

New and interesting geometrid moths from Sokotra islands (Lepidoptera, Geometridae)

Axel HAUSMANN

Abstract

New and interesting records of 25 Geometridae species from Sokotra islands, Yemen, are presented. Six species are new for the fauna of Sokotra: *Eupithecia urbanata* FLETCHER, 1956; *Scopula dhofarata* (WILTSHIRE, 1986); *Scopula tornisecta* (PROUT, 1916); *Microloxia ruficornis* WARREN, 1897; *Palaeaspilates mariusi* **sp.n.**; *Microbaena pulchra minor* HAUSMANN, 1996. With these the geometrid fauna list increases from 22 to 28 species. The taxonomical analysis is based on both morphological and molecular traits. Two species and one subspecies are described as new: *Idaea africarabica khameesi* **ssp.n.**, *Oar tertia* **sp.n.**, *Palaeaspilates mariusi* **sp.n.**

Introduction, material and methods

The geometrid fauna of Sokotra was poorly studied, so far. After a very few old expeditions (see FORBES 1903), only one reference on that subject has been published in the last 100 years (HERBULOT 1994). Very interesting new material of Geometridae from Sokotra islands, Yemen, has been collected in the years of 2008 and 2009 by Aidas SALDAITIS (Vilnius Lithuania), yielding a total of 25 species. Species identification was performed by both morphometrical (incl. dissections, standard method) and molecular analysis. The latter was based on a representative selection of 70 specimens from the 2008 expedition examined with a mtDNA-marker, the COI 5' barcode fragment. Material and laboratory work were that excellent to get all 70 specimens successfully sequenced to the complete fragment length of 658 bp at CCDB, University of Guelph (Paul HEBERT) using standard high-throughput protocols (IVANOVA et al. 2006). Sequences were analysed using Barcode of Life Datasystems (BOLD; RATNASINGHAM & HEBERT 2007) and Mega4 (TAMURA et al. 2007).

Images, neighbor joining tree, and further details such as voucher hosting institution, GPS coordinates and trace files can be obtained online from BOLD (2008), and from the webpage of the geometrids of Sokotra islands (HAUSMANN & SALDAITIS 2009). That strategy of multimedial publication was chosen for accelerating taxonomy (see HAUSMANN & HEBERT 2009; HAUSMANN et al. 2009a; 2009b).

Abbreviations and conventions

SI = Sokotra islands; SO = Sokotra main island; AK = Abd al Kuri island; SA = Samha island; at the head of the texts the islands are mentioned from which new material was recently collected by Aidas SALDAITIS; ZSM = Zoologische Staatssammlung München; SCDP = Sokotra Archipelago Conservation & Development Programme (Hadibo, Sokotra, Yemen with associated museum); the terms 'sequence variation' and 'genetic difference' refer to the analysis of the COI 5' barcode fragment (658 bp) with Kimura 2 Parameter.

Systematic account

Larentiinae Xanthorhoini

Xanthorhoe holophaea (HAMPSON, 1899)

SO, SA.

Disclisoprocta natalata (WALKER, 1862)

SO, SA. Populations from SI at large genetic distance from *D. natalata* (WALKER, 1862) examined from Yemen mainland (4.2%) and Ethiopia (3.4%). Intrapopulational sequence variation low, so far, within Sokotran (max.

divergence 0.0%, n=3) and Yemen mainland populations (0.5%, n=2). Basing on habitus features, HERBULOT (1994) strictly negates status of Sokotran populations as separate taxon from *D. natalata*, a view which is shared by the absence of differential features in genitalia. Even the South American sister species *D. stellata* (GUENÉE, 1858), without significant differences in ♂ and ♀ genitalia.

Eupitheciini

Eupithecia urbanata FLETCHER, 1956

SO. New for the fauna of Sokotra islands. Populations from SI at comparatively large genetic distance from specimens examined from Yemen mainland (2.6%). Intrapopulation sequence variation low, so far, within Sokotran (max. divergence 0.2%, n=3) and Yemen mainland populations (0.0%, n=2). Male and female genitalia well corresponding to those of Yemen mainland populations.

Pasiphila socotrensis (HERBULOT, 1994)

SO, SA. Sokotran *P. socotrensis* showed comparatively low genetic distance from both *P. derasata* (BASTELBERGER, 1905) examined from Ethiopia (2.0%) and *P. lita* (PROUT, 1916) from Yemen mainland (0.6%). Despite such a similar COI sequence *P. socotrensis* and *P. lita* are clearly different in ♂ genitalia: *P. lita* with one broad and comparatively short sinuous and one very small sinuous cornutus; sternum A8 with dorsolateral spines distant from each other, at its base with a long lateral projection; tergum A8 with two truncate projections; ventral margin of valva sinuous. *P. socotrensis* with four long, narrow and rather straight cornuti; sternum A8 with dorsolateral spines very close to each other, without lateral projection at its base; tergum A8 with two shallow, rounded lobes.

Sterrhinae

Sterrhini

Idaea africarabica khameesi ssp.n.

SO, SA.

Holotype: ♂, Yemen, Sokotra Island N., Di Hamri env., 1.III.2008; leg. A. Saldaitis, coll. ZSM, DNA barcode BC ZSM Lep 14024

Paratypes: 28♂♀, id.; 1♀, id., 26.III.2009; 1♂, id., Haghier Mts., Ayhaft loc., 500m, 4.III.2008; 5♂♀, id., 20.III.2009; 1♂, id., near Dicksam loc., 900m, 5.III.2008; 3♂♀, id., Diksam canyon, 23.III.2009; 5♂♀, N. Sokotra, Hills near Hadibu, 21.III.2009; 5♂♀, N. Sokotra isld., Qadab loc., 25.III.2009; 2♀, Yemen, Sokotra Island W., 30km E Qalansiya, 6.III.2008, leg. A. Saldaitis; 9♂♀, id., Qalansiya env., 22.II.2008; 1♂1♀, Sokotra archipelago, Samha island W, 12°09' N 52°59' E, 23-24.II.2008, leg. A. Saldaitis. Paratypes are divided between ZSM, coll. Saldaitis, and SCDP.

Description (Fig. 1): Wingspan 10-12 mm. Forewing narrow. Wings unicolorously dark grey, slightly glossy in freshly emerged specimens, fading to brownish grey when worn. Wing pattern vestigial, usually without transverse lines, without cell spots. Rarely with vague and diffuse postmedial fascia on fore- and hindwings. Underside of wings concolorous to upper side, without pattern. Palpi, and frons black, vertex brownish or blackish grey. Proboscis developed, but weak and short. Palpi extremely short. Antennae of ♂ with shallow intersegmental incisions, ciliate-subfasciculate, length of cilia 1.2-1.5 times width of flagellum. Hindtibia weakly developed in ♂, with pencil, tarsus 0.6-0.7 times length of tibia.

Differential diagnosis: N nominate subspecies slightly smaller, wingspan 8-10 mm, wings more rounded, ground colour paler, with creamy tinge, ♂ antennal cilia shorter, ♂ hindtarsus less shortened. No constant and significant difference in ♂ and ♀ genitalia (Figs 5, 9), except for the basal, dilated part of cornutus being slightly larger in the male aedeagus of the new subspecies. Though reminiscent of the *Idaea microptera* species-group, in habitus and genitalia, COI analysis reveals comparatively large genetic distance from this group: Nearest neighbours are *Idaea mimetes* (BRANDT, 1941) and *Idaea dhofarica* WILTSHIRE, 1986 at large distances of 7.4% and 8.7% respectively. N nominate subspecies not barcoded, so far.

Etymology: Named after Mr. Fouad Nasseeb Saeed KHAMEES (Hadibo, Sokotra, Yemen; SCDP ‘Sokotra Archipelago Conservation & Development Programme’) for kindly supporting the collection trip and the cooperation project (see acknowledgements).

Remarks: The only ‘*Idaea* species’ so far recorded from Sokotra by some old authors is *Idaea testacea* (SWINHÖE, 1886) (cf. HACKER & HAUSMANN 1999; HAUSMANN 2006) which was described under the genus *Eupithecia* from India, Poona. Swinhoe’s description and illustration, however, clearly referring to a completely different, much larger and much paler taxon with clear and sharp wing pattern. ‘*Idaea testacea*’ should be deleted from the fauna list of Sokotra, the most probable explanation is confusion with one of the Sokotran *Scopula* species.

Scopulini ***Oar tertia* sp.n.**

Oar pratana: sensu REBEL (1907) and HAUSMANN (2006) nec FABRICIUS, 1794

Holotype: ♂, Yemen, W. Sokotra Island, Shuab loc., coast line, mangoves, 24.III.2009; leg. A. Saldaitis, coll. ZSM, DNA barcode BC ZSM Lep 24277, gen.prp. ZSM G 14259.

Paratype: 1♀, id, gen.prp. ZSM G 14268.

Description (Fig. 2): Wingspan ♂ 14, ♀ 18 mm. Forewing sand coloured with dominant black brown pattern, antemedial line distinct, area between medial and postmedial line filled black brown, forming a zigzagging fascia, terminal area with dark brown shadows and a sharply bordered white double spot between median veins. Hindwing with conspicuous black brown spots in the terminal area of the female paratype, fused to a fascia in the male holotype. Cell spot of forewing conspicuous. Palpi, and frons grey mixed with dark brown scales, roughly scaled. Palpi long, extremely bushy. Antennae of ♂ bipectinate, longest branches about 5 times width of flagellum. Hindtibia of ♂ with 2, of ♀ with 4 spurs, hindtarsus long. Male genitalia (Fig. 6): small, socii not clearly projecting from posterior margin, juxta sclerite small, nearly symmetrical, aedeagus with one small cornutus and a patch of minute spinules, length of aedeagus 0.8 mm, sternum A8 with two very short posterior spines. Lateroposterior margin of sternum A8 bent towards tergum forming a spinulose crest. Female genitalia (Fig. 10): Antrum sclerotised, sub-rectangular. Lamella antevaginalis with paired, sclerotised lateral pockets. Corpus bursae elongate, posterior half sclerotised, longitudinally wrinkled, anterior half membranous, with cuticula finely and irregularly folded, signum absent.

Differential diagnosis: *Oar pratana* (see HAUSMANN 2004) differing in habitus in the missing conspicuous black brown spots of the terminal area of hindwing, cell spot of forewing usually smaller. Male genitalia of *O. pratana* approx. twice as large, socii projecting, juxta sclerite much larger, asymmetrically forked, aedeagus with much stouter and larger cornuti, length of aedeagus 1.2-1.3 mm, sternum A8 with 2-7 conspicuous spines at posterior margin, populations from Sudan and Yemen with 4-7 long spines, lateroposterior crests absent. In female genitalia corpus bursae much broader.

Molecular diagnosis: Large genetic distance from *O. pratana* examined from Israel (5.3 %) and Yemen (5.5 %).

Etymology: The name refers to the fact that this is the third species of this genus (lat. tertia = third).

Remarks: The sister species *Oar pratana* is distributed in several subspecies in North Africa from Morocco to Egypt and Sudan, in the Levant and on the western Arabian peninsula along the Red Sea coast. The taxa *obscuraria* BETHUNE-BAKER, 1894 from NW Egypt, *mortuaria* STAUDINGER, 1898 from Israel, and *nigrescens* HAMPSON, 1896 from Yemen structurally belong to *Oar pratana*, cf. HAUSMANN (2004; 2006).

***Scopula tornisecta* (PROUT, 1916)**

SA. New for the fauna of Sokotra islands. The single male from SI at medium genetic distance from *Scopula larseni* WILTSHIRE, 1982 (in HAUSMANN 1999 and 2006 under ‘*Zygophyxia larseni*’) examined from Yemen mainland (2.4%). Also genitalia strongly differing (cf. WILTSHIRE 1982, under ‘*Zygophyxia tornisecta*’). Both data sets confirming the taxonomy as presented in WILTSHIRE (1982). Type locality of *S. tornisecta* is Somalia.

***Scopula colymbas* HERBULOT, 1994**

SO. Populations from SI (locus typicus of *colymbas*) at large genetic distance from populations of Yemen mainland (2.7%). Intraspecific sequence variation low, so far, within Sokotran (max. divergence 0.4%, n=2) and somewhat larger in Yemen mainland populations (1.3%, n=3). Re-examination of genitalia revealing slight differences between female holotype from Socotra and Yemen populations, in the latter antrum larger, ductus bursae broader, hook-shaped sclerite at posterior border of corpus bursae larger. The new Sokotran material includes the first male specimen ever known from the type locality. In male genitalia well corresponding to the population in Yemen, cf fig. in HAUSMANN (1999). Requiring further study, including mainland African material.

***Scopula fulvicolor* (HAMPSON, 1899)**

SO.

***Scopula dhofarata* WILTSHIRE, 1986**

SO. New for the fauna of Sokotra islands. Populations from SI at medium genetic distance from presumably conspecific populations of Ethiopia (1.5%), difference due to geographical distance. Examination of genitalia revealing conspecificity with *Scopula dhofarata* WILTSHIRE, 1986 from south-western Oman. Male genitalia in a specimen from Yemen mainland with cerata slightly narrower and longer, but possibly within the range of variation (HAUSMANN 2006). Relationships to the African *Scopula lubricata* (WARREN, 1905) with type locality in Angola not excluded.

***Scopula latitans* (PROUT, 1920)**

SO, SA. Type locality of *S. latitans* is Zaire, see redescription and remarks in HAUSMANN (2006). Identity confirmed by dissection, genitalia well corresponding to figs 60-62 in JANSE (1935), in the legends erroneously under the name '*S. nesciaria*'.

***Scopula lactaria* (WALKER, 1861)**

SO. Populations from SI without genetic difference from other barcoded specimens from Ethiopia and Yemen mainland. Identity confirmed by dissection.

***Scopula adelpharia* (PÜNGELER, 1894)**

Recorded in HAUSMANN (2006), but not yet collected by Aidas SALDAITIS.

***Scopula minorata* (BOISDUVAL, 1833)**

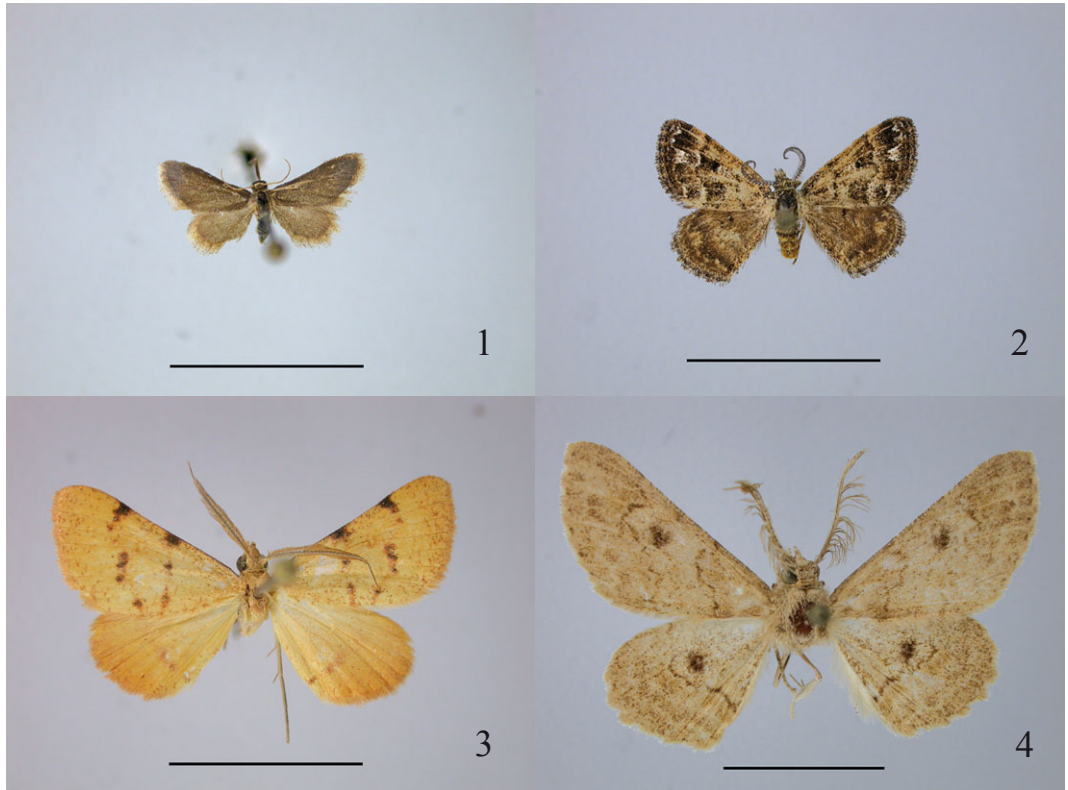
Recorded in HAUSMANN (2006), but not yet collected by Aidas SALDAITIS.

***Scopula rhodinaria* (REBEL, 1907)**

SO, SA.

***Scopula disparata* (HAMPSON, 1903)**

SO, SA, AK. Populations from SI at large genetic distance (3.4%) from Yemen mainland sister species *Scopula alferii* WILTSHIRE, 1949 (in HAUSMANN 1999 and 2006 combined with genus '*Glossotrophia*')



Figs 1-4: Adult habitus of newly described taxa, scale bar = 1 cm. **Fig. 1** *Idaea africarabica khameesi* **ssp.n.**, holotype. **Fig. 2** *Oar tertia* **sp.n.**, holotype. **Fig. 3** *Palaeaspilates mariusi* **sp.n.**, holotype. **Fig. 4** *Cleora littoralis* HERBULOT, 1999.

confirming species rank of both taxa. Intraspecific sequence variation comparatively low, so far, in both taxa: max. divergence in *S. disparata* 0.9% (n=3), in *Scopula alferii* from Yemen mainland 0.2% (n=2).

Cosymbiini
***Traminda mundissima* (WALKER, 1861)**

SO. Populations from SI at very low genetic distance from populations of United Arab Emirates (0.5%).

***Palaeaspilates mariusi* sp.n.**

SO. New for the fauna of Sokotra islands.

Holotype: ♂, Yemen, Sokotra Island N., Haghier Mts., Ayhaft loc., 500m, 4.III.2008, leg. A. Saldaitis, coll. ZSM, Gen.prp. ZSM G 12013; DNA barcode BC ZSM Lep 13996.

Paratypes: 3♀, id.; 1♀, id., 22.XI.2008; 1♀, id., Di Hamri env., 1.III.2008; 3♀, id., 20-21.XI.2008; 1♀, 20-21.XI.2008; 3♂12♀, id., Haghier Mts., Dicksam loc., N 12°28' E 54°00', 300m, 2.III.2008; 1♀, id., Haghier Mts., near Dicksam loc., 900m, 5.III.2008; 15♀, id., Diksam canyon, 23.III.2009; 1♀, id., top of Diksam valley, 22.III.2009. Paratypes are divided between ZSM, coll. Saldaitis, and SCDP.

Description (Fig. 3): Wingspan 18-23 mm. Wings sand coloured, usually with strong orange or yellow tinge. Forewing usually slightly irrorated with brown scales. Ante- and postmedial lines fine, red brown, sometimes dissolved to spots and better marked at costa. Antemedial line straight, postmedial line slightly undulate. Cell

spot developed as a fine ring, sometimes inconspicuous or vestigial. Hindwing darker towards termen, pattern vestigial, postmedial line slightly marked towards anal margin. Underside of wings with similar ground colour as on upperside, pattern vestigial, with vague postmedial line only. Male antennae bipectinate, branches long, 8-10 times width of flagellum; female antennae filiform. Proboscis well developed. Frons strongly projecting. Palpi broad and bushy, not exceeding tip of frons in male, slightly exceeding in female. Legs very long. Hindtibia with two spurs in both sexes. Male genitalia (Fig. 7): uncus membranous, with strongly sclerotised bilobous, setose socii, both lobes more approached than in *P. reducta* (WILTSHIRE, 1981) and *P. sublutearia* (WILTSHIRE, 1977) from southern Arabian peninsula. Saccus broad, strongly sclerotised. Valva long and slender, membranous. Sacculus ending in a forked harpe, both arms long, slender, strongly sclerotised; in both the Arabian species posterior arm arising from base of sacculus. Aedeagus with one stout and narrow cornutus. Female genitalia (Fig. 11): Antrum sclerotised, laterally bilobous. Corpus bursae very long and slender, with granulate cuticula, signum vestigial.

Etymology: Named after Marius Butkevicius (Vilnius, Lithuania), friend of the collector, for the organization of Sokotra field trips.

Remarks: Somewhat reminiscent of syntopic *Lhommeia aediphlebia*. For the identity of authentic *L. aediphlebia* see below. Generic attribution to *Palaeaspilates* clearly indicated by wing pattern, similar external morphology and wing venation, such as many synapomorphies resp. common genitalic features, e.g. in male shape of harpe, bilobous setose socii, broad saccus, presence of a stout, single cornutus, in female the long corpus bursae with granulate cuticula, signum vestigial. Nearest neighbour in COI analysis: *P. sublutearia* (10.5% divergence).

Geometrinae Comibaenini

***Microbaena pulchra minor* HAUSMANN, 1996**

SO. New for the fauna of Sokotra islands. One single male from the 2009 expedition. Identification verified by dissection, but with large genetic distance from populations from Yemen (4.5 %) and Oman (4.8 %).

Comostolini

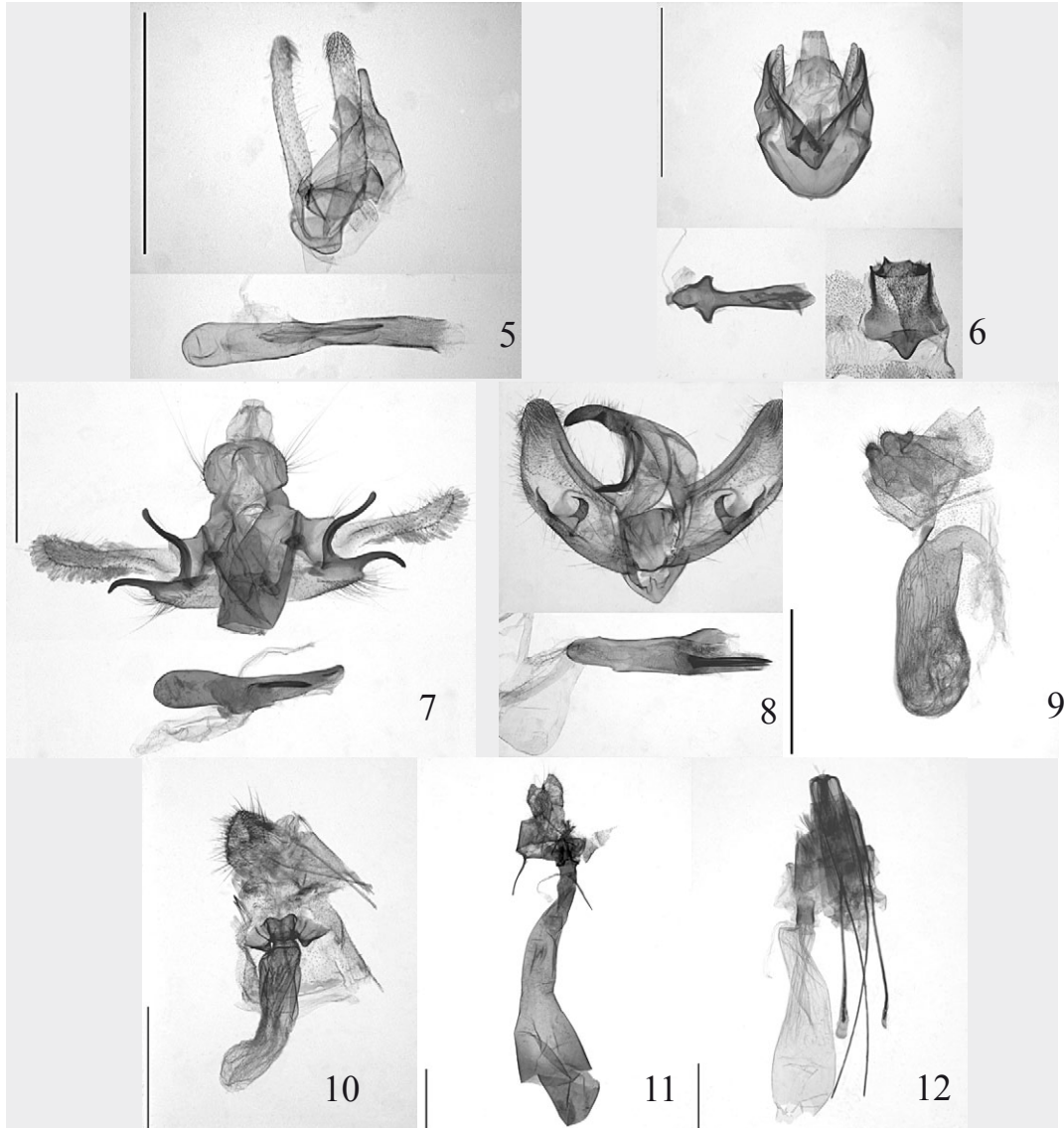
***Eucrostes pygmaea* REBEL, 1907**

SO. For species rank and differential features in habitus see HAUSMANN (2006). After examination of the vouchers all differential features can be confirmed except the fringe usually with pale ochreous tinge distally rather than being pure white. Female palpi on average longer than in *E. disparata* (WALKER, 1861) from Yemen mainland, exceeding by 0.7-0.8 mm beyond eyes, diameter of eye 0.5 mm. Total length of palpi 1.7-2.0 times diameter of eye. Fresh specimens with clear white forewing costa. Male genitalia very small, valva with one basal spinose lobe only, much smaller and weaker than in African *E. disparata* (WALKER, 1861) and Mediterranean *E. indigenata* (VILLERS, 1789). Populations from SI at large genetic distance (2.8%) from Yemen mainland sister species *E. disparata* (WALKER, 1861), confirming species rank. Intraspecific sequence variation comparatively low in both taxa: max. divergence in *E. pygmaea* 0.5% (n=4), in *E. disparata* from Yemen mainland 0.3% (n=3).

Hemitheini

***Phaiogramma faustinata* (MILLIÈRE, 1868)**

SO. The single female from SI at large genetic distance from *Phaiogramma faustinata* (MILLIÈRE, 1868) examined from Yemen mainland (2.3%). This may be a new species or subspecies, but more material is required to confirm constancy of differential features.



Figs 5-8: ♂ genitalia of newly described taxa, scale bar = 1 mm. **Fig. 5** *Idaea africarabica khameesi* ssp.n., prp. ZSM G 12457, paratype. **Fig. 6** *Oar tertia* sp.n., prp. ZSM G 14259, holotype. **Fig. 7** *Palaeaspilates mariusi* sp.n., prp. ZSM G 12013, holotype. **Fig. 8** *Cleora littoralis* HERBULOT, 1999, prp. ZSM G 14258.

Figs 9-12: ♀ genitalia of newly described taxa, scale bar = 1 mm. **Fig. 9** *Idaea africarabica khameesi* ssp.n., prp. ZSM G 12219, paratype. **Fig. 10** *Oar tertia* sp.n., prp. ZSM G 14268, paratype. **Fig. 11** *Palaeaspilates mariusi* sp.n., prp. ZSM G 12019, paratype. **Fig. 12** *Cleora littoralis* HERBULOT, 1999, prp. ZSM G 14267.

***Neromia pulvereisparsa* (HAMPSON, 1896)**

SO. Populations from SI at medium genetic distance (1.4%) from Yemen mainland populations. Male genitalia without differences from populations of Yemen mainland, considering the intrapopulational variability of the latter in shape of harpe and basal appendages of valva.

Mimaplasta canui HERBULOT, 1993

SO.

Microloxiini

Microloxia ruficornis WARREN, 1897

SO, SA. New for the fauna of Sokotra islands. Three of four barcoded Sokotran specimens at a genetic distance of 1.6% from *M. ruficornis* WARREN, 1897 examined from Yemen mainland, Arabia, Levant and North Africa. Genetical distances between several other *Microloxia* species (*M. herbaria*, *M. indecretata*, *M. aistleitneri*) at similar level. On Sokotra, however, one specimen with the typical haplotype of the African/Arabian populations, possibly referring to a specimen which has recently immigrated from there. In habitus this male differs from the rest of the Sokotran specimens by the presence of the forewing postmedial line, in genitalia, that specimen perfectly matches slides from continental Africa. Also the rest of the Sokotran populations without significant differences from those of *M. ruficornis*, but here male genitalia smaller, harpe slightly shorter, tip of harpe drop-shaped and slightly separated from the rest, uncus broader to 2/3 of its length; in female genitalia the two signa with longer spines. In the latter feature slightly reminiscent of Indian *M. indecretata*. Requiring further study.

Acidaliastis micra HAMPSON, 1896

Mentioned for the fauna of Socotra in HAUSMANN (2006), basing on the taxon *Acidalia vinnularia* REBEL, 1907 described from Socotra and recognized as synonym by SCOBLE (1999); not yet collected by Aidas SALDAITIS. Type material should be submitted to dissection to examine whether it may refer to small pale forms of *M. ruficornis*.

Ennominae

Boarmiini

Cleora rothkirchi amydropa FLETCHER, 1967

SO. Sokotran ssp. *amydropa* at large genetic distance (3.4%) from nominate subspecies *C. rothkirchi* (STRAND, 1914), examined from Ethiopia. Genus and species-group requiring integrated large-scale revision basing on ample material.

Cleora littoralis HERBULOT, 1999

Material: 8♂, 3♀ Yemen, W. Sokotra Island, Shuab loc., coast line, mangoves, 24.III.2009; leg. A. Saldaitis, coll. ZSM, Saldaitis, and SCDP.

Since this species (which was overlooked in the Sokotran fauna list of HAUSMANN 2006) was so far based only on a very short description of three females, it deserves a redescription and differential diagnosis towards the related *C. nana* and *C. quadrimaculata*.

Redescription (Fig. 4): Wingspan ♂ 28-29, ♀ 30-32 mm. Forewing narrow. Ground colour light brown, pattern vague, with weak contrasts against the ground colour. Ground colour of females light grey with pale brown tinge. Ante- and postmedial lines very fine, dark brown. Medial line usually absent, but in two specimens strongly marked. Cell spots round, without light filling, diffusely bordered, usually conspicuous, but in some specimens diffuse on upperside. Underside whitish pale brown, with cell spots on all wings conspicuous. Male genitalia (Fig. 8): uncus broad digitiform, gnathos narrow and tapering, valva with hook-shaped, tapering harpe directed dorsad, ventral margin of valva sclerotised, with fine, tapering, S-shaped tip, aedeagus short (length 2.2 mm) with two comparatively short and slender cornuti (length 0.8 mm). Female genitalia (Fig. 12): Antrum rectangular, corpus bursae elongate, longitudinally wrinkled in the posterior half.

Differential diagnosis: In habitus reminiscent of *Cleora nana* HAUSMANN & SKOU, 2008 from the United Arab

Emirates and northern Oman, but the latter with more vivid light brown coloration, cell spots less conspicuous, in male genitalia harpe shorter, not curved but with two lateral spines at tip. In female genitalia antrum broader, conical, dilating towards corpus bursae. The irregularly shaped apophyses as figured in HAUSMANN & SKOU (2008) may be due to an artefact or to an individual aberration. The closest ally on the African continent is *Cleora quadrimaculata* (JANSE, 1932) from S Africa, and Madagascar, differing in habitus (see FLETCHER 1967) in the sharper, less diffuse wing pattern, and in the dark coloured terminal area of the wing underside. Variation similar. In male genitalia *Cleora quadrimaculata* differs in the gnathos being broader, harpe longer and narrower, with terminal teeth, ventral margin of valva without S-shaped sclerotised tip, and cornuti (1.1 mm) longer and stouter. In female genitalia antrum with lateral incision, towards corpus bursae with additional clasp (colliculum), corpus bursae shorter and much broader, more sclerotised, longitudinal wrinkles over almost the whole length.

Caberini

Lhommeia aediphlebia (HAMPSON, 1899)

SO. HAMPSON's detailed original description of morphological traits, wing colour and wing pattern clearly referring to this species and not to the above described, somewhat similar *Palaeaspilates mariusi*. In HAUSMANN (2006) erroneously combined with genus *Hyperythra* following the original description. Transferred to *Lhommeia* in SCOBLE (1999). The newly collected material at moderately large genetic distance from *Lhommeia subapicata* (WARREN, 1899) examined from Yemen mainland (7.7%). Similarly, genitalic structure supports relationship of *L. aediphlebia* and *L. subapicata*, though there are clear-cut differences, e.g. in the presence of small socii beneath uncus, long posterior appendages of vinculum, in the sclerotised sacculus with two terminal spines, and in the aedeagus being short and straight, and bearing sclerotised cornuti.

Acknowledgements

This paper is part of an official cooperation project between ZSM Munich, Aidas SALDAITIS and SCDP Museum (Hadibo, Yemen, Sokotra): "The Lepidoptera of Sokotran Islands / Yemen. An integrative study of the fauna for reconstruction of evolutionary scenarios and for determination of conservation needs". Mr. Ahmed Saeid SULIMAN and Mr. Fouad Naseeb Saeed KHAMEES from Sokotra gave every possible support. We are deeply grateful also to Mr. Salem Dahaq ALI (Director of E.P.A.), for supporting the project and for kindly releasing the necessary permits. Many thanks to the partners Aidas SALDAITIS (Vilnius, Lithuania) for professional collecting, for kind cooperation and donation of the material. Sonja KNÖLKE (Munich, Germany) helped by tissue sampling, photographing and databasing Sokotran specimens. Paul HEBERT (CCDB, University of Guelph, Canada) and his team kindly and professionally performed sequencing of the material in the framework of the Global Campaign DNA Barcoding Geometridae.

Zusammenfassung

Neue und interessante Nachweise von 25 Geometridenarten aus Sokotra (Yemen) werden vorgestellt. Sechs Arten sind neu für die Fauna Sokotras: *Eupithecia urbanata* FLETCHER, 1956; *Scopula dhofarata* (WILTSHIRE, 1986); *Scopula tornisecta* (PROUT, 1916); *Microloxia ruficornis* WARREN, 1897; *Palaeaspilates mariusi* **sp.n.**; *Microbaena pulchra minor* HAUSMANN, 1996. Damit erweitert sich die Faunenliste von 22 auf 28 Arten. Die taxonomische Analyse erfolgt unter Berücksichtigung sowohl morphologischer als auch molekularer Daten. Zwei Arten und eine Unterart werden als neu für die Wissenschaft beschrieben: *Idaea africarabica khameesi* **sp.n.**, *Oar tertia* **sp.n.**, *Palaeaspilates mariusi* **sp.n.**.

References

- BOLD 2008: <http://www.barcodinglife.com/views/taxbrowser.php?taxid=525>
 FLETCHER, D. S. 1967: A revision of the Ethiopian species and a check list of the world species of *Cleora* (Lepidoptera: Geometridae). – Bull. Brit. Mus. (Nat. Hist.) Ent. Ser., Suppl. **8**, 1-119.

- FORBES, H. O.(ed.) 1903: The natural history of Socotra and Abd-el-Kuri. – Bulletin of the Liverpool Museums (Special Bulletin); pp xlvii + 598 with 27 coloured plates and 88 illustrations in the text.
- HACKER, H. & A. HAUSMANN 1999: Geometridae. In HACKER (ed.): Systematic List of the Lepidoptera of the Arabian Peninsula with a survey of the spread with special reference to the fauna of Yemen. – Esperiana 7 (15-237), 95-114.
- HAUSMANN, A. 1999: Geometrid Moth Species from Yemen (Lepidoptera: Geometridae). – Esperiana 7, 283-305, 5 pls.
- HAUSMANN, A. 2004: Sterrhinae. – In A. HAUSMANN (ed.): The Geometrid Moths of Europe 2. – Apollo Books, Stenstrup, 600 pp., 24 pl., 237 text-figs, 420 b/w drawings, 198 maps.
- HAUSMANN, A. 2006: The geometrid moths of Yemen – With 50 new records for the country and description of 20 new taxa (Lepidoptera: Geometridae) – Esperiana 12, 9-62, 10 colour plates.
- HAUSMANN, A. & P. HEBERT 2009: The Geometridae of the UAE revised in the light of mtDNA data. In VAN HARTEN, T. (ed.): Arthropod fauna of the UAE 2, 468-479.
- HAUSMANN, A., HEBERT, P., MITCHELL, A., ROUGERIE, R., SOMMERER, M., EDWARDS, T. & C. J. YOUNG 2009a: Revision of the Australian *Oenochroma vinaria* GUENÉE, 1858 species-complex (Lepidoptera, Geometridae, Oenochrominae): DNA barcoding reveals cryptic diversity and assesses status of type specimen without dissection. – Zootaxa 2239, 1-21.
- HAUSMANN, A., SOMMERER, M., ROUGERIE, R. & P. HEBERT (2009b): *Hypobapta tachyhalotaria* n. sp. from Tasmania – an example of a new species revealed by DNA barcoding (Lepidoptera, Geometridae). – Spixiana, 32(2) in print.
- HAUSMANN, A. & A. SALDAITIS 2009: The Geometridae of Sokotra islands www.zsm.mwn.de/lep/sokotra.htm, with pdf of version 2, 10-7-2009.
- HAUSMANN, A. & P. SKOU 2008: Order Lepidoptera, family Geometridae. – In VAN HARTEN, T. (ed.): Arthropod fauna of the UAE (754 pp), 1: 562-590.
- HERBULOT, C. 1994: Geometridae (Lepidoptera) récoltés a Sokotra par le Dr J.-G. CANU. – Lambillionia 94, 389-393, 4 fig.
- 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, 998–1002.
- JANSE, A. J. T. 1933-1935: The Moths of South Africa, Vol. II Geometridae: 1-448 – E.P. & Commercial Printing Co. Ltd., Durban.
- RATNASINGHAM, S. & P. D. N. HEBERT 2007: BOLD: The Barcode of Life Data System (<http://www.barcodinglife.org>). – Molecular Ecology Notes 7, 355–364.
- REBEL, H. 1907: Lepidopteren aus Südarabien und von der Insel Sokotra. – Denkschr. Akad. Wiss. Wien, Math. Nat. Kl. 71, 1-100.
- SCOBLE, M.J. (ed.) 1999: Geometrid Moths of the World, a Catalogue. – Csiro Publishing, Apollo Books – Collingwood/Australia, Stenstrup/Denmark (1,400 pp.).
- WILTSHIRE, E. P. 1982: Insects of Saudi Arabia. Fam. Cossidae, Zygaenidae, Sesiidae, Lasiocampidae, Bombycidae, Sphingidae, Thaumetopoeidae, Thyretidae, Notodontidae, Geometridae, Lymantriidae, Noctuidae, Ctenuchidae (Pt. 2). – Fauna of Saudi Arabia 4, 271-332.

Authors address:

Axel HAUSMANN
Zoologische Staatssammlung München
Germany
Münchhausenstr. 21
D-81247 München
E-mail: Axel.Hausmann@zsm.mwn.de

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Mitteilungen der Münchner Entomologischen Gesellschaft](#)

Jahr/Year: 2009

Band/Volume: [099](#)

Autor(en)/Author(s): Hausmann Axel

Artikel/Article: [New and interesting geometrid moths from Sokotra islands \(Lepidoptera, Geometridae\). 95-104](#)