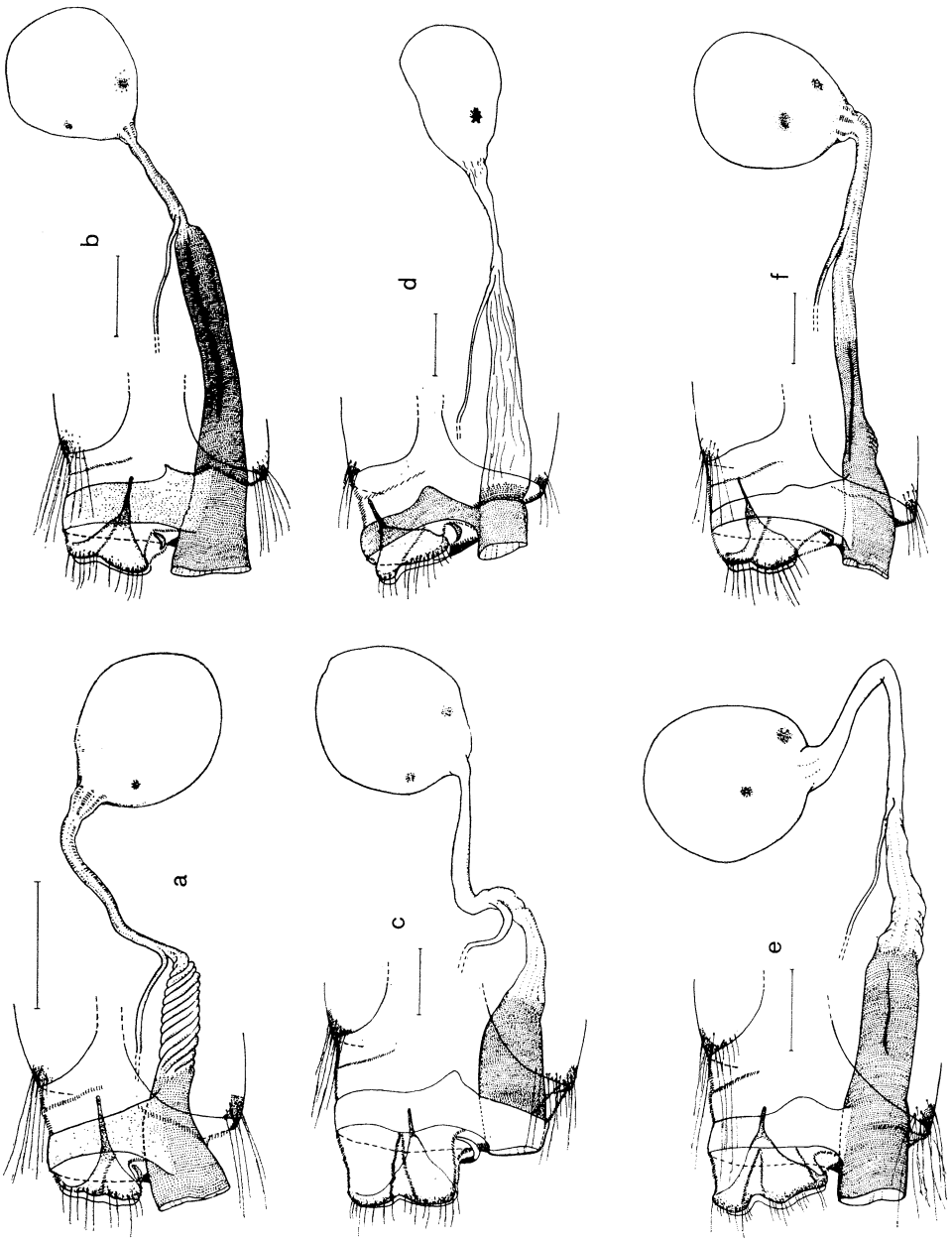

FIG. 15—*Orocrambus* spp. ♀ genitalia:
(a) *melitastes* (New River, Southland);
(b) *mylites* (Mt. Arthur, Nelson);
(c) *oppositus* (Cleughearn, Fiordland);
(d) *ordishi* (Hinds, Cant.);
(e) *philpotti* (Iron Hill, Nelson);
(f) *punctellus* (Portobello, Otago).

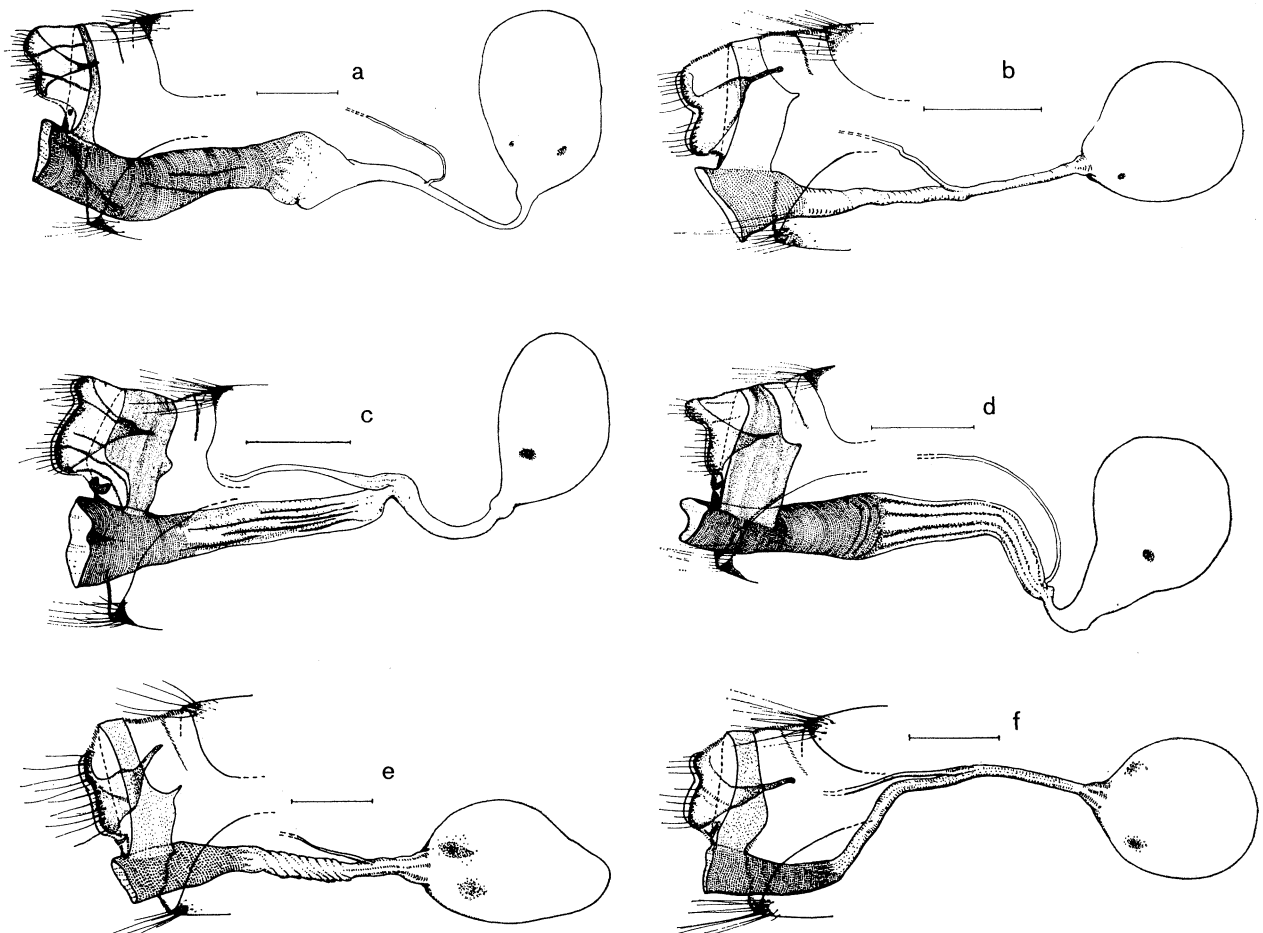

FIG. 16—*Orocrambus* spp. ♀ genitalia:
(a) *ramosellus* (Palmerston N.);
(b) *scoparioides* (Paradise, L. Wakatipu);
(c) *simplex* (Waiouru);
(d) *siriellus* (Mt. Holdsworth, Tararua Range);
(e) *sophronellus* (Wedderburn, Otago);
(f) *thymiastes* (Invercargill).

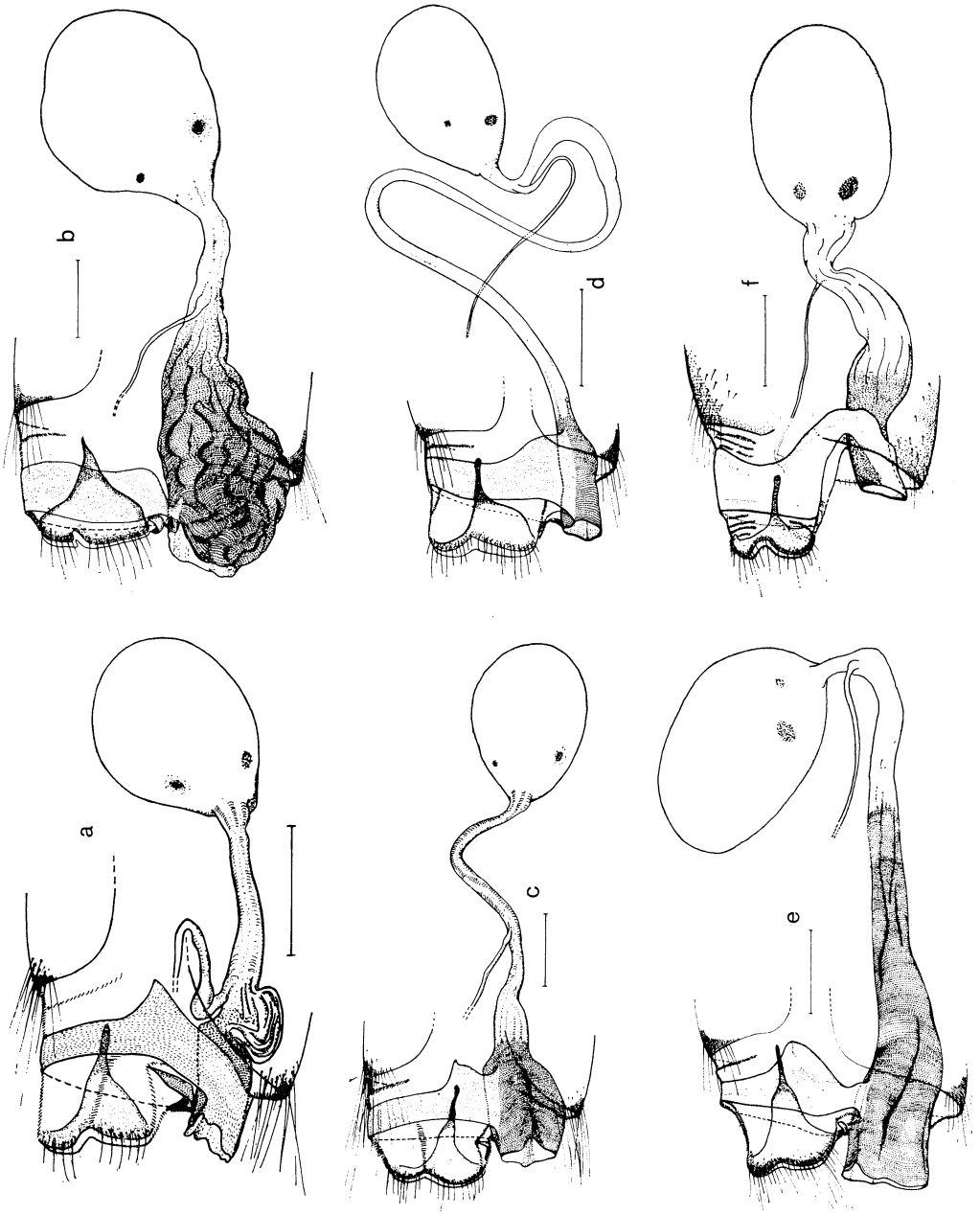

FIG. 17—*Orocrambus* spp. ♀ genitalia:
(a) *tritonellus* (Mt. Grey, Cant.);
(b) *luhualis* (Kaitoke, Wellington;
(c) *ventosus* (Mt. Arthur, Nelson);
(d) *vittellus* (Palmerston N.);
(e) *vulgaris* (Wellington);
(f) *xanthogrammus* (Kaikoura).

Orocrambus abditus (Philpott) n.comb.

Philpott, 1924, Trans. N.Z. Inst. **55**: 212 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. 1, fig. 18 (*Crambus*).

TYPE DATA. Holotype ♀ CM, author's genit. prep. AGA – "*C. abditus* A. Philpott, holotype ♀. Otarama (bred from larva) 20.10.21" (wrongly recorded by Philpott (loc. cit.) as ♂).

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 24–28 mm (both sexes).

GENITALIA. **Male** (Fig. 3a). As for generic description except: arms of vinculum about 0.5× uncus; saccus tapered to truncate apex; costa of valva flanged, dorsal margin about 0.8× uncus; sacculus flanged; gnathos tapered, bluntly pointed, slightly longer than uncus; aedeagus narrowly conical to truncate apex, 2.8× uncus, LMB ratio 8:1, without external ornamentation but with 18–22 cornuti between apex and midlength. **Female** (Fig. 11a, holotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae about 7× anal papillae, strong and pleated to and narrowing at 0.3, ductus seminalis joining at about 0.7; ostium a tapered funnel, ostiolar pouch region not swollen relative to ostium; corpus bursae with 2 unequal oval signa.

DISTRIBUTION & BIOLOGY. North Canterbury and Marlborough, and a small area of South Canterbury around Birdlings Flat. **Flight period**: October–March.

MATERIAL EXAMINED. 25♂♂, 1♀.

REMARKS. As in the other members of the "*simplex*" species group, the apices of the forewings are much more acute in the female than in the male. *O. abditus* cannot be separated from *simplex*, *lewisi*, *ordishi*, or even small specimens of *crenaeus* without examination of the genitalia. (*See* Remarks under *O. simplex* for detailed discussion of sibling species.) Judging from Burrows's (1967) figure this species is confined to the east of the 1270 mm isohyet; and to the north of the Rakaia River, according to distribution records at present available. This distribution may result from *abditus* being a species which survived in the eastern part of the Nelson/Marlborough biotic refuge during the Otiran glaciation, and extending its range in recent times. Southward spread of *abditus* could now be limited by some (unknown) physical environmental factor, or by competition with its more southerly sibling, *ordishi*. The flight period suggests bivoltinism, or perhaps a protracted single generation. Species group 6, '*simplex*'.

Orocrambus aethonellus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 19.
antimorus Meyrick, 1901, Trans. ent. Soc. Lond. **1901**: 567 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, fig. 23 (*Crambus*). New synonymy.
aulistes Meyrick, 1909, Trans. N.Z. Inst. **41**: 9 (*Crambus*). New synonymy.
heteranthes Meyrick, 1901, Trans. ent. Soc. Lond. **1901**: 567 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, fig. 7 (*Crambus*). New synonymy.
meristes Meyrick, 1919, Trans. N.Z. Inst. **51**: 351 (*Crambus*). New synonymy.
[*meritus* Philpott, 1929, Trans. N.Z. Inst. **60**: 496 (*Crambus*). Misspelling of *meristes*.]
saristes Meyrick, 1909, Trans. N.Z. Inst. **41**: 8 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xlv, fig. 18 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ *aethonellus* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 5630 – "Mt. Hutt New Zealand /1/01 R. W. F. Crambus aethonellus n.sp.". Paralectotype ♂ & ♀ *aethonellus* CM, author's genit. preps AGP & AGQ – "Mt. Hutt New Zealand Jan 77 Crambus aethonellus n.sp." and "Mt. Hutt New Zealand Jan 82 Crambus aethonellus n.sp.". Holotype ♂ *antimorus* BMNH, slide BM Pyral 5636 – "Mt. Cook New Zealand GVH. /12/99 Crambus antimorus" (genitalia checked against Philpott's figure (1929, p. 495) by Bleszynski). Holotype ♂ *aulistes* BMNH, slide BM Pyral 5631 – "Invercargill New Zealand GVH/00 Crambus aulistes" (checked against lectotype *aethonellus* genitalia by Bleszynski). Lectotype ♂ *heteranthes* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 5637 – "Mt. Cook New Zealand /12/99 GVH. Crambus heteranthes". Lectotype

♂ *meristes* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7973 – "Longwoods New Zealand A.P. 2700′ 12.10. Crambus meristes" (with 4 paralectotype ♂♂). Lectotype ♂ *saristes* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7974 – "Invercargill New Zealand, A.P. 1.07 Crambus saristes".

Eye with nude circumorbital strip. Female frenulum triple. Wingspan (male) 13–20 mm, (female) 15–21 mm.

GENITALIA. **Male** (Fig. 3b, based on topotype and paralectotype). As for generic description except: arms of vinculum about 0.6× uncus; saccus tapered, with "keel" of Philpott (1929); costa of valva flanged on inner posterior edge, dorsal margin about 0.5× uncus; sacculus undifferentiated; gnathos tapered, pointed, short, 0.7× uncus; aedeagus 2.3–2.5× uncus, LMB ratio 6–7:1, dorsal midline strong with apical torsion 45° sinistrad, a small apical thorn dorsosinistrad. **Female** (Fig. 11b, based on topotype and paralectotype). As for generic description except: tergite 8 encircling ostium, 2–3× as wide in ventral as in dorsal midline; sternite 8 absent; ductus bursae 4.5–5.0× anal papillae, weak, ductus seminalis joining at midlength; ostium bursae narrow, dorsoventrally compressed, with exaggerated dorsal lip, ostiolar pouch not swollen; corpus bursae with 2 markedly unequal oval signa.

DISTRIBUTION & BIOLOGY. South Island, from sandhills and bogs at sea level near Invercargill (Hudson 1928) up to about 1200 m in the main ranges. **Flight period**: late October–late January.

MATERIAL EXAMINED. 157♂♂, 23♀♀.

REMARKS. This is a variable species. Form *saristes* has a median constriction in the transverse white forewing line, but this character is neither constant nor reliable, even for the topotypes. Doubts as to specific status were expressed by Hudson (1928) of *saristes* and by Philpott (1929) of *aulistes* and *meritus* (=*meristes*). As there is no apparent geographical separation, subspecific status for any form cannot be justified. Forms *saristes*, *meristes*, and *aulistes* have been taken together near Invercargill at the same locality as typical *aethonellus*, despite Meyrick's (1919) contention that "they are closely allied but distinct, and seem not to occur together". In the Hudson Collection in the National Museum, specimens labelled *heteranthes* are larger than those labelled *saristes*, but such a size difference between alpine and lowland specimens is found in other members of the genus, e.g., *flexuosellus* and *enchophorus*. Form *antimorus* is characterised by white or whitish hindwings and paler brown forewings than the other forms, but although this form appears to be confined to the Lake Tekapo and Mount Cook regions, series of specimens taken by S. Lindsay and A. Philpott at both localities include all gradations from typical *aethonellus* to *antimorus*. Bleszynski examined the genitalia of the male types and confirmed that they are identical. Differences in the male genitalia of the forms illustrated by Philpott (1929) are very slight, and fall well within the range of variation found in *aethonellus* in the present study, for which more material was available than for Philpott's. Some seeming inaccuracies in Philpott's drawings, especially in the shape of the vinculum and saccus, were checked against the original slides. Apparently Philpott did not compensate in his drawings for some minor distortions caused by mounting. Although its food plant is not known, the distribution of *aethonellus* coincides suggestively with that shown for red tussock (*Chionochloa rubra*) by Burrows (1967). His remarks about the sites of *Ch. rubra* in the alpine zone also suggest a relationship: ". . . very poorly drained, flat to gently-sloping areas on cirque floors or flat-topped ridges up to about 5,000 ft. at 41°S and 4,000 ft. at 45°S . . . in wetter sites *Ch. rubra* vegetation grades into bog." *O. aethonellus* thus seems

to be associated with boggy areas. The flight period suggests univoltinism with protracted emergence. Species group 4, "*flexuosellus*".

Orocrambus angustipennis (Zeller) n.comb.

Zeller, 1877, Horae Soc. ent. Ross. **13**: 15 (*Chilo*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 22 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 38 (*Crambus*); 1939, Supplement to Butterflies & Moths of N.Z.: pl. lxii, fig. 9 (*Crambus*).

TYPE DATA. Holotype ♀ BMNH (Zeller Coll.), slide BM Pyral 5579 – "*Chilo angustipennis* Neu Seeland Knaggs 11/69."

Eye intermediate nocturnal/diurnal type, but tending largely to nocturnal. Female frenulum triple. Wingspan (male) 34–40 mm, (female) 44–50 mm.

GENITALIA. **Male** (Fig. 3c). As for generic description except: arms of vinculum 0.5× uncus; saccus not developed, junction of arms of vinculum apically rounded or slightly excavate; costa of valva flanged, valva drawn into dorsal and ventral teeth, dorsal margin 0.8× uncus; sacculus undifferentiated; gnathos tapered, pointed, as long as uncus; aedeagus 2.5–2.8× uncus, LMB ratio about 8:1, sharply tapering to long apical spur, a small thorn dextrad at about midlength. **Female** (Fig. 11c; compared with type sketch by Bleszynski). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, as wide at fusion as in dorsal midline, with short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 4.5–5.0× anal papillae, very swollen to midlength, strong to 0.3 and laterally to midlength, slightly constricted at 0.3–0.4, but ostiolar pouch region barely swollen compared with rest of ostiolar region, ductus seminalis joining at 0.8; ostium bursae a broad funnel; corpus bursae with 2 unequal oval signa.

LARVA (Fig. 19b). Reared to only the 4th instar, which at rest is 10–12 mm long; dull pinkish brown above, dirty creamy white beneath. Head capsule and prothoracic shield brown mottled with darker blackish brown. Prothorax: L2 slightly dorsocephalad of L1, SV2 slightly dorsocephalad of SV1. Mesothorax and metathorax: SD1 3–4× as long as SD2. Abdominal segments: 1 and 2 – D1 longer than D2, SV2 nearer SV1 than SV3, SV1 slightly cephalad of SV3; 3–6 – SV2 dorsad of SV1 and SV3; 7 – SV1 ventrocaudad of SV2; 9 and 10 – D2 very long, 3–4× as long as D1.

DISTRIBUTION & BIOLOGY. North, South, and Chatham Islands. **Host plants**: *Cortaderia* spp. (Gramineae), including *selloana* and *toetoe*; in growing stems and blades. **Flight period**: November–March; bivoltine.

MATERIAL EXAMINED. 27♂♂, 9♀♀ (South I.); 7♂♂, 5♀♀ (North I.); 4♂♂, 1♀ (loc. indet.).

REMARKS. This species is at once separated from any other by its large size, acute forewing apices, and forewings marked horizontally with white anteriorly and brown posteriorly. The female is the largest of any species of *Orocrambus*, having a wingspan up to 50 mm. Very large specimens are often nearly pure white, with just faint traces of brown in the basal posterior part of the forewings; the apex of the forewings is very acute in such specimens. *O. angustipennis* is very close to *ephorus* on male genital characters, both having the same rather unusual form of apical spur and small lateral thorn. There is little variation in genital structure: the depth of sclerotisation of the apical spur is slightly greater in large males. This species is found throughout New Zealand wherever *Cortaderia* is present. There are no long series from single localities in any of the museums investigated, indicating that populations are probably at low density. Even in the swampy country near Paiaka, Cumber (1951) took only 11 in a full year's trapping, although in my experience the species comes readily to light. Species group 3b, "*ephorus*".

Orocrambus apicellus (Zeller) n.comb.

Zeller, 1863, Chilonidarum et Crambidarum genera et species: 31 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 20 (♂) (*Crambus*).

Eye without nude circumorbital strip. Female frenulum double. Wingspan 22–26 mm (both sexes).

GENITALIA. **Male** (Fig. 3d). Saccus extremely elongate; juxta absent; costa of valva produced into a long, tapering prong; sacculus of valva only slightly differentiated, with small flange on inner posterior margin; gnathos slightly longer than uncus; aedeagus lacking cornuti. **Female** (Fig. 11d). Tergite 8 fusing with ostium bursae at about midlength, ostiolar region caudad of fusion serpentine, width at fusion only about 0.1 × that in dorsal midline; ductus bursae about 10× anal papillae; sternite 8 absent; ductus seminalis joining ductus bursae a little after midlength; corpus bursae with 2 subequal oval signa.

LARVA (Fig. 18b, head capsule; fig. 19c, chaetotaxy). Final instar 12–14 mm long, stout, sluggish, reddish brown with dark brown pinacula, giving appearance of a dorsal stripe and a pair of dorsolateral stripes, ventrally pinkish. Prothorax: XD2 nearer SD1 than SV1, L1 caudad of L2, SV1 caudad of SV2. Mesothorax and metathorax: D1 shorter than D2, SD2 shorter than SD1. Abdominal segments: SD2 very small; 1 and 2 – SV1–3 lie in a nearly vertical line; 3–6 – SV1–3 lie in a nearly horizontal line; 7 – SV1 longer than SV2; 9 and 10 – D1 and SD1 on same pinaculum.

EGG. Oblate, 22–27 vertical ribs, 0.40–0.43 × 0.36–0.39 mm, creamy white when laid, turning orange after 24–36 h. Duration of egg stage 19 days in November, 21 days in December.

DISTRIBUTION & BIOLOGY. North, South, Stewart, Chatham, and Auckland Islands; from sea level to 920 m, in swampy areas and poorly drained pastures with *Juncus* spp. and *Carex* spp. On Mount Ruapehu at about 600 m *O. apicellus* is the commonest crambine in December, occurring in large numbers amongst *Juncus* in forest clearings (pers. obs.). **Flight period**: October–April; bivoltine, the generations protracted.

MATERIAL EXAMINED. 59♂♂, 4♀♀ (South I.); 15♂♂, 6♀♀ (North I.).

REMARKS. It seems highly probable that the type specimen of *Crambus apicellus* Zeller has been lost. Both Bleszynski and I have searched the main collection and the crambine and pyraustine accessions at the British Museum (Natural History), but without success. The Zeller Collection was broken down and shared between London and Vienna some years ago. The New Zealand material (actually part of the Saunders Collection) was sent to London almost intact according to Bleszynski, but the type of *apicellus* went to Vienna, where Bleszynski searched for it in vain. There was a possibility that some material had been moved to Berlin; however, Dr H. J. Hannemann has indicated that the type of *apicellus* is not among the Crambinae in the collection at the Museum für Naturkunde. The International Code of Zoological Nomenclature, Article 75 (a)(i), states that a neotype is not to be erected in place of lost or destroyed type material unless it is essential for solving a complex zoological problem, such as the confused or doubtful identities of closely similar species. There is no such problem with *apicellus*. This species has diverged considerably from the more typical *Orocrambus* line, but retains a number of characters typical of the genus, notably the 2 signa on the corpus bursae and the shape of the uncus and gnathos. No variation in forewing pattern was noted in any of the specimens examined. It is at once distinguished from any other species by the subapical triangular patches of white on the costa of the forewings. Species group 2, "*apicellus*".

Orocrambus callirrhous (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 24 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 34 (*Crambus*).

[*callirhous* Bleszynski & Collins, 1962, p. 258 *in* A Short Catalogue of the World Species of the Family Crambidae (Lepidoptera), Acta zool. Cracov. **7**: 197–389 (*Crambus*). Misspelling of *callirrhous*.]

schedias Meyrick, 1911, Trans. N.Z. Inst. **43**: 60 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 33 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ *callirrhous* CM, author's genit. prep. BGM – "Lake Guyon, Feb.–Mar. 1871 R. W. Fereday coll." Holotype ♂ *schedias* BMNH, slide BM Pyral 7980 – "Wellington New Zealand GVH. 3.08." "*Crambus schedias* Meyr."

Frons conical. Eye normal. Female frenulum triple. Wingspan 24–32 mm (both sexes).

GENITALIA. **Male** (Fig. 3e; compared with lectotype). As for generic description except: arms of vinculum about 0.5× uncus; saccus elongate, tapered, with 'keel'; costa of valva flanged, dorsal margin 0.8–0.9× uncus; gnathos tapered, straight, bluntly pointed, as long as uncus; sacculus flanged; aedeagus tubular, 2.3× uncus, LMB ratio 10–11:1, simple subapical thorn dorsad, about 10 elongate cornuti clustered at midlength. **Female** (Fig. 11e). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about 3× as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae 7–8× anal papillae, strong to 0.3, ductus seminalis joining at 0.7; ostium bursae a simple funnel, curved ventrad, opening ventrocaudad, ostiolar pouch region markedly swollen; corpus bursae with 2 very unequal signa.

PUPA. One found by White (1963) but not described.

DISTRIBUTION & BIOLOGY. Eastern and central South Island up to about 1070 m; in North Island apparently coastal near Wellington and at Whangarei. **Host plants**: *Festuca novaezealandiae* (hard tussock) (White 1963); possibly others in coastal North Island. **Flight period**: December–April.

MATERIAL EXAMINED. 50♂♂, 5♀♀ (South I.); 14♂♂ (North I.); 1♀ (loc. indet.).

REMARKS. This species is related to *enchophorus* and *vittellus*. Worn specimens in particular are difficult to separate on external characters from the superficially similar *lectus*, *haplotomus*, *enchophorus*, *paraxenus*, and *vittellus*. Identification is easily checked by reference to the genital structure of either sex. The minor differences in forewing shape and colour which Meyrick (1911) used as justification for describing *C. schedias* as a separate species are not constant. Philpott (1929) showed an apparent difference in position of the entrance of the ductus ejaculatorius into the aedeagus between *schedias* and *callirrhous*, but I could not find any difference when re-examining the preparations from which he made his drawings, and can only conclude that he misinterpreted what he saw. Bleszynski has examined the type of *schedias* and other specimens labelled *callirrhous* in the Meyrick Collection in the British Museum (Natural History), and confirms my view that the 2 forms are identical. Species group 5a, "*vittellus*".

Orocrambus catacaustus (Meyrick)

Meyrick, 1885, Trans. N.Z. Inst. **17**: 134 (*Crambus*); 1888, op. cit. **20**: 67. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, figs 24 & 25.

pervius Meyrick, 1912, Trans. N.Z. Inst. **44**: 118. –Hudson, 1951, Fragments of N.Z. Entomology: 99. Syn. Bleszynski & Collins, 1962.

TYPE DATA. On the advice of Mr P. E. S. Whalley, I select as lectotype a BMNH ♂ syntype *catacaustus* labelled "Arthur's Pass, New Zealand 3,000 ft. 25/1/83 RWF Crambus catacaustus"; 4 other syntypes —3 in BMNH, 1 in CM—with identical label data thus become paralectotypes. Lectotype ♂ *pervius* (selected by Bleszynski and formally designated here) and 1 paralectotype ♂ BMNH – "L. Wakatipu New Zealand GVH. 2.11. *Orocrambus pervius*" (checked against *catacaustus* by Bleszynski).

Eye with nude circumorbital strip. Female frenulum triple, or double with apical elements of one unit partly separated. Wingspan 21–27 mm (both sexes).

GENITALIA. **Male** (Fig. 4a, paralectotype). As for generic description except: arms of vinculum about 0.3–0.5× uncus; saccus apically truncate or slightly excavate; sacculus with small flange; gnathos tapered, pointed; aedeagus stout, 2.3–2.5× uncus, LMB ratio 6–7:1, dorsal midline strong with torsion 45° sinistrad towards apex, a simple thorn in this line at 0.9. **Female** (Fig. 11f, topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, twice as wide at fusion as in dorsal midline, with vestigial projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 represented by 2 small, chitinised spots in membrane between the anal papillae and lamella postvaginalis; ductus bursae 3.0–3.5× anal papillae, strong to 0.3, with ventral pleats between 0.3 and 0.4; ostium bursae a simple, dorsoventrally compressed funnel; corpus bursae with 2 large, oval signa.

DISTRIBUTION & BIOLOGY. South Island; associated with bogs. **Flight period**: December–March.

MATERIAL EXAMINED. 89♂♂, 43♀♀.

REMARKS. This species is larger than *aethonellus*, but is best separated with certainty by examination of the genitalia; it is more closely related to *aethonellus* than to any other species. No consistent differences were found in either male or female genitalia of *pervius* and typical *catacaustus* forms. Slight variation in proportional size of structures was noted from specimen to specimen, but was found in both forms. Meyrick separated *pervius* from *catacaustus* primarily on its constricted white forewing fascia. Hudson (1951) doubted the validity of *pervius*, and indeed, in the long series examined in the present study, I found a complete range of intermediates. J. S. Dugdale (pers. comm.) mentioned that the *pervius* form appears to predominate in the Mount Arthur area, but in the Canterbury Museum there are also typical *catacaustus* specimens from this locality. The 2 forms have been taken together at Arthurs Pass and the mountains around Lake Wakatipu. There are thus no grounds at present to give *pervius* even subspecific rank. The constriction of the fascia generally (although not invariably) occurs in small, dark males. The syntypic specimens were first examined by Bleszynski some years ago, and *pervius* was published as a synonym of *catacaustus* in the catalogue of world Crambinae by Bleszynski & Collins (1962). Species group 4, "*flexuosellus*".

Orocrambus clarkei Philpott

This black alpine to subnival species exists as 2 geographically distinct subspecies.

Orocrambus clarkei clarkei Philpott

Philpott, 1930, Rec. Auckland Inst. Mus. **1**: 3. –Hudson, 1939, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 6.

nebulosa Philpott, 1930, Rec. Auckland Inst. Mus. **1**: 3 (*Tauroscopa*). –Hudson, 1939, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 5 (*Tauroscopa*).

TYPE DATA. Holotype ♂ & paratype ♂ *clarkei* AIM, author's genit. preps BMT & BMR – "Mt. Moltke 5,000 ft. Franz Joseph C1 20.1.25. *Orocrambus clarkei* Philp. Westland Co. South Island New Zealand. Auckland Museum." Holotype ♂ & paratype ♂ *nebulosa* AIM, author's genit. prep. BMS – "Minaret Pk L. Wanaka 30.12.20. *Tauroscopa nebulosa* Philp. C. E. Clarke Collection".

Eye with nude circumorbital strip. Wingspan 20–25 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 4b, paratype *clarkei*). As for generic description except: arms of vinculum about 0.5× uncus; saccus undeveloped, junction of arms of vinculum apically rounded; juxta a broad, lunate plate; costa of valva flanged, dorsal margin about 0.9×

uncus; sacculus flanged; gnathos tapered, pointed, as long as uncus; aedeagus tubular, 2.8× uncus, LMB ratio 7.5:1, apex broad, truncate, dorsoventrally compressed, large apical spur in dorsal midline curved dorsad.

DISTRIBUTION & BIOLOGY. Known only from Mount Moltke, Franz Josef (43°25′S) and Minaret Peak, Lake Wanaka (44°40′S) above 1400 m. **Flight period**: December–January.

MATERIAL EXAMINED. 4♂♂.

Orocrambus clarkei eximia (Salmon) n.comb.

Salmon, 1946, Rec. Dom. Mus. **1**: 6 (*Tauroscopa*). –Hudson, 1951, Fragments of N.Z. Entomology: pl. vii, fig. 4 (*Tauroscopa*).

TYPE DATA. Holotype ♂ NM, author's genit. prep. PCA – "Homer, 1.1.45."

Eye with nude circumorbital strip. Female frenulum sextuple. Wingspan 24–26 mm (both sexes). Hind wings white, compared with muddy brown in *O. c. clarkei.*

GENITALIA. **Male.** As for *O. c. clarkei* (Fig. 4b), but thorn of aedeagus slightly more massive and hooked. **Female** (Fig. 12a). As for generic description except: tergite 8 encircling ostium bursae, as wide ventrally as in dorsal midline, with very short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 3.5× anal papillae, strong to and narrowing at about 0.4, ductus seminalis joining just thereafter; ostium bursae a broad, dorsoventrally flattened funnel; corpus bursae with 2 very unequal signa.

DISTRIBUTION & BIOLOGY. Homer Saddle and Humboldt Range, Fiordland, above 1400 m. **Flight period**: December–January.

MATERIAL EXAMINED. 3♂♂, 1♀.

REMARKS. Easily confused with several species of *Tauroscopa* externally, but quite distinct on genital characters in both sexes. Subspecies *clarkei* differs from *eximia* externally in lacking the clear white hindwings. Variation in this species is sufficient to destroy any faith one might have in the value of venation as a criterion of taxonomic and systematic relationships in the Crambinae. Within the 1 species *O. clarkei* there is variation in both forewing and hindwing venation. In the paratype of *nebulosa*, although the genitalia are identical in detail with those of the paratype of *clarkei*, hindwing veins Sc and r_1 are free from rr (Fig. 22a); on Meyrick's criteria this specimen would be excluded from the Crambinae. In both the *nebulosa* and *clarkei* paratypes r_5 is stalked with r_4 in the forewing (Fig. 22a,b), but in both Humboldt Range and Homer Saddle specimens of *O. c. eximia* forewing r_5 is completely free (Fig. 22c). The male genitalia in both subspecies are almost identical, except that the aedeagal thorn in *O. c. eximia* is somewhat more massive and sharply hooked than in *O. c. clarkei.* I have made a provisional subspecific split on the basis of the forewing venation differences, and this is supported by different geographical distributions. The hindwing venation difference is regarded as being of less importance than that in the forewing, since the holotype of *O. c. clarkei* shows attentuaion of the link between Sc and r_1, transitional to the total lack of a cross-connection in the *nebulosa* paratype. This species requires more study, but obtaining large numbers of specimens will be difficult because it is a fast flyer with excellent disruptive camouflage. The flash of white of the hindwings of a flying *eximia* is easily followed, but this is lost when the moth drops suddenly and closes its wings (J. S. Dugdale, pers. comm.). The distribution of both subspecies partly coincides with the range given for *Chionochloa oreophila* (snow patch grass) by Burrows (1967). Species group 3a, "*melampetrus*".

Orocrambus corruptus (Butler) n.comb.

corrupta Butler, 1877, Proc. zool. Soc. Lond. **1877**: 399 (*Hypochalcia*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 20 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 1 (*Crambus*).
luridus Hudson, 1923, Ent. mon. Mag. **59**: 64 (*Crambus*). Syn. Hudson, 1928.

TYPE DATA. Holotype ♂ BMNH, slide BM Pyral 5567 – "*Hypochalcia corrupta* Butler type N.Z. 77.34."

Eye with nude circumorbital strip. Female frenulum triple. Wingspan 15–20 mm (both sexes).

GENITALIA. **Male**. (Fig. 4c; compared with type sketch by Bleszynski). As for generic description except: arms of vinculum as long as uncus; saccus undeveloped, junction of arms of vinculum apically excavate; costa of valva flanged, dorsal margin about as long as uncus; gnathos tapered, bluntly pointed, as long as uncus; aedeagus tubular, truncate, 2.8× uncus, simple lateral thorn at 0.3 and 8–12 small, rose-thorn-shaped cornuti between midlength and apex. **Female** (Fig. 12b). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, as wide at fusion as in dorsal midline, with triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae about 4.0–4.5× anal papillae, strong to 0.4, spirally pleated thence to junction with ductus seminalis at 0.6; ostium bursae a simple funnel flared at mouth, ostiolar pouch region not swollen; corpus bursae with 2 large, unequal, oval signa.

EGG. Oblate, 17–23 vertical ribs, 0.41–0.42×0.27–0.30 mm, creamy white when laid, turning orange after 24–36 h. Duration of egg stage 8 days in November.

DISTRIBUTION & BIOLOGY. Lowland and intermontane eastern and central South Island, to 760 m. Prefers poorly drained or boggy areas. **Flight period**: September–early December and, in some areas, again in February.

MATERIAL EXAMINED. 73♂♂, 17♀♀.

REMARKS. *O. corruptus* has a very clear and close phylogenetic affinity with *melitastes*, the 2 species forming part of a compact and sharply delimited group. Variation in forewing pattern and colour, especially of the dark markings, is considerable in *corruptus*. Hudson (1923) described as a new species an extreme colour variety (*luridus*), but synonymised it with *corruptus* in his later monograph (1928). However, the pale forewings facia are clear in almost all specimens, and the forewings are very slender by comparison with species such as *melitastes* and *aethonellus*. Attempts at rearing larvae of this species have failed. Mr J. I. Wood (Winchmore Irrigation Research Station) informed me that moths were flying "in considerable numbers in old pasture where sweet vernal and similar plants were common." Species group 1, "*melitastes*".

Orocrambus crenaeus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 197 (*Crambus*).
diplorrhous Meyrick, 1885, ibid.: 197 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 9 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ *crenaeus* (slightly worn) CM, author's genit. prep. BGJ – "*C. crenaeus* n. sp. 25.1.83." Lectotype ♂ and 4 paralectotype ♂ *diplorrhous* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7956 – "*Crambus diplorrhous*, L. Wakatipu New Zealand 17/12/82".

Eye without nude circumorbital strip. Wingspan (male) 31–38 mm. (Female unknown; quite probably semiapterous.)

GENITALIA. **Male** (Fig. 4d, lectotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus short, apically rounded; costa of valva flanged, dorsal margin as long as uncus; sacculus flanged; gnathos tapered apically, otherwise parallel-sided,

slightly longer than uncus, bluntly pointed; aedeagus dilated apically, 2.3–2.5× uncus, LMB ratio 8–9:1, length: apical breadth ratio 4:1, a large, variable, dorsal thorn apically, 6–10 deciduous, elongate cornuti between midlength and apex.

DISTRIBUTION & BIOLOGY. Alpine grasslands of the South Island, coincident with the range of *Chionochloa rubra* (red tussock) as shown by Burrows (1967). **Flight period**: December–February.

MATERIAL EXAMINED. 121♂♂.

REMARKS. This is one of the most abundant members of the genus in the South Island alpine grasslands (J. S. Dugdale, pers. comm.). The female is probably semi-apterous, like that of *ordishi* (same species group), for it has never been taken at light. Meyrick (1885) based *diplorrhous* on specimens of *crenaeus* with a distinct whitish streak on the subcosta of the forewings. These forms are identical to *crenaeus* on male genital structure. I have seen complete gradation of characters from specimens of form *diplorrhous* to those of typical *crenaeus*. On these grounds, and although the female is not yet known, I have no hesitation in synonymising *diplorrhous* with *crenaeus*. *O. crenaeus* bears a strong superficial resemblance to large specimens of *ordishi*; examination of genitalia is recommended for positive identification. There is much confusion in the illustrations to Philpott's (1929) paper as regards the genitalia of this species: fig. 31, labelled "*C. heteraulus*", shows male *crenaeus*; fig. 56, labelled "*C. crenaeus*", shows male *heteraulus*; fig. 58, labelled "*C. diplorrhous*", shows male *isochytus*. Species group 6, "*simplex*".

Orocrambus cultus Philpott

Philpott, 1917, Trans. N.Z. Inst. **49**: 242. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xliv, fig. 10

TYPE DATA. Type material cannot be traced.

Full description by Philpott (1917), coloured illustration by Hudson (1928, pl. xliv, fig. 10 (♀)). Forewing generally as follows: wingspan about 20 mm (both sexes); deep yellowish brown with dusky longitudinal black markings or shadings on costa, below middle disc, and on dorsum; a broad, broken, ochreous streak extends from base to 0.8 below the middle, with 2 other marks above this, and a whitish ochreous line crossing wing at 0.8 bends sharply outwards below costa as a subterminal line.

DISTRIBUTION & BIOLOGY. Cecil Peak, Lake Wakatipu. **Flight period**: January.

REMARKS. From the description given and the locality I suspect that, if rediscovered, this species may prove to be a local form of *scoparioides* or *thymiastes*. The holotype, allotype, and paratypes were said to have been deposited in the Pasco Collection (Philpott 1917, Hudson 1928). I have not been able to trace this collection, and no specimens from it have been deposited in the British Museum (Natural History) or any New Zealand museum. Species group affinities unknown.

Orocrambus cyclopicus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 29 (*Crambus*). –Hudson 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 44 (*Crambus*).

sophistes Meyrick, 1905, Trans. ent. Soc. Lond. **1905**: 226 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, fig. 24 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ *cyclopicus* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7978 – "Christchurch New Zealand 10/3/82 *Crambus cyclopicus*". Holotype ♂ *sophistes* BMNH, slide BM Pyral 5628 – "Dunedin New Zealand JHL/03. *Crambus sophistes*".

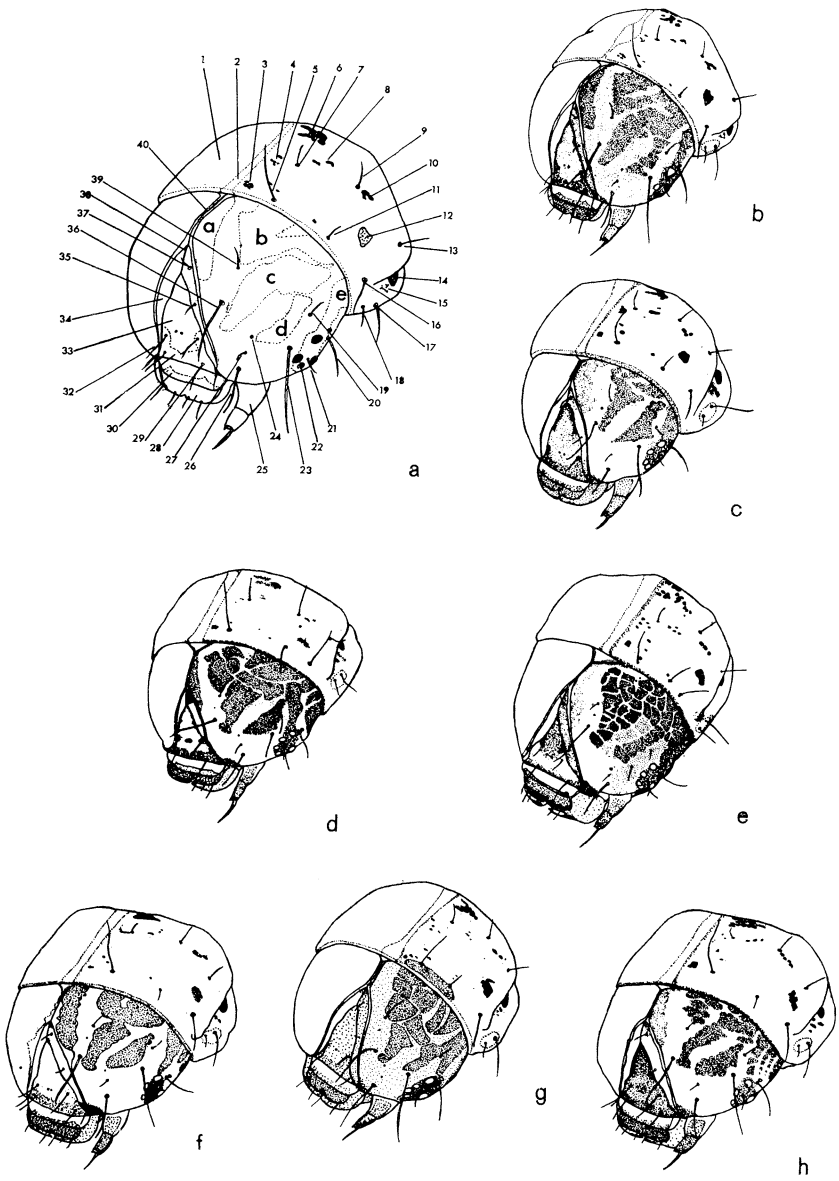

FIG. 18—Structures and main markings on head capsule and prothoracic shield of final-instar *Orocrambus* larvae. (a) Generalised diagram: dark areas of head capsule – a, dorsal; b, subdorsal; c, dorsolateral; d, lateral; e, ocellar; other characters – 1, prothoracic shield; 2, pale medial line; 3, anterior dorsal mark; 4, posterior dorsal mark; 5, seta XD1; 6, posterior mark; 7, seta D1; 8, upper dorsolateral mark; 9, seta D2; 10, lower dorsolateral mark; 11, seta XD2; 12, medial mark; 13, seta SD2; 14, prothoracic spiracle; 15, spiracular mark; 16, seta SD1; 17, seta L1; 18, seta L2; 19, seta L1 (head); 20, seta 02; 21, seta 01; 22, ocellus; 23, seta A3; 24, Aa (not bristle); 25, antenna; 26, seta Al; 27, seta A2; 28, labrum; 29, seta CL2; 30, membrana labroclypealis; 31, clypeus; 32, seta F1; 33, frons; 34, adfrons; 35, seta Frl 1; 36, seta P1; 37, seta Frl 2; 38, coronal suture (adfrontal section); 39, seta P2; 40, coronal suture (dorsal section). (b–h) Drawn from specimens: (b) *apicellus*; (c) *cyclopicus*; (d) *enchophorus;* (e) *flexuosellus;* (f) *ramosellus;* (g) *simplex*; (h) *vittellus*.

Eye with orbits scaled. Female frenulum triple. Wingspan 22–30 mm (both sexes).

GENITALIA. **Male** (Fig. 4e; checked against lectotype sketch by Bleszynski). As for generic description except: arms of vinculum about 0.8× uncus; saccus tapered, with rounded apex; juxta a U-shaped plate; costa of valva flanged, dorsal margin about 0.8× uncus; sacculus flanged; gnathos tapered, curved dorsad, with apical club, about as long as uncus; aedeagus tubular, truncate, 2.8–3.0× uncus, LMB ratio about 10:1, strong in dorsal midline from about 0.7 to apex, simple dorsal thorn subapically, 3–6 slender cornuti at about midlength. **Female** (Fig. 12c). As for generic description except: tergite 8 fusing diagonally with ostium bursae, anterior portion completely encircling ostium, about 4–5× as wide at fusion as in dorsal midline; sternite 8 a weak, lunate or oval plate; ductus bursae 9–10× anal papillae, strong to 0.3, pleated to junction with ductus seminalis at 0.8; ostium bursae a dorsoventrally flattened, crateriform funnel, ostiolar pouch swollen; corpus bursae with 2 unequal oval signa.

LARVA (Fig. 18c, head capsule; Fig. 19d, chaetotaxy). Fully fed final instar 12–15 mm long, stout, greyish brown with darker brown pinacula. Head: medium brown with darker brown markings. Prothorax: shield well developed, strong in 5th and 6th instars, L2 dorsad of L1, SV2 dorsad of SV1. Mesothorax and metathorax: D2 longer than D1, SD1 longer than SD2, L1 dorsad of L2. Abdominal segments: 1 and 2 – SD2 very small, D1 longer than S2, SV2 dorsad of and longer than SV1 and SV3; 3–6 – SV2 dorsad of SV1 and SV3, L1 dorsocaudad of L2; 7 – SV1 ventrocaudad of SV2. In final instar, dorsal pinacula continuous over dorsal midline.

EGG. Oblate, 16–21 vertical ribs, 0.46–0.48×0.34–0.37 mm, light brown when laid, turning orange-grey after 24–36 h. Duration of egg stage 15 days in March, 17 days in April.

DISTRIBUTION & BIOLOGY. Common in lowland pastures of the eastern South Island and southern North Island, becoming scarce north of the Manawatu except in some places on the Hawkes Bay coast (T. H. Davies, pers. comm.); subalpine and alpine regions of the South Island, to about 1220 m. **Host plants**: grasses, including the adventive species *Bromus mollis* and *Arrhenatherum elatius*; native hosts unknown. **Flight period**: January–May; strictly an autumnal species, peak flight activity occurring in March–April in both the North and South Islands.

MATERIAL EXAMINED. 81♂♂, 2♀♀ (South I.); 29♂♂, 21♀♀ (North I.).

REMARKS. The specimen illustrated in pl. xx, fig. 43 of Hudson (1928) as a *Crambus sophronellus* male is quite clearly an *O. cyclopicus* with the markings of the forewings obsolete, a form commonly met with. However, the illustration given in a later work by Hudson (1951; pl. v, fig. 2, ♀) is of a genuine specimen of *O. sophronellus*. This species resembles in a general way some pyraustines and phycitines, but, when present, the large, eye-shaped reniform of the forewings is a good character for immediate identification. Even when the forewing markings are obsolete this species is not easily confused with other crambines. Specimens taken by Mr J. S. Dugdale at Craigieburn had all forewing markings obsolete but had typical genitalia. The male genitalia resemble those of *harpophorus*, especially in the structure of the aedeagus, although retention of the juxta in *cyclopicus* is a primitive feature. However, the female genitalia show the relatively advanced feature of having the ostium encircled by tergite 8. There is no winter diapause in this species; larvae bred in captivity pupated in August and emerged in September and October at room temperature, a completely abnormal pattern considering the flight period in the wild. Species group 5a, "*vittellus*".

Orocrambus dicrenellus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 22 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 18 (*Crambus*) (not ♀ as captioned).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7983 – "Mt. Hutt New Zealand /1/81 RWF, Crambus dicrenellus"; 1 paralectotype ♂ BMNH, 2 paralectotype ♂♂ CM, author's genit. preps AGX & AGY – "Mount Hutt, 5.1.68 RWF Crambus dicrenellus n.sp.".

Eye orbits scaled. Wingspan (male) 29–33 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 4f, after paralectotype). As in generic description except: arms of vinculum 0.7× uncus; saccus tapered, with "keel" of Philpott (1929); costa of valva flanged, dorsal margin about 0.8–0.9× uncus; gnathos tapered, pointed, as long as uncus; aedeagus dilated apically, 2.8–3.0× uncus, LMB ratio 11–12:1, dorsal midline strong, ending in a sigmoid, spear-shaped apical spur about 0.3× aedeagus.

DISTRIBUTION & BIOLOGY. Alpine and subalpine tussock grasslands of central South Island, to 1220 m. **Flight period**: November–February (but no December records known at present; Hudson's records (1928, p. 164) include *philpotti*, and must be rejected).

MATERIAL EXAMINED. 15♂♂.

REMARKS. Every series of *dicrenellus* in the museum collections examined contained a mixture of this species and *philpotti*. When the specimens are in good condition the 2 species can be distinguished at sight with a little experience. The forewing colour of *philpotti* is a rich, lustrous bronze-yellow intermediate between the colour of *oppositus* and *heteraulus*; in *dicrenellus* it is dull glossy brown. The termen of the forewings in *philpotti* is slightly sinuate, whereas that of *dicrenellus* is moderately convex. Knowledge of the ecology of the 2 species is as yet insufficient to permit interpretation of this extreme convergence in external characters. The males of *dicrenellus* and *philpotti* are quite distinct on genital characters, *philpotti* having a thorn at the dorsal apex of the aedeagus. The drawing of the male genitalia by Philpott (1929, fig. 35), labelled "*Crambus dicrenellus* Meyr." is based on a specimen of *philpotti*. *O. dicrenellus* is close to *flexuosellus* and *horistes* in genital structure. The distribution of specimens of *O. dicrenellus* coincides with the range of *Chionochloa australis* (carpet grass) shown by Burrows (1967), but *Ch. pallens* (midribbed snowgrass), *Ch. rubra* (red tussock), and *Ch. rigida* (narrow-leaved snowgrass) are also possible food plants. Species group 4, "*flexuosellus*".

Orocrambus enchophorus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 136 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 16 (*Crambus*).

pedias Meyrick, 1885, Trans. N.Z. Inst. **17**: 137 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 32 (*Crambus*). New synonymy.

scitulus Philpott, 1925, Trans. N.Z. Inst. **56**: 390 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. li, fig. 23 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ *enchophorus* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 5628, and 4 paralectotype ♂♂, BMNH – "Castle Hill New Zealand 2,500 ft. 18/1/83, *Crambus enchophorus*". Lectotype ♂ *pedias* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7962, and 5 paralectotype ♂♂, BMNH – "Wanganui New Zealand 3/3/83"; paralectotype ♀ CM – "*Crambus pedias* n.sp. 3/3/83. Specimen ex abdomen." Holotype ♂ *scitulus* CM, author's genit. prep. BGK – "*Crambus scitulus* holotype male Mt. Arthur, 4,000 ft. 24.1.24, S. Lindsay."

Eye with orbits scaled. Female frenulum triple. Wingspan 24–40 mm (both sexes).

GENITALIA. **Male** (Fig. 5a; compared with lectotype sketch by Bleszynski). As for generic description except: arms of vinculum about 0.5× uncus; saccus tapered, elongate, curved dorsad, without 'keel'; costa of valva flanged, dorsal margin slightly shorter than uncus; sacculus flanged; gnathos clubbed apically, as long as uncus; aedeagus tubular, 2.8× uncus,

LMB ratio 10:1, dorsal midline with apical torsion 180° sinistrad, simple subapical thorn ventrad, often a second thorn dextrad at 0.6 apicad (especially in large, dark specimens), 10–12 slender, closely packed cornuti at about midlength. **Female** (Fig. 12d). As for generic description except: tergite 8 fusing dorsally with ostium bursae, about half as wide at fusion as in dorsal midline, with fragile, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae about 8–9× anal papillae, ductus seminalis joining at about 0.9; ostium bursae a cupuliform funnel, ostiolar pouch region swollen; corpus bursae with 2 subequal oval signa.
LARVA (Fig. 18d, head capsule; Fig. 19e, chaetotaxy). Final instar 12–18 mm long, stout, sluggish, glassy greyish green with brown pinacula, giving appearance of interrupted dorsal and dorsolateral striping, greenish brown ventrally. Prothorax: dorsal shield strong, L2 dorsocephalad of L1, SV2 cephalad of SV1. Mesothorax and metathorax: SD1 longer than SD2. Abdominal segments: 1 and 2 – L1 very slightly dorsocaudad of L2, SV2 cephalad of SV1 and SV3; 3–6 – SV2 dorsad of SV1, which is dorsad of SV3; 7 – SV1 caudad of SV2; 9 – D1 and SD1 on same pinaculum.
EGG. Oblate, 16–25 vertical ribs, 0.47–0.53×0.37–0.44 mm, pinkish white when laid, turning orange-grey after 24–36 h. Duration of egg stage (ambient room temperature) 12–14 days in March.

DISTRIBUTION & BIOLOGY. South Island: east of the main divide, up to 1600 m in north-west Nelson. North Island: in the south and west, in alpine and subalpine grassland in the central plateau, and recorded also from Haumoana and Little Bush, Hawkes Bay (T. H Davies, pers. comm.). **Host plants**: indigenous grass species not known, but associated with *Poa caespitosa* at Waiouru; adventive hosts include *Bromus catharticus* and *Festuca arundinacea*; will feed readily on *Poa annua* and *Agrostis tenuis* in captivity. **Flight period:** January–May.

MATERIAL EXAMINED. 89♂♂, 6♀♀ (South I.); 16♂♂, 4♀♀ (North I.).

REMARKS. Small, pale specimens are difficult to distinguish from *callirrhous*, and large, pale, alpine specimens which have been worn and rubbed are almost indistinguishable from *crenaeus* without examining the genitalia. Philpott (1929) gave drawings of male genitalia of *enchophorus* and *scitulus* but not of *pedias*. I examined the genitalia preparation of *scitulus* from which the drawing had been made and found it to be a specimen of *callirrhous*. Other specimens in the Philpott Collection labelled as *Crambus scitulus* were in fact very large dark specimens of *callirrhous*. However, the holotype of *scitulus* in the Canterbury Museum has genitalia identical with those of any large, dark *enchophorus*, and I have no hesitation in synonymising it with that species. Bleszynski checked the genitalia of the lectotypes of *enchophorus* and *pedias* in the British Museum (Meyrick Collection) and confirmed the synonymy. The main differences between the specimens called *enchophorus* and *pedias* by Meyrick (1885) are size and locality. Specimens under *pedias* in New Zealand museum collections are all from North Island lowland localities. Specimens under *enchophorus* are almost all from the subalpine eastern South Island. Hudson (1928) remarked on the great similarity of the 2 species, and mentioned size as the main difference. In the Canterbury Museum there is a long series of *enchophorus* from several South Island localities. The specimens from the Otago peninsula are as small as those labelled *pedias* from the southern part of the North Island. Variation in the male genitalia is confined to size and the degree of development of the ornamentation, which is more marked in large, dark specimens. The ostium bursae is more heavily chitinised in the larger females. There

is variation in the intensity of the grey forewing colour and in the degree to which terminal and subterminal rows of black dots are developed. Very large, worn *enchophorus* approach dark specimens of *crenaeus*, and small, pale specimens resemble dark *callirrhous*. Examination of the genitalia easily confirms identification. Phylogenetically *enchophorus* is very close to *callirrhous*. Species group 5a, "*vittellus*".

Orocrambus ephorus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 135 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xlviii, fig. 17 (*Crambus*).
corylana Clarke, 1926, Trans. N.Z. Inst. **56**: 417 (*Crambus*).

TYPE DATA. Holotype ♂ *ephorus* BMNH, slide BM Pyral 7960 – "Arthur's Pass New Zealand 4800 ft. 29/1/83". Holotype ♂ and 7 paratype ♂ *corylana* AIM – "Mt. Ida 19.2.22, C. E. Clarke".

Eye with narrow, nude circumorbital strip. Female frenulum quadruple. Wingspan 31–39mm (both sexes).

GENITALIA. **Male** (Fig. 5b, topotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus undeveloped; costa of valva flanged, toothed dorsally, dorsal margin of costa slightly shorter than uncus; sacculus undeveloped; gnathos tapered, pointed, as long as uncus; aedeagus 2.5× uncus, LMB ratio about 7:1, tapered apically, aperture of ductus dilated and turned dextrad, lateral thorn sinistrad at about 0.3, apical spur about 0.3× aedeagus. **Female** (Fig. 12e, topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, half as wide at fusion as in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae 6–7× anal papillae, strong to 0.3, ductus seminalis joining at midlength; ostium bursae a vase-shaped funnel with exaggerated dorsal lip, opening ventrad; corpus bursae with 2 equal oval signa.

DISTRIBUTION & BIOLOGY. South Island alpine tussock grasslands, above 1400 m. **Flight period**: November–February.

MATERIAL EXAMINED. 31♂♂, 2♀♀.

REMARKS. *O. ephorus* shares with *angustipennis* a number of apomorphic characters in the male genitalia, and possibly also in the unusual patterning of the forewings, though the latter could be parallelism. It is largely this strong affinity which leads me to discard their differing frons construction as a character representing a basic anatomical schism within the genus as a whole. *O. ephorus* is the only species in the genus with horizontal white and yellow-orange colouring, which in form *corylana* tends towards pale lemon yellow. Variation in the depth of the yellow colour of the forewings is considerable, and possibly depends partly on the amount of wear a specimen has had before capture. I have found all intermediate stages between typical *ephorus* and typical *corylana*, in both the depth and the extent of the yellow. Specimens from Craigieburn, the Tasman Mountains, and Mount Ida were all of the *corylana* form. Some differences in the shape and relative size of the apical spur of the aedeagus were noted between specimens from Arthurs Pass and Craigieburn. I see no strong case for retention of *corylana* as a valid subspecies, but this is a problem which should be examined again when more material is available. Species group 3b, "*ephorus*".

Orocrambus flexuosellus (Doubleday) n.comb.

Doubleday, 1843, *in* Dieffenbach's Travels in N.Z. **2**: 289 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 31 (*Crambus*). –Gaskin, 1966, Butterflies & Common Moths of N.Z.: pl. xviii, fig. 1 (*Crambus*).

TYPE DATA. Syntype ♂ BMNH – "New Zealand 42.55".

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 19–26 mm (both sexes).

GENITALIA. **Male** (Fig. 5c). As for generic description except: arms of vinculum about 0.5× uncus; saccus tapered; costa of valva with flange, dorsal margin about 0.8× uncus; sacculus with very small flange; gnathos tapered, pointed, as long as uncus; aedeagus 3.0–3.3× uncus, LMB ratio 10:1, dorsal midline strong from midlength to apex, subapical thorn dorsal. **Female** (Fig. 12f). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, width at fusion 1.5× that in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae about 8× anal papillae, sclerotised almost to reverse loop just beyond midlength, at junction with ductus seminalis; ostium bursae narrowed at mouth, with exaggerated dorsal lip, ostiolar pouch swollen; ostiolar region vase-shaped; corpus bursae with 2 subequal oval signa.

LARVA (Fig. 18e, head capsule; Fig. 19f, chaetotaxy). Final (6th) instar 12–18 mm long, moderately stout, greenish grey with dark grey pinacula. Head: dark brown with pale adfrontalia, A marking so formed much broader than in any other species examined. Prothorax: shield well developed dorsally, strong in 5th and 6th instars; L2 cephalad of L1. Mesothorax and metathorax: L1 longer than L2, D2 longer than D1. Abdominal segments: 1 and 2 – D1 longer than D2, L1 dorsad of L2, SV2 more than twice as long as SV1 and SV3; 3–6 – SV2 dorsad of SV1 and SV3; 7 – L1 near dorsad of L2, SV1 ventrocaudad of SV2; 9 – D1 and SD1 on same pinaculum. In instars 1–4 the dorsal pinacula are separate in the midline; in 5 and 6 they are continuous.

EGG. First described by Watt (1914); figured by Hudson (1928: frontispiece & fig. 24). Oblate, 11–17 vertical ribs, 0.40–0.45×0.28–0.32 mm, creamy yellow when laid, turning pinkish after about 24–36 h and vermilion after 4–7 days.

DISTRIBUTION & BIOLOGY. North, South, and Stewart Islands. The dominant *Orocrambus* species in all lowland North Island pastures, less common in the South Island, in dry pastures, and above 650 m (although adults found at 1300 m near Lake Sylvester, Nelson Province). **Host plants**: *Poa annua*, *Dactylis glomerata*, *Phleum pratense*, *Festuca rubra* var. *comutata*, and the moss *Ceratodon purpureus*; in captivity feeds readily on *Funaria hygrometrica*, *Bryum*(?) sp., *Bartramia*(?) sp., *Agrostis tenuis*, and *Alopecurus pratensis*. **Flight period**: late September–June; apparently (from breeding results) bivoltine. Further information has been given for Paiaka by Cumber (1951), for the Cass district by White (1963), and for Wellington by Gaskin (1964a, b).

MATERIAL EXAMINED: 178♂♂, 95♀♀ (North I.); 87♂♂, 24♀♀ (South I.); 2♂♂ (Stewart I.).

REMARKS. This species is readily distinguished from any other on genital characters, but externally, worn specimens might be confused with *vittellus* or *jansoni*. However, *vitellus* lacks the characteristic dark costa of the forewing and *jansoni* has no subterminal forewing markings. *O. flexuosellus* is the phylogenetic sister species of *horistes*, which is found only on the Chatham Islands, and I have no doubt that the two are of common ancestry (the relationship is discussed further under *horistes*). On the other hand, *flexuosellus* shows quite a close affinity with *dicrenellus* (which might be regarded as a derivative from the common stock which had radiated into the alpine habitat) and *haplotomus*. The success of *flexuosellus* is due at least in part to its ready adaptation to feeding on introduced European grasses. The list of host plant species will doubtless be extended with further study. Although *flexuosellus* has long been considered one of the most common lowland species of New Zealand Lepidoptera (Hudson 1928, Cumber 1951, Gaskin 1964a, b), only 3 brief observations have been made on its life history before the present study: Kelsey (1957) and Cumber

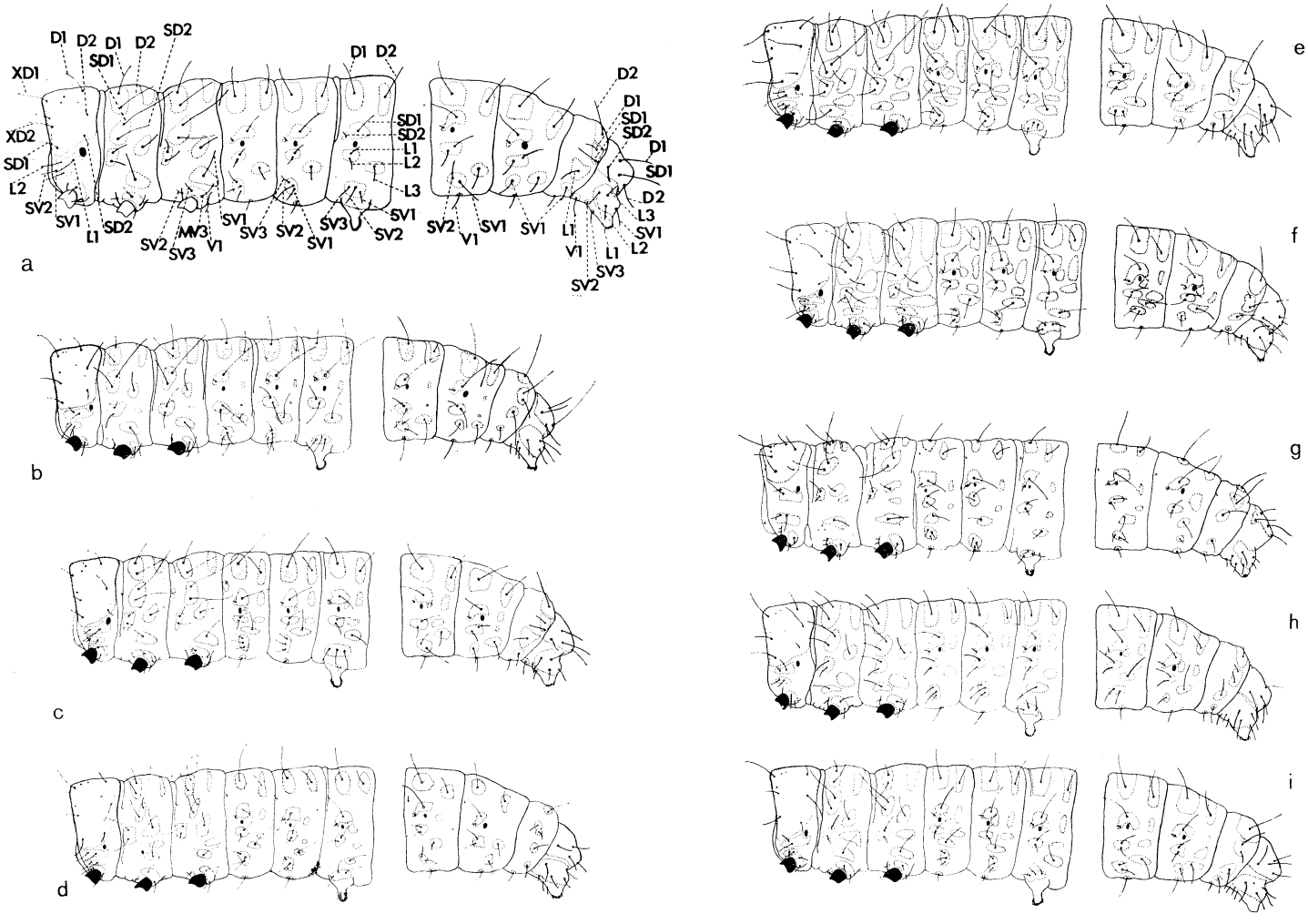

FIG. 19—Chaetotaxy of *Orocrambus* spp. larvae (final instar unless otherwise indicated; intermediate abdominal segments 4 and 5 omitted). (a) Generalised diagram. (b–i) Drawn from specimens: (b) *angustipennis* (4th instar); (c) *apicellus*: (d) *cyclopicus*; (e) *enchophorus*: (f) *flexuosellus*; (g) *heliotes* (4th instar); (h) *ramosellus*; (i) *vittellus*.

& Eyles (1961) reported that the larvae tunnelled through grass roots and soil, and White (1963) reared some adults from pupae found in the base of unspecified grass tussocks. None of these workers gave descriptions of the larvae found and bred. Species group 4, "*flexuosellus*".

Orocrambus fugitivellus (Hudson) n.comb.

Hudson, 1951, Fragments of N.Z. Entomology: 99; pl. iv, fig. 2 (*Crambus*).

TYPE DATA. Holotype ♂ Hudson Coll., NM, slide DM 160 – "McKenzie Country, Canterbury, Feb. 1939, R. D. Dick, Hudson Coll. 1773", "*Crambus fugitivellus* holotype"; 3 topotype ♂♂ DSIR – same coll. data (apparently not examined by Hudson for his diagnosis).

Eye without nude circumorbital strip. Wingspan (male) 18–19 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 5d, holotype). As for generic description except: arms of vinculum 0.3× uncus; saccus parallel-sided, with truncate apex; costa of valva poorly developed, flange small, dorsal margin about 0.7× uncus; sacculus little differentiated compared with most species, but very small flange present; gnathos tapered, pointed, as long as uncus; aedeagus tapered apically, 1.5× uncus, LMB ratio 6.5:1, minute subapical thorn dorsodextrad.

DISTRIBUTION & BIOLOGY. Known only from the McKenzie Plains. **Flight period**: February.

MATERIAL EXAMINED. Holotype ♂ and 3 topotype ♂♂ (see Type Data).

REMARKS. Phylogenetically this species is probably close to *aethonellus*, but it also shows affinities with *horistes* and *flexuosellus*. Species group 4, "*flexuosellus*".

Orocrambus haplotomus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 23 (*Crambus*). –Hudson, 1929, Butterflies & Moths of N.Z.: pl. xx, fig. 7 (*Crambus*).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) BMNH – "Lake Wakatipu New Zealand /1/81 RWF" (abdomen missing).

Frons conical. Eye without nude circumorbital strip. Female frenulum triple. Wingspan (male) 19–28 mm, (female) 25–30 mm.

GENITALIA. **Male** (Fig. 5e, topotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus parallel-sided for proximal half, tapering to rounded apex, with 'keel'; costa of valva flanged, dorsal margin 1.3–1.5× uncus; sacculus undifferentiated; gnathos tapering, bluntly pointed, as long as uncus; aedeagus 3.3–3.8× uncus, LMB ratio 11–12:1, simple, strong, subapical thorn 45° dextrad. **Female** (Fig. 13a). As for generic description except: tergite 8 fusing laterally and diagonally with ostium bursae, ventral ends drawn into protrusions, or 'wings', fused with ventrolateral walls of ostium below line of tergite; sternite 8 a strong, lunate plate; ductus bursae 6× anal papillae, sclerotised for half length, spirally pleated from 0.3 to midlength, an asymmetrical pouch sinistrad at base of spiral, pigmented with a few sclerotised spots, ductus seminalis joining at 0.8; ostium bursae a broad, tapering funnel with exaggerated dorsal lip; corpus bursae with 2 unequal oval signa.

DISTRIBUTION. Apparently confined to South Island subalpine areas around Lakes Te Anau and Wakatipu, extending to Milford Sound.

MATERIAL EXAMINED. 9 ♂♂, 6 ♀♀.

REMARKS. This species has a distinctive yellowish ground colour which is easily recognised but difficult to describe, and lacks the white median streak on the dorsal surface of the thorax common to most pale species of *Orocrambus*. The dorsum of the forewing is slightly concave. *O. haplotomus* shows affinities in male genital structures with *flexuosellus*, but the conical frons and the peculiar 'wings' of tergite 8 in the female are apomorphic characters not present in any other species of this group. Variation is largely in size, but as in *lectus* there is a tendency for the horizontal median white streak to be obliterated. Hudson (1928) claimed that this species occurs in the Castle Hill area near Arthurs Pass, but these specimens cannot be traced and are assumed to be a misidentification. He did not state whether he had collected them there himself or had been informed that the species existed there. I suspect that the specimens from Castle Hill were *lectus*, a species not seen by Hudson until after his 1928 work was published. Species group 4, "*flexuosellus*".

Orocrambus harpophorus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 30 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 36 (*Crambus*).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 7976 – "L. Wakatipu New Zealand /1/80 RWF."

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 25–29 mm (both sexes).

GENITALIA. **Male** (Fig. 5f; compared with lectotype sketch by Bleszynski). As for generic description except: arms of vinculum about 0.7× uncus; saccus tapered, with truncate apex and 'keel'; costa of valva flanged, dorsal margin as long as uncus; sacculus flanged; gnathos clubbed, as long as uncus; aedeagus tubular, truncate, 2.3× uncus, LMB ratio 9:1, apex slightly dilated, simple dorsal thorn at 0.2, smaller thorn (sometimes absent) sinistrolateral at about midlength, 10–15 elongate cornuti between midlength and apex. **Female** (Fig. 13b). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about twice as wide at fusion as in dorsal midline; sternite 8 strong; ductus bursae 5–6× anal papillae, strong to midlength, ductus seminalis joining at about 0.6; ostium bursae a tapered funnel with exaggerated dorsal lip, ostiolar pouch region slightly swollen; corpus bursae with 2 unequal oval signa.

DISTRIBUTION. Sea level to about 1524 m in North and South Islands; in North Island known only from Levin, Paiaka, and Mount Tongariro.

MATERIAL EXAMINED. 48 ♂♂, 4 ♀♀ (South I.); 3 ♂♂ (North I.).

REMARKS. Although the forewing pattern deviates from that more typical of "*vittellus*" group species, genital characters show that phylogenetically this species is close to *heteraulus*. The black and white basal streaks of the forewing give this species a superficial resemblance to *Tawhitia pentadactyla* and *Maoricrambus oncobolus*; the 3 species are best separated by examination of genitalia, especially when only worn specimens are available. A lowland North Island *harpophorus* from Levin is much smaller and browner than other specimens, and its forewing markings are indistinct. *O. harpophorus* is locally common in some coastal localities, but is probably basically alpine/subalpine. Its distribution coincides somewhat with the range given for *Chionochloa rubra* (red tussock) by Zotov (1963) and Burrows (1967). It is perhaps bivoltine in the North Island, since Cumber recorded adults at Paiaka in June. Species group 5a, "*vittellus*".

Orocrambus heliotes (Meyrick) n.comb.

Meyrick, 1888, Trans. N.Z. Inst. **20**: 68 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, figs 5 & 6 (*Crambus*).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) and 8 paralectotype ♂♂ BMNH – "Mt. Arthur New Zealand 3,800 ft. 15/1/86"; paralectotype ♂ CM, author's genit. prep. AGO – "Mt. Arthur, 15.1.86" (in Meyrick's handwriting).

Eye with nude circumorbital strip. Female frenulum double or triple. Wingspan (male) 14–17 mm, (female) 15–20 mm.

GENITALIA. **Male** (Fig. 6a, CM paralectotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus about 0.5× uncus in profile, apically excavate; juxta U-shaped; costa of valva flanged, dorsal margin about 0.8× uncus; gnathos tapered, pointed, as long as or slightly longer than uncus; aedeagus 3× uncus, LMB ratio 8–9:1, slender spur apical. **Female** (Fig. 13c). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, 2.5–3.0× as wide at fusion as in dorsal midline; sternite 8 a weak, oval plate; ductus bursae 4–4.5× anal papillae, strong to and narrowing at 0.3, ductus seminalis joining at 0.6; dorsal margin of ostium slightly excavate; corpus bursae with 2 equal, oval signa.

LARVA (Fig. 19g, chaetotaxy). Final instar at rest 10–13 mm long, stout, dull brown with darker brown pinacula. Head: dark brown with paler brown frontal region. Prothorax: shield strong, L2 dorsocephalad of L1, SV2 cephalad of SV1. Mesothorax and metathorax: L1 dorsad of L2, D2 longer than D1, SD1 longer than SD2. Abdominal segments: 1 and 2 – SV2 caudad of SV1, SV3 cephalad of SV1, L1 dorsad of L2, SD2 very small; 3–6 – SV2 dorsad of SV1 and SV3, L1 dorsad of L2; 7 – SV1 ventrocaudad of SV2, L1 dorsocaudad of L2. 9 – D1 and SD1 on same pinaculum.

EGG. Oblate, 20–26 vertical ribs, 0.39–0.42×0.28 – 0.29 mm, creamy white when laid, turning orange after 24–36 h if fertilised.

DISTRIBUTION & BIOLOGY. North Island (local) and South Island; associated with swamps and slow-moving streams in tussock grasslands, in the South Island apparently more common to the west of the main divide. **Host plants:** Captive larvae fed largely on *Funaria* sp., but also ate *Juncus bufonius*. **Flight period**: early November–early February. Diurnal, flight occurring only when the sun is shining.

MATERIAL EXAMINED. 53♂♂, 7♀♀ (South I.); 154♂♂, 25♀♀ (North I.).

REMARKS. This species is at once distinguished from any other by its bright orange hindwings. According to Hudson (1928) the white forewing markings are a male characteristic. This is not so; both sexes show forewings varying from plain brown to brown with curved, pale markings approaching those of *thymiastes*. In the North Island it has been taken at 1190 m on Mount Ruapehu by Dr K. Fox (pers. comm.) and at 1067 m on Mount Pureora (South Auckland) by J. S. Dugdale. The distribution in the South Island may be discontinuous between Southland/Otago and Nelson, but this is a very local species. I have collected *heliotes* over 3 years in the same localities at Waiouru and National Park, and conclude that it is protandrous, since the males were on the wing for about a week before the main peak of the female flight. Eighty-five specimens netted over a ditch at National Park in the first week of November 1967 were all males; careful searching revealed no females among the vegetation, so this was not a behavioural phenomenon. A week later males and females were flying together in almost equal numbers. Species group 3a, "*melampetrus*".

Orocrambus heteraulus (Meyrick) n.comb.

Meyrick, 1905, Trans. ent. Soc. Lond. **1905**: 225 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, fig. 37 (*Crambus*).

TYPE DATA. Holotype ♂ BMNH, slide BM Pyral 7957 – "Humboldt Mts. New Zealand GVH/03"; 2 ♂, 2 ♀ paratypes NM – "Humboldt Range 4,000 ft. 26–28.ii.03, G. V. Hudson."

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 28–35 mm (both sexes).

GENITALIA. **Male** (Fig. 6b, topotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus tapered, with 'keel'; costa of valva flanged, dorsal margin of costa about 0.8× uncus; sacculus flanged; gnathos parallel-sided, apically clubbed, as long as uncus; aedeagus tubular, 2.3× uncus, strong dorsally to midlength, simple thorn dextrodorsad at about 0.3, linear group of 5–16 elongate cornuti between midlength and apex. **Female** (Fig. 13d). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, as wide at fusion as in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae about 5× anal papillae, strongly sclerotised to 0.3 whence pleated to junction with ductus seminalis at 0.7; ostium bursae a tapered funnel, ostiolar pouch region barely swollen; corpus bursae with 2 unequal, oval signa.

DISTRIBUTION & BIOLOGY. Humboldt Range and Routeburn Valley (western Otago/ Fiordland boundary). **Flight period**: December and February.

MATERIAL EXAMINED. 13♂♂, 2♀♀.

REMARKS. This species is close to *harpophorus* in genital structure. In his paper on the male genitalia of the New Zealand Crambidae, Philpott (1929) confused this species with *crenaeus*: fig. 56 should read "*C. heteraulus* Meyr." and fig. 31 should read "*C. crenaeus* Meyr." This is a peculiar mistake, best attributed to an error in slide labelling. The 2 species are quite distinct, and Meyrick's descriptions (1885, 1905), repeated by Hudson (1928), are quite unambiguous. *O. heteraulus* is easily separated from any other species by its golden, lustrous forewings with basally originating white fascia branching beyond the central disc. Females are tinged with whitish, and dark interneural streaks occur in some. Species group 5a, "*vittellus*".

Orocrambus horistes (Meyrick) n.comb.

Meyrick, 1902, Trans. ent. Soc. Lond. **1902**: 276 (*Crambus*). – Hudson, 1928, Butterflies & Moths of N.Z.: 168 (*Crambus*).

TYPE DATA. Lectotype ♂ and paralectotype ♂ (selected by Bleszynski and formally designated here) BMNH – "Chatham Islands F./00"; paratype ♂ CM – "*Crambus horistes* Meyrick", "Paratype det. E. Meyrick 1924" (no abdomen).

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 25–29 mm (both sexes).

GENITALIA. **Male** (Fig. 6c, topotype). As for generic description except: arms of vinculum 0.7× uncus; saccus turned dorsad, parallel-sided for most of length, apex bluntly rounded or truncate; costa of valva flanged, dorsal margin about 0.7× uncus; sacculus undifferentiated; gnathos tapered, pointed, or very slightly clubbed, as long as uncus; aedeagus stout, truncate apically, 2.0–2.5× uncus, LMB ratio 6–7:1, dorsal midline strong from midlength to apex, very large thorn subapical, dorsal. **Female** (Fig. 13e, topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, as wide at fusion as in dorsal midline; sternite 8 a weak, oval plate; ductus bursae 3.5–4.0× anal papillae, strong to and narrowing at 0.3, ductus seminalis joining at about 0.6; ostium bursae with

swollen pouch, forming a simple, calathiform funnel; corpus bursae with 2 equal, oval signa of moderate size.

DISTRIBUTION & BIOLOGY. Restricted to Chatham Islands. **Flight period**: December–January.

MATERIAL EXAMINED. 24♂♂, 10♀♀.

REMARKS. This species is very close to *flexuosellus*, but is distinct on external and genital characters in both sexes. Like *flexuosellus* and *jansoni* it has a dark costal stripe. The dark subterminal forewing markings of *flexuosellus* are absent in *horistes*, or occasionally present very faintly as smudges in the white fascia. The forewing apices are less acute than in *jansoni*. *O. horistes* is known only from the Chatham Islands, where *flexuosellus* and *jansoni* do not occur. Its host plants are unknown, but a range of European grasses much as for *flexuosellus* seems probable. Species group 4, "*flexuosellus*".

Orocrambus isochytus (Meyrick) n.comb.

Meyrick, 1888, Trans. N.Z. Inst. **20**: 68 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 10 (*Crambus*).

TYPE DATA. Lectotype ♂ and 1 paralectotype ♂ (selected by Bleszynski and formally designated here) BMNH – "Mt. Arthur New Zealand 4,300 ft. 16/1/86".

Eye with a narrow circumorbital strip. Female frenulum triple. Wingspan 35–41 mm (both sexes).

GENITALIA. **Male** (Fig. 6d, topotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus tapered, with rounded apex; costa of valva with relatively weak flange, dorsal margin about as long as uncus; sacculus undifferentiated; gnathos tapered, straight, bluntly pointed, as long as uncus; aedeagus tubular, 2.8× uncus, LMB ratio 8–9:1, drawn apically into short, flat spur, aperture of ductus ejaculatorius angled dextrad, simple thorn ventrad at 0.8, dense patch of small cornuti sinistrad at about 0.3. **Female** (Fig. 13f, topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about 3× as wide at fusion as in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae about 6× anal papillae, strongly sclerotised to 0.3, ductus seminalis joining at about 0.7; ostium bursae a broad, pleated funnel, ostiolar pouch swollen; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Alpine tussock grasslands of western Nelson Province. **Flight period**: December–February.

MATERIAL EXAMINED. 24♂♂, 6♀♀.

REMARKS. The genitalia vary little in this species, and the dense patch of oval cornuti is a unique feature. Externally very similar to *crenaeus*, it differs in the sharper delimitation of the fascia colour, the more acute forewing apices, and the conical frons. Philpott (1929, fig. 54) illustrated the genitalia of this species correctly, but used another specimen of *isochytus* for his drawing of *Crambus diplorrhous* male genitalia (fig. 58), in which the aedeagus is turned to the right. Since Philpott drew all his specimens with the aedeagus in left lateral aspect, this error is a direct result of drawing genitalia which have been squashed under a cover slip without prior examination. Specimens in his collection at DSIR's Mount Albert Research Centre are correctly labelled, so possibly the confusion was compounded by mistakes in slide labelling. The host plants are unknown, but the distribution of this alpine species falls within that given for *Chionochloa australis* (carpet grass) by Burrows (1967). Species group 5a, "*vittellus*".

Orocrambus jansoni n.sp.

TYPE DATA. Holotype ♂ and allotype ♀, author's genit. preps ZPX and ZPY, and 5 paratype ♂♂ DSIR – "Waiouru, 4 Feb. 1966; 2,800 ft. D. E. Gaskin".

Frons conical. Eye without nude circumorbital strip. Female frenulum triple. Wingspan (male) 18–22 mm, (female) 22 mm.

Antennae dark brown, serrate in male, near filiform in female. Maxillary palpi triangular, brown laterally, yellowish medially. Labial palpi dark brown laterally, yellowish medially, porrect, about 2.4× as long as head. Thorax and abdomen yellowish to silvery white. Forewings with brown costal streak from base to apex, similar paler streak on dorsum, median area silvery white to yellowish from base to termen, anterior end of this fascia touching acute apex, cilia brown and white; hindwings dark brown with lighter brown cilia (holotype and paratype males). Allotype female very similar but with all markings very much paler and cilia of all wings white. Male frenulum single. Legs brown speckled with white in both sexes.

GENITALIA. **Male** (Fig. 6e, paratype). As for generic description except: arms of vinculum about 0.5× uncus; saccus tapered, with rounded apex; juxta thin, U-shaped; costa of valva flanged, dorsal margin about as long as uncus; sacculus undifferentiated; gnathos curved dorsad, clubbed apically, as long as uncus; aedeagus tubular, truncate, 3× uncus, LMB ratio about 13:1, strong ventrally from midlength to apex, small thorn ventrad at 0.3, 8–12 very slender cornuti in line from apex. **Female** (Fig. 14a, allotype). As for generic description except: tergite 8 fused dorsolaterally with ostium bursae, about 0.8× as wide at fusion as in dorsal midline; ductus bursae about 6× anal papillae, strong to 0.7, vertically pleated from 0.3 to 0.7, ductus seminalis joining at 0.8; ostium bursae a dorsoventrally compressed funnel with slightly exaggerated dorsal lip, ostiolar pouch slightly swollen; corpus bursae with 2 equal, oval signa.

DISTRIBUTION & BIOLOGY. Waiouru, central North Island. **Flight period**: December–February.

MATERIAL EXAMINED. 31♂♂, 1♀.

REMARKS. The male genitalia resemble those of *cyclopicus*. *O. jansoni* strongly resembles a small, worn specimen of *flexuosellus*; hence it may have been overlooked by Hudson and Clarke, who collected at Waiouru. It also closely resembles *fugitivellus* externally. The type locality at Waiouru is an area only 200 m long by 50 m wide beside the Ohakune road. Extensive collecting around Waiouru did not reveal any more colonies of *jansoni*. However, it will probably be found in other subalpine tussock localities on the central plateau, since these have not been extensively collected over. The host plant is possibly *Chionochloa rubra*, with which the moth was associated at the type locality, but several European grass species were growing there also. Species group 5a, "*vittellus*".

Orocrambus lectus (Philpott) n.comb.

Philpott, 1929, Trans. N.Z. Inst. **60:** 301 (*Crambus*). –Hudson, 1939, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 17 (*Crambus*).

GENITALIA. **Male** (Fig. 6f, paratype). As for generic description except: arms of vinculum about 0.7× uncus; saccus tapered to rounded or very slightly excavate apex; juxta a small, substellate plate; costa of valva flanged, dorsal margin slightly shorter than uncus; sacculus undeveloped; gnathos straight, tapered, bluntly pointed, as long as uncus; aedeagus tubular, 2.8× uncus, LMB ratio 6–7:1, occasionally very small thorn near apex, double row of rose-thorn-shaped cornuti arranged sometimes alternately, sometimes in pairs. **Female**

(Fig. 14b, paratype). As for generic description except: anal papillae with about 4 very coarse setae on anal margin of ventral lobe; tergite 8 fusing dorsolaterally with ostium bursae, less than half as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae 3.5–4.0× anal papillae, strong and pleated to 0.2, ductus seminalis joining at about 0.8; ostium bursae a broad, tapering funnel opening dorsocaudally; corpus bursae with 2 very large, lanceolate signa, one about twice as large as other.

DISTRIBUTION & BIOLOGY. Subalpine/alpine regions in Fiordland, Canterbury (1 specimen taken near sea level at Lincoln), and north-west Nelson. **Flight period**: December–February.

MATERIAL EXAMINED. 25♂♂, 4♀♀.

REMARKS. Frequently confused in New Zealand museum series with *ramosellus*, *haplotomus*, *callirrhous*, and the "*simplex*" species group. *O. lectus* is very variable, and difficult to identify on external characters alone. However, 2 remarkable features of the genitalia—the huge, lanceolate signa of the corpus bursae, and the double row of cornuti in the aedeagus of the male—are distinctive. Species group 5b, "*ramosellus*".

Orocrambus lewisi n.sp.

TYPE DATA. Holotype ♂ and allotype ♀ NM, author's genit. preps WAA and WAB – "Titahi Bay, 2.1.04, G. V. Hudson".

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 28-30 mm (both sexes).

Antennae serrate in male, near filiform in female. Maxillary palpi triangular. Labial palpi porrect, brown laterally, whitish yellow medially. Thorax and abdomen dark yellowish brown. Forewings yellow-brown with median white streak bordered obscurely with dark brown and an inconsistent tendency for dark interneural streaking, costa with a faint white streak to apex, and on dorsum to about 0.8, cilia white, basally brown; hindwing shining brownish white with whitish cilia. Legs brown, scaled with white. Female very similar to male, but with much more acute forewing apices. Very similar to *ordishi* n.sp., but on average specimens of *lewisi* are slightly smaller and darker.

GENITALIA. **Male** (Fig. 7a, holotype). As for generic description except: arms of vinculum about 0.8× uncus; saccus parallel-sided, apically truncate; costa of valva flanged, dorsal margin about as long as uncus; sacculus undeveloped; gnathos straight, tapered, bluntly pointed, as long as uncus; aedeagus tubular, slightly curved dorsad, moderately dilate apically, 2.3× uncus. LMB ratio 8–9:1, torsion of strong dorsal midline 160° sinistrad towards apex, hooked, subapical thorn near ventral, cornuti lacking. **Female** (Fig. 14c). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, 0.3× wider at fusion than in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae 4–5× anal papillae, strong to and narrowing at midlength, pleated from 0.3 to midlength, ductus seminalis joining at 0.6; ostium bursae a broad, dorsoventrally compressed funnel with slightly exaggerated ventral lip, ostiolar pouch region swollen; corpus bursae with 2 very unequal, oval signa.

LARVA. Not known for certain, but the description by Sunley (*in* Hudson 1928, p. 166) was probably of *O. lewisi*.

DISTRIBUTION & BIOLOGY. South Island, largely east of the main divide, up to about 620 m; Stephens Island (Cook Strait); and among dunes, south-west tip of North Island. **Host plant:** *Poa caespitosa* (silver tussock) (White 1963 [as *Crambus simplex*]). **Flight period**: October–March.

MATERIAL EXAMINED: 46♂♂, 6♀♀ (South I.); 1♂, 2♀♀ (North I.).

REMARKS. *See* Remarks under *simplex* for detailed discussion of this and the other siblings of the "*simplex*" species complex. Philpott's (1929a) fig. 52 labelled "*C. simplex*" is in fact *O. lewisi.*

Orocrambus lindsayi n.sp.

TYPE DATA. Holotype ♀ (author's genit. prep. BLX) and paratype ♀ AIM – "Mt. Ida 19.2.22, C. E. Clarke Collection."

Eye without nude circumorbital strip. Female frenulum triple. Wingspan (female) 22 mm. (Male unknown.)

Antennae greyish, near filiform. Maxillary palpi grey, triangular. Labial palpi porrect, grey laterally and whitish medially. Forewings, thorax, and abdomen grey faintly sprinkled with white and dark brown. Forewings very elongate with a few subterminal and discal dark markings, apices very acute; hindwings very much reduced, greyish white. Venation, Fig. 20d. Legs grey sprinkled with white. (Described from holotype.)

GENITALIA. **Female** (Fig. 14d, holotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, as wide at fusion as in dorsal midline; sternite 8 strong, fused to lamella postvaginalis as a projecting lip; ductus bursae 7–8× anal papillae, strong to 0.3, reverse loop at junction with ductus seminalis at midlength; ostium bursae a dorsoventrally compressed funnel, ostiolar pouch region swollen; corpus bursae with 2 large, unequal oval signa.

DISTRIBUTION & BIOLOGY. Known only from Mount Ida, Otago. **Flight period**: uncertain; adults found in February.

REMARKS. Without male genitalia for examination the pattern of characters is not complete enough for systematic analysis, but I would tentatively place this species in the "*simplex*" group.

Orocrambus machaeristes Meyrick

Meyrick, 1905, Trans. ent. Soc. Lond. **1905**: 224. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 22.

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) and paralectotype ♀ BMNH, slide BM Pyral 5633 – "Mt. Earnslaw New Zealand GVH./03."

Eye with nude circumorbital strip. Female frenulum triple. Wingspan 19–25 mm (both sexes).

GENITALIA. **Male** (Fig. 7b, topotype). As for generic description except: arms of vinculum about 0.7× uncus; saccus short, tapered, apically rounded; juxta a concave plate; costa of valva flanged, dorsal margin about as long as uncus; sacculus undifferentiated; gnathos tapered, pointed, slightly longer than uncus; aedeagus tapering, 2.5–3.0× uncus, LMB ratio 7–8:1, strong apical spur curved ventrad. **Female** (Fig. 14e, partly after damaged topotype). As for generic description except: tergite 8 encircling ostium bursae, as wide ventrally as in dorsal midline, with very short, triangular projections in lateral margins of anterior midlines representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 3× anal papillae, weak, with well defined pleats, ductus seminalis joining at mid-length; ostium bursae narrow, weak, ostiolar pouch swollen and bearing 1 or 2 characteristic very strong spots; corpus bursae with 2 unequal, oval signa.

DISTRIBUTION. North-west Nelson Province southward along the main axis of the Southern Alps to the vicinity of Lake Wakatipu; alpine.

MATERIAL EXAMINED. 34♂♂, 14♀♀.

REMARKS. The pale forewing fascia edged posteriorly with black and ending abruptly in the outer disc, and the dotted subterminal line at once distinguish *machaeristes* from any other species in the genus. It is very close to *tritonellus*, and shows affinity also with *clarkei* in the mode of encirclement of the ostium. Its restricted recorded range coincides with that of *Chionochloa pallens* (midribbed snowgrass) on and to the west of the main divide (Burrows 1967). Species group 3a, "*melampetrus*".

Orocrambus melampetrus Purdie

Purdie, 1884, N.Z. J. Sci. (Dunedin) **2**: 168. –Meyrick, 1885, Trans. N.Z. Inst. **17**: 133. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 26.

Eye with nude circumorbital strip. Female frenulum triple. Wingspan 24–28 mm (both sexes).

GENITALIA. **Male** (Fig. 7c). As for generic description except: arms of vinculum about as long as uncus; saccus undeveloped, arms of vinculum coming together at rounded apex; juxta weak, U-shaped; costa of valva flanged, dorsal margin almost as long as uncus; aedeagus tubular, 3.5–3.8× uncus, LMB ratio about 8:1, characteristic recurved, sickle-shaped thorn or spur apical. **Female** (Fig. 14f). As for generic description except: tergite 8 fusing dorsolaterally and diagonally with ostium bursae, with short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 6–7× anal papillae, very strong to and narrowing at 0.3, ductus seminalis joining at midlength; ostiolar pouch region deeply corrugated and pleated; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION. Higher alpine grasslands, South Island.

MATERIAL EXAMINED. 46♂♂, 10♀♀.

REMARKS. A thorough search of the British Museum (Natural History) collections by Bleszynski, and a search of all the New Zealand museum collections, failed to reveal the type or type series of *O. melampetrus*. The accidental pre-publication discussed earlier, and the fact that Purdie was an amateur collector, are reason enough for doubt that a type was ever designated or that the specimens in question were deposited in a museum. However, *melampetrus* is so distinct that I see no need to designate a neotype (ref. ICZN, Article 74 (a)(i)). This is the type species of *Orocrambus*. Meyrick (1885) referred to the brief descriptive note by Purdie (1884) and suggested that there might be 2 similar species, with pale and dark fascia respectively. However, *melampetrus* shows considerable variation in fascia colour, from very dark brown to pale brownish yellow. Purdie's description is so brief that any comparison is rather futile, but he did state clearly that he compared his own specimens with some labelled by Meyrick, and decided they were without doubt the same species. *O. melampetrus* frequents broken fellfield at altitudes above about 1300 m, and is highly adapted to these conditions, having a colour pattern suited to the fractured rock with its patches of black lichens. It has other adaptations to life at high altitudes; the labial and maxillary palpi are extremely hairy, and the blackish-brown colour of the forewings enhances absorption of solar energy (Downes 1965). This species is close to *clarkei*; the diagonal fusion of tergite 8 with the ostium bursae suggests a tendency for encirclement of the ostium, as in *clarkei*. However, the greatly enlarged ostiolar pouch region of *melampetrus* is a peculiar feature paralleled in *tuhualis*. Species group 3a, "*melampetrus*".

Orocrambus melitastes (Meyrick) n.comb.

Meyrick, 1909, Trans. N.Z. Inst. **4**: 9 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xix, figs 8 & 9 (*Crambus*).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) and 1 paralectotype ♂ BMNH – "Invercargill New Zealand 13.12.82, peltastes Meyrick" ("peltastes" is assumed to be a slip of the pen by Meyrick (Mr P. E. S. Whalley, in litt.)).

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 17–22 mm (both sexes).

GENITALIA. **Male** (Fig. 7d, after near-topotype). As for generic description except: arms of vinculum about 0.5× uncus; saccus with bluntly rounded or slightly excavate apex; costa of valva flanged, dorsally pronged, dorsal margin about as long as uncus; sacculus undifferentiated; gnathos tapered, pointed; aedeagus tubular, truncate, 2.0–2.5× uncus, LMB ratio 8–9:1, small, dorsolateral thorn about 0.3 from apex, 20–25 small cornuti between 0.3 and midlength. **Female** (Fig. 15a, after near-topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, twice as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae 4.0–4.5× anal papillae, strong to 0.3, whence characteristic diagonal pleating to junction with ductus seminalis at midlength; ostium bursae a simple, tapering funnel; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Southland, Otago, and Westland; subalpine zone down to sea level at Invercargill. **Flight period**: October–January.

MATERIAL EXAMINED. 29♂♂, 12♀♀.

REMARKS. Hudson (1928) doubted the specific status of *melitastes*, but of the 7 small, brown-and-white species described by Meyrick this is the only one which is clearly distinct from *aethonellus*. There are quite striking differences between the sexes of *melitastes*. The females usually have pale streaks on both costa and dorsum of the forewing, and are generally paler than the males, which lack such markings and have narrower white forewing fascia, being thus superficially more like *aethonellus*. However, both sexes have a small, subapical, white patch on the costa of the forewing, which is never found in *aethonellus*. The 2 species are quite distinct in both male and female genital characters. Females of *melitastes* approach *fugitivellus* in external appearance, but *fugitivellus* has much narrower forewings with very acute apices. Phylogenetically *melitastes* is close to *corruptus*. Species group 1, "*melitastes*"

Orocrambus mylites Meyrick

Meyrick, 1888, Trans. N.Z. Inst. **20**: 67. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 23.

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) and 4 paralectotypes BMNH – "Mt. Arthur New Zealand, 4,000 ft. 17/1/86".

Eye with nude circumorbital strip. Female frenulum triple, very rarely double. Wingspan 19–25 mm (both sexes).

GENITALIA. **Male** (Fig. 7e). As for generic description except: arms of vinculum about 0.8× uncus; saccus tapering to rounded apex; costa of valva flanged, dorsal margin about 0.8× uncus; aedeagus slender, 4.0–4.5× uncus, LMB ratio 15–16:1, long, apical spur, oval in cross-section, arising ventrally and curving dorsad. **Female** (Fig. 15b, topotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about 1.5× as wide at fusion as in dorsal midline, with very short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a weak, lunate plate; ductus bursae about 5× anal papillae, strong to junction with ductus seminalis

at 0.8; ostium bursae forming a wide, simple, tapering funnel with flared mouth, ostiolar pouch not noticeably swollen; corpus bursae with 2 unequal, oval signa.

DISTRIBUTION & BIOLOGY. Alpine zone, Nelson and Marlborough. **Host plant**: *Chionochloa australis* (*see* Remarks). **Flight period**: December–February.

MATERIAL EXAMINED. 79♂♂, 30♀♀.

REMARKS. Externally, the dark bluish-brown forewings with obscure greyish fascia are distinctive. The restricted range of *mylites* coincides with that of *Chionochloa australis* (carpet grass) as given by Burrows (1967). Recently, a *mylites* female was obtained from a pupa found in the base of a tiller of carpet grass and kept until emergence (J. S. Dugdale, pers. comm.; specimen in DSIR Coll.). Species group 3a, "*melampetrus*".

Orocrambus oppositus (Philpott) n.comb.

Philpott, 1915, Trans. N.Z. Inst. **47**: 197 (*Crambus*). –Hudson, 1928, Butterflies and Moths of N.Z.: pl. xliv, figs 1 & 2 (*Crambus*).

TYPE DATA. Holotype ♂ DSIR – "Cleughearn 22.1.14, 3.500′ A. Philpott".

Eye with nude circumorbital strip. Female frenulum quadruple. Wingspan 29–31 mm (both sexes).

GENITALIA. **Male** (Fig. 7f, paratype). As for generic description except: arms of vinculum about 0.5–0.7× uncus; saccus undeveloped; costa of valva flanged, dorsal margin as long as or slightly shorter than uncus; sacculus undeveloped; gnathos tapered, pointed, as long as uncus; aedeagus tubular, 2.8–3.0× uncus, LMB ratio 7–8:1, flattened spur apical. **Female** (Fig. 15c, paratype). As for generic description except: tergite 8 encircling ostium bursae, as wide in ventral as in dorsal midline, with very short, blunt, triangular projection in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 4–5× anal papillae, lightly chitinised to and narrowing at 0.3, ductus seminalis joining at 0.6; ostium bursae a moderately broad funnel, ostiolar pouch region barely swollen relative to ostium; corpus bursae with 2 equal, oval signa.

DISTRIBUTION & BIOLOGY. Alpine grasslands of Fiordland. **Flight period**: December–February.

MATERIAL EXAMINED. 32♂♂, 23♀♀.

REMARKS. The large size, dark bronze forewings, and sinuate termen are distinctive. This is one of the few species of *Orocrambus* in which colouring differs between sexes: the hindwings of the males are grey-brown, whereas those of the female are white. The female frenulum is quadruple, an arrangement otherwise found only in *ephorus* and *philpotti*. The limited southern distribution of this species coincides very closely with that shown for *Chionochloa teretifolia* (hairy snow grass) by Zotov (1963) and Burrows (1967). Species group 4, "*flexuosellus*".

Orocrambus ordishi n.sp.

TYPE DATA. Holotype ♂ and allotype ♀ AIM, author's genit. preps ALX and BLB – "Hinds 13.3.11, C. E. Collection".

Frons planoconvex. Eye without nude circumorbital strip. Female frenulum triple. Wingspan (male) 30–34 mm, (female) 28–32 mm.

Antennae serrate in male, near filiform in female. Maxillary palpi triangular. Labial palpi porrect, brownish yellow laterally and whitish medially. Thorax and abdomen golden brown, central thorax whitish. Forewings golden brown with median white streak from

base to termen, obscurely margined with dull brown posteriorly, costa with a faint white streak to 0.8, cilia white, basally streaked with brown; hindwings shining pale brown with white cilia, male frenulum single. Legs brown, scaled with white. (Foregoing based largely on male.) Female similar in colouring but semi-apterous; hindwings much reduced, forewings long and narrow, but venation not simplified. It is not possible to separate this species reliably from others in the "*simplex*" complex on external characters alone.

GENITALIA. **Male** (Fig. 8a, holotype). As for generic description except: arms of vinculum about 0.7× uncus; saccus tapering to rounded apex; costa of valva flanged, dorsal margin about 0.8× uncus; sacculus flanged; gnathos straight, tapered, bluntly pointed, slightly longer than uncus; aedeagus tubular, slightly dilated apically, 2.3× uncus, LMB ratio about 7:1, strong dorsally from 0.6 to apex, thorn dorsal, apical, 6–10 very small, rose-thorn-shaped cornuti between 0.3 and midlength. **Female** (Fig. 15d, allotype). As for generic description except: tergite 8 encircling ostium bursae, about 0.3× wider ventrally than in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae about 5× anal papillae, weak except in region of encirclement, ductus seminalis joining at 0.7; ostium bursae tubular with limen very slightly constricted, ostiolar pouch region slightly swollen; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Central and eastern South Island to about 720 m. **Flight period:** late December–April.

MATERIAL EXAMINED. 41♂♂, 3♀♀.

REMARKS. This species is discussed in detail in the Remarks under *simplex*. The northern limit of distribution appears to be the Waimakariri River. Species group 6, "*simplex*".

Orocrambus ornatus (Philpott) n.comb.

Philpott, 1927, Trans. N.Z. Inst. **58**: 82 (*Crambus*). –Hudson. 1938, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 28 (*Crambus*).

TYPE DATA. Holotype ♂ DSIR – "Golden Downs, 8.1.26, A. Philpott"; uncoded genit. prep. in Philpott Coll. – "*C. ornatus* type".

Eye without nude circumorbital strip. Wingspan (male) 20 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 8b, holotype). As for generic description except: arms of vinculum a little shorter than uncus; saccus tapered, with rounded apex; juxta a small plate concave dorsally, ventral margin convex, medially cleft; costa of valva flanged, drawn dorsally into blunt, in-curved prong, dorsal margin about 1.5× uncus; sacculus undifferentiated; gnathos parallel-sided for most of length, half as wide as long, tapering to rounded apex, slightly longer than gnathos; aedeagus tubular, truncate, slightly dilate apically, 3× uncus, LMB ratio 7.5:1, without external ornamentation, 4 rose-thorn-shaped cornuti between midlength and apex.

DISTRIBUTION & BIOLOGY. Golden Downs, Nelson Province. **Flight period**: January.

MATERIAL EXAMINED. Holotype ♂.

REMARKS. The genitalia drawing may be inaccurate in some details, as it had to be reconstructed from the dissected fragments (broken) on the type slide, which was in very poor condition. The drawing by Philpott (1929, fig. 27) does not agree exactly with the specimen, but the distortion is not important. The strong development of the costa of the valva is interesting, and similar to that in *apicellus*, *tuhualis*, and *aethonellus*. Another interesting feature is the spatulate uncus, which approaches the condition found in *Maoricrambus oncobolus*. Species group 5b, "*ramosellus*".

Orocrambus paraxenus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 137 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 17 (*Crambus*).

TYPE DATA. Lectotype ♂ and 4 paralectotype ♂♂ (selected by Bleszynski and formally designated here) BMNH, lectotype slide BM Pyral 7982 – "Wakatipu New Zealand 17/12/82".

Eye without nude circumorbital strip. Wingspan (male) 30–33 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 8c; compared with sketch of lectotype by Bleszynski). As for generic description except: arms of vinculum about 0.5× uncus; saccus tapered, parallel-sided, apically rounded, with 'keel'; costa of valva weakly flanged, dorsal margin about 0.5× uncus, produced dorsally into an introrse tooth; sacculus flanged; gnathos tapered, straight, bluntly pointed, as long as uncus; aedeagus pistol-shaped, twice as long as uncus, LMB ratio about 13:1, simple thorn ventrosinistrad at about 0.3, 4–7 elongate cornuti at midlength.

DISTRIBUTION & BIOLOGY. South Island, usually above about 600 m. **Flight period**: December–February.

MATERIAL EXAMINED. 24♂♂.

REMARKS. This species is apparently close to *vittellus*, and is difficult to distinguish from large specimens lacking the characteristic white fascia notch. It is also hard to separate on external characters from *dicrenellus*, though *paraxenus* has a conical frons. However, very fresh specimens of *paraxenus* usually have a slight greenish tinge to the forewings, and there are distinctive differences between the genitalia of the 3 species. Hudson (1928) and White (1963) state that it is associated with dry tussock areas. Species group 5a, "*vittellus*".

Orocrambus philpotti n.sp.

TYPE DATA. Holotype ♂ and allotype ♀ DSIR, author's genit. preps DGJ and EGA – "Iron Hill, 4,700–5,500 ft. 9.3.66 J.S.D.". All specimens under Material Examined (except primary types) are paratypes.

Eye without nude circumorbital strip. Female frenulum triple, 1 'element' comprising 2 fused or partially fused parts. Wingspan 26–35 mm (both sexes).

Labial palpi golden brown laterally, white medially, about 3× as long as eye. Forewings golden bronze-brown with white median streak from base to sinuate termen; hindwings glossy, whitish.

GENITALIA. **Male** (Fig. 8d, based on holotype and paratypes). As for generic description except: arms of vinculum about 0.7× uncus; saccus undeveloped, junction of arms of vinculum deeply excavate; costa of valva flanged, dorsal margin as long as uncus; sacculus with small flange; gnathos tapered, pointed, as long as uncus; aedeagus tubular, 2.5× uncus, LMB ratio 7–8:1, strong from 0.3 to apex, subapical thorn dorsad. **Female** (Fig. 15e, based on allotype and paratypes). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, half as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae about 7× anal papillae, strong to 0.4, ductus seminalis joining at 0.6; ostium bursae forming a broad, even funnel, ostiolar pouch region hardly swollen relative to ostium; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Alpine and subalpine tussock grasslands of the central South Island, from the Tasman Mountains to the Lake Tekapo area. **Flight period**: December–February.

MATERIAL EXAMINED. 75♂♂, 24♀♀.

REMARKS. The *Crambus dicrenellus* of Meyrick (1883), Philpott (1929), and Hudson (1928, 1939) included both *O. dicrenellus* and *O. philpotti* (discussed under *dicrenellus*). The resemblance is only superficial. The drawing by Philpott (1929, fig. 35) labelled "*C. dicrenellus* Meyr." shows the male genitalia of *O. philpotti*. This species shares the following characters with *oppositus:* the forewing termen is sinuate (an unusual feature in this genus) in exactly the same way in both species; the female frenulum in both species comprises 4 elements—even though 2 are nearly always fused in *philpotti*, the parts of the composite are still easily recognisable from their distinct basal insertions; the male genitalia are comparable except that the dorsal chitinisation of the aedeagus in *oppositus* has developed into a spur rather than a thorn, and the sacculus in *philpotti* has developed a small flange (*see* Fig. 8d). Variation in *philpotti* is slight. Worn and faded specimens, especially those which have lost cilia so that the margin of the forewing termen is rather indistinct, are difficult to distinguish from *dicrenellus* except on genital characters. The broad range of the species coincides with that given for *Chionochloa rubra* (red tussock) by Zotov (1963) and Burrows (1967). Maximum altitudes for *Ch. flavescens* given by Burrows (1967) are too low to agree with all records of *philpotti*. Species group 4, "*flexuosellus*".

Orocrambus punctellus (Hudson) n.comb.

Hudson, 1951, Fragments of N.Z. Entomology: 99, pl. 7, fig. 10 (*Crambus*).

TYPE DATA. Holotype ♀ NM, author's genit. prep. NCA – "Portobello 8.3.40" and in Hudson Coll. labelled "843a" (worn, labial palpi missing).

Frons planoconvex. Eye without nude circumorbital strip. Female frenulum triple. Wingspan (female) 23 mm. (Male unknown.)

GENITALIA. **Female** (Fig. 15f, holotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, 3–4× as wide at fusion as in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae about 5× anal papillae, strong to mid-length, with narrow constriction at about 0.2 whence ventrally pleated to about 0.3, ductus seminalis joining at 0.8; ostium bursae a simple funnel, ostiolar pouch region swollen; corpus bursae with 2 equal, oval signa.

DISTRIBUTION & BIOLOGY. Otago Peninsula only. **Flight period:** March.

MATERIAL EXAMINED. Holotype ♀.

REMARKS. The holotype female was not catalogued in any of New Zealand's museums, but was rediscovered in the Hudson Collection and identified from its data label. I do not discount the possibility that the *punctellus* type may be a very aberrant specimen of *vulgaris*, although there are significant differences between the genitalia of the 2 species (Figs 15f & 17e), e.g., in the relative size of the signa and in the pleating in the ostiolar region. In both species the anterior margin of tergite 8 is rather indistinct, and in many specimens of *vulgaris*, in which overall sclerotisation tends anyway to be weak, it blends into the lightly sclerotised intersegmental membrane. I would not, therefore, place undue emphasis on differences in shape of the tergite in my drawings; that of *vulgaris* was based on a specimen showing strong sclerotisation, whereas this is only moderate in the *punctellus* holotype. More material from the Otago Peninsula is needed. Species group 5a, "*vittellus*".

Orocrambus ramosellus (Doubleday) n.comb.

Doubleday, 1843, *in* Dieffenbach's Travels in N.Z. **2**: 288 (*Crambus*). –Hudson 1928, Butterflies & Moths of N.Z.: pl. xx, figs 29 & 30 (*Crambus*).

apselias Meyrick, 1907, Trans. N.Z. Inst. **39:** 109 (*Crambus*) –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 13 (*Crambus*). New synonymy.

leucanialis Butler, 1877, Proc. zool. Soc. Lond. **1877**: 401 (*Chilo*). Syn. Meyrick, 1883.

rangona Felder & Rogenhofer, 1875, Reise der Österreichischen Fregatte 'Novara', Lepidoptera **5**: pl. cxxxvii, fig. 25 (*Crambus*). Syn. Meyrick, 1883.

TYPE DATA. Syntype ♂ *ramosellus* BMNH – "New Zealand 42–55" (no abdomen). Lectotype ♂ *apselias* (selected by Bleszynski), slide BM Pyral 7975, and 4 paralectotype ♂♂ BMNH – "*Crambus apselias* Invercargill New Zealand GVH.06". Syntype ♂ *leucanialis* BMNH – "N. Zeal. 77.34 *Chilo leucanialis* Butler Type". Type ♀ *rangona* BMNH – "R. Nov. cxxxvii, f. 25 *Crambus rangona* N. Seeld. ♀".

Eye without nude circumorbital stripe. Female frenulum triple. Wingspan 23–29 mm (both sexes); principal forms of forewing variation, Fig. 20.

GENITALIA. **Male** (Fig. 8e). As for generic description except: arms of vinculum about 0.7× uncus; saccus tapered, longer than uncus, with 'keel'; costa of valva flanged, dorsal margin about 0.8× uncus; sacculus not flanged, but posterior extremity bears a short, triangular projection breaking ventrocaudal margin of valva; gnathos tapered, straight, bluntly pointed, slightly shorter than uncus; aedeagus tubular, 3.3–3.5× uncus, LMB ratio 9–10:1, dorsal midline with apical torsion 160° sinistrad, frequently a small, subapical thorn ventrosinistrad, irregular line of 3–7 scattered, variable, rose-thorn-shaped cornuti. **Female** (Fig. 16a). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, very narrow, 3–4× as wide at fusion as in dorsal midline; sternite 8 a strong, triangular plate; ductus bursae about 8× anal papillae, strong to near pleated swelling at midlength, ductus seminalis joining at about 0.8; ostium bursae a tapering funnel, slightly narrowed at mouth, ostiolar pouch region not swollen; corpus bursae with 2 very unequal, oval signa.

LARVA (Fig. 18f, head capsule; Fig. 19h, chaetotaxy). Final instar 12–15 mm long, moderately stout, brownish with darker pinacula, giving appearance of a dorsal and a pair of dorsolateral stripes, paler brown ventrally. Prothorax: L2 cephalad of L1, SV2 cephalad of SV1. Mesothorax and metathorax: L1 dorsad of L2, SD1 longer than SD2, D2 longer than D1. Abdominal segments: 1 and 2 – L1 dorsocaudad of L2, SD2 very small, D1 longer than D2, SV2 caudad of and longer than SV1 and SV3; 3–6 – L1 dorsad of L2, SV2 dorsad of SV1 and SV3; 7 – L1 dorsocaudad of L2, SV1 ventrocaudad of SV2; 9 – D1 and SD1 on same pinaculum.

EGG. Oblate, 18–22 vertical ribs, 0.43–0.45×0.32–0.35 mm, creamy white when laid, turning orange after about 24–36 h.

DISTRIBUTION & BIOLOGY. Ubiquitous in the North and South Islands up to 1400 m. Equally abundant at Cass, Canterbury in both improved and unimproved pastures (White 1963). White noted that the *apselias* form was far more common than typical *ramosellus* in several tussock grassland areas of the South Island between 488 m and 945 m. He quoted Hilgendorf to show a change in apparent abundance of *ramosellus* over the preceding 50 years, but Hilgendorf's identifications were almost certainly approximate. The *apselias* form of *ramosellus* is associated with intermontane pastures and lower subalpine tussock grasslands in the eastern South Island and central North Island. In the latter region the dark-spotted form (Fig. 20) predominates, especially in wet areas near ditches and watercourses. In swamps at Waiouru it is replaced by *simplex*, and in dry, well-drained areas with extensive thistle growth by *vittellus*. **Host plants**: *Poa caespitosa* (silver tussock) and *Festuca novaezealandiae* (hard tussock) (White 1963); *Agrostis tenuis* (browntop), *Poa annua*, *Alopecurus pratensis* (meadow foxtail), and *Bromus catharticus* (prairie grass). **Flight period**: October–July. Records were given for Paiaka by Cumber (1951), for Cass by White (1963), and for Wellington by Gaskin (1964a, b).

MATERIAL EXAMINED. 80♂♂, 24♀♀ (North I.); 103♂♂, 11♀♀ (South I.).

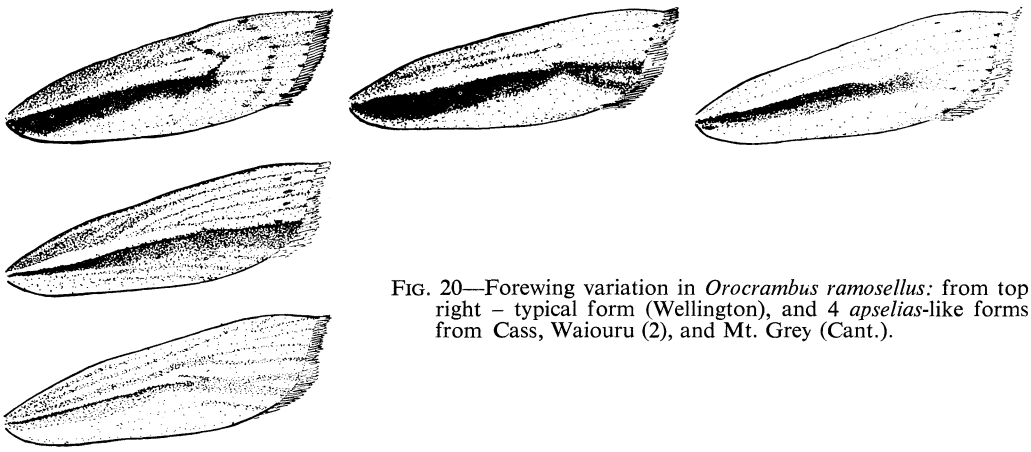

FIG. 20—Forewing variation in *Orocrambus ramosellus:* from top right – typical form (Wellington), and 4 *apselias*-like forms from Cass, Waiouru (2), and Mt. Grey (Cant.).

REMARKS. This species can usually be recognised by the pale yellowish or straw-coloured forewings with a dark basal streak ending in the disc. In form *apselias* this streak frequently reaches the termen, usually spreading and becoming more attenuated. Meyrick (1907) and Hudson (1928) distinguished *Crambus apselias* from *ramosellus* on forewing characters: *apselias* was stated to lack the row of terminal black dots on the forewings. Most lowland North Island female *ramosellus* lack these dots, but do not conform to the *apselias* description in any other respect. Philpott (1929a) showed slight differences in the shape of the gnathos and the shape and size of cornuti in *C. apselias* and *ramosellus*. However, these differences are not consistent in any long series of preparations, and indeed few specimens of either form are exactly alike in the shape and size of their cornuti. It is possible to set up series of specimens showing complete gradation of forewing pattern from the *apselias* type to the typical *ramosellus* (Fig. 20), and from Philpott's *apselias* form to typical Philpott *ramosellus* in cornuti shape and number, but the 2 series are not mutually consistent. The 2 forms have identical female genitalia. Species group 5b, "*ramosellus*".

Orocrambus scoparioides Philpott

Philpott, 1914, Trans. N.Z. Inst. **46**: 119. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xlv, fig. 1.

TYPE DATA. Holotype ♂ and 2 paratype ♂♂ DSIR, 6 paratype ♂♂ NM – "Ben Lomond 8.1.14, *Orocrambus scoparioides* Philpott."

Eye with nude circumorbital strip. Female frenulum triple. Wingspan (male) 13–16 mm, (female) 14–20 mm.

GENITALIA. **Male** (Fig. 8f, paratype). As for generic and species-group descriptions except: arms of vinculum about as long as uncus; saccus undeveloped, junction of arms of vinculum apically excavate or truncate; juxta a curved plate; costa of valva flanged, dorsal margin as long as or slightly longer than uncus; gnathos tapered, pointed, as long as uncus; aedeagus a simple, unadorned tube, 3× uncus, LMB ratio 7–8:1. **Female** (Fig. 16b). As for generic description except: tergite 8 fusing dorsally with ostium bursae, about twice as wide at fusion as in dorsal midline, with short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 absent; ductus bursae 3.5–4.0× anal papillae, strong to and narrowing at 0.3, ductus seminalis joining at midlength; ostium bursae a broad, dilated funnel; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Mountain ranges in Otago and Southland above 1000 m. **Flight period**: December–April.

MATERIAL EXAMINED. 22♂♂, 2♀♀.

REMARKS. The truncate termen of the brown forewings, the distinct subterminal line and other vertical markings, and especially the distinct reddish tinge found in most males give this species a very strong superficial resemblance to some of the endemic "*Scoparia*" species of the *ergatia* group (Hudson 1928, pl. xxii, fig. 28), but at once distinguish it from any other *Orocrambus* so far known. Variation in the species is considerable: a female in the National Museum is as large as *thymiastes*, and has markings so obscure that it resembles a small specimen of *ventosus*. However, the 3 species are distinct on genital characters. Variation in males is largely confined to the distinctness or otherwise of the transverse markings. Species group 1, "*melitastes*".

Orocrambus scutatus (Philpott) n.comb.

Philpott, 1917, Trans. N.Z. Inst. **49**: 242 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xliv, fig. 3 (*Crambus*).

TYPE DATA. Holotype ♂ and 2 paratype ♂♂ DSIR, 2 paratype ♂♂ NM – "Longwoods 26–29.12.15, A. Philpott" (author's paratype prep. AAE).

Eye without nude circumorbital strip. Wingspan (male) 26–30 mm. (Female unknown.)

GENITALIA. **Male** (Fig. 9a, paratype). As for generic description except: arms of vinculum about 0.8× uncus; saccus very elongate, longer than uncus, tapered to rounded apex, with 'keel'; costa of valva flanged, dorsal margin about as long as uncus; sacculus flanged; gnathos tapered, straight, bluntly pointed, as long as uncus; aedeagus tubular, curved dorsad, 3× uncus, LMB ratio about 10–11:1, strong apically in dorsal midline, short, ventrally flattened spur apically, 5–8 elongate, scattered cornuti.

DISTRIBUTION & BIOLOGY. Subalpine tussock country in Southland. **Flight period**: December–January.

MATERIAL EXAMINED. 24♂♂.

REMARKS. *O. scutatus* is most closely related morphologically to *isochytus*. It can be separated from the superficially similar *siriellus* by its fuscous hindwings. Its distribution coincides roughly with that shown by Burrows (1967) for *Chionochloa teretifolia* (hairy snowgrass). Species group 5a, "*vittellus*".

Orocrambus simplex (Butler) n.comb.

Butler, 1877, Proc. zool. Soc. Lond. **1877**: 400, pl. xliii, fig. 12 (*Chilo*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 24 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, figs 14 & 15 (*Crambus*). –Gaskin, 1966, Butterflies & Common Moths of N.Z.: pl. xviii, fig. 2 (*Crambus*).

TYPE DATA. Syntype ♂ BMNH – "N. Zeal. 77.34", and slide BM Pyral 5562 ♂ – "*Chilo simplex* Butler Type".

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 25–33 mm (both sexes). (The descriptions of wings and body given by Butler (1877) and Meyrick (1883) are applicable to the males of all the "*simplex*"-group sibling species.)

GENITALIA. **Male** (Fig. 9b; compared with type sketch by Bleszynski). As for generic description except: arms of vinculum about 0.8× uncus; saccus nearly parallel-sided, with excavate apex; costa of valva flanged, dorsal margin as long as uncus; aedeagus tubular, 2.5–2.8× uncus, LMB ratio 8:1, strong dorsally and with 4–7 elongate, scattered cornuti from midlength to apex. **Female** (Fig. 16c). As for generic description except: tergite 8 fusing dorsally with ostium bursae, about half as wide at fusion as in dorsal midline, sharply angled in lateral midlines; sternite 8 a strong, lunate plate; ductus bursae about 6× anal papillae, strong to and narrowing at about 0.3, ductus seminalis

joining at 0.8; ostium bursae a flared funnel, ostiolar pouch region not swollen relative to ostium; corpus bursae with 2 unequal signa.

LARVA (Fig. 18g, head capsule). Final instar 12–14 mm long, stout, brownish green with dark brown pinacula, giving appearance of a dorsal and a pair of dorsolateral stripes, greyish in spiracular region, paler brown ventrally. Prothorax: L2 cephalad of L1, SV2 cephalad of SV1. Mesothorax and metathorax: L1 slightly dorsocaudad of L2, SD1 longer than SD2, D2 longer than D1. Abdominal segments: 1 and 2 – L1 dorsocaudad of L2, SD2 very small, D1 longer than D2, SV2 caudad of and longer than SV1 and SV3; 3–6 – L1 dorsad of L2, SV2 dorsad of SV1 and SV3; 7 – L1 dorsocaudad of L2, SV1 ventrocaudad of SV2; 9 – D1 and SD1 on same pinaculum.

EGG. Oblate, with 14–19 vertical ribs, 0.50–0.52 × 0.36–0.38 mm, pale yellow when laid, turning orange after 24–36 h. Duration of egg stage at ambient room temperature 12–13 days in February.

DISTRIBUTION & BIOLOGY. Westland, from Franz Josef northward; Nelson Province; central North Island and coastal southern Hawkes Bay; usually below 700 m. **Host plants:** uncertain, but adults associated with *Poa caespitosa* and *Chionochloa rubra* at Waiouru.

MATERIAL EXAMINED. 54♂♂, 12♀♀ (North I.); 27♂♂ (South I.).

REMARKS. *O. simplex, lewisi, ordishi,* and *abditus* form a tight sibling complex, almost identical in habitus; they are closely related phylogenetically. Most if not all of the New Zealand museum series of *Crambus simplex* contained mixtures of some or all of these species; only in the Canterbury Museum is the *Crambus abditus* holotype correctly labelled. There is a trend among the females of this complex towards the semi-apterous state, with much narrower forewings than the male, very acute forewing apices, and generally a weaker flight. These characters are most pronounced in *ordishi,* which might be mistaken for a pterophorid by the casual collector. The coloured illustrations by Hudson (1928, pl. xx, figs 14 & 15) may have been taken from either *simplex* or *lewisi* specimens, which were mixed in the Hudson Collection series (*simplex* from Waiouru, *lewisi* from Titahi Bay). Sunley's description of the larva (*in* Hudson 1928, p. 166) probably applies to *lewisi,* since Sunley collected largely on the Makara coast near Wellington. However, this is uncertain because the specimens were not preserved in any museum collection. The food plant noted, *Poa caespitosa,* is the same as for *lewisi* at Cass (White 1963, under *O. simplex*). The description of *Crambus abditus* by Philpott is an interesting problem, since on external characters *abditus* is impossible to distinguish from the other species. The holotype is yellower than most specimens of the other 3 species, and indeed both sexes of *abditus* tend to be slightly more yellow in forewing colour, but not consistently so. In his description Philpott (1924) refers specifically to the acute forewing apices of *abditus,* yet he must have known that the same character occurs in the female of *simplex.* However, he calls the holotype a male, which it obviously is not, and the abdomen is entire, the genitalia unexamined. Thus, the original description seems to have resulted from one or more mistakes on Philpott's part, but *abditus* is nonetheless a valid species. The "*simplex*" group comprises tussock grassland species, 3 of which appear to have discrete allopatric ranges within the South Island, and is thus of particular interest for future ecological work on the genus. The factors limiting species distribution are not yet known. The males of *abditus* are recognisable by their trumpet-shaped aedeagus and large group of elongate cornuti; the apex of the saccus is truncate. The arched aedeagus with small grit-like cornuti and apical thorn at once separates *ordishi* males from others. The excavate saccus, strong posterior dorsal midline (without thorn), and elongate cornuti of the aedeagus of *simplex* are

characteristic. Only in the males of *lewisi* are cornuti completely absent from the aedeagus. There are also relatively small but consistent differences in the structure of the female genitalia of *simplex*, *abditus*, and *lewisi*. The ostium in *ordishi* is encircled by tergite 8. Species group 6, "*simplex*".

Orocrambus siriellus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 25 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 28 (*Crambus*).

TYPE DATA. Lectotype ♂ (selected by Bleszynski and formally designated here) BMNH – "Hamilton New Zealand 17/1/80."

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 29–34 mm (both sexes).

GENITALIA. **Male** (Fig. 9c). As for generic description except: arms of vinculum about 0.7× uncus; saccus parallel-sided, tapering abruptly to blunt apex, with 'keel'; costa of valva flanged, dorsal margin 0.8× uncus; sacculus flanged; gnathos straight, tapered, bluntly pointed, slightly longer than uncus; aedeagus tubular, curving dorsad, apically dilated, 2.8–3.0× uncus, LMB ratio 9–10:1, dorsally strong from midlength to apex, long, straight, apical thorn, 10–12 rather elongate rose-thorn-shaped cornuti. **Female** (Fig. 16d). As for generic description except: tergite 8 fusing dorsolaterally and diagonally with ostium bursae, about twice as wide at fusion as in dorsal midline; sternite 8 a weak, lunate plate; ductus bursae 6–7× anal papillae, strong to 0.2 whence pleated to junction with ductus seminalis at 0.8; ostium bursae a dorsoventrally compressed tapering funnel, ostiolar pouch region swollen with a distinct ring of thickening; corpus bursae with 2 very unequal, oval signa.

DISTRIBUTION & BIOLOGY. Northland to Southland, and the Chatham Islands; in swampy areas. **Flight period**: December–February.

MATERIAL EXAMINED. 42♂♂, 5♀♀ (South I.); 6♂♂ (North I.); 6♂♂ (Chatham Is).

REMARKS. I have found this species in close association with *apicellus* at National Park. It is phylogenetically close to *harpophorus*, but more primitive in most respects. Most specimens have a distinct reddish tinge to the forewings. The pale band on the dorsum separates this species from all but *scutatus*, *crenaeus*, and perhaps dark specimens of the "*simplex*" complex. Identification is easily confirmed by examination of the genitalia. Species group 5a, "*vittellus*".

Orocrambus sophronellus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 138 (*Crambus*). –Hudson, 1951, Fragments of N.Z. Entomology: pl. v, fig. 2 (*Crambus*).

TYPE DATA. Holotype ♀ BMNH, slide BM Pyral 5629 – "Christchurch? New Zealand RWF/82".

Frons planoconvex. Eye with nude circumorbital strip. Female frenulum triple. Wingspan (female) 18 mm. (Male unknown.)

GENITALIA. **Female** (Fig. 16e, from specimen taken by Lewis and figured by Hudson (1951, pl. v, fig. 2); compared with type genitalia sketch by Bleszysnki). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, twice as wide at fusion as in dorsal midline, anterior margin produced in lateral midlines into projections representing anterior apophyses; sternite 8 a weak, oval plate; ductus bursae about 4× anal papillae, strong to 0.3, spirally pleated from midlength to junction with ductus

seminalis at 0.8; ostium bursae a simple, tapering funnel; corpus bursae with 2 large, equal signa.

DISTRIBUTION & BIOLOGY. Central Otago and possibly mid Canterbury. **Flight period**: March.

MATERIAL EXAMINED. 1♀.

REMARKS. The illustration given by Hudson (1928, pl. xx, fig. 43) as the male of *sophronellus* is in fact of a form of *cyclopicus*. A form of *melitastes* with all the forewing markings obscured by grey scaling resembles *sophronellus*. However, the 2 species differ in eye shape (diurnal in *sophronellus*) and female genital characters (2 very large, equal signa in *sophronellus*; 1 very much reduced in *melitastes*). On female genital structures I would tentatively place *sophronellus* systematically close to *melitastes*, but its placing and status cannot be finally decided until the male has been examined. Species group 1, "*melitastes*".

Orocrambus thymiastes Meyrick

Meyrick, 1901, Trans. ent. Soc. Lond. **1901**: 567. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 21.

TYPE DATA. Lectotype ♀ (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 5632 – "Invercargill New Zealand P./00."

Eye with nude circumorbital strip. Female frenulum double. Wingspan 18–23 mm (both sexes).

GENITALIA. **Male** (Fig. 9d, topotype). As for generic and species-group descriptions except: arms of vinculum 0.5× uncus; saccus tapered, with rounded apex; juxta a concave, quadrate plate; costa of valva with small flange, dorsal margin about 0.7× uncus; sacculus flanged; gnathos tapered, pointed, as long as uncus; aedeagus tapered, 3× uncus, LMB ratio 10–11:1, strong apical spur curved dorsad. **Female** (Fig. 16f, topotype). As for generic description except: tergite 8 fusing dorsally with ostium bursae, 0.8× as wide in dorsal midline as at fusion; sternite 8 a strong, lunate plate; ductus bursae 4.5× anal papillae, strong to and narrowing at 0.3, ductus seminalis joining at 0.6; ostium bursae a lightly chitinised funnel, ostiolar pouch region not swollen; corpus bursae with 2 equal, oval signa.

DISTRIBUTION & BIOLOGY. Southland; confined to boggy areas, mostly subalpine or alpine, but with a sea level population in the *Chionochloa rubra* (red tussock) grasslands at Seaward Moss.

MATERIAL EXAMINED. 8♂♂, 3♀♀.

REMARKS. This species is close to *heliotes*, and also has strong affinities with *tritonellus* and *machaeristes*. It is still rare in New Zealand collections.

Orocrambus tritonellus (Meyrick)

Meyrick, 1885, Trans. N.Z. Inst. **17**: 134 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: 160, pl. xx, fig. 27.

TYPE DATA. Holotype ♀ BMNH, slide BM Pyral 5635 – "Porters Pass New Zealand JDE./82."

Eye with nude circumorbital strip. Female frenulum triple. Wingspan 18–23 mm (both sexes).

GENITALIA. **Male** (Fig. 9e). As for generic and species-group descriptions except: arms of vinculum 0.8× uncus; saccus tapering, with rounded apex; juxta a weak plate curved

ventrally around aedeagus; costa of valva flanged, dorsal margin 0.8–0.9× uncus; sacculus undifferentiated; gnathos tapered, pointed, as long as uncus; aedeagus tapered, 2.8–3.0× uncus, LMB ratio 9:1, lightly chitinised apical spur curved ventrad. **Female** (Fig. 18a; compared with drawing of type genitalia by Bleszynski). As for generic description except: tergite 8 encircling ostium bursae, about 1.5–2× as wide in ventral as in dorsal midline, with very short, triangular projections in lateral midlines of anterior margin representing anterior apophyses; sternite 8 a large, strong, lunate plate; ductus bursae 3–3.5× anal papillae, strong to ventrally pleated ostiolar pouch and junction of ductus seminalis at 0.3; ostium bursae a dorsolaterally compressed funnel; corpus bursae with 2 equal, oval signa.
DISTRIBUTION & BIOLOGY. Subalpine and alpine regions of the central and eastern South Island. **Flight period**: late September–mid February.

MATERIAL EXAMINED. 32♂♂, 12♀♀.

REMARKS. This species is frequently confused with pale specimens of *mylites* in New Zealand museum collections. Although the pale fuscous streaking of *tritonellus* is usually distinctive, separation on genital characters is decisive. The spur of the aedeagus curves dorsad in *mylites* but ventrad in *tritonellus*, in which it is always weakly chitinised, and *mylites* lacks a juxta. In the female of *mylites* the ostium is not encircled. Variation in *tritonellus* is restricted to the size and intensity of fuscous streaking of the forewings. This species is very close to *machaeristes*, which occurs in the high-rainfall areas to the west of the main divide. In contrast, *tritonellus* occurs largely to the east, in areas of lower rainfall, though its range extends to the Tasman Mountains in north-west Nelson province. Species group 3a, "*melampetrus*".

Orocrambus tuhualis (Felder & Rogenhofer) n.comb.

Felder & Rogenhofer, 1875, Reise der Österreichischen Fregatte 'Novara', Lepidoptera **5**: pl. cxxxvii, fig. 18 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 8 (*Crambus*).
thrincodes Meyrick, Trans. N.Z. Inst. **42**: 64 (*Crambus*). Syn. Bleszynski & Collins, 1962.

TYPE DATA. Holotype ♀ *tuhualis* BMNH, slide BM Pyral 5673 – "Novara CXXXVII f. 18 *Crambus tuhualis* N. Seeld. f.". Holotype ♂ *thrincodes* BMNH – "*Crambus thrincodes* Kaitoke, New Zealand GVH.07."

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 23–28 mm (both sexes).
GENITALIA. **Male** (Fig. 9f). Arms of vinculum about 0.8× uncus; saccus very elongate, longer than uncus, tapering to rounded apex, with 'keel'; costa of valva flanged, drawn dorsally into prominent, introrse prong, apically truncate, dorsal margin about 1.5× uncus; sacculus undeveloped; gnathos tapered, near straight, clubbed, about 1.3× uncus; aedeagus very stout, LMB ratio 6.5:1, apically 3.5:1, blunt subapical thorn sinistrad at about 0.2, 3 very large, rose-thorn-shaped cornuti between midlength and apex. **Female** (Fig. 17b; compared with type sketch by Bleszynski). As for generic description except: tergite 8 fusing dorsally with ostium bursae, about 0.3× as wide at fusion as in dorsal midline, narrowing sharply just before point of fusion; sternite 8 a strong, lunate plate; ductus bursae about 4× anal papillae, strong to midlength, ductus seminalis joining at 0.6; ostium bursae cupuliform, opening dorsocaudad, narrowing sharply at about 0.3, very strong, surface irregularly and deeply rugose, the pleats vertical from 0.3 to 0.5, ostiolar pouch region grossly swollen; corpus bursae with 2 unequal, oval signa.

DISTRIBUTION & BIOLOGY. Local throughout South Island and in North Island around Wellington, in swampy areas. **Flight period**: November-December.

MATERIAL EXAMINED. 32♂♂, 5♀♀ (South I.); 10♂♂ (North I.).

REMARKS. This species has the most distinctive genitalia in the genus. The grotesque cornuti are accommodated in the swollen apical region of the aedeagus, with which the swollen ostiolar region of the female obviously corresponds. Though close to *vulgaris*, it is less close than *vulgaris* is to *enchophorus*, because of its deviant genitalia. It is difficult to separate on external characters from *vulgaris*, especially when worn, and very difficult to tell from *ornatus* or *punctellus* without examining the genitalia. It is apparently never really common. The host plant may be a *Juncus* species, since Hudson (1928) recorded *tuhualis* from swampy areas at Kaitoke. Species group 5a, "*vittellus*".

Orocrambus ventosus Meyrick

Meyrick, 1920, Trans. N.Z. Inst. **52**: 30. –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xlviii, figs 15 & 18.

TYPE DATA. Lectotype ♀, author's genit. prep. GFD, and 1 paralectotype ♀ NM – "Mt. Arthur, 4,300 ft., 7.1.19, S. Hudson". *See also* Remarks.

Eye with nude circumorbital strip. Female frenulum triple. Wingspan 25–31 mm (both sexes).

GENITALIA. **Male** (Fig. 10a). As in generic and species-group descriptions except: arms of vinculum about 0.5× uncus; saccus undeveloped, junction of arms of vinculum apically truncate or slightly excavate; juxta a heart-shaped plate; costa of valva flanged, about as long as uncus; gnathos tapered, pointed, as long as or slightly longer than uncus; aedeagus tubular, apically dilate, 2.5–2.8× uncus, LMB ratio 6:1, chitinised ventrally from mid-length to apex, large, apical thorn ventrosinistrad. **Female** (Fig. 17c, lectotype). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, nearly twice as wide at fusion as in dorsal midline, with short, triangular projections in lateral midline of anterior margin representing anterior apophyses; sternite 8 a strong, lunate plate; ductus bursae 4.2–4.5× anal papillae, strong to 0.3, ductus seminalis joining at 0.5; ostium bursae a vase-shaped, broad funnel slightly crimped laterally at mouth, ostiolar pouch swollen; corpus bursae with 2 subequal, oval signa.

DISTRIBUTION & BIOLOGY. Alpine grasslands of Tasman Mountains and Mount Owen, north-west Nelson province. **Flight period:** December-February.

MATERIAL EXAMINED. 12♂♂, 8♀♀.

REMARKS. Dr S. Bleszynski (*in litt.*) selected a provisional lectotype for this species from among British Museum syntypes. However, the label data for this specimen (and a provisional paralectotype) are "Mt. Arthur New Zealand GVH. 4,200′ 1.18". The collector (G. V. Hudson cf. S. Hudson), the altitude (4200 ft cf. 4300 ft), and the year (1918 cf. 1919) do not conform with the information given by Hudson himself (1928, p. 159). Although this may result from a slip of the pen by Meyrick, I cannot agree to the use of this specimen as a lectotype, and have consequently selected one of the syntypes of the Hudson Collection instead. The plain, dark brown forewings distinguish this species from all except *melampetrus*, from which it is distinct in lacking transverse markings. Variation in *ventosus* is generally in size and the amount of whitish streaking in the interneural spaces of the terminal one-third of the forewings. Most specimens appear a rather drab brown, and the whitish streak is apparent only on close examination. One or two extreme specimens approach the forewing pattern of *tritonellus*. The restricted distribution of the species coincides closely with that shown for *Chionochloa australis* (carpet grass) by Burrows (1967). Species group 4, "*flexuosellus*".

Orocrambus vittellus (Doubleday) n.comb.

Doubleday, 1843, *in* Dieffenbach's Travels in N.Z. **2**: 289 (*Crambus*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 3 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, figs 2–4 (*Crambus*).
bisectellus Zeller, 1863, Chilonidarum et Crambidarum genera et species, Berolinensis: 32 (*Crambus*). Syn. Meyrick, 1883.
conopias Meyrick, 1907, Trans. N.Z. Inst. **39**: 110 (*Crambus*). New synonymy.
incrassatellus Zeller, 1863, Chilonidarum et Crambidarum genera et species, Berolinensis: 32 (*Crambus*). Syn. Meyrick 1883.
nexalis Walker, 1863, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum **27**: 178 (*Crambus*). Syn. Meyrick, 1883.
sublicellus Zeller, 1863, Chilonidarum et Crambidarum genera et species, Berolinensis: 31 (*Crambus*). Syn. Meyrick, 1883.
transcissalis Walker, 1863, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum **27**: 178 (*Crambus*). Syn. Meyrick, 1883.
vapidus Butler, 1877, Proc. zool. Soc. Lond. **1877**: 399 (*Crambus*). Syn. Meyrick, 1883.

TYPE DATA: Holotypes of *vittellus*, *bisectellus*, and *sublicellus* lost (*see* Remarks). Lectotype ♀ *vittellus* (selected by Bleszynski and formally designated here) BMNH, slide BM Pyral 5575 – "Auckland N. Zeal. 60.73.", "Crambus nexalis". Holotype ♀ *conopias* BMNH, slide BM Pyral 5634 – "Dunedin New Zealand GVH.05", "Crambus conopias". Holotype ♀ *incrassatellus* Naturhistorisches Museum, Vienna – "30.1871", "vidit ZII.871, Hugel 674", "Crambus incrassatellus" (no abdomen). Holotype ♂ *transcissalis* BMNH – "New Zealand 4.5.61.", "Crambus transcissalis". Syntype ♀ *vapidus* BMNH, slide BM Pyral 5532 – "N. Zeal. 77.34 Crambus vapidus type".

Eye without nude circumorbital strip. Female frenulum triple. Wingspan 19–28 mm (both sexes). Venation, Fig. 22e.

GENITALIA. **Male** (Fig. 10b). As for generic description except: arms of vinculum about 0.5× uncus; saccus parallel-sided for most of length, tapering abruptly to rounded apex, with 'keel'; costa of valva flanged, dorsal margin 0.7× uncus; sacculus flanged; gnathos tapered, straight, pointed, slightly longer than uncus; aedeagus pistol-shaped, 2.5–2.8× uncus, LMB ratio about 14–15:1, dorsal midline with apical torsion 180° sinistrad, small thorn sinistrad at about midlength, sometimes a second ventrad, subapical, 10–16 slender cornuti between midlength and apex. **Female** (Fig. 17d; compared with type sketches by Bleszynski). As for generic description except: tergite 8 fusing dorsolaterally with ostium bursae, about 3× as wide at fusion as in dorsal midline; sternite 8 lacking, unless possibly incorporated with lamella antevaginalis as a sclerotised 'lip'; ductus bursae 10–11× anal papillae, strong to about 0.2, ductus seminalis joining at about 0.9; ostium bursae a slender funnel, ostiolar pouch region swollen; corpus bursae with 2 unequal signa.

LARVA (Fig. 18h, head capsule; Fig. 19i, chaetotaxy). Final instar 10–13 mm long, moderately stout, pale brown with darker greenish-brown pinacula, giving appearance of a dorsal and a pair of dorsolateral stripes, pale brown ventrally. Prothorax: dorsal shield well developed, strong in 5th and final instars, L2 dorsocephalad of L1, SV2 cephalad of SV1. Mesothorax and metathorax: SD1 longer than SD2, D2 longer than D1. Abdominal segments: 1 and 2 – L1 near dorsad of L2, SV1 and SV3 cephalad of SV2; 3–6 – SV1–3 in almost horizontal line; 7 – L1 near dorsad of L2, SV1 ventrocaudad of SV2; 9 – D1 and SD1 on same pinaculum.

EGG. Oblate, 14–22 vertical ribs, 0.48–0.50×0.28–0.30 mm, orange-brown when laid, turning brown after 24–36 h. Duration of egg stage 11 days in January, 16 days in March.

DISTRIBUTION & BIOLOGY. North, South, and Stewart Islands. Associated with both indigenous and introduced grasses; especially prominent in improved grasslands in the eastern South Island (White 1963). **Host plants**: native grass host not known; adventive host *Agrostis tenuis* (browntop), but captive larvae readily eat all common pasture grasses. **Flight period**: November–April in most of New Zealand; in Taranaki and Auckland on wing in warm Octobers (pers. obs.).

MATERIAL EXAMINED. 85♂♂, 27♀♀ (North I.); 176♂♂, 25♀♀ (South I.); 1♂ (Stewart I.).

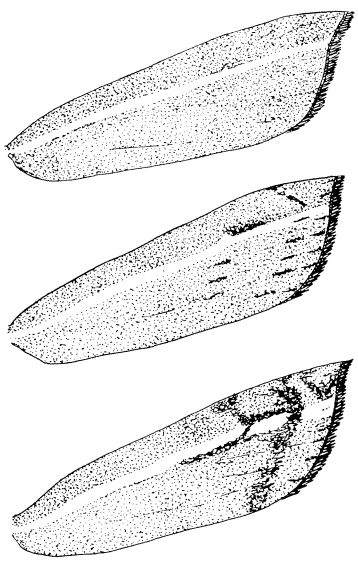

FIG. 21—Forewing variation in *Orocrambus vittellus:* from top – *vapidus* form (L. Tekapo), typical *vittellus* form (Palmerston N.), and *conopias* form (Palmerston N.).

TABLE 3—Monthly proportions of *Orocrambus vittellus* with spotted or unspotted forewing fascies in MV trap at Massey University, Palmerston North, Dec 1966–Apr 1967

	Dec	Jan	Feb	Mar	Apr
Total	18	227	620	134	2
Plain, unspotted	17	198	484	104	2
Spotted in subterminal region	1	29	136	30	0
Percentage spotted	5.5	12.8	21.9	22.3	0

REMARKS. The types of *Crambus vittellus*, *C. sublicellus*, and *C. bisectellus* are lost. Both Bleszynski and I checked the main and accession collections at the British Museum, and Bleszynski examined the collection at the Naturhistorisches Museum, Vienna. Dr H. J. Hannemann, of the Museum für Naturkunde, Berlin, informed me that the types were not held there either. Bleszynski designated a neotype for *C. vittellus* (slide BM Pyral 7955 – "New Zealand. 54.4" "Crambus vittellus"), but did not live to publish this. He based neotypes for *C. sublicellus* and *C. bisectellus* on the same specimen, but I cannot agree with his grounds for doing this. Zeller's descriptions of *sublicellus* and *bisectellus* are certainly of varieties of *C. vittellus*, but not the same varieties. The welter of names for this species results from Zeller and Walker publishing in the same year in ignorance of each other's work. As early as 1883 Meyrick synonymised *vittellus*, *nexalis*, *transcissalis*, and *vapidus*; presumably he was able to examine the type material, since he was then working at the British Museum. He also stated (1883) that he had seen unpublished drawings of Zeller's *sublicellus*, *bisectellus*, and *incrassatellus*, and had no hesitation in synonymising them with *vittellus*. I do not fault Meyrick in this, but would add his *conopias* to the synonyms of *vittellus*, having examined a photograph of the type sent to me by Mr P. E. S. Whalley and a sketch by Bleszynski of the type genitalia, and having later examining the type myself. The International Code of Zoological Nomenclature, Article 75(a), states "a neotype is to be erected when it is necessary for the solving of a complex zoological problem involving closely similar species." I submit that *Orocrambus vittellus*, though varying considerably in external characters, can not be confused with related species by anyone reasonably familiar with the genus, and see no grounds for designating a neotype. Article 75(b) of the Code clearly states that a neotype is not to be designated for "a species of which the name is not in general use either as a valid name or a synonym". Since *sublicellus* and *bisectellus* were correctly synonymised by Meyrick (1883) with *Crambus vittellus*, Bleszynski's unpublished neotype designations can be disregarded. The abundant material from most parts of New Zealand includes intermediates between all the described forms. The major variations in forewing pattern are shown in Fig. 21. The 2 common forms,

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shaped in profile; posterior apophyses slightly curved, longer than tube of tergite 8, which possibly incorporates sternite 8 (not separately represented); lamellae ante- and postvaginales fused laterally to form ostium bursae and anterolaterally with lobes of tergite 8 tube to form an external opening at base of tergite tube, shielded ventrally by posterior margin of sternite 7; lamella antevaginalis lip projecting much further posteriorly than dorsal postvaginalis lip, acutely triangular (Fig. 28A); anterior apophyses absent; ductus bursae about 3× posterior apophyses, strong only to about 0.2, ductus seminalis joining at 0.3; ostiolar pouch region swollen; corpus bursae asignate.

DISTRIBUTION & BIOLOGY. South Island and southern North Island, lowland to subalpine swamps. Recently reported from the Lake Taupo area (T. H. Davies, pers. comm.). **Flight period**: October, and December–March.

MATERIAL EXAMINED. 32♂♂, 2♀♀ (South I.); 5♂♂ (North I.).

REMARKS. This species was recently re-examined by Bleszynski (1962), who removed it from *Argyria* on the strength of male genital characters (the female was not examined) and erected for it a monotypic new genus, *Velasquez*. While concurring with the removal from *Argyria*, I do not agree that a new genus is necessary. The male and female genital structures of *pentadactyla* and *glaucophanes* have many important characters in common, and I have no hesitation in moving *pentadactyla* to *Tawhitia*. Its large size usually serves to distinguish *T. pentadactyla* from the superficially similar *Orocrambus harpophorus* and *Maoricrambus oncobolus*, but the identity of small specimens of *pentadactyla* is best confirmed by examination of genitalia.

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I thank the late Dr S. Bleszynski, tragically killed in a road accident in Germany in 1969, for designating certain lectotypes and for comparing my drawings and notes with type specimens held at the British Museum (Natural History); Mr J. S. Dugdale, Entomology Division, DSIR, for unstinting help, advice, and criticism both during the study and during preparation of the manuscript, and for arranging the photography of material by Mr B. S. Eykel; Dr E. Munroe, Biosystematics Research Unit, Agriculture Canada, for critically reading the manuscript and suggesting valuable changes; Messrs D. J. Greenwood, M. Mannering, and P. J. Wigley, Dept. of Botany and Zoology, Massey University, and Dr K. Fox, of Manaia, Taranaki, for generous assistance with light trap servicing and collecting; Messrs P. E. S. Whalley and D. Carter, British Museum (Natural History), for access to material and for supplying summaries of type label data; and the following institutions and staff members for access to collections and the loan of material: Auckland Institute and Museum (Mr K. A. J. Wise), Canterbury Museum (Messrs A. McFarlane and J. Penniket), DSIR (Dr J. S. Timlin, Plant Diseases Division, and Mr J. I. Townsend, Entomology Division), Lincoln College (Mrs M. McPherson), and the National Museum (Mr R. G. Ordish).

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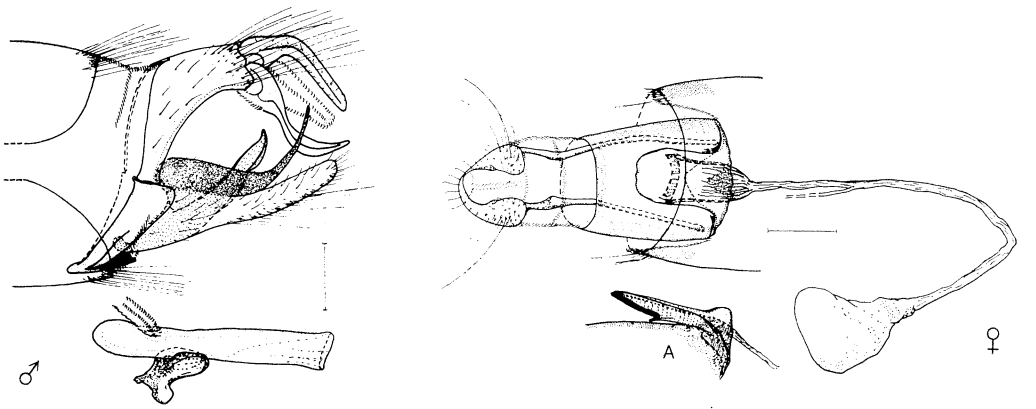

FIG. 28—*Tawhitia pentadactyla* genitalia: (*left*) ♂ (Sedgemere, Cant.); (*right*) ♀, ventral aspect (A, ostiolar region in right lateral aspect) (Long Acre, Wanganui).

DISTRIBUTION & BIOLOGY. Fiordland to Mount Cook; alpine to subnival. **Flight period**: late December–February.

MATERIAL EXAMINED. 17♂♂, 39♀♀.

REMARKS. *T. glaucophanes* may represent a New Zealand endemic segregate of the Australian lowland *Corynophora*. Forewing patterns indicate some regionalism, but insufficient material was studied for any firm conclusions to be reached. The distribution of this species is suggestive of an alpine relict (*see* Dumbleton 1966), and it would be an interesting species for further studies in regionalism in New Zealand Crambinae. Unfortunately nothing is known of its life history. Phylogenetically *Tawhitia* and *Corynophora* make up a very distinct sub-unit of the "*Crambus*" evolutionary line. *Tawhitia glaucophanes* has a strong superficial resemblance to members of *Tauroscopa*, but can at once be separated from them by the open discal cell of the hindwing.

Tawhitia pentadactyla (Zeller) n.comb.

pentadactylus Zeller, 1863, Chilonidarum et Crambidarum genera et species, Berolinensis: 32 (*Crambus*). –Meyrick, 1883, Trans. N.Z. Inst. **15**: 31 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 48; pl. lxii, fig. 15 (*Argyria*). –Bleszynski, 1962, Polsk. Pis. ent. **32**: 14 (*Velasquez*).

claviferella Walker, 1866, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum **5**: 1546 (*Aquita*). Syn. Meyrick, 1883.

strigosa Butler, 1877, Proc. zool. Soc. Lond. **1877**: 368, pl. xliii, fig. 10 (*Aphomia*).

TYPE DATA. Holotype ♂ *pentadactyla* BMNH – "Z. mon. 38 Neu Seeland Knaggs 11/69 pentadactylus."

Frons planoconvex. Female frenulum triple. Wingspan (male) 29–40 mm, (female) 30–36 mm.

GENITALIA. **Male** (Fig. 28). As for generic description except: arms of vinculum very narrow in profile, only about 0.2× as wide as uncus is long; saccus with leaf-like ventral extension caudad and with rounded apex; juxta a saddle-shaped plate; costal lobe of valva long and pointed, curving dorsad and introrse, dorsal margin of costa about 1.5× uncus; valvula an elongate, relatively weak median lobe with rounded apex; sacculus strongly developed as a broad prong curving introrse and dorsad; valva plus valvula a little shorter than aedeagus; uncus subtubular, curved ventrad; gnathos slightly longer than uncus, curved dorsad; gnathos tongue fused for posterior half only, with bluntly pointed apex; aedeagus tubular, truncate, 2× uncus, LMB ratio about 8:1, lacking any ornamentation. **Female** (Fig. 28). As for generic description except: anal papillae coalescent, 'Dutch clog'-

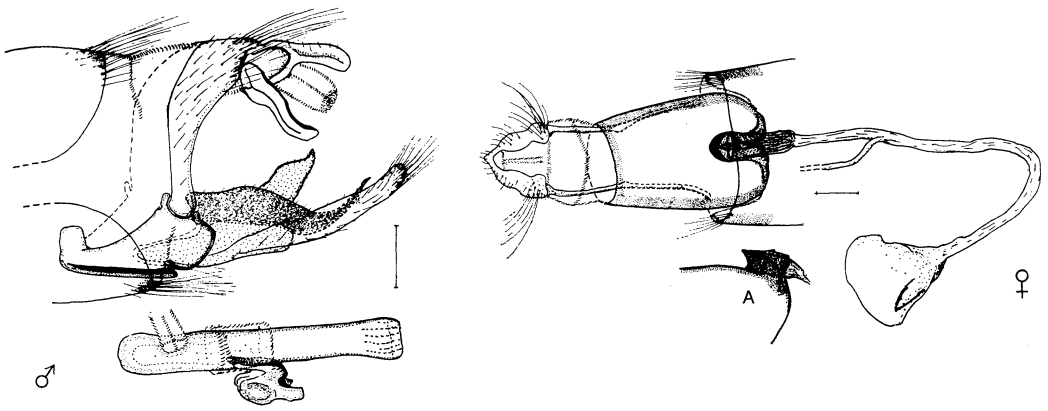

FIG. 27—*Tawhitia glaucophanes* genitalia: (*left*) ♂; (*right*) ♀, ventral aspect (A, ostiolar region in right lateral aspect) (Macetown, Otago).

Tawhitia glaucophanes (Meyrick)

Meyrick, 1907, Trans. N.Z. Inst. **39**: 110 (*Tauroscopa*). –Philpott, 1931, Trans. N.Z. Inst. **62**: 26 (*Tawhitia*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, figs. 45 & 46; pl. xlviii, fig. 5 (*Tawhitia*); 1939, Supplement to Butterflies & Moths of N.Z.: pl. lxi, fig. 15 (*Tawhitia*).
leonina Philpott, 1931, Trans. N.Z. Inst. **62**: 28 (Tawhitia). New synonymy.

TYPE DATA. Lectotype ♂ and 1 paralectotype ♂ *glaucophanes* (selected by Bleszynski and formally designated here) BMNH – "*Tauroscopa glaucophanes* Meyrick", "L. Wakatipu New Zealand GVH.06". Holotype ♂ and allotype ♀ *leonina* DSIR, paratype ♂ NM – "*Tawhitia leonina* Philpott, Takitimos 28.12.12".

Frons planoconvex. Eye with nude circumorbital strip. Female frenulum triple. Wingspan 21–32 mm (both sexes). Venation, Fig. 22i; forewing pattern variation, Fig. 26.

GENITALIA. **Male** (Fig. 27). As for generic description except: arms of vinculum broad in profile, a little shorter than uncus; saccus elongate, terminating anteriorly in a dorsal, truncate, thumb-like process, ventrally with a leaf-like, flattened, posterior extension; juxta a complexly folded anvil-shaped or saddle-shaped plate; costa of valva developed into a pointed, elongate lobe curving first ventrad, then introrse, then dorsad, dorsal margin slightly more than 2× uncus; valvula a slender, relatively weak, elongate lobe with rounded apex, twisting through 90° towards apex so that posterior extremity comes to lie below prongs of both costal lobe and sacculus; valva to tip of valvula as long as aedeagus; sacculus a strongly differentiated, elongate, pointed lobe, dorsal surface concave, turning introrse and dorsad under costal lobe; uncus and gnathos tubular, of equal length; aedeagus tubular, about 3.5× uncus, LMB ratio about 8:1, lacking any ornamentation. **Female** (Fig. 27). As for generic description except: anal papillae coalescent, 'Dutch clog'-shaped in profile; posterior apophyses elongate, slightly longer than tube formed by tergite 8, which encircles ovipositor; sternite 8 either absent or incorporated into tube; paired ostiolar sclerites fused laterally to form projecting ostium or limen at base of tergite tube, fusing with lobes of tergite 8 and protected ventrally by posterior margin of sternite 7; ventral lip of ostium projecting slightly further posteriorly than dorsal lip; anterior margin of tergite 8 cleft ventrally, ventrolateral margins curving introrse to fuse with sclerites; ductus bursae about 2.8× posterior apophyses, strong to and tapering sharply at about 0.2, ductus seminalis joining at 0.3; ostium bursae a dorsoventrally flattened funnel of complex origin, as detailed above, ostiolar pouch region slightly swollen; corpus bursae with a very narrow, U-shaped signum.

GENITALIA. **Male.** Saccus with posteroventral laminate flap; pseudosaccus absent; juxta strongly developed, either plate-like or saddle-shaped. **Female.** Anal papillae fused into characteristic "Dutch clog" shape; tergite 8 fused into a broad, closed tube with ostium bursae a smaller, flattened tube at its base.

TYPE OF SUBTRIBE: *Corynophora lativittalis* (Walker, 1863, List. Spec. lep. B.M. **27**: 171 (*Crambus*)). Eastern Australia. Venation, Fig. 22h.

Tawhitia Philpott

Philpott, 1931, Trans. N.Z. Inst. **62**: 26. Type-species: *Tauroscopa glaucophanes* Meyrick, 1907.
Argyria sensu Meyrick, 1905 (not Hübner, 1825, Verzeichniss bekannter Schmettlinge [sic], Augsburg). Type-species (designated by Fernald, 1896): *Argyria nummulalis* Hübner, 1818.
Crambus sensu Zeller, 1863 (not Fabricius, 1798, *in* Supplementum Entomologiae Systematicae). Type-species: *Phalaena (Tinea) pascuella* Linnaeus, 1798.
Tauroscopa sensu Meyrick, 1907 (not Meyrick, 1888, Trans. N.Z. Inst. **20**: 69). Type-species: *Tauroscopa gorgopis* Meyrick, 1888.
Velasquez Bleszynski, 1962, Pol. Pis. ent. **32**: 14. Type-species: *Crambus pentadactylus* Zeller, 1863.

Palpi, legs (except tibiae and tarsi), and thorax densely haired, less so in female and in *pentadactyla*.

Antennae stout, filiform, pubescent. Forewings with r_3 and r_4 stalked, bases of r_4 and r_5 approximated at base, but r_5 still distinctly free; hindwing discal cell open, as in *Orocrambus*, and all other hindwing venation as in *Orocrambus*; venation, Fig. 22h.

GENITALIA. **Male.** Saccus with characteristic ventral, leaf-like, flattened projection; juxta a complex, folded plate, roughly anvil-shaped; costal lobe and sacculus lobes of male valva strongly separated and developed, pointed; uncus curved ventrad, very broad in profile; gnathos Y-shaped, separate at base, fusing to form tubular apex, curved dorsad; aedeagus tubular, lacking any ornamentation. **Female.** Anal papillae coalescent with long posterior apophyses; tergite 8 forming a broad, deep tube; sternite 8 either incorporated into this tube or lost; ostium bursae a recessed tube at base of tergite tube, partially shielded by posterior margin of sternite 7; ventral lip of ostium bursae (lamella antevaginalis) projecting further caudad than dorsal lip (lamella postvaginalis); sclerites fusing at margins with lateral lobes of tergite 8; signum on corpus bursae present or absent.

REMARKS. *Tawhitia* is endemic in New Zealand, (2 spp.) and Tasmania (1 sp.), and is not close to any other genus except *Corynophora* (Australian). *Tawhitia* differs from *Corynophora* as follows. In *Corynophora* the costal lobe of the valva is barely developed, and the saccus remains fused marginally with the valvula for most of its length. The inner margin of the sacculus curves upwards, however, as in *Tawhitia*, though it bears a stiff cucullus of hairs at its posterior extremity. In the female of *Corynophora* evagination of the ostiolar sclerites is not as advanced as in *Tawhitia*. Short anterior apophyses are retained, and the corpus bursae bears a large, oval signum of the kind found in other genera of the '*Crambus*' line, compared with the U-shaped signum of *T. glaucophanes* and the asignate bursa of *T. pentadactyla*.

KEY TO SPECIES OF *Tawhitia*

Forewings variable in colour: silvery grey, greenish grey, yellowish brown, or dark brown, with blackish, wedge-shaped stigma and first and second lines. Genitalia: ♂ – saccus terminating in dorsal truncate process, gnathos about as long as uncus; ♀ – ostium bursae near circular, anteroventral margin of tergite 8 cleft in midline ..... ***glaucophanes***

Forewings grey with dark basal streak from base ending in disc. Genitalia: ♂ – saccus tapered to a blunt point, gnathos about 1.3× as long as uncus; ♀ – ventral lip of ostium bursae drawn into a flattened shield posterad, anteroventral margin of sternite 8 entire ..... ***pentadactyla***

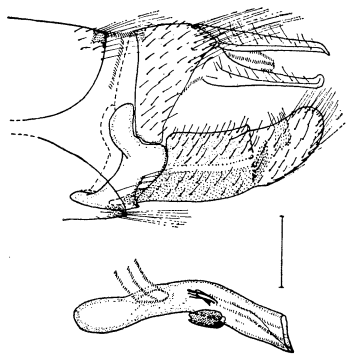

FIG. 25—*Kupea electilis* ♂ genitalia (Birdlings Flat, Cant.).

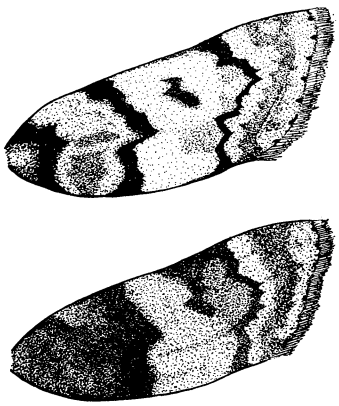

FIG. 26—Forewing variation in *Tawhitia glaucophanes:* from top – Mt. Burns form, typical *glaucophanes* (Macetown, Otago), and *leonina* form (Takitimu Mts).

Crambopsis de Lattin, 1952, Ent. Z. **62**: 91. Type-species: *Crambus malacellus* Duponchel, 1836 (monotypic). Preoccupied by *Crambopsis* Walker, 1865.

See Marion (1954) and Bleszynski (1965) for diagnosis.

REMARKS. A genus hitherto in some confusion, and represented in New Zealand by a single species, *A. malacelloides* (Bleszynski), probably accidentally introduced by human agency.

Angustalius malacelloides (Bleszynski)

Bleszynski, 1955, Pol. Pis. ent. **25**: 229; figs 3 & 6 (*Crambopsis*); 1965, Crambinae: Lepidoptera Palaearctica, Vienna: 230; fig. 144 (*Angustalius*). –Hudson, 1939, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 29 (*Crambus*).

For details of characters, *see* Bleszynski 1955 (full description, and genitalia drawings – male, fig. 3; female, fig. 6) and Bleszynski 1965 (drawings of venation of closely related *A. malacellus* Dup., and of male genitalia – pl. 54, fig. 144). Venation, Fig. 22g.

DISTRIBUTION & BIOLOGY. Himalayas, India, Ceylon, Kwangtung Province of mainland China, Malaya, Australia, Tasmania (type locality), and northern North Island, New Zealand (Bleszynski 1965). **Flight period**: November–April in eastern Australia, October and January (Hudson 1939) in New Zealand.

MATERIAL EXAMINED. 6♂♂ (3 Australian, 3 New Zealand from Waitangi).

REMARKS. This species was first recorded in New Zealand by Mr C. E. Clarke at Whangarei, Northland in 1927. In 1932 Clarke noted that the species was abundant at Lake Takapuna, Auckland (Hudson 1939). It is now common in Northland and Auckland, and is possibly still extending its range southwards (K. A. J. Wise, pers. comm.).

Subtribe **Corynophorina**

Characters as for tribe Crambini, but with the following features not found in subtribe Crambina. Forewing vein r_5 free.

MATERIAL EXAMINED. 3♂♂, 3♀♀.

REMARKS. Because of their similar forewing patterns, this species and *Orocrambus harpophorus* have been confused in New Zealand museum collections. However, *M. oncobolus* lacks subterminal spotting of the forewings, and the 2 species are dissimilar in male and female genital structure.

Kupea Philpott

TYPE-SPECIES: *Kupea electilis* Philpott, 1920, Rec. Cant. Mus. **3**: 247 (monotypic).

Labial palpi longer than head, porrect, smooth-scaled; maxillary palpi triangular, erect; antennae serrate in male, shortly ciliate; frons with conical protuberance. Male frenulum single; forewing veins r_3 and m_2 absent or vestigial, r_4 stalked with r_5; hindwing vein m_2 absent (Fig. 22f).

GENITALIA. **Male.** Saccus short, with rounded apex; juxta a heart-shaped plate; costa of valva a well differentiated, rectangular plate with flange on inner posterior margin; sacculus flanged; uncus and gnathos slender, tapered, but very large compared to rest of genitalia; aedeagus tubular, 1.8× uncus, LMB ratio about 8:1, group of 4–6 elongate cornuti at about midlength.

REMARKS. This genus differs from *Orocrambus* and *Maoricrambus* in its reduced forewing and hindwing venation. The male genitalia are much as in *Orocrambus*, but the uncus and gnathos are proportionately much larger.

Kupea electilis Philpott

Philpott, 1930, Rec. Cant. Mus. **3**: 247. –Hudson, 1939, Supplement to Butterflies & Moths of N.Z.: pl. lvi, fig. 37 (not ♀).

TYPE DATA. Holotype ♂ CM – "Birdling's Flat, Cant. 3.3.29, S. Lindsay."

Eye of nocturnal type. As for generic diagnosis except as follows. Forewings very elongate, brassy ochreous suffused with grey in disc, with a brownish-black mark in disc followed by an oblique white bar, and a much larger patch beyond this containing 2 white, oval blotches and a complete, circular spot, and with a well defined, white subterminal band; hindwings brownish; venation, Fig. 22f. Female unknown.

GENITALIA. **Male** (Fig. 25, paratype). As for generic diagnosis.

DISTRIBUTION & BIOLOGY. Birdlings Flat (between Banks Peninsula and Lake Ellesmere). **Flight period**: March.

MATERIAL EXAMINED. 28♂♂.

REMARKS. On male genital characters, *Kupea electilis* shows resemblances to *O. xanthogrammus* and other *Orocrambus* species (Figs 10d & 25); the female is not represented in any New Zealand museum collection. The specimens collected by S. Lindsay were probably taken by light-trapping, and from the lack of females I suspect that this sex may be semi-apterous. When the female has been obtained the systematic position of the genus will have to be re-assessed. At present *Kupea* is of uncertain status, but I think it may warrant transfer to *Orocrambus*, despite the reduced venation.

Angustalius Marion

Marion, 1954, Mem. Inst. Sci. Madagascar (E) **5**: 50. Type-species: *Angustalius ditaeniellus* Marion, 1954 (monotypic).

Bleszynskia de Lattin, 1961, Ent. Z. **71**: 115. Type-species: *Crambus malacellus* Duponchel, 1836 (monotypic).

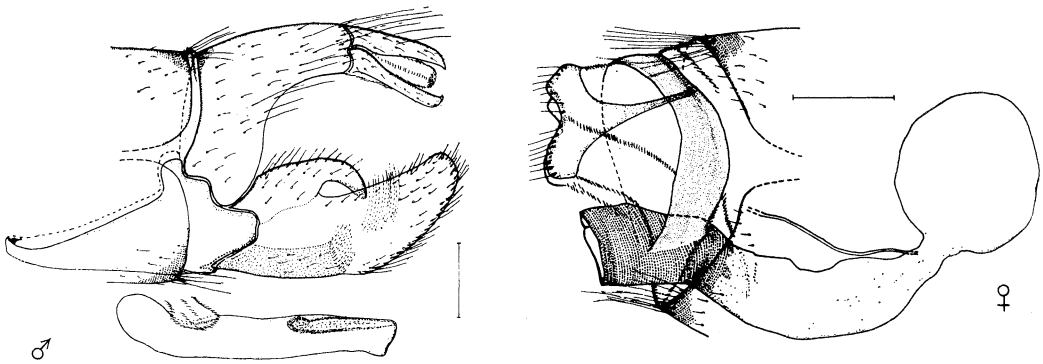

FIG. 24—*Maoricrambus oncobolus* genitalia (Castle Hill, Cant.).

Mohaka River (Hawkes Bay). *Raoulia* spp., e.g., *tenuicaulis*, are common mat plants in shingle river beds, and further study should reveal the specific host(s) of *O. xanthogrammus*. Species group 5a, "*vittellus*".

Maoricrambus n.gen.

TYPE-SPECIES: *Crambus oncobolus* Meyrick, 1885, Trans. N.Z. Inst. **17**: 138.

Labial palpi longer than head, porrect, smooth-scaled; maxillary palpi triangular, erect; ocelli small; compound eyes without nude circumorbital strip, of nocturnal type; frons with conical protuberance. Wings: female frenulum triple; venation as in *Orocrambus*; forewing r_4 and r_5 stalked.

GENITALIA. **Male.** Vinculum almost a right-angled triangle in profile; saccus elongate, with rounded apex; costa of valva flanged and developed dorsally into a large, strong, introrse prong; uncus and gnathos very broad, gnathos spatulate with strong rim enclosing weak central region; aedeagus tubular, 2.8× uncus, LMB ratio 7:1, thick, cusp-like thickening from 0.3 to about apex, cornuti lacking. **Female.** Tergite 8 fusing dorsolaterally with ostium bursae; sternite 8 absent; ductus bursae about 3× anal papillae, strong to 0.3 whence weakly pleated to 0.7, ductus seminalis joining at about 0.8; corpus bursae asignate.

REMARKS. Differs from *Orocrambus*, of which it is a segregate, in the form of the spatulate gnathos in the male (tapered, slender, and either pointed or clubbed in *Orocrambus*) and the asignate corpus bursae in the female (always 2 signa in *Orocrambus*).

Maoricrambus oncobolus (Meyrick) n.comb.

Meyrick, 1885, Trans. N.Z. Inst. **17**: 138 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 35 (*Crambus*).

[*oncolobus* Hampson, 1896, Proc. zool. Soc. Lond. **1896**: 940 (*Crambus*). (Misspelling of *oncobolus* Meyrick.)]

TYPE DATA. Lectotype ♂ and paralectotype ♀ (selected by Bleszynski and formally designated here) BMNH, slides BM Pyral 7984 and 7977, and paralectotype ♂ CM, author's genit. prep. CGT – "Castle Hill New Zealand 2,300 ft. 20/1/83."

Frons conical. Eye without nude circumorbital strip. Female frenulum triple. Wingspan 23–25 mm (both sexes).

GENITALIA. **Male** (Fig. 24, paralectotype) and **Female** (Fig. 24; compared with Bleszynski's sketch of paralectotype) as for generic description.

DISTRIBUTION & BIOLOGY. Restricted to central Canterbury and Southland. **Flight period**: December–February.

Zealand suggests that the most clearly marked typical *vulgaris* form occurs in the southern Wairarapa and Wellington. In the South Island a mixture occurs, but the *obstructus* form is most frequently taken in the subalpine grasslands of Canterbury and Otago. An extreme *obstructus* form from the Cass area, in the Lincoln College Collection, is almost white. Incidentally White (1963), who worked in this area, noted that the flight period was in late February, which is earlier than my records from Winchmore and Lincoln College. There is some variation in the genitalia as regards the degree of sclerotisation in both sexes and the number of cornuti and the size of the subapical thorn on the aedeagus, but this minor variation does not correlate with variation in forewing pattern between typical *vulgaris* and the *obstructus* form. Worn specimens are difficult to separate from *ornatus*, *punctellus*, and small *tuhualis*. Superficially *vulgaris* resembles *vittellus*, *enchophorus*, and several other species in this subgroup, but is quite distinct on genital characters in both sexes. In the west of the North Island it is not common, but in the east Mr T. M. Davies (pers. comm.) has recorded it as far north as Haumoana, Hawkes Bay, and states that it is plentiful in the lowland tussock around Waipukurau. Species group 5a, "*vittellus*".

Orocrambus xanthogrammus (Meyrick) n.comb.

Meyrick, 1882, N.Z. J. Sci. (Dunedin) **1**: 187 (*Crambus*); 1883, Trans. N.Z. Inst. **15**: 32–3 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 6 (*Crambus*).
obstructus Meyrick, 1911, Ent. mon. Mag. **47**: 82 (*Crambus*). – Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 5 (*Crambus*). New synonymy.

TYPE DATA. Lectotype ♂ (selected by D. E. Gaskin) CM – "Lake Coleridge New Zealand /3/73 R.W.F."

Frons conical. Eye without nude circumorbital strip. Female frenulum triple. Wingspan 20–30 mm (both sexes).

GENITALIA. **Male** (Fig. 10d). As for generic description except: arms of vinculum about as long as uncus; saccus tapered, with rounded apex; costa of valva flanged, dorsal margin about 1.3× uncus; sacculus undifferentiated; gnathos straight, tapered, bluntly pointed, slightly longer than uncus; aedeagus tubular, truncate, 2.8× uncus, LMB ratio 8–9:1, external ornamentation lacking, 1 slender, curved cornutus. **Female** (Fig. 17f). As for generic description except: tergite 8 encircling ostium, about 0.8× as wide at fusion as in dorsal midline; sternite 8 absent; ductus bursae 3.5–4× anal papillae, strong to 0.3 whence pleated to 0.7, ductus seminalis joining at about 0.8; ostium bursae a simple funnel, ostiolar pouch region swollen; corpus bursae with 2 large, unequal signa.

DISTRIBUTION & BIOLOGY. South Island and eastern North Island; shingle river beds. **Host plant**: pupa found among *Raoulia* sp. by S. Lindsay (Hudson 1939), and adult reared; tunnels around the chamber in which the pupa was found suggest that this was the actual food plant. **Flight period**: December–March.

MATERIAL EXAMINED. 51♂♂, 8♀♀ (South I.); 2♂♂ (North I.).

REMARKS. There is considerable variation in the reddish marks and the greenish background colour of the forewings. Some specimens appear quite chequered, others nearly silvery white. The forewing pattern is an adaptation to life among the shifting rocks and shingle of river beds, where the mottled colours make the moth very hard to find, even though its flight is not particularly strong (T. H. Davies, *in litt.*). This species is not very close systematically to the others in the "*vittellus*" group, but there is greater deviation from the typical pattern in forewing colour than in genital structure. *O. xanthogrammus* is known from 2 North Island localities: I have not been able to trace Hudson's Wairarapa specimen(s), but T. H. Davies has kindly allowed me to examine specimens from the

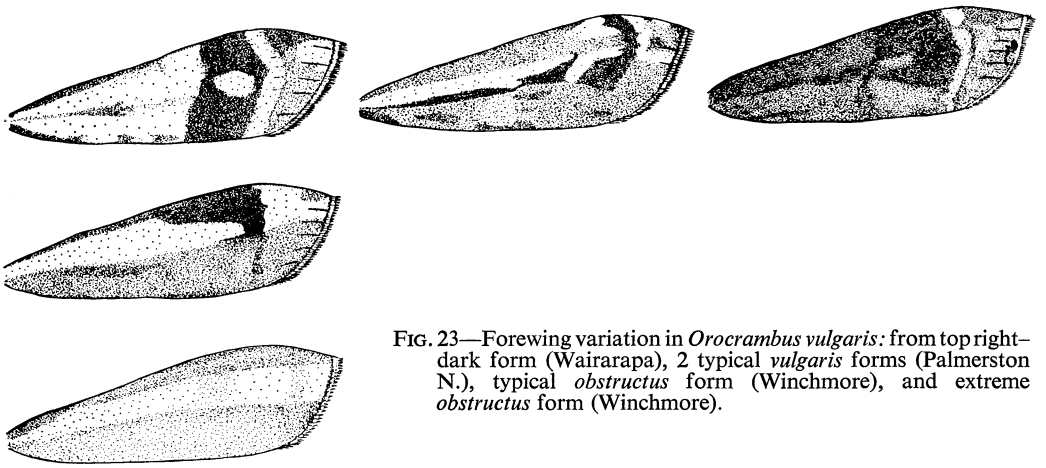

FIG. 23—Forewing variation in *Orocrambus vulgaris:* from top right–dark form (Wairarapa), 2 typical *vulgaris* forms (Palmerston N.), typical *obstructus* form (Winchmore), and extreme *obstructus* form (Winchmore).

Orocrambus vulgaris (Butler) n.comb.

Butler, 1877, Proc. zool. Soc. Lond. **1877**: 400 (*Crambus*). –Hudson, 1928 Butterflies & Moths of N.Z.: pl. xx, fig. 39 (*Crambus*).

obstructus Meyrick, 1911, Ent. mon. Mag. **47**: 82 (*Crambus*). –Hudson, 1928, Butterflies & Moths of N.Z.: pl. xx, fig. 5 (*Cranbus*). New synonymy.

tuhualis Meyrick, 1883, Trans. N.Z. Inst. **15**: 28 (*Crambus*) (not Felder, 1875). Syn. Meyrick, 1885.

TYPE DATA. Lectotype ♂ *vulgaris* (selected by Bleszynski and formally designated here) BMNH – "*Crambus obstructus* Lumsden New Zealand L. 8.3.10" (L. standing for Longstaff). Three syntype ♂ *vulgaris* BMNH – "N. Zeal. 77.34" (2 without abdomen, 1 complete and labelled "*Crambus vulgaris* Butler Type").

Frons moderately conical. Eye without nude circumorbital strip. Female frenulum double, but major element bifid apically, possibly indicating secondary fusion rather than a primitive condition. Wingspan 21–25 mm (both sexes). Forewing variation, Fig. 23.

GENITALIA. **Male** (Fig. 10c). As for generic description except: arms of vinculum about 0.5× uncus; saccus elongate, tapered, without 'keel'; costa of valva flanged, dorsal margin slightly longer than uncus; sacculus undeveloped; gnathos straight, tapered, as long as uncus, clubbed apically; aedeagus tubular, truncate, 3.0–3.3× uncus, LMB ratio 10–11:1, strong in ventral midline from midlength to apex, slightly hooked thorn ventrad at about 0.3, 12–20 small, elongate cornuti from 0.3 to midlength. **Female** (Fig. 17e). As for generic description except: tergite 8 fusing dorsally with ostium bursae, half as wide again at fusion as in dorsal midline; sternite 8 a strong, lunate plate; ductus bursae about 5× anal papillae, strong and vertically pleated to 0.8, ductus seminalis joining at 0.9; ostium bursae a broad, tapered funnel, ostiolar pouch region swollen; corpus bursae with 2 unequal, oval signa.

DISTRIBUTION & BIOLOGY. North and South Islands, in lowland and subalpine grasslands, largely east of the main axial ranges. **Flight period**: January–April, with the peak in March; essentially an autumnal species.

MATERIAL EXAMINED. 26♂♂, 3♀♀ (North I.); 117♂♂, 12♀♀ (South I.).

REMARKS. The extreme variability of this species results from white scales grouping around the median white forewing fascia in greater or lesser quantities. When the scaling is profuse and linear the fascia remains entire but becomes wide and diffuse, especially towards the termen, and the submarginal markings of typical *vulgaris* are partially or completely obliterated. This condition has been described as *Crambus obstructus* by Meyrick (1911). My examination of nearly 160 specimens from different parts of both main islands of New

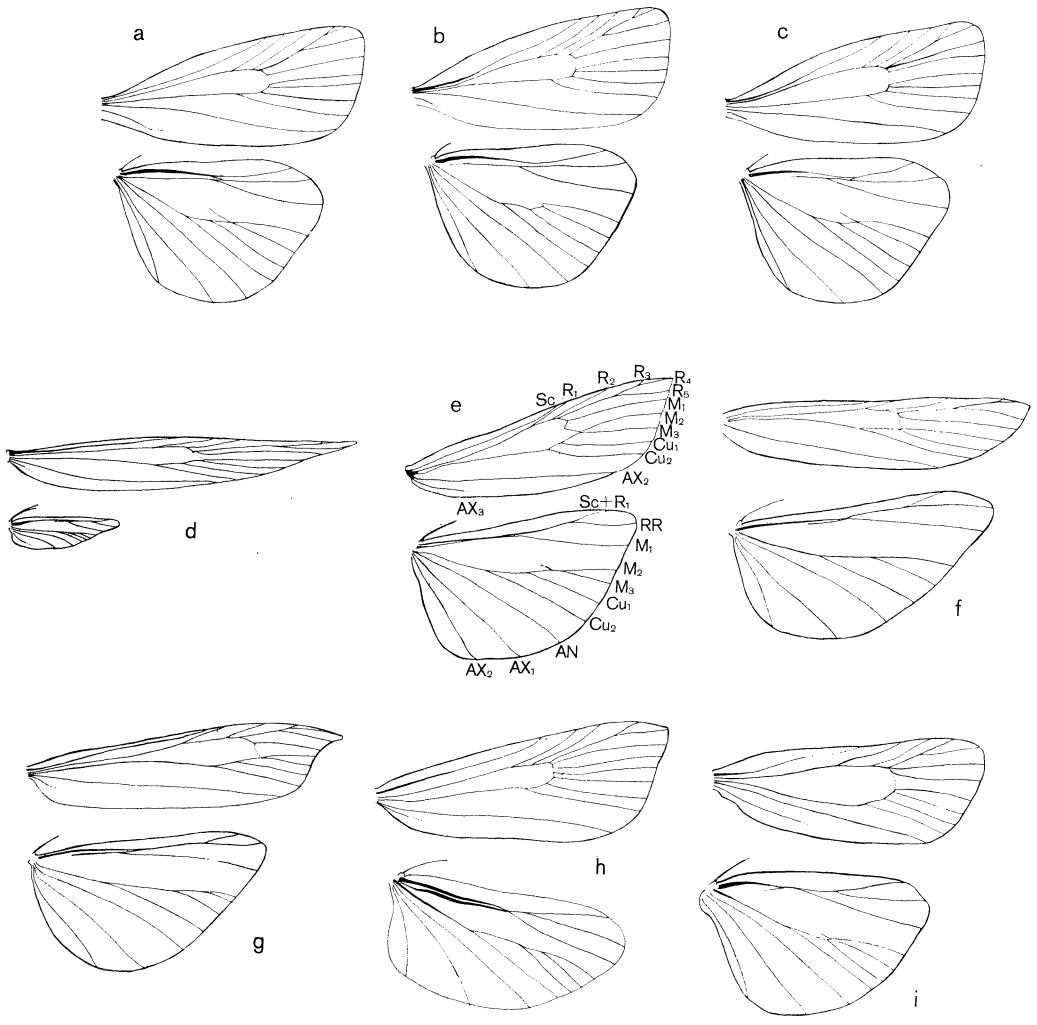

FIG. 22—Wing venation of crambine moths: (a) *Orocrambus clarkei clarkei*; (b) *O. c. clarkei II* ("*nebulosa*" paratype); (c) *O. c. eximia*; (d) *O. lindsayi* n.sp.; (e) *O. vittellus*; (f) *Kupea electilis*; (g) *Angustalius malacelloides*; (h) *Corynophora lativittalis*; (i) *Tawhitia glaucophanes*.

which are pale brown with notched, white forewing fascia and either have or lack submarginal spotting, occur throughout the country. From the original description, "*Crambus vittellus*" was applied to the spotted form. A detailed analysis of spotted *v.* unspotted forms at Palmerston North (Table 3) showed that the percentage of spotted specimens appeared to approach, but never exceed, 25% of the total catch, which suggests that this is a genetic variety. Collecting on the Wairarapa coast produced 5 females, all of the greyish forms *vapidus* or *nexalis*, and 5 of the 12 males taken were also greyish rather than brown, perhaps indicating the beginning of regional variation. In view of its abundance in pastures and its possible economic importance, this species would reward further study. Female genitalia show very little variation except in the degree of sclerotisation of the ostium bursae; male genitalia show a little variation in the size of the thorns, especially the subapical one, and the number of cornuti. Species group 5a, "*vittellus*".

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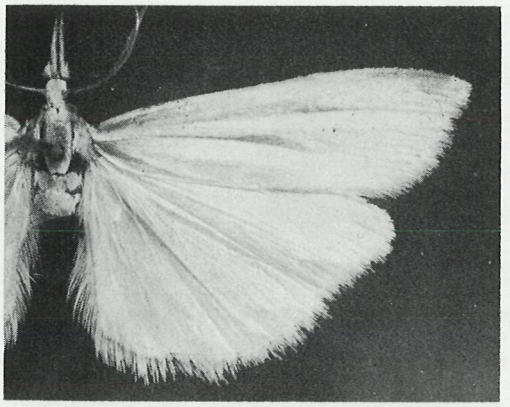

FIG. 29—*Orocrambus abditus*, Birdlings Flat.

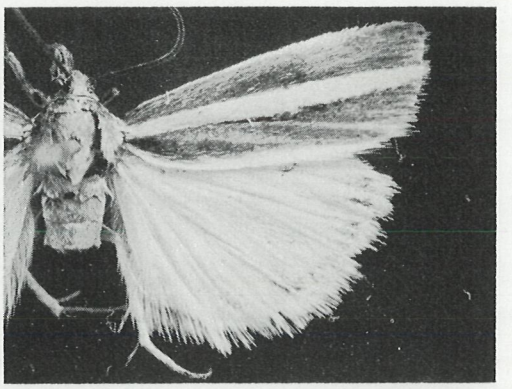

FIG. 30—*Orocrambus aethonellus*, L. Tekapo.

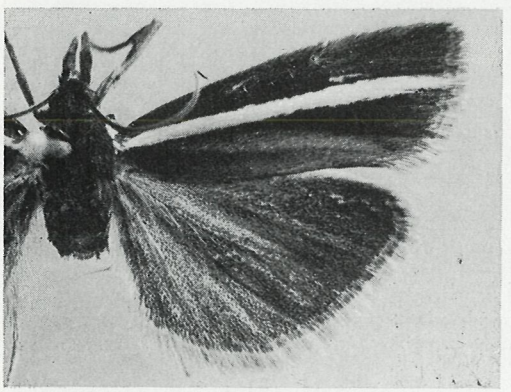

FIG. 31—*Orocrambus aethonellus*, Mt. Grey.

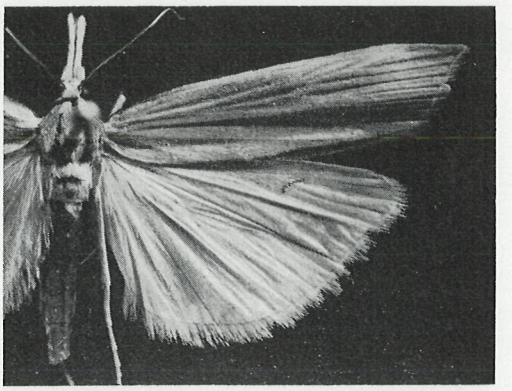

FIG. 32—*Orocrambus angustipennis*, Mt. Ruapehu.

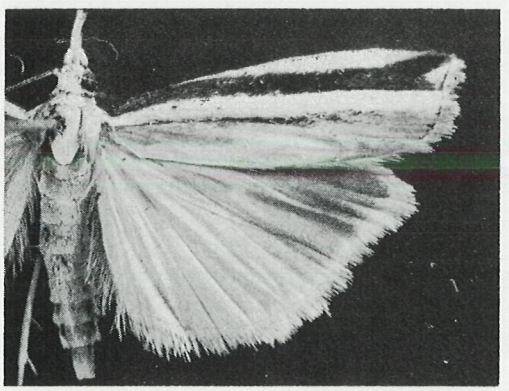

FIG. 33—*Orocrambus apicellus*, Knife & Steel.

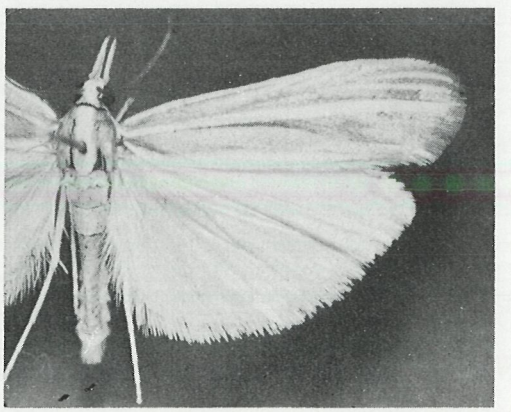

FIG. 34—*Orocrambus callirrhous*, Sandhill Point.

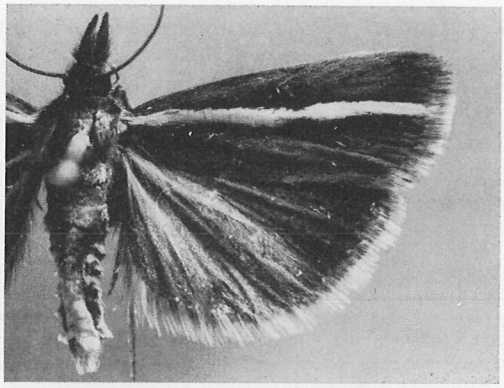

FIG. 35—*Orocrambus catacaustus*, Arthurs Pass.

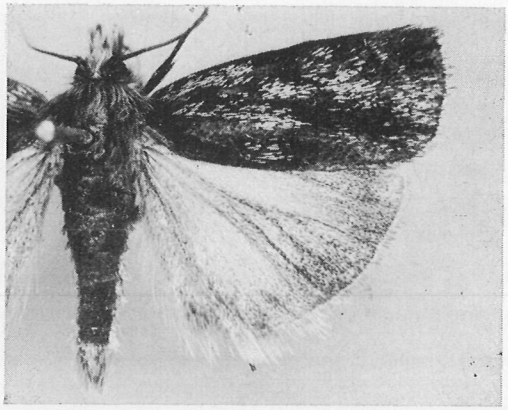

FIG. 36—*Orocrambus clarkei clarkei*, holotype.

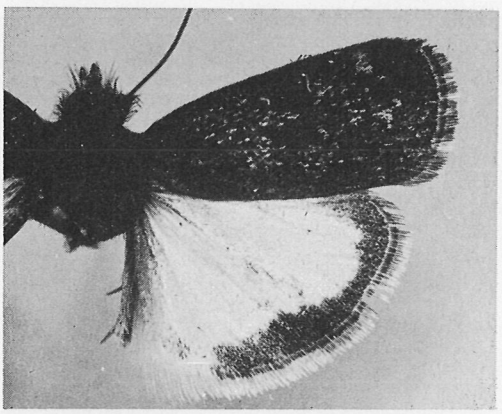

FIG. 37—*Orocrambus clarkei eximia*, holotype.

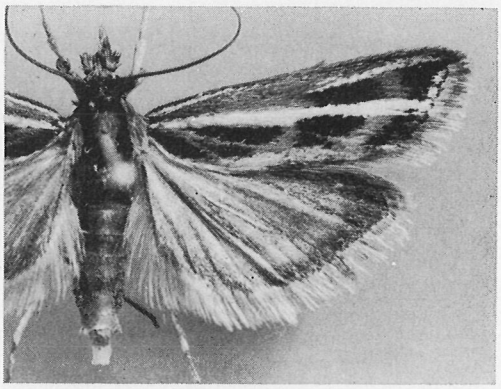

FIG. 38—*Orocrambus corruptus*, Coopers Knob.

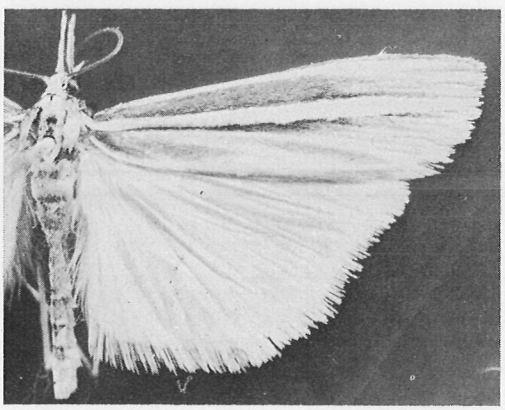

FIG. 39—*Orocrambus crenaeus*, L. Wakatipu.

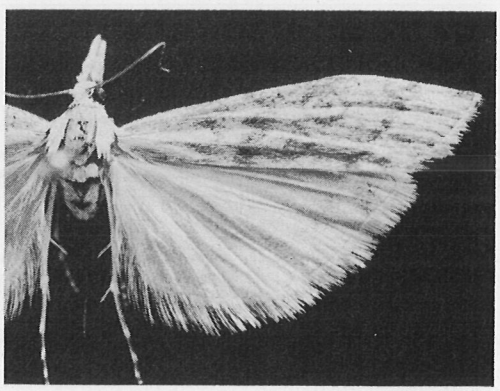

FIG. 40—*Orocrambus cyclopicus*, Nelson.

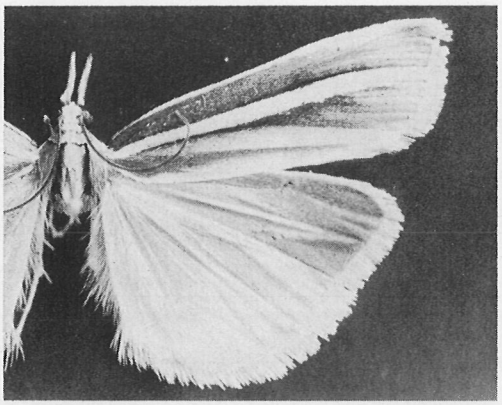

FIG. 41—*Orocrambus dicrenellus*, Dun Mtn.

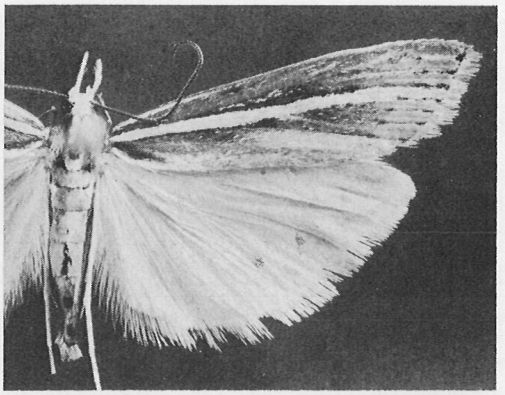

FIG. 42—*Orocrambus enchophorus*, Craigieburn Ra.

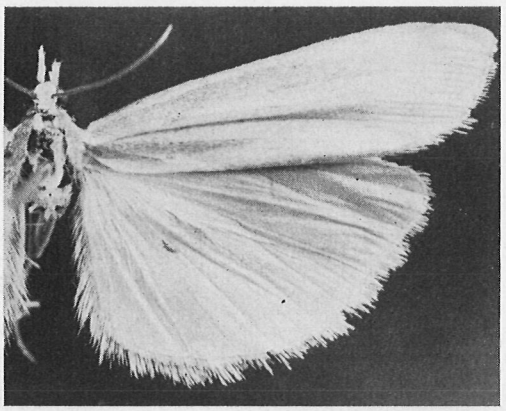

FIG. 43—*Orocrambus ephorus*, Mt. Arthur tableland.

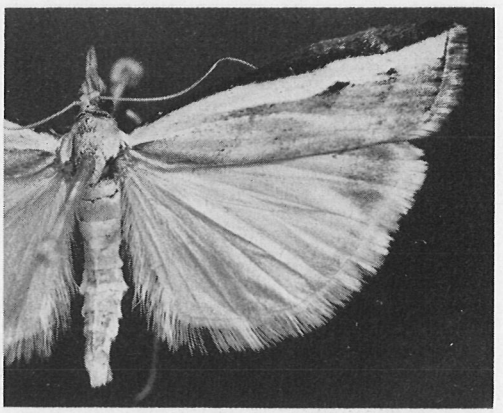

FIG. 44—*Orocrambus flexuosellus*, Nelson.

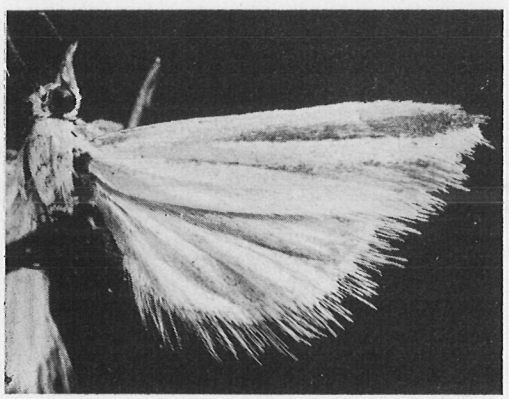

FIG. 45—*Orocrambus fugitivellus*, MacKenzie Plains.

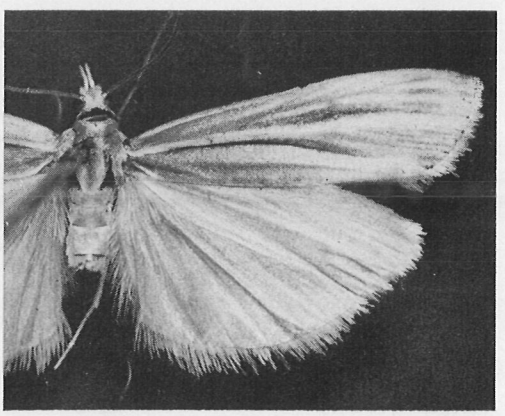

FIG. 46—*Orocrambus haplotomus*, L. Wakatipu.

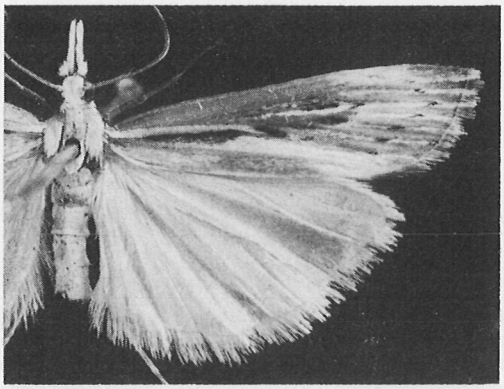

FIG. 47—*Orocrambus harpophorus*, Arthurs Pass.

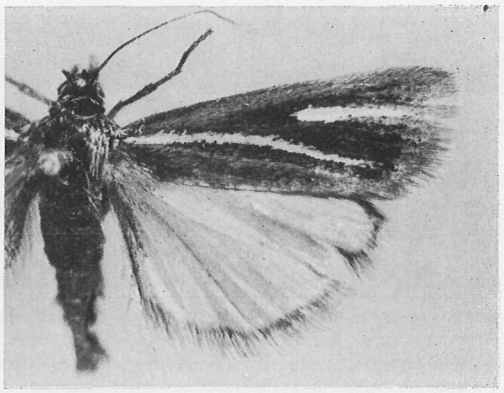

FIG. 48—*Orocrambus heliotes*, Waimarino.

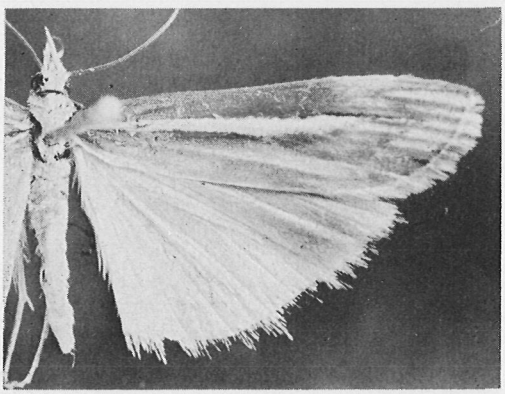

FIG. 49—*Orocrambus heteraulus*, Bold Peak.

FIG. 50—*Orocrambus horistes*, Chatham I.

FIG. 51—*Orocrambus isochytus*, Mt. Owen.

FIG. 52—*Orocrambus jansoni*, Waiouru.

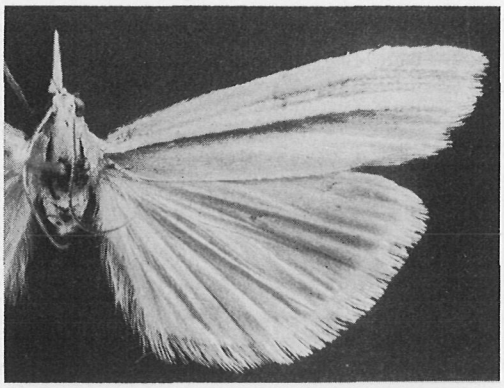

FIG. 53—*Orocrambus lectus*, L. Tekapo (p'type).

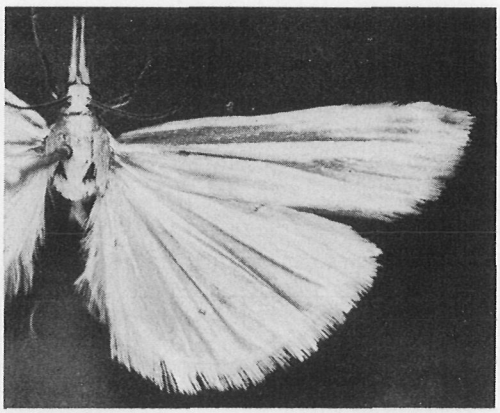

FIG. 54—*Orocrambus lewisi*, L. Pukaki.

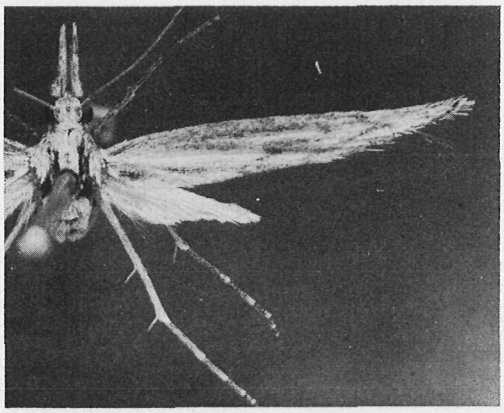

FIG. 55—*Orocrambus lindsayi*, Mt. Ida (p'type).

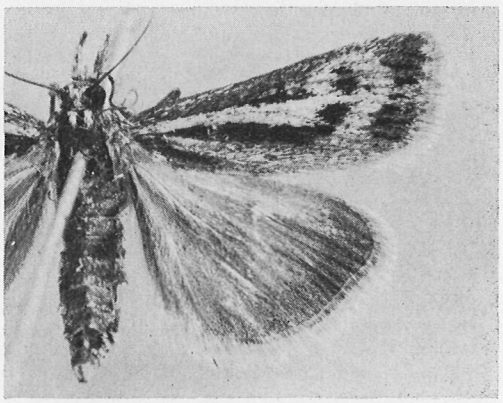

FIG. 56—*Orocrambus machaeristes*, Mt. Arthur.

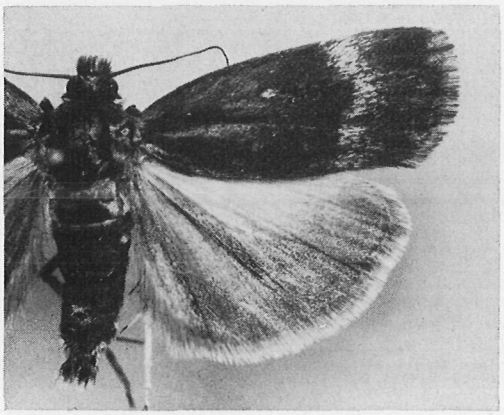

FIG. 57—*Orocrambus melampetrus*, Mt. Phipps.

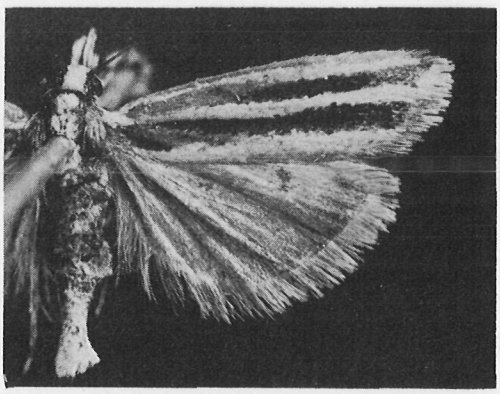

FIG. 58—*Orocrambus melitastes*, New River.

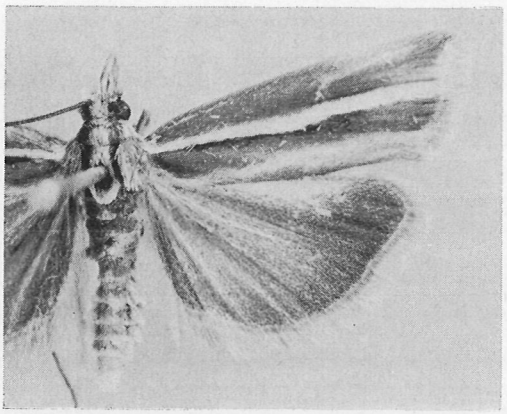

FIG. 59—*Orocrambus melitastes*, New River.

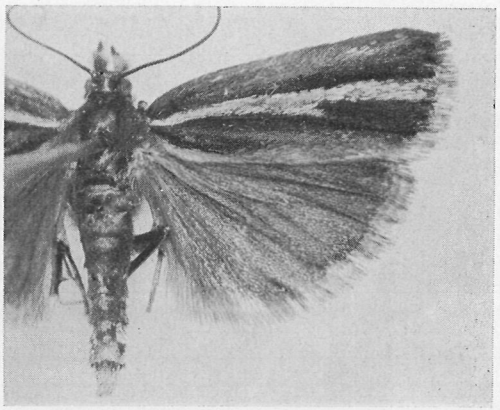

FIG. 60—*Orocrambus mylites*, Mt. Aorere.

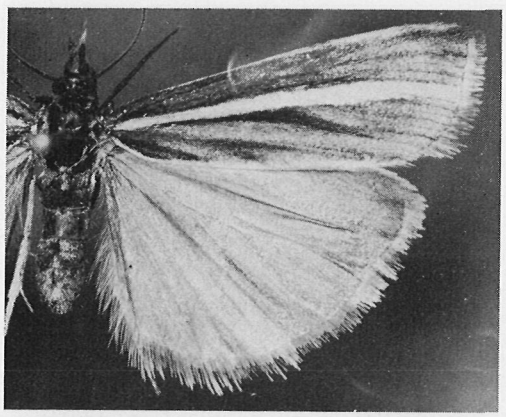

FIG. 61—*Orocrambus oppositus*, Hunter Mts.

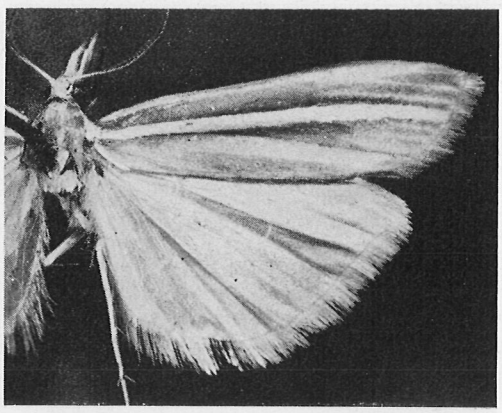

FIG. 62—*Orocrambus ordishi*, Christchurch.

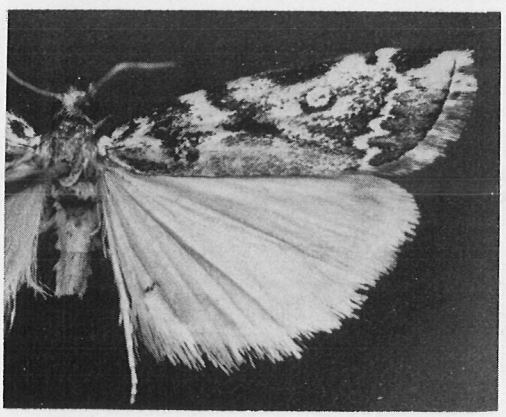

FIG. 63—*Orocrambus ornatus*, holotype.

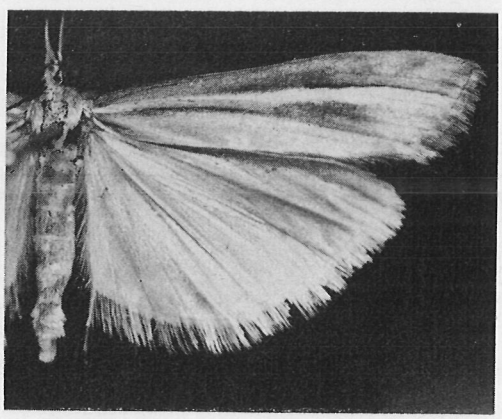

FIG. 64—*Orocrambus paraxenus*, L. Luna.

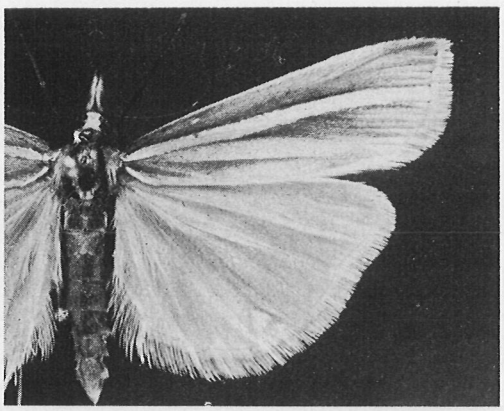

FIG. 65—*Orocrambus philpotti*, loc. unrec.

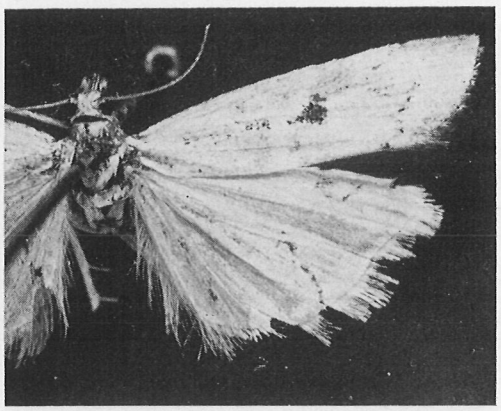

FIG. 66—*Orocrambus punctellus*, holotype.

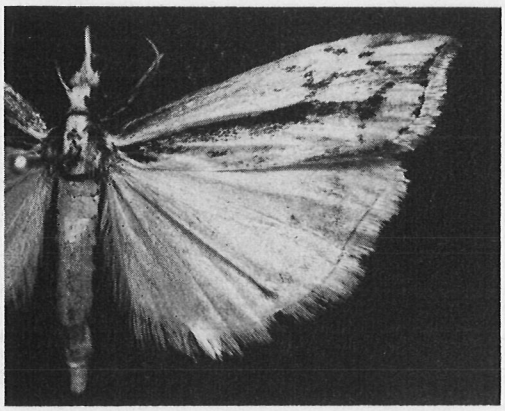

FIG. 67—*Orocrambus ramosellus*, Nelson.

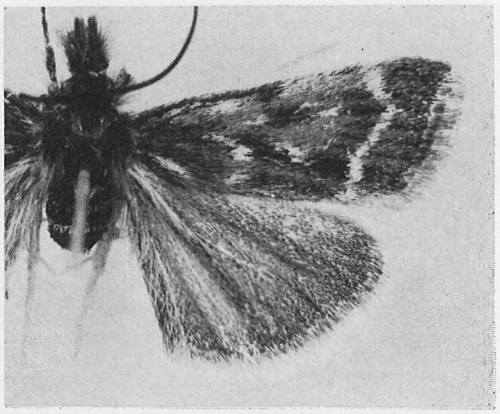

FIG. 68—*Orocrambus scoparioides*, Mt. Burns.

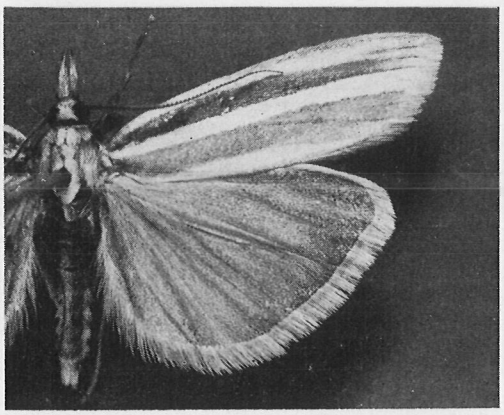

FIG. 69—*Orocrambus scutatus*, Longwoods Ra.

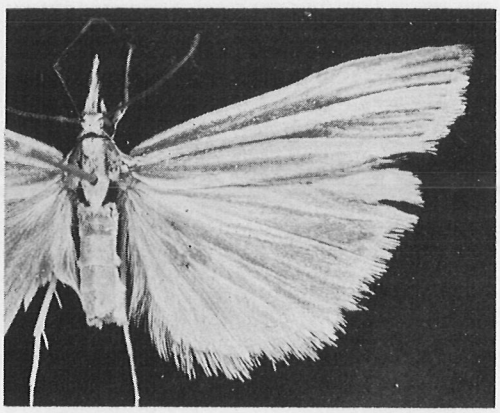

FIG. 70—*Orocrambus simplex*, L. Tekapo.

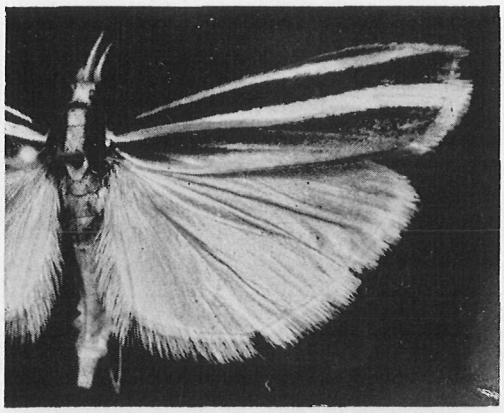

FIG. 71—*Orocrambus siriellus*, Golden Downs.

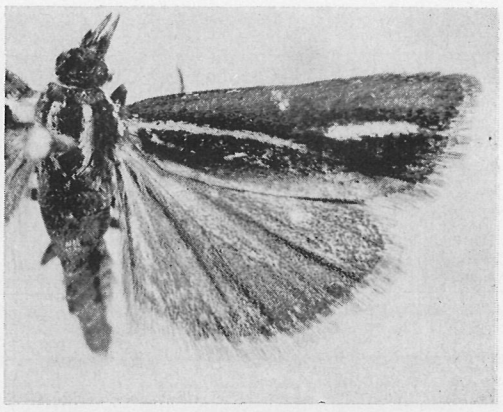

FIG. 72—*Orocrambus thymiastes*, Seaward Moss.

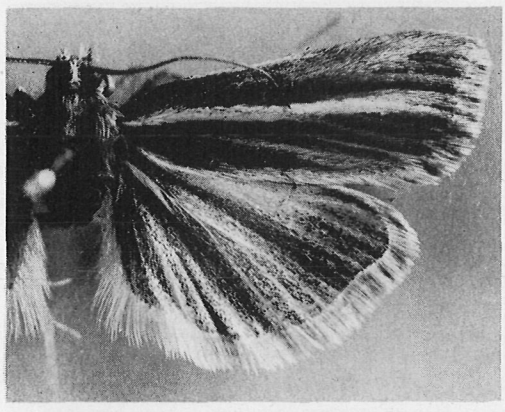

FIG. 73—*Orocrambus tritonellus*, Broken R.

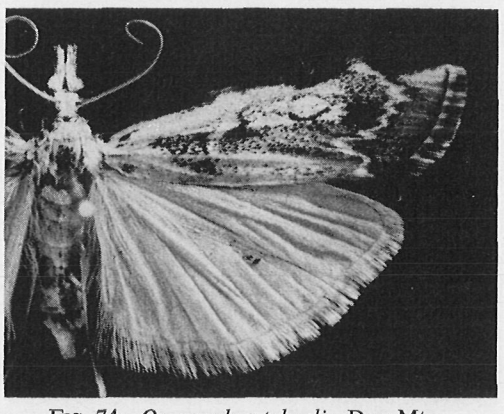

FIG. 74—*Orocrambus tuhualis*, Dun Mtn.

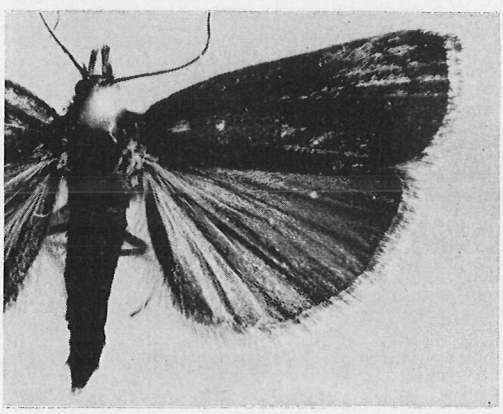

FIG. 75—*Orocrambus ventosus*, Tasman Mts.

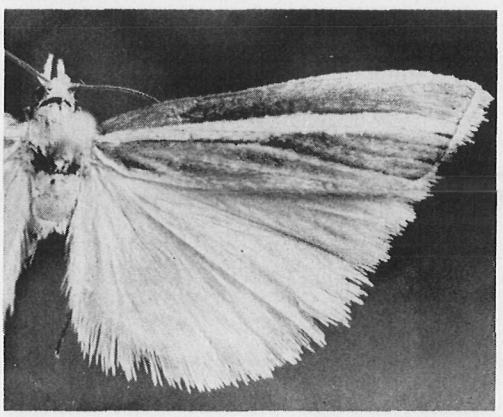

FIG. 76—*Orocrambus vittellus*, L. Sedgemere.

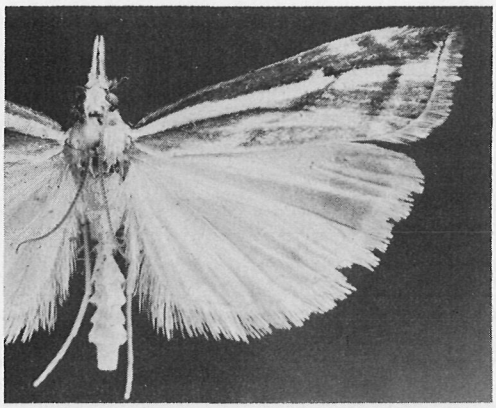

FIG. 77—*Orocrambus vittellus*, Dun Mtn.

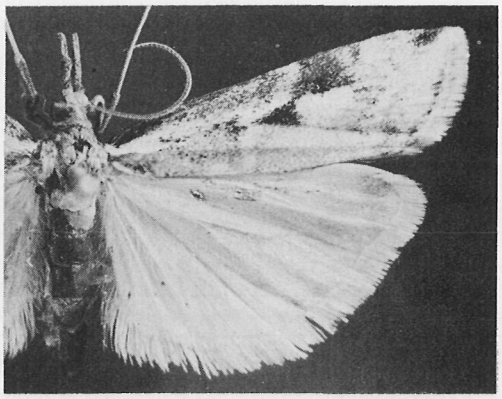

FIG. 78—*Orocrambus vulgaris*, Banks Pen.

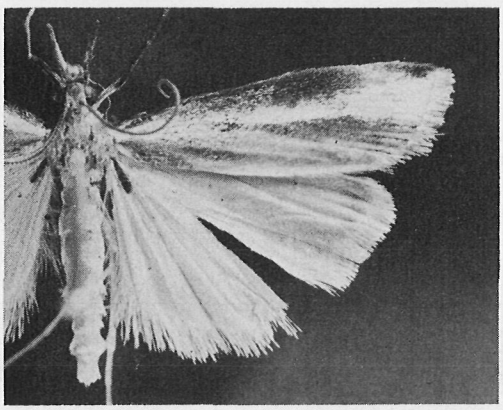

FIG. 79—*Orocrambus vulgaris*, Mt. Cook.

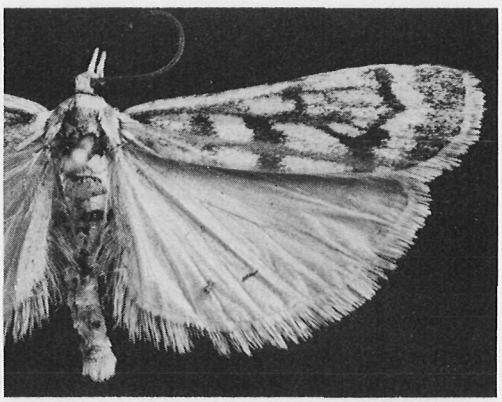

FIG. 80—*Orocrambus xanthogrammus*, Macetown.

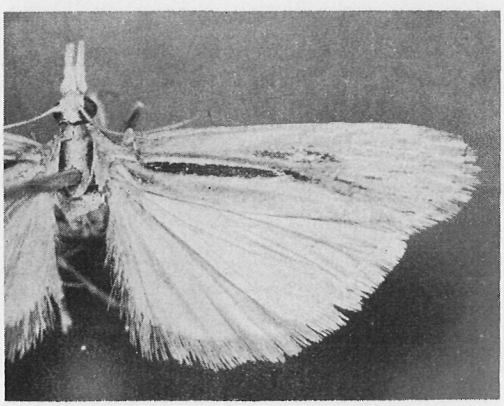

FIG. 81—*Maoricrambus oncobolus*, New River.

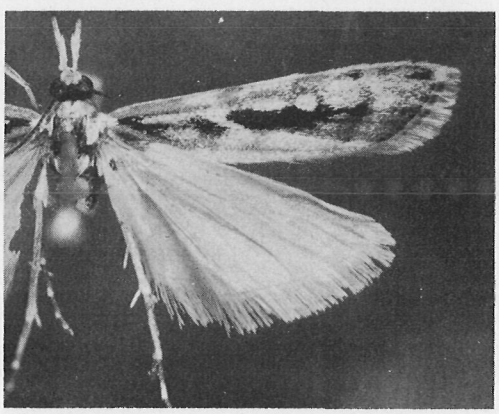

FIG. 82—*Kupea electilis*, Birdlings Flat.

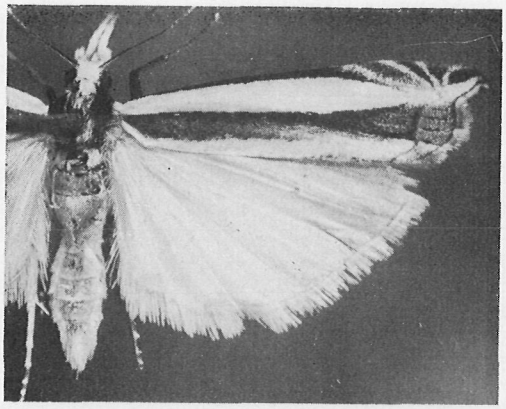

FIG. 83—*Angustalius malacelloides*, Whangarei.

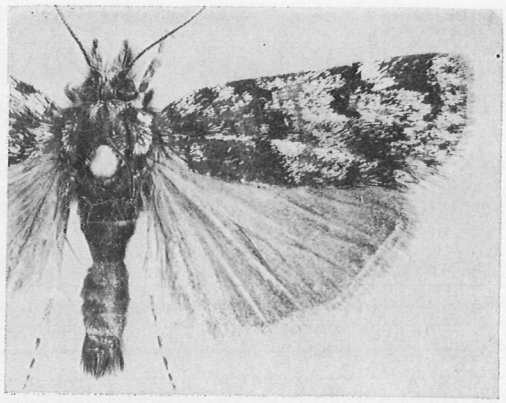

FIG. 84—*Tawhitia glaucophanes*, ♂, Hunter Mts.

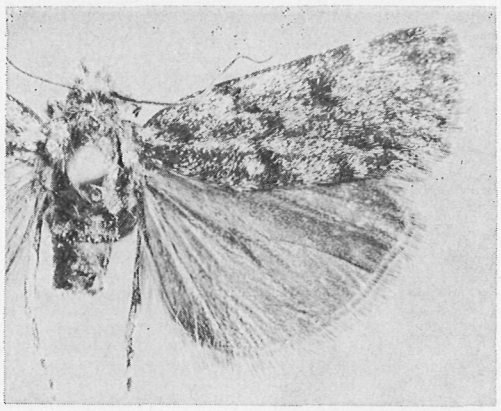

FIG. 85—*Tawhitia glaucophanes*, ♂, Macetown.

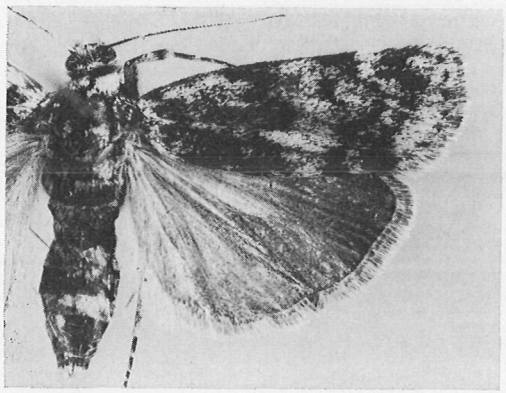

FIG. 86—*Tawhitia glaucophanes*, ♀, Mt. Luxmore.

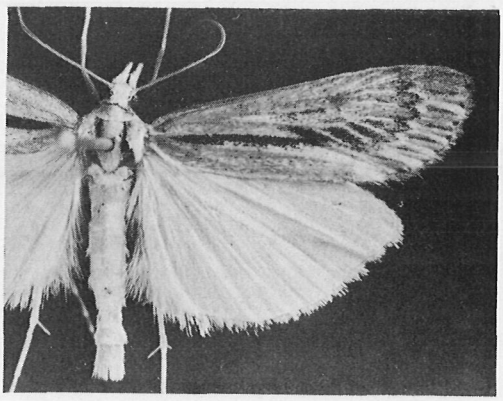

FIG. 87—*Tawhitia pentadactyla*, Christchurch.