

AUSTRALIAN LYGAEOIDEA (HETEROPTERA) OF ECONOMIC IMPORTANCE

IDENTIFICATION OF
FAMILIES, TRIBES AND
REPRESENTATIVE GENERA

M. B. Malipatil,
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Australian Government
Department of Agriculture,
Water and the Environment

AGRICULTURE VICTORIA

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Published by the Department of Jobs, Precincts and Regions

First Published June 2020

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Authorised by the Victorian Government,
1 Spring St, Melbourne 3000

ISBN 978-1-76090-316-9 (pdf/online/MS word)

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INTRODUCTION

The Lygaeoidea [The Big-Eyed Bugs, Chinch Bugs, Coon Bugs and Seed Bugs] represent the second largest superfamily within the infraorder Pentatomomorpha and are one of the most diverse groups of Heteroptera with 16 families in about 790 genera and more than 4,660 species in the world (Henry 2009, Henry et al. 2015, Dellapé & Henry 2020). These contain a few species that are major pests or predators of pests, or exotic species of considerable biosecurity significance for Australia. Lygaeoidea are a complex group with variable morphology, some are very small, and a significant proportion remain undescribed, particularly in tropical Australia.

There are no satisfactory comprehensive identification keys currently available for economic genera of some of the larger lygaeoid families. Most of the keys that exist are limited to one, or a few, closely related genera, with limited geographic distribution. For these reasons, the Lygaeoidea was included in the Tropical Australian Diagnostic list as medium – 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.

This project, funded by the Australian Government's Agricultural Competitiveness White Paper, Modern Diagnostics for northern Australia, aims to develop an illustrated identification key for major Australian endemic and exotic genera of Lygaeoidea, particularly those genera that include pest and predator species in tropical northern Australia.

SCOPE AND PLAN OF WORK

Due to the sheer diversity of lygaeoids in Australia and elsewhere, it was not possible to cover all Australian genera in this project. A total of 62 genera representing all families of Lygaeoidea, as well as within Rhyparochromidae all subfamilies and tribes recorded from Australia are covered in this resource. Each genus is represented by at least one species, and occasionally representatives of exotic species are included if the genus is agriculturally significant and widely distributed outside Australia. Certain representative genera of the non-economic families have been included in this resource to address the Australian Lygaeoidea fauna more broadly, so any lygaeoid specimens including those without associated host information could still be identified at least to family or tribal level. This approach was felt important also for making this resource relevant and useful to a wider range of users.

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 particularly in the tropical north, and
4. Some species that may have close relatives in neighbouring countries of South East Asia and Papua New Guinea.

The range and diversity of the genera and species covered in the comprehensive and authoritative reference work, Heteroptera of Economic Importance (Sweet 2000a & 2000b) have been taken into consideration while selecting the appropriate economic genera for inclusion in the present work. In some instances, non-economic genera were included to give representation and / or completeness to the coverage of families and tribes recorded from Australia.

The keys in this work have been illustrated as much as possible, particularly the diagnostic characters used in the keys, using mostly habitus images and occasionally line drawings and SEM micrographs.

Besides the key, this resource contains a brief diagnosis of each Australian recorded family, and of each subfamily and tribe of the large Rhyparochromidae. Dichotomous keys to the representative genera are provided when needed, and a factsheet is provided for each included genus. Details of the content of the genus factsheet are given below.

SPECIMENS EXAMINED FOR THE KEYS

Specimens for the present study have come from:

- collections from within Australia – museums, and other collections including agricultural departmental collections; see Acknowledgement section for names of individual collections;
- collections from overseas, e.g., University of Connecticut Biodiversity Research Collection (Jane O'Donnell); and New Zealand Arthropod Collection (NZAC) (Marie-Claude Lariviere); Natural History Museum (Mick Webb);
- individual workers – Cuiqing Gao (Nanjing Forestry University, China); Yeshwanth H M (University of Agricultural Sciences, Bangalore, India); Előd Kondorosy (University of Pannonia, Keszthely, Hungary).

IDENTIFICATIONS OF SPECIMENS FOR THE KEYS

- a few were designated type specimens (e.g., holotype, paratype);
- bulk of the specimens examined were identified, at least to genus but most to species level, by specialists such as Slater, Malipatil, Gross, O'Donnell, Woodward and Gao;
- remainder of specimens used for the key were identified by Malipatil using available taxonomic literature.

ILLUSTRATIONS IN KEYS AND FACTSHEETS

Most of the habitus dorsal and lateral multifocal images were taken with a Leica DFC450 camera, M205C microscope, MEB110 LED ring light and using the Leica Application Suite (LAS version 4.5.0). Over the duration of the project, multifocal image stacking was done in LAS, LAS X, Helicon Focus (version 6.2.2 or 7.0.2), depending on availability of the microscope and how well the montage worked. 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. The cuticular fine structure was observed and photographed with a Hitachi TM3030Plus and a FEI Qanta 200 Scanning Electron Microscope.

Images for the plates in this resource were taken by several individuals. Their names, in captions under individual plates, are indicated only by their family names, as follows: Gao (Cuiqing Gao, Nanjing Forestry University); Eow (Lixin Eow, Department of Jobs, Precincts and Regions); Thompson (Geoff Thompson, Queensland Museum); Cappaert (David Cappaert, University of Connecticut Biodiversity Research Collection); Blakett (Mark Blakett, Department of Jobs, Precincts and Regions); Daley (Tony Daley, Tasmania); Ellingsen (Kristi Ellingsen, Tasmania); CSIRO (Australian National Insect Collection, CSIRO).

COLLECTION, PRESERVATION, AND LABELLING

COLLECTION

Lygaeoidea, 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.

Sweeping: An insect net is the most common and widespread method used for collecting insects. The sweeping method is used to collect bugs 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.

Beating: 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 accurate host records.

Light trapping: This may involve using a genuine mercury vapour light, which mixes white and ultraviolet light to be attractive to a wider range of insects. The use of a black light on a warm, calm, and humid night will often attract 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.

Berlese funnels: This is the best method for extracting Lygaeoidea from forest litter and other decomposing plant material. These funnels (either made of metal and stationary, or built of fabric and transportable) are used most effectively by first concentrating the litter with a sifter and then placing the residue in Berlese funnels (with or without light / heat source to be processed for a day or longer, depending on the amount of moisture in the soil-litter layer).

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 of 70% ethanol.

Pitfall traps: Used to collect a variety of bugs that live on the ground. In its simplest form, it is an open-topped container set into the ground so that the upper edges are level with the soil surface. Animals walking around fall into it.

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. Often used for survey work targeting particular plant species, i.e., plant association. Some fragile species get easily damaged by this method of collecting.

PRESERVATION

Ethyl acetate: Specimens are killed promptly in ethyl acetate vapour and 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 relaxing chamber.

Dry mounting: Lygaeoidea usually being small they should be double mounted with a micropin passing through the specimen and into a short piece of pith. A number 3 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 card point mounted. 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 clear water-soluble glue for this purpose.

Wet preservation: Soft bodied specimens, such as early instar nymphs will collapse if dry mounted and need to 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.

For DNA analysis: Material that may be used for DNA extraction needs to be stored in at least 90% ethanol, preferably 100%. Remembering that improvements in DNA extraction and sequencing mean that usable DNA can also be extracted from dry material, but high % ethanol (and stored in a -20/-30C freezer) is still the best option. Specimens that have been rapidly dried after death and stored in a dry environment are known to retain better quality DNA than ethanol storage (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 someone with no prior knowledge of the specimen. This means that the information provided should be accurate, clear and not subject to interpretation.

Include latitude and longitude, or GPS co-ordinates, as this greatly assists interpretation of locality. If possible, print all labels with a good quality laser printer onto acid free paper. If 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 & Weirauch 2020.

PREPARATION OF GENITALIA

Some of the most distinctive features enabling Lygaeoidea to be identified are provided by the genitalia. Female genitalia are used in some groups, but the structures of the male genitalia are relatively more useful. For some groups it is sometimes impossible to identify the species without examination of the male genitalia. This means that nymphs and females may be unidentifiable.

Both male and female genitalia comprise several parts some of which are hidden inside the rear end of the abdomen and this needs to be cleared or dissected to make it possible to see the 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 section of the abdomen or, for small species, the entire abdomen.
2. For strongly sclerotised abdomen, place it 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 specimen treatment carried out in cold KOH in an excavated glass block for a few hours to overnight may be adequate. This process is called maceration and 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 with 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 or silicone 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.

ECONOMIC IMPORTANCE AND FEEDING

A comprehensive discussion on the economic importance of Lygaeoidea has been provided by Sweet (2000a & b); the reader is referred to these sources for further details including the specific references.

Among the superfamily Lygaeoidea, most economically significant species belong in a few families particularly Blissidae (chinch bugs), Colobathristidae, Geocoridae (big-eyed bugs), Oxycarenidae (coon bugs), Piesmatidae, and several generic groups of Rhyparochromidae (seed bugs) (Sweet 2000a).

The Blissidae are probably the most economically important family of Lygaeoidea. Although they have a worldwide distribution, the status of the species as pests varies considerably from region to region, which make accidental introductions a constant threat. For instance, eastern North America and eastern Palaearctic and Oriental areas have several serious blissid pests, Europe of the western Palaearctic appears to have no blissids of significant economic importance, while Australia also has no blissids recorded as pests (see Sweet 2000a).

In Lygaeoidea, the feeding methods can be divided into two types: 'stylet-sheath' feeders and 'lacerate-flush' feeders (Schuh & Slater 1995, Sweet 2000a, see Schuh & Weirauch 2020 for other earlier literature). The majority of Lygaeoidea are primarily lacerate-flush feeders, a method commonly used by a lot of heteropterans that feed on parts of the plants that are rich in nutrients, such as seeds (Schuh & Slater 1995, Wheeler 2001). The Blissidae (the chinch bugs), which includes many economic species, and Malcidae, Colobathristidae and Piesmatidae which include a few economic species are predominantly sap feeders and do not feed on seeds (Henry et al. 2015, Sweet 2000a). Berytidae are mostly phytophagous, few even pests although some are predators (Henry 2000). Geocoridae, the big-eyed bugs, are predators and may often also feed on seeds and foliage of plants (Sweet 2000a).

Details of host, pest status and associated information relating to individual genus or species or species group within that genus, have been provided under respective factsheet below.

MORPHOLOGY

Detailed typical Lygaeoid adult external morphology structures and structural terms are provided using labelled illustrations (Figs. 1 – 3, of *Nysius orarius* Malipatil), hind wing venation of a myodochine Rhyparochromidae (Fig. 4), abdominal terga and sterna of *Germalus victoriae* Malipatil (Figs. 5 & 6), and male and female genitalia characters (Figs. 7 – 14). Additionally, various diagnostic characters of external adult and nymphal morphology, and male genitalia, used in the keys as well as those in diagnoses of higher taxa, and genera in the factsheets have been illustrated through Figs. 15 to 35. See captions of individual figures for specific details.

A glossary of structures and terminology referred to in this work is provided after the Classification section.

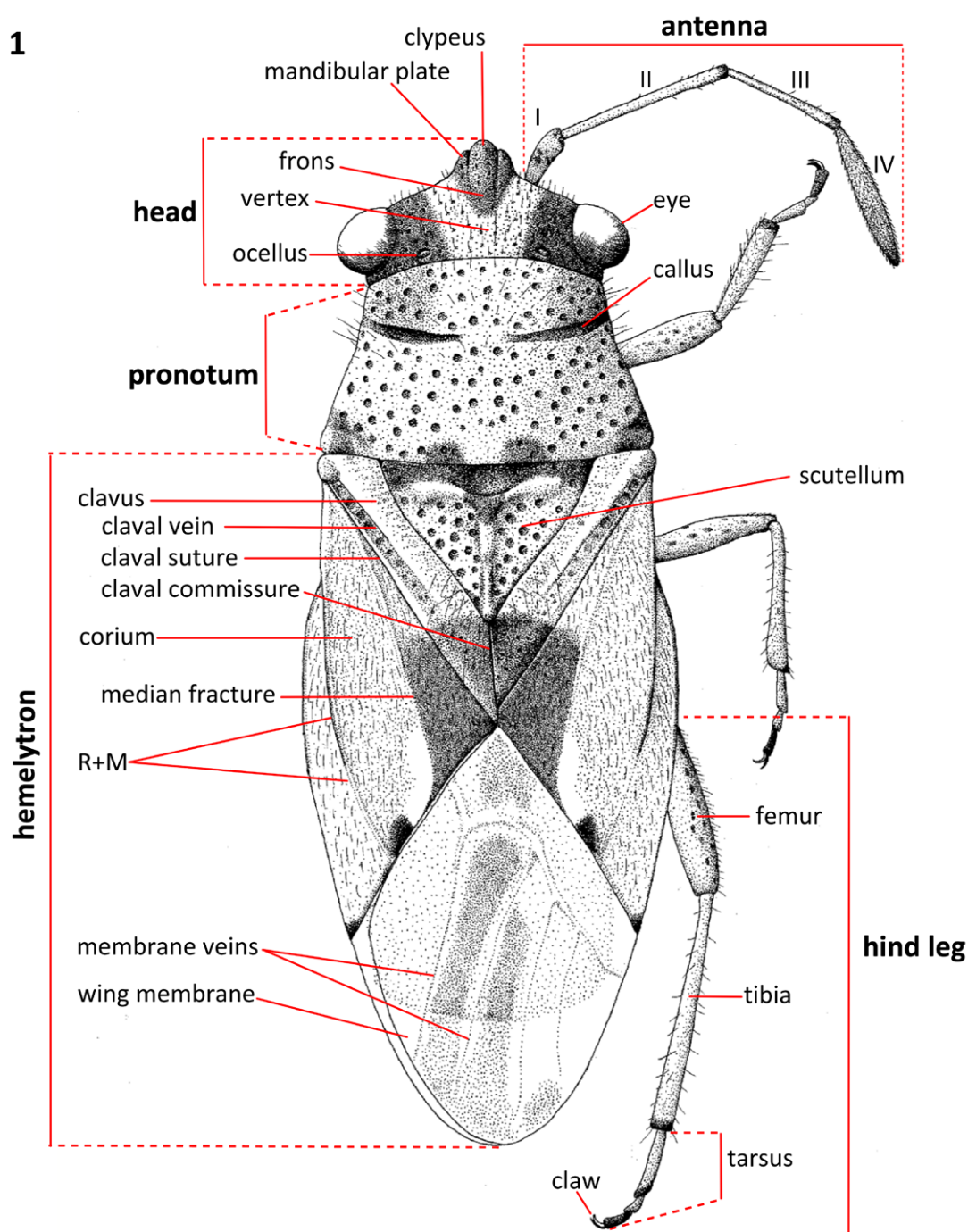
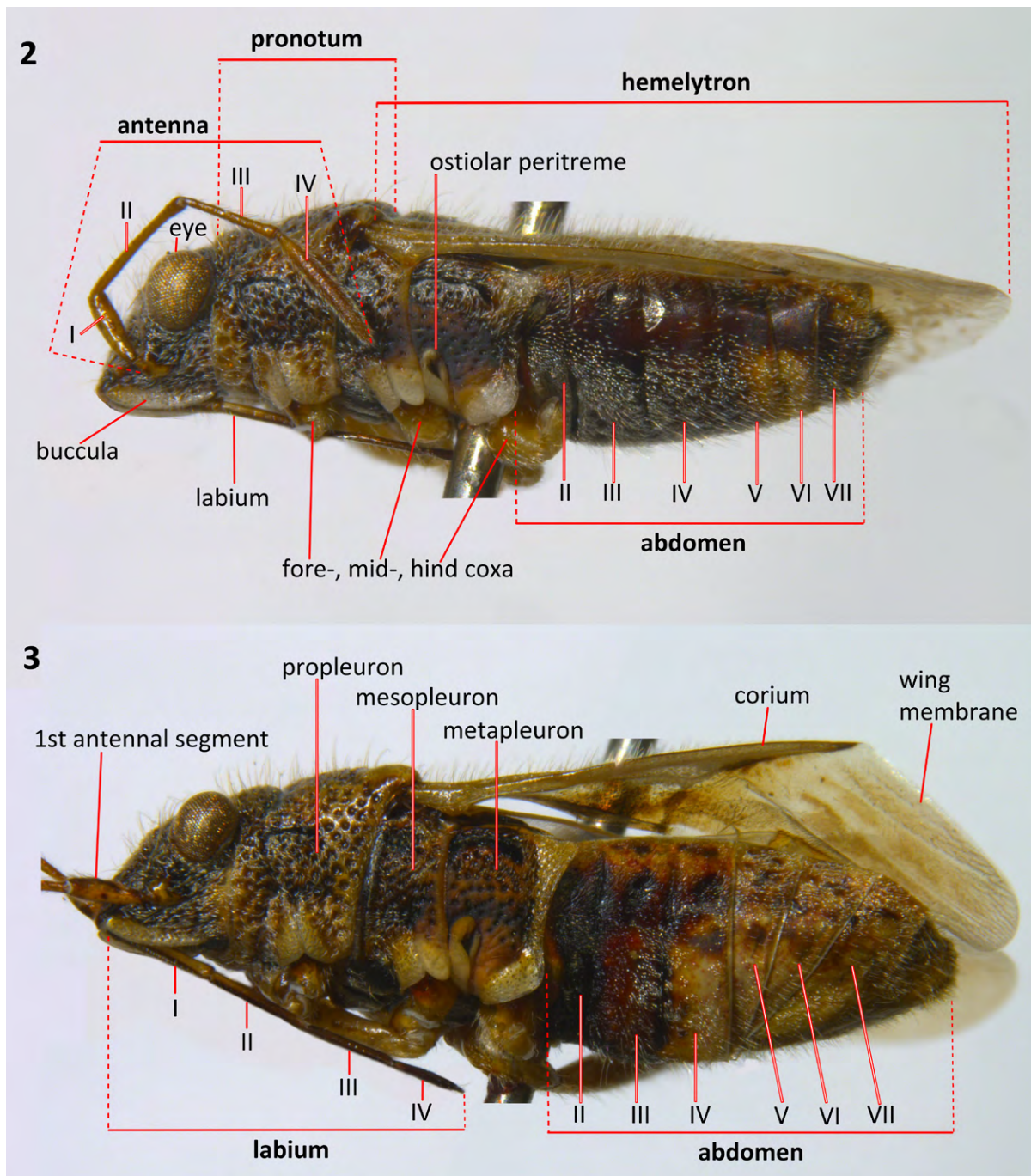
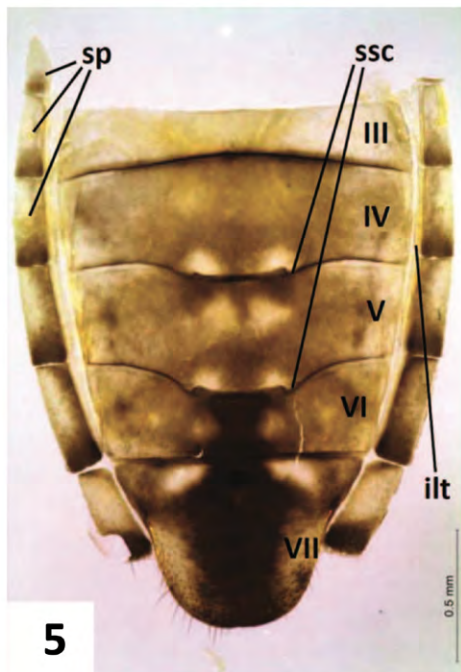
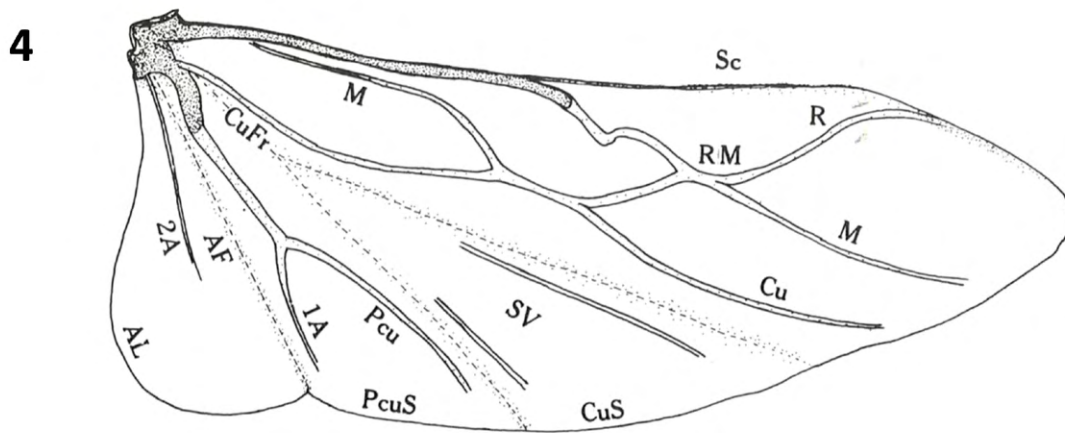


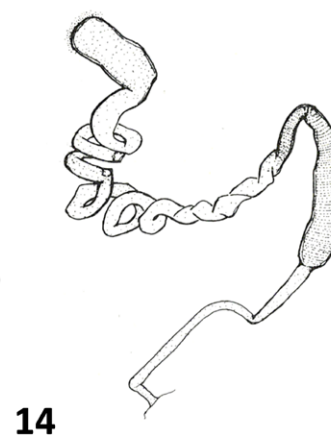
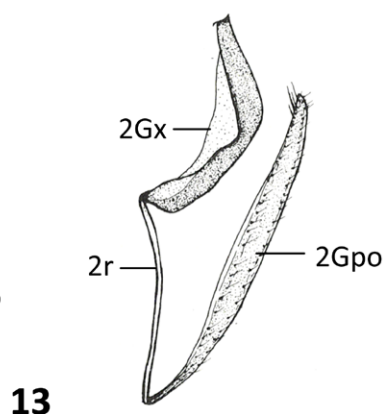
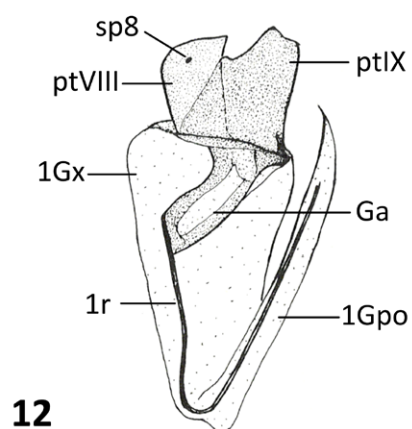
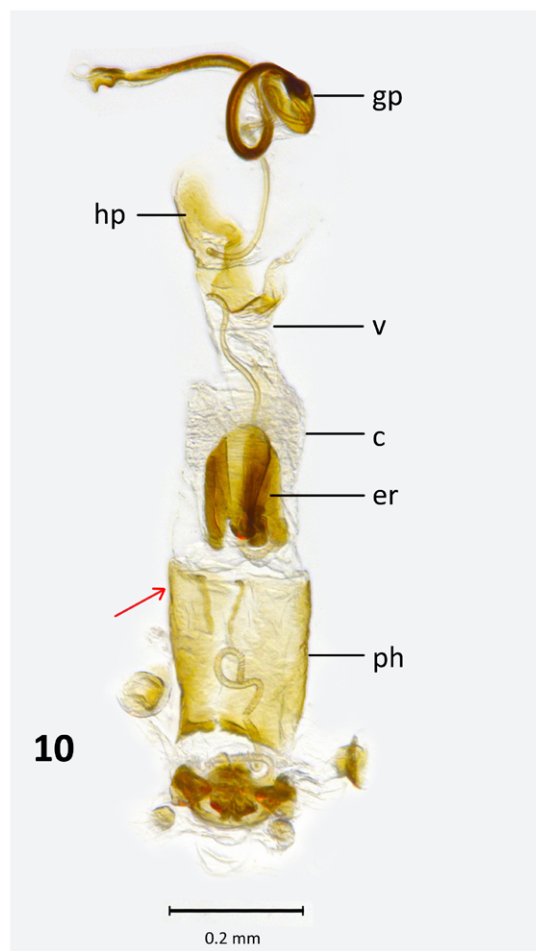
Figure 1. *Nysius orarius*, dorsal view, general adult lygaeoid morphology, showing typical structures and certain structural terms. [from Malipatil 2005]



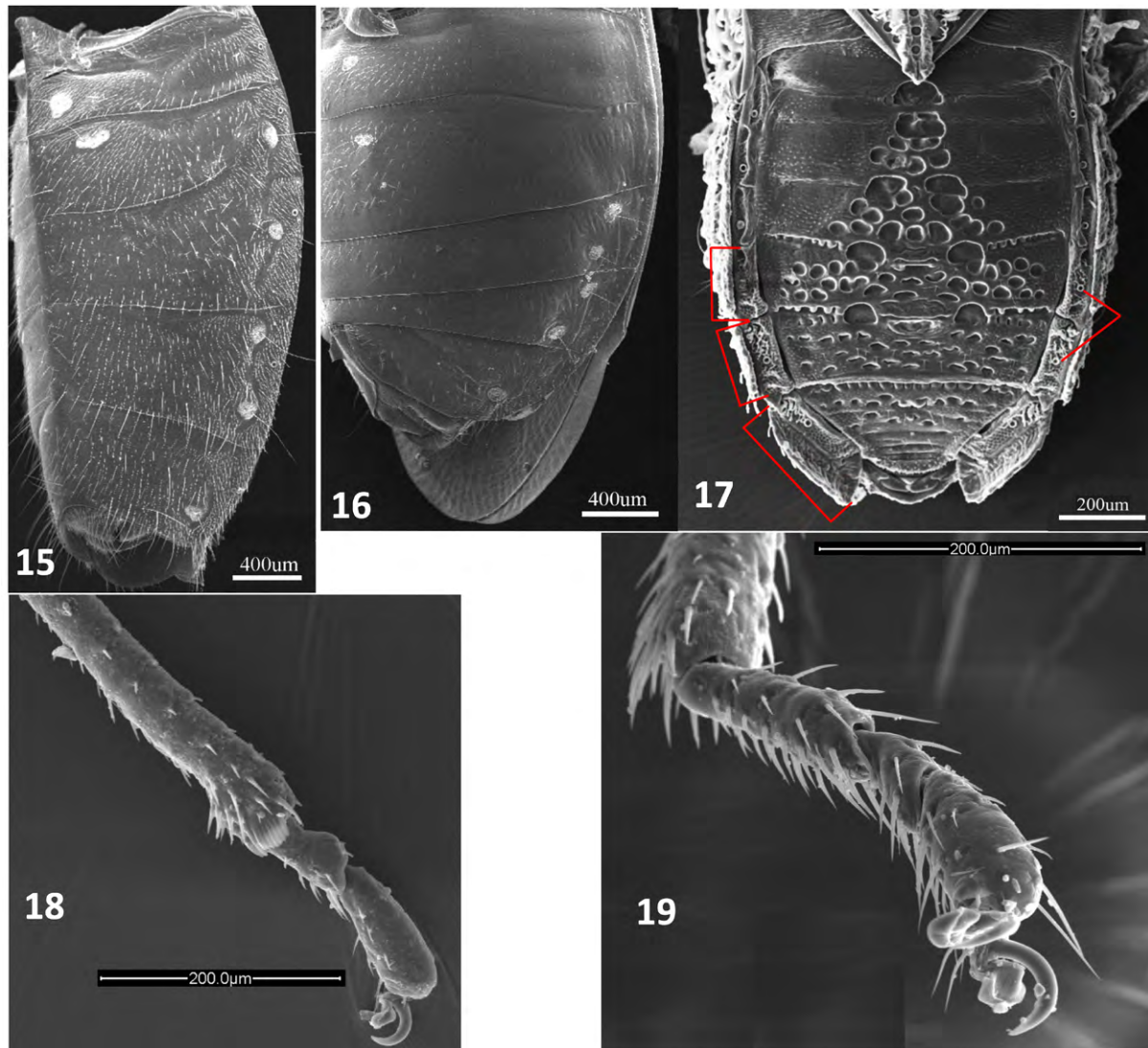
Figures 2 & 3. *Nysius orarius*, lateral view, most legs removed. 2, male and 3, female, showing structures and certain structural terms. [Eow]



Figures 4–6. 4, Myodochini (Rhyparochromidae) hind wing venation. 5, 6, *Germalus victoriae* male abdominal terga (dorsal) and sterna (ventral), showing position of spiracles, trichobothria, scent gland scars and intersegmental sutures. 1A, 2A, first and second anal vein; AF, anal fold; AL, anal lobe; Cu, cubitus; CuFr, cubital furrow; CuS, cubital sector; ilt, inner latero-tergite; M, media (basal part also called hamus); Pcu, postcubitus; PcuS, postcubital sector; R, radius; RM, radius media; Sc, subcosta; sp, spiracle; ssc, scent gland scar; SV, secondary vein. tr, trichobothria. [4, from Malipatil 1978; 5, 6, from Malipatil & Blacket 2013]

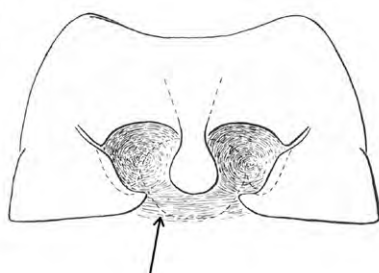


Figures 7–14. 7–9 and 12–14, *Remaudiereana inornata* (Walker); 10, *Meschia quadrimaculata* Distant; 11, *Sadoletus validus* Gao & Malipatil: 7, 8, pygophore, dorsal and lateral view. 9, left paramere. 10, 11, aedeagus showing distally parallel or narrow phallosome respectively, indicated by arrows. 12, 13, ovipositor. 14, spermatheca. c, conjunctiva; er, ejaculatory reservoir; Ga, gonangulum; gp, gonoporal process; 1Gpo, 2Gpo, first and second gonapophysis; 1Gx, 2Gx, first and second gonocoxa; hp, helicoid process; hs, holding sclerite; ph, phallosome; ptVIII, ptIX, eighth and ninth paratergite; 1r, 2r, first and second ramus; sp8, spiracle of eighth segment; v, vesica. [7–9 and 12–14 from Malipatil 1978; 10, from Gao & Malipatil 2019a; 11, from Gao & Malipatil 2019b]

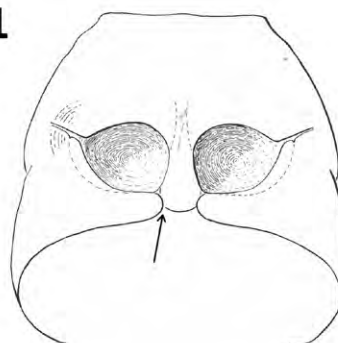


Figures 15–19. Scanning Electron Micrographs of: 15, *Harmostica hirsuta* Usinger abdomen showing sterna IV & V curving forward. 16, *Geocoris ochropterus* (Fieber) abdomen showing sterna IV & V not curving forward, attaining lateral margin of abdomen. 17, *Chauliops bisontula* Banks abdomen dorsal view showing spiracles on segments V–VI dorsal (pointed with red lines) and connexiva on segments V–VII produced into conspicuous lobes (defined with red lines). 18, *Mcateella* sp. showing two segmented tarsus. 19, *Chauliops conica* Gao & Bu showing three segmented tarsus. [Gao]

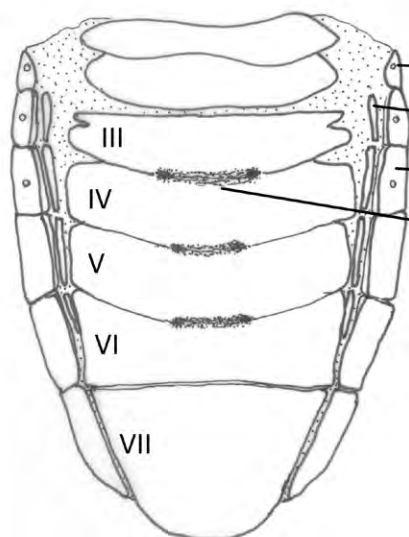
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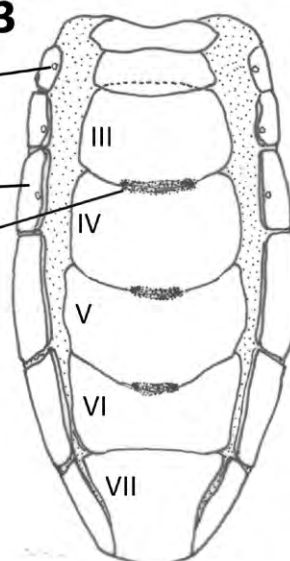
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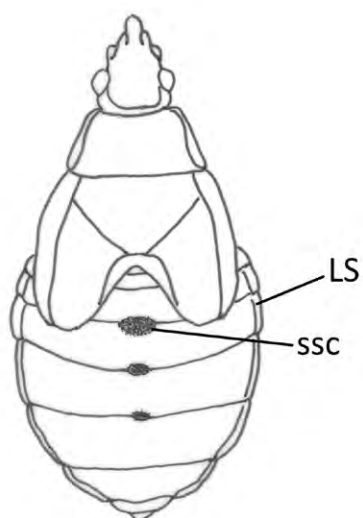
22



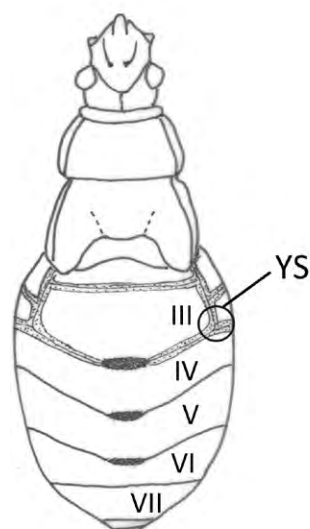
23



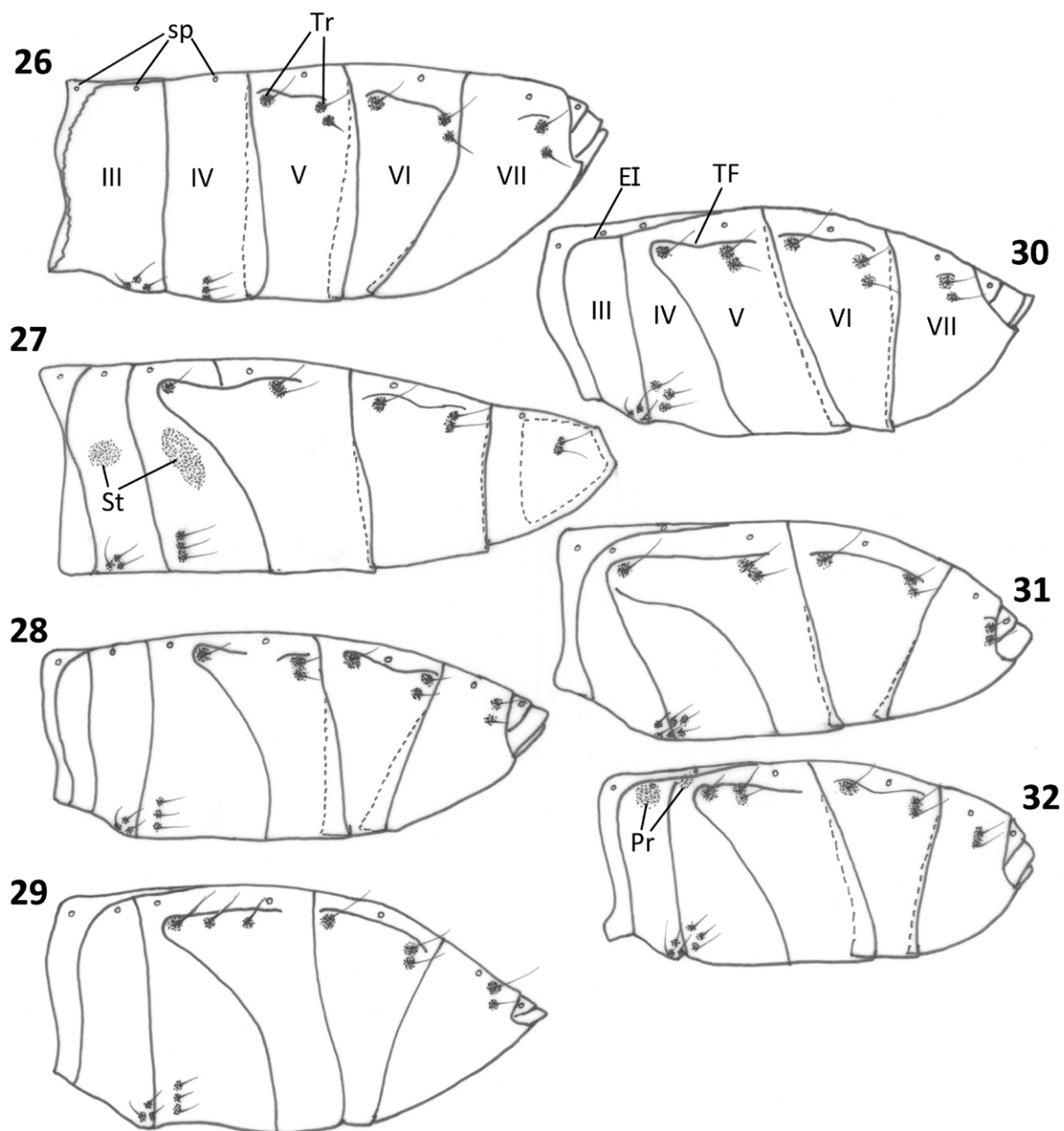
24



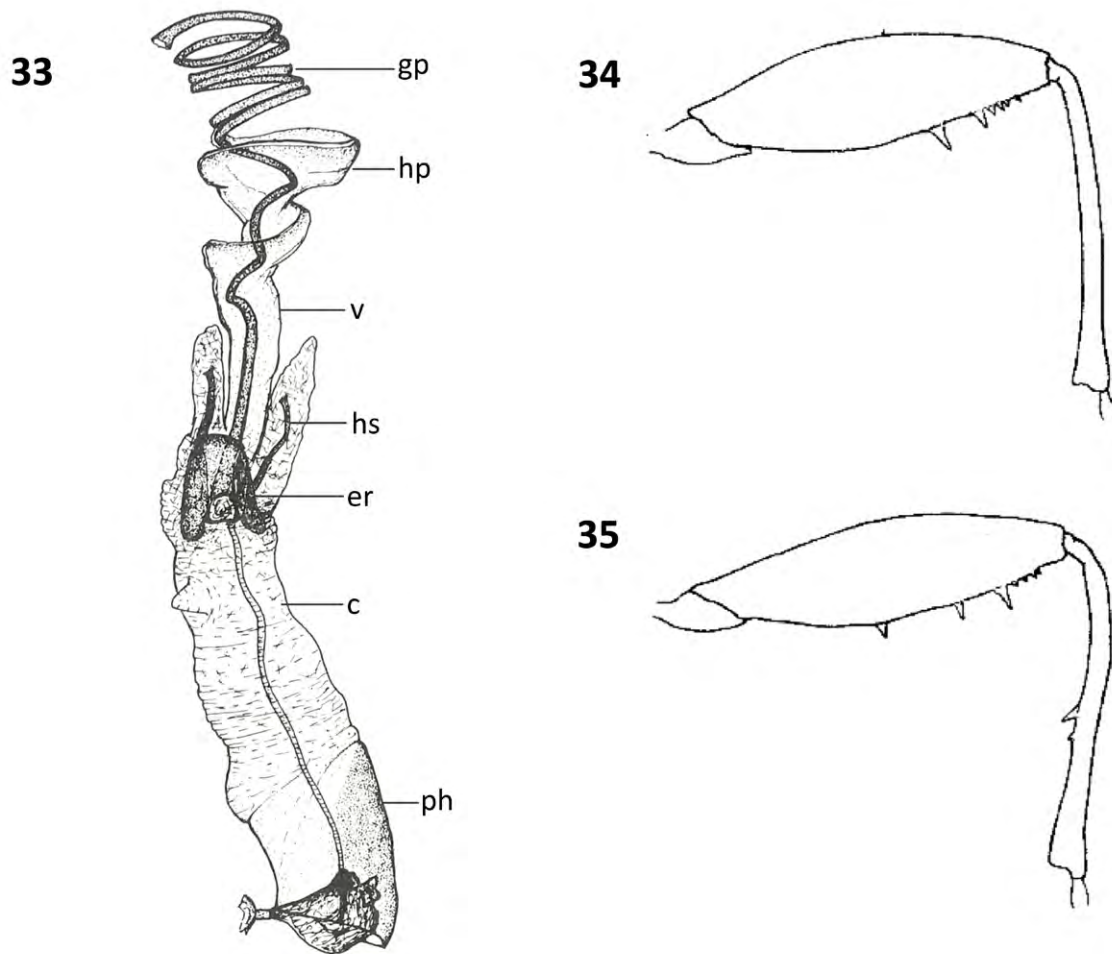
25



Figures 20–25. 20, *Capodemus sabulosus* Slater & Sweet, open fore coxal cavities, arrowed. 21, *Atrademus capeneri* (Slater), closed fore coxal cavities, arrowed. 22, 23, Abdominal terga of Udeocorini and Myodochini. 24, 25, Nymph of *Clerada apicicornis* Signoret (Fifth instar) and *Ozophora picturata* Uhler (Fourth instar), antennae and legs deleted. ilt, inner laterotergite; LS, Lateral suture; Lt, laterotergite; sp, spiracle; ssc, scent gland scar; YS, Y-suture. [20 & 21, from Slater 1979; 22–25, modified and redrawn from Sweet 1967]



Figures 26–32. Lateral view of abdomen, showing spiracle and trichobothria patterns in tribes of Rhyparochrominae. 26, Plinthisinae. 27, Cleradini. 28, *Ozophorini*. 29, Targaremini. 30, Stygnocorini. 31, Antillocorini. 32, Drymini. EI, epipleural impression; Pr, pores; Sp, spiracles; TF, trichobothrial furrow; Tr, trichobothria; St, stridulitrum. [modified and redrawn from Sweet 1967]



Figures 33–35. 33, *Remaudiereana inornata*, aedeagus. 34, *Horridipamera nietneri* (Dohrn), female, unarmed fore tibia. 35, *Horridipamera nietneri*, male, armed fore tibia. c, conjunctiva; er, ejaculatory reservoir; gp, gonoporal process; hp, helicoid process; hs, holding sclerite; ph, phallosome; v, vesica. [from Malipatil 1978]

CONVENTIONS AND HOW TO USE THIS RESOURCE

All the keys 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 or subcouplets, secondary characters are provided in square brackets, following the primary diagnostic characters. These characters need to be interpreted in combination and with caution only after the primary characters have been considered for confirmation of an identification.

The keys presented have been constructed based on the latest available papers, and then checked against the verified specimens.

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

This resource is primarily intended to cover genera that are of economic importance (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 factsheet, 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 specialist 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, as major pests or predators and / or biological control agents. These taxa are recorded from either distant regions (such as Palaearctic, 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.

Several such genera / species are included in this work, all with habitus images. Brief diagnostic, pest status and host notes for these species are provided individually under "Remarks" section of the factsheet of the most appropriate and related genus.

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 is alphabetical.

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

Genus name; author; subfamily; tribe; type species; number of Australian (and World) species; extralimital distribution; Australian distribution: this information has been obtained mostly from the Australian Faunal Directory (ABRS 2012), Slater 1964a, Slater & O'Donnell 1995, also from *Lygaeoidea Species File* (Dellapé & Henry 2020). [Information on species number worldwide for each genus as well as the number for Australia has been provided here to give some idea how likely an identification is to be correct, or how likely another species of the same genus might arrive and / or become of economic importance to Australia]. These resources need to be consulted for information on synonymic history relating to individual genus, subgenus, tribe or subfamily in this resource, as well as for names of species currently included in each genus.

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

Hosts / feeding: information has been obtained / summarized mostly from the Australian Faunal Directory (ABRS 2012); the feeding habit descriptors and host plant lists have also been adopted from that source. Additional host information has come from cited references including those listed in Key References in genus factsheets.

Diagnosis: taken from the most appropriate and up-to-date taxonomic papers, listed under Key References for that taxon, and often biased towards the Australian fauna and the genera included in this resource.

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.

MOLECULAR IDENTIFICATION

DNA barcoding (Ratnasingham & Hebert 2007) is a molecular approach to species identification that is independent of 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>).

Currently, there are about 305 species of Lygaeoidea that have DNA barcodes available on BOLD, representing every family except Cryptorhamphidae and Meschiidae (see Table 1. below). Ideally, these reference sequences were 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 also 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 (Gilbert et al. 2007) and may also clear the abdomen for genitalia examination.

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 Lygaeoids would greatly assist with rapid diagnostics – particularly when dealing with immature or damaged specimens, or when the only method of distinguishing a species is by difficult genitalia dissections of adults (see, [Preparation of Genitalia](#)).

Table 1. Reference DNA barcodes on BOLD, accessed 09/3/2020.

Taxon	Number of species with DNA barcodes on BOLD
Artheneidae	1
Berytidae	23
Blissidae	10
Colobathristidae	1
Cryptorhamphidae	Not present on BOLD
Cymidae	10
Geocoridae	18
Heterogastridae	3
Lygaeidae	89
Malcidae	3
Meschiidae	Not present on BOLD
Ninidae	1
Oxycarenidae	17
Pachygronthidae	4
Piesmatidae	4
Rhyparochromidae	121

Classification

SUPERFAMILY Lygaeoidea

(PLATES 1–42, FIGS. 1–35)

Diagnosis:

Hemelytral membrane venation reduced, with only 4 or 5 simple veins, almost always lacking closed cells at its base (except Heterogastridae and Meschiidae). Fore femora usually incrassate. Abdomen with trichobothrial pads (trichoma) usually present. Ovipositor usually laciniate.

Abdomen with trichobothrial pads (trichoma) usually present. Ovipositor usually laciniate.

Key References: Henry 1997a, Schuh & Slater 1995, Gao et al. 2017, Schuh & Weirauch 2020.

Number of Australian Families: 16.

KEY TO FAMILIES OF AUSTRALIAN LYGAEOIDEA

[modified from Schuh & Slater 1995, Henry 1997a, Carver et al. 1991]

1. Suture between abdominal sterna IV–V usually curving forward laterally and rarely attaining lateral margins of abdomen (**Fig. 7; Fig. 24**); if IV–V suture complete (**Fig. 26**), trichobothria usually present on head **Rhyparochromidae**
Suture between abdominal sterna IV–V not curving forward, attaining lateral margin of abdomen (**Fig. 8; Fig. 23**); head without trichobothria 2
2. Abdominal spiracles on segment II ventral (**Fig. 26**) 3
Abdominal spiracles on segment II dorsal (**Fig. 22**) 5
3. Fore femora strongly incrassate, much thicker than hind femora (**Plate 26A**); base of hemelytral membrane without closed cell (**Plate 26A**) **Pachygronthidae**
Fore femora weakly incrassate, little thicker than hind femora (**Plate 13A, B**); base of hemelytral membrane with a distinct closed cell (**Plate 22A**) 4
4. Bucculae long, extending nearly to base of head (**Plate 22D**); paraclypeal lobes with small protuberances anteriorly (**Plate 22C**); phallotheca not narrowed distally (**Fig. 10**, arrowed) **Meschiidae**
Bucculae short and not reaching base of head (**Plate 13B**); paraclypeal lobes without protuberances anteriorly (**Plate 13A**); phallotheca narrowed distally (**Fig. 11**, arrowed) **Heterogastridae**
5. Tarsi 2-segmented (**Fig. 18**); ocelli obscure (**Plate 27A**); trichobothria lacking on abdominal segments IV & V, often lacking on other segments as well **Piesmatidae**
Tarsi 3-segmented (**Fig. 19**); ocelli distinct (**Plate 26A**); trichobothria present on abdominal segments IV & V (**Fig. 26**) 6
6. Each ocellus nearly encircled by a distinct groove (**Plate 7A, C**) 7
Each ocellus not encircled by a groove (**Plate 1A**) 12

7. Abdominal spiracles on segments V & VI ventral (Fig. 15)	Colobathristidae
Abdominal spiracles on segments V & VI dorsal (Fig. 17)	8
8. Connexiva on abdominal segments V–VII produced into conspicuous dentate lobes (Fig. 17, Plate 21D)	Malcidae
Connexiva on abdominal segments V–VII simple, never produced into conspicuous lobes (Plate 1D)	9
9. First antennal segment long, slender, often apically clavate (or clubbed), subequal in thickness to and nearly always longer than segments 2 and 3 (Plate 1C, D)	Berytidae
First antennal segment short, stout, barrel-shaped, much shorter and thicker than segments 2 and 3 (Plate 8)	10
10. Corium hyaline to translucent beyond constricted base (Plate 23); head broad, eye substylate, vertex wider than anterior width of pronotum (Plate 23)	Ninidae
Corium usually opaque throughout, base not or only slightly constricted (Plate 8); head not broadened, eyes rarely substylate, vertex always narrower than anterior width of pronotum (Plate 8)	11
11. Bucculae short, not extending posteriorly beyond bases of antennae (Plate 8B); abdominal trichobothria present on sternites II–VII	Cymidae
Bucculae long, extending posteriorly to base of head (Plate 7D); abdominal trichobothria present only on sternites V & VI	Cryptorhamphidae
12. Abdominal spiracles on segments III & IV ventral (Fig. 26)	13
Abdominal spiracles on segments III & IV or at least III dorsal (Fig. 22)	14
13. Lateral pronotal margin explanate or with a wide flattened carina (Plate 1A, B); female abdomen rounded caudally (Plate 1B); male abdominal sternite VII without clusters or combs of setae ventrally	Artheneidae
Lateral pronotal margin rounded or, at most, weakly carinate (Plate 24); female abdomen often truncated caudally (Plate 24B); male abdominal segment VII with transverse combs or clusters of setae ventrally	Oxycarenidae
14. Eyes reniform, usually touching or wrapping around anterior margin of pronotum (Plates 9–11); abdominal spiracles on segments V & VI ventral (except Australocorinae have dorsal); sutures between tergites IV–V and V–V curving forward through middle	Geocoridae
Eyes not reniform and otherwise (Plate 2); abdominal spiracles on segments V & VI dorsal; all abdominal tergites transverse, sutures never curving forward	15
15. Abdominal spiracles on segment VII ventral; pronotal calli without impressed, transverse groove (Plate 2); scutellum without a cross-shaped carina (Plate 2)	Blissidae
Abdominal spiracles on segment VII dorsal; each pronotal callus with an impressed, transverse, usually shiny, groove (Plates 14–20); scutellum usually with a cross- shaped carina (Plates 14–20)	Lygaeidae

FAMILY Artheneidae

(PLATE 1A, B)

Diagnosis:

Body 2.5–4 mm, elongate-ovoid; strongly punctate above; mostly macropterous.

Head trichobothria absent.

Pronotum with lateral margins explanate. Hind wings with hamus (= basal part of M) (**Fig. 4**) lacking.

Abdomen lacking inner laterotergites (**Fig. 23**, ilt). Spiracles of segments III–VII ventral. Arrangement of trichobothria on sternum V with one anterior and two posterior to spiracle V, the latter located one above the other on a single elevation.

Male genitalia: Aedeagus (**Fig. 33**) with lateral processes and gonoporal process (**Fig. 33**, gp) very short in most species. Female genitalia: Spermathecal bulb most often invaginated.

Nymphs with three dorsal abdominal glands (**Fig. 24**)

Key References: Schuh & Slater 1995, Cassis & Gross 2002, Henry 1997a, Schuh & Weirauch 2020.

Number of Australian genera: 1.

Genus *Dilompus* Scudder, 1957

[FAMILY ARTHENEIDAE, SUBFAMILY DILOMPINAE]
(PLATE 1A, B)

Type species: *Dilompus robustus* Scudder, 1957, by monotypy.

Number of Australian (and World) species: 2 (2).

Extralimital Distribution: None.

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

Economic Significance: No.

Hosts / feeding: Granivore; under dry leaf litter of *Eucalyptus* and grasses.

Diagnosis:

Body punctured with short sericeous pubescence.

Head deeply punctate; wider than long; deeply set into prothorax; vertex about three times eye width; eyes posteriorly touching pronotum. Antennae with fourth segment longest, second slightly longer than third. Labium reaching posterior coxae.

Pronotum rectangular, wider than long; densely punctate; anterior margin deeply concave; lateral margin gently convex. Scutellum flat, deeply punctate. Clavus with three rows of punctures plus an incomplete fourth row. Legs robust; fore femora markedly incrassate, armed near apex with one long and two short spines ventrally; posterior tarsi with first and third segments subequal.

Three dorsal abdominal scent gland scars at posterior of segments III, IV and V.

Female genitalia: Spermatheca with a spherical apical bulb.

Key References: Scudder 1957a, Malipatil 1988.

FAMILY Berytidae

(PLATE 1C, D)

Diagnosis:

Body slender, delicate, elongate; often cylindrical with very long, thin appendages.

Head often with clypeus produced anteriorly; vertex has a transverse sulcus and the frons sometimes has a spine. Ocelli present. Antennae located above a line through middle of eye; antenniferous tubercles reduced; antennal segment 4 usually short and somewhat swollen. Labium 4-segmented.

Pronotum densely punctate. Scutellum triangular, apex sometimes elongate and pointed. Hemelytra almost always uniformly membranous. External efferent system of metathoracic glands prominent, often with a strongly auriculate peritreme. Evaporatorium extensive and often cover metapleuron. Coxae directed posteriorly; apex of femora sometimes incrassate; claws dentate.

Abdominal spiracles dorsal between inner laterotergites and laterotergites. Abdominal trichobothria with following pattern on segments III to VII: 3: 3: 2: 2: 2. Sternum VII of females entire.

Female genitalia: Spermathecal bulb large, and ovoid with distal pump flange well developed, proximal flange reduced or absent. Ovipositor reduced.

Nymphs with dorsal abdominal scent-gland openings between terga III & IV and IV & V or only between terga III & IV. Nymphs usually with glandular setae.

Key References: Schuh & Slater 1995, Henry 1997a, 1997b, 1997c, Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 6.

Genus *Metacanthus* Costa, 1847 [FAMILY BERYTIDAE, SUBFAMILY METACANTHINAE] (PLATE 1C, D)

Type species: *Metacanthus meridionale* Costa, 1838, by monotypy.

Number of Australian (and World) species: 2 in two subgenera (26).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Arboreal. Sap-feeder. Herbivore (associated flora: *Hibiscus* sp., [Malvaceae]; *Hibiscus mutabilis* L. [Malvaceae]; *Passiflora foetida* L. [Passifloraceae]; *Ononis* sp. [Fabaceae]; *Datura fastuosa* L. [Solanaceae]; Tomato, *Lycopersicon esculentum* Mill. [Solanaceae]; Tobacco, *Nicotiana tabacum* L. [Solanaceae]; Pigeon pea, *Cajanus cajan* (L.) [Fabaceae]; Soybean, *Glycine* sp. [Fabaceae]; Eggplant, *Solanum melongena* L. [Solanaceae]; Cacao, *Theobroma cacao* L. [Sterculiaceae]; Bottle gourd, *Lagenaria siceraria* (Molina) Standl. [Cucurbitaceae]). *Metacanthus* (*Cardopostethus*) *pulchellus* Dallas is an important pest of Cucurbitaceae in India and has a wide host range covering several plant families, and is widely distributed in Australia, Papua New Guinea and several countries in Asia (Henry & Froeschner 1998, Henry 2000).

Diagnosis:

Head moderately produced apically. Antennal segments 2 and 3 subequal. Labium reaching hind coxae.

Hemelytra reaching or surpassing apex of abdomen; corium and clavus impunctate.

Process of ostiolar peritreme produced into an upwardly directed spine which surpasses level of hemelytra and is recurved backwards at tip.

Key References: Gross 1950, Henry et al. 2015.

FAMILY Blissidae

(PLATES 2–6)

Diagnosis:

Body size (3–15 mm) and shape vary, ranging from short and stout to elongate and slender, often flattened to access leaf sheaths of their hosts. Body usually covered with a pruinose layer of minute spicules.

Hemelytra fully winged or brachypterous (between macropterous to micropterous); not or only weakly punctate.

Abdominal spiracles on segments II–VI are dorsal, VII ventral.

Male genitalia: Male genital segment with a tubercle. Ejaculatory reservoir with wings.

Nymphs with scent gland openings present between terga IV & V and V & VI.

Key References: Schuh & Slater 1995, Slater 1979, Henry 1997a, Henry et al. 2015, Schuh & Weirauch 2020.

Remarks: Only lygaeoid group to feed entirely on plant sap, rather than seeds (Sweet 2000a).

Number of Australian genera: 8.

KEY TO REPRESENTATIVE GENERA OF BLISSIDAE

(modified from Slater 1979)

1. Dorsal surface of pronotum at least partly pruinose (**Plate 6A**) 2
Dorsal surface of pronotum completely lacking pruinose areas (except a partial or complete ring of pruinosity anteriorly behind collar), but shining or sub-shining (**Plate 2**) 4
2. Fore coxal cavities open (**Fig. 17**)...EXOTIC *Blissus*
Fore coxal cavities closed (**Fig. 18**) 3
3. Pronotum with anterior half of dorsal surface shining, posterior half pruinose...EXOTIC..... *Cavelerius*
Pronotum either entirely pruinose, or with shining and pruinose areas but never anterior half completely shining and posterior half pruinose *Ischnodemus*
4. Fore coxal cavities open (**Fig. 20**) *Dimorphopterus*
Fore coxal cavities closed (**Fig. 21**) 5
5. Fore femora with at least three or four spines present;
[membrane of nearly uniform texture throughout; **Plate 3C**] *Macropes*
Fore femora with only one or two spines present (excluding spinules);
[males with prominent jugal extensions visible from above (**Plate 3A**),
females also have this but less prominent] *Iphicrates*

Genus *Blissus* Burmeister, 1835 [FAMILY BLISSIDAE, SUBFAMILY BLISSINAE] (PLATE 4)

Type species: *Lygaeus leucopterus* Say, 1831, (= *Blissus leucopterus leucopterus* (Say)), by subsequent designation.

Number of Australian (and World) species: 0 (27).

Extralimital Distribution: Western Hemisphere.

Australian Distribution: None.

Economic Significance: Minor to Major.

Hosts / feeding: Members of Poaceae.

Diagnosis:

Body short and thick. Head, pronotum and scutellum above completely pruinose with only tylus shining; head and thorax below completely pruinose.

Ocelli small. Antennae moderately clavate.

Metathoracic scent gland peritreme small rounded and earlike. All femora mutic; fore coxal cavities open. Membrane comparatively thin and semitranslucent; wing polymorphism present, brachypters and micropters common; macropters with moderately concave apical corial margin.

Ejaculatory reservoir with large cup and elongate, slender, straplike wings. Ovipositor elongate.

Key References: Slater 1979.

Remarks: EXOTIC. The 'common chinchbug', *Blissus leucopterus leucopterus* (Say), (**Plate 4A**) is the most notorious of the pest species of the Lygaeoidea attacking wheat, corn, millets, sorghum and other cultivated and uncultivated grasses (Sweet 2000a). The 'chinch bugs', *B. leucopterus hirtus* Montandon (**Plate 4B**) and *B. insularis* Barber (**Plate 4C, D**) are also important pests, attacking lawns, golf courses, and a variety of other grasses including some cultivated (Sweet 2000a).

Genus *Cavelerius* Distant, 1903 [FAMILY BLISSIDAE, SUBFAMILY BLISSINAE] (PLATE 5)

Type species: *Cavelerius illustris* Distant, 1903, by monotypy.

Number of Australian (and World) species: 0 (10).

Extralimital Distribution: Southern Asia, Taiwan, Ryukyus, Japan.

Australian Distribution: None.

Economic Significance: Minor.

Hosts / feeding: Members of Poaceae.

Diagnosis:

Body linear, moderately slender. Lateral and ventral surfaces of thorax and scutellum pruinose.

Ocelli small.

Pronotum dorsally with anterior half strongly shining, posterior half including humeral area pruinose. Metathoracic scent gland peritreme earlike, rounded but moderately elongate. Fore femora mutic; fore coxal cavities closed. Wing microptery, brachyptery, and submacroptery common; apical corial margin straight, membrane opaque but thin.

Spermatheca with large basal flange of bulb; pump short or elongate, always broadened noticeably at distal end.

Key References: Slater 1979.

Remarks: EXOTIC. 'Oriental chinch bug', *Cavelerius saccharivorus* (Okajima) (**Plate 5A, B**) is an important pest of sugarcane particularly in South East Asia, and the 'black bug of sugarcane' (*C. excavatus* (Distant) (**Plate 5C, D**) and *C. sweeti* Slater & Miyamoto) are serious pests of sugarcane in India (Sweet 2000a).

Genus *Dimorphopterus* Stål, 1872 [FAMILY BLISSIDAE, SUBFAMILY BLISSINAE] (PLATE 2)

Type species: *Micropus spinolae* Signoret, 1857, by subsequent designation.

Number of Australian (and World) species: 2 (38).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Herbivore (associated flora: *Eragrostis spartinooides* Steudel [Poaceae]). Often in large numbers at bases of plants, in sandy areas. *Dimorphopterus gibbus* (F.) (**Plate 2D**) is most widespread of the genus, from West Africa to the Oriental and Australian regions, but not in Australia itself, and an important pest attacking sugarcane and grasses; also, several other species of this genus are minor pests of rice, sorghum and other cultivated and wild grasses (see Sweet 2000a for further details).

Diagnosis:

Body generally short and stout.

Head dorsal surface shining or subshining, always lacking pruinosity. Ocelli small. Antennae moderately clavate.

Pronotum shining or subshining, always lacking pruinosity. Scutellum usually completely pruinose. Metathoracic scent gland peritreme short, rounded, earlike. Hemelytra commonly brachypterous or macropterous; apical coral margin usually concave; membrane thin, at least part of it translucent. Fore coxal cavities open; fore femora mutic or armed below with one or two ventral spines, meso- and metafemora mutic; fore tibiae flattened and spinose.

Male genitalia: Ejaculatory reservoir with cup large and wings slender and straplike. Female genitalia: Spermatheca variable often with elongate curving pump, bulb usually with well-developed basal flange.

Key References: Slater 1979, 1974.

Genus *Iphicrates* Distant, 1903 [FAMILY BLISSIDAE, SUBFAMILY BLISSINAE] (PLATE 3A, B)

Type species: *Iphicrates subauratus* Distant, 1903, by monotypy.

Number of Australian (and World) species: 4 (17).

Extralimital Distribution: Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Herbivore (associated flora: Bamboo, *Arundinaria cobonii* Bailey [Poaceae]). In tussocks.

Diagnosis:

Body moderately elongate, not strongly flattened; submacropterous form common; lateral and ventral surfaces with variable pruinosity.

Head dorsal surface subshining, sometimes appearing granulose. Ocelli small. Marked sexual dimorphism present. Males with bucculae much enlarged projecting forward in front of tylus and frequently distally expanded, and juga frequently raised above head surface and elongated as a pair of projecting horns (females also have but less enlarged). Antenniferous tubercles hooked.

Pronotum dorsal surface subshining, sometimes appearing granulose, with a partial or complete ring of pruinosity present anteriorly just behind collar. Metathoracic scent gland peritreme slightly produced above adjacent body surface, usually straight, not strongly tapered to distal end. Scutellum laterally either pruinose or shining.

Apical corial margin usually straight but sometimes strongly concave; membrane much thinner than corium. Fore coxal cavities closed; fore femora moderately incrassate usually armed below with two spines; middle and hind femora usually mutic.

Male genitalia: Ejaculatory reservoir with bulb stalked, margin thick, wings protruding at right angles to bulb, broad basally. Female genitalia: Spermathecal pump double flanged, similar to condition found in *Macropes*.

Key References: Slater 1979, 1961.

Genus *Ischnodemus* Fieber, 1837 [FAMILY BLISSIDAE, SUBFAMILY BLISSINAE] (PLATE 6)

Type species: *Ischnodemus quadratus* Fieber, 1837, by monotypy.

Number of Australian (and World) species: 1 (95).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

Australian Distribution: Western Australia.

Economic Significance: Minor.

Hosts / feeding: Herbivore (associated flora: *Gahnia* sp., sedge [Cyperaceae]). Sap-feeder.

Diagnosis:

Body elongate, slender, linear, not strongly flattened. Microptery, brachyptery, and submacroptery common. Pruinosity variable from completely pruinose to completely shining above and below.

Ocelli small.

Metathoracic scent gland peritreme variable but generally rounded and earlike. Apical corial margins straight; membrane usually much thinner than corium, rarely thickened, opaque and similar in texture to adjacent corium. Fore coxal cavities closed; fore femora mutic (in Australian species) or with one or two short spines present on ventral surface, rarely with three or four spines present; middle and hind femora always mutic.

Male genitalia: Ejaculatory reservoir extremely variable from a large cup and straplike wings to reduced to a tiny cup and minute wings or a very large cup and extremely large flattened platelike wings that cover most of the membranous portion of cup. Female genitalia: Ovipositor variable in length.

Key References: Slater 1979, Slater & Harrington 1970.

Remarks: Several species of *Ischnodemus* are recorded as less important pests of a great variety of plants such as rice, cardamom and other economic crops in many countries around the world (see Sweet 2000a for further details and specific references). Two exotic species, *Ischnodemus falicus* (Say) and *I. noctulus* Distant, are photographically illustrated in this contribution (**Plate 6**).

Genus *Macropes* Motschulsky, 1859

[FAMILY BLISSIDAE, SUBFAMILY BLISSINAE]
(PLATE 3C, D)

Type species: *Macropes spinimanus* Motschulsky, 1859, by subsequent designation.

Number of Australian (and World) species: 1 (49).

Extralimital Distribution: Afrotropical, Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Herbivore. Ex grass. Several species of this genus are less important pests of bamboo in China, Japan and countries in the Oriental region (Sweet 2000a).

Diagnosis:

Body elongate, varying from slender to robust; submacroptery common.

Head and prothorax shining, completely non-pruinose both above and below. Ocelli small.

Hemelytra with apical corial margin straight; membrane varying from thin and subhyaline to thickened and nearly of same texture as adjacent corium. Fore coxal cavities closed; fore femora enlarged, incrassate, multispinose, usually lying closely appressed to a lateroventrally excavated anterior portion of prothorax; foretibiae usually somewhat swollen and armed with terminal or subterminal spines; tarsi short, swollen, second segment generally relatively narrow and small.

Male genitalia: Paramere with outer knob frequently placed far from base, inner projection often obsolete. Ejaculatory reservoir with a generally small rounded or elliptical cup, wings slender and straplike. Female genitalia: Spermathecal pump usually double flanged.

Key Reference: Slater 1979, Gao & Bu 2010.

FAMILY Colobathristidae

(PLATE 7A, B)

Diagnosis:

Body very slender; medium-sized to large; deeply punctate and pruinose.

Head strongly declivent. Eyes stylate. Ocelli present.

Scutellum long and narrow and sometimes armed with spines. Evaporatorium extensive, occupying much of venter of thorax. Hemelytra with lateral margins weakly concave; corium at least in part transparent or translucent, usually with a triangular distal cell; clavi usually overlapping, no claval commissure; membrane with veins reduced or absent.

Abdominal spiracles II–IV dorsal, the remainder ventral. Abdomen strongly constricted basally.

Male genitalia: Aedeagus has an elongate phallobase and tubular membranous vesica. Female genitalia: Ovipositor reduced and plate-like and sternite VII not split mesally. Spermathecal bulb with reduced flanges.

Nymphs with dorsal abdominal glands between terga III & IV, IV & V and V & VI.

Key References: Schuh & Slater 1995, Henry 1997a, Štys 1966, Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 1.

Genus *Phaenacantha* Horváth, 1904

[FAMILY COLOBATHRISTIDAE]

(PLATE 7A, B)

Type species: *Phaenacantha biroi* Horváth, 1904, by subsequent designation.

Number of Australian (and World) species: 1 (35).

Extralimital Distribution: Oriental and Australian (outside Australia) regions.

Australian Distribution: Northern Territory, Queensland.

Economic Significance: Minor.

Hosts / feeding: Herbivore, sap-feeder (associated flora: Sugarcane, *Saccharum officinarum* L. [Poaceae]). On grasses. *Phaenacantha australiae* Kirkaldy, known as the 'linear bug', is a minor restricted irregular pest of sugarcane in Queensland (Sallam et al. 2007).

Diagnosis:

Head with a median unpaired sulcus present in front of ocelli (in *Phaenacantha* subgenus *Phaenacantha*).

Posterior lobe of pronotum without a spine.

Hemelytra very long; corium and clavus hyaline, clavus very narrow. Hind wing elongate, without anal lobe.

Male genitalia: Pygophore cup-shaped, visible for most part from above and below. Parameres symmetrical, bird-head-shaped. Female genitalia: Spermatheca simple, globular apical bulb, long irregularly coiled duct.

Key References: Štys & Exnerova 2012, Štys 1966.

FAMILY *Cryptorhamphidae*

(PLATE 7C, D)

Diagnosis:

Body elongate; brownish; coarsely punctate above and below.

Head quadrate. Bucculae long, extending to base of head. Ocelli present with a suture between them.

Pronotum lacking median carina. Metathoracic glands present; evaporatorium and peritreme well developed. Hemelytra punctate; membrane has 4 to 6 longitudinal veins. Hind wing with hamus and anterior and posterior secondary veins (vannals).

Abdomen with all spiracles dorsal. Dorsal scent gland scars present between terga IV & V and V & VI. Trichobothria only present on sterna V and VI.

Male genitalia: Gonoporal process elongate and coiled.

Key References: Schuh & Slater 1995, Hamid 1971, Henry 1997a, Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 2.

Genus *Cryptorhamphus* Stål, 1860

[FAMILY CRYPTORHAMPHIDAE]

(PLATE 7C, D)

Type species: *Cryptorhamphus orbus* Stål, 1859, by monotypy.

Number of Australian (and World) species: 2 (2).

Extralimital Distribution: None.

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

Economic Significance: No to Minor.

Hosts / feeding: *Cryptorhamphus orbus* – granivore (associated flora: *Tetrariopsis octandra* (Nees) C. B. Clarke [Cyperaceae]; *Spartochloa scirpoidea* (Steud.) C.E. Hubb. [Poaceae]; *Jacksonia nematoclada* F. Muell. [Fabaceae]; *Hypocalymma strictum* Schauer [Myrtaceae]; *Arthrocnemum halocnemoides pergranulatum* J. M. Black [Chenopodiaceae]; White Myrtle, *Hypocalymma angustifolium* (Endl.) Schauer [Myrtaceae]; Swan River Myrtle, *Hypocalymma robustum* (Endl.) Lindl. [Myrtaceae]). In seed heads.

Diagnosis:

Body form ovate; flattened; less than 6.5 mm long; general colour brown to light brown, calli lighter.

Head with 4th antennal segment shorter than 1st but longer than 2nd.

Hemelytra with corium median fracture not extending to forked R & M; membrane hyaline, usually with a few irregular fuscous streaks along veins, cross veins present.

Female with abdominal tergum VIII divided into 3 sclerites.

Key Reference: Hamid 1971.

FAMILY Cymidae

(PLATE 8)

Diagnosis:

Body small; elongate-ovoid or elliptical; densely punctate; usually brownish yellow.

Head with bucculae short. Ocelli present.

Abdominal spiracles II–VI dorsal, VII ventral (sometimes all spiracles dorsal).

Key References: Schuh & Slater 1995, Hamid 1975, Henry 1997a, Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 4.

Genus *Cymodema* Spinola, 1837

[FAMILY CYMIDAE, SUBFAMILY CYMINAE]

(PLATE 8A, B)

Type species: *Cymodema tabidum* Spinola, 1837, by monotypy.

Number of Australian (and World) species: 1 (7).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaeartic regions.

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

Economic Significance: No.

Hosts / feeding: *Cymodema basicornis* (Motschulsky) – granivore (associated flora: Scaly Sedge, *Cyperus tenuiflorus* Rottb. [Cyperaceae]).

Diagnosis:

Body generally brown sometimes with red streaks; long hairs lacking; coarsely punctured.

Head convex.

Hemelytral membrane hyaline, with or without fuscous streaks.

Key References: Hamid 1975, Péricart 1998a.

Genus *Ontiscus* Stål, 1874

[FAMILY CYMIDAE, SUBFAMILY ONTISCINAE]
(PLATE 8C, D)

Type species: *Ontiscus australis* Stål, 1874, by subsequent designation.

Number of Australian (and World) species: 7 (9).

Extralimital Distribution: Oriental and Australian (outside Australia) regions.

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

Economic Significance: No.

Hosts / feeding: *Ontiscus australis* – granivore (associated flora: *Cyperus* sp. [Cyperaceae]; Kangaroo Grass, *Themeda australis* (R.Br.) Stapf [Poaceae]). Found in maturing seed heads.

Diagnosis:

Body elongate; general colouration brownish with black markings.

Head hirsute.

Antennae or legs or both covered with hairs longer than width of second antennal segment.

Clavus, except for a line of punctures along dorsal commissure, impunctate and hyaline towards apex.

Key References: Hamid 1975.

FAMILY Geocoridae

(PLATES 9–12)

Diagnosis:

Body either elongate, elongate-ovoid to oval (Geocorinae, Henestarinae), elongate-ovoid with bizarre modifications (Pamphantinae: Epipolopini) or with ant-mimetic facies (Bledionotinae, Pamphantinae: Cattarini, Pamphantini).

Head broad, vertex wide. Eyes often reniform and sometimes stalked; usually touching or wrapping around anterior margin of pronotum. Ocelli present.

Abdominal spiracles II–IV dorsal and those on V, VI, and VII usually ventral (occasionally II – VII dorsal). Dorsal abdominal scent gland scars present between segments IV–V and V–VI; these segments curving weakly or strongly caudad from margin to meson. Hind wing with hamus and intervannals reduced or absent.

Nymphs with anteriorly curved dorsal abdominal sutures.

Key References: Schuh & Slater 1995; Malipatil 1994, 2012; Henry 1997a, 2009, Henry et al. 2015; Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 7.

KEY TO SUBFAMILIES AND REPRESENTATIVE GENERA OF GEOCORIDAE

1. Abdominal spiracles on segments II–VII dorsal ...**Australocorinae** *Australocoris*
Abdominal spiracles on segments V–VI ventral (**Fig. 5**) 2
2. Abdomen with sutures on sterna II, III and IV fused and without lateral trichobothria;
body elongate (**Plate 12A**)...**Pamphantinae** *Austropamphantus*
Abdomen with sutures on sterna II, III and IV entire and with distinct,
lateral trichobothria (**Fig. 6**); body stout (**Plate 10**)...**Geocorinae** 3
3. Labial segment 2 shorter than 3; ocular sulcus short, not extending to tip of head
(**Plate 9C**); hemelytra macropterous or brachypterous (**Plate 9C**) *Geocoris*
Labial segments 2 and 3 subequal; ocular sulcus extending to tip of head (**Plate 11**);
hemelytra always macropterous (**Plate 11**) *Germalus*

Genus *Australocoris* Malipatil, 2012

[FAMILY GEOCORIDAE, SUBFAMILY AUSTRALOCORINAE]
(PLATE 12B, C, D)

Type species: *Germalus kurandae* Kirkaldy, 1908, by original designation.

Number of Australian (and World) species: 3 (3).

Extralimital Distribution: None.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Predator.

Diagnosis:

Head broad.

Pronotum rather trapezoidal; calli smooth and impunctate. Prothoracic pleura punctate. Thoracic scent gland opening narrow and directed posteriorly. Scutellum distinctly punctate except for a median laevigate ridge. Hemelytra hyaline; corium with costal margin parallel-sided in basal third, then gradually slightly dilated.

Abdomen with sutures between terga IV–V only slightly curved and those between V–VI moderately curved caudad from margin to meson. Scent gland scars between terga IV–V and V–VI about subequal, that between III–IV absent. Inner laterotergites present. Sutures between sterna III–IV and V–VI almost straight, reaching lateral margin.

Male genitalia: Pygophore posteriorly gradually rounded, lacking processes. Paramere with dorsal (outer) flange more prominent than ventral (inner) lobe which has long setae. Aedeagus with conjunctiva tubular, gradually narrowed towards upper (distal) end; body; wings and neck of ejaculatory reservoir well developed.

Female genitalia: Only sternum VII divided by ovipositor. Spermatheca with bulb slightly sclerotised and spherical to subspherical in shape, with an indistinct flange near base; basal duct short.

Key References: Malipatil 2012.

Genus *Austropamphantus* Slater, 1981

[FAMILY GEOCORIDAE, SUBFAMILY PAMPHANTINAE]
(PLATE 12A)

Type species: *Austropamphantus woodwardi* Slater, 1981, by original designation.

Number of Australian (and World) species: 1 (1).

Extralimital Distribution: None.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Granivore.

Diagnosis:

Body elongate, slender, nearly parallel-sided; above and below bearing large, coarse punctures; abdomen strongly constricted at base. Body and appendages clothed with numerous elongate, upright, golden hairs.

Head evenly sloping downward from posterior margin; vertex flat. Eyes extremely large, somewhat reniform and curving backward over anterolateral corners of pronotum. Bucculae occupying only basal area of head. Antennal segment I very short. Labial segment I ending well before base of head.

Pronotum with shallow median transverse impression; lateral margins sinuate, evenly rounded and non-carinate. Scutellum flat. Hemelytra with clavus with one even lateral row of punctures, only scattered, irregularly placed punctures forming an indistinct second and even a partial third row mesad of this outer row. Metathoracic scent gland peritreme short and rounded, evaporatorium very small. Fore femora unarmed.

Abdomen with spiracles on II, III and IV dorsal, V, VI and VII ventral. Sutures between terga IV–V and V–VI strongly curved posteriorly from lateral margins to meson. Scent gland scars present between terga IV–V and V–VI. Sterna II, III and IV indistinguishably fused, no suture lines visible.

Female genitalia: Spermatheca lacking proximal and distal flanges, pump elongate and broadly expanded proximally.

Key References: Slater 1981.

Genus *Geocoris* Fallén, 1814 [FAMILY GEOCORIDAE, SUBFAMILY GEOCORINAE] (PLATE 9A, B, C; PLATE 10)

Type species: *Geocoris megacephalus* Rossi, 1790, by subsequent designation.

Number of Australian (and World) species: 9 (143).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

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

Economic Significance: Major.

Hosts / feeding: *Geocoris lubra* Kirkaldy is a common key predator on Australian cotton crops (Mensah & Pyke 2007). All Australian species are omnivore, predator. *Geocoris elegantulus* Distant – herbivore (associated flora: Spotted-leaved Red Mangrove, *Rhizophora stylosa* Griff. [Rhizophoraceae]). *G. borealis* Malipatil – collected on leaves of cashew (*Anacardium occidentale* Linnaeus), in plantation. *G. lubra* Kirkaldy – granivore (associated flora: *Dolichos* sp. [Papilionaceae]; *Lophostemon grandiflorus* (R.Br.) Peter G. Wilson & J.T. Waterh. [Myrtaceae]; Watermelon, *Citrullus lanatus* (Thunb.) Matsum. & Nakai [Cucurbitaceae]; Sunflower, *Helianthus annuus* L. [Asteraceae]; Rice, *Oryza sativa* L. [Poaceae]; Potato, *Solanum tuberosum* L. [Solanaceae]; Mung Bean, *Vigna radiata* (L.) R. Wilczek [Fabaceae]; Sorghum, *Sorghum bicolor* (L.) Moench [Poaceae]; Cotton, *Gossypium hirsutum* L. [Malvaceae]; Alfalfa, Lucerne, *Medicago sativa* L. [Fabaceae]. *G. proviusus* Bergroth – herbivore (associated flora: Soybean, *Glycine max* (L.) Merr. [Fabaceae]).

Three exotic species, *Geocoris punctipes* (Say), *G. bullatus* (Say) and *G. pallens* Stål (see **Plate 10**), have been considered of important economic benefit in the USA (Sweet 2000b). Considerable research on the use of geocorids for biological control has particularly focused on the former species (*G. punctipes*). There has been some work relating to the impact of *G. punctipes* on pests such as two-spotted mite *Tetranychus urticae* Koch, banded wing whitefly *Trialeurodes abutilonea* (Haldman), tobacco budworm *Heliothis virescens* (F.) and Mexican bean beetle *Epilachna varivestis* Mulsant (see Sweet 2000b for specific references). While *G. bullatus* and *G. pallens* have been found important in reducing the number of green peach aphids, *Myzus persicae* (Sulzer), and *G. pallens* also on corn earworm *Helicoverpa zea* (Boddie) and other pests (see Sweet 2000b for specific references).

Diagnosis:

Head with ocular sulcus ending well before apex of head. Bucculae usually rounded anteriorly, in dorsal view of head usually visible as distinct flaps on either side of tylus, flaps abruptly lowering behind base of labium, extending caudad as low ridges. Labium with segment 2 shorter than 3.

Hemelytra either macropterous or coleopteroid; clavus in macropters gradually narrowing from base to an apical point; without a claval commissure; clavus with outer row of punctures almost complete. Scutellum with weakly or feebly developed Y or T median elevation.

Male and female with abdominal terga III and IV impunctate. Male genitalia: Aedeagus with gonoporal process long, slender, 6-20 coils. Female genitalia: Spermatheca with bulb distinct; duct long, coiled or looped.

Key References: Malipatil 1994, Malipatil & Blacket 2013.

Genus *Germalus* Stål, 1862

[FAMILY GEOCORIDAE, SUBFAMILY GEOCORINAE]
(PLATE 11)

Type species: *Henestaris kinbergi* Stål, 1859, by subsequent designation.

Number of Australian (and World) species: 6 (37).

Extralimital Distribution: Afrotropical, Australian (outside Australia) and Oriental regions.

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

Economic Significance: No to Minor.

Hosts / feeding: Predator.

Diagnosis:

Differs from *Geocoris* in:

Labial segment 2 and 3 subequal. Ocular suture long, clearly reaching tip of head.

Hemelytra macropterous; clavus almost parallel for entire length; usually with a distinct claval commissure. Scutellum with a well-developed Y or T median elevation.

Abdominal terga III and IV impunctate.

Male genitalia: Gonoporal process variable in length. Female genitalia: Spermathecal duct short or long, usually with coils.

Key References: Malipatil & Blacket 2013.

FAMILY Heterogastridae

(PLATE 13)

Diagnosis:

Body elongate-ovate; sometimes ant-mimetic.

Head with bucculae short.

Hemelytral membrane with 1 or 2 closed cells at base. Hind wing with hamus and intervannals.

All adult abdominal spiracles ventral.

Male genitalia: Aedeagus simple, vesica reduced; phallosome narrowed distally. Female genitalia: Spermatheca elongate and non-flanged.

Nymphs with dorsal abdominal scent-gland openings present between terga III–IV, IV–V and V–VI.

Key References: Schuh & Slater 1995, Scudder 1957c, Scudder 1962a, Slater 1981, Henry 1997a, Péricart 1998a, Cassis & Gross 2002, Gao & Malipatil 2019b, Schuh & Weirauch 2020.

Number of Australian genera: 4.

Genus *Parathyginus* Scudder, 1957

[FAMILY HETEROGASTRIDAE]

(PLATE 13A, B)

Type species: *Heterogaster signifer* Walker, 1872, by original designation.

Number of Australian (and World) species: 3 (6).

Extralimital Distribution: Australian (outside Australia) and Oriental regions.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Arboreal; granivore (associated flora: *Ficus* sp. [Moraceae]).

Diagnosis:

Body elongate; length more than 4 times as long as pronotal width; clothed with dense silky decumbent pubescence.

Head rounded anteriorly; paraclypeal lobes distinctly carinate. Bucculae raised anteriorly. Antennae with second segment longest, fourth longer than first and subequal to third.

Pronotum coarsely punctate; divided into anterior and posterior lobes by transverse impression in middle; anterior lobe narrower than posterior lobe; posterior margin conspicuously concave before scutellum. Scutellum with pale Y-shaped carina. Hemelytra with three rows of punctures on clavus. Legs with fore femora apically armed with ventral spines; tibiae usually without annulations but fuscous apically.

Female genitalia: Spermatheca without a terminal spherical apical bulb.

Key References: Scudder 1957c.

Remarks: Genus *Sadoletus* Distant is represented in Australia by *S. variabilis* Gao & Malipatil (**Plate 13C, D**). This genus differs from *Parathyginus* in small body size (less than 5.5 mm), and scutellum without a longitudinal or Y-shaped carina [*Parathyginus* has a large (more than 5.8 mm long) and elongate body (length more than 4.0 times pronotal width), and a scutellum with a distinct longitudinal or Y-shaped carina].

FAMILY Lygaeidae

(PLATES 14–20)

Diagnosis:

Body elongate to elongate-ovate; mostly impunctate. Body colour either dark grey-brown (Ischnorhynchinae and Orsillinae) or brightly coloured, contrastingly marked with orange to red and black (many Lygaeinae).

Head porrect. Bucculae well developed.

Pronotum with a transverse impression across the calli. Scutellum bears a raised Y-shaped marking. Hemelytra with 4 or 5 veins in membrane.

Abdominal spiracles dorsal in position, but extremely variable.

Nymphs with dorsal abdominal gland openings present between terga IV–V and V–VI.

Key References: Schuh & Slater 1995, Henry 1997a, Cassis & Gross 2002, Schuh & Weirauch 2020.

Remarks: The status of Ischnorhynchinae and Orsillinae in relation to family Lygaeidae (*sensu stricto*) needs clarifying. In his phylogenetic analysis of Pentatomomorpha, Henry (1997a) proposed Ischnorhynchinae and Orsillinae to be classified as subfamilies of the family Lygaeidae. However Sweet (2000a) recognized them as families (Ischnorhynchidae and Orsillidae), as distinct families from the Lygaeidae (*sensu stricto*) based on a large suite of synapomorphies (Sweet, unpublished). Regarding the Orsillinae, a few workers followed Sweet, including Eyles & Malipatil 2010 and Malipatil 2010, in adopting family status, Orsillidae. Lately, Henry et al., 2015 for instance, rejected Sweet's action by saying "he did not, however, provide information to support his hypothesis". For this reason, it has been decided to retain the original subfamily status Orsillinae and Ischnorhynchinae (*sensu* Henry 1997a, Schuh & Weirauch 2020), in the present work.

Number of Australian genera: 23.

KEY TO SUBFAMILIES AND REPRESENTATIVE GENERA OF LYGAEIDAE

1. Clavus at least in part punctate (**Plate 14**); posterior margin of pronotum not depressed or concave lateral of base of scutellum (**Plate 14**)...**Ischnorhynchinae** 2
 Clavus impunctate (**Plate 15**); posterior margin of pronotum depressed or concave between scutellum and humeral angles (**Plate 15**) 4
2. Scutellum with a distinct triradiate, usually pale carina (**Plate 14D**); corium with a single regular row of punctures adjacent to claval suture (**Plate 14D**); [mid-coxal cover anteriorly impunctate and "frosted"] **Pylogrus**
- Scutellum without a distinct triradiate, pale carina (**Plate 14C**); corium with more than just a single regular row of punctures adjacent to claval suture (**Plate 14C**) 3
3. Anterior femora with two spines; lateral margin of pronotum not anteriorly appearing serrate (**Plate 14A**) **Crompus**
- Anterior femora with four spines; lateral margin of pronotum anteriorly appearing rather serrate (**Plate 14C**) **Acanthocrompus**
4. Body usually dull brownish yellow with hemelytra partially hyaline (**Plate 19**); apical corial margin sinuate on mesal half (**Plate 19**); hind wing with secondary veins (SV in **Fig. 4**) present...**Orsillinae** 5
- Body often brightly coloured with red, yellow, orange and black (**Plate 15**); apical corial margin straight (**Plate 15**); hind wing without secondary veins...**Lygaeinae** 6
5. Pronotum sometimes with triangular projection over each clavus; spermatheca with a complete flange; New Zealand...EXOTIC **Rhypodes**
- Pronotum never with triangular projection over clavus; spermatheca rarely with a flange, if so, minute, not surrounding spermatheca; cosmopolitan **Nysius**
6. Scutellum tumid, at most with a distinct longitudinal median carina (**Plate 17A, B**) 7
- Scutellum not tumid, with a T- shaped median carina and well-defined lateral foveae (**Plate 16**) 8
7. Posterior margin of pronotum produced caudad on either side of scutellum (**Plate 17A**); lateral pronotal margins covered with long, stout hairs **Oncopeltus**
- Posterior pronotal margin nearly straight, not produced caudad to either side of scutellum (**Plate 15B**); pronotum laterally without long, straight hairs **Melanerythrus**
8. Metathoracic scent gland opening not auriculate; ostiolar peritreme scarcely differentiated from surrounding pleural surface (**Plate 18C**) **Spilostethus**
- Metathoracic scent gland opening auriculate; ostiolar peritreme considerably raised above surrounding pleural surface 9
9. Posterolateral angle of metapleura rectangular or slightly rounded, not distinctly protruded to acute angle;...EXOTIC **Lygaeus**
- Posterolateral angle of metapleura distinctly protruded to acute angle, nearly covering abdominal sternum II laterally 10
10. Membrane of fore wing without discal spot (**Plate 16**) **Graptostethus**
- Membrane of fore wing with a white discal spot (**Plate 15A**) **Aspilocoryphus**

Genus *Acanthocrompus* Scudder, 1958

[FAMILY LYGAEIDAE, SUBFAMILY ISCHNORHYNCHINAE]
(PLATE 14C)

Type species: *Acanthocrompus grandis* Scudder, 1958, by original designation

Number of Australian (and World) species: 1 (3).

Extralimital Distribution: Oriental region.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Arboreal; granivore.

Diagnosis:

Body robust, with short; semi decumbent setae from punctures of head, pronotum and scutellum.

Head porrect; with deep, close punctation giving a rugose appearance. Eyes large; touching anterolateral angles of pronotum. Antennal tubercles visible from above; segment I reaching or slightly exceeding apex of head; segment II thinnest. Labium reaching beyond hind coxae; segment I extending onto prosternum.

Pronotum wider than long; deeply punctate; weakly divided into anterior and posterior lobes by an incomplete transverse impression; lateral margins slightly sinuate, narrowly carinate, with weakly or strongly developed series of setigerous tubercles. Scutellum wider than long; deeply punctate; with base depressed; without a median carina. Metapleural scent-gland peritreme auricular. Hemelytra well surpassing apex of abdomen; clavus with 3 complete rows of punctures; corium with punctures additional to row adjacent to claval suture, with costal margin broadly explanate. Fore femora strongly incrassate, in distal half with 4 sharp, prominent ventral spines; fore tibiae strongly curved in both sexes.

Abdomen with 2 dorsal abdominal scent-gland scars present between sterna IV–V and V–VI.

Key References: Woodward 1984, Scudder 1962b.

Genus *Aspilocoryphus* Stål, 1874

[FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE]
(PLATE 15A)

Type species: *Lygaeus fasciiventris* Stål, 1868, by subsequent designation.

Number of Australian (and World) species: 1 (8).

Extralimital Distribution: Afrotropical and Oriental regions.

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

Economic Significance: No.

Hosts / feeding: Arboreal; granivore.

Diagnosis:

Body with short dense decumbent hairs.

Head with base completely black.

Ostiole black.

Abdomen with laterotergites separated from mediotergites II to VI.

Male genitalia: Phallosome with lateral spur.

Key References: Slater A 1985, Péricart 1998a.

Genus *Crompus* Stål, 1874 [FAMILY LYGAEIDAE, SUBFAMILY ISHCHNORHYNCHINAE] (PLATE 14A, B)

Type species: *Crompus oculus* Stål, 1874, by monotypy.

Number of Australian (and World) species: 2 (3).

Extralimital Distribution: Australian (outside Australia) region.

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

Economic Significance: No.

Hosts / feeding: Arboreal. *Crompus oculus* Stål – granivore (associated flora: Tooton, *Leptospermum flavescens* Sm. [Myrtaceae]; Drooping Bottlebrush, *Callistemon viminalis* (Sol. ex Gaertn.) G. Don [Myrtaceae]). *C. opacus* Scudder – granivore (associated flora: *Bursaria* sp. [Pittosporaceae]; *Kunzea recurva* Schauer [Myrtaceae]; *Agonis linearifolia* (DC.) Sweet [Myrtaceae]; Tea-tree, *Leptospermum* sp. [Myrtaceae]; River Red Gum, *Eucalyptus camaldulensis* Dehnh., 1832 [Myrtaceae]; Broom Baeckea, *Baeckea behrii* (Schltdl.) F. Muell. [Myrtaceae]).

Diagnosis:

Body short and robust.

Head deeply and densely punctate. Antennal tubercle just visible from above; second segment longest, third and fourth subequal and slightly incrassate. Labium reaching hind coxae; first segment almost reaching anterior margin of prosternum.

Pronotum wider than long; densely punctate; with erect hairs; lateral margins carinate; posterior margin shallowly convex; anterior margin with a vague collar, expanded and raised dorsally, without distinct transverse impression near middle. Ostiolar peritreme auriculate. Mid coxal covers anteriorly distinctly punctate. Scutellum deeply punctate, hirsute; wider than long; deep transverse impression at base, without triradiate carina.

Hemelytra surpassing apex of abdomen; clavus with 3 regular rows of punctures; corium with 2 regular rows adjacent to claval suture; apical margin very slightly concave with 3 fuscous spots; corium and clavus with pruinose spots.

Legs robust; fore femora incrassate with 2 subapical spines – one long and one short.

Abdomen with dorsal abdominal scent gland scars at posterior margin of terga IV and V; sutures between sterna II, III and IV obsolete.

Female with sternite VII roundly produced postero-ventrally and sterna V and VI bisected. Female genitalia: Spermatheca with spherical apical bulb, annular flange and short duct.

Key References: Scudder 1958, 1962b.

Genus *Graptostethus* Stål, 1868 [FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE] (PLATE 16)

Type species: *Cimex servus* Fabricius, 1787, by subsequent designation.

Number of Australian (and World) species: 4 (27).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: *Graptostethus servus* is a minor, widespread irregular pest of pulses in Australia (Brier 2007). Arboreal. *G. servus* – granivore (associated flora: *Cleome* sp. [Capparidaceae]; *Canthium didymum* C.F. Gaertner [Rubiaceae]; *Eucalyptus setosa* Schauer [Myrtaceae]; *Crotalaria juncea* L. [Fabaceae]; *Ipomoea tuberosa* L. [Convolvulaceae]; *Pistacia vera* L. [Anacardiaceae]; *Salsola pestifera* A. Nels [Chenopodiaceae]; *Solanum lucani* F. Muell. [Solanaceae]; *Terminalia platypteri* F. Muell. [Combretaceae]; *Lophostemon grandiflorus* (R. Br.) Peter G. Wilson & J.T. Waterh. [Myrtaceae]; *Urena lobata* L. [Malvaceae]; *Ziziphus* sp. [Rhamnaceae]; *Nauclea orientalis* L. [Rubiaceae]; Sword Bean, *Canavalia ensiformis* (L.) DC. [Fabaceae]; Sweet Potato, *Ipomoea batatas* (L.) Lam. [Convolvulaceae]; Sunflower, *Helianthus annuus* L. [Asteraceae]; Sugarcane, *Saccharum officinarum* L. [Poaceae]; Millet, Sorghum, *Sorghum bicolor* (L.) Moench [Poaceae]; Kimberley Grey Box, *Eucalyptus argillacea* W. Fitzg., 1918 [Myrtaceae]; Jute, *Corchorus olitorius* L. [Malvaceae]; Jute, *Corchorus capsularis* L. [Malvaceae]; Cotton, *Gossypium hirsutum* L. [Malvaceae]; Coolabah, *Eucalyptus microtheca* F.Muell. [Myrtaceae]; Common Morning Glory, *Ipomoea purpurea* (L.) Roth [Convolvulaceae]; Coast Morning Glory, *Ipomoea cairica* (L.) Sweet [Convolvulaceae]). *Graptostethus cardinalis* (Stål), *G. pubescens* Slater – granivore (associated flora: Sensitive Plant, *Mimosa pigra* L. [Mimosaceae]. Collected on *Rosa* L. [Rosaceae], rose flowers.

Outside Australia, this species is recorded as injuring cotton in several countries, also attacking other Malvaceae, beans, sunflower, nuts and a number of ornamental plants. (see Sweet 2000a).

Diagnosis:

Head with base of vertex not black but at least pale spot present.

Labium scarcely extending beyond metacoxa.

Pronotum with callar impression unbranched. Mesopleuron lightly punctured anteriorly, impunctate posteriorly. Posterolateral angle of metapleura produced, nearly covering abdominal sternum II laterally.

Abdomen with fused medio- and paratergites.

Key References: Slater A 1985, Péricart 1998a.

Genus *Lygaeus* Fabricius, 1794 [FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE] (PLATE 18D)

Type species: *Cimex equestris* Linnaeus, 1758, designated by Curtis, 1833.

Number of Australian (and World) species: 0 (54).

Extralimital Distribution: Afrotropical, Nearctic, Neotropical, Oriental and Palaeartic regions.

Australian Distribution: None.

Economic Significance: Minor.

Hosts / feeding: *Lygaeus equestris*, (**Plate 18D**) the brightly colored Palaeartic species, is considered a less important species (Sweet 2000a). This species is known to feed on the asclepiad swallowwort *Cyanthium vincetoxicum* B. Bs., as well as a number of other medicinal plants such as *Artemisia absinthium* L., *A. maritima* L., *Digitalis amandiana* Sampaio, *D. chinensis* Hook et Arn., *Pyrethrum cinerariaefolium* Trev., *Lysimachia vulgaris* L., *Echinops sphaerocephalus* L., *Rheum capsicum* Pall, *Centaurea sibirica* L. (see Sweet 2000a for further details and specific references).

Diagnosis:

This exotic genus is similar to *Graptostethus* and *Aspilocoryphus* which occur in Australia, but differs from both in having the posterolateral angle of metapleura rectangular or slightly rounded, not distinctly protruded to acute angle. Also, *Lygaeus* has head black except for longitudinal yellow or orange macula extending from vertex forward toward tylus and sometimes splitting anteriorly to reach mandibular plate.

Key References: Slater A 1985, Slater 1992.

Remarks: EXOTIC.

Genus *Melanerythrus* Stål, 1868

[FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE]
(PLATE 15B, C, D)

Type species: *Lygaeus mactans* Stål, 1867, by monotypy.

Number of Australian (and World) species: 5 (5 valid; 4 not valid).

Extralimital Distribution: Australian (outside Australia) region.

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

Economic Significance: Minor.

Hosts / feeding: Arboreal; granivore. *Melanerythrus mactans* is a minor, widespread irregular pest of pulses (Brier 2007). *M. mactans* – granivore (associated flora: *Solanum* sp. [Solanaceae]; *Solanum lucani* F. Muell. [Solanaceae]; Strawberry, *Fragaria ananassa* Duch. [Rosaceae]; Pecan Nut, *Carya pecan* C.K. Schneider [Juglandaceae]). *M. biguttatus* (Fabricius) – granivore (associated flora: *Oenothera drummondii* Hook. [Onagraceae]; Giant Sensitive Weed, *Mimosa pigra* L. [Mimosaceae]).

Diagnosis:

Pronotum with posterior margin straight or slightly concave. Ostiolar peritreme swollen but not greatly produced. Scutellum tumid, lacking lateral scutellar foveae.

Female genitalia: Spermatheca long, tubular, irregularly coiled, pigmented and widened apically.

Key References: Slater, A 1985.

Genus *Nysius* Dallas, 1852 [FAMILY LYGAEOIDAE, SUBFAMILY ORSILLINAE] (PLATE 19; PLATE 20A, B)

Type species: *Lygaeus thymi* Wolff, 1804, by designation under Plenary Powers, Opinion 319, 1955

Number of Australian (and World) species: 5 (96).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

Australian Distribution: Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria, Western Australia, [Other Regions: Christmas Island, Cocos (Keeling) Islands]

Economic Significance: Minor – Major.

Hosts / feeding: Arboreal; granivore. *Nysius vinitor* Bergroth, 'Rutherglen bug', is a minor, widespread irregular pest of cotton in Australia (Wilson, et al., 2007); both *N. vinitor* and *N. caledoniae* Distant (also its junior synonyms, *N. clevelandensis* Evans, 'grey cluster bug' and *N. turneri* Evans 'Invermay bug') are major pests of oilseed, the latter mainly in Queensland (Berlandier & Baker 2007); *N. vinitor* minor widespread irregular pest on pulses (Brier 2007).

N. vinitor [possibly also its junior synonyms, *N. caledoniae* and *N. turneri*, although ABRS 2012 does not specify] is herbivore (some associated flora: *Citrus* sp. [Rutaceae]; Turnip, *Brassica rapa* L. [Brassicaceae]; Sunflower, *Helianthus annuus* L. [Asteraceae]; Tomato, *Lycopersicon esculentum* Mill. [Solanaceae]; Tobacco, *Nicotiana tabacum* L. [Solanaceae]; Tea-tree, *Melaleuca* sp. [Myrtaceae]; Strawberry, *Fragaria ananassa* Duch. [Rosaceae]; Silverbeet, *Beta vulgaris flavescens* (Lam.) Lam. & DC. [Chenopodiaceae]; Safflower, *Carthamus tinctorius* L. [Asteraceae]; Rhubarb, *Rheum rhaponticum* L. [Polygonaceae]; Rapeseed, Canola, *Brassica napus* L. [Brassicaceae]; Radish, *Raphanus sativus* L. [Brassicaceae]; Potato, *Solanum tuberosum* L. [Solanaceae]; Plum, *Prunus domestica* L. [Rosaceae]; Pigweed, *Portulaca oleracea* L. [Portulacaceae]; Pear, *Pyrus communis* L. [Rosaceae]; Peach, Nectarine, *Prunus persica* (L.) Batsch [Rosaceae]; Pawpaw, Papaya, *Carica papaya* L. [Caricaceae]; Passionfruit, *Passiflora edulis* Sims [Passifloraceae]; Parsnip, *Pastinaca sativa sativa* L. [Apiaceae]; Parsley, *Petroselinum crispum* (Mill.) Fuss [Apiaceae]; Millet, Sorghum, *Sorghum bicolor* (L.) Moench [Poaceae]; Maize, *Zea mays* L. [Poaceae]; Linseed, Flax, *Linum usitatissimum* L. [Linaceae]; Gum Tree, Eucalyptus sp. [Myrtaceae]; Grape, *Vitis vinifera* L. [Vitaceae]; Cudweed, *Gnaphalium purpureum* L. [Asteraceae]; Cotton, *Gossypium hirsutum* L. [Malvaceae]; Corn Sperry, *Spergula arvensis* L. [Caryophyllaceae]; Common Sowthistle, *Sonchus oleraceus* L. [Asteraceae]; Common Prickly Pear, *Opuntia stricta stricta* (Haw.) Haw. [Cactaceae]; Cherry, *Prunus cerasus* L. [Rosaceae]; Celery, *Apium graveolens dulce* (Mill.) Pers. [Apiaceae]; Carrot, *Daucus carota* L. [Apiaceae]; Capsicum, *Capsicum frutescens* L. [Solanaceae]; Cape Weed, Cape Dandelion, *Arctotheca calendula* (L.) Levyns [Asteraceae]; Cabbage, *Brassica oleracea* L. [Brassicaceae]; Beetroot, *Beta vulgaris* L. [Chenopodiaceae]; Bean, *Phaseolus* sp. [Fabaceae]; Apricot, *Prunus armeniaca* L. [Rosaceae]; Apple, *Malus pumila* Mill. [Rosaceae]; Alfalfa, Lucerne, *Medicago sativa* L. [Fabaceae]). *Nysius orator* Malipatil – herbivore (associated flora: She-Oak, *Casuarina* sp. [Casuarinaceae]).

Sweet (2000a) provided a comprehensive review of the economic importance of several species of *Nysius* in relation to various crops in many countries including Australia. *Nysius niger* Baker, *N. raphanus* Howard, *Nysius vinitor* Bergroth, *N. caledoniae* (formerly *clevelandensis*), *N. plebeius* Distant, and the New Zealand species *Nysius huttoni* Buchanan-White (**Plate 20A, B**) are considered as important species, while a number of other species of *Nysius* as less important species of economic importance. (see Sweet 2000a for further details and references).

Diagnosis:

Body elongate to oval, not depressed; body covered with short appressed pubescence, often with long erect hairs.

Head produced in front of eyes from 1 – 1 ¼ times length of eye. Bucculae impunctate. Eye prominent. Labium extending to between middle coxa and second abdominal segment.

Scutellum with a Y-shaped elevation, acute and not turned up apically. Hemelytra entirely covering connexivum and apex of abdomen; impunctate or obscurely punctate on clavus at base of claval suture, or exceptionally with a row of small punctures on both sides of claval suture; costal margin straight only to level with apex of scutellum, then more or less arcuately curving to apex of corium; without stridulatory structures; membrane with two inner veins connected by a crossvein. Fore femur unarmed.

Key References: Ashlock 1967, Péricart 1998a, Henry et al. 2015.

Genus *Oncopeltus* Stål, 1868
[FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE]
(PLATE 17A, B)

Type species: *Cimex famelicus* Fabricius, 1781, by subsequent designation.

Number of Australian (and World) species: 6 (40).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical and Oriental regions.

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

Economic Significance: Minor.

Hosts / feeding: Arboreal; granivore. *Oncopeltus* (*Oncopeltus*) *quadriguttatus* (Fabricius) – granivore (associated flora: *Sarcostemma australe* R.Br. [Asclepiadaceae]; *Gossypium* sp. [Malvaceae]). *O. (O.) sordidus* (Dallas) – (associated flora: *Hoya* sp. [Asclepiadaceae]; Oleander, *Nerium oleander* L. [Apocynaceae]; Mothvine, *Araujia hortorum* E. Fourn. [Asclepiadaceae]; Common Silkpod, *Parsonsia straminea* (R.Br.) F. Muell. [Apocynaceae]).

Diagnosis:

Pronotum with well-developed median carina; posterior margin produced posteriorly laterad of scutellum; calli recessed, impression slightly oblique, sinuate, unbranched, and impressed below general level of pronotum. Scutellum tumid.

Female genitalia: Spermatheca long, thin, coiled; thickened basal sperm pump.

Key Reference: Slater, A 1985.

Genus *Pylorgus* Stål, 1874 [FAMILY LYGAEOIDAE, SUBFAMILY ISCHNORHYNCHINAE] (PLATE 14D)

Type species: *Cimex colon* Thunberg, 1874, by monotypy.

Number of Australian (and World) species: 1 (34).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

Australian Distribution: New South Wales, Queensland.

Economic Significance: No.

Hosts / feeding: Arboreal; granivore.

Diagnosis:

Head punctate. Bucculae low, anterior part only visible from side. Eyes large; posteriorly touching anterior margin of pronotum. Antennal tubercle visible from above; fourth segment thicker than second and third; second longest, fourth slightly longer than third. Labium reaching hind coxae or beyond.

Pronotum wider than long; sloping from posterior to anterior and distinctly flattened before anterior margin; punctate except sometimes with a few raised impunctate areas near calli; disc with transverse impression before middle; lateral margin slightly carinate; posterior margin slightly impressed near humeral angles; collar obscure. Ostiolar peritreme auriculate. Posterior margin of metapleura slightly concave. Mid-coxal covers anteriorly impunctate and "frosted". Scutellum wider than long, deeply punctate, with triradiate carina usually pale and impunctate. Hemelytra usually hyaline and reaching beyond end of abdomen; clavus with 3 regular rows of punctures; corium with single regular row of punctures adjacent to claval suture, this row continuing all way along apical margin. Legs with fore femora unarmed.

Abdomen with dorsal abdominal gland scars present at posterior margin of terga IV and V; sutures between sternite II, III and IV obsolete. Female with sternite VII slightly concave near lateral margin; sternite VI and often V bisected.

Female genitalia: Spermatheca with spherical apical bulb; loose spirally twisted duct.

Key Reference: Scudder 1962b.

Genus *Rhypodes* Stål, 1868

[FAMILY LYGAEIDAE, SUBFAMILY ORSILLINAE]
(PLATE 20C, D)

Type species: *Nysius zealandicus* Dallas, = *Lygaeus clavicornis* Fabricius.

Number of Australian (and World) species: 0 (28).

Extralimital Distribution: New Zealand.

Australian Distribution: None.

Economic Significance: Minor.

Hosts / feeding: *Rhypodes anceps* (White) known to feed on wheat and grasses, is a species of minor importance in New Zealand (see Sweet 2000a for further details and references).

Diagnosis:

Similar to *Nysius*, except bucculae tapering posteriorly to level of antenniferous tubercle, extending almost to base of head as a low carina.

Pronotum in some species having posterior projection at base of each clavus.

Spermatheca with a complete flange.

Key References: Ashlock 1967.

Remarks: EXOTIC.

Genus *Spilostethus* Stål, 1868 [FAMILY LYGAEIDAE, SUBFAMILY LYGAEINAE] (PLATE 17C, D; PLATE 18A, B, C)

Type species: *Cimex militaris* Fabricius, 1775 (= *Cimex pandurus* Scopoli, 1763), by subsequent designation.

Number of Australian (and World) species: 3 (24).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: Minor – Major.

Hosts / feeding: Arboreal; granivore. *Spilostethus hospes* (Fabricius) – granivore (associated flora: *Solanum lucani* F. Muell. [Solanaceae]; *Solanum lasiophyllum* Poirlet [Solanaceae]; *Sida* sp. [Malvaceae]; *Physalis peruviana* L. [Solanaceae]; *Gossypium* sp. [Malvaceae]; *Urena lobata* L. [Malvaceae]; *Crotalaria saltiana* Andr. [Fabaceae]; *Asclepias fructicosa* L. [Asclepiadaceae]; *Asclepias curassavica* L. [Asclepiadaceae]; Thickhead, *Crassocephalum crepidioides* (Benth.) S. Moore [Asteraceae]; Emilia, *Emilia sonchifolia* (L.) DC. [Asteraceae]; Deadly Nightshade, *Solanum nigrum* L. [Solanaceae]; Australian Bluebell, *Wahlenbergia gracilis* (G. Forst.) A. DC. [Campanulaceae]). *S. pacificus* (Boisduval) – granivore (associated flora: Australian Bluebell, *Wahlenbergia gracilis* (G. Forst.) A. DC. [Campanulaceae]). The exotic *Spilostethus pandurus* (Scopoli) (**Plate 18A, B, C**) is an important species, sucking sap from flowers, fruits, shoots, branches and leaves; known to attack crops such as sesame and millet ragi in India (Sweet 2000a). A few other species of this genus including *S. hospes* are minor pests attacking a few crops in India, China, Australia, and countries in Africa (see Sweet 2000a for further details).

Diagnosis:

Pronotum with lateral margin swollen, presenting a “rolled” appearance. Ostiolar peritreme obsolete. Legs with all femora in male usually armed with series of short spines.

Male genitalia: Phallosomal process complexly sculptured. Secondary gonopore surrounded by disc with stout, pointed secondary process.

Key References: Slater A 1985, Péricart 1998a.

FAMILY *Malcidae*

[NON-AUSTRALIAN]

(PLATE 21, FIG. 17)

Diagnosis:

Head strongly declivent. Ocelli present. Bucculae large. Antennae placed above a line drawn through middle of eye.

Hemelytral membrane with five nonbranching veins. Tarsi 3-segmented.

Abdomen with sterna II to V fused, VII entire. Inner laterotergites absent. Trichobothria located on "loaflike" tubercles, submedial on sternum III as well as laterally where 2 arranged diagonally; missing on sternum IV. Lateral margins of abdominal segments V–VII usually expanded into distinct flanges. Spiracles dorsal on abdominal segments II–VI.

Female genitalia: Ovipositor lacinate. Spermatheca often with elongate ductus.

Nymphs with dorsal abdominal scent glands small, situated between terga III–IV, IV–V, and V–VI or between terga IV–V and V–VI.

Eggs quadrate in cross section.

Key References: Schuh & Slater 1995, Štys 1967, Gao & Bu 2009, Schuh & Weirauch 2020.

Genus *Chauliops* Scott, 1874

[FAMILY MALCIDAE, SUBFAMILY CHAULIOPINAE]
(PLATE 21, FIG. 17)

Type species: *Chauliops fallax* Scott, 1874, by monotypy.

Number of Australian (and World) species: 0 (12).

Extralimital Distribution: Afrotropical, Oriental and Palaearctic regions.

Australian Distribution: None.

Economic Significance: Minor.

Hosts / feeding: *Chauliops fallax* Scott occurs in China, and Japan where it is known as the 'small bean bug' (**Plate 21A**), and *C. choprai* Sweet & Schaefer 'little bean bug' and *C. nigrescens* Distant 'black bean bug', in India. Some species of this genus including *C. fallax* are of known economic importance particularly on beans of various types and other legumes. Also, generally these insects are most damaging in the more temperate part of their range than the more tropical (see Sweet 2000a for details of references).

Diagnosis:

Body short and stout; size small (less than 2 mm, in *bisontula*-group) or large (over 2.2 mm, in *fallax*-group).

Antenniferous tubercles large, spinous, produced.

Metathoracic scent gland peritreme not produced. No tubercle at apex of corium. Hind femora armed (in *fallax*-group) or unarmed (in *bisontula*-group).

Abdominal terga III–VI separate (**Fig. 17**).

Nymphs lacking elongate spines. Nymphal dorsal abdominal scent glands paired between terga IV–V and V–VI.

Key References: Schuh & Slater 1995, Gao & Bu 2009, Štys 1967.

Remarks: EXOTIC. Two other species, *Chauliops quaternaria* Gao & Bu and *C. conica* Gao & Bu are photographically illustrated in this contribution (**Plate 21B, C, D**).

FAMILY Meschiidae

(PLATE 22)

Diagnosis:

Body broadly ovate and flat above (**Plate 22A**).

Head with lateral margins anterior to eyes almost parallel-sided. Bucculae long, projecting slightly, extending nearly to anterior margin of prosternum (**Plate 22D**). Gular groove present on under surface of head to receive first labial segment. Paraclypeal lobes with small protuberances anteriorly.

Pronotal lateral margin carinate. Hemelytral membrane with a distinct basal cell and five longitudinal veins. Hind wing with or without hamus. Fore femora weakly incrassate, slightly thicker than hind femora; unarmed.

Abdomen with all spiracles ventral.

Male genitalia: Pygophore gradually produced to a median conical protuberance ventro-posteriorly. Conjunctiva not greatly elongated; ejaculatory reservoir with moderately developed body and wings.

Key Reference: Malipatil 2014, Schuh & Weirauch 2020.

Number of Australian genera: 2.

Genus *Meschia* Distant, 1910

[FAMILY MESCHIIDAE]

(PLATE 22)

Type species: *Meschia pugnax* Distant, 1910, by original designation.

Number of Australian (and World) species: 2 (5).

Extralimital Distribution: Oriental (only India) and Palaearctic (only China) regions.

Australian Distribution: Queensland, Western Australia.

Economic Significance: No.

Hosts / feeding: Granivore. *Meschia quadrimaculata* Distant – adults and nymphs occur in litter of *Ficus religiosa* L. [Moraceae] in India (Mukhopadhyay 1988).

Diagnosis:

Head much broader than long (**Plate 22A, C**); antennifers produced anteriorly and rounded to a shiny smooth pad-like area ventrally (**Plate 22D**); clypeus prominent, somewhat strongly produced, slightly exceeding juga. Ocelli on extreme basal margin, nearer to eyes than to each other. Antennae robust, with segment 2 longest, 3 and 4 subequal in length, segments 2–4 of equal thickness. Labium long, 1st segment reaching base of head, 2nd segment longest. Labrum about one-fourth length of 1st labial segment.

Pronotum much broader than long (**Plate 22A**); anterior margin almost appearing as a very slight collar; with transverse impression demarking anterior lobe; calli without distinct smooth groove. Scutellum slightly broader than long; coarsely punctate. Hemelytra with clavus punctate in three almost complete rows of punctures; membrane slightly passing abdominal apex; corium faintly punctate, more prominently near claval and costal margins. Hind wing lacking hamus.

Abdominal connexivum either exposed or fully covered beyond middle of corium. Sutures between terga III–IV, IV–V and V–VI curved caudad.

Female genitalia: Spermatheca generally short, bulb moderately sclerotized, with a distinct basal rim but no flange; duct short, saccoid, narrowing to 2–3 tightly coiled turns.

Key Reference: Malipatil 2014, Gao & Malipatil 2019a.

FAMILY *Ninidae*

(PLATE 23)

Diagnosis:

Body small (3–4 mm); elongate-ovoid; punctate.

Head strongly deflexed. Eyes stylate. Ocelli present and relatively close to each other. Antennifers reduced; first antennal segment small.

Pronotum neither constricted laterally nor carinate. Scutellum apically bifid. Membrane of hemelytra reduced. Hind wings with hamus. Ostiole of metathoracic glands enlarged.

Abdominal spiracles dorsal on segments II–VI, and ventral on VII.

Female genitalia: Spermathecal flanges generally reduced.

Nymphs with dorsal abdominal glands present between terga III–IV, IV–V, V–VI, with the latter reduced.

Key References: Scudder 1957b, Schuh & Slater 1995, Štys 1967, Hamid 1975, Cassis & Gross 2002, Henry 1997a, Schuh & Weirauch 2020.

Number of Australian genera: 2.

Genus *Cymoninus* Breddin, 1907

[FAMILY NINIDAE]

(PLATE 23A, B)

Type species: *Cymoninus subunicolor* Breddin, 1907 (= *Ninus sechellensis* Bergroth, 1893), by original designation.

Number of Australian (and World) species: 1 (4).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical and Oriental regions.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Granivore. In seed heads. On native ferns in Fiji.

Diagnosis:

Head wider than long; coarsely punctate. Eyes large; remote from pronotum. Antennae covered with long pubescence; first segment short and incrassate, second and third segments conspicuously thinner than fourth segment which is slightly incrassate, third shorter than second and fourth segments. Labium reaching to or exceeding middle coxae; first segment not swollen in apical half, nor reaching beyond anterior margin of prosternum.

Pronotum with long pubescence; lateral margin slightly convex at level of calli; humeral angles rounded; coarsely punctate except at calli; posterior margin impressed before scutellum. Scutellum wider than long; with long pubescence; with tip bifid; coarsely punctate. Hemelytra are largely transparent; conspicuously constricted at base; anterior margin fringed with long hairs; clavus with row of punctures along margin adjacent to scutellum, basal half with two rows of punctures nearer suture margin; disc of apical half of clavus hyaline; corium with punctures partially along apical margin; membrane with a central longitudinal fuscous area. Legs with long pubescence; femora long and unarmed; posterior tarsi with first segment subequal to combined length of second and third segments.

Key References: Scudder 1957b, Brailovsky 1975.

Genus *Ninus* Stål, 1860

[FAMILY NINIDAE]

(PLATE 23C, D)

Type species: *Ninus insignis* Stål, 1860, by monotypy.

Number of Australian (and World) species: 1 (4).

Extralimital Distribution: Afrotropical, Australian (outside Australia) and Oriental regions.

Australian Distribution: Queensland.

Economic Significance: No to Minor.

Hosts / feeding: Granivore (associated flora: *Fimbristylis cymosa* R.Br. [Cyperaceae]; Sugarcane, *Saccharum officinarum* L. [Poaceae]). In seed heads.

Diagnosis:

As in *Cymoninus* except:

Body pruinose on head, thorax, scutellum and claval commissure.

Head hirsute; vertex more than three times eye width. Eyes small; stylate and placed obliquely, directed forwards and outwards. Antennae with long pubescence; second and fourth segments longer than third. Labium extending to middle coxae; first segment thickened in apical half.

Pronotum coarsely punctate; with long pubescence; wider than long. Posterior angle of metasternum acute.

Abdomen long and slender, with pubescence laterally.

Key References: Scudder 1957b.

FAMILY Oxycarenidae

(PLATES 24 – 25)

Diagnosis:

Body usually small; often flattened; dorsum punctate; sometimes ant-mimetic.

Head commonly porrect.

Pronotum with lateral margins rounded, non-explanate. Hemelytra with explanate margins. Hind wings with intervannals but without hamus.

Abdominal spiracle II dorsal, III–VII ventral. Abdominal sutures reach lateral margins. Inner laterotergites absent. Abdominal sternum V with at most a single posterior trichobothrium.

Female genitalia: Spermatheca reduced or absent, and non-functional.

Key References: Schuh & Slater 1995; Péricart 1998a; Cassis & Gross 2002; Henry 1997a, Schuh & Weirauch 2020.

Number of Australian genera: 1.

Genus *Oxycarenus* Fieber, 1837

[FAMILY OXYCARENIDAE]

(PLATES 24 – 25)

Type species: *Stenogaster tardus* Hahn, 1835 (= *Acanthia lavaterae* Fabricius, 1787), by monotypy.

Number of Australian (and World) species: 4 (57).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Neotropical, Oriental and Palaerctic regions.

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

Economic Significance: Major.

Hosts / feeding: Arboreal; granivore; sap-feeder. *Oxycarenus* (*Oxycarenus*) *arctatus* (Walker), 'coon bug' – herbivore (associated flora: Slender Platysace, *Platysace heterophylla heterophylla* (Benth.) C. Norman [Apiaceae]; Plum, *Prunus domestica* L. [Rosaceae]; Peach, Nectarine, *Prunus persica* (L.) Batsch [Rosaceae]; Orange, *Citrus aurantium* L. [Rutaceae]; Cotton, *Gossypium hirsutum* L. [Malvaceae]; Apricot, *Prunus armeniaca* L. [Rosaceae]); pest, found feeding on cattle dung. *O. (O.) bicolor* Fieber – herbivore (associated flora: Cotton, *Gossypium hirsutum* L. [Malvaceae]); pest species. *O. (O.) luctuosus* (Montrouzier), 'cottonseed bug' – herbivore (associated flora: *Malva parviflora* L. [Malvaceae]; *Hibiscus solanifolius* F. Muell. [Malvaceae]; *Sida acuta* Burm.f. [Malvaceae]; Strawberry, *Fragaria ananassa* Duch. [Rosaceae]; Potato, *Solanum tuberosum* L. [Solanaceae]; Orange, *Citrus aurantium* L. [Rutaceae]; Kurrajong, *Brachycton populneus populneus* (Schott & Endl.) R. Br. [Malvaceae]; Flannel Weed, *Sida cordifolia* L. [Malvaceae]; Cotton, *Gossypium hirsutum* L. [Malvaceae]; Common Prickly Pear, *Opuntia stricta stricta* (Haw.) Haw. [Cactaceae]). *O. (O.) westraliensis* Malipatil – herbivore (associated flora: *Grevillea ilicifolia lobata* (F. Muell.) Benth. [Proteaceae]; *Lasiopetalum discolor* Hook. [Sterculiaceae]; *Lasiopetalum behrii* F. Muell. [Sterculiaceae]).

A number of species of this genus, particularly the widely distributed species throughout Africa into southern Europe through subtropical and tropical Asia to the Philippine islands, *O. hyalinipennis* (Costa) (**Plate 25A, B**), are considered economically important in different parts of the world. They are sometimes called 'dusky cotton stainer bugs' or 'cotton seed bugs', particularly attacking cotton and other malvaceous hosts. They are known to attack also fruit trees, such as apricot and peach (see Sweet 2000a for further details and references).

Diagnosis:

Head appearing rather ovoid and elongate. Bucculae elongate and extending nearly to base of head. Antennae with first segment barely attaining apex of tylus. Labium with second segment extending at least to fore coxae.

Clavus usually with two rows of punctures; hemelytral membrane with anterior two veins branched near apex. Fore femora spinous below.

Key References: Slater 1964b, Gross 1959.

Remarks: Two additional exotic species, *Oxycarenus* (*Pseudoxycarenus*) *modestus* (Fallén) and *Oxycarenus* (*Oxycarenus*) *lugubris* (Motschulsky) are photographically illustrated in this contribution (**Plate 25C, D**).

FAMILY Pachygronthidae

(PLATE 26)

Diagnosis:

Body elongate; generally pale in colour; coarsely punctate.

Head declivent. Bucculae short. Antennae elongate and filiform or weakly fusiform; first segment either greatly exceeding clypeus (Pachygronthinae) or barely reaching apex of clypeus (Teracriinae).

Pronotum trapeziform, usually with a shallow transverse impression medially. Hemelytra usually macropterous and occasionally brachypterous; costal margins not explanate and do not extend over connexiva; membrane possesses simple veins that are neither anastomosing nor connected by cross-veins. Fore femora incrassate and armed with prominent spines.

Abdominal spiracles ventral. Abdominal sutures straight and extend to lateral margins.

Male genitalia: parameres symmetrical and either have a tuft of sensory hairs (Pachygronthinae) or lack them (Teracriinae). Female genitalia: Spermatheca elongate, non-flanged.

Nymphs with scent glands present between terga IV–V and V–VI.

Key References: Slater 1955, Schuh & Slater 1995, Henry 1997a, Cassis & Gross 2002, Schuh & Weirauch 2020.

Number of Australian genera: 6.

Genus *Pachygrontha* Germar, 1838 [FAMILY PACHYGRONTHIDAE, SUBFAMILY PACHYGRONTHINAE] (PLATE 26A, B)

Type species: *Pachygrontha lineata* Germar, 1837, by monotypy.

Number of Australian (and World) species: 5 (37).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palearctic regions.

Australian Distribution: Northern Territory, Queensland.

Economic Significance: No.

Hosts / feeding: Granivore, up-on-plants. *Pachygrontha robusta* Slater – granivore (associated flora: *Gahnia* sp. [Cyperaceae]). *P. walker* Distant – granivore (associated flora: *Paspalum longifolium* Roxb. [Poaceae]; Kangaroo Grass, *Themeda australis* (R.Br.) Stapf [Poaceae]). Ex grasses.

Diagnosis:

Body elongate and slender; testaceous to ochraceous in colour.

Head strongly declivent; jugal carina present. Eyes broader than long and shorter than preocular head length. Antennae filiform and elongate; sexually dimorphic, much longer in males; first segment abruptly swollen near terminal end, fourth segment shortest.

Pronotum broader at base than median length; with a broad shallow transverse impression near centre. Scutellum with a basal depression and a median longitudinal carina. Hemelytra reaching or exceeding tip of abdomen. Fore femora incrassate; armed below with prominent spines.

Abdominal venter impunctate; in female with a pair of longitudinal black vittae, in male unicolorous.

Key References: Slater 1955.

Genus *Stenophyella* Horváth, 1914 [FAMILY PACHYGRONTHIDAE, SUBFAMILY TERACRIINAE] (PLATE 26C, D)

Type species: *Stenophyella macreta* Horváth, 1914, by monotypy.

Number of Australian (and World) species: 1 (1 valid; 2 not valid).

Extralimital Distribution: Afrotropical, Australian (outside Australia) and Oriental regions.

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

Economic Significance: No.

Hosts / feeding: Granivore, up-on-plants. *Stenophyella macreta* Horváth – granivore (associated flora: *Helichrysum diosmifolium* Less [Asteraceae]; *Ehrharta brevifolia* Schrader [Poaceae]). Common on broad range of grasses.

Diagnosis:

Body elongate; depressed; covered with scattered punctures.

Head with bucculae short, lobate. Ocelli closer to eyes than to each other. Antenniferous tubercles acute. Antennae with first and second segments punctate; three and four sub-fusiform, with more prominent hairs. Labium reaching middle coxae.

Pronotum slightly wider at base than median length, its caudo-lateral angles lobate. Scutellum short, equilateral with a faint median carina. Hemelytra with corium with mesal area impunctate; membrane hyaline, not attaining apex of abdomen. Legs with fore femora incrassate, armed below with 3 large and a number of small spines; basal tarsal segment longer than either second or third segments.

Abdomen with apex bifid, with two thick conical spines. Abdominal dorsum with a pair of prominent longitudinal black vittae.

Key Reference: Slater 1955.

FAMILY Piesmatidae

(PLATE 27)

Diagnosis:

Body small, usually less than 5 mm in length; resembling tingids superficially, with thoracic nota and hemelytra having a reticulate and densely punctate pattern.

Head transverse. Bucculae well developed. Mandibular plates strongly produced and at least reach apex of clypeus. Eyes contiguous with pronotum. Ocelli usually present, but obsolete in brachypterous forms.

Pronotum subquadrate, without collar, but with distinct calli. Metathoracic glands absent. Tarsi 2-segmented.

Abdomen with all spiracles dorsal. Trichobothria reduced with a single trichobothrium placed anterior to spiracle on sternite V and VI.

Adults and nymphs have dorsal abdominal glands on terga III–IV and IV–V that remain functional in adults.

Key References: Drake & Davis 1958, Heiss & Péricart 1983, Schuh & Slater 1995, Henry 1997a, Cassis & Gross 2002, Schuh & Weirauch 2020.

Remarks: Piesmatids are phytophagous and usually feed on the leaves, stems and flowers of Caryophyllaceae, Chenopodiaceae, and Fabaceae (Schaefer 1981, 1983). *Piesma cinereum* (Say) transmits the virus known as "Savoy" that causes serious damage to sugar beets in North America (Schuh & Weirauch 2020).

Number of Australian genera: 1.

Genus *Mcateella* Drake, 1924 [FAMILY PIESMATIDAE, SUBFAMILY PIESMATINAE] (PLATE 27)

Type species: *Mcateella splendida* Drake, 1924, by monotypy.

Number of Australian (and World) species: 11 (11).

Extralimital Distribution: None.

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

Economic Significance: Minor.

Hosts / feeding: Sap-feeder (associated flora: various species of the families Proteaceae, Myrtaceae, Euphorbiaceae, Santalaceae, Sapindaceae and Fabaceae). Herbivore (associated flora: various species of the families Fabaceae, Proteaceae, Cupressaceae, Myrtaceae, Rhamnaceae, Rousseeaceae and Elaeocarpaceae) (see ABRS 2012 for full host list).

Diagnosis:

Mcateella is recognised by the following combination of characters:

Head with mandibular plates subequal in length to clypeus.

Pronotum with medial carina reduced or absent. Mesosternum lightly sclerotized anteriorly. Hemelytral membrane reduced; membranal veins absent. Hind wing with Y-shaped secondary vein area.

Legs with flattened tarsal guard setae, but greatly reduced parempodia.

Abdominal trichobothria absent.

Key References: Elias & Cassis 2012.

FAMILY Rhyparochromidae

(PLATES 28–42)

Diagnosis:

Body usually dull brown or mottled brown, black and white; frequently myrmecomorphic.

Head usually with trichobothria. Ocelli present, sometimes lacking in species with reduced wings.

Fore femora usually incrassate, strongly armed below with stout spines.

Abdomen with suture between sterna IV and V fused, usually curving forward anterolaterally from midline of sternum, terminating at the trichobothrial furrow (except in Plinthisinae) not reaching dorsal margin of abdomen.

Male genitalia: Vesica usually with a helicoid process.

Key References: Schuh & Slater 1995; Sweet 1967; Cassis & Gross 2002; Henry 1997a, Schuh & Weirauch 2020.

Number of Australian subfamilies and tribes: 2; 11.

KEY TO SUBFAMILIES AND TRIBES OF AUSTRALIAN RHYPAROCHROMIDAE

(modified from Schuh & Slater 1995, Carver et al. 1991)

1. Females with a conjunctiva present between abdominal sterna IV and V (**Fig. 26**); pronotum wider across anterior one-third than across humeral angles (**Plate 28A**); males with a stridulatory mechanism involving abdominal segment 1 (plectrum) and hind wing (stridulitrum); [small, shiny or sub shiny bugs] **Subfamily Plinthisinae**
 Both sexes with abdominal sterna IV and V fused, lacking a conjunctiva between them (**Fig. 27**); pronotum variable, usually wider across humeral angles than across anterior lobe (**Plate 28C**); males lacking an abdominal and hind wing stridulatory mechanism...**Subfamily Rhyparochrominae** 2
2. All abdominal spiracles located on sternum (**Fig. 27**) 3
 At least spiracle of abdominal segment IV located dorsally on laterotergite (**Fig. 22**) 10
3. Posterior pair of trichobothria on abdominal sternum V located one above the other (**Fig. 28**) 4
 Posterior pair of trichobothria on abdominal sternum V located one in front of the other so that the 3 abdominal trichobothria of segments IV and V occur as a linear series (**Fig. 29**) 8
4. Ocelli lateral, behind eyes (**Plate 31A**); suture between abdominal sterna IV and V attaining lateral connexival margin (**Fig. 27**); labial segment 2 usually not attaining base of head (**Plate 31B**); [nymphs lacking a Y-shaped suture but with a lateral suture along length of abdomen; **Fig. 24**] **Cleradini**
 Ocelli located between and slightly posterior to eyes (**Plate 37A**); suture between abdominal sterna IV and V usually not attaining lateral connexival margin and usually markedly curving anteriorly from venter dorsally (**Fig. 28**); labium variable, but usually with segment 2 reaching or exceeding base of head (**Plate 37B**) 5
5. Minute, yellowish brown species (**Plate 33A, B**); tarsi 2-segmented (**Fig. 18**); nymphs lacking Y-suture **Lilliputocorini**
 Body size and colour variable; tarsi 3-segmented (**Fig. 19**); nymphs with a Y-suture (**Fig. 25**) 6
6. Abdominal trichobothria on sternum V closer to spiracle than to posterior margin of segment V (**Fig. 32**); hind wing usually with both hamus and secondary veins 7
 Abdominal trichobothria on sternum V located closer to posterior margin of sternum V than to spiracle (**Fig. 28**); hind wing veins reduced, either hamus or secondary veins absent (usually both); [pronotum with a distinct ringlike anterior collar (**Plate 37**)] **Ozophorini**
7. All trichobothria on sterna IV and V located anterior to spiracle of sternum V (**Fig. 32**); spiracle V located in central third of segment (**Fig. 32**); pores present near spiracles of segments III and IV (**Fig. 32**) **Drymini**
 Posterior trichobothria of sternum V located posterior to spiracle V (**Fig. 30**); spiracle V located in posterior third of segment (**Fig. 30**); no pores present near spiracles III and IV (**Fig. 30**) **Stygnocorini**
8. All trichobothria on segment V located anterior to spiracle and usually equidistant from each other (**Fig. 29**); nymphs with a Y-suture (**Fig. 25**) **Targaremini**
 Usually with one trichobothrium on segment V posterior to spiracle (**Fig. 31**); middle trichobothrium not equally distant, some quite close to each other (**Fig. 31**); nymphs lacking a Y-suture (**Fig. 24**) 9
9. Apical corial margin mostly deeply concave (**Plate 30A, C**); inner laterotergites present (**Fig. 22**); head lacking iridescent areas **Antillocorini**
 Apical corial margin straight (**Plate 32C**); inner laterotergites absent (**Fig. 23**) or present; head frequently with iridescent areas present basally **Lethaeini**

10. Abdominal spiracles located dorsally on either segments III and IV or IV only, always ventral on segment II	Rhyparochromini
Abdominal spiracles of segments II – IV located dorsally (Fig. 22)	11
11. Inner laterotergites absent (Fig. 23); lateral pronotal margins almost always rounded (Plate 33C, D; Plates 34 – 36); nymphs lacking large black sclerotized areas around dorsal abdominal scent-gland openings	Myodochini
Inner laterotergites present (Fig. 22); lateral pronotal margins variable from rounded to carinate (Plate 42); nymphs frequently with black sclerotized areas around dorsal abdominal scent-gland openings	Udeocorini

SUBFAMILY *Plinthisinae*

(PLATE 28A, B)

Diagnosis:

Body small; shining or subshining.

Pronotum usually expanded across anterior lobe (especially in flightless forms). Wings often greatly reduced, usually in a staphylinoid manner, posterior half of abdominal dorsum exposed. Stridulatory mechanism present. Fore femora heavily incrassate and spined.

Male genitalia: Ejaculatory reservoir continuous with body when not reduced.

Key Reference: Schuh & Slater 1995.

Number of Australian genera: 1 (in 3 subgenera).

Genus *Plinthisus* Stephens, 1829

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY PLINTHISINAE]

(PLATE 28A, B)

Type species: *Lygaeus brevipennis* Latreille, 1807, by monotypy.

Number of Australian (and World) species: 15 in 3 subgenera (100 in 6 subgenera).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: No.

Hosts / feeding: Granivore. Also in mosses and lichens. *Plinthisus* (*Locutius*) Distant – tussocks and fallen leaves, in lava fields in New Zealand; associated with plants of Proteaceae, Myrtaceae and Pandanaceae. *P.* (*Nanoplinthisus*) Wagner – associated with plants of Epacridaceae, Poaceae, Fabaceae and Myrtaceae.

Diagnosis:

Plinthisus is represented in Australia by 15 species, in three subgenera, *Isioscytus* Horváth (3 species), *Locutius* Distant (1 species), and *Nanoplinthisus* Wagner (11 species). The subgenus *Locutius* includes the most widely distributed Australian species, *P.* (*L.*) *woodwardi* Slater & Sweet. The genus diagnosis given below alludes to this subgenus but see Slater & Sweet (1977) for definition of other subgenera.

Body size over 2.5 mm. Body macropterous, brachypterous or coleopteroid with a membrane vestige on hemelytra, apical margin oblique.

Ocelli present in both macropterous and brachypterous wing morphs.

Lateral margin of pronotum and epi-pleura narrowly carinate-explanate; propleural pores present. Hemelytra extending to seventh abdominal tergum. Metathoracic scent gland peritreme curved posteriorly. Fore femora with two rows of spines.

Abdomen with connexivum broad in middle, narrowed anteriorly and posteriorly.

Male Genitalia: Parameres straight. Aedeagus with gonoporal process of 2-3 turns; ejaculatory reservoir with wings present. Female genitalia: Spermatheca very small; bulb hemispherical; distal sclerotized portion of duct long.

Key References: Slater & Sweet 1977.

SUBFAMILY *Rhyparochrominae*

(PLATE 28C, D; PLATES 29–42)

Diagnosis:

Body usually dull brown or mottled brown, black and white; frequently myrmecomorphic.

Head with cephalic trichobothria usually present.

Fore femora usually incrassate; strongly armed below with stout spines.

Abdomen with suture between sterna IV and V fused, usually curving forward anterolaterally from midline of sternum, not reaching dorsal margin of abdomen.

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

Number of Australian tribes: 11.

TRIBE *Antillocorini*

(PLATE 30)

Diagnosis:

Body very small to minute.

Head with bucculae joined by a carina well behind first labial segment.

Pronotum lacking anterolateral trichobothria. Apical corial margin shallowly to deeply concave.

Abdomen with inner laterotergites present. Abdomen with trichobothria linearly arranged on all segments.

Nymphs with well-developed scent glands between terga III–IV, IV–V and V–VI.

Key References: Schuh & Slater 1995, Sweet 1967.

Number of Australian genera: 3.

Genus *Botocudo* Kirkaldy, 1904

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE ANTILLOCORINI]

(PLATE 30A, B)

Type species: *Aphanus diluticornis* Stål, 1858, by subsequent designation.

Number of Australian (and World) species: 1 (38).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical and Oriental regions.

Australian Distribution: Queensland, Victoria.

Economic Significance: No.

Hosts / feeding: Granivore, ground dweller.

Diagnosis:

Pronotum lacking explanate margin. Prosternum lacking labial groove. Fore femora mutic.

Spiracles of abdominal segments II and IV placed on lateral sternal shelf; spiracles of segment III and V placed below shelf. Dorsal abdominal scent gland scars broad and well developed between terga III–IV, IV–V and V–VI. Inner laterotergites present on abdominal segments III–V. Trichobothria on sternum V with posterior two trichobothria placed close together, posterior one placed well behind spiracle.

Key References: Slater & Brailovsky 1994.

Genus *Tomocoris* Woodward, 1953

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE ANTILLOCORINI]

(PLATE 30C, D)

Type species: *Tomocoris truncatus* Woodward, 1953, by original designation.

Number of Australian (and World) species: 3 (8).

Extralimital Distribution: Oriental and Australian (outside Australia) regions.

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

Economic Significance: No.

Hosts / feeding: Granivore; ground dweller; herbivore.

Diagnosis:

Body small (1.5–3.0 mm); in macropterous form with posterior margin of corium emarginate medially.

Head triangular. Ocelli small or obsolete. Antennae about half as long as body, segments 1 and 2 thickened apically, 4 fusiform. Labium passing hind coxae; basal segment nearing or reaching base of head.

Pronotum oblong, wider than long; lobes indistinct; apex, base and sides almost parallel and straight. Scutellum flat; triangle. Hemelytra with clavus, corium and membrane variable in macropterous, brachypterous and sub-brachypterous forms. Hind wings vestigial or absent. Fore femora incrassate; unarmed.

Abdomen. Sutures between terga III–VI shallowly curved cephalad. Middle trichobothrium on sternum V slightly closer to posterior than to anterior trichobothrium; posterior 2 trichobothria on sternum VI separate; submedian trichobothria on sternum III and IV reduced, arranged in a close triangle.

Male genitalia: Paramere short, flat, triangular. Phallosome in ventral aspect with regular sclerotized areas; gonoporal process distal to helicoid process slender, unusually long, regularly coiled, not encased in inflatable sheath or lobe. Female genitalia: Spermatheca long, slender; proximal part short; distal part tubular, loosely and irregularly coiled, distended towards distal bulb, which is prominently developed.

Key References: Malipatil 1977a, Woodward 1955.

TRIBE Cleradini

(PLATE 31)

Diagnosis:

Head with ocelli located behind rather than between eyes. Antennal segment 3 short, often shorter than segment 1.

Pronotum with lateral margin carinate or explanate. A transverse sulcus often present on anterior margin of pronotum. Fore femora usually slender; unarmed below. Metathoracic wing with hamus present.

Abdomen with spiracles ventral, the spiracle of segment V centrally located. Posterior pair of trichobothria of segment V one above the other and located much nearer the spiracle than posterior margin of segment. Inner laterotergites absent; connexival membrane greatly expanded.

Male genitalia: Parameres frequently bifurcate. Aedeagus with body of ejaculatory reservoir reduced to tubercle; holding sclerites absent; helicoid process proximal.

Female genitalia: Spermatheca with spherical bulb; duct long, thin and 2-parted.

Nymph with no Y-suture; lateral line present running parallel to margin of abdomen. Three scent glands present, the anterior gland broadest, scent-gland plates small. Abdomen pale pink or white.

Key References: Sweet 1967, Schuh & Slater 1995, Malipatil 1983.

Number of Australian genera: 7.

Genus *Clerada* Signoret, 1862

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE CLERADINI]

(PLATE 31A, B)

Type species: *Clerada apicicornis* Signoret, 1862, by monotypy.

Number of Australian (and World) species: 1 (3).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical and Oriental regions.

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

Economic Significance: Minor.

Hosts / feeding: Sanguinivore, synanthropic. Known to feed on humans, possible vector of Chagas' disease in the Neotropical region.

Diagnosis:

Body narrowly ovate, depressed.

Head with postocular part parallel-sided; head width across eyes about twice minimum interocular width. Antennal segment I exceeding apex of head by half its length. Labium extending to middle coxae.

Pronotum transverse, trapezoidal; without distinct red, orange or testaceous areas. Fore femur unarmed.

Abdomen with anterior scent gland scar (between terga III–IV) about 2 X as wide as posterior scars (between terga IV–V and V–VI) which are subequal.

Male genitalia: Paramere blade not forked. Aedeagus with reduced ejaculatory reservoir. Female genitalia: Second gonapophysis with a small spherical sclerotized area near distal end.

Key References: Malipatil 1981, 1983.

Genus *Laticlerada* Malipatil, 1981

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE CLERADINI]

(PLATE 31C, D)

Type species: *Clerada laticollis* Horváth, 1909, by original designation.

Number of Australian (and World) species: 8 (8).

Extralimital Distribution: None.

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

Economic Significance: Minor.

Hosts / feeding: Sanguinivore. *Laticlerada laticollis* (Horváth) – Nest, sanguinivore (host(s): Common Ringtail Possum, *Pseudocheirus peregrinus* (Boddaert) [Pseudocheiridae]; Common Brushtail Possum, *Trichosurus vulpecula* (Kerr) [Phalangeridae]). *L. monteithi* Malipatil – sanguinivore (host(s): Common Ringtail Possum, *Pseudocheirus peregrinus* [Pseudocheiridae]).

Diagnosis:

Body large flat broadly ovate and sparsely punctate above; orange or testaceous areas on pronotum; body subshiny and non-pilose.

Head behind eyes gradually rounded; width about twice interocular space. Antennal segment 1 only slightly exceeding apex of head, second 2.5 to 3 X as long as first and slightly longer than fourth. Labium extending to between mid coxae and abdominal sternum IV.

Pronotum transverse, lateral margins explanate and carinate; calli area only slightly swollen and finely punctate. Hemelytra slightly exceeding abdomen.

Abdomen with anterior scent gland scar 1.5 – 2 X as wide as posterior 2 scars; tergum III slightly reduced.

Male genitalia: Paramere blade bifurcated, dorsal or outer arm of fork much shorter than ventral or inner arm. Aedeagus with ejaculatory reservoir reduced.

Key References: Malipatil 1981, 1983.

TRIBE *Drymini*

(PLATE 28C, D; PLATE 29)

Diagnosis:

Body usually small to medium-sized (2 – 4.5 mm).

Pronotum with lateral margins usually carinate or narrowly explanate. Hemelytra with apical corial margin usually straight.

Abdomen with posterior pair of trichobothria on sternum V located dorsoventrad of one another, placed anterior to spiracle V. Pores present near spiracles III and IV.

Key References: Schuh & Slater 1995.

Number of Australian genera: 12.

Genus *Appolonius* Distant, 1901

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE DRYMINI]

(PLATE 28C, D)

Type species: *Ophthalmicus cincticornis* Walker, 1872, by monotypy.

Number of Australian (and World) species: 2 (11).

Extralimital Distribution: Afrotropical, Oriental and Palearctic regions.

Australian Distribution: Northern Territory, Queensland.

Economic Significance: No.

Hosts / feeding: Frugivorous. *Appolonius robustus* Gross – Frugivorous (associated flora: Fig, *Ficus carica* L. [Moraceae]). On bark of *Ficus* sp. in India. *A. territorialis* Gross – Frugivorous (associated flora: Rosella, *Hibiscus sabdariffa* L. [Malvaceae]).

Diagnosis:

Head broad; triangular. Eyes large; touching anterior margin of pronotum. Antennae robust; all segments relatively short. Labium reaching mid coxae.

Pronotum nearly rectangular with almost straight lateral explanate margins; with prominent transverse impression. Scutellum lacks prominent raised triradiate keel but slightly raised medially. Hemelytra with corium and clavus coarsely punctate; clavus with three longitudinal rows of punctures; lateral margins of corium almost straight. Fore femora heavily incrassate; apically ventrally with one large tooth followed by five or six small spines.

Key References: Gross 1965.

Genus *Brentiscerus* Scudder, 1962

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE DRYMINI]

(PLATE 29A, B)

Type species: *Scolopostethus putoni* Scudder, 1962, by original designation.

Number of Australian (and World) species: 2 (2).

Extralimital Distribution: Australian region (outside Australia in New Zealand).

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

Economic Significance: No.

Hosts / feeding: Granivore. *Brentiscerus australis* (Bergroth) – Granivore (associated flora: *Daviesia divaricata* Benth. [Fabaceae]; *Leucopogon unilateralis* Stschegl. [Epacridaceae]; *Hypocalymma cordifolium* Schauer [Myrtaceae]; *Helichrysum diosmifolium* Less [Asteraceae]; White Myrtle, *Hypocalymma angustifolium* (Endl.) Schauer [Myrtaceae]; Swan River Myrtle, *Hypocalymma robustum* (Endl.) Lindl. [Myrtaceae]; She-Oak, *Casuarina* sp. [Casuarinaceae]; Mountain Ash, *Eucalyptus regnans* F. Muell. [Myrtaceae]).

Diagnosis:

Body medium size.

Head strongly rugulose above and below. Eyes prominent; ocelli remote from each other and placed along hind margin of eyes. Antennae robust; longer than head and pronotum together. Labium with second segment longest.

Pronotum with collar; anterior and posterior margins almost straight; lateral explanate margin broad; strong transverse impression in middle; front lobe strongly convex and finely punctate; hind lobe strongly punctate and less strongly convex. Scutellum punctate; with prominent triradiate keel. Hemelytra with corium lateral margin moderately sinuate; two rows of punctures paralleling claval suture and a basal outer half row more or less parallel to outer margin, remainder of corium with scattered punctures. Clavus with three rows of fine punctures, middle row converging towards outer row and merging with it before apex. Fore femora incrassate; armed on apical ventral surface, one spine large.

Abdomen covered with fine pilosity.

Key References: Scudder 1962c, Gross 1965.

Genus *Grossander* Slater, 1976

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE DRYMINI]

(PLATE 29C, D)

Type species: *Brentiscerus major* Gross, 1965, by original designation.

Number of Australian (and World) species: 4 (2 valid; 2 not valid).

Extralimital Distribution: Australian (outside Australia) region.

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

Economic Significance: No.

Hosts / feeding: Granivore. *Grossander major* (Gross) – Granivore (associated flora: *Rondeletia* sp. [Rubiaceae]).

Diagnosis:

Head punctate. First antennal segment exceeding tip of head by about 1/2.

Pronotum with lateral margins with explanate margin, concave in region of transverse constriction placed almost in middle of pronotum; anterior margin with distinct collar; posterior margin sinuate, straight or concave; anterior lobe more finely punctate than posterior lobe. Scutellum deeply punctate and with a distinct Y shaped carina. Hemelytra concave in basal third; clavus with three rows of punctures; corium with two rows close to and parallel to claval suture. Fore femora incrassate with a large spine and anterior to it are a series of smaller spines.

Parameres robust, pointed.

Key References: Gross 1965, Slater 1976, Malipatil 1977b.

TRIBE *Lethaeini*

(PLATE 32)

Diagnosis:

Body usually shining to subshining.

Head usually with single or double iridescent areas at its base. Bucculae joined posteriorly by carina immediately behind labial base.

Pronotum with margins usually carinate or explanate; anterolateral angles frequently with an elongate trichobothrium (or "macroseta" according to Schuh & Weirauch 2020) (often broken off).

Male genitalia: Ejaculatory reservoir complex, highly modified.

Nymphs lacking Y-suture but with evaporatorium laterally.

Key References: O'Donnell, 1991, Schuh & Slater 1995.

Number of Australian genera: 11.

Genus *Diniella* Bergroth, 1893

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE LETHAEINI]

(PLATE 32A, B)

Type species: *Dinia glabrata* Stål, 1874, by subsequent designation.

Number of Australian (and World) species: 2 (20).

Extralimital Distribution: Afrotropical, Oriental and Palaearctic regions.

Australian Distribution: Northern Territory, Queensland, Western Australia
[Other Regions: Torres Strait Islands].

Economic Significance: No.

Hosts / feeding: Granivore. *Diniella glabrata* (Stål) – On grass.

Diagnosis:

This genus may be distinguished by the combination of the following:

Body length 2 – 4 mm.

Head with median ventral trough; with posteroventral region punctate and swollen (more so in male than in female). Antenna with first segment not or scarcely passing apex of head. Labium with segment 3 shorter than 1.

Pronotum with a pair of long, erect anterolateral trichobothria or macrosetae (often broken off); punctate and with a punctate collar-like area not demarcated mesally; transverse impression separating lobes not distinct; posterior lobe area punctate; with lateral margins weakly carinate, and straight or shallowly excavated. Scutellum punctate. Hemelytra punctate, but not coarsely and on entire surface; clavus with three complete rows of punctures. Metapleural scent gland peritreme short and rounded; raised above adjacent evaporatorium.

Key References: Woodward 1979.

Genus *Neolethaeus* Distant, 1909

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE LETHAEINI]
(PLATE 32C, D)

Type species: *Neolethaeus typicus* Distant, 1909, by monotypy.

Number of Australian (and World) species: 4 (27).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: No.

Hosts feeding: Granivore. *Neolethaeus australiensis* Woodward – Ex bulk wheat, ex rotten corn cobs.
N. tenebrosus (Distant) – In leaf litter under *Lantana* [Verbenaceae].

Diagnosis:

This genus may be readily distinguished by the combination of the following:

Pronotum with lateral margins carinate and explanate; with distinctly demarcated and strongly punctate anterior collar-like area.

Hind femora with ventral series of both spines and pointed tubercles.

Key References: Woodward 1963, 1968, Slater 1964b, Distant 1910.

TRIBE *Lilliputocorini*

(PLATE 33A, B)

Diagnosis:

Body minute or very small (< 2 mm long); somewhat flattened; yellowish brown; macropterous or staphylinoid.

Antennae clavate.

Abdomen with all spiracles ventral. Trichobothria variably placed, posterior pair on sternum V sometimes lacking, when present placed in dorsoventral position. Inner laterotergites absent. Legs with fore femora mutic; tarsi 2-segmented.

Female genitalia: Ovipositor reduced.

Nymph with scent glands between terga III–IV and IV–V, troughed groove present between terga III–IV and IV–V leading to evaporatorium laterally on abdomen.

Key References: Schuh & Slater 1995, Slater & Woodward 1982.

Number of Australian genera: 1.

Genus *Lilliputocoris* Slater & Woodward, 1979

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE LILLIPUTOCORINI]

(PLATE 33A, B)

Type species: *Lilliputocoris exiguus* Slater & Woodward, 1979, by original designation.

Number of Australian (and World) species: 2 (10).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Neotropical and Oriental regions.

Australian Distribution: Northern Territory, Queensland.

Economic Significance: No.

Hosts / feeding: Litter, rotting leaves. *Lilliputocoris punctatus* (Woodward) – Ex *Melaleuca* litter, brigalow scrub.

Diagnosis:

Same as above for tribe.

Key References: Slater & Woodward 1982.

TRIBE Myodochini

(PLATE 33C, D; PLATES 34–36)

Diagnosis:

Body size medium to large; form elongate or short and stout.

Pronotum usually rounded, rarely subcarinate. Legs short to slender and long.

Abdomen with inner laterotergites absent. Spiracles II, III, and IV dorsal on connexivum, others ventral on sternum. Trichobothria on segment V with 1 anterior and 2 posterior with 1 above the other. Stridulatory mechanism, when present, with stridulitrum either abdominal or prothoracic series of striae; plectrum of ridges or tubercles on hind femur or fore femur.

Male genitalia. Phallus with conjunctiva with spines in many genera. Female genitalia. Spermatheca with apical sclerotized bulb; duct 2-parted, with distal portion annulated and much thicker than proximal portion.

Nymph with Y-suture well developed. Pronotum and wing pads with explanate margins. Abdomen never with extensive black sclerotized region. Dorsal abdominal scent-gland openings present between terga III–IV, IV–V and V–VI.

Key References: Sweet 1967, Schuh & Slater 1995, Harrington 1980, Malipatil 1978.

Number of Australian genera: 12.

KEY TO REPRESENTATIVE GENERA OF MYODOCHINI

(modified from Malipatil 1978, Harrington 1980)

1. Body robust, total length 3.0–3.5 X maximum width; head, pronotum and abdomen usually ochraceous to dark brown; hind wing with R strongly curved anteriorly, without reaching margin; aedeagus without spines and processes, but with holding sclerites (**Fig. 33**) *Remaudiereana*
Body slender, total length 3.5–5.6 X maximum width; head, pronotum and abdomen usually castaneous to black; hind wing with R usually reaching anterior margin; aedeagus with spines and processes, but without holding sclerites (**Fig. 10**) 2
2. Scutellum about 1.5 times as long as wide (**Plate 34A**); postocular part of head gradually narrowed posteriorly (**Plate 34A**); [body elongate and narrow (**Plate 34A, B**); conjunctiva with large, pigmented flaps *Paromius*
Scutellum as long as or slightly longer than wide (**Plate 34C**); postocular part of head abruptly narrowed posteriorly (**Plate 34C, D**) 3
3. Male fore tibiae armed (**Fig. 35**) *Horridipamera*
Male fore tibiae unarmed *Pseudopachybrachius*

Genus *Horridipamera* Malipatil, 1978

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE MYODOCHINI]

(PLATE 33C, D)

Type species: *Plociomerus nietneri* Dohrn, 1860, by original designation.

Number of Australian (and World) species: 3 (12).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: No.

Hosts / feeding: Granivore; herbivore. *Horridipamera nietneri* (Dohrn) – granivore (associated flora: Smooth-barked Bloodwood, *Eucalyptus foelscheana* F. Muell., 1882 [Myrtaceae]). In India, adults and nymphs of this species have been recorded as attacking rice in the fields (see Sweet 2000a for details).

Diagnosis:

Body elongate-ovate in outline; generally black and white or brown and white with proximal part of 4th antennal segment pale or whitish.

Head about as wide across eyes as long; bucculae short, projecting; ocelli prominent.

Eyes large, placed away from pronotum. Antennal 1st segment exceeding apex of head, 2nd segment subequal to or slightly shorter than 4th. Pronotal collar distinct; constriction deep, more so in male; anterior lobe longer and more gibbous in male; posterior lobe punctate. Scutellum slightly longer than wide, punctate especially on margins. Clavus with 3 complete rows of punctures, and a short row between middle and inner rows. Legs with fore coxae armed with 1 spine; fore femora much incrassate, armed below with several variously developed spines in 2 series; fore tibiae almost always armed in male (**Fig. 35**), unarmed in female (**Fig. 34**).

Male genitalia: Paramere with produced dorsal lobe, a sickle-shaped blade. Conjunctiva with 2 strong distal or subdistal spines, ejaculatory reservoir complete, body and wings well developed, holding sclerites absent, vesica long, with large flap-like marginal lobe having finely dentate margins. Female genitalia: Spermatheca slender, 4-partite, basal part very narrow and long, coiled part with several coils, apical part elongate-ovate.

Key References: Malipatil 1978, Slater & Zheng 1984.

Remarks: The related exotic genus *Togo* Bergroth (**Plate 36C, D**) differs from this genus in having generally brachypterous hemelytra, and anterior pronotal lobe equal to or more than 2.5 times as long as posterior lobe.

Genus *Paromius* Fieber, 1861

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE MYODOCHINI]

(PLATE 34A, B)

Type species: *Stenocoris gracilis* Rambur, 1839, by monotypy.

Number of Australian (and World) species: 2 (15).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Granivore; herbivore. *Paromius gracilis* (Rambur) – Granivore (associated flora: *Andropogon ischaemum* L. [Poaceae]; *Andropogon distachyos* L. [Poaceae]; *Andropogon hirtus* L. [Poaceae]; Ravenna Grass *Saccharum ravennae* L. [Poaceae]; Blady Grass, *Imperata cylindrica* (L.) P Beauv. [Poaceae]).

In parts of USA, *Paromius longulus* (Dallas) has been recognized as a pest in rice fields causing pecky rice, also reported to injure strawberries, and feed on a variety of other plants (see Sweet 2000a for details).

Diagnosis:

Body elongate and parallel-sided; abdomen longer than combined head and pronotal lengths.

Head with buccular juncture V-shaped.

Pronotum tapering anteriorly with anterior lobe in a lower plane than posterior lobe; lateral margins of both pronotal lobes rounded; anterior collar present and demarcated posteriorly by a line-like groove, and collar with a characteristic median V-necked appearance. Clavus with punctures in three or more rows. Mesepimeron enclosed. Evaporatorium extensive. Fore femur with spines double ranked; male fore tibia slightly curved and unarmed.

Male genitalia: Pygophore with posterior edge broadly rounded.

Key References: Harrington 1980, Péricart 1998b.

Genus *Pseudopachybrachius* Malipatil, 1978 [FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE, TRIBE MYODOCHINI] (PLATE 34C, D)

Type species: *Rhyparochromus gutta* Dallas, 1852, by original designation.

Number of Australian (and World) species: 2 (8).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Nearctic, Neotropical, Oriental and Palaearctic regions.

Australian Distribution: Northern Territory, Queensland [Other region: Christmas Island].

Economic Significance: Minor.

Hosts / feeding: Granivore; herbivore. *Pseudopachybrachius guttus* (Dallas) – granivore (associated flora: *Sophora* sp. [Fabaceae]; *Vaccinium* sp. [Ericaceae]; *Clermontia* sp. [Campanulaceae]; Tobacco, *Nicotiana tabacum* L. [Solanaceae]; Bitter Gourd, *Cucurbita* sp. [Cucurbitaceae]; Bermuda Grass, *Cynodon dactylon* Pers. [Poaceae]).

Diagnosis:

Body less than 4.5 mm, elongate; hemelytra macropterous to brachypterous.

Head as wide as or slightly wider than long; abruptly contracted behind eyes; dorsal surface convex; bucculae short; antennifers narrowed anteriorly. Antennal segment 1 exceeding apex of head. Labium exceeding fore coxae, 1st segment longest.

Pronotum with collar wide, more so in middle; constriction deep in macropters, dorsally shallower and in lateral view inconspicuous in other forms; anterior lobe narrower than and never more than twice as long as posterior lobe which is finely punctate, gradually convex posteriorly in macropters and almost flat in other forms.

Scutellum equilateral or slightly longer than wide, punctate especially along margins. Clavus with 3 rows of punctures and usually a short; irregular row between middle and inner rows. Metathoracic scent gland opening oval. Fore femur with spines double-ranked; fore coxa in both sexes armed with 1 spine; fore trochanter unarmed; fore tibia in male unarmed.

Male genitalia: Paramere with a distinct ventral lobe. Conjunctiva with only 1 pair of pigmented spines, additional pair of inflatable lobes or processes absent; vesica with only ventral (left) process (which is large and leaf-like) dentate on margins. Female genitalia: Spermatheca without apical bulb.

Key References: Malipatil 1978, Harrington 1980.

Genus *Remaudiereana* Hoberlandt, 1954 [FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE, TRIBE MYODOCHINI] (PLATE 35)

Type species: *Remaudiereana tibialis* Hoberlandt, 1954, by original designation.

Number of Australian (and World) species: 4 (14).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

Australian Distribution: New South Wales, Northern Territory, Queensland, South Australia, Victoria, Western Australia [Other regions: Christmas Island].

Economic Significance: Minor.

Hosts / feeding: Granivore; herbivore. *Remaudiereana inornata* (Walker) – Granivore (associated flora: *Myrsine kermadecensis* Cheesem. [Myrsinaceae]; *Metrosideros kermadecensis* W.R.B. Oliv. [Myrtaceae]; *Polygonium aviculare* L. [Polygonaceae]; *Nephrolepis* sp. [Davalliaceae]; *Cyperus* sp. [Cyperaceae]; *Cotula* sp. [Asteraceae]; *Coprosma crassifolia* Colenso [Rubiaceae]; *Ageratum conyzoides* L. [Asteraceae]; *Acaena sanguisorbae* (L.) M. Vahl [Rosaceae]; *Acaena pallida* (T. Kirk) Allan [Rosaceae]; Strawberry, *Fragaria ananassa* Duch. [Rosaceae]; Norfolk Island pine, *Araucaria excelsa* W.T. Aiton [Araucariaceae]; Manuka, *Leptospermum scoparium* J.R. Forst. & G. Forst. [Myrtaceae]); on grasses in cabbage field, subalpine vegetation, moss, lichens. *R. nigriceps* (Dallas) – Granivore (associated flora: Maize, *Zea mays* L. [Poaceae]). *R. robusta* (Malipatil) – In Banksia-dominated forest.

Diagnosis:

Body robust, elongate ovate, covered with numerous long curving semierect hairs.

Pronotum with anterior collar impunctate and narrow ringlike, demarcated posteriorly by a deep groove; transverse impression deeply incised; lateral margins of both lobes rounded. Clavus with punctures in three or more rows. Mesepimeron enclosed.

Metathoracic scent gland evaporatorium extensive. Fore femur with a single row of spines along inner edge of ventral surface and one well-developed heavy median spine on outer edge; male fore tibia curved with a single, large, well-developed spine in the middle, female unarmed.

Key References: Harrington 1980, Malipatil 1978.

Remarks: The exotic genus *Mydocha* Latreille (**Plate 36A, B**) differs from all Australian genera included here in having head with interocular distance less than head length behind eyes. This genus has been included here to photographically illustrate mydochine morphological diversity that exists in Australian exotic fauna.

TRIBE *Ozophorini*

(PLATE 37)

Diagnosis:

Body medium to large sized, slender.

Head generally porrect; with faint grooves in front of ocelli.

Pronotal collar usually well developed. Hind wing lacking hamus and secondary veins.

Abdominal spiracles ventral; spiracle of segment V located in middle third of segment.

Posterior pair of trichobothria on segment V closer to posterior margin of segment than to spiracle.

Inner laterotergites absent.

Male genitalia: Aedeagus with well-developed body and proximally directed wings; 2 pairs of holding sclerites present. Female genitalia: Spermatheca with sclerotized spherical bulb (rarely with proximal flange present); thin 2-parted duct.

Nymphs with strongly developed Y-suture. Dorsal abdominal scent glands between terga III–IV, IV–V and V–VI.

Key References: Sweet 1967; Schuh & Slater 1995.

Number of Australian genera: 2.

Genus *Bedunia* Stål, 1874

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE OZOPHORINI]

(PLATE 37A, B)

Type species: *Bedunia cuspidata* Stål, 1874, by subsequent designation.

Number of Australian (and World) species: 3 (10).

Extralimital Distribution: Australian (outside Australia) and Oriental regions.

Australian Distribution: Queensland [Other Regions: Christmas Island].

Economic Significance: No.

Hosts / feeding: Granivore; ground dweller. *Bedunia turneri* (Distant) – Herbivore.

Diagnosis:

Head with eyes set near middle of head, far from anterior margin of pronotum; postocular area somewhat swollen but tapering basally. Ocelli set well behind posterior margins of compound eyes.

Pronotum with a distinct anterior collar; lateral margins of anterior lobe rounded, not carinate or explanate. Fore femora extremely incrassate; armed below with 2 rows of small acute spines; fore tibiae with series of obtuse crenulations, these are variably developed in different species and sexes (moderately large in both sexes, weakly developed in both sexes, or very weakly developed in females).

Key References: Barber 1958, Slater & Woodward 1974.

Genus *Ethaltomarus* Scudder, 1963

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE OZOPHORINI]

(PLATE 37C, D)

Type species: *Ethaltomarus rugosus* Scudder, 1963, by original designation.

Number of Australian (and World) species: 2 (5).

Extralimital Distribution: Afrotropical Region.

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

Economic Significance: No.

Hosts / feeding: Herbivore. *Ethaltomarus australicus* Slater & Woodward – Granivore (associated flora: White Myrtle, *Hypocalymma angustifolium* (Endl.) Schauer [Myrtaceae]).

Diagnosis:

This genus resembles *Bedunia* but differs from the latter in the following main external characters:

Antennae relatively shorter, e.g. length of segments 1, 3 and 4 each less than head width (subequal to or greater than head width in *Bedunia*), segment 4 short fusiform with length about 6 times maximum width (elongate fusiform with length about 8 to 11 times maximum width in *Bedunia*).

Pronotum with posterior lobe distinctly shorter than anterior lobe (subequal in *Bedunia*). Hemelytra about half total body length (considerably more than half in *Bedunia*). Fore femora more globosely incrassate, with maximum depth 0.4 or more times length (0.3 or less in *Bedunia*).

Key References: Slater & Woodward 1974.

TRIBE *Rhyparochromini*

(PLATE 38; PLATE 39)

Diagnosis:

Body usually large (about 6 – 10 mm) and robust.

Pronotal lateral margins carinate or explanate.

Abdomen with spiracles of segments III and IV dorsal. Inner laterotergites present.

Nymphs frequently with variegated, lightly sclerotized abdomen. Y-suture well developed.
Dorsal abdominal scent-gland openings between terga III–IV, IV–V and V–VI.

Key References: Schuh & Slater 1995.

Number of Australian genera: 7.

Genus *Dieuches* Dohrn, 1860

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE RHYPAROCHROMINI]

(PLATE 39)

Type species: *Dieuches syriacus* Dohrn, 1860, by subsequent designation.

Number of Australian (and World) species: 13 (138).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

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

Economic Significance: Minor.

Hosts / feeding: Granivore; herbivore. *Dieuches grandicus* Gross & Scudder – granivore (associated flora: *Alpinia* sp. [Zingiberaceae]). *D. notatus* (Dallas) – granivore (associated flora: *Hypericum* sp. [Clusiaceae]; Lesser Swinecress, *Coronopus didymus* (L.) Sm. [Brassicaceae]).

Diagnosis:

This genus is superficially similar to *Elasmolomus* Stål (see below), but differs from it particularly in the characters given in *italic font* below.

Body elongate, robust.

Head fuscous, triangular, antennal tubercle visible from above. Eyes almost touching anterior margin of pronotum; finely punctate. Antennal first segment exceeding apex of head by 1/2.

Pronotum disc particularly anterior lobe area mostly fuscous; distinctly punctate; lateral margins carinate, carina laminate, often broad near middle (impression) but narrowed in anterior lobe area, and usually turned slightly dorsal; disc usually with distinct transverse impression near middle; posterior margin concave. Scutellum distinctly punctate, longer than broad, basal half of disc flat or slightly excavate.

Hemelytra variably coloured brown, black or ochraceous; usually with a conspicuous subapical pale spot on corium; clavus with more than three rows of punctures; corium punctate. Legs with fore femora moderately incrassate and with subapical ventral spines; middle femora in male usually with small ventral spines; tibiae with stout bristles; hind tarsi with basal segment twice as long as combined length of two distal segments.

Abdominal venter fuscous, often coxal covers and lateral spots on abdomen ochraceous. Spiracles on segments III and IV dorsal, II and V–VII ventral. Inner laterotergites present. Male genitalia: Pygophore with posterior of dorsal edge rounded. Aedeagus with short conjunctiva; vesical with lobes, ejaculatory reservoir with broad wings.

Key References: Gross & Scudder 1963, Eyles 1973.

Genus *Elasmolomus* Stål, 1872

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE RHYPAROCHROMINI]

(PLATE 38A, B)

Type species: *Cimex sordidus* Fabricius, 1787, by subsequent designation.

Number of Australian (and World) species: 6 (19).

Extralimital Distribution: Afrotropical, Australian (outside Australia), Oriental and Palaearctic regions.

Australian Distribution: Northern Territory, Queensland, Western Australia [Other Regions: Christmas Island].

Economic Significance: Minor to Major.

Hosts / feeding: Granivore; herbivore. *Elasmolomus pallens* (Dallas), known as 'peanut trash bug' or 'sesame pod bug', is a minor widespread irregular pest of peanuts in Australia (Brier 2007). Also (associated flora: Sweet Tuber, *Apios americana* Medik. [Fabaceae]; Sunflower, *Helianthus annuus* L. [Asteraceae]; Safflower, *Carthamus tinctorius* L. [Asteraceae]; Peanut, *Arachis hypogaea* L. [Fabaceae]; Millet, Sorghum, *Sorghum bicolor* (L.) Moench [Poaceae]). *E. pallens* has wide distribution extending from Cape Verde Islands through Africa and southeast Asia to Indonesia, China, Japan, and is an important species of economic importance. It not only feeds on peanuts (groundnuts) in field and storage, also on sesame (see Sweet 2000a for details).

Diagnosis:

This genus is superficially similar to *Dieuches* (see above), but differs from it particularly in the characters given in italic font below.

Body elongate, ovate.

Head triangular; finely punctate; antennal tubercles visible from above. Eyes almost in contact with anterior margin of pronotum. Antennae with first segment exceeding tip of head by 1/2.

Pronotum wider than long; disc of anterior half dark brown to black and posterior half pale with fuscous punctures; disc often with a median transverse impression; *lateral margins gently convex, lateral carina to pronotum uniformly broad and expanded in middle, carina not turned dorsal*; posterior margin concave; covered with finer punctures on anterior half than those on posterior half. Scutellum punctate; longer than wide; dark brown with an apical V-shaped pale spot; with basal half shallowly excavate. Hemelytra pale with brown punctures and patches; apical angle fuscous; clavus with more than three rows of punctures; corium densely punctate, without a pale apical spot. Legs with fore femora moderately incrassate and with few small ventral spaced spines; tibiae with erect stout bristles; fore tibiae in male curved and with small spines in distal half; posterior tarsi with basal segment more than twice combined length of two apical segments.

Abdominal venter dark brown with sternal connexiva with pale areas.

Key References: Gross & Scudder 1963.

Remarks: A lot of existing literature pertaining to economic damage alludes to *Elasmolomus sordidus* (Fabricius), which is now a junior synonym of *E. pallens*.

Genus *Poeantius* Stål, 1865

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE RHYPAROCHROMINI]

(PLATE 38C, D)

Type species: *Rhyparochromus nigropictus* Stål, 1855, by monotypy.

Number of Australian (and World) species: 1 (19).

Extralimital Distribution: Afrotropical, Oriental and Palaearctic regions.

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

Economic Significance: No.

Hosts / feeding: Granivore; herbivore.

Diagnosis:

Body below dark brown with coxal covers and posterior margin of metapleurae ochraceous.

Head triangular. Antennal tubercles not visible from above.

Pronotum with a transverse impression; narrow lateral carinae; anterior lobe with punctures denser and finer than on posterior lobe; posterior margin shallowly concave.

Scutellum deeply punctate; longer than wide. Hemelytra with apical half more or less castaneous and with a subapical pale spot to corium; clavus with more than three rows of punctures; corium with dense irregular punctures in addition to two rows along claval suture; membrane with pale areas near base.

Legs with fore femora moderately swollen and a small sub-apical spine and a few stiff bristles in female, but in male 3 or 4 spines in apical half and fore tibiae with 4 or 5 small spines; posterior tarsi with basal segment twice as long as apical two segments together.

Key References: Gross & Scudder 1963.

TRIBE *Stygnocorini*

(PLATE 40A, B)

Diagnosis:

Body short and stout.

Head declivent; eyes nearly touching margin of pronotum; vertex without longitudinal grooves near ocelli.

Pronotum with collar present, lateral margin subcarinate to explanate. Hind wing with hamus and secondary veins strongly developed.

Abdominal spiracles ventral. Inner laterotergites present.

Male genitalia: Aedeagus with well-developed body, ventral neck, and proximally directed wings; holding sclerites usually absent. Female genitalia: Spermatheca with spherical sclerotized bulb and long, thin, 2-parted duct.

Nymphs with Y-suture present. Dorsal abdominal scent-gland openings present between terga III–IV, IV–V and V–VI. Abdominal colour reddish.

Key References: Sweet 1967, Schuh & Slater 1995.

Number of Australian genera: 1.

Genus *Tasmanicola* Slater & Sweet, 1970

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE STYGNOCORINI]

(PLATE 40A, B)

Type species: *Tasmanicola truganinae* Slater & Sweet, 1970, by monotypy.

Number of Australian (and World) species: 1 (1).

Extralimital Distribution: None.

Australian Distribution: New South Wales, Queensland, Tasmania.

Economic Significance: No.

Hosts / feeding: Granivore; herbivore. Ex moss, ex *Nothofagus* forest. Closed forest.

Diagnosis:

Antennae with segments 2 and 3 slender, 4 narrowly fusiform, segment 1 exceeding tip of tylus by half.

Pronotum with lateral margin sharply and acutely carinate; transverse impression obsolete; bicoloured with pale posterior lobe; posterior lobe prominently punctate. Scutellum with a shallow median impression, lacking a carina. Clavus with three distinct rows of punctures, an irregular field between inner and median rows.

Legs with fore femora slender, only slightly incrassate, armed blow on distal 1/3 with a single sharp spine.

Abdomen with venter shining.

Male genitalia: Aedeagus with gonoporal process extremely elongate and unsclerotized.

Key References: Slater & Sweet 1970.

TRIBE Targaremini

(PLATE 40C, D; PLATE 41A, B)

Diagnosis:

Body usually small to medium sized (2 – 6 mm).

Abdomen with all spiracles ventral. Trichobothria on abdominal sternum V located anterior to spiracle, usually equidistant from one another, in linear sequence as in Lethaeini and many Antillocoriini.

Nymphs with a Y-suture.

Key References: Schuh & Slater 1995, Malipatil 1977a.

Number of Australian genera: 6.

Genus *Hebrolethaeus* Scudder, 1962

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE TARGAREMINI]

(PLATE 40C, D)

Type species: *Lethaeus aurantiacus* Distant, 1914, by original designation.

Number of Australian (and World) species: 2 (5).

Extralimital Distribution: Australian (outside Australia) region.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Granivore; herbivore.

Diagnosis:

Body above generally dark.

Head with eyes almost touching anterior margin of pronotum; clypeus not reaching end of 1st antennal segment; area of head before eyes shorter than length of 1st antennal segment; head finely pilose and indistinctly punctate above. Ocelli and head trichobothria distinct. Antennae with first segment as long as head; second a little longer than third; third and fourth subequal. Labium at most just reaching hind coxae; first segment almost reaching base of head.

Pronotum punctate on posterior lobe area; pilose; wider than long; lateral margins broadly carinate (not as broadly as in *Lachnophoroides*), pale and almost straight; anterior margin with V-shaped dorsal collar, delimited from disc by row of punctures; disc with faint median transverse impression. Scutellum longer than wide; distinctly punctate; basal half brown and excavate in centre; apical half with a central brown raised line. Hemelytra with apical margin straight; corium with two rows of punctures adjacent to claval suture; clavus with three rows of punctures. Fore femora moderately incrassate and with one two subapical spines. Ostiolar peritreme non-auriculate.

Key References: Scudder 1962c, 1981, Ashlock 1964, Distant 1914.

Genus *Lachnophoroides* Distant, 1914

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE TARGAREMINI]

(PLATE 41A, B)

Type species: *Lachnophoroides ornatipennis* Distant, 1914, by monotypy.

Number of Australian (and World) species: 2 (5).

Extralimital Distribution: Australian region.

Australian Distribution: Queensland.

Economic Significance: No.

Hosts / feeding: Granivore; herbivore. *L. thompsoni* Woodward – Granivore (associated flora: Chinese Huckleberry, *Celtis sinensis* Pers. [Ulmaceae]). Moss on tree trunks.

Diagnosis:

Antennae long, about as long as from apex of head to base of membrane; first segment well exceeding tip of head; second longer than first; fourth shortest.

Pronotum as long as broad; anterior collar-like area delimited by a shallow, finely punctate impression not reaching lateral pronotal margins; lateral margins with carina broad, as wide as or wider than width of an antenna. Scutellum centrally foveate.

Anterior femora long, narrowed apically and basally, finely spined ventrally; anterior tibiae in male strongly curved, as long as femora, finely spined ventrally.

Key References: Woodward 1977, Eyles 1967, Distant 1914.

TRIBE Udeocorini

(PLATE 41C, D; PLATE 42)

Diagnosis:

Superficially similar to Myodochini in particular, but differs in the following:

Pronotal margins rounded, carinate, or explanate.

Abdomen with inner laterotergites present. Stridulatory mechanism absent.

Male genitalia: Aedeagus with conjunctiva never spined.

Nymphs with Y-suture well developed; abdomen often with extensive black sclerotized region.

Key References: Sweet 1967, Schuh & Slater 1995.

Number of Australian genera: 10.

Genus *Euander* Stål, 1865

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE UDEOCORINI]

(PLATE 41C, D)

Type species: *Pachymerus lacertosus* Erichson, 1842, by subsequent designation.

Number of Australian (and World) species: 4 (4).

Extralimital Distribution: None.

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

Economic Significance: Minor.

Hosts / feeding: Granivore; ground dweller; herbivore. *Euander lacertosus* (Erichson) – Granivore (associated flora: *Poa caespitosa* G. Forst. [Poaceae]; Sundew, *Drosera* sp. [Droseraceae]; Strawberry, *Fragaria ananassa* Duch. [Rosaceae]; Cape Weed, Cape Dandelion, *Arctotheca calendula* (L.) Levyns [Asteraceae]); in *Eucalyptus obliqua* dry sclerophyll forest, pest species of strawberries, on ground under leaves.

In Australia, *E. lacertosus* is known as 'strawberry bug' often occurring in large numbers, although primarily found feeding on achenes on the outside of the fruit rather than strawberry fruit itself (see Sweet 2000a for details).

Diagnosis:

Pronotum with posterior lobe paler than anterior lobe; as wide as head including eyes; anterior margin slightly elevated and forming an indistinct collar; lateral margins narrowed towards apex and slightly sinuate behind middle; a distinct transverse sulcus behind middle. Scutellum much longer than wide. Hemelytra with clavus and corium with rows of punctures with scattered punctures between them.

Fore femora moderately incrassate, with three large and several small teeth beneath; fore tibiae of male curved and with one large tooth towards apex. Hind tarsi with first segment about 2 times as long as apical two segments together.

Key References: Gross 1962.

Genus *Udeocoris* Bergroth, 1918

[FAMILY RHYPAROCHROMIDAE, SUBFAMILY RHYPAROCHROMINAE,
TRIBE UDEOCORINI]

(PLATE 42)

Type species: *Pachymerus nigroaeneus* Erichson, 1842, by monotypy.

Number of Australian (and World) species: 3 (4).

Extralimital Distribution: Australian (outside Australia) region.

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

Economic Significance: Minor.

Hosts / feeding: Granivore; ground dweller; herbivore. *Udeocoris nigroaeneus* (Erichson) – In tussocks. In harvested wheat field (Schuh & Weirauch 2020).

Diagnosis:

This genus is generally similar to *Euander*, but differs in lacking transverse constriction on pronotum.

Head oblong; including eyes slightly wider than anterior margin of pronotum.

Pronotum wider than long; no trace of anterior collar; lateral margins nearly straight, fairly acute or almost carinate; disc of pronotum nearly flat. Scutellum about as long as wide or longer; flat, finely punctate. Hemelytra macropterous or brachypterous with abbreviated membrane, in the latter the hemelytra coriaceous with fused clavus and corium.

Legs with fore femora moderately incrassate, with a row of four to seven small stout spines on apical half on inner ventral aspect; middle and hind femora slightly flattened; hind tarsi with first segment much longer than apical two segments combined.

Key References: Gross 1962, Eyles 1971.

GLOSSARY

- A glossary of terminology and structures referred to in this work have been provided below.
- Structures labelled in Figures 1 – 35 are not repeated here.
- For detailed explanation of individual structures, the reader is referred to Kelton 1980 & 1982, and the glossary section (pages 734–739) in True Bugs of the World book by Schuh & Weirauch 2020.

TERMINOLOGY

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

costal – lateral margin of hemelytron

declivent – sloping gradually downwards

fuscous – dark coloured

globose – like a globe

incrassate – thickened

macropterous – with fore- and hind wings fully developed and functional

mutic – without spines

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

rugose – wrinkled

sericeous – silky

stramineous – straw coloured

stylate, substylate – pointed or sub-pointed

trapeziform – a quadrilateral having no two sides parallel

truncate – squared rather than rounded at the tip

tumid – swollen

STRUCTURE

antennal segment 1 – scape of the 4-segmented heteropteran (groundplan) antenna

antennal segment 2 – pedicel of the 4-segmented heteropteran (groundplan) antenna

antennal segment 3 – basiflagellomere of the 4-segmented heteropteran (groundplan) antenna

antennal segment 4 – distiflagellomere of the 4-segmented heteropteran (groundplan) antenna

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

ejaculatory reservoir – complex differentiation of proximal end of ductus seminis in endosoma

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

flagellum (pl., flagella) – distal portion of ductus seminis, especially in Pentatomomorpha, often long and coiled in Lygaeoidea

gena (pl., genae) – ventrolateral area of anterior portion of head

gonapophysis (pl., gonapophyses) – in females, 2 pairs of sclerites derived from abdominal segments 8 and 9, together with gonocoxae and sometimes additional appendage on gonocoxa 9 forming ovipositor

gonocoxa (pl., gonocoxae) – in females, 2 pairs of sclerites derived from abdominal segments 8 and 9, together with gonapophyses and sometimes other sclerites forming ovipositor

gonopore – see **secondary gonopore**

gonoporal process – see **flagellum**

helicoid process – in some Pentatomomorpha, a parietal differentiation of endosoma delimiting conjunctiva from vesica

hemelytron (pl., hemelytra) – forewing of Heteroptera, with distinctly thickened proximal portion (corium) and membranous distal portion (membrane)

humeral angle – or **humerus (pl., humeri)**, posterolateral angle of pronotum,

inner laterotergite – slender sclerite located between laterotergite and tergum

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 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

ostiolear peritreme – area of variable shape surrounding the ostiole of the metathoracic gland

ostiole (s) – external opening of metathoracic scent gland or of dorsal abdominal scent glands

peritreme – see **ostiolear peritreme**

phallosoma – sclerotized proximal part of phallosoma

plectrum – ordinary moveable portion of stridulatory structure, see stridulitrum

secondary gonopore – opening of ductus seminis at or near apex of phallus

sperm reservoir – see **ejaculatory reservoir**

spermatheca (pl., spermathecae) – median unpaired sclerotised diverticulum of bursa copulatrix serving as sperm storage receptacle

spermathecal bulb – bulb shaped spermathecal reservoir

spermathecal duct – typically narrow portion of spermatheca between bursa copulatrix and spermathecal reservoir

spermathecal pump – part of spermatheca between spermathecal duct and spermathecal reservoir, frequently differentiated into a muscular pump with flanges

spiracle (pl., spiracles) – 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

stridulitrum – ordinary stationary portion of stridulatory mechanism, see plectrum

tarsus (pl., tarsi) – leg segment between tibia and the pretarsus, typically with 3 segments or tarsomeres

tergite (pl., tergites) – any one of the subdivisions of a tergum

tergum (pl., terga) – dorsal portion of an individual body segment, e.g., abdominal tergum 1

trichobothrium (pl., trichobothria) – specialised, slender hairlike sensory seta arising from and including tubercles or pits (bothria) on many body regions and appendages in Heteroptera.

trichoma – spicules surrounding the bothrium of trichobothria in many Heteroptera

ACKNOWLEDGEMENTS

The development of this resource would not have been possible without the generous support and assistance of various individuals and organizations detailed below. We sincerely thank them all.

Department of Agriculture and Water Resources (DAWR) provided funding for this project under The Agricultural Competitiveness White Paper, Modern Diagnostics for northern Australia [Craig Marston & James Walker]. We are grateful in particular to Craig Marston for his ongoing and appreciative co-operation and support over the entire duration of the project.

Specimens for the study were obtained from various sources, both within Australia and from overseas. Some collections were personally visited, and specimens examined by the lead author (MBM), while other collections kindly lent the specimens for study at AgriBio, Bundoora. Additionally, a small number of specimens were received from overseas colleagues as donation. We are grateful to collection managers / curators of respective collections detailed below:

- Australian Museum, Sydney [Derek Smith];
- Australian National Insect Collection, CSIRO, Canberra [Cate Lemann & Debbie Jennings];
- Museum of Victoria, Melbourne [Ken Walker];
- Northern Territory Museum, Darwin [Gavin Dally];
- Queensland Museum, Brisbane [Susan Wright, Geoff Thompson & Karin Koch];
- South Australian Museum, Adelaide [Peter Hudson];
- Victorian Agricultural Insect Collection (VAIC), Agri Bio, DJPR, Bundoora [Mallik Malipatil];
- Queensland Department of Agriculture and Forestry QDAF, Brisbane [Mark Schutz];
- NAQS Cairns [Sally Cowan];
- NAQS Darwin / Northern Territory Quarantine Intercept Collection (NTQIC) [Eliza Finlay];
- NT DAFF, Darwin [Haidee Brown];
- NSW DPI, Orange [Peter Gillespie];
- Waite Insect and Nematode Collection, SARDI, Adelaide [Helen Brodie];
- WA DPIRD Collection, Perth [Cameron Brumley].

Overseas collections and individuals:

- New Zealand Arthropod Collection (NZAC), Auckland [Marie-Claude Lariviere];
- Natural History Museum, London [Mick Webb] ;
- University of Connecticut Biodiversity Research Collection [Jane O'Donnell];
- Cuiqing Gao (China);
- Yeshwanth H M (University of Agricultural Sciences, Bangalore, India).

Photographs are a feature of this resource, and we are much grateful to all the following:

Habitus images were taken by the collaborative authors. Images of some type and other specimens were provided, with appropriate permissions for use, by the Australian National Insect Collection CSIRO (Debbie Jennings), David Cappaert and Jane O'Donnell (University of Connecticut Biodiversity Research Collection), and a few excellent professional quality images by Geoff Thompson (Queensland Museum), and Tony Daley and Kristi Ellingsen, Insects of Tasmania. [Note, source of individual image has been indicated under respective captions as appropriate].

We are grateful to Jane O'Donnell, University of Connecticut, Storrs, USA, for her critical review of versions of the manuscript, and for numerous valuable comments and suggestions that have vastly improved the paper; Mark Blacket (Agriculture Victoria, DJPR) for assistance with the molecular identification section; and Sally Cowan (DAWR), Mark Schutz (QDAF), and Linda Semeraro (Agriculture Victoria, DJPR) for review of the draft manuscript and the diagnostic keys.

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Plates

PLATE 1:

Artheneidae
& Berytidae

PLATES 2-6:

Blissidae

PLATE 7:

Colobathristidae
& Cryptorhamphidae

PLATE 8:

Cymidae

PLATES 9-12:

Geocoridae

PLATE 13:

Heterogastridae

PLATES 14-20:

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PLATE 21:

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PLATE 22:

Meschiidae

PLATE 23:

Ninidae

PLATES 24-25:

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Pachygronthidae

PLATE 27:

Piesmatidae

PLATES 28-42:

Rhyparochromidae

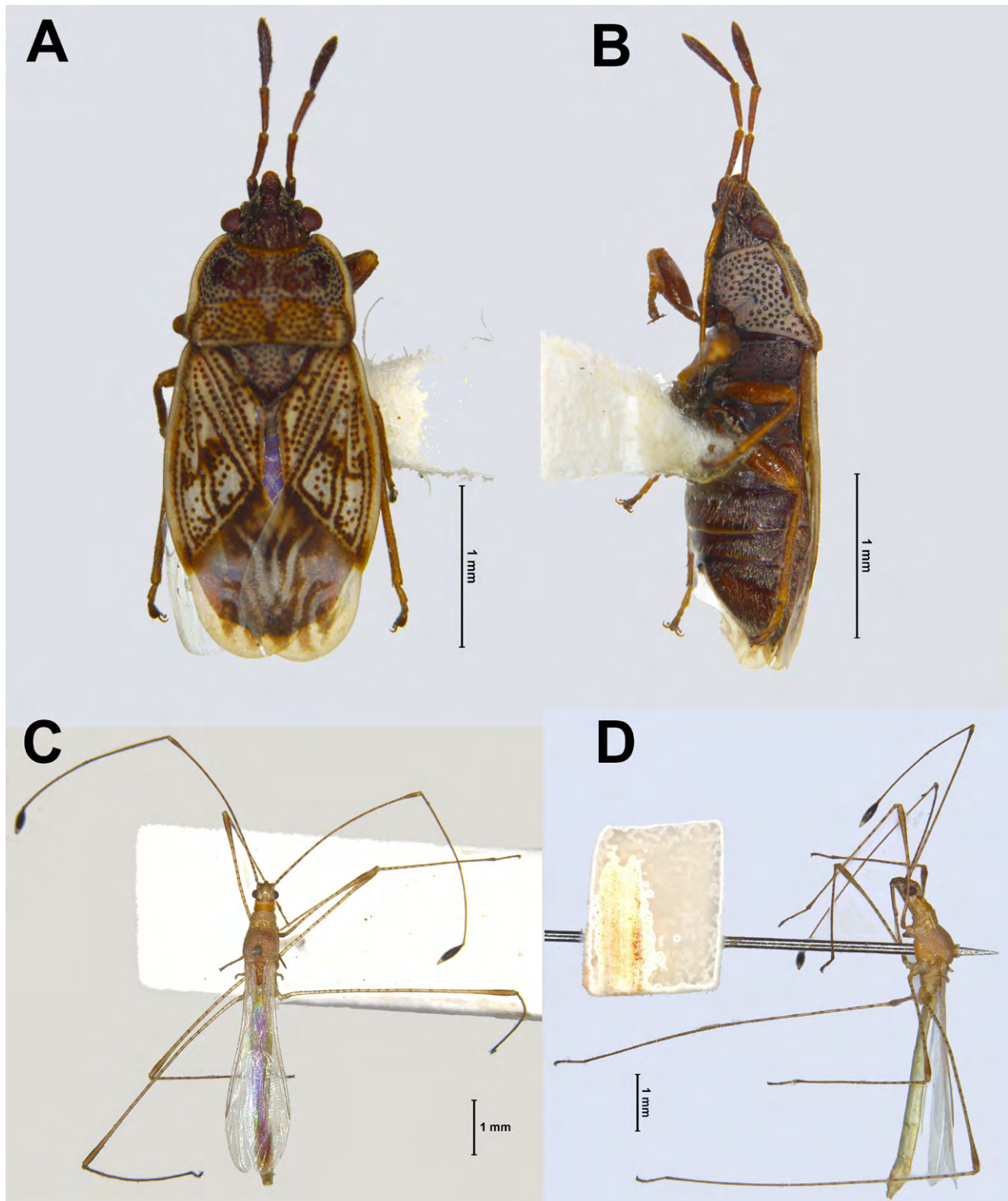


PLATE 1. ARTHENEIDAE (A&B) AND BERYTIDAE (C&D):

A, B, *Dilompus woodwardi* Malipatil female, habitus dorsal and lateral. C, D, *Metacanthus (Metacanthus) pertener* (Breddin) female, habitus dorsal and lateral. [all, Gao]

A



B



C



D



PLATE 2. BLISSIDAE:

A, B, C, *Dimorphopterus pilosus* (Barber) female, micropterous and macropterous habitus dorsal, and micropterous lateral. D, *Dimorphopterus gibbus* Fabricius male, habitus dorsal EXOTIC. [all, Gao]

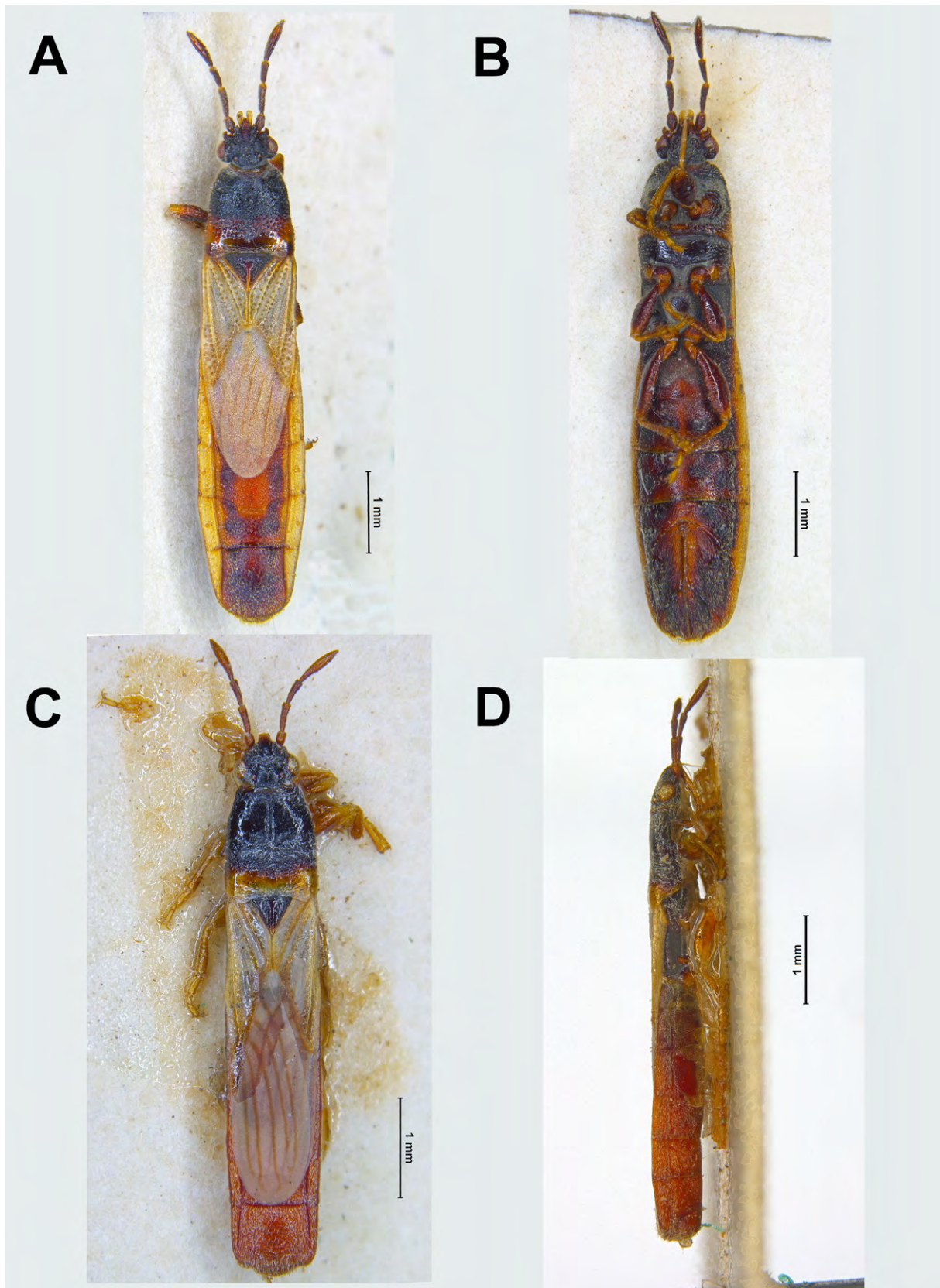


PLATE 3. BLISSIDAE:

A, B, *Iphicrates spathus* Slater female, habitus dorsal and ventral.
C, D, *Macropes australis* (Distant) male, habitus dorsal and lateral. [all, Gao]



PLATE 4. BLISSIDAE EXOTIC:

A, *Blissus leucopterus leucopterus* (Say) female, habitus dorsal. B, *Blissus leucopterus hirtus* Montandon male, habitus dorsal. C, D, *Blissus insularis* Barber male, habitus dorsal and lateral. [A, C, D, Cappaert. B, Gao]

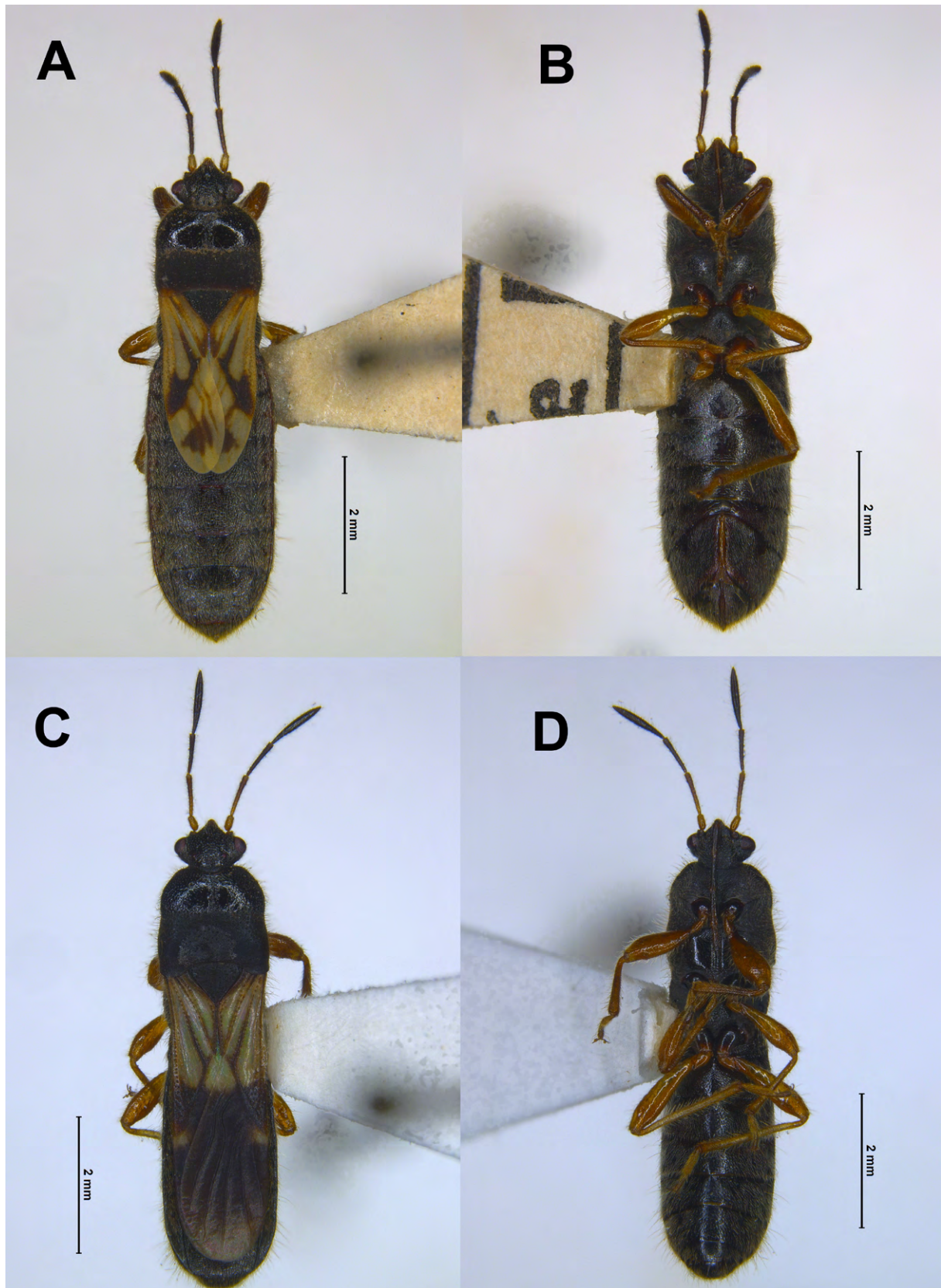


PLATE 5. BLISSIDAE EXOTIC:

A, B, *Cavalerius saccharivorus* (Okajima) female, habitus dorsal and ventral.
C, D, *Cavalerius excavatus* (Distant) male, habitus dorsal and ventral. [all, Gao]

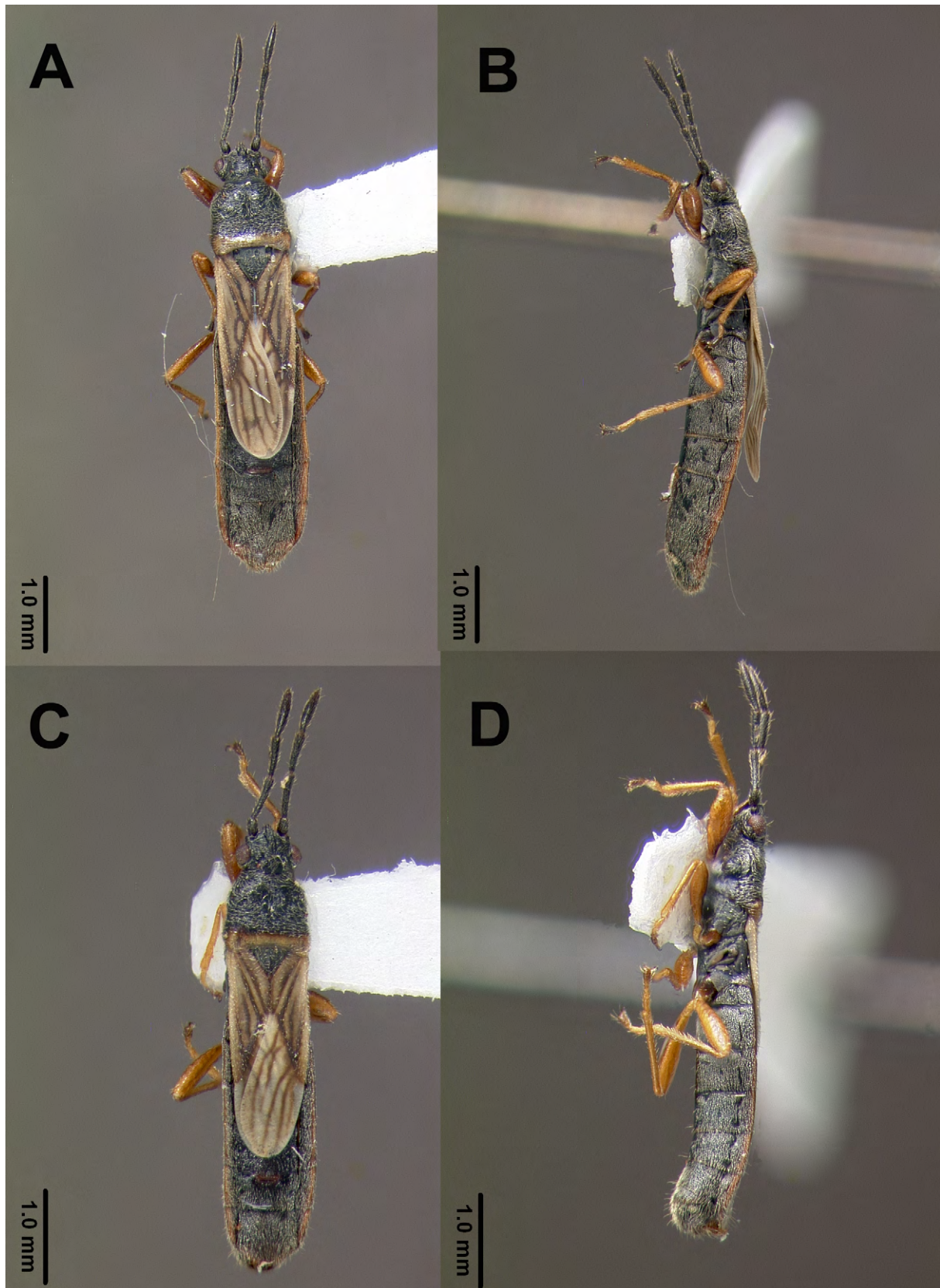


PLATE 6. BLISSIDAE EXOTIC:

A, B, *Ischnodemus falicus* (Say) female, habitus dorsal and lateral. C, *Ischnodemus falicus* male, habitus dorsal. D, *Ischnodemus noctulus* Distant, male, habitus lateral. [A, B, C, Cappaert. D, Gao]

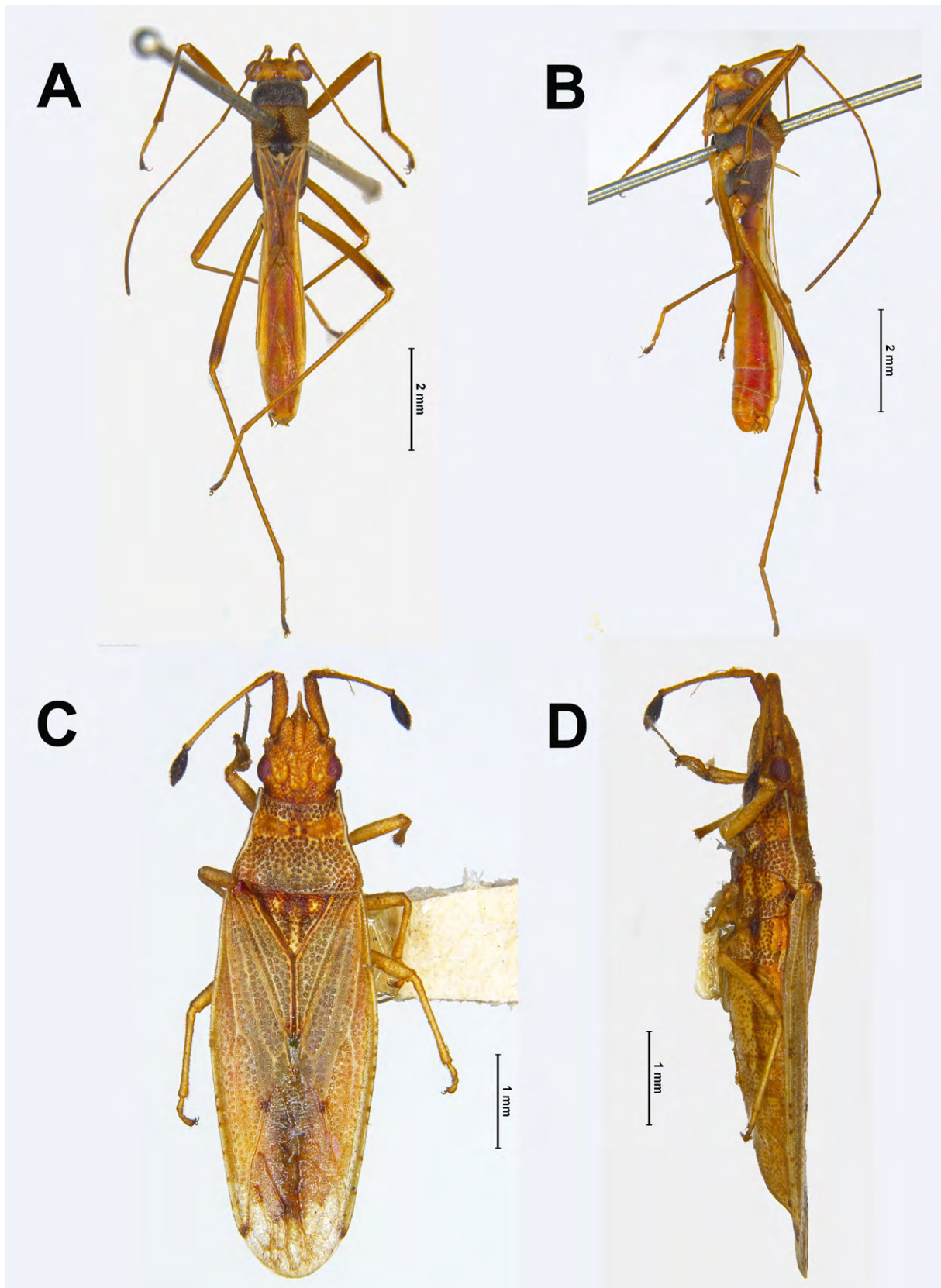


PLATE 7. COLOBATHRISTIDAE (A & B) AND CRYPTORHAMPHIDAE (C & D):

A, B, *Phaenacantha australiae* Kirkaldy male, habitus dorsal and lateral.
C, D, *Cryptorhamphus orbus* Stål male, habitus dorsal and lateral. [all, Gao]

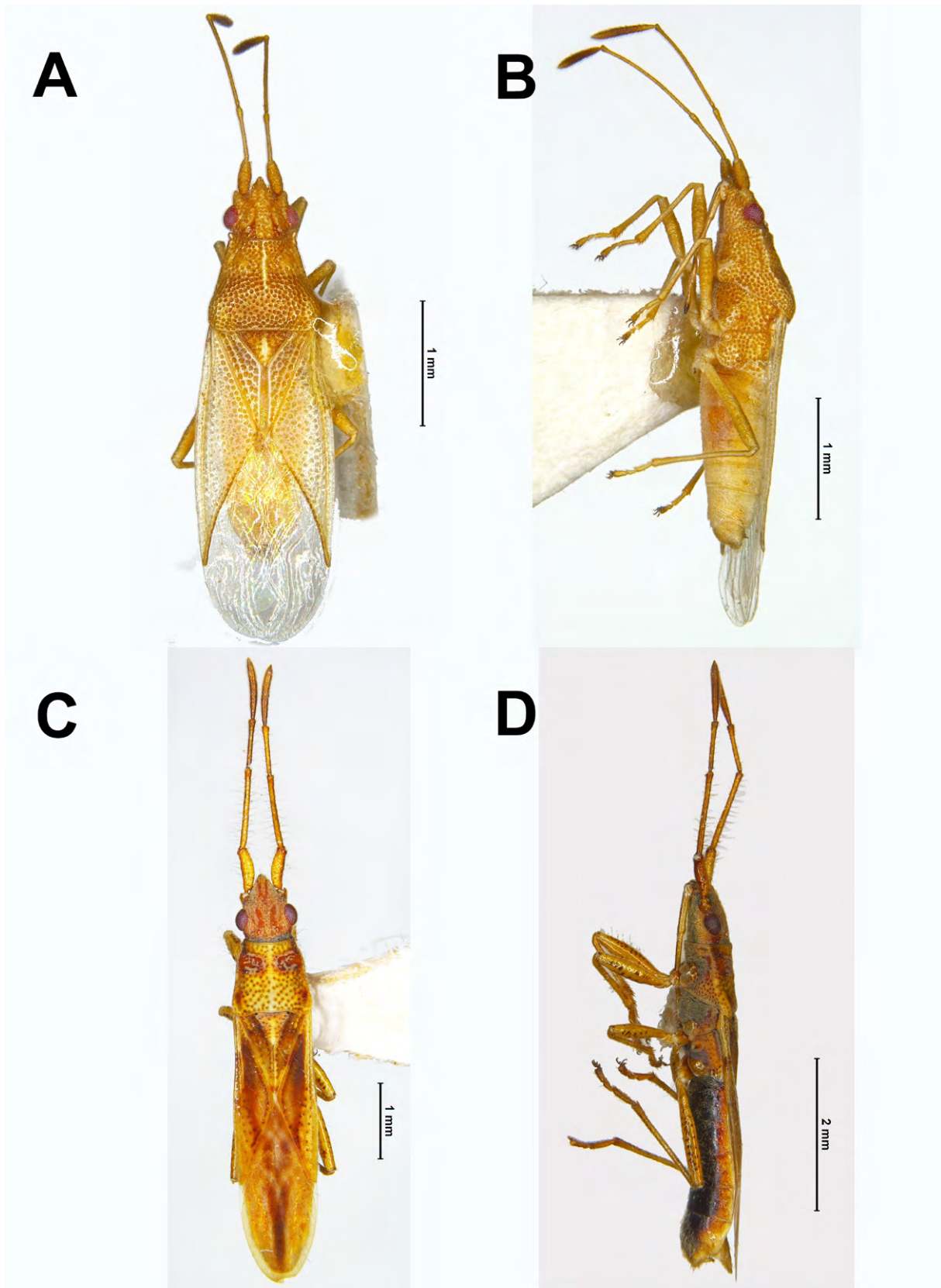


PLATE 8. CYMIDAE:

A, B, *Cymodema basicornis* (Motschulsky) male, habitus dorsal and lateral.
C, D, *Ontiscus australis* Stål male, habitus dorsal and lateral. [all, Gao]

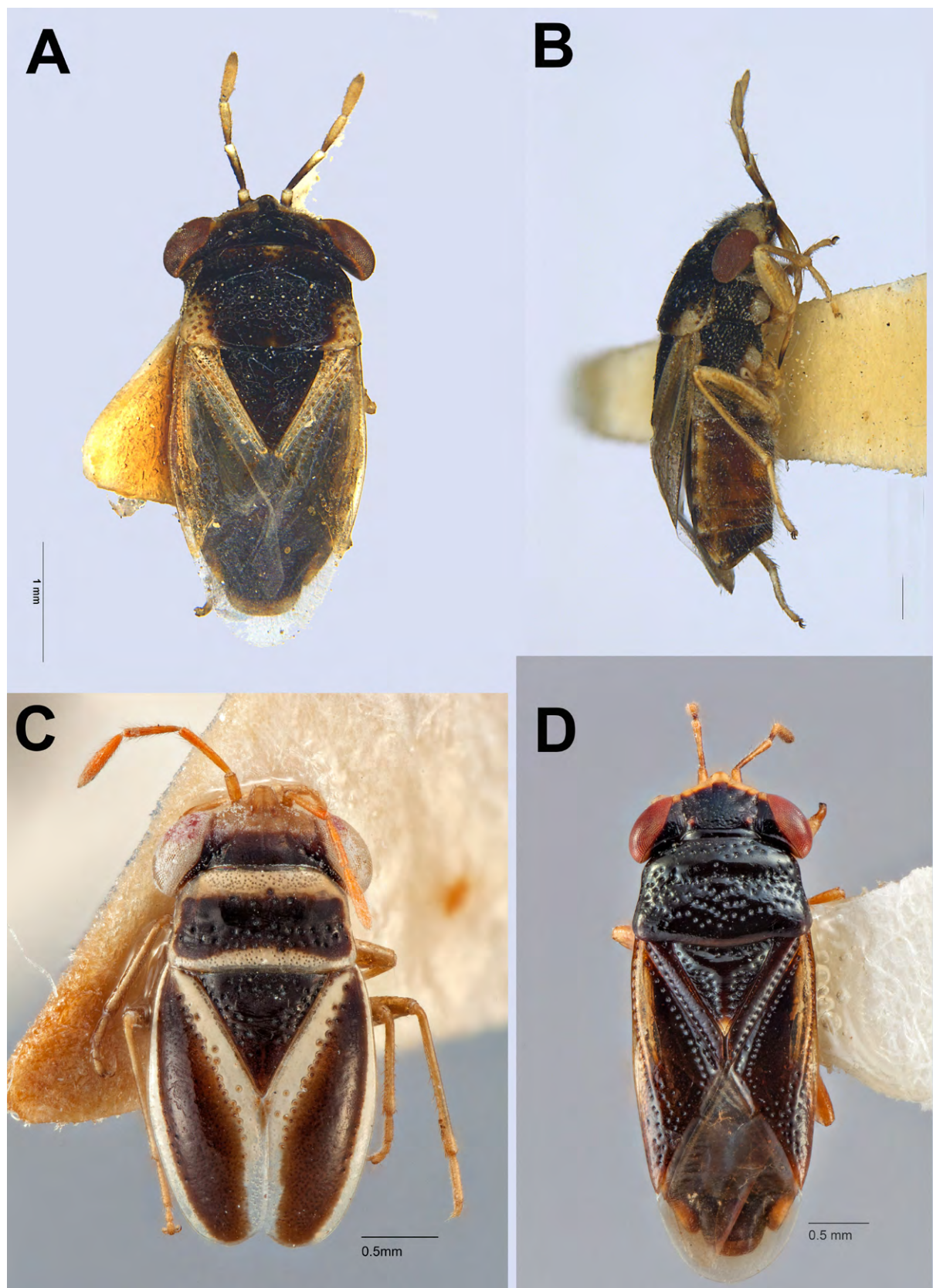


PLATE 9. GEOCORIDAE:

A, B, *Geocoris lubra* Kirkaldy male, habitus dorsal and lateral. C, *Geocoris asetosus* Malipatil paratype, habitus dorsal. D, *Stylogeocoris capricornutus* (Kirkaldy) habitus dorsal. [A, B, Eow. C, D, Thompson]

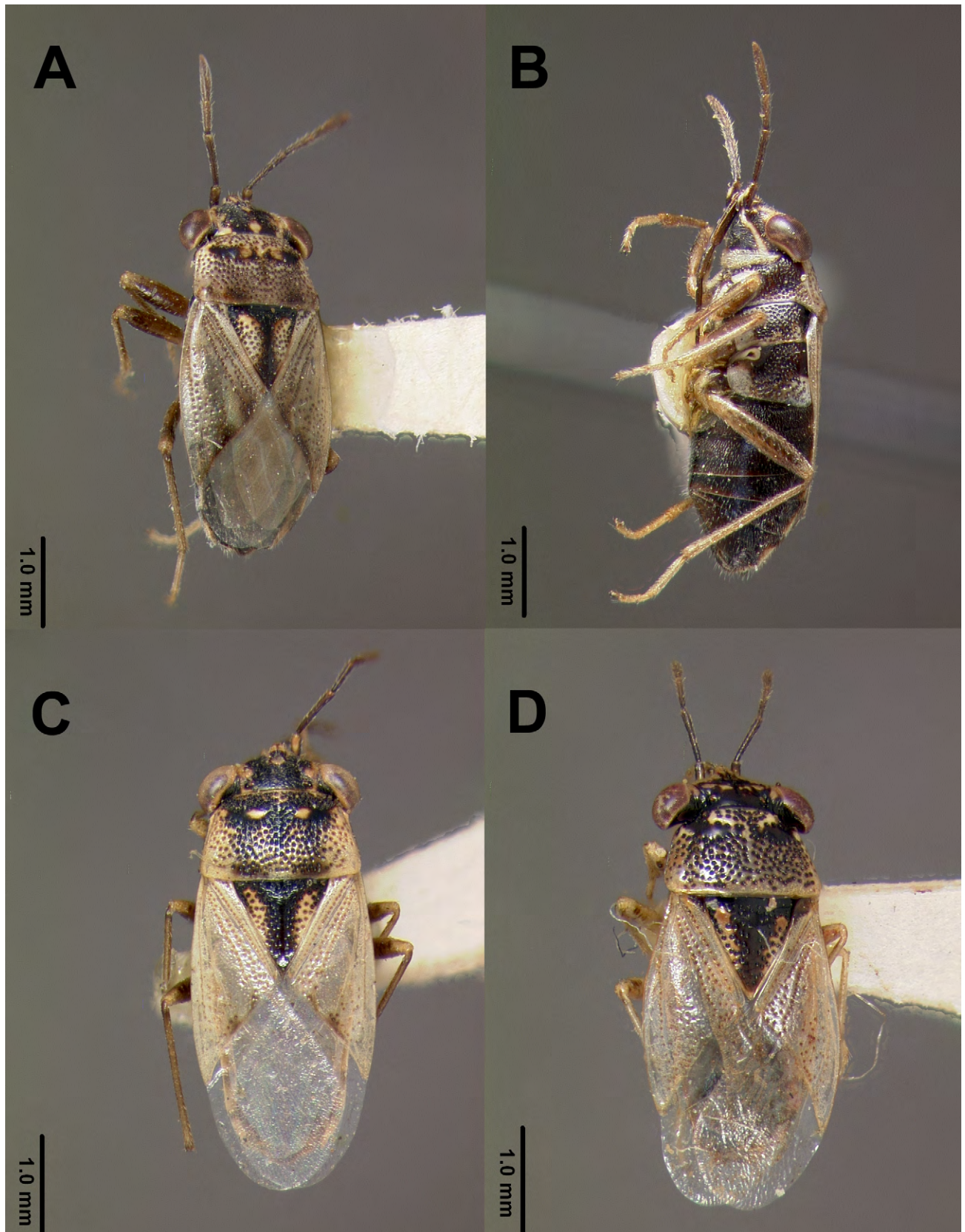


PLATE 10. GEOCORIDAE EXOTIC:

A, B, *Geocoris (Geocoris) bullatus* (Say) female, habitus dorsal and lateral. C, *Geocoris (G.) pallens* Stål female, habitus dorsal. D, *Geocoris (G.) punctipes* (Say) female, habitus dorsal. [all, Cappaert]

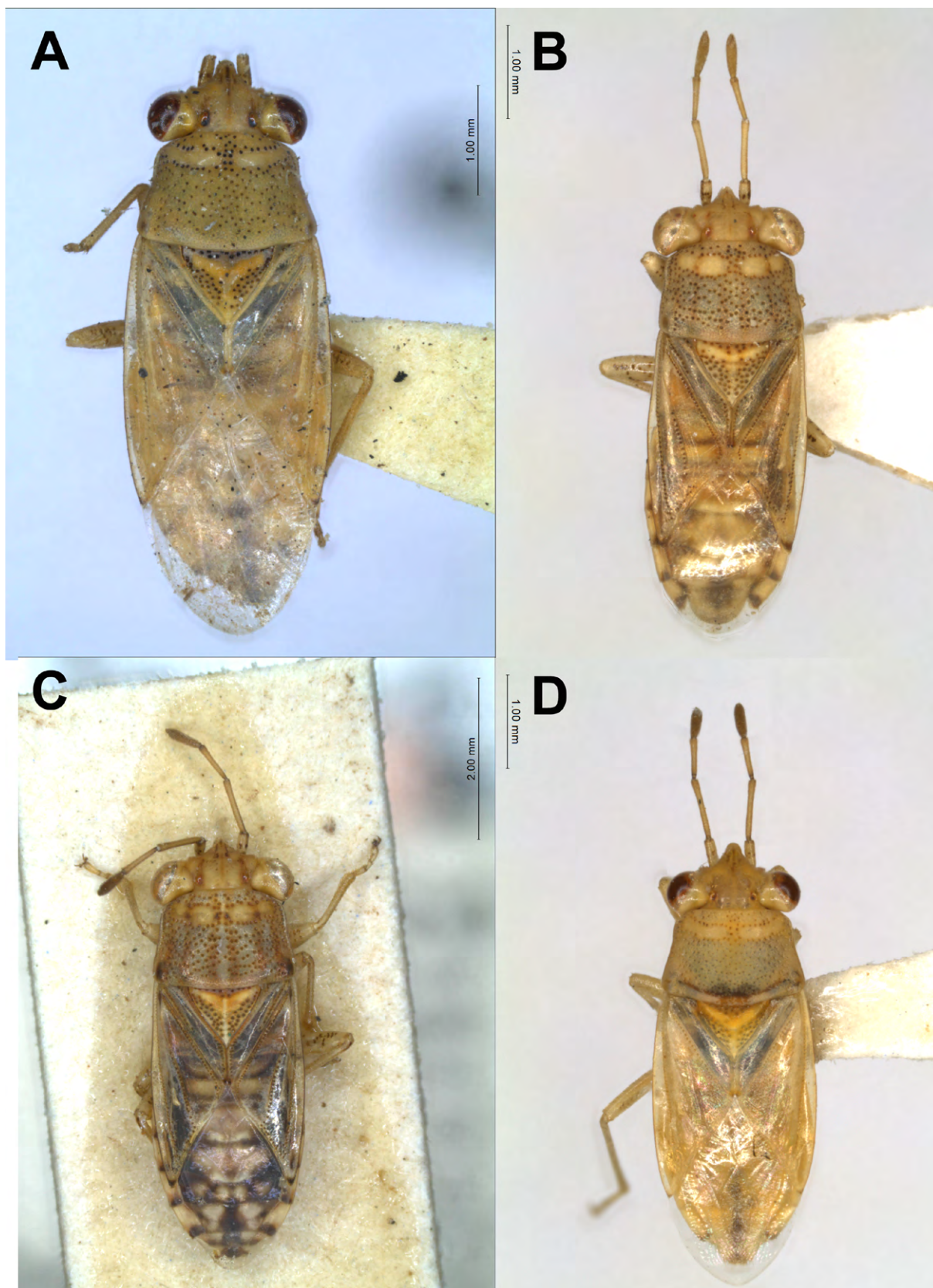


PLATE 11. GEOCORIDAE:

A, *Germalus victoriae* Bergroth female, habitus dorsal. B, C, *Germalus victoriae* male, habitus dorsal, variation in colour markings. D, *Germalus australis* Malipatil female, habitus dorsal. [all, Malipatil & Blacket]

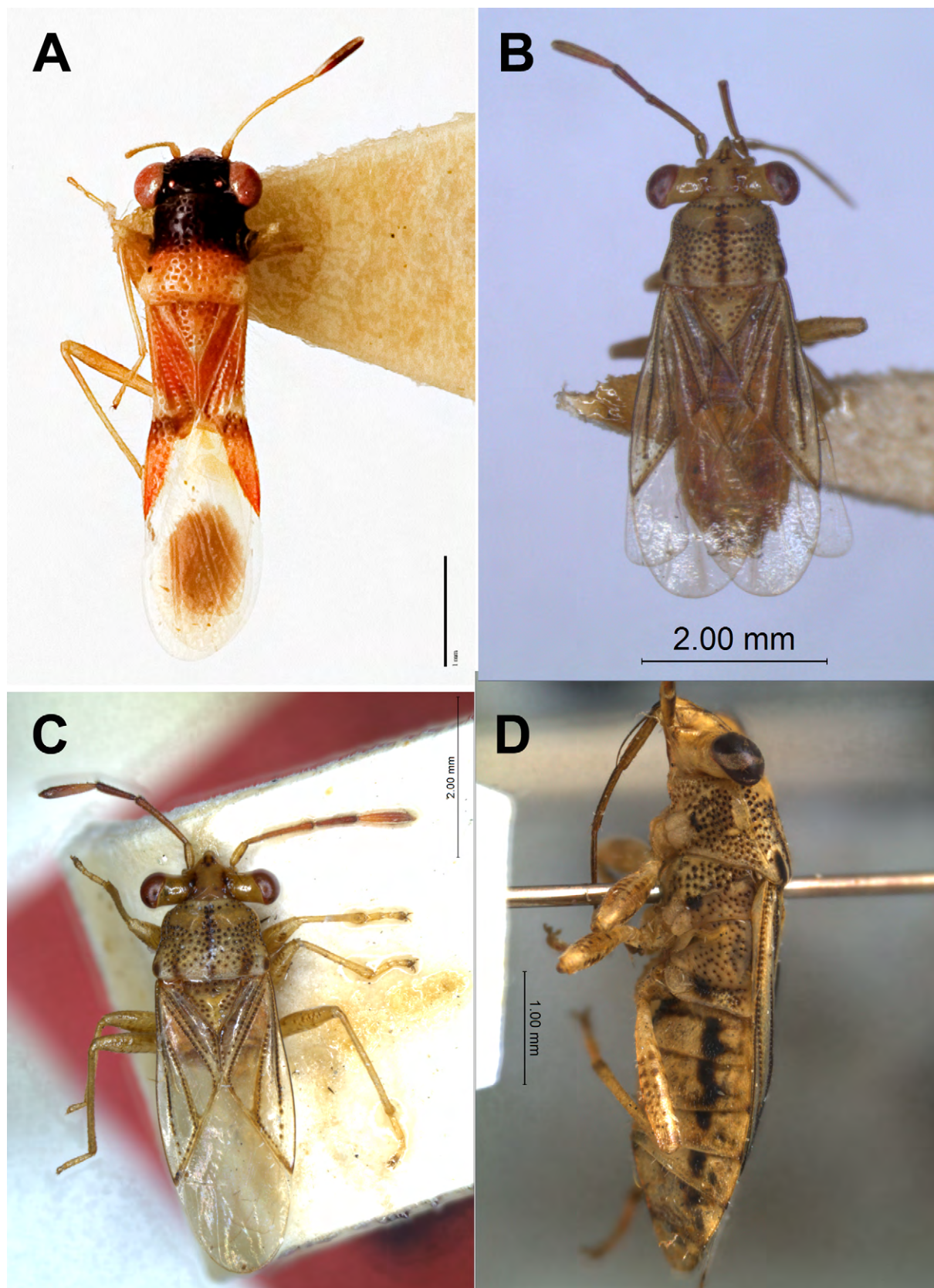


PLATE 12. GEOCORIDAE:

A, *Austropamphantus woodwardi* Slater holotype female, dorsal. B, *Australocoris kurandae* (Kirkaldy) male, habitus dorsal. C, *Australocoris kurandae* female, habitus dorsal. D, *Australocoris fuscomaculatus* Malipatil female, habitus lateral. [A, CSIRO. B, C, D, Blacket]

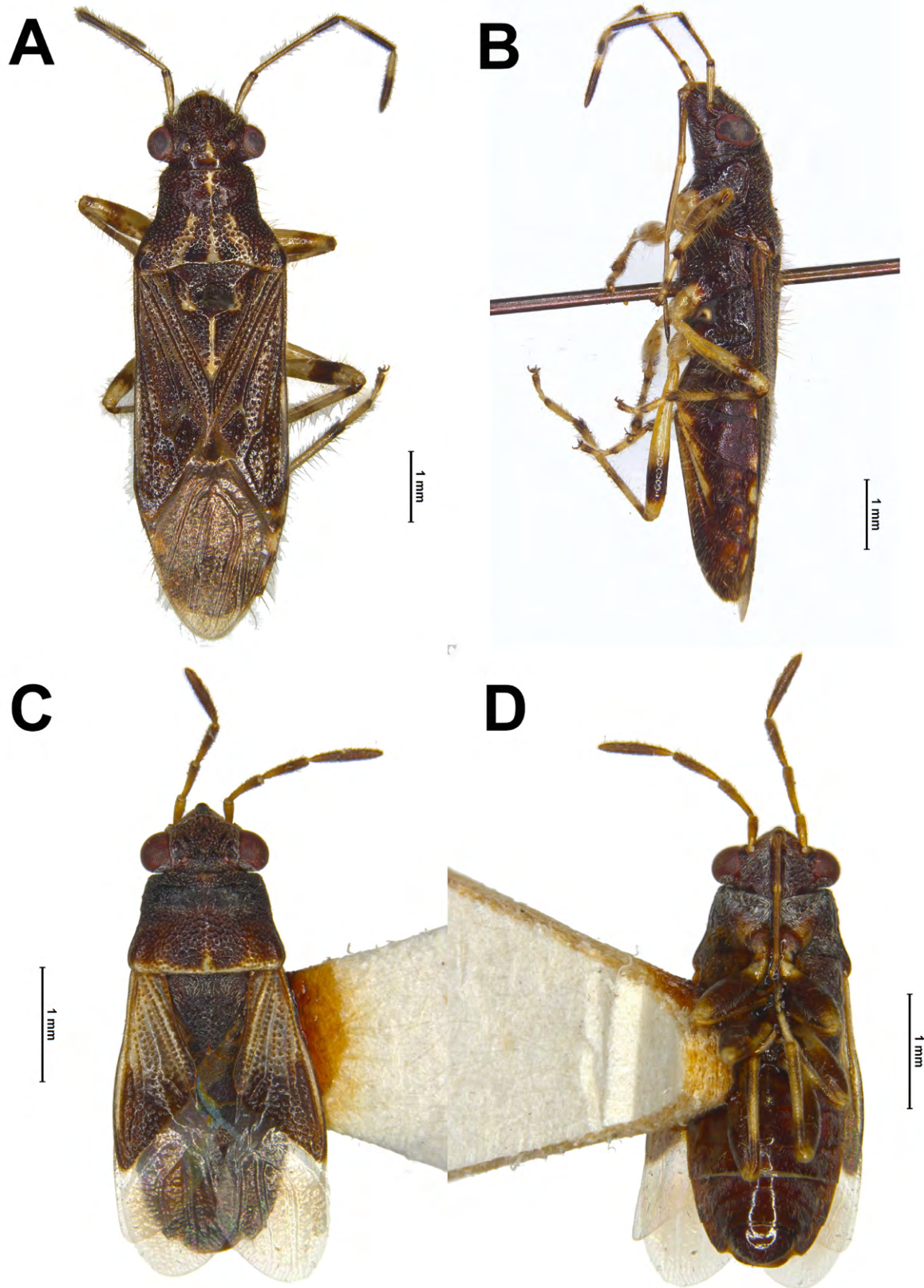


PLATE 13. HETEROGASTRIDAE:

A, B, *Parathyginus kurandae* (Distant) female, habitus dorsal and lateral.
C, D, *Sadoletus variabilis* Gao & Malipatil male, habitus dorsal and ventral. [all, Gao]



PLATE 14. LYGAEIDAE ISCHNORHYNCHINAE:

A, B, *Crompus opacus* Scudder female, habitus dorsal and lateral. C, *Acanthocrompus grandis* Scudder female, habitus dorsal. D, *Pylorgus australensis* Scudder female, habitus dorsal. [A, B, Gao. C, D, Thompson]

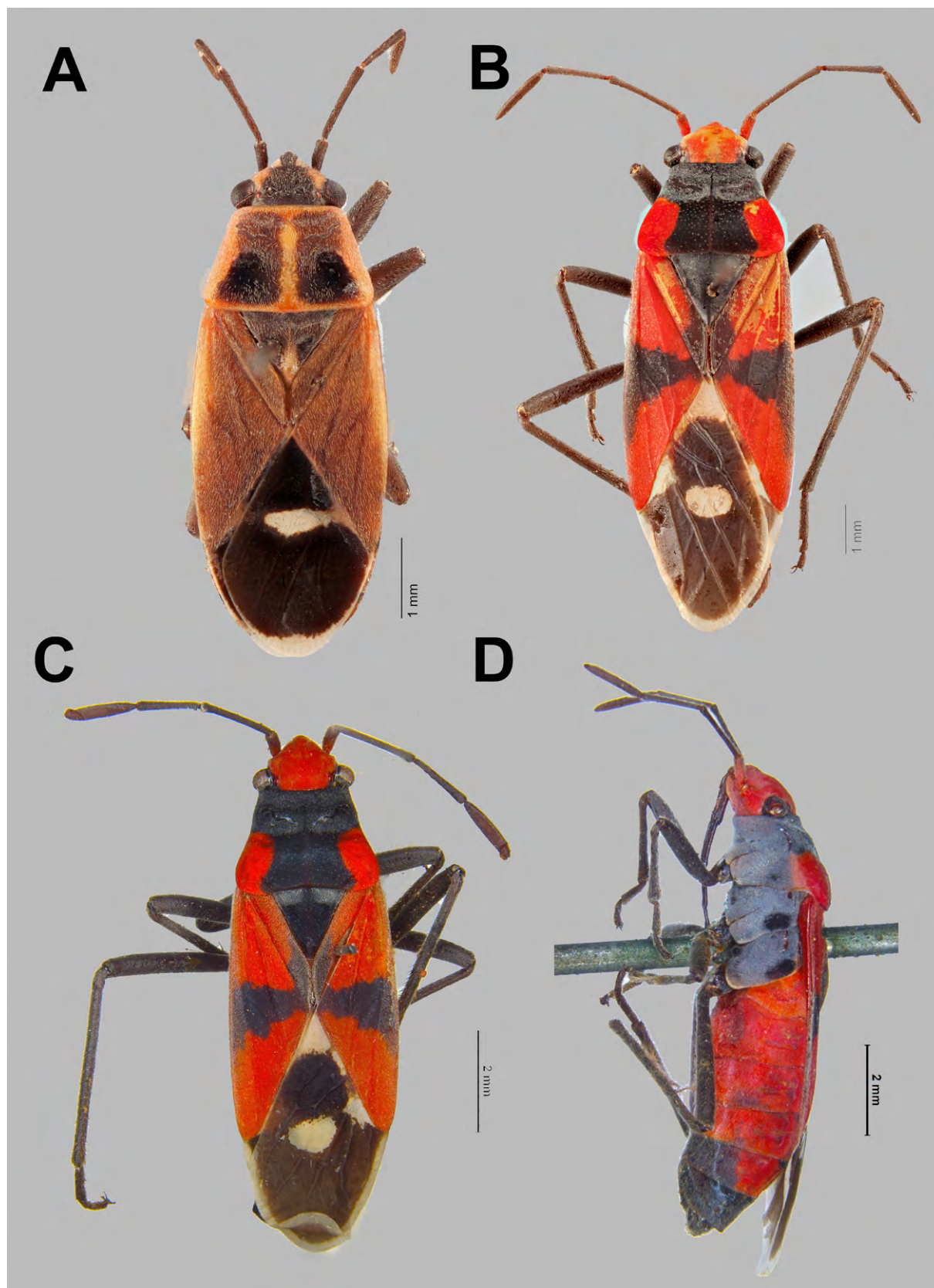


PLATE 15. LYGAEIDAE LYGAEINAE:

A, *Aspilocoryphus australicus* Stål, habitus dorsal. B, *Melanerythrus mactans* (Stål) female, habitus dorsal.
C, D, *Melanerythrus mactans* female, habitus dorsal and lateral. [A, B, Thompson. C, D, Gao]

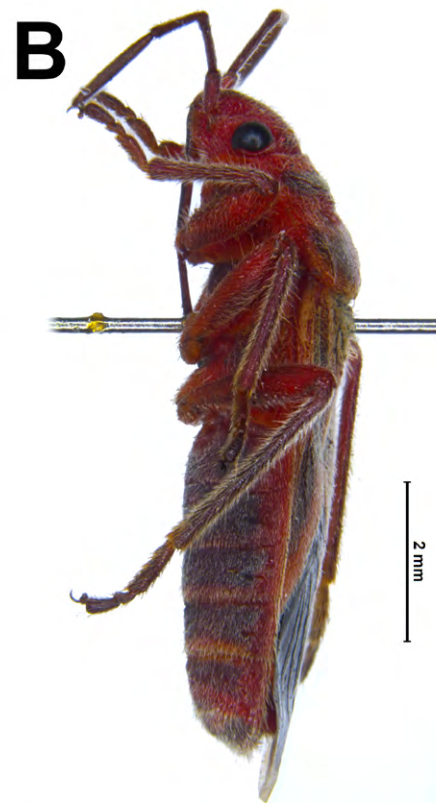


PLATE 16. LYGAEIDAE LYGAEINAE:

A, B, C, *Graptostethus servus* (Fabricius) male, habitus dorsal, lateral and dorsal.
D, *Graptostethus pubescens* Slater paratype, habitus dorsal. [A, B, C, Gao. D, Eow]

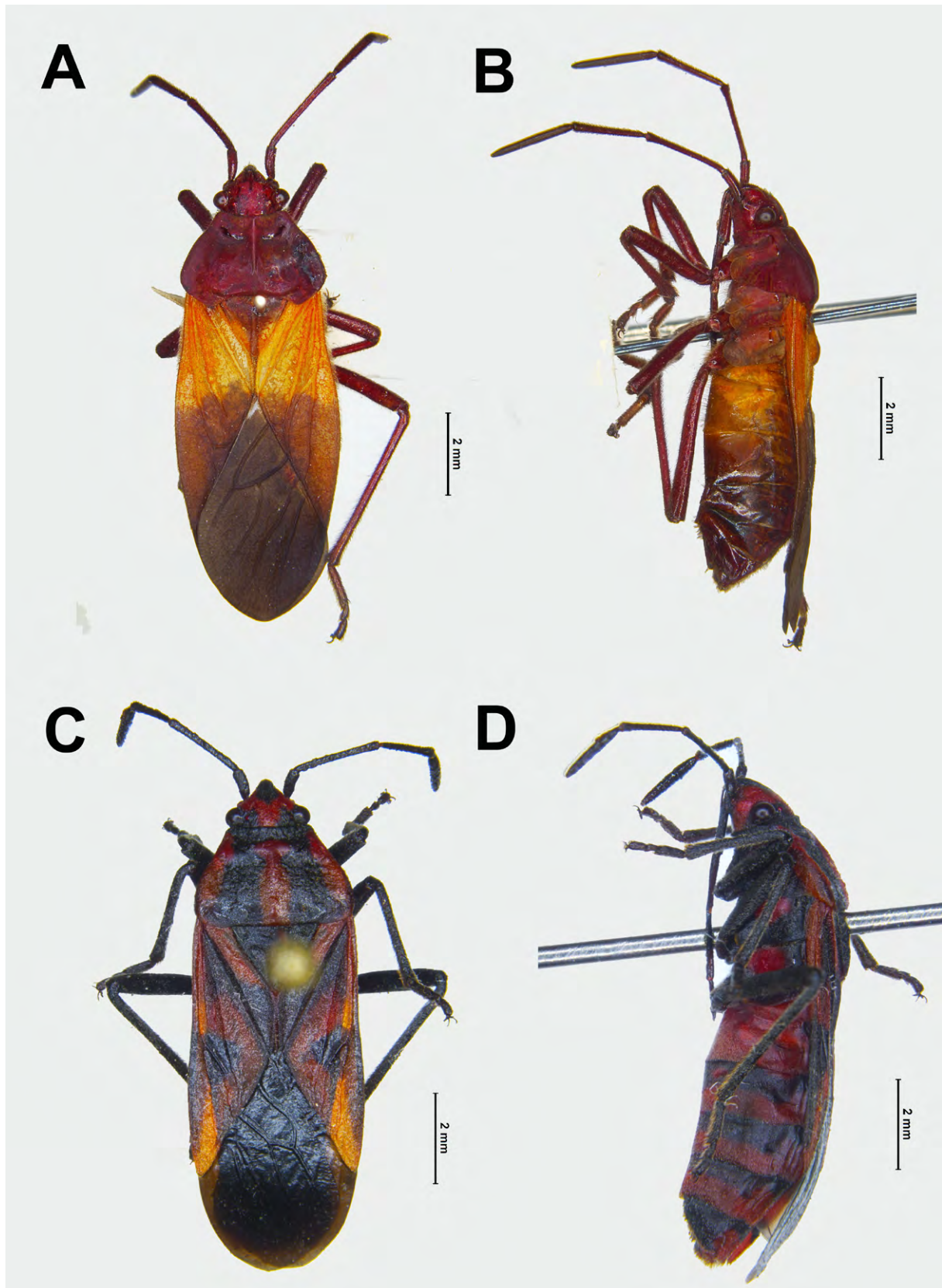


PLATE 17. LYGAEIDAE LYGAEINAE:

A, B, *Oncopeltus (Oncopeltus) sordidus* (Dallas) female, habitus dorsal and lateral.
C, D, *Spilostethus hospes* (Fabricius) female, habitus dorsal and lateral. [all, Gao]



PLATE 18. LYGAEIDAE LYGAEINAE EXOTIC:

A, B, C, *Spilostethus pandurus* Scopoli male, habitus dorsal and lateral, close up lateral.
D, *Lygaeus equestris* (L.) habitus dorsal. [A, B, C, Cappaert. D, Gao]

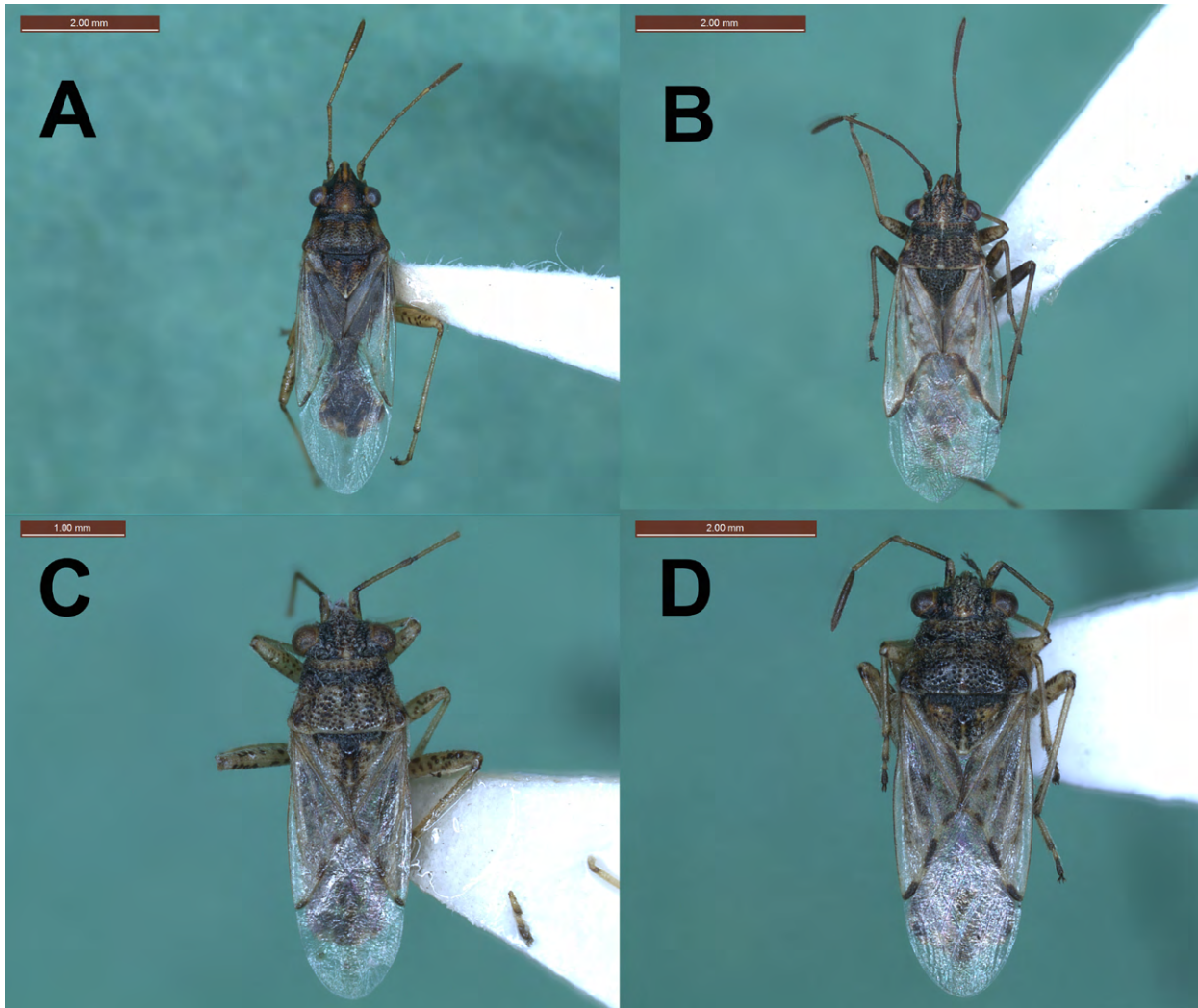


PLATE 19. LYGAEIDAE ORSILLINAE:

A, B, *Nysius vinitor* Bergroth male and female, habitus dorsal.

C, D, *Nysius caledoniae* Distant male and female, habitus dorsal. [all, Blacket]

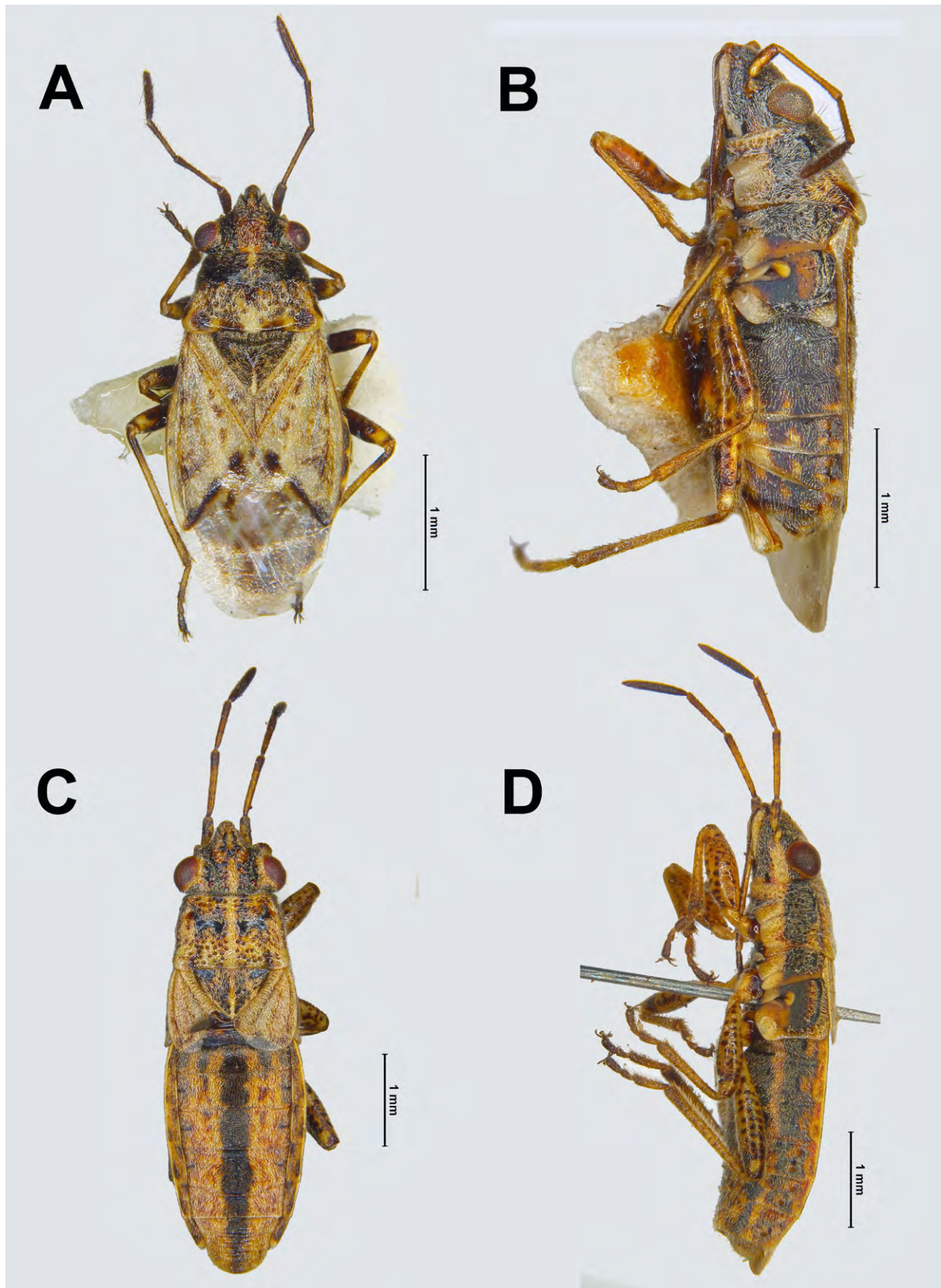


PLATE 20. LYGAEIDAE ORSILLINAE EXOTIC:

A, B, *Nysius huttoni* White female, habitus dorsal and lateral.
C, D, *Rhyodes anceps* (White) male, habitus dorsal and lateral. [all, Gao]

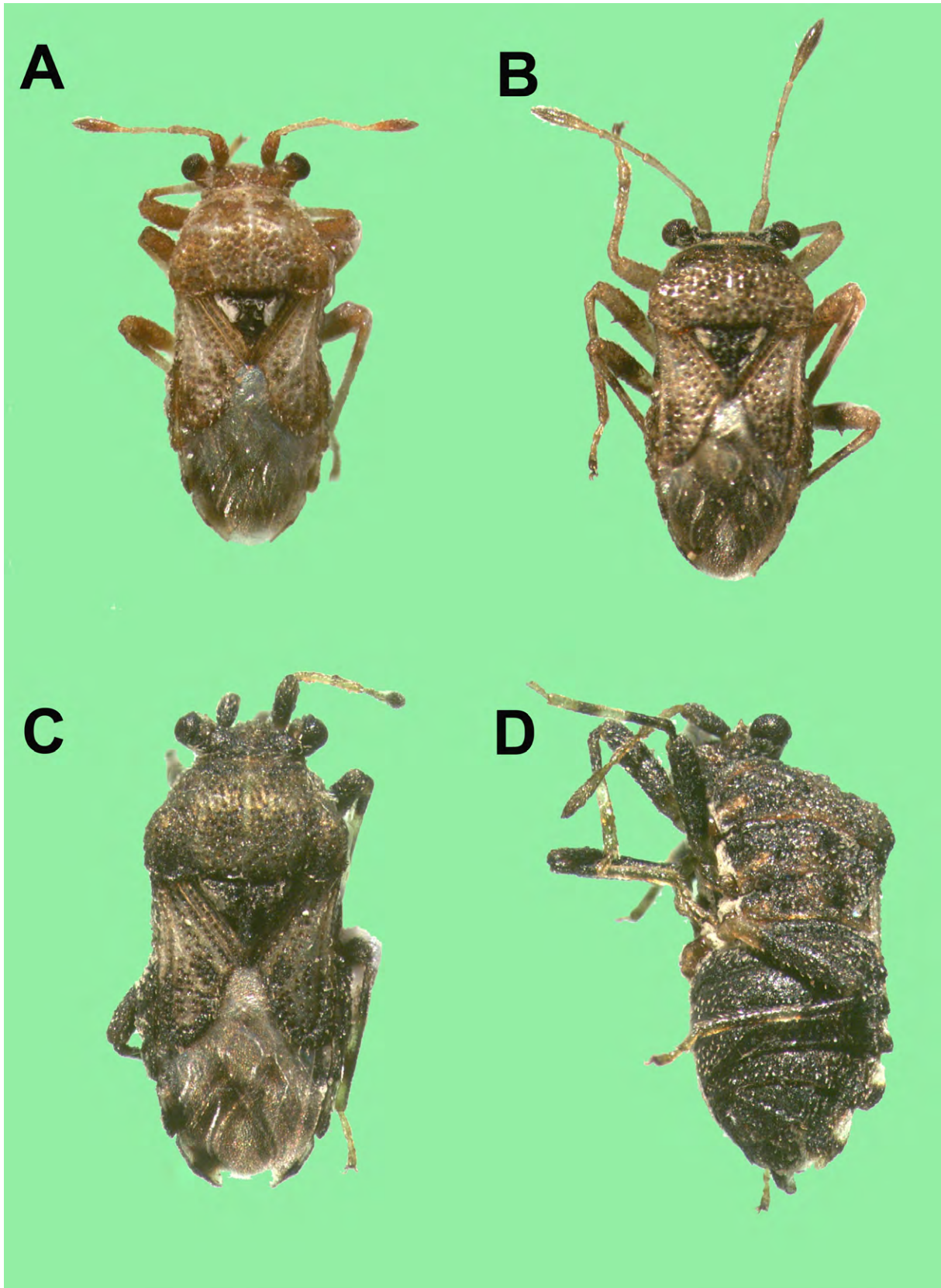


PLATE 21. MALCIDAE EXOTIC:

A, *Chauliops fallax* Scott, habitus dorsal. B, *Chauliops quaternaria* Gao & Bu, habitus dorsal.
C, D, *Chauliops conica* Gao & Bu female, habitus dorsal and lateral. [all, Gao]

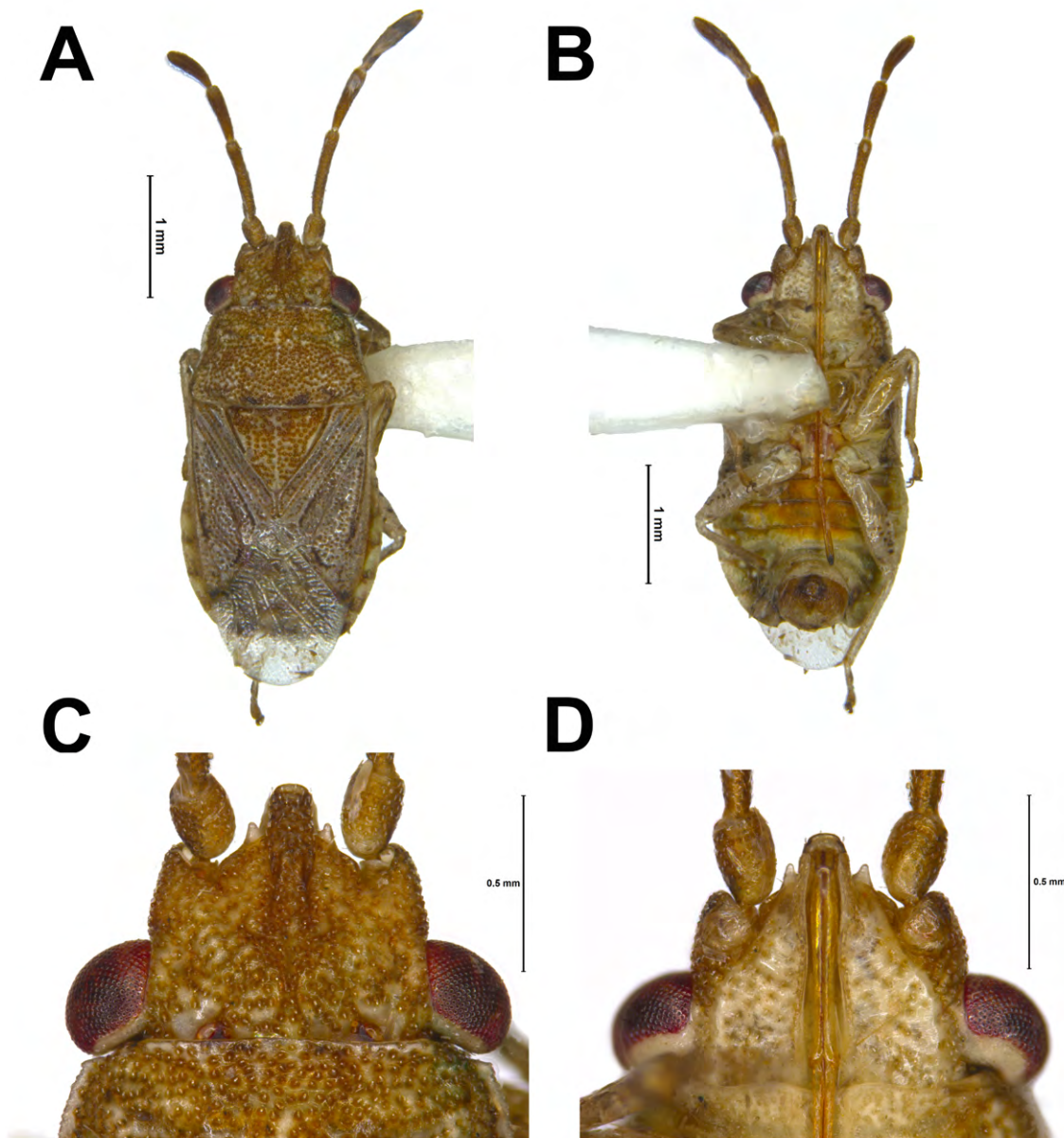


PLATE 22. MESCHIIDAE EXOTIC:

Meschia quadrimaculata Distant male.

A, B, habitus dorsal and ventral. C, D, head dorsal and ventral. [all, Gao]

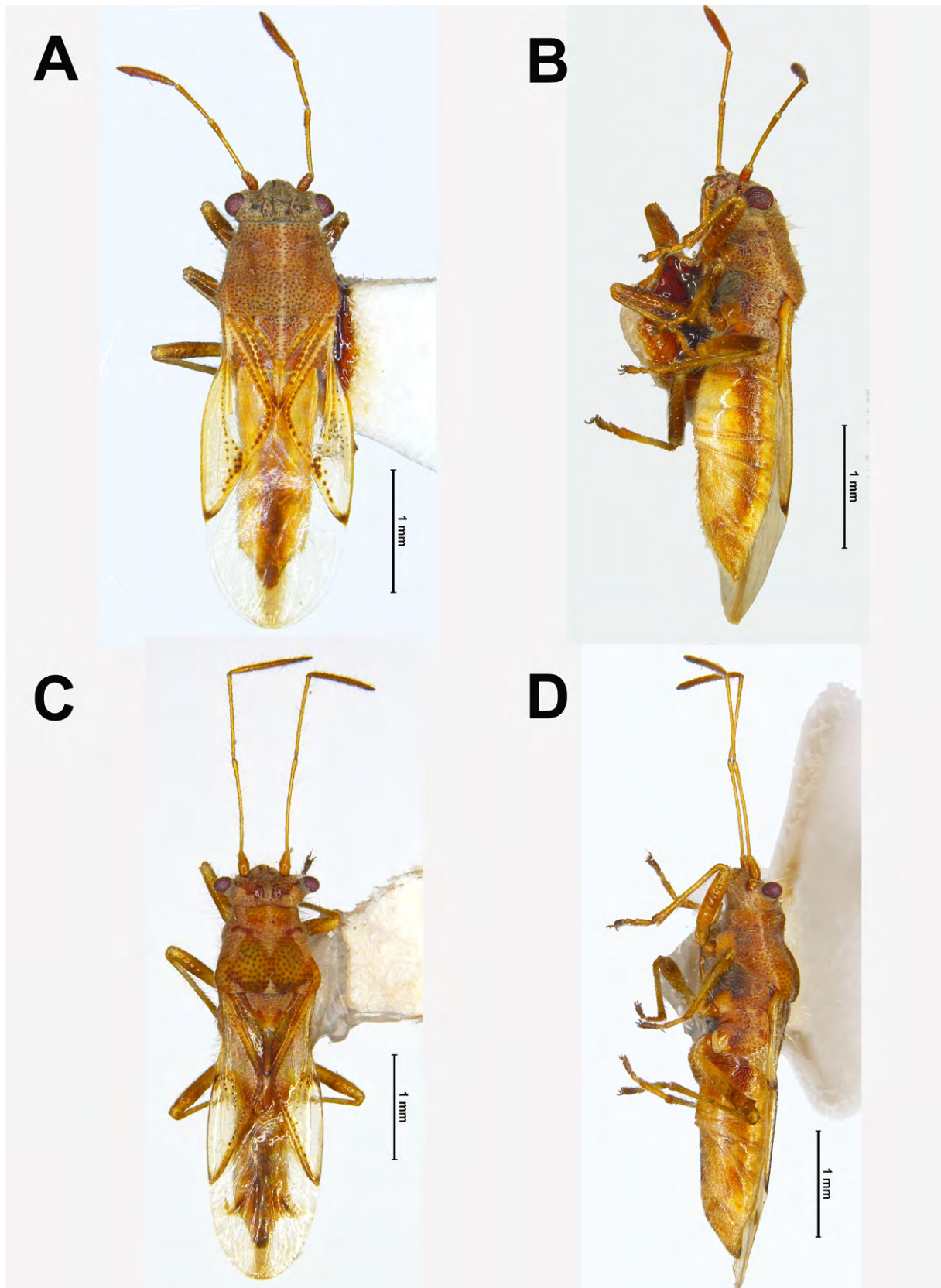


PLATE 23. NINIDAE:

A, B, *Cymoninus sechellensis* (Bergroth) female, habitus dorsal and lateral.
C, D, *Ninus insignis* Stål female, habitus dorsal and lateral. [all, Gao]

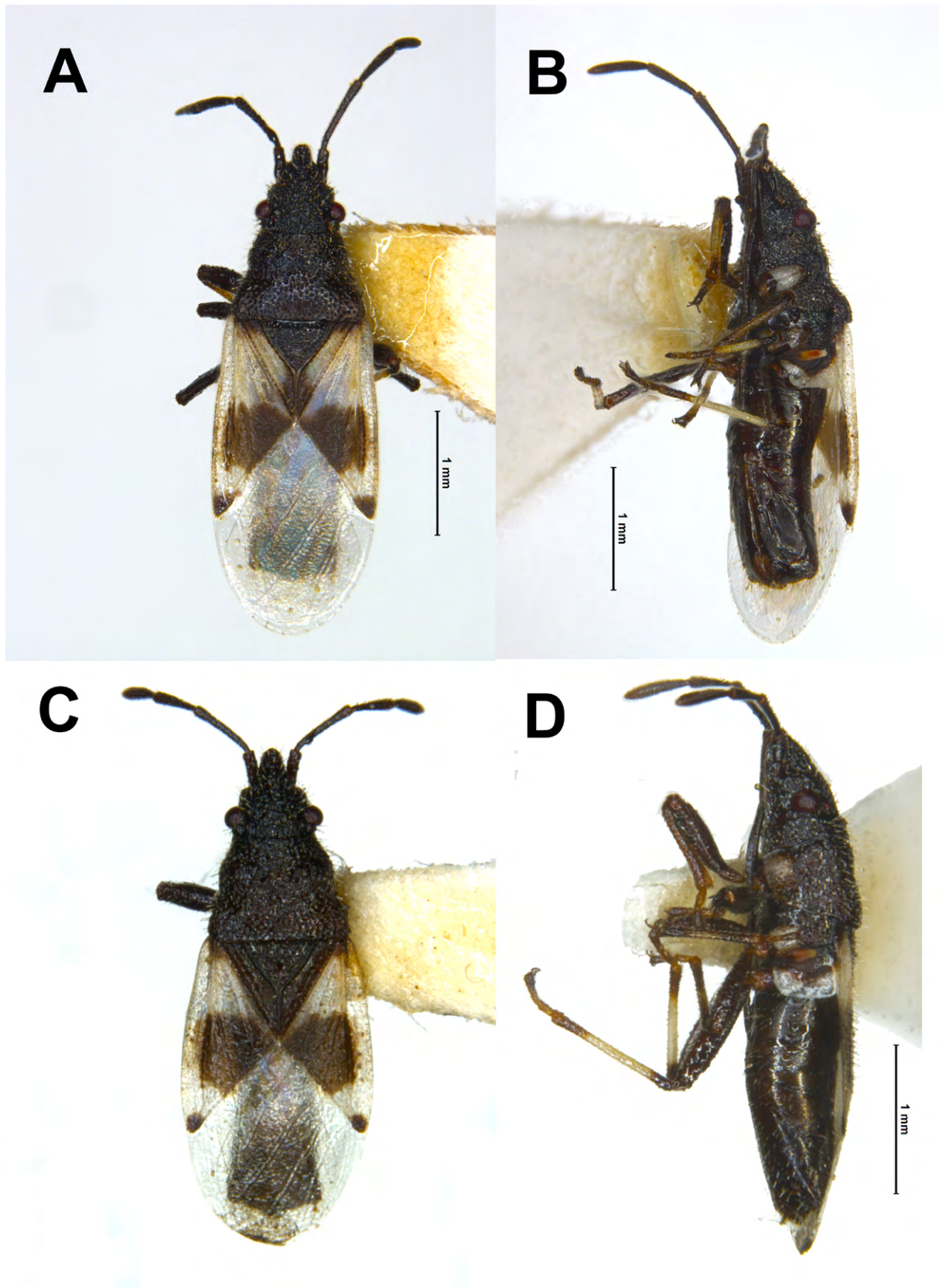


PLATE 24. OXYCARENIDAE:

A, B, *Oxycarenus (Oxycarenus) arctatus* (Walker) female, habitus dorsal and lateral.
C, D, *Oxycarenus (Oxycarenus) luctuosus* (Montrouzier) female, habitus dorsal and lateral. [all, Gao]

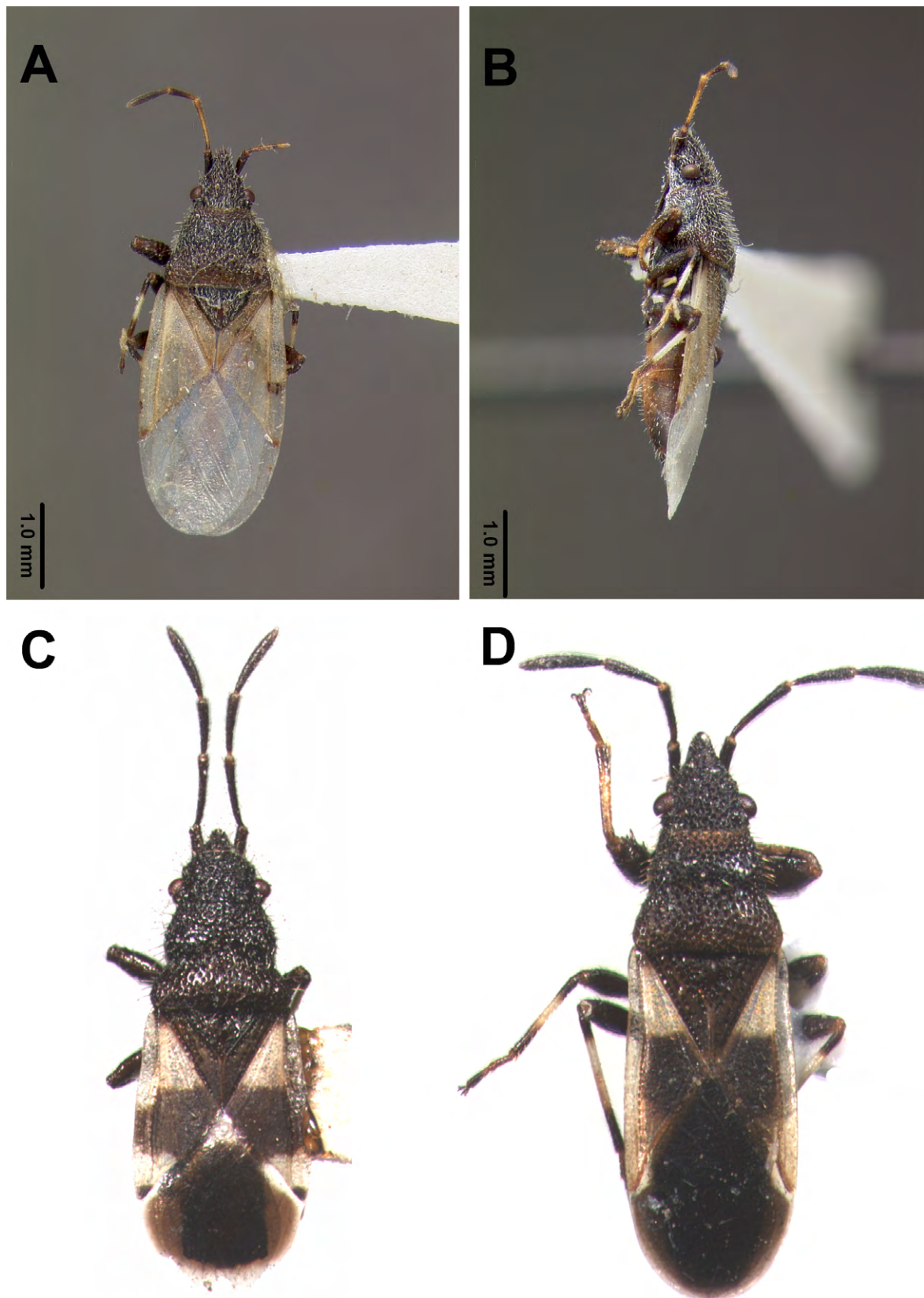


PLATE 25. OXYCARENIDAE EXOTIC:

A, B, *Oxycarenus (O.) hyalinipennis* (Costa) female, habitus dorsal and lateral.
C, *Oxycarenus (Pseudoxycarenus) modestus* (Fallen) female, habitus dorsal.
D, *Oxycarenus (O.) lugubris* (Motschulsky), habitus dorsal. [A, B, Cappaert. C, D, Gao]

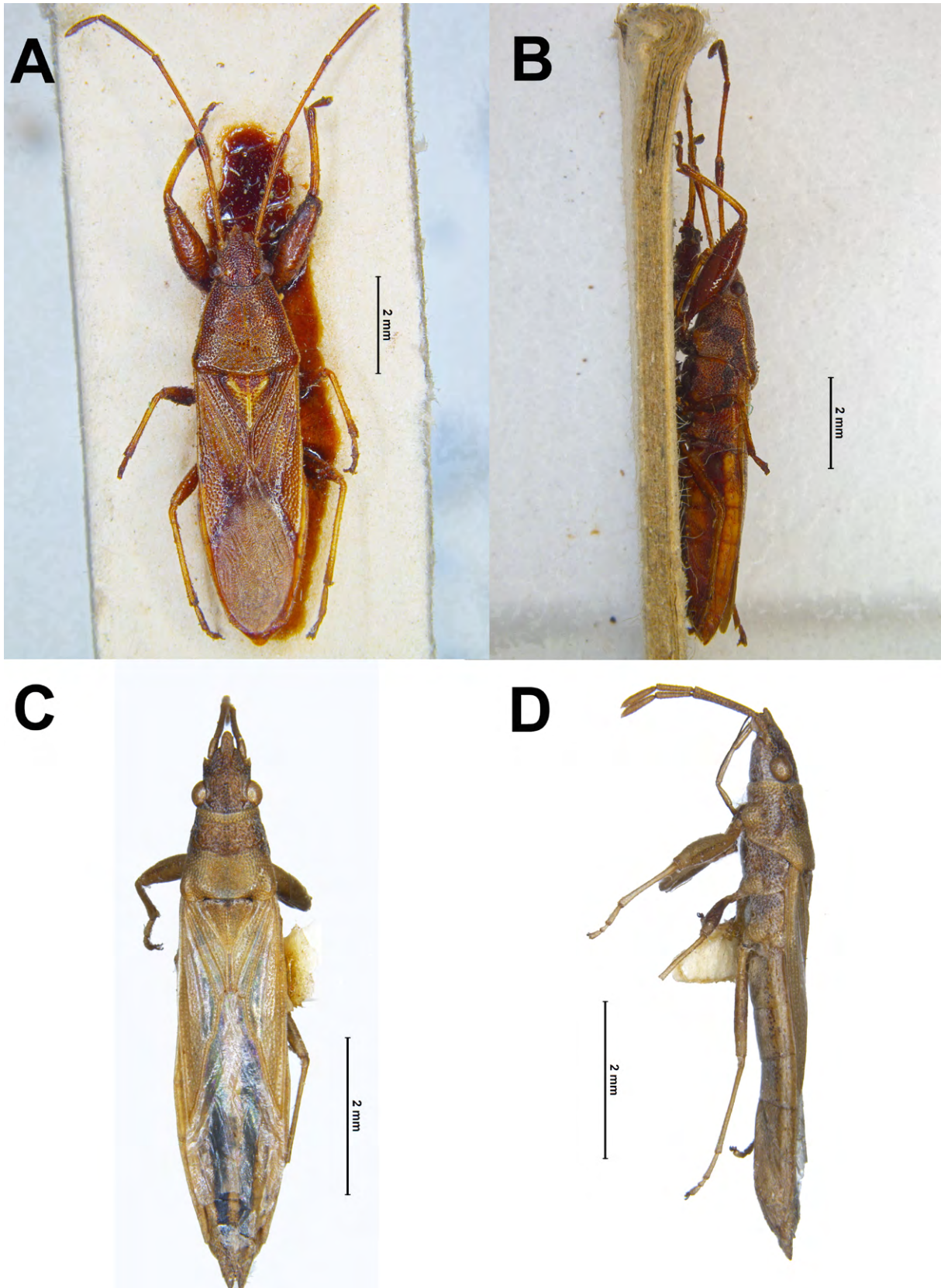


PLATE 26. PACHYGRONTHIDAE:

A, B, *Pachygrontha robusta* Slater female, habitus dorsal and lateral.
C, D, *Stenophyella macreta* Horváth female, habitus dorsal and lateral. [all, Gao]

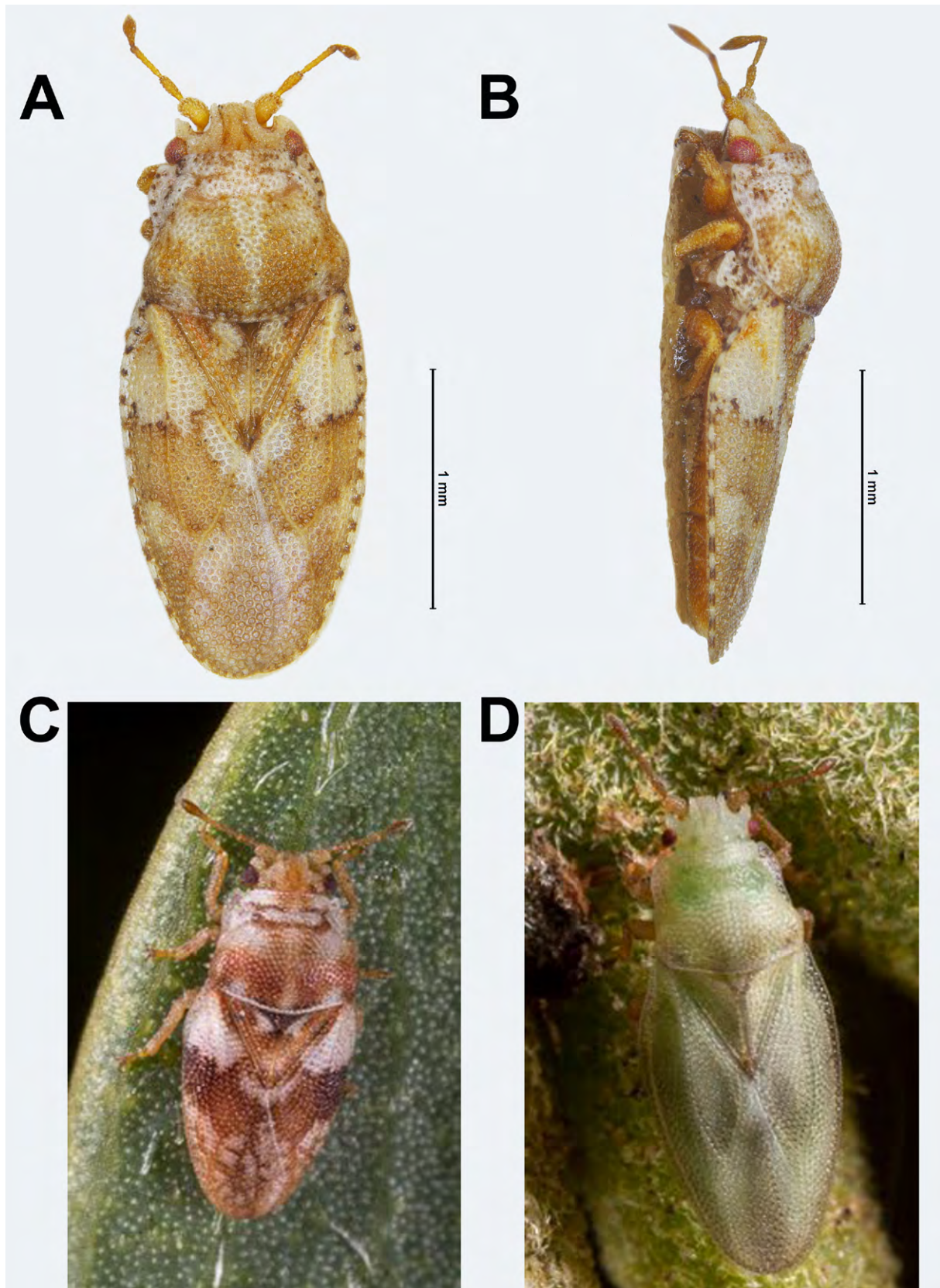


PLATE 27. PIESMATIDAE:

A, B, *Mcateella interioris* Hacker paratype female, habitus dorsal and lateral.

C, *Mcateella* sp. live adult on *Acacia longifolia*, Tasmania.

D, *Mcateella* sp. live adult on *Acacia mearnsii*, Tasmania. [A, B, Gao. C, D, Daley & Ellingsen]

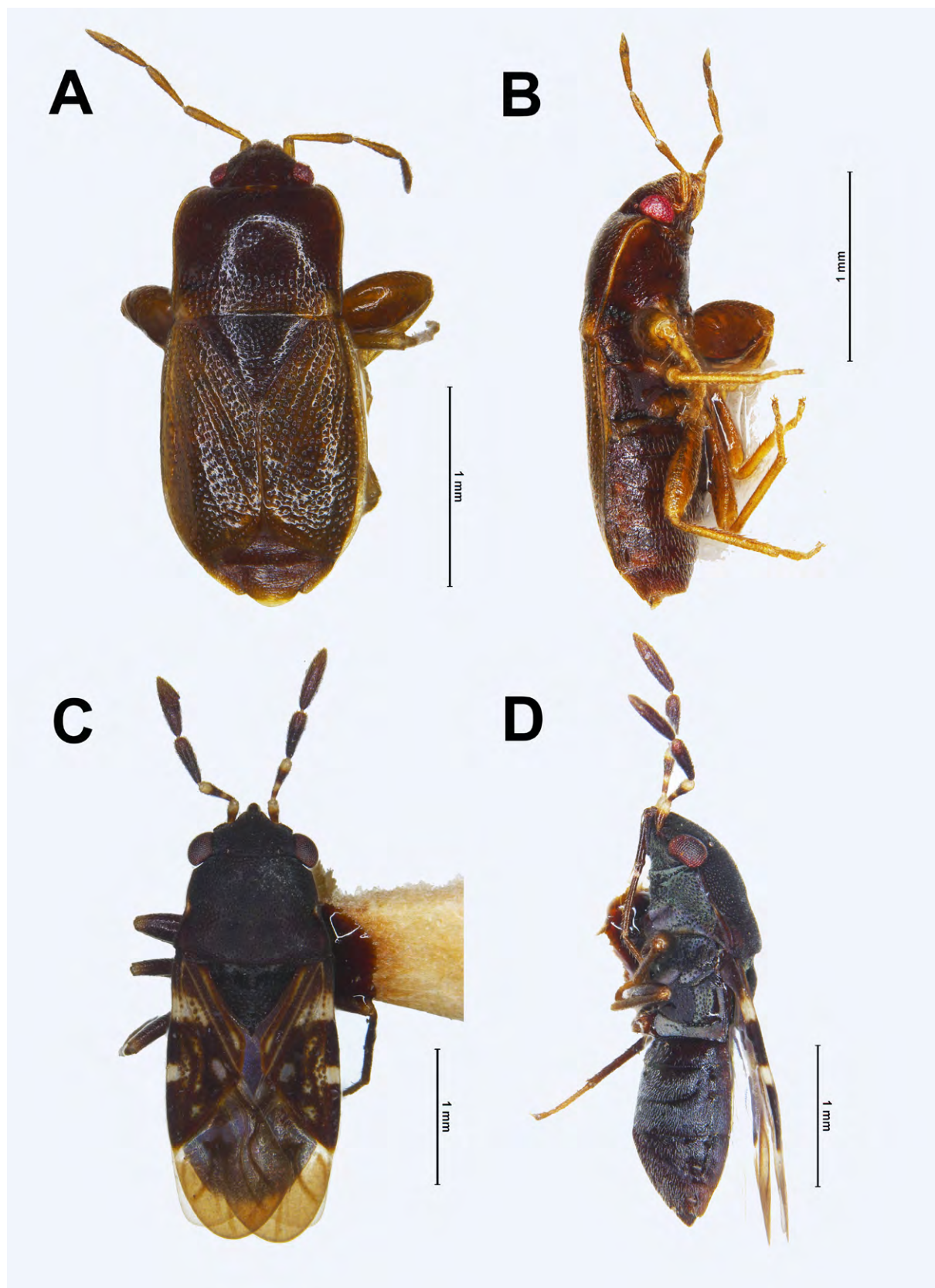


PLATE 28. RHYPAROCHROMIDAE PLINTHISINAE (A & B) AND DRYMINI (C & D):

A, B, *Plinthisus (Locutius) woodwardi* Slater & Sweet male, habitus dorsal and lateral.
C, D, *Appolonius robustus* Gross female, habitus dorsal and lateral. (all, Gao]

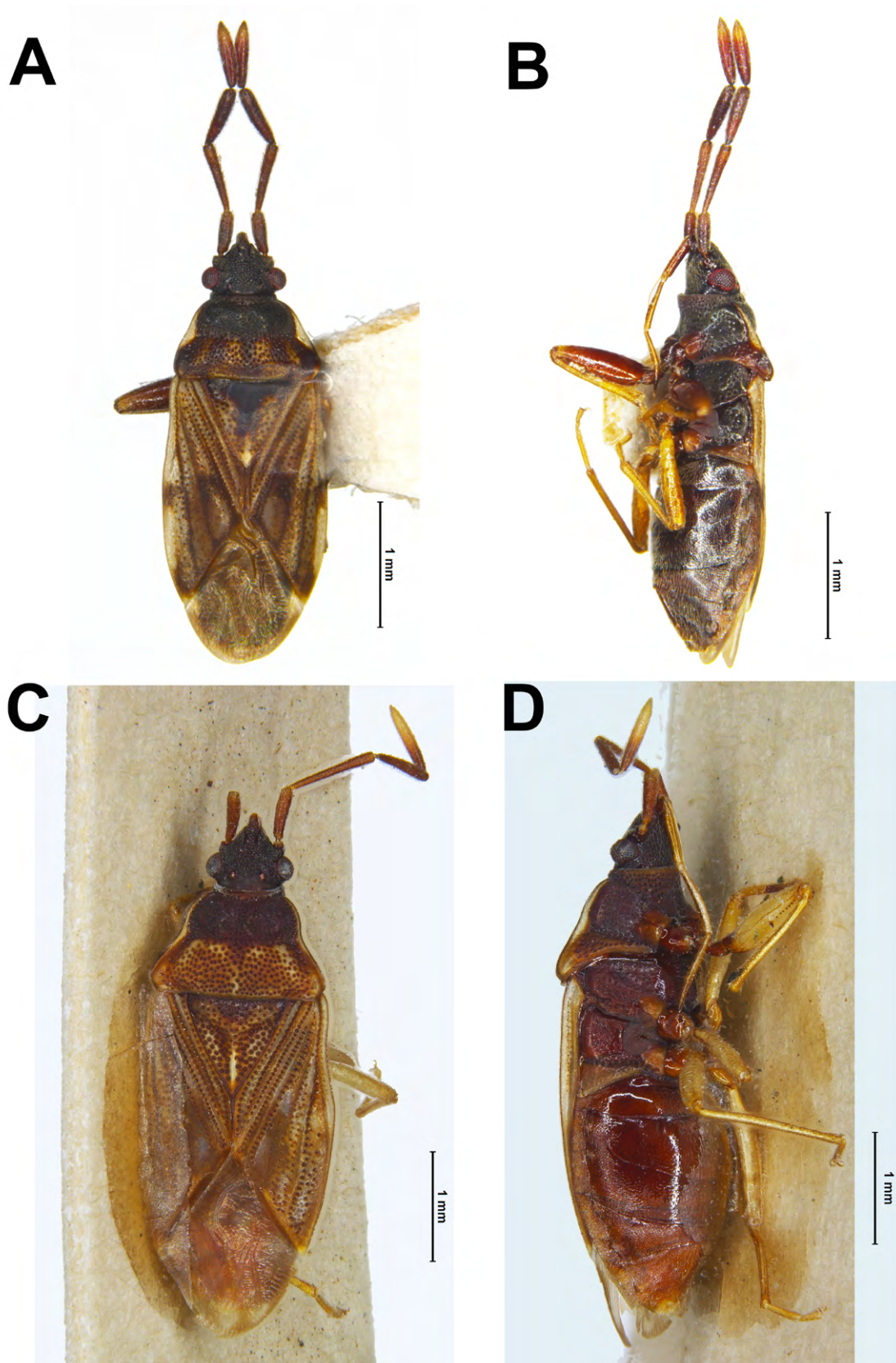


PLATE 29. RHYPAROCHROMIDAE DRYMINI:

A, B, *Brentiscerus australis* (Bergroth) female, habitus dorsal and lateral.
C, D, *Grossander major* (Gross) paratype female, habitus dorsal and lateral. [all, Gao]

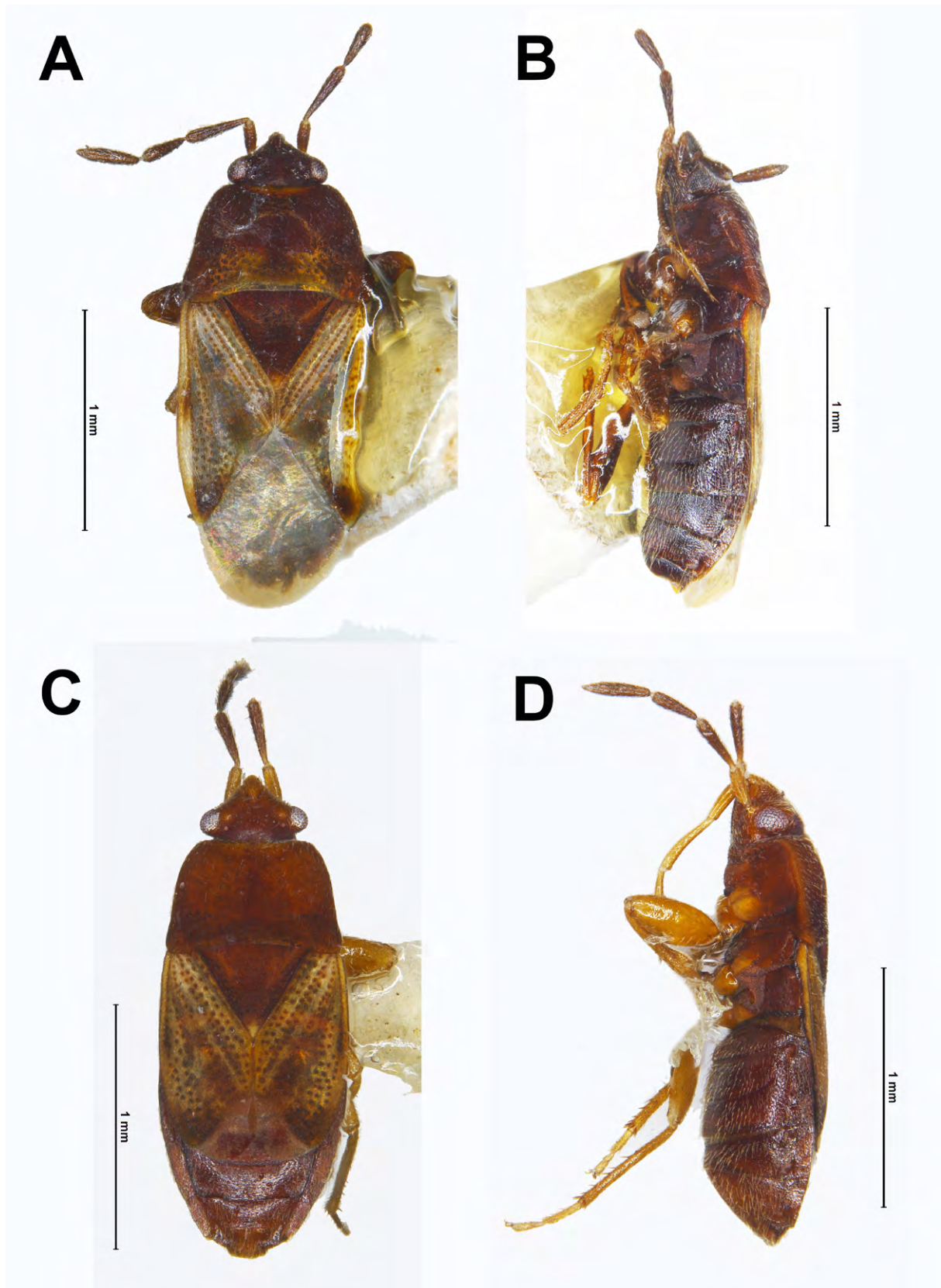


PLATE 30. RYPAROCHROMIDAE ANTILLOCORINI:

A, B, *Botocudo ornatulus* (Bergroth) male, habitus dorsal and lateral.

C, D, *Tomocoris scutellaris* Woodward female, habitus dorsal and lateral. [all, Gao]

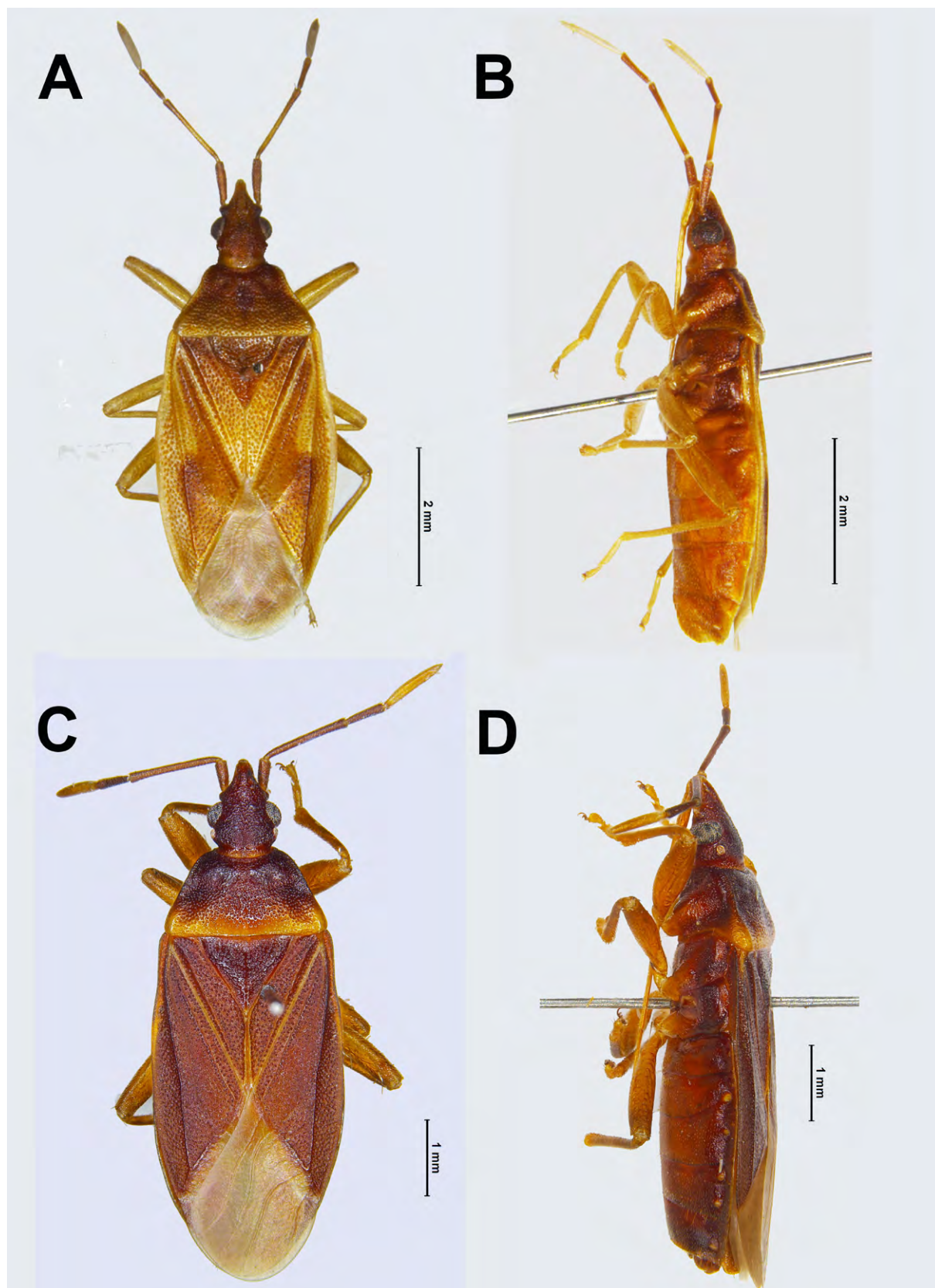


PLATE 31. RHYPAROCHROMIDAE CLERADINI:

A, B, *Clerada apicicornis* Signoret female, habitus dorsal and lateral.
C, D, *Laticlerada laticollis* (Horváth) male, habitus dorsal and lateral. [all, Gao]

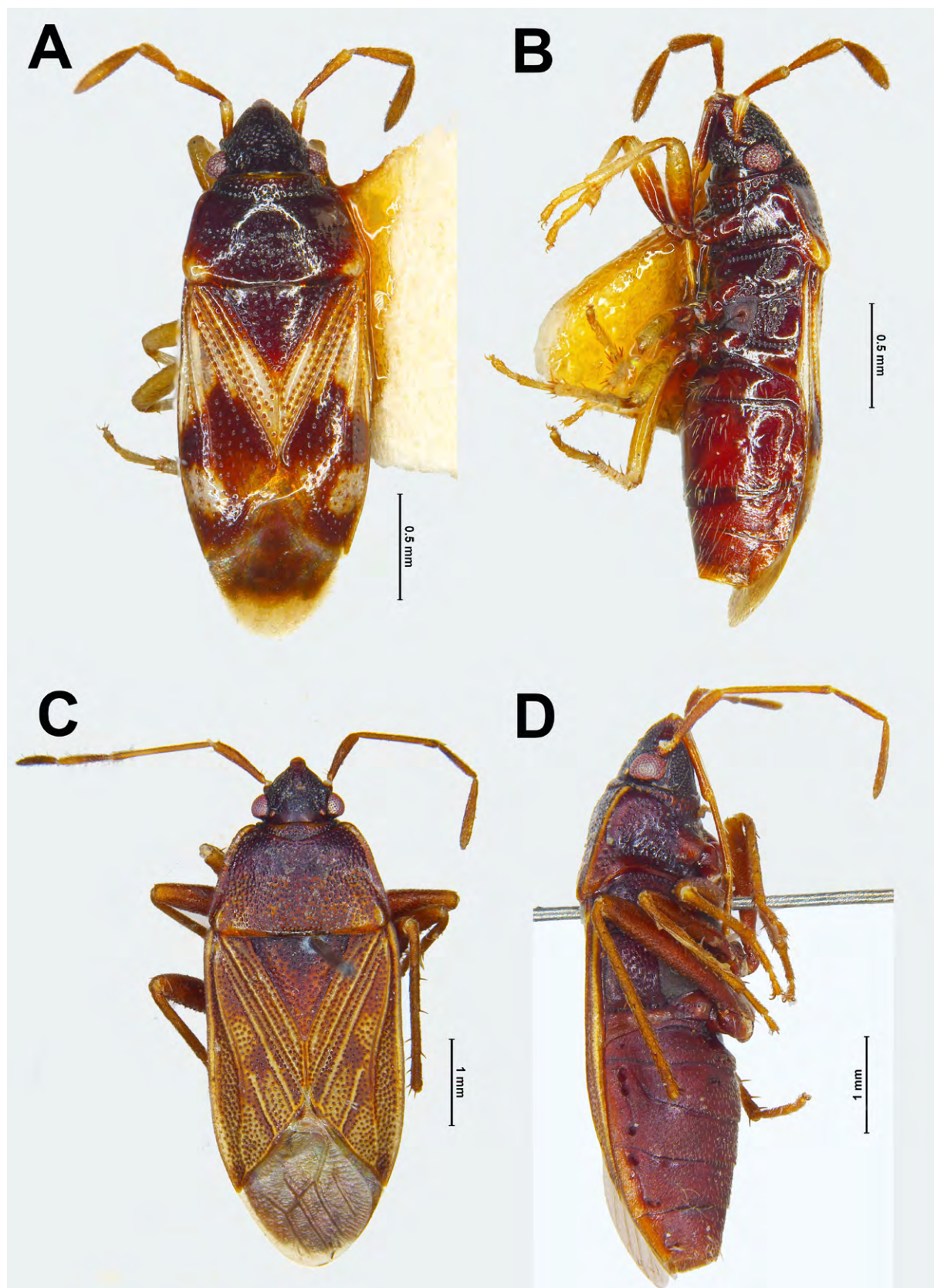


PLATE 32. RHYPAROCHROMIDAE LETHAEINI:

A, B, *Diniella glabrata* (Stål) male, habitus dorsal and lateral.

C, D, *Neolethaeus descriptus* (Walker) male, habitus dorsal and lateral. [all, Gao]

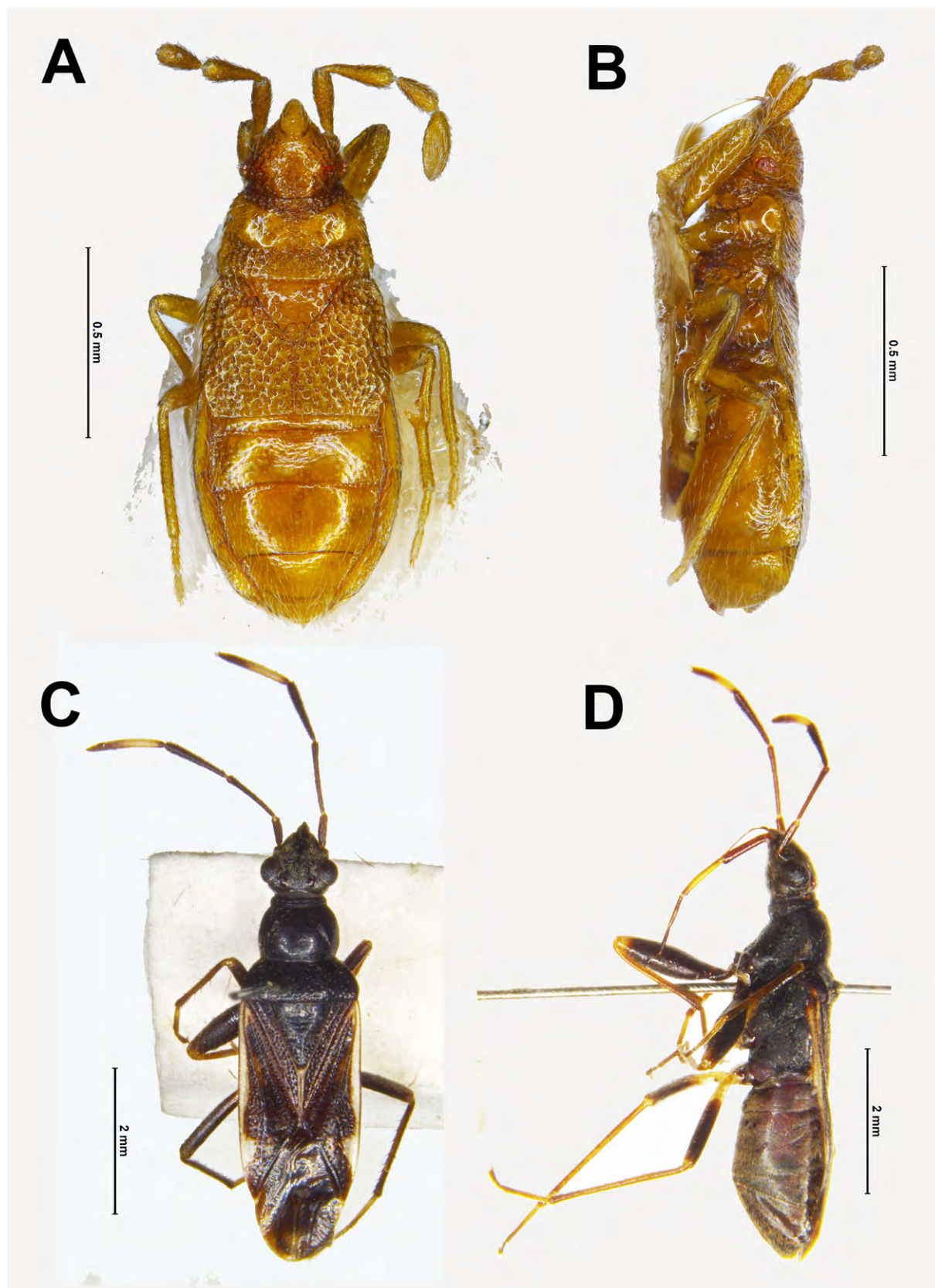


PLATE 33. RHYPAROCHROMIDAE LILLIPUTOCORINI (A & B) AND MYODOCHINI (C & D):

A, B, *Lilliputocoris punctatus* (Woodward) male, habitus dorsal and lateral.

C, D, *Horridipamera nietneri* (Dohrn) female, habitus dorsal and lateral. [all, Gao]

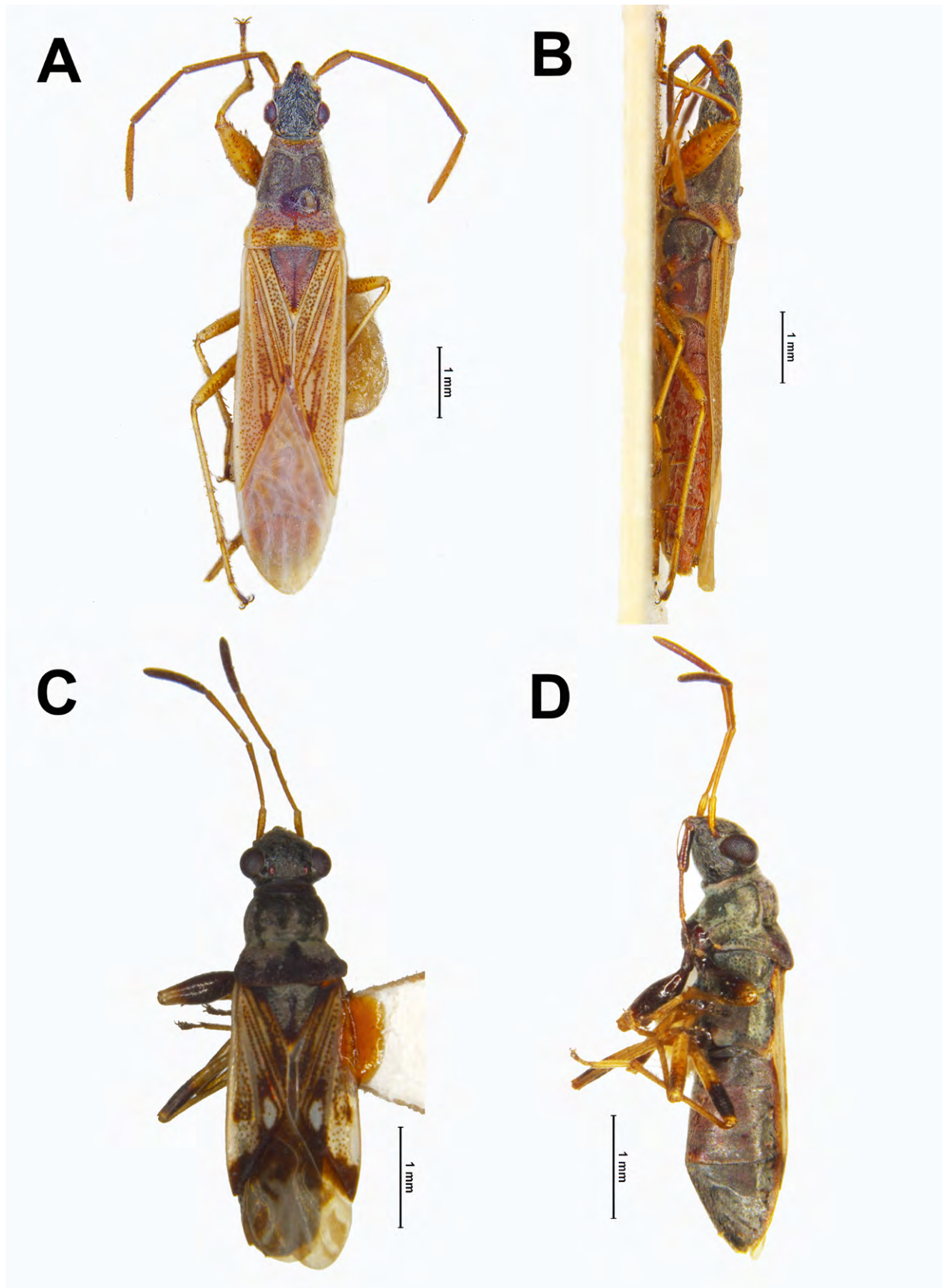


PLATE 34. RHYPAROCHROMIDAE MYODOCHINI:

A, B, *Paromius gracilis* (Rambur) male, habitus dorsal and lateral.

C, D, *Pseudopachybrachius guttus* (Dallas) female, habitus dorsal and lateral. [all, Gao]

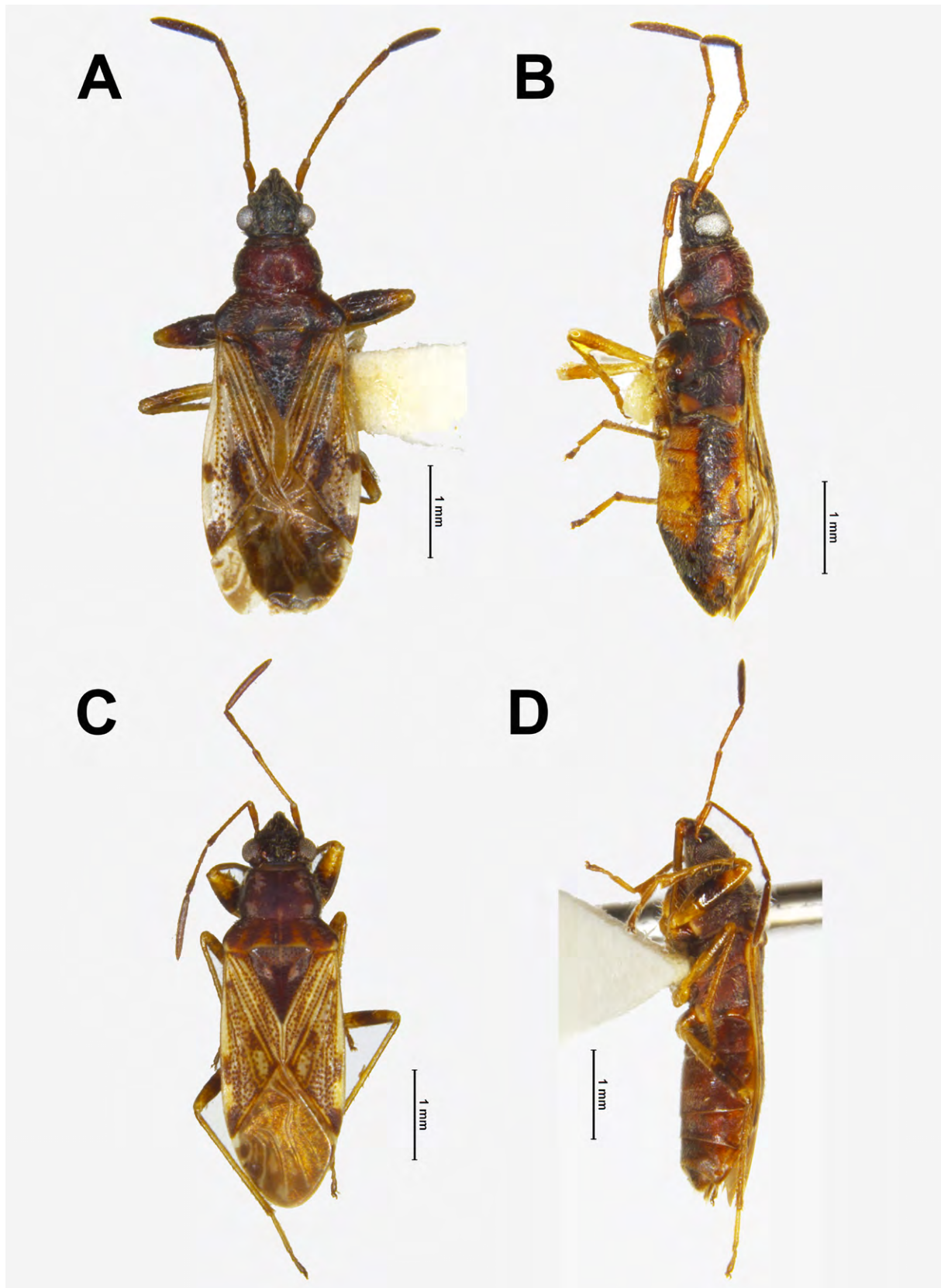


PLATE 35. RHYPAROCHROMIDAE MYODOCHINI:

A, B, *Remaudiereana inornata* (Walker) female, habitus dorsal and lateral.
C, D, *Remaudiereana nigriceps* (Dallas) male, habitus dorsal and ventral. [all, Gao]

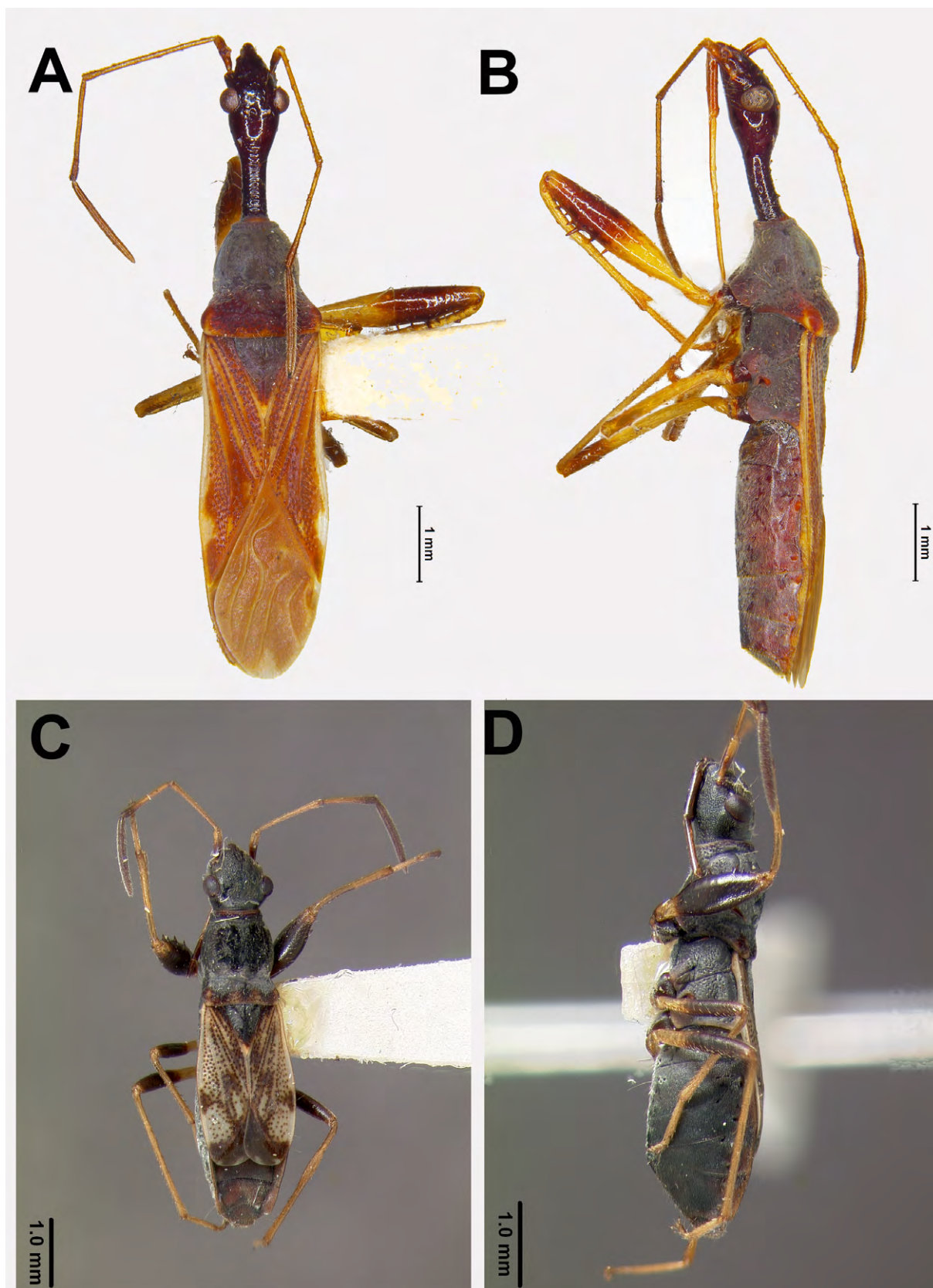


PLATE 36. RHYPAROCHROMIDAE MYODOCHINI EXOTIC:

A, B, *Myodocha serripes* Olivier male, habitus dorsal and lateral.
C, D, *Togo hemipterus* (Scott) female, habitus dorsal and lateral. [all, Cappaert]

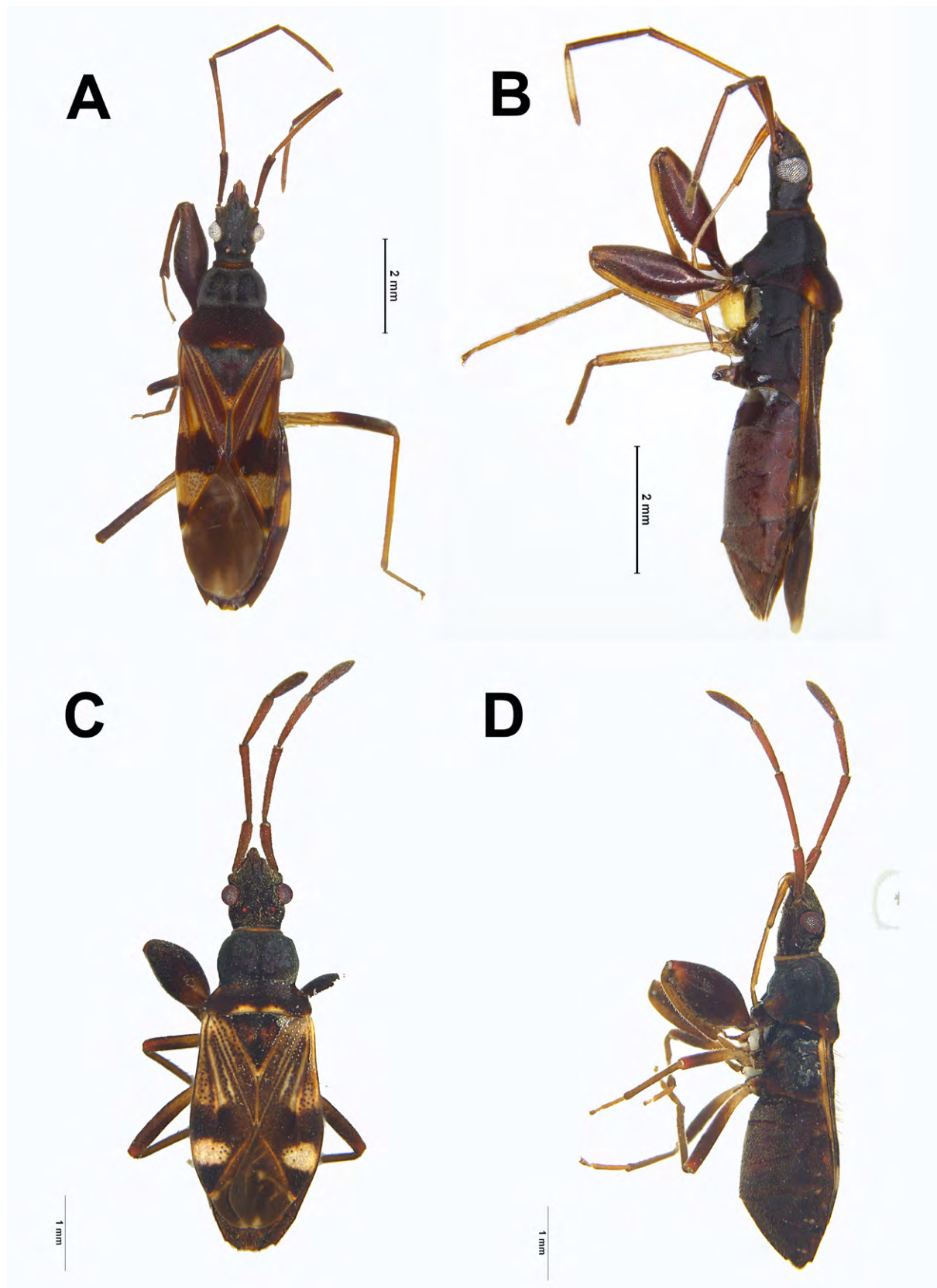


PLATE 37. RHYPAROCHROMIDAE OZOPHORINI:

A, B, *Bedunia cuspidata* Stål female, habitus dorsal and lateral.

C, D, *Ethaltomarus terraereginae* Slater & Woodward female, habitus dorsal and lateral.

[A, B, Gao. C, D, Eow]

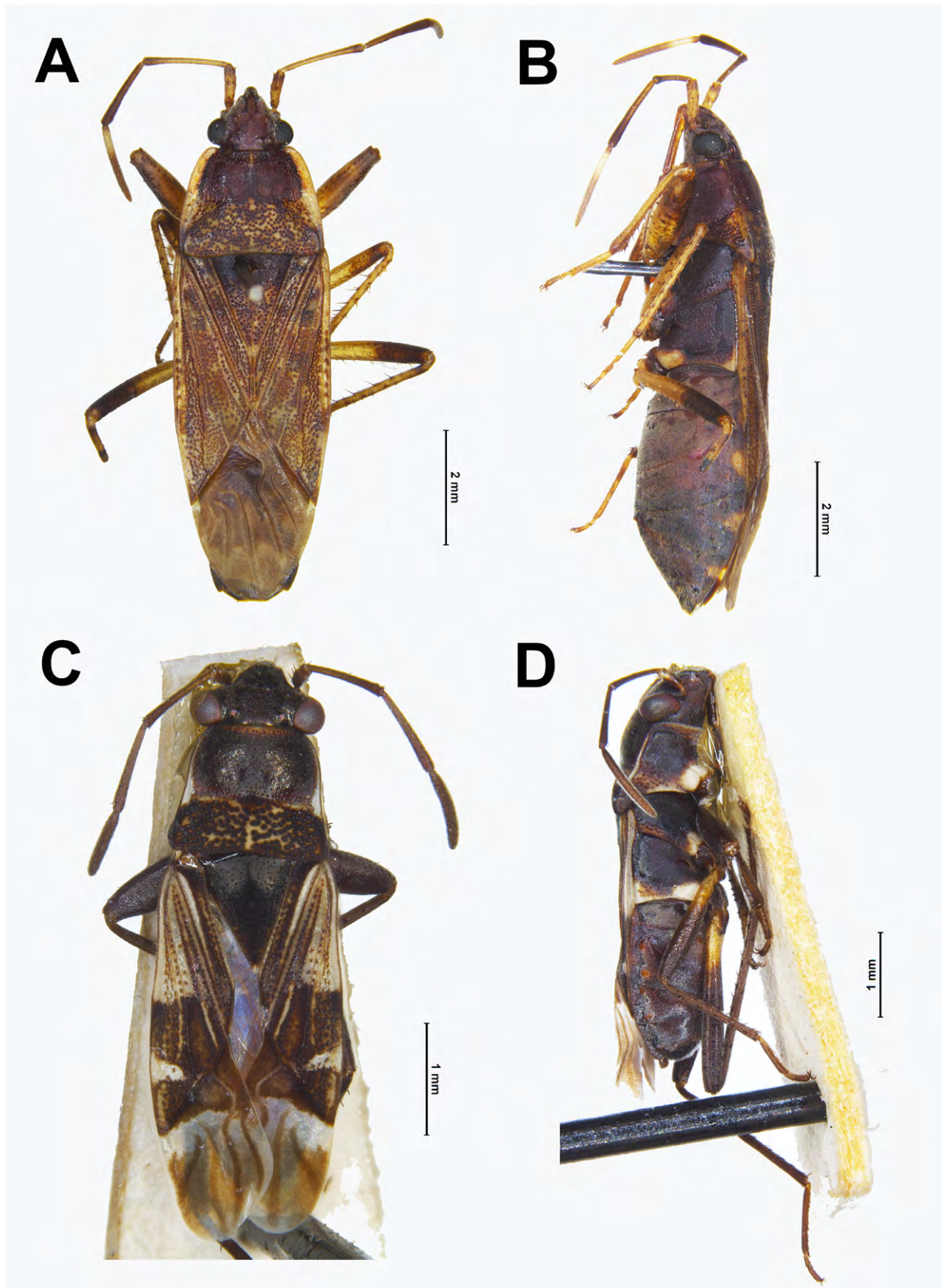


PLATE 38. RHYPAROCHROMIDAE RHYPAROCHROMINI:

A, B, *Elasmolomus pallens* (Dallas) female, habitus dorsal and lateral.

C, D, *Poeantius australopictus* Gross & Scudder male, habitus dorsal and lateral. [all, Gao]

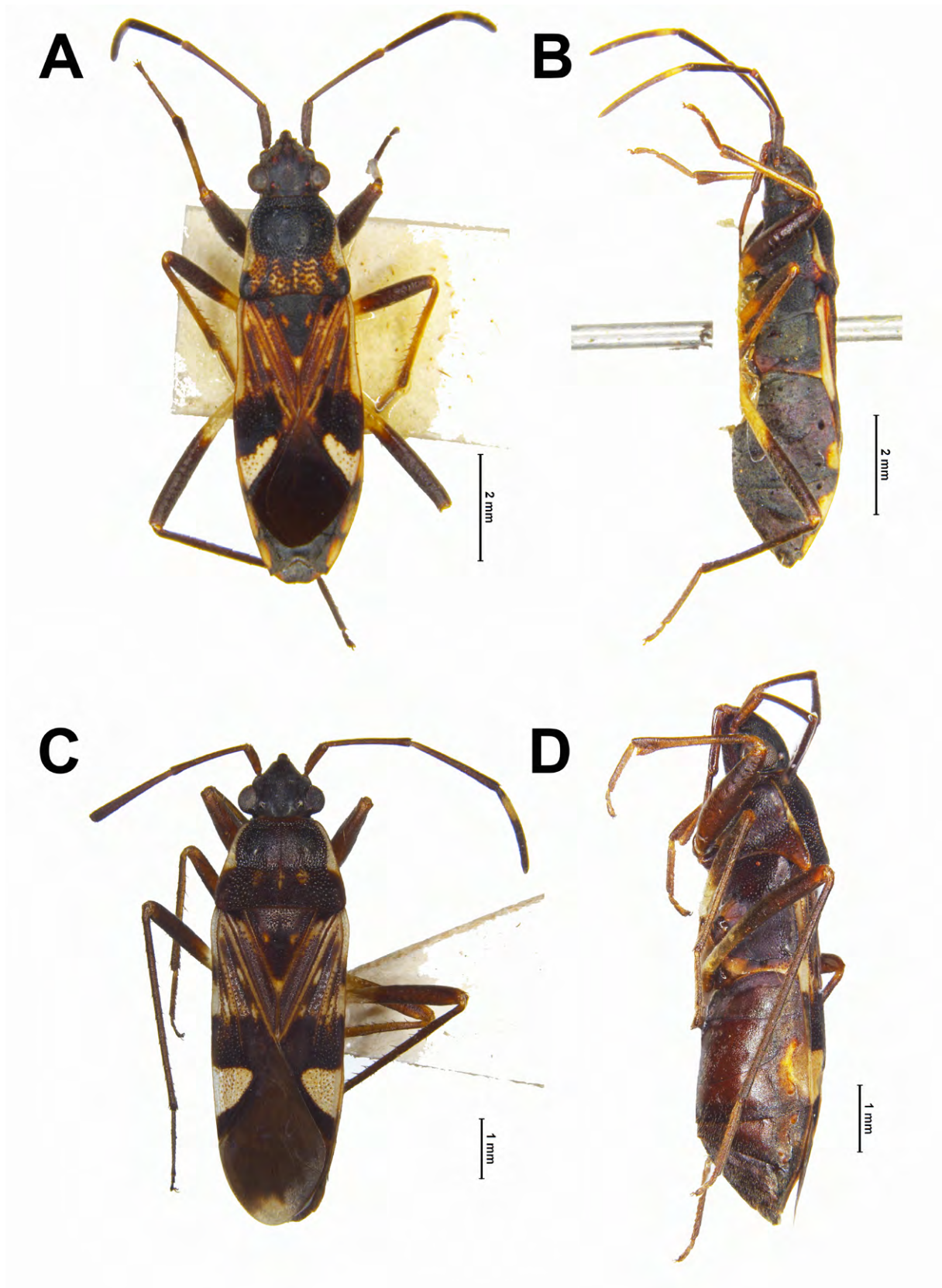


PLATE 39. RHYPAROCHROMIDAE RHYPAROCHROMINI:

A, B, *Dieuches notatus* (Dallas) female, habitus dorsal and lateral.
C, D, *Dieuches scutellatus* Distant female, habitus dorsal and lateral. [all, Gao]

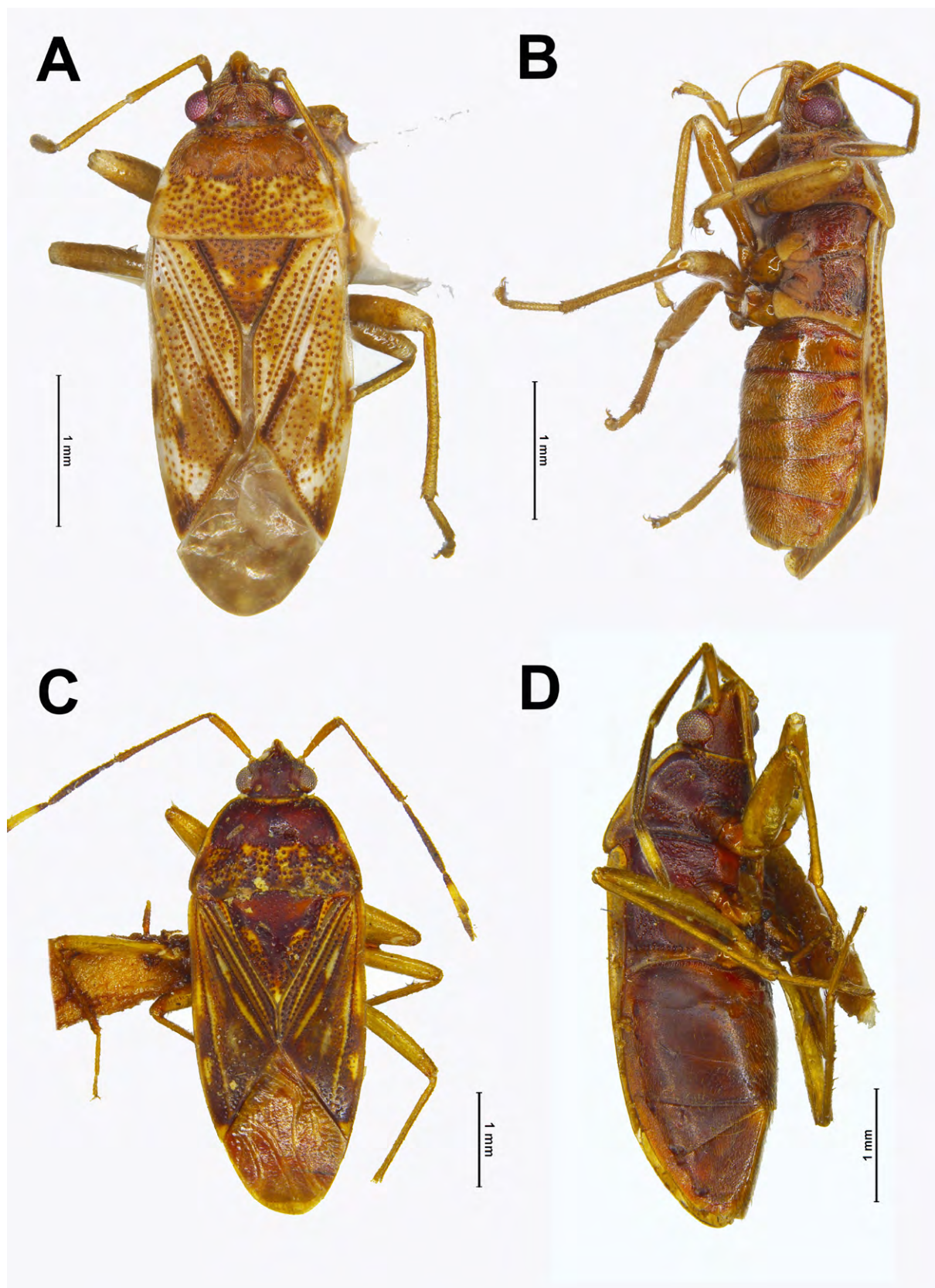


PLATE 40. RHYPAROCHROMIDAE STYGNOCORINI (A & B) AND TARGAREMINI (C & D):

A, B, *Tasmanicola truganinae* Slater & Sweet male, habitus dorsal and lateral.

C, D, *Hebrolethaeus aurantiacus* (Distant) female, habitus dorsal and lateral. [all, Gao]

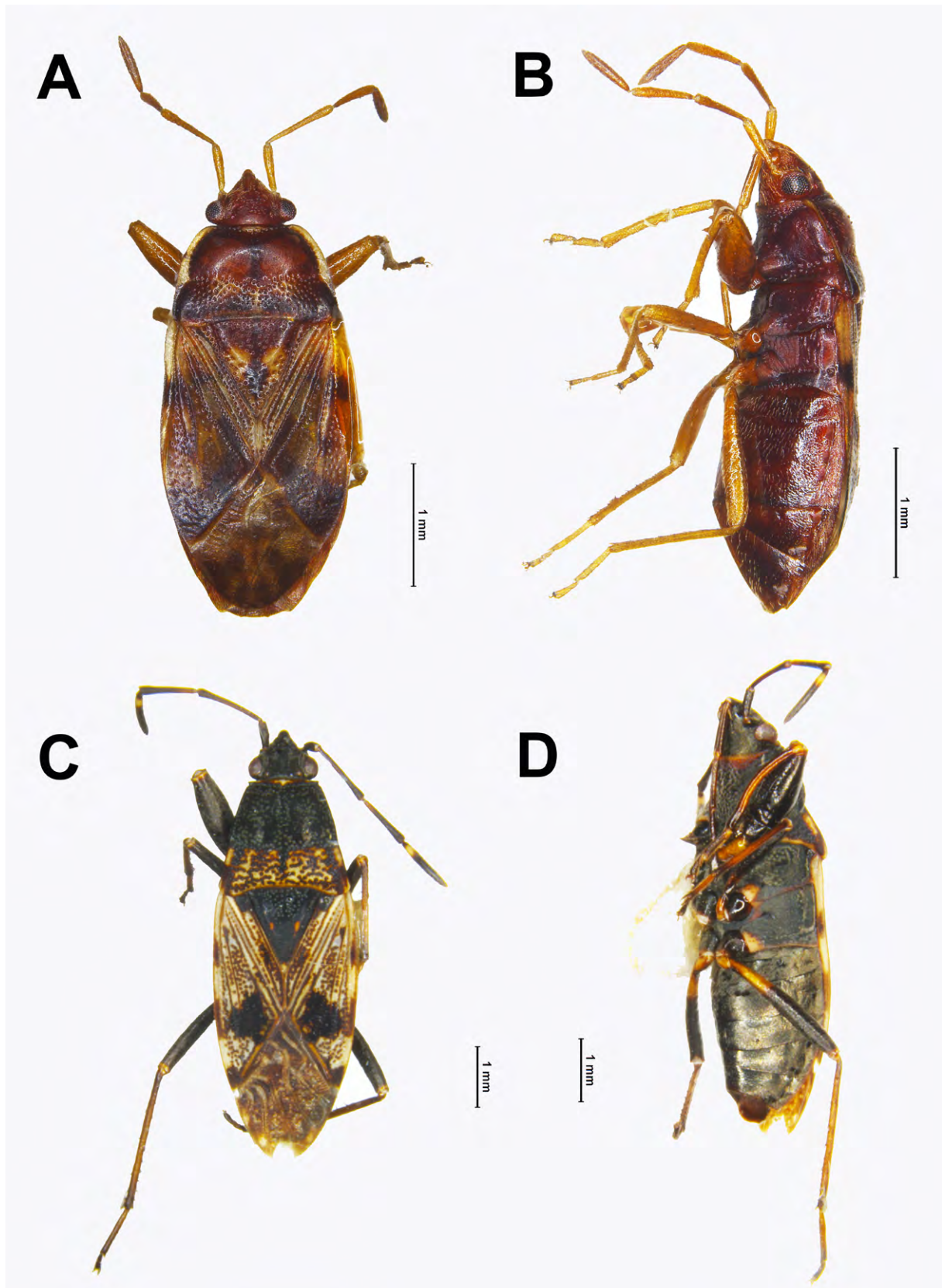


PLATE 41. RHYPAROCHROMIDAE TARGAREMINI (A & B) AND UDEOCORINI (C & D):

A, B, *Lachnophoroides thompsoni* Woodward paratype female, habitus dorsal and lateral.
C, D, *Euander lacertosus* (Erichson) male, habitus dorsal and lateral. [all, Gao]

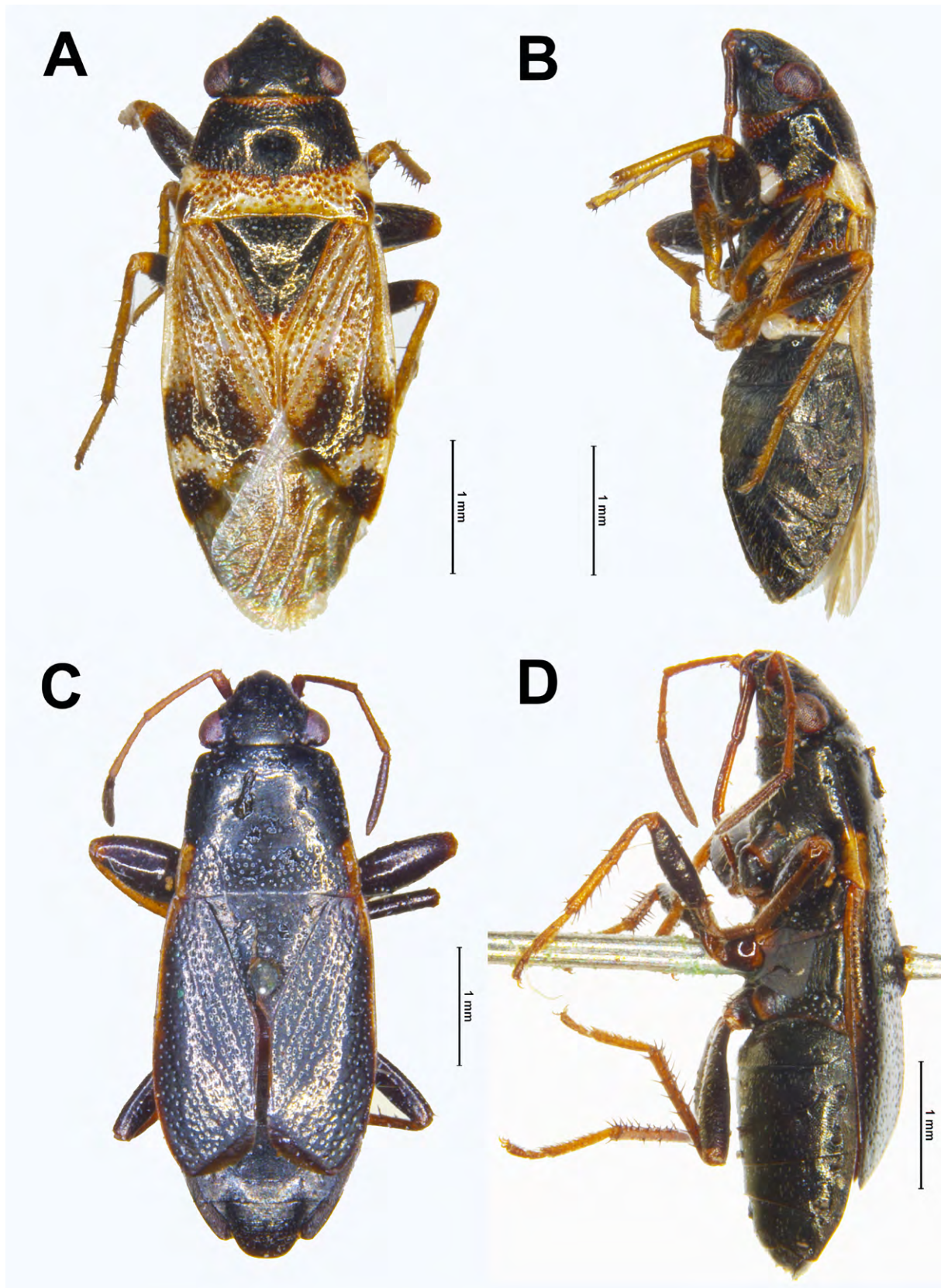


PLATE 42. RHYPAROCHROMIDAE UDEOCORINI:

A, B, *Udeocoris rolandi* (Distant) female, habitus dorsal and lateral.
C, D, *Udeocoris nigroaeneus* (Erichson) male, habitus dorsal and lateral. [all, Gao]

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