

## Notes on the Saturniidae of the Arabian Peninsula, with description of a new species (Lepidoptera: Saturniidae)

Wolfgang A. NÄSSIG<sup>1</sup>, Stefan NAUMANN<sup>2</sup> and Rolf G. OBERPRIELER

Dr. Wolfgang A. NÄSSIG, Entomologie II, Forschungsinstitut und Museum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt am Main, Germany; wolfgang.naessig@senckenberg.de

Dr. Stefan NAUMANN, Hochkirchstrasse 11, D-10829 Berlin, Germany; sn@saturniidae.com

Dr. Rolf G. OBERPRIELER, CSIRO National Research Collections Australia, GPO Box 1700, Canberra, ACT 2601, Australia; rolf.oberprieler@csiro.au

**Abstract:** The available information of the two saturniid species recorded from the south-western region of the Arabian Peninsula is summarised and updated. *Campimoptilum arabicum* (ROUGEOT, 1977) **comb. n.** is transferred from the genus *Goodia* HOLLAND, 1893 to *Campimoptilum* KARSCH, 1896, and *Usta arabica* sp. n. is described as new and differentiated from its most similar species, *U. angulata* ROTHSCHILD, 1895. The classification of the Saturniidae is reconciled with recent advances made in the phylogeny of the family, Bunaeinae are recognised as a subfamily and brief notes on the composition of the tribes Micragonini and Urotini are given. Comments are provided on the recent subdivision of the genus *Goodia*, and *Yatanga* DARGE, 2008 **syn. n.** is synonymised with *Campimoptilum*, *Yatanga sicca* DARGE, 2011 **syn. n.** with *C. smithii* (HOLLAND, 1897) and *Yatanga sudanica* DARGE, 2011 **syn. n.** and *Y. tandala* DARGE, 2011 **syn. n.** with *C. oriens* (HAMPSON, 1909).

### Anmerkungen zu den Saturniidae der Arabischen Halbinsel, mit Beschreibung einer neuen Art (Lepidoptera: Saturniidae)

**Zusammenfassung:** Verfügbare Informationen über die einzig bekannten Saturniidarten der südwestlichen Arabischen Halbinsel werden zusammengestellt und aktualisiert. *Campimoptilum arabicum* (ROUGEOT, 1977) **comb. n.** wird aus der Gattung *Goodia* HOLLAND, 1893 zu *Campimoptilum* KARSCH, 1896 überstellt, und *Usta arabica* sp. n. wird als neue Art beschrieben und mit der ähnlichsten Verwandten, *U. angulata* ROTHSCHILD, 1895, verglichen. Neue Erkenntnisse zur Phylogenie der Saturniidae werden in Form einer neuen Klassifikation der Familie dargestellt: die Bunaeinae werden als separate Unterfamilie erkannt und die Komposition der beiden Triben Micragonini und Urotini werden diskutiert. Die jüngsten Untergliederungen der Gattung *Goodia* werden kurz diskutiert und *Yatanga* DARGE, 2008 **syn. n.** wird synonymisiert mit *Campimoptilum*, *Yatanga sicca* DARGE, 2011 **syn. n.** mit *C. smithii* (HOLLAND, 1897) sowie *Yatanga sudanica* DARGE, 2011 **syn. n.** und *Y. tandala* DARGE, 2011 **syn. n.** mit *C. oriens* (HAMPSON, 1909).

### Introduction

The southern or south-western part of the Arabian Peninsula has traditionally been regarded as part of the Afrotropical biogeographical region or ecozone, although recent biogeographical analyses of vertebrate faunas (KREFT & JETZ 2010, LINDER et al. 2012, PROCHEŞ & RAMDAHNI 2012, VILHENA & ANTONELLI 2015) have excluded it from this region. Its fauna is also usually treated together with that of the whole Arabian Peninsula

(see, e.g., the book series “Fauna of [Saudi] Arabia” or several publications in the book series “Esperiana”). It does, however, harbour a small fauna of Saturniidae that is entirely African in character, although the few recent works dealing with part of it (DARGE 2008, 2011) have regarded it as not belonging to the African fauna.

The two species of Saturniidae recorded from the Arabian Peninsula are taxonomically poorly known and studied. Apart from the description of one of them (ROUGEOT 1977), they have only been included in a few lists of the Lepidoptera fauna of the Arabian Peninsula (WILTSHIRE 1994, HACKER 1999, HACKER et al. 1999, 2001), and partly under an incorrect name. For an update of the list of the Lepidoptera fauna of Yemen (HACKER in prep.), we were asked to revise their classification and describe the second species, but as this planned updated list does not provide the necessary space, we do so in a separate paper here.

### Abbreviations

NHMUK The Natural History Museum, London, UK (formerly British Museum (Natural History) = BMNH).

MNHN Muséum National d’Histoire Naturelle, Paris, France.

SMFL Senckenberg-Museum, Frankfurt am Main (Lepidoptera collection), Germany.

### Classification

The family Saturniidae comprises at least 2350 described species in the world (VAN NIEUKERKEN et al. 2011: 217) and about 450 in the Afrotropical region, although many additional species of doubtful validity have been described from the latter recently, and this number may still be inflated. Together with the families Lasiocampidae, Apatelodidae, Eupterotidae, Brahmaeidae, Endromididae, Anthelidae, Carthaeidae, Phiditiidae, Sphingidae and Bombycidae it comprises the superfamily Bombycoidea (ZWICK et al. 2011).

The classification of the Saturniidae into natural subfamilies and tribes remains somewhat unsettled. Recent phylogenetic analyses (REGIER et al. 2002, 2008, ZWICK 2008, BARBER et al. 2015) indicate that the family includes two small basal lineages (subfamilies Oxyteninae and Cercophaninae) and two larger adelphic clades, one

<sup>1</sup> 86th contribution to the knowledge of the Saturniidae (85th contribution: S. NAUMANN, G. NOGUEIRA G. & W. A. NÄSSIG [2015]: A new species of the genus *Syssphinx* HÜBNER, 1819 (“1816”) from Jalisco and Colima, Mexico (Lepidoptera: Saturniidae, Ceratocampinae) – SHILAP Revista de Lepidopterología, Madrid, 43 (170): 217–227).

<sup>2</sup> Research Associate of Museum für Naturkunde Berlin, Germany.

essentially New-World and the other mainly Old-World. The former comprises the New-World subfamilies Arsenurinae and Ceratocampinae (with tribes Ceratocampini and Hemileucini) as well as the Old-World Agliinae, and the latter includes the small Asian subfamily Salassinae, the cosmopolitan Saturniinae (with tribes Attacini and Saturniini) and the predominantly Afrotropical Bunaeinae (with tribes Micragonini, Urotini and Bunaeini). The three Afrotropical tribes are usually classified in the subfamily Saturniinae, but the phylogenetic analyses show that there is an equivalent dichotomy in the Old-World clade as there is in the New-World one (between Arsenurinae and Ceratocampinae) (see BARBER et al. 2015), and it is thus appropriate to treat Bunaeinae as a subfamily distinct from Saturniinae.

The Saturniidae of the Arabian Peninsula represent the subfamily Bunaeinae and two of its tribes, the Micragonini and Urotini.

### Subfamily Bunaeinae

The Bunaeinae currently include about 45 genera, but the status of some is disputed and no phylogenetic analysis of any meaningful sample of the major species groups has been published to date, so as to allow a delimitation of natural genera. The vast majority of the species occurs in continental Africa south of the Sahara desert, only the ca. 19 species of *Maltagorea* BOUYER, 1993 (Urotini) and ca. one species of *Bunaea* HÜBNER, 1819 (Bunaeini) living in Madagascar, two species in the Arabian Peninsula (see below) and three species of *Sinobirma* BRYK, 1944 (Urotini) in the larger eastern Himalaya region (see ROUGERIE et al. 2012). Madagascar and the Arabian Peninsula are part of the Afrotropical region, and the distribution range of *Sinobirma* lies at the north-eastern corner of the Indian tectonic plate, which separated from Madagascar and collided with Asia in the Eocene and is thought to have carried the ancestors of *Sinobirma* with it from Madagascar to about the current range of the genus (NÄSSIG & OBERPRIELER 1994).

### Tribe Micragonini

This is the group treated as a subfamily Ludiinae in the past, until OBERPRIELER & NÄSSIG (1994) downgraded its rank to that of a tribe and added to it the genera *Micragone* WALKER, 1855 and *Decachorda* AURIVILLIUS, 1898, which had previously been classified in their own tribes. As the name used for this group until then, Ludiinae AURIVILLIUS, 1904, is a junior homonym of an older family-group name in Coleoptera (beetles), OBERPRIELER (1997) changed its name to Micragonini COCKERELL, 1914. Subsequent phylogenetic analyses (REGIER et al. 2002, 2008, ZWICK 2008, BARBER et al. 2015) confirmed that Micragonini have an equivalent (tribal) status to Bunaeini and Urotini and that these three African tribes are closely related to each other, although the precise compositions (as monophyletic groups) of all of them have not yet been clarified.

The Micragonini most likely constitute a monophylum in their present composition, although the inclusion of the enigmatic genus *Eosia* LE CERF, 1911 in the tribe (OBERPRIELER 1997) has been disputed (BOUYER 2002) and remains somewhat uncertain. The salient characters of Micragonini were listed and briefly discussed by OBERPRIELER (1997), and a more comprehensive morphological study of the group was undertaken by JORDAN (1922), though excluding *Micragone* and *Decachorda* (and *Eosia*).

The Micragonini currently comprise about 13 genera (including *Eosia*) and are distributed throughout subsaharan Africa but absent from Madagascar. A single genus and species has been recorded from the Arabian Peninsula.

### Genus *Campimoptilum* KARSCH, 1896

*Campimoptilum* KARSCH, 1896: 248 (type species, by monotypy: *Saturnia kuntzei* DEWITZ, 1881).

*Lasioptila* KIRBY, 1896: 386 (type species, by subsequent designation (JORDAN 1922: 291): *Lasioptila ansorgei* KIRBY, 1896); synonym.

*Yatanga* DARGE, 2008: 12 (type species, by original designation: *Saturnia smithii* HOLLAND, 1897); syn. n.

The genus *Campimoptilum* was erected by KARSCH (1896) in distinction from *Orthogoniopitulum* KARSCH, 1893 (which he considered to be the same as *Goodia* HOLLAND, 1893) on wing venation, but AURIVILLIUS (1904), correcting KARSCH's error, could find no differences between *Campimoptilum* and *Goodia* and synonymised their names. This synonymy was accepted by later authors, in particular by JORDAN (1922) in his detailed study of the Micragonini, and supported by the unique structure of the antennae of the males (the proximal pairs of rami not arising at the posterior segmental margin, unlike in all other Micragonini). In his key to the species of *Goodia*, JORDAN (1922) segregated the two smaller species, *G. kuntzei* (DEWITZ, 1881) and *G. smithii* (HOLLAND, 1897), from the other, larger ones on their rounder forewings without a pale yellowish patch outside the cell and, in the male genitalia, on the more broadly rounded apex of tergite 8 (the superuncus) and the non-denticulate phallus, and he suggested that the name *Campimoptilum* might be used for the two smaller species should a need arise to divide the genus.

Such a need was later perceived by COOPER (2002), who formally resurrected *Campimoptilum* to the status of a valid genus, stating "good morphological and phylogenetic grounds" for a separation from *Goodia* but not specifying any of them. DARGE (2008) tabulated such differences, adding some further ones of the male genitalia to those already listed by JORDAN (1922) and separating also the small *G. smithii* into another, new genus, *Yatanga*. This tripartite division of *Goodia* was particularly attractive to him as he then, and more so later (e.g., DARGE 2011, 2012), recognised several additional species similar to *G. kuntzei* and *G. smithii*, so that both *Campimoptilum* and *Yatanga* are now considered to comprise a substantial number of species.

Lost in this division, however, was the fact that *Goodia* in such a restricted concept still comprises two groups of species (the *nubilata* and the *lunata* groups), which differ not only in wing pattern (as already noted by JORDAN) but also in the male genitalia, the *nubilata* group having the valves apically divided into a dorsal hook and a ventral lobe (*versus* no ventral lobe in the *lunata* group), the superuncus long and narrow (*versus* broad and spatulate) and the phallus with a small ventral patch of denticles (*versus* large areas of denticles both dorsally and ventrally). Furthermore, the *lunata* group is much more similar to *G. kuntzei* and *G. smithii* in wing colour and pattern, and evidence from DNA barcodes also suggests that it is more closely related to these than to the *nubilata* group, so that *Goodia sensu* COOPER and DARGE is a paraphyletic group.

This situation was very recently rectified by BOUYER (2015) by way of describing the *lunata* group as yet another new genus, *Dogoia*. This further division of the previous genus *Goodia* is, however, not particularly robust as it is based on an unstable “phylogenetic” tree and an incomplete assessment of the morphological characters of the entire complex. Being merely a neighbour-joining “barcode” tree without statistical support for any of its clades, the relationships between the clades (genera) are capricious and vary according to the chosen outgroup (root). BOUYER (2015) selected a species of *Adafroptilum* DARGE, 2004 as outgroup and found *Dogoia* forming the sister-group of (*Goodia* + (*Campimoptilum* + *Yatanga*)), but rooting the tree with the genus *Holocerina* PINHEY, 1956 results in *Goodia* forming the sister-group of (*Dogoia* + (*Campimoptilum* + *Yatanga*)).

From the morphological aspect, the latter is the more plausible relationship as *Dogoia* shares its wing pattern and coloration with *Campimoptilum* and *Yatanga*. Clearly a more robust phylogenetic analysis is required to place the distinction of these putative genera on a secure footing. While it is, therefore, currently preferable to follow JORDAN and continue to recognise a single genus for this complex of taxa, we here, with some reluctance, maintain the genera *Goodia*, *Dogoia* and *Campimoptilum* as valid. The distinction of *Yatanga* from *Campimoptilum* is, however, both morphologically and on evidence from DNA barcodes too small and weak to carry any credence, and we therefore here synonymise the names *Yatanga* and *Campimoptilum*.

This synonymy effects a transfer of recently described species of *Yatanga* to *Campimoptilum*, as *Campimoptilum siccum* (DARGE, 2011) **comb. n.**, *Campimoptilum sudanicum* (DARGE, 2011) **comb. n.** and *Campimoptilum tandala* (DARGE, 2011) **comb. n.** – the endings of the former two changing to accord with the neuter gender of the name *Campimoptilum*, the ending of the last, a name in apposition (a Swahili name for an antelope), remaining unchanged; Art. 31.2. of the ICZN –, but all of them are based on only minute morphological and DNA barcode differences (see DARGE 2011) and here not accepted as

valid (see below). The original spelling of *Campimoptilum parensis* DARGE, 2008 is incorrect and must be emended to *C. pareense*.

*Campimoptilum* comprises about five species, although some additional ones of doubtful validity have been described and/or recognised recently. The genus ranges in distribution throughout the drier savannah regions of Africa, around the central tropical rainforests from West Africa eastwards to Ethiopia and southwards along the eastern side of the continent into southern Africa. A single species occurs in the Arabian Peninsula.

The life histories of the genus are poorly known, only the larva and hosts of the widespread *C. kuntzei* (DEWITZ, 1881) being recorded (with a few incomplete additions to other taxa in BOUYER 2015). Its larva is very variable in colour and in southern Africa feeds on several species of Fabaceae, mainly *Bauhinia galpinii*, *Brachystegia spiciformis*, *Dichrostachys cinerea*, *Julbernardia globiflora* and *Vachellia sieberiana* (PLATT 1921, PINHEY 1972, OBERPRIELER 1995).

***Campimoptilum arabicum* (ROUGEOT, 1977) comb. n.**  
(Figs. 1–2)

*Goodia smithii* [sic] *arabica* ROUGEOT, 1977: 92, fig. 4. – BOUYER (1999: 28). – Type locality: Yemen, Dhala, 4800 ft.

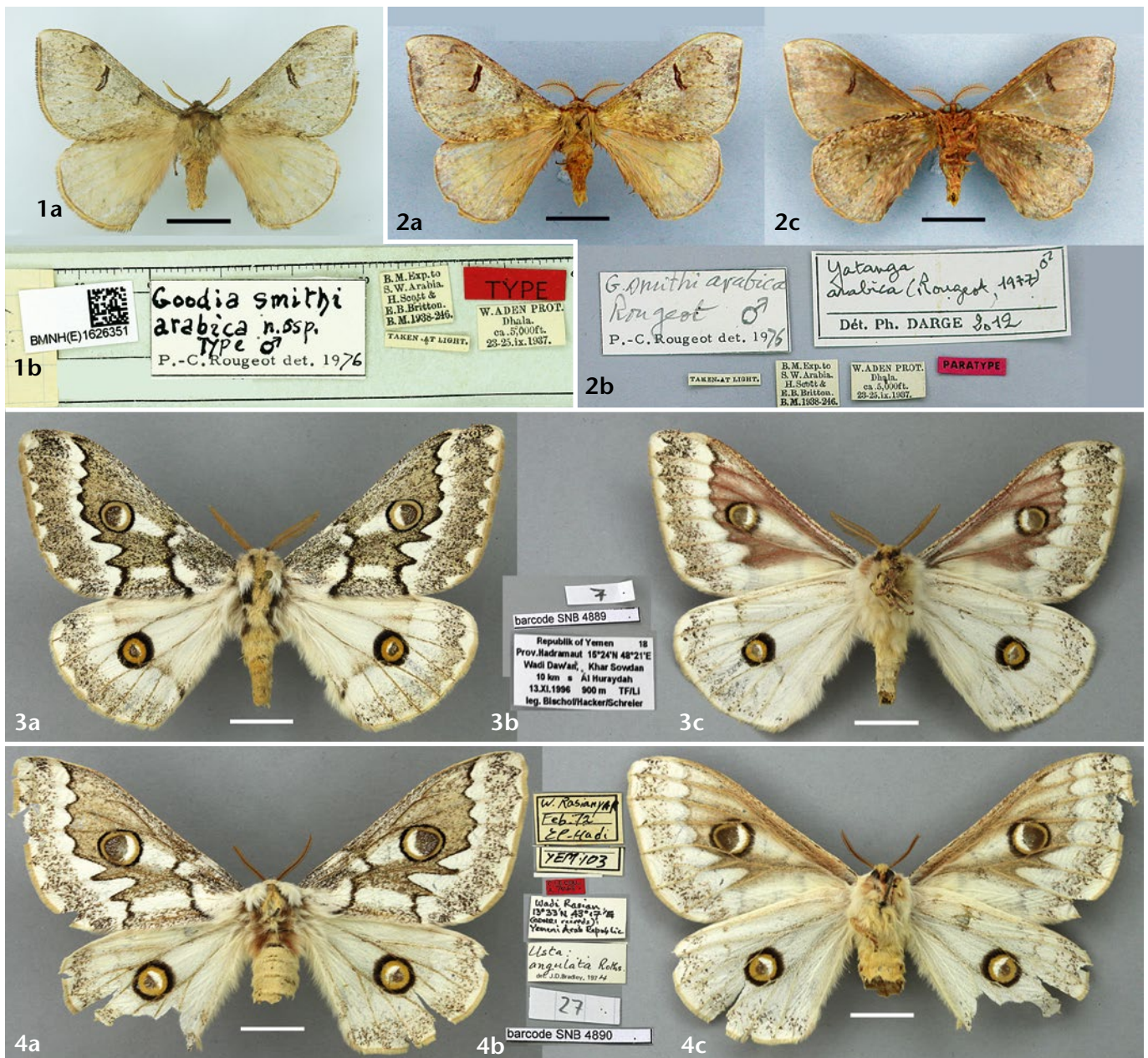
*Goodia smithii arabica* ROUGEOT, 1977: WILTSHIRE (1994: 115), HACKER (1999: 79).

*Yatanga arabica* (ROUGEOT, 1977): DARGE (2008: 13, 2011: 2).

This species was described from two male specimens collected at light at Dhala between the 23<sup>rd</sup> and the 25<sup>th</sup> of September 1937 by Hugh SCOTT and Everard BRITTON, during the 1937–1938 British Museum Expedition to Yemen (then a British Protectorate). The holotype is deposited in the NHMUK in London and the paratype in the MNHN in Paris. No further specimens appear to have been found, and nothing is recorded about the life history and larval foodplants. SCOTT & BRITTON (1941) described the habitat as “an undulating plain from which rise stony hillocks sparsely covered with low succulent Euphorbias, about 3 ft. high, and other low plants; scattered ‘ilb trees (*Ziziphus Spina-Christi* (Rhamnaceae)) and thorny acacia trees; cultivation mainly *dhurra* (*Sorghum*)”.

*Campimoptilum arabicum* was described as a subspecies of *C. smithii* – commonly misspelled as *C. smithi* –, which was described from Ethiopia but of unknown locality. The names of similar taxa later described from Uganda (*Goodia oriens* HAMPSON, 1909) and Kenya (*Goodia decolor* LE CERF, 1911 and *Goodia oriens heptapora* FAWCETT, 1915) were generally treated as synonyms of *smithii* (e.g., JORDAN 1922), until DARGE (2008), in his division of *Goodia*, elevated the former two to species rank again and placed them in his new genus *Yatanga*. In a follow-up article on *Yatanga* (DARGE 2011), he described three further very similar taxa, from Ethiopia and Somalia (*Yatanga sicca*), Sudan (*Yatanga sudanica*) and Tanzania (*Yatanga tandala*), but the incomplete DNA barcode neighbour-joining tree he published with them shows





**Figs. 1–2:** *Campimoptilum arabicum*, type specimens. **Figs. 1a–1b:** holotype ♂. **1a:** specimen, dorsal, **1b:** labels; photos H. SULAK, © NHMUK. **Figs. 2a–2c:** paratype ♂. **2a:** specimen, dorsal, **2b:** labels, **2c:** specimen, ventral; photos S. NAUMANN, taken in MNHN. — **Figs. 3–4:** *Usta arabica* sp. n., type specimens. **Figs. 3a–3c:** holotype ♂. **3a:** specimen, dorsal, **3b:** labels, **3c:** specimen, ventral. **Figs. 4a–4c:** paratype ♀. **4a:** specimen, dorsal, **4b:** labels, **4c:** specimen, ventral. Photos *Usta* W. A. NÄSSIG, specimens in SMFL (♂) and NHMUK (♀), © NHMUK). — Scale bars = 1 cm; i.e., specimens approximately natural size; labels not to the same size.

that only *Y. sicca* is genetically appreciably different from the others; *C. oriens* and *C. arabicum* were not included in this tree. Slight but seemingly constant differences in the male genitalia (the shape of the valves) suggest that only one East-African species, *C. oriens* (with synonyms *Goodia decolor* LE CERF, 1911, *Goodia oriens heptapora* FAWCETT, 1915, *Yatanga sudanica* DARGE, 2011 syn. n. and *Yatanga tandala* DARGE, 2011 syn. n.), exists besides the Ethiopian *C. smithii* (with synonyms *Goodia uniformis* DE JOANNIS & VERITY, 1912 and *Yatanga sicca* DARGE, 2011 syn. n.).

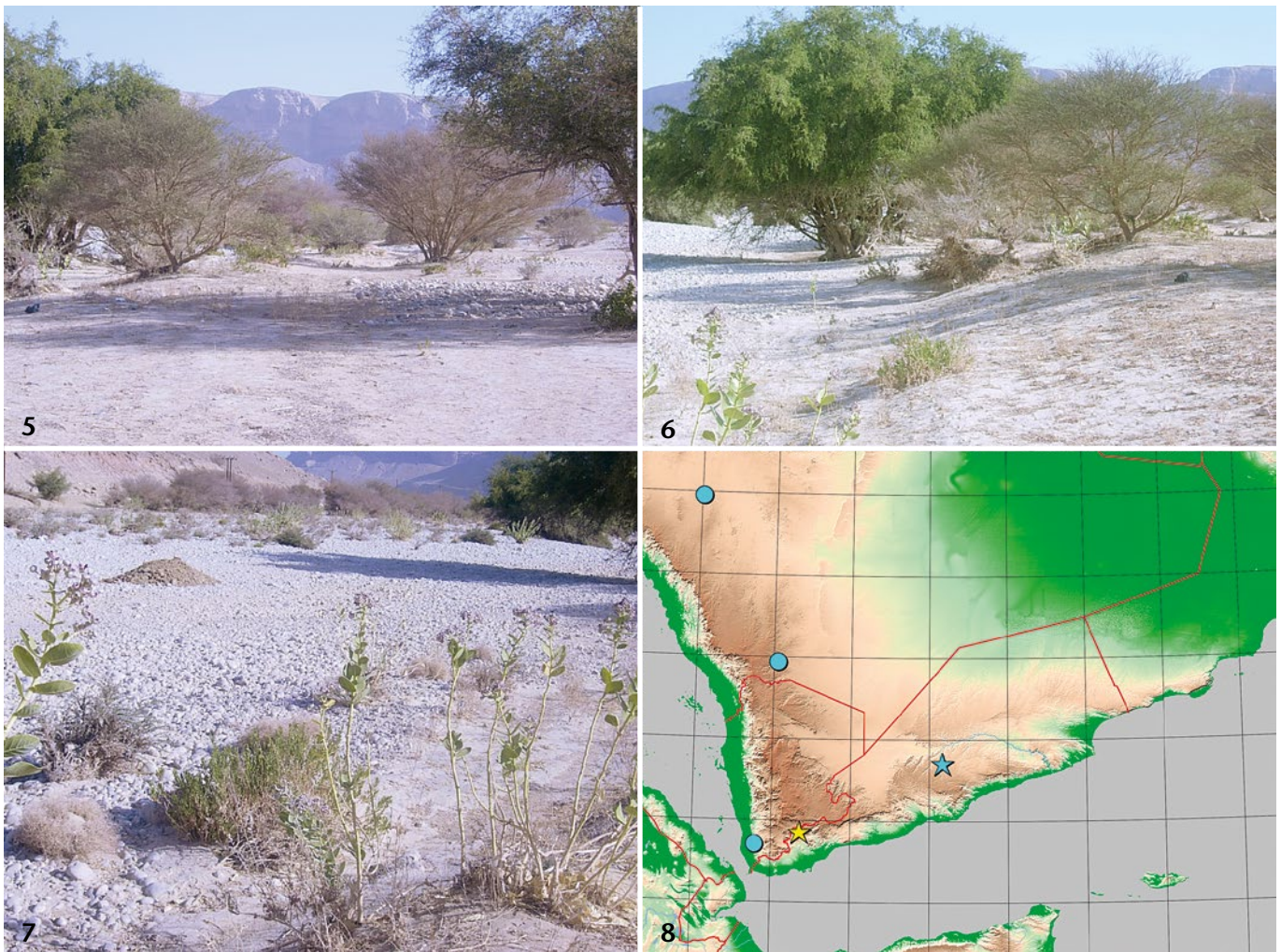
*Campimoptilum arabicum* differs from *C. smithii* and *C. oriens* in its larger size (male wingspan 51–53 mm, ca. 46 mm in *C. smithii*) and in its larger forewing eyespots with a hyaline centre, and in all probability it represents a morphologically as well as genetically distinct species. The genitalia of the two types have evidently not yet

been studied. Although only recorded from Dhala in south-western Yemen, the species is likely to occur more widely in the Yemen highlands and further north into south-western Saudi Arabia (see map, Fig. 8).

### Tribe Urotini

This tribe was previously referred to as Pseudapheliini PACKARD, 1914, until OBERPRIELER (1997) showed that a valid older name exists for it, Urotini PACKARD, 1902, and renamed it accordingly. The 11 genera currently placed in this tribe are characterised by possessing bipectinate antennae, in contrast to the quadripectinate antennae of the Micragonini and Bunaeni, but this character is phylogenetically weak and does not convincingly delimit the Urotini as a monophylum. OBERPRIELER (1997) suggested





**Figs. 5–7:** *Usta arabica* sp. n., habitat in Wadi Doan [= Daw'an], different viewpoints. — Photos Karim Abdul NASHER, 2008. — **Fig. 8:** Map of the southern part of the Arabian Peninsula with the localities of *Campimoptilum arabica* (yellow) and *Usta arabica* sp. n. (blue). — **Symbols:** asterisk: type locality, circle: other locality. — Map created with Map Creator 2.0 Personal Edition (W.A.N.), © 2003–2007 primap software, modified and localities added.

that a core group of genera (comprising *Urota* WESTWOOD, 1849, *Pseudantheraea* WEYMER, 1892, *Maltagorea* BOUYER, 1993, *Tagoropsis* C. & R. FELDER, 1874, *Pseudaphelia* KIRBY, 1892, *Pselaphelia* KIRBY, 1892 and *Sinobirma*) is probably monophyletic, but that the positions of *Usta* WALLENGREN, 1863 and *Parusta* ROTHSCHILD, 1907 as well as of *Eudaemonia* HÜBNER, 1819 and *Antistathmoptera* TAMS, 1935 in the group are uncertain. This is supported by the few phylogenetic analyses to date that have included a number of genera of Urotini (though too few to properly address the matter), which indicate that the core group is related to Bunaeni whereas *Usta* may be more closely related to Micragonini and *Eudaemonia* may represent the basal-most lineage of Bunaeninae (REGIER et al. 2008, BARBER et al. 2015). A number of potential synapomorphic characters for the core group (Urotini *sensu stricto*) were outlined by OBERPRIELER (1997).

The Urotini in the current, wide sense live mainly in forested regions of continental Africa as well as Madagascar, and also the Asian *Sinobirma* inhabits high-altitude forests in the Himalaya *s.l.* In contrast, *Usta* and *Parusta* occur in open savannah to semi-desert areas, and it is a single species of *Usta* that is known from the Arabian Peninsula.

### Genus *Usta* WALLENGREN, 1863

*Usta* WALLENGREN, 1863: 142 (type species, by original designation: *Saturnia wallengrenii* C. & R. FELDER, 1859).

*Usta* currently contains three species, *U. wallengrenii* (C. & R. FELDER, 1859), *U. terpsichore* (MAASSEN, 1885) and *U. angulata* ROTHSCHILD, 1895, although some regional or colour forms of *U. terpsichore* (*subangulata* BOUVIER, 1930, *alba* TERRAL & LEQUEUX, 1991, *grantae* TERRAL & LEQUEUX, 1991, *yaere* DARGE, 1994) are sometimes treated as distinct species. The status of the Ethiopian taxon, *abyssinica* AURIVILLIUS, 1898, is in need of further investigation. *Usta terpsichore* occurs in savannah habitats around the equatorial forests, from West Africa across to Sudan and south into southern Africa, whereas *U. wallengrenii* is limited to arid regions in north-western Namibia and Angola and *U. angulata* appears restricted to southern Somalia, eastern Kenya and north-eastern Tanzania. The larvae feed mainly on *Commiphora* (Burseraceae), but those of *U. terpsichore* also on *Sclerocarya birrea* (Anacardiaceae) and sometimes the introduced *Schinus molle* (Anacardiaceae) and *Melia azedarach* (Meliaceae), and those of *U. angulata* also on *Schinus molle*.

***Usta arabica* sp. n.**

(Figs. 3–4.)

*Usta subangulata* BOUVIER, 1930: WILTSHIRE (1994: 115), HACKER (1999: 79), HACKER et al. (1999: 269).

*Usta* sp.: HACKER et al. (2001: 601).

**Holotype:** ♂, “Republic of Yemen 18 / Prov. Hadramaut [Hadhramaut] 15°24' N, 48°21' E / Wadi Daw'an [Doan], Khar Sowdan / 10 km s. Ál Huraydah / 13. xi. 1996, 900 m, TF/Li / leg. BISCHOF, HACKER, SCHREIER” (SMFL), type catalogue no. SMFL 4683, barcode SNB 4889. Figs. 3a–3c.

**Paratypes** (2 ♂♂, 1 ♀): 1 ♂, Saudi Arabia, Khurma [21°54' N, 42°3' E], 6. xi. 1936, H. St. John PHILBY (NHMUK). 1 ♂, Saudi Arabia, Tarima (nr. Najran Oasis) [17°52' N, 44°7' E], 8. xi. 1936, H. St. John PHILBY (NHMUK). 1 ♀, Yemen, “W[adi] Rasian [Rasyan] YAR [13°24' N, 43°36' E] / Feb. [19]72 / El-Hadi // YEM 103 // C.I.E. COLL. / A. 7068 // *Usta / angulata* ROTHS. / det. J. D. BRADLEY, 1974” (NHMUK), barcode SNB 4890 [without result, no successful DNA analysis] (Figs. 4a–4c).

**Derivatio nominis.** The species is named after the Arabian Peninsula, where it occurs.

**Description**

Length of forewing [lfw.], ♂ holotype [HT]: 40 mm, ♀ paratype [PT]: 41 mm; wingspan ♂ HT 76 mm, ♀ PT 80 mm.

**Male** (Figs. 3a–3c): Antennae dark ochreous to reddish-brown, length ca. 10 mm (HT), ca. 40-segmented, bipectinate, longest rami ca. 1.3–1.5 mm long (strongly bent, not clearly measurable). Ground colour creamy to greyish-white, suffused with greyish-black scales forming a distinct pattern. Head and thorax dorsally with creamy-white hairs, patagia with pure white hairs (more prominent than in *U. angulata*).

Forewings: relatively elongate with rounded apex; upper-side in basal area with dense grey scales, separated from strong blackish antemedian fascia by broad white portion; median area also suffused with grey scales, with two white transverse patches, anterior one basally of eyespot and posterior one connecting ante- and postmedian fasciae; eyespot oval, maximum diameter 6 mm, outer ring black, inner ring ochreous, centre divided, proximal part white, distal part dark grey; postmedian fascia narrow, intensely black, sinuous but strongly irregularly serrate, posterior 3 serrations much larger than 4 anterior ones, outside bordered by white band and then broad greyish speckled submarginal area; outer margin with a row of white, bluntly triangular marks and ochreous fringe. Underside less strongly marked, without antemedian fascia, basal area up to postmedian fascia with greyish carmine markings, especially along veins, postmedian fascia similar to that of upperside but much fainter, eyespot also similar but fainter.

Hindwings: upperside much paler, basal and median parts almost white, only submarginal area sparsely speckled with grey scales, outer margin with tiny white triangular marks and faint ochreous fringe; eyespot sub-circular, maximum diameter 5.5 mm, outer ring broad black, inner ring also broad, orange-yellow, centre as in

forewing but much smaller. Underside similar to upperside but with even fewer markings.

Thorax ventrally covered with long white hairs. Legs greyish-brown. Abdomen dorsally ochreous, ventrally more creamy white.

**♂ genitalia:** Similar to those of *Usta wallengrenii* and especially *U. angulata*; uncus broad, dorsally expanded, with acute ventrolateral processes; gnathos with median portion strongly rounded; juxta short, transverse, posterior margin shallowly bisinuate and laterally sharply angled; valves with apex rounded, without tooth-like process, with sparse long setae on inside; phallus typical for genus, apex asymmetrically expanded. Sternite 8 without pair of median processes and without any strong sclerotisation.

**Female** (Figs. 4a–4b): Antennae slightly more reddish-brown, length ca. 10 mm, ca. 50-segmented, bipectinate, rami shorter than in male (length ca. 0.8 mm, much less bent). Very similar to male in ground colour and pattern, with broader, rounder wings and broader abdomen.

Forewings: eyespot maximum diameter 7.5 mm, more prominent than in male; underside with more greyish than carmine basal portion and along veins.

Hindwings: eyespot maximum 7 mm in diameter. Abdomen a little darker, more creamy-ochreous than in ♂.

**♀ genitalia:** Similar to those of *U. angulata*.

**Differential diagnosis**

*Usta arabica* is most similar to *U. angulata* but differs from this as follows: jagged black forewing postmedian fascia anteriorly only slightly incurved basad (strongly and sharply incurved/angulate in *U. angulata*); white bar connecting forewing ante- and postmedian fasciae posteriorly present (absent in *U. angulata*); eyespot centres of all wings with distinct white proximal crescent (proximal crescent small and narrow, greyish in *U. angulata*); hindwing postmedian fascia ending at posterior margin without or with only faint black spot (with conspicuous spot in *U. angulata*); dark wing areas without purplish hue (usually with purplish hue in *U. angulata*); valves of male genitalia apically rounded (usually truncate or with slight inner angle or point in *U. angulata*); uncus dorsally inflated (flat or only slightly rounded in *U. angulata*). In these differences of the wings, *U. arabica* is more similar to the geographically far distant *U. wallengrenii*, which differs in having the forewing postmedian fascia evenly jagged and curved (not more strongly jagged posteriorly and incurved anteriorly, as in *U. angulata* and *U. arabica*), the hindwing postmedian fascia usually distinct, the valves narrower, apically rounded or bluntly angled, and the uncus smaller (narrower and shorter) and dorsally flat.

**Distribution**

The species is currently known from only four specimens and four localities, two in Saudi Arabia and two in Yemen



(Fig. 8), but these circumscribe a large area of highlands on the south-western side of the Arabian Peninsula and suggest that *U. arabica* may be quite widely distributed there, at least as far north as Mecca.

The northernmost locality, Khurma, was described by SCOTT (1957) as being 120 miles NNE of Taif, on the road to Riyadh, and must be the oasis (town) of Al Khurma, at 21°54' N, 42°3' E.

Tarima was identified by SCOTT (1957) as the Wadi Tarima, a tributary of the Wadi Habauna, roughly 30 miles from Najran and near the fringe of the interior desert. The coordinates given, 17°50' N, 44°0' E, are those of the village of Hubuna, but the Wadi Tarima lies a little further to the east, its confluence with the Wadi Habauna (or Habawna) at about 17°52' N, 44°7' E; this latter locality is plotted on the map.

The locality of the female paratype is only stated on its label as the Wadi Rasyan in Yemen; on an additional label a position is provided (as "ODNRI records") as "13°33' N, 43°7' E", but these coordinates mark a location in the Red Sea. This Wadi Rasyan is the western extension of the Wadi ar Rub (from near Zibiah) and flows north-westwards towards the Red Sea. The specimen is likely to have been collected along the upper reaches of this wadi, where it emerges from the mountains, and we have plotted the locality as about the point where it crosses the road N3 (13°24' N, 43°36' E). It is the southernmost locality known for the species.

The locality of the holotype, the Wadi Doan (Daw'an) in Yemen, is the easternmost and lies on the highlands north of the coastal town Al Mukalla, and it is likely that *U. arabica* does not occur much further east.

## Biology

All known localities of *U. arabica* are in or near wadis, dry river beds with sparse vegetation emerging from mountaineous terrain. Photos of the habitat in the Wadi Doan taken in 2008 (Figs. 5–7) were kindly provided by Karim Abdul NASHER, who was unfortunately unable to find additional specimens at light there at the time.

The larvae of *U. arabica* and their foodplants are not recorded, but the larvae are likely to be similar to those of *U. angulata* and also feed on *Commiphora* (Burseraceae), of which about 15 species occur in Yemen (AL KHULAIIDI 2013).

## Remarks

This species was seemingly first collected in Saudi Arabia in 1936 by Harry Saint John Bridger PHILBY (1885–1960), a British Arabist, explorer, author and colonial intelligence officer. The two males he collected, at Khurma and Tarima, were lodged in the NHMUK but received no taxonomic attention until WILTSHIRE (1994) listed them as *Usta subangulata* in the supplement to his catalogue of Saudi Arabian Macro-Heterocera. The

female taken at the Wadi Rasyan in Yemen in 1974, also in the NHMUK, was first brought to our attention in 1993 by the late Angus McCRAE, who treated it as *Usta angulata*, probably due it being so labelled by J. D. BRADLEY, but suspected that it might represent an undescribed species (A. McCRAE, pers. comm. 9. XI. 1993 to R.G.O.). The circumstances of its collection are seemingly not recorded. The holotype, from the Wadi Doan in Yemen, was first recorded by HACKER (1999) and HACKER et al. (1999), also as *U. subangulata*, but in a more recent list of the Lepidoptera of Yemen HACKER et al. (2001) recorded it as „*Usta* sp., apparently undescribed“.

## Acknowledgements

We sincerely thank Hermann H. HACKER, Bad Staffelstein, Germany, for depositing the holotype of *Usta arabica* in SMFL and for encouraging this study; the late Angus McCRAE for an early photo of the single known female of *U. arabica* and for valuable discussions on the taxonomy of *Usta*; Alessandro GIUSTI and earlier colleagues of NHMUK, London, U.K., for the loan of this and other *Usta* specimens; Harald SULAK, München, Germany, for taking photographs of *Goodia* specimens in London; Joël MINET and Rodolphe ROUGERIE of MNHN, Paris, France, for giving access to the extensive African Saturniidae collection; and Karim Abdul NASHER, Sana'a University, Sanaa, Yemen, for the photos of the habitat of *Usta arabica* in the Wadi Daw'an.

## References

- AL KHULAIIDI, A. W. A. (2013): Flora of Yemen. [Sustainable Natural Resource Management Project, Yemen.] – Download in two parts (Introduction and Checklist) from URL: ye.chm-cbd.net/implementation/documents/1-flora-final-by-dr-abdul-wali-al-khulaidi-2013-part-1-introduction.pdf (last accessed: 22. v. 2015).
- AURIVILLIUS, P. O. C. (1904): Beiträge zur Kenntnis der Insektenfauna von Kamerun. N:o 11. Lepidoptera Heterocera. – Arkiv för Zoologi, Stockholm, 2 (4): 1–68.
- BARBER, J. R., LEAVELL, B. C., KEENER, A. L., BREINHOLT, J. W., CHADWELL, B. A., McCLURE, C. J. W., HILL, G. M., & KAWAHARA, A. Y. (2015): Moth tails divert bat attack: Evolution of acoustic deflection. – Proceedings of the National Academy of Sciences, Washington, 112 (9): 2812–2816.
- BOUYER, T. (1999): Catalogue des Saturniidae africains. Catalogue of African Saturniidae. – Entomologia africana, Chênée, Collection Hors Série no. 1: 1–73.
- (2002): Description du mâle supposé d'*Éosia insignis* LE CERF, 1911 (Lepidoptera: Saturniidae). – Entomologia Africana, Chênée, 7 (1): 3–14.
- (2015): Description d'un nouveaux genre de Saturniidae africain. *Dogoia* n. gen. (Lepidoptera, Saturniidae, Saturniinae). – Entomologia Africana, Chênée, 20 (1): 7–16.
- COOPER, M. R. (2002): Note(s) on classification. – Pp. x–xvi in: COOPER, M. R., & COOPER, M. D., The Emperor Moths of Kwa-Zulu-Natal. – New Germany (Peroniceras Press), xvi + 103 pp.
- DARGE, P. (2008): Démembrement du genre *Goodia* HOLLAND et description de *Yatanga* nouveaux genre (Lepidoptera, Saturniidae, Saturniinae, Micragonini). – Saturnafrica, Clenay, 2: 11–16.

- (2011): Données complémentaires sur le genre *Yatanga* DARGE, 2008, avec description de nouvelles espèces de l'Afrique de l'Est et du Cameroun (Lepidoptera, Saturniidae, Saturniinae, Micragonini). — *Saturnafrika*, Clenay, **9**: 2-10.
- (2012): Nouvelle contribution à l'étude de la faune de Zambie: Lépidoptères Saturniidae récoltés en Novembre 2011 par Robert MINETTI et description de nouvelles espèces. — *Saturnafrika*, Clenay, **11**: 13-18.
- HACKER, H. H. (1999): Systematic list of the Lepidoptera of the Arabian Peninsula with a survey of the spread with special reference to the fauna of Yemen. — *Esperiana*, Buchreihe zur Entomologie, Schwanfeld, **7**: 15-237.
- , AULOMBARD, F., BISCHOF, A., BITTERMANN, J., FIBIGER, M., & SCHREIER, H.-P. (2001): Lepidoptera of the Yemen Arab Republic, collected during three expeditions in 1996, 1998 and 2000. — *Esperiana*, Buchreihe zur Entomologie, Schwanfeld, **8**: 597-632.
- , SCHREIER, H.-P., & BISCHOF, A. (1999): Lepidoptera of Yemen Arab Republic, collected by A. BISCHOF, H. HACKER and H.-P. SCHREIER in autumn 1996 and B. MÜLLER in summer 1987 (plts. VII-IX). — *Esperiana*, Buchreihe zur Entomologie, Schwanfeld, **7**: 267-282.
- HOLLAND, W. J. (1893): New species of West African Drepanulidae. — *Entomological News*, Philadelphia, **4** (5): 171-181.
- JORDAN, K. (1922): A monograph of the Saturnian subfamily Ludiinae. — *Novitates zoologicae*, Tring, **29**: 249-326.
- KARSCH, F. (1896): Berichtigungen und Ergänzungen zu W. ROTHCHILD: „Notes on Saturniidae“. — *Entomologische Nachrichten*, Berlin, **22** (16): 246-255.
- KIRBY, W. F. (1896): On a collection of moths from East Africa formed by Dr. W. J. ANSORGE, Medical Officer to the Uganda Administration. — *Annals and Magazine of Natural History*, London, (6) **18** (107): 375-396, pl. XIX.
- KREFT, H., & JETZ, Q. W. (2010): A framework for delineating biogeographical regions based on species distributions. — *Journal of Biogeography*, Oxford, **37** (11): 2029-2053.
- LINDER, H. P., DE KLERK, H. M., BORN, J., BURGESS, N. D., FJELDSÅ, J., & RAHBEK, C. (2012): The partitioning of Africa: statistically defined biogeographical regions in sub-Saharan Africa. — *Journal of Biogeography*, **39** (7): 1189-1205.
- NÄSSIG, W. A., & OBERPRIELER, R. G. (1994): Notes on the systematic position of *Sinobirma malaisei* (BRYK 1944) and the genera *Tagoropsis*, *Maltagorea*, and *Pseudantheraea* (Lepidoptera, Saturniidae: Saturniinae, Pseudapheliini). — *Nachrichten des Entomologischen Vereins Apollo*, Frankfurt am Main, N.F. **15** (3): 369-382.
- OBERPRIELER, R. G. (1995): The Emperor Moths of Namibia. — *Pretoria (Ekogilde)*, 91 pp.
- (1997): Classification of the African Saturniidae (Lepidoptera) — the quest for natural groups and relationships. — *Metamorphosis*, Occasional Supplement, **3**: 142-155.
- , & NÄSSIG, W. A. (1994): Tarn- oder Warntrachten — ein Vergleich larvaler und imaginaler Strategien bei Saturniinen (Lepidoptera, Saturniidae). — *Nachrichten des Entomologischen Vereins Apollo*, Frankfurt am Main, N.F. **15** (3): 267-303.
- PINHEY, E. C. G. (1972): Emperor Moths of South and South Central Africa. — Cape Town (C. Struik), 150 pp.
- PLATT, E. E. (1921): List of foodplants of some South African lepidopterous larvae. — *South African Journal of Natural History*, Pretoria, **3** (1): 65-138.
- PROÇES, Ş., & RAMDHANI, S. (2012): The world's zoogeographical regions confirmed by cross-taxon analyses. — *BioScience*, Berkeley, **62**: 260-270.
- REGIER, J. C., GRANT, M. C., MITTER, C., COOK, C. P., PEIGLER, R. S., & ROUGERIE, R. (2008): Phylogenetic relationships of wild silkmoths (Lepidoptera: Saturniidae) inferred from four protein-coding nuclear genes. — *Systematic Entomology*, London, **33**: 219-228.
- , MITTER, C., PEIGLER, R. S., & FRIEDLANDER, T. P. (2002): Monophyly, composition, and relationships within Saturniinae (Lepidoptera: Saturniidae): evidence from two nuclear genes. — *Insect Systematics and Evolution*, Leiden/Copenhagen, **33**: 9-21.
- ROUGEOT, P.-C. (1977): Description de Lépidoptères Attacidae éthiopiens inédits. — *Bulletin de la Société entomologique de France*, Paris, **82** (3-4): 92-96.
- ROUGERIE, R., NAUMANN, S., & NÄSSIG, W. A. (2012): Morphology and molecules reveal unexpected cryptic diversity in the enigmatic genus *Sinobirma* BRYK, 1944 (Lepidoptera: Saturniidae). — *PLoS ONE*, San Francisco, **7** (9): e43920 [doi: 10.1371/journal.pone.0043920] (pp. 1-12).
- SCOTT, H. (1957): Note on Mr. PHILBY's collecting stations. — *British Museum (Natural History) Expedition to South-West Arabia 1937-8*, **15**: 177-178.
- , & BRITTON, E. B. (1941): List and brief description of collecting stations. — *British Museum (Natural History) Expedition to South-West Arabia 1937-8*, **1**: i-xiv.
- VAN NIEUKERKEN, E. J., KAILA, L., KITCHING, I. J., KRISTENSEN, N. P., LEES, D. C., MINET, J., MITTER, C., MUTANEN, M., REGIER, J. C., SIMONSEN, T. J., WAHLBERG, N., YEN, S.-H., ZAHIRI, R., ADAMSKI, D., BAIXERAS, J., BARTSCH, D., BENGSSON, B. Å., BROWN, J. W., BUCHELI, S. R., DAVIS, D. R., DE PRINS, J., DE PRINS, W., EPSTEIN, M. E., GENTILI-POOLE, P., GIELIS, C., HÄTTENSCHWILER, P., HAUSMANN, A., HOLLOWAY, J. D., KALLIES, A., KARSHOLT, O., KAWAHARA, A. Y., KOSTER, S. (J. C.), KOZLOV, M. V., LAFONTAINE, J. D., LAMAS, G., LANDRY, J.-F., LEE, S., NUSS, M., PARK, K.-T., PENZ, C., ROTA, J., SCHINTLMEISTER, A., SCHMIDT, B. C., SOHN, J.-C., SOLIS, M. A., TARMANN, G. M., WARREN, A. D., WELLER, S., YAKOVLEV, R. V., ZOLOTUHN, V. V., & ZWICK, A. (2011): Order Lepidoptera LINNAEUS, 1758. — Pp. 212-221 in: ZHANG, Z.-Q. (ed.), *Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness*. [Special issue on Animal Biodiversity.] — *Zootaxa*, Auckland, **3148**: 1-237.
- VILHENA, D. A., & ANTONELLI, A. (2015): A network approach for identifying and delimiting biogeographical regions. — *Nature Communications*, London, **6** (6848): doi: 10.1038/ncomms7848.
- WALLENGREN, H. D. J. (1863): Lepidopterologische Mittheilungen. III. — *Wiener entomologische Monatschrift*, Vienna, **7** (5): 137-151.
- WILTSHIRE, E. P. (1994): Arabian Lepidoptera: a supplement to the catalogue of Saudi Arabian Macro-Heterocera. — *Fauna of Saudi Arabia*, Riyadh/Basel, **14**: 113-136.
- ZWICK, A. (2008): Molecular phylogeny of Anthelidae and other bombycoid taxa (Lepidoptera: Bombycoidea). — *Systematic Entomology*, London, **33**: 190-209.
- , REGIER, J. C., MITTER, C., & CUMMINGS, M. P. (2011): Increased gene sampling yields robust support for higher-level clades within Bombycoidea (Lepidoptera). — *Systematic Entomology*, London, **36**: 31-43.



# ZOBODAT - [www.zobodat.at](http://www.zobodat.at)

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Nachrichten des Entomologischen Vereins Apollo](#)

Jahr/Year: 2015

Band/Volume: [36](#)

Autor(en)/Author(s): Nässig Wolfgang A., Naumann Stefan, Oberprieler Rolf G.

Artikel/Article: [Notes on the Saturniidae of the Arabian Peninsula, with description of a new species \(Lepidoptera: Saturniidae\) 31-38](#)