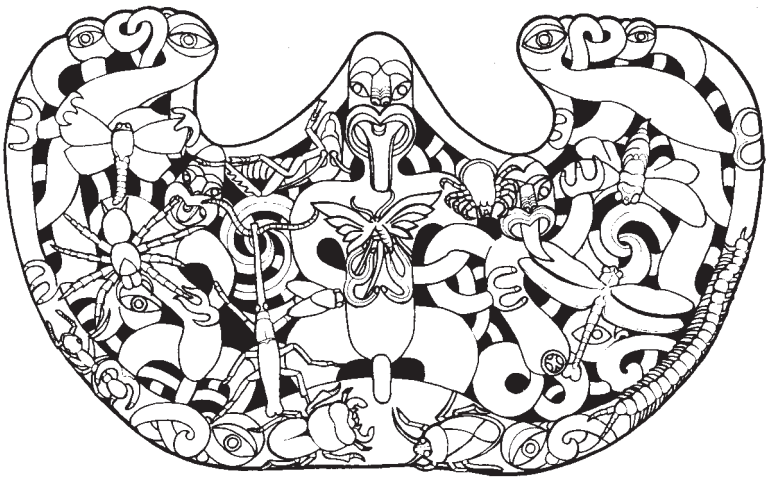

Fauna of New Zealand

Ko te Aitanga Pepeke o Aotearoa

Fauna of New Zealand
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Number / Nama 81

Guide to the sawflies and woodwasps (Hymenoptera, Symphyta) of New Zealand

by
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Auckland, New Zealand
2021

Cataloguing in publication

Ward, Darren

Guide to the sawflies and woodwasps (Hymenoptera, Symphyta) of New Zealand / by Darren Ward and Henri Goulet. -- Lincoln, N.Z. : Landcare Research NZ, 2021.

1 online resource

(Fauna of New Zealand, ISSN 1179-7193 (online) ; no. 81 = Ko te Aitanga Pepeke o Aotearoa ; nama 81)

ISBN 978-0-947525-75-0 (online)

ISBN 978-0-947525-74-3 (print)

1. Hymenoptera -- New Zealand. I. Title. II. Goulet, Henri. III. Landcare Research New Zealand Ltd.

UDC 595.793(931)

Suggested citation:

Ward D. and Goulet, H. 2021. Guide to the sawflies and woodwasps (Hymenoptera, 'Symphyta') of New Zealand. Lincoln, N.Z. : Landcare Research.

https://doi.org/10.7931/J2/FNZ.81

Prepared for publication by Zhi-Qiang Zhang and the authors using computer-based text processing, layout, and printing at Manaaki Whenua - Landcare Research, Private Bag 92170, Auckland, New Zealand.

To access on-line extracts from this series visit:

https://www.landcareresearch.co.nz/publications/fauna-of-new-zealand-series/

Published by Manaaki Whenua - Landcare Research, P.O. Box 40, Lincoln, Canterbury, N.Z.

Website: http://www.landcareresearch.co.nz/

Printed by 3A

Cover design: Birgit Rhode

Date of publication 30 June 2021

Publication of the Fauna of New Zealand series is supported by Core funding for Crown Research Institutes from the Ministry of Business, Innovation and Employment's Science and Innovation Group, for the Biota Portfolio research programme.

POPULAR SUMMARY

Class **Insecta**

Order **Hymenoptera**

Superorder **Symphyta**

Sawflies and woodwasps consist of 15 families with over 8300 species worldwide. They are found on all major land masses except Antarctica, but they are often absent from oceanic islands.

All sawflies as larvae feed on plants; most feed on leaves, many are gall makers on leaves, the petiole and stems, and a few live in the pith of twigs or deep in tree trunks. Because of their associations with plants some species are serious pests in agricultural, horticultural and forestry industries.

As adults, sawflies and woodwasps are recognized by a well-defined sclerotized stigma along the anterior margin of the fore wing and by the absence of a constriction between the first and second abdominal segments (no "wasp waist"). Many leaf feeding larvae look very similar to caterpillars, but they have a greater number of prolegs (7 or 8 pairs of false legs) on the abdomen and the eye consists of only a single ommatidium. Wood boring and leaf mining sawflies lack these prolegs but have a dark brown horn-like projection at the end of the abdomen.

In New Zealand, the diversity of sawflies and woodwasps is extremely low. There are only four endemic species belonging to two families of woodwasps (Orussidae and Xiphydriidae). Nine species have either been accidentally introduced or, for one species, intentionally introduced as a biological control agent. The introduced species belong to three families Siricidae, Pergidae, and Tenthredinidae.

This Fauna of New Zealand contribution is aimed at experts, naturalists, and non-specialists; it is abundantly illustrated and should greatly facilitate identification and information gathering about these insects.

HE WHAKARĀPOPOTOTANGA

Nō ētahi whānau 15 ngā ngaro-kani me ngā wāpi-rākau. Huri i te ao, e 8300 ngahoro ngā momo e mōhiotia ana. Kei ngā whenuarahi katoa, atu i Te Kōpakatanga ki te Tonga, engari he wā anō me uaua ka kitea i ngā moutere tū ki wē moana.

Katoa ngā ngaro-kani, he kai tipu ka torongū ana; he kai rau te nuinga, ā, ko ētahi he hanga pukuwaho ki ngā rau, ngā tātārau me ngā tātā. Arā anō ētahi, ruarua nei, noho ai ki te uho o te rārā, ki roto rawa rānei o te kōhiwi o te rākau. I tā rātou āta piri ki ngā tipu, arā ētahi momo e kīia ana he riha i ngā mahi ahuwhenua, ahumāra, ahungahere.

Kia kātua, ka mōhiotia te ngaro-kani me te wāpi-rākau mā te ngangahu o te tiwha mārō kei te tapamua o te parihau o mua, mā te korenga anō hoki o tētahi notinga i waenga i te tuatahi me te tuarua o ngā wehenga o te puku (arā, karekau he ‘hope wāpi"). He maha ngā torongū kai rau he rite ki te tōtorongū te āhua, engari he maha ake ngā waewaehori (e 7, e 8 rānei ngā takirua waewaehori) i te puku, ā, ko te karu, he koeko-kite kotahi. Kāore ngā ngaro-kani wirirākau, hukerau e whai waewaehori, engari he hanga parauri pēnei i te pihi mārō nei kei te kumu.

I Aotearoa nei, kei te tino whāiti te matahuhua o ngā ngaro-kani me ngā wāpi-rākau. E whā noa iho ngā momo ko Aotearoa anake tō rātou kāinga noho, kei ngā whānau wāpi-rākau e rua (a ngāi Orussidae me ngāi Xiphydriidae). E iwa ngā momo rāwaho kua kawea pokerehūtia mai, ā, kotahi te momo rāwaho i āta kawea mai hei kaitāmi koiora. Nō ētahi whānau e toru ngā momo rāwaho nei, arā, nō ngāi Siricidae, nō ngāi Pergidae, nō ngāi Tenthredinidae.

Kua tuhia tēnei kōrero o Ko te Aitanga Pepeke o Aotearoa mā ngā mātanga, ngā kaimātai ao tūroa me te hunga anō hoki ehara i te mātanga ki ēnei hanga; he huhua ngā whakaahua, ā, ko te tikanga ka kaha āwhina i te tautohunga me te kohinga o ngā kōrero mō ēnei pepeke.

CONTRIBUTORS

Contributor **Darren Ward** was born in Oamaru, New Zealand. He completed his B.Sc. at the University of Otago in Zoology, an MSc at La Trobe University in Melbourne, and then a PhD at the University of Auckland. After his graduate studies he was employed at Manaaki Whenua – Landcare Research as an insect ecologist and a curator in the New Zealand Arthropod Collection (NZAC), responsible for the research, curation, and identification of Hymenoptera. He currently has a co-appointment at the University of Auckland, sits on the B3 (Better Border Biosecurity) leadership group, and is the Head Curator of the NZAC. He has published broadly on insect biodiversity and conservation, and on the risk, surveillance, and impacts of exotic species. Taxonomic projects have mostly focused on ichneumonid and braconid parasitoid wasps. He has an interest in utilising museum data for addressing applied questions for the conservation of insect species and biosecurity.

Contributor **Henri Goulet** was born in Canada. He completed his B.Sc. at McGill University (Montreal, Quebec), and then pursued his graduate studies on the taxonomy and ecology of ground beetles at the University of Alberta (Edmonton, Alberta) ending with his Ph.D. under Dr. G. E. Ball in 1978. After his graduate studies he was employed at the Canadian National Collection of Insects, Arachnids and Nematodes (Ottawa, Ontario) responsible for the research, curation and identification of sawflies and woodwasps with a minor responsibility for the identification of ground beetles. He retired in 2011 but remains an Honorary Research Associate. He is the author of over 100 papers and monographs on the taxonomy, distribution, and natural history of Symphyta (sawflies and woodwasps) and Carabidae (ground beetles). He revised the North American sawflies of the genus *Dolerus* (Tenthredinidae), co-authored and was an editor of the Hymenoptera of the World, co-authored the revision of the horntail wasps of the western hemisphere (Siricidae), revised the world species of *Xeris* (Siricidae), and the species of the African genus *Afrotremex* (Siricidae). Most of his recent research is on species of the North American genus Tenthredo (Tenthredinidae). He has a special interest in the photography of live and preserved insects, especially species of ground beetles and sawflies.

NGĀ KAITUHI

I whānau mai a **Darren Ward** ki Te Oha-a-Maru (Oamaru), i Aotearoa. Ka oti mai tana Tohu Pūtaiao Paetahi i te Whare Wānanga o Ōtākou, ko te mātai kīrehe te kaupapa. Ko tana Tohu Kauati Pūtaiao i mahia ki te Whare Wānanga o La Trobe, i Poipiripi, ā, ko te Tohu Kairangi ki Te Whare Wānanga o Tāmaki. Nō muri i ana akoranga ki tua o paetahi, ka whiwhi mahi ia ki Manaaki Whenua hei kaimātai hauropi pepeke, hei kaitiaki hoki i te Kohinga Aitanga Pepeke o Aotearoa (NZAC), ko āna kawenga, he rangahau, he tiaki, he tautohu hoki i a ngāi Hymenoptera. He tūranga anō tōna i Te Whare Wānanga o Tāmaki, kei te rōpū hautū o te B3 (Better Border Biosecurity), ko ia hoki te Kaitiaki Matua o te NZAC. He whānui ngā kōrero kua puta i a ia mō te matahuhua koiora me te whāomoomo pepeke, tae atu ki ngā tūraru, te tūteitanga me ngā pānga o ngā momo rāwaho. Kua arotahi te nuinga o ana kaupapa whakarōpū ki ngā wāpi pirinoa ichneumonid, braconid anō hoki. He mahi ngahau ki a ia te whakamahi raraunga whare taonga hei whakautu pātai e pā ana ki te whāomoomotanga o ngā momo pepeke me te haumaru koiora.

I whānau mai a Henri Goulet ki Kānata. Ka oti tana Tohu Pūtaiao Paetahi i te Whare Wānanga o McGill (i Montreal, Quebec), kātahi ka whāia ana akoranga ki tua o paetahi i te Whare Wānanga o Alberta (i Edmonton, Alberta), ko te pūnaha whakarōpū me te mātauranga hauropi o ngā pītara nohopapa te kaupapa, ko tōna otinga atu, ko te Tohu Kairangi i raro i a Tākuta G. E. Ball i te 1978. Whai i muri, ka whiwhi mahi ia i te Canadian National Collection of Insects, Arachnids and Nematodes (Ottawa, Ontario), ko tāna i reira he whakahaere i ngā mahi rangahau, tiaki, tautohu, i ngā ngaro-kani me ngā wāpi-rākau, me te paku whai wāhi tonu ki ngā mahi tautohu i ngā pītara nohopapa. Nō te 2011 ia i ritāia ai, engari e noho tonu mai ana hei Āpiti Rangahau Hōnore. Neke atu i te 100 ngā tuhinga kua oti i a ia mō te whakarōpūtanga, te tītaringa me ngā tāhuhu kōrero māori o ngāi Symphyta (ngā ngaro-kani me ngā wāpi-rākau) me ngāi Carabidae (ngā pītara nohopapa). Nāna i arotake ngā kōrero mō ngā ngaro-kani o Amerika ki te Raki kei te puninga Dolerus (Tenthredinidae), ko ia tētahi o ngā kaituhi, tētahi hoki i ngā ētita o Hymenoptera of the World, ko ia tētahi o ngā kaituhi i te arotakenga o ngā kōrero mō ngā wāpi pihitou o te tuakoi uru (Siricidae), nāna i arotake ngā kōrero mō ngā momo o te ao o te Xeris (Siricidae), me ngā momo o te puninga Āwherika Afrotremex (Siricidae). Ko te nuinga o ana rangahau o nā tata nei, mō ngā momo o te puninga o Amerika ki te Raki e kīia ana ko Tenthredo (Tenthredinidae). He runaruna nāna te kapo whakaahua o ngā pepeke ora me ngā pepeke kua rokirokia, mātua rā ērā o ngā momo pītara nohopapa me ngā ngaro-kani.

Māori translation by Te Haumihiata Mason & Hēni Jacob

ABSTRACT

Thirteen species of sawflies and woodwasps of Symphyta (Hymenoptera) are known from New Zealand. Four species are endemic to New Zealand, eight species have been accidentally introduced, and one species has been deliberately released as a biological control agent. We provide a guide to the identification of these species, with keys to both adult and larval life stages, and for each species provide information on synonymy, diagnosis, description of known sexes of adults and of larvae, taxonomic notes, hosts, biology, and distribution.

http://www.zoobank.org/urn:lsid:zoobank.org:pub:97C24EC6-4C17-4EEA-8899-DEE819924C1B

Accepted by Zhi-Qiang Zhang: 21 Mar. 2021; published: 30 Jun. 2021

CHECKLIST OF TAXA

Family Orussidae **35**
Genus *Guiglia* Benson, 1938 35
schauinslandi (Ashmead, 1903) 35

Family Pergidae **37**
Genus *Phylacteophaga* Froggatt, 1899 37
froggatti Riek, 1955 37

Family Siricidae **40**
Genus *Sirex* Linnaeus, 1761 40
noctilio Fabricius, 1793 40

Family Tenthredinidae **44**
Subfamily Blennocampinae **45**
Genus *Monophadnus* Hartig, 1837 45
spinolae (Klug, 1816) 45
Subfamily Heterarthrinae **47**
Genus *Caliroa* Costa, 1859 47
cerasi (Linnaeus, 1758) 47
Subfamily Nematinae **50**
Genus *Cladius* Illiger, 1807 50
(*Priophorus*) *brullei* Dahlbom, 1835 50
(*Trichiocampus*) *grandis* (Serville, 1823) 52
Genus *Euura* Newman, 1837 54
oligospila (Förster, 1854) 55
proxima (Serville, 1823) 57
viduata (Zetterstedt, 1838) 59

Family Xiphydriidae **62**
Genus *Moaxiphia* Maa, 1949 63
decepta (Smith, 1876) 63
duniana (Gourlay, 1927) 65
gourlayi Ward & Goulet, 2011 66

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ACKNOWLEDGMENTS

Thanks to John Early (AMNZ) and John Marris (LUNZ) for access to their respective collections, and to Cor Vink (CMNZ) for distribution records. Thanks to those who helped in the preparation of the manuscript: Birgit Rhode

for graphical support and expertise with the layout of images; Svetlana Malysheva for formatting references and adding doi numbers; and D. Hegg and B. Slippers who gave permission to use images. This project received funding from MBIE to Landcare Research within the Biota Portfolio.

INTRODUCTION

Sawflies and woodwasps are phylogenetically basal Hymenoptera, traditionally grouped together under the name Symphyta (Goulet & Huber 1993, Aguiar et al. 2013). Their larvae are phytophagous, except those of Orussidae which are parasitoids (Vilhelmsen & Turrisi 2011). There are over 8300 valid species in the world (Taeger et al. 2010), however, they are very poorly represented in the New Zealand region (Valentine & Walker 1991, Berry 2010). Of the known 15 families of Symphyta, only five are recorded from New Zealand. Furthermore, only thirteen species are known from New Zealand, of which only four are endemic (three Xiphydriidae and one Orussidae). A further eight species have been accidentally introduced (one Pergidae, one Siricidae, and six Tenthredinidae); and one species of Tenthredinidae was deliberately introduced as a biological control agent (Valentine & Walker 1991, Berry 2010, Ward & Edney-Browne 2015).

Of the introduced species, several are notable pests that have been the target of considerable research and biological control programs (Cameron et al. 1989; Ferguson et al. 2007). For example, the cherry slug sawfly, *Caliroa cerasi* (Linnaeus, 1758) (Tenthredinidae), is a well-known and widespread pest of cherries, pears, plums and hawthorn in New Zealand, and a biological control agent, *Lathrolestes luteolator* (Gravenhorst, 1829) (Ichneumonidae), was released for its control in the 1920s and again in the 1970s (Cameron et al. 1989). Accidentally introduced from Australia, *Phylacteophaga froggatti* Riek, 1955 (Pergidae) mines the leaves of numerous *Eucalyptus* species used for plantation forestry (Farrell & New 1980). However, an introduced parasitoid, *Bracon phylacteophagus* Austin, 1989 (Braconidae), was released in New Zealand in the late 1980s as a biological control agent (Faulds 1990, 1991). *Nematus oligospilus* Förster, 1854 (Tenthredinidae) was found in New Zealand in 1997 (Berry 1997). Its larvae can defoliate and even kill willow trees, and because *Salix* are often used for soil stabilisation and riverbank erosion control, *N. oligospilus* has been the subject of plant breeding trials to determine which *Salix* clones or hybrids are most at risk (Charles et al 1998). However, the most economically important species is the sirex wood wasp *Sirex noctilio* Fabricius, 1793 (Siricidae). Historically it was a major pest in commercial pine plantations before an extensive biological control program brought it under control in the 1950-1960s (Zondag 1979; Zondag & Nuttall 1961).

In contrast to the introduced species, very little is known about the biology of the four endemic species in New Zealand. The first endemic species, a Xiphydriidae, was described in 1876 as *Derecyrta deceptus* (= *Moaxiphia decepta*) (Smith 1876), and transferred by Maa (1949) to *Moaxiphia*, an endemic genus. Ashmead (1903) named the Orussidae *Ophrynopus schauinslandi* (= *Guiglia schauinslandi*) from the Chatham Islands. Gourlay (1927) described *Xiphydria duniana* (= *Moaxiphia duniana*), and Ward and Goulet (2011) described *Moaxiphia gourlayi*.

Here we provide a guide to the identification of sawfly and woodwasp species in New Zealand, with keys to the adults and larval life stages, and for each species a history of synonymy, diagnosis of adults and larvae, taxonomic notes, and information on its biology and distribution.

MATERIAL AND METHODS

MATERIAL EXAMINED

This study is based on the examination of material housed in the Auckland War Memorial Museum (AMNZ), Auckland, New Zealand; the Canadian National Collection of Insects (CNC), Ottawa, Canada; the Entomology Research Collection (LUNZ), Lincoln University, Lincoln, New Zealand; and the New Zealand Arthropod Collection (NZAC), Manaaki Whenua-Landcare Research, Auckland, New Zealand. Distribution records were also obtained from the Canterbury Museum (CMNZ), Christchurch, New Zealand.

Two-letter area codes following Crosby et al. (1998) are used to document the distribution of each species. Specimen records from the NZAC are available on the Global Biodiversity Information Facility (GBIF) from the following link: https://www.gbif.org/dataset/6e4b215e-9019-4934-8433-65d80a35c230 and also listed under each species.

Lists of taxonomic names are available electronically from Taeger et al. (2010) and via 'ECatSym: Electronic World Catalog of Symphyta' (Taeger et al. 2018). Subsequently, we have not provided full lists of nomenclature for each species, but only the valid name, original name, and names that have previously been used in New Zealand.

MORPHOLOGY

Terms for structures follow Huber and Sharkey (1993), but a few terms are specific to sawflies and follow Wong (1963) and Vitasaari (2002). Terms for genitalia follow Ross (1937) and Wong (1963). Illustrations of general morphological features can be found online at 'Sawfly GenUS' (Baine et al. 2020; https://idtools.org/id/sawfly/sawflies_morphology.php). In addition to structural terms for body parts, we use the following terms to designate surface features, such as "ridges" (carinae), "furrows" (sulci), "pits" (punctures), and microsculpture. The words "edge" and "margin" have previously been used interchangeably but are not synonyms. The "edge" refers to a border of a structure. A border can be straight, round, in-curved or out-curved. A "margin" is an area of a surface term that includes the edge. The width of a "margin" could be defined by a colour change, a furrow, or a ridge. Only a "margin", not an "edge", can be "emarginated" (meaning out of a portion of a margin surface). So, for example the clypeus is "emarginated", it means that the margin of the clypeus is in-curved. The area of a structure that is not a margin is referred to as a "disk". The words "band" and "stripe" though similar have different meanings in entomology (Torre-Bueno, 1937). A "band" is a transverse marking broader than a line. A "stripe" is a longitudinal streak different from the ground.

IMAGING

Images were made using a DSLR Canon Rebel T6i camera with an MPE-65 lens. Multiple images were taken of a structure through a range of focal planes from top to bottom and these were combined using Zerene® to produce a single, focused image. Specimens were illuminated by a flash through a semi-transparent plastic cylinder and reflected from a glossy photographic paper to eliminate glare. The final combined image was improved using Adobe Photoshop® CS6 and plates were assembled using the same software. For each species, up to three specimens were used to produce images to show structures clearly.

Other images were taken from literature and the internet. The source is mentioned under each image.

NOTES ON USE OF KEYS

Keys to species for adults and larvae are provided using morphological features. The larval key is based on the last instar larvae for the colour patens. Younger instar larvae tend to be whitish, and patterns are often lacking. Information about host plants and biology is also provided as this is likely to be important to help confirm the species identification. A short diagnosis and description of key morphological characters is provided for each genus and family. For the larva of several species, a diagnosis and description are provided for the first time.

Use of figures. Each figure has letter matching the appropriate text in the couplet. Two or more figures with the same letter code show a range of variation for a character. The illustration shown is not necessarily that of the species at hand but is a similar feature of the character to be observed. Therefore, other structures in the figure should be ignored.

Key construction. Each couplet is arranged in contrasting pairs of statements labeled, respectively, with lower- and upper-case letters. Each statement describes one feature of a character, and different expressions of the same character would be found as "a)" and "A)". For example, in couplet 1, the presence "a)" or absence "A)" of the axilla are illustrated. Information that is not compared in the alternate part of the couplet is given in square brackets as "Additional character." or "Note.". Clarification notes are given in parentheses.

Specimen sexing, condition, and preparation. Specimens free of debris and with their wings slightly open are best to view all surfaces. At least one antenna and one leg of each pair must be present and complete. It is often important to know the sex of the specimen to be keyed. In females, the abdomen consists of 10 terga and 7 sterna. In males, the abdomen consists of 8 terga and 9 sterna. Identification of male and female does not require dissection of the genitalia for this key. Sawfly larvae are soft-bodied, so they need to be treated differently from adult specimens. The most common way to store larvae is in glass vials of 70–95% EtOH. Use of a critical point drier can help preservation but colours are lost; freeze-drying specimens will retain their colour.

Microscope and Lighting. A dissecting microscope with a magnifying range of 20–60 × is recommended to view structures clearly. The best light is diffused, either from a daylight fluorescent bulb (13 watts is usually satisfactory) or is produced with a small piece of semi-opaque plastic between the light source and the specimen. We normally diffuse the light using a small (5 by 7 cm) piece of translucent plastic (Mylar) placed vertically on a base of modeling clay. The best diffusion is achieved when the plastic is less than 20 mm from the specimen. This type of lighting eliminates most or all the glare from smooth surfaces or those with metallic reflections. Such lighting makes structural features very clear as here illustrated.

Colour. In general, colouration on live and preserved specimens may be different. Body parts that are black may fade to dark brown or brown. The colour white in pinned specimens may be very different on live specimens. In live specimens, the pale pattern may be green, yellow, or white. The yellow and white patterns of live specimens may be white, dirty yellow or yellowish white in pinned specimens depending on the preparation methods. Dark colour patterns are generally derived from black pigments and depending on the intensity of the melanisation, the cuticle may vary from a straw-coloured surface to black. The following expressions for increasing levels of melanisation are used: very light reddish brown (straw colour), light reddish brown, reddish brown, brown, dark brown, and black. The pale colour pattern is based on the best-preserved specimens.

METHODS FOR COLLECTING & TRAPPING

Visual collecting is an excellent way to find the free-living larvae of sawflies and those in leaf galls on willows. This approach is also excellent to observe behaviour of adults and larvae. A sweep net will also collect adults and free-living larvae on potential host plants (e.g., willows, *Eucalyptus*, poplars). This method is excellent for short sampling periods.

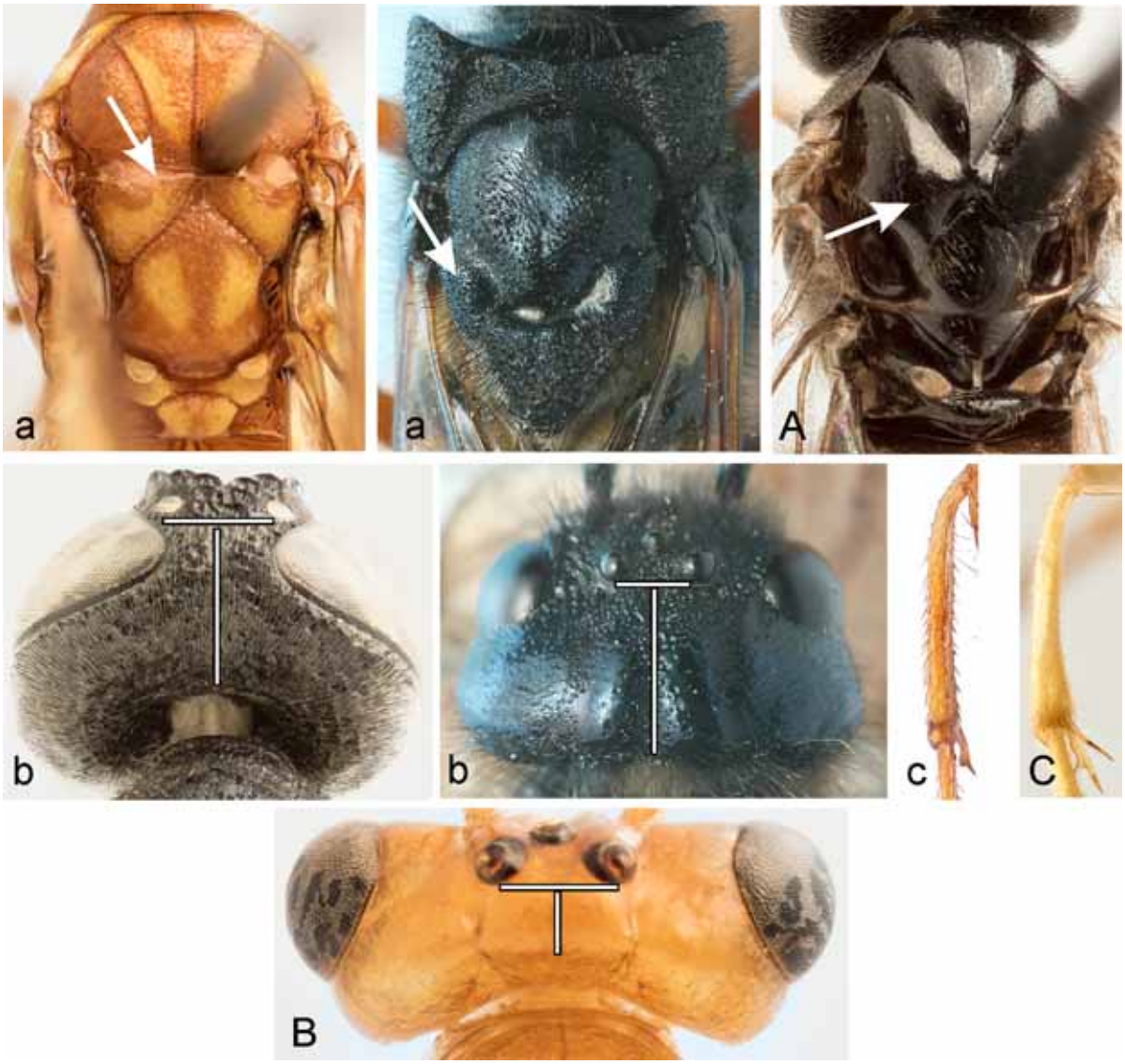
Trapping adults is commonly done with a Malaise trap (Townes 1972). The trap should be installed along an east-west flight path, with the catching container facing north so it is in the sunlight (in the southern hemisphere) with the main axis of the trap following a north-south direction. Traps are commonly used at the same site for many weeks. Another trapping method for adults involves the use of yellow pan traps in short vegetation. With taller vegetation the traps should be located higher up (e.g., on a stump or a rock). The trap should be bright yellow (as an attractant), almost filled with water and a few drops of a non-scented detergent to break the surface tension. Ideally traps should be emptied every 1–2 days, preferably in the evening, to ensure high quality specimens. For longer periods, saturated salt solutions can be used, however, the results are not very good as specimens start to rot after a few hot days. Pan traps are easy to install and moved, and the traps can be put near potential host plants. After a few weeks, these traps must be cleaned as dust obscures the yellow colour and a film of bacterial slime grows on the plastic.

Acquiring insects associated with tree boles (trunks) and large branches is best dealt with by rearing. Because of the time needed for this activity, woodwasps are usually underrepresented in collections. The easiest method for Xiphydriidae is to collect branches (3 to 5 cm in diameter) in the spring. For Siricidae, cut dead or almost dead trees (cut in small sections of about 1 m) and put these in rearing containers or cages. Siricidae are found on tree trunks and higher up in the canopy. Many specimens of Sircidae in collections have been reared from tree trunks brought into the laboratory.

KEY TO ADULTS

1 a) Mesoscutum with a transverse furrow or suture that divides into anterior scutum and posterior axilla (a triangular surface lateral to mesoscutellum).
b) Postocellar area very long, length to back of head anterior to occiput or if present to occipital ridge 2–3 × as long as width between ocelli.
c) Protibia with one apical spur.
d) Body large (8 mm or more).
[**Note**. Larvae of these species live inside dead or live wood.]
..... 2

– A) Axilla absent, the mesoscutum not divided with a transverse furrow or suture, and axilla not outlined.
B) Postocellar area short, length to occiput or occipital ridge about as long as or shorter than width between ocelli.
C) Protibia with two apical spurs.
D) Body small (7 mm or less).
[**Note**. Larvae of these species are associated with leaves.]
..... 6

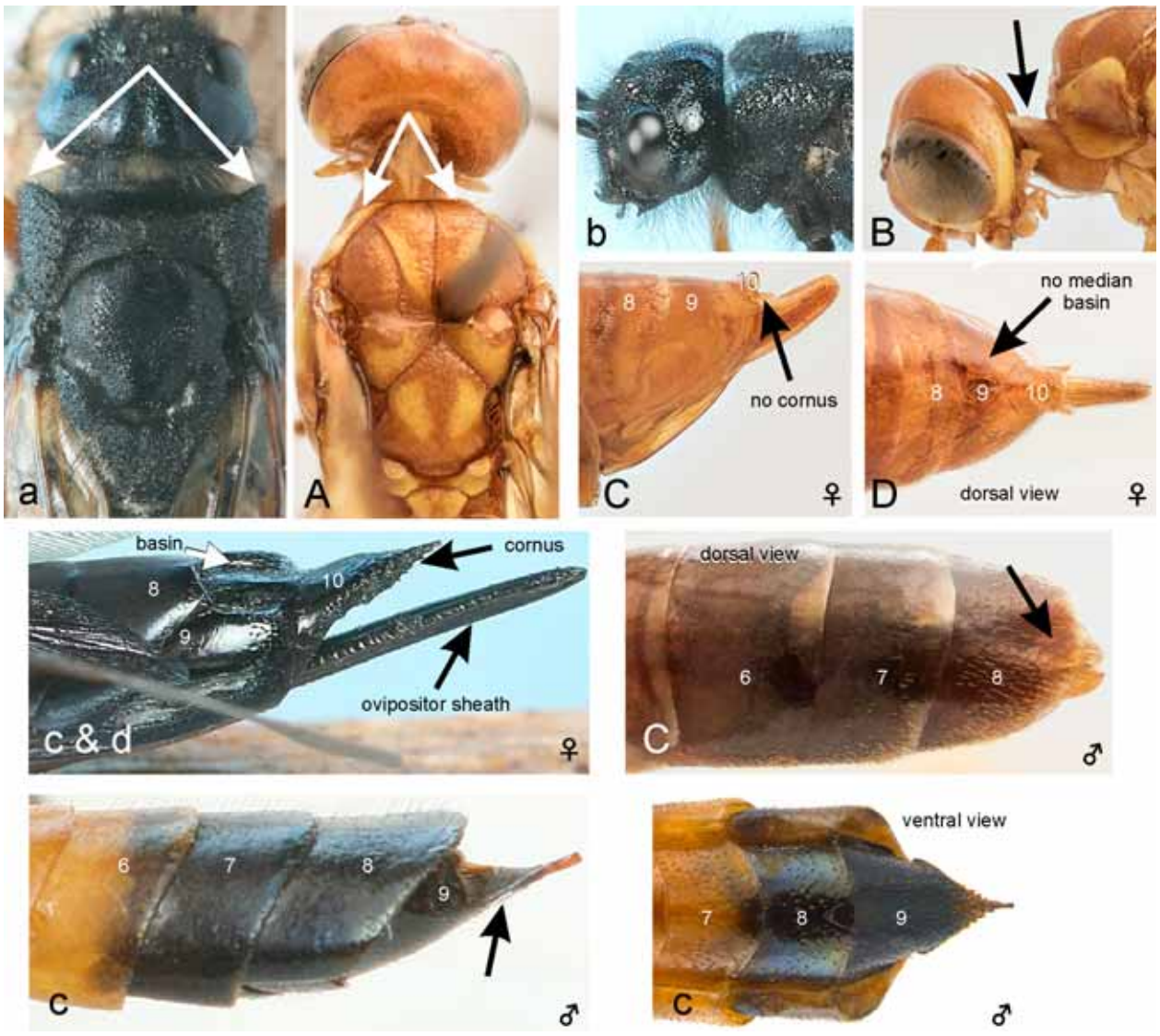


2(1) a) Head with a crown of backward-pointing teeth around median ocellus.
b) Antennal toruli clearly inserted below eye level.
c) Lateral ocelli very close to the inner orbit of the eye, so that the distance between the lateral ocelli is much greater than the distance between an ocellus and eye.
[**Note**. Larvae of this species are external parasitoids of probably many wood boring beetles and at least one species of Hymenoptera.]
..... Orussidae—*Guiglia schauinslandi* (Ashmead, 1903)

– A) Head without a crown of backward-pointing teeth around median ocellus.
B) Antennal toruli inserted between eyes.
C) Lateral ocelli distant from the inner orbit of the eye, so that the distance between the lateral ocelli is subequal or shorter than the distance between an ocellus and eye.
[**Note**. Larvae of these species feed on fungi on live or dead wood.]
..... 3

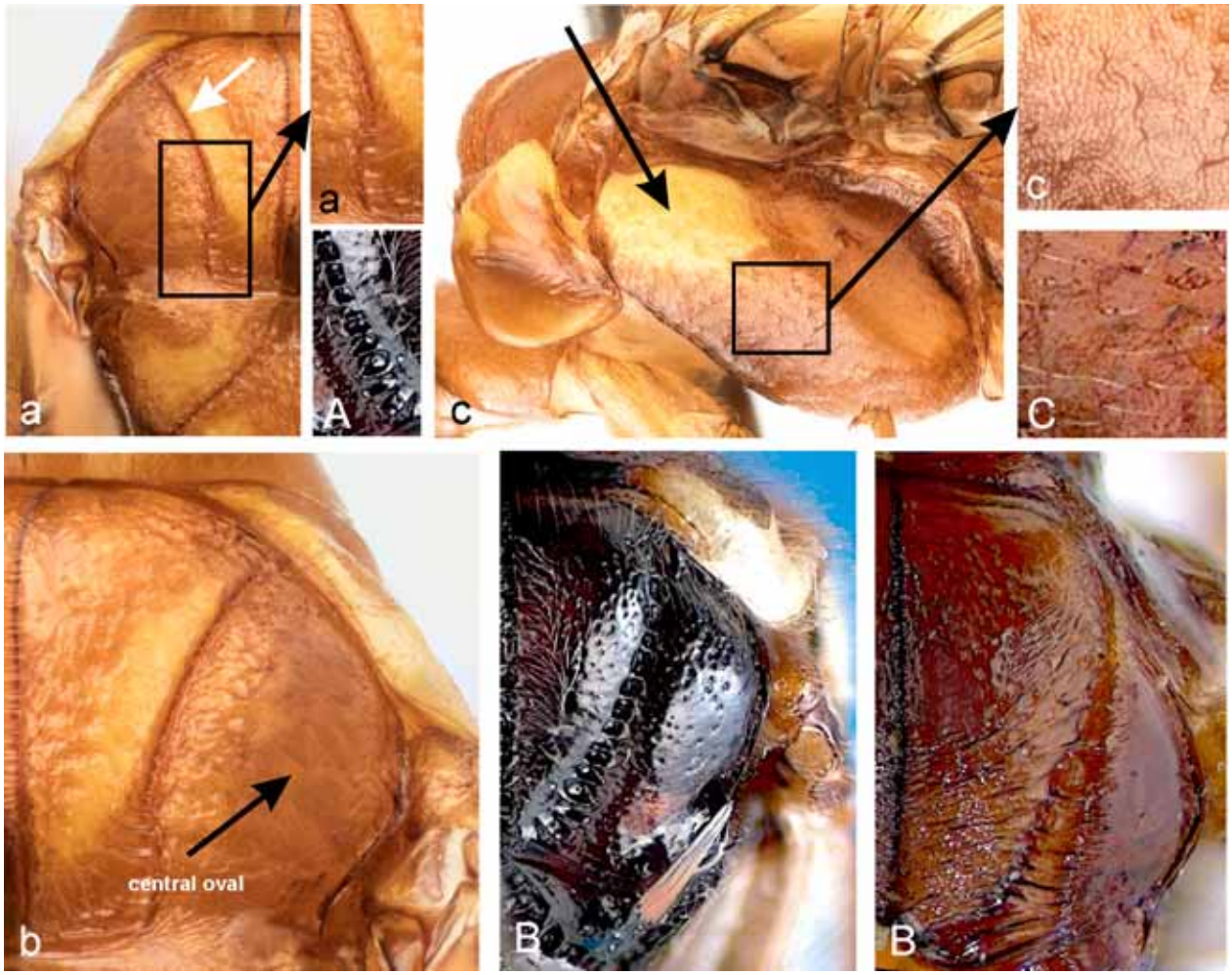
3(2) a) Pronotum collar-like (lateral surface extending dorsally and anteriorly around the back of the head).
b) Propleuron in lateral view short and head close to pronotum.
c) In female, last tergum (tergum 10), and in male, last sternum (sternum 9) extending as a horn (cornus).
d) In female, tergum 9 with large median basin (best seen in dorsal view).
[**Note**. Adults and larvae are associated mostly with species of exotic pine trees in New Zealand.]
..... Siricidae—*Sirex noctilio* Fabricius, 1793

– A) Pronotum not collar-like (lateral surface extending only ventrally).
B) Propleuron in lateral view long and head clearly distant from pronotum.
C) In female and male, apically without a horn.
D) In female, tergum 9 without a median basin (best seen in dorsal view).
[**Note**. Adults and larvae are associated only with native New Zealand trees.]
.....Xiphydriidae—4



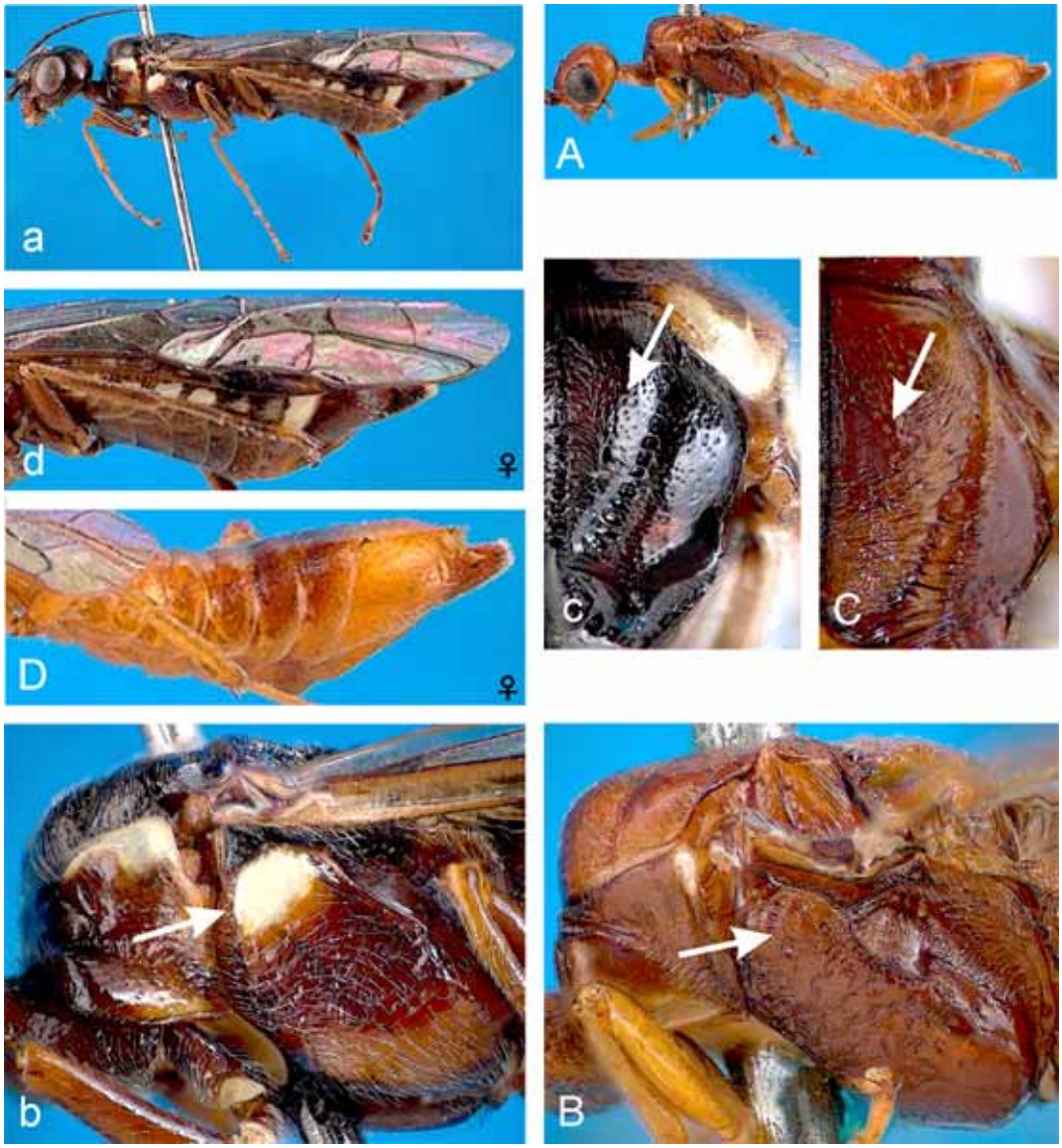
4(3) a) Notaulus with very small pits in anterior 0.7 and with crenulated pits in posterior 0.3.
b) Median lobe of mesoscutum flat or only slightly convex; surface shallowly and densely pitted and with microsculpture; lateral lobe with a large central oval of microsculpture with convex sculpticells and without pits
c) Mesepisternum with large white spot dorsally, shallowly pitted, with widespread microsculpture.
..... *Moaxiphia decepta* (Smith, 1876)

– A) Notaulus with large crenulated pits throughout length.
B) Median lobe of mesoscutum strongly convex, either with surface smooth and finely pitted or with transverse ridges and coarse pits; lateral lobe without a large central oval of microsculpture and surface smooth with many or few pits.
C) Mesepisternum dorsally without white spot, or if spot present it is small; mesepisternum with more clearly outlined pits.
..... 5



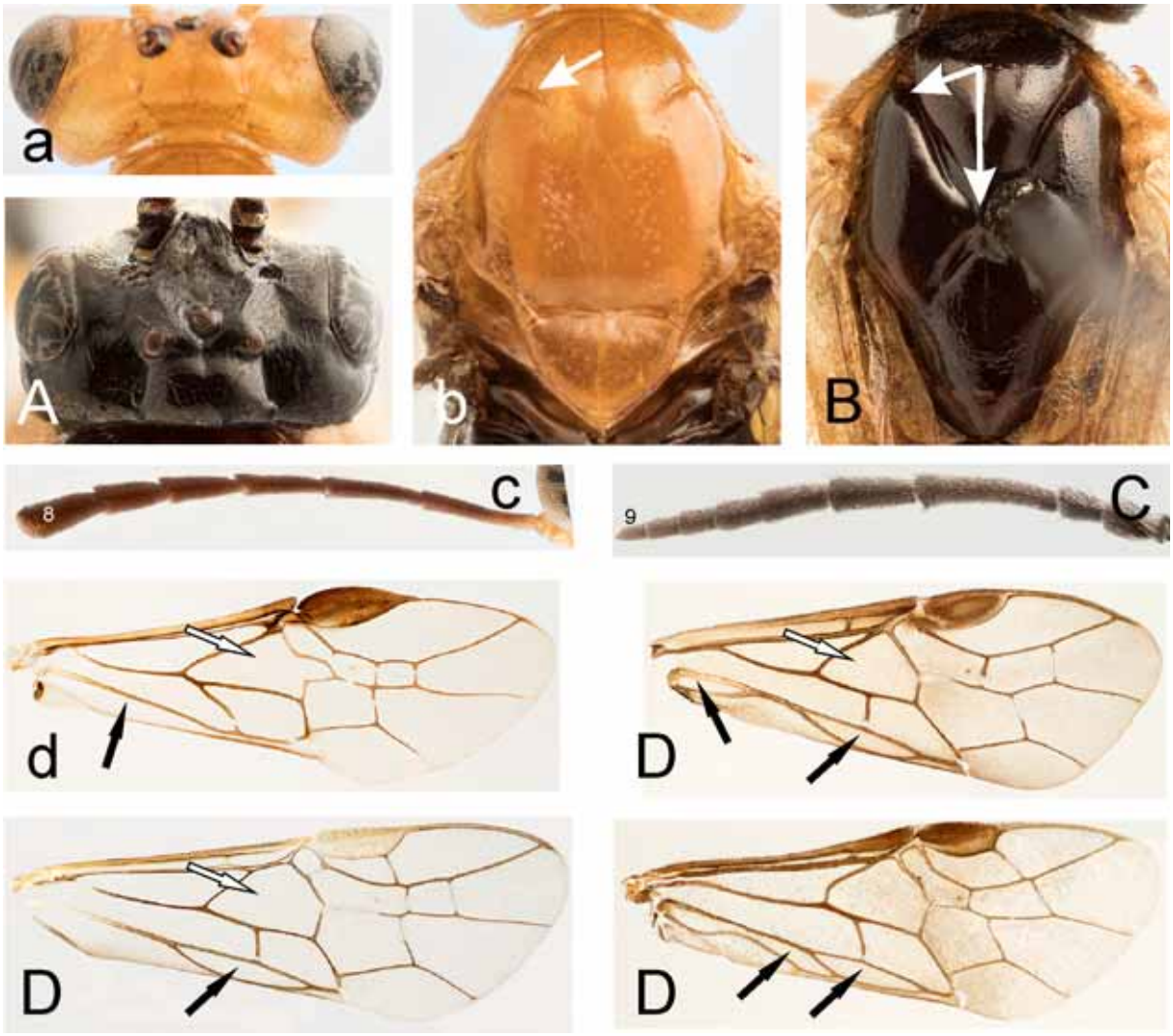
5(4) a) Body and legs mainly black and dark brown.
b) Mesepisternum with small white spot dorsally, finely pitted with dense hairs and smooth between pits.
c) Median lobe of mesoscutum finely pitted with dense hairs and smooth between pits.
d) In female, abdomen black with a white spot laterally on terga 2–6, and with a large white spot on tergum 8.
..... *Moaxiphia duniana* (Gourlay, 1927)

– A) Body and legs reddish-brown, may be partly black on abdominal segments 2–8.
B) Mesepisternum without white spot dorsally, and coarsely pitted with sculpticells between pits.
C) Median lobe of mesoscutum with coarse pits and transverse ridges.
D) In female, abdomen reddish-brown (may be black on all or some of terga 2–8), and without white spot laterally on terga 2–6 and tergum 8.
..... *Moaxiphia gourlayi* Ward & Goulet, 2011



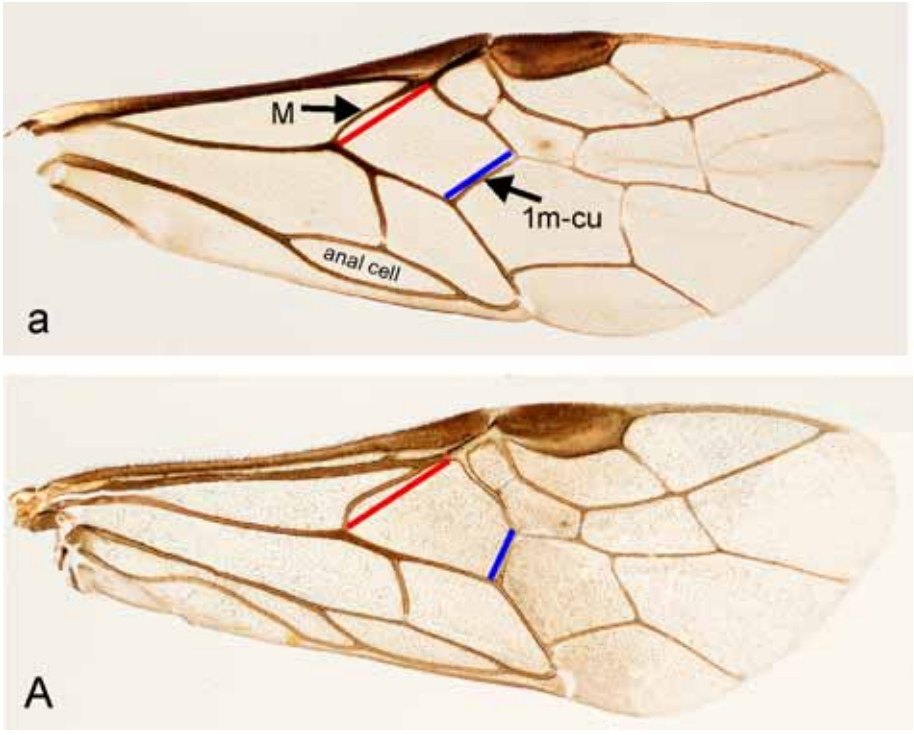
6(1) a) Head in dorsal view very transverse.
b) Notauli very short, not meeting posteriorly (present only near pronotum).
c) Antenna with 8 antennomeres; In female, antennomeres in lateral view enlarging gradually, the last antennomere the largest and clearly abruptly rounded at apex.
d) Fore wing without a closed anal cell; cell 1M arrowhead-like.
[Note. This is a leaf mining sawfly and is an exotic species from Australia.]
..... Pergidae—*Phylacteophaga froggatti* Riek, 1955

– A) Head in dorsal view not so transverse.
B) Notauli long and meeting posteriorly.
C) Antenna with 9 antennomeres; In female, antennomeres in lateral view almost thread-like (flagellum thinning down a little) or seta-like (flagellum gradually thinning down and hair-like), and last antennomere narrow and not enlarged at apex.
D) Fore wing with one or two closed anal cells; cell 1M cell 4– or 5– sided.
[Note. All of the following species are exotic in New Zealand, all are originally from Europe.]
..... Tenthredinidae—7



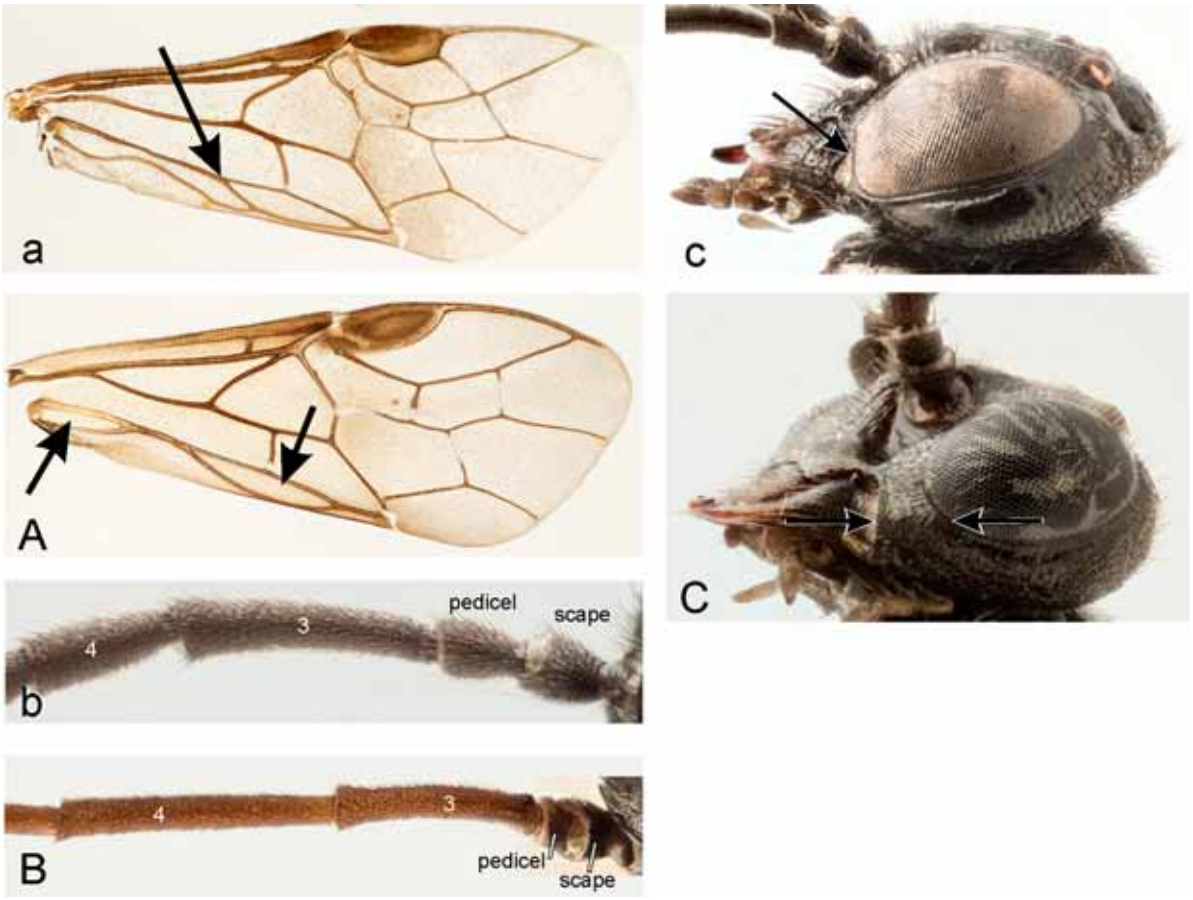
7(6) a) Fore wing veins M and 1m–cu subparallel. Fore wing vein 1m–cu about 0.8 × as long as vein M.
[Additional characters. Fore wing with one anal cell. Note. larvae of this species feed on leaves of Clematis. This European species was introduced as a biocontrol agent.]
..... Blennocampinae—*Monophadnus spinolae* (Klug, 1816)

– A) Fore wing veins M and 1m–cu clearly convergent toward anterior margin of wing. Fore wing vein 1m–cu about 0.5– 0.6 × as long as vein M.
..... 8



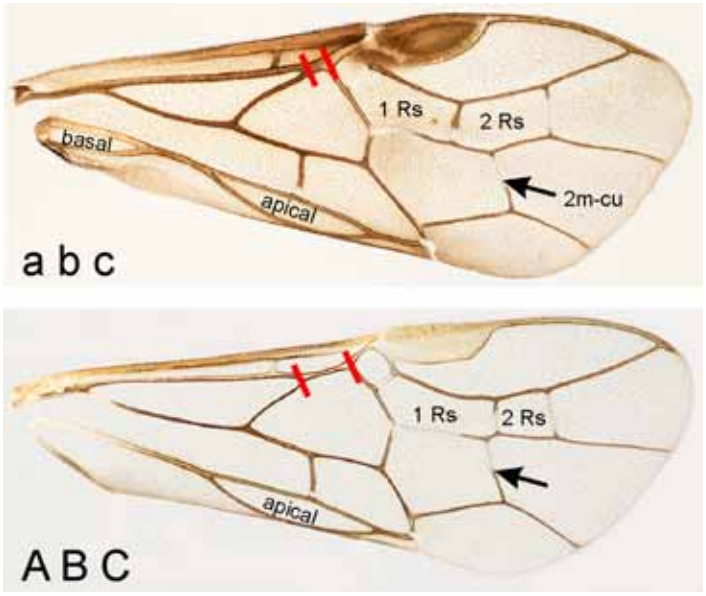
8(7) a) Fore wing with anal cell complete and divided by a cross vein.
b) Scape and pedicel each about 1.5 × as long as wide. Combined length of scape and pedicel about 1.2 × as long as antennomere 4. Antennomere 3 almost 2.0 × as long as antennomere 4.
c) Malar space very thin and thread-like.
[Note. Larvae of this species feed on rosaceous plants like apples and pears.]
..... *Caliroa cerasi* (Linnaeus, 1758)

– A) Fore wing with anal cell constricted at middle and divided into closed basal and apical cells, or with one closed apical cell.
B) Scape about as wide as long, and pedicel wider than long. Combined length of scape and pedicel 0.3–0.6 × as long as antennomere 4. Antennomere 3 shorter than antennomere 4.
C) Malar space as long as, or slightly shorter than, width of antennomere 3 or 4.
.....Nematinae—9



9(8) a) Fore wing with anal cell constricted at middle and divided into closed basal and apical cells.
b) Fore wing vein M meets vein R a short distance before junction of Rs+M.
c) Fore wing vein 2m–cu joined to cell 2RS.
..... 10

– A) Fore wing with anal cell constricted in basal 0.5 and with a closed apical cell only.
B) Fore wing vein M meets vein R distinctly before junction of Rs+M.
C) Fore wing vein 2m–cu joined to cell 1RS.
[**Note**. The following species are associated with willows, *Salix* spp.]
..... 11



10(9) a) Abdomen, mesopleuron, coxae, and most of femora black.
b) In female, ovipositor sheath in dorsal view very broad.
c) Metatarsomere 1 as long as combined length of metarsomeres 2–4.
[**Note**. Larvae of this species feed on various species of brambles (*Rubus* spp.).]
..... *Cladius* (*Priophorus*) *brullei* Dahlbom, 1835

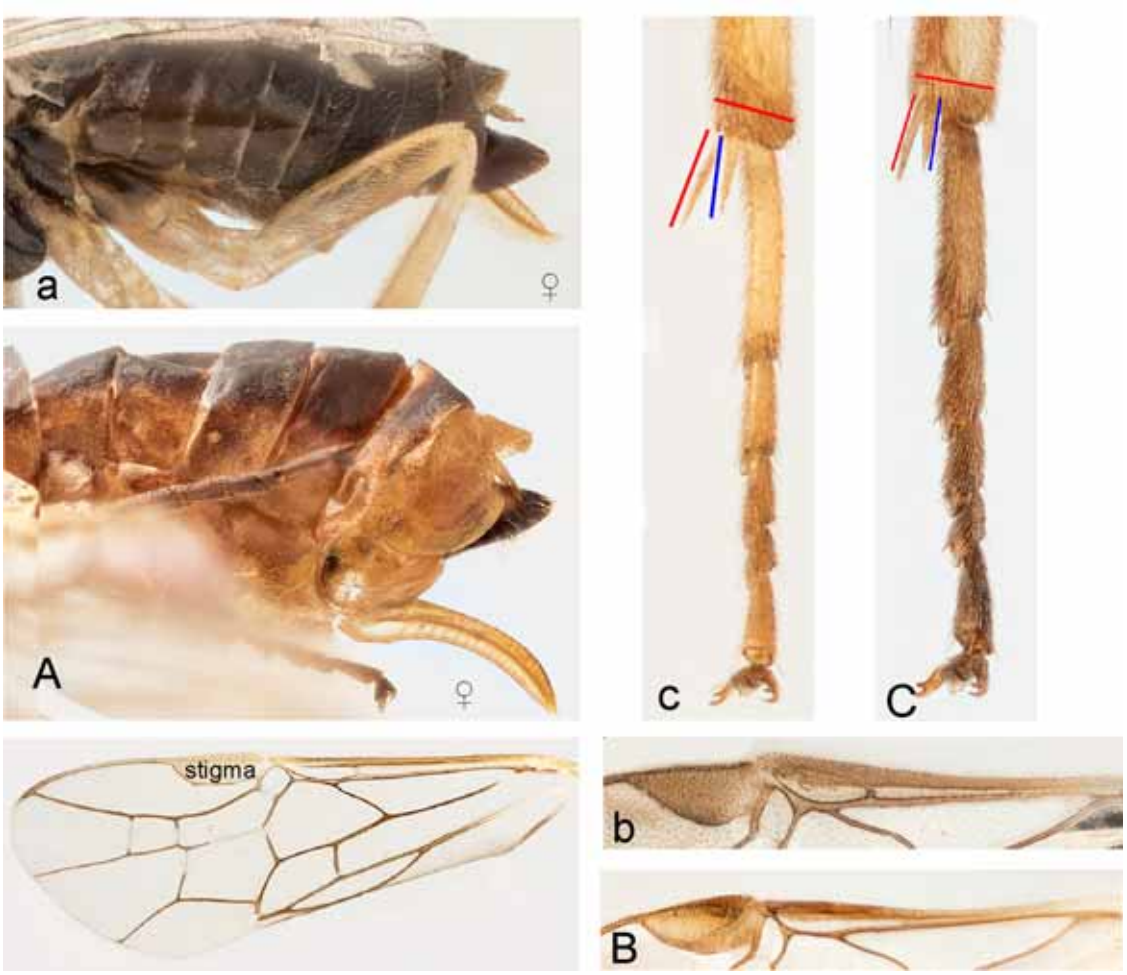
– A) Abdomen, most of mesopleuron, and legs light reddish-brown.
B) In female, ovipositor sheath in dorsal view narrow.
C) Metatarsomere 1 as long as combined length of metarsomeres 2–3.
[**Note**. Larvae of this species feed mainly on poplars (*Populus* spp.) and occasionally on willows (Salix spp.).]
.....*Cladius* (*Trichiocampus*) *grandis* (Serville, 1823)

11(9) a) Antennae very long and clearly tapering. Antennomere 3 in lateral view 5.0–7.0 × as long as wide. ..... *Euura oligospila* (Förster, 1854)

– A) Antenna short and tapering only slightly. Antennomere 3 in lateral view about 3.0 × as long as wide. 12

12(11)a) Abdomen, in female, black (male is not recorded in New Zealand).
b) Fore wing with stigma dark brown in apical 0.6.
c) Metatibia with apical spurs unequal; longest spur longer than apical width of tibia in lateral view.
[**Note**. Larvae are found in reddish leaf galls on willows. The galls are on each side of the leaf midrib and are found above and below the leaf blade.]
.....*Euura proxima* (Serville, 1823)

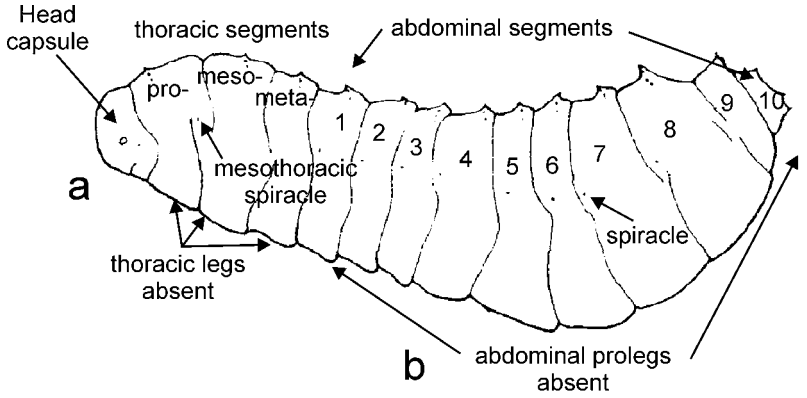
– A) Abdomen, in female, black, or mainly light reddish brown and black dorsally, and in male, abdomen black but light reddish brown on sternum 9.
B) Fore wing with stigma light reddish brown throughout.
C) Metatibia with apical spurs subequal; longest spur the same as, or shorter than, apical width of tibia in lateral view.
..... *Euura viduata* (Zetterstedt, 1838)

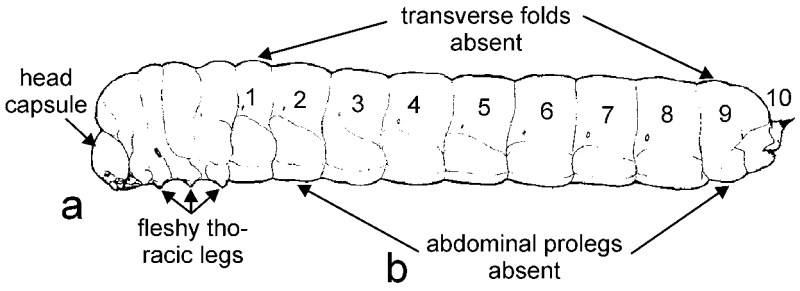


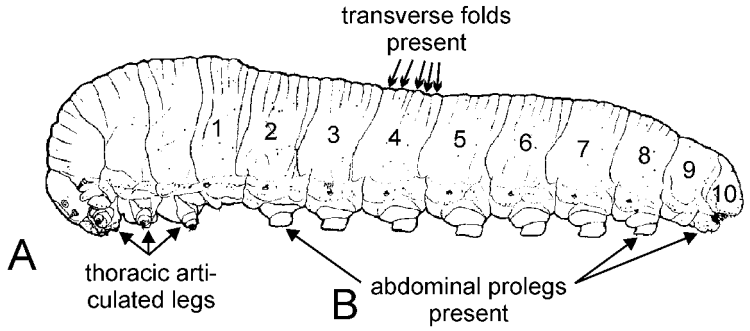
KEY TO LARVAE

1 a) Thoracic legs absent, or present as membranous conical lobes and not articulated.
b) Abdominal prolegs absent.
[Note. Larvae are found in branches and logs of trees.]
..... 2

– A) Thoracic legs clearly developed and articulated with 3–5 segments.
B) Abdominal prolegs usually present but absent in leaf mining larvae.
[Note. Larvae are found feeding on, or in, leaves of angiospermous plants. None of the following species are native to New Zealand.]
..... 4







from Yussa (1922)

2(1) a) Thoracic legs absent.

b) Tergum 10 not sclerotized, without a deep median furrow, and without a dark cornus (apical portion of suranal process) at apex.

[Additional characters. Antenna 1–segmented. Maxilla and labium vestigial, membranous, lobe-like, and without palpi. Thoracic nota and abdominal terga with a submedian transverse row of 2–5 recurved short spines. Mesothoracic spiracle as small as abdominal spiracles. Note. Larvae are parasitic on wood-boring larvae of Coleoptera and Hymenoptera. This is an endemic species.]

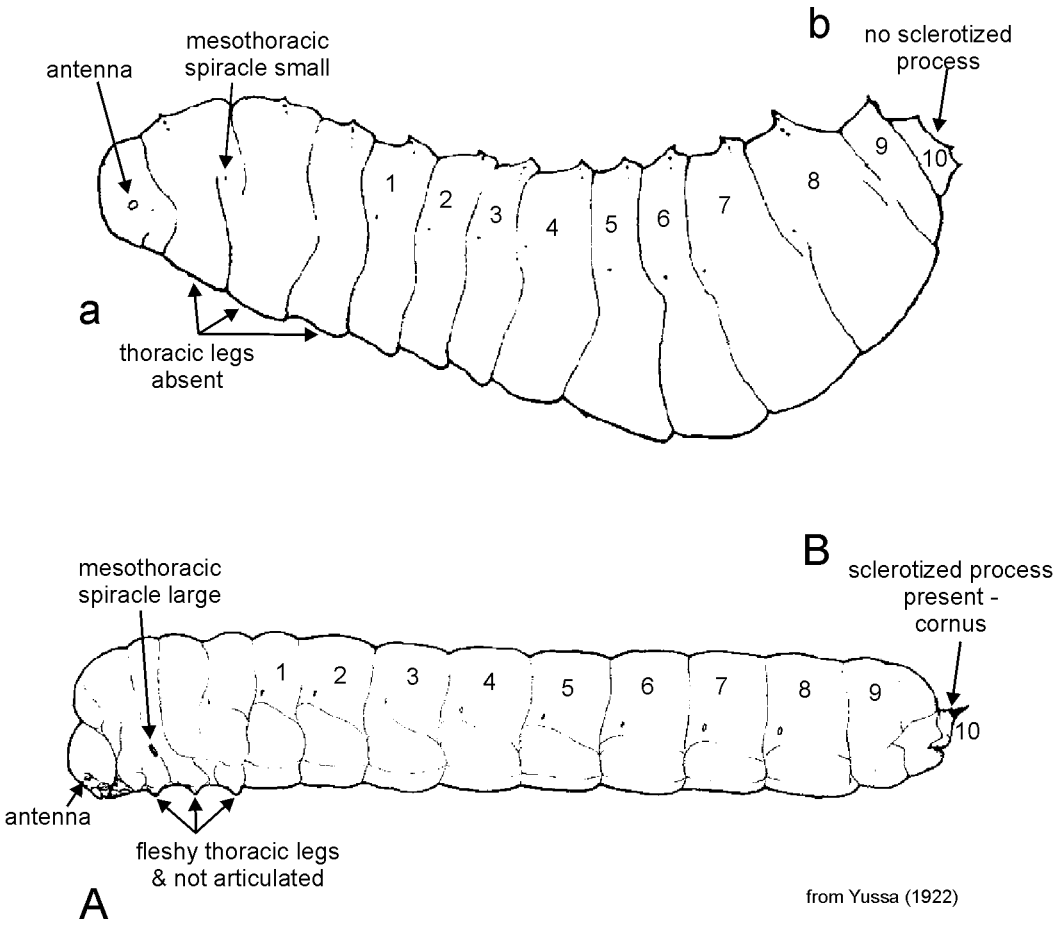
.....Orussidae—*Guiglia schauinslandi* (Ashmead, 1903)

– A) Thoracic legs present as membranous conical lobes, but not articulated.

B) Tergum 10 sclerotized, with a deep median furrow, and a dark cornus (apical portion of suranal process) at apex.

[Additional characters. antenna with 3 or 4 antennomeres. Maxilla and labium well developed with palpi. Thoracic nota and abdominal terga without a submedian transverse row of recurved short spines. Mesothoracic spiracle clearly larger than other spiracles on the thorax and abdomen. Note. Larvae feed on wood inoculated from spores of a special fungus deposited on eggs by the female.]

.....3



3(2) a) Cornus on tergum 10 in lateral view with teeth on dorsal surface only; in dorsal view with two large and broad teeth at base and two teeth about centre; apex in dorsal knife-like.

b) In dorsal view, the anterior lateral margins of tergite 10 strongly convergent, almost meeting in the midline at their most anterior point; posterior margins of tergum 10 oblique.

c) Clypeus asymmetrical, with a well-defined lobe ventrally on right side.

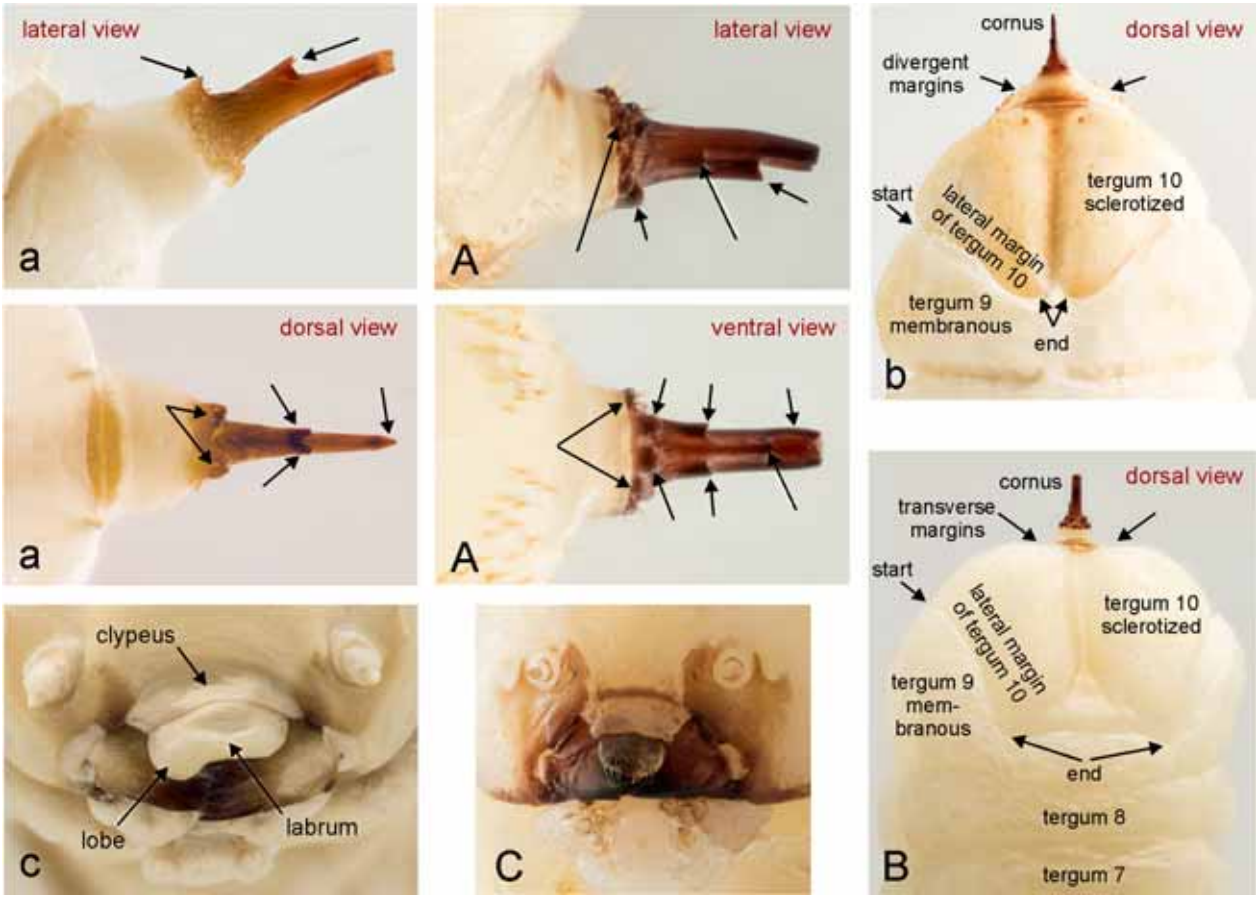
..... Siricidae—*Sirex noctilio* Fabricius, 1793

– A) Cornus on tergum 10 in lateral view with teeth on ventral surface only; in ventral view with many small teeth or tubercles with long setae around base and three teeth; apex in dorsal broad.

B) In dorsal view, the anterior lateral margins of tergite 10 slightly convergent, still widely separated at their most anterior point; posterior margins of tergum 10 transverse.

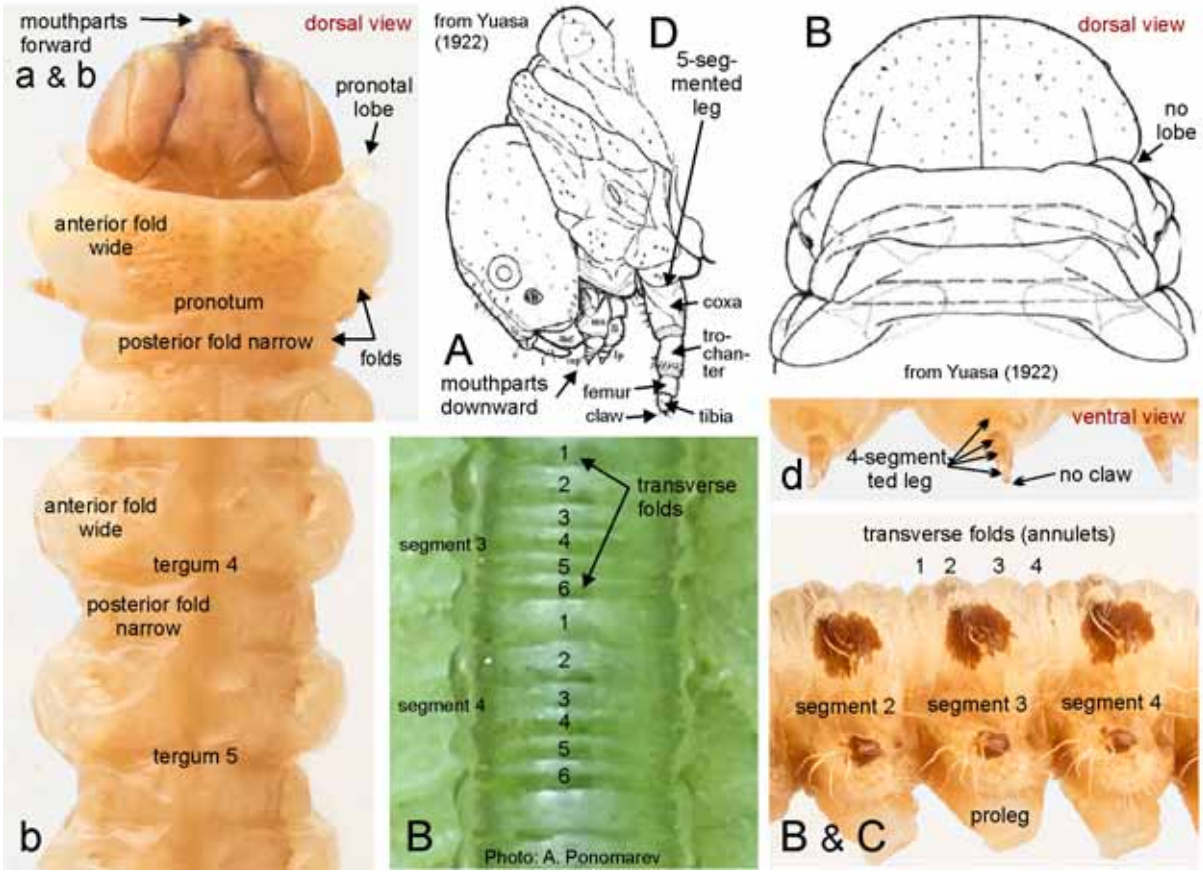
C *Clypeus symmetrical*, without a lobe ventrally.

.....Xiphydriidae—*Moaxiphia*



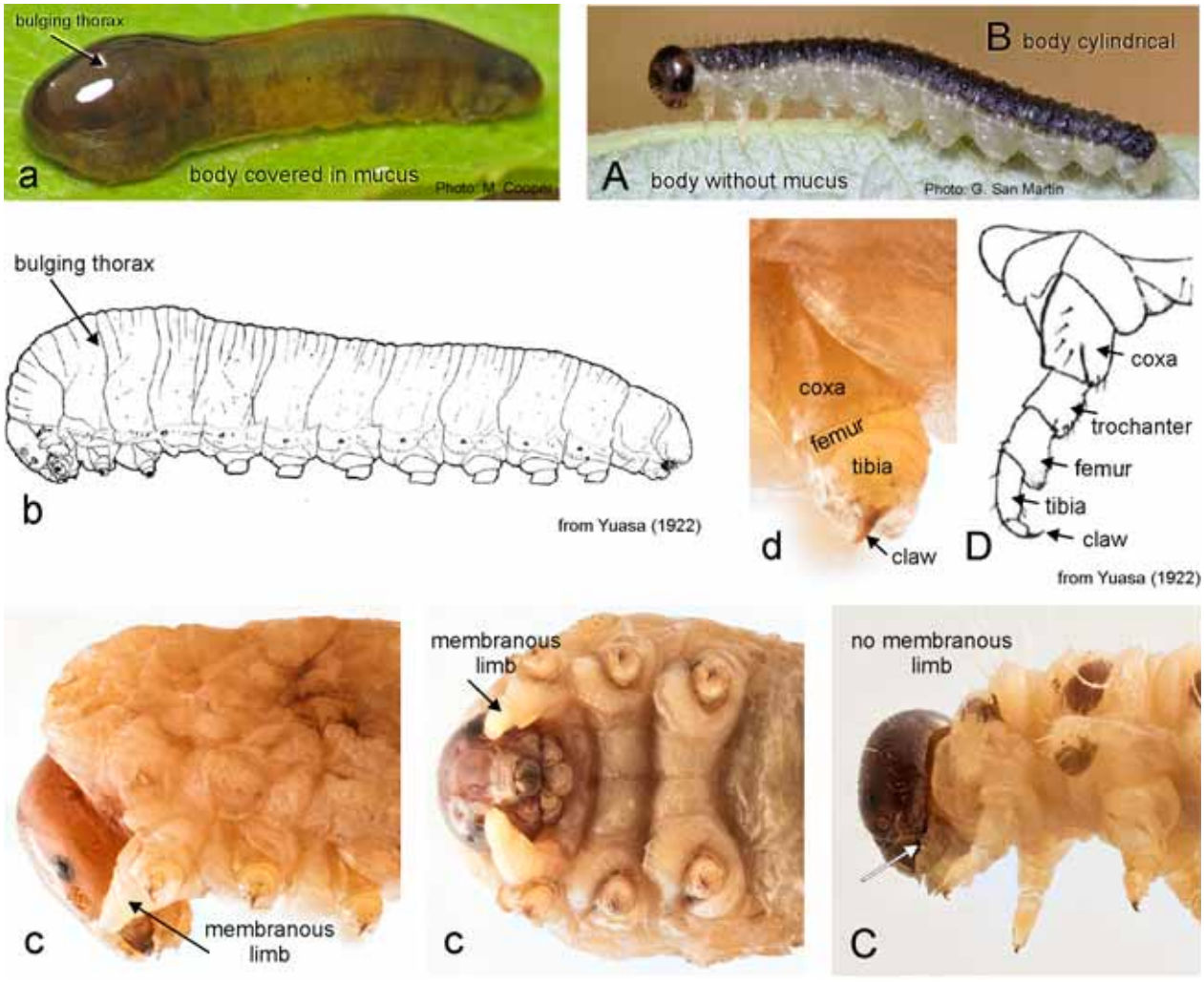
4(1) a) Body dorsoventrally compressed; mouthpart oriented forward (prognathous).
b) Pronotum and terga 1–8 in dorsal view with two transverse folds (annulets), and anterior fold clearly wider than posterior one; pronotum with a membranous lobe on anterolateral corner.
c) Abdominal prolegs absent.
d) Thoracic legs small, each with 4 segments, but without a claw.
[Note. This is the only leaf mining sawfly in New Zealand. Larvae occur inside leaf blotches on various species of *Eucalyptus*. *P. froggatti* and like its host are not native to New Zealand.]
..... Pergidae—*Phylacteophaga froggatti* Riek, 1955

– A) Body round in cross section; mouthpart oriented downward (hypognathous).
B) Pronotum and terga 1–8 with 4–7 transverse folds (annulets), and transverse folds subequal in width; pronotum without a lobe on anterolateral corner.
C) Abdominal prolegs (best seen in lateral view) present on segments 2–7 and 10, or 2–8 and 10).
D) Thoracic legs long, each with 4 or 5 segments, and with a claw.
[Note. All following seven species are originally from Europe. Most species are free living but two are found in galls, and none are leaf miners.]
.....Tenthredinidae. 5



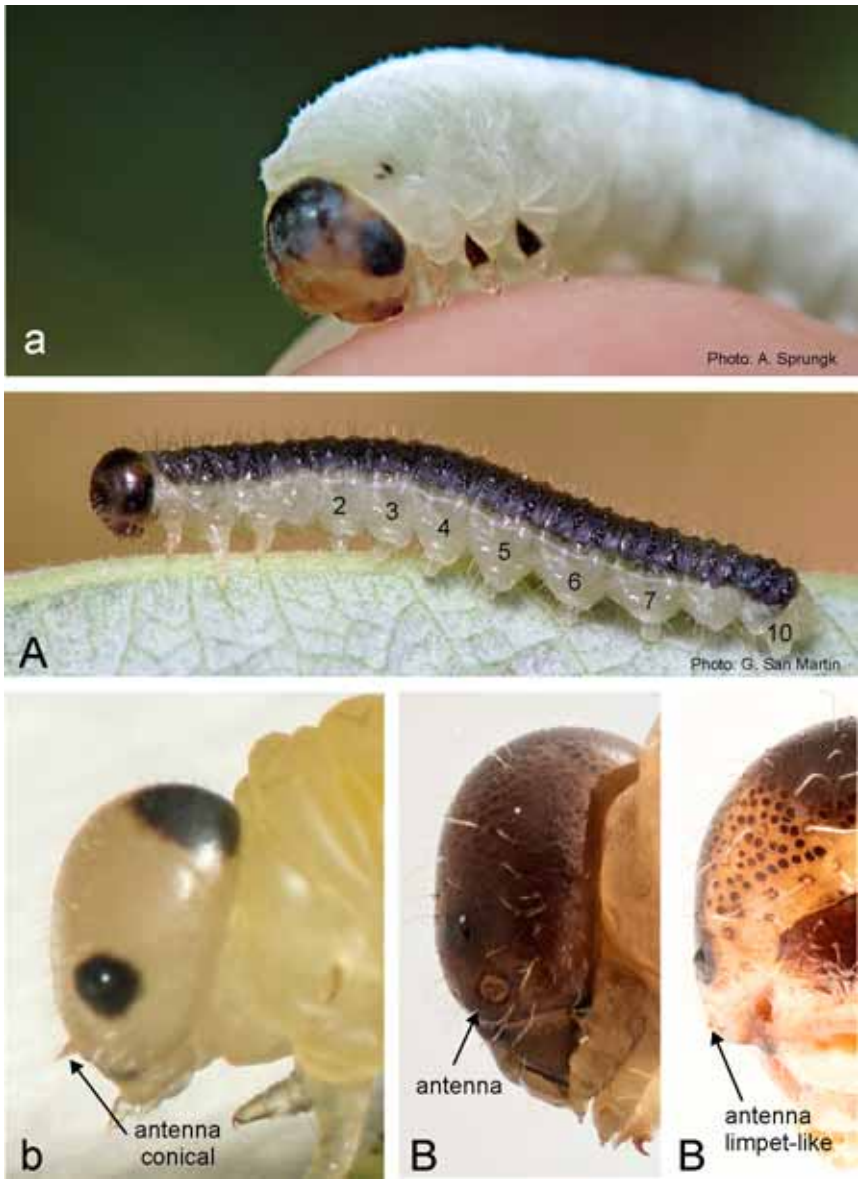
5(4) a) Body covered with mucus when alive (hence their common name pear-slug).
b) Thorax greatly bulging and abdomen tapering from segment 1 to 10.
c) Base of proleg extending along lateral surface of head as a thick membranous limb.
d) Thoracic legs 4–segmented.
[Note. Larvae mainly feed on rosaceous plants (e.g., pears, cherries, etc.).]
..... Heterarthrinae—*Caliroa cerasi* (Linnaeus, 1758)

– A) Body never covered in mucus. Body with or without wax cover.
B) Thorax not particularly thickened, body cylindrical.
C) Base of proleg without a thick membranous limb extending outward along lateral surface of head.
D) Thoracic legs 5–segmented.
..... 6



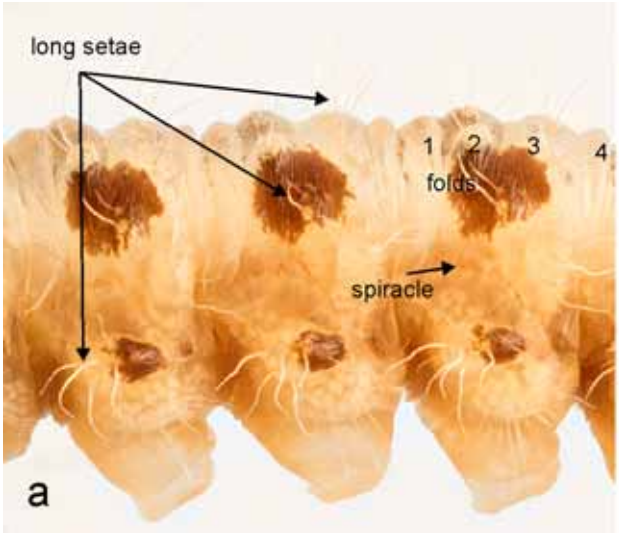
6(5) a) Abdomen with prolegs on segments 2–8 and 10.
b) Antenna conical and extending beyond surface of head
[Additional character. The head is yellowish brown with a large black spot on the temple and vertex. Note. This species was introduced as a biocontrol agent. Larvae feed only on *Clematis vitalba*.]
.....*Monophadnus spinolae* (Klug, 1816)

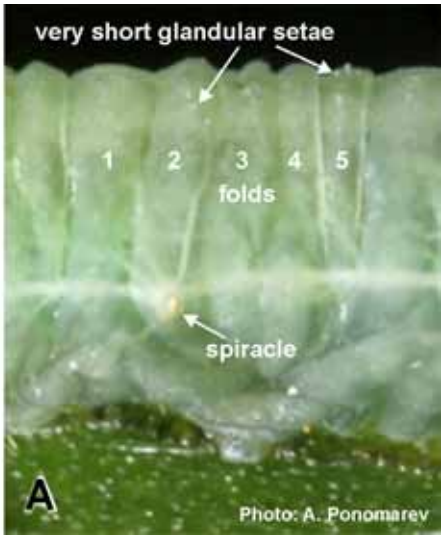
– A) Abdomen with prolegs on segments 2–7 and 10.
B) Antenna very low, hardly extending beyond surface of head, and flat or limpet shaped.
[Note. Larvae are on willows (*Salix* spp.), poplars (*Populus* spp.), or brambles (*Rubus* spp.)]
.....Nematinae. 7



7(5) a) Abdominal transverse folds (annulets) with long setae.
b) Abdomen with 4 transverse folds (annulets) on at least central segments.
.....*Cladius*. 8

– A) Abdominal transverse folds (annulets) without long setae but with short glandular setae (glandubae).
B) Abdomen with 4–6 transverse folds (annulets) on at least central segments.
[Note. The following species are associated with willows only.]
.....*Euura*. 9



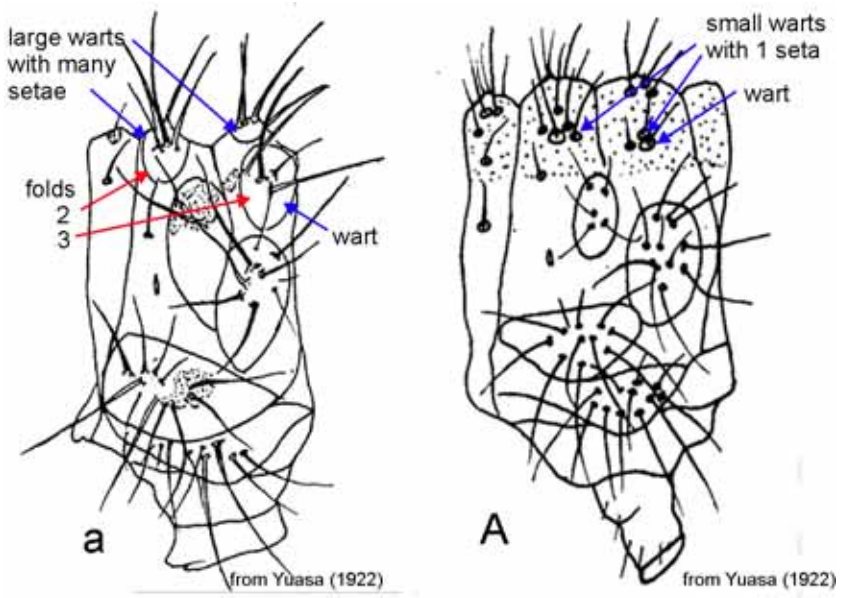


8(7) a) Abdomen with several long setae on each large wart dorsally on transverse folds (annulets) 2 and 3.

b) Body of mature larvae mostly yellow, and thoracic and abdominal segments with a large black spot sublaterally on post-stigmal lobe and a small black spot laterally on supra-pedal lobe (lobe above legs and proleg base).
[Note. Larvae feed on willows (*Salix* spp.) and poplars (*Populus* spp.).]
.....*Cladius* (*Trichiocampus) grandis* (Serville, 1823)

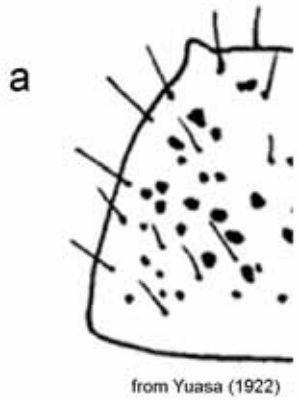
– A) Abdomen with single setae on each small wart (warts are in small groups) dorsally on transverse folds (annulets) 2 and 3.

B) Body of mature larvae mostly white, and thorax and abdomen with a broad dark stripe dorsally.
[Note. Larvae feed on brambles (*Rubus* spp.)]
..... *Cladius* (*Priophorus*) *brullei* (Dahlbom, 1835)

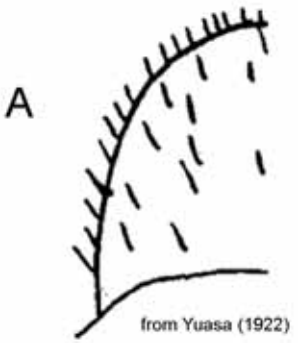


9(7) a) Suranal lobe on segment 10 with a posterolateral process present (can be short to well-developed).
b) Head either mainly black or brown, or pale green with black spot or band above eye and medially along median suture and over upper 0.5 of frons.
..... 10

– A) Suranal lobe on segment 10 without process.
B) Head pale green.
[Note. Early instar larvae live in a rolled leaf roll gall and are free living in later instars.]
..... *Euura viduata* (Zetterstedt, 1838)



from Yuasa (1922)



from Yuasa (1922)

10(9) a) Head of mature lava entirely dark brown or black.
b) Suranal process on segment 10 small, sharp, and triangular.
[Note. Larva lives in a red bean-shape gall on willows.]
.....*Euura proxima* (Serville, 1823)

– A) Head of mature larva mainly yellowish green with a vertical streak extended from eye to vertex and a black median stripe along epicranial suture and dorsal 0.5 of frons.
B) Suranal process on segment 10 quite large, knob-like with dense small tubercles over surface of suranal lobe.
[Note. The larva is free living on willows.]
.....*Euura oligospila* (Förster, 1854)

TAXONOMIC AND BIOLOGICAL SYNOPSIS

ORUSSIDAE

Diagnosis

Among all families of Symphyta, the Orussidae are easily recognised by having the head with a crown of backward-pointing teeth around the median ocellus (Fig. 1b); the lateral ocellus being very close the inner orbit of the eye (distance between lateral ocelli is much greater than distance from lateral ocellus to inner orbit (Fig. 1c)); and in frontal view, the antennal toruli are inserted below the level of the eyes (Fig. 1c).

Genus *Guiglia* Benson, 1938

Guiglia Benson, 1938: 11. Type species *Guiglia bombycinis* Benson, 1938, by original designation. Taeger et al. 2010: 59.

Diagnosis

Guiglia is distinguished from other orussid genera by the usually distinct occipital carina displaced medially; the slightly swollen antennomere 9 in the female; the lack of lateral ridge on antennomere 9; and a distinct triangular projection on the posterior surface of the apicoventral corner of the metafemur. Based on Vilhelmsen & Smith (2002).

Guiglia schauinslandi (Ashmead, 1903)

Figures: adult 1a–1h; habitus 1g & 1h; map 1i.

Ophrynopus schauinslandi Ashmead, 1903: 73. Taeger et al., 2010: 60.

Adults

Diagnosis

Guiglia schauinslandi is the only species in the genus with a lateral longitudinal frontal carina (Fig. 1c, arrow) and without dorsal frontal transverse carina on the front of the head. In New Zealand, *G. schauinslandi* is immediately distinguished from other species of Symphyta by the presence on the head of a crown of backward-pointing teeth around median ocellus (Fig. 1b).

Description

Colour. Body and appendages entirely dark brown or black (Figs 1a, g, h). **Head**. Head with lateral longitudinal frontal carina, but without dorsal frontal transverse carina (Fig. 1c). **Thorax**. Metepisternum with more than half of its surface smooth. **Abdomen**. In female, abdomen without conspicuous hairs at apex (Fig. 1g). **Legs**. Metacoxa with dense pubescence of elongate and shiny hairs. **Wings**. Fore wing vein Rs dark brown for most of its length, with vein 2r– m distinctly bent toward base and not reaching M posteriorly. Diagnosis and description based on Vilhelmsen & Smith (2002).

Larvae

Diagnosis

Among Symphyta, larvae of Orussidae are unique as they have no thoracic legs and the thoracic nota and abdominal terga have transverse rows of 2–5 small and slightly recurved cuticular spines submedially. Based on Vilhelmsen (2003).

Hosts & biology

The native hosts of *Guiglia schauinslandi* are thought to be the larvae of pit weevils (*Psepholax*) (Gourlay 1951) and the longhorn beetle *Stenopotes pallidus* Pascoe, 1875 (Nuttall 1980). Gourlay (1951) was the first to find that

G. schauinslandi was also a parasitoid of *Sirex noctilio* in New Zealand. However, Nuttall (1980) states its importance in the control of *Sirex* is very limited because the number of larvae attacked are few. Gourlay (1951) also thought that *Rhyssa* could be hyper-parasitised by *Guiglia*, but there is no evidence of this. Gourlay (1927) provided the first account of the biology, including habitats, movement, and oviposition behaviour of *G. schauinslandi*. Rawlings (1957) also recorded these behaviours in relation to *G. schauinslandi* attacking *Sirex*.

Figures 1a–1i *Guiglia schauinslandi*. 1a dorsal view of head and pro- & mesonotum; 1b head lateral; 1c head anterior; 1d & 1e apical antennomeres; 1f protibia; 1g & 1h habitus lateral; 1i distribution. Arrows point to key features in the diagnosis and description sections.

Distribution

New Zealand: North Island (AK, BP, CL, HB, ND, TO); South Island (BR, DN, MB, MC, NC, NN, SD, SI), and Chatham Islands (map, Fig.1i). GBIF distribution records of *Guiglia schauinslandi* in New Zealand in GBIF available from: doi.org/10.15468/dl.55ed44.

PERGIDAE

Diagnosis
The Pergidae is distinguished from other families by reduced wing venation; the fore wing is without vein 2r and usually without the anal cell (the New World Perreyiinae have a complete petiolate anal cell) (Fig. 2f); and the hind wing without median and anal cells. Based on Smith (1990).

Genus *Phylacteophaga* Froggatt, 1899

Phylacteophaga Froggatt, 1899: 130. Type species: *Phylacteophaga eucalypti* Froggatt, 1899, by monotypy. Taeger et. al. 2010: 240.

Diagnosis
Antenna 8–segmented. Mesepisternum without tubercle; lateral panel of pronotum fused to spinasternum. Protibia with 1 apical spur. Fore wing with cells 1R1 and 1RS separated by cross-vein; posterior edge of stigma not parallel to anterior edge of wing. Based on Naumann (1983).

Phylacteophaga froggatti Riek, 1955

Figures: adult 2a–2f; habitus 2a & 2b; larva 2g-2i; feeding damage 2i-2j; map 2k.
Phylacteophaga froggatti Riek, 1955: 97–98. Pl 1. Taeger et al. 2010: 240.

Common name
Eucalyptus leaf blister sawfly.

Adults
Diagnosis and description based on Riek (1955).

Diagnosis
Phylacteophaga froggatti can be distinguished from other species of the genus by the pale scape, pedicel and pronotum (Figs 2a & 2e).

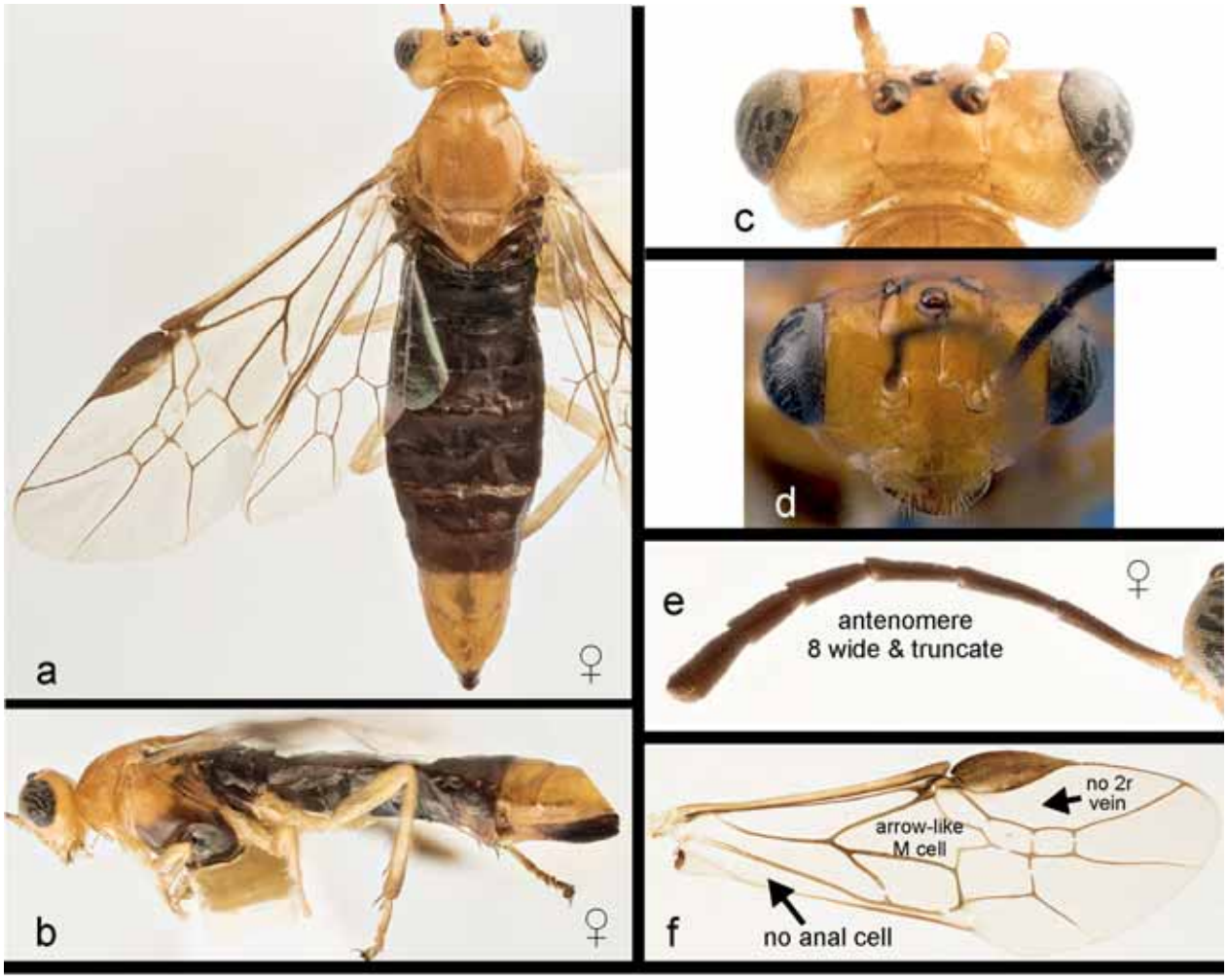
Description
Colour. Scape and pedicel pale (could be slightly infuscate in some males) (Fig. 2e); mesoscutum in female pale (Fig. 2a), or in male black. Mesoscutellum in female pale (Fig. 2a). Metapostnotum dark; mesepisternum in female mostly pale (Fig. 2b), or in male mostly to entirely black. **Head**. Flagellomere 1 in female about 1.4 ×, or in male about 1.0 × as long as apical flagellomere (Fig. 2e). **Legs**. Tibial spur formula for pro- meso- and metatibia: 1,3,3 more rarely 1,2,3 or 1,2,2.

Larvae
As described here.

Diagnosis
Among the known species of Symphyta in New Zealand, *P. frogatti* is recognised by its dorsoventrally compressed body with forward pointing mouthparts (prognathous) and two well defined folds (anterior fold longer and wider than posterior fold) on the pronotum and abdominal terga 1–8. The larva is a leaf miner in leaf blisters of *Eucalyptus*.

Description
Body. Body dorsoventrally compressed. **Head**. Head sclerotized; dorsal surface with longitudinal furrows sublaterally (not reaching posterior margin and in-curved posteriorly) and more medially (associated with tentorial

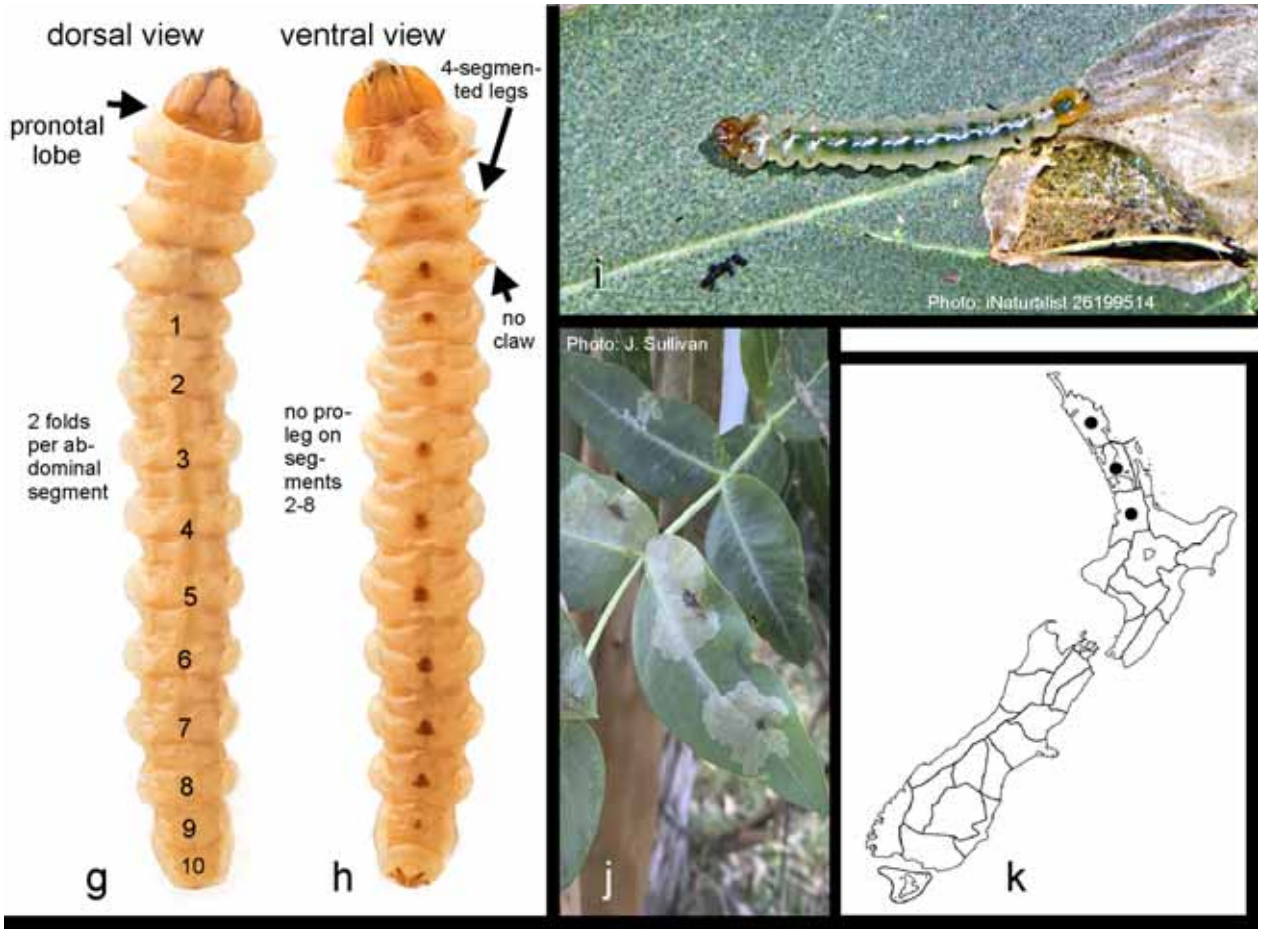
pit and extending to posterior margin on parietal) (Fig. 2g); ventral surface with parietal very broadly separated by maxilla and labium; lateral surface with a weakly outlined eye (Fig. 2h). Maxilla with a long and wide stripe, with a 3–segmented maxillary palp and galea (lacinia not visible). Labium long and wide with a 2-segmented lacinia. Mandible dark brown. Antenna apparently flat and segmentation not clear. Frons very long and extending to or near posterior margin (Fig. 2g).



Figs 2a–2f. *Phylacteophaga froggatti*. 2a habitus dorsal; 2b habitus lateral; 2c head dorsal; 2d head anterior; 2e antenna lateral; 2f fore wing. Arrows point to key features in the diagnosis and description sections.

Thorax. Pronotum with two transverse folds; anterior fold twice as long as posterior fold (Fig. 2g); anterior fold with sclerotized plates separated by a median unsclerotized furrow and with scattered shallow pits (Fig. 2g), and anterolateral margin extending into a membranous narrow lobe (Fig. 2g); posterior fold much narrower than anterior fold with surface not sclerotized or pitted (Fig. 2g); surface with shallowly impressed meshes of microsculpture. Ventral surface of prothorax with a 4–segmented leg without setae and claw (Fig. 2h); surface with sclerotized brown surface sublaterally before coxa and posteromedially (Fig. 2h); surface smooth on lateral lobes; microsculpture clearly outlined medially to lobes and consisting of isodiametric meshes medially more transverse meshes sublaterally and very transverse meshes on anterior margin; tuberculate microsculpture an anterior lobe of coxa and a lobe anterior to coxa (Fig. 2h). Meso- and metathorax without transverse folds (Fig. 2g); surface with a small C-shape impression submedially and a large but narrow C-shape impression sublaterally. Ventral surface of meso- and metathorax with a triangular dark spot and a slanted U-shape impression sublaterally (Fig. 2h); surface smooth on posterior 0.5 and on lateral lobe, and clearly impressed in anterior 0.5 and microsculpture consisting of mainly slightly to markedly transverse meshes; tuberculate microsculpture on anterior lobe of coxa.

Abdomen. Abdominal segments 1–8 with two transverse folds on each tergum; anterior fold about twice as long as posterior fold and a little wider than posterior fold (Fig. 2h); tergal surface of segments with shallowly impressed meshes of microsculpture in medial 0.3, with division between folds and segments deep sublaterally and darker, with impressed slanted line sublaterally and darker (Fig. 2h), and with 3 or 4 setae laterally; sternal surface of segments with clearly impressed meshes of microsculpture in medial 0.3, meshes isodiametric finer on brown spot then elsewhere, with impressed lines outlined laterally, and with 2 or 3 setae laterally. Abdominal segments 9 and 10 without transverse folds or with fold that are as narrow or narrower than posterior fold of anterior segments (Fig. 2g); tergal surface with longitudinal brown furrows sublaterally, surface smooth and with weakly outlined meshes of microsculpture in medial 0.3, with a few long setae on lateral surface and many setae along margin of tergum 10; sternal surface of segment 9 similar to anterior segment except brown spot smaller; sternal surface of segment 10 smooth generally with shallowly impressed meshes anteromedially, with sclerotized slanted spots in posterior 0.3 at middle (lateral finger-like structure is probably not a cercus) (Fig. 2h).



Figs 2g–2k. *Phylacteophaga froggatti* (continued). 2g larvae dorsal; 2h larvae ventral; 2i live larva dorsal; 2j blister mines on *Eucalyptus*; 2k distribution. Arrows point to key features in the diagnosis and description sections.

Hosts & biology

Phylacteophaga froggatti is not native to New Zealand and was first discovered in March 1985 near Auckland (Nuttal 1985, Kay 2009). This species is originally from Australia probably from the southeastern region. The larvae are leaf miners and form leaf blotches or blisters - hence its common name, the Eucalyptus leaf blister sawfly. In New Zealand a wide range of *Eucalyptus* species is attacked, and although most host species are *Eucalyptus*, larvae also mine leaves of *Lophostemon confertus* (brush box), *Quercus* (oak), occasionally *Betula* (birch) and *Agonis flexuosa* (weeping willow myrtle) (Moore 1966, Kay 2009).

Eggs are laid singly near the midrib on the underside of a leaf – a small, raised lump on the upper side of the leaf marking the position of the egg (Kay 2009). Females may lay up to 70 eggs, but it appears only a few of these successfully hatch (Kay 2009). Rain is probably the main cause of mortality, drowning the larvae within the mine. A biological control agent, *Bracon phylacteophaga* Austin 1989 (Braconidae), was released in New Zealand in 1988 and has become well established such that *P. froggatti* is no longer considered a serious forestry pest (Kay 2009).

Distribution
Phylacteophaga froggatti is probably native to southeastern Australia, but has been introduced accidentally in western Australia, Tasmania, New Caledonia, and New Zealand (Faulds 1990, Kay 2009). **New Zealand**: North Island (AK, CL, ND, WI, WN, WO); South Island (MC) (map, Fig. 2k). GBIF Distribution records of *Phylacteophaga froggatti* in New Zealand available from: doi.org/10.15468/dl.sfmvw3

SIRICIDAE

Diagnosis
Among all families of Symphyta, the Siricidae are recognised at once by the collar-like pronotum and the cornus (or horn) at the end of tergum 10 in the female (Fig. 3a & 3c) or sternum 9 in the male (Fig. 3b & 3d). Larvae of Siricidae are most similar to those of the Xiphydriidae but are distinguished from them by the cornus having teeth on the dorsal side and being knife-like in dorsal view. Based on Schiff et al. (2012).

Genus *Sirex* Linnaeus, 1761

Sirex Linnaeus, 1761: 396. Type species: *Sirex juvencus* (Linnaeus, 1758), subsequent designation by Curtis 1829: 377. Taeger et al. 2010: 100.

Diagnosis
Sirex can be distinguished from other genera of Siricidae by the absence of vein Rs+M in the fore wing, the presence of two spurs at apex of the metatibia, and with cell 1A present in the hind wing. *Sirex* is distinguished by metallic reflections over dark areas of the body, the absence of a pale spot on upper 0.5 of gena, and in the female, by the apical section of sheath with teeth in apical 0.3 along dorsal margin. Based on Schiff et al. (2012).

Sirex noctilio Fabricius, 1793

Figures: adult 3a–3k; habitus 3a–3d; larva 3l–3r; map 3k.
Sirex noctilio Fabricius, 1793: 130. Taeger et al. 2010: 102.

Common name
Sirex woodwasp.

Adults
Diagnosis and description based on Schiff et al. 2012.

Diagnosis
Sirex noctilio is distinguished from other species in the genus by finer pits on the vertex of the head and especially on the mesoscutum (Figs 3e & 3f); the black tarsomere 5 on all legs; and, in the female, by the very large pits on the lancet of the ovipositor (Figs 3i & 3j).

Description

Colour. Gena black with dark blue metallic reflections. Metafemur light reddish brown (Figs 3a & 3b). In male, at least metatarsomeres 1–3 black (Fig. 3b); metatibia black but widely light reddish brown at base (Fig. 3h). Tarsomere 5 black (Fig. 3g). In female, abdomen black with dark blue metallic reflections (Fig. 3c). **Head**. Head posterodorsally with setae each with or without small pit at base (Fig. 3f). Gena and vertex with pits smaller (diameter 0.1–0.25 that of lateral ocellus) and scattered (on gena pits 4–10 pit diameters apart, and on vertex 2–8 pit diameters apart) (Fig. 3f). **Thorax**. Mesoscutum with most discal pits mainly round or with tooth behind larger pits, giving a rasp-like pattern (Fig. 3e); few teeth fused laterally into irregular transverse ridges. **Legs**. In female, metatarsomere 2 2.0–3.6 × as long as high (Fig. 3g); metatarsomere 2 with tarsal pad 0.3–0.4 × as long as tarsomere (Fig. 3g). **Ovipositor**. Ovipositor pits near middle at least 0.5 × as long as annulus length (Figs 3i & 3j).

Larvae

Previously the larval stage of Siricidae has only been described from one species, *Tremex columba* (Linnaeus, 1763) by Yuasa (1922). No other larvae of the ten extant genera of Siricidae have been described. We take this opportunity to provide a description of the larvae of *Sirex noctilio* below.

Diagnosis

The larva is cylindrical and long (Fig. 3r), with membranous and unarticulated thoracic legs (Fig. 3r), and a cornus with black teeth on dorsal edge of cornus (Figs 3q).

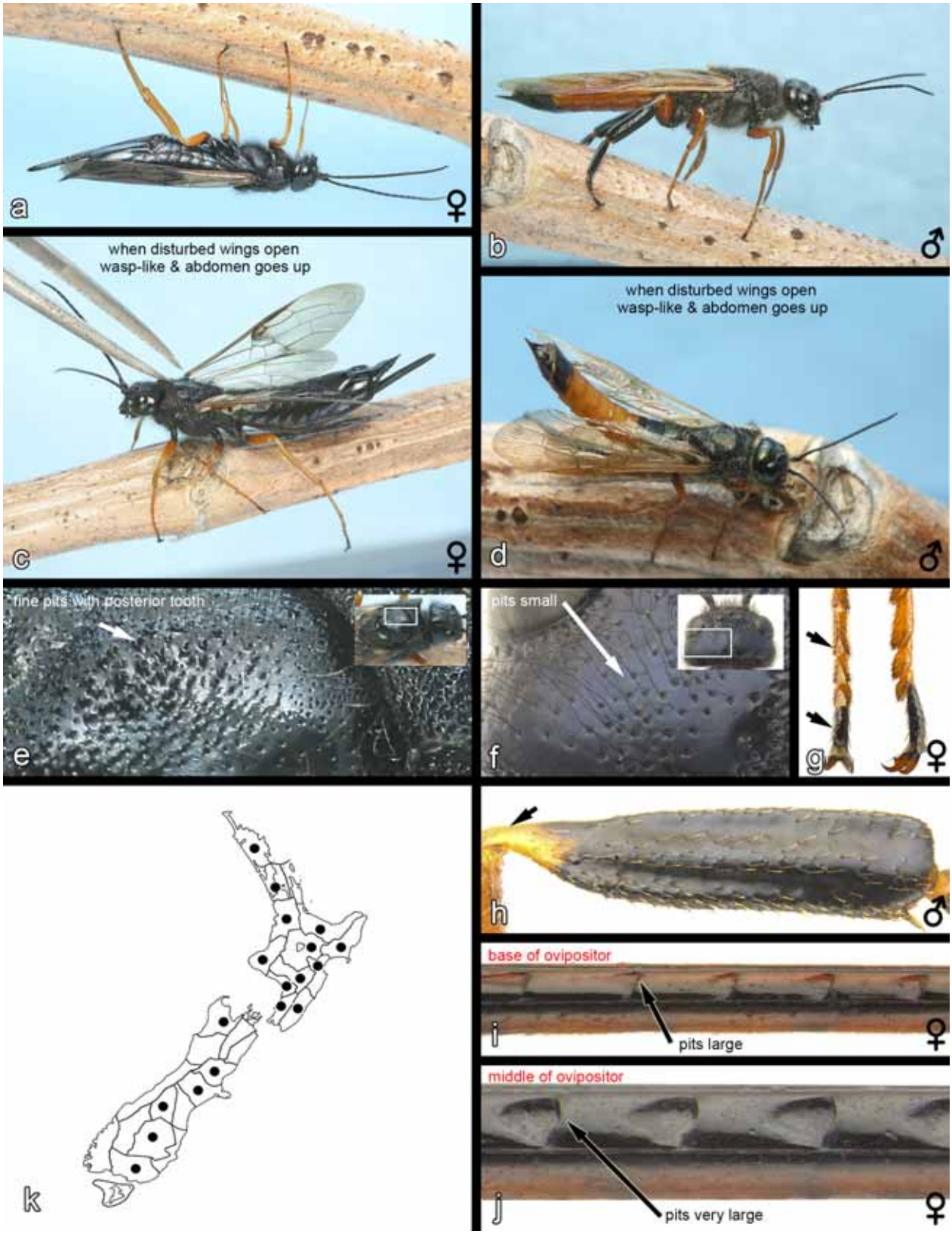
Description

Body. Larva cylindrical and long (Fig. 3r). **Head**. Capsule clearly outlined, but frons and parietal not or barely outlined by shallow furrows. Eye absent. Clypeus 6–7 × as wide as long medially (Fig. 3n). Labrum about 2 × as wide as long medially, asymmetrical with a well-defined lobe ventrally on right side (Fig. 3n). Antenna consisting of 3 or 4 antennomeres (apical antennomere is either single or may appear divided); second antennomere with a few very small setae. Labial and maxillary palpi 2–segmented and galea 1–segmented. Mandible large and darkly sclerotized in apical 0.5 and ending on left side in a transverse row of four apical teeth ventrally. **Thorax**. Thorax with fleshy unarticulated legs. **Abdomen**. Abdomen without prolegs and without dorsal folds. Tergum 10 sclerotized with a deep longitudinal furrow medially and ending with a darkly sclerotized process, the cornus, with short reddish-brown spines over surface of main tergal and lateral surface; with anterior edge of main tergal surface markedly diverging and extending to lateral margin mid-way between anterior and posterior margin of tergum, and anterior edge almost meeting medially; with a pair of submedian cone-like processes posteriorly on main portion of surface. Cornus with dark teeth on dorsal edge, with two large teeth at base dorsally, with clearly two teeth centrally, and in dorsal view with a wedge-shape apex and knife-like posterior surface (Figs 3p & 3q); without long and fine setae at base of cornus.

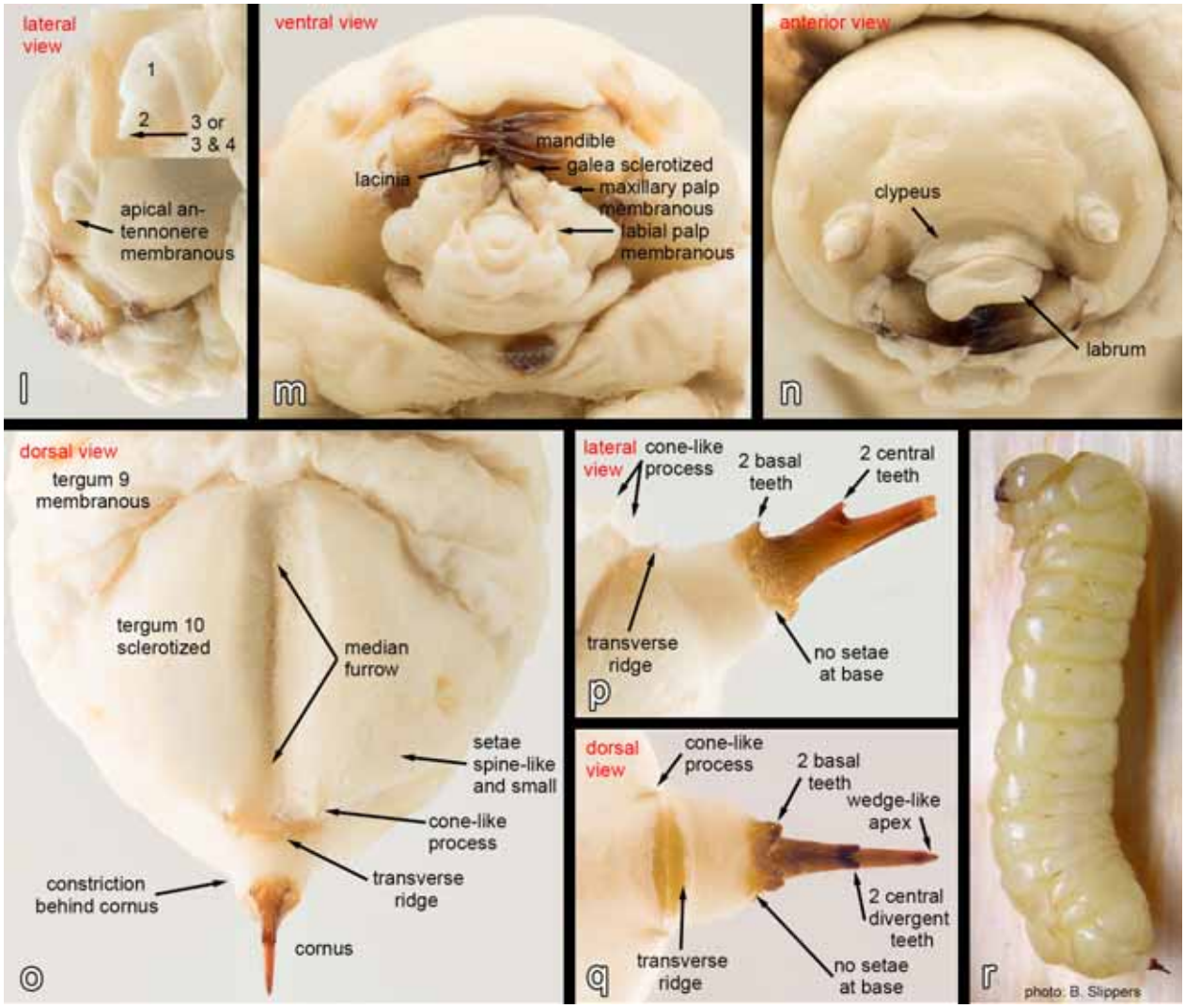
Comparison between *Tremex* and *Sirex* larvae

Head. Last antennomere, maxillary palpomere 2, labial palpomere 2, and galea sclerotized and light reddish-brown in *Tremex* (Fig. 3t) but maxillary and labial palpomere membranous and white and galea light reddish-brown in *Sirex* (Fig. 3m). Labrum asymmetrical along ventral edge with right ventral lobe little produced in *Tremex* (Fig. 3u) but markedly produced in *Sirex* (Fig. 3n).

Tergum 10. Cornus with fused preapical teeth (only shallow furrow present medially on dorsal surface) in *Tremex* (Fig. 3x) but clearly separated in *Sirex* (Fig. 3q); with a row of long and slender setae present around base in *Tremex* (Figs 3w & 3x) but absent in *Sirex* (Figs 3p & 3q). Main tergal surface near posterior margin with pair of cone-like darkly sclerotized processes in *Tremex* (Figs 3w & 3x) but membranous and white in *Sirex* (Figs 3p & 3q).



Figs 3a–3k. *Sirex noctilio*. 3a & 3b habitus lateral; 3c & 3d defense posture; 3e sculpture on mesoscutum; 3f pits on vertex of head; 3g metatarsus ventral & lateral; 3h metatibia anterior view; 3i & 3j ovipositor lateral; 3k distribution. Arrows point to key features in the diagnosis and description sections.



Figs 3l–3r. *Sirex noctilio* (continued). 3l head lateral; 3m head ventral; 3n head anterior; 3o terga 8-10 dorsal; 3p cornus lateral; 3q cornus dorsal; 3r habitus lateral. Arrows point to key features in the diagnosis and description sections.

Hosts & biology

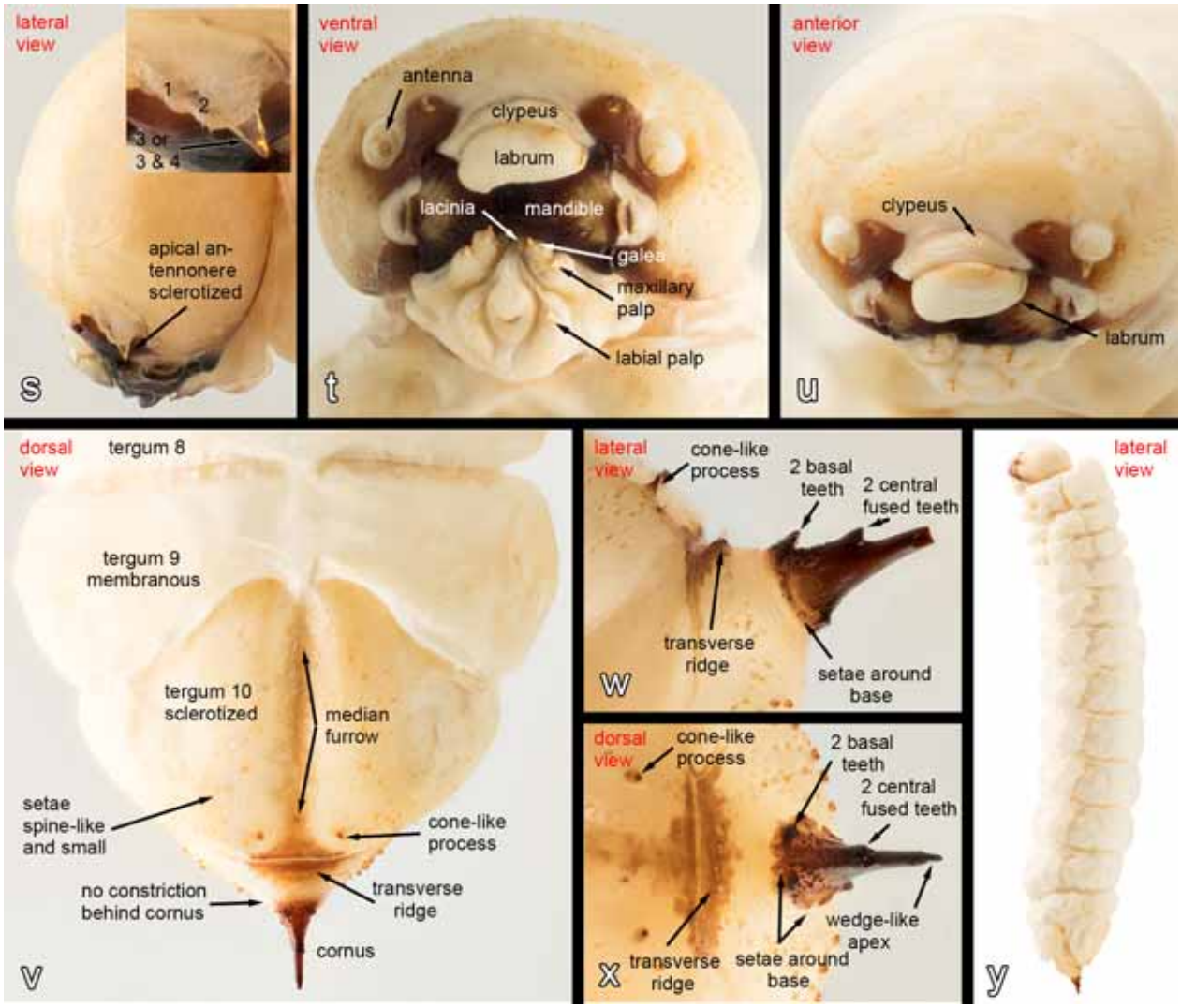
The sirex woodwasp was first found in New Zealand in 1900 but did not become a significant pest until several decades later when numerous dead pine trees were found in overcrowded plantations (Rawlings 1948, 1949, 1953, Bain et al. 2012). *Sirex noctilio* is native to the pine (*Pinus*) growing areas of Europe, Asia, and northern Africa, but it is seldom a pest in its native range (Spradberry & Kirk 1978). The preferred hosts are various species of pine trees (*Pinus radiata* in New Zealand), but there are records from fir (*Abies*), larch (*Larix*), spruce (*Picea*), douglas fir (*Pseudosuga*) and *Auraucaria*, although these last hosts may be due in part to the misidentification of the *Sirex* species involved, and the host association is uncertain.

Despite the deliberate introduction of three parasitoid wasp species (*Rhyssa persuasoria persuasoria* (Linnaeus, 1758), *Megarhyssa nortoni nortoni* (Cresson, 1864) and *Ibalia leucospoides leucospoides* (Hochenwarth, 1785)), the best control is by the nematode, *Deladenus siricidicola* Bedding, 1968 which causes female sterility in *Sirex* (Bedding 2007, Bain et al. 2012). The nematode was probably accidentally introduced along with *S. noctilio*, but significant control of *Sirex* was obtained when the nematode was effectively propagated and disseminated (Bain et al. 2012). Biological control agents and improved silviculture methods have both caused a significant decrease in

populations of *S. noctilio*, and today it is rare in plantations and considered to be only a minor pest (Bain et al. 2012).

Distribution

Native to the Palaearctic, *S. noctilio* has been accidentally introduced into temperate, Nearctic, Neotropical, Afrotropical, and Australasian regions. **New Zealand:** North Island (AK, BP, GB, HB, ND, RI, TK, TO, WA, WI, WN, WO), South Island (CO, MC, MK, NC, NN, SL) (map, Fig. 3k). GBIF distribution records of *Sirex noctilio* in New Zealand available from: doi.org/10.15468/dl.db6v8q



Figs 3s–3y *Tremex columba*. 3s head lateral; 3t head ventral; 3u head anterior; 3v terga 8-10 dorsal; 3w cornus lateral; 3x cornus dorsal; 3y habitus lateral. Arrows point to key features in the diagnosis and description sections.

TENTHREDINIDAE

Diagnosis

Tenthredinidae are distinguished from other Symphyta by the following character combination: antenna with less than 15 antennomeres (usually 9 applies to all New Zealand species); pronotum in dorsal view with posterior margin strongly in-curved; mesoscutum without a transverse groove between bases of fore wings and therefore without axilla; mesoscutellar appendage clearly outlined at least laterally; abdominal tergum 1 not extending to

metacoxa and not fused with metapleuron; protibia with 2 apical spurs; fore wing without longitudinal vein Sc (vein Sc is completely fused with R basal to vein Sc1), at most a short vein Sc1 dividing costal cell C. Based on Goulet & Huber (1993).

Subfamily Blennocampinae

Genus *Monophadnus* Hartig, 1837

Tenthredo (*Monophadnus*) Hartig, 1837: 271. Type species: *Tenthredo albipes* Gmelin, 1790 [= *Monophadnus pallescens* (Gmelin, 1790)], by subsequent designation of Ashmead 1898. Taeger et al. 2010: 335.

This is a small genus with 22 species and found in the northern hemisphere (Taeger et al., 2010). There is only one species in New Zealand that was introduced from Europe as a biocontrol agent.

Diagnosis
Among the Tenthredinidae of New Zealand the genus *Monophadnus* is easily recognized from the fore wing cell M where veins M and 1m-cu are parallel and of similar length, and from the anal cell reduced to one apical cell (Fig. 4e). Based on Smith (1969), Benson (1952), and Goulet (1992).

Monophadnus spinolae (Klug, 1816)

Figures: adult 4a–4e; habitus 4a–4d; larva 4f; map 4g.

Hylotoma ventralis Spinola, 1806: 1–3. Secondary homonym of *Tenthredo ventralis* Panzer, 1799 [= *Eurhadinoceraea ventralis* (Panzer, 1799)]. Note. The name *H. ventralis* is not in use according to Art. 59.3. (ICZN 1999 0784). Taeger et al., 2010: 337.

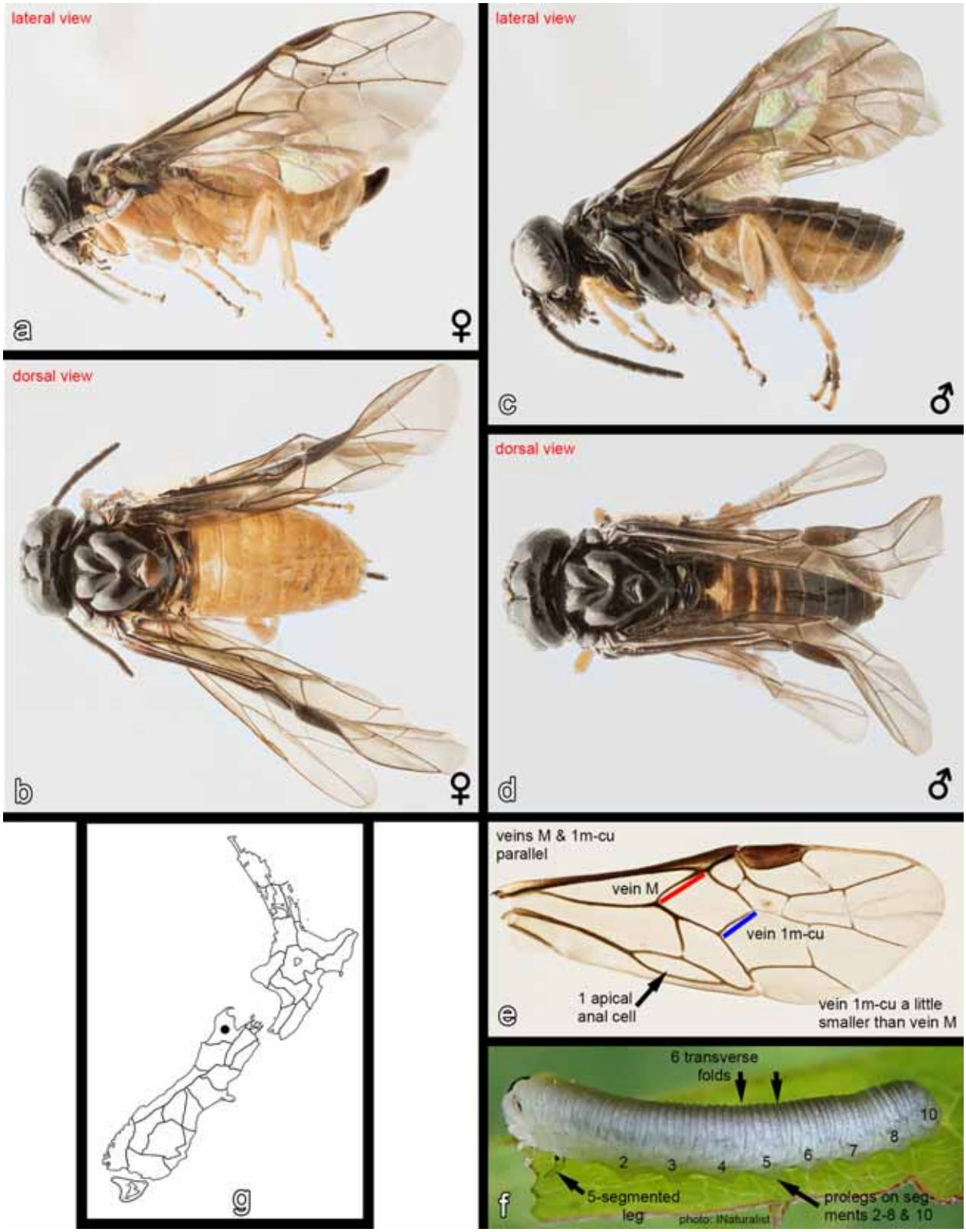
Common name
Old man's beard sawfly

Diagnosis and description based on Smith (1969), Benson (1952), and Goulet (1992).

Adults

Diagnosis
This species is distinguished from other species of Symphyta in New Zealand by the long inner tooth on the claw (inner tooth slightly shorter than apical tooth); by the black head and mesonotum (scutellum may be brown); and **in the female**, by the entirely orange mesopleuron (excluding anepimeron) and abdomen (Figs 4a & 4b), and, **in the male**, by the black mesopleuron and the abdomen orange in ventral half and black dorsally (Figs 4c & 4d).

Description
Colour. Head and mesonotum black (scutellum may be brown) (Figs 4b & 4d); **in female**, mesopleuron (excluding anapimeron) and abdomen entirely orange (Fig 4a), and **in male**, mesopleuron black and abdomen orange in ventral half (black dorsally) (Fig. 4c). **Head**. Anterior margin of clypeus truncate. Postgenal ridge may be slightly outlined below eye. Antenna thread-like and apical four antennomeres not reduced (Fig. 4c). Flagellomere 1 distinctly longer than flagellomere 2. **Thorax**. Prepectus absent. Katepimeron of mesepimeron sharply divided into anterior and posterior areas. **Legs**. Tarsal claw with long inner tooth, and without basal lobe. Pulvillus clearly developed on tarsomeres 1 and 2. **Wings**. Fore wing with vein 2A and 3A atrophied; only a straight basal stub present and with an apical anal cell (Fig. 4e).



Figs 4a–4g. *Monophadnus spinolae*. 4a habitus lateral; 4b habitus dorsal; 4c habitus lateral; 4d habitus dorsal; 4e fore wing (of another species *M. pallescens*); 4f larva dorsolateral; 4g distribution. Arrows point to key features in the diagnosis and description sections.

Larvae

Diagnosis

The larvae of *M. spinolae* are typical of the Tenthredinidae as they are caterpillar-like with prolegs (Fig. 4f). *Monophadnus spinolae* is distinguished from other species of Tenthredinidae in New Zealand by the presence of prolegs on abdominal segments 2–8 and 10, the lack of mucus over surface of the body, and the absence of membranous limb originating at base of proleg. The body is pale yellow – pale green, but it is usually hidden under a white wax cover (Fig. 4f). The head has a black spot around the eye and on the vertex dorsally (Fig. 4f).

Hosts & biology

Larvae of *Monophadnus spinolae* (also known as the old man's beard sawfly) feed on *Clematis vitalba* (known as old man's beard) (Gourlay 2016). In New Zealand, *C. vitalba* is an invasive weed, originally from Europe, and is a threat to native plants since it grows vigorously and forms a canopy which smothers all other plants. Larvae of *M. spinolae* are extremely unlikely to attack any other species of *Clematis* unless these are intertwined with *C. vitalba* (Gourlay 2016).

In 1998 old man's beard sawflies were released in New Zealand, but due to difficulties with mass-rearing they were only released at a limited number of sites (Gourlay 2016). For many years it was thought that the species had not established, however, surveys in 2016 show it has established at one site near Nelson where it remains rare (Gourlay 2016).

Distribution

Monophadnus spinolae is a West Palaearctic species introduced into New Zealand as a biocontrol agent of *Clematis vitalba*. **New Zealand**: South Island (NN) (map, Fig. 4g). GBIF distribution records of *Monophadnus spinolae* in New Zealand available from: https://doi.org/10.15468/dl.gjzaxj

Subfamily Heterarthrinae

Genus *Caliroa* Costa, 1859

Caliroa Costa, 1859: 59. Type species: *Caliroa sebetia* Costa, 1859 [= *Caliroa cothurnata* (Serville, 1823)], by monotypy. Taeger et al. 2010: 364.

This is a small genus with about 60 species and found in the northern hemisphere (Taeger et al., 2010). There is only one species of *Caliroa* accidentally introduced from Europe into New Zealand.

Diagnosis and description are based on Goulet (1992) and Smith (1971).

Diagnosis

This genus is distinguished from other Heterarthrinae by the fore wing with the completely outlined vein 2A and 3A, and with the basal anal cell without a spur along veins 2A and 3A (Fig. 5c). Among the Tenthredinidae, larvae of *Caliroa* are recognised at once by the presence of mucus over the body and the membranous process originating anteriorly from the base of the prothoracic leg.

Caliroa cerasi (Linnaeus, 1758)

Figures: adult 5a–5e; habitus 5a & 5b; larva 5g–5l; damage 5l; map 5f.

Tenthredo Cerasi [sic!] Linnaeus, 1758: 557. Smith 1971: 15; Taeger et al., 2010: 365.

Common name

Pear and cherry slug (larva)

Adults

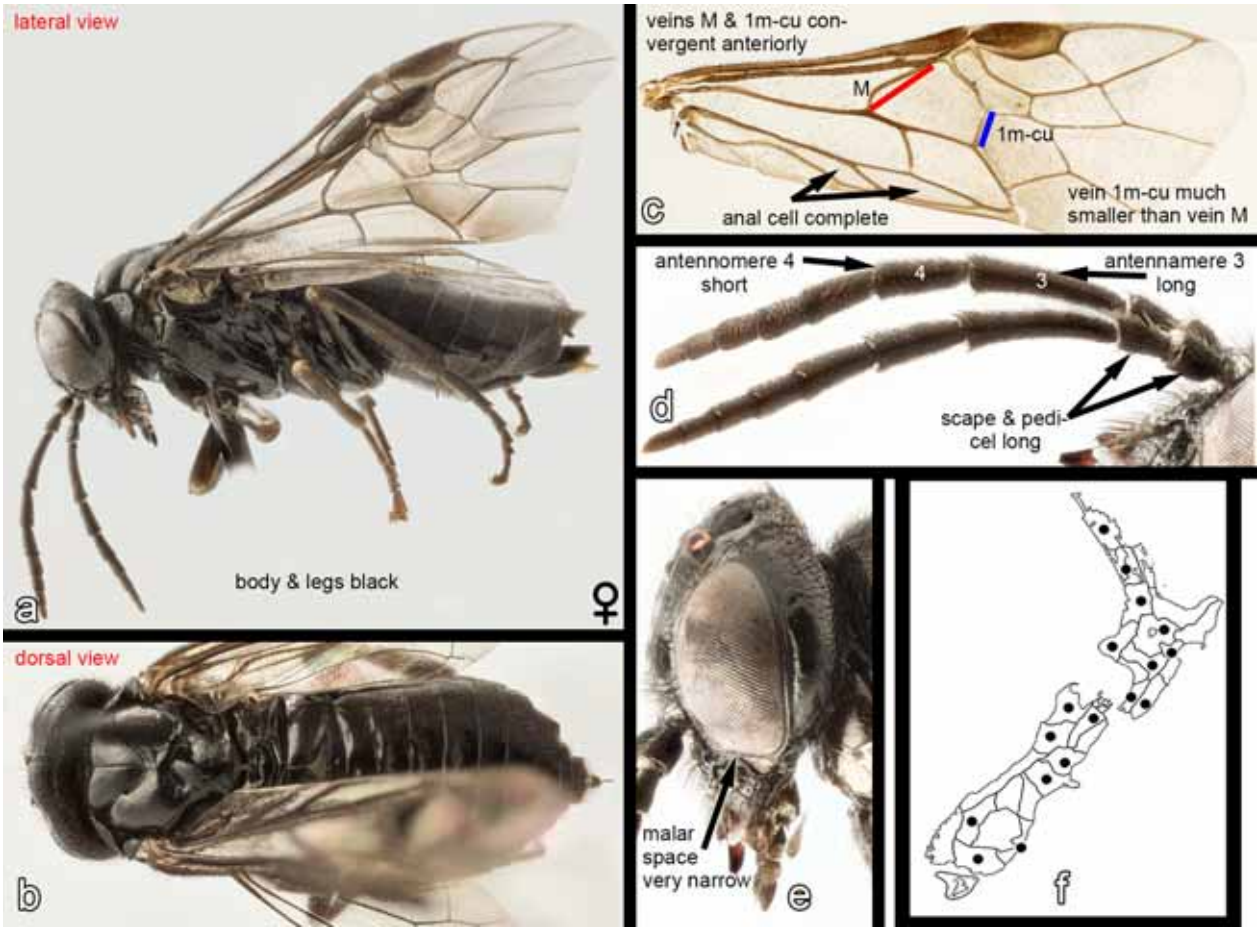
Diagnosis and description based on Smith (1971). The male is not recorded in New Zealand.

Diagnosis

Females of this species are distinguished from females of other New Zealand species of Tenthredinidae by having a black body and legs (tibiae may be dark brown) (Smith 1971).

Description

Colour. Black with front and middle tibiae black or dark brown (Figs 5a & 5b). **Head**. Clypeus shallowly, circularly emarginated. Antenna with antennomere 3 subequal in length to antennomeres 4 plus 5 (Fig. 5d). **Wings**. Lightly and uniformly infuscated (Fig. 5c). Hind wing with anal cell sessile; cells Rs and M usually both present, sometimes both absent or one or the other present.



Figs 5a–5f. *Caliroa cerasi*. 5a habitus lateral; 5b habitus dorsal; 5c fore wing; 5d antennae; 5 head lateral; 5f distribution. Arrows point to key features in the diagnosis and description sections.

Larvae

Diagnosis

Body dark, slug-like and covered in mucus (Fig. 5g), or after the last molt not mucus-covered, bright yellow and typically sawfly-like in appearance (Fig. 5k); head, thorax and abdomen not dorsoventrally flattened; prolegs distinct (Fig. 5h). Head higher than wide; membranous process originating anteriorly from base of each prothoracic leg (Figs 5i & 5j). Based on Smith (1971).

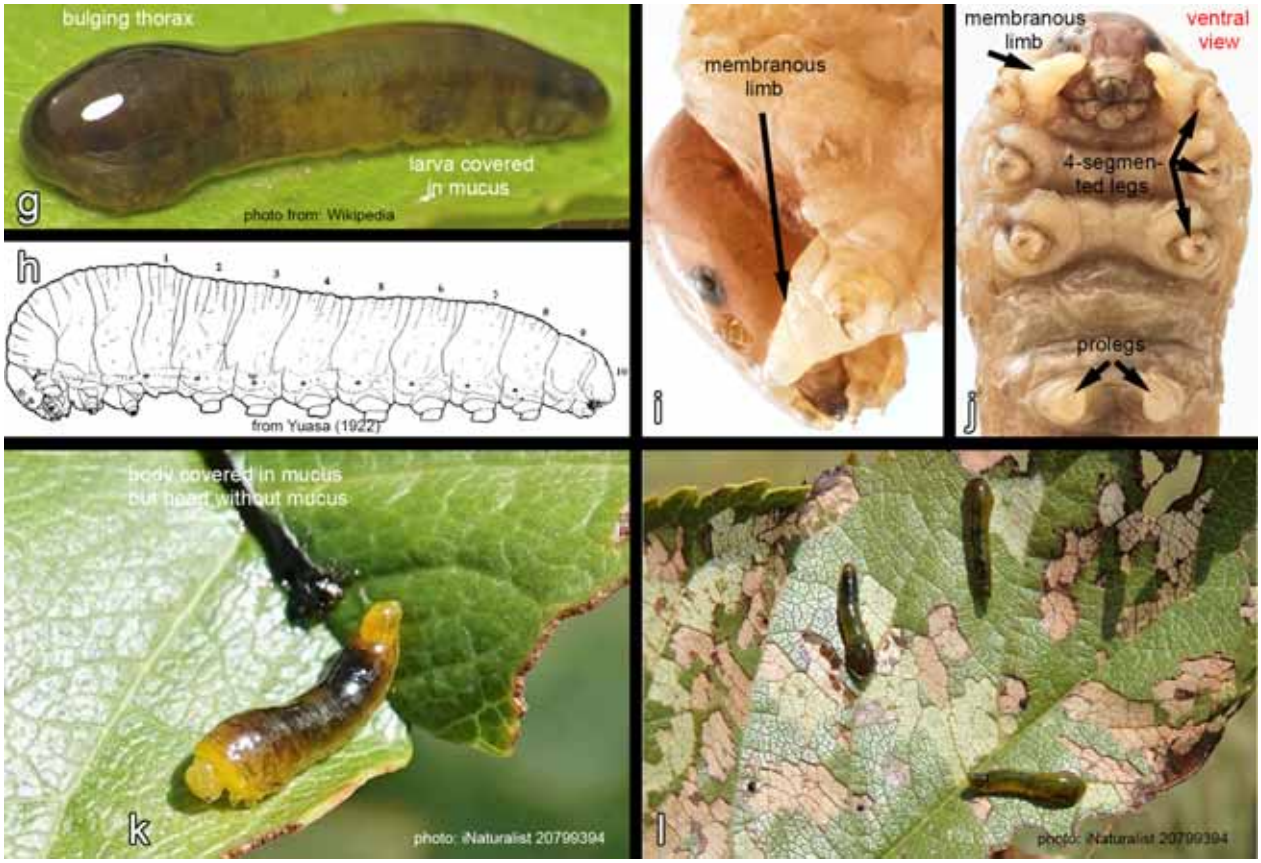
Hosts & biology

Caliroa cerasi was accidentally introduced into New Zealand, sometime before 1870 (Charles 1998), early in the period of European settlement. The larvae are commonly referred to as "pear slugs" or "cherry slugs" as they are covered in mucus (Fig. 5g). Larval feeding causes damage to the leaves of *Pyrus* and *Prunus* in particular, but also on *Crataegus*, *Amelanchier*, *Cotoneaster*, *Amygdalus*, *Betula*, *Cydonia*, *Mespilus*, *Quercus*, *Rosa*, *Rubus*, *Salix*, and *Sorbus* (Benson 1952. Smith 1971). Large leaf veins and lower surfaces of leaves are rarely damaged, resulting in a characteristic skeletonised appearance of leaves (Fig. 5l). Despite the successful introduction of an ichneumonid parasitoid, *Lathrolestes luteolator* (Gravenhorst), as a classical biological control agent, *Caliroa cerasi* infestations are still a problem, particularly in organic or reduced-spray orchards (Shaw et al. 2004). Heavy infestations can reduce plant vigour and completely defoliate plants. Damage from larvae in late summer can affect subsequent bud set (Brewer et al. 2000, Shaw et al. 2004).

In New Zealand as in other regions except Europe, males are unknown and the species outside of Europe is parthenogenetic.

Distribution

This species is originally from the Palaearctic and Oriental regions but was introduced accidentally into the Nearctic, Neotropical, Afrotropical, and Australasian regions (Smith 1971). It is a widespread species in **New Zealand**: North Island (AK, HB, ND, RI, TK, TO, WA, WN, WO), South Island (BR, DN, MB, MC, NC, NN, OL, SL) (map, Fig. 5f). GBIF distribution records of *Caliroa cerasi* in New Zealand available from: doi.org/10.15468/dl.m75zp5



Figs 5g–5l. *Caliroa cerasi* (continued). 5g live larva; 5h larva lateral; 5i head & prothorax lateral; 5j head & thorax ventral; 5k live larva anterolateral; 5l molting larva & damage. Arrows point to key features in the diagnosis and description sections.

Subfamily Nematinae

Genus *Cladius* Illiger, 1807

Cladius Illiger, 1807 0785: 190. Type species: *Tenthredo difformis* Panzer, 1799 [= *Cladius* (*Cladius*) *pectinicornis* (Geoffroy, 1785)], by subsequent designation of Latreille 1810. Taeger et al. 2010: 393.

This is a small genus with about 40 species found in the northern hemisphere and clustered in three subgenera (often treated as genera in past century) (Taeger et al., 2010). There two species in New Zealand, both accidentally introduced from Europe.

Diagnosis

Among species of Nematinae, adults of *Cladius* in New Zealand are best recognised by wing characteristics of the fore wing: length of vein R between junctions with veins M and Rs+M short, and with the anal cell of the fore wing constricted medially and divided into a closed basal and a closed apical cell. Among species in New Zealand, larvae of *Cladius* are recognised by the long setae on the body. Based on Goulet (1992) and Smith (1971).

Cladius (*Priophorus*) *brullei* (Dahlbom, 1835)

Figures: adult 6a–6e; habitus 6a & 6b, 6g–6i; larva 6g–6i; map 6f.

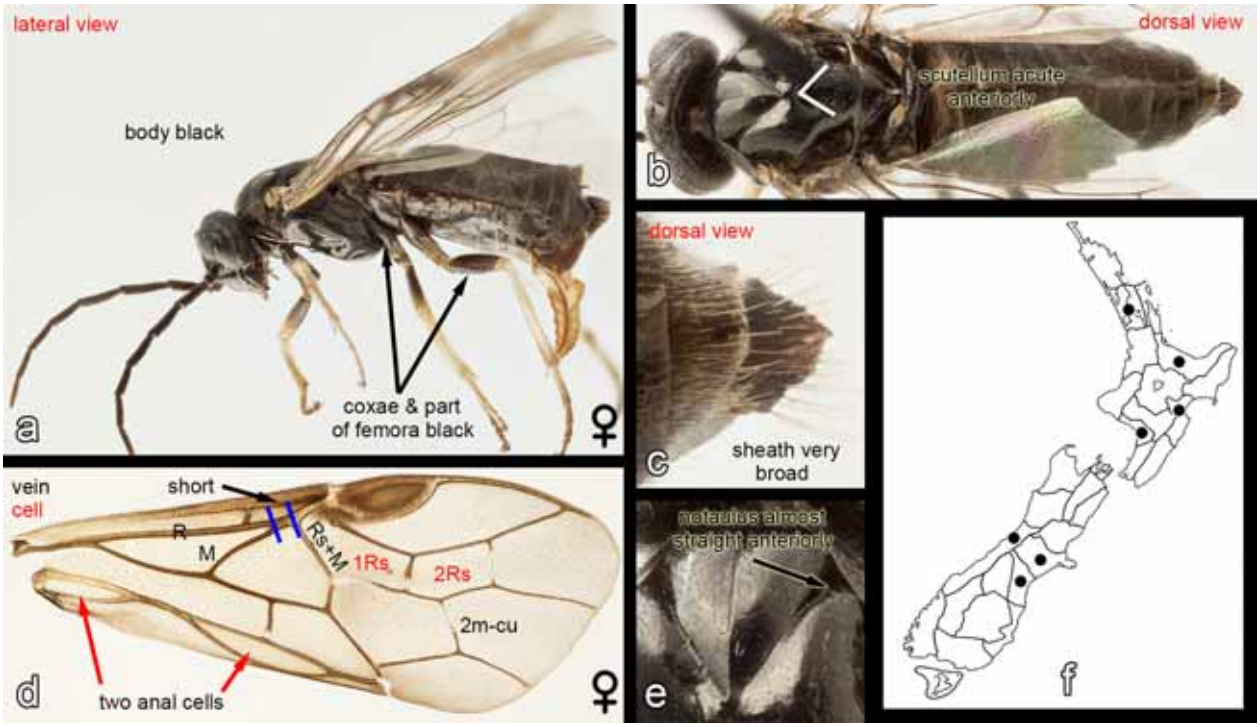
Nematus (*Priophorus*) *Brullei* [sic!] Dahlbom, 1835: 20–21. Taeger et al., 2010: 394.

Common Name

Raspberry sawfly

Taxonomic note

Commonly used names in the literature for this species have been *Cladius morio* or *Priophorus morio* (Taeger et al. 2010, Taeger et al. 2018). The name *Priophorus morio* has been used in New Zealand but this is invalid and is a misinterpretation (Taeger et al. 2018). Diagnosis and description based on Jeffries (1939), Smith (1974), Goulet (1992), and Prous et al. (2014).



Figs 6a–6f. *Cladius brullei*. 6a habitus lateral; 6b habitus dorsal; 6c ovipositor sheath dorsal; 6d fore wing; 6e mesoscutum; 6f distribution. Arrows point to key features in the diagnosis and description sections.

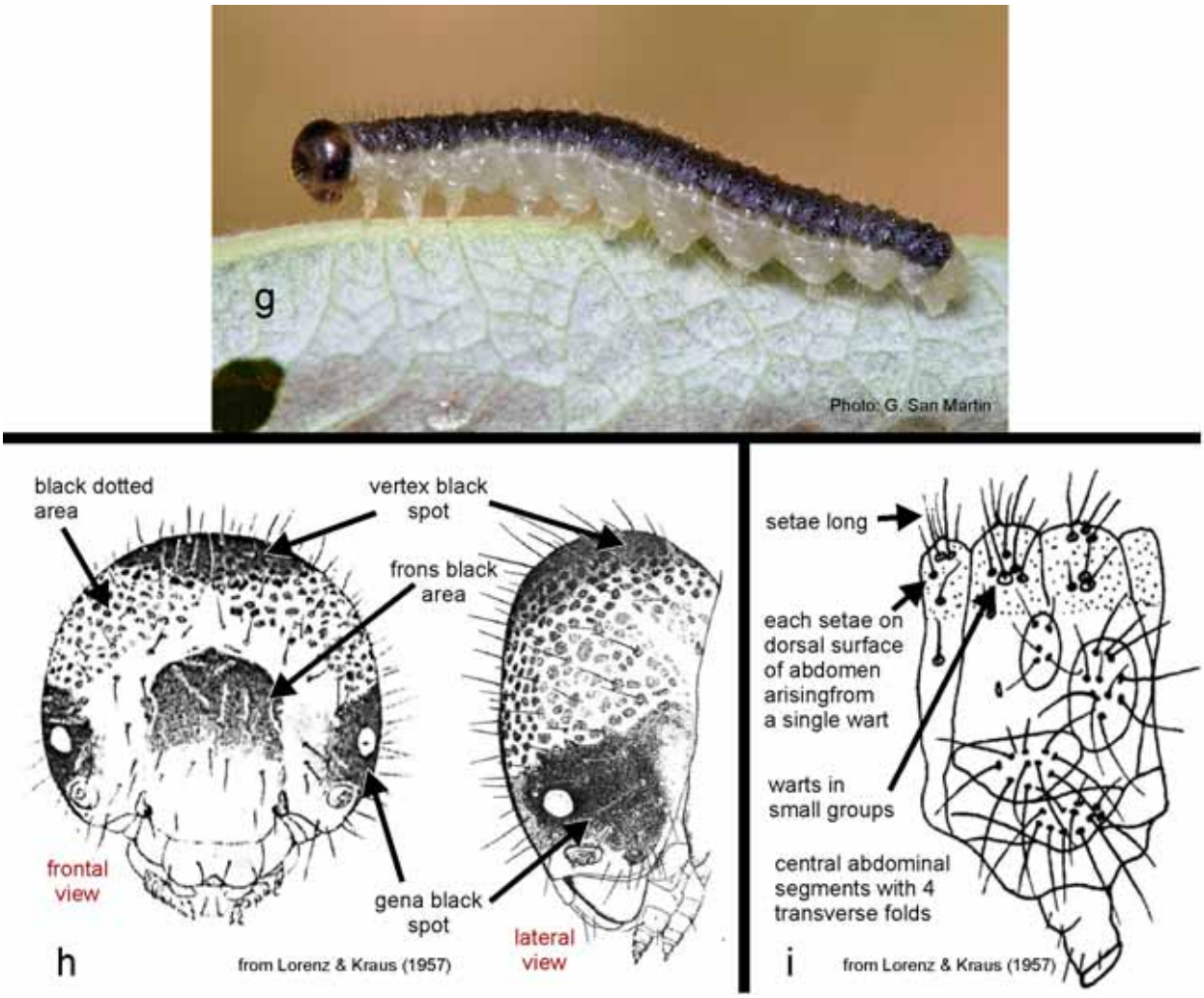
Adults

Diagnosis

Among Tenthredinidae of New Zealand with two anal cells in the fore wing (Fig. 6d), females of *Cladius brullei* are distinguished by the mainly black coxae and femora (Fig. 6a), and by the very wide and triangular ovipositor sheath in dorsal view (Fig. 6c).

Description

Colour. Body and legs black, but tegula, apex of femora, tibiae and basal tarsomere light reddish brown (Fig. 6a). **Head**. Clypeus short: medial length as short as or shorter than shortest distance between antennal socket and clypeus. Flagellomere 1 at least 4 x as long as wide and straight along ventral margin. Combined length of scape and pedicel at most 0.5 × as long as than flagellomere 1. Male and female flagellum dissimilar: seta-like, with short pubescence in female, and seta-, saw- or comb-like, with long pubescence in male (male not recorded in New Zealand). **Thorax**. Pubescence between mesepisternum and pectus continuous, without glabrous area separating them. **Abdomen**. Cercus in female 0.5 as long as length of dorsal margin of valvula 3 in lateral view. **Legs**. Pulvillus of tarsomeres 1–4 clearly narrower than base of tarsomere. Metatarsomere 1 as long as metatarsomeres 2 and 4 combined. **Ovipositor**. Ovipositor in dorsal view very wide and triangular (Fig. 6c).



Figs 6g–6i. *Cladius brullei* (continued). 6g habitus dorsal; 6h head anterior & lateral; 6i abdominal segment lateral near middle. Arrows point to key features in the diagnosis and description sections.

Larvae

Diagnosis

Among larvae from New Zealand with long setae over the body, mature larvae of *Cladius brullei* are distinguished by a broad dark stripe extending from the thorax to the end of the abdomen (Fig. 6g).

Hosts & biology

Cladius brullei was first recorded (as *Priophorus tener*) in Timaru in 1936 (Jeffreys 1939, Gurr 1954). The species is considered as a minor pest of raspberries (Gurr 1954), but larvae also feed on blackberry (*Rubus* spp.) and *Sorbus* in England (Benson, 1958).

In New Zealand, life history information is provided by Jeffreys (1939) and Gurr (1954). Larvae are present from mid- to late November, with adults appearing in mid-December. Females oviposit in the petioles or stems of the host, and pupation is in a thin papery cocoon (Jeffreys 1939). The species is parthenogenetic in New Zealand, males are only known from Europe.

Distribution

Cladius brullei is native to the Palaearctic, Nearctic, and Oriental regions. It has been accidentally introduced into the Neotropical and Australasian regions (New Zealand and Tasmania). **New Zealand**: North Island (AK, BP, HB, WI), South Island (WD, MC, SC) (map: Fig. 6f). GBIF distribution records of *Cladius brullei* in New Zealand available from: doi.org/10.15468/dl.485kv6

Cladius (*Trichiocampus*) *grandis* (Serville, 1823)

Figures: adult 7a–7g; habitus 7a–7d, 7i; larva 7i–7k; map 7h.

Tenthredo viminalis Fallén, 1808: 117. Primary homonym of *Tenthredo viminalis* Schrank, 1796 [= *Tenthredo (Tenthredo) vespa vespa* Retzius, 1783]. Taeger, 2010: 396.

Common Names

Poplar sawfly, hairy poplar sawfly

Taxonomic note

The commonly used names for the species in the past 100 years has been *Trichiocampus viminalis*, *Cladius viminalis*, or more recently *Cladius grandis*.

Diagnosis and description based on Smith (1974), Goulet (1992) and Prous et al. (2014).

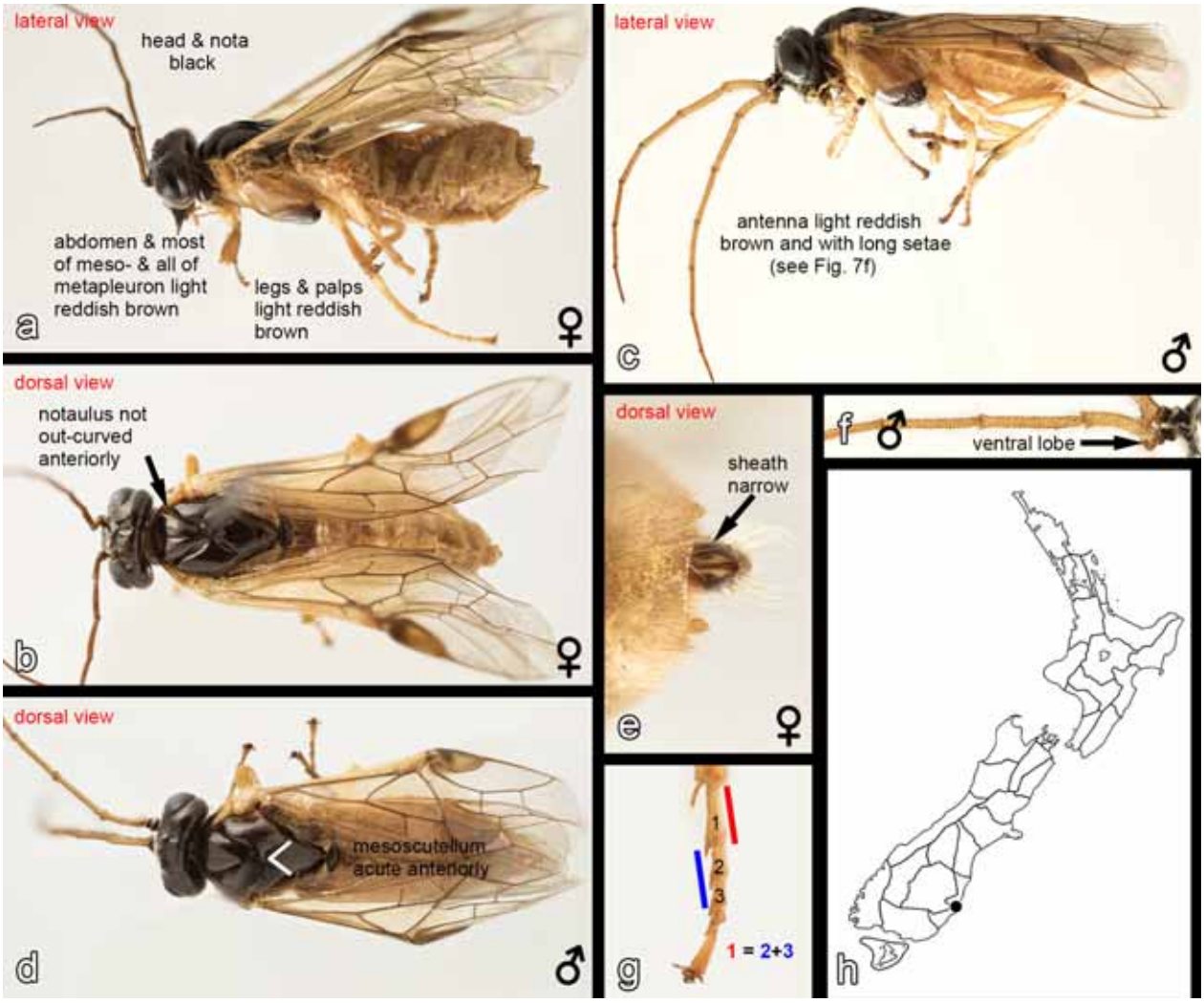
Adults

Diagnosis

Among the Tenthredinidae in New Zealand with two anal cells in the fore wing (Fig. 6d), *Cladius grandis* is distinguished by the black head, nota and pectus against a light reddish brown posterior margin of pronotum, mesepisternum, metepisternum, and abdomen (Figs 7a–7d), and in females, by having a very narrow ovipositor sheath in dorsal view (Fig. 7e).

Description

Colour. Head, nota and pectus black, but posterior margin of pronotum, mesopleuron and metapleuron, abdomen light reddish brown (Figs 7a–7d). **Head**. Antenna black or dark brown in female (Figs 7a & 7b) and light reddish brown in male (Figs 7c & 7d). Flagellomere 1 in male with ventral lobe at base (Fig. 7f). Clypeus long: medial length longer than shortest distance between antennal socket and clypeus. **Legs**. Pulvillus of tarsomeres 1–4 as wide as base of tarsomere (best seen on tarsomere 4). Metatarsomere 1 as long as metatarsomeres 2 and 3 combined (Fig. 7g). **Ovipositor**. Ovipositor sheath in dorsal view narrow (Fig. 7e).



Figs 7a–7h. *Cladius grandis*. 7a & 7c habitus lateral; 7b & 7d habitus dorsal; 7e ovipositor sheath dorsal; 7f antenna lateral; 7g metatarsus lateral; 7h distribution. Arrows point to key features in the diagnosis and description sections.

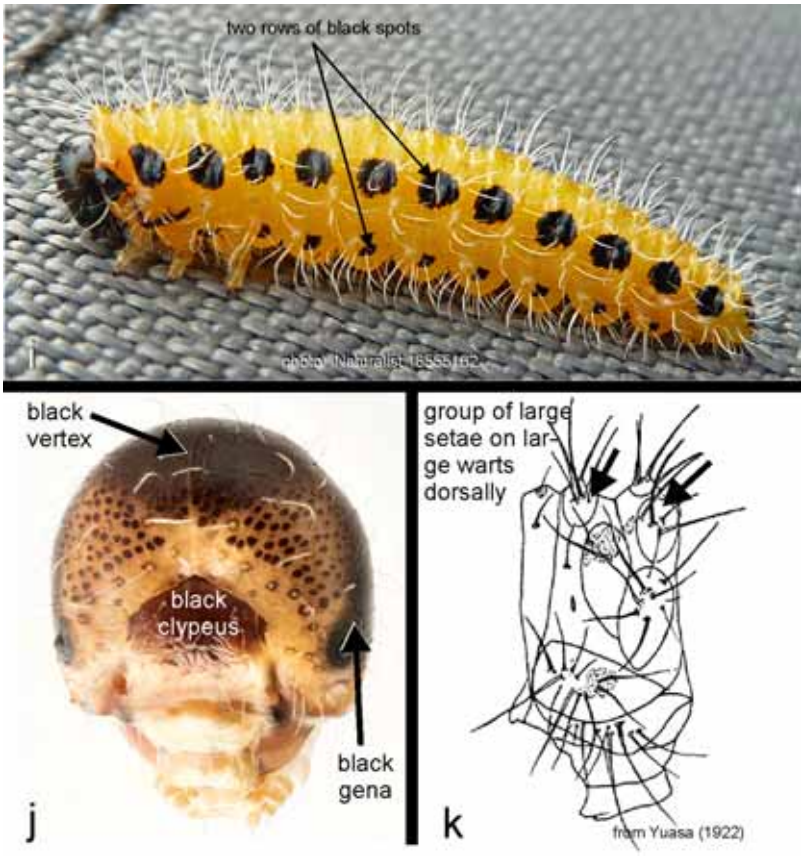
Larvae

Diagnosis

Among tenthredinid larvae in New Zealand with long setae over the body, mature larvae of *Cladius grandis* are distinguished by a yellow body with a row of large black spots sublaterally on the post-stigmal lobes (lobe posterior to stigmal lobe) and a row of small black spots laterally on the supra-pedal lobes (lobe above base of thoracic legs and prolegs) (Fig. 7i).

Hosts & biology

The poplar sawfly was first reported in New Zealand from Dunedin, in January 2019. (Anonymous 2019). Based on Nearctic records their preferred hosts appear to be species of *Populus* (Smith 1974). A record from Connecticut (USA) indicates this species may also feed on *Alnus* (Smith 1974), and Raizenne (1957) recorded *Salix* spp. as additional hosts. In England, the larvae feed on *Populus* and sometimes *Salix* (Benson, 1958). Females oviposit in leaf petioles and overwinter in a cocoon, while the larvae are free living and are found together in clusters feeding on leaves. Larvae change from pale green to yellow with two rows of smaller black spots which become larger as the larvae mature (reaching about 15 mm in length) (Anonymous 2019, Fig. 7i). Mature larvae walk down the tree trunk and pupate in bark crevices, leaf litter, any sheltered spot near the base of the tree, or in the ground, and remain hidden until they emerge as adults (Anonymous 2019).



Figs 7i–7k. *Cladius grandis* (continued). 7i habitus lateral; 7j head anterior; 7k abdominal segment lateral near middle. Arrows point to key features in the diagnosis and description sections.

Distribution

Palaearctic region and Greenland, but introduced accidentally into eastern and western North America, and **New Zealand:** South Island (DN) (map, Fig. 7h). GBIF distribution records of *Cladius grandis* in New Zealand available from: doi.org/10.15468/dl.dcebsy

Genus *Euura* Newman, 1837

Euura Newman, 1837 1442: 259–260. Type species: *Euura gallae* Newman, 1837 [= *Euura* (*Euura*) *amerinae* (Linnaeus, 1758)], by subsequent designation of Rohwer 1911. Taeger et al. 2010: 402.

There are three accidentally introduced species in New Zealand. Diagnosis and description based on Benson (1958) and Goulet (1992).

Adults

Diagnosis

In New Zealand, all species have the vein 2m–cu clearly joined to cell 1Rs in the fore wing.

Larvae

Diagnosis

Body without conspicuous tubercles and without long setae; central abdominal segments with 4–6 transverse folds dorsally.

***Euura oligospila* (Förster, 1854)**
Figures: adult 8a–8e; habitus 8a–8d, 8i; larva 8g & 8h; damage 8i; map 8f.
Nematus oligospilus Förster, 1854: 284. Smith 1979: 68; Taeger et al., 2010: 425

Taxonomic note
In most of the literature in the past century this species was known as *Nematus oligospilus.* Only recently this species was transferred to the genus *Euura* (Prous et al., 2014).

Diagnosis and description based on Benson (1958) and Goulet (1992).

Common Name
Willow sawfly

Adults
Diagnosis
Among three species of *Euura* in New Zealand, *E. oligospila* is distinguished by the very long antennomere 3 (5–7 × as long as maximum width) (Figs 8a & 8b). It is distinguished from *E. proxima* by the very light reddish-brown stigma on the fore wing, and from both *E. proxima and E. viduata* by the almost completely light reddish-brown abdomen (in preserved specimens).

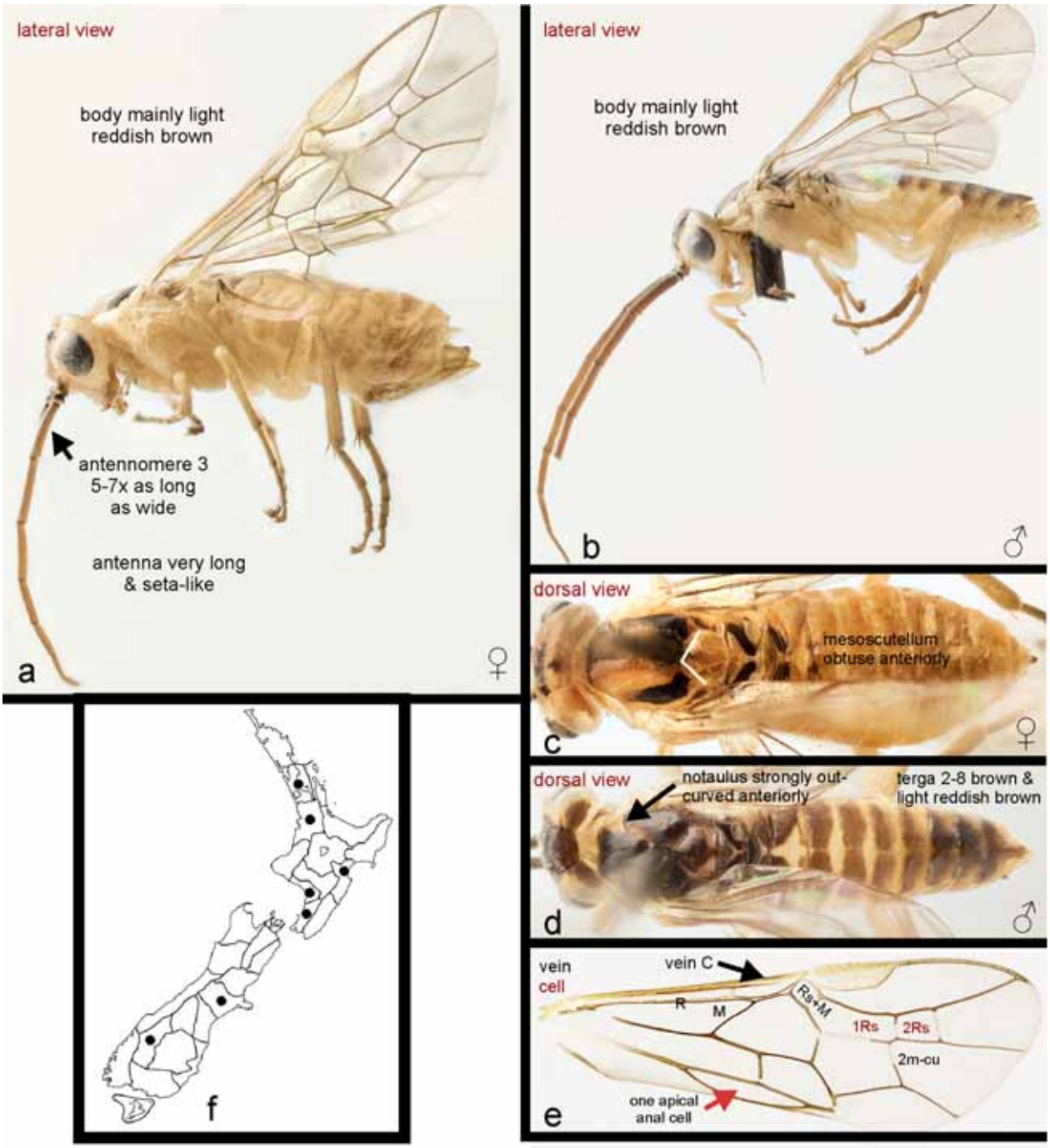
Description
Colour. Head and mesonotum light reddish brown (Figs 8a & 8d). Postocular area mainly pale with at most a black spot (Fig. 8d). Flagellum at least pale below and at apex (Fig. 8a). Mesonotum with pale background marked more or less with black on lobes (Fig. 8c). Abdomen green when alive fading to light reddish brown in dead (Figs 8a & 8b). Basal terga more or less marked with black. Stigma very light reddish brown (Figs 8e). **Head**. Capsule interantennal surface between antennal sockets and supraclypeal area markedly elevated in lateral view and angular below medial pit. Lateral ocelli about as far apart as their distance from posterior margin of head. Postocellar area much longer in the middle than the diameter of an ocellus and not clearly margined behind. Anterior margin of clypeus in-curved: depth of emargination 0.5–0.7 × remaining medial length of clypeus. Flagellomere 1 long, at least 5–7 × as long as wide; antennae seta-like (Figs 8a & 8b). Maxillary palpomere 2 short: 0.5-0.7 × as long as palpomere 3. **Thorax**. Notauli sharply outlined and clearly out-curved anteriorly. Anterior margins of mesoscutellum forming an obtuse angle (Fig. 8c). **Legs**. Spurs at apex of metatibia clearly unequal: length of outer spur at most 0.7 × that of inner one; longest spur at apex of metatibia 0.5 × as long as metatarsomere 1 and usually clearly longer than apical breadth of tibia. Preapical tooth of tarsal claw long and close to apical tooth. **Wing**. Fore wing with vein C of fore wing slightly swollen near apex (Fig. 8e) and cell C not horn-like but angular at junction of Rs+M and R; cell C about as wide as that of vein C at level of junction of Rs+M and R. **Ovipositor Sheath**. Sheath in lateral view angularly rounded at apex, and length of free upper edge clearly less than the greatest height; dorsal edge in lateral view longer than length of cercus; in dorsal view tapering behind. **Size**. Body 5-10mm.

The male is unknown in New Zealand (Caron et., 2013). If the male was found, it would be very light reddish brown on abdominal sterna and partly black on abdominal terga (as illustrated in Figs 8b & 8d).

Larvae
Diagnosis
Body of mature larva with light and dark green stripes (Fig. 8g). Head of mature larva with a dark band above eye and a median stripe extending from back of head to part of clypeus (Fig. 8g). Tergum 10 with posterolateral knob-like processes (Fig. 8h).

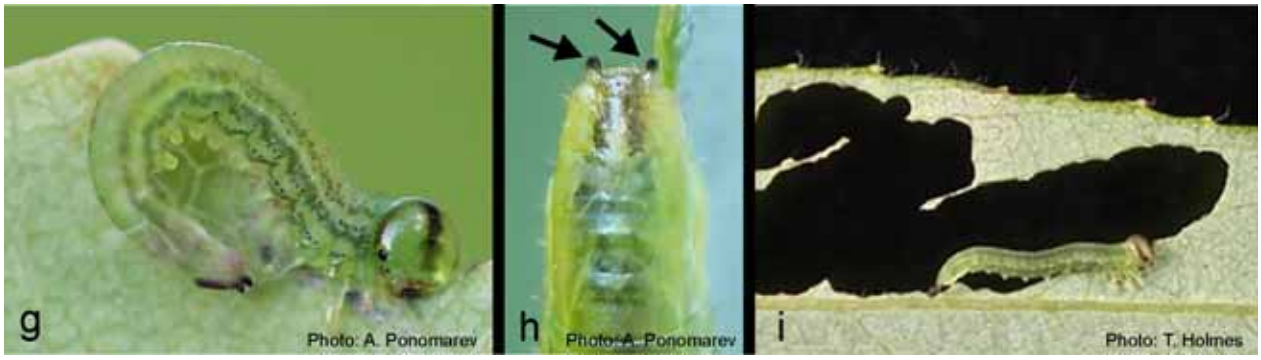
Hosts and biology
Euura oligospila was discovered in Auckland in February 1997 (then named as *Nematus oligospilus*). The larvae of *Euura oligospila* feed exclusively on *Salix* (willows) (Smith 1979, Martin 2015) and because *Salix* are often used for soil stabilisation and riverbank erosion control, there have been plant breeding trials to determine which *Salix*

clones or hybrids are most susceptible (Charles et al. 1998). In New Zealand, only females have been recorded. Detailed life history information is given by Martin (2015) and Malagon-Aldana et al. (2017). Females lay their eggs in willow leaves under the epidermis of a leaf, and the larvae feed along the edge of a leaf. When mature, larvae form cocoons either on the tree or in the soil under the tree. In New Zealand, a complete life cycle in summer takes about 30–40 days from newly laid egg to adult emergence (Martin 2015). Females live for about 5 days and larvae develop in about 14 days and pupation last about 9 days (Martin 2015). The diapause in winter is as larvae and pre-pupae inside a cocoon. In Auckland, larvae entered diapause during May and adults emerge about 5 months later in October (Martin 2015).



Figs 8a–8f. *Euura oligospila*. 8a & 8b habitus lateral; 8c & 8d habitus dorsal; 8e fore wing; 8f distribution. Arrows point to key features in the diagnosis and description sections.

Distribution
A Holarctic species introduced accidentally into the Neotropical, Afrotropical, and Australasian regions (including New Zealand). **New Zealand:** North Island (AK, HB, WI, WN, WO), South Island (MC, OL) (map, Fig. 8f). GBIF distribution records of *Euura oligospila* in New Zealand available from: doi.org/10.15468/dl.9zr3z8



Figs 8g–8i. *Euura oligospila* (continued). 8g habitus laterally; 8h abdomen apex dorsally with distinct posterolateral knob-like process; 8i damage by larva. Arrows point to key features in the diagnosis and description sections.

***Euura proxima* (Serville, 1823)**
Figures: adult 9a–9d; habitus 9a & 9b, 9f; larva 9f; damage 9g; 9e map.
Nematus proximus Serville, 1823: 69. Smith 1979: 73.; Taeger et al. 2010: 446.

Common Name
Willow gall sawfly

Taxonomic note
In most of the literature in the past century this species was known as *Pontania proxima.* Only recently, this species was transferred to the genus *Euura* (Prous et al. 2014).

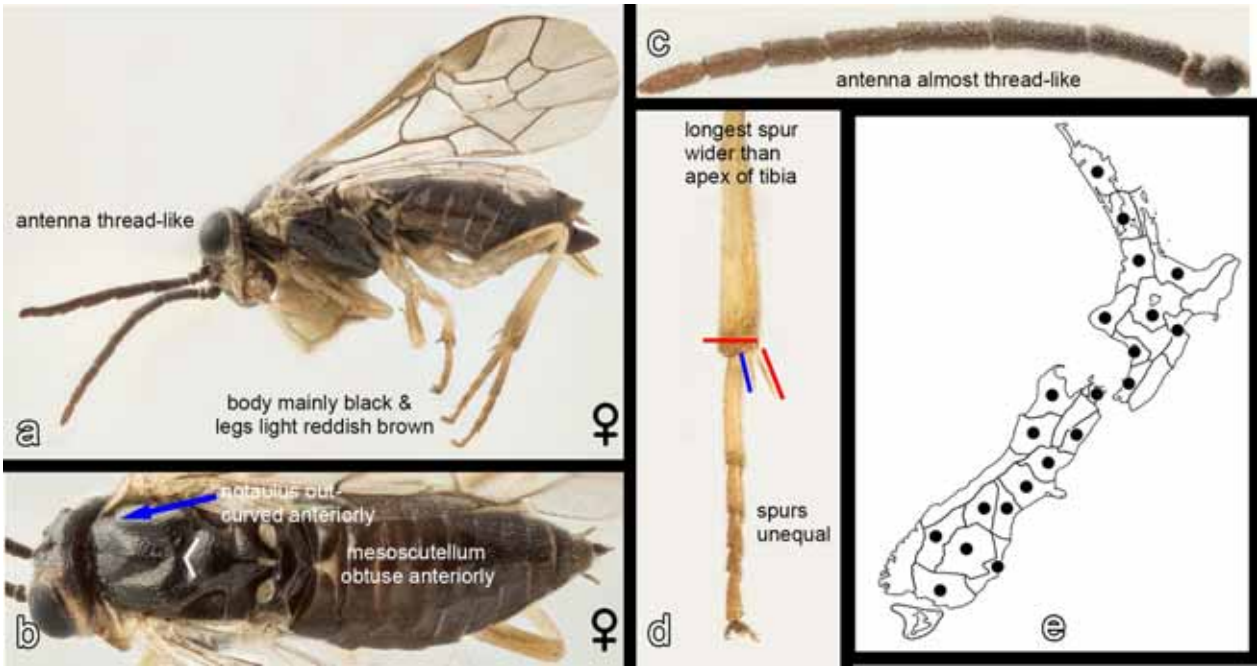
Diagnosis and description based on Benson (1958) and Goulet (1992).

Adults
Diagnosis
Among species of *Euura* in New Zealand, *E. proxima* is distinguished from the other two species by the mainly brown fore wing stigma; from females of *E. oligospila* by the completely black abdomen (Figs 9a & 9b) and by the short antennomere 3 (about 3 × as long as maximum width) (Fig. 9c); and from females of *E. viduata* by the longest spur at apex of metatibia being clearly longer than maximum width of tibia (Fig. 9d).

Description
Colour. Stigma brown at apex. Metafemur mostly light reddish brown. **Head**. Medial surface of head between antennal sockets and supraclypeal area markedly elevated in lateral view and angular below medial pit. Anterior edge of clypeus in-curved: emargination as deep as 0.5–0.7 × remaining medial length of clypeus. Lateral surface of mandibles dissimilar: left mandible markedly constricted near middle. Maxillary palpomere 2 short: 0.5–0.7 × as long as 3. Flagellum short: antennomere 3 is 2.0–3.5 × as long as wide; threadlike (Fig. 9c). **Thorax**. Notauli sharply outlined and clearly out-curved anteriorly (Fig. 9b). Anterior margins of mesoscutellum forming an obtuse angle (Fig. 9b). **Abdomen**. Cercus very short in lateral view, reaching back less than half-way to apex of ovipositor sheath (Fig. 9a). **Legs**. Metatibia and metatarsomeres slightly or not flattened and slightly or not grooved laterally. Metatarsomere 1 a little longer than length of tarsomeres 2 and 3 together. Metatarsomere 3 usually 2.0–3.0 × as

long as wide in lateral view. Spurs at apex of metatibia more similar in length: length of outer spur 0.75–0.90 that of inner one and clearly longer than maximum width of tibia (Fig. 9d); longest spur 0.3 (usually) to 0.5 as long as length of metatarsomere 1 (Fig. 9d). Preapical tooth of tarsal claw long and close to apical tooth. **Wings**. Fore wing with vein 2m–cu of fore wing joined to cell 1Rs; with vein C slightly swollen near apex and cell C not horn-like but angular at junction of Rs+M and R; cell C about as wide as that of vein C at level of junction of Rs+M and R; without vein 2r (Fig. 9a). Hind wing with 2A of hind wing completely developed, thus cell closed. **Ovipositor sheath**. Sheath in lateral view rounded and in dorsal view apex acute; with lateral hairs in dorsal view directed more outwards; sheath longer than metatarsomeres 1 and 2. **Size**. Body length less than 5 mm.

Males are rarely seen in England (Benson 1958). In New Zealand, *E. proxima* is probably a parthenogenetic species as only females have been recorded.



Figs 9a–9e. *Euura proxima*. 9a habitus lateral; 9b habitus dorsal; 9c antenna lateral; 9d metatibia and metatarsus lateral; 9e distribution. Arrows point to key features in the diagnosis and description sections.

Larvae

Diagnosis

Head of mature lava entirely dark brown or black (Fig. 9f). Tergum 10 with short triangular process posterolaterally. Larva found in coffee bean-like galls on willows (Fig. 9g).

Hosts & biology

Euura proxima known as the willow sawfly is a small exotic sawfly approximately 3.5–5 mm long. It was likely introduced into New Zealand along with its host plants. Larvae cause a gall to form on leaves of *Salix* (such as *S. alba*, *Salix ×fragilis*, and *Salix matsudana*) throughout New Zealand.

Adults emerge in late spring in December, and females seek out suitable willows on which to lay eggs. Females insert an egg that induces the leaf to form gall tissue where the egg hatches and the larva begin to eat the soft leaf tissue. The galls look like coffee beans, are longer than broad and are covered with irregular ridges and protuberances (Figs 9g. Typically, the galls are reddish but the colour may vary with the host tree (Benson 1958).

Despite the very large number of galls that can occur on leaves and on a single plant, the species does not appear to seriously affect the growth of willow.

Figs 9f–9g. *Euura proxima* (continued). 9f habitus lateral; 9g galls. Arrows point to key features in the diagnosis and description sections.

Distribution

Euura proxima is native to the western Palaearctic region but was accidentally introduced in the Nearctic and Australasian regions (Taeger et al. 2010). **New Zealand**: North Island (AK, BP, HB, ND, TK, TO, WI, WN, WO), South Island (BR, CO, DN, KA, MC, MK, NC, NN, OL, SC, SD, SL) (map, Fig. 9e). GBIF distribution records of *Euura proxima* in New Zealand available from: oi.org/10.15468/dl.jphrg6

***Euura viduata* (Zetterstedt, 1838)**

Figures: adult 10a–10k; habitus 10a–10d, larva 10o–10p; damage 10n; map 10m.

Tenthredo viduata Zetterstedt, 1838: 351. Smith 1979: 81; Taeger et al. 2010: 389

Taxonomic note

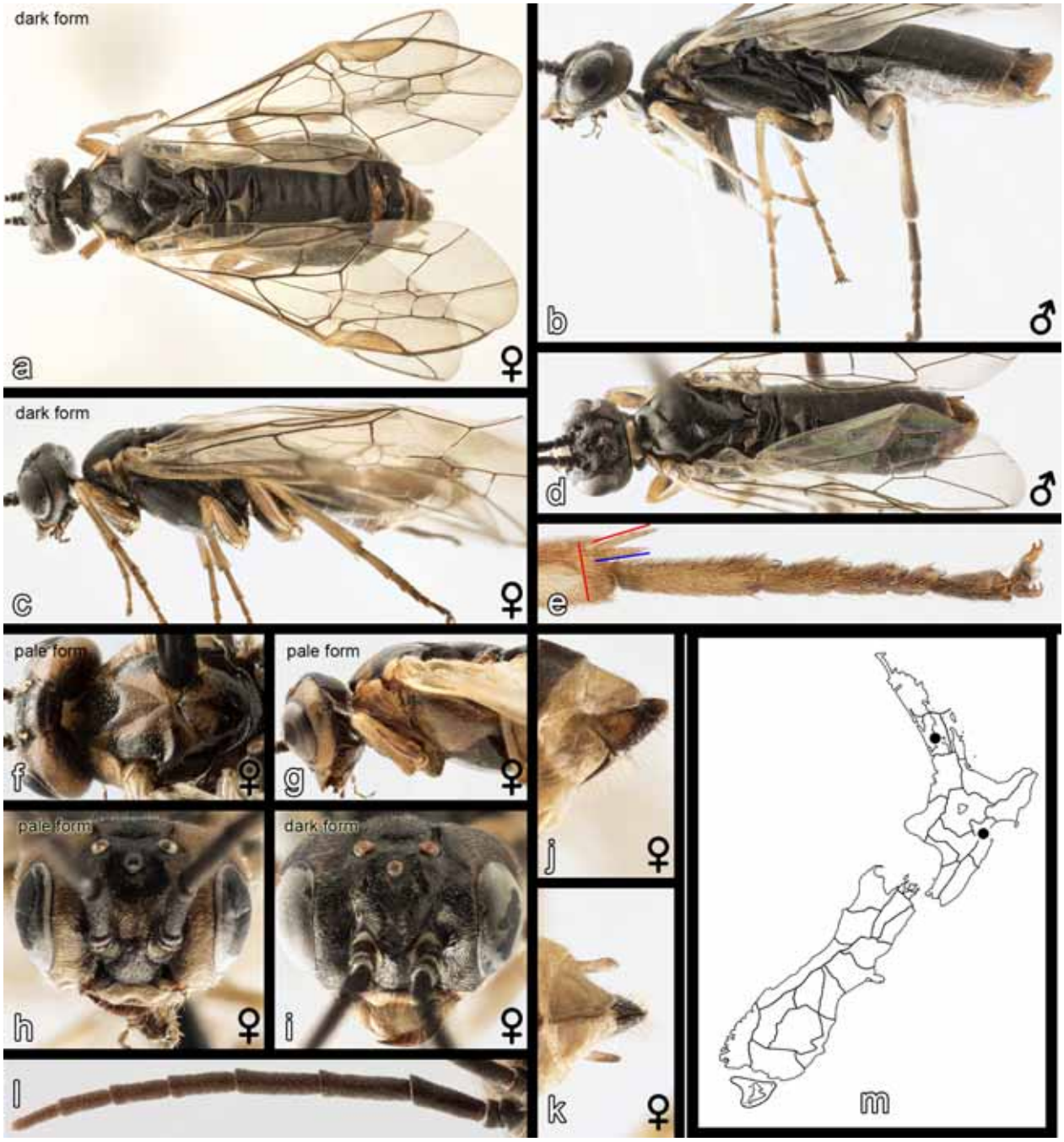
In most of the literature in the past century this species was known as *Amauronemtus viduatus*. Only recently was this species was transferred to the genus *Euura* (Prous et al. 2014).

Diagnosis and description based on Benson (1958), Goulet (1992) and Prous et al. (2014).

Adults

Diagnosis

Among New Zealand species of *Euura*, *E. viduata* is distinguished from females of *E. oligospila* by the mainly black abdominal terga dorsally and by the short antennomere 3 (about 3 × as long as maximum height) (Fig. 10l), and from females of *E. proxima* by the fore wing with a light reddish-brown stigma. This is the only species of *Euura* with known males in New Zealand. Males have the abdomen black except for the light reddish-brown sternum 9.



Figs 10a–10m. *Euura viduata*. 10a habitus dorsal; 10b habitus lateral; 10c habitus lateral; 10d habitus dorsal; 10e spurs and tarsus of hind leg; 10f head & thorax dorsal; 10g head & thorax lateral; 10h & 10i head anterior; 10j ovipositor sheath lateral; 10k ovipositor sheath dorsal; 10l antenna lateral; 10m distribution. Arrows point to key features in the diagnosis and description sections.

Description

Colour. Body partly to almost entirely black above and with a pale stigma (Figs 10a & 10f). Head in anterior view partly reddish brown to almost entirely black (Figs 10h & 10i). Front lobe of mesonotum and pectus often marked with black or entirely black (Figs 10a & 10f). Thorax in lateral view entirely black to mainly light reddish brown and black on pectus (Figs 10c & 10g). Abdomen entirely black to mostly light reddish brown with terga 3–5 at least flecked with black medially. **Head**. Medial surface of head between antennal sockets and supraclypeal area little elevated in lateral view and slightly or not angular below median pit. Height of eye in lateral view 3–4 × as long as distance from dorsal margin of eye to highest point of head. Malar space not longer than distance between antennal

sockets. Outer surface of mandibles dissimilar: left mandible markedly constricted near middle. Antenna short: flagellomere 1 about 3 × as long as maximum height at apex; apical antennomere narrow: about 4–5 × as long as wide (Fig. 10l). Maxillary palpomere 2 long: 0.7–1.0 × length of 3. Microsculpture of head and thorax obsolete. **Thorax**. Notauli sharply outlined and clearly out-curved anteriorly. Mesopleuron shining, without surface microsculpture. Mesothoracic katepimeron with at most a few setae. Front lobe of mesonotum with medial furrow obsolescent posteriorly. **Legs**. Metatibia and metatarsomeres slightly or not flattened and slightly or not grooved laterally. Length of smaller apical spur of metatibia 0.8–1.0 that of longest one; length of longer apical spur of metatibia usually less than 0.5 length of metatarsomere; longer spur equal or shorter than maximum width of tibia (Fig. 10e). Tarsal claw with long preapical tooth (Fig. 10e). **Wings**. Fore wing with vein 2m–cu joined to cell 1Rs (Fig. 10a); vein 2r of absent. Hind wing with vein 2A present, thus cell closed. **Ovipositor sheath**. Sheath broader in lateral view at base than apex, and narrowly rounded apically (Fig. 10j); in dorsal view sheath broad at base and acute at apex (Fig. 10k). **Ovipositor**. Ovipositor shorter than metatibia; lancet with only up to 13 apical segments and sometimes with 2 basal ones bearing marginal teeth. **Size**. Small species (5–7 mm.).

Larvae

Diagnosis

The larvae are green with dark and pale green stripes on the thorax and abdomen and the head is light green with no dark spots except narrowly around the eye (Figs 10o & 10p). They do not have a process along the posterolateral margin of tergum 10 (Fig. 10q). Young larvae live in a rolled leaf gall (Fig. 10n), and older larvae are free living.

Figs 10n–10q. *Euura viduata* (continued). 10n rolled leaf gall (arrows); 10o habitus lateral; 10p habitus dorsal; 10q apex of abdomen dorsally. Arrows point to key features in the diagnosis and description sections.

Hosts & biology

Euura viduata (known then as *Amauronematus viduatus*) was first discovered in New Zealand in 2009 from a sample of *Salix babylonica* foliage collected in Auckland.

In Europe and Australia, larvae of *E. viduata* feed on many species of *Salix* (Benson 1958) and complete one generation per year. In New South Wales mature larvae were found to leave the host tree in September and spin cocoons among plant debris, with adults not emerging until early the following spring. The rolled leaf galls made by *E. viduata* are superficially like the shelters of some caterpillars. However, the structures created by these sawflies are technically galls because the plant growth is modified. While ovipositing, the females inject an unknown substance into the willow tissues resulting in the development of soft and sticky leaves which become tightly glued together. Larvae of *E. viduata* first live in these developing buds and leaves and then become free living as they mature. Although larvae are defoliators, this insect is generally not regarded as a pest in the Northern Hemisphere, or New Zealand.

Distribution

The species is native to the Holarctic region, but it was accidentally introduced into Australia and New Zealand. **New Zealand**: North Island (AK, HB) (map, Fig. 10m).

XIPHYDRIIDAE

The larvae of woodwasps (Xiphydriidae) develop in the wood of angiosperms, and although there are over 100 described species distributed worldwide (Smith 2008), they are poorly represented in the Australasian region (Jennings et al. 2007).

Adults

Diagnosis

Xiphydriidae are distinguished from other sawflies families by the adults possessing an elongated propleuron, forming a long 'neck' (thus, the head is clearly distant from the pronotum), a rounded head, head dome-shaped above the eyes, and an elongated, cylindrical body. Based on (Smith 1978)

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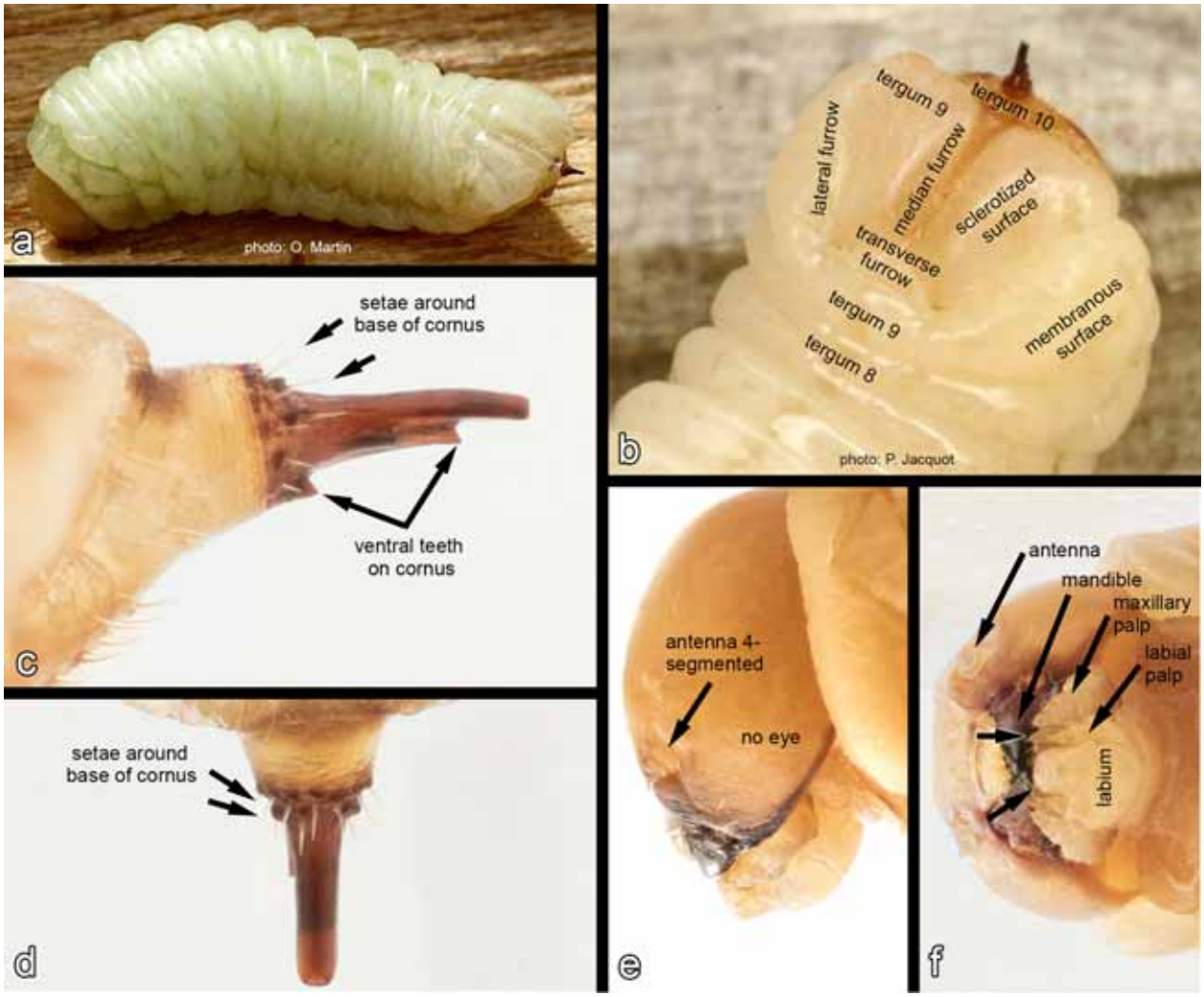


Figs 11a–11f *Xiphydria maculata*. 11a habitus dorsolateral; 11b abdomen apex dorsolateral; 11c tergum 10 lateral; 11d tergum 10 dorsal; 11e head lateral; 11f head ventral. Arrows point to key features in the diagnosis and description sections.

Larvae

Diagnosis

Among Symphyta species of larvae with fleshy and unarticulated thoracic legs, larvae of Xiphydriidae are distinguished from those of the Siricidae by having ventral teeth on the cornus (Fig. 11c), the apex of the cornus

tube-like, and a less transverse clypeus and labrum. The larvae of Xiphydriidae are poorly known and not well described. Information on the Nearctic species *Xiphydria maculata* Say, 1836, is given below as there is no material available for the larval stages of the New Zealand species.

Description of *Xiphydria maculata* larva

Body. The larva a little flattened and short (Fig. 11a). **Head**. Capsule clearly outlined, but frons not or barely outlined by shallow furrows or very little impressed sutures, and epicranial suture indistinct. Eye absent (Fig. 11e). Clypeus 2.7 × as wide as long medially. Labrum about 1.3 × as wide as long medially, symmetrical without a lobe ventrally (Fig. 11f). Antennae consisting of 3 antennomeres: first antennomere without very small setae; last two antennomeres sclerotized and light reddish-brown (Fig. 11e). Labial palps 2–segmented, maxillary palps 3–segmented, and galea 2–segmented (Fig. 11f). Mandible large and dark brown, in ventral view ending sharply (Fig. 11f) with 2–3 teeth along inner edge. **Thorax**. Thorax with fleshy unarticulated legs; extreme apex of thoracic legs sclerotized (or with a sclerotized ring), and light reddish-brown with one to three apical setae. **Abdomen**. Abdomen without prolegs. With a weakly outlined distinct dorsal fold on at least basal segments. Tergum 10 sclerotized with a deep longitudinal median furrow (Fig. 11b); with long fine setae over main tergal surface; lateral surface with lateral edges of main tergal surface slightly diverging posteriorly and reaching toward posterolateral area but lateral edges clearly distant from each other anteriorly; without a pair of unsclerotized submedian cone-like processes on main tergal surface posteriorly; apex of tergum ending with a darkly sclerotized process, the cornus (precornus). Cornus with dark teeth on ventral edge consisting of two basal teeth in basal 0.2 followed by a blade-like medial tooth in basal 0.7; with many tubercles, each with a seta, around base; apex broad and tube-like (Figs 11c & 11d).

Genus *Moaxiphia* Maa, 1949

Moaxiphia Maa, 1949: 22 (key), 29. Type species: *Derecyrta decepta* F. Smith, 1876 [= *Moaxiphia decepta* (F. Smith, 1876)], by original designation. Taeger et al. 2010: 116.

Moaxiphia is an endemic New Zealand genus. Diagnosis and description based on Jennings et al. (2007), Smith (2008), and Ward & Goulet (2011).

Adults

Diagnosis

Adults of *Moaxiphia* are distinguished from other Australasian Xiphydriidae by the combined presence of the following character states: the distance between antennal toruli is much less than twice distance between antennal socket and the anterior edge of clypeus; the inner orbits of eyes converge dorsally (Fig. 12e); and the fore wing vein 2r is present (Jennings et al. 2007; Smith 2008) (Fig. 12a).

Moaxiphia decepta (F. Smith, 1876)

Figures: adult 12a–12j; habitus 12a; map 12k.

Derecyrta deceptus F. Smith, 1876: 474. Teager et al. 2010: 116.

Xiphydria flavo-picta [sic!] F. Smith, 1878: 1–2. Taeger et al. 2010: 116.

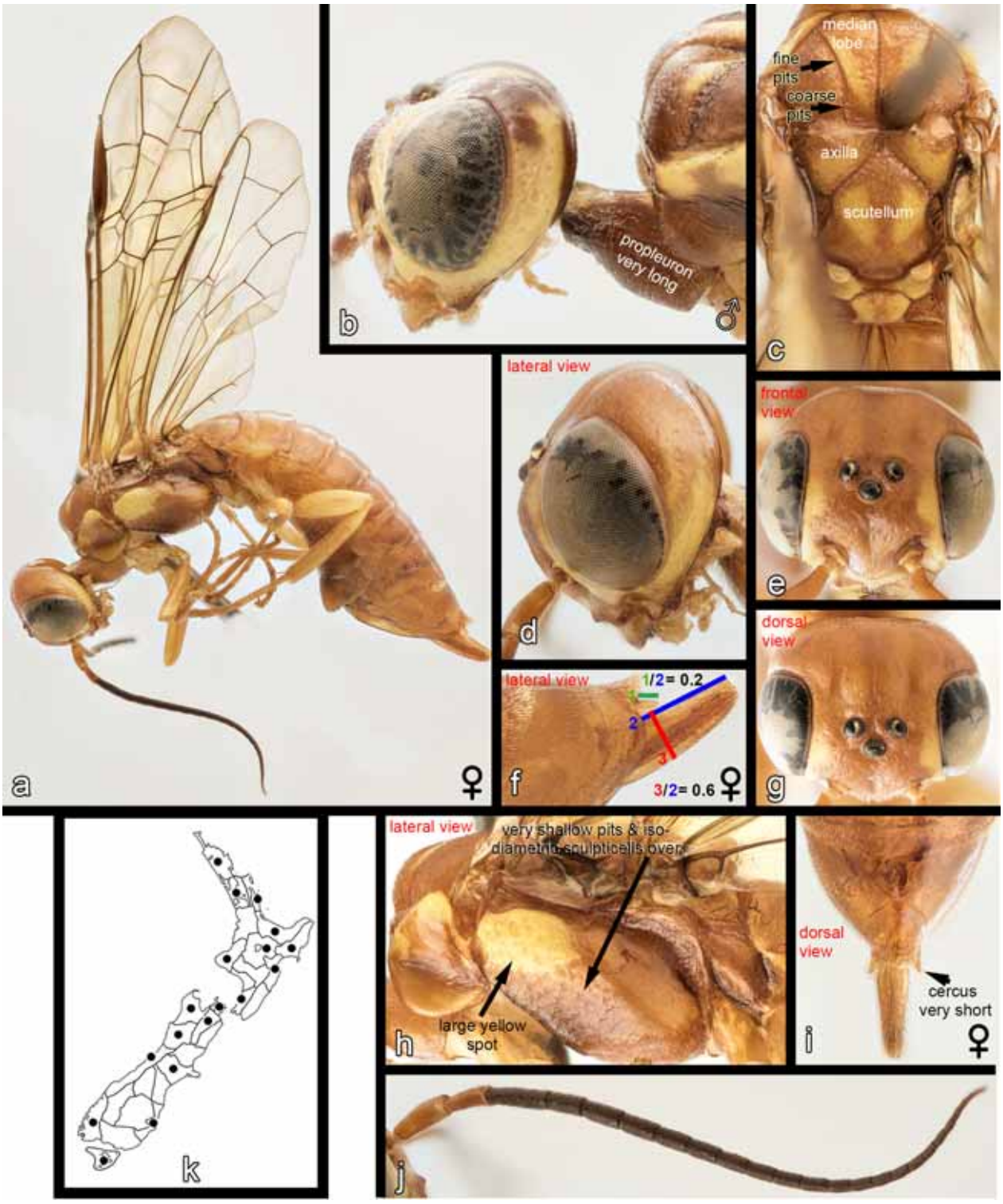
The diagnosis and the description are based on Ward and Goulet (2011).

Adults

Diagnosis

Specimens of *Moaxiphia decepta* are distinguished from those of *M. gourlayi* and *M. duniana* by the notaulus having very small pits in anterior 0.7 followed by large crenulated pits in posterior 0.3; the mesepisternum with shallowly pitted surface and widespread and isodiametric sculpticells (Fig. 12h); and in females, the cercus being

0.20 × as long as dorsal edge of exposed ovipositor sheath (Fig. 12f); and from *M. gourlayi* by the mesepisternum with large white/yellow spot dorsally (Fig. 12h).



Figs 12a–12k *Moaxiphia decepta*. 12a habitus lateral; 12b head and propleuron lateral; 12c mesothorax dorsal; 12d head lateral; 12e head anterior; 12f apex of abdomen lateral; 12g head dorsal; 12h thorax lateral; 12i apex of abdomen dorsal; 12j antenna; 12k distribution. Arrows point to key features in the diagnosis and description sections.

Description

Colour. Mesepisternum with large white spot dorsally (Fig. 12h). **Thorax**. Notaulus with very small pits in anterior 0.7 and crenulated pits in posterior 0.3. Median lobe of mesoscutum flat or only slightly convex (Fig. 12c); surface shallowly and densely pitted and with minute isodiametric sculpticells. Lateral lobe of mesoscutum with a large oval consisting of isodiametric convex meshes andwithout pits (Fig. 12c). Mesepisternum shallowly pitted, with widespread isodiametric sculpticells (Fig. 12h). **Ovipositor sheath**. Sheath narrow (width less than two-thirds × the length of the exposed dorsal margin of sheath) and cercus about 0.20 × as long as dorsal edge of sheath (Figs 12f & 12i).

Hosts & biology

Very little is known about the biology of this widespread endemic species. The larvae of *Moaxiphia decepta* (Smith) have been noted from the twigs of *Coprosma robusta* Raoul, however it appears that no reference material of larva was ever deposited in natural science collections and so is not available for further study.

Distribution

New Zealand: North Island (AK, BP, CL, GB, HB, ND, TK, TO, WN), South Island (BR, DN, FD, MC, MB, NN, SD, WD) and Stewart Island (map, Fig. 12k). GBIF distribution records of *Moaxiphia decepta* in New Zealand available from: doi.org/10.15468/dl.deedhf

***Moaxiphia duniana* (Gourlay, 1927)**

Figures: adult 13a–13f; habitus 13a; map 13f.

Xiphydria duniana Gourlay, 1927: 72. Taeger et al. 2010: 116.

The diagnosis and the description are based on Ward and Goulet (2011).

Adults

Diagnosis

Specimens of *Moaxiphia duniana* are distinguished from those of *M. decepta* by the large crenulated pits throughout the length of notaulus the (Fig. 13e); the mesepisternum with fine pits with dense hairs, and with a smooth surface between pits (Fig. 13b); and in females, by the cercus being 0.36– 0.50 x as long as dorsal edge of exposed ovipositor sheath (Fig. 13d); *Moaxiphia duniana* is distinguished from *M. gourlayi* by the mainly black or dark brown body (Fig. 13a).

Description

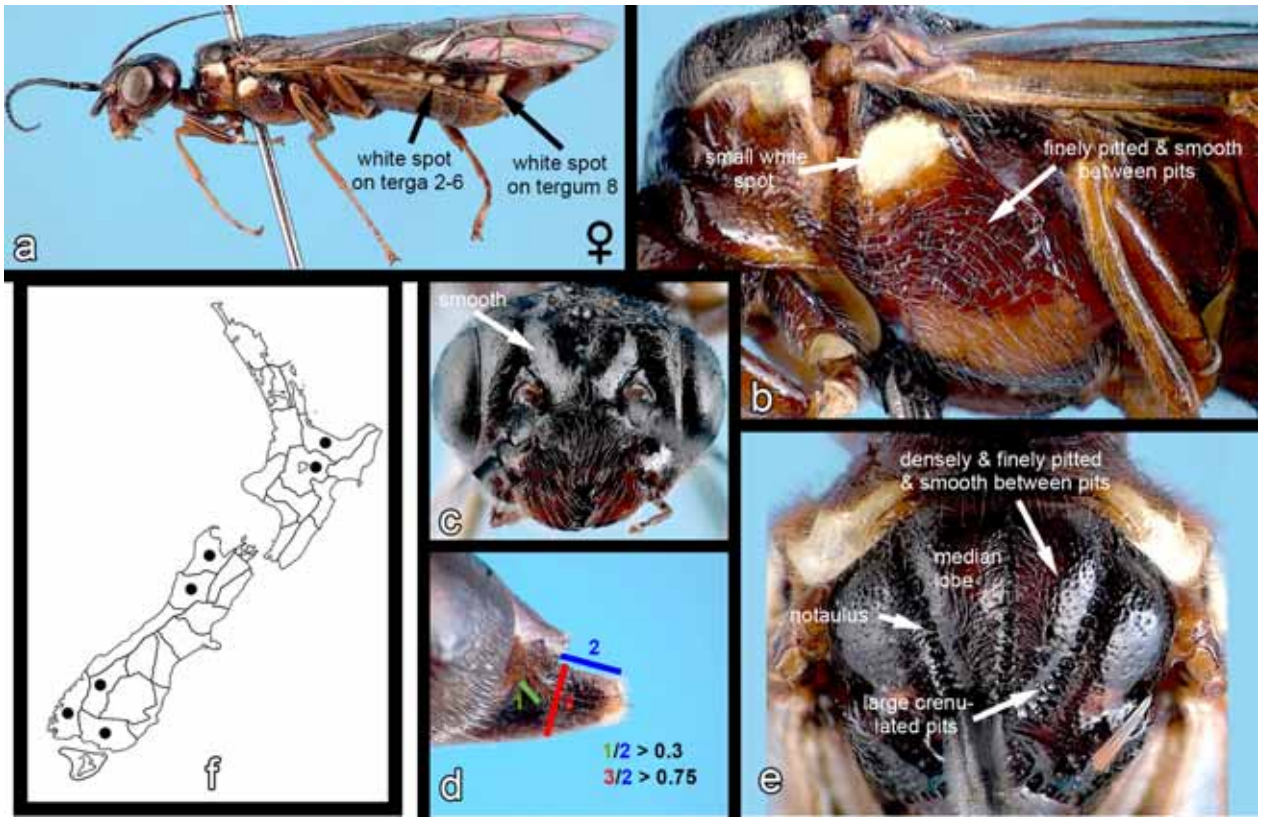
Colour. Body and legs mainly black and reddish brown to dark brown (Figs. 13a & 13c). Mesepisternum with a small white spot dorsally (Fig. 13b). In female, abdomen in lateral view black with small white spots on side of terga 2–6, and a large white spot on tergum 8 (Fig. 13a). **Thorax**. Notaulus with large crenulated pits (Fig. 13e). Median lobe of mesoscutum strongly convex, with surface smooth and finely pitted and with dense setae (Fig. 13e). Lateral lobe of mesoscutum without a large oval of isodiametric microsculpture; surface smooth and finely pitted with dense setae and a smooth surface between pits (Fig. 13e). Mesepisternum with or without white spot dorsally (spot small when present), and with coarse sculpturing (Fig. 13b). **Ovipositor sheath**. Sheath wide (width more than 0.75 × the length of the exposed dorsal margin of sheath) and cercus 0.30–0.50 × as long as dorsal edge of sheath (Fig. 13d).

Hosts & biology

Very little is known about the biology of this endemic species except that larvae tunnel in small branches of two species southern beech trees, *Fuscospora fusca* and *Lophozonia menziesii* (both previously in the genus *Nothofagus*) (Valentine & Walker 1991). No reference material of larva has been found and so is not available for further study.

Distribution

New Zealand: North Island (BP, TO) and South Island (BR, FD, NN, OL, SL) (map, Fig. 13f). GBIF distribution records of *Moaxiphia duniana* in New Zealand available from: doi.org/10.15468/dl.9fzktv



Figs 13a–13f *Moaxiphia duniana*. 13a habitus lateral; 13b thorax lateral; 13c head anterior; 13d abdomen apex lateral; 13e mesoscutum dorsal; 13f distribution. Arrows point to key features in the diagnosis and description sections.

***Moaxiphia gourlayi* Ward & Goulet, 2011**

Figures: adult 14a–14e; habitus 14a; map 14f.

Moaxiphia gourlayi Ward & Goulet, 2011: 1.

The diagnosis and the description are based on Ward and Goulet (2011).

Adults

Diagnosis

Specimens of *Moaxiphia gourlayi* are distinguished from those of *M. decepta* by the notaulus with large crenulated pits (Fig. 14d); the mesepisternum rugose and coarsely pitted surface (Fig. 14b), and in females, the cercus being 0.36–0.50 × as long as dorsal edge of exposed ovipositor sheath, and from *M. duniana* by the reddish-brown head and body (Fig. 14a).

Description

Colour. Body and legs mainly reddish-brown (Figs 14a & 14c). Mesepisternum without a white spot dorsally (Fig. 14b). Female abdomen reddish-brown (may be black on all or some of terga 2–8), but without white spot on side of tergum 8 (Fig. 14a). **Thorax**. Notaulus with large crenulated pits narrowing anteriorly (Fig. 14d). Median lobe of mesoscutum strongly convex, and with transverse ridges and coarse pits (Fig. 14d). Lateral lobe of mesoscutum

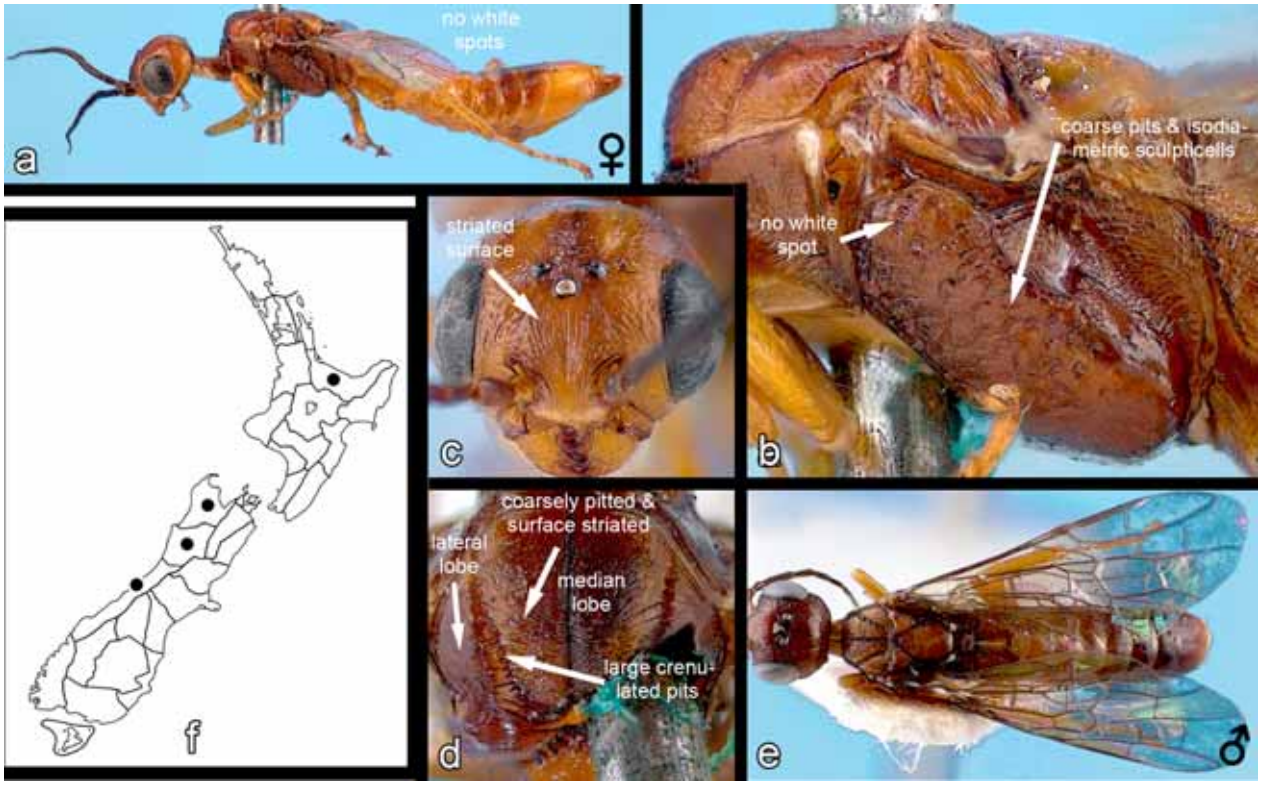
without a large oval of isodiametric microsculpture; surface smooth and almost without pits (Fig. 14e). Mesepisternum with sculpticells between coarse pits (Fig. 14b). **Ovipositor sheath**. Sheath wide (width more than 0.75 × the length of the exposed dorsal margin of sheath) and cercus 0.30– 0.50 × as long as dorsal edge of sheath.

Hosts & biology

The biology of this endemic species is unknown but given the host plant associations of the other New Zealand endemic species, the larvae are likely to be found in small branches of angiospermous trees. Adults have been captured in January and December.

Distribution

New Zealand: North Island (BP) and South Island (BR, NN, WD) (map, Fig. 14f). GBIF distribution records of *Moaxiphia gourlayi* Ward in New Zealand available from: doi.org/10.15468/dl.6bfjq2



Figs 14a–14f *Moaxiphia gourlayi*. 14a habitus lateral; 14b thorax lateral; 14c head anterior; 14d mesoscutum dorsal; 14e habitus dorsal; 14f distribution. Arrows point to key features in the diagnosis and description sections.

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NOTICES

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Fauna of N.Z. deals with non-marine invertebrates only, since the vertebrates are well documented, and marine forms are covered by the series *NIWA Biodiversity Memoirs.*

Contributions are invited from any person with the requisite specialist skills and resources. Material from the N.Z. Arthropod Collection is available for study.

Contributors should discuss their intentions with a member of the Editorial Board or with the Series Editor before commencing work; all necessary guidance will be given.

NGĀ PĀNUI

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 mārama 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 *NIWA Biodiversity Memoirs.*

Ka āhei te tangata ki te **whakauru tuhituhinga** mehemea kei a ia ngā tohungatanga me ngā rauemi e tutuki pai ai tana mahi. Heoi anō, e wātea ana te Kohinga Angawaho o Aotearoa hei āta tirotiro mā te tangata mehemea he āwhina kei reira.

Me whāki te kaituhi i ōna whakaaro ki tētahi o te Kāhui Ārahi Whakarōpūtanga Tuarā-Kore, ki te Ētita rānei i mua i te tīmatanga, ā, mā rātou a ia e ārahi mō te wāhi ki tana tuhinga.