



<http://dx.doi.org/10.11646/zootaxa.3768.4.4>

<http://zoobank.org/urn:lsid:zoobank.org:pub:3163DA35-CCC9-4DC2-9216-3D013107796C>

The geometrid moths of Ethiopia I: tribes Pseudoterpnini and Comibaenini (Lepidoptera: Geometridae, Geometrinae)

AXEL HAUSMANN¹, FRANCESCO PARISI² & ANDREA SCIARRETTA²

¹Zoologische Staatssammlung München, Münchhausenstraße 21, D-81247 München. E-mail: Axel.Hausmann@zsm.mwn.de

²Department of Agricultural, Environmental and Food Sciences – University of Molise – Via De Sanctis, I-86100 Campobasso, Italy

Abstract

In this paper we present a checklist for Ethiopian Geometridae, subfamily Geometrinae, tribes Pseudoterpnini and Comibaenini. Six species were found to belong to the tribe Pseudoterpnini, two species to the tribe Comibaenini. One species is described as new, *Comibaena theodori* **sp. nov.** Adults of all species are illustrated, genitalia are figured for the new species.

Key words: Lepidoptera, Geometridae, Geometrinae, Pseudoterpnini, Comibaenini, Africa, Ethiopia, DNA Barcoding, integrative taxonomy, new species

Introduction

Though the first descriptions of Ethiopian geometrids date back to the year 1858, the country still has to be regarded as poorly investigated. So far, 90 taxa have been described from Ethiopia of which 79 are currently accepted as valid at species rank (Scoble 1999; Scoble & Hausmann 2007). Most descriptions were done by Herbulot (22 taxa, various papers), Guenée (1858; 18 taxa), Prout (16 taxa; various papers), Fletcher (10 taxa; various papers) and Debauche (1937; 8 taxa). Only 16 descriptions have been contributed by other authors. Most type specimens are deposited in the Natural History Museum in London (51 taxa) and in the State Collection of Zoology in Munich (23 taxa) which facilitates work on Ethiopian Geometridae. A rough estimate based on the study of collection material involving both morphology and DNA barcoding leads to a projected number of geometrids for Ethiopia of at least 500 species. No comprehensive study on this country's fauna has been published. Since the authors have access to thousands of Ethiopian geometrid moths in their collections, this material offers a good basis for reviewing the historical descriptions and for offering additional data. In order to realize this review we are planning about 15 contributions, the first of which presents a checklist for the tribes Pseudoterpnini and Comibaenini (subfamily Geometrinae).

Material and methods

Specimens were collected by netting during daytime or at dusk, by attraction to 125W mercury vapour or miscellaneous light bulbs (in front of white sheets) powered by portable generators, by actinic light traps powered by lead batteries, and by attraction to bait. Specimens were pinned, mounted and identified by comparison with collections, type specimens and literature or, if necessary, by genitalia dissection. Dissection and preparation of genitalia slides were performed applying standard protocols (cf. Robinson 1976); the genitalia were embedded in Euparal and mounted on slides. Measurements were done with a reticule in a Wild M3Z microscope. Specimens are deposited in the entomological collections of the Zoologische Staatssammlung München (Germany), and of the Department of Agriculture, Environment and Food Science at the University of Molise, Campobasso (Italy). Systematic order and attribution to tribes was taken from Hausmann (1996; 1999; 2006); nomenclature follows Scoble (1999) and Scoble & Hausmann (2007).

mixed brown and white scales, length 1.5 mm, last segment smoothly scaled. ♂ antennae long bipectinate, length of branches up to 1.3 mm, approx. 10 times width of flagellum. ♂ hindtibia with four spurs and a terminal process, length of the latter 0.75 mm. **Male genitalia** (Figs 10a–10c): Uncus with lateral projections much longer than central, 0.5–0.6 mm deepest incision. Valva comparatively broad at centre. Saccus projections comparatively short, length 0.5–0.6 mm from central excavation. Aedeagus straight, length 2.25 mm. Sternum A8 with moderately long projection, length 0.3 mm in the holotype (but 0.95 mm in the specimen from Didessa river).

Differential diagnosis. African members of genus *Comibaena* often show interspecific differential features in coloration and wing pattern, though the differences in male genitalia are often small, e.g. in the *rufitornus/leucospilata/esmeralda* species-group. The specific differential traits in the habitus, however, are well correlated with COI-haplotypes at interspecific genetic distances of usually 5 to 8%. Anticipating a comprehensive revision of the African species of the genus *Comibaena* (probably raising the species number from actually 12 to more than 20) we describe a new Ethiopian species here, which is well differentiated from all other African species in male genitalia and DNA barcodes. The new species differs from *C. rufitornus* Prout, 1916 (dissections examined from Kenya, Cape Verde), *C. leucospilata* (Walker, 1863) (South Africa, Natal) and *C. esmeralda* (Warren, 1898) (Nigeria, Guinea) by a shorter projection of sternum A8 (0.3 mm rather than 0.5–0.9 mm) by the long lateral projections of uncus (0.55 mm rather than 0.35–0.50 mm) which are clearly exceeding the length of the central projections and by the comparatively short saccus projections. *C. leucospilata* from South Africa (Natal) very similar in habitus, on average with narrower medial area, length of ♂ antennal branches 1.1–1.2 mm, length of ♂ hindtibial process 0.5 mm. Genetically the nearest neighbour (6.2%) is an undescribed species from Kenya and Tanzania which strongly differs in habitus (transverse lines absent, discal spots weak, triangle pattern of terminal line and fringe absent) and genitalia (aedeagus much longer, with termino-lateral lobe, saccus projections and posterior spine on sternum A8 much longer). *C. rufitornus* (barcoded from Uganda, Yemen and Cape Verde, the last tentatively considered conspecific), *C. leucospilata* (South Africa, Zimbabwe, Zambia, Tanzania) and *C. esmeralda* (Ghana, Cameroon, Sierra Leone) diverge from *C. theodori* sp.nov. by 6.8%, 7.5% and 6.5% respectively.

Etymology. The new species is dedicated to Theodor Beck, the father of the collector of two paratypes.

Acknowledgements

We thank Robert Beck (Munich), Vasiliy Kravchenko (Tel Aviv), Günter Müller (Haifa), Stefan Naumann (Berlin), Günter Riedel (Munich) and Harald Sulak (Munich) who collected and donated numerous Ethiopian geometrids and provided information on the collecting localities. We thank Giuseppe Spina (Campobasso) and Alenuccio Palladino (Campobasso) for their help in the collection of moths during the entomological expeditions of the University of Molise in Ethiopia. The genetic analyses have received considerable support from Paul D. N. Hebert and the Biodiversity Institute of Ontario (BIO) and the Canadian Centre for DNA Barcoding (CCDB University of Guelph). The data management and analysis system BOLD was provided by Sujeevan Ratnasingham. The work was financially supported by Genome Canada (Ontario Genomics Institute) in the framework of the iBOL program, WG 1.9.

Literature

- deWaard, J.R., Ivanova, N.V., Hajibabaei, M. & Hebert, P.D.N. (2008) Assembling DNA barcodes: analytical protocols. In: Martin, C. (Ed.), *Methods in molecular biology: environmental genetics*. Totowa, Humana Press, NJ, pp. 275–293.
- Guenée, A. (1858) *Histoire naturelle des insectes (Lepidoptera), Species Général des Lépidoptères*. Uranides et Phalénites I. II. Paris., Tom. IX, pp. 1–514, X, pp. 1–584.
- Hausmann, A. (1996) The Morphology of the Geometrid Moths of the Levant and its Neighbouring Countries (Part I: Orthostixinae-Geometrinae). *Nota lepidopterologica*, 19 (1/2), 3–90.
- Hausmann, A. (1999) Geometrid Moth Species from Yemen (Lepidoptera: Geometridae) (pls. I–V). *Esperiana, Staffelstein, Buchreihe zur Entomologie*, Bd 7, 283–305.
- Hausmann, A. (2006) The geometrid Moth Species from Yemen – With 50 new records for the country and description of 20 new taxa (Lepidoptera: Geometridae) (plates 12–21). *Esperiana, Schwanfeld, Buchreihe zur Entomologie*, Bd 12, 9–62.

- Ivanova, N.V., deWaard, J.R. & P.D.N. Hebert (2006) An inexpensive, automation-friendly protocol for recovering high-quality DNA. *Molecular Ecology Notes*, 6 (4), 998–1002.
<http://dx.doi.org/10.1111/j.1471-8286.2006.01428.x>
- Joannis, de, J. (1912) Geometridae. In: de Joannis, J. & Verity, R (Eds.), *Materiali per lo studio della fauna Eritrea raccolti nei 1901–03 dal Dott. A. Andreini tenente medico principalmente nelle regioni circostanti ad Adi-Ugri ed ad Adi-Caiè. Lépidoptères Rhopalocera. Bollettino della Società Entomologica Italiana*, 44, 115–135.
- Mabille, P. (1893) Description de lépidoptères nouveaux. *Annales de la Société Entomologique de Belgique*, 37, 50–65.
- Oberthür, C. (1887) Without title. *Bulletin de la Société entomologique de France*, 1887, xlviii–xlix, lvii–lix.
- Ratnasingham, S. & P.D.N. Hebert (2007) BOLD: The Barcode of Life Data System. *Mol. Ecol. Notes*, 7 (3), 355–364.
- Ratnasingham, S. (2013) BOLD Barcode of Life Data System. Available from: <http://www.boldsystems.org/views/login.php> (accessed 10 June 2013)
- Robinson, G.S. (1976) The preparation of slides of Lepidoptera genitalia with special reference to the Microlepidoptera. *Entomologist's Gazette*, 27, 127–132.
- Rougeot, P.-C. (1984) Missions Entomologiques en Ethiopie 1976–1982. *Mémoires du Muséum National d'Histoire Naturelle*, Série A, Zoologie, Tome 128.
- Scoble, M.J. (Ed.) (1999) *Geometrid Moths of the World, a Catalogue*. CSIRO Publishing, Apollo Books Collingwood, Stenstrup, Australia/Denmark, 400 pp.
- Scoble, M.J. & Hausmann, A. (2007) Online list of valid and nomenclaturally available names of the Geometridae of the World. Available from: http://www.lepbarcoding.org/cl_geometridae.php (accessed 12 February 2014)
- Tamura, K., Stecher, G., Peterson, D., Filipinski, A. & Kumar, S. (2013) MEGA6: Molecular Evolutionary Genetics Analysis Version 6.0. *Molecular Biology and Evolution*, 30, 2725–2729.
<http://dx.doi.org/10.1093/molbev/mst197>
- Walker, F. (1860) *List of the specimens of lepidopterous insects in the collection of the British Museum*. XX: Geometrites, pp. 1–276.
- Warren, W. (1901) Drepanulidae, Thyrididae, Epiplemidæ, and Geometridæ from the Aethiopian region. *Novitates Zoologicae*, 8, 202–217.