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Three new species of the apterous genus *Ribesaptera* Heiss, 2011 (Heteroptera: Aradidae: Mezirinae) from Madagascar

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Abstract

Two species of the apterous Mezirinae genus *Ribesaptera* Heiss, 2011 are known to date from Madagascar: *R. elongata* Heiss, 2011 and *R. seraphinei* Baňař & Heiss, 2016. Three species sharing essential characters of this genus from localities distant from the recorded ones are recognized as new and described and illustrated as *R. mahajangana* sp.n., *R. taomasinana* sp.n. and *R. toliarana* sp.n. A key to all species of *Ribesaptera* is provided.

Key words: Heteroptera, Aradidae, Mezirinae, apterous, new species, Madagascar.

Zusammenfassung

Von der apteren Rindenwanzengattung *Ribesaptera* Heiss, 2011, sind bisher zwei Arten aus Madagaskar beschrieben worden: *R. elongata* Heiss, 2011 und *R. seraphinei* Baňař & Heiss, 2016. Weitere Belege von weit entfernt liegenden Fundorten, welche jedoch wesentliche gemeinsame morphologische Merkmale der Gattung aufweisen, werden zu dieser Gattung gestellt und als *R. mahajangana* sp.n., *R. taomasinana* sp.n. und *R. toliarana* sp.n. beschrieben und abgebildet. Ein Bestimmungsschlüssel für alle Arten der Gattung wird vorgelegt.

Introduction

Eleven apterous genera of the flat bug family Aradidae are described to date from Madagascar, all of them are considered endemic: *Ambohitantelya* Heiss & Baňař, 2013 (1 sp.), *Antsirabenus* Heiss, 2008 (2 spp.), *Cervinotaptera* Heiss & Marchal, 2012 (2 spp.), *Chlonocori*s Usinger & Matsuda, 1959 (3 spp.), *Cimicomanes* Kiritshenko, 1959 (5 spp.), *Classeyana* Hoberlandt, 1963 (1 sp.), *Paulianum* Hoberlandt, 1957 (1 sp.), *Pericartaptera* Heiss, 2009 (2 spp.), *Ribesaptera* Heiss, 2011 (2 spp.), *Robertiessa* Hoberlandt, 1963 (1 sp.), and *Tananarivea* Drake, 1957 (3 spp.).

Meeting the expectations about the rich aradid fauna of Madagascar, every newly collected material contains new species and additional specimens of poorly known or even new genera. Three new species of the genus *Ribesaptera* Heiss, 2011, of which only two species (*R. elongata* Heiss, 2011 and *R. seraphinei* Baňař & Heiss, 2016) and four specimens were recorded to date, are described and illustrated in this paper.

Material and methods

The specimens upon which the descriptions are based, were borrowed from the Californian Academy of Science (CAL), where the holotypes will be deposited.

After cleaning from incrustation obscuring body structures, photos were taken through an Olympus SZX 10 binocular microscope with an Olympus E 3 digital camera and processed with Helicon Focus 4.3 software, using Adobe Photoshop and Lightroom 2.3.

Measurements were taken with a micrometer eyepiece; numbers in the text (except body lengths) refer to units at 100× magnification, 40 units = 1 mm.

Abbreviations: deltg = dorsal external laterotergite (connexivum); mtg = mediotergites (of tergal plate); ptg = paratergite, vltg = ventral laterotergite.

Taxonomy

Aradidae Brullé, 1836

Mezirinae Oshanin, 1908

Ribesaptera Heiss, 2011

Type species: *Ribesaptera elongata* Heiss, 2011.

Key to species of *Ribesaptera*

1 (4) Head longer than wide. Postocular lobes conically converging posteriorly without conspicuous tubercles. 2

2 (3) Pronotum without anteromedian tubercle. Antenna shorter, 2.5–2.6 times as long as width of head. Figures 1, 11 (♂). Maromizah (Andasibe). ..... ***R. elongata* Heiss, 2011**

3 (2) Pronotum with an anteromedian tubercle. Antenna longer, 3.0–3.1 times as long as width of head. Figure 2 (♂). Mantadia (Andasibe). .... ***R. seraphinei* Baňař & Heiss, 2016**

4 (1) Head as wide as long or wider than long. Postocular lobes with distinct laterally protruding tubercles. 5

5 (6) Pronotum without anteromedian tubercle. Tergal plate with distinct longitudinal ridge; mtg II with conical elevation at middle. Figures 5–8, 13 (♂♀). Mahajanga. ..... ***R. mahajangana* sp.n.**

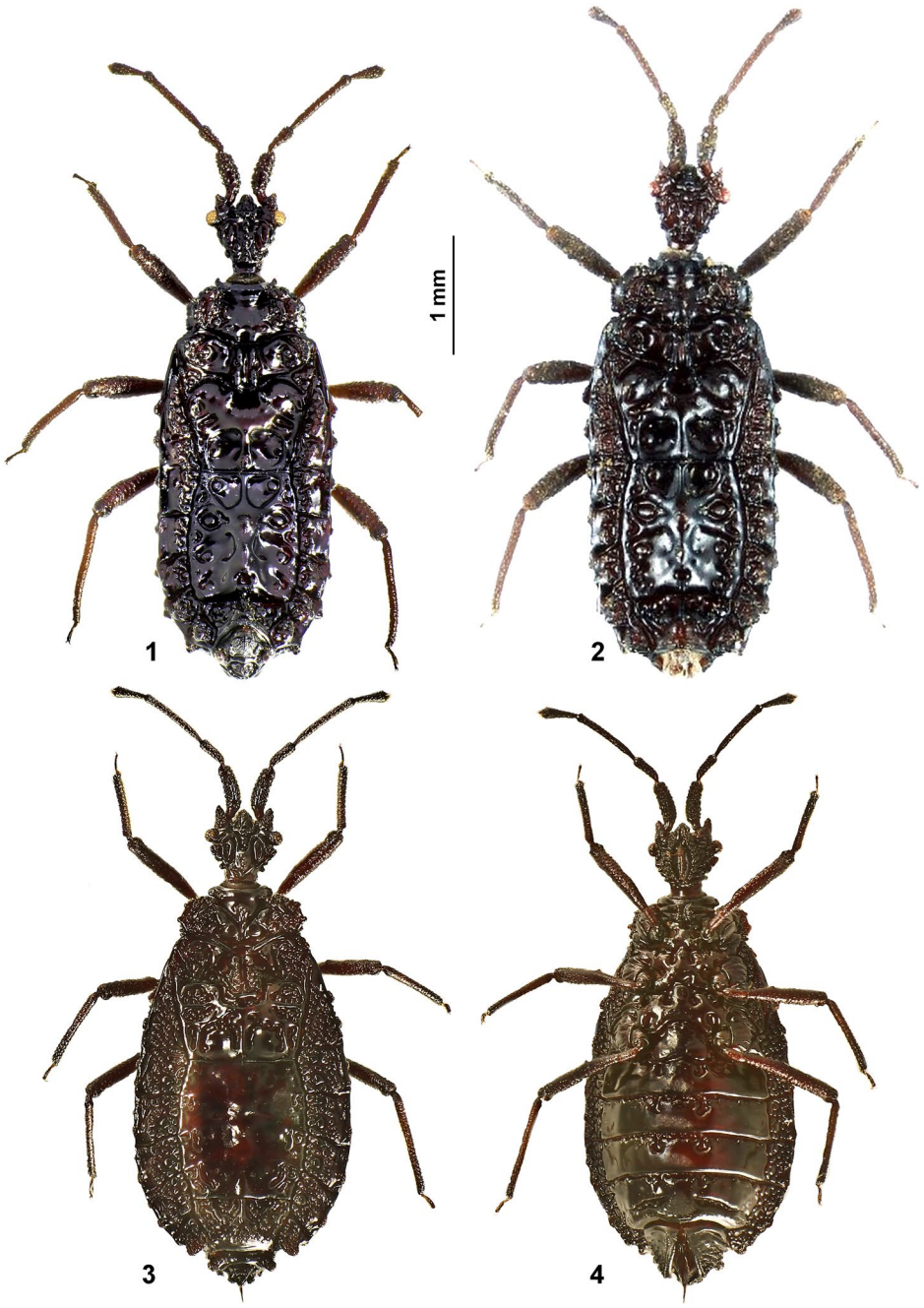
6 (5) Pronotum with anteromedian tubercle. Tergal plate without or with a weak longitudinal ridge: Mtg II with median carina. 7

7 (8) Lateral raised lobes of pronotum roundly converging anteriorly. Postocular lobes less protruding, not reaching outer margin of eyes. Metanotum transversely carinate adjacent to furcate median mesothoracic elevation. Figures 3, 4, 12 (♀). Taomasina ..... ***R. taomasinana* sp.n.**

8 (7) Lateral raised lobes of pronotum of rectangular shape. Postocular lobes laterally protruding, reaching outer margin of eyes. Metanotum with a deep cavity adjacent to furcate median mesothoracic elevation. Figures 9, 10, 14 (♀). Toliara. ..... ***R. toliarana* sp.n.**

Ribesaptera taomasinana sp.n. (Figs. 3, 4, 12)

Type material: Holotype (female): Madagascar, Taomasina, Analamay, elev. 1068 m, 21.III.2004, 18°48'22" S, 48°20'13" E, leg. Malgasy team, California Academy of Sciences general collecting, montane tropical dry forest, BLF 9558, Caslot 038235 (CAS); the specimen is designated and labelled accordingly.



Figs. 1–4: Habitus of *Ribesaptera* species: (1) *R. elongata*, holotype male, dorsal view; (2) *R. seraphinei*, holotype male, dorsal view; (3, 4) *R. taomasinana* sp.n., holotype female, (3) dorsal and (4) ventral view.

Etymology: The specific epithet refers to the locality where it was collected.

Description: Head as wide as long (30 / 30); genae shorter than clypeus; antenniferous lobes conical, surface granulate. Antennae 2.83 times as long as width of head, beset with small round tubercles bearing short setae; length of segments I / II / III / IV = 21 / 13 / 30 / 21. Eyes slightly stalked. Postocular lobes notched adjacent to eyes, followed by a cluster of tubercles, then smooth and converging to neck region; a pair of protruding tubercles placed at a lower level. Vertex with deep rugosities and a large round tubercle directed upward. Rostrum arising from an open atrium.

Pronotum: Collar ring-like, with a pair of larger lateral and smaller sublateral knob-like elevations, triangularly protruding posteriorly with a larger tubercle at apex; disk with a median groove; lateral pair of oval sclerites smooth, delimited by strongly raised and granulate lateral sclerites, separated from mesonotum by a deep furrow.

Mesonotum: Median furcate elevation granulate, laterally deeply depressed, followed by rugose sclerites which are not raised along lateral margin.

Metanotum: Raised transverse median ridge smooth, with two round tubercles directed anteriorly, laterally sloping and deeply depressed with oval sclerites, posteriorly fused to mtg I+II, the latter with a longitudinal median carina and lateral oval depressions.

Abdomen: Tergal plate about as wide as long; surface smooth, without a median ridge or elevation; deltg I+II fused, of triangular shape anteriorly reaching mesonotum; surface of deltg II–VII with granulate upward directed expansions adjacent to tergal plate, largest on deltg VII, lateral margin smooth; granulate tergite VII triangularly raised medially, tergite VIII with knob-like ptg VIII; spiracles II–VII sublateral on round tubercles, II+III visible from above; surface of vltg II–VII and pleura with round flat tubercles, median part of sternites III–VI smooth and shiny.

Legs: Femora and tibiae beset with small setigerous tubercles.

Measurements: body length 4.7 mm; length of antennae 85; length / width of tergal plate 50 / 51; width of abdomen 85.

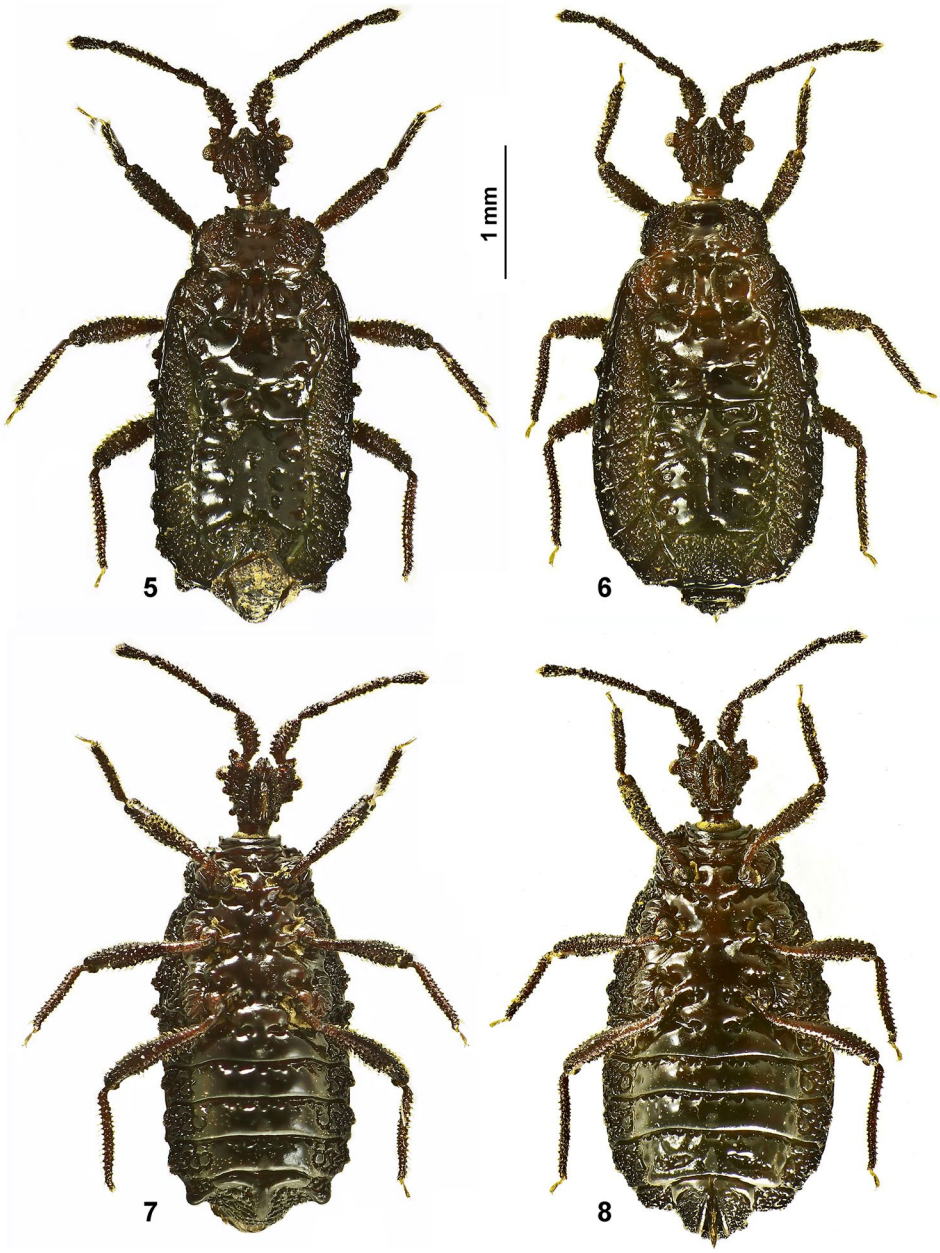
Comparative notes: *Ribesaptera taomasinana* sp.n. is distinguished from *R. elongata* and *R. seraphinei* by the wide head and differs from *R. toliarana* sp.n. by longer antennae, smaller postocular tubercles, larger median tubercle on collar, anterolateral angles of pronotum subrounded, not angular, different structure and fusion of metanotum, and lacking ridge on tergal plate.

Ribesaptera mahajangana **sp.n.** (Figs. 5–8, 13)

Type material: Holotype (male): Madagascar, Mahajanga Province, Parc National Tsingy de Bemaraka, 10.6 km ESE 123° Antsalova, elev. 150 m, 16–20.XI.2001, 19°42'34" S, 44°43'5" E, leg. Fisher, Griswold et al., California Academy of Sciences, sifted litter, tropical dry forest, Collection code BLF4432 Caslot 037510 (CAS); paratype (female) collected with holotype (Ernst Heiss Collection); the types are designated and labelled accordingly.

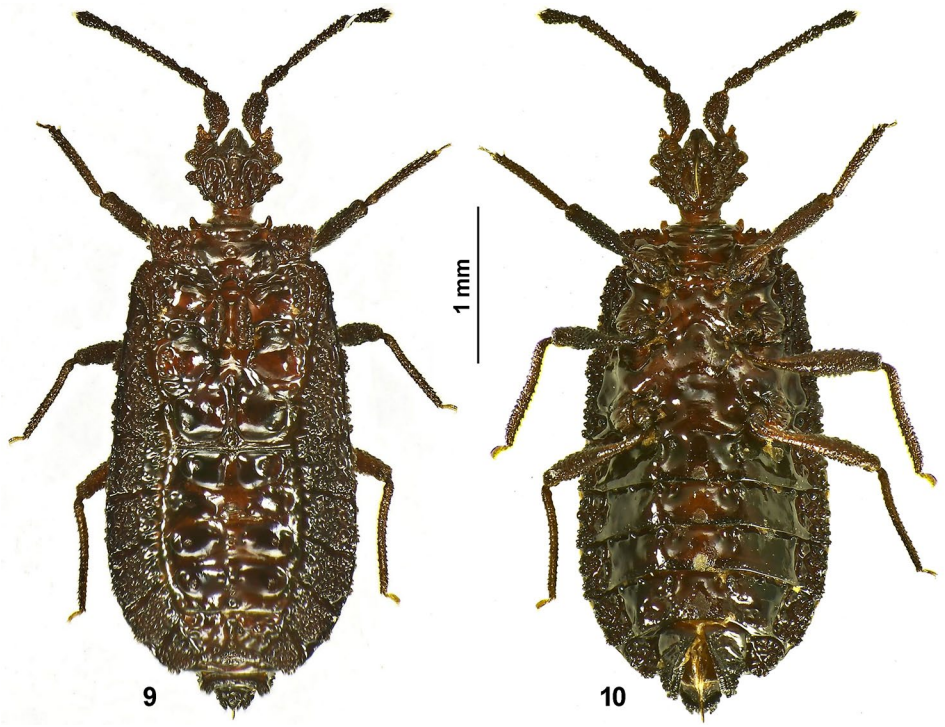
Etymology: The specific epithet refers to the Province where it was collected.

Description: Head wider than long (30 / 27); antenniferous lobes blunt, as long as clypeus. Antenna 2.23 times as long as width of head, densely beset with distinct setigerous tubercles; length of antennal segments I / II / III / IV = 17 / 11 / 25 / 14. Eyes slightly stalked. Postocular lobes with a large round setigerous tubercle adjacent to eyes and a



Figs. 5–8: Habitus of *R. mahajangana* sp.n.: (5) holotype male, dorsal view; (6) paratype female, dorsal view; (7) holotype male, ventral view; (8) paratype female, ventral view.

longer one posteriorly. Vertex with three rows of setigerous tubercles. Rostrum arising from an open atrium.



Figs. 9–10: Habitus of *R. toliarana* sp.n., holotype female: (9) dorsal view; (10) ventral view.

Pronotum: Collar ring-like with a pair of longer lateral and shorter sublateral tubercles followed posteriorly by a transverse carina; disk smooth and depressed medially, delimited laterally by elevated granulate sclerites, lateral margins roundly converging anteriorly at a lower level; posterior margin with a pair of round tubercles at middle directed posteriorly, separated from mesonotum by a deep furrow.

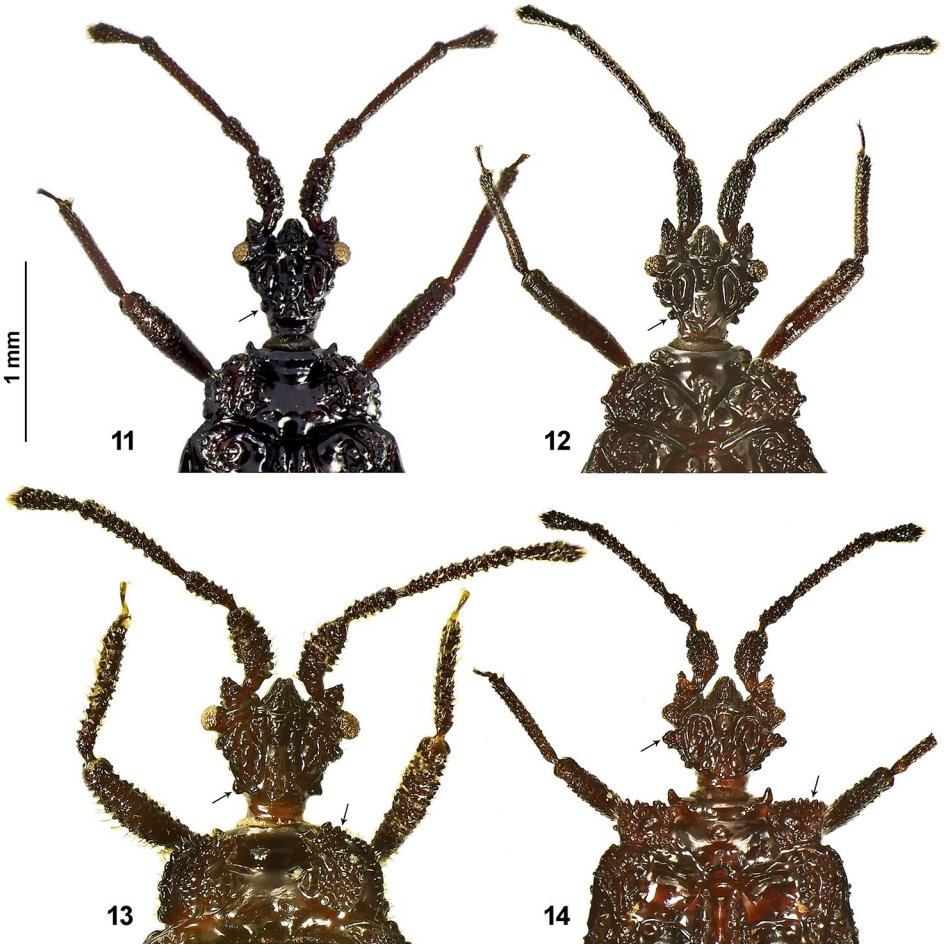
Mesonotum: Median longitudinal elevation with a deep furrow, depressed and smooth laterally, delimited by triangular granulate sclerites and separated from metanotum by a deep cavity.

Metanotum: Transversely elevated and smooth with a pair of pivot-like tubercles directed anteriorly and opposed to the furcate median elevation of mesonotum; laterally raised triangular sclerites granulate, posteriorly fused to mtg I+II which are depressed lateral of erect median conical tubercle.

Abdomen: Tergal plate smooth, longer than wide, with a median ridge highest on mtg IV, laterally depressed; surface of deltg densely granulate, deltg I+II fused into a triangular sclerite reaching mesonotum, deltg II–VII separated; tergite VII medially raised and granulate; spiracles II–VII lateral and visible from above, those of mtg II distinctly protruding.

Legs beset with setigerous tubercles like antennal segments.

Measurements: Holotype (male): body length 4.2 mm (pygophore displaced); length of antennae 67; width of abdomen 65. Paratype (female): body length 4.25 mm; head width



Figs. 11–14: Head and pronotum of *Ribesaptera* species: (11) *R. elongata*, holotype male; (12) *R. taomasinana* sp.n., holotype female; (13) *R. mahajangana* sp.n., paratype female; (14) *R. toliarana* sp.n., holotype female. Arrows indicate differing body structures.

/ length 31 / 29, length of antennal segments I / II / III / IV = 16 / 11 / 25 / 15; ratio length of antennae / width of head 2.16; width of abdomen 70.

Comparative notes: The new species is distinguished from *R. elongata* and *R. seraphinei* by the shape of head (comp. Figs. 1–6), the distinct postocular tubercles, and setigerous tubercles on all antennal segments. It shares the wide head (wider than long) with *R. taomasinana* sp.n. and *R. toliarana* sp.n. The latter species differs by the larger postocular tubercles and the rectangular shape of the pronotum. *Ribesaptera taomasinana* sp.n. has much longer antennae (ratio antennal length / width of head = 2.83 vs. 2.16–2.23) and less tuberculate appendages.

Ribesaptera toliarana **sp.n.** (Figs. 9, 10, 14)

Type material: Holotype (female): Madagascar, Toliara Province, Forêt Classée d'Analavelona, 29.2 km NNW Mahaboboka, elev. 1100 m, 18–22 Feb. 2003, 22° 40' 30" S, 44° 11'24" E, coll. Fisher, Griswold et al., California Academy of Sciences, sifted litter in montane rainforest, Collection code BLF 7893, Caslot 037514 (CAS); the specimen is designated and labelled accordingly.

Etymology: The specific epithet refers to the province where it was collected.

Description: Head wider than long (27.5 / 25); antenniferous lobes triangular with acute apex. Antenna 2.1 times as long as width of head, densely beset with setigerous tubercles; segment I bent and thickest, III longest; length of antennal segments I / II / III / IV = 14 / 9 / 23 / 12. Eyes globular not stalked. Postocular lobes with large, laterally and upward protruding cluster of tubercles, posteriorly with three round tubercles and converging to neck. Vertex raised and granulate, with a large round tubercle at middle.

Pronotum: Collar ring-like, with a pair of pivot-like, anteriorly diverting lateral and smaller, round, sublateral tubercles; posterior triangular projection with smooth surface and a distinct tubercle at apex; disk smooth at middle, with ovate callosities and a pair of posteriorly directed tubercles, laterally delimited by raised granulate lobes of rectangular shape, separated from mesonotum by a deep transverse furrow.

Mesonotum: Median raised furcate and granulate elevation laterally flanked by deep smooth depressions, these laterally delimited by granulate raised sclerites.

Metanotum: Smooth and rather depressed, with oval callosities, laterally delimited by fused triangular deltg I+II, the latter deeply depressed lateral of median carinate ridge.

Abdomen: Tergal plate longer than wide; surface smooth with a median, posteriorly increasing elevation from mtg IV–VII; tergite VII smooth, posteriorly granulate and raised, tergite VIII carinate beset with round tubercles; deltg I+II fused to a triangular sclerite anteriorly reaching mesonotum; deltg I–VII strongly bent upward, surface densely granulate; spiracles II+III sublateral and visible from above, IV–VII subventral, but hardly discernible from above; venter with vltg I-VII granulate; sternites III–VII and meso- and metapleura smooth and shiny.

Legs: Femora and tibiae beset with rows of small setigerous tubercles.

Measurements: body length 4.1 mm; length of antennae 58; length / width of tergal plate 46 / 40; width of abdomen 69.

Comparative notes: *Ribesaptera toliarana* sp.n. is easily distinguished from all congeners by the structure of head and antennae and the rectangular pronotum.

Discussion and biogeographical remarks

Apterous species of Aradidae generally have a very limited range of distribution. The new records of different taxa from localities considerably distant from each other raise the question how they reached these habitats and developed from a hypothetical common ancestor. The widespread and isolated localities (Fig. 15) support the assumption that all species are regional endemics.

The five species presently assigned to *Ribesaptera* show partly remarkable differences in habitus (*R. toliarana* sp.n.), structure of head and antennae (*R. taomasinana* sp.n., *R.*

tolariana sp.n.), or shape of pronotum (*R. tolariana* sp.n.). However, they share a unique set of common morphological characters not observed in other Madagascan Aradidae, such as the furcate median elevation of mesonotum, two pairs of tubercles on a ring-like collar, and pairs of tubercles directed to the median mesothoracic elevation on pronotum and mesonotum, respectively. They are considered to belong to this genus. The use of molecular data will show if the present generic assignment to *Ribesaptera* can be supported or not.

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Fig. 15: Type localities of *Ribesaptera* species in Madagascar. Made with Natural Earth.

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