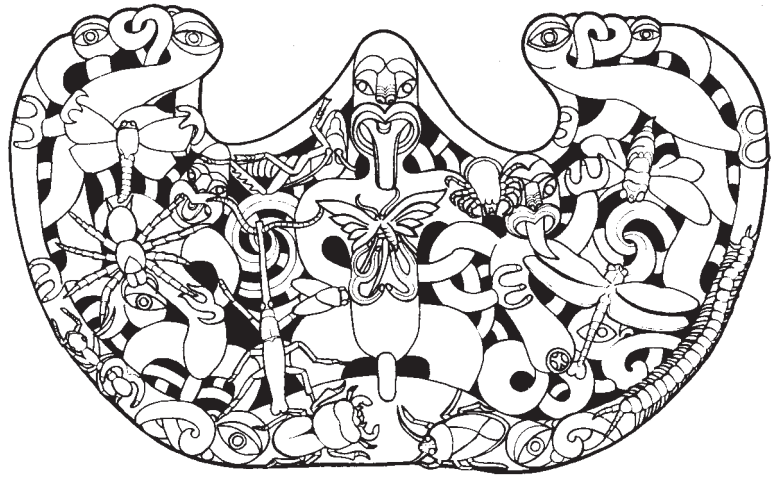

Fauna of New Zealand

Ko te Aitanga Pepeke o Aotearoa

Fauna of New Zealand
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Number / Nama 65

Izatha

(Insecta: Lepidoptera: Gelechioidea: Oecophoridae)

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with colour plates by B.E. Rhode

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POPULAR SUMMARY

Class **Insecta**

Order **Lepidoptera**

Superfamily **Gelechioidea**

Family **Oecophoridae**

Genus ***Izatha*** Walker

Lichen tuft moths

The moths of the genus *Izatha* treated in this volume have been popularly named 'lichen tuft moths'. Most of them are beautifully camouflaged when resting on the trunks of our forest trees and shrubs, not only because of their colours, which mimic bark or lichen, but also because of the tufts of raised scales on their wings and mouthparts, which imitate the raised and irregular surface of lichens. The genus *Izatha* only occurs in New Zealand, and is one of our very special and diverse groups of endemic moths, with 40 species now recognised. The bright green and black species are often illustrated in popular guides to New Zealand insects; formerly these were usually considered to belong to a single species, but there are in fact 3 species (*Izatha huttonii*, *I. peroneanella*, and *I. taingo*), distinguished clearly for the first time in this book. Caterpillars of *Izatha* almost all tunnel in dead wood, where they are probably largely digesting the fungal element; one or two caterpillars have been found in bracket fungi and others are known or suspected to feed on lichens. Therefore, *Izatha* species form part of New Zealand's decomposer community, which are essential for recycling the nutrients in our forests and shrublands. Despite their interesting form and ecological significance, the study of these moths has been neglected, and 15 new species are described in this volume, which represents an increase of 60% over the 25 previously known.

Amongst the most extraordinary features of *Izatha* described in this volume are the strange and extreme genitalia, especially of the males. The phallus (penis) is often ornamented with strong ridges bearing backward-pointing

(continued overleaf)

HE WHAKARĀPOPOTOTANGA

Illustration / Whakaahua: *Izatha caustopa* (Meyrick, 1892), male (Illustrator / Kaiwhakaahua: B. E. Rhode).

Ngā pūrēhua wekuweku pukoko

Kua karangatia ngā pūrēhua o te puninga *Izatha* e tirohia ana i tēnei putanga ko ngā 'pūrēhua wekuweku pukoko'. Ko te nuinga, ka huna pai noa iho i te piringa atu ki ngā kahiwi o ngā rākau i te ngahere. I pai ai te huna, nā ngā tae e rite ana ki te peha o te rākau, ki te pukoko rānei ka tahi, nā ngā pū unahi rerewa i ngā parihau me te waha e rite ana ki te mata torehapehape o te pukoko. Kei Aotearoa anake te puninga *Izatha*, koia tētahi o ngā kāhui pūrēhua ahurei, matahuhua tonu o tēnei motu. E 40 ōna momo e mōhiotia ana. Kua whakaahuatia nuitia ngā momo he kākāriki kitakita, he pango ngā tae, i roto i ngā aratohu mō ngā pepeke o Aotearoa. I mua atu, tērā te whakaaro kotahi anō tēnei momo, engari kua kitea iāianei e toru kē (arā, ko *Izatha huttonii*, ko *I. peroneanella*, me *I. taingo*), ā, ko tēnei pukapuka nei te wāhi tuatahi kua tuhia ngā kōrero hei āta wehewehe i tēnā, i tēnā. Ko tā te tino nuinga o ngā torongū o ngāi *Izatha*, he wiri atu ki roto i te rākau kua mate, ko te wāhi harore kē pea o te rākau tāna kai; e rua pea ia nei ngā torongū kua kitea i roto i ngā harore o te whānau pukupae, ā, arā anō ētahi e whakapaetia ana he kai pukoko. Nā runga i ēnei kitenga, kua uru a ngāi *Izatha* ki te hapori kaiwhakapopo o Aotearoa, nā rātou te mahi nui ki te whakahoki i ngā painga o ngā hanga mate ki te ngahere me ngā whenua mauwha. Ahakoa te korokē o te hanga me te wāhi nui ki a rātou i te pūnaha hauropi, kua hapa ēnei pūrēhua i roto i ngā mahi rangahau. Tekau mā rima ngā momo hou e whakaahuatia ana i tēnei putanga — e 25 i mōhiotia i mua atu i tēnei, nō reira e 60% te pikinga ake.

(haere tonu)

teeth, and damage presumed to be from these teeth has been observed in the female genital tract. Some females have the genital tract reinforced, presumably to minimise potential damage from the males during mating. This 'sexual antagonism' may have evolved as a way for the male to 'dissuade' the female from mating more than once, thus ensuring that his sperm fertilise her ova. However, females are known to mate more than once in *Izatha*! Another peculiarity of the males of some *Izatha* species is their possession of up to 48 sword-like spines inside the phallus, which are deposited in the female genital tract during mating. These detachable spines (the 'deciduous cornuti') are known from some other moths, but their function is still not understood. Males deposit all their cornuti at once, but can still mate again after this. So these little moths, often overlooked or taken for granted, have strange and fascinating sex lives that are worthy of further study.

Some *Izatha* species are apparently rare, and may be in need of special conservation. A small brown species (*I. rigescens*) was found on the Wellington coast in 1929; it has not been seen since. The pale grey *I. psychra* is only known from a small patch of shrubland near Lake Pukaki in the Mackenzie Country; it was formerly found at one other site where it has not been seen since the 19th century. The rather large brown *I. caustopa* used to be found in Wellington on certain old kotukutuku (*Fuchsia*) trees, where the larvae tunnelled in dead branches; it has also been found at Ohakune and Puketitiri, but only 3 have been seen in the last 70 years. Since kotukutuku is declining as a result of browsing by possums, the moth may be in trouble.

Contributor **Robert Hoare** was born in Winchester in the south of England. He was educated at Eton, and then attended Oxford University where he completed a degree in Classics (Latin and Greek literature and philosophy). He followed this, logically enough, with a degree in Biological Sciences at Exeter University. An early interest in butterflies was fostered by his father Ian, who painstakingly reared many species through from egg to adult. The acquisition of a Robinson pattern mercury vapour moth trap at a formative point in life transformed him instantly into a mothman, after which he progressed inexorably towards the study of smaller and smaller moths, culminating in his PhD thesis on the Nepticulidae of Australia at the Australian National University in Canberra (nepticulids are the smallest moths of all). Since joining Landcare Research in 1998, Robert has concentrated his research efforts on slightly less tiny moths, especially those in the family

(continued overleaf)

Ko ētahi o ngā āhuatanga tino korokē o ngāi *Izatha*, kei ngā taihemahema, ā, ko ō ngā toa ngā mea tino rerekē. He mea whakanakonako te ure o ētahi ki ētahi pāhiwihiwi, ā, he momo niho kei ngā hiwi nei, he niho anga whakamuri. Waihoki, kua kitea he tohu i te aroaro o ngā uwha, e whakapaetia ana ko ngā takakinotanga a aua niho. He kaha tonu ngā aroaro o ngā uwha o ētahi momo, kia kore ai pea e raru rawa te uwha i te ainga. Ko tētahi whakapae, tērā pea i pēnei ai te uaua o te ai, kia kore ai te uwha e tahuri ki te kimi hoa ai atu anō mōna — ā, mā konei e toa ai ngā tātea o te toa tuatahi. Engari arā ētahi uwha *Izatha* e mōhiotia ana kua tukuruatia te ai. Ko tētahi atu āhuatanga rerekē o ngā toa o ētahi momo, ko te noho mai o ētahi tarakina, e 48 rawa pea, ki te ure, ā, i te kuhunga atu o te ure ki te tara, ka whakarērea atu ki reira. Kei ētahi atu momo pūrēhua ēnei 'pihi ngahoro', engari kāore e mōhiotia ana te kaupapa a ēnei hanga. Tukuna katoatia ai ngā tarakina nei i te tuhanga kotahi a te ure, engari ka pai tonu te ai anō a te toa, ahakoa kua riro katoa ngā mea rā. E kite ake nei tātou, ko te taha ai o ēnei pūrēhua, e tama, ehara i te hanga noa — me haere tonu pea ngā rangahau ka tika.

E whakaarotia ana he onge ētahi momo *Izatha*, ā, e tika ana pea kia āta tiakina. Arā hoki tētahi momo parauri ririki (*I. rigescens*) i kitea i te tahatika o Te Upoko-o-te-Ika i te tau 1929; engari mai i tērā wā, korekore nei i kitea. Tērā anō tētahi momo kiwikiwi tea (*I. psychra*) kei tētahi papa mauwha iti e pātata ana ki Roto Pūkakī, i te takiwā o Aorangi; i mua atu i kitea i tētahi atu wāhi kotahi nei, engari nō te rautau 19 te kitenga whakamutunga i a ia i reira. He momo parauri āhua rahi a *I. caustopa*, ā, i kitea ia i Te Upoko-o-te-Ika i ētahi kōtukutuku kua kaumātua, he mea wiri atu ngā torongū ki ngā peka mate; kua kitea anō i Ōhakune me Puketitiri, engari e 3 noa iho kua kitea i te 70 tau kua hipa. I te mea kei te pāhekeheke te kōtukutuku (i te kaikainga e te paihamu), tērā pea kei te pāhekeheke anō taua pūrēhua.

Translation by **H. Jacob**
Ōtaki

Oecophoridae, but retains a broad interest in all Lepidoptera, particularly leaf-miners and detritus-feeders. More recently he has commenced a study of the New Zealand Noctuidae. Since 2000 he has lectured annually on systematic entomology at the University of Auckland, and also frequently gives talks to primary school children about insects. When not engaged in moth collecting, research, or teaching, Robert enjoys dancing, drawing, and composing light verse.

Frontispiece. Female of *Izatha prasophyta* (Meyrick, 1884), Herekino Forest, Northland, 6 February 2006. (Photograph: R. J. B. Hoare).

FrontisSonnet for *Izatha prasophyta*

(see frontispiece above, description p. 71–72)

O little dame of lilac, green and black,
As soon as I behold thy tufty wings,
I am amazed and fall upon my back,
Unused to such refulgent sculpted things.
And as I fall, imagination teems
With patterns made by scales like olive dust;
They swirl in bright kaleidoscopic dreams,
Until I meet the ground and lie concussed.
Is aught so lichen-like, or so refined
In loveliness as thee, is aught so rare?
Such are the playthings of my idle mind
As I recover in Intensive Care.
I yearn once more to seek thy habitat,
Sweet dame... but not without a padded hat.

R. J. B. Hoare

ABSTRACT

The endemic New Zealand genus *Izatha* Walker (Oecophoridae) is revised. Forty species are recognised, including the following 15 species described as new: *Izatha blepharidota* n. sp., *I. dasydisca* n. sp., *I. dulcior* n. sp., *I. gekkonella* n. sp., *I. gibbsi* n. sp., *I. haumu* n. sp., *I. katadiktya* n. sp., *I. lignyarcha* n. sp., *I. minimira* n. sp., *I. notodoxa* n. sp., *I. quinquejacula* n. sp., *I. spheniscella* n. sp., *I. taingo* n. sp., *I. voluptuosa* n. sp. and *I. walkerae* n. sp. Three new synonymies are established: *Zirosaris amorbas* Meyrick and *Trachypepla amorbas* Meyrick are sunk as junior subjective synonyms of *I. copiosella* (Walker) and *I. plumbosa* Philpott as a junior subjective synonym of *I. mira* Philpott. *Izatha huttonii* Butler is removed from synonymy with *I. peroneanella* (Walker), and *I. acmonias* Philpott from synonymy with *I. picarella* (Walker). *Izatha griseata* Hudson is removed from Oecophoridae and transferred to Gelechiidae as a junior subjective synonym of *Anarsia dryinopa* Lower. The adults of all species are described and illustrated in colour, along with the genitalia of both sexes, where known. Larvae are briefly described for all species for which positive associations have been made. Seven informal species-groups are recognised, based on characters of the head, wing pattern, and male and female genitalia.

The larvae of most species that have been reared feed in dead rotten wood, but the larvae of *I. gekkonella* n. sp. and probably *I. convulsella* (Walker) and *I. phaeoptila* (Meyrick) feed on lichens (and/or epiphytic mosses), and *I. prasophyta* Meyrick was once reared from a fruiting body of the bracket fungus *Bjerkandera adusta*. The systematic position of *Izatha* is discussed: it is assigned to the *Hierodoris* group of Hoare, and is considered most closely related to dead-wood feeding members of the genus *Gymnobathra* Meyrick, which is also endemic to New Zealand.

The diversity and distribution patterns of *Izatha* are discussed. It is the second largest genus of true (i.e. non-pyraloid) Microlepidoptera in New Zealand after *Tingena* (Oecophoridae), though *Stigmella* (Nepticulidae) when revised will probably rival *Izatha* in diversity. Among New Zealand Lepidoptera genera containing over 30 species, *Izatha* is unique in having more species endemic to the North Island than to the South Island: 22 species are confined to the North Island (including offshore islands), 10 to the South Island, and 6 are shared between both islands; 2 further species are endemic to the subantarctic Snares Islands. This pattern of diversity is similar to that observed in other insect groups associated with dead wood and fungi in forest habitats, e.g., Aradidae (Hemiptera: Heteroptera), and may reflect the persistence of greater areas of forest refugia in the North Island (especially Northland) during the last glaciation.

Izatha displays remarkable diversity in the structure of the genitalia, and this is discussed with respect to sexual selection and sexually antagonistic coevolution. Males of many species have strongly spinose phalli, and there is evidence of corresponding damage to the female genital tract. Females of some species have the ductus bursae strongly reinforced with sclerotised scobinations. A group of 11 predominantly North Island species have deciduous cornuti in the male vesica, which are left behind in the female tract after mating; all cornuti are apparently committed to the first mating. From spermatophore counts, the females are known to mate up to 4 times.

Adult *Izatha* are cryptically patterned bark and/or lichen mimics. Most species have raised scale-tufts on labial palpi, legs, and forewings that enhance the crypsis; the forewing tufts consist of strongly curled scales. The shining leaden or

golden iridescent undersides of the curled scales may further break up the pattern; the iridescence is due to the very fine corrugations of the lower scale lamina, which act as a diffraction grating.

Most species of *Izatha* are widespread, although some are known from very few localities. Species likely to be endemic to restricted areas are *I. quinquejacula* n.sp. (Three Kings Islands), *I. haumu* n. sp. and *I. taingo* n. sp. (Aupouri peninsula), *I. dulcior* n. sp. (Poor Knights Islands), and *I. oleariae* Dugdale and *I. spheniscella* n. sp. (Snares Islands). Three species are considered of immediate conservation concern: *I. rigescens* Meyrick, not collected since its discovery on the Wellington coast in 1929, *I. psychra* (Meyrick), currently only known from a single Mackenzie Country shrubland, which is vulnerable to fire and pine invasion, and *I. caustopa* (Meyrick), which has been seen only 3 times in the last 70 years, and may have been affected by the decline of its only known host tree, *Fuchsia excorticata*, due to attack by introduced possums.

Keywords. Lepidoptera, Gelechioidea, Oecophoridae, New Zealand, classification, distribution, ecology, biology, new species, keys, conservation, saproxyly, sexual selection, sexual antagonism.

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CHECKLIST OF TAXA

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I would like to thank Ainsley Seago for her generosity in taking the SEM images reproduced as Fig. 110–111 in her own spare time, and John Early for allowing me to borrow and reproduce his photograph of the windswept type locality of *Izatha spheniscella* n. sp. Brian Patrick provided useful notes on the biology of *I. gekkonella* n. sp. Thanks also to Katy Dika, who helped me with curation during her visit to New Zealand.

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INTRODUCTION

Historical notes

Izatha was described by Francis Walker (Walker, 1864a) for the single species *I. attactella.* Walker apparently picked the genus name (in common with others) at random from a list of ancient place-names, perhaps that of the early geographer Ptolemy; Izatha was a town in Mauritania, North Africa. Walker (1864a, 1864b) described 6 other species now placed in *Izatha* (*adapertella, convulsella, copiosella, lichenella, peroneanella,* and *picarella*), but failed to recognise their relationships and placed them in *Gelechia* (*convulsella, copiosella, adapertella, peroneanella*), *Oecophora* (*picarella*), and *Cryptolechia* (*lichenella*). The extent of his confusion is revealed by the fact that *lichenella* and *adapertella* (placed by him in separate genera) are synonymous with *peroneanella*.

No subsequent author has had such trouble with the genus. Only two species have ever been incorrectly referred to *Izatha* (*planetella* Hudson and *griseata* Hudson; see below), but Meyrick (1884, 1910) erected three new genera that are now considered synonymous with it. One of these (*Semiocosma* Meyrick, 1883a) was described because Meyrick had not yet satisfied himself as to the identity of Walker's *attactella* (Meyrick, 1884: 46), and anyway had scant regard for the usefulness of Walker's descriptions. A second genus (*Zirosaris* Meyrick, 1910) was erected to receive a species (*amorbas* Meyrick, 1910, here synonymised with *copiosella* Walker) that differs in labial palp and other characters from 'typical' *Izatha,* and is here treated as a member of a distinctive species-group. Both *Semiocosma* and *Zirosaris* were subsequently synonymised with *Izatha* by Meyrick (1905, 1920). The third genus (*Aochleta* Meyrick, 1883a) was described for the single species *psychra*, at the time known only from one specimen; again the genus was distinguished by characters of the labial palpi, and Meyrick considered it to be "doubtless a development of *Semiocosma*". *Aochleta* was synonymised with *Izatha* by Dugdale (1988).

Meyrick described 16 species of *Izatha* between 1884 and 1929; 3 of these names (*mystis, paraneura*, and *platyptera*) he subsequently recognised as synonyms of species described by Walker, and 1 (*percnitis*) as a species (*metadelta*) that he himself had described earlier. Philpott (1913, 1926, 1927a) described 5 new species (*heroica, milligani, mira, florida,* and *plumbosa*); of these, *milligani* is a junior synonym of *balanophora* Meyrick (Hudson 1939), and *plumbosa* is here synonymised with *mira*.

G. V. Hudson had a particular fondness for *Izatha,* as revealed in his introductory remarks on the genus: "Most of the species imitate lichens, and in many the colouring is very beautiful. One of them, *Izatha peroneanella,* may be ranked as one of the loveliest of the New Zealand Lepidoptera.... Much pleasure awaits the field naturalist who investigates these insects, as the beauty of their perfect adaptations can only be properly appreciated by a study of living specimens, in their natural surroundings" (Hudson, 1928: 277–278). Hudson reared a number of species and described the larvae of *attactella, austera, convulsella, metadelta, peroneanella* (or perhaps *huttonii*), and *phaeoptila* (Hudson 1928); he can also be credited with the discovery of *balanophora, caustopa, manubriata, mesoschista, metadelta, phaeoptila,* and *rigescens*, all described by Meyrick from Hudson specimens. He only named two species in *Izatha* himself, but both were incorrectly placed: the first, *I. planetella*, described in 1923, is a junior synonym of *Barea exarcha* Meyrick (Philpott 1927a, Dugdale 1988). The second, *I. griseata,* is here recognised as a synonym of the adventive Australian gelechiid *Anarsia dryinopa* Lower (see Appendix 1).

Since 1939, only one previously unrecognised species of *Izatha* has been described; this is *I. oleariae,* endemic to the subantarctic Snares Islands. This species was collected by P. M. Johns and named by Dugdale (1971). Later, Dugdale (1988) briefly diagnosed two new species of *Izatha* (*churtoni* and *hudsoni*); these had previously been recognised as distinct, but *churtoni* (*picarella* var. β of

Walker, 1864a) lacked an available name, and *hudsoni* had been known under the misapplied name *huttonii* Butler. Dugdale (1988) recognised 1 further undescribed species in collections, i.e. *copiosella* in the sense of Hudson (not of Walker): this is described in this work as *voluptuosa* n. sp.

It is perhaps suprising that as many as 14 further new species of *Izatha* have since been discovered in collections, although several of these are obscure in appearance or very similar to described taxa. Given that several species are known only from a handful of specimens and localities, the discovery of more new taxa is likely.

METHODS AND CONVENTIONS

Collection

Many *Izatha* species have been collected at light after dark, a 125W mercury vapour bulb being highly effective. However, some species are rarely or never collected by this method, and are possibly largely diurnal in habit. This may account for the apparent rarity of species such as *I. walkerae* n. sp., which has been collected in a Malaise trap and in a car, and *I. dasydisca* n. sp., which has been taken at rest on a tree trunk and by sweeping. Searching tree trunks and fences, especially those with a covering of lichen, is another method by which *Izatha* species may be found, and many specimens were probably taken this way by the earlier collectors. Hudson collected *I. caustopa* on the trunks of *Fuchsia* trees from the dead branches of which they had recently emerged (Hudson 1928).

Rearing

With larvae feeding in dead wood, better results have been obtained by keeping the substrate humid rather than allowing it to become too dry. However, it is better to collect wood containing larvae on a dry day to avoid excessive humidity and the attendant risk of mould. Adults have been reared by placing pieces of dead wood or twigs containing larvae in closed plastic containers on absorbent kitchen paper. Condensation should be wiped away when it forms on the inside of the container. Alternatively, a hole may be cut in the lid of the container and netting material fastened over the hole; the substrate must then be kept moist by regular spraying with water.

Specimen preparation

Moths collected for this study by the author were usually killed in ammonia and the wings spread on balsa-wood setting boards, using a 'setting bristle' to brace the wings as they were moved into position, and strips of tracing paper to hold them in place, following the method described, e.g., by Sokoloff (1980). To avoid flattening the scale-tufts on the forewings, the tracing paper can be pinned across only the terminal portion of the wings. Ammonia will quickly alter the green colour of members of the *I. peroneanella* complex, and adults of these species should preferably be placed in a freezer overnight or killed with another agent such as ethyl acetate.

Preparation of slides of genitalia followed the methods described by Hoare (2000) for Nepticulidae, except that a solution of 3% acid fuchsin in 70% ethanol was substituted for the acid fuchsin-azophloxin stain described there, and no lactophenol was used. The valvae of males were spread in the usual manner for microlepidoptera (e.g., Robinson 1976). Wing venation preparations followed the methods described by Common (1990). Larvae were killed in boiling water, and preserved and examined whole in 70% ethanol; pupal exuviae were examined either dry or immersed in glycerol.

Identification

Most specimens of *Izatha* in good condition can be identified to species by comparison with the colour figures provided here (Fig. 1–83). In cases of uncertainty, the identification can be checked by running the specimen through the key to adults (Key 1, p. 24), or by consulting the descriptions and diagnoses. Some species appear to lack external distinguishing characters (e.g., *acmonias*, *lignyarcha*, *picarella*); these can be determined on genitalia (using the illustrations or Key 2, p. 27), or, with caution, from locality, since records indicate they are allopatric. In the case of very worn or aberrant specimens, or those preserved in fluid, it may be necessary to dissect out the genitalia and (for males) identify using the key to genitalia (Key 2), or compare the dissection with the genitalia figures.

Conventions and terminology

Morphological terminology largely follows Common (1994, 1997, 2000), but the term 'bulbus ejaculatorius' is used here for the membranous structure connected to the outer wall of the phallus at or near its base (cf. Oiticica 1946), whilst the ductus ejaculatorius is the membranous tube that runs inside this into the phallus, and forms the primary gonopore at the point where it merges with the vesica (cf. Callahan 1958). Kristensen (2003) regards the intromittent organ in male Lepidoptera as a phallus rather than a true aedeagus; his terminology is followed here. Other terms that are novel or may cause confusion are explained below.

Juxto-costal plate. This term is coined here for the structure in the valva of the male genitalia running from the base of the lateral lobe of the juxta to the costa (Fig. 124). The same structure was termed the 'basal costal process' by Dugdale (1971: 133, description of *I. oleariae*), and was

noted by Philpott (1927b: 103), who stated 'it is probably a development of the editum, which in *Borkhausenia* [i.e. *Tingena*] and other related genera consists only of a slight fold clothed with a few short hairs.' Philpott's 'editum' is here termed the pulvinus, following Common (1994: fig. 13). Since the pulvinus is often well-developed and distinct from the juxto-costal plate in *Izatha*, I disagree with Philpott's interpretation, and regard the plate as probably homologous with the 'fusiform appendages' described by Common (2000: 14) for the *Barea* group of Oecophoridae. The 'fusiform appendages' run between the juxta and the pulvinus, as does the juxto-costal plate. Because the plate is rarely fusiform, and because it is dubiously homologous with the basal costal process in other genera, I have coined a neutral term for the structure. The juxto-costal plate is also present in *Gymnobathra* Meyrick *s.s.* (see below for restricted definition of *Gymnobathra*), but not in *Hierodoris*.

Phallus: lobes. Most species of *Izatha* have the apex of the phallus divided more or less distinctly into 3 sclerotised lobes (Fig. 126). The arrangement of these lobes does not appear to be constant in the genus, i.e., they are presumed to rotate during the course of evolution with respect to the base of the phallus. Since the degree of sclerotisation and number of teeth borne by each lobe also varies considerably, it is very difficult to assess the homology of the lobes across the different species and adopt a consistent nomenclature. Therefore, the lobes have been described 'naïvely' for each species, as observed in slide preparations with the ventral surface of the phallus uppermost, and no assumption should be made, e.g., that the 'left lobe' of one species is homologous with the 'left lobe' of another. Further careful comparative work will be needed to establish these homologies.

Phallus / vesica: spines and teeth. The terms 'spine' and 'spinule' are here used for narrow-based pointed processes, whilst 'teeth' are broad-based pointed processes, often hook-like (i.e., asymmetrical). Most of the small exterior processes on the phallus in *Izatha* can be regarded as teeth on this definition. The direction of the asymmetrical teeth is described with the phallus apex pointing upwards (as in most slide preparations), i.e., 'backward-pointing teeth' are those with tips directed back towards the phallus base. The vesica of many species bears rows of translucent spinules (Fig. 127), which may be mechanoreceptive sensilla.

Vesica: compound cornutus. This term is coined here for a structure present only in the *attactella*-group (Fig. 130, 132) and in *Izatha convulsella* (Fig. 199), and consisting of a number of closely associated small leaf-like or spine-like fixed cornuti. The structure resembles the group of overlapping cornuti described for *Hierodoris electrica* (Meyrick), *H. s-fractum* Hoare, and *H. pachystegiae* Hoare by Hoare (2005). There is 1 compound cornutus in *Izatha attactella* and *I. convulsella*, and 2 in *I. blepharidota* and *I. voluptuosa*. The structure in *convulsella* is different to that in the *attactella*-group and may not be homologous.

Vesica: fishhook cornutus. This is a blade-like fixed cornutus in the vesica, typically with a strongly curved and robust base (Fig. 125–127). Often the apex is very fine and poorly sclerotised, terminating in a tiny bead-like tip. It is positioned towards the apex of the phallus, i.e., near the base of the everted vesica.

Vesica: deciduous cornuti. These cornuti (Fig. 126) are present only in the *balanophora*-group. They number from 3 to possibly 48 in the various species, and are usually blade-like with buttressed bases; they are associated with a similar number of disc-like pores (Fig. 127) in the vesica wall. These cornuti become detached during copulation and are released in the female genital tract, where they are often found on dissection. Intriguingly, the cornuti are never found closely approximated to the pores in KOH-treated specimens, and indeed the pores appear to be too small and closely packed to represent sockets in the strict sense, since the buttressed bases of the cornuti seem much too large to fit directly against them, even allowing for some overlap of the 'buttresses'. Since there is always one pore per cornutus, there must be some form of connection, and it is presumed that some intervening structure, destroyed by KOH, exists. In some slide preparations, the Chlorazol Black stain shows up what appears to be an indistinct mushroom-shaped vesicle emerging from the *outer* side of each pore into the lumen between the vesica and the phallus wall (Fig. 128). Unless an artefact of staining, these vesicles seem likely to have some function related to the detachment of the cornuti. Such structures do not seem to have been reported previously in Lepidoptera, and they require further investigation.

Female genitalia: S8. In most *Izatha* species, the ostium is margined anteriorly by a narrow sclerotised strip, often strongly curved, here called the lamella antevaginalis. The posterior sclerotised portion of the segment is simply termed 'S8'; this usually has a broad anterior evagination of the same width as the ostium. The anterolateral arms of S8 are often somewhat recurved and concave where they meet the lamella antevaginalis, forming what are here termed the 'scoop-like lateral flanges' (Fig. 129). The term 'lamella postvaginalis' is reserved for sclerotisation of S8 separate from this posterior sclerotised portion, and immediately adjacent to the ostium; such sclerotisation is only known in the *oleariae*-group.

Female genitalia: antrum / ductus bursae / corpus bursae. The antrum is here defined as the section of the female genital tract from the ostium to the level of the ductus seminalis inception; the ductus bursae runs from here to the corpus bursae. The transition from ductus to corpus bursae is here taken as indicated by the cessation of folding and / or lightening of Chlorazol Black stain.

Larvae. In larval descriptions adapted from Hudson (1928), only coloration is given; Hudson's references to 'bristles' (i.e., setae) and 'warts' (i.e., pinacula) are generally omitted, since they are not detailed enough to provide species-level characters. The chaetotaxy and arrangement of plates and pinacula are covered in the genus description, and are not known to vary substantially between species.

A standardised list of characters has been described for all species. Additional characters of interest, unique to a particular species or species-pair, are occasionally included (e.g., lobes at the base of the uncus in *I. rigescens*); such characters are placed in parentheses. Ranges of wingspan and forewing length given for each species represent the extremes for the material examined.

Repository of specimens and label data

The following acronyms are used for collections where specimens are held:

AMNZ: Auckland Museum, Auckland, New Zealand

BLNZ: Brian Lyford private collection, Queenstown, New Zealand

BMNH: British Museum (Natural History), London, England

CMNZ: Canterbury Museum, Christchurch, New Zealand

LUNZ: Entomology Research Museum, Lincoln University, New Zealand

MONZ: Museum of New Zealand, Wellington, New Zealand

NHNZ: Neville Hudson private collection, Auckland, New Zealand

NZAC: New Zealand Arthropod Collection, Landcare Research, Auckland, New Zealand

OMNZ: Otago Museum, Dunedin, New Zealand

Data for primary types are quoted exactly, from the top label down, the data on separate labels being segregated by slashes [/]. Paratype label data are given as far as possible in standard format. The following abbreviations are used for names of frequently mentioned collectors: AP, Alfred Philpott; BHP, Brian H. Patrick; GWG, George W. Gibbs; GH, Grace Hall; GVH, George V. Hudson; HP, Hamish Patrick; JSD, John S. Dugdale; KJF, Kenneth J. Fox; RJBH, Robert J. B. Hoare. Where 'HP' appears twice on the data of a single specimen, the second 'HP' is Holly Patrick.

Two-letter codes for collecting localities within New Zealand follow Crosby *et al.* (1998).

Type specimens

Primary type specimens have been examined for all available names, except *adapertella* Walker, 1864 and *amorbas* Meyrick, 1910, for which the holotypes are apparently lost. Unless a genitalia slide number is quoted in the type label data below, the primary type has not been dissected for genitalia examination. In all cases where genitalia have not been examined, the identity of the type specimen is deemed to be unambiguous based on external characters and/or locality. For all species, males and females from a selection of localities throughout the distributional range have been dissected to establish variation and species boundaries.

Species concept and order

The species concept adopted here is a morphological one, i.e., I have treated as separate species only those entities showing constant and easily definable morphological differences, with particular weight being given to genitalic characters (cf., Scoble *et al*. 1995; Hoare 2005). Morphological separation is taken to be indicative of reproductive isolation, as per the Biological Species Concept.

The order of species groups has been determined on the following basis. The first 5 species groups are those considered most likely to prove monophyletic, and these are arranged roughly in order of increasing morphological complexity and/or specialisation, keeping related groups (e.g., the *mira*- and *apodoxa*-groups) close together. The *oleariae*-group is anomalous, and apparently without close relatives, so is placed last in this series. The remaining 2 groups contain the less easily placed taxa and are the most tentative; the groups are placed in alphabetical order of the species after which they are named. Within their species groups, species that are believed to be closely related are grouped together; otherwise alphabetical order is followed. Whilst the order adopted here is admittedly based on subjective criteria, and must be subject to revision following phylogenetic studies, it should maximise ease of identification by placing related and similar species close together in the figures and text, and was therefore considered preferable to a purely alphabetical arrangement.

Plant names

Scientific names of plants follow the New Zealand Plants (2004) website.

SYSTEMATICS

Genus *Izatha* Walker

Izatha Walker, 1864a: 786 (type species *Izatha attactella* Walker, by original monotypy).

Aochleta Meyrick, 1883a: 523 (type species *Aochleta psychra* Meyrick, by original monotypy). Synonymised by Dugdale (1988: 94).

Semiocosma Meyrick, 1883a: 523 (type species *Gelechia peroneanella* Walker, by subsequent designation by Meyrick (1915: 215). Synonymised by Meyrick (1905: 238).

Zirosaris Meyrick, 1910: 66 (type species *Zirosaris amorbas* Meyrick, by original monotypy). Synonymised by implication by Meyrick (1920: 31).

Note. Meyrick included *Aochleta* and *Semiocosma* in a key to Australian genera of Oecophoridae (Meyrick 1883b), and this is the earliest published occurrence of the names (cf., Dugdale 1988: 94). However, since no included species were cited, the names are not available from this publication under the International Code of Zoological Nomenclature (ICZN, 1999), Article 12. The names next appear in an abstract of a paper read before the Philosophical Institute of Canterbury in May 1883 (Meyrick 1883a). Here, although the genera themselves are not characterised, there are included species, and therefore the genus names are available from this date under Article 12, clauses 12.2.5 and 12.2.6 of the Code. The full paper including the complete descriptions was not published until May 1884 (Meyrick 1884).

Diagnosis. The following adult characters in combination distinguish *Izatha* from other genera of the *Hierodoris* group (for diagnosis of the *Hierodoris* group, see Hoare 2005: table 2). Ocelli absent; tergites lacking stout spine-like scales; forewing without overlay of narrow scales; hindwing 1A+2A strongly deflected costad in middle; male genitalia lacking gnathos; uncus reduced, mostly membranous; base of valva with more or less distinct sclerotised plate (the juxto-costal plate) running from base of juxta lateral arm to costa, bearing 1–2 flanges (except *mira*, *prasophyta*); sacculus with at most 1 distal process; inner face of valva before apex lacking modified or dense setae; phallus lacking large discrete backward-pointing tooth; vesica with at most 1–2 elongate fixed cornuti, lacking dense small spine-like fixed cornuti.

The following adult characters, not present in all *Izatha* species, immediately identify a member of the *Hierodoris* group as belonging to this genus. Labial palp segment 3 with dorsal scale-tuft; forewing with 7 or more scale-tufts of curled scales with iridescent undersides; phallus divided apically into 3 sclerotised lobes; vesica with fixed fish-hook-like cornutus; vesica with blade-like deciduous cornuti and vesica wall with disc-like pores; female S8 with scoop-like anterolateral flanges; female genital tract containing deciduous cornuti from male; ductus seminalis arising ventrally and curving initially caudad; signum with bulbous apical boss.

Description

Adult. Head (Fig. 106). Ocelli absent. Chaetosemata absent. Interocular index ca 0.88 (*metadelta*) to 1.45 (*heroica*) (not measured for all species). Transfrontal sulcus well developed, other sulci absent. Vestiture: frons and vertex with more or less appressed lamellate scales directed forwards and downwards, scales of lower frons directed mesad from each side; scale-tufts emerging postero-laterally above eyes, spreading forward over antennal bases and mesad behind these, merging along posterior occipital margin with a line of narrower, posteriorly directed scales. Mouthparts: pilifers well developed; maxillary palpi short, 4-segmented; labial palpi 3-segmented, long, upcurved, with acute apical segment; scaling of segment 2 appressed above, appressed to suberect beneath; scaling of segment 3 mostly appressed, with or without dorsal scale-tuft at about mid-length; vom Rath's organ basal on segment 3, bowl-like with many sensilla; haustellum well developed, scaled almost to tip (at least laterally), and with prominent peg-like sensilla apically. Antennae ca 3/4–5/6 length of forewing; scape elongate, broadening distally, without pecten; pedicel longer and broader than flagellar segments; flagellum dorsally with 2 rows of scales per segment, scaling sparser ventrally; male flagellomeres with sensilla (ciliations) from ca 1/3–3× width of flagellum; female with very short sensilla.

Thorax. Prothorax laterally and dorsally clothed in appressed lamellate scales (the 'collar'). Mesothorax mostly covered with appressed lamellate scales, often with tuft of raised scales, usually of a dark colour, at apex of mesonotum. Metathorax anteriorly unscaled, laterally with mesally directed tufts of hair-scales; metascutellum with lamellate scales. Legs: Tibial spurs 0–2–4; fore-tibia with epiphysis; scales of tibial apex forming more or less distinct lateral tuft; mid-tibia with raised whorls of scales at mid-length and apex, usually paler than rest of leg; hind-tibia with less distinct whorls in these positions, but with extensive hair-scales on dorsal surface. Wings: forewing scales not forming strongly divergent classes in width and apical scalloping; scale-tufts present in most species, consisting of curled, raised scales with undersides shining and iridescent; where present, usually a subbasal tuft; a line of 3 tufts from below fold to lower margin of discal cell, a line of 3 tufts along upper margin of discal cell most distinct, occasionally other tufts present. Wing-coupling: in male, a

single frenulum from base of hindwing costa hooks under an elongate scaled subcostal fold of forewing (the retinaculum); associated with anterior part of retinaculum is a group of spreading narrow lamellate scales or hair-scales; female usually with 3 frenular bristles (occasionally 4, but no species always has 4 and number may be different on left and right of same specimen), retinaculum similar to that of male. Wing-venation (Fig. 107–109): forewing R4 stalked with R5, R5 running to apex or costa just before apex; M2 arising closer to M3 than to M1; discal cell with chorda weakly indicated; CuA1 arising at lower angle of discal cell, sometimes connate with M3, moderately to strongly curved near base; CuA2 running to tornus; CuP non-tubular except distally; 1A+2A with long basal fork. Hindwing Sc+R1 strong, parallel to costa and terminating on costa at 4/5; sometimes an oblique cross-vein between Sc+R1 and Rs just before 1/2 (*acmonias*); Rs to costa just above apex, more or less parallel to M1; M2 more or less strongly deflected costad from near base; M3 connate with CuA1 from lower angle of cell; CuA2 slightly sinuous, running to tornus; CuP straight, weak but tubular; 1A+2A strongly deflected costad in middle; a fold between this vein and 3A; 3A simple (most species) or forked (*balanophora*, *churtoni*).

Male abdomen and genitalia (Fig. 112–114, 116–128, 130–258): S2 apodemes well developed to strongly reduced; venulae well developed, long, curved mesally towards posterior end; segments 2–3 each with 2 pairs of tuberculate plates on pleura, 1 dorsal, 1 ventral; S8 usually squarish to rectangular, entire, occasionally with anterior invagination. Tergites with or without modified narrow, pointed scales centrally (usually on T2–7, or a subset of these, occasionally also on T1); modified scales deciduous, not spine-like; T8 a narrow I-shaped sclerite, or triangular, or without distinct sclerotisation. Uncus more or less membranous, with or without some dorsolateral sclerotisation, usually terminating in paired tufts of setae, or a single pair of setae; setae sessile or raised on distinct lobes. Anal tube free. Gnathos absent. Transtilla membranous, usually narrow. Vinculum produced into more or less V-shaped saccus; saccus short to very elongate and narrow. Valva with well differentiated sacculus, which terminates in single distal process of variable shape; process free or appressed to valva; outer (dorsal) margin of sacculus often with 1–3 extremely elongate setae; base of valva modified into more or less strongly sclerotised and differentiated plate (the juxto-costal plate) running from lateral corner of juxta to base of costa; plate bears 1–2 flanges of variable shape (usually digitate or triangular); flanges occasionally absent (*mira*, *prasophyta*); pulvinus present as a distinct setose lobe projecting caudally from membranous transtilla near where it meets the costa, or poorly differentiated from transtilla, or absent. Juxta: base-plate entire (most species) or divided medially by membrane (*attactella*-group and *peroneanella*-complex), occasionally much reduced; lateral arms present, of variable shape, setose, occasionally apically scobinate or spinose. Anellus membranous. Manica forming moderately sclerotised sheath around proximal half of phallus, sheath proximally including a pair of elongate lateral sclerites (Fig. 148, 158) (manica closely appressed to, and appearing to be part of phallus unless phallus is removed caudad, everting the manica). Phallus narrow to very broad, straight to curved; caecum penis usually present, occasionally absent. Apex very variable, usually divided into 2–3 sclerotised lobes separated by membranous strips; lobes smooth, or with fields of small backward-pointing teeth, which may be arranged on sclerotised ridges, or a single large spine on one or more lobes (*mesoschista*, *haumu*). Vesica without cornuti, or with single large fixed cornutus, usually fishhook-shaped, and/or with 1–2 'compound cornuti' (i.e. a ridge or comb-like group of small fixed cornuti), sometimes (*balanophora*-group) with ca 3–48 blade-like deciduous cornuti, usually with buttressed bases, associated with similar number of disc-like pores in vesica wall; often several rows of short translucent spinules (probably mechanoreceptive sensilla) in vesica wall. Bulbus ejaculatorius with or without distinct tubular portion, hood usually more or less sigmoid; ductus ejaculatorius very finely spinose in anteriormost portion.

Female abdomen and genitalia (Fig. 115, 129, 259–295): S2 apodemes well developed; venulae and tuberculate plates as in male. Narrow, modified scales of tergites, when present, as in male, but usually on fewer segments (i.e., not extending as far caudally). Segments 8–10 form very weakly to strongly extensile ovipositor; papillae anales of segment 10 narrow, setose, weakly sclerotised to membranous. Apophyses posteriores longer than anteriores; both sets of apophyses long and narrow. Segment 9 membranous, short to long. Caudal part of segment 8 with more or less numerous setae, mostly concentrated in 2 ventral patches. S8 a well sclerotised plate, usually anteriorly invaginated, with anterolateral corners produced, often forming scoop-like lateral flanges, sclerotisation weakest centrally, occasionally more or less divided into 2 club-shaped sclerites. Ostium bursae on intersegmental membrane between S7 and S8, narrow to very broad, subtended by strip-like, usually curved lamella antevaginalis; antrum usually weakly to strongly scobinate; ductus seminalis usually arising ventrally, occasionally laterally on right side, membranous throughout its course to oviduct, not swollen, i.e. bulla seminalis not developed; anterior portion of ductus bursae membranous to strongly scobinate; ductus

not coiled, broadening gradually or abruptly into corpus bursae. Corpus bursae membranous, usually with 2 fields of small interior spinules; signum present or absent; when present, very small to very large, usually diamond-shaped to cordate with transverse V-shaped spinose strip, sometimes with bulbous apical boss.

Egg. (Fig. 302). (Description based only on *I. copiosella* and *I. huttonii*). Oblong; white with a pinkish tinge when first laid. Surface with a tessellated sculpturing of contiguous triangles with raised sides.

Late instar larva. (Description based on associated material of *I. austera*, *I. oleariae*, and similar but unassociated larvae from dead wood from the Waitakere Ranges AK, especially rearing no. DW59 (dead *Coprosma grandifolia*)). **Head** (Fig. 98, 99): semiprognathous; brown with more or less strongly indicated pattern of darker brown stripes; cuticle with fine reticulate sculpturing. Prementum (Fig. 99) with oblong sclerite, containing 2 parallel longitudinal slits with strongly sclerotised margins; anterior margin of sclerite with pair of projections each terminating in a seta. Chaetotaxy as in Fig. 98, 99; L1 rather anterior, close to S2 and A3; stemmata 1–4 and 6 forming semicircle; stemma 5 displaced ventrally.

Thorax (Fig. 100, 101): Prothoracic plate with medial dorsal split, not quite reaching anterior margin; spiracular plate fused with prothoracic plate anteriorly, posteriorly separated by narrow split that curves rather steeply up over spiracle, then more gently down to point dorsad of L2; L1–3 below spiracle, in shallow V-formation (L1 very slightly below L2; L3 well above both); SV bisetose. Mesothorax: D, SD, and L setal groups borne on a single large pinaculum on each side; a pair of much smaller posterior dorsal pinacula; D2, SD1–2 and L1–3 dorsally displaced as compared to prothorax; a black pore between L1 and L3 present or absent; SV unisetose. Metathorax: as mesothorax, except D group, SD group, L1–2 and L3 borne on 4 separate pinacula. Thoracic legs: coxa with 7 setae; femur with 2 setae; tibia with 6 setae; tarsus with 4 setae (all setiform).

Abdomen (Fig. 100, 101): A1–8 with D1 pinacula broader than or about equal to D2 pinacula; SD1 very long, above and slightly anterior to spiracle on A1–7, more or less level with and anterior to spiracle on A8; SD2 minute, closely associated with and anterior to base of SD1; a minute dark-edged pore adjacent and just posteroventrad to SD1; SD pinaculum more or less crescentic to ♂-shaped, surrounding but not contiguous with SD setae; tail of ♂ passing behind spiracle; L2 above or somewhat anterior to the much longer L1; A1–6 with 3 SV setae, A7 with 2 SV setae, A8 with 1–2 SV setae; A1–8 with 1 V seta. Prolegs with crochets in a biordinal uniserial lateral penellipse, with very narrow lateral break. A9: SD1 unmodified or hairlike; L1-3 nearly vertically arranged; 1 SV and 1 V seta. A10: 4 dorsal setae on anal plate; proleg with 4 setae on inner (anterior) surface, 6 setae laterally and caudally, plus a lateral pore; cuticle between anal shield and prolegs finely spinulose.

Notes: Larvae of *Izatha* differ from *Hierodoris* in the distinct fusion of prothoracic spiracular and dorsal plates (areas of lighter sclerotisation in *Hierodoris* give the appearance of several separate plates; Hoare 2005: fig. 45); in the more dorsal position of L3 on T1 (much closer to spiracle than in *Hierodoris*); in the distinct fusion of D, SD and L pinacula on the mesothorax; and in the presence of 3 SV setae on A1 (2 only in *Hierodoris*).

One larva from a *Phellinus* fruiting body (Mt William AK) (presumed to be an *Izatha* sp. on other characters) has a pair of basally sclerotised, finely spinulose, slightly down- and in-curved processes arising from the inner (dorsal) surface of the anal prolegs. These are presumed to be a specialisation for flicking frass away from the feeding site.

Pupa. (Based on associated material of *I. attactella*, *I. blepharidota*, *I. huttonii*, *I. mesoschista*, *I. oleariae*, *I. voluptuosa*). **Head** (Fig. 104): Fronto-clypeal and clypeolabral sulci very weakly indicated; clypeus with 2 pairs of setae; frons with 2 pairs of setae; mandible (gena *sensu* Common 1990: fig. 7) with 1 seta; eyepiece with 2 setae; eyepiece either remains attached to antennal base and separates from gena on eclosion or stays with gena. Labial palpi exposed. Antennae curving inwards ventrally, meeting just anterior to tips of metathoracic legs, then diverging to apex.

Thorax (Fig. 102, 104): Prothorax, mesothorax, and metathorax each with 3 pairs of dorsal setae (2 on prothorax and 2–3 on mesothorax in *oleariae*). Fore femora narrowly exposed. Wings extending to posterior margin of A4 or A5 in ventral view.

Abdomen (Fig. 103, 105): Tergites without spines, but anterior margin of A5 dorsally with a series of ca 9–10 sclerotised transverse raised ridges; A1 (on each side) with 2 D setae only; A2 with 2 D setae, 1 SD seta and pore between SD1 and spiracle; A3 with 2 D, 1 SD seta plus pore, and 2 L setae (L setae contiguous with margin of hindwing); A4 as A3 but with 3 L setae; A5–6 as A4 but ventrally with proleg scars and 3 SV setae, V setae absent; A7 as A5–6 but without proleg scars, and with 2 SV setae, V seta present (absent in *oleariae*); A8 as A7 but with 1 SV seta; A9 with 5–6 setae (except *mesoschista*, which has 1 D seta, all other setae absent); A10 extended into strongly sclerotised, rugose, elongate, slightly upturned cremaster with 2 pairs of stout curled setae laterally near base, and 1 similar pair at 2/3; apex slightly forked, each fork with stout curled seta.

Notes. *Izatha* pupae differ from those of *Hierodoris* in the following characters (state in *Hierodoris* in parentheses): labial palpi exposed (concealed); A5 with a series of sclerotised transverse ridges (ridges absent); SD2 absent (present); A3–4 with L setae (without L setae); A5–6 without V setae (with 1 V seta); cremaster an elongate slightly forked process with curled setae (cremaster 2 pairs of stout spines, or curled setae only).

Biology. Almost all known *Izatha* larvae are detritivores and/or fungivores. Most occur in dead wood, some species apparently preferring drier wood of dead standing trees or shrubs, others being found in moist logs on the forest floor, though rarely in very large logs. Larvae tunnel into the softer portions of the wood; their feeding behaviour has rarely been observed, but from damage and frass associated with larvae it appears that, in some species at least, most feeding takes place near the surface, especially under any remaining bark, and deeper tunnels may be protective retreats (pers. obs. on *Coriaria* inhabited by *I. austera* and *I. churtoni*). There are probably species-specific differences in behaviour; Hudson (1928) records *I. attactella* feeding 'on the soft inner surface of the bark, but often leaving the solid wood untouched', whereas he says that *I. peroneanella* 'does not live immediately under the bark' (N.B. his remarks may apply to *I. huttonii*, q.v., which is commoner than *peroneanella* in Wellington where he collected).

Larvae of some *Izatha* species feed on lichens, although definitive observations are sparse. Hudson (1928: 282) records *I. phaeoptila* as feeding 'on lichens (?) growing on tree trunks'; the question-mark is significant, since the only reared specimen from Hudson's collection corresponds with a record in his register in MONZ reading 'bred from moss'. Further observations are required. The larva of *I. convulsella* was recorded living 'under the scales of the bark of Rimu trees (*Dacrydium cupressinum*)' (Hudson, 1928: 282); it is likely that lichens rather than the bark itself were the true pabulum, since the sister-species of *convulsella*, *I. gekkonella* n. sp., has been reared from licheniferous rock-faces in Otago by B. H. Patrick. A similar larval habit occurs in *I. spheniscella* n. sp., which was reared from algae on rocks on Rima Islet, in the Snares.

One specimen of *Izatha prasophyta* has been reared from a fruiting body of the bracket fungus *Bjerkandera adusta*; this species has also been reared from rotten wood, so it is doubtful if any *Izatha* is an obligate inhabitant of fungal fruiting bodies. However, the unidentified *Phellinus*-feeding larva (see above) may possibly be a specialist, given its morphological specialisation for frass-flicking, which is unknown in the dead wood feeding species. It is likely that the fungal content of the dead wood in which they feed is a significant component of the larval diet of *Izatha* (cf. Rawlins, 1984), and there may be some specificity to particular kinds of wood-rotting fungi in some species.

There is little evidence of extreme specialisation in any species to wood of a single genus or species of plant. *Izatha caustopa* was repeatedly reared from *Fuchsia excorticata* by Hudson, who also found adults resting on the trunks (Hudson, 1928; unpublished collection register in MONZ); it has not been found associated with any other plant, but since *caustopa* has so rarely been observed, it is premature to consider it a *Fuchsia* specialist. *Izatha oleariae* is almost invariably associated with dead wood of *Olearia lyallii*, but the larva has also been found in dead pine (*Pinus* sp.) being used as a marker-peg.

Parasitoids. It can be difficult to associate parasitoids accurately with their dead wood feeding insect hosts, since several saproxylic species, often belonging to different orders, may infest the same log or branch, and sometimes the parasitised species produces no adults. Isolation of individual larvae is one solution, but this reduces the chances of successful rearing, because the reduced quantity of substrate is more liable to dry out. For this reason, there are few definitive records of parasitoids for *Izatha* species. Three probable associations are discussed here. An undescribed species of Tachinidae (Diptera) in the genus *Pales* (J. S. Dugdale det.) has been reared several times from dead wood containing *Izatha* larvae (specific associations are *I. attactella* and *I. austera*), and is almost certainly a parasitoid of these, though it has also been reared from rotten wood with larvae of *Lysiphragma epixyla* Meyrick (Tineidae). An undescribed species of *Pronkia* (Hymenoptera: Braconidae: Meteorideinae; D. Ward det.) emerged in some numbers from dead wood from the Waitakere Ranges AK containing numerous larvae of *Izatha austera* and a few larvae of '*Tinea*' *belonota* Meyrick (Tineidae). Meteorideinae are recorded overseas as gregarious endoparasitoids of Gelechiidae, Tortricidae, and Pyralidae (van Achterberg 1990), but hitherto there are no host records for the endemic New Zealand genus *Pronkia*. A species of *Campoplex* (Hymenoptera: Ichneumonidae: Campopleginae; J. A. Berry det.) emerged from dead wood of *Brachyglottis* from Mt Taranaki TK containing larvae of an undescribed *Gymnobathra* species related to *G. dinocosma* (Meyrick). Since it is improbable that a parasitoid would distinguish between the ecologically and morphologically very similar larvae of *Gymnobathra* and *Izatha*, *Campoplex* is very likely to attack *Izatha* as well, presuming that the original host association is correct.

Systematic position. *Izatha* belongs to the *Hierodoris* group of genera; the definition and systematic position of this genus group were discussed by Hoare (2005). While

the *Hierodoris* group is currently assigned to Oecophoridae (Oecophorinae), in accordance with traditional practice, there is evidence that it may be more appropriately placed in Xyloryctidae (Kaila 2004, Hoare 2005); current work on the phylogeny of Ditrysia, which includes representatives of this group, should help to resolve this problem (L. Kaila, pers. comm.).

Within the *Hierodoris* group, *Izatha* is probably most closely related to dead wood feeding species of the genus *Gymnobathra*, i.e., *G. ambigua* (Philpott), *G. bryaula* Meyrick, *G. dinocosma* (Meyrick), *G. flavidella* (Walker), *G. hamatella* (Walker), *G. hyetodes* Meyrick, *G. omphalota* Meyrick, *G. philadelpha* Meyrick; *Lathicrossa* Meyrick, of which *L. leucocentra* Meyrick has been reared from dead wood and dead tree-fern stipe bases, should probably also be included here. This group is here termed *Gymnobathra* s.s. (*sensu stricto*). Dead wood feeding is probably in itself a behavioural synapomorphy for *Izatha* + *Gymnobathra* s.s.; only one other endemic oecophorid (‘*Eulechria*’ *zophoessa* Meyrick) is known to feed in dead wood. No unique morphological synapomorphies uniting the genera have been identified; possibly significant similarities are the presence of a flanged juxto-costal process at the base of the valva and the development of the lamella antevaginalis as a sclerotised strip subtending the ostium; the distribution of these characters needs assessing more comprehensively within the group and in the wider ‘xyloryctid assemblage’ of Kaila (2004). It is highly significant that no characters have been found to distinguish the larvae of *Izatha* from those of *Gymnobathra* s.s.: although it is not yet clear which of the similarities are plesiomorphic and which apomorphic, this strongly supports a close relationship. *Gymnobathra* s.s. is retained as a genus separate from *Izatha* based on the following characters shared by all species, but never found in *Izatha*: uncus well developed and sclerotised (plesiomorphy); gnathos present (plesiomorphy); inner surface of valva with specialised patch of setae (apomorphy).

Species groups and complexes. For convenience, *Izatha* is here divided into 7 informal species groups, based on an intuitive assessment of 12 characters of the head, wing pattern, and male and female genitalia (see Diagnosis under each group). It would have been possible to accord these groups subgeneric rank, and names are available for three groups, by resurrecting current synonyms of *Izatha* as subgenera (*Izatha* for the *attactella*-group, *Zirosaris* for the *mira*-group and *Semiocosma* for the *balanophora*-group). However, in the absence of a rigorous phylogenetic analysis, the evidence for monophyly of some of these groups is not strong. Therefore the species groups are not formalised here as named subgenera.

Two groups (the *apodoxa*- and *balanophora*-groups), have been subdivided into species complexes, which consist of species that are closely related, often very similar or identical externally, and best distinguished on characters of the genitalia.

Diversity and distribution. With 40 species recognised here, *Izatha* is the second largest genus of Microlepidoptera (excluding Pyraloidea) in New Zealand, after *Tingena* Walker (Oecophoridae; 81 described species; Dugdale 1988). It also now ranks as the third largest endemic genus of Lepidoptera in the country, after *Tingena* and *Orocrambus* Purdie (Crambidae; 50 described species), although this ranking is likely to change following revision of *Asaphodes* Meyrick (Geometridae) and *Graphania* Hampson (Noctuidae).

Izatha differs from all other species-rich Lepidoptera genera in that it contains many more species endemic to the North Island than to the South Island. Twenty-two species are confined to the North Island (including offshore islands), 10 to the South Island and 7 are shared between both islands; 2 further species are endemic to the subantarctic Snares Islands. Only one species (*I. huttonii*) is known from Stewart Island. A similar north-biased pattern of diversity is known in a few other insect groups in New Zealand, e.g. Aradidae (Hemiptera: Heteroptera), which are likewise associated with rotten wood and fungi (Larivière & Larochelle 2004).

The distribution patterns of the various species can be grouped into the following broadly defined types:

1. Species endemic to northern offshore islands and former islands: *dulcior* (Poor Knights), *quinquejacula* (Three Kings), *taingo* (Te Paki), *haumu* (Te Paki).

2. Species endemic to the North Island, apparently restricted to north of the Taupo line: *minimira*.

3. Species endemic to, and more or less widespread through the North Island: *balanophora*, *blepharidota*, *churtoni*, *dasydisca*, *epiphanes*, *gibbsi*, *hudsoni*, *mesoschista*, *metadelta*, *peroneanella*, *phaeoptila*, *prasophyta*, *voluptuosa*.

4. Species endemic to the North Island, apparently restricted to south of the Taupo line: *apodoxa*, *caustopa*, *lignyarcha*, *rigescens*.

5. Species widespread throughout the North Island and in the northern South Island: *attactella* (Northland to Christchurch), *austera* (Northland to north-west Nelson).

6. Species restricted to the eastern part of both main islands: *convulsella*, *copiosella*, *katadiktya* (all Hawkes Bay to Invercargill).

7. Species widespread throughout the South Island and Stewart Island, occurring in the North Island only around Wellington: *huttonii*.

8. Species endemic to the northern South Island: *florida*,

notodoxa, *picarella*, *walkerae*.

9. Species endemic to the western South Island: *acmonias*, *heroica*, *mira*.

10. Species endemic to the southern South Island: *gekkonella*, *manubriata*, *psychra*.

11. Species endemic to the Snares Islands: *oleariae*, *spheniscella*.

Wing scales and crypsis. *Izatha* shows some of the strongest adaptations for crypsis to be found in New Zealand Lepidoptera. The brown, grey, and blackish species can probably be regarded as bark-mimics, the strikingly marked white and black species of the *apodoxa*-group and the green and black species of the *peroneanella*-complex as lichen-mimics. The green species *huttonii*, *peroneanella*, and *taingo* are all polymorphic, having white forms, and they probably evolved from a white ancestor similar to *hudsoni*. The green is fugitive, turning yellowish when the wings are exposed to moisture. The olive-green forewing colour of *Izatha prasophyta* does not appear to be affected by moisture, and is presumably differently derived. Since the greens of all 4 species are not iridescent, they may be pigmentary rather than structural colours (cf. Nijhout 2003). In most *Izatha* species, crypsis is enhanced by the presence of raised scale-tufts, not only on the forewings, but also on the tibiae and usually the labial palpi (see Fig. 306, 309, 310). The scale-tufts on the wings consist of curled scales with the undersides more or less prominently exposed. As a further surprising adaptation, the exposed scale undersides are metallic (leaden or golden) and show iridescent reflections; this presumably enhances the disruptive effect of the wing coloration and texture. Scanning electron microscopy reveals that the exposed lower lamina of the curled scales in *I. epiphanes* has a complex pattern of fine irregular corrugations (Fig. 111). These corrugations may function as a diffraction grating (A. Seago, pers. comm.), one of the iridescence mechanisms described in Coleoptera by Seago *et al.* (2008). Many examples of iridescence in Lepidoptera wings have been described, but invariably attributed to modifications of the complex upper lamina of the scales (e.g., Ghiradella 1984); the lower lamina is usually smooth and unmodified, although there are exceptions (Schmidt 1965; Simonsen 2001). This may be the first example of lower lamina iridescence to be documented and illustrated for the order.

Genital evolution and sexual selection. The genus *Izatha* shows great variation in the genitalia, both male and female, and some species exhibit remarkable developments whose evolutionary significance would be highly interesting to elucidate. Rapid divergent evolution of genitalia is nowadays most often attributed to sexual selection (e.g., Eberhard 1985; Arnqvist 1998), although the mechanisms involved are still subject to debate. A few variable traits in the genitalia of *Izatha* are briefly discussed here from a functional perspective; all hypotheses require confirmation by detailed morphological studies similar to those, for example, of Callahan (1958).

1. Juxto-costal plate. For a definition and discussion of this term and homology, see under 'Conventions and terminology' above. The plate varies from being very weakly developed or absent (e.g., *Izatha mira*) to strongly sclerotised and bearing 2 flanges (most members of the *balanophora*-group). The flanges probably have a steadying or positioning function during copulation, and may aid in gripping the female, especially when they bear spine-like scobinations (e.g., *picarella*). They vary greatly in shape, from short and triangular (*metadelta*) to half-shield-shaped (*notodoxa*) or long and digitate (*gibbsi*, *minimira*). The flanges are strongly reduced or absent in the *oleariae*-group, where the juxto-costal plate forms part of a ring tightly fusing the valvae and encircling the phallus.

2. Lateral lobes of the juxta. These probably have a similar role to the flanges of the juxto-costal plate, providing ventral stabilisation for the phallus. They vary from short, broad, and hummock-like (e.g., *churtoni*), to very long, narrow, and curved (*blepharidota*, *taingo*), and may bear a subsidiary sclerotised process (*peroneanella*) or apical spines (*voluptuosa*).

3. Phallus: shape. The phallus varies from short and narrow (e.g., *gibbsi*, *oleariae*) to very long and narrow (*copiosella*) or long and very broad (e.g., *churtoni*).

4. Phallus: armature. The outer wall of the phallus towards its apex may entirely lack sclerotised teeth or spines (*gibbsi*, *oleariae*), have a weak or moderate clothing of tiny teeth (e.g., *florida*, *minimira*, *peroneanella*), fewer somewhat larger teeth (e.g., *convulsella*, *epiphanes*) or just 3 substantial spines (*mesoschista*). Especially in the *apodoxa*-group, the teeth may be arranged on sclerotised ridges projecting moderately (*acmonias*, *katadiktya*) or strongly (*picarella*) from the profile of the phallus. Evidence of damage to the antrum and ductus bursae has been observed in several species (e.g., *mesoschista*, *peroneanella*, *taingo*) and is most likely attributable to the external armature of the phallus. A good example of likely damage is shown in Fig. 129: 3 melanised areas in the broad posterior portion of the ductus bursae of a mated *mesoschista* correspond with the 3 apical spines on the phallus in the male. (A virgin female *mesoschista* examined has folding in these positions but no melanisation). The damage appears superficially similar to the melanised haemocyte plugs illustrated for the female bean weevil *Callosobruchus maculatus* (Fabricius) (Coleoptera: Chrysomelidae) by Crudgington & Siva-Jothy (2000: fig. 2), and caused in that species by the spines of

the everted internal sac of the aedeagus. Likewise, Hardwick (1965: 36) mentions 'conical mounds of scar tissue' on the inner walls of the appendix bursae of *Helicoverpa armigera* (Hübner) (Noctuidae) caused by the male cornuti.

5. Vesica: 'fishhook' cornutus. This is present in all members of the *apodoxa*- and *balanophora*-groups, most members of the *attactella*-group, and a few other species. The relatively basal position of this cornutus on the everted vesica suggests a possible function in guiding the collum of the spermatophore so that the aperture is positioned against the ductus seminalis inception, analogous to the positioning function of cornuti in *Mythimna unipuncta* (Haworth) (Noctuidae) (Callahan & Chapin 1960).

6. Vesica: deciduous cornuti. Deciduous cornuti occur in other Lepidoptera, and are especially common amongst olethreutine Tortricidae (e.g., Horak 2006; Wright 2008). They occur in *Izatha* only in the *balanophora*-group. The possible functions of deciduous cornuti have been recently discussed by Cordero (2010), who established 4 hypotheses. These are: helping the female to break up the spermatophore; reducing the mating success of subsequently mating males by interfering with the positioning of their spermatophores, or breaking them before sperm migration; stimulating the female after mating; reducing the probability of remating, e.g., should the pressure of the spermatophore of the next male against the cornuti damage the wall of the corpus bursae. Dissected males of the *Izatha balanophora*-group either have all or none of their deciduous cornuti, indicating that they commit them all to their first mating. Dissected females often contain more than 1 spermatophore in their genital tracts, frequently along with more than a single male's complete complement of cornuti, showing that the cornuti are not entirely effective in deterring or preventing multiple matings by females. Interestingly, no female has been found to contain more than twice the full number of male cornuti. However, mating does occur more than twice, since up to 4 spermatophores have been found in a single female. One female of *I. epiphanes* with 4 spermatophores in her corpus bursae contained no deciduous cornuti, which indicates that males too mate more than once. All this points to a fascinating reproductive biology in *Izatha*, inviting further elucidation. As indicated by Cordero (2010), much basic information on mating biology in species with deciduous cornuti is needed before we can begin to unravel their functions.

7. Female ostium / antrum: width. The ostium and antrum vary from very narrow (*oleariae*, *prasophyta*) to extremely broad (*churtoni*, *picarella*), corresponding with the apical width of the phallus.

8. Female genital tract: reinforcement. There is usually at least some form of sclerotisation in the inner wall of the female tract, usually in the form of scobination. In some species, heavy scobination takes up an extensive portion of the inner wall of the ductus bursae, and is overlaid by rugosity (which may form a reticulate pattern) in the outer wall of the ductus. This reinforcement appears to correspond strongly with the degree of apical armature of the male phallus, and is particularly well-developed in species such as *copiosella* and *acmonias*, whose phalli bear prominent toothed sclerotised ridges. This correspondence strongly suggests an 'evolutionary arms race' between the sexes, i.e., sexually antagonistic coevolution; a similar case in *Callosobruchus* was discussed by Rönn *et al.* (2007). Eberhard (2006) regarded such cases of defensive female divergence as very uncommon.

9. Corpus bursae: signum. *Izatha* shows a full range of variation in the development of the signum, from completely absent (e.g., *attactella*-group) to very large and spinose (e.g., *epiphanes*-complex). A signum is present in all species that have deciduous cornuti in the male, but also in the *apodoxa*-group, and several other species. Recent observations support the hypothesis that the signum in Lepidoptera functions in breaking the spermatophore envelope (Galicia *et al.* 2008). This probably represents a female counteradaptation to the evolution by males of a more resistant envelope that increases the female refractory period (Drummond 1984).

An extraordinary aspect of genital evolution in *Izatha* is a strong geographical bias in some traits. All of the 11 species that possess deciduous cornuti occur in the North Island, and 10 of these are endemic to that island. *Izatha huttonii* is the only species with such cornuti to occur in the South Island, and it is also present on the North Island around Wellington. It is likely that *Izatha heroica*, a South Island endemic, has secondarily lost the cornuti, since it appears on other characters to be phylogenetically subordinate within the *balanophora*-group, but if so, this loss itself raises questions (see below for other examples). The diversification of the *balanophora*-group in the North Island on its own accounts for most of the disparity in the number of *Izatha* species between North and South Islands. This may be a case of localised 'runaway' evolution during the period(s) when the two main islands of New Zealand were separated. The near-total failure to colonise the South Island may be due to low dispersal ability of the moths and large areas of unsuitable habitat during the glacial period when the islands were joined; in this case *heroica* and *huttonii* represent examples of rare successful dispersal events, the former ancient, the latter recent. (See Remarks under *huttonii* for further discussion of the distribution of this species). Alternatively, the South Island has suffered a major extinction in this species-group, with *heroica* representing a relictual species.

There is some limited but intriguing evidence for a tendency towards loss or reduction of the number of deciduous cornuti on offshore islands. The classic example of this is *Izatha dulcior*, the sister-species to *I. epiphanes*, differing from the latter in the complete absence of deciduous cornuti. Given that *dulcior* is identical to *epiphanes* in most other characters, and is the only member of the *epiphanes*-complex without deciduous cornuti, it is almost certain that the loss is secondary. Likewise, *I. quinquejacula*, endemic to the Three Kings Islands, has only 3–5 deciduous cornuti, compared to 12 or more in its mainland relatives *mesoschista* and *haumu*. The Poor Knights population of *Izatha peroneanella* has no fewer cornuti than mainland populations, but may have colonised more recently than the ancestor of *dulcior*; the Aupouri Peninsula endemics *haumu* and *taingo* also show no reduction in cornuti number, although their habitat is a former island. It is not clear why island life should relax or even reverse the selection for sexual weaponry.

Conservation

Three species of *Izatha* were listed as being 'at risk' from a conservation perspective by Patrick & Dugdale (2000). One of these (*I. griseata*) is shown here to be a synonym of an adventive Australian gelechiid and can be dismissed. The other 2, *I. rigescens* and *I. psychra*, continue to be of concern. *Izatha rigescens* has not been collected since its original discovery in March 1929 on the Wellington coast. It is tentatively suggested here that the species-group to which it is assigned is associated with lichens and/or epiphytic mosses, and this may provide a clue to its rediscovery. *Izatha psychra* is currently known from a single shrubland site in the Mackenzie Country, where it has been observed in small numbers. The site is vulnerable to fire, and to invasion by wildling pine trees, but has a high level of protection as a Scientific Reserve. Given the extensive collecting in this and other similar shrubland areas of the southern South Island by E. G. White and B. H. Patrick over many years, there must be concern that the species is indeed extremely localised. A survey at the type locality, Porter's Pass MC, is desirable.

Further species likely to be endemic to restricted areas are *I. quinquejacula* n.sp. (Three Kings Islands), *I. haumu* n. sp. and *I. taingo* n. sp. (Aupouri peninsula), *I. dulcior* n. sp. (Poor Knights Islands), and *I. oleariae* Dugdale and *I. spheniscella* n. sp. (Snares Islands). These are not considered to be in immediate danger as their ranges are either protected island sanctuaries (*quinquejacula*, *dulcior*, *oleariae*, *spheniscella*), or include large areas of conservation estate (*haumu*, *taingo*). Several species that are extremely rare in collections have probably been overlooked due to their habits (e.g. they are not attracted to light at night); these are *I. dasydisca*, *I. florida*, and *I. walkerae*.

Izatha caustopa has not appeared on any lists of threatened species, despite having barely been seen for 70 years. Hudson was the only collector familiar with this species' habits; he invariably collected it from dead *Fuchsia excorticata*, and almost all his specimens come from Karori, Wellington. This site is now a fenced wildlife sanctuary. Only 2 other localities are known: Ohakune TO and Little Bush, Puketitiri HB. It may not be restricted to *Fuchsia* as a host, but if so, there are concerns, since the tree is declining and has disppeared from some areas due to browsing by introduced possums (Pekelharing *et al*. 1998). According to Hudson, *caustopa* was extremely local even where it occurred, and presumably would need to move its ground every few years to find wood in the appropriate state of decay. It may therefore be prone to local extinction, especially in fragmented habitat. There is an urgent need to investigate the status of this species.

SPECIES TAXONOMY

Keys to adults

Identification of a specimen as belonging to *Izatha* may not be straightforward, especially if it is in poor condition or preserved in fluid; recognition characters are given above under the genus diagnosis. Most specimens in good condition should be identifiable to species using Key 1 (external characters); fluid-preserved or very worn male specimens, or those belonging to species complexes, can be identified following dissection using Key 2 (male genitalia). No key is offered to female genitalia because characters in many cases are small and comparative, and females of several species are unknown. However, careful comparison of a dissected female with the illustrations and descriptions may often result in a positive identification.

Key 1. Key to adults of *Izatha* species, based on external characters

Start with Key 1A. Specimens should be viewed under a good stereomicroscope. The keys should be used in conjunction with the colour plates of adults (Fig. 1–83). It will not work well for worn specimens of some species.

Key 1A

1 Forewing with a characteristic pattern of narrow dark dashes on a pale (white, greyish or green) ground (Fig. 48–61); basal blotch above fold reduced to dark spot on costa ..... … **Key 1B**

—Forewing not as above ..... …2

2(1) Forewing ground colour white; markings bold, black; basal blotch above fold complete, black (may enclose white scaling) (Fig. 21, 22, 25–30, 36, 37)… **Key 1C**

—Forewing not as above ..... … 3

3(2) Forewing ground colour olive green; basal blotch above fold a white mark surrounded by black scaling (Fig. 66, 67) ....(p. 71)... ***prasophyta***

— Forewing ground colour whitish, grey, brown or black (not green); basal blotch various ..... … **Key 1D**

Key 1B

1 Forewing greyish white; a pair of dark spots between and below 2nd and 3rd costal marks; head without protuberance (South Island) (Fig. 60, 61, 89) ....(p. 61)... ***heroica***

—Forewing pure white or green; no spots below and between 2nd and 3rd costal marks; head with conical protuberance (Fig. 48–59, 90–92) ..... … 2

2(1) Forewing white; dark markings towards dorsum paler; hindwing very pale, hardly infuscated apically (North Island) (Fig. 49) .. ...(p. 63)... ***hudsoni*** (typical form)

—Forewing white or green; dark markings towards dorsum not paler; hindwing dark or distinctly infuscated apically (North, South, and Stewart Islands) ..... … 3

3(2) Central dash from base of forewing continues along fold to 1/3; no separate spot on fold in this position (Fig. 48) ....(p. 63)... ***hudsoni*** (northern form)

—Forewing with a spot or dash on fold at 1/3 separate from basal dash ..... …4

4(3) Hindwing with dark line along termen broken into dashes; forewing with dark 'M' mark in disc complete (Wellington district, South, and Stewart Islands) (Fig. 50–53) ....(p. 64)... ***huttonii***

—Hindwing with dark line along termen continuous; forewing with black 'M' mark complete or interrupted by ground colour beyond first stroke (North Island) ... 5

5(4) Male terminalia with juxta arms not visible in undissected specimen (North Island, except Aupouri Peninsula ND) (Fig. 54–57) ...(p. 65)... ***peroneanella***

—Juxta arms visible as 2 strongly sclerotised elongate processes in undissected males (Aupouri Peninsula ND) (Fig. 58, 59) ....(p. 67)... ***taingo***

[N.B. Females of these 2 species probably cannot be distinguished morphologically. All known specimens from south of the Aupouri Peninsula are *peroneanella*, and all from Houhora north are *taingo*. No specimens of this complex have been collected between Ahipara and Houhora, and it is possible there may be some overlap in this region.]

Key 1C

1 Forewing cilia partly black; margin of black basal blotch not complete from costa to dorsum (interrupted by white below fold) (Fig. 36, 37, 97) ...(p. 54)... ***churtoni***

—Forewing cilia all white; margin of basal blotch complete from costa to dorsum (though may enclose white scales) 2

2(1) Forewing basal blotch forms obtuse angle with costa (blotch roughly M-shaped) (Fig. 95) ..... …3

—Forewing basal blotch forms right angle with costa (blotch roughly L-shaped) (Fig. 96) ..... … 4

3(2) Forewing basal blotch encloses area of white scaling below fold (Fig. 21, 22, 95) ....(p. 44)... ***katadiktya***

—Forewing basal blotch solid grey to black below fold (Fig. 19) ....(p. 46)... ***apodoxa*** (pied form)

4(2) North Island specimen (Fig. 27, 28) ....(p. 48)... ***lignyarcha***

—South Island specimen ..... … 5

5(4) Specimen from Nelson (east from Aorere River) or Marlborough districts (Fig. 29, 30) ....(p. 49)... ***picarella***

—Specimen from Nelson west coast, Buller district, or further south (Fig. 25, 26, 96) .. ...(p. 46)... ***acmonias***

[N.B. Specimens of this complex from northwest Nelson should be dissected to confirm their identity, since the limits of the ranges of the 2 species are not fully known in this area.]

Key 1D

1 Abdomen blackish, each segment with a strongly contrasting white band at the posterior margin; head with vertex produced into conical protuberance (Fig. 13–18, 84–87) ..... …2

—Abdomen not as above; vertex with or without protuberance ..... … 5

2(1) Hindwing with conspicuous area of yellow scaling (N.B. may be confined to streak near costa, hidden in specimens with wings not fully spread) (Fig. 13, 14, 16) .... …3

—Hindwing without yellow scaling, or with minute inconspicuous patch only (Fig. 15, 17, 18) ..... … 4

3(2) Hindwing with yellow scales confined to streak near costa; narrow dark scales of T1 all 1-pointed (south-eastern North Island, eastern South Island, lowlands) (Fig. 13, 14) ....(p. 37)... ***copiosella***

—Hindwing with broad area of yellow scaling to about 1/2; a few narrow dark scales of T1 2-pointed (north-west Nelson, subalpine) (Fig. 16) ...(p. 40)... ***florida***

4(2) Prothoracic collar with posterior line of white scales; male antenna with short, pale ciliations (western South Island) (Fig. 17, 18) ....(p. 41)... ***mira***

—Prothoracic collar without white scales (some scales may be white-tipped); male antenna with very long dark ciliations (eastern South Island) (Fig. 15, 93) ....(p. 39)... ***walkerae***

5(1) Head with vertex strongly produced; T1–2 of abdomen with extensive narrow orange scaling contrasting with rest of abdomen (North Island) (Fig. 31, 32, 88) ....(p. 51)... ***metadelta***

—Vertex not strongly produced; T1–2 scaling not contrasting with rest of abdomen (North or South Islands, offshore islands) ..... …6

6(5) Forewing with distinct basal blotch, complete from costa to dorsum, and contrasting with ground colour immediately beyond ..... … 7

—Forewing without basal blotch, or blotch indistinct ... 11

7(6) Outer margin of forewing basal blotch sharply angulated on fold (North and South Islands) ..... … 8

—Outer margin of forewing basal blotch not sharply angulated (Three Kings, Poor Knights Islands) … 10

8(7) Forewing with distinct dark-margined reniform mark at 2/3 enclosing scale-tuft (North Island) (Fig. 38, 39) ....(p. 56)... ***epiphanes***

—Forewing without distinct mark in this position (North or South Island) ..... … 9

9(8) Forewing with a distinct black spot between black streak in disc and costa; wingspan over 24 mm (South Island) (Fig. 72, 73) ....(p. 75)... ***manubriata***

—No distinct black spot above forewing discal streak; wingspan 15.5–25 mm (North Island) (Fig. 40) ....(p. 57)... ***mesoschista*** (part)

10(7) Forewing with black-margined reniform mark in disc at 2/3 (Poor Knights Islands ND) (Fig. 46) ....(p. 55)... ***dulcior***

—Forewing without such mark (Three Kings Islands TH) (Fig. 47) ....(p. 60)... ***quinquejacula***

11(6) Forewing with brown reniform marking in disc at 2/3 consisting of 2 scale-tufts; a black longitudinal line bisecting this marking, and a distinct pale angulated fascia at 3/4 (North Island) (Fig. 68–71) ..... … 12

—Forewing not as above (North or South Island) . … 13

12(11) Hindwing pale, brownish; labial palp segment 3 expanded with scales (Fig. 68, 69)...(p. 72)... ***caustopa***

—Hindwing very dark, blackish; labial palp segment 3 smooth (Fig. 70, 71) ....(p. 74)... ***dasydisca***

13(11) Forewing and 3rd segment of labial palpi completely without scale-tufts; male antenna with very long ciliations, ca 3× width of flagellum (Snares Islands only) (Fig. 62–65) ..... … 14

—Forewing and/or 3rd segment of labial palpi with at least small tuft(s) of raised scales; male antenna with ciliations shorter than width of flagellum (North and South Islands) ..... … 15

14(13) Forewing length 7.5 mm or over; female wings extend beyond abdomen (Fig. 62, 63) ...(p. 68)... ***olearia***e

—Forewing length 7 mm or less; female wings barely reach end of abdomen (Fig. 64, 65) ...(p. 69)... ***spheniscella***

15(13) Forewing with slightly curved longitudinal black streak in disc, subtended near its base by scale-tuft (Fig. 41–45) ..... … 16

—Forewing without such streak ..... … 17

16(15) Specimen from North Island south of Aupouri Peninsula (Fig. 41, 42) ....(p. 57)... ***mesoschista***

—Specimen from Aupouri Peninsula (Fig. 43–45) ....(p. 59)... ***haumu***

[N.B. *I. mesoschista* and *I. haumu* are probably not reliably distinguishable externally, but see main text for further diagnostic remarks. As with *peroneanella* and *taingo*, the exact boundaries of the ranges of the 2 species are not currently known.]

17(15) Forewing greyish, with transverse V- or Y-shaped black marking just before 1/2 (Fig. 19, 20, 23, 24) … 18

—Forewing without such marking ..... … 19

18(17) Specimen from North Island (Fig. 19, 20) ....(p. 46)... ***apodoxa*** (grey form)

—Specimen from South Island (Fig. 23, 24) ....(p. 42)... ***notodoxa***

[N.B. The grey form of *I. apodoxa* and *I. notodoxa* are probably not reliably distinguished on external characters. See text for further remarks.]

19(17) Forewing with distinct black blotch on costa at 2/3; small species (wingspan 18.5 mm or less) (North Island) (Fig. 78, 79, 82, 83) ..... … 20

—Forewing without distinct black blotch on costa at 2/3 (may be indistinct greyish or brown mark in this position); small or large species (North and South Islands) ..... … 21

20(19) At least some all-white scales on forewing; undersides of curled forewing scales golden (Fig. 82, 83) .. ..(p. 83)... ***phaeoptila***

—Forewing scales at most white-edged; undersides of curled forewing scales leaden (Fig. 78, 79)...(p. 81)... ***minimira***

21(19) Forewing ground colour white, with many greyish yellow-tipped scales (Fig. 12, 74–77) ..... … 22

—Forewing ground colour grey, brown or cream, without greyish yellow-tipped scales ..... … 24

22(21) Forewing with distinct dark basal dash; dark antennal scape contrasting strongly with pale head and flagellum (Fig. 12) ....(p. 36)... ***psychra***

—Forewing without basal dash; antennal scape mottled, not contrasting strongly with head or flagellum (Fig. 74–77) ..... … 23

23(22) Hindwing dark grey; forewing appearing brownish due to extensive irroration of yellow-tipped scales (eastern Otago only) (Fig. 76, 77) . ...(p. 79)... ***gekkonella***

—Hindwing rather pale grey; forewing appearing greyish, with fewer yellow-tipped scales (south-eastern North Island to Southland) (Fig. 74, 75)...(p. 77)... ***convulsella***

24(21) Forewing with 3 distinct dark clouds along costa, the middle one most extensive (labial palp 3rd segment with scale-tuft; hindwing vein 3A forked) (Fig. 33–35) ....(p. 52)... ***balanophora***

—Forewing not as above (labial palp 3rd segment with or without scale-tuft; hindwing vein 3A not forked) .... … 25

25(24) Forewing without distinct dark streaking between veins in apical 1/3 (labial palp 3rd segment with scale-tuft; forewing without black basal streak; forewing scale-tufts conspicuous at least basally) (Fig. 10, 11) ....(p. 34)... ***austera***

—Forewing with distinct dark streaking between veins in apical 1/3 (labial palp 3rd segment with or without scale-tuft; forewing with or without basal streak; forewing scale-tufts conspicuous or inconspicuous) ..... … 26

26(25) Large species, forewing length 11 mm or over; labial palp 3rd segment without median scale-tuft (may have groups of curled scales at 1/3 and 2/3) (Fig. 1–9) .... … 27

—Small species, forewing length 9 mm or under; labial palp 3rd segment with median scale-tuft (Fig. 80, 81) ..... … 29

27(26) Forewing scale-tufts conspicuous at least basally; fore-wing with distinct black basal streak (greyish species; North and South Islands) (Fig. 1–4) ....(p. 29)... ***attactella***

—Forewing scale-tufts very small and inconspicuous; black basal streak indistinct or broken (pale ochreous to dark brown species; North Island) (Fig. 5–9) ..... … 28

28(27) Forewing ground colour pale ochreous or creamy brown; male hindwing pale; female hindwing with veins infuscated (Fig. 8, 9) ....(p. 31)... ***blepharidota***

—Forewing ground colour dull ochreous to dark brown; male hindwing blackish; female hindwing without infuscation along veins (Fig. 5–7) ...(p. 33)... ***voluptuosa***

29(26) Forewing greyish, many scales with the scalloped tips contrastingly white; hindwings dark grey (Fig. 80) ....(p. 80)... ***gibbsi***

—Forewing brownish, scales not contrastingly white-tipped; hindwings pale brownish (Fig. 81) ....(p. 82)... ***rigescens***

Key 2. Key to adults of *Izatha* species, based on male genitalia

The abdomen of specimens to be identified using this key should be macerated in cold 10% KOH overnight. The genital capsule should be removed from the end of the abdomen. Characters of the abdominal cuticle are referred to in the key to separate one species-pair (*oleariae* and *spheniscella*). Slide-mounted specimens with the phallus removed and mounted separately from the genital capsule will be easiest to run through the key, but most important features should be visible with manipulation of specimens held in glycerol or alcohol in an excavated glass block. Refer to Fig. 124–127 for terminology. Start with Key 2A.

Key 2A

1 Sacculus apex distinctly exceeded by valva apex 2

—Sacculus apex roughly level with or exceeding valva apex (N.B. if sacculus ends just before valva apex (e.g., Fig. 160), key here) .... **Key 2B**

2(1) Juxta base plate divided in 2 medially by membrane, or base-plate reduced to indistinct lateral sclerites connected by narrow sclerotised strip .... **Key 2C**

—Juxta base-plate entire, sclerotisation not interrupted medially (but may be indented between lateral lobes posteriorly) 3

3(2) Vesica wall with disc-like pores (vesica in virgin specimens with blade-like deciduous cornuti); base of valva (juxto-costal plate, see Fig. 124) with 2 distinct flanges .... **Key 2D**

—Vesica without disc-like pores, without deciduous cornuti; juxto-costal plate with 1 or 2 distinct flanges 4

4(3) Saccus very elongate, longer than valva (valva measured from mid-length of vinculum lateral arm to apex) .... **Key 2E**

—Saccus much shorter than valva .... **Key 2F**

Key 2B

1 Sacculus apex distinctly exceeding valva apex; saccus very narrow and elongate with spatulate apex (Fig. 140) ....(p. 37)... ***copiosella***

—Sacculus apex not or hardly exceeding valva apex; saccus not as above 2

2(1) Base of valva (juxto-costal plate, see Fig. 124) without laterally protruding flanges (may have 2 thickenings representing flanges) 3

—Juxto-costal plate with a laterally protruding flange (N.B. may be small) 6

3(2) Phallus apex exteriorly with rows of small backward-pointing teeth (South Island) (Fig. 147)...(p. 41)... ***mira***

—Phallus apex exteriorly smooth (North Island or Snares Islands) 4

4(3) Saccus pointed, arrowhead-shaped; vesica with single cornutus; caecum penis absent; North Island (Fig. 190, 191) ....(p. 71)... ***prasophyta***

—Saccus bluntly rounded; vesica without cornuti; caecum penis present; Snares Islands (Fig. 186–189) 5

5(4) Saccus thicker than lateral arms of vinculum (Fig. 186); T8 longer than broad (Fig. 122) ...(p. 68)... ***oleariae***

—Saccus not thicker than vinculum arms (Fig. 188); T8 as broad as, or broader than long (Fig. 123) ....(p. 69)... ***spheniscella***

6(2) Flange of juxto-costal plate elongate, club-like with tapered tip, more or less parallel to juxta lateral lobe (Fig. 202, 204, 220) 7

—Flange of juxto-costal plate short and blunt, or broad and triangular, not parallel with juxta lateral lobe ... 8

7(6) Phallus apex exteriorly with rows of small backward-pointing teeth; saccus arrowhead-shaped (Fig. 204, 205) ....(p. 81)... ***minimira***

—Phallus exteriorly smooth; saccus bluntly rounded (Fig. 202, 203) ....(p. 80)... ***gibbsi***

8(6) Flange of juxto-costal plate large, triangular; vesica wall with ca 5 disc-like pores (vesica in virgin specimens with ca 5 blade-like deciduous cornuti) and vesica with single straight, fixed cornutus (Fig. 160, 161) ... .(p. 51)... ***metadelta***

—Flange of juxto-costal plate small, thumb-like; vesica without fixed cornutus, without deciduous cornuti and without disc-like pores 9

9(8) Vesica with stout comb-like compound cornutus with 2–4 points (Fig. 199, 256) ....(p. 77)... ***convulsella***

—Vesica without compound cornutus 10

10(9) Lateral lobes of juxta covered in fine spines towards apex; sacculus apex a broad crescentic lobe (Fig. 142) ....(p. 39)... ***walkerae***

—Lateral lobes of juxta without spines; sacculus apex a narrow process 11

11(10) Juxta base plate as long as broad; lateral arms elongate, club-like; tegumen elongate; phallus lacking well-differentiated right lobe with strongly spinose base (Fig. 144, 145) ....(p. 40)... ***florida***

—Juxta base plate shorter than broad; lateral arms stout, tapering; tegumen short; phallus with well-differentiated right lobe with strongly spinose base (Fig. 200, 201) ....(p. 79)... ***gekkonella***

Key 2C

1 Juxta base-plate entirely divided by membrane medially; base of valva (juxto-costal plate, see Fig. 124) with only 1 flange; vesica without disc-like pores, without deciduous cornuti (Fig. 130–139; *attactella*-group) 2

—Juxta base-plate with lateral potions connected by narrow sclerotised strip; juxto-costal plate with 2 flanges (N.B. dorsal flange may be less distinct than ventral); vesica with or without disc-like pores and deciduous cornuti (Fig. 176–185; *peroneanella*-complex) 6

2(1) Juxta lateral lobes elongate, digitate, with apices recurved dorsad (Fig. 132, 134) 3

—Juxta lateral lobes triangular or thumb-like, not recurved apically 4

3(2) Juxta lateral lobes spinose near apex ....(p. 33)... ***voluptuosa***

—Juxta lateral lobes not spinose ...(p. 31)... ***blepharidota***

4(2) Vesica with 'compound cornutus' of overlapping leaf-like cornuti, without digitate fixed cornutus (Fig. 131) ....(p. 29)... ***attactella***

—Vesica without compound cornutus, with digitate fixed cornutus (Fig. 137, 139) 5

5(4) Saccus elongate, tapered; fixed cornutus of vesica not recurved basally (Fig. 136, 137) ... ...(p. 34)... ***austera***

—Saccus short, bluntly rounded; fixed cornutus of vesica recurved basally (Fig. 138, 139) .. ...(p. 36)... ***psychra***

6(1) Phallus without laterally-directed dorsal denticulate lobe; vesica without disc-like pores, without deciduous cornuti; uncus with apical setae ...(p. 61)... ***heroica***

—Phallus with laterally-directed dorsal denticulate lobe (Fig. 250, 252); vesica with disc-like pores in wall, and (in virgin specimens) blade-like deciduous cornuti; uncus lacking apical setae 7

7(6) Basal flanges of valva of similar shape, both apically narrow and more or less recurved (Fig. 217, 218) ... 8

—Valva with flanges of different shapes: inner flange apically narrow, outer flange broad, more or less triangular (Fig. 216) 9

8(7) Juxta lateral lobes short (just reaching to tegumen base); each lobe with dorsal sclerotised accessory tooth (Fig. 217) ....(p. 65)... ***peroneanella***

—Juxta lateral lobes extremely long (reaching well beyond tegumen base), lacking accessory teeth (Fig. 218) ....(p. 67)... ***taingo***

9(7) Juxta lateral lobe with distinct sclerotised accessory tooth at apex (South Island and Wellington) (Fig. 180) ....(p. 64)... ***huttonii***

—Juxta lateral lobe without apical accessory tooth (North Island, including Wellington) (Fig. 178) ....(p. 63)... ***hudsoni***

Key 2D

1 Apex of phallus lacking rows or groups of small backward-pointing teeth, but with 3 stout spine-like processes (Fig. 171, 242) ....(p. 57)... ***mesoschista***

—Apex of phallus with groups or rows of small backward-pointing teeth, at most 1 stout spine-like process 2

2(1) Inner flange of valva with bulbous base (Fig. 164, 214); juxta lateral lobes dorsally scobinate (Fig. 214); left lobe of phallus in ventral view strongly convex (Fig. 165, 239) ....(p. 54)... ***churtoni***

—Inner flange of valva without bulbous base; juxta lateral lobes without scobinations; left lobe of phallus not strongly convex 3

3(2) Phallus central lobe with a single spine-like process, without further teeth 4

—Phallus central lobe without spine-like process, with at least a few small teeth 5

4(3) Vesica with at most 5 disc-like pores, and in virgin specimens, at most 5 blade-like deciduous cornuti (Three Kings Islands) (Fig. 175, 244, 245) ....(p. 60)... ***quinquejacula***

—Vesica with over 10 disc-like pores and in virgin specimens, over 10 blade-like deciduous cornuti (Aupouri Peninsula ND) (Fig. 173, 243) ....(p. 59)... ***haumu***

5(3) Inner flange of juxto-costal plate a recurved digitate process without scobinations (Fig. 162) ....(p. 52)... ***balanophora***

—Inner flange of juxto-costal plate a straight digitate process with fine scobinations (Fig. 168) ....(p. 56)... ***epiphanes***

Key 2E

1 Flange of juxto-costal plate broad, half-shield-shaped 2

—Flange of juxto-costal plate narrow, triangular to tooth-like 3

2(1) Flange reaches 2/3 of way along juxto-costal plate to costa; phallus exteriorly with 2 toothed ridges (South Island) (Fig. 148, 149) ....(p. 42)... ***notodoxa***

—Flange reaches 1/2 way along juxto-costal plate to costa; phallus exteriorly with 3 toothed ridges (North Island) (Fig. 152, 153) ....(p. 46)... ***apodoxa***

3(1) Flange of juxto-costal plate strongly scobinate; phallus markedly swollen at 2/3 length (Fig. 158, 159) ... .(p. 49)... ***picarella***

—Flange of juxto-costal plate lacking scobinations; phallus not markedly swollen at 2/3 length 4

4(3) Flange of juxto-costal plate short (about equal in length to uncus), straight (Fig. 150) .. ...(p. 44)... ***katadiktya***

—Flange of juxto-costal plate long (distinctly longer than uncus), slightly recurved (Fig. 154, 156) 5

5(4) Phallus apically with 3 groups of backward-pointing teeth borne on 3 sclerotised ridges (South Island) (Fig. 155, 232, 233) ....(p. 46)... ***acmonias***

—Phallus apically with 2 groups of backward-pointing teeth, only 1 of these set on a sclerotised ridge (North Island) (Fig. 157, 234, 235) ... ...(p. 48)... ***lignyarcha***

Key 2F

1 Apex of sacculus a broad spatulate lobe with strong scobinations; uncus produced basally into paired lobes (Fig. 206) ....(p. 82)... ***rigescens***

—Apex of sacculus not spatulate, not scobinate; uncus without paired basal lobes 2

2(1) Apex of sacculus with narrow, curved, free digitate process perpendicular to valva surface; juxta lateral lobes apically scobinate (Fig. 208, 221) ....(p. 83)... ***phaeoptila***

—Apex of sacculus without perpendicular process; juxta lateral lobes not scobinate 3

3(2) Vesica without cornuti (South Island) (Fig. 197) ....(p. 75)... ***manubriata***

—Vesica with single fishhook-like fixed cornutus (North Island, including offshore islands) 4

4(3) Lateral lobes of juxta widely separated at their bases; juxta base-plate cup-shaped, narrowing anteriorly; valva rather narrow (Fig. 166) (Poor Knights Islands ND only) ....(p. 55)... ***dulcior***

—Lateral lobes of juxta closely approximated basally; juxta base-plate squarish; valva rather broad (Fig. 192, 194) (North Island) 5

5(4) Apex of valva rather square; flange of juxto-costal plate broad and elongate along plate; juxta lateral lobes short and hummock-like (Fig. 192) ...(p. 72)... ***caustopa***

—Apex of valva rounded; flange of juxto-costal plate narrow-triangular; juxta lateral lobes elongate and digitate (Fig. 194) ....(p. 74)... ***dasydisca***

Species groups and species descriptions

The *attactella*-group

Diagnosis. Medium-sized to large species; head with vertex unmodified; forewings grey to brown without distinct pattern but with dark basal streak; male genitalia with valva apex exceeding sacculus apex; juxta base-plate split in two longitudinally; juxto-costal plate not displaced caudad, with 1 large flange, not forming transtilla-like bridge between valvae; saccus moderate; vesica without deciduous cornuti, with or without 1–2 'compound cornuti'; female genitalia with ductus membranous; corpus bursae without signum.

Notes. *Izatha attactella*, *I. blepharidota*, and *I. voluptuosa* all share a probable apomorphy: 1 or 2 spinose strips in the wall of the male vesica, here termed 'compound cornuti'. *I. austera* and *I. psychra* lack this structure, but are included in this group based on the membranous median longitudinal strip in the juxta, a character that is only found elsewhere in *Izatha* in the *peroneanella*-complex. Only *austera* in this group has a conspicuous scale-tuft on the third segment of the labial palpus, and only *austera* and *attactella* have conspicuous scale-tufts on the forewing.

Izatha attactella Walker, 1864a

Fig. 1–4, 112, 130, 131, 222, 259, 306; Map 1

Izatha attactella Walker, 1864a: 787.

Semiocosma platyptera Meyrick, 1888: 80. Synonymised by Meyrick (1915: 215).

Diagnosis. *Izatha attactella* resembles *I. voluptuosa* superficially, but can usually be distinguished when in good condition by the narrower forewing, with its more conspicuous scale-tufts and longer dark basal streak, and the paler hindwing. Where the two species occur together in the North Island, *attactella* is generally on the wing earlier (September to December) than *voluptuosa* (November to February).

Male (Fig. 1, 3). Forewing length 12–18.5 mm; wingspan 24.5–38 mm. Head capsule smooth, without protuberance; vertex whitish grey, some of the scales brown-tipped; frons whitish; proboscis whitish; labial palpi whitish, speckled brown; segment 2 exteriorly brown at base, and with more or less well defined brownish ring just below apex; segment 3 whitish with brown bands at ca 1/2 and apex; whitish bands with some curled, spreading scales in fresh specimens tending to form 2 indistinct tufts; antennae pale greyish, mottled brown; ciliations pale, dense ventrally, ca 1/2 flagellum width. Collar, tegulae, and thorax pale grey, mottled brown, paler posteriorly. Forewing pale greyish, speckled with brown and black; a conspicuous black streak from base to 1/3 just below centre of wing;

2 brownish dashes from costa near base and at 1/4, each associated with an inconspicuous scale-tuft; a brownish mark on costa at 2/3, associated with a more or less distinct concavity in the costa; an indistinct curved pale grey fascia at 4/5; 2–3 variably distinct blackish dashes in disc before and beyond fascia; 4 costal and 5 terminal brown to blackish spots around apex of wing to tornus; sometimes a more or less broken line of blackish scales along posterior 1/3 of fold to tornus. Scale-tufts prominent in fresh specimens. Cilia grey, tipped brown. Hindwing whitish, exteriorly brownish-tinged; cilia whitish, interrupted by brownish lines at ca 1/4 and 3/4 of cilia depth; outer cilia line obsolescent at anal angle. Underside: forewing pale whitish brown, more or less speckled with darker brown along costa and between veins exteriorly, and with distinct elongate whitish patch along costa before costal concavity; hindwing whitish, lightly to densely speckled brown along costa and around apex. Abdomen dorsally whitish; T2–7 with central field of narrow, pale golden spine-like scales; ventrally white, speckled brown; anal tuft white.

Female (Fig. 2, 4). Forewing length 11.5–18 mm; wingspan 22–36 mm. Similar to male, but antennal ciliations much sparser and more appressed; head, thorax, and forewing coloration much browner and darker; forewing fascia at 4/5 usually much less distinct; black dashes along veins in apical 1/3 of wing more distinct than in male.

Male abdomen and genitalia. Abdomen (Fig. 112): S2 apodemes rather long. S8 approximately equal to S7, caudally straight to slightly concave; anterior corners not produced. Genitalia (Fig. 130): tegumen a broad arc, with deep basal excavation; uncus short, membranous except weak dorsal sclerotisation, terminating in 2 sessile tufts of setae. Valva upright, apically rounded; apex densely setose except in a pre-apical subcostal patch; apex exceeding sacculus; sacculus exterior margin with 1 or 2 enlarged setae; sacculus ending in blunt appressed tooth; costa concave towards apex; costa continuously sclerotised; pulvinus a group of setae, not differentiated as lobe; juxto-costal plate strip-shaped, extended along costa to 1/3 length of costa, basal arm very short, not scobinate; a single flange, elongate, triangular or truncate-triangular, blunt, weakly scobinate along upper margin and around apex. Juxta baseplate as 2 rounded triangular sclerites completely divided by membranous strip; lobes well separate at bases, short, conical, not curved or apically expanded, without spines or scobinations. Saccus short, V-shaped to cup-shaped. Phallus (Fig. 131, 222): broad, left lobe slightly longer than right, more or less dorsally positioned, with numerous rows of small backward-pointing teeth to near apex; right lobe short, rather dorsal, with a few rows of forward-pointing teeth well below apex; central lobe broad, inverted U-shaped, with a few rows of backward-pointing teeth below apex on left; lobe apex scobinate along curve of 'U'; a sclerotised strip running down from near lobe apex on right and curving obliquely across to near 1/2 way down phallus. Vesica base with numerous translucent spinules; vesica with single large 'compound cornutus', i.e., a curved, basally membranous structure with smaller overlapping leaf-like cornuti; fishhook cornutus and deciduous cornuti absent. Bulbus ejaculatorius with distinct short tubular portion; hood ovoid. Caecum penis present.

Female abdomen and genitalia (Fig. 259). Segments 8–10 barely extensible. S8 squarish, broader anteriorly, almost completely divided medially into 2 ovoid sclerites, linked by 'bridge' of scobinations distally; sclerites densely setose and finely scobinate distally; scoop-like lateral flanges absent. Ostium broad, subtended by boomerang-like lamella antevaginalis; antrum scobinate; ductus seminalis arising ventrally, strongly recurved near base; ductus bursae broad, strongly scobinate posteriorly, scobinations extending further anteriorly on right side (in ventral view), not forming rugae; ductus longitudinally rugose between scobinate section and corpus, gradually broadening into corpus; corpus bursae ovoid, without signum, but with a pair of large patches of small spinules.

Larva. Described by Hudson (1928: 280) as follows: head dark brown, shining; abdomen ochreous white.

Biology. Hudson (1928) reports the larva as feeding under the bark of dead *Elaeocarpus dentatus* (hinau) and *Aristotelia serrata* (wineberry) (both Elaeocarpaceae), *Nothofagus* (beech) (Nothofagaceae), *Myoporum laetum* (ngaio) (Myoporaceae), and *Rhopalostylis sapida* (nikau palm) (Arecaceae), feeding on the soft inner surface of the bark. Also recorded from dead wood of the following (introduced plants indicated by an asterisk*): **Castanea* sp. (chestnut) (Fagaceae), *Litsea calicaris* (mangeao) (Lauraceae), *Olearia paniculata* (golden akeake) (Asteraceae), **Pinus patula* (Mexican yellow pine) and **P. radiata* (Monterey pine) (Pinaceae), *Sophora* sp. (kowhai) (Fabaceae) (all records from FRNZ). Around Auckland, larvae have been found in unidentified rotten logs on the ground. The larva pupates under the bark in an oval cocoon of silk into which fragments of chewn wood are densely incorporated.

Flight period. Chiefly September to November, with a very few specimens appearing in December or January in the South Island. Emerges from July onwards when reared in captivity in the North Island.

Type data. *Izatha attactella*: **Lectotype:** Male, 'Type / New Zeal 54.4 / Izatha attactella Wkr Cat. Lep. BM. 29 p. 787 (1864) TYPE ♂', designated by implication by Dugdale (1988: 94) (BMNH) (examined). **Paralectotypes:** 9 males, 5 females. **AK:** 6 males, 4 females, Auckland, 1850–1853,

D. Bolton (BMNH); Auckland, 3 males, 1 female, A. Sinclair (BMNH).

Semiocosma platyptera: **Lectotype:** Female, 'LECTOTYPE / Wellington New Zealand GVH. /85 / Lectotype Izatha platyptera Meyr. teste P.A. Brown / Izatha attactella Walk. 7/8 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938-290 / LECTOTYPE ♀ Semiocosma platyptera Meyrick teste J.S. Dugdale, 1988'. **Paralectotypes:** Not located. **Note:** Meyrick's paper describing *Semiocosma platyptera* was read before the Philosophical Institute of Canterbury on 6th October 1887. Meyrick (1888) refers to "several specimens taken by Mr G. V. Hudson, to whose kindness I am indebted for a type", implying that though the species was described from more than one specimen (i.e., a syntype series), Meyrick was only able to retain one. There are 7 specimens of *attactella* from Wellington collected by Hudson in BMNH, but these are all dated '88'. There are no specimens in the Hudson collection in MONZ taken before 1920, but the Hudson register refers to 3 specimens reared from larvae found under hinau bark in August 1884 (register nos. 95b, c, and d). The number 95c has been crossed out, suggesting this may have been the one retained by Meyrick (i.e., the lectotype: Meyrick would have removed the Hudson label and replaced it with his own (see Clarke, 1955)); the other 2 specimens are presumed to have been given away or destroyed by Hudson and replaced by more recent material.

Note on synonymy. Meyrick's (1915) synonymy of *platyptera* (type locality Wellington) with *attactella* (type locality Auckland) is here upheld. Specimens from Taranaki, Wellington, and the South Island have shorter juxta lobes, a less prominent ventral sclerotised bar on the phallus, and a relatively longer ductus bursae than Auckland specimens. Since these differences are small and comparative, they are not here considered sufficient for species recognition. However, further investigation is desirable.

Material Examined. Type material plus 124 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread in both main islands as far south as mid Canterbury.

ND, AK, CL, WO, BP, TK, TO, HB, RI, WN / SD, NN, BR, MB, MC.

Remarks. *I. attactella* is the most widespread member of the genus, and the only one to encompass both Auckland and Christchurch in its range. Even so, it is probably overlooked, since it does not come in large numbers to light. It is one of the more frequently reared species. The hook-like teeth on the right lobe of the phallus are forward-pointing, all others are backward-pointing; the functional significance of this difference during mating would be intriguing to investigate, especially since the teeth in the same position on the closely related *I. voluptuosa* are backward-pointing.

Izatha blepharidota new species

Fig. 8, 9, 132, 133, 223, 260, 307; Map 2

Diagnosis. Pale specimens of *Izatha blepharidota* could be confused with pale *I. balanophora*, but the latter species always has an elongate dark cloud along the forewing costa just before 1/2, the equivalent mark in *blepharidota* is a narrow oblique dash. Well marked females of *blepharidota* resemble female *voluptuosa*, but the ground colour is always paler in *blepharidota*, and the hindwing has rather distinct infuscation along the veins, whereas the veins in *voluptuosa* are not distinctly darker than the rest of the wing.

Male (Fig. 8). Forewing length 11–13 mm; wingspan 22.5–26 mm. Head capsule smooth, without protuberance: vertex brownish white, with a few scales tipped brown, especially posteriorly; frons brownish white with dark brown spots on either side at mid-level of eye; proboscis brownish white; labial palpi brownish white; segment 2 brown exteriorly in basal 1/2, and with some dark scales subapically, not forming ring; segment 3 ringed dark brown at base, at 1/2 and at apex, without dorsal scale-tuft; antennae dorsally whitish, but scape speckled brown in basal 2/3, ventrally (unscaled) tawny-brown with ciliations ca 2/3 width of flagellum. Collar and thorax brownish white, with some darker brown scales in paired lateral patches adjacent to tegulae and in posterior part of mesonotum; tegulae mostly dark brown. Forewing brownish cream, speckled with pale brown and dark brown scales; the following dark brown markings usually distinct: a short subbasal triangle from costa; a short dash from costa at 1/3; a diffuse cloud on costa at 2/3; a short to long basal streak along fold; discal spots at 1/3 and 2/3, the second larger and more or less C-shaped; 2 streaks between second discal and costa, and 3 more streaks beyond and below second discal at 4/5; ca 10 spots around apex of wing to tornus (3 along costa, 1 at apex, 6 along termen). Scale tufts small and indistinct in fresh specimens. Cilia brownish cream, with some darker scales basally between terminal spots. Hindwing whitish, with brown scaling exteriorly, especially along veins, and faint brown discal spot; cilia whitish with pale brown basal cilia-line. Underside: forewing greyish brown, whitish around margins and with cilia whitish; terminal spots dark brown as on upperside; hindwing whitish, brown along veins. Abdomen dorsally shining white; scales in centre of segments 2–7 modified, narrow, pale golden orange; ventrally shining white; anal tuft brownish white.

Female (Fig. 9). Forewing length 11–14.5 mm; wingspan 23–29 mm. Similar to male but some specimens narrower-winged; forewing often with more pronounced dark clouding from costa at 2/3 to near tornus, obscuring the longitudinal streaks; antennae without conspicuous ciliations.

Male abdomen and genitalia. Abdomen: S2 apodemes rather short to long; S8 longer than S7, caudally straight to slightly convex; anterior corners not produced. Genitalia (Fig. 132): tegumen saddle-shaped, deeply excavated basally; uncus relatively long, triangular, weakly sclerotised dorsolaterally, terminating in 2 distinct papillae, each bearing 1–3 setae. Valva at 45° to axis of genital capsule, rather square-ended; apex densely setose, except towards costa; apex exceeding sacculus; sacculus without enlarged setae; sacculus ending in strong suberect tooth; costa barely concave towards apex; costa continuously sclerotised; pulvinus not differentiated as a lobe, represented by a few setae; juxto-costal plate narrow, extended along costa to ca 1/3 length of costa; basal arm rather long, not scobinate; a single flange, large, recurved, blunt, with spinose tip. Juxta base-plate completely divided longitudinally into 2 oval sclerites by membranous strip; lateral lobes approximated basally, each long, recurved dorsad, terminating in blunt narrow tooth, without spines or scobinations. Saccus elongate-triangular. Phallus (Fig. 133, 223): rather narrow; left lobe longer than right, both lobes rather dorsally positioned; left lobe broad, with small backward-pointing teeth in area where it meets ventral embayment; right lobe narrow, smooth; central lobe small, smooth; sclerotised strip absent (cf. *attactella*). Vesica with single stout 'fishhook' cornutus, base not recurved into hook, usually 1-pointed apically, sometimes 2-pointed; also 2 'compound cornuti', similar to that described for *attactella* but smaller, 1 to left of central lobe in everted vesica, the other (larger, with fewer, larger spines) between central and right lobes; deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood round to ovoid. Caecum penis present.

Female abdomen and genitalia (Fig. 260). Segments 8–10 hardly extensible. S8 transverse, nearly divided into 2 sclerites by triangular medial membranous area reaching over 3/4 length of segment; sclerotised lateral areas moderately setose distally, with scobinate bridge between; scoop-like lateral flanges present, moderately developed. Ostium rather broad, lamella antevaginalis a broad straight strip; antrum sclerotised, not scobinate; ductus seminalis arising ventrally, not recurved basally; ductus bursae broad, with round scobinations in posterior portion, scobinations not forming rugae; anterior portion of ductus with small scattered scobinations, folded; corpus bursae elongate-ovate, with fine spinules; signum absent.

Larva. Not positively associated.

Biology. One specimen has been reared from dead branches of *Pseudopanax crassifolius* (lancewood, horoeka) (Araliaceae); 1 from dead rotten stems of the climber *Ripogonum scandens* (supplejack, kareao) (Smilacaceae); 1 from dead branches of *Coriaria arborea* (tutu) (Coriariaceae); and 3 from dead (?) *Kunzea ericoides* (kanuka) (Myrtaceae).

Flight period. November to April. Most wild-caught specimens have been taken in November and January, with 1 each in December and late March / early April. This probably indicates 2 peaks of emergence rather than 2 annual broods. Larvae collected in the Waitakere Ranges AK in October 2006 produced adults in November, December and January.

Type data. **Holotype:** Male, 'NEW ZEALAND AK 37.13S 175.01.8E Mt William c. 150m emg. 17 Nov 2005 R.J.B. Hoare / DW38 Reared from dead stems *Ripogonum scandens* coll. 24 Jul 2005 / [orange label, blank] / Photographed 2007–2008 by B.E. Rhode for Fauna NZ' (NZAC). **Paratypes:** 10 males, 2 females. **AK:** 1 male, same locality as holotype, on *Nothofagus* trunk, 29 Nov 1986, JSD (genitalia slide Oec. 366); 1 male, Titirangi, Minnehaha Ave, lit window, 12 Nov 2000, RJBH; 1 male, Waitakere Ra., Kakamatua Inlet, netted after dark, 4 Jan 2009, RJBH; 2 males, Waitakere Ra., Cutty Grass Tk (SW end), 360 m, la. in dead wood of (?) *Kunzea ericoides* 15 Oct 2006, emg. 29 Nov, 13 Dec 2006; 2 males, 1 female, same locality, to m.v. light, 21–22 Jan 2007 (genitalia slides Oec. 355 ♂, Oec. 357 ♀), 29 Nov 2008 (1 male), RJBH, N. Hudson, A. W. Emmerson; 1 female, Waitakere Ra., Huia Dam Rd, la. in dead wood of *Coriaria arborea* 28 Aug 2005, emg. 7 Nov 2005, RJBH (all NZAC). **CL:** 1 male, Cuvier Is., Main Ridge Tk, 100 m, Malaise trap, 10–18 Nov 1999, J. W. Early, S. E. Thorpe; 1 male, Cuvier Is., orchard, 120 m, at light, 30 Mar–7 Apr 2000, J. W. Early, R. Gilbert (both AMNZ). **BP:** 1 male, Mamaku-Kaimai S.F., Woods Mill Tk, 27 Jan 1986, JSD (NZAC).

Note. The orange label on the Holotype was used to indicate the fact that it is a reared specimen, a standard practice in the Lepidoptera collection at NZAC.

Material Examined. Type material plus 10 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Apparently confined to the northern half of the North Island, but not yet known from Northland or the Waikato.

AK, CL, BP, GB / —

Etymology. The specific name is derived from the Greek *blepharis*, an eyelash, and the adjectival ending *-ota*, and refers to the delicate eyelash-like streaks in the subterminal part of the forewing.

Remarks. *I. blepharidota* is a rather elusive species, and was overlooked by the earlier New Zealand collectors. The first known example was collected by A. J. Hipwell in Onehunga, Auckland in December 1935; this specimen was

recently rediscovered in NZAC in an old store-box, where it stood over the name *Izatha milligani* (a synonym of *I. balanophora*). A second specimen was taken at light in Titirangi AK by C. R. Thomas in November 1952. Recent collecting has shown that *blepharidota* may be not uncommon in parts of the Waitakere Ranges AK. It is possible that offshore islands of the Coromandel region are another stronghold of the species, since several specimens have been collected recently on Cuvier and Great Barrier Islands.

Izatha voluptuosa new species

Fig. 5–7, 134, 135, 224, 261; Map 3

Izatha copiosella sensu Hudson, 1928 *nec* Walker, 1864b.

Diagnosis. See under *I. attactella* and *I. blepharidota* for differences from those species. Despite having gone under the name *copiosella* in collections, it cannot possibly be confused with that species since it is very much larger and broader-winged, and lacks yellow on the hindwing.

Male (Fig. 5, 6). Forewing length 14–15 mm; wingspan 29–31 mm. Head capsule smooth, without protuberance; vertex brownish white mixed with dark brown; frons brownish white; labial palpi segment 2 brownish white strongly mottled dark brown, especially exteriorly; segment 3 brownish white, but dark brown anteriorly at base and with distinct dark brown bands at 1/2 and apex, without scale tuft; proboscis brownish white; antennae dorsally brownish white more or less strongly mottled with darker brown, or with scape dark brown except at apex, ventrally unscaled, tawny brown; ciliations silvery, dorsally sparse, appressed, ventrally dense, suberect, ca 1/2 width of flagellum. Collar with mixed dark brown and pale orange-brown scales. Thorax predominantly orange-brown to mid-brown, with admixture of dark brown scales especially laterally and on tegulae. Forewing very broad, costa faintly concave beyond 1/2, termen slightly oblique; dull ochreous, with indistinct patterning formed by dark brown scales as follows: a streak along base of fold, blotches from costa at base, 1/3 and 2/3, that at 1/3 slightly concave on inner margin, that at 2/3 extending as a broad, poorly defined, transverse fascia to dorsum just before tornus, the fascia demarcated distally by a faint, narrow, curved, serrate ochreous-brown line; 2–3 dark brown dashes emerge from between the serrations in subapical area; ca 9 dark brown dots along distal 1/4 of costa, around apex and along termen to tornus; a crescent of pale scales in disc at 2/3 demarcates an indistinct mid- to dark-brown discal spot (apices of crescent point dorsad); crescent edged antero-costally by a dark brown arrowhead mark. Scale-tufts small and indistinct in fresh specimens. Cilia pale ochreous with 2 dark brown cilia-lines. Hindwing dark greyish brown, silvery white where overlain by forewing in set specimens; cilia ochreous with distinct basal and indistinct distal cilia-lines. Underside: forewing dark brown, somewhat paler centrally; hindwing greyish, darker towards apex. Abdomen grey brown, slightly lustrous, scales of T2–7 very narrow and pointed, those of T1 less so; hind margins of segments with normal silvery grey scales; abdomen ventrally pale ochreous; anal tuft mixed brownish white and dark brown.

Female (Fig. 7). Forewing length 16–19.5 mm; wingspan 33–40 mm. Similar to male, but distinctly larger, forewings broader and antennae without conspicuous ciliations. The head, thorax, and forewing coloration tends to be lighter than in the male, and the hindwings are distinctly lighter (basally yellowish white, distally brownish grey). The abdomen is also paler, dorsally pale ochreous with the margins of the segments lustrous white.

Male abdomen and genitalia. Abdomen: S2 apodemes moderately long; S8 longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 134): tegumen elongate, moderately excavated basally (to about 1/3 length); uncus relatively long, rounded, weakly sclerotised dorsolaterally, terminating in two small papillae, each bearing 2 setae. Valva at ca 45° to axis of genital capsule, rather square-ended; apex densely setose, except towards costa; apex exceeding sacculus; sacculus without enlarged setae; sacculus ending in strong suberect blunt tooth; costa straight; costa continuously sclerotised; pulvinus not differentiated as a lobe, represented by a few scattered setae; juxto-costal plate narrow, extended along costa for ca 1/3 costa length; basal arm moderately long, not scobinate; a single flange, large, slightly recurved, triangular, without scobinations. Juxta base-plate completely divided longitudinally into 2 oval sclerites by membranous strip; lateral lobes basally approximated, long, recurved dorsad, bent at nearly 90 degrees near tip into apical tooth, tooth and dorsal surface of lobe just below with fine spines of irregular size. Saccus elongate-triangular. Phallus (Fig. 135, 224) rather short and narrow: left lobe longest, rather dorsally positioned, without teeth, with straight well sclerotised edge where it meets dorsal embayment; right lobe slightly convex and with many rows of small backward-pointing 'teeth'; central lobe inverted U-shaped with field of small backward-pointing teeth ventrally and fine scobinations around apex of 'U'. Vesica base without distinct spinules; vesica with short 2-pointed 'fishhook' cornutus, with base not recurved, and two 'compound cornuti', similar to those described for *blepharidota*; deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood round to ovoid. Caecum penis present.

Female abdomen and genitalia (Fig. 261). Segments 8–10 hardly extensible. S8 saddle-shaped, with triangular medial membranous area; lateral sclerites roughly pear-shaped, strongly setose distally, joined by finely scobinate bridge; scoop-like lateral flanges well developed. Ostium rather broad, subtended by semicircular strip-like lamella antevaginalis; antrum posteriorly smoothly sclerotised, anteriorly scobinate; ductus seminalis arising ventrally near ostium, basally recurved; ductus bursae broad, with dense round scobinations in elongate band posteriorly, scobinations becoming weaker and more scattered anteriorly, scobinations not forming rugae; ductus bursae folded and bent somewhat to left in proximal part towards corpus bursae; corpus bursae elongate-ovate, with fine spinules in posterior 1/2; signum absent.

Larva. Not described.

Biology. One specimen was reared from a larva in an unspecified rotten log; another from a rotten log of *Weinmannia racemosa* (kamahi) (Cunoniaceae).

Flight period. November to February. Most records are from January and February.

Type data. **Holotype:** Male, 'Waimarino 24.1.19 / AMNZ 15277 AUCKLAND MUSEUM NEW ZEALAND / Photographed 2007–2008 by B.E. Rhode for Fauna NZ' (AMNZ). **Paratypes:** 4 males, 7 females. **AK:** 1 male, 2 females,Waitakere Ra., Cutty Grass Tk (SW end), 360 m, m.v. light, 29 Nov 2008, RJBH, N. Hudson, A. W. Emmerson (1 male, 1 female), 25 Jan 2009, RJBH, L. Kaila, J. Kullberg (1 female) (NZAC). **TK:** 1 female, Mt Egmont, South side, 18 Feb 1977, KJF (genitalia on slide) (MONZ); 1 female, Dawson Falls, 16 Dec 1971, F. Chambers (MONZ). **TO:** 1 male, Rangataua Sc. Res., m.v. light, 6 Feb 2003, RJBH, GH (genitalia slide Oec. 358) (NZAC); 1 male, Ohakune, in forest, 23–30 Jan 1912, GVH (Hudson register 833a) (MONZ); 1 female, Ohakune, to sugar, 29 Jan 1912, GVH (Hudson register 833c) (MONZ); 1 female, Ohakune, Nov 1919 (CMNZ); 1 female, Raurimu, 16 Jan 1919 (AMNZ). **RI:** 1 male, Otaihape Sc. Res., 780 m, m.v. light, 19 Feb 2007, RJBH, GH, T. Buckley (NZAC).

Material Examined. Type material plus 11 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Scattered localities in the central and northern North Island.

ND, AK, BP, TK, TO, RI / —

Etymology. The specific name is from the Latin *voluptuosus*, referring to the large size and broad wings of the female, which attains the greatest wingspan (40 mm) of any gelechioid moth in New Zealand.

Remarks. The first specimens of *I. voluptuosa* were collected by G. V. Hudson at Ohakune TO in January 1912; he sent one to Meyrick, which is now in the BMNH. Hudson's collection register in MONZ gives the identification as "*Izatha copiosella* Walker, probably"; it is not clear whether this was his own view or the advice of Meyrick. Either way, the misidentification became entrenched, and this striking species, the largest in its superfamily in New Zealand, has remained without a valid name to this day. The male and female are depicted by Hudson (1928) on plate XXV, figures 26 and 27 respectively (his fig. 27 represents *voluptuosa* and not *copiosella* (*pace* Dugdale 1988: 95). *I. voluptuosa* is a rarely encountered species, apparently most frequent in the central North Island in the area around Tongariro National Park TO, but also known from near Taihape RI, Mt Taranaki and the Waitaanga Plateau TK, the Kaimai Range BP, and from the Waitakere Ranges AK, whence a single specimen was reared by P. T. Leaf in 1976 from a rotten log. Recently 3 further specimens have been captured at light in the Waitakere Ranges, on the Cutty Grass Track at ca 360 m a.s.l. (the habitat shown in Fig. 297). Here, *voluptuosa* is sympatric with its probable sister-species, *I. blepharidota*. The northernmost known locality is Mangamuka Gorge Scenic Reserve ND, where a single specimen was collected in January 2010.

Izatha austera (Meyrick, 1884)

Fig. 10, 11, 136, 137, 225, 262; Map 4

Semiocosma austera Meyrick, 1884: 25–26.

Diagnosis. *Izatha austera* may be confused with *I. dasydisca*; for differences, see under that species.

Male (Fig. 10). Forewing length 7–9.5 mm; wingspan 13–19 mm. Head capsule smooth, without protuberance; vertex dark brown mixed with ochreous brown to whitish brown scales; frons whitish brown; proboscis whitish, more or less speckled dark brown basally; labial palpi segments 2 and 3 whitish brown speckled dark brown, especially exteriorly; segment 3 with dark brown ring just beyond middle, extended dorsally into conspicuous tuft; antennae dark brown, slightly serrate, scape edged whitish brown distally; ciliations pale, moderately appressed, ca 1/3 width of flagellum, denser ventrally. Collar pale to dark brown. Thorax dark brown, mottled ochreous brown. Forewing dark brown with admixture of ochreous brown scales; ochreous scales form ill-defined blotch across fold at ca 1/4 and curved transverse fascia at 3/4, better defined in costal 1/2 of wing; a black discal mark at 2/3 tending to form a V with its apex towards the costa; 3 pale ochreous spots along distal 1/3 of costa, first in line with fascia, each followed by a blackish mark; a faint indication of black streaks along veins in subterminal area; 3–5 more or less clearly indi-

cated whitish spots along termen. Scale-tufts conspicuous in fresh specimens. Cilia blackish brown, darker basally. Hindwing blackish brown, slightly paler basally; cilia blackish brown, with distinct cilia-line. Underside: forewing dark brown with costa pale ochreous from 1/3 to apex, except for blackish spot at 2/3; hindwing mixed whitish brown and dark brown, paler towards base. Abdomen dorsally dark grey-brown, T2–7 with modified, narrow-pointed scales, posterior margins of segments with broad scales, many of them whitish; ventrally ochreous whitish; anal tuft grey-brown.

Female (Fig. 11). Forewing length 8–13 mm; wingspan 16.5–25 mm. Differs from male as follows: antennal ciliations inconspicuous; coloration much paler, with far more extensive areas of pale ochreous scaling; blotch across fold at 1/4 conspicuous, whitish ochreous, sometimes almost joining pale costal blotch at 1/2 to form strongly inwardly oblique fascia; fascia at 3/4 more conspicuous; a series of ca 5 dark spots along termen bordered proximally by ochreous scales; hindwings and abdomen paler.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate to rather long; S8 approximately equal to S7, caudally straight, anterior corners not produced. Genitalia (Fig. 136): tegumen saddle-shaped, deeply excavated basally; uncus short, weakly sclerotised dorsolaterally, terminating in single sessile seta on each side. Valva upright, apically rounded; apex densely short-setose, except on subtriangular apical costal sclerite; apex exceeding sacculus; sacculus without enlarged setae; sacculus ending in low, broad free tooth; costa barely concave towards apex; costa membranous for short distance between apical sclerite and juxto-costal plate; pulvinus a long diffuse row of setae, not a distinct lobe; juxto-costal plate extended along costa for nearly 1/2 costa length, broad, triangular, densely and finely scobinate, basal arm very short, not scobinate; a single flange, large, triangular, slightly recurved, not scobinate. Juxta basally completely divided by membranous strip into 2 triangular sclerites; lateral lobes very widely separate at bases, short, finger-like, weakly curved, without spines or scobinations. Saccus arrowhead-shaped to almost Y-shaped. Phallus (Fig. 137, 225): moderately stout; left lobe rather dorsally positioned, short, with 2–3 rows of small backward-pointing teeth; central lobe longest, with small backward-pointing teeth in 2–3 rows along right margin and with an apical dorsal flange bearing further teeth directed right; right lobe ventral, with 2 rows of forward- and right-pointing teeth around curved apex. Vesica with single, long, fishhook cornutus, not curved at base, occasionally with subapical fork (aberrant specimen?); compound cornuti and deciduous cornuti absent. Bulbus ejaculatorius with very long tubular portion; hood oval to ovoid. Caecum penis present.

Female abdomen and genitalia (Fig. 262). Segments 8–10 moderately extensible. S8 broadly M-shaped, rather sparsely steose distally, without scobinations; scoop-like lateral flanges weakly developed. Ostium broad, subtended by gently curved lamella antevaginalis; antrum very short, membranous, lacking scobinations; ductus seminalis arising ventrally and barely recurved basally; ductus bursae broad, scobinate and longitudinally folded, narrowing into elongate oblong corpus bursae; corpus bursae without signum or spinules.

Larva. Described by Hudson (1928: 282) as follows, with the terminology updated: Length ca 13 mm; slender and cylindrical; head highly polished, reddish brown; prothoracic plate dark brown; mesothorax with triangular brown dorsal plates; rest of body dull ochreous, with very broad slaty-black dorsal band; anal plate yellowish brown; a whitish lateral ridge; setae yellowish brown. This description is probably not of a fully grown larva; no certainly associated material has been described more recently, but the larva is believed to be one of the species showing a strong pinkish tinge when fully fed (pers. obs.).

Biology. Larvae feed during the winter in dead wood, including moist logs on the forest floor, and drier standing dead wood. Recorded from dead branches of *Aristotelia serrata* (wineberry) (Elaeocarpaceae) (Hudson, 1928), *Coprosma grandifolia* (kanono) and probably *C. robusta* (karamu) (Rubiaceae), *Cordyline australis* (ti, cabbage tree) (Agavaceae), *Coriaria arborea* (tutu) (Coriariaceae), *Laurelia novae-zelandiae* (pukatea) (Monimiaceae), *Litsea calicaris* (mangeao) (Lauraceae), *Melicytus ramiflorus* (mahoe) (Violaceae), and *Olearia rani* (heketara) (Asteraceae) (FRNZ and NZAC reared specimens), tunnelling into the wood and producing copious frass, which is often conspicuous on the outside of the affected branch. Many larvae often occur together in a single branch or log.

Flight period. December to February in the wild; adults emerge from October in captivity.

Type data. **Lectotype:** Male, 'LECTOTYPE / Wellington New Zealand 1/1/80 / Izatha austera Meyr. 1/9 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♂ Semiocosma austera Meyrick teste J.S. Dugdale, 1988', designated by Dugdale (1988: 94) (BMNH) (examined). **Paralectotype:** Male, same data as Lectotype, but 2/9 in Meyrick collection.

Material Examined. Type material plus 157 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread throughout the North Island, with a single South Island record from north-west Nelson (Aorere Valley).

ND, AK, CL, WO, BP, TK, TO, GB, HB, RI, WN / NN

Remarks. *I. austera* can frequently be reared in numbers from rather moist logs and dead branches on the ground, although larvae also occur in drier standing dead wood. In the Auckland district (AK), it is by far the most commonly reared saproxylic moth. However, the adult comes only sparingly to light, so the species is not often seen unless reared. The single South Island specimen, a female, was captured by B. Lyford; probably the species has been overlooked in the northwest Nelson area.

Izatha psychra (Meyrick, 1884)

Fig. 12, 138, 139; Map 5

Aochleta psychra Meyrick, 1884: 21.

Diagnosis. The narrow forewings and pale greyish coloration with black basal streak and 3 black dots forming a broad triangle in the basal 1/2 of the wing are distinctive within the genus. A further useful character is the black scape of the antenna (usually white-ringed apically), which contrasts markedly with the whitish head and with the greyish flagellum. There is the possibility of confusion with some greyish species of the *Tingena* group of Oecophoridae (e.g., *Tingena marcida* (Philpott)); however, members of this group have an antennal pecten, lacking in *Izatha*.

Male (Fig. 12). Forewing length 9.5–10 mm; wingspan 20–21 mm. Head capsule smooth, without protuberance; vertex and frons white, with a few pale brownish grey scales; labial palpi segment 2 exteriorly blackish in basal 2/3, interiorly and apically white with a few brownish grey scales, scales of apical 1/3 spreading ventrally into tuft; segment 3 white with some blackish scaling ventrally at base, a black band just beyond 1/2, very slightly thickened but not forming distinct scale-tuft, apically blackish; proboscis white; antennae with scape blackish, usually white-ringed apically, pecten blackish, flagellum ventrally brownish, white-scaled dorsally in basal 1/5, rest of flagellum dark silvery grey; ciliations white, dorsally appressed, ventrally suberect, ca 1/2 width of flagellum. Collar mostly obscured by backward-directed scales of occiput, white with some brownish grey scales. Thorax and tegulae white with admixture of pale greyish and pale brownish scales; no posterior crest on mesonotum. Forewing narrow, termen rather strongly oblique, white, sprinkled with blackish and grey, yellowish-tipped scales; the following markings blackish: a streak along fold at base to 1/6, apically joined to a very short streak or spot just above in disc, a spot on fold at 1/4, a small spot in disc at 1/3, a tiny spot just above disc at 1/2, a V-shaped to triangular mark in disc at 2/3 (with apex of V towards wing base); the following markings grey with a variable admixture of blackish scales: wedge-shaped mark on costa at 1/3, bar on costa at 2/3, area of clouding between V-shaped discal mark and tornus, clouding between V-shaped mark and apex; 3 spots or short streaks in apical 1/4 of costa to apex, and 4 spots or streaks along termen to tornus. Scale-tufts small and inconspicuous. Cilia whitish, tinged brownish grey at mid-length and apically. Hindwing translucent whitish, tinged with brownish, especially exteriorly, and with indistinct discal spot at 1/2; cilia white with indistinct greyish cilia-line. Underside: forewing brownish grey, white below fold, and with cilia paler; hindwing white, tinged with pale brown along costa and veins. Abdomen: T1 silvery white, rest of tergites pale shining greyish brown, the scales narrow and pointed, but hind margins of segments with normal silvery white scales; abdomen ventrally greyish with admixture of white scales; anal tuft ochreous white.

Female. Unknown.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate to long. S8 approximately equal to S7, caudally straight, anterior corners not produced. Genitalia (Fig. 138): tegumen a broad arc, with deep basal excavation; uncus a truncate triangle, weakly sclerotised dorsolaterally, terminating in a pair of setae borne on short papillae. Valva at ca 45° to axis of genital capsule, apically rounded; apex densely setose except in a pre-apical subcostal patch; apex exceeding sacculus; sacculus without enlarged setae; sacculus ending in blunt slightly recurved free tooth; costa straight; costa with sclerotised strip only in apical 1/2; pulvinus a distinct mound, bearing setae on prominent papillae; juxto-costal plate narrow, strip-shaped, not extended along costa; basal arm short, not scobinate; a single flange, elongate-triangular, without scobinations. Juxta basally completely divided by membranous strip into 2 oval sclerites; lateral lobes well separated at bases, short, digitate, not bent, without spines or scobinations. Saccus short, rounded to V-shaped. Phallus (Fig. 139): short, narrow, broadening to apex; left lobe dorsal in position; central and right lobes ventral; all 3 lobes with a few rows of small backward-pointing teeth along right margin in ventral view. Vesica with a large basally strongly curved fishhook cornutus; compound cornuti and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present.

Larva and Biology. Unknown.

Flight period. January, February.

Type data. **Holotype:** Male, 'Holotype / Porters Pass New Zealand JDE. .82 / Aochleta psychra Meyr. 1/1 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / Aochleta Meyr. / psychra Meyr. / B.M. Genitalia slide No. 30747' (BMNH) (examined).

Material Examined. Holotype plus 5 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only known from two localities, in Canterbury and the Mackenzie Basin.

— / MC, MK

Remarks. For many years, *I. psychra* was only known from the type specimen collected by J. D. Enys at Porter's Pass MC in 1882. In January 2001, it was rediscovered by Brian Patrick, who caught 2 specimens at light at the Pukaki Scientific Reserve, an area of shrubland near Lake Pukaki in the Mackenzie Country (MK). Since then, 3 more specimens have been captured at the same site. The female remains unknown. See 'Conservation' section under the genus description for further remarks on the conservation status.

The *mira*-group

Diagnosis. Medium-sized species; head with vertex produced into cone; forewings predominantly blackish brown with some scales white-tipped; male genitalia with valva apex level with or exceeded by sacculus apex; juxta baseplate entire; juxto-costal plate not displaced caudad, without distinct flanges, not forming transtilla-like bridge between valvae; saccus moderate or elongate; vesica without deciduous cornuti, without 'compound cornuti'; female genitalia with ductus membranous (*mira*) or reinforced with internal scobinations (*copiosella*); corpus bursae with signum minute or absent (female unknown in two species).

Notes. Species in this group have a characteristic facies, with conical head, dark forewings, and pale-banded dark abdomen. All species except *mira* have at least some yellow scaling on the hindwing, a feature not found elsewhere in *Izatha*. All species except *copiosella* are probably or certainly diurnal. Their very similar male genitalia indicate that the western species *florida* and *mira* are sister-taxa. In some genitalic characters (elongate saccus and long, apically serrate phallus in the male, and corresponding strongly reinforced antrum and ductus bursae in the female), *copiosella* stands out from the other species, and resembles members of the *apodoxa* group. However, in external appearance it closely resembles *walkerae*, and the males of the two species also share a modified rounded S8 with the anterior corners produced forwards; they are therefore tentatively considered to be sister-species.

Izatha copiosella (Walker, 1864)

Fig. 13, 14, 84, 94, 106, 121, 140, 141, 226, 263; Map 6

Gelechia copiosella Walker, 1864b: 1028.

Zirosaris amorbas Meyrick, 1910: 66. **New synonymy**.

Trachypepla amorbas Meyrick, 1911: 66. **New synonymy**. Synonymised (with *amorbas* Meyrick, 1910) by Meyrick, 1915: 217.

Diagnosis. *Izatha copiosella* can be distinguished from *I. mira* by the presence of a streak of yellow scales in the anterior 1/2 of the hindwing; *I. florida* has the yellow scaling of the hindwing more extensive, not confined to the anterior 1/2. Differences from *I. walkerae* are discussed under that species.

Male (Fig. 13, 94). Forewing length 7–9 mm; wingspan 15–20 mm. Head (Fig. 84, 106): (behind antenna, no unscaled strip between dorsal margin of eye and vertex); vertex roughly triangular, strongly melanised, extended weakly forwards between antennal bases as conical protuberance, scales narrow, brownish grey tipped with white; frons mixed white and greyish; labial palpi segment 2 with suberect scales beneath, mixed white and greyish brown, predominantly white interiorly, apex ringed white; segment 3 chiefly grey-brown ventrally, white dorsally, brown scales forming a thickening or small scale-tuft at mid-length; proboscis white with some greyish scales; antenna filiform; antennal scape grey-brown speckled white, rest of antenna black, banded white ventrally and with scattered white scales dorsally; ciliations white, ca 1/3 width of flagellum. Collar grey-brown, edged white posteriorly. Thorax and tegulae grey-brown, the scales tipped white; mesonotum posteriorly white. Forewing rather narrow and parallel-sided, the termen slightly oblique, dark brown, mottled with grey-brown, white-tipped scales and a few tawny-brown scales; markings indistinct: short, dark brown bars from costa at 3/8 and 2/3, and 2–3 very indistinct spots beyond these towards apex; blackish spot or short vertical bar in fold at 1/5; a blackish discal spot at 3/8 and a blackish spot just beyond this on fold; a short vertical dash in disc at 3/4 usually rather distinct and surrounded by paler scales; a few tawny scales costad of each discal spot and others basad of each plical spot. Scale-tufts small and inconspicuous, except for large tuft on fold at 1/2. Cilia dark brown with indistinct cilia-line. Hindwing dark brown, with central subcostal dash of pale yellow below costal white area overlapped by forewing; cilia grey-brown with dark basal cilia-line. Underside: forewing dark brown with scattered whitish yellow scales, predominantly whitish yellow below fold, and with whitish spots where veins meet termen, cilia dark brown; hindwing grey-brown, whitish along veins and with whitish cloud towards costa between 1/2 and apex; cilia grey-brown. Abdomen: T1–4 shining greyish, sometimes brassy-tinged, scales very narrow, sharp-tipped, except for a posterior band of broad white scales on each segment; T5–8 with scales broader, greyish with brassy reflections, white posterior margins of segments progressively less well defined; T8 without white scaling; abdo-

men ventrally white to S7, S8 grey-brown; anal tuft greyish with the scales paler basally; (phallus often protruding from abdomen in the set specimen).

Female (Fig. 14). Forewing length 9–11 mm; wingspan 19–23 mm. Similar to male, but more robust, antennae without conspicuous ciliations, and forewing rather broader, paler, with dark markings showing up more prominently.

Male abdomen and genitalia. Abdomen (Fig. 121): S2 apodemes moderate; S8 longer than S7, caudally rounded, anterior corners produced forwards. Genitalia (Fig. 140): tegumen narrow, elongate, with moderate basal excavation; uncus rounded, weakly sclerotised dorsolaterally, terminating in 2 small tufts of sessile setae. Valva upright, apically narrow, rather pointed; apex sparsely setose; sacculus without enlarged setae, ending in prominent free digitate process exceeding valva apex; costa slightly convex, continuously sclerotised; pulvinus apparently absent; juxto-costal plate enlarged, subrectangular, and extended along costa for 3/4 costa length; plate projects beyond costa as very elongate scalene triangle, apical part of which may be interpreted as a single flange, without scobinations; basal arms moderate in length, broad-digitate. Juxta base-plate entire, squarish or anteriorly rounded; lobes slightly separate at base, long, straight, with dorsally expanded apices, without scobinations. Saccus very long, narrow, with spatulate apex. Phallus (Fig. 141, 226): very elongate and narrow; right lobe ventral in position, smooth, apically rounded, longer than others; left lobe dorsal, with 2–3 rows of small hooked teeth, teeth short around apex, longer down sclerotised ridge on left side, culminating in 2–3 prominent backward-pointing teeth proximally (at ca 3/4 length of phallus); membranous outer wall of phallus strongly folded next to apex of this lobe; central lobe shortest, a sclerotised strip with 2–3 rows of alternating small backward pointing teeth. Vesica without translucent spinules basally; without fishhook, compound or deciduous cornuti. Bulbus ejaculatorius without distinct tubular portion; hood oval. Caecum penis present.

Female abdomen and genitalia (Fig. 263). Segments 8–10 strongly extensible. S8 of 2 ovate, anteriorly pointed plates, fused medially, without scobinations, moderately setose distally; scoop-like lateral flanges very strongly developed. Ostium rather narrow, subtended by weakly curved, weakly sclerotised lamella antevaginalis; antrum very elongate, posteriorly sclerotised, without scobinations, anteriorly sclerotised and densely scobinate; ductus seminalis arising ventrolaterally on left side, basally recurved; ductus bursae of moderate width, with inner wall densely scobinate, the scobinations forming fine contours and reticulations and overlain by strong rugae anteriorly, where ductus bends to meet corpus; corpus bursae elongate, finely spinulose anteriorly; signum tiny, C-shaped to diamond-shaped with a few teeth, or absent.

Larva. Not described.

Biology. The only reared specimen was collected (presumably as a larva) in dead elm wood (*Ulmus* sp.) (Ulmaceae) at Wakapuaka NN on 17 July 1966, emerging on 16 December 1966 (female in NZAC). Two specimens were taken at light beside Lake Tutira HB close to large old *Sophora tetraptera* (kowhai) (Fabaceae), with few other trees present, and dead wood of *Sophora* is a likely native larval pabulum.

Type data. *Gelechia copiosella*: **Holotype:** Male, 'Type / Auckld N. Zeal / Gelechia copiosella Wkr. Cat. Lep. BM. 30 p. 1028 (1864) TYPE ♂' (BMNH) (examined). **Note**. The correct locality for this specimen is Nelson; it was collected by T. R. Oxley (Dugdale, 1988).

Zirosaris amorbas: Holotype not located by Dugdale (1988); type locality Broken River MC (collector J. H. Lewis).

Trachypepla amorbas: **Holotype:** Male, 'Holotype / Invercargill New Zealand AP. .08 / Izatha amorbas Meyr. 1/3 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938-290 / NOT holotype of Zirosaris amorbas Meyr. 1910 p. 66 J.S.D. 1980' (BMNH) (examined). **Note:** Meyrick (1911: 66) and Dugdale (1988: 94) erroneously state that the specimen is female and Dugdale (*loc. cit.*) indicates that the abdomen is missing. The abdomen is present, and perhaps the protruding phallus was mistaken by Meyrick for an ovipositor.

Note on synonymy. Meyrick (1910) almost certainly described *amorbas* without having seen Walker's type of *copiosella*. The name *copiosella* has subsequently been used incorrectly to refer to the species described above as *I. voluptuosa*; it is not clear whether Meyrick or Hudson was responsible for the misinterpretation of Walker's description. Meyrick described the true *copiosella* twice, each time as a new species, each time as *amorbas*, and each time in a different genus (Meyrick, 1910 (*Zirosaris amorbas*), 1911 (*Trachypepla amorbas*)). The second description makes no reference to the first, but Meyrick presumably did not intend them as separate taxa, since he lists only one *amorbas* in his subsequent Tineina revision (Meyrick, 1915), cites both descriptions, and synonymises *Zirosaris* with *Trachypepla*. Neither Walker nor Meyrick make any reference to the yellow scaling on the hindwings, which is present in nearly all specimens, though sometimes concealed beneath the forewings when the wings are not fully spread.

Dugdale (1988) examined the type material and recognised that Walker's name had been misintepreted but hesitated to synonymise *amorbas*, the two surviving types

being from different localities, and Walker's male having lost its abdomen. However, in NZAC he placed *amorbas* as an unpublished synonym of *copiosella*, and re-examination of the types along with further material makes it clear that this is correct.

Material Examined. Type material plus 108 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. South-eastern North Island and throughout the South Island except the West Coast.

HB, WA ,WN / SD, NN, BR, KA, NC, MC, OL, CO, DN, SL, FD.

Remarks. *Izatha copiosella* is characteristic of the drier eastern side of both main islands from Hawkes Bay south, having a distribution broadly similar to *I. katadiktya* and to other Lepidoptera such as *Gymnobathra hamatella* (Walker) (Oecophoridae) and *Pseudocoremia pergrata* (Philpott) (Geometridae). Although *copiosella* is the commonest member of the *mira*-group in collections, it has never been found abundantly, and occurs only locally in small numbers at light. The female is very seldom caught. Of the 3 females dissected, one (from West Plains SL) lacks any trace of a signum in the corpus bursae; no other differences between Southland specimens and those from elsewhere have been noted, and the significance of this variation is not known.

There is a melanic female in CMNZ, captured in Riccarton Bush (Dean's Bush), Christchurch, in December 1934 by S. Lindsay. This lacks the pale edging to the forewing scales and any trace of yellow hindwing scales, and has the posterior margins of the abdominal segments leaden grey, not white. Though I have assigned it to *copiosella* here, it is possible that this unique specimen represents an undescribed species. It is not considered likely to be the unknown female of *walkerae*, because T1 has narrow scales. In view of damage sustained to the head and wings during postage, I have preferred not to dissect the specimen and risk further mutilation, when results may not be conclusive. It is highly desirable that further similar specimens, including males, should be found, so that the taxonomic status can be properly investigated.

Izatha walkerae new species

Fig. 15, 85, 93, 142, 143, 210, 227; Map 7

Diagnosis. *I. walkerae* is very similar to *I. copiosella*, but the male can be easily distinguished by the characters listed in the description below, especially the whorls of long dark sensilla on the antennae (Fig. 93). The female of *walkerae* is unknown, but it is expected that the scaling of T1 (see below) will distinguish it from the female of *copiosella*. The antennal characters also distinguish male *walkerae* from *mira* and *florida*. Male genitalia of *walkerae* are characteristic and differ widely from those of *copiosella* (see Fig. 140–143).

Male (Fig. 15, 85, 93). Forewing length 8–9.5 mm; wingspan 18–20 mm. Very similar to *I. copiosella*; only the following distinguishing features have been noted: head (Fig. 85) behind antenna with unscaled strip between dorsal margin of eye and vertex (scaled in *copiosella*); antennae (Fig. 93) submoniliform (filiform in *copiosella*), with ciliations black, 2–3× width of flagellum, arranged in distinct whorls (ciliations white, 1/3 width of flagellum, and not arranged in whorls in *copiosella*); hindwing with only a small yellow subcostal spot at 1/2 (usually a yellow streak in this position in *copiosella*); forewing underside with fewer yellowish white scales than in *copiosella*, and without pale spots where veins meet termen; T1 with broad scales with scalloped tips, contrasting with narrow scales of T2–4 (T1–4 all narrow-scaled in *copiosella*). The forewings of both known specimens of *walkerae* are rather worn, but the markings appear to be similar to those of *copiosella*.

Female. Unknown.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate. S8 slightly longer than S7, caudally rounded, anterior corners produced. Genitalia (Fig. 142): tegumen elongate, with moderate basal excavation; uncus elongate, parallel-sided basally, tapering to a point, weakly sclerotised laterally, with a pair of sessile setae before apex. Valva at ca 45° to axis of genital capsule, apex rounded, sparsely setose, level with sacculus apex; sacculus without enlarged setae, ending in crescentic lobe, proximal end of lobe projecting as a blunt free tooth; costa straight, continuously sclerotised to base; pulvinus represented by a small dense group of setae subcostally at about 1/2 length of valva, not differentiated as a lobe; juxto-costal plate extending ca 1/2 way along costa but not clearly differentiated from costa at this point, plate band-like; basal arms short, weakly developed, not scobinate; a single short blunt digitate flange without scobinations. Juxta (Fig. 210) base-plate entire, cup-shaped; lobes slightly separated at bases, long, with dorsally expanded apices and with fine dorsal and lateral spines in apical 1/2. Saccus moderately elongate, narrow, tapering. Phallus (Fig. 143, 227): elongate, narrow; left lobe longest, apically smooth, with ca 12 very small teeth, in 1–2 rows on right side near base; right lobe dorsal, inconspicuous, smooth; central lobe with group of very small teeth basally in 3–4 rows, apically rounded. Vesica without translucent spinules basally; without fishhook, compound or deciduous cornuti. Bulbus ejaculatorius without distinct tubular portion; hood elongate-sigmoid. Caecum penis present (very small and ventrally recurved).

Larva and biology. Unknown.

Flight period. November, January.

Type data. **Holotype:** Male, 'NEW ZEALAND MB L Tennyson 1220m 21 Jan 1976 A.K. Walker Malaise trap / NZAC slide Oec. 258 genitalia ♂ / Photographed 2007–2008 by B.E. Rhode for Fauna NZ' (NZAC). **Paratype:** 1 male. **SD:** Port Underwood Rd, ca. 4km S of Curious Cove, 16 Nov 1999, R. Hoare, R. Leschen (NZAC).

Material Examined. Type material only.

Distribution. North-eastern South Island.
— / SD, MB

Etymology. The species is named in honour of Annette Walker, who captured the holotype. Annette's contribution to New Zealand entomology includes revisionary work on Thysanoptera and Braconidae (Hymenoptera), popular books on New Zealand insects, and hospitality to the author and colleagues at her idyllic former home in St Arnaud.

Remarks. *Izatha walkerae* was overlooked by the earlier New Zealand collectors. The holotype was taken in a Malaise trap in 1976, and the paratype in a rental car in 1999. Although the latter specimen is in better condition, I have not made it the holotype because of doubt as to its exact locality. It is possible that the moth had remained undetected in the car since the previous night's light trapping at Onamalutu Scenic Reserve MB, having been brought in on the trapping equipment. However, the eyes of *walkerae* have a nude periorbital strip, unlike those of its relative *copiosella*. This character is correlated with diurnal activity (J. S. Dugdale, pers. comm.), so the moth is more likely to have flown into the car near its place of capture on the Port Underwood Road.

This species is the most elusive and little known member of the genus. All known series of *copiosella* in collections have been carefully checked for specimens of *walkerae*, but still only the holotype and paratype are known.

Izatha florida Philpott, 1927

Fig. 16, 86, 144, 145, 211; Map 8
Izatha florida Phipott, 1927a: 86.

Diagnosis. *Izatha florida* is similar to *I. mira*, the most conspicuous difference being the extensive suffusion of golden-yellow scales on the hindwing in *florida*. In the male genitalia, the presence of a distinct though small flange at the base of the valva distinguishes *florida* from *mira*.

Male (Fig. 16, 86). Forewing length 7–9.5 mm; wingspan 14.5–20 mm. Head (Fig. 86): (eye surrounded by unscaled strip); vertex roughly triangular, strongly melanised, extended strongly forwards between antennal bases as conical protuberance, scales narrow, mixed dark brown and white; frons dark brown mixed with white above, white below; labial palpi dark brown speckled with white; segment 2 roughened with suberect scales beneath; segment 3 whitish with dark brown central band extended dorsally just beyond 1/2 into slight scale-tuft, tip narrowly brown; proboscis speckled dark brown and white; antennal scape dark brown speckled white; rest of antenna filiform, black with bands of dark brown scales, with a few whitish scales intermixed, white scales scattered and not forming conspicuous bands beneath; ciliations white with a faint golden sheen, suberect, ca 1/3–1/2 width of flagellum. Collar dark brown, fringed white to yellowish white behind. Thorax and tegulae dark brown, speckled white; hindmost scales of tegulae pale greyish brown, tipped white; hind margin of mesonotum with a whitish spot. Forewing with costa gently arched, termen hardly oblique, overall appearance dark brown: scales of ground-colour grey-brown tipped with bluish white, giving wing a more or less conspicuous grey-blue sheen; the following markings blackish brown: an outwardly obliquely, more or less clearly M-shaped fascia at 1/5, sometimes obsolete below fold, a similar, often broader, faintly 3-shaped fascia just before 1/2, a spot on costa at 2/3 and an inverted V-shaped mark just below this in disc; bluish-tipped scales form indistinct, strongly angulated fascia at 5/6; a yellowish white spot on dorsum at 1/6. Scale-tufts rather small and inconspicuous, that on fold at 1/2 not appearing larger than others (cf. *copiosella*). Cilia dark leaden brown. Hindwing bronzy brown to dark brown; a strip of silvery white scales along costa where it is overlapped by forewing; beyond this, an area of golden-yellow reaching 1/2–2/3 across wing, scattered with dark brown scales basally; rest of wing dark brown; cilia brown with indistinct basal cilia-line. Underside: forewing dark brown, whitish below fold, with faint whitish streaking along costa, especially around 1/2; a whitish streak in disc radiating along base of veins beyond; hindwing mostly yellowish white, bordered dark brown around apex and along termen and dorsum. Abdomen blackish brown, central dorsal scales of T1–7 narrow and pointed; T1–6 conspicuously margined with normal, broad yellowish white scales posteriorly; T7 with this whitish band broken or obsolescent; abdomen ventrally white; anal tuft blackish.

Female. Unknown.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate. S8 slightly longer than S7, caudally square, anterior corners not produced. Genitalia (Fig. 144): tegumen elongate, with moderate basal excavation; uncus rounded, weakly sclerotised laterally, terminating in a more or less prominent pair of papillae, each bearing a seta. Valva at ca 45° to axis of genital capsule or more upright; apex elon-

gate-spatulate, sparsely setose, level with sacculus apex; sacculus without enlarged setae, ending in elongate, tapering scoop-like free process; costa apically membranous, otherwise not differentiated from juxto-costal plate; pulvinus absent; juxto-costal plate extended along costa for 3/4 costal length, a broad elongate band, slightly concave on costa; basal arms long, not scobinate; a single very short blunt triangular flange without scobinations. Juxta (Fig. 211) base-plate entire, squarish; lobes well separated at bases, moderately long, with dorsally strongly expanded apices, without scobinations or spines. Saccus triangular, pointed, apex narrow. Phallus (Fig. 145): rather short and narrow; central lobe longest; left and right lobes both rather dorsally positioned, each with ca 3 longitudinal rows of very small backward-pointing teeth in basal 3/4; central lobe ventral, smooth. Vesica without translucent spinules basally; without fishhook, compound or deciduous cornuti. Bulbus ejaculatorius without distinct tubular portion; hood oval to sigmoid. Caecum penis present.

Larva and Biology. Unknown.

Flight period. November, December.

Type data. **Holotype:** Male, 'Mt. Arthur Td. 16–11–1925 A. Philpott / Izatha florida Philp. Holotype. ♂. / Photographed 2007–2008 by B.E. Rhode for Fauna NZ' (NZAC) (examined). **Paratypes:** NN: 1 male, Mt Arthur Tableland, 18 Nov 1925, W. Heighway; 1 male, Salisbury's, 18 Nov 1925, A. Philpott (both NZAC).

Material Examined. Type material plus 2 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. North-west Nelson only.
— / NN

Remarks. *Izatha florida* was discovered by A. Philpott and W. Heighway, who collected the 3 specimens of the type series on Mt Arthur in November 1925. Since then only 2 further specimens have been taken, 1 on Mt Aorere in 1962, and 1 on Mt Domett in 1971, both by J. S. Dugdale. All these specimens are males. The species is almost certainly endemic to north-west Nelson, being replaced elsewhere along the west coast by its presumed sister-species, *I. mira*. It has probably been overlooked because of its relatively early flight time (latest specimen taken on 5 December), its diurnal habits, and its restriction to subalpine habitats. The author visited Mt Arthur in company with J. S. Dugdale and G. Hall on 28 November 2007 and spent about 2 hours just above treeline (1300 m) near the Mt Arthur hut (see Fig. 299) on a fine but cloudy afternoon. Other diurnal Lepidoptera, such as *Declana glacialis* Hudson and *Dasyuris partheniata* Guenée (Geometridae) were flying, but no *florida* were seen. A much longer search in the area is desirable, especially to locate the unknown female.

Izatha mira Philpott, 1913

Fig. 17, 18, 87, 107, 113, 146, 147, 228, 264; Map 9
Izatha mira Philpott, 1913: 78.
Izatha plumbosa Phipott, 1927a: 86. **New Synonymy**.

Diagnosis. Differences from *I. florida* are noted under that species, *q.v. I. mira* can be distinguished from *I. copiosella* by the presence of scalloped scales centrally on T1 of the abdomen; T1 of *copiosella* has only narrow scales similar to those on the other tergites. *I. mira* also lacks golden-yellow scaling on the hindwing (present in almost all *copiosella*), and has the forewings broader and the blackish forewing markings heavier than those of *copiosella*. The genitalia in both sexes are widely distinct (see Fig. 140, 141, 146, 147, 263, 264).

Male (Fig. 17). Forewing length 7.5–9.5 mm; wingspan 16–21 mm. Head (Fig. 87): (eye surrounded by unscaled strip); vertex roughly triangular, strongly melanised, extended strongly forwards between antennal bases as conical protuberance, scales narrow, mixed dark brown and white; frons dark brown mixed with white above, white below; labial palpi dark brown speckled with white; segment 2 roughened with suberect scales beneath; segment 3 whitish with dark brown central band extended dorsally into slight scale-tuft, tip narrowly brown; proboscis speckled dark brown and white; antennal scape dark brown speckled white; rest of antenna filiform, black, ringed with dark brown scales with a few whitish scales intermixed (whitish scales fewer and less conspicuous than in *florida*); ciliations shining greyish, moderately appressed, ca 1/3 width of flagellum. Collar dark brown, fringed white behind. Thorax, tegulae, and forewing as described for *florida* (no species-specific differences noted). Hindwing bronzy brown to dark brown; a strip of silvery white to whitish yellow scales along costa where it is overlapped by forewing; a variable basal suffusion of whitish scales in basal 1/2 of wing, often indistinct or absent; cilia brown with indistinct basal cilia-line. Underside: forewing dark brown, whitish below fold, with variable whitish streaks along costa at ca 1/5, 1/2, and 3/4; hindwing dark brown, with variable basal suffusion of whitish to yellowish white scales; suffusion may cover most of wing except strip along costa and area near apex. Abdomen blackish brown, dorsal scales of T1–7 mostly narrow and pointed; T1 with at least some broader scalloped scales; T1–6 conspicuously margined with normal, broad yellowish white scales posteriorly; T7 with this whitish band broken or obsolescent; abdomen ventrally white; anal tuft blackish.

Female (Fig. 18). Forewing length 8–10.5 mm; wingspan 17–23 mm. Antennae without conspicuous ciliations. More robust and heavy-bodied than male. Forewing with scales of ground colour paler and more extensive than in male, giving the wing a grey appearance, against which the black-

ish markings show up more clearly; markings similar to those of male. Wing venation illustrated in Fig. 107.

Male abdomen and genitalia (Fig. 113, 146, 147, 228). As described for *I. florida*, except juxto-costal plate of valva lacking flange anteriorly, and saccus usually narrower and more elongate (specimen from Lochnagar Ridge has *florida*-like saccus).

Female abdomen and genitalia (Fig. 264). Segments 8–10 strongly extensible. S8 saddle-shaped, with triangular anterior excavation, moderately setose distally, a small area of scobinations centrally between setose areas; scoop-like lateral flanges not developed. Ostium of moderate width, subtended by straight, weakly sclerotised lamella antevaginalis; antrum short, scobinate, the scobinations forming fine contours; ductus seminalis arising mid-ventrally and basally recurved; ductus bursae of moderate width, membranous, not scobinate or rugose, blending imperceptibly with elongate membranous corpus bursae; corpus without spinules, signum absent.

Larva and Biology. Unknown.

Flight period. November, December, January.

Type data. *Izatha mira*: **Holotype:** Male, 'Hump R. 3000' 27.12.11 / Izatha mira Philpott Holotype ♂ / NZAC slide Oec. 263 genitalia ♂' (NZAC) (examined).

Izatha plumbosa: **Holotype:** Female, 'Arthur's Pass 9–2–1926 A. Philpott / Izatha plumbosa Philp. Holotype. ♀' (NZAC) (examined).

Note on synonymy. *Izatha mira* shows sexual dimorphism in size and forewing coloration, which led Philpott to describe the sexes as separate species (*plumbosa* being the female). South of the range of *I. florida*, I can find no evidence of more than one western species in this group, and so I here synonymise *plumbosa* with *mira*. Philpott (1927a) and Hudson (1939) both commented that *plumbosa* (described from a single specimen from Otira Basin WD) might prove to be the female of *florida*; they probably did not consider *mira* as a candidate because at the time its known range was more southerly.

Material Examined. Type material plus 23 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Western South Island, except north-west Nelson.

— / BR, WD, OL, FD, SL

Remarks. *Izatha mira* is a widespread but rarely collected species associated with subalpine and alpine shrublands in the western South Island. Hudson's (1928) records from Christchurch and Dunedin are erroneous and probably refer to *copiosella*. According to Hudson (1928: 281), "it frequents the upper edges of the beech forest on the mountain sides, flying rapidly in the hottest sunshine." More recently, the species has been collected flying low amongst alpine shrubs in Fiordland by day (B. Patrick, pers. comm.).

The *apodoxa*-group

Diagnosis. Medium-sized to large species; head with vertex unmodified; forewings either grey with indistinct darker pattern or white with distinct black pattern; male genitalia with valva apex exceeding sacculus apex; juxta base-plate entire; juxto-costal plate not displaced caudad, with 1 large flange, not forming transtilla-like bridge between valvae; saccus elongate; vesica without deciduous cornuti, without 'compound cornuti'; female genitalia with ductus reinforced with extensive internal scobinations; corpus bursae with signum present, cordate.

Notes. Most species in this group share a similar bold wing pattern of black on a white background; although *notodoxa* and some *apodoxa* are grey with less distinct darker markings, close examination will reveal that these form basically the same pattern as in the other species. *Izatha churtoni* has much the same piebald wing-pattern but its genitalia indicate that it belongs to the *balanophora* group (q.v.). Genitalic apomorphies of the group are: the elongate saccus and phallus, the tendency of the spines on the phallus to form (up to 3) longitudinal sclerotised ridges, rendering the tip of the phallus broader than the base, and the co-evolved reinforcement of the female ductus bursae.

The *Izatha apodoxa* complex

Diagnosis. Grey or black and white species, with basal forewing blotch meeting costa at obtuse angle.

Izatha notodoxa new species

Fig. 23, 24, 148, 149, 229, 265; Map 10

Diagnosis. Superficially nearly indistinguishable from the greyish form of *I. apodoxa*, but the inwardly oblique dark costal mark at 2/3 on the forewing tends to be rather thick in this species and narrower in *apodoxa*. In the male genitalia the extent of the flange on the juxto-costal plate of the valva (reaching 2/3 to the costa vs. 1/2 in *apodoxa*) and the presence of only 2 toothed ridges on the phallus (3 in *apodoxa*) are diagnostic. The two species are almost certainly allopatric, with *notodoxa* restricted to the South Island and *apodoxa* to the North Island.

Male (Fig. 23). Forewing length 9–11 mm; wingspan 19–23 mm. Head capsule smooth, without protuberance; vertex white to pale grey with a few pale brownish scales; frons white above, brown below, the brown scales arising laterally beside eyes and directed mesally; proboscis white, more or less speckled with pale grey; labial palpi segment

2 brown in basal 1/2, white in apical 1/2, sometimes with some brownish scales subapically; segment 3 white with brown band just beyond middle, forming small dorsal tuft, tip of segment more or less tinged brown; antennae greyish brown; ciliations pale, dense ventrally, ca 1/3 flagellum width. Collar, thorax, and tegulae white to pale grey, mottled brown. Forewing white, mottled with grey and pale brown, giving it an overall pale grey appearance; the following markings usually conspicuous, blackish brown: a V- to Y-shaped mark in wing centre from 1/3 to 1/2, a dot, dash, or V-shaped mark in disc at 2/3; the following markings more or less conspicuous, brownish grey: basal blotch on costa, outwardly oblique mark from dorsum near base, not reaching fold, outwardly oblique mark from costa at 1/3, inwardly oblique costal mark at 2/3, cloud of scales in subapical area above tornus, more or less extensive V-shaped cloud around wing apex, 3 costal spots above this in apical 1/3 of wing, 4–5 weakly indicated dashes along termen. Scale-tufts small and inconspicuous. Cilia white to grey with some pale brownish scales. Hindwing mottled white and greyish, paler towards base; an inconspicuous discal spot; cilia brownish white with inconspicuous brownish cilia-line. Underside: forewing pale brown with some whitish scaling towards costa; hindwing pale brown, whitish in anal area and between veins exteriorly. Abdomen whitish anteriorly, brownish white posteriorly; scales of T2–3 somewhat smaller and narrower than other scales, but not conspicuously modified; anal tuft whitish.

Female (Fig. 24). Forewing length 11–11.5 mm; wingspan 22–23 mm. Very similar to male, but antennal ciliations shorter and appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes short to moderate; S8 about equal to S7, caudally straight, anterior corners not produced. Genitalia (Fig. 148): tegumen saddle-shaped, with large excavation basally; uncus bell-shaped, weakly sclerotised dorsolaterally, with 2 sessile setae on each side. Valva upright, apically tongue-shaped, apex centrally setose; apex exceeding sacculus; sacculus without enlarged setae, ending in Y-shaped appressed sclerite (stem of Y fused with lower margin of valva apex); costa gently concave, continuously sclerotised; pulvinus present as a group of setae, not differentiated as a lobe; juxto-costal plate extending along costa for ca 1/3 costa length, roughly triangular; basal arms moderately short, not scobinate; a single very large, half-shield-shaped flange extended apically into caudally-directed tooth (flange extends ca 3/4 way along juxto-costal plate towards costa); flange without scobinations. Juxta base-plate entire, square anteriorly; lobes basally slightly separate, short, digitate, without spines or scobinations. Saccus very elongate, narrow. Phallus (Fig. 149, 229): very elongate and narrow; left and central lobes about equal in length, longer than right lobe; left and right lobes rather ventrally positioned, each with a few rows of backward-pointing teeth, left lobe developed into strong sclerotised ridge; central lobe dorsal, not toothed. Vesica without translucent spinules basally; with a large, basally strongly curved, fishhook-like fixed cornutus; compound cornutus and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood small, ovoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 265). Segments 8–10 only slightly extensible. S8 saddle-shaped, distally moderately setose with central area of fine scobinations; anterolateral corners finely scobinate; scoop-like lateral flanges absent. Ostium moderately broad, subtended by weakly curved lamella antevaginalis; antrum broad and moderately long, urn-shaped, posteriorly (near ostium) sclerotised in a ring with fine scobinations, anteriorly with larger scobinations centrally (both dorsally and ventrally), membranous laterally; ductus seminalis arising ventrally and basally recurved; ductus bursae long, narrower than antrum, with short membranous posterior portion near ductus seminalis, anteriorly strongly and densely scobinate, scobinations forming fine transverse contours, ductus longitudinally rugose towards corpus bursae and scobinations becoming finer and more scattered; corpus bursae round, finely spinulose except anteriorly; signum large, in shape of 4-pointed star, with spinose V-shaped central strip.

Larva and Biology. Unknown.

Flight period. October, November (most specimens), January (specimens from Mt Misery BR).

Type data. **Holotype:** Male, 'NEW ZEALAND NN 41 02.9S 172 55.4E Riwaka V., W.F. Moss Sc. Res., to light 29 Nov 2007 R. Hoare, J. Dugdale, G. Hall / NZAC slide Oec. 361 genitalia ♂' (NZAC). **Paratypes:** 4 males, 3 females. **NN:** 1 male, Wakefield, Faulkner's Bush, at light, 30 Nov 2005, RJBH, JSD (NZAC genitalia slide Oec. 362); 1 male, Clifton, The Grove Sc. Res., to light, 30 Nov 2007 RJBH, JSD, GH; 1 male, Wairoa Gorge, at light 28 Nov 2005, RJBH, JSD; 1 male, 1 female, Nelson 23 Oct 1924, AP; 1 female, Nelson, 11 Nov 1920, AP (NZAC genitalia slide Oec. 363); 1 female, Nelson, Atawhai, to light, 8 Nov 2007, JSD. (All NZAC).

Material Examined. Type material plus 13 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Northern South Island only.
— / SD, NN, BR

Etymology. The name is a combination of the Greek *notos* (the south or south-west wind) and *apodoxa* (its near relative), and refers to its more south-westerly distribution as compared to that species.

Remarks. *Izatha notodoxa* has been confused in collections with its North Island sister-species, *I. apodoxa*, which can be superficially identical, but the latter appears to be far more variable in forewing colour pattern. The two differ in male genital characters as described above. Known habitats for *notodoxa* are riparian podocarp forest (W.F. Moss Scenic Reserve and Faulkner's Bush, Wakefield NN) and beech-podocarp forest (Mt Misery BR).

Izatha katadiktya new species

Fig. 21, 22, 95, 150, 151, 230, 266, 308; Map 11

Diagnosis. For distinctions from *I. churtoni*, see Diagnosis under *churtoni*, Fig. 95, and description below. For distinctions from the black and white form of *apodoxa*, see under that species. *I. katadiktya* is distinguished from members of the *I. picarella* complex (*picarella*, *acmonias*, and *lignyarcha*) by the greater amount of white dorsally on the antennal scape; by the strongly obtuse angle formed by the outer margin of the basal blotch (above the fold) with the costa (90° in *picarella* complex); by the inclusion of white scales in the basal blotch below the fold, and (usually) by the presence of a complete row of black terminal dots on the forewing from tornus to apex (first 1 or 2 dots below apex more or less obsolescent in *picarella* complex). The hindwing cilia are paler than in either of the other 2 species, with a more distinct cilia-line.

Male (Fig. 21). Forewing length 10–13.5 mm; wingspan 21–27.5 mm. Head capsule smooth, without protuberance: vertex white, sometimes a few black-tipped scales centrally on occiput; frons white, lateral marks from mid-level of eye black; proboscis white, speckled black basally; labial palpi white; segment 2 basally black exteriorly, and with poorly defined subapical black ring; segment 3 with black ring just beyond 1/2 extended into dorsal scale-tuft, and apex black; antennae with scape dorsally black, basal 1/2 white; pedicel and flagellum dorsally black, shading to grey apically, (slightly serrate, especially towards tip); ventrally dark brown, ciliations very short, pale, ca 1/2 width of flagellum. Collar centrally white, laterally black. Thorax and tegulae white, tegulae with a few black scales anteriorly; a black arrowhead mark between tegulae, and apex of mesonotum black. Forewing (Fig. 95) white with the following black markings: a basal M-shaped blotch meeting costa at a strongly obtuse angle; dashes from costa at 1/2 and 2/3, with short subcostal extensions directed basad; a short black dash from costa at 3/4, usually flanked on each side by smaller dashes; in disc, contiguous with the costal markings at 1/2 and 2/3, rather narrow marks roughly in the shapes '3' (or '}') and 'N' respectively ('reading' the right wing); '3' reaches just below fold, and 'N' to near tornus; a short dash or spot above the 'N'; an apical spot connected to a subapical triangle; a spot on dorsum at 2/3; 4 dots or short dashes along termen from apex to tornus. Scale-tufts inconspicuous, but tuft on vein Rs in black '3'-mark from costa at 1/2 may be relatively prominent. Cilia white. Hindwing whitish, darker brownish grey towards anal angle, and with grey discal dot and shading between this and termen, especially along veins M2–CuA2 and along basal 1/2 of CuP; dark dashes around termen between veins; cilia white around apex, grey towards anal angle, with basal darker cilia-line. Underside: forewing dark grey with white smudge along costa at 1/2, and 3–4 white dashes from costa in apical 1/3, cilia white; black forewing markings show through indistinctly; hindwing more or less as upperside. Abdomen dorsally silvery grey mixed with pale brownish grey to dark brown; without distinctly narrower scales; ventrally blackish, with more or less extensive white scaling along central line; anal tuft yellowish white.

Female (Fig. 22). Forewing length 11–14.5 mm; wingspan 21.5–30 mm. Similar to male, but antenna with ciliations appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes short; S8 longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 150): tegumen arch-shaped, with large excavation basally; uncus bell-shaped, weakly sclerotised dorsolaterally, apical setae in 2 groups of 2–4, sessile. Valva upright; apex tongue-shaped, rounded, apex exceeding sacculus, centrally setose; sacculus without enlarged setae, ending in Y-shaped sclerite with broad curved 'stem' fused to lower margin of valva apex; costa gently concave; costa continuously sclerotised; pulvinus present as a group of setae, pulvinus lobe absent, but some setae may be borne on papillae; juxto-costal plate extending ca 1/2 way along costa, very broad, half-shield-shaped; basal arm of moderate length, not scobinate; a single narrow triangular flange without scobinations. Juxta base-plate entire, square anteriorly; lobes basally slightly separate, short, rounded, with dorsally expanded apices, without spines or scobinations. Saccus very elongate, a narrow triangle (less narrow than in *apodoxa*). Phallus (Fig. 151, 230): elongate, narrow; central lobe longest; right and left lobes each with a few rows of distinct backward-pointing teeth reaching ca 1/3 way down phallus, both lobes developed into sclerotised ridges; central lobe dorsal, with 2–3 rows of teeth near apex only. Vesica without translucent spinules basally; with a large, basally strongly curved, fishhook cornutus; compound cornuti and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood small, sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 266). Segments 8–10 only slightly extensible. S8 saddle-shaped, distally sparsely setose, with central area of fine scobinations, anterolaterally finely scobinate; scoop-like lateral flanges moderately developed. Ostium moderately broad, subtended by curved lamella antevaginalis; antrum rather short, of even width, posteriorly sclerotised, anteriorly scobinate; ductus seminalis arising ventrally and basally recurved; ductus bursae long, densely scobinate through its entire length, the scobinations form fine transverse contours, rugose anteriorly, where scobinations become less dense; corpus bursae round, finely spinulose except anteriorly; signum moderately large, cordate, with spinose V-shaped strip.

Larva and Biology. Poorly known. A specimen in OMNZ from Enfield DN has pupal exuviae pinned beneath it, but lacks rearing data; according to B. H. Patrick (pers. comm.) this was reared from unidentified dead wood from forest.

Flight period. November to February.

Type data. **Holotype:** Male, 'NEW ZEALAND MK 44 07.7S 170 07.3E Pukaki Scientific Res. m.v. light 630m 9 Feb 2005 R.J.B. Hoare, G. Hall / NZAC slide Oec. 319 genitalia ♂' (NZAC). Paratypes: 23 males, 9 females. **MB:** 1 male, Onamalutu Sc. Res., m.v. light, 15 Nov 1999, RJBH, R. Leschen (NZAC genitalia slide Oec. 326) (NZAC). **MC:** 1 male, Riccarton Bush, m.v. light, 19 Jan 2000, RJBH, JSD, K. Hill, S. Pawson (NZAC genitalia slide Oec. 360) (NZAC); 1 male, 1 female, Christchurch, in house, 13, 17 Dec 1981, J.W. Early (LUNZ); 1 male, Christchurch, in garden, 1 Dec 1991, C.J. Vink (LUNZ); 1 male, 1 female, Banks Peninsula, Prices Valley, 29 Nov–6 Dec, 14–19 Dec 1989, C.A. Muir (LUNZ); 1 female, Prices Bush, 25 Jan 1936, S. Lindsay (CMNZ). **SC:** 1 male, Waihi Gorge, 28 Dec 1943, S. Lindsay (CMNZ). **MK:** 1 male, 1 female, Pukaki Sci. Res., m.v. light, 8 Jan 2006, RJBH, T. Buckley (NZAC); 1 male, Freehold Ck, Lake Ohau, m.v. light, 10 Jan 2006, RJBH, T. Buckley, K. Hill *et al.* (NZAC). **OL:** 1 male, 1 female, Buckler Burn, nr Glenorchy, m.v. light, 2 Feb 2005, RJBH, GH (NZAC genitalia slide Oec. 407 ♀) (NZAC); 1 female, Glacier Burn, m.v. light, 3 Feb 2005, RJBH, GH (NZAC genitalia slide Oec. 318) (NZAC). **CO:** 1 male, Jordan R., Pomahaka Valley, 19–20 Dec 1998, BHP, HP (OMNZ). **DN:** 2 males, Dunedin, 22 Jan, 8 Dec 1915 [Fenwick?] (MONZ); 1 male, Dunedin, 13 Nov 1943, G. Howes (MONZ); 1 male, Dunedin, 16 Dec 1982, BHP (OMNZ); 1 male, Portobello, 1 Dec 1940, G. Howes (MONZ); 1 male, Portobello, 25–29 Dec 1984, BHP (OMNZ); 1 male, Vauxhall, 7 Dec 1908, Fenwick (MONZ); 1 male, 1 female, Anderson's Bay, 21 Jan 1914 (♀),18 Nov 1918 (♂), Fenwick (MONZ); 1 male, Waitati, 28 Nov 1917 [Clarke?] (AMNZ); 1 male, Enfield, 18 Dec 1978, BHP (OMNZ); 1 female (with pupal exuviae), Enfield, 6 Feb 1979, C. Patrick (OMNZ). **SL:** 1 female, Waikaia Forest, Post Office Ck, m.v. light, 4 Feb 2005, RJBH, GH (NZAC);1 male, Tisbury, 28 Jan 1915, AP (NZAC genitalia slide Oec. 323) (NZAC); 2 males, Otatara, 29 Nov 1981, BHP (OMNZ).

Material Examined. Type material plus 94 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Eastern South Island, and (tentatively) Hawkes Bay (see Remarks below).

HB(?) / NN, MB, MC, NC, MC, SC, MK, OL, CO, DN, SL

Etymology. The species name is from the Greek *kata*, implying a downward direction (towards the base), and *diktyon*, a net, and refers to the net-like basal blotch on the forewing, which distinguishes this species from members of the *picarella* complex and from *I. churtoni*.

Remarks. The black and white species of *Izatha* have been the subject of considerable confusion in the literature and collections. The confusion is not surprising because 6 species are involved, some differing only in characters of the genitalia, whereas only 2 species have traditionally been recognised. The ironic result is that *katadiktya*, one of the commonest and most widespread species, has remained without a valid name until now.

Walker (1864a) recognised a distinction between his *picarella* (pale hindwings) and *picarella* var. β (now *churtoni*, uniformly grey hindwings). He did not see material of any of the other black and white species.

Philpott's (1921) '*picarella*' is in fact *katadiktya*; his conviction that the two were distinct was correct, but he misidentified *picarella* (see under *I. acmonias*).

Hudson (1928) noted Philpott's belief that '*picarella*' and *acmonias* were distinct, but did not understand Philpott's application of the name '*picarella*'; his description and illustration of '*picarella*' are in fact of *churtoni*, though he includes localities of *katadiktya* under the name *picarella* as well, on the authority of Meyrick.

I. katadiktya is the only one of the 6 black and white species to occur throughout most of the eastern South Island, but it overlaps with *picarella* in some northern localities (e.g., Onamalutu and Pelorus Bridge MB) and with *acmonias* at the southern end of its range (e.g., Invercargill SL). It is often common where it occurs.

Three North Island specimens are here tentatively referred to *katadiktya*. All are from Haumoana and nearby Clifton HB, and all are females. No wing pattern differences have been found between these and South Island specimens. The two with abdomens have been dissected and appear to have a slightly broader ostium than their South Island counterparts; since the degree of difference is

similar to that found between the ostia of *apodoxa* and *notodoxa*, and since no other member of this species group is found on both main islands, it is not unlikely that the specimens represent yet another undescribed species in this complex. Confirmation must await the discovery of males.

Izatha apodoxa (Meyrick, 1888)

Fig. 19, 20, 114, 152, 153, 231, 267; Map 12
Semiocosma apodoxa Meyrick, 1888: 79.

Diagnosis. This species is variable: some specimens are black and white, well-marked and similar to *I. katadiktya*; and others are grey, indistinctly marked and similar to *I. notodoxa*. The basal blotch on the forewing has no pale inclusion below the fold in well-marked specimens of *apodoxa*, but almost invariably contains a white or pale grey area in *katadiktya*. In the male genitalia, *apodoxa* has a broad half-shield-shaped flange on the valva reaching half way up the juxto-costal plate towards the costa; the flange is of similar shape but larger and reaching well over half way up the plate in *notodoxa*; it is elongate and narrow in *katadiktya*. Other distinctions are as detailed below in the description.

Male (Fig. 19). Forewing length 10–13 mm; wingspan 20.5–26.5 mm. Either as described for *notodoxa*, except with inwardly oblique costal mark at 2/3 on the forewing narrower; or as described for *katadiktya*, except forewing ground-colour sometimes with greyish tinge, due to scattering of pale grey-brown scales; basal blotch includes narrow white dash above fold as in *katadiktya*, but solid black below fold (a white inclusion in *katadiktya*, giving basal blotch the appearance of an 'M'); final stroke of 'N' mark on forewing (near tornus) thicker than in *katadiktya*, forming a solid black triangle (equivalent mark in *katadiktya* is finer and more or less C-shaped).

Female (Fig. 20). Forewing length 10 mm; wingspan 21 mm. Similar to male, but antenna with ciliations appressed. Only *notodoxa*-like grey form is known so far.

Male abdomen and genitalia. Abdomen (Fig. 114): S2 apodemes short or moderate; S8 slightly longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 152): genital capsule as described for *notodoxa*, except flange at base of valva smaller, extending only ca 1/2 length of juxto-costal plate (ca 3/4 length in *notodoxa*), and juxta lobes slightly more widely separated at their bases. Phallus (Fig. 153, 231): as described for *katadiktya*, but central lobe has rows of teeth extending as far down phallus as other lobes.

Female abdomen and genitalia (Fig. 267). As described for *notodoxa*, but ostium, antrum, and posterior portion of ductus bursae broader, and non-scobinate portion of ductus adjacent to ductus seminalis inception shorter than in that species.

Larva and Biology. Unknown.

Flight period. December, January.

Type data. **Lectotype:** Male, 'LECTOTYPE / Wellington New Zealand /84 / Izatha apodoxa Meyr. 3/4 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♂ Semiocosma apodoxa Meyrick teste J.S. Dugdale, 1988', designated by Dugdale (1988: 94) (BMNH) (examined). **Paralectotypes:** 1 male, 1 female. **WN:** 1 male, same data as lectotype but 2/4 in Meyrick coll.; 1 female, same locality but GVH /85, 4/4 (BMNH).

Material Examined. Type material plus 30 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Scattered localities in the southern North Island.

TK, HB, RI, WA, WN / —

Remarks. Very few specimens of *I. apodoxa* are known from outside Wellington. Wellington specimens are all of the grey *notodoxa*-like form, as are the 2 known specimens from Hawkes Bay. The specimen from Mt Taranaki TK and those from Taruarau Hill RI are of the black and white form (not illustrated, due to the poor condition of the specimens), whilst the illustrated male from near Ruakokoputuna WA (Fig. 19) is intermediate in coloration. The black and white specimens have consistently been misplaced in collections, but their genitalia indicate that they are conspecific with *apodoxa*.

The *Izatha picarella* complex

Diagnosis. Black and white species, with basal forewing blotch meeting costa at right angle.

Notes. Members of the *picarella* complex can be most easily distinguished from *I. churtoni* by the white forewing cilia, and from *I. katadiktya* by the form of the basal forewing blotch (see Fig. 95–97). The 3 species of this complex are probably not reliably distinguished on external characters. All 3 show diagnostic characters in the male genitalia; *I. lignyarcha* is the only species known from the North Island.

Izatha acmonias Philpott, 1921 reinstated species

Fig. 25, 26, 96, 125, 154, 155, 212, 232, 233, 268, 269; Map 13
Izatha acmonias Philpott, 1921: 340–341.

Diagnosis. *Izatha acmonias* is probably not reliably distinguishable from *I. lignyarcha* or *I. picarella* on external

characters. However, some specimens of *lignyarcha* have the hindwing almost entirely translucent white, with just the apex darkened, and a very faint cilia-line; this form is not known to occur in *acmonias* or *picarella*. In the male genitalia, *lignyarcha* and *acmonias* lack scobinations on the flange of the valva; the flange is strongly scobinate in *picarella*. The phallus distinguishes this species from *I. lignyarcha*: *acmonias* has 3 groups of backward-pointing teeth borne on 3 longitudinal ridges, whilst *lignyarcha* has only 2 groups of teeth, and only 1 of these is borne on a distinct sclerotised ridge (see Fig. 232–235). In the female genitalia, *acmonias* has a narrower ostium than either of the other species, and a more definite constriction in the ductus bursae at the level of the ductus seminalis; it also usually has a more strongly rugose anterior portion of the ductus bursae, with the rugae tending to form reticulations, though this character is variable (see below and Fig. 268–271).

Male (Fig. 25). Forewing length 10–14 mm; wingspan 21–28.5 mm. Head capsule smooth, without protuberance: vertex white, sometimes a few black-tipped scales centrally towards rear of vertex; frons white, lateral marks from mid-level of eye black; proboscis white, sometimes speckled black basally; labial palpi white; segment 2 basally black exteriorly, and with poorly defined subapical black ring; segment 3 with black ring just beyond 1/2 extended into dorsal scale-tuft, and apex black; antennae with scape dorsally black, with a few white scales basally (often hidden beneath head vestiture in dorsal view), ventrally white; pedicel and flagellum dorsally black, shading to brown-grey apically, slightly serrate, especially towards tip; ventrally dark brown, ciliations very short, pale, ca 1/2 width of flagellum. Collar centrally white, laterally black. Thorax and tegulae white, tegulae with a few black scales anteriorly; a black arrowhead mark between tegulae, and apex of mesonotum black. Forewing (Fig. 96) white with the following bold black markings: a basal blotch in the shape of a thick L, meeting costa at a right angle, enclosing a short basal white dash above fold, obliquely angled to dorsum below fold; dashes from costa at 1/2 and 2/3, with short subcostal extensions directed basad; a short black dash from costa at 3/4, usually flanked on each side by smaller dashes; in disc, contiguous with the costal markings at 1/2 and 2/3, rather narrow marks roughly in the shapes '3'(or '}') and 'N' respectively ('reading' the right wing); '3' reaches just below fold, and 'N' to near tornus; a short dash or spot above the 'N'; an apical spot connected to a subapical triangle, apex of triangle sometimes extended towards tornus; a spot on dorsum at 2/3; 4 dots or short dashes along termen from apex to tornus, the top 2 usually indistinct. Scale-tufts moderately conspicuous in fresh specimens. Cilia white. Hindwing whitish grey to grey, darker grey towards apex and termen, and with dark grey discal dot; a dark line around termen, sometimes broken into dashes between veins; cilia greyish, blackish at apex, and usually white just below apex, with basal, often very indistinct, darker cilia-line. Underside: forewing dark grey with white smudge along costa at 1/2, and 3–4 white dashes from costa in apical 1/3, cilia white; black forewing markings show through indistinctly; hindwing more or less as upperside, but darker around apex. Abdomen dorsally silvery grey; narrower scales in centre of T2–7 tinged yellowish; ventrally blackish, with more or less extensive white scaling along central line; anal tuft brownish white, laterally with some greyish scales.

Female (Fig. 26). Forewing length 11.5–17 mm; wingspan 23–35 mm. Very similar to male, but usually larger, and antennal ciliations shorter and appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate; S8 about equal to or slightly longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 154): tegumen arch-shaped, with large excavation basally; uncus broadly rounded, weakly sclerotised dorsolaterally, apical setae in 2 groups of ca 4, sessile. Valva upright; apex rounded, densely setose except near costa; apex exceeding sacculus; sacculus with 1 enlarged seta; sacculus ending in Y-shaped sclerite with broad curved 'stem' fused to lower margin of valva apex; costa gently concave, continuously sclerotised; pulvinus present as a group of sessile setae, pulvinus lobe poorly or moderately differentiated; juxto-costal plate (Fig. 212) extending ca 1/3 way along costa, broad, half-shield-shaped; basal arms moderately long, robust, not scobinate or very finely scobinate; a single rather narrow upturned beak-like flange without scobinations; juxta (Fig. 212) base-plate entire, cup-shaped; lobes basally approximated, moderate, digitate, dorsally expanded for most of their length, without spines or scobinations. Saccus very elongate, a narrow triangle. Phallus (Fig. 125, 155, 232, 233): elongate, narrow, somewhat expanded apically; lobes of about equal length; right lobe in ventral view with 2–3 rows of distinct backward-pointing teeth set on sclerotised ridge, left lobe with a short ridge of similar teeth towards apex only (ridge about 1/2–2/3 length of that on right lobe); central lobe dorsal, with 3–4 rows of teeth reaching slightly further proximally than on right lobe. Vesica without translucent spinules; a large basally strongly curved, fishhook-like fixed cornutus; compound cornutus and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 268, 269). Segments 8–10 only slightly extensible. S8 saddle-shaped, distally moderately setose; entire sclerite covered in fine

regular scobinations; scoop-like lateral flanges only slightly developed. Ostium broad, subtended by almost straight lamella antevaginalis; antrum short, broad, posteriorly with smooth sclerotised ring, anteriorly scobinate; ductus seminalis arising ventrally and barely recurved basally; ductus bursae narrower than antrum (a distinct constriction at transition), scobinate through its entire length and more or less strongly rugose anteriorly, the rugae sometimes tending to form a reticulate pattern; corpus bursae round, finely spinulose throughout; signum moderately large, diamond-shaped, with spinose V-shaped strip.

Larva and Biology. Unknown. Hudson beat specimens from dead *Hoheria lyallii* (mountain lacebark) (Malvaceae) at Otira WD, and was probably correct to assume that this is a host (Hudson, 1928).

Flight period. November, December, January.

Type data. **Holotype:** Male, 'Tisbury 26/11/16 / Izatha acmonias Philpott Holotype ♂ / NZAC slide Oec. 338 genitalia ♂' (NZAC) (examined). **Paratypes:** 4 males. **SL:** 1 male, Tisbury, 2 Dec 1917, AP; 3 males, West Plains, [no date], AP (all NZAC).

Notes: Two paratypes lack abdomens and were probably dissected by Philpott; a third has the abdomen in a capsule beneath the specimen.

Material Examined. Type material plus 46 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Western South Island only.

— / NN, BR, WD, NC, OL, FD, SL

Remarks. In describing *I. acmonias*, Philpott was correctly distinguishing his new species from *I. katadiktya*, which as he states tends to have the black markings less pronounced. However, he wrongly believed that *katadiktya* was Walker's *picarella*. Meyrick had originally proposed the name *acmonias* after being sent specimens by Hudson, but presumably after comparing the material with Walker's *picarella* in BMNH, concluded that they belonged to the same species, and therefore did not describe them (Philpott, 1921: 341). Dugdale's examination of the types of *picarella* and *acmonias* led him to the same conclusion as Meyrick, and he synonymised the two names (Dugdale, 1988). Hudson's (1928: 279) concept of *acmonias* includes *acmonias*, *picarella*, and *lignyarcha*.

As shown here, *I. acmonias* is indeed distinct from *picarella*, but only in genitalic characters. Specimens here assigned to *acmonias* from the Buller and Westland districts (including Arthur's Pass) have a longer ridge of backward-pointing teeth on the left lobe of the phallus (Fig. 233) than do specimens from Southland, Fiordland, and Otago Lakes (Fig. 232). Females from these more northerly populations also tend to have a slightly broader ostium and less strongly rugose ductus bursae (Fig. 269) than southern females (Fig. 268). I have not here considered these small comparative differences enough to warrant the erection of a new species, though further investigation is desirable. This genital variation may be of interest from the perspective of sexually antagonistic co-evolution in *Izatha*, as discussed in the Introduction.

Izatha lignyarcha new species

Fig. 27, 28, 156, 157, 234, 235, 270; Map 14

Diagnosis. See under *I. acmonias*. The distribution of *lignyarcha* does not overlap with that of *acmonias* or *picarella*.

Male (Fig. 27). Forewing length 12–15 mm; wingspan 24.5–30 mm. As described for *I. acmonias*, but hindwing in some specimens translucent whitish with very faint darker discal spot, dark apex and cilia-line; hindwing underside on these specimens with apex more extensively darkened than on upperside.

Female (Fig. 28). Forewing length 11.5–15 mm; wingspan 24–31 mm. Very similar to male, but antennal ciliations shorter and appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate; S8 about equal to or slightly longer than S7, caudally straight, anterior corners not produced. Genital capsule (Fig. 156) as described for *acmonias*, except flange of juxto-costal plate is sinuous, i.e., slightly convex in middle of costal margin, basal arms of plate lack even weak scobinations. Phallus (Fig. 157, 234, 235) as described for *acmonias*, but right lobe in ventral view with 1–3 rows of indistinct backward-pointing teeth, teeth not set on sclerotised ridge; left lobe with 2–3 rows of distinct backward-pointing teeth set on sclerotised ridge, reaching further proximally than teeth of right lobe; central lobe dorsal, without teeth or ridge. Vesica with a large basally strongly curved, fishhook-like fixed cornutus; compound cornutus and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 270). As described for *acmonias*, except ostium slightly broader; no distinct constriction at transition from antrum to ductus bursae; rugae of ductus not forming reticulations.

Larva and Biology. Unknown.

Flight period. November (Masterton specimen only); December, January, February.

Type data. **Holotype:** Male, 'New Zealand Stratford Plateau, TK, F. Chambers / Below Strat. Plat. 17–12–70 / F. Chambers Collection / Photographed 2007–2008 by B.E. Rhode / Genitalia ♂ on slide (RJBH prep. Feb 2009)'

(MONZ). **Paratypes:** 4 males, 11 females. **TK:** 2 females, Stratford Plateau, 17 Feb 1972, 21 Jan 1973, F. Chambers (MONZ); 1 female, Mt Egmont, South Side, 2800 ft, 8 Jan 1973, K.J. Fox (genitalia on slide, RJBH prep. 2008) (MONZ); 1 female, Mt Egmont, 23 Jan 1916, M.N. Watt (MONZ); 1 female, Mt Egmont, 1000 m, 23 Jan 1995, BHP, HP, HP (OMNZ). **TO:** 1 female, Taupo, 14 Dec 1934, J.S. Armstrong (NZAC); 1 male, N. Ruapehu, 3600 ft, 14 Jan 1975, KJF (genitalia on slide, RJBH prep. 2007) (MONZ); 1 male, Mt Ruapehu, 18 Jan 1976, F. Chambers (genitalia on slide, RJBH prep. 2007) (MONZ); 2 males, 1 female, Whakapapa, Mt Ruapehu, 4000 ft, early Jan 1922, GVH [Hudson register 800e, 800f, 800g] (MONZ); 2 females, Waimarino, early Jan 1931, Christmas 1931, GVH [Hudson register 800k, 800l); 1 female, Ohakune Mtn Rd, u.v. light, 28 Nov 1970, GWG (NZAC). **WA:** 1 female, Masterton, 2 Nov 1927, S. Hudson (MONZ).

Material Examined. Type material plus 2 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only known from higher altitudes on the North Island volcanoes (Mt Taranaki and Mt Ruapehu), except for one specimen from Taupo and one from Masterton.

TK, TO, WA / —

Etymology. The specific name is derived from the Greek *lignys* (smoke mixed with flame, murky fire) and *archos* (indicating leadership or command) and refers to the moth's fearless occupancy of one active and one dormant volcano.

Remarks. *Izatha lignyarcha* has been confused in collections with *I. acmonias* and *I. picarella*. It appears to have been discovered by Morris Watt, who collected a specimen on Mt Taranaki in January 1916. Most subsequent specimens were collected in the 1920's and 1930's by G. V. Hudson and Stella Hudson, and in the 1970's by G. W. Gibbs, F. Chambers and K. J. Fox (material in MONZ), on Mt Taranaki and Mt Ruapehu (Tongariro National Park). Only one more recent record is known, a female (in OMNZ) from Mt Taranaki (1000 m), collected in 1995 by Brian, Hamish, and Holly Patrick. The Masterton and Taupo records are anomalous, but accepted here as there is no *prima facie* reason to believe the specimens are mislabelled.

J. S. Dugdale collected in Tongariro National Park in February and again in December 1996, but did not capture *lignyarcha*. The author searched for larvae of this species and *I. voluptuosa* in dead wood on the Stratford Plateau, Mt Taranaki, in September 2005, without success. There has been relatively little collecting on the North Island volcanoes in recent years, and weather conditions at 1000 m often do not favour light-trapping for microlepidoptera. The species has therefore probably been overlooked. Stratford Plateau, the type locality, is shown in Fig. 298.

Izatha picarella (Walker, 1864a)

Fig. 29, 30, 158, 159, 213, 236, 271; Map 15

Oecophora picarella Walker, 1864a: 699.

Psecadia teras Felder & Rogenhofer, 1875, pl. cxl fig. 28. Synonymised by Meyrick (1884: 23).

Diagnosis. Probably not distinguishable externally from *I. lignyarcha* (q.v.), but the two species are almost certainly allopatric. Also not distinguishable externally from *I. acmonias*, but easily recognised on male and female genitalic characters, as follows: in *picarella*, the flange of the valva and the basal arm of the juxto-costal process are covered in strong spine-like scobinations (smooth in *acmonias*, which has at most very weak scobinations on the basal arm only), the phallus is abruptly dilated at 3/4 length (only slightly dilated at 1/2–2/3 in *acmonias*), and the ostium takes up almost the entire width of the S7 / S8 border (about 2/3 of the width in *acmonias*).

Male (Fig. 29). Forewing length 11–14 mm; wingspan 22.5–28.5 mm. As described for *I. acmonias*.

Female (Fig. 30). Forewing length 10–13.5 mm; wingspan 20.5–28 mm. Similar to male, but antennal ciliations appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate; S8 about equal to S7. Genital capsule (Fig. 158) as descibed for *acmonias*, except lower 2/3 of flange and basal arm of juxto-costal plate (Fig. 213) with dense, small tooth-like scobinations, longest on lower margin of flange. Phallus (Fig. 159, 236): strongly club-shaped, right and left lobes in ventral view with 2–3 rows of distinct backward-pointing teeth set on sclerotised ridges of equal length, right lobe with smooth base where it projects strongly from contour of phallus at angle just over 90 degrees; central lobe dorsal, with 3–4 rows of teeth on sclerotised ridge about equal to other 2 ridges. Vesica without translucent spinules; a large basally strongly curved, fishhook-like fixed cornutus; compound cornutus and deciduous cornuti absent. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 271). As described for *acmonias*, except: ostium extremely broad, taking up most of width of S8, no distinct constriction at transition from antrum to ductus bursae; rugae of ductus bursae less extensive, not forming reticulate pattern; signum smaller, more or less cordate.

Larva (Fig.) Not described.

Biology. Reared once from dead wood of apple (presumably *Malus domesticus*) (Rosaceae), and once from dead branches of *Melicytus ramiflorus* (mahoe) (Violaceae). The specimen from apple must have been present as a pupa, as it was collected on the 12th of October and emerged on the 16th. The *Melicytus* specimen was collected in August and emerged the following February.

Flight period. September to January, with most specimens collected in November and January.

Type data. *Oecophora picarella*: **Holotype:** Female, 'Type H.T. / Auckland N. Zeal. / Oecophora picarella Wlkr. Cat. Lep. Het. BM. 29. p. 699 (1864) TYPE ♂' [*sic*] (BMNH) (examined).

Psecadia teras. **Holotype:** Female, 'Type / 337 / Felder Coll. Rothschild 1913–86 / Novara CXL 728 Psecadia teras n. N. Seeld. ♂ / FELDER'S TYPE / abdomen (♀, ?Geometrid) is irrelevant. JSD 1980' (BMNH) (examined).

Notes. The true locality of the type of *picarella* is Nelson, not Auckland, as established by Dugdale (1988: 17). The locality for *teras* is given in the caption to Plate CXL in Felder & Rogenhofer (1875) as 'ins. austr.', i.e., South Island, and again this is a Nelson specimen supplied by Oxley to the Austrian Novara expedition (cf. Dugdale 1988: 10).

Material Examined. Type material plus 45 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Nelson and Marlborough districts of the northern South Island.

— / SD, NN, MB

Remarks. No reliable external characters have been found to distinguish the two more heavily marked South Island black and white *Izatha* species. Since the type specimens of both *picarella* Walker and *teras* Felder & Rogenhofer are lacking their original abdomens (Dugdale, 1988), their identity is established here purely on the basis of type locality (Nelson in both cases). North of Buller and east of the Arthur Range, only the species with the strongly scobinate flange of the male valva and the abruptly dilated phallus has been recorded; therefore the name *picarella* (= *teras*) is here assumed to refer to this species. The other species is *I. acmonias* Philpott.

There are three males of *I. picarella* in NZAC labelled 'Hermitage, Mt Cook, 4 Nov 1969, H. Wilson' (identity determined by genitalia dissection of one specimen). Hugh Wilson (pers. comm. 2008) has kindly confirmed that he did collect Lepidoptera from Mt Cook at about this time, but has no specific memory of these specimens. Mt Cook is a long way outside the known range of *picarella*, and all other *Izatha* specimens of this complex from south of the Buller River are referred here to *acmonias*. In their mode of pinning and labelling, the three specimens resemble a series of *picarella* collected in 1968–1969 from a light trap in Opouri NN. The light trap contained Vapona as a killing agent resulting in eversion of the genitalia of trapped specimens (J. S. Dugdale, pers. comm.), and the 'Mt Cook' examples all show this eversion. Therefore, the specimens are considered to be mislabelled, and most likely formed part of the Opouri series.

The phallus of *Izatha picarella* is extreme, even for this genus, its form resembling a spined club. The female has apparently co-evolved by broadening the ostium to almost the full width of S8. Interestingly, the ductus bursae shows less defensive rugosity than that of *acmonias*.

The *balanophora*-group

Diagnosis. Medium-sized to large species; head with vertex unmodified or conical; forewing with various patterns; male genitalia with juxta base-plate entire or split longitudinally; juxto-costal plate not displaced caudad, usually with 2 flanges (1 in *metadelta*), not forming transtilla-like bridge between valvae; saccus moderate; vesica usually with deciduous cornuti (except *dulcior* and *heroica*), without compound cornuti; female genitalia with ductus membranous; corpus bursae with signum usually present (except *heroica*), cordate.

Notes. The chief apomorphy used to define this diverse group is the presence of deciduous cornuti in the vesica of the male phallus; the development of a more or less well differentiated second flange on the juxto-costal plate at the base of the valva is also characteristic. Most members of the group fall into two subgroups or species complexes: the *epiphanes*-complex and the *peroneanella*-complex (qqv.). *Izatha dulcior* lacks deciduous cornuti, but its close resemblance in all other characters, external and genitalic, to *I. epiphanes*, indicates that it belongs in this group, and has probably lost the cornuti secondarily (see Introduction). *Izatha heroica* is also aberrant in lacking both deciduous cornuti in the male and a signum in the female, but it shares a distinctive wing-pattern of streaks and spots on a paler ground with members of the *peroneanella*-complex, and like these, has a centrally membranous juxta with the base-plate strongly reduced, so it is assigned to the same subgroup with some confidence.

One species cannot be confidently placed in either complex: *Izatha metadelta* is the only member of the *balanophora*-group that has no trace of a second flange on the juxto-costal plate, but it has deciduous cornuti. The phallus is rather 'weakly armed' and unspecialised compared to other species placed here, so *metadelta* may be sister-species to the rest of the group. *Izatha heroica* and *I. huttonii* are the only members of the *balanophora*-group that occur in the South Island, and *I. heroica* is the only South Island endemic (see Introduction).

Izatha metadelta Meyrick, 1905

Fig. 31, 32, 88, 160, 161, 237, 272; Map 16

Izatha (Semiocosma) metadelta Meyrick, 1905: 238.

Izatha percnitis Meyrick, 1909: 14. Synonymised by Meyrick (1912: 121).

Diagnosis. *Izatha metadelta* can immediately be distinguished from all other species by the golden-orange narrow scales on T1 and T2 which contrast with the ground colour of the abdomen. The strongly developed protuberance on the head is also a useful feature to distinguish it from similar members of the *balanophora* group, such as *I. epiphanes*.

Male (Fig. 31). Forewing length 7–8.5 mm; wingspan 15–18.5 mm. Head (Fig. 88): (eyes without nude periorbital strip); vertex strongly melanised, strongly produced forwards between antennal bases into triangular protuberance, scales shining pale to dark greyish, with a few whitish scales intermixed on occiput and white scales anteriorly on each side of protuberance; frons shining greyish above, white below; labial palpi segment 2 white interiorly, white mixed with dark brown exteriorly, and with dark brown subapical ring; segment 3 dark brown, with whitish subapical ring and white spot dorsally before middle; brown scales produced dorsally into distinct scale-tuft at 1/2; proboscis white, with or without some brownish scales; antennae dorsally dark brown, with the bases of many scales showing pale greyish and with scattered white scales, ventrally brown with more or less regular white banding; ciliations white, dorsally appressed, ventrally suberect, ca 1/2 width of flagellum. Collar dark brown, paler posteriorly with the occasional whitish scale. Thorax dark brown with admixture of pale tawny brown and whitish scales; posterior part of tegulae and posterior mesonotal scale-tuft predominantly pale tawny; mesonotal tuft also with some white scales beneath the tawny ones. Forewing dark brown with admixture of white, pale tawny brown, and black scales, forming the following markings: tiny black dot on costa at base; an indistinct brownish basal patch, narrowing to dorsum, bordered whitish and including many tawny-brown and white scales; beyond this an indistinct brown to blackish triangle with apex on fold and base just above dorsum, demarcated dorsally and distally by white scales; black, slightly outward-curved and irregular fascia at 1/2, demarcated beyond by narrow line of white scales; dorsum basad of this below fold may be largely dark brown or entirely pale ochreous brown; a dark brown half-oblong on costa from 2/3–3/4 bordered by some blackish scales below, a black open reniform or heart-shaped mark in the disc below this, demarcated narrowly in white and enclosing mainly tawny-brown scales that 'break through' tornal angle of the mark; a curved narrow whitish fascia at 5/6; a blackish line around apex and along termen. Scale-tufts large and conspicuous in fresh specimens. Cilia shining greyish, with basal darker cilia-line. Hindwing blackish brown, somewhat paler basally; cilia dark greyish brown with basal cilia-line. Underside: forewing blackish brown; hindwing dark greyish brown. Abdomen: anterior and lateral margins of T1 blackish; T1–2 mostly covered with very narrow golden-orange scales; those on T2 more or less divided into 2 lateral patches by a central longitudinal strip of normal dark brown scales; T3 dark brown, with an inconspicuous scattering of the narrow golden-orange scales, remainder of tergites dark brown, scales normal, hind margins of segments leaden greyish; abdomen ventrally whitish with scattered brown scales; anal tuft dark brown.

Female (Fig. 32). Forewing length 8.5–12 mm; wingspan 19–25.5 mm. Antennae without conspicuous ciliations. Forewing broader than in male; markings similar to those of male, but ground colour of wing usually much paler, with predominance of white and pale ochreous scales, the dark brown scales more or less confined to the patches on costa at 1/2 and 2/3; black markings as in male but showing up more conspicuously against paler wing; hindwing in basal 1/2 with strong admixture of white scales. Hindwing underside whitish in basal 1/2, with admixture of white scales beyond this, and with rather distinct discal spot. Abdomen with golden-orange scales as in male, but hind margins of T1–6 white, and T3–6 with strong admixture of white scales amongst the brown.

Male abdomen and genitalia. Abdomen: S2 apodemes short to moderate; S8 about equal to or longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 160): tegumen elongate, arch-shaped, very deeply excavated basally; uncus short, membranous, rounded-triangular to teat-shaped, with apical pair of sessile setae. Valva at 45° to axis of genital capsule; apex rounded, with evenly spaced long setae; apex slightly exceeding sacculus; sacculus with 1–4 enlarged setae, ending in large prow-shaped free tooth; costa rather convex, rounded; costa not sclerotised except in basal 1/3; pulvinus not differentiated as a lobe, a few scattered setae in this position only; juxtocostal plate extending ca 1/2 way along costa, narrow; basal arms short, with weak transverse rugosities; a single broad blunt-triangular flange, weakly scobinate on inner surface or lacking scobinations. Juxta base-plate entire, squarish to broad V-shaped; lateral lobes moderately separate at their bases, elongate, digitate, without spines or scobinations. Saccus arrowhead-shaped. Phallus (Fig. 161, 237) rather short, moderately stout; lobes approximately equal in length; ventral and dorsal lobes broad, with very small scattered backward-pointing teeth towards their apices; central lobe with a few backward-pointing teeth below apex (all lobes weakly sclerotised). Vesica with translucent spinules basally; a short to moderately long single- or double-spined fixed fishhook cornutus, with base not recurved;

4–5 moderate blade-like deciduous cornuti with weakly buttressed bases and equivalent disc-like pores; compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood elongate, sigmoid. Caecum penis present (moderately long).

Female abdomen and genitalia (Fig. 272). Segments 8–10 moderately extensible. S8 saddle-shaped, finely scobinate throughout; scoop-like lateral flanges weakly developed. Ostium narrow, subtended by strongly curved lamella antevaginalis; antrum rather short, narrow, posteriorly sclerotised, anteriorly scobinate in fingerprint-like patch with curved posterior margin; ductus seminalis arising ventrally on left and basally recurved; ductus bursae narrow and finely scobinate only in posteriormost portion, the scobinations continuous with those of antrum; ductus twisted to right and longitudinally weakly folded in proximal part towards corpus bursae; corpus bursae round, densely spinulose except anteriorly; signum large, cordate, with apical boss and V-shaped spinose strip.

Larva. Hudson (1928: 281) describes the larva as closely resembling that of *I. austera*, but lacking tubercles (i.e., presumably with less distinct pinacula). Later (Hudson 1950: 108 and plate X: fig. 12), he illustrates the larva and gives a more detailed description, summarised here, with the terminology updated: Length in final instar 30 mm; head pale brown, highly polished; body cylindrical, extremely attenuated; prothoracic shield polished, pale brown; thoracic segments short; abdominal segments 2–7 gradually increasing in length and thickness; abdomen thence narrowing rapidly and very slender caudally. Colour dull pink, paler beneath; a suffused blackish patch on dorsum of abdominal segment 6; abdominal segments 7–10 pale ochreous; an irregular whitish lateral ridge. Pinacula obscure, setae ochreous.

Biology. Reared from under bark of dead *Aristotelia serrata* (wineberry) (Elaeocarpaceae) (Hudson, 1928), from a "rather dry, soft fallen branch" of *Hedycarya arborea* (pigeonwood, kaiwhiri) (Hudson, 1950), and from unspecified damp, rotten wood on the ground (reared specimens in NZAC).

Flight period. December, January, February.

Type data. *Izatha metadelta*: **Lectotype:** Female, 'LECTOTYPE / Wellington New Zealand GVH /03 / Izatha metadelta Meyr. 6/8 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♀ Semiocosma metadelta Meyrick teste J.S. Dugdale 1988', designated by Dugdale (1988: 95) (BMNH) (examined). **Paralectotypes:** 1 male, 1 female. [No exact locality, probably **WN:** Wellington]: 1 male, New Zealand, GVH (3/8 in Meyrick coll.); 1 female, [no locality] GVH, 1894 (4/8 in Meyrick coll.). **Note:** Hudson's register in MONZ mentions no *metadelta* specimens from 1894, but does refer to one taken in 1884 at Karori, which is no longer in his collection in MONZ. Sometimes Meyrick put the date of receipt of specimens on his labels, rather than the date of capture, as with the holotype of *Titanomis sisyrota* Meyrick (Dugdale, 1988: 214).

Izatha percnitis: **Lectotype:** Male, 'LECTOTYPE / Wellington New Zealand GVH. /00 / Lectotype Izatha percnitis Meyr. teste P.A. Brown / Izatha metadelta Meyr. 2/8 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♂ Izatha percnitis Meyrick teste J.S. Dugdale, 1988', designated by Dugdale (1988: 95) (BMNH) (examined). **Note**. Meyrick described *percnitis* from two specimens, stated to be a male and a female. The paralectotype has not been identified amongst material in the BMNH; all of Meyrick's *metadelta* specimens that are not paralectotypes of *metadelta* were collected subsequent to May 1908, when the paper describing *percnitis* was read before the Wellington Philosophical Society.

Material Examined. Type material plus 89 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. North Island only, rare north of Waikato and the Bay of Plenty.

AK, WO, BP, TK, TO, GB, RI, WA, WN / —

Remarks. *Izatha metadelta* has an unusual North Island distribution, being found fairly commonly from Mt Te Aroha BP south, and rarely in the eastern part of the Auckland district (Albany and Hunua Ranges). The species has not been found in the *Izatha*-rich Waitakere Ranges of west Auckland, nor in Northland. Occasionally, it comes in reasonable numbers to light (e.g., at Otaihape Scenic Reserve RI on 3 February 2003), though it is seldom reared.

The *Izatha epiphanes* complex

Diagnosis. Head with vertex unmodified. Wing pattern variable, not reduced to narrow black or brown markings on a pale ground. Juxta base-plate well-developed, entire. Phallus without laterally-directed dorsal denticulate lobe.

Izatha balanophora (Meyrick, 1897)

Fig. 33–35, 115, 127, 128, 162, 163, 238, 273; Map 17

Semiocosma balanophora Meyrick, 1897: 389.

Izatha milligani Phipott, 1927a: 87. Synonymised by Hudson (1939: 448).

Diagnosis. *Izatha balanophora* may be confused with weakly marked specimens of *I. mesoschista* and *I. haumu*, but it lacks the curved black streak in the forewing disc, which is almost always well developed in those species. Instead *balanophora* has at most 2 straight, short, disconnected black dashes in the disc. In *balanophora*, the basal blotch is reduced to a brown costal streak; in *mesoschista*

and *haumu* the blotch is obsolete only below the fold. It is usually a much larger species than *mesoschista* or *haumu*.

Male (Fig. 33, 34). Forewing length 9.5–13 mm; wingspan 19.5–27 mm. Head capsule smooth, without protuberance; vertex white to pale ochreous with some scales tipped grey-brown; frons white with some dark brown scaling on each side at mid-level of eye; proboscis dark brown, speckled with white; labial palpi white, more or less speckled ochreous, segment 2 ochreous to dark brown exteriorly in basal 1/2 and with pale to dark brown subapical ring; segment 3 with pale to dark brown ring just beyond middle extended dorsally into slight tuft, and with dark brown tip; antennae dark brown, contrasting with head; ciliations minute, pale, ca 1/4 width of flagellum. Collar white with mid-brown scales laterally. Thorax white, mottled with ochreous and grey-brown. Forewing white, more or less densely mottled with pale grey-brown scales; dark brown elongate costal blotches at base of wing, at 1/3 and just beyond 1/2, the central one longest; a variably developed dark brown longitudinal dash in disc at 1/2; followed by and sometimes nearly joined to a shorter dash at 2/3; occasionally a dark brown plical spot directly below first discal; ca 5 vaguely indicated grey-brown parallel dashes beyond this at 3/4 from near costa to just above tornus; up to ca 7 grey-brown indistinct terminal dashes. Scale-tufts rather small and inconspicuous. Cilia mottled ochreous to grey-brown. Hindwing pale brownish grey; cilia pale greyish with indistinct cilia-line basally. Underside: forewing pale brown, with pale spots on costa at 1/2 and 3/4; hindwing pale brown, densely mottled with white scales, especially exteriorly. Abdomen dorsally yellowish white to greyish white, without modified scales; ventrally whitish, mottled grey-brown; anal tuft whitish.

Female (Fig. 35). Forewing length 11.5–14.5 mm; wingspan 23.5–31 mm. Very similar to male, but antennal ciliations even shorter.

Male abdomen and genitalia. Abdomen: S2 apodemes rather long; S8 slightly longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 162): tegumen saddle-shaped, deeply excavated basally; uncus short, rounded, weakly sclerotised dorsolaterally, terminating in a pair of sessile setae. Valva at 45° to axis of genital capsule; apex tongue-shaped, densely short-setose, except towards costa; apex exceeding sacculus; sacculus with 1–3 enlarged setae, ending in V-shaped appressed tooth; costa barely concave towards apex; costa continuously sclerotised; pulvinus developed as a small lobe with sessile setae; juxto-costal plate extended about 1/2 way along costa, crescent-like; basal arms moderately long, with weak transverse rugosities; outer flange a small to moderate tooth; inner flange a large recurved digitate process, both flanges lacking scobinations. Juxta base-plate entire, rectangular to weakly W-shaped; lateral lobes moderately separate at their bases, very short, hummock-like, without scobinations. Saccus arrowhead-shaped. Phallus (Fig. 127, 128, 163, 238) large and stout; central lobe longest; ventral (right) lobe with backward-pointing small teeth on right margin, teeth becoming more numerous apically; dorsal (left) lobe similar, with fewer teeth; central lobe with 2–3 rows of backward-pointing teeth ventrally on oblique apical ridge. Vesica with translucent spinules basally; a large basally strongly curved, fishhook-like fixed cornutus; ca 16 long blade-like deciduous cornuti with buttressed bases and equivalent disc-like pores (Fig. 128); compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood sigmoid. Caecum penis present, moderate.

Female abdomen and genitalia (Fig. 273). (S2 as in Fig. 115.) Segments 8–10 moderately extensible. S8 saddle-shaped, distally moderately setose, covered in fine scobinations throughout; scoop-like lateral flanges moderately developed. Ostium very broad, subtended by gently curved lamella antevaginalis; antrum posteriorly membranous, anteriorly scobinate, the scobinations forming fine transverse crenulate lines; ductus seminalis arising ventrally on left and recurved basally; ductus bursae broad, gradually tapering anteriorly, finely scobinate in posterior portion, scobinations denser on right side where similar to those of antrum; ductus narrowed, folded and twisted to right in proximal part towards corpus bursae, where scobinations are less dense; corpus bursae ovoid, densely spinulose except anteriorly; signum large, cordate, with apical boss and V-shaped spinose strip.

Larva. Not described.

Biology. Two specimens in MONZ were reared from dead kanuka (*Kunzea ericoides*) (Myrtaceae) by J. T. Salmon, and another has been reared from an unidentified rotten log on the ground.

Flight period. December to March, with most specimens occuring in January and February. Salmon's reared material emerged in captivity in October.

Type data. *Semiocosma balanophora*: **Holotype:** Male, 'Holotype / Wellington New Zealand GVH. /97 / Izatha balanophora Meyr. 1/3 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290' (BMNH) (examined).

Izatha milligani: **Holotype:** Male, 'Leigh, Auck. Jan 1926 D.D. Milligan / Izatha milligani Philp Holotype. ♂.' (NZAC) (examined). **Paratypes:** 2 males, same data as holotype.

Material Examined. Type material plus 39 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread in the North Island, probably under-recorded.

ND, AK, WO, TK, TO, RI, WN / —

Remarks. *I. balanophora* appears to be a widespread but relatively uncommon species; adults come occasionally to light in small numbers. Records from the South Island given by Hudson (1928) are in error; all such records probably refer to *I. manubriata*. Vein 3A in the hindwing is forked in this species, as in *I. churtoni* (Fig. 108).

Izatha churtoni Dugdale, 1988

Fig. 36, 37, 97, 108, 164, 165, 214, 239, 274; Map 18

Izatha churtoni Dugdale, 1988: 94.

Diagnosis. This species can be distinguished from all the other black and white *Izatha* species (*katadiktya*, *apodoxa*, *acmonias*, *lignyarcha*, and *picarella*) by the blackish cilia in the lower 3/4 of the forewing (white in the other species) and by the form of the forewing basal black blotch, which is interrupted on its outer margin by white (see Fig. 97). A further diagnostic character is the tuft of hair-like scales arising from the prothoracic pleuron (examine the specimen from the side, looking between the eye and the base of the foreleg); this tuft consists of tawny scales in *churtoni*, but white scales or a mix of black and white scales in all other similar species.

Male (Fig. 36). Forewing length 9–15 mm; wingspan 18–31.5 mm. Head capsule smooth, without protuberance: vertex white, sometimes a few black-tipped scales centrally on occiput; frons white, lateral tufts from mid-level of eye black; proboscis white, speckled black basally; labial palpi white; segment 2 basally black, and with poorly defined subapical black ring; segment 3 with black ring just beyond 1/2 extended into dorsal scale-tuft; antennae with scape black, a very narrow basal band and a few scales ventrally near apex white; pedicel and flagellum dorsally black, shading to grey apically, slightly serrate, especially towards tip; ventrally dark brown, ciliations very short, pale, ca 1/3 width of flagellum. Collar black. Tegulae white, black-edged anteriorly; thorax white, with a curved black transverse band just behind tegulae, and apex of mesonotum black. Forewing (Fig. 97) white with the following black markings: a basal blotch from fold to costa, meeting costa at 90°, extended along and below fold to form a squat 'L' with an emarginate base; elongate costal blotches at 1/2 and 2/3, with short subcostal extensions directed basad; a short black dash from costa at 3/4, usually flanked on each side by smaller dashes; in disc, contiguous with the costal markings at 1/2 and 2/3, broad marks roughly in the shapes '3' and 'N' respectively ('reading' the right wing); '3' reaches just below fold, and 'N' to near tornus; a short dash above the 'N'; an apical dash connected to a subapical triangle; a short dash along base of dorsum; a spot on dorsum at 2/3; a line along lower 3/4 of termen, consisting of 3–4 joined dots (the constrictions between these still evident in less heavily-marked specimens). Scale-tufts moderately conspicuous in fresh specimens. Cilia blackish grey at apex and from 1/3 way down termen to tornus, otherwise white. Hindwing smoky grey, shading to whitish grey towards anal angle; cilia smoky grey with basal darker cilia-line. Underside: forewing dark grey with white smudge along costa at 1/2, and 3–4 white dashes from costa in apical 1/3, cilia as for upperside; black forewing markings show through indistinctly; hindwing whitish grey, darker along veins and at apex. Abdomen dorsally silvery grey; narrower scales in centre of T2–7 yellowish white; ventrally blackish, with more or less extensive white scaling along central line; anal tuft off-white.

Female (Fig. 37). Forewing length 11.5–14 mm; wingspan 24.5–30 mm. Very similar to male, but antennae with ciliations appressed and black band across centre of thorax tending to be broader. Wing venation is shown in Fig. 108.

Male abdomen and genitalia. S2 apodemes rather long; S8 about equal to S7, caudally square, anterior corners not produced. Genitalia (Fig. 164): tegumen arch-shaped, very deeply excavated basally; uncus short, membranous, pointed, with 1–4 apical setae on each side, setae sessile. Valva at 45° to axis of genital capsule; apex narrow, tongue-shaped, densely short-setose, except towards costa; apex exceeding sacculus; sacculus with 1–4 enlarged setae, ending in elongate U-shaped to leaf-shaped apically free tooth; costa weakly concave, continuously sclerotised; pulvinus a moderate to well differentiated lobe with sessile setae; juxto-costal plate extended ca 1/2 way along costa, a broad crescent; basal arms short, swollen, not scobinate; outer flange digitate to triangular; inner flange more strongly sclerotised than outer, distally short-digitate, basally bulbous and scobinate; flanges overlap narrowly at base. Juxta (Fig. 214) base-plate entire, rectangular to weakly W-shaped; lateral lobes moderately separate at their bases, short, thumb-like, with dorsal scobinations. Saccus triangular to funnel-shaped. Phallus (Fig. 165, 239) stout, strongly enlarged apically: central lobe longest; right (ventral) lobe with backward-pointing teeth along right margin and sideways-pointing teeth at and near apex; left (dorsal) lobe strongly convex, with ca 10 rows of backward-pointing teeth; central lobe with projecting ridge from base to near apex bearing several rows of backward-pointing teeth. Vesica basally with translucent spinules; a large basally strongly curved, fishhook-like fixed cornutus; ca 21 long blade-like deciduous cornuti with buttressed bases and equivalent disc-like pores; compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 274). Segments 8–10 hardly extensible. S8 inverted bowl-shaped, covered in fine scobinations; scoop-like lateral flanges weakly developed. Ostium extremely broad (taking up most of width of segment 8), subtended by boomerang-shaped lamella antevaginalis; antrum posteriorly membranous, anteriorly scobinate (not well differentiated from ductus bursae); ductus seminalis arising ventrally on left and strongly recurved basally; ductus bursae posteriorly extremely broad and densely but finely scobinate, not rugose; ductus abruptly narrowed, folded and twisted to right in anterior part towards corpus bursae, the narrow anterior portion lacking scobinations; corpus bursae ovoid, densely spinulose except anteriorly; signum very large, cordate, with apical boss and V-shaped spinose strip.

Larva. Not positively associated.

Biology. Larvae have been found in dead branches of *Coriaria arborea* (tutu) (Coriariaceae) in the Waitakere Ranges AK (collected 31 August) and at the base of Mt Pirongia WO (collected 13 October), moths emerging in captivity from late November to late December. One specimen was reared by T. H. and J. M. Davies from a larva in dead *Fuchsia excorticata* (kotukutuku) (Onagraceae) at White Pine Bush HB, the moth emerging in early November. Further rearing records (from FRNZ) are from dead wood of the following hosts (introduced plants indicated with an asterisk*): **Alnus rubra* (red alder) (Betulaceae), **Quercus* sp. (oak) (Fagaceae), *Pittosporum tenuifolium* (black matipo) (Pittosporaceae).

Flight period. October to February, with most records before Christmas (all February specimens are from sites above 600 m).

Type data. **Holotype:** Female, 'var. â / 51.136 N. Zeal.' (BMNH) (examined). **Note:** The collector of the holotype was J. F. Churton, and the locality is probably Auckland, in common with that of other Churton specimens sent to Walker (Dugdale 1988: 9).

Material Examined. Holotype plus 119 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread throughout the North Island.
ND, AK, CL, WO, BP, TK, TO, HB, RI, WI, WN / —

Remarks. *I. churtoni* is by far the commonest and most widespread of the 4 black and white *Izatha* species found in the North Island, but is absent from the South Island. On the basis of genitalic characters, it is not closely related to the other similarly coloured species, which belong to the *apodoxa*-group and may have converged on the same pattern independently. For a discussion of the nomenclatural history of the black and white species, see under *I. katadiktya*.

Izatha churtoni is the only species of *Izatha* apart from *I. balanophora* known to have a forked vein 3A in the hindwing; no other characters have been found to support a sister-species relationship, but they are tentatively grouped together here. The phallus of *churtoni* is one of the most extreme in the genus, the breadth of the apical toothed lobes being particularly noteworthy.

Izatha dulcior new species

Fig. 46, 166, 167, 215, 275; Map 19

Diagnosis. *Izatha dulcior* closely resembles some darker forms of *I. epiphanes*, but can be distinguished by the lack of a sharp prominence on the outer margin of the dark basal blotch of the forewing. In the male genitalia, the vesica of *dulcior* completely lacks deciduous cornuti and their associated disc-like pores; there are ca 15 cornuti plus pores in unmated *epiphanes*, and the pores remain in mated examples that have lost their cornuti.

Male (Fig. 46). Forewing length 9–12 mm; wingspan 18.5–24.5 mm. Head smooth, without protuberance; vertex white to ochreous white, with variable admixture of ochreous and/or dark brown scales; frons concolorous, with dark brown to black scaling extending in from eye; labial palpi whitish, segment 2 with basal 1/2 dark brown interiorly and exteriorly, and with dark brown subapical ring (incomplete on inner surface); segment 3 whitish, with dark brown to blackish ring medially and brown apex; medial ring extended dorsally into distinct scale-tuft; proboscis dark brown, with some whitish mottling; antennae with scape basally whitish on dorsum, remainder of antenna brownish and black, slightly serrate; ciliations ca 1/3 width of flagellum, more or less appressed. Collar laterally blackish brown, centrally with variable mixture of greyish, brown and/or ochreous white scales. Thorax and tegulae with mixed whitish, ochreous, and dark brown scales; usually a pair of indistinct blackish spots either side of rear margin of mesonotum. Forewing ground colour whitish with strong admixture of ochreous scales, speckled with dark brown scales, appearing greyish brown; the following markings brown to blackish brown: basal blotch to ca 1/5, with smoothly rounded blackish outer margin, enclosing area of ochreous scales below fold; bar along costa from ca 1/3–1/2, and contiguous with this a roughly D-shaped mark, with point on outer margin, running across disc to fold; margins of 'D' blackish, interior brown; a brown bar on costa at 2/3, with black-margined reniform discal spot below it; inner margin of reniform may touch the outer point of the 'D'; reniform 'invaded' on lower margin by ground-colour scales; broad area of brown scaling around apex and termen. Palest part of wing is usually between first 2 dark

marks from costa and around basal blotch, as in *I. epiphanes*. No distinct spots along termen. Scale-tufts apparently moderately small, smaller than in *epiphanes*, though specimens may be slightly worn. Cilia brownish, indistinctly paler-tipped, but without distinct cilia-line. Hindwing grey, paler basally, a whitish line along base of cilia; cilia grey with very indistinct cilia-line. Underside: forewing grey brown, with pale spot on costa at 1/2, and indistinct pale line around apex and termen; hindwing grey-brown shading to whitish towards anal angle. Abdomen dorsally silvery greyish, with admixture of brownish scales, tending to be darker posteriorly; tergites without conspicuously modified scales; ventrally brownish with pale central longitudinal line; anal tuft brownish white.

Female. Forewing length 9.5–10 mm; wingspan 19.5–20.5 mm. Very similar to male, but antenna without conspicuous ciliations.

Male abdomen and genitalia. Abdomen: S2 apodemes rather short; S8 about equal to S7. Genitalia: capsule (Fig. 166) and phallus (Fig. 167) as described below for *epiphanes*, except vesica narrower, and lacking deciduous cornuti and disc-like pores. Juxta as in Fig. 215 (similar to that of *epiphanes*).

Female abdomen and genitalia (Fig. 275). As described below for *epiphanes*, except corpus bursae and signum smaller.

Larva and Biology. Unknown.

Flight period. All known specimens captured in early December.

Type data. **Holotype:** Male, 'NEW ZEALAND ND Poor Knights Is Tawhiti Rahi South Ridge 3 Dec 1980 / R.H. Kleinpaste To light / NZAC slide Oec. 312 genitalia ♂' (NZAC). **Paratypes:** 2 males, 3 females. **ND:** 1 female, same data as holotype; 2 females, Tawhiti Rahi campsite, to light, 5 Dec 1980, M.F. Tocker; 1 male, Tawhiti Rahi, South Tk, to light, 6 Dec 1980, R.H. Kleinpaste; 1 male, Tawhiti Rahi, Tawa Knoll, to light, 8 Dec 1980, R.H. Kleinpaste (all NZAC).

Material Examined. Type material only.

Distribution. Poor Knights Islands only.
ND / —

Etymology. The name is derived from the Latin (*dulcior* = gentler), and refers to the lack of deciduous cornuti in the vesica of the male, as well as the lack of a sharp point on the outer edge of the forewing basal fascia, the features that distinguish the species from *epiphanes*.

Remarks. The Poor Knights Islands are a haven for the native New Zealand fauna and flora, currently free from introduced mammalian pests. They show some degree of endemism in their invertebrate fauna: the giant weta *Deinacrida fallai* Salmon (Anostostomatidae) and giant cave weta *Pachyrhamma giganteum* (Richards) (Rhaphidophoridae) (Orthoptera) are both endemic, and there is also an endemic undescribed stick insect (Phasmatodea: Phasmatidae) (*Clitarchus* sp.: T. R. Buckley, pers. comm.). *Izatha dulcior* is the first species of Lepidoptera to be described as endemic to the Poor Knights.

Izatha epiphanes (Meyrick, 1884)

Fig. 38, 39, 110, 111, 168, 169, 241, 276; Map 20
Semiocosma epiphanes Meyrick, 1884: 24–25.

Diagnosis. *Izatha epiphanes* resembles *I. quinquejacula* and some forms of *I. mesoschista*, but may be distinguished by the distinct black-margined pale reniform discal spot, which is absent or indistinct in the other species; for other differences see under those species. For differences from *dulcior*, see under that species.

Male (Fig. 38). Forewing length 8–12.5 mm; wingspan 17–25 mm. Head smooth, without protuberance; vertex snow-white to ochreous white, or white with admixture of ochreous-white scales; frons concolorous, with dark brown to black scaling extending in from eye; labial palpi white, segment 2 with basal 1/2 black exteriorly, and with black subapical ring (incomplete on inner surface); segment 3 white, with black ring medially and black apex; medial ring extended dorsally into distinct scale-tuft; proboscis variably mottled with black and whitish scales; antennae with scape basally white on dorsum, remainder of antenna dark grey to black, slightly serrate; ciliations ca 1/3 width of flagellum, more or less appressed. Collar laterally black, centrally snow-white to ochreous-white. Thorax and tegulae white to ochreous-white with variable admixture of blackish scales; usually a pair of small black spots either side of rear margin of mesonotum. Forewing ground colour white, variably speckled with ochreous-white and dark grey-brown scales, so that darkest specimens appear grey; the following black markings more or less distinctly indicated: costal bar from base to ca 1/5, and outward-oblique line from there to fold, produced on fold into small arrowhead; bar along costa from ca 1/3–1/2, and contiguous with this an oblique, roughly M-shaped mark across disc to fold; a bar on costa at 2/3, with reniform discal spot below it; inner margin of reniform may touch the outer point of the 'M'; reniform encloses curled scales of discal scale-tuft (with grey metallic undersides showing) and 'invaded' on lower margin by ground-colour scales. Palest part of wing is usually between first 2 black marks from costa and around apex of arrowhead on fold: this area often white. A few indistinct greyish to black streaks along veins posteriorly,

often obsolete, and up to 7 dots around apex and along termen, sometimes fused or obsolete. Scale-tufts large and conspicuous in fresh specimens. Cilia dark shining grey, whitish at tornus, cilia-line moderately distinct. Hindwing pale to dark grey, paler basally, a whitish line along base of cilia; cilia grey with indistinct cilia-line. Underside: forewing grey brown, with pale spot on costa at 1/2, and up to 7 small pale spots around apex and along termen at ends of veins; hindwing whitish, exteriorly grey-brown. Abdomen dorsally silvery white to greyish, tending to be darker posteriorly; tergites without conspicuously modified scales; ventrally greyish to blackish with broad pale central longitudinal line; anal tuft whitish.

Scanning electron micrographs of forewing upperside wing scales are shown in Fig. 110, 111.

Female (Fig. 39). Forewing length 9–14 mm; wingspan 18.5–28 mm. Very similar to male, but antenna without conspicuous ciliations.

Male abdomen and genitalia. Abdomen: S2 apodemes long; S8 about equal to S7, caudally square, anterior corners not produced. Genitalia (Fig. 168): tegumen saddle-shaped, deeply excavated basally; uncus rounded, weakly sclerotised dorsolaterally, apically with 1–6 sessile setae on each side. Valva rather upright; apex densely setose, except towards costa; apex exceeding sacculus; sacculus with 2 enlarged setae, ending in V-shaped tooth-like partially free process; costa almost straight, continuously sclerotised; pulvinus a distinct lobe with sessile setae; juxtocostal plate extended along costa for ca 1/2 costal length, band-like; basal arms rather long and broad (tapering to point), not scobinate; outer flange a short triangular tooth, without scobinations; inner flange a finely scobinate digitate process; (flanges slightly overlapping). Juxta baseplate entire, weakly W-shaped; lobes moderately separate at bases, short, hummock-like, without spines or scobinations. Saccus a long triangle. Phallus (Fig. 169, 241) long and moderately broad; central lobe longest; ventral (right) lobe with large field of backward-pointing teeth apically; dorsal (left lobe) with smaller field of similar teeth; central lobe with a few laterally-pointing teeth. Vesica basally with translucent spinules; a large basally strongly curved, fishhook-like fixed cornutus; 15 long blade-like deciduous cornuti with buttressed bases and equivalent disc-like pores; compound cornutus absent. Bulbus ejaculatorius with moderate tubular portion; hood large, sigmoid. Caecum penis present (long).

Female abdomen and genitalia (Fig. 276). Segments 8–10 only slightly extensible. S8 saddle-shaped; distally moderately setose, covered in fine scobinations; scoop-like lateral flanges weakly developed. Ostium very broad, subtended by strongly curved lamella antevaginalis; antrum broad, posteriorly membranous, anteriorly scobinate in fingerprint-like pattern; ductus seminalis arising ventrally on left and recurved basally; ductus bursae broad, strongly scobinate (scobinations continuous with those of antrum), especially at mid-length of ductus where it tapers distinctly, scobinations finer proximally; ductus rugose and twisted to right in proximal part towards corpus bursae; corpus bursae ovoid, densely spinulose except anteriorly; signum very large, cordate, with apical boss and V-shaped spinose strip.

Larva. Not positively associated.

Biology. Reared from dead wood of *Pittosporum tenuifolium* (black matipo) (Pittosporaceae) and *Fuchsia excorticata* (kotukutuku) (Onagraceae) (Hudson 1928; specimen from his collection reared from former host in CMNZ), and dead standing wood of *Coprosma* (probably *C. grandifolia*, kanono) (Rubiaceae) (reared specimen in NZAC).

Flight period. Late October to February, with one Wellington record from March.

Type data. **Holotype:** Male, 'Holotype / Wellington New Zealand 3/1/86 / Izatha epiphanes Meyr. 3/8 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290' (BMNH) (examined).

Material Examined. Holotype plus 130 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread throughout the North Island.
ND, AK, CL, WO, BP, TK, TO, HB, WI, WN / —

Remarks. *Izatha epiphanes* is a common species throughout much of the North Island. It often comes to light in moderate numbers, but is seldom reared. It is absent from the South Island, the records of Hudson (1928: 281) and Gaskin (1966: 186) being in error. This is the only member of the *balanophora*-group that occurs in the far north of Northland at Te Paki but has apparently not formed a vicariant segregate species there (cf. *haumu*, *taingo*); the genitalia of Te Paki specimens are identical to those from further south.

Izatha mesoschista Meyrick, 1931

Fig. 40–42, 124, 129, 170, 171, 242, 277; Map 21

Izatha mesoschista Meyrick, 1931: 96.

Diagnosis. Very similar to *I. haumu*; differences are listed under that species. More variegated forms can also be confused with *I. epiphanes*, but usually the presence of the curved black longitudinal line in the disc of the forewing from 1/2–2/3 will distinguish *mesoschista* from that species; *epiphanes* also has a large black-margined reniform mark in the disc at 2/3 that is much reduced in *mesoschista*.

In the male genitalia, the very distinctive 3-pronged tip of the phallus is diagnostic of *mesoschista*, and can often be seen without dissection.

Male (Fig. 40). Forewing length 7.5–10 mm; wingspan 15.5–21 mm. Head smooth, without protuberance; vertex white, more or less mixed with pale grey-brown; frons dark brown; labial palpi white, segment 2 exteriorly blackish brown in basal 2/3 and with exterior subapical blackish bar, interiorly blackish brown in basal 1/3–1/2; segment 3 with blackish ring just beyond 1/2 extended into dorsal scale-tuft, and with blackish apex; proboscis white, more or less speckled brown to blackish, especially basally; antennae greyish brown; ciliations ca 1/2 width of flagellum. Collar white, more or less mixed grey-brown to pale brown, anterolaterally dark brown. Thorax white with variable admixture of grey-brown or pale brown scales, and traces of a central transverse dark brown bar. Forewing white with very variable admixture of pale brown and grey-brown scales; the following markings blackish brown: a more or less obscure line along fold from near base to 1/2, often obsolete, and a curved dash in disc from just before 1/2–2/3; the following markings dark brown: base of costa; broad dash along costa from 1/4–1/2; mark from costa at 2/3, usually more or less extended into stout inverted T or fishtail-shape (lobes of the 'tail' fall either side of apex of discal dash); ca 7 more or less well defined spots around apex and along termen, those along termen usually darker; an indistinct subterminal fascia parallel to these spots, preceded by a more or less distinct curved fascia of white ground colour, kinked outwards dorsally to tornus; brownish scaling at base of wing usually forms outward-angled basal blotch, indistinct to obsolete below fold where white scaling predominates; occasionally basal blotch outlined blackish exteriorly to fold. Scale-tufts large and conspicuous in fresh specimens. Cilia white to grey-brown, with more or less distinct cilia-line. Hindwing pale brownish grey; cilia whitish brown to brown, with distinct cilia-line. Underside: forewing brown, with costa, dorsum, and cilia paler, more or less contrasting; hindwing whitish, speckled brown along costa, and around apex and termen. Abdomen dorsally silvery white, slightly yellowish-tinged; scales of T2–5 slightly smaller and narrower than those of other segments with many scales tapering to point; ventrally mixed white and brown, usually with paler longitudinal band; anal tuft brownish white.

Female (Fig. 41, 42). Forewing length 8–12 mm; wingspan 17–25 mm. Similar to male, but antennal ciliations appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes rather long; S8 about equal to S7, caudally square, anterior corners not produced. Genitalia (Fig. 124, 170): tegumen arch-shaped, deeply excavated basally; uncus rounded, moderately sclerotised dorsally, with 1–3 sessile setae on each side apically. Valva at ca 45 degrees to genital capsule; apex densely setose; apex exceeding sacculus; sacculus with 2–3 enlarged setae, ending in bluntly rounded subtriangular partially free tooth; costa almost straight, continuously sclerotised; pulvinus differentiated as a low lobe with sessile setae; juxto-costal plate extending ca 1/2 way along costa, band-like, broadening towards costa; basal arms moderately long and narrow, not scobinate; outer flange a long flattened narrow lobe, finely serrate and occasionally with small subsidiary tooth on lower margin; inner flange finely scobinate, of about equal length or slightly shorter, digitate; (flanges divergent, not overlapping). Juxta base-plate entire, broad V-shaped; lobes well separated at bases, short, hummock-like, without spines or scobinations. Saccus an equilateral or slightly elongate triangle. Phallus (Fig. 171, 242) stout; central lobe longest; right (ventral) and left (dorsal) lobes each terminating in a single strong laterally-directed spine apically; central lobe terminating in a single right-pointing spine, longer than the other 2 spines; no other spines or teeth. Vesica basally with translucent spinules; a large basally strongly curved, fishhook-like fixed cornutus; ca 13–20 long blade-like deciduous cornuti with buttressed bases, each cornutus slightly narrowed near the tip, equivalent number of disc-like pores; compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood large, sigmoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 129, 277). Segments 8–10 only slightly extensible. S8 saddle-shaped, sides concave, covered in fine scobinations; scoop-like lateral flanges moderately developed. Ostium very broad, subtended by narrow sinuous lamella antevaginalis; antrum very short, broad, posteriorly membranous but with central ventral patch of fine scobinations, a broad tranverse fold separates this portion from strongly and evenly scobinate anterior portion; ductus seminalis arising ventrally in centre and strongly recurved basally; ductus bursae strongly and densely scobinate posteriorly, narrowing rather abruptly into more finely and sparsely scobinate anterior portion with longitudinal folding; ductus not or barely twisted to right anteriorly; corpus bursae round to ovoid, finely spinulose throughout; signum large, cordate, with apical boss and V-shaped spinose strip.

Larva. Not described.

Biology. Two specimens in FRNZ were reared from *Populus* sp. (poplar) (Salicaceae), presumably from the dead wood, and another from 'pine logs'. Apparently, there are no other rearing records.

Flight period. October to February, with most specimens occurring from November to January.

Type data. **Lectotype:** Male, 'LECTOTYPE / Wellington New Zealand GVH .11 / Izatha mesoschista Meyr. 4/7 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♂ Izatha mesoschista Meyrick teste J.S. Dugdale, 1988', designated by Dugdale (1988: 95) (BMNH) (examined). **Paralectotypes:** 3 males, 3 females. **WN:** (all Wellington, GVH): 2 males, Jan 1909 (2/7 and 6/7 in Meyrick coll.); 1 female, 1910 (1/7); 1 male, 1911 (5/7); 1 female, Dec 1914 (3/7), 1 female, 1930 (7/7) (all BMNH).

Material Examined. Type material plus 95 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Throughout the North Island, except Te Paki / Aupouri peninsula, and apparently not known from Hawkes Bay or the Wairarapa.

ND, AK, CL, WO, BP, GB, TK, TO, RI, WI, WN / —

Remarks. *I. mesoschista* is one of the commonest and most widespread species of *Izatha* in the North Island, but because of its variability and the similarity of many forms to *I. epiphanes* and *I. balanophora*, it was not recognised and named until relatively late (Meyrick 1931). Hudson (1928: plate XXXII fig. 3) figured *mesoschista* under the name *balanophora*; later he corrected his error (Hudson 1939). In view of its frequent occurrence at light, it is surprising that *I. mesoschista* has so rarely been reared, and never from a native host. There is some variability in the male genitalia, particularly in the number of deciduous cornuti.

Izatha haumu new species

Fig. 43–45, 172, 173, 243, 278; Map 22

Māori name: Pepepepe haumu o Ngāti Kurī

Diagnosis. *I. haumu* is probably not distinguishable externally from grey, nearly unicolorous forms of *mesoschista*, although from the few known specimens it appears to be on average a larger species. It can best be distinguished by the phallus in the male genitalia, which has apical spine-like scobinations on the ventral and dorsal lobes instead of the single large spine in each position in *mesoschista*. These features are sometimes visible without dissection.

Male (Fig. 43, 44). Forewing length 9–11 mm; wingspan 18–22 mm. Head smooth, without protuberance; vertex white, mottled with pale grey-brown; frons dark brown; labial palpi white, segment 2 exteriorly blackish brown in basal 2/3 and with exterior subapical blackish bar, interiorly blackish brown in basal 1/3–1/2; segment 3 with blackish ring just beyond 1/2 extended into dorsal scale-tuft, and with blackish apex; proboscis white, more or less speckled brown to blackish, especially basally; antennae greyish brown; ciliations ca 1/2 width of flagellum. Collar mixed white and pale grey-brown, anterolaterally dark brown. Thorax white with admixture of pale grey-brown scales, and traces of a central transverse dark brown bar. Forewing white with strong admixture of pale grey-brown scales; the following markings blackish: an obscure line along fold from near base to 1/2, and a curved dash in disc from just before 1/2–2/3; the following markings dark brownish: base of costa; broad dash along costa from 1/4–1/2, often obscure or obsolete; indistinct mark on costa at 2/3, very obscurely extended into stout inverted T; poorly defined spots around apex and along termen; usually indistinct subterminal fascia parallel to these spots, preceded by a more or less distinct curved fascia of pale ground colour, kinked outwards dorsally to tornus; brownish scaling at base of wing sometimes forms traces of outward-angled basal blotch. Scale-tufts rather large and conspicuous in fresh specimens. Cilia grey-brown, with more or less distinct cilia-line. Hindwing pale brownish grey; cilia whitish brown to brown, with distinct cilia-line. Underside: forewing brown, with dorsum, cilia, and sometimes costa paler; hindwing whitish, speckled brown along costa, and around apex and termen. Abdomen dorsally silvery white, slightly yellowish-tinged; scales of T2–5 slightly smaller and narrower than those of other segments, with many scales tapering to point; ventrally mixed white and brown, usually with paler medial longitudinal band; anal tuft brownish white.

Female (Fig. 45). (Description based on single specimen). Forewing length 11.5 mm; wingspan 23 mm. Similar to male, but antenna without conspicuous ciliations.

Male abdomen and genitalia. Abdomen: S2 apodemes rather long; S8 about equal to S7. Genital capsule (Fig. 172): as described for *mesoschista*, except flanges of juxtocostal plate overlapping at base, parallel (not divergent). Phallus (Fig. 173, 243) as described for *mesoschista*, but right (ventral) lobe with subapical ridge of 3–5 backward-pointing spines; left (dorsal) lobe with lateral cluster of ca 6 smaller teeth; central lobe terminating in a single stout, curved spine, shorter than in *mesoschista*. Vesica with translucent spinules basally; a large basally strongly curved, fishhook-like fixed cornutus; ca 13–15 long blade-like deciduous cornuti with buttressed bases, each cornutus slightly narrowed near the tip, and equivalent disc-like pores; compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood large, sigmoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 278). As described for *mesoschista*, except narrow anterior portion of ductus bursae shorter.

Larva and Biology. Unknown.

Flight period. October, November.

Type data. **Holotype:** Male, 'NEW ZEALAND ND 34 30.4S 172 47.7E Te Paki (shearers' quarters) m.v. light 2 Nov 2007 R. Hoare, S. Forgie / NZAC slide Oec. 345 genitalia ♂' (NZAC). **Paratypes:** 7 males, 1 female. **ND:** 4 males, same data as holotype, except 3 undissected, 1 with genitalia slide Oec. 346; 1 male, same locality, but 1 Nov 2007, to window light; 1 male, Tom Bowling Bay, 14–15 Nov 1967, J. McBurney and J.I. Townsend (genitalia slide Oec. 309); 1 male, 1 female, Parengarenga Harbour, Paua, m.v. light, 13, 15 Oct 2008, RJBH (female genitalia slide Oec. 413) (all NZAC).

Material Examined. Type material plus 2 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. The Aupouri peninsula of Northland only. ND / —

Etymology. I am very grateful to the Ngāti Kurī iwi of Northland, who provided the specific name and the official Māori name for this moth, which is only known from the area of Northland that falls within their rohe. The word *haumu* means 'hairy' and refers to the grizzled appearance of the moth.

Remarks. The first specimen of *I. haumu* was collected by Jack McBurney and Ian Townsend at Tom Bowling Bay ND in November 1967. Not surprisingly, it was placed in the series of *I. mesoschista* in NZAC, until dissection in 2007 revealed its status as a new species. Further specimens were collected in November 2007 at Te Paki and October 2008 at Paua on the Parengarenga Harbour, and, like *I. taingo* n. sp., *haumu* is believed to be endemic to the Aupouri peninsula. For remarks on the distribution and conservation status of this species and *I. taingo*, see under the latter species.

Izatha quinquejacula new species

Fig. 47, 126, 174, 175, 244, 245, 279; Map 23

Diagnosis. *Izatha quinquejacula* resembles *I. epiphanes*, *I. mesoschista*, and *I. haumu* superficially. It can be distinguished from *epiphanes* by the much less distinct discal spot at 2/3 (this spot is conspicuous and reniform in *epiphanes*), and by the strong forked ('fishtail') mark from the costa just above this (this mark is just a short bar in *epiphanes*); the basal forewing blotch in *quinquejacula* also lacks the sharp outer projection found in *epiphanes*. It can be distinguished from *mesoschista* and *haumu* by the strongly developed 3-shaped black mark from the costa to the fold just before 1/2 (there is no distinct mark in this position in *mesoschista* or *haumu*); usually the curved black line in the disc (almost always present in *mesoschista* and *haumu*) is rather indistinct or absent in *quinquejacula*. In the male genitalia, *quinquejacula* very closely resembles *haumu*, but the ventral and dorsal lobes of the phallus have more extensive fields of spines than in the latter species, and there are only 3–5 deciduous cornuti in the vesica (13+ in *haumu*).

Male (Fig. 47). Forewing length 9–11 mm; wingspan ca 19–23 mm. Head smooth, without protuberance; vertex white, with some scales tipped pale tawny; frons concolorous, with dark brown to black scaling extending in from eye; labial palpi white, segment 2 with basal 1/2 black, and with black subapical bar or spot exteriorly; segment 3 white, with black ring medially and sometimes black apex; medial ring extended dorsally into distinct scale-tuft; proboscis black; antenna with scape basally with white and pale tawny scales, often hidden amongst scales of vertex, remainder of scape and antenna dark brown to black, slightly serrate; ciliations ca 1/2 width of flagellum, more or less appressed. Collar laterally black, centrally white and pale tawny. Thorax and tegulae white to mottled with pale tawny scales, without darker spots or bar. Forewing ground colour white, with strong even mottling of pale tawny scales; the following markings black: slightly outwardly oblique basal blotch to 1/5, produced along fold into very short point, and enclosing area of white and tawny scales at base of dorsum; triangle along costa just before 1/2, and contiguous with this an oblique, roughly M-shaped or 3-shaped mark across disc to fold; fishtail mark from costa at 2/3, with variably shaped diffuse discal spot below and between the 'fins'; a few indistinct blackish streaks along veins posteriorly, often obsolete, and up to 7 dots around apex and along termen. Scale-tufts large and conspicuous in fresh specimens. Cilia pale brownish grey, whitish at tornus, cilia-line indistinct. Hindwing pale to dark grey, cilia whitish grey with indistinct cilia-line. Underside (from single set specimen): forewing and hindwing dark grey without contrasting markings. Abdomen dorsally silvery greyish, tending to be darker posteriorly; tergites without conspicuously modified scales; ventrally blackish with indistinct pale central longitudinal line; anal tuft greyish brown.

Female. (Description from single damaged specimen). Forewing length ca 12.5 mm; wingspan ca 26 mm. Apparently much darker than male, forewing ground colour predominantly blackish brown, with contrasting subterminal band of white and pale tawny scales; markings as in male. However, specimen appears greasy and forewings may be discoloured.

Male abdomen and genitalia. Abdomen: S2 apodemes long; S8 about equal to S7, caudally square, anterior corners not produced. Genital capsule (Fig. 174): as described

for *mesoschista*, but flanges of juxto-costal plate parallel, not divergent (cf. *haumu*); not distinctly overlapping as in *haumu*. Phallus (Fig. 126, 175, 244, 245): right (ventral) lobe with subapical field of 10+ outward-pointing teeth; left (dorsal) lobe with more extensive field of smaller teeth; central lobe terminating in a single stout, curved spine, as in *haumu*. Vesica with translucent spinules basally; a large basally strongly curved, fishhook-like fixed cornutus; 3 or 5 moderately long blade-like deciduous cornuti with weakly buttressed bases, each cornutus slightly narrowed near the tip, plus equivalent number of disc-like pores. Bulbus ejaculatorius with distinct tubular portion; hood large, sigmoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 279). As described for *mesoschista*, but broad posterior portion of ductus bursae longer, and narrow anterior portion shorter.

Larva and Biology. Unknown.

Flight period. November, December.

Type data. **Holotype:** Male, 'Three Kings Is Great I. Nov. 70 NZ. Ent. Div. Exp. / Castaway Camp / G. Ramsay / at light / Photographed 2007–2008 by B.E. Rhode' (NZAC). **Paratypes:** 8 males, 1 female. TH: 6 males, 1 female, same data as holotype (genitalia slides NZAC Oec. 237, 245, 246 ♂; Oec. 240 ♀); 1 male, same locality and date, but J.C. Watt (all NZAC); 1 male, same locality, on kanuka at night, 10 Dec 1963, P.M. Johns (CMNZ).

Material Examined. Type material plus 3 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Three Kings Islands only, and so far only known from Great Is.

TH / — / —

Etymology. The name comes from the Latin '*quinque*' (five) and '*jaculum*' (a javelin or dart), and refers to the (maximum of) 5 deciduous cornuti in the vesica, one of the diagnostic characters of the species.

Remarks. *I. quinquejacula* is the only species of *Izatha* known from the Three Kings Islands off the northern tip of New Zealand, and is almost certainly endemic to these islands, which are a well-known area of insect endemism. It was first discovered by Peter Johns, who collected a single male in December 1963. The type series was collected on the DSIR Entomology Division field-trip to the Three Kings in November 1970. The species has not been collected since, but no Lepidoptera specialist has ever visited the islands, and there is no reason to believe the species is threatened.

The *Izatha peroneanella* complex

Diagnosis. Head with vertex produced into conical protuberance (except *heroica*). Wing pattern reduced to narrow black or brown markings on a pale ground. Male S8 with anterior excavation (except *heroica*). Uncus lacking apical setae (except *heroica*). Juxta base-plate reduced, divided by membrane medially. Phallus with laterally-directed dorsal denticulate lobe (except *heroica*).

Note. *Izatha heroica* is almost certainly sister to the rest of this complex, since it lacks several characters shared by all other species.

Izatha heroica Philpott, 1926

Fig. 60, 61, 89, 176, 177, 246, 247, 280; Map 24

Izatha heroica Philpott, 1926: 396.

Izatha toreuma Clarke, 1926: 419. Synonymised by Hudson (1939: 278).

Diagnosis. *I. heroica* is easily distinguished from species with similar forewing markings (*hudsoni*, pale forms of *peroneanella* and *huttonii*) by its large size, greyish forewing and the absence of a conical process on the vertex of the head.

Male (Fig. 60). Forewing length 11–14 mm; wingspan 23–29 mm. Head (Fig. 89) smooth, without protuberance; vertex white; frons mixed white and dark brown, or dark brown; labial palpi white; segment 2 exteriorly dark brown in basal 1/2, and with indistinct brown subapical ring, sometimes reduced to spot on outer surface; segment 3 with dark brown ring just beyond 1/2 extended into dorsal scale-tuft, and extreme apex brown; proboscis white; antennae: scape white, speckled brown; rest of antenna greyish brown, sometimes with some whitish scaling; ciliations ca 1/2 width of flagellum. Collar white, with some dark brown scaling anteriorly on either side. Thorax white, with some blackish scaling on posterior margin of mesonotum. Forewing white, thinly speckled with pale orange-brown scales, and towards apex with pale grey-brown scales, overall appearing grey-white; the following markings blackish brown: a narrow line along costa at base, curving away from costa distally; a short outward-oblique dash from costa just before 1/3; a short dash along costa at 2/3; 4 evenly spaced spots in a subcostal row between 1/3–3/4; the 3rd somewhat displaced towards the costa and/or more or less obsolete; a short dash along fold at base, a >-shaped mark on fold at 1/6; a dash just below fold at 1/3 parallel with dorsum, sometimes joined to the >-mark to form a long-stemmed 'Y'; a dash in disc from 1/2–2/3, with a short dorsad extension at 1/3 of its length and a short costad extension near its apex; parts of this mark often obsolete, leaving just the 'extensions' or a dash and a dot; a spot or dash above tornus; a short inward-oblique dash in disc at

4/5; 3 spots along costa in apical 1/4 and 5–6 along termen to tornus; a short subbasal dash on dorsum. Scale-tufts small and inconspicuous. Cilia white. Hindwing whitish, clouded brown exteriorly, with distinct discal spot; short brownish dashes around apex and along termen; cilia white. Underside: forewing pale brown, cilia white; hindwing whitish, brown towards costa and apex, cilia white. Abdomen dorsally white; most of T2–7 except posterior margin covered with narrow pale yellowish scales; ventrally white with more or less strong admixture of grey-brown scales; anal tuft whitish.

Female (Fig. 61). Forewing length 13–15.5 mm; wingspan 27–32 mm. Similar to male, but antennal ciliations shorter, more appressed, forewing tending to be slightly darker, more greyish.

Male abdomen and genitalia. Abdomen: S2 apodemes long; S8 longer than S7, caudally square, anterior corners not produced. Genitalia (Fig. 176): tegumen arch-shaped, deeply excavated basally, each side terminating in a small hump; uncus triangular, dorsolaterally sclerotised, truncate, with 2 tufts of sessile setae apically, each with a few setae. Valva upright to rather transverse; apex tongue-shaped, densely setose, except towards costa; apex exceeding sacculus; sacculus with 2 enlarged setae, ending in partially free, curved, elongate tooth; costa barely concave, continuously sclerotised except in short strip where overlaps with juxto-costal plate; pulvinus not differentiated as lobe, reduced to a few scattered setae, sessile or raised on very short papillae; juxto-costal plate extending ca 1/3 way along costa, a moderately broad band; basal arms moderately short, not scobinate; outer flange a weakly sclerotised equilateral triangle; inner flange a well sclerotised digitate process, without scobinations; flanges slightly overlapping basally. Juxta base-plate reduced to 2 tiny sclerites at base of lateral lobes, separated from each other by membrane; lobes basally approximated, elongate, slightly curved, without spines or scobinations. Saccus triangular to arrowhead-shaped. Phallus (Fig. 177, 246, 247) stout; dorsal (left) lobe longest; ventral (right) lobe with a ridge bearing a few rows of small backward-pointing teeth; dorsal (left) lobe with more extensive field of small backward-pointing teeth; central lobe poorly differentiated from right lobe, membranous. Vesica with a few translucent spinules basally; a long basally curved, fishhook-like fixed cornutus, deciduous cornuti and compound cornutus absent. Bulbus ejaculatorius with short tubular portion; hood sigmoid. Caecum penis present (moderate).

Female abdomen and genitalia (Fig. 280). Segments 8–10 barely extensible. S8 saddle-shaped, rather densely setose distally, with fine scobinations confined to setose area; scoop-like lateral flanges not or hardly developed. Ostium very broad, subtended by sinuous lamella antevaginalis; ductus seminalis arising ventrally on left and basally strongly recurved; antrum short, posteriorly weakly sclerotised, anteriorly densely scobinate, scobinations forming contours in fingerprint-like pattern; ductus bursae broad, strongly scobinate (scobinations continuous with those of antrum), scobinations finer proximally; ductus nearly straight, narrowing slightly towards corpus bursae; corpus bursae ovoid, with two longitudinal bands of fine spinules laterally in posterior portion; signum absent.

Larva. Not described.

Biology. The only known reared specimen emerged from 'erect dead *Leptospermum*' (Myrtaceae), from Okarito Trig WD (5 Dec 1982, J.W. Early and C.A. Muir, LUNZ). The host may have been kanuka (*Kunzea ericoides*) or manuka (*Leptospermum scoparium*), since both were placed in *Leptospermum* at this time.

Flight period. January, February, early March.

Type data. *Izatha heroica*: **Holotype:** Female, 'Flora Riv. 23–1–24 A. Philpott / Izatha heroica Philp. Holotype ♀', (NZAC) (examined).

Izatha toreuma: **Holotype:** Male, 'Arthurs Pass 23–1–22 / C.E. Clarke collection / Izatha toreuma type ♀ Clarke T… [illegible] / [blank red label] / AMNZ 21772 AUCKLAND MUSEUM NEW ZEALAND' (AMNZ) (examined). **Note**. The holotype of *toreuma* is a male, not a female as indicated by Clarke (1926) and Dugdale (1988).

Note on synonymy. *Izatha heroica* and *I. toreuma* were published almost simultaneously; there is no evidence for more than one species with the distinctive *heroica* wing pattern.

Material Examined. Type material plus 68 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread in the South Island, chiefly western.

— / SD, NN, MB, BR, WD, NC, OL, CO, FD

Remarks. *I. heroica* is mainly associated with the wetter forests of the western South Island, where it is generally collected at light in small numbers. It has often been collected in beech (*Nothofagus*) forest, but from the single rearing record (above), is clearly not dependent on this forest type. It is of considerable biogeographic and phylogenetic interest as the likely sister-species to the remaining members of the *peroneanella*-complex, as the only member of the *balanophora*-group that is endemic to the South Island, and as 1 of 2 species in this group that lack deciduous cornuti.

Izatha hudsoni Dugdale, 1988

Fig. 48, 49, 90, 178, 179, 248, 249, 281; Map 25
Izatha hudsoni Dugdale, 1988: 95.

Diagnosis. For differences from *I. peroneanella* and *I. huttonii*, see under *peroneanella.*

Male. Forewing length 9–12.5 mm; wingspan 19–26 mm. Head (Fig. 90) with sharp-tipped conical protuberance on vertex behind antennae; vertex white; frons white with more or less distinct dark brown spot on each side at mid-level of eye; labial palpi white; segment 2 dark brown exteriorly in basal 1/2; segment 3 with dark brown to pale brown ring just beyond 1/2 extended distally and dorsally into scale-tuft, apex brown; proboscis white; antennae: scape white with some pale brown scales, rest of antenna pale brown with silvery white scaling; ciliations ca 1/2 width of flagellum. Collar white, with brown scales antero-laterally. Thorax and tegulae white. Forewing snow-white, with the following markings varying from dark brown to pale orange-brown (markings towards costa tend to be darker than those towards dorsum): a narrow line along costa at base, curving away from costa distally; an outward-oblique dash from costa at 3/8, somewhat zigzag and tending to form indistinct 'M'; a mark on costa at 2/3 in form of a stout 'X' or inverted 'Y'; 2–3 costal spots from 3/4 to apex, and 3–4 more around termen to tornus; a dash from near base along fold to 1/6, distally bifurcate (i.e., in form of 'Y' on its side); a spot or very short dash subbasally along dorsum; a spot or short dash just below fold at 1/3; an M-shaped mark in disc from 1/2–2/3; an inward-oblique dash or >-shaped mark in disc at 4/5; a small spot before tornus. Scale-tufts moderately small. Cilia white. Hindwing white, sometimes with faint pale brownish scaling in disc and in a line around apex and along termen; cilia white. Underside: forewing whitish, mixed brown, especially between veins distally, cilia white; hindwing white, brownish towards costa and apex, and with faint brown dashes along termen between veins. Abdomen dorsally white; most of T2–7 except posterior margin covered with narrow pale yellowish scales; ventrally white with a few brownish scales laterally; anal tuft white.

Female (Fig. 48, 49). Forewing length 9.5–13.5 mm; wingspan 20–27.5 mm. Very similar to male, but ciliations of antennae more appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes rather long; S8 longer than S7 (with anterior excavation reaching to ca 1/2 length of segment); caudally straight, anterior corners not produced. Genitalia (Fig. 178): tegumen arch-shaped, deeply excavated basally, each side terminating in a small hump; uncus reduced, triangular, dorsally weakly sclerotised, without apical setae. Valva rather transverse; apex rounded, densely fine-setose, except towards costa; apex exceeding sacculus; sacculus with 1–2 enlarged setae, ending in appressed V-shaped tooth; costa curved, strongly concave, sclerotised only beyond juxto-costal plate; pulvinus a moderately differentiated lobe with setae on slightly raised bases (not papillae); juxto-costal plate extending ca 1/3 length of costa, broad, crescent-like; basal arms not differentiated from broad basal part of inner flange; outer flange a broad triangle, weakly sclerotised; inner flange prow-shaped, basally rounded, terminating in a narrow well sclerotised straight tooth, without scobinations; (flanges strongly overlapping basally). Juxta base-plate reduced to paired sinuous strips, completely divided by membrane medially; lobes well separated at bases, elongate, curved, tapering slightly but abruptly towards apex, without spines or scobinations. Saccus blunt-triangular. Phallus (Fig. 179, 248, 249) rather short and stout; central lobe slightly the longest; left and right lobes with numerous very fine backward-pointing teeth in several rows; left lobe dorsally with strong laterally-directed basal flange with numerous fine hooked teeth; central lobe poorly differentiated from right lobe, apically membranous but with tiling of overlapping scale-like teeth / scobinations becoming more diffuse anteriorly. Vesica basally with translucent spinules; a long fixed fishhook cornutus (not hooked basally); ca 8, 12, or (based on number of pores in mated specimen from Pureora, TO) 20 long blade-like deciduous cornuti with weakly buttressed bases and equivalent pores; compound cornutus absent. Bulbus ejaculatorius with distinct tubular portion; hood sigmoid. Caecum penis present (moderate).

Female abdomen and genitalia (Fig. 281). Segments 8–10 only slightly extensible. S8 saddle-shaped; distally sparsely setose; fine scobinations in setose area only; scoop-like lateral flanges hardly developed. Ostium broad, subtended by semicircular lamella antevaginalis; antrum short, broad, posteriorly sclerotised, anteriorly densely scobinate, the scobinations forming fingerprint-like contours; ductus seminalis arising ventrally on left and strongly recurved basally; ductus bursae broad, strongly scobinate (scobinations continuous with those of antrum), scobinations finer proximally; ductus narrowed, folded and twisted to right in proximal part towards corpus bursae; corpus bursae elongate-ovate, with 2 lateral patches of spinules in region of signum; signum moderate, diamond-shaped, with apical boss and central weakly spinose strip.

Larva. Not described.

Biology. There are 2 known rearing records: one specimen from 'mixed dead branches' (FRNZ) and one from dead twigs of *Aristotelia serrata* (wineberry) (Elaeocarpaceae) (MONZ).

Flight period. November to January.

Type data. Holotype: Male, 'Wellington 12–1–09 / HOLOTYPE ♂ Izatha hudsoni Dugdale (n.n. pro huttoni auct.).' (NZAC) (examined).

Material Examined. Type material plus 60 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread throughout the North Island.
ND, AK, CL,WO, BP, TK, TO, GB, HB, WN / —

Remarks. *Izatha hudsoni* is endemic to the North Island, and occurs chiefly from Mt Te Aroha south in well-forested localities. Specimens from the Waitakere Ranges AK and Herekino Forest ND are somewhat anomalous in that they have the basal streak of the forewing extending beyond the slight bifurcation to join up with the spot on the fold, as in *heroica* (see Fig. 48). The male differs from other *hudsoni* specimens dissected in that the inner flange of the juxto-costal plate is slightly upcurved at its apex; the phallus appears identical to typical *hudsoni*. Since the observed differences are very minor, the specimens are treated here as a geographical form of *hudsoni*. However, further study is desirable.

Gaskin (1966: pl. 23 fig. 5) figures *hudsoni* under the name *huttoni* [*sic*], and records this 'form or distinct species' as occurring commonly in Northland near Mangonui. Gaskin's collection (now in Canada) was not examined for this revision, and this record is not accepted here, since *hudsoni* has never been collected in numbers, and the record seems more likely to refer to the white form of *peroneanella*, which appears to be commoner in eastern districts of the northern North Island.

See under *I. huttonii* for a discussion of the confusion between these species in the literature.

Izatha huttonii (Butler, 1879) reinstated species

Fig. 50–53, 91, 180, 181, 216, 250, 251, 282; Map 26

Oecophora huttonii Butler, 1879: 511.

Semiocosma mystis Meyrick, 1888: 79. **Transferred synonymy**.

Izatha huttoni (Butler): Dugdale, 1988: 95, incorrect subsequent spelling.

Diagnosis. This species is very similar to *I. peroneanella*, with which it has long been confused. External differences are subtle and somewhat variable, as follows: the conical protuberance of the vertex (Fig. 91) is sharp in *huttonii*, blunter in *peroneanella* (Fig. 92); the forewing discal M-mark is complete (usually interrupted beyond the first stroke in *peroneanella*); it is usually separated from the costal Y-mark at 2/3 by a narrow strip of ground colour (usually contiguous with this mark in *peroneanella*); hindwing is whitish grey with some darker clouding in outer 1/3 especially along veins, discal spot rather distinct, grey line bordering dorsum broken into dashes towards wing apex (hindwing in *peroneanella* darker grey, with a continuous dark grey line around dorsum to apex, discal spot very faint or absent). The forewing ground colour of *huttonii* tends to be pale green, whereas in *peroneanella* it is usually a brighter lime green, but both species vary in this respect. The hindwing coloration is the most reliable superficial character for separating the species. The male genitalia provide clear diagnostic characters, in particular the shorter accessory tooth of the juxta lateral lobe (see Fig. 216, 217).

Male (Fig. 50, 52). Forewing length 8.5–12 mm; wingspan 18–25 mm. As described below for *peroneanella*, with the differences noted above in the Diagnosis.

Female (Fig. 51, 53). Forewing length 10–14 mm; wingspan 20–29 mm. Similar to male, but antennal ciliations sparser, more appressed.

Male abdomen and genitalia (Fig. 180, 181, 216, 250, 251). Very similar to those of *peroneanella* (q.v.), but with the following differences: outer flange of juxto-costal plate reduced to a blunt lobe, smaller than inner flange (Fig. 180, 216); lateral lobe of juxta ending at or just beyond base of accessory tooth, so that apex is not bifurcate (Fig. 180, 216); central lobe of phallus (Fig. 181, 250, 251) with sclerotised ridge less prominent.

Female abdomen and genitalia (Fig. 282). Similar to those of *peroneanella*; no consistent differences have been observed.

Larva. Not positively associated. In G. V. Hudson's collection in MONZ, the series under the name '*peroneanella*' contains many more specimens of *huttonii* than *peroneanella*. This suggests that Hudson's (1928: 278) description of the larva of '*peroneanella*' is likely to refer to *huttonii*; however, strangely, there appear to be no specimens in the series reared from the larva, and no mention of such specimens in Hudson's register. His description is summarised here: Head bright reddish brown, very shining; prothoracic plate pale brown; body dull white, except last 3 abdominal segments, which are yellowish-ochreous; a conspicuous white lateral ridge. Hudson states that the larva is variable in colour, some individuals being much darker than others.

Biology. Hudson gives dead branches of *Aristotelia serrata* (wineberry) (Elaeocarpaceae) as the host (of *peroneanella*); that this correctly refers to *huttonii* is confirmed by a specimen in his collection reared from a pupa (Hudson register no. 58cc). The only other definite host is *Coprosma robusta* (karamu) (Rubiaceae) (reared specimen from Roding Valley NN in NZAC). Hudson (*loc. cit.*) states that the larva is full fed in November, and pupates in the wood without making a cocoon.

Flight period. November to March (1 specimen seen captured in October).

Type data. *Oecophora huttonii*. **Holotype:** Female, 'Type H.T. / Otago 79.19 / 76 [reverse of label] / Oecophora huttoni Btlr. Cist. Ent. 2 p. 511 (1880 [*sic*, parentheses not closed] TYPE ♂' (BMNH) (examined).

Semiocosma mystis. **Lectotype:** Female, 'LECTOTYPE / Christchurch New Zealand 23/12/82 / Izatha peroneanella Walk. 10/13 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / var mystis Meyr.', designated by Dugdale (1988: 95) (BMNH) (examined). **Paralectotype:** 1 female. **MC:** same data as lectotype, except 9/13 in Meyrick coll. **Note**. In describing *mystis* as a southern segregate of *peroneanella*, Meyrick had apparently forgotten the locality of Butler's *huttonii* holotype, which he had certainly examined (Meyrick, 1884: 23).

Material Examined. Type material plus 312 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. South Island, Stewart Island, and the Wellington district of the North Island.

WN / SD, NN, BR, WD, KA, NC, MC, SC, MK, OL, CO, DN, FD, SL / SI

Remarks. Butler (1879) described this species as 'greyish white' and stated that it was allied to *picarella*. Unfortunately, this led to subsequent entomologists (e.g., Hudson 1928) employing the name to refer to a quite distinct North Island white species; Dugdale (1988) finally sorted out the confusion by naming this latter species *I. hudsoni*. Subsequently, *huttonii* and *mystis* have been treated as synonyms of *peroneanella*, following Meyrick (1884, 1915). However, as shown here, *huttonii* is indeed a good species (with *mystis* as a synonym), displaying constant differences in male genitalia from the closely similar *peroneanella*. Both *peroneanella* and *huttonii* have white forms, so forewing ground colour is not diagnostic. *I. huttonii* and *peroneanella* overlap in distribution only in Wellington, where, on the basis of material collected by G. V. Hudson and G. W. Gibbs, *huttonii* appears to predominate.

Izatha huttonii is one of the commonest species of *Izatha* throughout its range, coming freely to light. As discussed in the Introduction, it is the only South Island species of *Izatha* that has deciduous cornuti in the vesica. In view of its very close alliance to *peroneanella*, the most likely explanation seems to be a chance colonisation of the South Island by the common ancestor of *peroneanella* and *huttonii*, followed by speciation and reinvasion of the North Island.

Izatha peroneanella (Walker, 1864)

Fig. 54–57, 92, 116, 182, 183, 217, 252, 253, 283, 284, 304, 309; Map 27

Gelechia peroneanella Walker, 1864a: 658.

Gelechia adapertella Walker, 1864a: 653. Synonymised by Meyrick (1915: 215).

Cryptolechia lichenella Walker, 1864a: 769. Synonymised by Meyrick (1884: 22).

Diagnosis. The bright lime-green ground colour of the commonest form of *I. peroneanella* immediately distinguishes it from all other species except *huttonii* and *taingo* (and both of these species tend to be a paler green); *I. prasophyta* has olive-green forewings without longitudinal black markings. Differences from *I. huttonii* are listed under that species (q.v.). White forms of *peroneanella* resemble *I. hudsoni*, but differ in their grey hindwings (translucent whitish in *hudsoni*), and in the M-mark in the disc at 2/3: in *peroneanella* an imaginary line through the two upper points of the 'M' will run to the costa well before the apex; in *hudsoni* such a line will run to the apex. *I. taingo* is apparently identical to pale green forms of *peroneanella* externally, but the male differs in the greatly elongated lateral lobes of the juxta (often visible without dissection); the two species are not known to be sympatric, with *taingo* probably being confined to the Aupouri Peninsula at the northern tip of Northland.

Male (Fig. 54, 56). Forewing length 7–11.5 mm; wingspan 15–24.5 mm. Head (Fig. 92) with rather blunt-tipped conical protuberance on vertex behind antennae; vertex pale yellowish green to pale bluish green, occasionally white; frons white to very pale green, with dark brown spot on each side at mid-level of eye; proboscis white; labial palpi very pale green to white; segment 2 blackish exteriorly in basal 1/3, and with incomplete (often obsolete) subapical blackish ring; segment 3 with blackish ring just beyond 1/2 extended distally and dorsally into scale-tuft; antennae: scape pale green to whitish, concolorous with vertex, rest of antenna blackish with some scale-bases showing indistinctly paler, greyish; ciliations ca 1/3 width of flagellum. Collar dorsally green to white, concolorous with vertex, antero-laterally blackish. Thorax and tegulae pale green to white, concolorous with vertex; a pair of oblique blackish dashes on thorax level with about mid-length of tegulae (dashes often absent or indistinct); mesothorax posteriorly with a blackish scale-tuft. Forewing white to pale bluish green or lime green, concolorous with thorax; blackish markings as described for *I. hudsoni*, but with discal 'M'-mark tilted so that the second arch of the M closely approaches or is contiguous with the Y-shaped mark from the costa at 2/3; M usually broken beyond basalmost stroke (except some specimens from WO and TK); markings usually black, darker than in *hudsoni*, and not showing any tendency to

be paler towards wing dorsum. Forewing markings are somewhat variable in intensity; some specimens have the black markings replaced with pale brown. Scale-tufts moderately small but conspicuous. Cilia concolorous with forewing. Hindwing greyish, slightly paler basally, and with a continuous dark grey line around dorsum to apex, discal spot very faint or absent, cilia grey, paler towards apex and with cilia line near base. Underside: forewing grey-brown to dark brown, whitish subbasally, along centre of costa, and extensively along dorsum where hindwing overlaps; cilia pale green, the coloration sometimes extending a short distance basad along veins; hindwing underside similar to upperside. Abdomen with T1 silvery white, T2–7 with close-set narrow pale yellow scales in large central field, bordered by unmodified silvery white scales laterally and posteriorly; an admixture of brownish scales amid the white, especially on posterior segments; anal tuft pale yellow.

Female (Fig. 55, 57). Forewing length 8–14 mm; wingspan 17–29.5 mm. Similar to male, but antennal ciliations inconspicuous.

Male abdomen and genitalia. Abdomen (Fig. 116): S2 apodemes rather long; S8 (anteriorly excavated), longer than S7, caudally square, anterior corners not produced. Genitalia (Fig. 182, 217): tegumen arch-shaped, deeply excavated basally, each side terminating in a small hump; uncus reduced, triangular, dorsally weakly sclerotised, without apical setae. Valva rather transverse; apex tongue-shaped, densely fine-setose, except towards costa; apex exceeding sacculus; sacculus with 1 enlarged seta, sacculus ending in Y-shaped appressed sclerite; costa curved, strongly concave, sclerotised only beyond juxto-costal plate; pulvinus a prominent lobe with setae sessile or on papillae; juxto-costal plate (Fig. 217) extending ca 1/4 way along costa, crescent-like; basal arms not differentiated from broad basal part of inner flange; outer flange a long recurved tooth, sometimes serrate on lower margin; inner flange prow-shaped with broad base tapering to elongate straight or recurved tooth, without scobinations. Juxta (Fig. 217) base-plate reduced to a weakly W-shaped sclerotised strip; lobes well separated at bases, digitate, curved, tapering, each with strongly sclerotised accessory dorsal tooth arising at 2/3 length; lobe ends roughly level with tip of tooth, so that whole structure is bifurcate in dorso-ventral plane; no other spines or scobinations. Saccus moderate, rounded-triangular. Phallus (Fig. 183, 252, 253) rather large and broad; central lobe slightly the longest; left lobe with a few rows of inconspicuous and tiny backward-pointing teeth near apex, and dorsally with strong laterally-directed basal flange with numerous fine hooked teeth; right lobe poorly differentiated from left, smooth or with a few minute spinules laterally; central lobe subapically with tiling of overlapping scale-like teeth / scobinations, ventrally (to right of scobinations) produced into prominent sclerotised ridge with numerous rows of tiny backward-pointing teeth. Vesica with translucent spinules basally; a long fishhook cornutus with small to moderate basal hook; ca 24+ long blade-like deciduous cornuti with weakly buttressed bases and equivalent disc-like pores; compound cornutus absent. Bulbus ejaculatorius with long tubular portion; hood sigmoid. Caecum penis present (moderate).

Female abdomen and genitalia (Fig. 283, 284). Segments 8–10 hardly extensible. S8 saddle-shaped with long sides; densely setose distally, covered in small scobinations throughout; scoop-like lateral flanges weakly developed. Ostium very broad, subtended by strongly curved, almost semicircular lamella antevaginalis; antrum short and broad, posteriorly membranous, anteriorly scobinate, with round to oblong scobinations; ductus seminalis arising ventrally on left and strongly recurved basally; posterior portion of ductus broad, strongly scobinate, scobinations (continuous with those of antrum) tending in places to form contour-like lines; ductus tapering rather abruptly to narrow weakly pleated anterior portion with finer more scattered scobinations; ductus slightly twisted to right where it meets corpus; corpus bursae round to ovoid, with fine scobinations throughout (anteriorly extremely fine); signum large, cordate, with apical boss subtended by V-shaped spinose strip.

Larva (Fig. 304). (Description from larvae in dead branch of *Coriaria arborea*, Mill Bay, near Cornwallis AK, 5 Sep 2004). Head chestnut brown with cloudy darker markings posteriorly. Prothoracic shield blackish brown, shiny; rest of thorax and abdomen pinkish white, more yellowish white on posterior segments; hind margins and lateral areas of segments white; pinacula shiny translucent, except on T2 where greyish. Spiracles black, setae pale brown.

Biology. The larva has been found feeding in the dead wood of a variety of angiosperm species; rearing records are as follows (with introduced plant species indicated by an asterisk*): *Alseuosmia* sp. (toropapa) (Alseuosmiaceae), *Carpodetus serratus* (marbleleaf, putaputaweta) (Grossulariaceae), *Coprosma grandifolia* (kanono) (Rubiaceae), *Coriaria arborea* (tutu) (Coriariaceae), *Fuchsia excorticata* (kotukutuku) (Onagraceae), *Nestegis* sp. (maire) (Oleaceae), *Pseudopanax arboreus* (five-finger (Araliaceae), *Ripogonum scandens* (supplejack, kareao) (Smilacaceae), *Sophora* sp. (kowhai), and **Wisteria* sp. (Fabaceae).

Flight period. September to early April.

Type data. *Gelechia peroneanella*: **Lectotype:** Male, 'Type H.T. / New Zeal. / Gelechia peroneanella Wlkr. Cat. Lep. BM. 29 p. 658 (1864) TYPE ♂' designated by Dugdale (1988: 95) (BMNH) (examined). [Type locality Auckland

AK, collector D. Bolton.] **Note**. The female paralectotype of *peroneanella* in BMNH labelled 'Auckland' is a specimen of *huttonii* from Nelson (cf. Dugdale, 1988: 95).

Gelechia adapertella. **Holotype:** not located. The specimen appears to have been lost for a long time; an irrelevant specimen of *Endrosis sarcitrella* was in its place in the BMNH (Dugdale, 1988: 95). Synonymy follows Meyrick (1915: 215) and all subsequent authors. The specimen was from Col. D. Bolton in Auckland, so if a member of this complex, must have been *peroneanella*.

Cryptolechia lichenella: **Holotype:** Male, 'Type / New Zealand / Cryptolechia lichenella Wkr. Cat. Lep. BM 29 p. 769 (1864) TYPE ♂' (BMNH) (examined). [Type locality Auckland AK, collector A. Sinclair.]

Material Examined. Type material plus 305 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Throughout the North Island, except the Aupouri Peninsula of Northland.

ND, AK, CL, WO, BP, TK, TO, GB, HB, RI, WI, WN / —

Remarks. *I. peroneanella* is one of the commonest species of *Izatha* in the North Island; it is very frequent at light, but less commonly reared than *I. austera*. There is considerable variation in the ground colour of the head, thorax and forewings and in minor details of the forewing markings. The species is absent from the South Island where it is replaced by the very similar *I. huttonii*, here removed from synonymy with *peroneanella* (see above); on the Aupouri Peninsula of Northland it is replaced by *I. taingo* (see below). Specimens of *peroneanella* from the Poor Knights Islands ND are a dull bluish green colour and have additional blackish speckling in the tornal area of the forewing (Fig. 54); however, their genitalia are identical to those of mainland *peroneanella*.

Izatha taingo new species

Fig. 58, 59, 184, 185, 218, 254, 285; Map 28

Māori name: Pepepepe tāingo ō Ngāti Kurī

Diagnosis. No external characters have been found to differentiate *Izatha taingo* consistently from *I. peroneanella* although all specimens of *taingo* so far taken are either white or pale whitish green, and not the bright lime green typical of *peroneanella;* nonetheless similar white and pale green forms of *peroneanella* are not uncommon. In the male genitalia, the extremely elongate curved lateral arms of the juxta at once distinguish *taingo* from *peroneanella* and all other species; the arms are often visible without dissection. Apart from the pale green ground-colour, which resembles that of *I. huttonii*, external differences from *huttonii* are as described for *peroneanella*.

Male (Fig. 59). Forewing length 9–11 mm; wingspan 18.5–22.5 mm. As described for *I. peroneanella*, but head, thorax and forewing apparently always white or pale whitish green; thorax and forewing markings black or brown.

Female (Fig. 58). (From single, possibly dwarfed specimen). Forewing length 7.5 mm; wingspan 16 mm. Similar to male, but antennal ciliations inconspicuous.

Male abdomen and genitalia. Abdomen: S2 apodemes rather long; S8 anteriorly excavated, longer than S7, caudally square, anterior corners not produced. Genital capsule (Fig. 184, 218): as described for *peroneanella*, except outer flange of juxto-costal plate tending to be narrower and more curved, never serrate on lower margin; juxta (Fig. 218) lateral lobes enormously elongate (reaching to 1/2 length of tegumen, cf. to base of tegumen in *peroneanella*), curved, tusk-like, acute, strongly sclerotised throughout, without accessory tooth. Phallus (Fig. 185, 254): as described for *peroneanella*, but (based on number of disc-like pores) probably with up to 48 deciduous cornuti.

Female abdomen and genitalia (Fig. 285). Based on the only available specimen, similar to those of *peroneanella*.

Larva and Biology. Unknown.

Flight period. October, November, December (most specimens taken in November).

Type data. **Holotype:** Male, 'NEW ZEALAND ND 34 28.4S 172 45.8E Te Paki, Kauri Bush Tk, 170 m, m.v. light 20 Dec 2007 R. Hoare, T. Buckley, D. Seldon / NZAC slide Oec. 415 genitalia ♂' (NZAC). **Paratypes:** 4 males, 1 female. **ND:** 1 female, same locality and collectors as holotype, but 240 m, 18 Dec 2007 (genitalia slide Oec. 387); 3 males, Te Paki (shearers' quarters), m.v. light, 2 Nov 2007, RJBH, S. Forgie (genitalia slides Oec. 347, 348); 1 male, Parengarenga Harbour, Paua, m.v. light, 14 Oct 2008, RJBH.

Material Examined. Type material plus 4 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only from the Aupouri peninsula of Northland.

ND / —

Etymology. I am very grateful to the Ngāti Kurī iwi of Northland, who provided the specific name and the official Māori name for this moth, which is only known from the area of Northland that falls within their rohe. The word *tāingo* is Māori for 'speckled' or 'mottled' and refers to the forewing pattern.

Remarks. The first specimen of *I. taingo* was collected at Spirits Bay in November 1967 by Jack McBurney, but stood in the NZAC series of *I. hudsoni* until dissected during the course of the present revision. *I. taingo*, like *I.*

haumu, is only known from, and is probably endemic to the Aupouri peninsula of Northland. Although indigenous forest habitat is much reduced on the peninsula, both these species of *Izatha* were captured in 2007 in an area of farmland with exotic trees such as *Eucalyptus*, and little native woody vegetation apart from a small planted hedge of *Coprosma repens*. Therefore, it is unlikely that either is threatened, although neither has been taken in the extensive manuka scrub that dominates the Te Paki landscape. A view over Kauri Bush, the type locality of *taingo*, is shown in Fig. 296.

Izatha taingo and *I. haumu* are presently the only two Lepidoptera species believed to be endemic to the Aupouri peninsula, but there are many examples of other endemic invertebrates, e.g., *Placostylus ambagiosus* Suter (Gastropoda: Bulimulidae), 6 of the 42 known species of *Cytora* Kobelt & Moellendorff (Gastropoda: Pupinidae) (Marshall & Barker 2007), *Paralissotes oconnori* (Holloway) (probably endemic: see Holloway 2007) (Coleoptera: Lucanidae), *Tuiharpalus moorei* Larcohelle & Larivière and *Parabaris hoarei* Larochelle & Larivière (Coleoptera: Carabidae) (Larochelle & Larivière 2005), *Clavaptera ornata* Kirman and *Modicarventus wisei* Kirman (Hemiptera: Aradidae) (Larivière & Larochelle 2004), and *Novothymbris extremitatis* Knight (Hemiptera: Cicadellidae) (Knight 1974).

The *oleariae*-group

Diagnosis. Small to medium-sized species; head with vertex unmodified; forewing white and ochreous, white and grey or olive-green and whitish; male genitalia with juxta base-plate entire; juxto-costal plate displaced caudad, with 0 or 2 flanges, forming strong transtilla-like bridge between valvae; saccus moderate; vesica without deciduous cornuti, without 'compound cornuti'; female genitalia with ductus membranous; corpus bursae with signum poorly sclerotised or absent.

Notes. *Izatha oleariae* and *I. spheniscella* are very closely related sister-species, differing mainly in biology and wing form. The assignment of the externally very different *I. prasophyta* to the same species group is somewhat tentative. However, in addition to the unusual form of the juxto-costal plate, unique to these 3 species, the males also share a Y-shaped interior sclerite in the juxta base-plate, strongly reduced S2 apodemes and a concave posterior margin to S8, and the females a narrow ostium, presence of a lamella postvaginalis and ductus seminalis arising laterally.

Izatha oleariae Dugdale, 1971

Fig. 62, 63, 102–105, 117, 122, 186, 187, 286; Map 29

Izatha oleariae Dugdale, 1971: 133.

Diagnosis. *I. oleariae* is unlikely to be confused with any other species in its limited distribution apart from *I. spheniscella* (q.v.), these being the only 2 gelechioid moths known from the Snares Islands. Amongst *Izatha* species, the combination of very pale coloration, absence of scale-tufts on labial palpi and wings, and male antennae with very long ciliations, is diagnostic of these 2 taxa.

Male (Fig. 62). Forewing length 7.5–9.5 mm; wingspan 15.5–20 mm. Head smooth, without protuberance; vertex white, mixed with ochreous; frons white; labial palpi white, mottled ochreous; segment 2 with some ochreous scaling exteriorly near base and ochreous subapical exterior bar; segment 3 with brown bands subbasally and at 1/2 length and apex; segment 3 without scale-tuft; proboscis white; antennae with scape white, mottled ochreous to brown; flagellum banded white and brown; ciliations very long, ca 3x width of flagellum. Collar, thorax and tegulae white, mottled ochreous. Forewing rather narrow and pointed, with termen oblique; white, variably mottled ochreous, and sometimes with a few scales tipped dark brown; ochreous scaling forms the following more or less distinct pattern: subbasal spot on costa, and spot just below and beyond this; largish spot in disc at 3/8 and spot just beyond (at 1/2) in fold, these more or less joining with other ochreous scaling to form interrupted, irregular outward oblique fascia; a less distinct (often obsolete) spot in fold just before and more or less joined to fascia; a spot in disc at 2/3, more or less joined to costa and tornus by paler ochreous scaling; clouding towards wing apex. Dark brown scaling, if present, is concentrated in the spots described above, and in a row of ca 7–8 (often indistinct or obsolete) spots or dashes around apex and along termen to tornus. Scale-tufts absent. Cilia pale greyish ochreous. Hindwing unicolorous grey; cilia grey, with very indistinct cilia-line. Underside: forewing greyish brown with costa and cilia whitish; hindwing grey with concolorous cilia. Abdomen dorsally with T1, T8, and margins of T2–7 white; rest of T2–7 pale brown with narrow ochreous-whitish scales arranged in staggered lines; ventrally white, mottled brown; anal tuft white.

Female (Fig. 63). Forewing length 7.5–9.5 mm; wingspan 15.5–20 mm. Similar to male but antenna without conspicuous ciliations; coloration generally paler, with forewing markings less contrasting than in male; hindwing basally translucent whitish; abdomen ventrally white.

Male abdomen and genitalia. Abdomen (Fig. 117, 122): S2 apodemes reduced to minute stubs or absent; S8 shorter than S7, caudally slightly concave, anterior corners not

produced; (T8 longer than broad, concave on each side). Genitalia (Fig. 186): tegumen crescent-shaped, strongly excavated basally; uncus a half-ellipse, weakly sclerotised basally, moderately sclerotised along lateral and terminal margins, without terminal setae. Valva upright; apex rounded / crescentic, densely setose with long and short setae; apex level with sacculus apex; sacculus with ca 1–3 enlarged setae, ending in broad, hooked beak-like free process; costa slightly convex, continuously sclerotised, except apex; pulvinus absent; juxto-costal plate not reaching costa, roughly J-shaped, broadening distally, forming part of transtilla-like bridge between costal margins of sacculi that fuses them strongly; basal arms short, without scobinations; outer and inner flanges present as well sclerotised short triangular lobes lying side by side and enclosing an O-shaped perforation in the juxto-costal plate, flanges lacking spines or scobinations. Juxta base-plate entire, V-shaped; between lateral lobes a strongly scerotised blunt digitate process extending anterodorsally in from the base-plate; lobes closely approximated basally, digitate, curved dorsad near apices, not tapering until beyond curve, without spines or scobinations. Saccus very short, rounded (distinctly thicker than vinculum arms). Phallus (Fig. 187) narrow; a single, moderately sclerotised, smooth leaf-shaped ventral lobe; other lobes absent; no teeth. Vesica without peg-like spines basally; without fixed, deciduous or compound cornuti. Bulbus ejaculatorius without distinct tubular portion; hood small, cup-shaped. Caecum penis present (moderate).

Female abdomen and genitalia (Fig. 286). Segments 8–10 hardly extensible. S8 subrectangular, anterior margin almost straight, but pinched centrally into short inverted Y-shaped lamella postvaginalis opposite ostium; sparsely setose distally, fine scobinations only distal to setose area; scoop-like lateral flanges absent. Ostium very narrow, without lamella antevaginalis; antrum very short, narrow, membranous; ductus seminalis arising laterally on right; ductus bursae broadening from antrum, weakly and indistinctly sclerotised in posterior portion, expanding slightly anteriorly, where membranous, without distinct folding; corpus bursae oblong, without scobinations; signum round to weakly diamond-shaped, poorly sclerotised, with small marginal spines. (The genital tract is very short and barely extends anterior to segment 7).

Larva. Not described in life. Most characters given by Dugdale (1971: 133) in his description of the larva are applicable at the genus level, but the sclerotised arms leading from the mentum sclerite to the mentum setae (Dugdale, 1971: fig. 129) are much shorter than those observed in other species. The pupa is illustrated in Fig. 102–105.

Biology. The larva has most frequently been found boring in dead twigs and branches of *Olearia lyallii* (tupare) (Asteraceae), or under the bark on dead trees of this species; one larva was found 'under a lead plate on a pine nestpeg' (i.e., a peg used to mark a penguin burrow), and another in the bark of a live *Brachyglottis stewartiae* (Stewart Island tree groundsel) (Asteraceae).

Flight period. November to February.

Type data. **Holotype:** Male, 'Station Pt Snares Is. P.M. Johns Jan. 67 / HOLOTYPE ♂ Izatha olearie Dugdale' (NZAC) (examined). **Paratypes:** 9 males, 4 females. **SN:** 6 males, 4 females, same data as holotype; 3 males, same locality and collector, but 8 Jan 1967, [at rest on] *Olearia lyallii*.

Material Examined. Type material plus 54 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Endemic to the subantarctic Snares Islands.
— / — / SN

Remarks. *I. olearie* was discovered by Peter Johns, who collected the type series in January 1967. It is one of only 3 species of Oecophoridae native to New Zealand's subantarctic islands; the others are *Tinearupa sorenseni* Salmon & Bradley, from Auckland and Campbell Islands (Dugdale 1971), and *Izatha spheniscella*, described as new below. The presence of *olearie* and *spheniscella* on the Snares is of considerable biogeographic importance, since otherwise *huttonii* is the only *Izatha* species known to occur as far south as Stewart Island, and there is no evidence of a close relationship. Both *olearie* and *spheniscella* display a number of morphological peculiarities, and resolution of their phylogenetic placement in the genus would be of great interest.

Izatha spheniscella new species

Fig. 64, 65, 123, 188, 189; Map 30

Diagnosis. The male of *Izatha spheniscella* is similar to *I. olearie*, but shorter-winged (forewing length up to 7 mm, 7.5 mm or over in *olearie*). The spotting and banding on the labial palpi appears to be darker than in *olearie*, and the forewings tend to be more extensively mottled with brown, with more dark brown scales and fewer clear white areas than in *olearie*, giving the moth a grey appearance (*olearie* always appears pale brownish); the forewing cilia are ochreous in *olearie* and whitish in *spheniscella*. The female of *spheniscella* is very distinct from that of *olearie*, being rather physogastric and brachypterous, the forewings very pointed and pure white with clearly contrasting ochreous markings (*olearie* fully winged with forewings largely ochreous and markings indistinct).

Male (Fig. 64). Forewing length 6.5–7 mm; wingspan ca

14–15 mm. Head smooth, without protuberance; vertex white, mixed with ochreous; frons white; labial palpi white, mottled dark brown; segment 2 with some dark brown scaling exteriorly near base and dark brown subapical ring; segment 3 with dark brown bands subbasally and at 1/2 length and apex; segment 3 without scale-tuft; proboscis white; antennae with scape white, mottled dark brown; flagellum banded white and dark brown; ciliations very long, ca 3× width of flagellum. Collar, thorax, and tegulae white, mottled ochreous, and dark brown. Forewing rather narrow and pointed, with termen oblique; white, strongly mottled ochreous, and usually with markings containing some dark brown scales; ochreous and dark brown scaling forms the following more or less distinct pattern: subbasal spot on costa, and spot just below and beyond this; largish spot in disc at 3/8 and more diffuse, paler elongate spot just below in fold, not forming impression of fascia; a spot in disc at 2/3, more or less joined to costa (but not to tornus) by ochreous scaling; clouding towards wing apex. Dark brown scaling is concentrated in the spots described above, and in a row of ca 7–8 spots or dashes around apex and along termen to tornus. Scale-tufts absent. Cilia whitish, without distinct cilia-line. Hindwing unicolorous pale grey; cilia whitish, with very indistinct cilia-line. Underside: forewing pale greyish with costa and cilia whitish; hindwing whitish to grey with whitish cilia. Abdomen dorsally white; central areas of T2–7 with narrow silvery grey scales arranged in staggered lines; ventrally white, with or without some pale greyish scaling; anal tuft white.

Female (Fig. 65). Forewing length 6.5 mm; wingspan ca 14 mm. Head white with just a few ochreous scales on vertex; labial palpi with segment 2 white except for a few dark brown scales subapically; segment 3 as described for male; antennae without conspicuous ciliations; scape white, rest banded as in male. Thorax white, with a few ochreous to dark brown scales anteriorly and at apex of mesonotum. Forewing elliptical, pointed (moth brachypterous), white, with the following clearly contrasting markings ochreous, with some dark brown scaling admixed: a diffuse subbasal fascia, not reaching costa; largish spot in disc at 3/8 and more diffuse, paler elongate spot just below in fold; a spot in disc at 2/3, more or less joined to costa by ochreous scaling; clouding towards wing apex. Cilia white. Hindwing white; cilia white. Underside entirely white. Abdomen dorsally white, narrowed scales of tergites yellowish; ventrally white.

Male abdomen and genitalia (Fig. 123, 188, 189). As described for *oleariae*, except: T8 as broad as, or broader than long (Fig. 123); uncus (Fig. 188) strongly reduced and with central concavity; saccus reduced to a band hardly thicker than vinculum arms.

Female abdomen and genitalia. Not dissected (see below).

Larva. Unknown.

Biology. Pupae were found amongst green algae, the presumed larval pabulum, on an overhanging granite rock on Rima Islet, part of the Western Chain of the Snares. The male paratype from Alert Stack was found amongst crustose lichens, suggesting these may also be fed on by larvae.

Flight period. The only 2 wild-caught adults known were collected in December and February; pupae of the type series were collected in November, and emerged as adults in early December.

Type data. **Holotype:** Male, 'NEW ZEALAND The Snares Rima Islet Western chain 21 Nov. 1976 / ex green alga on granite overhang / em. 1. Dec. reared 1976 / Photographed 2007–2008 by B.E. Rhode for Fauna NZ' (NZAC). **Paratypes:** 4 males, 2 females. **SN:** 3 males, 2 females, same data as holotype; 1 male, Alert Stack, on crustose lichen-covered rock, 20 Dec 1976, D.S. Horning (all NZAC).

Material Examined. Type material plus 4 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Endemic to the subantarctic Snares Islands; chiefly from the Western Chain.

— / — / SN

Etymology. The species name is a female diminutive of *spheniscus*, a penguin, and refers to the female moth's brachyptery and to the rocky subantarctic island habitat.

Remarks. This species was first collected by John Early and D. S. Horning on Rima Islet in November 1976; they found a single adult and a number of pupae, which were reared to adulthood by John Dugdale. D. S. Horning took further specimens on Alert Stack in December 1976, and at North Promontory on the main island of the Snares in February 1977. The female is certainly flightless, based on her large abdomen and reduced wings; the male may retain some flight ability, but given the habitat of the species (see Fig. 301), it is unlikely to make extensive use of this.

Izatha spheniscella is undoubtedly recently derived from *I. oleariae*, and has stood in NZAC as a distinctive population of *oleariae* since its discovery. It is here treated as a distinct species in view of the female brachyptery, the lack of overlap with *oleariae* in male forewing measurements, the small differences in the male T8, uncus, and saccus, and particularly the specialised biology, in which it departs significantly from *oleariae*.

There are only two females in collections, one of which is glued to a card mount, the other pinned but unset. Because of the expense and difficulty of re-collecting the species, and because the female genitalia are unlikely to differ significantly from those of *oleariae*, these specimens have not been dissected.

Izatha prasophyta (Meyrick, 1884)

Fig. 66, 67, 118, 190, 191, 287, 310; Map 31

Semiocosma prasophyta Meyrick, 1884: 25.

Diagnosis. *Izatha prasophyta* is easily distinguished from all other species by its olive-green ground colour, and the large almost S-shaped raised mark in the disc at 2/3 (formed from 2 of the scale-tufts), which is usually more or less picked out by surrounding white and/or pale lilac scales (see Fig. 310).

Male (Fig. 66). Forewing length 7–10.5 mm; wingspan 16–22.5 mm. Head: vertex (not strongly melanised), weakly produced between antennal bases into small scobinate protuberance, scales brownish to greyish white posteriorly, white anteriorly; frons snow-white; labial palpi segment 2 white, ringed dark brown basally and subapically; segment 3 dark brown mixed with ochreous brown, white basally and apically, the apex ochreous-tinged; dark brown scales extended dorsally into tuft at 3/4 length of segment; proboscis white with scattered brownish scales; antennae with scape white, tinged ochreous, and with a few dark brown scales subapically; rest of antenna with rings of brownish white scales, dorsally complete, ventrally incomplete, in between rings dorsally dark brown (scaled), ventrally pale brown (unscaled); ciliations silvery white, ca 1/2 width of flagellum, dorsally appressed, ventrally suberect. Collar centrally white, laterally dark brown, tipped white. Thorax: narrow anterior band between tegulae dark brown, narrow band posterior to this white, rest of thorax and tegulae olive green, fading to white on tegulae posteriorly; lower scales of posterior mesonotal scale crest white; a small brownish patch of scales on each side of base of crest. Forewing predominantly olive-green, with the following markings: a white spot in centre of wing at base, bordered black distally; a white subcostal oblong just beyond this surrounded by blackish scales (oblong also encloses a few olive-green scales distally); a very short blackish streak just above base of dorsum; a somewhat inwardly oblique, broad pale lilac fascia at 1/6 enclosing these basal markings; a short, slightly outward-curved blackish dash from costa just before 1/2; an elongate blackish spot on costa at 2/3; beyond this a strongly outwardly angled pale lilac fascia, narrow in dorsal 1/2 of wing, but expanded basad subcostally into broad subtriangular patch that meets distal edge of 3rd discal scale-tuft; 3 blackish spots on costa beyond this interspersed with white scales; a weak, outward curved subterminal whitish fascia arising from costa between 2nd and 3rd of these spots and running ca 1/2 way across wing; a tiny blackish spot at apex and 5–6 less discrete blackish spots along termen to tornus. Pale lilac fasciae may be suffused with ground colour so that they are almost obsolete in some specimens (especially those from the Poor Knights Islands ND and Wellington WN). Scale-tufts large and conspicuous in fresh specimens. Cilia pale brownish with faint darker cilia-line. Hindwing whitish in basal 1/2, distally shading to brown, without clear demarcation; cilia brown, demarcated by a narrow whitish line at their bases around apex, termen and dorsum; cilia-line indistinct. Underside: forewing greyish brown, with darker streak on costa at ca 2/3, bordered on each side by whitish streaks, and some whitish streaking between veins beyond discal cell; hindwing mostly whitish, suffused with brown along costa. Abdomen: T1 snow-white with central triangle of very narrow shining golden-orange scales; T2 mostly covered with similar golden-orange scales, white normal scales posteriorly and sometimes also in a central longitudinal strip; T3 as T2 but always with central strip of white unmodified scales; T4 with a few narrow golden scales in 2 lateral patches, almost hidden amongst grey scales; remainder of tergites greyish, with broad bluntly pointed scales, each segment bordered greyish white posteriorly; abdomen ventrally white with variable admixture of brown scaling; anal tuft greyish.

Female (Fig. 67). Forewing length 9.5–12 mm; wingspan 19.5–26 mm. Antenna with ciliations reduced to discrete tufts arising ventrally from beneath each ring of whitish scales. Vertex darker than in male, with many silvery grey to dark grey scales. Forewing tends to be darker than in male, with a greater admixture of blackish scales in disc and in S-mark formed by scale tufts at 2/3. Otherwise similar to male.

Male abdomen and genitalia. Abdomen (Fig. 118): S2 apodemes reduced to minute stubs; S8 about equal to S7, caudally concave, anterior corners not produced; (T2–7 each with central unsclerotised longitudinal strip; T8 a narrow, elongate sclerite). Genitalia (Fig. 190): tegumen crescent-shaped to arch-shaped, strongly excavated basally; uncus triangular, membranous basally, sclerotised laterally towards apex, with 1–2 terminal sessile setae on each side. Valva upright; apex rounded / semicircular, densely setose with long and short setae; apex exceeded slightly by sacculus apex; sacculus with 3 enlarged setae, ending in elongate, hooked free process shaped like a pelican's-beak; costa concave, continuously sclerotised; pulvinus absent, but a few scattered setae in this position; juxto-costal plate extending over 1/2 way along costa, anteriorly reduced, possibly represented by sclerotised struts subtending lateral arms of juxta, and forming part of Y-shaped central juxta sclerite, posteriorly more or less triangular, forming part of transtilla-like bridge between valvae that fuses them rather strongly (less so than in *oleariae* and *spheniscella*); basal arms not clearly differentiated; flanges apparently absent. Juxta base-plate entire, V-shaped, a Y-shaped strut extends anteriorly along centre of plate, but does not form

free process (cf. *oleariae*); lobes moderately separated basally, short and broad, not curved, without spines or scobinations. Saccus arrowhead-shaped. Phallus (Fig. 191) narrow, elongate; ventral lobe with apical short curved sclerotised tooth; dorsal lobe much longer, triangular with very straight sides. Vesica without peg-like basal spines; a single fixed cornutus, not hooked at base, without deciduous or compound cornuti. Bulbus ejaculatorius with distinct tubular portion; hood large, rounded L-shaped. Caecum penis absent.

Note. Interpretation of the juxto-costal plate is especially difficult in this species. The interpretation offered here is that the part of the plate most conspicuously developed in, e.g., the *balanophora* group, i.e., the proximal part bearing the flanges, is extremely reduced in *prasophyta*, and fused to the juxta. This modification is associated with elongation of the juxta and reduced mobility in the valvae. The distal part of the plate is relatively well-developed and essentially similar to the equivalent part in other species.

Female abdomen and genitalia (Fig. 287). Segments 8–10 hardly extensible. S8 divided into two raised rounded sclerites, rather densely long-setose distally; fine scobinations only present between and anterior to these sclerites; scoop-like lateral flanges absent; anteriorly an irregular transverse sclerotised lamella postvaginalis. Ostium narrow, subtended by rather straight lamella antevaginalis; antrum rather short, narrow, membranous; ductus seminalis arising laterally on right; ductus bursae posteriorly weakly bulbous, then narrowing to finely scobinate anterior portion; corpus bursae oblong, with 1 or 2 patches of very fine spinules posteriorly; signum absent.

Larva. Not described.

Biology. One specimen was reared from an unidentified log on a beach, and another from a fruiting body of the bracket fungus *Bjerkandera adusta* (smoky bracket) (Polyporales: Hapalopilaceae) growing on an unidentified rotting stump.

Flight period. November to February.

Type data. **Lectotype:** Male, 'LECTOTYPE / Wellington New Zealand 1/1/80 / Izatha prasophyta Meyr. 1/5 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / LECTOTYPE ♂ Semiocosma prasophyta Meyrick teste J.S. Dugdale 1988' (BMNH) (examined). **Paralectotype:** 1 female. **TK:** Taranaki, 28 Feb 1883 (2/5 in Meyrick coll.) (BMNH).

Material Examined. Type material plus 39 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. North Island only, but not recorded from Hawkes Bay or the Wairarapa.

ND, AK, WO, BP, TK, WN / —

Remarks. *Izatha prasophyta* is another widespread but rarely collected North Island species. Its unique coloration renders it one of the most spectacular lichen-mimics in the genus; as reported by Hudson, the resting posture enhances the mimicry (see Fig. 310). It appears to be phylogenetically isolated, its apparent closest relatives (*oleariae* and *spheniscella*) differing in many respects morphologically.

The *caustopa*-group

Diagnosis. Medium-sized to large species; head with vertex unmodified; forewing brown or grey with pattern variable; male genitalia with juxta base-plate entire; juxto-costal plate not displaced caudad, with 1 or 2 flanges, not forming transtilla-like bridge between valvae; saccus moderate; vesica without deciduous cornuti, without 'compound cornuti'; female genitalia with ductus membranous; corpus bursae without signum or signum very small.

Notes. The 3 species assigned to this group are rather disparate in external appearance; the male and female genitalia are rather similar, especially in *caustopa* and *dasydisca*, but most similarities are possibly plesiomorphic. The reduction of the S2 apodemes in the male is a probable synapomorphy, but occurs elsewhere in the genus. In both *caustopa* and *dasydisca*, the female has S8 more or less divided into a pair of club-shaped sclerites (a probable synapomorphy); this character is less clearly developed in *manubriata*. *I. manubriata* has a wing-pattern similar to that of members of the *epiphanes*-complex, and like these has 2 flanges on the juxto-costal plate, so it may be misplaced here. All 3 species are rare in collections.

Izatha caustopa (Meyrick, 1892)

Fig. 68, 69, 119, 192, 193, 288; Map 32

Semiocosma caustopa Meyrick, 1892: 219.

Diagnosis. Somewhat similar to *I. dasydisca*, especially in the discal forewing spot bisected by a black line and the conspicuous angled pale subterminal fascia, but larger. In *caustopa* there is contrast between the pale costa and the dark tornal area of the wing before the fascia; the forewing of *dasydisca* appears almost unicolorous in comparison. *I. dasydisca* also has very dark hindwings, whereas those of *caustopa* are pale.

Male (Fig. 68). Forewing length 11.5–12.5 mm; wingspan 24–26 mm. Head capsule smooth, without protuberance: vertex dark brown, with many of the scales tipped whitish; frons whitish with dark brown spots laterally at midlevel of eye; proboscis white, immaculate; labial palpi

speckled dark brown and whitish; segment 2 mostly dark brown exteriorly; segment 3 mostly whitish with dark brown subbasal ring, dark brown ring just beyond 1/2 extended ventrally into scale-tuft, and dark brown tip; antennae weakly serrate, dorsally dark brown, ventrally (unscaled) tawny brown; ciliations ca 3/4 width of flagellum. Collar, thorax, and tegulae dark brown with strong mottling of whitish scales. Forewing dark brown with strong admixture of whitish to pale brown scales; pale scales predominate below fold from ca 1/5–1/2 and form angulated subterminal fascia at ca 5/6, clearest towards dorsum; an indistinct dark brown dash from costa at 1/3; a large dark brown discal spot at 2/3, edged whitish above; a black streak in disc from ca 1/2 to subterminal fascia, and a shorter black streak above this, beyond discal spot, crossing subterminal fascia; ca 9 dark brown dashes around apex of wing and along termen to tornus, interspersed and bordered exteriorly by whitish scales. Scale-tufts (especially basal group) large and conspicuous in fresh specimens. Cilia dark brown with faint cilia-line. Hindwing with mixed brown and white scaling; brown exteriorly; cilia basally white, brownish beyond this with darker cilia-line subbasally. Underside: forewing pale brownish, with white clouding along costa at 1/2, and subterminal pale fascia showing clearly, cilia brownish; hindwing whitish with brown clouding along basal 1/2 of costa and at apex. Abdomen: T1 white with a few brownish scales; rest of segments dorsally with admixture of brown and whitish scales, with posterior margins of segments whitish; many, but not all of the paler scales on T2–7 modified, narrow, sharp-pointed; these narrow scales progressively sparser and less conspicuous on posterior segments; ventrally abdomen white with scattered brown scales; anal tuft whitish.

Female (Fig. 69). Forewing length 14–15.5 mm; wingspan 29–31.5 mm. Similar to male, but antennae narrower, not serrate, only sparsely ciliate ventrally.

Male abdomen and genitalia. Abdomen (Fig. 119): S2 apodemes minute; S8 about equal to or slightly longer than S7, caudally weakly concave, anterior corners slightly produced laterally. Genitalia (Fig. 192): tegumen elongate, subelliptical, with moderate excavation basally; uncus moderately long, rounded, with some weak sclerotisation laterally, terminating in 1–2 setae on each side; setae sessile or on small papillae. Valva at 45° to axis of genital capsule; apex rather broad and square, densely short-setose in patch beyond sacculus apex and along extreme distal margin from here to apex; apex exceeding sacculus; sacculus without enlarged setae, ending in indistinct broad triangular appressed sclerite; costa convex, continuously sclerotised; pulvinus not developed as discrete lobe, represented by scattered sessile setae; juxto-costal plate extending just under 1/2 way along costa, moderately broad, band-like; basal arms short, without scobinations; a single large flange, elongate-oval with irregular outer margin, without scobinations. Juxta base-plate entire, squarish; lateral lobes basally contiguous, short, hummock-like, without spines or scobinations. Saccus blunt-triangular. Phallus (Fig. 193) rather short and narrow; lobes of equal length; ventral and dorsal lobes not strongly sclerotised; ventral lobes with 2–3 rows of tiny indistinct backward-pointing teeth on right; dorsal lobe with similar arrangement of teeth on left; central lobe poorly differentiated / membranous. Vesica without translucent spinules basally; a moderate fishhook-like fixed cornutus arising with basal curve from a large base; deciduous cornuti and compound cornutus absent. Bulbus ejaculatorius without distinct tubular portion; hood small, oval. Caecum penis present (very short).

Female abdomen and genitalia (Fig. 288). Segments 8–10 only slightly extensible. S8 divided medially into 2 club-shaped sclerites, long-setose distally; fine scobinations present only between and distal to these sclerites; scoop-like lateral flanges absent. Ostium of moderate width, subtended by W-shaped lamella antevaginalis; antrum of even width, weakly sclerotised near ductus seminalis inception, otherwise membranous; ductus seminalis arising ventrally and not recurved basally; ductus bursae of moderate width, not scobinate or rugose, gradually expanding towards corpus; corpus bursae elongate-ovoid, without spinules; signum absent.

Larva. According to Hudson (1928: 280), the larva closely resembles that of *I. attactella*, q.v.

Biology. Only reared from dead branches of *Fuchsia excorticata* (kotukutuku) (Onagraceae) by Hudson, who states that it "feeds during the winter months… driving burrows through the soft wood in all directions", and becomes full grown about October (Hudson 1928: 280).

Flight period. Wild-caught specimens were all taken in January and February, except for 1 on 28th December, and 1 on 6th April.

Type data. **Holotype:** Female, 'Holotype / Wellington New Zealand GVH. /90 / Izatha caustopa Meyr. 1/1 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / abdomen missing / caustopa Meyr.' (BMNH) (examined).

Material Examined. Type material plus 18 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only known very locally from the southern half of the North Island.

TO, HB, WN / —

Remarks. Although most major Lepidoptera collections in New Zealand contain specimens of *caustopa*, almost all of these were collected by Hudson at Karori, Wellington.

Hudson reared the species from dead branches of *Fuchsia excorticata* (kotukutuku), and also found freshly emerged adults resting on the trunks of these trees (Hudson 1928). He also took a single specimen at sugar (Hudson collection register, MONZ). He states (1928: 280): "It is extremely local, apparently being confined to certain patches of fuchsia trees, where one or two specimens may, perhaps, be taken for several successive seasons." Hudson also found the species at Gollans Valley and in Wilton's Bush WN, where he collected his last specimen on 28 December 1942. Only 2 localities outside Wellington are known: T. R. Harris took one specimen at Ohakune TO in 1921 and T. H. Davies took 2 specimens at Little Bush, Puketitiri HB in 1964 and 1985 (all 3 specimens in MONZ). A fine old *Fuchsia excorticata* tree is shown in Fig. 311.

Since only 3 specimens have been collected in the last 70 years, the conservation status of *caustopa* needs assessing. The negative effects of possum browse on *Fuchsia* populations have been well documented (Pekelharing *et al.*, 1998) and the tree is probably in long-term decline. *I. caustopa* has only ever been reared from dead wood of *Fuchsia*, but it may not be completely dependent on this tree: no other *Izatha* species is known to be monophagous on dead wood of a single tree species. Possibly *caustopa* has been overlooked, since apparently it never comes to light. Further field-work is a priority.

Izatha dasydisca new species

Fig. 70, 71, 194, 195, 255, 289; Map 33

Diagnosis. For differences from *caustopa*, see under that species. The male of *I. dasydisca* is superficially similar to that of *I. austera*. They differ as follows: the antennae in *austera* are uniform blackish; in *dasydisca* they are pale orange to reddish brown and mottled. *I. dasydisca* lacks a scale-tuft on the 3rd segment of the labial palp; this tuft is well developed in *austera* (it is lost only in the most worn specimens). *I. dasydisca* has a pair of large scale-tufts on the forewing at 2/3; these are absent in *austera*. On the underside, *dasydisca* has a distinct pale line around the base of all the cilia; in *austera* this line is absent or indistinct. The females of the two species are more easily distinguished: in addition to the features listed above, the hindwing of *dasydisca* is much darker than that of *austera*, with the veins barely visible (venation picked out by darker scaling in *austera*). In worn specimens of both sexes, the hindwing shape is a good guide: *austera* has the hindwing subtrapezoidal, similar to that in some Gelechiidae (e.g., *Anisoplaca* Meyrick spp.), whereas in *dasydisca* the termen is smoothly rounded.

In life, *I. dasydisca* resembles *Gymnobathra dinocosma* (Meyrick), but it can be distinguished by the presence of scale-tufts on the forewing, and (in worn specimens) the lack of contrast between the colour of the discal spot / tuft and the rest of the forewing; *dinocosma* has the discal spot conspicuously darkened.

Male (Fig. 70). Forewing length 7–9 mm; wingspan 15–19 mm. Head smooth, without protuberance; vertex and frons worn in all specimens examined, (from remaining scales) apparently dull reddish brown to grey-brown, mixed with whitish, the white predominating on the frons; frons with dark brown spots laterally at mid-level of eye; labial palpi segment 2 dark reddish brown, speckled white, especially interiorly, with dark reddish brown ring before apex; segment 3 whitish with 3 dark reddish brown bands subbasally, centrally, and subapically, without scale-tuft; proboscis mostly white-scaled with some brown speckling; antennae pale orange brown, variably ringed with dark brown; ciliations pale, recumbent, ca 1/3 width of flagellum. Collar dark reddish brown with some scales tipped yellowish white. Thorax dark reddish brown, tegulae posteriorly yellowish white; posterior mesothoracic scale-tuft and 2 patches of scales lateral and anterior to this tipped yellowish white. Forewing dark reddish brown with speckling of many pale reddish-brown and yellowish white scales; the pale reddish scales showing a strong brassy lustre in certain lights; yellowish white scales densest in a vaguely defined band across wing at 1/3, and forming a relatively distinct outwardly angled fascia at 3/4; ca 8–9 blackish streaks from 2/3 to apex radiating from disc along veins and terminating in a series of spots around apex and termen (whitish fascia overlies these streaks). Scale-tufts conspicuous in fresh specimens. Cilia dark brown. Hindwing and cilia blackish. Underside of both wings dark brown, mottled white, and with distinct whitish line around base of cilia. Abdomen: T1 shining greyish; remaining segments mixed dark brown and whitish; many of the pale scales on T2–4 and a few basally on T5–6 very narrow-pointed, these being interspersed with normal blunt scales; ventral surface of abdomen laterally dark brown, centrally whitish in a broad band; anal tuft blackish.

Female (Fig. 71). (Description from single worn specimen). Forewing length 12.5 mm; wingspan 26 mm. Similar to male, but larger; labial palpi apparently longer; antenna with less conspicuous ciliations.

Male abdomen and genitalia. Abdomen: S2 apodemes very short; S8 slightly longer than S7, caudally square, anterior corners laterally produced. Genitalia (Fig. 194): tegumen narrow, with very small excavation basally; uncus squarish, with a distinct small papilla at each corner bearing ca 4–5 setae. Valva upright; apex smoothly rounded, densely setose except towards costa; apex exceeding sacculus; sacculus without enlarged setae, ending in rounded

V-shaped partially free process; costa convex towards apex, continuously sclerotised; pulvinus not developed as discrete lobe, a few sessile setae in this position; juxto-costal plate extending ca 1/3 length of costa, band-like, outer margin papillate (papillae bearing setae); basal arms moderately long, without scobinations; a single short narrow-triangular flange, without scobinations. Juxta base-plate entire, large, squarish; lobes basally approximated, digitate, slightly expanded apically, without spines or scobinations. Saccus arrowhead-shaped. Phallus (Fig. 195, 255) rather short and stout; central lobe longest, ventral, not strongly sclerotised, without teeth; left (dorsal) lobe more strongly sclerotised and with irregular longitudinal field of backward-pointing teeth on right margin; right (dorsal) lobe with similar field of slightly smaller teeth on left margin. Vesica with translucent spinules basally (arranged in ca 4–5 rows); a stout, blunt fishhook-like fixed cornutus with curved base; deciduous cornuti and compound cornutus absent. Bulbus ejaculatorius with moderate tubular portion; hood small, ovoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 289). Segments 8–10 barely extensible. S8 divided into 2 club-shaped sclerites, long-setose distally; fine scobinations throughout; scoop-like lateral flanges weakly developed. Ostium rather narrow, subtended by W-shaped lamella antevaginalis; antrum short, rather narrow, finely scobinate throughout; ductus seminalis arising ventrally and apparently not recurved basally (may be displaced in preparation); ductus bursae posteriorly of same width as antrum and with moderately fine scobinations, anteriorly narrower, somewhat folded and twisted to left and without distinct scobinations; corpus bursae elongate-ovoid, with very fine scattered spinules anteriorly; signum very small, roundish, arising from slight pocket-like invagination of corpus, with radiating fine spines.

Larva and Biology. Unknown.

Flight period. December, January, February.

Type data. **Holotype:** Male, 'NEW ZEALAND AK Mt Auckland Atuanui S.F. 10 Jan 1974 J.S. Dugdale / [upside-down label] Mt Auckland Atuanui S.F. 10 Jan 1974 J.S. Dugdale / NZAC slide Oec. 381 genitalia ♂' (NZAC). **Paratypes:** 2 males, 1 female. **ND:** 1 female, Russell Forest, Ngaiotonga Sc. Res. by day 22 Jan 1999, RJBH, GH, R. Leschen (NZAC). **AK:** 1 male, Waitakere Ra., start of Centennial Tk, 320 m,, swept by day, 4 p.m., 16 Feb 2008, RJBH (NZAC). **GB:** 1 male, Kakanui, 300 m, 16 Mar 1993, JSD (genitalia slide Oec. 231) (NZAC).

Material Examined. Type material plus 2 non-type specimens (see Appendix 2 for collection localities of specimens.

Distribution. Only known from the northern half of the North Island.

ND, AK, GB/ —

Etymology. The name comes from the Greek *dasys* (shaggy) and *diskos* (indicating the disc of the forewing) and refers to the scale-tufts which help to distinguish this species from *I. austera*.

Remarks. *I. dasydisca* eluded the earlier New Zealand collectors, the first specimen being taken by John Dugdale on Mt Auckland AK as late as 1974. He collected a second specimen in beech / *Dracophyllum* forest at Kakanui GB in 1993. Neville Hudson collected single specimens in the Hunua Ranges and Waitakere Ranges AK in 1982 and 1993 respectively. The only known female was taken at Ngaiotonga Scenic Reserve, Russell ND in 1999 on a tree trunk. A sixth specimen was swept at about 4 pm in rich secondary podocarp-broadleaf forest in the western Waitakere Ranges AK, in February 2008, near the site illustrated in Fig. 297. All 6 specimens were collected by day.

The most recent specimen adopted an 'alert' resting posture when tubed, with the wings raised slightly over the abdomen and held flat; the same posture is adopted by some other endemic oecophorids of the *Hierodoris*-group, e.g., *Lathicrossa leucocentra* Meyrick and *Gymnobathra omphalota* Meyrick, both of which are at least partly diurnal, and also by the diurnal *Asterivora* Dugdale spp. (Choreutidae). When refrigerated, the *dasydisca* specimen reverted to a more typical *Izatha* posture, with wings appressed to the substrate.

Clearly *I. dasydisca* is an extremely difficult species to find, although it appears to be widespread, and is probably not threatened. Undoubtedly it has been overlooked; like *I. caustopa*, it seems never to be attracted to light, and this has doubtless contributed to its great rarity in collections.

Izatha manubriata Meyrick, 1923

Fig. 72, 73, 196, 197, 290; Map 34

Izatha manubriata Meyrick, 1923: 165.

Diagnosis. The wing-pattern of *Izatha manubriata* is distinctive amongst the South Island *Izatha* fauna. It resembles the North Island *I. mesoschista* in its curved dark discal streak, but in *mesoschista* this streak is anteriorly approximated to a long dark cloud on the costa; the costal mark is much shorter in *manubriata*. In addition, *manubriata* has a well-defined blackish spot above the streak; *mesoschista* has at most indistinct clouding in this position. *Izatha manubriata* (wingspan over 24 mm) is usually a much larger species than *mesoschista* (wingspan 15.5–25 mm).

Male (Fig. 72, 73). Forewing length 12–13.5 mm; wingspan 24.5–27.5 mm. Head smooth, without protuberance; vertex with mixed white and pale grey-brown scales; frons mixed white and dark brown; labial palpi white, speckled dark brown; segment 2 dark brown exteriorly in basal 1/2 and with usually indistinct brown ring subapically; segment 3 with dark brown ring just beyond 1/2 extended dorsally and distally into small scale-tuft, apex brown; proboscis white; antennae brown with variable admixture of white scales; ciliations ca 1/2 width of flagellum. Collar mixed white and pale brown, dark brown anterolaterally. Thorax white, with admixture of pale brown and dark brown scales, mesonotum edged dark brown posteriorly. Forewing ground-colour white, with admixture of grey-brown and pale orange-brown scales, appearing greyish overall; grey-brown scales predominating in an outwardly acutely angled basal blotch, an area between disc and dorsum from ca 1/3–2/3, and apex and termen beyond a subterminal outward-angled whitish fascia; the following markings blackish brown: small basal scale-tuft beyond a white basal spot; narrow outer edging to basal blotch; transversely placed spots in disc and on fold just beyond 1/3, the discal usually larger and usually connected via a slightly curved line to a 2nd elongate mark in disc at 5/8; the 2nd mark more or less in the form of a stout ð, the space between the legs of the ð occupied by a patch of white scales, tipped with pale orange-brown, that may extend in an indistinct line to tornus; a spot 1/2 way between and just costad of these 2 discal marks (or 1/2 way along streak if present); the following markings dark brown (less blackish): base of costa, spot on costa at 1/3, dash along costa at 2/3, ca 9 spots around apex and along termen to tornus. Scale-tufts small and inconspicuous. Cilia grey-brown beyond a distinct whitish line around termen. Hindwing whitish, speckled brown, with the veins marked out in brown, and brown line around apex and termen, or uniform grey-brown; cilia whitish with 2 indistinct grey-brown cilia-lines. Underside: forewing uniform brown, with costa and cilia whitish; hindwing as for upperside. Abdomen: posterior margins of all tergites white, sometimes with some grey-brown scales; rest of tergites grey-brown; T1–4 paler and with slight yellowish tinge; T2–7 with all but posterior white scales modified, narrow, pointed; ventral surface white, with variable admixture of brown scales; anal tuft white.

Female. (From single, very worn specimen). Forewing length 12.5 mm; wingspan 26 mm. Apparently similar to male, but darker, antennal ciliations more appressed, and forewing slightly narrower. Abdomen: T1 silvery, scales normal (small), posteriorly pale shining brown, T2–6 as for male; T7–8 with mixed dark brown and white scales.

Male abdomen and genitalia. Abdomen: S2 apodemes reduced to small stubs; S8 slightly longer than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 196): tegumen a broad inverted U with narrow basal excavation; uncus elongate, somewhat sclerotised laterally and terminating in a few sessile setae on each side. Valva at ca 45 degrees to axis of genital capsule; apex smoothly rounded, densely short-setose with 1 or 2 much longer setae in disc just beyond apex of sacculus tooth; apex exceeding sacculus; sacculus with ca 3 enlarged setae, ending in broad, cordate free tooth with raised, well sclerotised margins; costa smoothly and weakly concave, continuously sclerotised; pulvinus a small well-defined round lobe with sessile setae; juxto-costal plate extending almost entire length of costa, narrow, band-like; basal arms short, without scobinations; outer flange weakly differentiated, flat, hummock-like; inner flange a rounded lobe of variable width, with exterior surface bearing small teeth. Juxta base-plate entire, large, squarish; lobes basally approximated, short, hummock-like, without spines or scobinations. Saccus short, arrowhead-shaped. Phallus (Fig. 197) short, rather club-shaped; central lobe slightly the longest; right lobe with field of fine backward-pointing teeth laterally and dorsally; left lobe with very fine scattered inconspicuous teeth dorsally; central lobe with basal ventral projection and field of fine backward-pointing teeth in basal 1/2. Vesica basally with translucent spinules; without fixed, deciduous or compound cornuti. Bulbus ejaculatorius without tubular portion; hood small. Caecum penis present (long and narrow).

Female abdomen and genitalia (Fig. 290). Segments 8–10 only slightly extensible. S8 saddle-shaped, moderately setose distally; fine scobinations only posteriorly in central area and in fine bands along inner margins of saddle 'arms'; scoop-like lateral flanges hardly developed. Ostium broad, subtended by strongly curved lamella antevaginalis; antrum broad, cup-shaped, with central triangular scobinate area; ductus seminalis arising ventrally towards left and recurved basally; ductus bursae tapering strongly from antrum, without distinct scobinations, weakly rugose; ductus then broadening gradually to elongate-ovoid corpus bursae, with very fine scattered spinules anteriorly; signum absent.

Larva and Biology. Unknown.

Flight period. December to early March.

Type data. **Holotype:** Male, 'Holotype / L. Wakatipu New Zealand GVH. 2000'. 1.21 / Izatha manubriata Meyr. 1/1 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / manubriata Meyr.' (BMNH) (examined).

Material Examined. Type material plus 16 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Southern South Island only, and probably endemic to the Otago Lakes district and adjacent ranges of

Central Otago.
— / OL, CO

Remarks. *I. manubriata* appears to be another rare species, which has only been collected in small numbers at light. It has never been reared, and as with *dasydisca*, only a single female is known. Almost all specimens have been taken in the vicinity of Lake Wakatipu (see Fig. 300) and Mavora Lakes OL; known localities include Bold Peak, Mt Aurum, Queenstown, Moke Lake, and Ben Lomond; in Central Otago, it is known from the Garvie Mountains and Pomahaka Valley. All Hudson's records of *I. balanophora* from the South Island (Hudson 1928: 279) undoubtedly refer to *manubriata*, since *balanophora* is endemic to the North Island. There are two old specimens in AMNZ with the locality 'Flagstaff'; Hudson's (1928) record of '*I. balanophora*' from Flagstaff Hill, Dunedin almost certainly refers to these specimens. No subsequent examples of *manubriata* have been found near Dunedin, despite intensive collecting there by B. H. Patrick. However, there is a 'Flagstaff' on the shores of Lake Wakatipu (at 45º05´S 168º40´E), and the records are tentatively referred to this locality here.

The *convulsella*-group

Diagnosis. Small species; head with vertex unmodified or with slight conical protuberance (*minimira*); forewing brown or grey with pattern variable; male genitalia with juxta base-plate entire; juxto-costal plate not displaced caudad, with 1 flange, not forming transtilla-like bridge between valvae; saccus moderate; vesica without deciduous cornuti, without 'compound cornuti' (except *convulsella*); female genitalia with ductus membranous; corpus bursae without signum or with cordate signum.

Notes. The species gathered here lack conspicuous apomorphic characters that allow their placement in the other 6 species groups defined above, and may form a paraphyletic or polyphyletic group. However, all species are small, and those whose life histories have been (partly) documented feed on lichen or possibly moss on tree-trunks and rocks; it may be that feeding on epiphytes rather than dead wood is a synapomorphy of the whole group. *Izatha convulsella* and *gekkonella* are closely related sister-species, sharing most external and genitalic characters. *Izatha gibbsi*, *minimira*, and *rigescens* all have the flange of the juxto-costal plate closely approximated to the juxta, which may be a synapomorphy for this group of 3 species; they also fly late in the season compared to most *Izatha*. *Izatha phaeoptila* shows several autapomorphies in the genitalia, and its relationships are hard to assess.

Izatha convulsella (Walker, 1864)

Fig. 74, 75, 120, 198, 199, 256, 291; Map 35
Gelechia convulsella Walker, 1864a: 656.
Semiocosma paraneura Meyrick, 1892: 219.

Diagnosis. *Izatha convulsella* is very similar externally to *I. gekkonella*; for differences, see under that species. It also superficially resembles some greyish and white oecophorines belonging to the *Barea* group of genera, especially when worn, and might be mistaken for, e.g., *Trachypepla photinella* Meyrick. *T. photinella* has a strong antennal pecten (absent in *Izatha*), lacks modified narrow scales on the abdomen and scale-tufts on the forewing, and has a straight whitish fascia beyond the basal blotch that is strongly inwardly oblique from costa to dorsum (whitish fascia curved around basal blotch in *convulsella*). *T. photinella* also lacks yellow-tipped scales on the forewing (usually present in *convulsella*).

Male (Fig. 74). Forewing length 7–10 mm; wingspan 14–20 mm. Head smooth, without protuberance: vertex and frons white to cream with some scales brown-tipped; frons with or without distinct lateral dark brown patches at mid-level of eye; labial palpi white to cream, much speckled with brown, especially on segment 2; a more or less defined brown ring at or just beyond 1/2 length of segment 3, extended into very slight dorsal tuft; proboscis scales mostly white; antennae speckled brown and white, slightly serrate distally; ciliations ca 3/4 width of flagellum. Collar, thorax, and tegulae white to cream, variably speckled with pale brown and dark brown. Forewing white, with admixture of pale brown or grey-brown to dark brown scales, many of the brown scales tipped with yellow; the following markings dark brown to black: 3–4 spots forming a curve from costa to fold at 1/3, the lowest one sometimes extended distally as a short dash; 2 small spots placed transversely in disc at ca 1/2, the lower slightly beyond the upper; a slightly larger spot between and beyond these in disc at 2/3; an indistinct cloud on costa level with this spot; ca 8 spots around apex of wing and along termen to tornus. Greyish to mid-brown clouding is most conspicuous in an outwardly angled blotch at base, beyond the spots at 1/3, in a cloud between the last discal spot and the tornus, and in a cloud towards the apex; these clouds leave the following whiter areas: a rather distinct broad curved subbasal fascia, an elongate blotch on costa at ca 1/2, and a narrow curved fascia at 3/4. Scale-tufts rather small and inconspicuous. Cilia mottled greyish brown and white. Hindwing greyish brown; cilia slightly paler, with rather distinct cilia-line basally. Underside: forewing brown with pale scaling along costa and cilia pale grey-brown; hindwing white with brown speckling towards costa and apex, cilia white. Abdomen: venter, T1 and broad scales on hind and lateral margins of other tergites silvery white, with admixture of

pale brown scales; T2–7 with large central fields of narrow, well-spaced yellowish white scales in staggered rows; anal tuft with a few brownish scales.

Female (Fig. 75). Forewing length 6.5–9.5 mm; wingspan 13.5–19 mm. Similar to male; forewing slightly broader, and antennae not serrate or conspicuously ciliate.

Male abdomen and genitalia. Abdomen (Fig. 120): S2 apodemes short to moderate; S8 equal to S7, caudally square, anterior corners not produced. Genitalia (Fig. 198): tegumen saddle-shaped, deeply excavated basally; uncus short, triangular to teat-shaped, weakly sclerotised dorsolaterally, tapering to small pair of papillae each with several setae. Valva at ca 45–60° to axis of genital capsule; apex rounded, setose in a narrow exterior strip; apex slightly exceeding sacculus; sacculus without enlarged setae, ending in scoop-like elongate-triangular free tooth; costa shallowly concave along entire length, weakly but continuously sclerotised; pulvinus a small lobe or elongate low hummock, setae sessile or raised on small papillae; juxtocostal plate a narrow strip, not running to costa but along inner face of valva, parallel to margins of valva (terminating level with 1/2 length of costa); basal arms moderate, not scobinate; a single short, blunt digitate flange, with a few indistinct scobinations. Juxta base-plate entire, weakly W-shaped; lateral lobes well separated basally, short-digitate, without spines or scobinations. Saccus arrowhead-shaped. Phallus (Fig. 199, 256) moderately stout; left (dorsal) lobe longest; right (ventral) lobe with small field of forward-pointing teeth near apex; dorsal lobe with more extensive field of weakly backward-pointing prominent teeth; central lobe poorly differentiated / membranous. Vesica with translucent spinules basally; with a stout comb-like 'compound cornutus' with a single base giving rise to 2–4 blade-like points of decreasing length from left to right in ventral view; fishhook cornutus and deciduous cornuti absent. Bulbus ejaculatorius with short tubular portion; hood sigmoid. Caecum penis present (short to moderate).

Female abdomen and genitalia (Fig. 291). Segments 8–10 hardly extensible. S8 a transverse strip, with smoothly curved anterior indentation, rather sparsely setose distally; fine scobinations confined to setose area and lateral areas; scoop-like flanges absent. Ostium moderately broad, subtended by gently curved lamella antevaginalis; antrum tapering slightly from ostium, largely membranous, with small central patch of scobinations ventrally; ductus seminalis arising ventrally in centre and basally recurved; ductus bursae moderately broad, densely scobinate from near ductus seminalis inception to ca 2/3 way along its length, scobinations more scattered from there to inception of corpus bursae; a sclerotised small evagination of ductus wall at ca 1/2 length; corpus bursae round, spinulose in large patches either side of signum; signum moderate, oblong to weakly diamond-shaped, with radiating submarginal and marginal spines.

Larva. Described by Hudson (1928: 282) as follows, with the terminology updated: Length ca 12.5 mm; stout, head dark brown, prothorax with 2 dark brown plates; rest of body dull yellowish brown. Hudson describes the head, prothorax, and pinacula as 'horny', i.e., presumably well sclerotised and shiny.

Biology. Not well understood. Hudson (1928) records the larva living under the bark of rimu (*Dacrydium cupressinum*). A specimen in FRNZ was reared 'ex *Sequoia* sp.', perhaps also from the bark. The true pabulum may be lichens growing on the bark, by analogy with the closely related *I. gekkonella, q.v.*

Flight period. Late September to February, with the majority of records before Christmas.

Type data. *Gelechia convulsella*: **Holotype:** Female, 'Type / Auckld N. Zeal / Gelechia convulsella Wkr. Cat Lep BM. 29. p. 655 (1864) TYPE ♀' (BMNH) (examined). **Paratype:** 1 female, [**NN:** Nelson], same data as holotype (BMNH). **Note**. Both holotype and paratype are Oxley specimens from Nelson (Dugdale, 1988); *I. convulsella* is absent from the Auckland area.

Semiocosma paraneura. **Lectotype:** Female, 'LECTOTYPE / Wellington New Zealand GVH. /90 / LECTOTYPE Izatha paraneura Meyr. Teste P.A. Brown / Izatha convulsella Walk. 5/12 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938-290 / LECTOTYPE ♀ Semiocosma paraneura Meyrick teste J.S. Dugdale, 1988', designated by Dugdale (1988: 94) (BMNH) (examined). **Paralectotypes:** 1 male, 1 female. **WN:** Wellington, same data as lectotype (BMNH).

Material Examined. Type material plus 193 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Widespread in the eastern part of the South Island; only recorded from Wellington, Otaki, Palmerston North, Taihape, and Waipawa in the North Island.

HB, RI, WI, WN / SD, NN, BR, MB, KA, NC, MC, MK, OL, CO, DN, SL

Remarks. *I. convulsella* is characteristically a species of drier forest and shrubland localities in the east of the South Island, and the southern portion of the North Island. Hudson (1928) remarks on an apparent decline in numbers in the first quarter of the 20th century, and it certainly remains a rarely collected species in the North Island, though frequent in the South Island.

The presence of a 'compound cornutus' in the vesica of this species could indicate a relationship with the *attactella*-group, although the structure is of very different form from that in *attactella, blepharidota,* and *voluptuosa. Izatha convulsella* also has an entire juxta base-plate, in contrast to members of the *attactella*-group.

Izatha gekkonella new species

Fig. 76, 77, 200, 201, 257, 292; Map 36

Diagnosis. *I. gekkonella* is very similar externally to *I. convulsella*. The most significant diagnostic character is the absence of the comb-like 'compound cornutus' in the vesica of the male phallus of *gekkonella* (this cornutus is present in *convulsella*). The following comparative external characters can be used to aid recognition of the two species: *I. gekkonella* (forewing length 6.5–8 mm) is, on average, smaller than *convulsella* (forewing length 6.5–10 mm); the forewing of *gekkonella* has a more extensive irroration of yellow-tipped greyish scales, which give it a pale brownish appearance (*convulsella* has a few such scales, but is predominantly grey and white); the hindwing of *gekkonella* is darker than that of *convulsella*.

Male (Fig. 76). Forewing length 6.5–7.5 mm; wingspan 13.5–15.5 mm. Head smooth, without protuberance: frons white, without distinct dark lateral patches, vertex whitish with strong speckling of brown scales; labial palpi white, much speckled with brown, especially on segment 2; a more or less defined brown ring at or just beyond 1/2 length of segment 3, not extended into tuft; proboscis white; antennae speckled brown and white, slightly serrate distally; ciliations ca 3/4 width of flagellum. Collar, thorax, and tegulae white to cream, variably speckled with yellow, pale brown, and dark brown. Forewing white, with admixture of pale brown or grey-brown to dark brown scales, many of the brown scales tipped with yellow (yellow-tipped scales more extensive than in *convulsella*); blackish markings and whiter areas as described for *convulsella*, but whitish area beyond basal blotch tending to be less contrasting than in that species due to greater mottling of yellow-tipped scales. Scale-tufts small and inconspicuous. Cilia mottled greyish brown and white. Hindwing dark greyish; cilia slightly paler, with rather distinct cilialine basally. Underside: forewing brown with pale scaling along costa and cilia pale grey-brown; hindwing white with brown speckling towards costa and apex, cilia white. Abdomen: venter, T1, and broad scales on hind and lateral margins of other tergites silvery white, with admixture of pale brown scales; T2–7 with large central fields of narrow, well-spaced yellowish white scales in staggered rows; anal tuft mixed brown and white.

Female (Fig. 77). Forewing length 6.5–8 mm; wingspan 13.5–17 mm. Similar to male; forewing slightly broader, and antennae not serrate or conspicuously ciliate; abdomen with T2–4 with yellowish central narrow scales; T5–6 centrally with less modified silvery scales.

Male abdomen and genitalia. Abdomen: S2 apodemes short to moderate; S8 equal to S7, caudally square, anterior corners not produced. Genital capsule (Fig. 200): as described for *convulsella*; no constant differences observed. Phallus (Fig. 201, 257): as described for *convulsella*, except vesica without 'compound cornutus'.

Female abdomen and genitalia (Fig. 292). As described for *convulsella*, except anterior portion of ductus bursae (next to corpus bursae) smooth, lacking fine scobinations, and signum smaller.

Larva. Not described.

Biology. The larva feeds on lichens on rock-faces, making a silken web amongst the lichens (reared specimens in OMNZ; B. Patrick, pers. comm.). Preferred host lichens have not been identified.

Type data. **Holotype:** Male, 'New Zealand CO nr Sutton 400 m 3 Nov 1984 B.H. Patrick'; 'NZAC slide Oec. 375 genitalia ♂' (NZAC). **Paratypes:** 6 males, 10 females. **CO:** 1 male, 2 females, same data as Holotype (OMNZ); 1 female, same locality and collector, but 30 Oct 1988 (genitalia on slide) (OMNZ); 1 female, Taieri Ridge, 620 m, 4 Nov 1984, BHP (NZAC); 1 male, 2 females, Sutton Salt Lake, 250 m, 11 Nov 1989, BHP (OMNZ); 1 male, Kakanui Mts, Maerewhenua S.P., 12 Dec 1989, BHP (genitalia on slide) (OMNZ); 1 female, Nenthorn, 500 m, 14 Nov 1988, BHP (genitalia on slide) (BHP) (OMNZ). **CO/DN:** 1 male, Emerald Stream, 560 m, 18 Dec 1993, BHP; 1 male, Redbank, 500 m, 19 Dec 1993, BHP (genitalia on slide) (both OMNZ). **DN:** 1 male, Taieri Gorge, The Notches, 200 m, 26 Oct 1993, BHP (genitalia on slide) (OMNZ); 1 female, Taieri Gorge, Reefs Hotel, 250 m, 26 Oct 1993, BHP (OMNZ); 1 female, Shag Pt Reserve, 70 m, 24 Oct 1991, BHP (OMNZ); 1 female, Horse Ra., 220 m, bred rockface, 1 Oct 1991, BHP (OMNZ).

Flight period. October, November, December.

Material Examined. Type material only.

Distribution. Only known from the region of the Taieri and Shag River catchments in eastern Otago.

— / CO, DN

Etymology. The name *gekkonella* means 'little gecko' and refers to the moth's mottled and scaly appearance under the microscope, as well as its gecko-like fondness for rock-faces. Geckos are common and diverse in the region of the South Island favoured by *I. gekkonella* (Jewell 2008).

Remarks. *Izatha gekkonella* is the most recently discovered *Izatha* species: it was first found by Brian Patrick near Sutton in Central Otago on 3 November 1984. It is now known to be very locally widespread in the district. The habitat is lichen-covered rock-faces, where adults may sometimes be found resting in numbers, walking away rather than flying when disturbed (B. Patrick, pers. comm.).

Izatha gibbsi new species
Fig. 80, 202, 203, 220, 293; Map 37

Diagnosis. The small size, greyish coloration, and absence of distinct markings are characteristic of this species. *I. rigescens* is similar but pale brownish, and has much paler hindwings. The female of the adventive Australian gelechiid *Anarsia dryinopa* Lower could be confused with *I. gibbsi*; however, *dryinopa* has the second segment of the labial palpi strongly tufted beneath (no tuft in *gibbsi*), the forewing has distinct blackish markings (darkest markings in *gibbsi* are brown), and the base of the hindwing is very pale (dark in *gibbsi*). The male of *dryinopa* has extensive black androconial scales on the abdomen and hindwing, and no visible third segment on the labial palp, precluding confusion with *gibbsi*.

Male. (From single specimen). Forewing length 6–6.5 mm; wingspan 12.5–13.5 mm. Head smooth, without protuberance: vertex grey-brown with the scales tipped white; frons white below, greyish above (in transverse band at mid-level of eyes); labial palpi whitish, segment 2 exteriorly grey-brown at base, and with a grey-brown ring subapically; segment 3 with grey brown ring just beyond 1/2, extended dorsally into scale-tuft, and with grey-brown tip; proboscis white, mottled grey-brown; antennae grey-brown, mottled white; ciliations ca 2/3 width of flagellum, present dorsally and ventrally. Collar grey-brown, the scales narrowly tipped white. Thorax grey-brown, mottled white. Forewing scales grey-brown to dark brown, some pale tawny-brown, more or less extensively tipped white, so that most of wing has whitish grey appearance; darker scales predominate in apical 1/4 of wing, and form indistinct cloud on costa at 2/3; even less distinct dark clouding on costa subbasally and just before 1/2; a vague indication of dark streaking along veins in apical 1/2 of wing, and of spots around apex and along termen. Scale-tufts moderately small and inconspicuous. Cilia dark grey-brown, speckled white. Hindwing dark brown; cilia dark brown with faint cilia-line. Underside: forewing dark brown, paler dorsally and basally; hindwing grey-brown. Abdomen dorsally dark greyish; T2–3 with predominance of paler yellow-grey narrow scales in staggered lines; progressively fewer such scales on T4–6; ventrally pale grey, the segments bordered whitish posteriorly; anal tuft dark grey.

Female (Fig. 80). Forewing length 6.5–9.5 mm; wingspan 13.5–20 mm. Similar to male, but antennal ciliations appressed.

Male abdomen and genitalia. Abdomen: S2 apodemes moderate; S8 about equal to S7, caudally square, anterior corners not produced. Genitalia (Fig. 202, 220): tegumen squarish, with small excavation basally; uncus dome-shaped, weakly sclerotised dorsolaterally, terminating in 2 small papillae, each bearing a seta. Valva at ca 45º to genital capsule; apex rounded, densely setose with long and short setae; apex level with sacculus apex; sacculus without enlarged setae, ending in spatulate free sclerite; costa nearly straight, weakly sclerotised; pulvinus hardly differentiated as a lobe, a few scattered sessile setae in this position; juxto-costal plate extending just beyond 1/3 length of costa, a narrow band; basal arms short, (closely associated with lateral lobes of juxta), not scobinate; a single long digitate flange, sharply tapered just before apex, without scobinations. Juxta (Fig. 220) base-plate entire, large, squarish; lobes well separated at their bases, thumb-like, converging distally, without spines or scobinations. Saccus bluntly rounded. Phallus (Fig. 203) moderately small and narrow, poorly sclerotised; ventral lobe developed as a blunt, flat, elongate process without spines; other lobes not clearly differentiated and membranous. Vesica without translucent spinules; without fixed, deciduous or compound cornuti. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (moderate).

Female abdomen and genitalia (Fig. 293). Segments 8–10 moderately extensible. S8 trapezoidal, with moderate anterior excavation, sparesly setose distally; fine scobinations along distal margin, in Y-shaped central patch and near anterolateral corners; scoop-like lateral flanges not developed. Ostium broad, subtended by boomerang-shaped lamella antevaginalis; antrum funnel-shaped (i.e., sharply tapering in middle), membranous; ductus seminalis arising ventrally in centre and not recurved basally; ductus bursae long, narrow, without scobinations; corpus bursae ovoid, densely spinulose in 2 patches at mid-length; signum small, round with 2 spinose lateral patches (ND) or larger, diamond-shaped, with spinose V-shaped strip (holotype, TK).

Larva and Biology. Unknown.

Flight period. February, March.

Type data. **Holotype:** Female, 'NEW ZEALAND TK Waitaanga Plat. NG Tucker Res 16 Feb 1996 J.S. Dugdale / NZAC slide Oec. 249 genitalia ♀' (NZAC). **Paratypes:** 1 male, 4 females. **ND:** 1 female, Kaitaia Walkway, m.v. light, 20 Jan 1999, RJBH, GH, R. Leschen (genitalia slide Oec. 248); 1 male, 2 females, Omahuta S.F., Kauri Sanctuary, to light, 9 Mar 1977, JSD (genitalia slides Oec. 247 ♂, 391 ♀) (all NZAC). **AK:** 1 female, Waitakere Ra., Cutty Grass Tk, 360 m, m.v. light, 28 Feb 2006, RJBH, N. Hudson (NZAC).

Material Examined. Type material plus 4 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Western North Island.

ND, AK, TK / —

Etymology. This species is named after George W. Gibbs, in honour of his major contribution to New Zealand entomology over many years, and especially his work on the biogeography and systematics of primitive microlepidoptera.

Remarks. *I. gibbsi* is a small, obscure species that was not collected until 1975, when a single specimen was taken in Te Paki Coastal Park, ND by J. C. Watt, A. K. Walker and S. Nichols. John Dugdale subsequently collected 3 further specimens in Omahuta Forest ND in 1977, and single specimens were taken in Herekino Forest near Kaitaia ND in 1999 and in the Waitakere Ranges AK in 2006 and 2008. Two specimens were found at Whakaangi ND in January 2010. The only other example known is the holotype female from the Waitaanga Plateau TK, collected by John Dugdale in 1996; this specimen is distinctly larger than those from Northland. Clearly this is another elusive species, which has probably been overlooked; it may be commonest in Northland, but in view of the Auckland and Taranaki records, it is likely to occur widely throughout the western North Island. The flight period is rather late in the season, as in *I. minimira* and *I. rigescens*. Only 2 males have so far been found.

The apparent difference in signum shape between Taranaki and Northland specimens is not here considered to be of taxonomic significance, though further investigation is desirable. The Taranaki specimen has been chosen as holotype because of its better condition and preparation than the other specimens.

Izatha minimira new species

Fig. 78, 79, 204, 205, 294; Map 38

Diagnosis. This species resembles a small *I. metadelta*, but lacks the patches of golden-orange spine-like scales on T1–2, and has a less strongly produced vertex. The lack of a sharply pointed vertex, the small size, and the lack of white terminal bands on the abdominal segments distinguish it from *I. mira*, and the ranges of the two do not overlap.

Male (Fig. 78). Forewing length 6 mm; wingspan 12.5 mm. Head: vertex moderately melanised, extending weakly forward between antennae into slight conical protuberance, scales grey, tipped with white; frons weakly shining, grey, white below; labial palpi grey mixed with white and pale brown, paler interiorly on segment 2; segment 2 ringed grey subapically; segment 3 mainly grey with indistinct whitish bands basally, medially and subapically, a dorsal scale-tuft at 2/3 greyish; proboscis mottled white and dark brown; antennal scape grey, mixed whitish; rest of antenna pale brown, ringed with dark brown scales, the rings more closely spaced basally, a few scattered whitish scales; ciliations white, moderately appressed to suberect, ca 1/2 width of flagellum. Collar brownish grey, edged white behind. Thorax with anterior band of bronzy brown scales between tegulae, rest of thorax and tegulae greyish with many scales white-tipped; posterior part of mesonotum pale silvery grey, the scales white-tipped. Forewing dark grey, with paler suffusion resulting from the white tips of many scales; blackish scales without white tips form the following indistinct markings: a subbasal M-shaped fascia, a straight transverse fascia just before 1/2, not quite reaching dorsum, a half-ellipse on costa from 2/3–3/4, an inverted V in disc below this; white-tipped scales form a faint angulated fascia at 4/5; greyish scales beyond this mostly without white tips; scattered bronzy brown scales, some white-tipped, are associated with the blackish markings. Scale-tufts rather large and conspicuous in fresh specimens. Cilia dark grey, faintly shining, demarcated from termen by indistinct row of white-tipped scales. Hindwing dark brown; cilia dark brown with darker basal cilia-line. Underside: forewing dark brown, whitish grey below fold; hindwing dark greyish brown. Abdomen dark brown, the segments faintly paler apically; T1 without modified scales; T2 anteriorly with very narrow well-spaced pale yellowish scales arranged in staggered transverse rows; remaining tergites with the brown scales elongate-oval, bluntly pointed; abdomen ventrally whitish; anal tuft blackish.

Female (Fig. 79). Forewing length 6–8 mm; wingspan 13–17.5 mm. Antennae without conspicuous ciliations. Forewing scales much paler grey than in male, giving the moth a far lighter appearance; blackish markings similar to those of male, but showing up more conspicuously against lighter ground colour; bronzy brown scales more numerous than in male, especially in apical 1/4, and more scattered over wing. Hindwing paler than in male, greyish with bronzy sheen. Underside of both wings paler, more greyish than in male. Abdomen dark greyish, the pale narrow scales of T2 more extensive and conspicuous than in male.

Male abdomen and genitalia. Abdomen: S2 apodemes short; S8 about equal to S7, caudally square, anterior corners somewhat produced laterally. Genitalia (Fig. 204): tegumen arch-shaped, with large excavation basally; uncus dome-shaped, weakly sclerotised dorsolaterally, terminating in 2 setae, each borne on an indistinct papilla. Valva at ca 45º to genital capsule; apex rounded, densely setose with long and short setae; apex about level with sacculus apex; sacculus without enlarged setae, ending in spatulate free sclerite; costa weakly concave, weakly sclerotised; pulvinus not developed as a separate lobe, a few scattered

sessile setae in this position; juxto-costal plate extending ca 1/2 way along costa, a crescentic band; basal arms short, (closely associated with lateral lobes of juxta), not scobinate; a single long recurved digitate flange, tapering to, and slightly pinched just before apex, without scobinations. Juxta baseplate entire, W-shaped; lobes well separated at their bases but converging distally, short-digitate, slightly expanded apically, without spines or scobinations. Saccus arrowhead-shaped. Phallus (Fig. 205) short and moderately stout; ventral lobe slightly the longest; ventral lobe with subapical field of small backward-pointing teeth; central lobe (left of ventral lobe) with similar field of teeth; dorsal lobe nearly as long as ventral, with smaller field of larger teeth well below apex. Vesica without translucent spinules; without fixed, deciduous or compound cornuti. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 294). Segments 8–10 only slightly extensible. S8 arch-shaped, with strongly curved well sclerotised lip-like margin to anterior excavation, sparsely setose caudally; fine scobinations in central narrow longitudinal strip and along anterior 2/3 of S8 'arms'; scoop-like lateral flanges weakly developed. Ostium broad, subtended by weakly boomerang-shaped lamella antevaginalis; antrum posteriorly membranous, anteriorly with round area of scobinations forming fingerprint-like mark (just extending beyond ductus seminalis inception into posterior part of ductus bursae); ductus seminalis arising ventrally and recurved basally; antrum tapers into moderately broad ductus bursae without scobinations; corpus bursae ovoid, finely spinulose in 2 patches at mid-length; signum moderately large, elongate diamond-shaped with tranverse spinose strip.

Larva and Biology. Unknown.

Flight period. January, February, March, April (latest capture 1 April).

Type data. **Holotype:** Male, 'NEW ZEALAND AK 36.53.2S 174.31.3E Waitakere Range Cascades Kauri Pk to m.v. light 10 Feb 2004 R.J.B. Hoare / Photographed 2007–2008 by B.E. Rhode for Fauna NZ / NZAC slide Oec. 382 genitalia ♂' (NZAC). Paratypes: 1 male, 11 females. **ND:** 1 female, Herekino F., N. end of Kaitaia Walkway, m.v. light, 20 Jan 1999, RJBH, GH, R. Leschen (genitalia slide Oec. 383); 1 female, same locality, but 6 Feb 2006, RJBH, T. Buckley (both NZAC). **AK:** 1 female, Auckland, Laingholm, 11 Mar 1980, R.H. Kleinpaste (genitalia slide Oec. 262) (NZAC); 4 females, Titirangi, Minnehaha Ave, m.v. light, 21 Feb 2000, 30 Jan 2001 (genitalia slide Oec. 264), 6 Mar 2001, 30 Jan 2003, RJBH (all NZAC). **BP:** 1 male, 3 females, Moutohora Is., 16 Jan (male), 18 Jan 1995, BHP, HP, HP (OMNZ).

Material Examined. Type material plus 5 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only known from the northern North Island; Northland to the Bay of Plenty.

ND, AK, CL, BP / —

Etymology. The name refers to the superficial appearance of the moth, which resembles a miniature version of *I. mira*.

Remarks. This inconspicuous species was not discovered until 1980, when Ruud Kleinpaste took a specimen at Laingholm, west Auckland AK. It has since been collected in small numbers at mercury vapour light in Titirangi and the Waitakere Ranges (west Auckland), in the Hunua Ranges, south of Auckland, and in Herekino Forest in Northland. Five specimens were taken on Moutohora Island near Whakatane BP by Brian, Hamish, and Holly Patrick in 1995, and one at Stony Bay CL by Neville Hudson in 2009. The male genitalia, in particular the form and position of the flange on the juxto-costal plate, indicate a close relationship with *I. gibbsi*. In both species the flight season is late, and females appear much more readily attracted to light than males; only 2 males of *minimira* are known.

Izatha rigescens Meyrick, 1929

Fig. 81, 206, 207; Map 39

Izatha rigescens Meyrick, 1929: 490.

Diagnosis. For differences from *I. gibbsi*, see under that species. *I. rigescens* could possibly be confused with *Thamnosara sublitella* (Walker) (Oecophoridae), which is of similar size and coloration, but *sublitella* has the 2nd segment of the labial palp strongly tufted beneath (no tuft in *rigescens*). *T. sublitella* lacks the dark interneural streaking of the distal 1/3 of the wing present in *I. rigescens*.

Male (Fig. 81). Forewing length 8.5–9 mm; wingspan 17–18 mm. Head: vertex (not strongly melanised), weakly produced forwards between antennal bases into small conical protuberance, cream to ochreous brown with some of the scales darker-tipped; frons ochreous to honey-brown above, whitish below; labial palpi segment 2 cream with scattered honey-brown scales, ringed honey-brown to dark brown basally and subapically; segment 3 ringed honey-brown to dark brown at mid-length, the brown scales extending dorsally into small but distinct tuft; proboscis cream; antenna with scape basally cream, distally brown, rest of antenna dorsally dark brown ringed with cream, ventrally tawny brown (mostly unscaled beneath); ciliations white, dorsally appressed, ventrally suberect, ca 1/3 width of flagellum. Collar anteriorly honey-brown, posteriorly pale ochreous. Thorax and tegulae pale ochre-

ous with scattered darker brown scales. Forewing rather narrow, termen oblique, cream with scattering of many honey-brown to dark brown scales, the darker scales forming the following indistinct pattern elements: very poorly defined basal blotch, outwardly angled at fold, arrowhead mark on fold just beyond this, short bars from costa just before 1/2 and at 2/3, c-shaped mark in disc just below this at 2/3 (opening of the 'c' towards tornus), weak streaking between veins in distal 1/3 of wing, the streaks more or less interrupted by a narrow indistinct outward-curved cream fascia at 4/5. Scale-tufts apparently very small and inconspicuous (examined specimens all worn). Cilia cream to ochreous brown, mottled dark brown. Hindwing with basal 1/2 of costa white, rest of wing pale brown, slightly lustrous; cilia brownish white, with distinct darker basal cilia-line. Underside: forewing pale brown with costa and dorsum broadly whitish and narrow whitish line along termen at base of cilia; hindwing white with scattered pale brown scales towards costa and apex. Abdomen: T1 silvery grey with a few white scales posteriorly and laterally; rest of abdomen pale greyish brown with a few whitish scales at hind margin of segments; T2 with extensive patch of very narrow pale golden brown scales in basal 2/3; similar scales present on T3 and T4, mainly at base, inconspicuous and more or less scattered amongst normal darker scales; abdomen ventrally white; anal tuft whitish.

Female. Unknown.

Male abdomen and genitalia. Abdomen: S2 apodemes short; S8 shorter than S7, caudally straight, anterior corners not produced. Genitalia (Fig. 206): tegumen arch-shaped, with moderate excavation basally; uncus dome-shaped, moderately sclerotised laterally, terminating in 2 small lobes, each bearing a seta. (A pair of ventrally-directed lobes arising from base of uncus and incurved, with blunt membranous apices, possibly representing remnants of gnathos lateral arms.) Valva at ca 45º to genital capsule; apex rounded, densely setose with short to moderate setae; apex slightly exceeding sacculus; sacculus with 1 enlarged seta; sacculus ending in spatulate, strongly scobinate sclerite near valval apex (scobinations largest at margins); costa slightly concave, continuously sclerotised; pulvinus moderately differentiated, a large hummock with sessile setae; juxto-costal plate reaching ca 1/3 way along costa, narrow, bandlike; basal arms short, (closely associated with lateral lobes of juxta), not scobinate; a single long triangular flange, not scobinate. Juxta base-plate entire,V-shaped; lobes slightly separated at their bases and converging distally, short, thumb-like, without spines or scobinations. Saccus rounded. Phallus (Fig. 207) rather short, club-like; ventral lobe longest; ventral lobe with small subapical ridge of minute backward-pointing teeth on right side; right dorsal lobe with subapical field of minute backward-pointing teeth in several rows; left dorsal lobe about equal in length, with smaller apical field of weaker teeth. Vesica without translucent spinules; without fixed, deciduous, or compound cornuti. Bulbus ejaculatorius without distinct tubular portion; hood sigmoid. Caecum penis present (rather long).

Larva and Biology. Unknown.

Flight period. March.

Type data. **Holotype:** Male, 'Holotype / Wellington New Zealand GVH. .3.29 / Izatha rigescens Meyr. 1/1 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290 / rigescens Meyr. / B.M. ♂ Genitalia slide No. 30757' (BMNH) (examined).

Material Examined. Holotype plus 4 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. Only known from the Wellington coast.

WN / —

Remarks. *Izatha rigescens* resembles *I. gibbsi* and *I. minimira* in its male genitalia, but differs from those 2 species in the strongly scobinate apex of the sacculus and the broad-based flange of the juxto-costal plate. G. V. Hudson beat the 5 known specimens from coastal scrub at Howard Point, Wellington in March 1929. The species has not been seen since. It has probably been overlooked because of its small size, coastal habitat, and late season of occurrence; further field-work in an attempt to rediscover it is a priority. Once the ecology of this group of small species is better understood, a search for larvae may be productive.

Izatha phaeoptila (Meyrick, 1905)

Fig. 82, 83, 109, 208, 209, 221, 258, 295; Map 40

Trachypepla phaeoptila Meyrick, 1905: 236–237.

Diagnosis. *Izatha phaeoptila* has the most variegated wing pattern of all the small *Izatha* species. The presence of all-white forewing scales distinguishes it from *minimira*, and the well-developed blackish blotch on the costa at 2/3 from all other species of the *convulsella*-group. When the moth is in fresh condition, viewed under the microcope, the golden iridescent undersides of the curled scales and the bluish iridescence of the scales in the disc at 2/3 are striking and characteristic.

Male (Fig. 82). Forewing length 6–7 mm; wingspan 13–15 mm. Head smooth, without protuberance; vertex dark brown, with admixture of white and pale brown scales, spreading scales arising behind eye mainly white; frons

white mixed with pale brown and dark brown; labial palpi white; segment 2 blackish exteriorly at base, and with narrow blackish ring subapically; segment 3 white, with black ring just beyond 1/2 not produced into distinct scale-tuft, and apex black; proboscis dark brown, mottled white; antennal scape mixed white and dark brown, rest of antenna blackish with dense white dorsal and ventral ciliations ca 1/2 width of flagellum. Collar dark brown with variable admixture of white and pale brown. Thorax and tegulae mixed white, dark brown, and pale brown, mesothorax darker posteriorly with blackish scales at posterior margin. Forewing mixed white, pale tawny brown, and blackish brown, the bases of the brown scales pale iridescent bluish grey (this iridescence most visible in patches of scales on the dorsum at the base and in the disc at 2/3); markings rather ill-defined: tawny brown scales mostly concentrated in a vague spot on fold at 1/4 and a larger spot near tornus at 3/4, the latter indistinctly bisected by a narrow blackish line; white scales concentrated near costa in basal 1/3 of wing and in transverse oblique fascia at 4/5 from costa to tornus; blackish brown scales form dark spot below fold in basal 1/5, small spot on costa at 1/6, short oblique streak from costa just before 1/2, and squarish blotch on costa at 2/3; blackish scales also predominate at apex of wing beyond white fascia, along dorsum and around tornus. Scale-tufts large and conspicuous in fresh specimens (undersides of curled scales iridescent golden). Cilia shining leaden brown with indistinct blackish cilia line. Hindwing dark brown; cilia leaden-brown, with basal dark brown cilia-line. Underside: forewing dark brown with faint pale spots on costa at 1/2 and 3/4; hindwing dark brown. Abdomen dorsally shining pale lead grey, without strongly modified scales, but some scales narrower on centre of T3–T7; abdomen ventrally dark brown with the hind margins of the segments white; anal tuft shining grey, the scales basally whitish.

Female (Fig. 83). Forewing length 6.5–8.5 mm; wingspan 14–18.5 mm. Similar to male, but antenna without conspicuous ciliations; forewing appearing much paler due to more extensive white scaling at 1/3 and 3/4; abdomen dorsally with the hind margins of the segments whitish. Wing venation shown in Fig. 109.

Male abdomen and genitalia. Abdomen: S2 apodemes long; S8 slightly longer than S7, caudally straight to very slightly convex, anterior corners not produced. Genitalia (Fig. 208): tegumen elongate arch-shaped, with large excavation basally; uncus narrow-triangular, truncate, terminating in 2 tufts of sessile setae, borne on indistinct lobes. Valva at ca 45º to genital capsule; apex rounded, densely setose with long and short setae except in subapical costal patch; apex exceeding sacculus; sacculus with 1 enlarged seta; sacculus ending in narrow, curved, serrate free digitate process perpendicular to valva surface; costa slightly convex in basal 1/2, concave towards apex, moderately sclerotised; pulvinus a moderately distinct lobe with sessile setae; juxto-costal plate extending just less than 1/2 way along costa, band-like; basal arms short, very broad, finely scobinate on mesal surfaces; a single short narrow curved digitate flange, usually with 2–3 apical points, not scobinate. Juxta (Fig. 221) base-plate entire, V-shaped; lateral lobes closely approximated at their bases, broad-digitate, not tapering, apically strongly scobinate on dorsal/mesal surface. Saccus trowel-shaped. Phallus (Fig. 209, 258) long and narrow; lobes about equal in length; ventral lobe a short sclerotised ridge with minute backward-pointing teeth in a few rows; dorsal lobe with similar but more extensive rows of teeth; central lobe membranous / poorly differentiated. Vesica without translucent spinules; a basally strongly curved fishhook-like fixed cornutus; without deciduous or compound cornuti. Bulbus ejaculatorius with short tubular portion; hood elongate, sigmoid. Caecum penis present (short).

Female abdomen and genitalia (Fig. 295). Segments 8–10 only moderately extensible. S8 trapezoidal, with small anterior excavation, sparsely setose distally; fine scobinations present in broad median band (absent laterally); scoop-like lateral flanges slightly developed. Ostium moderately broad, subtended by boomerang-shaped lamella antevaginalis; antrum funnel-shaped, with sharp constriction; an area of sclerotisation with fine scobinations just before the constriction; ductus seminalis arising ventrally in centre and not recurved basally; ductus bursae narrow with fine rather dense scobinations throughout; corpus bursae ovoid, without spinules; signum absent.

Larva. Described by Hudson (1928: 282) as follows (with the terminology updated): Length ca 12.5 mm, cylindrical, slightly tapering posteriorly; head and prothoracic plate dark brown; rest of body pinkish brown, paler beneath; abdominal segment 10 black, becoming yellowish brown posteriorly; pinacula of A1 large, black; setae brown.

Biology. Hudson (1928: 282) states that the larva feeds on "lichens (?) growing on tree trunks". The question-mark probably indicates that Hudson was unsure whether the pabulum was a lichen or another epiphytic growth. Interestingly, Hudson's collection register in MONZ only mentions a single reared specimen (no. 515b), and states that it was 'bred from moss'. This specimen is now in NZAC. The species has not been reared recently and the details of its life history require confirmation.

Flight period. January to early March.

Type data. **Holotype:** Male, 'Holotype / Mangaterera R.

New Zealand GVH /04 / Izatha phaeoptila Meyr. 2/5 E. Meyrick det. in Meyrick coll. / Meyrick Coll., B.M. 1938–290' (BMNH) (examined).

Material Examined. Type material plus 73 non-type specimens (see Appendix 2 for localities of specimens).

Distribution. North Island only.

ND, AK, BP, RI, WN / —

Remarks. *Izatha phaeoptila* is common in the forests of west Auckland (Waitakere Ranges including Titirangi), but has not been encountered elsewhere in numbers. Interestingly, it has not been collected around the volcanoes of the central North Island (Tongariro National Park and Mt Taranaki), but occurs north and south of these. According to Hudson (1928: 282), the moth often enters houses, but this habit has not been observed in recent years. The genitalia show no close resemblance to any other species, and *phaeoptila* appears to be phylogenetically rather isolated from its congeners. Hudson (*loc. cit.*) described the species as "very inconspicuous-looking"; he overlooked the spectacular golden undersides of its curled scales, and the pale bluish iridescence of the discal area, features which no doubt enhance the disruptive effect of its coloration.

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APPENDIX 1. On the identity of *Izatha griseata* Hudson, 1939

The identity of *Izatha griseata* has been an enigma since its description by Hudson (1939: 448). Dugdale (1988) could not locate the unique holotype in the Auckland Museum, where Hudson states it was deposited, and the species has remained unrecognised, in spite of Hudson's colour illustration (Hudson 1939, pl. lxii, fig. 2). According to the original description, the specimen, a female, was captured by C. E. Clarke at Mataitai School, South Auckland, in April (no year is given). Because of the apparently unique nature of the lost specimen, *I. griseata* was placed on the New Zealand list of potentially threatened Lepidoptera by Patrick & Dugdale (2000).

During a visit to the Auckland Museum, the author requested a search of the specimen database for any Lepidoptera material from 'Mataitai'. Only one such specimen was recorded; this was listed as an example of *Acroclita discariana* Philpott (Tortricidae). Since *A. discariana* is a very local species associated with matagouri (*Discaria toumatou*) and confined to the eastern side of the South Island (Patrick & Dugdale 2000), it was apparent that this identification could not be correct for a specimen from the Auckland district. An investigation of the collection confirmed this; the specimen in question was a female of the adventive Australian gelechiid *Anarsia dryinopa* Lower (= *trichodeta* Meyrick).

The label data on the specimen read "Mataitai School 15.4.31" [handwritten white label], "C.E. Clarke Collection" [printed white label]. To these have been added the following: "HOLOTYPE ♀ Izatha griseata Hudson det. R.J.B. Hoare 2005" [pink label], "Anarsia dryinopa Lower det. R.J.B. Hoare 2005" [white black-bordered label].

The specimen is identified as the holotype of *Izatha griseata* for the following reasons. (1) It is the only specimen in AMNZ with the appropriate label data, and Mataitai School is a collecting locality not seen on any other label in any collection by the author. (2) The specimen matches Hudson's description and illustration of *griseata* closely in size and colour, except that the illustration does not show the distinct black streaking on the forewing that is present in the specimen; however, Hudson does refer to 'speckling' on the forewing in the description. (3) The month of collection of the specimen (April) matches Hudson's data; and relatively few Lepidoptera are collected this late in the season. (4) The year of collection (1931) is consistent with Hudson not mentioning the species in his earlier volume on New Zealand Lepidoptera (Hudson 1928).

In assigning the specimen to *Izatha*, Hudson was undoubtedly deceived by the slightly raised ring of dark scales on the 3rd segment of the labial palp in the female of *A. dryinopa*; a scale-tuft in this position is present in most species of *Izatha* (Hudson 1928; this work). Moreover, *Anarsia* does not have the distinctive 'pointing finger' hindwing shape of most Gelechiidae. Hudson followed Meyrick in dismissing the use of genital characters for taxonomic purposes (Hudson 1939: Introduction), and his superficial examination of the *dryinopa* specimen was inadequate to allow him to classify it correctly. Since there are no other known records of *dryinopa* in New Zealand prior to 1964 (Dugdale 1988), it is not surprising that Hudson described the species as new. Hudson also appears to have followed Meyrick in considering that descriptions were more important than type specimens; as a consequence Meyrick rarely labelled types (see Clarke 1955), and Hudson's failure to do so with the *griseata* type must have contributed to its being misplaced.

The updated synonymy for *A. dryinopa* is:

***Anarsia dryinopa* Lower, 1897: 57**
= *trichodeta* Meyrick, 1904: 415-416 (*Anarsia*)
= *griseata* Hudson, 1939: 448 (*Izatha*) **new synonymy**

Synonymy of *trichodeta* with *dryinopa* follows Edwards (1996: 109); however, Meyrick regarded them as separate species, and there remains some doubt over the synonymy (K. Sattler, pers. comm.). Specimens from New Zealand conform to Meyrick's description of *A. trichodeta*, but not to his concept of *dryinopa*. The type material of *dryinopa* in the South Australian Museum will need to be examined to resolve this issue.

Anarsia dryinopa is well established in the warmer regions of New Zealand in both the North (ND; AK) and the South Islands (NN), although infrequently collected. The larvae are reported by Common (1990) to feed on the phyllodes and in galls on *Acacia* spp. (Mimosaceae), and in New Zealand they have been reared from the foliage of *Acacia longifolia*, *A. melanoxylon*, and *Albizzia julibrissin* (Mimosaceae; Dugdale 1988 and specimens in NZAC).

APPENDIX 2. Localities of specimens examined

The following list does not give label data from all specimens examined. Where a specimen has an imprecise locality (e.g., 'Auckland'), this is usually not listed separately when other specimens are known from the same area with more precise data. Obvious spelling errors on labels are corrected without comment; abbreviations are interpreted in square brackets. Repositories from which data has been extracted are listed in parentheses. Localities derived from the Hudson collection in MONZ are annotated 'GVH, MONZ'. Two classic localities lie on the border between areas defined by Crosby *et al.* (1998): Ohakune (TO/RI) and Arthur's Pass (WD/NC). In the absence of further information, records for Ohakune are arbitrarily assigned to TO and those for Arthur's Pass to NC. A few additional records without supporting specimens have been extracted from the author's notes (RJBH, notes) and Hudson's register (GVH, register), for species where sight identification is deemed reliable.

Izatha attactella Walker, 1864

North Island. **ND**. Omahuta S.F. (MONZ). **AK**. Wenderholm Reg. Park (NZAC). Albany, Wright Rd (NZAC). Wattle Track, Tiritiri Matangi Island (NHNZ). Laingholm (NZAC). Titirangi (NZAC). Mt William (NZAC). Hunua Gorge, Hunua Rd (NHNZ). **CL**. Cuvier Is. (NZAC). **WO**. Mangatoa S., SW King Country (MONZ). **BP**. FRI, Rotorua (FRNZ). Whakarewarewa S.F. (FRNZ). Rotorua (FRNZ). Thompsons Track, Kaimai Range (NHNZ). Waiaroho (NZAC). **TK**. Manaia, Taranaki (MONZ). Ihuia Track, Egmont (MONZ). Stratford cedar belt (MONZ). S. Egmont (MONZ). Opunake (MONZ). Whitecliffs Walkway, S of Tongaporutu (NZAC). Waitaanga Plateau (NZAC). Dawson Falls (NZAC). **TO**. S.W. Ruapehu (MONZ). Waipakihi (NZAC). Blyth Tk, Ohakune Mtn Rd (NZAC). Whakapapanui Vly, Mt Ruapehu, Tongariro NP (NHNZ). **HB**. Little Bush, Puketitiri (MONZ, NZAC). Napier (CMNZ). White Pine Bush (NZAC). **RI**. Ohakune (AMNZ, MONZ, CMNZ). **WN**. Wellington (CMNZ, NZAC). Karori (MONZ, NZAC). Nr Karori reservoir (AMNZ). Wiltons Bush (AMNZ, GVH, MONZ). Rona Bay (GVH, MONZ). Owhiro Bay (GVH, MONZ). Khandallah (AMNZ). Lowry Bay (NZAC). Eastbourne (NZAC). Barney's Whare, Palliser Bay (NZAC). Ecol. Div. DSIR Field Stn, Orongorongo V. (NZAC). **South Island**. **SD**. D'Urville Is. (NZAC). **NN**. Dun Mt Track (MONZ). Dun Mts, Coads Crk (OMNZ). Mt Arthur, Flora carpark (NZAC). Upper Maitai (NZAC). Oparara (NZAC). Whangamoa Sdle (BLNZ). **BR**. Fletchers Ck, Inangahua West (NZAC). Capleston, Inangahua V. (NZAC). Mataki Lodge (OMNZ). Coal Creek Falls Tk (OMNZ). Lower Buller Gorge (OMNZ). Waitahu R. (OMNZ). **MB**. Rai Valley, Nelson (FRNZ). Hanmer, Boyle R. (OMNZ). **MC**. Deans Bush (CMNZ). Otarama (CMNZ). Craigieburn, Thermistor Hut (NZAC). Cass (OMNZ).

Izatha blepharidota new species

North Island. **AK**. Mt William (NZAC). Titirangi, Minnehaha Ave (NZAC). Waitakere Ra., Kakamatua Inlet (NZAC). Waitakere Ra., Cutty Grass track (NZAC). Waitakere Ra., Huia Dam Rd (NZAC). Huia, Destruction Gully (NZAC). Mt William Scenic Reserve (NZAC). Mt Auckland (NZAC). Onehunga (NZAC). Hunua Gorge, Hunua Rd (NHNZ). Mangatangi Track, Hunua Ranges (NHNZ). **CL**. Cuvier Is., Main Ridge Track (AMNZ). Cuvier Is., Orchard (AMNZ). Great Barrier I., Mt Hobson (AMNZ; in ethanol). **BP**. Mamaku-Kaimai S.F., Woods Mill track (NZAC). L. Rotoiti Scenic Reserve (NZAC). Mamaku Plateau, Galaxy Rd (NZAC). **GB**. L. Waikaremoana (NZAC).

Izatha voluptuosa new species

North Island. **ND**. Mangamuka Walkway (NZAC). **AK**. Waitakere Ra., Cutty Grass Track (NZAC). **BP**. Thompsons Track, Kaimai Range (NHNZ). **TK**. Mt Egmont, South side (MONZ). Dawson Falls (MONZ). Waitaanga Plat. (NZAC). **TO**. Raurimu (AMNZ, NZAC). Rangataua Sc. Res. (NZAC). Waimarino (AMNZ). Ohakune (CMNZ, GVH, MONZ). **RI**. Otaihape Sc. Res. (NZAC).

Izatha austera (Meyrick, 1883a)

North Island. **ND**. Mangamuka Walkway (NZAC). Ricker Track, Waipoua R, Waipoua S.F. (NZAC). Te Matua Ngahere (NZAC). **AK**. Wayby Gorge (AMNZ). Torbay (MONZ). Kauri Gully, Birkenhead (AMNZ). Mt Auckland (NZAC). Noises Is., Motuhoropapa Is. (NZAC). Waitakere Ra., Ridge Road Tk (NZAC). Waitakere Ra., Fletcher Tk (NZAC). Waitakere Ra., Fairy Falls (NZAC). Waitakere Ra., Kauri Knoll (NZAC). Waitakere Ra., Anderson Tk (NZAC). Waitakere Ra., Huia, Karamatura carpark (NZAC). Waitakere Stm (OMNZ). Waitakere Ra., Twin Peaks Track, Karamatura Valley (NHNZ). Waitakere Ra., Cutty Grass Track (Anawhata Rd end) (NHNZ). Kakamatua Inlet (NZAC). Huia (NZAC). Huia, Destruction Gully (NZAC). Laingholm (NZAC). Sunnyvale, Henderson (NZAC). Onehunga (NZAC). Mt William (NZAC). Hunua Ranges, Mangatangi Track (NHNZ). Hunua Gorge, Hunua Rd (NHNZ). **CL**. Cuvier Is., Main Ridge Tk (AMNZ). Cuvier Is., Orchard Ridge (AMNZ). Tapu-Coroglen Saddle (NZAC). Kennedy Bay Road, Coromandel (NZAC). **WO**. Mt Pirongia, Nikau Walk (NZAC). Waipuna Reserve, Waitomo (NZAC). Te Kuiti (NZAC). Te Whakapatiki Stream, Awakino R., Upper Awakino Valley, Mahoenui (NHNZ). **BP**. Mt Ngongotaha (NZAC). Mamaku Plateau, Galaxy Rd (NZAC). Mamaku Plateau, Tarukenga Res. (NZAC). 0.5 km N of Otaramarae (NZAC). Otaramarae (NZAC). Te Koau (NZAC). Papatea (NZAC). Waitawheta V., Kaimai Ra. (NHNZ). Kaimai Saddle (NZAC). **TK**. Opunake (MONZ). Mokau V. (NZAC). Mt Messenger (NZAC). **TO**. Taupo (NZAC). Pureora S.F., Pikiariki (NZAC). **GB**. Paoneone, SW of Te Araroa (NZAC). Kakanui (NZAC). **HB**. Lake Tutira, S. shore (NZAC). **RI**. Taihape (MONZ). Mataroa, Paengaroa Sc. Res. (NZAC). **WN**. Wainuiomata (AMNZ,

GVH, MONZ). Karori (AMNZ, GVH, MONZ, NZAC). Wadestown (GVH, MONZ). Haywards (GVH, MONZ). Orongorongo Track, Wainuiomata (GVH, MONZ). Orongorongo Field Stn (NZAC). Campbells Hill, Karori (GVH, MONZ). **South Island**. **NN**. Rockville, Aorere R. (BLNZ).

Izatha psychra (Meyrick, 1883a)

South Island. **MC**. Porter's Pass (BMNH). **MK**. Pukaki Scientific Res. (NZAC, OMNZ).

Izatha copiosella **(**Walker, 1864)

North Island. **HB**. Hastings (MONZ). Lake Tutira, S. shore (NZAC). Haumoana (NZAC). **WA**. Putangirua Pinnacles Sc.Res. (NZAC). **WN**. Rona Bay (GVH, MONZ). **South Island**. **SD**. Picton (CMNZ, GVH, MONZ). **NN**. Nelson (NZAC). Wakapuaka, Nelson (NZAC). **BR**. Buller Gorge (CMNZ). L. Rotoiti (NZAC). **KA**. Claverley, Conway R. (CMNZ). Half Moon Bay Sc. Res. (NZAC). **NC**. Mt Grey (CMNZ). North Loburn (CMNZ). Glentui R, Mt Thomas (OMNZ). **MC**. Christchurch, Riccarton Bush (= Deans Bush) (CMNZ, LUNZ, OMNZ). Puke Atua (CMNZ). Hoon Hay Valley (NZAC). Port Hills (CMNZ). Banks Pen., Prices Valley (LUNZ). Prices Bush (CMNZ). Governors Bay (CMNZ). Akaroa (CMNZ). Craigieburn F.P. (OMNZ). Craigieburn Ra. (OMNZ). Sharplin Falls, Staverley (OMNZ). **OL**. Mt Earnslaw (MONZ). Kinloch (GVH, MONZ). Queenstown (OMNZ). Bobs Cove Sc. Res. (OMNZ). Queenstown, L.Wakatipu (BLNZ). Five Mile Ck, L.Wakatipu (BLNZ). Two Mile Ck, L.Wakatipu (BLNZ). Bobs Pk, L.Wakatipu (BLNZ). Twelve Mile Ck, L.Wakatipu (BLNZ). Glacier Burn, Humboldt Mountains (NHNZ). **CO**. E bank of Clutha R, 2km W of Heathcote Farm (NZAC). **DN**. Mt Maungatua (AMNZ). St Leonards (AMNZ). Waipori (AMNZ, OMNZ). Cape Saunders (OMNZ). Rongahere Gorge (OMNZ). Horse Ra., South Pk (OMNZ). Leith Vly (OMNZ). **SL**. Beaumont S.F., Riversdale Rd (NZAC). West Plains (NZAC). Tapanui, Black Gully (NZAC). Blue Mtns, Black Gully (OMNZ). **FD**. Sunnyside [Waiau] (NZAC).

Izatha walkerae new species

South Island. **SD**. 4 km S. of Curious Cove, Port Underwood Rd (NZAC). **MB**. Lake Tennyson (NZAC).

Izatha florida Philpott, 1927

South Island. **NN**. Salisbury's, Mt Arthur (NZAC). Mt Arthur Tableland (NZAC). Mt Aorere, Tasman Mts (FRNZ). Mt Domett (NZAC).

Izatha mira Philpott, 1913

South Island. **BR**. Lochnagar Ridge, Paparoa Ra (NZAC). **WD**. Arthur's Pass [Otira River] (NZAC). **OL**. Mt Earnslaw (GVH, MONZ). Humboldt Ra. (NZAC). **FD**. Murchison Mts, Lower East McKenzie Burn (LUNZ). Hump Mt (AMNZ, CMNZ). Hump R (NZAC). Hope Arm, L. Manapouri (AMNZ). Homer (OMNZ). Key Summit (MONZ). **SL**. Takitimus (OMNZ). Longwoods (MONZ, NZAC).

Izatha notodoxa new species

South Island. **SD**. Opouri (NZAC). **NN**. Wairoa G. (NZAC). Nelson City, Atawhai (NZAC). Whangamoa Sdle (BLNZ). **BR**. Ecology Div. Stn, Mt Misery (NZAC).

Izatha katadiktya new species

North Island. **HB**. Clifton (NZAC). Haumoana, Hawkes Bay (NZAC). White Pine Bush (MONZ). **South Island**. **NN**. Dun Mts, Coads Ck (OMNZ). **MB**. Hanmer (OMNZ). State Highway 1, Blenheim (NHNZ). **NC**. Mt Grey (CMNZ). **MC**. Christchurch (LUNZ). Lincoln College (LUNZ). Deans Bush (CMNZ). Hoon Hay Valley (CMNZ). Governors Bay (CMNZ). Banks Peninsula, Prices Valley (LUNZ, NZAC). Prices Bush (CMNZ). Kaituna (CMNZ). Head of the bay, Akaroa harbour (CMNZ). Cave Ck, Craigieburn (CMNZ). Craigieburn Forest, Holloway Lodge (AMNZ). **SC**. Waihi Gorge (CMNZ). Temuka (AMNZ). Kakahu Bush (OMNZ). **MK**. Pukaki Sci. Res. (NZAC, OMNZ). **OL**. Arthurs Pt, Queenstown (AMNZ). Paradise, Lake Wakatipu (NZAC). Glenorchy (OMNZ). Mt Dewar, Kerrymans Ck (OMNZ). Queenstown, L.Wakatipu (BLNZ). Long Gully Ck, Shotover R. (BLNZ). The Gorge, Queenstown (BLNZ). Two Mile Ck, L.Wakatipu (BLNZ). Five Mile Ck, L.Wakatipu (BLNZ). Queenstown-Frankton Rd, Frankton (NHNZ). **CO**. Piano Flat, Waikaia R. (NZAC). Waikaia Bush (OMNZ). Kawarau Gorge (OMNZ). **DN**. Waitati (AMNZ). Cape Saunders (AMNZ). Dunedin (AMNZ). Glenleith, Dunedin (OMNZ). Outram (AMNZ). Enfield (OMNZ). Cooks Head Rock (OMNZ). Kaikorai Vly Rd, Kaikorai Vly, Dunedin (NHNZ). **SL**. West Plains (NZAC). Tisbury (NZAC). Otatara (OMNZ). Owaka (OMNZ). Lora Valley, Hokonui Hills (NHNZ). Piano Flat Rd, Riversdale (NHNZ). Jacks Bay, Catlins Coast (NHNZ).

Izatha apodoxa (Meyrick, 1888)

North Island. **HB**. Haumoana, Hawkes Bay (MONZ, NZAC). **RI**. Taruarau Hill (CMNZ). **TK**. Stratford Plat. (MONZ). **WA**. Blue Rock Rd (NZAC). Cape Palliser, Kirikiri Stm (OMNZ). **WN**. Aurora Terrace, Wellington (AMNZ). Days Bay Bush (GVH, MONZ). Karaka Grove, near Sinclair Hd (GVH, MONZ). Gollans Valley (GVH, MONZ). Bush Hill, Karori (GVH, MONZ). Bolton St (GVH, MONZ). Sydney Street (GVH, MONZ). Lowry Bay (NZAC).

Izatha acmonias Philpott, 1921

South Island. **NN**. Karamea Bluffs (NZAC). **BR**. Lewis Pass (NZAC). Hibernia Ck (MONZ). Fletchers Ck, Inangahua (NZAC). Rahu Saddle (NZAC). Blackball (NZAC). Mataki Lodge (OMNZ). Orangipuku R., nr L. Brunner (NZAC). Paroa, nr Greymouth (NZAC). **WD**. Kaniere, nr Hokitika (NZAC). Kumara (CMNZ). Kellys Creek, Otira (GVH, MONZ). The

Windbag (OMNZ). **NC**. Arthurs Pass (MONZ, NZAC). Arthurs Pass, Rough Creek (NZAC). **OL**. Makarora Bush (NZAC). Glenorchy, Routeburn Ldge (OMNZ). Chinamans Bluff, Dart R. (BLNZ). **FD**. Tutoko Valley (MONZ). Camp, Tutoko Bench, Darran Mts (NZAC). Supply Bay Rd, L. Manapouri (NZAC). Cascade Creek (NZAC). Moss Burn, Rowallan Forest (NZAC). **SL**. L. Te Anau, nr Control Gates (NZAC). West Plains (MONZ, NZAC). Tisbury (NZAC). Owaka (OMNZ). Otatara (OMNZ).

Izatha lignyarcha new species

North Island. **TK**. Mt Egmont, Sth side (MONZ). Stratford Plateau (MONZ). **TO**. N. Ruapehu (MONZ). Whakapapa, Mt Ruapehu (GVH, MONZ). Waimarino (GVH, MONZ). **WA**. Masterton (GVH, MONZ).

Izatha picarella (Walker, 1864)

South Island. **SD**. Opouri (NZAC). Opouri Valley (NZAC). **NN**. Rockville, Aorere R. (BLNZ). Pearse Saddle, Mt Arthur Track (GVH, MONZ). Mt Peel (NZAC). Mahana (NZAC). Rough Is., Nelson (NZAC). J. Higgs Orchard, Mapua (NZAC). Wakefield, Faulkner's Bush (NZAC). Wairoa G. (NZAC). Clifton, The Grove Sc. Res. (NZAC). Riwaka V., W.F. Moss Sc. Res. (NZAC). Whangamoa Saddle (BLNZ). **MB**. Pelorus Bridge (NZAC). Onamalutu Sc. Res. (NZAC). Nr St Ronans Well, Upper Wairau V. (NZAC).

Izatha metadelta Meyrick, 1905

North Island. **AK**. Albany, Redvale, Wright Rd (NZAC). Hunua Ra., Waharau Reg. Park (NZAC). Hunua Ra., Mangatangi Track (NHNZ). **WO**. Waipuna Reserve, Waitomo (NZAC). **BP**. Mt Te Aroha (NZAC). Mamaku Plateau, Galaxy Rd (NZAC). Mamaku Plateau, Tarukenga Res. (NZAC). **TK**. S. Egmont cedar belt (MONZ). Dawson Falls (MONZ). Stratford Plateau (MONZ). Waitaanga Plat. (NZAC). **TO**. Ohakune Mtn Rd, Blyth Tk and old picnic area (NZAC). **GB**. Kakanui (NZAC). L. Waikaremoana, Old Maori Tk (NZAC). **RI**. Otaihape Sc. Res. (NZAC). **WA**. E. end Manawatu Gorge (MONZ). **WN**. Otari, Wellington (MONZ). Karori (AMNZ, CMNZ, NZAC). Campbells Hill, Karori (CMNZ). Wainuiomata (CMNZ, GVH, MONZ). Wiltons Bush (GVH, MONZ). Gollans Valley (GVH, MONZ). Kaka Hill, Wellington (CMNZ). Orongorongo V. Res. Stn (NZAC). Mt Bruce F.P. (NZAC).

Izatha balanophora (Meyrick, 1897)

North Island. **ND**. Whangarei (CMNZ). Parua Bay (AMNZ). Waikaraka Valley, Whangarei (AMNZ). Omahuta S.F. (NZAC). **AK**. Wayby Gorge (AMNZ). Omeru Reserve, Kaukapakapa (MONZ). Muriwai (MONZ). Leigh (NZAC). Titirangi, Minnehaha Ave (NZAC). Waitakere Ra., Cutty Grass Tk (NZAC). Waitakere Ra., Lookout, McElwain Loop Track (NHNZ). Hunua Ranges, Mangatangi Track (NHNZ). **WO**. Waitomo (AMNZ). Te Whakapatiki stream, Awakino R., Upper Awakino Valley, Mahoenui (NHNZ). **TK**. Whitecliffs, S. of Tongaporutu (NZAC). **TO**. Pureora S.F., Mt Pureora (NZAC). Rangataua Sc. Res. (NZAC). Ohakune Mtn Rd, old picnic area (NZAC). **RI**. Mataroa, Paengaroa Sc. Res. (NZAC). **WN**. Gollans Valley, Muritai Park Track (GVH, MONZ). Botanical Gardens, Wellington (GVH, MONZ).

Izatha churtoni Dugdale, 1988

North Island. **ND**. Mangamuka Bridge (NZAC). Mangamuka Gorge (NZAC). Waipoua S.F. (NZAC). **AK**. Albany, Wright Rd (NZAC). Titirangi, 10 Rimutaka Pl. (NZAC). Titirangi, Minnehaha Ave (NZAC). Waitakere Ra., Spraggs Bush (NZAC). Waitakere Ra., Cutty Grass Tk (NZAC, NHNZ). Waitakere Ra., Huia, Karamatura carpark (NZAC). Bethells, Matuku Res. (NZAC). Waitakere Ra., N. end Scenic Drive (NHNZ). Hunua Ra., Mangatangi Track (NHNZ). **CL**. Cuvier Is. (AMNZ). Kauaeranga V. (NZAC). Kennedy Bay Rd, Coromandel (NZAC). **WO**. Mangatarata (NZAC). Mt Pirongia, Nikau Walk (NZAC). Waitomo (AMNZ). Waitomo carpark (NZAC). Te Whakapatiki Stream, Awakino R., Upper Awakino Valley, Mahoenui (NHNZ). **BP**. Mt Te Aroha (NZAC). Mamaku Plateau, Galaxy Rd (NZAC). Rereauira Swamp (NZAC). Te Koau (NZAC). Lottin Pt Rd, Waenga Bush (NZAC). Punaruku, nr Te Araroa (NHNZ). **TK**. Whitecliffs, S. of Tongaporutu (NZAC). Waitaanga Plat., 2 km W. of Waitaanga (MONZ, NZAC). Awakau Rd, Mokau V. (NZAC). Mt Messenger (NZAC). Mt Egmont, E. side (MONZ). Dawson Falls (MONZ, NZAC). Stratford Plateau (MONZ). Mt Egmont, S. side (MONZ). Kapuni V. (NZAC). **TO**. Pureora S.F., Waimiha Saddle (NZAC). Pureora Camping Ground (NZAC). Ohakune Mtn Rd, Blyth Tk (NZAC). Ohakune (GVH, MONZ). **GB**. L.Waikaremoana, Old Maori Tk (NZAC). East Cape – Paoneone, near Te Araroa (OMNZ). **HB**. White Pine Bush Sc. Res. (MONZ, NZAC). **RI**. Mataroa, Paengaroa Sc. Res. (RJBH, notes). **WI**. Wanganui (MONZ). Palmerston North (AMNZ). **WN**. Campbells Hill Bush (GVH, MONZ). Orongorongo Valley (AMNZ). Gollans Valley (GVH, MONZ). Kaitoke (GVH, MONZ). Pakuratahi, Kaitoke (GVH, MONZ). Days Bay (GVH, MONZ). Near Cape Terawhiti (GVH, MONZ).

Izatha dulcior new species

North Island. **ND**. Poor Knights Is., Tawhiti Rahi, South Ridge (NZAC). Poor Knights Is., Tawhiti Rahi, Tawa Knoll (NZAC). Poor Knights Is., Tawhiti Rahi, South Track (NZAC). Poor Knights Is., Tawhiti Rahi, campsite (NZAC).

Izatha epiphanes (Meyrick, 1883a)

North Island. **ND**. Te Paki, Kauri Bush (NZAC). S. Pandora, Te Paki Coastal Park (NZAC). Unuwhao, Spirits Bay (NZAC). Kaitaia Walkway (NZAC). Whangarei (AMNZ, NZAC). Whangarei Falls (OMNZ). Helena Bay (OMNZ). **AK**. Wayby Gorge (AMNZ). Leigh (NZAC). Mt Auckland (NZAC). Rangitoto Is. (AMNZ). Albany, Wright Rd (NZAC). Torbay (MONZ). Piha, Garden Rd (NZAC). Piha Beach (OMNZ). Waitakere Ra., Sharps Bush (NZAC). Waitakere Ra., SW end

Cutty Grass Tk (NZAC). Laingholm (NZAC). Titirangi, Minnehaha Ave (NZAC). Titirangi, 10 Rimutaka Place (NZAC). Waitakere Ra., Matuku Reserve (NHNZ, NZAC). Hunua Ra., Mangatangi Track (NHNZ). Mt William Scenic Res. (NHNZ). **CL**. Little Barrier Is., Bunkhouse (NZAC). **WO**. Waitomo (AMNZ). **BP**. Karakatuwhero V, Waipiata (NZAC). **TK**. Whitecliffs, S. of Tongaporutu (NZAC). Waitaanga Plateau (NZAC). Opunake (MONZ). Top, Kahui Rd (MONZ). **TO**. Ohakune Tract, Mt Ruapehu (MONZ). Mt Ruapehu, Turoa skifield (OMNZ). **HB**. Little Bush, Puketitiri (MONZ). White Pine Bush Sc. Res. (NZAC). **WI**. Kawakawa Rd, Fldg [Feilding?] (MONZ). Pohangina (CMNZ). **WN**. Ballance Res., Manawatu Gorge (NZAC). Wiltons Bush (CMNZ, GVH. MONZ). Karori (CMNZ, AMNZ, GVH, MONZ, NZAC). Gollans Valley (CMNZ, GVH, MONZ). Makara Bush (GVH, MONZ). Wainuiomata (GVH, MONZ). Bolton Street Cemetery (GVH, MONZ). Wadestown (GVH, MONZ). Botanical Gdns (MONZ). Porirua (NZAC). Orongorongo V. Res. Stn (NZAC).

Izatha mesoschista Meyrick, 1931

North Island. **ND**. Herekino F., N. end Kaitaia Walkway (NZAC). Hen Is. (MONZ). Mangawhai Heads (NZAC). **AK**. Motuora Is. (NZAC). Rangitoto Is. (AMNZ). Noises Is., Motuhoropapa Is. (NZAC). Torbay (MONZ). Takapuna (AMNZ). Waitakere Ra., Cutty Grass Track, (Anawhata Rd end) (NHNZ). Bethells, Matuku Reserve (NZAC). Piha, Garden Rd (NZAC). Laingholm (NZAC). Titirangi, 10 Rimutaka Place (NZAC). Titirangi, 51 Minnehaha Ave (NZAC). Henderson (NZAC). Pollen Is. (NZAC). Onehunga (NZAC). Greenhaven Ave, Papakura (NHNZ). Mokau St, Ponsonby, Auckland City (NHNZ). **CL**. Little Barrier Is., Bunkhouse (NZAC). Little Barrier Is., Hamilton Tk (NZAC). Thames (MONZ). Cuvier Is. (AMNZ). Kirikiri Saddle, Kopu-Hikuai Rd (NZAC). Kenny St, Waihi (NHNZ). **WO**. Piako R. (NZAC). Te Kuiti, Mangapehi V. (NZAC). **BP**. Whakarewarewa (FRNZ). Moutohora Is. (OMNZ). Te Rereauira (NZAC). Waiotuma (NZAC). Waiaroho (NZAC). **GB**: Awatere Motor Camp (MONZ). **TK**. Whitecliffs Walkway, S. of Tongaporutu (NZAC). Dawson Falls (MONZ). Opunake (MONZ). S. Egmont (MONZ). Manaia (NZAC). **TO**. Lake Taupo (MONZ, NZAC). Taupo, Acacia Bay (NZAC). Pureora S.F. camping ground (NZAC). Mt Pureora (NZAC). Balmoral Drive, Tokoroa (NHNZ). **RI**. Mataroa, Paengaroa Sc. Res. (NZAC). **WI**. Paiaka (NZAC). **WN**. Karori Wildlife Sanctuary (CMNZ, MONZ). Campbells Hill Bush (GVH, MONZ). Botanical Gdns, Wellington (GVH, MONZ). Sievers Hill, near Cape Terawhiti (GVH, MONZ). Rona Bay (GVH, MONZ). Wiltons Bush (GVH, MONZ). Wainuiomata (GVH, MONZ). Orongorongo V. Res Stn (NZAC).

Izatha haumu new species

North Island. **ND**. Te Paki (shearers' quarters) (NZAC). Parengarenga Harbour, Paua (NZAC). Tom Bowling Bay (NZAC). Pukenui, nr Houhora (NHNZ). Kapowairua, Spirits Bay (NHNZ).

Izatha quinquejacula new species

Three Kings Islands. **TH**. Three Kings Is., Great Is., Castaway Camp (CMNZ, NZAC). Three Kings Is., Great Is., Tasman Valley (NZAC).

Izatha heroica Philpott, 1926

South Island. **SD**. Opouri Valley (NZAC). **NN**. Mount Arthur, main spur (GVH, MONZ). Cobb V., Trilobite Hut (LUNZ). Karamea Bluff (NZAC). Whanganui Inlet (NZAC). Dun Mt (NZAC). Stoney Ck, Waimangaroa, Westport (NZAC). **MB**. Mt Richmond, Fell Pk (NZAC). **BR**. Hibernia Ck, S. of Punakaiki (MONZ). L. Rotoiti, Nelson Lakes NP (MONZ). Lake Rotoiti, St Arnaud (OMNZ). Inangahua West S.F., Fletchers Ck (NZAC). Mawhera S.F. (NZAC). Capleston, nr Cronadun (NZAC). Coll Ck, Inangahua S.F. (NZAC). Ecology Div. Stn, Mt Misery (NZAC). Safety Camp Ck (OMNZ). Lewis Pass, summit main road (OMNZ). Paroa, nr Greymouth (BLNZ). **WD**. Okarito Trig. (LUNZ). Simonin Ck, Upper Pyke R. (NZAC). Kaniere, nr Hokitika (BLNZ). **NC**. Arthurs Pass (CMNZ, MONZ). **OL**. L. Mavora (MONZ). Daleys Flat, Dart River (NZAC, OMNZ). Dart Hut, Otago Lakes (MONZ, NZAC). **CO**. Bush Huts, Garvie Mountains (NZAC). Piano Flat, Waikaia R. (NZAC). **FD**. West Arm, L. Manapouri (NZAC). Grebe Valley, near South Arm (OMNZ). Mt Burns (OMNZ). Borland Saddle (BLNZ).

Izatha hudsoni Dugdale, 1988

North Island. **ND**. Herekino F., N. end Kaitaia Walkway (NZAC). **AK**. Waitakere Ra., Fairy Falls Tk (NZAC). Waitakere Ra., Cutty Grass Tk (NZAC). **CL**. Seddon St, Waihi (NHNZ). **WO**. Herangi Ra., Mangatoa Sdle, S. of Marokopa (NZAC). Taumatamaire Rd, Mahoenui (NHNZ). **BP**. Mt Te Aroha (NZAC). Mamaku Plat, Tarukenga (NZAC). Mt Ngongotaha summit (NZAC). Kaimai Ra., Thompsons Track (NHNZ). Thompsons Track, saddle to Ngatamahinerua Trig. Track (NHNZ). **TK**. Mt Egmont, Dawson Falls (MONZ). Waitaanga Plateau (NZAC). **TO**. Raurimu (AMNZ). **GB**. Taikawakawa (NZAC). **HB**. Little Bush, Puketitiri (MONZ, NZAC). **WN**. Wiltons Bush (AMNZ, CMNZ, GVH, MONZ). Karori (CMNZ, NZAC). Wainuiomata (AMNZ, GVH, MONZ). Haywards Bush, Hutt River (GVH, MONZ). Wadestown (GVH, MONZ). Gollans Valley (GVH, MONZ). Campbells Hill Bush (GVH, MONZ).

Izatha huttonii (Butler, 1879)

North Island. **WN**. Karori (MONZ, NZAC). Waterfall Gully, Wadestown (GVH, MONZ). Crofton, Wellington (GVH, MONZ). Bush Hill, Karori (GVH, MONZ). Reservoir Bush, Karori (GVH, MONZ). Botanical Gdns, Wellington (GVH, MONZ). Wiltons Bush (GVH, MONZ). York Bay (MONZ). Khandallah (MONZ). Seatoun (MONZ). Campbells Hill Bush (GVH, MONZ). Lowry Bay (NZAC). **South Island**. **SD**. Picton (GVH, MONZ). Stephens Is. (NZAC). Opouri (NZAC). **NN**. Rockville, Aorere R. (BLNZ). Karamea (BLNZ). Karamea

Bluffs (NZAC). Karamea, Splinter Ck (OMNZ, BLNZ).Whanganui Inlet, Mangarakau (NZAC). Westport, Buller R. mouth (NZAC). Abel Tas. NP, Totaranui (LUNZ). Nelson (CMNZ, NZAC). Tapawera (GVH, MONZ). Dun Mt (NZAC). Denniston Hill, Westport (NZAC). Wairoa Gorge (NZAC). Roding V. (NZAC). Mahana (NZAC). Belgrove (NZAC). Riwaka V., W.F. Moss Sc. Res. (NZAC). Dun Mts, Coads Ck (OMNZ). Nelson, Eves Valley Bush (NZAC). **BR**. L. Rotoiti (CMNZ, NZAC). Hibernia Creek, S. of Punakaiki (MONZ). Ecology Div. Stn, Mt Misery (NZAC). Inangahua West S.F., Fletchers Ck (NZAC). Mawhera S.F. (NZAC). Reefton Saddle, Tawhai S.F. (NZAC). Paroa, nr Greymouth (BLNZ). State Highway 6, Punakaiki (NHNZ). **WD**. Waiho (NZAC). L. Kaniere (NZAC). Carters Beach, Westport (NZAC). Depot Ck, Haast R. (BLNZ). **KA**. Puhi-Puhi R., Kaikoura (CMNZ). Puhi Puhi Res. (NZAC). Claverley, Conway R. (CMNZ). Okarahia (CMNZ). **NC**. Glentui (CMNZ). **MC**. Riccarton Bush (= Deans Bush) (LUNZ, CMNZ, NZAC, OMNZ). Hoon Hay Valley (CMNZ, NZAC). Governors Bay (CMNZ). Puke Atua Bush (CMNZ). Banks Pen., Prices Valley (LUNZ). Prices Bush (CMNZ, NZAC). Okuti Valley (CMNZ). Cave Ck, Craigieburn (CMNZ). Drayton, Pudding Hill gully (CMNZ). **SC**. Waihi Gorge (NZAC). Kakahu Bush (OMNZ). Peel Forest (OMNZ). Totara V., nr Pleasant Point (BLNZ). **MK**. Mt Cook NP, Governor's Bush (LUNZ). Ahuriri V., Canyon Ck (OMNZ). **OL**. Glacier Burn (NZAC). Paradise, L.Wakatipu (NZAC). Makarora Bush (NZAC). Daleys Flat (OMNZ). Queenstown, L.Wakatipu (BLNZ). Chinamans Bluff, Dart R. (BLNZ). One Mile Ck, L.Wakatipu (BLNZ). Moke L., L.Wakatipu (BLNZ). **CO**. Beaumont River bridge (LUNZ). Beaumont (NZAC). E. bank of Clutha R., 2 km W of Heathcote farm (NZAC). Island Block (NZAC). Piano Flat, Waikaia R. (NZAC). Pomahaka V., Jordan R. (OMNZ). Jordan Ck, Umbrella Mts (NZAC). Bush Huts, Garvie Mountains (NZAC). Whitecoomb Ck, Waikaia Bush (OMNZ). Edievale-Raes Junction gully (OMNZ). **DN**. Woodhaugh, Dunedin (AMNZ, MONZ). Leith (AMNZ). Leith V. (OMNZ). Waitati (AMNZ). Vauxhall (MONZ). Maungatuas (OMNZ). Waipori Valley (OMNZ). Bradford, Dunedin (OMNZ). Glenleith, Dunedin (OMNZ). Cooks Head Rock (OMNZ). Waipori (OMNZ). Port Chalmers, Dunedin (BLNZ). Aramoana, Dunedin (BLNZ). Kaikorai Vly Rd, Kaikorai, Dunedin (NHNZ). **FD**. Knife & Steel [Harbour] (NZAC). Dean Burn, Motu Bush (NZAC). Moss Burn, Rowallen Forest (NZAC). Supply Bay Rd, L. Manapouri (NZAC). Deep Cove (OMNZ). Borland Saddle, Hunter Mts (BLNZ). **SL**. West Plains (MONZ, NZAC). Haldane (NZAC). Thomsons Bush, Invercargill (NZAC, OMNZ). Tisbury (NZAC). Edendale Sc. Res. (NZAC). Beaumont S.F., Riversdale Rd (NZAC). Catlins S.F., Tautuku Lodge (LUNZ). Wyndham (NZAC). Seaward Bush (OMNZ). Otatara (OMNZ). Black Gully (OMNZ). Longwoods Forest, Pourakino (OMNZ). Whalers Bay, New R. Estuary (BLNZ). Purakaunui Bay, Catlins Coast (NHNZ). Tussock Creek Sc. Res. (NZAC). **Stewart Island**. **SI**. Rakeahua Valley (NZAC). Lee Bay (NZAC). Halfmoon Bay (NZAC). Mason Bay lagoon forest (OMNZ).

Izatha peroneanella (Walker, 1864)

North Island. **ND**. Ahipara Plateau (NZAC). Warawara Forest (NZAC). Mangonui (NZAC). Paihia (AMNZ). Ngawha Springs (NZAC). Waipoua S.F. (NZAC). Poor Knights Is., Aorangi (NZAC). Poor Knights Is., Tawhiti Rahi (NZAC). Hen Is. (MONZ). Mangawhai Heads (NZAC). Trounson (OMNZ). Mangamuka Gorge (OMNZ). Waimea F. (OMNZ). Rangiputa (NHNZ). **AK**. Okura Bush Walkway, nr Dacre Cottage (NZAC). Mt Auckland (NZAC). Torbay (MONZ). Muriwai (MONZ). Whenuapai (NZAC). Riverhead (NZAC). Bethells, Matuku Reserve (NZAC). Destruction Gully, Huia (NZAC). Waitakere Ra., Mill Bay (NZAC). Waitakere Ra., Sharps Bush (NZAC). Waitakere Ra., Ridge Road Tk. (NZAC). Laingholm (NZAC). Titirangi (NZAC). Waitakere Ra., Spraggs Bush (NZAC). Waitakere Ra., Cutty Grass Track (Anawhata Rd end) (NHNZ). Waitakere Ra., N. end Scenic Drive (NHNZ). Karekare, 81 Lone Kauri Rd (AMNZ). Rangitoto Is., Islington Bay (NZAC). Henderson (NZAC). Blockhouse Bay (NZAC). Owairaka (NZAC). Onehunga (NZAC). Greenlane (NZAC). Ellerslie (AMNZ). One Tree Hill (NZAC). Auckland, Symonds St. (OMNZ, NHNZ). Auckland City, Beresford St, Freemans Bay (NHNZ). Hayden St, Freemans Bay, Auckland City (NHNZ). Murphys Bush, Flat Bush (NZAC). Hunua Ra., Waharau Reg. Park (NZAC). Mt William (NZAC). Greenhaven Ave, Papakura (NHNZ). **CL**. Little Barrier Is., Hamilton Tk (NZAC). Little Barrier Is., Summit Tk (NZAC). Cuvier Is., Ridge Tk, Orchard Ridge and Old Radar Station (AMNZ). Riverview Rd, Cooks Beach (NHNZ). **WO**. Mangatarata, S. Auckland (NZAC). Kopuatai Peat Dome, Tee Canal Access (NZAC). Waitomo carpark (NZAC). Herangi Ra., Mangatoa Sdle (NZAC). Mangatoa Rd, SW King Country (MONZ). Whareorino (MONZ). Karewa Beach, Kawhia (NHNZ). Taumatamaire Rd, Mahoenui (NHNZ). Upper Awakino Vly, Mahoenui (NHNZ). Te Whakapatiki Stream, Awakino R., Upper Awakino Valley, Mahoenui (NHNZ). **BP**. FRI, Rotorua (LUNZ). Mamaku Plateau, Galaxy Rd (NZAC). Mamaku Plateau, Tarukenga Res. (NZAC). Waiotuma (NZAC). L. Rotoiti, Rotorua (NZAC). Moutohora Is. (OMNZ). Punaruku, nr Te Araroa (NHNZ). Te Koau (NZAC). Lottin Pt (NZAC). Hicks Bay (NZAC). Whangaparaoa Beach (NZAC). Waiaroho (NZAC). **TK**. Waitaanga Plat., N.G. Tucker Reserve (NZAC). Waitaanga Plat., 2 km W. of Waitaanga (NZAC). Whitecliffs Walkway, S. of Tongaporutu (NZAC). Mt Messenger (NZAC). Manaia (MONZ). Tangarakau Gorge (MONZ). Mt Egmont south side (MONZ). Opunake (MONZ). Dawson Falls (MONZ). **TO**. 10 km SE of Rangitaiki (NZAC). Pureora S.F., camping ground (NZAC). Pureora S.F., Waimiha Sdle (NZAC). Mt Pureora (NZAC). Pureora S.F., Pikiariki (NZAC). Opepe Reserve (NZAC). Turangi, Tongariro River (AMNZ). Raurimu (AMNZ). Whareroa Stm (MONZ). Kuratau, L. Taupo (MONZ). Taupo (NZAC). 3 miles E. of Desert Rd (MONZ). Ohakune Mtn Rd, Blyth Tk (NZAC). Ohakune Tract, Mt Ruapehu (MONZ). Kaimanawa Nth F.P. (NZAC). **GB**. Pohutu, Awatere V. (NZAC). **HB**. Haumoana (MONZ). White Pine Bush (MONZ). Little Bush, Puketitiri (NZAC). **RI**.

Mataroa, Paengaroa Sc. Res. (RJBH, notes). **WI**. Wanganui (MONZ). **WN**. Ballance Res., Manawatu Gorge (NZAC). Levin Ranges (MONZ). Moonshine (GVH, MONZ). Gollans Valley (GVH, MONZ). Wadestown (GVH, MONZ). Rona Bay (NZAC). Haywards Bush, Hutt R. (GVH, MONZ). Maori Bank, Upper Hutt (GVH, MONZ). Upper Hutt, Te Marua (NZAC).

Izatha taingo new species

North Island. **ND**. Te Paki, Kauri Bush Tk (NZAC). Te Paki (shearers' quarters) (NZAC). Parengarenga Harbour, Paua (NZAC). Spirits Bay (NZAC). Kapowairua, Spirits Bay (NHNZ). Otaipango Rd, Henderson Bay, nr Houhora (NHNZ).

Izatha oleariae Dugdale, 1971

The Snares. **SN**. Snares Is., West Ridge (CMNZ). Snares Is., South Ridge (NZAC). Snares Is., Penguin Creek (NZAC). Snares Is., Boat Harbour (NZAC). Snares Is., Biological Station (NZAC, OMNZ). Snares Is., Station Point (NZAC, OMNZ). Snares Is., N. Promontory (NZAC). Snares Is., West Coast (NZAC). Snares Is., Muttonbird Ck (NZAC). Snares Is., SW Promontory razorback (NZAC). Snares Is., Sinkhole area (NZAC). Snares Is., Ho Ho Bay (NZAC). Snares Is., S. Promontory (NZAC).

Izatha spheniscella new species

The Snares. **SN**. Rima Islet, Western Chain (NZAC). Alert Stack (NZAC). Snares Is., North Promontory (NZAC).

Izatha prasophyta (Meyrick, 1883a)

North Island. **ND**. S. Pandora, Te Paki Coastal Park (NZAC). Kohuronaki (RABL, photo). Kaeo (GVH, MONZ). Paihia (MONZ). Whangarei (CMNZ). Poor Knights Is., Aorangi (NZAC). Poor Knights Is., Tawhiti Rahi (NZAC). Herekino F., N. end Kaitaia Walkway (NZAC). **AK**. Mt Auckland (NZAC). Bethells, Matuku Res. (NZAC). Henderson (NZAC). Waitakere Ra., Twin Peaks Tk, Karamatura Vly (NHNZ). **WO**. Rauroa Station, Taumatamaire Rd, Mahoenui (NHNZ). **BP**. Papatea (NZAC). **TK**. Wai iti, North Taranaki (NZAC). Opunake (MONZ). **WN**. Reservoir Reserve, Karori (GVH, MONZ). Bush Hill, Karori (GVH, MONZ). Gollans Valley (GVH, MONZ). Karaka Grove near Sinclair Hd (GVH, MONZ).

Izatha caustopa (Meyrick, 1892)

North Island. **TO**. Ohakune (MONZ). **HB**. Little Bush, Puketitiri (MONZ). **WN**. Bush Hill, Karori (GVH, MONZ). Wiltons Bush (GVH, MONZ). Gollans Valley (GVH, MONZ).

Izatha dasydisca new species

North Island. **ND**. Russell Forest, Ngaiotonga Sc. Res. (NZAC). **AK**. Mt Auckland, Atuanui S.F. (NZAC). Waitakere Ra., start of Centennial Tk (NZAC). Waitakere Ra., Twin Peaks Tk, Karamatura Valley (NHNZ). Hunua Gorge, Hunua Rd (NHNZ). **GB**. Kakanui (NZAC).

Izatha manubriata Meyrick, 1923

South Island. **OL**. L. Mavora (MONZ). Bold Pk (NZAC). Moke Lake (FRNZ). Queenstown, Fernhill (OMNZ). Queenstown, Two Mile Ck (OMNZ). Ben Lomond (AMNZ). Mt Aurum (GVH, MONZ). **CO**. McEwens Bush, Pomahaka Valley (OMNZ). Bush Huts, Garvie Mountains (NZAC).

Izatha convulsella (Walker, 1864)

North Island. **HB**. Waipawa (FRNZ). **RI**. Otaihape Sc. Res. (NZAC). **WI**. Palmerston North (GVH, register). **WN**. Levin Ranges (MONZ). Kaitoke (MONZ). W. Karori (MONZ). Johnsons Hill, north Karori (GVH, MONZ). Wiltons Bush (CMNZ). Ngaio (GVH, MONZ). Owhiro Bay (GVH, MONZ). Karaka Grove nr Sinclair Head (GVH, MONZ). Bolton Street Cemetery (GVH, MONZ). Gollans Valley (GVH, MONZ). Botanical Gardens, Wellington (GVH, MONZ). Lowry Bay (NZAC). **South Island**. **SD**. Rarangi (NZAC). Wetlands SW of trig KK, Rarangi (NZAC). Opouri (NZAC). **NN**. Aniseed V. (NZAC). Upper Maitai (NZAC). Wairoa Gorge (NZAC). Oparara R., nr Karamea (BLNZ). Karamea (BLNZ). **BR**. L. Rotoiti, N. shore (NZAC). **MB**. Pelorus Bridge (NZAC). **KA**. Claverley, Conway River (CMNZ). Clarence Bridge (GVH, MONZ). Puhi Puhi, Kaikoura (GVH, MONZ). **NC**. Mt Grey (CMNZ). **MC**. Christchurch (CMNZ, NZAC). South Brighton (NZAC). Papanui, Christchurch (LUNZ). Horseshoe Lake Road (CMNZ, NZAC). Riccarton Bush (= Deans Bush) (LUNZ, CMNZ, NZAC). Spreydon (CMNZ). Prices V., Banks Pen. (LUNZ). Prices Bush (NZAC). Port Hills (CMNZ). Port Hills, Mt Pleasant (NZAC). Port Hills, Sign of the Bellbird (NZAC). Port Hills, Puke Atua Bush (CMNZ, OMNZ). Coopers Knob (CMNZ). Governors Bay Bush (CMNZ). Governors Bay (GVH, MONZ). Akaroa (CMNZ). **MK**. Mt Cook (CMNZ). **OL**. Queenstown (MONZ, NZAC, OMNZ). Glacier Burn (NZAC). Lake Wanaka (NZAC). Two Mile Ck, L. Wakatipu (BLNZ). Bobs Pk, L. Wakatipu (BLNZ). Bobs Cove, L. Wakatipu (BLNZ). The Gorge, Queenstown (BLNZ). Queenstown Hill, L.Wakatipu (BLNZ). **CO**. Roaring Meg Ck, Kawarau Gorge (NZAC). 6.4 km SE of Luggate (NZAC). Site of DG3 dam, Fruitgrowers Rd, Clyde (NZAC). Conroys Rd (OMNZ). Alexandra (OMNZ). South Millers Flat (OMNZ). Kawarau Gorge (OMNZ). Waipiata (BLNZ). **DN**. Knights property, E. side Clutha R., opp. Birch Is. (NZAC). Opoho, Dunedin (AMNZ, NZAC). Woodhaugh, Dunedin (AMNZ). Waitaki V., Otekaieke R. mouth (OMNZ). Waianakarua R. terrace nr camps (OMNZ). Waianakarua, Lookout Bluff (OMNZ). Enfield (OMNZ). Otago Peninsula, Robertsons Ck (OMNZ). Leith V. (OMNZ). Port Chalmers, Dunedin (BLNZ). Kaikorai Vly Rd, Kaikorai Vly, Dunedin (NHNZ). **SL**. Manapouri (NZAC). West Plains (MONZ, NZAC). Tisbury (NZAC). Wallacetown (NZAC). Blue Mtns (OMNZ). Cannibal Bay (NHNZ).

Izatha gekkonella new species

South Island. **CO:** nr Sutton (OMNZ). Sutton Salt Lake (OMNZ). Taieri Ridge (NZAC). Kakanui Mts, Maerewhenua S.P. (OMNZ). **CO/DN:** Emerald Creek (OMNZ). Redbank (OMNZ). **DN:** Nenthorn (OMNZ). Taieri Gorge, The Notches (OMNZ). Taieri Gorge, Reefs Hotel (OMNZ). Shag Pt Reserve (OMNZ). Horse Ra. (OMNZ).

Izatha gibbsi new species

North Island. **ND**. Te Paki Coastal Park, S. Pandora (NZAC). Herekino F., Kaitaia Walkway (NZAC). Omahuta F. (NZAC). Whakaangi (NZAC). **AK**. Waitakere Ra., Lookout, McElwain Loop Track (NHNZ). Waitakere Ra., Cutty Grass Tk, SW end (NZAC). **TK**. Waitaanga Plateau.

Izatha minimira new species

North Island. **ND**. Herekino F., N. end Kaitaia Walkway (NZAC). **AK**. Waitakere Ra., Cascades Kauri Park (NZAC). Titirangi (NZAC). Hunua Ra., Mangatangi Track (NHNZ). **CL**. Stony Bay (NHNZ). **BP**. Moutohora Is. (OMNZ).

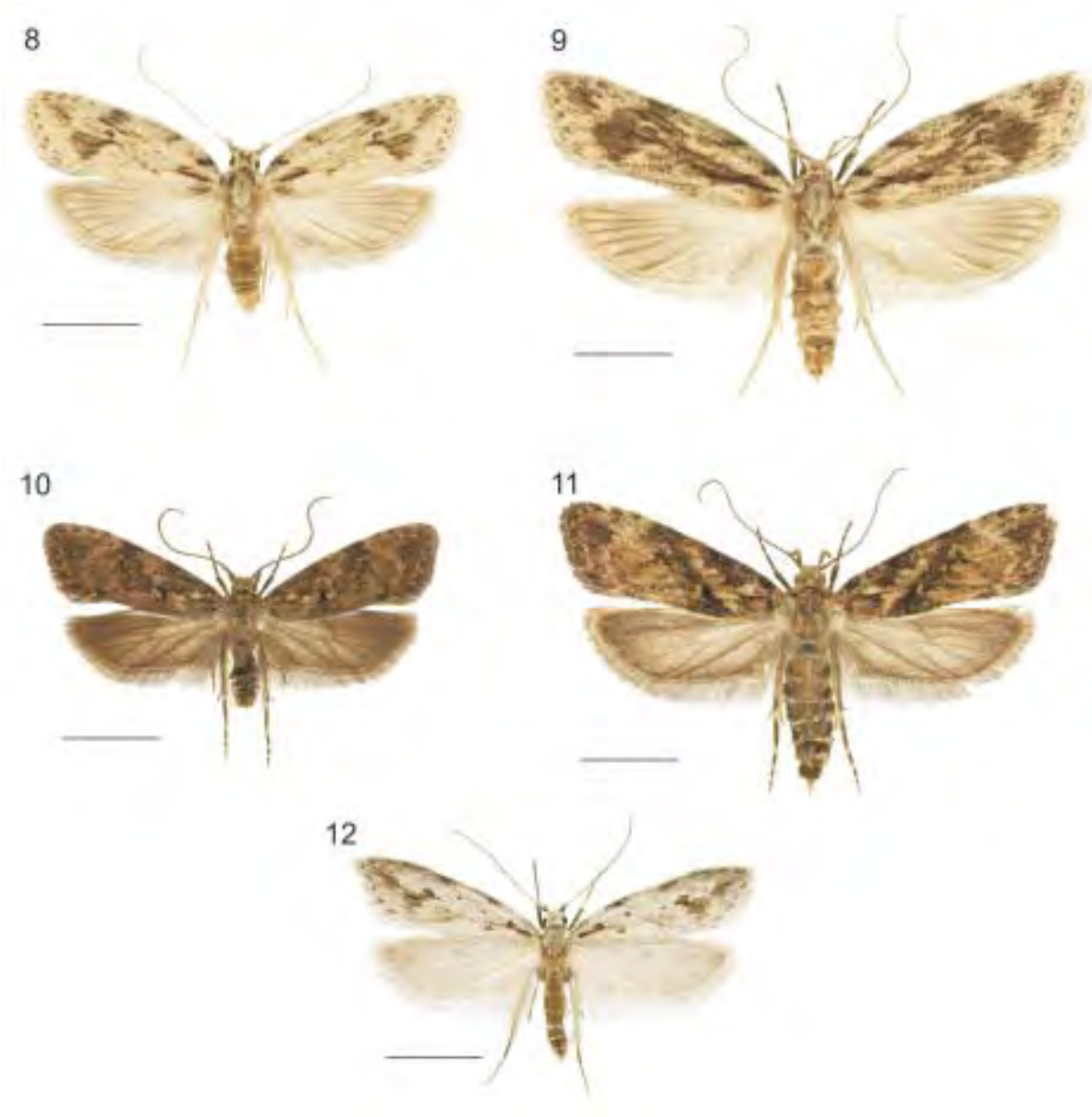
Izatha rigescens Meyrick, 1929

North Island. **WN**. Howard Point, Lowry Bay, Wellington (GVH, MONZ).

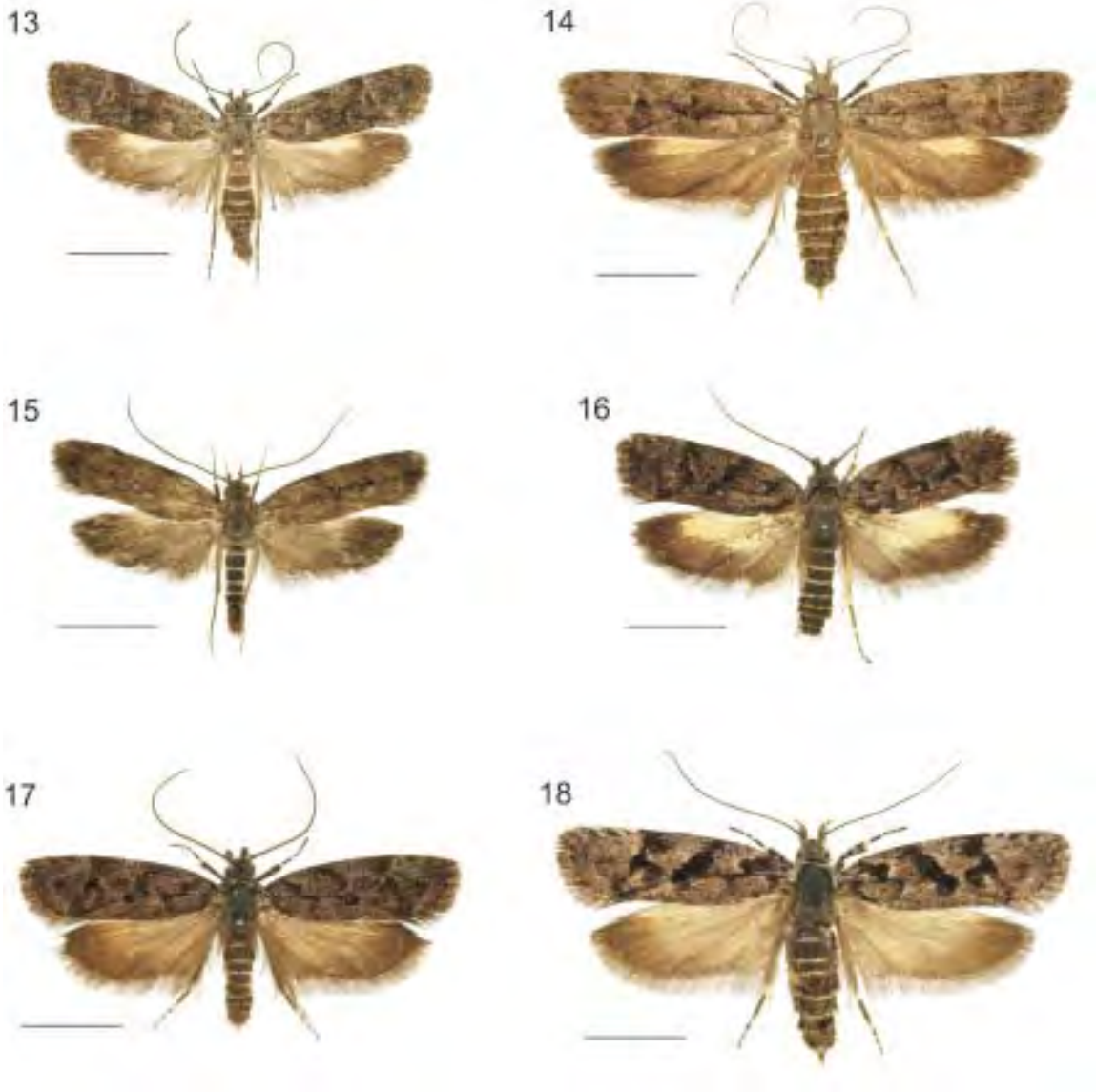
Izatha phaeoptila (Meyrick, 1905)

North Island. **ND**. S. Pandora, Te Paki Coastal Park (NZAC). Herekino F., N end Kaitaia Walkway (NZAC). Hikurangi (AMNZ). **AK**. Kauri G. [Glen] (AMNZ). Titirangi, Minnehaha Ave (NZAC). Titirangi, 10 Rimutaka Place (NZAC). Laingholm (NZAC). Waitakere Ra., Cascades Kauri Park (NZAC). Waitakere Ra., Spraggs Bush (NZAC). Waitakere Ra., Cutty Grass Tk (Anawhata Road end) (NZAC, NHNZ). Riverhead (NZAC). Hunua Ra., Mangatangi Track (NHNZ). **BP**. Mamaku Plat., Tarukenga Res. (NZAC). Waiotuma (NZAC). **RI**. Mataroa, Paengaroa Sc. Res. (NZAC). **WN**. Karori (CMNZ, GVH, MONZ). Deep Gully, Wadestown (GVH, MONZ). Makara Bush (GVH, MONZ).

Fig. 1–83 *Izatha* adults, dorsal habitus (Automontage photographs by B. E. Rhode). Scale bars 5 mm. Moths on each plate to same scale, but scales may differ detween plates. (1–4) *I. attactella*, 1, 3 males (AK), 2 female (NN), 4 female (?BP); (5–7) *I. voluptuosa*, 5 male holotype (TO), 6 male paratype (AK), 7 female paratype (TO).



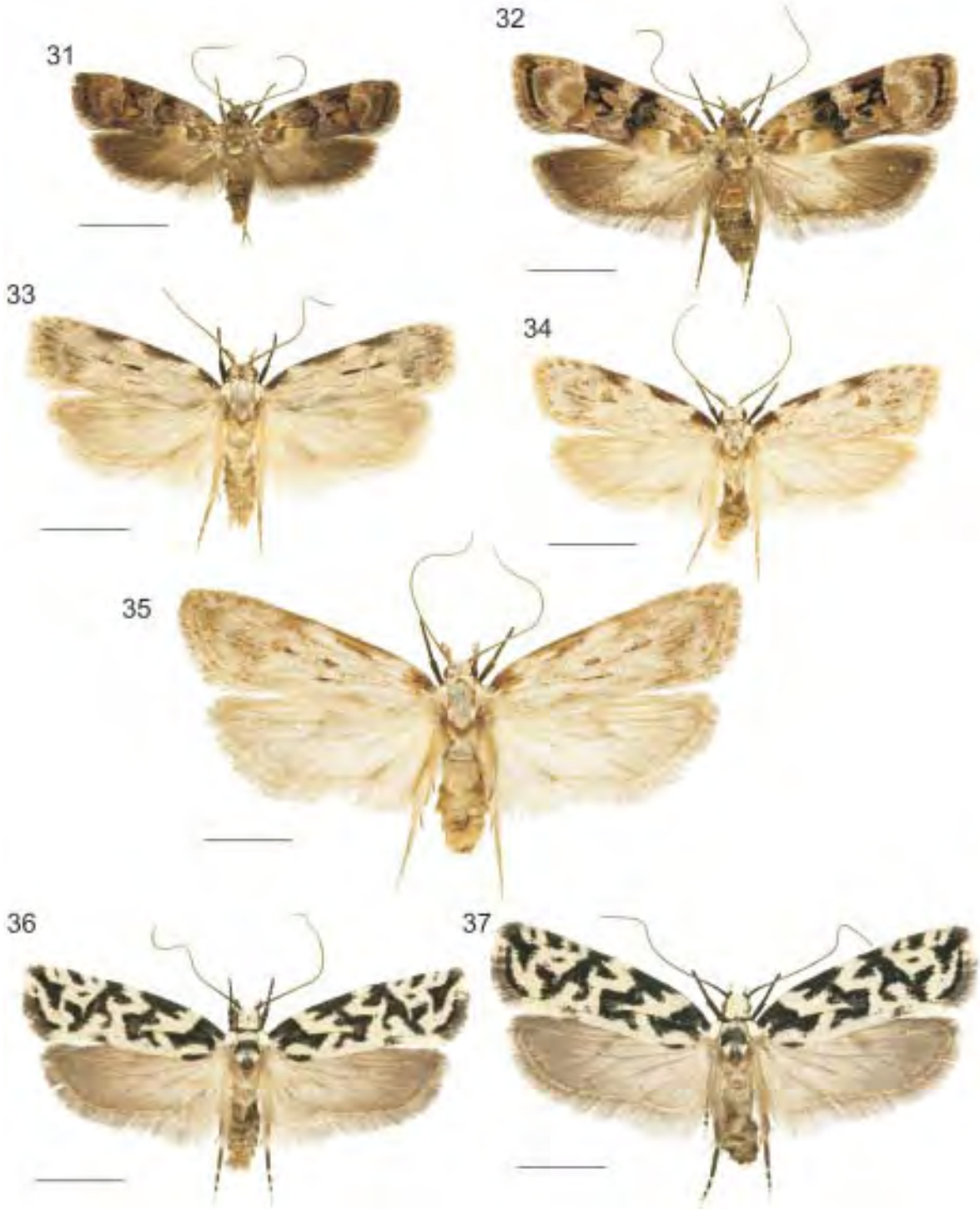
(8, 9) *I. blepharidota*, 8 male paratype (AK), 9 female paratype (AK); (10, 11) *I. austera*, 10 male (AK), 11 female (AK); (12) *I. psychra*, male (MK).



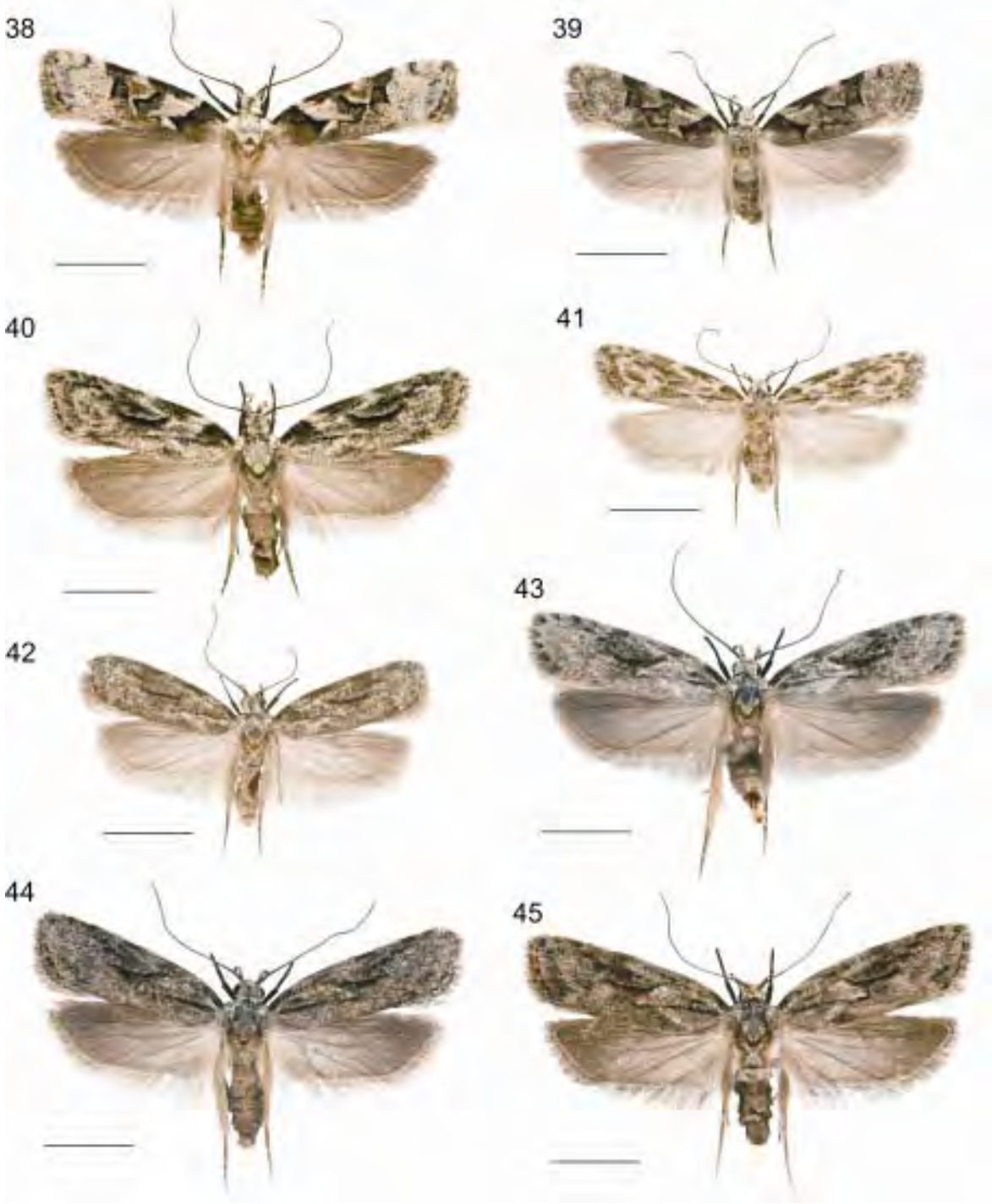
(13, 14) *I. copiosella*, 13 male (HB), 14 female (DN); (15) *I. walkerae*, male paratype (SD); (16) *I. florida*, male holotype (NN); (17, 18) *I. mira*, 17 male (FD), 18 female (FD).

(19, 20) *I. apodoxa*, 19 male (WA), 20 female (WN); (21, 22) *I. katadiktya*, 21 male paratype (MK), 22 female paratype (MK); (23, 24) *I. notodoxa*, 23 male paratype (NN), 24 female paratype (NN).

(25, 26) *I. acmonias*, 25 male paratype (SL), 26 female (BR); (27, 28) *I. lignyarcha*, 27 male paratype (TO), 28 female paratype (TO); (29, 30) *I. picarella*, 29 male (NN), 30 female (MB).

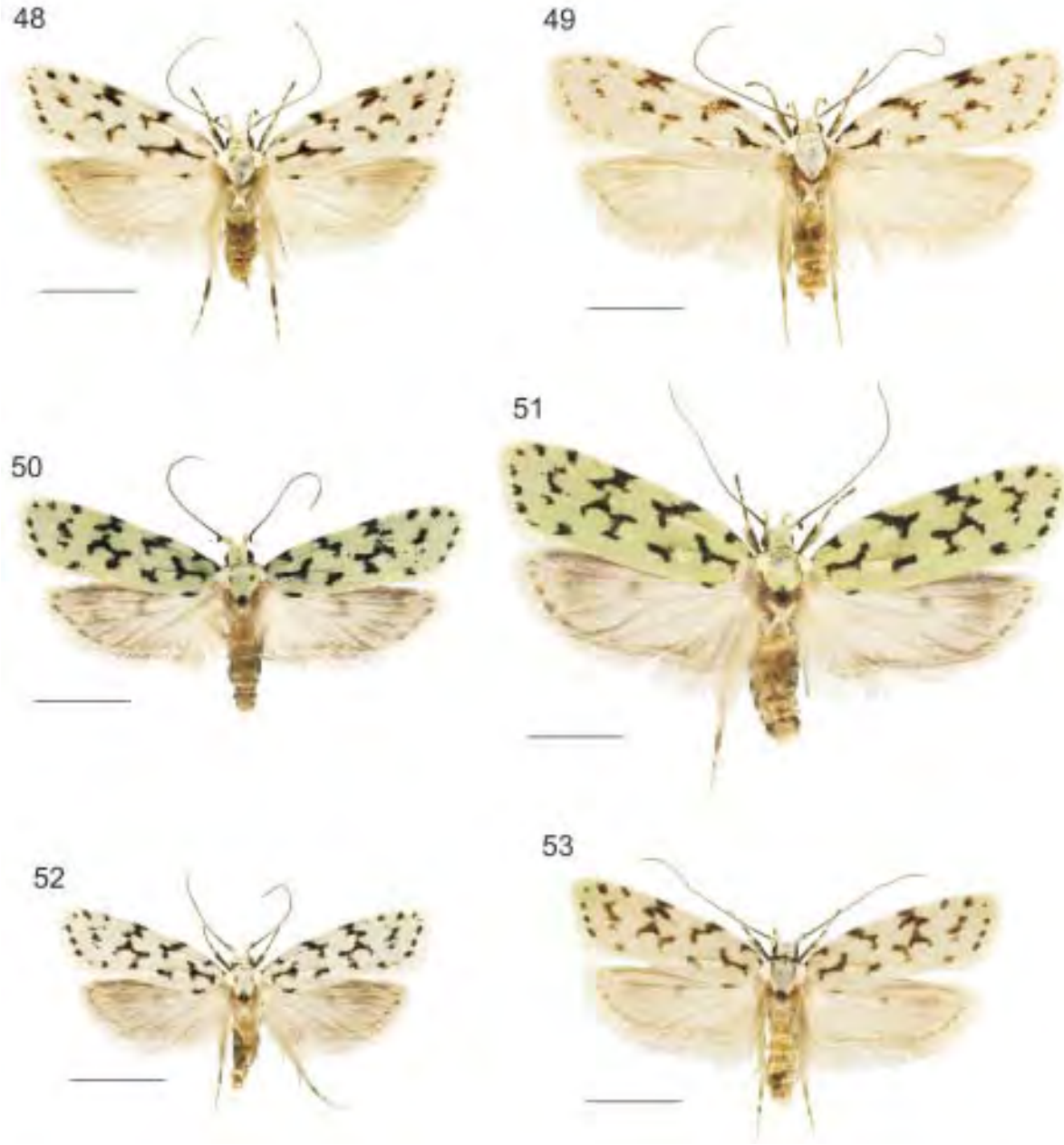


(31, 32) *I. metadelta*, 31 male (BP), 32 female (BP); (33–35) *I. balanophora*, 33 male (AK), 34 male (RI), 35 female (TO); (36, 37) *I. churtoni*, 36 male (AK), 37 female (BP).



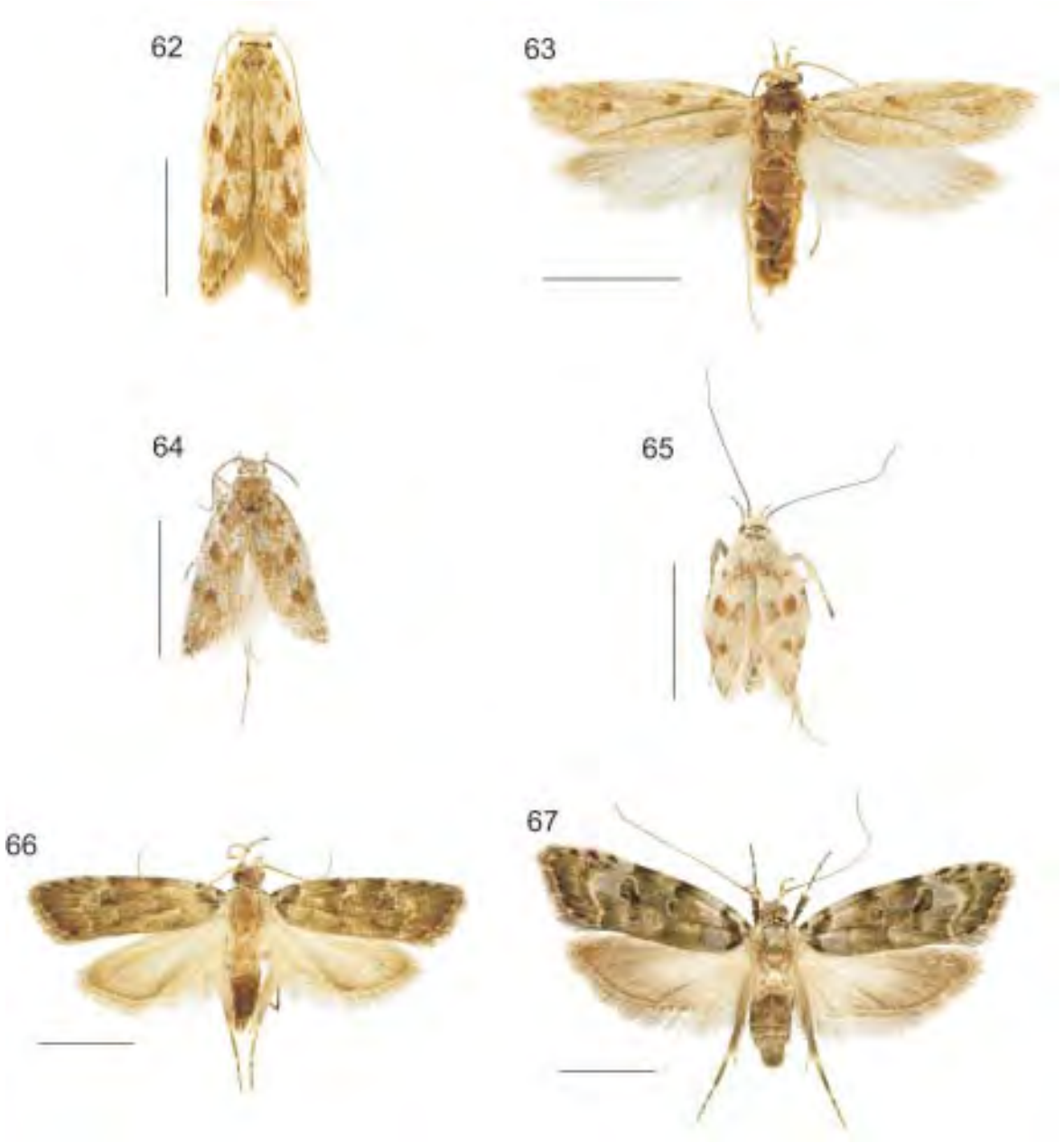
(38, 39) *I. epiphanes*, 38 male (AK), 39 female (AK); (40–42) *I. mesoschista*, 40 male (AK), 41, 42 females (AK); (43–45) *I. haumu*, 43, 44 male paratypes (ND), 45 female paratype (ND).

(46) *I. dulcior*, male paratype (ND); (47) *I. quinquejacula*, male paratype (TH).

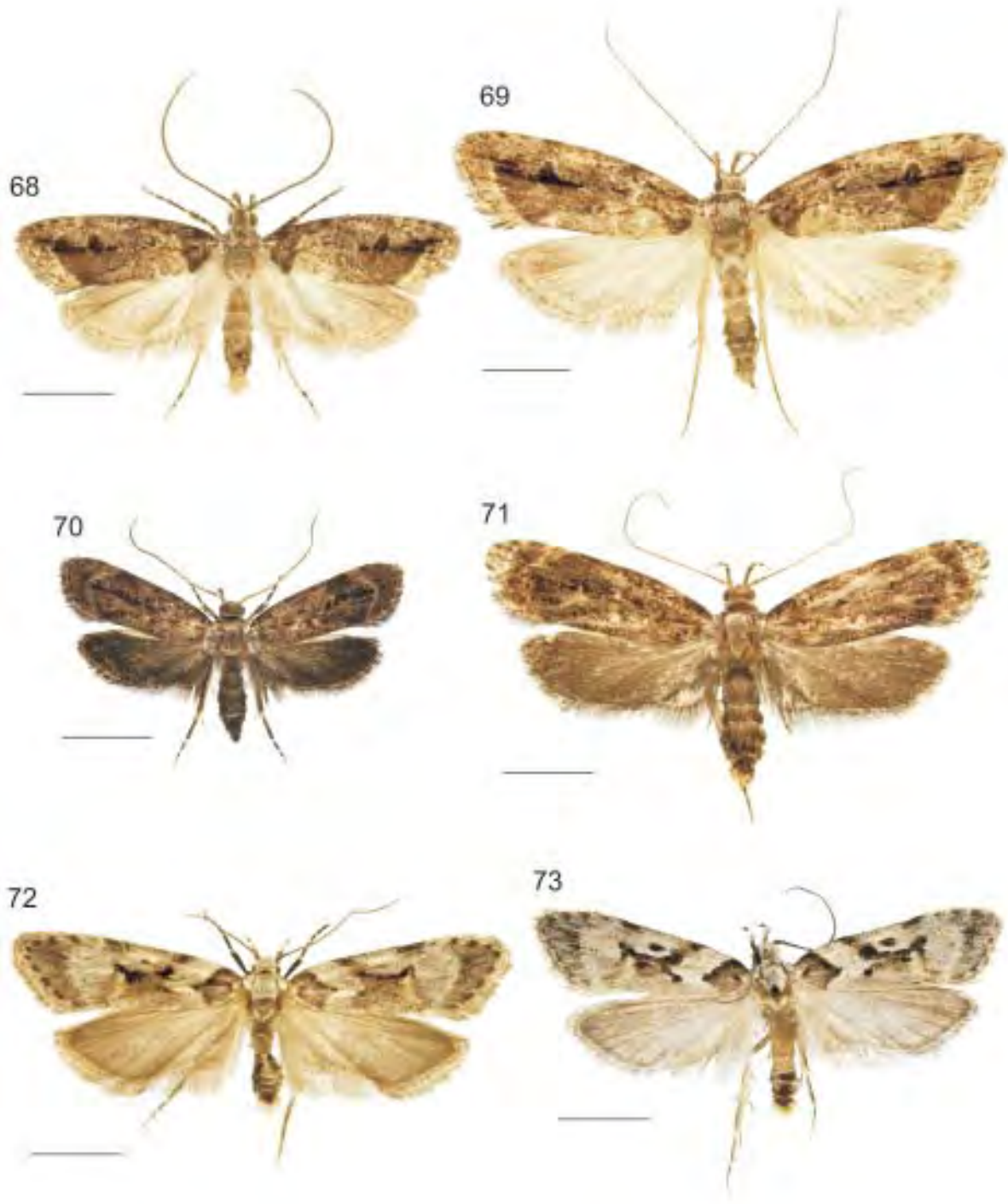


(48, 49) *I. hudsoni*, females, 48 (AK), 49 (BP); (50–53) *I.huttonii*, 50 male (SC), 52 male (NN), 51, 53 females (NN).

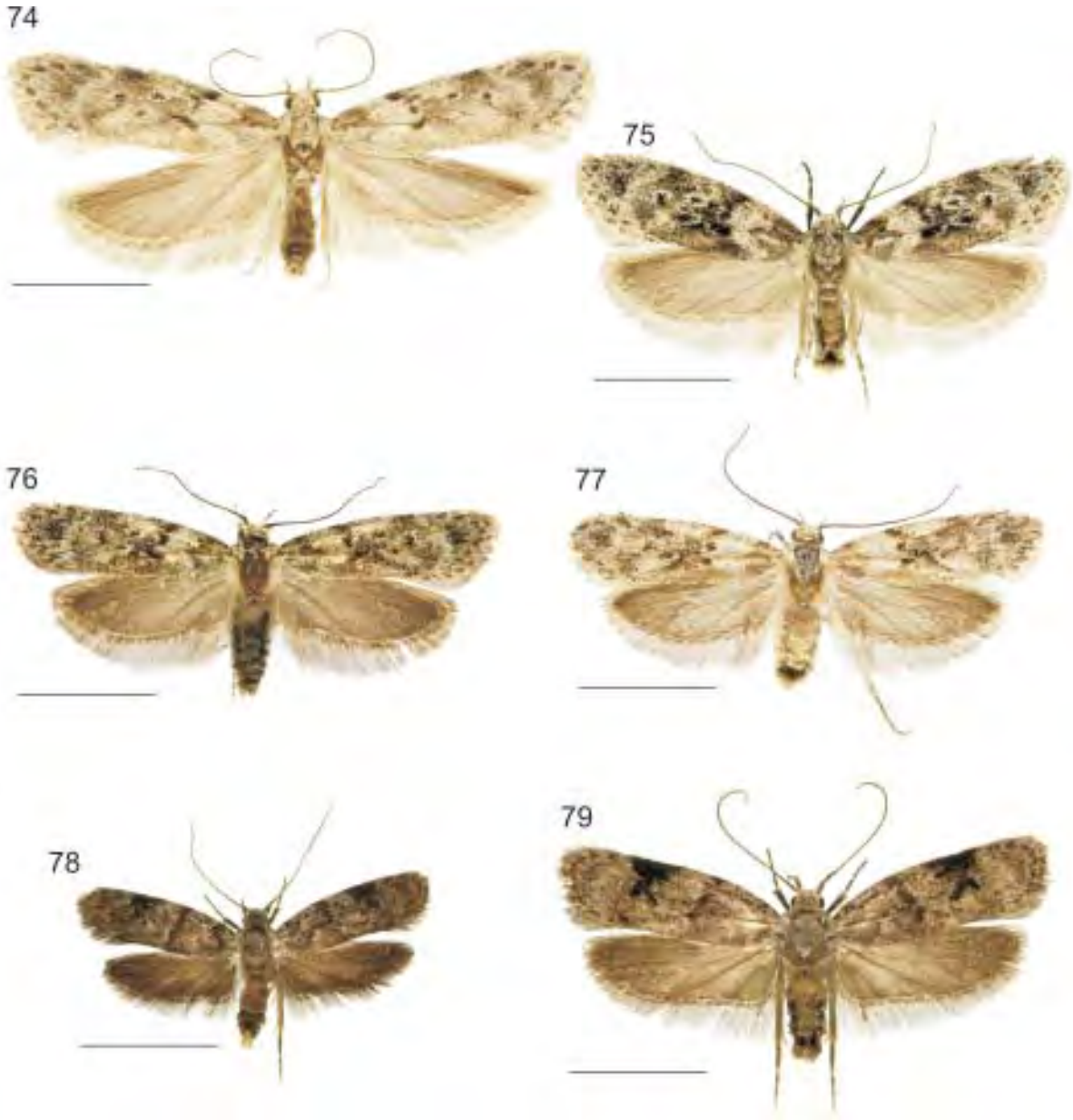
(54–57) *I. peroneanella*, 54 male (Poor Knights Is. ND), 55 female (AK), 56 male (AK), 57 female (TK); (58, 59) *I. taingo*, 58 female paratype (ND), 59 male paratype (ND); (60, 61) *I. heroica*, 60 male (FD), 61 female NN).



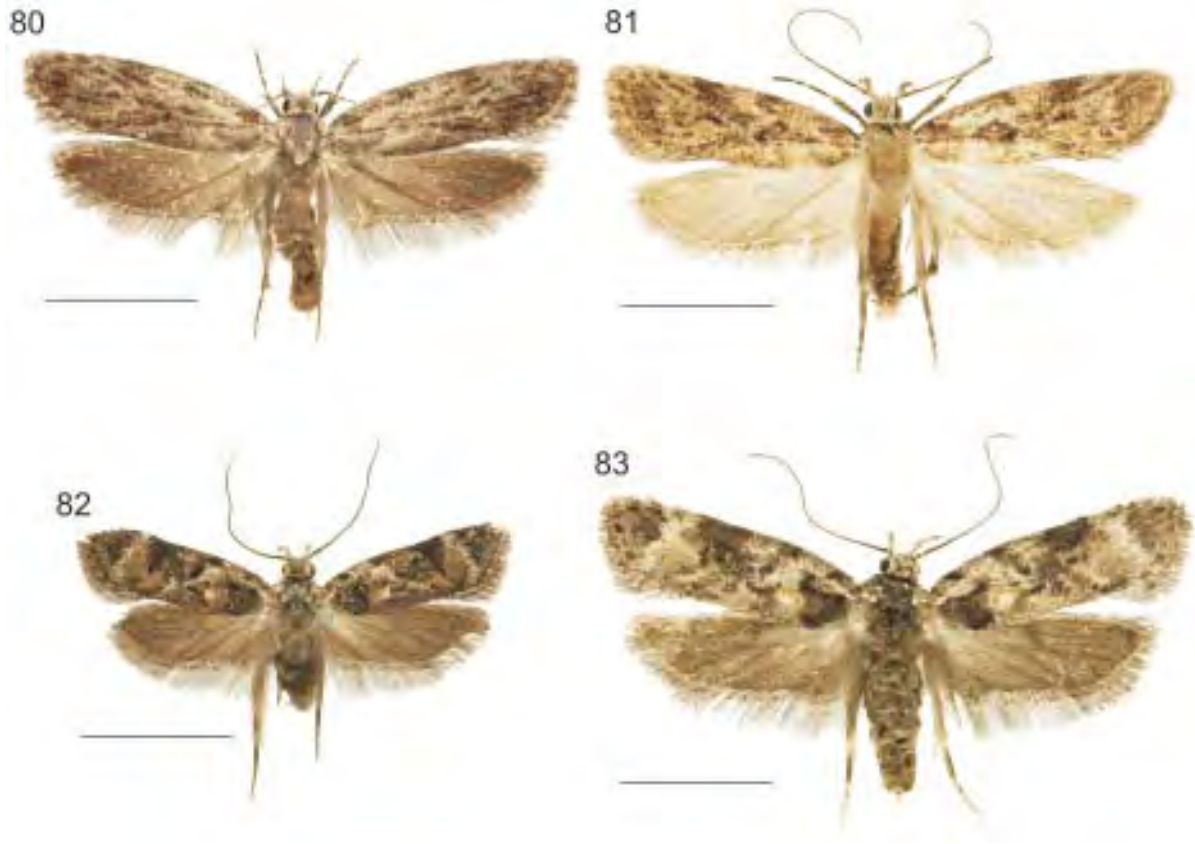
(62, 63) *I. oleariae*, 62 male (SN), 63 female (SN); (64, 65) *I. spheniscella*, 64 male holotype (SN), 65 female paratype (SN); (66, 67) *I. prasophyta*, 66 male (ND), 67 female (ND).



(68, 69) *I. caustopa*, 68 male (WN), 69 female (WN); (70, 71) *I. dasydisca*, 70 male paratype (AK), 71 female paratype (ND) (very worn specimen); (72, 73) *I. manubriata*, males, 72 (OL), 73 (CO).



(74, 75) *I. convulsella*, 74 male (MC), 75 female (NN); (76, 77) *I. gekkonella*, 76 male paratype (DN), 77 female paratype (DN); (78, 79) *I. minimira*, 78 male holotype (AK), 79 female paratype (ND).



(80) *I. gibbsi*, female paratype (AK); (81) *I. rigescens*, male (WN); (82, 83) *I. phaeoptila*, 82 male (AK), 83 female (AK).

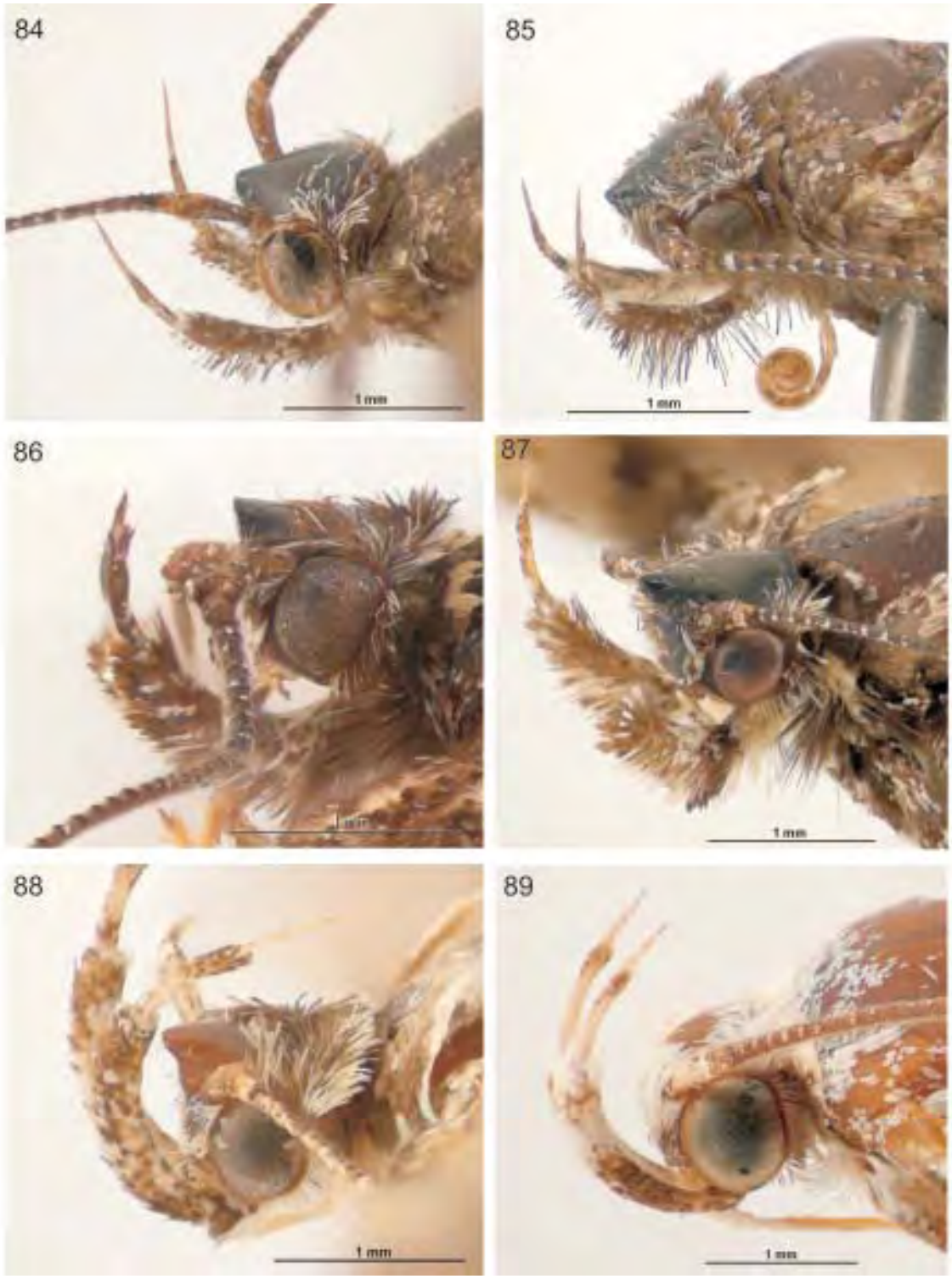
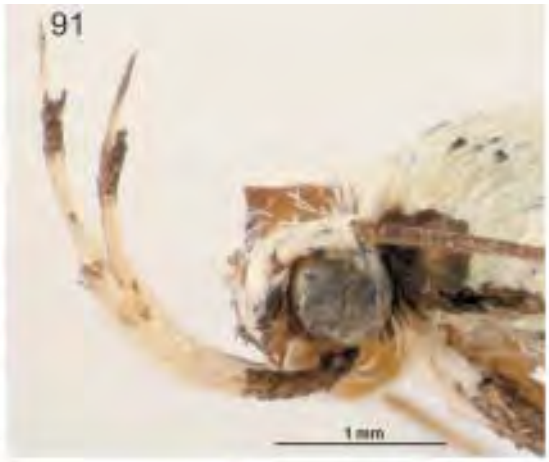


Fig. 84–94 *Izatha*, adult heads, lateral view (partially descaled) (Automontage photographs by B. E. Rhode): (84) *I. copiosella*; (85) *I. walkerae*; (86) *I. florida*; (87) *I. mira*; (88) *I. metadelta*; (89) *I. heroica*.



Heads. (90) *I. hudsoni*, (91) *I. huttonii*, (92) *I. peroneanella* (note blunt protuberance); (93, 94) Heads, dorsal view, males, 93, *I. walkerae* (note long antennal ciliations), 94, *I. copiosella*.

Fig. 95–97 Forewings, black and white *Izatha* species, diagnostic characters arrowed: (95) *I. katadiktya* (note obtuse angle at which basal blotch meets costa and white inclusion in blotch); (96) *I. acmonias* (note right angle at which basal blotch meets costa, blotch without white inclusion); (97) *I. churtoni* (note white gap in outer edge of basal blotch, black cilia). N.b. *I. lignyarcha* and *I. picarella* cannot be distinguished from *I. acmonias* on forewing characters. (Automontage photographs by B. E. Rhode.)

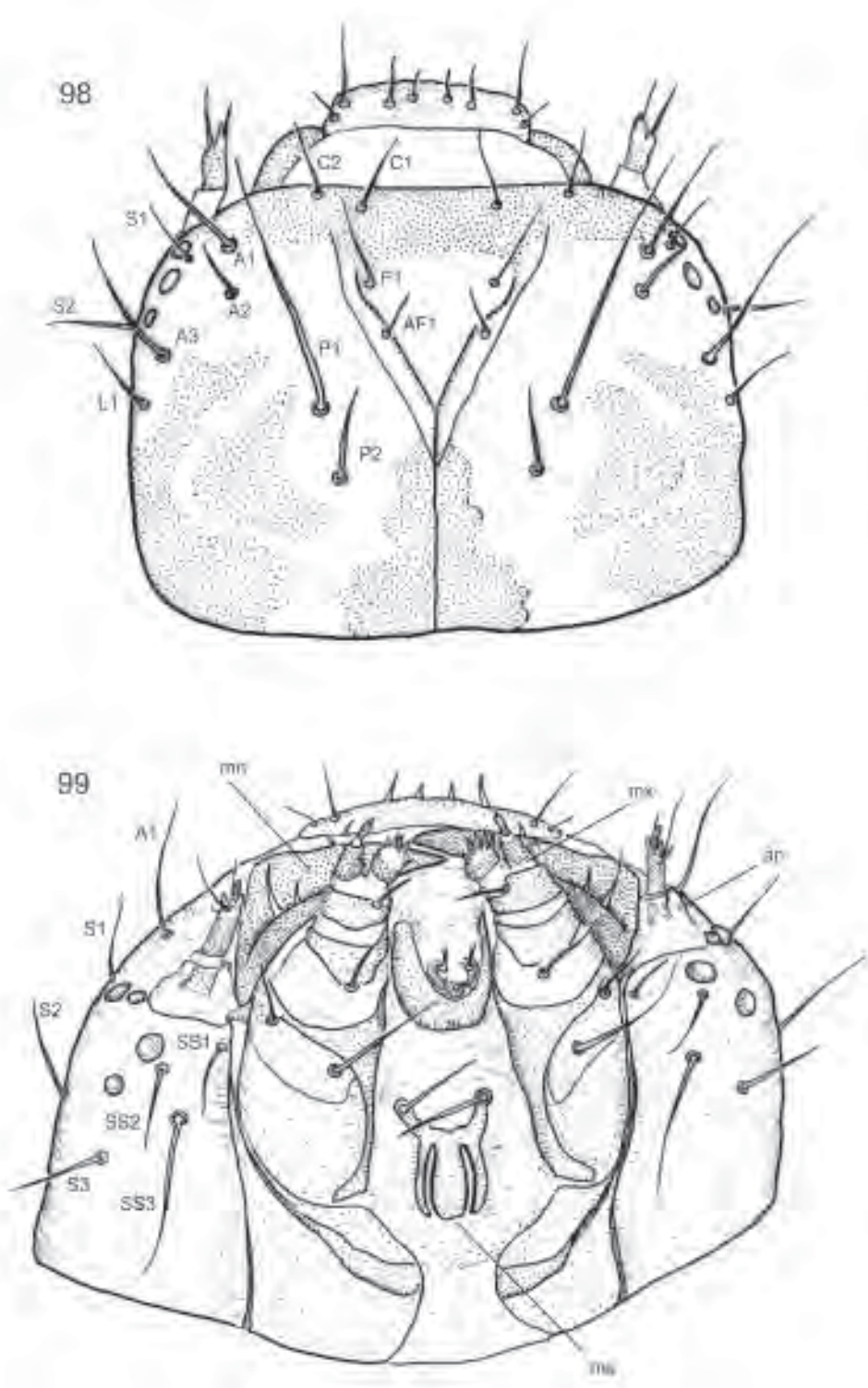


Fig. 98, 99 Larval head, *Izatha* sp., showing chaetotaxy: (98) dorsal view; (99) ventral view, slightly oblique. (an, antenna; mn, mandible; ms, mentum sclerite; mx, maxilla.)

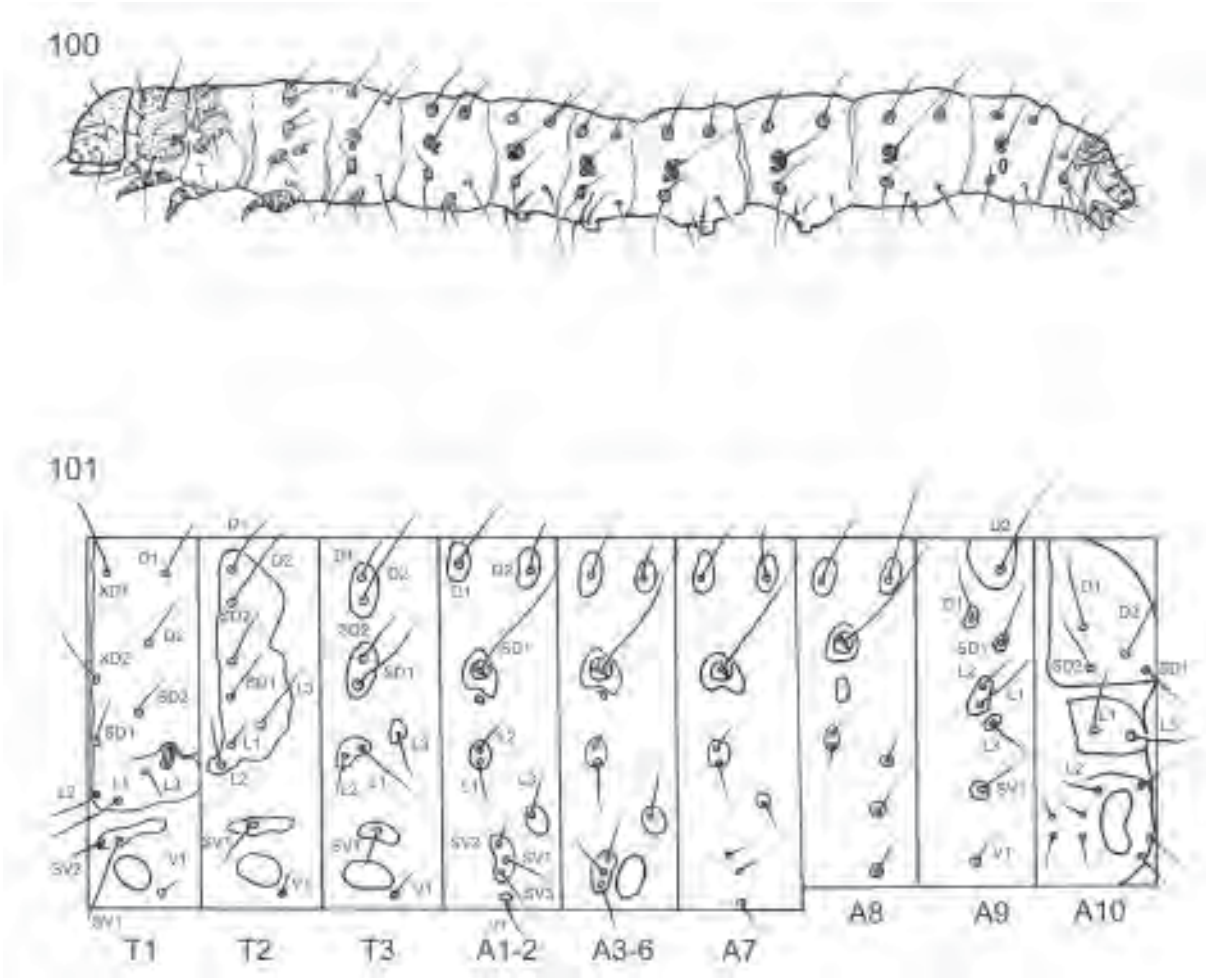


Fig. 100, 101 Larva, *Izatha* sp.: (100) habitus, lateral; (101) chaetotaxy, thorax and abdomen.

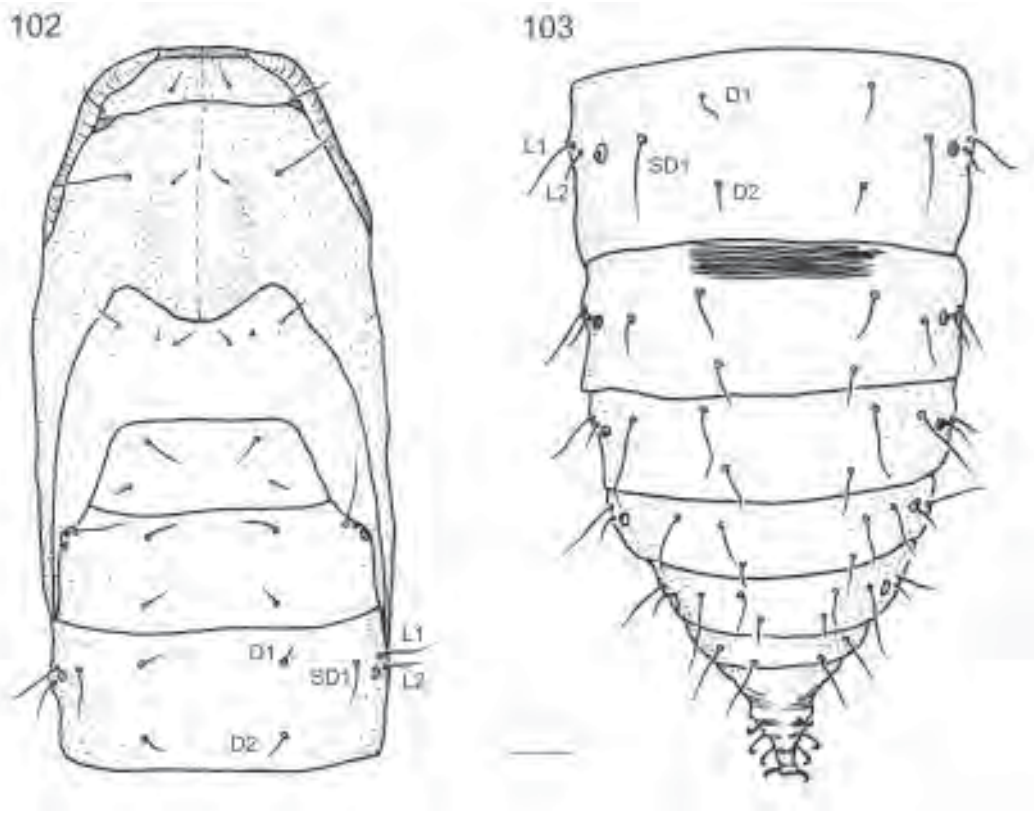


Fig. 102, 103 Pupa, *Izatha oleariae*, dorsal view: (102) head, thorax, A1–3; (103) A4–10.

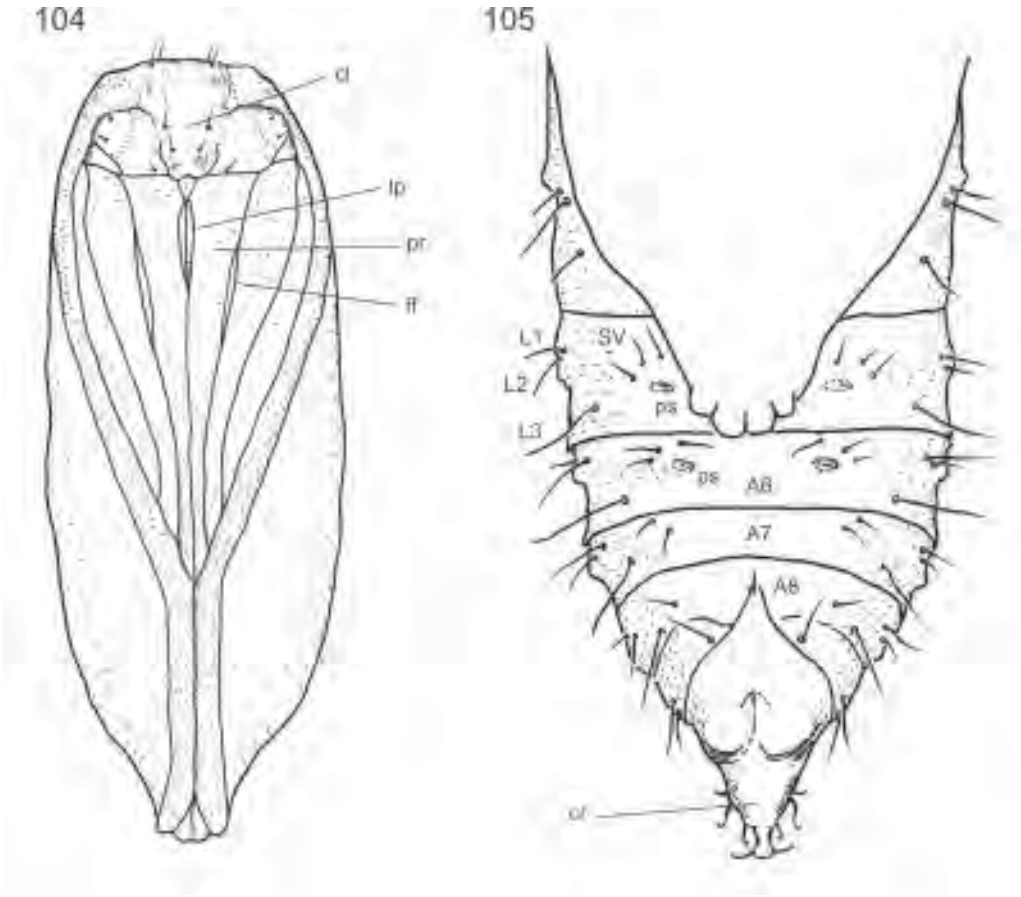


Fig. 104, 105 Pupa, *Izatha olearíae*, ventral view: (104) head, thorax; (105) A4–10. (cl, clypeus; cr, cremaster; ff, fore–femur; lp, labial palpi; pr, proboscis; ps, proleg scar.)

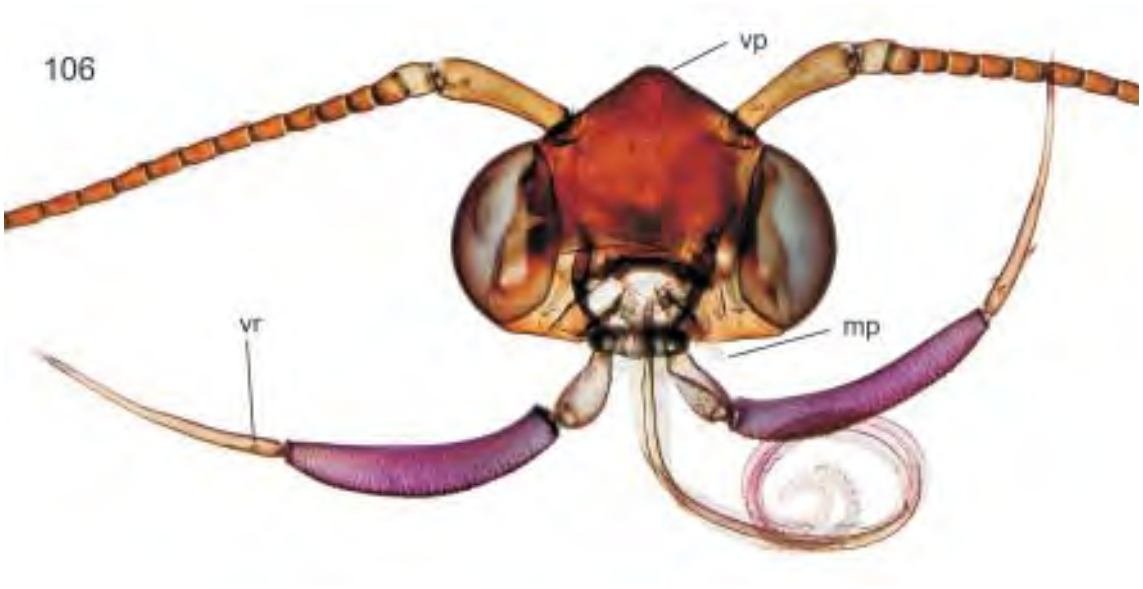


Fig. 106 Adult head, *Izatha copiosella*, anterior view. (mp, maxillary palp; vp, vertex protuberance; vr, organ of vom Rath.) (Automontage photograph by R. J. B. Hoare and B. E. Rhode.)

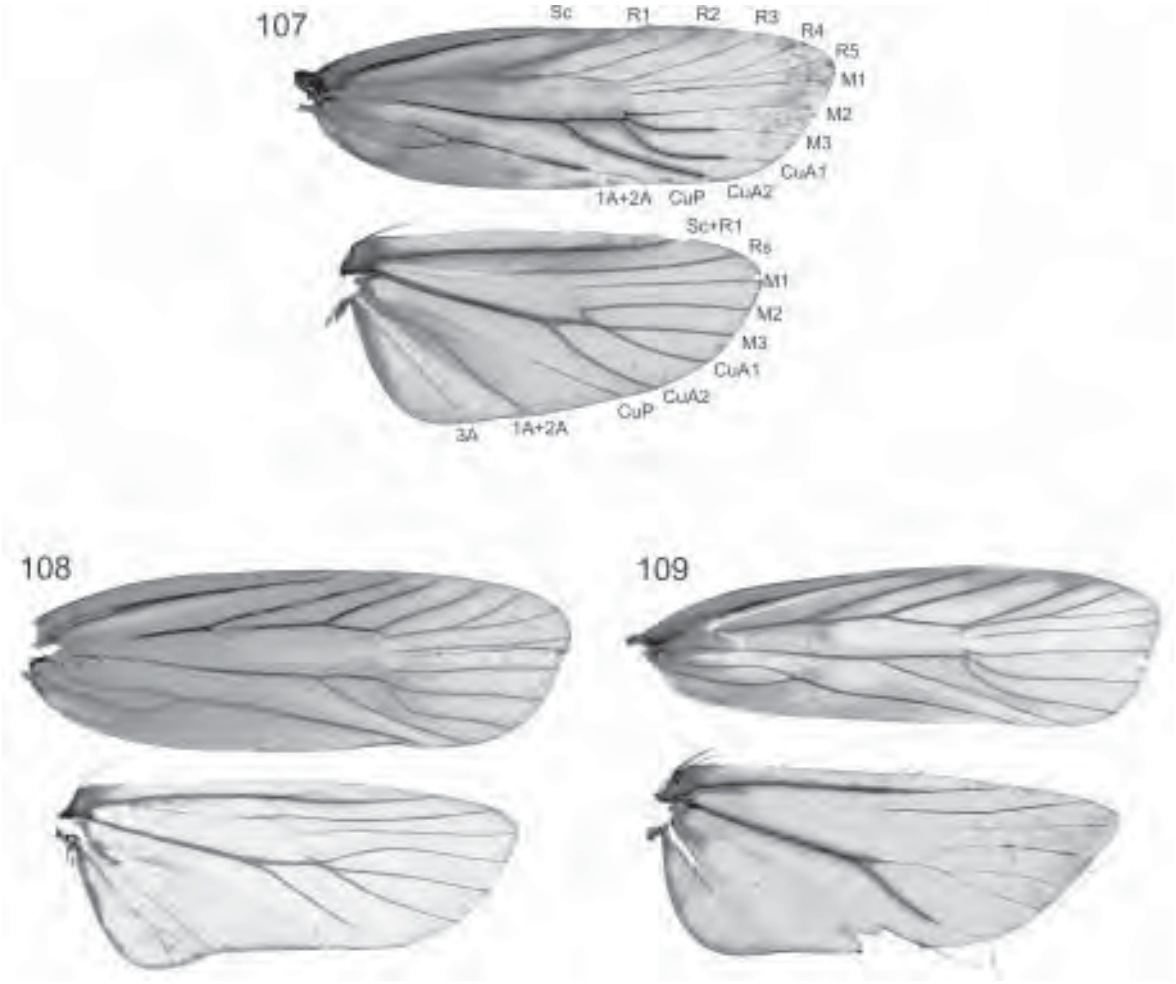


Fig. 107–109 *Izatha*, adult female wing venation: (107) *I. mira*; (108) *I. churtoni* (note forked 3A of hindwing); (109) *I. phaeoptila*. (Automontage photographs by R. J. B. Hoare and B. E. Rhode.)

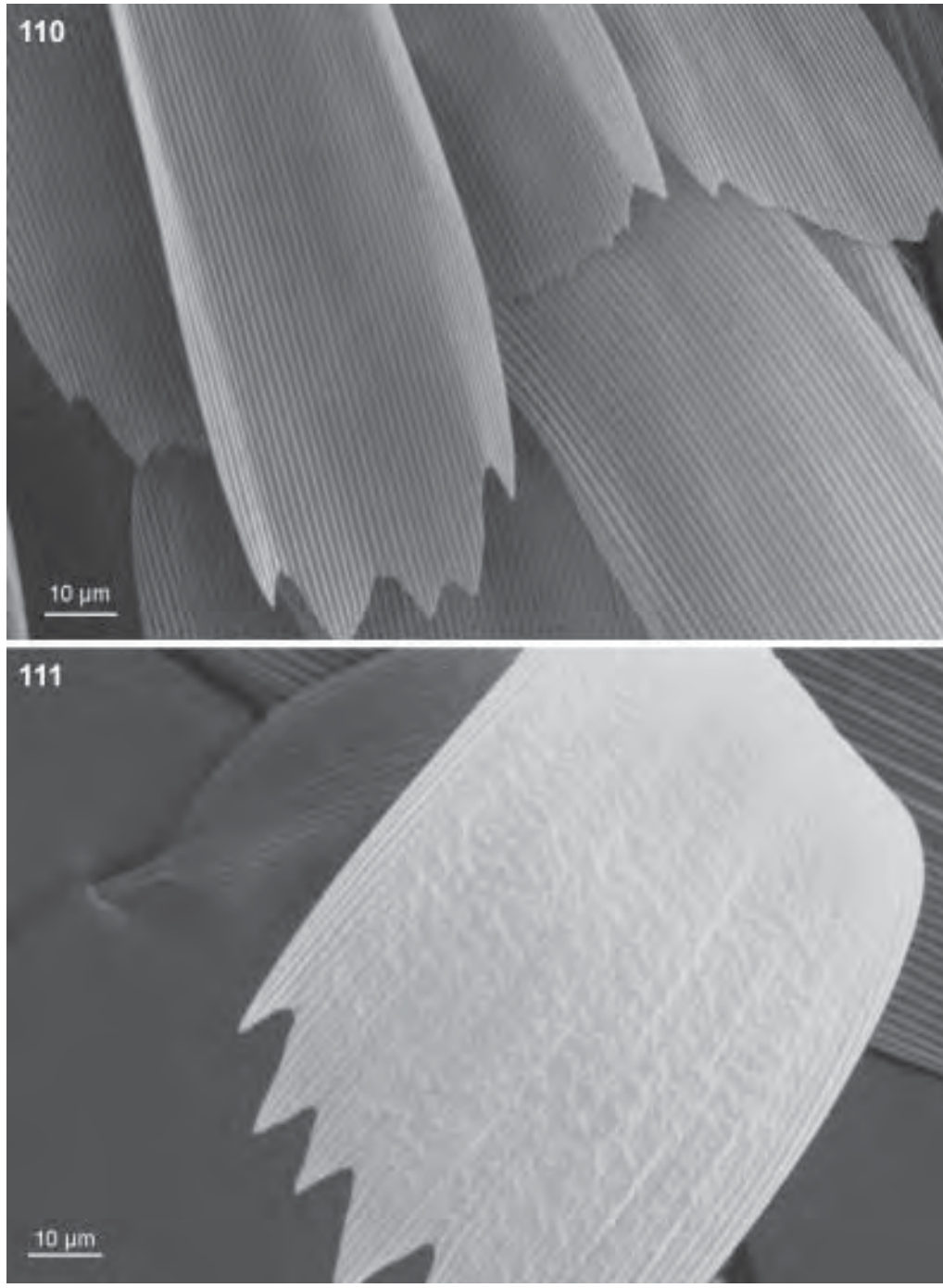


Fig. 110, 111 *Izatha epiphanes*, forewing upperside scales: (110) normal scales, upper lamina; (111) curled scale of scale–tuft, showing corrugated lower lamina. (SEM photographs by A. E. Seago.)

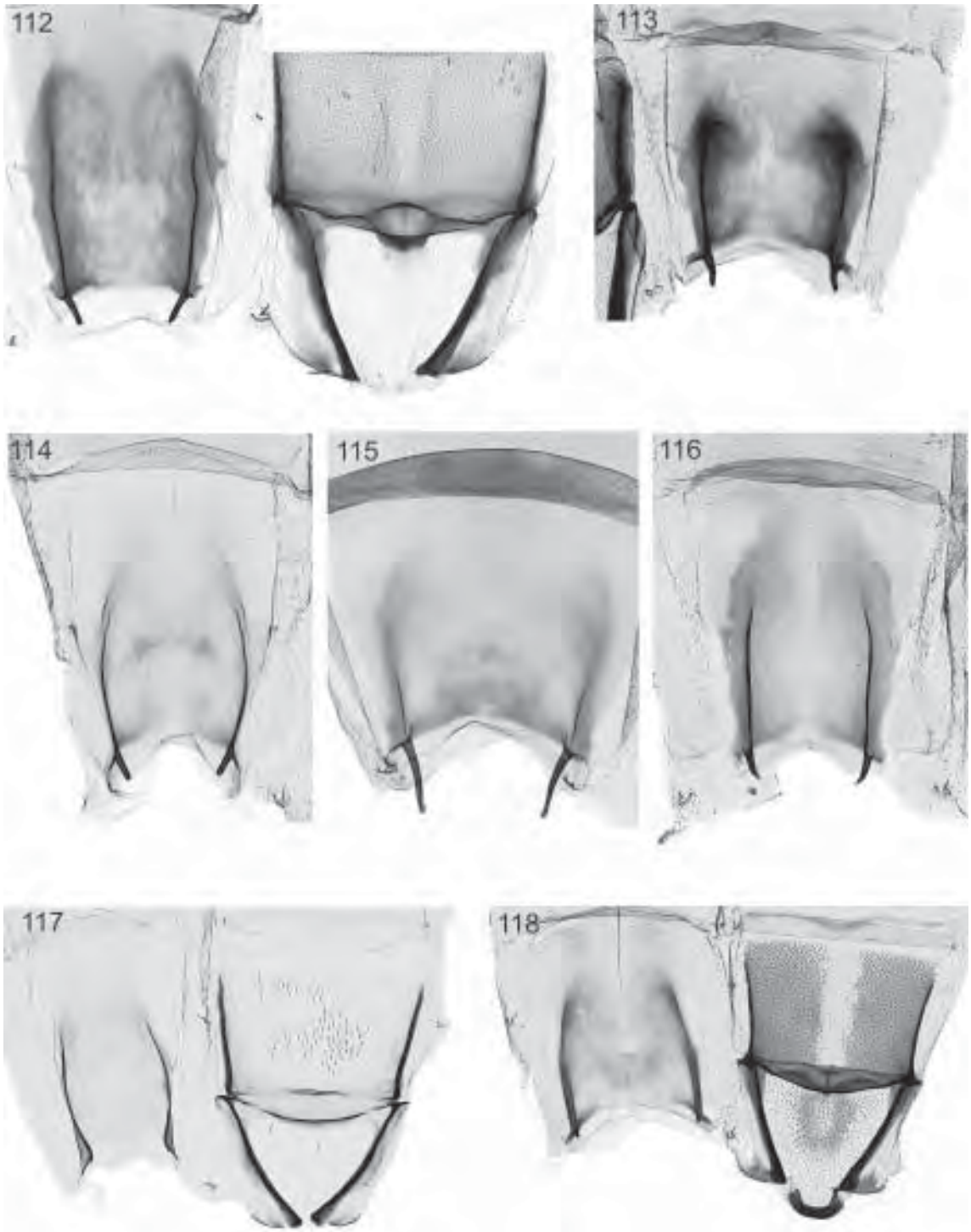


Fig. 112–118 *Izatha*, adult abdominal base, descaled: (112) *I. attactella* male, S2 and T1–2; (113) *I. mira* male, S2; (114) *I. apodoxa* male, S2; (115) *I. balanophora* female, S2; (116) *I. peroneanella* male, S2; (117) *I. oleariae* male, S2 and T1–2; (118) *I. prasophyta* male, S2 and T1–2. (Automontage photographs by R. J. B. Hoare and B. E. Rhode.)

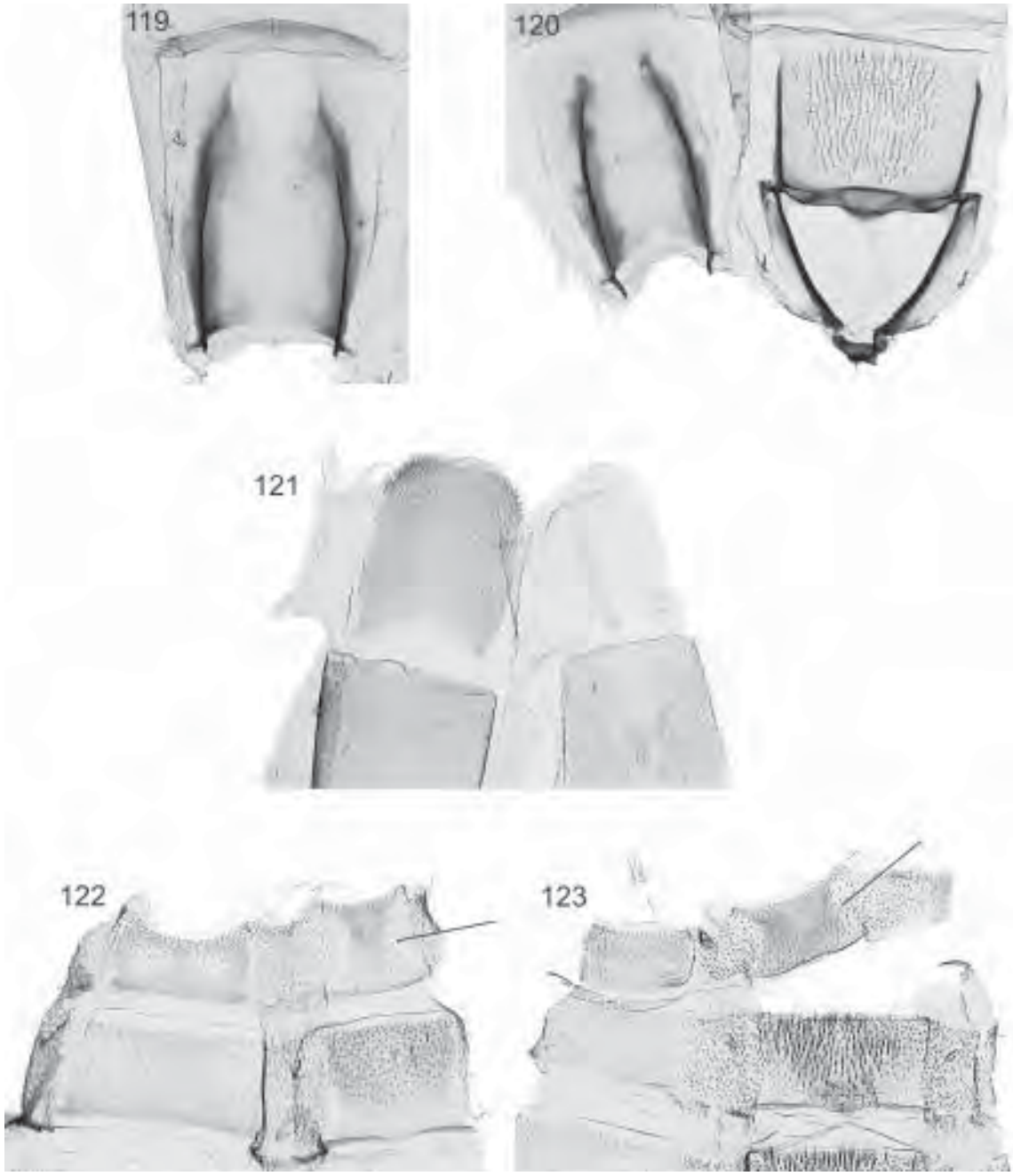


Fig. 119–123 *Izatha*, adult abdomens, descaled: (119) *I. caustopa* male, S2; (120) *I. convulsella* male, S2 and T1–2; (121) *I. copiosella* male, S8 and T7–8; (122) *I. oleariae* posterior segments, T8 arrowed; (123) *I. spheniscella* posterior segments, T8 arrowed. (Automontage photographs by R. J. B. Hoare and B. E. Rhode.)

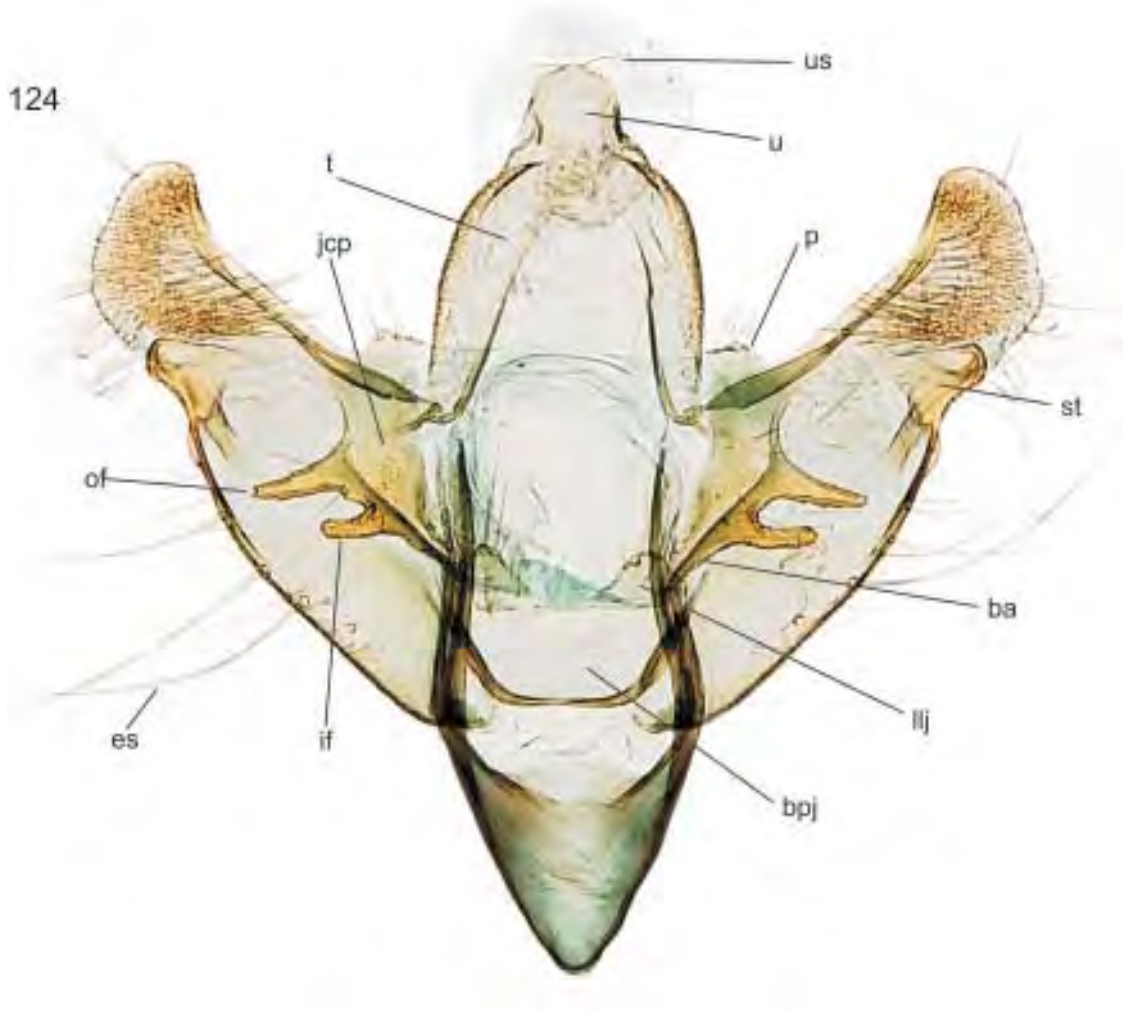


Fig. 124 *Izatha mesoschista*, male genital capsule morphology. (ba, basal arm of juxto–costal plate; bpj, base–plate of juxta; es, enlarged seta of sacculus; if, inner flange of juxto–costal plate; jcp, juxto–costal plate; llj, lateral lobe of juxta; of, outer flange of juxto–costal plate; p, pulvinus; st, apical tooth of sacculus; t, tegumen; u, uncus; us, uncus terminal seta.) (Automontage photograph by R. J. B. Hoare and B. E. Rhode.)

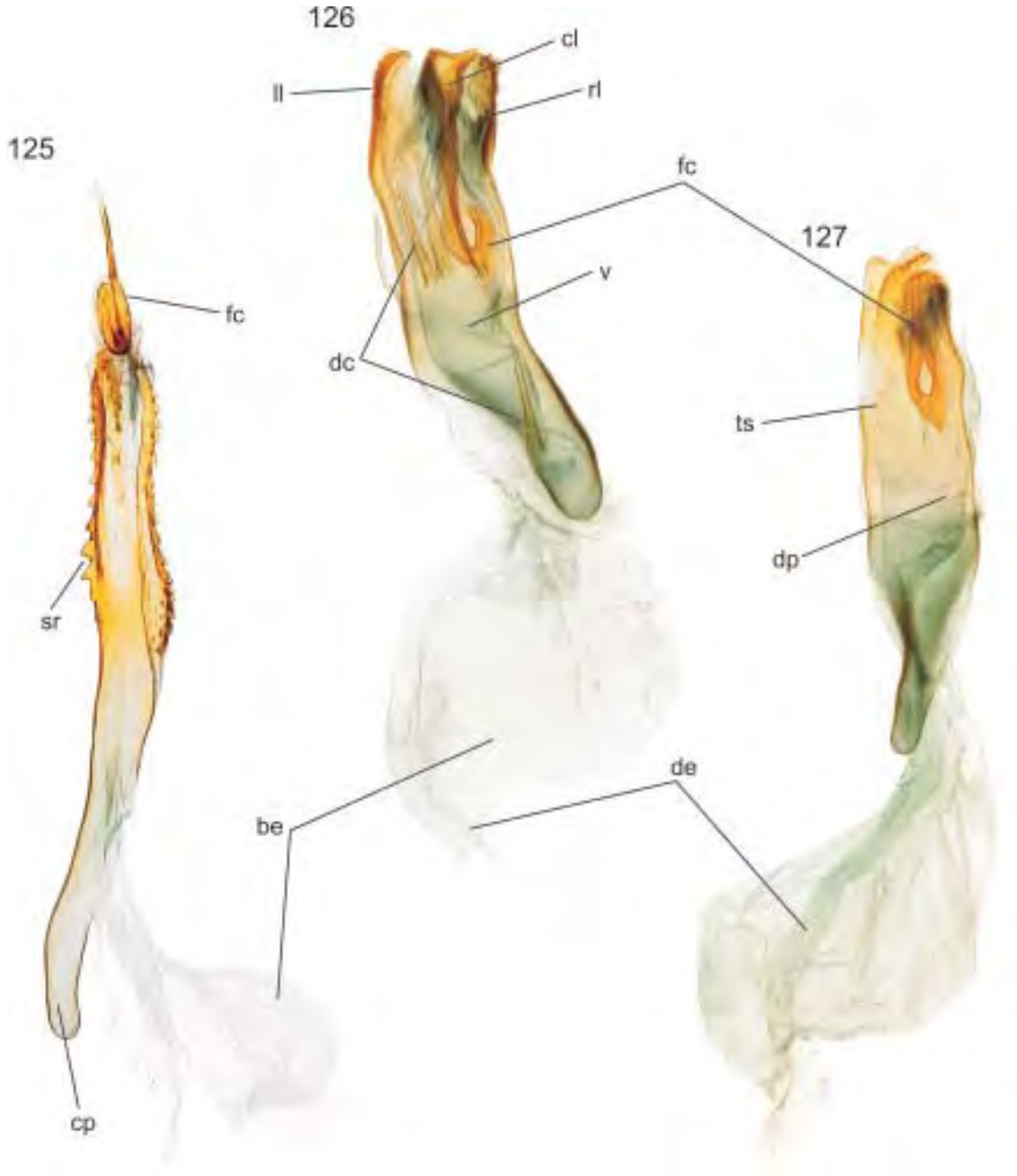


Fig. 125–127 *Izatha* spp., phalli, morphology: (125) *I. acmonias*; (126) *I. quinquejacula*; (127) *I. balanophora*. (be, bulbus ejaculatorius; cl, central sclerotised lobe of phallus; cp, caecum penis; dc, deciduous cornuti; de, ductus ejaculatorius; dp, disc–like pores of vesica; fc, fishhook cornutus; ll, left sclerotised lobe of phallus; rl, right sclerotised lobe of phallus; sr, sclerotised toothed ridge; ts, translucent spinules of vesica; v, vesica.) (Automontage photographs by R. J. B. Hoare and B. E. Rhode.)

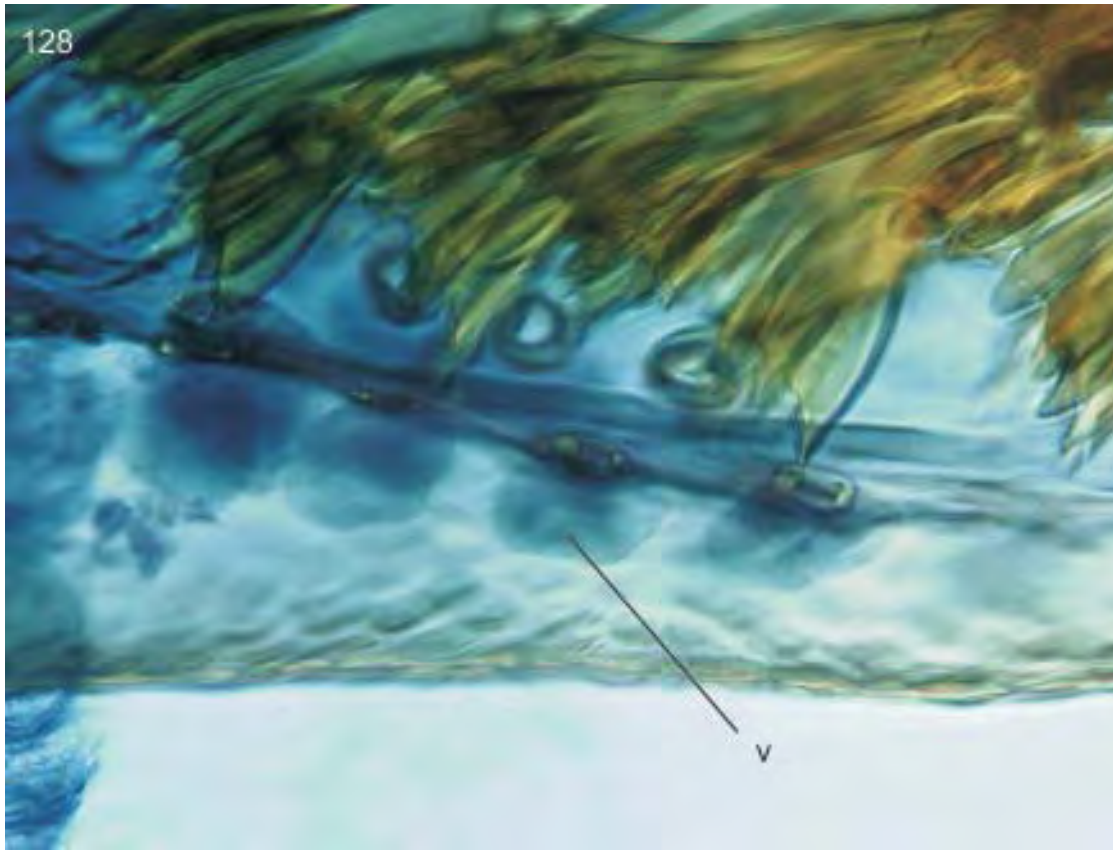


Fig. 128 *Izatha balanophora*, close-up of vesica wall, showing buttressed bases of deciduous cornuti, disc-like pores, and membranous vesicles (v) in lumen between vesica and phallus wall. (Automontage photograph by R. J. B. Hoare and Z. Zhao.)

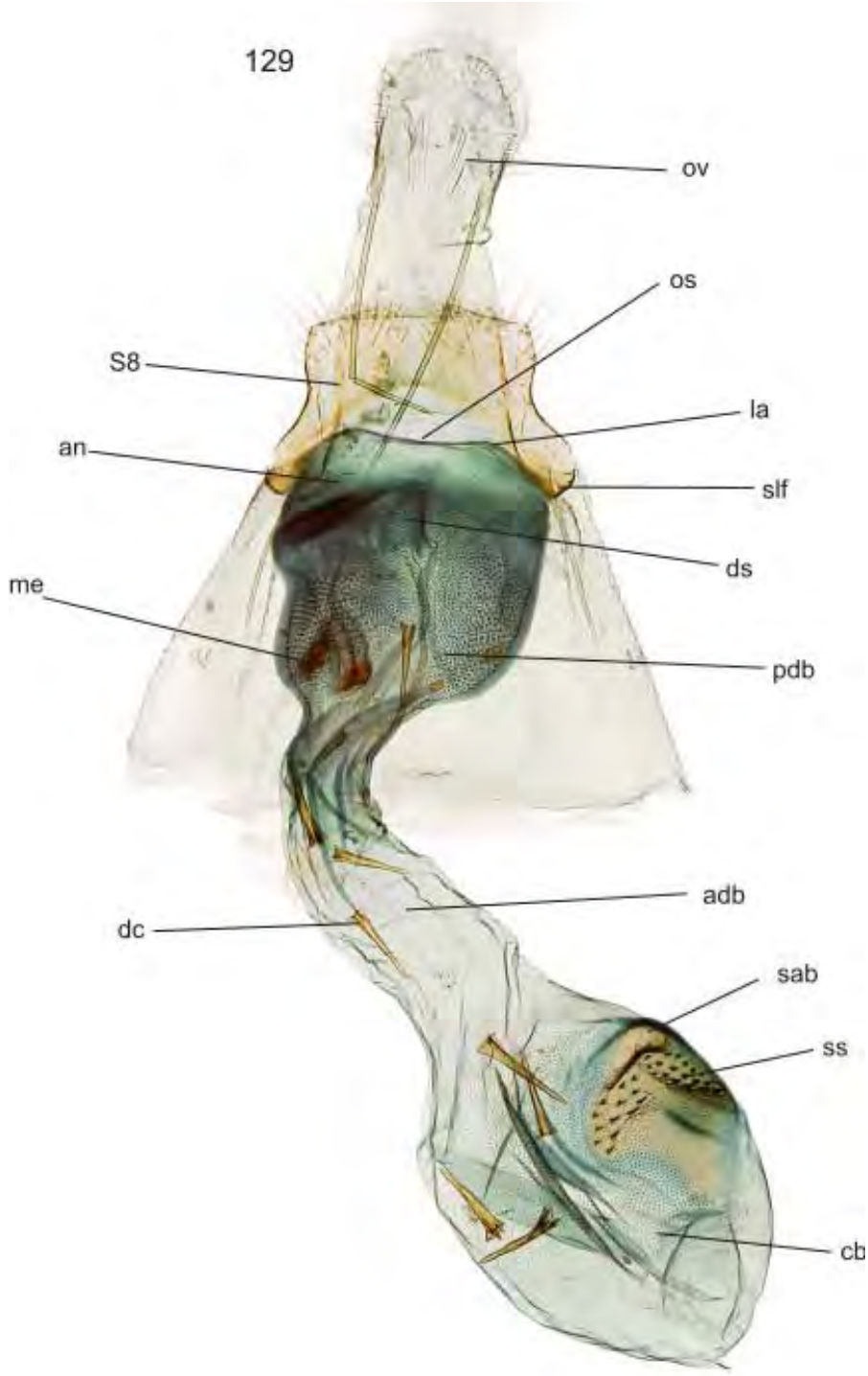


Fig. 129 *Izatha mesoschista*, female terminalia morphology, mated specimen. (adb, anterior portion of ductus bursae; an, antrum; cb, corpus bursae; dc, deciduous cornutus from male vesica; ds, ductus seminalis inception; la, lamella antevaginalis; me, melanised area of ductus bursae, probably resulting from damage by male phallus [note there are 3 such areas, corresponding to the 3 phallus spines]; os, ostium; ov, ovipositor; pdb, posterior (scobinate) portion of ductus bursae; S8, sternite 8; sab, apical boss of signum; slf, scoop–like lateral flange of S8; ss, spinose transverse strip of signum.) (Automontage photograph by R. J. B. Hoare and B. E. Rhode.)

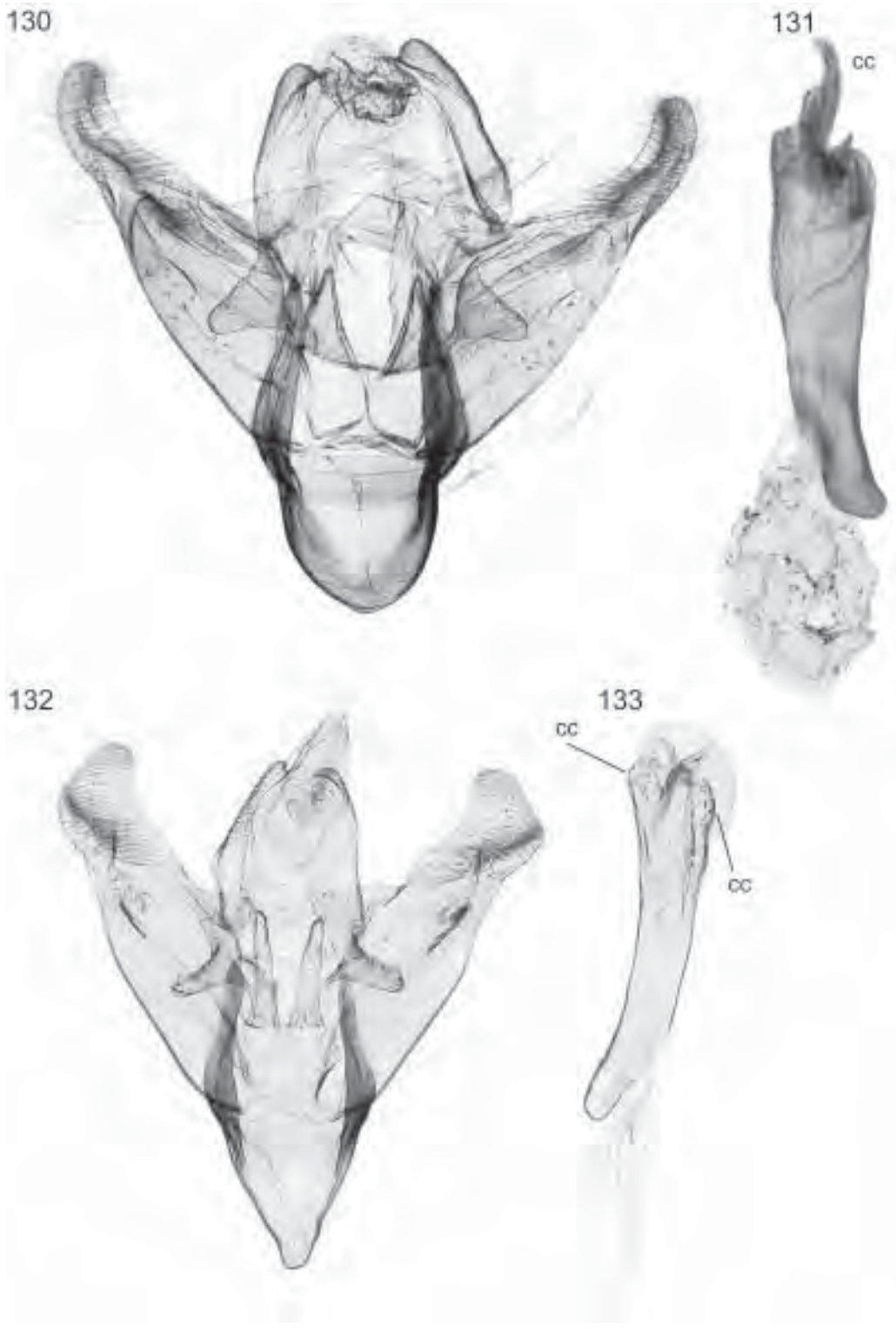
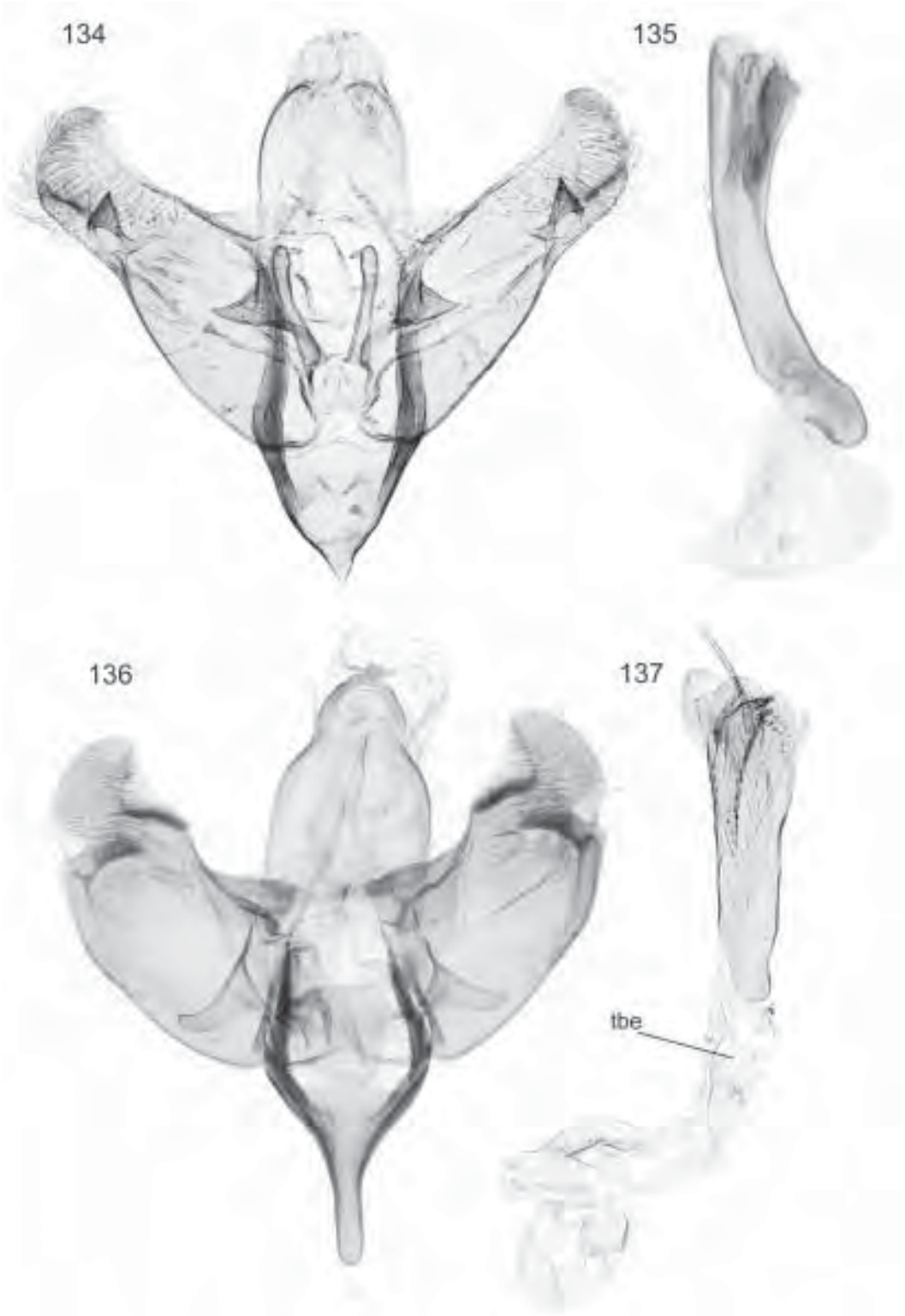
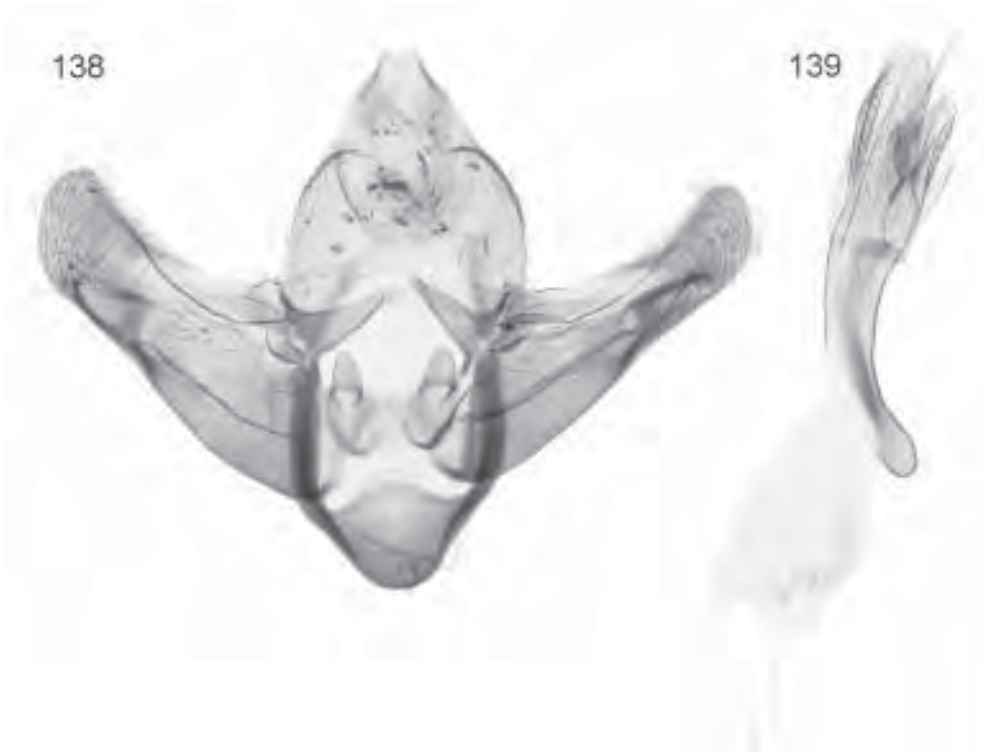


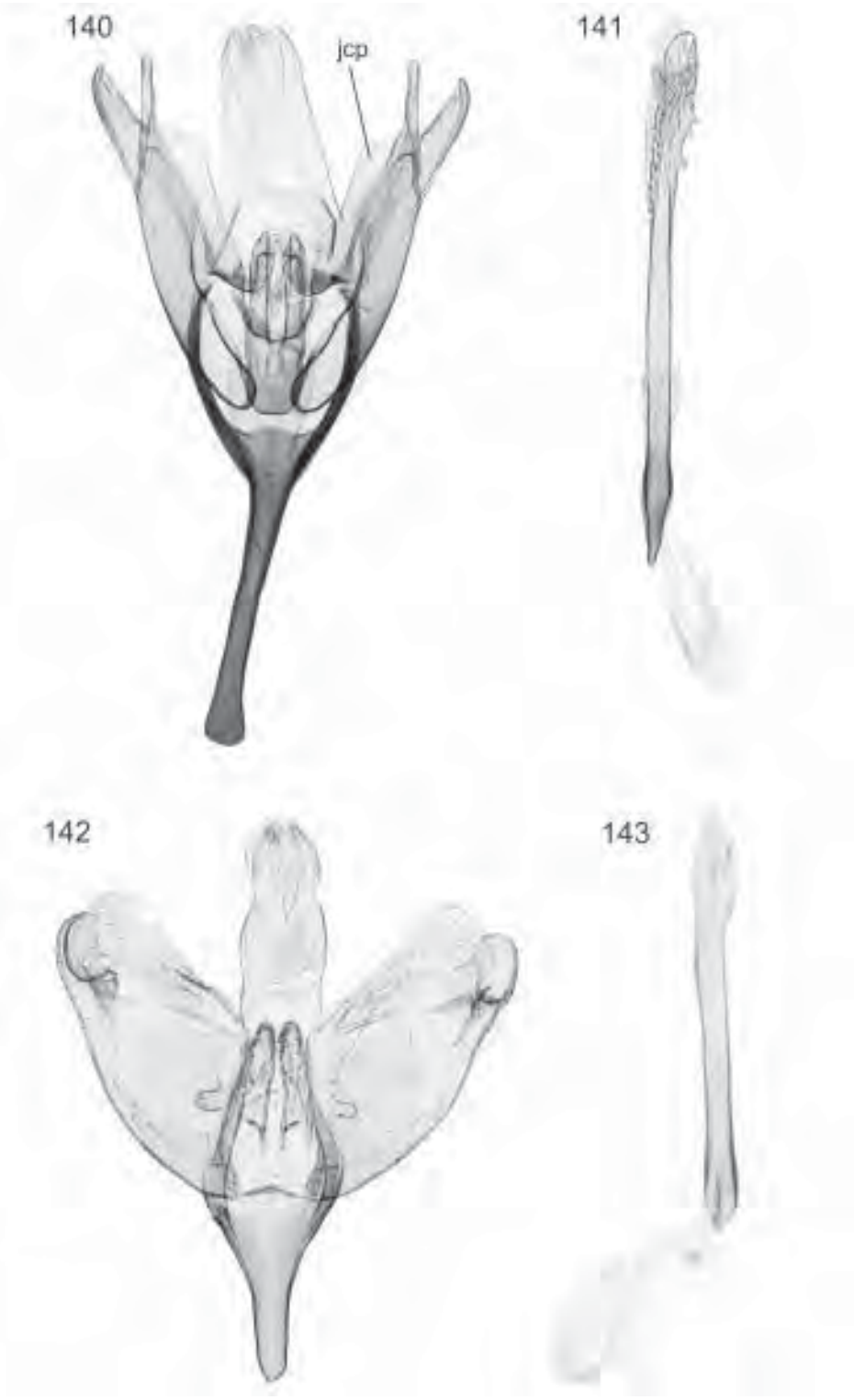
Fig. 130–258 Male genitalia of *Izatha* species (Automontage photographs by R. J. B. Hoare and B. E. Rhode). (130, 131) *Izatha attactella*: 130 genital capsule, 131 phallus (cc, compound cornutus.) (132,133) *Izatha blepharidota*: 132 genital capsule, 133 phallus. (cc, compound cornutus).



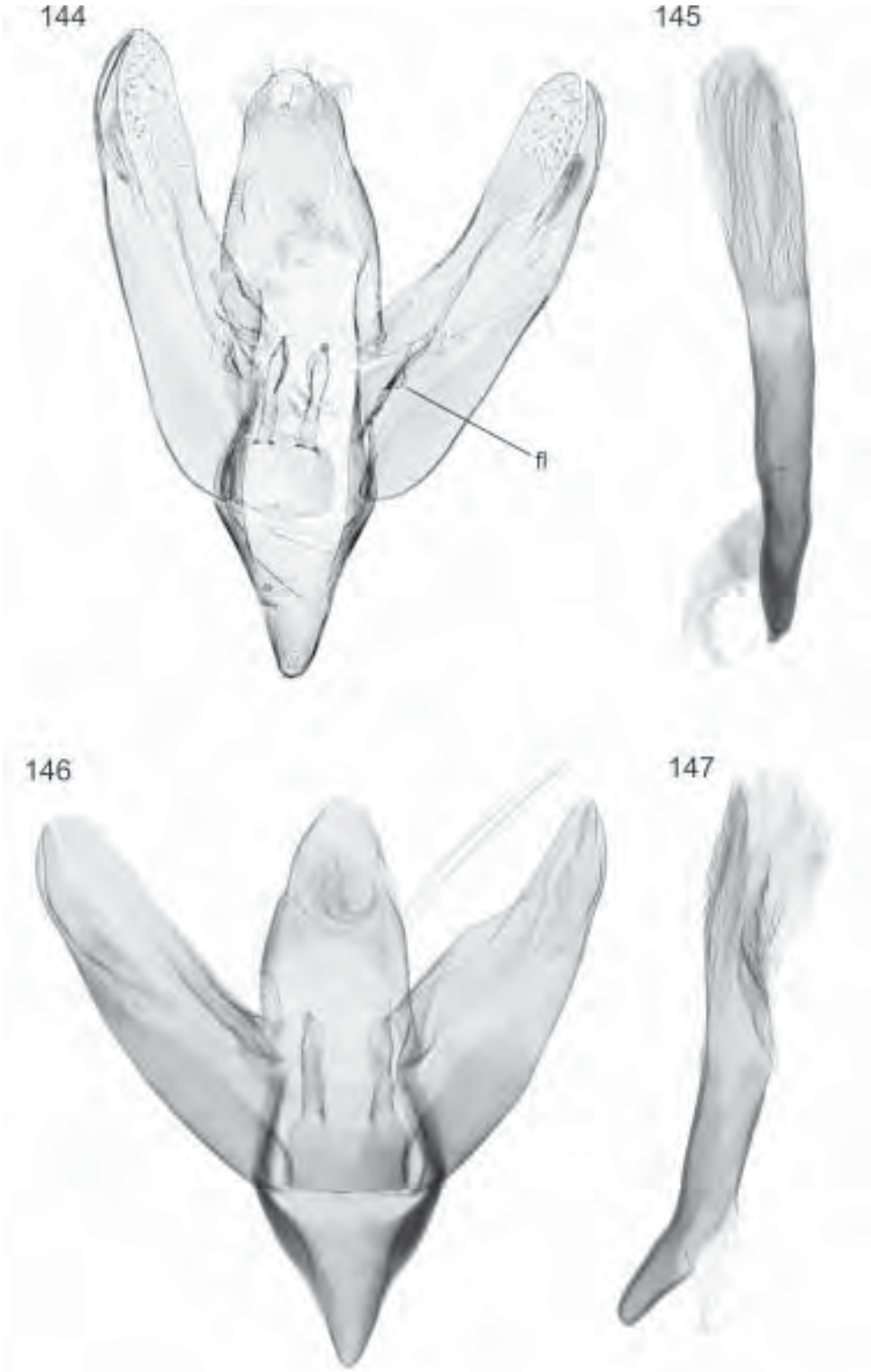
Male genitalia. (134, 135) *Izatha voluptuosa*: 134 genital capsule, 135 phallus. (136, 137) *Izatha austera*: 136 genital capsule, 137 phallus. (tbe, tubular portion of bulbus ejaculatorius.)



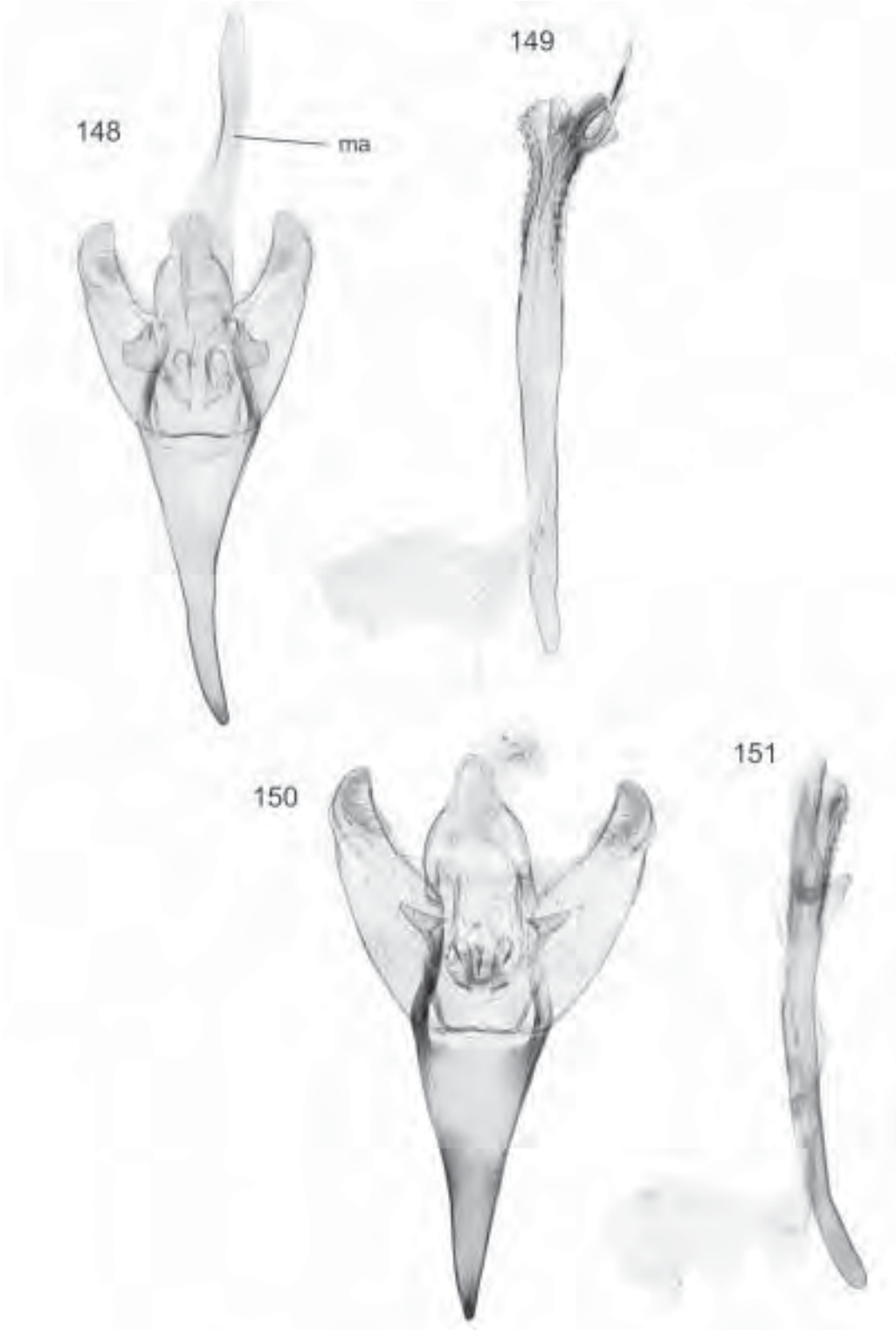
Male genitalia. (138, 139) *Izatha psychra*: 138 genital capsule, 139 phallus.



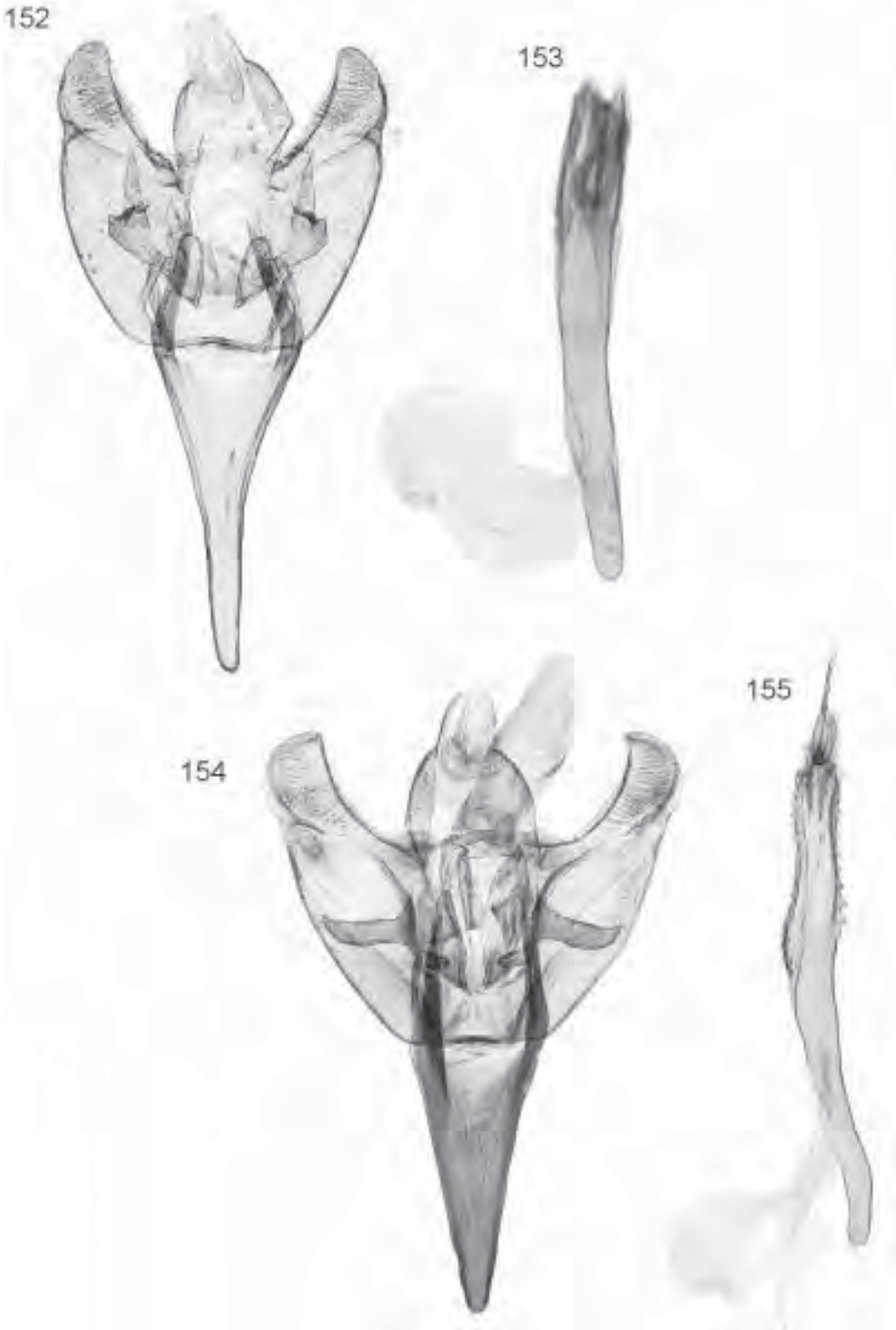
Male genitalia. (140, 141) *Izatha copiosella*: 140 genital capsule, 141 phallus. (jcp, juxto-costal plate). (142, 143) *Izatha walkerae*: 142 genital capsule, 143 phallus.



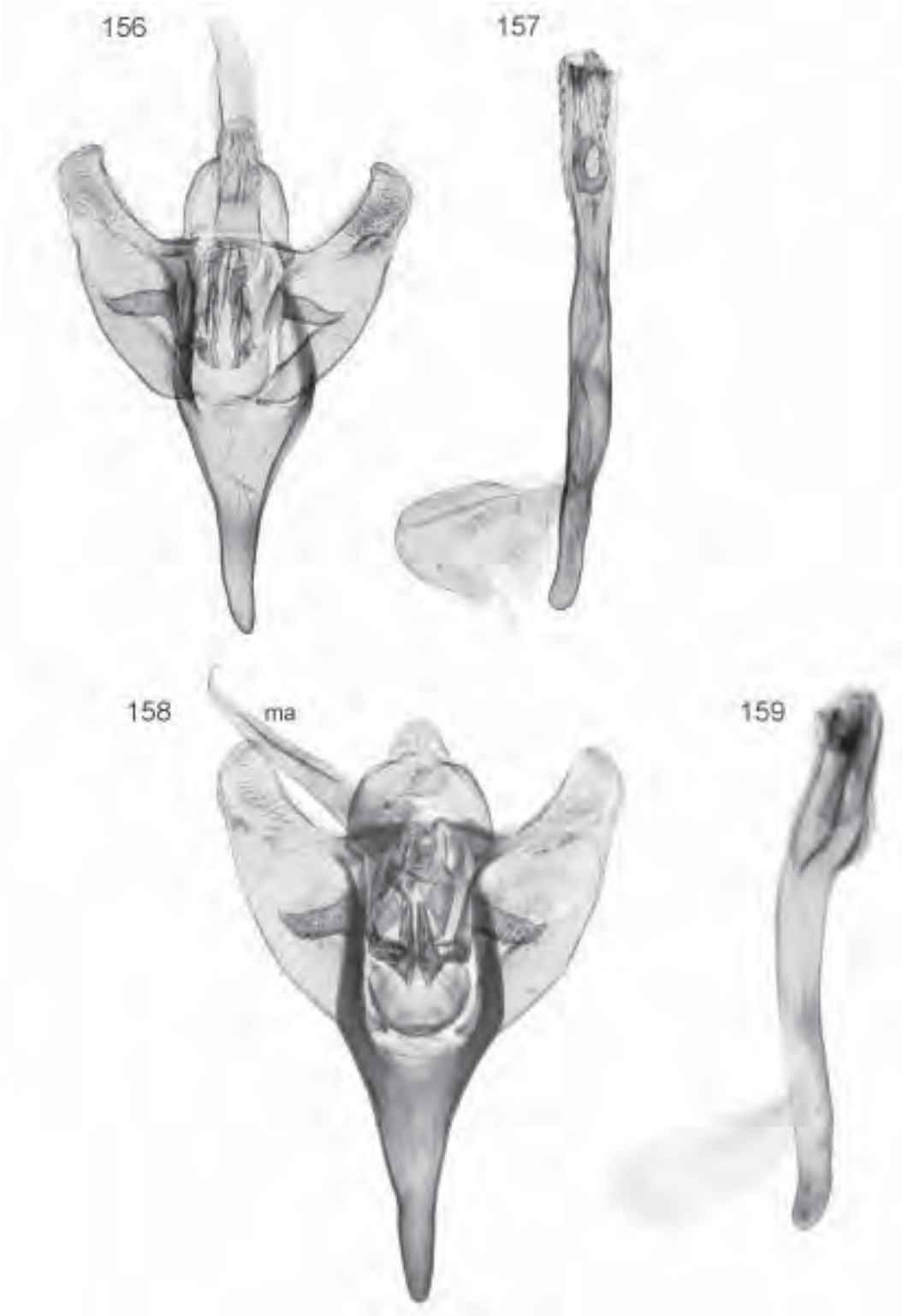
Male genitalia. (144, 145) *Izatha florida*: 144 genital capsule, 145 phallus. (fl, flange of juxto-costal plate.) (146, 147) *Izatha mira*: 146 genital capsule, 147 phallus.



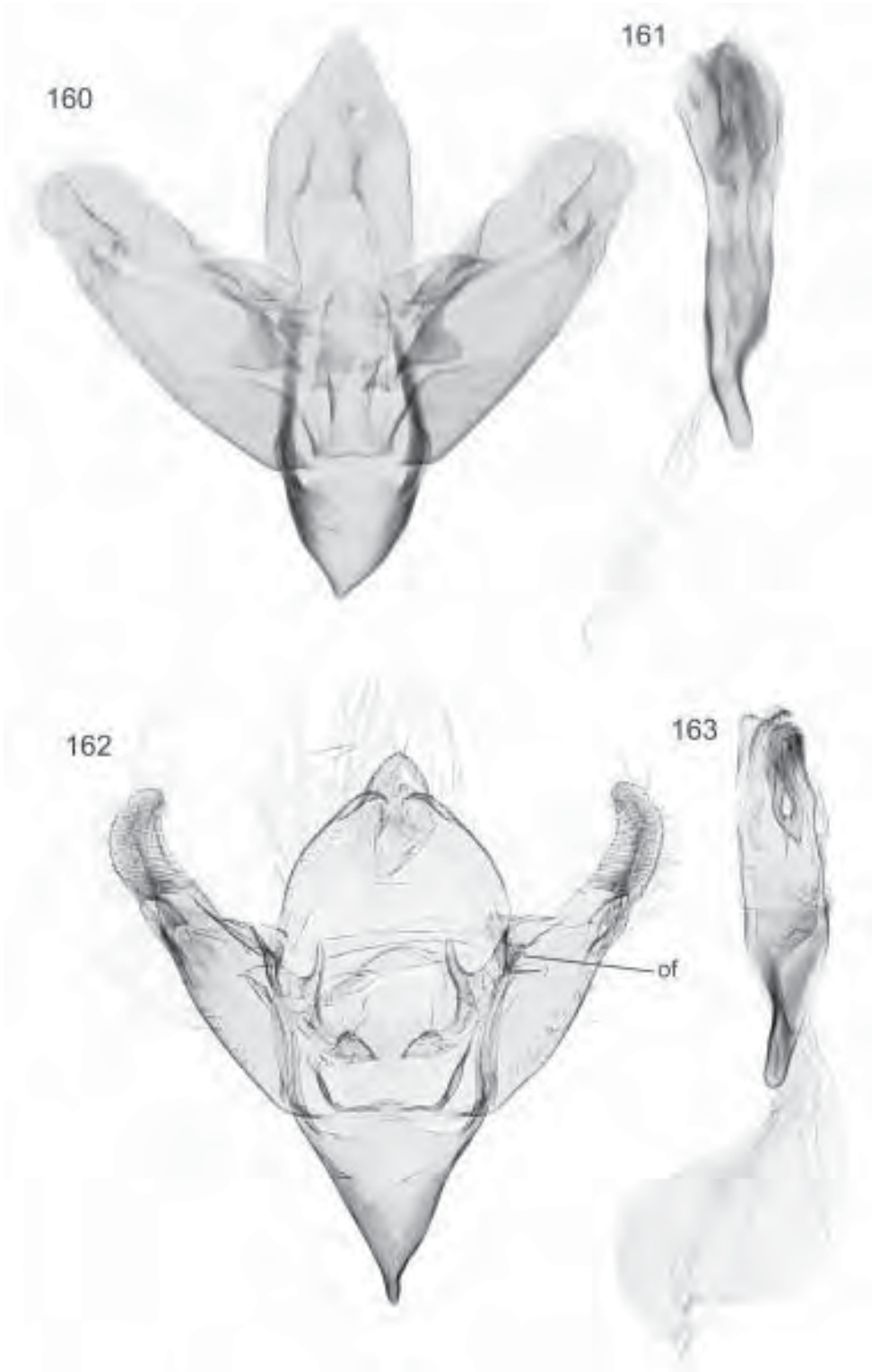
Male genitalia. (148, 149) *Izatha notodoxa*: 148 genital capsule, 149 phallus. (ma, everted manica.) (150, 151) *Izatha katadiktya*: 150 genital capsule, 151 phallus.



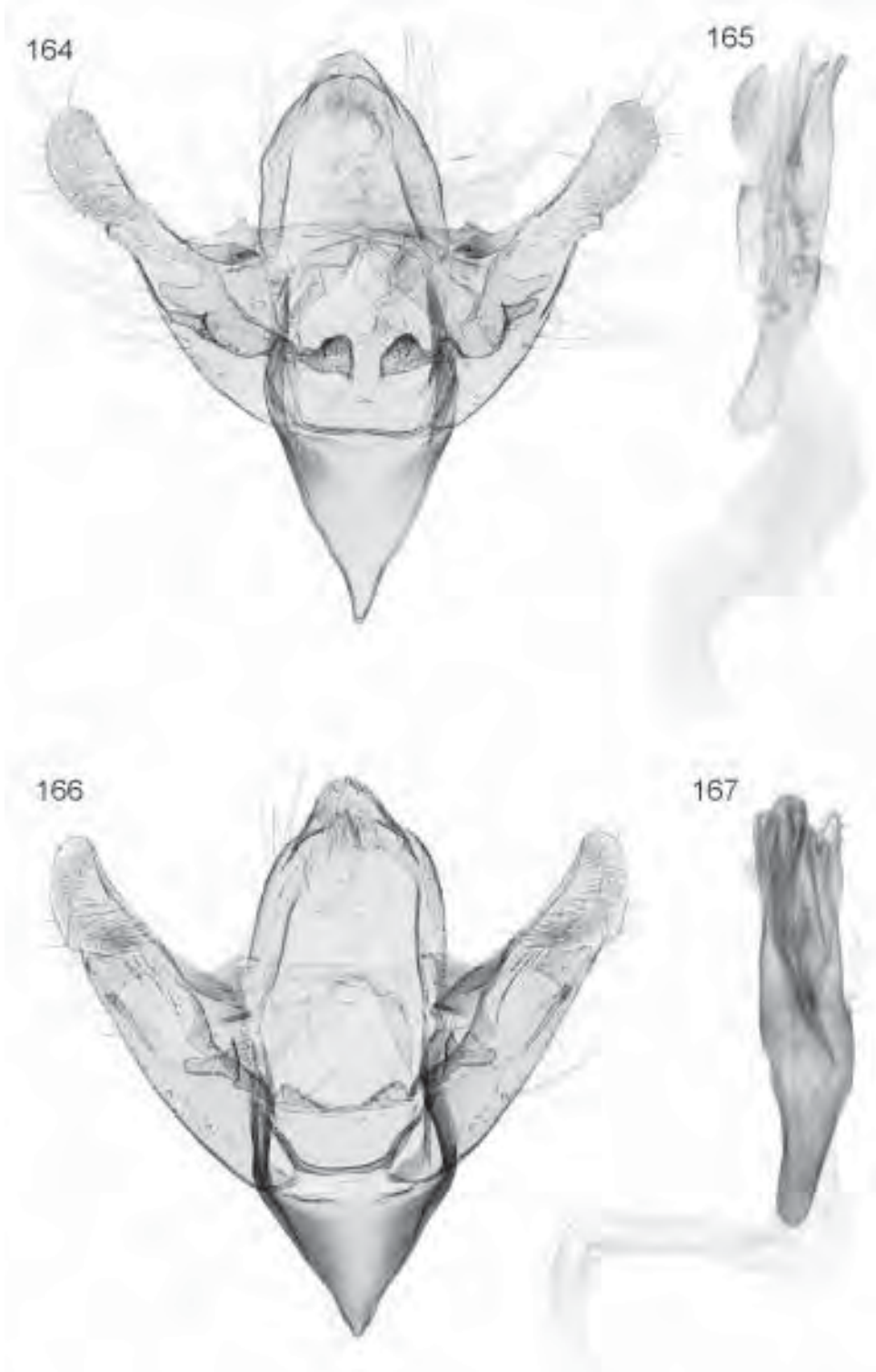
Male genitalia. (152, 153) *Izatha apodoxa*: 152 genital capsule, 153 phallus. (154, 155) *Izatha acmonias*: 154 genital capsule, 155 phallus.



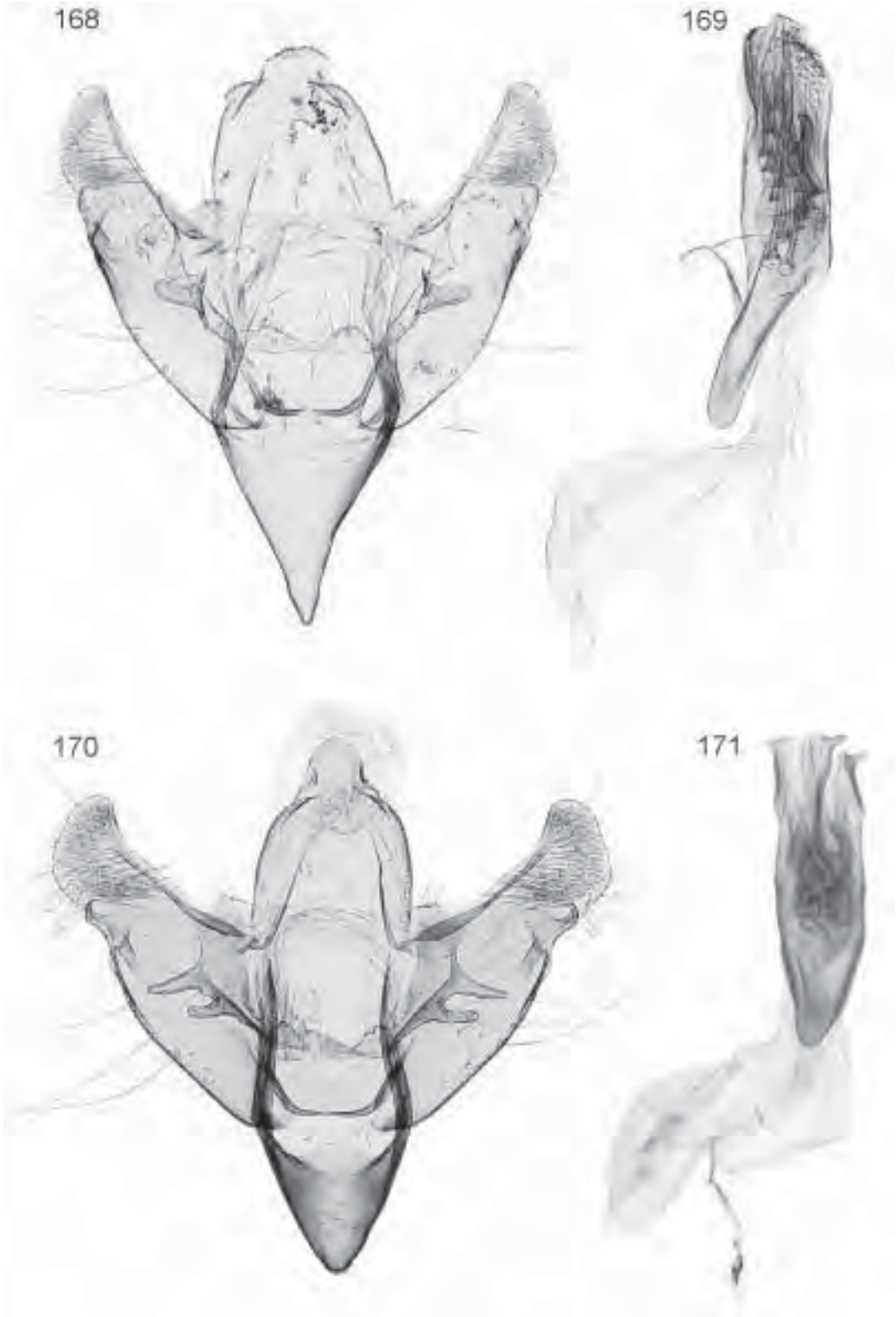
Male genitalia. (156, 157) *Izatha lignyarcha*: 156 genital capsule, 157 phallus. (158, 159) *Izatha picarella*: 158 genital capsule, 159 phallus. (ma, everted manica.).



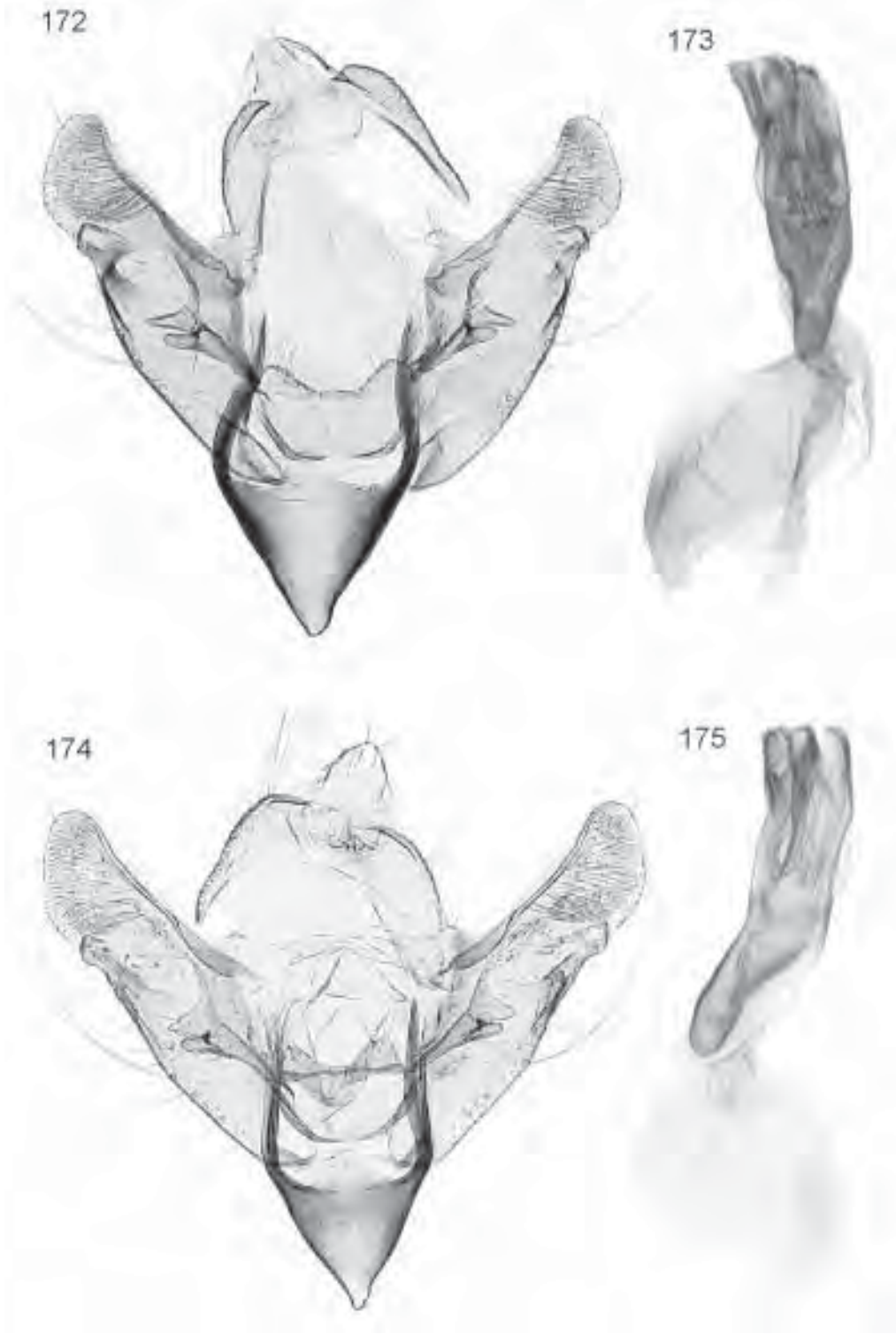
Male genitalia. (160, 161) *Izatha metadelta*: 160 genital capsule, 161 phallus (mated specimen). (162, 163) *Izatha balanophora*: 162 genital capsule, 163 phallus (mated specimen). (of, outer flange of juxtocostal plate.)



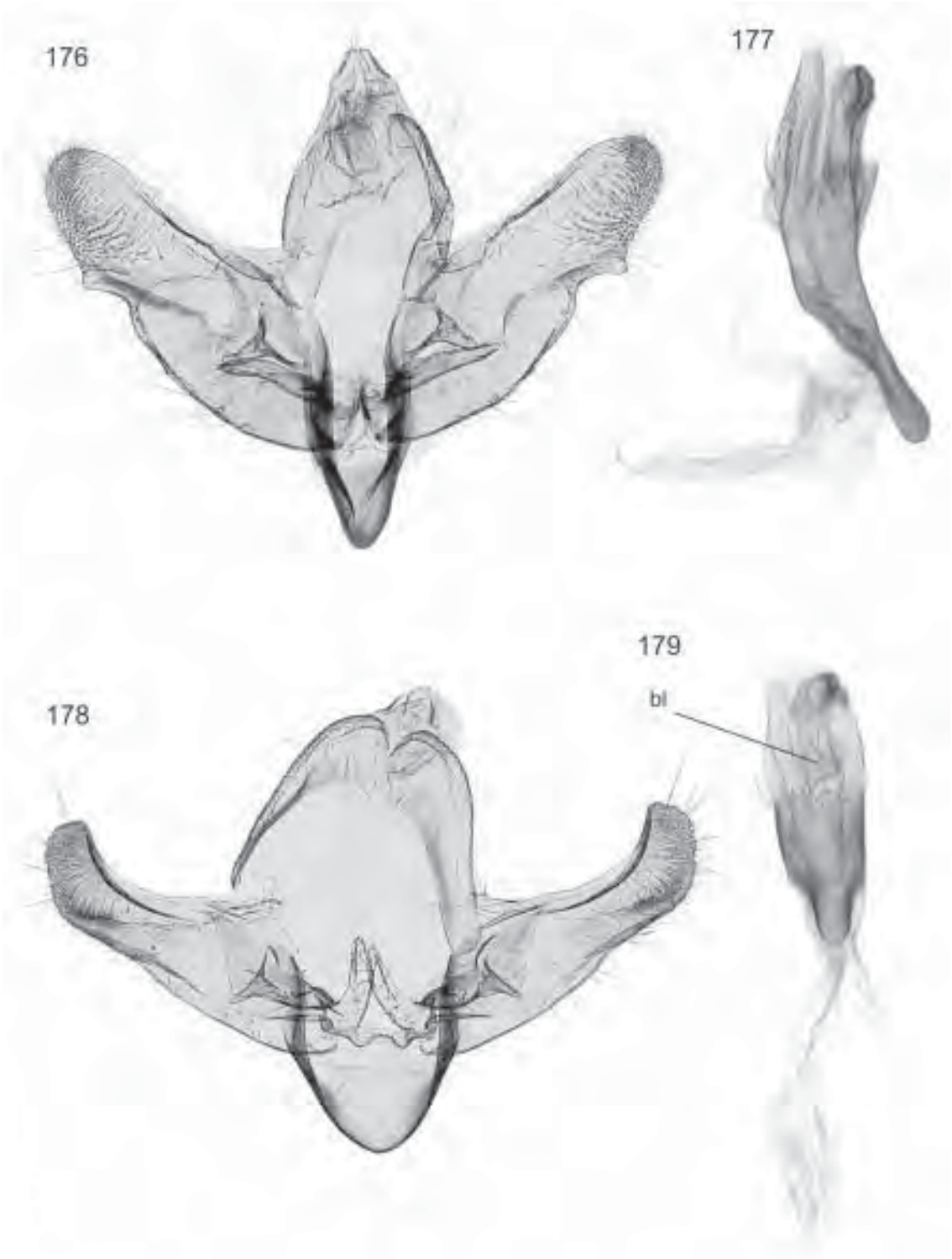
Male genitalia. (164, 165) *Izatha churtoni*: 164 genital capsule, 165 phallus (unmated specimen). (166, 167) *Izatha dulcior*: 166 genital capsule, 167 phallus.



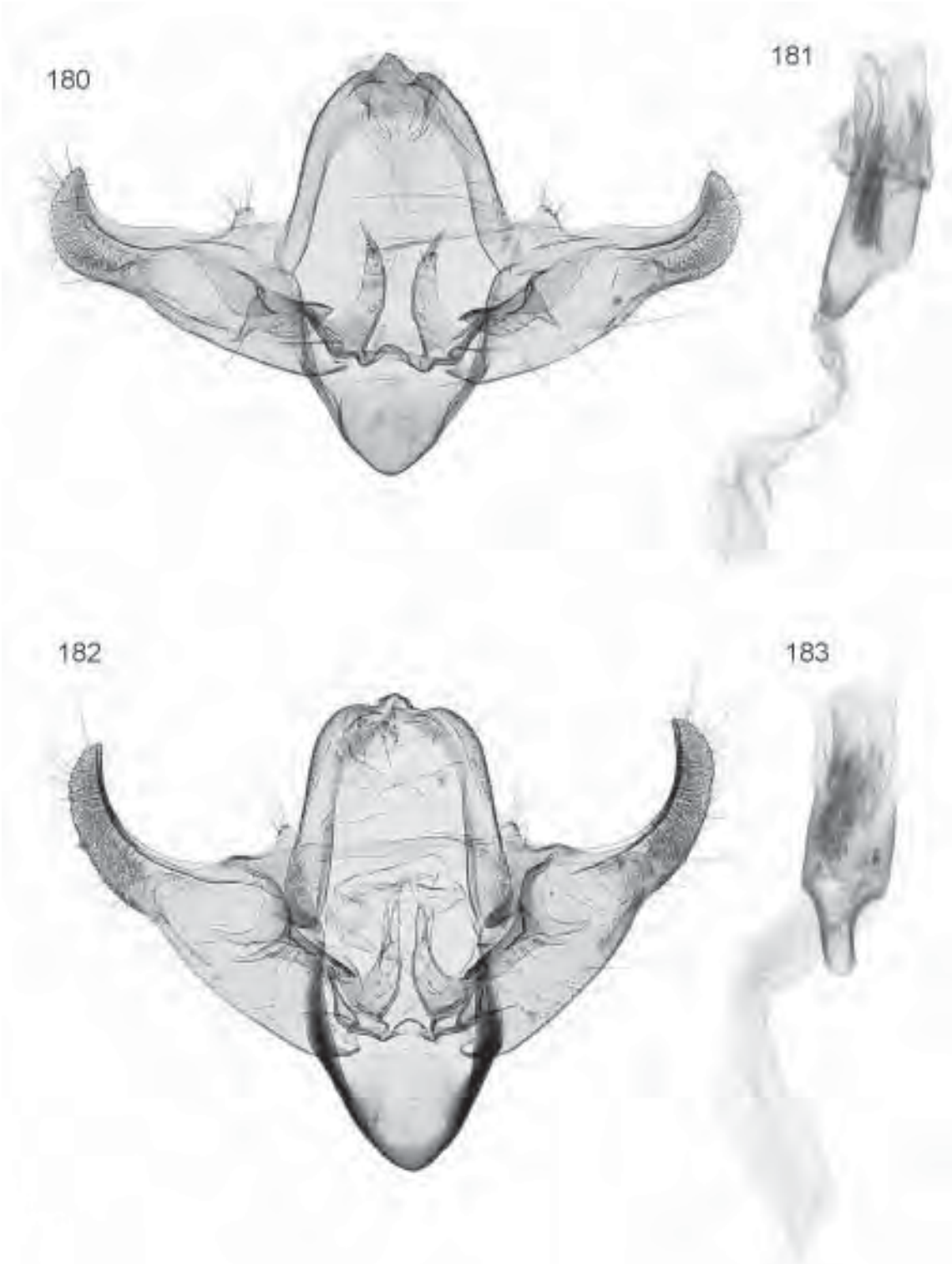
Male genitalia. (168, 169) *Izatha epiphanes*: 168 genital capsule, 169 phallus (unmated specimen). (170, 171) *Izatha mesoschista*: 170 genital capsule, 171 phallus (unmated specimen).



Male genitalia. (172, 173) *Izatha haumu*: 172 genital capsule, 173 phallus (unmated specimen). (174, 175) *Izatha quinquejacula*: 174 genital capsule, 175 phallus (unmated specimen).

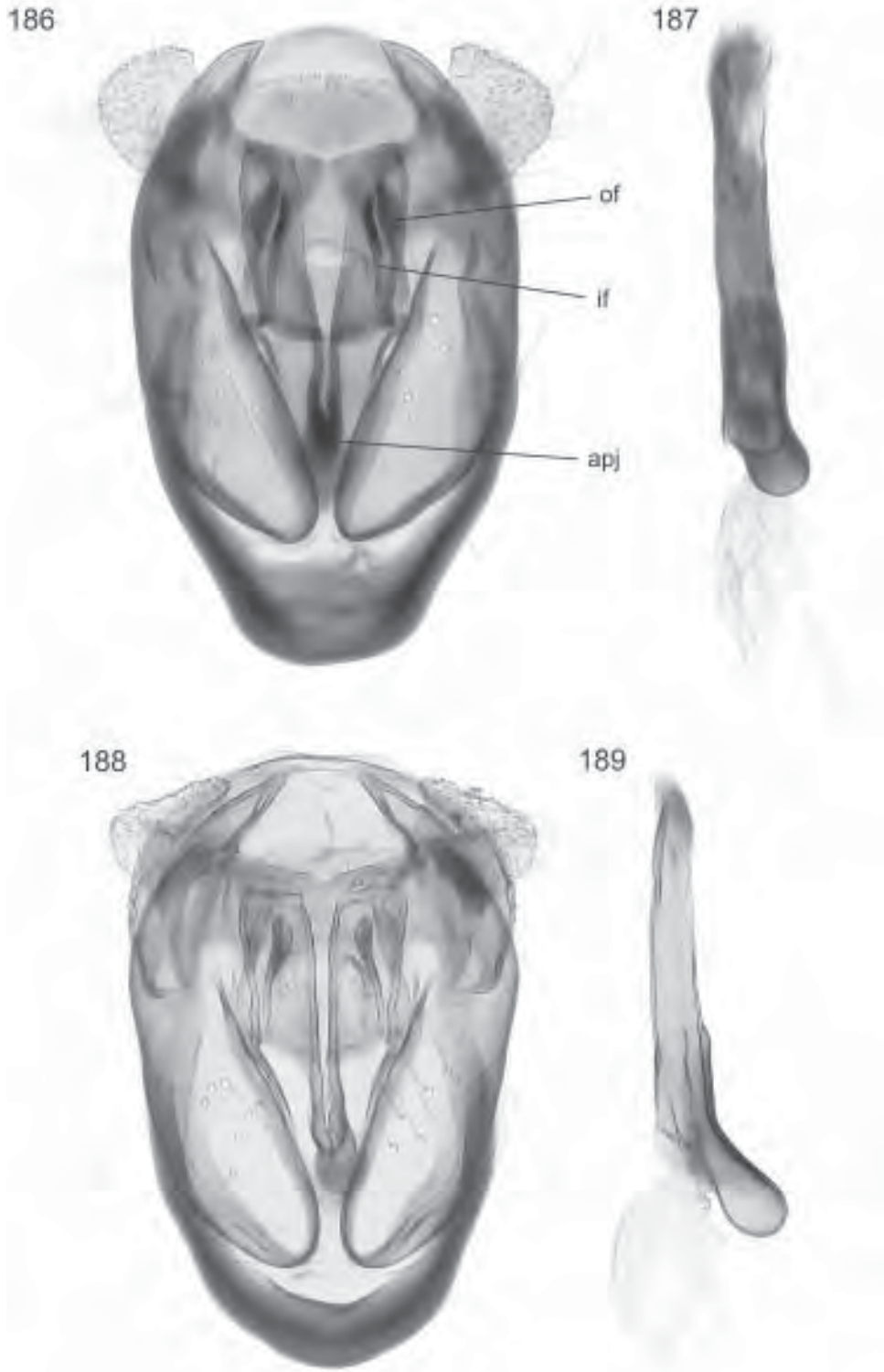


Male genitalia. (176, 177) *Izatha heroica*: 176 genital capsule, 177 phallus. (178, 179) *Izatha hudsoni*: 178 genital capsule, 179 phallus (mated specimen). (bl, basal flange of left lobe of phallus).

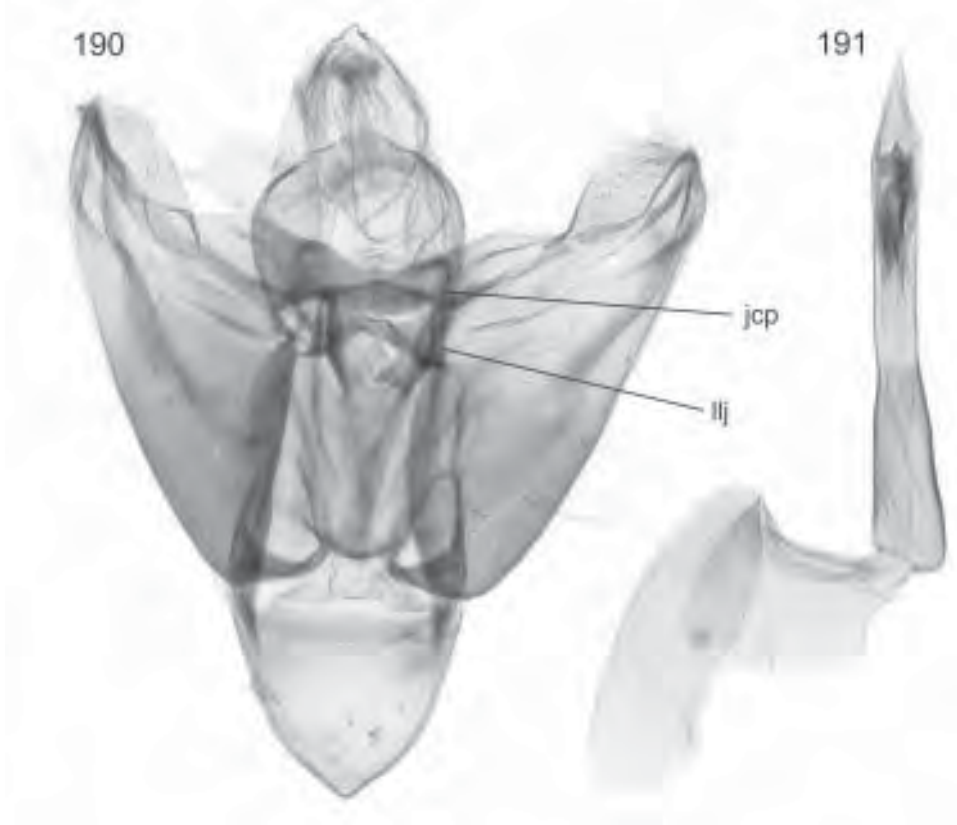


Male genitalia. (180, 181) *Izatha huttonii*: 180 genital capsule, 181 phallus (unmated specimen). (182, 183) *Izatha peroneanella*: 182 genital capsule, 183 phallus (unmated specimen).

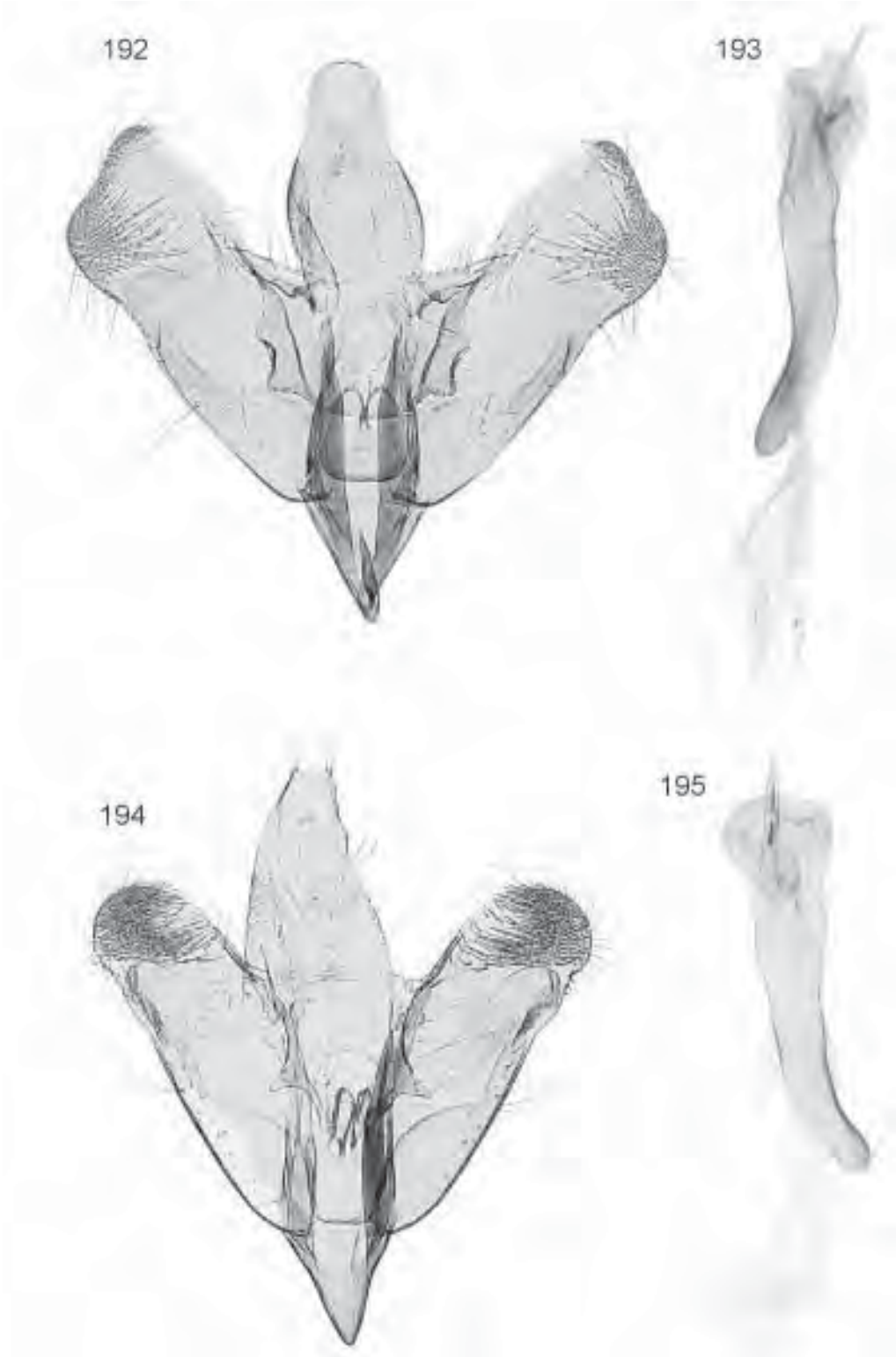
Male genitalia. (184, 185) *Izatha taingo*: 184 genital capsule, 185 phallus (unmated specimen).



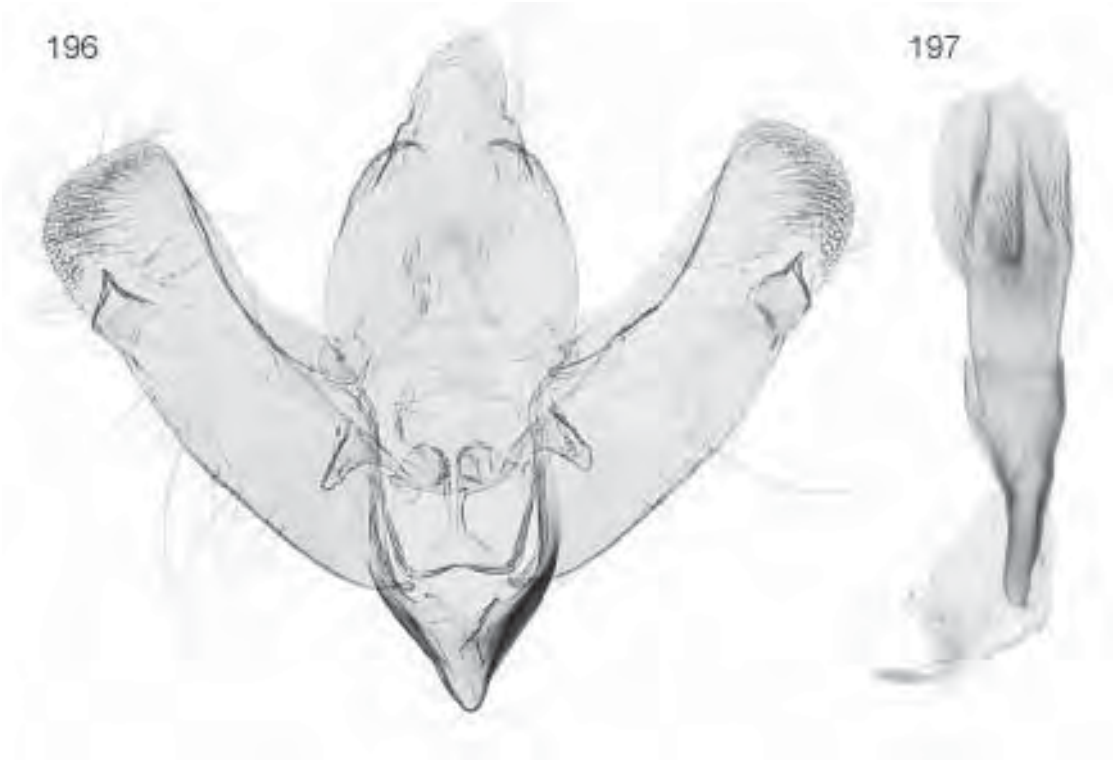
Male genitalia. (186, 187) *Izatha oleariae*: 186 genital capsule, 187 phallus. (apj, anterodorsal process of juxta; if, inner flange of juxto-costal plate; of, outer flange.) (188, 189) *Izatha spheniscella*: 188 genital capsule, 189 phallus.



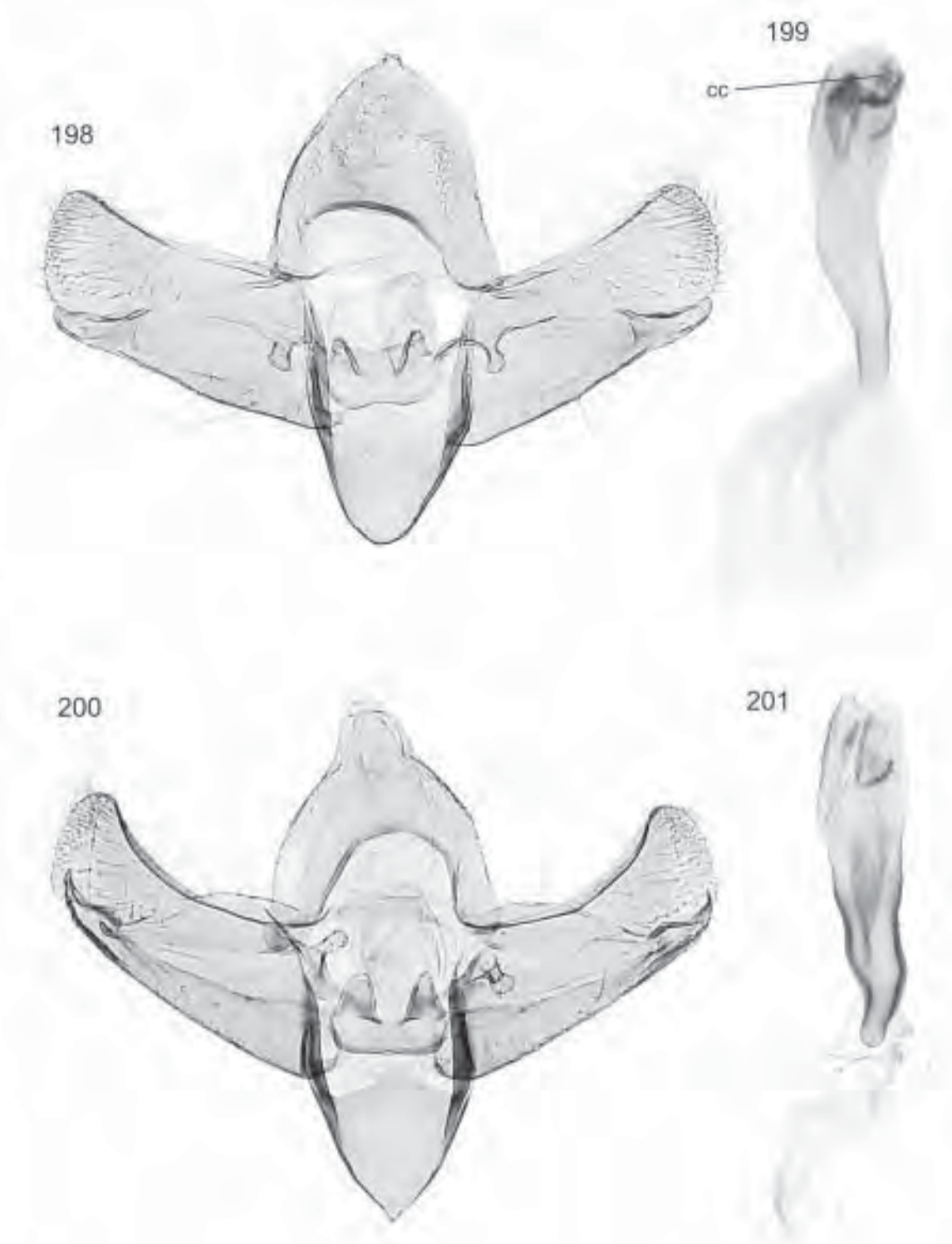
Male genitalia. (190, 191) *Izatha prasophyta*: 190 genital capsule, 191 phallus. (jcp, juxto-costal plate; llj, lateral lobe of juxta.)



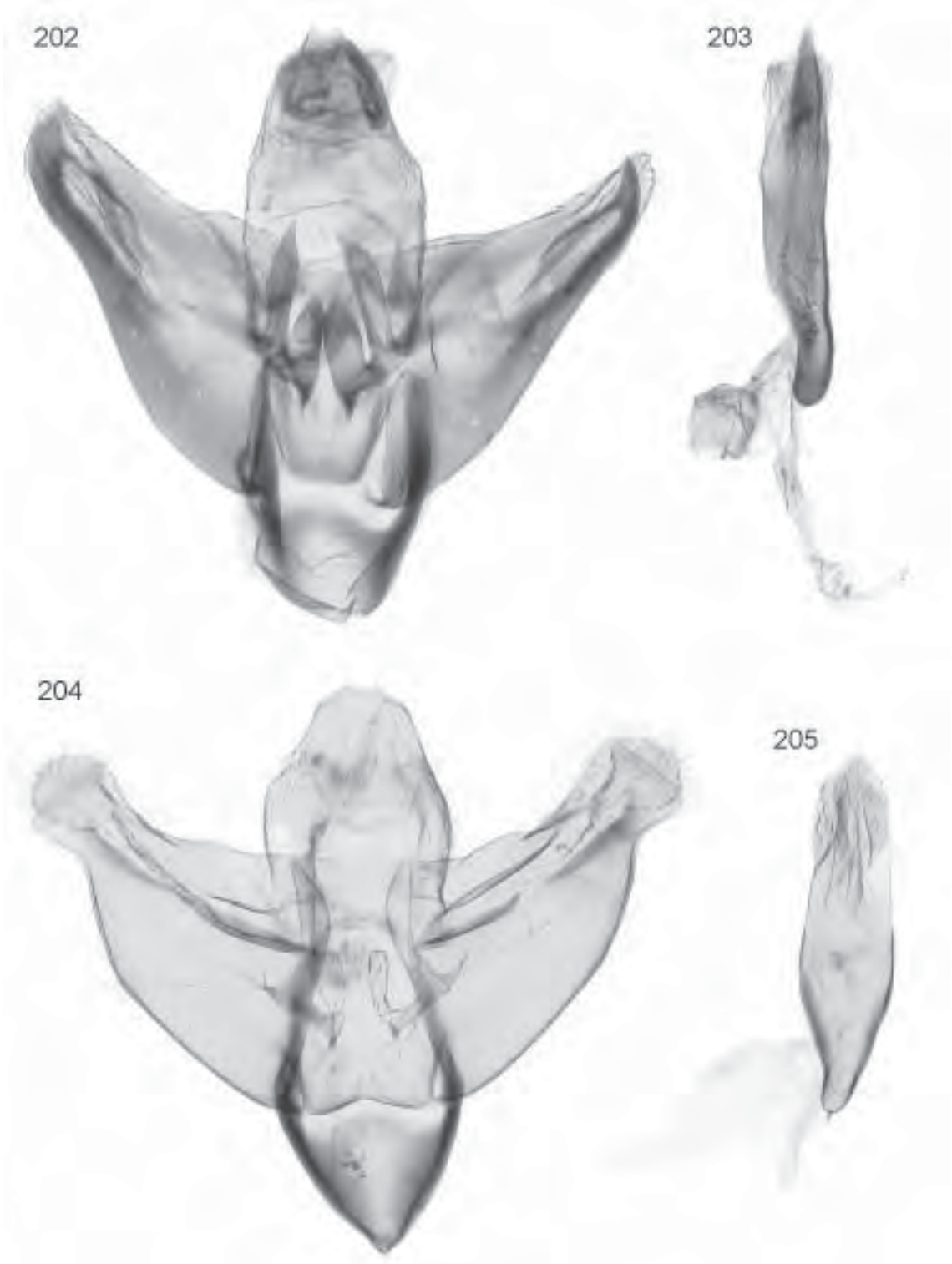
Male genitalia. (192, 193) *Izatha caustopa*: 192 genital capsule, 193 phallus. (194, 195) *Izatha dasydisca*,: 194 genital capsule, 195 phallus.



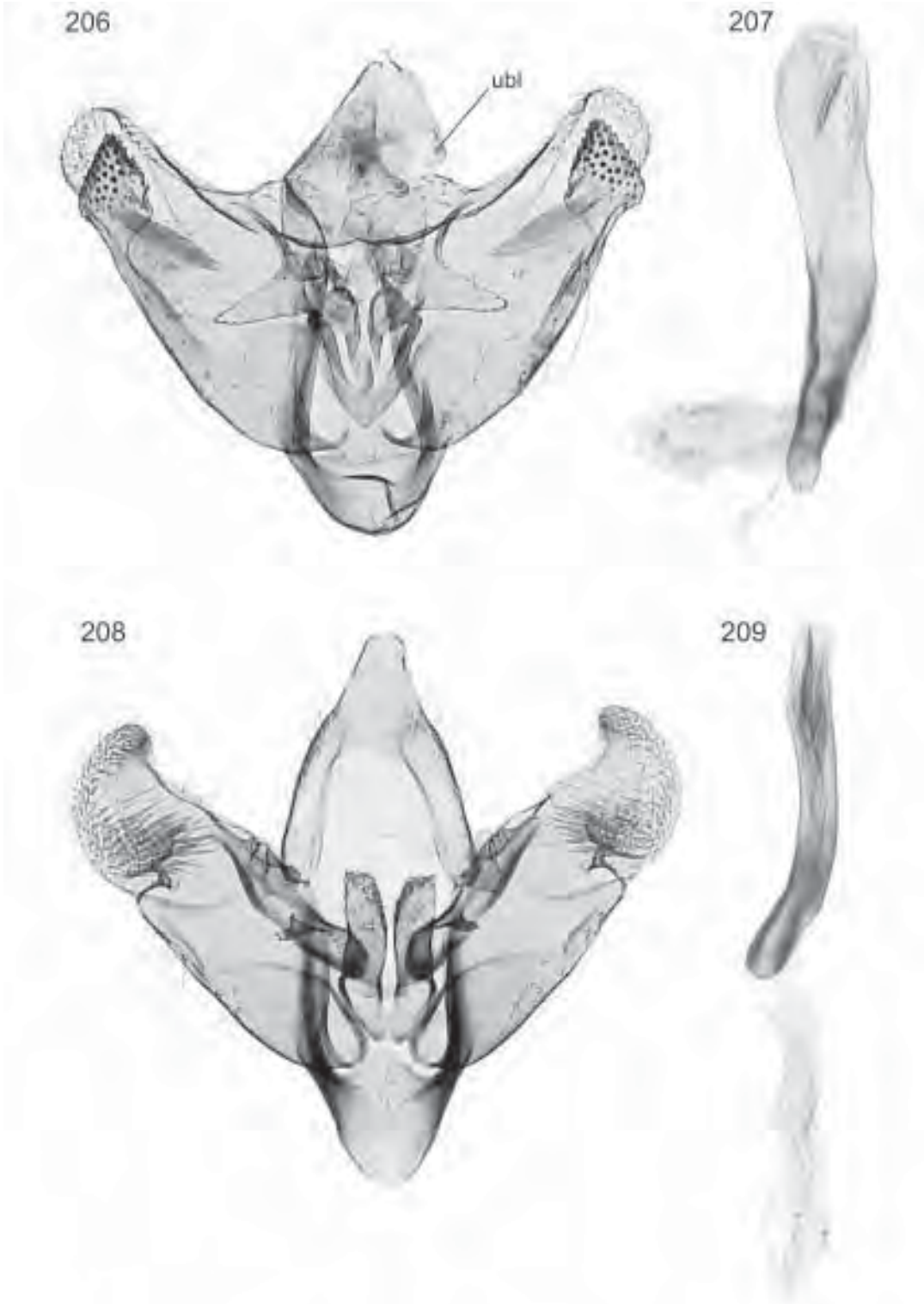
Male genitalia. (196, 197) *Izatha manubriata*: 196 genital capsule, 197 phallus.



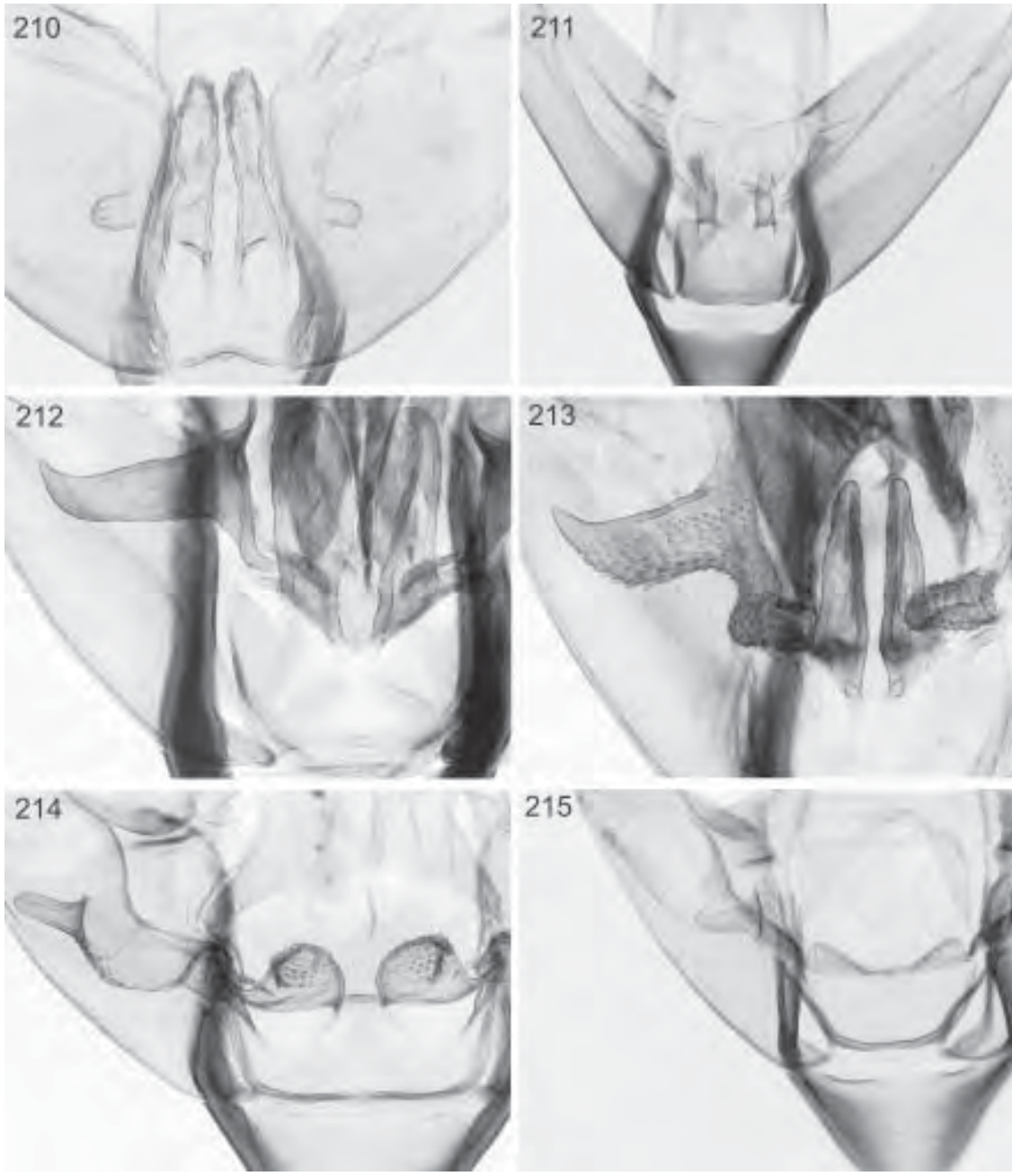
Male genitalia. (198, 199) *Izatha convulsella*: 198 genital capsule, 199 phallus. (cc, compound cornutus.) (200, 201) *Izatha gekkonella*: 200 genital capsule, 201 phallus.



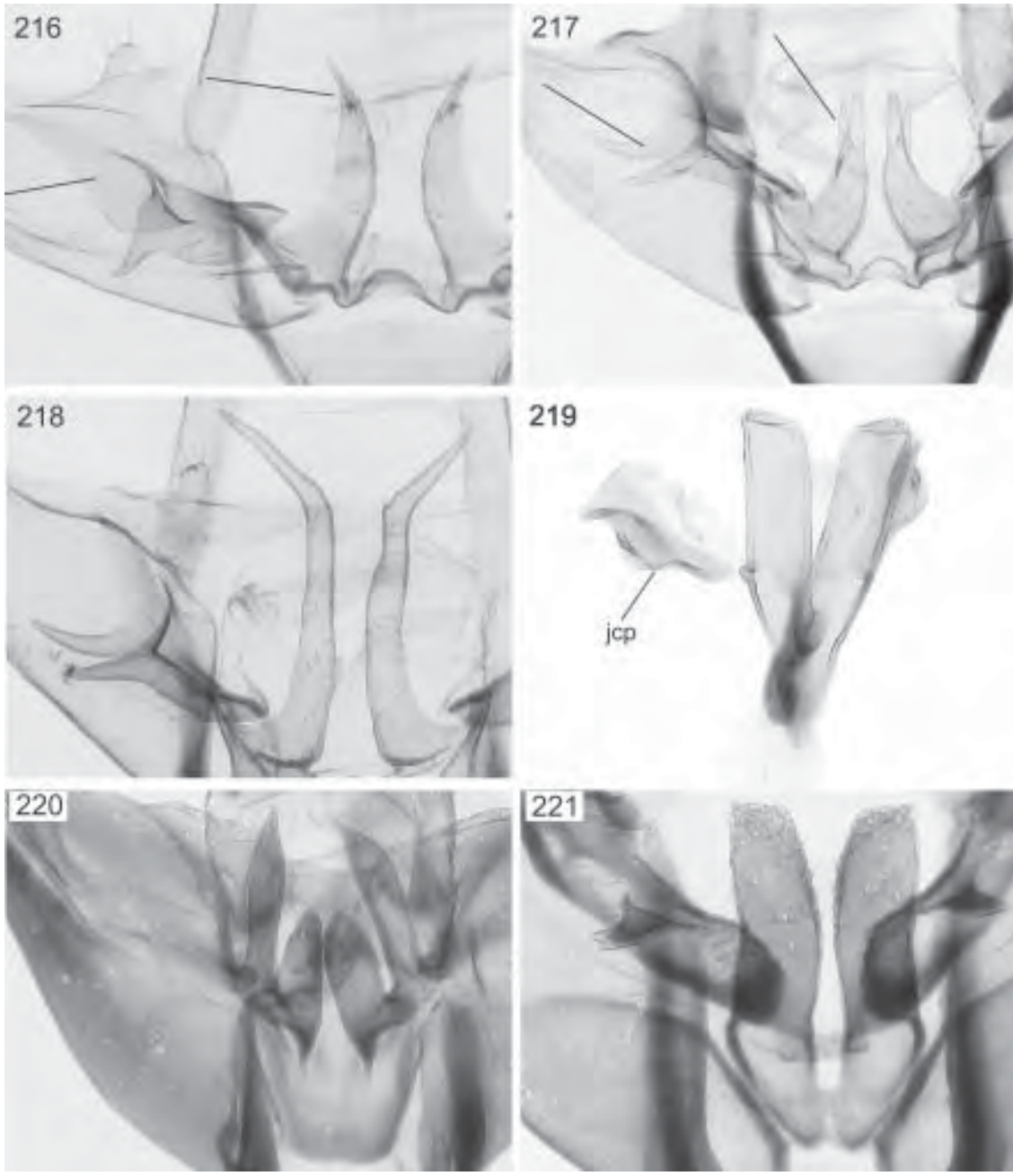
Male genitalia. (202, 203) *Izatha gibbsi*: 202 genital capsule, 203 phallus. (204, 205) *Izatha minimira*: 204 genital capsule, 205 phallus.



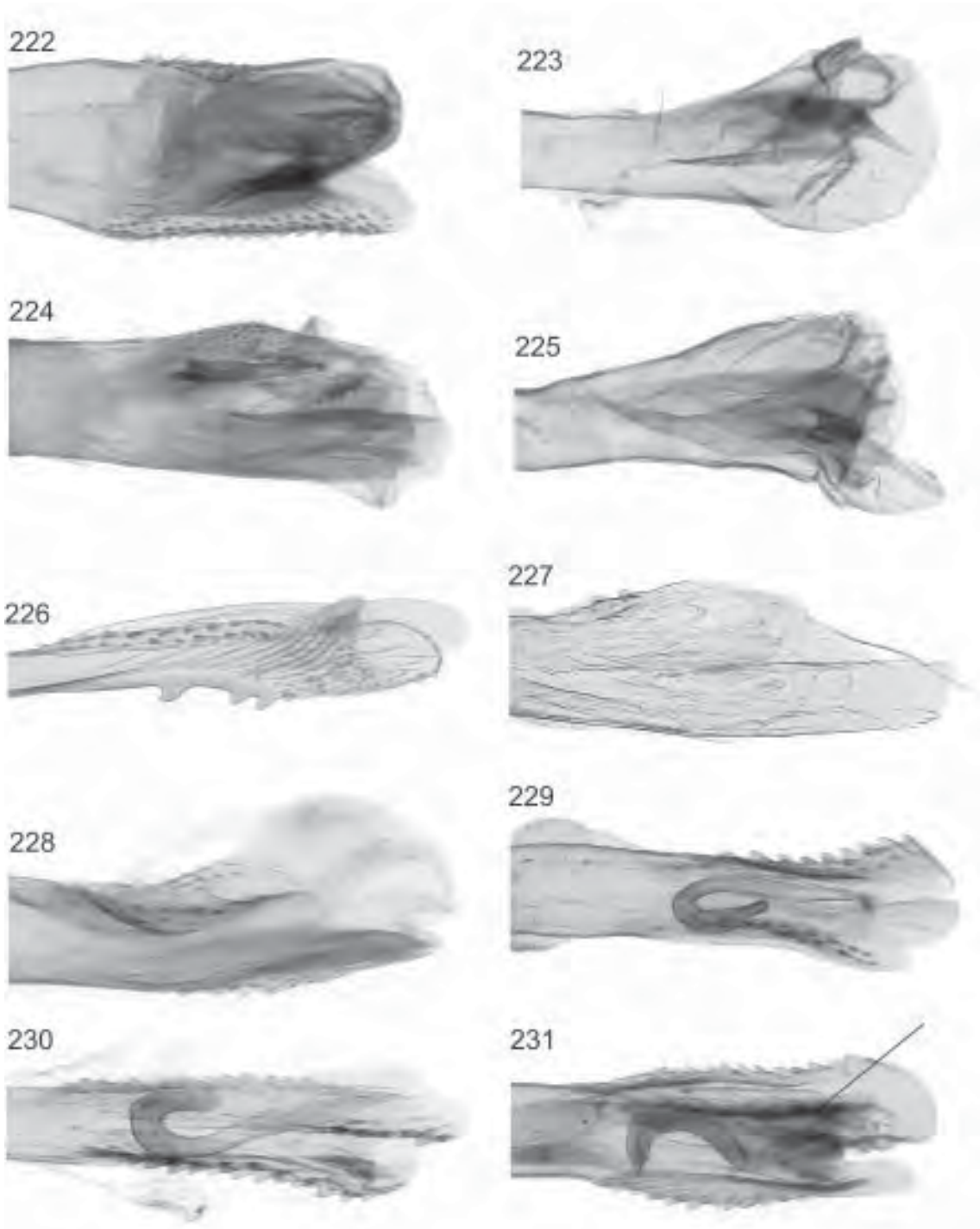
Male genitalia. (206, 207) *Izatha rigescens*: 206 genital capsule, 207 phallus. (ubl, uncus basal lobe.) (208, 209) *Izatha phaeoptila*: 208 genital capsule, 209 phallus.



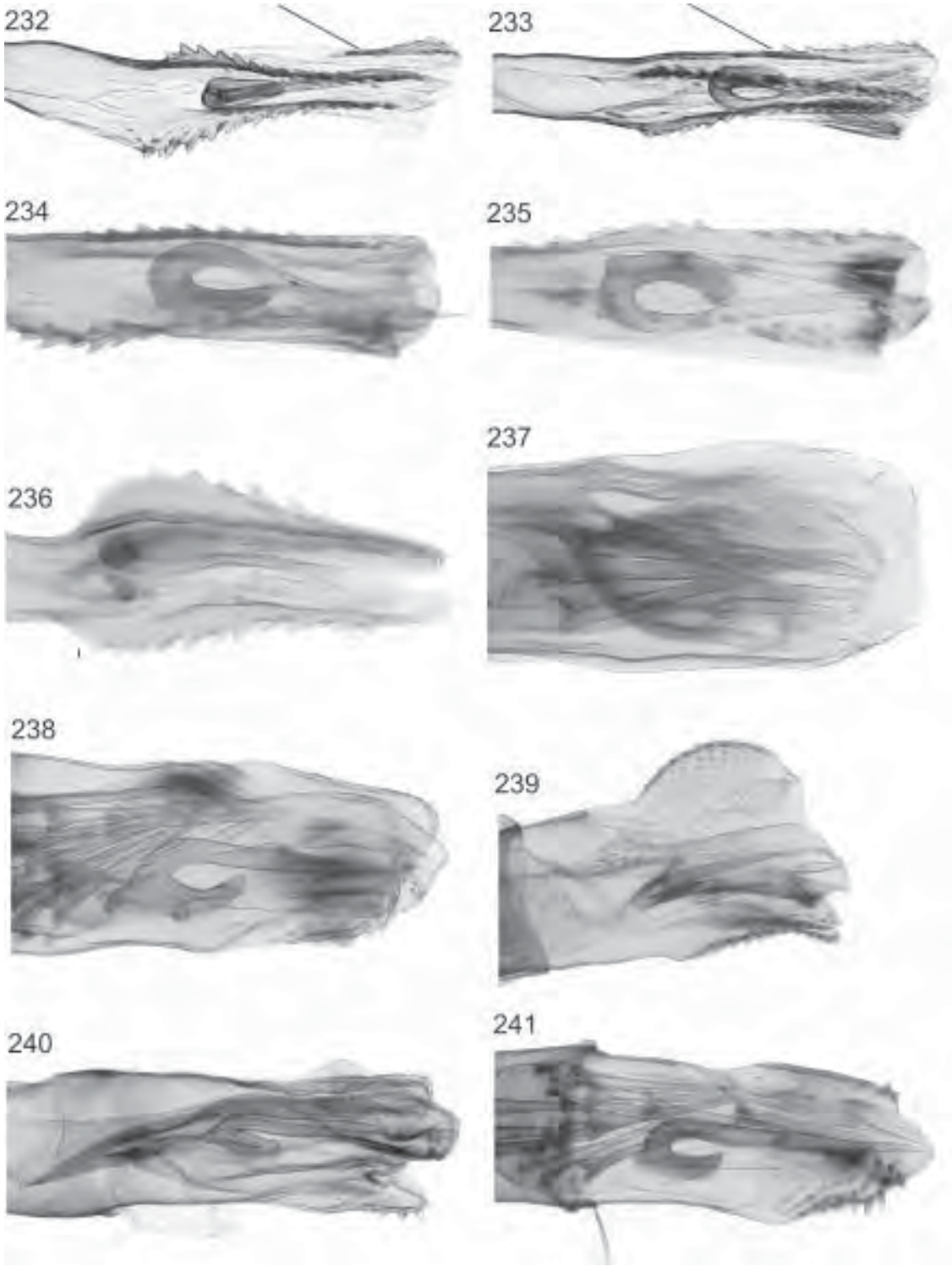
(210–215) *Izatha,* male genitalia, juxta (selected species): 210 *I. walkerae*; 211 *I. florida*; 212 *I. acmonias*; 213 *I. picarella*; 214 *I. churtoni*; 215 *I. dulcior*.



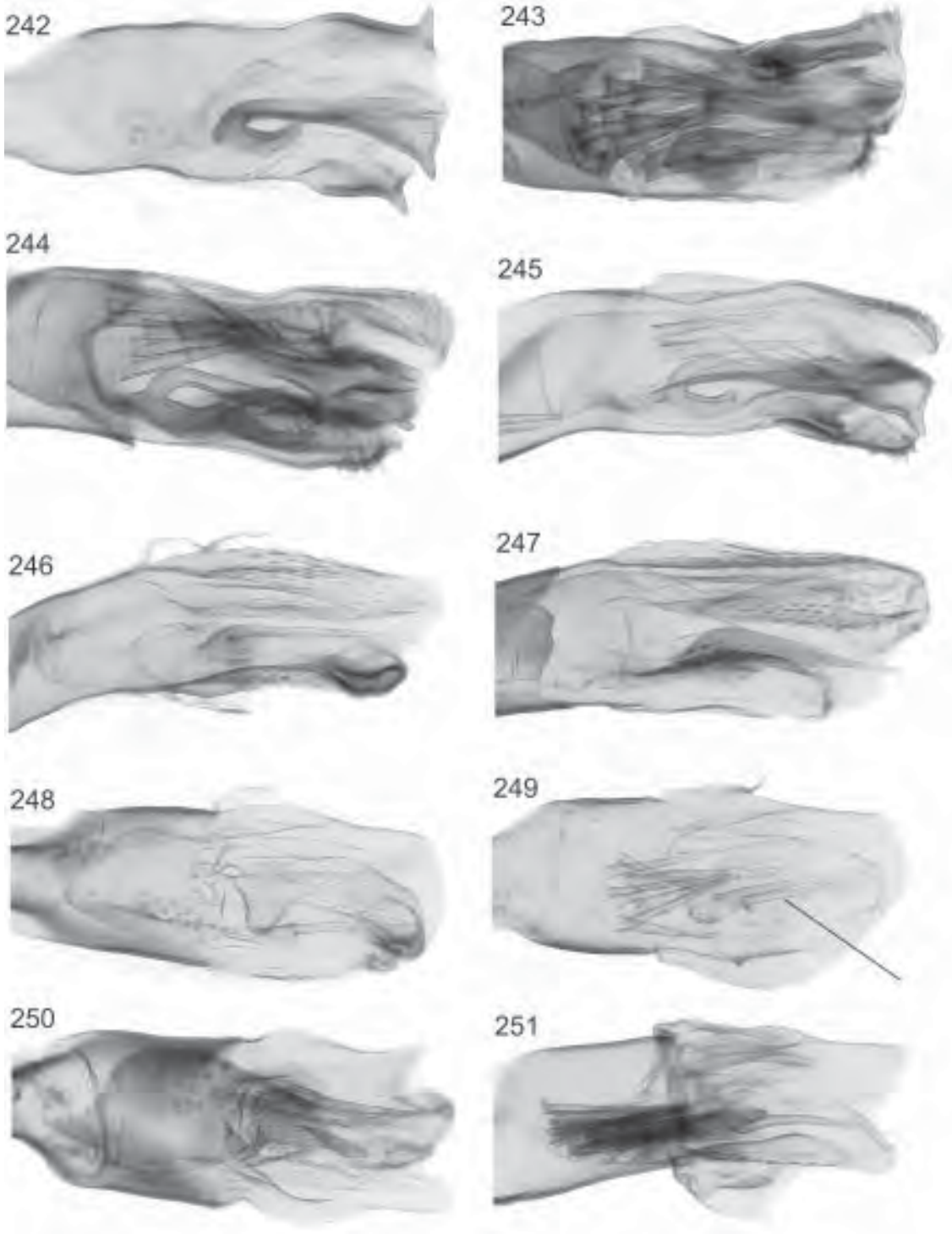
(216–221) *Izatha*, male genitalia, juxta (selected species): 216 *I. huttonii*; 217 *I. peroneanella*; 218 *I. taingo*; 219 *I. oleariae*; 220 *I. gibbsi*; 221 *I. phaeoptila*. Diagnostic features arrowed for *huttonii* and *peroneanella*. (jcp, juxto-costal plate.)



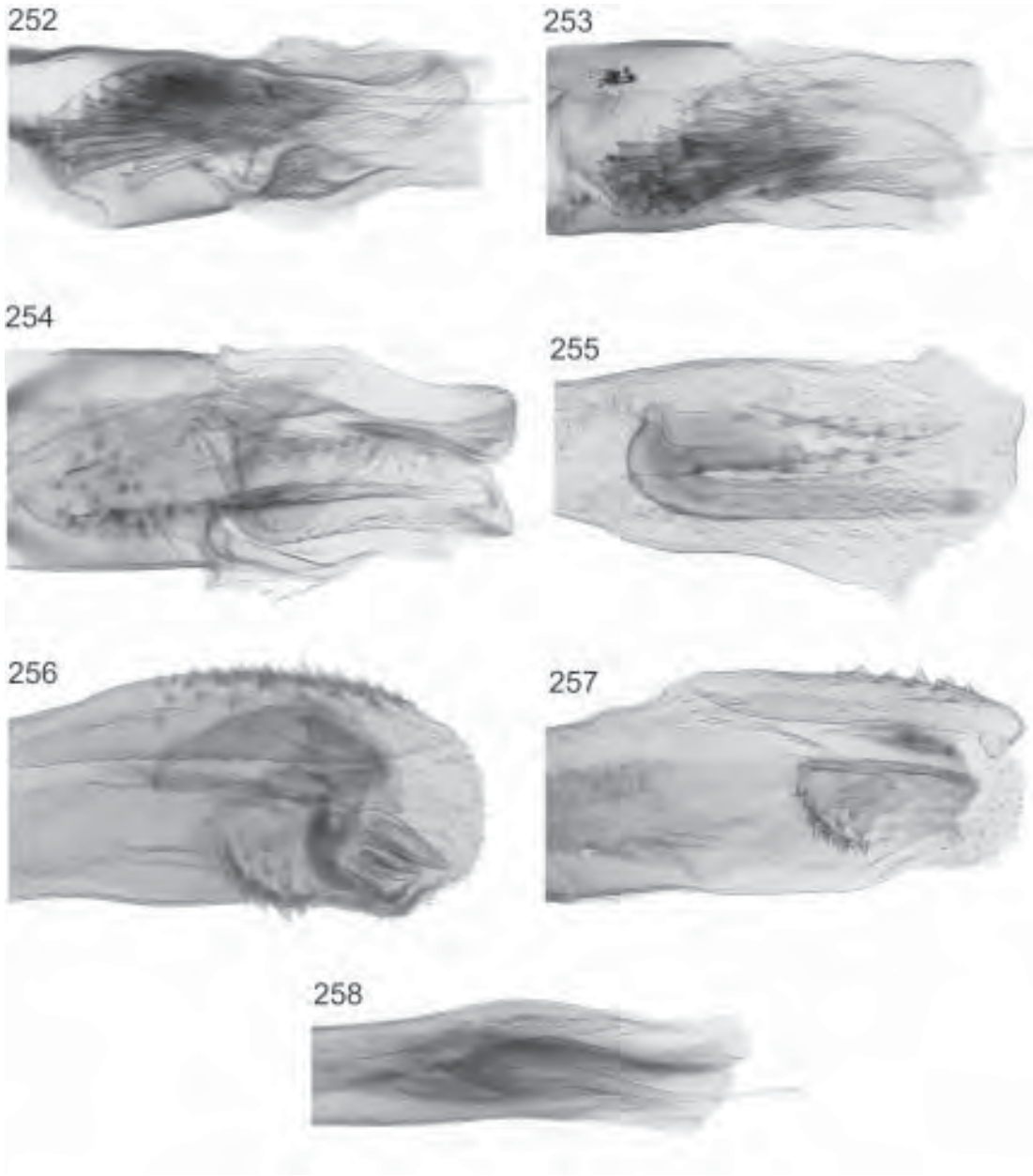
(222–231) *Izatha*, male genitalia, apex of phallus (selected species): 222 *I. attactella*; 223 *I. blepharidota*; 224 *I. voluptuosa*; 225 *I. austera*; 226 *I. copiosella*; 227 *I. walkerae*; 228 *I. mira*; 229 *I. notodoxa*; 230 *I. katadiktya*; 231 *I. apodoxa* (N.B., fishhook cornutus broken; 3rd toothed ridge distinguishing this species from *notodoxa* arrowed).



(232–241) *Izatha*, male genitalia, apex of phallus (selected species): 232 *I. acmonias* (FD) (note short toothed ridge on left lobe, arrowed); (233) *I. acmonias* (NC) (note longer toothed ridge on left lobe, arrowed); 234, 235 *I. lignyarcha* (note only 2 toothed ridges in this species); 236 *I. picarella*; 237 *I. metadelta* (unmated specimen); 238 *I. balanophora* (unmated specimen); 239 *I. churtoni* (mated specimen); 240 *I. dulcior*; 241 *I. epiphanes* (unmated specimen).



(242–251) *Izatha*, male genitalia, apex of phallus (selected species): 242 *I. mesoschista* (mated specimen); 243 *I. haumu* (unmated specimen); 244 *I. quinquejacula* (unmated specimen, 5 deciduous cornuti); 245 *I. quinquejacula* (unmated specimen, 3 deciduous cornuti); 246, 247 *I. heroica*; 248 *I. hudsoni* (mated specimen); 249 *I. hudsoni* (unmated specimen, aberrant double–tipped fishhook cornutus arrowed); 250 *I. huttonii* (mated specimen); 251 *I. huttonii* (unmated specimen).



(252–258) *Izatha*, male genitalia, apex of phallus (selected species): 252, 253 *I. peroneanella* (unmated specimens); 254 *I. taingo* (mated specimen); 255 *I. dasydisca*; 256 *I. convulsella*; 257 *I. gekkonella*; 258 *I. phaeoptila*.

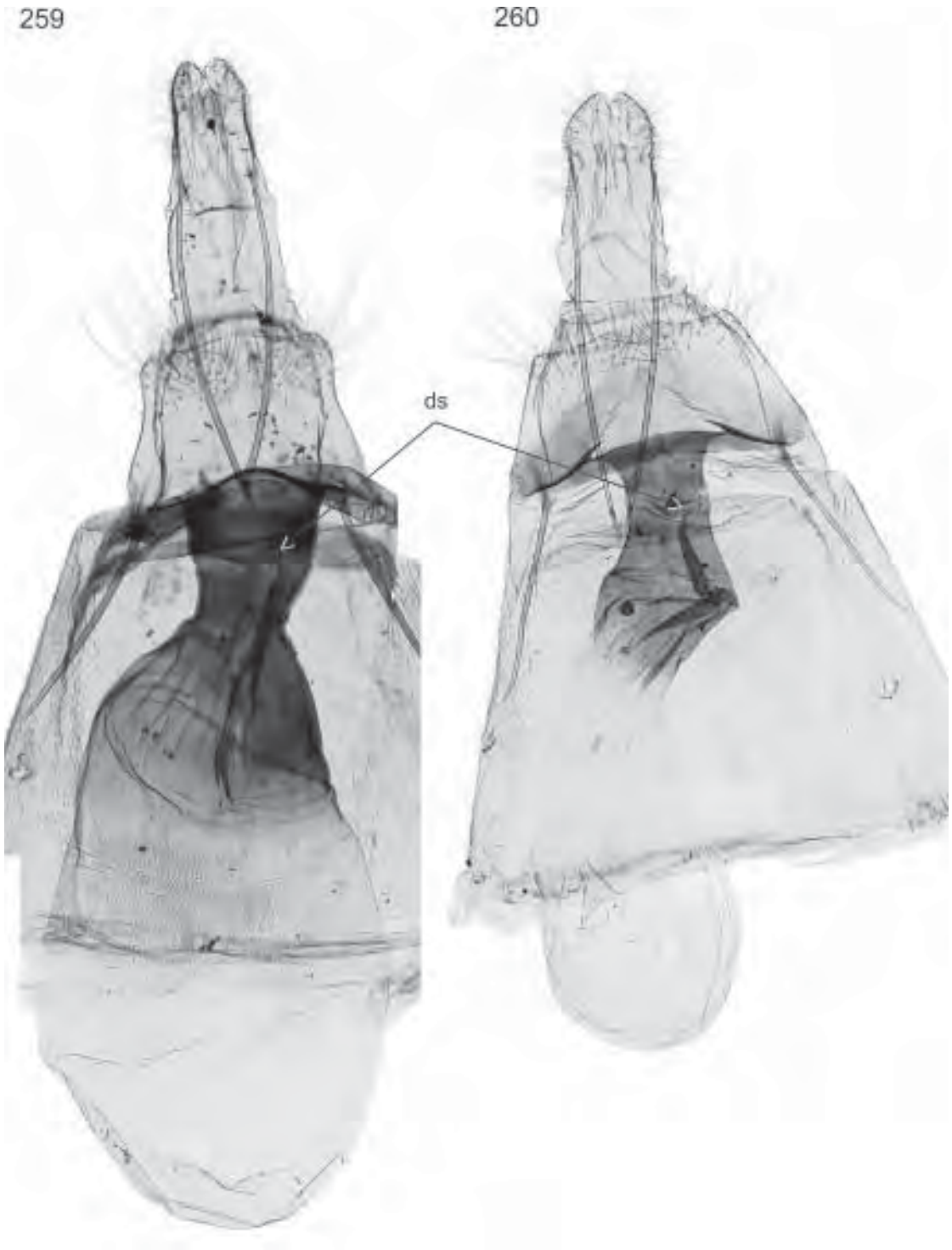
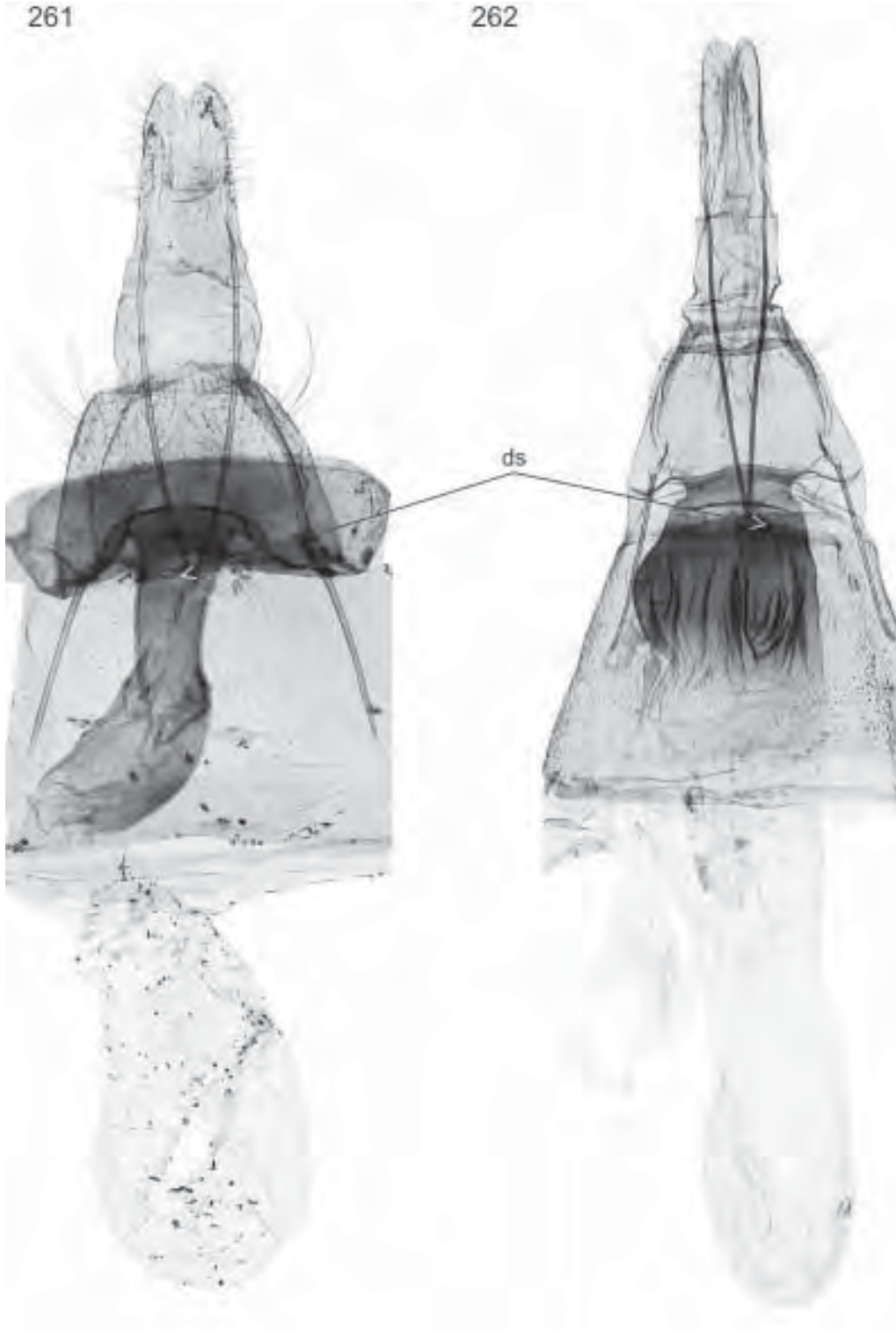
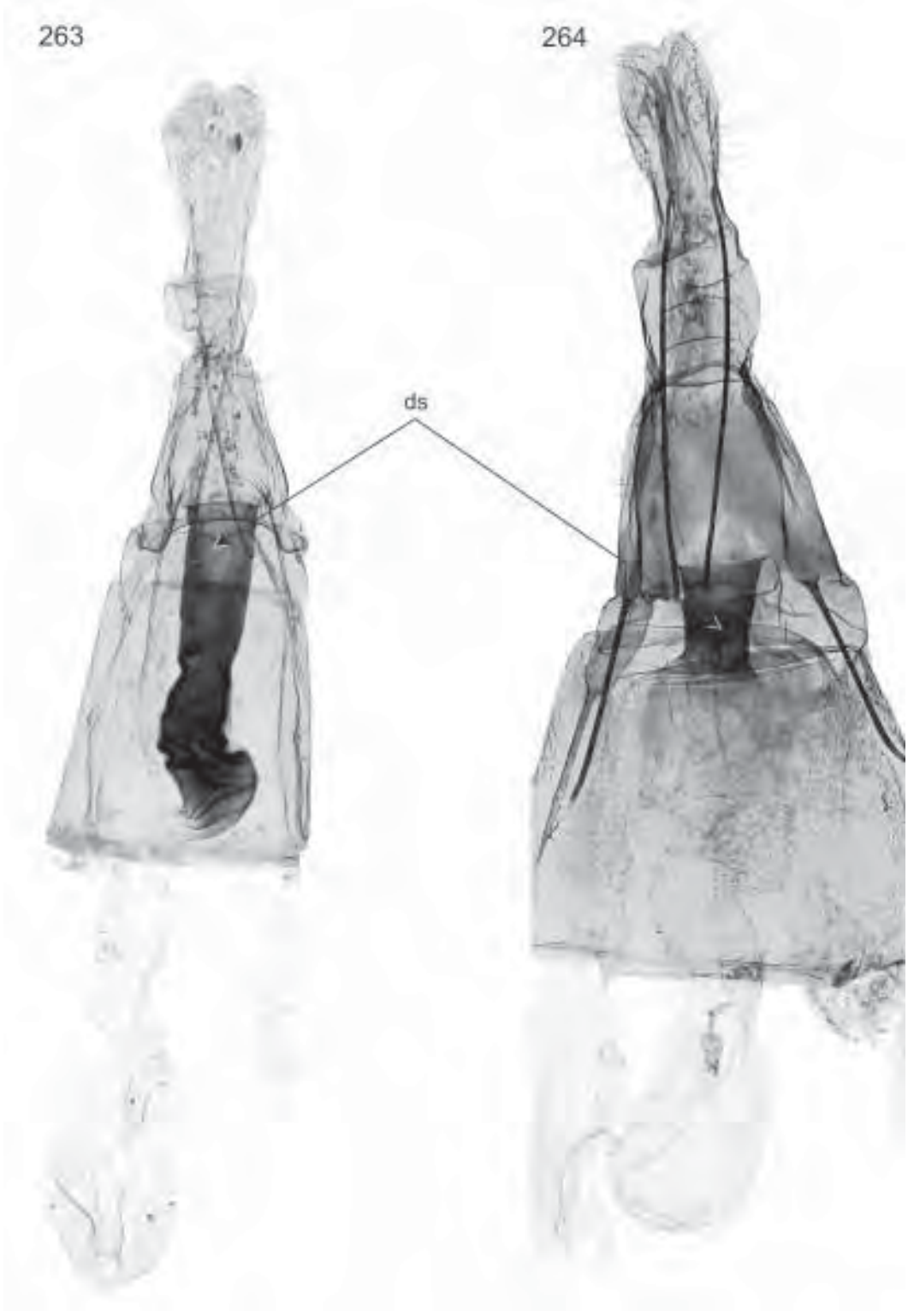


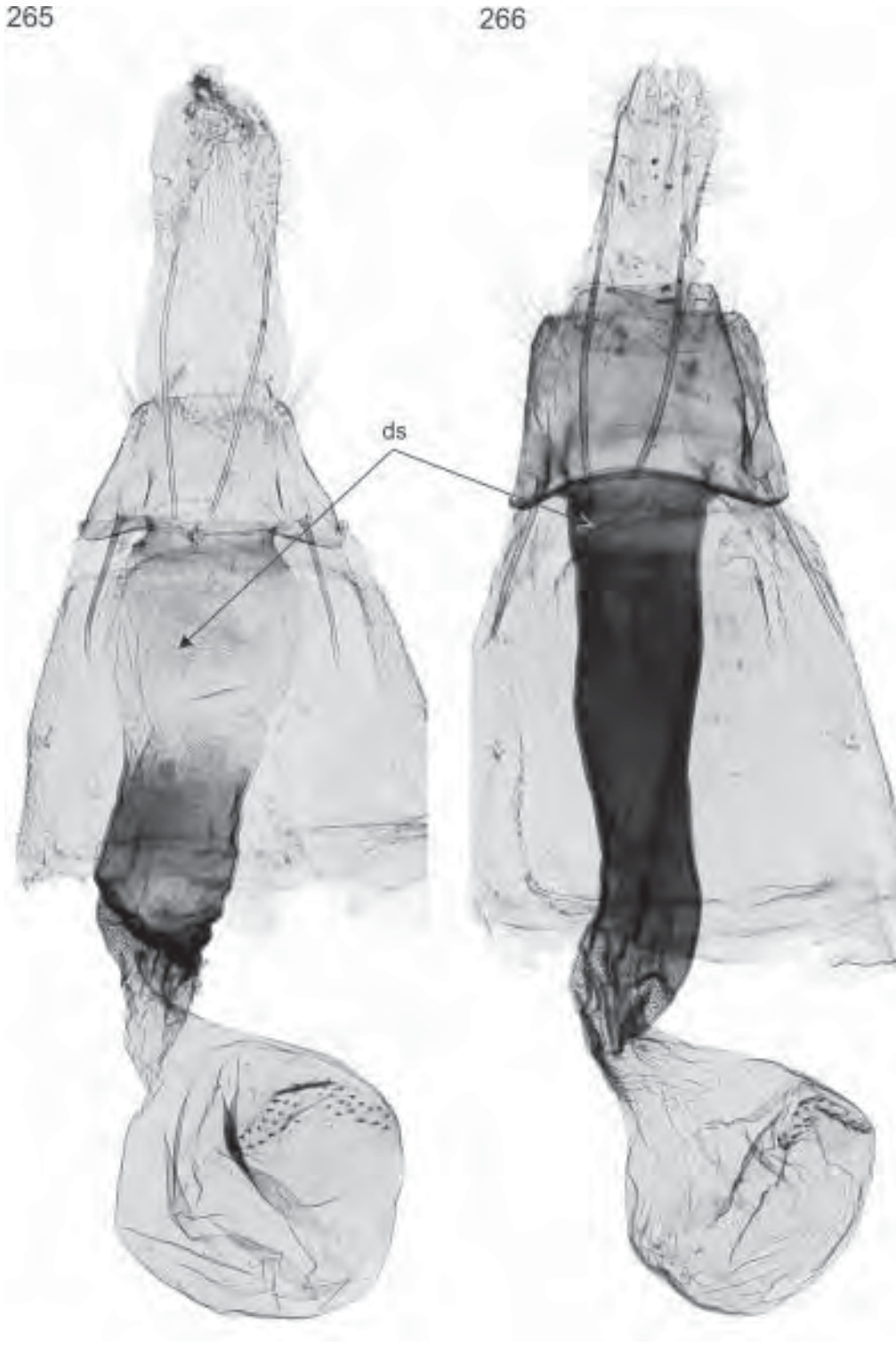
Fig. 259–295 *Izatha*, female terminalia (Automontage photographs by R. J. B. Hoare and B. E. Rhode.): (259) *I. attactella*; (260) *I. blepharidota*. (ds, ductus seminalis inception.)



Female terminalia. (261) *Izatha voluptuosa*; (262) *I. austera*. (ds, ductus seminalis inception.)

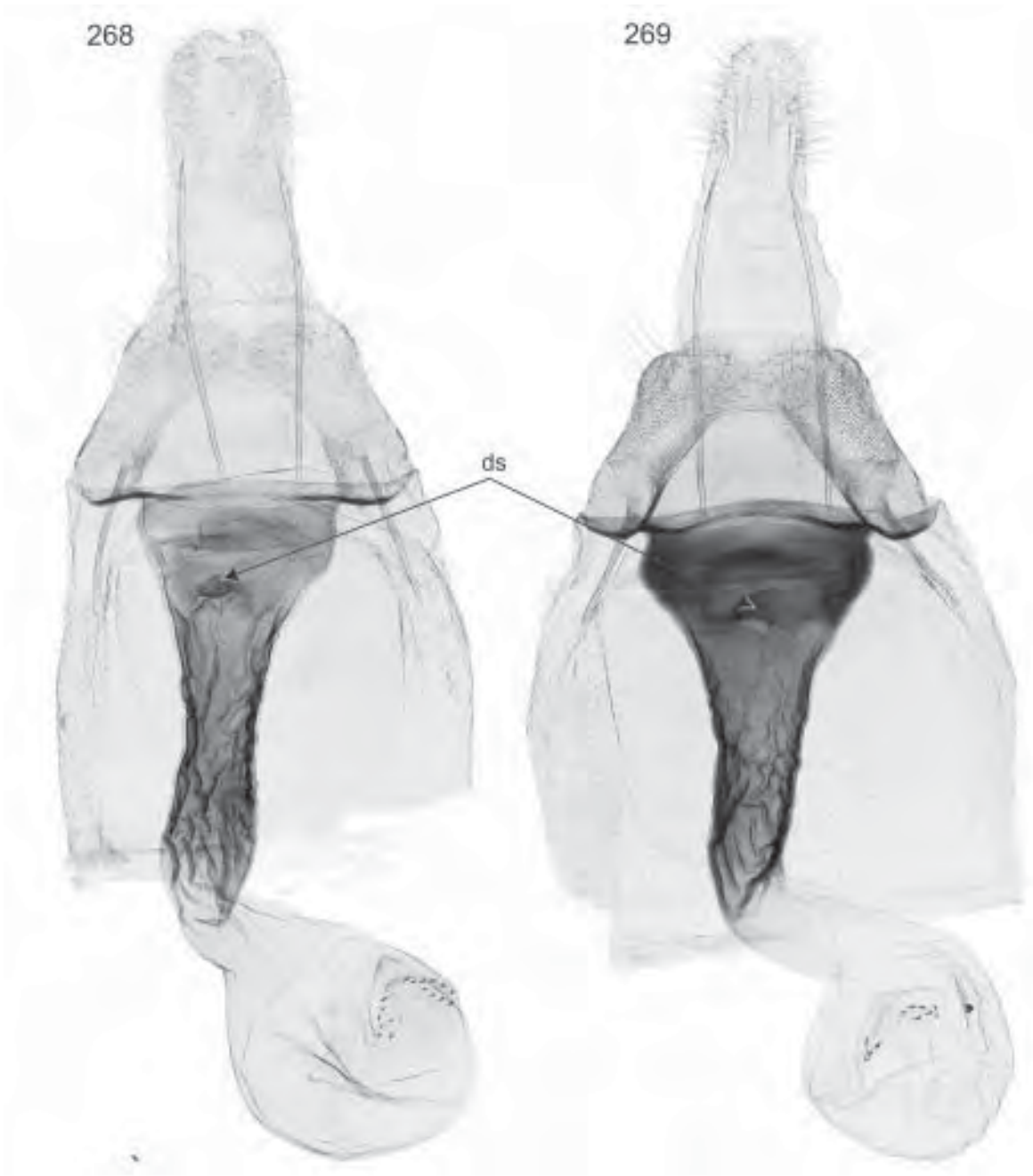


Female terminalia. (263) *Izatha copiosella*; (264) *I. mira*. (ds, ductus seminalis inception.)

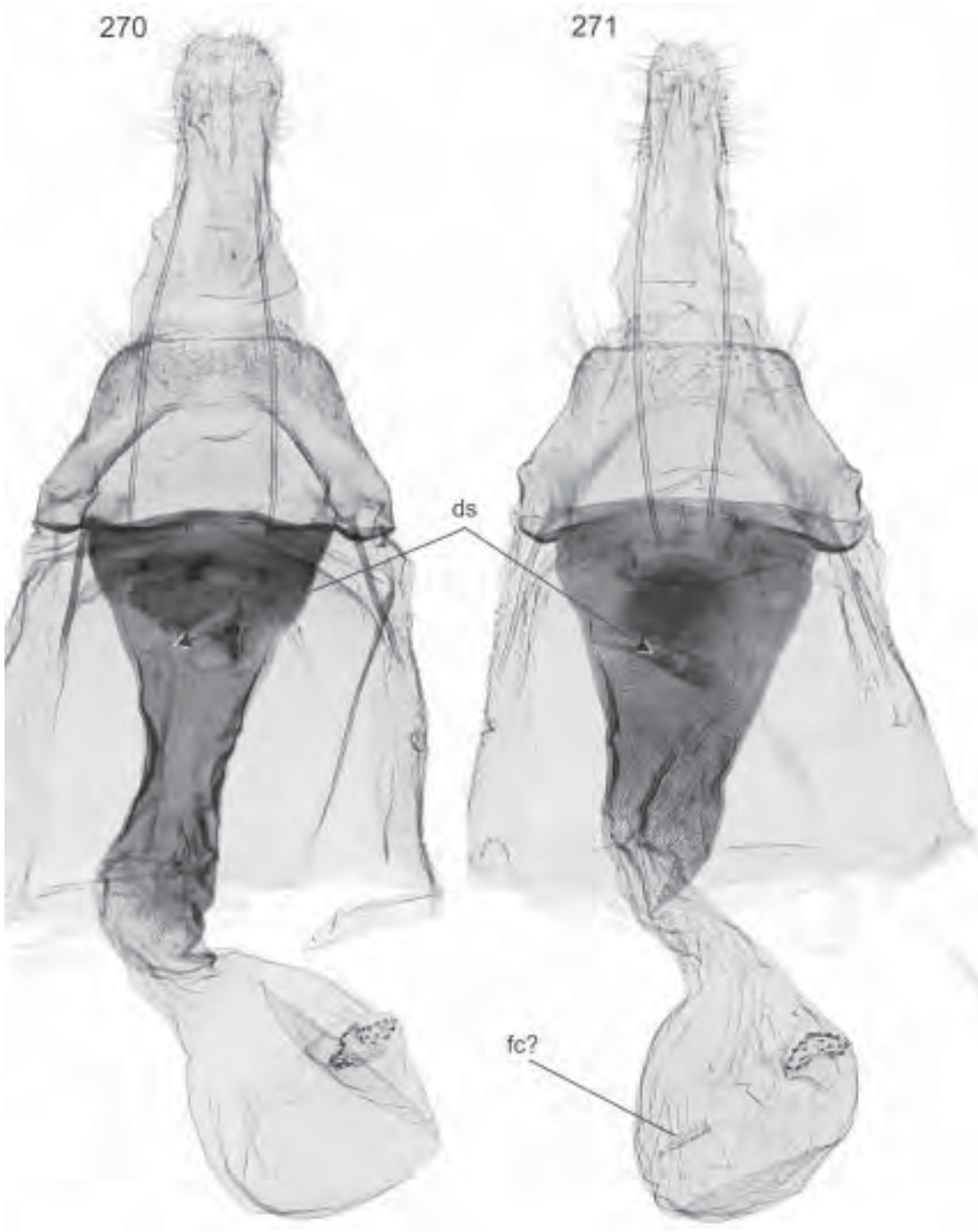


Female terminalia. (265) *Izatha notodoxa*; (266) *I. katadiktya*. (ds, ductus seminalis inception.)

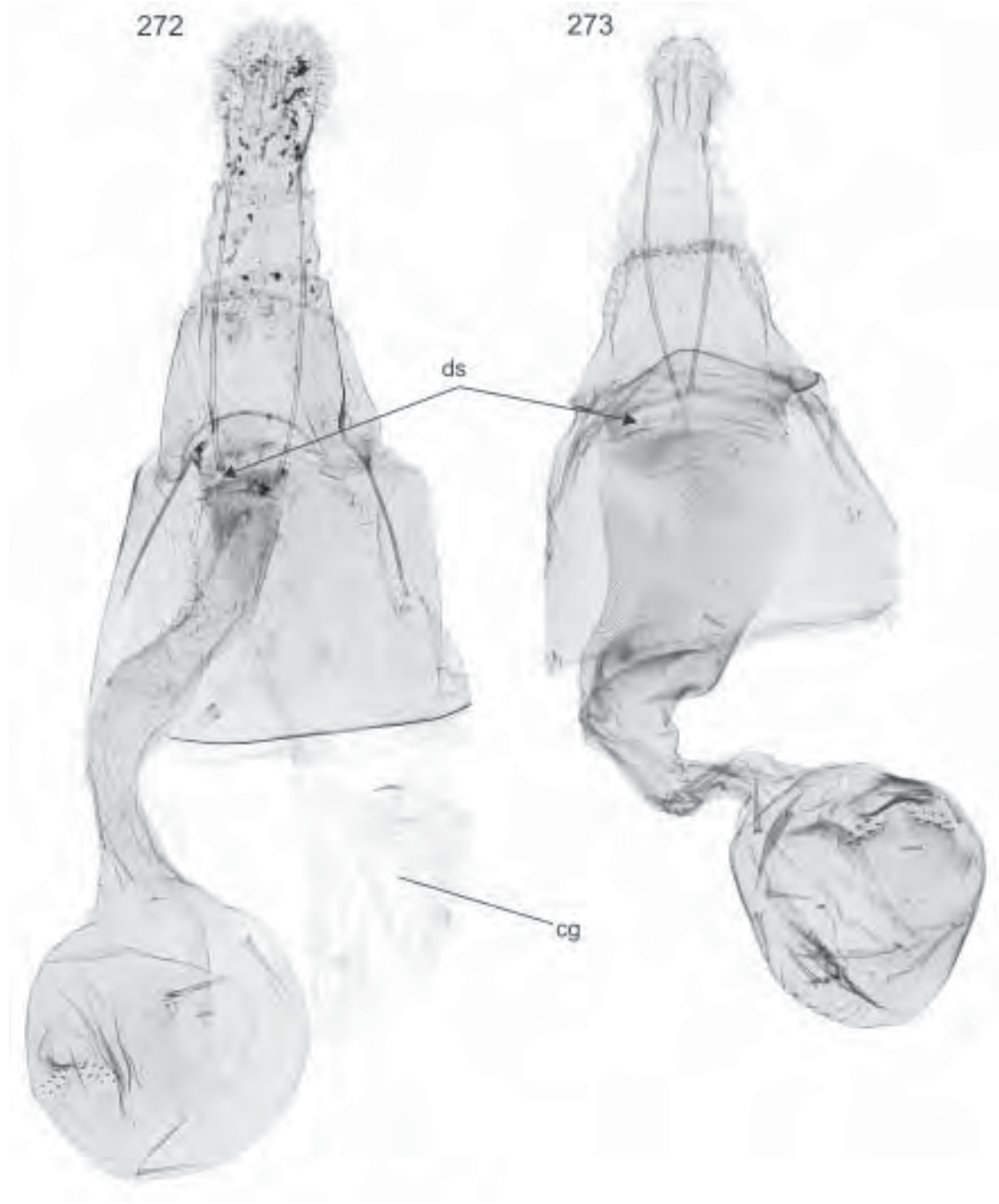
Female terminalia. (267) *Izatha apodoxa* (ds, ductus seminalis inception.)



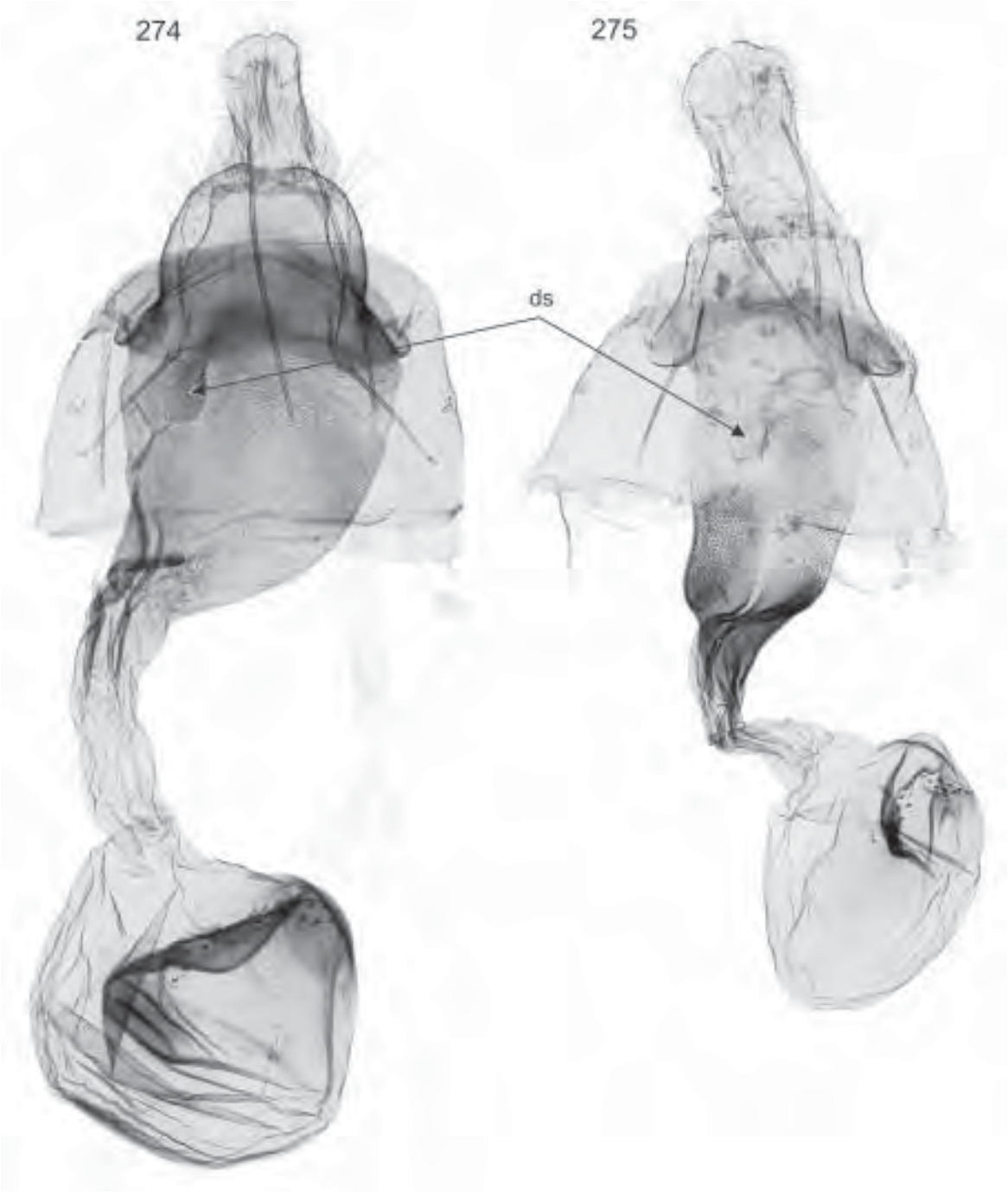
Female terminalia. (268, 269) *Izatha acmonias*: 268 (FD); 269 (BR). (ds, ductus seminalis inception.)



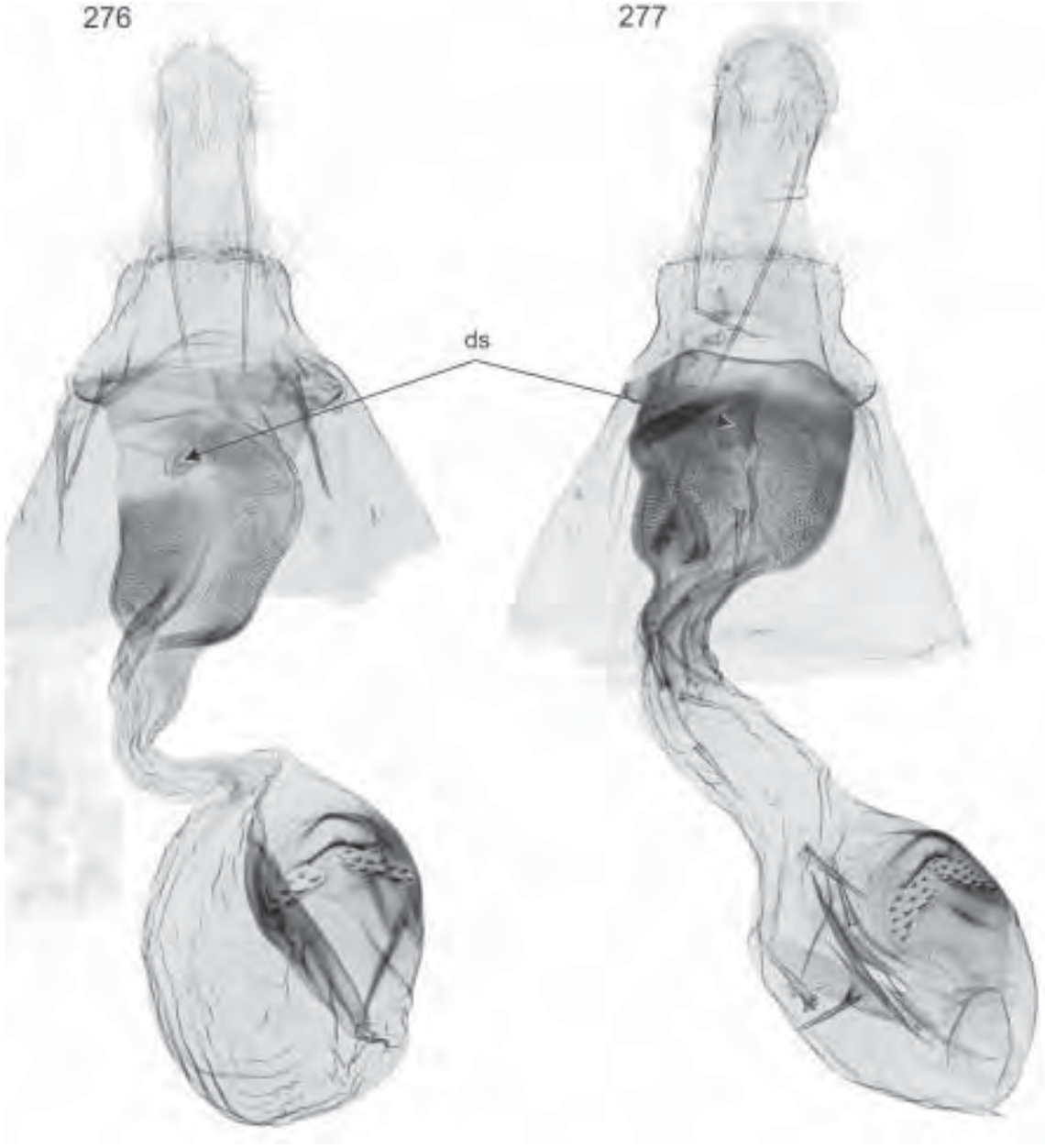
Female terminalia. (270) *Izatha lignyarcha*; (271) *I. picarella*. (ds, ductus seminalis inception; fc?, broken off part of male genitalia, possibly the fishhook cornutus.)



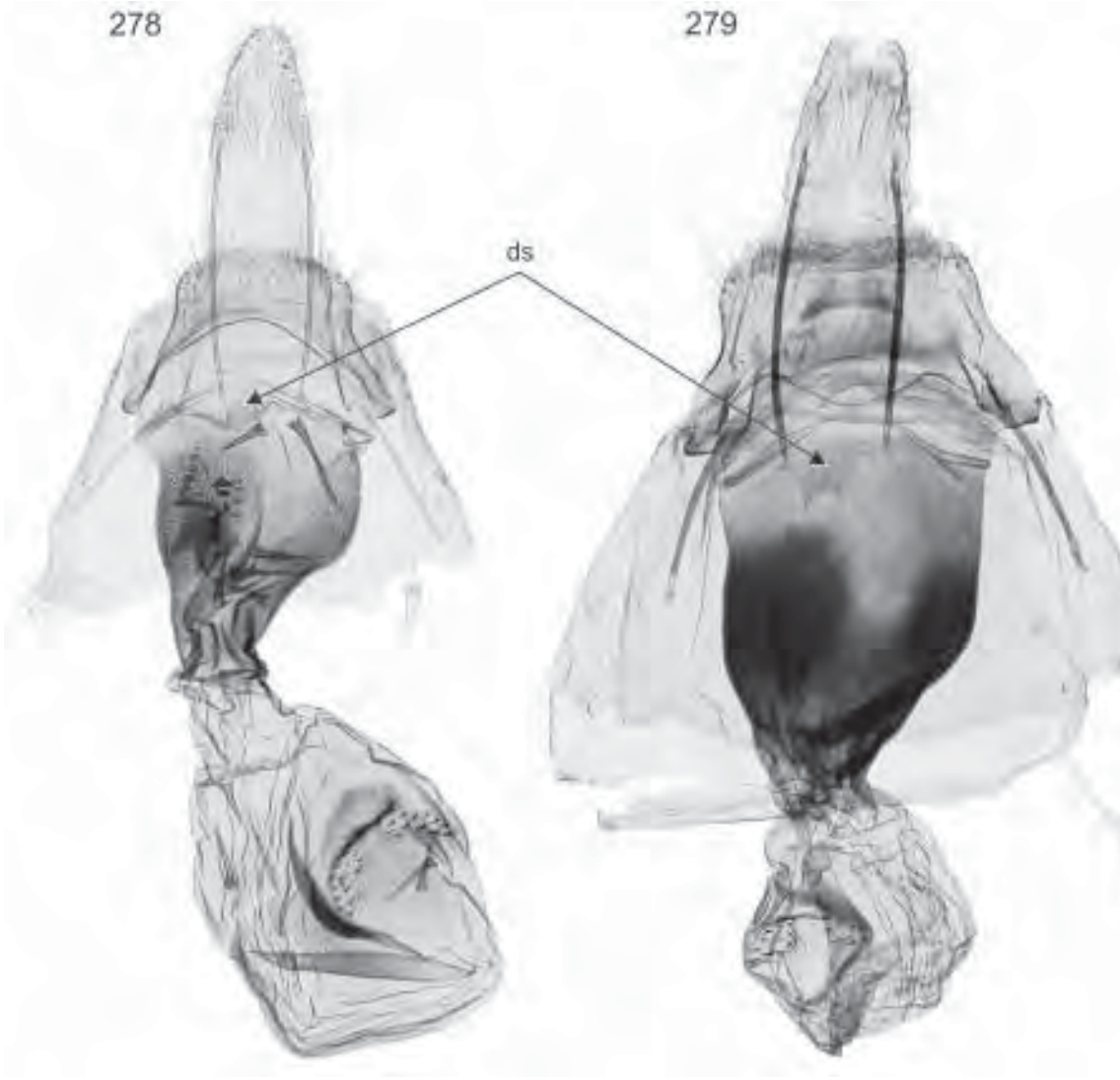
Female terminalia. (272) *Izatha metadelta*; (273) *I. balanophora*. (cg, colleterial glands; ds, ductus seminalis inception.)



Female terminalia. (274) *Izatha churtoni*; (275) *I. dulcior*. (ds, ductus seminalis inception.)



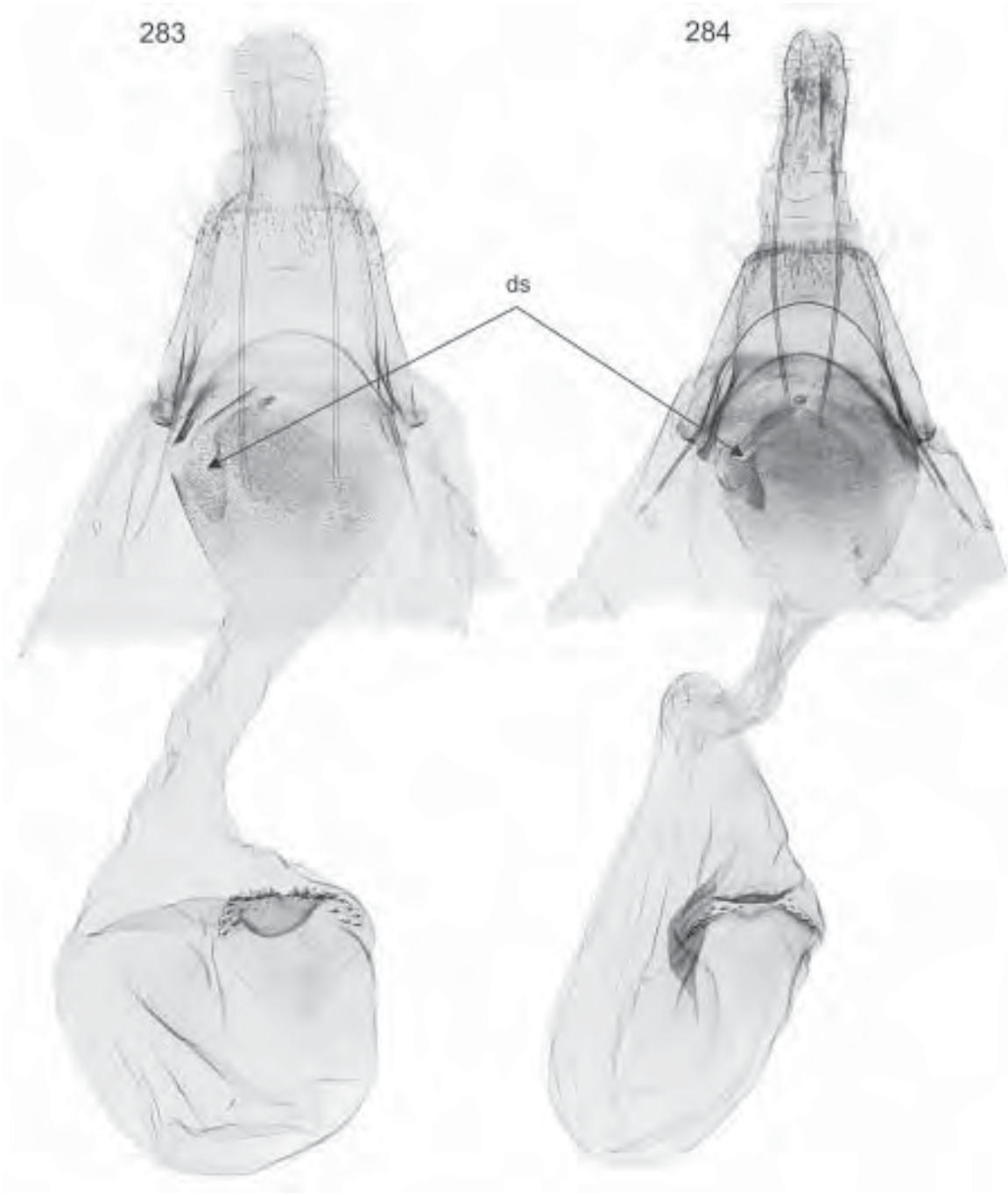
Female terminalia. (276) *Izatha epiphanes*; (277) *I. mesoschista*. (ds, ductus seminalis inception.)



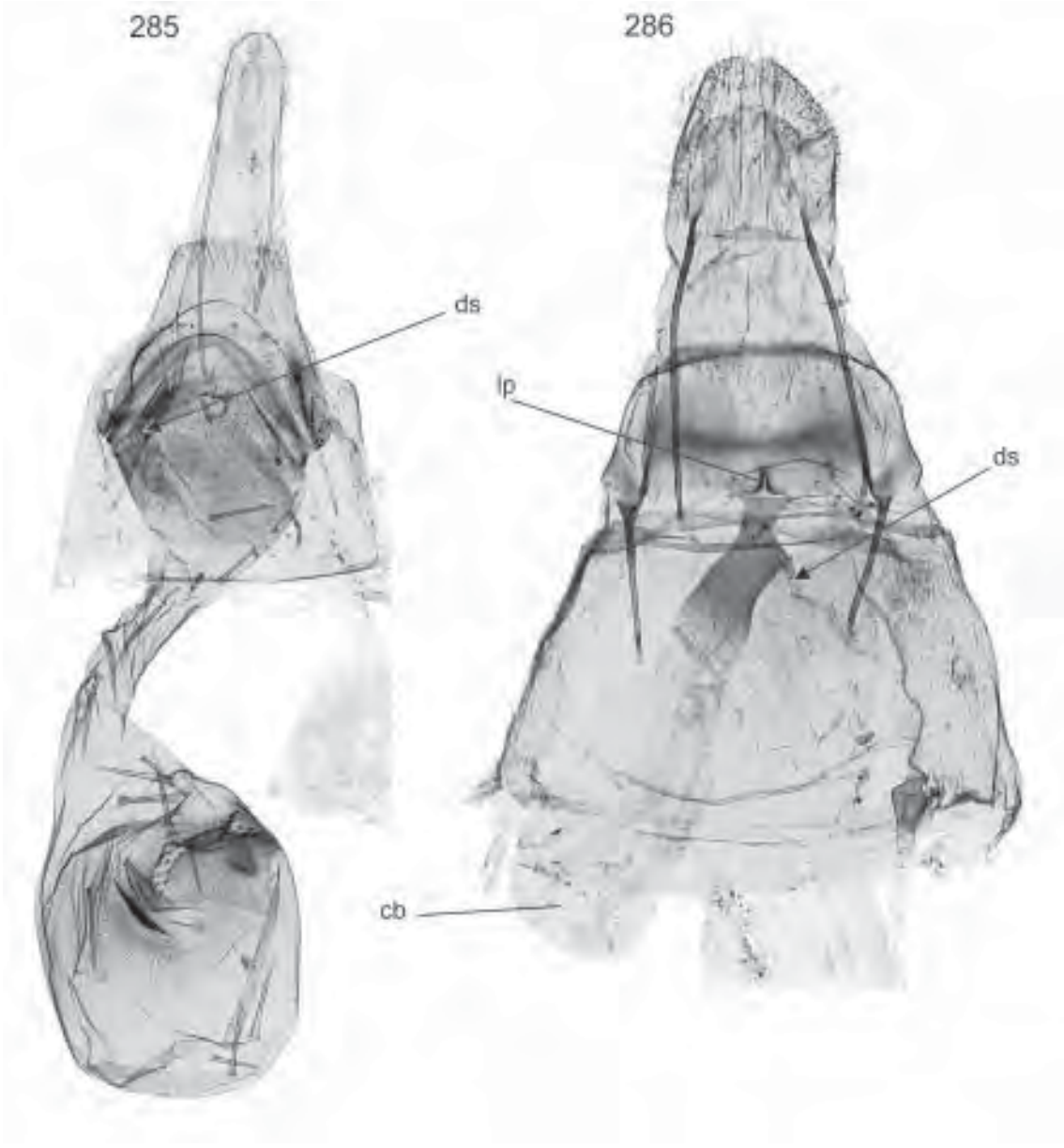
Female terminalia. (278) *Izatha haumu*; (279) *I. quinquejacula*. (ds, ductus seminalis inception.)

Female terminalia. (280) *Izatha heroica*; (281) *I. hudsoni*. (ds, ductus seminalis inception; la, lagena; ut, utriculus.)

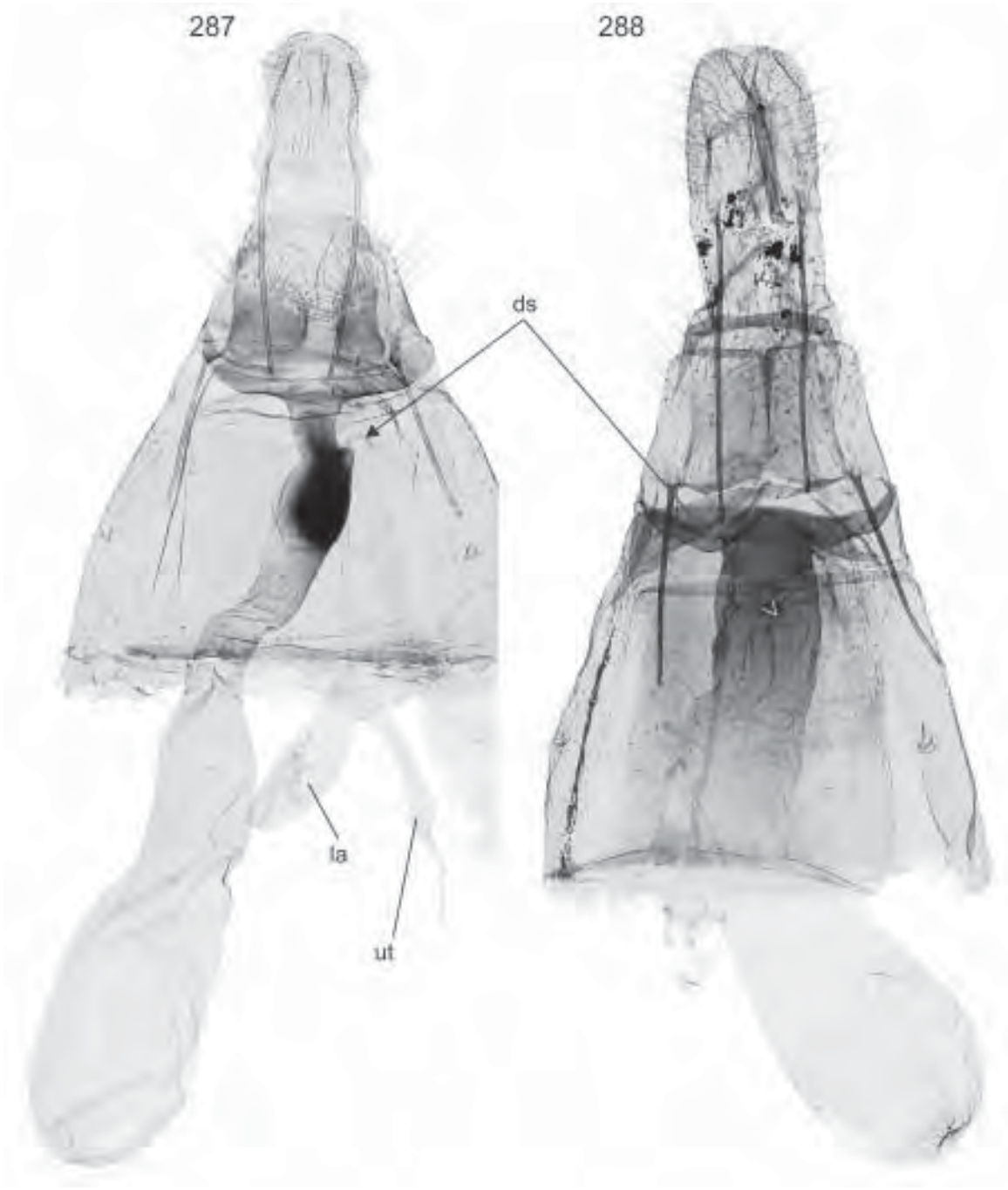
Female terminalia. (282) *Izatha huttonii*. (ds, ductus seminalis inception).



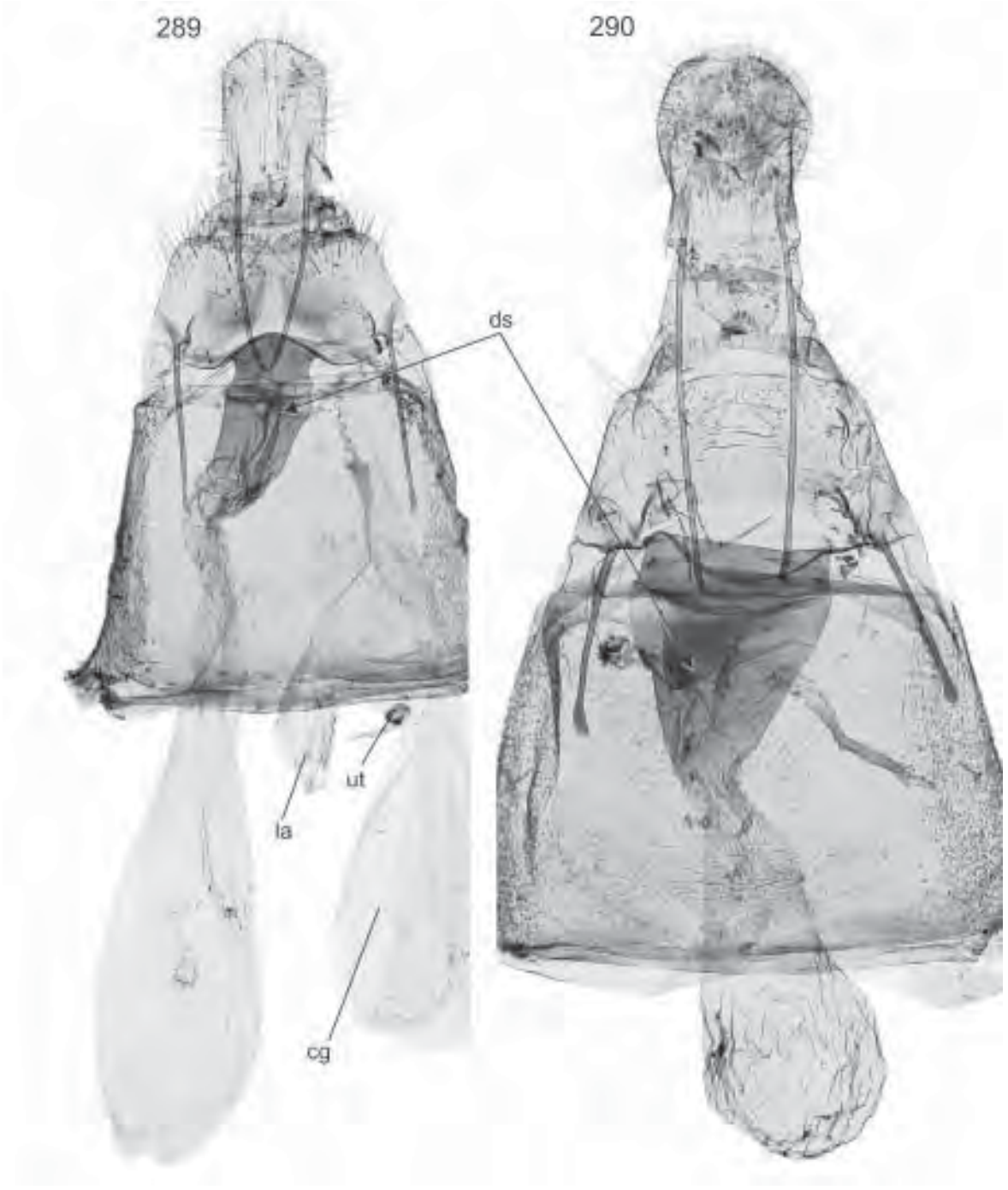
Female terminalia. (283, 284) *Izatha peroneanella*,: 283 (BP); 284 (ND, Poor Knights Islands). (ds, ductus seminalis inception.) (N.B. The difference in the shape of the corpus bursae represents individual variation and is not a consistent difference between localities.)



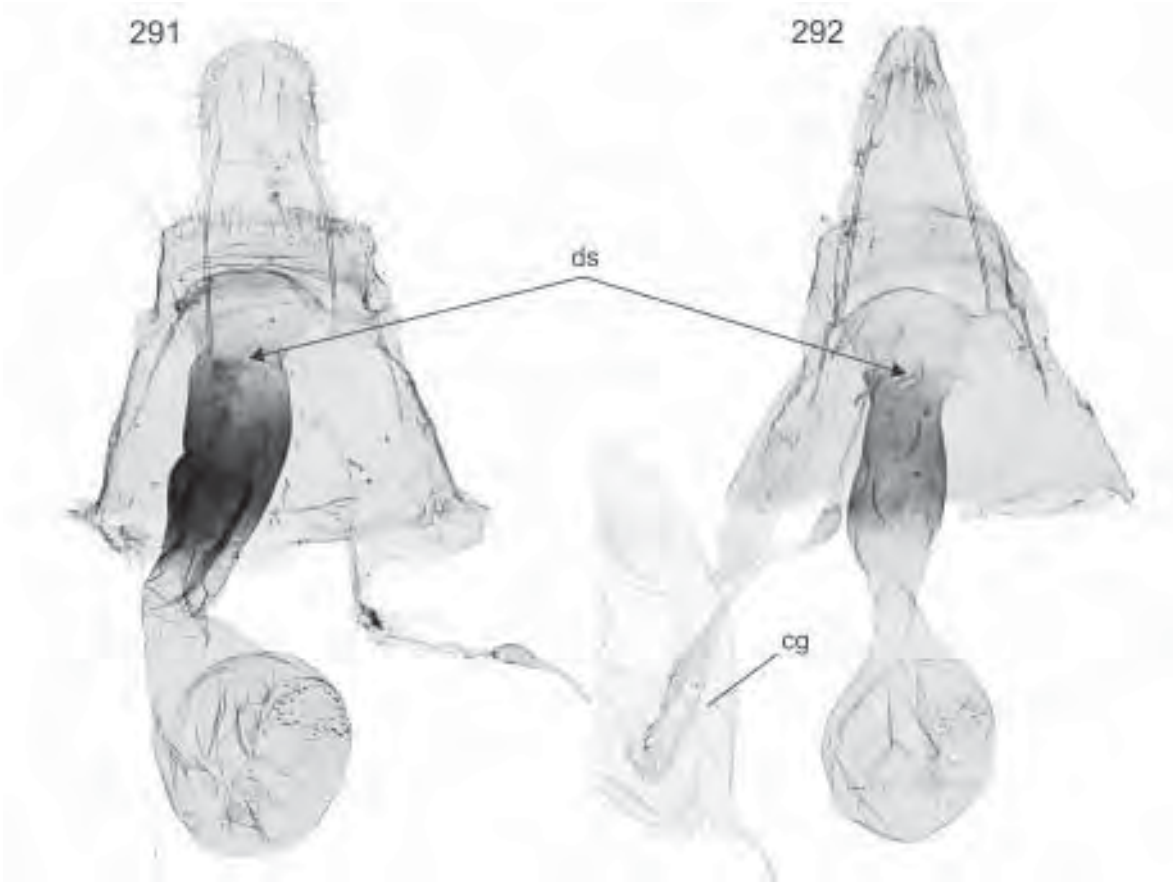
Female terminalia. (285) *Izatha taingo*; (286) *I. oleariae*. (cb, corpus bursae; ds, ductus seminalis inception; lp, lamella postvaginalis.) (N.B. The poorly sclerotised signum of *oleariae* does not show up in the photograph.)



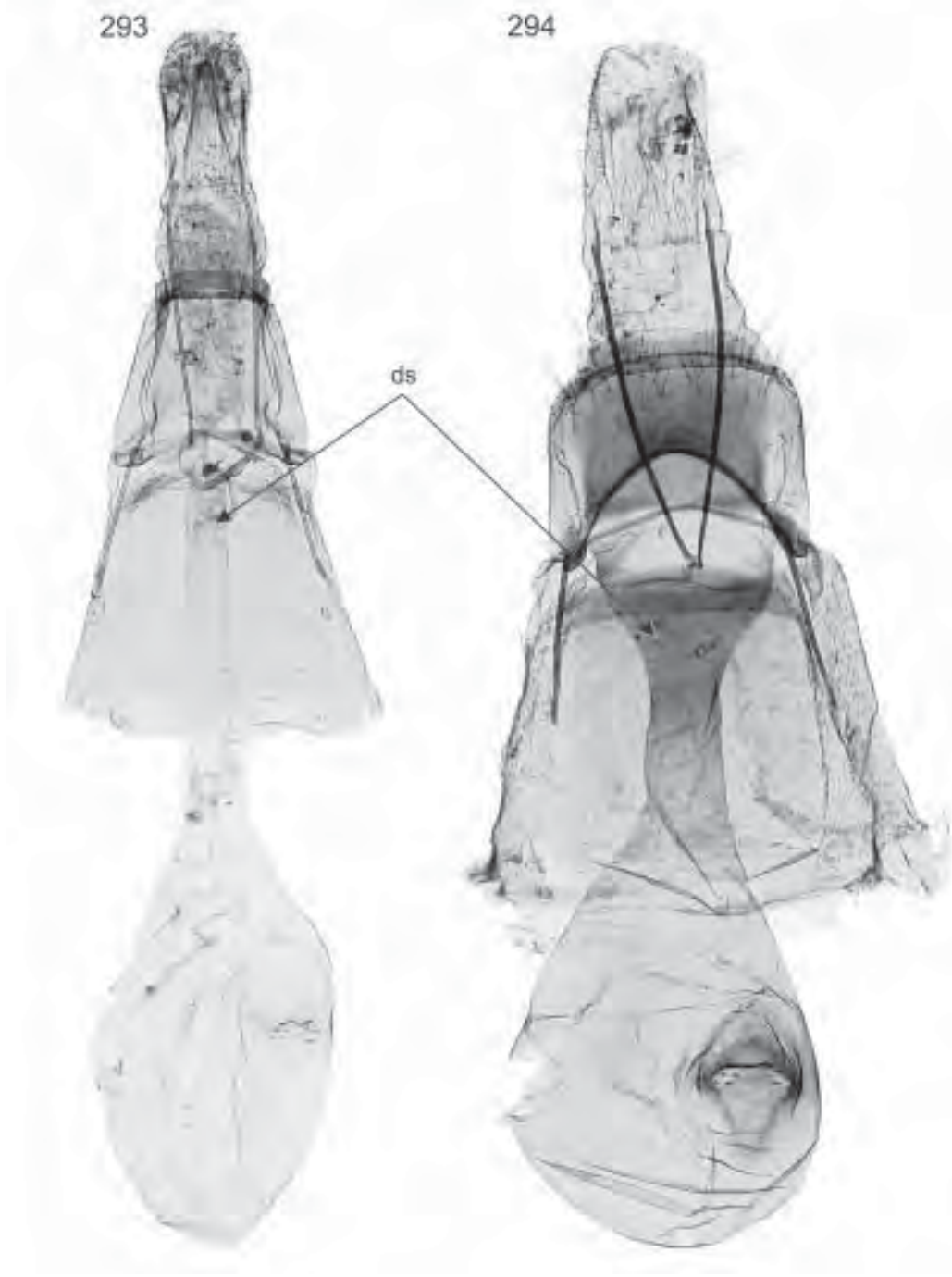
Female terminalia. (287) *Izatha prasophyta*; (288) *I. caustopa*. (ds, ductus seminalis inception; la, lagena; ut, utriculus.)



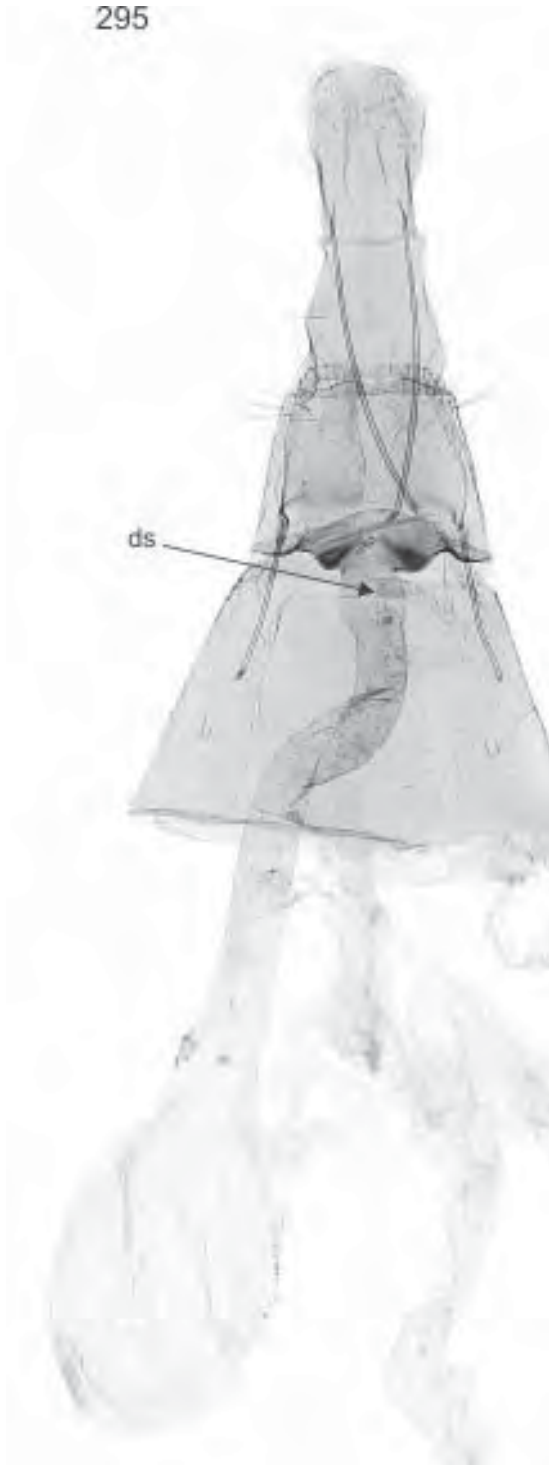
Female terminalia. (289) *Izatha dasydisca*; (290) *I. manubriata*. (cg, colleterial glands; ds, ductus seminalis inception; la, lagena; ut, utriculus.)



Female terminalia. (291) *Izatha convulsella*; (292) *I. gekkonella*. (cg, colleterial glands; ds, ductus seminalis inception.)



Female terminalia. (293) *Izatha gibbsi*; (294) *I. minimira*. (ds, ductus seminalis inception.)



Female terminalia. (295) *Izatha phaeoptila*. (ds, ductus seminalis inception.)

Fig. 296–301 Habitats for *Izatha* spp.: (296) Te Paki, tip of Aupouri Peninsula, ND, looking over Kauri Bush (ca. 180 m a.s.l.); *Izatha haumu* and *I. taingo* are endemic to this area, and *I. epiphanes*, *I. gibbsi,* and *I. prasophyta* are also recorded; (297) Waitakere Ranges AK, southwest end of the Cutty Grass Track (ca. 360 m a.s.l.); the richest known *Izatha* site, with 12 species recorded within 2 km of this clearing: *I. blepharidota*, *I. voluptuosa*, *I. austera*, *I. balanophora*, *I. churtoni*, *I. epiphanes*, *I. mesoschista*, *I. hudsoni*, *I. peroneanella*, *I. dasydisca*, *I. gibbsi,* and *I. phaeoptila*.

Habitats for *Izatha* spp.: (298) Mt Taranaki TK, Stratford Plateau (ca 1100 m a.s.l.), type locality of *I. lignyarcha*; also recorded: *I. voluptuosa*, *I. apodoxa* (pied form), *I. metadelta,* and *I. churtoni*; (299) Mt Arthur NN, treeline (ca 1300 m); *I. florida* is known from this area (photo courtesy of T. R. Buckley).

Habitats for *Izatha* spp.: (300) North arm of L. Wakatipu OL, between Queenstown and Glenorchy; *I. manubriata* occurs in this area, along with *I. copiosella*, *I. katadiktya*, *I. acmonias*, *I. huttonii,* and *I. convulsella*; (301) Snares Islands SN, Western Chain, type locality of *I. spheniscella* (photo courtesy of J. W. Early).

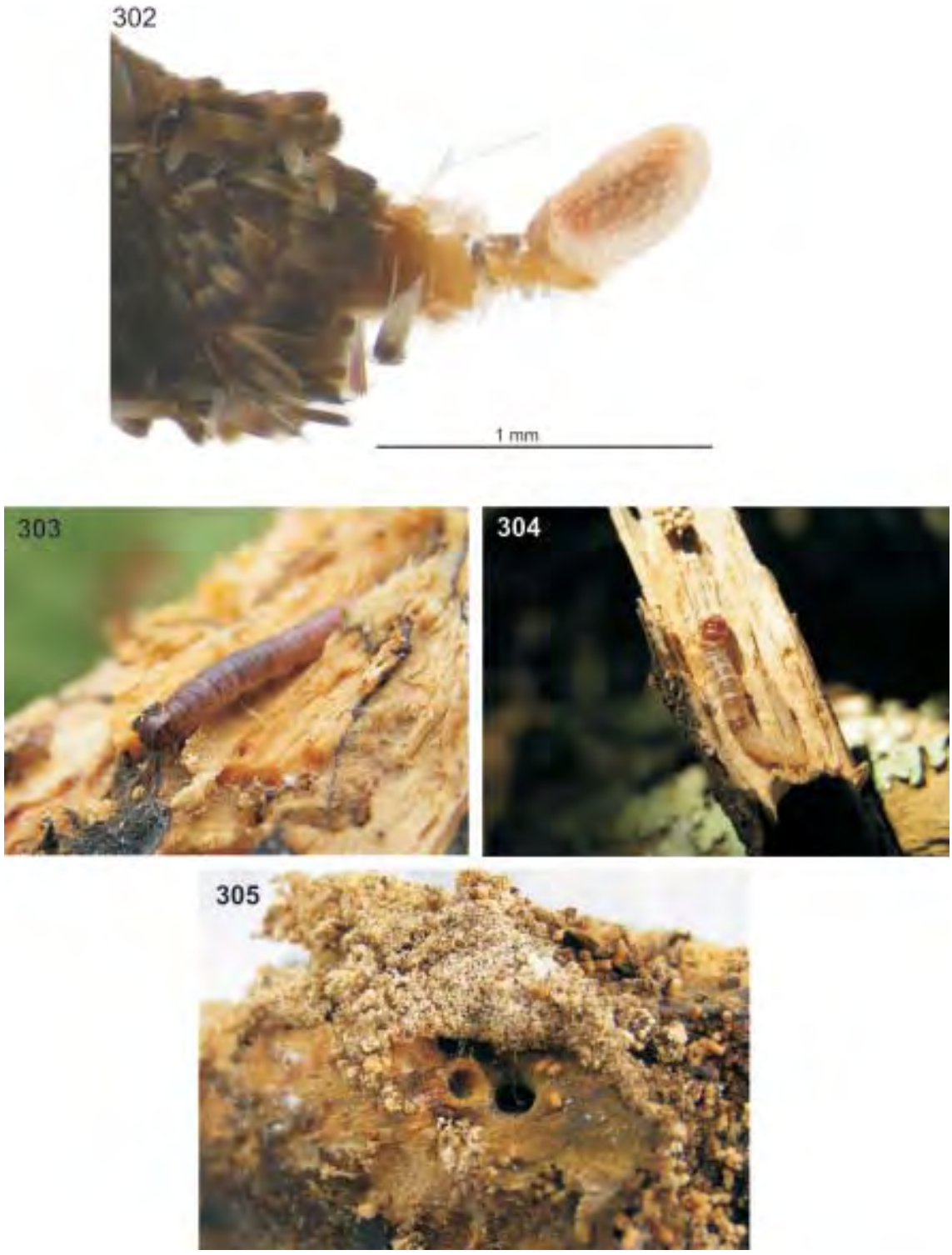
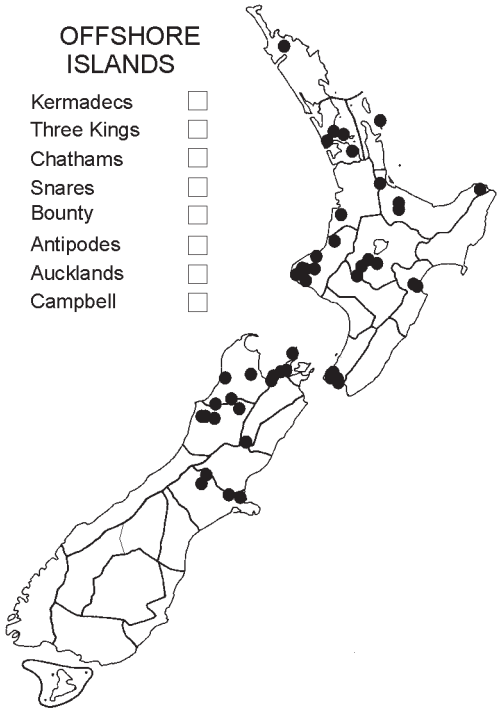


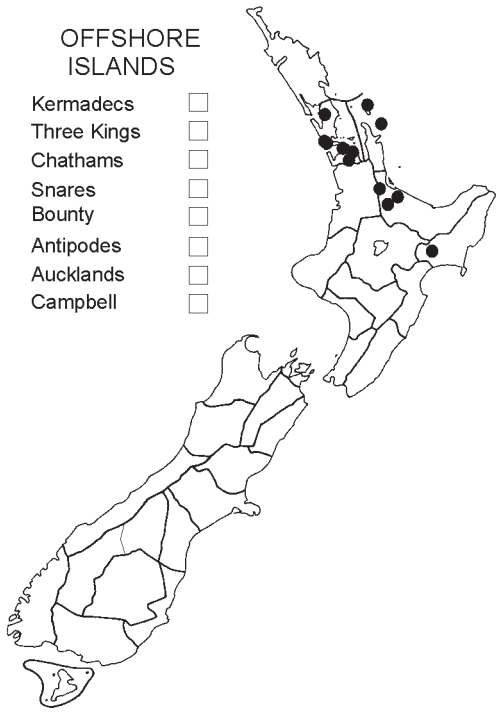
Fig. 302–305 Immature stages and larval damage of *Izatha*: (302) egg of *I. copiosella*, still attached to female ovipositor; (303) larva of undetermined species, in dead wood of *Coprosma grandifolia*; (304) larva of *I. peroneanella*, in dead wood of *Coprosma grandifolia*; (305) larval damage of *Izatha* sp. on *Coprosma grandifolia*: silken webbing incorporating frass has been peeled away to show larval retreat.

Fig. 306–310 Live adults of *Izatha*: (306) *I. attactella*; (307) *I. blepharidota*; (308) *I. katadiktya*; (309) *I. peroneanella*; (310) *I. prasophyta* (photo courtesy of R. A. B. Leschen).

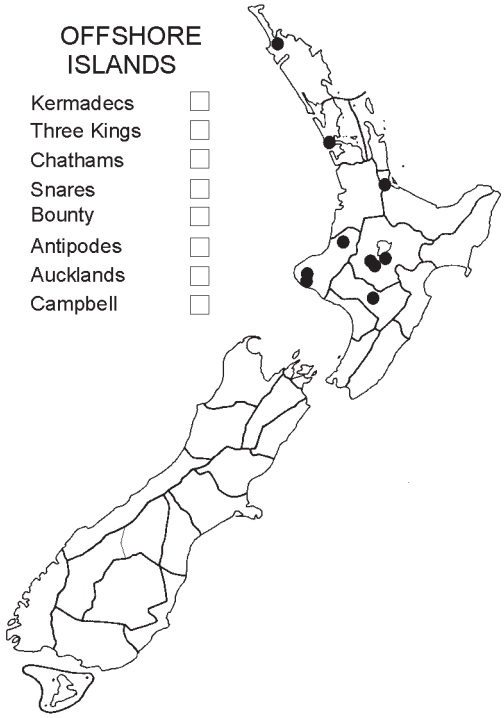
Fig. 311 *Fuchsia excorticata* (kotukutuku): dead branches are a favoured pabulum of *Izatha* larvae, including the rare *I. caustopa* (Mt Taranaki TK.)



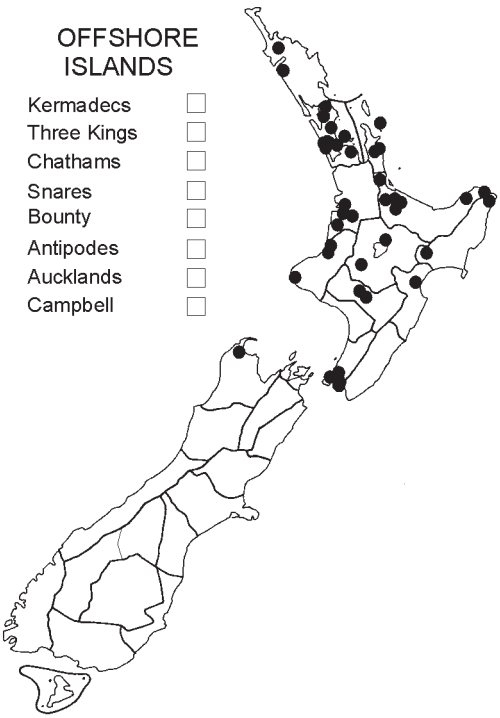
Map 1 Collection localities, *Izatha attactella*



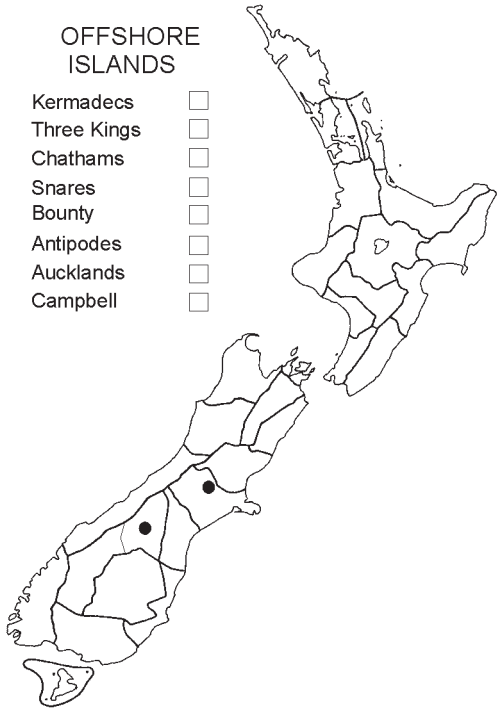
Map 2 Collection localities, *Izatha blepharidota*



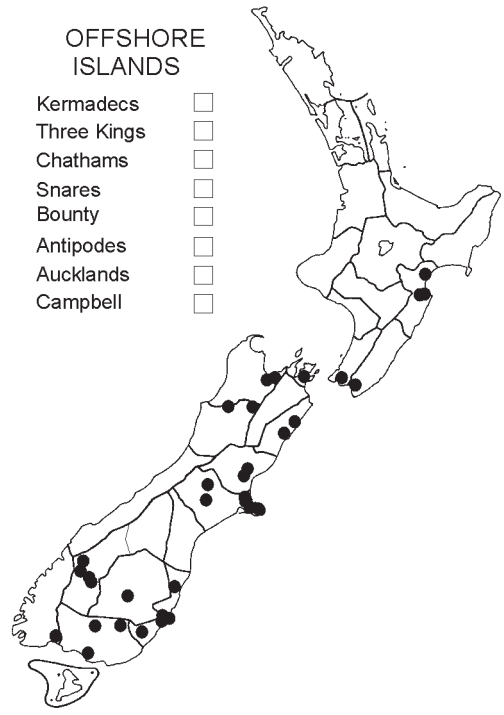
Map 3 Collection localities, *Izatha voluptuosa*



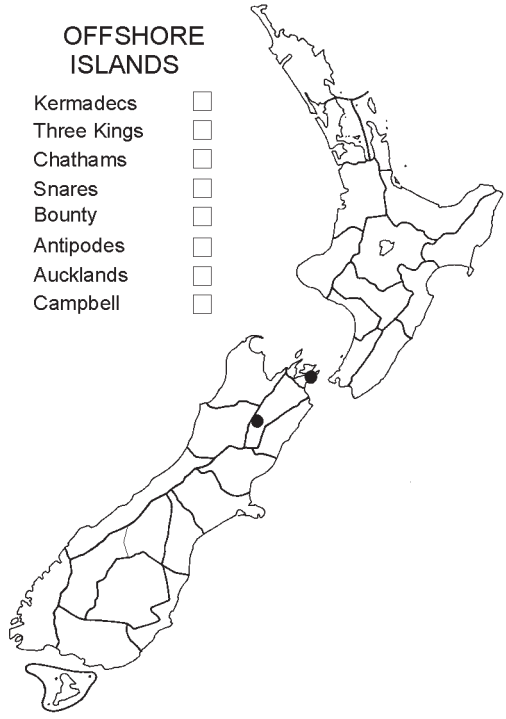
Map 4 Collection localities, *Izatha austera*



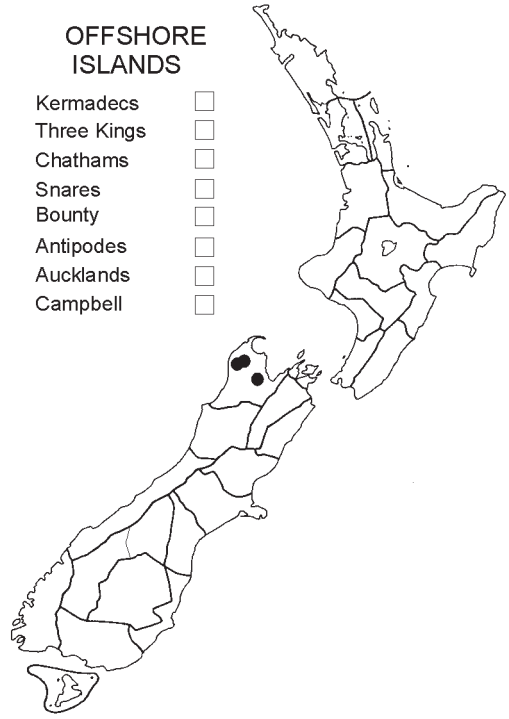
Map 5 Collection localities, *Izatha psychra*



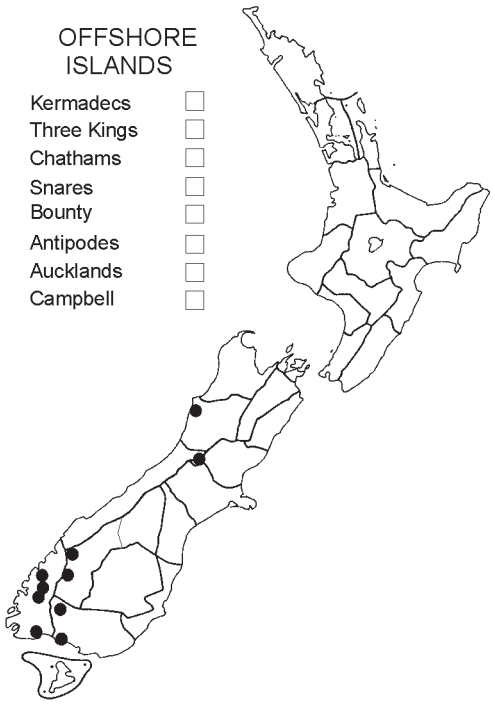
Map 6 Collection localities, *Izatha copiosella*



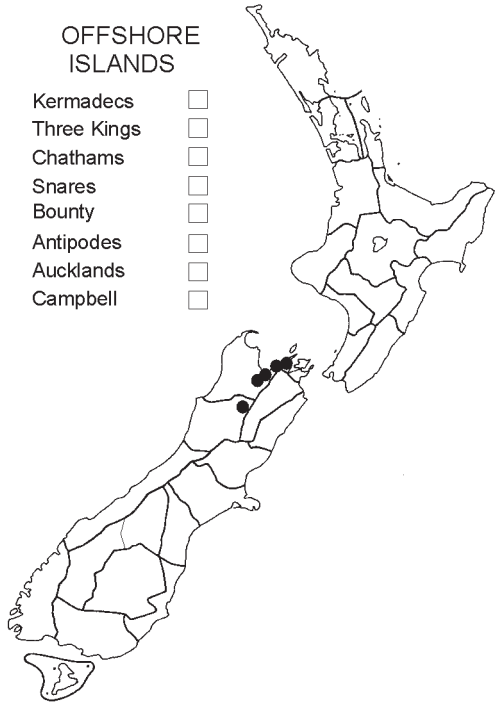
Map 7 Collection localities, *Izatha walkerae*



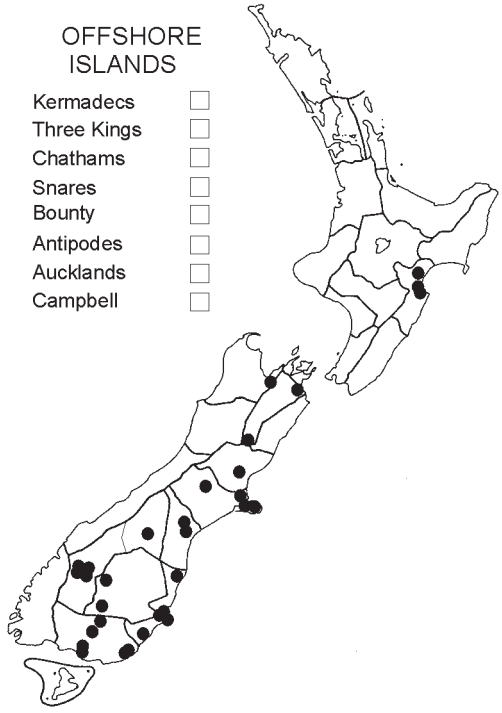
Map 8 Collection localities, *Izatha florida*



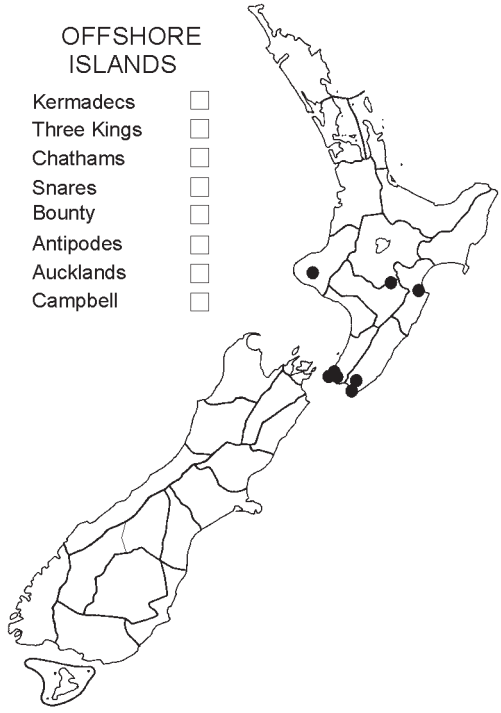
Map 9 Collection localities, *Izatha mira*



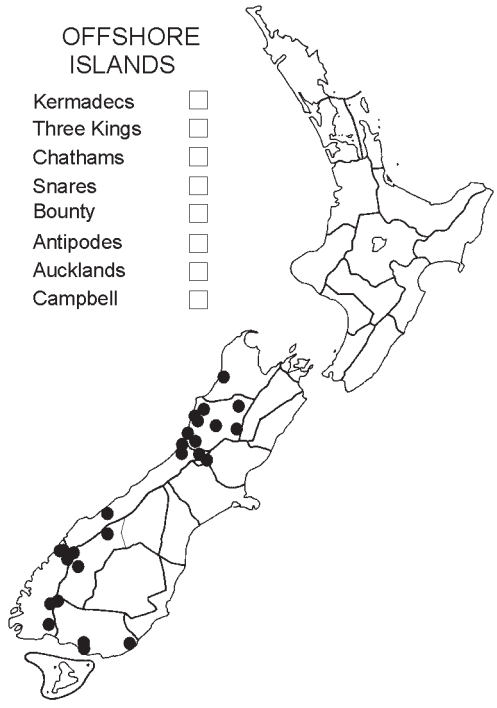
Map 10 Collection localities, *Izatha notodoxa*



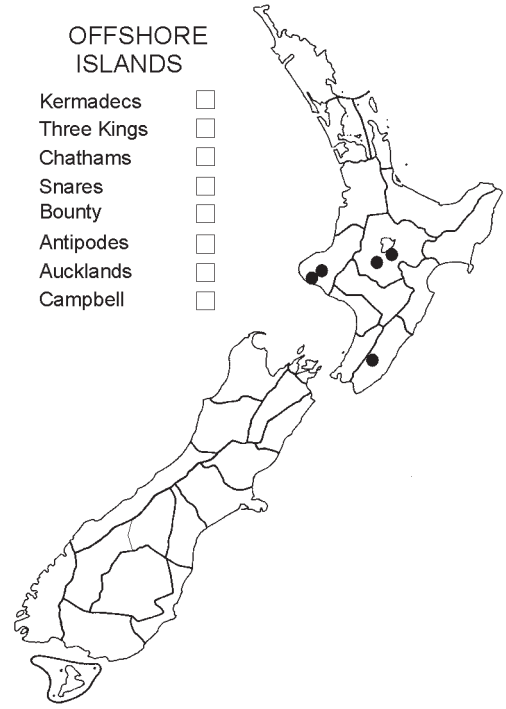
Map 11 Collection localities, *Izatha katadiktya*



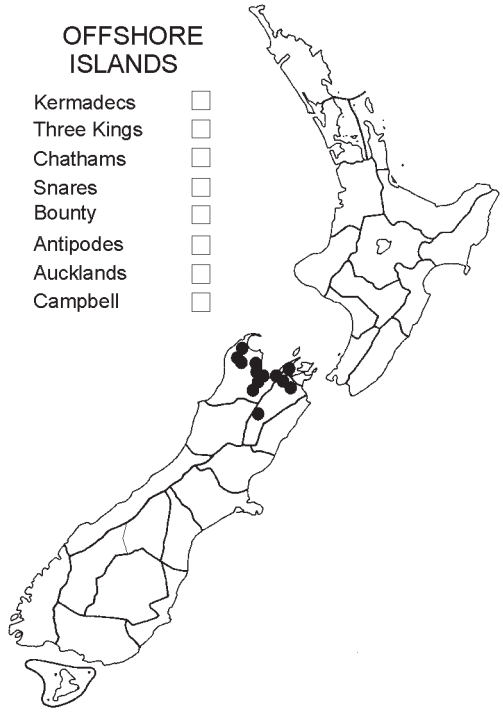
Map 12 Collection localities, *Izatha apodoxa*



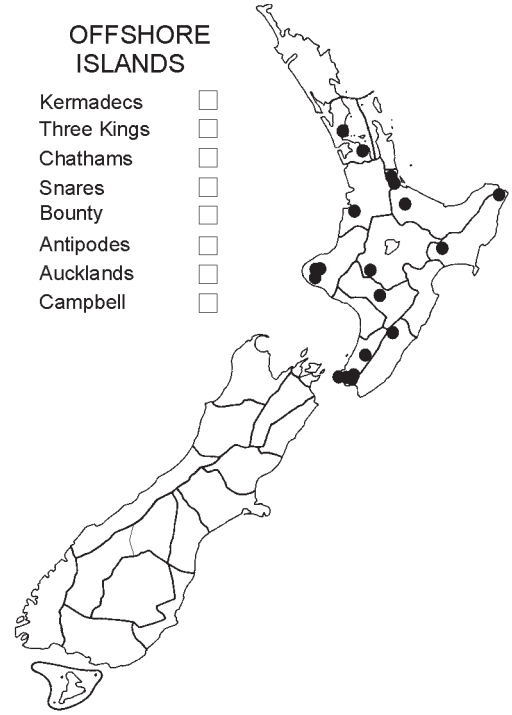
Map 13 Collection localities, *Izatha acmonias*



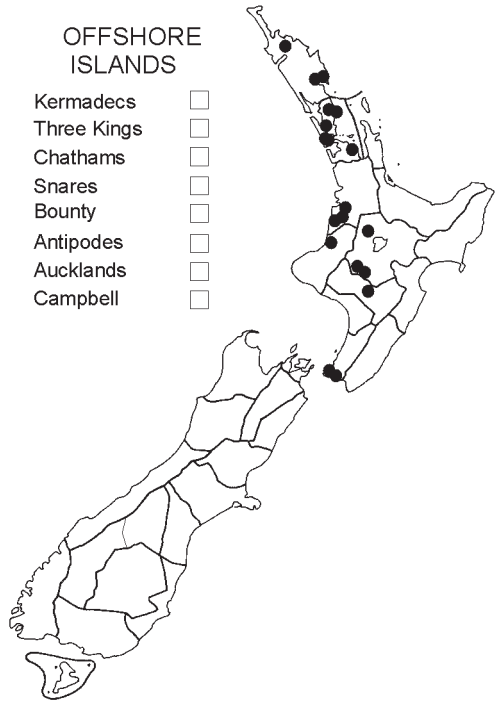
Map 14 Collection localities, *Izatha lignyarcha*



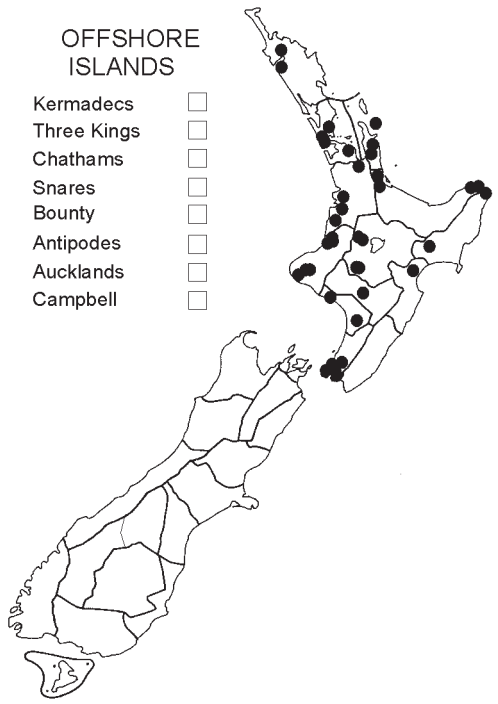
Map 15 Collection localities, *Izatha picarella*



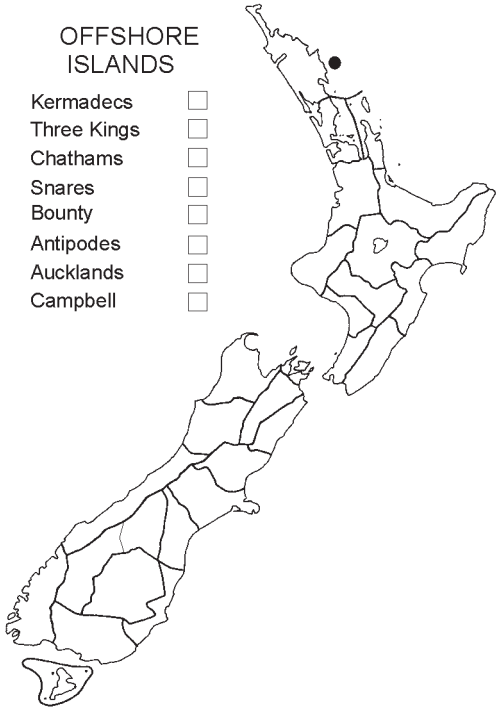
Map 16 Collection localities, *Izatha metadelta*



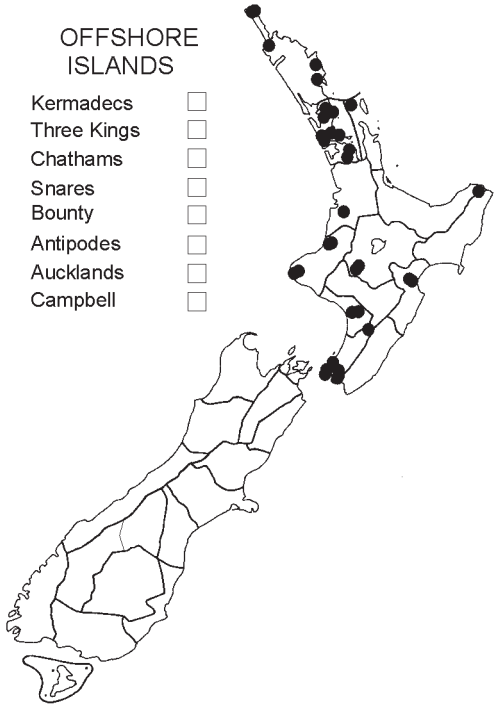
Map 17 Collection localities, *Izatha balanophora*



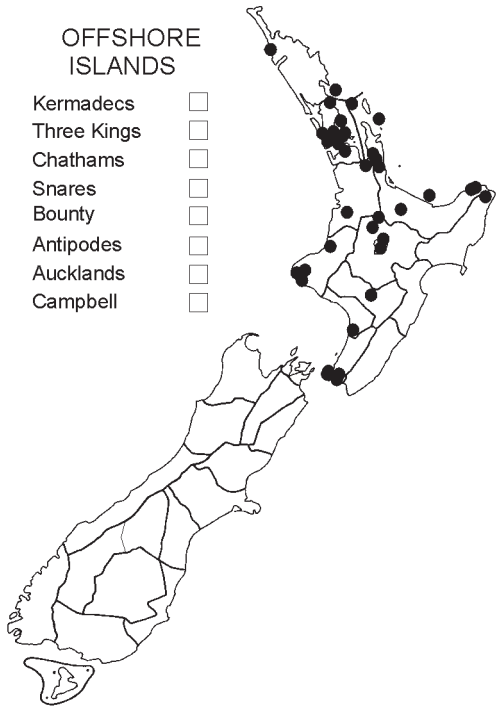
Map 18 Collection localities, *Izatha churtoni*



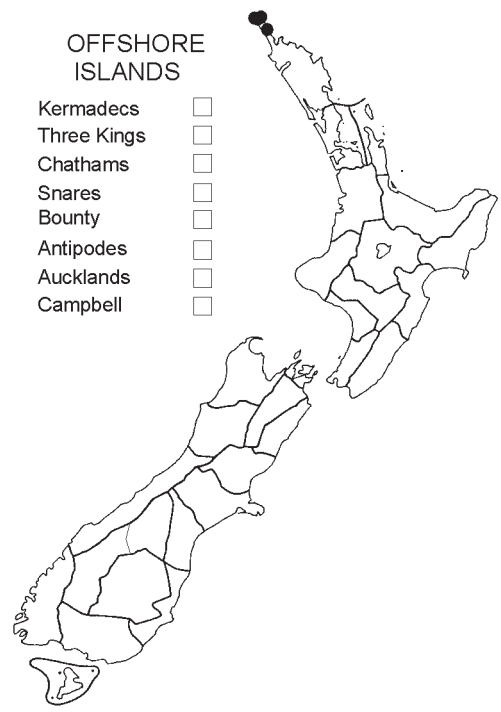
Map 19 Collection localities, *Izatha dulcior*



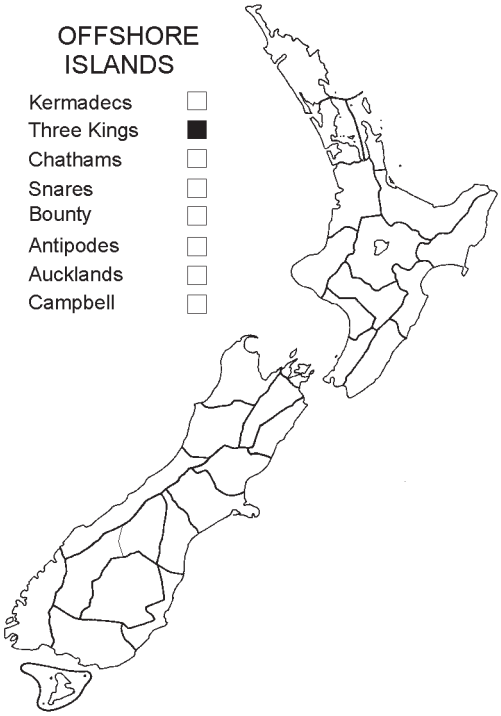
Map 20 Collection localities, *Izatha epiphanes*



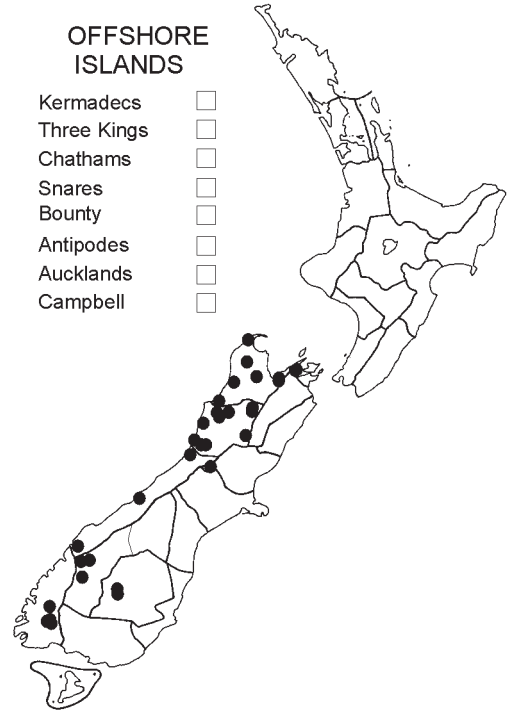
Map 21 Collection localities, *Izatha mesoschista*



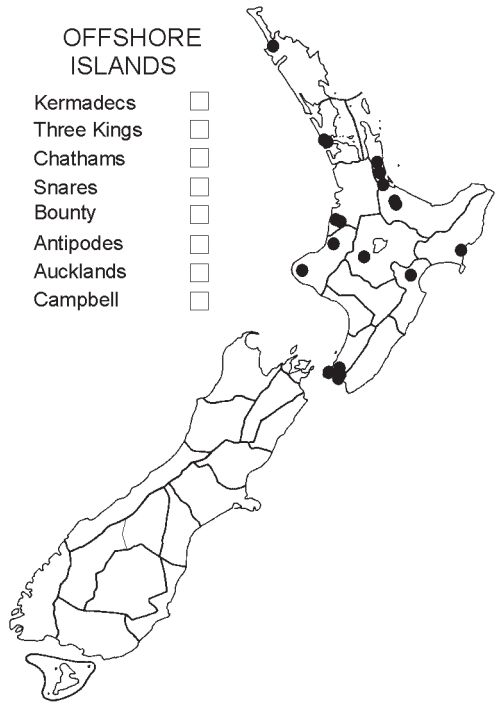
Map 22 Collection localities, *Izatha haumu*



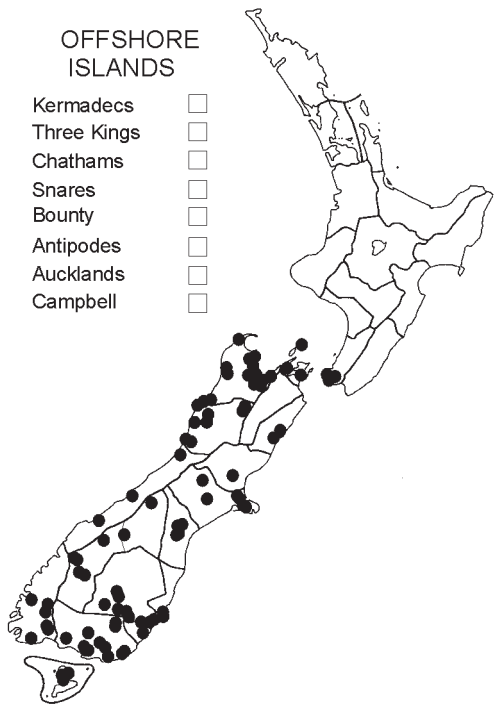
Map 23 Collection localities, *Izatha quinquejacula*



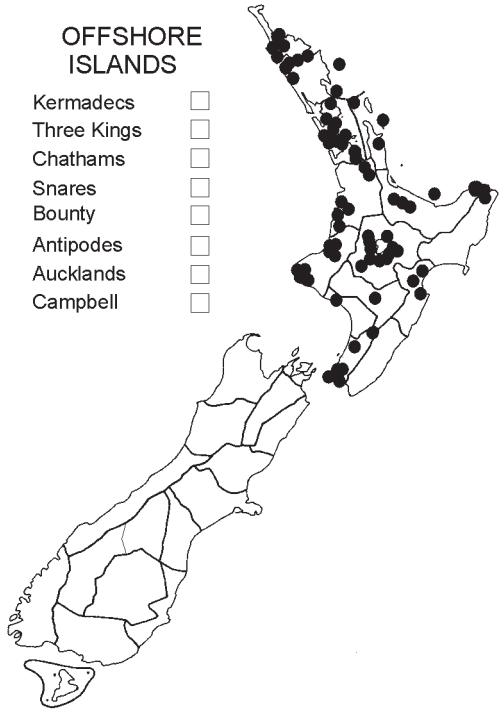
Map 24 Collection localities, *Izatha heroica*



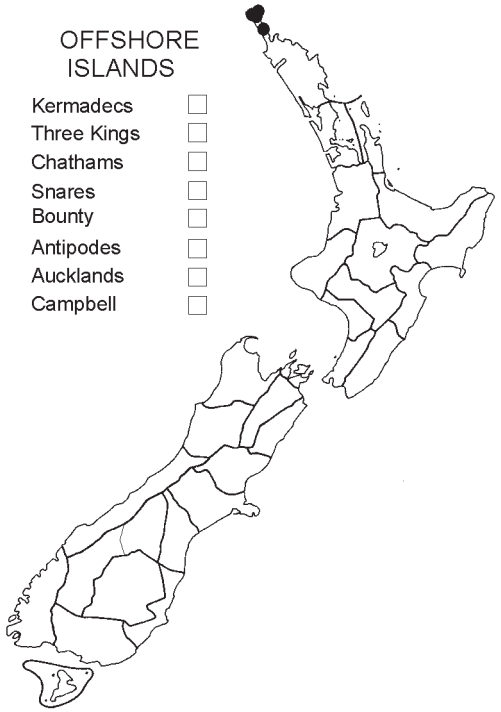
Map 25 Collection localities, *Izatha hudsoni*



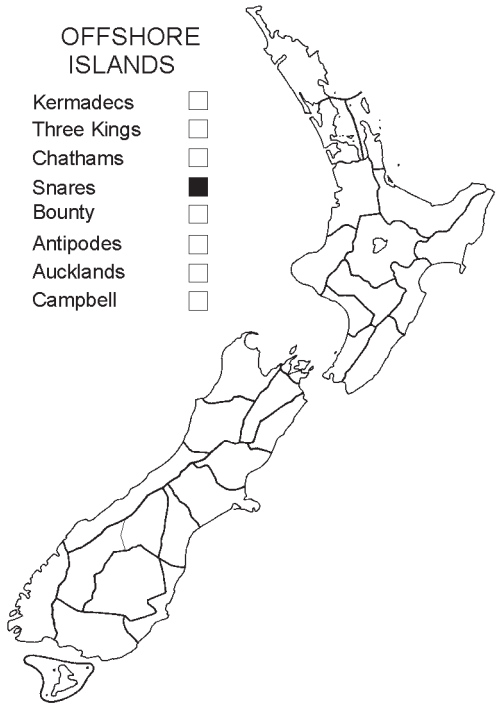
Map 26 Collection localities, *Izatha huttonii*



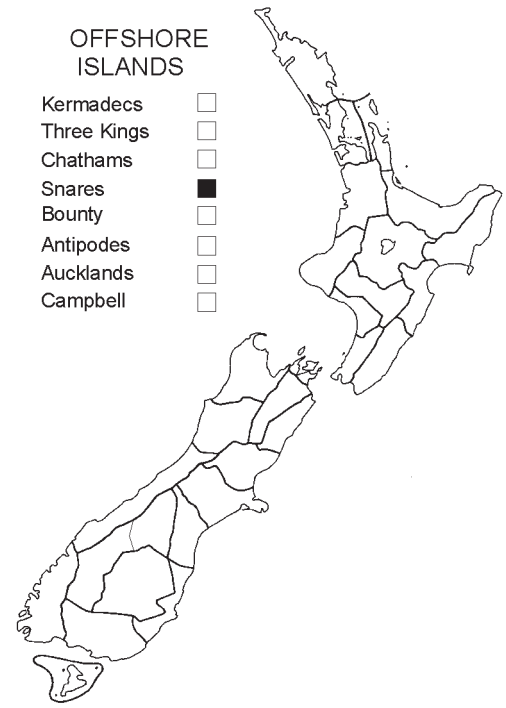
Map 27 Collection localities, *Izatha peroneanella*



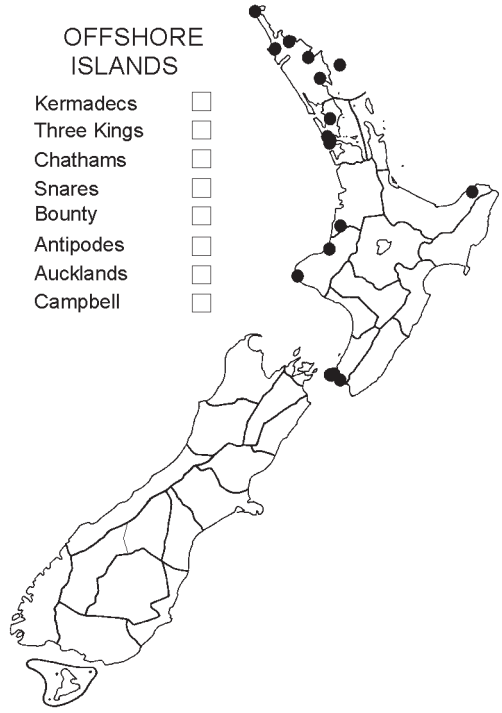
Map 28 Collection localities, *Izatha taingo*



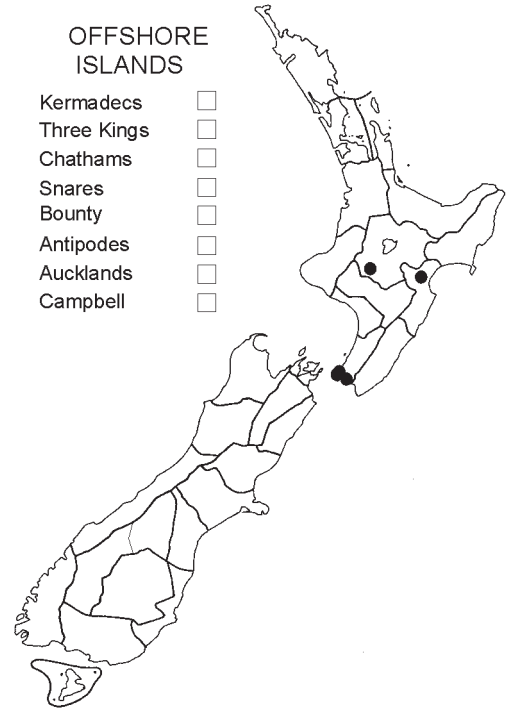
Map 29 Collection localities, *Izatha olearíae*



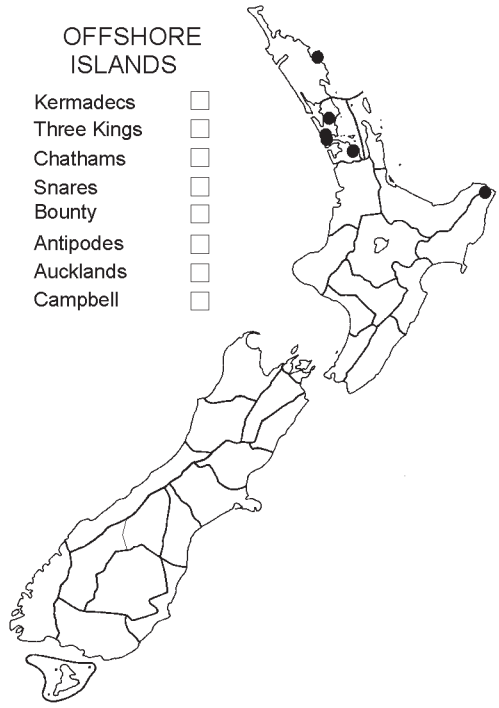
Map 30 Collection localities, *Izatha spheniscella*



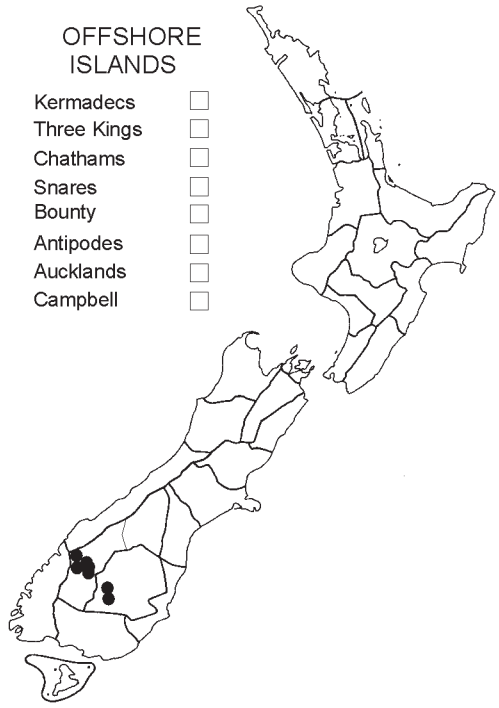
Map 31 Collection localities, *Izatha prasophyta*



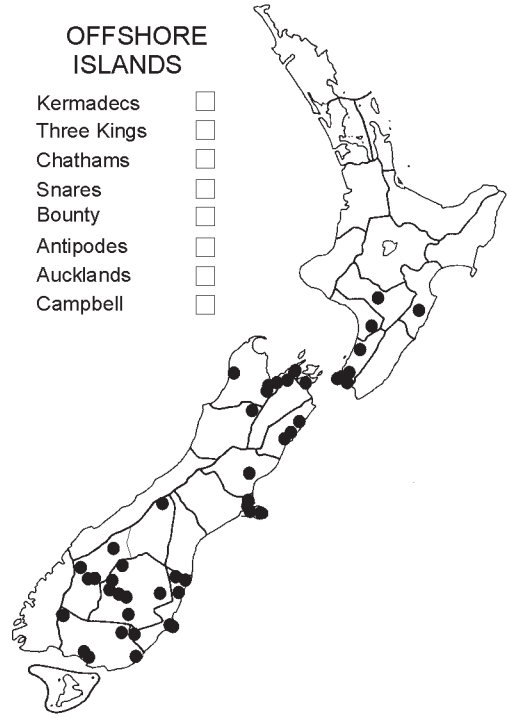
Map 32 Collection localities, *Izatha caustopa*



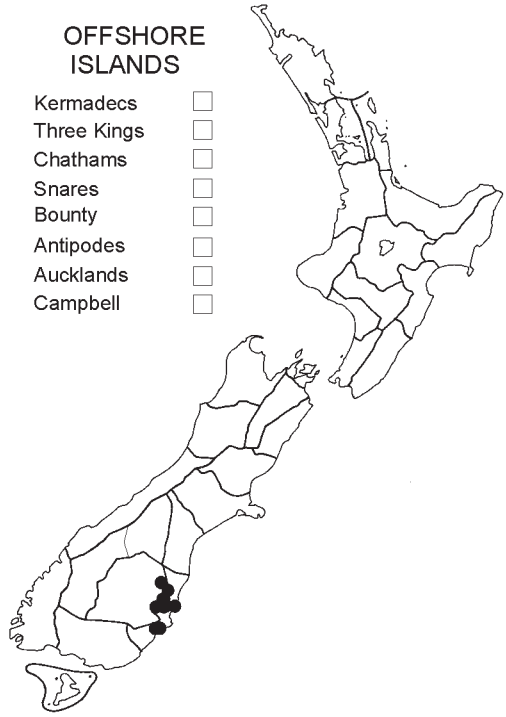
Map 33 Collection localities, *Izatha dasydisca*



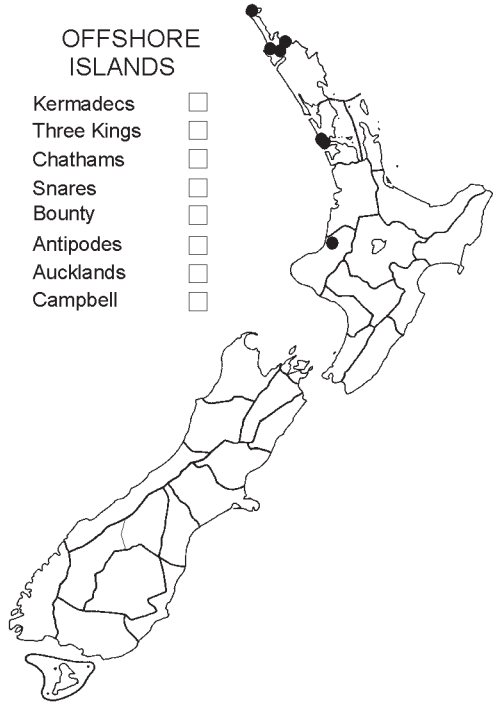
Map 34 Collection localities, *Izatha manubriata*



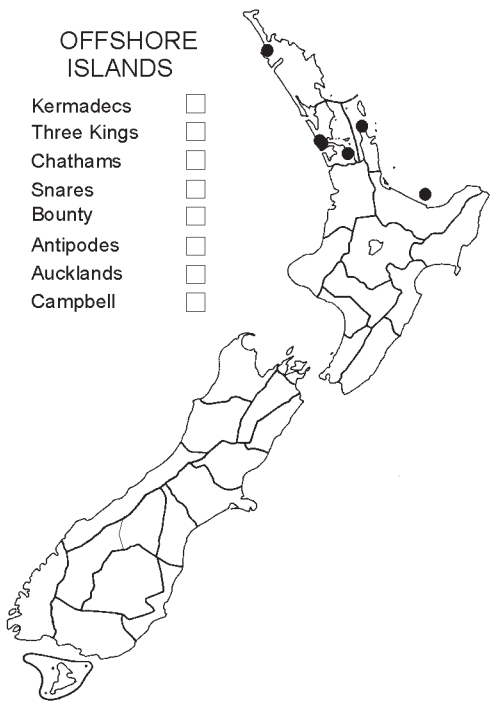
Map 35 Collection localities, *Izatha convulsella*



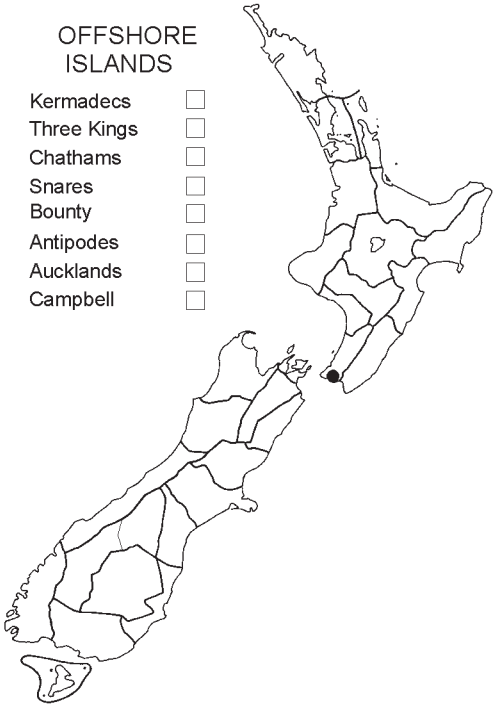
Map 36 Collection localities, *Izatha gekkonella*



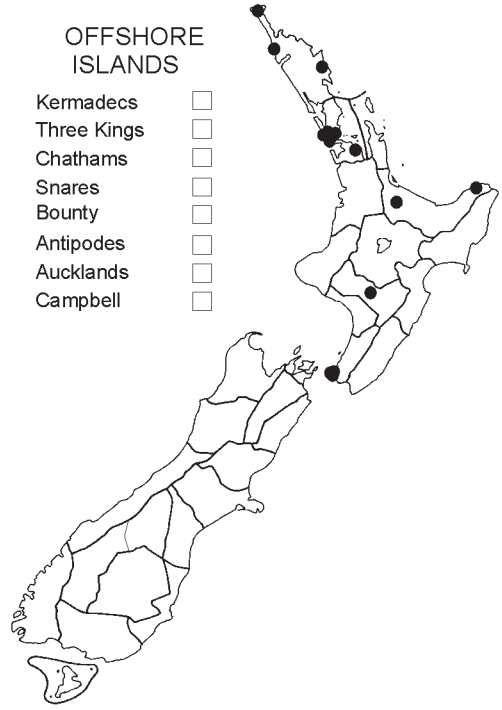
Map 37 Collection localities, *Izatha gibbsi*



Map 38 Collection localities, *Izatha minimira*



Map 39 Collection localities, *Izatha rigescens*



Map 40 Collection localities, *Izatha phaeoptila*

Taxonomic index

This index covers the nominal taxa mentioned in the text, regardless of their current status in taxonomy. In the case of synonyms, the combinations of generic and specific names are those originally published by authors, and may differ from combinations implicit in current usage. Taxa in **bold** are those included in the checklist. Page numbers in **bold** indicate main entries. Page numbers in *italics* indicate **figures**. The letter "**p**" after a page indicates **photographs**, the letter "**k**" indicates a **key**, and the letter "**m**" indicates a **distribution map**.

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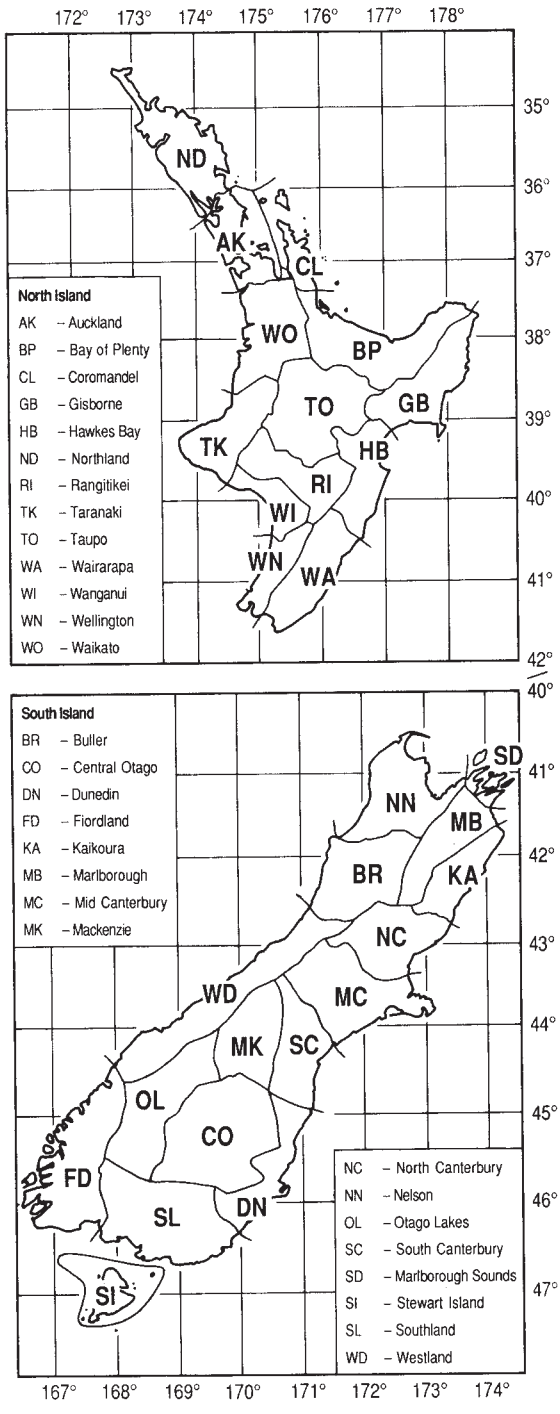
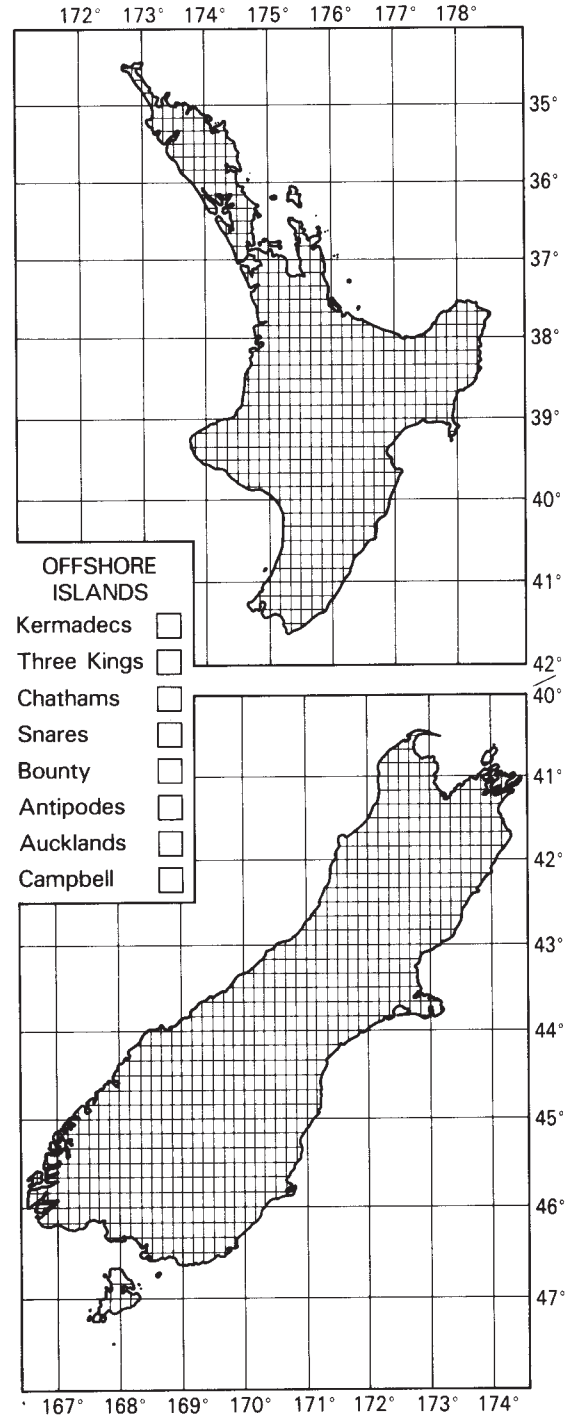
Introduced plants are marked with an asterisk*. For authorities for plant names, consult the New Zealand Plants website (http://www.nzflora.landcareresearch.co.nz). For authorities for fungus names, consult New Zealand Fungi (http://nzfungi.landcareresearch.co.nz/html/mycology.asp).



Area codes and boundaries used to categorise specimen locality data (after Crosby *et al.* 1976)



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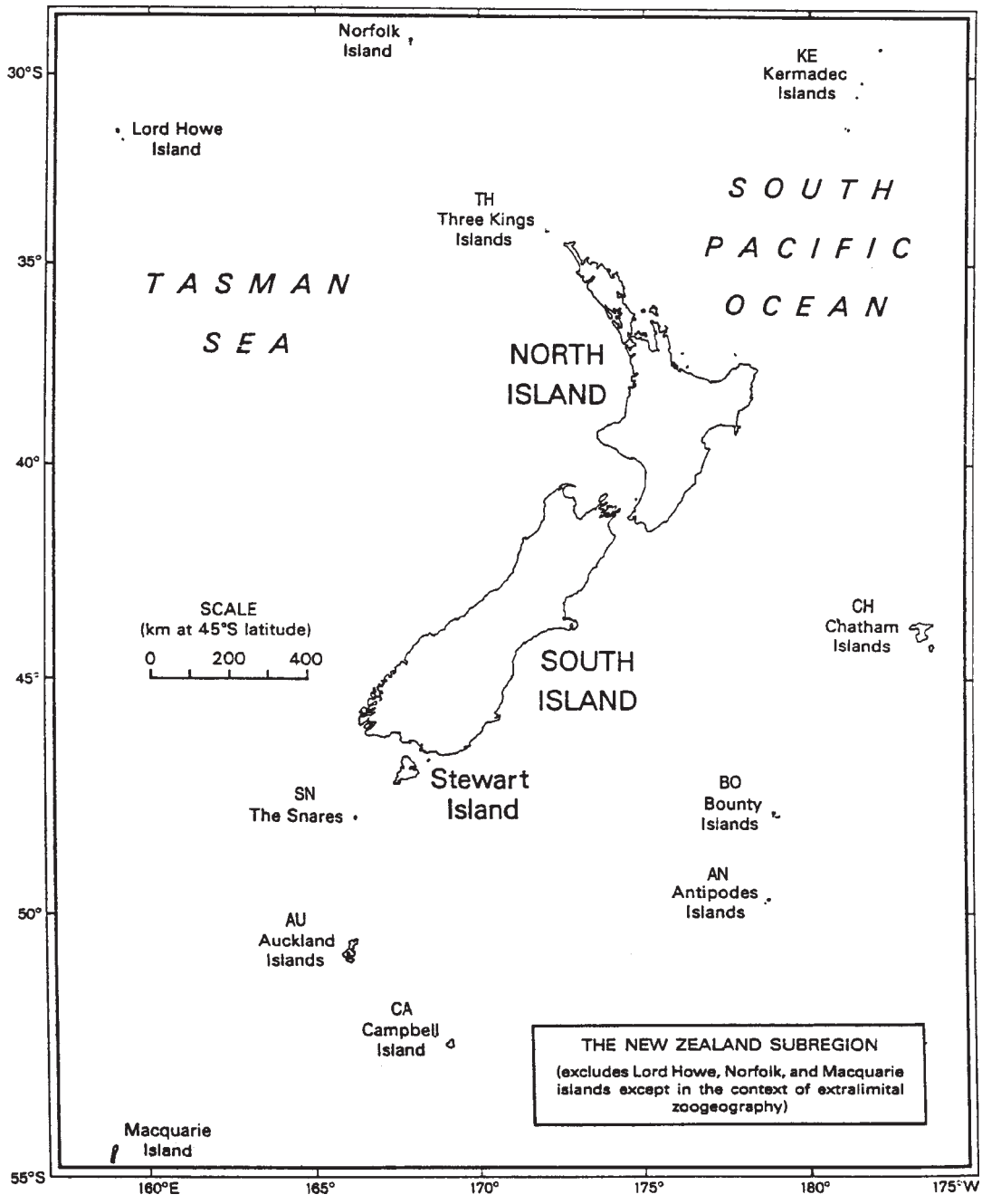

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He titiro whāiti tā tēnei pukapuka ki ngā mea noho whenua, kāore he tuarā; i pēnei ai i te mea kei te mōhio whānuitia ngā mea whai tuarā, ā, ko ngā mea noho moana, koirā te tino kaupapa o te huinga pukapuka *Marine Fauna of N.Z.*

Ka āhei te tangata ki te **whakauru tuhituhinga** mehemea kei a ia ngā tohungatanga me ngā rauemi e tutuki pai ai tana mahi. Heoi anō, e wātea ana te Kohinga Angawaho o Aotearoa hei āta tirotiro mā te tangata mehemea he āwhina kei reira.

Me whāki te kaituhi i ōna whakaaro ki tētahi o te Kāhui Ārahi Whakarōpūtanga Tuarā-Kore, ki te ģtita rānei i mua i te tīmatanga, ā, mā rātou a ia e ārahi mō te wāhi ki tana tuhinga.

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Te utu (tirohia "Titles in print", whārangi 198). Me utu te hunga e noho ana i Aotearoa me Ahitereiria ki ngā tāra o Aotearoa. Ko ētahi atu me utu te moni kua tohua, ki ngā tāra Merikana, ki te nui o te moni rānei e rite ana.

E toe ana he pukapuka o ngā putanga katoa o mua. Mehemea e hiahia ana koe ki te katoa o ngā pukapuka, ki ētahi rānei, tonoa mai kia whakahekea te utu. Tekau ōrau te heke iho o te utu ki ngā toa hoko pukapuka.