

A new velvet ant genus *Arkaditilla* (Hymenoptera, Mutillidae, Trogaspidiini) from the Oriental Region, with review of species

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Abstract

A new Old World genus in the tribe Trogaspidiini Bischoff, 1920, *Arkaditilla* **gen. nov.**, is described based on male morphology. Six species are recognized in this genus: *A. bagrada* (Cameron, 1902), **comb. nov.** (Indonesia, Malaysia), *A. depressicornis* (Mickel, 1935), **comb. nov.** (Malaysia), *A. frim* **sp. nov.** (Malaysia), *A. gibba* **sp. nov.** (Indonesia), *A. leleji* **sp. nov.** (Indonesia), and *A. nallinia* (Zavattari, 1914), **comb. nov.** (Indonesia). The species of this new genus were formerly placed in the genus *Krombeinidia* Lelej, 1996, but they are differentiated from it and other genera by having a unique set of morphological character states, such as the mandible inner margin expanded, forming subbasal tooth; the paramere antero-ventrally serrate; and the digitus dorsal margin lamellate. A key to species of *Arkaditilla* is provided.

Keywords

Aculeata, distribution, new species, Southeast Asia, taxonomy

Introduction

The tribe Trogaspidiini Bischoff, 1920 has the greatest species diversity of the four tribes of the subfamily Mutillinae (Pagliano et al. 2020). The eastern Oriental species of this tribe were assigned to the subgenus *Trogaspidia* Ashmead, 1899 of the New

World genus *Timulla* Ashmead, 1899 by Mickel (1933a, b, 1934, 1935), but Invrea (1954) resurrected *Trogaspidia* to full genus status. Chen (1957) transferred some species of *Trogaspidia* sensu Mickel to *Smicromyrme* Thomson, 1870. Lelej (1995, 1996a) and Lelej and Yamane (1992) reclassified the *Smicromyrme-Trogaspidia* assemblage, recognized new genera for species of *Smicromyrme* sensu Chen, and arranged them in the subtribe Petersenidiina Lelej, 1996. Along with this, East Asian members of *Trogaspidia* sensu Chen were divided into five genera constituting Trogaspidiina Bischoff, 1920. Those two subtribes were included in Trogaspidiini, but later regarded as separate tribes by Lelej and Nemkov (1997). However, Brothers and Lelej (2017) found that Petersenidiini was a paraphyletic group and synonymized it with Trogaspidiini. Consequently, Trogaspidiini is now represented by 13 genera in the eastern Oriental Region (Brothers and Lelej 2017; Pagliano et al. 2020). The species of this tribe are sometimes difficult to place in those previously established genera, because the “petersenidiine” genera exhibit various intermediate character states between Petersenidiini and Trogaspidiini (Brothers and Lelej 2017). Also, the species of Trogaspidiini show great interspecific morphological variations, making genus delimitation difficult (e.g. Okayasu et al. 2021). Revision of genus-level classification is thus required, and generic placement of described species, which are mostly known from the old literature only (Okayasu et al. 2021), needs to be extensively reviewed.

In this study, I present a review of the *Krombeinidia* Lelej, 1996 species with male flagellomere 1 depressed, *K. depressicornis* (Mickel, 1935) and *K. nallinia* (Zavattari, 1914), because Mickel’s (1935) key suggests they are the only species with that trait in the former Petersenidiini. I also examined *K. bagrada* (Cameron, 1902), which was placed near those two species by Mickel (1935) although it has the flagellomere 1 cylindrical, and three undescribed species that are similar to *K. depressicornis* and *K. nallinia*. As discussed below, those “*Krombeinidia*” species share additional character states that are their potential synapomorphies, so the new genus *Arkaditilla* is proposed to accommodate them.

Material and methods

The following abbreviations are used to denote institutes housing the material discussed in this study:

- EUM** Ehime University Museum, Matsuyama, Japan;
- FRIM** Forest Research Institute Malaysia, Selangor, Malaysia;
- NARO** Insect Museum, National Agriculture and Food Research Organization, Tsukuba, Japan (former Institute for Agro-Environmental Sciences);
- TKPM** Tokushima Prefectural Museum, Tokushima, Japan;
- TUA** Laboratory of Entomology, Tokyo University of Agriculture, Atsugi, Japan.

In the synonymic lists and the material examined sections, abbreviations for depository and additional or corrected data by the author are given in square brackets. New records are asterisked (*).

Specimens were observed under a Leica S8APO stereomicroscope (10–80× magnification). Photo images were taken with a Nikon Digital Sight DS-Fi1 camera attached to a Leica S8APO, and stacked using CombineZM software (Hadley 2008). Measurements of specimens were taken twice, in order to reduce measurement errors, and the mean value was indicated in the description. The distributional maps (Figs 73–76) were generated using SimpleMappr (Shorthouse 2010). Figures were edited with Adobe Photoshop software and Adobe Illustrator software. Terminology mostly follows the Hymenoptera Anatomy Consortium (2021) for the general morphology, and Harris (1979) for the integument sculpture.

The following abbreviations are used:

F	flagellomere;	OOD	ocular-ocellar distance (between lateral ocellus and eye);
LOD	lateral ocellus diameter;	POD	posterior ocellar distance (between lateral ocelli);
MOD	median ocellus diameter;	S	metasomal sternum;
OD	interocellar distance (between median and lateral ocellus);	T	metasomal tergum.

Prior to observation, the male genitalia were soaked in a 10% potassium hydroxide (KOH) solution without heating for one to three hours to dissolve muscles, and subsequently soaked in a 25% acetic acid solution to neutralize. Then, the genitalia were observed in a Petri dish filled with 70% ethanol under a stereomicroscope. Further dissection was done using forceps and a minuten pin attached to a handle. Dissected parts were photographed under incident light in a Petri dish filled with glycerin except that the penis valves were placed on a glass slide with a drop of glycerin and a cover glass. After examination, all dissected parts were stored in micro vials filled with glycerin and pinned with their respective specimens.

Results

Arkaditilla gen. nov.

<http://zoobank.org/A07954E6-26EB-4494-860C-51F96F27D2C1>

Figures 1–76

Mutilla (in part): Cameron 1902: 76, ♂; Zavattari 1914: 100, ♂.

Timulla (*Trogaspidia*) (in part): Mickel 1935: 263, 264, ♂; 1937: 449, ♂.

Krombeinidia (in part): Lelej 1996a: 11, ♂.

Petersenidia (in part): Lelej 1996b: 94, 95, ♂.

Diagnosis. Male. Frons punctate; vertex roundly sloping posteriorly; postgenal bridge flattened; hypostomal carina simple, without denticle; clypeus dorsally elevated; prementum without tubercle. Mandible apically bidentate, ventrally excised into basal tooth (Figs 19–24); inner margin expanded, forming subbasal tooth (Figs 13–18);

dorso-lateral carina sharp, not crooked. Scape ventrally with two longitudinal carinae, densely punctate or mostly smooth with sparse punctures apically between carinae (Figs 25, 27, 29, 31, 33, 35); flagellum with yellow or reddish brown ventral markings; F1 longer than F2, depressed (Figs 28, 30, 32, 34, 36) except *A. bagrada* with F1 cylindrical (Fig. 26). Mesosoma black; notaulus present, reaching anterior 1/3 to 1/2 of mesoscutum; parascutal carina forming weakly elevated, rounded tubercle posteriorly; regula posterior margin slightly protruding over transscutal articulation, not recurved; mesoscutellum evenly convex, puncto-reticulate; mesopleuron divided into dorsal and ventral convexities by transverse groove; propodeum gradually sloping posteriorly, without sublateral longitudinal carina; propodeal dorso-lateral margin without denticles. Pterostigma length subequal to distance between origin of RS on vein SC and proximal base of pterostigma. Protibial spur slender; mesocoxa evenly convex; metacoxa evenly convex with long sparse recumbent setae, without tubercle on inner margin. Metasoma black with segments 1–2 or 3 orange; S2 swollen anteriorly, without lateral felt line (Figs 2, 4, 6, 8, 10, 12); T7 medially with slender longitudinal smooth convex line; S6–S8 without lateral carina; S7 entirely exposed, 0.75× as long as S8; S8 mostly sclerotized with posterior membranous area evenly convex posteriorly; left and right basiparameres ventro-medial margins connected to form postero-medial tongue-like tubercle (Figs 38, 40, 42, 46, 48); parapenial lobe spatulate, not flexed; ventral portion of basiparamere strongly projecting posteriorly to connect volsella (Figs 49, 52, 55, 58, 61, 64); paramere antero-ventrally serrate (Figs 49, 52, 55, 58, 61, 64); digitus straight, dorsal margin lamellate (Figs 67–72); paracuspis absent, tuberculate or stick-like; penis valves symmetrical, with posterior hook (Figs 50, 51, 53, 54, 56, 57, 59, 60, 62, 63, 65, 66). **Female.** Unknown.

Type species. *Arkaditilla leleji* gen. et sp. nov., designated here.

Species included. This genus includes the following six species: *Arkaditilla bagrada* (Cameron, 1902), comb. nov., ♂ (Indonesia, Malaysia); *A. depressicornis* (Mickel, 1935), comb. nov., ♂ (Malaysia); *A. frim* sp. nov., ♂ (Malaysia); *A. gibba* sp. nov., ♂ (Indonesia); *A. leleji* sp. nov., ♂ (Indonesia); *A. nallinia* (Zavattari, 1914), comb. nov., ♂ (Indonesia).

Distribution. Widespread in Sundaland, the Oriental Region (Figs 73–76).

Etymology. I am delighted to name this new genus in honor of Arkady Stepanovich Lelej, a fellow mutillidologist, pioneer of Old World mutillid systematics, and friend, to celebrate his 75th birthday and 50th anniversary of his career since the publication of Lelej (1971), with a common suffix for mutillid genera. Gender feminine.

Biology. This genus is rare in collections; only twelve specimens of *A. bagrada*, nine specimens of *A. depressicornis*, and seven specimens of *A. nallinia* have been reported by previous authors (Cameron 1902; Zavattari 1914; Mickel 1935, 1937; Lelej 1996b). In this study, however, a series of 28 specimens collected in Malaise traps placed in a lowland rain forest at Pasoh Forest Reserve was examined, suggesting greater abundance in forested habitats. See Maetò et al. (1999) for sampling sites.

Remarks. This new genus belongs to the former Petersenidiini Lelej, 1996 by having the penis valves symmetrical, and the species of this genus were formerly placed

in *Krombeinidia* Lelej, 1996 (Lelej 1996a) or *Petersenidia* Lelej, 1992 (Lelej 1996b). However, the males of *Arkaditilla* differ from those of *Krombeinidia* and *Petersenidia* by having the mandible with a subbasal inner tooth (mandibular inner margin entire in *Krombeinidia* and *Petersenidia*), the basiparamere antero-ventrally serrate (entire in *Krombeinidia* and *Petersenidia*), and the digitus dorsal margin lamellate (digitus cylindrical in *Krombeinidia* and *Petersenidia*). Within Trogaspidiini, the males of this new genus and *Serendibiella* Lelej, 2005 share the mandible with subbasal inner tooth, but the former differs from the latter by having the hypostomal carina without a tubercle (present in *Serendibiella*), the mesocoxa evenly convex (laterally swollen in *Serendibiella*), S2 without a lateral felt line (present in *Serendibiella*), S8 flattened (with sublateral longitudinal carina in *Serendibiella*), and the penis valves symmetrical (right penis valve longer than left in *Serendibiella*).

Key to species of *Arkaditilla*

- 1 Scape ventral carinae subparallel (Fig. 25), mostly smooth between them; flagellum at most with F1 apical 1/3 and F2 basal 1/2 yellow; F1 cylindrical (Fig. 26); paracuspis stick-like (Fig. 67). – Indonesia, Malaysia.....***A. bagrada* (Cameron)**
- Scape ventral carinae divergent apically (Figs 27, 29, 31, 33, 35), densely punctate between them; flagellum at least with F1 apical 1/3 and F2 entirely whitish yellow ventrally; F1 depressed (Figs 28, 30, 32, 34, 36); paracuspis absent or slightly tuberculate (Figs 68–72).....**2**
- 2 Mandible ventrally slightly excised with small basal tooth (Fig. 23); mandible inner margin lamellately expanded near apex (Fig. 17); F1 weakly depressed, F1 height subequal to pedicel diameter (Fig. 34); T3 black; penis valve strongly expanded ventrally on posterior half (Figs 62, 63). – Indonesia.....***A. leleji* sp. nov.**
- Mandible ventrally deeply excised with large basal tooth (Figs 20, 21, 23, 24); mandible inner margin expanded subbasally (Figs 14–16, 18); F1 strongly depressed, F1 height ~0.8× pedicel diameter (Figs 28, 30, 32, 36); T3 orange; penis valve weakly expanded ventrally (Figs 53, 54, 56, 57, 59, 60, 65, 66).....**3**
- 3 Digitus posteriorly slender stick-like (Fig. 39); paracuspis absent (Fig. 68). – Malaysia.....***A. depressicornis* (Mickel)**
- Digitus posteriorly expanded, forming triangular projection (Figs 41, 43, 47); paracuspis slightly tuberculate (Figs 69–72).....**4**
- 4 Clypeus medially strongly elevated even ventrally; cuspis widened near apex, forming oblique posterior margin (Figs 58, 70). – Indonesia ...***A. gibba* sp. nov.**
- Clypeus dorsally elevated, sloping ventrally; cuspis widened on posterior 1/3 with rounded apex (Figs 55, 64, 69, 72).....**5**
- 5 Mandible with weak subapical and subbasal teeth (Fig. 15); cuspis weakly widened on posterior 1/3 (Figs 55, 69). – Malaysia.....***A. frim* sp. nov.**
- Mandible with sharp subapical tooth and large inner subbasal tooth (Fig. 18); cuspis strongly widened on posterior 1/3 (Figs 64, 72). – Indonesia***A. nallinia* (Zavattari)**

***Arkaditilla bagrada* (Cameron, 1902), comb. nov.**

Figures 1, 2, 13, 19, 25, 26, 37, 38, 49–51, 67, 73

Mutilla bagrada Cameron, 1902: 76, ♂, holotype ♂ (Kuching, Sarawak, [Malaysia]) [Natural History Museum, London, UK].

Timulla (Trogaspidia) bagrada: Mickel 1935: 263, ♂; 1937: 449, ♂.

Krombeinidia bagrada: Lelej, 1996a: 11; 2005: 65; Lo Cascio 2015: 550; Pagliano et al. 2020: 250.

Petersenidia bagrada: Lelej 1996b: 95, ♂.

Diagnosis. Male. Clypeus dorsally elevated, sloping ventrally. Mandible with sharp subapical and large inner subbasal teeth (Fig. 13), ventrally deeply excised with large basal tooth (Fig. 19). Scape ventral carinae subparallel, mostly smooth between them (Fig. 25); F1 apical 1/3 and F2 basal 1/2 yellow, F2 apical 1/2 and F3–F11 with ventral reddish brown patch; F1 cylindrical (Fig. 26). T3 orange (Fig. 2); cuspis strongly widened on posterior 1/3 with rounded apex (Figs 49, 67); digitus posteriorly slender stick-like (Fig. 37); paracuspis stick-like (Fig. 67); penis valve weakly expanded ventrally (Figs 50, 51). **Female.** Unknown.

Material examined. 24♂. **MALAYSIA:** NEGERI SEMBILAN: Pasoh Forest Reserve, 25.III–2.IV.1993, K. Konishi & K. Maeto leg., coarse Malaise trap, plot 2 [2♂ FRIM, NARO], 2–8.IV.1993 [1♂ FRIM], 8–15.IV.1993 [1♂ NARO]; Pasoh Forest Reserve, 25.III–2.IV.1993, K. Konishi & K. Maeto leg., fine Malaise trap, plot 2 [2♂ FRIM, NARO]; Pasoh Forest Reserve, 26.III–3.IV.1993, K. Konishi & K. Maeto leg., coarse Malaise trap, plot 4 [1♂ FRIM], 9–16.IV.1993 [1♂ NARO]; Pasoh Forest Reserve, 3–9.IV.1993, K. Konishi & K. Maeto leg., fine Malaise trap, plot 4 [1♂ FRIM]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., coarse Malaise trap, plot 1 [2♂ FRIM, NARO]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., coarse Malaise trap, plot 4 [2♂ FRIM, NARO]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., fine Malaise trap, plot 1 [2♂ FRIM, NARO], 10–17.XII.1993 [1♂ FRIM]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., fine Malaise trap, plot 3 [1♂ NARO], 10–17.XII.1993 [1♂ FRIM]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., fine Malaise trap, plot 4 [1♂ NARO], 3–10.XII.1993 [1♂ NARO]; Pasoh Forest Reserve, 3–10.XII.1993, K. Maeto leg., coarse Malaise trap, plot 6 [1♂ NARO]; Pasoh Forest Reserve, 10–17.XII.1993, K. Maeto leg., coarse Malaise trap, plot 2 [1♂ FRIM]; Pasoh Forest Reserve, 10–17.XII.1993, K. Maeto leg., fine Malaise trap, plot 2 [2♂ FRIM, NARO].

Identification source. Keyed using Mickel (1935) and compared with the original description. No differences were found between the specimens examined herein and Cameron's description.

Distribution. Indonesia: Kalimantan Timur (Lelej 1996b). Malaysia: Negeri Sembilan*, Sarawak (Cameron 1902; Mickel 1937).

Remarks. This is the only species in *Arkaditilla* with F1 cylindrical, like most species of Mutillinae. Similarly, the species of East Asian genera of the former Peterseniini, like *Krombeinidia*, *Orientidia* Lelej, 1996, *Pagdenidia* Lelej, 1996, *Petersenidia*,



Figures 1–6. *Arkaditilla* spp., ♂, habitus **1, 3, 5** dorsal view **2, 4, 6** lateral view **1, 2** *A. bagrada* (Cameron) **3, 4** *A. depressicornis* (Mickel) **5, 6** *A. frim* sp. nov., holotype. Scale bars: 3 mm.

Taiwanomyrme Tsuneki, 1993, and *Zavatilla* Tsuneki, 1993, have the F1 cylindrical. I presume that this is a plesiomorphic state in *Arkaditilla*, and *A. bagrada* is sister to the remaining members of the genus.

***Arkaditilla depressicornis* (Mickel, 1935), comb. nov.**

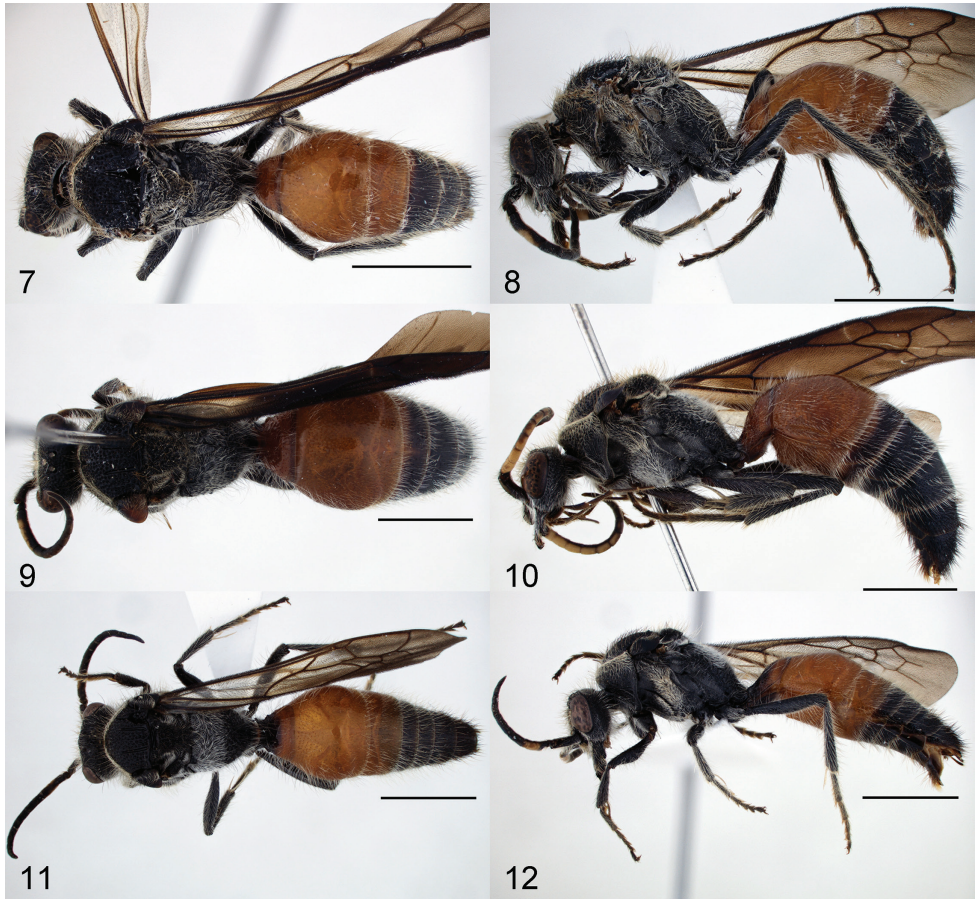
Figures 3, 4, 14, 20, 27, 28, 39, 40, 52–54, 68, 74

Timulla (*Trogaspidia*) *depressicornis* Mickel, 1935: 264, ♂, holotype ♂ (Sandakan, [Sabah], Borneo, [Malaysia]) [National Museum of Natural History, Washington D.C., USA]; Mickel 1937: 449, ♂.

Krombeinidia depressicornis: Lelej 1996a: 11; 2005: 66; Lo Cascio 2015: 550; Pagliano et al. 2020: 251.

Petersenidia depressicornis: Lelej 1996b: 94, ♂.

Diagnosis. Male. Clypeus dorsally elevated, sloping ventrally. Mandible with sharp subapical and large inner subbasal teeth (Fig. 14), ventrally deeply excised with large basal tooth (Fig. 20). Scape ventral carinae divergent apically (Fig. 27), densely punctate between them; F1 apical 1/3, F2–F3, F2–F4, or F2–F5 whitish yellow on ventral half, F5 or F5–F6 with ventral whitish yellow patch, F6–F11 or F7–F11 with ventral dark brown patch; F1 strongly depressed, F1 height $\sim 0.8 \times$ pedicel diameter (Fig. 28). T3 orange (Fig. 4); cuspis weakly widened on posterior 1/3 with rounded apex (Figs 52, 68); digitus posteriorly slender stick-like (Fig. 39); paracuspis absent (Fig. 68); penis valve weakly expanded ventrally (Figs 53, 54). **Female.** Unknown.



Figures 7–12. *Arkaditilla* spp., ♂, habitus **7, 9, 11** dorsal view **8, 10, 12** lateral view **7, 8** *A. gibba* sp. nov., holotype **9, 10** *A. leleji* sp. nov., holotype **11, 12** *A. nallinia* (Zavattari). Scale bars: 3 mm.

Material examined. 3♂. **MALAYSIA:** NEGERI SEMBILAN: Pasoh Forest Reserve, 31.III.1993, K. Konishi leg. [1♂ NARO]; Pasoh Forest Reserve, 26.XI–3.XII.1993, K. Maeto leg., fine Malaise trap, plot 6 [1♂ FRIM]; PAHANG: Cameron Highland, 19 mile, 15.III.2006, K. Takasuka leg. [1♂ EUM].

Identification source. Keyed using Mickel (1935) and compared with the original description. Mickel (1935) described this species as having the F1 apical 1/2 and F2–F4 ventrally “pale ferruginous”, but the specimens examined herein have the F2–F3, F2–F4, or F2–F5 entirely whitish yellow ventrally.

Distribution. Malaysia: Negeri Sembilan*, Pahang*, Sabah, Sarawak (Mickel 1935, 1937; Lelej 1996b).

Remarks. This species was originally described from Borneo (Mickel 1935) and is newly recorded from Peninsular Malaysia. In this study, this species was primarily recognized by having the F2–F4 ventrally entirely yellow as included in Mickel’s (1935) key.

Arkaditilla frim sp. nov.

<http://zoobank.org/E5FFF6B3-52AC-49E9-8B78-B07E69973CFF>

Figures 5, 6, 15, 21, 29, 30, 41, 42, 55–57, 69, 75

Diagnosis. Male. Clypeus dorsally elevated, sloping ventrally. Mandible with weak subapical and subbasal teeth (Fig. 15), ventrally deeply excised with large basal tooth (Fig. 21). Scape ventral carinae divergent apically (Fig. 29), densely punctate between them; F1 apical 1/3, F2, F3 basal half whitish yellow on ventral half, F5–F11 with ventral yellow to reddish brown patch; F1 strongly depressed, F1 height $\sim 0.8\times$ pedicel diameter (Fig. 30). T3 orange (Fig. 6); cuspis weakly widened on posterior 1/3 with rounded apex (Figs 55, 69); digitus posteriorly expanded, forming triangular projection (Fig. 41); paracuspis slightly tuberculate (Fig. 69); penis valve weakly expanded ventrally (Figs 56, 57). **Female.** Unknown.

Description. Male. Body length: 11.2–15.0 mm (holotype: 15.0 mm; mean: 13.1 mm); forewing length: 8.09–10.7 mm (holotype: 10.7 mm; mean: 9.37 mm).

Color and setae. Frons, vertex, gena, clypeus, pedicel, flagellum mostly, prementum, stipes, mesosoma, T4–T7, S4–S8 black; mandible brown to black, with apex always black and medial 1/5–1/2 yellowish brown; labrum, protibial spur yellow; scape, tegula brownish black; F1 apical 1/3, F2, F3 basal half whitish yellow on ventral half; F5–F11 yellow to reddish brown ventrally; trochanters brown to dark brown; coxae, femora, tibiae, tarsi dark brown to brownish black; meso- and metatibial spurs pale yellow; T1–T3, S1–S3 orange; wings pale brown on proximal 1/3, brown on distal 2/3, with veins dark brown. Upper frons, vertex, trochanters, T1, S1 with sparse long erect pale golden setae; lower frons, dorsal propodeal face, dorsal half of lateral propodeal face with dense short appressed and sparse long erect pale golden setae; eye dorsal margin with long erect black setae; gena, pronotal dorsum, metascutellum with sparse short recumbent and sparse long erect pale golden setae; clypeus with dense long recumbent pale golden setae; mandible, tibiae, tarsi, T2–T5 with sparse long recumbent



Figures 13–18. *Arkaditilla* spp., ♂, face **13** *A. bagrada* (Cameron) **14** *A. depressicornis* (Mickel) **15** *A. frim* sp. nov., holotype **16** *A. gibba* sp. nov., paratype **17** *A. leleji* sp. nov., holotype **18** *A. nallinia* (Zavattari).

pale golden setae; scape, femora, S2 with sparse long recumbent and sparse long erect pale golden setae; pedicel, F1, tegula anterior portion with sparse short recumbent pale golden setae; F2–F11 with sparse erect pale golden microsetae; pronotal collar anteriorly, T2 disc, T3–T5 medially, S3–S6 with sparse short erect pale golden setae; pronotal collar posteriorly glabrous; pronotal lateral face meso- and metacoxae with sparse long appressed pale golden setae; propleuron with sparse long appressed and sparse long erect pale golden setae; mesoscutum with sparse short recumbent black and sparse short erect pale golden to black setae; tegula inner margin with sparse short recumbent pale golden and sparse short erect pale golden to black setae; mesoscutellum with sparse short recumbent pale golden, sparse long erect black, sparse long erect pale golden setae; anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face with sparse short appressed pale golden setae; axilla, metanotal trough, medial and ventral parts of mesopleuron, procoxa with dense long appressed and sparse long erect pale golden setae; T6–T7, S7–S8 with sparse long recumbent and sparse long erect black setae; T2 with lateral golden felt line; T1–T5, S2–S5 with posterior fringe of sparse pale golden setae; S6–S8 with posterior fringe of sparse black setae.

Structure. Head 1.82–2.00× as wide as long (holotype: 2.00); lateral margins strongly convergent behind eye; vertex rounded posteriorly; POD/OOD = 0.56–0.58 (holotype: 0.56); OD:MOD:LOD = 1.00:1.08–1.12:0.94–1.00 (holotype: 1.00:1.12:0.94); ocellar region slightly convex, ocelli without posterior carina; antennal scrobe with weak inverted V-shaped dorsal carina not reaching inner eye margin; genal carina absent; postgenal bridge flattened; hypostomal carina weakly developed; clypeus dorsally elevated, sloping ventrally, with subventral transverse groove laterally not defined by carina; anterior clypeal margin projecting medially; mandible robust, narrowed to apex with inner margin expanded forming small subbasal tooth; mandible apex bidentate; mandible ventral margin excised into large basal tooth; mandible dorsal carina sharp; prementum flattened; scape curved medially, with two longitudinal ventral carinae divergent apically; F1 depressed, F1 height 0.67–0.80× pedicel diameter (holotype: 0.67); relative length of pedicel, F1 and F2 = 1.00:2.85–3.06:1.92–2.29 (holotype: 1.00:3.06:2.29); F2–F11 almost equal in width; F11 as long as F2, conical.

Mesosoma widest at mesonotum including tegulae; head width:humeral width:pronotal width:mesonotal width = 88:62:91:100; humeral angle rounded, with sharp humeral carina on ventral half; mesoscutum strongly convex; mesoscutal width 1.12× its length; tegula short rounded, posteriorly reaching mesoscuto-scutellar articulation, 1.44–1.53× as long as wide (holotype: 1.53); notaulus evenly wide, reaching anterior 1/2 of mesoscutum, subparallel; parapsidal line length 0.25× mesoscutal length; parascutal carina forming rounded, weakly elevated process on postero-lateral angle of mesoscutum; mesoscutellum convex without medial carina, tubercle or impunctate line; mesopleuron divided into dorsal and ventral convexities by distinct transverse mesopleural groove, ventrally without transverse precoxal ridge, longitudinal impunctate line, or precoxal swelling; dorsal propodeal face without distinct dorsum and sub-lateral carina, with anterior inverted triangular cell and semicircular sublateral cell; lateral margins of propodeum gradually convergent posteriorly; dorsal and lateral propodeal faces not separated by carina.

Wings well developed; distance between origin of RS on vein SC and base of stigmatic cell equal to stigmatic cell length and first abscissa of RS length; cell 2RS present.

Meso- and metacoxae evenly convex; metacoxa with weak complete inner longitudinal carina; protibial spur slender; tibiae without outer spines.

T1 without distinct dorsum; T1 spiracle weakly tuberculate; T2 evenly convex, 1.28× as wide as long; S1 with straight medial longitudinal carina with its ventral margin slightly elevated posteriorly; S2 swollen anteriorly; T7 medially with longitudinal impunctate convex line, posteriorly not forming tubercle; S6–S8 without lateral carina or tubercle; S7 entirely exposed, 0.75× as long as S8; S8 mostly sclerotized with posterior membranous area evenly convex posteriorly. Paramere down-curved posteriorly, with weak inner protuberance on posterior 1/2 of dorso-inner margin; inner margin of paramere dorsally with short erect golden setae; ventral lobe posteriorly projecting, pointed; parapenial lobe large, with posterior margin slightly concave; cuspis long slender, weakly widened on posterior 1/3 with rounded apex, slightly surpassing apex of penis valve, with dense long erect setae ventrally and posteriorly; digitus straight, posteriorly expanded, forming triangular projection, with dense erect golden setae posteriorly; paracuspis slightly tuberculate with few erect golden setae; penis valves symmetrical slender, weakly expanded ventrally, with posterior ventral hook, without setae.

Frons, vertex, gena, pronotal dorsum, mesoscutum, medial part of mesopleuron with large dense punctures; postgenal bridge, clypeus lateral portion, mandible outer face, scape between ventral carinae, flagellum, pronotal lateral face, propleuron, axilla, metanotal trough, anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face, procoxa, tarsi with minute dense punctures; clypeus medial convexity with large sparse punctures; mandible mostly, pronotal collar posteriorly smooth; scape mostly, trochanters, femora, tibiae, T1 medially, T2 disc, T3–T6, S1–S2 with small sparse punctures; pedicel, pronotal collar anteriorly, meso- and metacoxa with minute sparse punctures; mesoscutellum with large confluent punctures; metascutellum with small confluent punctures; dorsal propodeal face, dorsal half of lateral propodeal face reticulate; T1–T2 laterally, T7, S3–S8 with small dense punctures; tegula mostly microreticulate with few small punctures anteriorly, postero-inner portion with minute sparse punctures.

Type material. 2♂. *Holotype* ♂: **MALAYSIA:** NEGERI SEMBILAN: Pasoh Forest Reserve, 3–10.XII.1993, K. Maeto leg., coarse Malaise trap, plot 6 [FRIM]. *Paratype*: **MALAYSIA:** NEGERI SEMBILAN: Pasoh Forest Reserve, 25.III–2.IV.1993, K. Konishi & K. Maeto leg., fine Malaise trap, plot 2 [1♂ NARO].

Distribution. Malaysia: Negeri Sembilan.

Etymology. This new species is named after FRIM, Forest Research Institute Malaysia, which was the Malaysian counterpart of the Japan-Malaysia joint research project in 1993 funded by the Ministry of the Environment of Japan. Treat as a noun in apposition.

Remarks. This species occurs sympatrically with *A. depressicornis*, but this new species differs from it by having the mandible with weakly developed subbasal and subapical teeth (subbasal and subapical teeth large in *A. depressicornis*), the digitus posteriorly expanded (digitus slender in *A. depressicornis*), and the paracuspis tuberculate (paracuspis absent in *A. depressicornis*).

***Arkaditilla gibba* sp. nov.**

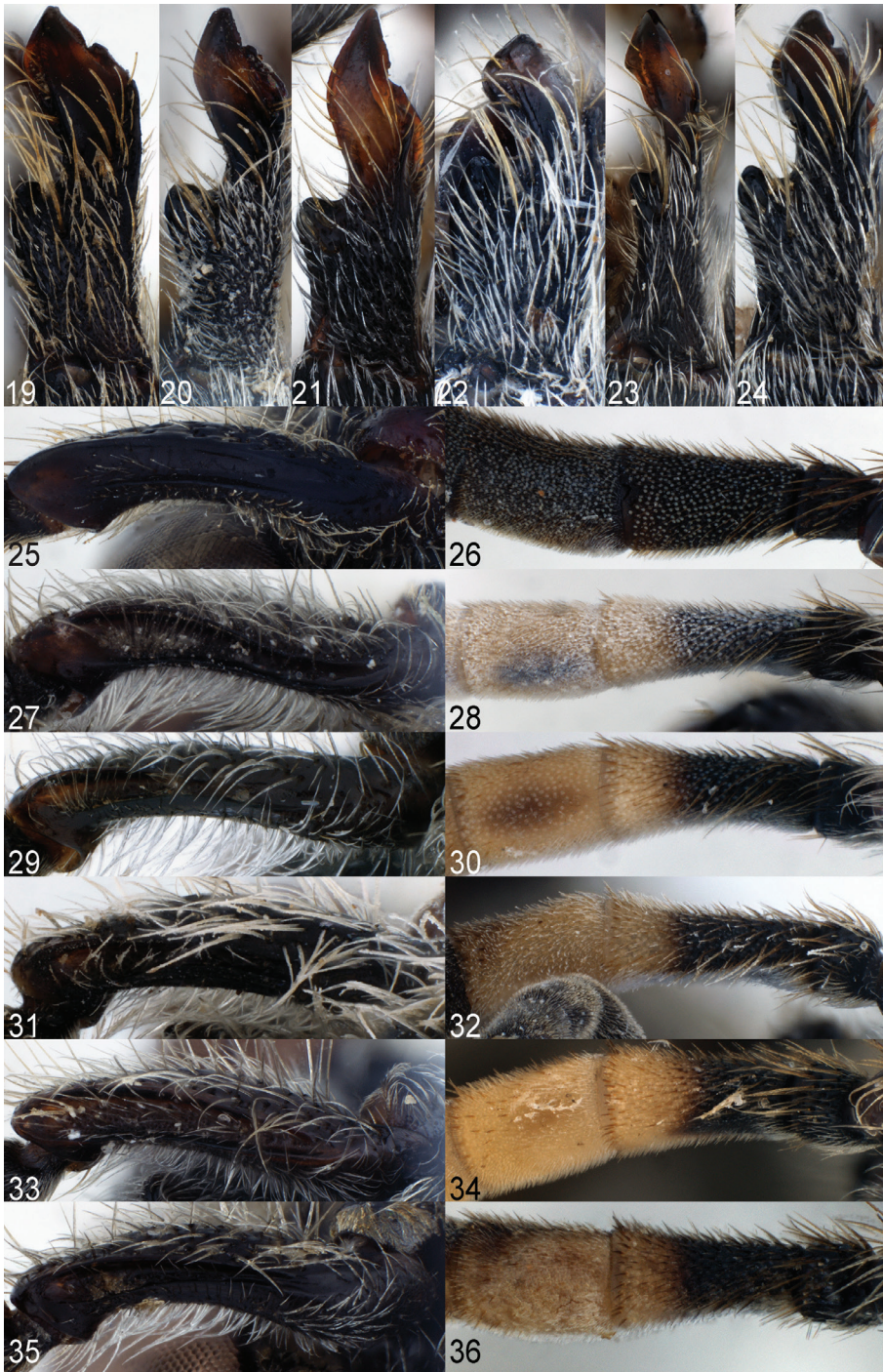
<http://zoobank.org/25D8F0E2-795C-4BC7-BDAB-461B910EE8A9>

Figures 7, 8, 16, 22, 31, 32, 43, 44, 58–60, 70, 75

Diagnosis. Male. Clypeus medially strongly elevated even ventrally. Mandible with sharp subapical and large inner subbasal teeth (Fig. 16), ventrally deeply excised with large basal tooth (Fig. 22). Scape ventral carinae divergent apically (Fig. 31), densely punctate between them; F1 apical 1/3 and F2 whitish yellow on ventral half; F1 strongly depressed, F1 height $\sim 0.8 \times$ pedicel diameter (Fig. 32). T3 orange (Fig. 8); cuspis widened near apex, forming oblique posterior margin (Figs 58, 70); digitus posteriorly expanded, forming triangular projection (Fig. 43); paracuspis slightly tuberculate (Fig. 70); penis valve weakly expanded ventrally (Figs 59, 60). **Female.** Unknown.

Description. Male. Body length: 12.4–15.1 mm (holotype: 12.4 mm; mean: 13.8 mm); forewing length: 10.6–11.0 mm (holotype: 10.6 mm; mean: 10.8 mm).

Color and setae. Frons, vertex, gena, clypeus, mandible mostly, scape, pedicel, flagellum mostly, prementum, stipes, mesosoma, coxae, femora, tibiae, tarsi, T4–T7, S1 medial carina, S4–S8 black; mandible medial 1/4 reddish brown; F1 apical 1/3, F2 whitish yellow on ventral half; labrum, tegula brownish black; trochanters, protibial spur dark brown; meso- and metatibial spurs pale yellow; T1–T3, S1 except medial carina, S2–S3 orange; wings pale brown, with veins dark brown. Upper frons, vertex, T1, S1 with sparse long erect pale golden setae; lower frons, pronotal dorsum, dorsal propodeal face, dorsal half of lateral propodeal face with dense short appressed and sparse long erect pale golden setae; gena, femora, tibiae with sparse short recumbent and sparse long erect pale golden setae; eye dorsal margin with long erect black setae; clypeus with dense long recumbent pale golden setae; mandible, trochanters, T2 lateral margin with sparse long recumbent pale golden setae; scape with sparse long recumbent and sparse long erect pale golden setae; pedicel, F1 with sparse short recumbent pale golden setae; F2–F11 with sparse erect pale golden microsetae; pronotal collar anteriorly, T2 disc, T3–T5, S3–S6 with sparse short erect pale golden setae; pronotal collar posteriorly glabrous; pronotal lateral face, coxae with sparse long appressed pale golden setae; propleuron with sparse long appressed and sparse long erect pale golden setae; mesoscutum with sparse short recumbent and sparse short erect goldish black setae; mesoscutellum, metascutellum with sparse short recumbent pale golden and sparse long erect pale golden to blackish golden setae; axilla, metanotal trough with dense long appressed pale golden setae; anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face with sparse short appressed pale golden setae; medial and ventral parts of mesopleuron with dense long appressed and sparse long erect pale golden setae; tegula anterior portion, tarsi with sparse long recumbent pale golden setae; tegula inner margin with sparse short recumbent and sparse short erect golden setae; S2 with sparse short recumbent and sparse short erect pale golden setae; T6–T7, S7–S8 with sparse short erect black setae; T2 with lateral golden felt line; T1–T5, S2–S5 with posterior fringe of sparse pale golden setae; S6–S8 with posterior fringe of sparse black setae.



Figures 19–36. *Arkaditilla* spp., ♂ **19–24** mandible, lateral view **25, 27, 29, 31, 33, 35** scape, ventral view **26, 28, 30, 32, 34, 36** pedicel, F1, and F2, lateral view **19, 25, 26** *A. bagrada* (Cameron) **20, 27, 28** *A. depressicornis* (Mickel) **21, 29, 30** *A. frim* sp. nov., holotype **22, 31, 32** *A. gibba* sp. nov., holotype **23, 33, 34** *A. leleji* sp. nov., holotype **24, 35, 36** *A. nallinia* (Zavattari).

Structure. Head 1.89–1.92× as wide as long (holotype: 1.92); lateral margins strongly convergent behind eye; vertex rounded posteriorly; POD/OOD = 0.56–0.77 (holotype: 0.77); OD:MOD:LOD = 1.00:1.15–1.58:0.92–1.08 (holotype: 1.00:1.58:0.92); ocellar region slightly convex, ocelli without posterior carina; antennal scrobe with weak inverted V-shaped dorsal carina not reaching inner eye margin; genal carina absent; postgenal bridge flattened; hypostomal carina weakly developed; clypeus medially strongly elevated even ventrally, without subventral transverse groove; anterior clypeal margin projecting medially; mandible robust, narrowed to apex with inner margin expanded forming large subbasal tooth; mandible apex bidentate; mandible ventral margin excised into large basal tooth; mandible dorsal carina sharp; prementum flattened; scape curved medially, with two longitudinal ventral carinae divergent apically; F1 depressed, F1 height 0.75× pedicel diameter; relative length of pedicel, F1 and F2 = 1.00:3.00–3.05:1.84–2.26 (holotype: 1.00: 3.05:1.84); F2–F11 almost equal in width; F11 as long as F2, conical.

Mesosoma widest at mesonotum including tegulae; head width:humeral width:pronotal width:mesonotal width = 87:60:93:100; humeral angle rounded, with sharp humeral carina not reaching pronotal dorsum; mesoscutum strongly convex; mesoscutal width 1.20× its length; tegula short rounded, posteriorly reaching mesoscuto-scutellar articulation, 1.43–1.44× as long as wide (holotype: 1.44); notaulus evenly wide, reaching anterior 1/2 of mesoscutum, subparallel; parapsidal line length 0.25× mesoscutal length; parascutal carina forming rounded, weakly elevated process on postero-lateral angle of mesoscutum; mesoscutellum convex without medial carina, tubercle or impunctate line; mesopleuron divided into dorsal and ventral convexities by distinct transverse mesopleural groove, ventrally without transverse precoxal ridge, longitudinal impunctate line, or precoxal swelling; dorsal propodeal face without distinct dorsum and sublateral carina, with anterior inverted triangular cell and semicircular sublateral cell; lateral margins of propodeum gradually convergent posteriorly; dorsal and lateral propodeal faces not separated by carina.

Wings well developed; distance between origin of RS on vein SC and base of stigmatic cell equal to stigmatic cell length and first abscissa of RS length; cell 2RS present.

Meso- and metacoxae evenly convex; metacoxa with weak complete inner longitudinal carina; protibial spur slender; tibiae without outer spines.

T1 without distinct dorsum; T1 spiracle weakly tuberculate; T2 evenly convex, 1.25× as wide as long; S1 with straight medial longitudinal carina with its ventral margin convex; S2 swollen anteriorly; T7 medially with longitudinal impunctate convex line, posteriorly not forming tubercle; S6–S8 without lateral carina or tubercle; S7 entirely exposed, 0.75× as long as S8; S8 mostly sclerotized with posterior membranous area evenly convex posteriorly. Paramere down-curved posteriorly, with weak inner protuberance on posterior 1/2 of dorso-inner margin; inner margin of paramere dorsally with short erect golden setae; ventral lobe posteriorly projecting, pointed; parapenial lobe large, with posterior margin concave; cuspis long slender, widened near apex, forming oblique posterior margin, apparently surpassing apex of penis valve, with dense long erect setae ventrally and posteriorly; digitus straight, posteriorly expanded, forming triangular projection, with dense erect golden setae posteriorly; para-

cuspid slightly tuberculate with few erect golden setae; penis valves symmetrical slender, weakly expanded ventrally, with posterior ventral hook, without setae.

Frons, vertex, gena, pronotal dorsum, mesoscutum, medial part of mesopleuron with large dense punctures; postgenal bridge, trochanters, femora, tibiae, T1 medially, T2 disc, S2 with small sparse punctures; clypeus lateral portion, mandible outer and dorsal faces, scape between ventral carinae, flagellum, pronotal lateral face, propleuron, axilla, metanotal trough, anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face, coxae, tarsi with minute dense punctures; clypeus medial convexity, scape mostly, pedicel, T1–T2 laterally, T3–T7, S1, S3–S8 with small dense punctures; mesoscutellum with large confluent punctures; metascutellum with small confluent punctures; dorsal propodeal face, dorsal half of lateral propodeal face reticulate; pronotal collar anteriorly with minute sparse punctures; pronotal collar posteriorly smooth; tegula mostly microreticulate with few small punctures anteriorly, postero-inner portion with minute sparse punctures.

Type material. 2♂. *Holotype* ♂: INDONESIA: EAST JAVA: Mt. Argopuro, 31.VII.1995 [TKPM]. *Paratype*: INDONESIA: EAST JAVA: Mt. Argopuro, 31.VII.1995 [1♂ TKPM].

Distribution. Indonesia: East Java.

Etymology. The specific name *gibba* is a Latin noun meaning gibbosity. It refers to the strongly elevated clypeus of this new species.

Remarks. This species and *A. nallinia* are recognized in *Arkaditilla* by having the mandible with sharp subapical and large inner subbasal teeth, the mandible ventral margin deeply excised with large basal tooth, the scape ventral carinae divergent apically, F1 strongly depressed, the cuspis widened posteriorly, the digitus posteriorly expanded, the paracuspis tuberculate, and the penis valve weakly expanded ventrally, but the former differs from the latter by having the clypeus strongly elevated even ventrally (clypeus elevated dorsally in *A. nallinia*), and the cuspis widened near apex (cuspis widened on posterior 1/3 in *A. nallinia*).

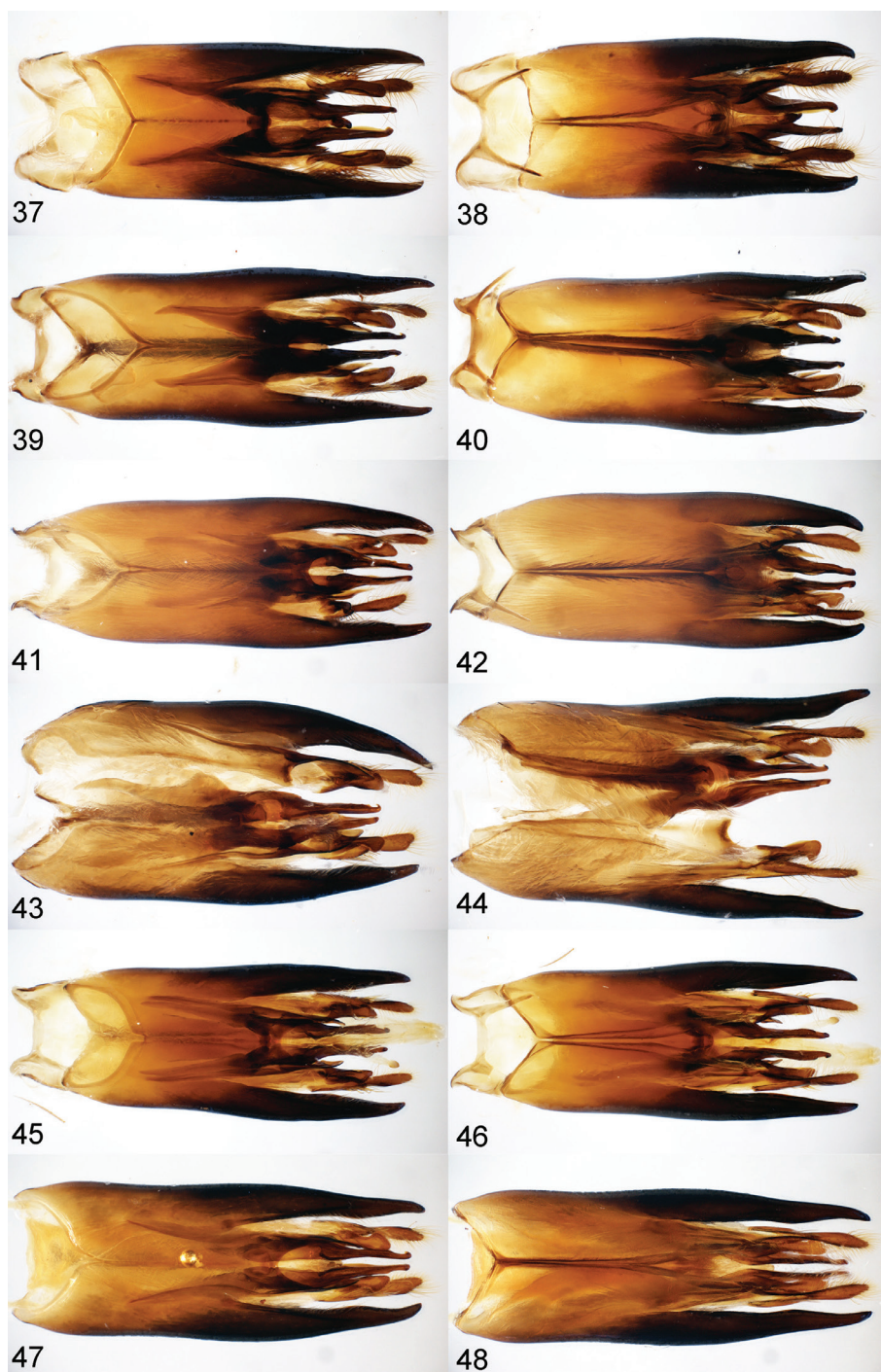
Arkaditilla leleji sp. nov.

<http://zoobank.org/1A4CD8F4-673F-40E8-8A9A-D12E0DBFFE0A>

Figures 9, 10, 17, 23, 33, 34, 45, 46, 61–63, 71, 75

Diagnosis. Male. Clypeus dorsally elevated, sloping ventrally. Mandible with sharp subapical and large inner subbasal teeth lamellately expanded near apex (Fig. 17), ventrally slightly excised with small basal tooth (Fig. 23). Scape ventral carinae divergent apically (Fig. 33), densely punctate between them; F1 apical half and F2–F6 whitish yellow on ventral half, F7–F11 with ventral dark brown patch; F1 weakly depressed, F1 height subequal to pedicel diameter (Fig. 34). T3 black (Fig. 10); cuspis weakly widened on posterior 1/3 with rounded apex (Figs 61, 71); digitus posteriorly slender stick-like (Fig. 45); paracuspis slightly tuberculate (Fig. 71); penis valve strongly expanded ventrally on posterior half (Figs 62, 63). **Female.** Unknown.

Description. Male. Body length: 15.9 mm; forewing length: 13.0 mm.

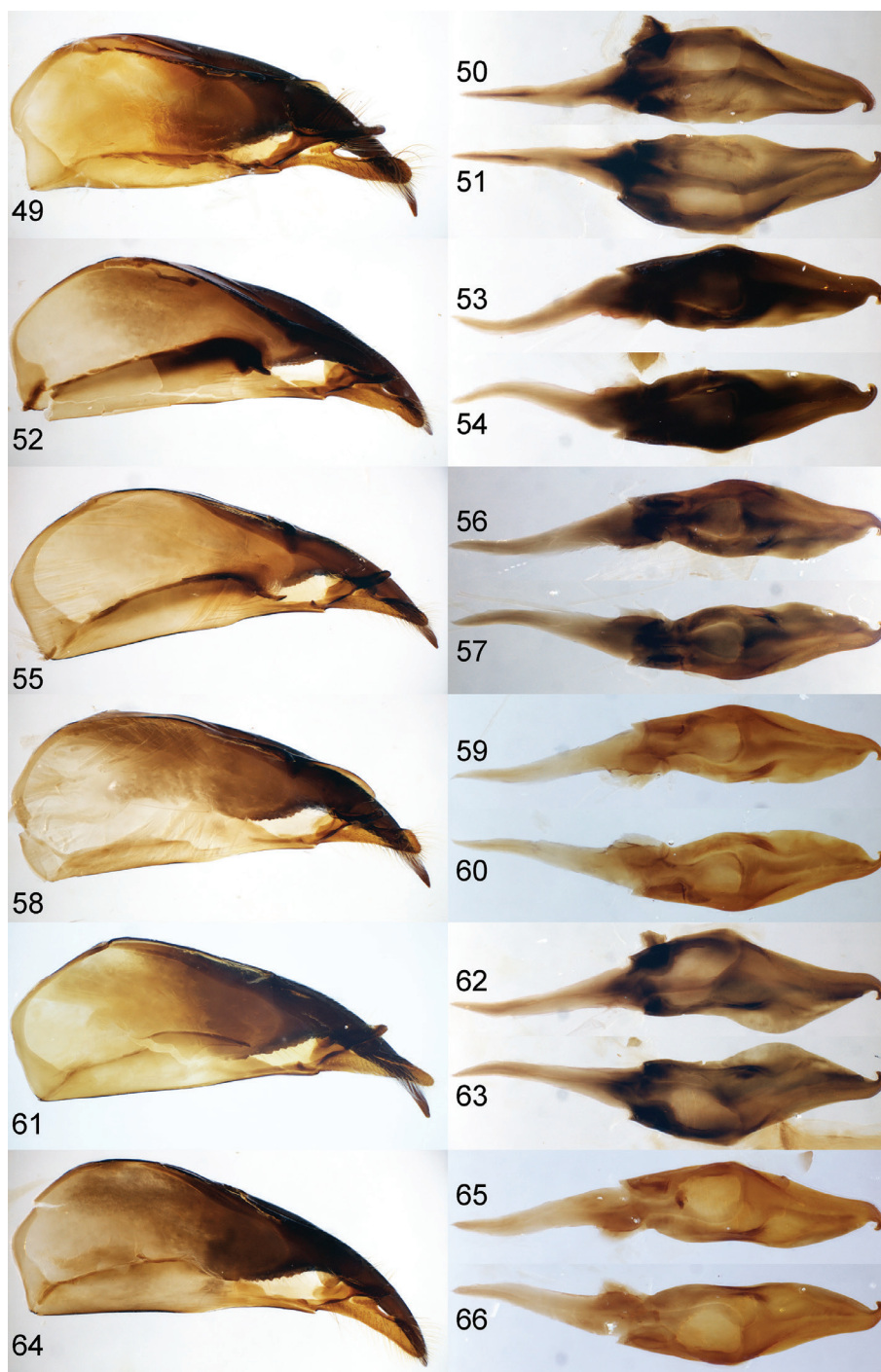


Figures 37–48. *Arkaditilla* spp., ♂, genitalia **37, 39, 41, 43, 45, 47** dorsal view **38, 40, 42, 44, 46, 48** ventral view **37, 38** *A. bagrada* (Cameron) **39, 40** *A. depressicornis* (Mickel) **41, 42** *A. frim* sp. nov., holotype **43, 44** *A. gibba* sp. nov., holotype **45, 46** *A. leleji* sp. nov., holotype **47, 48** *A. nallinia* (Zavattari).

Color and setae. Frons, vertex, gena, clypeus, mandible mostly, pedicel, flagellum mostly, prementum, stipes, mesosoma, meso- and metacoxae, T3–T7, S1 medial carina, S4–S8 black; mandible medial 1/3 brown; labrum, protibial spur yellow; scape, F7–F11 ventrally, trochanters dark brown; F1 apical half, F2–F6 whitish yellow on ventral half; tegula, procoxa, femora, tibiae, tarsi, S3 lateral portion brownish black; meso- and metatibial spurs pale yellow; T1–T2, S1 except medial carina, S2–S3 mostly orange; wings brown, with veins dark brown. Upper frons, vertex, T1, S1 with sparse long erect pale golden setae; lower frons, gena, pronotal dorsum, dorsal propodeal face, dorsal half of lateral propodeal face, coxae with dense short appressed and sparse long erect pale golden setae; eye dorsal margin with long erect black setae; clypeus with dense long recumbent pale golden setae; mandible with sparse short recumbent and sparse long erect pale golden setae; scape with sparse long recumbent and sparse long erect pale golden setae; pedicel, F1, trochanters, T2 lateral margin with sparse short recumbent pale golden setae; F2–F11 with sparse erect pale golden microsetae; pronotal collar anteriorly, T2 disc, T3–T5, S3–S6 with sparse short erect pale golden setae; pronotal collar posteriorly glabrous; pronotal lateral face with sparse long appressed pale golden setae; propleuron with sparse long appressed and sparse long erect pale golden setae; mesoscutum with sparse short recumbent and sparse short erect dark golden setae; meso- and metascutellum, femora with sparse short recumbent pale golden and sparse long erect golden setae; anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face with sparse short appressed pale golden setae; axilla, metanotal trough, medial and ventral parts of mesopleuron with dense long appressed and sparse long erect pale golden setae; tegula anterior portion, tarsi with sparse long recumbent golden setae; tegula inner margin with sparse short recumbent and sparse short erect golden setae; tibiae with sparse short recumbent golden and sparse long erect golden setae; T6–T7, S7–S8 with sparse short erect black setae; S2 with sparse short recumbent and sparse short erect pale golden setae; T2 with lateral golden felt line; T1–T5, S2–S5 with posterior fringe of sparse pale golden setae; S6–S8 with posterior fringe of sparse black setae.

Structure. Head $2.00\times$ as wide as long; lateral margins strongly convergent behind eye; vertex rounded posteriorly; $POD/OD = 0.54$; $OD:MOD:LOD = 1.00:1.29:1.00$; ocellar region slightly convex, ocelli without posterior carina; antennal scrobe with weak inverted V-shaped dorsal carina not reaching inner eye margin; genal carina absent; postgenal bridge flattened; hypostomal carina weakly developed; clypeus dorsally elevated, sloping ventrally, without subventral transverse groove; anterior clypeal margin projecting medially; mandible robust, narrowed to apex with inner margin expanded forming large subbasal tooth; mandible apex bidentate; mandible ventral margin slightly excised into small basal tooth; mandible dorsal carina sharp; prementum flattened; scape curved medially, with two longitudinal ventral carinae divergent apically; F1 depressed, F1 height $0.91\times$ pedicel diameter; relative length of pedicel, F1 and F2 = $1.00:3.00:2.37$; F2–F11 almost equal in width; F11 as long as F2, conical.

Mesosoma widest at mesonotum including tegulae; head width:humeral width:pronotal width:mesonotal width = $83:62:85:100$; humeral angle rounded, with sharp humeral carina not reaching pronotal dorsum; mesoscutum strongly convex;



Figures 49–66. *Arkaditilla* spp., ♂, genitalia 49, 52, 55, 58, 61, 64 genital capsule and volsella, inner view 50, 53, 56, 59, 62, 65 left penis valve 51, 54, 57, 60, 63, 66 right penis valve 49–51 *A. bagrada* (Cameron) 52–54 *A. depressicornis* (Mickel) 55–57 *A. frim* sp. nov., holotype 58–60 *A. gibba* sp. nov., holotype 61–63 *A. leleji* sp. nov., holotype 64–66 *A. nallinia* (Zavattari).

mesoscutal width $1.11\times$ its length; tegula short rounded, posteriorly reaching mesoscuto-scutellar articulation, $1.54\times$ as long as wide; notaulus evenly wide, reaching anterior $1/2$ of mesoscutum, subparallel; parapsidal line length $0.3\times$ mesoscutal length; parascutal carina forming rounded, weakly elevated process on postero-lateral angle of mesoscutum; mesoscutellum convex without medial carina, tubercle or impunctate line; mesopleuron divided into dorsal and ventral convexities by distinct transverse mesopleural groove, ventrally with transverse precoxal ridge, without longitudinal impunctate line, or precoxal swelling; dorsal propodeal face without distinct dorsum and sublateral carina, with anterior inverted triangular cell and semicircular sublateral cell; lateral margins of propodeum gradually convergent posteriorly; dorsal and lateral propodeal faces not separated by carina.

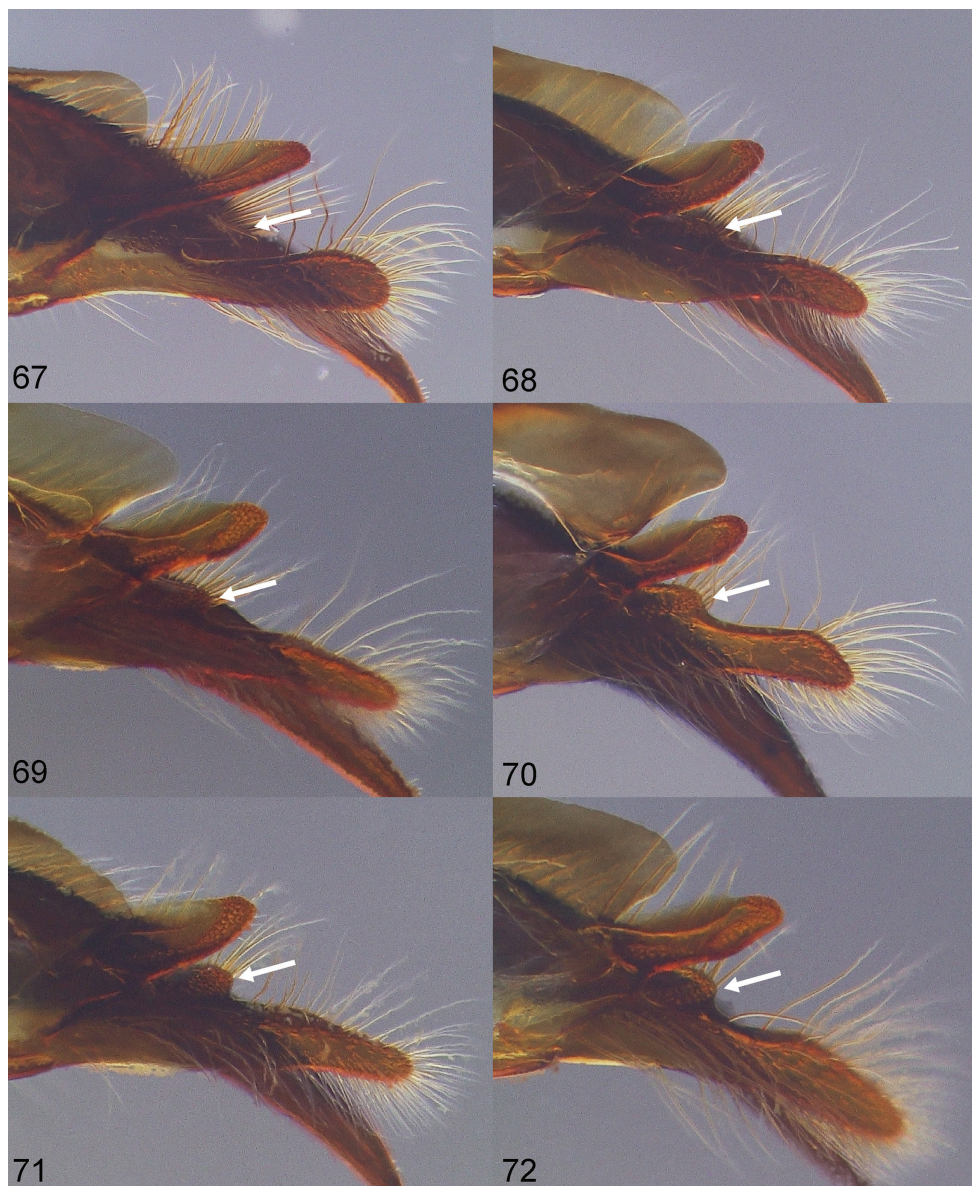
Wings well developed; distance between origin of RS on vein SC and base of stigmatic cell equal to stigmatic cell length and first abscissa of RS length; cell 2RS present.

Meso- and metacoxae evenly convex; metacoxa with weak complete inner longitudinal carina; protibial spur slender; tibiae without outer spines.

T1 without distinct dorsum; T1 spiracle weakly tuberculate; T2 evenly convex, $1.15\times$ as wide as long; S1 with straight medial longitudinal carina with its ventral margin convex; S2 swollen anteriorly; T7 medially with longitudinal impunctate convex line, posteriorly not forming tubercle; S6–S8 without lateral carina or tubercle; S7 entirely exposed, $0.75\times$ as long as S8; S8 mostly sclerotized with posterior membranous area evenly convex posteriorly. Paramere down-curved posteriorly, without inner protuberance on dorso-inner margin; inner margin of paramere dorsally with short erect golden setae; ventral lobe posteriorly projecting, pointed; parapenial lobe large, with posterior margin slightly concave; cuspis long slender, weakly widened on posterior $1/3$ with rounded apex, apparently surpassing apex of penis valve, with dense long erect setae ventrally and posteriorly; digitus straight, posteriorly not expanded, with dense erect golden setae posteriorly; paracuspis slightly tuberculate with few erect golden setae; penis valves symmetrical slender, strongly expanded ventrally on posterior half, with posterior ventral hook, without setae.

Frons, vertex, gena, pronotal dorsum, mesoscutum, medial part of mesopleuron with large dense punctures; postgenal bridge, trochanters, femora, tibiae, T1 medially, T2 disc with small sparse punctures; clypeus mostly, mandible outer and dorsal faces, scape between ventral carinae, flagellum, pronotal lateral face, propleuron, axilla, metanotal trough, anterior and posterior parts of mesopleuron, metapleuron, ventral half of lateral propodeal face, coxae, tarsi with minute dense punctures; clypeus anterior margin with few large punctures; scape mostly, pedicel, T1–T2 laterally, T3–T7, S1–S8 with small dense punctures; pronotal collar anteriorly with minute sparse punctures; pronotal collar posteriorly smooth; mesoscutellum with large confluent punctures; metascutellum with small confluent punctures; dorsal propodeal face, dorsal half of lateral propodeal face reticulate; tegula mostly microreticulate with few small punctures anteriorly, postero-inner portion with minute sparse punctures.

Type material. 1♂. *Holotype* ♂: INDONESIA: KALIMANTAN TIMUR: Bukit Soeharto, 13–17.III.1994, K. Matsumoto & K. Konishi leg. [NARO].



Figures 67–72. *Arkaditilla* spp., ♂, genital volsella, ventro-inner view **67** *A. bagrada* (Cameron) **68** *A. depressicornis* (Mickel) **69** *A. frim* sp. nov., holotype **70** *A. gibba* sp. nov., holotype **71** *A. leleji* sp. nov., holotype **72** *A. nallinia* (Zavattari). White arrows indicate the paracuspis.

Distribution. Indonesia: Kalimantan Timur.

Etymology. This new species is dedicated to Arkady Lelej as is the genus itself.

Remarks. This new species is unique in *Arkaditilla* by having the mandible ventral margin slightly excised with small basal tooth, F1 weakly depressed, T3 black, and the penis valve strongly expanded ventrally on posterior half.

***Arkaditilla nallinia* (Zavattari, 1914), comb. nov.**

Figures 11, 12, 18, 24, 35, 36, 47, 48, 64–66, 72, 76

Mutilla nallinia Zavattari, 1914: 100, ♂, syntypes ♂ (Giava [= Java], [Indonesia]; Bali, [Indonesia]) [Museo Regionale di Scienze Naturali, Torino, Italy].

Timulla (Trogaspidia) nallinia: Mickel, 1935: 263, ♂.

Krombeinidia nallinia: Lelej 1996a: 11; 2005: 66; Lo Cascio 2015: 551; Pagliano et al. 2020: 251.

Petersenidia nallinia: Lelej 1996b: 94, ♂.

Diagnosis. Male. Clypeus dorsally elevated, sloping ventrally. Mandible with sharp subapical and large inner subbasal teeth (Fig. 18), ventrally deeply excised with large basal tooth (Fig. 24). Scape ventral carinae divergent apically (Fig. 35), densely punctate between them; F1 apical 1/3, F2 and F3 basal 1/3 whitish yellow on ventral half; F1 strongly depressed, F1 height $\sim 0.8 \times$ pedicel diameter (Fig. 36). T3 orange (Fig. 12); cuspis strongly widened on posterior 1/3 with rounded apex (Figs 64, 72); digitus posteriorly expanded, forming triangular projection (Fig. 47); paracuspis slightly tuberculate (Fig. 72); penis valve weakly expanded ventrally (Figs 65, 66). **Female.** Unknown.

Material examined. 2♂. **INDONESIA:** BALI: Tabanan, Bengkel, Pura Batu Salahan, 08°23'31.8"S, 115°05'E, 682 m alt., 12.VIII.2006, K. Watanabe leg. [1♂ TUA].

Identification source. Keyed using Mickel (1935) and compared with the original description. No differences were found between the specimen examined herein and Zavattari's description.



Figure 73–76. Distributional map of *Arkaditilla* spp. based on specimens examined herein and the literature (Cameron 1902; Lelej 1996b; Mickel 1935, 1937; Zavattari 1914) **73** *A. bagrada* (Cameron) (red circle) **74** *A. depressicornis* (Mickel) (blue circle) **75** *A. frim* sp. nov. (yellow circle), *A. gibba* sp. nov. (purple triangle), and *A. leleji* sp. nov. (light blue square) **76** *A. nallinia* (Zavattari) (orange circle).

Distribution. Indonesia: Bali, Java (Zavattari 1914; Mickel 1935; Lelej 1996b).

Remarks. Only three mutillid species have been recorded from Bali, namely *Arkaditilla nallinia*, *Krombeinidia griseomaculata* (André, 1898), and *Mickelomyrme pusillaeformis* (Hammer, 1962) (Zavattari 1914; Lelej 2005; Okayasu 2020; current data), although Zavattari's record of *K. griseomaculata* was not accepted by Lelej (2005) and Mickel (1935). Field surveys in this small island will be useful for discovery of the female of *Arkaditilla*.

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