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**Fauna of New Zealand
Ko te Aitanga Pepeke o Aotearoa**

Number / Nama 54

Hierodoris

(Insecta: Lepidoptera:
Gelechioidea: Oecophoridae),
and overview of Oecophoridae

Robert J. B. Hoare

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Manaaki
Whenua
P R E S S

Lincoln, Canterbury, New Zealand
2005

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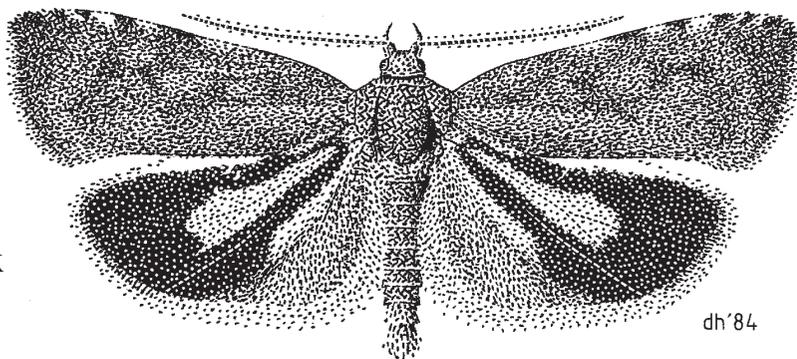
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Front cover: *Hierodoris tygris* n. sp., paratype female (Photographer: M. Heffner).

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POPULAR SUMMARY

HE WHAKARĀPOPOTOTANGA

Class **Insecta**Order **Lepidoptera**Superfamily **Gelechioidea**Family **Oecophoridae**Genus ***Hierodoris* Meyrick****Oecophorid moths**

Oecophoridae are an unusual family of small moths that occur throughout the world. Whilst most moth caterpillars feed on the living leaves of plants, the caterpillars of Oecophoridae usually feed on the dead leaves in the leaf-litter on the forest floor, or in dead wood. More than 4000 species of Oecophoridae are known worldwide, but most of these (over 3000) occur only in Australia, where many species have adapted to feed on the abundant resource of dead eucalyptus leaves. Adult oecophorid moths are often very dull in colour, their various shades of brown helping to conceal them from birds (and entomologists) as they rest amongst dead vegetation or on tree-trunks by day. However, even these brown species are often attractively speckled or patterned, whilst other species, especially those that mimic lichen, are extremely beautiful. It is difficult to tell oecophorids apart from other small moths, but most New Zealand species have rather broad wings, a wingspan of between 10 and 35 mm, and the labial palpi (mouthparts that lie either side of the tongue or proboscis) are curved up and back over the front of the head.

New Zealand has a diverse and interesting fauna of Oecophoridae, containing well over 200 species. This compares with only 86 species in the whole of the former U.S.S.R., an area about 80 times as great as New Zealand. Probably the abundance of leaf-litter and dead wood in New Zealand's ancient evergreen forests over millions of years has aided in the evolution of such a large number of oecophorid species. Most New Zealand Oecophoridae have not been studied in detail since the 1920s, and only two new species have been scientifically described in the last 50 years. However, we know of many other unnamed species in collections, and 8 of these are described in this book.

Illustration / Whakaahua: *Hierodoris illita* (Illustrator / Kaiwhakaahua: D. W. Helmore).

Ngā pūrēhua Oecophorid

He whānau pūrēhua pakupaku a Oecophoridae ka kitea i ngā tōpito katoa o te ao. He whānau āhua rerekē anō hoki, i te mea kai ai te nuinga o ngā torongū pūrēhua i ngā rau ora, engari ko tā ngā torongū Oecophoridae, he kai i ngā rau mate e takoto ana i ngā otaota i te papa o te ngahere, he kai rānei i ngā rākau kua mate. He nui ake i te 4000 ngā momo Oecophoridae e mōhiotia ana huri i te ao, engari ko te nuinga (neke atu i te 3000), kei Ahitereiria anake. He maha ngā momo kua urutau kia pau ai i a rātou ngā rau mate o ngā purukamu e rangea ana te tipu i taua whenua. Ka pakeke ana, he matahunahuna te maha atu o ngā momo pūrēhua oecophorid – mai i te parauri tea ki te parauri uriuri te tae, kia kore ai rātou e tere kitea e te manu (e te kaimātai pepeke rānei) i a rātou e noho ana ki ngā otaota, i runga rānei i te kahiwi rākau i te awatea. Engari hāunga anō ngā momo parauri, he ātaahua tonu te kōtingotingo me ērā atu taura o runga. Arā anō ētahi momo inā kē te ātaahua, tae atu ki ērā ka whai kia rite ki te hawa whai hoa pūkohuwai tō rātou āhua. Ki te titiro kau, he uaua te wehewehe i ngā oecophorid i ērā atu momo pūrēhua pakupaku, engari he whānui tonu ngā parirau o te nuinga o ngā momo o Aotearoa, ā, kei te 10 ki te 35 mm te tawhiti mai i te pito o tētahi parirau ki tētahi. Waihoki, ko ngā hihipā i te taha o te waha, e piko whakarunga ana ki tua o te rae.

(continued overleaf)

(haere tonu)

The genus *Hierodoris* probably belongs to an ancient lineage, and only occurs in New Zealand. The 18 species are very varied in size and coloration, and some are very attractive, with metallic shining scales on their wings. Their caterpillars are also varied in their habits: some feed inside the twigs of trees or shrubs, for example tutu (*Coriaria*) or beech (*Nothofagus*); others on seedheads or leaf-tomentum of plants in the daisy family (*Celmisia* and *Pachystegia*); one has gregarious larvae that bunch together the twigs of conifers, manuka, kanuka, or tauhinu with silk, and feed on the dying leaves inside the spinning. There are several species whose life-history we do not know, and five species that are known from very few specimens, and may possibly be threatened.

One rare and particularly interesting species of *Hierodoris*, *H. stella*, imitates a bug. The antennae are thickened with scales and look like the bug's antennae, and the wing-tips are bent downwards in the manner of the bug's wings. The bug is thought to be distasteful to birds, so probably the moth has evolved its mimicry to avoid being eaten.

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



(continued overleaf)

He matahuhua te whānau Oecophoridae i Aotearoa – neke atu i te 200 ngā momo. E 86 noa ngā momo i te whenua i kīia rā ko te U.S.S.R. i mua, ahakoa e 80 whakaraunga pea tōna rahi ake i Aotearoa. Tērā tonu pea ko te nui o popo, o hanehane i te wao nui a Tāne i roto i ngā miriona tau tētahi take i huhua ai ngā momo oecophorid i tō rātou kunenga mai i Aotearoa. Nō ngā tau o ngā 1920 te rangahautanga whakamutunga o te nuinga o ngā momo Oecophoridae o Aotearoa, ka mutu, e rua anake kua āta whakaahuatia i runga i ngā tikanga pūtaiao i te 50 tau ka taha. Heoi anō, arā ētahi atu momo maha kāore anō kia whakaingoatia e mau mai ana ki ētahi kohinga, ā, e 8 o ēnei e whakaahuatia ana i tēnei pukapuka.

E whakapaetia ana nō tētahi kāwai o tua whakarere te puninga *Hierodoris*, ka mutu, ko Aotearoa anake tana kāinga. He tino rerekē ngā momo 18, tētahi i tētahi, mō te wāhi ki te rahi me te tae; he tino ātaahua ētahi, inā he āhua konumohe, he pīataata ngā unahi i ō rātou parirau. He rerekē anō tā ngā torongū noho ki te ao, tētahi i tētahi: ka pau i ētahi a roto o ngā rārā te kai. Ko ngā rārā o te tutu (*Coriaria*) me te tawai (*Nothofagus*) ka pērātia. Ko ētahi anō ka kai i runga i ngā pūkākano, i ngā hune rānei o ngā rau o ngā tipu o te whānau daisy *Celmisia* and *Pachystegia*; he noho ā-kāhui anō tētahi momo, ko tā rātou, he kāpui i ngā rārā o ngā rākau whai koroī, te mānuka, te kānuka, te tauhinu rānei ki tōna anō momo hiraka, kātahi ka kai i ngā rau e mate haere ana i roto. He maha ngā momo kāore i te mōhiotia te āhua o tā rātou noho ki te ao. Waihoki e rima ngā momo he ruarua noa iho ngā taura e mōhiotia ana, ā, tērā pea he momo ēnei e tino mōrearea ana te noho.

Tērā tētahi momo *Hierodoris* tino rerekē nei, ko *H. stella* te ingoa, ka whakatau i te pepeke. He mātotoru, he whai unahi anō ngā pūhihi, he rite ki ō te pepeke te āhua. Ka mutu, e piko whakararo ana te pito o ia parirau, pērā anō i ō te pepeke. Ko te whakaaro ia, he kawa te pepeke ki ngā manu, ā, koirā tā te pūrēhua nei i whai ai kia rite tana āhua ki tō te pepeke, kia kore ai ia e kainga e te manu.

I whānau mai te kaituhi, a **Robert Hoare**, i Winchester, i te tonga o Ingarangi. I kuraina ia ki Eton, kātahi ka haere ki te Whare Wānanga o Oxford. I reira ka riro i a ia tana tohu mātauranga Kōrero Onamata (ngā tuhinga Rātini, Kariki, me te tātai whakaaro). Whai i muri mai i tēnei, ko tētahi tohu mātauranga Pūtaiao Ōmataora i te Whare Wānanga o Exeter. Nā tana pāpā i ngākaunui ai ia ki ngā pūrēhua i tana ohinga, he mea āta whakatipu hoki e te pāpā ētahi momo maha mai i te whānautanga o te hua ā, pakari noa. Nāwai ā, ka whiwhi ia i tētahi māhanga tuku tauira tākohu konoai,

(haere tonu)

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 Oecophoridae, but retains a broad interest in all Lepidoptera, particularly leaf-miners and detritus-feeders. In 2003, he took on the managing editorship of the *New Zealand Entomologist*, and since 2000 he has also enjoyed lecturing on systematic entomology at the University of Auckland. When he is not engaged in moth research, teaching, or editing, Robert composes light verse, often of an entomological nature (see *Frontispoem*, p. 8), and dances, sometimes in public.

ka kīia ko te māhanga a Robinson, ā, riro tonu atu i reira ōna mahara i tēnei mea te pūrēhua. Ka taka te wā, ka pakupaku kē atu, ka pakupaku kē atu ngā pūrēhua e mātaihia ana e ia. Ko tōna mutunga, ko tana tuhinga PhD mō ngā Nepticulidae o Ahitereiria, i te Whare Wānanga ā-Motu o Ahitereiria, i Canberra (ko ngā nepticulid ngā pūrēhua ririki katoa e mōhiotia ana). Nōna ka tīmata i Manaaki Whenua i te tau 1998, ka aro whāiti ki ngā pūrēhua paku rahi ake, tae atu ki ērā o te whānau Oecophoridae. Heoi, kei te ngākaunui tonu ki te huinga Lepidoptera whānui tonu, tae atu ki ngā huke-rau me ngā hanga kai popo. I te tau 2003, ka riro māna e ētita te *New Zealand Entomologist*, ā, mai i te tau 2000, arā tētahi mahi pārekareka kua whāia e ia, ko te kauhau ki ngā ākongā i te Whare Wānanga o Tāmaki-makau-rau, ko ngā whakapapa pepeke te kaupapa. I ngā wā kāore ia e rangahau ana i ngā pūrēhua, kāore rānei e whakaako ana, e ētita ana rānei, kua tahuri a Robert ki te tito ruri, ko ngā pepeke tonu pea te kaupapa, kua kanikani rānei, i ētahi wā i ngā whakaaturanga tūmatanui.

Translation by **H. Jacob**
Tāmaki-makau-rau / Auckland

The Titirangi Tyger

(see cover illustration,
p. 42–43 and Fig. 41, 42)

*Tyger, Tyger, burning bright
In the Titirangi night,
What immortal pair of mits
Could frame thy silver stripy bits?*

*In what distant trees or shrubs
Munch'd thine undiscovered grubs?
In what pupae grew they wings?
Where may I find the blessèd things?*

*And what hand, in little lines,
Could insert thy tergal spines?
When thou wast scaled, who made thee scalièr?
And who designed thy genitalia?*

*What the hammer and what the tongs
Furnished thine aedeagal prongs?
What dread instrument sans mercy
Fashioned thy bulging corpus bursae?*

*When the arachnids gave a hiss
And said "We will not feast on this!"
Did he smile his work to see?
Had he no spider-sympathy?*

*Tyger, Tyger, burning bright,
In the Titirangi night,
What mere mortal tube or vial
Dare cramp thy fearful stripy style?*

R. J. B. Hoare (after W. Blake)

ABSTRACT

An overview of New Zealand Oecophoridae is presented, and a new genus-group, the ‘*Hierodoris* group’, is defined. The systematic placement of this group is discussed. New Zealand oecophorid genera not assigned to the *Hierodoris* group are assigned to the *Wingia*, *Chezala*, and *Barea* groups of Common. Stathmopodinae are excluded from Oecophoridae.

The endemic New Zealand genus *Hierodoris* Meyrick is revised. The genus is fully redescribed, and 18 species are recognised, including 8 new species: *H. gerontion*, *H. huia*, *H. pachystegiae*, *H. polita*, *H. sesioides*, *H. s-fractum*, *H. torrida*, and *H. tygris*. *Gymnobathra squamea* Philpott is transferred to *Hierodoris*. *Coridomorpha* Meyrick is sunk as a junior subjective synonym of *Hierodoris*, and *H. chlorobela* Meyrick as a junior subjective synonym of *H. illita* (Felder & Rogenhofer). All species are fully described and adults illustrated in colour; male genitalia are illustrated for all species and female genitalia for all except *H. sesioides*. Larvae and pupae are described for the species in which they are known. Information is given on biology, distribution, and conservation status, with 5 species considered potentially threatened at the national level: *H. huia*, *H. polita*, *H. sesioides*, *H. stella*, and *H. tygris*. Two species-groups are recognised: the *Hierodoris iophanes* group including *H. iophanes*, *H. frigida*, *H. polita*, *H. torrida*, and *H. huia*, and the *Hierodoris illita* group including all the remaining species.

Keywords. Gelechioidea, Oecophoridae, Xyloryctidae, New Zealand, taxonomy, key, new species, distribution, endemism, mimicry, galls, fauna.

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Genus <i>Hierodoris</i> Meyrick, 1912	18
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synonymy	

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My own interest in Oecophoridae was encouraged by the magnificent work of Ian Common, whose genus-level revision of the huge Australian fauna constitutes a true *magnum opus*. I have had the pleasure of discussing various matters relating to my work with Ian, and thank him very much for the interest he has taken and the inspiration he has provided.

Martin Heffer (HortResearch) took the exquisite colour photographs of the adult moths for this volume. For the superb line drawings of the 'difficult' species pairs *electrica* / *s-fractum* and *polita* / *frigida* I am greatly indebted to Des Helmore. Rosa Henderson and Birgit Rhode provided much further assistance with the illustrations. Extra thanks to Rosa for scanning in the line figures after the initial scanned set had disappeared, and to Birgit for preparing the maps and putting together all the plates. Leonie Clunie helped unstintingly with drawing up lists of material examined, and with many other curatorial and administrative tasks.

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INTRODUCTION

Oecophoridae: General Remarks

Oecophoridae belong to the ‘megadiverse’ superfamily Gelechioidea, one of the largest radiations of Lepidoptera with over 16,000 described and countless undescribed species (Kaila 2004). The family Oecophoridae is worldwide in distribution and probably contains well over 4000 described and undescribed species, even in its narrowest definition (see below). It is best represented in the southern hemisphere, and particularly in Australia, where over 3000 endemic species (including undescribed taxa) are known (Common 1994; 1997; 2000). Most species with known life histories have larvae feeding on dead plant material, especially leaf-litter.

The family has a complex taxonomic history and systematists still disagree about its limits. The Stathmopodinae have usually been included in Oecophoridae as a subfamily (e.g., Common 1990; Hodges 1998) or even as a tribe of Oecophorinae (Hodges 1978). The Depressariinae and Ethmiinae, formerly treated as oecophorid subfamilies (e.g., Hodges 1978), have either been given separate family status (Common 1990; Nielsen *et al.* 1996) or transferred as subfamilies to an expanded Elachistidae (Minet 1990; Hodges 1998). Stenomatinae, Xyloryctinae, Deuteroniinae and Chimabachinae, all formerly treated as oecophorid subfamilies (e.g., Hodges 1978; Palm 1989; Nielsen *et al.* 1996), were excluded by Hodges (1998). Thus, in the most recent classification of Gelechioidea (Hodges 1998), Oecophoridae is restricted to the two subfamilies Oecophorinae and Stathmopodinae.

In an outstanding recent contribution to the systematics of Gelechioidea, Kaila (2004) presented a cladistic analysis based on 187 morphological and 5 behavioural characters scored for 143 species representing almost the full range of recognised gelechioid lineages. Given his extensive use of characters from the immature stages as well as formerly neglected character-complexes from adults (e.g., internal thoracic structure), Kaila’s attempt to resolve relationships in the group must be regarded as the most thorough and objective to date. His results support a basal division of the superfamily into two major lineages, the ‘gelechiid lineage’ and the ‘oecophorid lineage’. The low consistency index for Kaila’s most parsimonious trees indicates the high incidence of convergent evolution amongst Gelechioidea, and whilst there is support for the monophyly of many of the lineages recognised, e.g., by Hodges (1998), a large number of groups lack unique defining apomorphies and are recovered only on the basis of homoplasious characters. Also, as pointed out by Kaila, some of the basal clades, especially in his ‘oecophorid lineage’, have relatively weak character support, and there is a lack of data for immature stages of some taxa in these groups. Because of

these problems, Kaila did not recommend the use of his cladogram (Kaila 2004: fig. 1) to construct a new classification of Gelechioidea, but indicated how Hodges’ (1998) classification could be minimally rearranged to accommodate the revised hypothesis of relationships.

Kaila’s study suggests that *Stathmopoda* and related genera are closely allied to genera currently assigned to Batrachedridae and Coleophoridae in the ‘gelechiid lineage’. The support for this relationship is strong: four synapomorphies, two of them unique, are shared by *Stathmopoda* with *Idioglossa*, *Batrachedra*, *Goniodoma*, and *Coleophora* (Kaila 2004). I accept this here as sufficient evidence for the removal of Stathmopodinae from Oecophoridae.

Taxa formerly assigned to Oecophorinae in New Zealand appear to belong to two distinct groups. On the basis of Kaila’s cladogram (Kaila 2004: fig. 1), *Tingena* (and related genera: see below) would be referable to Oecophoridae *sensu stricto*, whilst *Hierodoris*, *Izatha*, and *Phaeosaces* (and related genera: see below) would be assigned to the ‘xyloryctid assemblage’, with *Hierodoris* occupying a basal position as sister to all remaining taxa in this clade. However, as Kaila emphasises, character support at the base of the ‘oecophorid lineage’ is weak, and the inclusion in the analysis of the Russian ‘oecophorine’ *Martyringa ussuriella* Lvovsky collapses the basal resolution in this large clade. Likewise, one of the apomorphies supporting monophyly of the sister-group of the ‘xyloryctid assemblage’ in Kaila’s cladogram (i.e. Oecophoridae *s.s.* + Amphisbatidae *s.s.* + Carcinidae + Stenomatidae + Chimabachidae + Elachistidae *s.l.*) is ‘mesal part of gnathos scobinate with small thorns’; this character-state also occurs in *Hierodoris*, but not in the species sampled by Kaila. So although there is evidence for assigning *Hierodoris* and its relatives to an expanded ‘Xyloryctidae’, the phylogenetic position of these genera remains potentially unstable and sensitive to taxon sampling. Therefore, for the present I have adopted a conservative approach, retaining in Oecophoridae all New Zealand taxa assigned to Oecophorinae by Dugdale (1988) except for *Compsistis bifaciella* Walker, which is placed in Lecithoceridae (Dugdale 1996). However, following the approach of Common (1994; 1997; 2000), I here assign the New Zealand Oecophoridae to informal genus groups and erect the ‘*Hierodoris* group’ (see below for definition) to accommodate the basal genera of Kaila’s ‘xyloryctid assemblage’. All New Zealand taxa not assigned to the *Hierodoris* group are collectively placed in ‘Oecophoridae *sensu stricto*’, and divided between Common’s named groups. The assembly of these groups into a stable higher classification should await further phylogenetic analysis of the basal taxa in the ‘oecophorid lineage’ (cf. Kaila 2004: 324).

Overview of New Zealand Oecophoridae

In New Zealand, Oecophoridae is the second most species-rich family of Lepidoptera (after Geometridae), with 247 known species in 28 genera. The composition of this diversity is indicated in Table 1. Numbers for the *Hierodoris* group are based on recent sorting of specimens held in NZAC and are probably relatively accurate; those for the Oecophoridae s.s. are based on Dugdale (1988), together with some more recent sorting of material, and are only best estimates, since this group contains many externally variable and closely similar taxa, and requires much further work. All species in the *Hierodoris* group are endemic, with the exception of *Scieropepla typhicola* Meyrick, which is shared with Australia. There are 14 species in the Oecophoridae s.s. suspected or known to be adventive (Dugdale 1988; Hoare 2001).

As revision of the Oecophoridae progresses, the species count can be expected to increase, since the number of cryptic taxa awaiting recognition in collections (especially in *Tingena* and related genera) probably exceeds the number of new synonymies to be made. Further new species are likely to be added as a result of field-work in poorly collected areas. The current figure for recognised genera (28) can only be regarded as a rough guide to higher level diversity, since almost no endemic genus has been satisfactorily defined to modern systematic standards. A number of New Zealand species are still placed in Australian and European genera to which they do not belong.

Although not rivalling the extraordinary Australian fauna, the New Zealand Oecophoridae still represent an impressive endemic radiation. The oecophorid fauna of Russia and adjacent countries (i.e. the former USSR) was recently catalogued by Lvovsky (2003), who listed 110 species for this entire vast area; however, at most, 86 of these belong to the Oecophoridae as here defined. In comparison, New Zealand, with less than 1/80 of the land area, probably has about three times the diversity of Oecophoridae.

A revision of the Oecophoridae of New Zealand is timely for several reasons:

1. As one of the two most species-rich families of New Zealand Lepidoptera (alongside Geometridae), Oecophoridae has a high priority in the documentation of New Zealand's biodiversity.
2. The family has high conservation value, since (a) it includes a number of enigmatic or 'lost' species that have not been recognised for many years, e.g., *Izatha rigescens* Meyrick, *Lathicrossa prophetica* Meyrick, *Chersadaula ochrogastra* Meyrick (Patrick & Dugdale 2000), (b) the level of endemism at both species and

Table 1. Known diversity of Oecophoridae *sensu lato* in New Zealand.

	Described	Known undescribed	TOTALS	Described genera
<i>Hierodoris</i> group	72	13+	85+	9
Oecophoridae s.s.	145	17++	162++	19
TOTALS	217	30++	247++	28

genus level is nearly 100% for native taxa, and (c) the detritivorous larvae are probably 'key players' in recycling nutrients in forests and other ecosystems (Dugdale 1996).

3. Being species-rich and numerically abundant, Oecophoridae are likely to prove useful indicators of environmental change, e.g., the drying out of forest fragments as the result of 'edge effects' and the predations of introduced social Hymenoptera. This especially applies to the many species with litter-feeding larvae, which are likely to be vulnerable to such environmental pressures.
4. Since most adventive Lepidoptera that successfully establish in New Zealand belong to the detritivorous guild (Hoare 2001), we urgently need a basis from which to study the effects of these invaders on the native fauna. This will rely on a thorough up-to-date documentation of the taxonomy and natural history of native taxa.
5. The recent revisions at the generic level of the huge Australian oecophorid fauna by Common (1994; 1997; 2000) have established a very sound context for the taxonomic reassessment of other southern hemisphere Oecophoridae.
6. The present genus-level classification is confused and outdated, and a new framework is needed to understand the true diversity and relationships of the New Zealand species.
7. Kaila's (2004) phylogenetic work suggests that some New Zealand taxa, such as *Hierodoris*, occupy key (basal) positions in the evolutionary history of the vast gelechioid radiation; therefore New Zealand will play an important role in understanding that history, and in placing the classification of Gelechioidea on a more stable basis.

Earlier work on the New Zealand Oecophorinae

Most of the genera and species of New Zealand Oecophoridae were described by Francis Walker (especially Walker 1864) and Edward Meyrick (many publica-

tions, but especially Meyrick 1884; 1914). Walker's generic concepts were very sketchy by modern standards: for example, he erected the genus *Izatha* for *attactella*, but placed its congeners *convulsella* and *picarella* in *Gelechia* and *Oecophora* respectively (Walker 1864). Moreover, he described *I. peroneanella* three times in two different genera! Meyrick, on the other hand, was a fine systematist, and much of the foundation he laid for the classification of Lepidoptera still stands. However, he based his system entirely on external characters such as scale vestiture, antennae, palpi, and especially wing venation, and dismissed the study of the genitalia as at best unnecessary, or at worst misleading (e.g., Clarke 1955: 13–14). It has now been universally recognised that the genitalia provide crucial clues to the classification of Lepidoptera at all levels, and, as a result, many of Meyrick's generic and family concepts have had to be revised (although his species-level taxonomy remains largely sound). For example, in revising the Australian oecophorine genera, Common (1994; 1997; 2000) found it necessary to change substantially the circumscription of many genera treated by Meyrick: an extreme instance is *Eulechria* Meyrick, in which Meyrick (1922) included 244 species, only 37 of which are accepted by Common (1997) as correctly placed.

Alfred Philpott also described a number of New Zealand Oecophoridae, and was a pioneer in the study of the genitalia of Lepidoptera. He illustrated the genitalia of most of the oecophorid species known at the time (Philpott 1926; 1927a, b). In general, he did not attempt any redefinition of genera on the basis of his results, but continued to follow Meyrick's systematic concepts. He was, however, able to demonstrate the existence of a number of 'cryptic' species, best distinguished on the basis of the genitalia (for example *Gymnobathra primaria*, *G. levigata*, and *G. inaequata* (Philpott 1928)).

The only complete descriptive treatment of the New Zealand Oecophoridae is that contained in G. V. Hudson's admirable, fully illustrated account of the country's Lepidoptera (Hudson 1928; 1939; 1950). Hudson relied on Meyrick's classification, and accepted the latter's arguments against a consideration of genital structures (see Hudson 1939: Introduction). His works are still very helpful (though rare and expensive), but caution is required in using them to identify species in families such as Oecophoridae, where the taxonomy of the numerous similar species is still confused, and there are a number of undescribed species Hudson did not know. Comparison of the genitalia with those of type specimens will often be required to arrive at a satisfactory diagnosis.

Until now, only two new species of New Zealand Oecophoridae have been described since 1950: *Tinearupa sorenseni* by Salmon & Bradley (1956) and *Izatha oleariae*

by Dugdale (1971). Dugdale (1971) also described a new subspecies of *T. sorenseni* (*T. s. aucklandica*). All these taxa are endemic to New Zealand's subantarctic islands.

The annotated catalogue of Dugdale (1988) summarised the current state of taxonomic knowledge, and introduced several new synonymies and the 10 species recorded in New Zealand or described since Hudson's time. Dugdale altered the generic placement of many species in line with a more critical assessment of relationships than Meyrick's or Hudson's, and transferred to the family the genera *Hierodoris* Meyrick and *Coridomorpha* Meyrick, the species of which had previously been assigned to the Glyphipterigidae (either as a family or as a subfamily of the old, broad concept of Tineidae).

In an important and often overlooked contribution, Dugdale (1996) described and keyed oecophorid larvae found in beech (*Nothofagus*) forest leaf-litter in the Orongorongo Valley, near Wellington. This was the first work to recognise a distinction between the *Hierodoris* group ('*Gymnobathra* group' of Dugdale 1996) and other Oecophoridae in New Zealand, on the basis of larval characters.

Finally, Hoare (2001) added three adventive Australian Oecophoridae to the New Zealand list.

Generic groupings of Oecophoridae

Dugdale (1988) divided the New Zealand Oecophorinae into 2 major groupings: Group A, species with ocelli, containing *Coridomorpha* and *Hierodoris*, and Group B, species without ocelli, containing all remaining genera. In his revision of the Australian fauna, Common (1994, 1997, 2000) named 6 genus groups, i.e. the *Wingia*, *Philobota*, *Chezala*, *Eulechria*, *Barea*, and *Tisobarica* groups. From his study of larvae, Dugdale (1996) referred several New Zealand genera (*Tingena*, *Trachypepla*, *Atomotricha*, and *Leptocroca s.l.*) to Common's *Barea* group, and distinguished a '*Gymnobathra* group' comprising *Thamnosara* and litter-feeding species assigned to *Gymnobathra*.

Here I propose a '*Hierodoris* group' to include the following endemic New Zealand taxa: *Hierodoris* (= *Coridomorpha*), *Gymnobathra* (excluding *G. rufopunctella* Hudson), *Izatha*, *Lathicrossa*, *Phaeosaces*, *Thamnosara*, *Tinearupa*, and '*Schiffmuelleria*' *orthophanes* Meyrick. This represents an amalgamation and expansion of Dugdale's (1988) Group A and his (1996) *Gymnobathra* group. The diagnostic features of the *Hierodoris* group are summarised in Table 2. Character states for Oecophoridae *s.s.* are based on Common (1994; 1997; 2000) and Kaila (2004) and on a study of New Zealand species of the *Barea* group. Those for Xyloryctinae + Blastobasinae are based largely on Kaila (2004).

Table 2. Provisional diagnosis of the *Hierodoris* group of genera (Oecophoridae s.l.).

Character	<i>Hierodoris</i> group	Xyloryctinae + Blastobasinae	Oecophoridae s.s.
Antennal scape: pecten	Absent	Absent (except Blastobasinae)	Present (usually)
Forewing: pterostigma	Absent	Present	Present (usually)
T2–8: Sclerotisation of anterior margin	Irregular, interrupted by 'windows'	Irregular, interrupted by 'windows'	A smooth uninterrupted strip
Gnathos: dorsal prominence	Absent	Absent	Present (usually)
Gnathos: beak-like process	Absent	Absent	Present (usually)
Gnathos: lateral arms	Not fused to uncus or tegumen	Fused to uncus	Fused to tegumen
Valva: muscle attachment scar at base of costa	Absent	Absent	Present (usually)
Valva: proximal flange	Present (except <i>Hierodoris</i>)	Present	Absent
Valva: sclerotised lobe at sacculus apex	Present (usually)	Absent	Present or absent
Aedeagus	More or less straight (except <i>Phaeosaces</i>)	More or less straight	Proximally curved
Bulbus and ductus ejaculatorius	Not coiled (except <i>Phaeosaces</i>)	Not coiled	More or less coiled
Signum (where present)	Without mesal fold	With mesal fold (usually)	Without mesal fold
Larva: mentum	With paired parallel slits	With paired parallel slits (Xyloryctinae) or pit (Blastobasinae)	Slits absent; may have pit
Larva: SV group of metathorax	Unisetose	Unisetose	Sometimes bi- or multisetose (<i>Barea</i> group)

The inclusion of *Phaeosaces* in the *Hierodoris* group is based on Kaila (2004), who recovered the genus as sister to *Izatha* on the basis of 7 shared homoplasious characters. However, I assign it to the group only tentatively, since it has some features in common with many Oecophoridae s.s. (especially the curved base of the aedeagus and the coiled bulbus and ductus ejaculatorius). Larval characters of *Phaeosaces* should help to resolve its relationships, but these have not yet been examined.

The following Australian genera are tentatively assigned to the *Hierodoris* group: *Scieropepla* (14 described species, including 1, *S. typhicola* Meyrick, shared with New Zealand), *Nemotyta* (1 Tasmanian alpine species, *N. oribates* Nielsen, McQuillan & Common) and *Athrotaxivora* (1 Tasmanian species, *A. tasmanica* McQuillan). The inclusion of *Scieropepla* and *Nemotyta* is

based on their position in Kaila's (2004) cladogram, where together with *Izatha* + *Phaeosaces* they form a monophyletic group basal to the core Xyloryctinae + Blastobasinae. *Athrotaxivora* was provisionally associated with Xyloryctinae by McQuillan (1998), who noted however that it lacked characters of the core Xyloryctinae. In characters illustrated by McQuillan (*loc. cit.*) it matches the diagnosis of the *Hierodoris* group given here.

Metaphrastis Meyrick from South Australia and Western Australia (redescribed by Common (2000: 401–406)) has 2 characters in common with *Hierodoris*, i.e. presence of ocelli and an overlay of narrow scales on the forewing, but the genitalia of both sexes differ widely from those of any genus here assigned to the *Hierodoris* group. In particular, the basally coiled aedeagus with its single long cornutus (Common 2000: fig. 719) would suggest a

closer relationship with the *Barea* group of genera in Oecophoridae *s.s.* I agree with Common (*loc. cit.*) in considering *Metaphrastis* to have no near relationship to *Hierodoris*.

No claim is made here for the monophyly of the *Hierodoris* group, which is intended as a convenient informal association of genera that fall outside the core Oecophoridae and Xyloryctidae, whilst sharing some characters with each of these groups. Indeed, Kaila's (2004) cladogram would indicate that the *Hierodoris* group is not monophyletic. However, it is possible that denser taxon sampling in this region of the phylogeny, and a better coverage of immature stages, might recover a monophyletic *Hierodoris* group.

Relationships of the *Hierodoris* group

As indicated above, the *Hierodoris* group appears to be related to taxa traditionally assigned to Xyloryctidae / Xyloryctinae (Kaila 2004). Probably the most convincing character supporting this relationship is the presence of paired sclerotised slits in the larval mentum: outside the *Hierodoris* group and Xyloryctinae, these slits are known only from a few Lecithoceridae. However, because some more derived taxa in Kaila's 'xyloryctid assemblage' (*Uzucha humeralis* Walker and Blastobasinae) lack these slits, and because there are no data for the larvae of other taxa, their presence is not recovered as an unambiguous apomorphy supporting the monophyly of the assemblage (L. Kaila, pers. comm.).

The second character linking the *Hierodoris* group to the xyloryctid assemblage in Kaila's phylogeny is the presence of a pinacular ring around the abdominal SD setae of larvae. This is again paralleled in Lecithoceridae, and in some species of *Scythris* and *Stathmopoda*; Hodges (1998) also listed it as an apomorphy of Autostichinae (Autostichidae).

Hierodoris group: overview of unrevised New Zealand genera

The largest genus in the *Hierodoris* group is *Izatha* Walker, with 26 described species (Dugdale 1988). The genus is probably monophyletic, possible apomorphies being the loss of the gnathos and uncus in the male genitalia, and the form of the aedeagus (outer wall spinose in apical half, and sclerotisation interrupted lengthwise). Many species, but not all, possess a tuft of scales on the third segment of the labial palp, and/or tufts of raised scales on the forewing, and the coloration is often beautifully cryptic. The known larvae feed in dead wood (Hudson 1928). *Izatha* is possibly unique amongst species-rich Lepidoptera genera in New Zealand in that there are many more species endemic to the

North Island than to the South Island.

Gymnobathra Meyrick currently contains 21 species (with the removal of *G. squamea*, here transferred to *Hierodoris*). On external characters, *G. rufopunctella* Hudson closely resembles some members of the *Barea* group of genera (e.g., *Euchersadaula* spp.) and is almost certainly misplaced in *Gymnobathra*. *Gymnobathra origenes* Meyrick is an enigmatic taxon known from a single specimen that has unfortunately lost its abdomen; from the hindwing shape and the presence of ocelli it appears to be related to '*Hierodoris*' *insignis* Philpott (Gelechiidae), but further material is needed to confirm this. The remaining species of *Gymnobathra* are rather heterogeneous in genitalic morphology (see Philpott 1927a) and in biology, and even without the species discussed above, the genus is unlikely to be monophyletic. Several species have larvae feeding in bark or dead wood (Hudson 1928): these include *G. flavidella* Walker (the type species), *G. omphalota* Meyrick, *G. bryaula* Meyrick, and *G. dinocosma* Meyrick. *Gymnobathra calliploca* Meyrick and *G. levigata* Philpott have leaf-litter feeding larvae that make silken nests covered with frass and leaf fragments; they construct silken runways from these shelters into the surrounding litter (Dugdale 1996). There is another litter-feeding group with case-bearing larvae; Dugdale (1996) illustrated cases of *G. tholodella* Meyrick and of another species, which he called *G. sarcozantha*. This second species is probably in fact undescribed and represents *G. coarctatella* in the sense of Meyrick and Hudson (not Walker). The true *G. sarcozantha* Meyrick and *G. parca* (Butler) probably have similar habits; this group is here considered the probable monophyletic sister-group of *Hierodoris*, and as such will require a new genus.

Lathicrossa currently contains 2 species, the common *L. leucocentra* Meyrick, and the very elusive *L. prophetica* Meyrick. On male genitalia, *L. leucocentra* appears to be closely related to *Gymnobathra omphalota*, and the genus may fall into synonymy with *Gymnobathra* when further studies are undertaken.

Thamnosara and *Tinearupa* each contain 1 species, although 2 subspecies of *Tinearupa sorenseni* Salmon & Bradley have been described (Dugdale 1971, 1988). *Thamnosara sublitella* (Walker) is an abundant and widespread species with larvae feeding in forest leaf-litter in a similar manner to *Gymnobathra calliploca* and *levigata* (Dugdale 1996). The male and female genitalia do not indicate any obvious close relationship to these *Gymnobathra* species, however, and the genus may well remain separate and monotypic. *Tinearupa* is confined to the subantarctic Auckland and Campbell Islands; both sexes are brachypterous. Dugdale (1971) compared *T. sorenseni* to *Gymnobathra omphalota*, but the genitalia indicate strong divergence from other described genera, e.g., in the

reduced aedeagus, and the affinities of the genus are obscure.

'*Schiffermuelleria orthophanes* is a very small species wrongly placed in the European genus *Schiffermuelleria* by Meyrick. Hudson (1928) considered it common, although it had formerly been very rare, and noted that most specimens were taken indoors. The species appears to have become rare again, and there are very few recent specimens. A possible relationship with *Hierodoris* is indicated by the presence of backward-pointing 'teeth' on the apex of the aedeagus, but *orthophanes* lacks both the invagination on S8 and the strap-like forewing scales of this genus. It also lacks ocelli. The relationships and life history of this species remain unknown, as does the reason for its apparent decline.

Other generic groups in New Zealand

The remaining species of Dugdale's 'Group B' can almost all be referred to the generic groupings of Common (1994; 1997; 2000). Three of Common's groups (the *Wingia*, *Chezala*, and *Barea* groups) are represented in New Zealand, probably only 2 of these by endemic species, and only 1 by endemic genera.

The *Wingia* group, recognised mainly by the strongly sexually dimorphic conformation of abdominal sternite 2 (apodemes elongate in females, strongly reduced in males; see Common 1994) is represented in New Zealand by 2 species. *Heteroteucha dichroella* (Zeller) is an Australian adventive known in New Zealand from a single specimen captured in Havelock North (HB) in 1925 (Hoare 2001) and not known to be established. The other species in this group is '*Trachypepla indolescens* Meyrick. This species was described from New Zealand (Meyrick 1927) and has not been recognised elsewhere. However, it is presumed adventive, as it was not collected in New Zealand prior to 1909, but has become very common in some localities in recent years, suggesting a pattern of progressive establishment. Also, the species shows relationships to the endemic northeast Australian genera *Limothnes* Turner, *Basiplecta* Common, and *Idiozancla* Turner, all of which it resembles in wing pattern, in the reduction of the proboscis, and in its tendency to go greasy in collections. '*T. indolescens* does not conform in genital morphology to any of the genera treated by Common (1994) and requires a new genus.

The *Chezala* group of genera as defined by Common (1997) is possibly not monophyletic: Common could find no unambiguous apomorphies linking the included genera. The group is represented in New Zealand by 4 species, only 1 of which is endemic. The Australian *Tachystola acroxantha* (Meyrick) (formerly placed in *Parocystola*) has been established here since 1886 or before (Hudson 1928). It is also established in England (Harper *et al.* 2002).

Two abundant and now cosmopolitan pests, whose origins are obscure, are also established: these are *Hofmannophila pseudospretella* (Stainton) and *Endrosis sarcitrella* (Linnaeus). The larvae of both species are almost omnivorous, feeding on stored foodstuffs, woollen clothing and carpets, in birds' nests, on dead insects, and other pupula. The assignment of *Hofmannophila* and *Endrosis* to this largely Australian group of genera is tentative (Common 1997). The fourth New Zealand member of the *Chezala* group is the endemic *Prepalla austrina* (Meyrick). Meyrick assigned this species at first to *Saropla* and later to *Oxythecta*. Its true relationships were worked out by Common (1997) who included it in his new genus *Prepalla*, along with 9 Australian species. B. Patrick has reared *P. austrina*, which occurs in coastal and mountainous areas of the South Island and on the central volcanic plateau of the North Island, from the small shrub *Leucopogon fraseri* (Epacridaceae) (Patrick 1994). No species of *Prepalla* has been reared in Australia (Common 1997), but as *Leucopogon* is a genus shared between the two countries, it seems likely that the Australian species will prove to have similar habits.

All remaining genera of New Zealand Oecophorinae can be assigned to the *Barea* group in the sense of Common (2000), the defining apomorphy of which is the presence in the male genitalia of a pair of fusiform appendages arising from near the basal plate of the juxta and ending near the pulvinus of the valva on each side. In contrast to most members of the *Hierodoris*, *Wingia*, and *Chezala* groups, species of the *Barea* group lack distinct lateral lobes of the juxta (however, these are also absent in *Prepalla*). A number of Australian species of this group have become established in New Zealand, including 5 species of *Barea* Walker, and 1 each of *Sphyrelata* Meyrick, *Leptocroca* Meyrick, and *Atalopsis* Common (see Dugdale 1988; Hoare 2001).

There is an extensive endemic radiation of the *Barea* group in New Zealand, encompassing species currently assigned to the genera *Atomotricha* Meyrick, *Chersadaula* Meyrick, *Corocosma* Meyrick, *Euchersadaula* Philpott, *Eulechria* Meyrick, *Euthictis* Meyrick, *Leptocroca* in the sense of Philpott, *Locheutis* Meyrick, *Mermeristis* Meyrick, *Tingena* Walker, and *Trachypepla* Meyrick. '*Gymnobathra rufopunctella* also probably belongs to this group, but dissection will be required to confirm this. This complex of closely related taxa comprises at least 140 species, and there are many problems in the taxonomy, both at the specific and generic levels. The type species of *Eulechria*, *Euthictis*, *Leptocroca* Meyrick (*L. sanguinolenta*: see above), *Locheutis*, and *Mermeristis* were all described from Australia, and with the single exception of *Mermeristis*, no endemic New Zealand species is correctly assigned to any of these genera (Common 2000). Known larvae are all associated with dying plant material, leaf-litter or dead wood (Patrick 1994, Dugdale 1996).

METHODS AND CONVENTIONS

Collection

Most *Hierodoris* species can be taken, usually in small numbers, at light after dark, and a strong light such as that produced by a 125W mercury vapour bulb is the only method by which some species (e.g. *H. huia*, *H. tygris*) have been collected. However, almost all species have well-developed ocelli, which is a characteristic of moths with diurnal habits, and many can be found flying by day in sunshine. This is especially true of the South Island inhabitants of open habitats, e.g., *H. frigida*, *H. gerontion*, *H. polita*.

Rearing

Species with larvae feeding on plant foliage or seedheads (e.g., *H. atychioides*, *H. pachystegiae*, *H. eremita*) can be reared indoors in closed plastic containers, as long as an eye is kept open for mould. Internal feeders (e.g., *H. callispora*, *H. illita*) are more difficult, but *callispora* has been successfully reared by planting twigs containing the larval galls in a pot of damp peat, and tying a spacious transparent plastic bag over the top. Again, a watch must be kept out for mould, and muslin or nylon stocking can be substituted for the plastic bag if mould appears. *Hierodoris illita* has also been reared by placing *Coriaria* twigs containing larvae on tissue in a closed plastic container.

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). Ammonia can alter the orange hindwing colour of species such as *H. illita*, and 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 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 preserved and examined whole in 70% ethanol, and pupal exuviae either dry or immersed in glycerol.

Identification

Most specimens of *Hierodoris* can easily be identified to species by comparison with the colour figures provided

here (Fig. 1–42). In cases of uncertainty, the identification can be checked by running the specimen through the key to adults (p. 22), or by consulting the descriptions and diagnoses. For the similar species pairs *frigida* / *polita* and *electrica* / *s-fractum*, line drawings are provided with pointers to diagnostic features (Fig. 183–186). In the case of very worn or aberrant specimens, it may be necessary to dissect out the genitalia and compare with the genitalia figures.

Drawings: conventions

The male genital capsule is shown in ventral view, with the left valva omitted. The lateral arm of the vinculum/saccus is shown on the left side, but omitted on the right so as not to obscure the base of the valva. The valva in *Hierodoris*, as in most Lepidoptera, is clothed in numerous setae; these have been omitted from the drawings for the sake of simplicity. Generally some of the posterior part of the juxta comes away with the aedeagus when the latter is removed from the genital capsule, so most drawings only show the most sclerotised portion of the basal plate, together with the lateral arms. The area of striated cuticle between the lateral arm of the gnathos and the tegumen is shown semi-diagrammatically as a dense stippling of small dashes.

In the drawings of the aedeagus, the bulbus ejaculatorius (*sensu* Oiticica 1946) is shown, but the ductus ejaculatorius is usually omitted, as the course of this inside the bulbus is hard to discern in most slide preparations.

In preparations of the female genitalia, the ductus and especially the corpus bursae usually become somewhat distorted and wrinkled when dehydrated, especially if the corpus bursae has been pierced in order to remove the spermatophore. Thus not too much reliance should be placed on the shape of these structures as drawn. The ductus spermathecae has been shown separately for purposes of clarity.

Stippling in all drawings is intended to give a rough indication of opacity and/or degree of sclerotisation of structures; however, in the ductus and corpus bursae of the female genitalia, stippling represents the small scobinations with which these structures are beset. The scobinations are generally finer, more numerous and more close-set than could be indicated in the drawings, so the representation should be treated as semi-diagrammatic.

The drawings of genitalia are intended to complement the descriptions and aid in the identification of worn or aberrant specimens. As such, they show characters of diagnostic importance at the species level. They cannot be guaranteed to show all structures of relevance for a phylogenetic analysis, and should not be used in isolation for such a purpose.

Repository of specimens and label data

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

AMNZ: Auckland Museum, Auckland, 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, the data on each label being enclosed in single inverted commas, and labels being separated by commas. Other 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; GVH, George V. Hudson; JSD, John S. Dugdale; RJBH, Robert J. B. Hoare.

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). No problems have been encountered in defining species boundaries on this basis, except in the case of 2 very widespread and extremely variable species, *H. atychioides* and *H. illita*. In the case of these species, I have adopted a conservative approach, as recently advocated for bird taxonomy by Zink (2004), who emphasises the need for multiple congruent characters to define taxa. For further discussion of these species and their synonymy, see the Remarks under the respective species descriptions.

The order of species has been determined on the following basis: the type species is treated first; within their species groups, species that are clearly closely related are grouped together; otherwise alphabetical order is followed.

Plant names

Scientific names of plants follow the New Zealand Plants (2004) website. The authorities for plant names are omitted in the main text, but listed in Appendix 2.

SYSTEMATICS

Genus *Hierodoris* Meyrick

Hierodoris Meyrick, 1912: 41 (type species *Hierodoris iophanes* Meyrick, by original monotypy).

Coridomorpha Meyrick, 1914: 111 (type species *Coridomorpha stella* Meyrick, by original monotypy).

New synonymy.

Taoscelis Meyrick, 1938: 428 (type species *Taoscelis crocostoma* Meyrick, by original monotypy).

Synonymised by Dugdale, 1988: 89.

Diagnosis. Small to medium-sized Oecophorinae, usually with more than 1 scale-type on forewing (i.e. scales vary in number and depth of apical indentations), and always with 1, usually both, of the following characters: ocelli present; aedeagus with discrete, well-sclerotised subapical 'tooth'.

Adult. Head (Fig. 60, 181, 182): ocelli usually present (reduced in *H. squamea* (Philpott) (Fig. 181, 182), absent in *H. tygris* sp. nov.). Chaetosemata absent. Interocular index ca 0.6–1.0. Transfrontal suture well developed, other sutures absent. Vestiture: frons and vertex with appressed, more or less broad lamellate scales directed forwards; usually narrower scales postero-laterally above eyes, slanting forward over antennal bases and often forming strong lateral tufts on occiput; these scales merging with a line of narrow, often contrastingly coloured scales along posterior occipital margin (here termed the 'ruff'). Mouthparts: pilifers well developed; maxillary palpi short, 4-segmented; labial palpi 3-segmented, long, upcurved, with acute apical segment; scaling usually appressed (but suberect on underside of segment 2 in *H. gerontion* sp. nov.); vom Rath's organ basal on segment 3, bowl-like with many sensilla coeloconica; 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 more or less quadrate, shorter and broader than flagellar segments; flagellum dorsally with 2 rows of scales per segment, scaling sparser ventrally; male flagellomeres with sensilla (ciliations) from ca 1/4–2× width of flagellum; female with very short sensilla.

Thorax: Prothorax laterally and dorsally clothed in appressed lamellate scales (here termed the collar). Foreleg with tibial epiphysis; scales appressed. Tibial spurs 0–2–4. Mid and hind tibiae with at least some suberect scales medially on dorsal surface; usually also a terminal tuft dorsally; or strong whorls of scales medially and terminally. Tarsomeres 1–4 each with up to 12 spines ventrally in apical 1/2. Wings: forewing usually with scales of more than one type; darker scales generally broader and with a greater number of apical ‘teeth’ (4 or more); lighter scales often very narrow and with only 2–3 ‘teeth’. 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; female with 3 frenular bristles (only 2 observed in *H. huia* sp. nov.), retinaculum similar to that of male. Wing-venation (Fig. 56–59): forewing has R4 stalked with R5 or these 2 veins fused, running to costa; M1–M3 more or less equidistant at base, or M2 arising closer to M3 than to M1; discal cell with chorda weakly indicated or absent; CuA arising at lower angle of discal cell, CuP non-tubular except in distal portion; 1A+2A with long basal fork. Hindwing has Sc+R1 strong, terminating on costa at 4/5; Rs to costa just above apex, more or less parallel to M1; M3 short-stalked with CuA1; CuP tubular only towards termen; 1A+2A straight, short-forked basally, the fork enclosing anal pecten; a fold between this vein and 3A; 3A distinct, reaching wing margin.

Pregenital abdomen (Fig. 61–92): apodemes of S2 very reduced in male (Fig. 62, 64), well developed in female (Fig. 63, 65); venulae in male well developed, long, curved mesally towards posterior end; female venulae usually less distinct, shorter. Segments 2–3 each with 2 pairs of tuberculate plates on pleura; the dorsal pair elongate, the ventral pair rounded. S8 sclerite in male (Fig. 69–74, 76–78, 80, 83–88, 90–92) anteriorly invaginated; invagination may reach posterior margin and divide sclerite in two. T2–7 each with a patch of strong short posteriorly directed spines covering most of sclerite (Fig. 61); T8 in male (Fig. 69–77, 79–92) usually a rather narrow pointed sclerite, occasionally with some spines.

Male genitalia (Fig. 93–157): Uncus variable: elongate, blunt and finger-like, or shorter and hook-like, or broadening apically and more or less bilobed, or strongly reduced; often with apical dorsal setae. Anal tube either free, unmodified, or laterally sclerotised and appressed to uncus. Gnathos with lateral arm on each side separated from tegumen by strip of modified cuticle that appears granular or striated under high magnification (Fig. 93); central element either well sclerotised, scoop-like and upcurved, or

tapering and pointed, or reduced to a V-shaped sclerite, or absent (although lateral sclerites may remain); when well-developed, with more or less distinct dorsal scobinations. Transtilla membranous (except in *H. sesioides*). Vinculum produced into moderate or well developed V-shaped sacculus. Valva with well differentiated and well sclerotised sacculus, which usually bears 1–2 more or less strongly curved distal processes; pulvinus absent; remainder of valva elongate, tip rounded, relatively weakly sclerotised and without modifications. Juxta: anteriorly a subtriangular to V-shaped plate produced laterally into 2 more or less elongate, apically setose arms (arms apparently fused to distal part of juxta in *H. sesioides* (Fig. 130)); posteriorly a pair of moveable sclerites hingeing with the base of the lateral arms, and grading distally into a membranous ring, which represents the apex of the manica (sheath enclosing basal 1/2 of aedeagus); manica containing a pair of elongate lateral sclerites (Fig. 122) (manica and sclerites closely appressed to, and appearing to be part of aedeagus in most slide preparations). Aedeagus relatively long and straight; outer wall well sclerotised, except apically on dorsal surface, i.e., where vesica is everted; apex of sclerotised portion laterally with a more or less prominent backward (i.e., anteriorly) directed ‘tooth’ (‘tooth’ absent in some species; 1 or 2 ancillary ‘teeth’ present in others); vesica (i.e., broader eversible portion of ductus ejaculatorius inside aedeagal wall) usually without cornuti, or with 1–3 large cornuti in apical 1/2 or a group of 6 or more small cornuti apically. Bulbus ejaculatorius (membranous structure through which anterior portion of ductus ejaculatorius runs) with tubular portion usually at least as long as aedeagus, uncoiled, broadening anteriorly into hood-like structure; bulbus fused with aedeagus dorsally at or near base, where ductus enters; ductus spinose in anteriormost portion where it enters bulbus ejaculatorius.

Female genitalia (Fig. 158–180) (note: segments 8–10 in *H. eremita* are strongly modified and the description of these segments that follows does not apply to this species, *q.v.*): Segments 8–10 typically form extensile ovipositor; papillae anales of segment 10 narrow, not well differentiated, setose, membranous. Apophyses posteriores longer than anteriores; both sets of apophyses long and narrow. Segment 9 short and membranous. Caudal part of segment 8 with more or less numerous setae, mostly concentrated in 2 ventral patches. S8 an anteriorly invaginated plate, with anterolateral corners produced, sclerotisation weakest centrally, and occasionally more or less divided into two sclerites. Ostium bursae on intersegmental membrane between S7 and S8; antrum usually thick walled (staining strongly in Chlorazol Black), colliculum a more or less distinct sclerotised ring, and occasionally some additional sclerotisation associated with inception of ductus

seminalis. Ductus bursae moderately narrow, uncoiled, elongate, usually broadening gradually into corpus bursae; ductus usually faintly to strongly scobinate, and with some additional sclerotisation in a few species (*H. tygris*, *H. huia*, *H. atychioides*, *H. callispora*). Corpus bursae membranous, lacking signum except in *H. illita* (Fig. 174); often some scattered scobinations in posterior 1/2.

Egg. The egg has not been observed for any species.

Final instar larva. Head (Fig. 43, 44): semiprognathous; brown with a pattern of darker brown stripes. Prementum (Fig. 48) with broad M-shaped sclerite, containing 2 parallel longitudinal slits with strongly sclerotised margins. Chaetotaxy as in Fig. 43, 44; L1 rather anterior, close to S2 and A3; stemmata 1–4 and 6 forming semicircle; stemma 5 displaced ventrally.

Thorax (Fig. 45, 49): Prothorax with L1–3 below spiracle, in shallow V-formation (L1 slightly below L2 and L3); SV bisetose. Mesothorax: D, SD, and L setal groups dorsally displaced as compared to prothorax; posterior dorsal sclerites broader than D pinacula; a black pore on L pinaculum between L1 and L3; SV unisetose. Metathorax: as mesothorax, except posterior dorsal sclerites narrower than D pinacula. Thoracic legs: coxa with 7 setae; femur with 2 setae; tibia with 6 setae; tarsus with 4 setae (all setifrom; one seta sometimes reduced).

Abdomen (Fig. 46, 47, 49): A1–8 with D1 pinacula narrower than 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 between SD1 and spiracle; L2 above and somewhat anterior to the much longer L1; A1 with 2 SV setae, A2–6 with 3 SV setae, A7 with 2 SV setae; A8 with 1 SV seta; A1–8 with 1 V seta. Prolegs with crochets in a biordinal or triordinal uniserial circle. A9: SD1 small, 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, 5–7 setae laterally and caudally, plus a lateral pore; cuticle between anal shield and prolegs finely spinose in some species.

Pupa. (Description based on pupal exuviae of *H. callispora*, *H. electrica*, *H. pachystegiae*, *H. eremita*, *H. illita*, and *H. atychioides*). **Head** (Fig. 50): fronto-clypeal and clypeo-labral sutures very weakly indicated; clypeus with 2 pairs of setae; frons with 2 pairs of setae; mandible (gena *sensu* Common 1990: fig. 7) usually with 1 seta (2 in *callispora*); eyepiece with 2 setae. Labial palpi concealed. Antennae curving inwards ventrally, meeting just anterior to tips of

metathoracic legs, then diverging to apex.

Thorax (Fig. 53): prothorax, mesothorax, and metathorax each with 3 pairs of dorsal setae (4 pairs on mesothorax in *callispora*). Fore femora exposed. Wings extending to anterior 1/2 of A4 in dorsal view, to A5 or A6 in ventral view.

Abdomen (Fig. 51, 53–55): tergites without spines or other modifications; A1 with 2 pairs of D setae only; A2–4 with 2 pairs of D setae and 2 pairs of SD setae; A5–7 with 2 pairs of D setae, 2 pairs of SD setae, 3 pairs of L setae, 3 pairs of SV setae (1 pair on A7 in *atychioides*) and 1 pair of V setae (V setae absent in *atychioides*); A5–6 with larval prolegs represented by conspicuous ‘scars’ between SV and V setae; SD2 on A2–7 minute, spine-like, not as closely approximated to SD1 as in larva. A8 as A7 but with only 1 pair of SV/V setae; A9 with 2 to 6 pairs of setae. A10 usually (in all species examined except *eremita*) with cremaster in the form of 4 stout strongly sclerotised spines, directed ventro-laterally; these may be borne on distinct lateral lobes (see Fig. 51, *callispora*); in addition, up to 4 pairs of strong setae caudally on segment (no setae on A10 in *electrica*, *pachystegiae* and some specimens of *atychioides*). In *H. eremita*, which lacks the cremastral spines, the setae are robust with hooked tips (Fig. 55).

Biology. The larvae are probably essentially detritivores, and several species are known or suspected to be associated with leaf-litter in various situations (*iophanes*, *frigida*, *polita*, *torrida*, *s-fractum*). Leaf-litter feeding may be the ‘primitive’ larval biology for the genus, as it is shared with the suspected sister-group (*Gymnobathra* spp.: see below). Some species feed on live plant material, chiefly on Asteraceae (*eremita* on *Celmisia*, *electrica* on *Olearia*, *pachystegiae* on *Pachystegia*); *H. atychioides* has gregarious larvae, which are moderately polyphagous on Gymnospermae, and also feed on *Kunzea* and *Leptospermum* (Myrtaceae) and *Ozothamnus* (Asteraceae) — they may include bark and dead leaves of the host as part of their diet. The final group with known larvae feed internally in woody stems, sometimes in galls (*callispora*, *illita*, *sesioides*). *Hierodoris callispora* is probably a primary gall-former, whilst *illita* appears to be a facultative secondary inhabitant of galls formed by other species. *Hierodoris illita* has also been reared from cones of larch (*Larix decidua*).

Parasitoids. The only published records of parasitoids of *Hierodoris* relate to *H. atychioides*, and are summarised by Berry (1990). Berry reports 4 hymenopterous parasitoids reared from this species: the ichneumonids *Xanthopimpla rhopaloceros* Krieger, *Campoplex* sp., and *Aucklandella* sp., and the bethylid *Goniozus* sp. She also lists 2 dipterous parasitoids, the tachinids *Trigonospila brevifacies*

Hardy and *Pales funesta* (Hutton). Of these, *X. rhopaloceros* and *T. brevifacies* are Australian species introduced in the 1960's for biological control of *Epiphyas postvittana* (Walker) (Tortricidae); the remainder are endemic (e.g., Dugdale 1969). The introduced species dominated the parasitoid complex in material reared from larval nests of *H. atychioides* on *Thuja orientalis* (Berry 1990) in suburban Auckland.

Taxonomic history. The genus has a complex taxonomic history. Its members confused Meyrick and Hudson, who did not examine the genitalia, and even Philpott, who did. They split its species between 5 genera: *Hierodoris* Meyrick, *Heliostibes* Zeller, *Coridomorpha* Meyrick, *Gymnobathra* Meyrick, and *Taoscelis* Meyrick. The first 3 of these were placed in the Glyphipterigidae, and the last 2 in the Oecophoridae. The confusion was compounded by the inclusion in *Hierodoris* of 2 completely unrelated species, *H. stellata* Philpott (transferred to Plutellidae by Dugdale (1988)) and *H. insignis* Philpott (transferred to Gelechiidae by Dugdale (1988)). *Taoscelis crocostoma* was synonymised with *Hierodoris frigida* by Dugdale (1988), and *Coridomorpha* is here synonymised with *Hierodoris*. In addition, *Gymnobathra squamea* Philpott is here transferred to *Hierodoris*. *Heliostibes* (type species *H. mathewi* Zeller) is a Chilean genus of Oecophoridae, not closely related to *Hierodoris* (Dugdale 1988). It is perhaps not surprising, in view of the morphological diversity of the genus, that its members were scattered so liberally across higher taxa.

Relationships, phylogeny, and species-groups. The probable sister-group of *Hierodoris* is a group of species currently placed in *Gymnobathra*, i.e., *G. parca* (Butler), *G. sarcoxantha* Meyrick, *G. tholodella* Meyrick, and the unnamed taxon referred to above (*G. coarctatella* sensu Meyrick (*nec* Walker)). These species share 3 probable apomorphies with *Hierodoris*, i.e., S8 in male with anterior invagination (all species), bulbus ejaculatorius with long tubular portion (all species), and sacculus produced into paired distal processes (most species, except some *Hierodoris* and *G. tholodella*). These characters do not appear in other species currently assigned to *Gymnobathra*. The autapomorphies defining *Hierodoris* are: forewing with scales of more than one type, and aedeagus with subapical tooth (cf. Diagnosis, above). All species have one or both of these characters. However, in *H. iophanes* and related species, the aedeagal tooth is absent, and in *H. gerontion* and *H. sesioides* there is only minor variation in the forewing scales; all these species are tentatively considered to have lost the autapomorphic states of these characters secondarily.

The presence of ocelli is a good diagnostic character for *Hierodoris* (although they are absent in *tygris* and reduced in *squamea*), since ocelli are absent in the presumed sister-group, and indeed almost all other Oecophoridae (except *Metaphrastis*: see above, under Generic groupings). To consider presence of ocelli an autapomorphy of the genus, one has to accept a contravention of Dollo's Law, i.e., an apomorphic 'reactivation of a suppressed genetic capability', as argued for ocelli in omaliine Staphylinidae (Coleoptera) by Newton and Thayer (1995). On the other hand, presuming that *Metaphrastis* is not closely related to *Hierodoris*, as argued above, to regard presence of ocelli in both these lineages as plesiomorphic would presumably entail multiple losses in the evolutionary history of Oecophoridae, which is not parsimonious. In the absence of information on the genetic basis for presence or absence of ocelli, I leave the question of polarity open here (cf. Leschen & Beutel 2004).

A phylogenetic analysis has not been attempted for *Hierodoris*, but the following monophyletic groups can be recognised:

1. The *iophanes*-group. Uncus with minute setae ventrally near tip (possible apomorphy); gnathos well-developed and scoop-like (probable plesiomorphy), dorsally scobinate (plesiomorphy); tooth of aedeagus absent (probable apomorphy); forewing with 4 areas of iridescent scaling (apomorphy). Included species: *H. iophanes*, *H. frigida*, *H. polita*, *H. torrida*.
2. The *illita*-group. Uncus with dorsal setae, but no ventral setae (probable plesiomorphy); gnathos reduced to a narrow V- or Y-shaped process or absent (apomorphy), not scobinate (apomorphy); tooth of aedeagus usually present (plesiomorphy). Included species: *H. atychioides*, *H. bilineata*, *H. callispora*, *H. electrica*, *H. eremita*, *H. gerontion*, *H. illita*, *H. pachystegiae*, *H. sesioides*, *H. s-fractum*, *H. squamea*, *H. stella*, *H. tygris*.

Within the *illita*-group, *H. electrica*, *H. s-fractum*, and *H. pachystegiae* form a monophyletic entity, sharing a characteristic sinuous silver line on the forewing (obscured by overlying scales in *pachystegiae*), a series of leaf-like overlapping cornuti on the vesica, and a strongly coiled ductus spermathecae in the female genitalia.

One species cannot easily be placed in either group. *Hierodoris huia* has the scoop-like, scobinate gnathos and the ventrally setose uncus of the *iophanes*-group, but lacks the characteristic iridescent forewing pattern and has a well-developed tooth on the aedeagus. The species is here tentatively placed in the *iophanes*-group on the basis of its uncus and gnathos characters alone; it is presumably sister-species to the remainder of the group.

Circumscription of genus and synonymy. *Hierodoris frigida* (= *crocotoma*, the type species of *Taoscelis* Meyrick) is very closely related to *H. iophanes*, as indicated above, and the synonymy of *Taoscelis* with *Hierodoris* (Dugdale 1988) is upheld.

Coridomorpha stella shares the characters of the *illita*-group listed above, and is therefore phylogenetically nested within *Hierodoris* as here defined. I considered expanding the concept of *Coridomorpha* to include all members of the *illita*-group, and restricting the concept of *Hierodoris* to the *iophanes*-group. However, as indicated above, the generic placement of *huia* would then have become problematic. It seems preferable to retain an inclusive generic concept, emphasising the relationships of all these taxa, at least until the phylogeny is better resolved.

Distribution. The genus *Hierodoris* is distributed from the Three Kings Islands off the northern tip of the North Island to Stewart Island. It has not been recorded from the Chatham Islands or from any of the subantarctic islands, and *H. atychioides* is the only species so far collected on Stewart Island. One species is known only from the Three Kings, 4 species only from the North Island, 8 species only from the South Island, and 5 are shared between North and South Islands.

Status and Conservation. Several species appear to be rare, and the following were listed by Patrick & Dugdale (2000) as 'at risk': *H. stella* (as *Coridomorpha stella*), *H. huia* (as *Coridomorpha* 'long palpi'), *H. sesioides* (as *H.* 'clear wing'), *H. polita* (as *H.* 'silver banded'), and *H. tygris* (as *H.* 'tiger-stripes RJBH'). Although two of these were last collected some years ago (*H. huia* in 1980 and *H. sesioides* in 1964), it is unlikely that extinction is an immediate threat to any species. Most probably, the seldom-collected taxa have been overlooked due to our poor understanding of their ecology. Clearly, further field-work is desirable to elucidate the life histories of these apparent rarities.

Remarks. *Hierodoris* is one of the most extraordinary genera amongst New Zealand's endemic Lepidoptera fauna. Diverse in size, morphology, colour pattern, and biology, its members display a number of features of interest to conservationists and evolutionary biologists, e.g., geographical restriction (*bilineata*, *huia*, *pachystegiae*, *polita*, *tygris*), host-plant specialisation (*callispora*, *eremita*, *pachystegiae*), probable larviparity (*bilineata*), strong sexual dimorphism (*huia*, *stella*), mimicry (*stella*), and polymorphism (*atychioides*, *illita*). It is interesting that so many of its species were overlooked by the early collectors, and have consequently remained unnamed; amongst the newly

described taxa in this volume are several very striking and distinctive species (e.g., *gerontion*, *sesioides*, *huia*, *tygris*), which would no doubt have impressed Meyrick, Hudson, and Philpott.

Hierodoris appears to be an ancient element of the endemic New Zealand fauna. Great age is suggested both by the divergence between species in morphology, and by the wide range of life histories and adaptations to different habitats. The genus includes species with internal-feeding larvae in stems (e.g., *H. illita*, *H. callispora*), leaf-litter feeders (*H. frigida*, and probably *H. polita*, *H. s-fractum*), leaf-tiers (*H. atychioides*, *H. electrica*), and tomentum or seed-feeders (*H. eremita*, *H. pachystegiae*). There are specialist alpine species (*H. eremita*, *H. squamea*), shrubland species (*H. s-fractum*), rock-bluff species (*H. polita*), and suspected forest canopy-dwellers (*H. iophanes*, *H. torrida*, *H. tygris*, *H. huia*).

This basal radiation of *Hierodoris* is overlain by a presumably much more recent pattern of divergence, with 2 taxa in particular, *H. atychioides* and *H. illita*, showing a remarkable degree of variability, which extends to their larval biology.

Key to adults of *Hierodoris* based on external characters

- 1 Hindwing with distinct area(s) of yellowish or orange scaling 2
- Hindwing without distinct yellowish or orange scaling 6
- 2(1) Forewing lustrous and/or with metallic markings .. 3
- Forewing not lustrous, without metallic markings 4
- 3(2) Smaller species (wingspan up to 17 mm); yellow or orange on hindwing in a single narrow strip, no basal suffusion; labial palp with segment 3 normal (Fig. 33, 34)(p. 38)... **stella**
- Larger species (wingspan over 20 mm); hindwing with broad basal orange suffusion; labial palp with segment 3 minute (Fig. 5, 6)(p. 27)... **huia**
- 4(2) Head and thorax shining metallic; forewing with suffusion of greenish scales (Fig. 17)(p. 31)... **callispora** (rare form with orange hindwing base)
- Head and thorax not metallic; forewing without greenish scales 5
- 5(4) Larger species (wingspan 20 mm or over); yellow or orange on hindwing in 1 or 2 distinct strips (Fig. 25–28)(p. 34)... **illita**
- Smaller species (wingspan under 16 mm); hindwing with basal orange suffusion only (Fig. 13, 14)(p. 30)... **bilineata**

- 6(1) Antenna basally thickened with black scales (Fig. 34)(p. 38)... *stella* (female)
—Antenna not thickened with scales 7
- 7(6) Forewing grey, without distinct markings 8
—Forewing not grey, or with distinct contrasting markings 9
- 8(7) Very large species (wingspan over 22 mm); forewing unicolorous shining dark grey to whitish grey (Fig. 19, 20)(p. 32)... *eremita*
—Smaller species (wingspan under 19 mm); forewing not shining and with traces of darker markings (Fig. 35, 36)(p. 41)... *pachystegiae*
- 9(7) Forewing with basal iridescent patch and two more or less complete iridescent fasciae at ca 1/2 and 3/4 .. 10
—Forewing without such iridescent markings (but may have silvery lines not forming fasciae) 13
- 10(9) Forewing with only few blue-white scales; a discrete blue-white discal spot at 2/3 (Fig. 1)(p. 23)... *iophanes*
—Forewing with broad bands of scattered white scales at ca 1/3 and subapically; no discrete discal spot 11
- 11(10) Segment 2 of labial palp entirely yellow (Fig. 2, 183)(p. 24)... *frigida*
—Segment 2 of labial palp with dark scaling on outer surface 12
- 12(11) Forewing with complete narrow white fascia just beyond 1/2 (Fig. 3, 184)(p. 25)... *polita*
—Forewing without such a fascia (Fig. 4)(p. 26)... *torrida*
- 13(9) Hindwing basally white or with whitish markings 14
—Hindwing without whitish markings 17
- 14(13) Whitish hindwing markings confined to 1 or 2 narrow strips from base (Fig. 29, 30)(p. 34)... *illita*
—Hindwing with entire base white, or at least a whitish basal suffusion 15
- 15(14) Hindwing base translucent; wing with well-defined black border (Fig. 18)(p. 36)... *sesioides*
—Hindwing base not translucent; black border, if present, poorly defined 16
- 16(15) Forewing blackish, with subbasal pale fascia; hindwing all white or with variable dark border; labial palp segment 2 thickened with suberect scales beneath (Fig. 21–23)(p. 33)... *gerontion*
—Forewing brownish to greenish, without subbasal fascia; hindwing with at most pale basal suffusion; labial palp segment 2 smooth beneath (Fig. 10)(p. 28)... *atychioides* (pallid form)
- 17(13) Forewing with dark oblong to triangular costal mark at 2/3 bordered by sinuous silvery line 18
—Forewing without such markings 19
- 18(17) Forewing with pale basal streak(s); sinuous silvery line broken by distinct whitish dash from costa; subbasal fascia grey, weakly shining (Fig. 39, 40, 186)(p. 40)... *s-fractum*
—Forewing without pale basal streak; silvery line unbroken; subbasal fascia silver, metallic (Fig. 37, 38, 185)(p. 39)... *electrica*
- 19(17) Ocelli absent or strongly reduced 20
—Ocelli present, clearly visible 21
- 20(19) Large forest species (wingspan 16 mm or over) with ferruginous, longitudinally striped forewings (Fig. 41, 42)(p. 42)... *tygris*
—Very small alpine species (wingspan 13 mm or under) with black forewings suffused with yellow scales (Fig. 31, 32)(p. 37)... *squamea*
- 21(19) Head and thorax shining metallic; forewing with suffusion of greenish scales; discal spot absent (Fig. 15, 16)(p. 31)... *callispora*
—Head and thorax not metallic; if forewing greenish, then discal spot present 22
- 22(21) Larger species (wingspan 20 mm or over); hindwing with trace of pale streak(s) from base (Fig. 24)(p. 34)... *illita* (rare form with brownish hindwings)
—Smaller species (wingspan under 20 mm); hindwing completely unmarked (Fig. 7–9, 11, 12)(p. 28)... *atychioides*

The *Hierodoris iophanes* group

Hierodoris iophanes Meyrick, 1912

Fig. 1, 64, 65, 67, 68, 69, 93–95, 158; Map 10
Hierodoris iophanes Meyrick, 1912: 42.

Diagnosis. The combination of purplish-metallic transverse forewing fasciae, together with the lack of extensive white scaling and the presence of a discrete blue-white discal mark, is diagnostic.

Male. (Fig. 1). Forewing length 5–6.5 mm; wingspan 11.5–14 mm. Head: ocelli present, very small; frons and vertex with narrow lamellate scales dark bronze with faint purple reflections; labial palpi with appressed scales, bronze below, yellowish above, segment 3 ca 3/4 as long as 2; antennae blackish, shining, ciliations very short, ca 1/4 width of flagellum. Collar golden bronze, paler than head. Thorax dark bronze, reflecting purple, tegulae paler bronze.

Forewing blackish bronze, appearing greenish in some lights; basal blotch below fold and transverse fasciae (not quite reaching dorsum or costa) at 1/2 and 3/4 dark metallic purple; termen reflecting purple; a broken line of bluish white scales extending from costa to below fold just beyond basal blotch; a white dot or comma-like mark in disc at 2/3; cilia blackish bronze. Forewing scales: all similar, 4- or 5-pointed, except in metallic marks, where scales are blunt and only finely scalloped at tips. Hindwing blackish brown; cilia blackish brown. Underside uniform blackish brown. Abdomen blackish bronze.

Female. Forewing length 5.5 mm; wingspan 12 mm. Similar to male but with distinct white mark just beneath costa at 3/4, and a subterminal line of bluish white scales just beyond this on dorsum, reaching 1/2 way across wing.

Male abdomen and genitalia. Abdomen (Fig. 69): S8 squarish, invagination teardrop-shaped, reaching to ca 1/2; T8 sclerite linear, broader at mid-length. Genitalia (Fig. 93): tegumen with basal invagination to just under 1/2. Uncus tapering, pointed, curved; a few minute setae ventrally near tip. Gnathos longer than uncus, tip upcurved and bluntly rounded, dorsally with minute spinules. Valva: costa slightly convex before 1/2, outer margin rounded; sacculus with outer distal process reaching just beyond costa, inner process short, blunt to slightly hooked, at ca 90 degrees to outer. Juxta basal plate V-shaped, lateral arms elongate, reaching to base of valval costa. Saccus short, V-shaped. Aedeagus (Fig. 94): tooth absent, sclerotisation of outer wall coming to a sharp point distally; vesica without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 95) ca 1.3× as long as aedeagus.

Female genitalia. (Fig. 158). Segments 8-10 only slightly extensible. Apophyses very narrow, posteriores ca 1.3× as long as anteriores. Ostium narrow, colliculum distinct; ductus bursae narrow; corpus bursae more or less round, signum absent. Scobinations from ca 1/3 ductus length to inception of corpus bursae. Ductus spermathecae with ca 5 weak loops.

Larva, Hostplant, and Biology. Unknown. The species may well be associated with leaf-litter, like its relatives *frigida* and *polita*.

Type data. **Holotype:** male, 'Wellington New Zealand GVH .1.12', 'Holotype', '*Hierodoris iophanes* Meyr. 1/1 E. Meyrick det. in Meyrick Coll.' (BMNH, genitalia slide 30739).

Material Examined. Holotype plus 22 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Patchily recorded from Auckland to Southland.

AK, WO, BP, WN / NN, DN, SL.

Remarks. *Hierodoris iophanes* is a widespread but rarely collected forest species. Hudson (1928: 305) records it flying "very actively in the hottest sunshine", but most recent specimens have been attracted to light at night.

Hierodoris frigida Philpott, 1923

Fig. 2, 56, 60, 70, 96-98, 159, 183; Map 6

Hierodoris frigida Philpott, 1923: 153.

Taoscelis crocostoma Meyrick, 1938: 428. Synonymised by Dugdale, 1988: 89.

Diagnosis. This species can easily be distinguished from the similar *H. polita* and *H. torrida* by the all-yellow segment 2 of the labial palp (see Fig. 183, 184). Other differences are listed under those species.

Male. Forewing length 5–6 mm; wingspan 11.5–13 mm. Head: ocelli present, very small; vertex with broad short lamellate scales, shining leaden metallic; labial palpi strongly upcurved, segment 2 entirely yellow, segment 3 ca 1/2 length of 2, black with a few yellow scales dorsally; antennae leaden, ciliations nearly 1/2 width of flagellum. Collar, thorax and tegulae leaden metallic. Forewing blackish brown, basally shining metallic blackish with turquoise and violet reflections; a scattered overlay of narrow whitish scales from near base to 1/3, and from ca 2/3 to apex; dark silvery fasciae at 1/2 and 2/3 with violet reflections, the first reaching only 1/2 way across wing from costa; a yellowish white spot on costa and a bronzy area in disc between these; a more or less defined whitish spot on fold at 1/2; cilia shining leaden. Forewing scales: basal group of white scales very narrow and mostly 3-pointed; white scales towards termen similar, but those towards apex broader and 4-pointed; central pale areas consisting of 4- to 5-pointed scales; metallic areas with blunter scales, indentations less pronounced, ca 4-pointed; dark scales mostly ca 5-pointed with distinct indentations. Hindwing uniform blackish brown, somewhat paler towards base, especially in specimens from CO. Underside brown, hindwing somewhat paler exteriorly. Abdomen leaden to blackish, spines copery.

Female. (Fig. 2). Forewing length 5.5–6 mm; wingspan 12–14 mm. Similar to male but antennae without conspicuous ciliations.

Male abdomen and genitalia. Abdomen (Fig. 70): S8 with invagination ca 1/2 depth of sclerite; T8 sclerite very narrow. Genitalia (Fig. 96): tegumen with basal invagination reaching to just under 1/2 length. Uncus hooked over, a few small setae ventrally near tip. Gnathos well-developed, slightly longer than uncus, bluntly tapered, somewhat upturned, dorsally spinulose. Valva: costa nearly straight; sacculus well developed, inner process short,

spatulate, reaching 1/2 across valva, outer process digitate, reaching beyond costa of valva. Juxta V-shaped, lateral lobes elongate, short and narrow, not reaching base of valval costa. Saccus short, more or less rounded. Aedeagus (Fig. 97): tooth absent, vesica without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 98) ca 1.2× as long as aedeagus.

Female genitalia. (Fig. 159) Segments 8–10 narrow, strongly extensible. Apophyses posteriores ca 1.3× as long as anteriores. Ostium rather broad, ca 1/2 width of segment; colliculum distinct. Ductus bursae rather broad, straight, gradually widening into corpus bursae; signum absent. Scobinations from ca 1/3 length of ductus to inception of corpus bursae. Ductus spermathecae with 3 weak loops.

Larva, Hostplant, and Biology. The species is associated with leaf-litter in open locations, and has been reared from litter collected from beneath *Thymus* (J. S. Dugdale, pers. comm.; specimen not located).

Type data. *Hierodoris frigida*: **Holotype:** male, ‘Dun Mt. 3000ft 17-1-21 A. Philpott’, ‘Hieroderis [*sic*] frigida Philp. Holotype ♂’ (NZAC). **Paratypes:** NN: female, Dun Mt, 3000ft, 6 Jan 1921, AP (designated ‘Allotype’ by Philpott); 4 males, Dun Mt, 3000ft, 3 Jan 1921, AP. 1 male (abdomen missing), Dun Mt, 3000ft, 5 Jan 1921, AP. 5 males, Dun Mt, 3000ft, 6 Jan 1921, AP. 1 male, Dun Mt, 2500ft, 17 Jan 1921, AP. 1 male, Dun Mt, 3000ft, 17 Jan 1921, AP. 1 male, Dun Mt, 3000ft, 24 Jan 1921, AP (NZAC genitalia prep. L293). 2 males, 1 female (abdomen and hindwings missing, sexed on antennae), Dun Mt, 3000ft, 9 Feb 1921, AP (all NZAC).

Taoscelis crocostoma: **Holotype:** male, ‘Freehold Rg. Lake Ohau 4000ft 31/12/36 S. Lindsay’, ‘*Taoscelis* (Type) crocostoma. det E. Meyrick.’, ‘HOLOTYPE’ (CMNZ).

Material Examined. Type series plus 64 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. South Island only. Apparently a disjunct distribution, in Nelson and from South Canterbury to Dunedin.

— / NN, SC, MK, CO, DN.

Remarks. *Hierodoris frigida* appears to have adapted successfully to the leaf-litter habitat provided by invasive *Thymus* in certain Otago localities (Peat & Patrick 1999). It is a diurnal species: in his original description, Philpott records the adults “flying close to the ground beneath *Leptospermum* and other scrubs [*sic*]” on Dun Mt., Nelson.

Hierodoris polita new species

Fig. 3, 71, 99, 100, 160, 161, 184; Map 12

Diagnosis. Apart from the labial palp character listed under *frigida*, this species may be distinguished by the white scales on the posterior part of the tegulae (tegulae all dark in *frigida*) and the pure white transverse band on the forewing at 1/2 (band absent in *frigida*, which has only a yellowish white spot on the costa and a spot in the fold at 1/2). See also Fig. 183, 184.

Male. (Fig. 3) Forewing length 5–6.5 mm; wingspan 11–14.5 mm. Head: ocelli present, small; frons and vertex with shining dark bronze to blackish scales; labial palpi blackish, yellowish white on upper part of interior surface, segment 3 ca 1/2 length of 2; antennae black, ciliations very short, ca 1/3 width of flagellum. Collar blackish, shining, sometimes with a few white scales. Thorax shining blackish, sometimes with a few off-white scales; tegulae shining blackish, with some off-white scales posteriorly. Forewing blackish, basal area with patch of shining brassy scales centrally; area from near base to just over 1/3 and subterminal area with many scattered white and yellowish white scales; an irregular white fascia of variable width just beyond 1/2, often with some yellowish white scales posteriorly; area of ground-colour preceding fascia with brassy shining scales in patches above and below fold; area beyond fascia with brassy shining scales more extensive, sometimes almost reaching costa and dorsum; terminal area blackish; cilia leaden, base of cilia with inconspicuous line of brassy shining scales. Forewing scales: scale-types as described for *H. frigida*. Hindwing brown, slightly paler basally; cilia brown. Underside: forewing brown with some yellowish white scales towards costa, and pure white scales dorsally below fold; hindwing brown with or without some yellowish white scales towards costa and apex. Abdomen blackish, spines showing conspicuously golden.

Female. Forewing length 5.5–6 mm; wingspan 12.5–13.5 mm. Very similar to male.

Male abdomen and genitalia. Abdomen (Fig. 71): S8 with invagination ca 1/3 depth of sclerite; T8 sclerite short and irregular in shape. Genitalia (Fig. 99) similar to those of *H. frigida*, but tegumen less elongate, valva narrower, inner saccular process reduced to a very short blunt triangle, juxta lobes much broader. Aedeagus (Fig. 100) as in *H. frigida*.

Female genitalia. (Fig. 160, 161). Segments 8–10 strongly extensible. Apophyses posteriores ca 1.5× as long as anteriores. S8 more or less divided into 2 sclerites. Ostium rather narrow; colliculum indistinct. Ductus bursae fairly broad, gradually widening into elongate corpus bursae.

Scobinations confined to a small U-shaped patch ca 1/2 way along ductus bursae (Fig. 161). Ductus spermathecae with ca 2–3 loops.

Larva. Not described in life.

Hostplant and Biology. The species has not been reared but a suspected larva has been recovered from litter trapped in strips of the moss *Grimmia laevigata* (Grimmiaceae) on a rockface where moths were common. The only other ‘vegetation’ on the rockface consisted of crustose lichens.

Type data. Holotype: male, ‘NEW ZEALAND CO Craig Flat Clutha Valley 16 March 1986 J. S. Dugdale’ (NZAC).

Paratypes: 18 males, 7 females. **CO:** 1 male, Canadian Stream, E side Clutha Valley, 18 Nov 1985, on rock faces, JSD; 1 female, Craig Flat, Clutha Valley, 16 Mar 1986, JSD; 1 male, Craig Flat, Clutha Valley, on outcrops, 18 Nov 1985, JSD (NZAC genitalia prep. L424); 1 female, Craig Flat Rd, 16 Nov 1985, BHP (genitalia slide NZAC Oec. 158); 1 male, Roxburgh Dam, E side, on rock faces, 21 Nov 1985, C. A. Muir; 1 male, McCunn Rd, W side Clutha V, on rock faces, 19 Nov 1985, JSD (all NZAC); 1 female, Clutha River, Craig Flat, 16 Nov 1985, C. A. Muir, lichen covered rocks (LUNZ); 1 male, Conroys Rd., 300 m, 11 Jan 1992, BHP; 1 male, nr. Sutton, 300 m, 16 Mar 1985, BHP; 1 male, 1 female, Maniototo, nr Patearoa, 500 m., 11 Mar 1988, BHP; 1 male, Waitaki Valley, Otematata saline area, 21 Feb 1989, BHP; 1 female, Waitaki Valley, Otematapaio River, 25 Mar 1989, BHP (all OMNZ). **DN:** 3 males, Chinamans Flat, on bluff crest, 2.3 km SSW of Beaumont, 18 Mar 1986, JSD (genitalia slide NZAC Oec. 145) (NZAC); 7 males, 2 females, Taieri Gorge, Hindon, 100 m, 26 Oct 1993, BHP (female genitalia slide OMNZ Oec. 11) (OMNZ).

Material Examined. Type series plus 3 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution.

— / CO, DN.

Etymology. The specific name is from the Latin *politus* (‘polished’) and refers to the shining scales of the forewing.

Remarks. This species sometimes occurs with *H. frigida* in the same localities at the same time of year, but is much more local in distribution overall. *Hierodoris polita* is also more specialised in habitat, and appears to be largely confined to south-facing rocky bluffs, with communities of *Grimmia* moss. It was overlooked by the earlier New Zealand collectors, the first known example being taken near Sutton CO by Brian Patrick in March 1985.

***Hierodoris torrida* new species**

Fig. 4, 73, 101, 102, 162; Map 17

Diagnosis. *Hierodoris torrida* lacks the transverse white forewing fascia of *polita* and segment 2 of the labial palp is infuscated, not yellow as in *frigida*. It is a lowland forest species, and is unlikely to occur in the same localities as either of its close relatives.

Male. (Fig. 4). Forewing length 5–6 mm; wingspan 11–11.5 mm. Head: ocelli present, small; frons and vertex shining bronze; labial palpi exteriorly greyish, interiorly white, segment 3 ca 1/2 length of 2; antennae blackish, ciliations ca 1/3 width of flagellum. Collar, thorax, and tegulae shining blackish brown. Forewing blackish brown, basal metallic area with violet reflections, area beyond this to 1/2 with scattering of very narrow white scales; a transverse pale tawny brown fascia at 2/3, obsolete on costa and dorsum, bounded proximally and distally by 2 irregular narrow fasciae of metallic scales reflecting violet and turquoise, the proximal fascia replaced below fold by a poorly defined subtriangular area of pale brown and off-white scales on dorsum; area beyond fasciae with scattered narrow white scales; an inconspicuous line of metallic scales along termen; cilia shining dark grey. Forewing scales: white scales towards base and termen very narrow, mostly 2-pointed; white and brownish scales in centre of wing mostly 4- or 5-pointed; metallic scales blunt, faintly scalloped at tip. Hindwing brown, cilia grey-brown. Underside uniformly lustrous dark brown with greenish reflections. Abdomen shining blackish with spines showing golden.

Female. Forewing length 4.5 mm; wingspan 10.5 mm. Similar to male, but antennae without conspicuous ciliations; forewing with short white streak from costa at 1/2 just beyond first metallic fascia.

Male abdomen and genitalia. Abdomen (Fig. 73): S8 rather short, invagination to ca 1/2 length of sclerite; T8 sclerite rectangular. Genitalia (Fig. 101): tegumen, uncus and gnathos as in *H. polita*. Valva rather narrow, subtriangular; sacculus with inner process absent, outer narrow and digitate, reaching beyond costa. Juxta with very short broad triangular lateral lobes. Saccus short, rounded. Aedeagus (Fig. 102): tooth absent. Tubular portion of bulbus ejaculatorius about same length as aedeagus.

Female genitalia. (Fig. 162). Segments 8–10 only moderately extensible. Apophyses posteriores ca 1.4× as long as anteriores. S8 more or less divided into 2 sclerites. Ostium narrow; colliculum indistinct. Ductus and corpus bursae narrow, short; scobinations very faint, reaching ca 1/2 way along ductus. Ductus spermathecae with 2 loops.

Larva, Hostplant, and Biology. Unknown.

Type data. Holotype: male, 'NEW ZEALAND MC 43.32S 172.36E Riccarton Bush m.v. light 19 Jan 2000 R. Hoare, J. Dugdale, K. Hill, S. Pawson' (NZAC). **Paratypes:** 7 males, 3 females. **RI:** 1 male, Mataroa, Paengaroa Sc. Res., 2 Feb 2003, m.v. light, RJBH, G. Hall (NZAC). **WN:** 1 female, 998d [Moonshine, 23 Feb 1934, S. Hudson] (MONZ). **SD:** 2 males, Stephen's Isd, 14–28 Jan 1933, E. S. Gourlay (NZAC genitalia slide Oec. 147). **KA:** 1 male, Omihi Sc. Res., Goose Bay, 24 Jan 1988, JSD. **MC:** 1 male, Riccarton Bush, sweeping, 16 Jan 1988, JSD (NZAC genitalia slide Oec. 146) (all NZAC); 1 male, 1 female, Riccarton Bush, Feb 1995, BHP, P. Quinn (female genitalia slide OMNZ Oec. 10) (OMNZ); 1 female, Price's Bush, 27 Feb 1944, S. Lindsay (CMNZ). **SC:** 1 female, Waihi Gorge, 4 Jan 1944, S. Lindsay (CMNZ).

Material Examined. Type series plus 3 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Scattered localities in the southern North Island and eastern South Island.

RI, WN / SD, KA, MC, SC.

Etymology. The specific name is derived from the Latin *torridus* ('hot' or 'scorched') and refers to the very dark wing coloration.

Remarks. This species comes sparingly to mercury vapour light, perhaps only on the warmest nights. It is probably largely diurnal, and has been captured in a Malaise trap. The known habitats are coastal and riverine forest. Hudson's (1939: 456) record of *Hierodoris frigida* from Upper Hutt WN is in fact the first record of *H. torrida*. The specimen (in MONZ) was captured by Stella Hudson in 1934.

Hierodoris huia new species

Fig. 5, 6, 72, 103–106, 163, 164; Map 8

Diagnosis. The minute segment 3 of the labial palp, the white subapical patch on the antenna and the metallic patches of curled scales on the forewing are all unique to this species.

Male. (Fig. 5). Forewing length 9–10 mm; wingspan 20.5–21.5 mm. Head: ocelli present; vertex worn in all specimens examined, apparently some broad and some narrow scales, greyish to dark grey; frons shining pale grey; labial palpus almost porrect, only slightly recurved, segment 2 greyish, whitish on inner surface, segment 3 reduced to a very short acute point; antennae dark grey, with a subapical strip of shining white scales dorsally between ca 3/4

and 7/8, ciliations ca 3/4 width of flagellum. Collar, thorax and tegulae shining lead-grey. Forewing blackish brown with sparse overlay of whitish scales; a pair of somewhat obliquely placed round blackish spots at 1/3 with strong violet reflections; a large reniform mark in disc at 3/4 blackish with violet reflections, and enclosing a short dash of pale brassy yellow scales; a faint pale brownish mark at tornus. Forewing scales: most scales narrow, 4-pointed; scales of blackish spots curled towards wing surface, broadest subapically, then tapering slightly, 5- to 7-pointed. Cilia blackish brown. Hindwing dark brown with an orange blotch extending 1/2 way across wing in dorsal 1/2; cilia orange. Underside: forewing dark brown, unicolorous; hindwing dark brown with basal blotch and cilia dull orange. Abdomen dark brown with hind margins of segments faintly paler; spines very inconspicuous, shining dark brown.

Female. (Fig. 6). Forewing length 11 mm; wingspan 24.5 mm. Strikingly different from male. Labial palpus with segment 2 strongly elongate, porrect, 3× length of head in dorsal view, and with covering of black metallic scales reflecting green, red and violet; segment 3 minute as in male; antennae pale brownish with overlay of dark metallic scales similar to those of labial palpi; subapical strip of white scales more conspicuous than in male. Collar greyish. Thorax shining greyish, tegulae and forewing with admixture of whitish, buff, and dark brown scales making moth appear much lighter than male; darker scales predominating towards costa, and forming an indistinct transverse fascia at 1/4; black shining marks reflecting violet as in male but larger and more conspicuous against paler ground-colour, the dark scales distinctly curled to form raised spots; brassy scales in discal spot at 2/3 more extensive than in male; a vaguely indicated whitish subterminal fascia. Forewing scales: all scales relatively broad, tending to be narrower in distal part of wing, mostly 5- to 7-pointed, a few up to 9-pointed. Cilia brassy brown.

Male abdomen and genitalia. Abdomen (Fig. 72): S8 sclerite slightly longer than broad, invagination to ca 1/3 or 1/2 length of sclerite; T8 sclerite weak, elongate, tapering. Genitalia (Fig. 103, 104): tegumen rather long, with large rounded anterior invagination to ca 1/2. Uncus triangular with slight lateral protuberances, tip narrowly squared off, ventrally setose near tip. Gnathos (Fig. 104) longer than uncus, upcurved, scoop-like, with broadly rounded tip and dorsal scobinations. Valva moderately narrow, with numerous scattered long setae; sacculus with processes forming crescent-shaped, pincer-like arrangement, outer process strongly curved, pointed, inner process slightly curved, broader and blunter, neither process reaching costa of valva. Juxta with basal plate V-shaped, arms narrow and

elongate, reaching beyond base of valval costa. Saccus short, subtriangular. Aedeagus (Fig. 105, 106): tooth very large, directed laterally, with a tiny subsidiary tooth projecting from it at ca 45 degrees; a single long narrow cornutus in apical 1/2 of uneverted vesica. Tubular portion of bulbous ejaculatorius (Fig. 105) ca 1.3× length of aedeagus.

Female genitalia. (Fig. 163, 164). (From single, damaged slide mount). Tergal spines smaller than in male. Segments 8–10 rather strongly extensible, narrow. Apophyses posteriores ca 1.6× as long as anteriores. Ostium broad; colliculum distinct; posterior portion of ductus bursae with sclerotised lateral strip; ductus bursae very narrow; corpus bursae very narrow and elongate. Scobinations from near colliculum to inception of corpus bursae. (Ductus spermathecae not observed.)

Larva, Hostplant, and Biology. Unknown.

Type data. Holotype: male, 'NEW ZEALAND AK Titirangi to light. 28 Jan 1980 P. A. Maddison' (NZAC).

Paratypes: 2 males, 1 female. **AK:** 1 male, 1 female, same data as holotype (male genitalia slide NZAC Oec. 152; female genitalia slide NZAC Oec. 155); 1 male, Titirangi, ex light trap, Jan 1953, C.R. Thomas (genitalia slide NZAC Oec. 157).

Material Examined. Type series only.

Distribution. Only known from the type locality in west Auckland.

AK / —.

Etymology. The species is named after the extinct New Zealand wattle-bird, the huia (*Heteralocha acutirostris* (Gould)). The huia is famous for the strong sexual dimorphism in the beak; the female had a much longer narrower bill than the male. This is paralleled in *H. huia*, where the female has much longer labial palpi than the male. The name also refers to the type locality of the moth, a garden in Huia Road, Titirangi AK.

Remarks. This is one of the strangest and most distinctive species of *Hierodoris*. The sexual dimorphism in the labial palpi is unusual amongst Lepidoptera as a whole. This is the species listed by Dugdale (1988) as an undescribed member of *Coridomorpha*. The chief character it has in common with *H. stella* (the only species hitherto assigned to *Coridomorpha*) is the dimorphism in colour pattern, with the female much paler and greyer than the male. However, the genitalia indicate that the two species belong to different species-groups of *Hierodoris*.

The modified labial palpi of *huia*, with their extraordinarily elongate metallic second segment in the female, the white subapical patch on the antennae, and the raised shining spots on the forewing in both sexes hint at some behavioural peculiarities that would be most

interesting to elucidate. Possibly some form of mimicry is involved, as in *H. stella*.

Adults of *huia* attracted to light are extremely wary, walking jerkily on the sheet, in common with other chiefly diurnal species (J. S. Dugdale, pers. comm.).

Status and Conservation. *Hierodoris huia* has only been collected on two occasions, in gardens less than 500 metres apart; it is possible that it may be a largely diurnal canopy species that can only be attracted down from its haunts with a powerful light. Hence it is probably overlooked, but the author has not rediscovered it, despite frequent light-trapping in Titirangi over 5 summers. Thus, until further specimens are found, it should continue to be regarded as a potentially threatened species (cf. Patrick & Dugdale 2000).

The *Hierodoris illita* group

Hierodoris atychioides (Butler, 1877)

Fig. 7–12, 62, 63, 74, 75, 107–109, 165–167; Map 1

Tachyptilia atychioides Butler, 1877: 405–406.

Heliosibes gregalis Philpott, 1928: 369. Synonymised by Hudson, 1939: 456.

Heliosibes barbarica Philpott, 1930a: 12. Synonymised by Hudson, 1939: 456.

Diagnosis. The species may usually be recognised by the rather distinct dark discal spots on the forewing at 1/3 and 2/3, contrasting with the intervening paler scales, together with the all-dark hindwings (occasionally with pale base). Unicolorous forms may resemble worn specimens of *callispora*, but lack the metallic head and thorax of that species. *Hierodoris gerontion* always has a much more extensive white base to the hindwing and the labial palp is tufted beneath (smooth in *atychioides*). Forms of *illita* with dark hindwings are larger (wingspan at least 20 mm) than *atychioides* (usually 18.5 mm or less), and the hindwing has traces of pale streaks.

Male. (Fig. 7–9, 12). Forewing length 6–9 mm; wingspan 13.5–20 mm. Head: ocelli present; vertex with leaden and pale brown to reddish brown scales; frons shining whitish to shining pale brown; labial palpi basally and interiorly pale brown, distally and exteriorly leaden, segment 3 nearly as long as 2; antennae shining blackish with pale scaling beneath in basal 2/3, ciliations ca 2× width of flagellum. Collar, thorax and tegulae leaden with variable admixture of pale brown to reddish brown scales. Forewing blackish brown overlain with scales that may be whitish through cream-brown to pale brown to reddish brown; the following markings more or less indicated: a short blackish dash on fold just before 1/2, a black dot just above this in disc, a blackish discal spot at 2/3, a whitish to pale brown or reddish brown curved fascia at 4/5; basal area and area between discal spots usually concolorous with this fascia.

Forewing scales: dark scales mostly 4- to 5-pointed; pale brownish or reddish scales variable, tending to be narrower, 2- to 3-pointed, especially near base of wing; whitish scales where present 3- to 5-pointed near base, 4- to 6-pointed distally. Cilia shining leaden. The forewings may be almost unicolorous whitish brown to dark brown with the markings obscure. Hindwing dark brown, cilia slightly paler. Underside: forewing dark brown, lustrous, with costa narrowly yellowish white, and white scaling from fold to dorsum, cilia grey; hindwing usually lustrous greyish brown with whitish scaling along costa and around apex, cilia brownish at anal angle, fading to whitish around apex, or all whitish; in dark forms hindwing may be uniform dark brown without white scaling. Abdomen dark grey-brown, posterior margins of segments paler grey, spines showing faintly orange.

Note: A single male from Otatara SL in OMNZ attains a wingspan of 20 mm; most males are distinctly smaller.

Female. (Fig. 10, 11). Forewing length 6–8 mm; wingspan 14–18.5 mm. Similar to male, but antennae with very sparse erect ciliations ca 1/3 flagellum width; forewing often more contrastingly marked: dash in fold often coalesced with discal spot above it to form roughly C-shaped mark; areas of pale scaling preceding and following this mark in disc often present; second discal spot usually larger than in male and more or less surrounded by whitish scales; fascia at 4/5 often prominent. Hindwing occasionally with conspicuous white patch basally.

Male abdomen and genitalia. Abdomen (Fig. 74, 75): S8 with very broad invagination to posterior margin, leaving 2 slightly curved lateral sclerites; T8 more or less narrow, elliptical to leaf-shaped. Genitalia (Fig. 107): tegumen moderate in length, basal invagination reaching to ca 2/3 length. Uncus long, digitate, curved; anal tube apically conical and tapering to a narrow point. Gnathos inverted V- to Y-shaped with more or less distinct short central process. Valva with costa slightly concave in distal 1/3, outer margin smoothly rounded; setae close-set, especially near sacculus; sacculus processes absent. Juxta basal plate anteriorly rounded, with small medial anterior projection; lateral arms elongate, slightly broader beyond middle, then tapering to apex. Saccus very elongate, triangular. Aedeagus (Fig. 108, 109): tooth large; distal part of unevverted vesica strongly and densely scobinate. Tubular portion of bulbus ejaculatorius (Fig. 109) ca 1.4× as long as aedeagus.

Female genitalia. (Fig. 165–167). Segments 8–10 rather strongly extensible. Apophyses posteriores ca 1.4× as long as anteriores. S8 more or less divided into 2 sclerites. Ostium very broad, taking up most of width of segment; antrum finely spinulose; colliculum indistinct, but a distinct curved sclerite present near inception of ductus

seminalis (Fig. 166); anterior to this a folded, somewhat sclerotised zone; ductus bursae narrow; a swelling at anterior end of ductus bearing a large roundish sclerite; corpus bursae oblong, elongate, without signum. Scobinations from anterior margin of folded zone to posterior 1/4 of corpus bursae. Ductus spermathecae with ca 1–3 very weak loops.

Larva. (From spinings on *Kunzea ericoides*, Karekare, AK). Dull purplish brown; head red-brown with black markings; thoracic segments heavily sclerotised dorsally, blackish with paler brown areas; dorsal line whitish; on each of T3 and A1–8, the D pinacula show up as 2 blackish, white-edged spots on each side of midline; also a more or less conspicuous whitish subdorsal line. A10 yellowish, brown-spotted. The colour of the larva is variable, and Kay (1980) figures light and dark varieties.

Hostplant and Biology. The larva has been recorded on a number of introduced and native trees and shrubs. It is most commonly found on Gymnospermae; native hosts are rimu (*Dacrydium cupressinum*), matai (*Prumnopitys taxifolia*), kahikatea (*Dacrycarpus dacrydioides*) (all Podocarpaceae), and kaikawaka (*Libocedrus bidwillii*) (Cupressaceae) (reared specimens in NZAC, MONZ, OMNZ), and exotic hosts are fir (*Abies* spp.), spruce (*Picea* spp.), pine (*Pinus* spp., including *Pinus radiata*) (all Pinaceae) (Kay 1980), hemlock (*Thuja* spp.), and Monterey cypress (*Cupressus macrocarpa*) (both Cupressaceae) (reared specimens in NZAC). Larvae are also found on three angiosperm hosts: manuka (*Leptospermum scoparium*), kanuka (*Kunzea ericoides*) (both Myrtaceae), and tauhinu (*Ozothamnus leptophyllus*) (Asteraceae).

H. atychioides larvae form untidy spinings on their hostplant, incorporating frass and leaves. The spinings are usually conspicuous because many of the included leaves die and turn brown. Suppressed dying and dead leaves may form much of the diet of the larva, but there are no detailed observations on feeding habits. Larvae are gregarious and 85 have been counted in a single spinning 100 mm long (Kay 1980).

Type data. *Tachyptilia atychioides*: **Holotype:** female, 'N. Zeal. 77.34', 'Tachyptilia atychioides Butler Type', 'Type' (BMNH, genitalia slide 30737).

Heliostibes gregalis: **Holotype:** female, 'Russell -/12/26 Bred' 'R.S. Florance' [underside of label], 'Heliostibes gregalis Philpott Holotype ♀' (NZAC). **Paratypes:** 2 females, same data as holotype (NZAC).

Heliostibes barbarica: **Holotype:** male, 'Whangarei 11.1.21', 'Heliostibes barbarica Philp. Holotype. ♂', 'AMNZ 21768 AUCKLAND MUSEUM NEW ZEALAND' (AMNZ). **Paratypes:** 1 female, same data as holotype (AMNZ).

Material Examined. Type series of *atychioides*, *gregalis*, and *barbarica*, plus 386 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Widespread throughout New Zealand, including Stewart Island.

ND, AK, CL, WO, BP, TK, TO, HB, RI, WI, WN
/ NN, BR, KA, MC, CO, DN, SL, SI.

Remarks. *Hierodoris atychioides* is a very variable species that may be in the process of speciation. Entities on different (and unrelated) larval hosts tend to show differences in colour pattern, which have led in the past to the description of separate species. However, these entities intergrade when seen in long series, and no constant and reliable differences in morphology have been found to separate them. They are therefore treated here as elements of a single polymorphic species. It is possible that some of these forms may already be reproductively isolated from each other, so further more detailed research, involving pheromones, molecular techniques and mating experiments, is desirable to clarify the situation.

The variation in *atychioides* extends to characters of the pupa; in the few specimens of exuviae examined, A9 may have 2–5 pairs of setae, and A10 0–3 pairs. On the limited evidence available, these differences appear not to correspond to different host-plants or colour-forms.

Note on synonymy. *Hierodoris gregalis* Philpott: Philpott (1928) described *gregalis* from specimens with unicolorous forewings, reared from manuka. Hudson (1939: 456) synonymised *gregalis* with *atychioides* on the basis that faint indications of the normal pale markings were sometimes visible in this form. In fact, some specimens reared from manuka and kanuka have the normal markings well developed, and as I can find no consistent differences in either markings or genitalia between *gregalis* and *atychioides*, I retain the synonymy here.

H. barbarica Philpott: Philpott (1930a) described *barbarica* on the basis of 2 rather small reddish-marked specimens from Whangarei (ND). Since that date, identical specimens have frequently been reared from larvae on rimu in the North Island. Hudson (1939: 456) synonymised *barbarica* with *atychioides*. Whilst the *barbarica* form can look strikingly distinct from typical *atychioides*, NZAC and AMNZ have specimens of intermediate colouring reared from rimu in west Auckland in the 1940's by T. Skeates. There are also larger reddish specimens in NZAC, reared from *Libocedrus bidwillii* from Mt Hauhangatahi TO. Again, the genitalia of all these forms appear to be identical, and the synonymy is upheld.

Hudson (1939: 456–7) mentions a further form, associated with tauhinu (*Ozothamnus leptophyllus*) on the

Wellington coast. This pallid form has also been collected in the Orongorongo Valley WN by J. Dugdale and on the Kaikoura coast by B. Patrick. These specimens tend to have a pale khaki or almost greenish tinge when viewed with the naked eye, and often have a conspicuously pale hindwing fringe, and sometimes a white hindwing base. The overall coloration corresponds well with the glaucous foliage of the host-plant. But despite its apparent adaptation to a specialised host, there still seems to be no character, external or genitalic, by which this pallid morph can be consistently and straightforwardly distinguished from other varieties of *atychioides*. Specimens reared from matai from Thomson's Bush, Invercargill (OMNZ) have the same colours and distributions of scales as some of the tauhinu-reared specimens. To define a new species or subspecies on the basis of hostplant and habitat alone would be a disservice to future workers, since these details will not be available for all specimens.

The only practical course for the moment is to regard all colour forms as 'ecological races' of *atychioides* that have not diverged sufficiently in morphology to merit taxonomic separation. Rutten & Karsholt (1998) discussed an analogous situation in the European gelechiid *Bryotropha umbrosella* (Zeller), where a pale coastal form had been consistently regarded as a distinct species, *B. mundella* (Douglas), despite the existence of intermediate specimens.

Hierodoris bilineata (Salmon, 1948)

Fig. 13, 14, 76, 110–112, 168; Map 2

Heliothibes bilineata Salmon, 1948: 310.

Diagnosis. *Hierodoris bilineata* can be distinguished from other species with orange hindwing markings by its unmodified, unmarked antennae (cf. *huia*, *stella*), non-metallic thorax (cf. *callispora*), and small size (cf. *illita*).

Male. (Fig. 13). Forewing length 5.5 mm; wingspan 13 mm. Head: ocelli present, small. Vertex and upper frons with appressed leaden and some pale orange scales; lower part of frons whitish; narrow lamellate scales laterally on head leaden and pale orange; labial palpi with appressed scales, exteriorly leaden and orange, interiorly orange and whitish, segment 2 nearly as long as 3; antennae blackish with a few pale scales on each segment in basal 1/2, scape with some orange scaling, ciliations very short and more or less appressed. Collar, thorax, tegulae, and forewing glossy leaden brown with overlay of narrow orange scales; areas more or less clear of orange scaling form vague dark fascia just before 1/2, not reaching costa, and second fascia at 2/3–3/4, narrowing toward tornus and interrupted by some orange scaling in disc; terminal 1/5 and most of dorsum also lacking orange scales; scales between the two dark fasciae

paler orange than on rest of wing. Cilia shining leaden. Forewing scales: most orange and dark scales ca 4- to 5-pointed; some orange scales towards base 3-pointed with central point broadest. Hindwings dark brown with diffuse orange streak from base to just over 1/2 in costal 1/2; cilia brown-grey, tinged orange in apical 1/2. Underside: forewing lustrous brown with coppery reflections, white below fold, cilia lustrous dark grey; hindwing lustrous brown, but pale orange in disc and along distal 1/2 of costa and apical 1/2 of termen, cilia brown, tipped orange-brown. Abdomen blackish brown, terminal edge of segments orange, spines showing faintly; anal tuft leaden.

Female. (Fig. 14). Forewing length 7 mm; wingspan 15.5 mm. Similar to male, but larger, and apparently without narrow orange scales on thorax and tegulae (available specimens somewhat worn); forewings broader, with much of overlay of narrow scales white instead of orange, these scales forming rather distinct bands at 2/3 and 5/6.

Male abdomen and genitalia. Abdomen (Fig. 76): S8 with invagination to ca 3/4; T8 sclerite narrow, spearhead-shaped. Genitalia (Fig. 110): tegumen short with very shallow anterior invagination. Uncus tapering, then broadening to bilobed apex, with second smaller pair of projections laterally. Gnathos absent; lateral margins of anal tube somewhat sclerotised. Valva rather narrow, costa smoothly concave; sacculus outer process slightly sinuous, reaching distinctly beyond costal margin of valva, inner process broadly fused to outer, reaching just to costa, with blunt squared-off tip. Juxta basal plate V-shaped; lateral lobes short, broad, triangular, just reaching base of valval costa. Saccus short, more or less rounded. Aedeagus (Fig. 111): tooth small, associated with looped sclerotisation at apex of aedeagus; vesica without cornuti. Tubular portion of bulbous ejaculatorius (Fig. 112) about equal in length to aedeagus.

Female genitalia. (Fig. 168). Tergal spines shorter than in male. Segments 8–10 moderately extensible. Apophyses posteriores ca 1.5× length of anteriores. Ostium rather narrow; antrum finely spinulose; colliculum rather indistinct. Ductus bursae long, narrow, broadening into elongate, bluntly pointed corpus bursae; signum absent. Scobinations from near colliculum to inception of corpus bursae. Ductus spermathecae with ca 8 loops.

Larva, Hostplant, and Biology. Unknown. A female paratype in AMNZ was dissected and a larva found in the oviduct. Thus it is presumed this species is larviparous. Larviparity is rare in Lepidoptera, but is well known in the Tineidae (*Monopis* spp.: Robinson & Nielsen 1993: 31, and references therein), and amongst Gelechioidea has been recorded in Coleophoridae (*Coleophora albella* (Thunberg): Toll 1962: 592; Emmet *et al.* 1996: 210). This is thought to

be the first record of larviparity both for Oecophoridae and for New Zealand Lepidoptera.

Some specimens are labelled as having been captured on flowers of kanuka (*Kunzea ericoides*), and it is possible that this may be the host. As larviparity in insects has been considered an adaptation to make use of ephemeral resources (e.g., Meier *et al.* 1999), the larvae may possibly feed on the *Kunzea* flowers.

Type data. Holotype: female, 'Great I. Three Kings 24 APR 46 E.G. Turbott flowering kanuka E. end', 'Helioestibes bilineata Type Det. J.T. Salmon', 'AMNZ 21769 AUCKLAND MUSEUM NEW ZEALAND' (abdomen missing) (AMNZ). **Paratypes:** TH: 1 male, 2 females, Great I., 24 Apr 1946, E.G. Turbott (MONZ); 2 females, same data (AMNZ 15739, 15740; both dissected, genitalia slides with same numbers) (AMNZ).

Material Examined. Type series plus 5 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Probably endemic to the Three Kings Islands, where it has been found on Great Island and South West Island. It is the only species of *Hierodoris* so far known from the Three Kings.

TH / — / —.

Remarks. This species has only been found on the Three Kings Islands. The islands are small and a number of their endemic animals and plants are threatened, especially those confined to Great Island, which is ecologically degraded from past fires and browsing by goats (Baylis 1948; Turbott 1948; Brook 2002). No Lepidoptera specialist has ever visited the islands, but most insect-collecting expeditions there have returned with specimens of *bilineata*. Hence, there is no evidence that the species is uncommon or declining, and if the suspected host association with *Kunzea* is correct, it may even have benefitted from changes to the islands' ecology.

Hierodoris callispora (Meyrick, 1912)

Fig. 15–17, 50, 51, 57, 77, 113–115, 169, 170; Map 3
Helioestibes callispora Meyrick, 1912: 41.

Diagnosis. The metallic thorax and dusting of pale green scales on an otherwise uniform-looking forewing distinguish *callispora* from all other *Hierodoris* species. The orange ruff, contrasting with the otherwise dark head and thorax, is also distinctive.

Male. (Fig. 15). Forewing length 7–8.5 mm; wingspan 15–18 mm. Head: ocelli present, rather small; frons and vertex with long narrow leaden scales, reflecting purple or green; ruff orange; labial palpi blackish with overlay of orange scales except on underside of segment 3 and underside

apex of segment 2, scales more or less appressed; segment 3 ca 3/4 length of 2; antennae blackish, ciliations ca 1/3 width of flagellum. Collar, thorax and tegulae blackish with coppery, greenish or purple reflections. Forewing blackish with overlay of deep russet scales, giving purplish black appearance; a variable dusting of green scales, either more or less covering wing, or confined to basal 1/3 and subterminal area, with or without a further area extending from costa at 1/2 and leaving a U-shaped patch of ground colour in centre of wing. Forewing scales: russet and green scales mostly 2- to 3-pointed (some 4-pointed); dark scales mostly 4-pointed. Hindwing blackish brown, cilia concolorous. Underside more or less uniform dark brown, hindwings slightly paler than forewings. Abdomen blackish, spines faintly shining brown.

Female. (Fig. 16, 17). Forewing length 7–9 mm; wingspan 15.5–19 mm. Similar to male, but forewing somewhat shorter and broader; ‘U-shaped’ forewing pattern more usual than in male. Underside of forewing with pale brown streak following costa from 1/2 to near apex, and of hindwing with exterior areas paler than rest. Abdomen with hind margin of segments dirty whitish.

Male abdomen and genitalia. Abdomen (Fig. 77): S8 with invagination to ca 1/2. Tergal spines long, narrow; T8 sclerite club-shaped. Genitalia (Fig. 113): tegumen short, basal invagination very shallow. Uncus elongate, bluntly rounded; gnathos central element absent. Valva rather broad, rounded; sacculus processes basally fused on a long ‘stalk’, inner process very broadly spatulate, outer process longer, drop-shaped. Juxta basal plate V-shaped, with long narrow lateral arms reaching beyond base of valval costa. Saccus moderately short, rounded. Aedeagus (Fig. 114, 115): tooth very small; sclerotisation of aedeagus extended into long point ventrally; vesica without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 115) very long, ca 2× as long as aedeagus.

Female genitalia. (Fig. 169, 170). Segments 8–10 broad, not much extensible. Apophyses posteriores ca 1.4× as long as anteriores. Ostium rather narrow; colliculum rather indistinct; ductus bursae narrow, broadening very gradually into narrow corpus bursae; a sclerotised ring on ductus bursae just posterior to corpus; signum absent. Scobinations from ca 1/3 length of ductus to inception of corpus bursae. Ductus spermathecae with ca 3 loops.

Larva. Head chestnut brown; body purplish white, whiter ventrally, with translucent pinacula and setae; A10 pale brownish white.

Hostplant and Biology. The larva lives inside and causes a swelling in twigs of *Nothofagus* spp. It excavates a shaft in the twig, lying with its head towards the entrance, which is covered with silk and frass. It crops the callus tissue

developed by the host in response to its activities. The mode of feeding is similar to that of the puriri moth larva (*Aenetus virescens* (Doubleday), Hepialidae).

The gall is often situated at or near a fork in the twig. Occupied galls have been collected from August to October. The empty galls are colonised by other invertebrates, especially Coleoptera, and occasionally by larvae of *Hierodoris illita* (q.v.).

Type data. **Holotype:** male, ‘Wellington New Zealand GVH 1.12’, ‘Holotype’, ‘Heliostibes callispora Meyr. 1/1 E. Meyrick det. in Meyrick Coll.’ (BMNH, genitalia slide 30740).

Material Examined. Holotype plus 38 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Widespread in beech forest from the Bay of Plenty south, probably under-recorded.

BP, TO, TK, WN / NN, BR, DN, SL.

Remarks. The adult moth has been caught flying freely in hot sunshine (Hudson 1928: 306), and also taken at light.

The pupa of *callispora* has the antennal bases produced into strongly sclerotised rugose processes (Fig. 50), similar to the respiratory horns of tipulid and other nematoceran pupae (Diptera). These processes probably help to anchor the pupa during adult eclosion from the gall.

A female in NZAC from Pigeon Saddle, northwest Nelson (Fig. 17), has a basal area of orange scales on the hindwing, and the fringe of the hindwing largely orange. Since there appear to be no other differences between this specimen and typical *callispora*, and the genitalia are identical, it is here treated as a colour-form of that species, and included as such in the key (p. 22).

Hierodoris eremita Philpott, 1930

Fig. 19, 20, 54, 55, 78, 79, 119–123, 171; Map 5
Hierodoris eremita Philpott, 1930b: 438.

Diagnosis. The large size (wingspan over 22 mm) and uniform whitish to grey forewing coloration are unique to *H. eremita*. It might be confused at a glance with females of *Gelophaula* species (Tortricidae) but may be easily distinguished by its recurved labial palps and scaled haustellum.

Male. (Fig. 19). Forewing length 10–11.5 mm; wingspan 22.5–25 mm. Head: ocelli present, rather small; frons and vertex with short broad dark shining grey scales; labial palpi long, dark grey with variable overlay of whitish grey scales, segment 2 thickened with scales beneath, segment 3 ca 2/3 length of 2; antennae dark grey, ciliations ca 2/3 width of flagellum. Collar, thorax, and tegulae shining dark grey. Forewing entirely shining grey. Forewing scales: all narrow, 3- to 5-pointed, the apical incisions rather ragged

and irregular. Cilia mixed grey and white, shining. Hindwings grey-brown, darker apically; cilia whitish to brownish. Underside: forewing dark grey, cilia paler grey; hindwing pale greyish, cilia greyish white. Abdomen blackish with spines showing through orange-gold.

Female. (Fig. 20). Forewing length 10.5–11.5 mm; wingspan 23.5–25.5 mm. Similar to male, but with all grey and dark-grey scales replaced by faintly lustrous white-grey scales; forewing fringe pure white; antennae longer (>3/4 length of forewing); hindwing paler. Underside: forewing greyish with fringe white; hindwing all white.

Male abdomen and genitalia. Abdomen: S2 with central field of very short setae; S3–7 with scattered short setae; S8 with scattered longer setae. S8 (Fig. 78) rather short and broad, anterior invagination to just less than 1/2. T8 sclerite (Fig. 79) a truncated triangle, with numerous spines and numerous long setae laterally. Genitalia (Fig. 119, 122, 123): tegumen rather short, with very shallow anterior excavation. Uncus digitate, with scattered dorsal setae laterally from base to near apex. Gnathos reduced to weak lateral sclerites. Valva parallel-sided, moderately broad; sacculus with a single strongly curved apical process not reaching costa of valva. Juxta (Fig. 122, 123) with basal plate cordate, lateral arms elongate, broad at base, rather sharply pointed at tips, reaching just beyond base of valval costa. Saccus long, anteriorly rounded. Aedeagus (Fig. 120) constricted near base anterior to fusion with bulbus ejaculatorius; tooth prominent, long; vesica smooth, without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 121) short, ca 0.6× length of aedeagus.

Female genitalia. (Fig. 171). Tergal spines short. Segments 8–10 hardly extensible; segment 10 laterally flattened and strongly sclerotised to form sharp, piercing ovipositor, upcurved in lateral view with tip directed slightly dorsad; segment 9 densely covered in short forward-directed spines, ventral spines stouter and more strongly sclerotised than dorsal ones; segment 8 with numerous long setae in posterior 1/2, especially ventrally and laterally. S8 more or less divided into 2 sclerites. Apophyses posteriores extremely robust, broad and blunt at anterior ends, ca 2× as long as much narrower, slightly sinuate apophyses anteriores. Ostium rather broad; colliculum indistinct; antrum well folded, tapering abruptly to short narrow ductus bursae; corpus bursae moderately broad, oval, signum absent. Scobinations from antrum to inception of corpus bursae. Ductus spermathecae with 3–4 very weak loops.

Larva. Not described in life.

Hostplant and biology. The late-instar larva feeds under the tomentum on the underside of a leaf of *Celmisia coriacea*, eroding the green tissue of the leaf. Early instar

feeding has not been discovered. Pupation is in the feeding place.

Type data. Holotype: female, 'Ball Glacier 14-12-29 A. Philpott', 'Hierodoris eremita Philp. Holotype. ♀', 'HOLOTYPE' (CMNZ). **Paratypes:** 3 females. **MK:** 1 female, Hooker Valley, 13 Dec 1929, A. Philpott (CMNZ); 1 female, Hooker Valley, 13 Dec 1929, A. Philpott (NZAC); 1 female, Ball Glacier, 14 Dec 1929, AP (MONZ).

Note. Philpott (1930b) mentions 2 paratypes in the Cawthron Institute collection (now NZAC); only one of these has been located.

Material Examined. Type series plus 31 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution.

— / WD, MK.

Remarks. This species was discovered in the Mt Cook region by A. Philpott in 1929 (Philpott 1930b). It is still only known from this area, and northwards into the Westland National Park, inhabiting alpine herbfields at altitudes of ca 900–1400 m (ca 2950–4600 ft). In describing the female of *H. eremita*, Philpott remarked on its close resemblance to a female *Gelophaula* (Tortricidae). This is a good example of convergent crypsis: both *eremita* and *Gelophaula* spp. are associated with large-leaved *Celmisia* spp., and their female coloration blends with the pale tomentum on the underside of the *Celmisia* leaves. The pupation site of *eremita* may be one of the most extreme of any New Zealand moth, as the *Celmisia* tomentum is very thin, leaving the pupa effectively exposed to ambient air temperature until the snow-pack arrives (J. S. Dugdale, pers. comm.).

Hierodoris gerontion new species

Fig. 21–23, 80, 81, 116–118, 172; Map 7

Diagnosis. Although a variable species, *H. gerontion* can be distinguished from its congeners by the suberect scales on the underside of segment 2 of the labial palp. The paler forms from the type locality are particularly distinctive, with their all-white hindwings and white undersides.

Male. (Fig. 21). Forewing length 6.5–8 mm; wingspan 14.5–17.5 mm. Head: ocelli present; frons and vertex with short black scales; labial palpi white above, black beneath, segment 2 tufted below with long scales, segment 3 nearly as long as 2; antennae black with a few white scales on underside of each segment; ciliations ca 3/4 width of flagellum. Collar, thorax, and tegulae blackish with a few white scales, tegulae tipped white. Forewing black with variable white markings formed by overlying scales: a narrow transverse fascia at 1/4 almost always present, other markings may be more or less obsolete. Usually some white

scales from costa at 1/2 which may enclose an area of ground colour and thus form a reniform mark; a white lunule beyond this in disc, and a curved white subterminal fascia; often 3 or 4 small dashes from costa towards apex. Forewing scales: all scales relatively broad, typically 6-pointed, apical incisions rather deep. Cilia snow-white, or with a few brownish scales. Hindwing either snow-white (especially specimens from Old Man Range), sometimes with a few brownish scales at base of cilia, or with a variably extensive infuscate border (especially specimens from Pisa and Lammermoor Ranges); base of wing always pale. Underside (in specimens with white hindwings) white, forewing with a few brownish dashes on costa towards apex, and a more or less well defined brownish line around base of cilia; or most of underside (in specimens with darker hindwings) infuscated. Abdomen blackish, each segment with a row of white scales posteriorly; spines on dorsum showing as a shining orange sheen.

Female. (Fig. 22, 23). Forewing length 6–8 mm; wingspan 14–17.5 mm. Very similar to male.

Male abdomen and genitalia. Abdomen (Fig. 80, 81): S8 squarish, invagination reaching to 3/4 length of sclerite; T8 with sclerite elongate, in shape of narrow club. Genitalia (Fig. 116): tegumen short, basal invagination shallow. Uncus triangular with spatulate apex, a tuft of strong setae dorsally near apex; gnathos central element absent. Valva with costa nearly straight, outer margin smoothly rounded; sacculus with single moderately curved distal process, reaching well beyond costa. Juxta with basal plate V-shaped, lateral arms elongate, very bluntly rounded, reaching to base of valval costa or just beyond. Saccus moderately short, rounded. Aedeagus (Fig. 117): tooth very large and bearing a small subsidiary tooth; vesica without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 118) ca 0.8× as long as aedeagus.

Female genitalia. (Fig. 172). Segments 8–10 rather broad, only slightly extensible. Apophyses narrow and short; posteriores ca 1.2× as long as anteriores. Ostium moderately broad; colliculum indistinct; ductus bursae rather broad; corpus bursae very long and narrow; signum absent. Scobinations from ca 1/2 length of ductus to inception of corpus bursae. Ductus spermathecae with 3–4 loops.

Larva, Hostplant, and Biology. Unknown.

Type data. **Holotype:** male, 'NEW ZEALAND CO Old Man Range 1640 m, in flushes 11 Feb 1982 J. S. Dugdale' (NZAC). **Paratypes:** 15 males, 13 females. **CO:** 10 males, 4 females, same data as holotype (male wings slide NZAC Oec. 181); 1 female, Obelisk, Old Man Range, 1670 m, 11 Feb 1982, JSD (female genitalia slide NZAC Oec. 135); 1 male, 3 females, Old Man Range, 1375–1470 m, 24 Feb 1974, R. R. Forster, JSD (male genitalia slide NZAC Oec.

134; female genitalia NZAC prep. L443) (all NZAC); 1 female, Obelisk Range, 1680 m, 7 Feb 1986, M. H. Bowie (LUNZ); 1 male, Old Man Range, 1700 m, 10 Jan 1982, BHP; 1 male, Old Man Range, 1420 m, 23 Feb 1986, BHP; 1 male, 3 females, Rocky Mt, Garvie Mountains, 1800, 1820, 1880 m (females), 1830 m (male), 17 Jan 1989, BHP; 1 female, central Garvie Mountains, 1820 m, 17 Jan 1989, BHP; 1 male, Hector Mountains, Ben Nevis area, 21–23 Feb 1994, BHP (all OMNZ).

Material Examined. Type series plus 35 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Widespread in the mountains of Central Otago, and also recorded further west from the Eyre Mountains (Otago Lakes) and Mt Burns (eastern Fiordland).

— / OL, CO, FD.

Etymology. The specific name is the diminutive of *geron* (Greek, an old man), and refers both to the type locality (Old Man Range), and to the shaggy 'beard' on the second segment of the labial palpi.

Remarks. This alpine species is another that was overlooked by the earlier New Zealand collectors. It was discovered in the Old Man Range CO in February 1974 by John Dugdale and Ray Forster. Since then, it has been found to be widespread in the mountains of Central Otago and adjacent ranges by Brian Patrick. The habitat appears to be seepage areas, where larvae may possibly feed on suppressed herbaceous plant foliage (J. S. Dugdale, pers. comm.). The species is variable, especially in the coloration of the hindwing, which may be pure white (Fig. 21, 22) to almost wholly infuscated (Fig. 23). The genitalia, however, appear to be relatively constant. I have restricted the type series to specimens with pale hindwings from the central part of the species' range.

Hierodoris illita (Felder & Rogenhofer, 1875)

Fig. 24–30, 43–49, 52, 53, 58, 66, 82, 83, 124–128, 173, 174; Map 9

Atychia illita Felder & Rogenhofer, 1875: pl. cxi fig. 32.

Helioptis chlorobela Meyrick, 1921: 334. **New Synonymy.**

Diagnosis. The common form with orange hindwing markings can be distinguished from *bilineata* by its larger size (wingspan at least 20 mm; under 16 mm in *bilineata*), from *huia* by its unmodified labial palpi and lack of metallic forewing scales, and from *stella* by its larger size and unmodified antennae. The form with whitish hindwing markings has these markings confined to 2 narrow strips from the wing base; other species with pale hindwing markings have the whole base whitish. Specimens with very dark hindwings might possibly be confused with *atychioides*, q.v.

H. illita is the only species of *Hierodoris* with a signum on the corpus bursae in the female genitalia.

Male. (Fig. 24, 25, 27, 29). Forewing length 9–11.5 mm; wingspan 20–25.5 mm. Head: ocelli present; vertex with broad dark shining brownish grey scales; frons shining paler grey; labial palpi with appressed scales, grey exteriorly, whitish on inner surface; segment 3 from ca 1/2 to 3/4 length of segment 2; antennae dark shining leaden; ciliations ca 2× diameter of flagellum. Collar shining dark grey-brown with some orange scales. Thorax shining dark grey-brown overlain with orange and white scaling especially posteriorly and on tegulae. Forewing blackish, variably overlain with reddish and whitish scales: white scales usually concentrated in disc just beyond 1/2 and in faint curved fascia at 4/5; an oblique blackish mark in centre of wing at 1/2 and a black longitudinal dash in disc at 3/4 both more or less strongly indicated; costa with 4 black dots in apical 1/2. Markings may be more or less obscure and sometimes forewing appears almost unicolorous deep reddish brown. Cilia shining leaden. Forewing scales: red and white scales very narrow, 2- or 3-pointed; dark scales mostly somewhat broader, 4- to 5-pointed. Hindwing blackish; an orange streak along vein Cu from base to 1/2, broader distally; a narrower orange streak along 1A+2A, sometimes only indicated by dusting of orange scales; anal area of wing with scattering of orange scales; cilia orange, blackish towards anal angle. Orange hindwing markings may be replaced by yellowish white to white, or be almost obsolete. Underside: forewing dark brown, costa pale yellowish, interrupted by 4 dark marks in apical 1/2; apex with some orange scaling; cilia leaden; hindwing as upperside, but with strong scattering of orange scales along costa and around wing apex. Abdomen black, posterior margins of segments faintly whitish orange.

Female. (Fig. 26, 28, 30). Forewing length 9–13 mm; wingspan 20–30 mm. Differs from male as follows: antennae not conspicuously ciliate; labial palpi with segment 2 pale exteriorly and with some reddish scaling on upper surface; forewing with more extensive white scaling than in male, making it appear more variegated; often a strong white streak along fold to 1/2, and a more or less pronounced oblique white streak from costa at ca 1/4. Forewing underside as in male; hindwing underside predominantly orange, with some reddish and white scaling towards apex, and blackish scaling confined to anal angle.

Male abdomen and genitalia. Abdomen: S2 (Fig. 66) with pentagonal field of very short spinules in centre at base. S8 (Fig. 83) with invagination to over 3/4 length of sclerite. T8 sclerite narrow, skittle-shaped (Fig. 83) to subrectangular with basal ‘wings’ (Fig. 82). Genitalia (Fig.

124–126): tegumen rather short, basal invagination very shallow. Uncus (Fig. 124–126) tapering gradually or rather abruptly from near base, apically blunt, very weakly to strongly bilobed, with dorsal setae near apex. Gnathos reduced to a pair of weakly sclerotised lateral sclerites, bearing a posteriorly directed pair of narrow rods parallel with the uncus, which support the anal tube. Valva elongate, rounded, costa smoothly concave; sacculus strongly sclerotised, with inner process curved and reaching beyond costa, outer process straight and only slightly longer than inner. Juxta with basal plate long, V-shaped, lateral arms elongate, bluntly pointed, reaching beyond base of valval costa. Saccus short, rounded. Aedeagus (Fig. 127, 128): tooth present, short; vesica without cornuti. Tubular portion of bulbus ejaculatorius (Fig. 127) about equal in length to aedeagus.

Female genitalia. (Fig. 173, 174). Segments 8–10 moderately extensible. Apophyses posteriores ca 1.7× as long as anteriores. S8 nearly divided into 2 sclerites. Ostium broad, narrowing to distinct colliculum; ductus bursae moderately broad, widening more or less abruptly into round or oval corpus bursae. Signum present, an elongate strap with short teeth pointing out laterally on each side. Scobinations from near colliculum to anterior portion of corpus. Ductus spermathecae with 2 weak and 3 stronger loops.

Larva. (Fig. 43–49). Head dark brown, marked darker longitudinally. Thorax and abdomen dorsally and laterally grey, ventrally whitish grey; broad irregular broken dorsal and subdorsal lines whitish yellow; dorsal pinacula black and shiny; A10 darker grey, mottled black.

Hostplant and Biology. The larva has most often been found feeding inside a woody (brown) stem or branch of *Coriaria arborea* (Coriariaceae), making a gallery with little frass. In spring, the only external sign of occupation is a small hole in the stem, through which frass is ejected; no frass accumulates on the outside of the hole (pers. obs.). Pupation is in the stem. A specimen has also been reared from a gall on a stem of *Muehlenbeckia australis*. These *Muehlenbeckia* galls are usually the work of *Morova subfasciata* Walker (Lepidoptera: Thyrididae), and indeed a specimen of the thyridid also emerged from the same batch of galls. Therefore it is suspected that the *H. illita* larva was an inquiline, or secondary inhabitant, of the gall, rather than the gall-maker. The male in NZAC from Featherstone, collected by W. W. Smith, has a note on the underside of the label that reads ‘*Muehlenbeckia australis*’. The specimen is in good condition, but it is not clear whether it was reared or just beaten from this climber. There are 2 specimens in the Forest Research Collection at Rotorua that were reared from cones of larch (*Larix decidua*) collected in Whakarewarewa SF. A specimen has also been

reared from twig galls on *Nothofagus truncata* by Brenda May, who collected larvae near Nelson in November 1977. It may be that the galls were old feeding sites of *H. callispora*.

Type data. *Atychia illita*: **Holotype**: male, 'Type', '341', 'Felder Coll. Rothschild 1913-86', 'Novara CXL f 32 *Atychia?* *illita* n. N. Seeld. ♂', 'TYPE', 'FELDER'S TYPE' (BMNH).

Heliostibes chlorobela: **Holotype**: male, 'Mt Arthur New Zealand GVH 3600' 1.20.', 'Holotype', 'Heliostibes chlorobela Meyr. 1/1 E. Meyrick det. in Meyrick Coll.' (BMNH, genitalia slide 30738).

Material Examined. Holotypes of *illita* and *chlorobela* plus 201 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Widespread throughout New Zealand, but not recorded from Stewart Island.

ND, AK, BP, TK, TO, GB, HB, WN, WA(?) / SD, NN, BR, WD, MB(?), KA, MC, SC, OL, DN, SL.

Remarks. *Hierodoris illita* is at least partly diurnal: Hudson (1928: 307) describes it flying "very actively, with a mazy flight, over the tops of high bushes in the hottest sunshine" and B. Patrick (pers. comm.) has observed the species flying up to 6 m from the ground on hot days. It is also attracted to light at night, occasionally in large numbers. This is one of the most widespread and common members of the genus, and it is interesting that its biology is still poorly understood.

Note on synonymy. *Hierodoris illita* is a very variable species, the variation extending to characters of the genitalia. Specimens with the orange coloration of the hindwings replaced by whitish (Fig. 29, 30) have previously been treated as a separate species, *H. chlorobela* Meyrick. Such specimens are rare but have occasionally been collected in numbers, especially in Westland (WD). Hudson (1928) stated that the third segment of the labial palp was proportionately distinctly shorter in *chlorobela* than in *illita*, but this character varies within both supposed species. No other differences have been found between the two, and the genitalia of the *chlorobela* colour form (including the holotype) are identical to those of South Island specimens of *illita*. Meanwhile, some otherwise typical specimens of *illita* (especially from Auckland) diverge from South Island *illita* in the form of the uncus; thus to erect *chlorobela* as a separate taxon at either species or subspecies level would be to weight a superficial character over a genitalic one. However, even the genitalic divergence is not here considered to be sufficiently constant or well defined to allow the recognition of more than one taxon.

Hierodoris sesioides new species

Fig. 18, 84, 129–131; Map 13

Diagnosis. The very narrow forewing and the semi-transparent white hindwing, with its well-defined black border, are diagnostic.

Male. (Fig. 18). Forewing length 6 mm; wingspan 13.5 mm. Head: ocelli present; frons and vertex blackish with admixture of off-white and pale brownish scales; labial palpi slender, segment 2 with mixed blackish and white scales, segment 3 blackish, nearly as long as 2; antennae blackish, ciliations very short, appressed, ca 1/4 width of flagellum. Collar, thorax, and tegulae blackish brown. Forewing very narrow, blackish brown; faint indications of a discal spot just before 1/2 and a plical spot just beyond it, each edged with a few white scales posteriorly; a faint spot in disc at 2/3 demarcated only by a few whitish scales preceding it and a short transverse line of white scales beyond it; a weak subterminal fascia of off-white scales. Forewing scales: all scales rather narrow, mostly 4- to 5-pointed. Cilia brown, paler than ground-colour. Hindwing with basal 2/3 almost devoid of scales, white, semi-transparent; remainder of wing blackish brown, cilia paler brown as in forewing. Underside: forewing unicolorous dull brownish; hindwing as upperside, but with apical patch of whitish scales. Abdomen dorsally blackish, T4-6 with a few white scales posteriorly, spines showing faintly orange, anal tuft (scales arising from lateral margins of tegumen) white; ventrally white.

Female. Unknown.

Male abdomen and genitalia. Abdomen (Fig. 84): S8 with invagination reaching to posterior margin; T8 sclerite spatulate. Genitalia (Fig. 129, 130): uncus broad-digitate, slightly emarginate distally; a few long dorsal setae at tip. Gnathos reduced to 2 pairs of lateral sclerites, one pair pointing mesally and one distally. Valva very narrow, costa slightly convex beyond 1/2; sacculus inner process longer than outer, both more or less straight, inner reaching beyond valval costa; outer reaching to costa, ca 1/2 length of inner. Juxta (Fig. 130): basal plate a broad Y; lateral arms smoothly fused into tube surrounding aedeagus; manica with paired evaginations on either side at junction with aedeagus; dorsal part of membrane attached to paired thin sclerites at base of tegumen representing the transtilla. Saccus moderate, rounded. Aedeagus (Fig. 130): sclerotised portion tapering to a point ventrally; distally with 3 teeth in row perpendicular to long axis of aedeagus, the dorsal tooth longest, next 2 progressively shorter; distal portion of (uneverted) vesica faintly scobinate. Tubular portion of bulbus ejaculatorius (Fig. 131) rather short, ca 0.6× length of aedeagus.

Larva. Not described.

Host plant and Biology. The label on the type specimen indicates that it was reared from “?galls” on *Sophora tetraptera*. According to J. S. Dugdale (pers. comm.), the larval feeding place was woody excrescences on the bark of the trunk.

Type data. Holotype: male, ‘Esk S.F. Cpt 35 Ex S. tetraptera (? galls) coll. 4.3.64 H. Auld em. 9.10.64’ ‘NZAC slide Oec. 190 genitalia ♂’ (NZAC).

Material Examined. Holotype only.

Distribution. Only known from the type locality in Hawkes Bay.

HB /—.

Etymology. The specific name is derived from *Sesia* (type genus of Sesiidae, the clearwing moths) and *eides* (Greek, ‘form’ or ‘likeness’) and refers to the narrow forewings and semi-transparent hindwings, which give this species a resemblance to a sesiid.

Remarks. This extraordinary and characteristic species is still only known from the type specimen collected in 1964, despite searches in the type locality and other likely localities in the Hawkes Bay district. The type locality is (and was at the time of capture) a commercially managed pine plantation with remnant native vegetation, and the host-plant is still present.

Hierodoris squamea (Philpott, 1915) new combination

Fig. 31, 32, 85, 86, 136–142, 175, 181, 182; Map 15
Gymnobathra squamea Philpott, 1915: 200.
Gymnobathra nigra Philpott, 1930a: 9–10. Synonymised by Hudson, 1939: 447.

Diagnosis. *Hierodoris squamea* can be distinguished by its very small size, the reduced ocelli and the dark forewing with its overlay of orange-yellow scales.

Male. (Fig. 31). Forewing length 5–6 mm; wingspan 12–13 mm. Head: ocelli present, strongly reduced (Fig. 181, 182); vertex and frons with narrow forward-directed blackish shining scales; labial palpi ventrally black with scattered orange scales, dorsally orange, segment 3 nearly as long as 2; antennae blackish with short, dense appressed white ciliations ca 1/2 width of flagellum. Ruff with mixed blackish and orange scales; collar shining blackish with a few orange scales. Thorax and tegulae blackish brown. Forewing blackish brown with variable scattering of elongate orange scales; orange scales usually sparser or absent below fold and in terminal 1/5 of wing. Forewing scales: orange scales 3- to 4-pointed; dark scales 4- to 5-pointed; all with long narrow indentations. Cilia shining dark grey-

ish brown. Hindwing greyish brown to dark brown; cilia basally concolorous with wing, apically whitish grey. Underside: forewing dark brown, faintly whitish yellow along costa; hindwing grey-brown. Abdomen blackish, anal tuft grey.

Female. (Fig. 32). Forewing length 5.5 mm; wingspan 12.5 mm. Similar to male, but antennal ciliations much sparser, and cilia of forewing yellowish brown.

Male abdomen and genitalia. Abdomen (Fig. 85, 86): S8 with invagination reaching almost to hind margin of sclerite; T8 sclerite subtriangular to nearly pentagonal, tapering posteriorly. Genitalia (Fig. 136–138): tegumen very short, very bluntly rounded apically, with very large anterior invagination reaching level of gnathos. Uncus absent or membranous; gnathos represented by weakly sclerotised curved transverse bar. Valva (Fig. 136, 138) elongate, narrow; sacculus processes reduced to 1 or 2 short blunt stumps. Juxta (Fig. 137) basal plate V-shaped, lateral arms well separated, weakly sclerotised, with only few setae, variable in length. Saccus short, rounded to V-shaped. Aedeagus (Fig. 139–142): tooth absent; vesica with ca 9 small overlapping cornuti in 2 rows. Tubular portion of bulbus ejaculatorius (Fig. 141) short, ca 0.6× length of aedeagus.

Female genitalia. (Fig. 175). Segments 8–10 rather strongly extensible. Apophyses posteriores ca 1.2× as long as anteriores. Ostium very broad; antrum finely scobinate; colliculum distinct. Ductus bursae broadening abruptly into round corpus bursae; signum absent. Scobinations small, reaching ca 1/2 way along corpus. Ductus spermathecae with 4 loops.

Larva, Hostplant, and Biology. Unknown. The adult inhabits alpine tussock communities and herbfields.

Type data. *Gymnobathra squamea*: **Holotype:** male, ‘Cleughearn 21/1/14’ ‘3500’ [underside of label], ‘*Gymnobathra squamea* Philpott Holotype ♂’ (NZAC, genitalia slide Oec. 174). **Paratype:** FD: male (left wings and abdomen missing), same data as holotype but 3000ft (NZAC).

Gymnobathra nigra: **Holotype:** male, ‘Kepler Mts 4000ft W. L. Te Anau 3.1.25’, ‘*Gymnobathra nigra* Philpott Holotype ♂’ ‘AMNZ 21766 AUCKLAND MUSEUM NEW ZEALAND’ (AMNZ).

Material Examined. Type specimens of *squamea* and *nigra* plus 15 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Only known from the mountains of Fiordland and the Olivine Range in south Westland.

— / WD, FD.

Remarks. In describing this species as a *Gymnobathra*, Philpott understandably overlooked the reduced ocelli, which are only clearly visible in SEM preparations (see Fig. 181, 182). The presence of ocelli points to the assignment of this species to *Hierodoris*, although it lacks the characteristic 'tooth' on the aedeagus, and the genitalia are otherwise somewhat atypical. The male genitalia show variation in the development of the lateral arms of the juxta and the processes of the sacculus, but this is not here considered to indicate the existence of more than one species, as variants occur sympatrically and show no other differences.

***Hierodoris stella* (Meyrick, 1914) new combination**

Fig. 33, 34, 61, 87, 132–135, 176; Map 16

Coridomorpha stella Meyrick, 1914: 111.

Diagnosis. In the female, the peculiar antennae, thickened basally with dark scales, are diagnostic. In both sexes, the antennae have a central orange-yellow section, which is also characteristic.

Male. (Fig. 33). Forewing length 7–7.5 mm; wingspan 15–16.5 mm. Head: ocelli present; frons and vertex shining black; labial palpi greyish white, segment 3 as long as 2; antenna with scape shining black, pedicel and basal 2–3 segments of flagellum dorsally black, ventrally orange-yellow, flagellum beyond this to 2/3 mainly orange yellow with a few dark brown scales, apical 1/3 black, ciliations very short, ca 1/4 width of flagellum. Collar, thorax, and forewing shining blackish with green and violet reflections; hind edge of thorax (in fresh specimens) with shining dark grey blunt-tipped scales which show a tendency to curl. Forewing with a scattered overlay of white scales; an area in disc just before 1/2, and a larger area from above fold to near costa at 2/3 devoid of white scales and strongly lustrous dark bronze with coppery reflections; cilia dark bronzy brown. Forewing scales: pale scales mostly 3-pointed; dark scales mostly 4-pointed. Hindwings brown with faint green and violet reflections; a straight narrow streak from base to just beyond 1/2 (running along vein Cu) orange; cilia brown, tipped orange, orange tips narrower towards apex and anal angle. Underside: forewing uniform brown with greenish and coppery reflections; hindwing similar but with pale orange streak along Cu. Abdomen shining black, spines inconspicuous, brownish.

Female. (Fig. 34). Forewing length 7–8 mm; wingspan 15.5–17 mm. Differing from male considerably: overall much paler. Head shining silvery grey; antennae to 1/2 shining black, reflecting violet, from 1/2 to 2/3 mixed orange and brown, apical 1/3 black; basal 1/2 of antenna strongly thickened with scales dorsally. Collar shining grey; thorax and tegulae with mixed pale grey, brown-grey and

shining dark grey scales, and a few narrow white scales. Forewing ground-colour blackish with much more extensive overlay of white scales than in male, so that wing appears greyish; violet and green reflections less conspicuous than in male; bronzy areas as in male but contrasting more conspicuously with the ground colour; bronzy area at 2/3 coincides in life with deflection of apex of wing (see below) and shows up strongly. Forewing scales: pale and dark scales almost all 4-pointed. Hindwing as in male but paler, and with additional faint pale orange streak between Cu and inner margin of wing. Abdomen brownish, hind margins of segments paler, orange-white.

Male abdomen and genitalia. Abdomen (Fig. 87): S8 with sclerite somewhat narrowed posteriorly, invagination to ca 1/2; anterior portion of segment with scattered setae; T8 sclerite narrow, elongate, broader in middle. Genitalia (Fig. 132, 133): tegumen fairly long, anterior invagination moderate. Uncus (Fig. 133) in shape of a fishtail, with shallow apical excavation. Gnathos central element absent. Valva subtriangular, costa distinctly concave beyond middle; sacculus robust, inner process broad, blunt, slightly curved, reaching just to costa; outer process long, narrow, somewhat sinuate, reaching well beyond costa of valva. Juxta basal plate more or less U-shaped, lateral arms elongate, narrow, reaching well beyond base of valval costa. Saccus moderate, subtriangular. Aedeagus (Fig. 134, 135): tooth small; wall of aedeagus with sclerotised strip in apical 1/2; vesica with 3 very small cornuti. Tubular portion of bulbus ejaculatorius (Fig. 135) about equal in length to aedeagus.

Female genitalia. (Fig. 176). Tergal spines long, as in male. Segments 8–10 only slightly extensible. Apophyses posteriores ca 1.3× as long as anteriores; anteriores slightly thicker than posteriores. Ostium narrow; antrum spinulose, narrowing to very indistinct colliculum. Ductus bursae moderately wide, broadening fairly abruptly into oblong corpus bursae; signum absent. Scobinations from near colliculum to ca 1/2 way along corpus bursae, denser and larger in a ring just posterior to corpus. Ductus spermathecae with 5 loops.

Larva, Hostplant, and Biology. Unknown.

Type data. **Holotype:** female, 'Auckland New Zealand GVH .1.13', 'Coridomorpha Meyr.', 'stella Meyr.', 'Lectotype ♀ Coridomorpha stella Meyr. by Heppner '76', 'Coridomorpha stella Meyr. 1/1 E. Meyrick det. in Meyrick Coll.' (BMNH).

Note: Meyrick only saw this one specimen of *H. stella*, so it is the holotype, not the lectotype (Dugdale 1988).

Material Examined. Holotype plus 9 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. North Island only.

AK, BP, TK, HB, WN / —.

Remarks. This is another specialised and remarkable member of the genus. The female has long been recognised as a probable mimic of a heteropteran bug, the likely model being *Romna capsoides* (White) (Miridae, = *Oxychilophora marginicollis* Reuter), according to Hudson (1928). The modified antennae, and the wingtips, which are sharply bent down beyond 2/3 in life, resemble the antennae and hemelytra of the bug. *Romna* is undoubtedly distasteful to birds, but it is not known whether the moth is distasteful (i.e. a Muellierian mimic) or not (i.e. a Batesian mimic).

The generic synonymy of *Coridomorpha* with *Hierodoris* is discussed under the genus description.

Hierodoris electrica (Meyrick, 1889)

Fig. 37, 38, 88, 89, 143–146, 177, 185; Map 4

Helioistibes electrica Meyrick, 1889: 157.

Diagnosis. This species is only likely to be confused with *H. s-fractum*: for differences see under that species, and Fig. 185, 186.

Male. (Fig. 37, 38). Forewing length 7–7.5 mm; wingspan 15–16.5 mm. Head: ocelli present; vertex and frons with broad lamellate lead-grey scales; labial palpi long, grey, with yellow scales above, segment 2 somewhat thickened below with scales, segment 3 ca 1/2 to 2/3 length of 2; antennae lead-grey; ciliations ca 1/2 width of flagellum. Collar, thorax, and tegulae lead-grey; tegulae with some yellow scales posteriorly. Forewing ground-colour dark brown, largely overlain by narrow yellow scales; an angulated silver fascia at 1/3 followed by a narrow band of clear ground-colour; an outwardly oblique silver line in centre of wing at 1/2 not reaching costa or dorsum, and a sinuate silver mark (like an S on its side) in distal 1/2 of wing, enclosing an area of plain ground-colour on costa at 2/3 (this area sometimes also overlain by yellow scales); a small whitish dot on costa at 3/4; cilia shining leaden. Forewing scales: silver scales with ca 4–5 shallow blunt points; yellow scales very narrow, 2- to 3-pointed; dark scales broader, mostly 4-pointed. Hindwing brown, darker exteriorly, cilia shining grey brown. Underside: forewing grey-brown; hindwing pale brownish with a discal dot. Abdomen greyish brown, spines very faintly yellowish.

Female. Forewing length 6.5–7.5 mm; wingspan 15.5–16.5 mm. Very similar to male, but antennae not conspicuously ciliate.

Male abdomen and genitalia. Abdomen (Fig. 88, 89): S8 with invagination very shallow, to ca 1/4 length of sclerite; T8 sclerite narrow, the segment centrally with 1 or 2, or up

to ca 40 persistent spines. Genitalia (Fig. 143): tegumen short with very shallow basal invagination. Uncus digitate. Gnathos with central element forming an indistinct shallow V. Valva moderately narrow, costa slightly concave; sacculus with inner process long, reaching costa, curved, with slight protrusion on outer edge; outer process very long, curved, reaching well beyond costa. Juxta basal plate long, Y-shaped, lateral arms rather short, rounded, reaching just beyond base of valval costa. Saccus relatively long, subtriangular. Aedeagus (Fig. 144, 146): tooth small; vesica with ca 6–11 short, overlapping cornuti of various sizes. Tubular portion of bulbous ejaculatorius (Fig. 145) about equal in length to aedeagus.

Female genitalia. (Fig. 177). Segments 8–10 moderately extensible. Apophyses posteriores ca 1.4× length of anteriores. Ostium very broad, narrowing abruptly to rather indistinct colliculum; ductus bursae rather narrow, elongate, gradually broadening into narrow corpus bursae, signum absent. Scobinations begin somewhat anterior to colliculum, ending in anterior portion of corpus bursae. Ductus spermathecae with 8 pronounced loops.

Larva. Not described.

Hostplant and Biology. Dugdale (1988: 89) notes that *electrica* stays close to shrubs of *Ozothamnus* (= *Cassinia* sensu auct. partim), which is a possible host. However, the only reared specimen examined emerged from a spinning on *Olearia nummulariifolia* (specimen in NZAC).

Type data. **Lectotype** (here designated): female, 'Mt Peel New Zealand 17.1.86', '*Helioistibes electrica* Meyr. 1/6 E. Meyrick det. in Meyrick Coll.' (BMNH). **Paralectotype:** 1 female. NN: Nelson, 1884 (BMNH) (see below).

Note: Meyrick (1889) mentions 2 specimens in his original description of *electrica*, and gives the locality as Mt Arthur. His diary of captures in the BMNH shows that he visited Mt Arthur on 16 Jan 1886 and Mt Peel (at end of Cobb Reservoir) on 17 Jan 1886. The entry for 16 Jan makes no mention of *H. electrica*, although this was the date on which the type series of *Tingena siderota* (Meyrick) was collected, and this species appears in the diary as "*Hel. siderota*". The entry for 17 Jan mentions "*Hel. electrica*, 1". The only other specimen in the BMNH collected prior to the description is a female labelled 'Nelson .84'. This cannot have been collected by Meyrick, because he was not in New Zealand in 1884. In considering the Mt Peel specimen to be the holotype, Dugdale (1988: 89) implies that there is evidence that Meyrick only had one specimen before him when he made the description, and that his mention of two is a *lapsus calami*. Confusion with *T. siderota* seems an unlikely source of error given that Meyrick described both species and consistently identified them correctly.

There is further evidence in the original description that Meyrick had more than one specimen before him, i.e., that he gives the wingspan as 16–17 mm. In other species described in the same paper from a single specimen, only one wingspan measurement is given. Thus, either a specimen has been lost, or else Meyrick included the ‘Nelson .84’ specimen in the original description, but gave misleading locality data. Either way, it seems best to treat the Mt Peel specimen as the lectotype rather than the holotype; it is thus designated here to ensure stability of nomenclature.

Material Examined. Lectotype, presumed paralectotype, plus 38 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Apparently a disjunct distribution, in the northern and southern parts of the South Island, and not known from the Buller, Westland, or Canterbury regions.

— / NN, MB, KA, MK, OL, SL.

Remarks. This species appears to be rarer or more elusive than its close relative *H. s-fractum*, and most specimens in collections are from prior to 1930. There appears to be some variation in the number of cornuti on the vesica, but this is not thought at present to indicate the existence of more than one species.

Hierodoris s-fractum new species

Fig. 39, 40, 91, 147–150, 178, 186; Map 14

Diagnosis. Very similar to *H. electrica* superficially; best distinguished by the following characters: longer, more porrect labial palps; presence of a diffuse pale basal forewing streak (or streaks); forewing fascia at 1/3 weakly shining grey (fascia metallic silver in *electrica*); triangular blotch of ground-colour on the costa at 2/3 (blotch oblong in *electrica*), and interruption of the forewing silver S-mark by a white dash from the costa (S-mark not interrupted in *electrica*). (See Fig. 185, 186).

Male. (Fig. 39). Forewing length 7–8 mm; wingspan 14.5–17 mm. Head: ocelli present, very small; frons and vertex with shining grey narrow lamellate scales; ruff yellowish buff; labial palpi very long, segment 2 distinctly longer than in *electrica*, and appearing more porrect and less upcurved, grey with a covering of yellow scales; segment 3 ca 2/3 length of 2, mostly yellow; antennae blackish, ciliations ca 1/2 width of flagellum. Collar shining leaden; thorax and tegulae leaden with admixture of buff scales, especially on tegulae. Forewing pattern similar to that of *electrica*, but differing as follows: ground colour less exten-

sively covered by yellow scales; presence of an area on dorsum at base, a narrow triangle with base on dorsum from 1/3 to ca 1/2 and apex on costa, and a blunt inverted triangle on costa at 2/3 to 3/4 plain dark brown; presence of a diffuse streak or 2 streaks of very narrow cream scales from base of wing to ca 1/3; fascia at 1/3 consisting of pale shining grey-white (not silver) scales; sinuate silver mark towards wing apex interrupted by subapical white streak from costa; presence of a further white streak from costa at 1/2 which joins proximal end of S. Forewing scales: silver scales broad, blunt, very finely scalloped apically (more finely than those of *H. electrica*); yellow scales narrow, 3- to 4-pointed; white costal scales slightly broader, 4- to 5-pointed; basal pale streak with very narrow 2- to 3-pointed scales; dark scales and scales of subbasal pale grey fascia mostly 4-pointed. Hindwings greyish. Underside greyish, darker than in *electrica*. Abdomen dark brown with spines showing faintly golden; anal tuft grey.

Female. (Fig. 40). Forewing length 5.5–6.5 mm; wingspan 12–14 mm. Similar to male, but smaller and shorter-winged, and antennae not conspicuously ciliate.

Male abdomen and genitalia. Abdomen (Fig. 91): S8 with invagination reaching ca 3/4 length of sclerite; T8 without spines, sclerite narrow and elongate. Genitalia (Fig. 147) very similar to those of *H. electrica*, but uncus narrower, valva somewhat narrower and more pointed; saccular processes narrower. Juxta similar to that of *H. electrica*, but basal plate shorter and lateral arms not reaching valval costa. Aedeagus (Fig. 148, 150) similar to that of *H. electrica*; vesica with 6 cornuti of regular shape, the distal ones progressively shorter than the proximal. Tubular portion of bulbus ejaculatorius (Fig. 149) ca 0.8× length of aedeagus.

Female genitalia. (Fig. 178). Similar to those of *H. electrica*, but ovipositor much narrower, ductus and corpus bursae somewhat narrower. Apophyses posteriores ca 1.2× as long as anteriores. Ductus spermathecae with ca 7–8 loops.

Larva. Unknown.

Hostplant and Biology. The species is almost certainly associated with leaf-litter, usually in dry open environments. Formerly native shrub communities (especially ‘grey scrub’) would have provided the necessary pabulum; nowadays the species seems to have adapted successfully, at least in some localities, to gorse (*Ulex europaeus*), around which the adults have been caught flying abundantly in Mid-Canterbury (J. S. Dugdale, pers. comm.).

Type data. **Holotype:** male, ‘NEW ZEALAND MC firing range West Melton 22 Jan. 1988 JS Dugdale’, ‘Illustrated D.W. Helmore 4.6.02’. **Paratypes:** 56 males, 9 females. **MC:** 1 male, 1 female, same data as holotype (NZAC); 1 male, Harewood, Waimakariri R., 15 Dec 1929, S. Lindsay

(MONZ); 3 males, same data (CMNZ); 1 female, same locality, 3 Jan 1925, S. Lindsay (CMNZ); 1 female, Hoon Hay Valley, Jan 1920 (AMNZ); 1 female, Hoon Hay Bush, 1 Dec 1923 (CMNZ); 1 male, Dean's Bush, 17 Jan 1928, S. Lindsay (CMNZ); 1 male, Price's Bush, 26 Dec 1942, S. Lindsay (CMNZ); 1 male, Kaitorete Spit, 25 Dec 1989, BHP (OMNZ); **SC**: 1 male, 4 km SE of Hakataramea, 12 Oct 1988, BHP, Chisholm; 1 male, Waitaki R., nr. Kurow, 22 Oct 1988, BHP, Chisholm; 1 male, Station Peak 200 m, Waitaki Valley, 1 Dec 2001, BHP, H. Patrick (all OMNZ). **MK**: 1 male, 1 female, Pukaki, 2000 ft, scrub zone, 15 Jan 1964, JSD (female genitalia slide NZAC Oec. 139); 1 male, Lake Pukaki, 25 Dec 1928, S. Lindsay (CMNZ); 1 male, Ohau Kettles, 29 Dec 1988, BHP (OMNZ). **CO**: 5 males, Cairnmuir–Bannockburn Rd, Clyde end, 8 Jan 1991, JSD; 3 males, Craig Flat, E side Clutha V., in scrub, 18 Nov 1985, JSD; 1 male, Craig Flat, Clutha V., 16 Nov 1985, JSD; 2 males, Clutha River, Craig Flat, 18 Nov 1985, C. A. Muir (LUNZ); 2 males, 1 female, Clutha Valley, 1 km S of Canadian Stm, 15 Nov 1985, JSD (female genitalia slide NZAC Oec. 191); 1 male, Island Block, W side Clutha V., in scrub, 16 Nov 1985, JSD; 2 males, Roxburgh Dam, E side, in scrub, 21 Nov 1985, JSD (wings slide NZAC Oec. 186); 1 male, Cromwell Gorge, 2 km SE Cromwell, in litter under *Coprosma* + *Carex*, 21 Nov 1974, J. C. Watt (genitalia slide NZAC Oec. 138) (all NZAC); 1 male, Cromwell Gorge, 26 Dec 1982, BHP; 1 male, Conroys Rd. 300 m, 6 Dec 1991, BHP; 1 male, nr Paerau 500 m, 15 Nov 1987, BHP (all OMNZ). **DN**: 1 male, Roxburgh Dam [as 'Roxborough Dam'], 21 Nov 1985, swept manuka, C. A. Muir (LUNZ); 3 males, Moeraki, in forest, 1 Feb 1983, JSD (male genitalia NZAC prep. L428) (NZAC); 1 female, Dunedin, 2 Dec 1923, Fenwick Coll. (MONZ); 10 males, Woodhaugh, Dunedin, 15 Dec 1916, 5 Dec 1917, 6 Feb, 11 Feb, 12 Feb (2), 14 Feb, 18 Feb (2), 26 Feb 1919; 1 male, Andersons Bay, Dunedin, 26 Nov 1924; 1 male, Otago Heads, 12 Feb 1922 (all AMNZ); 1 male, Mt Watkin 440 m, 2 Feb 2001, BHP, H. Patrick; 1 male, Waitaki Valley, nr Kurow, 27 Dec 1988, BHP; 2 males, 1 female, Waitaki Valley, Otekaieke River mouth, 27–28 Dec 1988, BHP (all OMNZ). **SL**: 1 male, Beaumont SF, riverside, 15 Nov 1985, JSD; 1 male, New River, 10 Jan 1908, [AP] (NZAC); 1 female, Otatara, 18 Feb 1982, BHP (OMNZ).

Material Examined. Type series plus 56 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Southern South Island only.

— / MC, SC, MK, OL, CO, DN, SL.

Etymology. The specific name is from the Latin ('broken S') and refers to the interruption in the sinuous silver mark on the forewing that distinguishes this species from *H. electrica*.

Remarks. This species has long been confused with *electrica* in collections, and was in fact first found by Philpott at West Plains, Invercargill (SL) in 1898 (the specimen was donated to Hudson, and is now in BMNH: see Appendix 1). The female is distinctly smaller than the male, and shows a slight tendency towards brachyptery. Females are much rarer than males in collections, and probably fly little.

Hierodoris pachystegiae new species

Fig. 35, 36, 90, 151–154, 179; Map 11

Diagnosis. The predominantly grey coloration is similar to that of *eremita*, but *pachystegiae* is a much smaller species, and retains the silver forewing markings of *electrica* and *s-fractum* beneath the grey scaling.

Male. (Fig. 35). Forewing length 8 mm; wingspan 17.5 mm. Head: ocelli present; frons and vertex with shining blackish scales centrally, more erect lateral scales grey, and a line of grey scales running between antennal bases; labial palpi long, strongly recurved, grey mixed with whitish, scales appressed, segment 3 ca 2/3 length of 2; antennae dark shining grey, ciliations ca 1× width of flagellum. Ruff pale grey; collar and thorax shining dark grey to blackish; tegulae grey with a few long white scales. Forewing grey with silver marks as described for *H. electrica*, except that fascia at 1/3 is more or less obsolete; whole wing so densely overlaid with long narrow white and yellowish white scales as to obscure the silver pattern; more or less distinct whitish spots on costa just beyond 1/2 and at 3/4. Forewing scales: white and yellowish white scales very narrow, 2-pointed, with broad semicircular indentation at tip; silver scales slightly broader, 3-pointed; dark grey scales broader, 3- to 4-pointed. Cilia shining grey. Hindwing brown, darker exteriorly, cilia grey-brown. Underside brown; costa of both wings whitish. Abdomen grey, spines faintly golden.

Note: The male was not described from freshly killed material, and it is possible that in life the head and thorax are light greyish as in the female, the darker colours described being the effect of grease.

Female. (Fig. 36). Forewing length 7–8.5 mm; wingspan 15–18.5 mm. Very similar to male, but antennae not conspicuously ciliate; head and thorax entirely light greyish; forewing somewhat paler; hindwing and abdomen paler, with the spines showing more conspicuously orange.

Male abdomen and genitalia. Abdomen (Fig. 90): S8 with invagination to just less than 1/2; T8 with sclerite inverted T-shaped. Genitalia (Fig. 151): tegumen short, with very shallow anterior invagination. Uncus bluntly pointed, not hooked. Gnathos a weak sclerotised band,

shallowly V-shaped. Valva rather broad, costa smoothly concave; sacculus with inner process slightly curved, not reaching costa, outer process strongly curved, reaching well beyond costa; field of setae on sacculus just below base of processes strongly developed. Juxta with deep basal plate; lateral arms elongate, very bluntly rounded, reaching just to base of valval costa. Saccus rather long, subtriangular. Aedeagus (Fig. 152, 154): tooth small, rounded; vesica with a row of ca 15 cornuti of varying size and shape. Tubular portion of bulbus ejaculatorius (Fig. 153) about equal in length to aedeagus.

Female genitalia. (Fig. 179). Segments 8–10 moderately extensible. Apophyses posteriores ca 1.5× as long as anteriores. Ostium rather narrow, colliculum indistinct; posterior portion of ductus with some elongate sclerites associated with inception of ductus seminalis. Ductus bursae moderately narrow, widening slightly into oval corpus bursae; signum absent. Scobinations from near colliculum to inception of corpus bursae. Ductus spermathecae with 6 loops.

Larva. Not described in life.

Hostplant and Biology. The larvae of the type series were found in the seedheads of *Pachystegia* (Marlborough rock daisy, Asteraceae) in February, pupating in the feeding place. At Ward Beach KA, larvae were found in December by Brenda May feeding on the tomentum beneath the leaves of *Pachystegia*; unfortunately, one of the resulting adults is mouldy and the other failed to emerge properly from the pupa; thus their identification as *pachystegiae* remains somewhat tentative. The host is recorded on the labels of all specimens as *P. insignis*, but this identification needs checking, since at least four other species of *Pachystegia* have been distinguished from *P. insignis* relatively recently (Molloy 2001).

Type data. Holotype: male, 'NEW ZEALAND KA 41.56S 174.04E Woodside Creek emg. 19 Apr 1999 R. Hoare, J. Dugdale', 'La. 26 Feb '99 seedhead *Pachystegia insignis*' (NZAC). **Paratypes:** 3 males, 4 females. **KA:** 1 male, 3 females, same data as holotype, but emerged 16 Apr (female), 26 Apr (1 male, 1 female, male genitalia slide NZAC Oec. 143), 11 Sep 1999 (female) (all NZAC); 1 male, same data as holotype, but emg. 20 Apr 1999 (OMNZ); 1 male, 1 female, Kekerengu (coastal), larvae 5 Feb 1976, in capitula of *Pachystegia insignis*, emg. 20 Feb (male), 1 Mar (female) 1999, JSD (female genitalia NZAC prep. L432) (all NZAC).

Material Examined. Type series plus 4 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Only known from the Kaikoura coast.

— / KA.

Etymology. The specific name is derived (in the genitive) from that of the host-plant *Pachystegia*.

Remarks. *Hierodoris pachystegiae* was first discovered in 1976 by John Dugdale, who reared moths from larvae collected at Kekerengu (KA). This is one of two known Lepidoptera species restricted to *Pachystegia* as a host; the other is an undescribed species of *Epiphthora* (Gelechioidea) with leaf-mining larvae. Interestingly, the two species have not yet been found together at the same locality. *Pachystegia* itself is confined to the Marlborough region; there are three described and at least two undescribed species (Molloy 2001).

Hierodoris tygris new species

Fig. 41, 42, 59, 92, 155–157, 180; Map 18

Diagnosis. The complete lack of ocelli and the ferruginous 'tiger-striped' forewing pattern are unique to this species.

Male. (Fig. 41). Forewing length 7–8.5 mm; wingspan 16–18 mm. Head: ocelli absent; frons and vertex with brown and ferruginous scales; labial palpi with segment 2 ferruginous, segment 3 dark brown with ferruginous scales above, segment 3 ca 1/2 to 2/3 length of 2; antennae black, ciliations ca 1/2 width of flagellum. Collar, thorax, and tegulae with mixed dark brown, red-brown and pale ferruginous scales. Forewing with pale ferruginous, reddish brown, blackish and silvery white scales forming a complex pattern of streaks as follows: ground-colour reddish brown, an inconspicuous blackish spot at base of dorsum, a blackish brown line along fold to just beyond 1/2; a blackish brown longitudinal line in disc from 1/3 to 2/3; a series of ca 7 longitudinal blackish brown dashes at 3/4 from near costa to tornus; forewing cell and veins R1–3 lined with pale ferruginous scales, and a pale ferruginous line below fold from 1/4 to tornus; silvery scales from 1/2 to 3/4 forming an oblique S-shape, the S interrupting the black markings but overlain by the pale ferruginous markings; near wing apex S joins a subterminal line of silvery scales; base of cilia with line of ferruginous scales with pale bases. Forewing scales: silvery scales broad and mostly 5-pointed, with shallow indentations; basal part of dark streak along fold with scales very variable, 1- to 4-pointed; dark scales of subapical dashes mostly 6-pointed; pale ferruginous scales very narrow, 2- to 3-pointed; other ferruginous scales variable, mostly 4- to 6-pointed; blackish scales at base of dorsum bluntly 1-pointed, but grading towards wing-centre into scalloped and 5-pointed forms. Cilia shining greyish with reddish brown tips. Hindwing dark grey, cilia grey, more reddish towards apex of wing. Underside brown, more or less unicolorous, but with margins of wings ferruginous. Abdomen black, spines shining orange, anal tuft pale ferruginous.

Female. (Fig. 42). Forewing length 8–10 mm; wingspan 17–22 mm. Very similar to male, but with pale ferruginous areas of forewing more extensive; underside with ferruginous margins much more extensive than in male; abdominal segments edged ferruginous posteriorly.

Male abdomen and genitalia. Abdomen (Fig. 92): S8 with invagination to ca 1/3; lateral and posterior margins of segment setose; T8 sclerite leaf-shaped. Genitalia (Fig. 155): tegumen moderate, anterior invagination to ca 1/3. Uncus broad-digitate, squared off, hooked over, with minute setae dorsally at apex. Gnathos well-developed, with central process narrow and upturned. Valva narrow, costa concave; sacculus with inner process short, blunt, not reaching costa, outer process very long, bent at 90 degrees near base and reaching well beyond costa. Juxta basal plate a wide V, lateral arms slightly curved, elongate, slightly broader apically, reaching to base of valval costa. Saccus moderate, V-shaped. Aedeagus (Fig. 156, 157): tooth well developed, curved; (uneverted) vesica with a large hooked apical cornutus, and two very large slightly curved cornuti just beyond 1/2. Tubular portion of bulbus ejaculatorius (Fig. 157) very long, ca 2× as long as aedeagus.

Female genitalia. (Fig. 180). Tergal spines short. Segments 8–10 broad, only slightly extensible. S8 with numerous well-spaced setae in apical 1/2 and divided into two pyriform sclerites. Apophyses posteriores ca 1.5× as long as anteriores. Ostium broad, nearly 1/2 width of segment; colliculum indistinct. Ductus bursae rather broad, a sclerite near junction with corpus bursae; corpus bursae oval, with short blunt diverticulum in posterior 1/3; signum absent. Scobinations from near colliculum to inception of corpus bursae, strongest in anterior 1/2 of ductus; 2 broad rows of additional smaller spinules on corpus. Ductus spermathecae with 2–3 very weak loops.

Larva, Hostplant, and Biology. Unknown. The coloration and pattern of *Hierodoris tygris* are reminiscent of *Pyrgotis plinthoglypta* Meyrick (Tortricidae), which feeds on rimu (*Dacrydium cupressinum*), and this tree is common in Titirangi, where the moth has been most frequently collected. It is possible that the larva is a canopy-dweller and has been overlooked for this reason.

Type data. Holotype: male, 'NEW ZEALAND AK 36.57S 174.38E Titirangi Minnehaha Ave 7 Jan 2000 m.v. light R.J.B. Hoare' (NZAC). **Paratypes:** 10 males, 21 females. **AK:** 3 males, 10 females, same data as holotype, except 24 Mar 2000 (male), 29 Jan (female), 6 Mar 2001 (4 females), 1 Feb (1 male, 1 female), 12 Mar 2002 (2 females; wing

slide NZAC Oec. 188), 14 Jan (male), 25 Jan 2004 (male) (all NZAC), 6 Mar 2001 (female), 7 Mar 2003 (female) (OMNZ); 3 males, 8 females, Titirangi, Rimutaka Place, m.v. light, 15 Jan (3 females), 17 Jan (female), 22 Jan (male; genitalia slide NZAC Oec. 160), 26 Jan (female), 31 Jan (female; genitalia slide NZAC Oec. 151), 8 Mar (female), 16 Mar 1999 (female), RJBH (all NZAC), 26 Jan, 15 Mar 1999, RJBH (2 males) (OMNZ); 3 males, 1 female, Titirangi, ex light trap, Feb (male), Mar (1 male, 1 female; NZAC female genitalia prep. L429), Dec 1953 (male; NZAC genitalia prep. L289), C.R. Thomas (NZAC); 1 female, Clevedon, nr. polo ground, m.v. light, 24 Jan 2001, RJBH; 1 female, Murphy's Bush, Manurewa, m.v. light, 8 May 2004, RJBH (NZAC).

Material Examined. Type series plus 4 non-type specimens (see Appendix 1 for collection details of specimens).

Distribution. Only known from the Auckland region, and a single specimen from the Orongorongo Valley, Wellington.

AK, WN / —.

Etymology. The species is named for its striped coloration and ferruginous ground-colour. The Latin word 'tigris' (tiger) has been combined with the archaic English spelling of William Blake ('Tyger, Tyger, burning bright / In the forests of the night'), since the poet's lines are appropriate to the species' habitat and nocturnal habits.

Remarks. *Hierodoris tygris* was first discovered in the early 1950's by C. R. Thomas, who collected five specimens at a light trap in Titirangi, west Auckland. A further specimen was collected at the Orongorongo Research Station WN in 1971 by M. J. Meads, but was misidentified as *H. atychioides* and only recently rediscovered in MONZ. *Hierodoris tygris* was then not seen again until 1999, when the author found it quite commonly in another garden in Titirangi. Since then, it has also occurred commonly in a third garden in Titirangi, and one has been taken at Cascades Park, Waitakere Ranges. The only other known localities are a tiny riverine forest remnant near Clevedon, and Murphy's Bush, Manurewa (both south Auckland), where single females were caught in 2001 and 2004 respectively. Females are far more commonly seen than males.

Hierodoris tygris is probably more widespread than it appears to be; if, as suggested above, the larvae are canopy-feeders, it may take a strong light to attract the adults down from the tops of the trees. It should be sought in other North Island localities with an abundance of rimu.

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APPENDIX 1. Collection details of non-type specimens examined. All NZAC unless otherwise stated.

Note. Code numbers from G.V. Hudson's specimens (mostly in MONZ) are enclosed in single inverted commas, and the corresponding diary entries in square brackets. In addition to material sent to Meyrick for description, Hudson often gave away specimens (some are in NZAC and CMNZ), and may have discarded others, so that many entries in his diary no longer have a corresponding specimen in MONZ. Only records supported by examined specimens have been included here. Occasionally Hudson's lettering system is confusing, and/or his handwriting not easily interpreted, making it difficult to associate data with a particular specimen; for example, two specimens of *Hierodoris illita* have the code '220B', but the diary gives two different localities under this code. Thus the data given here represent an interpretation, and some errors are likely.

An asterisk* indicates that a locality has not been traced on any map. In the case of 'Mt Wakere, Kaikouras' (see under *H. electrica*), a dot has been placed on the distribution map even though the exact identity of the locality is unknown; we do, however, know that Lindsay had collected at the Puhi Puhi River KA on the previous day, so it is assumed that 'Mt Wakere' is close to this.

***Hierodoris iophanes* Meyrick, 1912**

North Island: AK. 2, Titirangi, Rimutaka Place, 26 Jan (1), 31 Jan (1) 1999, m.v. light, RJBH; 1, Titirangi, Minnehaha Ave, 12–13 Jan 2002, m.v. trap, RJBH. **WO.** 1, Upper Awakino Valley, Mahoenui, 16 Jan 1985, to light, N. Hudson (NHNZ). **BP.** 1, Kaimai Range, Thompsons Track (saddle to Ngatamahinerua Trig Track), 1 Jan 1981, beaten out by day, N. Hudson (NHNZ); 1, Mamaku Plateau, Tarukenga Sc. Reserve, to light, 10 Jan 1985, JSD. **WN.** 1, Greens Stm, Orongorongo V., 5 Dec 1973, M. J. Meads; 1, '516b' [Kaitoke, 28 Dec 1910, GVH]; 1, '516c' [Waterfall Gully, Wadestown, 26 Nov 1916, GVH]; 1, Karori, Jan [no other data]; 1, '516d' [Porirua Bush, 30 Nov 1916, GVH] (MONZ); 1, '516e' [Campbells Hill Bush, 6 Jan 1918, GVH] (MONZ); 1, '516f' [Crows Nest Bush, 15(?) Feb 1921, GVH] (MONZ); 1, '516g' [Wilton's Bush, 4 Jan 1926, GVH] (MONZ); 1, '516h' [Wilton's Bush, 14 Feb 1932, GVH] (MONZ); 1, '516k' [Korokoro, 14 Dec 1940, GVH] (MONZ); 2, '516l', '516m' [Wilton's Bush, 24 Jan 1944, GVH] (MONZ). **South Island: NN.** 1, Nelson, 2 Dec 1923, E. S. Gourlay. **DN.** 1, Dunedin, Glenleith, 23–26 Jan 1984, BHP (OMNZ). **SL.** 1, Catlins, Tautuku, 7–8 Jan 1994, BHP (OMNZ).

***Hierodoris frigida* Philpott, 1923**

South Island: NN. 3, Cobb Dam Rd, ca 1000 m, beaten from *Nothofagus solandri*, forest edge / scrub, 24 Jan 2005,

RJBH, R. Leschen, T. Buckley; 2, Dun Mt., 3000 ft, 17 Jan 1921, AP, Fenwick collection (MONZ); 1, '998b' [Dun Mt., 17 Jan 1921, AP] (MONZ); 1, '998c' [Dun Mt., Christmas 1926, S. Hudson] (MONZ); 4, Dun Mt., 3000ft, 16 Jan 1925 (1), 22 Jan 1925 (1), 23 Jan 1925 (1), 14 Jan 1926 (1), AP; 2, Dun Mt., 24 Dec 1927 (1), 27 Dec 1927 (1), AP. **SC.** 1, 4 km SE of Hakataramea, 12 Oct 1988, BHP, Chisholm (OMNZ). **MK.** 1, L. Pukaki, 29(?) Dec 1928, AP; 1, Waitaki Valley, Parsons Rock, 26 Mar 1989, BHP (OMNZ). **CO.** 12, Alexandra, 1st Terrace, 184 m, 19 Feb 1974, JSD; 8, Alexandra, 11 Feb 1981 (3), 21 Feb 1983 (5), BHP (OMNZ); 2, near Alexandra, 21 Feb 1983, BHP (OMNZ); 1, Alexandra, Earnsclough Tailings, 27 Oct 1997, BHP, H. Patrick (OMNZ); 1, Bannockburn, off *Pimelea*, 1 Dec 1979, BHP (OMNZ); 4, Conroys Rd, 300 m, 6 Dec 1991 (1), 8 Mar 1992 (2), 25 Oct 1993 (1), BHP (OMNZ); 1, Conroys Rd, 335 m, 2 Nov 1990, BHP (OMNZ); 3, Roxburgh Dam, E side, on thyme, 21 Nov 1985, JSD; 1, Teviot River, Roxburgh, 17 Mar 1986, JSD; 1, Beaumont, Chinamans Flat, E side Clutha V., on cliff faces, 20 Nov 1985, JSD; 1, knoll between Oturehua & St. Bathans, 8 Jan 1991, JSD; 1, Roaring Meg Ck, Kawarau Gorge, 26 Nov 1974, JSD, scrub, grassland and seepages; 1, Sandflat Rd, Cromwell, 19 Nov 1974, JSD; 1, Cromwell Gorge, 492 m, 21 Feb 1974, JSD; 2, site of DG3 dam, Fruitgrowers Rd, Clyde, 20 Nov 1974, JSD; 1, Lookout, Clyde, 750 m, 22 Mar 1973, JSD; 1, Clutha R bank, 5 km E Clyde, 6 Dec 1977, E. Schlinger; 1, Nevis Bluff, 11 Apr 1987, BHP (OMNZ); 1, North Rough Ridge, 750 m, 30 Nov 1988, BHP (OMNZ); 1, Raggedy Range, 600 m, 12 Apr 1987, BHP (OMNZ). **DN.** 1, Taieri Gorge, Reefs Hotel, 250 m, 26 Oct 1993, BHP (OMNZ); 1, Taieri Gorge, Hindon, 100 m, 26 Oct 1993, BHP (OMNZ); 1, Taieri Ridge, 500 m, 16–20 Oct 1985, BHP (OMNZ); 1, Mt Watkin, 500 m, 9 Nov 1989, BHP (OMNZ); 1, Silver Peaks, 760 m, 14 Dec 1988, BHP (OMNZ).

Hierodoris polita new species

South Island: **CO.** 1, Craig Flat Rd, 16 Nov, 1985, BHP (OMNZ); 1, Clutha R., Craig Flat, 16 Nov 1985, lichen covered rocks, C. A. Muir (LUNZ); 1, Raggedy Range, Lauder, 400–460 m, 25 Nov 1993, flying about lichen covered rocks, N. Hudson (NHNZ).

Hierodoris torrida new species

South Island: **MC.** 2, Riccarton Bush, Feb 1995, BHP, P. Quinn (OMNZ). **SC.** 1, Waihi Gorge, 3 Jan 1944, S. Lindsay (CMNZ).

Hierodoris huia new species

[Type material only.]

Hierodoris atychioides (Butler, 1877)

North Island: **ND.** 1, Spirits Bay, sand-dunes, 8 Nov 1967, J. McBurney. 5, Waipoua Forest, Yakas Track, pupae in web on *Dacrydium cupressinum* 14 Jan 2000, emg. 15 Jan (3), 16 Jan (1), 22 Jan (1), 2000, RJBH. **AK.** 1, Grey Lynn, Jessel St., 9 Nov 1985, on window, N. Hudson (NHNZ); 10,

Auckland Domain, bred rimu, 25 Oct, 26 Oct, 30 Oct (2), 31 Oct, 3 Nov, 6 Nov, 9 Nov (3) 1993, BHP (OMNZ); 11, Titirangi, bred from larvae on rimu, emg. 25 Aug (1), 2–5 Sep (10) 1944, T. Skeates; 3, Titirangi, bred from larvae on rimu, emg. 4 Sep (1), 5 Sep (2) 1944, T. Skeates (AMNZ); 4, Titirangi, Rimutaka Place, m.v. light, 6 Nov (2), 9 Nov, 11 Nov 1998, RJBH; 3, Titirangi, 3 Jan 2000, BHP, H. Patrick (OMNZ); 3, Titirangi, Minnehaha Ave, m.v. light, 30 Oct 1999, 20 Nov 2000 (2), RJBH; 10, Titirangi, 28 Jan 1980, P. A. Maddison; 3, Titirangi, to light, 20 Jan 1982, P. A. Maddison, JSD; 26, Laingholm, 30 Jan (1), 2 Feb (3), 4 Feb (1), 9 Feb (9), 18 Feb (5), 25 Feb (1), 3 Mar (1), 5 Mar (2), 19 Mar (1), 8 Apr (1), 9 Nov (1) 1980 R. H. Kleinpaste; 2, Karekare, emg. 5 Nov, 9 Nov 2000, larvae in webbing on *Kunzea ericoides* 22 Oct 2000, N. A. Martin; 4, Waitakere Range, Spraggs Bush, 9 Mar 1984, JSD, C. J. Green; 1, Waitakere Range, Walkers Bush, to light, 29 Nov 1981, JSD; 1, 'Waitakere Hills', 19 Feb 1965, J. S. Armstrong; 1, Ponui Island, 0.5 km N of Motunau Bay, amongst manuka, 21 Nov 1999, L. H. Clunie; 4, Weymouth, McInnes Rd, 22 Oct 1987, ex *Thuja orientalis*, J. A. Berry; 1, Mangere, 9 Jan 1951, C. Woodroffe; 2, Mairangi Bay, bred cypress, 3 Sep 1949, emg. 23 Sep, S. Bonny; 1, Meadowbank, bred juniper, emg. before 24 Nov 1950, K. A. J. Wise; 8, Murphys Bush, Flat Bush, 30 Aug 1977, '*Podocarpus dacrydioides*', J. C. Watt; 2, Murphys Bush, la. in spinning on *Dacrydium cupressinum*, 25 Nov 2000, emg. 11–12 Dec 2000, N. A. Martin; 2, Papakura, Greenhaven Ave, 22 Nov, 15 Dec 1980, on *Conium* flowers, N. Hudson (NHNZ); 1, same locality, 21 Dec 1983, on *Daucus carota* flower, N. Hudson (NHNZ); 1, same locality, 17 Nov 1986, in *Rosa* flower at night, N. Hudson (NHNZ). **CL.** 1, Little Barrier Island, Te Titoki Pt, 28 Nov 1954, R. A. Harrison; 1, Great Barrier Island, Nov 1940, D. Spiller; 7, Great Barrier Is., Whangaparapara, 25 Nov 1992, attracted to light, M. D. Wilkinson (NHNZ). **WO.** 2, Ruakura, Nov 1972, B. B. Given. **BP.** 1, Mt Te Aroha summit, 3200 ft, 21 Oct 1967, JSD; 11, East Cape, Orete Forest, bred rimu, 17 Dec, 19 Dec, 21 Dec (2), 24 Dec, 26 Dec, 28 Dec (3), 30 Dec 1992, 6 Jan 1993, BHP (OMNZ). **TK.** 3, Manaia, 27 Dec 1983, 1 Jan, 3 Jan 1984, K. J. Fox; 1, Manaia, to light, 9 Jan 1983, JSD. **TO.** 4, Tokaanu, 'tying manuka twigs', Dec 1930, W. Cottier; 5, Mt Hauhungatahi, 1140 m, ex *Libocedrus bidwillii*, 28 Nov 1989, emg. 15 Dec 1989, S. Pilkington. **HB.** 1, Little Bush, to blacklight, 29 Dec 1969, T. H. Davies (MONZ). **RI.** 2, Kakatahi, 22 Jan 1937. **WI.** 6, Palmerston North, bred from *Leptospermum scoparium*, 17 Oct 1949, emg. 4 Nov 1949, R. C. Coleman; 2, 'Flagswamp, Palmerston, x D. Hewson', H. K. Edie; 4, Bulls, 'bred from macrocarpa', '139/49'; 1, Feilding, Mt Biggs Rd, beaten from bush, 19 Dec 1956. **WN.** 3, Titahi Bay, 29 Oct 1927, E. S. Gourlay; 2, Orongorongo Valley, 'ex *Cassinia*', 26 Sep 1969, JSD; 4, '244f', '244g', '244h', '244k' [Paekakariki, 17 Mar 1915, amongst tauhinu, GVH] (MONZ); 1, '244u' [Karaka Grove, Red Rocks, 23 Dec 1926, GVH] (MONZ); 2, '244q', '244r' [Karaka Grove, Red Rocks, 14 Nov 1923, GVH] (MONZ); 2, '244z' [Karaka Grove, nr Sinclair Head, 28 Dec 1927, GVH] (MONZ); 6, '244ā' (1), '244ā' (3), '224ā' (1), '244ā' (1) [Makara Bush, amongst rimu, 25 Feb

1928 (1), 21 Feb 1929 (3), 22 Feb 1930 (1), 19 Feb 1934 (1), GVH] (MONZ); 2, '244d', '244e' [Botanical Gardens, Wellington, bred from larvae in twisted shoots of manuka, Dec 1888, GVH] (MONZ); 8, Karori Park, pupa 15 Nov 1935, emg. 3–13 Dec 1935, [no host data on label], J. T. Salmon (MONZ); 1, Karori Park, 3 Dec 1935, J. T. Salmon (MONZ); 11, Pencarrow Heads, bred *Cassinia*, 18 Nov, 20 Nov, 26 Nov, 29 Nov, 12 Dec (5), 16 Dec, 19 Dec 1992, BHP (OMNZ). **South Island:** NN. Moutere Hill, 27 Oct 1954, emg. 15 Nov 1954, [no host on label], E. S. Gourlay. **BR.** Inangahua West SF, Fletcher Ck, 750 ft, 9 Nov 1971, JSD, H. P. McColl. **KA.** 3, Cape Campbell, 5–6 Nov 1998, BHP, H. Patrick (OMNZ). **MC.** 5, Christchurch, Sockburn, bred ex webbing on conifer, 10 Oct 1971, emg. 16–18 Oct (3), 19 Oct, 20 Oct 1971, B. M. Lawson (LUNZ); 2, Bankside Sci. Res., 25 Nov 1978, reared from larvae on twigs of *Kunzea ericoides*, J. W. Early (LUNZ); 2, Bankside Sci. Res., reared from pupae on *Kunzea ericoides*, J. W. Early (LUNZ); 61, Lincoln College, bred ex conifer, 12 Oct (33), 15 Oct (28) 1981, C. A. Muir (LUNZ); 1, Christchurch, Riccarton Bush, Dec 1994, BHP, P. Quinn (OMNZ); 11, Riccarton, ex macrocarpa, 14 Sep 1942, emg. 29 Oct 1942, F. Smith; 3, Christchurch, bred ex macrocarpa, emg. 19 Dec 1950, J. L. Gilloody; 1, Christchurch, ex macrocarpa [as 'microcarpa'], 8 Dec 1950, J. L. Gilloody, emg. 24 Dec 1950, K. A. J. Wise; 4, Governors Bay, 18 Nov (2), 19 Nov (2) 1922, [S. Lindsay]; 2, Governors Bay, 4 Dec, 6 Dec 1950, 'ex Lindsay'; 1, Governors Bay, 19 Nov 1922, 'Coll. S. Lindsay' (MONZ); 1, Governors Bay, larva on juniper 30 Nov 1930, emg. 3 Dec 1930, S. Lindsay (MONZ); 2, '244n', '244p' [Governors Bay, bred from larvae on juniper, 15 Nov 1922, S. Lindsay] (MONZ); 4, Governors Bay, 3, 4, 7, 15 Dec 1920, E. V. Lindsay (CMNZ); 5, Governors Bay, 11 (2), 18 (2), 19 Nov 1922 (CMNZ); 5, Governors Bay, 1 Nov (2), 9, 14, 26 Nov 1922, J. F. Tapley collection (CMNZ); 11, Governors Bay, larvae on juniper 30 Nov 1920, emg. 3 Dec (6), 10 Dec (5) 1920, S. Lindsay (CMNZ); 1, Governors Bay, 30 Nov 1930, S. Lindsay (CMNZ). **CO.** 1, Alexandra, ex *Picea abies*, emg. 15 Nov 1979; 1, Ewe Range, 1000 m, 30 Jan 1987, BHP (OMNZ). **DN.** 2, Dunedin, Opoho, 25 Dec 1918, 17 Dec 1919 (AMNZ); 1, Dunedin, 26 Dec 1909 (AMNZ); 1, Dunedin, 21 Oct 1980, BHP (OMNZ); 1, Dunedin, bred kahikatea, 8 Nov 1995, BHP, H. Patrick, H. Patrick (OMNZ); 1, Dunedin, St Kilda, 18 Jan 1990, BHP, Green (OMNZ); 4, Mapoutahi, bred macrocarpa, 30 Oct, 31 Oct, 5 Nov, 15 Nov 2000, BHP (OMNZ); 1, Mapoutahi Pa, bred ex dead wood, 16 Nov 2000, BHP (OMNZ); 1, Waipori, 150 m, 1–16 Jan 1987, BHP; 8, Swampy Spur, bred ex *Libocedrus*, 18 Nov (6), 19 Nov, 22 Nov 1982, BHP (OMNZ). **SL.** 6, Ryal Bush, 17 Dec 1912; 2, Ryal Bush, 23 Dec 1912 (AMNZ); 2, Ryal Bush, 28 Dec 1912, 'Coll. S. Lindsay' (MONZ); 2, West Plains, [no other data], [AP]; 1, Sandy Point, 25 Jan 1984, JSD; 1, Otatara, 12 Dec 1980, BHP (OMNZ); 4, Thomsons Bush, bred matai, 11 Nov 1995, BHP (OMNZ). **SI.** 1, Rakeahua Valley, in bogs, 8 Feb 1968, JSD. **Unknown locality.** 1, '*Bullivans D' [?], 7 Dec 1940, G. Howes collection (MONZ); 1, '*Whaka P.2, ex manuka L.N.', 'Ro. Fo.' (LUNZ). **No locality.** 8, bred ex conifer, Oct 1950, W. Broad; 2, bred ex

macrocarpa, 3 Jan 1951, K. A. J. Wise; 1, 'bred ex larva in conifer, coll. 2 Oct 1968, G. Tait' (LUNZ); 4, 'Fereday collection' (CMNZ).

Hierodoris bilineata (Salmon, 1948)

TH. 1, Great Is., Castaway, kanuka at night, 10 Dec 1963, P. M. Johns; 3, Great Is., Castaway Camp, Nov. 1970, NZ Ent. Div. Exp.; 1, South West Is., daytime, 25 Nov 1983, C. F. Butcher.

Hierodoris callispora (Meyrick, 1912)

North Island: **BP.** 1, Mamaku SF, ex *Nothofagus truncata*, 7 Oct 1984, emg. 23 Oct 1984, R. Zondag; 1, Rereauria Swamp, 17 Sep 1992, ex *Nothofagus truncata*, emg. 30 Oct 1992, JSD. **TO.** 1, Mahuia Stream, 26 Jan 1958, J. S. Armstrong. **TK.** 1, Waitaanga Plateau, beech forest, 2 km W of Waitaanga, 15 Dec 1981, JSD, K. J. Fox, m.v. light trap; 2, Waitaanga Plateau, in forest, 520 m, 16–18 Dec 1981, JSD, K. J. Fox, m.v. light trap; 3, Waitaanga Plateau, 17 Dec 1981, JSD, K. J. Fox, m.v. light trap; 1, Mt Egmont North, 29 Dec 1981, T. H. Davies (MONZ); 1, Pouakai Ridge, 4500 ft, 9 Jan 1978, K. J. Fox (MONZ). **WN.** 1, Wellington, [no other data] (BMNH); 1, Wellington, 17 Dec 1919, G. V. Hudson; 1, Greens Stm, Orongorongo V., 5 Dec 1973, M. J. Meads; 1, '519c' [Wilton's Bush, 28 Nov 1921, GVH] (MONZ); 1, '519d' [Crows Nest Bush, 21 Dec 1921, GVH] (MONZ); 1, '519d', Crowsnest Bush, 21 Dec 1921, GVH (CMNZ); 1, '519f' [Gollans Valley, 15 Dec 1932, GVH] (MONZ); 1, '519g' [Gollans Valley, 29 Nov 1934, GVH] (MONZ); 1, '519h' [Gollans Valley, 13 Dec 1943, GVH] (MONZ). **South Island:** **NN.** 1, Pigeon Saddle, m.v. light, 15–16 Feb 1999, RJBH, R. A. B. Leschen; 1, Nelson, Brook Reserve, 4 Jan 1973, T. H. & J. M. Davies, to black light (MONZ). **BR.** 1, Speargrass Ck, 1097 m, Travers Ra., 6 Feb 1964, JSD; 1, L. Rotoiti, 610 m, 16 Jan 1976, A. K. Walker, to light; 1, Lake Rotoiti, Nelson Lakes NP, 1 Jan 1973, T. H. & J. M. Davies; 10, 15 km S of Murchison, la. 11 Aug 1998, *Nothofagus fusca* galls, emg. 4–12 Sep 1998, RJBH, R. E. Beever. **DN.** 1, Dunedin, 23 Dec 1982, BHP (OMNZ); 1, Dunedin, Glenleith, 9–12 Jan 1984, BHP (OMNZ). **SL.** 1, Beaumont SF, 30 Jan 1984, JSD, *Nothofagus* forest.

Hierodoris eremita Philpott, 1930

South Island: **WD.** 2, Fox Glacier, Mt Fox, 1220 m (1), 1340 m (1), 19 Jan 1996, BHP (OMNZ); 1, Fox Glacier, Chancellor Shelf, 1160 m, 12 Dec 1984, on *Celmisia* leaf, H. M. Harman (LUNZ); 1, Fox Glacier, Chancellor Shelf, 1220 m, 15 Dec 1984, R. M. Emberson, P. Syrett (LUNZ); 4, Westland NP, Alex Knob, 1295 m, 13 Jan 1982, subalpine tussock-herbfield, J. W. Early (LUNZ). **MK.** 1, Hooker V., Kea Point, 1400 m, coll. 3 Apr 1977, J. Sweney, emg. Aug–Sep, ex *Celmisia coriacea* (BMNH); 4, same data (NZAC); 1, Ball Ridge, Tasman V., 1400 m, coll. 1 Apr 1977, JSD, emg. Aug–Sep, ex *Celmisia coriacea* (BMNH); 7, same data (NZAC); 1, Ball Ridge, 1370 m, 1 Apr 1977, JSD, J. Sweney, ex *Celmisia coriacea* (abortive emergence); 2, Mt Cook NP, Wakefield Track, 750 m, 8 Apr 1977, ex *Celmisia*

coriacea leaves, emg. 13 Jun 1977, W. J. Sweney (LUNZ); 3, Mt Cook NP, Redlakes Track, 900 m, 19 Oct 1977, pupae in *Celmisia coriacea* leaves, emg. 25 Oct (2), Nov 1977, W. J. Sweney (LUNZ); 2, Mt Cook NP, Redlakes Track, 900 m, 11, 16 Apr 1977, ex *Celmisia coriacea* leaves, emg. 16, 20 Jun 1977, W. J. Sweney (LUNZ); 1, Mt Cook NP, Sealy Range, 1160 m, 8 Dec 1975, swept ex scrub, W. J. Sweney (LUNZ); 1, Mt Cook NP, Liebig Range, 950 m, 8 Aug 1977, burnt area, ex *Celmisia coriacea* leaves, emg. 21 Jun 1977, W. J. Sweney (LUNZ).

Hierdoris gerontion new species

South Island. **OL.** 1, Eyre Mts, Symmetry Peaks, 1550 m, 8 Jan 1987, BHP (OMNZ). **CO.** 2, Old Man Range, 1640 m, in flushes, 11 Feb 1982, JSD; 2, Rock and Pillar Range, 12 Mar 1983, 1200 m (1), 1250 m (1), BHP (OMNZ); 4, Rock and Pillar Range, 25 Feb 1983, 1200 m (2), 1250 m (2), BHP (OMNZ); 1, Lammermoor Range, Lammermoor Top, 1130 m, 8 Feb 1986, flying about bogland, N. Hudson (NHNZ); 4, Lammermoor Range, 23 Feb 1983, 1150 m, BHP (OMNZ); 1, Lammermoor Range, 1100 m, 2 Mar 1985, BHP (OMNZ); 3, Dunstan Range Mts., 6 Feb 1984, 1540 m (1), 1560 m (1), 1620 m (1), BHP (OMNZ); 1, Dunstan Mts., Mt Makariri, 1600 m, 7 Feb 1997, BHP (OMNZ); 11, Pisa Range, 12 Feb 1983, 1600 m (1), 1700 m (6), 1720 m (4), BHP (OMNZ); 2, Pisa Range, Column Rocks, 1850 m, 19 Jan 1986, BHP (OMNZ); 1, Pisa Range Sth, 1700 m, 19 Jan 1986; 1, Remarkables, Rastus Burn, 1900 m, 17 Feb 1985, BHP (OMNZ). **FD.** 1, Mt Burns, 1400 m, 3 Feb 1982, BHP (OMNZ).

Hierdoris illita (Felder & Rogenhofer, 1875)

North Island. **ND.** 1, Mangamuka Gorge & River 10 Dec 1959, J. S. Armstrong; 1, Puketia Forest, 16 Jan 1994(?), J. Ward, BHP (OMNZ). **AK.** 2, Laingholm, 30 Jan 1980, 18 Dec 1981, R. Kleinpaste; 2, Titirangi, light trap, Jan, Dec 1953, C. R. Thomas; 2, Titirangi, 18 Jan 1979, P. A. Maddison; 2, Titirangi, 28 Jan 1980, JSD; 1, Titirangi, 20 Jan 1982, P. A. Maddison, JSD; 1, Titirangi, Rimutaka Place, 26 Jan 1999, RJBH; 1, Hunua Gorge, Hunua Rd., 18 Dec 1983, flying by day, N. Hudson (NHNZ); 1, Titirangi, Little Muddy Ck, la. Sep 2001 in woody twig of *Coriaria arborea*, emg. 24 Nov 2001, RJBH; 2, same locality, la. 2 Oct 2004 in twigs of *Coriaria arborea*, emg. 14, 23 Nov 2004, RJBH. **BP.** 1, Mt Ngongotaha 850 m, 28 Dec 1983, JSD; 1, Te Wairoa, 15 Nov 1919; 1, Rotokakahi, Rotorua district, 14 Feb 1910 (BMNH); 3, Rotorua, Forest Research Institute, 10 Nov (2), 17 Dec 1961 (1), JSD (FRNZ); 1, Whakarewarewa, ex galls in tutu, emg. 25 Nov 1963 (FRNZ); 2, Whakarewarewa, from *Larix decidua* cones, emg. Nov, 2 Dec 1981, A. Zandvoort (FRNZ); 1, Whakarewarewa SF, ex larch cone, 7 Oct 1981, C. Taylor (FRNZ). **TK.** 1, New Plymouth, 4 Mar 1911 (MONZ); 10, Waitaanga Plateau 520 m, N. G. Tucker Res., 14 Dec (4), 16–18 Dec 1981 (6), JSD, K. J. Fox; 1, beech forest 2 km W of Waitaanga, 15 Dec 1981, JSD, K. J. Fox; 1, Waitaanga Plateau, 14–18 Dec 1981, K. J. Fox (MONZ); 2, Waitaanga, 16 Dec 1981, K. J. Fox (MONZ); 1, Taranaki, Dawson Falls Gates, 10 Jan

1962(?), F. Chambers (BMNH); 2, Dawson Falls, 22 Dec 1972 (1), 3 Jan 1974 (1), F. Chambers (MONZ); 3, Pouakai Ridge, 4500 ft, 9 Jan 1978, K. J. Fox (MONZ); 1, Mt Egmont, North Chalet, 3200 ft, 29 Dec 1981, flying high in hot sunshine, T. H. Davies (MONZ). **TO.** 2, Taupo, 28 Nov 1931, J. S. Armstrong; 3, Taupo, 'P & T Bush', 13 Dec 1931 (1), 24 Dec 1933 (2), J. S. Armstrong; 4, Taupo, Lake side, 10 Dec 1931, J. S. Armstrong; 3, Taupo, Hatepe River, 28 Jan 1934, J. S. Armstrong; 1, Tauhara, 27 Jan 1931, J. S. Armstrong; 1, Mt Ruapehu, Ohakune Track, 1 Jan 1980, T. H. Davies; 1, Mt Ruapehu, Ohakune Track, 3 Jan 1982, flying in sunshine, T. H. Davies (MONZ); 1, Ohakune Track, 2500 ft, 6 Jan 1982, K. J. Fox (MONZ); 2, Pureora SF, Waimiha Saddle, 13 Feb 1984 (1), JSD, 14 Jan 1986 (1), C. J. Green, JSD; 2, Pureora SF, 8 Dec 1961, JSD (FRNZ). **GB.** 1, Waikaremoana, 12 Feb 1974, K. J. Fox. **HB.** 1, Little Bush, 2 Jan 1970, T. H. Davies; 2, Little Bush, 2 Jan 1970, flying high in hot sunshine, T. H. Davies (MONZ); 1, White Pine Bush, 21 Jan 1963, T. H. Davies. **WN.** 3, Akatarawa Saddle, 6 Jan 1974, K. J. Fox; 2, Ecol. Div. DSIR Field Station, Orongorongo Valley, 1–10 Oct 1969, M. Meads; 1, Wellington, GVH, 1906(?) (BMNH); 3, Wainuiomata, Dec 1915, GVH (BMNH); 3, '220n', '220o', '220p' [all Wainuiomata, 28 Dec 1909, flying in hot sunshine near reservoir, GVH] (MONZ); 1, '220q' [Wainuiomata (?Dec) 1915, GVH] (MONZ); 1, '220b' [Wainuiomata, Xmas 1939, GVH] (MONZ); 3, Kaitoke, 30 Nov 1919, GVH (BMNH); 2, '220c', '220g' [Kaitoke, 30 Nov 1903, flying over [tutu] in hot sunshine, GVH] (MONZ); 1, '220r' [Kaitoke, in train, 16 Dec 1919, GVH] (MONZ); 3, '220v' [Gollans Valley, 24 Dec 1921, GVH] (MONZ); 1, '220w' [Gollans Valley, 22 Dec 1923, GVH] (MONZ); 1, '220A' [South Karori, 28 Dec 1937, GVH] (MONZ); 1, '220B' [Gollans Valley, 3 Jan 1938, GVH] (MONZ); 1, Wellington, 18 Dec 1908 (MONZ). **WN/WA.** 1, Featherstone, [no date], *Muehlenbeckia australis*, W.W.S. **South Island:** **SD.** 2, Opouri Valley, 26–27 Feb 1967 (1), 26–30 Dec 1968 (1), R. J. B. Power. **NN.** 2, '1031a', '1031b' [Mt Arthur, at rest on *Astelia* leaves, main spur, 3600 ft, 18 Jan 1920, GVH] (MONZ); 1, Golden Downs, Gordons Knob, 4500–5000ft, 5 Feb 1965, W. A. H. (FRNZ); 1, Nelson, 22 Jan 1886 (BMNH); 1, Whanganui Inlet nr Pakawau, Dec 1977, ex *Nothofagus fusca*, B. M. May; 1, Dun Mt. Track, 29 Dec 1967, T. H. & J. M. Davies; 1, Dun Mt. Track, 29 Dec 1967, flying in hot sunshine, T. H. & J. M. Davies (MONZ); 1, Nelson, 21 Dec 1922, R. J. Tillyard; 1, Mt Fell, Mt Richmond, 4300–4500 ft, 13 Mar 1969, JSD; 1, Tadmor Valley, 24 Jan 1927, E. S. Gourlay; 2, Denniston Plateau, 4 Jan 1999, BHP, H. Patrick (OMNZ). **NN/MB.** 1, Mt Starveall, 25 Jan 1926, AP. **BR.** 1, Fletcher Ck, Inangahua West SF, 9 Nov 1971; 1, Ecology Div. Field Station 550 m, Mt Misery, 24 Jan 1977; 1, Maruia Springs [as 'Mauruia Springs'], 28 Dec 1938, J. Lindsay (CMNZ). **WD.** 1, Karangarua River, 12 Dec 1960, P. R. Kettle, J. I. Townsend; 1, Franz Josef Glacier, Sentinel Rock, 3 Dec 1964, JSD; 2, The Windbag, 5–6 Jan 1999, BHP, H. Patrick; 16, The Windbag, same data (OMNZ); 1, Haast, 3 Nov 1994, BHP, J. Ward (OMNZ); 1, Waiho Gorge, 16 Jan 1925 (AMNZ). **KA.** 3, Puhi Puhi Res., 3–6 Dec 1957, E. S. Gourlay; 5, Puhi

Puhi River [as 'Pui-pui'], 22, 24, 26 Dec 1929, 1, 3 Jan 1930, S. Lindsay (CMNZ); 1, *'Mt Wakere, Kaikouras', 4 Jan 1930, S. Lindsay (CMNZ); 1, Half Moon Bay Sc Res, m.v. light, 17 Nov 1999, RJBH, R. A. B. Leschen; 1, Kowhai Bush, 22 Dec 1987, R. de Hamil, BHP (OMNZ). **MC.** 1, Christchurch, Riccarton Bush, 8 Dec 1982, attracted to light, C. A. Muir, P. T. Syrett (LUNZ); 1, Banks Peninsula, Hinewai Bush, la. 22 Jul 2002, gall on *Muehlenbeckia australis*, emg. 23 Sep 2002, N. A. Martin; 4, Governors Bay, 11 Nov (3), 18 Nov 1922 [J. F. Tapley?] (CMNZ); 4, Governors Bay, 24, 25, 26 Nov (2) 1922, J. F. Tapley collection (CMNZ); 1, Governors Bay, early Dec 1935, GVH (BMNH); 1, '220z' [Governors Bay, early Dec 1935, GVH] (MONZ). **SC.** 3, Kakahu Bush, limestone scarps, 3–4 Jan 2002, BHP, H. Patrick (OMNZ); 2, Lindisfarne Camp Area, Upper Pareora Gorge, 3–4 Feb 1970, Entomology Department field trip (LUNZ). **OL.** 1, Matukituki Valley, 350 m, 7–8 Feb 1999, BHP, H. Patrick (OMNZ). **DN.** 4, Dunedin, 6 Jan 1880 (BMNH); 1, Dunedin, 24 [Jan?] 1900; 1, Evansdale, 18 Jan 1910; 1, Evansdale, 27 Dec 1915 (MONZ); 1, Dunedin, Bradford, 14 Jan 1992, BHP (OMNZ); 1, Dunedin, Bradford, 20 Jan 2002, BHP, H. Patrick (OMNZ); 1, Dunedin, Ross Creek, 19 Jan 1990, BHP (OMNZ); 1, Dunedin, Otago Museum, 4 Feb 1998, H. Patrick, H. Patrick, BHP (OMNZ); 1, Dunedin, University area, 16 Jan 1992, BHP (OMNZ); 1, Broad Bay, 15 Jan 1914 (MONZ); 1, Opoho, 18 Jan 1920 (MONZ); 2, Dunedin, 26 Dec 1909 (MONZ). **SL.** 1, West Plains, [no date], [AP]; 1, Tisbury, 17 Nov 1917, [AP]; 2, Beaumont SF, Riversdale Rd, 14 Nov 1985, JSD; 1, Beaumont River Rd, 7 Dec 1963, JSD; 1, Beaumont SF, River Rd, 7 Dec 1963, JSD (FRNZ); 1, Catlins, Tautuku, 7–8 Jan 1994, BHP (OMNZ); 2, Catlins coast, Purakaunui Bay, 13, 16 Dec 1987, to light, N. Hudson (NHNZ). **No precise locality.** 2, 'New Zealand', 1906, GVH (BMNH); 3, 'New Zealand', 1910, GVH (BMNH); 1, 'New Zealand', '88.8', '*Heliothibes illita* F & R teste Drnt' (BMNH); 1, 'Fereday collection' (CMNZ). **No data.** 2 (NZAC).

Hierodoris sesioides new species

[Holotype only.]

Hierodoris squamea (Philpott, 1915), new combination

South Island: WD. 1, Simonin Pass, W. Olivine Ra., 945–1036 m, 30 Jan 1975, JSD; 1, Tempest Spur, W. Olivine Ra., 30 Jan 1975, JSD. **FD.** 1, Turret Ra., above Wolfe Flat, Jan 1970, A. C. Eyles; 1, Wolfburn Flats, 3200 ft, Turret Ra., Manapouri, 10 Jan 1970, JSD; 1, Kepler Mts, West L. Te Anau, 3 Jan 1925 (AMNZ); 1, Kepler Mts, West Sth Arm L. Te Anau, 3 Jan 1925 (AMNZ); 1, Mt Burns 3500 ft, Hunter Mts, 8 Jan 1970, J.McBurney; 1, Mt Burns, 1400 m, 3 Feb 1982, BHP; 1, Mt Burns summit, 1400 m, 2 Feb 2002, BHP; 1, Mt Burns, 1200 m, 3 Feb 1982, BHP (OMNZ); 1, Mt Burns, 1310–1430 m, sweeping tussock herbfield, 3 Feb 1982, J. W. Early (LUNZ); 2, Mt Luxmore, 1000 m (1), 1400 m (1), 8 Feb 1987, BHP (OMNZ); 2, Borland Saddle, 988m, 21 Dec 1985, BHP (OMNZ).

Hierodoris stella (Meyrick, 1914), new combination

North Island: AK. 1, Titirangi, Minnehaha Ave, 11 Dec 1999, m.v. light, RJBH. **BP.** 2, Mamaku Plateau, Tarukenga Sc. Res., to light, 10 Jan 1985, JSD; 1, L. Rotorua, beaten from *Muehlenbeckia*, 15 Feb 1979, L. A. Mound. **TK.** 1, Mokau Valley, 30 m, 3 km E of Mokau, 8 Dec 1983, JSD. **HB.** 1, Puketitiri, Little Bush, 2 Jan 1963, caught flying in daylight, T. H. Davies (MONZ). **WN.** 1, '840a' [Campbells Hill Bush, 2 Feb 1913, S. Hudson] (MONZ); 1, '840b' [Campbells Hill Bush, on leaf in sun, 31 Jan 1915, GVH] (MONZ); 1, '840c' [Silverstream, Karori, 9 Dec 1919, GVH] (MONZ).

Hierodoris electrica (Meyrick, 1889)

South Island: NN. 2, Dun Mt., 22 Dec, 29 Dec 1925, AP; 10, Dun Mt., 3000 ft, 9 Feb 1921 (1), 8 Jan 1922 (8), 16 Jan 1925 (1), AP; 4, Dun Mt., 3500 ft, 6 Jan 1921 (1), 18 Dec 1925 (2), 14 Jan 1926 (1), AP; 1, Nelson, 26 Dec 1924, AP; 1, Cobb Valley, Lake Sylvester Track, 1200–1300 m, 5 Jan 1996, JSD. **MB.** 2, Red Hills, 1371 m, 8 Feb 1964, JSD; 1, Black Birch Ra., 1249 m, 21 Oct 1970, JSD, ex *Olearia nummulariifolia*; 1, Black Birch Ra., 3500–4200 ft., 17 Feb 1970, A. C. Eyles; 1, Black Birch Ra., 4800–5500 ft., 16 Feb 1970, J. S. Dugdale; 1, Upper Wairau, Coldwater Creek shrubland, swept, 24 Jan 2003, I. R. Millar; 1, Jacks Pass, Hanmer, 28 Dec 1930, S. Lindsay (CMNZ). **KA.** 4, *'Mt Wakere, Kaikouras', 4 Jan 1930, S. Lindsay (CMNZ). **MK.** 1, Mt Cook, 8 Feb 1929, AP (CMNZ). **OL.** 1, Bold Peak, 7 Jan 1920, G. Howes collection (MONZ); 1, Bold Peak, 10 Jan 1920, [no collector] (CMNZ); 1, L. Wakatipu, ca 4000 ft, 8 Jan 1920, GVH (BMNH); 1, 'L. Wakatipu .15, GVH' (BMNH). **SL.** 1, Takitimus, 800 m, 24 Jan 1981, BHP (OMNZ); 3, Blue Mountains, 900 m (1), 920 m (2), 8 Jan 1984, BHP (OMNZ).

Hierodoris s-fractum new species

South Island: MC. 1, Mt Sugar Loaf, fan 610 m, 26 Jan 1988, light trap, E. G. White (LUNZ); 1, Christchurch, Riccarton Bush, Dec 1994, BHP, P. Quinn (OMNZ); 4, Harewood, Waimakariri R., 15 Dec 1929, S. Lindsay (CMNZ); 1, '513k' [Harewood, 15 Dec 1929, S. Lindsay] (MONZ); 1, Hoon Hay Bush, 15 Nov 1922 (CMNZ); 1, Hoon Hay Valley, Jan 1922 (CMNZ); 3, Governors Bay, 10 Nov, 21 Nov, 6 Dec 1920, J. F. Tapley collection (CMNZ); 1, Dean's [=Riccarton] Bush, 8 Jan 1925, A. L. Tonnoir (CMNZ); 1, Akaroa, Dec 1924, A. L. Tonnoir (CMNZ). **SC.** 2, Temuka, 26 Dec 1908 (AMNZ); 1, Waitaki Valley, Station Peak, 200 m, 1 Dec 2001, BHP, H. Patrick (OMNZ). **MK.** 1, Benmore Range, 540 m, 17 Jan 1996, light trap, E. G. White; 3, Benmore Range, 510 m, 30 Jan, 14 Feb (2) 1996, light trap, E. G. White (LUNZ); 2, L. Pukaki, 29 Dec 1928, AP; 1, Lake Pukaki, 26 Dec 1928, S. Lindsay (CMNZ); 1, Grays Hills / Haldon Flats, 380 m, 17 Feb 1994, light trap, E. G. White (LUNZ); 1, Pukaki Flats, 510 m, 18 Feb 1993, light trap, E. G. White (LUNZ); 1, '513b' [Lake Tekapo, 20 Dec 1899, GVH] (MONZ); 1, Lake Tekapo, Dec 1899, GVH (BMNH). **OL.** 1, '513c' [Paradise, Lake Wakatipu, 15 Feb 1903, GVH] (MONZ); 3, '513f', '513g',

513h' [Glenorchy, Lake Wakatipu, amongst wild irishman, 19 Jan 1914, GVH] (MONZ). **CO.** 1, Tarras, 1000 ft, 16–22 Jan 1954, E. S. Gourlay; 4, Cairnmuir–Bannockburn Rd, Clyde end, 8 Jan 1991, JSD; 2, Craig Flat, Clutha Valley, 16 Nov 1985, JSD; 2, Clutha R., Craig Flat, 16, 18 Nov 1985, C. A. Muir (LUNZ); 3, Clutha R., Island Block, 15 Nov 1985, C. A. Muir (LUNZ); 1, Clyde, Fruitgrowers Rd, site of DG3 dam, 20 Nov 1974, JSD; 1, Conroys Rd, 300 m, 10 Jan 2001, BHP (OMNZ); 2, Old Man Range, 15 Jan 1979, BHP (OMNZ); 1, Kawarau Gorge, 1–4 Dec 1990, BHP (OMNZ); 1, St Cuthbert Ra., Chain Hills, 650 m, 13 Jan 2000, E. G. White (LUNZ). **DN.** 1, Dunedin, Woodhaugh, 15 Jan 1918 (MONZ); 1, Roxburgh Dam, 21 Nov 1985, swept manuka, C. A. Muir (LUNZ). **SL.** 1, 'Invercargill GVH .99' [probably the specimen listed in Hudson's register as 513a: West Plains, Invercargill, 4 Jan 1898, AP] (BMNH); 1, West Plains, 12 Jan 1909; 2, The Key, Mararoa River, 29 Jan 1976, JSD, beating *Carmichaelia*.

***Hierodoris pachystegiae* new species**

South Island: **KA.** 1, Kekerengu, coastal, 5 Feb 1976, JSD, ex *Pachystegia insignis*, in capitula, emg. 20 Feb 1976; 2, Ward Beach, 9 Dec 1977, B. M. May, *Pachystegia insignis*, leaf tomentum (1 crippled, 1 mouldy); 1, Woodside Creek, la. 26 Feb 1999, seedheads of *Pachystegia insignis*, emg. 11 Mar 1999, RJBH, JSD (crippled).

***Hierodoris tygris* new species**

North Island: **AK.** 1, Titirangi, ex light trap, Dec 1953, C. R. Thomas; 1, Titirangi, Rimutaka Place, 16 Mar 1999, m.v. light, RJBH; 1, Waitakere Ra., Cascades Park, m.v. light, 10 Feb 2004, RJBH. **WN.** 1, Orongorongo Research Station, 2 Mar 1971, M. J. Meads (MONZ).

APPENDIX 2. Authorities for plant names mentioned in the text. Taxa are listed alphabetically.

Celmisia coriacea (G. Forst.) Hook. f.
Coriaria arborea Linds.
Cupressus macrocarpa Hartw. ex Gordon
Dacrycarpus dacrydioides (A. Rich.) de Laub.
Dacrydium cupressinum (D. Don) de Laub.
Grimmia laevigata (Brid.) Brid.
Kunzea ericoides (A. Rich.) Joy Thomps.
Larix decidua Mill.
Leptospermum scoparium J. R. Forst. & G. Forst.
Leucopogon fraseri A. Cunn.
Libocedrus bidwillii Hook. f.
Muehlenbeckia australis (G. Forst.) Meisn.
Nothofagus truncata (Colenso) Cockayne
Olearia nummulariifolia (Hook. f.) Hook. f.
Ozothamnus leptophyllus (G. Forst.) Breitw. & J. M. Ward
Pachystegia insignis (Hook. f.) Cheeseman
Pinus radiata D. Don
Prumnopitys taxifolia (D. Don) de Laub.
Sophora tetraptera J.S. Mill.
Thuja orientalis L.
Ulex europaeus L.

*Hierodoris iophanes*, ♂*Hierodoris frigida*, ♀*Hierodoris polita*, ♂ holotype*Hierodoris torrida*, ♂ holotype*Hierodoris huia*, ♂ holotype*Hierodoris huia*, ♀ paratype

Fig. 1–6 Adults: (1) *Hierodoris iophanes*, male (WN: Wilton's Bush, 24 Jan 1944); (2) *H. frigida*, female (CO: between Oturehua and St Bathans, 8 Jan 1991); (3) *H. polita*, male holotype (CO: Craig Flat, Clutha Valley, 16 Mar 1986); (4) *H. torrida*, male holotype (MC: Riccarton Bush, 19 Jan 2000); (5) *H. huia*, male holotype (AK: Titirangi, 28 Jan 1980); (6) *H. huia*, female paratype (AK: Titirangi, 28 Jan 1980).

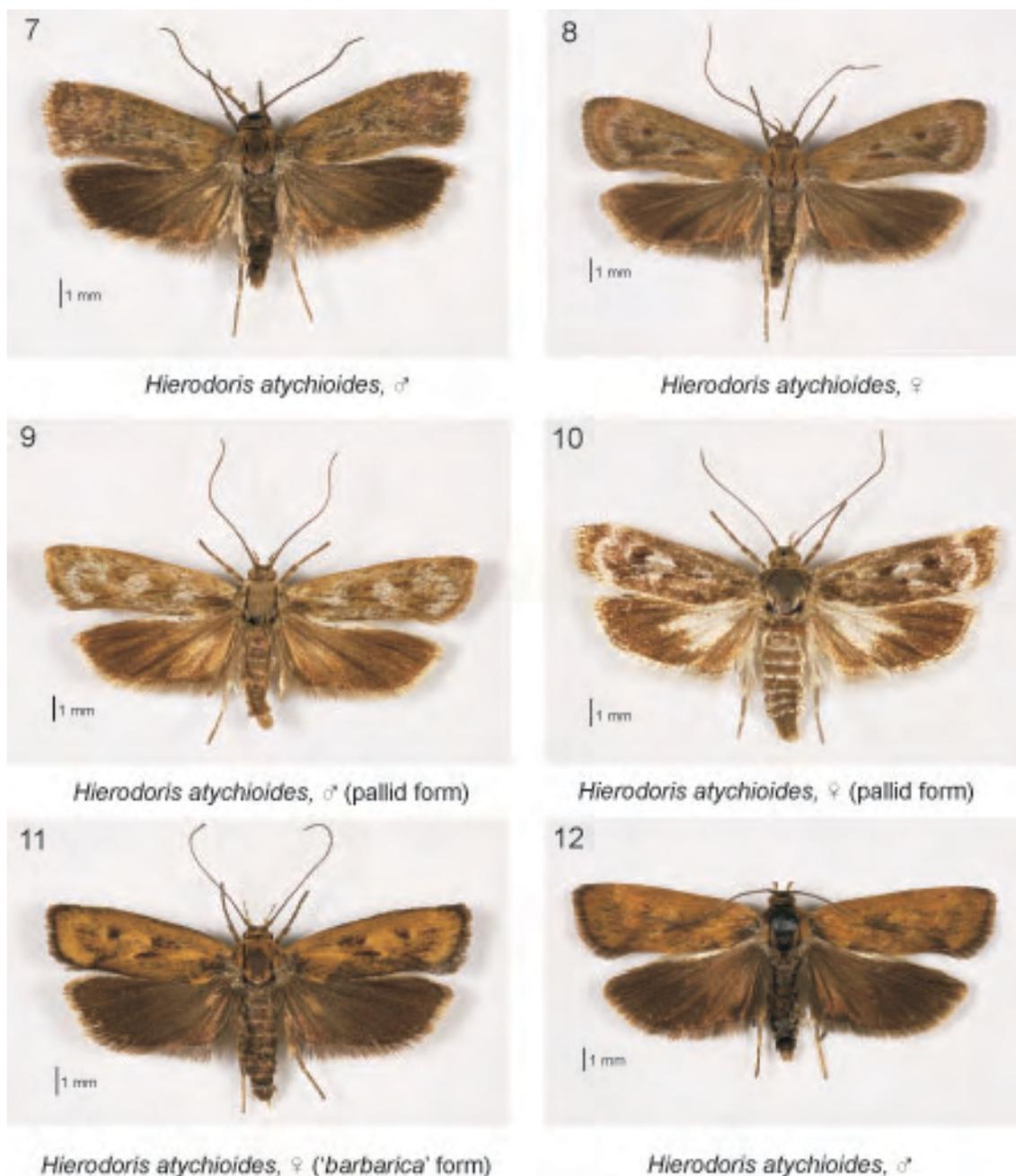


Fig. 7–12 Adults, *Hierodoris atychioides*: (7) male (AK: Karekare, ex *Kunzea ericoides*, emg. 5 Nov 2000); (8) male (AK: Titirangi, 11 Nov 1998); (9) male (WN: Karaka Grove, Red Rocks, 14 Nov 1923); (10) female (WN: Karaka Grove, Sinclair Head, 28 Dec 1927); (11) female (AK: Manurewa, Murphy's Bush, ex *Dacrydium cupressinum*, emg. 11–12 Dec 2000); (12) male (TO: Mt Hauhangatahi, ex *Libocedrus bidwillii*, emg. 15 Dec 1989).



Hierodoris bilineata, ♂ paratype



Hierodoris bilineata, ♀ paratype



Hierodoris callispora, ♂



Hierodoris callispora, ♀



Hierodoris callispora, ♀



Hierodoris sesioides, ♂ holotype

Fig. 13–18 Adults: (13) *Hierodoris bilineata*, male paratype (TH: Great I., 24 Apr 1946); (14) *H. bilineata*, female paratype (TH: Great I., 24 Apr 1946); (15) *H. callispora*, male (BR: 15 km S of Murchison, ex *Nothofagus fusca*, emg. 4 Sep 1998); (16) *H. callispora*, female (BR: 15 km S of Murchison, ex *Nothofagus fusca*, emg. 7 Sep 1998); (17) *H. callispora*, female (NN: Pigeon Saddle, 15–16 Feb 1999); (18) *H. sesioides*, male holotype (HB: Esk SF, ex *Sophora tetraptera*, emg. 9 Oct 1964).

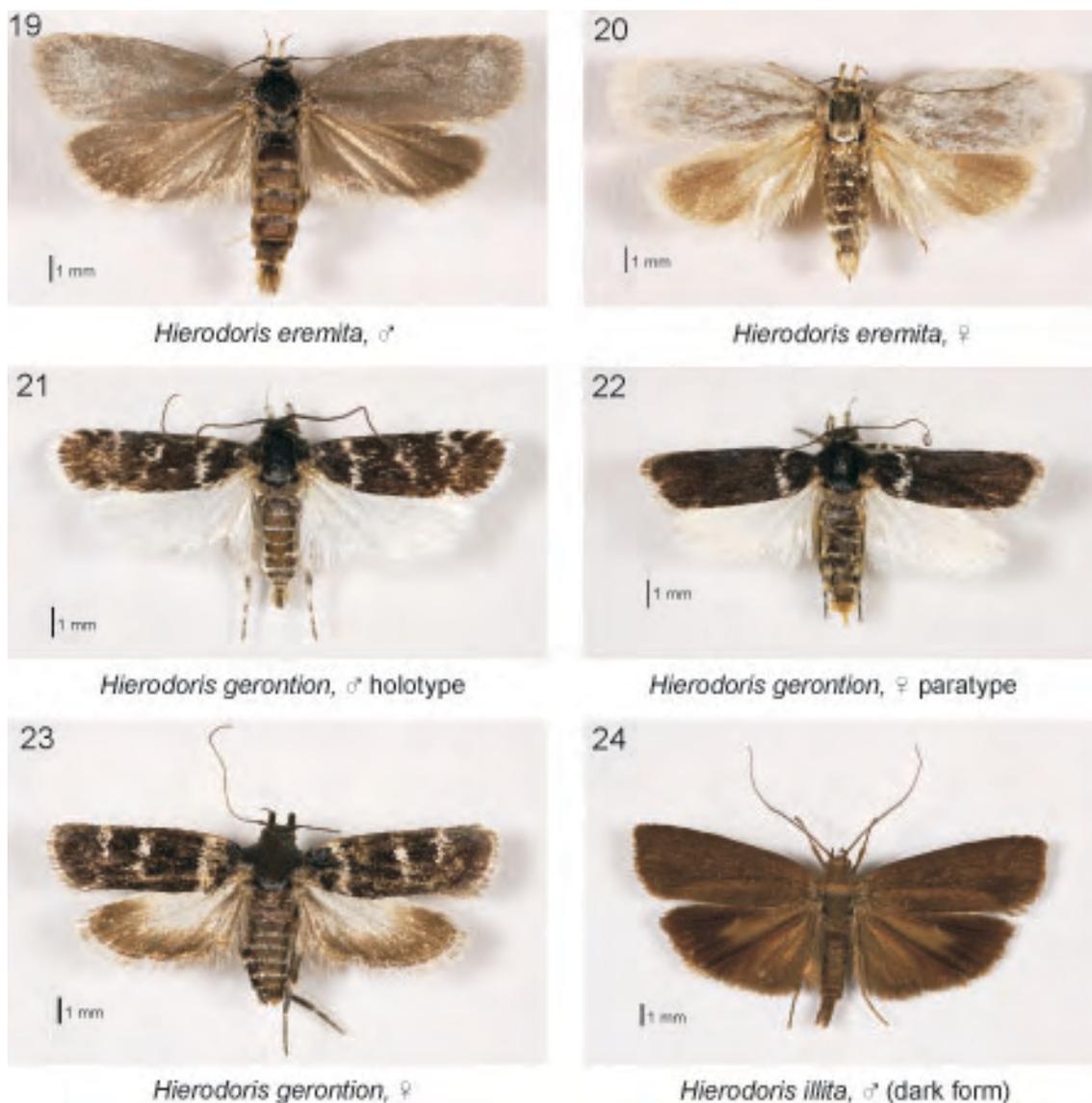


Fig. 19–24 Adults: (19) *Hierodoris eremita*, male (WD: Fox Glacier, 1340 m, 19 Jan 1996); (20) *H. eremita*, female (MK: Ball Ridge, Tasman Valley, ex *Celmisia coriacea*, emg. Aug-Sep 1977); (21) *H. gerontion*, male holotype (CO: Old Man Range, 1640 m, 11 Feb 1982); (22) *H. gerontion*, female paratype (CO: Old Man Range, 1640 m, 11 Feb 1982); (23) *H. gerontion* (CO: Rock and Pillar Range, 1200 m, 25 Feb 1983); (24) *H. illita*, male (WN: Gollans Valley, 24 Dec 1921).

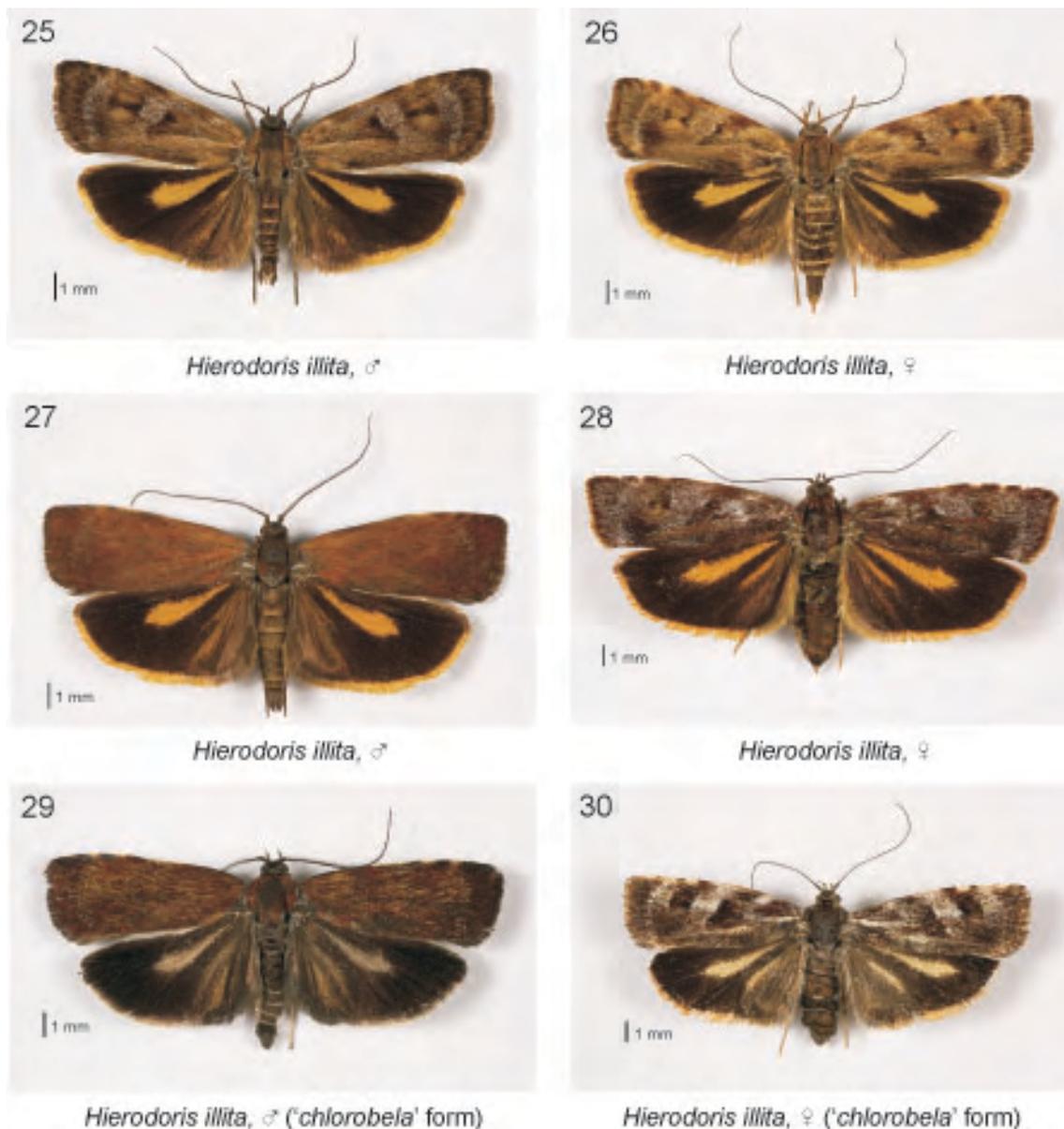


Fig. 25–30 Adults, *Hierodoris illita*: (25) male (AK: Titirangi, 26 Jan 1999); (26) female (AK: Titirangi, Little Muddy Ck, ex *Coriaria arborea*, emg. 24 Nov 2001); (27) male (BP: Mt Ngongotaha, 850 m, 28 Dec 1983); (28) female (TK: Waitaanga Plateau, N. G. Tucker Res., 520 m, 16 Dec 1981); (29) male (WD: The Windbag, 5–6 Jan 1999); (30) female (WD: The Windbag, 5–6 Jan 1999).

*Hierodoris squamea*, ♂*Hierodoris squamea*, ♀*Hierodoris stella*, ♂*Hierodoris stella*, ♀*Hierodoris pachystegiae*, ♂ holotype*Hierodoris pachystegiae*, ♀ paratype

Fig. 31–36 Adults: (31) *Hierodoris squamea*, male (FD: Borland Saddle, 988 m, 21 Dec 1985); (32) *H. squamea*, female (FD: Mt Luxmore, 1000 m, 8 Feb 1987); (33) *H. stella*, male (BP: Mamaku Plateau, Tarukenga Sc. Res., 10 Jan 1985); (34) *H. stella*, female (AK: Titirangi, 11 Dec 1999); (35) *H. pachystegiae*, male holotype (KA: Woodside Creek, ex *Pachystegia insignis*, emg. 19 Apr 1999); (36) *H. pachystegiae*, female paratype (KA: Woodside Creek, ex *Pachystegia insignis*, emg. 16 Apr 1999).

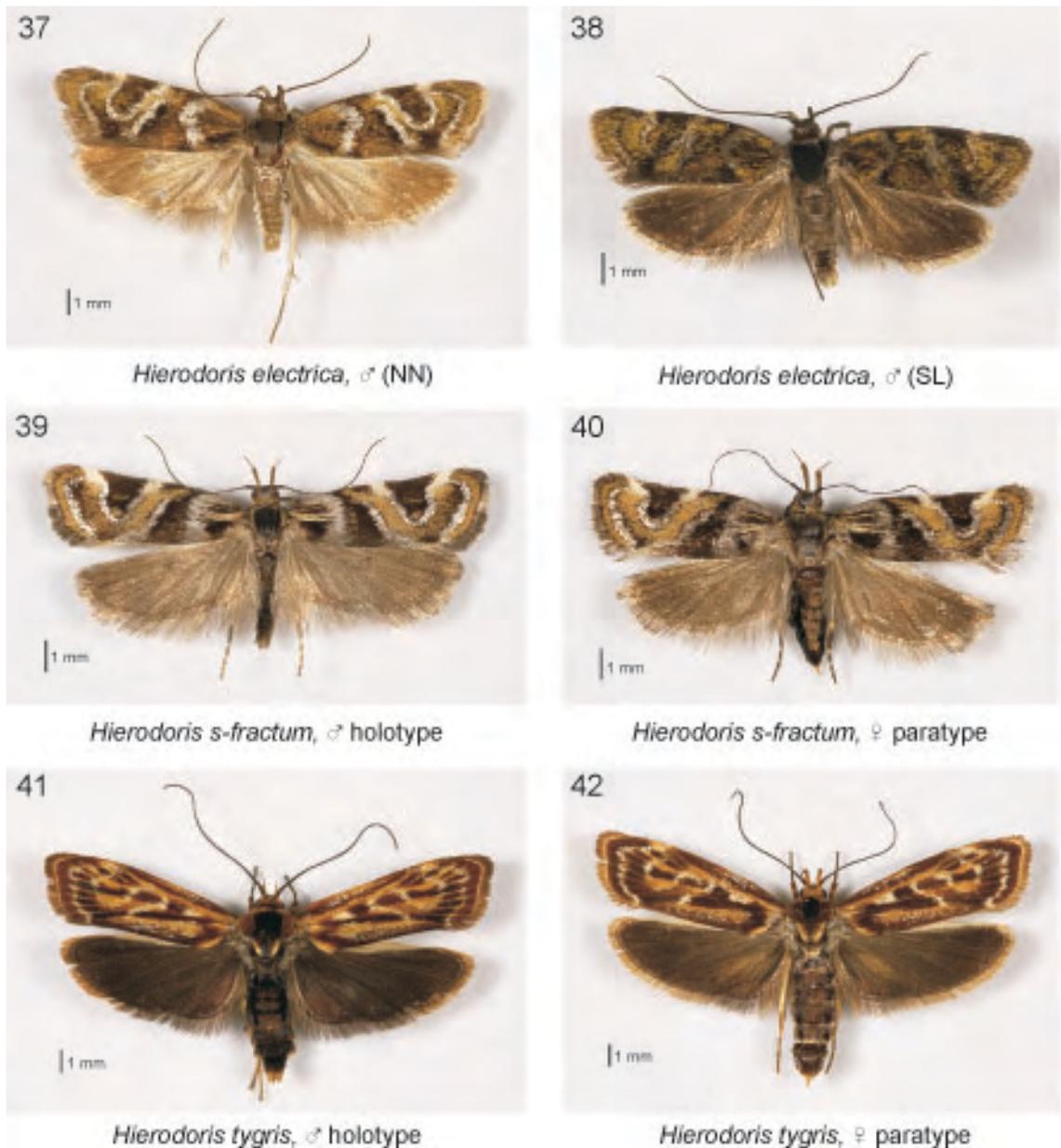


Fig. 37–42 Adults: (37) *Hierodoris electrica*, male (NN: 'Nelson', 26 Dec 1924); (38) *H. electrica*, male (SL: Blue Mountains, 920 m, 8 Jan 1984); (39) *H. s-fractum*, male holotype (MC: West Melton, 22 Jan 1988); (40) *H. s-fractum*, female paratype (MC: West Melton, 22 Jan 1988); (41) *H. tygris*, male holotype (AK: Titirangi, 7 Jan 2000); (42) *H. tygris*, female paratype (AK: Titirangi, 29 Jan 2001).

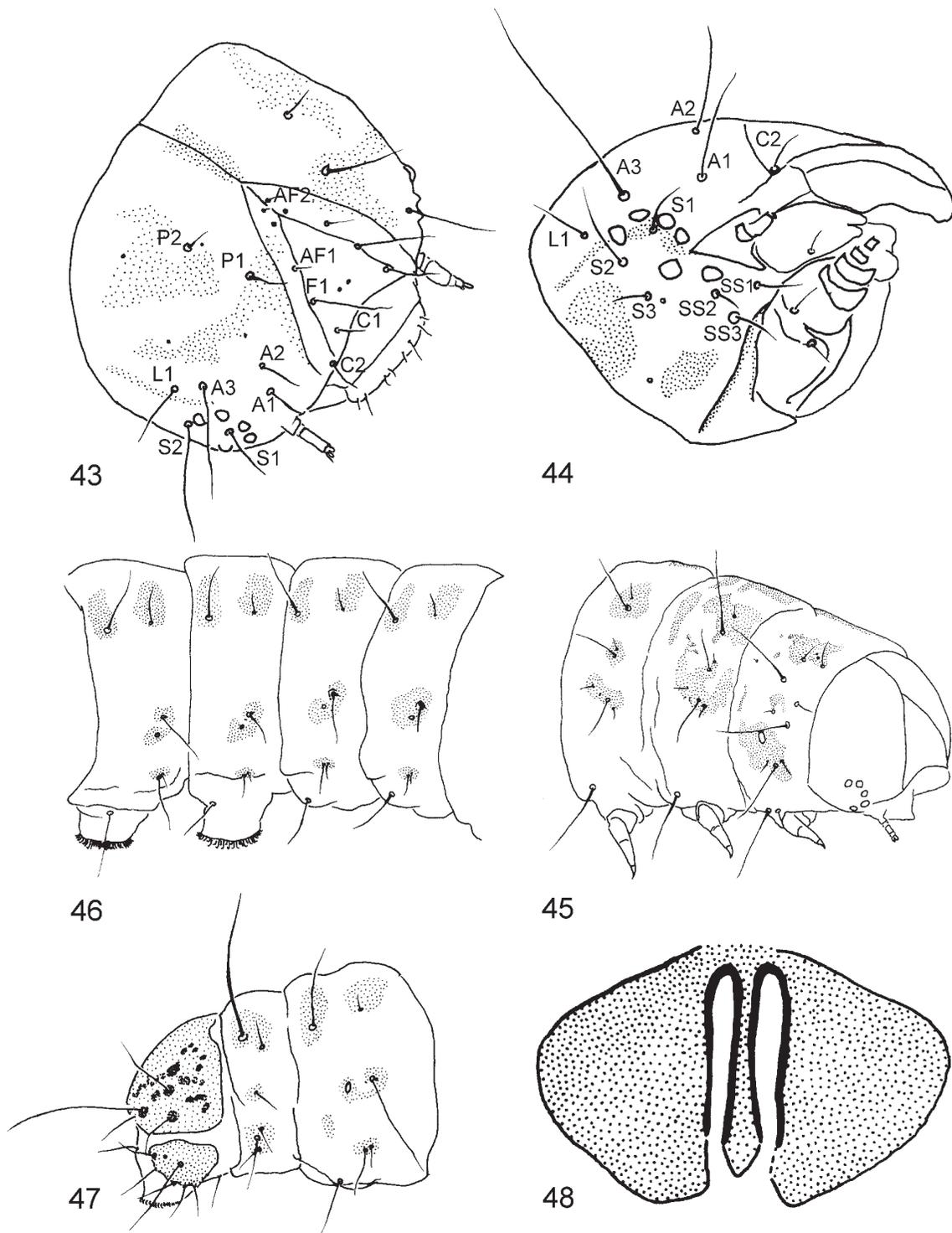
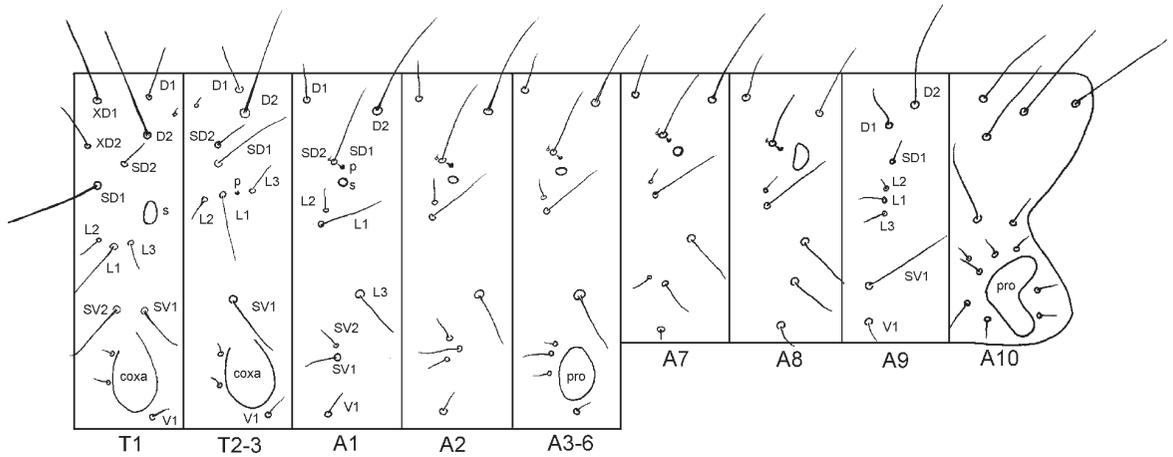
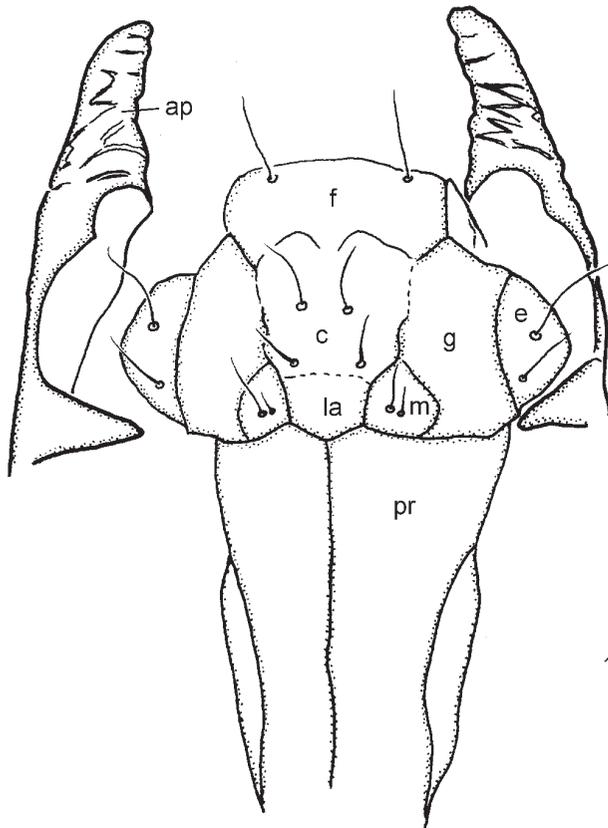


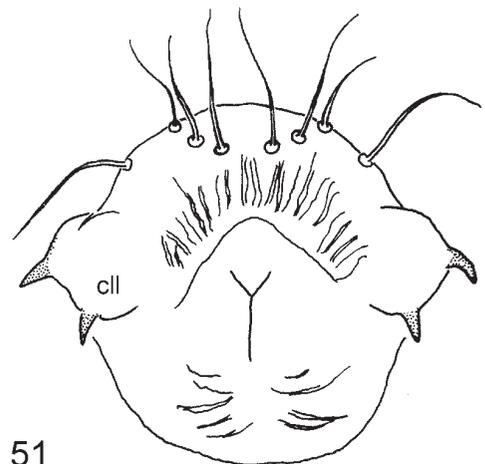
Fig. 43–48 *Hierodoris illita*, larva: (43) head, dorsolateral view showing chaetotaxy; (44) head, ventrolateral view showing chaetotaxy; (45) head and thorax, lateral view; (46) A1–4, lateral view; (47) A8–10, lateral view; (48) mentum sclerite, showing longitudinal slits (anterior end above).



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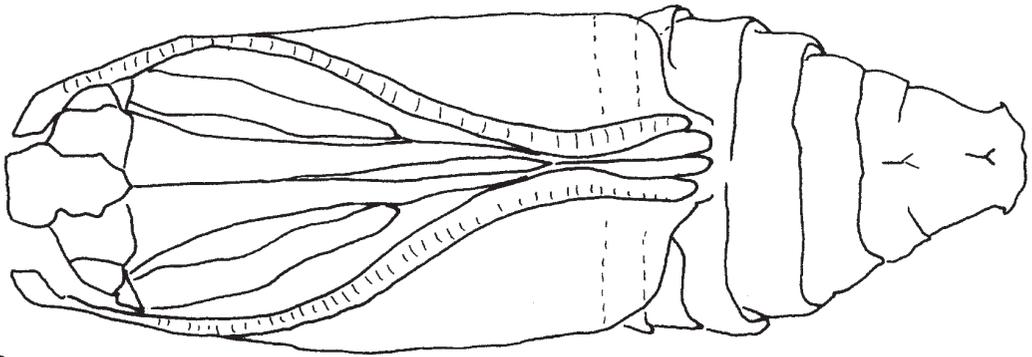


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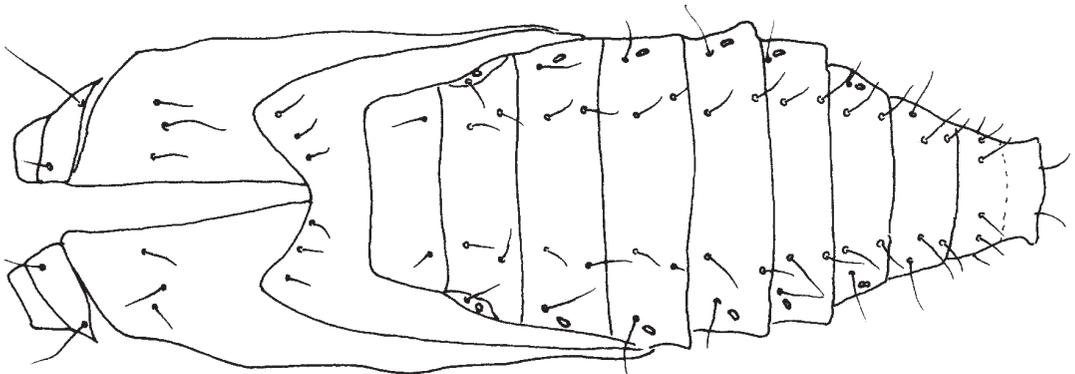


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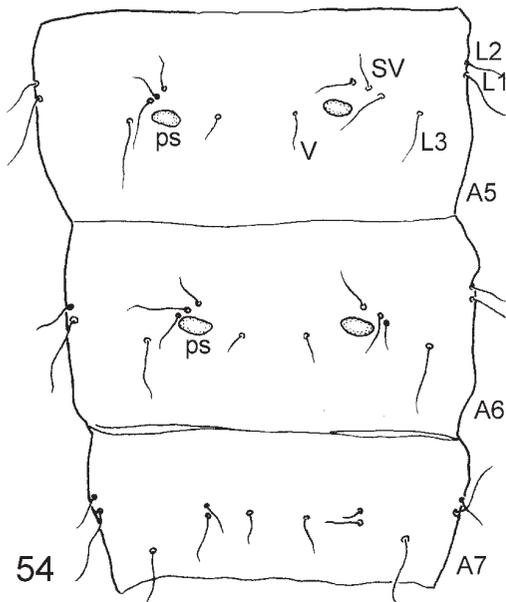
Fig. 49–51 (49) *Hierodoris illita*, larval chaetotaxy (p = pore; pro = proleg; s = spiracle); (50, 51) *H. callispora*, pupal exuviae: (50) head, ventral view (ap = antennal process; c = clypeus; e = eyepiece; f = frons; g = gena; la = labrum; m = mandible; pr = proboscis); (51) A10, caudal view (ccll = cremaster lateral lobe).



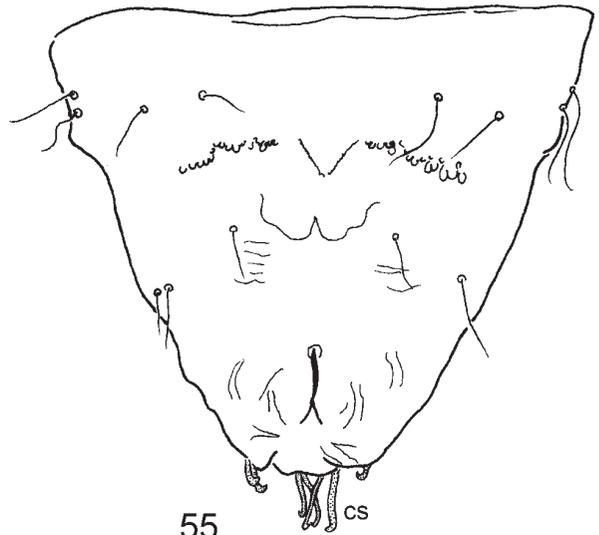
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Fig. 52–55 Pupal exuviae: (52, 53) *Hierodoris illita*: (52) habitus, ventral, chaetotaxy omitted; (53) habitus, dorsal, showing chaetotaxy; (54, 55) *H. eremita*, ventral: (54) A5–7 (ps = proleg scar); (55) A8–10 (cs = cremaster setae).

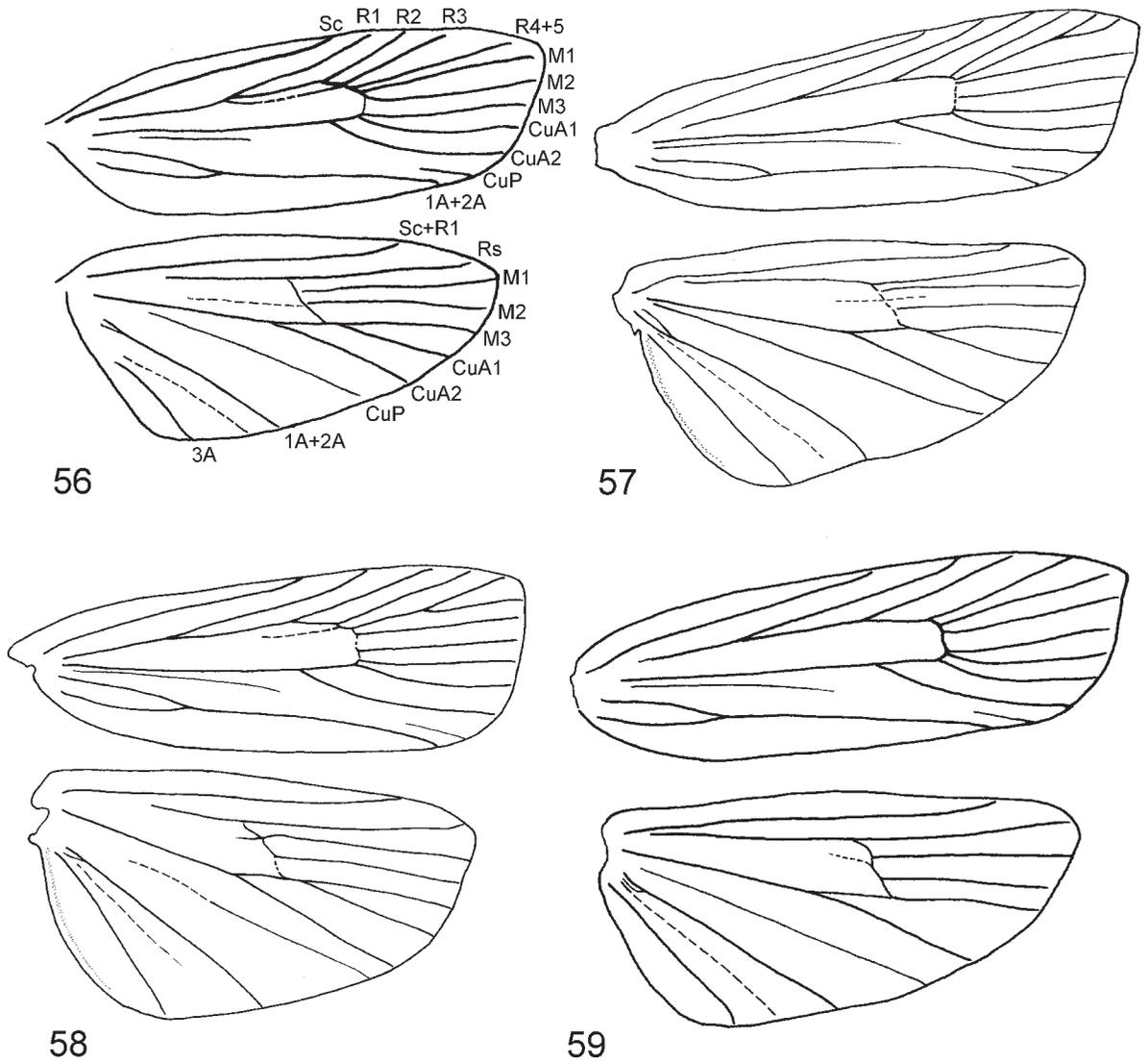


Fig. 56–59 Wing venation: (56) *Hierodoris frigida*; (57) *H. callispora*; (58) *H. illita*; (59) *H. tygris*.

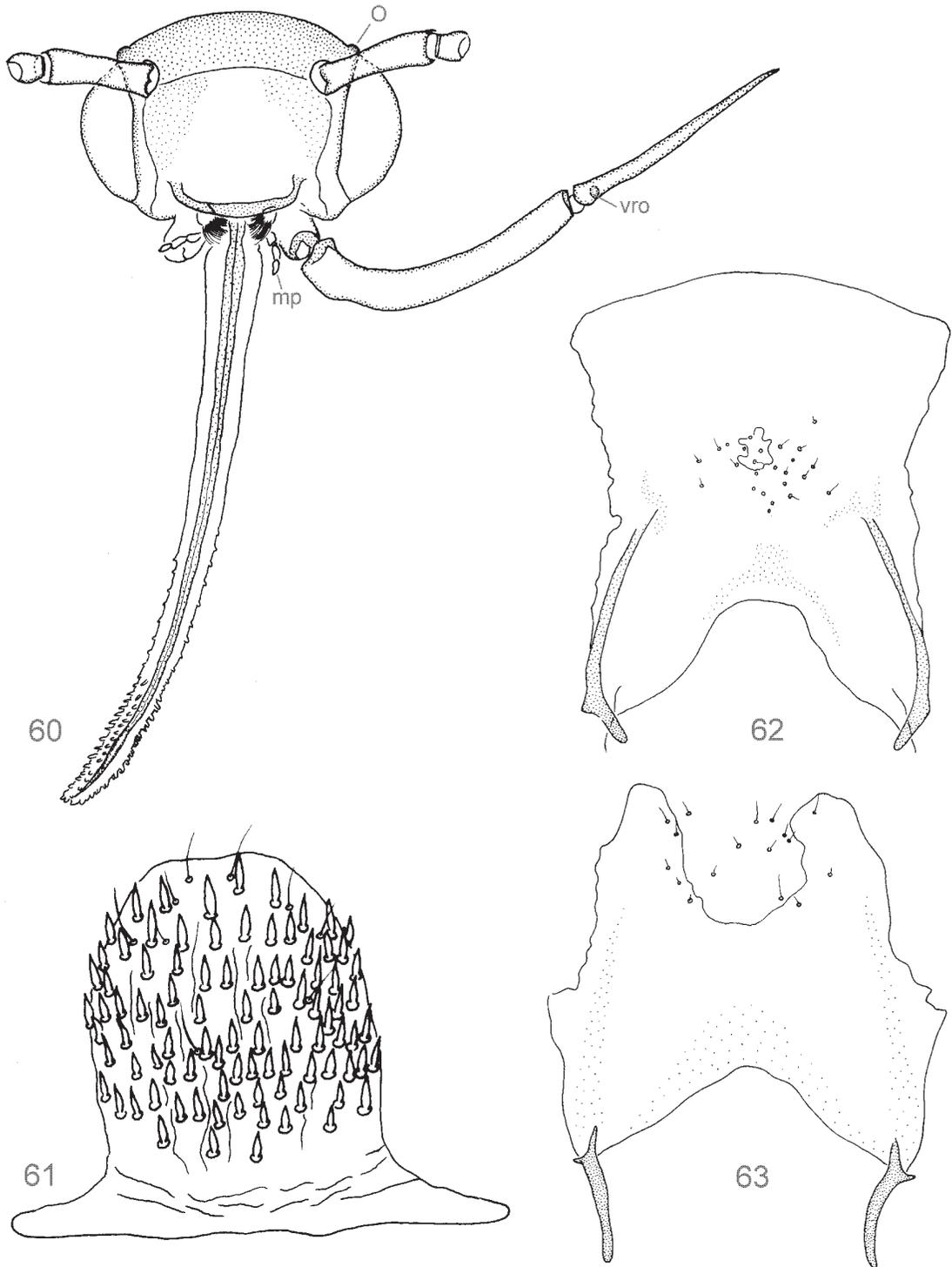


Fig. 60–63 (60) *Hierodoris frigida* female, descaled head, frontal view, right labial palp omitted (mp = maxillary palp; o = ocellus; vro = Vom Rath's organ); (61) *H. stella* male, T7 showing spines; (62, 63) *H. atychioides*, S2: (62) male; (63) female. (Fig. 61–63 with anterior end to bottom of page.)

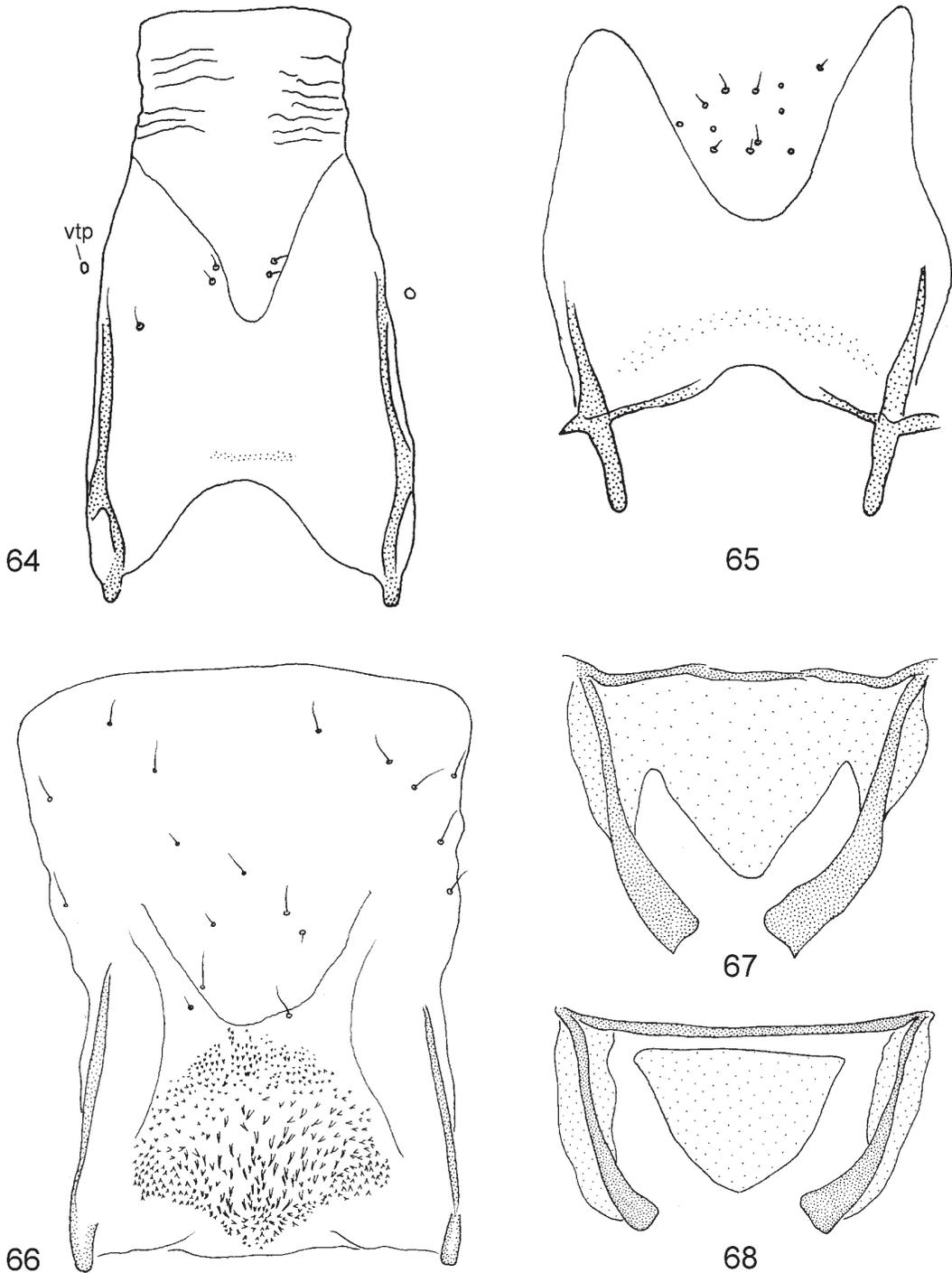


Fig. 64–68 Structures of abdominal base: (64–66) S2: (64) *Hierodoris iophanes* male (vtp = ventral tuberculate plate); (65) *H. iophanes* female; (66) *H. illita* male; (67, 68) *H. iophanes*, T1: (67) male; (68) female. (Anterior end to bottom of page.)

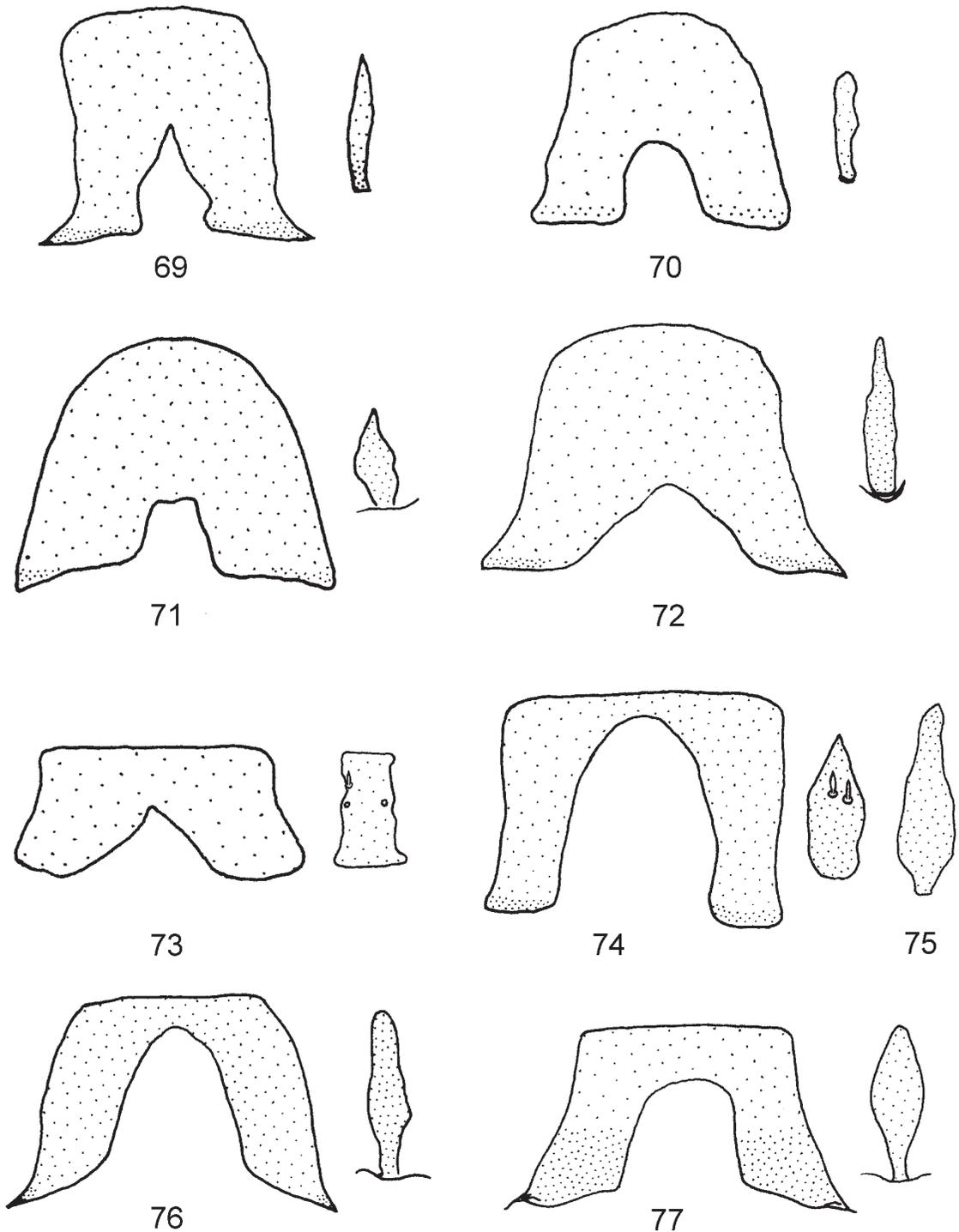


Fig. 69–77 Male S8 (left) and T8 (right): (69) *Hierodoris iophanes*; (70) *H. frigida*; (71) *H. polita*; (72) *H. huia*; (73) *H. torrida*; (74) *H. atychioides* (AK); (75) *H. atychioides*, T8 only (TO); (76) *H. bilineata*; (77) *H. callispora*. (Anterior end to bottom of page.)

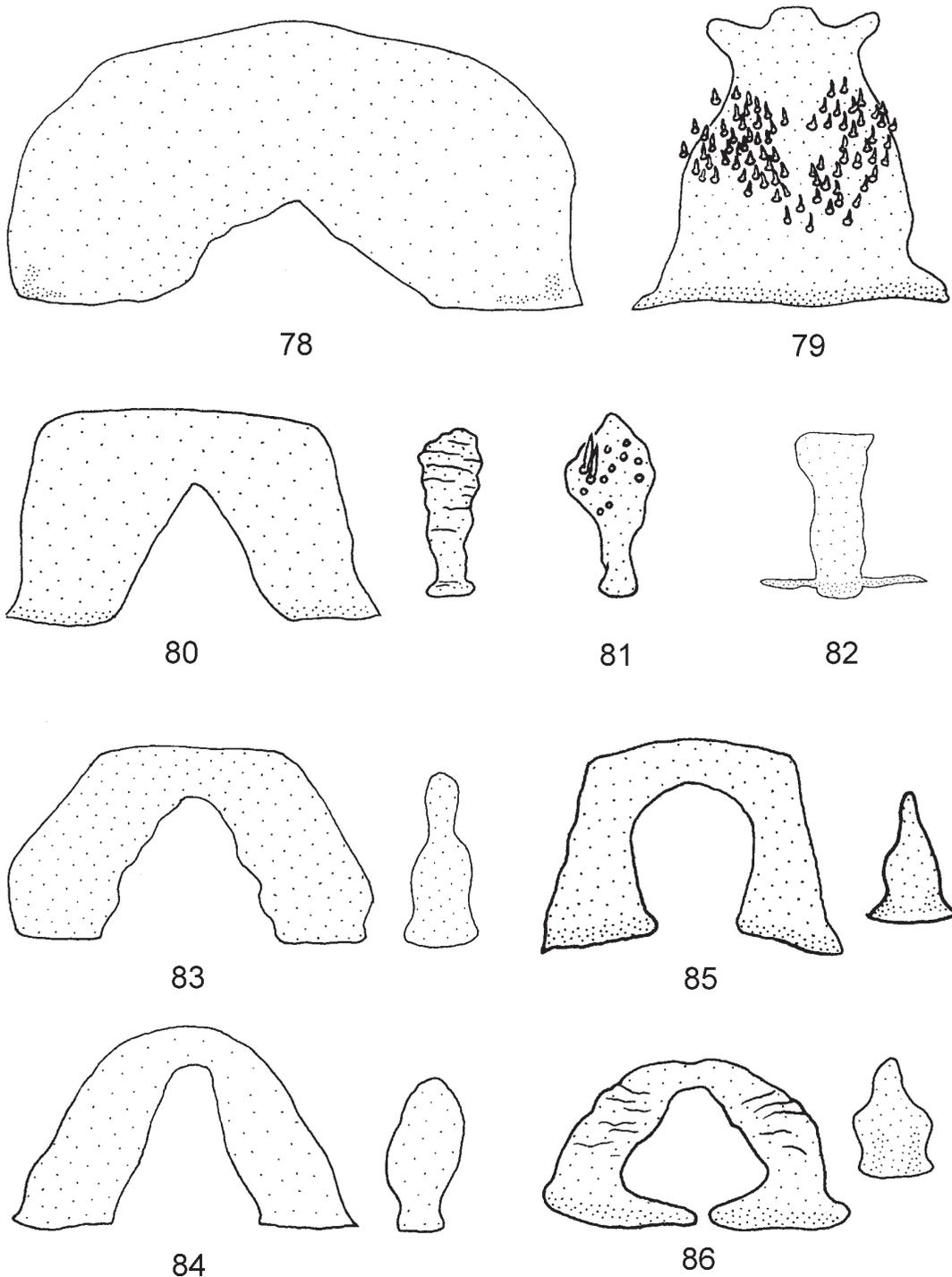
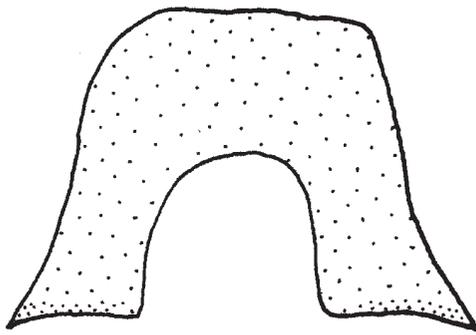
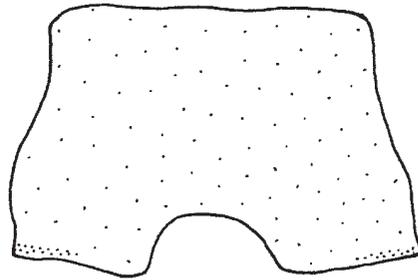


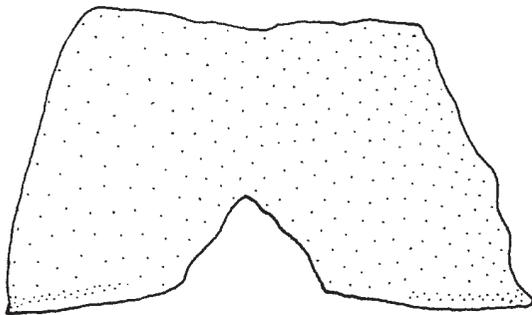
Fig. 78–86 Male S8 (left) and T8 (right): (78) *Hierodoris eremita*, S8; (79) *H. eremita*, T8; (80) *H. gerontion* (Old Man Range CO); (81) *H. gerontion*, T8 only (Lammermoor Range CO); (82) *H. illita*, T8 only (TK); (83) *H. illita* (AK); (84) *H. sesioides*; (85) *H. squamea* holotype (Mt Cleughearn FD); (86) *H. squamea* (Mt Luxmore FD). (Anterior end to bottom of page.)



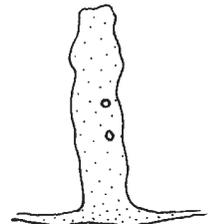
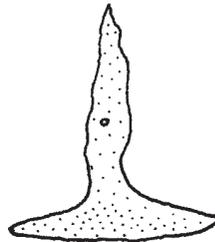
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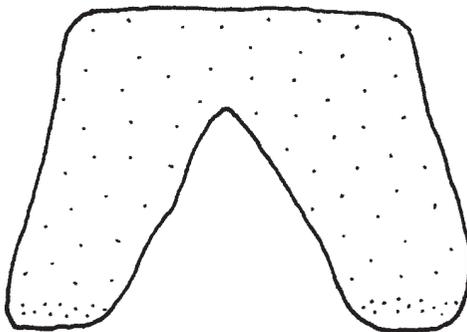
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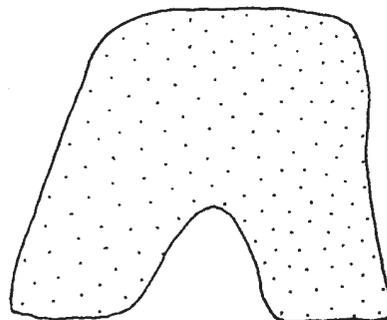
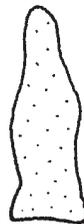
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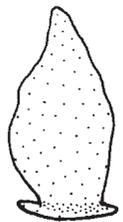


Fig. 87–92 Male S8 (left) and T8 (right): (87) *Hierodoris stella*; (88) *H. electrica* (NN); (89) *H. electrica*, T8 only (SL); (90) *H. pachystegiae*; (91) *H. s-fractum*; (92) *H. tygris*. (Anterior end to bottom of page.)

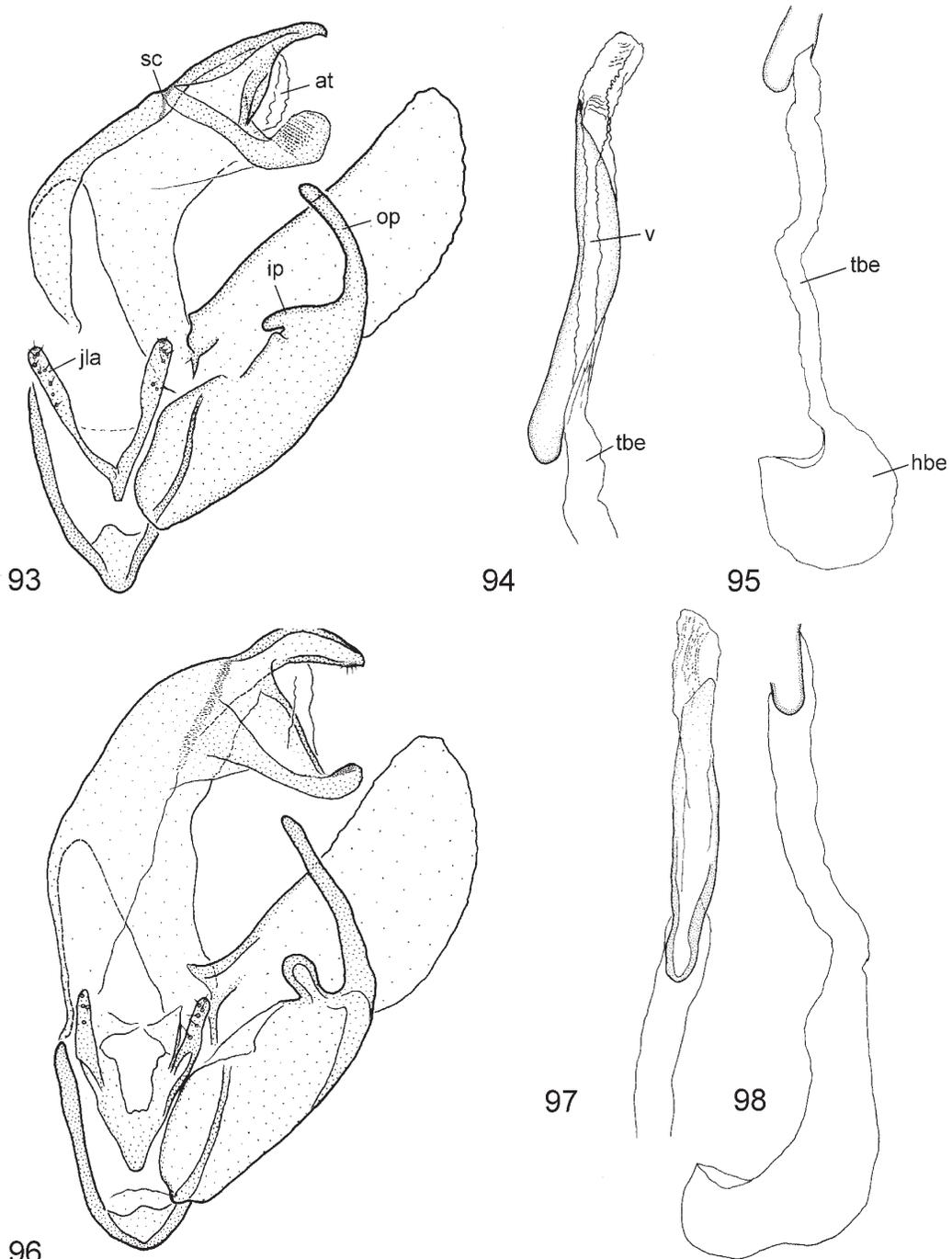


Fig. 93–98 Male genitalia (lengths in parentheses): (93–95) *Hierodoris iophanes*: (93) genital capsule (950 μm) (at = anal tube; ip = inner process of sacculus; jla = juxta lateral arm; op = outer process of sacculus; sc = striated cuticle); (94) aedeagus, lateral (1050 μm) (tbe = tubular portion of bulbus ejaculatorius; v = vesica); (95) bulbus ejaculatorius (1300 μm) (hbe = 'hood' of bulbus; tbe = tubular portion); (96–98) *H. frigida*: (96) genital capsule (1050 μm); (97) aedeagus, ventral (950 μm); (98) bulbus ejaculatorius (1300 μm).

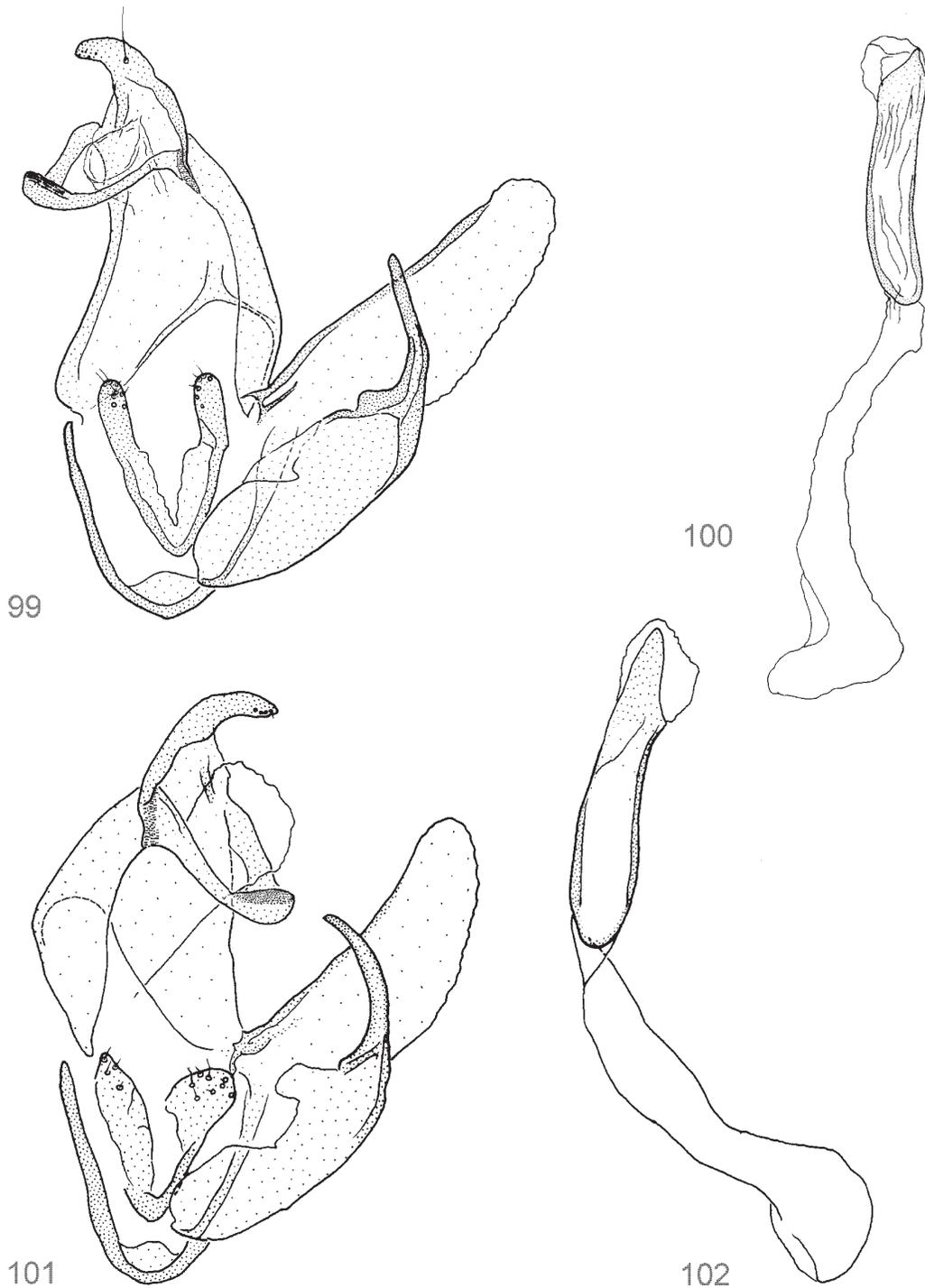


Fig. 99–102 Male genitalia (lengths in parentheses): (99, 100) *Hierodoris polita*: (99) genital capsule (1000 μm); (100) aedeagus and bulbus ejaculatorius, ventral (1650 μm); (101, 102) *H. torrida*: (101) genital capsule (900 μm); (102) aedeagus and bulbus ejaculatorius (1150 μm).

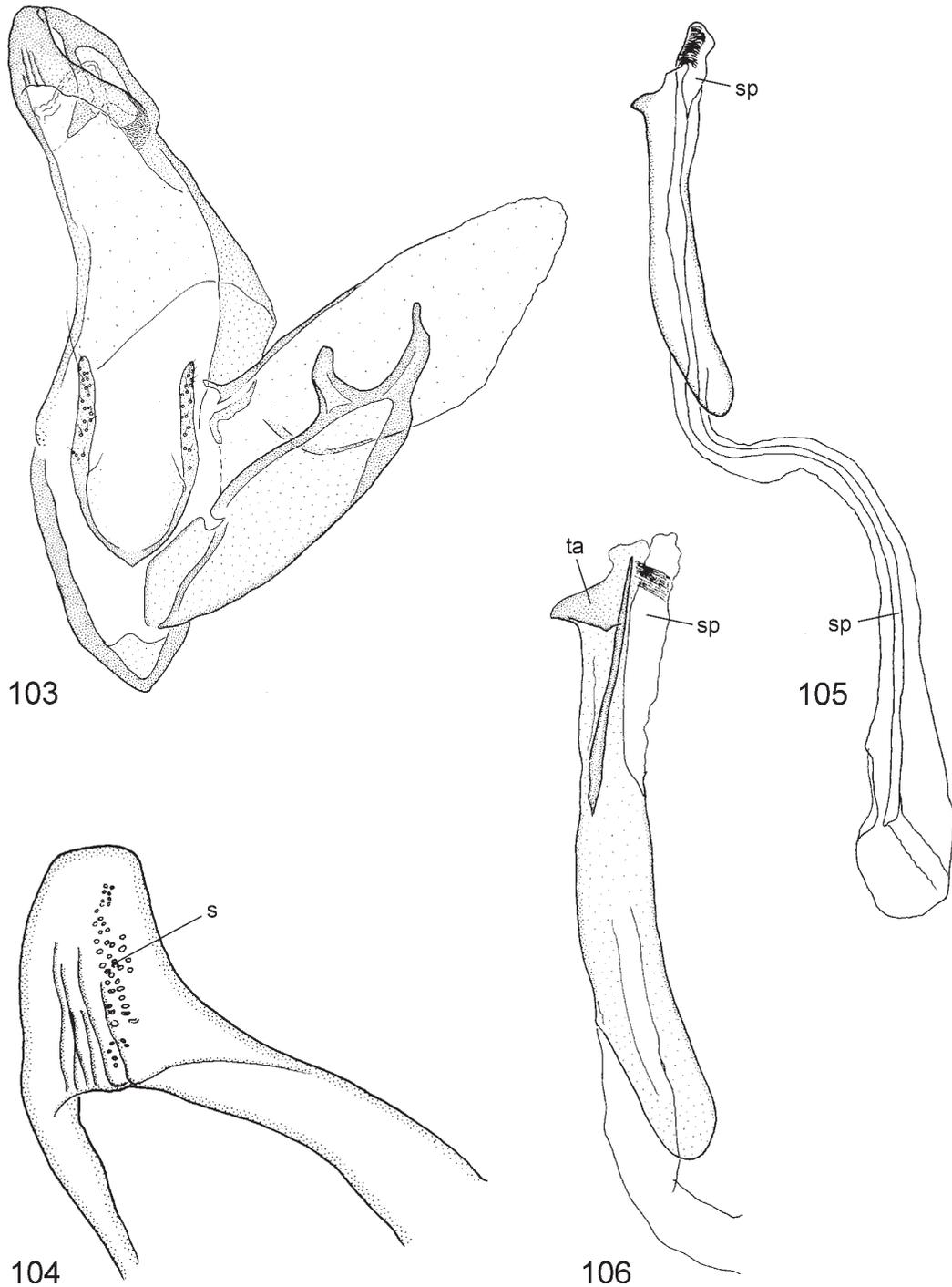


Fig. 103–106 *Hierodoris huia*, male genitalia (lengths in parentheses): (103) genital capsule (1650 μm); (104) gnathos, ventrolateral (s = scobinations of dorsal surface); (105) aedeagus (lateral, cornutus omitted) and bulbus ejaculatorius, showing spermatophore (sp) (3500 μm); (106) aedeagus, showing cornutus (1500 μm) (sp = spermatophore; ta = 'tooth' of aedeagus).

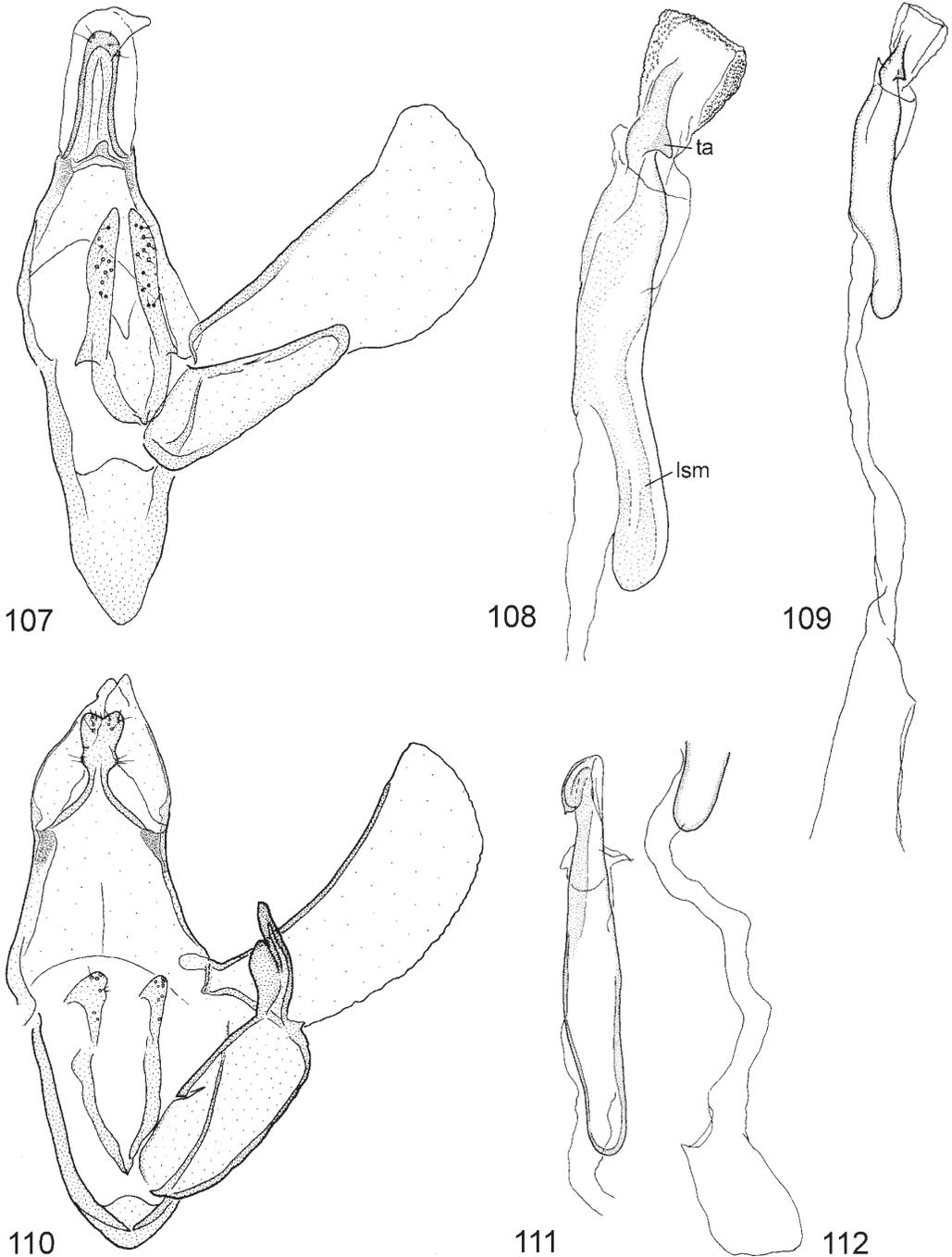


Fig. 107–112 Male genitalia (lengths in parentheses): (107–109) *Hierodoris atychioides*: (107) genital capsule (1600 μm); (108) aedeagus, lateral (scobinations of vesica only partly indicated) (1750 μm) (lsm = lateral sclerite of manica; ta = 'tooth' of aedeagus); (109) aedeagus and bulbus ejaculatorius (base of bulbus 'hood' omitted) (4300 μm , including 'hood'); (110–112) *H. bilineata*: (110) genital capsule (1150 μm); (111) aedeagus, ventral (1150 μm); (112) bulbus ejaculatorius (1150 μm).

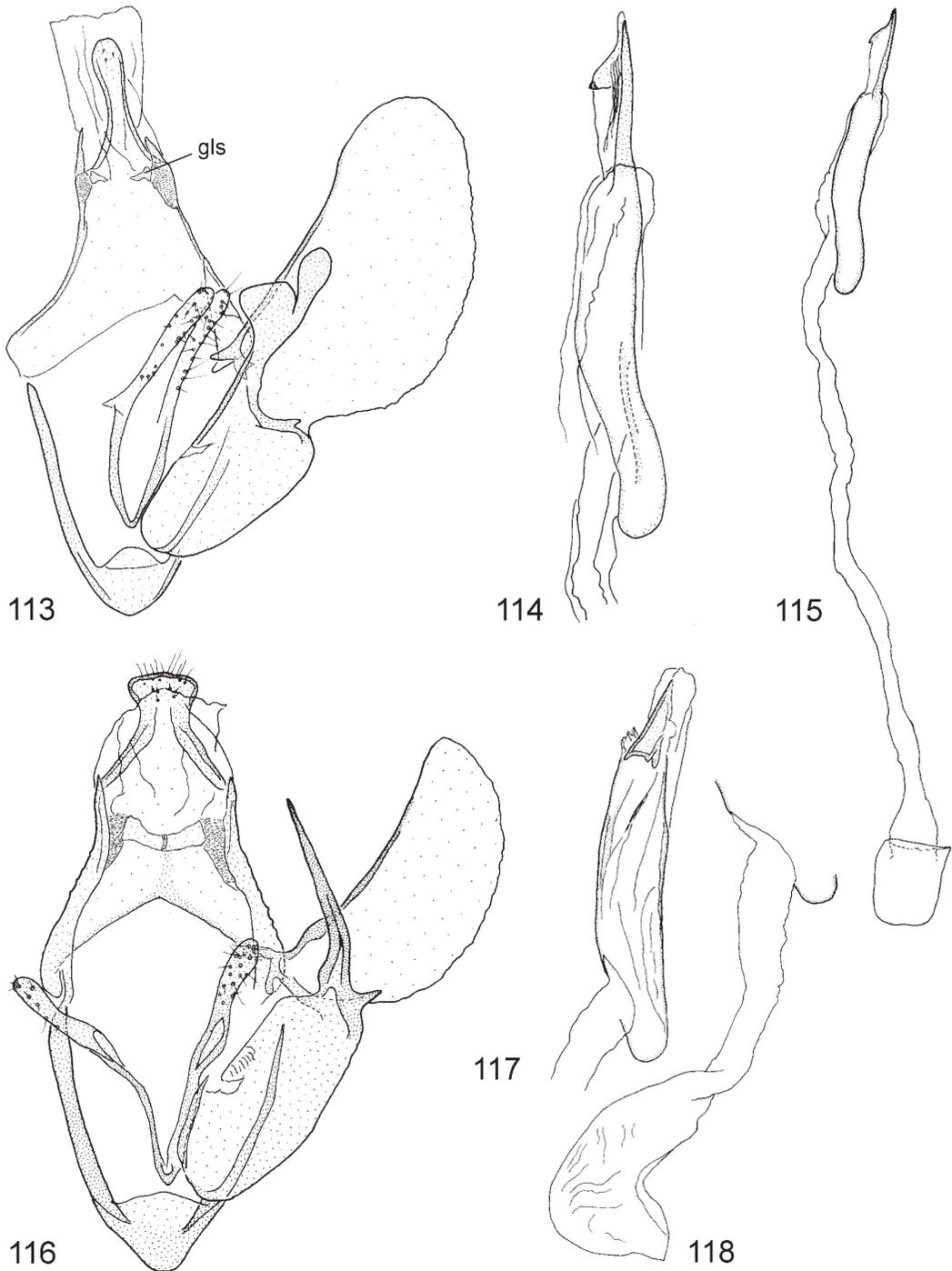


Fig. 113–118 Male genitalia (lengths in parentheses): (113–115) *Hierodoris callispora*: (113) genital capsule (1400 μm) (gls = gnathos lateral sclerite); (114) aedeagus, lateral (1100 μm); (115) aedeagus and bulbus ejaculatorius (3550 μm); (116–118) *H. gerontion*: (116) genital capsule (1300 μm); (117) aedeagus, lateral (1150 μm); (118) bulbus ejaculatorius (1000 μm).

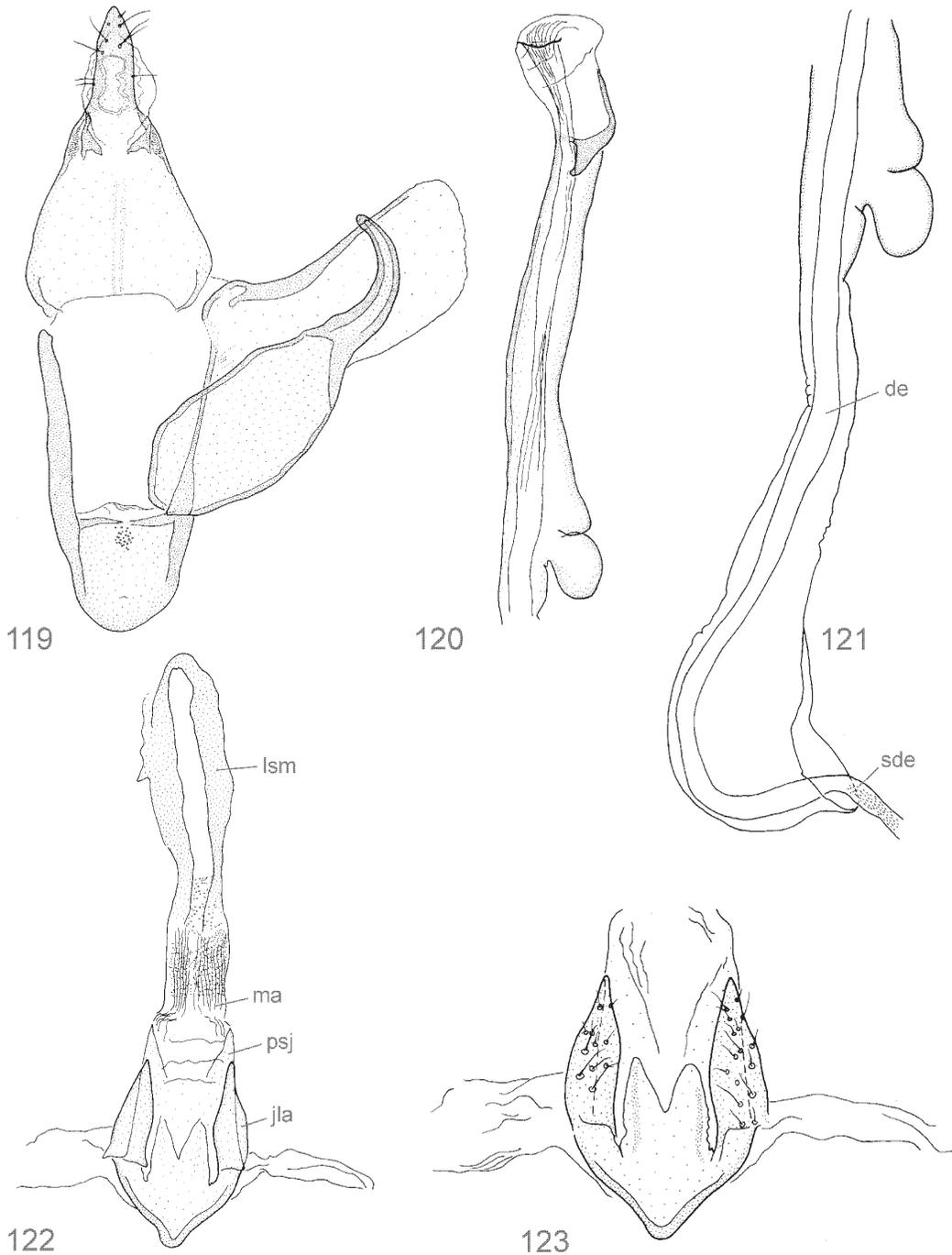


Fig. 119–123 *Hierodoris eremita*, male genitalia (lengths in parentheses): (119) genital capsule, juxta omitted (2100 μm); (120) aedeagus, lateral, without manica, showing ductus ejaculatorius (1800 μm); (121) bulbus and base of ductus ejaculatorius (1300 μm) (de = ductus ejaculatorius; sde = spiculate portion of ductus); (122) juxta, with everted manica (jla = juxta lateral arm; lsm = lateral sclerite of manica; ma = apex of manica; psj = posterior sclerite of juxta); (123) juxta, base.

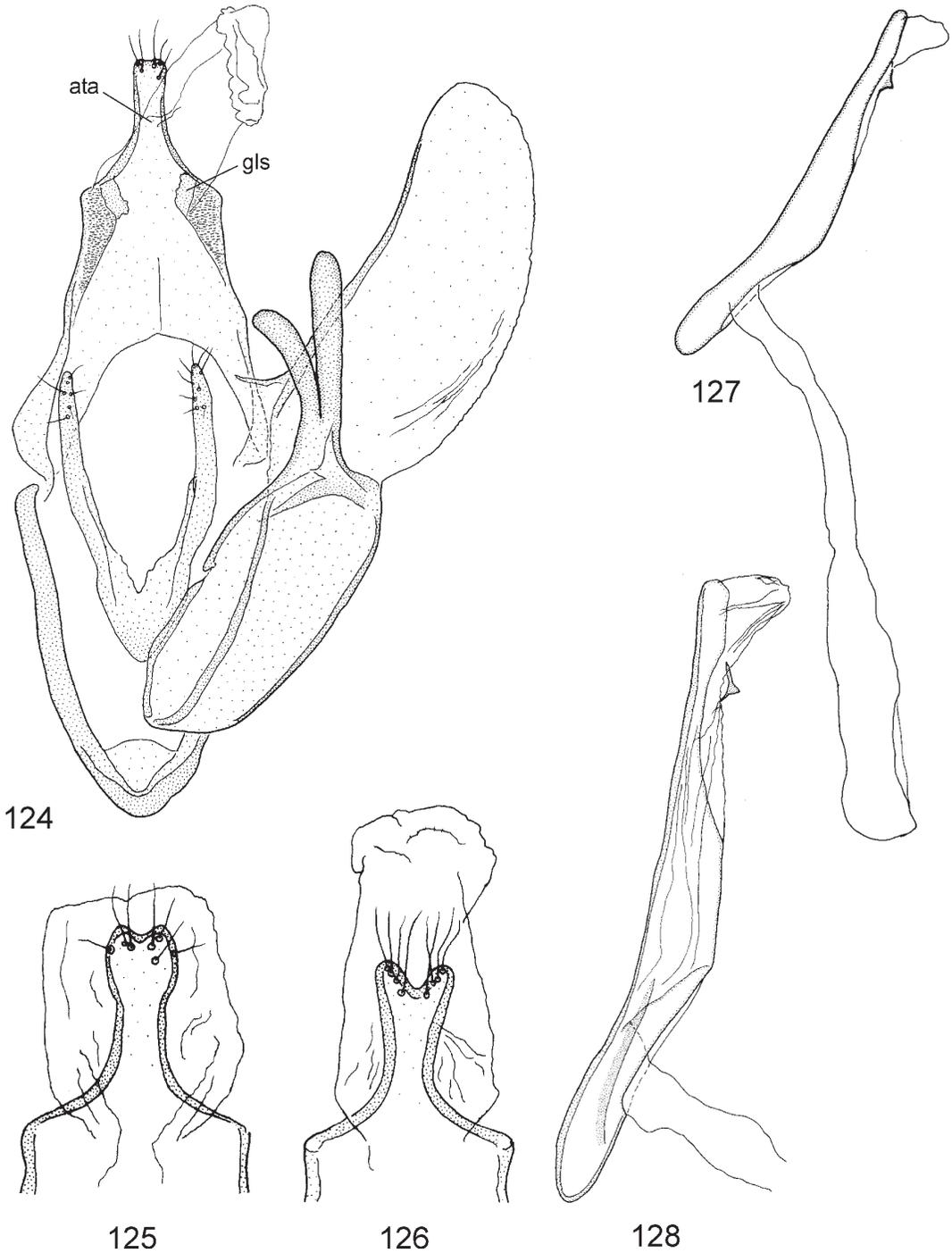


Fig. 124–128 *Hierodoris illita*, male genitalia (lengths in parentheses): (124) genital capsule (AK) (1900 μm) (ata = anal tube attachment point to uncus; gls = gnathos lateral sclerite); (125) uncus (TO); (126) uncus (TK); (127) aedeagus and bulbus ejaculatorius (3650 μm); (128) aedeagus, lateral (1950 μm).

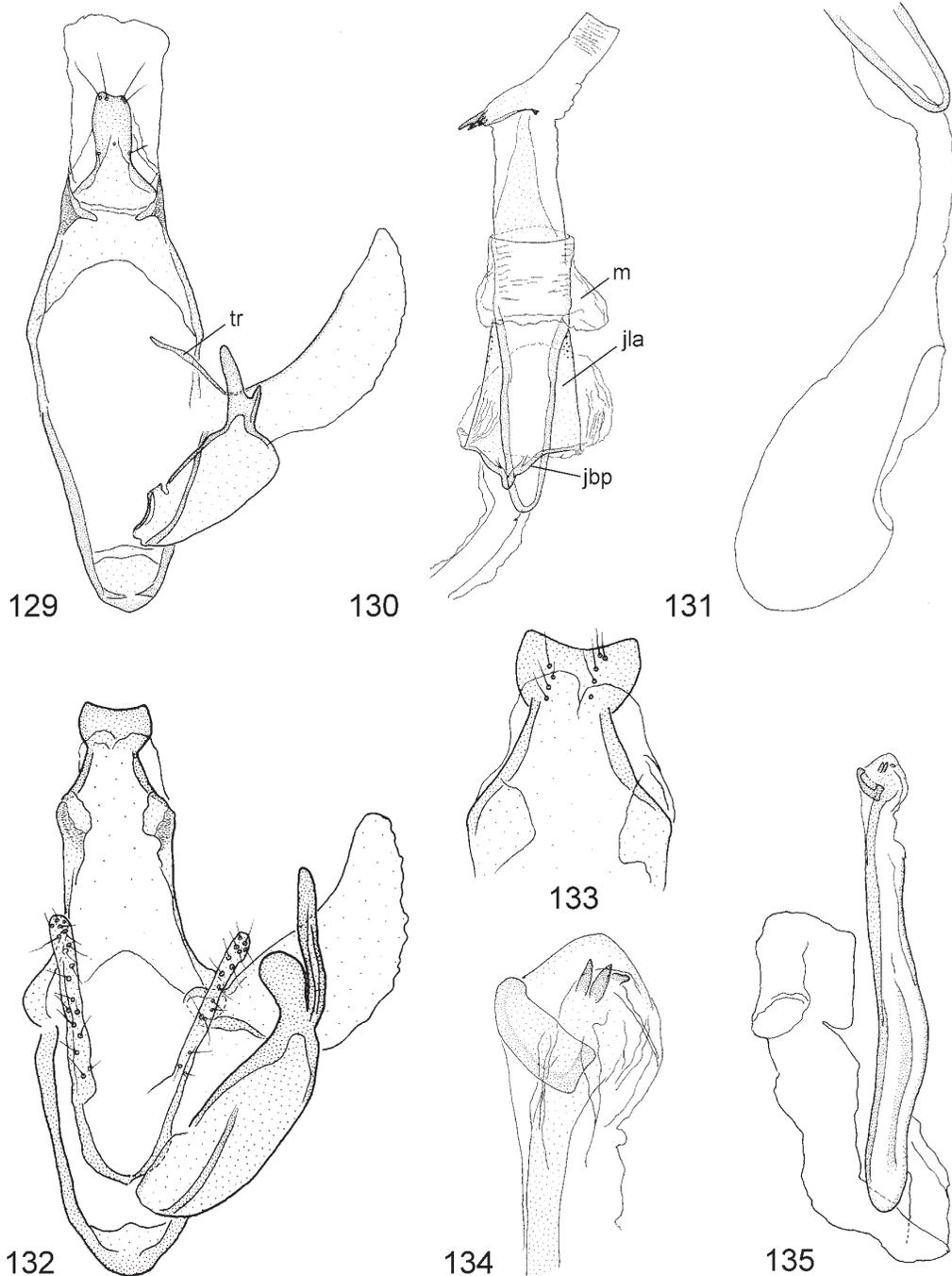


Fig. 129–135 Male genitalia (lengths in parentheses): (129–131) *Hierodoris sesioides*: (129) genital capsule, juxta omitted (1400 μm) (tr = sclerotised transtilla); (130) juxta and aedeagus, ventral (1700 μm) (jbp = juxta base plate; jla = juxta lateral arm; m = manica); (131) bulbus ejaculatorius (1500 μm); (132–135) *H. stella*: (132) genital capsule (1050 μm); (133) uncus, showing setae; (134) tip of aedeagus; (135) aedeagus and bulbus ejaculatorius, lateral (unfolded length 2300 μm).

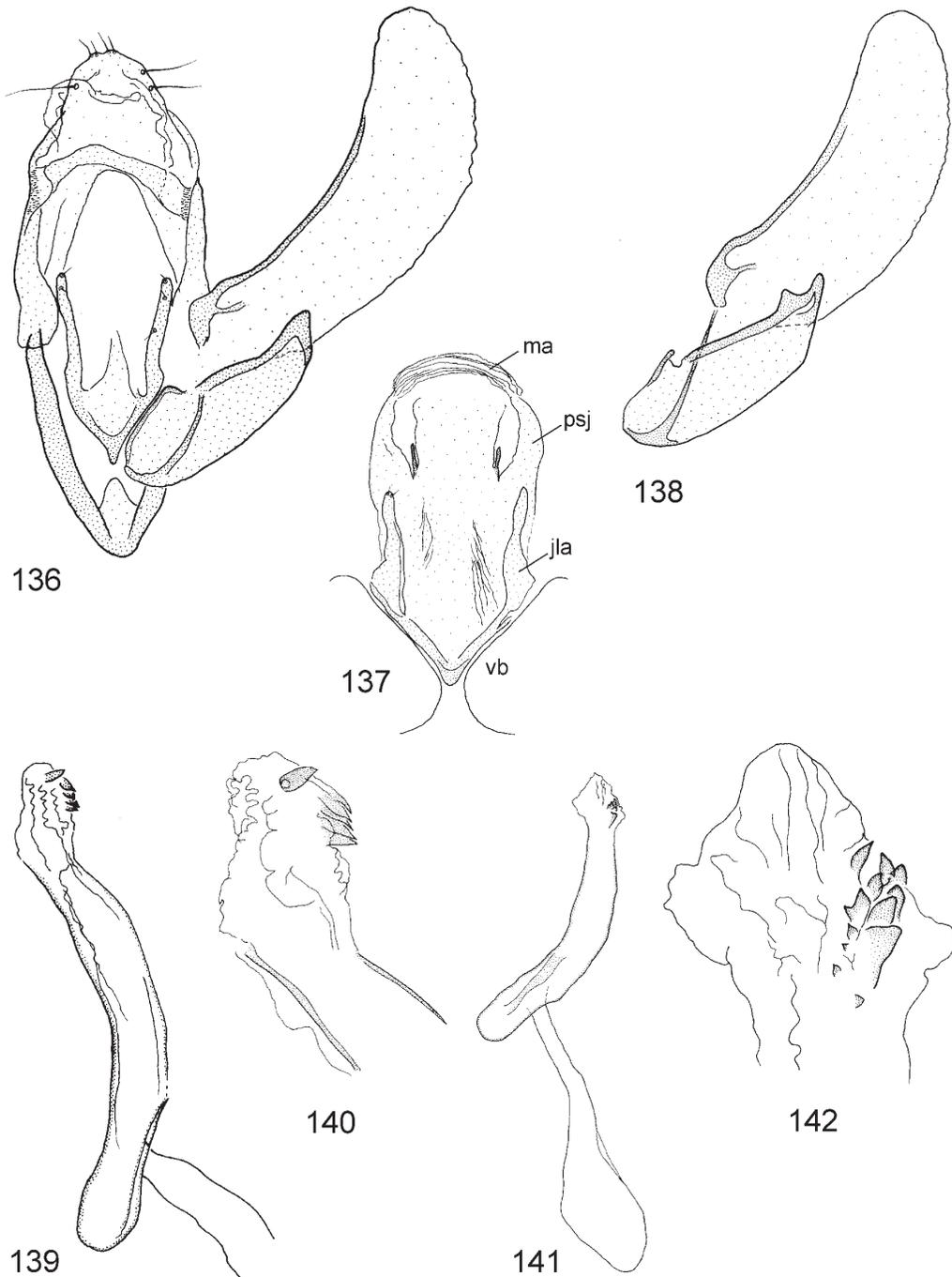


Fig. 136–142 *Hierodoris squamea*, male genitalia (lengths in parentheses): (136) genital capsule, holotype (Mt Cleughearn FD) (900 μ m); (137) juxta, showing reduced lateral arms (Mt Luxmore FD) (jla = juxta lateral arm; ma = apex of manica; psj = posterior sclerite of juxta; vb = valva base); (138) valva (Turret Range FD); (139) aedeagus, lateral (Mt Burns FD) (700 μ m); (140) same, detail of cornuti; (141) aedeagus and bulbus ejaculatorius, lateral (Turret Range FD) (1750 μ m); (142) same, detail of cornuti.

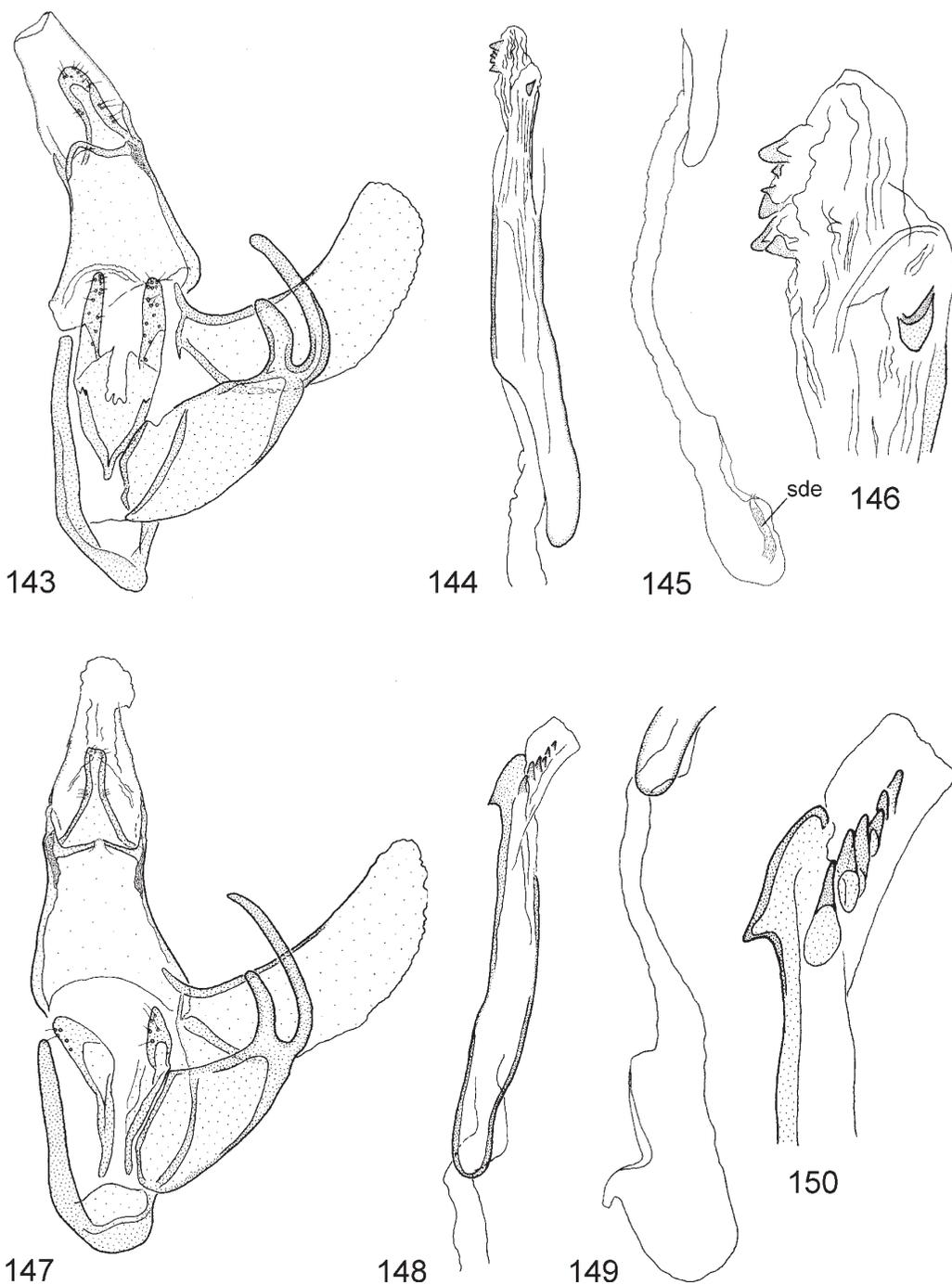


Fig. 143–150 Male genitalia (lengths in parentheses): (143–146) *Hierodoris electrica* (SL): (143) genital capsule (1300 μm); (144) aedeagus, lateral (1250 μm); (145) bulbus ejaculatorius (1400 μm) (sde = spiculate portion of ductus ejaculatorius); (146) detail of aedeagus apex, showing cornuti; (147–150) *H. s-fractum*: (147) genital capsule (1200 μm); (148) aedeagus, ventral (1000 μm); (149) bulbus ejaculatorius (1000 μm); (150) detail of aedeagus apex, showing cornuti.

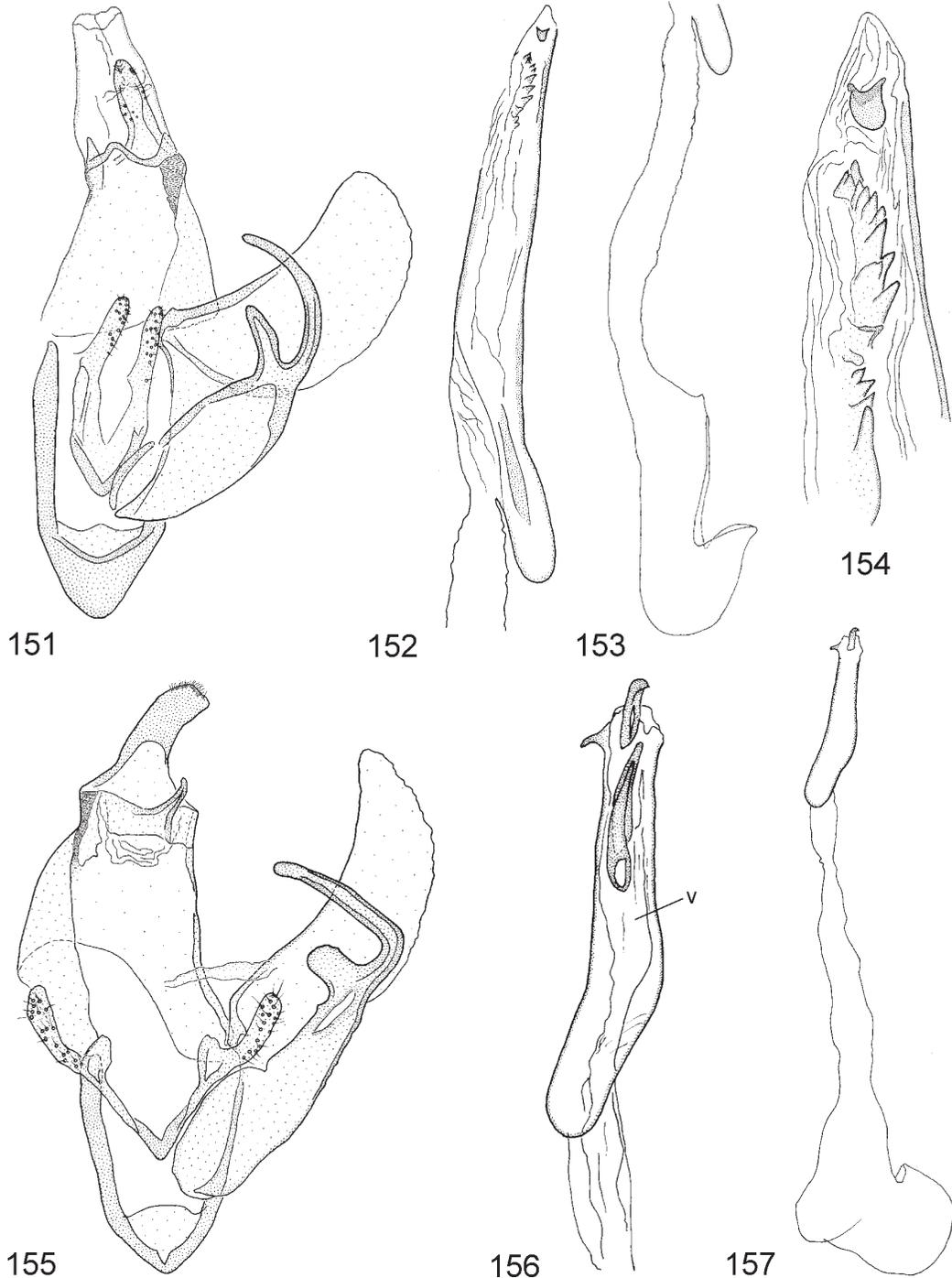


Fig. 151–157 Male genitalia (lengths in parentheses): (151–154) *Hierodoris pachystegiae*: (151) genital capsule (1500 μm); (152) aedeagus, lateral (1300 μm); (153) bulbus ejaculatorius (1950 μm); (154) detail of aedeagus apex, showing cornuti; (155–157) *H. tygris*: (155) genital capsule (1450 μm); (156) aedeagus, ventral (1000 μm) (v = vesica); (157) aedeagus and bulbus ejaculatorius (3500 μm).

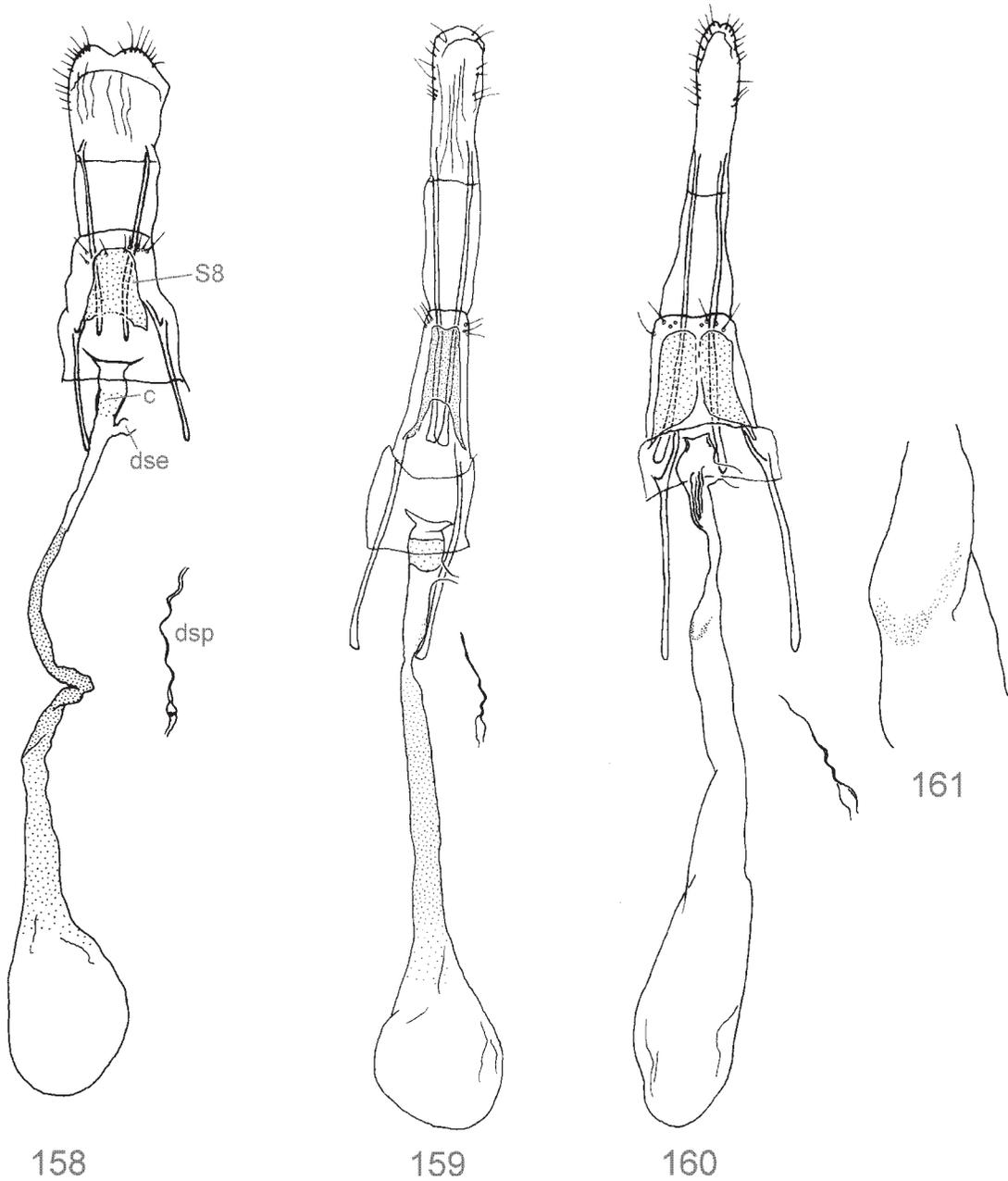


Fig. 158–161 Female genitalia (lengths in parentheses): (158) *Hierodoris iophanes* (4800 μm) (c = colliculum; dse = ductus seminalis; dsp = ductus spermathecae); (159) *H. frigida* (6800 μm); (160) *H. polita* (5400 μm); (161) *H. polita*, detail of central portion of ductus bursae showing fine scobinations.

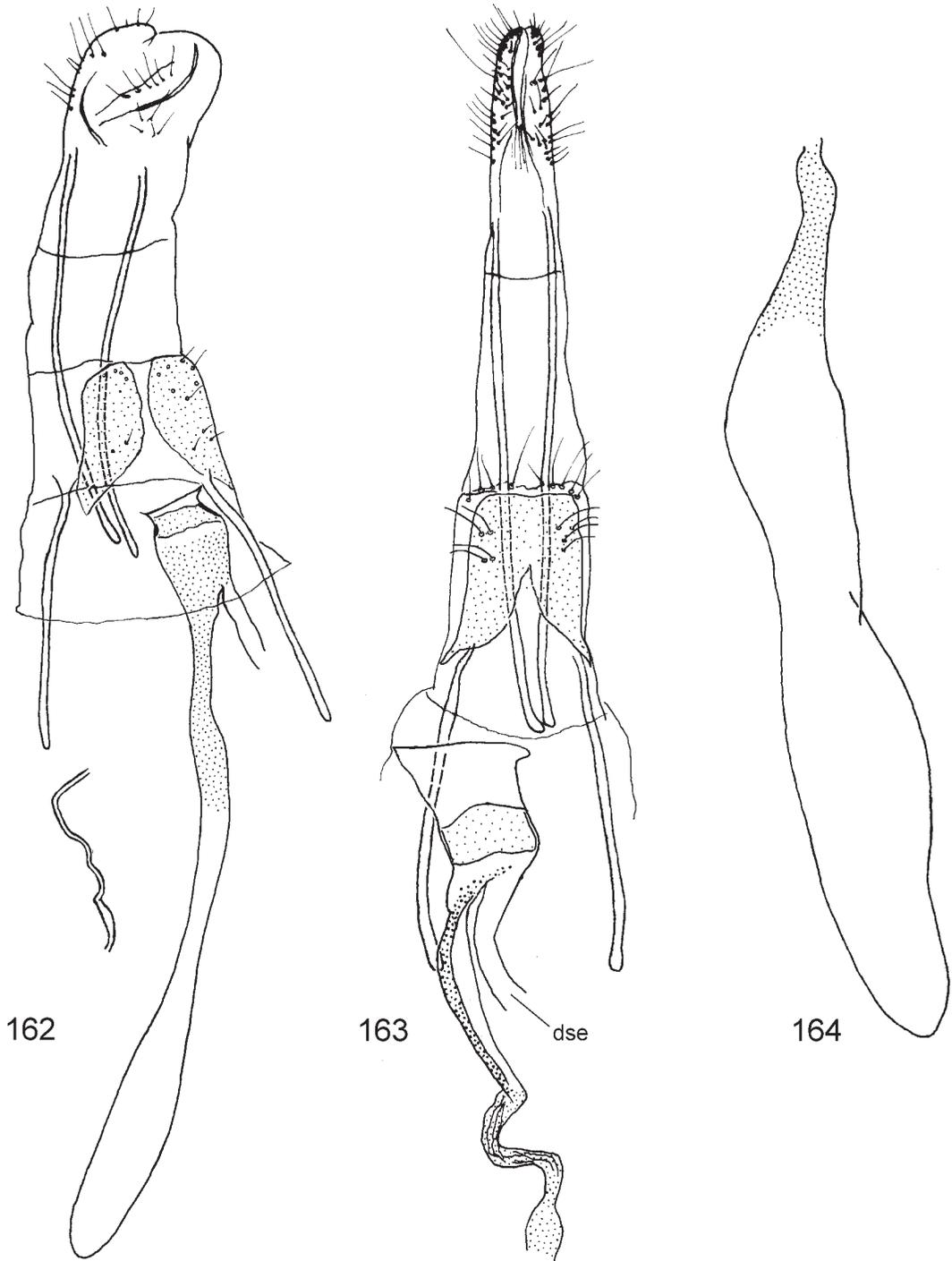


Fig. 162–164 Female genitalia (lengths in parentheses): (162) *Hierodoris torrida* (3200 μm); (163) *H. huia*, A8–10 and posterior portion of ductus bursae (without ductus spermathecae) (dse = ductus seminalis); (164) *H. huia*, corpus bursae and anterior portion of ductus (total length of *H. huia* genitalia ca 8500 μm).

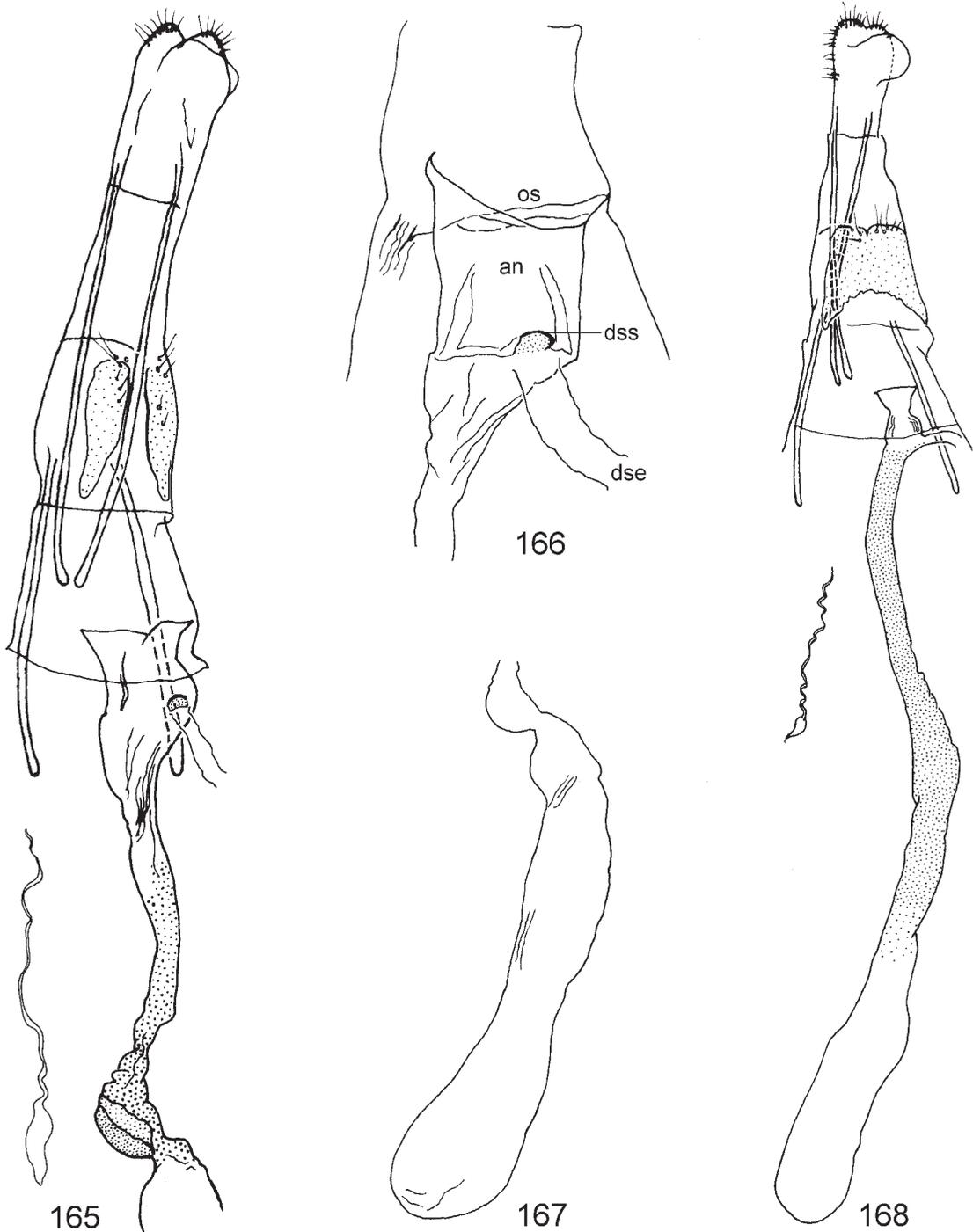


Fig. 165–168 Female genitalia (lengths in parentheses): (165–167) *Hierodoris atychioides* (7450 μm): (165) A8–10 and ductus bursae; (166) detail of ostium (os) and antrum (an), showing small sclerite (dss) associated with inception of ductus seminalis (dse); (167) corpus bursae; (168) *H. bilineata* (6250 μm).

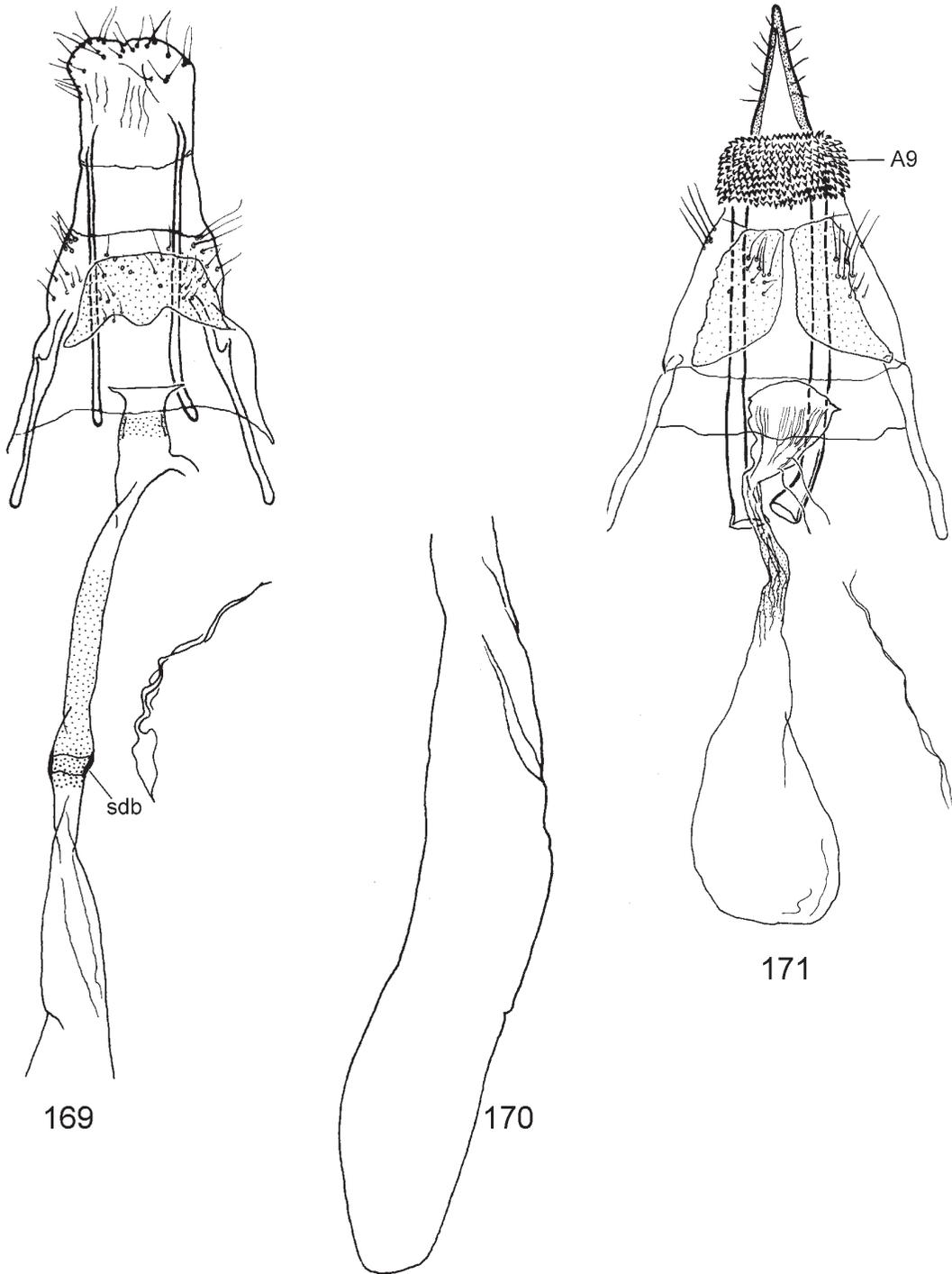


Fig. 169–171 Female genitalia (lengths in parentheses): (169) *Hierodoris callispora*, A8–10, ductus bursae, and posterior portion of corpus (sdb = sclerotised portion of ductus bursae); (170) *H. callispora*, corpus bursae (total length of *H. callispora* genitalia 5950 μm); (171) *H. eremita* (5700 μm).

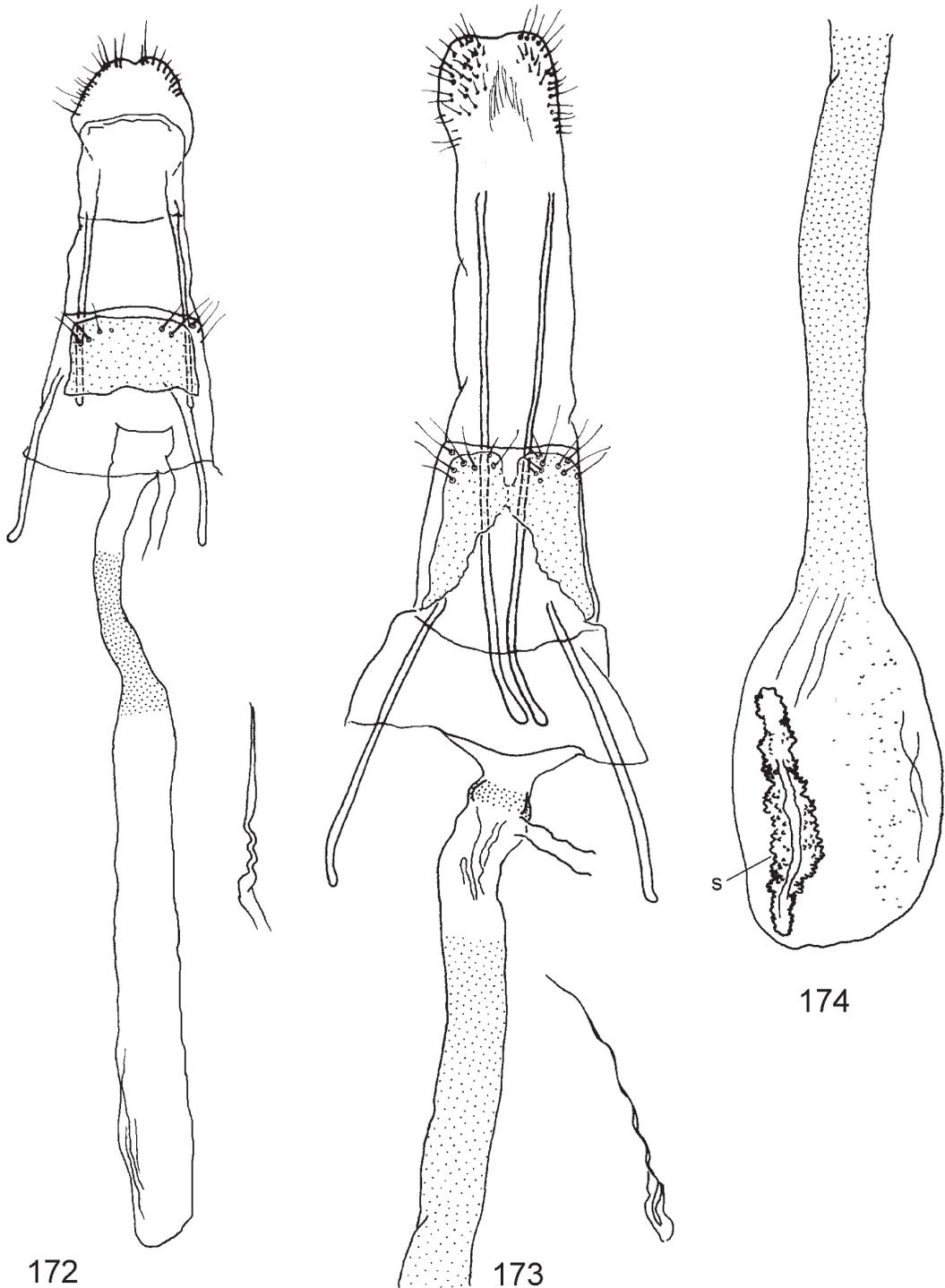


Fig. 172–174 Female genitalia (lengths in parentheses): (172) *Hierodoris gerontion* (4350 μm); (173) *H. illita*, A8–10 and posterior portion of ductus bursae; (174) *H. illita*, anterior portion of ductus bursae and corpus (total length of *H. illita* genitalia 7350 μm) (s = signum).

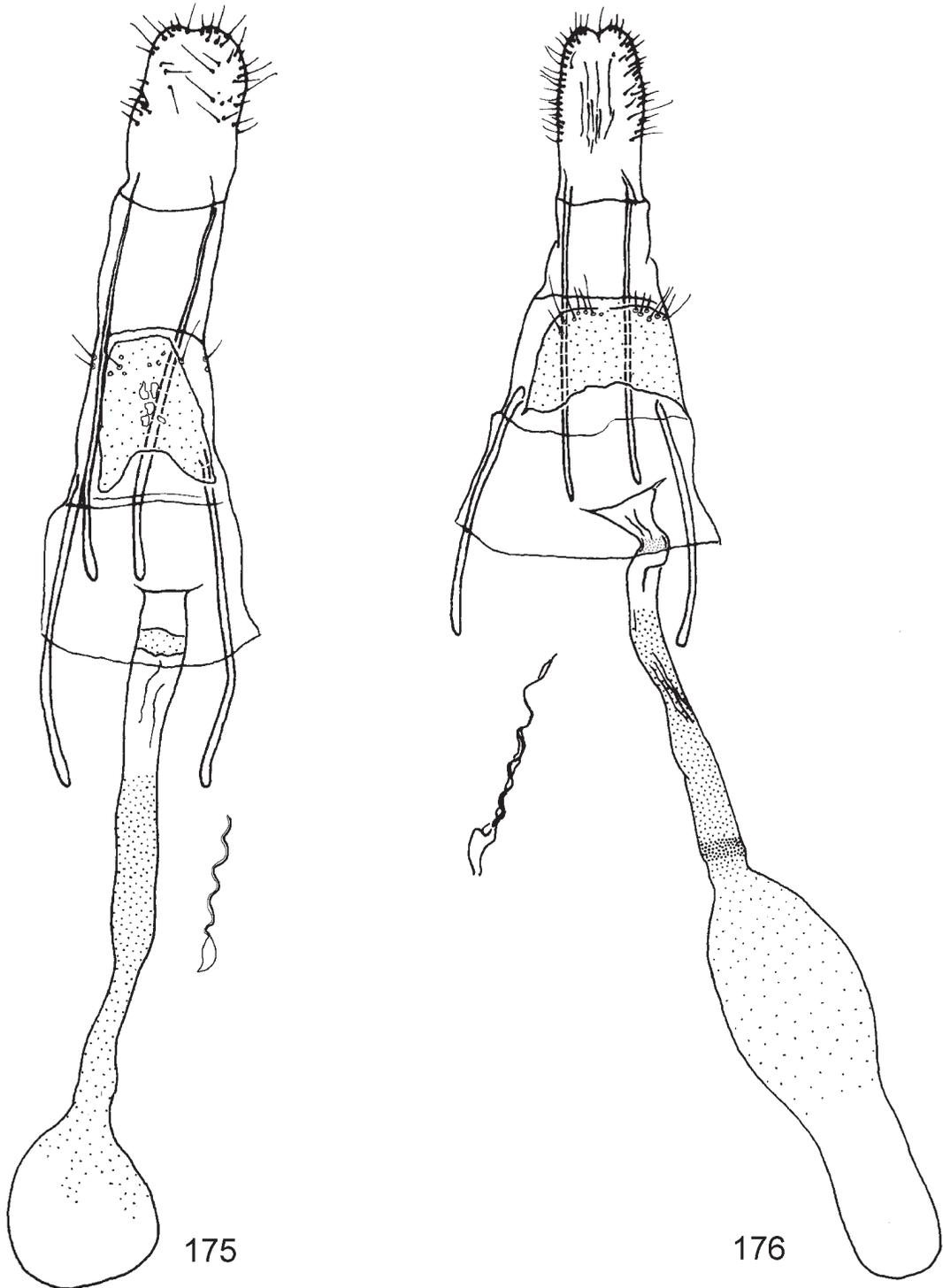


Fig. 175, 176 Female genitalia (lengths in parentheses): (175) *Hierodoris squamea* (4400 μm) (ductus seminalis not observed); (176) *H. stella* (4850 μm) (ductus seminalis not observed).

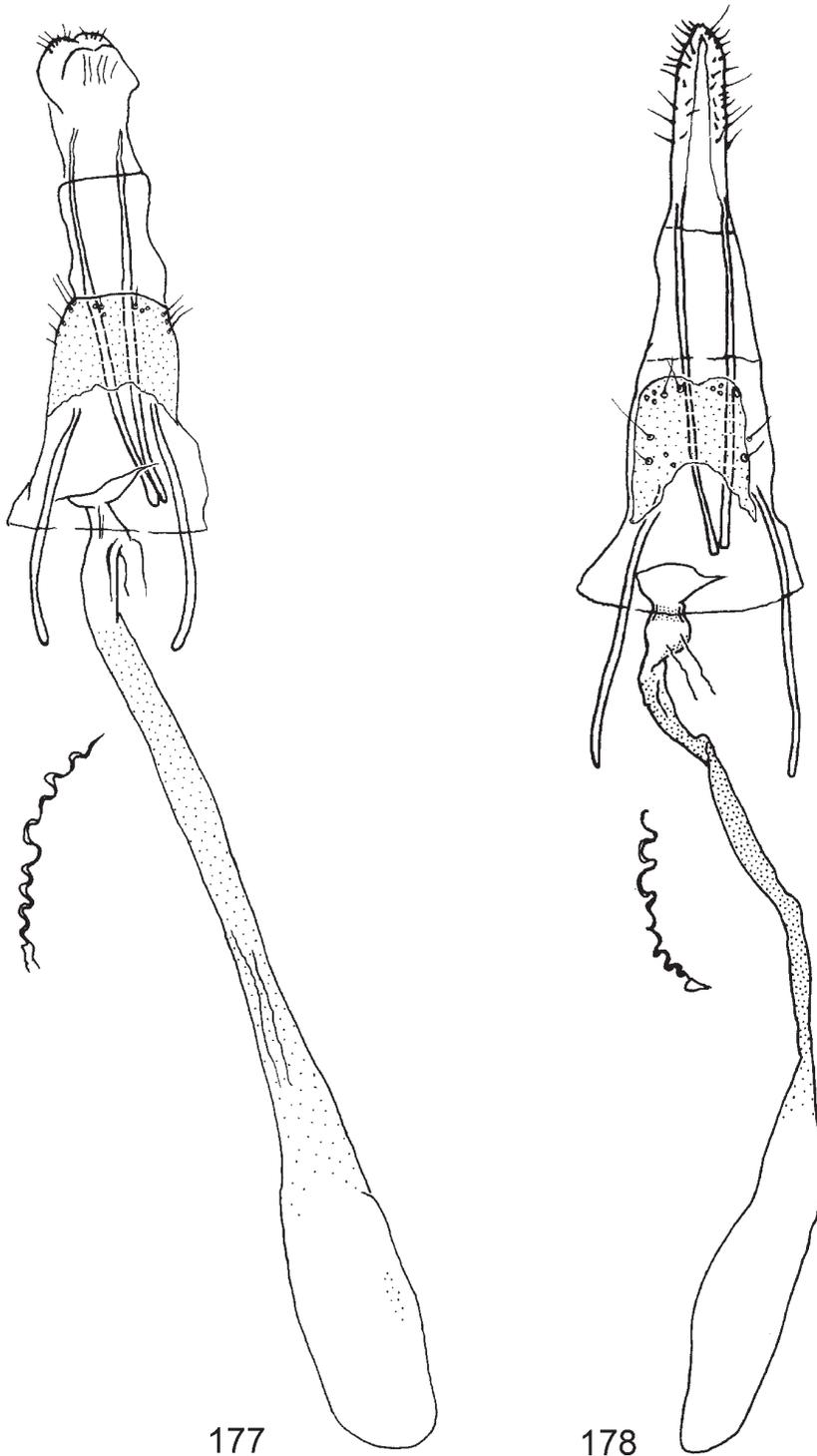


Fig. 177, 178 Female genitalia (lengths in parentheses): (177) *Hierodoris electrica* (5700 μm); (178) *H. s-fractum* (4300 μm).

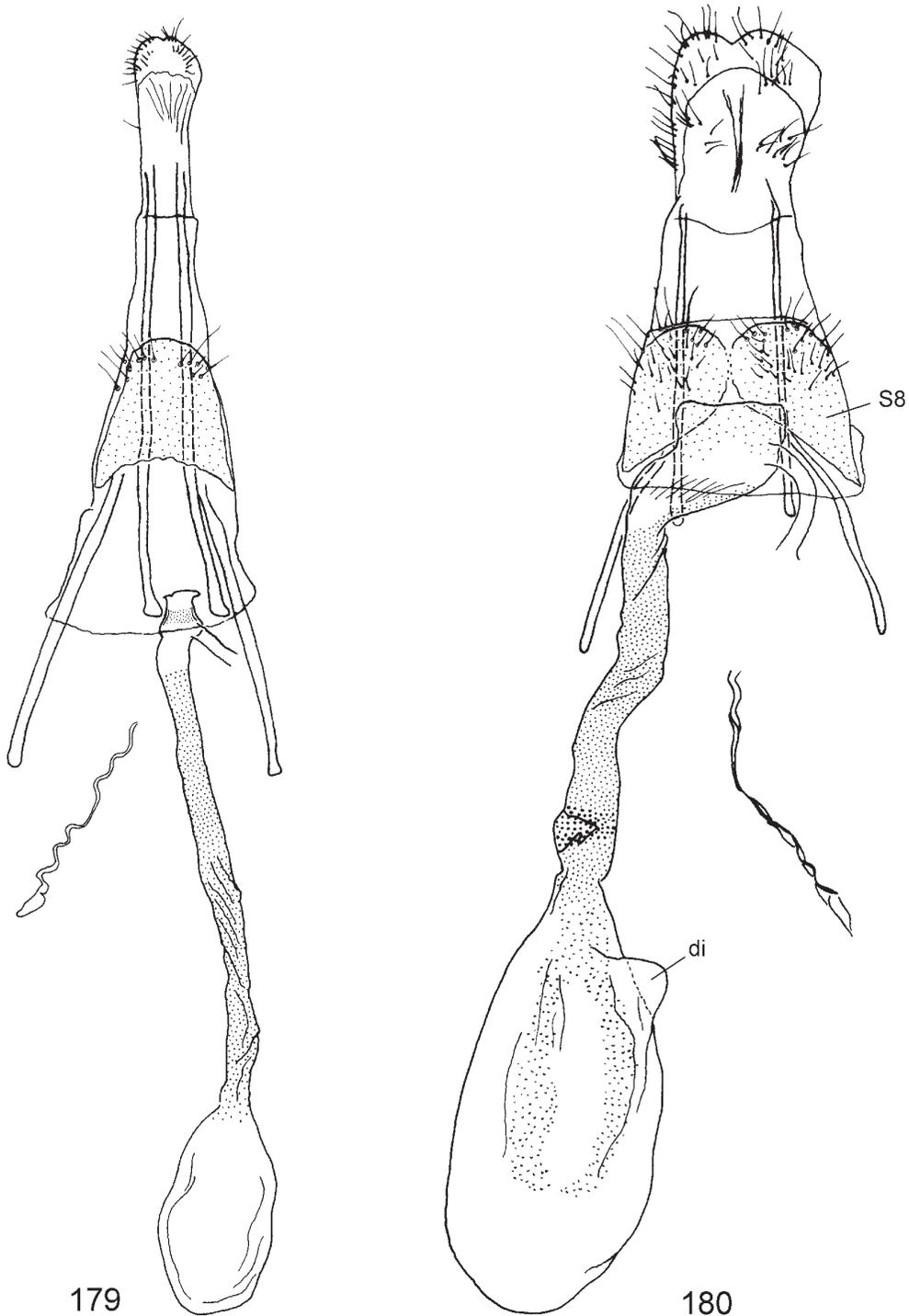


Fig. 179, 180 Female genitalia (lengths in parentheses): (179) *Hierodoris pachystegiae* (6000 μm); (180) *H. tygris* (5900 μm) (ostium posteriorly displaced in slide preparation, so that it lies over S8 sclerites; di = diverticulum of corpus bursae).

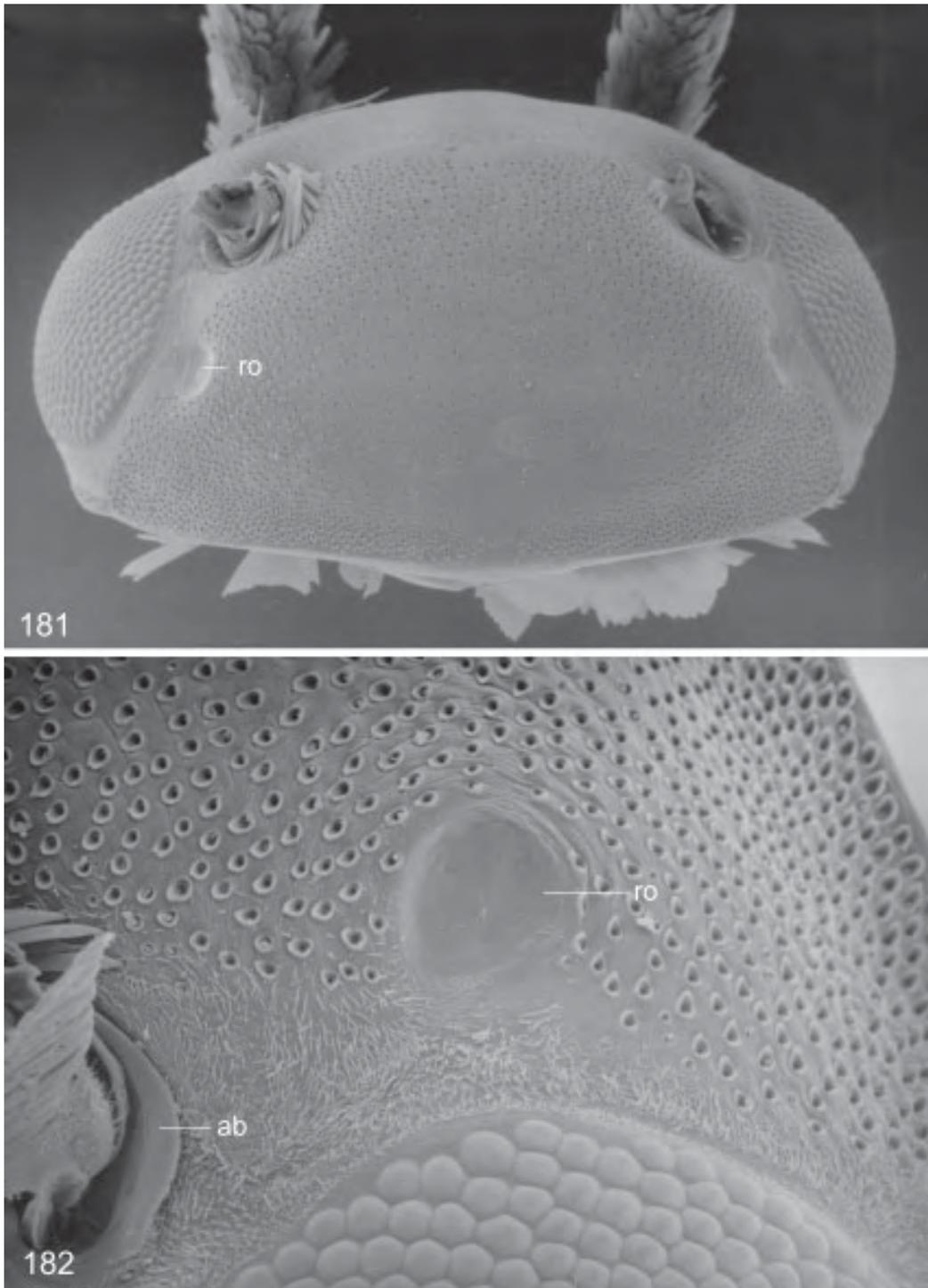
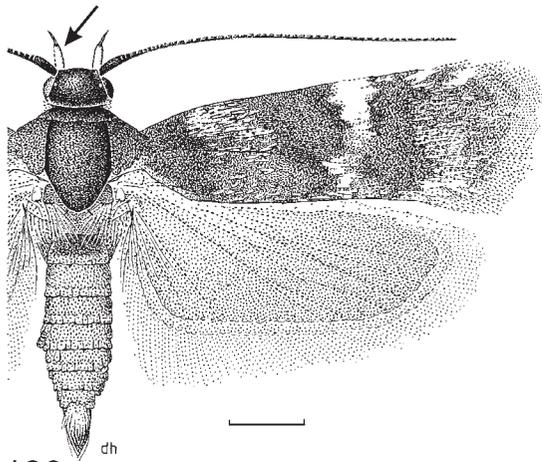
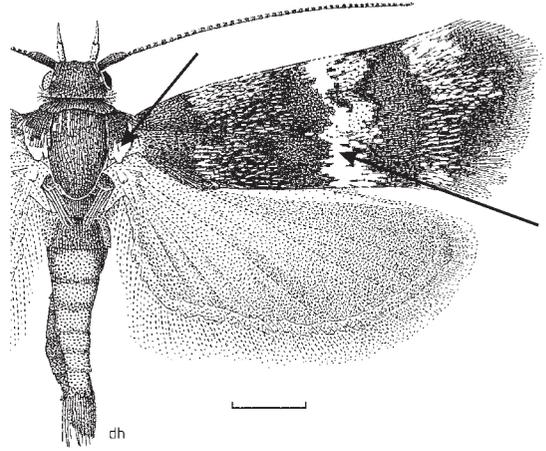


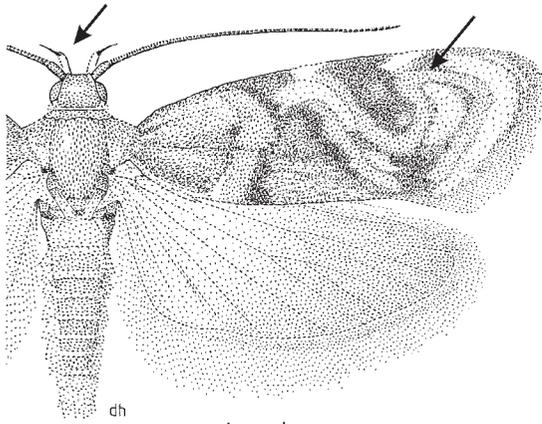
Fig. 181, 182 *Hierodoris squamea*, female head (antennae removed), showing reduced ocelli: (181) dorsal view; (182) top of compound eye and ocellus, lateral view (ab = antennal base; ro = reduced ocellus).



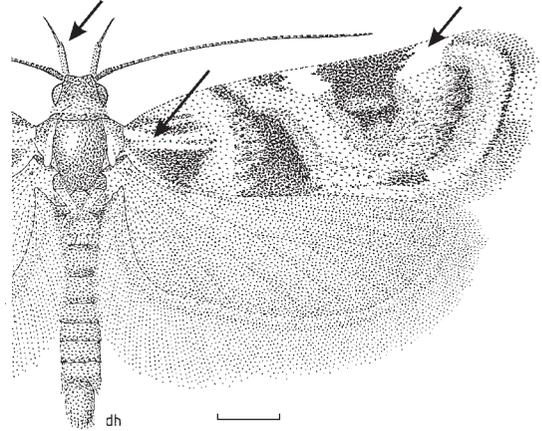
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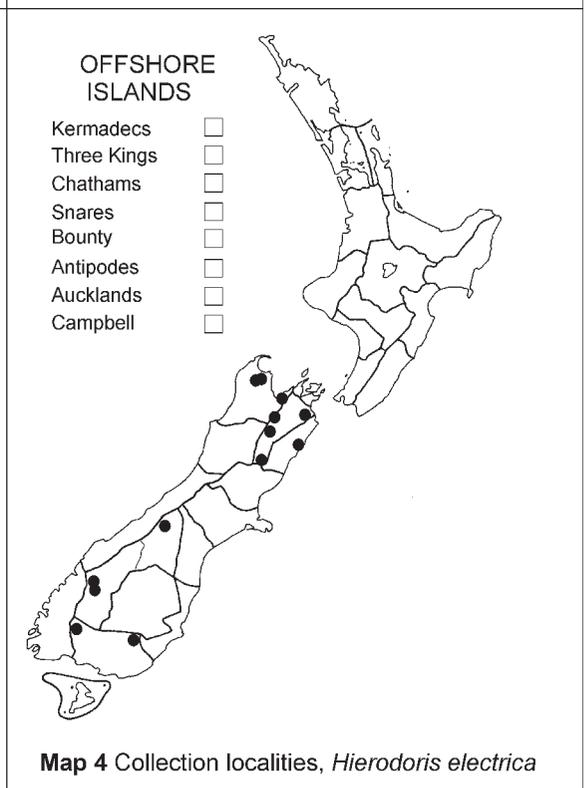
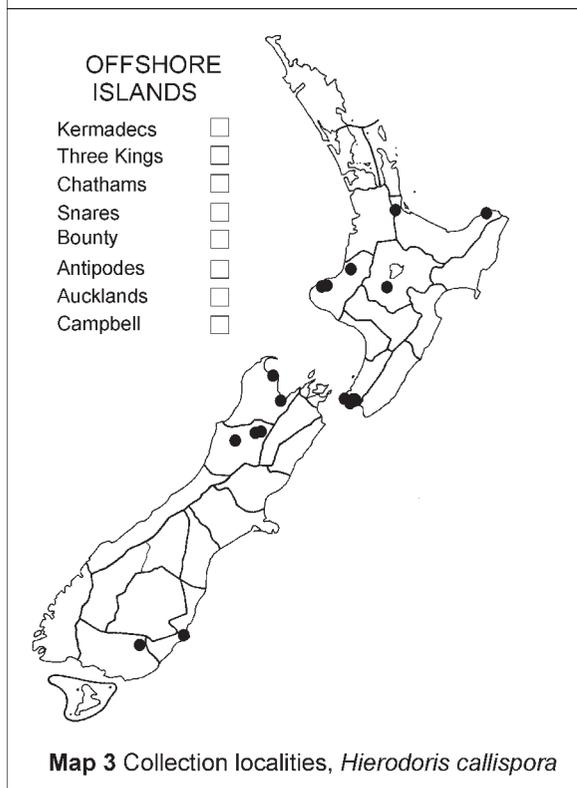
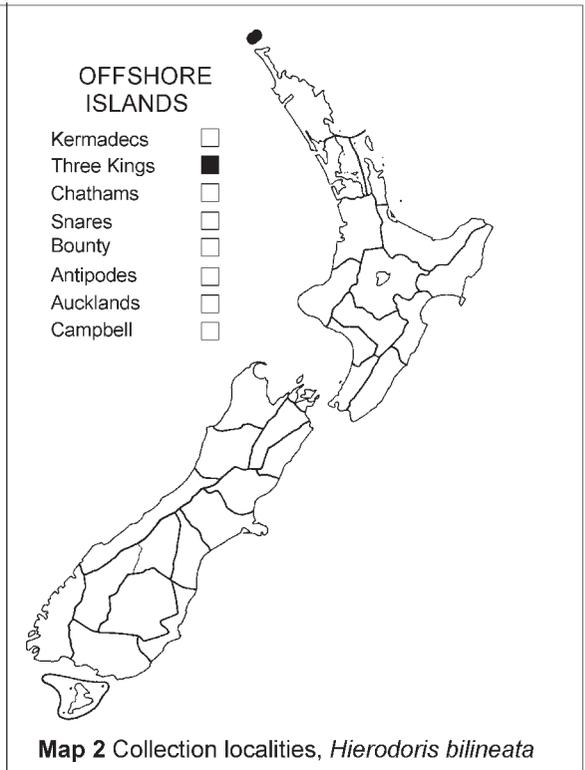
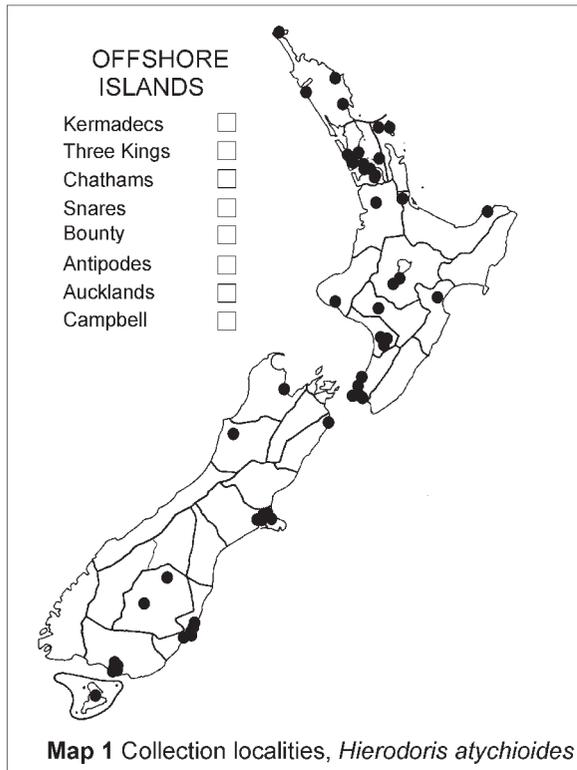


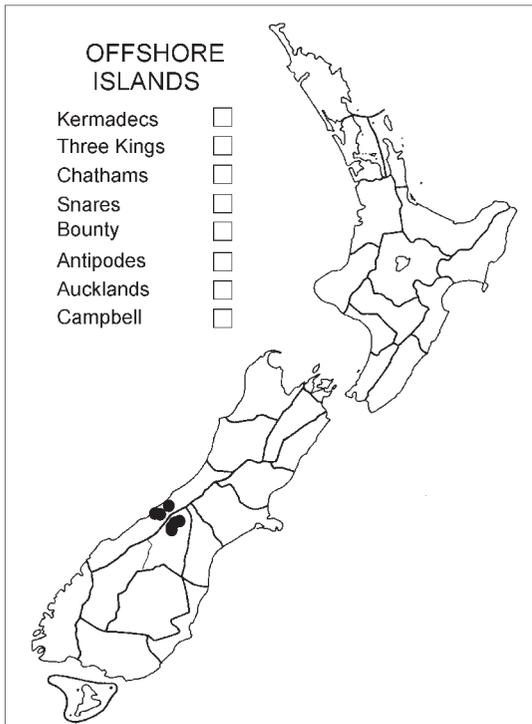
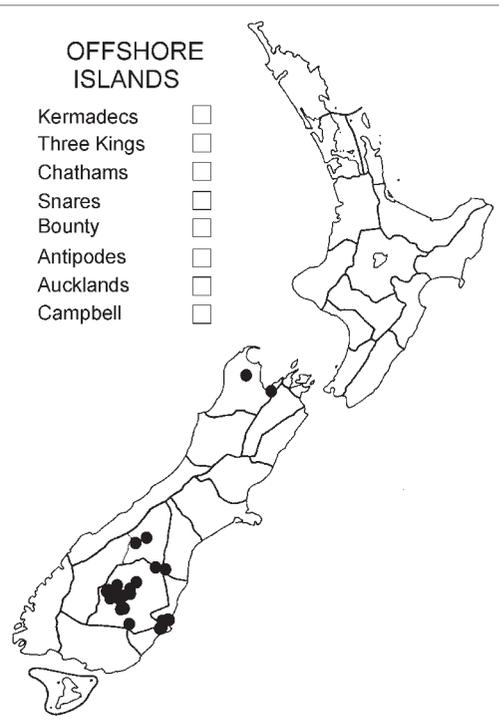
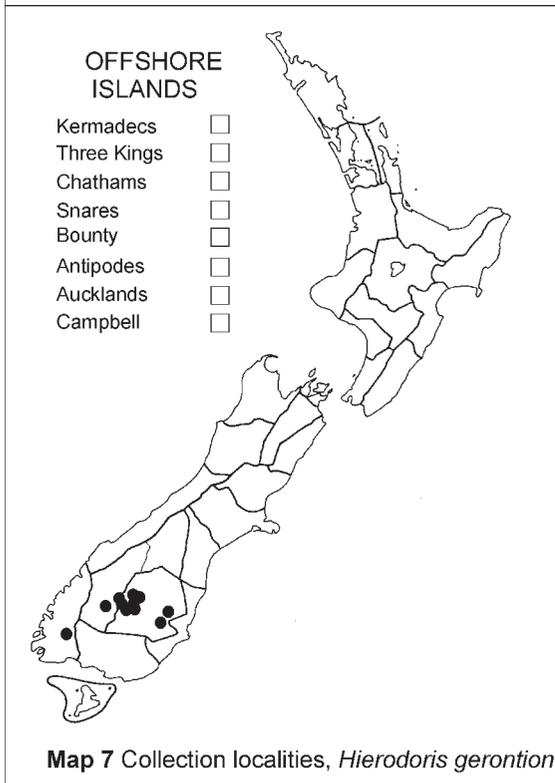
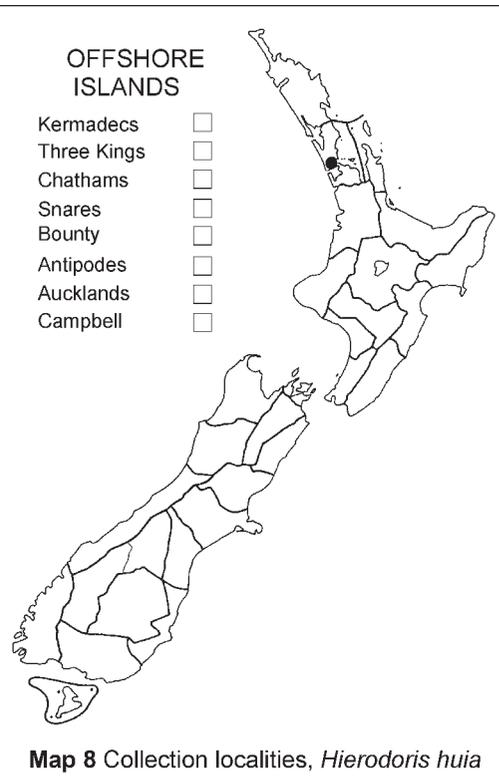
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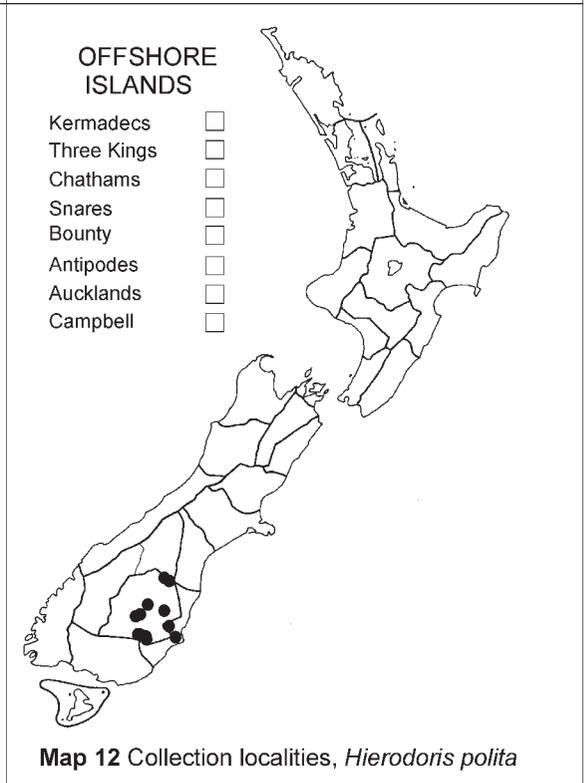
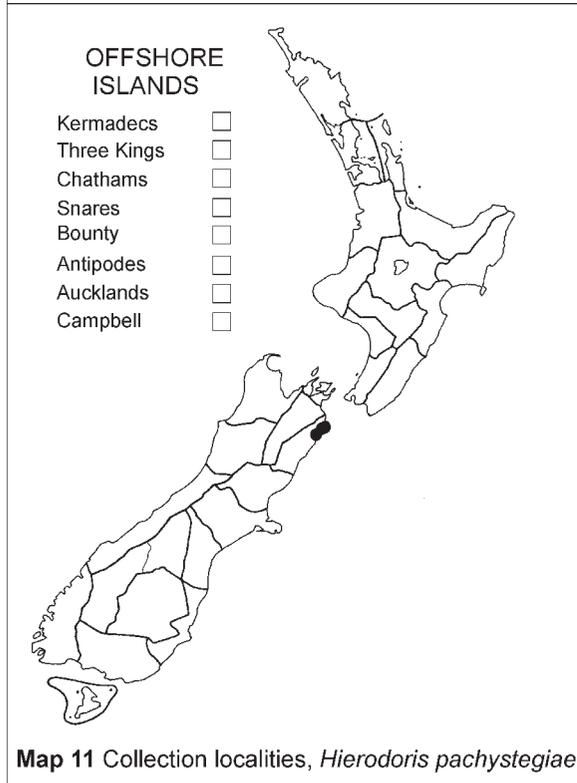
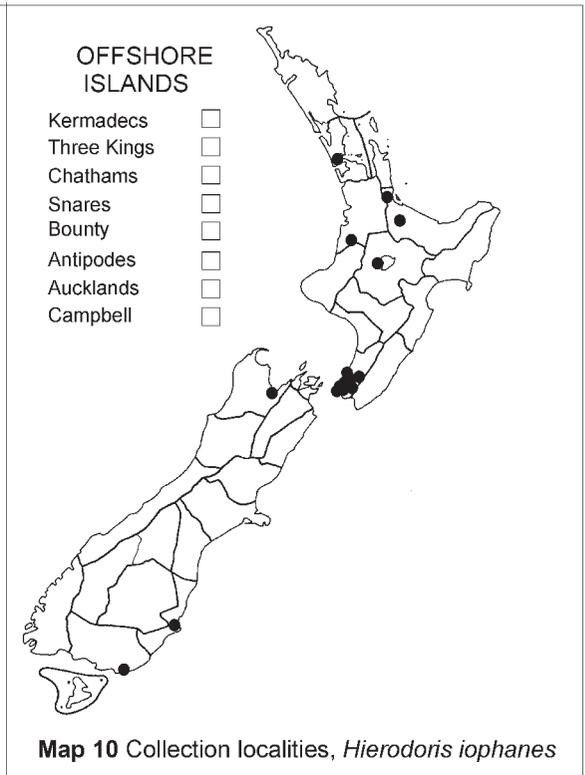
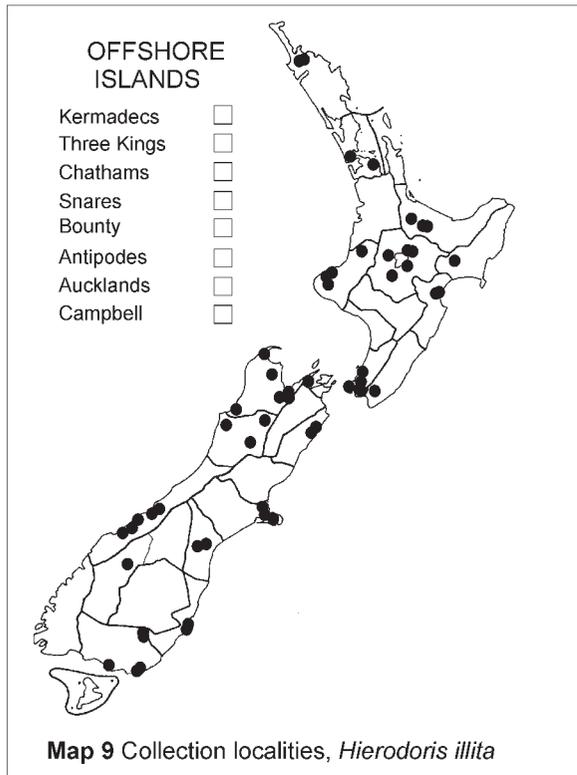


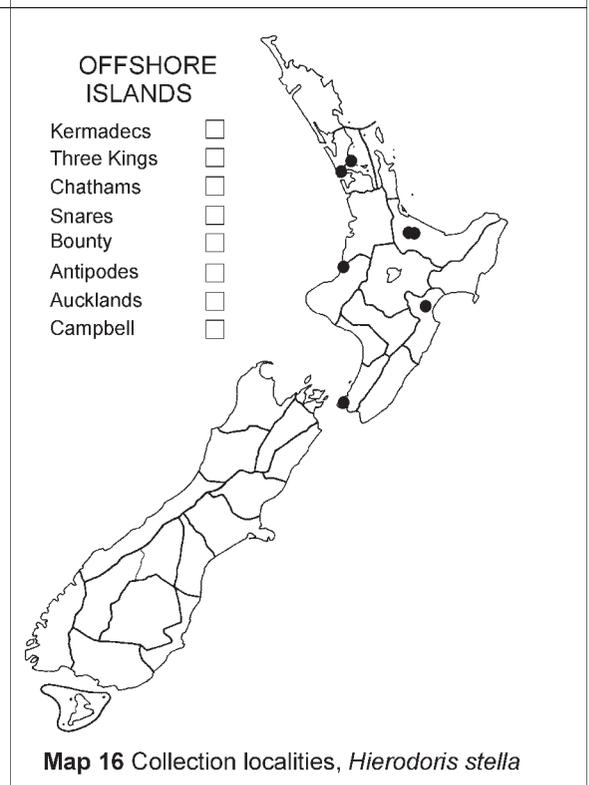
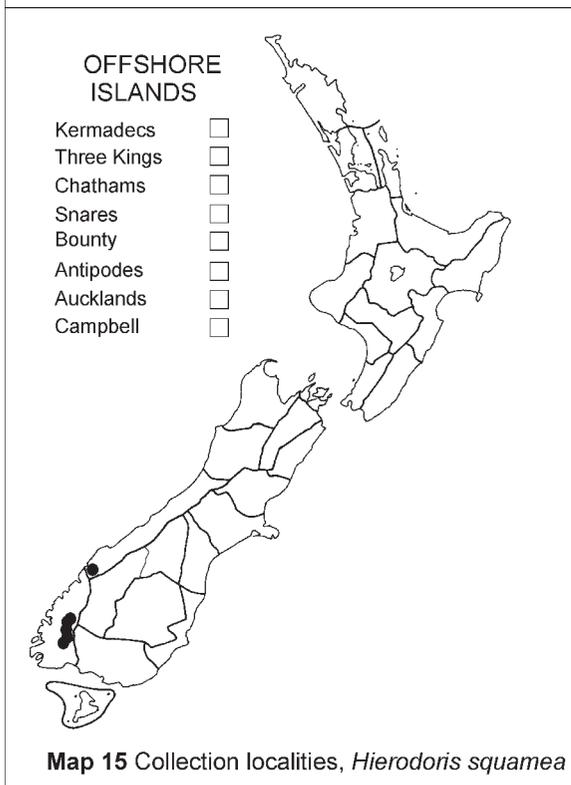
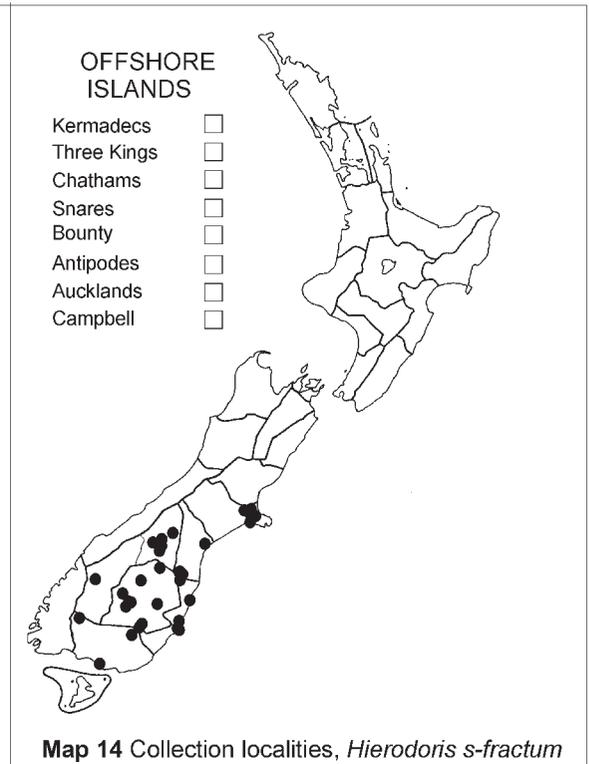
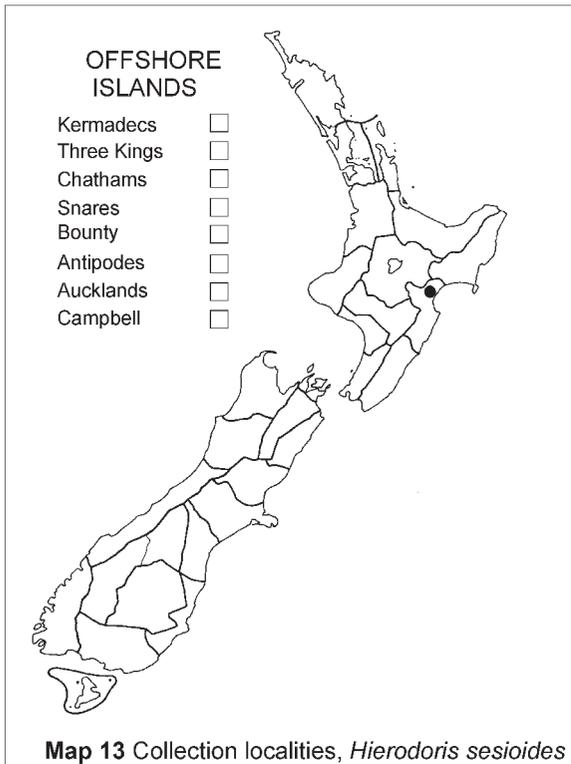
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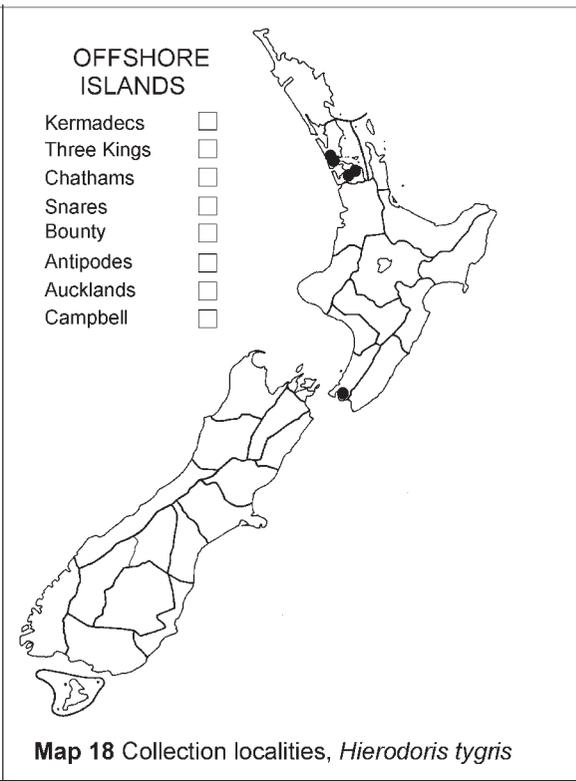
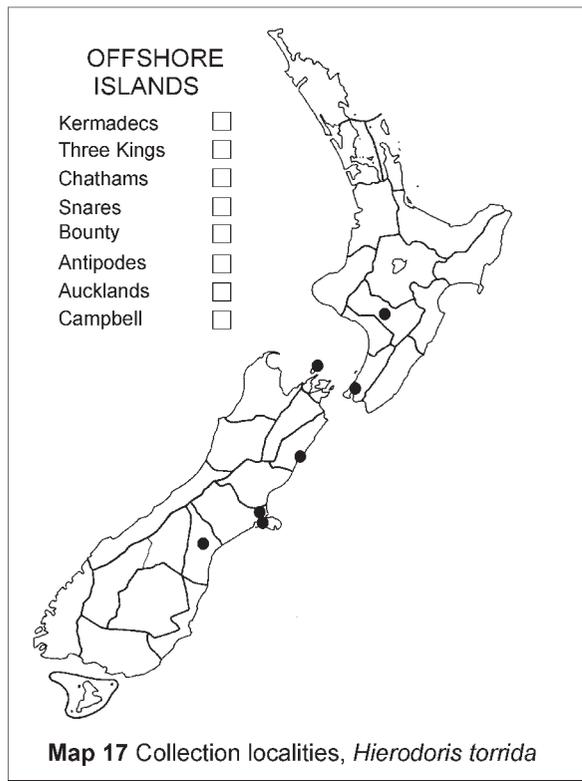
Fig. 183–186 Habitus of critical species pairs, diagnostic features arrowed (see text): (183) *Hierodoris frigida*; (184) *H. polita*; (185) *H. electrica*; (186) *H. s-fractum*.



**Map 5** Collection localities, *Hierodoris eremita***Map 6** Collection localities, *Hierodoris frigida***Map 7** Collection localities, *Hierodoris gerontion***Map 8** Collection localities, *Hierodoris huia*







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 listed are those originally published by authors, and may differ from combinations implicit in current usage. Taxa in **bold** indicate valid taxa. Page numbers in **bold** indicate main entries. The letter "f" after a page indicates a **figure**. The letter "m" indicates a **distribution map**. The letter "p" indicates a **type photograph**.

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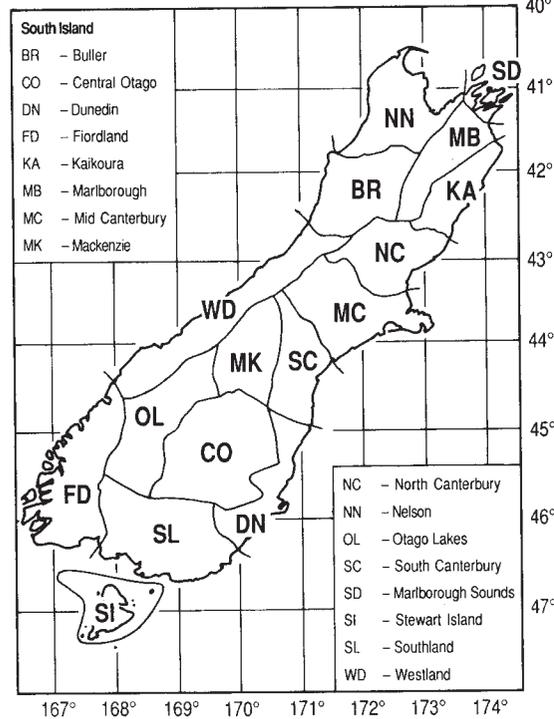
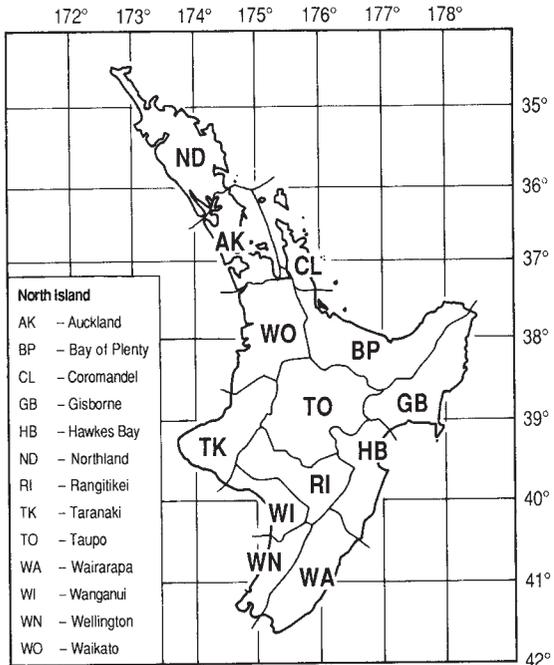
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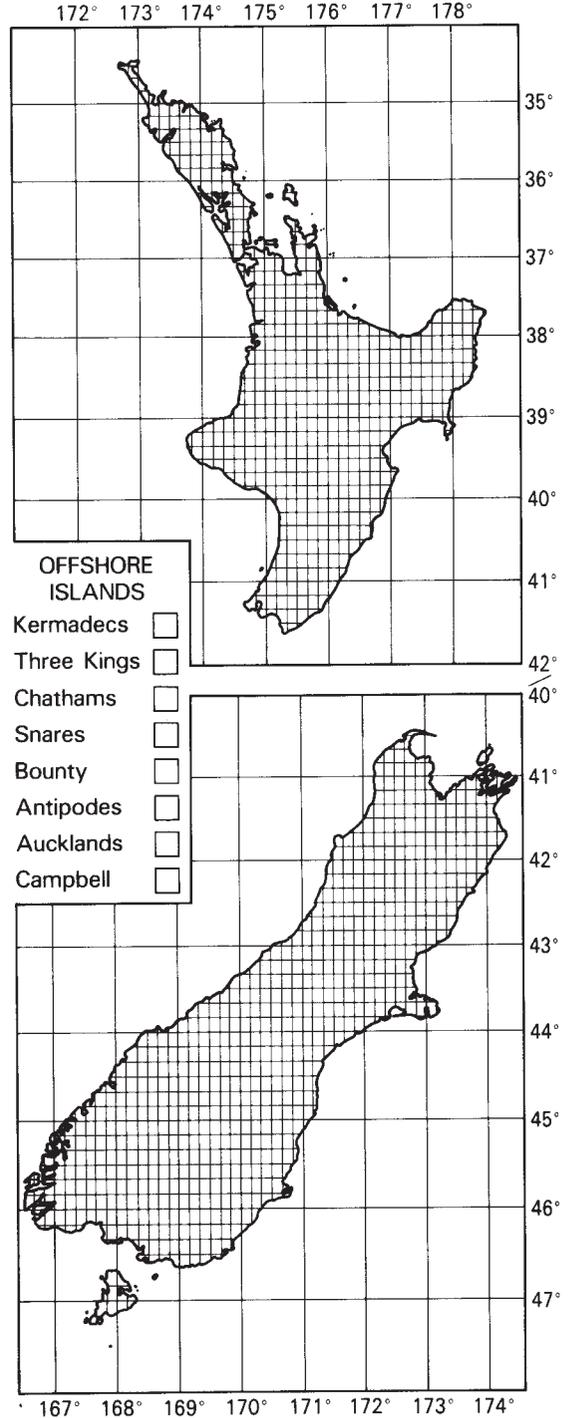
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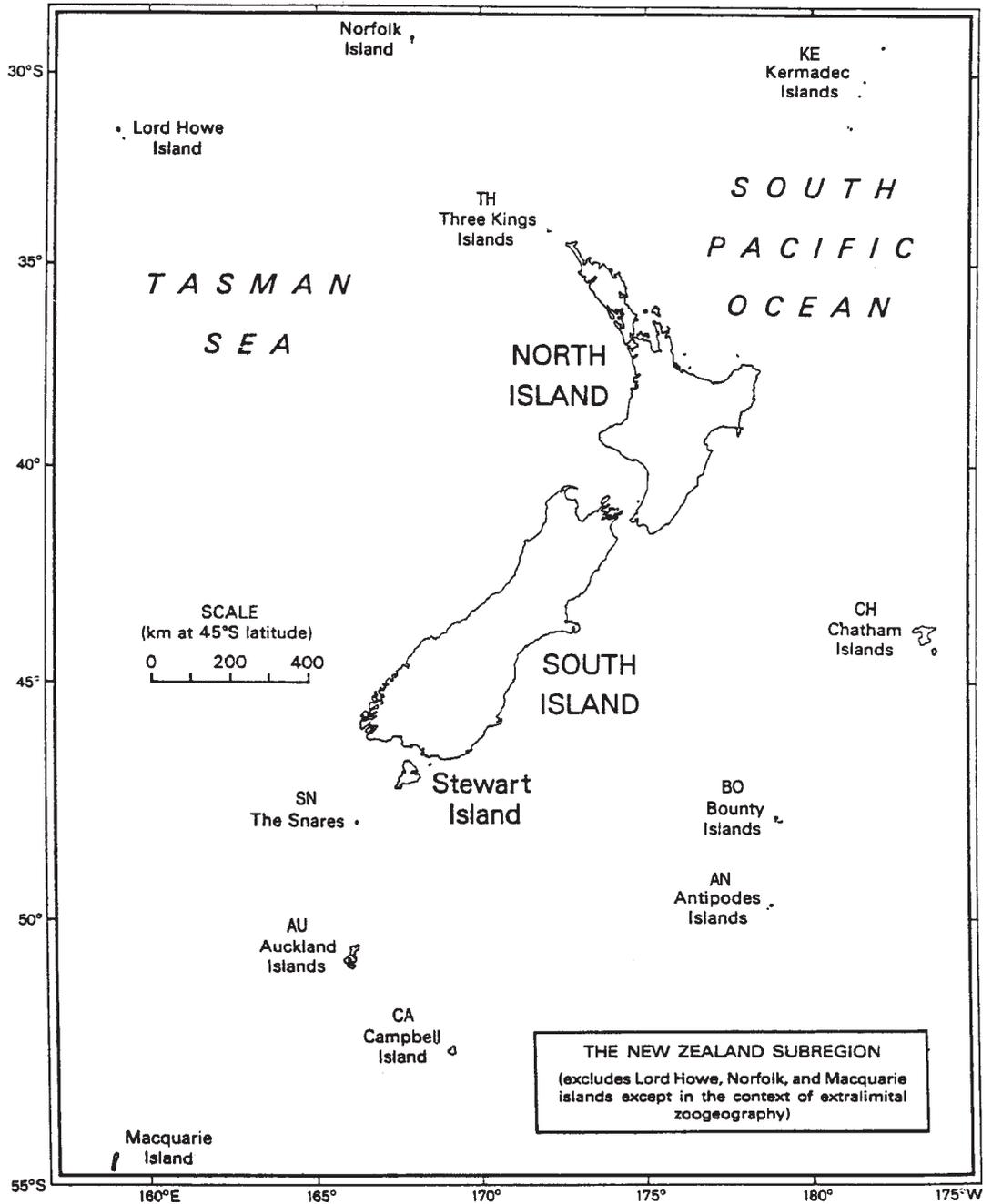
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Area codes and boundaries used to categorise specimen locality data (after Crosby *et al.* 1976)



Base-map for plotting collection localities; this may be photocopied without copyright release



The New Zealand subregion with area codes (from Crosby *et al.* 1998).

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Kua whakatūria tēnei huinga pukapuka hei whakahauhau i ngā tohunga whai mātauranga kia whakaputa i ngā kōrero poto, engari he whaikiko tonu, e pā ana ki ngā aitanga pepeke o Aotearoa. He tōtika tonu te āhua o ngā tuhituhi, engari ko te tino whāinga, kia mārāma te marea ki ngā tohu tautuhi o ia ngārara, o ia ngārara, me te roanga atu o ngā kōrero mō tēnā, mō tēnā.

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 tiro tiro mā te tangata mehemea he āwhina kei reira.

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Ko te hunga pīrangi **hoko pukapuka**, me tuhi ki *Fauna of N.Z.*, Manaaki Whenua Press, Manaaki Whenua, Pouaka Poutāpeta 40, Lincoln 8152, Aotearoa.

E rua ngā tūmomo kaihoko: “A” – kaihoko tūmau, ka tukua ia pukapuka, ia pukapuka, me te nama, i muri tonu i te tānga; “B” – ka tukua ngā pānui whakatairanga me ngā puka tonu i ōna wā anō.

Te utu (tirohia “Titles in print”, whārangi 99). Ko te kōpaki me te pane kuini kei roto i te utu. 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.

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