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Lilliputocoris (Hemiptera: Heteroptera: Rhyparochromidae: Rhyparochrominae: Lilliputocorini) now known from Madagascar (*)

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Abstract

The Lilliputocorini is reported from Madagascar for the first time. A summary of known species and a hypothesis of new species are presented, along with notes on morphology and habitat.

Key words: Wing dimorphism, Tsingy, sifted litter, Lilliputocorini, Madagascar.

Resumen

Lilliputocoris (*Hemiptera: Heteroptera: Rhyparochromidae: Rhyparochrominae: Lilliputocorini*) *también presente en Madagascar*

La tribu Lilliputocorini es registrada por primera vez en Madagascar. Se presenta un compendio de las especies conocidas y una hipótesis de nuevas especies, junto con comentarios sobre morfología y hábitat.

Palabras clave: Dimorfismo alar, Tsingy, hojarasca tamizada, Lilliputocorini, Madagascar.

Laburpena

Lilliputocoris (*Hemiptera: Heteroptera: Rhyparochromidae: Rhyparochrominae: Lilliputocorini*) *Madagaskarren ere bai*

Lilliputocorini tribua lehenengo aldiz aipatzen da Madagaskarren. Espezie ezagunen sintesia eta espezie berrien hipotesi bat aurkezten dira, bai eta morfologia eta habitatei buruzko hainbat iruzkin ere.

Gako-hitzak: Hego-dimorfismoa, Tsingy, orbel bahetua, Lilliputocorini, Madagaskar.

Introduction

The Lilliputocorini, the smallest rhyparochromids (Slater, 1994) and among the smallest Heteroptera, take their name from their diminutive stature, all species being less than 2 mm in length. The tribe is also known for sexually dimorphic wing reduction, in which the males are macropterous and the females macropterous or with reduced wings, a situation not known in other lygaeids (as then construed) (Slater and Woodward, 1982; Slater, 1994). The 10 species included in the genus are known from widely separated localities, predominately in the Southern Hemisphere. Here we review the described species and their distributions, report the tribe from Madagascar for the first time, and give biological notes for specimens collected in Madagascar.

The presence of the tribe in Madagascar was expected, given the hypothesized ancient nature of the tribe/genus (Slater and Woodward, 1982; Slater, 1994)

(*) We are very pleased to dedicate this paper to Dr. Jordi Ribes, on the celebration of his 80th birthday.

and the distribution of its known species (Australia, Borneo, Nepal, Sri Lanka, Ghana, Brazil, and the Seychelles). Štys (1987) hypothesized that the group was circumtropical, but has been overlooked in most areas, and he provided a synopsis of the species of *Lilliputocoris*; we expand and clarify his list below.

Synopsis of Lilliputocorini: *Lilliputocoris*

Lilliputocoris coatoni Slater, 1994 (South Africa) is known from 5 specimens: the male holotype (deposited in the Transvaal Museum) is macropterous; 2 males paratypes are macropterous and 2 female paratypes are staphylinoid. These specimens were collected in baited ground traps and sifted litter in savannah and dry sandy forest habitats. This is a yellowish-brown species (1.42 mm) with dark chocolate brown antennae and a reddish brown scutellum; it is coarsely punctate and covered with long silvery hairs (Slater, 1994). The staphylinoids are similar to *L. seychellensis*, but have a longer first antennal segment (Slater, 1994).

Lilliputocoris exiguus Slater and Woodward, 1979 [in: Slater, 1979] (Sri Lanka), the type species, was described, and remains known, from a single macropterous female, collected in a sweep net; no males or micropters are known. The holotype is in the Zoological Collection of Lund University. This species is bright brown with pale yellow hemelytra and legs, and has a smooth polished head and pronotal calli; it is 1.62 mm long (Slater and Woodward, 1979 [in: Slater, 1979], 1982).

Lilliputocoris ghanaensis Slater and Woodward, 1982 (Ghana) is known only from the holotype, a macropterous female, deposited in the American Museum of Natural History. No males or specimens with reduced wings are known, nor are habitat or collecting methods. This a generally pale yellow species, 1.62 mm long, with a darker reddish-brown scutellum and tip of corium (note that the image of the holotype (AMNH Type Database, 2011) seems darker than the pale yellow mentioned in the original description); the first antennal segment is dark brown, whereas the second and third are dark proximally and pale distally; the fourth segment is pale (Slater and Woodward, 1979 [in: Slater, 1979], 1982). The dorsal surface has numerous elongate silvery hairs and, excepting the corium, is thickly and coarsely punctate (Slater and Woodward, 1979 [in: Slater, 1979], 1982).

Lilliputocoris grossocerata Slater and Woodward, 1982 (Borneo) is known from 2 specimens. The holotype is a macropterous female collected in a berlesate from rainforest litter, and is deposited in the Australian National Insect Collection. One female paratype is presumed macropterous and was collected from litter in primary rainforest. No males or specimens with reduced wings are known. This species is 1.5 mm long and bright yellow, with a dark apical corial margin, bicolored membrane, spotted femora, and long, dark brown antennae. The head lacks punctures, but the remainder of the dorsum is coarsely punctate (Slater and Woodward, 1982).

Lilliputocoris neotropicalis Slater and Woodward, 1982 (Brazil) is known only from the holotype, a macropterous female, deposited in the American Museum of Natural History. No males, or females with reduced wings, are known, and no collecting method or habitat has been specified. It is pale yellow, 1.38 mm long, with a narrow dark apical corial margin and extensive pale brown markings on the membrane (like *L. terrareginae*). The antennae are bicolored, with the first segment darkening toward the tip, second and third dark with pale tips (fourth missing although it is shown in the illustration of the holotype by Slater and Woodward (1982)). The head is impunctate (shining and convex) but the pronotum has a collar and transverse impression defined by punctures, and the scutellum is punctate (Slater and Woodward, 1982).

Lilliputocoris punctatus (Woodward, 1959) was described from a single specimen as *Tomocoris punctatus*, from Papua New Guinea, and placed in the Lethaeini as then construed. The staphylinoid holotype female (Queensland Museum) was collected from rainforest leaf litter near a river-bank. Slater and Woodward (1982) transferred the species to *Lilliputocoris* and examined 33 additional specimens from Queensland, Northern Territory, and Dauan Island (Torres Strait, not far from New Guinea), Australia. These specimens included 15 macropterous males, 2 macropterous females, and 16 staphylinoid females, and were collected from a variety of habitats and substrates, such as: berlesate (*Melaleuca* litter in grass); leaf litter, brigalow scrub; leaf mold near creek; berlesate, rainforest, sieved litter; rainforest, dry site, sieved litter; and stick brushing. *Lilliputocoris punctatus* is approximately 1.43 mm long (Slater and Woodward, 1982) (although

Woodward (1959) states 1.3 mm in his original description], is pale with dark antennae, and does not have a dark area on the membrane (Slater and Woodward, 1982); staphylinoids and macropters both have a relatively short first antennal segment.

Lilliputocoris seychellensis Slater and Woodward, 1982 (Seychelles) is known from 2 specimens; both the holotype (Musée Royal de l'Afrique Central) and paratype (now in the American Museum of Natural History) are staphylinoid females collected in palm forest. No males or macropterous females are known. *L. seychellensis*, 1.46 mm long, is reddish brown with the second and third antennal segments lighter distally, and has strongly punctate hemelytra (Slater and Woodward, 1982). In addition, it lacks the posterior pair of trichobothria on abdominal sternum 5, as does at least *L. slateri* and *L. taylori* (Štys, 1987).

Lilliputocoris slateri Štys, 1987 (Nepal) was collected in a berlesate from a cultivated area with remnants of forest; the single known specimen of this species is the staphylinoid female holotype (preserved in alcohol, Senckenberg Museum). No males or macropters are known. This extremely small species (1.13 mm) is light brown and has long hairs on the dorsum.

Lilliputocoris taylori Slater and Woodward, 1982 (Borneo) is known from 14 specimens, all micropterous females, collected in rainforest berlesates. The holotype is deposited in the Australian National Insect Collection. No males or macropters are known. This species, 1.54 mm long, has hemelytra reduced to the point where they do not cover tergum 3; upstanding hairs cover the dorsum. It is bright reddish yellow brown, with the bases of antennal segments 2 and 3 darker brown. Punctures form a «neck» on the head; the pronotum is coarsely punctate anteriorly and transversely behind calli, as are the scutellum and wing pads (Slater and Woodward, 1982).

Lilliputocoris terrareginae Slater and Woodward, 1982 (Australia) is known from 31 specimens. The holotype (Australian National Insect Collection) is macropterous male (berlesate, rainforest); paratypes include 6 male macropters and 24 female staphylinoids (leaf litter, leaf mold, rainforest). Staphylinoids and macropters both have a relatively elongate first antennal segment. This species, 1.8 mm long, is pale yellow, and has base of the scutellum, the tip of the corium, and extensive areas of the membrane darker (Slater and Woodward, 1982).

Material and methods

We examined 90 specimens from 13 localities, in 3 of the 6 Madagascar provinces. These specimens were collected as part of the California Academy of Science's Madagascar Arthropod Biodiversity Project (supported by U.S. NSF grant no. DEB 0072713). This is more than double the total number previously known.

Specimens were sorted from mixed samples of Heteroptera stored in 95% ethanol; they were subsequently air-dried, mounted on points with a water-reversible glue, and labelled. Locality data and collection codes (letters and numbers in bold below) are given as they appear on the locality labels. We include these numbers to facilitate further research across taxa (for example, many of these localities can be found on AntWeb (2011), because ants were also collected there; several of these localities also yielded lethaeine rhyparochromids).

Material examined:

MADAGASCAR:

BLF7300 (CAS lot 011717): Fianarantsoa Province, Parc National d'Isalo, 9.1 km 354º N Ranohira, elev 725m, 27-31 Jan 2003, 22º 28' 54" S, 045º 27' 42" E, coll. Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) gallery forest; 9 staphylinoids.

BLF7651 (CAS lot 011721): Fianarantsoa Province, Parc National d'Isalo, Sahanafa River, 29.2 km 351º N Ranohira, 10-13 Feb 2003, 22º 18' 48" S, 045º 17' 30" E, coll. Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) in gallery forest, elev 500m; 6 staphylinoids.

BLF7151 (CAS lot 011724): Fianarantsoa Prov., Forêt d'Atsirakambiaty, 7.6 km 285º WNW Itremo, elev 1550m, 22-26 Jan 2003, 20º 35' 36" S, 046º 33' 48" E, colls. Fisher, Griswold et al., California Acad. of Sciences, sifted litter - montane rainforest; 2 macropters (male); 4 staphylinoids (+1 left in ethanol).

BLF6446 (CAS lot 011731): Mahajanga Province, Parc National de Namoroka, 9.8 km 300º WNW Vilanandro, 4-8 Nov 2002, 6º 28' 00" S, 045º 21' 00" E, coll. Fisher, Griswold et al., California Acad. of Sciences, sifted litter - tropical dry forest, elev 140m;

7 macropters (6 males, 1? missing abdomen); 11 staphylinoids.

BLF6506 (CAS lot 011715): Mahajanga Province, Parc National de Namoroka, 17.8 km 329° WNW Vilanandro, elev 100m, 8 – 12 Nov 2002, 16° 22' 36" S, 045° 19' 36" E, coll. Fisher, Griswold et al., California Acad. of Sciences, pitfall trap - in tropical dry forest; 3 macropters (2 male, 1 female); 8 staphylinoids.

BLF6582 (CAS lot 011718): Mahajanga Province, Parc National de Namoroka, 16.9 km 317° NW Vilanandro, 12 – 16 Nov 2002, 16° 24' 24" S, 045° 18' 36" E, colls: Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) - in tropical dry forest, elev 100m; 2 staphylinoids.

BLF4432 (CAS lot 011714): Mahajanga Prov: Parc National Tsingy de Bemaraha, 10.6 km ESE 123° Antsalova, elev 150m, 16-20 November, 2001, 19° 42' 34" S, 44° 43' 5" E, coll: Fisher, Griswold et al., California Acad. of Sciences, sifted litter - tropical dry forest on Tsingy; 2 macropters (male); 9 staphylinoids; (several pieces still in ethanol).

BLF5966 (CAS lot 011725): Toliara Prov., Forêt de Tsinjoriaky, 6.2 km 84° E Tsifota, 22° 48' 8" S, 43° 25' 14" E, elev 70m, 6-10 Mar 2002, coll: Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) - spiny forest thicket; 2 macropters (male); 1 staphylinoid.

BLF7820 (CAS lot 011731): Toliara Province, Forêt Classée d'Analavelona, 29.2 km 343°, NNW Mahaboboka, elev 1100m, 18-22 Feb 2003, 22° 40' 30" S, 044° 11' 24" E, coll. Fisher, Griswold et al., California Acad. of Sciences, sifted litter, in montane rainforest; 2 macropters (male); 7 staphylinoids.

MA-02-21-13 (CAS lot 027379): Tulear Province, Andohahela Nat'l Park, Ihazofotsy Parcelle III, 24° 49.85' S, 46° 32.17' E, 18 – 29 March 2003, California Acad. of Sciences, colls: M. Irwin, F. Parker, R. Harin'Hala, elev 80 m, malaise trap - in dry spiny forest; 2 macropters (male).

BLF4810 (CAS lot 011723): Toliara Prov., Parc National d'Andohahela, Forêt de Manantalinjo 33.6 km 63° ENE Amboasary, 7.6 km 99° E Hazofotsy, 12-16 I 2002, 24° 49' 1" S, 46° 36' 36" E, coll: Fisher, Griswold et al., California Acad. of Sciences, sifted litter - in spiny forest thicket, elev 150m; 1 staphylinoid.

BLF7893 (CAS lot 011730): Toliara Province, Forêt Classée d'Analavelona, 29.4 km 343° NNW Mahaboboka, elev 1050m, 21 Feb 2003, 22° 40' 30" S, 044° 11' 12" E, coll. Fisher, Griswold et al., California Acad. of Sciences, sifted litter, in montane rainforest; 2 macropters (male); 8 staphylinoids.

BLF4726 (CAS lot 011720): Toliara Prov., Parc National de Kirindy Mite, 16.3 km 127° SE Belo sur Mer, elev 80m, 6-10 Dec. 2001, 20° 47' 43" S, 44° 8' 49" E, coll: Fisher, Griswold et al., California Acad. of Sciences, sifted litter (leaf mold, rotten wood) - in tropical dry forest; 2 staphylinoids.

Results

We hypothesize that 5 species are represented by the following groups of specimens. The distribution of these 5 species is shown in Fig. 1.

Species 1:

Known from 2 macropters collected in a Malaise trap in spiny forest in southeast Tulear Province. This species has a distinctive chocolate-brown head and pronotum, with antennae to match, in stark contrast to the pale hemelytra (**MA-02-21-13**).

Species 2:

Known from 3 specimens collected in spiny forest (**BLF5966**), and additional specimens collected in tropical dry forest (some **BLF6446**, **BLF6506**). This species has dark humeri and a dark scutellum.

Species 3:

Known from a single specimen collected in montane rainforest (**BLF7151**). It exhibits striking coloration, with dark antennae, dark humeri, dark lateral edges to the scutellum, and a fumose band across the apical corial margin and adjacent membrane.

Species 4:

Known from tropical dry forest (**BLF6446**, some), and forest on Tsingy (**BLF4432**).

Species 5:

Specimens from 2 locations in montane rainforest (**BLF7820**, **BLF7893**) may be conspecific, or they might be 2 distinct species.

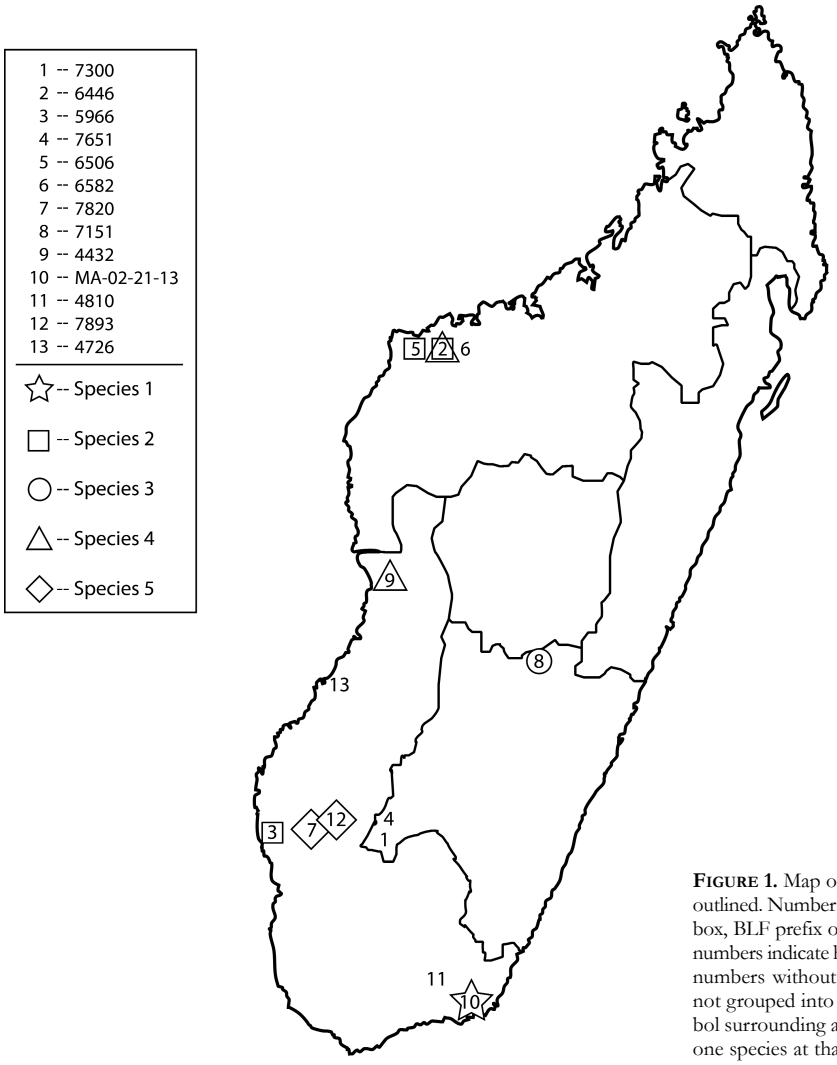

Figure 1. Map of Madagascar with provinces outlined. Numbers refer to collection codes (see box, BLF prefix omitted); symbols surrounding numbers indicate hypothesized species (see box); numbers without symbols indicate specimens not grouped into species; more than one symbol surrounding a number indicates more than one species at that locality.

Discussion

Madagascar appears to be a biodiversity hotspot for *Lilliputocoris*. Although 2 species occur in Queensland, Australia, at least 5, and possibly more, occur in Madagascar. Some, if not all, of the specimens cited above are likely to represent new species, but we choose not to describe them here pending analysis of even more material from Madagascar soon to become available. Also, given that 3 out of the 10 known species were described from a single specimen, that both sexes are known for only 3 out of 10 (males are unknown for 7 species), and that 7 species are known from only one wing form or another, we feel such action would be premature without detailed study of type material, which is beyond the scope of the current contribution.

Locality **BLF6446** appears to have more than one species. This is significant, as it is the first report of more than one species occupying the same habitat.

Although Slater and Woodward (1982) state that *Lilliputocoris punctatus* is sympatric with *L. terrareginae*, these 2 species were not collected at the same locality. Specimens of *L. terrareginae* were collected above 600 m and *L. punctatus* was collected at or close to sea level, «in some instances very close to the sites of occurrence of *terrareginae*» (Slater and Woodward, 1982).

Štys' (1987) interpretation of the all-important trichobothria and spiracle arrangements differed significantly from that presented by Slater and Woodward (1982), and he doubted the «naturalness» (his quotes, which we take to mean «holophyletic nature») of the tribe and genus. We believe the small size of lilliputocorine specimens and their lightly sclerotized nature make interpreting what is structure versus what is artifact particularly challenging, and we predict that a careful, comparative reassessment of these features will show that the trichobothrial arrangements are not as different as have been presented in the literature. We also predict that current litter surveys will turn up additional material that will enhance our understanding of the evolution of this interesting group of bugs.

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