



## Discovery of the genus *Andreimyrmex* Lelej, 1995 (Hymenoptera: Mutillidae) in India and description of a new species from the Western Ghats



JOSHUA B. TERINE<sup>1,3\*</sup>, ARKADY S. LELEJ<sup>2,4\*</sup> & GIRISH P. KUMAR<sup>1,5</sup>

<sup>1</sup>Zoological Survey of India, Western Ghat Regional Centre, Kozhikode 673006, Kerala, India.

<sup>2</sup>Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch of the Russian Academy of Sciences, Vladivostok, Russia.

<sup>3</sup> [terinejb@gmail.com](mailto:terinejb@gmail.com);  <https://orcid.org/0000-0002-6981-7401>

<sup>4</sup> [lelej@biosoil.ru](mailto:lelej@biosoil.ru);  <https://orcid.org/0000-0001-7501-0981>

<sup>5</sup> [kpgiris@gmail.com](mailto:kpgiris@gmail.com);  <https://orcid.org/0000-0003-2121-0165>

\*Corresponding authors

### Abstract

The Oriental genus *Andreimyrmex* Lelej, 1995 is newly reported from India. A new species *A. paniya* **sp. nov.** is described based on a female specimen from Kerala part of Western Ghats. Diagnostic features of this new species to separate it from similar species *A. neaera* (Mickel, 1935) and *A. sarawakensis* Lelej, 1996 are discussed. This new species has the mesosoma and metasoma with reddish-brown cuticle which approximates Eastern mimicry ring in North America. *Andreimyrmex paniya* **sp. nov.** expresses a rare color pattern. In India such color syndromes occur in two species of the tribe Smicromyrmecini and two species of the subfamily Dasyaburinae. These species inhabit the tropical moist broadleaf forest ecoregion of southern India. An updated diagnosis for males and females of *Andreimyrmex* is given.

**Key words:** velvet ant, Smicromyrmecini, *Andreimyrmex*, new species, color syndrome, Western Ghats, India, Oriental Region

### Introduction

The genus *Andreimyrmex* Lelej, 1995 is composed of nine valid species, one subdivided into two subspecies, distributed mainly in the Oriental Region, two of these penetrate to the Eastern Palaearctic Region (Lelej 2005, Pagliano *et al.* 2020). According to the latest classification proposed by Brothers and Lelej (2017), *Andreimyrmex* Lelej belongs to the tribe Smicromyrmecini Bischoff, 1920 of the subfamily Mutillinae. In this paper, the genus *Andreimyrmex* is newly recorded from India with the description of a new species from Periyar, Wayanad, in the Nilgiri Biosphere Reserve of the Western Ghats.

### Materials and methods

This study is based on a single specimen collected during the survey conducted by Long Term Ecological Observatories (LTEO, India) project team in the Wayanad region, Kerala. The attempts to collect more specimens of this species or find it in the collections were not successful. The specimen of *Andreimyrmex paniya* was studied using LEICA M205 stereo microscope. Photographs were taken by a LEICA DFC 500 camera and images were stacked using Leica V3.80. The images were post-processed to improve contrast and brightness using Adobe® Photoshop® CS6 software. The holotype is deposited in the ‘National Zoological Collections’ at Western Ghat Regional Centre, Zoological Survey of India, Kozhikode (ZSIK).

The terminology mostly follows the Hymenoptera Anatomy Ontology (2013). We use the abbreviations T1, T2, T3, etc. to denote the first, second, third, etc., metasomal terga, S1, S2, S3 etc., to denote the first, second, third, etc., metasomal sterna, and F1, F2, F3, etc., to denote the antennal flagellomeres.

## Results

### Tribe Smicromyrmini Bischoff, 1920

#### Genus *Andreimyrme* Lelej, 1995

*Andreimyrme* Lelej, 1995: 5, ♂ ♀; Lelej 1996: 100, ♀; Lelej 2007: 88; Lelej *et al.* 2007: 56; Lelej & Brothers 2008: 7; Brothers & Lelej 2017: 95, ♂ ♀; Williams *et al.* 2019: 16, ♂ ♀; Okayasu 2020: 56, ♂ ♀; Pagliano *et al.* 2020: 169.

Type species *Andreimyrme long* Lelej, 1995, ♂, by original designation.

**Diagnosis** [based on Lelej (1995) for males and Okayasu (2020) for females]. MALE. Mandible usually robust, widened apically, tridentate at apex, without tooth and emargination beneath near the base, with additional large inner tooth. Clypeus deeply concave. F1 as long as wide. Scape bicarinate beneath. Tegulae not protruding beyond mesoscuto-scutellar suture. Notauli full, parapsidal furrow scarcely visible. Scutellum simple. Mesopleuron anteriorly with median deep glabrous depression, without precoxal denticles or tubercles beneath. Wings infuscated. T2 with lateral felt line. S2 without basomedial carina and without lateral felt lines (except *A. davidi* with traces of felt lines). S8 (hypopygium) without tubercles or carinae. Genital volsella wide, without basal external lobe, with long setae on inner and ventral margins. FEMALE. Genal carina weakly developed, forming raised small distinct tooth with hypostomal carina. Clypeus with sub-apical transverse carina. Mandible wide, tridentate apically. Scutellar scale lacking. Pronotum slightly wider than propodeum. T1 without pale setal spots, T2 with or without basomedial spot of pale setae, apically with narrow band of pale setae, T3 with or without wide band of pale setae. Pygidial plate elongate, carinate laterally, glabrous, weakly and longitudinally rugose on basal half, smooth apically or glabrous throughout.

**Gender.** Feminine.

**Sex association.** The possible female of the type species was associated and identified as *Smicromyrme tridentiens* Chen, 1957 (= *A. substriolata* (Chen, 1957)) by Lelej (1995: 7).

**Species included.** The genus currently includes nine valid species, one of which is divided into two subspecies: *Andreimyrme annexa* (Cameron, 1909), ♂ (Malaysia: Sabah, Sarawak), *A. davidi* (André, 1898), ♂ (China, Fujian, Jiangsu, Jiangxi, Taiwan); *A. long* Lelej, 1995, ♂ (China: Yunnan); *A. neaera* (Mickel, 1935), ♀ (Malaysia: Sabah); *A. pakistanensis* Lelej and Ullah, 2007, ♂ (Pakistan: Islamabad); *A. sarawakensis* Lelej, 1996, ♀ (Malaysia: Kuala Lumpur, Sabah, Sarawak); *A. substriolata* (Chen, 1957), ♀ (= *A. tridentiens* Chen, 1957, ♀) (China: Anhui, Fujian, Jiangxi, Taiwan, Zhejiang; Indonesia: Sumatra; Japan: Ryukyu; Laos: Houaphanh, Xiengkhouang; Malaysia: Terengganu; Thailand: Chiang Mai; Vietnam: Hanoi, Thua Tien-Hue, Hoa Binh, Gia Lai); *A. v. viriata* (Mickel, 1934), ♂ (Philippines: Biliran, Luzon, Mindanao, Samar, Sibuyan, Panay, Negros), *A. v. nitela* (Mickel, 1934), ♂ (Philippines: Luzon, Mindanao, Negros, Samar, Sibuyan) and *A. volupia* (Mickel, 1935), ♂ (Malaysia: Sabah) (Lelej 1995, 2005; Lelej *et al.* 2007; Okayasu 2020; Pagliano *et al.* 2020).

**Distribution.** Predominantly from the eastern Oriental Region, but two species penetrate to Eastern Palaearctic Region (Lelej 2007) and *A. pakistanensis* is known from Pakistan (Islamabad) westward of India.

#### *Andreimyrme paniya* Terine, Lelej & Girish Kumar, sp. nov.

(Figs 1–9)

**Diagnosis.** This is the only known female of *Andreimyrme* with the head and metasoma predominantly reddish-brown. Other useful diagnostic features include: clypeus apically emarginated, basomedially with a longitudinal tubercle not reaching the apex. Scutellar scale lacking. T2 posteriorly with a medially interrupted white fringe. T3–5 with black erect setae. Pygidial plate long sub-ovate, widest sub-apically with lateral carina, smooth and shiny throughout.

**Description.** FEMALE. Body length 4.76 mm. *Coloration and setation.* Body ferruginous-red, vertex with black tint, mandible and clypeus with same color as body, mandible apically black, antennae black dorsally, reddish ventrally; pronotum dorsally brownish-red, posterior propodeal face with large dorsomedial black spot; legs ferruginous-brown with darker reddish-brown tibia and tarsus. Frons with sub-erect black setae, vertex with mixed

black and yellowish setae, gena and ventral portion of occiput with sub-appressed white setae. Mandible and clypeus with sub-erect white setae. Mesosoma dorsally with sub-erect black setae mixed with white ones on mesoscutum anteriorly and posteromedially. Posterior propodeal face, except dorsomedial black spot with long erect white setae. Mesopleuron and metapleuron with sub-appressed white setae, propleuron with sparse sub-appressed white setae. Legs with white sub-erect setae. T1 with white erect setae. T2 with sub-appressed and erect black setae and apically with narrow band interrupted medially of white sub-appressed setae. T3–5 with black erect setae. T6 except pygidial plate with white erect setae. S1–5 with white erect setae, S6 with black setae mixed with some white ones.

*Head.* Shape almost oval in frontal view, not elongated behind eyes, width behind eye  $1.2 \times$  pronotum width; eyes oval, longitudinal eye diameter  $1.04 \times$  minimal distance between eyes, inner margin with slight shallow emargination; genal carina distinct, forming raised small distinct tooth with hypostomal carina; mandible acuminate apically and tridentate; clypeus emarginated apically, not bidentate, basomedial portion convex, with tubercle. Scape  $4.39 \times$  maximal width; F1–3 length ratio 20:18:18; frons with large punctures, gena reticulate.

*Mesosoma.* Maximal pronotal width  $0.85 \times$  head width behind eye; pronotum width  $1.2 \times$  propodeum width; mesosomal dorsum with coarse confluent large punctures; dorsal and lateral faces of pronotum and mesonotum separated by a wavy carina; humeral carina distinct, expanded dorsally; scutellar scale lacking; mesopleuron and metapleuron with dense small punctures; lateral and posterior propodeal faces separated by wavy sub-dentate carina; lateral propodeal face smooth and shiny; posterior propodeal face reticulate, basally with small punctures.

*Legs.* Mid and hind tibia with two rows of spines.

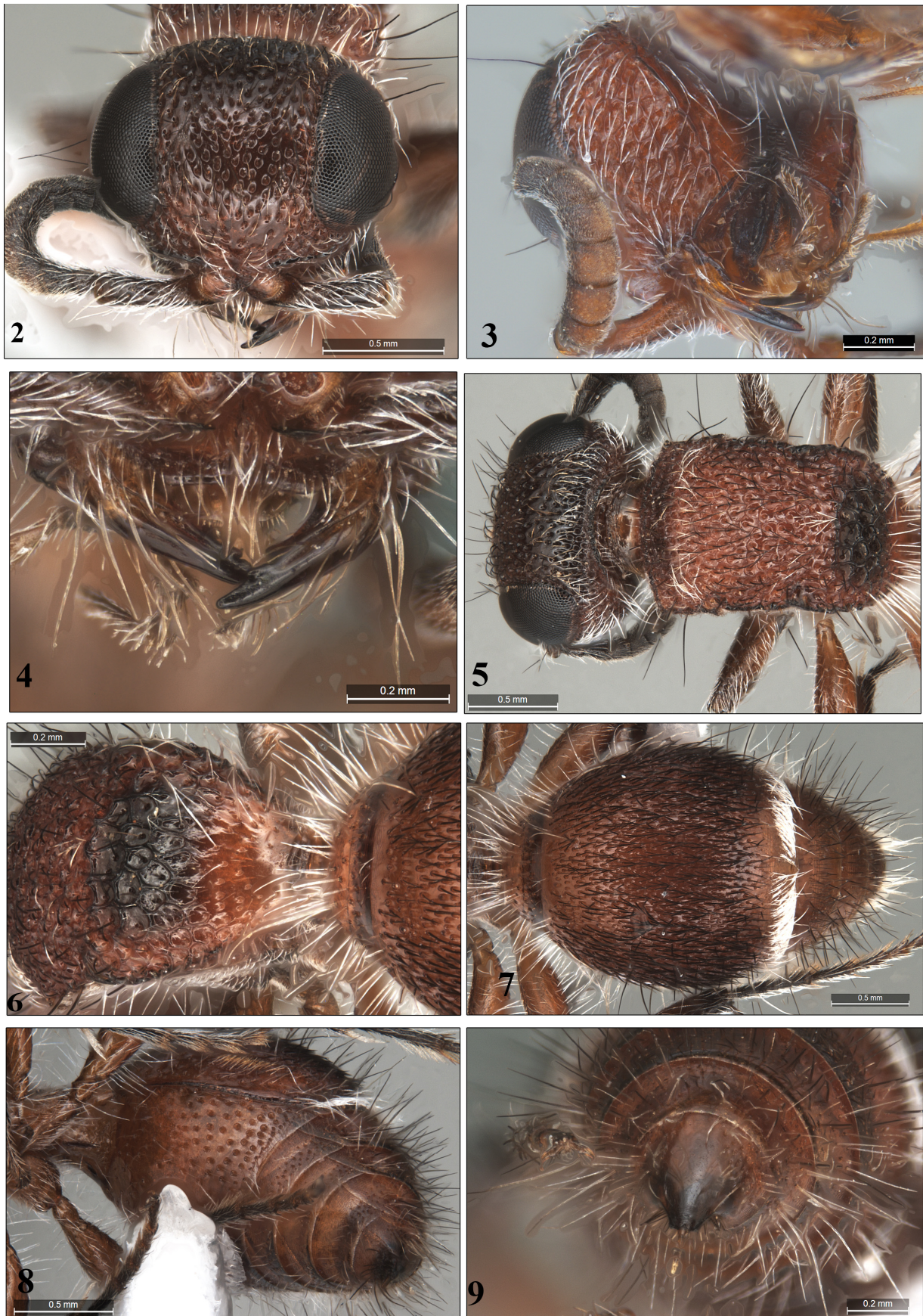
*Metasoma.* T1 not constricted posterad; T2 maximal width  $2.0 \times$  T1 maximal width; T2 with lateral felt line; S1 with simple longitudinal lamella; T6 with long sub-ovate pygidial plate, widest sub-apically with lateral carina, smooth and shiny throughout; S6 posterior margin truncate; T1–5 and S3–6 with small punctures throughout, denser on T2 disc; S2 with large sparse punctures.

MALE. Unknown.



FIGURE 1. *Andreimyrmex paniya* sp. nov., holotype, ♀, habitus, lateral view.





**FIGURES 2–9.** *Andreimyrmex paniya* sp. nov., holotype, ♀. 2. Head, face view. 3. Head, ventro-lateral view. 4. Clypeus and mandible, face view. 5. Head and mesosoma, dorsal view. 6. Posterior propodeal face. 7. Metasoma, dorsal view. 8. Metasoma, ventral view. 9. Pygidial plate.



**Material examined.** Holotype ♀, INDIA, Kerala, Wayanad district, Periya, Camp shed, 11°51'5.06"N, 75°47'22.55"E, 594 m, 10.II.2021, K.A. Subramanian & party, ZSI/WGRC/IR/INV. 17336 [ZSIK].

**Distribution.** India (Kerala).

**Etymology.** The specific name *paniya* is derived from the name of an indigenous tribe present in Wayanad and other parts of the Western Ghats. The term Paniya means 'someone who does work', which described their social standing, as a community who does work for their landlords. Paniyas were agrestic slaves who worked in the agricultural field of the janmis (jenmis) or landlords. This new species is named after the 'paniya' to honour this indigenous tribal community of the Western Ghats and to speak against the caste system that prevailed in the past. Treat as a noun in apposition.

**Remarks.** The new species *Andreimyrmex paniya* is similar to *A. sarawakensis* Lelej, 1996 and *A. neaera* (Mickel, 1935) but differs from both by having the head mostly ferruginous-red (entirely black in both), the metasoma reddish-brown (dark metallic blue in both). The new species differs from *A. sarawakensis* by having T2 posterior margin with the narrow band of white setae interrupted medially (with broad, medially slightly widened band of appressed yellowish setae in *A. sarawakensis*), and the pygidial plate smooth with lateral carinae (anterior half of pygidial plate obscurely and longitudinally rugose and posterior half smooth in *A. sarawakensis*). *Andreimyrmex paniya* differs from *A. neaera* by having T2 without setal spots, posteriorly with narrow band of white setae interrupted medially (with antero-medial small spot of pale setae and posteriorly with wide complete band of yellowish setae in *A. neaera*), and the T6 with pygidial plate smooth (pygidial area smooth, anterior half weakly, obscurely, longitudinally rugose in *A. neaera*).

## Discussion

The Western Ghats of India and Sri Lanka were included among the first 18 global biodiversity hotspots due to high levels of species endemism (Gunawardene *et al.* 2007). The Wayanad district where the new species was collected belongs to the South Western Ghats moist deciduous forests which is a tropical moist broadleaf forest ecoregion of southern India (Olson *et al.* 2001). Forty-six species of Mutillidae from 22 genera are found in the Western Ghats, of these 24 species are endemic to the Western Ghats (Terine *et al.* 2020). *Andreimyrmex paniya* **sp. nov.** from Wayanad will be added to the list of endemic species of Western Ghats.

Of the nine East Asian mutillid taxa with different color patterns than the Black-headed Color Syndrome and Red-headed Color Syndrome (Okayasu *et al.* 2018), three species from the genus *Taiwanomyrmex* (tribe Trogaspidiini: *T. basirufus* (Chen, 1957), *T. cheni* Lelej, 2020, and *T. latisquamula* Tu, Lelej et Chen, 2015) (Lelej 2020a) have a body entirely black, except for the second metasomal segment which is reddish. The latter pattern approximates Texan mimicry ring in North America (Wilson *et al.* 2015). Three Oriental species from the tribe Smicromyrmini were recently discovered with the mesosoma and T2 reddish (Lelej 2020b), which is similar to *A. paniya* **sp. nov.** and approximates the Eastern mimicry ring in North America. These similarly colored insects from disparate continents cannot be treated as members of the same mimicry rings. The color patterns that define these mimicry rings, however, are significant indicators of aposematism, and potentially mimicry (Okayasu *et al.*, 2018).

The color pattern of *A. paniya* **sp. nov.** (metasoma reddish-brown) is different from any other *Andreimyrmex* species: metasoma dark metallic blue in *A. neaera* (Mickel, 1935) and *A. sarawakensis* Lelej, (1996) and black in *A. substriolata* (Chen, 1957) (Okayasu *et al.* 2018; Okayasu 2020). *Andreimyrmex paniya* **sp. nov.** does express a rare color pattern. In India, this color syndrome occurs in the tribe Smicromyrmini (*Smicromyrme burgeri* Lelej, 2020 and *A. paniya* **sp. nov.**) and the subfamily Dasylabrinae (*Dasylabris argentipes* (Smith, 1855) and *D. rugosa* (Olivier, 1811)). These species inhabit the tropical moist broadleaf forest ecoregion of southern India. Species with a ferruginous red T2 also occur in China (three species of *Taiwanomyrmex* and *Ephucilla hejunhuai* Lelej, 2020), where they inhabit tropical seasonal and rain forest in South China. Forest canopy may provide escape from excessively high temperatures and from UV-B radiation by affording shade. In environments with high incident radiation, melanin apparently assumes a protective function in mutillids, rather than thermoregulation (Lopez *et al.* 2021). These factors allow mutillid females to increase their daily periods of activity.

*Andreimyrmex* currently has no sexes matched up at the species level. The male of this genus, with its mandible strongly widened apically and lacking a sub-ventral tooth will likely be easily recognized in the Western Ghats when eventually examined. It is necessary to extensively collect male mutillids in this region, especially with the use of Malaise traps and yellow pan traps.

## Acknowledgements

We thank Subject Editor Kevin Williams, and especially the anonymous reviewers who helped to improve this MS. We are grateful to the Director (Zoological Survey of India, Kolkata, India) and Dr. P.M. Sureshan, Officer-in-Charge (ZSIK) for providing facilities and encouragements. We are also grateful to Dr. K.A. Subramanian, Officer-in-Charge (Southern Regional Centre, Zoological Survey of India, Chennai, India) and Principal Investigator of LTEO (Arthropods) Project (No. 13008/72/2019-CC by Climate Change Division, MoEF & CC, Govt. of India) by a Consortium of Organisations led by Indian Institute of Science, Bengaluru for permission to study of the collected specimen and Dr. Prabitha Mohan, Post Doctoral Fellow of LTEO project for some inputs. GPK thanks the authorities of Kerala Forest Department for granting the permission for faunistic surveys and specimen collection and other helps rendered during the field work. JBT thankfully acknowledges authorities of University of Calicut for heartening and CSIR for the financial support by means of CSIR-JRF (09/1297(0002)/2019-EMR-I).

## References

- André, E. (1898) Étude sur les mutillides du Muséum de Paris. *Annales de la Société Entomologique de France*, 67, 1–79.
- Bischoff, H. (1920–1921) Monographie der Mutilliden Afrikas. *Archiv für Naturgeschichte*, 86A(1–3 & 4–5), 1–480 (1920) & 481–830 (1921).
- Brothers, D.J. & Lelej, A.S. (2017) Phylogeny and higher classification of Mutillidae (Hymenoptera) based on morphological reanalyses. *Journal of Hymenoptera Research*, 60, 1–97.  
<https://doi.org/10.3897/jhr.60.20091>
- Cameron, P. (1909) Description of two new species of *Mutilla* from Kuching, Borneo. *The Entomologist*, 42, 146–147.  
<https://doi.org/10.1002/mmnd.48019090204>
- Chen, C.-W. (1957) A revision of the velvety ants or Mutillidae of China (Hymenoptera). *Quarterly Journal of the Taiwan Museum*, 10 (3–4), 135–224, 6 pls.
- Gunawardene N.R., Dulip Daniels, A.E., Gunatilleke, I.A.U.N., Gunatilleke, C.V.S., Karunakaran, P.V., Geetha Nayak, K., Prasad, S., Puyravaud, P., Ramesh, B.R., Subramanian, K.A. & Vasanthy, G. (2007) A brief overview of the Western Ghats – Sri Lanka biodiversity hotspot. *Current Science*, 93 (11), 1567–1572.
- Hymenoptera Anatomy Ontology (2013) Hymenoptera Glossary. Available from: <http://glossary.hymao.org> (accessed 20 April 2021)
- Lelej, A.S. (1995) To the knowledge of east Asian species of the tribe Smicromyrmini Bischoff, 1920 with description of four new genera and eight new species. *Far Eastern Entomologist*, 13, 1–28.
- Lelej, A.S. (1996) Mutillid wasps collected in Malaysia and Indonesia by Dr. Sk. Yamane (Hymenoptera, Mutillidae). *Tropics*, 6 (1/2), 91–104.  
<https://doi.org/10.3759/tropics.6.91>
- Lelej, A.S. (2005) *Catalogue of the Mutillidae (Hymenoptera) of the Oriental Region*. Vladivostok, Dalnauka, 252 pp.
- Lelej, A.S. (2007) Biogeography of mutillid wasps (Hymenoptera, Mutillidae). In: Rasnitsyn, A.P. & Gokhman, V.E. (Eds.), *Studies on Hymenopterous Insects. Collection of Scientific Papers*. KMK Scientific Press Ltd., Moscow, pp. 82–111. [in Russian]
- Lelej, A.S. (2020a) To the knowledge of velvet ants of the genera *Artiotilla* Invrea, *Radoszkowskitilla* Lelej and *Taiwanomyrme* Tsuneki (Hymenoptera: Mutillidae). *Far Eastern Entomologist*, 410, 1–10.  
<https://doi.org/10.25221/fee.410.1>
- Lelej, A.S. (2020b) Three new species of velvet ants from the tribe Smicromyrmini (Hymenoptera: Mutillidae) with unusual color syndrome. *Far Eastern Entomologist*, 421, 1–9.  
<https://doi.org/10.25221/fee.421.1>
- Lelej, A.S. & Brothers, D.J. (2008) The genus-group names of Mutillidae (Hymenoptera) and their type species, with a new genus, new name, new synonymies, new combinations and lectotypifications. *Zootaxa*, 1889 (1), 1–79.  
<https://doi.org/10.11646/zootaxa.1889.1.1>
- Lelej, A.S., Ullah, M. & Mahmood, K. (2007) Additions to the knowledge of the Mutillidae (Hymenoptera) of Pakistan. *Zootaxa*, 1444 (1), 53–60.  
<https://doi.org/10.11646/zootaxa.1444.1.4>
- Lopez, V.M., Tosta, T.A.V., Silva, G.G.D., Bartholomay, P.R., Williams, K.A. & Ferreira, G.F. (2021) Color lightness of velvet ants (Hymenoptera: Mutillidae) follows an environmental gradient. *Journal of Thermal Biology*, 100 (1), 103030, 1–9.  
<https://doi.org/10.1016/j.jtherbio.2021.103030>
- Mickel, C.E. (1934) Mutillidae of the Philippine Islands (Hymenoptera). *The Philippine Journal of Science*, 54 (1), 91–219, pl. 1.
- Mickel, C.E. (1935) The mutillid wasps of the islands of the Pacific Ocean (Hymenoptera: Mutillidae). *Transactions of the Royal Entomological Society of London*, 83 (2), 177–307.

<https://doi.org/10.1111/j.1365-2311.1935.tb01207.x>

- Okayasu, J., Williams, K.A. & Lelej, A.S. (2018) A remarkable new species of *Sinotilla* Lelej (Hymenoptera: Mutillidae: Smicromyrmini) from Taiwan and an overview of color diversity in East Asian mutillid females. *Zootaxa*, 4446 (3), 301–324.  
<https://doi.org/10.11646/zootaxa.4446.3.1>
- Okayasu, J. (2020) Velvet ants of the tribe Smicromyrmini Bischoff (Hymenoptera: Mutillidae) of Japan. *Zootaxa*, 4723 (1), 1–110.  
<https://doi.org/10.11646/zootaxa.4723.1.1>
- Olivier, [A.G.] (1811) *Encyclopédie Méthodique. Histoire Naturelle. Insectes. Vol. 8.* Chez Panckoucke, Imprimeur-Libraire, hôtel de Thou, rue des Poitevins, Paris, 722 pp.
- Olson, D.M., Dinerstein, E., Wikramanayake, E.D., Burgess, N.D., Powell, G.V.N., Underwood, E.C., D’Amico, J.A., Itoua, I., Strand, H.E., Morrison, J.C., Loucks, C.J., Allnutt, T.F., Ricketts, T.H., Kura, Y., Lamoreux, J.F., Wettengel, W.W., Hedao, P. & Kassem, K.R. (2001) Terrestrial ecoregions of the world: A new map of life on Earth. *BioScience*, 51 (11), 933–938.  
[https://doi.org/10.1641/0006-3568\(2001\)051\[0933:TEOTWA\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2)
- Pagliano, G., Brothers, D.J., Cambra, R., Lelej, A.S., Lo Cascio, P., Matteini Palmerini, M., Scaramozzino, P.L., Williams, K.A. & Romano, M. (2020 “2018”) Checklist of names in Mutillidae (Hymenoptera), with illustrations of selected species. *Bollettino del Museo Regionale di Scienze Naturali di Torino*, 36 (1–2), 5–425.
- Smith, F. (1855) *Catalogue of Hymenopterous Insects in the Collection of the British Museum. Part III. Mutillidae and Pompilidae.* Trustees of the British Museum, London, [4] + 206 pp., pls. A + 1–5.
- Terine, J.B., Girish Kumar, P. & Sureshan, P.M. (2020) Insecta: Hymenoptera: Mutillidae. In: Kailash Chandra, Raghunathan, C., Sureshan, P.M., Subramanian, K.A. & Rizvi, A.N. (Eds.), *Faunal Diversity of Biogeographic Zones of India: Western Ghats*. Director, Zoological Survey of India, Kolkata, pp. 445–448.
- Tu, B.B., Lelej, A.S. & Chen, X.X. (2015) Review of the genus *Taiwanomyrme* Tsuneki, 1993 (Hymenoptera, Mutillidae, Mutillinae), with description of two new species from China. *Zootaxa*, 4020 (3), 588–600.  
<https://doi.org/10.11646/zootaxa.4020.3.10>
- Williams, K.A., Lelej, A.S., Okayasu, J., Borkent, C.J., Malee, R., Thoawan, K. & Thaochan, N. (2019) The female velvet ants (aka modkhong) of southern Thailand (Hymenoptera: Mutillidae), with a key to the genera of southeast Asia. *Zootaxa*, 4602 (1), 1–69.  
<https://doi.org/10.11646/zootaxa.4602.1.1>
- Wilson, J.S., Jahner, J.P., Forister, M.L., Sheehan, E.S., Williams, K.A. & Pitts, J.P. (2015) North American velvet ants form one of the world’s largest known Müllerian mimicry complexes. *Current Biology*, 25, 704–706. [R704–R706]  
<https://doi.org/10.1016/j.cub.2015.06.053>