ZooKeys 333: 1–30 (2013)
doi: 10.3897/zookeys.333.5084
www.zookeys.org

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
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The Nabidae (Insecta, Hemiptera, Heteroptera) of Argentina

Marcela Cornelis[1], María C. Coscarón[2]

1 *Universidad Nacional de La Pampa. Facultad de Ciencias Exactas y Naturales. Uruguay 151 L6300CLB, Santa Rosa, La Pampa. Argentina* **2** *Universidad Nacional de La Plata. Facultad de Ciencias Naturales y Museo. División Entomología. Paseo del Bosque s/n 1900, La Plata, Buenos Aires. Argentina*

Corresponding author: *Marcela Cornelis* (cornelismarcela@gmail.com),
María C. Coscarón (mcoscaron@fcnym.unlp.edu.ar)

Academic editor: *Thomas Henry* | Received 8 March 2013 | Accepted 14 August 2013 | Published 20 September 2013

Citation: Cornelis M, Coscarón MC (2013) The Nabidae (Insecta, Hemiptera, Heteroptera) of Argentina. ZooKeys 333: 1–30. doi: 10.3897/zookeys.333.5084

Abstract

In Argentina, five genera and 14 species are recorded in the subfamilies Prostemmatinae and Nabinae: *Hoplistoscelis sordidus* Reuter, *Lasiomerus constrictus* Champion, *Metatropiphorus alvarengai* Reuter, *Nabis argentinus* Meyer-Dür, *Nabis* (*Tropiconabis*) *capsiformis* Germar, *Nabis faminei* Stål, *Nabis paranensis* Harris, *Nabis punctipennis* Blanchard, *Nabis roripes* Stål, *Nabis setricus* Harris, *Nabis tandilensis* Berg, *Pagasa* (*Pagasa*) *costalis* Reuter, *Pagasa* (*Lampropagasa*) *fuscipennis* Reuter and *Pagasa* (*Pagasa*) *signatipennis* Reuter.

Keywords

Nabidae, key, Argentina, taxonomy, distribution

Introduction

The Nabidae, often called damsel bugs, are a small group of predatory insects of various shapes and colours, ranging from 5 to 15 mm.

In the Neotropical catalogue, Volpi and Coscarón (2010) and Coscarón and Volpi (2013) provided a summary of the classification of the group and an exhaustive introduction to the literature. Two subfamilies, Nabinae and Prostemmatinae, comprising 11 genera and 83 species are recognized in the Neotropical Region and in Argentina four genera and 13 species (Coscarón, submitted). Although all of them are predators, some have been observed feeding on plants (Ridgway and Jones 1968, Stoner 1972,

Kiman and Yergan 1985). The members of Nabinae feed on many different small arthropods including aphids, leafhoppers, larvae and adults of Hemiptera, thrips, flies, caterpillars, beetle larvae, eggs of insects, small spiders and acari, whereas those of Prostemmatinae appear to prey exclusively on other Heteroptera, especially Lygaeoidea (Pericart 1987, Lattin 1989). The predaceous habit, together with the widespread occurrence of some species in agroecosystems, has attracted the attention of entomologists (Lattin 1989). Although all known species are terrestrial, some have been found in moist areas on the ground or at the edge of streams, ponds, and marshes (both fresh and saline) (Lattin 1966, 1989, Pericart 1987).

Argentina, the geographical area considered in this paper, lies in the Neotropical Region. The country covers an area of 2,791,810 km^2 and is bordered by Uruguay, Brazil, Paraguay, Bolivia, and Chile. Approximately 75% of the country is occupied by arid and semiarid areas, but rainforests are also present in the northeastern part of the country, for example the Yungas and Paranaense regions.

Knowledge of the South American fauna is poor, especially in relation to the taxa of economic importance, and no comprehensive keys for identification of the species living in the region have previously been published.

The objective of this paper is to provide an illustrated key of the genera of Nabidae from Argentina, including a diagnosis, geographical distribution, list of species for each genus, and a redescription when necessary.

Materials and methods

The specimens examined belong to the collections of the Museo de Ciencias Naturales de La Plata (MLP), La Plata, Buenos Aires, Argentina (http://www.fcnym.unlp.edu.ar/abamuse.html), the American Museum of Natural History (AMNH), New York, USA (http://www.amnh.org/) and the Swedish Museum of Natural History (NHRS), Stockholm, Sweden (http://www.nrm.se/).

Observations were made with a Leica MZ95 stereoscope and measurements with a micrometer eyepiece and expressed in millimeters (mm). The male genitalia were dissected by removing the pygophore from the abdomen with a pair of forceps, and the female genitalia by cutting the genital plates with 12 cm dental standard straight scissors. Genitalia from both sexes were cleared in a KOH solution for 24 hours. All dissected structures were stained with methylene blue and photographed in glycerin. Images of adults and genitalia were taken with a digital camera (Kodak 3.1 megapixels) and a magnifying Wild M-Stereomicroscope. The terminology of the male and female genitalia follows Dupuis (1955) and Pericart (1987). The photographs were compared with material from the Naturhistoriska Riksmuseet of Stockholm, Sweden (http://www.nrm.se/2.1286b10fdbe80efba80001.html) and the American Museum of Natural History of New York (http://www.amnh.org/). Descriptions were taken from http://www.biodiversitylibrary.org/ , http://archive.org/. The diagnosis of the genus *Pagasa*, *Metatropiphorus* and *Nabis* were

taken from Blatchley (1926) (http://www.biodiversitylibrary.org/item/29937); and the diagnosis of *Lasiomerus* and *Hoplistoceslis* from Champion (1899) (http://www.biodiversitylibrary.org/item/14631#page/311/mode/1up), Harris (1928) and Reuter (1890) (http://www.archive.org/search.php?query=Revue%20d%C2%B4Entomologie%201890). Specimen locations were georeferenced using Google Earth 6.1.0.4738 (beta) (Google Inc. 2011). Location decimal degree coordinates were processed with DIVA-GIS 7.1.7 (http:// www.diva-gis.org/) to generate species distribution maps.

Results

Key to species of Nabidae from Argentina

1 Scutellum with 1–7 pairs of conspicuous trichobothria along lateral margins (Fig. 1c). Legs short and thick, fore femur usually strongly incrassate; labium relatively short and stout; antennae four segmented, plus one extra at the base of antennal segment II, which is half or more than half of the length of antennal segment I (Fig. 1b). Body shiny black. (Subfamily Prostemmatinae Reuter) ... **2**

– Scutellum without trichobothria; legs long and thin, fore femur at most only moderately incrassate; rostrum relatively slender and elongate; antennae long with four segments, and sometimes an additional ring-shaped segment at the base of the second; not shiny black. (Subfamily Nabinae Costa) **4**

2 Rostral segment II shorter than III, not extending beyond hind margins of eyes (Subgenus *Lampropagasa* Reuter) ..... ***Pagasa fuscipennis*** **Reuter** (Fig. 1a–k)

– Rostral segment II longer than III, extending distinctly beyond hind margins of eyes (Subgenus *Pagasa* Stål) **3**

3 Rostrum reaching from the middle to the apex of fore coxae. Fore trochanter with 4–6 minute black teeth, middle and hind trochanters without teeth. Fore femur strongly thickened ..... ***Pagasa costalis*** **Reuter**

– Rostrum reaching the middle of the mesothorax. Fore, middle and hind trochanters without teeth. Fore femur moderately thickened..... ..... ***Pagasa signatipennis*** **Reuter**

4 First antennal segment twice as long as the head and thickened on apical third ..... ***Metatropiphorus alvarengai*** **Reuter**

– First antennal segment never twice the long of the head and not thickened apically **5**

5 Fore and middle legs with rows of long and rigid spines (Fig. 2a) .... ***Lasiomerus constrictus*** **Champion** (Fig. 3)

– Fore and middle legs without rows of long and rigid spines **6**

6 Fore and middle femora armed beneath with minute, short, rather blunt piceous teeth (Fig. 2b) ..... ***Hoplistoscelis sordida*** **Reuter** (Fig. 4a–c)

– Fore and middle femora with short dense setae shiny, without teeth (Fig. 2c)...7

7 Body robust and shining, sparsely covered with fine, whitish pubescence..... ..... ***Nabis tandilensis* Berg** (Fig. 5)
– Body not robust and shining, covered with abundant whitish pubescence... **8**
8 Body slender and elongate **9**
– Body not slender and elongate **10**
9 Hemelytra clear and hyaline. Second segment of rostrum slightly longer than the third. Pronotum slightly longer than broad (Subgenus *Tropiconabis* Kerzhner) ..... ***Nabis capsiformis* Germar** (Fig. 6a–j)
– Hemelytra not clear and hyaline. Second segment of rostrum slightly shorter than the third. Pronotum slightly broader than long... ***Nabis setricus* Harris**
10 Venter uniformly sordid brown. Hemelytra short in brachypterous form, reaching onto the middle of the first dorsal segment of the abdomen..... ***Nabis roripes* Stål**
– Venter not sordid brown. Hemelytra in brachypterous form surpassing the middle of the first dorsal segment of the abdomen **11**
11 Length of first antennal segment equal to or slightly shorter than the distance between the eyes. Length of second antennal segment subequal to the width of the base of the pronotum. Membrane in brachypterous form slightly surpassing the apex of the corium ..... ***Nabis paranensis* Harris** (Fig. 7a–i)
– Length of first antennal segment markedly shorter than the distance between the eyes. Second antennal segment shorter than the width of the base of the pronotum. Membrane in brachypterous form widely surpassing the apex of the corium **12**
12 Pronotum in macropterous form greatly expanded behind, a third wider than long. Pronotum in brachypterous form visibly wider than long, but strongly compressed on the sides between the anterior and posterior lobes..... ..... ***Nabis argentinus* Meyer-Dür** (Fig. 8a–i)
– Pronotum in macropterous form not more than one fifth wider than long. Pronotum in brachypterous form as wide as long, anterior and posterior lobes not so markedly different **13**
13 Body and legs robust. Eyes large. Length of antennal segment II hardly equal to the width of the head across eyes ..... ***Nabis faminei* Stål** (Fig. 9a–i)
– Body and legs more slender. Eyes smaller. Length of antennal segment II slightly longer than width of the head across eyes..... ..... ***Nabis punctipennis* Blanchard** (Fig. 10a–j)

Subfamily Prostemmatinae Reuter, 1890
Tribe Prostemmatini Reuter, 1890

Genus *Pagasa* Stål, 1862

Diagnosis. Black or fuscous shining species, having the eyes large, prominent and coarsely granulated; pronotum longer than broad with a fine, straight, transverse

groove very close to front margin; scutellum with two small median fovea; embolium of hemelytra present; front and middle tibiae with a spongy fossa at apex.

Subgenus *Lampropagasa* Reuter, 1909

Diagnosis. Rostral segment II shorter than or as long as segment III, in most species not surpassing hind margin of eye. Corium and clavus uniformly (strongly or moderately) shining throughout. Both veins of corium (R+M and Cu) or at least the inner vein (Cu) distinct up to hind margin of corium. Vein Cu with punctures (obsolete in some species) on both sides.

***Pagasa fuscipennis* Reuter, 1909**
http://species-id.net/wiki/Pagasa_fuscipennis
Figs 1a–k, 13a

Pagasa nitida Berg 1884. Annales de la Sociedad Científica Argentina 2: 105.
Pagasa fuscipennis Reuter and Poppius 1909. Acta Societatis Scientiarum Fennicae 37: 30. Pennington 1921. Lista de los Hemipteros de la Républica Argentina. Segunda Parte: 26. Harris 1939. Notas del Museo de La Plata 26: 369. Ruffinelli and Pirán 1959. Boletín de la Facultad de Agronomía de Montevideo 51: 41. Kerzhner and Konstantinov 2008. Zoosystematica Rossica 17: 38. Volpi and Coscarón 2010. Zootaxa 2513: 62.

Material examined. ARGENTINA: BUENOS AIRES: Prov. de Buenos Aires, J. Bosq. 1 ♀ (MLP); Ciudad de Buenos Aires 34°36'30.30"S; 58°22'23.38"W, 25–XII–1918 Bosq. col., 1 ♀ (MLP); Ciudad de Buenos Aires, 9–III–1914, 1 ♀ (MLP); Caballito 34°37'0.00"S; 58°27'0.00"W, I–1928 Bosq. col., 1 ♀ (MLP); Chacabuco 34°38'9.36"S; 60°27'54.44"W, F. Lynch col., Harris det. 1 ♀ (MLP). CHACO: Km 42, 18–V–1936 P. Denier det., 1 ♀ (MLP); Resistencia 27°27'5.96"S; 58°59'10.51"W, 21–I–1939 Harris det. 1 ♀ (MLP). SANTIAGO DEL ESTERO: Río Salado, Wagner col., 1 ♀ (MLP). URUGUAY: Montevideo, Colón 34°48'8.30"S, 56°13'26.90"W, 12–I–1929 A. Montora col., Harris det., 1 ♀ (MLP).

Distribution in Argentina. Buenos Aires: Caballito, Ciudad de Buenos Aires, Chacabuco, Ciudad de Bs. As., San Fernando, Tandil; Chaco: Resistencia; Chubut: Rio Turbio, El Maiten, Pedregos Epuyen; Córdoba: Alta Gracia Misiones; Río Negro: Ñorquinco, El Bolsón; Salta: Metan; San Luis; Santa Fé: Ciudad de Santa Fé.

Distribution outside Argentina. Brazil: Goyas, São Paulo, Minas Gerais, Santa Catarina; Paraguay: Asunción, Horqueta; Uruguay: Colonia, Montevideo, Soriano.

Measurements. Female (n = 5): Length 5.00–6.36 (mean = 5.96). Head: length 0.82–0.90 (mean = 0.85), width 0.82–0.91 (mean = 0.89); eye width 0.41–0.48 (mean = 0.45), interocular width 0.29–0.33 (mean = 0.30). Rostrum: ratio of segment lengths

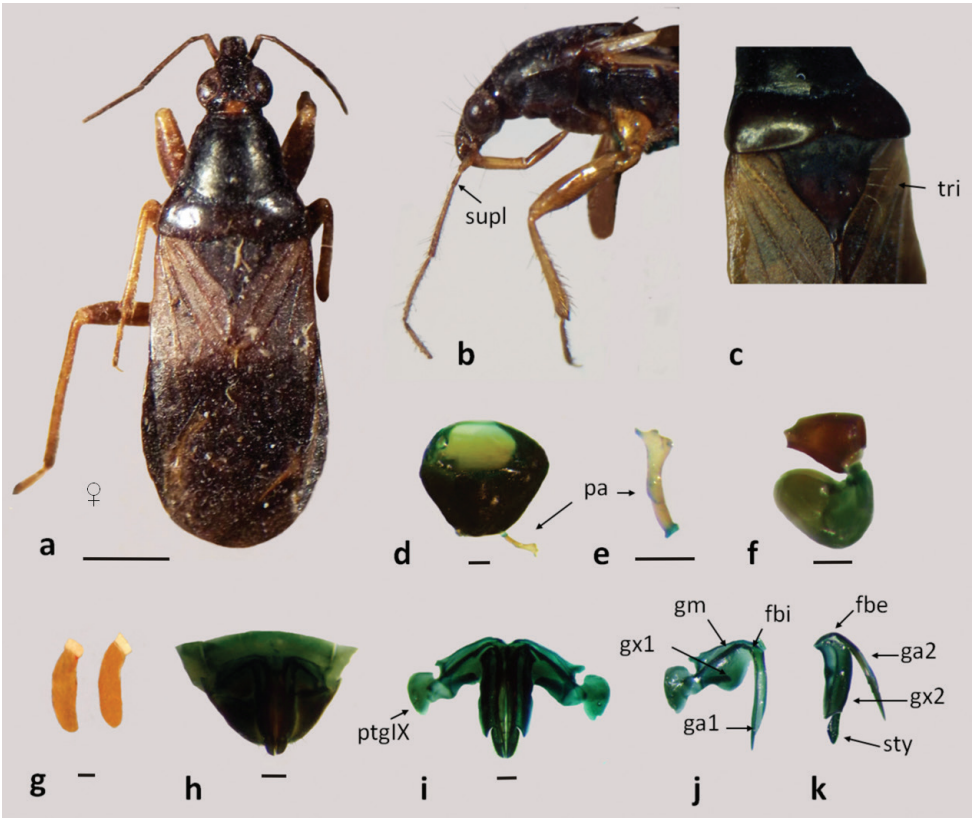

Figure 1. *Pagasa fuscipennis:* **a** dorsal view **b** lateral view **c** scutellum with trichobotrias; **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g** eggs **h–k** female genitalia: **h–i** genital segment **j** first gonapophysis and gonocoxite 1 **k** second gonapophysis and gonocoxite 2. (fbe: external fibula; fbi: internal fibula, ga1 and ga2: gonapophysis 1 and 2; gm: gonangulum; gxp1 and 2: gonocoxites 1 and 2, pa: paramere, ptgIX: paratergite IX; sty: styloid; supl: supplementary; tri: trichobotria.). Figures **a–c** scale line 1mm; **d–k** scale line 0.2mm.

about 1: 1.96 : 2.28 : 1. Antenna: ratio of segment about 1: 0.57 : 2.48 : 2.27 : 2.21. Pronotum length 1.35–1.59 (mean = 1.47), width 1.69–1.88 (mean = 1.77). Hemelytra length 2.07–4.05 (mean = 3.47). Abdomen: length 2.17–2.66 (mean = 2.47), width 1.93– 2.18 (mean = 2.07). Legs: fore femora: length 1.24–1.35 (mean = 1.31), width 0.42–0.53 (mean = 0.47); middle femora: length 1.21–1.40 (mean = 1.33), width 0.27–0.33 (mean = 0.30); hind femora 1.78–1.83 (mean = 1.81), width 0.29–0.33 (mean = 0.31). Fore tibiae: length 1.03–1.25 (mean = 1.12), width 0.21–0.29 (mean = 0.27); middle tibiae: length 1.11–1.35 (mean = 1.24), width 0.14–0.19 (mean = 0.15); hind tibiae: length 1.87–2.12 (mean = 2.01), width 0.09–0.17 (mean = 0.13).

Eggs (Fig. 1g). Length 1.08–1.12 (mean = 1.10; n = 4), width 0.28–0.36 (mean = 0.31; n = 4). Microsculpture absent. Mature eggs were taken from dissected female oviducts.

New record. Argentina: La Pampa, Santa Rosa: 36°37'17.41"S; 64°17'5.91"W, Cornelis col.

Subgenus *Pagasa* Stål, 1862

Diagnosis. Rostral segment II longer than or as long as segment III and surpassing hind margin of eye. At least inner half of clavus and inner corner of corium dull, differing from the shining outer part of hemelytron; in most species, the shining part occupies only the outer part of corium outside the medial fracture. Only vein Cu on corium distinct, but obsolete or lacking in hind part of corium. Usually, vein Cu with punctures on outer side only.

***Pagasa costalis* Reuter, 1909**

Pagasa costalis Reuter in Reuter and Poppius 1909. Acta Societatis Scientiarum Fennicae 37: 26–29. Harris 1939. Notas del Museo de La Plata 26: 368. Ruffinelli and Pirán 1959. Boletín de la Facultad de Agronomía de Montevideo, 5l: 40. Kerzhner and Konstantinov 2008. Zoosystematica Rossica, 17: 48. Volpi and Coscarón 2010. Zootaxa, 2513: 63.

Distribution in Argentina. Buenos Aires, Salta.

Distribution outside Argentina. Ecuador: Milagro; Paraguay: Asunción; Surinam: Saramacca; Uruguay: Montevideo.

***Pagasa signatipennis* Reuter, 1909**
http://species-id.net/wiki/Pagasa_signatipennis

Pagasa signatipennis Reuter and Poppius 1909. Acta Societatis Scientiarum Fennicae 37: 26. Harris 1939. Notas del Museo de La Plata 26: 369. Kerzhner and Konstantinov 2008. Zoosystematica Rossica 17: 48. Volpi and Coscarón 2010. Zootaxa 2513: 64.

Distribution in Argentina. Formosa.

Distribution outside Argentina. Bolivia: Rosario, Villa Vicencio; Brazil: Mato Grosso, Santarem; Colombia; Paraguay: Gran Chaco, Horqueta; Surinam: Kwatta, Wagenijen; Venezuela: Sarán de Aquae Apuae.

Subfamily Nabinae Costa, 1853
Tribe Nabini Costa, 1853

Genus *Metatropiphorus* Reuter, 1872
http://species-id.net/wiki/Metatropiphorus

Diagnosis. Elongate, narrow finely pubescent species having the head behind eyes constricted to form a long cylindrical neck; vertex with two fine median grooves; rostrum reaching front coxae; pronotum about as wide at base as long, strongly constrict-

ed behind middle, front lobe with a narrow median carina, and side margins distinct; hemelytra surpassing tip of abdomen, membrane large without closed discal cells; fore femora feebly swollen, armed beneath with a number of short distinct spines; fore tibiae setose beneath, apices obliquely truncate.

***Metatropiphorus alvarengai* Kerzhner, 1987**
http://species-id.net/wiki/Metatropiphorus_alvarengai
Figs 13b

Metatropiphorus alvarengai Kerzhner 1987. Journal New York Entomological Society 95: 569. Holotype (AMNH). Volpi and Coscarón 2010. Zootaxa 2513: 57.

Holotype. http://research.amnh.org/iz/types_db/details.php?specimen_id=5458

Distribution in Argentina. Buenos Aires: Tigre, San Fernando.

Distribution outside Argentina. Brazil: Bahia, Mato Grosso, Santa Catarina. Surinam: Moengo.

Genus *Lasiomerus* Reuter, 1890

Diagnosis. Posterior lobe of pronotum strongly punctate; hemelytra distinctly constricted before the middle, the costal margin ciliate; femora annulate before the apex; posterior tibiae clothed with long, suberect setae.

***Lasiomerus constrictus* (Champion, 1899)**
http://species-id.net/wiki/Lasiomerus_constrictus
Figs 2a, 3, 13c

Nabis (Hoplistoscelis) constrictus Champion 1899. Biologia Centrali-Americana 2: 303.
Nabis constrictus Blatchley 1926. Heteroptera or True Bugs of Eastern North America, with especial reference to the faunas of Indiana and Florida: 596.
Nabis (Lasiomerus) constrictus Harris 1928. Entomologica Americana 9: 51.
Lasiomerus constrictus Henry and Lattin 1988. Catalog of the Heteroptera, or True Bugs, of Canada and the Continental United States, p 512. Volpi and Coscarón 2010. Zootaxa 2513: 57.

Material examined. ARGENTINA: BUENOS AIRES: San Isidro 34°28'14.98"S 58°31'43.00"W, 1 ♀ (NHRS).

Distribution in Argentina. Buenos Aires: San Isidro.

Distribution outside Argentina. Guatemala; Honduras; México: Atoyac, Teapa; Panama: Volcan de Chiriqui. México to Panama.

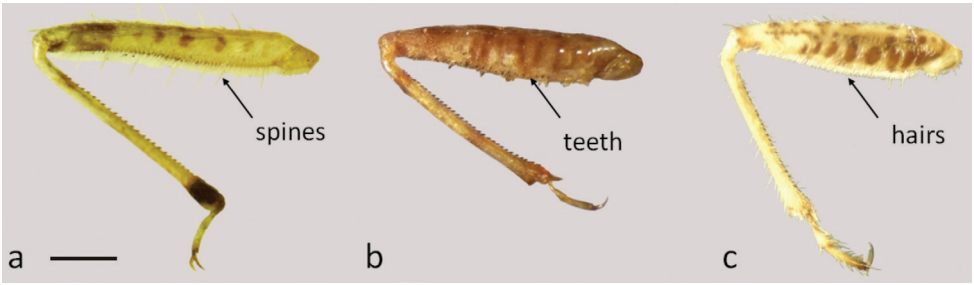

Figure 2. Fore leg: **a** *Lasiomerus constrictus* **b** *Hoplistoscelis sordida* **c** *Nabis argentinus*. Scale line 0.05mm.

Figure 3. *Lasiomerus constrictus* dorsal view. Scale line 1mm.

Measurements. Female (n = 1): Length 6.88. Head: length 0.83, width 0.67; eye width 0.31, interocular width 0.26. Rostrum: ratio of segment lengths about 1: 3.86 : 3.47 : 2.08. Antenna: ratio of segment about 1: 1.56 : 1.56 :1.45. Pronotum length 1.19, width 1.40. Hemelytra length 4.68. Abdomen: length 3.12, width 1.76. Legs: fore femora: length 1.82, width 0.26; middle femora: length 1.71, width 0.20; hind

femora 2.34, width 0.15. Fore tibiae: length 1.66, width 0.10; middle tibiae: length 1.71, width 0.10; hind tibiae: length 2.96, width 0.078.

Description. Body elongated and light brown. Head covered with abundant long white setae; area between eyes and antennae, and lateral anteocular region brown. Rostrum reaching middle coxae. Antennae long with setae, segment II with a distal band dark brown band; segments III and IV darker than I and II.

New records. 1 ♀**:** Argentina: Buenos Aires: San Isidro 34°28'14.98"S, 58°31'43.00"W, (NHRS).

Genus *Hoplistoscelis* Reuter, 1890

Diagnosis. Anterior and intermediate femora armed beneath with minute short, rather blunt, piceous teeth; tibiae annulate through out the entire length.

Hoplistoscelis sordida (Reuter, 1872)

http://species-id.net/wiki/Hoplistoscelis_sordida
Figs 2b, 4a–c

Nabis sordidus Reuter 1872. Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Förhandlingar 29: 85. Holotype (NHRS). Champion 1899. Biologia Centrali-Americana 2: 303. Harris 1930. Annals of the Carnegie Museum 19: 241–248.

Hoplistoscelis sordida Kerzhner 1993. Zoosystematica Rossica 1: 39. Volpi and Coscarón 2010. Zootaxa 2513: 56.

Holotype: http://www2.nrm.se/en/het_nrm/s/hoplistoscelis_sordidus.html

Material examined. USA: Iowa: Ames 42°1'38"N, 93°37'54"W, 12–X–1926 H. M. Harris col., Harris det. 1 ♀ (MLP); Davenport 41°33'15"N, 90°36'14"W, 31–VIII–1927 H. G Johnston col., Harris det. 2 ♂♂ (MLP).

Distribution outside Argentina. Brazil. Central and South America from the central part of México to Argentina. Costa Rica: Volcán de Iraza. Eastern North America. Guatemala: Vera Paz, Capetillo. México: Atoyac, Cuernavaca, Guerrero, Orizaba, San Marcos, Teapa, Vera Cruz. Panama: Volcán de Chiriqui. West Indies.

Observations. This species is not mapped because the exact place is not specified, according to Kerzhner (1993) "it occurs in Central and South America from central part of Mexico to Argentina".

Measurements. Male (n = 2): Length 6.24–6.60 (mean = 6.42). Head: length 0.90–1.01 (mean = 0.95), width 0.82; eye width 0.37, interocular width 0.30–0.33 (mean = 0.31). Rostrum: ratio of segment lengths about 1: 2.45 : 2.63 : 1.36. Antenna: ratio of segment about 1: 1.60: 1.38: 1.34. Pronotum length 1.30, width 1.45–1.60 (mean = 1.52). Hemelytra length 3.91–4.44 (mean = 4.17). Abdomen: length 3.00–3.18 (mean = 3.09), width 1.65– 1.93 (mean = 1.79). Legs: fore femora: length 1.84–

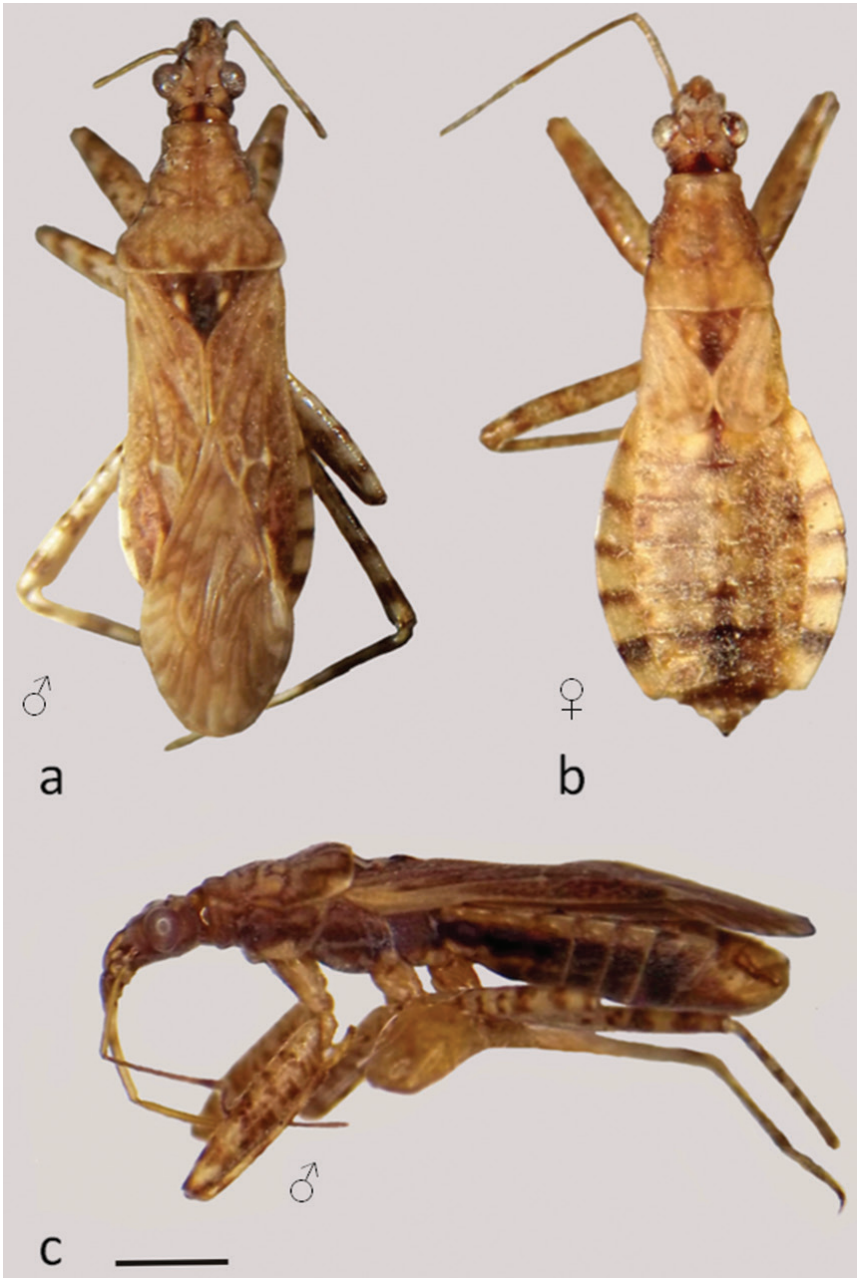

Figure 4. *Hoplistoscelis sordida* **a–b** dorsal view **c** lateral view. Scale line 1mm.

1.88 (mean = 1.86), width 0.37); middle femora: length 1.70–1.76 (mean = 1.73), width 0.26; hind femora 2.00–2.25 (mean = 2.12), width 0.18–0.20 (mean = 0.19). Fore tibiae: length 1.54, width 0.11; middle tibiae: length 1.61–1.70 (mean = 1.65), width 0.075; hind tibiae: length 2.44–2.60 (mean = 2.52), width 0.075.

Female (n = 1)**:** Length 6.06. Head: length 0.82, width 0.86; eye width 0.41, interocular width 0.35. Rostrum: ratio of segment lengths about 1: 2 : 3.03 : 4.39. Antenna: ratio of segment about 1: 1.40 : 1.22 : 1.23. Pronotum length 1.27, width 1.20. Hemelytra length 1.12. Abdomen: length 2.70, width 2.25. Legs: fore femora: length 1.88, width 0.41; middle femora: length 1.76, width 0.26; hind femora 2.30, width 0.22. Fore tibiae: length 1.57, width 0.13; middle tibiae: length 1.70, width 0.11; hind tibiae missing.

Genus *Nabis* Latreille, 1802
http://species-id.net/wiki/Nabis

Diagnosis. Body elongate or oblong-oval, usually slender. Pronotum campanulate with two fine transverse constrictions, humeral angles rounded, hind margin subtruncate; scutellum small, triangular, apex obtuse; clavus widened behind; hemelytra entire reaching or surpassing tip of abdomen, or abbreviated reaching only second dorsal segment, membrane with three elongate cells, their terminal bounding vein with numerous short veins radiating to tip of membrane; connexivum in males of macropterous forms usually narrowly or not at all exposed, in females more broadly so; front femora spindleshaped, moderately swollen, femora and tibiae beset beneath with numerous fine setae; front and middle tibiae with a short spongy lobe at apex; tarsi 3-jointed.

***Nabis tandilensis* (Berg, 1884)**
http://species-id.net/wiki/Nabis_tandilensis
Figs 5, 13d

Coriscus tandilensis Berg 1884. Annales de la Sociedad Científica Argentina 2: 106.
Nabis tandilensis Pennington 1921. Lista de los Hemipteros de la República Argentina. Segunda Parte: 26. Harris 1939. Notas del Museo de La Plata 26: 377. Holotype (MLP). Volpi and Coscarón 2010. Zootaxa 2513: 59.
Holotype: ♂, Argentina, Buenos Aires: Tandil (MLP)

Material examined. Holotype ♂ BUENOS AIRES: Tandil 37°19'4.12"S; 59° 9'1.41"W, 5–XI–1983 Doctor Holmberg, (MLP).

Distribution in Argentina. Buenos Aires: Tandil.

Subgenus *Tropiconabis* Kerzhner, 1968

Diagnosis. Body long and narrow, antennae and legs long, hemelytra surpassing tip of abdomen. Abdomen usually with clear edges. Paramere small.

Figure 5. *Nabis tandilensis* dorsal view. Scale line 1mm.

***Nabis capsiformis* Germar, 1837**
http://species-id.net/wiki/Nabis_capsiformis
Figs 6a–j, 13d

Nabis capsiformis Germar 1837. Silbermann's Revue Entomologique 5: 132. Pennington 1920–1921. Lista de los Hemípteros Heterópteros de la República Argentina. Segunda Parte: 26. Harris 1930. Annals of the Carnegie Museum Argentina 19: 246. Harris 1939. Notas del Museo de La Plata 26: 376. Ruffinelli and Pirán 1959. Boletín de la Facultad de Agronomía de Montevideo 5l: 40. Prado 2008. Boletín del Museo Nacional de Historia Natural Chile 57: 44. Volpi and Coscarón 2010. Zootaxa 2513: 60.

Nabis elongatus Meyer-Dür 1870. Mitteilungen der Schweizerischen Entomologischen Gesellschaft 3:178. Synonymized by Reuter 1908: 114.

Nabis kinbergii Reuter 1872. Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Forhandlingar 29: 90. Synonymized by Reuter 1908: 114.

Coriscus capsiformis Stål 1873. Kongliga Svenska Vetenskaps-Akademiens Handlingar 11: 113.

Coriscus elongatus Stål 1873. Kongliga Svenska Vetenskaps-Akademiens Handlingar 11: 114.

Coriscus kinbergii Stål 1873. Kongliga Svenska Vetenskaps-Akademiens Handlingar 11: 113.

Reduviolus capsiformis Reuter 1908 Mémoires de la Société Entomologique de Belgique 15: 114.

Material examined. BUENOS AIRES: Bs. As. 1 ♀ (MLP); J. Bosq col., 1 ♀ (MLP); 1776 Harris det., 1 ♂ (MLP); Alm. Brown 34°50'24.22"S; 58°23'40.24"W, 19–V–36 1 ♀ (MLP); Arrecifes 34° 3'49.96"S; 60° 6'12.56"W, 17–I–1939 Biraben-Scott leg. col., 1 ♀ (MLP); Ciudad de Buenos Aires 34°36'30.30"S; 58°22'23.38"W, XI–1918 1 ♀ (MLP), 12–II–1912 1 ♀ (MLP); José C. Paz 34°30'54.38"S; 58°45'58.49"W, XI–1958 1 ♀ (MLP), XII–1911 1 ♂ (MLP), 1940 J. A. Rosas Costa leg. col., 1 ♂, 2 ♀♀ (MLP); La Plata 34°55'2.28"S; 57°57'0.47"W, 1 ♀ (MLP), Harris det., 1 ♂, 1 ♀ (MLP); Luján 34°33'56.63"S; 59° 7'2.76"W, 18–XII–58 2 ♂♂, 3 ♀♀ (MLP); Mar del Plata 37°58'47.49"S; 57°35'23.26"W, 5–XII–1938 Biraben-Scott leg. col., 1 ♂ (MLP); Punta de Indio 35°16'27.66"S; 57°15'38.66"W, 4–XII–1938 Biraben-Scott leg. col., 2 ♀♀ (MLP); Rincón de Noario 8–IX–1935, 1 ♀ (MLP); San Nicolas 34°36'19.00"S; 58°22'33.00"W, Biraben-Scott leg. col., 1 ♀ (MLP). CATAMARCA: Pomán 28°23'47.29"S; 66°13'7.56"W, 8–III–62 Torres-Ferreyra col., 1 ♀ (MLP). CORDOBA: Alta Gracia 31°39'16.39"S; 64°25'50.17"W, I–35 C. Bruch leg. col., 1 ♀ (MLP); Cabana 31°13'0.01"S; 64°22'0.01"W, 03–I–1926 Harris det., 1 ♀ (MLP), 10–XI–1942 Biraben col., 1 ♂ (MLP), Marull 30°59'45.16"S; 62°49'37.61"W, 22–I–1940 Biraben, 1 ♂ (MLP); San Antonio de Arredondo 31°28'57.22"S; 64°31'25.50"W, 14–II–1940 Biraben col., 1 ♂, 1 ♀ (MLP). CORRIENTES: Harris det., 1 specimen (without abdomen) (MLP); I–1921 De Carlo col., 1 ♂ (MLP); San Roque 28°34'28.86"S; 58°42'32.85"W, II–1920 1 ♂, 2 ♀♀ (MLP). JUJUY: Pampa Blanca 24°31'58.57"S; 65° 4'24.57"W, 13–III–1939 Biraben-Scott leg. col., 1 ♂ (MLP). MISIONES: Loreto 27°19'0.01"S; 55°31'59.98"W A. A. Orgloblin col., 2 ♀♀ (MLP). SANTIAGO DEL ESTERO: Girardet 27°37'0.02"S; 62°10'0.02"W, 9–XII–1939 Biraben–Bezzi, 2 ♀♀ (MLP); Quimilí 27°38'39.06"S; 62°24'56.03"W, 9–XII–1939 Biraben–Bezzi col., 1 ♀ (MLP).

Distribution in Argentina. Buenos Aires: Alm. Brown, Arrecifes, Ciudad de Buenos Aires, José C. Paz, La Plata, Luján, Mar del Plata, Punta de Indio, Rincón de Noario, San Nicolas; Catamarca: Pomán; Córdoba: Alta Gracia, Cabana, Marull, San Antonio de Arredondo; Corrientes: San Roque; Jujuy: Pampa Blanca; La Pampa: Winifreda; Misiones: Loreto, Río Bermejo, Salto; Salta (Río Bermejo); Santiago del Estero: Girardet, Quimilí.

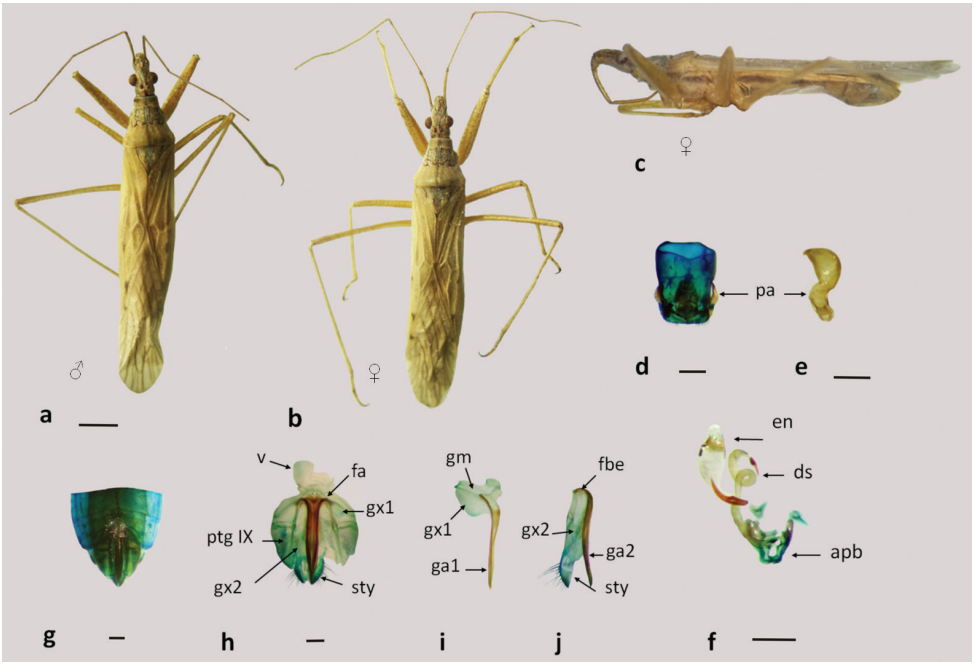

Figure 6. *Nabis capsiformis* **a–b** dorsal view **c** lateral view; **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g–j** female genitalia: **g–h** genital segment **i** first gonapophysis and gonocoxite 1 **j** second gonapophysis and gonocoxite 2. (apb: articulatory apparatus; ds: ductus seminis; en: endosoma; fa: anterior fibula; fbe: external fibula; ga1 and ga2: gonapophysis 1 and 2; gm: gonangulum; gx1 and 2: gonocoxites 1 and 2, pa: paramere, ptgIX: paratergite IX ; sty: styloid; v: vagina). Figures **a–c** scale line 1mm; **d–j** scale line 0.2mm.

Distribution outside Argentina. Brazil: Santaren, Corumbá, Rio de Janeiro; Chile: Arica, Continental Chile and Easter Island; Guyana; México; Peru: Lima; Uruguay: Montevideo.

According to Kerzhner (2007) this species is widely distributed in nearly all tropical and subtropical regions of the world, the Americas from the USA to Argentina.

Measurements. Male (n = 5): Length 8.54–9.10 (mean = 8.74). Head: length 0.92–1.06 (mean = 1.00), width 0.71–0.72 (mean = 0.712); eye width 0.28–0.33 (mean = 0.31), interocular width 0.28–0.32 (mean = 0.30). Rostrum: ratio of segment lengths about 1: 2.59 : 2.73 : 1.38. Antenna: ratio of segment about 1: 1.75 : 1.76 : 1.07. Pronotum length 1.19–1.35 (mean = 1.25), width 1.27–1.42 (mean = 1.36). Hemelytra length 6.10–6.60 (mean = 6.38). Abdomen: length 3.05–3.76 (mean = 3.38), width 1.14–1.70 (mean = 1.45). Legs: fore femora: length 2.13–2.16 (mean = 2.14), width 0.31–0.36 (mean = 0.34); middle femora: length 1.87–1.98 (mean = 1.95), width 0.12–0.23 (mean = 0.16); hind femora 3.05–3.26 (mean = 3.13), width 0.12–0.15 (mean = 0.13). Fore tibiae: length 1.70–1.86 (mean = 1.79), width 0.10;

middle tibiae: length 1.77–1.92 (mean = 1.84), width 0.05–0.07 (mean = 0.064); hind tibiae: length 3.48–3.76 (mean = 3.66), width 0.05–0.07 (mean = 0.064).

Female (n = 5): Length 7.77–9.87 (mean = 8.85). Head: length 0.98–1.13 (mean = 1.03), width 0.71–0.78 (mean = 0.73); eye width 0.31–0.35 (mean = 0.33), interocular width 0.28–0.32 (mean = 0.30). Rostrum: ratio of segment lengths about 1: 2.42 : 2.57 : 1.28. Antenna: ratio of segment about 1: 1.69 : 1.73 : 1.07. Pronotum length 1.27–1.42 (mean = 1.34), width 1.42–1.63 (mean = 1.51). Hemelytra length 5.53–7.17 (mean = 6.44). Abdomen: length 3.12–3.69 (mean = 3.46), width 1.04–1.56 (mean = 1.32). Legs: fore femora: length 2.08–2.27 (mean = 2.23), width 0.35–0.39 (mean = 0.37); middle femora: length 1.91–2.13 (mean = 2.03), width 0.20–0.28 (mean = 0.22); hind femora 3.12–3.33 (mean = 3.2), width 0.12–0.26 (mean = 0.19). Fore tibiae: length 1.82–1.91 (mean = 1.86), width 0.10–0.12 (mean = 0.104); middle tibiae: length 1.91–2.05 (mean = 1.97), width 0.07–0.12 (mean = 0.08); hind tibiae: length 3.74–3.97 (mean = 3.85), width 0.07.

Description. General coloration light brown. Body elongated, covered with white setae over the surface. Head with whitish pilosity and sparse long setae, more abundant ventrally; brown area between eyes and antennae and post-ocular region laterally. Rostrum passing fore coxae, segment IV brown distally. Antennae long and slender with setae. Pronotum pilose with a brown stripe in the middle (in some specimens diffused); anterior lobe tinged with brown; posterior lobe with a suture and granulate. Scutellum brown in the centre and with two depressions, and the sides clear. In some specimens meso- and metasternum dark brown. Pro- meso- and metapleura and abdomen ventral sides with a brown stripe. Abdomen with abundant sparse setae, not uniformly pigmented, connexivum without spots. Legs long and slender, with long white setae.

Biology. Ojeda-Peña (1971) and Cornelis et al. (2012) described the nymphs, eggs, and biology. The last authors collected the material using a sweeping net in *Medicago sativa* L. (Fabaceae).

Nabis seticrus Harris, 1930

Nabis seticrus Harris 1930. Annals of the Carnegie Museum, 19:241–248. Volpi and Coscarón 2010. Zootaxa 2513: 59.

Distribution in Argentina. Salta

Distribution outside Argentina. Brazil: Chapada, Rio de Janeiro.

Nabis roripes Stål, 1860

http://species-id.net/wiki/Nabis_roripes

Nabis roripes Stål 1860. Kongliga Svenska Vetenskaps-Akademiens Handlingar 2: 70. Holotype (NHRS). Reuter 1890. Revue d´Entomologie 9: 297. Reuter 1908. Mémoires de la Société Entomologique de Belgique 15: 99–101. Harris 1930. Annals

of the Carnegie Museum 19: 246. Harris 1939. Notas del Museo de La Plata 26: 376. Volpi and Coscarón 2010. Zootaxa 2513: 59.
Holotype: http://www2.nrm.se/en/het_nrm/r/nabis_roripes.html

Distribution in Argentina. Misiones: Loreto.

Distribution outside Argentina. Brazil: Chapada; Colombia: Pandi (Cundimarca); Peru: San Juan.

Punctipennis complex

The *punctipennis* complex (according to Harris (1939)) is comprised of *Nabis argentinus* Meyer-Dür, *Nabis faminei* Stål, *Nabis paranensis* Harris, and *Nabis punctipennis* Blanchard.

Body with abundant long whitish setae. Head brown; with a line in the middle (widened anteriorly), sides of head and ventrally dark brown. Rostrum pallid testaceus, segment I darker at base, IV distally darker. Pronotum with a dark brown stripe in the middle, anterior lobe with irregular fuscous patterns. Scutellum black with a yellowish spot at the sides of the base; with two fovea in the center the area between noticeably depressed. Abdomen above and a wide line on each side sordid brown. Legs pilose, mottled.

Nabis paranensis Harris, 1931

http://species-id.net/wiki/Nabis_paranensis
Figs 7a–i, 11a, 12a, 13d

Nabis paranensis Harris 1931. Annals of the Zoological Museum of Polonian 9: 182. Harris 1939. Notas del Museo de La Plata 26: 374. Volpi and Coscarón 2010. Zootaxa 2513: 58.

Material examined. BUENOS AIRES: 1 ♂ (MLP); José C. Paz 34°30'54.38"S; 58°45'58.49"W, 1940 J. A. Rosas Costa leg. Col., Harris det., 1 ♂ (MLP); La Plata 34°55'2.28"S; 57°57'0.47"W A. R. Bezzi leg. col., 1 ♀ (MLP); V. Ballester 34°32'57.25"S; 58°33'31.75"W, 12–VII–1938 1 ♂ (MLP); V. Devoto 34°36'0.00"S; 58°30'60.00"W, 05–III–1939 1 ♂ (MLP). JUJUY: Termas de Reyes 24°10'16.60"S; 65°29'10.62"W, 27–XII–1971 L. Herman col., Kerzhner det. 1985, 1 ♂ (AMNH); Yala 24° 7'10.77"S; 65°24'14.34"W, 12–III–1939 Biraben-Scott leg. col., 1 ♂, 2 ♀♀ (MLP). LA PAMPA: E. Castex 35°54'49.15"S; 64°17'19.94"W, 31–I–1957 Torres-Ronderos col., 2 ♀♀ (MLP); Parque Luro 36°57'34.32"S; 64°15'7.15"W, 26–I–1957 Torres-Ronderos col., 1 ♀ (MLP). MISIONES: Delta Paraná Guazú 29–II–1919, Bosq col., 1 ♂ (MLP).

Distribution in Argentina. Buenos Aires: José C. Paz, La Plata, V. Ballester, V. Devoto; Jujuy: Termas de Reyes, Yala; La Pampa: Eduardo Castex, Parque Luro; Misiones: Delta Paraná Guazú.

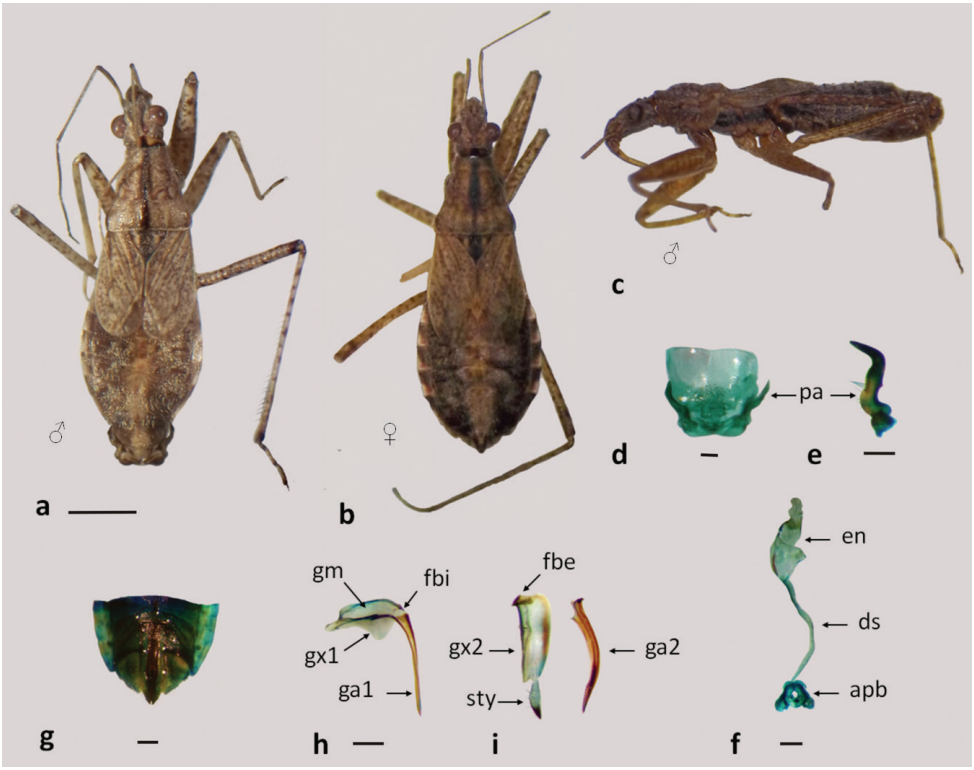

Figure 7. *Nabis paranensis* **a–b** dorsal view **c** lateral view **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g–i** female genitalia: **g** genital segment **h** first gonapophysis and gonocoxite 1 **i** second gonapophysis and gonocoxite 2. (apb: articulatory apparatus; ds: ductus seminis; en: endosoma; fbe: external fibula; fbi: internal fibula; ga1 and ga2: gonapophysis 1 and 2; gm: gonangulum; gx1 and 2: gonocoxites 1 and 2, pa: paramere; sty: styloid). Figures **a–c** scale line 1mm; **d–i** scale line 0.2mm.

Distribution outside Argentina. Brazil: Parana (São Pedro de Mallet).

New record. Argentina: La Pampa, Winifreda: 36°18'45.30"S; 64°11'55.45"W, Cornelis col.

Measurements. Male (n = 5)**:** Length 5.17–6.30 (mean = 5.53). Head: length 0.79–1.00 (mean = 0.89), width 0.79–0.85 (mean = 0.81); eye width 0.32–0.42 (mean = 0.35), interocular width 0.33–0.35 (mean = 0.33). Rostrum: ratio of segment lengths about 1: 2.28 : 1.97 : 1.11. Antenna: ratio of segment about 1: 1.59 : 1.32 : 1.09. Pronotum length 1.09–1.24 (mean = 1.14), width 1.12–1.40 (mean = 1.22). Hemelytra length 1.16–3.94 (mean = 1.91). Abdomen: length 2.21–3.50 (mean = 2.83), width 1.46–2.48 (mean = 1.71). Legs: fore femora: length 1.61–1.98 (mean = 1.74), width 0.35–0.41 (mean = 0.38); middle femora: length 1.42–1.63 (mean = 1.53), width 0.26–0.30 (mean = 0.27); hind femora 2.06–2.48 (mean = 2.22), width 0.14–0.18 (mean = 0.17). Fore tibiae: length 1.31–1.61 (mean = 1.41), width 0.10–0.11 (mean = 0.108); middle tibiae: length 1.35–1.65 (mean = 1.45), width 0.07–0.11 (mean = 0.08); hind tibiae: length 2.33–2.98 (mean = 2.57), width 0.07–010 (mean = 0.076).

Female (n = 5)**:** Length 5.45–5.89 (mean = 5.67). Head: length 0.75–1.00 (mean = 0.88), width 0.82–0.86 (mean = 0.84); eye width 0.35–0.39 (mean = 0.37), interocular width 0.33–0.37 (mean = 0.35). Rostrum: ratio of segment lengths about 1: 2.23 : 2.41 : 1.17. Antenna: ratio of segment about 1: 1.51 : 1.30 : 1.03. Pronotum length 1.12–1.24 (mean = 1.17), width 1.20–1.35 (mean = 1.28). Hemelytra length 1.50–2.10 (mean = 1.79). Abdomen: length 2.70–3.00 (mean = 2.84), width 1.69–1.95 (mean = 1.84). Legs: fore femora: length 1.61–2.06 (mean = 1.87), width 0.33–0.43 (mean = 0.39); middle femora: length 1.70–2.05 (mean = 1.84), width 0.22–0.26 (mean = 0.24); hind femora 1.80–2.63 (mean = 2.26), width 0.15–0.18 (mean = 0.17). Fore tibiae: length 1.27–1.61 (mean = 1.49), width 0.09–0.11 (mean = 0.10); middle tibiae: length 1.39–1.80 (mean = 1.60), width 0.07–0.11 (mean = 0.08); hind tibiae: length 2.63–3.15 (mean = 2.78), width 0.07.

Description. Eyes prominent; antennae and legs longer than in the others species of the complex. Length of first antennal segment equal or slightly shorter than the distance between the eyes. Length of second antennal segment subequal to the width of the base of the pronotum. In brachypterous forms, hemelytra reaching to the fifth abdominal segment and membrane slightly surpassing the apex of the corium. Paramere distally shorter and more thickened than in *N. faminei* and *N. punctipennis*. Paramere with a thickening on the inner margin of the blade and a protuberance on the outer margin of the blade. Female genitalia with the styloid constricted basally and sharp distally.

***Nabis argentinus* Meyer-Dür, 1870**
http://species-id.net/wiki/Nabis_argentinus
Figures 8a–i, 11b, 12b, 13d

Nabis argentinus Meyer-Dür 1870. Mitteilungen der Schweizerischen Entomologischen Gesellschaft 3: 177. Harris 1939. Notas del Museo de La Plata 26: 373. Ruffinelli and Pirán 1959. Boletín de la Facultad de Agronomía de Montevideo 5l: 40. Volpi and Coscarón 2010. Zootaxa 2513: 58.

Coriscus argentinus Stål 1873. Köngliga Svenska Vetenskaps-Akademiens Handlingar 11: 114.

Nabis punctipennis: Berg 1879. Anales de la Sociedad Científica Argentina 9: 143. Berg 1892. Anales de la Sociedad Científica Argentina 34: 104. Pennington 1920. Lista de los Hemípteros Heterópteros de la República Argentina. Segunda Parte: 26.

Material examined. BUENOS AIRES: 1852 Harris det., 1 ♀ (MLP), 15–I–1921 1 ♂ (MLP), XII–1938 Drake and Richardson col., Harris det., 1 ♂, 1 ♀ (MLP); Bahía Blanca 38°42'42.04"S; 62°16'5.08"W, III–1984 Mianzan col., 3 ♀♀ (MLP), 18–II–1977 S. Coscarón col., Kerzhner det. 1987, 3 ♂♂, 3 ♀♀ (AMNH); Baradero 33°48'31.95"S; 59°30'16.86"W, 1 ♂ (MLP), Harris det. 1 ♂ (MLP); Ciudad de Buenos Aires 34°36'30.30"S; 58°22'23.38"W, 24–XII–1918 Bosq col., 1 ♀ (MLP), 25–XII–1918 1 ♀ (MLP), 29–I–1919 Bosq col., 1 ♂ (MLP), 29–III–1919 Bosq col., 1 ♀ (MLP);

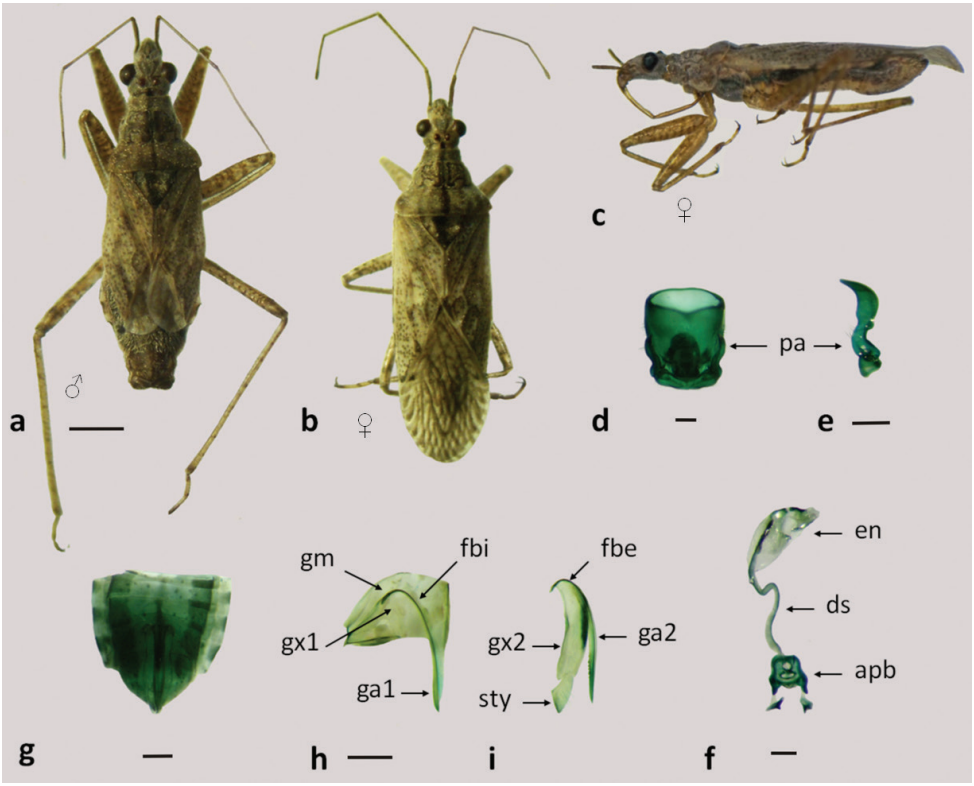

Figure 8. *Nabis argentinus* **a–b** dorsal view **c** lateral view **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g–i** female genitalia: **g** genital segment **h** first gonapophysis and gonocoxite 1 **i** second gonapophysis and gonocoxite 2. (apb: articulatory apparatus; ds: ductus seminis; en: endosoma; fbe: external fibula; fbi: internal fibula; ga1 and ga2: gonapophysis 1 and 2; gm: gonangulum; gx1 and 2: gonocoxites 1 and 2, pa: paramere; sty: styloid). Figures **a–c** scale line 1mm; **d–i** scale line 0.2mm.

Flores 34°37'60.00"S; 58°28'0.00"W, 7–III–1917 Bosq col., 1 ♀ (MLP); José C. Paz 34°30'54.38"S; 58°45'58.49"W, XII–1938 1 ♂ (MLP), 07–III–1939 1 ♀ (MLP), 21–I–1939 1 ♂ (MLP), 05–IX–1939, 1 ♀ (MLP), 1940 J. A. Rosas Costa leg. col.; La Colina 37°21'41.73"S; 61°32'2.76"W, 29–XI–1938 Carl J. Drake col., 3 ♂♂, 2 ♀♀ (MLP), 29–XI–1938 Carl J. Drake col., Harris det. 1 ♀ (MLP); La Madrid 37°14'51.31"S; 61°15'38.11"W, 19–XI–1938, 1 ♂ (MLP); La Plata 34°55'2.28"S; 57°57'0.47"W, 1935 J. A. Rosas Costa col., Harris det., 1 ♀ (MLP); Harris det., 1 ♂, 1 ♀ (MLP), A. R. Bezzi leg. col., 1 ♀ (MLP), 03–III–2003 P. M. Dellape col., 1 ♀ (MLP); Monte Hermoso 38°58'58.01"S; 61°17'50.69"W, 28–II–1957 Torres-Ronderos col., 1 ♀ (MLP); Pedro Luro 39°30'5.86"S; 62°41'0.10"W, 08–II–1941 Biraben col., 3 ♀♀ (MLP); Punta del Indio 35°16'27.66"S; 57°15'38.66"W, 4–XII–1938 Biraben-Scott leg. col., 1 ♂ (MLP); Tandil 37°19'14.28"S; 59° 7'44.78"W, Harris det. 1 ♀ (MLP). CATAMARCA: Belén 27°38'59.42"S; 67° 1'59.09"W, 02–III–1939 Biraben-Scott leg col. 2 ♀♀ (MLP). CÓRDOBA: Alta Gracia 31°39'16.39"S; 64°25'50.17"W, I–1935 C. Bruch leg. Col., Harris

det., 1 ♀ (MLP); Bajo Grande 31°37'0.02"S; 64°13'0.00"W, 07–XII–1939 Biraben-Bezzi col., 1 ♀ (MLP); Cabana 31°13'0.01"S; 64°22'0.01"W, IX–1938 Biraben-Scott leg. col., 1 ♀ (MLP), 10–II–1942 Biraben col., 1 ♀ (MLP), 10–XI–1942 Biraben col., 1 ♂ (MLP); Copina 31°34'23.82"S; 64°40'25.01"W, 14–II–1940 Biraben col., 1 ♀ (MLP); La Puerta 30°53'38.28"S; 63°15'7.24"W, 23–I–1940 Biraben col., 1 ♀ (MLP); Mar Chiquita 30°47'60.00"S; 62°52'59.99"W, 22–I–1940 Biraben col., 1 ♀ (MLP); Marull 30°59'45.16"S; 62°49'37.61"W, 22–I–1940 Biraben col., 2 ♀♀ (MLP); San Antonio de Arredondo 31°28'57.22"S; 64°31'25.50"W, 14–II–1940 Biraben col., 2 ♀♀ (MLP); San Francisco 31°25'30.00"S; 62° 5'2.98"W, 21–I–1940 Biraben col., 1 ♀ (MLP). CHACO: Nueva Pompeya 24°55'53.10"S; 61°28'59.70"W, Harris det., 1 ♀ (MLP). ENTRE RÍOS: Gualeguaychú 33°0'54.06"S; 58°31'9.28"W, 20–XII–1941 Biraben–Bezzi col. 1 ♂ (MLP). LA PAMPA: Eduardo Castex 35°54'49.15"S; 64°17'19.94"W, 31–I–1957 Torres-Ronderos col., 1 ♀ (MLP). MENDOZA: Luján 33° 2'1.96"S; 68°52'56.50"W, 27–II–1940 Biraben col., 1 ♂ (MLP); Tupungato 33°22'9.58"S; 69° 8'43.59"W, 27–II–1940 Biraben col., 1 ♀ (MLP). RÍO NEGRO: I–1951 1 ♀ (MLP); San Antonio Oeste 40°43'49.84"S; 64°56'57.03"W, 20–II–1915, 2 ♀♀ (MLP). SALTA: San Lorenzo 24°43'46.97"S; 65°29'7.42"W, 14–VII–1939 1 ♀ (MLP). SAN LUIS: Nogolí 32°55'6.09"S; 66°19'30.79"W, 21–II–1940 Biraben col., 1 ♂, 1 ♀ (MLP); Quines 32°14'1.21"S; 65°48'8.50"W, 18–II–1940 Biraben col., 1 ♀ (MLP); San Francisco 33°16'51.13"S; 66°18'32.36"W, 20–II–1940 Biraben col., 1 ♀ (MLP).

Distribution in Argentina. Buenos Aires: Bahía Blanca, Baradero, Ciudad de Buenos Aires, Flores, José C. Paz, La Colina, La Madrid, La Plata, Monte Hermoso, Pedro Luro, Punta del Indio; Catamarca: Belén; Córdoba: Alta Gracia, Bajo Grande, Cabana, Copina, La Puerta, Mar Chiquita, Marull, San Antonio de Arredondo, San Francisco; Chaco: Nueva Pompeya; Entre Ríos: Gualeguaychú; La Pampa: Eduardo Castex; Mendoza: Luján, Tupungato; Río Negro: San Antonio Oeste; Salta: San Lorenzo; San Luis: Nogolí, Quines, San Francisco.

Distribution outside Argentina. Uruguay: Artigas, Canelones, Colonia, Durazno, Maldonado, Montevideo, Paysandú.

New record. Argentina: La Pampa, Winifreda: 36°18'45.30"S; 64°11'55.45"W, Cornelis col.

Measurements. Male (n = 5): Length 5.32–6.81 (mean = 6.34). Head: length 0.78–0.99 (mean = 0.86), width 0.85–0.92 (mean = 0.86); eye width 0.38–0.42 (mean = 0.40), interocular width 0.38–0.42 (mean = 0.41). Rostrum: ratio of segment lengths about 1: 2.54 : 2.48 : 1.29. Antenna: ratio of segment about 1: 1.73 : 1.33 : 0.90. Pronotum length 1.06–1.27 (mean = 1.17), width 1.42–1.77 (mean = 1.57). Hemelytra length 2.48–4.68 (mean = 4.11). Abdomen: length 1.91–2.69 (mean = 2.28), width 1.42–1.77 (mean = 1.65). Legs: fore femora: length 1.70–1.77 (mean = 1.73), width 0.35–0.42 (mean = 0.37); middle femora: length 1.42–2.05 (mean = 1.67), width 0.28–0.32 (mean = 0.29); hind femora 2.27–2.34 (mean = 2.29), width 0.14–0.21 (mean = 0.18). Fore tibiae: length 1.42–1.49 (mean = 1.43), width 0.10–0.12 (mean = 0.105); middle tibiae: length 1.49–1.60 (mean = 1.52), width 0.07–0.10 (mean = 0.09); hind tibiae: length 2.55–2.84 (mean = 2.70), width 0.07–010 (mean = 0.08).

Female (n = 5): Length 5.75–7.10 (mean = 6.57). Head: length 0.88–1.06 (mean = 0.98), width 0.74–0.92 (mean = 0.88); eye width 0.38–0.42 (mean = 0.41), interocular width 0.35–0.42 (mean = 0.39). Rostrum: ratio of segment lengths about 1: 2.67 : 2.58 : 1.35. Antenna: ratio of segment about 1: 1.82 : 1.41 : 0.91. Pronotum length 1.13–1.35 (mean = 1.25), width 1.13–1.84 (mean = 1.65). Hemelytra length 1.60–4.97 (mean = 4.25). Abdomen: length 2.69–3.05 (mean = 2.88), width 1.77–2.13 (mean = 1.88). Legs: fore femora: length 1.70–1.91 (mean = 1.80), width 0.35–0.42 (mean = 0.37); middle femora: length 1.60–1.77 (mean = 1.66), width 0.28–0.32 (mean = 0.29); hind femora 2.27–2.48 (mean = 2.40), width 0.15–0.21 (mean = 0.19). Fore tibiae: length 1.45–1.52 (mean = 1.48), width 0.10–0.14 (mean = 0.12); middle tibiae: length 1.55–1.63 (mean = 1.60), width 0.10; hind tibiae: length 2.84–3.05 (mean = 2.89), width 0.10.

Description. Pronotum in macropterous form greatly expanded behind, a third wider than long; posterior lobe markedly arched upward. Pronotum in brachypterous form visibly wider than long, but strongly compressed on the sides between the anterior and posterior lobes. Hemelytra in macropterous forms surpassing apex of abdomen; in brachypterous forms, reaching to the base of sixth abdominal segment. Paramere with the distal area more thickened than in the other species of the complex; the blade wide, with a protuberance on the outer margin. Base of the paramere more constricted than in *N. paranensis*. Female genitalia with the styloid more thickened than in *N. paranensis*.

Nabis faminei Stål, 1859

http://species-id.net/wiki/Nabis_faminei
Figs 9a–i, 11c, 12c 13d

Nabis faminei Stål 1859. Kongliga Svenska Fregattens Eugenies Resa Omkring Jorden 4: 260. Lectotype (NHRS). Reuter 1872. Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Forhandlingar 29: 92. Berg 1879. Anales de la Sociedad Científica Argentina: 145. Pennington 1921. Lista de los Hemípteros de la República Argentina. Segunda parte: 26. Harris 1939. Notas del Museo de La Plata 26: 372. Prado 2008. Boletín del Museo Nacional de Historia Natural Chile 57: 44. Volpi and Coscarón 2010. Zootaxa 2513: 58.

Nabis punctipennis: Reuter 1908. Mémoires de la Société Entomologique de Belgique 15: 122.

Lectotype: http://www2.nrm.se/en/het_nrm/f/nabis_faminei.html

Material examined. BUENOS AIRES: La Plata 34°55'2.28"S; 57°57'0.47"W 1 ♀ (MLP). TIERRA DEL FUEGO: Harris det., 1 ♀ (MLP); Cabana Ruby 17–I–1988, 1 ♀ (MLP); Cabo Espíritu Santo 52°39'32.29"S; 68°36'8.83"W, 18–I–1988 4 ♂♂, 1 ♀ (MLP); Estancia La Indiana 54°20'46.48"S; 67°25'44.27"W, 17–I–1988 2 ♂♂, 1 ♀ (MLP); Lago Fagnano 17–I–1988 Leg. Molta and Lombardo col., 2 ♀♀ (MLP); Paso Garibaldi 54°41'29.80"S; 67°51'0.99"W, 17–I–1988 (MLP); Río Chico, Las Violetas 54°47'55.02"S; 68°18'29.55"W, 13–I–1988 2 ♀♀ (MLP).

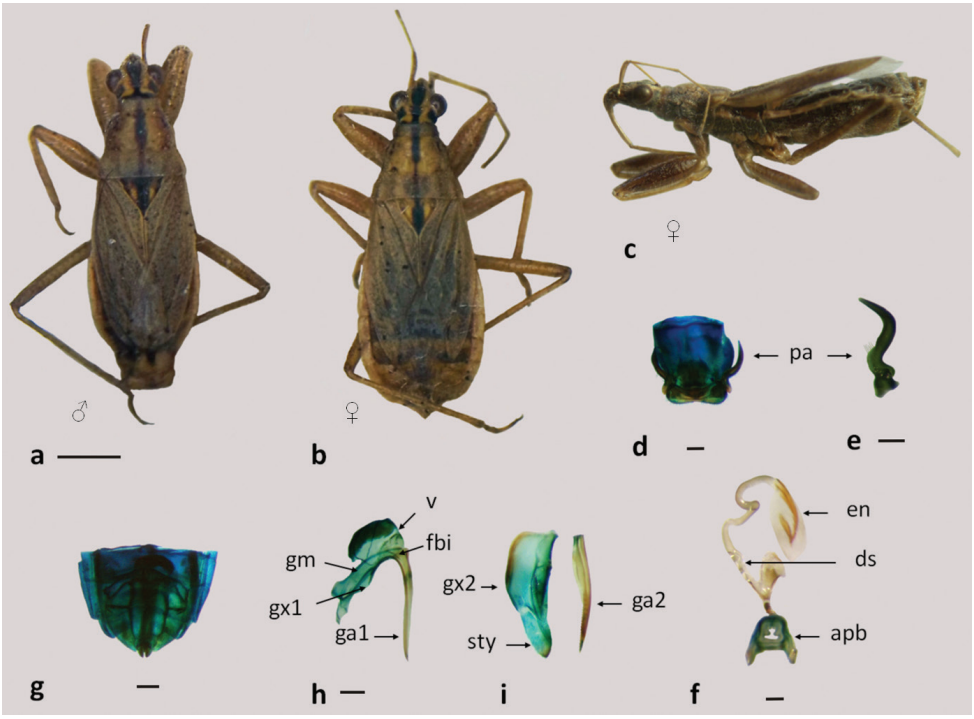

Figure 9. *Nabis faminei* **a–b** dorsal view **a** male **b** female **c** lateral view **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g–i** female genitalia: **g** genital segment **h** first gonapophysis and gonocoxite 1 **i** second gonapophysis and gonocoxite 2. (apb: articulatory apparatus; ds: ductus seminis; en: endosoma; fbi: internal fibula; ga1 and ga2: gonapophysis 1 and 2; gm: gonangulum; gx1 and 2: gonocoxites 1 and 2, pa: paramere; sty: styloid; v: vagina). Figures **a–c** scale line 1mm; **d–i** scale line 0.2mm.

Distribution in Argentina. Buenos Aires: La Plata; Patagonia, Tierra del Fuego: Cabana Ruby, Cabo Espíritu Santo, Estancia La Indiana, Lago Fagnano, Paso Garibaldi, Río Chico (Las Violetas).

Distribution outside Argentina. Chile.

Measurements. Male (n = 3): Length 4.92–5.84 (mean = 5.26). Head: length 0.82–0.93 (mean = 0.87), width 0.82–0.86 (mean = 0.83); eye width 0.36–0.37 (mean = 0.365), interocular width 0.37. Rostrum: ratio of segment lengths about 1: 2.26 : 0.59 : 0.62. Antenna: ratio of segment about 1: 1.64 (segments III and IV missing). Pronotum length 1.01–1.16 (mean = 1.08), width 1.16–1.46 (mean = 1.28). Hemelytra length 2.44–3.79 (mean = 2.91). Abdomen: length 2.17–2.66 (mean = 2.48), width 1.50– 1.67 (mean = 1.57). Legs: fore femora: length 1.36–1.39 (mean = 1.38), width 0.39–0.41 (mean = 0.396); middle femora: length 1.25–1.27 (mean = 1.265), width 0.30–0.33 (mean = 0.31); hind femora 1.78–1.87 (mean = 1.82), width 0.17–0.18 (mean = 0.175). Fore tibiae: length 1.09–1–15 (mean = 1.12), width 0.09–0.12 (mean = 0.10); middle tibiae: length 1.06–1.17 (mean = 1.13), width 0.075–0.09 (mean = 0.08); hind tibiae: length 2.03–2.14 (mean = 2.08), width 0.06–0.07 (mean = 0.065).

Female (n = 3)**:** Length 5.07–5.84 (mean = 5.39). Head: length 0.82–0.93 (mean = 0.88), width 0.78–0.86 (mean = 0.82); eye width 0.36–0.39 (mean = 0.37), interocular width 0.36–0.37 (mean = 0.365). Rostrum: ratio of segment lengths about 1: 2.19 : 2.43 : 1.19. Antenna: ratio of segment about 1: 1.47 : 1.41 : 1.15. Pronotum length 1.09–1.20 (mean = 1.13), width 1.27–1.42 (mean = 1.32). Hemelytra length 2.60–3.12 (mean = 2.84). Abdomen: length 2.42–2.59 (mean = 2.52), width 1.80–1.95 (mean = 1.86). Legs: fore femora: length 1.09–1.60 (mean = 1.35), width 0.36–0.42 (mean = 0.38); middle femora: length 1.21–1.51 (mean = 1.33), width 0.21–0.30 (mean = 0.26); hind femora 1.75–2.24 (mean = 1.94), width 0.18. Fore tibiae: length 1.18–1.33 (mean = 1.24), width 0.09–0.12 (mean = 0.11); middle tibiae: length 1.15–1.33 (mean = 1.23), width 0.09–0.10 (mean = 0.093); hind tibiae: length 2.12–2.39 (mean = 2.21), width 0.075–0.10 (mean = 0.088).

Description. Similar to *N. punctipennis* but with the body more robust, the eyes larger, and the antennae and legs shorter. Length of antennal segment II hardly equal to the width of the head across eyes. Anterior lobe of pronotum arcuate, strongly raised above the collar. Hemelytra exposing part of the abdomen. Legs robust, anterior femora thickened. Paramere blade thin, with apex pointed. Female genitalia with thick and robust styloid.

***Nabis punctipennis* Blanchard, 1852**
http://species-id.net/wiki/Nabis_punctipennis
Figs 10a–j, 11d, 12d, 13d

Nabis punctipennis Blanchard 1852. In: Gay C (Ed) Historia Física y Política de Chile 7: 161. Signoret 1863. Annales de la Société Entomologique de France 3: 577. Reuter 1872. Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Forhandlingar 29: 90. Harris 1939. Notas del Museo de La Plata 26: 370–371. Prado 2008. Boletín del Museo Nacional de Historia Natural Chile 57: 44. Volpi and Coscarón 2010. Zootaxa 2513: 59.

Nabis parvulus Reuter 1872. Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Forhandlingar 29: 90–91. Synonymized by Reuter 1908: 123.

Coriscus punctipennis Stål 1873. Kongliga Svenska Vetenskaps-Akademiens Handlingar 11: 114.

Reduviolus punctipennis Reuter 1908. Mémoires de la Société Entomologique de Belgique 15: 122 (in part).

Material examined. CHUBUT: El Hoyo 42° 3'51.98"S; 71°31'11.29"W, 21–I–1965 A Kovacs col., Kerzhner det., 1987 1 ♂, 1 ♀ (AMNH). MENDOZA: Jensen-Haarup det., 1 ♀ (MHND); Chacras de Coria 32°58'51.27"S; 68°52'36.84"W Jensen-Haarup, 1 ♀ (MHND). NEUQUÉN: Huechulaufquen 39°46'4.95"S; 71°22'14.02"W, 23–II–1942 M. Biraben col., 1 ♀ (MLP); Nahuel Huapi, Isla Victoria 40°55'59.99"S; 71°33'0.04"W, 1–XI–1969 Bosq col., 1 ♂ (MLP). RIO NEGRO: San Carlos de Bariloche 41°8'57.44"S; 71°18'4.57"W, 2–IV–1964 A Kovacs col., Kerzhner det., 1987 1 ♂, 1 ♀ (AMNH).

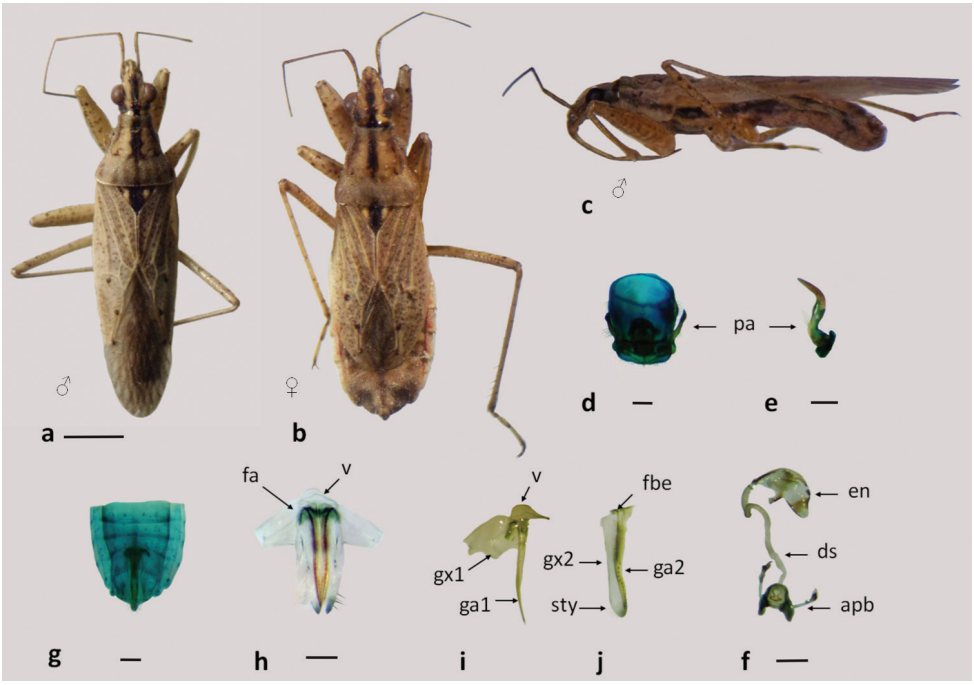

Figure 10. *Nabis punctipennis* **a–b** dorsal view **c** lateral view **d–f** male genitalia: **d** pygophore **e** paramere **f** aedeagus **g–j** female genitalia: **g–h** genital segment **i** first gonapophysis and gonocoxite 1 **j** second gonapophysis and gonocoxite 2. (apb: articulatory apparatus; ds: ductus seminis; en: endosoma; fa: anterior fibula; fbe: external fibula; ga1 and ga2: gonapophysis 1 and 2; gx1 and 2: gonocoxites 1 and 2, pa: paramere; sty: styloid; v: vagina). Figures **a–c** scale line 1mm; **d–j** scale line 0.2mm.

Distribution in Argentina. Chubut: El Hoyo; Mendoza: Chacras de Coria; Neuquén: Huechulaufquen, Nahuel Huapi: Isla Victoria; Río Negro: San Carlos de Bariloche.

Distribution outside Argentina. Chile: Colina, Osorno, Puerto Varas. Continental Chile and Archipiélago Juan Fernández.

Measurements. Male (n = 2)**:** Length 5.26–6.24 (mean = 5.75). Head: length 0.86–0.88 (mean = 0.87), width 0.71–0.86 (mean = 0.78); eye width 0.33–0.39 (mean = 0.36), interocular width 0.37–0.39 (mean = 0.38). Rostrum: ratio of segment lengths about 1: 1.91 : 2.08 : 0.91. Antenna: ratio of segment about 1: 1.74: 1.44: 1.33. Pronotum length 1.16–1.23 (mean = 1.19), width 1.27–1.42 (mean = 1.34). Hemelytra length 2.63–4.11 (mean = 3.37). Abdomen: length 2.25–2.41 (mean = 2.33), width 1.27– 1.39 (mean = 1.33). Legs: fore femora: length 1.63–1.69 (mean = 1.66), width 0.35–0.37 (mean = 0.36); middle femora: length 1.46–1.49 (mean = 1.475), width 0.28–0.30 (mean = 0.29); hind femora 2.05–2.10 (mean = 2.07), width 0.14–0.15 (mean = 0.145). Fore tibiae: length 1.31–1–42 (mean = 1.36), width 0.10–0.11 (mean = 0.105); middle tibiae: length 1.35, width 0.09–0.10 (mean = 0.095); hind tibiae: length 2.36–2.48 (mean = 2.42), width 0.07–0.10 (mean = 0.085).

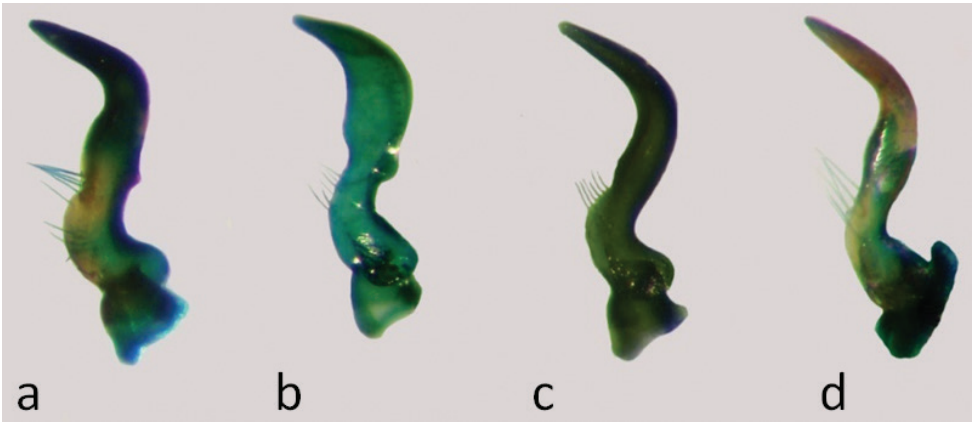

Figure 11. Parameres: **a** *N. paranensis* **b** *N. argentinus* **c** *N. faminei* **d** *N. punctipennis.*

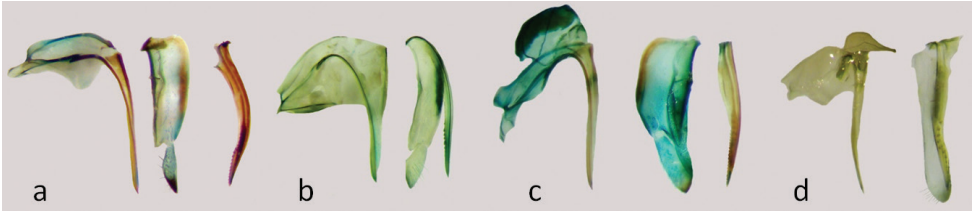

Figure 12. Genital segments of female: **a** *N. paranensis* **b** *N. argentinus* **c** *N. faminei* **d** *N. punctipennis.*

Female (n = 5)**:** Length 4.92–6.67 (mean = 6.06). Head: length 0.81–1.06 (mean = 0.91), width 0.78–0.92 (mean = 0.84); eye width 0.33–0.42 (mean = 0.37), interocular width 0.31–0.40 (mean = 0.35). Rostrum: ratio of segment lengths about 1: 2.30 : 2.33 : 1.24. Antenna: ratio of segment about 1: 1.61 : 1.33 : 1.15. Pronotum length 1.12–1.35 (mean = 1.24), width 1.20–1.77 (mean = 1.52). Hemelytra length 2.44–4.61 (mean = 3.68). Abdomen: length 2.48–3.26 (mean = 2.83), width 1.57–2.13 (mean = 1.78). Legs: fore femora: length 1.51–1.61 (mean = 1.56), width 0.39–0.42 (mean = 0.40); middle femora: length 0.45–1.68 (mean = 1.55), width 0.26–0.35 (mean = 0.30); hind femora 1.87–2.60 (mean = 2.21), width 0.15–0.21 (mean = 0.17). Fore tibiae: length 1.31–1.42 (mean = 1.35), width 0.07–0.11 (mean = 0.10); middle tibiae: length 1.27–1.60 (mean = 1.42), width 0.07–0.11 (mean = 0.09); hind tibiae: length 1.81–2.77 (mean = 2.40), width 0.07–0.10 (mean = 0.08).

Description. Length of antennal segment II slightly longer than the width of the head across eyes. Hemelytra in macropterous form surpassing the apex of abdomen, in brachypterous form reaching eight segment. Paramere very similar to *N. faminei*, but with the blade slightly more widened and the base more constricted. Female genitalia with the styloid less thickened than in *N. faminei*.

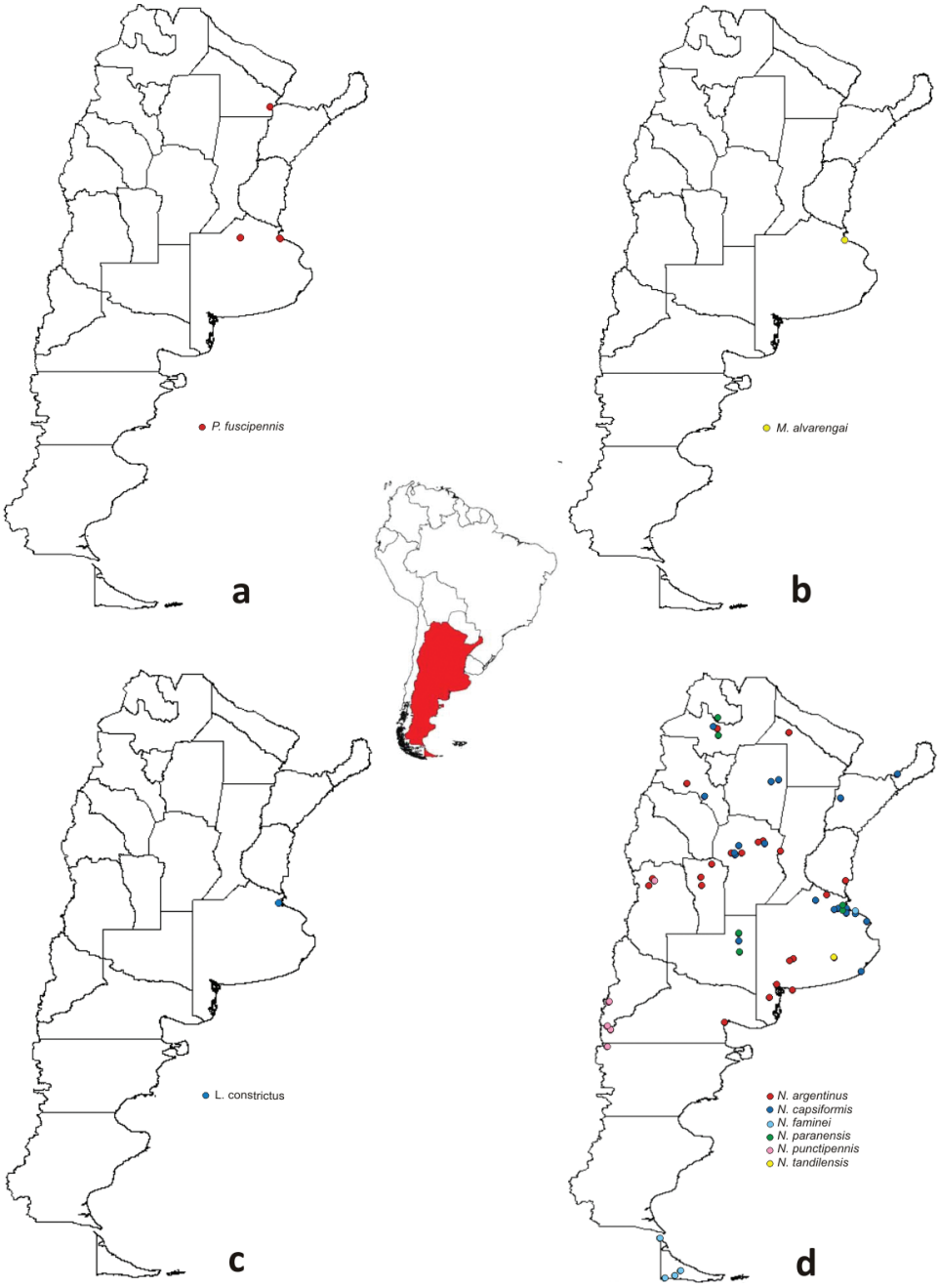

Figure 13. Geographical distribution of species of Nabidae in Argentina: **a** *Pagasa* **b** *Metatropiphorus* **c** *Lasiomerus* **d** *Nabis*.

Acknowledgements

This work was supported by the Consejo Nacional de Investigaciones Científicas y Técnologicas (CONICET). Special thanks for lending material: Dr. G. Lindberg (Swedish Museum of Natural History); Dr. R. Schuh and Dr. R. Salas (The American Museum of Natural History). We thank Dr. T. Henry (Systematic Entomology Laboratory, USDA, c/o National Museum of Natural History, Smithsonian Institution) and Dr. D. Polhemus (Bishop Museum) for revising and improving the manuscript.

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ZooKeys 333: 31–43 (2013)
doi: 10.3897/zookeys.333.5324
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Review of the grassland leafhopper genus *Exitianus* Ball (Hemiptera, Cicadellidae, Deltocephalinae, Chiasmini) from China

Yani Duan[1,2], Yalin Zhang[2]

1 *School of Plant Protection, Anhui Agricultural University, Hefei, Anhui Province 230036, China* **2** *Key Laboratory of Plant Protection Resources and Pest Management of Ministry of Education, Entomological Museum, Northwest A & F University, Yangling, Shaanxi Province 712100, China*

Corresponding author: *Yalin Zhang* (yalinzh@nwsuaf.edu.cn)

Academic editor: *Mick Webb* | Received 15 April 2013 | Accepted 1 August 2013 | Published 20 September 2013

Citation: Duan Y, Zhang Y (2013) Review of the grassland leafhopper genus *Exitianus* Ball (Hemiptera, Cicadellidae, Deltocephalinae, Chiasmini) from China. ZooKeys 333: 31–43. doi: 10.3897/zookeys.333.5324

Abstract

The two Chinese species of the leafhopper genus *Exitianus* Ball (Hemiptera: Cicadellidae: Deltocephalinae: Chiasmini) (*E. indicus* (Distant) and *E. nanus* (Distant)) are reviewed. Descriptions of the species and a key for their separation are provided. *E. fulvinervis* Li & He is considered a junior synonym of *E. nanus* **syn. n.**

Keywords

Hemiptera, Auchenorrhyncha, morphology, taxonomy

Introduction

Among the most widespread and often abundant tropical and temperate species of grassland leafhoppers are the moderately large tawny forms comprising the genus *Exitianus* Ball. It contains 43 species of which 6 species occur in Asia. Members of the genus are most readily distinguished by usually having a transverse dark band on the vertex (Plate II: A–E), males with a small number of apical stout setae on the pygofer (Figs 1A–D) and the female with a relatively long ovipositor extending conspicuously beyond the last dorsal segment (Plate I: D). These characters are shared only by the presumably sister

genus *Nephotettix* Matsumura, but which differs in having the crown sharply ridged where it meets the face, and being opaque green with various black markings.

This study reviews for the first time the species of *Exitianus* from China. From using the revision of Ross (1968) we identify two species (*E. indicus* (Distant) and *E. nanus* (Distant)) but have found and figured further variation in the male genitalia to that given by Ross for the two species. With respect to *E. nanus* these findings allow us to place *E. fulvinervis* Li & He, from China, as a junior synonym. As our work includes the study of numerous specimens we conclude that the remaining three species recorded from China, i.e., *E. capicola* (Stål) by Matsumura (1914: 186), *E. coronatus* (Distant) by Li et al. (2011: 69, fig. 57) and *E. fusconervosus* (de Motschulsky) by Kuoh (1966: 143, fig. 133) are probably misidentifications.

Material examined

Material examined is deposited in the Entomological Museum of Northwest A & F University (NWAFU) and the Institute of Zoology, the Chinese Academy of Sciences (IZCAS). Morphological terminology follows Oman (1949) and Zhang (1990).

Taxonomy

***Exitianus* Ball**
http://species-id.net/wiki/Exitianus

Exitianus Ball, 1929: 5. Type species: *Cicadula obscurinervis* Stål.
Mimodrylix Zachvatkin, 1935: 108. Type species: *Athysanus capicola* Stål. Synonymized by Evans 1947: 235.
Exitianus; Ross 1968: 1–30 [Review].
Exitianus; Oman, Knight and Nielson 1990: 213 [Listed; Athysanini].
Exitianus; Fang et al. 1993 [Phylogeny, mitochondrial sequences].
Exitianus; Emeljanov 1999: 547 [To Doraturini].
Exitianus; Dmitriev 2003: 677 [Immatures].
Exitianus; Zahnizer and Dietrich 2013: 56 [To Chiasmini].

Remarks. An adequate description of this genus is given by Ross (1968). See introduction for the main distinguishing features. The two species from China can be separated by the following key.

Key to species of *Exitianus* Ball from China

1 Vertex usually with transverse arcuate brown band interrupted medially (Plate I: A–B). Scutellum with dark brown basal triangles (Plate I: A–B).

Male pygofer side with 2–6 apical brown or black macrosetae (Figs 1A–D). Aedeagal shaft slightly laterally compressed with small gonoduct (Fig. 2C); without processes (Figs 2B–C). Female VIIth sternite with posterior margin tri-lobed (Plate I: D) ..... ***E. nanus***

– Vertex usually with transverse arcuate brown band complete (Plate II: A–E). Scutellum with faint brown basal triangles (Plate II: A–E). Male pygofer side with 2–3 apical brown or black macrosetae (Figs 3–4). Aedeagal shaft strongly laterally compressed, gonopore large with rim forming concave margin in lateral view; with pair of small dorsobasal processes (Figs 5G, 6). Female VIIth sternite with a shallow notch in mid-line (Plate II: G)..... ***E. indicus***

***Exitianus nanus* (Distant)**
http://species-id.net/wiki/Exitianus_nanus
Plate I, Figures 1–2

Athysanus nanus Distant, 1908: 345.
Athysanus insularis; Distant 1909: 47, pl. 4, figs 10, 10a. Synonymized by Ross 1968: 7.
Athysanus fasciolatus; Melichar 1911: 107. Synonymized by Linnavuori 1975: 626.
Athysanus simillimus; Matsumura 1914: 185. Synonymized by Ross 1968: 7.
Athysanus vulnerans; Bergevin 1925: 42, figs 5–9. Synonymized by Ross 1968: 7.
Limotettix albipennis; Haupt 1927: 25, pl. II, figs 20a–c. Synonymized by Dlabola 1963: 325.
Limotettix unifasciata; Haupt 1930: 159, fig. 9. Synonymized by Dlabola 1963: 325.
Athysanus digressus; Van Duzee 1933: 32. Synonymized by Linnavuori and DeLong 1978: 237.
Exitianus nanus; Ross 1968: 7, figs 1–3, 15–18, 76.
Exitianus karachiensis; Ahmed 1986: 59, fig. 5. Synonymized by Khatri and Webb 2010: 10.
Exitianus peshawarensis; Ahmed and Rao 1986: 76–77, fig. 1. Synonymized by Khatri and Webb 2010: 10.
Exitianus minor; Ahmed, Qadeer and Malik 1988: 12, fig. 2. Synonymized by Khatri and Webb 2010: 10.
Exitianus fulvinervis; Li and He 1993: 27; Li et al. 2011: 68, fig. 55. **syn. n.**

Description. Length. Male: 3.0–4.1mm; female: 3.9–5.2mm.

Yellow-brown with variable brown markings on vertex comprising spots on anterior margin and a more posterior arcuate band interrupted medially (Plate I: A–B); frontoclypeus with faint brown lateral arcs (Plate I: C). Pronotum usually with some dark infuscation (Plate I: A–B). Scutellum with dark brown basal triangles (Plate I: A–B).

Crown width about 3× length (Plate I: A–B).

Male genitalia. Pygofer side usually with 2–6 apical brown or black macrosetae (Figs 1A–D). Style preapical lobe broadly triangular, apophysis evenly tapered to apex

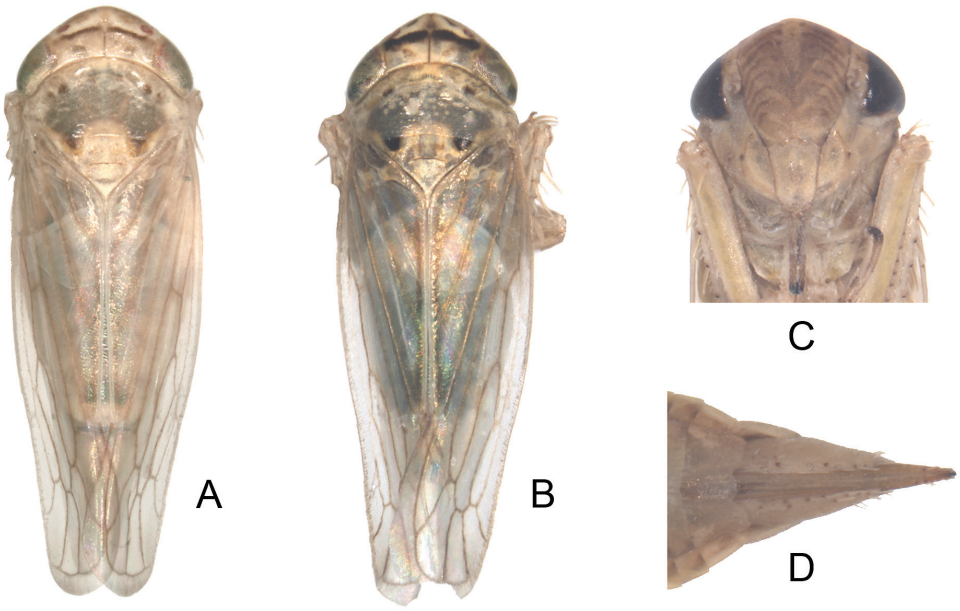

Plate I. *Exitianus nanus*. **A–B** habitus, dorsal view **C** face **D** the end of female abdomen, ventral view.

(Fig. 2A). Aedeagal shaft slightly laterally compressed with small subapical dorsal gonoduct (Fig. 2C); without processes (Figs 2B–C).

Female. Sternite VII with posterior margin tri-lobed (Plate I: D).

Material examined. China: Zhejiang Prov.: 1 female, Wuyanling, 2.VIII.2005, coll. DY; **Fujian Prov.:** 8 males, 15 females, Wuyishan, Nantan, 12.VIII.2002, coll. SQ; 41 males, 48 females, Guangze County, 23.VIII.2002, coll. SQ; **Jiangxi Prov.:** 16 males, 5 females, Anfu County, 10.VIII.2002, coll. SQ; **Henan Prov.:** 1 male, Baiyunshan, 17.VIII.2008, coll. LL; **Hunan Prov.:** 1 female, Hengshan, 30.VIII.1980, coll. TX; **Guangdong Prov.:** 1 male, 1 female, Shenzhen City, VIII.1986, coll. ZY; **Guangxi Prov.:** 1 female, Fangcheng City, 3.VI.2000, coll. Li Wenzhu (IZCAS); **Hainan Prov.:** 10 males, 2 females, Liangyuan, 10/29.V.1983, coll. ZY; 1 male, Wuzhishan, 640m, 16.V.2007, coll. DY; 2 males, 5 females, Jianfengling, 22.VII.2010, coll. WY; 4 males, Wuzhishan City, Maoyang Town, 3.VIII.2010, coll. Sun Jing; 3 females, Yinggeling, 4.VIII.2010, coll. WY; 30 males, 40 females, Bawangling, 9.VIII.2010, coll. WY; 7 males, 2 females, Limu, 933m, 22.VIII.2010, coll. WY; 61 males, 30 females, Tongguling, 26.VIII.2010, coll. WY; **Yunnan Prov.:** 1 male, Mengla County, Yaoqu Town, 660m, 3.V.1991, coll. Liu Guanchun & Cai Wanzhi; 1 male, Mengla County, Yaoqu Town, 18.VI.1991, coll. WT; 2 females, Mengla County, Menglun, 19.V.1991, coll. WT; 2 males, Jinghong City, Jinghong County, 30.VIII.2010, coll. Han Juan; 1 male, Jinghong City, Jinghong County, 23.X.2010, coll. Chai Yonghui & Feng Jinian; 1 male, Menglian County, 971m, 24.V.2011, coll. LL; 1 male, Lancang County, 25.V.2011, coll.

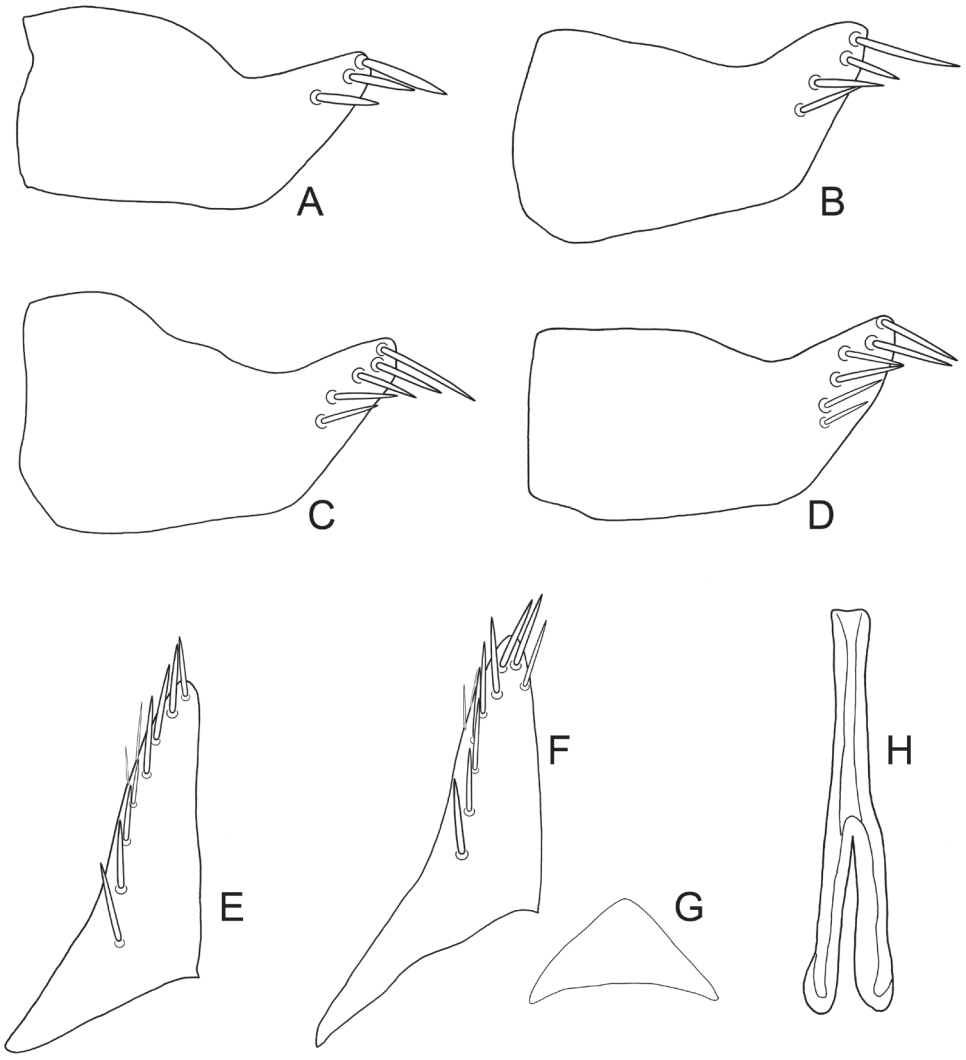

Figure 1. *Exitianus nanus*. **A–D** male pygofer side, lateral view **E–F** subgenital plate, ventral view **G** valve, ventral view **H** connective, dorsal view.

LL; 2 males, Yexianggu, 1226m, 9.VI.2011, coll. LL; 1 male, Zhenyuan County, 13.VI.2011, coll. LL. All deposited in NWAFU, except where indicated and mainly collected at light. Abbreviations for collectors: DY: Duan Yani; SQ: Sun Qinxia; LL: Lu Lin; TX: Tong Xinwang; ZY: Zhang Yalin; WY: Wang Yang; WT: Wang Yinglun & Tian Rungang.

Distribution. Eastern Hemisphere.

Remarks. *E. fulvinervis* was described by Li & He (1993) based on specimens collected from Tibet. As these fall within the variation found in *E. nanus*, the two species are here synonymised.

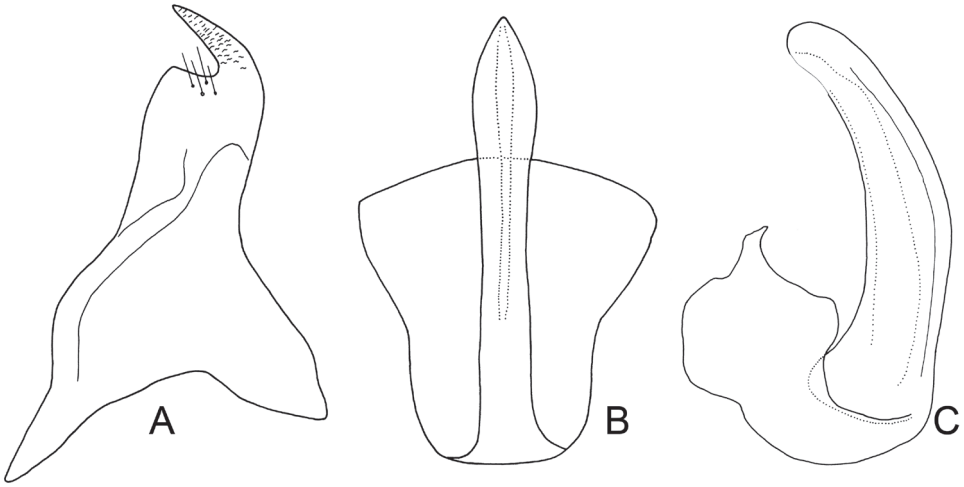

Figure 2. *Exitianus nanus*. **A** style, dorsal view **B, C** aedeagus, ventral and lateral view, respectively.

***Exitianus indicus* (Distant)**
http://species-id.net/wiki/Exitianus_indicus
Plate II, Figures 3–6

Athysanus indicus Distant, 1908: 344.
Athysanus atkinsoni; Distant 1908: 345. Synonymized by Ross 1968: 12.
Exitianus indicus; Ross 1968: 12, figs 9–10, 26–30, 69.
Exitianus major; Ahmed, Qadeer and Malik 1988: 10, fig. 1. Synonymized by Khatri and Webb 2010: 10.

Description. Length. Male: 4.0–4.5mm; female: 4.0–5.2mm.

Yellow-brown with variable transverse arcuate brown band on vertex (Plate II: A–E); frontoclypeus with faint brown lateral arcs (Plate II: F). Scutellum with faint brown basal triangles (Plate II: A–E).

Male genitalia. Pygofer side usually with 2–3 apical brown or black macrosetae (Figs 3–4). Style preapical lobe narrowly triangular, apophysis abruptly tapered at apex (Fig. 5E). Aedeagal shaft strongly laterally compressed, gonopore large with rim forming concave margin in lateral view; with pair of small dorsobasal processes (Figs 5G, 6).

Female. Sternite VII with posterior margin with a shallow notch in mid-line (Plate II: G).

Material examined. China: Jilin Prov.: 1 male, Lingjiang City, 30.VII.1983, coll. Wu Zhengliang & Hua Baozhen; **Zhejiang Prov.:** 21 males, 10 females, Wuyanling, 400m, 1.VIII.2005, coll. DY; **Fujian Prov.:** 1 male, Wuyishan, Nantan, 18.VIII.2002, coll. SQ; 2 males, Guangze County, 24.VIII.2002, coll. SQ; 1 male, Wuyishan Sanggang, 19.VII.2006, coll. YM; 41 males, 10 females, Shanghang County, Buyun Town, 21.VII.2009, coll. CY; 3 males, 1 female, Wuyishan, Tongmucun, 7.VIII.2009, coll. CY; **Jiangxi Prov.:** 34 males,

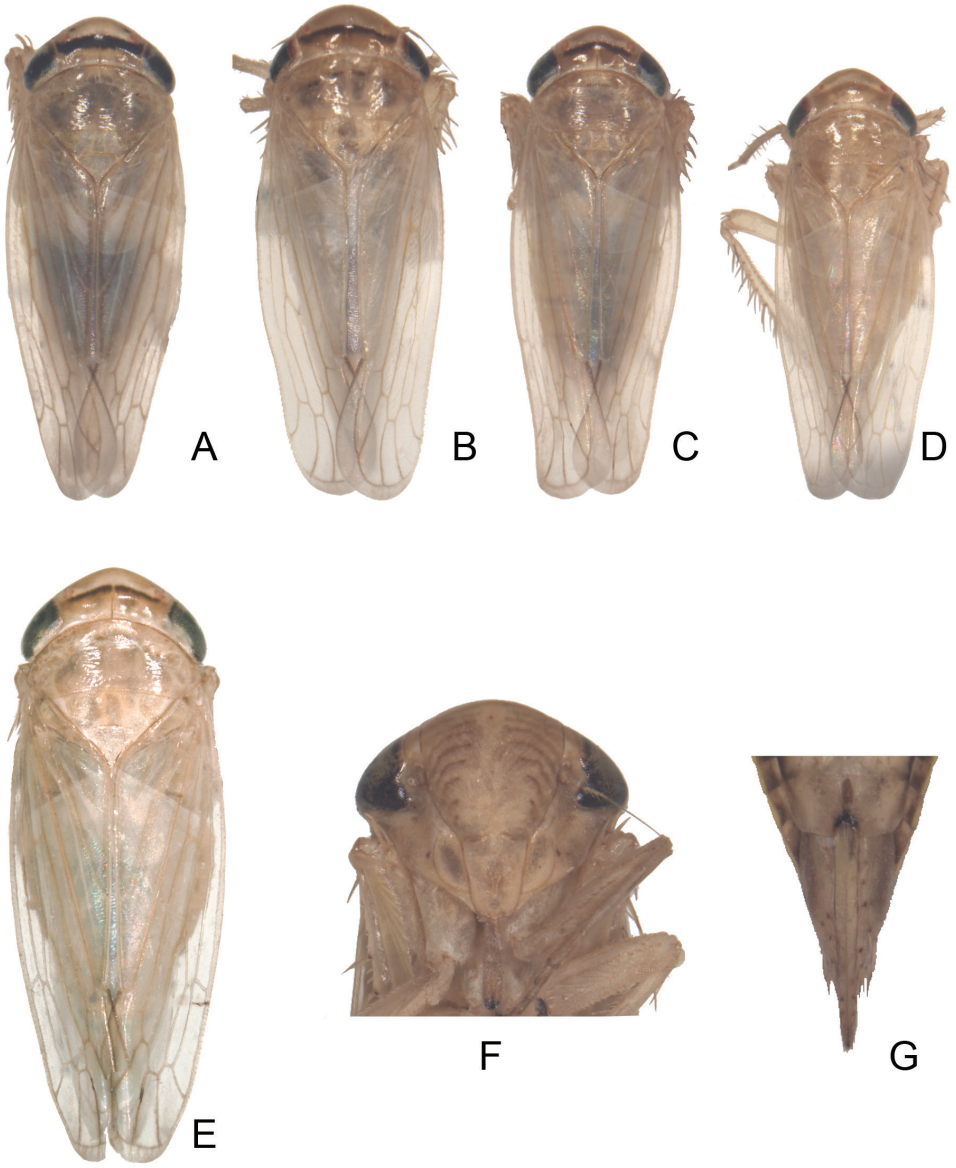

Plate II. *Exitianus indicus*. **A–E** habitus, dorsal view **F** face **G** the end of female abdomen, ventral view.

10 females, Anfu County, 10.VIII.2002; 4 males, 4 females, Ruijin City, Baying Town, 280m, 15.VIII.2004, coll. WC & YM; 7 males, 6 females, Pingxiang City, Lianhua County, 4.VIII.2002, coll. SQ; **Henan Prov.:** 1 male, Jigongshan, 11.VII.1997, coll. SQ; 1 male, Ruijin City, Baying Town, 280m, 15.VIII.2004, coll. WC & YM; 1 male, Baiyunshan, 17.VIII.2008, coll. LL; **Hubei Prov.:** 1 male, Wudangshan, 22.VII.2001, coll. Huang Min & Zhang Guiling; **Hunan Prov.:** 1 male, Chenzhou City, 28.VIII.1985, coll. ZY & Chai Yonghui; 9 males, 3 females, Changde City, Huanan Factory, 22.VII.2002, coll. SQ; 6

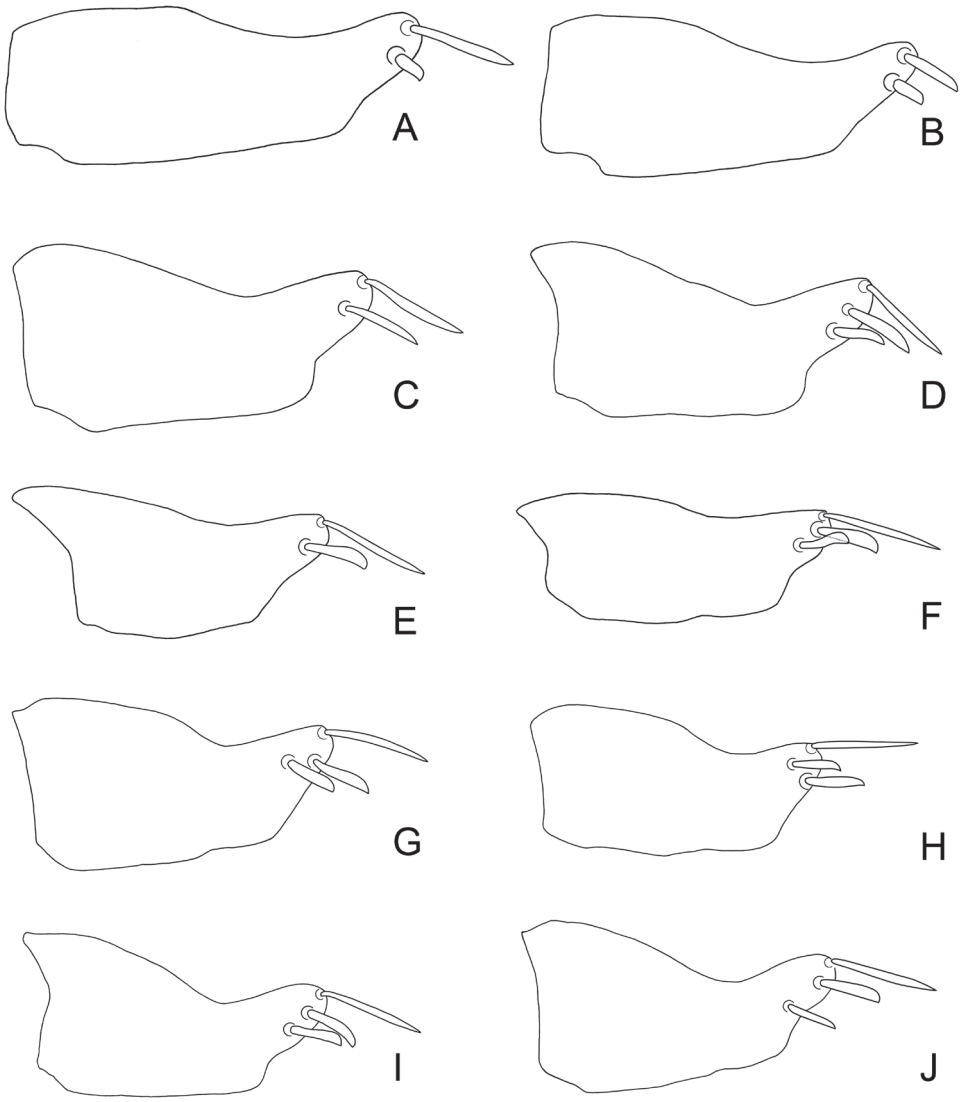

Figure 3. *Exitianus indicus*. **A–J** male pygofer side, lateral view from the same specimen, respectively.

males, Zhangjiajie, 25.VII.2002; **Guangdong Prov.:** 1 male, Dianbai County, 13.IV.1983, coll. ZY; 1 male, Shenzhen, 18.IV.1983, coll. ZY; 1 male, Dinghushan, 7.VII.1985, coll. ZY; **Guangxi Prov.:** 10 males, 4 females, Huaping, 9.VIII.2000, coll. LZ; 1 male, Huaping, 26.VIII.2000, coll. LZ; 5 males, Fangchenggang City, Naqin Town, 1–3.VIII.2001, coll. He Zhiqiang; 13 males, 6 females, Xinzhai, 18.VIII.2005, coll. YM & KJ; 1 male, Yuanbaoshan, 12.VIII.2006, coll. YM & KJ; **Hainan Prov.:** 10 males, 5 females, Yacheng, 6.V.1983, coll. ZY; 1 male, Wuzhishan, 720m, 31.VII.2009, coll. Gaoxia; 1 male, Bawangling, 9.VIII.2010, coll. WY; 1 male, Tongguling, 26.VIII.2010, coll. WY; **Sichuan Prov.:**

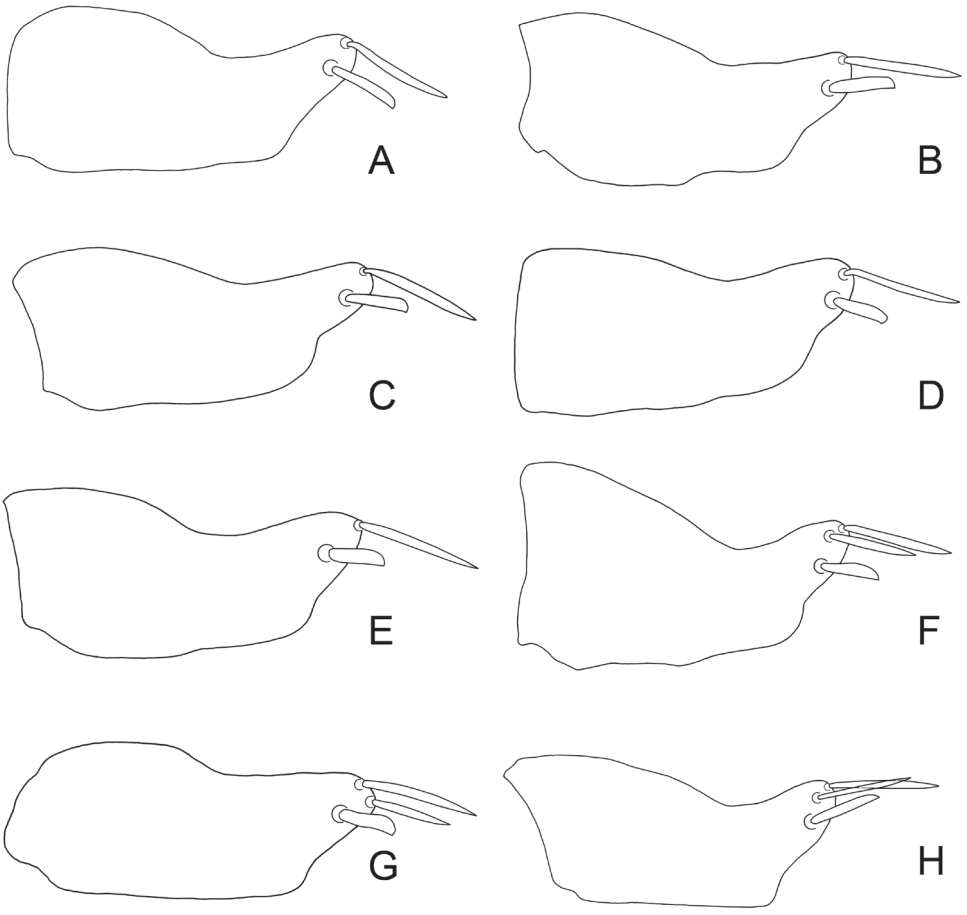

Figure 4. *Exitianus indicus*. **A–H** male pygofer side, lateral view.

2 males, 9 females, Kangding, 2500m, 8.XI.1999, coll. Qin Daozheng; 2 males, 8 females, Zhubalong, 2450m, 11.VII.2011, coll. Sun Qiang; **Guizhou Prov.:** 5 males, Guiyang City, Huaxi Park, 1100m, 25.VII.2001; **Yunnan Prov.:** 1 male, Daluo Town, 26.X.1987, coll. Feng Jinian & Lili; 10 males, 8 females, Mengla County, Yaoqu Town, V.1991; 1 male, Tengchong County, 22.XI.1999; 2 males, Xishuangbanna, 11.VII.2003; 1 male, Mengla City, 21.VII.2005, coll. LL; 1 male, Simao City, 30.VII.2005, coll. LL; 31 males, 20 females, Tengchong County, Huoshan Park, 1930m, 14.VIII.2005, coll. YM & KJ; 1 male, Dali, 29.VIII.2010, coll. ZM; 1 male, Diqing, 14.VIII.2010, coll. ZM; 1 male, Jinghong City, 1.IX.2010, coll. ZM; 1 male, Daluo Town, 679m, 23.V.2011, coll. LL; 1 male, Lancang County, 25.V.2011, coll. LL; 1 male, Nansan Town, 29.V.2011, coll. LL; 1 male, Yingjiang County, Zhanxi Town, 1009m, 2.VI.2011, coll. LL; 1 male, Tengchong County, 1632m, 5.VI.2011, coll. LL; 4 males, Lushui County, Chenggan Town, 1013m, 6.VI.2011, coll. LL; 1 male, Zhenyuan County, 13.VI.2011, coll. LL; **Shaanxi Prov.:** 1 male, Liuba County, 20.VII.1995, coll. ZR; 3 males, 3 females, Liuba County,

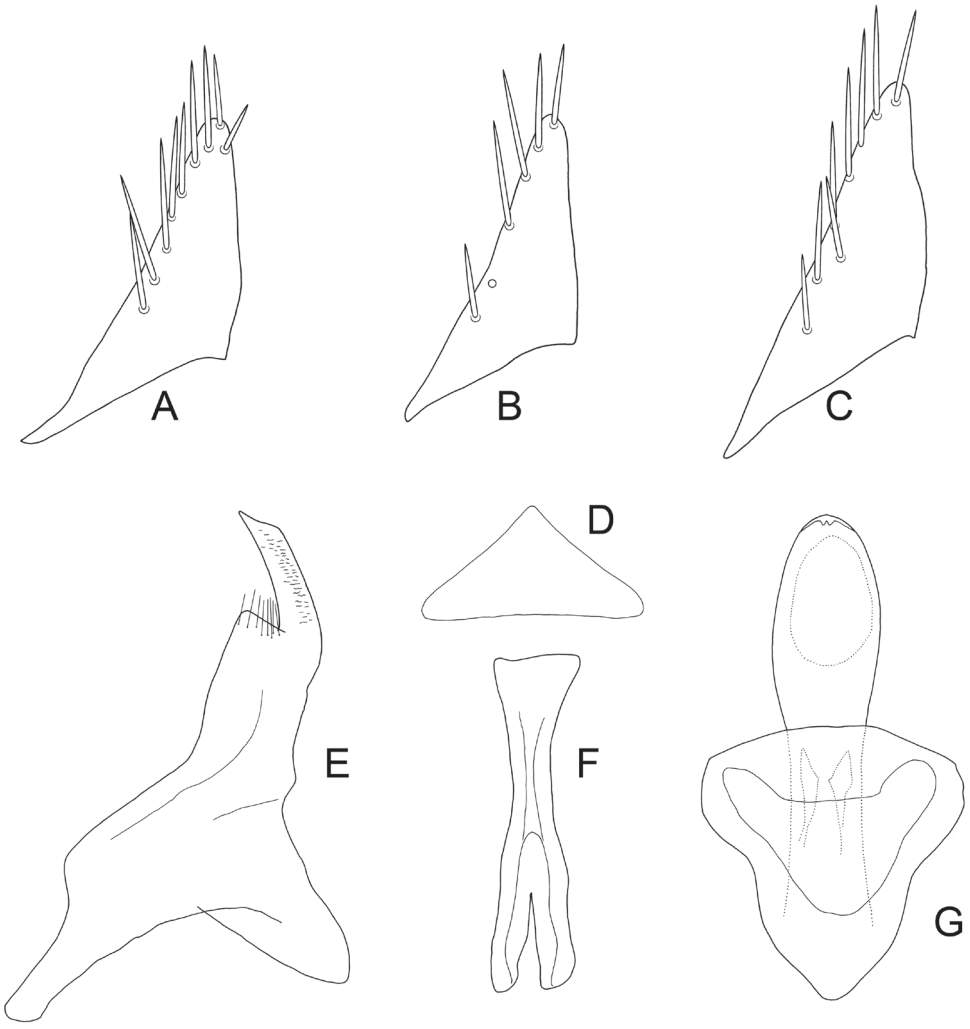

Figure 5. *Exitianus indicus*. **A–C** subgenital plate, ventral view **D** valve, ventral view **E** style, dorsal view **F** connective, dorsal view **G** aedeagus, dorsal view.

20.VIII.1995, coll. ZR; 1 male, Zhouzhi County, 24.IX.2008, coll. LL; 1 male, Foping County, 1060m, 1.X.2008, coll. LL; **Gansu Prov.:** 1 male, Cheng County, 25.VII.2002, coll. WC & Shang Suqin; 1 male, Ruijin City, Baying Town, 280m, 15.VIII.2004, coll. WC & YM. All deposited in NWAFU and mainly collected at light. Abbreviations for collectors: DY: Duan Yani; SQ: Sun Qinxia; LL: Lu Lin; YM: Yang Meixia; CY: Cao Yanghui; ZY: Zhang Yalin; ZM: Zhang Meng; ZR: Zhang Wenzhu & Ren Liyun; WC: Wei Cong; LZ: Liu Zhenjiang; KJ: Kang Juxia; WY: Wang Yang.

Distribution. Eastern Hemisphere.

Remarks. Considerable variation was found in the apical black macrosetae of the male pygofer and shape of the aedeagus in this species (see Figs 3, 4 & 6).

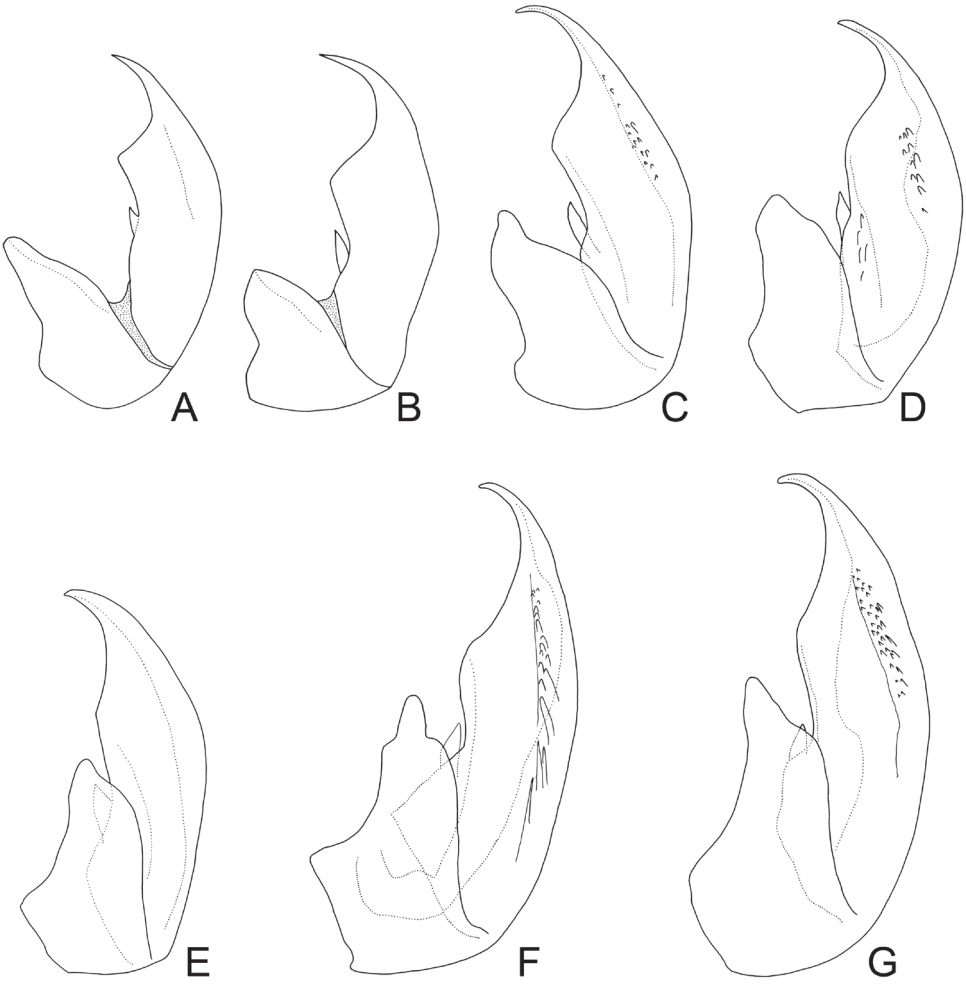

Figure 6. *Exitianus indicus*. **A–G** aedeagus, lateral view **A, B** (after Ross, 1968)

Acknowledgements

We express our sincere thanks to Mr. M. D. Webb, the Natural History Museum, London, UK, and Dr. C. H. Dietrich, Department of Entomology, University of Illinois, USA for reading the manuscript and making some suggestions. We thank Dr. C. A. Viraktamath, Department of Entomology, University of Agricultural Sciences, Bangalore, India, and Dr. J. N. Zahniser, Department of Entomology, University of Illinois, USA for revising the manuscript. We would like to acknowledge the Institute of Zoology, the Chinese Academy of Sciences for the loan of specimens. This research is supported by the National Natural Science Foundation of China (30970385, 31093430, 31000968) and the Fok Ying-Tong Education Foundation for Young Teachers in the Higher Education Institutions of China (131022).

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Moreiba gen. n., a new Canarian genus in Laparocerini (Coleoptera, Curculionidae)

Miguel A. Alonso-Zarazaga[1,†]

1 *Depto. de Biodiversidad y Biología Evolutiva, Museo Nacional de Ciencias Naturales (CSIC), José Gutiérrez Abascal, 2, E-28006 Madrid, Spain*

† *http://zoobank.org/EA3695DA-2C2E-4021-95CB-11D24ED253F0*

Corresponding author: *Miguel A. Alonso-Zarazaga* (zarazaga@mncn.csic.es)

Academic editor: *L. Penev* | Received 19 August 2013 | Accepted 30 August 2013 | Published 20 September 2013

http://zoobank.org/0C4439D4-965A-4430-A4F2-CEC22CDBF383

Citation: Alonso-Zarazaga MA (2013) *Moreiba* gen. n., a new Canarian genus in Laparocerini (Coleoptera, Curculionidae). ZooKeys 333: 45–54. doi: 10.3897/zookeys.333.6122

Abstract

A new genus *Moreiba* is described for *Strophosoma canariense* Franz, 1995 (type species) and placed in Laparocerini. It differs from *Laparocerus* Schoenherr, 1834 by the small size, the strongly transverse rostrum, the dense longitudinal strigosity on head and rostrum, the body covered by dense, adpressed scales and short, semierect subspatulate to parallel setae, the slender antennae with bisinuate scape and short oval club, the granulate pronotum and all tibiae lacking a mucro in both sexes. *Moreiba canariensis* (Franz, 1995), **comb. n.**, is the only described species, distributed in El Hierro and Gran Canaria. The tribal placement of the genera *Aphyonotus* Faust, 1895, *Asmaratrox* Heller, 1909, *Straticus* Pascoe, 1886 and *Cyrtozemia* Pascoe, 1872 is discussed.

Keywords

Weevils, Laparocerini, *Moreiba*, *Strophosoma canariense*, new genus, new combination, morphology, systematics, Canary Islands

Introduction

Herbert Franz (1995) described a new species of Canarian weevil as *Strophosoma canariense* (type locality: El Hierro, Las Playas) based on a holotype and 81 paratypes, coming from three localities on El Hierro (Las Playas, La Dehesa, El Sabinal) and one

in Gran Canaria (Isleta). Reading the description, I noticed I had some similar specimens from Lanzarote sent by Gunnar Israelson and Lothar Dieckmann several years before for identification. I requested some specimens from Herbert Franz for study and he kindly sent me a dozen as a present for my collection. My materials and those from Franz belong to two different species of the same genus. Later some colleagues have found more populations in different islands, so I have decided to describe the genus as new (the original placement in *Strophosoma* Billberg, 1820 is incorrect), to allow them to publish their own discoveries under a legitimate generic name.

Material and methods

The specimens were studied under a binocular Leica Wild MZ8 microscope and photographed with an Olympus C7070WZ camera mounted on the same microscope. Microscope slides were studied and photographed with the same camera mounted on a Leitz Diaplan microscope, and some details were drawn by using a drawing tube. Extended focus images were generated using Alan Hadley's software CombineZP. The programs Adobe Illustrator CS5.0 and Adobe Photoshop CS5.0 were used for image postproduction and mounting. The description follows the usual terminology in Curculionidae, especially that in use in Machado (2010). Dissection methods follow Alonso-Zarazaga (1990). Genitalia and terminalia have been placed in a drop of DMHF on an acetate card accompanying the specimen for long-term conservation (Steedman 1958; Bameul 1990). Body length is measured from the midpoint of front margin of pronotum to the most apical point of the elytra (the apex is hidden under the overhanging declivity) in dorsal view, width is measured at the widest point of the elytra in dorsal view. In other structures, length and width are measured at the maximum points, unless otherwise stated.

Taxonomy

***Moreiba* Alonso-Zarazaga, gen. n.**
http://zoobank.org/2619B147-58F9-478F-9318-B567197CB90E
http://species-id.net/wiki/Moreiba
Figs 1–14

Type species. *Strophosoma canariense* Franz, 1995, by present designation.

Diagnosis. Small apterous Laparocerini with very short and wide rostrum; head and rostrum with a dense longitudinal strigosity; body covered by dense, adpressed scales; antennae distinctly slender with bisinuate scape and short oval club; pronotum granulate; elytra elliptical, weakly convex with declivity overhanging apex; legs with all femora edentate and all tibiae lacking mucro in both sexes, and endophallus devoid of visible sclerites.

Figures 1–4. *Moreiba canariensis* (Franz): **1** Habitus, dorsal **2** Habitus, lateral **3** Head, dorsal **4** Head, lateral.

Description. *Body* (Figs 1–2) densely covered by scales, completely covering integument, but not overlapping. Pronotal adpressed scales placed transversely with tips directed to midline, those on elytra pointing apicad. Elytral striae with very short, piliform setae. Antennal club densely tomentose. Tibiae without grooming patch. Ventral surface of body with sparse, adpressed to semierect piliform setae, integument clearly visible. Trochanteral setae present.

Rostrum in dorsal view (Fig. 3) short, transverse; epistome transverse, medially notched apically, more or less V-shaped, delimited behind by fine raised line, naked,

shiny, with one row of long parepistomal setae on each side; frons undelimited; epifrons flat, at the same level as head, medially sulcate, epifrons and head with a dense longitudinal strigosity from anterior border of pronotum to epistomal margin, covered by scales, sides of epifrons concave, tapering apicad in basal half, subparallel in apical half, lateral margin moderately projecting, extended above eyes in a supraocular ridge. Antennal scrobes in dorsal view inconspicuous, visible only in short apical part as narrow furrows, pterygia weakly prominent, in lateral view (Fig. 4) deep, short, curved in front of eyes, not reaching lower margin of rostrum, with ventral edge slightly longer than dorsal one, separated from eye about half width of scrobe.

Head with eyes small, lateral, in dorsal view strongly convex, asymmetrical, highest point displaced backwards, in lateral view slightly oblong, separated from supraocular ridge by a fine furrow. Vertex wide, flat, without fovea. Mandibles trisetose, with round, flat scar. Prementum subtrapezoidal, with angles rounded, glabrous, asetose. Postmentum with 2 very long subapical setae. Almost adelognathous, prementum very narrowly separated from hypostoma.

Antennae (Fig. 8) very slender, 11-segmented. Scape reaching anterior border of pronotum when folded, slightly longer than funicle, bisinuate, at basal half extremely slender, in the apical half clavate. Desmomeres 7, first 2 elongate, last 4 moniliform. Club oval, slightly wider than apical part of scape.

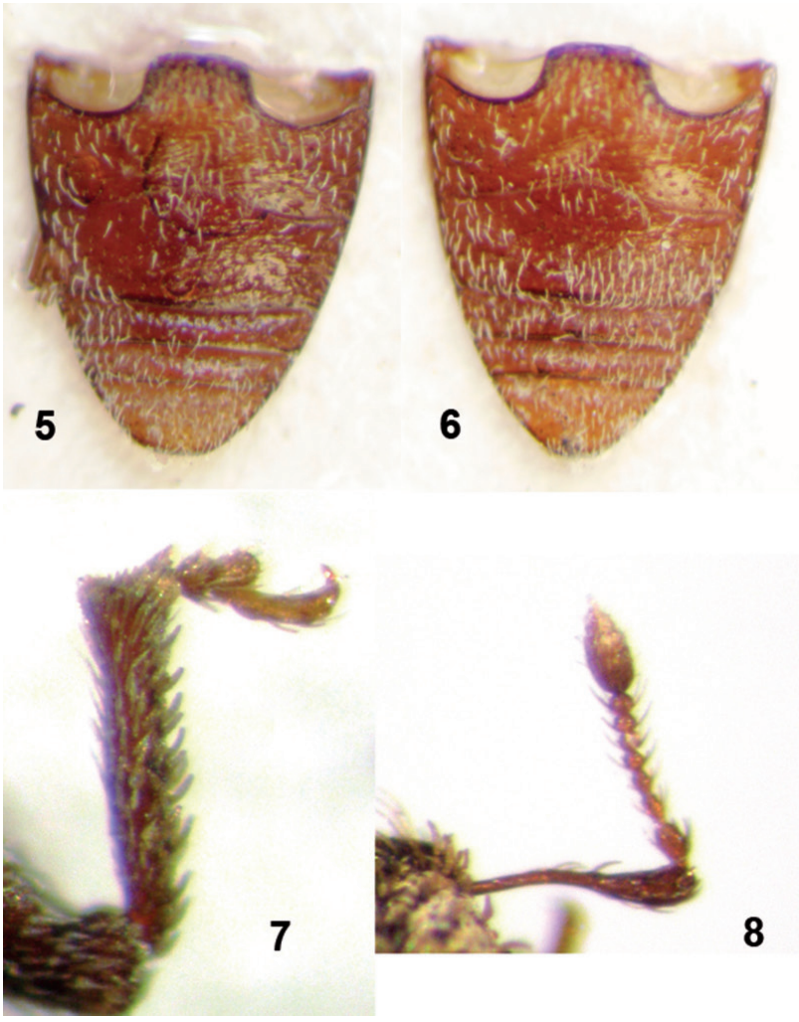
Pronotum moderately wider than long, with rounded sides, anterior border distinctly narrower than posterior one, disc weakly curved, in the same curve as elytra, weakly depressed behind apical margin, without postocular lobes or setae, pronotal surface densely granulate. Base curved towards scutellum. Procoxae tangent, subglobular, situated at midlength of the pronotum.

Scutellum triangular, very small.

Elytra strongly coapted, not fused; in dorsal view subelliptical, base connivent with that of pronotum, with a narrow vertical step towards mesonotum except near scutellum, humeral calli absent; in side view weakly convex on dorsum, slope overhanging apex, with 10 complete, finely punctured striae, interstriae flat, ca. 3 × as wide as striae, these at apex join 1, 2, 3+8, 4+5, 6+7, 9, 10.

Meso- and metaventrite. Mesoventrite transversally depressed, in a more dorsal plane than metaventrite. Mesocoxae subglobular, mesoventral process narrow, about as wide as 1/5 of diameter of mesocoxa. Metaventrite between coxae about as long as mesocoxa. Metanepisternal suture complete, metanepisternum narrow, its base oblique, projecting over outer angle of metacoxae. Metacoxae oval, transverse, not visibly touching costal margin of elytra; abdominal process distinctly narrower than largest diameter of metacoxa, subtruncate. Metendosternite very short, with long furcal arms in a flat angle, hemiducts weakly developed, anterior tendons well separated. Metathoracic wings absent.

Legs. Femora of all legs edentate, medially swollen. Protibia (Fig 7) in both sexes straight, apex slightly enlarged internally and externally, rounded, with a fringe of fine, yellow setae. Mucro of all legs not developed. Metatibial talus glabrous, slightly oblique, not ascending, without corbel or bevel. Tarsi slender, tarsomere 3 transverse,

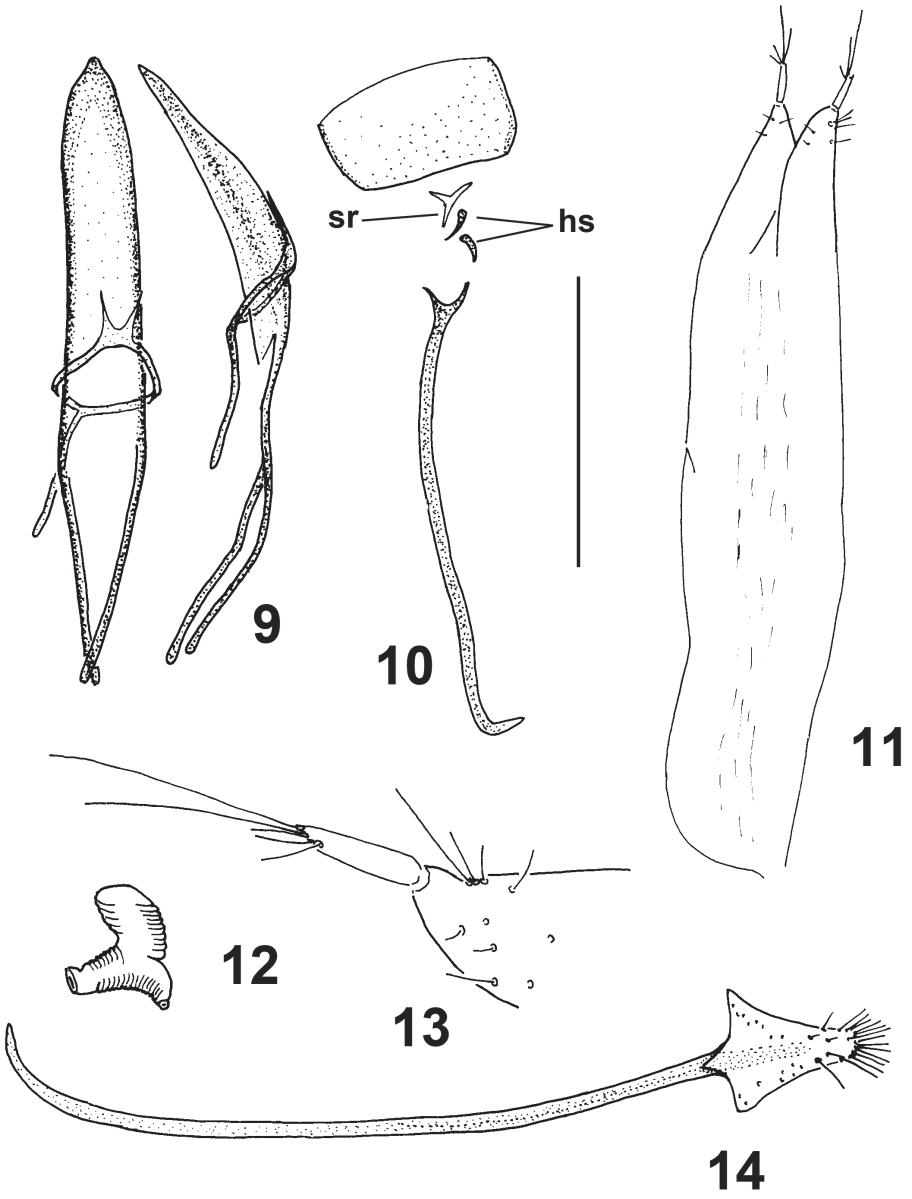


Figures 5–8. *Moreiba canariensis* (Franz): **5** Abdominal sternites, male **6** Abdominal sternites, female **7** Male right protibia, front view **8** Male right antenna.

wider than the others, deeply bilobed, onychium strongly projecting beyond the lobes. Claws 2, equal, connate in basal half.

Abdomen (Figs 5–6). Abdominal ventrite 1 in midline a little longer than ventrite 2 (21:19); ventrite 2 clearly longer than ventrites 3 and 4 combined (19: 11). Suture 1 fine, curved forward at middle; sutures 2, 3 and 4 straight, wide and deep. Fifth ventrite uniformly rounded in females, subtruncate at apex in males.

Male genitalia and terminalia. Genitalia of the 'pedal' type (Alonso-Zarazaga 2007). Penis (Fig 9) weakly sclerotised, slender, moderately long, pointed, temones slightly longer than pedon. Tegminal apodeme (manubrium) a little shorter than half the length of temones of penis; parameroid lobes long, narrow, fused at base, a little



Figures 9–14. *Moreiba canariensis* (Franz): **9** Penis, dorsal and lateral **10** Male sternite VIII (*sr* spiculum relictum) and IX (*hs* hemisternites) **11** Female IX hemisternites and styli **12** Spermatheca **13** Detail of apex of female IX hemisternite and stylus **14** Female sternite VIII. Scale: **9–12, 14**: 0.5 mm; **13**: 0.125 mm.

longer than half length of manubrium. Endophallus devoid of sclerotisations, with minute asperities. Sternite VIII membranous, *spiculum relictum* (Fig. 10) present, Y-shaped. Sternite IX (Fig. 10) with two small, comma-shaped sclerotized basal plates (hemisternites) and a long, narrow, Y-shaped *spiculum gastrale*, its apex turned 90°.

Female genitalia and terminalia. Sternite VIII (Fig 14) with long and slender apodeme (*spiculum ventrale*), curved at apex, without differentiated caput and terminated about middle of lamella, this small, translucent, without margo basalis and apicalis, subtriangular, slender, with an apical tuft of setae. Hemisternites IX (gonocoxites) (Figs 11, 13) of ovipositor elongate, weakly sclerotised, with long slender apical styli with setae. Spermatheca (Fig. 12) C-shaped, with corpus and cornu inflated, visibly ringed, ramus and nodulus developed.

Note. Sexual dimorphism not apparent, except for slight differences in fifth ventrite.

Distribution. This genus is presently known from two islands of the Canaries: Gran Canaria and El Hierro, but some samples are known as well from Tenerife, La Palma, Fuerteventura, Lanzarote and Montaña Clara. These are in study and may represent different species.

Etymology. Moreiba was the goddess of women and fertility among the ancient inhabitants of El Hierro (the 'bimbaches'). Gender feminine.

***Moreiba canariensis* (Franz, 1995), comb. n.**
http://species-id.net/wiki/Moreiba_canariensis

Strophosoma canariense Franz 1995: 37.

Description. *Measurements* (in mm): Length: 2.55–2.75 ($\bar{x}$= 2.65, σ_{n-1}= 0.07, n= 8). Width: 1.40-1.48 ($\bar{x}$= 1.44, σ_{n-1}= 0.03, n= 8). Ranges given by Franz (1995) for the length are apparently taken from apex of rostrum, which is not standard in Curculionoidea, and width seems to be a gross underestimation.

Integument reddish brown to pitch brown.

Body densely covered by subtriangular scales, these apically awned (with a projecting bristle), adpressed to slightly raised. Head vestiture mostly creamy or whitish, that of pronotum different shades of brown, with one lateral band and a median thin band (sometimes incomplete anteriorly) creamy or whitish, elytra watery chequered in shades of brown, whitish and cream, 4th interstria paler on declivity, 7th and 8th at base. Scutellum and legs with whitish scales. Semierect sublanceolate setae present among scales, on head forming a peculiar supraocular row, on pronotum denser, more perpendicular on sides, on elytra forming a regular row on interstriae. Semierect setae also present on antennae and legs.

Rostrum ca. 0.57 × as long as wide at base, as wide at pterygia as at base. Eyes asymmetrical, large-faceted, ommatidia separately convex, giving a blackberry aspect.

Antennae with scape ca. 7.0 × as long as wide, bisinuate, clubbed in apical half, desmomeres 1-3 oblong, pedicel about as long as desmomeres 2-3 together, desmomeres 4-7 moniliform. Club ca. 2.0 × as long as wide, oval, as long as the last 4 ½ desmomeres.

Pronotum ca. 0.80 × as long as wide. Surface under vestiture densely and irregularly granulate, granules flattened, small, ca. 30 μm in diameter.

Elytra ca. 1.30 × as long as wide, ca. 2.5 × as long as pronotum, interstrial setae longer on sides than on disc, apically rounded to subtruncate, with sides subparallel, on disc ca. half the width of an interstria, separated in the row by a distance about twice their length, interstrial adpressed scales in 4–5 irregular rows. Interstriae flat, smooth, minutely punctate. Striae with shortly subrectangular punctures separated a distance similar to their length, punctures bearing small, piliform scales not surpassing margins of puncture. Upper part of declivity slightly overhanging elytral apex.

Legs short, moderately robust, 1st tarsomere oblong, 2nd small, subtransverse, 3rd strongly transverse, bilobed, onychium a little longer than 1st, surpassing lobes of 3rd by 2/3 of its length.

Wings. Franz (1995) stated that the species was brachypterous. In the three specimens I have dissected into pieces, I have been unable to find any trace of a wing, the insects being totally apterous.

Penis in dorsal view with pedon ca. 4.5 × as long as wide, sides slightly converging towards ostium, apical plate subogival, apex slightly projecting, in side view slightly curved ventrally.

Styli of ovipositor ca. 4 × as long as wide.

Spermatheca with ramus curved opposite to cornu.

Material studied. 12 specimens, labelled El Hierro / Las Playas, ex coll. H. Franz, in coll. Alonso-Zarazaga (MNCN). The specimens have no date. They come from the type locality.

Biological notes. Franz (1995) mentions the presence of the species in xerophytic habitats in the islands, mostly under *Periploca laevigata* Aiton (Apocynaceae). A. Machado (*pers. comm.*) reports specimens under the basal leaves of *Asphodelus* sp. (Xanthorrhoeaceae). This is probably another polyphagous genus.

Discussion

The original placement of this species in the genus *Strophosoma* Billberg, 1820 is untenable, but easily understandable by the fact that Franz was not a specialist in Curculionoidea. In fact, the overall appearance and the size are more reminiscent of a *Trachyphloeus* Germar, 1817.

Of the characters stated by Machado (2010) to define the Laparocerini in the adult state, *Moreiba* matches each one, except the presence of mucronate tibiae. The character that Machado considered to be fundamental in the definition of the tribe (the presence of a *spiculum relictum* on the male VIII sternite) is present in *Moreiba*. Based on this definition, Machado (*l.c.*) excluded several genera from the tribe, and left the question open for three other genera: *Aphyonotus* Faust, 1895, *Asmaratrox* Heller, 1909 and *Straticus* Pascoe, 1886. The study of some specimens of *Asmaratrox intrusus* Heller, 1909 and of *A. coxalis* Heller, 1909 in the collections of the NHM (London) and of the MNHN (Paris), and of specimens of *Teripelus brachyderoides* (Fairmaire, 1882), *T. phoeostictus* (Fairmaire, 1882) and *Aseneciobius raffrayi* (Fairmaire, 1882) (Perrin and Alonso-Zarazaga

2012) has convinced me that they are closely related. Alonso-Zarazaga and Lyal (1999), following the current opinions, placed the genus *Asmaratrox* in Laparocerini, *Teripelus* Heller, 1909 in Omiini and *Aseneciobius* Hustache, 1939 in the Peritelini, reflecting thus the present chaos in Entiminae systematics. These three genera (and the Asian *Cyrtozemia* Pascoe, 1872) are related to *Systates* Gerstäcker, 1871 and belong to the so called 'African' Peritelini, characterized by the very short abdominal ventrite 2, about as long as the 3rd, and the straight suture 1. I have not studied *Straticus*, but it could also belong here. The placement of *Moreiba* in Laparocerini is also supported by molecular data (A. Machado, *pers. comm.*). As here restricted, Laparocerini includes only the genera *Laparocerus* and *Moreiba*, that can be separated by using the following key:

1 Rostrum more or less subisodiametric. Head and rostrum punctate or punctulate, never strigose. Scape straight to moderately curved. Antennal club fusiform. Pronotum punctate or punctulate. Elytral declivity not overhanging apex. At least one pair of tibiae mucronate in males. Endophallus with visible spines, teeth or other sclerites. Length usually more than 3 mm..... ***Laparocerus***

– Rostrum very transverse, less than 0.75× as long as wide. Head and rostrum with dense longitudinal strigosity. Scape bisinuate. Antennal club shortly oval. Pronotum granulate. Elytral declivity overhanging apex. All tibiae lacking mucro in both sexes. Endophallus devoid of visible sclerites. Length less than 3 mm..... ***Moreiba***

The presence of a *spiculum relictum* in Laparocerini is probably of the highest interest, as Machado (*l.c.*) has already pointed out, since it is absent in some Entiminae tribes (like Sciaphilini, Trachyphloeini, etc.). There is another peculiar feature that could be of some interest in characterizing the tribe Laparocerini, and that has been observed both in *Laparocerus* and in *Moreiba*. The basal margin of the metanepisternum protrudes obliquely over the outer angle of the metacoxa, hiding it in perpendicular view, so that the metacoxa does seem not to reach the elytral margin. In most Entiminae, the metanepisternal base ends transversely, not hiding the outer apex of the metacoxa, and the metacoxa is clearly seen touching the costal margin of the elytron. A survey of this character is needed to evaluate its phylogenetic significance.

The Laparocerini may be an evolutionary relict of former faunas that has been displaced by either climatological or competitive forces to a refuge in the Atlantic islands (Canaries and Madeira). There, at least *Laparocerus* has radiated into some two hundred species. The study of more *Moreiba* populations may help to cast light into the evolutionary history of this interesting taxon.

Acknowledgement

My deepest gratitude to the late Gunnar Israelson and Lothar Dieckmann, who brought this new genus to my attention, and to the late Herbert Franz, who kindly made me

a present of these 12 locotypic specimens and some other material of Curculionidae. Drs. Massimo Meregalli (Torino, Italy), Roman Borovec (Sloupno, Czech Republic) and Antonio Machado (La Laguna, Spain) are also thanked by their support during the preparation of this article. Dr Christopher H.C. Lyal (London, UK) checked the English language and is here warmly thanked.

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ZooKeys 333: 55–76 (2013)
doi: 10.3897/zookeys.333.5909
www.zookeys.org

RESEARCH ARTICLE

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Malagasyprinus, a new genus of the Saprininae from Madagascar with description of two new species (Coleoptera, Histeridae, Saprininae) (First contribution to the knowledge of the Histeridae of Madagascar)

Tomáš Lackner[1,†], Yves Gomy[2,‡]

1 *Czech University of Life Sciences, Faculty of Forestry and Wood Sciences, Department of Forest Protection and Entomology, Kamýcká 1176, CZ-165 21 Praha 6 – Suchdol, Czech Republic* **2** *2 Boulevard Victor Hugo, 58000 Nevers, France*

† *http://zoobank.org/E1DA422B-F56F-4253-A55D-481479D933B8*
‡ *http://zoobank.org/E168A92D-60ED-4127-812E-C384251AFC09*

Corresponding author: *Tomáš Lackner* (tomaslackner@me.com)

Academic editor: *Michael Caterino* | Received 3 July 2012 | Accepted 30 August 2013 | Published 20 September 2013

http://zoobank.org/A8CB99D2-33AD-470F-8D17-ED78F796A5A8

Citation: Lackner T, Gomy Y (2013) *Malagasyprinus*, a new genus of the Saprininae from Madagascar with description of two new species (Coleoptera, Histeridae, Saprininae) (First contribution to the knowledge of the Histeridae of Madagascar). ZooKeys 333: 55–76. doi: 10.3897/zookeys.333.5909

Abstract

Based on the results of recent phylogenetic analysis of the higher taxa of the Saprininae as well as external morphological characters, especially the presence of deep and large prosternal foveae, and the shape and position of the sensory organs of the antennal club, the species *Saprinus* (s.str.) *caeruleatus* Lewis, 1905 is excluded from the genus *Saprinus* and a new genus *Malagasyprinus*, exclusive to Madagascar, is established for it. The new genus shows mainly characters that are apomorphic for the subfamily and contains another two, highly similar allopatric species *M. perrieri* **sp. n.**, and *M. diana* **sp. n.**, described herein. The three species are best separated from each other by the structure of the prosternum and male terminalia, especially the shape of the aedeagus. We re-describe *M. caeruleatus* **comb. n.** and provide *M. perrieri* and *M. diana* with brief differential diagnoses. All taxon descriptions are accompanied with color habitat photographs, SEM micrographs and drawings of their male genitalia. A key to the species of *Malagasyprinus* is given. Sensory structures of the antenna of *M. caeruleatus* **comb. n.** are likewise depicted herein. The systematic position of the newly erected genus is discussed. A lectotype of *Saprinus caeruleatus* Lewis, 1905 is designated.

Résumé

Se référant aux résultats des récentes analyses phylogénétiques portant sur les taxa supérieurs des Saprininae ainsi que sur des caractères morphologiques externes comme les larges et profondes fovéoles prosternales et les forme et position des organes sensoriels des massues antennaires, l'espèce *Saprinus* (s.str.) *caeruleatus* Lewis, 1905 est exclue du genre *Saprinus* et un nouveau genre *Malagasyprinus*, endémique de Madagascar, est établi pour le recevoir. Le nouveau genre présente principalement des caractères apomorphes pour les Saprininae, et contient aussi deux autres espèces allopatriques et similaires *M. perrieri* **sp. n.** et *M. diana* **sp. n.** décrites ici. Les trois espèces sont bien séparées les unes des autres par la structure de leurs prosternums et par leurs genitalia mâles, spécialement la forme des édéages. Nous re-décrivons *M. caeruleatus* **comb. n.** et donnons de courtes diagnoses différentielles de *M. perrieri* et *M. diana*. Toutes les descriptions sont accompagnées des photographies d'habitus en couleurs, de photographies au microscope à balayage (MEB) et de dessins des genitalia mâles. Un tableau des espèces de *Malagasyprinus* est donné. Les structures sensorielles antennaires de *M. caeruleatus* sont également représentées. La position systématique du nouveau genre est discutée. Le lectotype de *Saprinus caeruleatus* Lewis, 1905 est désigné.

Keywords

Malagasyprinus, Histeridae, Saprininae, taxonomy, Madagascar

Mots-clés

Malagasyprinus, Histeridae, Saprininae, taxonomie, Madagascar

Introduction

Lewis (1905) described the species *Saprinus caeruleatus* based on a single specimen originating from southern Madagascar: Plateau de l'Androy, Région d'Ambovombe, adding a significant and explicative remark: 'I do not know of any species similar to this'. This assessment was perhaps why Dahlgren (1969: 263, fig. 2:A; 267, fig. 3:I) depicted drawings of apices of the 8th abdominal sternite of male as well as aedeagus based on the examination of four male specimens he found at MNHN collected by H. Perrier de la Bâthie in 1906. Probably because Dahlgren (1969) believed that he was dealing with such a well-characterized species he did not bother with the examination of its type specimen, housed at NHM. In this fashion, the identification process of specimens of '*Saprinus caeruleatus*' has been simple and quick among the specialists on the Histeridae.

While mounting a larger series of this 'species' based on old as well as new collections, the junior author noticed significant differences between the aedeagi among the specimens. In the light of this discovery, the minor differences in external morphology, hitherto attributed to individual variation, suddenly gained significance. Furthermore, the senior author, when entrusted with a lot of recently collected specimens of '*Saprinus caeruleatus*' discovered among them yet another, highly similar species. Based on these examinations, it became evident that '*Saprinus caeruleatus*' is, in fact, a complex of three sibling species, which are described and compared below. Fortunately, the sole type specimen of *S. caeruleatus*, housed in NHM is a male and allowed us to fix its identity in the light of the discovery of the other new species, based on the male genitalia (especially aedeagus). The three species, although very similar externally, differ in the male terminalia

as well as in external characters, and are also allopatric: while *S. caeruleatus* has so far been collected only in the southern part of the island, one of the newly described species occurs only in the west to north-west of Madagascar, while the other newly described species is found only in the northernmost tip of the great island (Fig. 62). As to Dahlgren's (Fig. 25) depictions of the eighth sternite and the apex of aedeagus, his drawings must be attributed to one of the newly described species, since the specimens he examined originated from Maevatanana (*former* Suberbieville), which is in the north-west of Madagascar.

During the PhD studies of the senior author a large number of species belonging to the Saprininae subfamily has been examined. Upon closer examination of *S. caeruleatus*, marked differences from the rest of the members of the genus were noticed and therefore a decision to include this species in the phylogenetic analysis of the subfamily was taken. Based on the results of the analysis (Lackner, unpublished), together with careful examination of the external morphological characters we decided to erect a new genus for the above-mentioned taxon that is characterized below.

Material and methods

All dry-mounted specimens were relaxed in warm water for several hours or overnight, depending on the body size. After removal from original cards, the beetles were side-mounted on triangular points and observed under a Nikon 102 stereoscopic microscope with diffused light. Some structures were studied using methods described by Ôhara (1994): the antenna and male genitalia were macerated in a hot 10% KOH solution for about 15 minutes, cleared in 80% alcohol, macerated in lactic acid with fuchsine, incubated at 60ºC for two hours, and subsequently transferred into a 1:1 mixture of glacial acetic acid and methyl salicylate heated at 60°C for 15 minutes and cleared in xylene. Specimens were then observed in α-terpineol in a small glass dish. Digital photographs of the male terminalia and antenna were taken by a Nikon 4500 Coolpix camera and edited in Adobe Photoshop CS4. Based on the photographs or direct observations, the genitalia and antennal structures were drawn using a light-box Hakuba klv-7000. SEM micrographs of *Saprinus caeruleatus* were taken with a JSM 6301F microscope at the laboratory of Faculty of Agriculture, Hokkaido University, Sapporo, Japan; while SEM micrographs of the newly-described species *M. perrieri* sp. n. and *M. diana* sp. n. were taken at the Laboratory of the Electron Microscopy at the Faculty of Biology, Charles University, Prague, Czech Republic. Habitat photographs of *M. perrieri* sp. n. were made by G. Goergen (Cotonou, Benin) and those of *M. caeruleatus* comb. n. and *M. diana* sp. n. were made by F. Slamka (Bratislava, Slovakia). All available specimens were measured with an ocular micrometer. Beetle terminology follows that of Ôhara (1994) and Lackner (2010). Separate lines of the same label are marked by slash (/). The following acronyms of museums and private collections are used throughout the text:

CAS California Academy of Sciences, San Francisco, USA (D. Kavanaugh);
CYG Yves Gomy collection, Nevers, France;

MNHN Muséum National d'Histoire Naturelle, Paris, France (A. Taghavian);
NHM The Natural History Museum, London, United Kingdom (R. Booth);
TLAN Tomáš Lackner collection, temporarily housed at NCB Naturalis, Leiden, Netherlands.

Abbreviations used in measurements

PEL Length between anterior angles of pronotum and apices of elytra;
APW Width between anterior angles of pronotum;
PPW Width between posterior angles of pronotum;
EL Length of elytron along sutural line;
EW Maximal width between outer margins of elytra.

Taxonomy

***Malagasyprinus* gen. n.**
http://zoobank.org/E01181D5-08DB-4651-98F7-7DFFE6106BB2
http://species-id.net/wiki/Malagasyprinus

Type species. *Saprinus caeruleatus* Lewis, 1905.

Diagnosis. Rather small Saprininae histerid (PEL 2.05–2.60 mm) with black body, brown to black elytra; dorsally with blue metallic tinge; legs and antennae paler than the rest. Frons rugulose-lacunose, coarsely and densely punctured, depressed; frontal stria widely interrupted anteriorly, prolonged onto clypeus, sometimes difficult to discern and appearing complete; sensory structures of antenna in form of a single sensory area with a corresponding stipe-shaped vesicle situated on internal distal side of the antennal club (Fig. 22); eyes large and strongly convex; pronotal hypomeron asetose; pronotal foveae (sensu Lackner 2010: 38, fig. 146) absent, pronotum with variously deep longitudinal lateral depression separated from the pronotal margin by a slightly convex punctate band, median part of pronotum moderately to strongly convex, entire pronotal disc with coarse punctures, lateral longitudinal depression and surface around it with extremely rugose and deep longitudinal wrinkles; marginal pronotal stria carinate laterally, slightly bi-sinuate; entire elytral disc (with exception of small, occasionally punctate 'mirror' on fourth elytral interval) coarsely verrucose-punctate; dorsal elytral striae obliterated by punctuation, represented occasionally only by their basal fragments; basal fragment of fourth dorsal elytral stria and basal third to half of sutural elytral stria present as a rule, connected; humeral elytral stria usually discernible. Prosternal foveae (pre-apical foveae of Lackner 2010: 41, fig. 148) large and deep; both sets of prosternal striae present; prosternal process in two species depressed on anterior two-thirds; underside of the body with variously coarse and dense punctuation (depending on species).

Differential diagnosis. Externally this new taxon at first glance resembles a specimen of the genus *Saprinus* s. str. (the type species of this genus has originally been a *Saprinus*), but the shape of the sensory structures of the antenna should distinguish it from *Saprinus* immediately (compare Figs 22 and 23). Furthermore, the deep longitudinal pronotal wrinkled depression with convex median part of the pronotum, and large and deep prosternal foveae quickly separate it from the members of *Saprinus* as well. However, prosternal foveae are present among the members of the primarily Palaearctic subgenus *Hemisaprinus* Kryzhanovskij in Kryzhanovskij and Reichardt 1976 of the genus *Saprinus* Erichson, 1834 but they are never as deep and large as in this newly erected genus, and, furthermore, the pronotal depressions (pronotal foveae of Lackner 2010: 38, fig. 146) are present in *Hemisaprinus*, whereas they are absent in *Malagasyprinus*. The most marked differences between *Hemisaprinus* and *Malagasyprinus* are found in the structure of their sensory areas of the antenna: the sensory structures of the antennal club of the type specimen of the subgenus *Hemisaprinus*, *S.* (*Hemisaprinus*) *subvirescens* (Ménétriés, 1832) are similar to those of *S. semistriatus*, and consist of four ovoid sensory areas on ventral side and one vesicle situated under internal distal margin (compare Figs 22 and 24). In order to distinguish this newly erected genus from other Afrotropical genera, the reader is referred to the key by the senior author (Lackner 2013: 66). Although this key features only the species "*Saprinus caeruleatus*", it is well applicable for all members of *Malagasyprinus*.

Biology. Series of *M. caeruleatus* comb. n. have been collected in a dry forest by a pitfall trap baited with fish. Specimens of *M. perrieri* sp. n. and *M. diana* sp. n. have been collected by beating the bushes, as well as by pitfall traps.

Distribution. Madagascar.

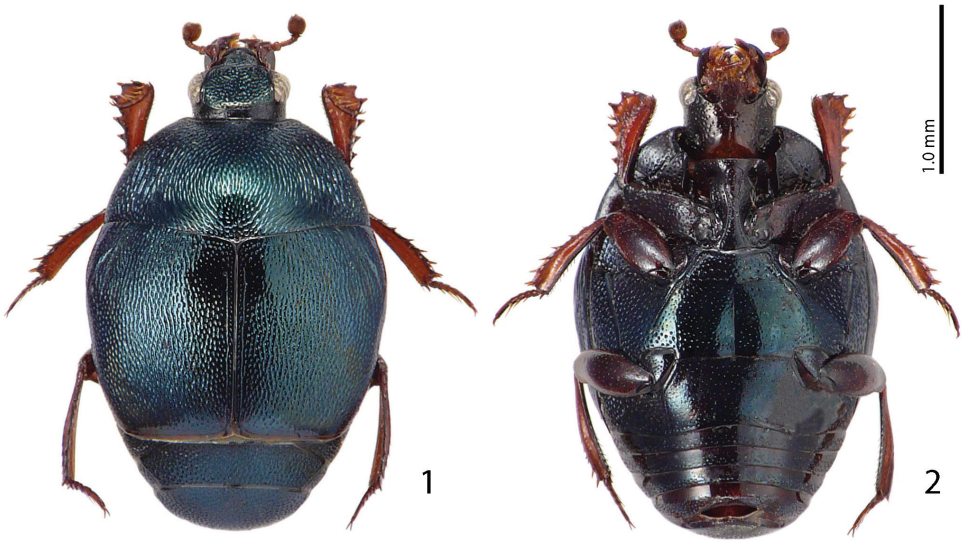
Etymology. The name of this newly erected taxon is a combination of the genus name *Saprinus* with a prefix derived from the epithet suggesting Madagascar origin. Gender masculine.

***Malagasyprinus caeruleatus* (Lewis, 1905) comb. n.**
http://species-id.net/wiki/Malagasyprinus_caeruleatus
Figs 1–22

Saprinus caeruleatus Lewis, 1905: 611; Mazur (1997): 220; Mazur (2011): 180.

Type locality. Madagascar, Androy region, Ambovombe.

Type material examined. MADAGASCAR: LECTOTYPE (present designation): Male, mounted in Entofix on its right side, with male terminalia extracted and glued to the same card, with the following labels: "♂"; (white, hand-written label); "Plateau de l'Androy, rég. D'Ambovombe" (light-blue, printed label); "Madagascar" (white label, narrow and long, printed); "G. Lewis Coll. B.M. 1926-369" (white label, elongate, printed and characteristic of the specimens originating from G. Lewis' collec-



Figures 1–2. *Malagasyprinus caeruleatus* (Lewis, 1905) comb. n. **1** habitus dorsal view **2** ditto, ventral view.

tion); "*Saprinus caeruleatus* Lewis Type" (white, hand-written label of Lewis); "TYPE" (white round label with red margin, printed); "Y. Gomy des. Lectotype" (red, printed label); "*Saprinus* (s.str.) *coeruleatus* Lew., Y. Gomy Det. 2006" (printed-written determination label) (NHM).

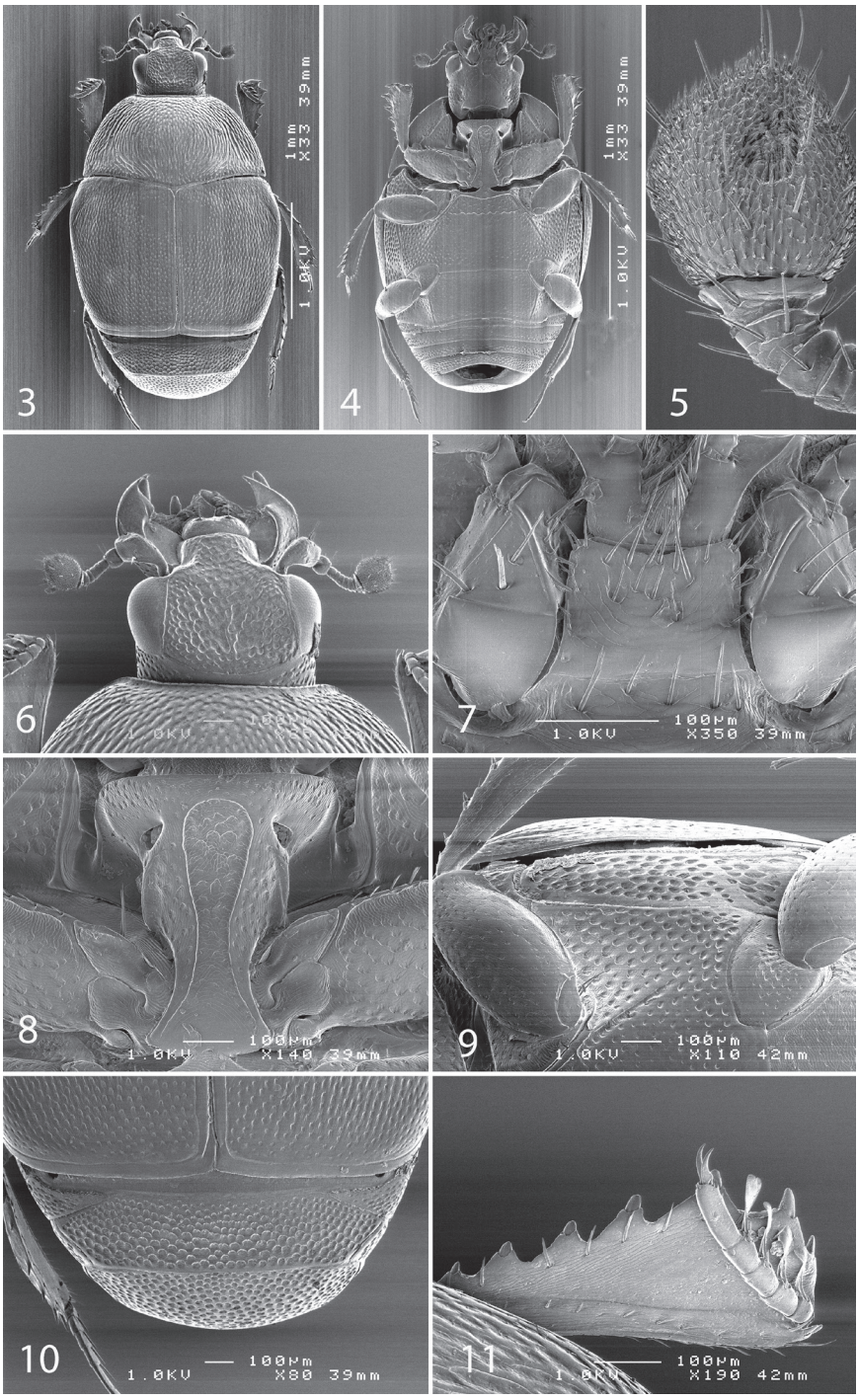
Additional material examined. 5 ♂♂ & 3 ♀♀ and 49 exs. (sex undetermined) "Mikea Forest / Feb. 2004"; dry forest / fish baited trap / Ilkka Hanski leg"; 1 ♀: "Toliara / Prov., Ranobe, elev. 30m / 23°02'03"S, 043°36'43"E / 5–9 February 2003; Frontier Wilderness / Project, sifted litter (leaf mold / rotten wood) in spiny forest / thicket code: MGF056"; 1 ♀, "Madagascar Sud-Ouest / LAMBOMAKANDRO 500m / Tuléar / vii-57 Andria R"; "Institut / Scientifique / MADAGASCAR".

Re-description. Body measurements: PEL: 2.05–2.30 mm; APW: 0.75–0.85 mm; PPW: 1.65–1.80 mm; EL: 1.10–1.30 mm; EW: 1.90–2.10 mm.

Body (Figs 1–4) roundly oval, convex, cuticle entirely pitch-black with dark blue metallic hue, shining; legs, mouthparts and antennae light red-brown.

Antennal scape (Fig. 6) slightly thickened, with shallow sparse punctures and three short setae; antennal club (Fig. 5) round with slightly pointed tip, without visible articulation, entire surface with dense short sensillae intermingled with sparser longer erect sensillae; sensory structures of antennal club in form of a single oval sensory area situated on internal distal part of the antennal club with a corresponding stipe-shaped vesicle situated underneath (Fig. 22).

Mouthparts. Mandibles (Fig. 6) with rounded outer margin, laterally with deep dense punctures, moderately curved inwardly, mandibular apex pointed; sub-apical tooth on inner margin of left mandible large, almost perpendicular; labrum (Fig. 6) convex, imbricate; labral pits deep, each with two well-sclerotized long setae; terminal



Figures 3–11. SEM micrographs *Malagasyprinus caeruleatus* (Lewis, 1905) comb. n. **3** habitus dorsal view **4** ditto, ventral view **5** antennal club, ventral view **6** head, dorsal view **7** mentum, ventral view **8** prosternum **9** lateral disk of metaventrite and metepisternum **10** propygydium and pygidium **11** protibia, dorsal view.

labial palpomere elongated, its width about half its length; mentum sub-trapezoid, anterior angles slightly produced; anterior margin (Fig. 7) medially with slight emargination surrounded with six long setae, lateral margins with row of sparse shorter ramose setae, several setae present also on disc of mentum; cardo of maxilla with few short setae; stipes triangular, with three short setae; terminal maxillary palpomere elongated, its width about one-third its length, approximately three times as long as penultimate.

Clypeus (Fig. 6) rugulose-lacunose, slightly depressed medially, sloping down laterally, faintly margined by prolonged frontal stria; frontal stria largely interrupted medially, for short distance prolonged onto clypeus, supraorbital stria well impressed, carinate; frontal disc (Fig. 6) depressed, coarsely and densely punctate, rugulose-lacunose; eyes strongly convex, well visible from above.

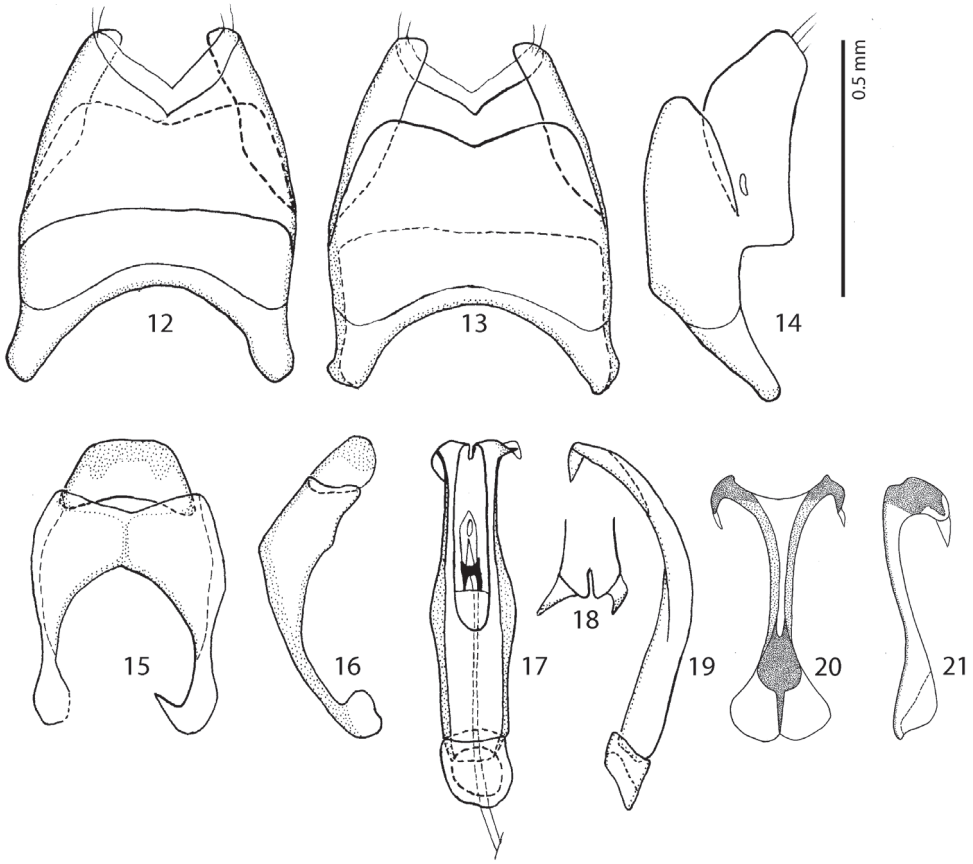
Pronotal sides moderately (Figs 1, 3) narrowing anteriorly, apical angles blunt, pronotal depressions absent; sides of pronotal disc with moderately deep longitudinal depression covered in deep longitudinal wrinkles, medially wrinkles disappear and become coarse and dense punctures; surface between longitudinal depression and pronotal margin slightly convex, punctate; marginal pronotal stria complete, laterally carinate and visible along its entire length from dorsal view; pronotal disc medially convex; pronotal hypomeron glabrous; scutellum small, but visible.

Elytral epipleura evenly punctate; marginal epipleural stria fine, complete; marginal elytral stria straight, well impressed and slightly carinate, continued as complete apical elytral stria. Humeral elytral stria weakly impressed on basal third, almost invisible under punctuation; inner subhumeral stria obliterated by coarse punctures; dorsal elytral striae (except for a tiny basal fragment of fourth dorsal elytral and complete sutural stria) completely erased by extremely coarse and dense elytral punctuation; fourth dorsal elytral stria present as short basal fragment connected with complete sutural elytral stria, which is apically connected with apical elytral stria; entire elytral disc (with exception of tiny punctate 'mirror' on fourth elytral interval) with extremely coarse and dense punctures, separated by less than half of their diameter; punctuation somewhat weakens before elytral apex.

Propygidium and pygidium (Fig. 10) densely and coarsely punctate, punctures separated by less than half of their diameter.

Anterior margin of prosternum (Fig. 8) almost straight; marginal prosternal stria present laterally; prosternal process on apical two-thirds concave, surface between carinal prosternal striae imbricate, laterally imbricate-punctate, punctures shallow; carinal prosternal striae well-impressed, carinae slightly divergent on prosternal apophysis, medially convergent and thence again divergent anteriorly, apically united under narrow loop; prosternal foveae large and deep; lateral prosternal striae carinate, sub-parallel, apically terminating near pre-apical foveae.

Anterior margin of mesoventrite almost straight, with median projection; discal marginal mesoventral stria well impressed, carinate, inwardly arcuate medially; disc of mesoventrite imbricate-punctate, punctures deep; meso-metaventral sutural stria undulate; intercoxal disc of metaventrite slightly depressed medially, with scattered round punctures of various sizes; lateral metaventral stria (Fig. 9) well impressed, carinate, al-



Figures 12–21. Male terminalia *Malagasyprinus caeruleatus* (Lewis, 1905) comb. n. **12** 8th sternite and tergite, ventral view **13** ditto, dorsal view **14** ditto, lateral view **15** 9th and 10th tergite, dorsal view **16** ditto, lateral view **17** aedeagus, dorsal view **18** apex of aedeagus, frontal view **19** aedeagus, lateral view **20** spiculum gastrale, ventral view **21** ditto, lateral view.

most straight, shortened; lateral disc of metaventrite (Fig. 9) slightly concave, with dense shallow punctures; metepisternum (Fig. 9) with even denser and coarser punctuation, punctures deeper than those of lateral disc of metaventrite; fused metepimeron with somewhat sparser punctures; metepisternal stria present only on fused metepimeron.

Intercoxal disc of the first abdominal sternite completely striate laterally; surface imbricate-punctate, punctures fine and sparse.

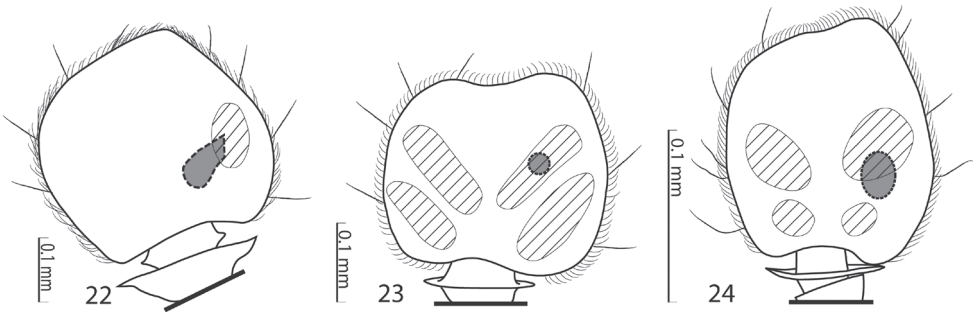
Protibia (Fig. 11) slightly dilated, outer margin with seven moderately large triangular teeth topped by short rounded denticle, diminishing in size in proximal direction; setae of outer row very short and sparse; protarsal groove deep, substrigulate; anterior protibial stria shortened apically; setae of median row shorter than those of outer row; two tarsal denticles present near tarsal insertion; protibial spur short, bent, inserted on apical margin of protibia; apical margin of protibia posteriorly with one tiny denticle; outer part of posterior surface imbricate, separated from imbricate me-

dian part of posterior surface by vague boundary and row of short sclerotized setae; posterior protibial stria complete, with a sparse row of tiny sclerotized setae becoming thicker apically; inner row of setae single, setae sparse and short.

Mesotibia slender, outer margin with two rows of sparsely spaced short denticles; setae of outer row regular, sparse, shorter than denticles; setae of median row regular, microscopic; posterior mesotibial stria complete; anterior surface of mesotibia imbricate; anterior mesotibial stria complete; mesotibial spur short; apical margin of mesotibia anteriorly with two short denticles; claws of apical tarsomere slightly bent, shorter than half its length; metatibia more slender and longer than mesotibia, in all aspects similar to it, but denticles on outer margin much sparser and claws of apical tarsomere slightly longer than half its length.

Male genitalia. Eighth sternite (Figs 12–13) fused medially, apically with short velum; apex fringed with two short setae; eighth tergite and eighth sternite fused laterally (Fig. 14). Ninth tergite (Figs 15–16) longitudinally fused medially, typical for the subfamily; spiculum gastrale (Figs 20–21) expanded on both ends; basal end with median emargination, not arcuate outwardly. Aedeagus (Figs 17–19) dilated medially; basal piece of aedeagus short, ratio of its length: length of parameres 1 : 5; parameres fused along their basal half; apex of aedeagus (Fig. 18) curiously split in two pointed halves curved inwardly; aedeagus strongly curved ventrad (Fig. 19).

Differential diagnosis. From the highly similar *M. perrieri* sp. n., *M. caeruleatus* differs by smaller size; darker elytral cuticle (the elytra of *M. perrieri* are brown to dark brown whereas those of *M. caeruleatus* are pitch-black; compare Figs 1 and 26) shallower lateral longitudinal pronotal depression, and coarser elytral punctuation (in *M. perrieri* the elytral striae are more discernible whereas they are almost completely obliterated by punctuation in *M. caeruleatus*); furthermore, the elytral 'mirror' is often larger and less densely punctate in *M. perrieri* whereas it is tiny and often densely punctate in *M. caeruleatus*. The shape of carinal prosternal striae is likewise different between the two species: in *M. caeruleatus* they are strongly bi-sinuate, approximate medially and diverging, connected by a round loop, whereas in *M. perrieri* they are only slightly bi-sinuate, occasionally even sub-parallel (compare Figs 8 and 32) and furthermore, the prosternal process is medially deeply depressed in *M. caeruleatus*, whereas it is only slightly so with *M. perrieri*. However, the best marked differences are found among the aedeagi of the two species: in *M. caeruleatus* it is apically split in two inwardly curved halves resembling a snake's tongue and in *M. perrieri* it is simply pointed apically and not split (compare Figs 18, 25 and 40). From *M. diana* sp. n., *M. caeruleatus* differs by its shallower lateral longitudinal depression of pronotum; furthermore, the deep longitudinal wrinkles occupy almost the entire pronotal disk in *M. diana*, whereas they are present mostly only in and around the longitudinal lateral pronotal depression with the median part of pronotum bearing simple punctures in *M. caeruleatus*. The elytral 'mirror' is proportionally larger in *M. diana* than in *M. caeruleatus* and it bears only sparse and fine punctures in *M. diana*, whereas it is coarsely and densely punctate in *M. caeruleatus* (compare Figs 1 and 44). More marked differences are found again between the shape of the carinal prosternal striae of the two taxa: those of *M. caeruleatus* are me-



Figures 22–24. Sensory structures of the antenna of Saprininae. **22** *Malagasyprinus caeruleatus* (Lewis, 1905) comb. n., sensory structures of the antennal club, ventral view **23** *Saprinus* (s.str.) *semistriatus* (Scriba, 1790) sensory structures of the antennal club, ventral view **24** *Saprinus* (*Hemisaprinus*) *subvirescens* (Ménétriés, 1832) sensory structures of the antennal club, ventral view.

dially approximate and diverge anteriorly where there are connected by a round loop, whereas the carinal prosternal striae of *M. diana* are not approximate medially, slightly diverging on apical half (compare Figs 8 and 50). Prosternal process of *M. caeruleatus* is depressed on apical two-thirds whereas it is even in *M. diana*. Male aedeagi are likewise very different: the one of *M. diana* resembles that of *M. perrieri*, whereas the one of *M. caeruleatus* is unique with its split apex (compare Figs 18 and 60).

Distribution. Known exclusively from the south of Madagascar, regions of Antsimo-Andrefana, Androy and Anosy (Fig. 62).

Biology. Collected in dry forest by pitfall traps, as well as by sifting litter in spiny forest and/or thicket.

***Malagasyprinus perrieri* sp. n.**
http://zoobank.org/4F10C7F4-46B8-40D1-89DB-8CDD8A1CFD8B
http://species-id.net/wiki/Malagasyprinus_perrieri
Figs 25–43

Type locality. Madagascar.

Type material examined. MADAGASCAR: Holotype, ♂, side-mounted on a triangular point, both antennal flagelli broken off, right fore- and mid legs missing, left mesotarsus missing, with male genitalia extracted and glued to the same mounting point as the specimen, with following labels: "♂" (printed), followed by light-green rectangular label, printed: "MUSEUM PARIS / MADAGASCAR / col. Perrier de la Bathie / 1906"; followed by hand-written label: "Saprinus / perrieri sp. n." with a consecutive red label, printed: "*Malagasyprinus perrieri* / sp. n. Det. T. Lackner & / Y. Gomy 2013 HOLOTYPE" (MNHN). Paratypes: 31 exs., same data as holotype (MNHN); 1 ♂, with following labels: "♂" (written); "Madagascar N. Ouest / Ankarafantsika Ampisoro / 30.xi.1973 (written)"; "battage d'arbustes / (L. Linarès rec.) (written); "Collection / Y. Gomy (print-

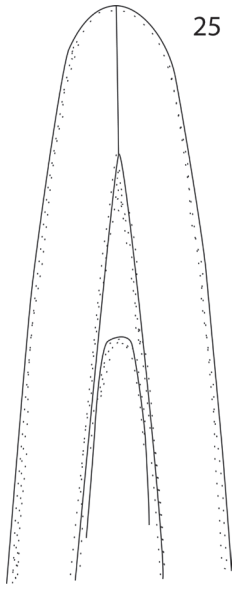
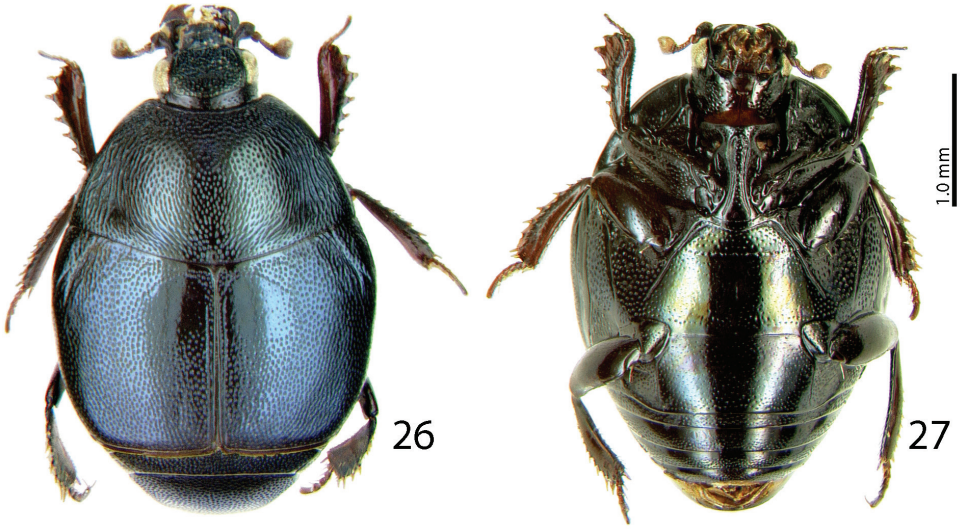
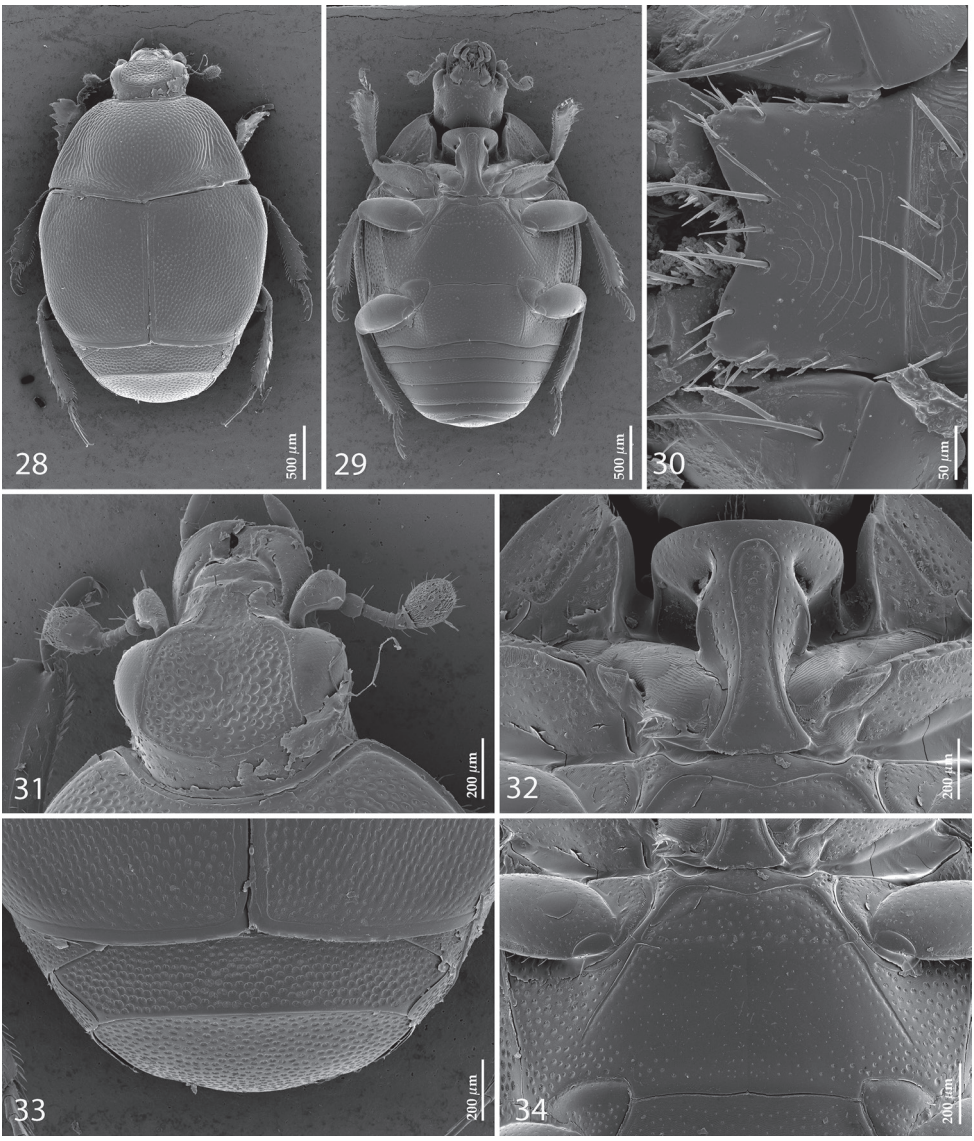


Figure 25. *Malagasyprinus perrieri* sp. n., apex of aedeagus, re-drawn from Dahlgren (1969).



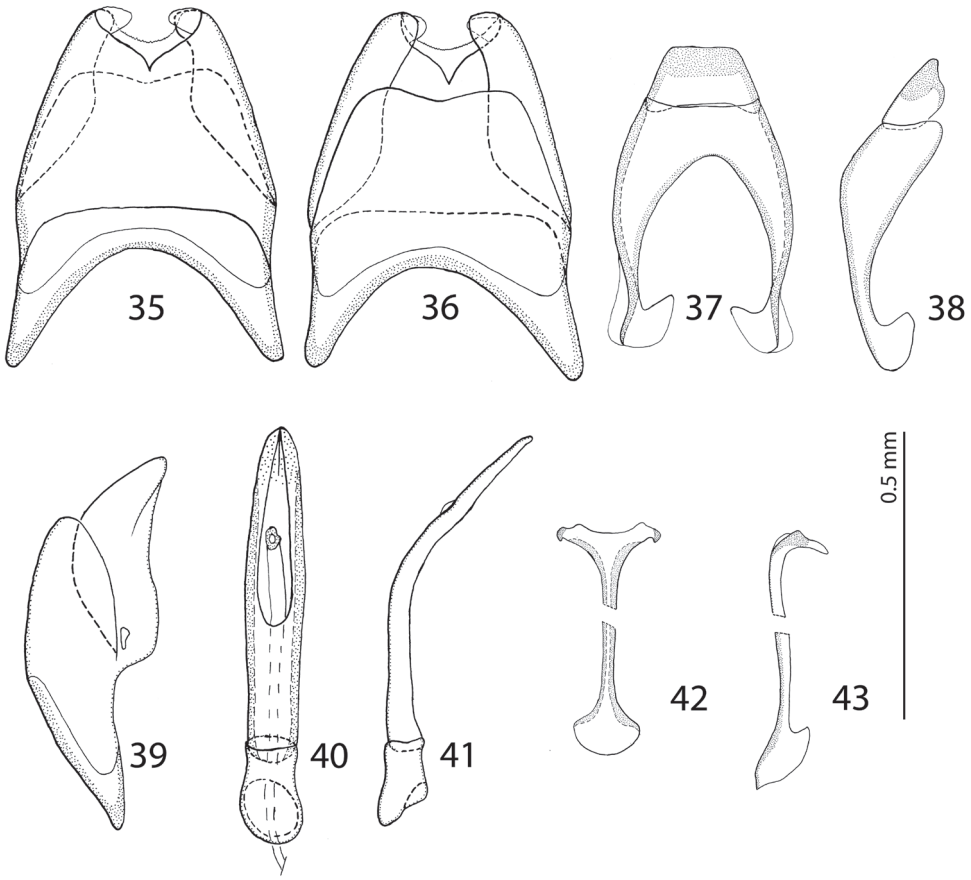
Figures 26–27. *Malagasyprinus perrieri* sp. n. **26** habitus, dorsal view **27** ditto, ventral view.

ed)"; "*Malagasyprinus perrieri* / sp. n. Det. T. Lackner & / Y. Gomy 2013 PARATYPE" (red label, printed)" (CYG); 2 ♀♀, with following labels: "♀" (written); "Madagascar N-Ouest / Ankarafantsika / Ampisoro 30.xi.1973 (printed label with black frame)"; "battage d'arbustes / (LLinarès rec.) (printed label with black frame)"; "Collection / Y. Gomy (printed)"; "*Malagasyprinus perrieri* / sp. n. Det. T. Lackner & / Y. Gomy 2013 PARATYPE" (red label, printed)" (CYG); 1 ♀, with the same labels as preceding, with an addi-



Figures 28–34. SEM micrographs *Malagasyprinus perrieri* sp. n. **28** habitus, dorsal view **29** ditto, ventral view **30** mentum, ventral view **31** head, dorsal view **32** prosternum **33** propygydium and pygidium **34** mesoventrite and metaventrite.

tional round, written label: "Photo / No 4 / 1ére série"; 3 ♂♂, ibid (two of the male PT are sputter coated with gold) (CYG); 1 ♀, "MADAGASCAR: Mahajanga / Province, Parc National de / Baie de Baly, 12.4 km 337° / NNW Soalala, elev. 10m / 26–30 Nov. 2002 (printed)"; "16°00'36"S, 045°15'54"E / coll. Fischer, Grislwold et al. / California Acad. of Sciences / pitfall trap - in tropical dry / forest, coll. code: BLF6815 (printed)"; "CASENT / 8065522" (CAS); 1 ♀, same data, but "CASENT / 8065523" (CAS); 1 ♀, same data,



Figures 35–43. male terminalia *Malagasyprinus perrieri* sp. n. **35** 8th sternite and tergite, ventral view **36** ditto, dorsal view **37** 9th and 10th tergite, dorsal view **38** ditto, lateral view **39** 8th sternite and tergite, lateral view **40** aedeagus, dorsal view **41** ditto, lateral view **42** spiculum gastrale, ventral view **43** ditto, lateral view.

but "CASENT / 8065521" (CAS); 1 ♀, same data, but "CASENT / 8065524" (CAS); 1 ♂, same data, but "CASENT / 8065520" (CYG); 1 ♂, same data, but "CASENT / 8065525" (TLAN); 1 ♀, same data, but "CASENT / 8065526" (TLAN); 1 ♀, same data, but "CASENT / 8065519" (TLAN); 1 ♀, same data, but "CASENT / 8065518" (CYG); 1 ♀, same data, but "CASENT / 8065517" (CYG).

Diagnosis. Body measurements: PEL: 2.20–2.60 mm; APW: 0.90–1.00 mm; PPW: 1.75–2.15 mm; EL: 1.25–1.50 mm; EW: 2.00–2.50 mm. Very similar to the preceding species, differing mainly by larger size; lighter color of legs and antennae (those of *M. perrieri* are brown to dark brown whereas those of *M. caeruleatus* are rufescent; compare Figs 1–2 and 26–27) deeper longitudinal pronotal depression, sparser elytral punctuation (in *M. perrieri* the elytral striae are more discernible whereas they are almost completely obliterated by punctuation in *M. caeruleatus*); furthermore, the elytral 'mirror' is often larger and less densely punctate in *M. perrieri* whereas it is tiny

and often densely punctate in *M. caeruleatus* (compare Figs 1 and 26). The shape the of carinal prosternal striae is likewise different between the two species, see comments to the preceding species and compare Figs 8 and 32. Aedeagi of the two species are markedly different: that one of *M. caeruleatus* is apically split in two inwardly curved halves resembling a snake's tongue and that one of *M. perrieri* is simply pointed apically and not split (compare Figs 18 and 40). From the following new species, *M. diana*, *M. perrieri* can be best distinguished by shallower longitudinal pronotal depression (the one of *M. diana* is the deepest among the three), the area of the pronotum covered by deep longitudinal wrinkles is the largest in *M. diana*, occupying almost the entire pronotal disk, whereas in *M. perrieri* it covers mostly the lateral pronotal depression and the surface around it; furthermore, the elytral 'mirror' is much smaller in *M. perrieri* than in *M. diana*, where it is proportionally the largest among the three taxa, and almost impunctate (compare Figs 26 and 44). The prosternal processes of the two species are likewise different: the carinal prosternal striae of *M. perrieri* are medially slightly approximate and rather narrowly separated, whereas those of *M. diana* are not approximate medially, widely separated and slightly divergent anteriorly (compare Figs 32 and 50). The prosternal process of *M. perrieri* is slightly depressed on its apical two-thirds, whereas that of *M. diana* is even. Male aedeagi (Figs 40 and 60) are similar between *M. diana* and *M. perrieri*, but the shape of 8th sternite is different among species: in *M. perrieri* it is slightly more narrowing apically whereas in *M. diana* it is almost running parallel-sided (compare also Figs 35–36 and 53–54).

Distribution. *M. perrieri* is known from two localities, both situated in the region of Boeny, north-western Madagascar; see also Fig. 62 for the distribution of the three species).

Biology. This species has been collected by beating the thickets as well as by pitfall trapping in tropical dry forest.

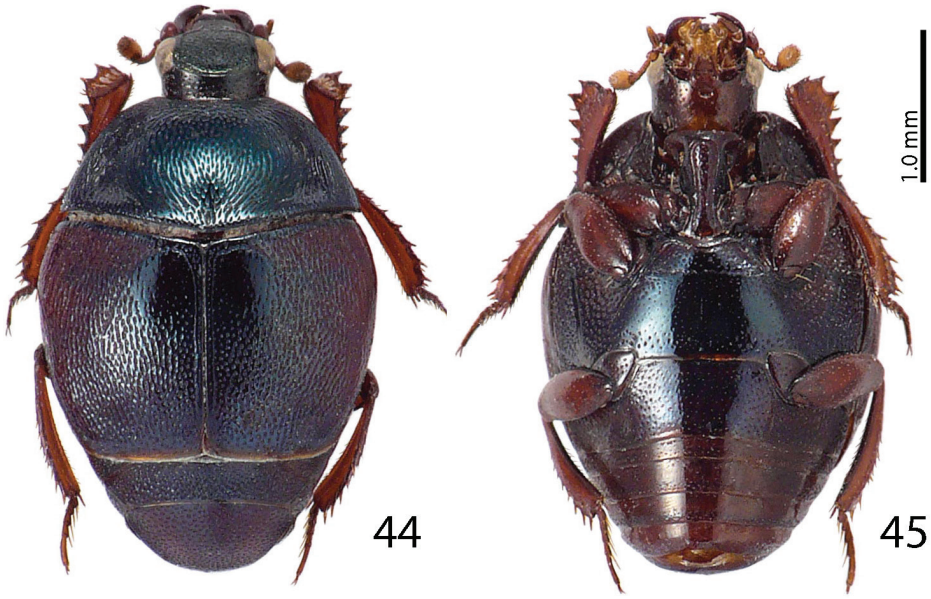
Remarks. The specimens from Ankarafantsika (Ampisoro) slightly differ from those from national park of Baie de Baly in their punctuation of the ventral side of the body, but we regard these differences as variation between the two populations as the male genitalia are constant.

Etymology. Patronymic, named in the honor of the first collector of this taxon, French botanist Henri Perrier de La Bâthie (1873–1958) well-known for his numerous studies of the Madagascar flora, who nonetheless collected also insects, currently deposited at MNHN.

***Malagasyprinus diana* sp. n.**
http://zoobank.org/93664EAE-B3E8-4FE8-9636-9D5E62F0E002
http://species-id.net/wiki/Malagasyprinus_diana
Figs 44–61

Type locality. Madagascar, Diana province, Forêt d'Orangea.

Type material examined. MADAGASCAR: Holotype, glued on its side on a triangular mounting point, with male genitalia extracted, glued to the same mounting

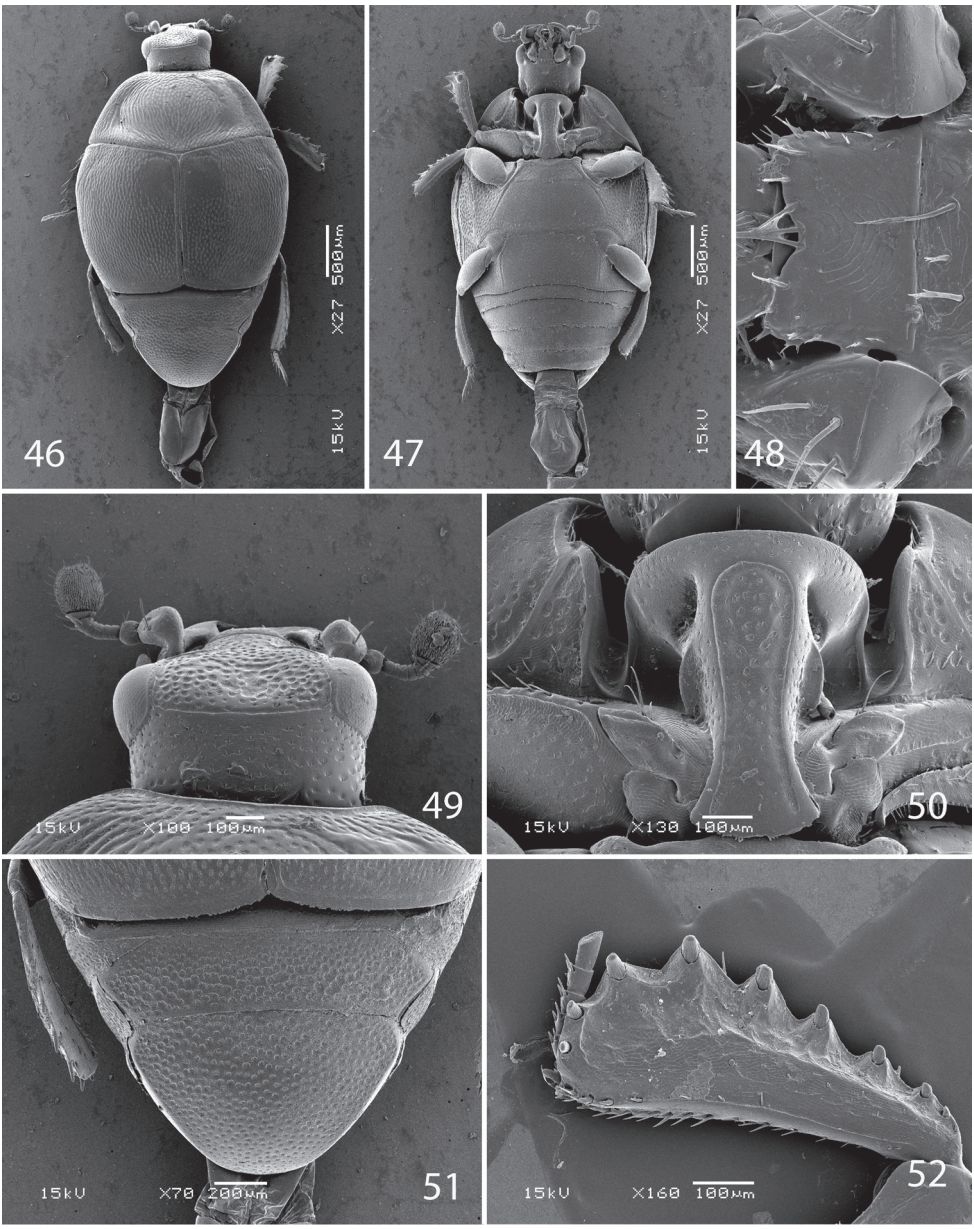


Figures 44–45. *Malagasyprinus diana* sp. n. **44** habitus, dorsal view **45** ditto, ventral view.

point as the specimen, with the following labels: "♂" (printed), followed by "MADAGASCAR: Province / d'Antsiranana Forêt / d'Orangea, 3.6 km 128° / SE Ramena Elev. 90m / 22–28 February 2001" (printed); followed by "12°15'32"S 49°22'29"E" / coll. Fischer, Griswold et al. / California Acad. of Sciences / pitfall trap - littoral rainforest / collection code: BLF3127" (printed); followed by: "CASENT /8065747" (printed); followed by: "*Malagasyprinus diana* / sp. n. Det. T. Lackner & / Y. Gomy 2013 HOLOTYPE (red label, printed) (CAS). Paratypes (one of the male PT is sputter coated with gold): 1 ♂, same data, but "CASENT / 8065750" (CYG); 1 ♂, same data, but "CASENT / 80657501" (CAS). 1 ♂, same data, but "CASENT / 8065748" (TLAN). 1 ♀, same data, but "CASENT / 8065749" (CAS).

Diagnosis. Body measurements: PEL: 2.20–2.30 mm; APW: 0.70–0.80 mm; PPW: 1.75–1.90 mm; EL: 1.40–1.50 mm; EW: 2.00–2.10 mm. Generally, this species has the deepest longitudinal pronotal depression and the largest area of the pronotum covered with deep longitudinal wrinkles. The elytral 'mirror' of *M. diana* is also the largest of the three species (compare Figs 1, 26 and 44 for the elytral sculpture of the three species). Furthermore, its carinal prosternal striae are rather widely separated, not approximate medially, only slightly diverging apically (compare Figs 8, 32 and 50 for the configuration of the prosternal striae among the three species) and the prosternal process is even, not depressed on anterior two-thirds. By the aedeagus (compare Figs 40 and 60) *M. diana* is most similar to *M. perrieri*, differing in the shape of 8th sternite.

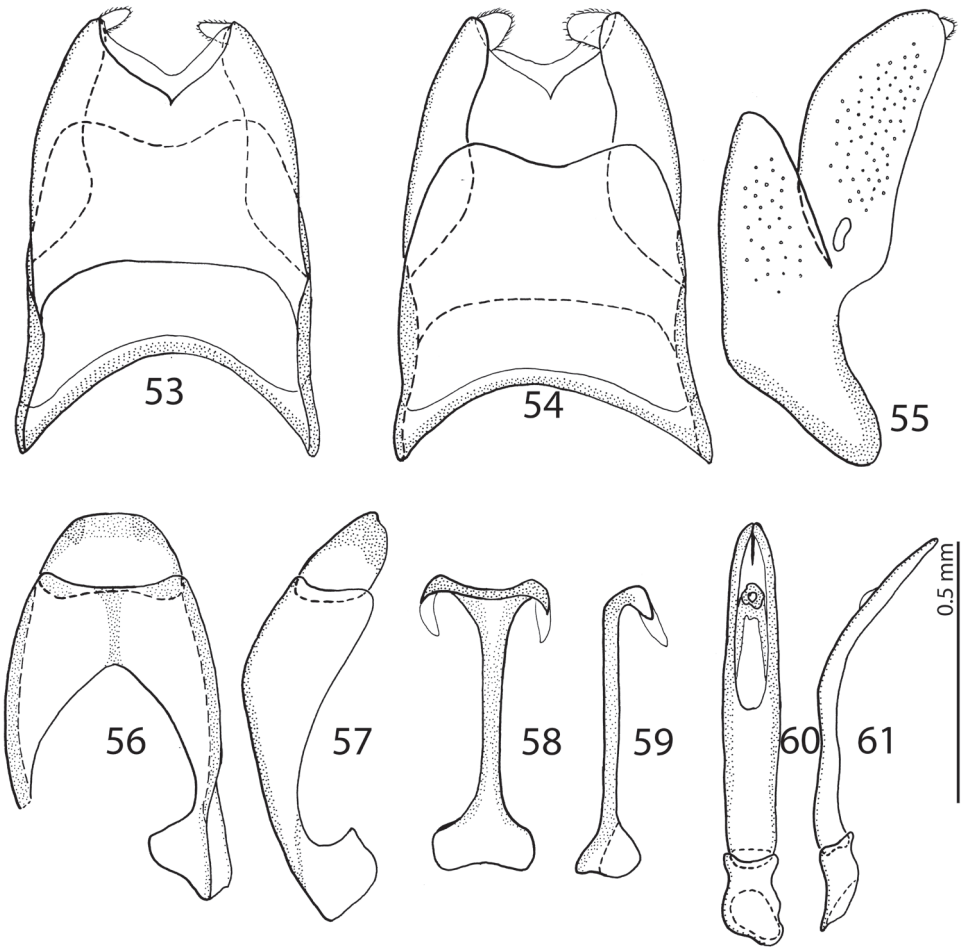
Distribution. Known only from the northernmost tip of the island, region of Diana, northern Madagascar (Fig. 62).



Figures 46–52. SEM micrographs *Malagasyprinus diana* sp. n. **46** habitus, dorsal view **47** ditto, ventral view **48** mentum, ventral view **49** head, dorsal view **50** prosternum **51** propygydium and pygidium **52** protibia, ventral view.

Biology. Collected in littoral rainforest by the method of pitfall trapping.

Etymology. Patronymic, named after the region of Diana, where this species has been collected.



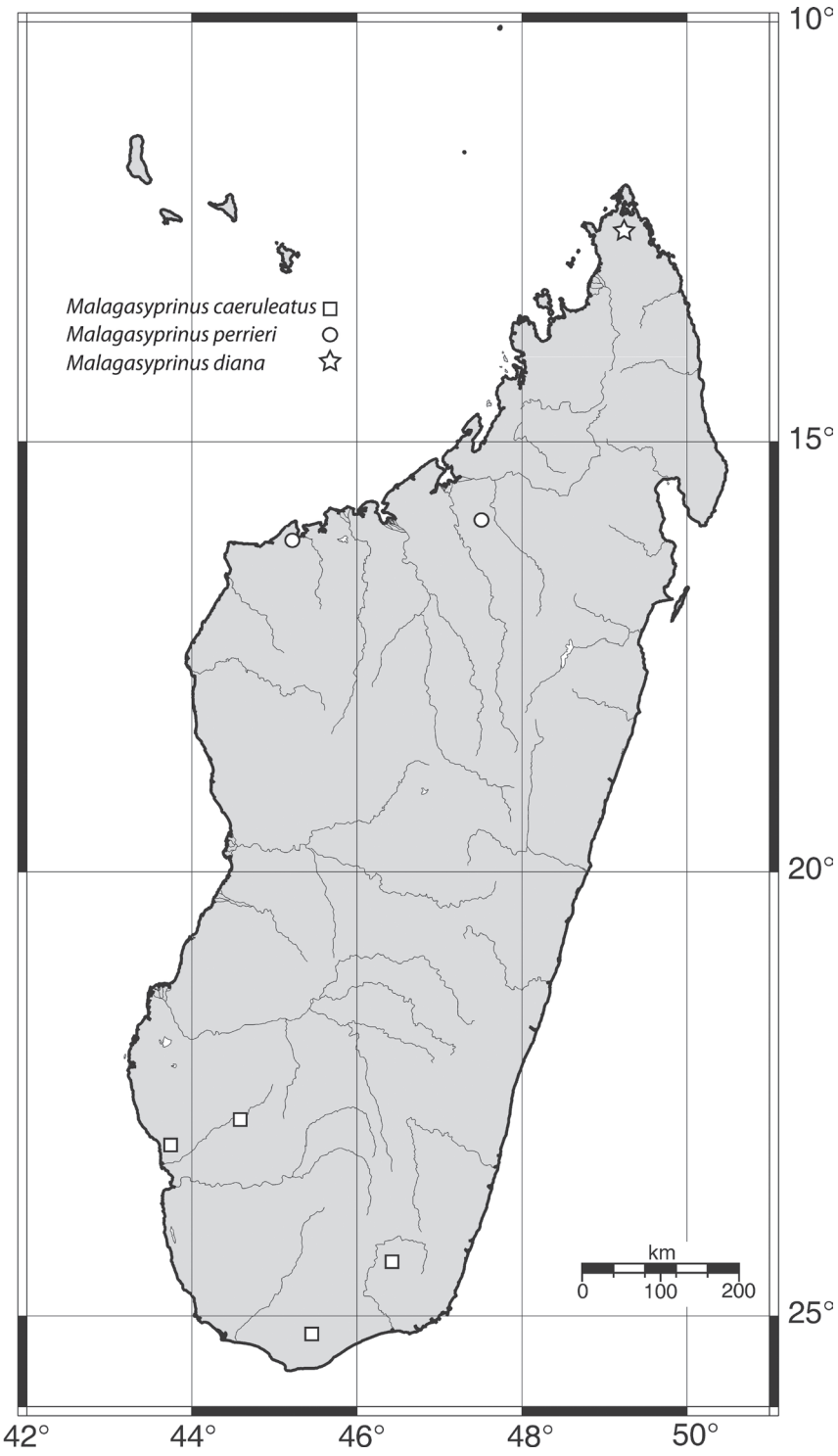
Figures 53–61. male terminalia *Malagasyprinus diana* sp. n. **53** 8th sternite and tergite, ventral view **54** ditto, dorsal view **55** ditto, lateral view **56** 9th sternite and tergite, dorsal view **57** ditto, lateral view **58** spiculum gastrale, ventral view **59** ditto, lateral view **60** aedeagus, dorsal view **61** ditto, lateral view.

Key to the species of *Malagasyprinus*

1 (2) Prosternal process even, carinal striae widely separated, not approximate medially, slightly divergent apically (Fig. 50) .... ***M. diana* sp. n. (extreme north of Madagascar)**

2 (1) Prosternal process depressed on anterior two-thirds, not even, carinal striae often approximate medially and thence divergent apically, occasionally united under round loop.

3 (4) Carinal prosternal striae only slightly approximate medially, not substantially divergent apically (see Fig. 32), longitudinal pronotal depression rather deep, elytra brown to dark brown, aedeagus simply pointed, not split into two halves apically ..... ***M. perrieri* sp. n. (west to north-west of Madagascar)**



Figures 62. Map of distribution of *Malagasyprinus* gen. n.

4 (3) Carinal prosternal striae approximate medially, broadly divergent apically (see Fig. 8), united under round loop; longitudinal depression of the pronotum rather shallow, elytra pitch-black, aedeagus on its apex curiously split into two inwardly curved halves (see Fig. 18)..... .....***M. caeruleatus*** **(Lewis, 1905) (southern Madagascar)**

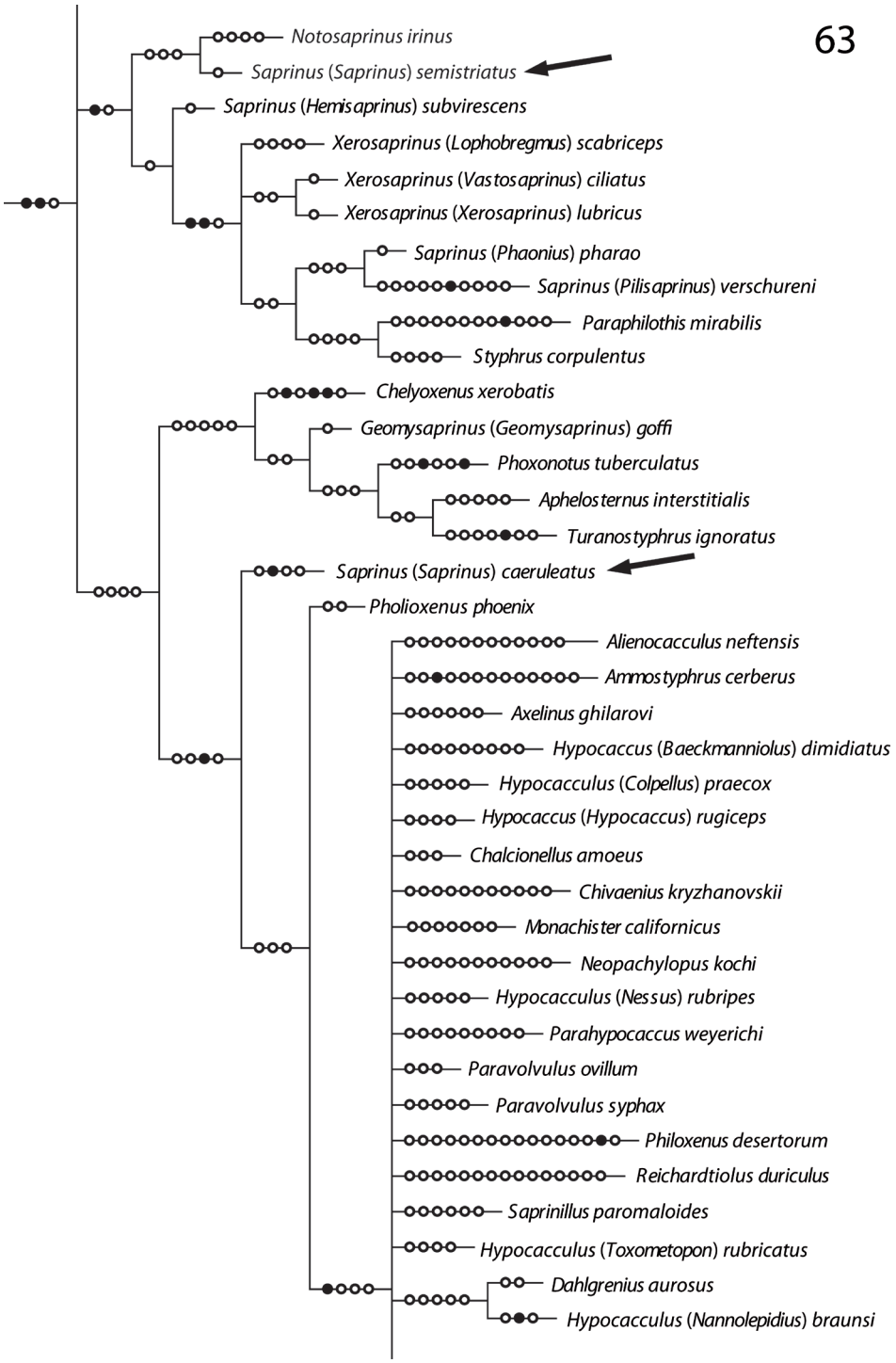
Discussion

In the recently performed phylogenetic analysis focused on the resolving the relationships of the higher taxa of the Saprininae subfamily, the species *Saprinus* (s.str.) *caeruleatus* has been included alongside the type species of the genus, *S. semistriatus* as there was a significant doubt that these two are actually congeneric. The reason for such doubt was mainly the conspicuously different structure of the sensory organs of the antennal club and the presence of large and deep prosternal foveae. The results of the yet unpublished analysis completely confirmed the initial suspicion as *S. caeruleatus* has been placed distant from *S. semistriatus* (Fig. 63), sister to a large and unresolved clade of genera that all share a unique synapomorphy of a single, stipe-shaped vesicle inside the antennal club, as well as several weaker synapomorphies, which are possibly homoplasies (Lackner, unpublished). The presence of the deep and large prosternal foveae exhibited by *S. caeruleatus* is also completely unnatural among the members of *Saprinus*, with only the Palaearctic subgenus *Hemisaprinus* possessing them. As this character is mainly present among the more 'derived' members of the Saprininae subfamily, it is apomorphic. Another apomorphic character is the single sensory area with the corresponding stipe-shaped vesicle situated underneath on the internal-distal side of the antennal club, as the taxa that are placed near the root of the tree possess in most cases two or more vesicles inside their antennal club.

When Lewis (1905) famously remarked 'I do not know of any species similar to this' little did he know that his quip will provide a reason for a thorough study of the Malagasy specimens of '*Saprinus caeruleatus*' which would yield another two, albeit very similar un-described species, and that his '*S. caeruleatus*' will rightly be awarded generic rank. It is highly likely that the three species of this newly erected genus share a single ancestor that reached Madagascar and subsequently speciated there. Based on the scant data available, we can hypothesize that the species *M. perrieri* and *M. diana* are closest relatives since their aedeagi are very similar, with *M. caeruleatus* as their common relative. However, the immediate ancestor of the three *Malagasyprinus* taxa is unknown, as we are unaware of a similar taxon either from Afrotropical region or from the Indian subcontinent.

Acknowledgements

We are indebted to Masahiro Ôhara (Sapporo, Japan), the former supervisor of the senior author for various help during his stay in Sapporo. The wife of senior author



Figures 63. Position of *Saprinus semistriatus* and *S. caeruleatus* on the phylogenetic tree (from Lackner, unpublished).

Pepina Artimová is thanked for help with Adobe Illustrator CS5. Thanks are due to Petr Baňař (Brno, Czech Republic) for the map of Madagascar used in this paper as well as for many valuable comments and suggestions. We thank photographers G. Goergen (Cotonou, Benin) and F. Slamka (Bratislava, Slovakia) for their help with the habitus photographs of *M. perrieri* and *M. caeruleatus* and *M. diana*, respectively. Authors thank one anonymous reviewer and the editor of Histeroidea for Zookeys for their input with reviewing this manuscript. The curators of the institutes mentioned above are duly acknowledged for their help with the specimens. This research was supported by the Internal Grant Agency (IGA n.20124364) Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic.

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ZooKeys 333: 77–91 (2013)
doi: 10.3897/zookeys.333.5483
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RESEARCH ARTICLE

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Eremonidiopsis aggregata, gen. n., sp. n. from Cuba, the third West Indian Dioptinae (Lepidoptera, Notodontidae)

Rayner Núñez Aguila[1,†]

1 *División de Colecciones Zoológicas y Sistemática, Instituto de Ecología y Sistemática, Carretera de Varona km 3. 5, Capdevila, Boyeros, La Habana, Cuba. CP 11900. Habana 19*

† *http://zoobank.org/C305E384-2206-4258-B49D-3D9C7CB60D98*

Corresponding author: *Rayner Núñez Aguila* (rayner@ecologia.cu, rayner_na@yahoo.com)

Academic editor: *Donald Lafontaine* | Received 8 May 2013 | Accepted 30 July 2013 | Published 20 September 2013

http://zoobank.org/76AFA50B-94CB-48DD-88FA-D7EB09CF9C71

Citation: Aguila RN (2013) *Eremonidiopsis aggregata*, gen. n., sp. n. from Cuba, the third West Indian Dioptinae (Lepidoptera, Notodontidae). ZooKeys 333: 77–91. doi: 10.3897/zookeys.333.5483

Abstract

A new genus and species of Dioptinae (Lepidoptera, Noctuoidea, Notodontidae) is described from Cuba, this being the third taxon of the subfamily known from the West Indies. *Eremonidiopsis aggregata*, **gen. n.**, **sp. n.**, appears to be closely related to *Eremonidia mirifica* Rawlins & Miller from Hispaniola among members of the tribe Dioptini. *Eremonidiopsis aggregata* is known from two localities in the middle and western portions of the northeastern Cuban mountain range, Nipe–Sagua–Baracoa. The species inhabits low elevations (300–400 m) covered by lowland rainforest and sclerophyll rainforest. The six known specimens, all males, were part of small swarms flying near the top of an unidentified tree during the day at both collecting sites. These localities are included within protected areas, the "Pico Cristal" National Park in the West and the "Alexander von Humbolt" National Park in the East.

Keywords

Taxonomy, Lepidoptera, Noctuoidea, Notodontidae, Dioptinae, Dioptini, West Indies, Cuba, aggregation, conservation

Introduction

The Dioptinae (Notodontidae) includes 466 species, all but one Neotropical (Miller 2009; Miller and Thiaucourt 2011). Until the present work, this subfamily was represented in the West Indies by two species placed in two endemic genera, *Eremonidia* Rawlins & Miller and *Caribojosia* Rawlins & Miller, from the island of Hispaniola (Rawlins and Miller 2008). In the same article, the authors mentioned the possible presence of other members of this subfamily above 1500 m in the Blue Mountains and Sierra Maestra mountain ranges, of Jamaica and Cuba respectively.

In the present paper, a new genus of Dioptinae is described from Cuba. As predicted by Rawlins and Miller (2008), this taxon was found in eastern Cuba but in the northeastern mountain range, Nipe–Sagua–Baracoa, instead of the southern Sierra Maestra. The systematic position of the new taxon is discussed and observations on its habitat and behavior are also described.

Materials and methods

Characters for genus and species descriptions are the same as those used by Rawlins and Miller (2008) and Miller (2009).

Genitalia were dissected by maceration in 10% potassium hydroxide, later neutralized in 30% alcohol with two drops of glacial acetic acid, and finally stored in glycerin in microvials. Wings were cleared in sodium hypochlorite bleach, stained with Eosin-Y, and slide-mounted in Euparal.

Type material is deposited at the entomological collection of the Institute of Ecology and Systematics (CZACC), Havana, Cuba. Updated information on species richness and endemism on other Lepidoptera groups at the Nipe–Sagua–Baracoa mountain range was obtained from the CZACC collection and the literature is cited in each case.

Other abbreviations used

AHNP "Alexander von Humboldt" National Park
CuA cubito–anal vein
FW forewing
HW hindwing
M medial vein
NSB Nipe–Sagua–Baracoa
R radial vein
Rs radial sector

Results

Systematics

***Eremonidiopsis* gen. n.**
http://zoobank.org/AE08ED3D-1B56-4580-81B6-514C840F310F
http://species-id.net/wiki/Eremonidiopsis

Type species. *Eremonidiopsis aggregata* Núñez, new species, by monotypy.

Diagnosis. *Eremonidiopsis* can be recognized by a combination of the following characters: antennae bipectinate; FW veins Rs2–Rs4 branch in the pattern Rs2+[Rs3+Rs4]; FW discal cell very long, about 65% of FW length; male without stridulatory organ, FW veins M1 and M2 not swollen at their bases; veins M3 and CuA1 separate in the FW and stalked in the HW.

Eremonidiopsis appears to be a close relative of *Eremonidia* from Hispaniola, one the two other known West Indian Dioptinae genera (Rawlins and Miller 2008; Miller 2009). The stalk of Rs1 with Rs2–Rs4 branch is long in *Eremonidia* but in *Eremonidiopsis* arises just after the origin from the discal cell or is even connate. They also differ by the color of the proboscis, golden brown in *Eremonidia* and blackish brown in *Eremonidiopsis*, and in the size head respect to insect size. Both taxa show a similar size, with a FW length of 12.7 mm in *Eremonidia mirifica* and 12.2 mm in *E. aggregata*; however, head width across the eyes is 1.41 mm in the latter whereas in the Hispaniolan genus the measure is 1.77 mm or 25% larger. The tympanum also exhibits differences. The membrane is enclosed, deep, and oriented horizontally in *Eremonidia* (Rawlins and Miller 2008; Miller 2009) whereas in *Eremonidiopsis* it is shallow, not enclosed, and oriented vertically. Although their male genitalia show similarities when compared to other Dioptinae, they exhibit differences in shape of the valvae, aedeagus, and anal tube, as well as in possession by *Eremonidiopsis* of dorsolateral keels on the uncus. Finally, the shape of the male eight sternum differs as well the male seventh sternum which is modified only in *E. aggregata*.

Compared to other Dioptinae, *Eremonidiopsis* is distinctive by having FW veins M3 and CuA1 separate, whereas in most Dioptinae these veins are stalked (Miller 2009). The radial system branching pattern also differs from the typical Dioptinae one, [Rs2+Rs3]+Rs4 (Miller 2009). *Eremonidiopsis* exhibits a color pattern similar to some species of *Scotura* Walker, 1854; however, the latter possesses ciliate male antennae, a shorter FW discal cell, and a stridulatory organ, among others differences.

The phylogenetic position of the new genus will be better understood when females and larvae are available. Although some characters suggest a relation with *Eremonidia*, the lack of FW stridulatory organ and different tympanum of *Eremonidiopsis* imply that may be is closer to some other clade within the Dioptinae.

Description. Male. *Head*. Labial palpus short and thin, curved strongly upward to just above clypeus, held close to front; first segment moderate in length, curved

upward; second segment slightly shorter than first segment; third segment short, conical, pointed at apex; labial palpus ratio 1/0.85/0.20; proboscis blackish brown; scales of front short, appressed and directed dorso-medially, a pair of small tufts between antennal bases and eyes; eyes moderately large, bulging; vertex covered with semi-erect scales; antennae bipectinate, each flagellomere bearing a basal pair of ciliate rami; rami longer at middle segments, about 3.5 times length of supporting flagellomere; flagellomeres 35–37. *Thorax*. Epiphysis long, equal in length to tibia; tibial spurs moderate in length, apical pair half as long as basal pair on metathoracic tibia; tegulae covered with long scales, outer margins fringed with hairlike scales; tympanum large, rounded, cavity shallow; tympanal membrane facing posteriorly. Forewing elongate, apical angle slightly acute; vein R1 arising from discal cell; Rs1 connate or stalked just after origin with Rs2–Rs4; veins Rs2–Rs4 in pattern Rs2+[Rs3+Rs4]; M1 separate from radial sector; stridulatory organ absent; discal cell about 65% length of wing; M3 widely separate from CuA1. Hindwings broad, outer margin expanded; apical angle rounded; vein M3 short stalked with CuA1; discal cell 60% length of wing. *Abdomen*. Short, gradually tapered, with a small, inconspicuous distal tuft of moderately long scales. Eighth tergum large, more than twice length of seventh tergum, slightly narrower posteriorly; eighth sternum relatively short, narrower than seventh sternum, anterior margin bearing a slightly elongate, sac-like apodeme. Seventh sternum with lateral margins curved, gradually tapering toward anterior margin, which is sclerotized and bears a short anteriorly directed mesal process.

Genitalia. Socii/uncus complex moderate in size, heavily sclerotized, narrowly joined to arms of tegumen; arms of tegumen relatively wide, much taller than vinculum; arms of vinculum short and wide; valve narrow, Barth's Organ absent; costal and ventral margin of valve sclerotized, each folded toward inner surface with a sclerotized low flange; inner surface of valve concave, with scattered coarse setae; arms of transtilla sclerotized and narrow, oriented horizontally, with a pair of short acute processes anteriorly and a wide sclerotized ventral plate; juxta large, dorsal margin with a shallow mesal excavation; aedeagus large, thin and cylindrical, base greatly expanded; apex of phallus curved downward, spoon shaped; opercular sclerite absent; vesica moderately long, much shorter than aedeagus, bent slightly upward; vesica bearing a large mass of deciduous caltrop cornuti along ventral surface, these varying in spine length.

Female. Unknown.

Etymology. The generic name *Eremonidiopsis* is derived from the name of its Hispaniolan relative *Eremonidia*. The suffix *–opsis* refers to the resemblance of the Cuban genus to the Hispaniolan one.

Distribution. The six known specimens were captured at two localities in different sections at the western half of the NSB mountain range in northeastern Cuba.

Immature stages. Unknown.

Remarks. This taxon and *Eremonidia* are evidently close relatives. They share several characteristics including the short labial palpi, similar wing venation (FW radial system pattern Rs2+[Rs3+Rs4], a long FW discal cell, and veins M3 and CuA1 separate in the forewing but stalked in the hindwing), as well as several features of the

male genitalia, which are highly divergent from the remaining Dioptini (Miller 2009). These similarities suggest placement of *Eremonidiopsis* close to *Eremonidia* in the basal clade of the Dioptini (Miller 2009). Available evidence shows few features linking *Eremonidiopsis* to the remaining members of this clade: *Scotura*, *Cleptophasia* Prout, 1918, *Oricia* Walker, 1854, and *Erbessa* Walker, 1854 (Miller 2009). The latter shares the possession of a shallow tympanum whereas *Cleptophasia* possesses a long FW discal cell. As in *Eremonidia*, the possession of large, deciduous caltrop cornuti on the vesica of males indicates a plesiomorphic phylogenetic position (Rawlins and Miller 2008).

***Eremonidiopsis aggregata* sp. n.**
http://zoobank.org/0EA20D76-403F-4526-BB2A-8CB2AF0D9AC2
http://species-id.net/wiki/Eremonidiopsis_aggregata
Figs 1–7

Type material. Holotype: ♂, Cuba, Holguí, Moa, vicinity of Morones mountain stream (20°26'22"N, 74°49'14"W), 300 m, 22/V/2007, R. Núñez. Paratypes: 5 ♂. Same data as holotype (4 ♂); Holguín, Mayarí, vicinity of La Zoilita (20°37'42"N, 75°29'08"W), 400 m, 6/IV/2012, R. Núñez (1 ♂).

Diagnosis. The uniform dark brown wing pattern of *Eremonidiopsis aggregata* is present only in *Scotura nigricaput* Dognin and *Scotura flavicapilla* (Hübner) among all Dioptinae. *Eremonidiopsis aggregata* can be easily separated from the first by its yellowish-orange collar and from the second by lacking yellowish color at other areas of the head such as the front and the vertex. In addition, many other features allow separation of *Eremonidiopsis* from *Scotura* including the possession of bipectinate antennae, a longer discal cell, absence of the FW stridulatory organ, and absence of the Barth's Organ in the male genitalia among other features.

Description. Male (Figs 1–5). *Head*. First segment of labial palpus covered with short, yellowish-orange scales; third and second segments of labial palpi brownish gray, second segment with scattered yellowish-orange scales on inner side; remaining parts of head covered with appressed, glossy brownish-gray scales. Eyes moderately large, measurements (N=6), mean ± S.D. (range); width of head across eyes: 1.41 ± 0.02 mm (1.38–1.43 mm); height of eye: 0.57 ± 0.02 mm (0.53–0.58 mm); ocular index (height of eye / width of head): 0.40 ± 0.01 mm (0.38–0.41 mm). *Thorax*. Propleuron and prosternal region yellowish orange between base of proboscis and base of brownish-gray procoxae (Figs 1, 2); dorsum brownish gray; venter, including legs, pale brownish gray except inner side of femora grayish white; tympanum contrastingly dirty white (Fig. 3). Forewing (Figs 1, 4) with dorsal surface glossy, uniformly brown; ventral surface uniformly brownish gray; measurements (N=6), mean ± S.D. (range); length: 12.2 ± 0.24 mm (12.0–12.7 mm); width: 5.5 ± 0.22 mm (5.2–5.8 mm); length / width ratio: 2.2 ± 0.05 (2.2–2.3). Hindwing (Figs 1, 4) with dorsal surface uniformly dark brownish gray; ventral surface uniformly brownish gray (Fig. 1); measurements (N=6), mean ± S.D. (range); length: 9.5 ± 0.35 mm (9.1–10.1 mm); width: 5.5 ± 0.11 mm (5.2–5.5 mm); length / width ratio:

Figure 1. Habitus of *Eremonidiopsis aggregata*. **A** Male holotype, dorsal view **B**Male holotype, ventral view.

1.8 ± 0.04 (1.75–1.84). *Abdomen*. Scales of dorsum glossy, brownish gray; venter white brownish gray but paler (Figs 1, 2). Mesal process on anterior margin of seventh sternum short and blunt, flanked by indentations (Fig. 5B). Eighth tergum elongate, slightly longer than corresponding sternum excluding apodeme; anterior margin one third broader than posterior one, slightly excavated at middle; lateral margins simple; posterior margin slightly convex with a short hood-shaped fold. Eighth sternum with lateral margins simple; posterior margin sclerotized except at shallow mesal excavation; anterior margin one third broader than posterior one (Fig. 5A); anterior apodeme saclike, about two thirds as long as sternum, gradually tapering toward rounded anterior end, lateral margins simple. *Genitalia*. Uncus short, wide, curved gradually downward, dorsum convex, apex acute, with a pair of triangular dorsolateral keels; socii short, wide at bases, curved strongly upward, apices cup shaped (Fig. 5C); dorsal portion of tegumen gently tapered, ventral portion slightly widened at junction with vinculum; saccus broad, quadrate, ventral margin

Figure 2. Head, thorax, and abdomen of *Eremonidiopsis aggregata*, lateral view.

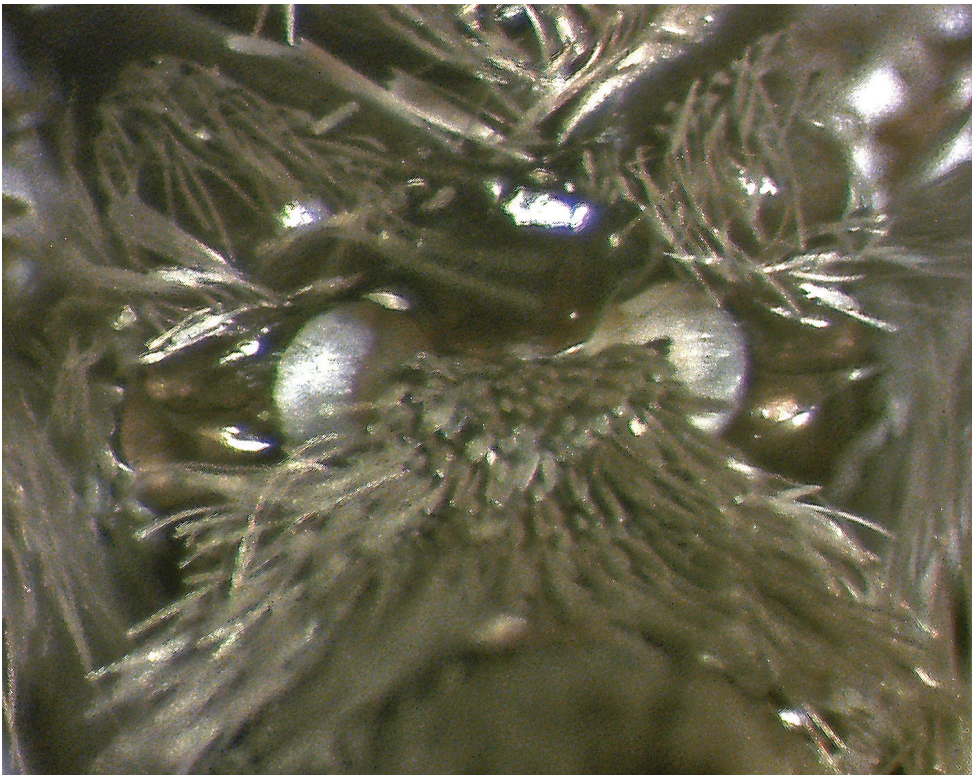

Figure 3. Tympanum of *Eremonidiopsis aggregata*, posterior view of metathorax.

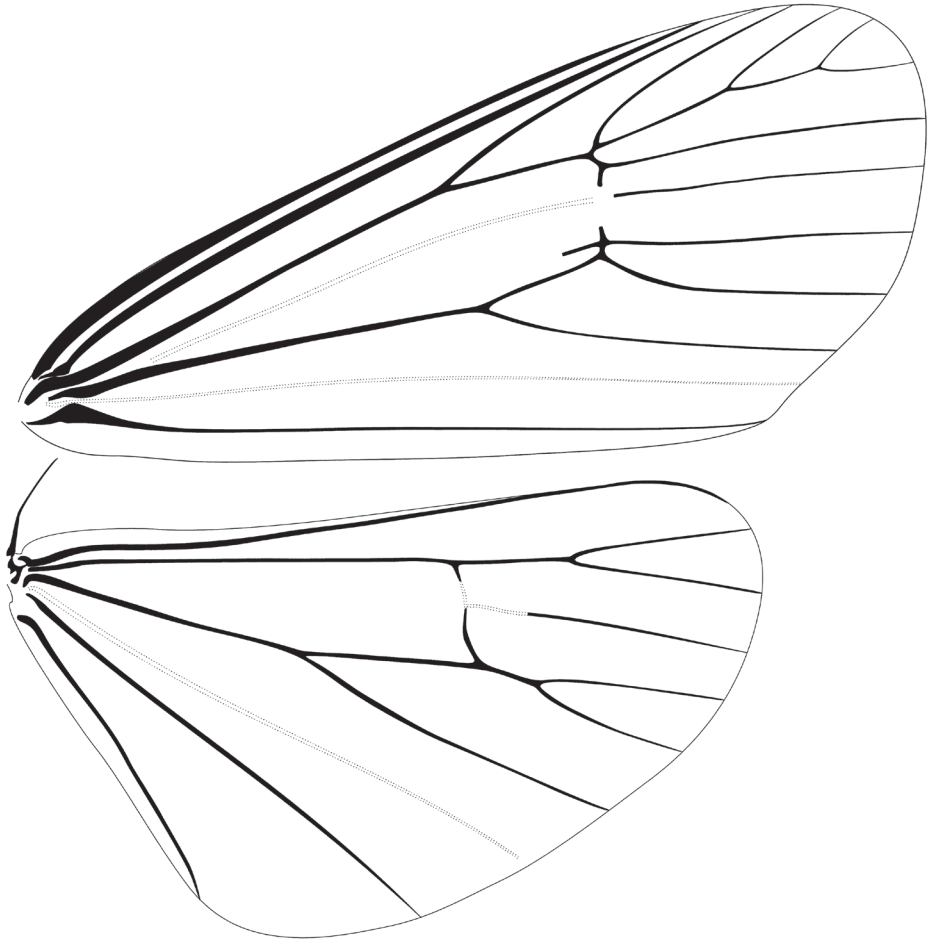

Figure 4. Wing venation of *Eremonidiopsis aggregata*.

transverse, dorsal margin wide, slightly convex, barely covering valve bases; inner surface of valve mostly membranous; dorsal margin of costa slightly convex with a low sclerotized flange on inner surface extending to apex, with a blunt expansion in apical third (Fig. 5C); ventral margin of valve mostly straight, folded toward inner surface to form a low sclerotized flange in distal third, flange with a blunt expansion at middle and a more acute one near apical third; apical portion of valve broadly expanded and rounded (Fig. 5C); anal tube short and broad, extending below apex of valvae; apex of aedeagus dentate along right lateral margin, teeth heavily sclerotized (Fig. 5D); caltrop cornuti bearing three or four straight upwardly oriented spines, longest spines up to 5 × length of shortest ones.

Female. Unknown.

Etymology. The species–group name is derived from the Latin *gregis* (flock, group) and the suffix *atus* (having the nature of), in reference to the aggregation of individuals observed during both collecting events.

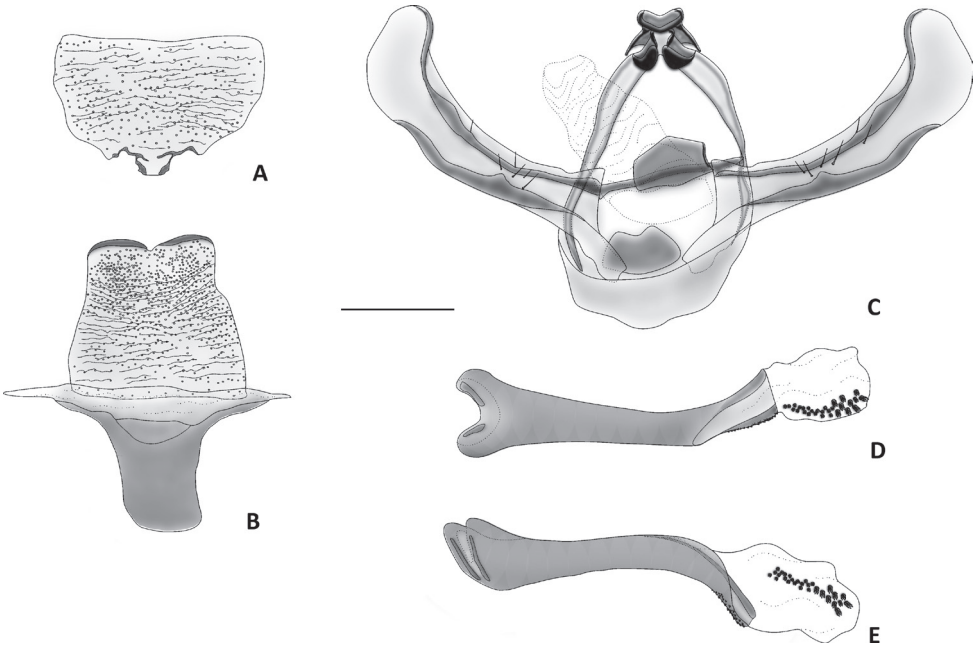

Figure 5. Seventh and eighth abdominal sterna and male genitalia of *Eremonidiopsis aggregata*. Scale bar 0.5 mm. **A** Seventh sternum, dorsal view **B** Eighth sternum, dorsal view **C** Genitalia, ventral view **D** Aedeagus, dorsal view **E** Aedeagus, lateral view.

Distribution (Fig. 6). Known from only two localities of the NSB mountain range, both in Holguín province, northeastern Cuba. The locality at the center of the NSB is in the vicinity of Morones mountain stream (20°26'22"N, 74°49'14"W; 300 m) near the Jaguaní river east of La Melba village on the southeastern slope of the El Toldo plateau. The westernmost locality is the vicinity of La Zoilita (20°37'42"N, 75°29'08"W; 400 m), on the northern slope of Sierra de Cristal.

Habitat (Fig. 7). The two localities where *Eremonidiopsis aggregata* has been collected are very different regarding both vegetation and climate. Vegetation around La Melba is represented by lowland rainforest, Cuba's most exuberant rainforest type (Figs 7A, B) (Reyes and Acosta 2005). The vegetation has a distinctly mesophyllic aspect due to the predominance of *Carapa guianensis* Aubl. (Meliaceae). Generally, there are two arboreal layers; the upper layer frequently reaches 30 to 35 m; when it only reaches 20 to 25 m, it has emergent individuals reaching 35 m (Reyes and Acosta 2005). Arboreal canopy coverage is 100%. A more detailed description of this rainforest is given by Reyes and Acosta (2005). Rainfall is 3400 mm per year; this is the rainiest region of Cuba with up to 240 rainy days per year (Montenegro 1991; Zabala and Villaverde 2005). October to January and May are the wettest periods, averaging 300–500 mm of rainfall per month; February and March are the least rainy months with about 200 mm (Montenegro 1991). Cuba's highest relative humidity rates occur there; yearly values vary between 90 and 95%. The most humid month is October and the least humid

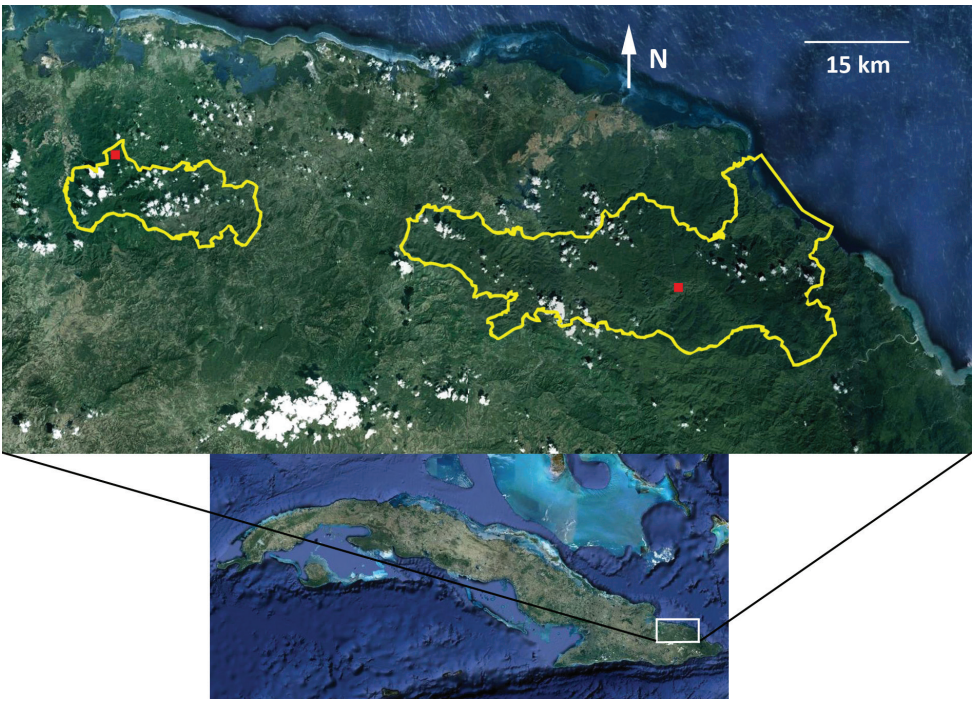

Figure 6. Distribution of *Eremonidiopsis aggregata* at the middle and western portions of the Nipe–Sagua–Baracoa range, northeastern Cuba. Right red square indicating the vicinity of the Morones mountains stream, left red square indicating the vicinity of La Zoilita. Yellow polygons showing area occupied by National Parks, "Alexander von Humboldt" at the right, and "Pico Cristal" at the left.

month is July. Temperatures are high, between 22 and 26°C, which along with frequent and long calm periods produce a sensation of suffocating heat (Montenegro 1991).

The substratum rocks are metamorphic. Soils are poor, acidic, and humid ("Ferralítico Rojo Lixiviado" and "Ferralítico Amarillento Lixiviado"), over a ferralitic, meteorized (weathered) crust (Zabala and Villaverde 2005).

The vicinity of La Zoilita is covered by sclerophyll rainforest [name modified from Borhidi (1991) following Reyes and Cantillo (2005)] (Figs 7C, D). Leaves are very sclerophyllous, mostly microphyll and notophyll. The arboreal layer is open and irregular in height and generally fluctuates between 15 and 20 m. Constant and abundant species include *Calophyllum utile* Bisse (Clusiaceae), *Guapira rufescens* (Heimerl) Lundell (Nyctaginaceae), and *Tabebuia dubia* (C. Wright ex Sauvalle) Britton ex Seibert (Bignoniaceae). The lower stratum is 5–12 m high and more closed. Details concerning the structure and species composition of this habitat can be found in Borhidi (1991) and Reyes and Cantillo (2005).

Rainfall is 1600 mm per year. Average annual relative humidity is 91% at 7:00 am, and 67% at 1:00 pm. The average yearly temperature is 21.6°C, with the highest average value being 23.8°C during July, and the minimum being 19.0°C in February.

Figure 7. Habitats of *Eremonidiopsis aggregata* in Nipe–Sagua–Baracoa range, northeastern Cuba. **A** Lowland rainforest at the riversides of the Jaguaní River at La Melba, near the type locality **B** Understory of the lowland rainforest in the vicinity of Morones mountain stream **C** Northern slopes of Sierra Cristal, near the type locality **D** Sclerophyll rainforest in the vicinity of La Zoilita.

The substratum rocks are ophiolithic. The soils are "Ferríticos Rojos Oscuros," very poor and acidic, and shallow to very deep; sometimes with bare rock exposed.

Behavioral observations. All individuals of *E. aggregata* were observed in flight during the early afternoon. At both localities the species was found in small, agitated swarms of 10 to 15 individuals. Flight was moderately strong and erratic, and on both occasions the moths were seen flying 3 to 4 meters above the ground around the top of an unidentified tree. Specimens were captured when they occasionally descended near the ground. No females where captured.

Roughly 60 hours of light trapping were spent at La Zoilita using a 250 watt mercury vapor bulb in February of 2010, but no *E. aggregata* specimens were attracted. However, individuals were collected there during the day in April and May in the vicinity of Morones mountain stream.

Discussion

The NSB range contains the largest and best-preserved mountain ecosystem remnants in Cuba and possibly in all of the Caribbean islands (Fong et al. 2005). With a maximum altitude of 1231 m (Pico Cristal), the NSB, which occupies an area of 9350 km^2, is the largest Cuban mountain range (C.N.N.G. 2000). The diversity of vegetation types (rainforests, pine forests, evergreen forests, and charrascals) cover large areas in a complex mosaic resulting from a multitude of soil types, as well as differences in humidity, sun exposure, and altitude (Fong et al. 2005).

NSB harbors the highest values of species richness and endemism in the Cuban flora and fauna for many groups including liverworts, mosses, vascular plants, spiders, hymenopterans, amphibians and reptiles (Sánchez-Ruiz 1999; Mustelier 2001; Portuondo and Fernández 2004; Fong et al. 2005). Regarding Lepidoptera, Alayón and Solana (1987) listed 113 butterfly species from the "Cuchillas del Toa" Biosphere Reserve. Today, with the addition of another 39 records (Smith and Hernández 1992; Hernández et al. 1998; Reyes and Núñez 2006; Núñez 2007, 2010; Núñez et al. 2012, 2013), there are 152 species known from NSB. That number represents 78% of all Cuban butterflies (Núñez and Barro 2012; Núñez et al. 2013). Endemism is also very high; 28 of the 33 butterflies exclusive to Cuba are present in that mountain range. The picture is similar for two of the best-known moth families, Notodontidae and Sphingidae. Twenty notodontid species have been recorded there, 71% of the Cuban total, and 8 of the 9 endemics (Torre and Alayo 1959; Núñez and Barro 2012; this work). The Sphingidae is represented by 38 species, 63% of the Cuban fauna, and 9 of the 14 endemic species (Zayas and Alayo 1956; Reyes et al. 2003; Haxaire and Melichar 2012; Núñez and Barro 2012).

The presence of *Eremonidiopsis* at NSB is not completely unexpected given the high Lepidoptera diversity mentioned above, as well the presence of Dioptinae on the neighboring Hispaniola (Rawlins and Miller 2008; Miller 2009). It has been well established that eastern Cuba and north–central Hispaniola were joined or in close proximity during the Paleocene–Eocene (Pindell and Barrett 1990; Draper and Barros 1994; Iturralde-Vinent and MacPhee 1999). Perhaps the Antillean Dioptinae ancestors evolved when the land masses separated from one another. This hypothesis could explain the close relationship between *Eremonidiopsis* and *Eremonidia*. A similar theory has been suggested for butterflies in the endemic West Indian genus *Calisto*, Nymphalidae: Satyrinae (Miller and Miller 2001; Núñez et al. 2012).

There is little information on the biology of *Eremonidiopsis aggregata*. Diurnal activity is common throughout the Dioptinae, although there are also strictly nocturnal species as well as others that fly both at night and during the day (Miller 2009). In the case of *E. aggregata* present data suggest that the species is diurnal; light collecting was performed at one of the type localities and in similar locations at NSB without success in attracting specimens.

Observed clustering during flight seems to be one of the few records of this behavior in the Dioptinae. The small size of *E. aggregata* and the flight's height precluded

more detailed observations. Possible explanations include that individuals were feeding on tree flowers or that they were engaging in some kind of courtship event, though neither have been reported for the Dioptinae.

Regarding potential hostplants, many of the genera used by the Dioptinae listed in Miller (2009) are present in Cuba. Among the plants used by members of the basal clade of Dioptini, where *Eremonidiopsis* is potentially placed, species of *Hybanthus* Jacq. (Violaceace), *Acalypha* L. (Euphorbiaceae), *Acacia* Mill. (Fabaceae), *Meliosma* (Meliosmaceae), *Genipa* L. and *Randia* L. (Rubiaceae), *Eugenia* L. (Myrtaceae), and *Miconia* Ruiz & Pav., *Conostegia* D.Don, and *Henriettea* DC. (Melastomataceae) are present in Cuba (Acevedo-Rodríguez and Strong 2012). Of these, *Eugenia*, *Miconia*, and *Henriettea* are well represented in the NSB range with 31 species of the three plant genera, including 21 endemics, recently recorded from AHNP (Martínez et al. 2005).

Concerning conservation, both collection localities are included within protected areas. The Morones mountain stream runs through the heart of the AHNP. This park, with 706.8 km^2, is one of Cuba's largest and most important protected areas (Category II, World Conservation Union, IUCN) in terms of biodiversity. The AHNP constitutes the core of the "Cuchillas del Toa" Biosphere Reserve. La Zoilita, with 185 km^2, is within the "Pico Cristal" National Park, and its eastern limit is located 20 km from the western border of AHNP.

Eremonidiopsis aggregata probably occurs across NSB at any location where habitats in good condition persist. Collections of Lepidoptera from the NSB range with vouchers at CZACC date from the first decade of the twentieth century. However, localities are mostly grouped around the towns of Baracoa and Moa. *Eremonidiopsis aggregata* remained undiscovered and absent from collections probably due to a combination of its small size and dark, non–attractive coloration, as well as perhaps to its rarity.

Acknowledgements

I thank Norvis Fernández and Sara Ilse Suárez and David Lambert for their help in preparing expeditions to "Alexander von Humboldt" and "Pico Cristal" National Parks respectively. Equipment using for this work was financed by Rufford Small Grants (8909–1).

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ZooKeys 333: 93–121 (2013)
doi: 10.3897/zookeys.330.5795
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Three new species of *Oreophryne* (Anura, Microhylidae) from Papua New Guinea

Fred Kraus[1,†]

1 *Department of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, MI 48109, USA*

† *http://zoobank.org/62E0A292-1B25-43FB-9429-220B76CE3D70*

Corresponding author: *Fred Kraus* (fkraus@umich.edu)

Academic editor: *F. Andreone* | Received 15 June 2013 | Accepted 20 August 2013 | Published 20 September 2013

http://zoobank.org/B8F0757A-63B3-4FE7-B1A3-17DF76A2F951

Citation: Kraus F (2013) Three new species of *Oreophryne* (Anura, Microhylidae) from Papua New Guinea. ZooKeys 333: 93–121. doi: 10.3897/zookeys.333.5795

Abstract

I describe three new species of the diverse microhylid frog genus *Oreophryne* from Papua New Guinea. Two of these occur in two isolated mountain ranges along the northern coast of Papua New Guinea; the third is from Rossel Island in the very southeasternmost part of the country. All three are the first *Oreophryne* known from these areas to have a cartilaginous connection between the procoracoid and scapula, a feature usually seen in species far to the west or from the central cordillera of New Guinea. Each of the new species also differs from the many other Papuan *Oreophryne* in a variety of other morphological, color-pattern, and call features. Advertisement-call data for *Oreophryne* species from the north-coast region suggest that they represent only two of the several call types seen in regions further south, consistent with the relatively recent derivation of these northern regions as accreted island-arc systems. The distinctively different, whinnying, call type of the new species from Rossel Island occurs among other *Oreophryne* from southeastern Papua New Guinea but has been unreported elsewhere, raising the possibility that it may characterize a clade endemic to that region.

Keywords

Adelbert Mts., advertisement calls, Frog, North-coast ranges, Rossel Island, Torricelli Mts

Introduction

Asterophryinae is a subfamily of Microhylidae consisting of 21 genera and hundreds of species that is largely restricted to New Guinea and its satellite islands. Of the constituent genera, *Oreophryne* is presently one of the largest within the Papuan Region, which consists of New Guinea and immediately adjacent islands, the Bismarck and Admiralty Archipelagos, and the Solomon Islands. Currently, the genus has 40 named species in this area (Frost 2013), second in local asterophryine species diversity only to *Cophixalus*, which currently has 42 species (Kraus 2012). Both genera also range outside this area: *Oreophryne* has ten additional species distributed across the Moluccas, Lesser Sundas, Sulawesi, and southern Philippines (Parker 1934, Frost 2013); *Cophixalus* has 18 additional species in northeastern Australia and one more on Halmahera (Parker 1934, Hoskin 2008, 2012, Hoskin and Aland 2011).

Species of *Oreophryne* are usually arboreal dwellers of rainforest habitats, but a few species are terrestrial inhabitants of alpine grasslands (Zweifel et al. 2005, Günther and Richards 2011). The genus is approximately evenly divided into two groups that differ in whether the connection between the procoracoid and scapula consists of a cartilaginous rod or a ligament (Parker 1934). The former group is largely restricted to the central cordillera of New Guinea or areas to the west; *O. kampeni* is currently the only recognized representative of this group in Papua New Guinea outside of that region, being known only from its type locality near Port Moresby. In contrast, the group having a ligamentous connection is distributed across the entire Papuan range of *Oreophryne* but appears to be absent from the islands west of New Guinea (Parker 1934, Brongersma 1948, Brown and Alcala 1967). There is currently no evidence to suggest if either of these groups is monophyletic. Additional phenotypic features of widespread systematic use for distinguishing among *Oreophryne* species include the presence and degree of toe webbing, relative length of the third vs. fifth toes, size of digital discs, aspects of color pattern, and (more recently) structure of advertisement calls (e.g., Parker 1934, Günther and Richards 2011, Zweifel et al. 2003, 2005).

Several of the early described species of *Oreophryne* have remained uncollected and little studied since their original descriptions, and this long hampered taxonomic study of the genus and diagnosis of new species. Consequently, the genus has received limited taxonomic attention until recently. Nonetheless, of the 40 species of Papuan *Oreophryne*, 24 have been described since 2000, and numerous additional species remain collected but undescribed. Most of these newly described species are from western New Guinea or from the central cordillera (e.g., Günther et al. 2001, Günther 2003a, b), but Zweifel et al. (2003) treated *Oreophryne* from the northern coast region of New Guinea. Herein, I describe a further three distinctive species from Papua New Guinea that belong to the group having a cartilaginous connection between the procoracoid and scapula. Two of these are from some of those same north-coast mountain ranges treated by Zweifel et al. (2003), and the third is from Rossel Island in southeasternmost Papua New Guinea. These bring to four the number of *Oreophryne* from outside

the central cordillera of Papua New Guinea that have a cartilaginous connection between the procoracoid and scapula. Other undescribed *Oreophryne* I have from this region have ligamentous connections between the scapulae and procoracoids and will be treated in a later paper.

Materials and methods

I collected specimens under all applicable institutional animal-care guidelines and provincial and national permits, euthanized them, fixed them in 10% buffered formalin, and then transferred them to 70% ethanol for storage. Livers were removed from representative specimens of each species and stored in 70% ethanol. I made all measurements with digital calipers (SV) or an optical micrometer to the nearest 0.1 mm, with the exception that disc widths were measured to the nearest 0.01 mm. Measurements, terminology, and abbreviations follow Zweifel (1985) and Kraus and Allison (2006): body length from snout to vent (SV); tibia length from heel to outer surface of flexed knee (TL); horizontal diameter of eye (EY); distance from anterior corner of eye to center of naris (EN); internarial distance, between centers of external nares (IN); distance from anterior corner of eye to tip of snout (SN); head width at widest point, typically at the level of the tympana (HW); head length, from tip of snout to posterior margin of tympanum (HL); horizontal tympanum diameter (TY); width of third finger disc (3rdF); and width of the fourth toe disc (4thT). I measured mass to the nearest 0.05 g on freshly euthanized animals using a 10-g Pesola spring scale. I determined sex of animals by examination of vocal slits or by dissection; I determined the cartilaginous nature of the connection between procoracoid and scapula by dissection of alcoholic specimens with a binocular dissecting microscope. Webbing formulae follow Savage and Heyer (1967) as modifed by Myers and Duellman (1982).

I recorded calls in the field using a Sennheiser ME66 microphone with a K6 powering module and either a Sony Professional Walkman WM-D6C cassette recorder, a Sony MDSJE480 minidisc recorder, or a Marantz PMD660 digital audio recorder. I analyzed call structure using the computer program Avisoft-SASLab Pro(v4.34), available from Avisoft Bioacoustics (http://www.avisoft.com/).

I confirmed generic assignment of the frogs using the presence of eleutherognathine maxillae, procoracoids, and clavicles that do not extend to the scapulae (Parker 1934). For discrimination from congeners I relied on direct comparison to museum material (Appendix) as well as to information from Günther (2003a, b), Günther and Richards (2011), Günther et al. (2001, 2009, 2012), Parker (1934), Richards and Iskandar (2000), van Kampen (1913), Zweifel (1956, 2003), and Zweifel et al. (2003, 2005).

Type specimens of new species are deposited in the Bernice P. Bishop Museum, Honolulu (BPBM) and Papua New Guinea National Museum and Art Gallery, Port Moresby (PNGNM). Additional museum abbreviations (Appendix) follow Leviton et al. (1985). Specimens have latitude and longitude coordinates using the Australian Geodetic Datum, 1966 (AGD 66).

Taxonomy

***Oreophryne cameroni* sp. n.**
http://zoobank.org/2F75551A-847F-41C0-A6A1-7ACBA408B37E
http://species-id.net/wiki/Oreophryne_cameroni
Figs 1, 2A, B

Holotype. BPBM 34677 (field tag FK 13704), adult male, collected by F. Kraus at Keki Lodge, Adelbert Mts., 4.7048°S, 145.4042°E, 850 m, Madang Province, Papua New Guinea, 1 October 2009.

Paratypes (n = 3). BPBM 34678, same data as holotype, except collected 4 October 2009; BPBM 22689, Siruohu, ~3 km SSE Mt. Sapau summit, Torricelli Mts., 3.3908°S, 142.5297°E, 550–700 m, West Sepik Province, Papua New Guinea; AMNH 78139, Mt. Nibo, 19 km NE Lumi, 700–1550 m, West Sepik Province, Papua New Guinea.

Diagnosis. *Oreophryne cameroni* can be distinguished from all congeners by its unique combination of small size (adult male SV = 19.5–20.4 mm); cartilaginous connection between the scapula and procoracoid; basal toe webbing; fifth toe longer than third; leg moderately long (TL/SV = 0.49–0.51); snout slightly shorter than broad (EN/IN = 0.94–0.95, IN/SV = 0.097–0.103); head relatively broad (HW/SV = 0.37–0.42); finger discs relatively narrow (3rdF/SV = 0.048–0.068); dorsum brown with scattered pustules, white flecks, and darker lateral blotches; venter heavily stippled with brown; dark-brown subocular blotch; dark-brown iris; and call a series of short peeps delivered at a rate of 2.8–2.9 notes/s with a dominant frequency of around 2900 Hz.

Comparisons with other species. The new species differs from all other Papuan *Oreophryne* except *O. idenburghensis*, *O. oviprotector* and *O. waira* in its unique combination of having a cartilaginous connection between the scapula and procoracoid and basal webbing between the toes. It is easily distinguished from *O. idenburghensis* by its much smaller size (SV = 19.5–20.4 mm vs. 43–47 mm in *O. idenburghensis*), longer leg (TL/SV = 0.49–0.51 vs. 0.42–0.44 in *O. idenburghensis*), broader head (HW/SV = 0.37–0.42 vs. 0.34–0.35 in *O. idenburghensis*), broader snout (EN/IN = 0.94–0.95 vs. 0.87–0.91 in *O. idenburghensis*, IN/SV = 0.097–0.103 vs. 0.076–0.081 in *O. idenburghensis*), and narrower finger discs (3rdF/SV = 0.048–0.068 vs. 0.077–0.091 in *O. idenburghensis*). It differs from *O. oviprotector* in its brown dorsal color with scattered white flecks (lime green, without flecks in *O. oviprotector*), dark-gray ventral coloration (pale translucent gray in *O. oviprotector*), dark-brown subocular blotch (absent in *O. oviprotector*), dark-brown iris (coppery brown around pupil and yellowish distally from pupil in *O. oviprotector*), absence of yellow inguinal and axillary blotches (present in *O. oviprotector*), absence of conspicuous green bar between eyes (present in *O. oviprotector*), absence of a white ring around eye (present in *O. oviprotector*), and call a series of peeps delivered at a rate of 2.8–2.9 notes/s (call a rattle delivered at a rate of 26–28 notes/s in *O. oviprotector*) and with each note of 71–134 ms duration (each note of approximately 12 ms duration in *O. oviprotector*). From *O. waira*, the new species differs

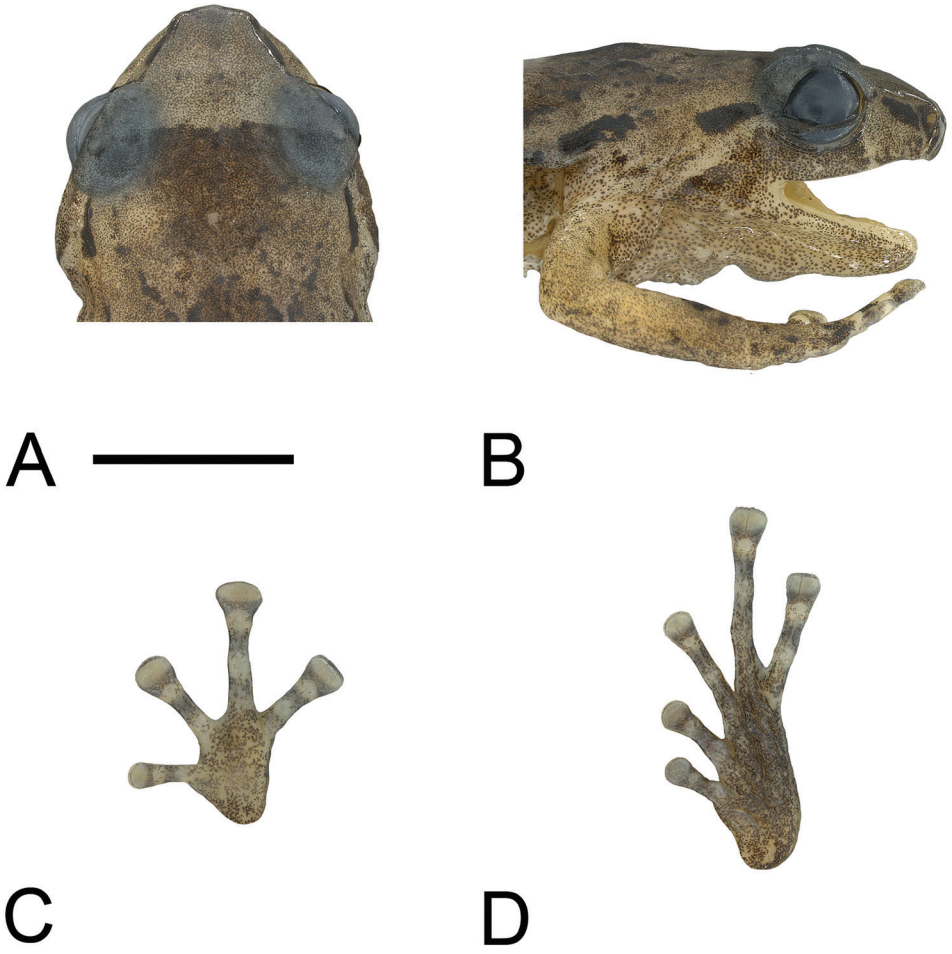

Figure 1. A Top of head **B** side of head **C** palmar view of left hand, and **D** plantar view of left foot of holotype of *Oreophryne cameroni* sp. n. (BPBM 34677). Scale bar = 5 mm.

in having the fifth toe longer than the third (subequal in *O. waira*), longer leg (TL/SV = 0.49–0.51 vs. 0.43–0.46 in *O. waira*), and call a series of peeps of around 2900 Hz and delivered at a rate of 2.8–2.9 notes/s (call a rattle of around 3600 Hz and delivered at a rate of 15–19 notes/s in *O. waira*).

Description of holotype. An adult male with an incision on right side and left pectoral region dissected. Procoracoid is connected to the scapula by a cartilaginous rod. Head wide (HW/SV = 0.42), with steep, almost vertical loreal region; upper lip inflated. Canthus rostralis rounded, straight when viewed from above (Fig. 1A). Nostrils directed laterally, much closer to tip of snout than to eyes. Internarial distance slightly wider than distance from naris to eye (EN/IN = 0.95, IN/SV = 0.101, EN/SV = 0.096). Snout slightly rounded when viewed from the side (Fig. 1B), shallowly angulate when viewed from above (Fig. 1A). Eyes moderately large (EY/SV = 0.14); eyelid

approximately two-thirds width of interorbital distance. Tympanum small (TY/SV = 0.045), but with a distinct annulus. Skin smooth above and below, except abdomen granular. Supratympanic fold absent. Fingers unwebbed, bearing discs with terminal grooves; relative lengths 3>4>2>1 (Fig. 1C). Finger discs approximately twice width of penultimate phalanges (3rdF/SV = 0.066). Subarticular tubercles low but distinct; inner metacarpal tubercle large, low, oval; outer not apparent. Toes with basal webbing between T2–T5, but absent between T1 and T2; bearing discs with terminal grooves; relative lengths 4>5>3>2>1 (Fig. 1D). Toe discs smaller than those of fingers (4thT/SV = 0.060, 3rdF/4thT = 1.10), somewhat less than twice width of penultimate phalanges. Subarticular tubercles low but distinct; inner metatarsal tubercle a narrow oval; outer not apparent. Hind legs moderately long (TL/SV = 0.51).

In preservative, dorsum dark tan, with a dark-brown smudge between the shoulders, flecked with dark brown dorsally and with a series of darker and larger dashes dorsolaterally extending from behind eye to mid-body. Ground color paler tan on snout and sides; pale region on snout sharply demarcated from darker body color along a front extending between eyes (Fig. 1A). Face pale tan, darker below eye, and with elongate dark-brown blotch on canthus (Fig. 1B). Dorsal surfaces of limbs medium brown; rear of thighs with small pale-straw patch of ground color proximally, distal three-fourths uniform medium brown; front of thighs uniformly medium brown. Ventral surfaces pale straw heavily and uniformly stippled with brown punctations throughout; plantar surfaces more densely stippled with brown. A vaguely defined dark-brown blotch present on each wrist, and a dark-brown ring or blotch present on each finger and toe, each followed distally by a pale-straw blotch at the junction of the last two phalanges. Iris dark brown.

Measurements of holotype (in mm). SV = 19.8, TL = 10.1, HW = 8.4, HL = 7.0, IN = 2.0, EN = 1.9, SN = 3.2, EY = 2.8, TY = 0.9, 3rdF = 1.30, 4thT = 1.18, mass = 0.7 g.

Variation. Mensural variation is limited (Table 1), as is to be expected from such a small sample. In life, animals have obvious scattered tubercles (Fig. 2A, B), but these become obscure in preservative. Color pattern shows somewhat more variation. The subadult male from the Torricelli Mts. (BPBM 22689) is similar to the holotype in color pattern except that the dorsum is somewhat darker brown, the brown blotch below the eye is more sharply delimited, and the venter is darker brown overall, with the brown punctations more aggregated and less uniformly dispersed than in the holotype. The second specimen from the Adelbert Mts. (BPBM 34678) is also darker dorsally and laterally than the holotype, and it has an irregular pale-straw stripe mid-dorsally that is broadened into one mid-dorsal pale-straw blotch midway along the back and another one in the sacral region. This pale stripe itself is intermittently bisected by a dark-brown vertebral line. In life, this broadening into blotches along the spine was not evident, and the bisecting brown line was continuous (Fig. 2A). The top of the snout in this specimen is also darker than that in the holotype, but the area between the eyes is pale. The venter is as seen in the holotype. The final specimen (AMNH 78139) also has a broad vertebral stripe on a dark-brown ground color; its venter too is like that seen in the holotype.

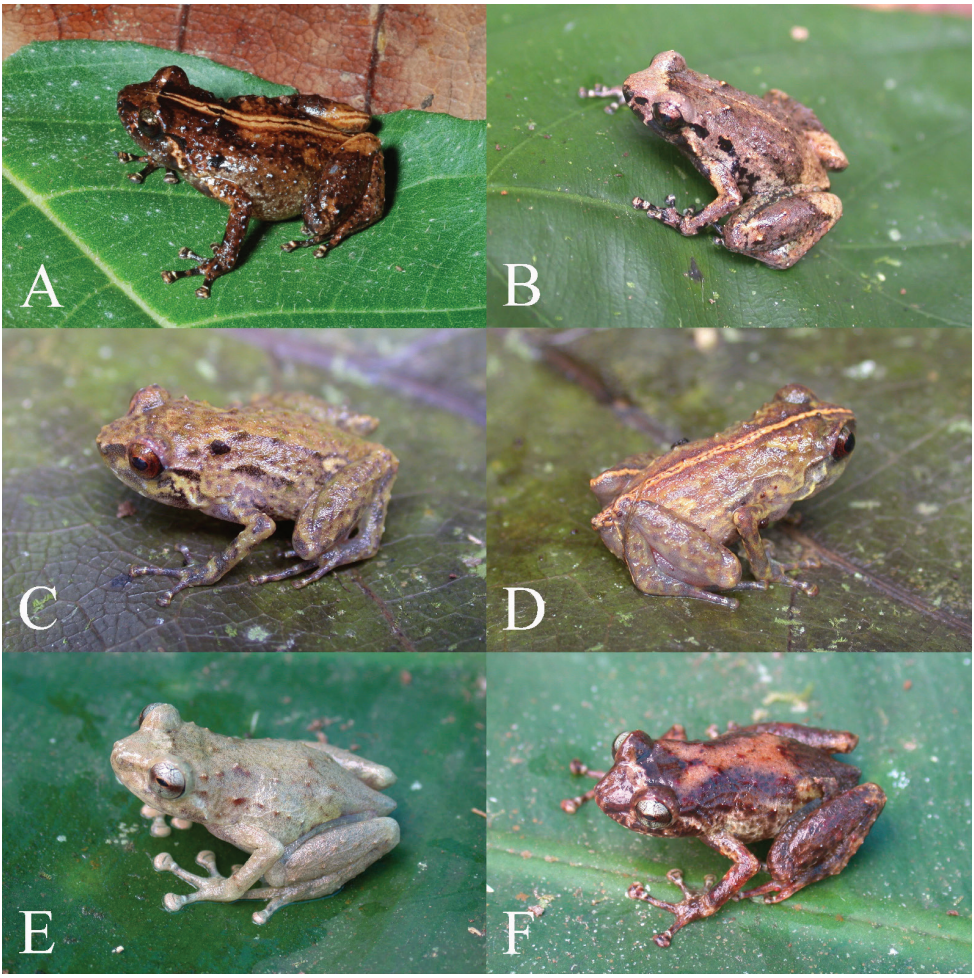

Figure 2. Portraits in life of **A** paratype of *Oreophryne cameroni* sp. n. (BPBM 34678) from Keki Lodge, Adelbert Mts., 850 m elevation **B** paratype of *Oreophryne cameroni* sp. n. (BPBM 22689) from Torricelli Mts., 550 m elevation **C** paratype of *Oreophryne parkopanorum* sp. n. (BPBM 22788) from near summit of Mt. Sapau, Torricelli Mts., 1100–1300 m elevation; and **D** holotype of *Oreophryne parkopanorum* sp. n. (BPBM 22789) from near summit of Mt. Sapau, Torricelli Mts., 1100–1300 m elevation **E** holotype of *Oreophryne gagneorum* sp. n. (BPBM 20542) from Rossel Island, 720 m elevation; and (F) paratype of *Oreophryne gagneorum* sp. n. (BPBM 20544) from Rossel Island, 720 m elevation.

Color in life. In life, BPBM 34678 was mottled dark brown on a burnt-orange ground dorsally, with the front and rear of thighs the same. An orange-tan vertebral stripe was bisected by a narrow brown vertebral line, the heels were paler than the remainder of the legs, a pale dash extended posteroventrally from the corner of the eye, and white flecks were scattered thoughout the lateral surfaces (Fig. 2A). The venter was pale yellow, heavily stippled with brown, and under the legs was the same. Iris was

Table 1. Mensural data for the type series of *Oreophryne cameroni* sp. n. All measurements except mass are in mm.

Character	BPBM 34677	BPBM 34678	BPBM 22689	AMNH 78139
Sex	M	M	subadult M	M
mass (g)	0.7	–	0.3	–
SV	19.8	20.4	15.6	19.5
TL	10.1	9.9	7.9	9.6
EN	1.9	2.0	1.5	1.8
IN	2.0	2.1	1.6	1.9
SN	3.2	3.1	2.4	2.6
TY	0.9	0.8	0.7	0.9
EY	2.8	2.7	2.1	2.7
HW	8.4	8.0	5.8	7.2
HL	7.0	7.0	5.3	6.4
3rd F	1.30	1.38	0.80	0.94
4th T	1.18	1.15	0.73	0.83
TL/SV	0.51	0.49	0.51	0.49
EN/SV	0.096	0.098	0.096	0.092
IN/SV	0.101	0.103	0.103	0.097
SN/SV	0.16	0.15	0.15	0.13
TY/SV	0.045	0.039	0.045	0.046
EY/SV	0.14	0.13	0.13	0.14
HW/SV	0.42	0.39	0.37	0.37
HL/SV	0.35	0.34	0.34	0.33
3rdF/SV	0.066	0.068	0.051	0.048
4thT/SV	0.060	0.056	0.047	0.043
EN/IN	0.95	0.95	0.94	0.95
3rd F/4th T	1.10	1.20	1.10	1.13
HL/HW	0.83	0.88	0.91	0.89

brown with a greenish cast on the upper half. The subadult animal from the Torricelli Mts. (BPBM 22689) had a paler ground color and greater contrast with the dark brown blotches (Fig. 2B). Field notes for that animal state: "Dorsum mottled tan and brown with black spots on face and sides. Venter light gray heavily flecked with black and silver-gray. Iris brown with upper edge tan."

Call. I could identify perches of only two calling animals; both called from hidden locations approximately 2.5–3.5 m above ground. I was able to record two calls from the holotype. The call is a short series of relatively rapid peeps.

Recorded calls comprised series of 8 and 27 peeps emitted at a rate of 2.64–2.75 notes/s; calls ranged from 2.74–9.55 s in duration (Table 2). Each note was brief, with a mean duration of 0.088 s (range 0.071–0.134 s). The interval between notes was approximately three times longer, averaging 0.280 s and ranging from 0.241–0.389 s. The first 1–3 notes in a series were longer than the remainder; as were the first inter-note intervals. In the second call, the terminal three inter-note intervals were also longer

Table 2. Data for two calls from the holotype of *Oreophryne cameroni* sp. n., BPBM 34677, recorded 1 October 2009, air temperature 23.0 °C. Numbers for call parameters are mean ± SD (range).

Call series	Number of notes	Call duration (s)	Note duration (s)	Inter-note duration (s)	Repetition rate (notes/s)	Dominant frequency (kHz)
a	8	2.74	0.101 ± 0.0051 (0.087–0.134)	0.278 ± 0.0091 (0.249–0.316)	2.64	2.906 ± 0.0065 (2.871–2.940)
b	27	9.55	0.084 ± 0.0025 (0.071–0.128)	0.281 ± 0.0071 (0.241–0.389)	2.75	2.900 ± 0.0032 (2.872–2.940)

than the preceding intervals. Hence, calls begin somewhat slowly, rapidly reach a regular pace, and may also slow down as they approach termination. There was approximately twice as much variation in inter-note duration than in note duration (Table 2). Notes may have a rounded amplitude envelope or may begin at maximum volume and decrease more or less monotonically, creating either a rounded or an approximately triangular amplitude envelope (Fig. 3A). Notes lack harmonic structure, pulsing, and frequency modulation (Fig. 3C). The dominant frequency of calls varied within a very narrow window (Fig. 3B), averaging 2901 Hz and ranging from 2871–2940 Hz.

Etymology. The name is an honorific for my friend H. Don Cameron, professor emeritus of classical studies at University of Michigan and provider of much etymological and grammatical advice on Greek and Latin over the years.

Range. Known from the Adelbert Mts., Madang Province, and the Torricelli Mts., West Sepik Province, Papua New Guinea at elevations of 550–850 m (Fig. 4, circles). The species will certainly be found at appropriate elevations in the intervening Prince Alexander Mts. and may, as well, occur in mountain ranges to the west.

Ecological notes. I collected the subadult male in primary lowland rainforest on a steep slope at 550 m elevation in the Torricelli Mts. Canopy was at approximately 30–35 m; understory was rather open and uncrowded; soil was greasy mud. I collected the two calling animals at 850 m in the Adelbert Mts. perched at night in trees approximately 2.5–3.5 m above the ground. These animals were the nearest to the ground that I heard; all others were calling from higher up in the trees. Forest at this site was a clearing edge in remnant primary rainforest on a ridgetop with gentle slopes and rather open understory; soil was thick, sticky clay.

Mature males were 19.5–20.4 mm SV, but one male was still immature at 15.6 mm SV.

Frogs syntopic with this species include *Albericus gudrunae*, *Austrochaperina basipalmata*, *A. blumi*, an undescribed *Austrochaperina*, *Callulops microtis*, *C. personatus*, *Choerophryne proboscidea*, *C. rostellifer*, *Cophixalus balbus*, *C. cheesmanae*, *C. pipilans*, *Copiula fistulans*, *C. tyleri*, *Hylarana arfaki*, *H. garritor*, *H. jimiensis*, *H. papua*, *H. volkerjane*, *Hylophorbus macrops*, *H. proekes*, two undescribed *Hylophorbus*, *Liophryne schlaginhaufeni*, *Litoria arfakiana*, *L. genimaculata*, *L. wollastoni*, *Oreophryne biroi*, *Mantophryne lateralis*, *Nyctimystes fluviatilis*, *N. pulcher*, *Platymantis papuensis*, *Sphenophryne cornuta*, *Xenorhina obesa*, *X. oxycephala*, and *X. tumulus*.

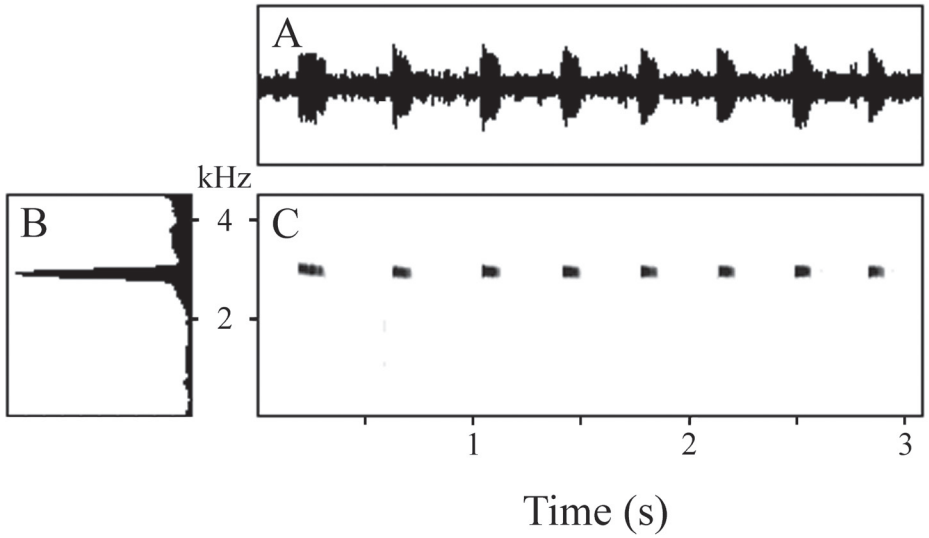

Figure 3. A Waveform **B** power spectrum, and **C** spectrogram of 8-note call of the holotype of *Oreophryne cameroni* sp. n. (BPBM 34677) recorded at Keki Lodge, Adelbert Mts., 1 October 2009, air temperature 23.0 °C.

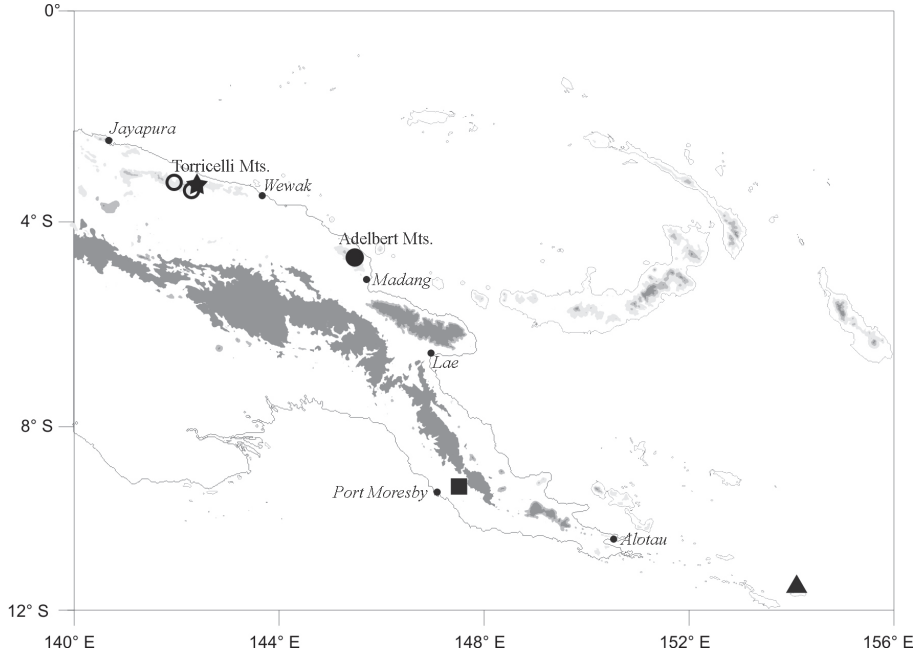

Figure 4. Map of eastern New Guinea showing type locality for *Oreophryne cameroni* sp. n. (filled circle), additional localities for *Oreophryne cameroni* sp. n. (open circles), type locality for *Oreophryne parkopanorum* sp. n. (star), and type locality for *Oreophryne gagneorum* sp. n. (triangle). The square shows the type locality for *Oreophryne kampen*i, the only previous member of the genus with a cartilaginous connection between the scapula and procoracoid known to occur in Papua New Guinea outside the Central Highlands.

Remarks. In their revision of *Oreophryne* species from the northern coast of New Guinea, Zweifel et al. (2003) pointed out that AMNH 78139 was problematic in its identification, not clearly fitting with the other species discussed. In assigning the specimen to this new species, that problem is resolved.

***Oreophryne parkopanorum* sp. n.**
http://zoobank.org/552EF19B-8CA3-4DD0-9271-DEB337E78FA9
http://species-id.net/wiki/Oreophryne_parkopanorum
Figs 2C, D, 5

Holotype. BPBM 22789 (field tag FK 11847), adult female, collected by F. Kraus 1.2 km S Mt. Sapau summit, Torricelli Mts., 3.3773°S, 142.5180°E, 1120–1320 m, West Sepik Province, Papua New Guinea, 27 May 2005.

Paratypes (n = 4). BPBM 22787–88, PNGNM 24152, same data as holotype; BPBM 22790, 1.6 km SSW Mt. Sapau summit, Torricelli Mts., 3.3807° S, 142.5155° E, 1050 m, West Sepik Province, Papua New Guinea.

Diagnosis. *Oreophryne parkopanorum* can be distinguished from all congeners by its unique combination of small size (adult male SV = 17.5–17.7 mm, adult female SV = 20.1 mm); cartilaginous connection between the scapula and procoracoid; unwebbed toes; third toe longer than fifth; leg moderately long (TL/SV = 0.45–0.51); head short (HL/SV = 0.35–0.36, HL/HW = 0.89–0.91), snout long and broad (EN/IN = 0.76–0.89, EN/SV = 0.085–0.097, IN/SV = 0.102–0.120); eye large (EY/SV = 0.14–0.15); finger and toe discs broad (3rdF/SV = 0.048–0.068, 4thT/SV = 0.044–0.053, 3rdF/4thT = 1.08–1.30); longitudinal rows of ridges or pustules on dorsum; dorsum paler mid-dorsally than dorsolaterally; and coppery-brown iris.

Comparisons with other species. The new species differs from all other Papuan *Oreophryne* except *O. alticola* and *O. habbemensis* in its unique combination of having a cartilaginous connection between the scapula and procoracoid, absence of toe webbing, and third toe longer than the fifth. *Oreophryne parkopanorum* differs from these species in its longer leg (TL/SV = 0.45–0.51 vs. 0.33–0.38 in *O. alticola* and *O. habbemensis*), longer and wider snout (EN/SV = 0.085–0.097 vs. 0.064–0.065 in *O. alticola*, 0.073–0.081 in *O. habbemensis*; IN/SV = 0.102–0.120 vs. 0.079–0.088 in *O. alticola*, 0.082–0.089 in *O. habbemensis*), larger eye (EY/SV = 0.14–0.15 vs. 0.10–0.13 in *O. alticola*, 0.12–0.13 in *O. habbemensis*), broader finger discs (3rdF/SV = 0.048–0.068 vs. 0.031–0.040 in *O. alticola*, 0.034–0.044 in *O. habbemensis*), and broader toe discs (4thT/SV = 0.044–0.053 vs. 0.026–0.033 in *O. alticola*, 0.034–0.038 in *O. habbemensis*).

Several other species also share with *O. parkopanorum* the combination of a cartilaginous connection between the scapula and procoracoid and absence of toe webbing. Of these, *Oreophryne anamiatoi*, *O. asplenicola*, *O. flava*, *O. graminus*, *O. notata*, *O. pseudasplenicola*, and *O. streiffeleri* are easily distinguished from *O. parkopanorum* in having the fifth toe obviously longer than the third. *Oreophryne brevicrus*, *O. clamata*, *O. geminus*, and *O. terrestris* are somewhat less distinct in this respect in having the

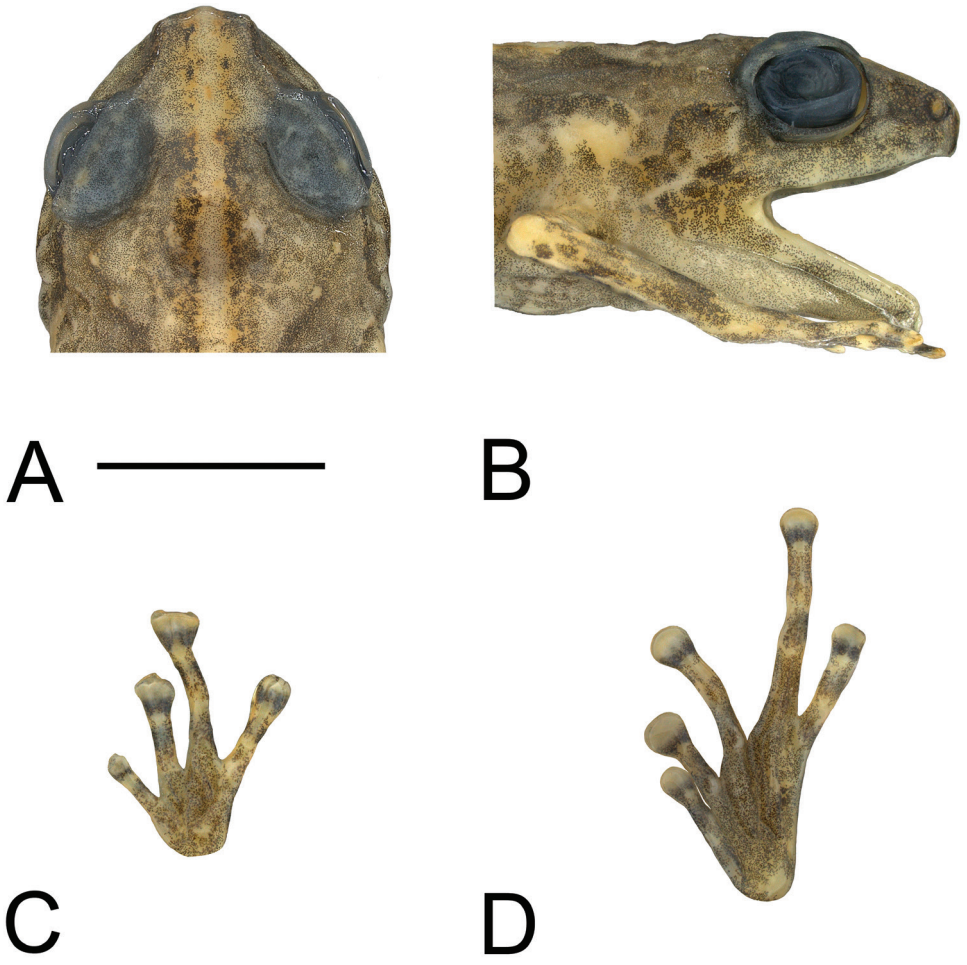

Figure 5. A Top of head **B** side of head **C** palmar view of left hand, and **D** plantar view of left foot of holotype of *Oreophryne parkopanorum* sp. n. (BPBM 22789). Scale bar = 5 mm.

third toe subequal to the fifth, instead of distinctly longer. Besides relative toe length, *Oreophryne parkopanorum* further differs from *O. clamata* in its broader snout (IN/SV = 0.102–0.120 vs. 0.091–0.103 in *O. clamata*), lesser relative size of finger discs to toe discs (3rdF/4thT = 1.08–1.30 vs. 1.50–1.63 in *O. clamata*), longer head (HL/SV = 0.35–0.36 vs. 0.28–0.30, HL/HW = 0.89–0.91 vs. 0.70–0.82 in *O. clamata*), and absence of a dark subocular blotch and black spots around arm insertion (both present in *O. clamata*).

O. brevicrus, *O. geminus*, and *O. terrestris* are all alpine species instead of mid-elevation forest dwellers. Beyond relative toe length, *O. parkopanorum* also differs from *O. brevicrus* in its longer leg (TL/SV = 0.45–0.51 vs. 0.36–0.42 in *O. brevicrus*), mid-dorsum paler than dorsolateral regions (mid-dorsum darker than dorsolateral regions in *O. brevicrus*), and venter with scattered large brown flecks (venter evenly stippled with brown in *O. brevicrus*); and it differs from *O. geminus* and *O. terrestris* in its longer leg

(TL/SV = 0.45–0.51 vs. 0.32–0.39 in *O. geminus*, 0.34–0.44 in *O. terrestris*), broader finger discs (3rdF/SV = 0.048–0.068 vs. 0.030–0.041 in *O. geminus*, 0.031–0.042 in *O. terrestris*), and broader toe discs (4thT/SV = 0.044–0.053 vs. 0.025–0.039 in *O. geminus*, 0.024–0.042 in *O. terrestris*).

Description of holotype. An adult female with lateral incision on right side and left pectoral region dissected. Head wide (HW/SV = 0.40), with steeply oblique, slightly concave loreal region; upper lip somewhat inflated. Canthus rostralis rounded, slightly concave when viewed from above (Fig. 5A). Nostrils directed laterally, closer to tip of snout than to eyes. Internarial distance wider than distance from naris to eye (EN/IN = 0.77, IN/SV = 0.109, EN/SV = 0.085). Snout truncate when viewed from the side (Fig. 5B), shallowly angulate when viewed from above (Fig. 5A). Eyes moderately large (EY/SV = 0.14); eyelid approximately two-thirds width of interorbital distance. Tympanum small (TY/SV = 0.050), with distinct annulus, partly covered by surrounding flesh dorsally, projecting ventrally. Dorsum with many raised ridges and series of tubercles, one paired series of tubercles forming an hourglass pattern from behind eyes to posterior of body, each line of warts constricting medially at shoulder and then diverging slightly laterally past this; sides tuberculate; ventral surfaces smooth anteriorly, granular on abdomen. Supratympanic fold absent; few tubercles posterior to tympanum. Fingers unwebbed, bearing discs with terminal grooves; relative lengths 3>4>2>1 (Fig. 5C). Finger discs slightly less than twice width of penultimate phalanges (3rdF/SV = 0.057), except for F1, which is only slightly wider than penultimate phalanx. Subarticular tubercles not obvious; inner metacarpal tubercle oval but low; outer not apparent. Toes unwebbed, bearing discs with terminal grooves; relative lengths 4>3>5>2>1 (Fig. 5D). Toe discs smaller than those of fingers (4thT/SV = 0.044, 3rdF/4thT = 1.32), somewhat less than 1.5 times width of penultimate phalanges on T4 and T5 but wider on T2 and T3. Subarticular tubercles very low or absent; inner metatarsal tubercle large, oval; outer absent. Hind legs moderately long (TL/SV = 0.50).

In preservative, dorsum with pale straw-yellow ground, heavily dusted with brown punctations, with areas having darker dusting and areas lacking dusting arrayed in rows. Pale straw-yellow vertebral stripe; pale straw-yellow blotch above each forearm insertion; pale straw-yellow triangle on top of snout (Fig. 5A). Series of darker-brown flecks dorsolaterally; dark-brown flecks widely scattered laterally; two dark-brown dashes behind eye, one largely superior to the tympanum, the other inferior to it and ending in a brown patch at rictus (Fig. 5B). Face irregularly dusted/mottled with brown, but not as dark as markings on body. Legs, including front and rear of thighs, pale straw yellow with scattered pale-brown flecks. Short, pale straw-yellow stripe on back surface of distal portion of shank and on heel. Irregular brown blotch dorsally on each wrist. Chin and throat evenly dusted with brown punctations except mid-ventrally on chin, where its absence forms a pale line, adjacent to which the brown dusting is more heavily concentrated; abdomen also heavily dusted with brown, but with more irregular distribution than on chin and throat. Palmar and plantar surfaces pale straw yellow evenly dusted with brown punctations. Iris dark brown.

Table 3. Mensural data for the type series of *Oreoprhyne parkopanorum* sp. n. All measurements except mass are in mm.

Character	BPBM 22787	BPBM 22788	BPBM 22789	BPBM 22790	PNGNM 24152
Sex	subadult M	M	F	M	M
mass (g)	0.35	0.60	0.80	0.55	–
SV	15.8	17.5	20.1	17.7	17.5
TL	8.3	9.0	10.0	8.0	8.7
EN	1.4	1.7	1.7	1.6	1.6
IN	1.8	1.9	2.2	1.8	2.1
SN	2.5	2.7	2.9	2.5	2.4
TY	0.7	0.8	1.0	0.8	0.8
EY	2.2	2.5	2.9	2.7	2.5
HW	6.3	7.1	8.0	6.9	7.0
HL	5.6	6.3	7.3	6.2	6.3
3rd F	0.78	0.90	1.14	0.85	1.14
4th T	0.70	0.79	0.88	0.79	0.93
TL/SV	0.53	0.51	0.50	0.45	0.50
EN/SV	0.089	0.097	0.085	0.090	0.091
IN/SV	0.114	0.109	0.109	0.102	0.120
SN/SV	0.16	0.15	0.14	0.14	0.14
TY/SV	0.044	0.046	0.050	0.045	0.046
EY/SV	0.14	0.14	0.14	0.15	0.14
HW/SV	0.40	0.41	0.40	0.39	0.40
HL/SV	0.35	0.36	0.36	0.35	0.36
3rdF/SV	0.049	0.051	0.057	0.048	0.065
4thT/SV	0.044	0.045	0.044	0.045	0.053
EN/IN	0.78	0.89	0.77	0.89	0.76
3rd F/4th T	1.11	1.14	1.30	1.08	1.23
HL/HW	0.89	0.89	0.91	0.90	0.90

Measurements of holotype (in mm).–SV = 20.1, TL = 10.0, HW = 8.0, HL = 7.3, IN = 2.2, EN = 1.7, SN = 2.9, EY = 2.9, TY = 1.0, 3rdF = 1.14, 4thT = 0.88, mass = 0.8 g.

Variation. The female is larger than the males and has a slightly larger tympanum and greater disparity in disc widths between the fingers and toes (Table 3). It remains to be determined from a larger sample size whether these represent instances of sexual dimorphism. Otherwise, there is little mensural variation of interest in the small sample.

Snout profile varies from truncate to shallowly angulate when viewed from the side, shallowly angulate to acutely rounded when viewed from above. The female holotype is more heavily tuberculate than the male paratypes, which typically have the hourglass-shaped rows of tubercles well-defined dorsolaterally and also have scattered tubercles on the lateral surfaces, as well as smaller pustules apparent elsewhere, especially posterior to the tympanum.

The holotype is the only specimen with a broad vertebral stripe and heel stripe (Fig. 2D), but two males (BPBM 22790 and PNGNM 24152) have narrower, inter-

mittent vertebral lines. All specimens have the mid-dorsal region paler than the sides, giving the impression of a paler hourglass-shaped region mid-dorsally. Most specimens are moderately heavily dusted with brown dorsally, as seen in the holotype, but the subadult male (BPBM 22787) is paler overall, with brown dusting less dense dorsally. This specimen also has two rows of dark-brown dashes laterally, extending from near forearm insertion to posterior third of body, the upper row at the level of the dark-brown supratympanic dash, the lower at the level of forearm insertion. BPBM 22790 also has these two rows of dark-brown lateral dashes well defined, but the other three specimens have brown flecking and spotting more irregularly distributed across the lateral surfaces. The snouts of all specimens are paler than the remainder of the head, but brown flecking occurs in this field in some specimens, thereby making the feature less obvious. The males all have an even dusting of brown punctations ventrally, as seen in the holotype, but also have large, darker-brown spots scattered across the ventrum, giving the impression of a pale venter with scattered large brown flecks; these spots are weaker in BPBM 22788 than in the other specimens. In the subadult male, these larger brown spots are arrayed more or less into two rows extending from the chin to the abdomen. None of the males has the pale, brown-bordered, mid-ventral line seen on the chin of the holotype.

Color in life. Field notes for BPBM 22787 note: "Dorsum light yellow brown with narrow dark-brown lines. Fore and aft of thigh and rear of shank orange-red. Venter pale straw with two rows of dark-gray flecks on chin and throat. Iris light brown." The holotype, BPBM 22789 (Fig. 2D) was similar but had a yellow stripe from chin to abdomen, another across the pectoral region, and an orange mid-dorsal stripe. Brown dorsolateral and postocular markings are more evident in some animals (Fig. 2C) than others (Fig. 2D). Animals are more orangish during the night and yellower during the day. The orange-red on the hidden surfaces of the thighs fades to pale straw in preservative.

Call. The call is uncertain. I heard two undetermined frog calls at the type locality that are consistent with *Oreophryne* species from the north-coast ranges. One of these was a rattle call, the other was a series of high-pitched peeps. But I could associate neither call with a particular frog, so the identities of both are undetermined. One of them almost certainly represents *O. parkopanorum*, but I cannot say which.

Etymology. The species name is a genetive plural honorific for the people of Parkop Village, whose unflagging help and friendliness made my expedition to the Torricelli Mts. successful and most pleasant.

Range. Known only from the upper elevations of Mt. Sapau, Torricelli Mts., West Sepik Province, Papua New Guinea at an elevation of 1050–1320 m (Fig. 4, star). It probably occurs in similar habitat elsewhere in the Torricelli Mts. and may occur in the upper elevations of other nearby north-coast ranges.

Ecological notes. This species inhabits primary mossy cloud forest at 1200–1300 m. We found our specimens active at night on moss-covered tree trunks from 6 cm to 2 m above ground. Forest in this area has a canopy of approximately 20 m height, many epiphytes, and a thick layer of leaf litter and duff.

Mature males were 17.5–17.7 mm in SV, but one male was still immature at 15.8 mm SV.

Syntopic frogs include *Albericus brunhildae*, *Austrochaperina septentrionalis*, *Choerophryne longirostris*, *C. rostellifer*, *Copiula tyleri*, *Hylarana jimiensis*, *H. volkerjane*, *Hylophorbus* sp., *Liophryne schlaginhaufeni*, *Litoria modica*, *L. wollastoni*, *Nyctimystes pulcher*, and *Xenorhina arboricola*.

***Oreophryne gagneorum* sp. n.**
http://zoobank.org/496AF6FA-988F-4805-B8A6-A0515CC8981E
http://species-id.net/wiki/Oreophryne_gagneorum
Figs 2E, F, 6

Holotype. BPBM 20542 (field tag FK 10121), adult female, collected by F. Kraus and local villagers on S slope of Mt. Rossel, 11.3555°S, 154.2246°E, 720 m, Rossel Island, Milne Bay Province, Papua New Guinea, 5 May 2004.

Paratypes (n = 52). Same data as holotype (BPBM 20538–41, 20543–57, PNGNM 24153–55); same data as holotype, except collected 3 May (BPBM 20531–37), 6 May (BPBM 20558–60, PNGNM 24156–60), 7 May (BPBM 20561–69), 8 May (BPBM 20570), 9 May (BPBM 20571), and 10 May (BPBM 20572) 2004; halfway between 11.3354°S, 154.2223°E and 11.3354°S, 154.2247°E, 275–280 m (BPBM 43075, PNGNM 24161).

Diagnosis. *Oreophryne gagneorum* can be distinguished from all congeners by its unique combination of small size (adult male SV = 16.3–20.0 mm, adult female SV = 19.0–23.5 mm); cartilaginous connection between the scapula and procoracoid; well-webbed toes; third and fifth toes subequal in length; steeply oblique lores; leg moderately long (TL/SV = 0.46–0.59); snout typically longer than broad (EN/IN = 1.00–1.33, EN/SV = 0.093–0.121, IN/SV = 0.080–0.109); head relatively broad (HW/SV = 0.36–0.43, HL/HW = 0.82–0.92); tympanum small (TY/SV = 0.034–0.051); finger and toe discs relatively broad (3rdF/SV = 0.063–0.086, 4thT/SV = 0.048–0.066, 3rdF/4thT = 1.18–1.47); shanks either unicolor or flecked/mottled with dark brown; pale-tan iris suffused or veined with black; and call a rapid series of short notes (23–190 ms) delivered at a rate of 9.57–11.32 notes/s with a dominant frequency of 3070–3510 Hz.

Comparisons with other species. The new species differs from all other Papuan *Oreophryne* except *O. crucifer* and *O. kampeni* in its unique combination of having a cartilaginous connection between the scapula and procoracoid and having well-webbed toes. *Oreophryne gagneorum* differs from *O. crucifer* in its longer leg (TL/SV = 0.46–0.59 vs. 0.45 in *O. crucifer*), longer snout (EN/SV = 0.093–0.121 vs. 0.092 in *O. crucifer*), shorter head (HL/HW = 0.82–0.92 vs. 0.78 in *O. crucifer*), smaller tympanum (TY/SV = 0.034–0.051 vs. 0.054 in *O. crucifer*), relatively wider finger discs (3rdF/4thT = 1.18–1.47 vs. 1.13 in *O. crucifer*), fourth finger longer than the second (second longer than fourth in *O. crucifer*), and absence of a golden-yellow bar between the eyes. It differs

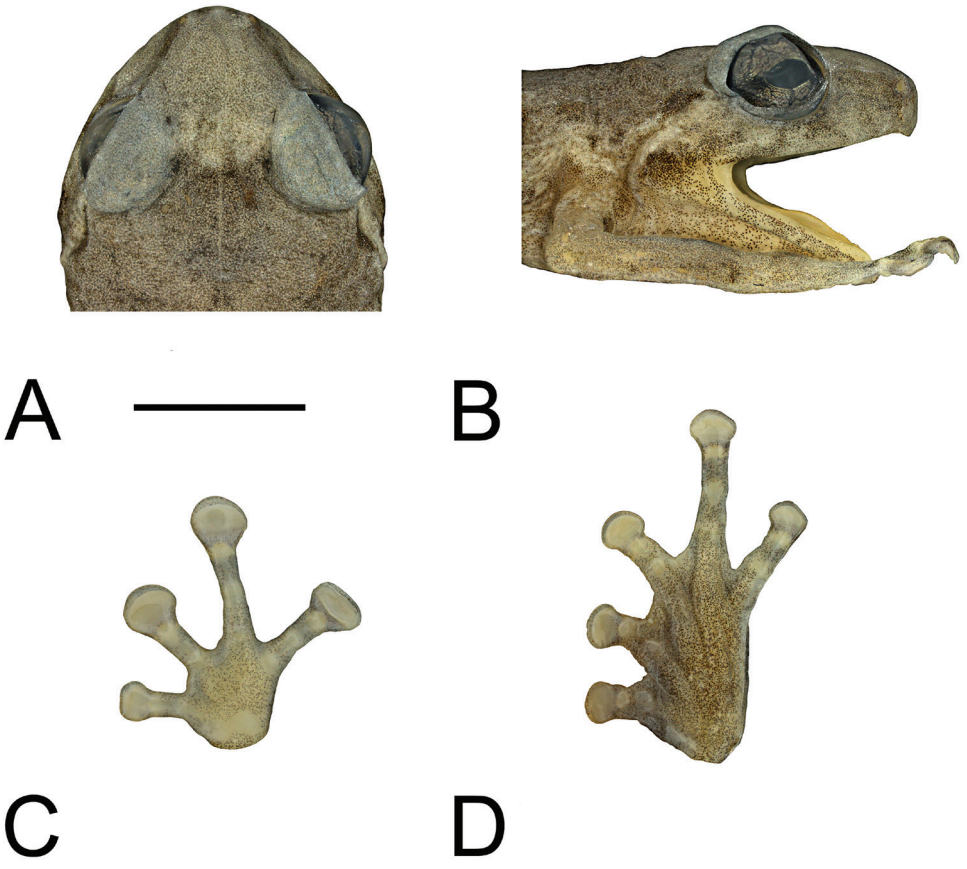

Figure 6. A Top of head **B** side of head **C** palmar view of left hand, and **D** plantar view of left foot of holotype of *Oreophryne gagneorum* sp. n. (BPBM 20542). Scale bar = 5 mm.

from *O. kampeni* in having the third and fifth toes subequal in length (third distinctly longer in *O. kampeni*), more oblique loreal region (lores almost vertical in *O. kampeni*), usually longer leg (TL/SV = 0.46–0.59 vs. 0.44–0.47 in *O. kampeni*) and longer snout (EN/IN = 1.00–1.33 vs. 0.094–1.05 in *O. kampeni*), larger toe discs (4thT/SV = 0.048–0.066 vs. 0.042–0.048 in *O. kampeni*), and the shanks without brown spots (shanks conspicuously patterned with round dark-brown spots in *O. kampeni*).

Oreophryne cameroni, *O. idenburghensis*, *O. oviprotector*, and *O. waira* also have a cartilaginous connection between the scapula and procoracoid and webbing between the toes, but they differ from *O. gagneorum* in having basal instead of extensive toe webbing. Furthermore, *O. cameroni* has the fifth toe distinctly longer than the third, a shorter snout (EN/IN = 0.94–0.95 vs. 1.00–1.3 in *O. gagneorum*), dark-brown iris, and call consisting of more slowly delivered notes (2.64–2.75 notes/s vs. 9.57–11.32 notes/s in *O. gagneorum*) of lower dominant frequeny (2870–2940 Hz vs. 3070–3510 Hz in *O. gagneorum*). *O. idenburghensis* is a much larger species (SV = 43–47 mm vs. 16.3–23.5 mm in *O. gagneorum*), with the fifth toe distinctly longer than the third,

and with a broader snout (EN/IN = 0.087–0.091 vs. 1.00–1.33 in *O. gagneorum*); *O. oviprotector* has the fifth toe distinctly longer than the third, is lime green dorsally with a green bar between the eyes and a white ring around the orbit, and has a rattle call; and *O. waira* is a slightly smaller species (SV = 17.8–21.0 mm vs. 16.3–23.5 mm in *O. gagneorum*) with a rattle call (vs. a high-pitched whinny in *O. gagneorum*) and a shorter snout (EN/IN = 0.094–0.105 vs. 1.00–1.33 in *O. gagneorum*). All other Papuan *Oreophryne* have either a ligamentous connection between the scapula and procoracoid, lack toe webbing entirely, or both.

Description of holotype. An adult female with an incision on right side and left pectoral region dissected. Procoracoid connected to the scapula by a narrow cartilaginous rod. Head wide (HW/SV = 0.40), with steeply oblique loreal region; upper lip inflated. Canthus rostralis rounded, straight when viewed from above (Fig. 6A). Nostrils directed laterally, much closer to tip of snout than to eyes. Internarial distance slightly wider than distance from naris to eye (EN/IN = 1.25, IN/SV = 0.085, EN/SV = 0.106). Snout truncate when viewed from the side (Fig. 6B), shallowly angulate when viewed from above (Fig. 6A). Eyes moderately large (EY/SV = 0.14); eyelid approximately two-thirds width of interorbital distance. Tympanum small (TY/SV = 0.034), but with a distinct annulus, partly covered by skin posterodorsally. Weak supratympanic fold present; another weak fold extends posteroventrally from rear margin of tympanum. Skin smooth above and below, except abdomen granular. Fingers unwebbed, bearing discs with terminal grooves; relative lengths 3>4>2>1 (Fig. 6C). Finger discs approximately twice width of penultimate phalanges except for F1, which is approximately 1.5 times as wide as penultimate phalanx (3rdF/SV = 0.074). Subarticular tubercles low but distinct; inner metacarpal tubercle a large, low oval; outer a low circle. Toes well webbed, formula **I** 2–2 **II** 2.7–3.6 **III** 3–4.5 **IV** 4.7–3.6 **V**; bearing discs with terminal grooves; relative lengths 4>5=3>2>1 (Fig. 6D). Toe discs smaller than those of fingers (4thT/SV = 0.060, 3rdF/4thT = 1.24), approximately 1.5 times width of penultimate phalanges. Subarticular tubercles low but distinct; inner metatarsal tubercle a narrow oval; outer not apparent. Hind legs rather long (TL/SV = 0.49).

In preservative, dorsum pale tan minutely speckled with brown, with a narrow, partially obscured tan vertebral line; limbs, including rear of thighs, same color as dorsum. Pale patch of lighter tan extends between eyes, narrowly margined posteriorly by dark brown. Short pale-cream dash extends from behind eye, through tympanum, to end near forearm insertion; this is bordered above and below by small, diffuse fields of brown. Lateral and ventrolateral surfaces suffused with pale cream. Venter pale straw yellow minutely stippled with brown, this more concentrated on chin and throat, somewhat sparser posteriorly; under limbs, hands, and feet stippled likewise. Sparse brown canthal stripe and subocular blotch present. Iris pale tan veined with black, which is especially concentrated in a horizontal plane before and behind the pupil.

Measurements of holotype (in mm). SV = 23.5, TL = 11.6, HW = 9.5, HL = 8.3, IN = 2.0, EN = 2.5, SN = 3.5, EY = 3.2, TY = 0.8, 3rdF = 1.73, 4thT = 1.40, mass = 1.20 g.

Variation. The only apparent sexual dimorphism in this species is in size; females are larger than males in both mass and SV (Table 4). Otherwise, standard deviation of

Table 4. Mensural variation among adults of *Oreophryne gagneorum* sp. n. Measurements are in mm, except for mass (g).

Character	Males (n = 35)			Females (n = 14)		
	mean	SD	range	mean	SD	range
mass	0.61	0.0168	0.40–0.85	0.86	0.0412	0.65–1.20
SV	18.5	0.1790	16.3–20.0	20.5	0.3410	19.0–23.5
TL	9.5	0.0754	8.5–10.5	10.6	0.1626	9.9–11.7
EN	2.0	0.0189	1.8–2.2	2.2	0.0359	2.0–2.5
IN	1.8	0.0185	1.5–1.9	1.9	0.0277	1.8–2.1
SN	2.9	0.0234	2.5–3.2	3.2	0.0633	2.8–3.5
TY	0.8	0.0134	0.6–0.9	0.9	0.0334	0.7–1.1
EY	2.6	0.0346	2.2–3.0	2.8	0.0518	2.5–3.2
HW	7.4	0.0825	6.5–8.2	8.2	0.1482	7.6–9.5
HL	6.5	0.0577	5.8–7.1	7.3	0.1475	6.6–8.3
3rd F	1.34	0.0187	1.13–1.56	1.52	0.0479	1.26–1.84
4th T	1.03	0.0146	0.86–1.23	1.15	0.0364	0.94–1.41
TL/SV	0.51	0.0049	0.46–0.59	0.52	0.0044	0.49–0.54
EN/SV	0.106	0.0008	0.093–0.117	0.105	0.0009	0.097–0.111
IN/SV	0.095	0.0009	0.80–0.104	0.093	0.0010	0.085–0.098
SN/SV	0.16	0.0013	0.14–0.17	0.15	0.0019	0.14–0.17
TY/SV	0.042	0.0007	0.035–0.051	0.043	0.0015	0.034–0.051
EY/SV	0.14	0.0013	0.12–0.16	0.14	0.0016	0.13–0.15
HW/SV	0.40	0.0026	0.36–0.43	0.40	0.0022	0.38–0.41
HL/SV	0.35	0.0018	0.32–0.37	0.36	0.0023	0.35–0.37
3rdF/SV	0.072	0.0007	0.065–0.082	0.074	0.0016	0.063–0.086
4thT/SV	0.055	0.0007	0.049–0.065	0.056	0.0011	0.048–0.066
EN/IN	1.12	0.0129	1.00–1.33	1.13	0.0162	1.00–1.25
3rd F/4th T	1.31	0.0122	1.18–1.47	1.33	0.0200	1.20–1.43
HL/HW	0.87	0.0044	0.82–0.92	0.89	0.0056	0.85–0.91

variables largely accords with the size of the mensural character, and variation across most variables is tight (Table 4). The snout shape varies from truncate to slightly rounded in lateral view and from shallowly angulate to slightly rounded in dorsal view. The tympanum is usually partially embedded in the surrounding skin, giving the impression that it sits in a depression. Webbing between the toes is always well developed, as in the holotype, and never merely basal. In life, animals have obvious scattered tubercles (Fig. 2E, F), but these become obscure in preservative.

This species presents a diverse array of color patterns in brown and gray. The dorsum varies from pale tan to dark brown, and may be uniform in pattern but more often with ill-defined dark smudges or suffusions of dark color that frequently form a vague, paler hourglass pattern mid-dorsally and/or a poorly defined, dark scapular W. Occasionally, there will be a large orange-tan blotch mid-dorsally, usually on the posterior half of the dorsum; there are also orange-tan blotches on the heels of two specimens. The pale cream or tan postocular dash is always present and extends through the tym-

panum; this is invariably bordered above by a dark-brown dash followed by a brief hiatus and another short brown dash over the forearm insertion. There is typically a diffuse dark-brown field below the cream postocular stripe; occasionally this is better developed into another brown dash or blotch. The dark-brown canthal stripe and subocular blotch may be present, absent, or only vaguely suggested. Top of the snout is often, but not always, paler than the remainder of the dorsum; there is often either a dark-brown or pale-tan bar extending between the eyes, but these too are variably present. A narrow, pale-tan vertebral line is present in 25 of the specimens; this is often broken or developed only anteriorly. Lumbar ocelli are almost always absent and are poorly developed in the few specimens in which they occur. Ventral ground color is typically pale straw yellow with the overlying dark pigment varying from minute and evenly distributed stippling to dense evenly distributed stippling to dense, aggregated dark stippling. Consequently, the impression of ventral coloration to the naked eye varies from evenly pale brown to evenly dark brown to pale brown with dark-brown flecks. Four specimens have poorly defined, pale-straw lines mid-ventrally on the chin and throat, and another four have pale-gray flecks scattered across the belly. Iris color is always pale tan either suffused or veined with black, this is usually concentrated in a horizontal plane before and behind the pupil.

Color in life. Field notes for BPBM 20531 in life recorded the color as: "Dorsum brown with darker brown mottling and tan stripe laterally, below which is dark brown. Iris tan. Tan postocular stripe. Venter pale gray stippled with dark gray. Rear of thighs dark brown." BPBM 20532 was dark tan dorsally with a few dark-brown spots; the rear of thighs were the same as the dorsum. BPBM 20533 was also brown dorsally with vague brown markings, a pale tan postocular stripe, and a small amount of yellow in the groin. The rear of the thighs were brown with a few light-gray stipples. Chin to chest was dark gray with light-gray flecks, and the abdomen and undersides of the legs were light gray heavily flecked with dark gray. BPBM 20534 had a tan vertebral stripe and a dusky red patch in groin and front and rear of thighs. BPBM 20535 was chocolate brown dorsally with a cream postocular stripe, yellow in the inguinal region, and dusky brick red in groin and hidden surfaces of thighs. The holotype was pale tan-gray in life with a few, scattered red-brown spots (Fig. 2E); BPBM 20544 was dark brown with an orangish hourglass-shaped figure mid-dorsally, white-tipped tubercles, tan inter-ocular bar, and cream on the sides (Fig. 2F). Both of these animals exhibited silver irises with a reddish-brown horizontal bar through the pupil.

Call. This species was the predominant frog calling around the summit of Mt. Rossel. I recorded 14 calls from six animals, and calls segregated into two types: a long and a short call (Table 5). The former was the most commonly produced call, with the shorter call being produced more frequently when conditions were drier. Note-delivery rate of both call types is so rapid that to the human ear calls sounds like a high-pitched whinny.

The more commonly delivered, long calls (n = 8) ranged from 1.98–2.92 s in duration and consisted of a series of 21–31 notes emitted at a rate of 10.30–11.02 notes/s (Table 5). The first note of each call was much longer than the remainder

Table 5. Call data for six specimens of *Oreophryne gagneorum* sp. n. from Rossel Island, Milne Bay Province, PNG. Numbers for call parameters are mean ± SD (range).

Specimen	Call type	Temperature (°C)	Number of calls	Call duration (s)	Notes/ call	Note duration (s)	Inter-note duration (s)	Repetition rate (notes/s)	Dominant frequency (kHz)
BPBM 20558	long	22.8	3	2.20 ± 0.1106 (1.98–2.33)	21–24	0.045 ± 0.0028 (0.033–0.157)	0.052 ± 0.0012 (0.032–0.082)	10.46 ± 0.0887 (10.30–10.61)	3.38 ± 0.0062 (3.26–3.51)
BPBM 20559	long	22.8	2	2.20 ± 0.0650 (2.13–2.26)	23–24	0.036 ± 0.0043 (0.028–0.190)	0.060 ± 0.0010 (0.051–0.078)	10.71 ± 0.0893 (10.62–10.80)	3.32 ± 0.0059 (3.19–3.37)
BPBM 20560	long	22.8	1	2.92	31	0.037 ± 0.0045 (0.023–0.170)	0.060 ± 0.0018 (0.036–0.079)	10.62	3.38 ± 0.0100 (3.23–3.47)
BPBM 20571	long	22.2	2	2.45 ± 0.0900 (2.36–2.54)	26–28	0.050 ± 0.0036 (0.041–0.182)	0.041 ± 0.0014 (0.029–0.067)	11.02 ± 0.0033 (11.02–11.02)	3.27 ± 0.0054 (3.21–3.31)
BPBM 20538	short	22.6	4	0.93 ± 0.0263 (0.85–0.96)	9–10	0.059 ± 0.0023 (0.047–0.105)	0.038 ± 0.0005 (0.032–0.044)	10.25 ± 0.2285 (9.57–10.59)	3.12 ± 0.0045 (3.07–3.18)
BPBM 20572	short	22.1	2	1.03 ± 0.0350 (0.99–1.06)	11–12	0.058 ± 0.0033 (0.046–0.112)	0.036 ± 0.0011 (0.026–0.043)	11.22 ± 0.1048 (11.11–11.32)	3.46 ± 0.0104 (3.30–3.50)

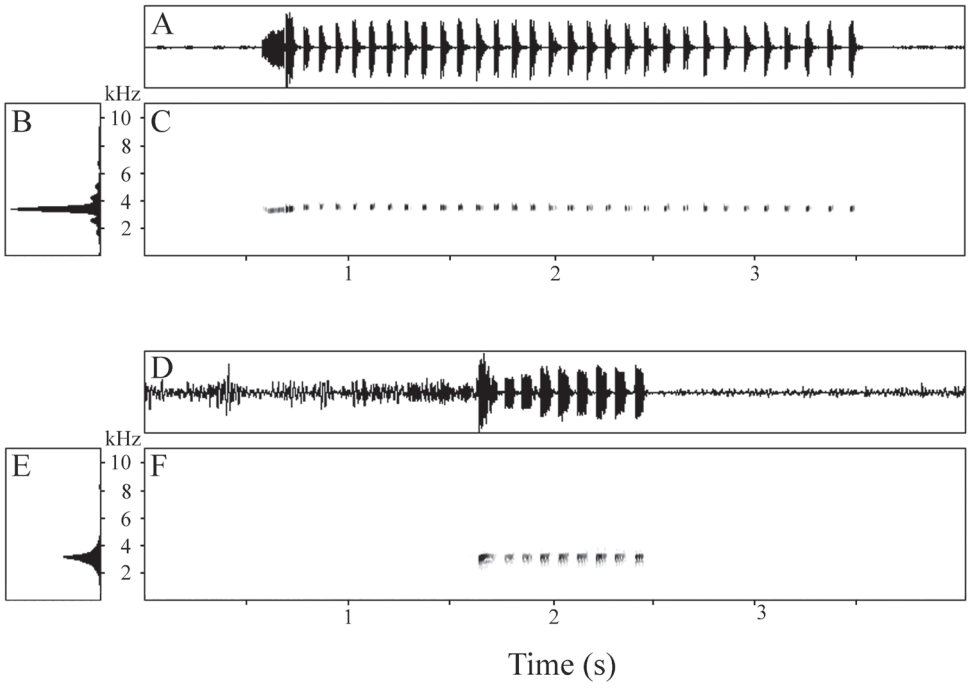

Figure 7. A Waveform **B** power spectrum, and **C** spectrogram of 31-note long call of paratype of *Oreophryne gagneorum* sp. n. (BPBM 20560) recorded on Mt. Rossel, Rossel Island, 6 May 2004, air temperature 22.8 °C, and **D** waveform **E** power spectrum, and **F** spectrogram of 9-note short call of paratype of *Oreophryne gagneorum* sp. n. (BPBM 20538), recorded on Mt. Rossel, Rossel Island, 5 May 2004, air temperature 22.6 °C.

(Fig. 7A), being 143–190 ms in length (mean 167 ms); subsequent notes were much briefer, with a mean of means of 37 ms (range 23–56 ms). The interval between notes was somewhat longer than the notes themselves, with a mean of means of 53 ms and range of 29–82 ms. The first note had a rounded amplitude envelope initially, followed by a short, sharp drop in volume, quickly succeeded by a large terminal spike (Fig. 7A); subsequent notes attained maximum volume rapidly and then decreased at an increasing rate, resulting usually in a concavely triangular amplitude envelope (Fig. 7A). Notes lacked harmonics, pulsing, and frequency modulation (Fig. 7C). The dominant frequency of calls varied within a very narrow window (Fig. 7B), with a mean of means of 3337 Hz and range of 3212–3514 Hz.

The less-frequently delivered short calls (n = 6) contained only 9–12 notes but were emitted at a rate similar to that found in the longer calls (9.57–11.32 notes/s); calls ranged from 0.85–1.06 s in duration (Table 5). Notes of these calls were not so internally divergent in length as those in the long calls. For each call, the first note was only approximately twice the length of the remainder (Fig. 7D), being 92–112 ms in length (mean 102 ms), compared to a mean of means of 54 ms (range 46–62

ms) for subsequent notes (Table 5). The interval between notes was shorter than in the long calls, with a mean of means of 37 ms and range of 26–44 ms. Hence, the length difference between notes and inter-note intervals was not as great as seen in the long calls. The first note attained maximum volume rapidly, decreased rapidly to a lower amplitude, and then maintained that until the end of the note (Fig. 7D); subsequent notes also increased to maximum amplitude quickly, maintained that volume rather evenly, and then decreased quickly to termination, producing an approximately square-shaped amplitude envelope (Fig. 7D). Notes lacked harmonics, pulsing, and frequency modulation (Fig. 7F). The dominant frequency of calls varied within a very narrow window (Fig. 7E), with a mean of means of 3289 Hz and range of 3068–3497 Hz.

Etymology. The name is an honorific for Betsy and Wayne Gagné, dedicated and inspiring conservationists of Pacific island biotas and among the few western researchers to visit Mt. Rossel, being members of the 1979 Lae Forestry Institute botanical expedition to that mountain.

Range. Endemic to Rossel Island, Milne Bay Province, PNG. It was very common along the upper elevations of Mt. Rossel at 720–750 m elevation, but I found it to occur as low as 280 m elevation.

Ecological notes. The type locality consists of dense cloud forest on a steep ridge on the south slope of Mt. Rossel. Forest here is approximately 5–10 m high, and large gingers and tree ferns are common. Even when rainfall is absent moisture at this site is largely constant due to fog drip from clouds blowing over the ridge. Soil consists of mud on the slopes but with pockets of humus, especially along the ridge. The region is subject to major landslides, with a large landslide extending from just below the type locality to the bottom of an adjacent valley at approximately 250 m elevation. Animals were abundant at the type locality. They also occured less commonly in tall, lowland secondary forest growing at 280 m on clay mud and scree slides. In this area the undergrowth was not dense, and palms, pandanus, and ferns were common.

Frogs called from late afternoon through early morning at the type locality; calling perches were typically stems or leaves from 1–4 m above ground. Frogs typically emitted the longer advertisement calls when conditions were wet. In those circumstances they were not shy and were easily captured. Under drier conditions, the frogs gave slower calls at more erratic intervals, and they often called from hidden perches. Calls in the population would often move in a wave of chorusing activity across the mountain.

The smallest mature male was 16.3 mm SV, and it was recorded calling, but another male at 16.5 mm SV was not yet mature. The smallest mature female had a SV of 19.0 mm; two immature females were 17.0 and 17.4 mm long. Hence, males mature at a smaller size than do females.

The frog community on Rossel Island is rather depauperate; syntopic frogs include only *Austrochaperina yelaensis*, *Barygenys exsul*, *Cophixalus cupricarenus*, *C. kethuk*, an undescribed *Copiula*, *Litoria eschata*, *L. louisiadensis*, *Mantophryne louisiadensis*, *Nyctimystes perimetri*, and an undescribed *Oreophryne*.

Discussion

The outlying mountain ranges that occur along the northern coast of New Guinea are derived from a series of offshore island arcs that have been sequentially accreted onto the New Guinea mainland in a west-to-east progression over the past 20 million years (Davies et al. 1997; Davies 2012). This region in composite may be referred to as the Northern Island-Arc Terranes (Pigram and Symonds 1991) and is separate in origin from the adjacent Vogelkop Composite Terrane (the "bird's-head" region of New Guinea) to the west, which was sutured to New Guinea approximately 12 MYA (Pigram and Symonds 1991; Polhemus and Polhemus 1998). Although currently remaining as offshore islands, Yapen and Biak islands in the west and New Britain in the east are parts of the same Northern Island-Arc Terranes system (cf., map in Polhemus and Polhemus 1998); they just haven't accreted to the mainland yet.

Seven species of *Oreophryne* are now known from the mainland north-coast ranges of the Northern Island-Arc Terranes: *O. biroi*, *O. cameroni*, *O. geislerorum*, *O. hypsiops*, *O. parkeri*, *O. parkopanorum*, and *O. wolterstorffi* (Zweifel et al. 2003; this study). On geologically allied offshore terranes, *O. brachypus* is restricted to New Britain (Zweifel et al. 2003), *O. kapisa* to Biak Island (Günther 2003b), and *O. asplenicola*, *O. pseudasplenicola*, and *O. waira* to Yapen Island (Günther 2003b). In the eastern portion of the Vogelkop Composite Terrane – immediately adjacent to the Northern Island-Arc Terranes but geologically independent of them – *O. atrigularis*, *O. clamata*, *O. sibilans*, and *O. unicolor* are known from the Wandammen Peninsula (Günther et al. 2001; Günther 2003a). As yet, none of the species described from the Northern Island-Arc Terranes system has been reported in the Vogelkop Composite Terrane, or vice versa.

As a biogeographically related community, the species of the Northern Island-Arc Terranes show interesting patterns of phenotypic variation in a few characters that may be useful in indicating phylogenetic relationships among them. Of the mainland species, *O. cameroni* and *O. parkopanorum* are the only north-coast species to have a cartilaginous connection between the procoracoid and scapula, a situation shared only with the three species endemic to Yapen Island in the west. However, one would expect additional species with this feature to surface once the large expanses of intervening terrain in Indonesian New Guinea are better surveyed. Most other Papuan *Oreophryne* with a cartilaginous connection occupy portions of the central cordillera, although *O. clamata* is known from the eastern portion of the Vogelkop Composite Terrane, *O. kampeni* is known only from the type locality near Port Moresby and *O. gagneorum* is restricted to Rossel Island. These latter two locations are part of the East Papuan Composite Terrane that comprises southeastern New Guinea and adjacent islands. The remaining species of the Northern Island-Arc Terranes and of the East Papuan Composite Terrane, whether occurring insularly or on the mainland, all have a ligamentous connection between these pectoral elements. As a hypothesis for future testing, it will be interesting to determine whether these *Oreophryne* from Yapen Island are in fact closely related to the two species described herein or whether they have independently acquired this pectoral feature. The preliminary phylogenetic tree for

western *Oreophryne* obtained by Köhler and Günther (2008) suggests that the latter may be the case.

Similarly interesting is that all *Oreophryne* from the Northern Island-Arc Terranes for which data are available exhibit one of only two call types: either a series of unpulsed peeps or a pulsed rattle. The calls of *O. asplenicola*, *O. cameroni*, *O. hypsiops*, *O. parkeri*, and *O. pseudasplenicola* are a series of peeps; those of *O. biroi*, *O. brachypus*, *O. geislerorum*, *O. kapisa*, and *O. waira* are rattles. The calls of *O. parkopanorum* and *O. wolterstorffi* remain unknown. This pattern also holds true for the *Oreophryne* of the Vogelkop Composite Terrane: the calls of *O. sibilans* and *O. unicolor* are peeps, those of *O. atrigularis*, and *O. clamata* are rattles. Both call types also occur among *Oreophryne* species in the central cordillera, but call types there are more diverse and include calls not easily placed in either of the preceding two categories (Zweifel et al. 2005; Kraus and Allison 2009a). More interesting is that most *Oreophryne* species from the East Papuan Composite Terrane have calls that represent two additional call types: either the high-pitched, rapid whinny found in *O. gagneorum* and a number of other, current undescribed, species, or a short honk (F. Kraus, unpubl. data), although additional call types that do not fit into these primary groups also occur (Menzies 2006; Kraus and Allison 2009b; F. Kraus, unpubl. data). In no case have I encountered *Oreophryne* species in this region having peep calls, but *O. geislerorum* and at least one undescribed species from this region have rattle calls. It is perhaps informative of phylogenetic history that some of these diverse call types (e.g., peep call, whinny call, honk call) should be exclusive to areas of New Guinea having very different geological histories. It remains to be determined whether call types will provide a better indicator of phylogenetic propinquity than several of the morphological features used for species discrimination. Because most of the species from southeastern New Guinea remain undescribed, I will explore this issue in greater detail upon their description.

In contrast to these characters, variation in toe webbing and relative length of third and fifth toes does not appear to divide into geographically discrete patterns. Species without toe webbing are largely, but not entirely, confined to the central cordillera and islands to the west, whereas those with either basal webbing or well-webbed toes are found throughout the region. And all variants in relative toe length are found throughout the region. Given that most *Oreophryne* species seem to have narrowly circumscribed geographic ranges suggestive of limited dispersal ability, the distribution patterns of these phenotypic features are consistent with independent origins of each character state.

Although the description of the new species treated herein now brings to seven the number of *Oreophryne* species reported from the north-coast region of New Guinea, the presence from these areas of additional specimens of uncertain identity (Zweifel et al. 2003) suggests that additional species likely await description. Furthermore, the large expanse of unexplored north-coast mountains in adjacent Papua Province of Indonesia will certainly disclose new species once they become more thoroughly investigated. Similarly, the description of *O. gagneorum* brings to eight the number of *Oreophryne* species described from the East Papuan Composite Terrane system (Parker 1934; Men-

zies 2006; Kraus and Allison 2009b). However, I have at least a dozen more new *Oreophryne* species remaining to be described from this region, and large portions of this terrane system remain unsurveyed. Hence, interpreting patterns of phenotypic variation in that region is premature at this time. But it is clear that the number of Papuan species contained within *Oreophryne* remains only poorly approximated.

Acknowledgements

I thank M. Wilkinson for kindly hosting my visit to BMNH; D. Frost and D. Kizirian (AMNH), M. Hagemann (BPBM), G. Doria (MSNG), and M. Praagman and R. Vonk (ZMA) for loans of specimens; D. Kizirian for providing photos of type specimens of *Oreophryne brevicrus*; S. Myers for producing Figs 1, 5, and 6; H.D. Cameron for providing advice on Latin grammar; C. Bernard, C. Graham, I. Haguna, R. Henry, F. Hurahura, S. John, C. Kembwa, F. Malesa, D. Mitchell, M. Okira, S. Simalken, T. Simalken, J. Slapcinsky, I. Yikida, Conservation International, and all the people of Parkop for providing field or logistical assistance during my expeditions. I thank the PNG National Museum and Art Gallery for providing in-country collaborative assistance and the Department of Environment and Conservation; National Research Institute; and the Madang, Milne Bay, and West Sepik provincial governments for permission to conduct this research. This research was supported by National Science Foundation grants DEB-0103794 and DEB-0743890 and a grant from Conservation International.

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Appendix

Specimens examined of Papuan *Oreophryne* with cartilaginous connection between procoracoid and scapula

Oreophryne anamiatoi (n = 20): Papua New Guinea: Southern Highlands Province: E slope Mt. Itukua, 5.6695°S, 142.6233°E, 2177 m (BPBM 33768, holotype; 33763–67, 33769–72, PNGNM 24097–99, paratypes), E slope Mt. Paramo, 5.6451°S, 142.6362°E, 1874 m (BPBM 33773–79, PNGNM 24100, paratypes).

Oreophryne crucifer (n = 1): Indonesia: Papua Province: Went Mts. (ZMA 5819, syntype).

Oreophryne flava (n = 1): Indonesia: Papua Province: Lorentz River, Kloofbivak (ZMA 5823, holotype).

Oreophryne idenburghensis (n = 2): Indonesia: Papua Province: 18 km SW Bernhard Camp, Idenburg River, 2150 m (AMNH 49663, holotype, AMNH 49666, paratype).

Oreophryne kampeni (n = 12): Papua New Guinea: Central Province: Moroka (BMNH 1947.2.12.14, holotype, BMNH 1947.2.12.43–44, paratypes, MSNG 29127, nine paratypes under the same number).

Oreophryne notata (n = 35): Papua New Guinea: Southern Highlands Province: E slope Mt. Itukua, Muller Range, 2170 m (BPBM 33672–706).