Zootaxa 3918 (2): 261–272
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3918.2.7
http://zoobank.org/urn:lsid:zoobank.org:pub:F87958CE-E652-4A48-9B79-38C56DAE90F8

A new species of *Samba s. str.* (Hymenoptera: Melittidae) from the Turkana Basin, Kenya with observations on the function of the metatibial spur in females

LAURENCE PACKER[1] & DINO J. MARTINS[2, 3]

[1]*Department of Biology, York University, 4700 Keele St., Toronto, ON., Canada, M3J 1P3. E-mail: xeromelissa@mail.com*
[2]*Turkana Basin Institute, Stony Brook University, Stony Brook NY 11794 USA. E-mail: dino@turkanabasin.org*
[3]*Insect Committee of Nature Kenya, National Museums of Kenya, Museum Hill, P O Box 44486 GPO 00100 Nairobi, Kenya*

Abstract

The third known species of the Afrotropical subgenus *Samba* s. str. is described based upon eight females. This is the northernmost and also the most arid habitat record for the genus. Images are provided of the habitus and diagnostic features for the species as well as the subgenus and some notes on floral hosts and habitat are provided. The species is added to a morphology—based phylogeny for the genus and results of barcoding of some species of the genus are presented. Some unusual morphological features of the subgenus are discussed, in particular, the function of the remarkable metatibial spurs of the female is recorded as assisting with removal of pollen from a floral host.

Key words: floral hosts, morphology, phylogeny, DNA barcodes, synapomorphy, foraging adaptation

Introduction

The genus *Samba* Friese was described by Friese (1908) and was monotypic until united with *Haplomelitta* Cockerell by Michez *et al.*, (2010). The latter authors retained the numerous subgenera of *Haplomelitta* previously described by Michener (1981) and described a second species of *Samba s. str.*—*S. ascheri* Michez & Patiny. The purpose of this paper is to describe a third species of the subgenus, make the name available for ongoing molecular phylogenetic research on bees and to provide more detailed images than have been available until now. In particular, some details of the rather highly modified mouthparts are imaged and discussed and the function of the remarkably enlarged metatibial spur is described. Additionally, we provide notes on host plants and habitat. Lastly, we add the species to a recent morphology–based phylogeny of the genus (Michez *et al.*, 2010) and results of available DNA barcode sequences for the genus are presented.

Methods

Terminology for structures is from Michener (2007) and Prentice (1998), for the sting apparatus the terminology of Packer (2003) as modified by Rightmyer (2004) is used, for surface sculpture we largely follow Harris (1997). F#, S# and T# denote particular flagellomeres and metasomal sterna and terga respectively and some measurements are given in terms of MOD—the transverse diameter of the median ocellus. Additional acronyms used are UOD and LOD for minimal upper and lower ocular distances, IAD and AOD for minimal distances between the antennal sockets and between a socket and the compound eye and IOD and OOC for minimal interocellar and ocellocular distances respectively.

Mouthparts and the sting apparatus were studied after relaxation, removal with fine forceps and clearing in ~10% KOH for 5 hours; they were observed and imaged stored in glycerine. These were described for a paratype only.

Accepted by C. Rasmussen: 20 Nov. 2014; published: 11 Feb. 2015

(2010) and to Connal Eardley for field assistance in South Africa where some of the related taxa were collected by the senior author in earlier years. Ms. Dumesh's contribution was funded by the Dean of the Faculty of Science and Engineering and the Vice President for Research and Innovation, both of York University. Funds for the imaging system were obtained through the Canadian Foundation for Innovation and the Ontario Research Fund (New Initiative Fund) through Canadensys. The senior author's contributions were supported by the Natural Sciences and Engineering Research Council of Canada through a Discovery Grant. Martins' work is supported by the Turkana Basin Institute—Stony Brook University, Nature Kenya, the National Geographic Society and the Whitley Fund for Nature. At the Turkana Basin Institute in Kenya assistance, insights and support were provided by R. Leakey, M. Leakey, L. Leakey, I. Angelei, L. Kabui and P. Lomosingo. T.N.T. is made freely available through the sponsorship of the Willi Hennig Society. We are grateful to Denis Michez, Jerry Rozen and Claus Rasmussen for helpful comments that improved the manuscript.

References

Farris, J.S. (1969) A successive approximations approach to character weighting. *Systematic Zoology*, 18, 374–385. http://dx.doi.org/10.2307/2412182

Friese, H. (1908) Neue Bienenarten aus Ostafrika. *Deutsche Entomologische Zeitschrift*, 1908, 567–572.

Goloboff, P.A., Farris, J.S. & Nixon, K. (2003a) T.N.T.: Tree analysis using new technology. Program and documentation from the authors. Available from: http://www.zmuc.dk/public/phylogeny (accessed 14 January 2015)

Goloboff, P.A., Farris, J.S., Källersjö, M., Oxelman, B., Ramírez, M.J. & Szumik, C.A. (2003b) Improvements to resampling measures of group support. *Cladistics*, 19, 324–332. http://dx.doi.org/10.1111/j.1096-0031.2003.tb00376.x

Harris, R.A. (1979) A glossary of surface sculpturing. *Occasional Papers in Entomology*, 28, 1–31.

Hebert, P.D.N., Ratnasingham, S. & deWaard, J.R. (2003) Barcoding animal life: cytochrome *c* oxidase subunit 1 divergences among closely related species. *Proceedings of the Royal Society of London Series B–Biological Science*, 270, S96–S99. http://dx.doi.org/10.1098/rsbl.2003.0025

Hebert, P.D.N., Penton, E.H., Burns, J.M., Janzen, D.H. & Hallwachs, W. (2004) Ten species in one: DNA barcoding reveals cryptic species in the neotropical skipper butterfly *Astraptes fulgerator*. *Proceedings of the National Academy of Sciences of the United States of America*, 101, 14812–14817. http://dx.doi.org/10.1073/pnas.0406166101

Kluge, A.G. & Farris, J.S. (1969) Quantitative phyletics and the evolution of anurans. *Systematic Zoology*, 18, 1–32. http://dx.doi.org/10.2307/2412407

Martins, D.J. (2012) Rare parasitic bee genus discovered in Kenya. *Swara, Journal of the East African Wildlife Society*, 33, 52–54.

Martins, D.J. (2014) Butterfly pollination of the dryland wildflower *Gloriosa minor*. *Journal of East African Natural History*, *103*, 25–30. http://dx.doi.org/10.2982/028.103.0103

Michener, C.D. (1942) Taxonomic observations on bees with descriptions of new genera and species (Hymenoptera: Apoidea). *Journal of the New York Entomological Society*, 50, 273–282.

Michener, C.D. (1981) Classification of the bee family Melittidae with a review of species of Meganomiinae. *Contributions of the American Entomological Institute*, 18, 1–135.

Michener, C.D. (2007) *The bees of the world. 2nd Edition*. Johns Hopkins University Press, Baltimore, xvi + 953 pp.

Michez, D., Eardley, C., Kuhlmann, M., Timmerman, K. & Patiny, S. (2010) The bee genera *Haplosamba* and *Samba* (Hymenoptera: Anthophila: Melittidae) phylogeny, biogeography and host plants. *Invertebrate Systematics*, 24, 327–347.

Miller, S.E., Martins, D.J., Rosati, M. & Hebert, P.D.N. (2014) DNA barcodes of moths (Lepidoptera) from Lake Turkana, Kenya. *Proceedings of the Entomological Society of Washington,* 116, 133–136. http://dx.doi.org/10.4289/0013-8797.116.1.133

Packer, L. (2003) Comparative morphology of the skeletal parts of the sting apparatus of bees (Hymenoptera: Apoidea). *Zoological Journal of the Linnean Society*, 138, 1–38. http://dx.doi.org/10.1046/j.1096-3642.2003.00055.x

Packer, L. (2006) A new *Leioproctus* with unique wing venation in males (Hymenoptera: Colletidae: Paracolletinae) with comments on unusual wing modifications in bees. *Zootaxa*, 1104, 47–57.

Praz, C.J. & Packer, L. (2014) Phylogenetic position of the bee genera *Ancyla* and *Tarsalia* (Hymenoptera: Apidae): a remarkable base compositional bias and an early Paleogene dispersal between North America and the Old World. *Molecular Phylogenetics and Evolution*, 81, 258–270. http://dx.doi.org/10.1016/j.ympev.2014.09.003

Ratnasingham, S. & Hebert, P.D.N. (2007) BOLD: the barcoding of life data system (www.barcodinglife.org). *Molecular Ecology Notes*, 7, 355–364. http://dx.doi.org/10.1111/j.1471-8286.2007.01678.x

Rightmyer, M. (2004) Phylogeny and classification of the parasitic bee tribe Epeolini (Hymenoptera: Apidae, Nomadinae).

Scientific Papers of the Natural History Museum, University of Kansas, 33, 1–51.
Tamura, K., Stecher, G., Peterson, D., Filipski, A. & Kumar, S. (2013) MEGA6: Molecular Evolutionary Genetic Analysis version 6.0. *Molecular Biology and Evolution*, 30, 2725–2729. http://dx.doi.org/10.1093/molbev/mst197
Winston, M.L. (1979) The proboscis of long–tongued bees: a comparative study. *University of Kansas Science Bulletin*, 51, 631–667.

APPENDIX 1. Barcode voucher codes for *Samba* species (only distinct sequences are shown in Fig. 4)

Samba atra. CCDB-15280 C05, CCDB-15281 E12, CCDB-15281-F01.
Samba griseonigra. CCDB-15278 A03, CCDB-15278 A04, CCDB-15280 B06, CCDB-15280 B07, CCDB-15281 F10, CCDB-15281 F11
Samba ogilvei CCDB-15278 F11 CCDB-15278 F12, CCDB-15279 A03, CCDB-15280 B08, CCDB-15280 B09, CCDB-15280 G09, CCDB-15281 F09, 06728A03-ZAF, 06728A11-ZAF
Samba turkana CCDB-09808 B08, CCDB-09808 C04