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RESEARCH PAPER

Scobinigaster, a new genus of Lethaeini from Madagascar (Hemiptera: Heteroptera: Rhyparochromidae)

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Abstract. A new genus of Rhyparochromidae, *Scobinigaster* gen. nov., with two new species, *Scobinigaster henryi* Kondorosy & Baňař, sp. nov. and *Scobinigaster paveli* Kondorosy & Baňař, sp. nov. is described from south-west Madagascar. The new genus is placed within the tribe Lethaeini of the subfamily Rhyparochrominae, and justification for this action is briefly discussed.

Key words. Hemiptera, Heteroptera, Lygaeoidea, Rhyparochromidae, *Scobinigaster*, new genus, new species, Madagascar, Afrotropical Region

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Introduction

Madagascar is one of the largest islands and is well-known for its very diverse and unique biota (Goodman & Benstead 2003). However, its fauna is still far from being well-known. In the case of the true bugs the situation is the same but it seems to be changing. Among pentatomorphan Heteroptera, Aradoidea, Coreoidea and Pentatomoidea have received considerable attention during the last decade (e.g., Baňař et al. 2014, 2016; Baňař & Heiss 2018a,b; Brailovsky 2011; Heiss 2012; Heiss et al. 2019; Kment 2013, 2015; Kment et al. 2014, 2016; Kment & Baena 2015; Kment & Rédei 2018; Lis et al. 2015; Roell et al. 2019). On the other hand, only a few papers (each concerning only one genus) have been published on the Lygaeoidea (Kóbor & Kondorosy 2016; Kment et al. 2016, 2017; Zámbó et al. 2019). This renewed research activity in Lygaeoidea is largely due to intensive collecting efforts by the staff of the Moravian Museum (MMBC) and other Czech researchers, which have yielded a large number of undescribed taxa.

Rhyparochromidae is the most diverse family of Lygaeoidea taxonomically, which is particularly species-rich in Madagascar. Recently Kment et al. (2016) compiled the first checklist of the Rhyparochromidae fauna of Madagascar, which contains 57 described species. However, this is certainly much lower than the real number of species, as there are many undescribed or in Madagascar unknown taxa in the collection of the MMBC and other museums.

Among the tribes of Rhyparochromidae, perhaps the easiest to recognize (O'Donnell 1991), is the worldwide-distributed Lethaeini currently with 187 described species in 39 genera, of which 56 species in 13 genera are known in the Afrotropical Region (Dellapé & Henry 2020; E. Kondorosy, unpubl. data). Before the present study, only 8 species (6 of them endemic), belonging to the 3 largest and most widespread Lethaeini genera (*Diniella* Bergroth, 1893, *Lethaeus* Dallas, 1852 and *Neolethaeus* Distant, 1909), were recorded from Madagascar, the half of them rather recently (Slater & O'Donnell 1999, Kment et al. 2016). However, many more Lethaeini species inhabit Madagascar, as we have found representatives of the genera *Lethaeus* or *Orbellis* Distant, 1913 (E. Kondorosy, unpubl. observ.), and we recently described three species

of *Noteolethaeus* Woodward & Slater, 1962 (Zámbó et al. 2019). In the present contribution, we forward our understanding of the Lethaeini of Madagascar, discovering a new genus based on two new species, which are described below.

Material and methods

The senior author studied the Lygaeoidea collections of several European museums, containing material from Madagascar (a large number of specimens can be found in the Museum National d'Histoire Naturelle, Paris) but did not find any specimens of the described taxa. The only collection containing the present type series is the Heteroptera collection of the Moravian Museum in Brno, Czech Republic (MMBC), of which a few paratypes are now deposited in the Hungarian Natural History Museum, Budapest, Hungary (HNHM), and the National Museum, Prague, Czech Republic (NMPC).

We examined the specimens with an Olympus SZ11 stereomicroscope, and we measured the main characters using an ocular eyepiece. When measuring head and pronotum, the actual body part was positioned horizontally to observe the maximum length; during body length measuring, the scutellum and hemelytra were in horizontal position. Colour photographs were taken with a Leica MSV266, and SEM micrographs of uncoated specimens with a Hitachi S-3700N environmental scanning electron microscope at the Department of Palaeontology, National Museum, Prague.

We follow the morphological terminology of Kment et al. (2016), O'Donnell (1991), Tsai et al. (2011), Tsai & Rédei (2017), and the nomenclature of antennomeres follows Zrzavý (1990).

Taxonomy

Scobinigaster Kondorosy & Baňař, gen. nov.

Type species. *Scobinigaster henryi* Kondorosy & Baňař, sp. nov., present designation.

Description. *Head* moderately short, wider than long, with laterally protruding, moderately big and well-developed eyes, ocelli situated close to them. Antennae rather short, all antennomeres covered with fine semidecumbent setae. Scape in apical half abruptly widened, pedicel linear, basiflagellum gradually slightly widened, distiflagellum almost linear. Ventral surface of head densely punctate reaching to eyes. Maxillary plates broadened with a vertical keel on apex, appearing as minute, tooth-shaped projections (Figs 9–10, arrows). Labium long, extending to base of abdomen, labiomere I reaching prosternum.

Thorax. Pronotum with wide and medially much broader collar, delimited with an impressed row of punctures (variable among specimens); lateral margin well developed, about as wide as basal part of scape; anterolateral trichobothria situated on lateral margin, its distance from anterior edge equal to the width of lateral margin; midline of pronotum variable among specimens – always raised on collar and most of posterior lobe, often vanished on anterior half of pronotum and near the posterior margin (Fig. 21). Anterior lobe of pronotum slightly longer than posterior lobe, transverse impression between anterior and posterior lobe absent. Surface with some small, variably developed impunctate spots: two pairs of dark, finely wrinkled spots on calli, and one usually visible shiny pair on posterior margin.

Scutellum elongate, triangular, coarsely punctate, with two very finely wrinkled, dark impunctate spots on anterolateral corners; with a low midline, being more prominent on posterior half, and more or less developed sublateral smooth shiny yellow keels in central part.

Clavus in brachypterous specimens not separated from corium, with four rows of punctures (the inner three ones being irregular). Corium with dense but irregularly organised punctation, only punctures along claval suture forming a regular row. Vein R strongly elevated along its entire length. Apical margin of corium convex in brachypterous specimens, with arched rudiment of membrane only slightly wider than tibiae, leaving tergite VI in greater part and VII fully exposed. Macropterous specimen similar, but apical margin of corium slightly S-shaped, membrane well developed, almost reaching apex of abdomen, with cross-veins forming two almost closed basal cells.

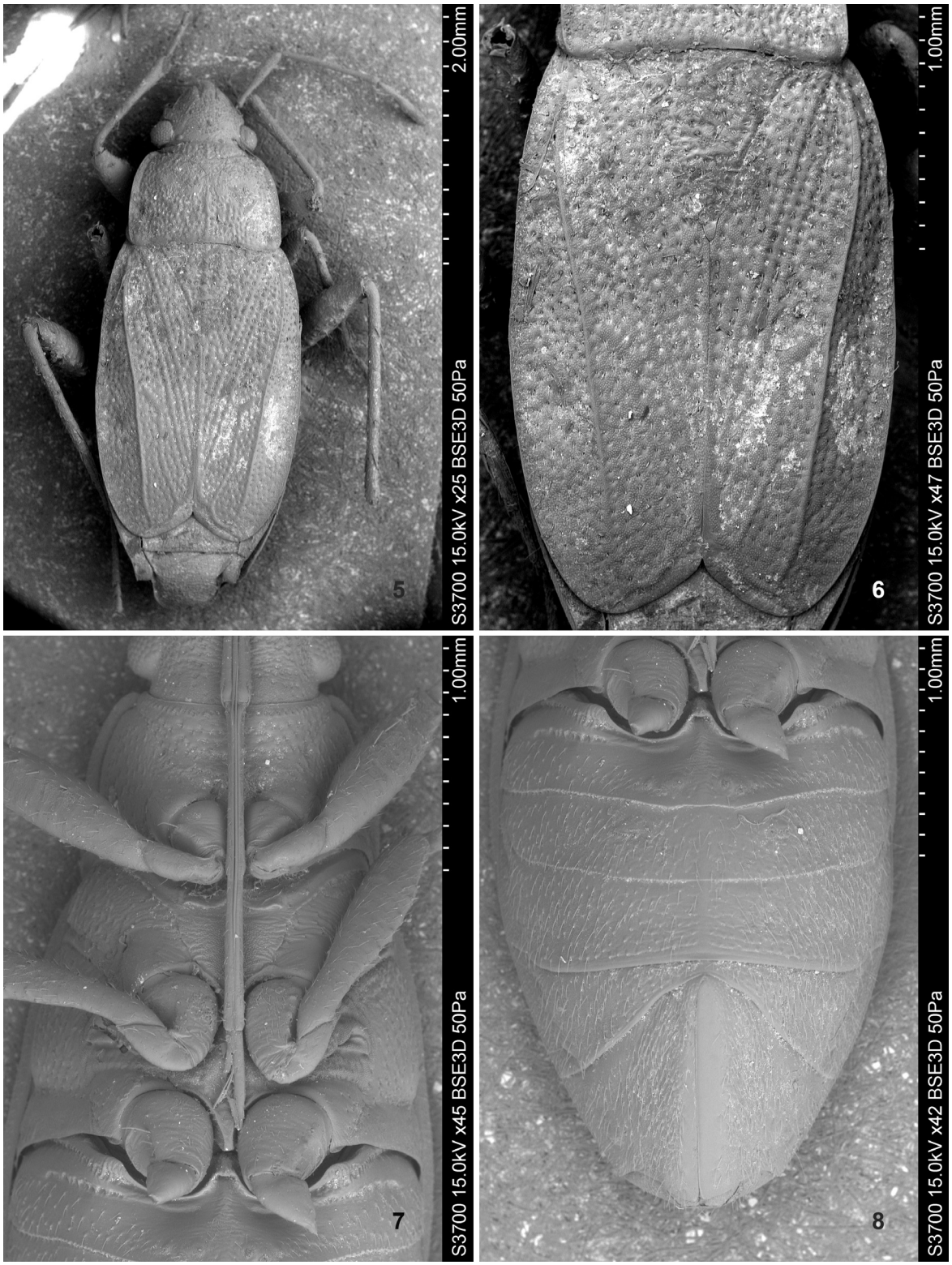
Thoracic venter densely punctate, appearing wrinkled; mesosternum impunctate with fine transverse wrinkles, metasternum with longitudinal median keel, dorsal parts of all pleura impunctate as well, with similar surface as basal spots of scutellum. Peritreme of metathoracic scent glands moderately long, with apical part curving posteriad. Evaporatorium (Figs 13–14) rather small, lateral margin convex, not surpassing half of metapleuron, anterolaterally narrowly extended along anterior metapleural margin, reaching lateral end of metathoracic spiracle, and on posterior margin of mesopleuron, reaching about midlength of metathoracic spiracle.

Coxae unarmed, femora with two complete ventral rows of strong stiff setae, similar to those of tibiae; on metafemora also with some additional strong dorsal setae in posterior half. Profemora with three very short tooth-like setae subapically in anteroventral row; both rows finer than on other legs (posteroventral row especially fine). Profemora moderately thickened; metafemora of males thicker than pro- and mesofemora, with several tiny teeth between stiff setae along all its length (on females thinner and without teeth). Tibiae straight, protibia with one ventral row, meso- and metatibiae with four rows of strong stiff setae being at least so long as width of tibiae. Metatarsus longer than remaining tarsi, tarsomere I about twice as long as tarsomeres II–III combined.

Abdomen robust, rather high in lateral view especially at segments IV–V, ventrally convex with smooth median keel (Figs 3, 8), abdomen in both sexes strongly dorsoventrally flattened posteriad of segment V. Connexivum of males ending abruptly usually with a tiny spine at 1/3 length of tergite VII (Figs 1, 4), in females running narrowly to tergite VIII, without prominent posterior angle. Tergite VII of females posteromedially arcuately

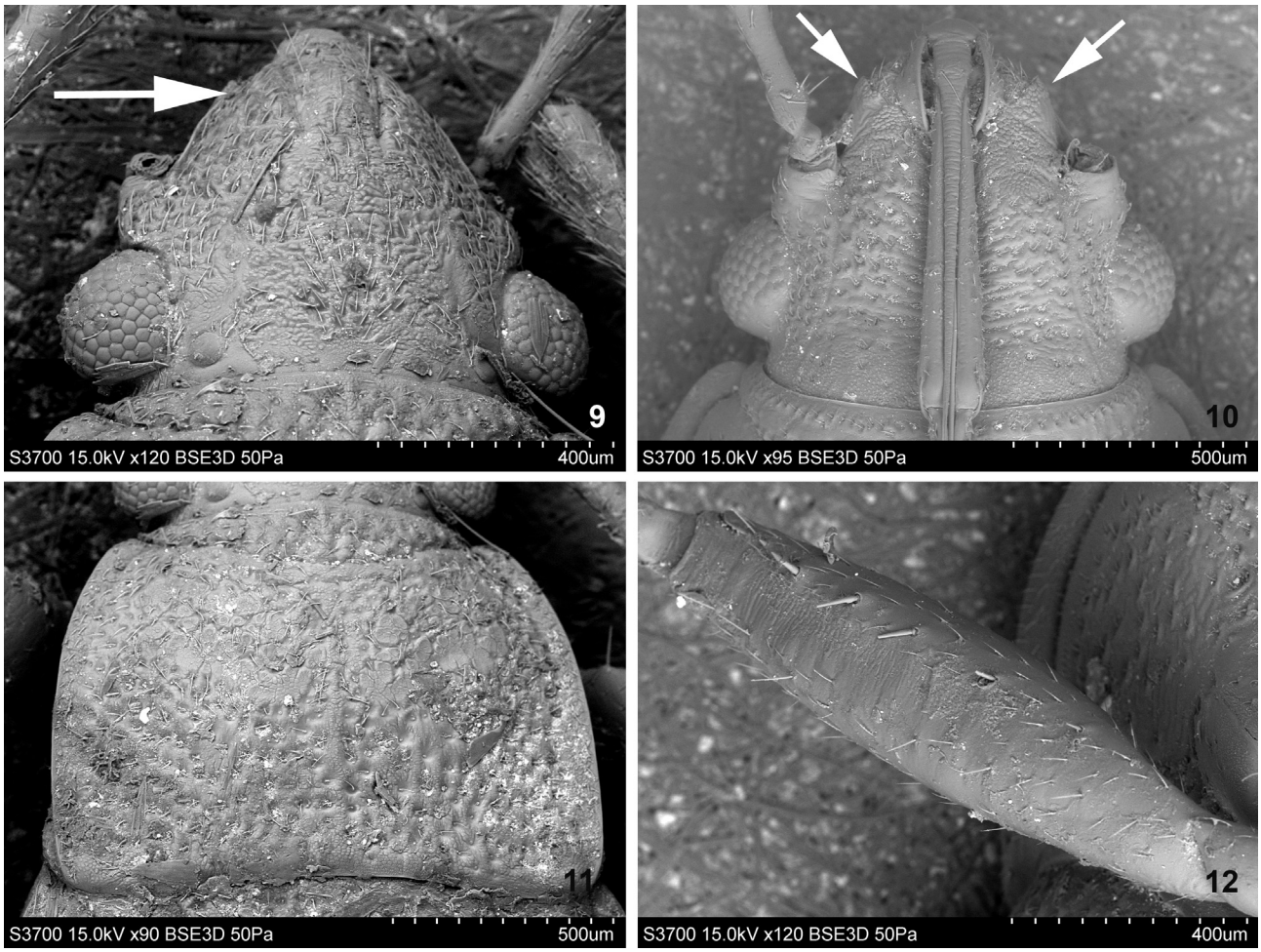
Figs 1–4. Habitus of *Scobinigaster* gen. nov. 1–3 – *S. henryi* Kondorosy & Baňař sp. nov.: 1 – holotype, male, dorsal habitus; 2 – paratype, female, dorsal habitus; 3 – paratype, female, ventral habitus. 4 – *S. paveli* Kondorosy & Baňař sp. nov., holotype, male, dorsal habitus.

excavated, in males basally with lateral keel vanishing at tip of connexivum, convexly bending posteriorly and laterally, with sternite VII fully enclosing genital segments; surface of tergite VII coarsely granulate at base of setae (finer than on ventral side). Ventral side of abdomen covered with long setae; their base provided with rasp-like coarse granules. Sternite VII of males with 3 hardly visible apical teeth. Ovipositor (Fig. 8) almost dividing sternite VI, sternite V not narrowed medially. Positions of abdominal spiracles, and number and pattern of abdominal trichobothria, as typical for Lethaeini (see also Differential diagnosis).



Figs 5–8. *Scobinigaster henryi* Kondorosy & Baňař sp. nov., scanning electron micrographs. 5 – holotype, male, dorsal habitus; 6 – holotype, male, elytra; 7 – paratype, female, thorax, ventral view; 8 – paratype, female, abdomen, ventral view.

Genitalia. Male genital capsule (Figs 18, 22, 26) subglobose, posterior half with fine decumbent pubescence, posterior aperture nearly quadrangular, anterior half with two tiny, blunt teeth on each side, cup-like sclerite large, reaching more than half length of aperture, with one medial and two lateral apices (Fig. 26). Paramere broad, shank short, blade subquadrate, ventral side (Figs 23, 25) more or less flat, with a fine medial keel in apical one-third, apical tip curving ventrally (Fig. 24); inner projection (on left side of Figs 23, 25) rectangular; outer projection slightly rounded; in lateral view almost evenly thickened to base of blade to a strong hump (on left side of Fig. 24); dorsal side with dense, relatively long semi -decumbent or erect pubescence. Female spermatheca



Figs 9–12. *Scobinigaster henryi* Kondorosy & Baňař sp. nov., scanning electron micrographs. 9 – holotype, male, head dorsally; 10 – paratype, female, head ventrally; 11 – holotype, male, pronotum; 12 – paratype, female, profemur, ventral view.

with a ring-like structure broadened to a globular apical receptacle (Fig. 27).

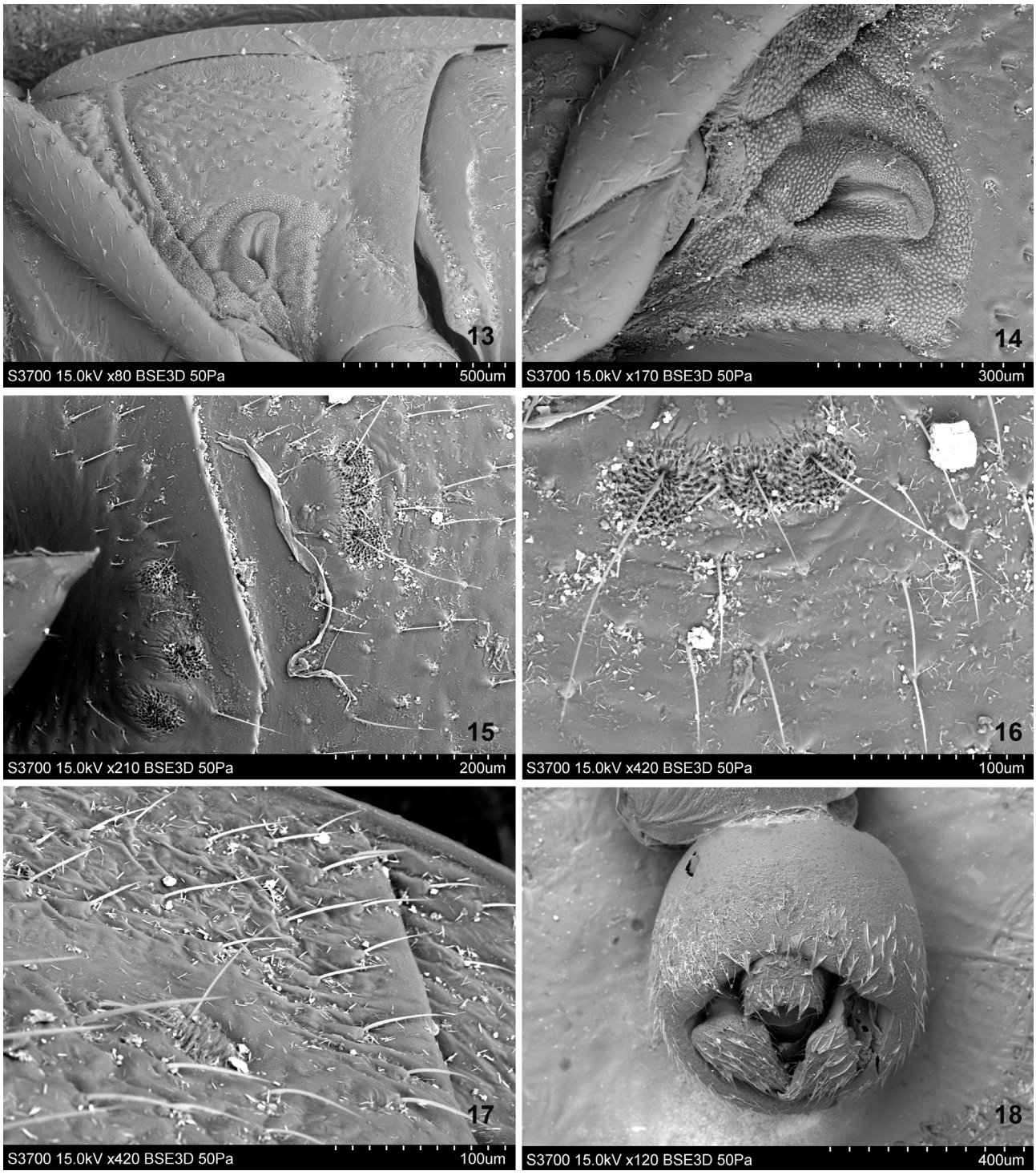
Differential diagnosis and systematic placement. *Scobinigaster* Kondorosy & Baňař, gen. nov. is unique within Rhyparochromidae by the ventral side of abdomen provided with rasp-like, coarse setiferous granules.

Scobinigaster is a typical member of the tribe Lethaeini, having two iridescent spots on the base of the head (Western Hemisphere species can have one spot instead, see e.g. O'Donnell 1991); a pair of anterolateral trichobothria on the pronotum; and the linear arrangement of trichobothria on sternum V (3rd trichobothrium always postspiracular).

The genus belongs to the largest group of genera in the tribe, which has cross-veins on the membrane of the hemelytra (although the majority of the *Scobinigaster* specimens are brachypterous), anterior collar on the pronotum and anterolateral trichobothria on the somewhat widened and not very concave lateral margin of the pronotum. This group contains five previously described genera, which are not always easy to separate, and some of them might be paraphyletic (i.e., *Neolethaeus* Distant, 1909 and *Lophoraglius* Wagner, 1961). In the genera *Adauctus* Distant, 1909, *Lophoraglius* and *Porrectolethaeus* Scudder, 1971, the pronotal collar is separated by a strong groove, not only with inserted punctures as in *Neolethaeus*, *Orbellis* Distant, 1913 and *Scobinigaster*. A further common feature of the 3 latter genera is that in many (but not in all) species the males have more or less widened metafemora with several small teeth and 3 stronger or smaller teeth on the posteroventral margin of abdominal sternite VII. Within these genera only *Scobinigaster* possesses the characteristic densely and strongly punctate anterior lobe of pronotum. There are some other Lethaeini taxa with densely punctate anterior lobe (*Afromydrus* Scudder, 1968, *Aristaenetus* Distant, 1901, *Lophoraglius punctatulus* Linnavuori, 1978, *Margolethaeus* Zsalakovics & Kondorosy, 2014, *Noteolethaeus* and *Porrectolethaeus*), but in these, the punctures are always rather fine and distinct, while in *Scobinigaster* the punctures are coarse and partially confluent. Only *Afromydrus* is similar in this feature, but it differs e.g. by wide lateral margins of pronotum without anterolateral trichobothria and lack of veins on the membrane except Cu.

Another very specific character is represented by the tiny teeth on the maxillary plates (Figs 9, 10: arrows) and the rasp-like structure formed by conspicuous setiferous tubercles, of the abdominal venter. These features seem to be unique within Lethaeini.

In most Lethaeini genera, some strong and/or long setae can be found on the profemora, but the additional presence

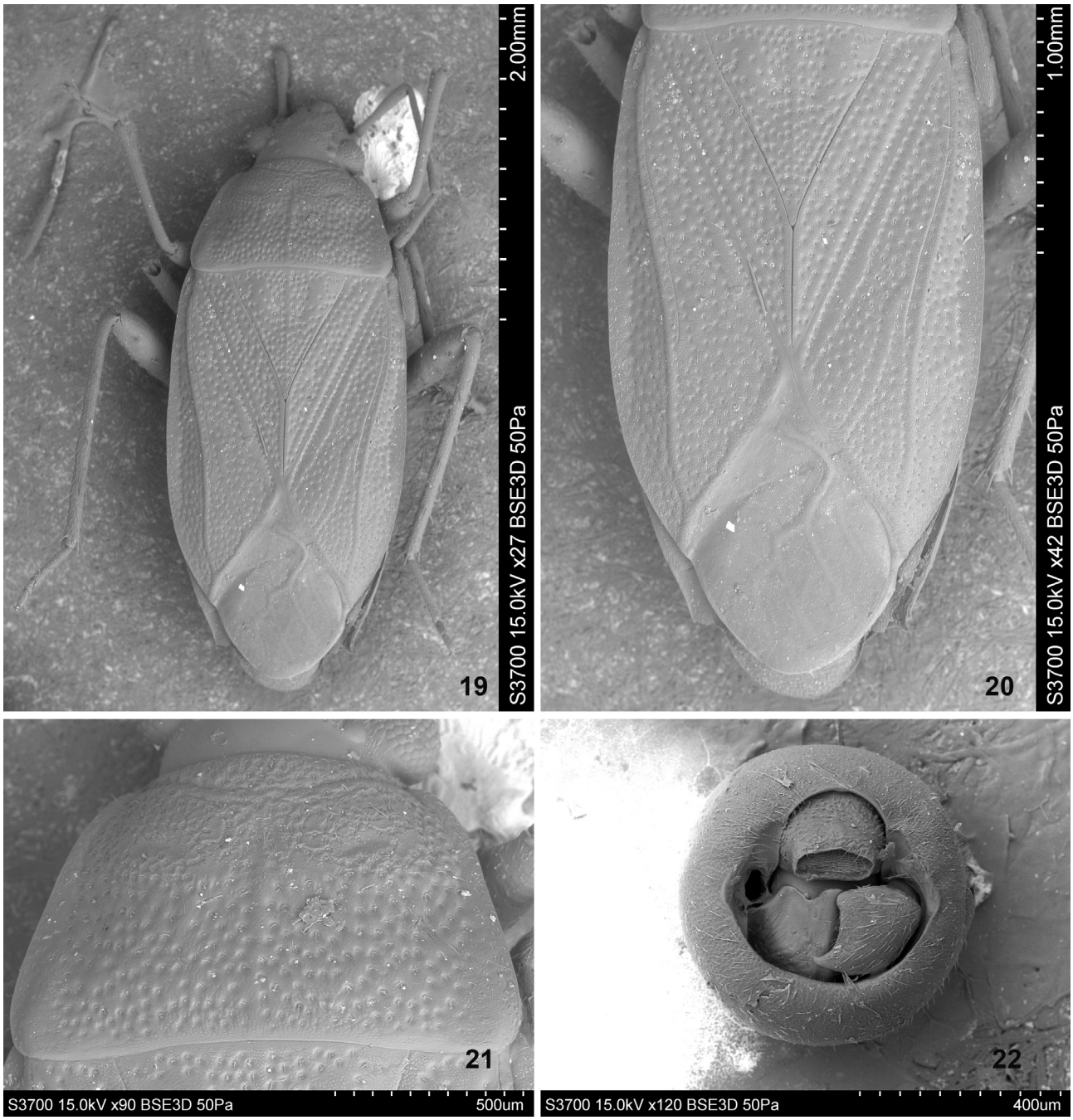


Figs 13–18. *Scobinigaster henryi* Kondorosy & Baňař sp. nov., scanning electron micrographs. 13–17 – paratype, female: 13 – metathorax with position of peritreme and evaporatium; 14 – detail of peritreme and evaporatorium; 15 – trichobothria on segments III and IV, lateroventral view; 16 – detail of trichobothria on segment IV, lateroventral view; 17 – trichobothria on segment VI, lateroventral view. 18 – holotype, male, pygophore, posterodorsal view.

of one series of strong stiff setae (similar to the regular setae of the tibiae) on the meso- and metafemora is quite rare. Two parallel rows of such setae on the meso- and metafemora are found only in Afrotropical species of *Neolethaeus* and *Orbellis*. Based on the characters mentioned above, those two genera seem to be the nearest relatives of *Scobinigaster*.

Only in the continental African *Neolethaeus* species (*N. aethiopicus* Hesse, 1925, *N. giganteus* Scudder, 1963 and *N. ulugurus* Scudder, 1962) is the last tergite (VII) of the males so decumbent that it is closed together with the last sternite, and the genital segments are not at all visible. When comparing the parameres of *Scobinigaster* with the figures of O'Donnell (1991), the most similar paramere is that of *Neolethaeus aethiopicus*, though there are enough differences to separate them.

Brachyptery is not a very common character in Lethaeini, except the taxa from the Cape region of Africa (see Slater 1977), some Australian and Neotropical genera, and almost



Figs 19–22. *Scobinigaster paveli* Kondorosy & Baňař sp. nov., scanning electron micrographs of holotype, male. 19 – dorsal habitus; 20 – hemelytra; 21 – pronotum; 22 – pygophore, posterior view.

always it is facultative, as far as macropterous specimens can be also found (e.g. in *Camptocera* Jakovlev, 1877, *Diniella* and *Noteolethaeus*). Interestingly, the only known specimen of the 'oldest' but long forgotten Lethaeini species, *Lethaeus ater* (Thunberg, 1822) from South Africa is also brachypterous (see Kondorosy et al. 2014). Now, with *Scobinigaster* and *Noteolethaeus* (see Zámbó et al. 2019), we have discovered brachyptery in Madagascan taxa as well.

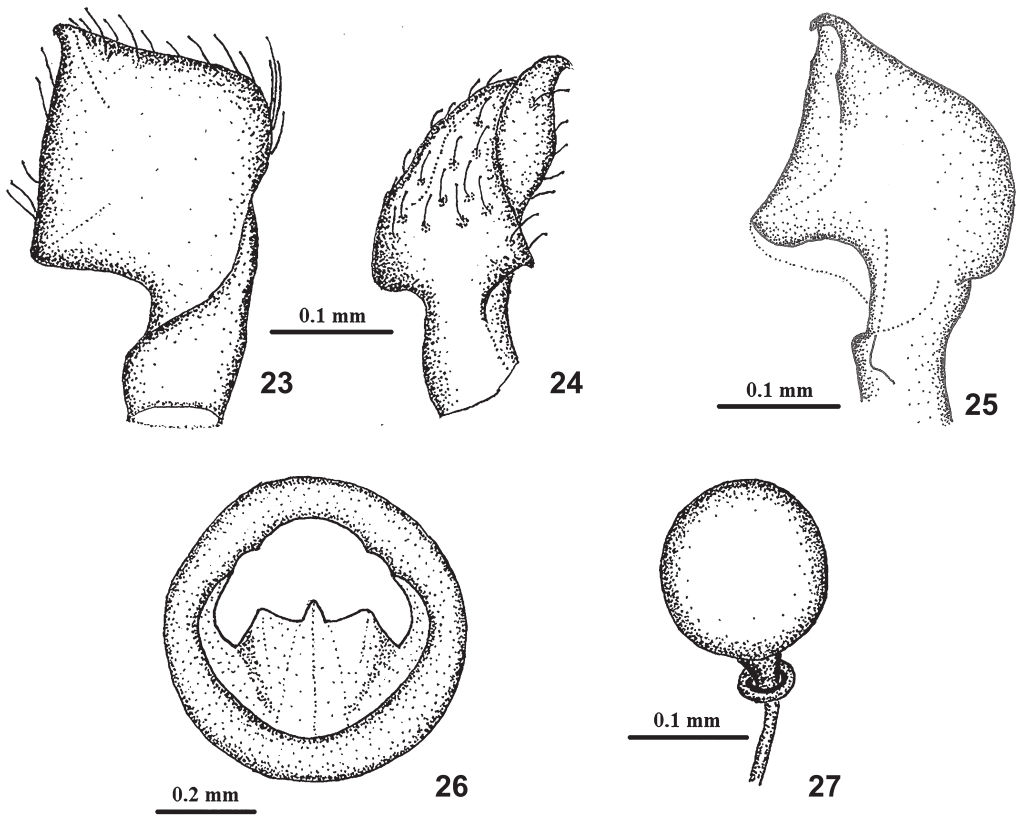
Etymology. The first part of the name of the genus refers to '*scobina*', which means rasp in Latin; the latter part is '*gaster*' meaning abdomen in Latinized Greek (originally γᾰστήρ, meaning stomach**)**, indicating the coarsely granulate surface of the abdomen. Gender is feminine.

Scobinigaster henryi Kondorosy & Baňař, sp. nov.

(Figs 1–3, 5–18)

Type locality. Southwestern Madagascar, Atsimo-Andrefana region, Zombitse-Vohibasia National Park, Zombitse forest, 22°53.171′ S 44°41.489′E.

Type material. Holotype: ♂ (MMBC), 'SW MADAGASCAR, Toliara pr. / Zombitse-Vohibasia N.P. / Zombitse forest, 824m main / entr. 22°53'171"S 44°41'489"E / 22-25.i.2014, M.Trýzna leg. [printed, white label] // HOLOTYPUS [printed] / Scobinigaster / henryi sp. nov. [handwritten] / det. Kondorosy & Baňař [printed, red label]'. Paratypes: 1 ♂ (NMPC), the same data as holotype; 1 ♀ (MMBC), 'SW MADAGASCAR / Isalo NP, Zahavola for. / cca 850m; 21.i.2013 / M. Trýzna leg.'; 1 ♀ (MMBC), 'ISL/Jan 2013/19 MADAGASCAR, Isalo NP; Piscine Naturelle; 852 m / S 22°33'43.5" E 45°23'00.4"; 21.i.2013 / sifting litter, Winkler app. extr.; L.S. / Rahanitriniaina & E. M. Rabotoson lgt.';



Figs 23–27. *Scobinigaster* gen. nov. species. 23–24, 26–27 – *S. henryi* Kondorosy & Bañař sp. nov., holotype, male; 23 – paramere, ventral view; 24 – paramere, lateral view; 26 – pygophore, posterior view; 27 – paratype, female, spermatheca. 25 – *S. paveli* Kondorosy & Bañař sp. nov., holotype, male, paramere, ventral view, hairs omitted.

1 ♀ (MMBC) 1 ♂ (HNHM), 'ISL/Jan 2013/09 MADAGASCAR / Isalo N.P., Analalava forest; 735m / S 22°34'45.5" E45°08'22.5" 19.i.2013 / sifting litter, Winkler app. extr.; L.S. / Rahanitriniaina & E.M. Rabotoson lgt.' Each paratype bears following red label: 'PARATYPUS [printed] / Scobinigaster / henryi sp. nov. [handwritten] / det. Kondorosy & Bañař [printed]'.

Description. *Colour* brown (Figs 1–4); head and anterior lobe of pronotum fuscous; antennae yellowish, apex of pedicel, basal half of basiflagellum and distiflagellum brownish, apical half of basiflagellum white; labium yellow; anterior margin of pronotal collar except middle and lateral margin yellow; posterior lobe of pronotum and hemelytra yellow with irregular dark spots of variable extension; scutellum mostly dark with narrow pale midline and submedial stripes; legs pale, coxae, trochanters, very base of femora and strong setae of middle and hind legs often dark.

Structure. Body oval, its entire surface densely punctate, fully covered with fine, very short, decumbent pilosity (Figs 6, 9, 11), hardly visible on hemelytra, while abdomen with longer but also decumbent fine setae (Fig. 8). Always brachypterous, clavus and corium not separated (Fig. 5), apical margin of corium convex, with arched membranal margin being slightly wider than tibiae, leaving tergite VI in greater part and VII fully free.

Male genitalia: cup-like sclerite with an acute tooth medially, much longer than blunt lateral apices. Paramere (Figs 23, 24) with long setae.

Measurements (all in mm, 3 males [holotype in parentheses], 3 females [basi- and distiflagellum on largest female absent]): Total body length: 4.56–4.86 (4.83), 4.27–5.39; head: length 0.75–0.78 (0.85), 0.72–0.85, width 0.94–0.98 (0.95), 0.85–1.05, interocular space 0.56–0.59 (0.58), 0.50–0.64; length of eye 0.27–0.29 (0.29), 0.28–0.32, length of antenniferous tubercle 0.15–0.17 (0.17), 0.16–0.19; length of antennomeres: I 0.61–0.74 (0.67), 0.54–0.69, II 0.92–1.09 (0.96), 0.75–1.04, III 0.69–0.74 (0.67), 0.56–0.75, IV 0.72–0.76 (0.69), 0.62–0.78; length of labiomeres: I 0.72–0.78 (0.77), 0.82–0.90, II 0.71–0.76 (0.73), 0.81–0.88, III 0.57–0.64 (0.61), 0.68–0.81, IV 0.44–0.48 (0.42), 0.45–0.46; pronotum: length 0.92–1.02 (0.97), 0.86–1.02, width 1.36–1.45 (1.42), 1.19–1.49; scutellum: length 0.88–0.89 (0.83), 0.75–0.97, width 0.79–0.81 (0.78), 0.69–0.86.

Differential diagnosis. See the differential diagnosis under *S. paveli*.

Etymology. We dedicate this species to Thomas Henry, the excellent specialist in many groups of Heteroptera, on the occasion of his 70th birthday (for biography and bibliography see Wheeler 2018). He helped us always very kindly when we asked him for a favour.

Collecting circumstances. Three specimens were sifted from forest leaf litter of dry seasonal forest of low canopy height (Isalo NP, Fig. 28), three specimens were collected by other, non-specified collecting method.

Distribution. South-west Madagascar.

Scobinigaster paveli Kondorosy & Baňař, sp. nov.

(Figs 4, 19–22, 25)

Type locality. Southwestern Madagascar, Mahafaly Plateau, Antanambao near Bezaha, approximately 23°29′00″S, 44°28′40″E

Type material. Holotype: ♂ (MMBC), 'S MADAGASCAR 2013 / 14.i.; Mahafaly Plateau, / Antanambao near Bezaha / vill., M.Trýzna leg.' // 'HOLOTYPUS [printed] / Scobinigaster / paveli sp. nov. [handwritten] / det. Kondorosy & Baňař [printed, red label]'.

Description. *Colour* similar to previous species, slightly paler; scape and pedicel almost uniformly pale; pale part of pronotum and hemelytra more extensive; scutellum pale except dark basal triangular spots along pale midline and lateral corners; legs pale.

Structure. Pronotum trapezoidal, anterior lobe shorter. Hemelytra macropterous, having a fully developed membrane, almost reaching the end of the abdomen. Profemora without stiff subapical setae.

Male genitalia: cup-like sclerite of pygophore with medial projection broad, not longer and similarly blunt as lateral apices. Paramere with moderately long setae.

Measurements (in mm): Total body length: 4.19; head: length 0.72, width 0.89, interocular space 0.49; length of eye 0.28, length of antenniferous tubercle 0.14; length of antennomeres: I 0.58, II 0.83, III 0.55, IV 0.61; length of labiomeres: I 0.61, II 0.49, III 0.50, IV 0.36; pronotum: length 0.91, width 1.41; scutellum: length 0.91, width 0.58.

Differential diagnosis. Both species are very similar but *S. paveli* is macropterous, having a fully developed membrane, almost reaching the end of the abdomen. It is slightly smaller than *S. henryi*, and with paler colouration. The form of the pronotum is clearly different, trapezoidal; the anterior lobe of the pronotum is also shorter than of *S. henryi*. The most important differences are that in *S. paveli* the stiff subapical setae of the profemora are absent, the

Figs 28–29. 28 – typical habitat in Isalo NP, where part of the type series of *Scobinigaster henryi* Kondorosy & Baňař sp. nov. was collected; 29 – habitat in Mahafaly plateau, type locality of *S. paveli* Kondorosy & Baňař sp. nov. Photo: Miloš Trýzna.

paramere has shorter pubescence, and the cup-like sclerite of the pygophore is clearly different.

Etymology. We dedicate this species to the late Professor Pavel Štys, the eminent heteropterist, our teacher, mentor and friend, who died unexpectedly in 2018 (for biography and bibliography see Kment et al. 2019).

Collecting circumstances. The single known specimen of this species was collected by a light trap in the Mahafaly plateau, an arid area in south-west Madagascar (Fig. 29).

Distribution. South-west Madagascar.

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