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A new species of *Bardunia* Stål, 1863 extends the distribution of the genus to the Philippines (Hemiptera: Fulgoromorpha: Issidae)

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Front cover: *Bardunia philippina* sp. nov., male holotype, dorsal view.

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Abstract

A new species of *Bardunia* Stål, 1863, *B. philippina* sp. nov., is described from Mindanao in the Philippines. Illustrations of habitus and of the male and female genitalia, a key to the species of the genus and a distribution map are provided. The new species is the first one of the genus recorded from the Philippines, and only the third Parahiraciini taxon in the Archipelago. The genus *Bardunia* now counts nine species.

Keywords: Hemisphaeriinae, Planthopper, Fulgoroidea, biodiversity, Oriental Region

Introduction

Within Hemisphaeriinae Melichar, 1906 (sec. WANG *et al.*, 2016), the tribe Parahiraciini Cheng & Yang, 1991 is a recently recognized taxon, originaly described from Taiwan. It represents a rather important tribe with 23 genera and almost 80 species now distributed in all Southeast Asia (BOURGOIN, 2018). One fossil taxon is known from Baltic amber (GNEZDILOV & BOURGOIN, 2016). Another species *Thabena brunnifrons* Bonfils, Attié & Reynaud, 2001 appears to be an introduced species in La Réunion island (GNEZDILOV, 2009).

The tribe Parahiraciini was not recorded from the Philippines until the recent work of GNEZDILOV (2017) who described the genus *Nisoprincessa* Gnezdilov, 2017 with one new species and subspecies, from Palawan Island. The subspecific status of *Nisoprincessa palawana bacuita* Gnezdilov, 2017 remains questionable and will need further scrutiny when male specimens will be available.

The genus *Bardunia* was described by STÅL (1863) to accommodate *B. nasuta* Stål, 1863 from Bacan Island off Halmahera Island in Indonesia. GNEZDILOV & WILSON (2007) synonymised the genus *Prosonoma* Melichar, 1906 under *Bardunia* and transferred its unique species *P. rugifrons* Melichar, 1906 from Enggano Island off Sumatra, to *Bardunia*. More recently, GNEZDILOV (2011) revised the genus and described six additional species from Laos, Vietnam, Sulawesi, Java and New Guinea. Another species, *Fortunia jianfenglingensis* Chen, Zhang & Chang, 2014 described from Hainan Island in China by CHEN *et al.* (2014), was transferred to *Bardunia* by WANG *et al.* (2015) but was since transferred to a separate genus, *Brevicopius*, by MENG *et al.* (2015).

The identification of recent material of Issidae in the collections of RBINS allowed the discovery of an undescribed species of Parahiraciini belonging to the genus *Bardunia* Stål, 1863.

The present paper aims to describe this new species of *Bardunia*, to include it in GNEZDILOV's (2011) key to the species of the genus, and to provide a distribution map for all the species of the genus.

Material and methods

The genitalia were extracted after boiling the abdomen several minutes in a 10% solution of potassium hydroxide (KOH) at about 100°C. Some drops of saturated alcoholic Chlorazol black solution were added for contrasting (CARAYON, 1969). The pygofer was separated from the abdomen and the aedeagus dissected with a needle blade for examination. The whole was then placed in glycerine for preservation in a tube attached to the pin of the specimen.

The measurements were taken as in CONSTANT (2004) and the following acronyms are used:

BF = maximum breadth of the frons
BTg = maximum breadth of the tegmen
BV = maximum breadth of the vertex
LF = length of the frons in median line
LTg = maximum length of the tegmen
LT = total length (apex of head to apex of tegmina)
LV = length of the vertex in median line

The photographs were taken with a Leica EZ4W stereomicroscope with integrated camera, stacked with CombineZ software and optimized with Adobe Photoshop CS3.
For the transcription of the labels of the types, the wording on each single label is delimited by square brackets. The distribution map was produced with SimpleMappr (SHORTHOUSE, 2010).

Acronyms used for the collections.
RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium.

Taxonomy

Order **Hemiptera** Linnaeus, 1758
Suborder **Auchenorrhyncha** Duméril, 1806
Infra-order **Fulgoromorpha** Evans, 1946
Superfamily **Fulgoroidea** Latreille, 1807
Family **Issidae** Spinola, 1839
Subfamily **Hemisphaeriinae** Melichar, 1906
Tribe **Parahiraciini** Cheng & Yang, 1991

Genus ***Bardunia*** Stål, 1863

Bardunia STÅL, 1863: 589.
Type species: *Bardunia nasuta* Stål, 1863 by monotypy.
Prosonoma MELICHAR, 1906: 235. Synonymised by GNEZDILOV & WILSON, 2007.
Type species: *Prosonoma rugifrons* Melichar, 1906 by monotypy.

The definition of the genus given by GNEZDILOV (2011) is followed here.

DISTRIBUTION. Widely distributed from Laos and Vietnam to the Greater Sunda (Sumatra, Java), Sulawesi, Maluku, the Philippines and New Guinea (Fig. 1).

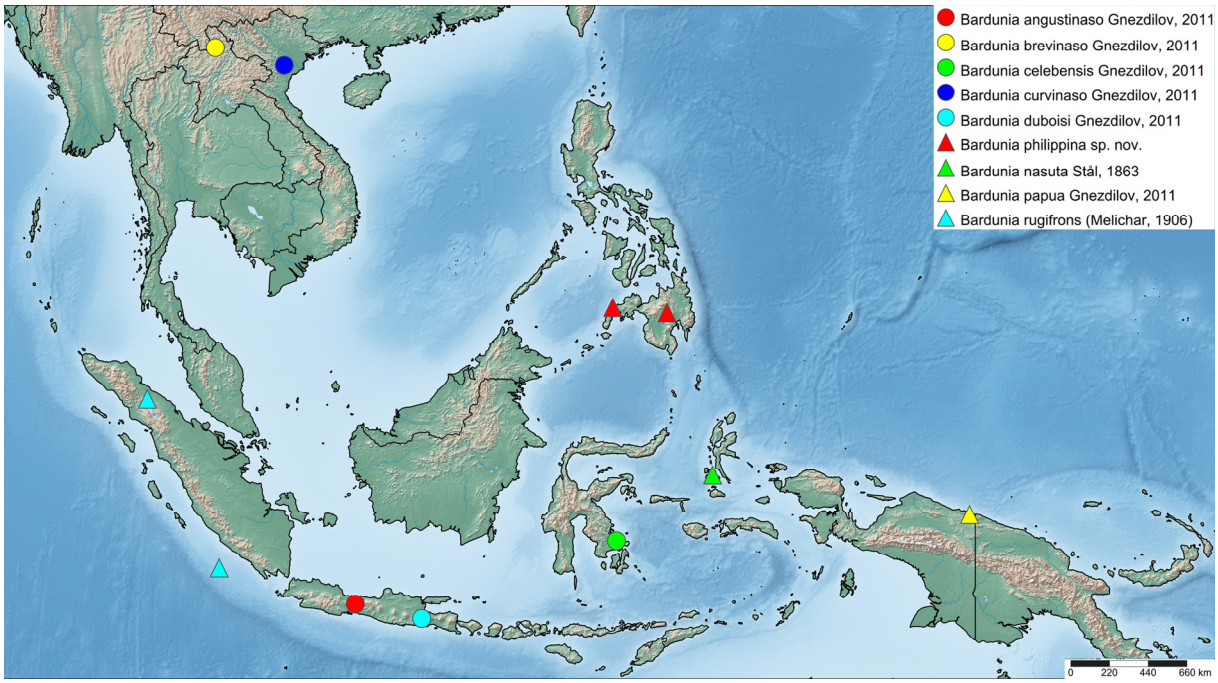

Fig. 1. *Bardunia* spp., distribution map.

SPECIES INCLUDED

Bardunia angustinaso Gnezdilov, 2011
Bardunia brevinaso Gnezdilov, 2011
Bardunia celebensis Gnezdilov, 2011
Bardunia curvinaso Gnezdilov, 2011
Bardunia duboisi Gnezdilov, 2011
Bardunia nasuta Stål, 1863 type species
Bardunia papua Gnezdilov, 2011
Bardunia philippina sp. nov.
Bardunia rugifrons (Melichar, 1906)

Identification key to the species of *Bardunia* (modified from GNEZDILOV, 2011)

1. Proboscis shorter than width of eye in lateral view (GNEZDILOV, 2011: figs 8, 10) ..... ***B. brevinaso*** Gnezdilov, 2011
- Proboscis equal or longer than width of eye in lateral view (GNEZDILOV, 2011: figs 1–7, 11–14) **2**

2. Proboscis relatively narrow apically in lateral view (GNEZDILOV, 2011: figs 7, 18) ..... ***B. angustinaso*** Gnezdilov, 2011
- Proboscis relatively wide apically in lateral view (GNEZDILOV, 2011: figs 2, 5, 11, 14–17) **3**

3. Proboscis in lateral view as long as post- and anteclypeus together ..... ***B. celebensis*** Gnezdilov, 2011
- Proboscis in lateral view shorter than post- and anteclypeus together **4**

4. Vertex nearly square (GNEZDILOV, 2011: fig. 1) **5**
- Vertex transverse, 1.5–2.0 times as wide as long (GNEZDILOV, 2011: figs 3–4, 12) **6**

5. Proboscis after clypeal suture shorter than broad in lateral view (Fig. 2D); smaller in size (♀: 6.9 mm); posterior margin of abdominal sternum VII of females broadly emarginate in middle (Fig. 2 H) ..... ***B. philippina*** sp. nov.
- Proboscis after clypeal suture longer than broad in lateral view (GNEZDILOV, 2011: fig. 2); larger in size (♀: 8.0 mm); posterior margin of abdominal sternum VII of females narrowly notched (GNEZDILOV, 2011: fig. 32) ..... ***B. nasuta*** Stål, 1863

6. Proboscis and clypeus are joint at acute angle in lateral view (GNEZDILOV, 2011: fig. 15) ... .***B. curvinaso*** Gnezdilov, 2011
- Proboscis and clypeus are joint at obtuse angle in lateral view (GNEZDILOV, 2011: fig. 17) **7**

7. Phallobase narrow in lateral view, without process on its dorsal surface (GNEZDILOV, 2011: fig. 66) .....***B. duboisi*** Gnezdilov, 2011
- Phallobase wide in lateral view, with long process on its dorsal surface (GNEZDILOV, 2011: figs 20, 34)..... **8**

8. Hind tibia with 2–3 lateral spines. Phallobase with long horn-shaped subapical process and with pair of narrow lobes below ventral hooks on each side (GNEZDILOV, 2011: fig. 20, lb). Dorsal surface of the phallobase with wide (in lateral view) chamber-shaped process. Apex of male anal tube without processes (GNEZDILOV, 2011: fig. 24)..... .....***B. rugifrons*** (Melichar, 1906)
- Hind tibia with single lateral spine. Phallobase with short horn-shaped subapical process and without lobes below ventral hooks on each side (GNEZDILOV, 2011: fig. 34). Dorsal surface of the phallobase with narrow (in lateral view) chamber-shaped process. Apex of male anal tube with pair of weakly sclerotized processes (GNEZDILOV, 2011: fig. 38)..... .....***B. papua*** Gnezdilov, 2011

Bardunia philippina **sp. nov.**

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Figs 1–3

ETYMOLOGY. The species epithet refers to the distribution of the species, the Philippines.

TYPE MATERIAL. PHILIPPINES: Holotype ♂ (dissected, left posterior wing mounted): [Coll. I.R.Sc.N.B., Philippines, Mindanao, Zamboanga del N, Gutalac, 7°58'57"N 122°24'17"E, iii.2016, local collector, I.G.: 32.907] (RBINS).
Paratype: 1 ♀: [Coll. I.R.Sc.N.B., Philippines, Mindanao, Bukidnon, Panamokan, ix.2014, purchased from I. Lumawig, I.G.: 32.907] (RBINS).

DIAGNOSIS. The species can be separated from all other *Bardunia* species by the following combination of characters: (1) proboscis rather long, but shorter than post- and anteclypeus combined; (2) vertex about as long as broad; (3) proboscis after clypeal suture shorter than broad in lateral view; (4) abdominal sternum VII of females broadly emarginate in middle posteriorly.
The most closely related species is *Bardunia nasuta*, which can be separated by characters (3) and (4) (see also identification key).

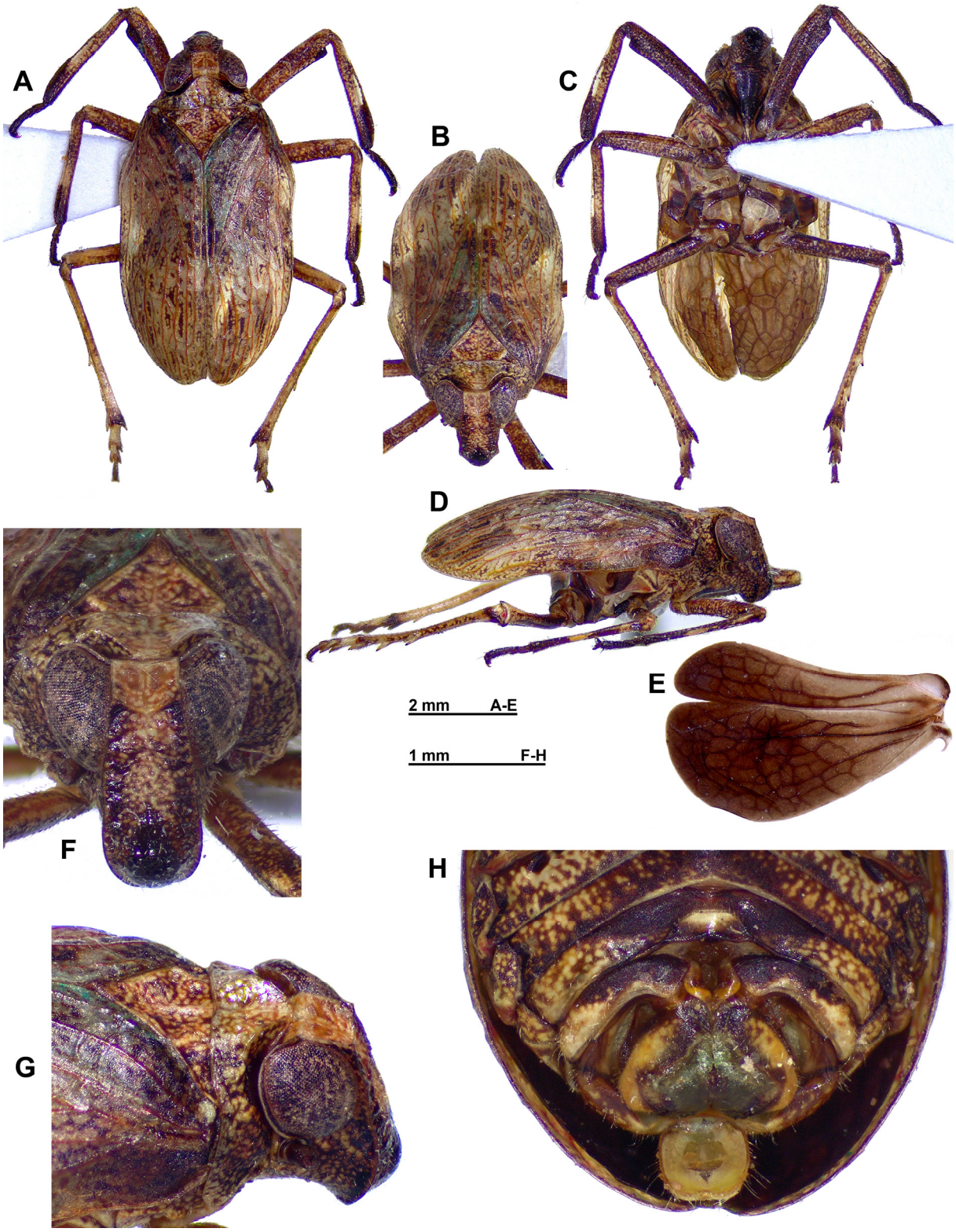

Fig. 2. *Bardunia philippina* sp. nov. A–G, holotype ♂. A, habitus, dorsal view. B, habitus, normal view of proboscis. C, habitus, ventral view. D, habitus, lateral view. E, left posterior wing. F, head and thorax, anterodorsal view. G, head and thorax, dorsolateral view. H, paratype ♀, distal portion of abdomen, ventral view.

DESCRIPTION.

Measurements and ratios: LT: ♂ (n = 1): 5.9 mm; ♀ (n = 1): 6.8 mm. LTg/BTg = 3.0; LV/BV = 1.2; LF/BF = 1.75.

Head: (Fig. 2 A–D, F–G) vertex subquadrate, yellowish with margins carinate; in dorsal view, anterior margin convex, posterior one concave and lateral ones subparallel; disc concave with narrow median groove. Genae yellowish, variegated with brown and black. Frons elongate and protruding anteroventrally into a proboscis; yellowish turning to brown laterally and ventrally; sides subparallel; lateral carinae roundly merging ventrally; convex with a shiny black globose bulge apically. Angle between proboscis and clypeus nearly right in lateral view. Clypeus black-brown, roundly elevated medially and with basilateral markings yellowish. Scape short, ring-shaped; pedicel bulbous, dark brown. Labium brown with sides of penultimate segment pale yellowish; last segment longer than broad, and shorter than penultimate.
Thorax: (Fig. 2 A–B, D, F–G) yellowish variegated with brown. Pronotum short with disc concave, obsolete median groove and with posterior margin slightly notched in middle. Mesonotum short, concave in middle, slightly coriaceous with obsolete median carina and obsolete oblique peridiscal carinae. Tegulae yellowish brown.
Tegmina: (Fig. 2 A–B, D) elongate, subcoriaceous; yellowish with base and irregular markings in cells brown; veins reddish brown; lateral margin bisinuate in dorsal view.
Hind wings: (Fig. 2 E) brown with base paler and veins darker, bilobed, slightly shorter than tegmina. Venation reticulate with main longitudinal veins distinct basally (C, ScP+R, MP, CuA), anal area reduced.
Legs: (Fig. 2 A, C) elongate and slender. Profemora variegated brown and yellowish, darker ventrally, laminate along posterior margin, with lamina stopped before apex and marked with a distal black marking dorsally. Mesofemora variegated brown and yellowish, slightly flattened dorsoventrally and with a small subapical tooth on posterior margin. Pro- and mesotibiae variegated brown and yellowish, black distally and with a median elongate white marking, slightly laminate along external margin, with lamina broadening from base towards apex. Pro- and mesotarsi black. Metafemora yellowish with ventral face variegated with brown. Metatibiae yellowish, brown at base and apex, with two lateral spines on distal half and 9 apical spines. Metatarsi mostly yellowish dorsally and brown ventrally, basal segment elongate with a strong spine at each side and a row of 6 smaller spines in between ventrally along posterior margin; second segment with a strong tooth at each side along posterior margin. Metatibiotarsal formula: (2) 9/8/2.
Abdomen: (Fig. 2 H) yellowish variegated with brown.
Genitalia ♂: pygofer higher than broad and with posterior margin abruptly narrowing on dorsal 1/4 in lateral view (Fig. 3 A); posterior margin deeply emarginate in dorsal view (Fig. 3 B). Anal tube elongate, about 1.5 times longer in median line than broad, weakly narrowing basally and apically in dorsal view (Fig. 3 B). Apex of anal tube truncate, turned down (Fig. 3 B); in posterior view, a central lobe projecting ventrally and two smaller, ear-shaped, less sclerotized lobes laterally (Fig. 3 A, B, D). Anal column short (Fig. 3 B). Gonostyli with a neck sinuate in lateral view and with strongly concaved hind margin (Fig. 3 A, D). Capitulum of gonostyli narrowing apically in shape of curved lamina, lateral tooth wide (Fig. 3 A, D). Phallobase moderately wide (Fig. 3 E, G). Each dorsolateral phallobase lobe with one wide semicircular and one horn-shaped subapical processes (Fig. 3 C). Dorsolateral phallobase lobes fused dorsally (Fig. 3 G). Dorsal surface of phallobase with long chamber-shaped process medially (Fig. 3 C, G). Ventral phallobase lobe elongate, roundly truncate apically

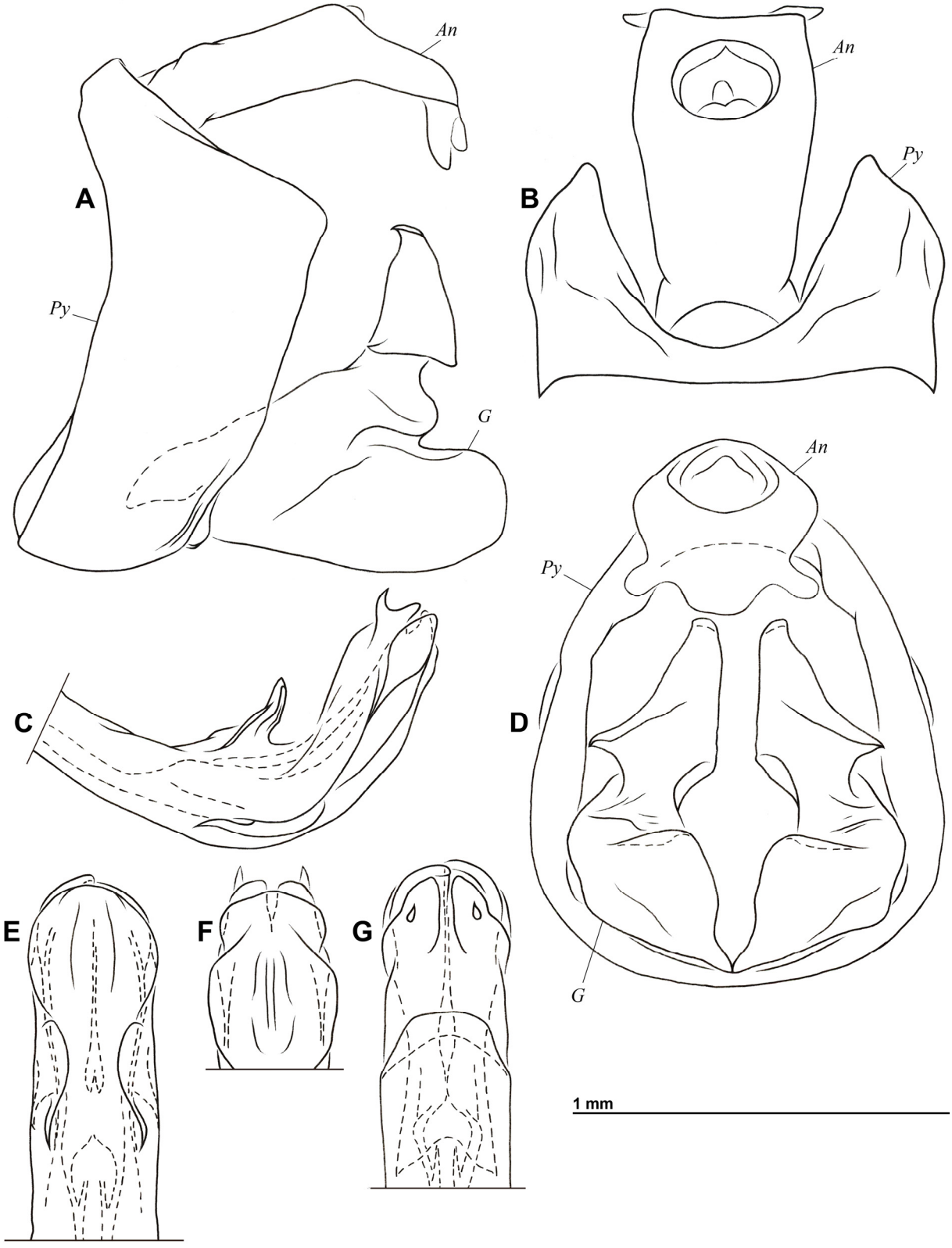

Fig. 3. *Bardunia philippina* sp. nov., holotype ♂, genitalia. A, pygofer, anal tube and gonostylus, left lateral view. B, anal tube and pygofer, dorsal view. C, aedeagus, left lateral view. D, pygofer, anal tube and gonostyli, posterior view. E, aedeagus, ventral view. F, aedeagus, posterior view. G, aedeagus, dorsal view.
An, anal tube. – *Py*, pygofer. – *G*, gonostylus. – *ac*, anal column. – *ap*, apical aedeagal processes. – *cp*, chamber-shaped process. – *el*, ear-shaped lobe – *hp*, horn-shaped subapical process. – *lt*, lateral tooth of capitulum. – *vh*, ventral aedeagal hooks. – *vl*, ventral phallobase lobe. – *vm*, ventral margin of dorsolateral phallobase lobe.

(Fig. 3 E–F). Apical aedeagal processes elongate, curved, weakly enlarged subapically (Fig. 3 C, E, G). Aedeagus with pair of short narrowing to acute apices ventral hooks sinuate in lateral view (Fig. 3 C).
Terminalia ♀ (Fig. 2 H): sternum VII with posterior margin deeply emarginate in middle over a central lamina. Anal tube broad and truncate apically.

BIOLOGY. Unknown.

Discussion

The tribe Parahiraciini Cheng & Wang, 1991 in the Philippines now counts two genera with three taxa (BOURGOIN, 2018). More species of the tribe, and of Issidae more generally, exist in the Philippines but the current low number of dedicated taxonomists does not allow any fast progress in the study of this species-rich family of Planthoppers and of insects more generally. As a consequence, this lack of knowledge of the biodiversity impedes an efficient strategy in terms of protection of the nature in the Archipelago.

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