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IDENTIFICATION OF SUBFAMILIES AND GENERA

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Australian Government
Department of Agriculture, Water and the Environment

AGRICULTURE VICTORIA

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Contents

INTRODUCTION

The Miridae are one of the largest and most important groups of Heteroptera (Hemiptera). With more than 11,100 described species worldwide (Schuh 2013), this family contains species that are major plant pests, as well as beneficial predators, and includes many examples of exotic species that are of considerable biosecurity concern to Australia.

Miridae can be difficult to work with because many species display considerable variation in morphology both between and within species, they are usually small and fragile, and many species are yet to be described, particularly in tropical Australia. There are also few specialist taxonomists in Australia with the skill and experience to confidently identify these bugs.

There are no comprehensive identification keys to the Australian genera, let alone species, of Miridae in Australia making it difficult for diagnosticians to tackle this group. Advances in taxonomy and extensive revisions have rendered past attempts manifestly inaccurate. Most of the keys that do exist are limited to one, or a few, closely related genera, with limited geographic distribution.

In recognition of their significance as plant pests, mirids are included in the Australian Emergency Plant Pest Response Deed (EPPRD) under Schedule 13 (EPPRD 2019), and the Northern Australia Quarantine Strategy (NAQS) insect pest list (NAQS 2020), and until the most recent revision, the Australian National Priority Plant Pest (NPPP) list (NPPP 2016), amongst others.

Because of their significance to biosecurity and agriculture the Miridae were included in the Tropical Australian Diagnostic list as a high priority gap, requiring the development of tools and training (including professional development opportunities for younger scientists) to enhance diagnostic capability, particularly in northern Australia (http://plantbiosecuritydiagnostics.net.au/initiatives/tropical-diagnostics).

Australia is under constant threat of incursion by exotic pests through the movement of people and goods through its borders (ports, airports and mail) but also from natural dispersal (e.g. wind currents) from countries to our near north (Eagles *et al*. 2012, 2013, 2014).

SCOPE AND PLAN OF WORK

The aim of the present project was to develop an illustrated identification key for major Australian endemic and exotic genera of Miridae, particularly genera that include pest and predatory species in tropical (northern) Australia. This has been achieved with the assistance of a grant under the Agricultural Competitiveness White Paper, Modern Diagnostics for northern Australia initiative. This resource is intended to help, in part, to bridge the capability gap and address biosecurity risks through better screening and diagnostics.

There are seven recognised subfamilies of Miridae: Isometopinae, Cylapinae, Deraeocorinae, Mirinae, Phylinae, Orthotylinae and Bryocorinae (e.g. Cassis & Schuh 2012, Schuh & Weirauch 2020). Most economically significant species belong to the subfamilies Mirinae, Bryocorinae, Orthotylinae and Phylinae. Therefore, special attention was focussed on these subfamilies. Certain representative genera of the remaining subfamilies were included in the keys to address the Australian mirid fauna more broadly, so any mirid specimens including those without associated host information could still be identified at least to subfamily or tribal level. This approach also felt important to the authors for making this resource relevant and useful to a wider range of users.

Due to the sheer diversity of mirids in Australia and overseas, it was not possible to cover all Australian genera in this project. A total of 72 genera from all subfamilies of Miridae recorded from Australia are covered. Each genus is represented by at least one species, and occasionally representatives of exotic species are included if the genus is large, agriculturally significant and widely distributed outside Australia.

The species mentioned include:

1. All pest species (major or minor)
2. Some predatory species including a few often found in association with pests
3. Some species commonly encountered in Australia
4. Some species that may have close relatives in neighbouring countries of South East Asia and Papua New Guinea, and
5. Species identified as Emergency Priority Plant Pests for Australia

Besides the main key to subfamilies, the work contains brief diagnoses of each Australian recorded subfamily, a dichotomous key to the Australian recorded tribes and representative genera, followed by brief diagnoses of these tribes, and a fact sheet for each included genus.

The keys are based on described genera and species only, all undescribed taxa are omitted. A significant proportion of the Australian mirid fauna, particularly the non-economic species, remains undescribed at present.

The keys in this work have been illustrated as much as possible using mostly habitus images and occasionally line drawings and scanning electron microscope images showing the major diagnostic characters.

SPECIMENS EXAMINED FOR THE KEYS

Specimens for the present study have come from: Australian collections, museums, and other collections including agricultural departmental collections; see the Acknowledgement section for names of all individual collections; overseas collections (e.g. Canadian National Collection (CNC) and New Zealand Arthropod Collection (NZAC)); and individual workers, e.g. Frédéric Chérot (Belgium); Tomo Yasunaga (Japan); Junggon Kim and Sunghoon Jung (Korea).

IDENTIFICATIONS OF SPECIMENS FOR THE KEYS

A significant number of those examined were type specimens (e.g. holotypes, paratypes). All other specimens were identified at least to genus level, but in most cases to species, usually by specialist heteropterists such as J. Carvalho, G. Gross, A. Namyatova, M. Schwartz, G. Cassis, T. Schuh, M. Malipatil, G. Stonedahl, H. Yeshwanth, F. Chérot and T. Yasunaga.

ILLUSTRATIONS IN KEYS AND FACTSHEETS

Most habitus dorsal and lateral multifocal images were taken with Leica Application Suite (LAS version 4.5.0) running a Leica DFC450 camera attached to a M205C microscope with MEB110 LED ring light. Later in the project, LiXin Eow collected further images using the newer LAS X software running a Leica MC190HD camera mounted on a M205C microscope with dome light. Multifocal image stacking was achieved using LAS, LAS X, Helicon Focus (version 6.2.2 or 7.0.2), or Adobe Photoshop CC 2019 software.

Scale bars were produced within LAS, and later reproduced in Photoshop to allow for consistent positioning. Line drawings were reproduced with permission and compiled / edited in Photoshop CC 2019. Other images were kindly shared by other authors.

Images for the plates in this report were taken by several people. Their names, in captions under individual plates, are indicated only by their family names, as follows: Finlay (Eliza Finlay, Department of Agriculture, Water and the Environment); Eow (Lixin Eow, Department of Jobs, Precincts and Regions); Thompson (Geoff Thompson, Queensland Museum); Yeshwanth (H.M. Yeshwanth, University of Agricultural Sciences, Bangalore, India); Chérot (Frédéric Chérot, Belgium); Daley (Tony Daley, Tasmania); Ellingsen (Kristi Ellingsen, Tasmania); CSIRO (Australian National Insect Collection, CSIRO); Hoath (Kristy Hoath, Museum of Victoria); Yasunaga (Tomo Yasunaga, Japan).

COLLECTION, PRESERVATION, LABELLING AND PREPARATION OF GENITALIA

COLLECTION

Miridae, like most Heteroptera, can be collected using a variety of methods. The collecting methods depend on the habitat, type of vegetation, and species to be collected. The most common methods are outlined below:

Hand collecting: Involves physically examining leaves, twigs or trunks of plants looking for bugs. Any specimens found are collected into appropriate vials for preservation as detailed below.

Sweeping: An insect net is one of the most common and effective method for collecting mirids living on grasses, sedges, herbaceous plants, shrubs, and delicate foliage of trees. This method may also provide accurate host associations when plants are isolated while sweeping. Mirids are fragile insects, so sweeping must be done carefully so as not to damage the bugs in the net. Leaves, flower heads, and other plant debris are often picked up in sweeping and can damage the bugs in the net if sweeping is prolonged; pick the mirids out of the net frequently with an aspirator (pooter). Also, sweeping should be done under dry conditions as moisture in the net will damage specimens, particularly their legs, wings and antennae that are necessary for identification.

Beating: The main method of collecting used by most mirid specialists. It involves holding a white beating tray or sheet of card under the foliage of a plant and shaking or beating the branches with a stick. Insects sheltering in the leaves and foliage are dislodged and land on the sheet. The bugs may then be picked off the sheet quickly with an aspirator. This is the best method for obtaining less damaged specimens as well as accurate host records.

Light trapping: This may simply involve watching what insects are attracted to the lights outside a building. Best results will be obtained by using a mercury vapour light which mixes white and ultraviolet light to be attractive to a wider range of insects. Similarly, black light fluorescent tubes which produce ultraviolet light will be more attractive than normal domestic lighting. The use of a mercury vapour or black light on a warm, calm, and humid night will often attract nocturnally active bugs not collected by sweeping or beating. Insects attracted to the light land on the sheet beside the light and can be collected by hand or with an aspirator. The disadvantage of collecting at light is that specimens cannot be associated with plant or other hosts.

Malaise trap: Similar to a small tent with a central wall instead of side walls. It is erected in a spot which would be a normal flight path for insects. The “tent” is higher at one end than the other. Insects landing on the central wall walk upwards to the highest point. Here they pass through a hole into a collecting bottle, which can be a dry killing bottle or a bottle containing 70% ethanol.

Pitfall traps: Used to collect a variety of bugs that live on the ground. It is an open-topped container set into the ground so that the upper edges are level with the soil surface. Insects stumble into the container which may be dry or hold a preservative such as ethanol or propylene glycol.

Vacuum sampling: One of the most efficient methods for collecting specimens. It involves using an electric or petrol-powered blower or outdoor vacuum cleaner that has been modified to filter insects out of the air passing through it. It is often used for survey work targeting particular plant species, i.e. plant association. Some fragile species are easily damaged by this method of collecting.

PRESERVATION

Ethyl acetate: Specimens are best killed promptly using ethyl acetate vapour and then mounted. If they cannot be mounted immediately, they may be stored for several days in pill boxes between layers of tissue. Make sure each pill box is labelled promptly with information about the specimens such as place collected, date, collector, and host plant if known. Before mounting the stored specimens, it would be beneficial to relax the bugs by placing the pill boxes in a damp (relaxing) chamber. If you plan on taking DNA samples this should be done before relaxing, as the moisture in the chamber will degrade DNA more quickly.

Dry mounting: Mirids are usually small and fragile so they should not be pinned through the body. Larger specimens can be double mounted with a micropin passing through the specimen and into a short piece of pith. A number three entomological pin can then be passed through the other end of the pith. Data labels can be attached to the larger pin.

If a specimen is so small that a micropin is impracticable or would make too big a hole, the specimen can be mounted on a card point. This involves gluing the specimen to the point of a small triangle of card. If the specimen is glued on its side, then the dorsal, ventral and one side of the specimen is still available for examination. Always use water-soluble glue that dries clear for this purpose.

Wet preservation: Mirids can be stored in 70-80% ethanol. This concentration has been shown to be the most suitable because it is strong enough to provide good preservation while a higher concentration causes the specimens to become brittle. Special care must be taken with wet preserved mirids as they are notorious for dropping their legs (which are necessary for identification), so if you must store them in ethanol, have one insect per vial.

Alternatively, large robust specimens can often be removed from ethanol, dried and mounted. While smaller specimens or those with delicate wings, may shrink and shrivel when dry mounted, so they may need to be treated in a *critical point dryer* first. This apparatus gradually replaces the liquid that is present in the tissues of the ethanol preserved specimen with gas allowing it to be dried without distortion. However, if you don't have access to a critical point dryer, then you may need to avoid storing specimens in ethanol and dry mount them in the first place.

HMDS (hexamethyldisilizane) protocol is noted as simple and effective alternative to critical point drying in Schuh & Weirauch 2020 (see for detailed references).

For DNA analysis: Material that may be used for DNA extraction is best stored in at least 90% ethanol, preferably 100%, and kept in the freezer. That being said, improvements in DNA extraction and sequencing mean that specimens that have been rapidly dried after death and stored in a dry environment are known to retain suitable quality DNA (D. Britton, pers. comm.).

LABELLING

All specimens must be labelled with (1) place of collection, (2) date of collection, (3) name of collector, and (4) also highly desirable to include the name of the plant (or animal, if predator) with which each specimen was associated. Keep in mind when preparing your labels that one day it will be read by somebody with no prior knowledge of the specimen. This means you need to be accurate and the information provided should be clear and not need interpretation.

If you can include latitude and longitude, or GPS co-ordinates, this greatly assists interpretation of locality. If possible, print all your labels with a good quality laser printer onto acid free paper. If you must hand write your labels, make sure the writing is legible and clear. Try to avoid abbreviations because it may be obvious what it means to you, but it might not be understandable to others.

For further details of collection and preservation, see references such as Kelton 1980, Martin 1977, Upton & Mantle 2010 and Schuh 2013.

PREPARATION OF GENITALIA

Male genitalia provide some of the most distinctive identification features. Female genitalia are used in some groups but the structures of the male genitalia are usually more commonly studied and used. For some groups it is sometimes impossible to identify the species or even genus without examination of male genitalia and nymphs and females may be unidentifiable. The male genitalia comprise several parts some of which are hidden inside the rear end of the abdomen. Genitalia needs to be cleared and dissected to make it possible to see these internal structures (Important: If molecular analysis is intended, please see alternative maceration technique under the section heading, **Molecular Identification**.)

Maceration with 10% KOH

1. Carefully remove the apical (distal) section of the abdomen or, for small species, the entire abdomen.
2. For a strongly sclerotised abdomen, place in 10% potassium hydroxide (KOH) in a small test tube (the top of which is plugged with cottonwool) and heat gently by placing it in a beaker of very gently boiling water for a few minutes or longer, and checking periodically to avoid over clearing / maceration and damaging the structures. For fragile and lightly sclerotized specimens, treatment carried out in cold KOH in an excavated glass block for a few hours to overnight may be adequate. Maceration dissolves the muscle and other tissues to leave the chitinous structures exposed.

NOTE: 10% KOH is caustic and will burn holes in your skin and/or clothes. Use an eyedropper or pipette when dispensing, don't use more than necessary, and avoid contact with the skin. If you splash some on you, wash the area generously in water. Also make sure the bottles containing 10% KOH are correctly labelled and stored.

3. Remove the abdomen from KOH and place in tube with distilled water. Replace distilled water at least three times to remove all traces of the KOH.
4. Transfer into 70% ethanol for ten minutes
5. Transfer into glycerine for examination
6. After examination, place into glycerine in a small genitalia vial with a rubber stopper. This vial is attached to the pin holding the original specimen by passing the pin through the rubber stopper. Ensure you attach the genitalia to the correct specimen.

FEEDING TYPES AND HOST ASSOCIATIONS

The majority of mirids feed on herbaceous plants, shrubs, trees, and ferns, and their development is often synchronous with meristematic growth and reproductive development of their host plants (Wheeler 2001). Available evidence indicates that plant bugs exhibit a high degree of host plant specificity, with the majority of species found on a single plant species, and the distribution of such species may be limited to the areas where the host plant grows (see Cassis & Schuh 2012 for specific references). Generally, mirids show highest frequency of association with asterid and rosid clades of angiosperms, and also high levels of association with conifers and grasses (Cassis & Schuh 2012). The latter paper also provides a detailed breakdown of host plant associations by tribe and a summary of what plant groups are attractive to mirids. Some species are omnivorous, so they readily disperse from plant to plant, and generally have extensive distributions.

There are other mirids that are now known to be either partly or mostly predaceous. They prey on soft bodied invertebrates and may substantially reduce large colonies of mites, leafhoppers, aphids and psyllids feeding on the host plant. Predatory mirids are generally found on many different plants predating on the invertebrate fauna that these host plants support. (Kelton 1980, 1982, Schuh & Weirauch 2020).

A small number of species, particularly in the nymphal stages, are both predaceous and phytophagous. They have been observed feeding on the foliage or fruit, and at other times preying on pest invertebrates. Therefore, these species are both harmful and beneficial (based on Kelton 1980, 1982).

MIRIDS AND PLANT DISEASES

Below is a short summary of a more detailed account of mirids and their association with plant diseases (viz., fungi, bacteria and viruses) compiled by Wheeler 2001 *(see that resource for details of specific references)*. Mirid bugs are relatively unimportant in the spread of plant diseases compared to other Heteroptera, and therefore have not received much attention from scientists who study interactions between insects and plant pathogens (Wheeler 2001).

Mirids are known to influence fungal diseases of plants by injuring hosts and allowing pathogens to enter, and can serve as carriers of fungal pathogens by helping disseminate spores. These include: Calonectria infection on cocoa by *Distantiella theobroma* (Distant) and *Sahlbergella singularis* Haglund; anthracnose of a dye plant annatto by *Helopeltis schoutedeni* Reuter; Verticillium wilt of alfalfa by *Adelphocoris lineolatus* (Goeze) and *Lygus* Hahn; boll rots of cotton by *Lygus lineolaris* (Palisot de Beauvois) and other *Lygus* species.

Some mirids are implicated in transmitting bacterial pathogens including fire blight of apple and pear by several mirids mostly several *Lygus* species, less commonly certain species of *Phytocoris* Fallén, *Lygocoris* Reuter, *Polymerus* Hahn, *Adelphocoris* Reuter and *Campylomma* Reuter; angular leaf spot of cotton by certain species of *Helopeltis* Signoret and *Taylorilygus* Leston; and heart rot of celery by *Lygus lineolaris*.

Reports of putative transmission of several plant viruses (types of mosaic viruses, luteoviruses, etc.) by mirids – included in the list are three species of *Lygus, Engytatus modestus* (Distant), *Microtechnites bractatus* (Say), *Closterotomus norwegicus* (Gmelin), *Polymerus cognatus* (Fieber) and *Orthotylus flavosparsus* (Sahlberg, C.)

MOLECULAR IDENTIFICATION

DNA barcoding (Ratnasingham & Hebert 2007) is a molecular approach to species identification that complements and informs morphological identification. Short DNA sequences are obtained from a specimen and compared to reference sequences on public databases, such as BOLD (http://www.boldsystems.org).

DNA analysis was beyond the scope of the current project, but remains a critical area of research for the future. The development of a verified DNA library for mirids would greatly assist with rapid diagnostics – particularly when dealing with immature or damaged specimens, cryptic species or when the only method of distinguishing a species is by difficult genitalia dissections of adults (see, *Preparation of Genitalia*).

The application of DNA sequence data to mirid systematics has had minimal impact to date (Cassis & Schuh 2012). The use of DNA sequence data in species-level studies has been negligible (e.g. Menard & Schuh 2011, Schuh & Pedraza 2010). However, this picture is rapidly changing.

Currently, there are 1156 mirid species from all over the world with DNA sequences available on BOLD, representing every subfamily (see Table 1. below). Ideally, these reference sequences have been obtained from specimens that have been identified correctly by a specialist taxonomist. However, this does not always occur, so caution should be used when interpreting identifications based solely on matches to public databases.

Preferably, molecular identification should involve "non-destructive" methods that allow physical specimens with key morphological characters to be retained (Floyd *et al*. 2010). It is possible to obtain DNA from specimens using Proteinase K enzyme digestion which retains hard structures and may also clear the abdomen for genitalia examination (Gilbert *et al*. 2007).

Table 1. Reference DNA barcodes on BOLD, accessed 9 March 2020.

Taxon	Number of species with DNA barcodes on BOLD
Miridae	1156
Isometopinae	7
Cylapinae	32
Deraeocorinae	69
Mirinae	441
Phylinae	326
Orthotylinae	216
Bryocorinae	64

MORPHOLOGY

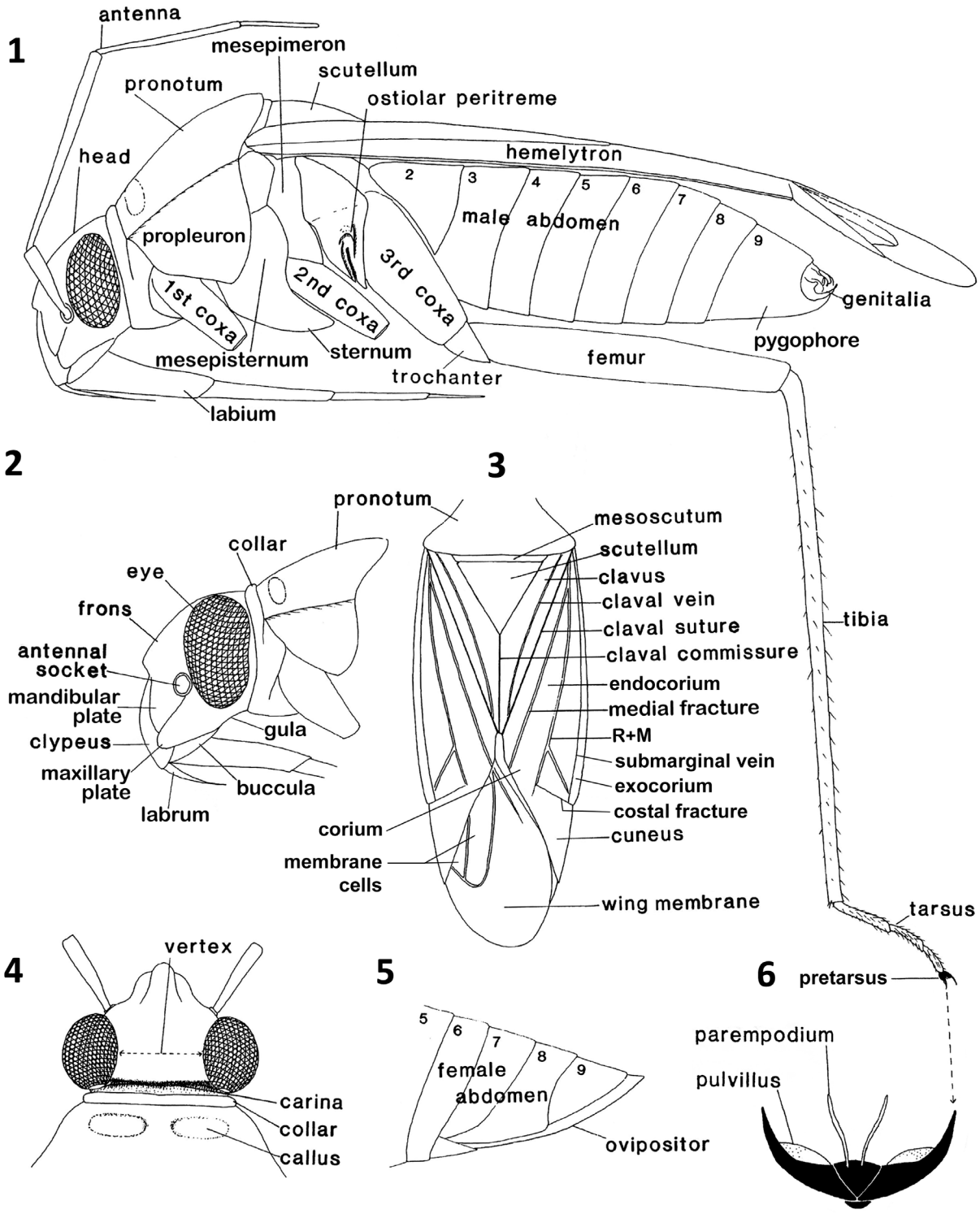
Typical external morphological structures of adult mirids and structural terms have been provided using labelled Figures 1 to 6 (modified from Kelton 1982).

Figure 7 gives details of the pretarsal claws and associated structures; these characters provide reliable characters for separating the subfamilies in Miridae (modified from Schuh 1976).

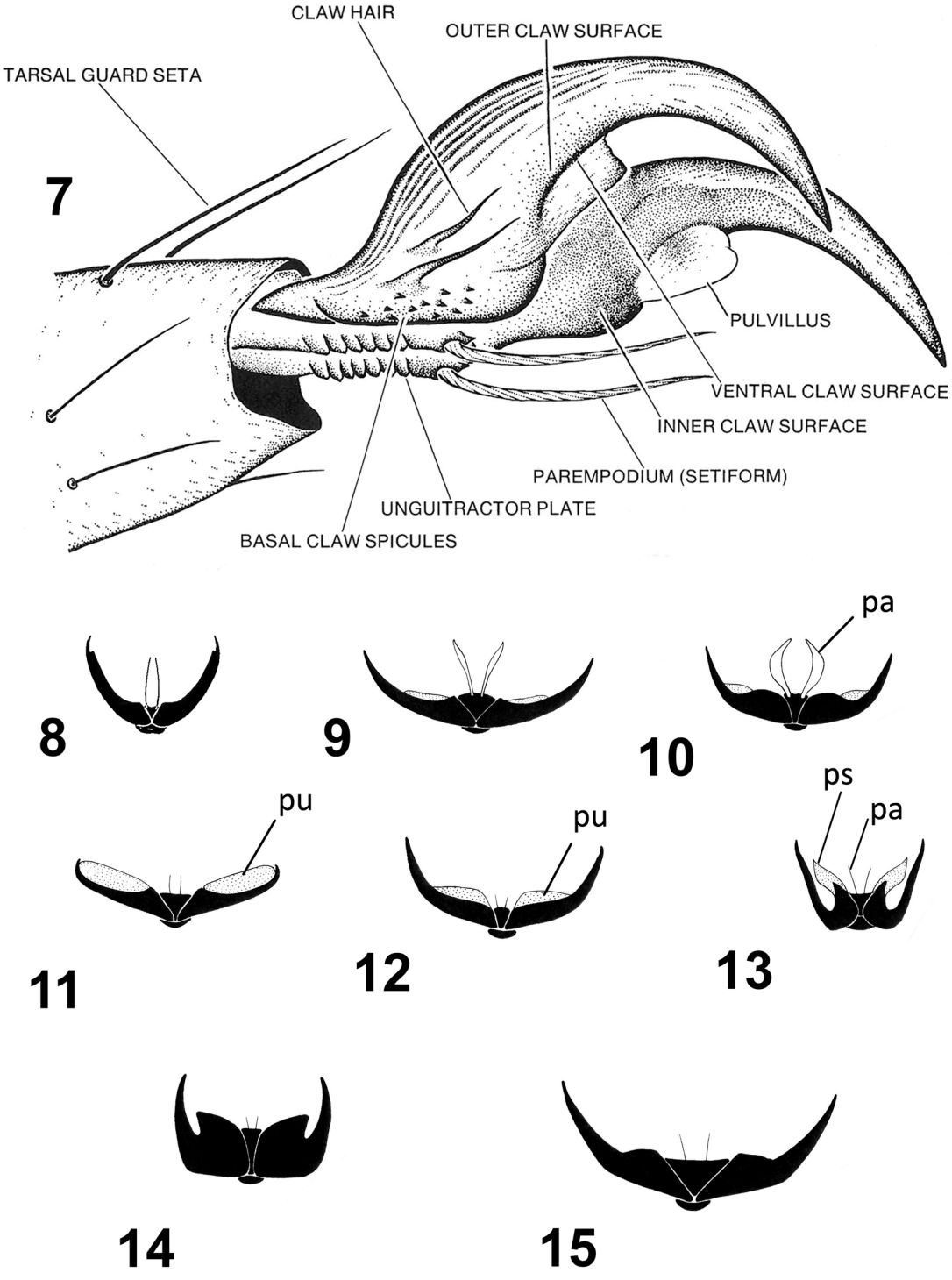
Variations in pretarsal structures in different groups of mirids are shown in Figures 8–15, 23, 26 & 27; wing membrane venation, pronotal collar and tarsal segment number in Figures 16–21; and other structural details are shown in Figures 22, 24 & 25.

Some major diagnostic characters of male and female genitalia are shown in Figures 28–44.

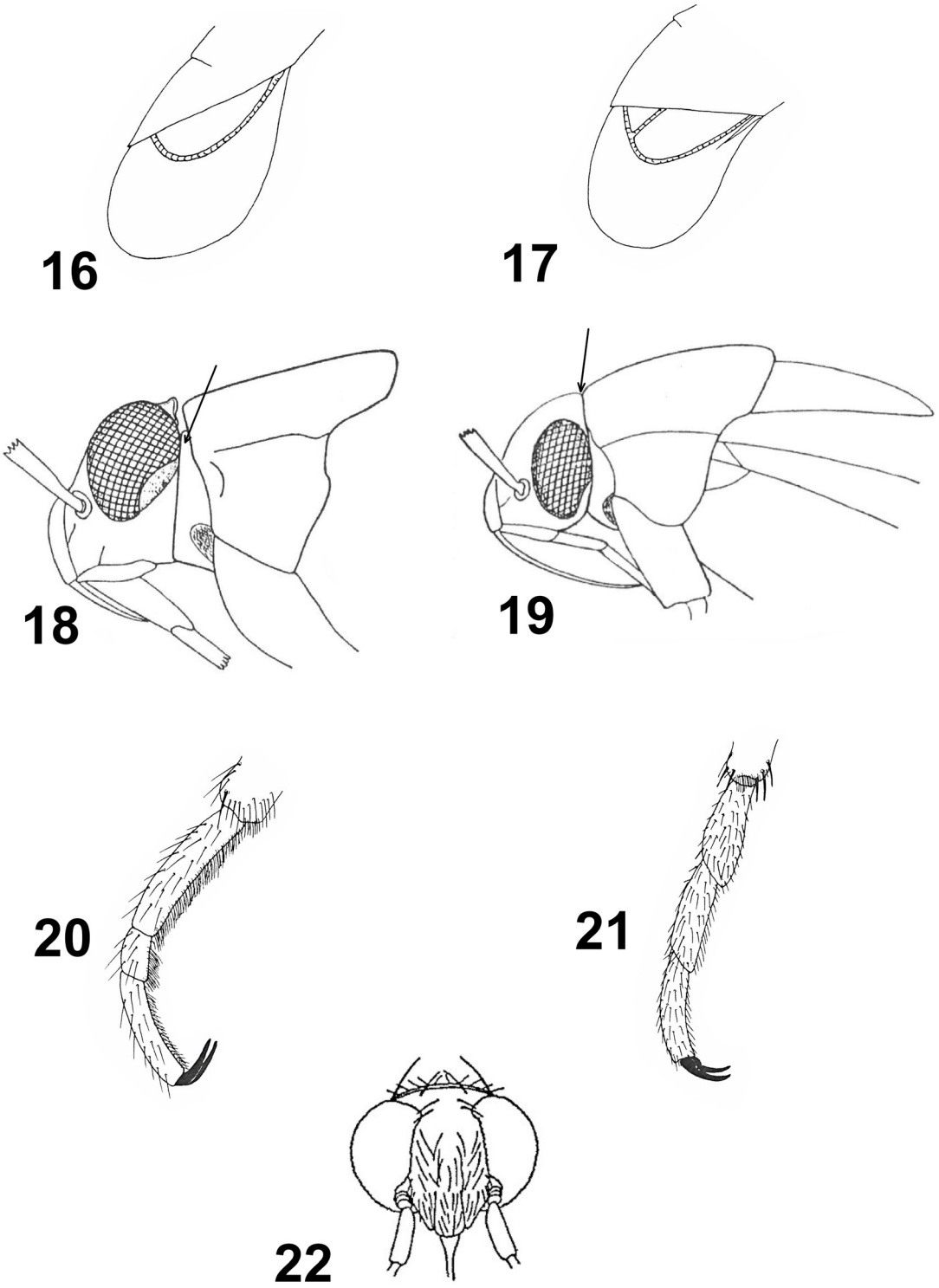
For male and female internal genitalia morphology details in representative species of major tribes and subfamilies of the family Miridae, the reader is referred to Fig. 82.4 (page 411) in the recently published *True Bugs of the World* by Schuh & Weirauch (2020).



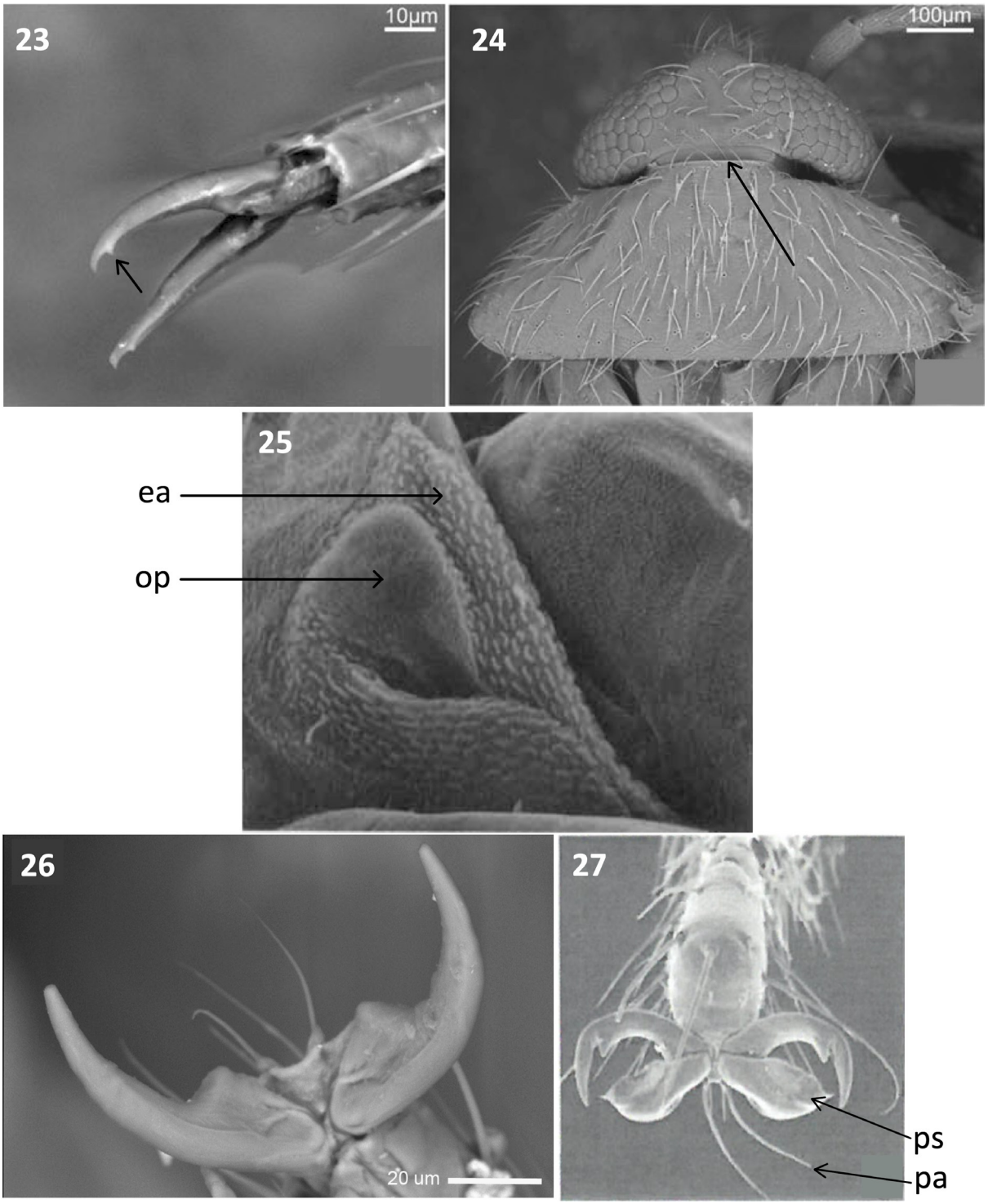
Figures 1–6. General adult mirid morphology, showing typical structures and illustrating certain structural terms: 1, body, male, lateral view. 2, head and pronotum, lateral view, Mirinae (also Deraeocorinae and Dicyphini (Bryocorinae)). 3, scutellum and hemelytra, dorsal view. 4, head and anterior part of pronotum, dorsal view, Mirinae. 5, apical part of female abdomen, lateral view. 6, hind tarsal claws and associated structures. [1–6, modified from Kelton 1982, with permission of the Minister of Agriculture and Agri-Food Canada 2019].



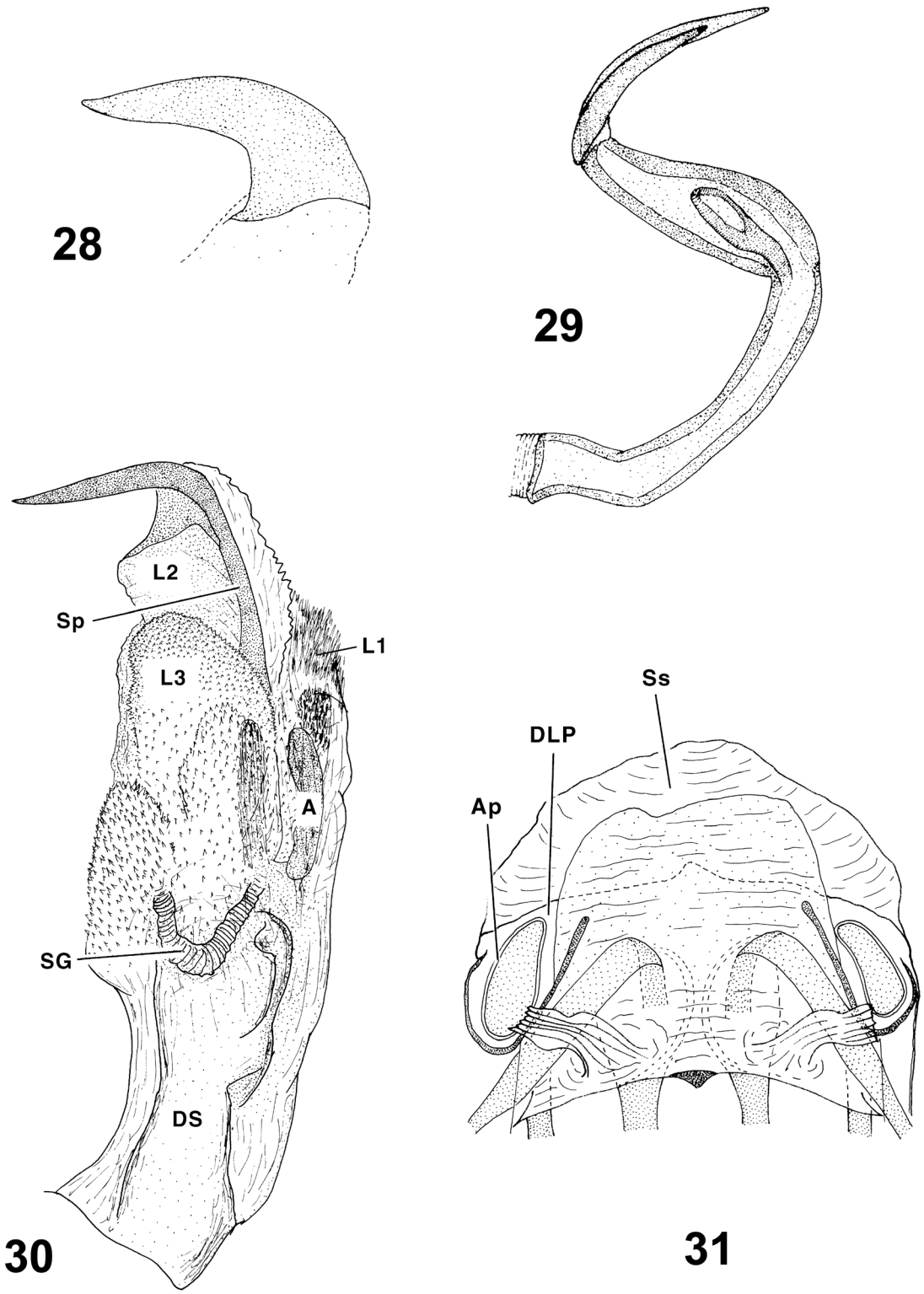
Figures 7–15. Pretarsal structures. 7, hypothetical pretarsus in Miridae, lateroventral view. 8, Cylapinae. 9, Mirinae. 10, Orthotylinae.11, 12, Phylinae. 13, Bryocorinae, Dicyphini. 14, 15, Deraeocorinae. Abbreviations: pa, parempodium; ps, pseudopulvillus; pu, pulvillus. [7, modified from Schuh 1976, with permission; 8, modified from Knight 1941; 9–15, from Kelton 1982, with permission of the Minister of Agriculture and Agri-Food Canada 2019].



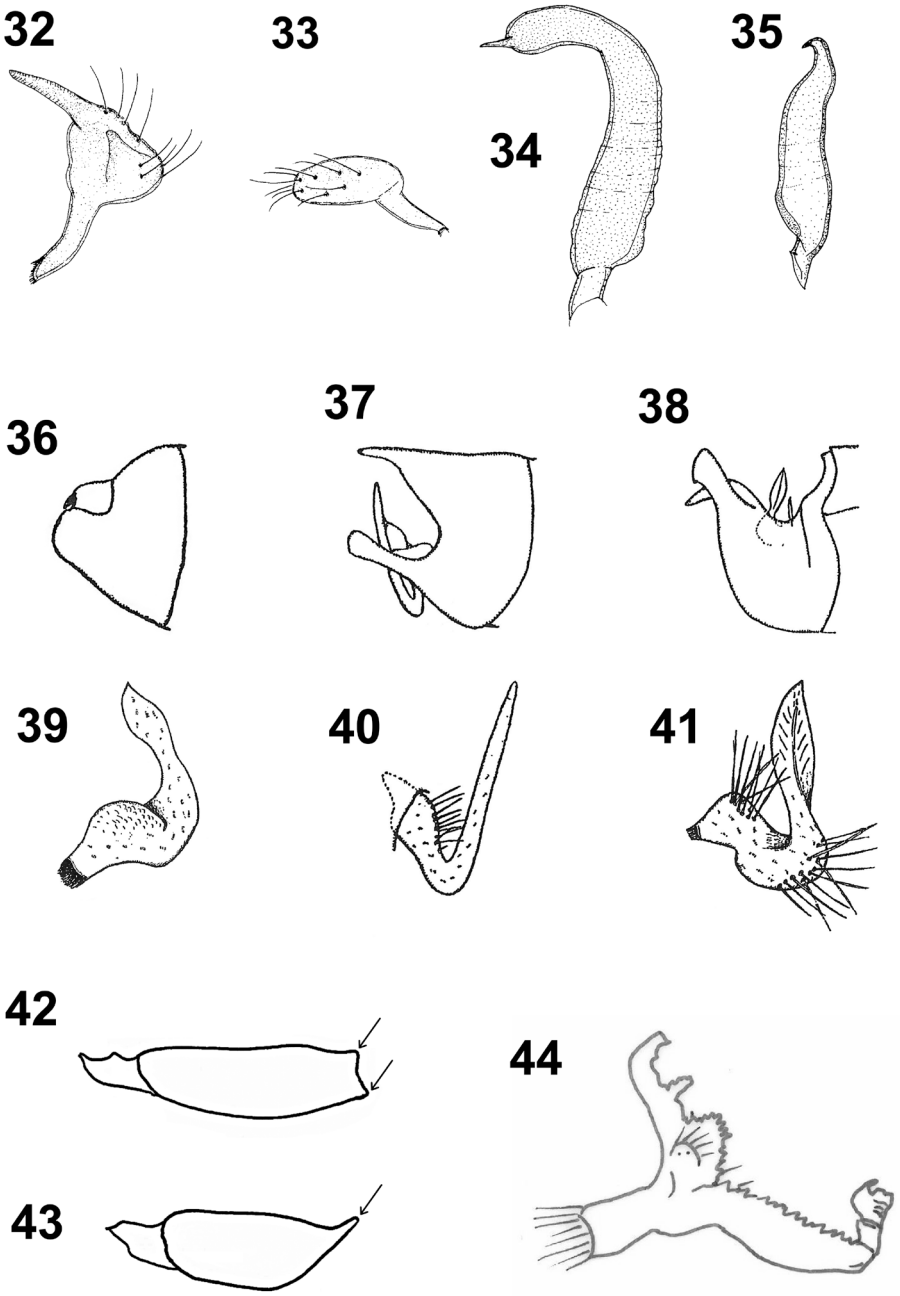
Figures 16–22. 16, 17, Forewing membrane showing one or two cells. 18, Pronotum (with depressed collar, arrowed) of Orthotylinae. 19, Pronotum (with no visible collar, arrowed) of Phylinae. 20, Tarsus of *Stenotus*. 21, Tarsus of *Closterotomus*. 22, Head of Psallopini, front view. [16, 17, 20, 21, from Kelton 1982, with permission of the Minister of Agriculture and Agri-Food Canada 2019; 18, 19, modified from Carvalho 1955; 22, modified from Usinger 1946].



Figures 23–27. 23, Pretarsus, ventro-lateral view, *Psallops cookensis* (preapical tooth arrowed). 24, Head and pronotum (margin arrowed), dorsal view, *Psallops kalumburu*. 25, Metathoracic scent gland, *Campylomma liebknechti*. 26, Pretarsus, ventral view, *Kalamemiris collessi*. 27, Pretarsus, ventral view, *Helopeltis theivora*. Abbreviations: ea, evaporative area; op, ostiolar peritreme; pa, parempodium; ps, pseudopulvillus. [23, 24, from Namyatova & Cassis 2018a with permission; 25, from Malipatil 1992; 26, from Hosseini & Cassis 2017 with permission; 27, from Stonedahl 1991].



Figures 28–31. Genitalia. 28, 29, Male genitalia, phallotheca and endosoma of *Campylomma* (Phylinae). 30, Male genitalia, endosoma of *Adelphocorisella* (Mirinae). 31, Female genitalia, posterior wall in dorsal view, *Adelphocorisella* (Mirinae). Abbreviations: A, sclerite A; Ap, parietovaginal rings; DLP, dorsal labiate plate; DS, ductus seminis; L1–L3, lobes 1–3; SG, secondary gonopore; Sp, spiculum; Ss, seminal sac. [28, 29, from Malipatil 1992; 30, 31, from Malipatil & Chérot 2002].



Figures 32–44. Male genitalia. 32, 33, Left and right parameres of *Campylomma* (Phylinae). 34, 35. Left and right parameres of *Creontiades*. 36, 37, 38, Pygophore of *Singhalesia, Nesidiocoris*, and *Engytatus*. 39, 40, 41, Left paramere of *Singhalesia, Nesidiocoris*, and *Engytatus*. 42, Right paramere of *Bifidostylus cassisi*, bifid apex arrowed. 43, Right paramere of *Omnivoriphylus frankenii*, apex arrowed. 44, Left paramere of *Taylorilygus apicalis*. [32, 33, from Malipatil 1992; 34, 35, from Malipatil & Cassis 1997; 36–41 modified from China & Carvalho 1952; 42, 43, modified and redrawn from Schuh & Schwartz, 2016; 44, redrawn from Eyles 2001].

CONVENTIONS / HOW TO USE THIS RESOURCE

The keys to subfamilies, tribes and genera are based, as far as possible, on external morphological characters to aid the non-specialist user. Internal genitalia characters are used only when no suitable external diagnostic characters are available.

At some couplets, additional characters (i.e. characters not provided in both subcouplets of a couplet) are provided in square brackets, following the diagnostic characters. These characters need to be interpreted in combination and with caution for confirmation of an identification. The keys presented have been constructed based on the latest available papers, and then checked against verified specimens.

Information given under the "Diagnosis" section for individual subfamilies, tribes, and for genera in factsheets is generally biased towards Australian fauna. Use caution when diagnosing extra limital fauna.

This resource is primarily intended to cover genera that are of economic importance (both as pests and beneficials) from Australia, and a small number of important exotic genera that are not known from Australia but that pose a biosecurity threat, as well as a limited number of non-economic genera that represent remaining higher taxa (subfamily and tribes) recorded from Australia. Once you have arrived at a genus in the key and checked through its diagnosis in the accompanying fact sheet, assume the identification is tentative until you have worked through the detailed description available in the key reference provided in that factsheet, and / or have consulted a mirid taxonomist.

Exotic taxa: One of the objectives of the present work is to include a limited number of exotic (non-Australian) species / genera that are of biosecurity significance to Australia, either as Emergency Priority Plant Pests or as major pests or predators and / or biological control agents. These exotic taxa are recorded from either distant regions (such as Palearctic, Nearctic, Neotropical or Oriental), or from the adjoining tropical countries of South East Asia and Papua New Guinea to the north of Australia, and are often related to taxa already present in Australia.

Of the exotic genera / species that have been included in this work, only the very large and major pest genera of biosecurity significance for Australia (such as *Lygus and Lygocoris*), have been directly included in the genus key, and provided with individual fact sheets. The remainder of the exotic genera, have been included under the Remarks section of the most relevant genus, along with essential diagnostic and / or pest status notes. All exotic genera/species in this work have habitus images.

Genus factsheets: are provided to assist further with the confirmation of an identification, once the specimen has been tentatively identified using the keys.

The sequence of genera arranged in the text follows that in the keys.

The headings and subheadings under which the information is arranged in these factsheets:

Genus name; author; subfamily; tribe; type species; number of Australian species; extralimital distribution; Australian distribution: this information has been obtained mostly from sources such as the On-line Systematic Catalog (Schuh 2013) and the Australian Faunal Directory (ABRS 2012). These two resources as well as other latest relevant taxonomic literature need to be consulted for information on any nomenclatural and synonymic history relating to individual genera, subgenera, tribes or subfamilies included in this work, as well as for names of species currently included in each genera.

Economic Significance: of included species, both as pest or beneficial. Categorised in this contribution as either "No" or "Minor" or "Major" or "No to Minor" or "Minor to Major", based on available host and pest status information on included species, as well as on comments that existed in Wheeler (2000a, b & 2001).

Hosts: taken primarily from the Key References listed in each genus factsheet, and from comprehensive references such as Wheeler (2000a, b & 2001), occasionally also from ABRS (2012).

Diagnosis: taken from the most appropriate and up-to-date taxonomic paper/s almost always those listed under Key References for that taxon, and often biased towards the Australian fauna.

Key References: usually contain most up-to-date and detailed information relating to diagnosis and description of the genus, and / or higher taxa such as tribe or subfamily. These need to be consulted for additional information including figures relating to diagnosis, description and taxonomy.

Remarks: information that could not be accommodated under any of the above headings included here.

Classification

FAMILY Miridae

(PLATES 1–69, FIGS. 1–44)

Diagnosis:

Body elongate ovate to short and ovate; body size 1 to 15 mm, mostly 3 to 6 mm.

Head triangular (**Fig. 4**) and prognathous (**Plate 5**) or hypognathous (**Plate 4B, D**); clypeus usually more-or-less vertical; eyes usually large; ocelli absent (except Isometopinae, **Plate 1A**). Antennae with four segments, segments 3 and 4 usually only slightly smaller in diameter than segment 2; labium with four segments, sometimes with subdivisions in Cylapinae, usually long and tapering, diameter of segment 1 greatest.

Metathoracic scent glands paired, scent-efferent system usually present and auricular in shape, with an extensive evaporative area composed of mushroom bodies (**Fig. 25**), sometimes greatly reduced. Metathoracic spiracle either exposed and teardrop-shaped or recessed, often surrounded with mushroom bodies. Middle and hind femora possess 2 to 10 trichobothria on ventral and lateral surfaces; tarsi commonly 3-segmented (**Figs. 20, 21**), rarely 2-segmented, most taxa with segments 1 and 2 short; claw shape variable, ranging from long, slender and frequently with a subapical tooth (**Figs. 8, 23**), to shorter and nearly straight or sharply bent near apex, to toothed basally (**Fig. 14**); pulvilli often present on either ventral or mesal (inner) surface of claw (**Figs. 11, 12**); sometimes membranous pseudopulvilli arising from connection between base of claw and unguitractor plate (**Figs. 13, 27**); parempodia setiform (**Figs. 8, 15**) or modified into lamellar pads of varied form (**Figs. 9, 10**).

Most species macropterous (**Plate 1**); wing abbreviation widespread (**Plate 4**), as is sexually dimorphic and intraspecific wing polymorphism; hemelytra usually with conspicuous costal fracture and cuneus (**Fig. 3**), hemelytra often declivent posterior to costal fracture (**Plates 7B, 8B**), membrane with 1 or 2 closed cells (**Figs. 16, 17**).

Male genitalia, pygophore always asymmetrical (**Figs. 36–38**); parameres always asymmetrical, left paramere often more strongly developed than right (**Figs. 32, 33**); endosoma often inflatable and with projecting lobes or spines (**Fig. 30**), sometimes rigid, sclerotised over entire length (**Fig. 29**). Female genitalia, with a variously ornamented posterior wall at base of gonapophyses (ovipositor valves); dorsal labiate plate of bursa copulatrix with ring sclerites (**Fig. 31**); ovipositor elongate-laciniate.

Key References: Cassis & Schuh 2012, Schuh & Slater 1995, Schuh & Weirauch 2020.

Number of Australian subfamilies: 7.

KEY TO SUBFAMILIES OF MIRIDAE

1. Ocelli present (**Plate 1A**); forewing membrane usually with one cell (**Fig. 16**) ..... **Isometopinae**

   Ocelli absent (**Plate 1C**); forewing membrane with 1 or 2 cells (**Figs. 16, 17**) 2

2. Body size usually small, less than 3 mm; pulvilli and pseudopulvilli absent; pretarsal claws elongate, tapered towards apex, with subapical tooth (**Figs. 8, 23**), or rarely cleft near midpoint; tarsi 2 or 3 segmented; [endosoma in male baglike, inflatable, without lobes or processes] ..... **Cylapinae**

   Body size variable, often much greater than 3 mm; pulvilli and / or pseudopulvilli often present; pretarsal claws without subapical tooth (**Fig. 9**), but may have a cleft near base, forming tooth or projection (**Figs. 14, 26**); tarsi commonly 3 segmented (**Fig. 21**) 3

3. Claws usually cleft near base, forming a tooth or projection (**Figs. 14, 15, 26**); if not cleft, then pronotum with collar and callosite region distinct, each demarcated posteriorly by punctate margin (**Plate 7A**); [parempodia setiform, pulvilli or pseudopulvilli absent (**Figs. 14, 26**)] ..... **Deraeocorinae**

   Claws not cleft near base, and without a basal tooth or projection (**Fig. 9**); if, rarely with a median / premedian tooth, then pulvilli or pseudopulvilli present (**Fig. 27**) 4

4. Parempodia between claws large, membranous and free, either diverging or converging at apices (**Figs. 9, 10**), do not confuse with fleshy pseudopulvilli (**Fig. 13**) 5

   Parempodia between claws slender and setiform (i.e. two parallel or near parallel hair-like setae) (**Figs. 11–13**) 7

5. Parempodia divergent apically (**Fig. 9**); pronotal collar usually distinct, separated from pronotal disc by a furrow (**Figs. 2, 4, Plates 10–32**) ..... **Mirinae**

   Parempodia convergent or occasionally parallel apically (**Fig. 10**); pronotal collar usually depressed and indistinct, not clearly visible from above (**Figs. 18, 19, Plate 36**) 6

6. Parempodia weakly flattened, sometimes weakly curving and convergent apically; endosoma in male sclerotized and rigid (**Fig. 29**); left paramere boat shaped to strongly flattened; sometimes thoracic pleuron and usually dorsum with some appressed, lanceolate, silvery setae, often arranged in dense patches or bands (**Plate 37**); [pronotal collar indistinct or weakly upturned (not visible from above) (**Fig. 19**); body form often myrmecomorphic (**Plate 36**)] ..... **Phylinae** (part) [Pilophorini, etc.]

   Parempodia flattened, lamellate, always convergent apically (lyriform) (**Fig. 10**); endosoma in male not sclerotized and rigid, commonly greatly exaggerated in structure; left paramere never boat-shaped; if body with scalelike setae, these usually not arranged in patches or bands; [pronotal collar depressed, not upturned and not separated from pronotal disc by a furrow (**Fig. 18, Plate 49A**); body form variable, not myrmecomorphic (**Plate 49**)] ..... **Orthotylinae**

7. Pronotal collar not usually visible from above, subdorsal, very slender, like a plate like anterior extension (**Fig. 19**); tarsi linear (**Plate 33D**); membrane with two cells (**Fig. 17, Plate 33**); left paramere with squat body, a prominent spur on left side, and a long arm on right side (**Fig. 32**) ..... **Phylinae** (part)

   Pronotal collar distinct, dorsal, robust, about as long as or longer than width of 1st antennal segment (**Plate 64A, B**); tarsi usually thickened towards apices (**Plate 58A, B**), except in Dicyphini (which has elongate body form (**Plates 62, 64**), and pseudopulvilli arising from membranous area between base of claw and unguitractor plate (**Fig. 13**); membrane (in macropters) usually with one cell (**Fig. 16, Plate 62**); left paramere with simple, straight body and without arm on right side (**Figs. 39–41**) ..... **Bryocorinae**

SUBFAMILY Isometopinae

(PLATE 1A, B)

Diagnosis:

Head with ocelli present; hypognathous and often flattened.

Tarsi 2- or 3-segmented; pretarsal claws usually with a subapical tooth. Membrane usually with a single cell (**Fig. 16**).

Phallotheca simple; a membranous endosoma with an undifferentiated secondary gonopore.

Key References: Cassis & Schuh 2012, Schuh & Slater 1995, Schuh & Weirauch 2020.

Tribes and genera present in Australia: Only tribe Isometopini, and 5 genera. One representative genus, *Paratopus* Herczek, is included in this work.

Remarks: Outside Australia, several species are important predators of armoured scales (Diaspididae) (Wheeler 2000b).

Genus *Paratopus* Herczek, 1993

[ISOMETOPINAE: ISOMETOPINI]

(PLATE 1A, B)

Type species: *Isometopus ovatus* Herczek, 1991, by monotypy.

Number of Australian species: 2.

Australian Distribution: Queensland.

Extralimital Distribution: Fiji.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Body broadly oval, convex, particularly so in front of the declivous membrane.

Head with clypeus greatly reduced, distinct only on underside of frontal plate.

Pronotum hidden almost to its half-length under obliquely overlying head. Hemelytra with a broad subcostal field reaching to two thirds of their length, surface distinctly shining.

Key References: Namyatova & Cassis 2016b, Herczek 1993.

SUBFAMILY Cylapinae

(PLATE 1C, D; PLATES 2–6)

Diagnosis:

Body dorsally weakly or often heavily punctured.

Head usually elongate. Antennae long, slender. Pronotum usually with a round collar. Legs long; tarsi 2 or 3 segmented; pretarsal claws long, slender, usually with a subapical tooth; parempodia usually setiform; pulvilli absent (**Fig. 8**). Membrane usually with 2 cells.

Endosoma in male baglike, inflatable, without lobes or processes.

Key Reference: Yeshwanth *et al*. 2016, Schuh & Weirauch 2020.

Tribes present in Australia: The following tribes have representatives known from Australia: Bothriomirini, Cylapini, Fulviini, Vanniini and Psallopini.

KEY TO AUSTRALIAN TRIBES AND REPRESENTATIVE GENERA OF CYLAPINAE

(mainly based on Yeshwanth *et al.* 2016)

1. Head nearly circular in frontal view, relatively short anteroposteriorly (**Fig. 22; Plate 1 C, D**)...Tribe Psallopini ..... ***Psallops***

   Head elongate either anteroposteriorly (prognathous) (**Plate 5B**) or dorsoventrally (hypognathous) (**Plate 4B**) 2

2. Pronotal collar absent (**Plate 2A, B; Fig. 19**); [body dorsal surface deeply and densely punctate (**Plate 2A**); head wider than long; labium usually not reaching beyond middle coxae; metathoracic scent gland peritreme polished; membrane covered with minute, dense vestiture]...Tribe Bothriomirini ..... ***Bothriomirella***

   Pronotal collar present (**Plate 2C, D**) 3

3. Head vertical (or hypognathous) (**Plate 4B**) 4

   Head not vertical, elongate in dorsal view (prognathous), longer than wide (**Plate 5B**); [body elongate, dorsal surface smooth; labium usually long, reaching beyond middle coxae (**Plate 5B**); membrane glabrous]...Tribe Fulviini 6

4. Macropterous habitus (**Plate 2C**); [combination of characters: pale body colour, antennae elongate thread-like; hind femora elongate; tarsi 2-segmented; parempodia spatulate; endosoma with basal sclerites; strap-like and / or digitiform] Tribe Vanniini ..... ***Vanniusoides***

   Coleopteroid or staphylinoid habitus (**Plates 3, 4**); [strongly punctate body]...Tribe Cylapini 5

5. Coleopteroid (**Plate 3**); costal margins not parallel-sided **Plate 3**)... ..... ***Schizopteromiris***

   Staphylinoid, apex truncate (**Plate 4**); costal margins parallel-sided (**Plate 4**) ..... ***Carvalhoma***

6. Antennal segments 3 and 4 elongate, together frequently longer than segment 2 (**Plate 5A**); cuneus absent or indistinct (**Plate 5A**); labium with segments 1 and 2 subdivided with suture; hind tarsus with segment 1 twice as long as segments 2 and 3 combined. ..... ***Rhinomiriella***

   Antennal segments 3 and 4 short, together shorter than or as long as segment 2, segment 2 longest (**Plate 5C, 6**); cuneus present (**Plate 5C, 6**); labium and hind tarsus otherwise; [readily recognised by elongate labium] 7

7. Body elongate-oval; lateral margins of pronotum elevated or upcurved (**Plate 5C**); exocorium wide (**Plate 5C**) ..... ***Peritropis***

   Body elongate; lateral margins of pronotum never elevated (**Plate 6**); exocorium narrow (**Plate 6**) ..... ***Fulvius***

TRIBE Psallopini SCHUH, 1976

[CYLAPINAE]

(PLATE 1C, D)

Diagnosis:

Body size very small, less than 2.2 mm long.

Head nearly spherical in frontal view (**Fig. 22**).

Pronotal collar upturned (**Fig. 24**). Tarsi usually 2-segmented; claws with a sub-apical tooth (**Fig. 23**); parempodia setiform. Membrane with 1 or 2 cells.

Endosoma membranous, with numerous elongate spicules.

Key References: Schuh & Slater 1995, Namyatova & Cassis 2018a, Schuh & Weirauch 2020.

Number of Australian genera: 1.

Remarks: This remained unrecorded from Australia until recently when Namyatova & Cassis (2018a) described three new species from the Australian continent of the widely distributed (see below) genus *Psallops* Usinger.

Genus *Psallops* Usinger, 1946

[CYLAPINAE: PSALLOPINI]

(PLATE 1C, D, FIGS. 23, 24)

Type species: *Psallops* oculatus Usinger 1946, by original designation.

Number of Australian species: 3

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

Extralimital Distribution: Widely distributed in Afrotropical, Palaearctic and Oriental regions.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Body generally brown; clothed with simple short setae.

Head hypognathous, wider than long, carinate posteriorly; eyes contiguous with pronotum. Antennal segment 1 cylindrical. Labial segment 1 slightly surpassing posterior margin of head; segments 1 and 2 subdivided subapically; segment 4 subdivided.

Pronotum trapeziform; lateral margins straight, not carinate; collar delimited with very fine line, as wide as antennal segment 2 (**Fig. 24**). Metathoracic scent gland evaporative area triangular with anterior angle rounded and posterior angle acute; peritreme flattened, setose, directed upwards and slightly posteriorly. Legs with posterior femora with erect setae on anterior margin. Clavus with shallow longitudinal ridge; cuneus about 1.5 times as long as wide.

Pygophore triangular, its opening placed dorsally. Left paramere strongly curved with swelling in basal half.

Key References: Namyatova & Cassis 2018a, Schuh & Slater 1995.

TRIBE Bothriomirini KIRKALDY, 1906
[CYLAPINAE]
(PLATE 2A, B)

Diagnosis: Body stout, dorsal surface deeply and densely punctate, mostly black. Head wider than long, vertically oriented. Labium short, usually not reaching beyond middle coxae. Pronotal collar absent (**Fig. 19**). Metathoracic scent gland peritreme polished. Membrane covered with minute, dense vestiture.

Key References: Yeshwanth *et al*. 2016, Schuh & Weirauch 2020.

Number of Australian genera: 2. One representative genus, *Bothriomirella* Namyatova, Contos & Cassis 2018, is illustrated in this work (**Plate 2A, B**).

TRIBE Vanniini GORCZYCA, 1997
[CYLAPINAE]
(PLATE 2C, D)

Diagnosis: Combination of characters: Delicate appearance, pale coloration. Head vertically oriented; antennae long, thread-like. Pronotal collar broad and flat. Hind femora elongate; tarsi two-segmented; parempodia spatulate. Macropterous. Endosoma with basal sclerites strap-like and / or digitiform.

Key Reference: Schuh & Weirauch 2020.

Number of Australian genera: 3. One representative genus, *Vanniusoides* Carvalho & Lorenzato, is illustrated in this work (**Plate 2C, D**).

TRIBE Cylapini KIRKALDY, 1906
[CYLAPINAE]
(PLATES 3, 4)

Diagnosis: Body strongly punctate, head hypognathous. In Australia, coleopteroid or staphylinoid habitus. Tarsal segment 1 longer than remaining 2 segments combined.

Key Reference: Schuh & Weirauch 2020.

Number of Australian genera: 2. Both genera, below, are included in this work.

Genus *Schizopteromiris* Schuh, 1986

[CYLAPINAE: CYLAPINI]

(PLATE 3)

Type species: *Schizopteromiris monteithi* Schuh, 1986, by original designation.

Number of Australian species: 3.

Australian Distribution: Queensland and Lord Howe Island.

Extralimital Distribution: Melanesia.

Economic Significance: No.

Host(s): None recorded. Assumed fungivore (Cassis & Gross 1995).

Diagnosis:

Body coleopteroid, habitus much like species of Schizopteridae; very small, less than 2.3 mm.

Head short, erect; vertex sloping. Eyes small, occupying about one-half or slightly more of height of head.

Pronotum short, transverse; calli usually distinct. Scutellum very small. Metathoracic scent gland evaporative area roughly rounded. Legs short; femora elongate rectangular; tarsal claws with a subapical tooth. Hemelytra usually deeply punctured, completely coriaceous, undifferentiated, strongly convex, covering entire abdomen.

Ovipositor occupying about four-fifths of length of abdomen.

Key Reference: Schuh 1986.

Genus *Carvalhoma* Slater & Gross, 1977

[CYLAPINAE: CYLAPINI]

(PLATE 4)

Type species: *Carvalhoma malcolmae* Slater & Gross, 1977, by original designation.

Number of Australian species: 5.

Australian Distribution: Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia and Western Australia.

Extralimital Distribution: NA.

Economic Significance: No.

Host(s): None recorded. Assumed fungivore (Cassis & Gross 1995).

Diagnosis:

Body staphylinoid habitus.

Head hypognathous with shallow midline depression. Eyes embedded into head, not pedunculate.

Pronotum about 1.1–1.6 times as wide as long. Metathoracic scent gland evaporative area elongate. Hemelytra reaching abdominal segments V–VI, veins obsolete, with distinct punctuation.

Right paramere straight; left paramere longer than right one, C-shaped. Aedeagus longer than left paramere; ductus seminis short, sclerotised around secondary gonopore. Sclerotised rings of dorsal labiate plate large and curved.

Key Reference: Namyatova & Cassis 2016a.

TRIBE Fulviini UHLER, 1886
[CYLAPINAE]
(PLATES 5, 6)

Diagnosis:

Body relatively small. Head prognathous, longer than wide, or vertical. Antennae shorter than body; segment 2 longest. Labium elongate. Pronotal collar present. Cuneus present in majority of species. Tarsi 2 or 3 segmented. Ostiolar peritreme often posteriorly positioned.

Key Reference: Yeshwanth *et al*. 2016, Schuh & Weirauch 2020.

Number of Australian genera: 15. Three representative genera, below, are included in this work.

Genus *Rhinomiriella* Gorczyca, 2001
[CYLAPINAE: FULVIINI]
(PLATE 5A, B)

Type species: *Rhinomiriella tuberculata* Gorczyca, 2001, original designation.

Number of Australian species: 2.

Australian Distribution: Queensland, New South Wales, Victoria, South Australia and Western Australia.

Extralimital Distribution: NA.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Head elongate, longer than high in lateral view, not carinate posteriorly. Antennal segments 3 and 4 elongate, together frequently longer than segment 2. Labium long, segments 1 and 2 subdivided with suture.

Pronotal collar present; calli upraised and conical. Cuneus absent or indistinct. Hind tarsus 3 segmented, segment 1 twice as long as segments 2 and 3 combined.

Key Reference: Gorczyca 2001, Namyatova & Cassis 2019.

Genus *Peritropis* Uhler, 1891

[CYLAPINAE: FULVIINI]

(PLATE 5C, D)

Type species: *Peritropis saldaeformis* Uhler, 1891, by monotypy.

Number of Australian species: 11.

Australian Distribution: All states and territories, except Tasmania and Victoria.

Extralimital Distribution: Cosmopolitan.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Body elongate-ovoid to ovoid; macropterous.

Head prognathous. Eyes elongate, reniform. Antennae shorter than body. Labium slender.

Pronotum trapezoidal; with lateral margins elevated; posterior margin excavate. Ostiolar peritreme short, tongue-like. Metathoracic spiracle exposed. Legs with pretarsal claws slender, with subapical tooth; setiform parempodia (**Fig. 8**). Embolium moderately explanate; cuneus slightly longer than wide.

Genital opening of male pygophore terminal in orientation. Parameres subequal in size. Aedeagus with membranous sac like endosoma with 1 or 2 endosomal spicules. Sclerotised rings simple.

Key Reference: Moulds & Cassis 2006.

Remarks: Likely that the *Peritropis* species living on tree trunks and branches will prove to be at least facultatively predaceous (Wheeler 2001).

Genus *Fulvius* Stål, 1862

[CYLAPINAE: FULVIINI]

(PLATE 6)

Type species: *Fulvius anthocorides* Stål, 1862, by monotypy.

Number of Australian species: 1 (see below).

Australian Distribution: Christmas Island.

Extralimital Distribution: Cosmopolitan.

Economic Significance: No to Minor.

Host(s): None recorded. Some species are known to prey on arthropod eggs (Wheeler 2001), and larvae and pupae of Lepidoptera (Pluot-Sigwalt & Chérot 2013).

Diagnosis:

Body elongate, slightly widened medially; almost impunctate dorsally; dark brown to black, usually with whitish to yellowish areas.

Head elongate, triangular; vertex without posterior carina and median sulcus. Eyes large, contiguous with or slightly removed from pronotal collar. Antennal segment 1 thickest, reaching beyond head apex. Labium long, often reaching genital segment.

Pronotum bell-shaped; at least two times longer than wide; lateral margins not carinate; collar present, relatively wide; callosities present, rounded, confluent but with a medial sulcus. Mesoscutum exposed. Tarsi two-segmented; claws with or without subapical tooth. Embolium narrow; cuneus present; membrane with a single cell.

Key Reference: Yeshwanth *et al*. 2016.

Remarks: The cosmopolitan *Fulvius anthocoroides* (Reuter), is recorded only from Christmas Island, hence is of some economic and biosecurity significance for Australia.

SUBFAMILY Deraeocorinae

(PLATES 7–9, FIGS. 14, 15, 26)

Diagnosis:

Body above often distinctly polished and punctate.

Pronotum deeply punctate; collar present, rounded.

Tarsal claws cleft basally; pulvilli and pseudopulvilli absent; parempodia usually setiform but may be flattened (**Figs. 14, 15, 26**).

Hemelytra deeply punctate.

Male genitalia similar to that in Mirinae (**Fig. 30**), with inflatable endosoma often bearing lobes with embedded sclerotised spines and with a heavily sclerotised secondary gonopore.

Key References: Cassis & Eyles 2006, Carvalho 1955, Schuh & Weirauch 2020.

Tribes present in Australia: The subfamily Deraeocorinae comprises six tribes (Schuh 2013), but only Deraeocorini, Saturniomirini, Hyaliodini and Termatophylini are represented in Australia (ABRS 2012, Schuh & Weirauch 2020).

Remarks: The deraeocorine plant bugs are predominantly known as general predators, and some species, such as *Stethoconus japonicus* Schumacher and *Fingulus longicornis* Miyamoto are reported as specialized predators for specific insect pests such as lace bugs, thrips, and scale insects (Wheeler 2001).

KEY TO AUSTRALIAN TRIBES AND REPRESENTATIVE GENERA OF DERAEOCORINAE

(mainly based on Cassis & Eyles 2006, Carvalho 1955)

1. Head porrect (**Plate 7A**); first labial segment short, subequal in length to bucculae (**Plate 7B**); species small (< 3 mm) [Anthocorid-like habitus]… Tribe Termatophylini ..... ***Termatophylum***

   Head almost always vertical or strongly declivous (**Plate 7C**), only occasionally porrect (**Plate 9A, B**); first labial segment long, much longer than bucculae (**Plate 7D**); species variable in size, medium or large (> *ca* 3 mm) 2

2. Head anteriorly truncate; exocorium broad and transparent…Tribe Hyaliodini ..... ***Stethoconus***

   Head anteriorly not truncate; exocorium narrow and opaque 3

3. Pronotum with calli large and fused; eyes semi-stylate (**Plate 7C, D**); [sometimes with hour-glass shaped pronotum, serrate lateral margin of scutellum, and setae on tarsal segment 3 with swollen apices]…Tribe Saturniomirini ..... ***Trilaccus***

   Pronotum with calli not prominent and separate; eyes not semi-stylate, situated near posterior margin of head (**Plates 8, 9**); [usually highly polished and deeply punctured dorsum and ovoid body form]…Tribe Deraeocorini 4

4. Labium reaching hind coxae; eyes contiguous to pronotum or so (**Plate 8**); [frons smooth, not striated or grooved (**Plate 8C**)] ..... ***Deraeocoris***

   Labium reaching or only slightly exceeding fore coxae; eyes removed from pronotum by a distance equal to at least one-half of its length (**Plate 9A, B**); [small glabrous species with strongly produced head and pronotum (**Plate 9A**)] ..... ***Fingulus***

TRIBE Trematophylini REUTER, 1884
[DERAEOCORINAE]
(PLATE 7A, B)

Diagnosis:

Anthocorid-like habitus. Head porrect. Labial segment 1 subequal in length to buccula; labial segment 2 elongate.

Pronotum with collar and callosite region distinct (**Fig. 4**), each demarcated posteriorly by punctate margin (**Plate 7A**). Metathoracic spiracle exposed. Ostiolar peritreme medial on metepisternum. Legs with claws cleft, with parempodia either setiform or flattened, ribbon-like. Hemelytra not hyaline, membrane with a single cell.

Secondary gonopore of male aedeagus undifferentiated, with or without lobal sclerites. Female genitalia with symmetrical sclerotised rings, but without inter-ramal lobes.

Key References: Cassis & Eyles 2006, Cassis 1995, Schuh & Weirauch 2020.

Number of Australian genera: 3. One representative genus, below, is included in this work.

Genus *Trematophylum* Reuter & Poppius, 1912
[DERAEOCORINAE: TERMATOPHYLINI]
(PLATE 7A, B)

Type species: *Trematophylum insigne* Reuter, 1884, by monotypy.

Number of Australian species: 2.

Australian Distribution: North-east coastal Queensland.

Extralimital Distribution: Afrotropical, Palaearctic, Oriental and Neotropical regions.

Economic Significance: No to Minor.

Host(s): Collected associated with *Acacia* sp. (Leguminosae) and *Melaleuca* spp. (Myrtaceae) (Cassis 1995). Some species have been recorded feeding on thrips (Wheeler 2001).

Diagnosis:

Following characters are additional to those given in tribal diagnosis:

Pronotal callosite region with a punctate groove near midline (**Plate 7A**).

Hemelytra has an abbreviated punctate R+M vein, which is shorter than medial fracture.

Key Reference: Cassis 1995.

TRIBE Hyaliodini KNIGHT, 1943
[DERAEOCORINAE]
(PLATE 9C, D)

Diagnosis:

Head anteriorly truncate, with eyes inserted at front of head; anterior aspect of frons and clypeus vertically oriented; a prominent postocular region present which strongly converges posteriorly.

Exocorium transparent, flat and broad. Claws dentate, slender tarsomeres with simple setae.

Parameres long and slender, and proctiger (anal tube) present.

Australian genera have different head structure, with clypeus visible from above, and head strongly transverse, and eyes occupying much of lateral aspect of head (Hosseini & Cassis 2019).

Key Reference: Henry & Ferreira 2003, Hosseini & Cassis 2019.

Number of Australian genera: 7. One representative genus, *Stethoconus* Flor, is included in this work, with the exotic species *S. japonicus* Schumacher illustrated (**Plate 9C, D**).

Genus *Stethoconus* Flor, 1861

[DERAEOCORINAE: HYALIODINI]

(PLATE 9C, D)

Type species: *Stethoconus cyrtopeltis* Flor, 1860, by monotypy.

Number of Australian species: 1.

Australian Distribution: Christmas Island and Queensland.

Extralimital Distribution: Eastern Hemisphere.

Economic Significance: The exotic *Stethoconus japonicus* Schumacher (**Plate 9 C, D**) is a less important predator, and has potential for biological control of major agricultural pests (Wheeler 2000b). The introduction of *S. praefectus* (Distant), reported until now from Oriental Region and USA, into Australia is of interest because of its economic importance and potential use as a biological control agent (Wheeler 2001, Hosseini & Cassis 2019).

Host(s): Predator. *Stethoconus* species (including *S. japonicus* and *S. praefectus*) have been reported associated with tingids (lacebugs), commonly of species of *Stephanitis* Stål, less commonly of species of *Teleonemia* Costa, *Corythucha* Stål, etc. (see Wheeler 2001 for details of references).

Diagnosis:

Body above pale ochraceous, ornamented with blackish markings; broadly ovate in shape, hair covering above pale, long and semierect.

Head small, much narrower than pronotum; eyes located at front of head; frons and tylus in lateral view vertical, scarcely extend beyond anterior margin of eyes. Antennae bicoloured pale ochraceous with dark markings, antennal pits above middle of eyes.

Pronotum with a punctate collar. Scutellum with a short tubercular process.

Hind tarsus short, 1st and 3rd tarsomeres subequal in length.

Key References: Linnavuouri 1995, Hosseini & Cassis 2019.

TRIBE Saturniomirini CARVALHO, 1952
[DERAEOCORINAE]
(PLATE 7C, D)

Diagnosis:

Head vertical or strongly declivous, much shorter than pronotum; eyes semi-stylate.

Pronotum constricted anteriorly; calli large and fused, without an impressed line running from anterolateral corner to posterior margin of calli; pronotum with carinae laterally behind calli, which has three large fossae or depressions behind, calli without a depression between them.

Hemelytra not hyaline or glassy; membrane usually with one cell.

Key Reference: Carvalho 1955.

Number of Australian genera: 2. One representative genus, below, is included in this work.

Genus *Trilaccus* Horvath, 1902
[DERAEOCORINAE: SATURNIOMIRINI]
(PLATE 7C, D)

Type species: *Trilaccus nigroruber* Horvath, 1902, by monotypy.

Number of Australian species: 4.

Australian Distribution: Australian Capital Territory, New South Wales, Queensland and Northern Territory.

Extralimital Distribution: NA.

Economic Significance: No.

Host(s): None recorded. Predator (Cassis & Gross 1995).

Diagnosis:

As in tribal diagnosis.

Key Reference: Carvalho 1955.

TRIBE Deraeocorini DOUGLAS & SCOTT, 1865
[DERAEOCORINAE]
(PLATES 8, 9A, B)

Diagnosis:

Body usually robust, elongate to ovoid and highly polished; often punctate.

Pronotal collar usually present; callosite region not marked posteriorly by distinct margin, never punctate. Metathoracic spiracle recessed. Ostiolar peritreme tongue like, often with posterior margin elevated. Legs with pretarsus robust; claws often with basal thickening, tooth-like; parempodia setiform; pulvilli and pseudopulvilli absent. Two membrane cells usually present.

Parameres strongly asymmetrical; left paramere often C- or L-shaped; right paramere often vestigial. Aedeagus mirine-like, with membranous endosoma, usually with ring-like secondary gonopore.

Key Reference: Cassis & Eyles 2006.

Number of Australian genera: 8. Two representative genera, below, are included in this work.

Genus *Deraeocoris* Kirschbaum, 1856

[DERAEOCORINAE: DERAEOCORINI]

(PLATE 8)

Type species: *Deraeocoris olivaceus* Kirschbaum, 1856, by subsequent designation.

Number of Australian species: 3.

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

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor.

Host(s): None recorded in Australia (Cassis & Gross 1995). Some species of *Deraeocoris* Kirschbaum have been considered as important, and several others including *D. signatus* (Distant) are less important predators (Wheeler 2000b). The widely distributed Australian species, *D. signatus* (Distant), commonly known as "Brown Smudge Bug", is known to feed on *Helicoverpa* spp. eggs, aphids, mites, apple dimpling bugs and small nymphs of green mirids associated with cotton in Australia (Mensah & Pyke 2007).

Diagnosis:

Body robust, shiny; strongly punctate.

Head oblique; clypeus not projecting beyond first antennal segment; frons smooth, polished; vertex not sulcate; eyes contiguous to pronotum. Antenna with segment 2 linear, not clavate apically; segment 3 much longer than segment 4, almost twice as long. Labium reaching posterior coxae; segment 1 reaching base of head.

Pronotum punctate; lateral margins carinate; collar present without lateral carinae. Hemelytra punctate; glabrous, or pubescent.

Key References: Cassis & Eyles 2006, Carvalho 1955, Kelton 1980, 1982.

Genus *Fingulus* Distant, 1904

[DERAEOCORINAE: DERAEOCORINI]

(PLATE 9A, B)

Type species: *Fingulus atrocaeruleus* Distant, 1904, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland and New South Wales.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions, and Melanesia.

Economic Significance: No to Minor.

Host(s): None recorded (Cassis & Gross 1995). Outside Australia, some species appear to be oligophagous and some associated with thrips (Yasunaga *et al*. 2016).

Diagnosis:

Body small to medium size (2.0–4.5 mm); dorsum and propleuron usually uniformly and distinctly punctate.

Head porrect, slender, with strongly developed, neck-like postocular region; vertex usually with a narrow basal carina.

Pronotal collar broad, flattened or rarely weakly rounded; costal fracture deep sometimes marking strongly deflexed hemelytron.

Key References: Yasunaga *et al*. 2016, Kim *et al*. 2017, Stonedahl & Cassis 1991.

SUBFAMILY Mirinae

(PLATES 10–32, FIGS. 1–6, 9, 30, 31, 34, 35)

Diagnosis:

Body usually large in size (frequently > 6 mm long).

Pronotum with rounded or flattened collar (**Fig. 4**). Legs with parempodia fleshy, lamellate, free and apically divergent (**Fig. 9**). Hemelytra usually fully formed, but in coleopteroid genera clavus, corium, and cuneus fused into one piece, lacking a membrane.

Male genitalia (**Fig. 30**) with endosoma membranous and sclerotized spicules and a ringlike secondary gonophore showing variation. Female genitalia (**Fig. 31**), posterior wall generally possess a median process (sigmoid process).

Key References: Cassis & Schuh 2012, Schuh & Slater 1995, Kelton 1980, Schuh & Weirauch 2020.

Tribes present in Australia: Three of the six tribes recognized within this family (Cassis & Schuh 2012), viz., Stenodemini, Hyalopeplini and Mirini, are represented in Australia.

Remarks: Most speciose subfamily with more than 4000 species worldwide. Mirinae contain plant pests such as lygus bugs, and many of the most familiar mirid pests belong to this subfamily and particularly the tribe Mirini (Wheeler 2000a).

KEY TO AUSTRALIAN TRIBES AND ECONOMICALLY IMPORTANT GENERA OF MIRINAE

[modified after Chérot and Malipatil's notes, Eyles 1999a, 2001, Carvalho 1956]

1. First segment of hind tarsi as long as or longer than second and third together excluding claws (**Fig. 20, Plate 11A, B**); [form long and slender; head entirely porrect (**Plate 11**); pronotal collar not demarcated by a furrow; pronotal lateral carinae present on both lobes (**Plate 11**); male with small secondary gonopore]...Tribe Stenodemini 2

   First segment of hind tarsi not as long as second and third together (**Fig. 21, Plate 12A, B**) 4

2. First antennal segment and base of second covered by long erect pubescence, hairs as long as or longer than, width of segments (**Plate 10C**); first antennal segment as long as from its insertion to base of pronotum (**Plate 10A, B, C**) ..... ***Dolichomiris***

   All antennal segments with only short pubescence, hairs shorter than half width of segments (**Plate 11A**); first antennal segment much shorter than distance from its insertion to base of pronotum (**Plates 11**) 3

3. First antennal segment much longer than head; second antennal segment with dark, bristle-like hairs near base (**Plate 11C**); body length in range 5.2 -8.7 mm ..... ***Chaetedus***

   First antennal segment about as long as head; second antennal segment without dark, bristle-like hairs (**Plate 11A, B**); body length in range 3.7–6.6 mm ..... ***Trigonotylus***

4. Hemelytra glassy and transparent allowing abdomen and membranous wings seen from above (**Plate 12**); [evaporative area of metathoracic scent gland very large (**Plate 12B**)]...Tribe Hyalopeplini 5

   Hemelytra not glassy and transparent, abdomen and membrane of wings not seen from above (**Plate 13**); [eyes prominent, extending ventrally beyond middle of head; pronotal collar demarcated by a furrow (**Plate 14A**); pronotal lateral carinae usually absent]...Tribe Mirini 6

5. Pronotum and scutellum almost smooth except on black areas where they are punctate or transversally striate (**Plate 12A, B**); [first antennal segment very short, its length frequently close to vertex width] ..... ***Hyalopeplinus***

   Punctation and striation of pronotal disk and scutellum, if present, never limited to black areas (**Plate 12C, D**) ..... ***Hyalopeplus***

6. Combination of characters (**Plate 13**): antennae long, cylindrical, segments linear; body slender, elongate, parallel; dorsum matt, usually mottled; head oblique, short; lora inflated / broadened laterally; carina between eyes absent; pronotum and hemelytra impunctate; pubescence generally of two types, appressed sericeous hairs intermixed with simple hairs; hind femora long, usually reaching beyond apex of abdomen, frequently sulcate; endosoma with one or more primary membranous lobes; [Australian record of true *Phytocoris* remains doubtful, see below] ..... ***Phytocoris***

   Combination of characters otherwise 7

7. Second antennal segment distinctly incrassate, sometimes only basally or apically (**Plate 14**) 8

   Second antennal segment not distinctly incrassate (**Plate 17**) 10

8. Sides of propleura with three or four longitudinal raised striae alternating with darker striae (**Plate 14B, D**); [second antennal segment incrassate only towards apex] ..... ***Austrocapsus***

   Sides of propleura without alternating light and dark longitudinal striae 9

9. Round, ovate insects; first antennal segment flattened, with two types of pubescence; hemelytral membrane vitreous, apical angle of its transversal vein broadly rounded (**Plate 15A, B**) ..... ***Eurystylus***

   Elongate insects; first antennal segment cylindrical, with one type of pubescence; hemelytral membrane opaque, apical angle of its transversal vein narrowly rounded (**Plate 16**) ..... ***Pseudopantilius***

10. Third and fourth antennal segments robust, nearly as thick as first and second segments (**Plate 17**); [body elongate, parallel or subparallel-sided; vertex usually with a longitudinal sulcus, frequently deep and lacking basal carina (**Plate 21**); veins generally raised; left paramere with a tertiary lobe] [*Adelphocoris-Creontiades-Megacoelum* complex] 11

    Third and fourth antennal segments distinctly thinner than first and second segments (**Plate 23**) 17

11. Scutellum swollen to ampulated (**Plate 17A, B**); [posterior margin of vertex slightly carinate; labium reaching at least middle coxae; tibial spines brown to red brown; body relatively uniform, stramineous to yellow brown, frequently with callous dorsal spots on pronotum and hemelytra] ..... ***Chimsunchartella***

    Scutellum flat or almost flat (**Plate 18**) 12

12. 12. Pronotal and hemelytral pilosity including silvery and dark brown to black setae (**Plate 18A, B**); [body length 4.5–6.2 mm; Australian, Oriental and Pacific Regions] ..... ***Adelphocorisella***

    Pronotal and hemelytral pilosity including only one colour of setae (**Plate 19**) 13

13. Tibial spines dark, red brown to black (**Plate 19A, B**); secondary gonopore always complete though reduced; [pilosity of hind femora erect, shorter than width of hind femora; dorsal pilosity reduced, short, recumbent; endophallus including only a subapical spiculum, devoid of comb; body length 5–8 mm; Australian record of true *Megacoelum* doubtful, see below] ..... ***Megacoelum***

    Tibial spines yellow to light brown (**Plate 19C, D**); secondary gonopore sometimes incomplete 14

14. Body sub-oblong, outer sides (connexivum) of hemelytra slightly convex (**Plate 20A, C**); stiff setae of pronotal anterior corners often present; [first antennal segment relatively elongate, club-like apically; primary apophysis of right paramere always with two pointed lobes; middle-sized bugs, total length 6–8 mm] 15

    Body elongate, outer sides (connexivum) of hemelytra almost straight (**Plate 21A, C**); stiff setae of pronotal anterior corners absent 16

15. Hemelytra always dull; pronotum frequently orange, with a wide longitudinal black stripe medially (**Plate 20A, B**); endophallus devoid of phallic support, secondary gonopore incomplete but with a pilose plate; Australian and Oriental Regions ..... ***Poppiocapsidea***

    Hemelytra frequently reflective; pronotum never orange with median black stripe (**Plate 20C**); endophallus including a phallic support, the secondary gonopore complete, devoid of pilose plate; [phallic support sickle-shaped; parieto-vaginal rings wide, thin, devoid of acute prolongation on their postero-outer margin; body uniformly dull, orange brown; Australia] ..... ***Poppiomegacoelum***

16. Hemelytra uniformly, stramineous, yellow, green, or yellow brown bugs sometimes with fine red or brown stripes (**Plate 21**); anterior projection of parieto-vaginal rings present; dorsal process of posterior wall present; endophallus devoid of sclerite ..... ***Creontiades***

    Hemelytra yellow and red, reflective, partly translucent (**Plate 17C, D**); anterior projection of parieto-vaginal rings absent; dorsal process of posterior wall absent; endophallus always with a gonoporal sclerite, associated to the apical (posterior) part of the secondary gonopore; [pronotal callosities reflective, including a small fuscous spot in the middle; body length 7–8.4 mm; Australia, Papua New Guinea] ..... ***Neopeplus***

17. Body, especially pronotum nearly glabrous, often highly polished, with a few hairs on exocorium, embolium and cuneus (**Plate 22A, B**); [labium short, reaching midcoxae; head without a carina across posterior of vertex; pygophore with a prominent projection on left side] ... ***Niastama***

    Body pilose, not highly polished ... 18

18. Pronotum smooth or slightly punctate, if punctate then first hind tarsal segment very long; head usually without a carina across posterior of vertex (**Plate 23**) ... 19

    Pronotum strongly punctate or finely rugosely punctate (**Plate 25C, D**), if finely punctate then first hind tarsal segment short; head with a carina across posterior of vertex (**Plate 25C, D**) ... 22

19. First segment of hind tarsi distinctly longer than second (**Plate 23**); [head about as long as wide, not pointed in frons, declivous] ... ***Stenotus***

    First segment of hind tarsi not longer than second ... 20

20. Eyes removed from anterior margin of pronotal collar by the thickness of first antennal segment; body rounded, dark, bearing silky or woolly golden pubescence; membrane vitreous (**Plate 22C, D**) ... ***Austropeplus***

    Eyes contiguous with anterior margin of pronotum (**Plate 25A**); body elongate, pubescence of another type, if silky then membrane opaque; [pronotal disk with a pair of black spots behind calli] ... 21

21. Vertex not carinate (**Plate 24C**); pronotal black spots not concave and separated to / from calli (spots may be obsolete in some individuals); black hairs intermixed with paler setae only along both sides of claval suture (**Plate 24**) ... ***Closterotomus***

    Vertex carinate (**Plate 25A**); pronotal black spot include in a concavity, just behind calli (spots may be obsolete in some individuals); pale pubescence not limited along sides of claval suture (**Plate 25A, B**) ... ***Sidnia***

22. Body covered with very long, fine, erect pubescence and adpressed silky or woolly pubescence, especially on exocorium and scutellum; hemelytra with silvery pruinose areas (**Plate 25C, D**); [exocorium with transverse dark and hyaline fasciae] ... ***Tinginotum***

    Body covered with short pubescence, if long hairs present, hemelytra without silvery pruinose areas; hemelytra clothed with adpressed silky woolly or silky pubescence, single or mixed with fine, erect pubescence (**Plate 27**) ... 23

23. Pronotal collar broad with mesal length equal or broader than thickness of first antennal segment (**Plate 26**); [hemelytra clothed with distinct silvery or woolly or silky pubescence, single or mixed with fine, erect hairs, sometimes easily rubbed off] ... ***Charagochilus***

    Pronotal collar narrow, much less elongate than thickness of first antennal segment (**Plate 27**) ... 24

24. Second antennal segment shorter than basal width of pronotum (**Plate 27**); distribution outside Australia; [pronotal collar considerably longer than basal width of second antennal segment; second antennal segment in male not as wide as first segment except apically; pronotum coarsely punctate] ... ***Lygus***

    Second antennal segment longer than basal width of pronotum (**Plate 29**) (if subequal to shorter then collar slender) ... 25

25. Pronotal collar not slender, being longer than basal width of 2nd antennal segment (**Plate 29**); head in lateral view about as long as in front of eyes than from anterior margin of eyes to posterior margin of cephalic capsule (**Plate 29B, D**); distribution outside Australia; [pronotum finely punctate, punctures shallow and close together] ... ***Lygocoris***

    Pronotal collar slender, being shorter than basal width of 2nd antennal segment (e.g. **Plate 31**); head in lateral view shorter in front of eyes than posteriorly (**Plate 30B**) ... 26

26. Tibiae with large dark spots at bases of spines (**Plate 30A, B**) ..... ***Micromimetus***

    Tibiae without spots at bases of spines (e.g. **Plates 31**, **32**) 27

27. Males with large spined extra process (visible in lateral view, without dissection) basal to basal lobe on left paramere (**Fig. 44**) ; maxillary plates (lora) prominent, jutting out from mandibular plates (juga) like an angled shelf (**Plate 31**) ..... ***Taylorilygus***

    Males without an extra process basal to basal lobe on left paramere; maxillary plates (lora) somewhat prominent, but gently rounding away from mandibular plates (**Plate 32**); [posterior margin of pronotum convex; left paramere not forked apically, but with 2 subapical shoulders] ..... ***Diomocoris***

TRIBE Stenodemini CHINA, 1943

[MIRINAE]

(PLATES 10–11)

Diagnosis:

Body form elongate, narrow.

Head porrect; frons usually with longitudinal sulcus.

Pronotum with proepisternum anteriorly produced; pronotum parallel-sided; lateral margin usually carinate; collar flattened, with medially obsolete posterior margin. Pretarsus usually with pulvillus; first segment of hind tarsus as long as second and third together (**Fig. 20**). Hemelytra parallel-sided.

Male genitalia with narrow ductus and small secondary gonopore. Female genitalia without lateral lobes.

Key References: Schwartz 2008, Carvalho & Gross 1980, Kelton 1980.

Number of Australian genera: 3. All genera, below, are included in this work.

Genus *Dolichomiris* Reuter, 1882

[MIRINAE: STENODEMINI]

(PLATE 10A, B, C)

Type species: *Dolichomiris linearis* Reuter, 1882, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, New South Wales.

Extralimital Distribution: Cosmopolitan.

Economic Significance: No.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995).

Diagnosis:

Body smooth or very finely punctured.

Head horizontal; frons slightly or more strongly projecting anterior to posterodorsal margin of clypeus; vertex sulcate between eyes which touch or nearly touch pronotum. Antennae long; segments 1 and 2 (at least basally) with long, fine, erect, hairs which are at least as long as half width of segment.

Pronotum with calli flat, smooth or very finely punctured; collar depressed and weakly marked; lateral margins carinate. Scutellum flat, smooth or very finely punctate. Hemelytra striped, smooth or very finely rugose; cuneus distinctly longer than wide. Legs long; hind tibiae covered with long, erect hairs; hind tibia wider than at least one-half width of segments.

Endosoma complex; secondary gonopore thickened ventrally and with dorsally projecting sclerite, one or two basal processes. Female genitalia posterior wall with interramal lobes variable, but always with two large well separated and ventrally produced apices.

Key References: Schwartz 2008, Carvalho & Gross 1980.

Genus *Chaetedus* Eyles, 1975

[MIRINAE: STENODEMINI]

(PLATE 11C)

Type species: *Chaetedus reuterianus* Buchanan-White, 1878, by original designation.

Number of Australian species: 2.

Australian Distribution: New South Wales, Victoria, Tasmania, South Australia, Western Australia; Norfolk Island.

Extralimital Distribution: New Zealand; Melanesia.

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder, host *Zea mays* L. (Poaceae) (Cassis & Gross 1995).

Diagnosis:

Body slender; dorsal surface smoothly rugulose with pronotum dorsally finely punctured.

Head horizontal; frons projecting slightly anterior to posterodorsal margin of clypeus, and even to mandibular plate; clypeus large and visible from above; frons striate; vertex sulcate between eyes which do not touch anterior margin of pronotum. Antennae long; antennal segment II with dark, bristlelike setae basally, vestiture of antennal segments 1 and 2 and hind tibia shorter than width of segments.

Pronotum with collar depressed and weakly marked; finely punctate except on calli; lateral margins thickly carinate except anteriorly. Scutellum nearly flat. Hemelytra smooth or very finely rugose; cuneus longer than wide.

Male genitalia: Endosoma with two basal processes, left process hooked. Posterior wall of female genitalia with interramal lobes large, with widely separated apices extending ventral to lateral portion of sclerite.

Key References: Schwartz 2008, Carvalho & Gross 1980.

Genus *Trigonotylus* Fieber, 1858

[MIRINAE: STENODEMINI]

(PLATE 11A, B)

Type species: *Trigonotylus ruficornis* Fallén, 1807, monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, New South Wales, Victoria, South Australia, Western Australia, Northern Territory.

Extralimital Distribution: Cosmopolitan.

Economic Significance: No.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995).

Diagnosis:

Body slender; dorsal surface smooth or smoothly rugose.

Head horizontal; frons projecting anterior to antennal fossa and posterodorsal margin of clypeus; clypeus large and visible from above; vertex sulcate medially between eyes. Antennae with vestiture of segments 1 and 2 and hind tibia shorter than width of segments.

Pronotum depressed laterally; collar depressed and weakly marked; calli flat. Scutellum flat and smooth. Legs relatively long and slender. Hemelytra smooth and glabrous; cuneus distinctly longer than wide.

Male genitalia. Endosoma with one sclerotized process, process sometimes obsolete. Female genitalia with sclerotized rings sometimes absent or merging with interramal sclerotization; median process faint and not projecting into dorsal structure; interramal lobes large and extending ventral to sclerite with medial margin moderately excavated.

Key References: Schwartz 2008, Carvalho & Gross 1980.

TRIBE Hyalopeplini CARVALHO, 1952
[MIRINAE]
(PLATE 12)

Diagnosis:

Body with dorsal surface generally rugose.

Thorax with evaporative area large, reaching dorsad of ventral margin of mesepimeron. Hemelytra glassy and transparent, abdomen easily visible in dorsal view at least under the endocorium; veins reduced or even absent.

Key References: Yeshwanth & Chérot 2018, Carvalho & Gross 1979.

Number of Australian genera: 5. Two representative genera, below, are included in this work.

Genus *Hyalopeplinus* Carvalho & Gross, 1979
[MIRINAE: HYALOPEPLINI]
(PLATE 12A, B)

Type species: *Callicratides antennalis* Distant, 1920, by original designation.

Number of Australian species: 1.

Australian Distribution: Queensland.

Extralimital Distribution: Oriental Region, Melanesia, Polynesia.

Economic Significance: No.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995).

Diagnosis:

Body elongate-oval; 4.7–6.2 mm long; dorsally glabrous.

Head about 2 times as wide as long; eyes prominent but never substylate, slightly removed from pronotal collar anterior margin or almost contiguous with it. Antennal segment 1 thick, incrassate sub-basally but never narrowed between both extremities, frequently shorter than head width across eyes.

Pronotum with collar slightly longer than first antennal segment maximal width; callosities wide, medially almost contiguous, reaching pronotal lateral margins; humeral angles never globose, laterally pointed but not produced; pronotal disk transversely deeply striate exclusively on dark areas (facies or spots). Mesoscutum exposed. Scutellum deeply striate transversally exclusively on dark medial facie, lateral sides never crenulated. Hemelytra with a line of deep and wide punctures along clavo-corial but not along embolio-corial suture (or the punctation reduced); clavus, endocorium and membrane transparent; embolium and cuneus opaque or translucent.

Key References: Yeshwanth & Chérot 2018, Carvalho & Gross 1979.

Genus *Hyalopeplus* Stål, 1871

[MIRINAE: HYALOPEPLINI]

(PLATE 12C, D)

Type species: *Hyalopeplus lineifer* Stål, 1855, by monotypy.

Number of Australian species: 5.

Australian Distribution: Northern Territory, New South Wales, Queensland.

Extralimital Distribution: Oriental, Palaearctic and Afrotropical Regions; Melanesia; Polynesia.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder, hosts *Phaseolus* L. (Fabaceae, beans), *Camellia sinensis* (L.) Kuntz (Theaceae, tea) (Cassis & Gross 1995). *H. pellucidus* Kirkaldy is considered a less important species as pest (Wheeler 2000a).

Diagnosis:

Body elongate; 6.4–12.3 mm long; dorsally almost glabrous.

Head relatively wide; eyes prominent but never sub-stylate, slightly removed from pronotal collar anterior margin or almost contiguous with it. Antennae with first segment thick, incrassate sub-basally but never narrowed between both extremities, frequently shorter or slightly longer than head width across eyes.

Pronotum with collar length relatively close to first antennal segment maximal width; callosities wide, medially almost contiguous, reaching pronotal lateral margins or slightly separated of pronotal lateral margins; pronotal disk deeply striate transversally or punctate and striate, punctation and striation shallower. Mesoscutum exposed, with lateral fossae. Scutellum deeply striate transversally or punctate, lateral sides of scutellum never crenulated. Hemelytra with a line of deep and wide punctures present along clavo-corial and embolio-corial sutures; clavus, endocorium and membrane transparent; embolium and cuneus opaque or translucent.

Key References: Yeshwanth & Chérot 2018, Carvalho & Gross 1979.

TRIBE Mirini HAHN, 1833

[MIRINAE]

(PLATES 13–32)

Diagnosis:

Body elongate oval.

Head often vertical or declivous, not porrect; part of head in front of eye (in lateral view) less than 1.5 times eye length; eyes extending ventrally beyond middle of head.

Pronotum with collar distinct, demarcated by a furrow in most included taxa.

Hind tarsi with first segment, not as long as second and third together.

Hemelytra generally not glassy and transparent, abdomen and membranous wings not seen from above.

Key References: Eyles 2001, Kelton 1980.

Number of Australian genera: 27 (ABRS 2012). Twenty representative genera, below, are included in this work. Included also are 3 exotic (non-Australian) genera that are of some biosecurity significance to Australia.

Genus *Phytocoris* Fallén, 1814

[MIRINAE: MIRINI]

(PLATE 13)

Type species: *Cimex populi* L., by subsequent designation.

Number of Australian species: 1 (see *Remarks* below).

Australian Distribution: Tasmania.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Major.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). Some *Phytocoris* species are considered important and some others less important predators (Wheeler 2000b).

Diagnosis:

Phytocoris, particularly those in Australasia / East Asia can be recognized by the following characters:

Body slender, elongate, parallel; moderate to large size; dorsum matt, usually mottled with pale and dark spots; covered with sericeous pubescence and one or two types of simple, erect or semierect setae.

Head oblique, short; lora inflated / broadened laterally; eyes large and prominent; carina between them absent. Antennae long and slender. Labium reaching or extending beyond metacoxa.

Pronotum impunctate; pubescence of two types, appressed sericeous hairs intermixed with simple slanting hairs. Legs long, slender; hind femur long and more or less flattened; parempodia fleshy, apically divergent.

Endosoma membranous, with a thick-rimmed secondary gonopore; parameres asymmetrical; distal part of sensory lobe and basal hypophysis of left paramere serrated; right paramere elongate, serrate along lateral margin. Female genitalia with sclerotized ring elongate ovoid, interramal lobe of posterior wall covered with minute spine, semicircular.

Key References: Oh *et al*. 2017, Kelton 1982, Stonedahl 1988a, Yasunaga & Schwartz 2015.

Remarks: Only one species, *Phytocoris varicornis* Erichson has been described from Australia (Tasmania). The validity and the generic placement of the species is unconfirmed, Schuh (1995) classified this species as *incertae sedis*. *Phytocoris* is mainly a Holarctic genus (or group of genera), with a (vast) majority of species present in South-western part of United States, in Mediterranean area, in Middle-East and Central Asia, other species present in Europe, Africa, Central and South America and Far-East (Schuh 2013). Very few species are present in Asia, also the genus is absent in Papua New Guinea, Micronesia Islands, Galapagos Islands and New Zealand. The type of this species has not been located to examine and confirm its occurrence. Therefore, we consider this genus a doubtful record for Australia.

Genus *Austrocapsus* Kirkaldy, 1901

[MIRINAE: MIRINI]

(PLATE 14)

Type species: *Austrocapsus martigena* Kirkaldy, 1901, by monotypy.

Number of Australian species: 9.

Australian Distribution: All states and territories except Northern Territory.

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder, host *Beyeria* Miq. (Euphorbiaceae), *Asparagus* L. (Liliaceae) (Cassis & Gross 1995).

Diagnosis:

Body length 4.8–7.2 mm; covered with short adpressed pubescence; propleura usually with a dark or reddish longitudinal fasciae. Sides of propleura with three or four longitudinal raised striae alternating with darker striae (**Plate 14B, D**).

Head subtriangular; with eyes wider than anterior pronotal margin; interior margin of eyes subsinuately convex. Antennal segment 2 strongly incrassate towards apex.

Pronotum raised posteriorly; with a distinct collar which is anteriorly straight; anteriorly callous on each side behind the collar; very rugose transversely, widely somewhat sinuately rounded posteriorly; lateral margins subsinuate. Ostiolar peritreme distinct, prominently raised. Scutellum transversely impressed near base. Interior cell of membrane very large.

Key References: Kirkaldy 1901, Carvalho 1993, Eyles 2001.

Genus *Eurystylus* Stål, 1871

[MIRINAE: MIRINI]

(PLATE 15A, B)

Type species: *Eurystylus costalis* Stål, 1871, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental Regions; Micronesia; Melanesia; New Zealand.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). *Eurystylus oldi* (Poppius) is a less important species as pest (Wheeler 2000a)

Diagnosis:

Body thick, box like; generally matt or shagreened; dorsum impunctate; with at least two types of vestiture.

Head weakly porrect and relatively horizontal or prognathous; lateral margin of frons, bordering to antennal tubercle and inner margin of eye, with a fuscous, velvety mark that is usually visible even in species with darkened head. Antennae shorter than body, with segment 1 tumid, distinctly flattened, segment 2 clavate (its apical part more than twice as thick as base), and segments 3 and 4 short and filiform.

Pronotum often with a pair of dark spots on disk, sometimes forming eye-shape, so-called 'head bugs'; collar thickened, broader than base of antennal segment 2. Scutellum tumid, long, with its lateral margin length greater than basal width. Each femur more or less flattened; hind tibia not much longer than hind femur.

Pygophore noticeably shortened; left paramere usually strongly constricted at base of widened and flattened (often flap-like) hypophysis; endosoma with well-developed membranous lobes. Female with abdominal sterna VIII and IX narrow.

Key Reference: Yasunaga *et al.* 2017.

Remarks: A related genus is *Pseudeurystylus* Poppius (**Plate 15C, D**). However, *Pseudeurystylus* can be distinguished easily by the four ivory-white, callose stripes on the pronotal lateral margin and propleuron, the pronotal collar thicker than the base of antennal segment II at middle but not laterally (the collar has the almost similar thickness throughout in *Eurystylus*) (Yasunaga *et al.* 2017).

Genus *Pseudopantilius* Reuter, 1904

[MIRINAE: MIRINI]

(PLATE 16)

Type species: *Pseudopantilius australis* Walker, 1873, by monotypy.

Number of Australian species: 2.

Australian Distribution: Queensland, New South Wales, Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia.

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder, hosts *Hakea* Schrader (Proteaceae) flowers, *Leptospermum* Forster & G. Forster (Myrtaceae), *Pultenaea hispidula* Benth. (Fabaceae) (Cassis & Gross 1995).

Diagnosis:

Body 8.1–9.8 mm; general colour green and red.

Thorax with ostiolar peritreme prominently raised, oval, shagreen; in male with a black spot apically on posterior edge, with one seta on blackspot, one in front of it, and one behind on lamellate margin.

Male genitalia: Endosoma with six lobes and two spiculi, four lobes bear spines, sometimes on sclerotised areas; lobe next to spiculi-bearing lobe oriented towards base of aedeagus; left paramere crescentic, with no basal lobe, apical process hooked, reddish-orange; right paramere slightly serrated on the edge bearing setae, cross section near apex more or less triangular, apical process stout, hooked, reddish-orange.

Female genitalia: Ring sclerite large, oval, anterior border with edge dark and wavy, disc colourless, lightly flecked; inter-ramal sclerites with bent forward flaps flat, extending anteriorly beyond basal sheet, curved apically, covered with spines in apical half on dorsal surface, and larger spines on edges, and with a large spur laterally near base; sigmoid process absent; ovipositor bulb with a long squarish extension dorsally at anterior.

Key Reference: Eyles 2001, Chérot 2002.

Genus *Chimsunchartella* Chérot & Pauwels, 2000

[MIRINAE: MIRINI]

(PLATE 17A, B)

Type species: *Chimsunchartella schwartzi* Chérot & Pauwels, 2000, by original designation.

Number of Australian species: 1.

Australian Distribution: South Australia, Northern Territory, Western Australia, New South Wales.

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): Chenopodiaceae and Myrtaceae (Chérot & Malipatil 2003, Schuh 2013).

Diagnosis:

Body length *ca* 6 mm; relatively uniform stramineous, yellow or yellow brown, frequently with small dark brown to black spots.

Vertex distinctly sulcate; slightly carinate. Eyes wide. Labium reaching mesocoxae. First antennal segment slightly club-like, relatively short, straight, with red spots.

Pronotum dull; with dense recumbent pilosity, less conspicuous in females; a pair of stiff erect setae on anterior corners; dorsal dark spots of pronotal disk frequently callose. Scutellum swollen. Mesoscutum slightly pilose. Tibial spines brown, red brown in females. Hemelytra dull, almost smooth; with two different punctations, one very reduced, narrow and shallow, the other sparse, wider, shallow; pilosity relatively dense, short, simple, recumbent; veins not raised.

Male genitalia with secondary gonopore complete, devoid of sclerite; endosoma devoid of comb or true spiculum, with an elongate, acute phallic support and several fields of denticles. Female genitalia with parieto-vaginal rings reduced, narrow, devoid of anterior projections; dorso-labiate plate elongated; dorsal process of posterior wall present but undivided, median process medially narrowed, interramal lobes (E structures) reduced. H structures absent.

Key Reference: Chérot & Malipatil 2016.

Genus *Adelphocorisella* Miyamoto & Yasunaga, 1993

[MIRINAE: MIRINI]

(PLATE 18A, B)

Type species: *Adelphocorisella lespedezae* Miyamoto & Yasunaga, 1993, original designation.

Number of Australian species: 2.

Australian Distribution: Queensland and Northern Territory.

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): Fabaceae. *Adelphocorisella brunnescens* (Poppius) was also collected by fogging on Meliaceae, Rubiaceae and Sapindaceae (Chérot *et al*. 2017).

Diagnosis:

Body 4–6 mm in total length; mostly brown-mottled colour pattern; dorsum usually with two types of vestiture (simple brown semierect setae and reclining silvery setae).

Head slightly to moderately oblique. Antennal segment 1 shorter than width of head across eyes; antennal segments 2–4 uniformly yellowish, linear with almost equal diameter. Labium long, usually exceeding apex of hind coxae.

Pygophore lacking paired, conical processes near paramere insertions; wide membranous endosoma always with a distinct spiculum as well as a set of gonoporal sclerites, and with a more or less (usually basally) sclerotized lateral lobe.

Key Reference: Chérot & Malipatil 2016.

Genus *Megacoelum* Fieber, 1858

[MIRINAE: MIRINI]

(PLATE 19A, B)

Type species: *Megacoelum infusum* (Herrich-Schaeffer, 1839), by monotypy.

Number of Australian species: *? 2 (see comment below).

Australian Distribution: Queensland.

Extralimital Distribution: Ethiopian and Palaearctic Regions; doubtfully from Oriental Region.

Economic Significance: Minor.

Host(s): Asteraceae, Betulaceae, Chenopodiaceae, Fabaceae, Fagaceae, Myrtaceae, Polygonaceae, Rosaceae, Tamaricaceae (Chérot & Malipatil 2016).

Diagnosis:

Body sub-oblong; total length 5–8 mm; uniformly stramineous or orange brown, sometimes with fine red or brown stripes or red brown areas.

Head regularly sloping anteriorly; in profile frons not protruding and devoid of a notch above tylus. Labium reaching middle or hind coxae. First antennal segment weakly club-like, elongate and curved.

Pronotum dorsally almost glabrous; with a dull, narrow collar; a pair of stiff erect setae on anterior corners. Scutellum relatively flat, slightly tumid. Pilosity of hind femora erect and shorter than width of femora; tibial spines dark brown to black. Hemelytra slightly reflective, frequently translucent; their punctation double, one very reduced, dense, narrow and shallow, the second shallow but larger; their pilosity variable, sometimes hemelytra almost glabrous; veins raised.

Male genitalia: Secondary gonopore complete, devoid of sclerite, hairs or pilose plate, endosoma devoid of comb or phallic support, always with several fields of denticles and an apical true spiculum, generally pointed, sometimes hooked.

Female genitalia with parieto-vaginal rings reduced, narrow, totally separated, devoid of a pair of anterior projections; dorso-labiate plate reduced, thin and elongate; dorsal process of posterior wall absent, median process absent, interramal sclerites (A structures) and interramal lobes (E structures) developed.

Key References: Chérot & Malipatil 2016.

Remarks: According to Chérot & Malipatil 2016, record of this genus from Australia is doubtful, pending further work involving all currently included species.

Genus *Poppiocapsidea* Yasunaga, 1998

[MIRINAE: MIRINI]

(PLATE 20A, B)

Type species: *Megacoelum clypeale* Poppius, 1915, by original designation.

Number of Australian species: 2.

Australian Distribution: Queensland, New South Wales and Northern Territory.

Extralimital Distribution: Malaysia, Thailand, Philippines, Taiwan.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Body length 6–8; sub-oblong, slightly convex; non-uniformly orange to pale red.

Labium almost reaching posterior coxae.

Pronotum dorsally almost glabrous; a shining collar; and a pair of stiff erect setae on anterior corners. Scutellum relatively flat. Hemelytra dull; rugose; punctation very reduced, dense, narrow and shallow; their pilosity dense, recumbent. Tibia with dense suberect setae and light, yellow spines.

Male genitalia with primary apophysis of right paramere with two pointed lobes; secondary gonopore incomplete, only lower half distinct, and thickly covered with long hairs; endosoma devoid of comb, true spiculum or phallic support. Female genitalia with parieto-vaginal rings wide, devoid of anterior projection; dorso-labiate plate reduced.

Key References: Chérot & Malipatil 2016.

Genus *Poppiomegacoelum* Chérot & Malipatil, 2016

[MIRINAE: MIRINI]

(PLATE 20C)

Type species: *Poppiomegacoelum gearyi* Malipatil & Chérot, 2016, by original designation.

Number of Australian species: 1

Australian Distribution: Queensland and New South Wales.

Extralimital Distribution: NA

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Body 6.5–7 mm; sub-oblong, slightly convex; almost uniformly orange brown, with yellow areas; dorsal pilosity relatively long, recumbent to semi-erect, white, particularly dense on scutellum and hemelytra.

Head gradually sloping anteriorly; in lateral view the tylus is distinctly curved and joined to frons without a notch; sulcus of vertex distinct, relatively deep; vertex not carinate; eyes wide, particularly in males. First antennal segment slightly club-like and curved. Labium reaching mid coxae.

Pronotum dorsally pilose; with a shining collar and a pair of stiff, semi- erect white setae on anterior corners. Scutellum relatively flat, slightly tumid and shagreened. Pilosity of hind tibia semi-erect, short, tibial spines light brown. Hemelytra slightly reflective; opaque; almost smooth; their punctation shallow and relatively wide; veins raised.

Primary apophysis of right paramere with two pointed lobes; endosoma devoid of comb or true spiculum but provided with a wide, elongate phallic support; secondary gonopore complete, devoid of sclerite, hairs or pilose plate. Female genitalia with parieto-vaginal rings thin, devoid of anterior projections, dorso-labiate and ventral labiate plates wide, margins reinforced.

Key References: Chérot & Malipatil 2016.

Genus *Creontiades* Distant, 1883

[MIRINAE: MIRINI]

(PLATE 21)

Type species: *Megacoelum rubrinerve* Stål, 1862, by monotypy.

Number of Australian species: 2 + (2 doubtful).

Australian Distribution: All states and territories.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor to Major.

Host(s): Asteraceae, Bataceae, Chenopodiaceae, Convolvulaceae, Fabaceae and Poaceae (from Chérot & Malipatil 2016; see that paper for details of references).

In Australia, *Creontiades dilutus* (Stål), commonly known as "Green mirid", has been recorded from a range of plants from a diversity of families (for details see Malipatil & Cassis 1997). However, plants on which the damage by this bug has been well documented are stone fruits and cotton, lucerne, grapes, potato, passionfruit, and many vegetables including beans, carrots, cucurbits, parsnips and potatoes (see further details, and references in Malipatil & Cassis 1997). *Creontiades pacificus* (Stål) commonly known as the "Brown mirid" has been recorded from several plants, however the damage by this bug has been documented on cotton and lucerne only (see further details, and references in Malipatil & Cassis 1997). *Creontiades dilutus* is a major widespread and irregular pest of cotton in Australia (Wilson *et al*. 2007), and both these species are major, widespread and regular pests of pulses in Australia (Brier 2007).

Diagnosis:

Body elongate; total length 6–8 mm; laterally straight; uniformly stramineous, yellow or yellowish brown, sometimes with fine red or brown stripes or small spots.

Head with distinct median longitudinal sulcus on vertex; eyes contiguous with anterior margin of pronotal collar; juncture of frons with strongly depressed tylus. Antennae with first segment slightly thicker than other segments, exceeding tip of head by 0.5–0.7 its length. Labium extending to about hind coxae.

Pronotum with distinct collar; posterior margin moderately arcuate. Scutellar apex declivous, pointed and with fuscous spot. Metepisternum with moderately large scent efferent system reaching beyond posteroventral angle of mesepimeron; ostiolar peritreme elongate, with posterior margin raised. Pretarsus with broad, lamellate, divergent parempodia; fleshy pulvilli; claws strongly recurved apically; tibiae with light, yellow spines.

Left paramere sickle shaped, sensory lobe undeveloped, shaft slightly expanded before apex, apical process pointed (**Fig. 34**); right paramere short, with pointed process at apex (**Fig. 35**); endosoma membranous, without sclerotised spines or processes. Parieto-vaginal rings wide, with a pair of anterior projections; dorso-labiate plate reduced; dorsal wall lacking sclerite (**Fig. 31**).

Key References: Chérot & Malipatil 2016, Malipatil & Cassis 1997.

Remarks: The two species confirmed present in Australia are the common *C. dilutus* and *C. pacificus*; the status of the other two species included in this genus, *C. angulifer* (Walker) and *C. vittipennis* Reuter is uncertain pending further work (Chérot & Malipatil 2016).

Genus *Neopeplus* Chérot, Malipatil & Schwartz, 2003

[MIRINAE: MIRINI]

(PLATE 17C, D)

Type species: *Neopeplus trianai* Malipatil, Chérot & Schwartz, 2003, by original designation.

Number of Australian species: 1.

Australian Distribution: Queensland.

Extralimital Distribution: Papua New Guinea.

Economic Significance: No.

Host(s): Myrtaceae (Chérot *et al*. 2003).

Diagnosis:

Body total length 7–8.4; uniformly yellow and red.

Head with vertex sulcate; not carinate; eyes wide; posterior margin contiguous with pronotal collar. Labium reaching posterior coxae. First antennal segment elongate, slightly club-like, straight.

Pronotum shining with reflective red calli including a small fuscous spot in middle and a fuscous posterior margin. Scutellum relatively flat, not ampule-like. Hemelytra translucent, reflective; yellow and red; their punctation shallow; clavus and corium with irregular but distinct rows of recumbent short setae; cuneus reflective red. Tibiae with light spines.

Secondary gonopore complete, devoid of sclerite or long hairs; endosoma devoid of comb or true spiculum; phallic support present in some species. Parieto-vaginal rings large but narrow, devoid of anterior projection or other additional sclerite, dorso-labiate plate reduced, dorsal process of posterior wall absent, median process reduced, interramal sclerite (A structures) classical, undivided, interramal lobes (E-structures) wide.

Key References: Chérot & Malipatil 2016.

Genus *Niastama* Reuter, 1904

[MIRINAE: MIRINI]

(PLATE 22A, B)

Type species: *Niastama punctaticollis* Reuter, 1904, by monotypy.

Number of Australian species: 2.

Australian Distribution: New South Wales, South Australia and Tasmania.

Extralimital Distribution: NA.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder, host *Baekea behrii* (Schld.) F. Muell. (Myrtaceae), *Malus pumila* Mill. (Rosaceae, apple), *Cupressus macrocarpa* Hartw. (Cupressaceae, Monterey cypress). *Niastama punctaticollis* Reuter, commonly known in Tasmania "Dimpling bug" is economic pest of apples (Cassis & Gross 1995).

Diagnosis:

Body size 6–6.5 mm.

Body, especially pronotum nearly glabrous, often highly polished, with a few hairs on exocorium, embolium and cuneus (**Plate 22A, B**).

Head without a carina across posterior part of vertex. Labium short, reaching midcoxae

Pygophore with a prominent projection on left side and a small narrow acute projection on right side; right paramere larger than left paramere; left paramere with a prominent horn-like apical process; phallotheca cylindrical with large elaborate sclerotised structure. Ring sclerite with dorsally curving lip anteriorly on outer edge, and near posterior on inner edge; sigmoid process very big and long, flattened, extending anteriorly.

Key Reference: Eyles 1999b.

Genus *Stenotus* Jakovlev, 1877

[MIRINAE: MIRINI]

(PLATE 23)

Type species: *Stenotus binotatus* Jakovlev, 1877, by monotypy.

Number of Australian species: 3.

Australian Distribution: Queensland, South Australia, Tasmania, Western Australia.

Extralimital Distribution: Ethiopian, Palaearctic and Nearctic regions; Hawaii; New Zealand.

Economic Significance: Minor.

Host(s): *Stenotus binotatus* breeds on grasses and feeds on flowering Asteraceae and other plants (Southwood & Leston 1959), in New Zealand taken from a wide variety of plants (Eyles 1999b), and in Canada collected on apple, pear, stone fruit and orchard grasses (Kelton 1982).

Diagnosis:

Body usually > 5 mm; elongate; green and black species, dorsal surface with two longitudinal black stripes (sometimes obscure in some females).

Head about as long as wide or wider than long, with clypeus not pointed dorsally, vertical or oblique in lateral view; carina between eyes absent or indistinct in female.

Hind tarsus with segment 1 distinctly longer than segment 2 and subequal to segment 3. Hemelytra impunctate or finely punctate; not transparent; abdomen and legs not visible through hemelytra; costal margin subparallel-sided; dorsal surface slightly shining and wrinkled; claval and anal veins without homogeneous lines of large and deep punctures; dorsal vestiture consisting of moderately dense, short adpressed, pale simple setae and sparse sericeous setae near claval suture.

Key References: Namyatova *et al*. 2013, Kelton 1982, Eyles 2001.

Genus *Austropeplus* Poppius, 1915

[MIRINAE: MIRINI]

(PLATE 22C, D)

Type species: *Austropeplus annulipes* Poppius, 1915, by original designation.

Number of Australian species: 1.

Australian Distribution: Queensland and New South Wales.

Extralimital Distribution: NA

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). Citrus blossom bug, *Austropeplus* sp., sometimes reduces blossom production on citrus trees in coastal districts by killing the small flower shoots. (NSW Primefact 508 May 2007). Also collected on *Urtica incisa* Poir. Urticaceae) (Chérot & Malipatil 2005).

Diagnosis:

Body rounded; dark; bearing silky or woolly golden pubescence and stiffer, longer erect setae, dorsally punctate, the punctation shallow, narrow, dense.

Head wide, vertex neither sulcate nor carinate; eyes slightly removed from anterior margin of pronotal collar, this distance inferior to thickness of first antennal segment. Labium reaching abdomen.

Pronotal collar elongate, its length close to or slightly superior to first antennal maximal width; callosities wide, separated from pronotal lateral margins. Mesoscutum almost covered, black, with lateral fossae. Hemelytra opaque, black and yellow, with a single type of pubescence, silky; membrane vitreous.

Left paramere with a prominent apex and a reduced sensory lobe; endosoma with a wide comb-like phallic support. Parieto-vaginal rings rounded; inter-ramal sclerites of posterior wall wing-like. Sigmoid process reduced.

Key References: Poppius 1915, Carvalho 1956, Chérot & Malipatil 2005.

Genus *Closterotomus* Fieber, 1858

[MIRINAE: MIRINI]

(PLATE 24)

Type species: *Closterotomus biclavatus* Herrich-Schaeffer, 1835, by monotypy.

Number of Australian species: 1.

Australian Distribution: Tasmania.

Extralimital Distribution: Palaearctic, Oriental and Nearctic regions; New Zealand.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder, hosts *Fragaria ananassa Duch.* (Rosaceae, strawberry), *Phaseolus* spp. (Leguminoseae, beans, broad beans), *Solanum tuberosum* L. (Solanaceae, potato); pests of various crops, grasses, weeds, pastures and other plants in New Zealand, Europe and North America (see further details in Cassis & Gross 1995).

The related *Calocoris angustatus* Lethierry (**Plate 19C**), exotic to Australia, is an important polyphagous pest, preferring crops such as sorghum, whereas *Closterotomus norwegicus* (Gmelin), the only recorded species in Australia, commonly known as "Potato Bug" (Cassis & Gross 1995) or "Potato mirid" is a less important species (Wheeler 2000a).

Diagnosis:

Body green (in *C. norwegicus*) with varying amounts of orange or dark brown; head, pronotum, scutellum and hemelytra densely covered with conspicuous, robust, black, bristle-like setae; silvery, blade-like setae very sparse, not diminishing the overall black pubescent appearance.

Second antennal segment normally blackened apically or completely black, if completely pale then labium reaching at least middle coxae.

Pygophore with prominent horn-like projection on left side, and an acute right projection half as long; apex of endosomal left lobe with double comb formed by two close together rows of denticles; forked phallic support massive, with obvious blunt process; true spiculum present. Parieto-vaginal rings elongate, linked dorsally by a sclerite (DLP) (**Fig. 31**); interramal lobes separated of the sigmoid process.

Key References: Eyles 1999a, 2001, Rosenzweig 1997, Kelton 1982, Ribes & Ribes 2003.

Remarks: The related genus *Calocoris* Fieber, 1858, may be distinguished as follows: Body robust and green. Head oblique, carina between eyes absent. Second antennal segment completely pale. Labium reaching at least mesocoxae. Pronotum finely rugose. Hemelytra finely punctate; with pubescence of two types, sericeous golden hairs intermixed with simple black hairs. Male genital segment with stout tubercles near base of left paramere.

Genus *Sidnia* Reuter, 1905

[MIRINAE: MIRINI]

(PLATE 25A, B)

Type species: *Sidnia kinbergi* Stål, 1859, monotypy.

Number of Australian species: 1.

Australian Distribution: All states and territories except Northern Territory.

Extralimital Distribution: Micronesia.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder, hosts *Agonis flexuosa* (Willd.) Sweet (Myrtaceae), *Medicago sativa* L. (Fabaceae) (Cassis & Gross 1995). *Sidnia kinbergi* (Stål) commonly known as Crop Mirid (Cassis & Gross 1995), is a minor widespread and irregular pest of pulses in Australia (Brier 2007).

Diagnosis:

Body colour variable, often with some spotting or mottling with darker brown.

First antennal segment thick, as wide as length of pronotal collar.

Propleuron with a black spot in upper posterior corner.

Male genitalia: Left paramere with very small basal lobe, shaft straight then curved and with a narrow apical process; right paramere small, with a tightly hooked apical process; endosoma distinctive, with narrow tubular lobes. Female genitalia: Ring sclerites hemispherical with wide edges, connected by a sclerotised band; sigmoid process very compressed.

Key References: Eyles 1999b, 2001.

Genus *Tinginotum* Kirkaldy, 1902

[MIRINAE: MIRINI]

(PLATE 25C, D)

Type species: *Tinginotum javanum* Kirkaldy, 1902, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, New South Wales and South Australia.

Extralimital Distribution: Afrotropical, Palaearctic, Oriental regions; Papua New Guinea; New Zealand (Eyles 2000).

Economic Significance: Minor.

Host(s): *Tinginotum minutum* Eyles has been taken in low numbers on *Guioa semiglauca* (F. Muell.) Radlk. (Sapindaceae) in Australia; also on a variety of plants belonging to several families including Apiaceae, Rubiaceae, Podocarpaceae, Caryophillaceae, Rosaceae and Fabaceae in New Zealand (Eyles 2000).

Diagnosis:

Characterised by the long outstanding setae at least on pronotum and scutellum (in tufts in some species), the pruinose areas mainly on hemelytra, and the evenly rounded apices of outer and inner ovipositor blades.

Distinguished from *Tinginotopsis* Poppius (one species in Australia) by the non-globose pronotum; absence of conspicuous double sinuation on posterior margin of pronotum; foot-shaped and curved left paramere; and possibly also by the unspined single pair of wings on inter-ramal sclerites of female genitalia.

Key References: Eyles 2000, 2001.

Genus *Charagochilus* Fieber, 1858

[MIRINAE: MIRINI]

(PLATE 26)

Type species: *Charagochilus gyllenhalii* Fallén, 1807, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, Western Australia and Northern Territory.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions.

Economic Significance: No.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995).

Diagnosis:

Body elongate-oval; shiny; pubescent species.

Head oblique, short; smooth; eyes large, prominent; carina between them distinct.

Pronotum trapeziform, with pit-like punctures, calli inconspicuous; mesal length of collar slightly broader than thickness of antennal segment 1. Ostiolar peritreme usually small, orifice narrow and sometimes indistinct. Hind tarsus with segment 1 subequal in length to segment 2. Scutellum transversely rugose.

Hemelytra finely punctate; pubescence woolly, shiny, often intermixed with erect hairs.

Males elongate; females oval, more robust.

Key References: Akingbohungbe 1978, Carvalho 1955, Kelton 1980, Odhiambo 1959a, 1959c.

Remarks: Akingbohungbe (1978) transferred the common species *Polymerus antennatus* (Distant) to *Charagochilus*, leaving the only other Australian species *Polymerus flavipes* (Distant) in the widely distributed genus *Polymerus* Hahn. The following four exotic species, *Charagochilus gyllenhalii* (Fallén), *C. weberi* Wagner, *Polymerus cognatus* (Fieber) and *P. nigritus* (Fallén) are illustrated in this contribution (**Plate 26**).

Genus *Lygus* Hahn, 1833

[MIRINAE: MIRINI]

(PLATES 27, 28A, B)

Type species: *Lygus pratensis* Linnaeus, 1758, by subsequent designation.

Number of Australian species: NA.

Australian Distribution: NA.

Extralimital Distribution: Palaearctic and Nearctic regions.

Economic Significance: Major.

Host(s): All Lygus bugs are plant feeders but at times they will attack less active and smaller invertebrates for food. Most occur on a wide range of herbaceous plants, shrubs, and trees. Some have a single host plant or are limited to a group of related plants. Many colonize fruit trees and nursery stock, variety of vegetable crops, seed crops, cotton, tobacco and commercial flower crops (Kelton 1975). Lygus bugs are an important pest group. They are highly polyphagous, particularly the species *L. hesperus* Knight ("western tarnished plant bug") known from more than 100 host plants and *L. lineolaris* (Palisto de Beauvois) ("tarnished plant bug") from more than 300 hosts. Some others are less important species such as *L. rugulipennis* Poppius ("European tarnished plant bug") (see Wheeler 2000a), or are less important predators also (Wheeler 2000b). See Wheeler 2000a, b, 2001 for details relating to hosts, biology and associated information. Another exotic species of the related genus is *Apolygus lucorum* (Meyer-Dur) (**Plate 28C, D**), known to cause damage to a number of plants (see Wheeler 2001).

Diagnosis:

Body elongate-oblong or oval; medium to large.

Head oblique; eyes large; carina between them prominent. Labium variable in length. Second antennal segment in male not as wide as 1st segment apically.

Pronotum coarsely punctate; anterior angles rounded or angular; calli smooth; glabrous or pubescent.

Hemelytra green or reddish brown; coarsely punctate; pubescence short and sparse, or long and dense.

Easily separated from *Apolygus* (**Plate 28C, D**) by coarse dorsal punctation, dense and deep (shallower and less dense in *Apolygus*) and by the base of tibia ("knee") darkened (concolorous in *Apolygus*).

Key References: Eyles 1999b, Kelton 1980, 1982.

Remarks: EXOTIC.

Genus *Lygocoris* Reuter, 1875

[MIRINAE: MIRINI]

(PLATE 29)

Type species: *Lygocoris pabulinus* Linnaeus, 1761, by subsequent designation.

Number of Australian species: NA.

Australian Distribution: NA.

Extralimital Distribution: Holarctic (Europe, Eurasia, Oriental, north America)

Economic Significance: Minor.

Host(s): *Lygocoris pabulinus* (L.), known as the common green mirid (or capsid) in Europe, and *L. rugicollis* (Fallén), commonly known as "Apple capsid (mirid) bug" are less important as pests and have a wide host range (Wheeler 2000a).

Diagnosis:

Body elongate-oblong.

Head oblique; eyes large; carina between them prominent; head in lateral view with about as much in front of eye as behind anterior of eye. Labium variable in length.

Pronotum finely punctate; anterior angles rounded; calli smooth, pubescent; collar not slender, being about or longer than basal width of 2nd antennal segment. Hemelytra green and black; finely punctate; pubescence simple, long, dense.

Key References: Eyles 1999b, Kelton 1980, 1982.

Remarks: EXOTIC.

Genus *Micromimetus* Eyles, 1999

[MIRINAE: MIRINI]

(PLATE 30A, B)

Type species: *Micromimetus pictipes* Eyles, by original designation.

Number of Australian species: 4.

Australian Distribution: unpublished as yet (Namyatova, *in litt.*)

Extralimital Distribution: Cook Islands.

Economic Significance: No.

Host(s): None recorded.

Diagnosis:

Superficially resemble *Taylorilygus* and *Diomocoris*, but may be distinguished from those two genera by the combination of the following characters:

Body slightly oval; small 3.2–4.0 mm; brown often blackish sometimes with reddish tinge; covered with dense pubescence of silvery flattened or bladelike curved setae intermixed with setae of circular cross section.

Head vertical; with very low and rounded carina; vertex with shallow mid-longitudinal sulcus; eyes large, compressed between front and back; maxillary plates prominent. Antennae long, when extended back reaching posterior of abdomen. Labium reaching hind coxae or slightly beyond.

Pronotum with very slender collar demarcated by a furrow; anterior corners rounded, bearing a stout curved seta; hind margin with distinct sinuation. Scutellum finely transversely rugose. Fore and mid legs relatively short; hind legs much longer; hind femora somewhat swollen; tibiae with large dark spots at bases of spines. Hemelytra with clavus and corium very finely rugosely punctate; cuneus and membrane declivous.

Pygophore with a small rounded left projection slightly bent back towards left side; left paramere with small basal lobe; right paramere with apical process not visible from above. Ring sclerites long, narrow, tapering laterally, concave; sigmoid process and associated wings complex, sigmoid process heavily sclerotised, S-shaped with underneath body; bulb of ovipositor with a prominent, sclerotised, platelike anterior extension.

Key Reference: Eyles 1999b.

Remarks: Although until now known only from the Cook Islands, this genus now contains four new species from Australia (Namyatova & Cassis 2018b, Namyatova, *in litt*. February 2019).

Genus *Taylorilygus* Leston, 1952

[MIRINAE: MIRINI]

(PLATE 31)

Type species: *Lygus simonyi* Reuter, 1903.

Number of Australian species: 4.

Australian Distribution: Christmas Island; Queensland, New South Wales and South Australia.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Major.

Host(s): Herbivore, sap-feeder, feeds mostly on composites in the Western Hemisphere (Cassis & Gross 1995). The widely distributed species in Australia *Taylorilygus apicalis* (Fieber) (= *T. pallidulus* (Blanchard), commonly called "Brokenbacked bug" is a pest of cotton, conifer seedlings and a number of composites, and Ethiopian *Taylorilygus vosseleri* (Poppius) is an important pest (Wheeler 2000a, 2001). *T. apicalis* is also a minor, widespread and irregular pest in pulses (Brier 2007).

Diagnosis:

Similar to *Diomocoris*, but may be distinguished from the latter by the combination of the following characters:

Body generally green.

Head with maxillary plates (lora) prominent, jutting out from mandibular plates (juga) like an angled shelf.

Pronotum with very short or slender collar; gentle sinuation on posterior margin.

Male genitalia with a large spined extra process (visible in lateral view without dissection) basal to basal lobe on left paramere (**Fig. 44**). Female genitalia with ring sclerites connected by a transverse rod.

Key References: Eyles 1999b, 2001.

Remarks: The other commonly distributed species in Australia, *Taylorilygus nebulosus* (Poppius), is now transferred to genus *Diomocoris* Eyles (Namyatova & Cassis 2018b, Namyatova, *in litt.* February 2019).

Genus *Diomocoris* Eyles, 1999

[MIRINAE: MIRINI]

(PLATE 32)

Type species: *Diomocoris woodwardi* Eyles, 1999, by original designation.

Number of Australian species: 1.

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

Extralimital Distribution: New Zealand.

Economic Significance: Minor.

Host(s): *Diomocoris nebulosus* (Poppius) – herbivore, sap-feeder, hosts *Melaleuca lanceolata* Otto (Myrtaceae), *Mimosa pigra* L. (Fabaceae) (Cassis & Gross 1995).

Diagnosis:

Similar to *Taylorilygus*, but differs in the following:

Body colour brown (or sometimes orange or red), not green.

Head with maxillary plates somewhat prominent, but gently rounding away from mandibular plates.

Pronotum narrow, with posterior margin convex, lacking carinae or carinal knobs; finely punctate; collar slender.

Left paramere without an extra process basal to basal lobe; left paramere not forked apically, but with 2 subapical shoulders; rim of secondary gonopore without a sclerotised process; endosoma with a spiculum. Females with ring sclerites not connected by a transverse rod.

Key Reference: Eyles 1999b.

Remarks: Only species from Australia, *Taylorilygus nebulosus* (Poppius), is being transferred to the genus *Diomocoris* Eyles (Namyatova & Cassis 2018b, Namyatova, *in litt*. February 2019).

ADDITIONAL EXOTIC PEST SPECIES

The following two pest species have been illustrated in this work since they are exotic, hence of economic and biosecurity significance to Australia:

1. *Adelphocoris lineolatus* (Goeze) is illustrated as **Plate 18C, D**, and is a less important pest species (Wheeler 2000a).
2. *Poecilocapsus lineatus* (Fabricius), "fourlined plant bug" is illustrated as **Plate 19D**.

SUBFAMILY Phylinae

(PLATES 33–48, FIGS. 11, 12, 19, 28, 29, 32, 33)

Diagnosis:

Pronotal collar absent in most species (**Fig. 19**); when present weakly upturned (flattened in Hallodapini).

Parempodia setiform or straight hairlike between claws (except Pilophorini, Cremnhorrhini, Semiini); pulvilli fleshy; claws not toothed basally or apically (**Figs. 11, 12**).

Male genitalia with endosoma rigid, straplike (usually S-shaped) (**Fig. 29**) or tubular; left paramere distinct, usually boat-shaped; phallotheca attached to posterior surface of pygophore rather than to phallobase as in other Miridae.

Key References: Cassis & Schuh 2012, Schuh & Slater 1995, Kelton 1982.

Tribes present in Australia: According to ABRS (2012), the following six tribes are recorded from Australia: Pilophorini, Hallodapini, Leucophoropterini, Phylini, Semiini and Cremnorrhinini. However, in this work, following Schuh & Menard 2013, the seventh tribe Nasocorini is also recognised from Australia to include the genus *Campylomma* Reuter, previously placed in Phylini.

KEY TO TRIBES AND REPRESENTATIVE GENERA OF PHYLINAE

(based on Schuh 1984, Schuh & Schwartz 2016, Schuh & Weirauch 2020)

1. Pulvilli elongate, free and extending to apex of claws (**Plate 35B, Fig. 11**); [this tribe recognised primarily on the basis of molecular data]...Tribe Cremnorrhinini 2

   Pulvilli short, not elongate and not extending to apex of claws (**Fig. 12**) 3

2. Right paramere with a broad, distinctly bifid apex (**Fig. 42**); never with pairs of dark spots at apex of corium and apex of membrane cells (**Plate 33**) ..... ***Bifidostylus***

   Right paramere with single pointed apex (**Fig. 43**); most have black spots on corium at inner angle of cuneus and at apex of membrane cells ..... ***Omnivoriphylus***

3. Parempodia lamellate, fleshy, and recurved apically (**Fig. 10**); [body dorsum and thoracic pleura vestiture usually at least some elongate-lanceolate silvery setae]...Tribe Pilophorini 4

   Parempodia setiform (**Fig. 7**) or only weakly fleshy, not lamellate and recurved 6

4. Sericeous scale like setae on dorsum arranged in patches on scutellum and usually as transverse bands on hemelytra, those on thoracic pleuron aggregated in an elongate patch on posterior margin of mesepimeron and a tiny patch on posterior margin of metepisternum (**Plate 36**) ..... ***Pilophorus***

   Sericeous scale-like setae on dorsum scattered, not in patches, always present on thoracic pleuron, and sometimes on dorsum and abdominal venter (**Plate 37**) 5

5. Hind tibial spines usually with dark bases (**Plate 37D**); endosoma with a group of glassy spicules just distad of the secondary gonopore; [all species feed on members of the Santalales; femora without spots; general colour blackish; eyes strongly compressed] ..... ***Hypseloecus***

   Hind tibial spines without dark bases; endosoma not as above; [body smooth; head produced in middle of antennal bases; small species with deciduous pubescence; cuneal fracture wide and deep (**Plate 38A**)] ..... ***Sthenaridea***

6. Combination of characters: Body weakly to strongly antlike, lateral corial margin usually weakly to strongly sinuous, sometimes nearly straight (**Plate 39**); anterior pronotal margin frequently flattened and collar-like (**Plate 43**); coloration usually brown or chestnut, hemelytra usually with some at least weakly contrasting lighter fasciae 7

   Combination of characters: Body ovoid in dorsal view, not antlike, lateral corial margin convexly rounded or straight, not sinuous (**Plate 45**); anterior pronotal margin never flattened and collar-like; coloration sometimes partially or completely dark, but pattern seldom organised into dark background with contrasting light fasciae 11

7. White fasciae, when present, never on cuneus, although often present on clavus and corium (**Plate 39A**); endosoma long, straplike / tubular, twisted; [pronotal collar flattened; cuneus elongate triangular; metathoracic scent-gland evaporatory area not protruding laterally; parempodia setiform; left paramere enlarged]...Tribe Hallodapini 8

   White fasciae, usually present basally on cuneus (**Plate 40A**), other light fasciae often present on clavus and corium; endosoma J-shaped or weakly sinuous and with a miniscule secondary gonopore...Tribe Leucophoropterini 9

8. Frons in the form of a distinct spine (**Plate 38C**) ..... ***Acrorrhinium***

   Frons not spiniform (**Plate 39A, B**); [post margin of eyes contiguous with anterior pronotal margin; hemelytral fascia in the form of complete bands, or round or quadrate patches] ..... ***Hallodapus***

9. Clavus and corium always lacking a dark brown transverse fascia along posterior margin of white transverse fascia (**Plate 40**); surface of hemelytron shiny and smooth, never punctate or possessing reflective patches ..... ***Ausejanus***

   Clavus and corium) with a dark brown transverse fascia along posterior margin of white transverse fascia (**Plate 42A, B, C**); if lacking a dark transverse line, hemelytron punctate; hemelytron with reflective patches 10

10. Head, pronotum, and scutellum distinctly shiny; mesoscutum often partially or completely hidden under posterior margin of pronotum; sometimes possessing a white area posterior to claval suture; hemelytron with elongate, erect setae or sericeous setae (**Plate 42A, B**); hemelytron often flat and punctate; *Ctypomiris* Group ..... ***Arafuramiris***

    Head, pronotum, and scutellum dull (**Plate 42C**); mesoscutum never completely obscured by posterior margin of pronotum; white area posterior to claval suture always absent; hemelytron with short, subadpressed gold or silver setae but never long, erect setae or sericeous setae; hemelytron never flat or punctate; *Gulacapsus* Group ..... ***Leucophoroptera***

11. Hind femur (almost always) with a more or less complete row of tiny brown to black spicules on distal half of dorsal surface (**Plate 44B**); vesica in male generally with two apical blades sometimes modified or absent; body coloration from entirely white with black spots on femora to entirely black...Tribe Nasocorini ..... ***Campylomma***

    Hind femur without row of spicules on dorsal surface; vesica variable, but never two apical blades; body coloration variable 12

12. Body elongate-ovate (**Plate 46**); pubescence sericeous, intermixed with simple hairs; hemelytra spotted with brown; femora usually spotted with black, tibiae with black spots at bases of spines...Tribe Phylini ..... ***Sthenarus***

    Not above combination of characters; [this tribe recognised primarily on molecular data] Tribe Semiini 13

13. Body size large (almost always > 4 mm); robust form, often pale yellow, sometimes with a few to many distinct red spots on pale background (**Plate 47**) ..... ***Wallabicoris***

    Body size small (1.0–3.6 mm); not above combination of characters (**Plate 48**); [small body, lengths ranging from 1.0 to more than 3.6 mm in *Tytthus mundulus*; head usually with a pale yellow spot on the vertex bordering inner margin of each eye; slightly protruding eyes not touching anterior margin of pronotum; shiny, trapeziform to campanulate pronotum, with lateral margins straight to weakly concave and moderately to strongly flared] ..... ***Tytthus***

TRIBE Cremnorrhinini REUTER, 1883

[PHYLINAE]

(PLATES 33–35)

Diagnosis:

This tribe is recognised primarily on the basis of molecular data (Schuh & Weirauch 2020).

Usually with sexual dimorphism, female shorter and more strongly ovoid than male, weakly to strongly brachypterous.

Head below eyes never more than one-half height of head to as little as one-fifth (Schuh & Menard 2013). Antennal sexual dimorphism weak.

Pronotal calli ranging from inconspicuous to distinctly demarcated. Mesoscutum narrowly to broadly exposed. Scutellum in form of equilateral triangle.

Pulvilli elongate; in Australian fauna in particular always having these structures free from claw except at base and extending to apex of claw.

Endosoma often sclerotised and stout.

Key Reference: Schuh & Schwartz 2016, Schuh & Menard 2013, Schuh & Weirauch 2020.

Number of Australian genera: 19. Two representative genera, below, are included in this work. Also included are illustrations of one representative species each of *Halophylus* Schuh & Schwartz (**Plate 34C, D**) and *Pulvillophylus* Schuh & Schwartz (**Plate 35**).

Genus *Bifidostylus* Schuh & Schwartz, 2016

[PHYLINAE: CREMNORRHININI]

(PLATE 33, FIG. 42)

Type species: *Bifidostylus silveirae* Schuh & Schwartz, 2016, by original designation.

Number of Australian species: 10.

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

Extralimital Distribution: NA.

Economic Significance: No to Minor.

Hosts: Collected on Scrophulariaceae (commonly on *Eremophila*, several species; *Myoporum platycarpum platycarpum*); Myrtaceae (*Melaleuca sheathiana*); Loranthaceae (*Amyema lucasii*); Asteraceae (*Parthenium hysterophorus*); Myrtaceae (*Eucalyptus populnea populnea*); Frankeniaceae (*Frankenia* sp.) (Schuh & Schwartz 2016).

Diagnosis:

Body moderately to strongly elongate, parallel sided; female somewhat shorter and more strongly ovoid than male; coloration of dorsum never with pairs of dark spots at apex of corium and apex of membrane cells.

Male genitalia. Right paramere with a bifid apex (**Fig. 42**); left paramere with an undulating posterior margin and posterior process; endosoma J-shaped to weakly sigmoid, without spines arising laterally and without membranous ornamentation apically; phallotheca usually greatly elongate on basal portion.

This genus exhibits considerable variation in structure and coloration.

Key Reference: Schuh & Schwartz 2016.

Genus *Omnivoriphylus* Schuh & Schwartz, 2016

[PHYLINAE: CREMNORRHININI]

(PLATE 34A, B, FIG. 43)

Type species: *Omnivoriphylus mangaensis* Schuh & Schwartz, 2016, by original designation.

Number of Australian species: 5.

Australian Distribution: Western Australia and Queensland.

Extralimital Distribution: NA.

Economic Significance: No to Minor.

Host(s): Recorded on Scrophulariaceae (commonly, *Eremophila* several species); Frankeniaceae (*Frankenia* sp.) (Schuh & Schwartz 2016).

Diagnosis:

This group of diverse habitus is diagnosed by the combination of:

Right paramere as in **Fig. 43**.

Most have black spots on corium, at inner angle of cuneus and at the apex of membrane cells.

Structure of the sigmoid endosoma, with one or two slender apical spines of length about equal to length of secondary gonopore.

Similar in endosomal structure to *Myoporophylus*, but *Omnivoriphylus* is smaller and usually slenderer bodied.

Key Reference: Schuh & Schwartz 2016.

TRIBE Pilophorini DOUGLAS & SCOTT, 1876
[PHYLINAE]
(PLATES 36–38A, B)

Diagnosis:

Body largely myrmecomorphic; vestiture with usually at least some silvery elongate-lanceolate setae, these frequently dense and sometimes grouped into distinct patches.

Head with posterior margin of the vertex upturned.

Parempodia mostly recurved apically and lamellate.

Key Reference: Schuh & Menard 2013, Schuh & Weirauch 2020.

Number of Australian genera: 5. Three representative genera, below, are included in this work.

Genus *Pilophorus* Hahn, 1826

[PHYLINAE: PILOPHORINI]

(PLATE 36)

Type species: *Pilophorus clavatus* Linnaeus, 1767, by subsequent designation.

Number of Australian species: 1.

Australian Distribution: Northern Territory.

Extralimital Distribution: Afrotropical, Palaearctic, Oriental and Nearctic regions; Melanesia, Micronesia, Polynesia.

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). Species of this genus are at least in part predaceous; in most cases, aphids and other "homopterans" seem to be the prey; and plant host specificity may be influenced by the host specificity of the prey (Schuh & Schwartz 1988).

Diagnosis:

Body elongate; antlike; black or brown; with sericeous scale like setae on dorsum arranged in patches on scutellum and usually as transverse bands on hemelytra, those on thoracic pleuron aggregated in an elongate patch on posterior margin of mesepimeron and a tiny patch on posterior margin of metepisternum, sometimes basally on cuneus, and usually with a patch anterolaterally on abdominal venter.

Head oblique, strongly triangular, base convex; carinae sharp; overlapping pronotum.

Pronotum more or less trapezoidal. Mesoscutum broadly exposed. Ostiolar peritreme well developed. Legs with claws broadened basally, smoothly and usually strongly curved on dorsal surface; pulvilli absent; parempodia lamellate, recurved, and convergent apically.

Key References: Schuh & Schwartz 1988, Schuh 1984, Kelton 1980, 1982.

Remarks: The exotic species, *Pilophorus perplexus* Douglas & Scott from Europe and North America, is illustrated in this contribution (**Plate 36A, B**).

Genus *Hypseloecus* Reuter, 1891

[PHYLINAE: PILOPHORINI]

(PLATE 37)

Type species: *Hypseloecus visci* Puton, 1888, by monotypy.

Number of Australian species: 9.

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

Extralimital Distribution: Africa, South-East Asia.

Economic Significance: No to Minor.

Host(s): All species are associated with parasitic mistletoes in the plant order Santalales, and one species *Hypseloecus schuhi* is described from specimens collected on *Amyema nestor* (Loranthaceae) (Symonds 2012).

Diagnosis:

Body with scattered lanceolate setae on dorsum.

Head relatively broad.

Hind tibial spines usually with dark bases.

Endosoma with a group of glassy spicules just distad of secondary gonopore.

Key References: Schuh & Menard 2011, Symonds 2012.

Remarks: The species of *Hypseloecus* are easily confused with *Coridromius* sp. (Orthotylinae) based on the short, squat body-shape and saltatorial hind legs, but can easily be distinguished by the presence of lanceolate setae on dorsum of body.

Genus *Sthenaridea* Reuter, 1885

[PHYLINAE: PILOPHORINI]

(PLATE 38A, B)

Type species: *Sthenaridea piceonigra* Reuter, 1885, by monotypy.

Number of Australian species: 2

Australian Distribution: Queensland.

Extralimital Distribution: Cosmopolitan.

Economic Significance: No.

Host(s): Herbivore, sap-feeder, host *Scleria margaritifera* Willd. (Cyperaceae). Available evidence indicates that most, if not all species are associated with sedges (Cyperaceae), sometime with rushes (Juncaceae), or rarely with grasses (Poaceace) (Schuh 1991).

Diagnosis:

Body length (apex of tylus to costal fracture) never more than 2 mm; scattered with sericeous scalelike setae, not in patches, always present on thoracic pleuron, and sometimes on dorsum and abdominal venter.

Head with antennal segment 2 of nearly uniform diameter over entire length.

Legs with lamellate convergent parempodia.

Male genitalia with vesica limited to simple tube; with no obvious secondary gonopore.

Key Reference: Schuh & Schwartz 1988.

TRIBE Hallodapini VAN DUZEE, 1916
[PHYLINAE]
(PLATES 38C, D, 39)

Diagnosis:

Most members of this tribe can be diagnosed by the following characters:

Head with projecting frons and clypeus.

Flattened pronotal collar.

Predominantly slender and straplike endosoma; left paramere enlarged.

Key Reference: Schuh & Menard 2013, Schuh & Weirauch 2020.

Number of Australian genera: 2. Both genera, below, are included in this work.

Genus *Acrorrhinium* Noualhier, 1895
[PHYLINAE: HALLODAPINI]
(PLATE 38C, D)

Type species: *Acrorrhinium conspersus* Noualhier, 1895, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland and Northern Territory.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions; Melanesia.

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder, host *Mimosa pigra* L. (Fabaceae) (Cassis & Gross 1995).

Diagnosis:

Body length (apex of tylus – cuneal fracture) 3.50–4.70 mm.

Head prognathous, with a projecting spinelike frons covering part of strongly compressed clypeus; length of projection about equal to thickness of first antennal segment.

Pronotum with a broad flat collar.

Male genital capsule usually with a small posteriorly directed spine.

Key References: Schuh 1984, Carvalho 1955.

Genus *Hallodapus* Fieber, 1858

[PHYLINAE: HALLODAPINI]

(PLATE 39)

Type species: *Hallodapus rufescens* Herrich-Schaeffer, 1838, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland and South Australia.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions; Melanesia.

Economic Significance: No.

Host(s): Herbivore, sap-feeder, host *Acanthospermum australe* (Loefl.) Kuntze (Asteraceae) in South Africa (Cassis & Gross 1995).

Diagnosis:

Body size small (*ca*. 3 mm); brown with contrasting white maculae on corium and / or clavus.

Head prognathous with a weak carina on posterior margin; posterior margin of eyes contiguous with pronotum.

Pronotum with flattened collar like anterior margin. Scutellum flat or convex in both sexes. Stridulatory device involving inner surface of hind femur and the costal margin of corium. Setiform parempodia.

Male genitalia with elongate to very long vesica with a well developed secondary gonopore; left paramere enlarged and usually densely covered with heavy setae.

Key References: Schuh 1984, Carvalho 1955.

TRIBE Leucophoropterini SCHUH, 1974
[PHYLINAE]
(PLATES 40–42)

Diagnosis:

Body overall coloration primarily dark brown, castaneous, or rarely red.

Head with relatively wide vertex in females. Second antennal segment being significantly thicker than antennal segments 3 and 4.

Anterior portion of hemelytra with a partial or complete transverse fascia; anterior margin of the cuneus adjacent to cuneal fracture white.

Male with genital capsule less than one third the total length of abdomen. Endosoma J-shaped or weakly sinuous, and at most a very weakly developed secondary gonopore. Female with apex of ovipositor with an expanded ventral notch which appears as a projecting ''spine'' in lateral view when ovipositor at rest.

Key References: Schuh & Menard 2013, Menard & Schuh 2011, Schuh & Weirauch 2020.

Number of Australian genera: 11. Three representative genera, below, are included in this work.

Genus *Ausejanus* Menard & Schuh, 2011

[PHYLINAE: LEUCOPHOROPTERINI]

(PLATE 40)

Type species: *Idatiella albisignatus* Knight, 1938, by original designation.

Number of Australian species: 18

Australian Distribution: All states and territories.

Extralimital Distribution: Southern Papua New Guinea; New Caledonia; New Zealand; Mauritius.

Economic Significance: Minor.

Host(s): Mostly endemic genera of Fabaceae, Myrtaceae, and Asteraceae in Australia, although several species are generalists and show little host specificity.

Ausejanus albisignatus (Knight) – herbivore, sap-feeder (predator), host (*Acacia* Miller (Fabaceae), *Corylus avellana* L. (Corylaceae), *Fraxinus excelsior* L. (Oleaceae), *Betula pendula* Roth = *B. alba* L. (Betulaceae), *Malus pumila* Mill. (Rosaceae, apple), *Pyrus communis* L. (Rosaceae, pear); possibly predaceous on aphids and psyllids (Cassis & Gross 1995, Menard & Schuh 2011). *Ausejanus albisignatus* is also a less important predator (Wheeler 2000b).

Diagnosis:

Distinguishable from other genera of Leucophoropterini and other Australian

Phylinae by combination of:

Body including hemelytra primarily red to dark brown.

Head with large reddish to purple eyes. Sexual dimorphism in coloration of antennal segment 2 and hemelytra.

Hemelytra with only simple setae; and with contrastingly coloured white to transparent transverse fascia on anterior portion.

Male with a simple S-shaped endosoma composed of two straps united by a membrane and simple secondary gonopore.

Key Reference: Menard & Schuh 2011.

Remarks: Ten Australian species of the related genus *Sejanus* Distant, have now been transferred to this genus, leaving only three species, including *Sejanus brittoni* Carvalho & Gross (**Plate 41A, B**) from Australia in the original genus *Sejanus*. Current distribution of *Sejanus* is Oriental and Palearctic regions; Indo-Pacific, and Australia (Menard & Schuh 2011). Most species are thought to be partially predatory and are often collected on trees with active psyllid infestations. Identification to species can be difficult, partially due to the paucity of genitalic characters and most identifications based on size and colour. Most similar in overall appearance to North American genus *Tuxedo* Schuh (Menard, pers. comm. 2019).

Genus *Arafuramiris* Schuh, 1984

[PHYLINAE: LEUCOPHOROPTERINI]

(PLATE 42A, B)

Type species: *Arafuramiris biakanus* Schuh, 1984, by original designation.

Number of Australian species: 3.

Australian Distribution: Queensland and Northern Territory.

Extralimital Distribution: Papua New Guinea.

Economic Significance: No.

Host(s): Cupressaceae and Euphorbiaceae (Menard & Schuh 2011).

Diagnosis:

Body castaneous in coloration.

Head with flat to convex vertex; large eyes.

Pronotum strongly medially constricted with posterior lobe strongly swollen and completely obscuring mesoscutum in dorsal view. Hind femora with knee like swellings at joint with hind tibia. Hemelytra with short and golden sericeous setae covering remainder of punctate area; anterior of clavus with long sericeous setae.

Abdominal sternite I longer than wide; abdomen petiolate form.

Key Reference: Menard & Schuh 2011.

Remarks: This genus is strongly ant-mimetic and often collected by sweeping or light traps in association with local ant diversity. The presence of setae and the medial constriction of the hemelytron aid in the appearance of an ant-like "petiole" characterizing this genus. The largest diversity is in Papua New Guinea (Menard, pers. comm. 2019).

Genus *Leucophoroptera* Poppius, 1921

[PHYLINAE: LEUCOPHOROPTERINI]

(PLATE 42C)

Type species: *Leucophoroptera quadrimaculata* Poppius, 1921, by original designation.

Number of Australian species: 5

Australian Distribution: Queensland, New South Wales, Victoria, Tasmania, South Australia and Western Australia.

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): Primarily Myrtaceae; also found on Fabaceae, Thymelaeaceae, Goodeniaceae, and Lauraceae (Menard & Schuh 2011).

Diagnosis:

Pronotum in female is boxlike with anterior margin nearly equal in width to posterior margin. Hind femur with a row of fringe-like setae. Hemelytra with lateral margins parallel; with dark and white coloration with majority of anterior of cuneus and anterior of corium white; hemelytra relatively more elongate in male than in female.

Pygophore small and with very small protrusion on ventral-posterior surface of apex; endosoma slender, twisted S-shaped; secondary gonopore small to medium sized, located at apex of endosoma; phallotheca small, C-shaped; left paramere moderately sized, posterior process slender, with dorsal surface convex medially.

Key References: Menard & Schuh 2011.

Remarks: This genus is considered weakly ant-mimetic with the transverse patterning of light on dark coloration across the hemelytron to give a slight appearance of an ant-like petiole. However, species in this genus do not have medial constrictions of the pronotum and sinuous lateral margins that are more characteristic of ant-like forms like other members of the *Gulacapsus* group Schuh (Menard, pers. comm. 2019).

TRIBE Nasocorini REUTER, 1883

[PHYLINAE]

(PLATES 43–45)

Diagnosis:

Combination of characters:

Most members of this tribe have a flat vertex; short and wide hind femora; row of spicules on the dorsal margin of the hind femur; sericeous or serrated scalelike setae, sometimes dark, erect setae; and/or cushion like pulvilli covering the entire ventral surface of the claw; and endosoma often elongate, frequently with a gonopore sclerite.

Key References: Schuh & Menard 2013, Menard *et al*. 2014, Schuh & Weirauch 2020.

Number of Australian genera: 1. Also included in this work are illustrations of representatives of two non-Australian (exotic) genera, *Rhinacloa* Reuter and *Atractotomus* Fieber.

Genus *Campylomma* Reuter, 1878

[PHYLINAE: NASOCORINI]

(PLATES 44, 45)

Type species: *Campylomma nigronasuta* Reuter, 1878, designated by Distant, 1904: 483.

Number of Australian species: 5.

Australian Distribution: All states and territories except Australian Capital Territory and Tasmania.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor to Major.

Host(s): Australian species, particularly the common species *Campylomma liebknechti* (Girault), commonly known "Apple Dimpling Bug" or "Dimpling Bug", have been recorded from a range of plants from a diversity of families, including Anacardiaceae, Brassicaceae, Compositae, Lamiaceae, Leguminosae, Malvaceae, Mimosaceae, Myoporaceae, Myrtaceae, Proteaceae, Rosaceae, Sapindaceae, Solanaceae, Sterculiaceae, Verbenaceae and Vitaceae. However, plants on which the damage by this bug has been well documented are apple, cotton, sunflower, lucerne, rose and other ornamentals (see Malipatil 1992), also a minor, widespread, regular pest of cotton in Australia (Wilson *et al*. 2007).

The main Australian pest species, *C. liebknechti*, is also predatory, the adults and nymphs are known to prey on eggs of *Helicoverpa* (Lepidoptera: Noctuidae) in cotton fields, on mites in orchards, and in laboratory on *Helicoverpa* eggs and cotton squares (see Malipatil 1992 for further details, as well as specific references).

Campylomma verbasci (Meyer-Dür) is a less important pest overseas (Wheeler 2000a), and some species including *C. liebknechti* and *C. verbasci* are less important predators (Wheeler 2000b).

Diagnosis:

Body without appressed scalelike setae covering entire body as in *Rhinacloa*.

All Australian species of *Campylomma*, except *C. seminigricaput*, may be diagnosed by the following combination of character states: Distal half of dorsal surface of hind femur with a row of tiny dark spicules (**Plate 44B**); vesica with two apical, blade-like structures (**Fig. 29**) and roughly S-shaped; parempodia setiform; proximal end of 2nd antennal segment with fuscous ring. *C. seminigricaput* lacks the dark spicules on hind femur and the parempodia are indistinctly setiform.

Key References: Malipatil 1992, Schuh 1984, Carvalho 1955.

Remarks: The exotic "mullein bug" *Campylomma verbasci* (Meyer-Dür) (Wheeler 2001) (**Plate 45C, D**) is illustrated here in addition to Australian taxa.

The related exotic (in Nearctic and Neotropical regions, introduced into Hawaii) genus *Rhinacloa* Reuter, differ from this genus in having body above with distinctive dense sericeous, appressed, scalelike setae (**Plate 43A, B**), and basally broad claws with pulvilli either flaplike or covering nearly entire ventral claw surface. Some species are host specific, *R. callicrates* Herring for example feeds on *Cercidium* spp. Some other species are more generalist: *R. forticornis* Reuter feeds on a wide variety of plants including cotton, and some authors considered *Rhinacloa* spp. to be important predators of cotton pests (Schuh & Schwartz 1985).

Also illustrated in this contribution is another Palaearctic species *Atractotomus mali* (Meyer-Dür) (**Plate 43C, D**) which according to Wheeler (2001) is an important predator.

TRIBE Phylini DOUGLAS & SCOTT, 1865
[PHYLINAE]
(PLATE 46)

Diagnosis:

No reliable morphological characters are presently available to define this tribe (Schuh & Menard 2013), probably not monophyletic amalgam of genera. The group shows great diversity in the Northern Hemisphere.

Forewings without white fleck on cuneus, and vertex without two white spots.

Key References: Schuh & Menard 2013, Eyles & Schuh 2003.

Number of Australian genera: 10. One representative genus, below, is included in this work.

Genus *Sthenarus* Fieber, 1858

[PHYLINAE: PHYLINI]

(PLATE 46A, B)

Type species: *Sthenarus rotermundi* Scholtz, 1847, by subsequent designation.

Number of Australian species: 1.

Australian Distribution: Victoria, South Australia and Western Australia.

Extralimital Distribution: Palaearctic; Texas.

Economic Significance: No.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). *Psallus ambiguus* (Fallén) is a less important predator (Wheeler 2000b).

Diagnosis:

General appearance similar to *Campylomma*.

Body *ca* 3 mm long; elongate-oval; yellowish or green colouration; dorsum uniformly covered with bright red or brown spots.

Head oblique. Second antennal segment longer than head width. Pronotum and hemelytra impunctate; pubescence sericeous, intermixed with simple hairs. Legs with femora usually spotted with reddish black, tibiae with reddish black spots at bases of spines.

This genus also resembles *Psallus* Fieber, but the latter differs in: dark brown to blackish body; length (apex tylus – cuneal fracture) 1.98-2.39; cuneus sometimes reddish.

Key References: Schuh 1984, Kelton 1980, 1982, Schuh & Menard 2013.

Remarks: This genus is usually associated with *Psallus* because of the great structural similarity of the endosoma. ABRS (2012) does not list either of these genera as present in Australia.

Sthenarus is primarily Palaearctic, and the species *S. australis* Reuter (**Plate 46A, B**) is the only Australian taxa tentatively placed in this genus by Schuh & Menard 2013. Similarly, *Psallus* is primarily Holarctic, and one Australian species *P. eximius* Reuter (**Plate 46C, D**) (Victoria and South Australia) has been placed in the genus *Wallabicoris* (ABRS 2012; see below). It appears they have been placed there (i.e. *Psallus*) simply because the classical taxa served as a dumping ground. All included species are in need of re-examination to determine their good generic classification.

TRIBE Semiini KNIGHT, 1923

[PHYLINAE]

(PLATES 47–48)

Diagnosis:

This tribe includes genera comprising two morphologically distinct subtribes grouped primarily on molecular data (Schuh & Weirauch 2020). Characters uniting this tribe include eyes that are parallel to the anterior margin of the pronotum; the relatively small scent gland; and the highly sclerotized ventral sac in females.

In Australia, the endemic subtribe Exocarpocorina are characterized by their unusual endosoma and female genitalia (often with lateral straps and feathery extensions and with posterior wall modifications respectively, e.g. *Polyozus* group in Weirauch 2007), and many species have scale-like setae on dorsal surface of wings or body.

Key References: Weirauch 2007, Schuh & Menard 2013, Menard *et al*. 2014.

Number of Australian genera: 6. Two representative genera, below, are included in this work.

Genus *Wallabicoris* Schuh & Pedraza, 2010

[PHYLINAE: SEMIINI]

(PLATE 47)

Type species: *Wallabicoris ozothamni*, Schuh & Pedraza, 2010, by original designation.

Number of Australian species: 37.

Australian Distribution: southern half of Australian continent (Western Australia, Northern Territory, South Australia, Victoria, Tasmania, New South Wales, Australian Capital Territory).

Extralimital Distribution: NA

Economic Significance: No to Minor.

Host(s): According to Schuh & Pedraza 2010, host association of this genus is restricted to seven plant families; Asteraceae, Boraginaceae, Fabaceae, Lamiaceae, Rhamnaceae, Sterculiaceae and Thymeleaceae.

Diagnosis:

Body relatively large and robust, size range 3.50–6.70 mm.

Male genitalia with left paramere frequently greatly elongate, always rowboat shaped and with an elongate posterior process and a sclerotized, triangular anterior process; right paramere weakly to conspicuously elongate, sometimes nearly parallel sided, apically with a short fingerlike process; and endosoma with a deep subproximal bend, but never forming a coil, the heavier (primary) strap terminating in an acute apex extending well beyond the secondary gonopore, a narrow (secondary), sometimes bifurcating or incomplete, strap connecting proximal end of secondary gonopore with body of endosoma; phallotheca L-shaped, apical portion about same length as basal portion, always with broad transparent ''window'' extending over apical half of posterior surface.

Female genitalia with unique asymmetrical sclerites of female vestibulum, and morphological elaborations of posterior wall of female genitalia.

Key References: Schuh & Pedraza 2010, Schuh & Menard 2013.

Genus *Tytthus* Fieber, 1864

[PHYLINAE: SEMIINI]

(PLATE 48)

Type species: *Tytthus pubescens* Flor, 1860, by subsequent designation.

Number of Australian species: 2.

Australian Distribution: Queensland, New South Wales, Northern Territory.

Extralimital Distribution: cosmopolitan.

Economic Significance: Minor.

Host(s): Most, if not all, species of *Tytthus* are specialized delphacid and, to a lesser extent, leafhopper egg predators. *T. mundulus* (Breddin) in particular has been documented as a good example of successful classical biological control (e.g. Wheeler 2001). The nymphs and adults of this species were discovered as predators of the sugarcane delphacid in Queensland, consequently was released into the sugarcane fields in Hawaii. *Tytthus mundulus* lives exclusively on the eggs of the sugarcane leafhopper, *Perkinsiella saccharicida* Kirkaldy, led to one of the most outstanding successes in the field of biological control of injurious insects. Other species have also shown considerable potential in the biological control of leafhoppers, planthoppers, delphacids and tropiduchid in other countries. (see further details and specific references in Henry 2012; Wheeler 2000b, 2001).

Diagnosis:

Body elongate parallel-sided, small (lengths ranging 1.08–3.60 mm), with simple pubescence.

Head relatively broad to nearly round, usually with a pale yellow spot on the vertex bordering the inner margin of each eye; slightly protruding eyes not touching the anterior margin of the pronotum. Second antennal segment shows a weak sexual dimorphism, in males cylindrical, and subequal in diameter to segment one; in female noticeably smaller diameter than segment one and tapering slightly basally.

Pronotum smooth, with a finely upturned carinate anterior margin; shiny, trapeziform to campanulate, and with lateral margins straight to weakly concave and moderately to strongly flared humeral angles, and flat to weakly raised calli. Legs pale greenish yellow, with claws slender and with setiform parempodia. Hemelytra subparallel, often brachypterous or abbreviated, pruinose, with membrane and cuneus greatly reduced; pubescence golden, appressed.

Abdomen slender and tapered. Male genitalia with genital capsule small; left paramere mitt-shaped; right paramere simple, round to elongate-oval; endosoma simple, C- to weakly S-shaped, and lacking a secondary gonopore.

Key References: Henry 2012, Menard *et al*. 2014, Schuh & Menard 2013, Schuh 1984, Kelton 1980.

Remarks: Also mentioned here in addition to Australian taxa is an exotic species, *Tytthus parviceps* (Reuter) (**Plate 48D**).

SUBFAMILY Orthotylinae

(PLATES 49–57)

Diagnosis:

Pronotum with collar small and depressed or collar absent. Parempodia fleshy, recurved or apically convergent, flattened laterally (also in phyline tribe Pilophorini).

Male with genital capsule sometimes with elongate processes; usually with long slender spicules arising from a short, non-inflatable endosoma, except in tribe such as Coridromiini. Female with characteristic flaplike K structures on posterior wall of bursa copulatrix, structure somewhat simpler in Halticini, or absent in Coridromiini.

Key Reference: Eyles 2005, Schuh & Weirauch 2020.

Tribes present in Australia: Australia has 4 of the recognised tribes (Cassis & Schuh 2012), Austromirini, Coridromiini, Halticini and Orthotylini (ABRS 2012).

Remarks: This subfamily contains relatively few crop pests that too only minor, but a larger number of facultative predators than does the Mirinae. Some predaceous orthotylines are important biological control agents (Wheeler 2000a).

KEY TO TRIBES AND REPRESENTATIVE GENERA OF ORTHOTYLINAE

(mainly based on Eyles 2005)

1. Head vertical (**Plate 49B**); eyes pressed hard against pronotum and extending down sides of pronotum (**Plate 49A, B**); [hind femora strongly incrassate compared with fore and mid femora (**Plate 49**) 2

   Head declivous (**Plate 51**); eyes if pressed hard against pronotum not extending down sides of pronotum (**Plate 51**); hind femora not strongly incrassate compared with fore and mid femora (**Plate 51**) 3

2. Body short and squat, hind femora greatly swollen and modified for jumping, hemelytra strongly deflected at cuneus (**Plate 49A, B**); with unique sickle-shaped left paramere in male containing endosoma (and functioning in the process of traumatic insemination]...Tribe Coridromiini ..... ***Coridromius***

   Not above combination of characters (**Plate 49C, D, 50**), particularly male genitalia not as above...Tribe Halticini ..... ***Halticus***

3. Elongate large body, with vertex sulcate longitudinally (**Plate 51A, B**) (sulcus may be faint in some) or strongly carinate in some myrmecomorphs (**Plate 51C, D**); frons protruding between antennae; peritreme of metathoracic gland swollen; both myrmecomorphic (**Plate 51C**) and non-myrmecomorphic (**Plate 51A**) species; calli flat and prominent in non-myrmecomorphic species; labium reaching middle coxae...Tribe Austromirini 4

   Not above combination of characters (**Plates 52–56**); [head declivous, head without sulci or carinae; eyes if pressed hard against pronotum not extending down sides of pronotum]...Tribe Orthotylini 5

4. Body not or at most only slightly myrmecomorphic (**Plate 51A, B**); head above scarcely impressed or sulcate, basally somewhat feebly marginate; macropterous; [eyes not touching pronotum; pronotum constricted a little above the middle, anterior lobe laterally rounded; posterior lobe transversely rugose, posterolateral angles prominent, posterior margin sinuately emarginate, exposing base of scutellum] ..... ***Austromiris***

   Body strongly myrmecomorphic (**Plate 51C, D**); head above strongly carinate and produced platelike with hatchlike appearance; brachypterous ..... ***Myrmecoroides***

5. Frons with a pointed or rounded protrusion anteriorly, overhanging clypeus (**Plates 52, 53**); eyes set forward, removed from anterior pronotal margin by about ½ diameter of eye ..... ***Zanchius***

   Frons without a pointed or sharply rounded protrusion anteriorly, and not overhanging clypeus; eyes not set forward (**Plate 54**) 6

6. Pronotum distinctly bell-shaped (**Plate 54A, C**); anterior lobe darker than posterior lobe (usually black or dark brown) and strongly convexly elevated; eyes noticeably large (**Plate 54**) ..... ***Cyrtorhinus***

   Pronotum not distinctly bell-shaped (**Plate 55A, C**); anterior lobe not darker than posterior lobe, and not strongly convexly elevated; eyes not noticeably large (**Plate 55**) 7

7. Body generally yellow to orange ground colour with darker orange to red or brown highlights (**Plate 55A, C**); black lanceolate scale-like setae intermixed with pale simple setae on the dorsum (**Plate 55**); [head with large bulbous eyes in males; elongate labium; male pygophore with two dorsolateral tergal processes visible externally] ..... ***Acaciacapsus***

   Body colour not as above but usually green (**Plate 56**); [vertex with a distinct raised carina at posterior margin (**Plate 56C**); second antennal segment about twice or less as long as third] ..... ***Orthotylus***

TRIBE Coridromiini TATARNIC & CASSIS, 2012
[ORTHOTYLINAE]
(PLATE 49A, B)

Diagnosis:

Readily distinguished from all other Miridae by the following characters:

Body short and squat.

Metafemora greatly swollen and modified for jumping. Hemelytra strongly deflected at cuneus.

Male genitalia with unique sickle-shaped left paramere containing endosoma (and functioning in the process of traumatic insemination). Female genitalia extremely reduced, with subgenital plate absent; vulvar region unsclerotized and symmetrical; posterior wall simple and lacking medial area and interramal lobes.

Key Reference: Tatarnic & Cassis 2012, Schuh & Weirauch 2020.

Number of Australian genera: 1.

Genus *Coridromius* Signoret, 1862

[ORTHOTYLINAE: CORIDROMIINI]

(PLATE 49A, B)

Type species: *Coridromius variegatus* Montrouzier, 1861, by monotypy.

Number of Australian species: 6.

Australian Distribution: All states and territories including Norfolk Island, except Tasmania.

Extralimital Distribution: Afrotropical region, Melanesia, New Zealand.

Economic Significance: Minor.

Host(s): All species are thought to be phytophagous. Host plant associations are known for some species, example being the common Australian species *C. chenopoderis* Tatarnic & Cassis, which is undoubtedly polyphagous, associated with plants from the following families: Asteraceae Brassicaceae Chenopodiaceae Frankeniaceae, Polygonaceae, Fabaceae, Lamiaceae, Scrophulariaceae, Malvaceae, Thymelaeaceae, Myrtaceae, Proteaceae, Rosaceae, Loranthaceae, Santalaceae, Nitrariaceae, and Rutaceae (Tatarnic & Cassis 2008).

Diagnosis:

Body compact and stout; most species 2–3 mm in length; generally fawn to brown.

Head short and broad; alternate brown and pale stripes on anterior of head; eyes substylate; frons striolate finely punctured. Antennae short. Segments of labium narrow.

Pronotum with pseudocollar; margins carinate. Legs with hind femora greatly enlarged; frequently marked with dark brown diagonal banding (**Plate 49B**); femora with recessed bothria. Hemelytra sharply deflected at costal fracture.

Male genitalia unique; aedeagus simple, membranous, without sclerotisations; left paramere generally sickle shaped, with gutter running from base to apex; right paramere smaller than left, triangulate to club-shaped. Female genitalia reduced, with the posterior wall entirely membranous.

Key References: Carvalho 1955, Tatarnic & Cassis 2008.

Remarks: In Australia and New Zealand, *C. variegatus* (Montrouzier) does not occur but three other species: *C. chenopoderis* Tatarnic & Cassis, *C. monotocopsis* Tatarnic & Cassis, and *C. pilbarensis* Tatarnic & Cassis do in Australia, but only *C. chenopoderis* in New Zealand. Superficially all four species are strikingly similar, but *C. variegatus* can readily be distinguished from the others by the small but distinctly rounded lobe on the upper posterior margin of the metepimeron, and males of *C. variegatus* by the relatively longer apex of the right paramere (Tatarnic & Cassis 2008).

TRIBE Halticini KIRKALDY, 1902
[ORTHOTYLINAE]
(PLATES 49C, D, 50)

Diagnosis:

Body generally stout and compact; usually black or dark brown with or without lighter contrasting markings.

Head typically vertical, height of genae almost always equal to or greater than height of eye; eyes pressed hard against pronotum and extending down sides of pronotum. Antennae often spinose.

Pronotum campanulate, rectangulate or trapezoidal; pronotal texture most often smooth and glossy, sometimes punctate; vestiture variable, either only with thin simple setae, or also with pale and lamellate setae. Legs often spinose; hind femora strongly incrassate compared with fore and mid femora.

Male with basal portion of both parameres usually elongate, both parameres ventrally concave; left paramere usually L-shaped, sometimes with swollen sensory lobe, with long apophysis; right paramere flattened and generally spoon- or club-shaped. Female with posterior wall sometimes without interramal lobes.

Key References: Eyles 2005, Tatarnic & Cassis 2012, Schuh & Weirauch 2020.

Number of Australian genera: 3. One representative genus, below, is included in this work. Also included are two exotic genera *Labops* Burmeister [Holarctic] (**Plate 50C, D**) and *Microtechnites* Berg [Neotropical and Nearctic regions] (**Plate 50A, B**), related to *Halticus* Hahn, see diagnoses below.

Genus *Halticus* Hahn, 1833

[ORTHOTYLINAE: HALTICINI]

(PLATE 49C, D)

Type species: *Halticus apterus* Fabricius, 1794, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, New South Wales, Australian Capital Territory, Victoria and Lord Howe Island.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor.

Host(s): The common species *H. tibialis* has been recorded from *Ipomoea* sp. Convolvulaceae; *Phaseolus* sp. Fabaceae; and unknown sp. Cucurbitaceae (Carvalho 1956). Overseas species, *Microtechnites bractatus* (Say) and *Labops hesperius* Uhler have been considered as less important pests by Wheeler 2000a.

Diagnosis:

Body short, oval, black, shiny.

Head vertical, dorsoventrally elongate, carina sharp; eyes contiguous, overlap anterior margin of pronotum. Second antennal segment longer than basal width of pronotum.

Pronotum trapeziform, smooth, lateral margins sharply angled, basal margin convex.

Femora black; hind femora saltatorial; tibiae pale. Hemelytra with patches of sericeous pubescence.

Right paramere elongate and flat; left paramere with twisted apophysis; scoop-shaped secondary gonopore and vestigial endosoma lacking spicules. Large, thin sclerotized rings.

[The two related exotic genera *Labops* Burmeister [Holarctic] (**Plate 50C, D**) and *Microtechnites* Berg [Neotropical and Nearctic regions] (**Plate 50A, B**) differ from *Halticus* as follows: *Labops* – Dull black body colour. Head tall, eyes pedunculate and angled upwards; vertex without an arcuate carina; second antennal segment shorter than width of pronotum at base. Hemelytra of brachypterous individuals nearly covering abdomen. Endosoma with mass of thin, needle-like spicules suspended in the membrane anterior to secondary gonopore. *Microtechnites* – Dark body colour, with moderate distribution of white scale-like setae. Eyes sessile. Hemelytra macropterous or brachypterous. Parameres subequal in size; left paramere L-shaped; male endosoma with numerous elongate spicules, often serrate. Female sclerotized rings widely separated, diagonally orientated.]

Key References: Tatarnic & Cassis 2012, Kelton 1980, Carvalho 1955.

Remarks: According to Tatarnic & Cassis (2012), all *H. minutus* from Africa; South-East Asia, South Pacific including Australia and New Zealand belong to *Halticus tibialis* Reuter, 1891. The second species classified in literature under *Halticus* from Australia, *H. chrysolepis* Kirkaldy, commonly known as "Kikuyu Grass Bug", is an accidental introduction from Hawaii, now placed in *Microtechnites*.

TRIBE Austromirini CARVALHO, 1976
[ORTHOTYLINAE]
(PLATE 51)

Diagnosis:

Body large and elongate in shape; either myrmecomorphic or non-myrmecomorphic.

Head with a longitudinally sulcate vertex or with frons and clypeus strongly compressed, platelike with hatchlike appearance; frons protruding between antennae. Labium reaching middle coxae.

Pronotum with anterior portion narrowed; calli flat and prominent in macropters but not in brachypters. Peritreme of metathoracic glands swollen. Parempodia divergent basally, large and convergent apically.

Key references: Carvalho 1976, Cassis & Schuh 2012.

Number of Australian genera: 12. Two representative genera, below, are included in this work.

Genus *Austromiris* Kirkaldy, 1902
[ORTHOTYLINAE: AUSTROMIRINI]
(PLATE 51A, B)

Type species: *Austromiris viridissimus* Kirkaldy, 1902, monotypy.

Number of Australian species: 2.

Australian Distribution: New South Wales, Victoria, Tasmania, South Australia, Western Australia.

Extralimital Distribution: NA

Economic Significance: No.

Host(s): None recorded. (Herbivore, sap-feeder) (Cassis & Gross 1995).

Diagnosis:

Head with vertex scarcely impressed or sulcate, basally somewhat feebly marginate; eyes not touching pronotum.

Pronotum constricted a little above the middle; anterior lobe laterally rounded; callose sub medianly on either side with a small impression on either side of middle; posterior lobe transversely rugose, lateral margins sinuately divergent, posterolateral angles prominent, posterior margin sinuately emarginate, exposing apex of scutellum. Hemelytra with membranal areas entirely membranous.

Key References: Carvalho 1955, Kirkaldy 1902.

Genus *Myrmecoroides* Gross, 1964

[ORTHOTYLINAE: AUSTROMIRINI]

(PLATE 51C, D)

Type species: *Myrmecoroides carinatus* Gross, 1964, by original designation.

Number of Australian species: 5.

Australian Distribution: Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia.

Extralimital Distribution: NA

Economic Significance: No.

Host(s): None recorded.

At least three species have been found associated with grasses (Cassis & Wall 2010).

Diagnosis:

Body of males macropterous; females micropterous.

Head with frons and clypeus strongly bicompressed, platelike, with hatchetlike appearance; bucculae short, arcuate. Labrum flat, triangular, not modified. Labium slender, reaching base of mesocoxae. Antennae slender, bicoloured, first segment bottle-shaped.

Pronotum with collar present; callosite region restricted; margins parallel-sided, weakly hour-glass shaped in females. External efferent system of metathoracic glands moderately developed; peritreme tumid. Metathoracic spiracle visible, bounded by evaporative bodies. Legs with pretarsal parempodia lamellate, broad, recurved apically; pulvilli prominent. Costal margins of male forewings strongly concave.

Male with genital opening of pygophore small; parameres short, clublike; aedeagus simple, with one enlarged, elongate basal sclerite, secondary gonopore simple. Female pregenital abdomen strongly constricted basally; sclerotized rings elaborate, folded.

Key Reference: Cassis & Wall 2010.

TRIBE Orthotylini VAN DUZEE, 1916
[ORTHOTYLINAE]
(PLATES 52–57)

Diagnosis:

Four generic groups with varying morphology are recognised in this tribe (Schuh 1974).
Body not myrmecomorphic; colour usually pale; upper surface rarely punctate.

Head declivous; eyes if pressed hard against pronotum not extending down sides of pronotum.

Hind femora not strongly incrassate compared with fore and mid femora. Wings usually fully developed.

Abdomen not constricted at base. Endosoma usually with sclerotised spicules. Posterior wall of bursa copulatrix with pair of K-structures.

Key References: Eyles 2005, Carvalho 1956, Linnavuouri 1994.

Number of Australian genera: 13. Four representative genera, below, are included in this work; also included are illustrations of the non-Australian (exotic) *Heterocordylus malinus* Slingerland, commonly "Apple red bug" (see **Plate 57C, D**).

Genus *Zanchius* Distant, 1904

[ORTHOTYLINAE: ORTHOTYLINI]

(PLATES 52, 53)

Type species: *Zanchius annulatus* Distant, 1904, by original designation.

Number of Australian species: NA.

Australian Distribution: NA.

Extralimital Distribution: Paleotropical.

Economic Significance: No to Minor.

Host(s): None recorded from Australia.

Adults and nymphs of some species are known to co-occur with leafhoppers on trees and shrubs (Wheeler 2001). Some known hosts from Micronesia are *Macaranga* Thouars. (Euphoribiaceae), *Ipomoea* L. (Convolvulaceae), *Terminalia* L. (Combretaceae), *Hibiscus* L. (Malvaceae), and *Piper guahamense* C. DC (Piperaceae) (Carvalho 1956, Usinger 1946).

Diagnosis:

Body elongate oval; green in colour.

Head short and quadrate; frons anteriorly projected; eyes removed from anterior pronotal margin by about half diameter of eye.

Pronotum small; lateral and basal margins distinctly slightly sinuated. Mesoscutum broadly visible. Legs without patterns. Hemelytra with lateral margins rounded.

Genitalia. Pygophore conical; right paramere small; aedeagus broad, provided with dentate, sclerotised plates, sometimes also with 1-2 falcate or clawlike spiculi.

Key References: Linnavuori 1994, Kim *et al*. 2017.

Remarks: Eyles (2005) described three new species as the first representatives of the Paleotropical genus *Zanchius* from New Zealand. It appears the genus is not yet formally recorded from Australia, although specimens of several undescribed species exist in Australian collections.

Genus *Cyrtorhinus* Fieber, 1858

[ORTHOTYLINAE: ORTHOTYLINI]

(PLATE 54)

Type species: *Cyrtorhinus caricis* Meyer-Dur, 1843, by monotypy.

Number of Australian species: 1

Australian Distribution: Queensland, Northern Territory.

Extralimital Distribution: Afrotropical, Nearctic, Palaearctic and Oriental regions; Micronesia; Melanesia; Polynesia; New Zealand.

Economic Significance: Minor.

Host(s): *Cyrtorhinus lividipennis* Reuter recorded as predator of *Peregrinus maidis* (Ashmead) (maize planthopper) Delphacidae on corn and *Sporobolus* R.Br. (Poaceae); *Nilaparvata lugens* (Stål) brown planthopper Delphacidae on rice; incidental biting on humans (Cassis & Gross 1995). Both *C. fulvus* Knight and *C. lividipennis* occurring in the Pacific and Oriental regions are important predators of delphacid and other leaf and planthoppers (Wheeler 2000b).

Diagnosis.

Body elongate, black and green; ventral surface black, abdomen in female often pale; legs pale.

Eyes pale, eyes noticeably large, removed from anterior margin of pronotum by about diameter of antennal segment 2.

Pronotum distinctly bell-shaped, without an anterior collar, anterior lobe darker than posterior lobe (usually black or dark brown, variable in non-Australian specimens), and strongly convexly elevated. Scutellum black. Hemelytra pale with fuscous; pubescence simple moderately long, dense.

Key References: Eyles 2005, Schuh 1974, Carvalho 1955, Kelton 1980.

Genus *Acaciacapsus* Cassis & Symonds, 2014

[ORTHOTYLINAE: ORTHOTYLINI]

(PLATE 55)

Type species: *Acaciacapsus aureolus* Cassis & Symonds, 2014, by original designation.

Number of Australian species: 8.

Australian Distribution: Queensland, New South Wales, South Australia, Western Australia, Northern Territory.

Extralimital Distribution: NA

Economic Significance: No.

Host(s): Five of the eight species have *Acacia* spp. records, with the remainder unknown. Some species are known from multiple species of *Acacia species*, whereas others restricted to a single *Acacia species* (Cassis & Symonds 2014).

Diagnosis:

Body generally yellow to orange ground colour with darker orange to red or brown highlights; black lanceolate scale-like setae intermixed with pale simple setae on the dorsum.

Head with large bulbous eyes in males. Labium elongate.

Pronotum usually with posterior lobes. Legs long and slender.

Abdomen small. Male genitalic characters of significance that are visible externally include: two dorsolateral tergal processes on the pygophore and a mostly acute sensory lobe of left paramere.

Key References: Cassis & Symonds 2014.

Genus *Orthotylus* Fieber, 1858

[ORTHOTYLINAE: ORTHOTYLINI]

(PLATES 56, 57A, B)

Type species: *Orthotylus marginalis* Reuter, 1883, by subsequent designation.

Number of Australian species: 3

Australian Distribution: New South Wales, Australian Capital Territory, Victoria, South Australia, Western Australia, N Australia (no exact locality).

Extralimital Distribution: cosmopolitan.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder (Cassis & Gross 1995). Some overseas species have been collected on a range of hosts such as apple and pear, also on species of *Acer, Fagus, Fraxinus, Juglans, Tilia* and *Ulmus*, and predaceous on pear psylla and aphids, (Canada; Kelton 1982); certain African species on hosts such as *Acacia* Miller (Leguminosae), *Erica arborea L.* and *Ericinella manni* Hook. (Ericaceae), *Indigofera L* (Leguminosae), *Tamarindus indicus L.* (Tamaricaceae), and Chenopodiaceae (Linnavuori 1994).

Diagnosis:

Body green or black although sometimes red or brown; elongate-ovate; pubescent.

Head in lateral view roundly declining ventrad, basal margin of vertex usually keeled. Second antennal segment about twice or less as long as third.

Pronotum trapezoidal; smooth; often finely transversely rugose; lateral margins angulate; calli distinct, smooth. Hemelytra impunctate; pubescence simple.

Structure of male genitalia often complicated.

Key References: Linnavuori 1994, Carvalho 1955, Kelton 1980.

SUBFAMILY Bryocorinae

(PLATES 58–69)

Diagnosis:

No single character defines this subfamily as currently recognized. The following combination of characters however, will allow recognition of the included taxa: Head with antennal fossae placed above the suture between mandibular and maxillary plates in lateral view (also occurring in some Cylapinae).

Pronotum with a more or less distinct collar.

Legs with tarsi swollen (incrassate) distally except Dicyphini, which have linear tarsi; claws with large fleshy pulvilli along under surface (Eccritotarsini only); parempodia bristlelike or absent (Bryocorini).

Hemelytral membrane usually with a single membrane cell, however, all dicyphines, some Felisacini and some Eccritotarsini have two membrane cells.

Key References: Schuh 1976, Ferreira & Henry 2011, Konstantinov *et al.* 2018, Schuh & Weirauch 2020.

Tribes present in Australia: According to ABRS (2012), the tribes Bryocorini, Dicyphini, Eccritotarsini, Felisacini, and Monaloniini occur in Australia. However, *Bromeliaemiris* Schumacher, the only Australian genus included in Bryocorini (Cassis & Gross 1995, ABRS 2012), has now been placed in tribe Eccritorarsini (e.g. Namyatova *et al*. 2016, Konstantinov *et al*. 2018).

Remarks: This subfamily contains some important pests of tropical crops (Wheeler 2000a). Feeding habits within Bryocorinae are diverse, and they are known to feed on a wide range of angiosperms, but there are also fern-feeding clades (Wheeler 2001, Cassis & Schuh 2012).

KEY TO TRIBES AND REPRESENTATIVE GENERA OF BRYOCORINAE

(based on Konstantinov *et al.* 2018, Namyatova *et al.* 2016, Ferreira & Henry 2011)

1. Hemelytra glassy or transparent; head square across front, with eyes nearer to anterior than to posterior (**Plate 58**); [head with eyes usually distinctly removed from pronotum, not carinate posteriorly; pronotum with fused calli and distinct sulcus delimiting calli posteriorly]...Tribe Felisacini ..... ***Felisacus***

   Hemelytra opaque; head otherwise (**Plate 60**) 2

2. Claws with large, disc-shaped pulvilli covering nearly the entire inner (mesal) claw surface; unguitractor plate with setiform, asymmetrical parempodia; [ventral surface of claw usually with a pulvillar comb of elongate spicules] ...Tribe Eccritotarsini 3

   Claws without pulvilli; unguitractor plate with large fleshy pseudopulvilli (**Figs. 13, 27**); parempodia setiform or absent 4

3. Pronotum with a distinct, narrow collar (subequal to diameter of fore tibia), dorsally almost of uniform width and well delimited by a deep groove (**Plate 60**) ..... ***Bromeliaemiris***

   Pronotum without a distinct, narrow collar, sometimes with a broader collar-like area (much broader than diameter of fore tibia) but not of uniform width dorsally, lacking a well-delimited dorsal groove (**Plate 59A, C**); [antenna never as long as body to apex of membrane (e.g. **Plate 64**)] ..... ***Frontimiris***

4. Pronotum with a distinct, narrow collar (subequal to diameter of fore tibia), dorsally almost uniform width and well delimited by a deep groove (**Plates 60, 61**) 5

   Pronotum without a distinct, narrow collar, sometimes with a broader collar-like area (much broader than diameter of fore tibia), but not usually of uniform width dorsally, lacking a well-delimited dorsal groove (**Plate 65A**); [body elongate, usually more than 8.0 mm long (**Plate 65**); antenna as long or longer than body to apex of membrane (**Plate 65**); scent-efferent system without evaporative area]...Tribe Monaloniini 9

5. All tarsal segments dilated or thickened distally (**Plate 60C**); hind tibia without distinct spines or spines small and obscured by simple setae (**Plate 60C**); hemelytral membrane with one cell; short, oval or elongate-oval species; [pronotum trapeziform, without constriction behind calli]...Tribe Bryocorini [EXOTIC] ..... ***Bryocoris***

   All tarsal segments uniformly slender, occasionally slightly widened distally (**Plate 61B, 62D**); hind tibia with distinct spines (**Plate 61B**); hemelytral membrane with two cells; elongate, slender species (**Plate 61**); [metathoracic spiracle surrounded by dense microsculpture]...Tribe Dicyphini 6

6. Both sexes brachypterous or macropterous; body covered with long and rigid/bristly setae; pronotum as long as wide, parallel sided (**Plate 61**); on sundews ..... ***Setocoris***

   Not above combination of characters (**Plate 62**); [head rounded in front, sides of head behind eyes curved, head narrower at neck than at eyes; first antennal segment not longer than width of head between eyes; labium reaching intermediate coxae or to hind coxae] 7

7. Pygophore without distinct processes from lower margin (**Fig. 36**); [left paramere thickest at base, apical half flattened towards tip (**Fig. 39**)] ..... ***Singhalesia***

   Pygophore with distinct processes from lower margin (**Figs. 37, 38**) 8

8. Upper margin of pygophore acutely produced (**Fig. 37**); process of lower margin of pygophore not furcate (**Fig. 37**); left paramere elbowed, apical half long and slender (**Fig. 40**) ..... ***Nesidiocoris***

   Upper margin of pygophore more or less truncate (**Fig. 38**); process of lower margin of pygophore furcate (**Fig. 38**); left paramere usually with a blade at apex (**Fig. 41**) ..... ***Engytatus***

9. Scutellum with a single very long and slender spine ending in button like knob (**Plates 65, 66**) ..... ***Helopeltis***

   Scutellum without a spine as above (**Plate 69**) 10

10. Third and fourth antennal segments distinctly club shaped; body short and ovate (**Plate 67**) ..... ***Volkelius***

    Third and fourth antennal segment elongate; body linear, and elongate (**Plate 69**) 11

11. Head between antennal bases broadly rounded and distinctly produced anteriorly (**Plate 68**) ..... ***Rayieria***

    Head between antennal bases slightly concave or in almost straight line but never produced anteriorly (**Plate 69**) ..... ***Ragwelellus***

TRIBE Felisacini NAMYATOVA, KONSTANTINOV & CASSIS, 2016
[BRYOCORINAE]
(PLATE 58)

Diagnosis:

Body generally small (under 5 mm in length), elongate, often with transparent or semi-transparent hemelytra.

Head with eyes distinctly removed from pronotum, with long gula; eyes inserted at front of head. Labium short, segments 1 and 2 almost as long as wide, sometimes slightly elongate, each of them distinctly shorter than segment 3, segment 4 distinctly longer than segment 3.

Pronotum always with fused calli, delimited by sulcus posteriorly, with two pairs of punctures laterally on this sulcus and with pair of punctures anteriorly to sulcus; pleura with distinct triangular evaporatorium. Pretarsus with outer parempodia shorter than inner one and large pseudopulvilli. Hemelytra with row of punctures on claval vein, membrane cell not surpassing apex of cuneus.

Key References: Namyatova *et al*. 2016; Schuh & Weirauch 2020.

Number of Australian genera: 1.

Genus *Felisacus* Distant, 1904
[BRYOCORINAE: FELISACINI]
(PLATE 58)

Type species: *Felisacus glabratus* Motschulsky, 1863, by subsequent designation.

Number of Australian species: 4.

Australian Distribution: Queensland, New South Wales, Victoria, Tasmania, South Australia, Christmas Island, Lord Howe Island, also New Zealand.

Extralimital Distribution: Cosmopolitan, dominantly in Oriental and Australian regions, also Seychelles and Madagascar.

Economic Significance: No.

Host(s): Herbivore, sap-feeder; associated with ferns (Cassis & Gross 1995).

Diagnosis:

Head square across the front, with eyes nearer to anterior than to posterior; head with a distinct neck. Labial segments 1 and 2 almost as long as wide, sometimes twice as long as wide, but each of them distinctly shorter than segment 3.

Pronotum smooth, usually shining, never punctate, strongly narrowed in front with two pairs of punctures laterally on sulcus delimiting calli and with pair of punctures anteriorly to sulcus. Pleura with distinct triangular scent gland evaporative area. Spiracle oval, surrounded with few evaporative bodies. Hemelytra glassy or transparent.

Key References: Eyles & Schuh 2003, Namyatova & Cassis 2016c, Carvalho 1956.

TRIBE Bryocorini BAERENSPRUNG, 1860
[BRYOCORINAE]
(PLATE 60C, D)

Diagnosis:

Pronotum punctate, collar narrow and distinct. Ostiolar peritreme well-developed with a distinct knob at the end of the channel. Tarsi weakly dilated, with recurved apically-convergent pseudopulvilli arising from inside of each claw, and parempodia absent. Hemelytral membrane with single closed cell.

Key Reference: Carvalho 1955, Schuh & Weirauch 2020.

Number of Australian genera: None.

Remarks: Illustrated in this contribution is *Bryocoris pteridis* (Fallén), an exotic species to Australia (**Plate 60C, D**).

TRIBE Eccritotarsini BERG, 1883
[BRYOCORINAE]
(PLATE 59)

Diagnosis:

Ostiolar peritreme and evaporative area greatly reduced or absent, usually with narrow tongue-shaped peritremal disc and weak ostiolar canal. Legs with area of insertion of metafemoral trichobothria 2, 3 and 4 distinctly swollen; pulvilli large and disc-shaped, covering nearly the entire inner (mesal) surface of claw; ventral surface of claw usually with a pulvillar comb of elongate spicules; unguitractor plate with setiform, asymmetrical parempodia. ; tarsi dilated. Wing membrane with single closed cell.

Male genitalia with strongly developed vesical sclerite bearing small membranous region distally.

Key References: Schuh 1976 & 1995, Stonedahl 1988b, Schuh & Weirauch 2020.

Number of Australian genera: 2. Both the genera, below, are included in this work. Also included are illustrations of the exotic bean capsid, *Pycnoderes quadrimaculatus* Guérin-Méneville (**Plate 59A, B**), see notes below.

Genus *Frontimiris* Carvalho, 1981

[BRYOCORINAE: ECCRITOTARSINI]

(PLATE 59C, D)

Type species: *Frontimiris fossatus* Carvalho, 1981, by original designation.

Number of Australian species: 3.

Australian Distribution: Queensland, Northern Territory, Western Australia.

Extralimital Distribution: Oriental Region; Melanesia.

Economic Significance: No.

Host(s): One species, *Frontimiris pandanaphilus* Cassis, Cheng & Tatarnic was discovered in the East Kimberley in association with the monocot species *Pandanus spiralis* R. Br. (Pandanaceae) (Cassis *et al*. 2016).

Diagnosis:

Body small, elongate ovoid dorsoventrally flattened, covered with moderately dense setiferous punctures. Body colour mostly yellow, often with red or dark brown markings.

Head with frons strongly projected in front of eyes covering clypeus in dorsal view, strongly depressed.

Pronotum tripartite, with triangular collar region, separated calli, medially depressed and convex disc. Scutellum flat. Ostiolar peritreme thin, depressed, striated, tongue like. Metathoracic spiracle weakly exposed. Costal margins of forewings weakly convex, clavus very thin extending to near apex of corium.

Male genitalia. Pygophore conical and weakly asymmetrical; parameres overlapping along midline; right paramere arcuate; left paramere C-shaped or Y-shaped. Endosoma membranous with two apical branches; secondary gonopore apical; phallotheca narrow, tubelike, usually with apical lateral branches, single or paired.

Key References: Cassis *et al*. 2016, Carvalho 1981.

Remarks: Illustrated in this contribution in addition to Australian species is the exotic bean capsid, *Pycnoderes quadrimaculatus* Guérin-Méneville (**Plate 59A, B**), a less important pest species (Wheeler 2000a). This species differs by having black hemelytra with one to several pale spots along embolium (**Plate 59A**), compound eyes extending beyond lateral margins of pronotum, pronotum sharply convex, usually prominent, much higher than hemelytra, and embolium explanate.

Genus *Bromeliaemiris* Schumacher, 1919

[BRYOCORINAE: ECCRITORARSINI]

(PLATE 60A, B)

Type species: *Bromeliaemiris bicolor* Schumacher, 1919, by monotypy.

Number of Australian species: 1.

Australian Distribution: Queensland, intercepted in Hawaii.

Extralimital Distribution: Oriental Region; Melanesia.

Economic Significance: No to Minor.

Host(s): Herbivore, sap-feeder; host *Dendrobium superbiens* H. G. Reichb. (Orchidaceae) Orchid. (Cassis & Gross 1995).

Diagnosis:

Body elongate; pilose with fine hairs.

Head short, twice as wide as long; vertex convex; eyes sub-stylate, well removed from anterior margin of pronotum. First antennal segment shorter than length of vertex; all segments with fine erect hairs not longer than width of segments. Labium reaching hind coxae.

Pronotum including collar punctate, narrowed anteriorly; collar thicker than thickness of first antennal segment; calli punctate. Scutellum laterally obscurely punctate. Tarsi with third segment swollen at apex, longer than first, subequal to second; claws simple, without parempodia; pseudopulvilli well developed with two fringes of long setae, arising from ventral surface of claws. Hemelytra almost impunctate, extending well beyond apex of abdomen.

Key References: Ghauri 1975 (Genus *Mertilanidea* Ghauri, synonymised with this genus), Carvalho 1955.

TRIBE Dicyphini REUTER, 1883
[BRYOCORINAE]
(PLATES 61–64)

Diagnosis:

Body slender, elongate.

Head with labial segments long.

Pronotal collar narrow, rounded, impunctate. Metathoracic spiracle exposed, densely surrounded with evaporative bodies. Ostiole a depressed cuticular region, ostiolar auricle well-developed to reduced. Hind tarsus with segment 1 distinctly shorter than segment 2, segment 3 shorter than segment 2, tarsi uniformly slender, not dilated; tarsal claws sometimes cleft at base; parempodia hairlike; pseudopulvilli present, arising from membranous area between claw and unguitractor plate, or pulvilli large and attached to entire ventral claw surface. Cuneus subtriangular, with convex medial margin, wing membrane with one or two closed cells.

Male genitalia greatly asymmetrical. Right paramere obsolete. Secondary gonopore undifferentiated. Female genitalia with posterior wall a simple plate.

Key References: Namyatova *et al*. 2016, Konstantinov *et al*. 2018, Kelton 1982, Schuh & Weirauch 2020.

Number of Australian genera: 4. All genera, below, are included in this work.

Genus *Setocoris* China & Carvalho, 1951

[BRYOCORINAE: DICYPHINI]

(PLATE 61)

Type species: *Setocoris bybliphilus* China & Carvalho, 1951, original designation.

Number of Australian species: 3.

Australian Distribution: Western Australia. [According to Atlas of Living Australia, un-confirmed records exist from Tasmania and New South Wales].

Extralimital Distribution: NA.

Economic Significance: Minor.

Host(s): Predator, sap-feeder, possibly mixed feeder, cleptoparasite, associated with insectivorous plants; hosts *Byblis gigantea* Lindley (Byblidiaceae); *Drosera pallida* Lindley and *D. erythrorhiza* Lindley (Droseraceae) (Cassis & Gross 1995).

Diagnosis:

Body in both sexes brachypterous or macropterous, covered with long and rigid setae.

Head smooth, shining, with a very short neck, eyes round, situated in middle of head, separated from pronotum by a distance equal to or less than width of one eye. Labium reaching apex of middle coxae, segment 1 wider and thicker than others, 2 thicker than 3 which is thicker than 4. Antennae with segment 1 extending beyond tylus by half its length, 2 slightly incrassate apically with a few long setae, 3 as thick as 2, more densely covered with setae, 4 about twice as wide as 2.

Pronotum as long as wide at base, parallel sided, strongly convex in middle with declivous margins, pronotal collar present, posterior margin straight. Legs stout and provided with many black strong long setae, especially on mid and hind tibiae; tarsi with third segment longer than first and second; claws short, thickened at base. Hemelytra in brachypterous forms with clavus fused with corium, cuneus and membrane absent; in macropterous forms all normal.

Abdomen convex in middle, depressed at sides, connexivum strongly reflexed, covered with numerous strong setae of the same type as those found on pronotum and scutellum.

Pygophore ventral margin without distinct process, dorsal margin possesses a distinct prominence (acuminate or slightly rounded apically) a little to left of middle line. Aedeagus with vesica separated into tuberculate lobes. Left paramere with base very broad, apical half bladelike with tip bent.

Key References: China & Carvalho 1951, China 1953, Carvalho 1955.

Genus *Singhalesia* China & Carvalho, 1952

[BRYOCORINAE: DICYPHINI]

(PLATE 62)

Type species: *Singhalesia indica* Poppius, 1913, by monotypy

Number of Australian species: 1

Australian Distribution: Queensland.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions; Melanesia.

Economic Significance: No.

Host(s): None recorded; herbivore, predator, sap-feeder; associated with sticky plants (Cassis & Gross 1995).

Diagnosis:

For these three genera (viz., *Singhalesia, Nesidiocoris* and *Engytatus*), diagnostic key characters are mainly on male genitalia, see China & Carvalho 1952.

Body elongate.

Head pointed in front, narrower at neck than at eyes; eyes relatively large, separated from pronotum by a distance equal to or less than length of eye seen from above. Antennae short, robust, first joint slightly shorter than head, not longer than width of head between eyes.

Pronotum narrowed anteriorly, with a distinct anterior collar, transversely constricted before middle with a distinct central longitudinal sulcation, posterior disc of pronotum convex, pronotal calli obsolete, or if not, without the distinct transverse furrow behind them. Mesonotum exposed. Scutellum subtriangular, a little tumid. Legs of moderate length, slender. Hemelytra with lateral margins straight; cuneus much longer than broad; membrane considerably passing abdominal apex.

Male genitalia: Pygophore very short, deep, without processes on ventral margin (**Fig. 36**). Left paramere thickest at base, apical half flattened and spatulate towards tip (**Fig. 39**). Aedeagus without spiculate chitinized endosomal appendages.

Key References: China & Carvalho 1952.

Genus *Nesidiocoris* Kirkaldy, 1902

[BRYOCORINAE: DICYPHINI]

(PLATE 63A, B)

Type species: *Nesidiocoris volucer* Kirkaldy, 1902, by monotypy.

Number of Australian species: 1

Australian Distribution: Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia, Western Australia, especially in tropical regions.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder; host *Nicotiana* L. (Solanaceae) Tobacco; *Cleome* L. (Capparaceae); economic pest of tobacco (Cassis & Gross 1995. According to Wheeler 2000a, *N. tenuis* (Reuter) is a less important pest species (Wheeler 2000a), as well as a less important predaceous species (Wheeler 2000b).

Diagnosis:

As in *Singhalesia*, except: Male genitalia. Pygophore with dorsal margin produced in middle to form a triangular apically pointed lobe, and ventral margin produced towards right side into a narrow process widened and truncate at apex, both processes about equal length (**Fig. 37**). Left paramere acutely elbowed near base with distal region long, slender and pointed (**Fig. 40**). Right paramere long and slender, base widened. Aedeagus with endosoma densely and finely tuberculate with an area of large conical tubercles, dorsal side of phallosoma with a transverse chitinized band.

Key References: China & Carvalho 1952, Distant 1904.

Genus *Engytatus* Reuter, 1876

[BRYOCORINAE: DICYPHINI]

(PLATE 64)

Type species: *Engytatus geniculatus* Reuter, 1876, by monotypy.

Number of Australian species: 2

Australian Distribution: Queensland, New South Wales.

Extralimital Distribution: Cosmopolitan.

Economic Significance: Minor.

Host(s): Herbivore, sap-feeder; host *Nicotiana* L., (Solanaceae) Tobacco; associated with sticky plants (Cassis & Gross 1995).

The non – Australian *Engytatus modestus* (Distant) is considered a less important pest species (Wheeler 2000a), also less important predacious species (Wheeler 2000b). *Engytatus modestus* is commonly known as "Tomato Mirid" or "tomato girdler" (Wheeler 2000a).

Engytatus nicotianae (Koningsberger) is commonly known as Tomato Mirid (Cassis & Gross 1995).

Diagnosis:

As in *Singhalesia*, except:

Male genitalia: Pygophore with process of dorsal margin simple without process or lobe, process of lower margin furcate – one lobe being acute and apically bent and other truncate (**Fig. 38**). Left paramere thickened at base with apical half blade-like bent at right angle to base (**Fig. 41**). Right paramere linear, slightly enlarged at base. Aedeagus with endosoma not tuberculate, dorsal side of phallosoma with a chitinized strip with a short transverse chitinized band at base.

Key References: Ferreira & Henry 2011, Carvalho 1956, China & Carvalho 1952, Reuter 1876.

TRIBE Monaloniini REUTER, 1892

[BRYOCORINAE]

(PLATES 65–69)

Diagnosis:

Body large (more than 8 mm), elongate cylindrical, often brightly coloured, with different outgrowths on different parts of body. Head, pronotum, and hemelytra shiny.

Head short, broad, more or less transverse; eyes often removed from pronotum. Antennae shorter than body, to extremely elongate and longer than body. Labial segments 1 and 2 more than two times as long as wide, segment 4 elongate, often distinctly longer than segment 3.

Pronotal collar weakly separated, usually delimited only laterally; metathoracic scent-efferent system without evaporative area. Pretarsus with pseudopulvilli and symmetrical parempodia. Membrane with single cell, latter often elongate, surpassing apex of cuneus.

Key References: Stonedahl 1991, Namyatova *et al*. 2016.

Number of Australian genera: 6. Four genera, below, are included in this work. Also included are illustrations of the exotic genus *Pseudodoniella* China & Carvalho (*P. typica* (China & Carvalho) (**Plate 63C, D**), related to *Volkelius* Distant, see diagnosis below.

Genus *Helopeltis* Signoret, 1858

[BRYOCORINAE: MONALONIINI]

(PLATES 65–66)

Type species: *Helopeltis antonii* Signoret, 1858, by monotypy.

Number of Australian species: 2

Australian Distribution: Queensland, New South Wales, Northern Territory.

Extralimital Distribution: Afrotropical, Palaearctic and Oriental regions; Melanesia.

Economic Significance: Major.

Host(s): Herbivore, sap-feeder. *Helopeltis* spp. have been recorded from a vast number of plants in the African, Oriental and Australasian regions. These plant hosts are from families including Acanthaceae, Anacardiaceae, Annonaceae, Araliaceae, Bixaceae, Euphorbiaceae, Fabaceae, Lauraceae, Myrtaceae, Passiofloraceae, Rubiaceae, Sterculiaceae and Theaceae. Pest Status: According to Wheeler (2000a), species such as *H. antonii* Signoret (**Plate 66C**) and *H. theivora* Waterhouse (**Plate 66D**) are important pests, while other species such as *H. clavifer* (Walker) are less important as pests. Primary economic plants attacked include cashew, cinchona, cocoa, tea, mango, guava, grapes, passionfruit, avocado, apple, allspice and black pepper. (Cassis & Gross 1995; Stonedahl 1991, Stonedahl *et al*., 1995 for further details of host plants, and references).

Diagnosis:

Body elongate.

Head with flattened or weakly concave frons not visible anteriad of antennal fossae in lateral view; tylus strongly produced with convex anterior margin; jugum flattened. Antennal segment I abruptly inflated distally.

Pronotum with weak transverse furrow, at least medially; neck-like region anteriad of furrow flattened or weakly convex. Scutellum broadly U-shaped, strongly inflated, with large spinelike process on its disc, base of scutellar process occupying most of dorsal surface of scutellum. Femora moderately to strongly inflated apically, usually also with swollen regions medially; pretarsal claw with premedian tooth arising from inner-ventral surface (**Fig. 27**). Hind wing with undivided cubital suture and with postcubital ending at margin of wing.

Left paramere with weakly to moderately developed sensory lobe and elongate, gradually curved shaft with excavated ventral surface; vesica unilobed with single, clublike lobal sclerite. Female genitalia with genital chamber encircled by pair of narrow, smooth sclerotised rings; anterior lobe of chamber without separately developed seminal depository, posterior lobe terminating in elongate tubular sleeve; posterior wall of chamber with two strongly elevated spinose lobes.

Key References: Stonedahl 1991, Stonedahl *et al*. 1995.

Genus *Volkelius* Distant, 1904

[BRYOCORINAE: MONALONIINI]

(PLATE 67)

Type species: *Volkelius sulcatus* Distant, 1904, by monotypy.

Number of Australian species: 4

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

Extralimital Distribution: NA

Economic Significance: No.

Host(s): None recorded. Herbivore, sap-feeder (Cassis & Gross 1995).

Diagnosis:

Body oval, shiny; hemelytra and scutellum densely pilose.

Head with antennal segment 1 ca. 1.5 times as long as wide, segment 2 incrassate towards apex, segments 3 & 4 distinctly club shaped. Labium slightly surpassing anterior margin of mesosternum.

Pronotum collar not delimited posteriorly; pronotum with longitudinal and shallow wrinkles, often impunctate or sometimes shallow punctures present posteriorly. Scutellum only moderately swollen, not vesiculate, with shallow punctures laterally, with longitudinal and shallow wrinkles. Tarsal claws with tooth long and moderately concave.

Female genitalia. Dorsal labiate plate with single sclerotised ring anteriorly; spermathecal gland placed on right side.

Key References: Namyatova & Cassis 2015, Carvalho 1955.

Remarks: Related to this genus is the exotic *Pseudodoniella* China & Carvalho with two species [*P. pacifica* China & Carvalho and *P. typica* (China & Carvalho) (**Plate 63C, D**)], pests of cocoa in New Guinea (Wheeler 2000a). The latter genus differs in the frontal tubercle and shape of scutellum (scutellum is distinctly swollen and uniformly coloured, not subdivided into lower and upper parts) (Miller & China 1957, Namyatova & Cassis 2016d).

Genus *Rayieria* Odhiambo, 1962

[BRYOCORINAE: MONALONIINI]

(PLATE 68)

Type species: *Rayieria basifer* Walker, 1873, by original designation.

Number of Australian species: 11.

Australian Distribution: all states and territories.

Extralimital Distribution: NA.

Economic Significance: Minor.

Host(s): The genus has been collected from species belonging to the plant families Asparagaceae, Fabaceae, Myrtaceae, Papilionaceae and Proteaceae (see further details in Namyatova & Cassis 2013). *Rayieria tumidiceps* (Horváth), now a junior synonym of the widely distributed species *R. basifer* (Walker), is commonly known as "Acacia spotting bug" (Cassis & Gross 1995).

Diagnosis:

Body elongate; body and appendages bristly.

Head with distinct longitudinal depression on dorsal surface subequal to or slightly longer than eye width, frons swollen and projecting between antennal fossa, clypeus swollen in lateral view, eyes only slightly protruding and not stalked. Antenna about 1.5 times as long as body; segment 1 subequal, slightly shorter or slightly longer than length of head and pronotum combined, incrassate towards apex; segment 2 distinctly longer than length of head and pronotum combined, not incrassate towards apex, segments 3 and 4 filiform. Labium short, length varying from slightly surpassing anterior margin of prosternum to reaching middle of mesosternum, segment 2 approximately twice as long as wide, segment 4 shorter than head.

Pronotum impunctate; with collar either swollen or sometimes flat; calli more or less swollen; posterior disc of pronotum almost flat to moderately raised. Scutellum impunctate, flat, without processes. Hemelytra glabrous or with a few hairlike setae, rarely densely clothed with suberect simple setae; clavus and R+M vein impunctate; claval commissure longer than scutellum, margins of claval commissure curved; margins of corial fracture straight; membrane cell greatly elongate, longer than pronotum; distance between apex of cell and apex of membrane distinctly shorter than cell length. Forecoxae separated; foretibiae as long as or only slightly longer than length of head and pronotum combined; fore- and middle femora not curved, hind femur almost straight or weakly curved, weakly swollen apically; pretarsal claws almost straight, curved only apically, without tooth.

Key References: Namyatova & Cassis 2013, Odhiambo 1962.

Genus *Ragwelellus* Odhiambo, 1962

[BRYOCORINAE: MONALONIINI]

(PLATE 69)

Type species: *Ragwelellus vittatus* Odhiambo, 1962, by original designation.

Number of Australian species: 1

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

Extralimital Distribution: Melanesia (Papua New Guinea, Fiji), South-East Asia, Pacific Islands.

Economic Significance: Minor.

Host(s): All species known so far to occur in the Pacific are pests of *Cinchona* L. (Rubiaceae) (Carvalho 1981, Odhiambo 1962), and also cardamom (Zingiberaceae) (Carvalho 1981). *Ragwelellus suspectus* is known from *Melaleuca quinquenervia* (Cav.) S. T. Blake (Myrtaceae)., causing spotting on leaves of coppice shoots (Cassis & Gross 1995).

Diagnosis:

Ragwelellus belongs to the *Monalonion* complex, and it is differentiated from other genera of this group by:

Body long and slender; dorsum shiny, glabrous except minute pubescence along edge of hemelytral membrane.

Head transverse, with frons not swollen or only slightly convex, with a median longitudinal sulcus; antennal segment 1 longer than head and pronotum combined.

Scutellum almost flattened, nearly equilateral, a little broader than long, apex blunt, without spine-like projection; forefemora curved; pretarsal claw broadly rounded.

Male genitalia with phallotheca usually more or less rounded or only slightly tapering apically.

Key References: Namyatova & Cassis 2013, Odhiambo 1962.

Remarks: The species *Ragwelellus suspectus* (Distant) was until 2016 placed in the genus *Eucerocoris* Westwood (Namyatova & Cassis 2013).

GLOSSARY

- A glossary of terminology and structures referred to in this work has been provided below.
- Structures labelled in Figures 1–44 are not repeated here.
- For detailed explanation of individual structures, the reader is referred to Kelton 1980 & 1982, and glossary section (pages 734–739) in True Bugs of the World book by Schuh & Weirauch 2020.

TERMINOLOGY

ampulate – flask shaped

angulate – formed with corners

adpressed – appressed, pressed close to or lying flat

appressed – pressed close to or lying flat

arcuate – arched

carinate – keel shaped

clavate – club shaped

coleopteroid – beetlelike form, often referring to structure of elytriform forewings

convergent – coming together

costal – lateral margin of hemelytron

declivent – sloping gradually downwards

divergent – separating

fuscous – dark coloured

glabrous – free from hair or down, smooth

globose – like a globe

incrassate – thickened

macropterous – with fore– and hind wings fully developed and functional

pilose – covered with long fine setae or hairs

porrect – stretched out, extending forward horizontally

pruinose – covered with whitish dust

pubescence – soft fine hair covering the surface

recumbent – reclining

rugose – wrinkled

sericeous – silky

stramineous – straw coloured

striate – finely grooved

stylate, substylate – pointed or sub–pointed

sulcate – narrow groove

trapeziform – a quadrilateral having no two sides parallel

traumatic insemination – puncturing body wall or wall of inner genitalia by phallus during mating, and deposition of sperm outside usual reproductive tract

truncate – squared rather than rounded at the tip

tumid – swollen

vitreous – translucent or transparent

STRUCTURES

anal tube – see **proctiger**

auricle, ostiolar auricle – ear-like shaped modification of ostiolar peritreme assisting in spreading of metathoracic scent gland secretions from ostiole onto evaporatorium.

bothrium (pl., bothria) – pit or tubercle from which a trichobothrium arises

bursa copulatrix – variously formed structure serving as a vagina, as in Mirinae

dorsal labiate plate – dorsal wall of bursa copulatrix, containing sclerotised ring glands

embolium – see **exocorium**, usually expanded submarginal part of corium proximal to costal fracture

endosoma (pl., endosomata) – distal portion of phallus, free of ligamentary processes and surrounding ductus seminis distalis from ejaculatory reservoir (when present) to secondary gonopore

evaporatorium – or **evaporative area,** area of specialised cuticle on metathoracic pleuron associated with, and usually surrounding, ostiole and auricle of metathoracic scent glands, possibly functioning in controlled dissemination and evaporation of scent gland products

exocorium – that part of corium lying between R or R+M and costal margin

gena (pl., genae) – ventrolateral area of anterior portion of head

gonopore – or **secondary gonopore,** opening of ductus seminis at or near apex of phallus

hemelytron (pl., hemelytra) – forewing of Heteroptera, with distinctly thickened proximal portion and membranal distal portion

humerus (pl., humeri) – or **humeral angle**, posterolateral angle of pronotum

jugum – see **mandibular plate**

lorum (pl., lora) – see **maxillary plate**

mandibular plate – that portion of head laterad of (posterior to) clypeus and dorsad of maxillary plate

maxillary plate – that portion of head ventral to mandibular plate

metacoxa – coxa of hind leg.

metathoracic scent-efferent system – the combination of structures, primarily on metepimeron, but sometimes on metasternum, that allow for and control dispersion of secretions from metathoracic scent glands.

metathoracic scent gland – paired or unpaired scent glands with single or paired ostiole on metapleuron or metasternum, frequently with external scent efferent system also comprising peritreme and evaporatorium

neck – cephalic neck

ocellus (pl., ocelli) – paired simple eye, absent in most Miridae, but present in most Heteroptera

ostiole (s) – external opening of metathoracic scent gland or of dorsal abdominal scent glands

ostiolar peritreme – area of variable shape surrounding the ostiole of the metathoracic gland

peritreme – see **ostiolar peritreme**

phallotheca – sclerotized proximal part of phallosoma

posterior wall – in female Miridae, a sclerotised, platelike structure lying between rami of gonapophyses 9 (second valvulae)

proctiger – reduced abdominal segments 10 and 11, bearing anus

ring sclerite (s) – paired or unpaired annular sclerotisations encircling ringed glands of vagina, vaginal pouch, or bursa copulatrix

secondary gonopore – opening of ductus seminis at or near apex of phallus

sigmoid process – median process (female genitalia)

spermatheca (pl., spermathecae) – median unpaired sclerotised diverticulum of bursa copulatrix serving as sperm storage receptacle

spiculum – a sclerite, part, spicule-like process

spiracle (s) – the connection of the tracheal system to the atmosphere; in all Heteroptera located on meso-and metathorax and abdominal segments 2-8

sternite (pl., sternites) – any one of the subdivisions of a sternum, e.g. laterosternite

sternum (pl., sterna) – entire ventral portion of an individual body segment

subapical tooth – sclerotized process subapically on the pretarsal claw

tarsomere – one segment of the tarsus, also tarsal segment

tarsus – leg segment between tibia and the pretarsus, typically with 3 segments or tarsomeres

trichobothrium (pl., trichobothria) – specialised, slender hairlike sensory seta arising from and including tubercles or pits (bothria) on many body regions and appendages in Heteroptera.

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Plates

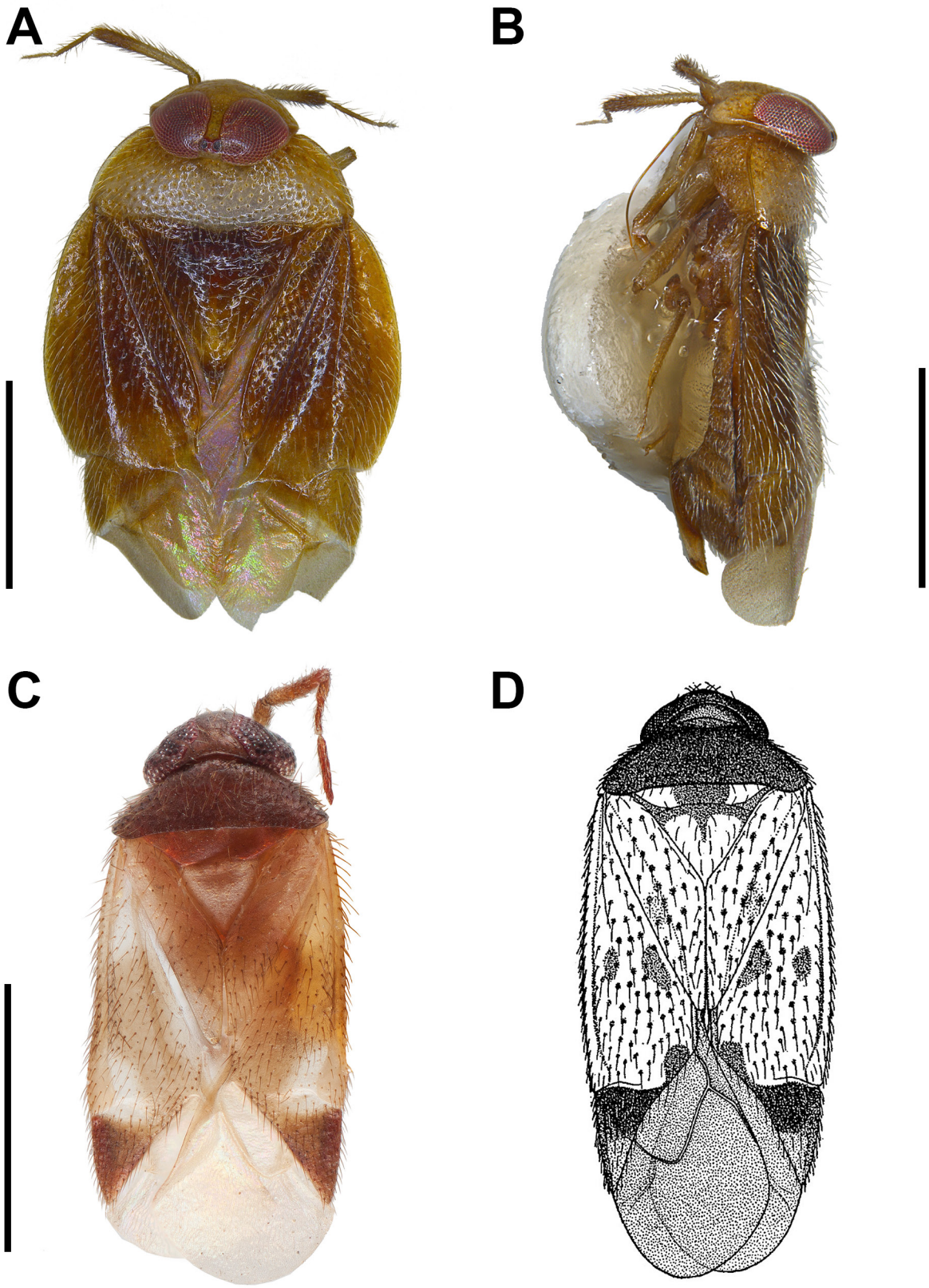

PLATE 1. ISOMETOPINAE (A&B) AND CYLAPINAE (C&D):

A, B, *Paratopus flavocapitus* paratype female, habitus dorsal and lateral.
C, *Psallops cookensis* male, habitus dorsal. D, *Psallops oculatus* female, habitus dorsal. Scale line = 1 mm.
[A, B, Finlay. C, Namyatova & Cassis (2018) with permission. D, From Usinger 1946].

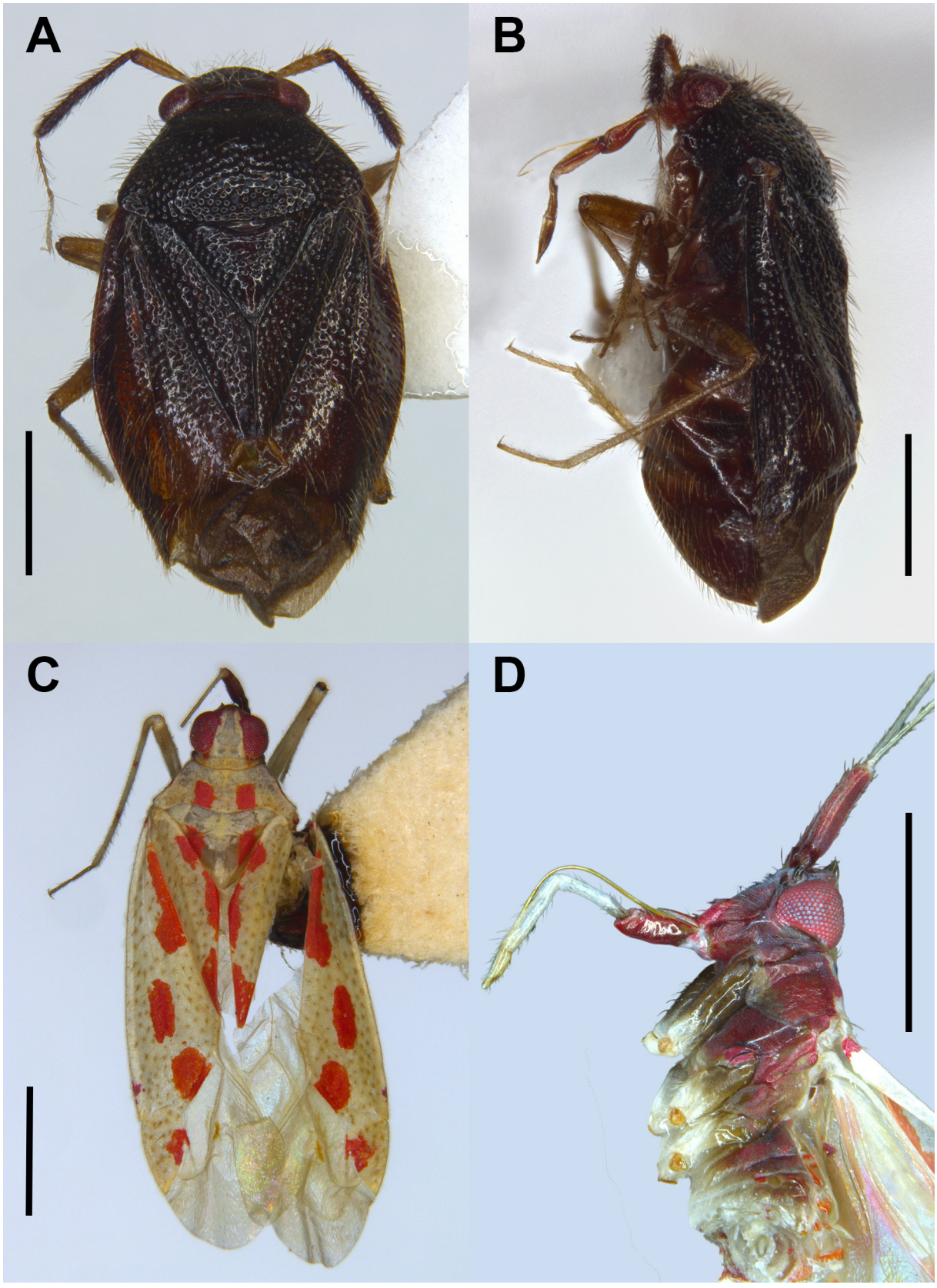

PLATE 2. CYLAPINAE:

A, B, *Bothriomirella ater* paratype female, habitus dorsal and lateral;
C, *Vanniusoides melafrons* paratype female, habitus dorsal.
D, *Vanniusoides melafrons* holotype male, habitus lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

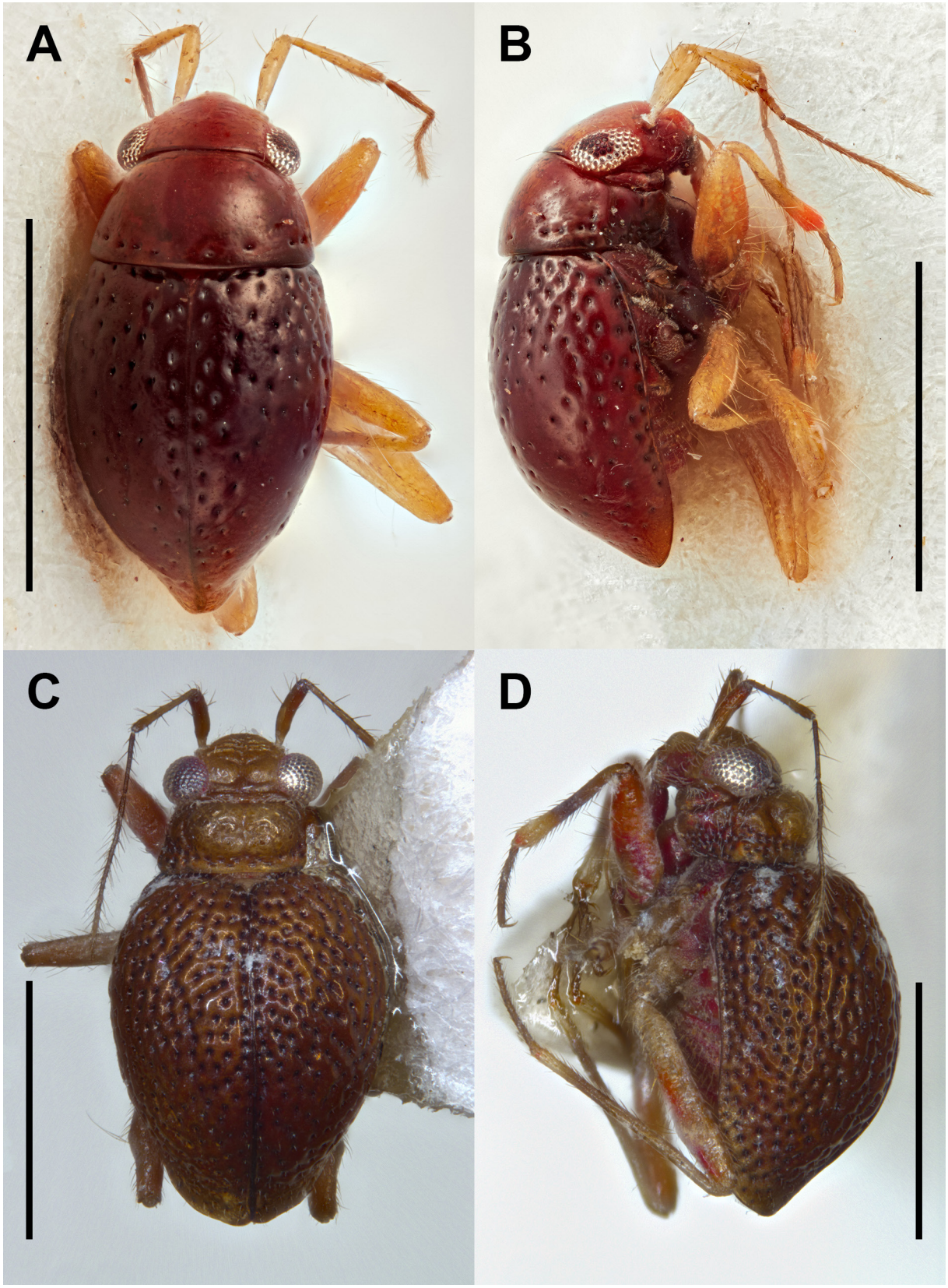

PLATE 3. CYLAPINAE:

A, B, *Schizopteromiris lordhowensis* holotype, habitus dorsal and lateral. C, D, *Schizopteromiris monteithi* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Thompson. C, D, Finlay]

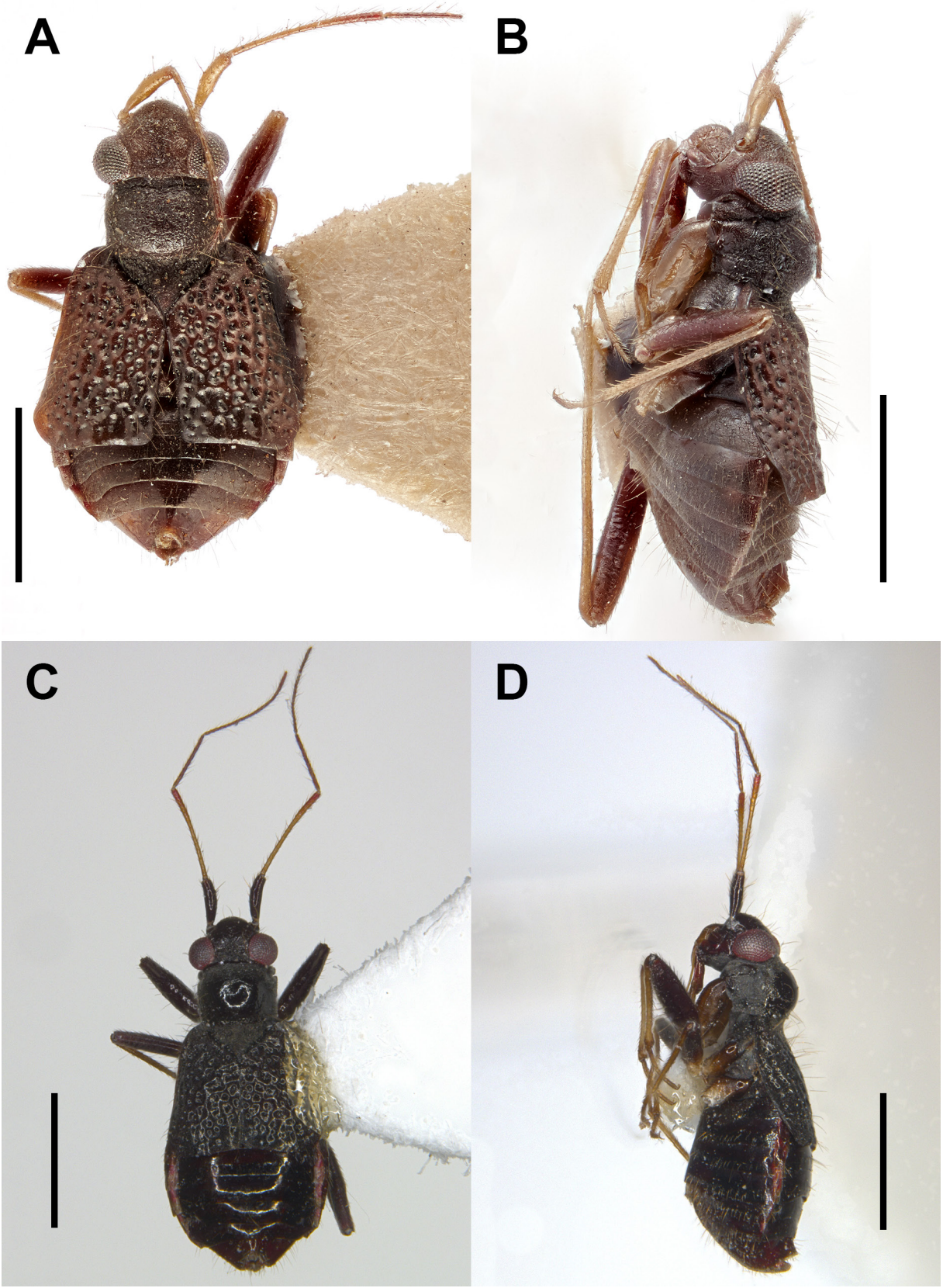

PLATE 4. CYLAPINAE:

A, B, *Carvalhoma taplini* holotype female, habitus dorsal and lateral. C, D, *Carvalhoma parvum* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, ANIC/CSIRO. C, D, Finlay]

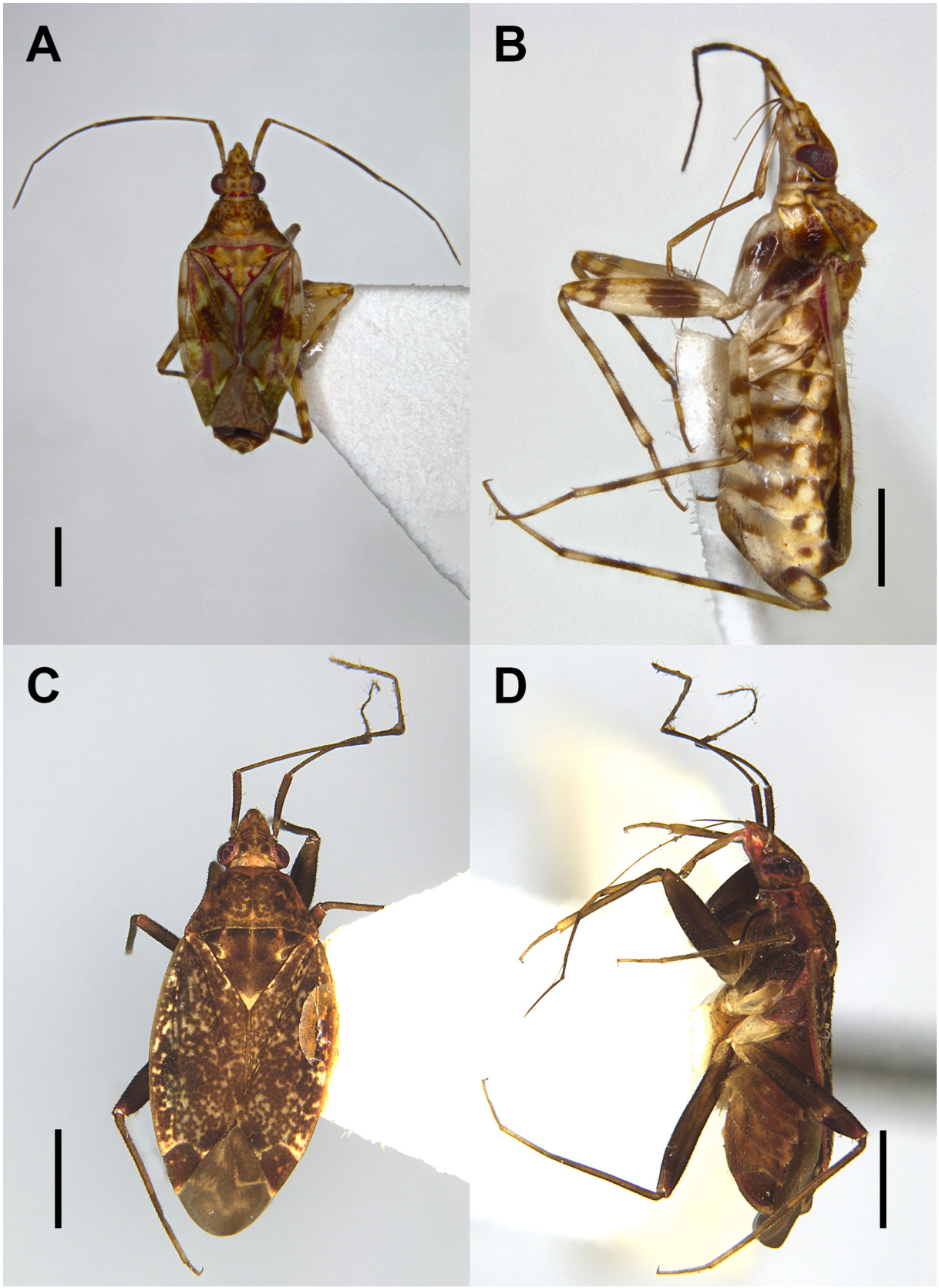

PLATE 5. CYLAPINAE:

A, B, *Rhinomiriella tuberculata* female, habitus dorsal and lateral.
C, D, *Peritropis* sp. female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow.]

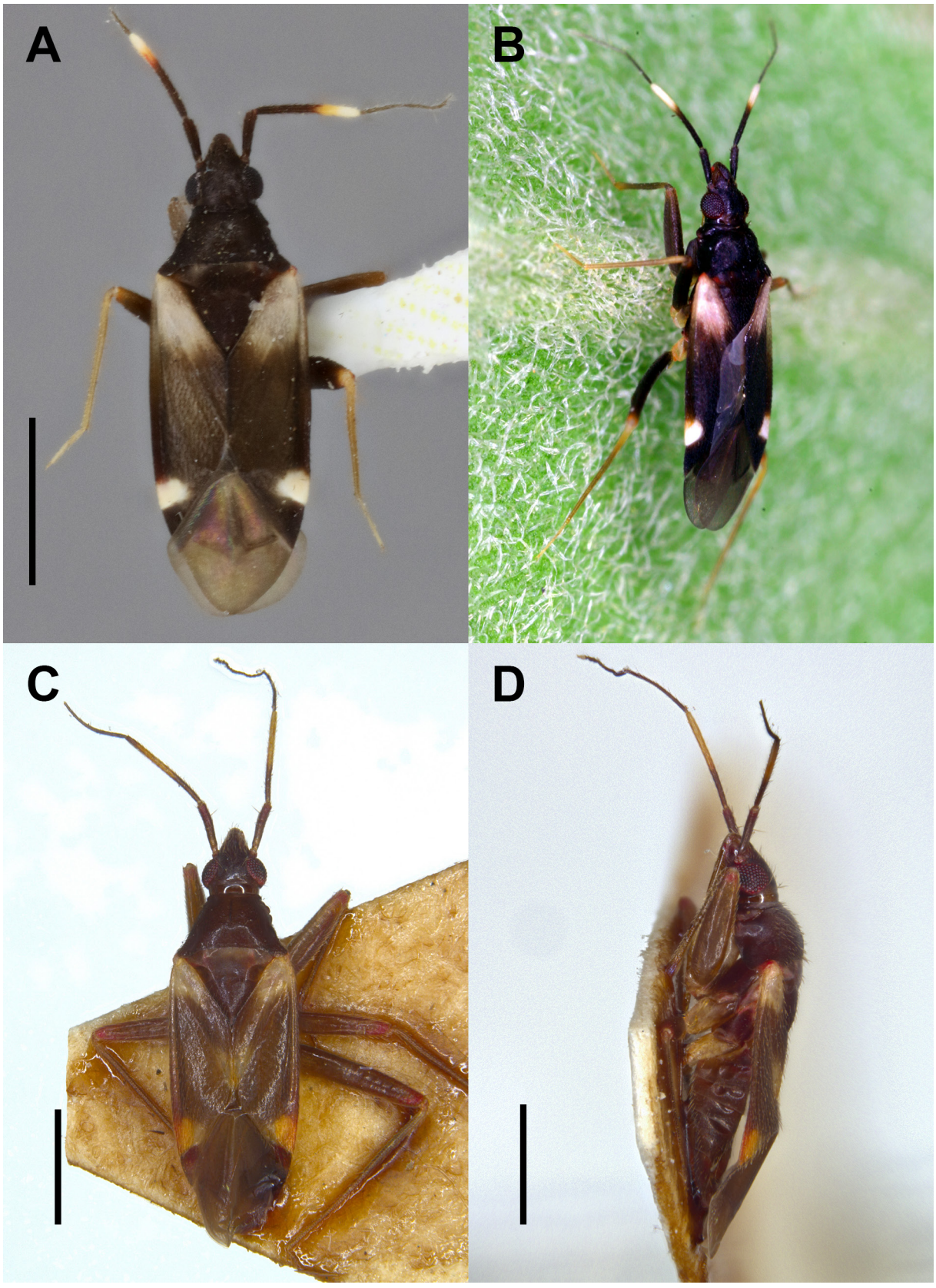

PLATE 6. CYLAPINAE:

A, *Fulvius anthocoroides*, habitus dorsal. B, *Fulvius anthocoroides*, live image. C, D, *Fulvius* sp. female, habitus dorsal and lateral. Scale line = 1 mm. [A, Yeshwanth. B, Yasunaga. C, D, Finlay]

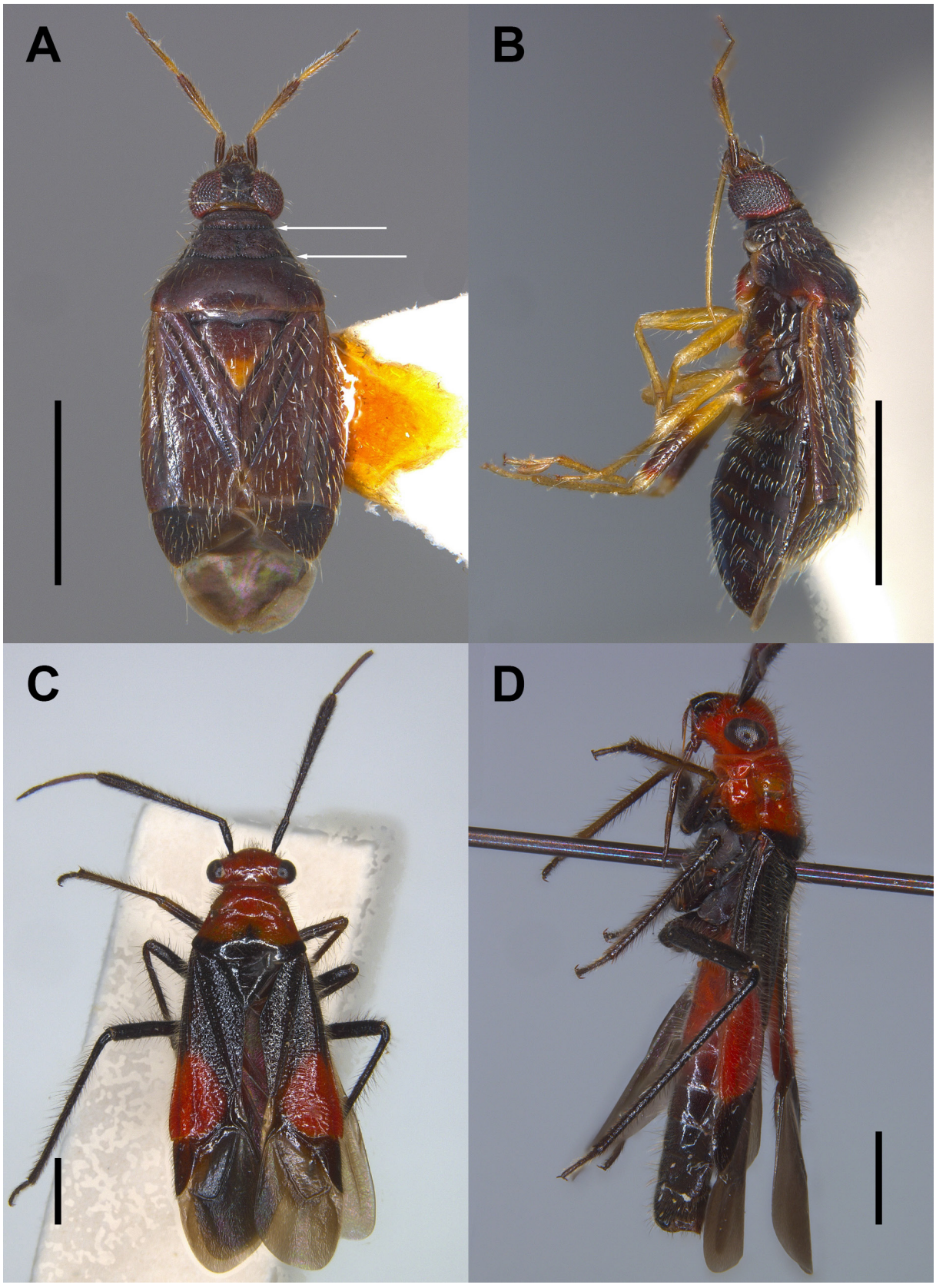

PLATE 7. DERAEOCORINAE:

A, B, *Termatophylum* sp. female, habitus dorsal and lateral (A, punctate margin of collar and callosite region arrowed). C, D, *Trilaccus nigroruber* male, habitus dorsal and lateral Scale line = 1 mm. [all, Finlay]

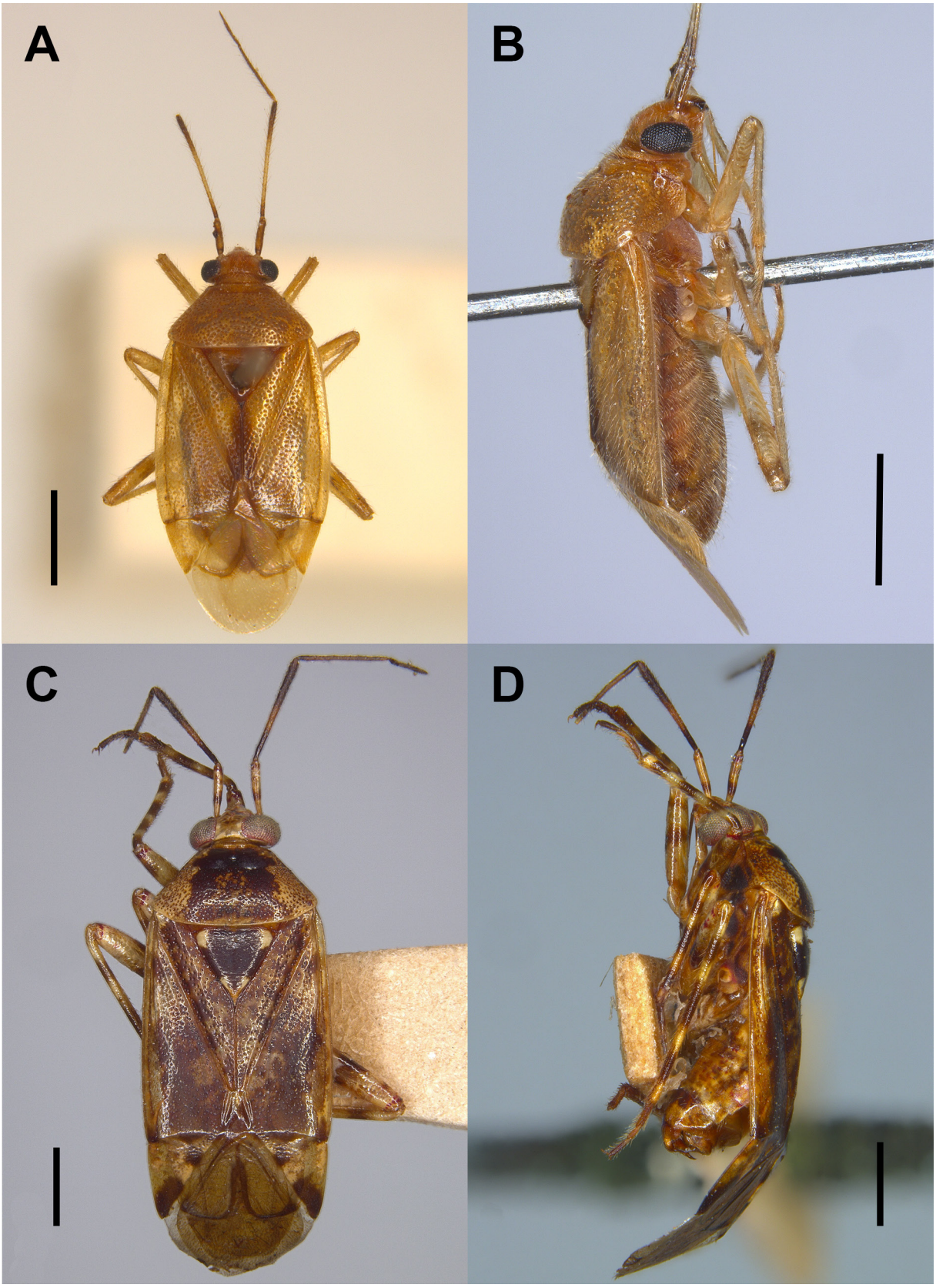

PLATE 8. DERAEOCORINAE:

A, B, *Deraeocoris signatus* female, habitus dorsal and lateral.
C, D, *Deraeocoris* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

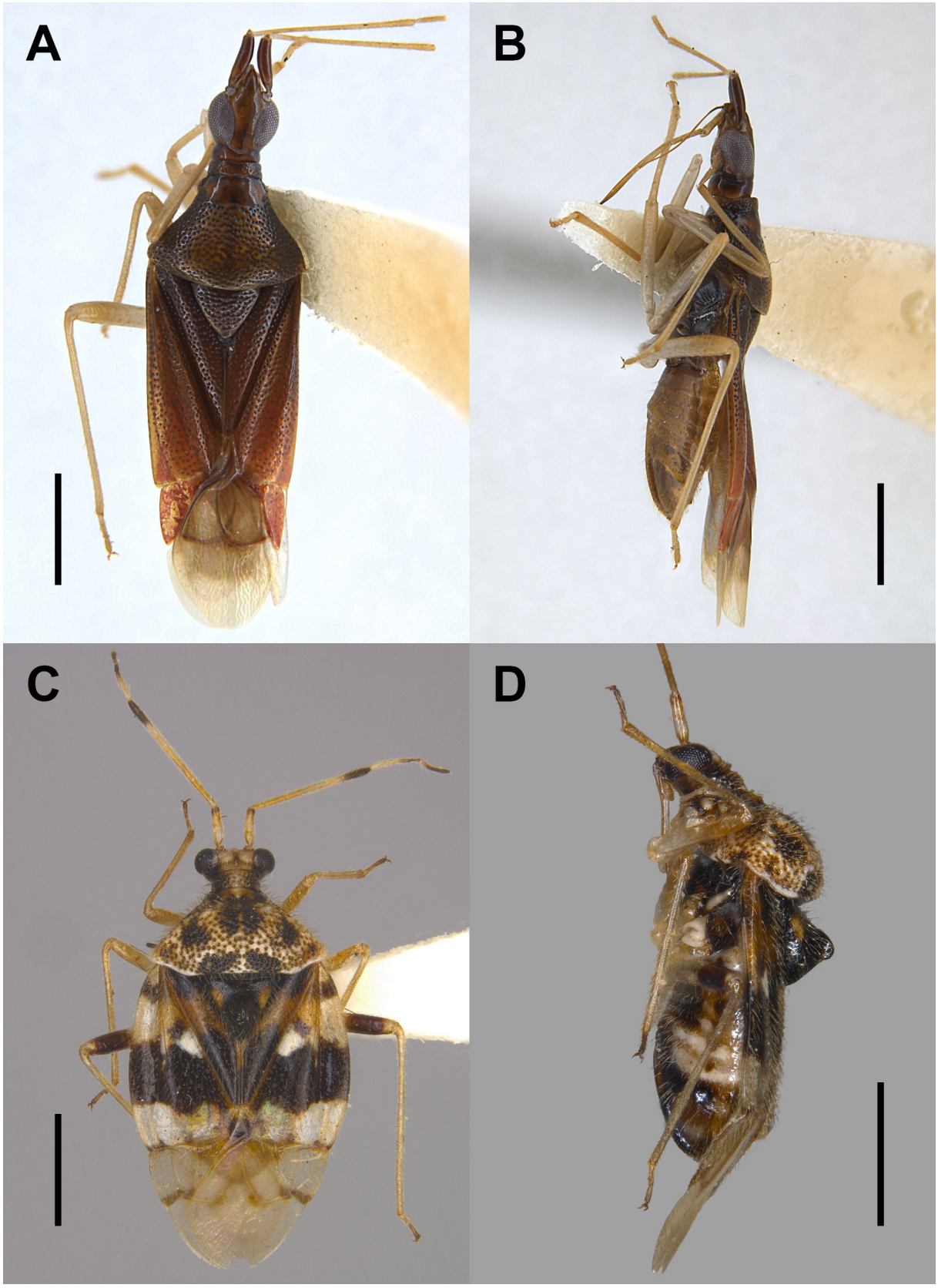

PLATE 9. DERAEOCORINAE EXOTIC:

A, B, *Fingulus porrecta* female, habitus dorsal and lateral. C, D, *Stethoconus japonicus* female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

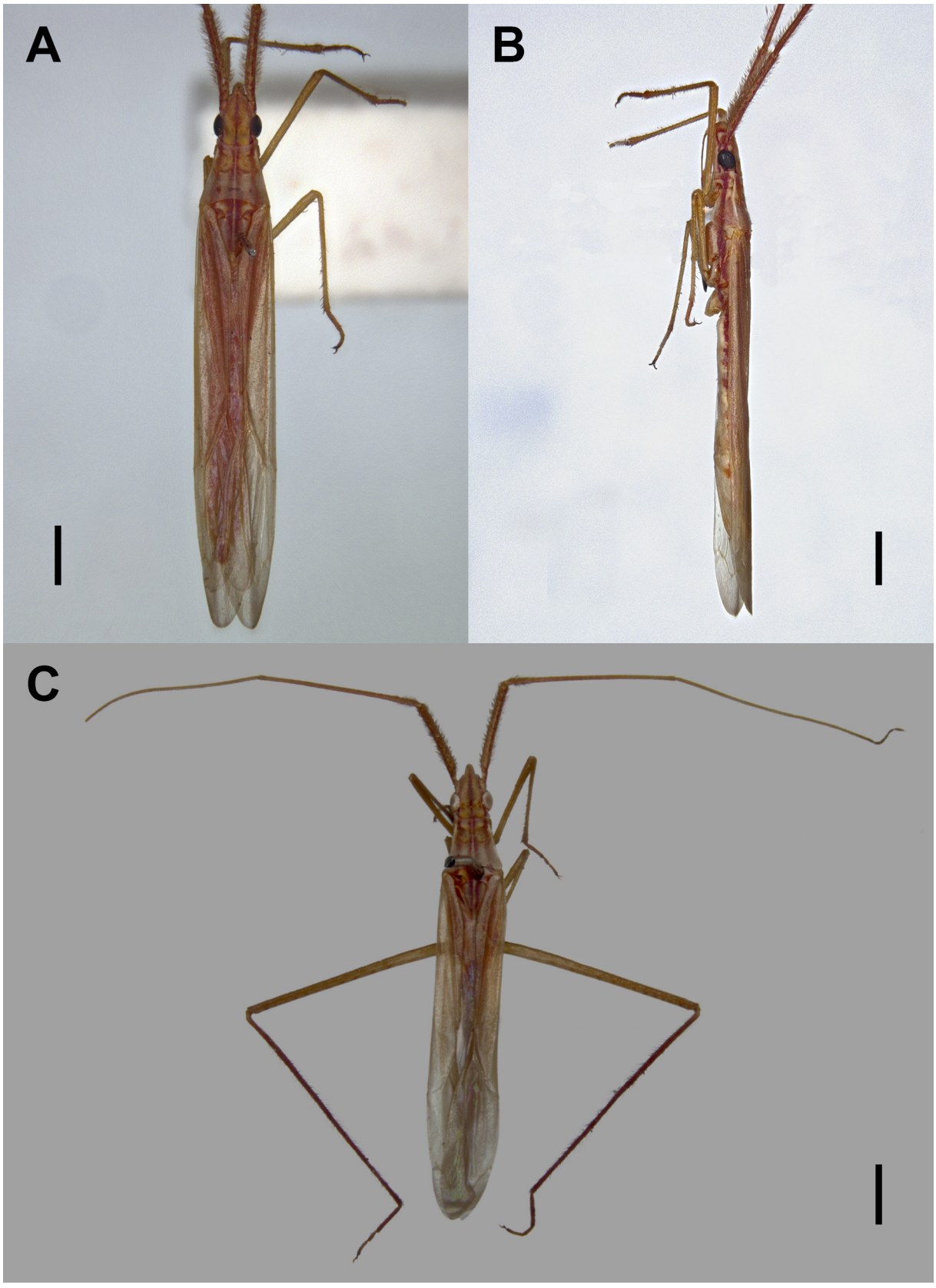

PLATE 10. MIRINAE:

A, B, *Dolichomiris linearis* female, habitus dorsal and lateral.
C, *Dolichomiris* sp. male, habitus dorsal. Scale line = 1 mm. [all, Finlay]

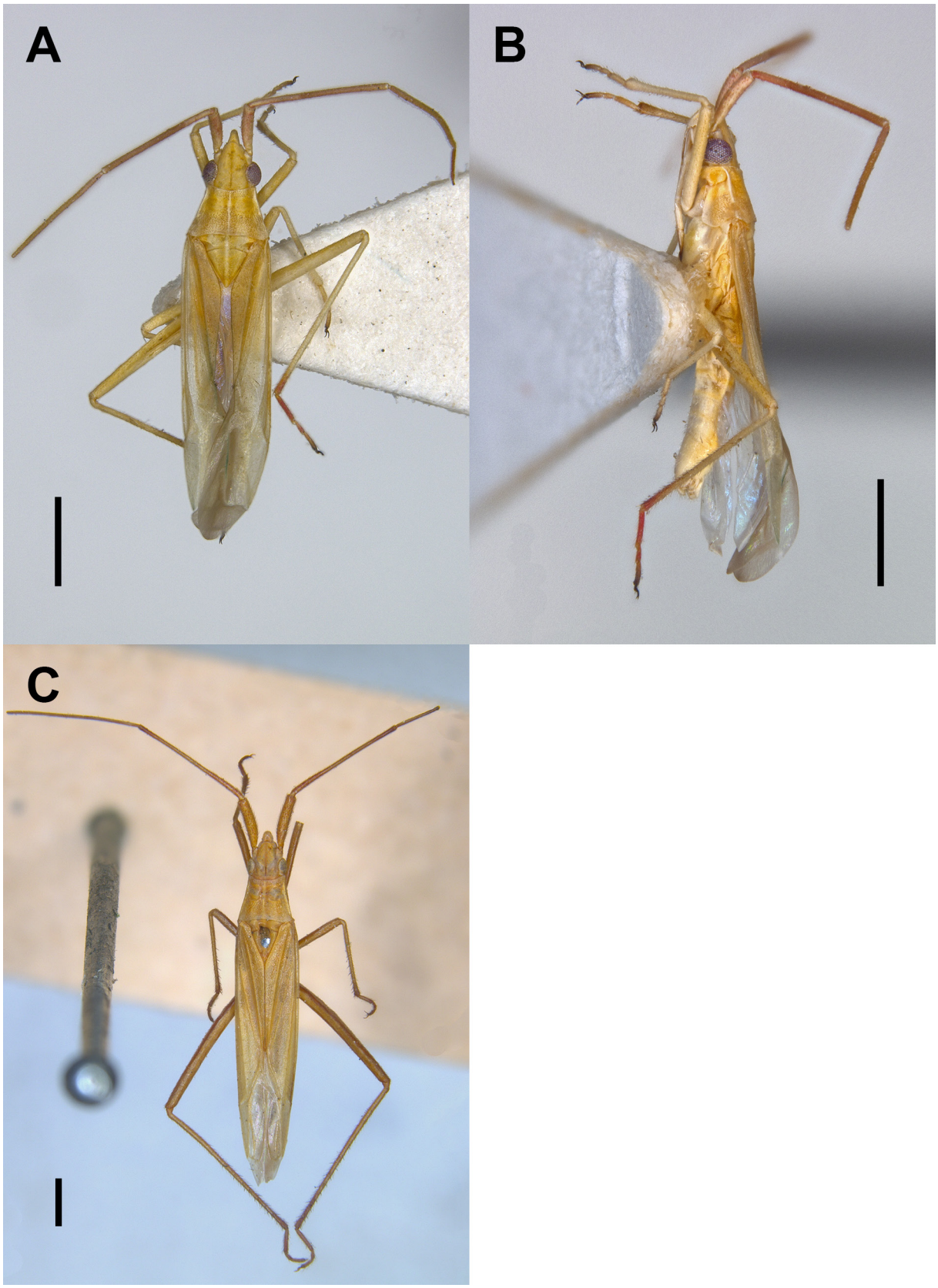

PLATE 11. MIRINAE:

A, B, *Trigonotylus tenuis* male, habitus dorsal and lateral.
C, *Chaetedus longiceps* female, habitus dorsal. Scale line = 1 mm. [all, Finlay]

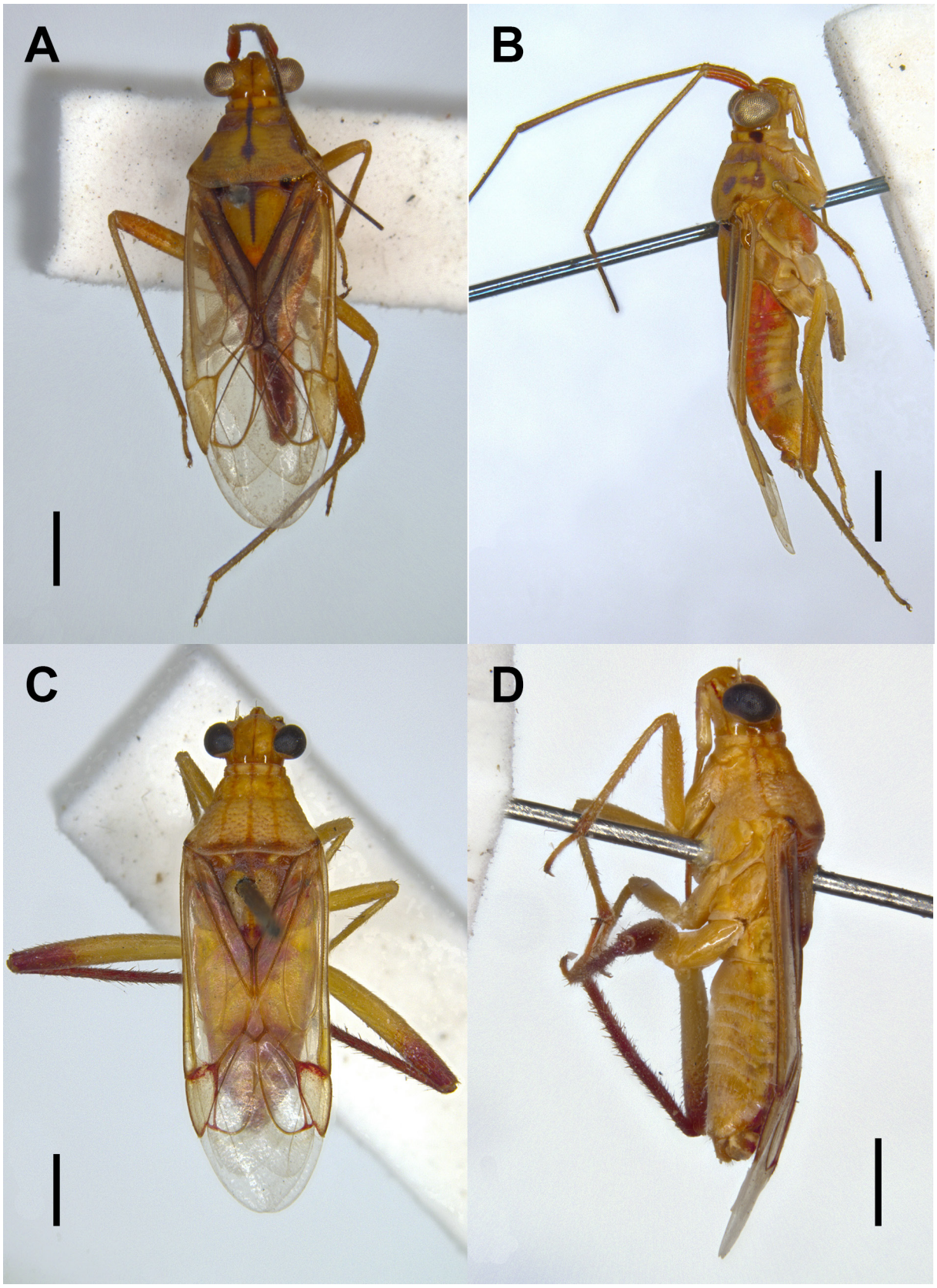

PLATE 12. MIRINAE:

A, B, *Hyalopeplinus cairnsensis* paratype male, habitus dorsal and lateral.
C, D, *Hyalopeplus loriae* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

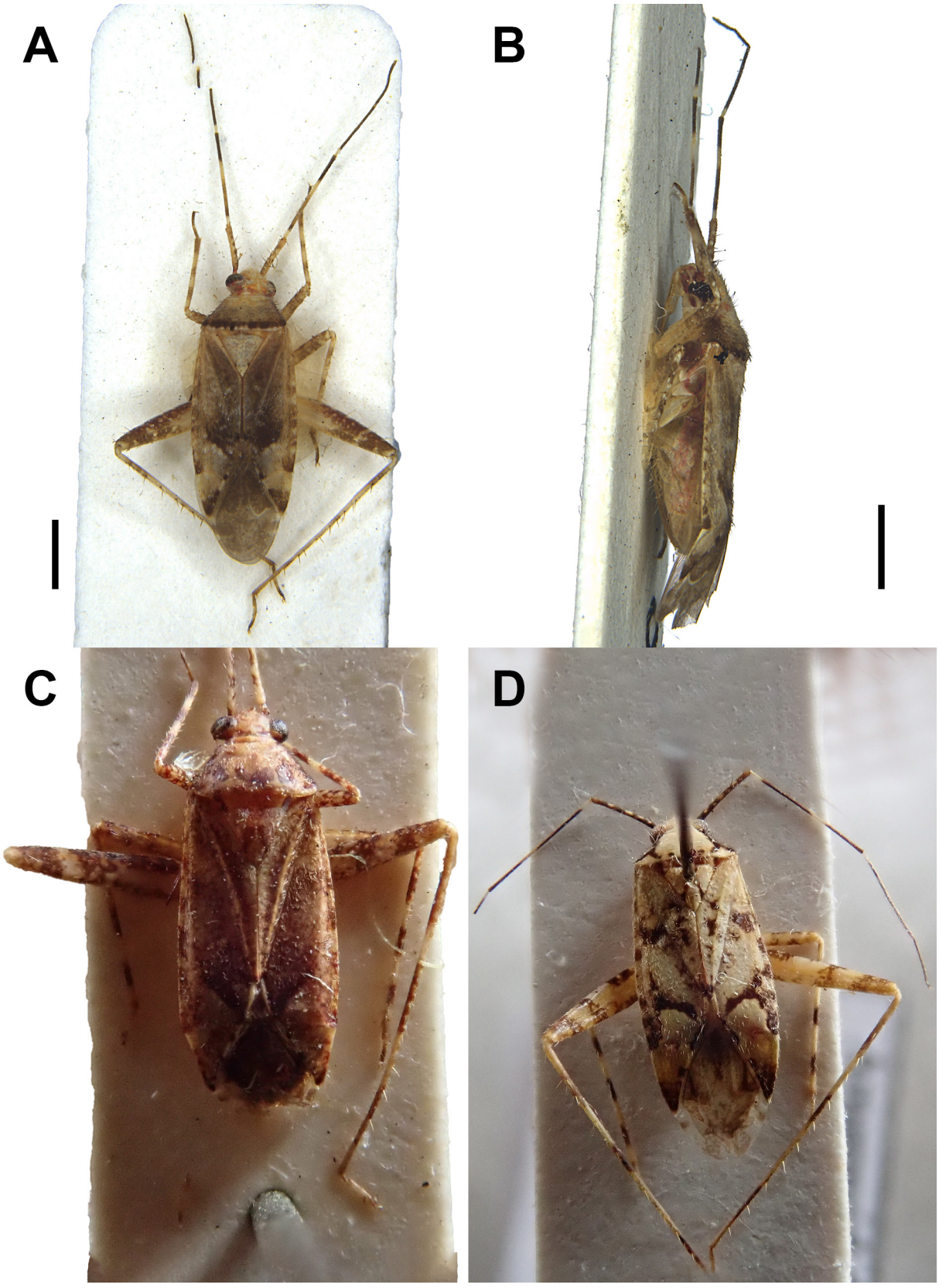

PLATE 13. MIRINAE EXOTIC**:**

A, *Phytocoris parvulus* male, habitus dorsal. B, *Phytocoris parvulus* female, habitus lateral. C, *Phytocoris reuteri*, habitus dorsal. D, *Phytocoris tiliae*, habitus dorsal. Scale line = 1 mm. [A, B, Eow. C, D, Chérot]

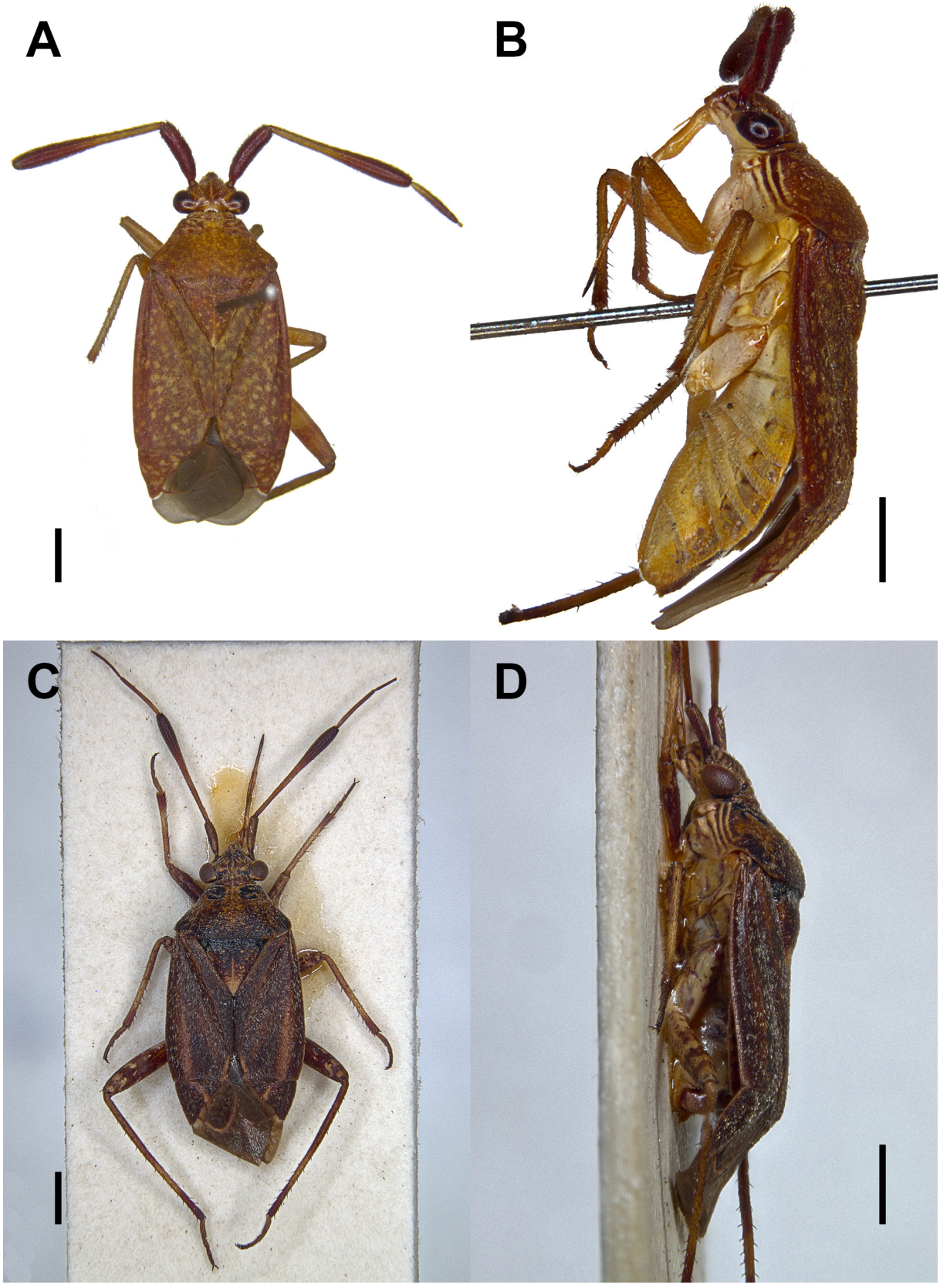

PLATE 14. MIRINAE:

A, B, *Austrocapsus antennatus* female, habitus dorsal and lateral.
C, D, *Austrocapsus dallasi* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

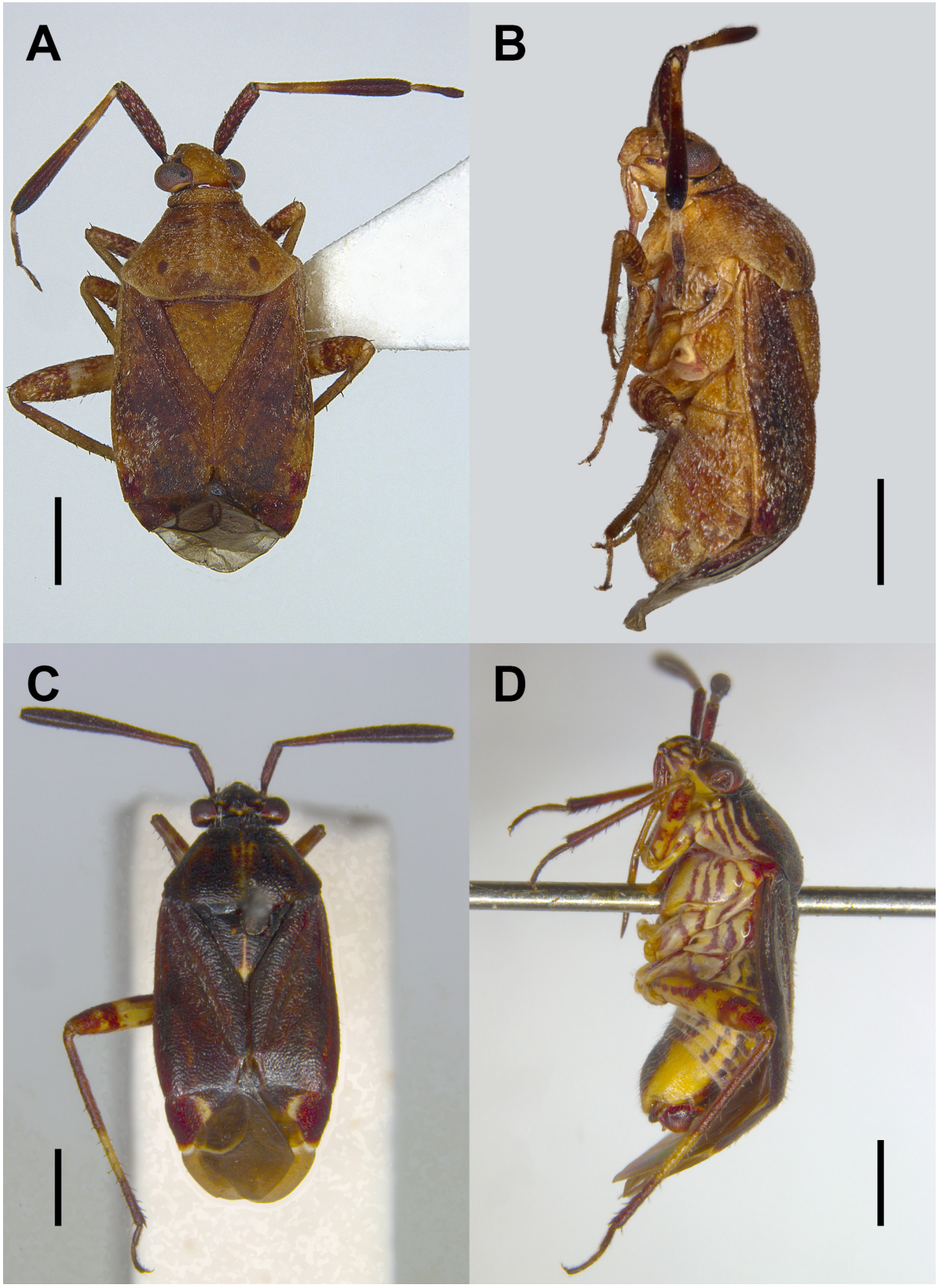

PLATE 15. MIRINAE:

A, B, *Eurystylus* sp. female, habitus dorsal and lateral.
C, D, *Pseudeurystylus* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

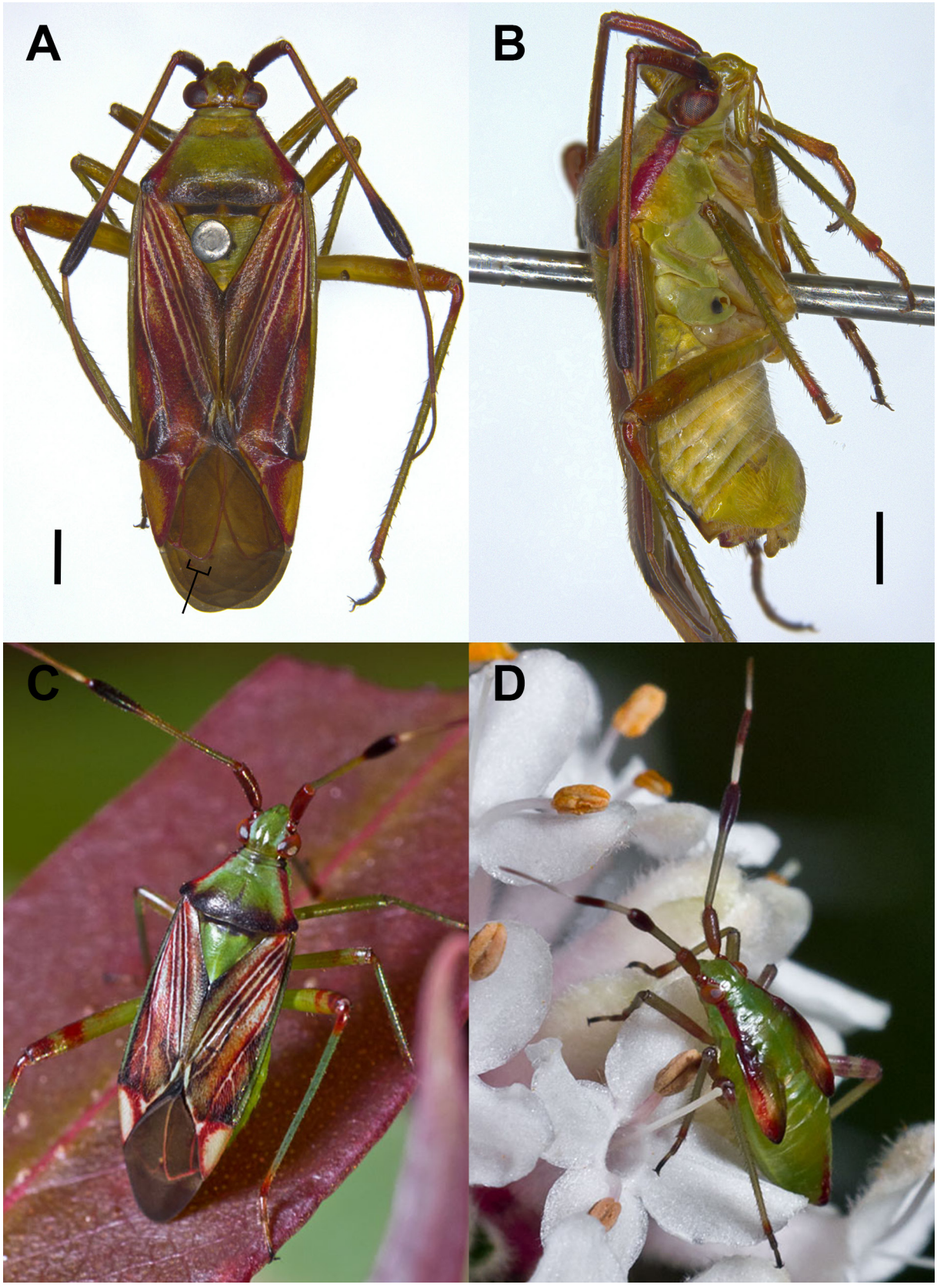

PLATE 16. MIRINAE:

A, B, *Pseudopantilius australis* male, habitus dorsal and lateral (A, apex of transversal vein narrowly rounded arrowed). C, D, *Pseudopantilius* sp. nr. *australis*, habitus dorsal and nymph habitus dorso-lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Daley]

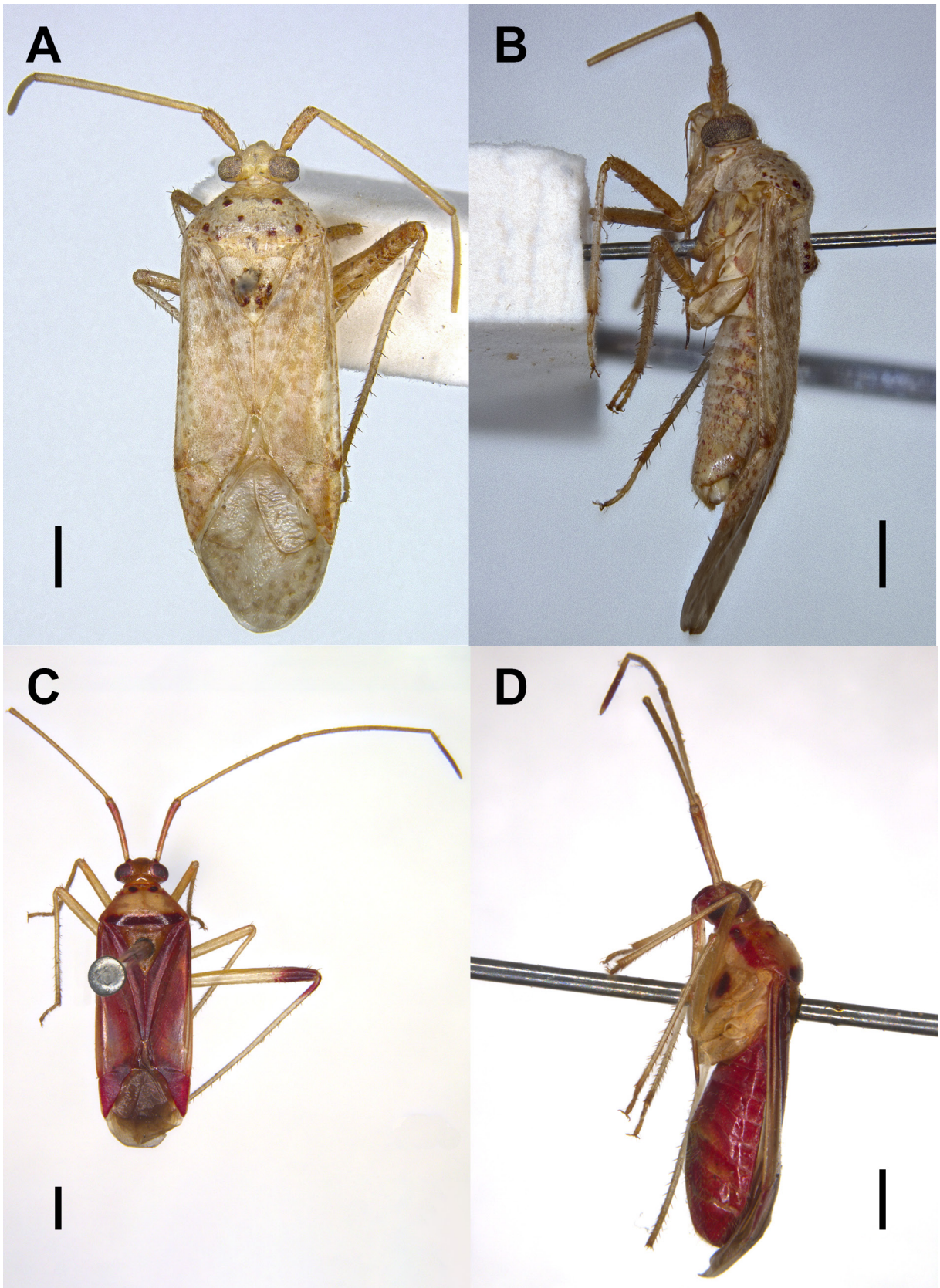

PLATE 17. MIRINAE:

A, B, *Chimsunchartella schwartzi* male, habitus dorsal and lateral.
C, D, *Neopeplus trianai* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

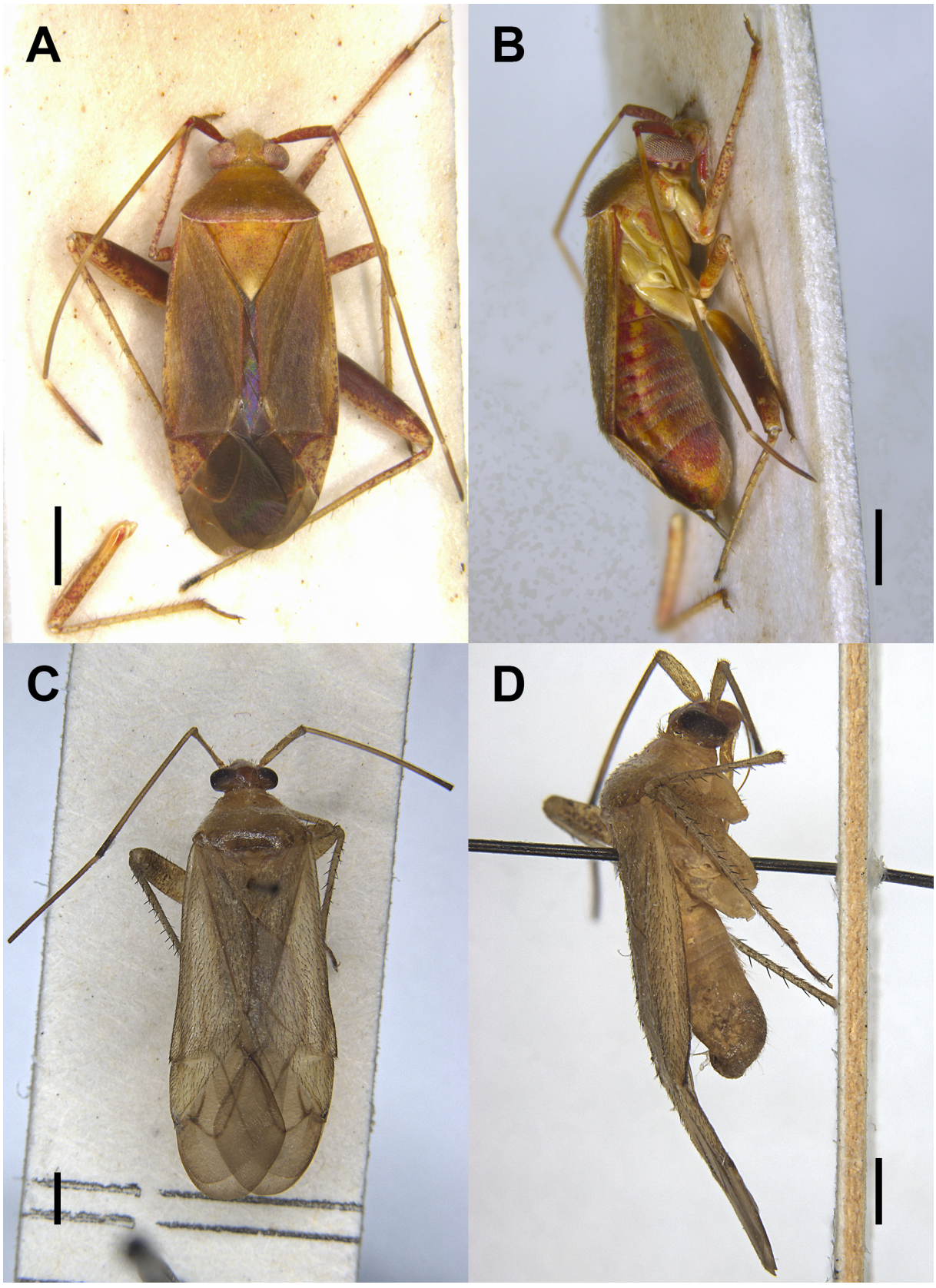

PLATE 18. MIRINAE:

A, B, *Adelphocorisella australis* male, habitus dorsal and lateral. C, D, EXOTIC *Adelphocoris lineolatus* male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

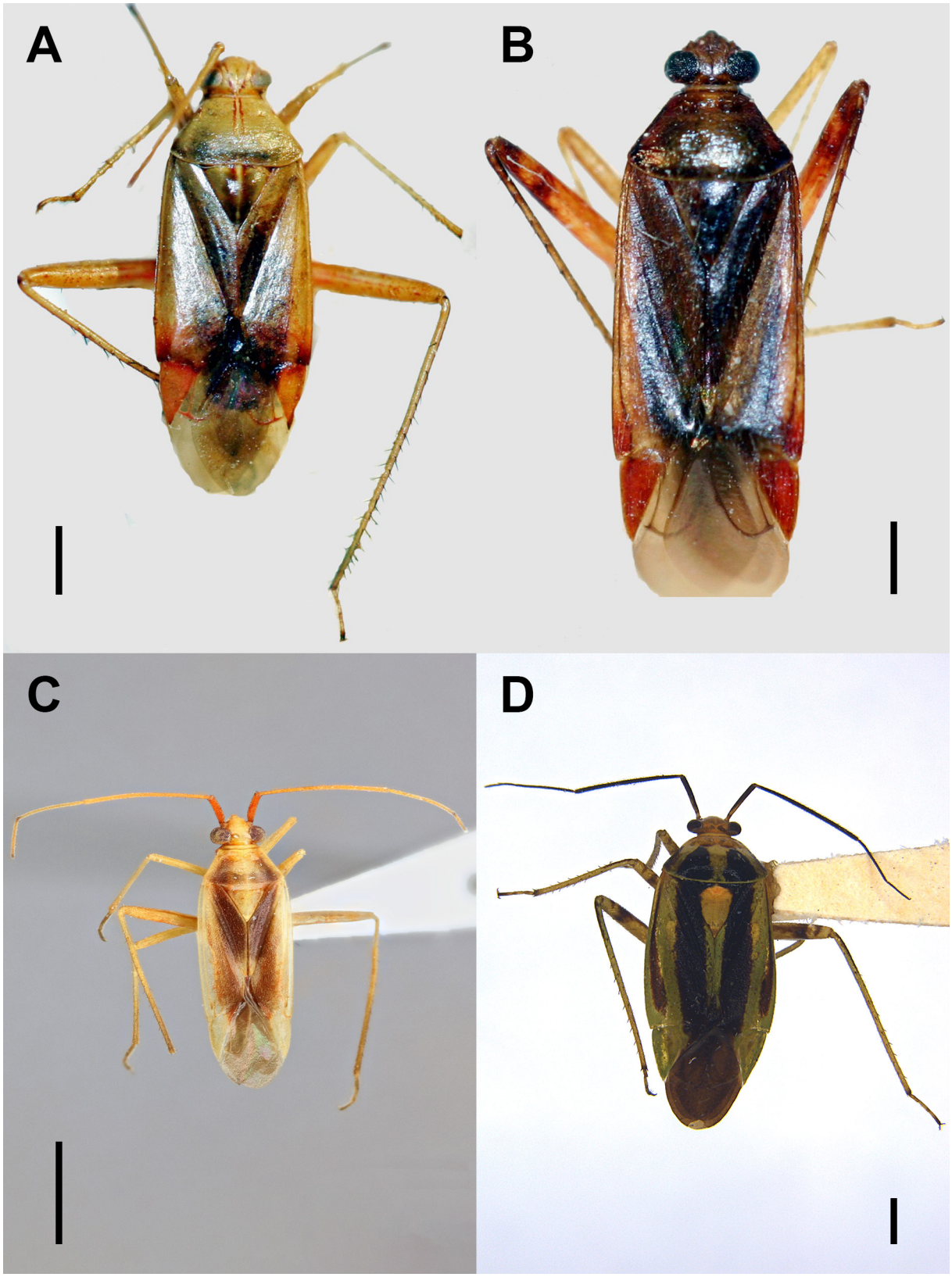

PLATE 19. MIRINAE EXOTIC**:**

A, *Megacoelum infusum*, habitus dorsal. B, *Megacoelum formosanum* lectotype male, habitus dorsal. C, *Calocoris angustatus*, habitus dorsal. D, *Poecilocapsus lineatus* male, habitus dorsal. Scale line = 1 mm. [A, B, Chérot & Malipatil (2016). C, Yeshwanth. D, Eow]

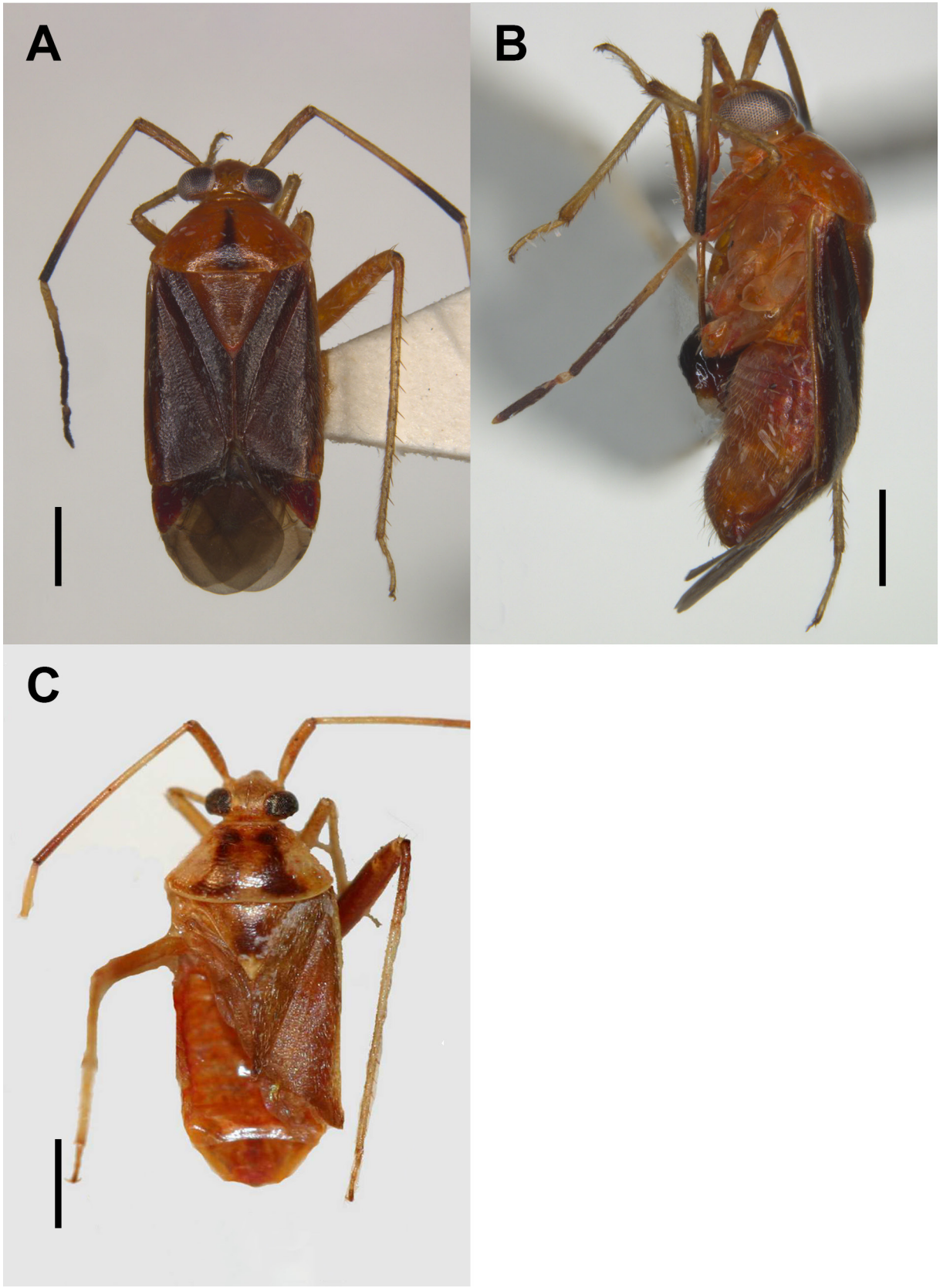

PLATE 20. MIRINAE:

A, B, *Poppiocapsidea biseratense* male, habitus dorsal and lateral. C, *Poppiomegacoelum gearyi* paratype female, habitus dorsal. Scale line = 1 mm. [A, B, Finlay. C, Chérot & Malipatil (2016)]

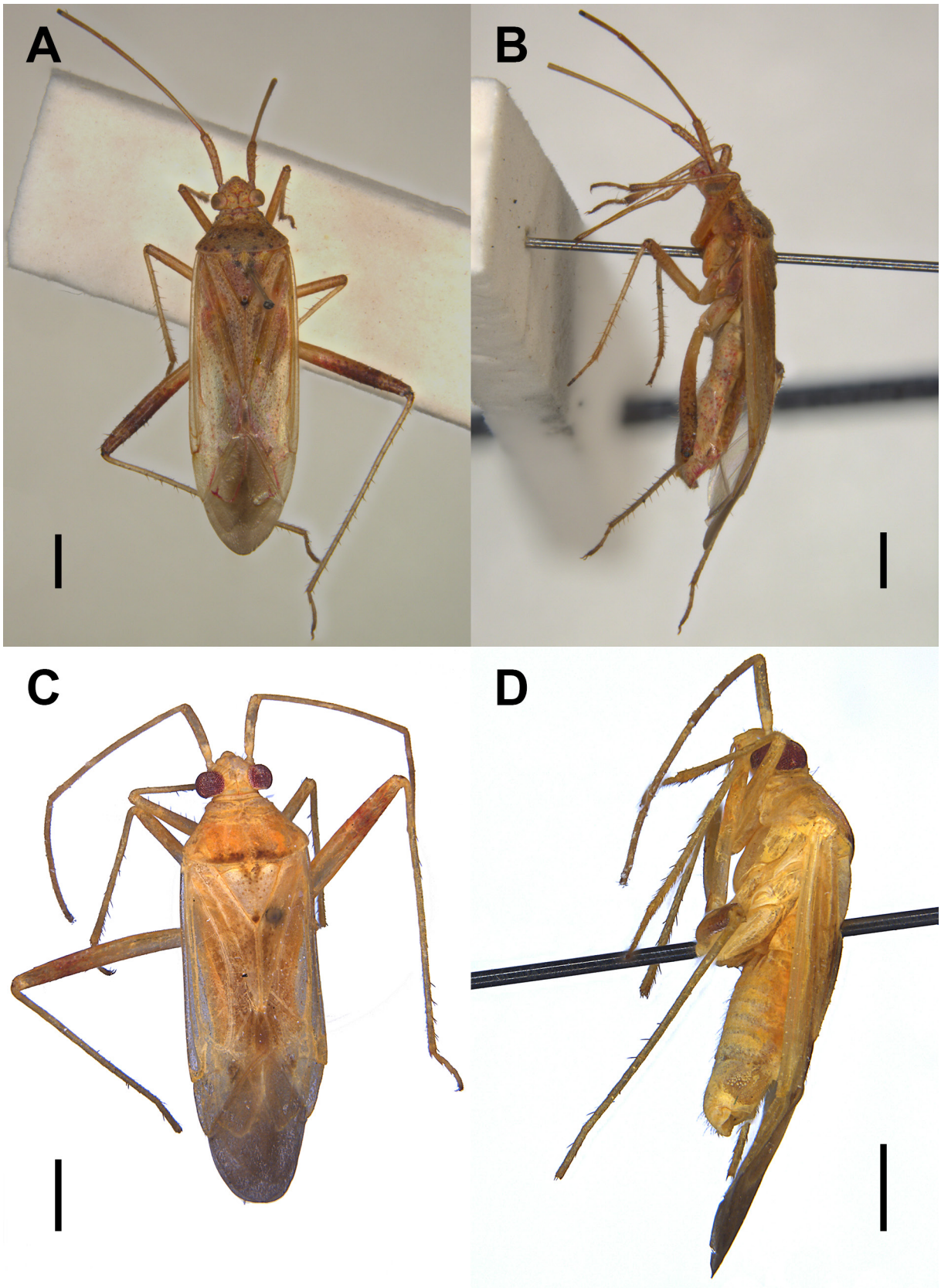

PLATE 21. MIRINAE:

A, B, *Creontiades pacificus* female, habitus dorsal and lateral.
C, D, *Creontiades dilutus* male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

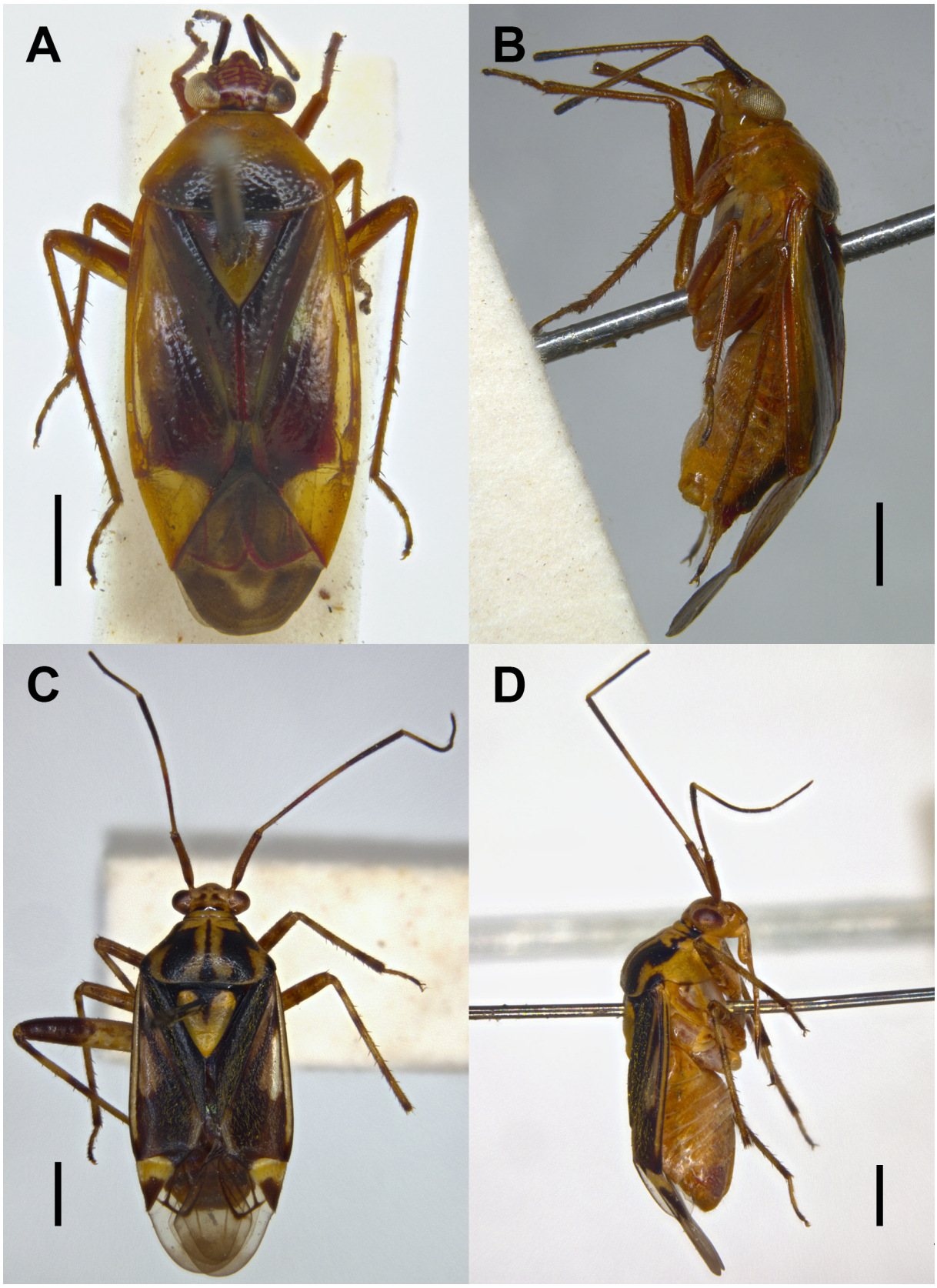

PLATE 22. MIRINAE:

A, B, *Niastama punctaticollis* male, habitus dorsal and lateral.
C, D, *Austropeplus annulipes* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

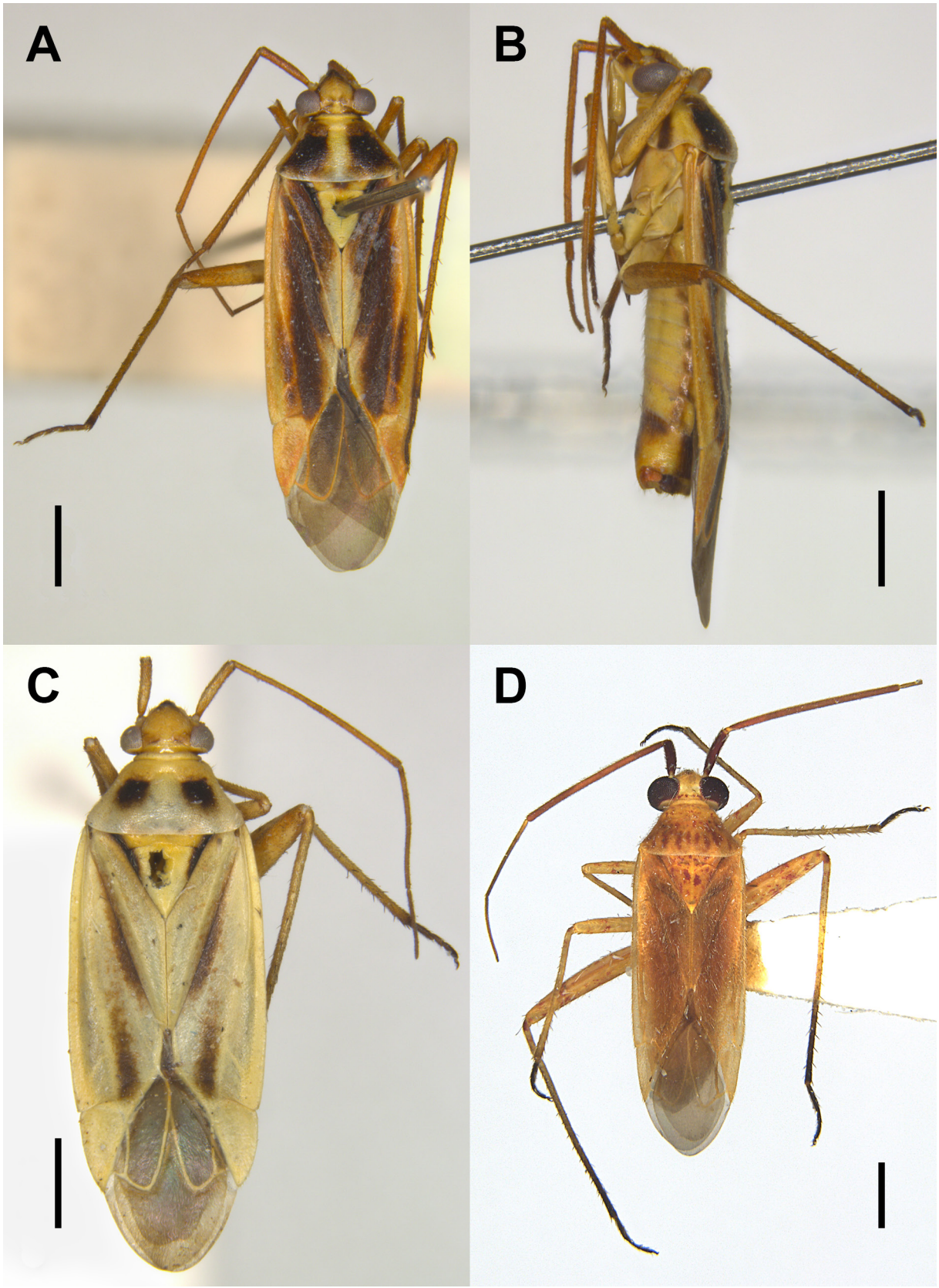

PLATE 23. MIRINAE:

A, B, *Stenotus binotatus* male, habitus dorsal and lateral. C, *Stenotus binotatus* female, habitus dorsal. D, *Stenotus* sp. nr. *gressitti* male, habitus dorsal. Scale line = 1 mm. [A, B, C, Finlay. D, Eow]

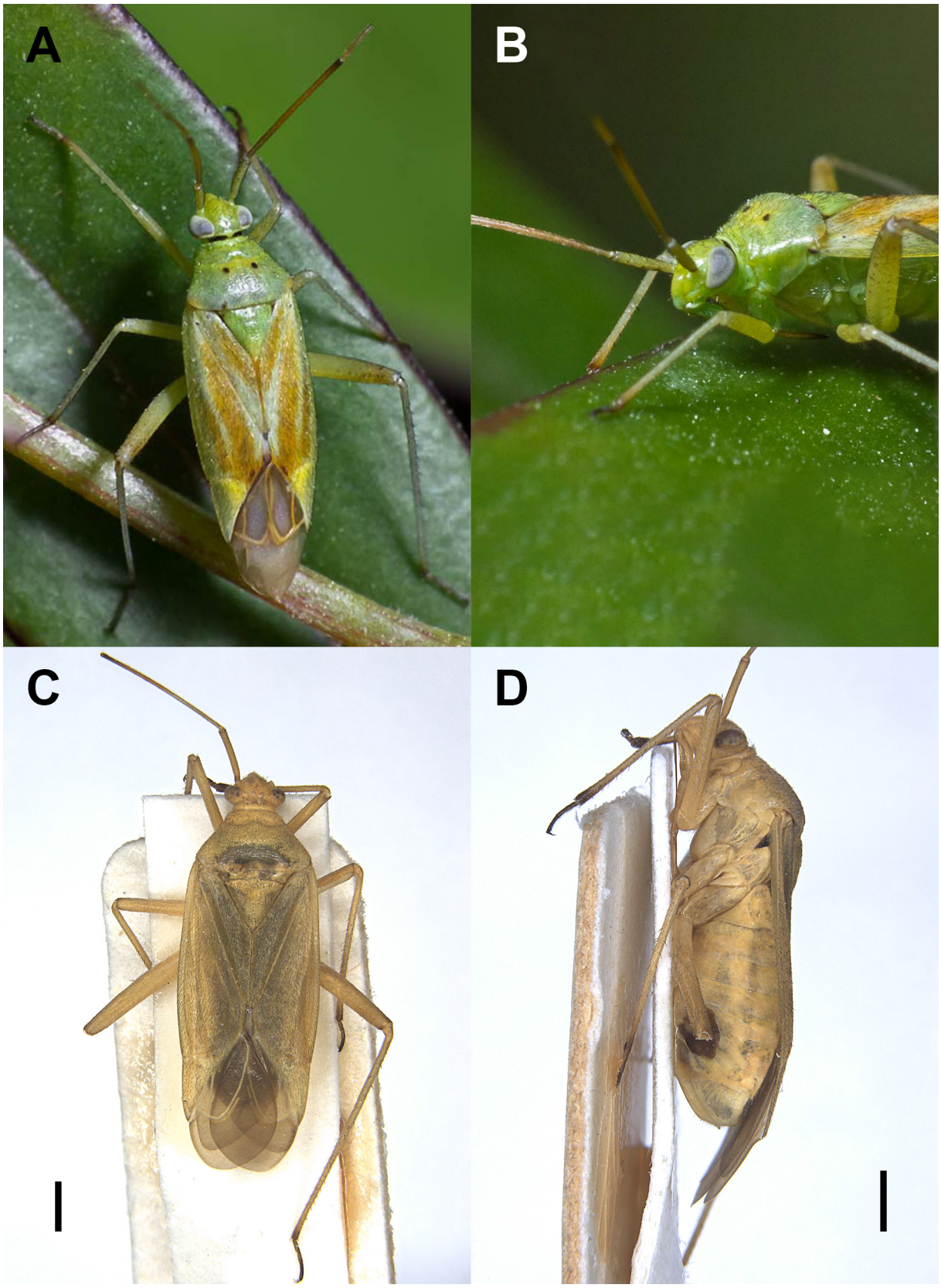

PLATE 24. MIRINAE:

A, *Closterotomus norwegicus* live image, dorsal. B, *Closterotomus norwegicus* live image, lateral view of anterior body. C, D, *Closterotomus norwegicus* female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Daley. C, D, Eow]

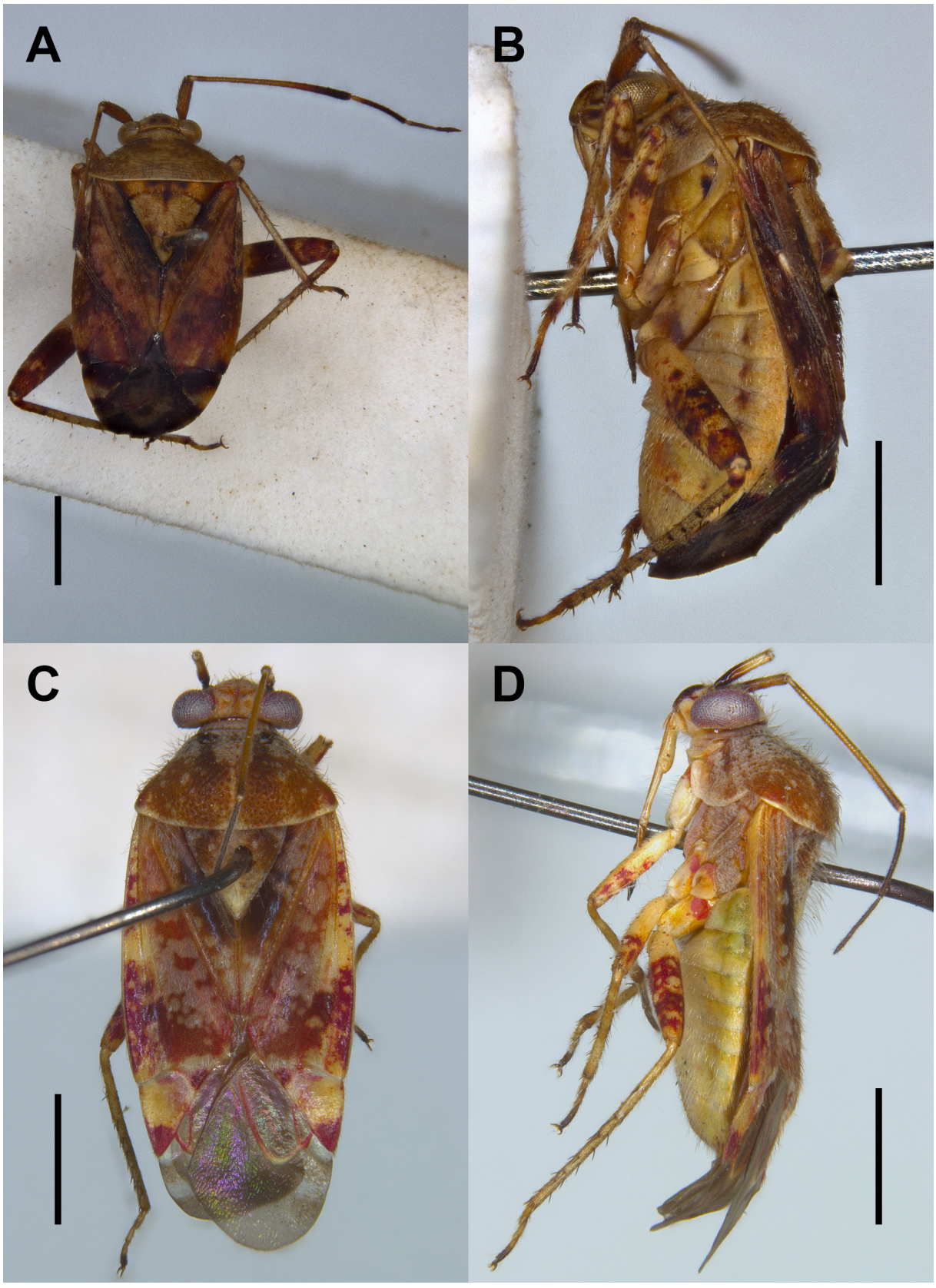

PLATE 25. MIRINAE:

A, B, *Sidnia kinbergi* female, habitus dorsal and lateral.
C, D, *Tinginotum minutum* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

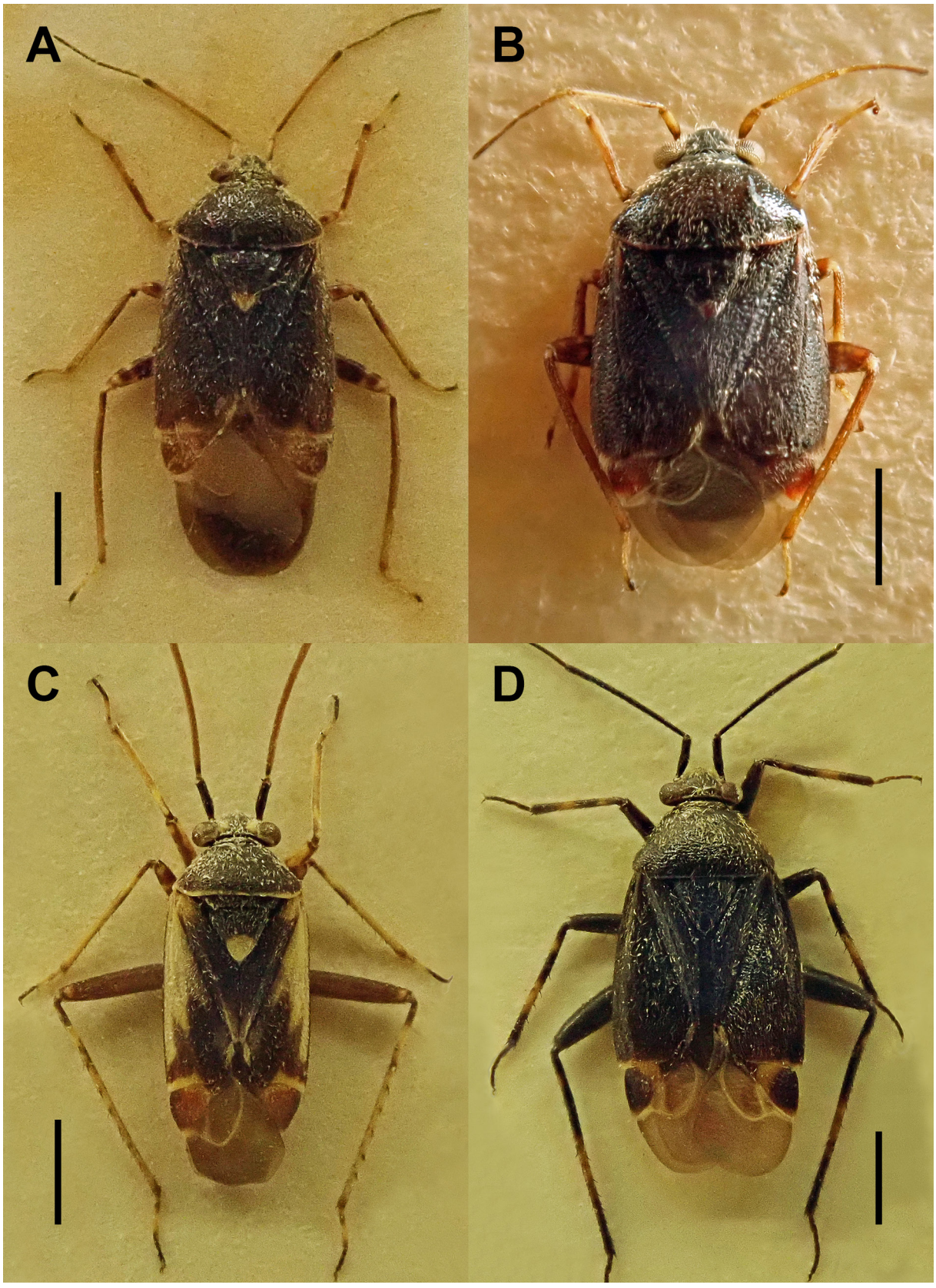

PLATE 26. MIRINAE EXOTIC**:**

A, *Charagochilus weberi* holotype male, habitus dorsal. B, *Charagochilus gyllenhalii*, habitus dorsal. C, *Polymerus cognatus*, habitus dorsal. D, *Polymerus nigritus*, habitus dorsal. Scale line = 1 mm. [all, Chérot]

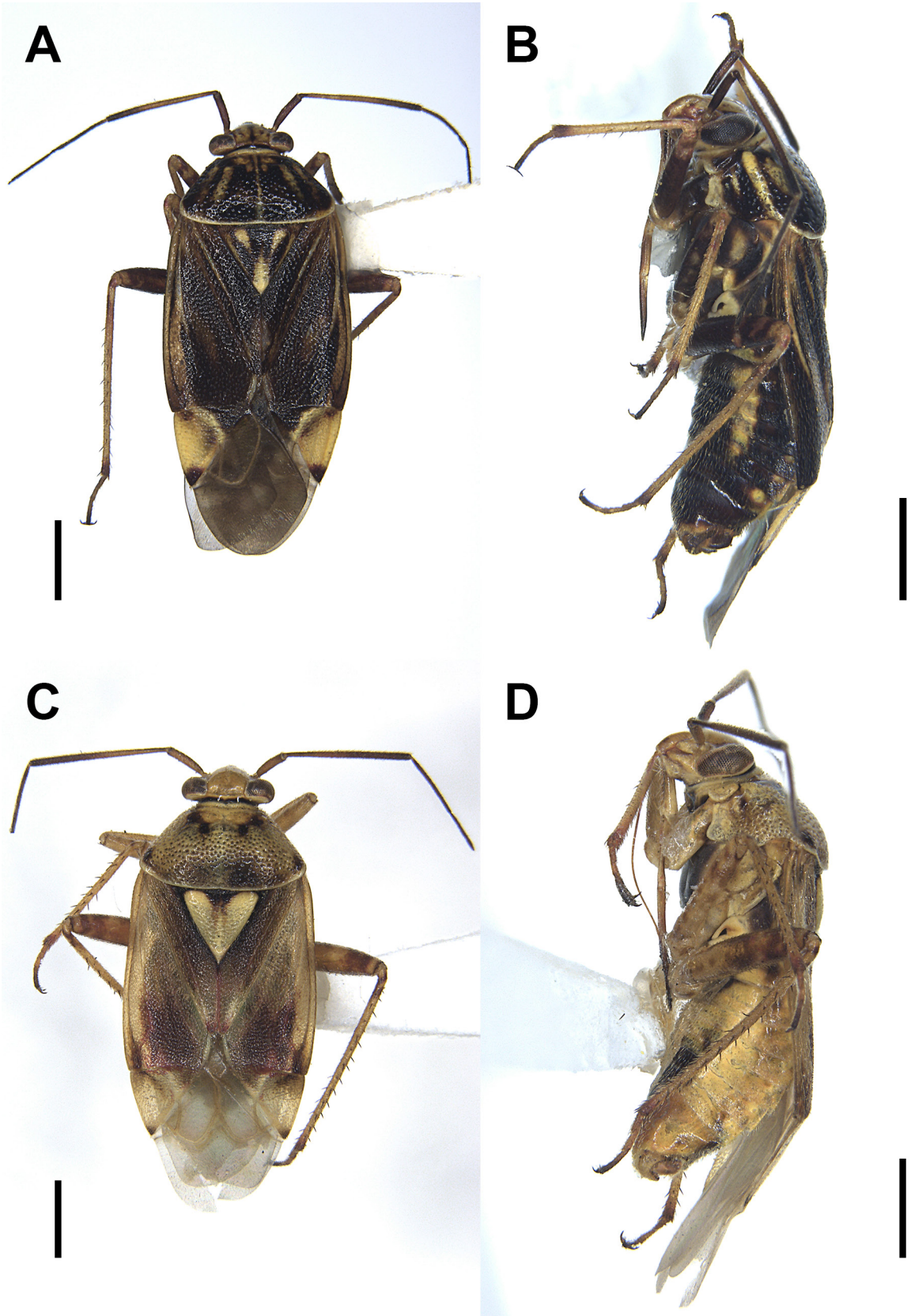

PLATE 27. MIRINAE EXOTIC**:**

A, B, *Lygus lineolaris* male, habitus dorsal and lateral.
C, D, *Lygus hesperus* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

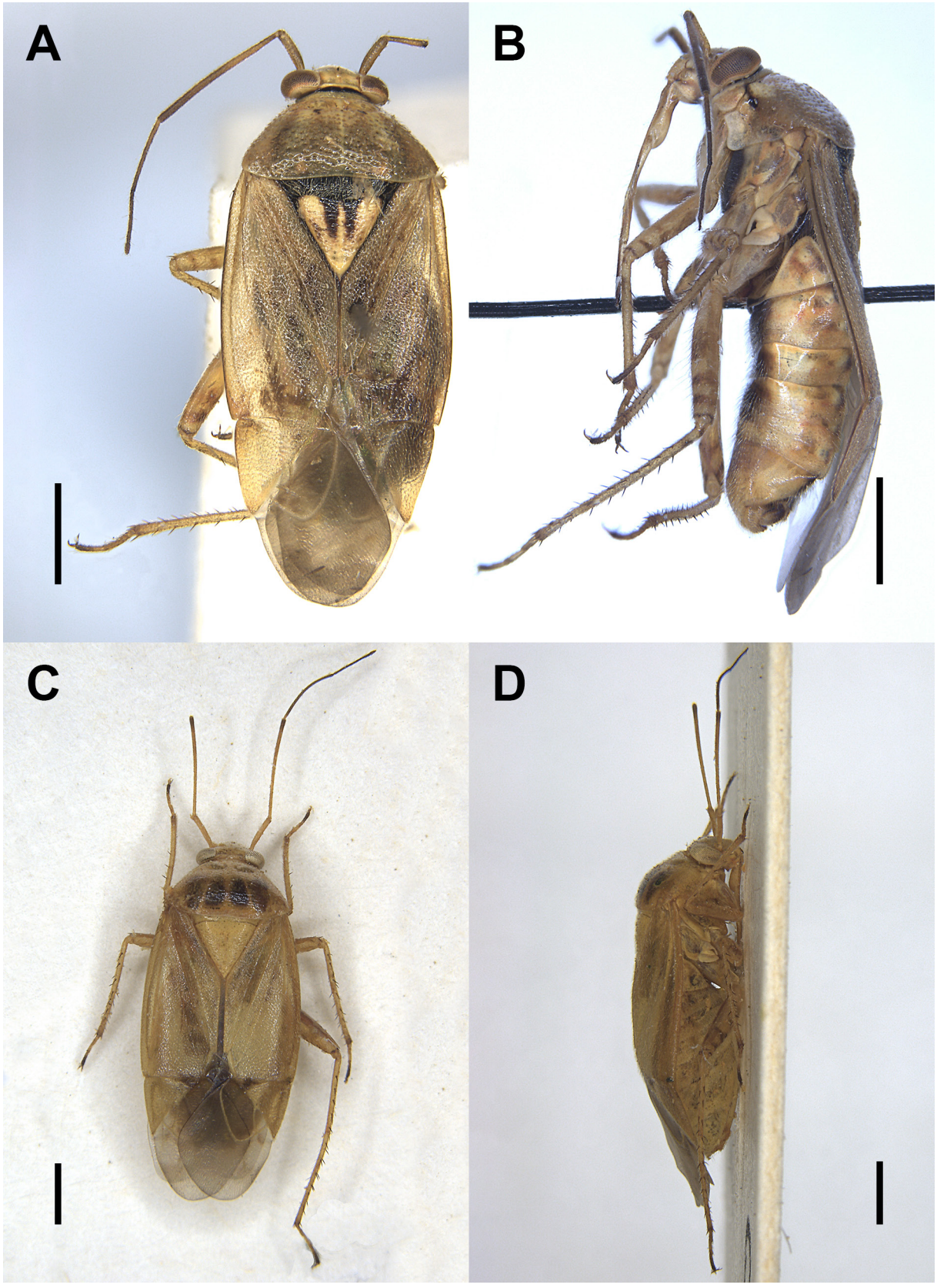

PLATE 28. MIRINAE EXOTIC**:**

A, B, *Lygus rugulipennis* male, habitus dorsal and lateral.
C, D, *Apolygus lucorum* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

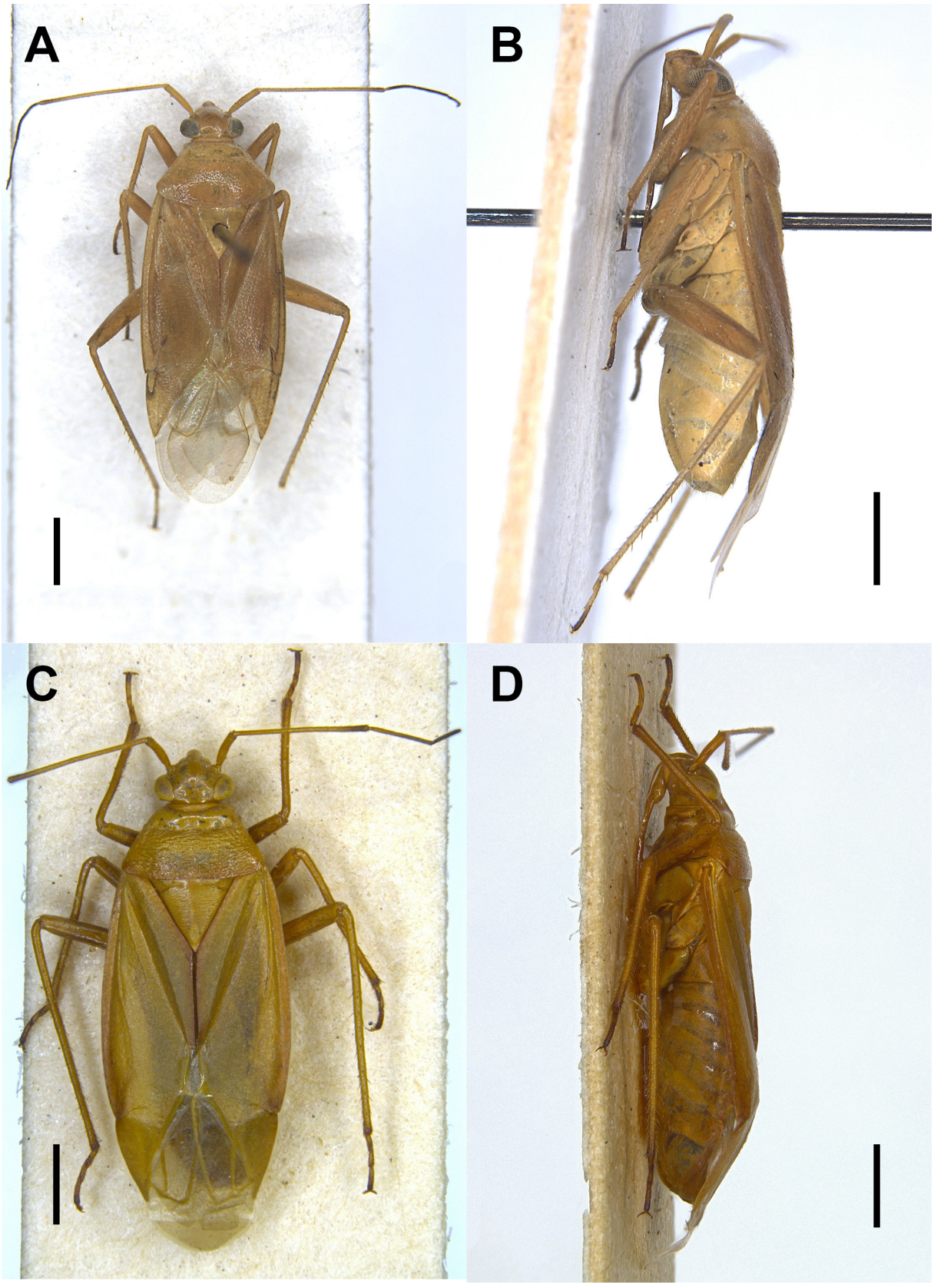

PLATE 29. MIRINAE EXOTIC**:**

A, B, *Lygocoris pabulinus* female, habitus dorsal and lateral.
C, D, *Lygocoris rugicollis* female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

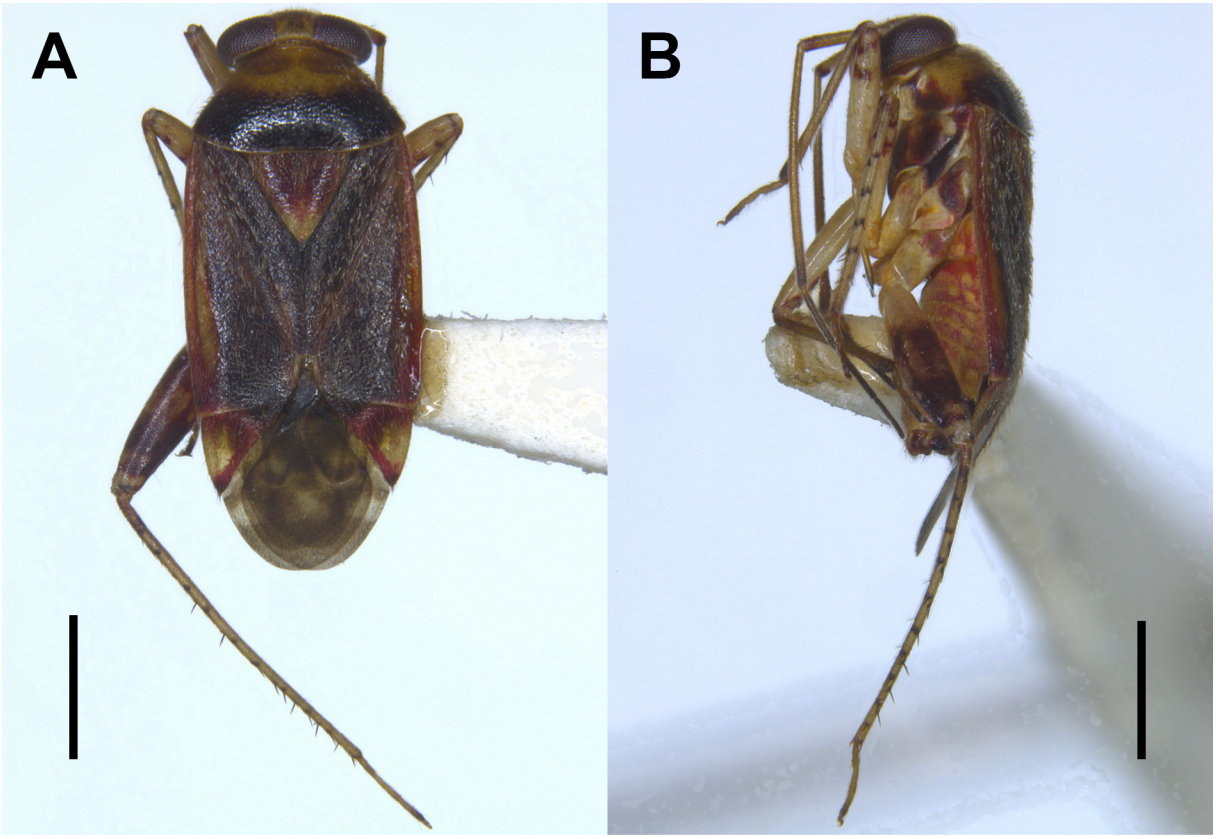

PLATE 30. MIRINAE:

A, B, *Micromimetus pictipes* paratype male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay]

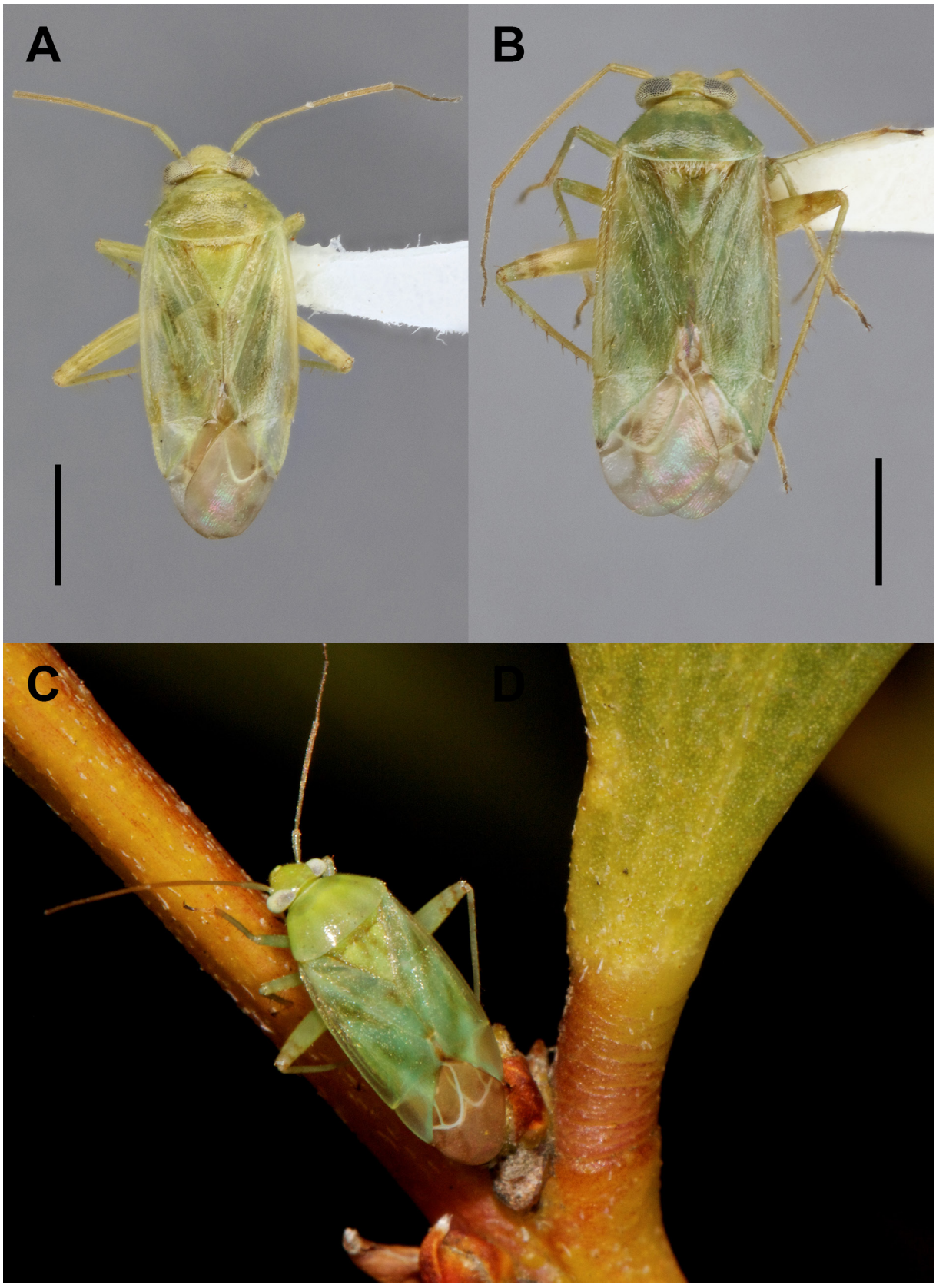

PLATE 31. MIRINAE:

A, B, *Taylorilygus apicalis*, habitus dorsal.
C, *Taylorilygus apicalis* live image. Scale line = 1 mm. [A, B, Yeshwanth. C, Ellingsen]

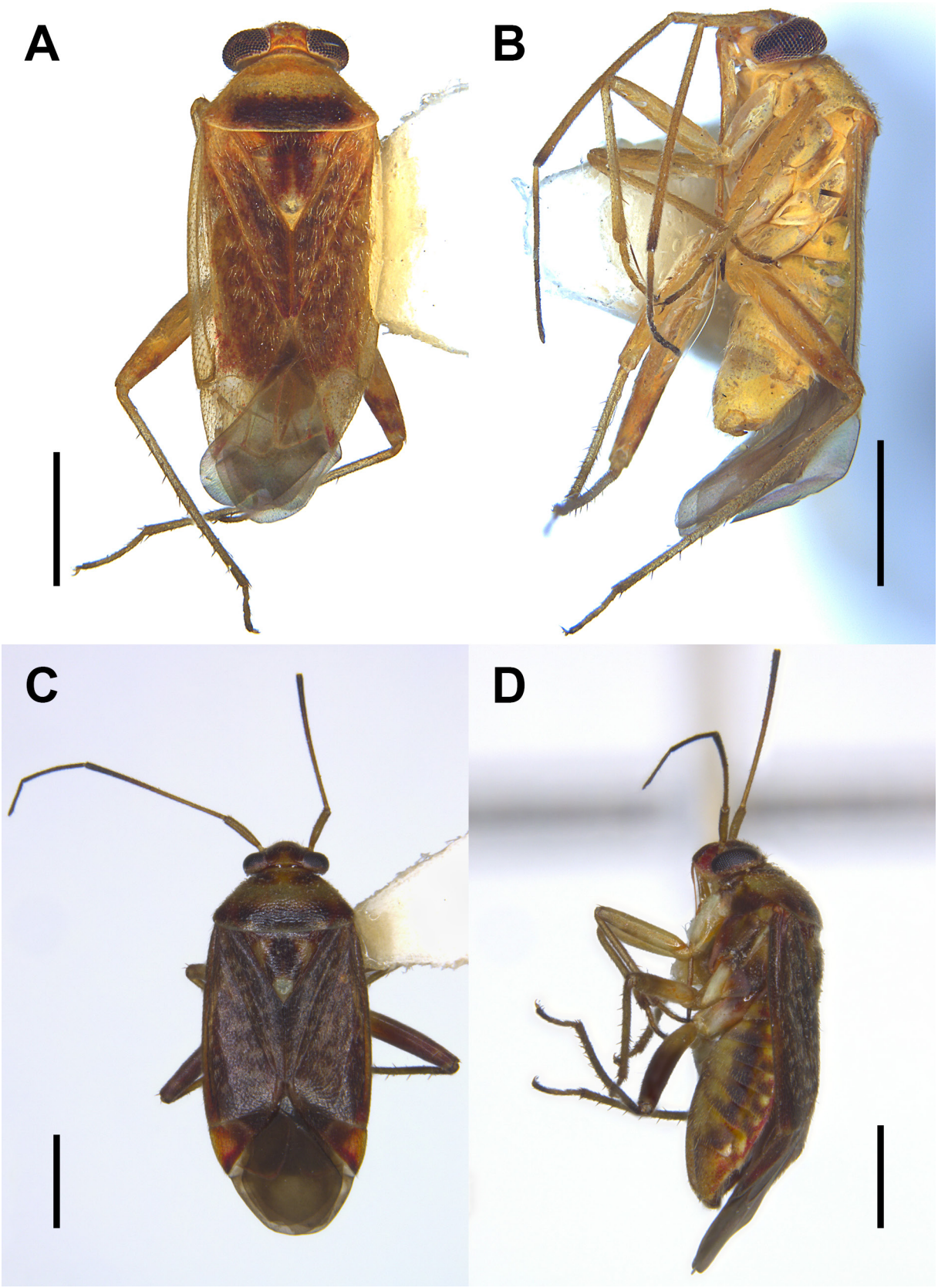

PLATE 32. MIRINAE:

A, B, *Diomocoris nebulosus* male, habitus dorsal and lateral. C, D, *Diomocoris punctatus* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

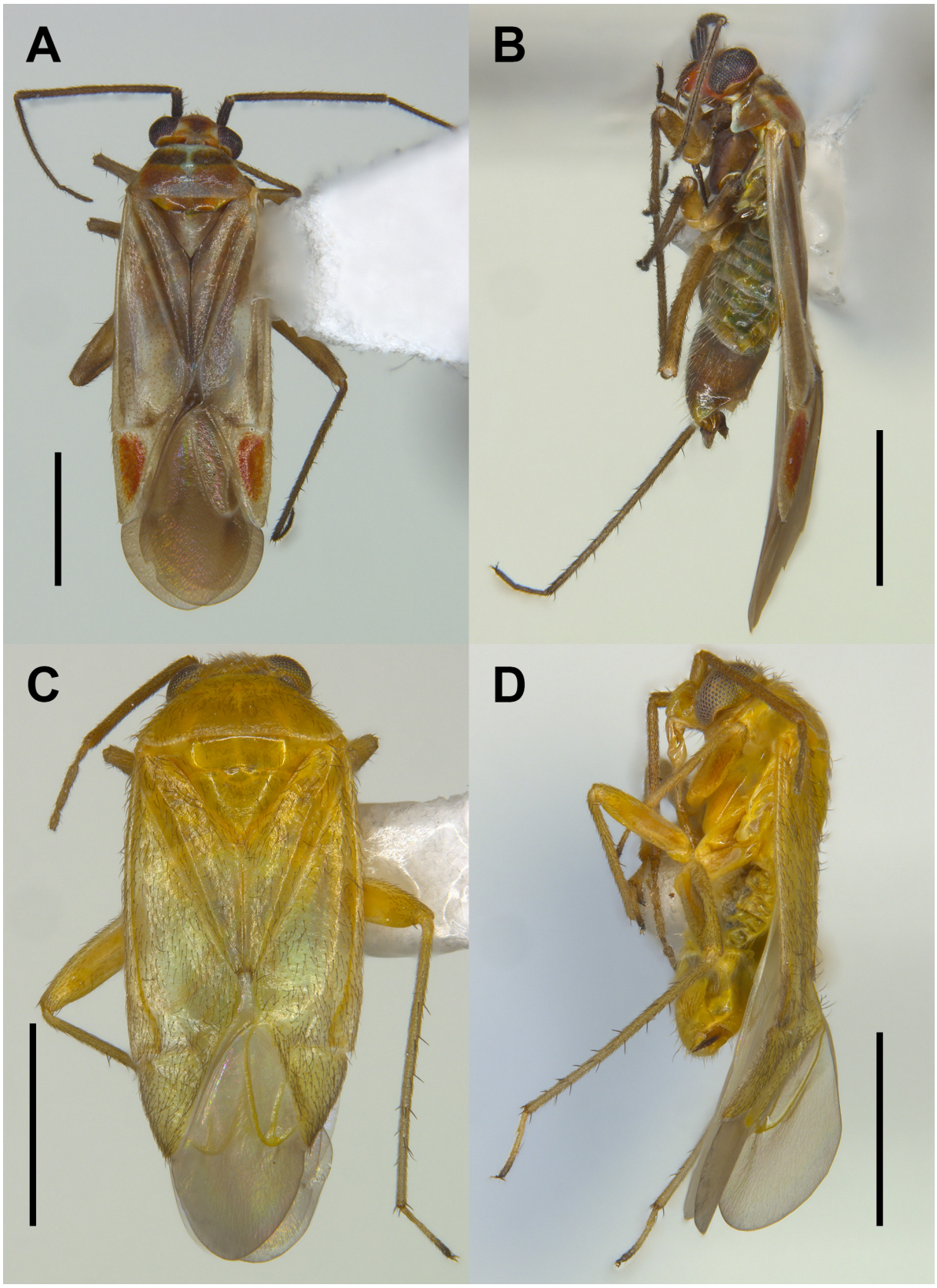

PLATE 33. PHYLINAE:

A, B, *Bifidostylus cassisi* paratype male, habitus dorsal and lateral.
C, D, *Bifidostylus omnivorus* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

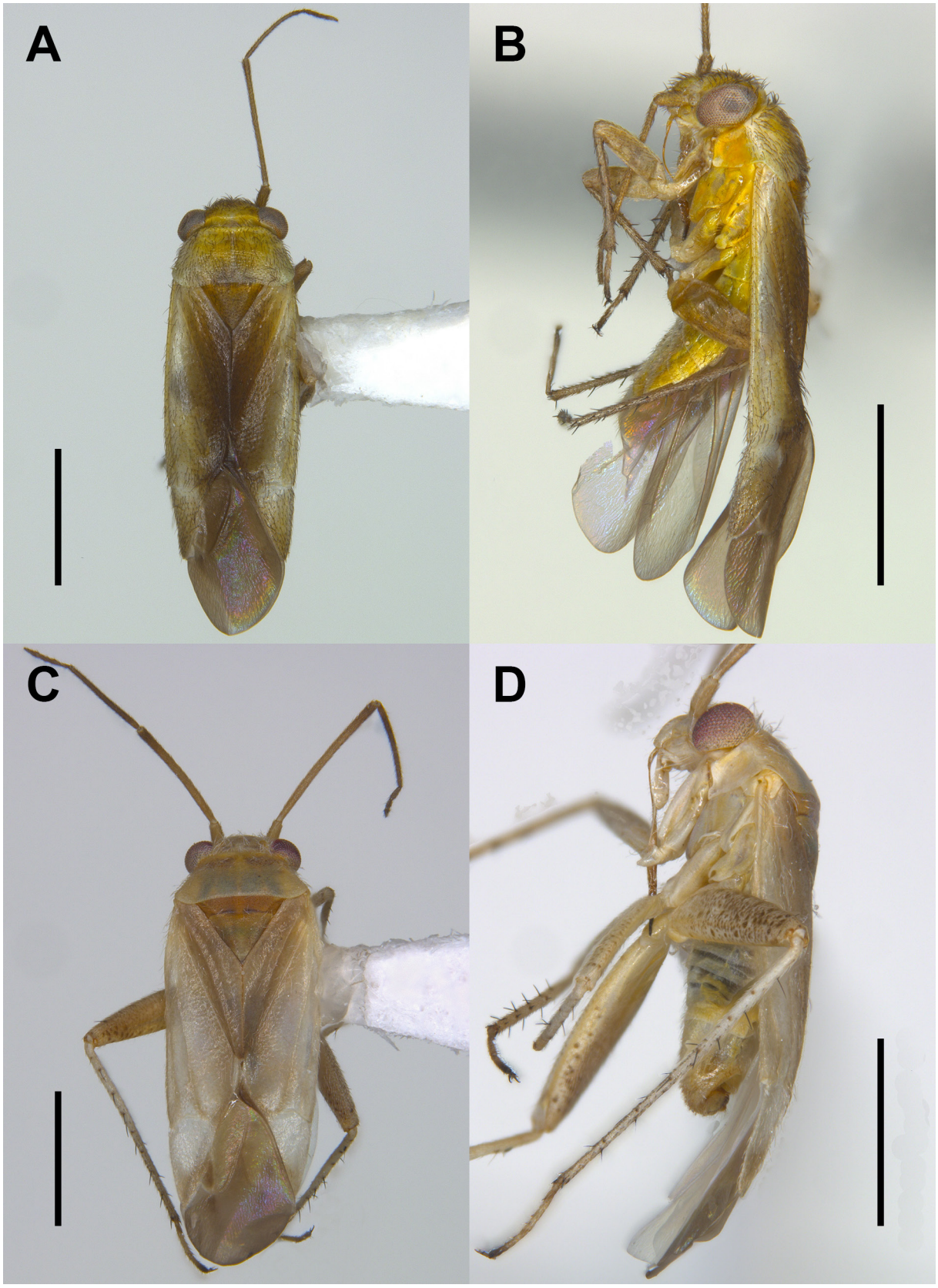

PLATE 34. PHYLINAE:

A, B, *Omnivoriphylus frankenii* paratype female, habitus dorsal and lateral.
C, D, *Halophylus maireani* paratype male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

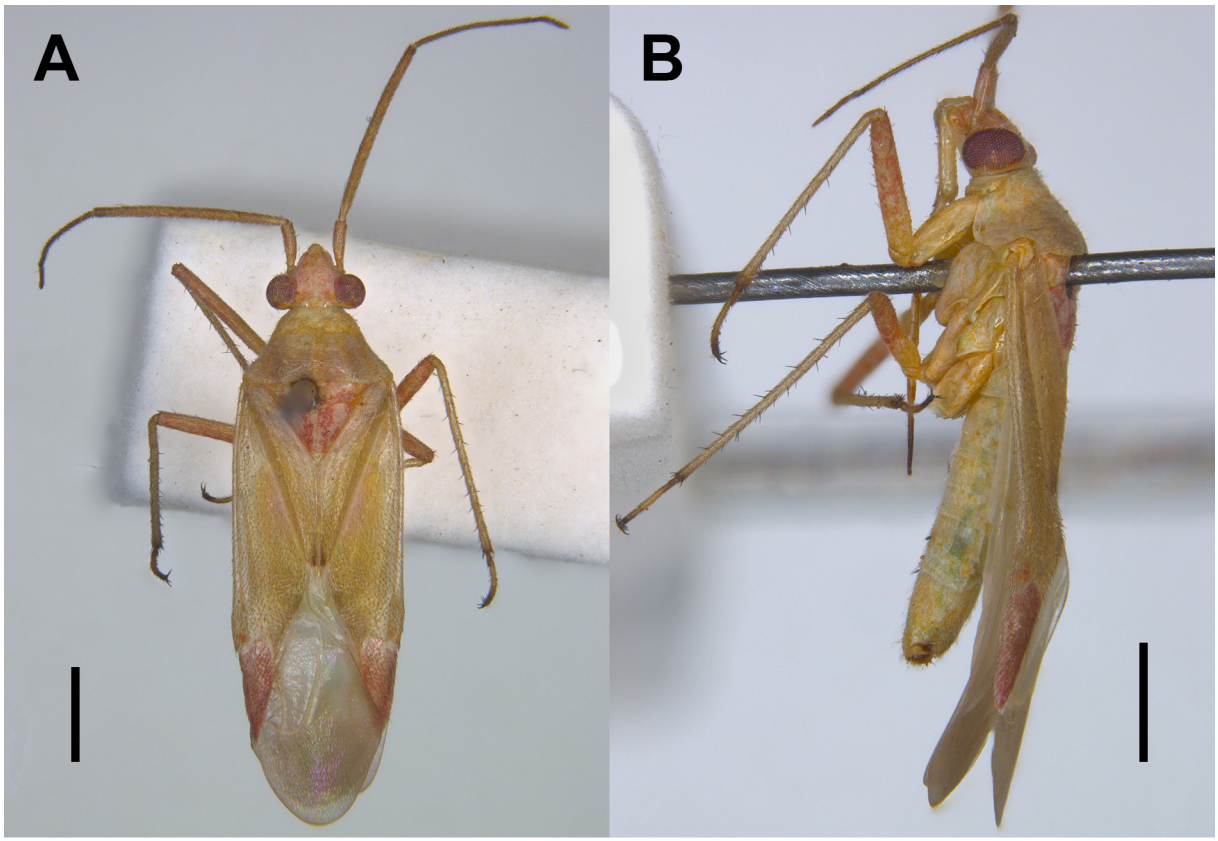

PLATE 35. PHYLINAE:

A, B, *Pulvillophylus cuneotinctus* paratype male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

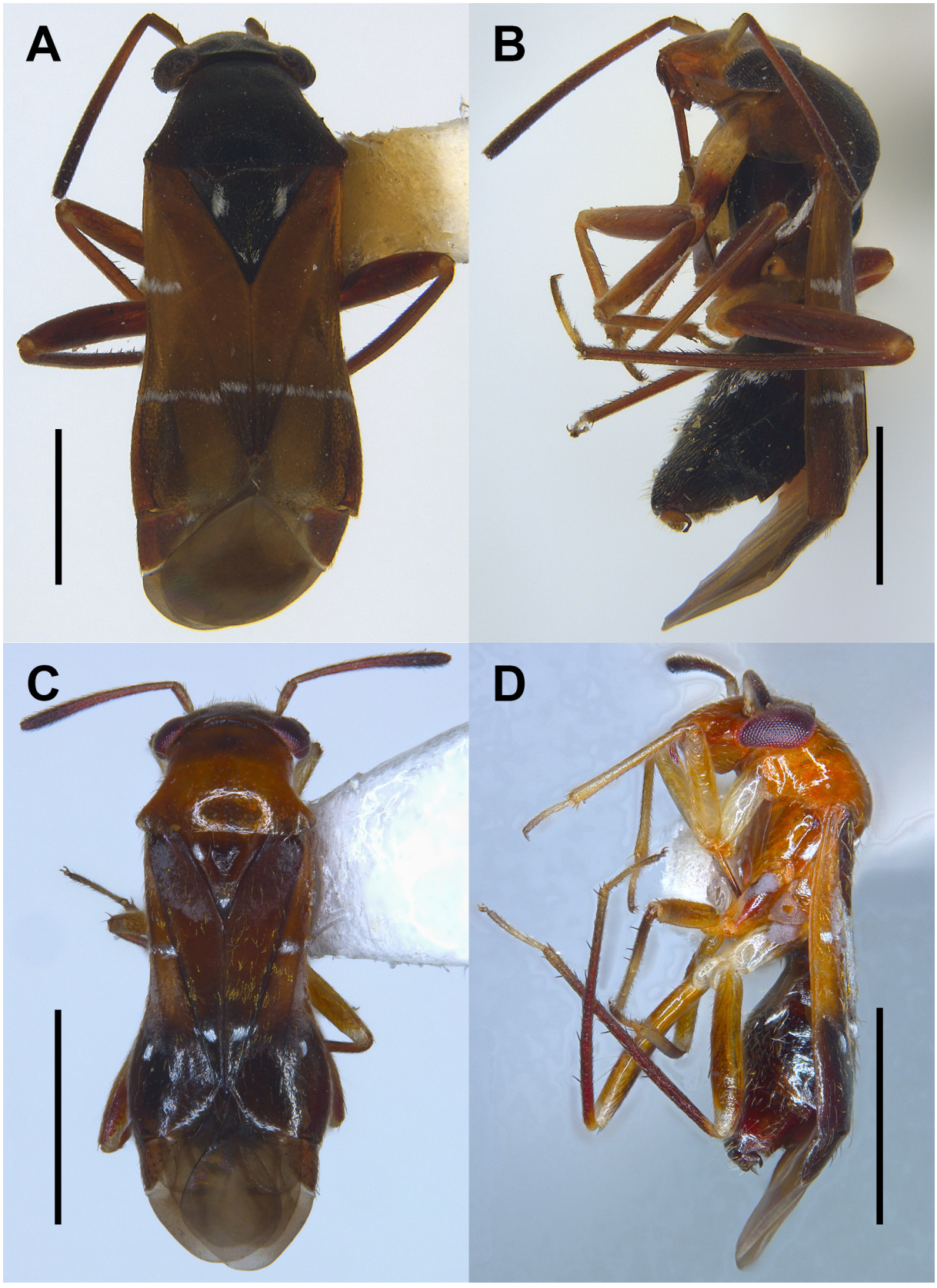

PLATE 36. PHYLINAE:

A, B, EXOTIC *Pilophorus perplexus* male, habitus dorsal and lateral.
C, D, *Pilophorus* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

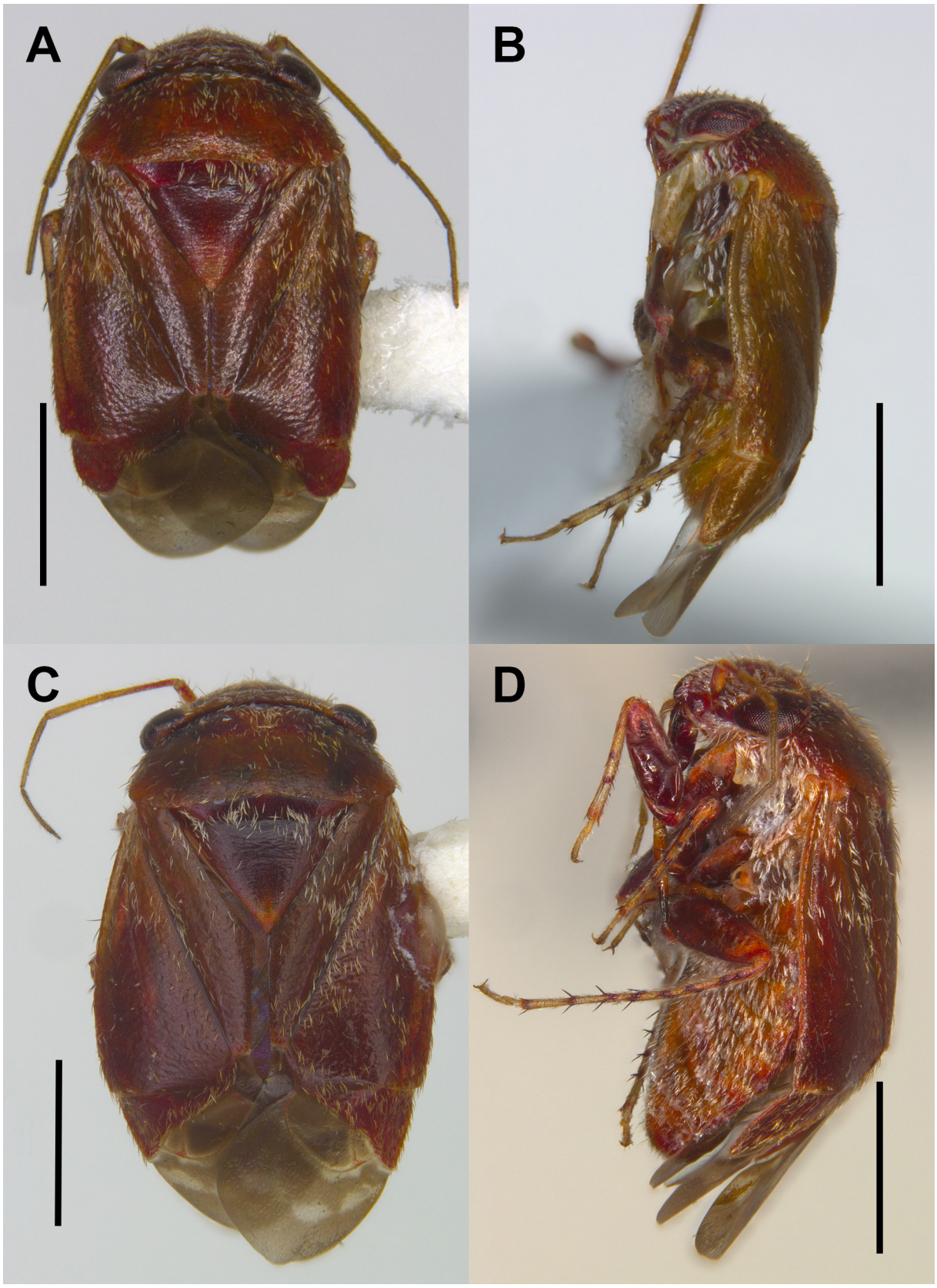

PLATE 37. PHYLINAE:

A, B, *Hypseloecus amyemicola* paratype female, habitus dorsal and lateral.
C, D, *Hypseloecus paramyemi* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

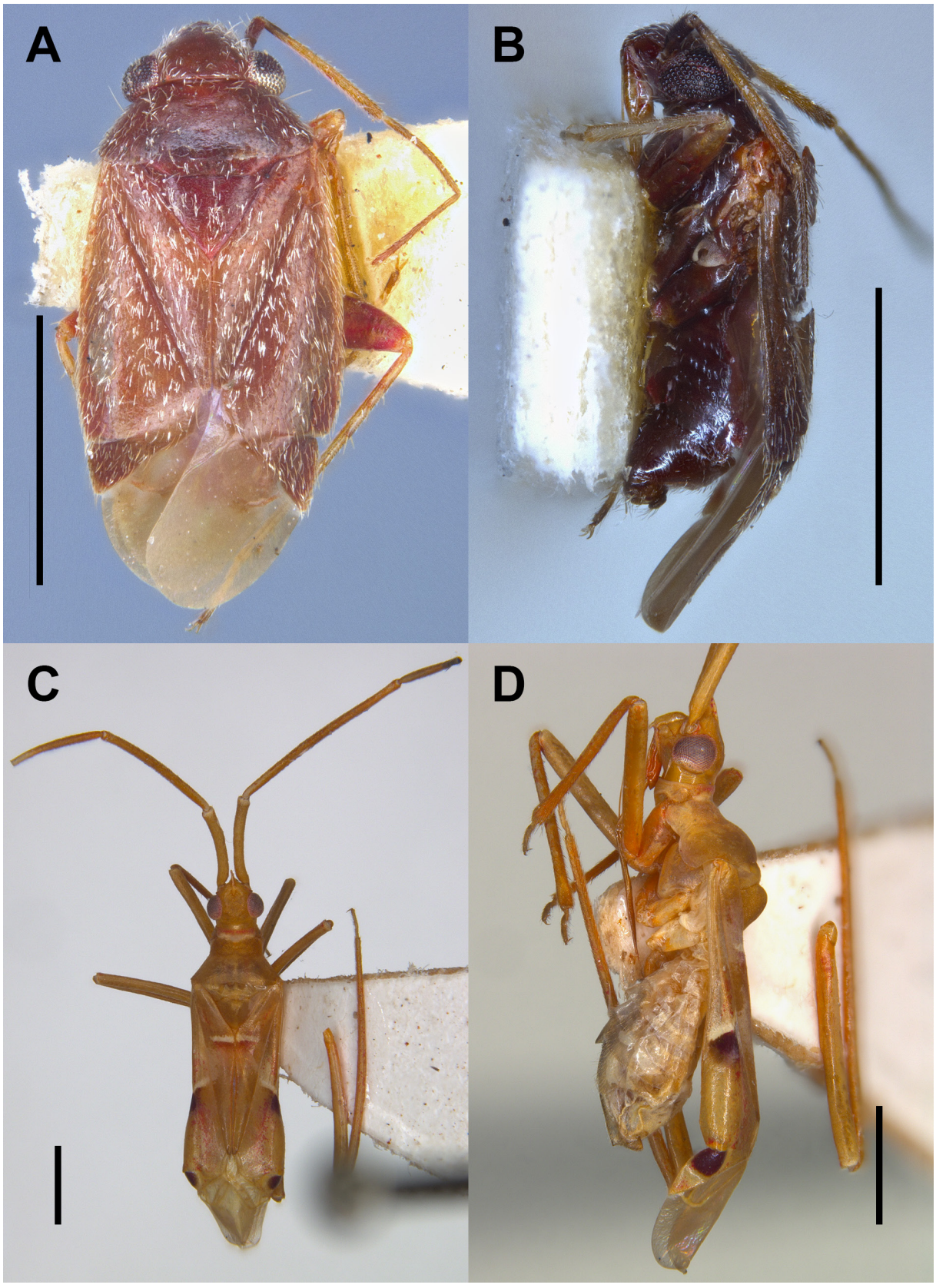

PLATE 38. PHYLINAE:

A, *Sthenaridea* sp. female, habitus dorsal. B, *Sthenaridea* sp. male, habitus lateral. C, D, *Acrorrhinium* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

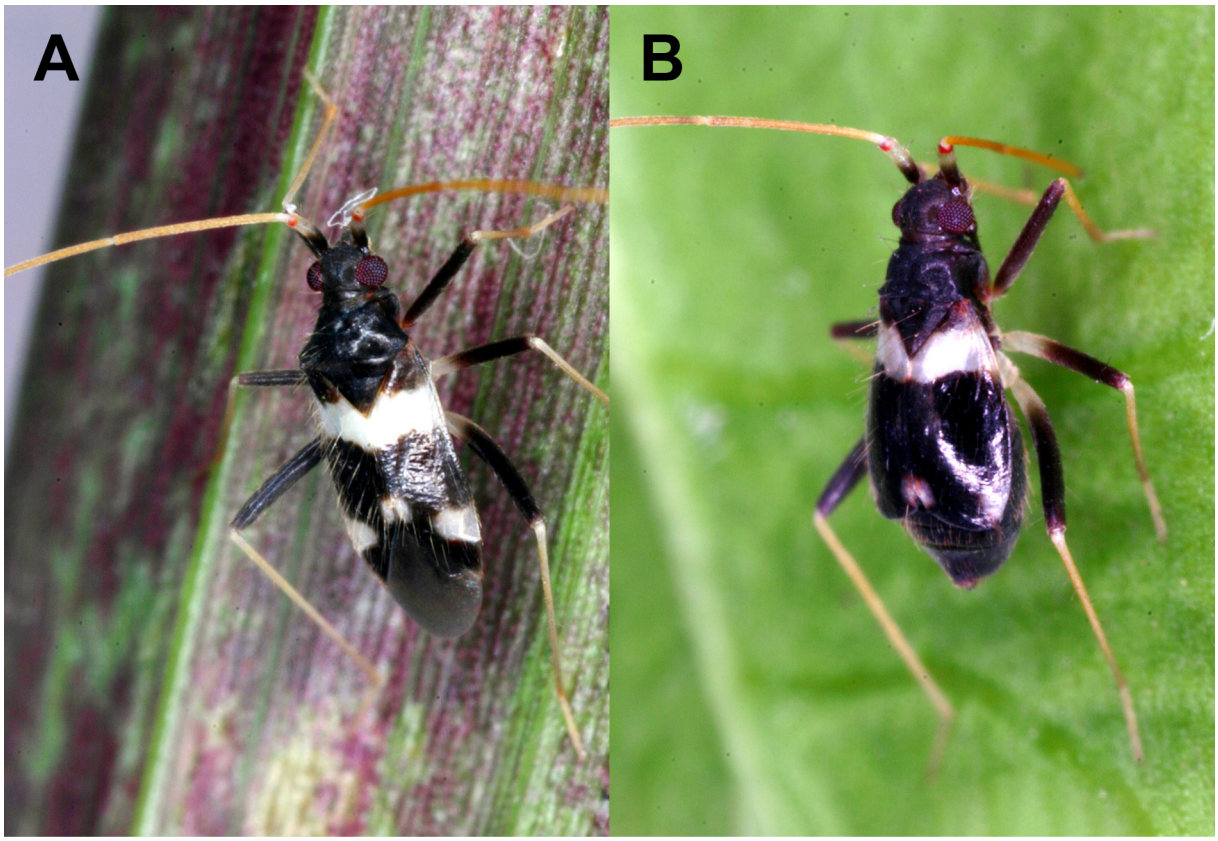

PLATE 39. PHYLINAE:

A, B, *Hallodapus albofasciatus* live image. [A, B, Yasunaga]

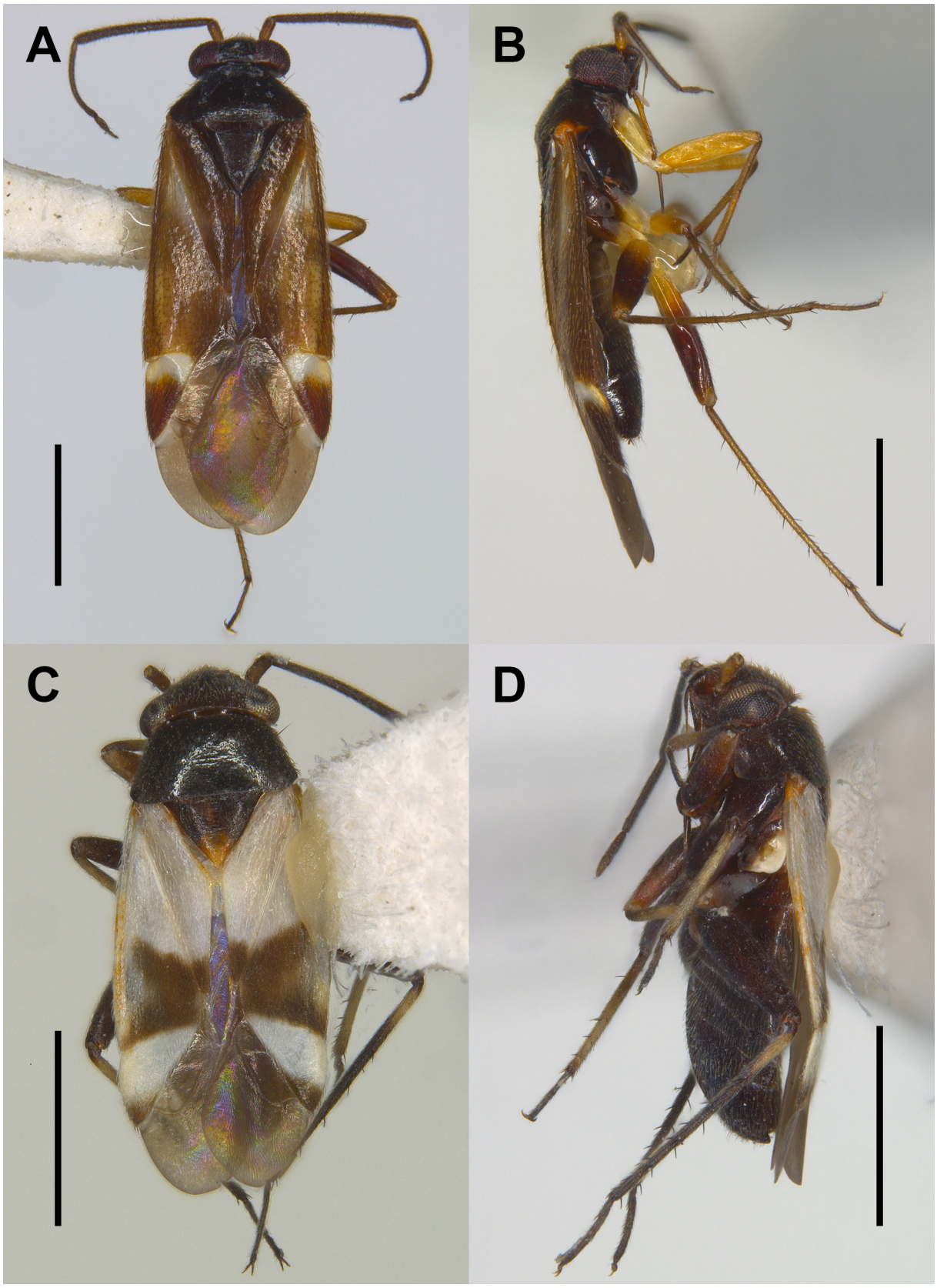

PLATE 40. PHYLINAE:

A, B, *Ausejanus albisignatus* male, habitus dorsal and lateral.
C, D, *Ausejanus tiramisu* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

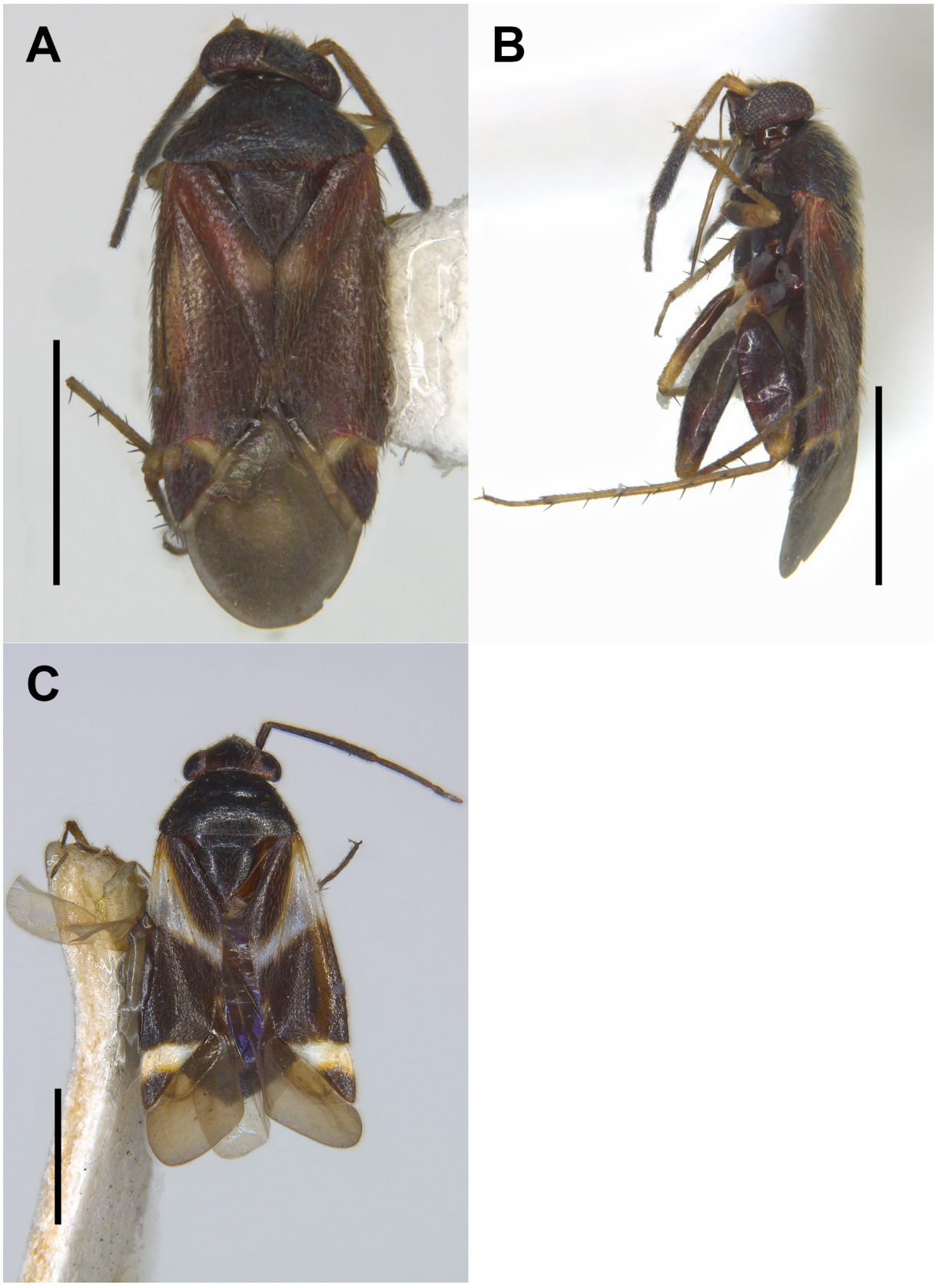

PLATE 41. PHYLINAE:

A, B, *Sejanus brittoni* male, habitus dorsal and lateral.
C, *Sejanus vividus* paratype female, habitus dorsal. Scale line = 1 mm. [all, Finlay]

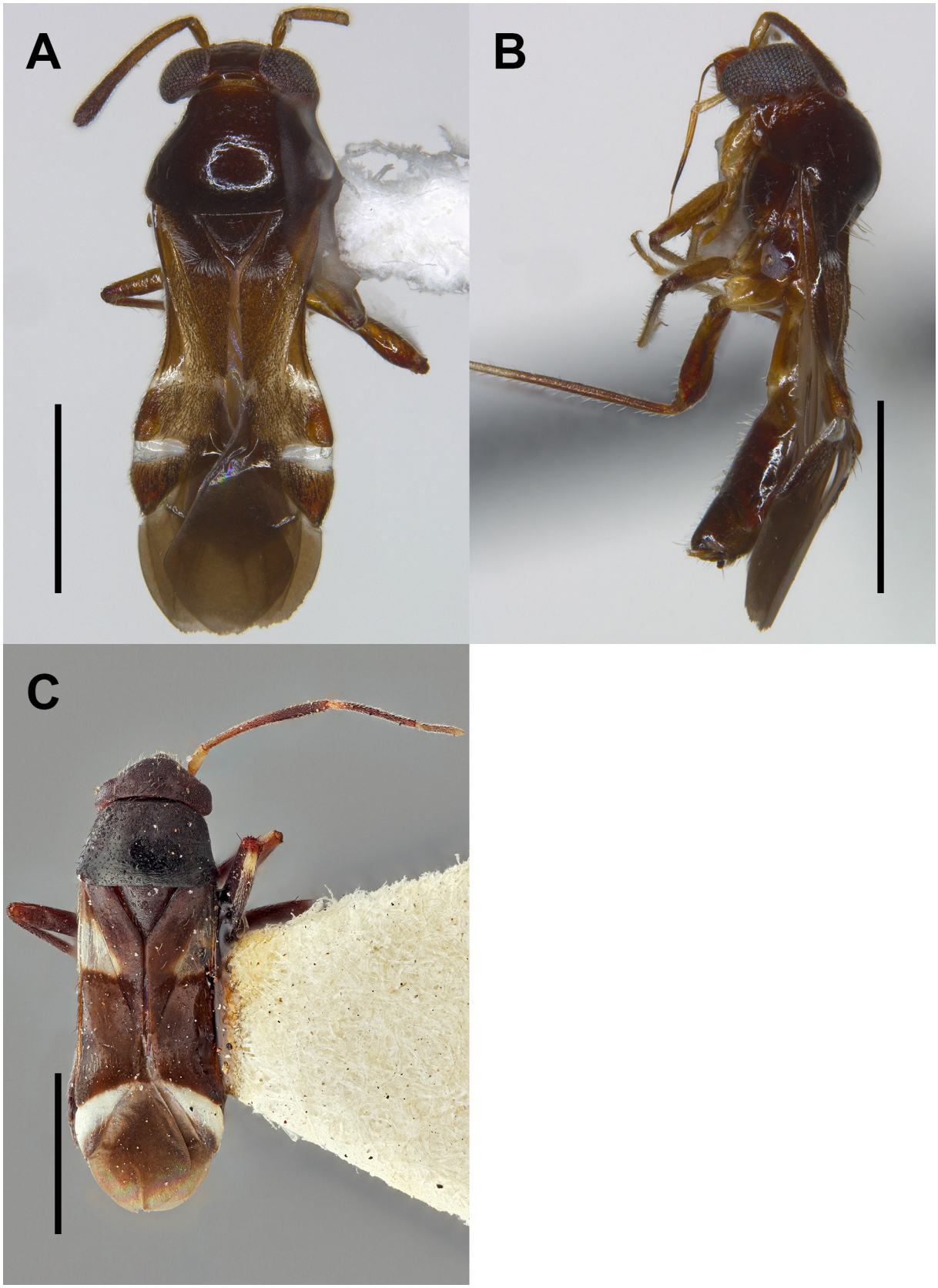

PLATE 42. PHYLINAE:

A, B, *Arafuramiris queenslandensis* paratype male, habitus dorsal and lateral.
C, *Leucophoroptera nitidor* holotype female, habitus dorsal. Scale line = 1 mm. [A, B, Finlay. C, Thompson]

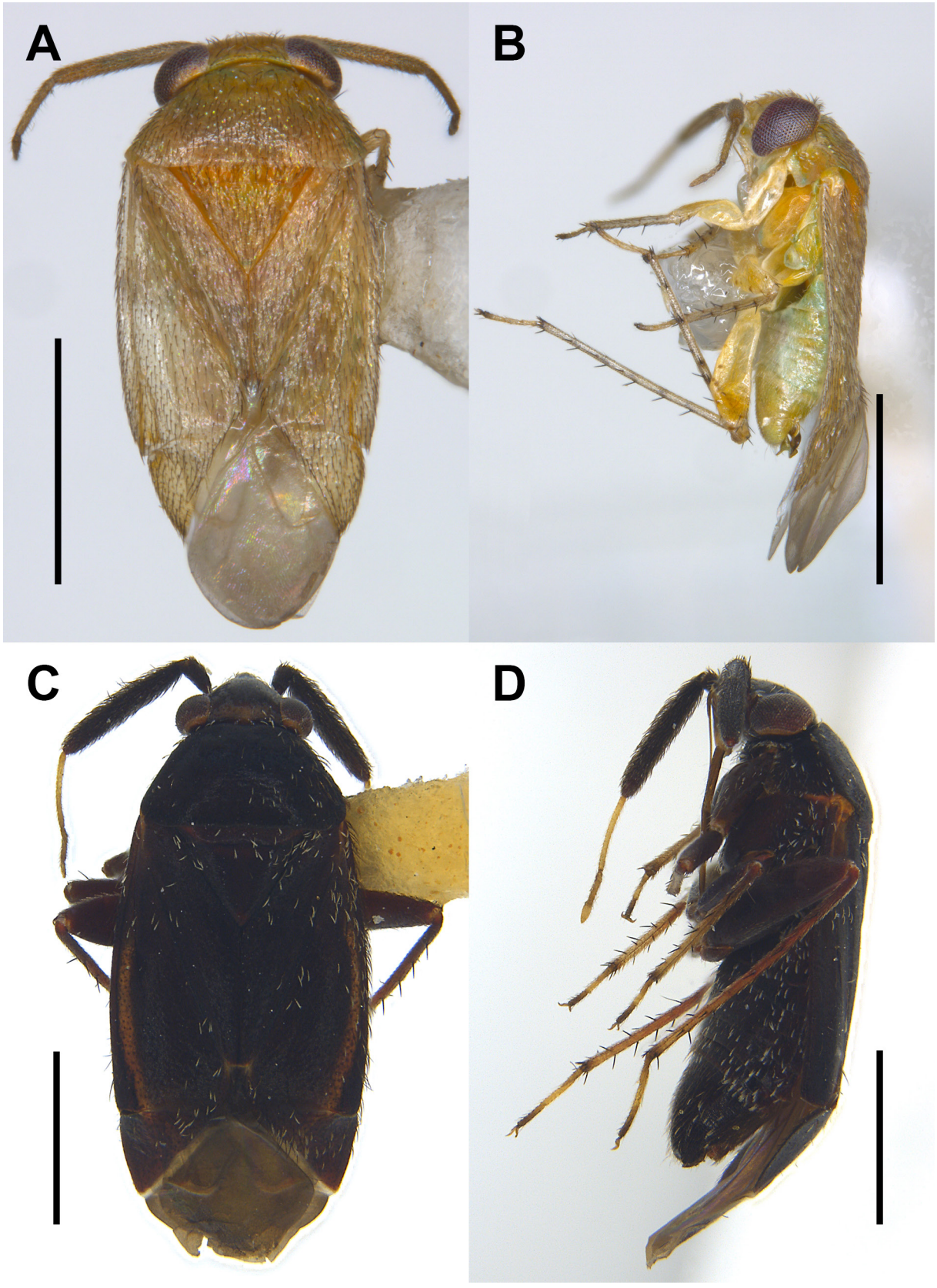

PLATE 43. PHYLINAE EXOTIC**:**

A, B, *Rhinacloa callicrates* male, habitus dorsal and lateral.
C, D, *Atractotomus mali* male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

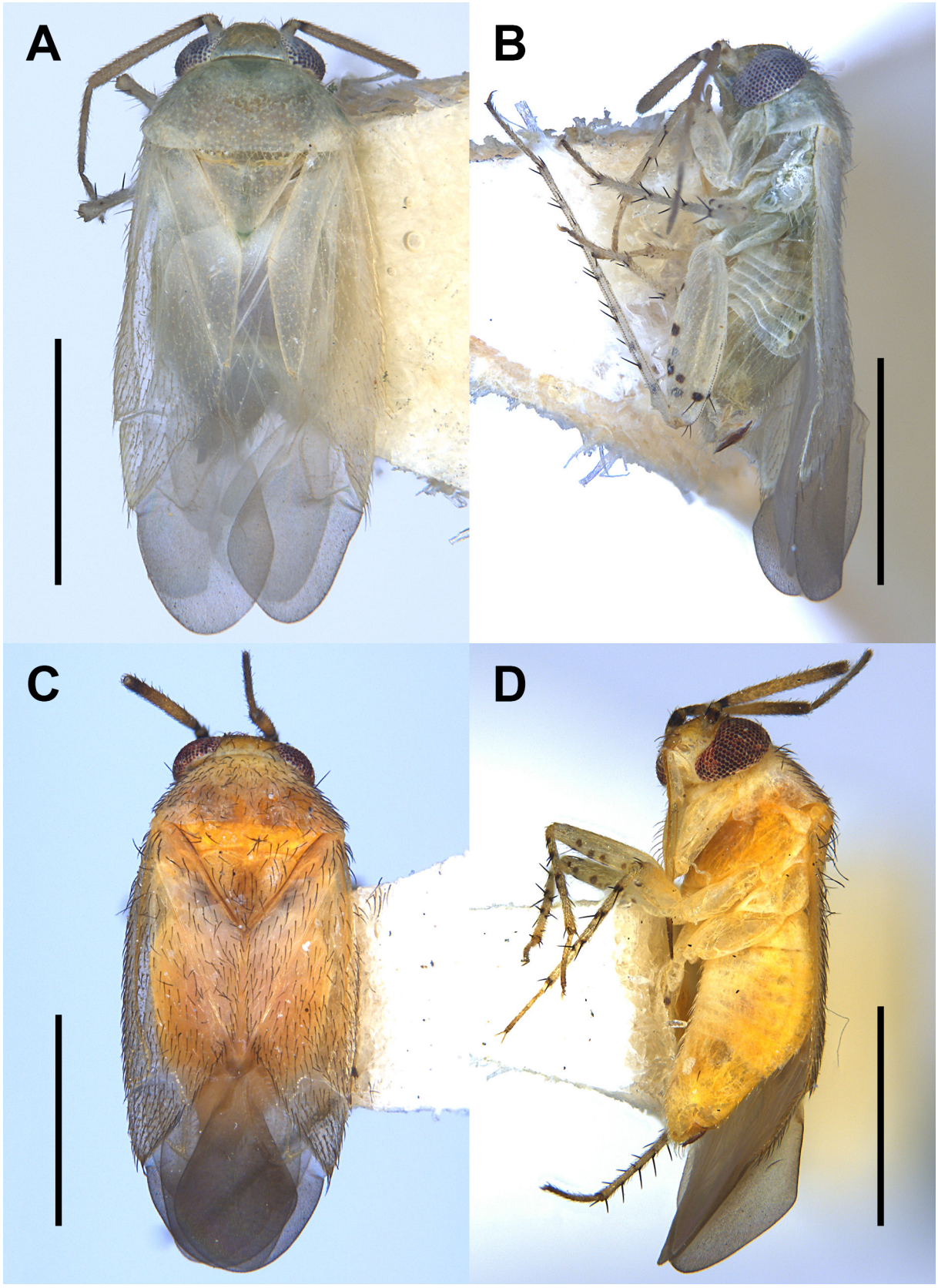

PLATE 44. PHYLINAE:

A, B, *Campylomma austrina* male, habitus dorsal and lateral.
C, D, *Campylomma liebknechti* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

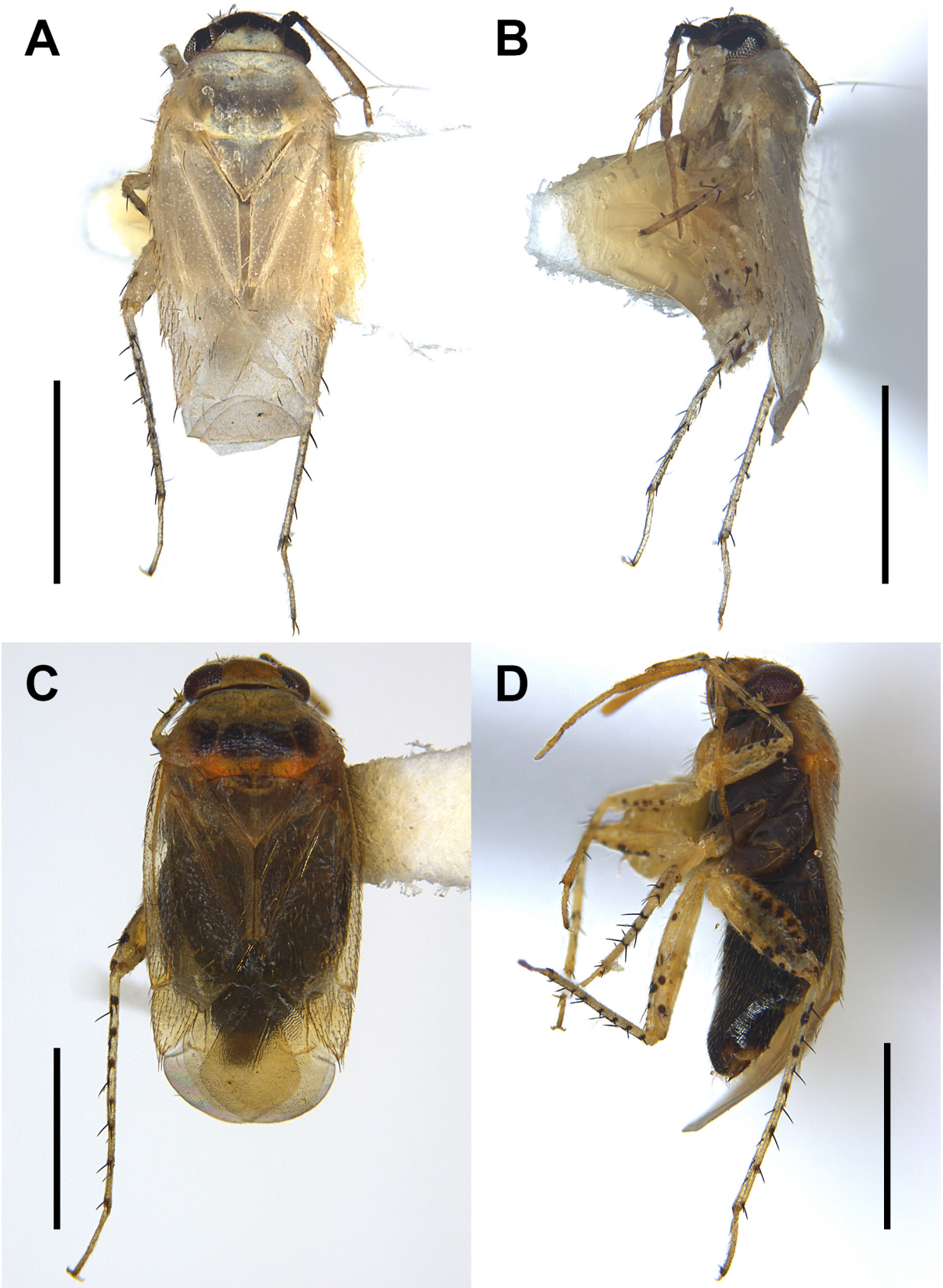

PLATE 45. PHYLINAE:

A, B, *Campylomma seminigricaput* male, habitus dorsal and lateral.
C, D, EXOTIC *Campylomma verbasci* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

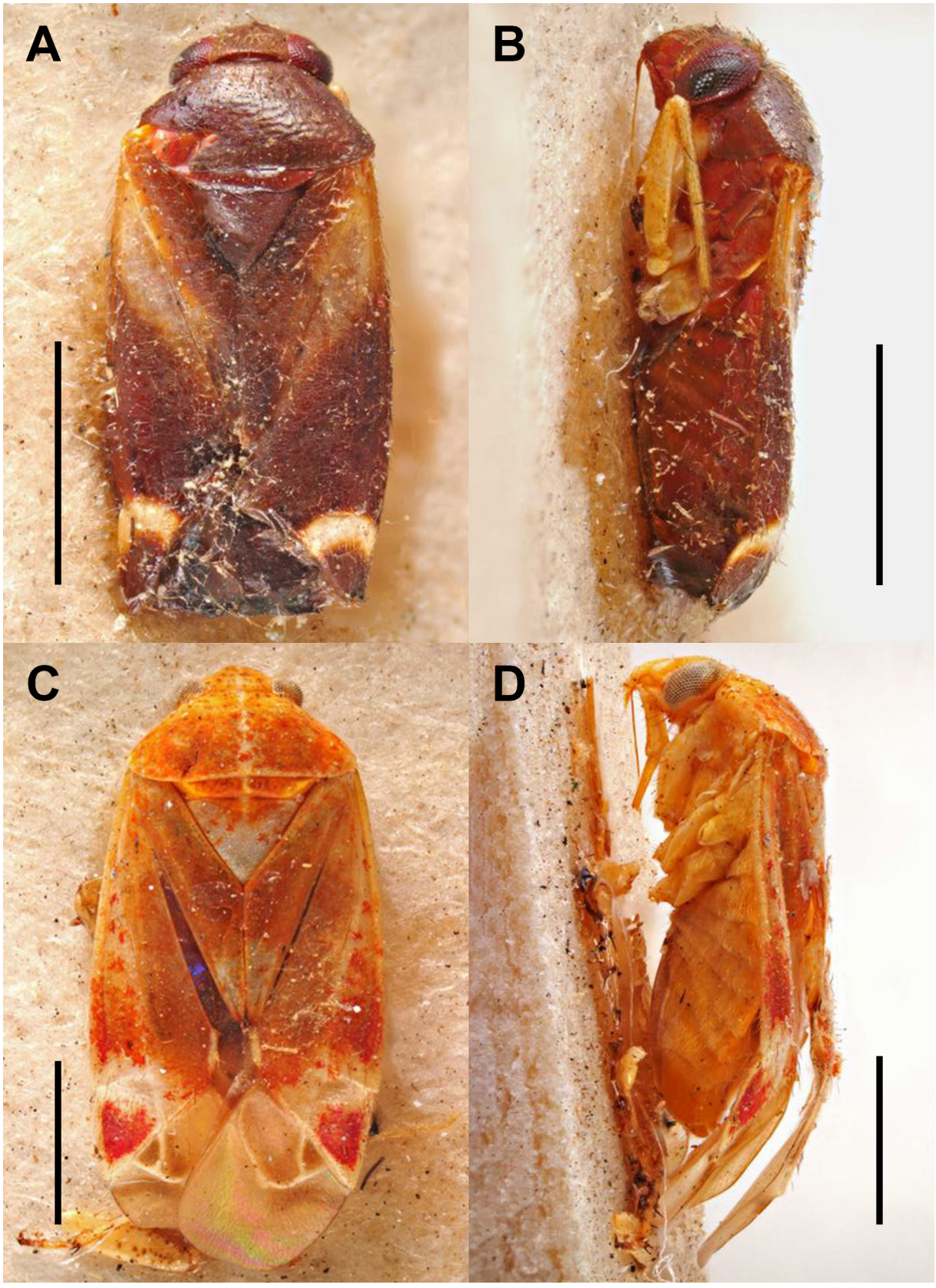

PLATE 46. PHYLINAE:

A, B, *Sthenarus australis* holotype male, habitus dorsal and lateral.
C, D, *Wallabicoris eximius* holotype female, habitus dorsal and lateral. Scale line = 1 mm. [all, Hoath]

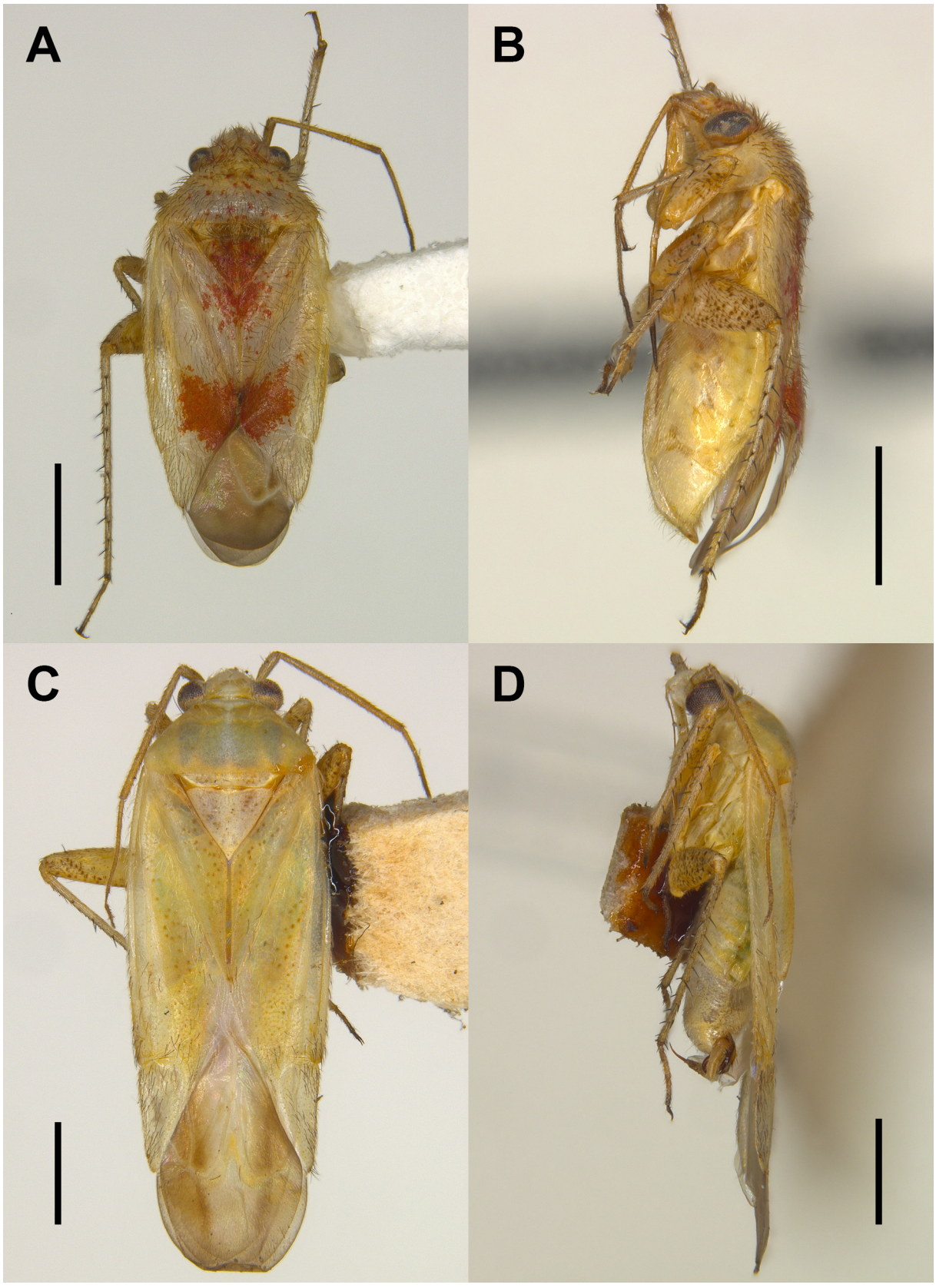

PLATE 47. PHYLINAE:

A, B, *Wallabicoris spyridii* paratype female, habitus dorsal and lateral.
C, D, *Wallabicoris* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

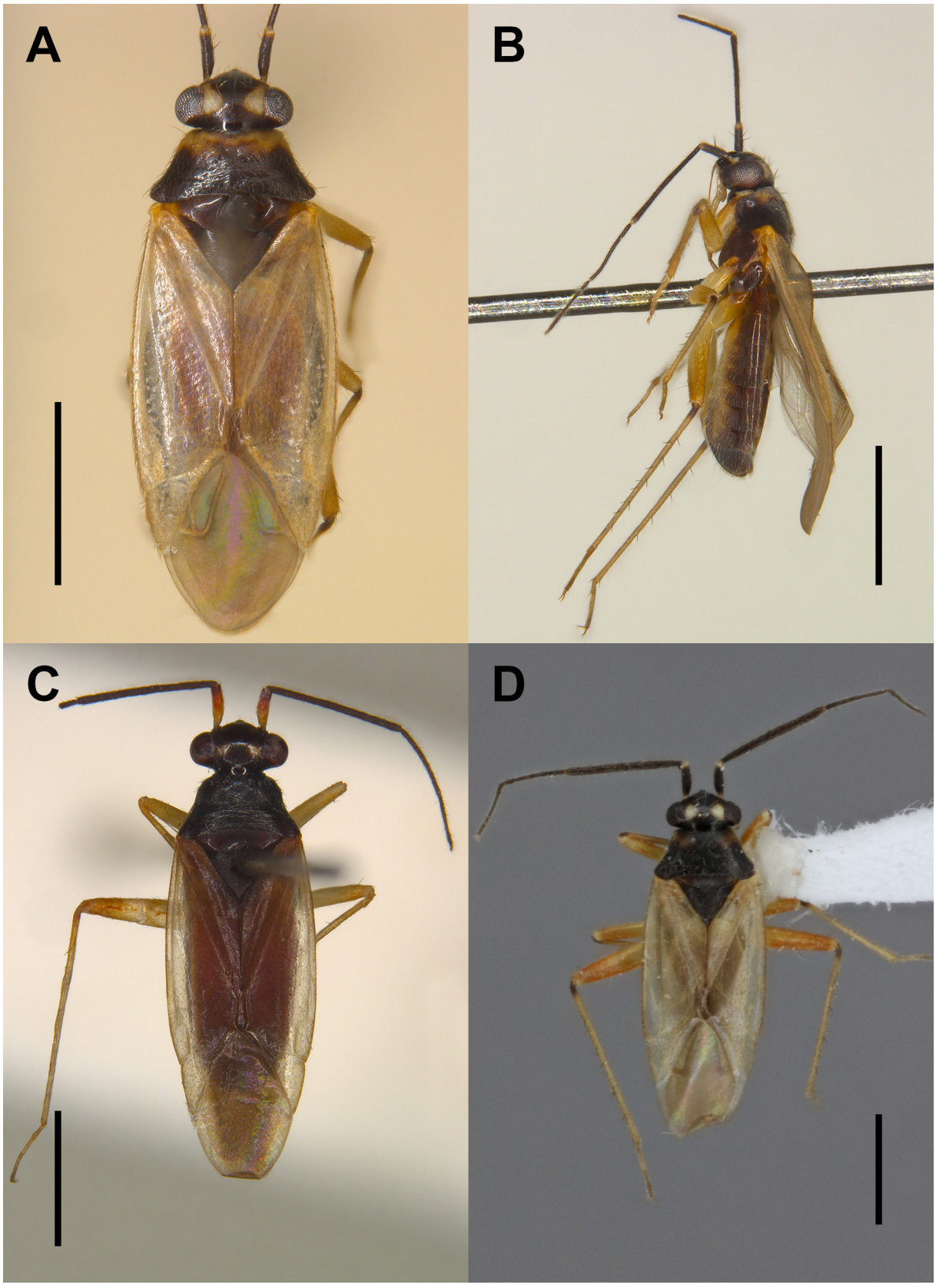

PLATE 48. PHYLINAE:

A, B, *Tytthus chinensis* female, habitus dorsal and lateral. C, *Tytthus mundulus* female, habitus dorsal. D, *Tytthus parviceps*, habitus dorsal. Scale line = 1 mm. [A, B, C, Finlay. D, Yeshwanth]

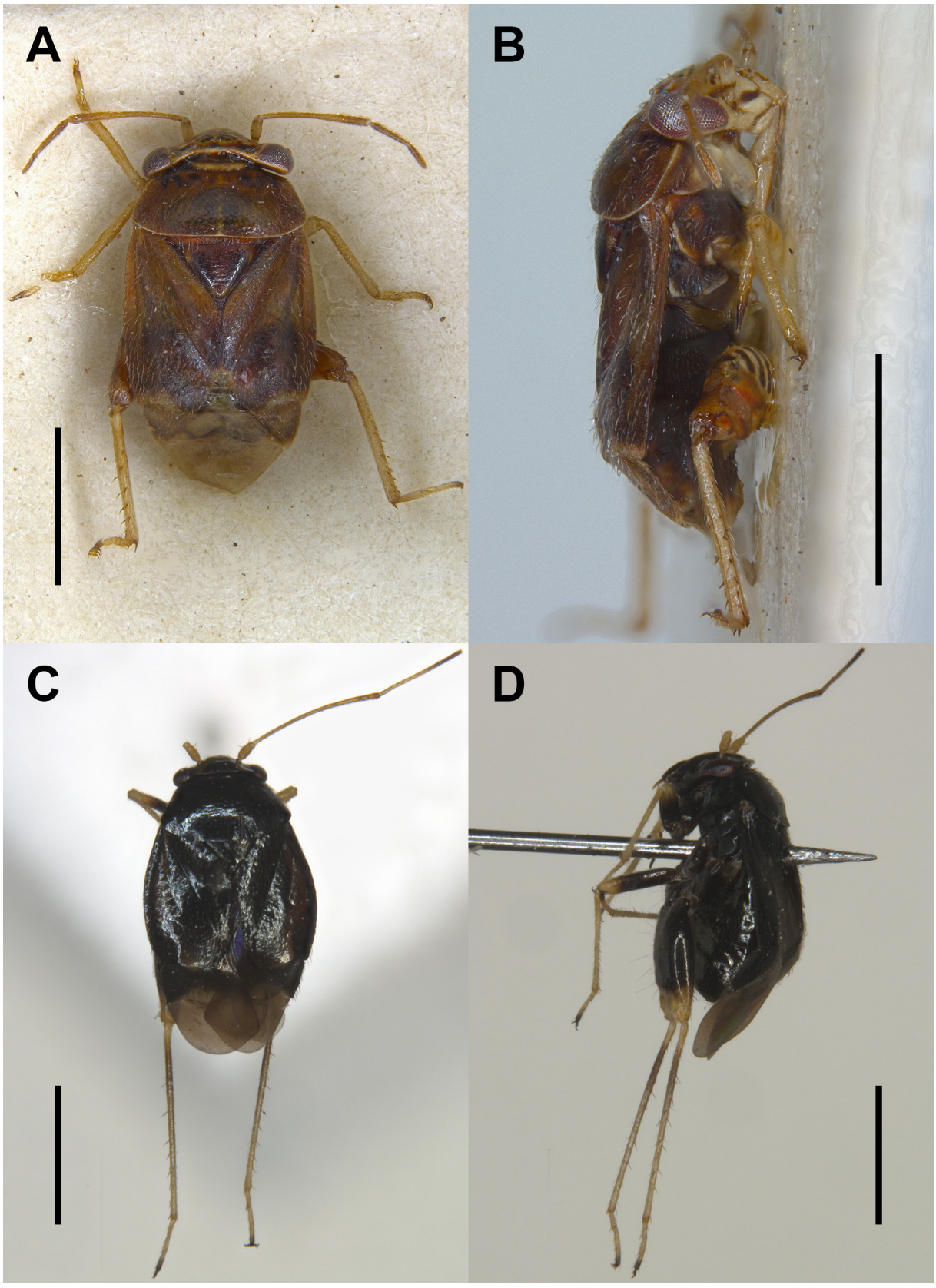

PLATE 49. ORTHOTYLINAE:

A, B, *Coridromius variegatus* male, habitus dorsal and lateral.
C, D, *Halticus tibialis* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

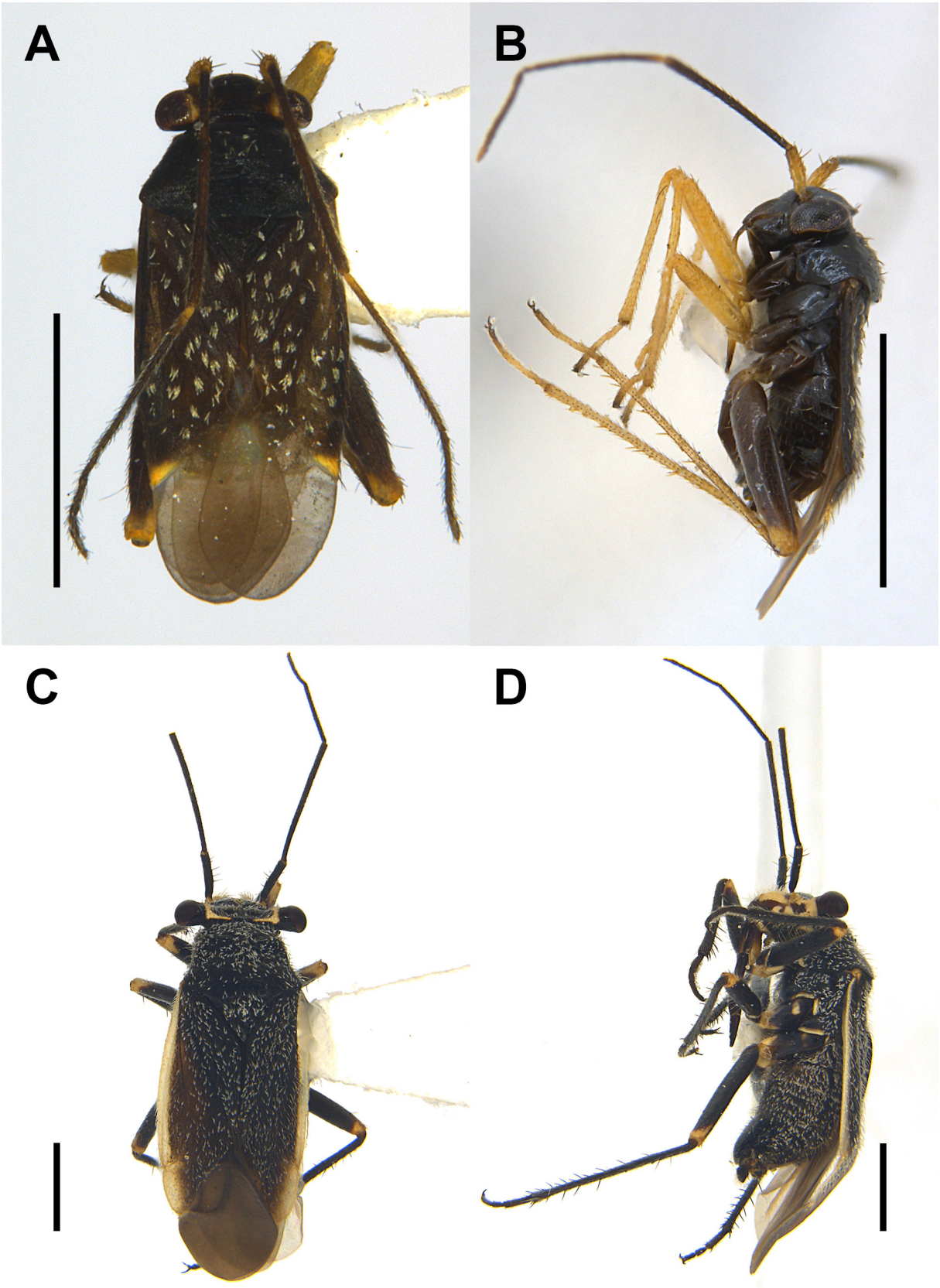

PLATE 50. ORTHOTYLINAE EXOTIC**:**

A, B, *Microtechnites bractatus* male, habitus dorsal and lateral.
C, D, *Labops hesperius* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

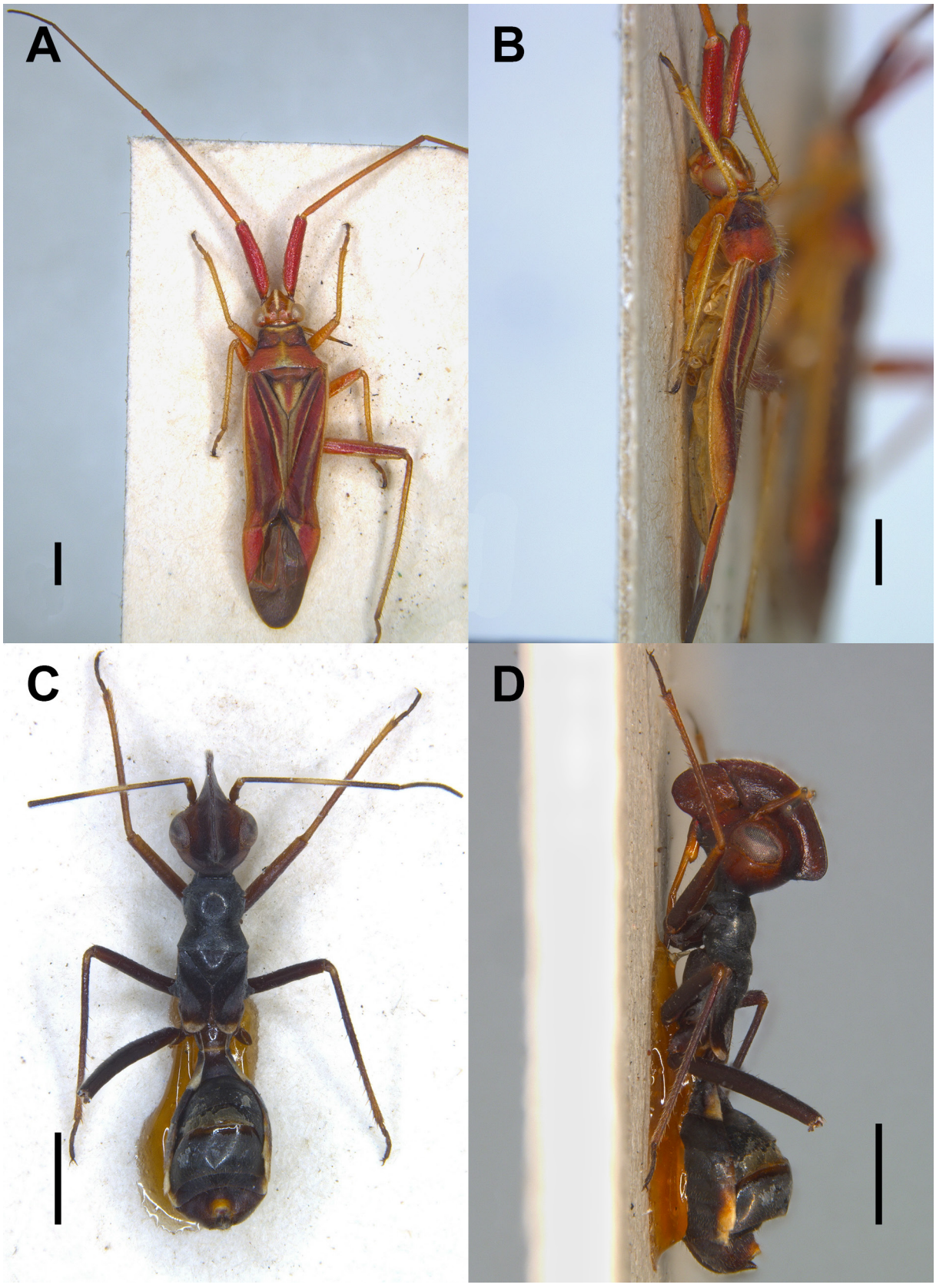

PLATE 51. ORTHOTYLINAE:

A, B, *Austromiris viridissimus* female, habitus dorsal and lateral.
C, D, *Myrmecoroides carinatus* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

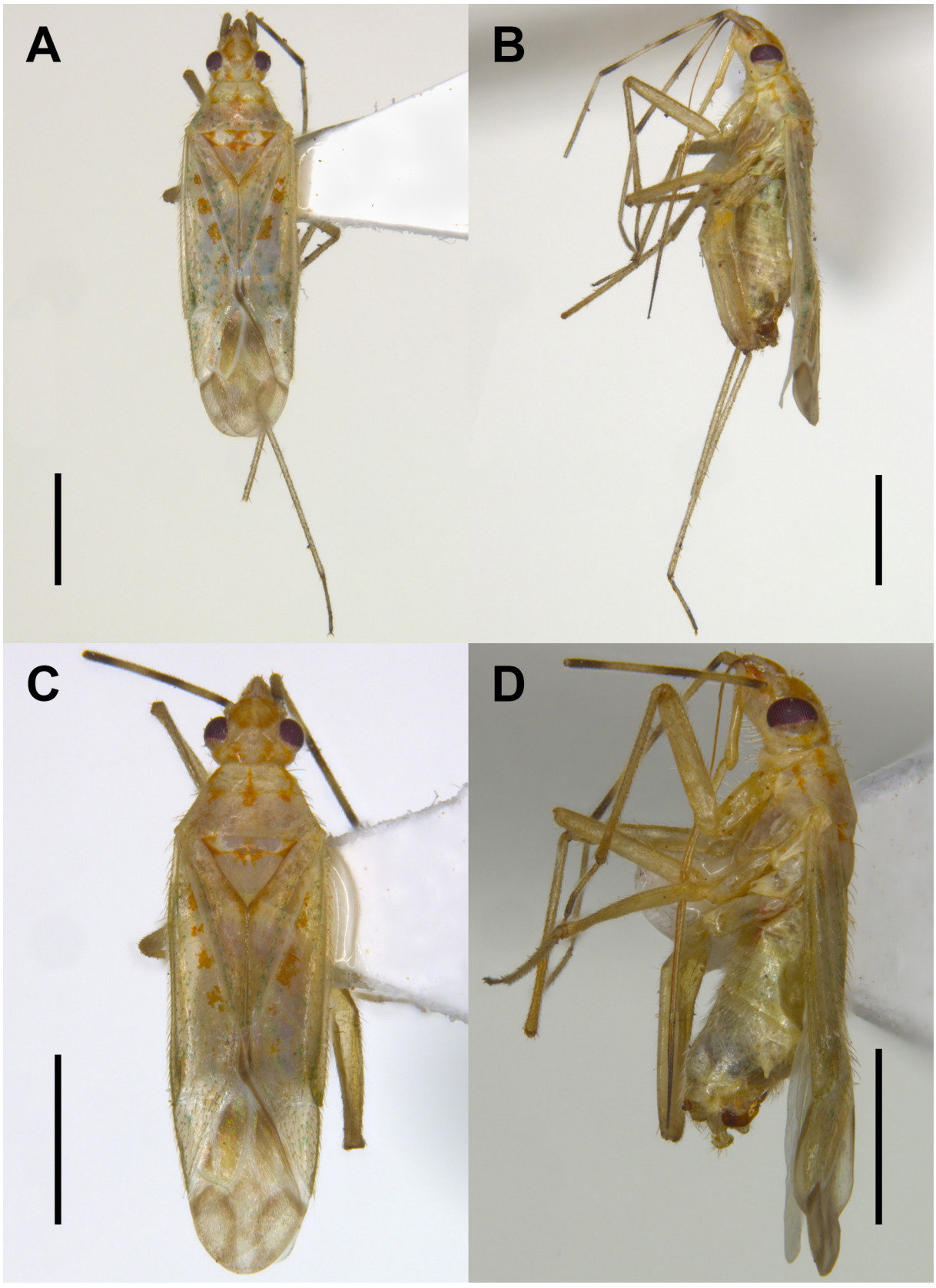

PLATE 52. ORTHOTYLINAE:

A, B, *Zanchius* sp. male, habitus dorsal and lateral.
C, D, *Zanchius* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

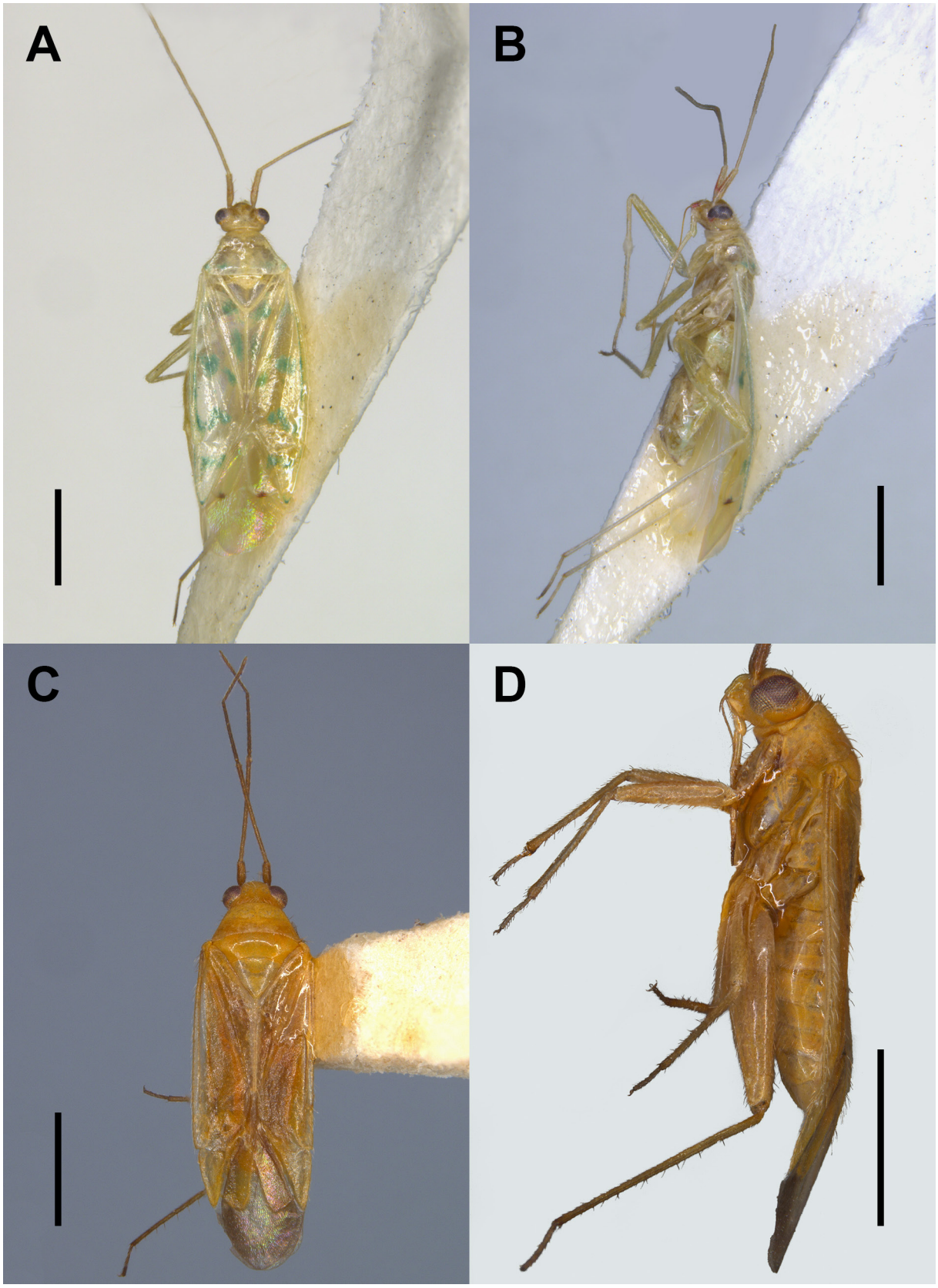

PLATE 53. ORTHOTYLINAE:

A, B, *Zanchius* sp. female, habitus dorsal and lateral.
C, D, *Zanchius* sp. female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

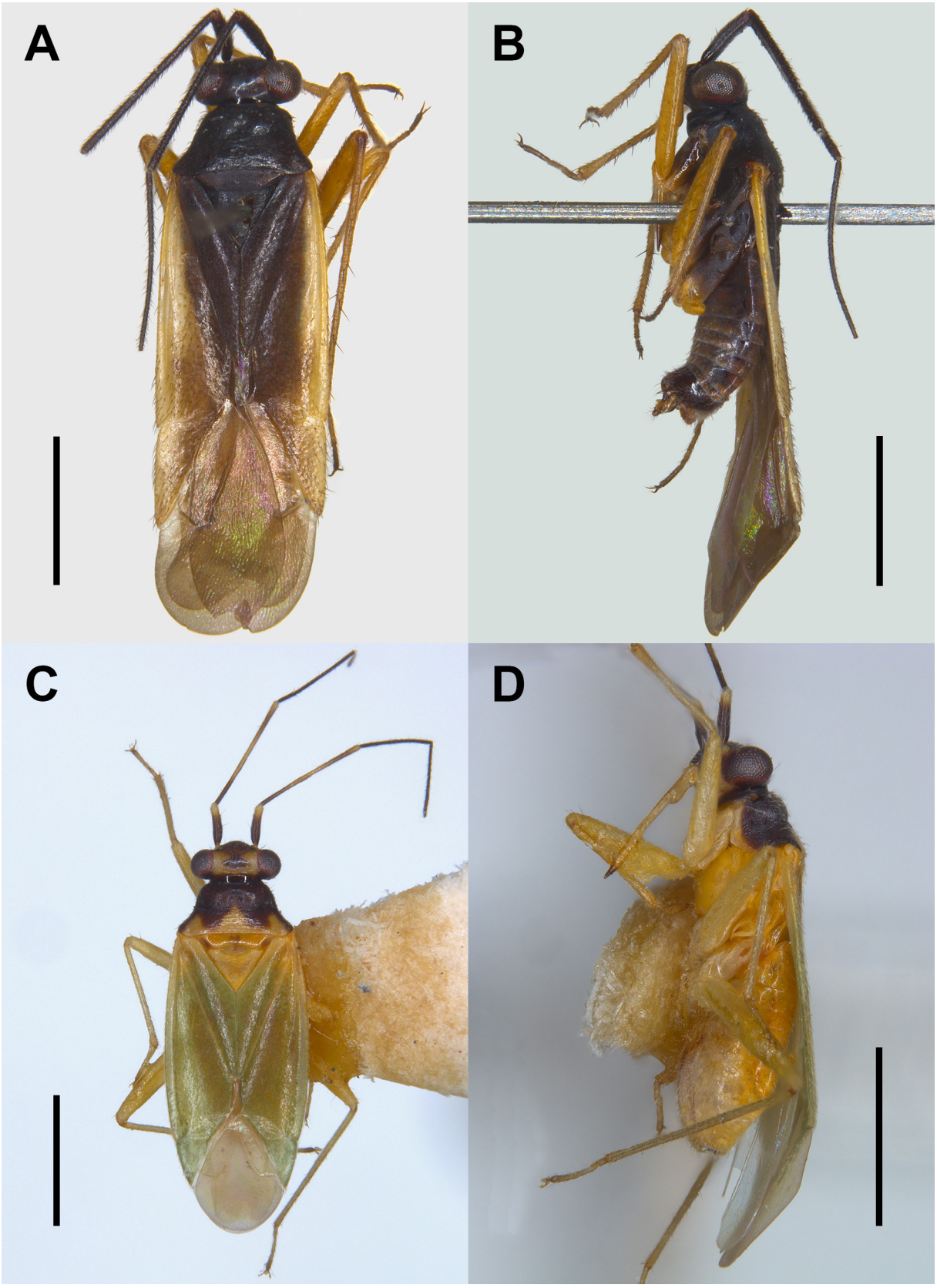

PLATE 54. ORTHOTYLINAE:

A, B, *Cyrtorhinus carvalhoi* paratype male, habitus dorsal and lateral.
C, D, *Cyrtorhinus lividipennis* female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

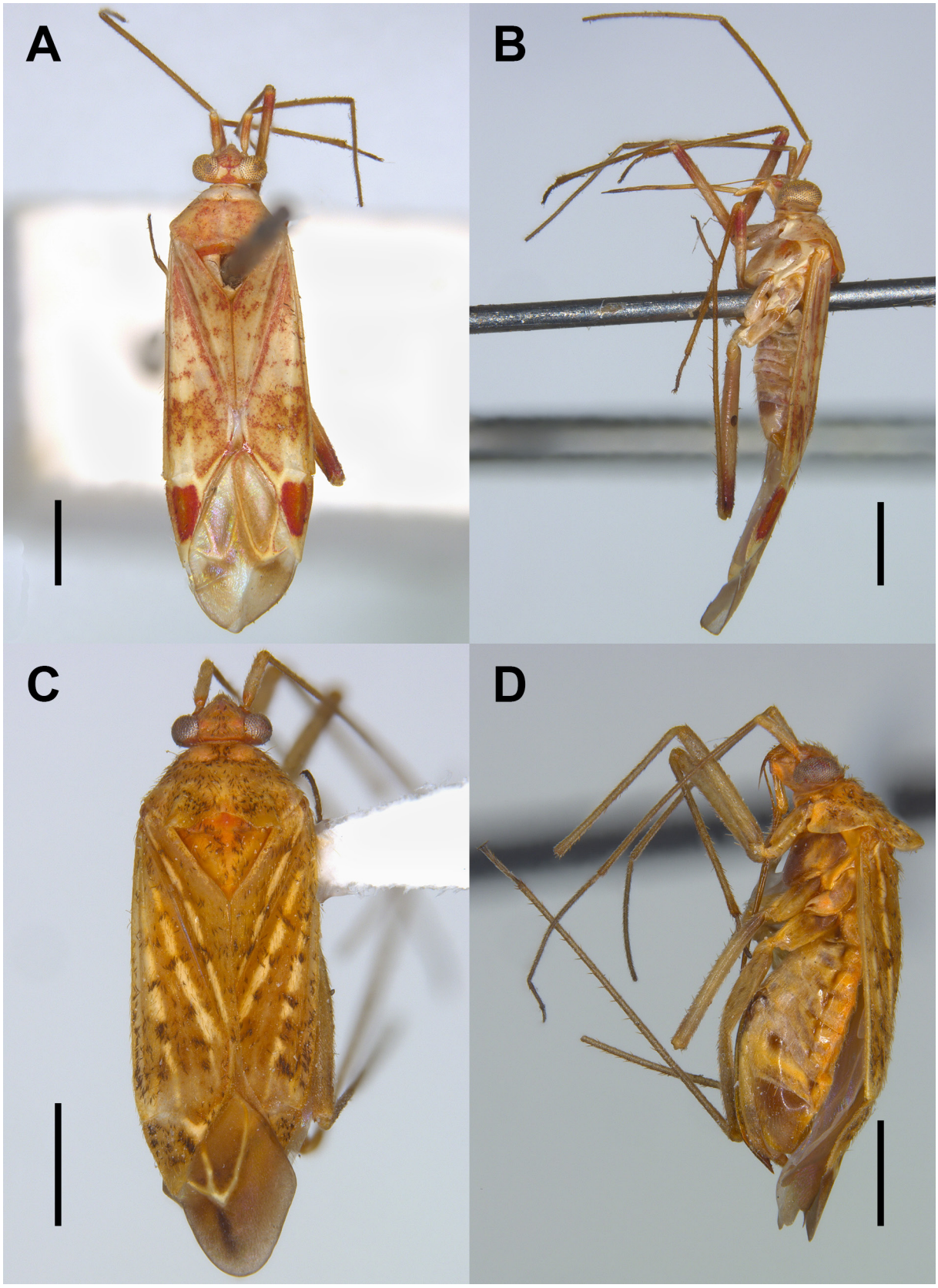

PLATE 55. ORTHOTYLINAE:

A, B, *Acaciacapsus emeraldensis* paratype male, habitus dorsal and lateral.
C, D, *Acaciacapsus lolworthensis* paratype female, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

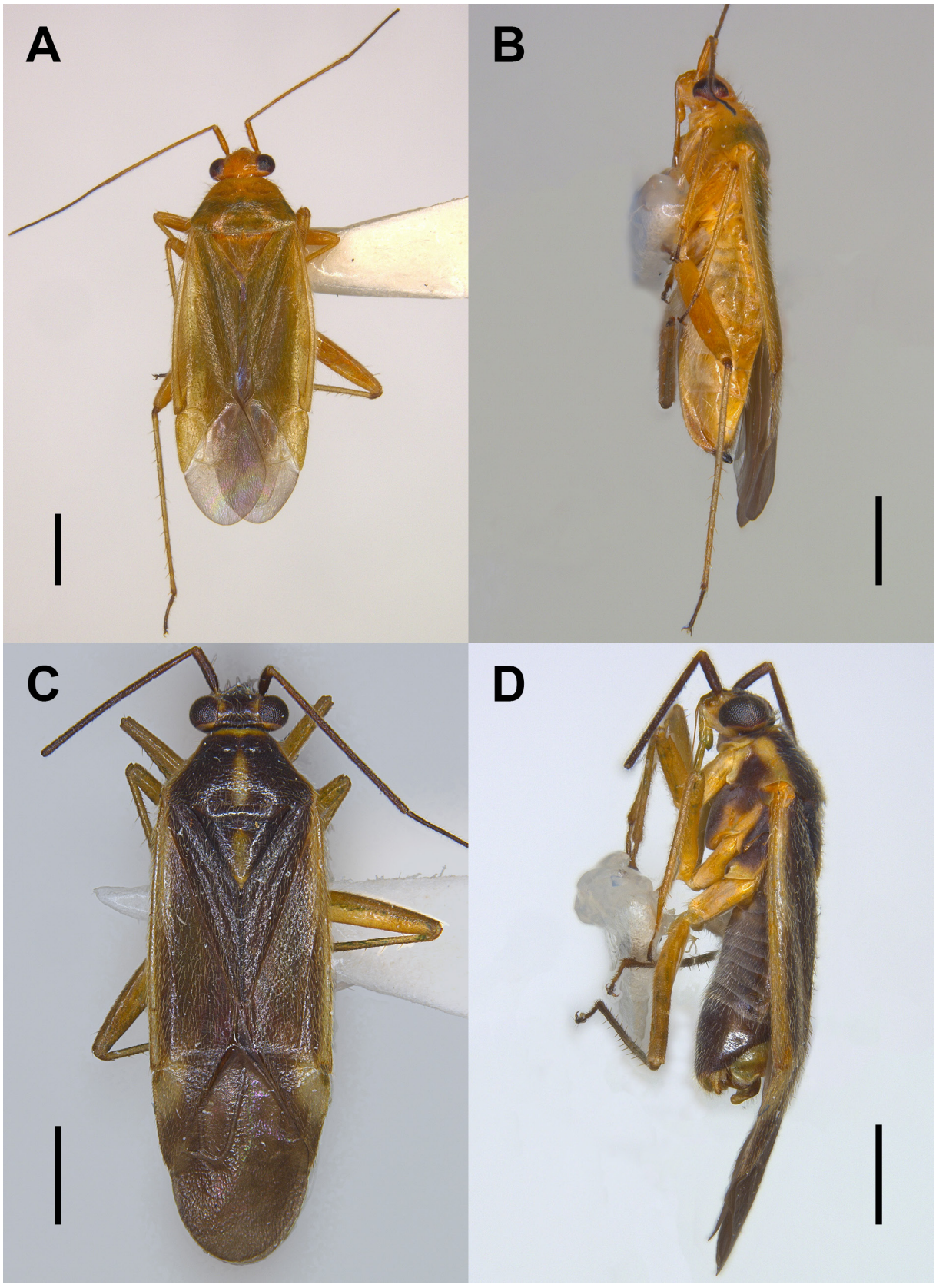

PLATE 56. ORTHOTYLINAE EXOTIC**:**

A, B, *Orthotylus japonicus* paratype female, habitus dorsal and lateral.
C, D, *Orthotylus pallens* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

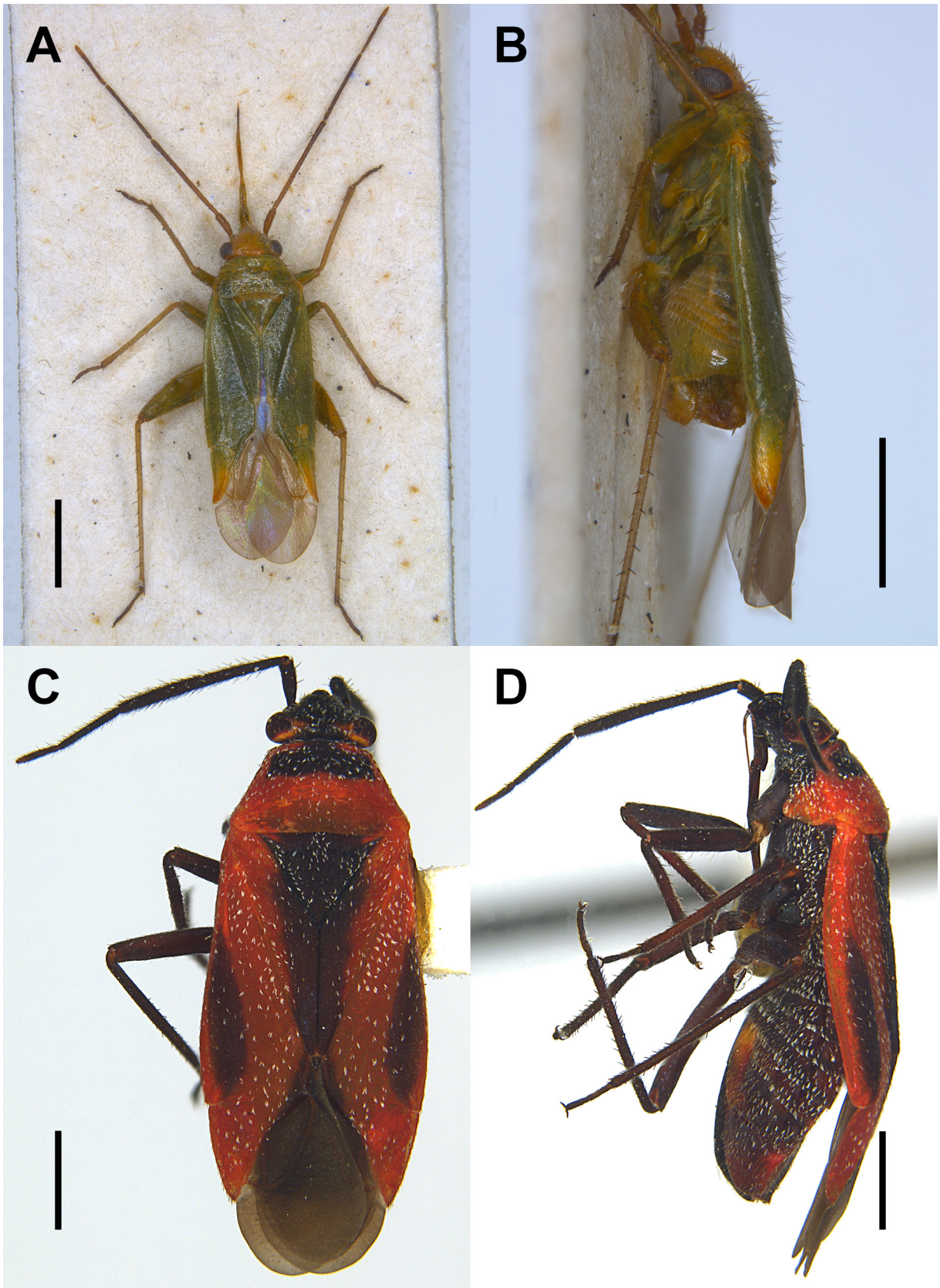

PLATE 57. ORTHOTYLINAE EXOTIC**:**

A, B, *Orthotylus ericetorum* male, habitus dorsal and lateral.
C, D, *Heterocordylus malinus* female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Finlay. C, D, Eow]

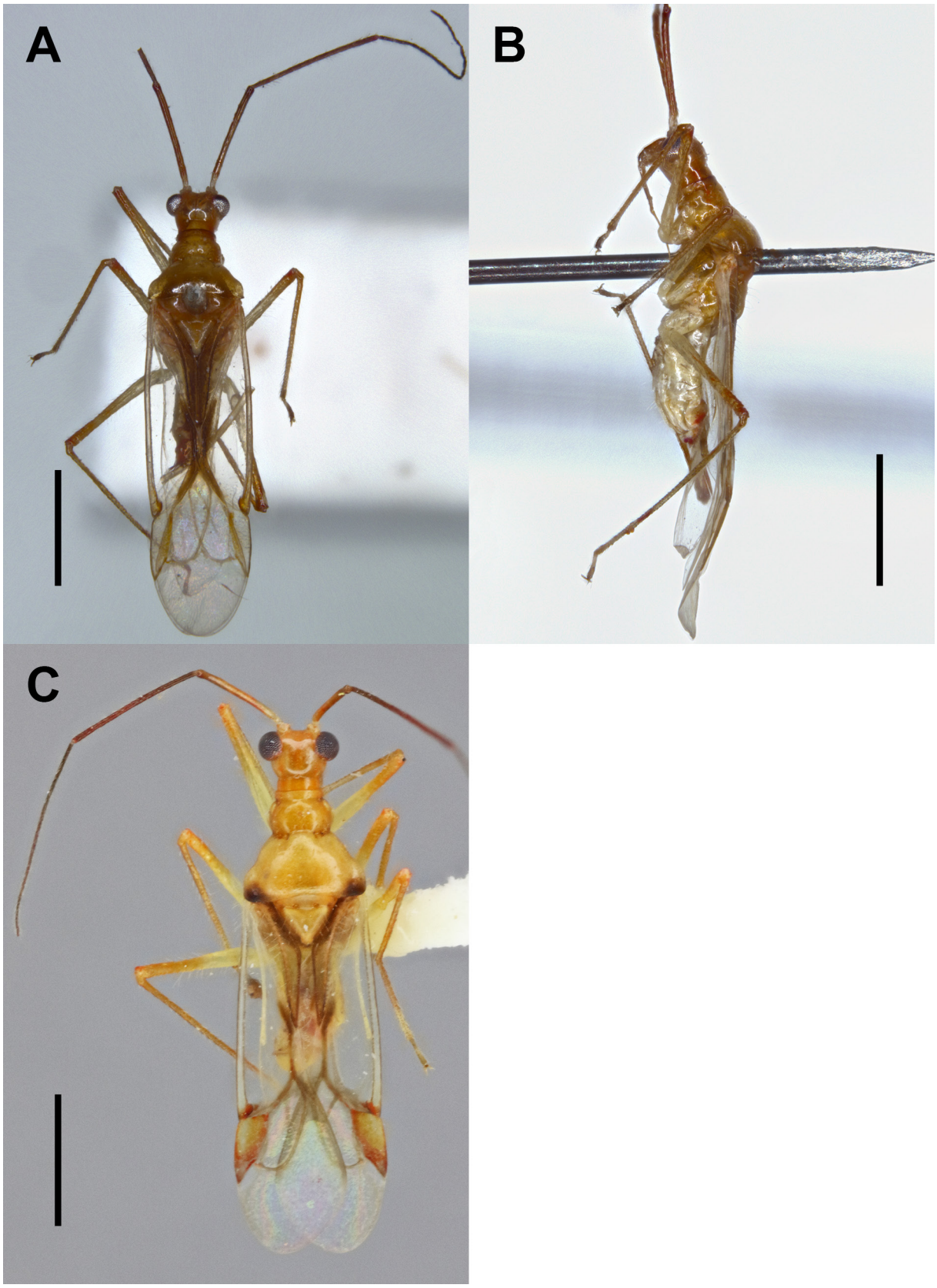

PLATE 58. BRYOCORINAE:

A, B, *Felisacus elegantulus* female, habitus dorsal and lateral.
C, *Felisacus* sp., habitus dorsal. Scale line = 1 mm. [A, B, Finlay. C, Yeshwanth]

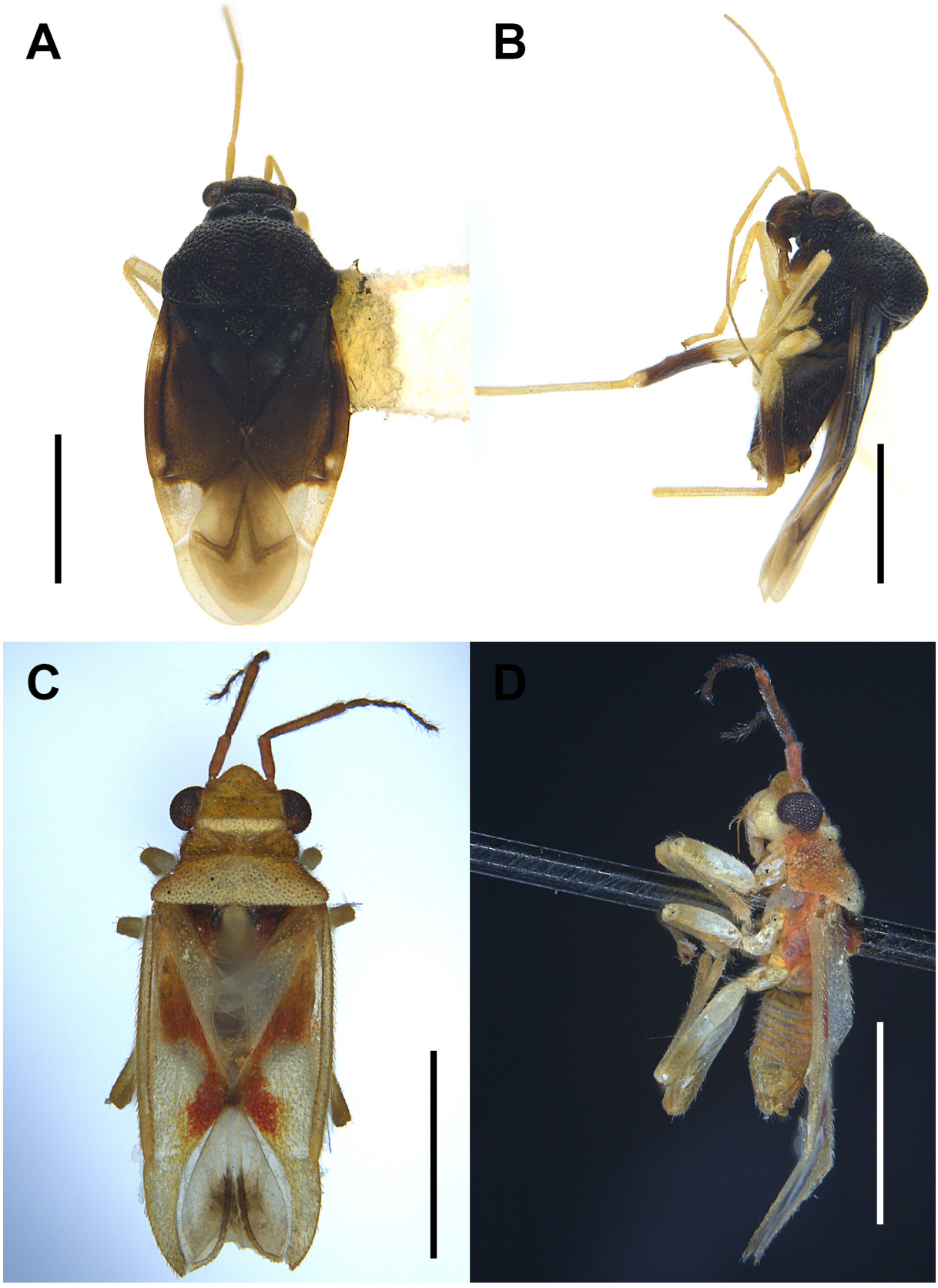

PLATE 59. BRYOCORINAE:

A, B, EXOTIC *Pycnoderes quadrimaculatus* male, habitus dorsal and lateral.
C, D, *Frontimiris bentickensis* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

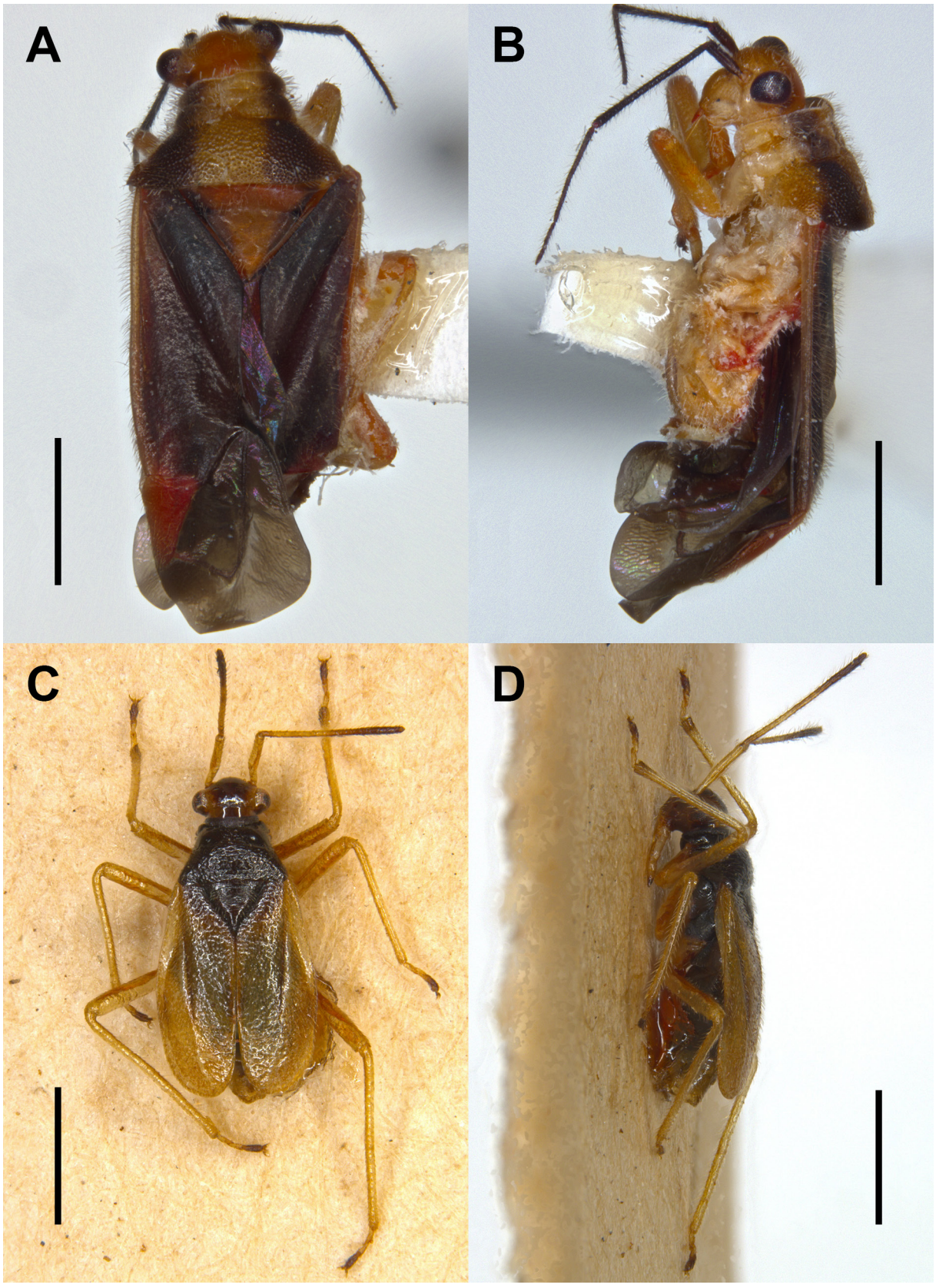

PLATE 60. BRYOCORINAE:

A, B, *Bromeliaemiris punctaticollis* female, habitus dorsal and lateral.
C, D, EXOTIC *Bryocoris pteridis* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

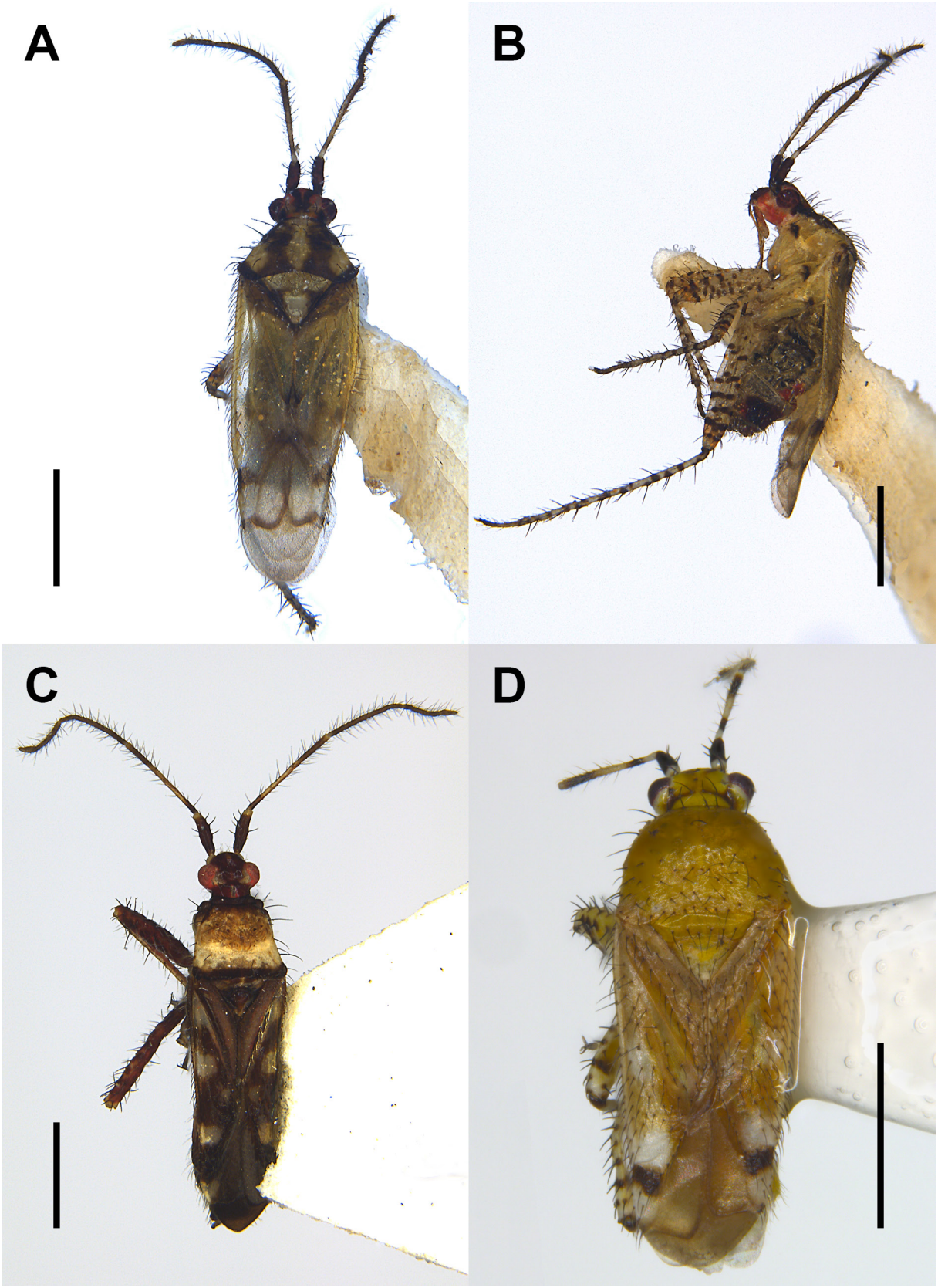

PLATE 61. BRYOCORINAE:

A, B, *Setocoris droserae* male, habitus dorsal and lateral. C, *Setocoris sp.* male, habitus dorsal. D, *Setocoris* sp. nr *bybliphilus* male, habitus dorsal. Scale line = 1 mm. [A, B, C, Eow. D, Finlay]

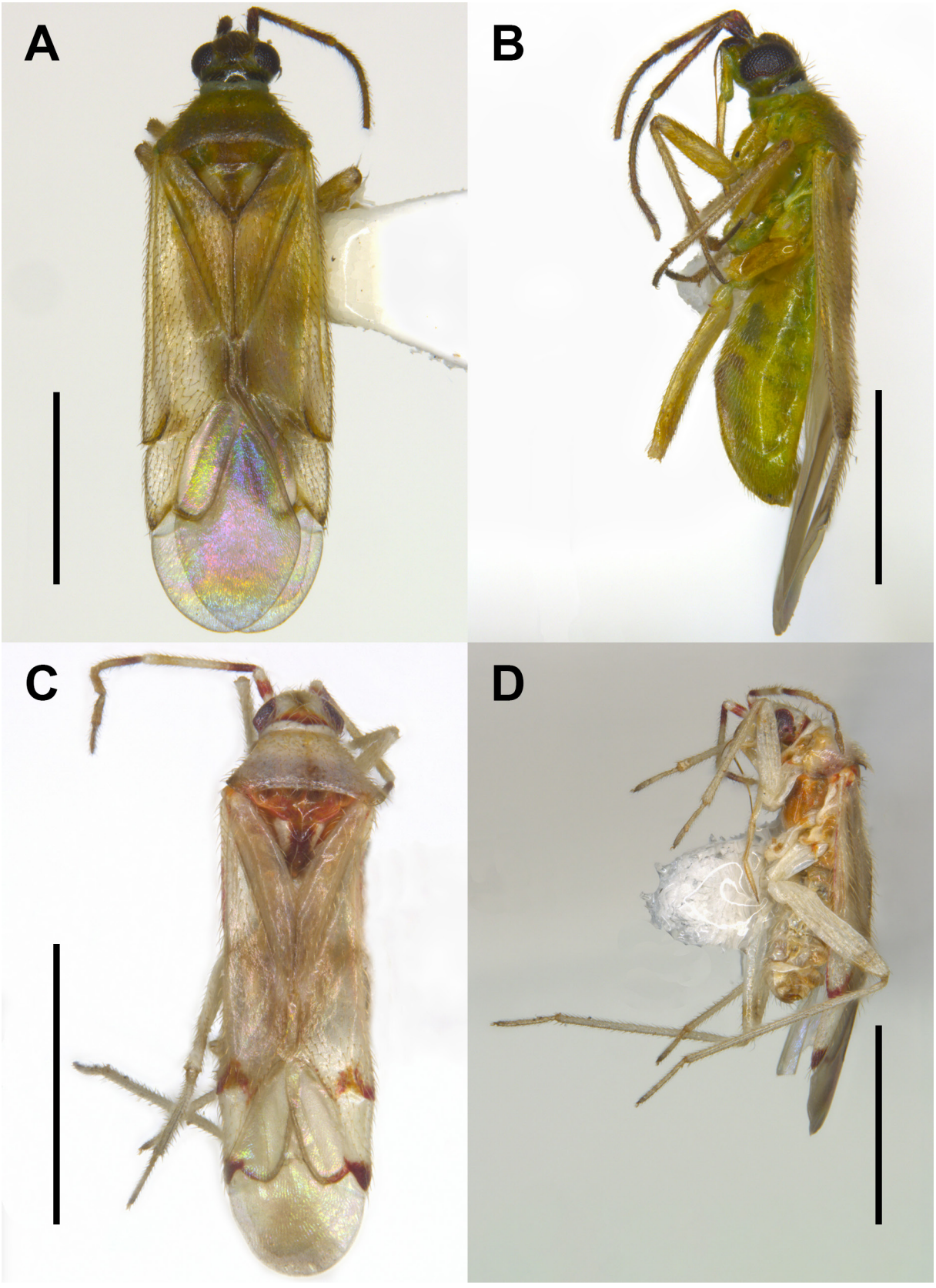

PLATE 62. BRYOCORINAE:

A, B, *Singhalesia* sp. female, habitus dorsal, and lateral.
C, D, *Singhalesia* sp. male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

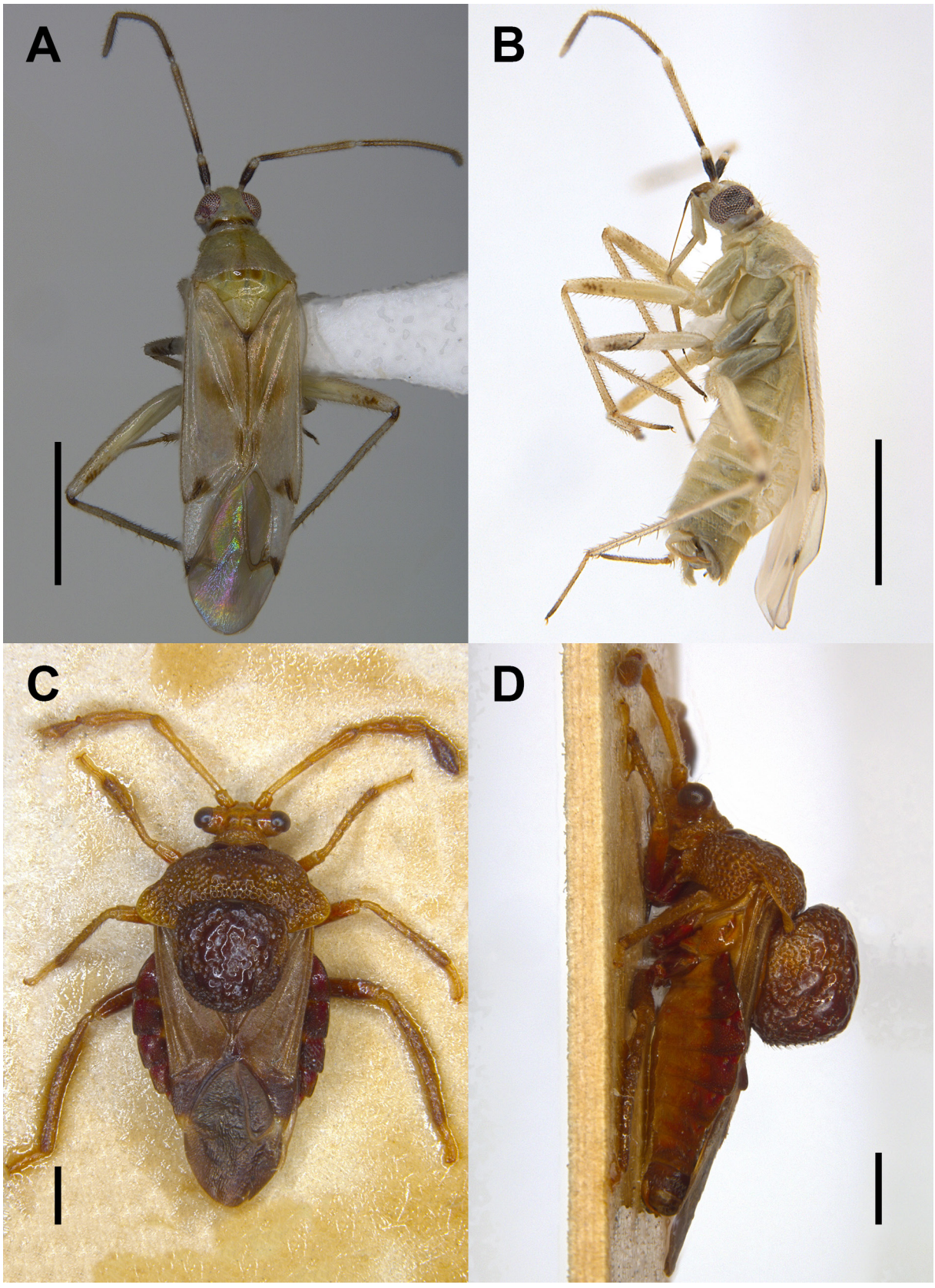

PLATE 63. BRYOCORINAE:

A, B, *Nesidiocoris tenuis* male, habitus dorsal and lateral.
C, D, EXOTIC *Pseudodoniella typica* male, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

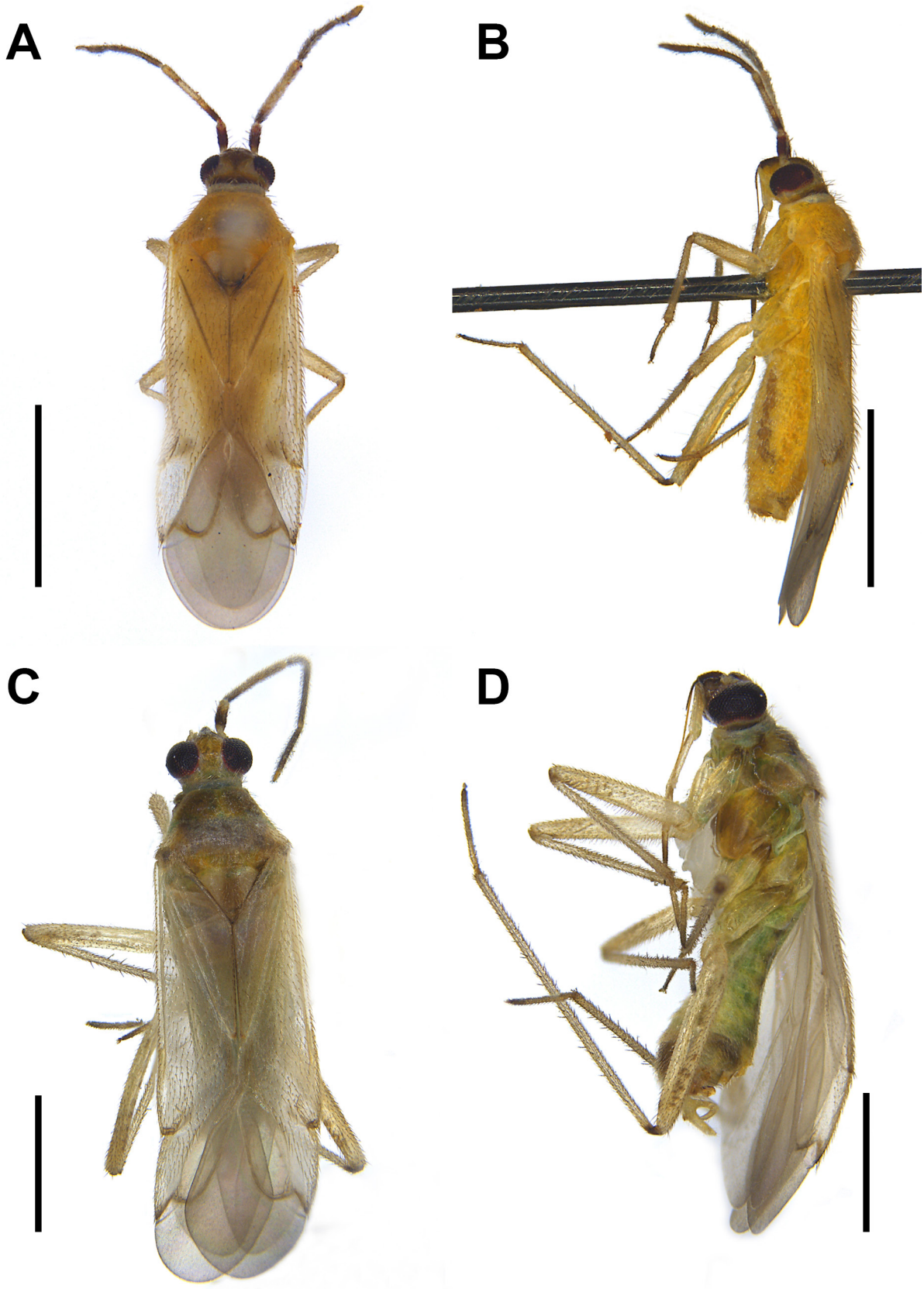

PLATE 64. BRYOCORINAE:

A, B, *Engytatus nicotianae* male, habitus dorsal and lateral.
C, D, EXOTIC *Engytatus modestus* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Eow]

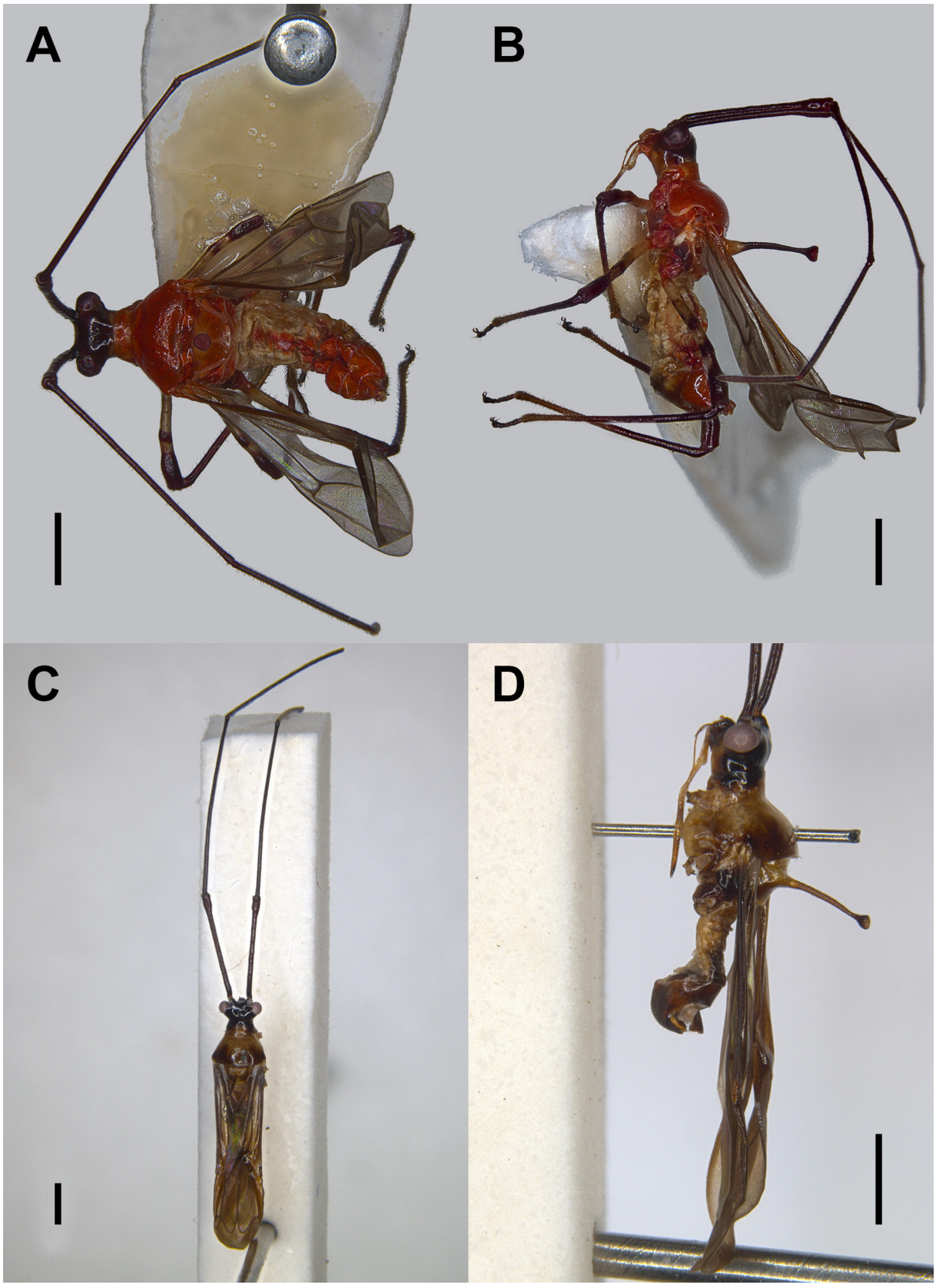

PLATE 65. BRYOCORINAE:

A, B, *Helopeltis pernicialis* paratype female, habitus dorsal and lateral.
C, D, *Helopeltis clavifer* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

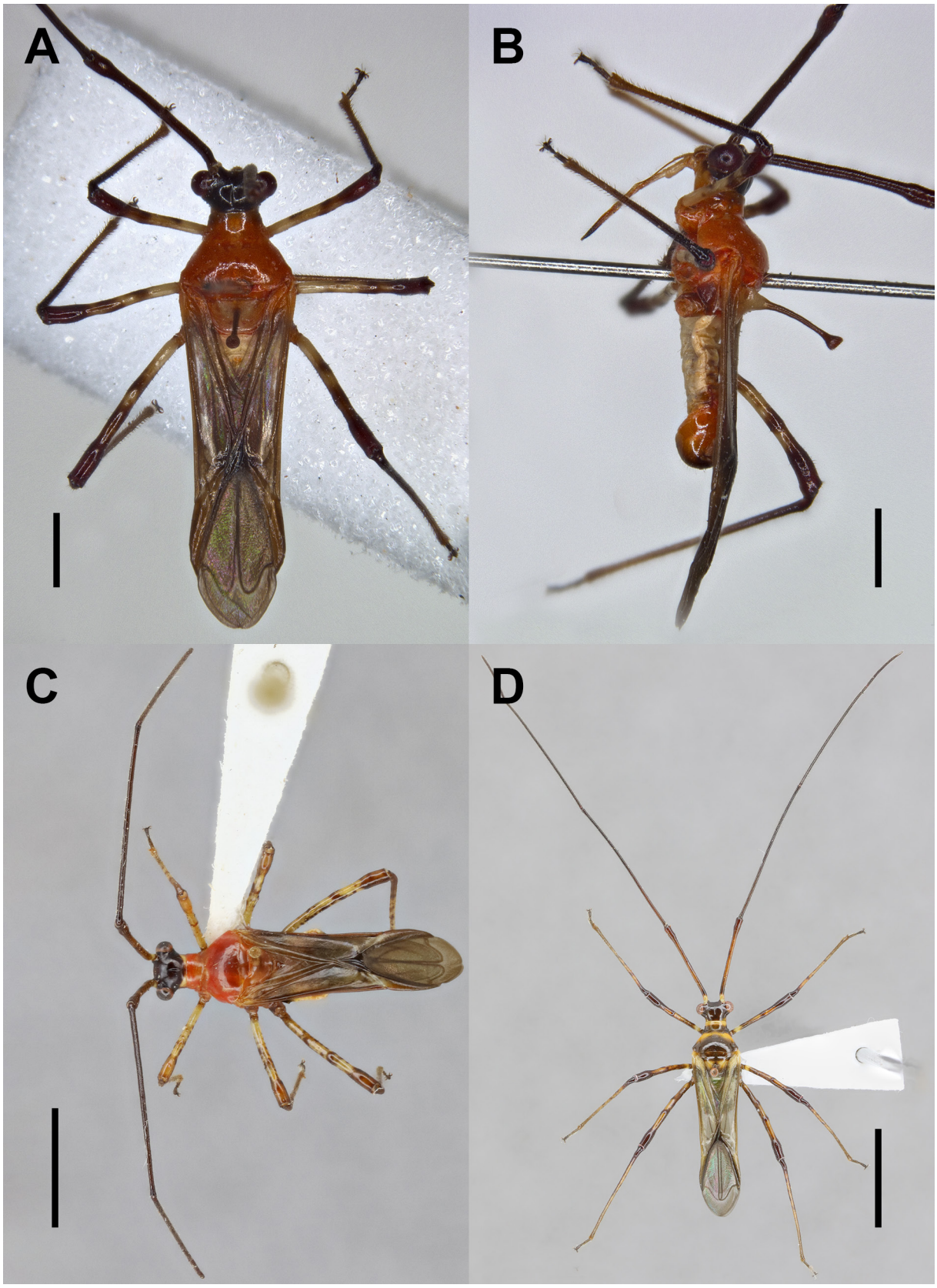

PLATE 66. BRYOCORINAE:

A, B, *Helopeltis* sp. male, habitus dorsal and lateral. C, EXOTIC *Helopeltis antonii*, habitus dorsal. D, EXOTIC *Helopeltis theivora*, habitus dorsal. Scale line = 1 mm. [A, B, Finlay. C, D, Yeshwanth]

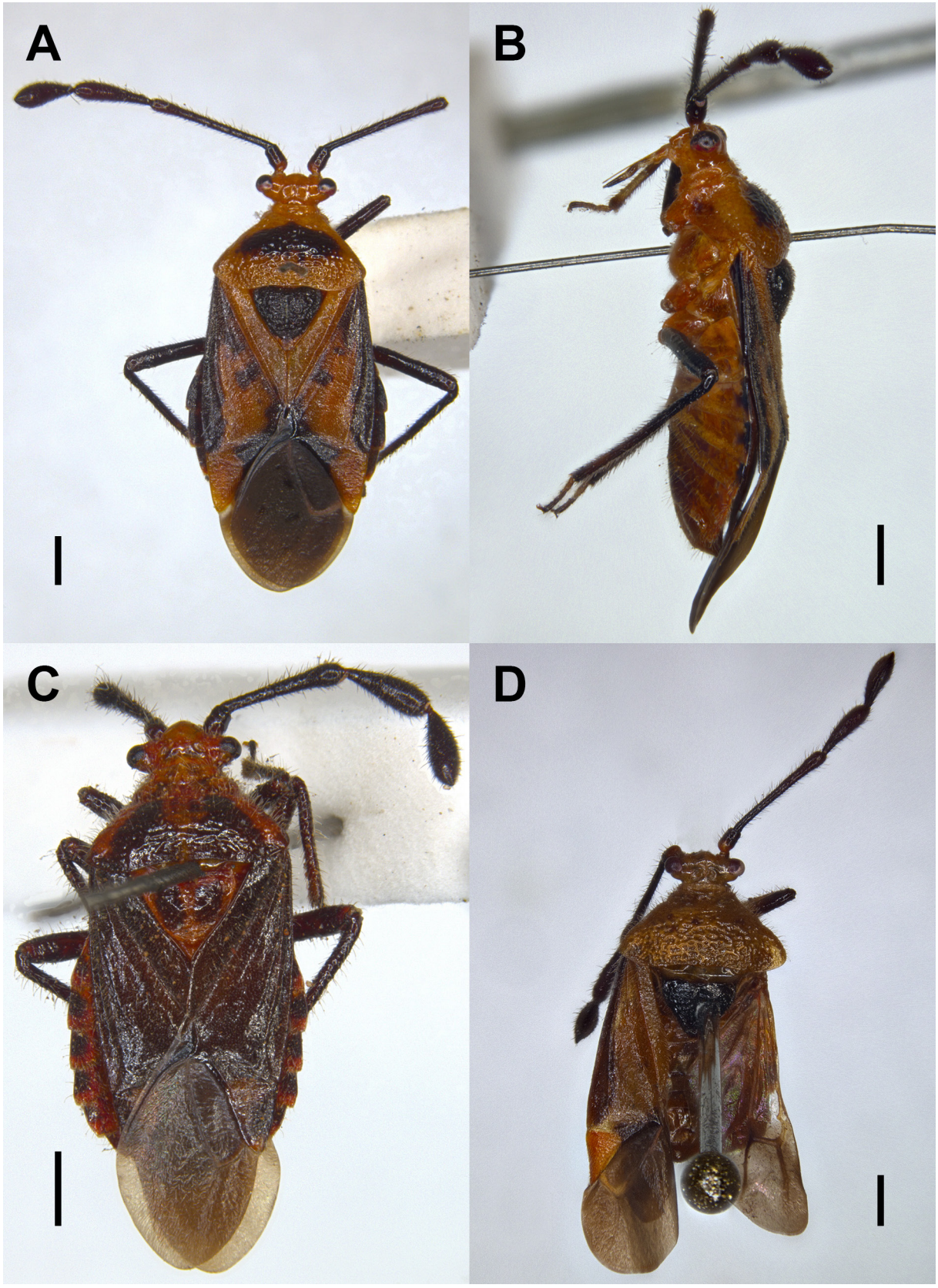

PLATE 67. BRYOCORINAE:

A, B, *Volkelius maculatus* female, habitus dorsal and lateral. C, *Volkelius carvalhoi* paratype female, habitus dorsal. D, *Volkelius sulcatus* female, habitus dorsal. Scale line = 1 mm. [all, Finlay]

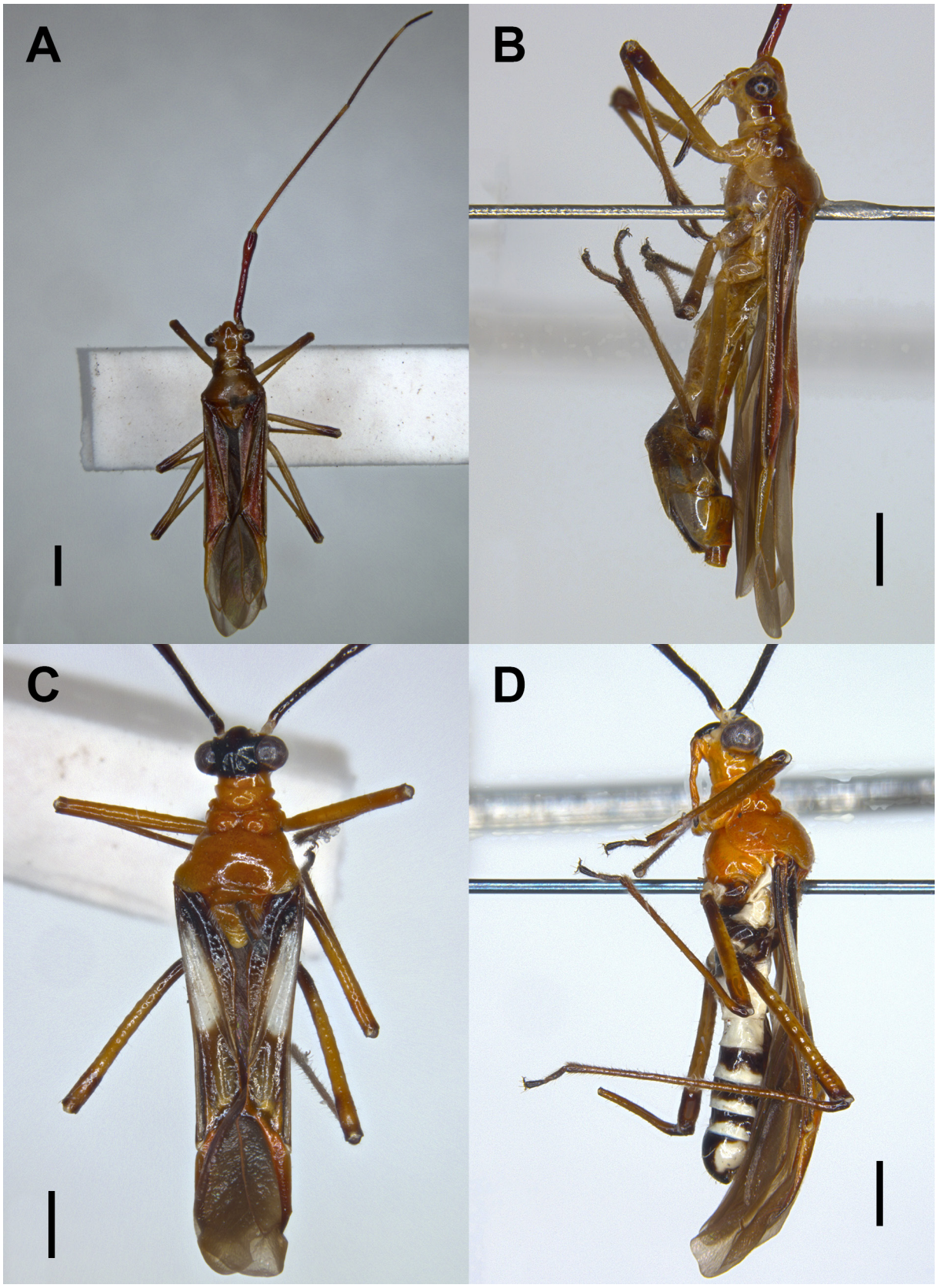

PLATE 68. BRYOCORINAE:

A, B, *Rayieria acaciae* paratype female, habitus dorsal and lateral.
C, D, *Rayieria basifer* male, habitus dorsal and lateral. Scale line = 1 mm. [all, Finlay]

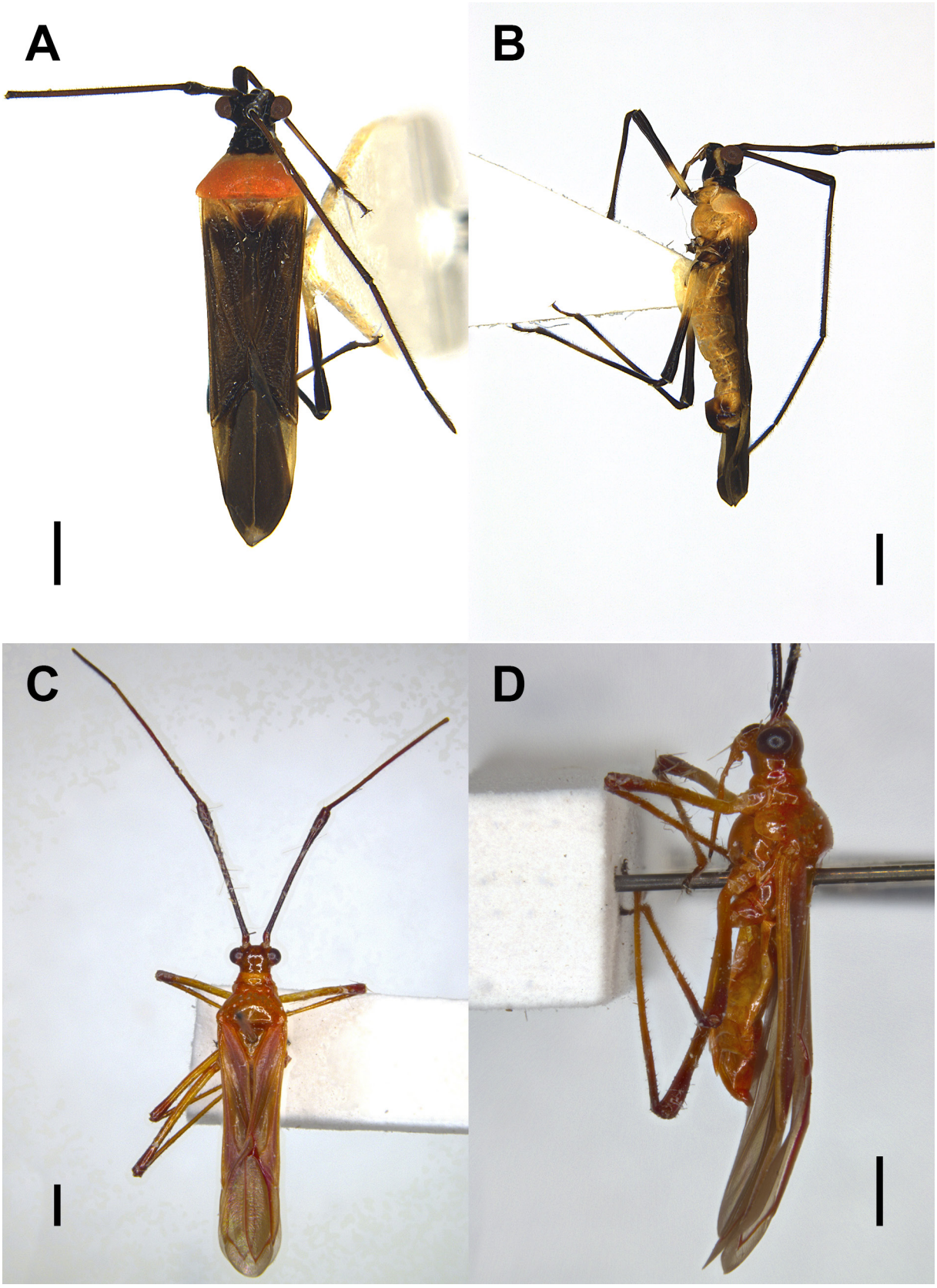

PLATE 69. BRYOCORINAE:

A, B, *Ragwelellus* sp. male, habitus dorsal and lateral.
C, D, *Ragwelellus suspectus* female, habitus dorsal and lateral. Scale line = 1 mm. [A, B, Eow. C, D, Finlay]

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Subfamilies are in **boldface**; exotic (i.e. non-Australian) genera / species in ***bold italic*** type; page numbers of genus fact sheets and diagnoses of subfamilies and tribes are in **bold.**

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