



Taxonomic study of Lebinthus Stål, 1877 (Orthoptera: Gryllidae: Eneopterinae) with description of six new species in the Philippines Running title: Taxonomy of Philippine Lebinthus

Jessica B. Baroga-Barbecho, Ming Kai Tan, Sheryl A Yap, Tony Robillard

► To cite this version:

Jessica B. Baroga-Barbecho, Ming Kai Tan, Sheryl A Yap, Tony Robillard. Taxonomic study of Lebinthus Stål, 1877 (Orthoptera: Gryllidae: Eneopterinae) with description of six new species in the Philippines Running title: Taxonomy of Philippine Lebinthus. 2020. hal-02946318

HAL Id: hal-02946318

<https://hal.science/hal-02946318>

Preprint submitted on 23 Sep 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Taxonomic study of *Lebinthus* Stål, 1877 (Orthoptera: Gryllidae: Eneopterinae) with description of six new species in the Philippines

Running title: Taxonomy of Philippine *Lebinthus*

JESSICA B. BAROGA-BARBECHO^{1,*}, MING KAI TAN², SHERYL A. YAP^{3,4}, & TONY ROBILLARD²

¹Office of the Vice Chancellor for Research and Extension, University of the Philippines Los Baños, College, Laguna, 4031 Philippines. Email: jbbaroga@up.edu.ph

²Institut de Systématique, Evolution et Biodiversité (ISYEB), Muséum national d'Histoire naturelle, CNRS, SU, EPHE, UA, 57 rue Cuvier, CP 50, 75231 Paris Cedex 05, France. E-mails: orthoptera.mingkai@gmail.com & tony.robillard@mnhn.fr

³Institute of Weed Science, Entomology and Plant Pathology, University of the Philippines Los Baños, College, Laguna, 4031 Philippines. Email: sayap3@up.edu.ph

⁴Museum of Natural History, University of the Philippines Los Baños, College, Laguna, 4031 Philippines.

*corresponding author

Abstract

The genus *Lebinthus* Stål, 1877 (Orthoptera: Gryllidae: Eneopterinae: Lebinthini) is studied. New locality records are provided for *L. bitaeniatus* Stål, *L. sanchezi* Bolívar, *L. polillensis* Baroga, Yap, & Robillard, *L. puyos* Robillard, and *L. luae* Robillard & Tan. Six new species are described from Mt. Porras, Sibalom (*L. dannybaletai* **sp. nov.**), Mt. Balatukan, Misamis Oriental (*L. parvus* **sp. nov.**), Mt. Empagatao, Misamis Oriental (*L. palaceus* **sp. nov.**), Tarumpitao, Palawan (*L. hamus* **sp. nov.**), Mt. Malinao, Albay (*L. magayon* **sp. nov.**), and Boracay, Aklan (*L. boracay* **sp. nov.**). A distribution map, a taxonomic key, and an updated checklist of the genus in the Philippines are also provided.

Key words: checklist, distribution, key, Lebinthini, redescription, Southeast Asia, taxonomy,

Introduction

Lebinthus Stål, 1877 is the third most diverse genus under the tribe Lebinthini, with 17 species worldwide, many species of which are widely distributed in Southeast Asia. Most species of this genus can be easily recognized by their average size, brachypterous wings, and their male genitalic features with short pseudepiphallid lophi. Species of *Lebinthus* produce calling songs with high-frequency harmonics, sometimes with completely ultrasonic frequencies (Robillard & Desutter-Grandcolas, 2004b; Robillard, 2010). Behavioral studies also demonstrated a unique communication mode including vibrational responses of the female to the high-frequency call of the male (ter Hofstede et al. 2015). Additionally, *Lebinthus* was also found to be a major prey of charismatic vertebrate species (e.g., common palm civets) among other species of orthopterans (Fung et al., 2018) but little is known beyond this study about the ecological niches of these crickets. Their wide distribution also allows the study of intra-specific variations in behaviors and life history, thus suggesting that species of *Lebinthus* can be useful model organisms. However, as with many orthopterans from Southeast Asia, undescribed species from this genus are yet to be discovered with increasing sampling effort (Tan et al., 2017). This in turns will also expand our understanding of species delimitation, distribution and identification. A clear and accurate understanding of the taxonomy is paramount if these crickets are to be further used as model subjects for behavioral, evolutionary, and ecological studies.

In the last decade, several studies have revised or described species of the genus in the Philippines. Robillard & Tan (2013) re-examined the type species using recently collected specimens of *L. bitaeniatus* Stål, 1877 found in the Philippines. They described a new species *L. luae* Robillard & Tan, 2013 from Singapore and South Sumatra, and redescribed *L. bitaeniatus* using modern taxonomic criteria.

Another study conducted by Robillard *et al.* (2013) focused on the species of *Lebinthus* found in Mt. Makiling: In this study, *L. sanchezi* Bolívar, 1889 was redescribed and *L. makilingus* Otte, 2007 was synonymized under *L. sanchezi*. Moreover, a new species from Mt. Makiling—*L. puyos* Robillard, 2013—was also described. These two taxonomic reviews provided a clear taxonomic reference for *Lebinthus* species in the Philippines.

Later, Robillard & Yap (2015) described a species in Visayas Islands—*L. estrellae* Robillard, 2015—and reported specimens of *L. luae*, a species previously known to occur only in Singapore, from several secondary forests in Leyte, thereby extending the geographical distribution of the species. More recently, Baroga *et al.* (2016) described *L. polillensis* Baroga, Yap & Robillard, 2016 from Polillo Island and provided the first key to known Philippines' eneopterine species, including *Lebinthus*. The Philippines currently has a total of six *Lebinthus* species.

In this paper, we make new locality records for *L. bitaeniatus*, *L. sanchezi*, *L. polillensis*, *L. puyos*, and *L. luae*. We also describe six new species of *Lebinthus* from Mt. Porras, Sibalom (*L. dannybaletai* **sp. nov.**), Mt. Balatukan, Misamis Oriental (*L. parvus* **sp. nov.**), Mt. Empagatao, Misamis Oriental (*L. palaceus* **sp. nov.**), Tarumpitao, Palawan (*L. hamus* **sp. nov.**), Mt. Malinao, Albay (*L. magayon* **sp. nov.**), and Boracay, Aklan (*L. boracay* **sp. nov.**). A taxonomic key, distribution map, and an updated checklist of the genus *Lebinthus* in the Philippines are also provided. With all of these findings, we are able to contribute additional information on the diversity and taxonomy of these crickets in the country.

Materials and Methods

Material examined

Newly collected specimens studied herein come from selected forested areas in the Philippines. These crickets were captured during day and night using sweep nets or by hand using a wide-mouthed plastic vial. Specimens were preserved in 80% ethyl alcohol or absolute analytical grade ethanol. Type and non-type specimens from personal collections and donations were deposited at UPLBMNH, NMP and MNHN. The institutions/museums and their acronyms where specimens were loaned from or were deposited in, are listed below. Information in brackets in the lists of materials refers to information not present on specimens' labels.

Observations and morphological analysis

Direct observations and dissections of male and female genitalia have been made using a dissecting microscope. General morphology follows terminology by Ragge (1955), Desutter-Grandcolas (2003), and Robillard & Desutter-Grandcolas (2004). Dissection and preservation of male and female genitalia as well as the measurements of characters follows Robillard & Yap (2015) and Baroga *et al.* (2016). Photographs of the habitus, genitalia, and other important morphological characters were taken using AmScope MU1000 digital camera and Canon EOS 50D digital SLR camera with a macro photo lens MP-E 65 mm f/2.8 USM (1–5×). Canon Macro Twin Lite MT-24EX and Canon Macro Ring Lite MR-14EX were used for lighting and flash. Image editing was accomplished using Adobe Photoshop CC 2014.

Acoustic analyses

The basic cricket song terminology follows Ragge & Reynolds (1998). One song unit is called a syllable and corresponds to one opening–closure cycle of the male forewings.

The recordings of *L. puyos* were made with a modified Condenser Microphone Capsule CM16 (Avisoft Bioacoustics, Berlin), with a flat frequency response from 3 to 150 kHz (R. Specht pers. comm.), connected to a Tascam HD-P2 digital recorder (96 kHz sampling frequency, 16 bit) in the field, or using Avisoft Triggering Harddisk Recorder version 2.97 and an 8-Pre MOTU sound card at a sampling frequency of 96 k-samples/s (16 bit). Song features were measured using Avisoft Lite 2.0.0 and the ‘specan’ function in the open source R package *WarbleR* version 1.1.14 (Araya-Salas and Wright, 2017) in the R software version 3.5.1 (R Development Core Team, 2018). To generate power spectra using FFT, we used the function ‘spec’ at 256,000 sampling frequency, using the Hanning window of window length 512. All recording files are deposited in the Sound Library of the MNHN.

Abbreviations

Descriptions:

General morphology: FW, forewing; HW, hindwing; Tarsomere III-1, III-3: first and third segments of hind leg tarsomere. Tegminal venation: 1A–4A, first to fourth anal veins; CuA, anterior cubitus; CuA1, CuA2, ... first, second, ... bifurcations of CuA; CuP, posterior cubitus; M, median vein; R, radial vein; Sc, subcostal vein; c1–3, first to third cells of C alignment; d1 cell (mirror), first cell(s) of D alignment.

Measurements:

FIIIL, length of hind femora; FIIIW, width of hind femora; FWL, forewing length; FWW, forewing width (at the level of maximal width); OL, ovipositor length; PronL, pronotum length; PronW, pronotum width; TIIL, length of hind tibiae.

Institutions:

BPBM	Bernice P. Bishop Museum, Honolulu, Hawaii, USA;
IWEP-Taxo. Lab.	Institute of Weed Science, Entomology, and Plant Pathology–Taxonomy Laboratory, UP Los Baños, Laguna, Philippines;
MNHN	Muséum national d’Histoire naturelle, Paris, France;
NMP	National Museum of the Philippines, Manila, Philippines;
OMNH	Osaka Museum of Natural History, Osaka, Japan;
UPLBMNH	University of the Philippines Los Baños Museum of Natural History, Laguna, Philippines;
ZIN	Zoological Institute of Russian Academy of Sciences, Russia
ZRC	Zoological Reference Collection, Lee Kong Chian Natural History Museum, Singapore.

Systematic part

Key to species of *Lebinthus* Stål, 1877 in the Philippines

1. Body with yellowish/whitish longitudinal bands along the whole body. Male FWs without a rounded false mirror in the harp.....2
– Body without yellowish/whitish longitudinal bands along the whole body. Male FWs with a rounded false mirror in the harp.....4
2. Longitudinal yellowish band wide, without a black line ventrally. Face with two black squarish spots between scapes..... *L. luae* Robillard & Tan, 2013

- Longitudinal yellowish band thin, underlined ventrally by a narrow black line. Face with a black band between scapes3
- 3. Longitudinal lateral yellowish band on tergites usually more distinct. Black facial band between scapes thicker, broader than the antennal fossa. Male genitalia: Pseudepiphallic parameres with inner lobe more triangular with more acute apex. Distribution: Palawan, Mindoro, Luzon
.....*L. bitaeniatus* Stål, 1877
- Longitudinal lateral yellowish band on tergites usually faded. Black facial band between scapes thinner, thinner than the antennal fossa. Male genitalia: Pseudepiphallic parameres with inner lobe more rounded and stouter. Distribution: Boracay*L. boracay* **sp. nov.**
- 4. Face generally whitish.....5
- Face generally dark brown or black6
- 5. Face mostly whitish, apex of fastigium without contrasted orange. Male genitalia with longer parallel lophi, pseudepiphallic parameres C-shaped. Female tegmina touching each other with apex more angular. Distribution: Luzon..... *L. puyos* Robillard, 2013
- Face with whitish bands below eyes, clypeus black with yellow edge. Male genitalia with short rounded lophi. Female tegmina clearly separated from each other with apex rounded. Distribution: Leyte.....*L. estrellae* Robillard, 2015
- 6. Pronotal lateral lobe generally dark brown with some light yellow pattern at ventral half.....7
- Pronotal lateral lobe black or dark brown dorsally, ventral margin yellow with a median black pattern.....9
- 7. Female tegmina touching each other with apex angular. Distribution: currently known only from Panay *L. dannybaletai* **sp. nov.**
- Female tegmina clearly separated, not touching each other; apex rounded. Distribution: not known from Panay8
- 8. Larger, PL 28 mm. Female tegmina longer, reaching middle of second tergite; with five longitudinal veins. Apex of female ovipositor without denticulation. Female copulatory papilla pentagonal shape. Distribution: Luzon (only female known) *L. magayon* **sp. nov.**
- Smaller, PL < 25 mm. Female tegmina shorter, reaching posterior end of first tergite; with six longitudinal veins. Apex of female ovipositor with denticulation. Female copulatory papilla cylindrical, narrowing apically. Distribution: Mindanao*L. parvus* **sp. nov.**
- 9. Male genitalia with pseudepiphallic lophi stout, about as long as wide (width at the base). Female tegmina touching (or nearly) each other with apex angular or very far from each other with apex rounded.....10
- Male genitalia with pseudepiphallic lophi more elongated, longer than wide (width at the base). Female tegmina always touching (or nearly) each other with apex angular11
- 10. Larger, PL ~27 mm. Male genitalia with pseudepiphallic parameres spade-shaped. Mirror (d1) of male tegmen with basal margin rounded. Female tegmina touching each other with apex angular. Distribution: Mindanao *L. palaceus* **sp. nov.**
- Smaller, PL ~21 mm. Male genitalia with pseudepiphallic parameres F-shaped. Mirror (d1) of male tegmen with basal margin angular. Female tegmina very far from each other with apex rounded. Distribution: Luzon*L. sanchezii* Bolívar, 1889
- 11. Very large, PL ~25 mm. Male genitalia with pseudepiphallic lophi more cylindrical and pointing externally. Female tegmina nearly touching each other. Distribution: Palawan
..... *L. hamus* **sp. nov.**

- Much smaller, PL ~21 mm. Male genitalia with pseudepiphallid lophi triangular and pointing posteriorly. Female touching each other, partly overlapping. Distribution: Luzon, Negros Oriental
..... *L. polillensis* Baroga, Yap & Robillard, 2016

Family Gryllidae

Subfamily Eneopterinae Saussure, 1874

Tribe Lebinthini Robillard, 2004

Genus *Lebinthus* Stål, 1877

Lebinthus Stål, 1877: 35.

Type species. *Lebinthus bitaeniatus* Stål, 1877.

Diagnosis. Mostly small to average in size, brachypterous in both sexes, characterized by the presence of the yellow lateral band on FWs and along the whole body in some species. The genus includes two groups of species, one characterized by a rounded false mirror in the harp in male FWs, and one characterized by longitudinal yellowish bands along the whole body.

Distribution. Japan; Taiwan; Indonesia; Malaysia; Singapore; Brunei; Philippines; Palau (Fig. 1)

Included species and distribution. Seventeen species are known worldwide. Six new species are added to the genus in this paper. They are listed (TL = type locality) below in chronological order based on when each species was described. Information about are provided, including country in bold, followed by islands where records are available for the species:

***Lebinthus bitaeniatus* species group**—characterized by longitudinal yellowish bands along the whole body:

L. bitaeniatus Stål, 1877—**Philippines** (TL): Luzon, Palawan, Mindoro, Masbate, Sulu Is.

L. lanyuensis Oshiro, 1996—**Taiwan**: Lanyu I. (TL),

L. luae Robillard & Tan, 2013—**Singapore** (TL); **Philippines**: Luzon, Leyte, Cebu, Palawan, Sulu;
Indonesia: Sumatra, West Java; Riau Islands, Sulawesi; **Palau**

L. boracay **sp. nov.**—**Philippines**: Boracay (TL)

***Lebinthus sanchezi* species group**—characterized by rounded false mirror in the harp in male FWs:

L. sanchezi Bolívar, 1889—**Philippines**: Luzon

L. truncatipennis Chopard, 1929—**Indonesia**: Sumatra, West Java, Sipora Island

L. yaeyamensis Oshiro, 1996—**Japan**: Yonaguni I. (TL)

L. villemantae Robillard, 2010—**Indonesia**: Sulawesi

L. puyos Robillard, 2013—**Philippines**: Luzon (TL)

L. estrellae Robillard, 2015—**Philippines**: Leyte (TL)

L. polillensis Baroga, Yap & Robillard, 2016—**Philippines**: Polillo I. (TL), Luzon, Negros Oriental

L. sandakan Tan, Japir, Chung & Robillard, 2019—**East Malaysia**: Sabah

L. dannybaletai **sp. nov.**—**Philippines**: Panay (TL)

L. hamus **sp. nov.**—**Philippines**: Palawan (TL)

L. magayon **sp. nov.**—**Philippines**: Luzon

L. palaceus **sp. nov.**—**Philippines**: Mindanao

L. parvus **sp. nov.**—**Philippines**: Mindanao

Incertae sedis:

L. punctatus (Brunner von Wattenwyl, 1898)—**Indonesia**: Maluku

L. striolatus (Brunner von Wattenwyl, 1898)—**Indonesia**: Maluka
L. flavipalpis Chopard, 1931—**Indonesia**: West Papua (TL)
L. leopoldi Chopard, 1931—**Indonesia**: West Papua (TL)
L. ambonensis Robillard, 2010—**Indonesia**: Ambon (TL)
L. buruensis Robillard, 2010—**Indonesia**: Buru (TL)

Account of *Lebinthus* from the Philippines

Lebinthus bitaeniatus Stål, 1877

(Figs. 1, 2, 3)

Lebinthus bitaeniatus Stål, 1877: 35 (original description); Bolívar, 1889: 425; Chopard, 1968: 354; Robillard & Desutter-Grandcolas, 2004a: 275; 2006: 644; 2008: 67 (phylogeny and taxonomy); Robillard & Tan, 2013: 712 (redescription); Baroga *et al.* 2016: 94 (taxonomic key); Schneider *et al.*, 2017: 1–12.

Type material. Holotype female. **Philippines.** Ins. Philipp., semper, 24-25/5-64 (NHRM-ORTH0012705) [examined, photo in Robillard & Tan, 2013]

Other material examined. Philippines. Luzon: Zambales, Malabayuan River, SBFR, 1♂ (JBB206), 25.iv.1998, coll. V.P.G. & M.G.S. (IWEP Taxo Lab-03008), left fore leg for molecular analysis (L142, IWEP Taxo Lab-03008); Bataan, Orani, Singtala, Mt. Natib, 1♂ (JBB161), 29.i–11.ii.2015, coll. J.B. Baroga, P.A.C. Buenavente (PNM); Laguna: UPLB, Mt. Makiling: 50 m, 1♂ (JBB296), 10.xi.1976, coll. C.R. Baltazar (UPLBMNH ORT-01139); 1♀ (JBB303), 11.iii.1989, coll. P. So-an (UPLBMNH ORT-01146); 50 m, 1♀ (JBB304), 28.ix.1948, coll. L.B. Uichanco (UPLBMNH ORT-01147); 50 m, 1♀ (JBB306), 21.ii.1949, coll. G.B. Viado (UPLBMNH ORT-01149); 50 m, 2♀ (JBB305, JBB344), 16.ix.1950, coll. L.B. Uichanco (UPLBMNH ORT-01148); shrubs, 1♀ (JBB311), 22.ix.1974, coll. N.G. Fabellar (UPLBMNH ORT-01154); 2♂ (JBB336–337), 19.iii.1985, coll. C.L. Dayanon (UPLBMNH ORT-01179–01180); 1♂ (JBB321), 23.iii.1986, coll. E. Oratai (UPLBMNH ORT-01164); 1♀ (JBB345), 1986, coll. B. Chantana (UPLBMNH ORT-01188); 1♀ (JBB329), 14.i.1987, coll. E.S. Solsoloy (UPLBMNH ORT-01172); 1♀ (JBB343), 30.xi.1988, coll. C.R. Bravo (UPLBMNH ORT-01186); 1♂ (JBB209), 31.i.2004, coll. G.D. Damao (IWEP Taxo Lab-02993); 1♂ (JBB013), 06.i.2014, coll. J.B. Baroga (UPLBMNH); 1♂ (JBB018), 15–16.ii.2014, coll. N.M. Barbecho (UPLBMNH); 1♂ (JBB027), 27.iv.2014, coll. J.B. Baroga (UPLBMNH); 3♀ (JBB102–104), 06.viii.2014, coll. J.B. Baroga (UPLBMNH); 2♂ (JBB107–108), 15.viii.2014, coll. J.B. Baroga (UPLBMNH); 1♀ (JBB176), 03.iv.2014, coll. J.B. Baroga (UPLBMNH); 1♀ (JBB223), 14.ii.2016, coll. Kath Dizon (IWEP Taxo Lab-30235); Mudspring: 1♂ (JBB210), 12.xi.1988, coll. V.G. (IWEP Taxo Lab-02999); 1♂ (JBB208), 17.i.2009, coll. C.M.B. Jarilla (IWEP Taxo Lab-02997); Makiling, Eco Trail, 1♂ (JBB212), 02.iv.2016, coll. J.E. Umerez (IWEP Taxo Lab-30232); [Makiling Botanic Garden] MBG: ex. grass, 1♀ (JBB329), i.1980, coll. M.C. Mendoza (UPLBMNH ORT-01173); 1♀ (JBB351), 21.ix.1980, coll. E.R. deGuia (UPLBMNH ORT-01194); 1♂ (JBB294), 18.vii.1987, coll. A. Ngatidjo (UPLBMNH ORT-01137); 1♂ (JBB211), 9.viii.1989, coll. Magcaring (IWEP Taxo Lab-03004); 1♂ (JBB293), ix.1989, coll. Rillon (UPLBMNH ORT-01136); 1♀ (JBB302), 28.ix.1990, coll. G. Barroga (UPLBMNH ORT-01145); UPLB: 1♀ (JBB225), vi.2003, coll. MRMMUAD (IWEP Taxo Lab-02998); 1♂ (JBB213), 29.iii.2009, coll. N.A.Q. Manalo (IWEP Taxo Lab-02996); 1♀ (JBB221), 29.iii.2009, coll. R.E. Bayot (IWEP Taxo Lab-02995); 1♀ (JBB224), 28.vi.2014, coll. MRMMUAD (IWEP Taxo Lab-03000); College: 1♂ (JBB317) 2♀ (JBB350, 352), 8.v.1958, coll. D.A. Galvez (UPLBMNH ORT-01160) (UPLBMNH ORT-01193, 01195); 1♀ (JBB353), 9.v.1958, coll. Bernardo (UPLBMNH ORT-01196); 50 m, 1♂ (JBB292), 14.v.1958, coll. S. Gallardo (UPLBMNH ORT-01135); 1♂ (JBB319), 16.v.1971, coll. L.A. Malabayoc (UPLBMNH ORT-01162); grasses, 1♀ (JBB346), 7.ix.1974, coll. P.B. Epino (UPLBMNH ORT-01189); Los Baños: 1♀ (JBB348), 29.v.1947, coll. L.B. Uichanco (UPLBMNH ORT-01191); 50 m, 1♂ (JBB295),

30.xii.1963, coll. R.G. Basio (UPLBMNH ORT-01138); 50 m, 1♀ (JBB307), 20.v.1963, coll. W.M. Amorica (UPLBMNH ORT-01150); 50 m, 2♀ (JBB308-309), 30.xii.1963, coll. R.G. Basio (UPLBMNH ORT-01151-01152); 100 m, 1♀ (JBB347), 6.ii.1965, coll. I.P. Novero (UPLBMNH ORT-01190); 1♀ (JBB310), 25.xi.1982, coll. E. Narong (UPLBMNH ORT-01153); 1♂ (JBB214), i.2004, coll. JOAN (IWEPTaxo Lab-03002); 1♀ (JBB220), 18.viii.2008, coll. K.B. Saliendra (IWEPTaxo Lab-02994); 1♀ (JBB222), 14.ii.2016, coll. JAD ADA (IWEPTaxo Lab-30230); Anos: 2♀ (JBB301, 312), 2.ix.1990, coll. A.U. Garcia (UPLBMNH ORT-01144, 01155); Puting Lupa: 1♀ (JBB219), 08.ii.1986, coll. E. Oratal (IWEPTaxo Lab-03003); Quezon Province: Atimonan, Quezon Nat'l Park, 1♂ (JBB291), 11.ix.1976, coll. V.P. Gapud (UPLBMNH ORT-01134); Mt. Banahaw, 1♀ (JBB355), 9.ix.1995, coll. P. Santos (UPLBMNH ORT-01198); SOR[Sorsogon], Iros [Irosin], Patag, shrubs, 1♀ (JBB218), 10.xii.2009, coll. M.J. Beltran (IWEPTaxo Lab-03007); [Masbate] Aroroy, 2♂ 1♀ (JBB418-420) (MNHN-ENSIF 1425,1419, 1426); Mindoro: 2♀ (JBB421-422) (MNHN-ENSIF 1420-1421); Palawan: Quezon: alt. 5-50 m (W. coast of Palawan), 1♀ 1♂ (JBB406-407), 10.xii.1969, coll. Yorio Miyatake (OMNH); 1♀ (JBB408), 13.xii.1969, coll. Yorio Miyatake (OMNH); Busuanga Is.: env. of Coron (S. coast), 2♂ 1♀ (JBB399-401), 21-23.ii.2004, coll. A.V. Gorochoy (ZIN); env. of Sabang (W. coast), 1♂ (JBB402), 1-2.iii.2004, coll. A.V. Gorochoy (ZIN); env. of Taytay (E. coast), 1♂ 2♀ (JBB403-405), 25-26.ii.2004, coll. A.V. Gorochoy (ZIN); Puerto Princesa, San Vicente, Port Barton, Secret Paradise Resort, coll. J.B. Baroga, S.A. Yap, T. Robillard, F. Legendre (UPLBMNH): 2♀ 1♂ (JBB044-047), 3♂ 1♀ (JBB048-050), 30.vii.2014; 1♂ (JBB060), 5♀ (JBB061-065), 31.vii.2014; 4♀ 1♂ (JBB080-084), 01.viii.2014; 2♂ 3♀ (JBB088-092), 02.viii.2014; Concepcion, Mt. Ababalnon coll. J.B. Baroga, S.A. Yap, T. Robillard, F. Legendre (UPLBMNH): 1♂ (JBB101), 04.viii.2014; [Mindanao]: [Sulu] Tapul, Philippines, 1♂ (JBB416), 27.iii.1957, coll. Yoshio Kondo (BPBM).

Type locality. Philippines [no specific locality].

Distribution. (Fig. 1) Philippines: Zambales, Malabayuan River (**new locality record**); Bataan, Mt. Natib (**new locality record**); Laguna, Mt. Makiling & Puting Lupa; Quezon Province: Atimonan, Quezon National Park (**new locality record**), Mt. Banahaw (**new locality record**); Sorsogon, Irosin (**new locality record**); Masbate, Aroroy (**new locality record**); Mindoro (**new locality record**); Palawan: Puerto Princesa, Port Barton (**new locality record**), Concepcion, Mt. Ababalnon (**new locality record**), Coron, Busuanga; Taytay & Quezon (**new locality record**); Sulu, Tapul (**new locality record**).

Diagnosis. This species differs from the other species in the *bitaeniatus* group by its more slender body shape, lighter coloration, a thinner yellow longitudinal band along the body and which is underlined ventrally by a narrow black line, and strong M-shaped sclerotization of ectophallic fold in male genitalia (Robillard & Tan, 2013).

Habitat. The species lives in shrubs, grasses, and in low to average elevations (50-100 m) in open secondary habitats.

***Lebinthus sanchezi* Bolívar, 1889**

(Figs. 1, 4, 5)

Lebinthus sanchezi Bolívar, 1889: 425 (original description); Casto de Elera, 1895: 219; Kirby, 1906: 88; Bruner, 1915: 263; Chopard, 1968: 354; Robillard *et al.*, 2013: 52 (redescription); Baroga *et al.*, 2016: 94 (taxonomic key).

Type material. Neotype male. **Philippines.** Luzon: Paete [Pakil], University of the Philippines Laguna Land Grant, secondary forest at 500 m from station, 14°23'56.9"N 121°32'47.2"E, 376 m (GPS LG2), 4.vii.2011, day, leaf litter, coll. T. Robillard (UPLBMNH) [examined]. Paraneotypes. 2♂,

1♀ (UPLBMNH), 3♂, 1♀ (MNHN) [examined], same information as NT.

Other material examined. Philippines. [Luzon]: Nueva Ecija, CLSU, 1♀ (JBB314), 16.xi.1985, coll. T.M. Aganon (UPLBMNH ORT-01157); Bataan, Orani, Singtala, Mt. Natib, 1♀ (JBB162), 29.i–11.ii.2015, coll. J.B. Baroga & P.A.C. Buenavente (PNM); Laguna: Putinlupa, 1♂ (JBB320), 8.iii.1986, coll. E. Oratai (UPLBMNH ORT-01163); Cavinti, 1♂ (JBB182), 26.v.2014, coll. N.M. Barbecho (UPLBMNH ORT-00875); UPLB, Mt. Makiling: 1500 ft, 1♂ (JBB338), 26.iv.1958, coll. D.A. Galvez (UPLBMNH ORT-01181); 1♂ (JBB017), 15–16.ii.2014, coll. N.M. Barbecho (UPLBMNH).

Type locality. Philippines. Luzon: Paete [Pakil], University of the Philippines Laguna Land Grant, secondary forest at 500 m from station.

Distribution. (Fig. 1) Philippines: Bataan, Mt. Natib (**new record**); Nueva Ecija, CLSU (**new record**); Laguna: Paete, UPLB Land Grant, Mt. Makiling, Puting Lupa, Cavinti (**new record**).

Diagnosis. This species is close to *L. puyos* from which it differs by having a black face and male genitalia with little differentiated triangular pseudepiphallic lophi and F-shaped pseudepiphallic parameres (Robillard *et al.*, 2013).

Habitat. This species lives underneath leaf litter of secondary forested areas and sometimes on top of leaves of small bushes or plants (Robillard *et al.*, 2013). A specimen from Mt. Natib in Orani, Bataan was also collected in a dry, slightly concrete path near residential houses.

***Lebinthus puyos* Robillard, 2013**

(Figs. 1, 6, 7)

Lebinthus puyos Robillard, 2013: 49 (original description); Baroga *et al.* 2016: 94 (taxonomic key).

Type material. Holotype male. **Philippines.** Luzon: Laguna, Los Baños, Mount Makiling, base, secondary forest on campus, 14°09'12.9"N 121°14'05.0"E, 168 m (GPS Maki1), 27.vi.2011, night, leaf litter (TR652), coll. T. Robillard (UPLBMNH) [examined]; Allotype female: same information as HT, TR653 (UPLBMNH) [examined]; Paratypes (5♂): same information as HT (MNHN) [examined].

Other material examined. Philippines. [Luzon]: Laguna: College, 50 m, 1♂ (JBB318), 20.ii.1958, coll. E.S. Novero (UPLBMNH ORT-01161); UPLB, Mt. Makiling, 1♀ (JBB106), 06.viii.2014, coll. J.B. Baroga (UPLBMNH); Los Baños, 300 m, 1♀ (JBB349), 21.iv.1960, coll. A. Djamin (UPLBMNH ORT-01192); [Quezon Province], Mt. Banahaw, 1♂ (JBB297), 2.vii.1994, coll. O. Reyes (UPLBMNH ORT-01140); same information as HT, 6♂, lab colony, call recording (F0-male1, F0-male1-3, F1-male1-2, F5-male1 (MNHN).

Type locality. Philippines. Luzon: Laguna, Los Baños, Mount Makiling, base, secondary forest on campus.

Distribution. Philippines: Laguna: Mt. Makiling and Los Baños; Quezon: Mt. Banahaw (**new record**).

Diagnosis. This species differs from *L. sanchezi* by its whitish face, a fastigium that is not orange apically, without clear longitudinal bands in the vertex (Robillard *et al.*, 2013), and male genitalia with long and rounded pseudepiphallic lophi and C-shaped pseudepiphallic parameres.

Calling song. The song of *L. puyos* consists of long trills (duration = 3.1 ± 0.8 s [1.7–4.0 s]; period = 25.6 ± 2.8 s [22.4–33.1 s]) made up of more than 200 syllables of increasing intensity (Figs. 7A–C). Syllable duration = 12.6 ± 1.2 ms (10–15 ms). The spectrogram analysis reveals that the frequency spectrum is completely ultrasonic. The syllables show a clear dominant peak at 23.12 ± 1.06 kHz typically corresponding to the first peak of a harmonic series with an intermediary peak at ca. 25 to 30 kHz (Figs. 7D, 7E).

Habitat. The species is found in secondary habitats in the type locality i.e., foot of Mt. Makiling; specimens are found in leaf litter and on top of leaves of small plants.

***Lebinthus luae* Robillard & Tan, 2013**

(Fig. 1)

Lebinthus luae Robillard & Tan, 2013: 705 (original description); Tan, 2013: 298 (record in mangroves in Singapore); Tan & Robillard, 2014: 375 (key to Eneopterinae species in Singapore); ter Hofstede *et al.* 2015: 2 (communication system); Baroga *et al.*, 2016: 94 (taxonomic key); Tan, 2017: 4; Fung *et al.*, 2018: 44 (major prey of common palm civet).

Lebinthus sp.: Tan, 2010: 246; Tan, 2012: 4; Tan & Wang, 2012: 315; Tan *et al.*, 2012: 66; Robillard *et al.*, 2013: 2003 (sound generation system).

Type material. Holotype male. **Singapore.** Labrador park, forêt secondaire littorale [coastal secondary forest], 01°15'59"N, 103°48'8.1"E, 57 m, day, leaf litter (ZRC), (GPS Lab1), (TR6), 12.vi.2011, coll. T. Robillard [examined]; Allotype female. **Singapore:** Pulau Ubin Island, Jalan Endut Senin, 01°24'19.3"N, 103°57'58.7"E, 0 m, day, leaf litter (ZRC), (TR42bis), 30.vi.2009, coll. T. Robillard [examined].

Other material examined. **Palau.** Koror, 1♀ (JBB412), 20.vii.1946, coll. Oakley (BPBM); 3♂ (JBB413–415), 15–25.iii.1948, coll. K.L. Maehler (BPBM); **Philippines.** [Luzon]: [Laguna], MBG [Makiling Botanic Garden], 1♀ (JBB298), i.1980 (UPLBMNH ORT-01141); Quezon Province: Polillo Is., Pinaglubayan, 1♀ (JBB034), 4–6.vi.2014, coll. J.B. Baroga, F. Signabon, & S.A. Yap (UPLBMNH); Atimonan: 1♀, juvenile (JBB229), 31.i.2009, coll. C.P.F. Garcia (IWEP Taxo Lab-03005); 1♂ (JBB207), 01.ii.2009, coll. J.M. Encarnacion (IWEP Taxo Lab-03006), left fore leg for molecular analysis (L140); Quezon Nat'l Park: 1♂, 1♀ (JBB290, JBB299), 11.ix.1976, coll. V.P.G (UPLBMNH ORT-01133, 01142); Pinagbenderahan, 1♀ (JBB328), 29.viii.1984, coll. V.P.G (UPLBMNH ORT-01171); Palawan: Ursula, off E., 1♂ (JBB409), 5.iii.1957, coll. Yoshio Kondo (BPBM); [Visayas]: Leyte, Maasin, 50 m, 1♀ (JBB300), 10.v.1952, coll. C.R. Baltazar (UPLBMNH ORT-01143); Leyte, Leyte-Leyte, 22.vi.2012, coll. T. Robillard; Biliran Islands, North Maripipi Island, iii.2013, 3♂, coll. T. Robillard; Leyte, Dulag, zone ouverte en bord de route [open area near road], 10°57'22"N 125°01'47.7"E (1 m), 26.vi.2012, 1 juvenile, coll. T. Robillard (MNHN); South Leyte, prox. Kuting Reef, 10°2'22.7"N 124°58'58.11"E, 10 m, zone herbacée en bord de route [herbaceous area near road], viii.2013, 2♀ (MNHN), 2♂ (MNHN), 1♂ (MNHN), call recording, 1 juvenile (MNHN), day, coll. T. Robillard, [Mindanao]: Sulu, Tawi-tawi Grp, Bongao Is., 1♀ (JBB417), 29.viii.1958, coll. H.E. Milliron (BPBM); Cebu: Moalboal, Blue Orchid Resort, 9.993583 N 123.3731 E, 24.vii.2014, 1 juvenile, (TR2), molecular sample L69, coll. T. Robillard (MNHN-EO-ENSIF1543).

Type locality. **Singapore.** Labrador park, forêt secondaire littorale [coastal secondary forest]

Distribution. Singapore: Labrador Park; Indonesia: Durian Is., Java & Sumatra; Palau: Koror (**new country record**). Philippines: Laguna: MBG (**new locality record**); Quezon Province: Atimonan, Quezon National Park (**new locality record**), Pinaglubayan, Polillo (**new locality record**); Palawan:

Ursula off (**new locality record**); Leyte: Biliran Island; Maasin (**new locality record**); Tawi-Tawi, Sulu (**new locality record**); Cebu, Moalboal, (**new locality record**).

Diagnosis. This species differs from *L. bitaeniatatus* by the yellow longitudinal along the whole body being wider and without a ventral black lining and by male genitalia wider and shorter and without M-shaped sclerotization in the ectophallic fold (present in *L. bitaeniatatus*) (Robillard & Tan, 2013). This species also differs from *L. boracay* **sp. nov.** by longitudinal lateral yellowish bands on tergites usually more distinct; black facial band between scapes thicker, broader than the antennal fossa; and pseudepiphallic parameres of male genitalia with inner lobe more triangular with more acute apex.

Habitat. The species is mostly found in secondary forests, some on rivers sides, and some on roadside or coastal areas (Robillard *et al.*, 2015). The species can be easily found resting above leaf litter and leaves. This species is active both in the day and at night but mainly sings during daytime.

***Lebinthus estrellae* Robillard, 2015**

(Fig. 1)

Lebinthus estrellae Robillard, 2015: 63 (original description); Baroga *et al.*, 2016: 94 (taxonomic key).

Type material. Holotype male. **Philippines.** [Visayas] Leyte: Burauen, Barangay Villa Corazon, forêt secondaire sur pente [secondary forest on slope] (GPS Bar2), 10°57'52.1"N 124°46'39.8"E, 345 m, (TR29), iii.2013, coll. T. Robillard (UPLBMNH) [examined]. Paratypes (2♂, 15♀): same information as the HT (MNHN) [examined].

Type locality. Leyte: **Philippines.** Burauen, Barangay Villa Corazon, secondary forest on slope

Distribution. Philippines: Leyte, Barauen

Diagnosis. This species can be recognized from other species of the *sanchezi* group by its dark brown colouration, short rounded lophi in male genitalia, presence of vertical whitish bands below eyes, clypeus black with yellow edge; male genitalia with short rounded lophi, and a very short female FWs (reaching posterior margin of first tergite).

Habitat. Found in bushes and leaf litter.

***Lebinthus polillensis* Baroga, Yap & Robillard, 2016**

(Fig. 1)

Lebinthus polillensis Baroga *et al.*, 2016: 93 (original description & taxonomic key).

Type material. Holotype male. **Philippines.** Luzon: Quezon Province, Polillo Island, Barangay Pinaglubayan, secondary forest, night, rainy, leaf litter (JBB036), 4–6.vi.2014, coll. J.B. Baroga, S.A. Yap & F. Signabon (UPLBMNH ORT-01096.) [examined]

Other material examined. **Philippines.** [Luzon]: Ifugao Province, Bunhian, Jacmal, 24 km E Mayoyao, 800–1000 m, 1♀ (JBB445), 4–6.v.1967, 1♀ juvenile (JBB446), 16–18.iv.1967, 1♀ (JBB447), 22–24.iv.1967, coll. H.M. Torrevillas (BPBM); Camarines Sur, Mt. Iriga, rec: 500–600 m, 1♀, 9.IV.[19]62, H.M. Torrevillas (BPBM); 500–600 m, 1♀, 17.IV.[19]62 (BPBM); 500–600 m, 1♂, 13.IV.[19]62 (BPBM); 500 m, 1♂, 25.III.[19]62 (MNHN); [Visayas]: Negros Or. [Oriental], L. Balinsasayao, 1♀ (JBB444), 1–7.x.1959, coll. C.M. Yoshimoto (BPBM).

Type locality. Philippines. Luzon: Quezon Province, Polillo Island, Barangay Pinaglubayan, secondary forest.

Distribution. Philippines: Ifugao Province, Bunhian (**new locality record**); Polillo Island, Pinaglubayan; Camarines Sur, Mt. Iriga (**new locality record**); Negros Oriental, Balinsasayao (**new locality record**).

Diagnosis. This species is close to *Lebinthus puyos* and *L. sanchezi*, from which it differs by some features in head and male genitalia, and female FWs slightly overlapping.

Habitat. The type material was found hiding underneath the leaf litter, usually in moist area, low elevation (500–600 m) of a secondary forest.

***Lebinthus dannybaletaei* Baroga-Barbecho & Robillard sp. nov.**

(Figs. 1, 8, 9, 20A, 21A, 22A, 23A)

Type material. Holotype male. **Philippines.** [Visayas]: [Panay Island], [Antique] Sibalom National Park, Mt. Porras, 11.x.2015 (JBB154), coll. N.M. Barbecho & M.D.M. Asio (PNM 13589). Allotype female. same locality as in HT, NC [night collection] along T1 [Transect 1], 18.x.2015 (JBB151), coll. N.M. Barbecho, M.D.M. Asio & A.C. Diesmos (PNM 13586). Paratypes: same locality as in HT, 4♀ (JBB155–158) (PNM 13590[MNHN]-PNM13593), 1♂ (JBB154) (PNM 13589), 11.x.2015, coll. N.M. Barbecho & M.D.M. Asio, 1♀ (JBB152), 1♂ juvenile (JBB153), 13.x.2015, coll. N.M. Barbecho & M.D.M. Asio (PNM 13587–13588); , 1♂, 1♀ (JBB159–JBB160), 17.x.2015, coll. N.M. Barbecho (PNM 13594/MNHN-EO-ENSIF13595); NC along T1: 1♀ (JBB145), 15.x.2015, coll. N.M. Barbecho (PNM 13580); 2♂ (JBB146–147), left mid leg of JBB146 for molecular analysis (L139); 4♀ (JBB148–150), 18.x.2015, coll. N.M. Barbecho (PNM 13581–13585).

Type locality. Philippines. Visayas: [Panay Island], [Antique] Sibalom National Park, Mt. Porras

Distribution. Philippines: Panay Island, Antique, Sibalom, Mt. Porras.

Etymology. The name of the species is dedicated to the late Mr. Danilo “Danny” S. Balete, a well-known Filipino Mammalogist and conservationist, for his contribution to science and Philippine conservation. He was the mentor of JBB in the mentoring program of the Biodiversity Conservation Society of the Philippines during its Annual Scientific Conference in 2010.

Diagnosis. The species differs from congeners by its general coloration, dark brown including face and head vertex. Male genitalia close to *L. puyos*, from which they differ by pseudepiphallus—thinner and slightly longer, and from pseudepiphallic parameres with inverted L-shaped (C-shaped in *L. puyos*).

Description. Size average for the genus (Fig. 8; Table 1). Coloration yellow brown and dark brown. Head dorsum (Fig. 20A) dark brown, region posterior to eyes and vertex black, with 2–3 thin yellow bands, not distinct. Fastigium darker than vertex, wider than long, setose golden brown, with a thin yellow band apically; upper facial part dark brown, with black markings. Scapes brown, antennae brown basally, then progressively darker. Face and mouthparts (except labium) dark brown, covered with black markings. Maxillary palpi and labium brown. Lateral part of head yellow with a brown area (Fig. 21A). Dorsal disk of pronotum with anterior lateral edge brown, posterior golden brown. Lateral lobes of pronotum dark brown (Fig. 21A), with thin brown patterns near ventral margin; ventral edge black. Fore- and median legs brownish; femora with dark brown spots; tibia with dark rings. Hind femora brown, with strong striated dark brown patterns on outer face; knees black; hind

tibia dark brown without dark or faint rings. Hind tarsomeres with 3–4 spines on dorsal outer edge and 0–1 on outer faces (n=6). Abdomen brown, with small black spots dorsally, lighter ventrally. Cerci brown, with dark rings near apex.

Male. FWs (Fig. 22A) not reaching abdomen mid-length. Cells brown, not translucent, veins dark brown. Lateral field with yellow longitudinal veins and faint black transverse veins. 1A curved, without a clear angle; CuP not visible. Diagonal vein clearly visible on anterior half, faint posteriorly. Harp wide, with a strong semi-circular vein, poly-furcated anteriorly, and delimiting rounded false mirror, with curved area of CuA. CuA curved on inner side, near apex, its distal part weak, posterior to curved area surrounding the median fold, small and located on abdomen dorsum. Posterior part of diagonal vein visible. Longitudinal veins very strong. Mirror (d1) not differentiated. Apical field very short. Lateral field with 6 strong longitudinal veins, R vein underlined with thin black linings. Subgenital plate elongate, clog-shaped.

Male genitalia (Figs. 9A–C). Close *L. puyos*. Pseudepiphallic sclerite elongate (slightly longer but thinner than *L. puyos*), convex dorsally, trapezoidal shaped, narrowed posteriorly, with short individualized lophi, separated by a V-shaped indentation; anterior margin of pseudepiphallic sclerite slightly bisinuated, its lateral margins slightly curved and raised dorsally. Rami short, straight, not diverging apically. Pseudepiphallic parameres inverted L-shaped (C-shaped in *L. puyos*), their anterior lobe rectangular and slightly curved, posterior ones elongate. Ectophallic arc wide, complete, deeply curved posteriorly, its base with long ventro-posterior expansions well sclerotized. Ectophallic fold membranous, with a rounded preapical sclerite and two short antero-lateral sclerotizations. Ectophallic apodemes very long, almost parallel. Endophallic sclerite very long, more or less straight, exceeding anterior margin of pseudepiphallic sclerite, its posterior apex with a small median expansion and short lateral arms; endophallic apodeme made of lateral lamella, without median crest.

Female. FWs (Fig. 23A) rather short, not reaching posterior margin of second tergite, slightly overlapping basally. Veins dark brown, not translucent, darker than cells. Dorsal field with five strong dark brown longitudinal veins. Lateral field darker, with four strong dark brown longitudinal veins. Ovipositor shorter than hind femora; apex of ovipositor lanceolate, and denticulate on dorsal edge. Copulatory papilla (Figs. 9D, 9E) small, slightly conical and narrow dorso-ventrally, with wide, V-shaped basal sclerotized ring; apex rounded and slightly enlarged, with some corrugations on its lateral margins.

Measurements (in mm). See Table 1.

Habitat. The type material was found in secondary forested areas where vegetation ranges from average to high, some in grasslands and leaf litter. Most of the specimens were collected during night.

***Lebinthus parvus* Baroga-Barbecho & Robillard sp. nov.**

(Figs. 1, 10, 11, 20B, 21B, 22B, 23B)

Type materials. Holotype male. **Philippines.** [Mindanao]: Misamis Or. [Oriental], Mt. Balatukan, 15 km SW of Gingoog, 1000–2000 m, 1–5.v.1960 (JBB432), coll. H. Torrevillas (BPBM); Allotype female. **Philippines.** [Mindanao]: Agusan, San Francisco, 10 km SE, 17.xi.1959 (JBB441), coll. C.M. Yoshimoto (BPBM); Paratype male. **Philippines.** [Mindanao]: Bukidnon, Mt. Katanglad [Kitanglad], 1480 m, 27–31.x.1959 (JBB429), coll. L. Qauate & C. Yoshimoto (MNHN-EO-ENSIF****).

Type locality. **Philippines.** Mindanao: Misamis Or. [Oriental], Mt. Balatukan, 15 km SW of Gingoog, 1000–2000 m.

Distribution. Philippines: Misamis Oriental, Mt. Balatukan; Bukidnon, Mt. Kitanglad; Agusan, San Francisco.

Etymology. The name comes from the Latin word “*parvus*” which means “small” referring to the size of the species, which is the smallest *Lebinthus* among Mindanao species.

Diagnosis. The species is characterized by its general shape and small size, face almost black except the posterior part yellow and yellow marking crossing clypeus and labrum. Pseudepiphallus of male genitalia close to *L. puyos*, from which it differs by triangular shape and pseudepiphallic parameres F-shaped more similar to that of *L. sanchezi*.

Description. Species size average for the genus (Fig. 10). Coloration brown to dark brown. Head dorsum (Fig. 20B) dark brown, with four longitudinal bands; region posterior to eyes and vertex yellow. Fastigium dark brown, wider than long, covered with golden brown setae. Scape and antenna brown. Face black except posterior part, yellow, with a yellow band crossing from clypeus to labrum; region between antennae with yellow markings. Maxillary palpi brown. Lateral face (Fig. 21B) with a yellow band running from vertex to labrum; region posterior to eyes dark brown. Dorsal disk of pronotum straight posteriorly. Lateral lobes black dorsally, ventral margin yellow or brown, with a median dark brown to black patch, sometimes linked to anterior margin or to the dorsal dark coloration. Fore- and median legs brown, sometimes mottled with dark brown. Hind femora brown, with some dark brown patches on lateral edges of its inner face. Hind tibia shorter than femora, brown to dark brown, with light to faint rings. Hind tarsomeres with 3–4 spines on dorsal outer edge (n=3) and 0–1 on outer faces (n=3). Abdomen dark brown. Cerci brown, tapering, slightly pointed apically, with some dark brown spots.

Male. FWs (Fig. 22B) close to that of *L. estrellae*, not reaching abdomen mid-length. Cells and veins golden brown to dark brown, apex of longitudinal band orange brown to golden brown, M and R orange brown, area in between yellowish, without transverse veins. Sc orange brown, area between R and Sc dark brown; rest of lateral field dark brown, lighter toward ventral margin, with dark brown longitudinal veins. 1A curved (<100°). Diagonal vein near CuA weak. Harp wide, occupying most of dorsal field surface, with a transverse harp vein, poly-furcated anteriorly, forming a rounded false mirror. CuA curved innerly near apex, connected to false mirror, basal part weak. Longitudinal veins of dorsal field stronger basally, transverse veins weak. Mirror (d1) not differentiated. Apical field very short, with no bifurcation of CuA posterior to diagonal vein. Lateral field with five strong longitudinal veins including R, Sc, and 3 more ventral veins; Sc without bifurcating veins. Subgenital plate elongate, clog-shaped.

Male genitalia (Figs. 11A–C). General shape intermediate between that of *L. puyos* and *L. sanchezi*. Pseudepiphallic sclerite elongate, convex dorsally, more or less triangular (more rectangular in *L. puyos*), narrowed posteriorly, with short individualized lophi, setose and separated by a wide V-shaped indentation; anterior margin straight, lateral margins slightly curved and raised dorsally. Rami short, prolonging triangular shape of pseudepiphallus. Pseudepiphallic parameres F-shaped (as in *L. sanchezi*), curved ventrally. Ectophallic arc complete, deeply curved posteriorly, its base with long vento-posterior expansions, sclerotized basally. Ectophallic fold with a wide bilobate preapical sclerite, anterior margin indented, posterior with lateral expansions. Ectophallic apodemes parallel and very long, exceeding anterior margin of pseudepiphallus. Endophallic sclerite very long, curved dorsally, exceeding anterior margin of pseudepiphallus, its anterior apex with a small triangular median expansion and with short lateral arms; endophallic apodeme made of lateral lamella, without a median crest.

Female. FWs (Fig. 23B) very short, reaching posterior margin of the first tergite, not overlapping. Dorsal field brown, with six very strong orange brown longitudinal veins. Lateral edges darker, with two golden brown longitudinal veins, slightly curved apically. Ovipositor slightly shorter than hind

femora; its apex lanceolate, denticulate on dorsal edge. Copulatory papilla (Figs. 11D, 11E) cylindrical, little sclerotized, narrowing apically, with wide and sclerotized base, median area indented; apex elongate, round and enlarged anteriorly.

Measurements (in mm). See Table 2.

Habitat. Based on the information in the labels, the species is found in secondary forested areas in low to average elevation.

Remarks. The type materials are from museum collections and were found in different locations in Mindanao. Close examination of the materials confirmed that the three known specimens belong to the same species based on the characters of the face and vertex, lateral lobes of pronotum and wing patterns. The male specimen from Bukidnon only varies from the type specimen by slight features in genitalia—translucent ectophallic fold and slightly longer lophi, which is probably because the specimen recently molted.

***Lebinthus palaceus* Baroga-Barbecho & Robillard sp. nov.**
(Figs. 12, 13, 20C, 21C, 22C, 23C)

Type materials. Holotype male. **Philippines.** [Mindanao]: Misamis Or. [Oriental], Mt. Empagatao, 1050–1200 m, 19–30.iv.1961 (JBB435), coll. H. Torrevillas (BPBM). Allotype female (JBB436) (BPBM) and paratype female (JBB437) (MNHN-EO-ENSIF****), same information as HT.

Type locality. **Philippines.** Mindanao: Misamis Or. [Oriental], Mt. Empagatao, 1050–1200 m

Distribution. **Philippines.** Misamis Oriental, Mt. Empagatao.

Etymology. The name *palaceus* is an adjective term, which means “spade-shaped” referring to the shape of the pseudepiphallic paramere of the male genitalia.

Diagnosis. The species can be recognized by its large size, black face yellow markings in regions below and between antennae, and by male genitalia with spade-shaped pseudepiphallic parameres and X-shaped preapical sclerites in ectophallic fold.

Description. Species large for the genus (Fig. 12, Table 3). Head dorsum (Fig. 20C) dark brown, with four longitudinal bands, little distinct; region posterior to eyes yellow. Fastigium dark brown to black, wider than long, with long golden setae. Scapes yellow, antennae brown, darker apically. Face including clypeus and labrum black, except posterior part, yellow to brown, with some yellow markings between and below antennae. Fronto-clypeal suture white. Mouthparts including maxillary palpi yellow to brown. Lateral face (Fig. 21C) yellowish to brownish, area posterior to eyes with a dark brown band. Dorsal disk of pronotum dark brown medially, fainter near lateral margins. Lateral lobes of pronotum dark brown to black dorsally, ventral margin brown, with a median dark brown to black patch sometimes linked to anterior margin or to dark dorsal coloration. Fore- and median legs brownish; femora with dark brown spots, tibiae with thick dark brown rings. Hind femora orange brown, with some dark brown patches on the lateral edges of their inner face. Knees dark brown, tibiae and tarsus brown basally, darker apically. Hind tarsomeres with 3 spines on dorsal outer edge and none on outer face (n=3). Abdomen dark brown, covered with short golden brown setae. Sternites yellow brown. Cerci brown, covered with dark brown to black patches.

Male. FWs (Fig. 22C) not reaching abdomen mid-length. Cells yellow brown, not translucent, veins yellow brown. Angle between dorsal and lateral fields forming a whitish band including bases of and distal part of CuA (rest of CuA dark brown), bases of M, CuA/M area, and distal part of M/R area. Lateral field dark brown dorsally, lighter ventrally, with dark brown transverse veins. 1A angle wide.

CuP absent. Area posterior to plectrum with a thick sclerotization. Harp wide, occupying most of dorsal field surface, with a strong transverse harp vein, poly-furcated anteriorly, forming a rounded false mirror. CuA curved innerly near apex. Mirror (d1) not differentiated. Apical field very short, with no bifurcation of CuA posterior to diagonal vein. Lateral field with six strong longitudinal veins including R, Sc, and 4 more ventral veins; Sc without bifurcating veins. Sub-genital plate elongate, clog-shaped.

Male genitalia (Figs. 13A–C). Close to that of *L. sanchezi*. Pseudepiphallic sclerite elongate, slightly trapezoidal and convex dorsally; posterior apex with short triangular lophi, wider than long, setose, and separated by a V-shaped indentation; anterior margin straight, lateral margins slightly raised dorsally. Rami very short. Pseudepiphallic parameres spade-shaped, with a broad blade apex and a short tapered base. Ectophallic arc complete, curved posteriorly, less sclerotized. Ectophallic fold with a longer than wide X-shaped paralleled sclerite, with a short median gap. Ectophallic apodemes very short, not reaching anterior margin of pseudepiphallos. Endophallic sclerite wide and long, translucent, its posterior apex with small, hook-like lateral expansions. Endophallic apodeme translucent or not visible.

Female. FWs (Fig. 23C) longer than pronotum, not overlapping. Dorsal field yellow to brown, with 6–7 strong yellow brown longitudinal veins, with dark transverse veins; posterior margin straight, slightly curved apically. Lateral field darker, with three strong and one weak longitudinal veins, with strong dark transverse veins. Ovipositor slightly shorter than hind femora, apex lanceolate, denticulate on dorsal edge. Copulatory papilla (Figs. 13D, 13E) conical and narrowed dorso-ventrally; base narrowing, triangular, convex dorsally; apex almost as wide as base, with a long lateral sclerotization forming a concave appearance.

Measurements (in mm). See Table 3.

Habitat. Unknown.

***Lebinthus hamus* Baroga-Barbecho & Robillard sp. nov.**

(Figs. 1, 13, 14, 20D, 21D, 22D, 23D)

Type materials. Holotype male. **Philippines.** [Luzon]: Palawan, Tarumpitao, light trap, 1.vi.1958 (JBB410), coll. H.E. Milliron (BPBM). Allotype female. **Philippines.** [Luzon]: [Palawan], Balabac, Pasig, 4.iii.1957 (JBB439), coll. Yoshio Kondo (MNHN-EO-ENSIF****).

Type locality. **Philippines.** Luzon: Palawan, Tarumpitao,

Distribution. **Philippines.** Southern Palawan.

Etymology. The name comes from a Latin word “hamo” which means “hook” referring to the shape of the pseudepiphallic parameres and sclerites in the ectophallic arc of the male genitalia.

Diagnosis. The species is characterized by its yellowish face, with black bands running in the upper part below antennae and eyes, resembling a mustache. It is also characterized by male genitalia with hook-shaped pseudepiphallic parameres and hook-like expansions in ectophallic arc.

Description. Size average for the genus (Fig. 13, Table 4). Coloration brown. Head dorsum (Fig. 20D) dark brown, with four wide dark brown longitudinal bands; region posterior to eyes yellow. Fastigium dark brown, wider than long, covered with golden brown setae. Scapes yellow, antennae brown. Face yellow with two pairs of black bands, one in upper face below antenna, and another one below eye, extending to gena and mandibles. Mouthparts yellow to brown, with some dark brown

markings. Maxillary palpi brown with dark brown patches. Lateral part of head (Fig. 21D) yellow, area posterior to eye with a black band linked to black coloration of pronotum. Dorsal disk of pronotum black medially, yellowish near lateral margins. Lateral lobe of pronotum black dorsally, with a small yellow patch on ventral margin. Fore- and median legs brownish; femora with dark brown spots, tibiae with thick dark brown rings. Hind femora orange brown, with striated dark brown patterns on outer faces. Knees dark brown, tibiae with dark rings, darker and almost merged apically. Hind tarsomeres with three spines on dorsal outer edge and 0–1 on outer faces (n=2). Abdomen orange brown covered with short golden setae. Cerci brown with dark brown rings.

Male. FWs (Fig. 22D) not reaching abdomen mid-length. Cells orange to golden brown, not translucent. M and R golden brown, M/R area whitish, without transverse veins; area between R and Sc dark brown, rest of lateral field progressively lighter toward ventral margin, with dark brown longitudinal veins. 1A slightly curved ($<100^\circ$). CuP absent. Diagonal vein faint, barely visible anteriorly. Harp wide, occupying most of dorsal field surface, with a strong transverse harp vein, poly-furcated anteriorly and forming a false mirror, slightly rounded. CuA curved innerly near apex, its distal part weak. Longitudinal veins of dorsal field very strong apically, transverse veins weaker. Mirror (d1) not differentiated. Apical field very short, with no bifurcation of CuA posterior to diagonal vein. Lateral field with five strong longitudinal veins including M, R, Sc and two more ventral veins. Sub-genital plate elongate, clog-shaped.

Male genitalia (Figs. 15A–C). Pseudepiphallic sclerite triangular, widened anteriorly; posterior apex with short triangular lophi curved dorsally and slightly diverging, setose, separated by a wide V-shaped indentation; anterior apex slightly curved anteriorly, its lateral margins slightly curved dorsally. Rami short, highly diverging. Pseudepiphallic parameres hook-shaped. Ectopthallic arc complete and wide, near bases of pseudepiphallic parameres, prolonged ventrally by hook-like expansions, very sclerotized. Ectopthallic fold longer than wide, with two sub-parallel lateral sclerotizations with lateral expansions. Ectopthallic apodemes very long, diverging, narrowing apically, exceeding anterior margin of pseudepiphallicus. Endopthallic sclerite long, almost straight and exceeding anterior margin of pseudepiphallicus, with small median expansion and short lateral arms; endopthallic apodeme with a small median crest.

Female. FWs (Fig. 23D) shorter than pronotum, not overlapping but close together basally, their posterior margin straight. Dorsal field yellowish, with six strong golden brown longitudinal veins, slightly curved apically; with few transverse veins. Lateral field with four strong yellow brown to golden brown longitudinal veins; transverse veins stronger anteriorly. Ovipositor longer than hind femora; apex lanceolate, slightly denticulate on dorsal edge. Copulatory papilla (Figs. 15D, 15E) conical, narrow dorso-ventrally; base wide and oblong, sclerotized; apex short, enlarged and rounded, its lateral margins corrugated.

Measurements (in mm). see Table 4.

Habitat. Unknown.

***Lebinthus magayon* Baroga-Barbecho & Robillard sp. nov.**
(Figs. 15, 16, 20E, 21E, 23E)

Type materials. Holotype female. **Philippines.** [Luzon]: Albay, Mt. Malinao, 24–25.x.2013 (JBB010), coll. S.A. Yap (UPLBMNH). Paratypes (2 females) JBB008 (UPLBMNH), JBB009 (MNHN-EO-ENSIF****), same information as HT, right mid leg of JBB008 for molecular analysis (L72).

Type locality. **Philippines.** Luzon: Albay, Mt. Malinao

Distribution. Philippines. Albay, Mt. Malinao.

Etymology. The name of the species comes from the word “magayon” of the Bicol language, which is a term used to appreciate the beauty of a woman, relating it to the type material used to describe the species.

Diagnosis. Species of average size, dark brown to black in color. Face and mouthparts completely orange to golden brown. Copulatory papilla pentagonal in shape.

Description. Size average for the genus (Figs. 16, Table 5). General coloration dark brown to black. Head dorsum (Fig. 20E) black. Scapes and antennae dark brown, each antennal segment lined with black markings. Face and mouthparts completely orange to golden brown. Maxillary palpi brown. Head lateral side (Fig. 21E) orange brown to dark brown. Dorsal disk of pronotum dark brown with few dark patterns. Lateral lobe of pronotum dark brown, with brownish to yellowish patterns basally. Legs brown, hind femora covered with thin yellowish to whitish setae. Hind knees black, tibiae dark brown. Hind tarsomeres with 3–4 spines on dorsal outer edge and one on outer faces (n=3). Abdomen homogeneously dark brown to black. Cerci brown.

Female. FWs (Fig. 23E) close to that of *L. estrellae*, very short, their posterior margin curved, reaching posterior margin of first tergite, far from overlapping. Dorsal field brown with five strong dark brown longitudinal veins (3–5 in *L. estrellae*). Lateral edge brown, with four strong dark brown longitudinal veins. Ovipositor shorter than hind femora; apex lanceolate, dorsal edge without denticulation, slightly carinated. Copulatory papilla (Fig. 17) pentagonal shape, membranous.

Male. Unknown.

Measurements (in mm). See Table 5.

Habitat. The species was found in vegetation, on top of fern plants.

***Lebinthus boracay* Baroga-Barbecho, Yap & Robillard sp. nov.**
(Figs. 17, 18, 20F, 22E, 23E)

Type material. Holotype male. **Philippines.** [Visayas]: Aklan, Boracay Is., Balinghai Beach Resort, 1♂ (JBB029), 14.v.2014, coll. J.B. Baroga, S.A. Yap, & B.J.V. Zulueta (UPLBMNH). Paratype (1 male) (JBB030), same information as the HT, right mid leg for molecular analysis (L141) (MNHN-EO-ENSIF***).

Type locality. Philippines. Visayas: Aklan, Boracay Is., Balinghai Beach Resort.

Distribution. Philippines. Aklan, Boracay.

Etymology. The species is named after the type locality.

Diagnosis. Species close to *L. bitaeniatus* from which it differs by faint but wide yellowish longitudinal bands on abdomen (thinner in *L. bitaeniatus*) and features of male genitalia, including shape of pseudepiphallic parameres and ectophallic apodemes longer than in *L. bitaeniatus*, exceeding anterior margin of pseudepiphallus.

Description. Size large for the genus (Figs. 18). Head dorsum (Fig. 20F) with six wide dark brown longitudinal bands. Fastigium wider than long, setose, dark brown, apex yellow with two thin black spots on facial part almost touching each other; scapes yellow brown, antennae brown. Epistomal

suture brown (yellow in *L. bitaeniatus* and *L. luae*). Mouthparts yellow brown, including maxillary palpi. Lateral part of head with a yellow area posterior to eye, underlined by a black band, then progressively lighter from dorsal to ventral region. Dorsal disk of pronotum slightly mottled with dark brown spots, with short black longitudinal lines on posterior apex. Lateral edges dark brown. Lateral lobes of pronotum dark brown dorsally, brown to yellow ventrally. Fore and median legs yellow brown, femora with brown spots and longitudinal patterns, tibiae with rings. Hind femora brown, with strong striated dark brown patterns on outer faces, knees black; hind tibiae brown basally darker to black apically, with yellow rings. For all pairs of legs, Ta1 and Ta3 yellow basally, dark brown apically. Abdomen homogeneously dark brown dorsally, covered with golden setae, lateral edges with faint but wide yellowish longitudinal bands. Sclerites yellowish brown with dark brown patterns laterally. Cerci yellowish basally, with black rings near apex, ventral side black.

Male. FWs (Fig. 22E) not reaching abdomen mid-length, cells and veins brown, not translucent; angle between dorsal and lateral field yellow, forming a narrow longitudinal band, including bases of CuA (rest of CuA dark brown), bases of M, CuA/M area, and half of M/R area. CuP absent. Area posterior to plectrum strongly sclerotized. Harp wide, with a longitudinal fold near angle of 1A, with 1 harp vein. Distal part of CuA straight. Mirror (d1) not differentiated. Apical field very short, with no bifurcation of CuA posterior to diagonal vein. Lateral field dark brown, with five strong longitudinal veins including M, R, Sc and two more ventral veins.

Male genitalia (Fig. 19). Close to that of *L. bitaeniatus*. Pseudepiphallic sclerite trapezoidal, convex dorsally, its apex not trilobate, lophi barely individualized, sl. Rami short, half as long as pseudepiphallic sclerite. Pseudepiphallic parameres differing from that of *L. bitaeniatus* by the more rectangular shape of their posterior lobe. Ectophallic arc complete and wide. Ectophallic fold wide and triangular, with a wide M-shaped sclerotization as in *L. bitaeniatus*, apex membranous. Ectophallic apodemes long and parallel (longer than *L. bitaeniatus*), exceeding anterior margin of pseudepiphallicus. Endophallic sclerite long, exceeding anterior margin of pseudepiphallicus, convex dorsally, its posterior apex with a small median triangular expansion and with short thick lateral arm.

Female (based on photograph, Figure 18B). FWs nearly as long as pronotum, light brown dorsally with at least four strong dark brown longitudinal veins; posterior margin slightly curved; lateral field darker. Ovipositor slightly shorter than FIII.

Habitat. *L. boracay* was found in a secondary habitat on top of leaves in small plants in the garden of Balinghai Beach Resort.

Acknowledgements

We are grateful to the Department of Science and Technology-Accelerated Science and Technology Human Resource Development Program (DOST-ASTHRDP) for J.B. Baroga-Barbecho's MS scholarship and to UP-Continuous Operational and Outcomes-based Partnership for Excellence in Research and Academic Training Enhancement (COOPERATE) Program for the travel grant, which allow us to further examine the specimens at MNHN, Paris France. We also thank Mr. Jose Macavinta and family for the accommodation during our stay in Boracay and Mr. Brian V. Zulueta for accompanying us during the sampling collection. To Mr. Normandy M. Barbecho and Mr. Maverick Asio for collecting the specimens in Mt. Porras and Simon Poulain of MNHN, France for taking photos of the specimens. MK Tan's work in the Philippines was granted by the Orthoptera Species File Grant 2018 under the taxonomic research project with the title "Advancing biodiversity informatics of Orthoptera from the Philippines".

References

- Araya-Salas, M. & Smith-Vidaurre, G. (2017) warbleR: an R package to streamline analysis of animal acoustic signals. *Methods in Ecology and Evolution*, 8 (2), 184–191. <https://doi.org/10.1111/2041-210X.12624>
- Baroga, J.B., Yap, S.A. & Robillard, T. (2016) Two new species of Eneopterinae crickets (Orthoptera: Gryllidae) from Luzon, Philippines. *Zootaxa*, 4139 (1), 93–105. <http://dx.doi.org/10.11646/zootaxa.4139.1.5>
- Bolívar, I. (1889) Enumeración de Gríllidos de Filipinas. *Anales de la Sociedad Española de Historia Natural*, 18, 415–431.
- Bruner, L. (1915) Preliminary catalogue of the Orthopteroid insects of the Philippines Island. *The University Studies of the University of Nebraska*, 15 (2), 195–281.
- Casto de Elera, R.P.F (1895) Ortópteros. *Catálogo sistemático de toda la fauna de Filipinas*, 2, 189–223. <https://doi.org/10.5962/bhl.title.58548>
- Chopard, L. (1929) *Orthoptera Palaearctica critica: VII. Les Polyphagiens de la faune paléarctique (Orth., Blatt.)*.
- Desutter-Grandcolas, L. (2003) Phylogeny and the evolution of acoustic communication in extant Ensifera (Insecta, Orthoptera). *Zoologica Scripta*, 32, 525–561. <https://doi.org/10.1046/j.1463-6409.2003.00142.x>
- Fung, T.K., Tan, M.K. & Sivasothi, N. (2018) Orthoptera in the scat content of the common palm civet (*Paradoxurus hermaphroditus*) in Pulau Ubin, Singapore. *Nature in Singapore*, 11, 37–44.
- Kirby, W.F. (1906) Orthoptera Saltatoria. Part I. (Achetidae et Phasgonuridae). *A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae)*, 2, i–viii, 1–562.
- Oshiro, Y. (1996) Description of a new species of the genus *Lebinthus* Stål (Orthoptera, Gryllidae) from Lan Yu Island, Taiwan. *Japanese Journal of Systematic Entomology*, 2 (2), 117–121.
- Otte, D. (2007) New species of *Cardiodactylus* from the western Pacific region. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 156, 341–400.
- R Core Team (2018) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Viennan. [program]
- Ragge, D.R. (1955) The wing venation of the Orthoptera Saltatoria. British Museum (Natural History), London, 159 pp.
- Robillard, T. (2010). New species of the genus *Lebinthus* (Orthoptera, Grylloidea, Eneopterinae, Lebinthini) from Indonesia and the Solomon Islands. *Zootaxa*, 2386 (1), 25–48. <http://dx.doi.org/10.11646/zootaxa.2386.1.2>
- Robillard, T. & Desutter-Grandcolas, L. (2004a) Phylogeny and the modalities of acoustic diversification in extant Eneopterinae (Insecta, Orthoptera, Grylloidea, Eneopteridae). *Cladistics*, 20 (3), 271–293. <https://doi.org/10.1111/j.1096-0031.2004.00025.x>
- Robillard, T. & Desutter-Grandcolas, L. (2004b) High-frequency calling in Eneopterinae crickets (Orthoptera, Grylloidea, Eneopteridae): an adaptive radiation revealed by phylogenetic analysis. *Biological Journal of the Linnean Society*, 83, 577–584. <http://dx.doi.org/10.1111/j.1095-8312.2004.00417.x>
- Robillard, T. & Desutter-Grandcolas, L. (2006) Phylogeny of the cricket subfamily Eneopterinae (Insecta, Orthoptera, Grylloidea, Eneopteridae) based on four molecular loci and morphology. *Molecular Phylogenetics and Evolution*, 40, 643–661. <https://doi.org/10.1016/j.ympev.2005.10.019>
- Robillard, T. & Desutter-Grandcolas, L. (2008) Clarification of the taxonomy of extant crickets of the subfamily Eneopterinae (Orthoptera: Grylloidea; Gryllidae). *Zootaxa*, 1789 (1), 66–68. <http://dx.doi.org/10.11646/zootaxa.1789.1.3>
- Robillard, T., Montealegre-Z, F., Desutter-Grandcolas, L., Grandcolas, P., & Robert, D. (2013) Mechanisms of high-frequency song generation in brachypterous crickets and the role of ghost frequencies. *Journal of Experimental Biology*, 216 (11), 2001–2011. <https://doi.org/10.1242/jeb.083964>
- Robillard, T., Yap, S.A. & Yngente, M.V. (2013) Systematics of cryptic species of *Lebinthus* crickets in Mount Makiling (Grylloidea, Eneopterinae). *Zootaxa*, 3693 (1), 49–63. <http://dx.doi.org/10.11646/zootaxa.3693.1.3>

- Robillard, T. & Tan, M.K. (2013) A taxonomic review of common but little known crickets from Singapore and the Philippines (Insecta: Orthoptera: Eneopterinae). *The Raffles Bulletin of Zoology*, 61 (2), 705–725.
- Robillard, T. & Yap, S.A. (2015) The Eneopterinae crickets from Leyte Island (Philippines) with description of two new species [Insecta: Orthoptera: Grylloidea: Gryllidae]. *The Raffles Bulletin of Zoology*, 63, 69–90.
- Schneider, E.S., Römer, H., Robillard, T. & Schmidt, A.K.D. (2017) Hearing with exceptionally thin tympana: Ear morphology and tympanal membrane vibrations in eneopterine crickets. *Scientific Reports*, 7 (15266): 1–12. <https://doi.org/10.1038/s41598-017-15282-z>
- Stål, C. (1877) Orthoptera nova ex Insulis Philippinis. *Öfversigt af Kongl. Vetenskaps-akademiens förhandlingar*, 34 (10), 35–58.
- Tan, M.K. (2010) Orthoptera in Pulau Ubin. *Nature in Singapore*, 3, 245–268.
- Tan, M.K. (2012) Orthoptera in the Bukit Timah and Central Catchment Nature Reserves (Part 2): Suborder Ensifera. Raffles Museum of Biodiversity Research, National University Singapore, Singapore, 70 pp. [uploaded 14 November 2012]
- Tan, M.K. (2013) Orthoptera in the mangroves of Singapore. *Nature in Singapore*, 6, 289–230.
- Tan, M.K. (2017) *Orthoptera in the Bukit Timah and Central Catchment Nature Reserves (Part 2): Suborder Ensifera. 2nd Edition*. Lee Kong Chian Natural History Museum, National University of Singapore, Singapore. 101 pages. Uploaded 16 June 2017.
- Tan, M.K., Choi, J. & Shankar, N. (2017) Trends in new species discovery of Orthoptera (Insecta) from Southeast Asia. *Zootaxa*, 4238 (1), 127–134. <https://doi.org/10.11646/zootaxa.4238.1.10>
- Tan, M.K., Ngiam, R.W.J. & Ismail, M.R.B. (2012) A checklist of Orthoptera in Singapore parks. *Nature in Singapore*, 5, 61–67.
- Tan, M.K. & Robillard, T. (2014) A new species of *Cardiodactylus* (Orthoptera: Grylloidea: Eneopterinae) from Singapore. *Zootaxa*, 3764 (3), 364–376. <http://dx.doi.org/10.11646/zootaxa.3764.3.6>
- Tan, M.K. & Wang, L.K. (2012) The Orthoptera of Semakau Landfill, Singapore: A Project Semakau checklist. *Nature in Singapore*, 5, 309–318.

Tables:

TABLE 1. Measurements of *Lebinthus dannybaletai* sp. nov.

	PronL	PronW	FWL	FWW	HWT	FHIL	FHIW	THIL
Male paratypes (n=3)	2.1– 2.7	4.1–4.7	4.0– 4.2	3.3– 3.5	–	8.4–12.2	2.8– 3.8	6.2–10.3
Female paratypes (n=3)	2.5– 2.6	4.3–4.7	1.9– 2.4	2.3– 2.7	–	12.4– 13.1	4.2– 4.5	10.2– 10.9
	THIs			TaHIs			OL	
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Male paratypes (n=3)	7–8	5–6	10–13	3–6	0	3–4	0–1	–
Female paratypes (n=3)	8–9	4–5	10–11	4–7	0	3–4	0–1	10.2– 10.9

TABLE 2. Measurements of *Lebinthus parvus* sp. nov.

	PronL	PronW	FWL	FWW	HWT	FHIL	FHIW	THIL
Male holotype	2.5	4.1	4.2	3.4	–	10.5	3.1	9.2

Female allotype	2.3	4.3	1.1	1.6	–	10.5	3.2	6.5
Male paratype (n=1)	1.9	3.5	3.3	2.8	–	8.0	3.1	6.9
	TIIs				TaIIs			OL
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Male holotype	5	4	9	4	0	4	0	–
Female allotype	5	4	8	5	0	3	1	7.8
Male paratype (n=1)	5	5	9	5	0	4	1	–

TABLE 3. Measurements of *Lebinthus palaceus* sp. nov.

	PronL	PronW	FWL	FWW	HWT	FIIL	FIHW	TIIL
Male holotype	2.4	4.3	4.2	3.7	–	14.1	4.4	13.1
Female allotype	2.7	4.8	3.9	3.3	–	14.8	4.6	11.3
Female paratype (n=1)	2.9	4.9	2.7	2.5	–	14.3	4.7	11.9
	TIIs				TaIIs			OL
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Male holotype	9	7	13	6	0	3	0	–
Female allotype	7	5	12	6	0	3	0	14.1
Female paratype (n=1)	8	5	12	5	0	3	0	13.0

TABLE 4. Measurements of *Lebinthus hamus* sp. nov.

	PronL	PronW	FWL	FWW	HWT	FIIL	FIHW	TIIL
Male holotype	2.5	4.0	3.6	3.0	–	12.2	3.8	10.4
Female allotype	1.9	3.0	1.3	1.7	–	8.3	3.0	7.6
	TIIs				TaIIs			OL
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Male holotype	7	7	9	7	0	3	1	–
Female allotype	6	4	11	5	0	3	0	8.4

TABLE 5. Measurements of *Lebinthus magayon* sp. nov.

	PronL	PronW	FWL	FWW	HW T	FIIL	FIHW	TIIL
Female holotype	2.8	4.9	1.6	1.8	–	12.8	4.2	10.6

Female paratype (n=2)	2.8	5.1–5.3	1.7– 1.9	1.9– 2.3	–	13.2– 14.1	4.2– 4.7	10.7– 1.11
	TIIIIs				TaIIIs			OL
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Female holotype	5	3	6	6	0	4	1	10.2
Female paratype (n=2)	3–5	4–5	7–10	5–6	0	3–4	1	10.8– 11.2

TABLE 6. Measurements of *Lebinthus boracay* sp. nov.

	PronL	PronW	FWL	FWW	HWT	FIII L	FIII W	TIII L
Male holotype (n=1)	***	**	**	**	*	**	**	**
Male paratype (n=1)	**	**	**	**	**	**	**	**
	TIIIIs				TaIIIs			OL
	Ias	Ibs	Oas	Obs	Int	Ext/dors	Ext/lat	
Male holotype (n=1)	***	**	**	**	*	**	**	**
Male paratype (n=1)	**	**	**	**	**	**	**	**

Figures captions

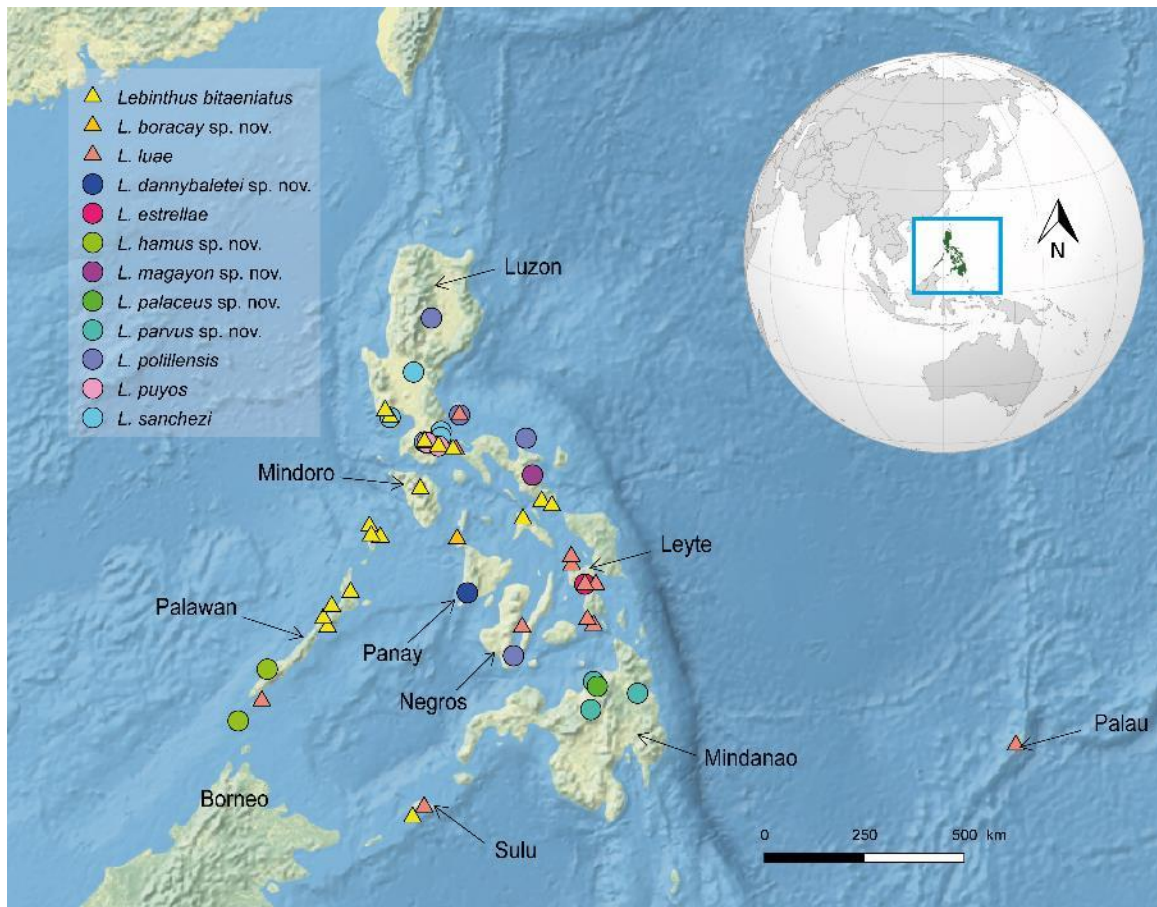


FIGURE 1. Distribution of *Lebinthus* in the Philippines. Triangular symbols refer to species of the *bitaeniatus* species group; round symbols to species of the *sanchezi* species group.



FIGURE 2. *Lebinthus bitaeniatus* male (A) and female (B) adults in their natural environment in Mount Makiling (Luzon).



FIGURE 3. *Lebinthus bitaeniatus* nymph (A) and male and female adults in pre-copulatory mode (B) in their natural environment in Mount Makiling (Luzon).

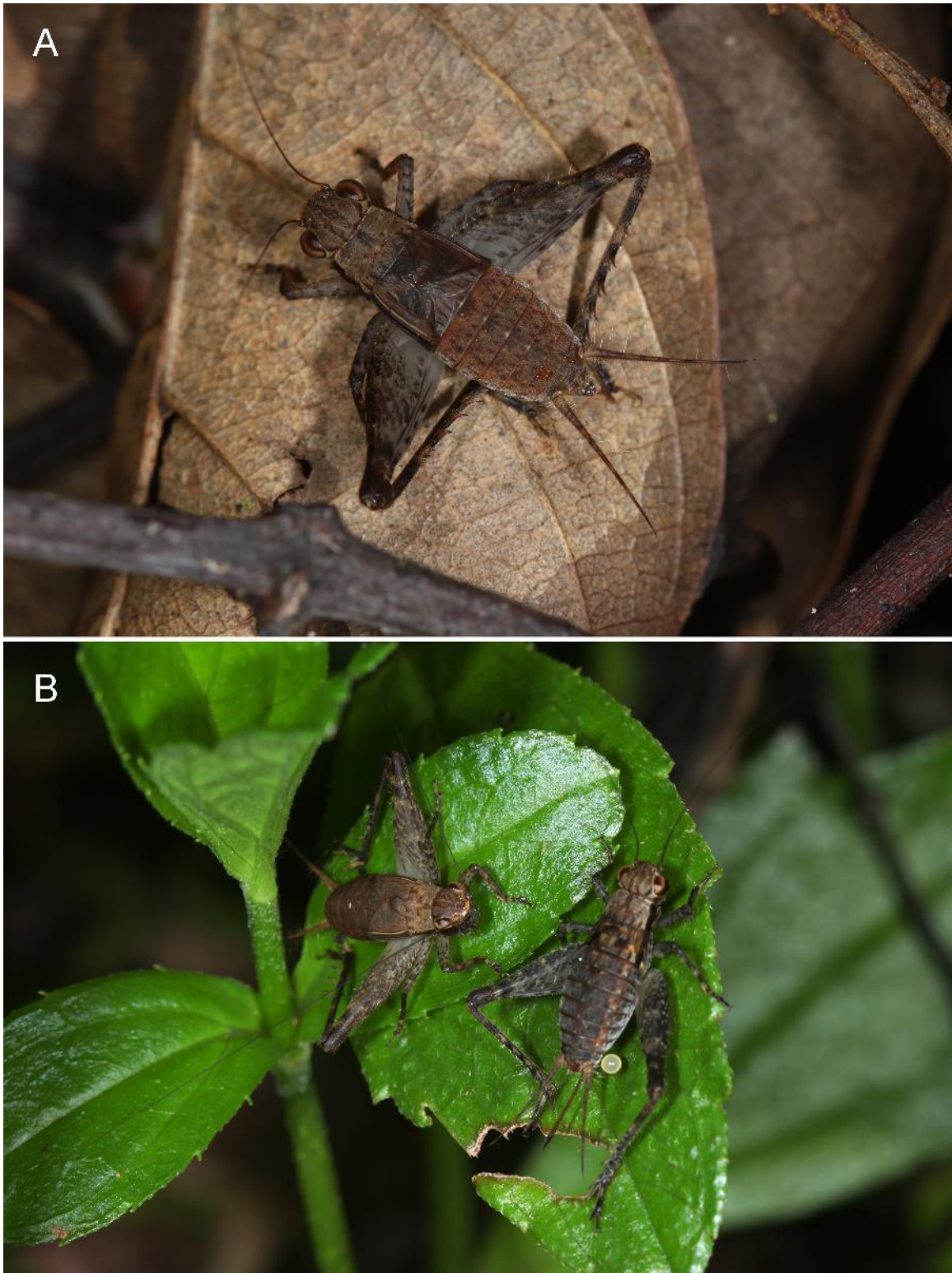


FIGURE 4. *Lebinthus sanchezi* male adult (A) and male and female adults mating (B) in their natural environment in Paete (Luzon).



FIGURE 5. *Lebinthus sanchezi* nymphs in their natural environment in Paete (Luzon).



FIGURE 6. *Lebinthus puyos* nymph in their natural environment in Laguna (A) and male adult in captivity (B).

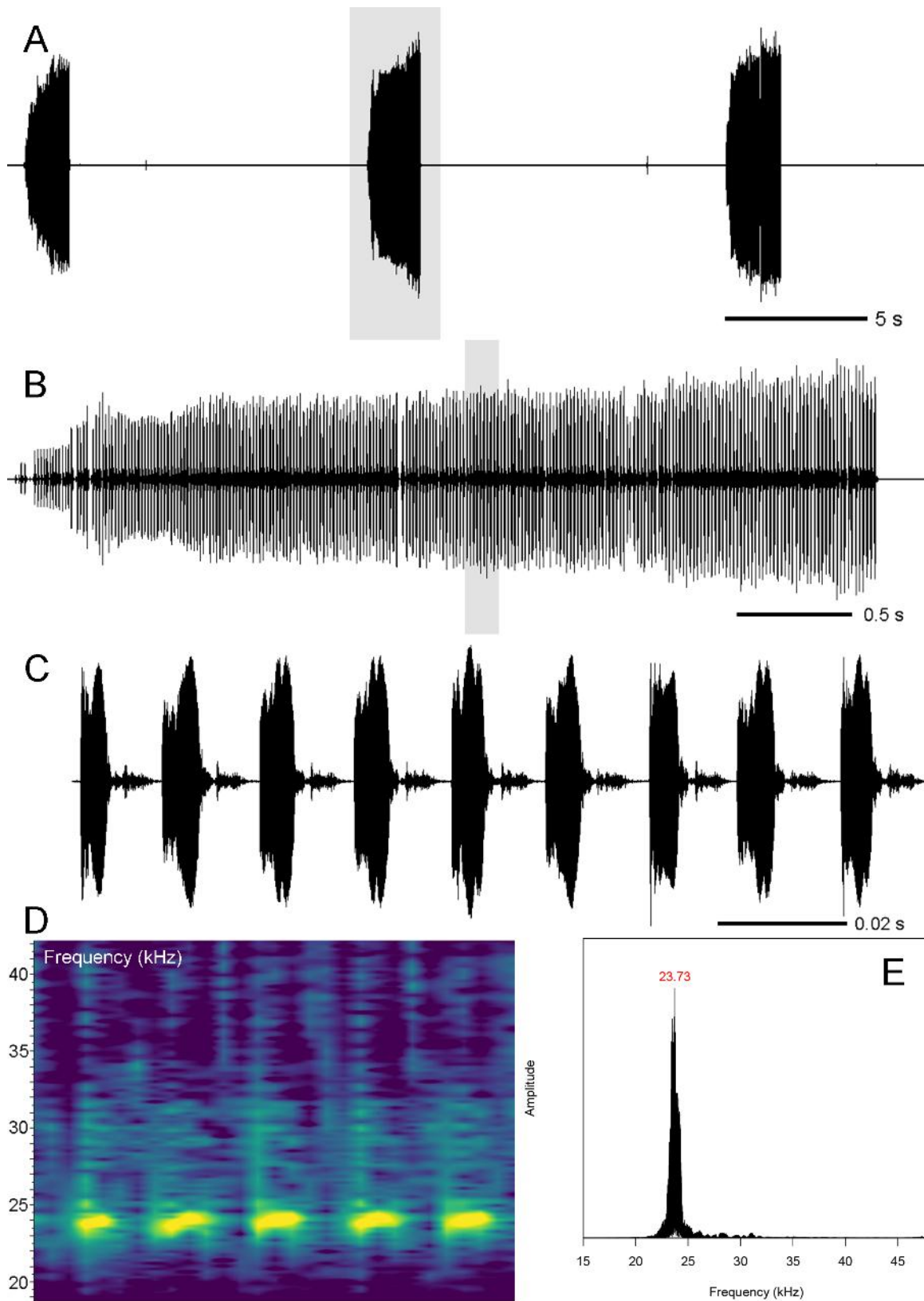


FIGURE 7. Calling song of *Lebinthus puyos*: oscillogram of 3 echemes (A), detailed oscillogram of 1 echeme (B), oscillogram (C) and spectrogram (D) of a section of 1 echeme, and power spectrum (E).

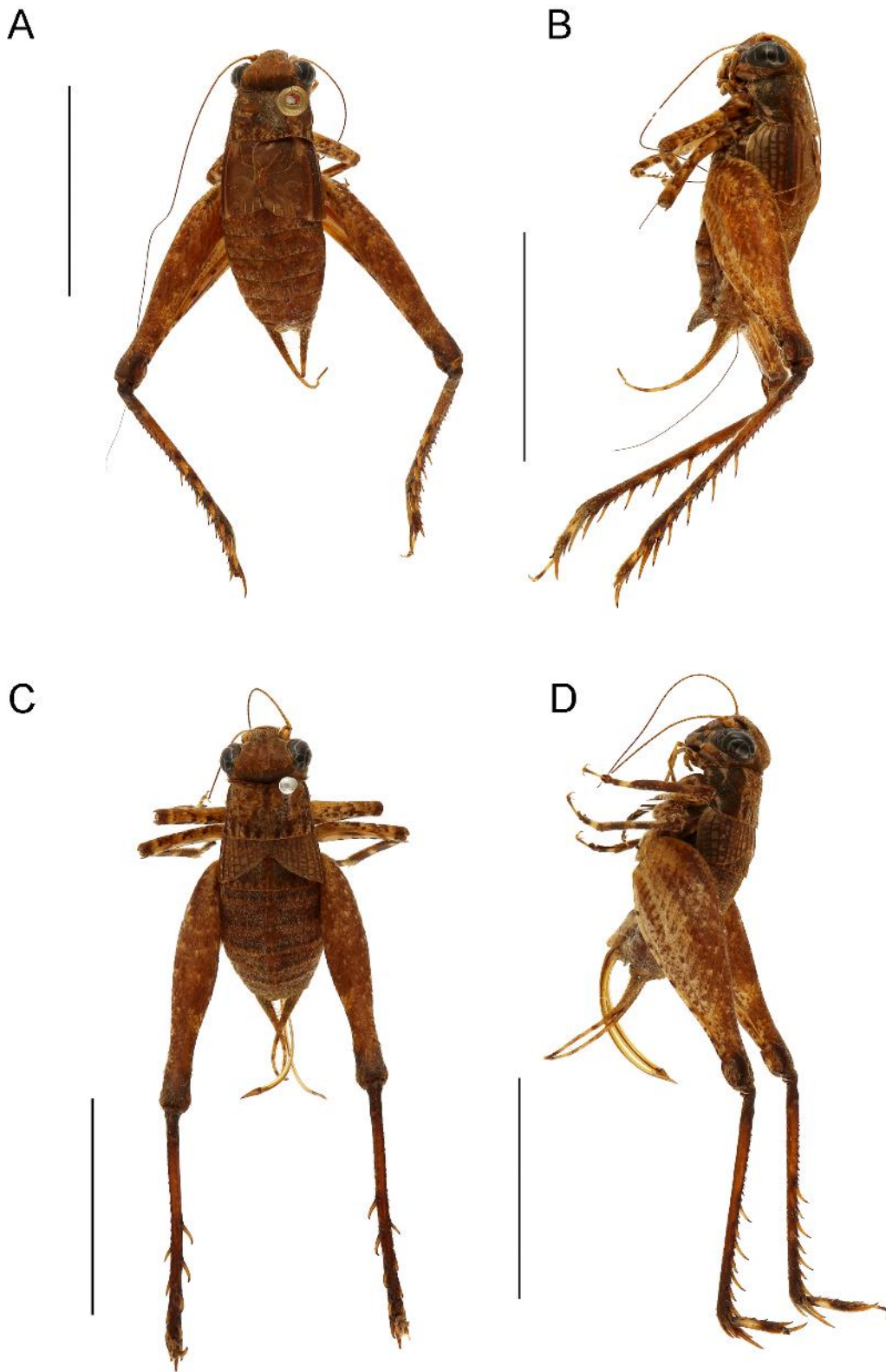


FIGURE 8. *Lebinthus dannybaletti* sp. nov. habitus of male (A, B) and female (C, D) in dorsal (A, C) and lateral (B, D) views. Scale bars: 5 mm.

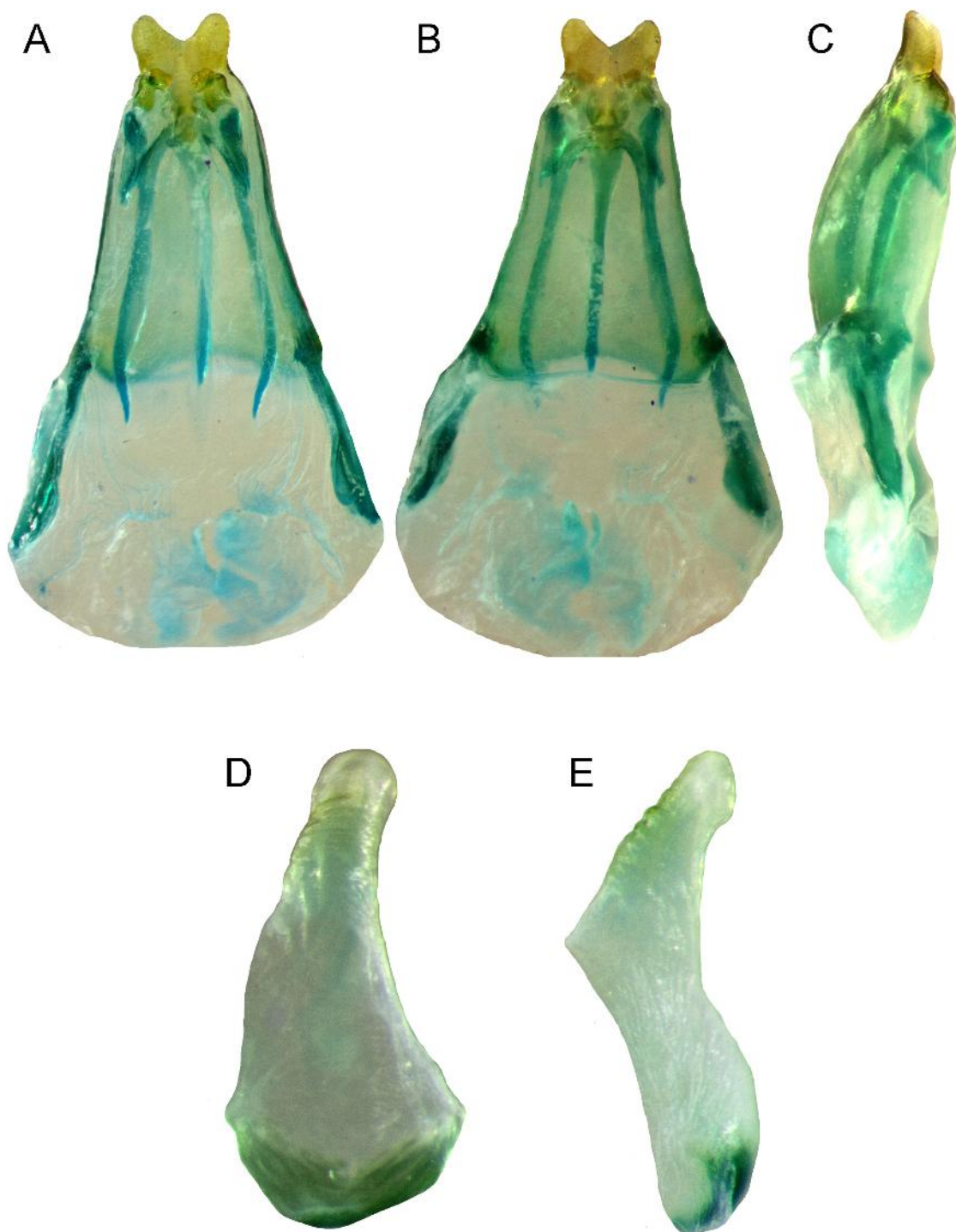


FIGURE 9. *Lebinthus dannybaletti* **sp. nov.** male genitalia in dorsal (A), ventral (B), and lateral (C) views, and female copulatory papilla in dorsal (D) and lateral views (E).

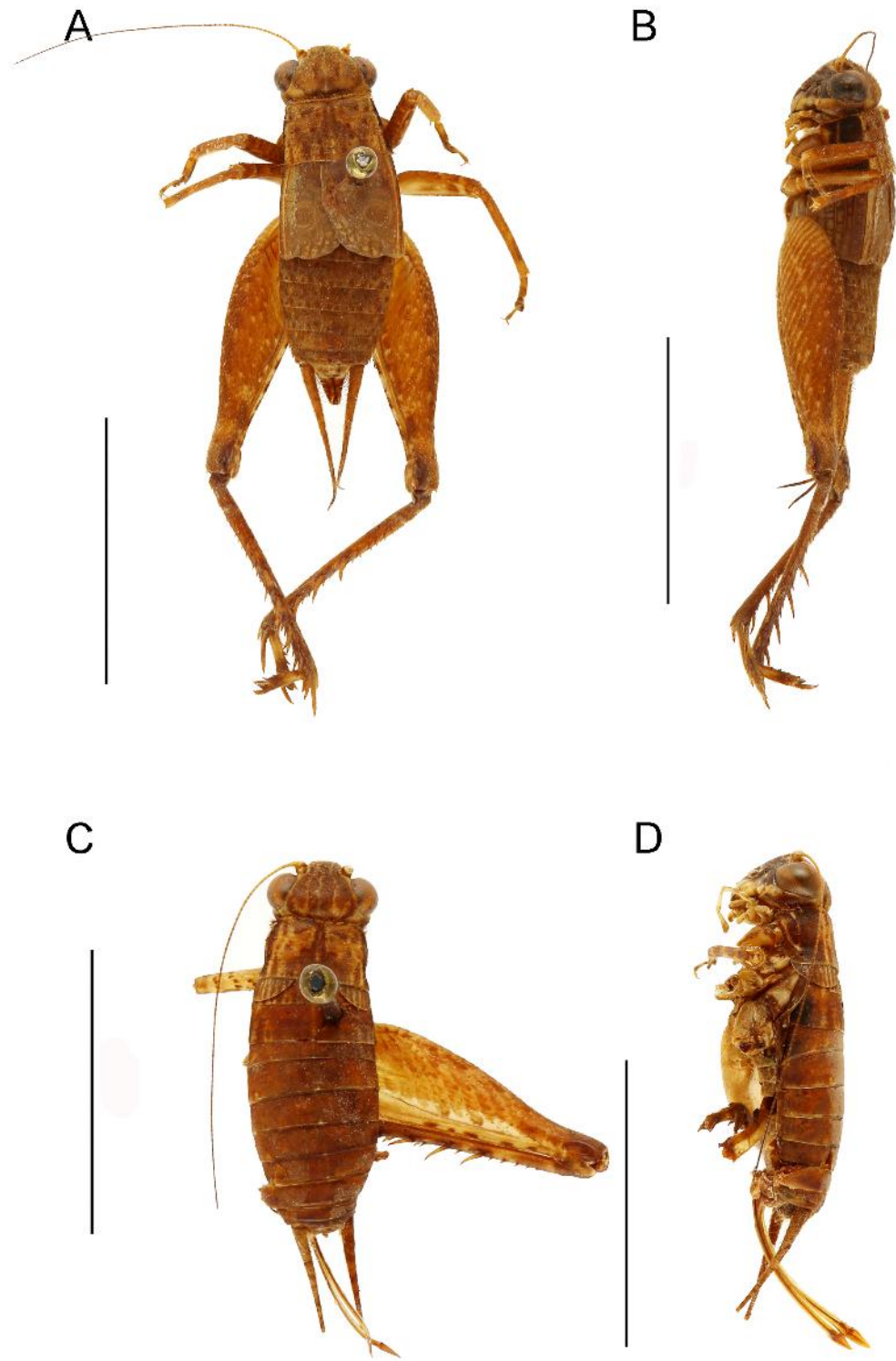


FIGURE 10. *Lebinthus parvus* sp. nov. habitus of male (A, B) and female (C, D) in dorsal (A, C) and lateral (B, D) views. Scale bars: 5 mm.

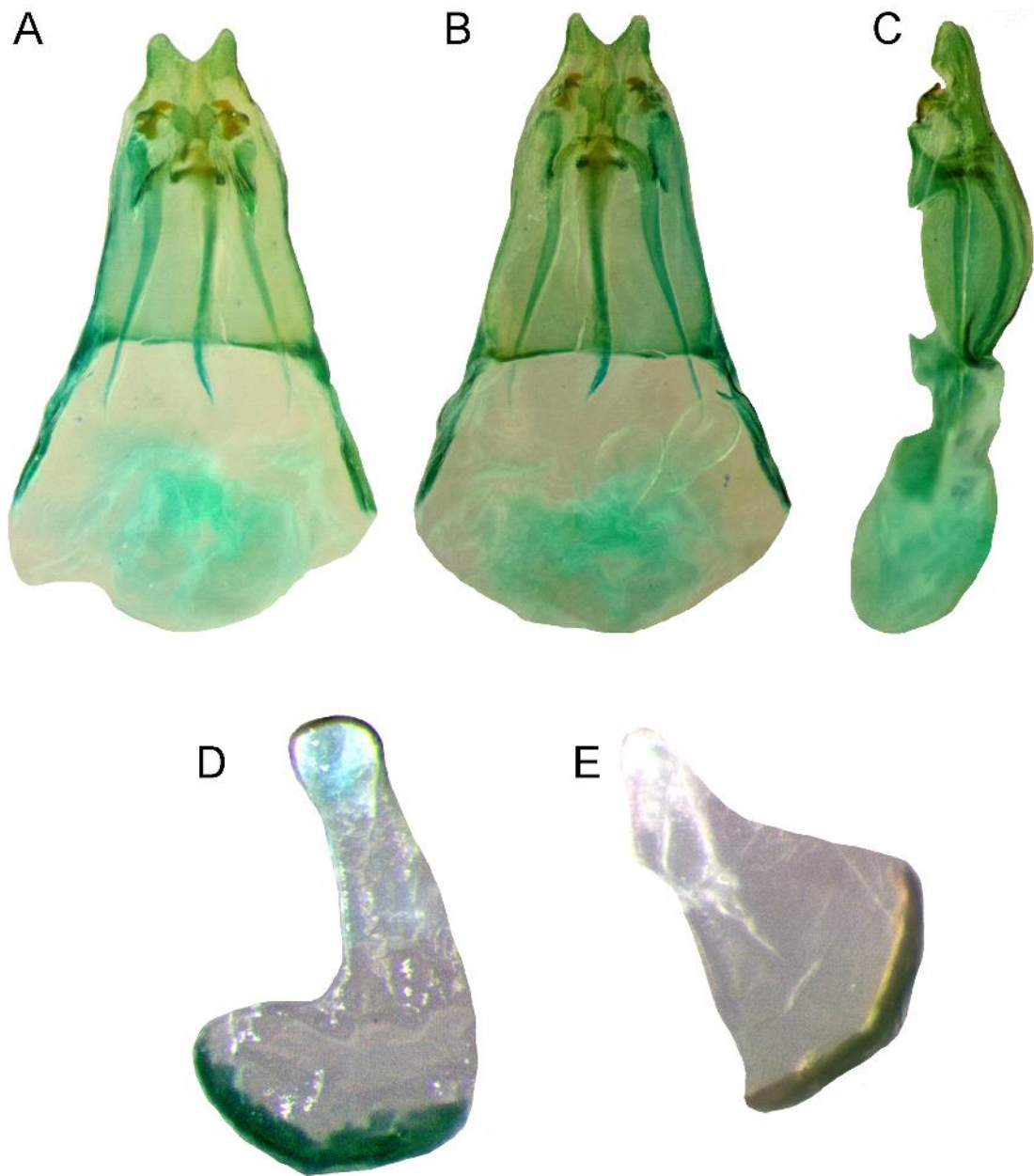


FIGURE 11. *Lebinthus parvus* **sp. nov.** male genitalia in dorsal (A), ventral (B), and lateral (C) views, and female copulatory papilla in dorsal (D) and lateral views (E).

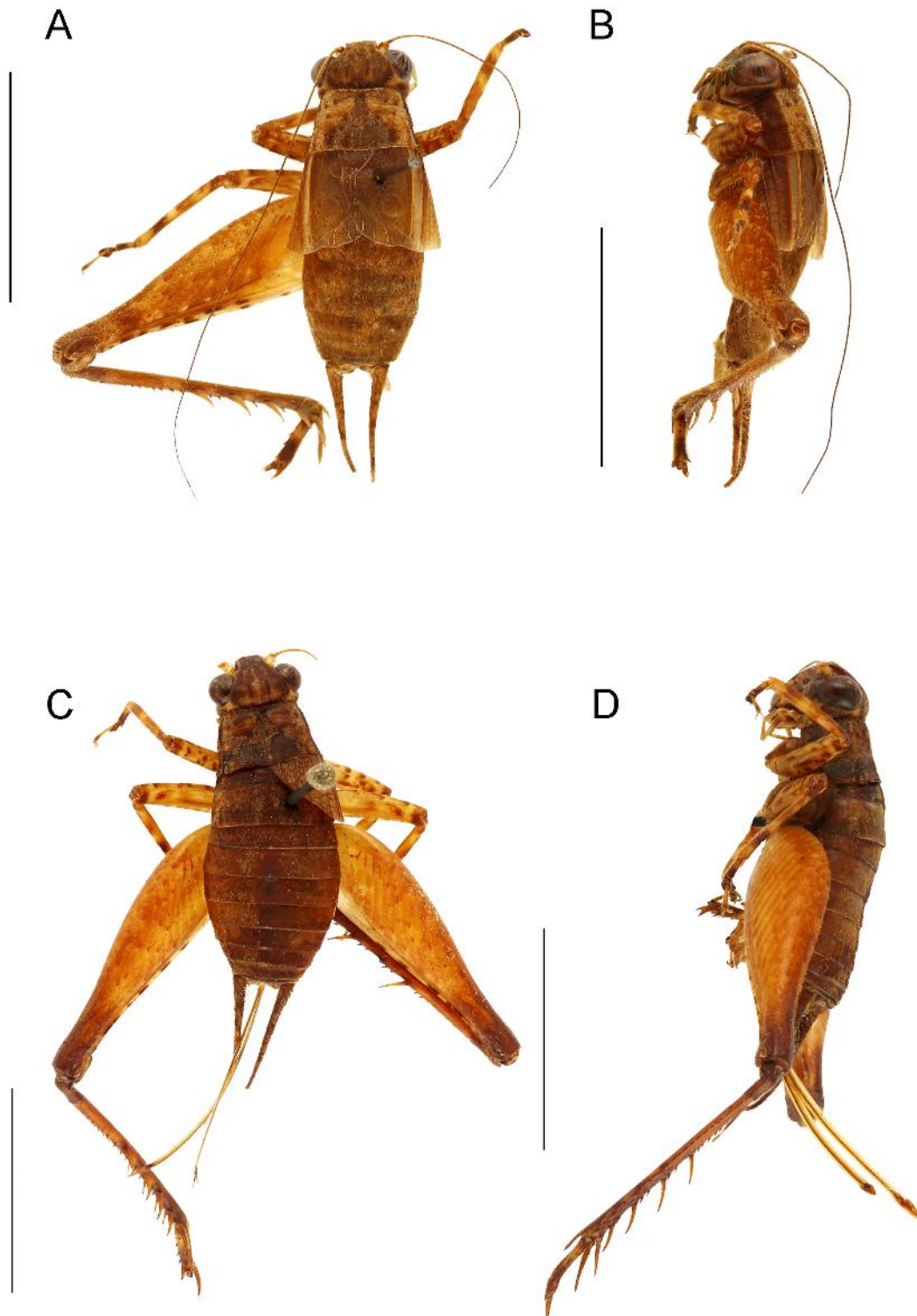


FIGURE 12. *Lebinthus palaceus* sp. nov. habitus of male (A, B) and female (C, D) in dorsal (A, C) and lateral (B, D) views. Scale bars: 5 mm.

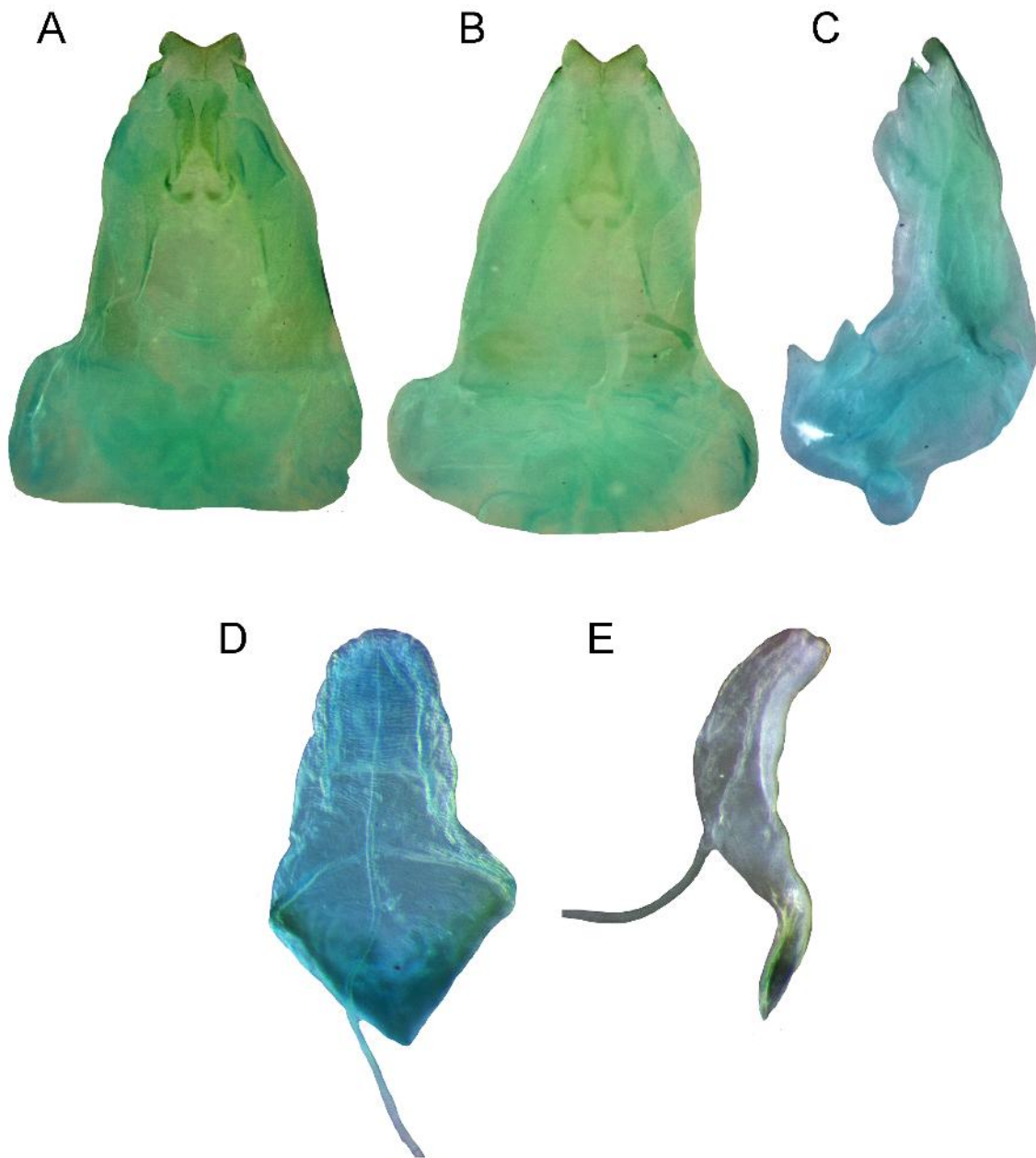


FIGURE 13. *Lebinthus palaceus* **sp. nov.** male genitalia in dorsal (A), ventral (B), and lateral (C) views, and female copulatory papilla in dorsal (D) and lateral views (E).

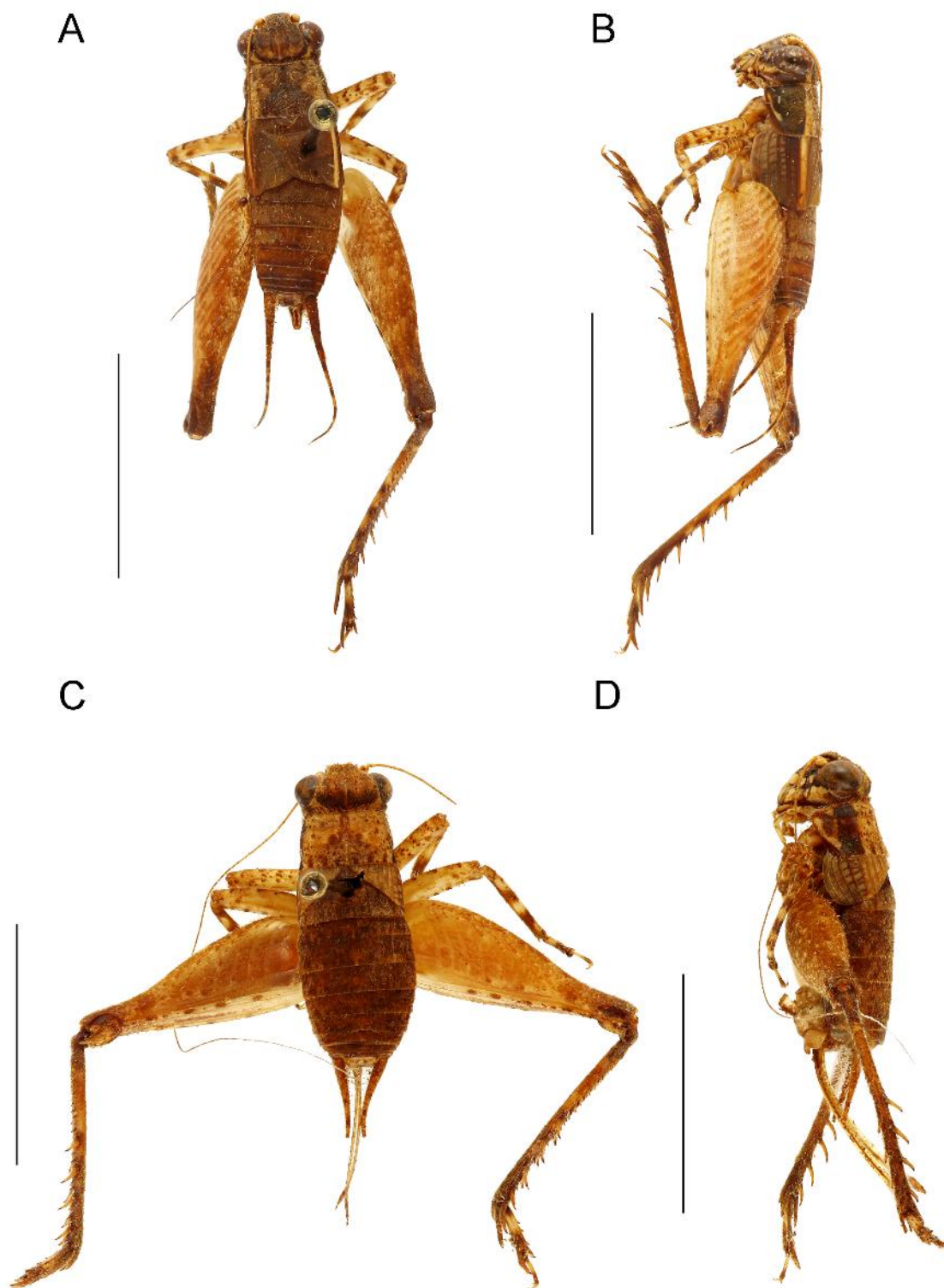


FIGURE 14. *Lebinthus hamus* sp. nov. habitus of male (A, B) and female (C, D) in dorsal (A, C) and lateral (B, D) views. Scale bars: 5 mm.

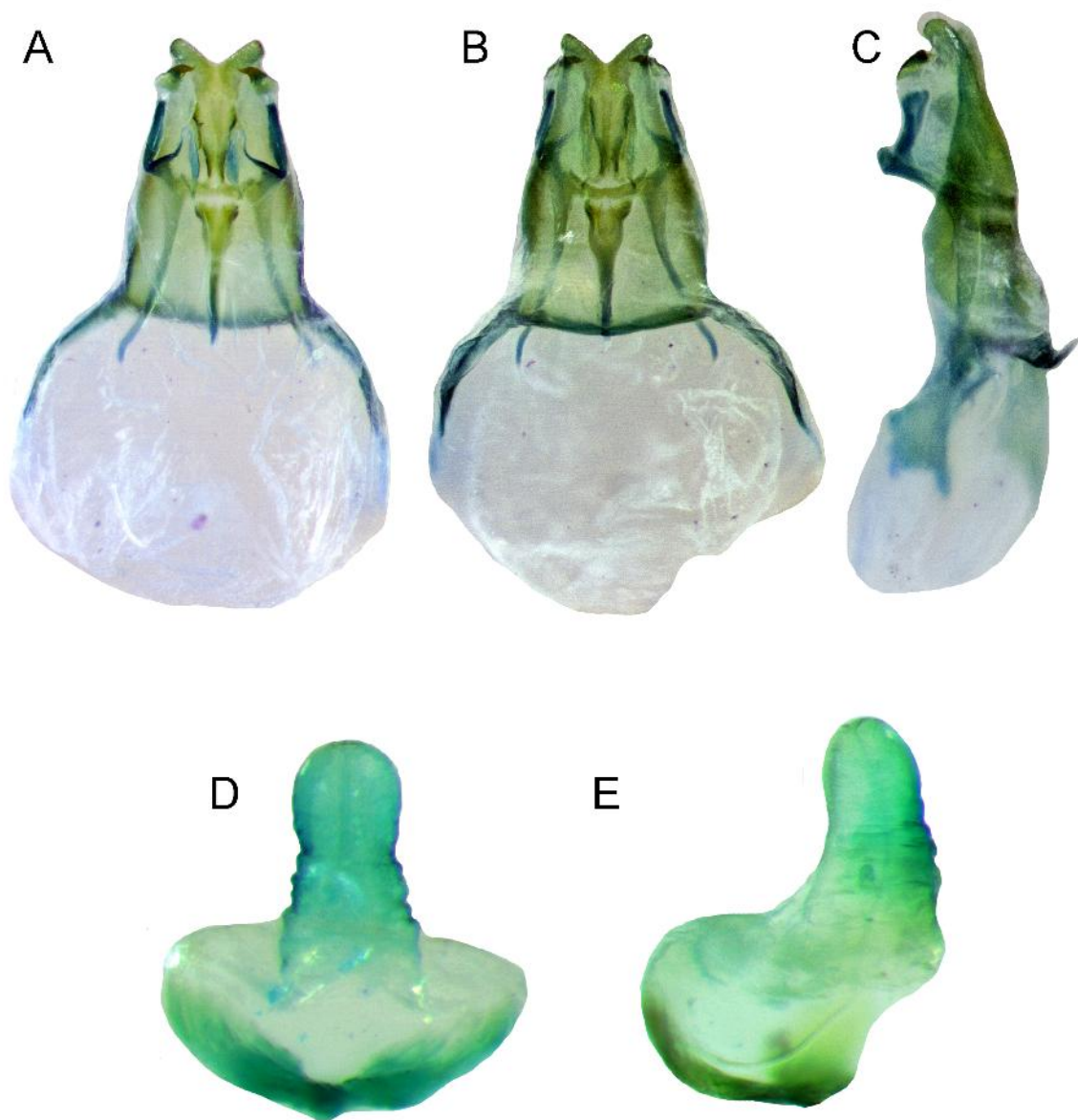


FIGURE 15. *Lebinthus hamus* **sp. nov.** male genitalia in dorsal (A), ventral (B), and lateral (C) views, and female copulatory papilla in dorsal (D) and lateral views (E).

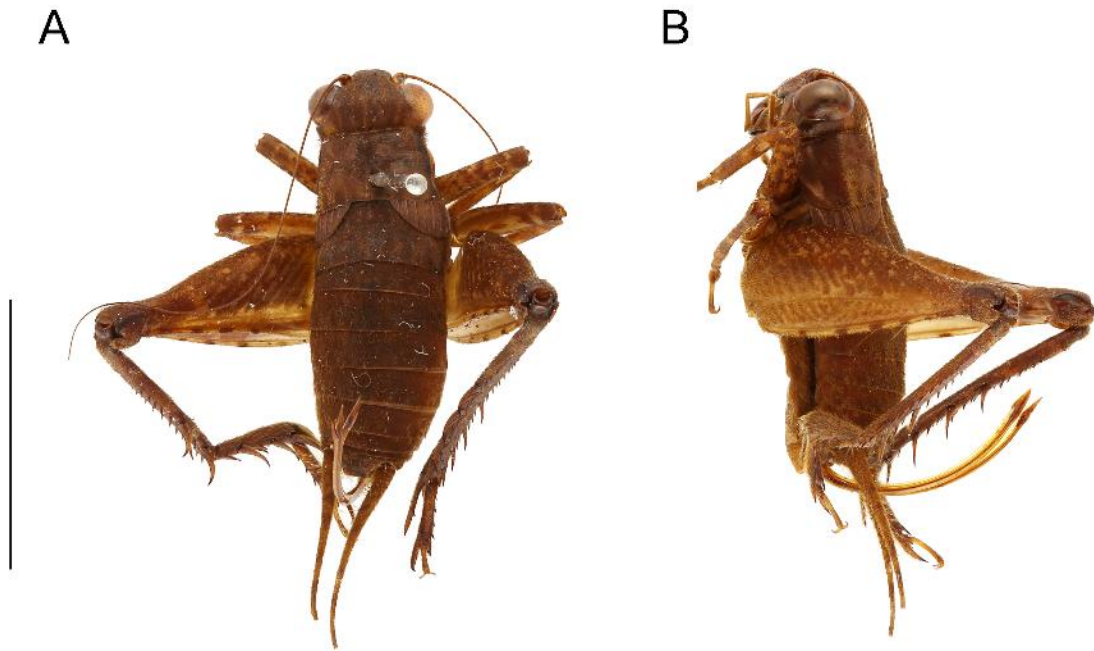


FIGURE 16. *Lebinthus magayon* **sp. nov.** habitus of female in dorsal (A) and lateral (B) views. Scale bar: 5 mm.

A

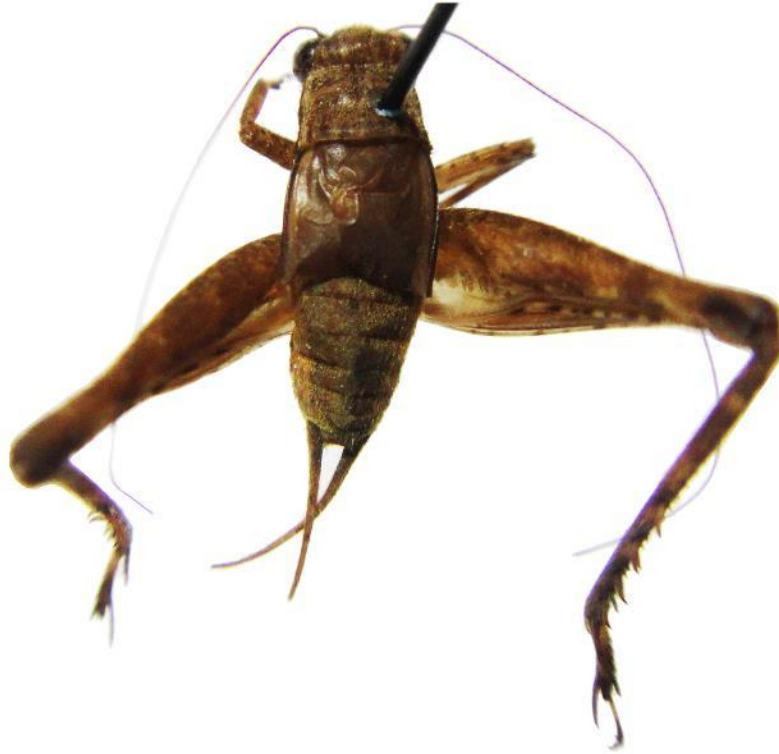


B



FIGURE 17. *Lebinthus magayon* **sp. nov.** female copulatory papilla in dorsal (A) and lateral views (B).

A



B



FIGURE 18. *Lebinthus boracay* **sp. nov.** habitus of male (A) and female in its natural environment (B).



FIGURE 19. *Lebinthus boracay* **sp. nov.** male genitalia in dorsal (A) and ventral (B) views.

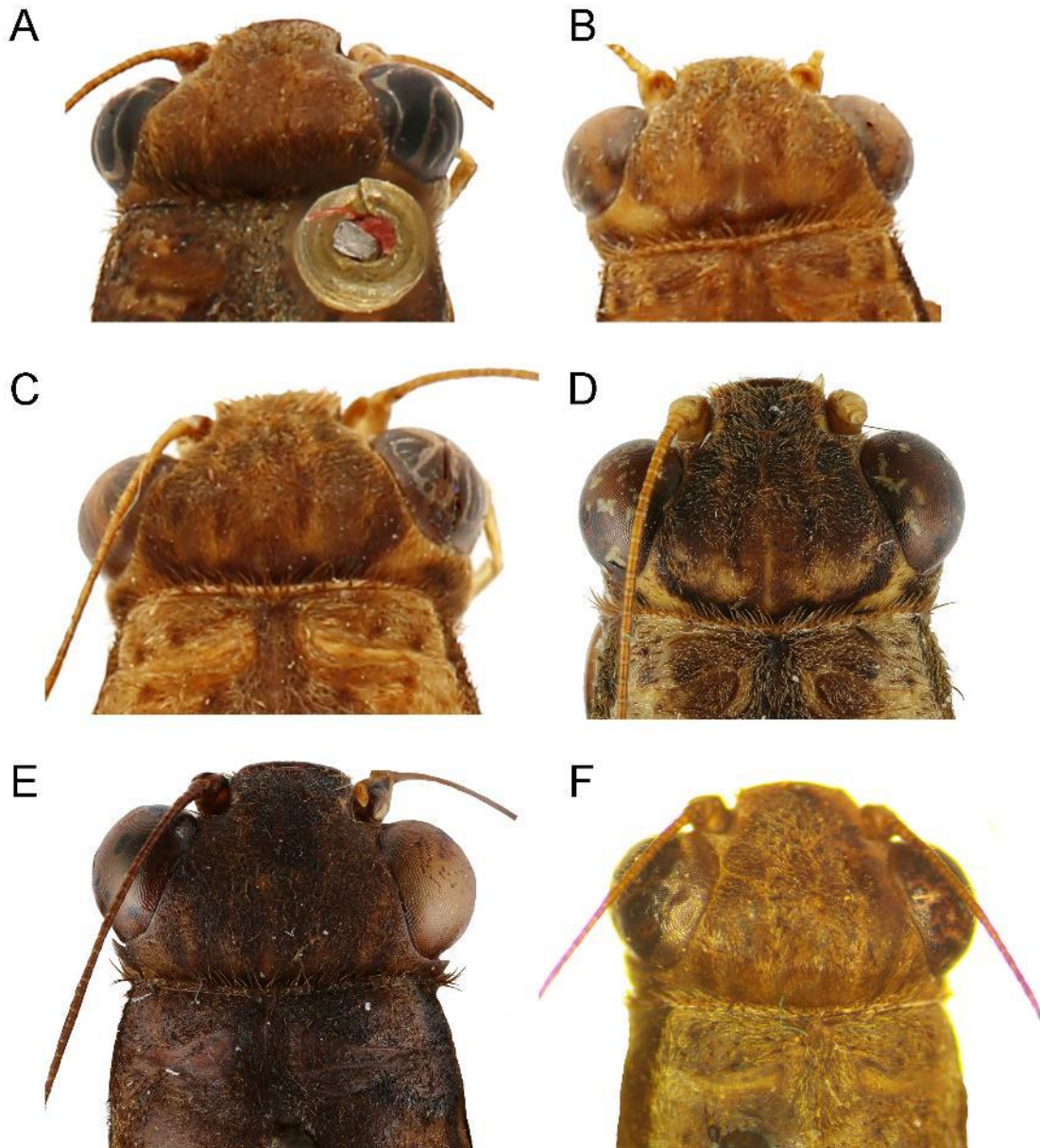


FIGURE 20. Head in dorsal view: *L. dannybaletai* sp. nov. (A); *L. parvus* sp. nov. (B); *L. palaceus* sp. nov. (C); *L. hamus* sp. nov. (D); *L. magayon* sp. nov. (E); *L. boracay* sp. nov. (F).

A



B



C



D



E



FIGURE 21. Head and pronotum in lateral view: *L. dannybaletei* **sp. nov.** (A); *L. parvus* **sp. nov.** (B); *L. palaceus* **sp. nov.** (C); *L. hamus* **sp. nov.** (D); *L. magayon* **sp. nov.** (E).

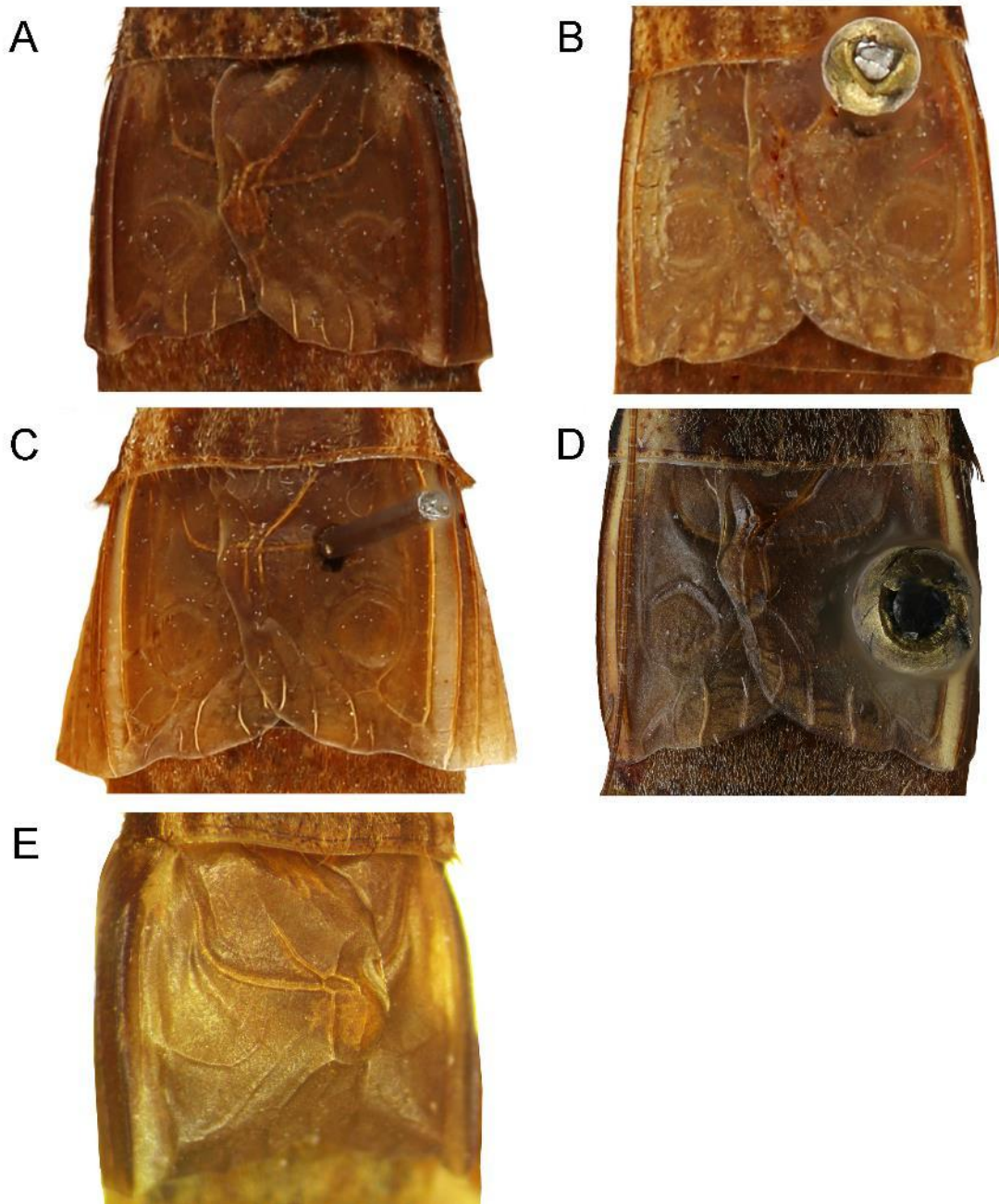


FIGURE 22. Male tegmen in dorsal view: *L. dannybaletti* **sp. nov.** (A); *L. parvus* **sp. nov.** (B); *L. palaceus* **sp. nov.** (C); *L. hamus* **sp. nov.** (D); *L. boracay* **sp. nov.** (E).

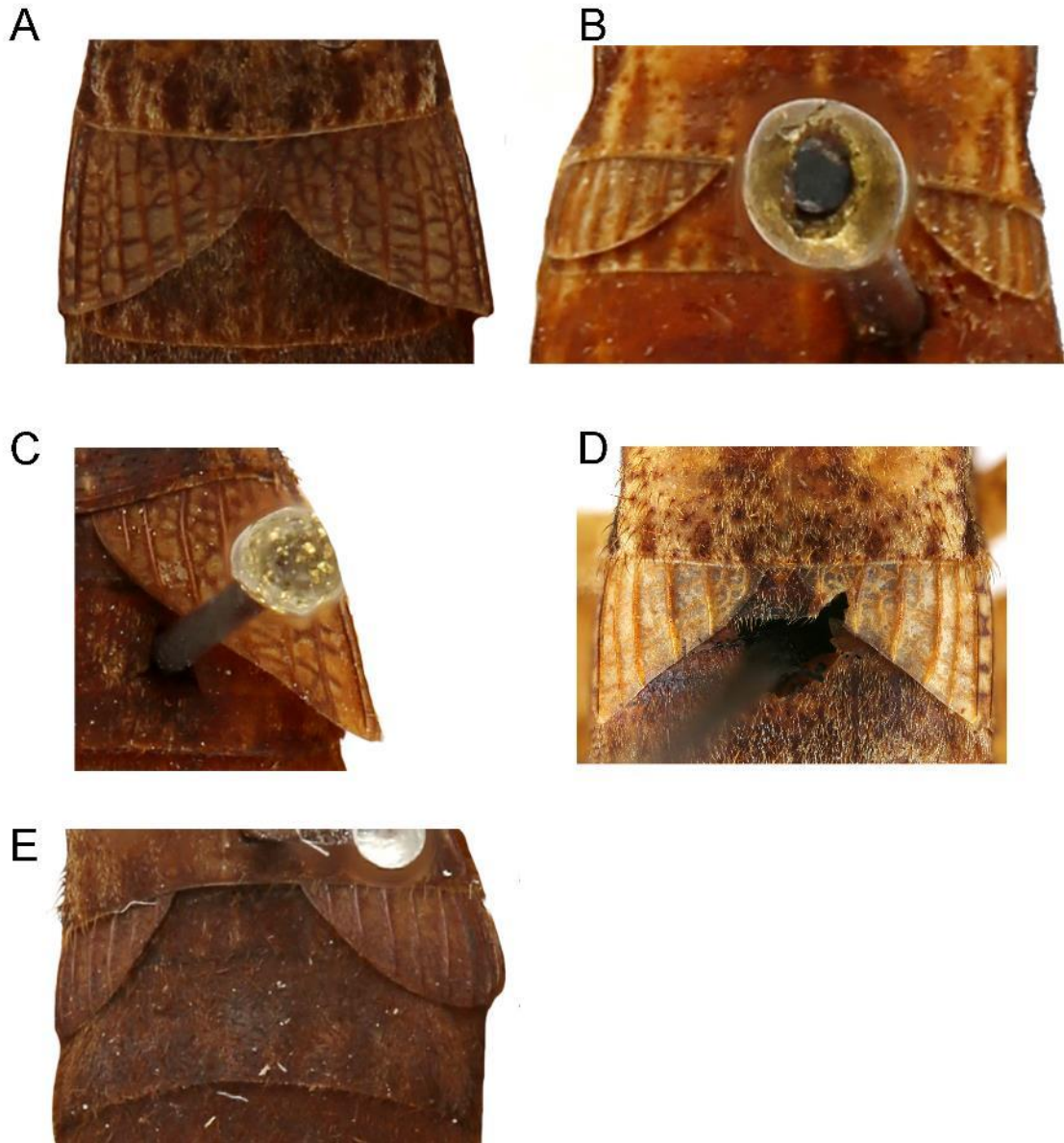


FIGURE 23. Female tegmen in dorsal view: *L. dannybaletai* **sp. nov.** (A); *L. parvus* **sp. nov.** (B); *L. palaceus* **sp. nov.** (C); *L. hamus* **sp. nov.** (D); *L. magayon* **sp. nov.** (E).