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Revision of the family Chrysopolomidae Aurivillius, 1895 (Lepidoptera: Zygaenoidea) with the description of three new genera

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Abstract. The taxonomy and nomenclature of the small Afrotropical family Chrysopolomidae Aurivillius, 1895 is updated utilising a holistic approach incorporating genetic and morphological evidence. The placement of genera within the two subfamilies erected by Hering (1937), Chrysopolominae and Ectropinae, is clarified, the generic boundaries are defined and a list of all known taxa is provided. Based on phylogenetic and morphological results, two new genera of Ectropinae are described: *Muscectropa* gen. n. and *Pseudectropona* gen. n. *Achrocerides* Hering, 1937, *Strigivenifera* Hering, 1937 and *Diquishia* Kurshakov & Zolotuhin, 2016 are transferred out of Ectropinae and back into Chrysopolominae, the *Chrysopoloma* species *C. restricta* Distant, 1899 is transferred to *Scotinocerides*, and three *Hamartia* taxa *H. medora moulini* Rougeot, 1977, *H. paupera paupera* (Hering, 1937) and *H. paupera johanni* Rougeot, 1977 are transferred to *Chrysopoloma*. In addition, a new genus for *S. nigrociliata* is established based on genital morphology and genetic divergences: *Auripoloma* gen. n. Genitalia figures accompany re-descriptions of each genus and a key to the genera is provided to facilitate identifications.

Key words. Taxonomy, phylogenetics, Afrotropics, subfamily.

INTRODUCTION

Chrysopolomidae Aurivillius, 1895 is a small poorly-studied family of uniquely Afrotropical moths currently containing twelve genera (Hering 1937; Kurshakov & Zolotuhin 2016). They are considered to be sister to the Limacodidae + Dalceridae based on recent phylogenetic reconstructions (Mayer et al. 2021) and share similar wing venation as well as larval and pupal stages (Aurvillius 1895; Hering 1937; Epstein 1996), although a few species of Eupterotidae and Lasiocampidae have mistakenly been associated with the family due to similarities in external appearance (e.g., Druce 1886). Chrysopolomidae species are small to medium in size, often beige or light brown in colour with broad, rounded wings and bipectinate antennae and many species also possess a discal spot on the forewing. The family is most species-rich in southern Africa (Hering 1937), although their range extends through Central and West Africa, as well as to Madagascar where a monotypic genus is present.

Hering (1937) revised the entire family in detail introducing two subfamilies, Chrysopolominae and Ectropinae, and described several new genera and a number of new species. Kurshakov & Zolotuhin (2013a) later believed that Hering's division into two subfamilies was "not complete" and that the generic placements were incorrect although no formal changes were made to rectify this.

Epstein (1996) had considered Chrysopolomidae to be a subfamily of Limacodidae due to observed synapomorphies in several stages of the life cycle including stemma 5 being proximate to stemma 4 in the larvae, the hard, oval cocoon with no visible 'lid' prior to eclosion, and the presence of pretarsal pads and lateral lobes on the 8th segment of adult females. Based on differences in the male genital musculature as well as the absence of a frenulum in Chrysopolomidae (which is present in Limacodidae), Zolotuhin et al. (2014) firmly concluded that they were distinct families. Two recent molecular studies that included Chrysopolomidae genera placed the family within the limacodid group (sensu Epstein 1996) but its position within this group has differed. Zaspel et al. (2015) utilised three genetic markers as part of investigations into the evolution of larval traits in the Limacodidae, which resulted in 'Chrysopolominae' being nested within Limacodidae, and Dalceridae + *Pantoctenia* Felder, 1874 forming a sister-group. In the most recent multi-gene analysis of Lepidoptera (Mayer et al. 2021), Chrysopolomidae was recovered in a highly-supported clade as sister to Limacodidae + Dalceridae, with the authors conclud-

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ing that either Chrysopolomidae should be treated as a family or Dalceridae be treated as a subfamily. Although it has been suggested that further research may support the inclusion of Dalceridae within Limacodidae (Epstein 1996), both Zaspel et al. (2015) and Mayer et al. (2021) treat is as a family and thus following the results of Mayer et al. (2021), Chrysopolomidae is herein maintained as a family.

In the most recent review of the Chrysopolomidae by Zolotuhin et al. (2014), the placement of genera within the subfamilies was investigated through examination of the muscle morphology of the male genitalia. Originally, Hering (1937) assigned two tribes within Chrysopolominae based on the numbers of spurs on the hind-tibia, comprised of the following genera: Achroceridini (*Achrocerides* Hering, 1937 and *Scotinocerides* Hering, 1937) and Chrysopolomini (*Chrysopoloma* Druce, 1886, *Strigivenifera* Hering, 1937, *Hamartia* Hering, 1937 and *Erythropteryx* Hering, 1937). Based on the "main morphological types" of the genitalia, Zolotuhin et al. (2014) transferred the tribe Achroceridini, which they stated to contain *Achrocerides* and *Strigivenifera* (incorrectly citing Hering (1937)), from Chrysopolominae to Ectropinae, while *Scotinocerides* was placed in the Chrysopolomini. It is clear that Zolotuhin et al. (2014) intended for *Strigivenifera* to be placed within the same tribe as *Achrocerides* due to similarities in their genitalia (e.g., the juxta is comprised of two long, distally pointed lobes). Kurshakov & Zolotuhin (2016) alluded to this later by placing their newly-described genus *Diquishia* Kurshakov & Zolotuhin, 2016 within the tribe Achroceridini while referring to similarities of the male genitalia to *Strigivenifera*.

Although Zolotuhin et al. (2014) presented a novel concept for taxonomic classification accompanied by detailed descriptions of the muscle morphology, a hitherto poorly researched topic, it cannot be overlooked that their review ignored Epstein's (1996) morphological synapomorphies and did not include any additional taxonomic methods to support their conclusions. This has resulted in the incorrect placement of several genera and species within each subfamily, which are discussed further and rectified herein. The present paper aims to revise the Chrysopolomidae, clarify the placement of genera within the subfamilies and define the generic boundaries based on a combination of external and genital morphology as well as modern genetic barcoding techniques.

MATERIAL AND METHODS

Morphological studies

Images of adults were taken using a Nikon D90 camera equipped with a Nikkor AF Micro 60 mm lens. The genitalia were dissected and stained with Eosin Y applying standard methods of preparation (Lafontaine & Mikkola 1987), then embedded in Euparal on microscope slides. The genitalia preparations were photographed using a Canon EOS 700D camera mounted on a Leitz Diaplan compound microscope.

Terminology of wing venation follows Zolotuhin et al. (2013a, b) and male genital morphology follows Zolotuhin et al. (2014), wherein 'transtilla' refers to a gnathos-like structure separated from the valve. Their research suggested that the muscles m3(2) and m4 found in Chrysopolomidae are typically associated with the transtilla or basal processes of the valve, but never with the gnathos and this conclusion is followed here. An annotated diagram of the Chrysopolomidae genitalia can be found in Fig. 1.

Genetic analyses

DNA barcodes were obtained by removing tarsal segments from 128 adult specimens (one Limacodidae and 127 Chrysopolomidae) and submitting them to the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) for extraction, amplification and sequencing of cytochrome oxidase subunit I (COI-5P) applying Single Molecule Real-Time sequencing through the Sequel (PacBio) pipeline (Hebert et al. 2018). Based on the phylogenetic inference of Mayer et al. (2021), a Limacodid *Parasa carnapi* Karsch, 1899, was selected as the appropriate outgroup taxon belonging to the sister family of Chrysopolomidae. These barcodes were combined with 142 publicly available sequence data from BOLD, resulting in a dataset of 270 sequences for the phylogenetic analyses. Taxon sampling included all bar two genera in the subfamily (*Diquishia* and *Vietteopoloma* Hering, 1961 could not be sequenced) and all type species for those genera sampled: *Achrocerides*, *Chrysectropa* Bethune-Baker, 1911, *Chrysopoloma*, *Chrysopolomides* Hering, 1937, *Ectropa* Wallengren, 1863, *Ectropona* Kurshakov & Zolotuhin, 2013, *Erythropteryx*, *Hamartia*, *Scotinocerides*, and *Strigivenifera*. All sequences and metadata are accessible in the BOLD public dataset (https://doi.org/doi.org/10.5883/DS-CHRY).

Sequences were aligned using MUSCLE in MEGA ver. X (Kumar et al. 2018) and genetic divergences within and between species were calculated using the Kimura 2-parameter model (Kimura 1980). Phylogenetic tree searches were performed using Bayesian Inference (BI) and Maximum Likelihood (ML). BI analyses were performed using MrBayes ver. 3.2.7a (Ronquist et al. 2012). Metropolis-coupled Markov chain Monte Carlo (MCMC) analyses were run with four chains (one cold and three heated) for 10,000,000 generations sampling every 100 generations, discarding the first 25% as burn-in. The two runs converged with the standard deviation of split frequencies 0.003. ML analyses were performed using RAxML on CIPRES Portal ver. 3.3 (Miller et al. 2010) with default settings and a GTR+G model. Support

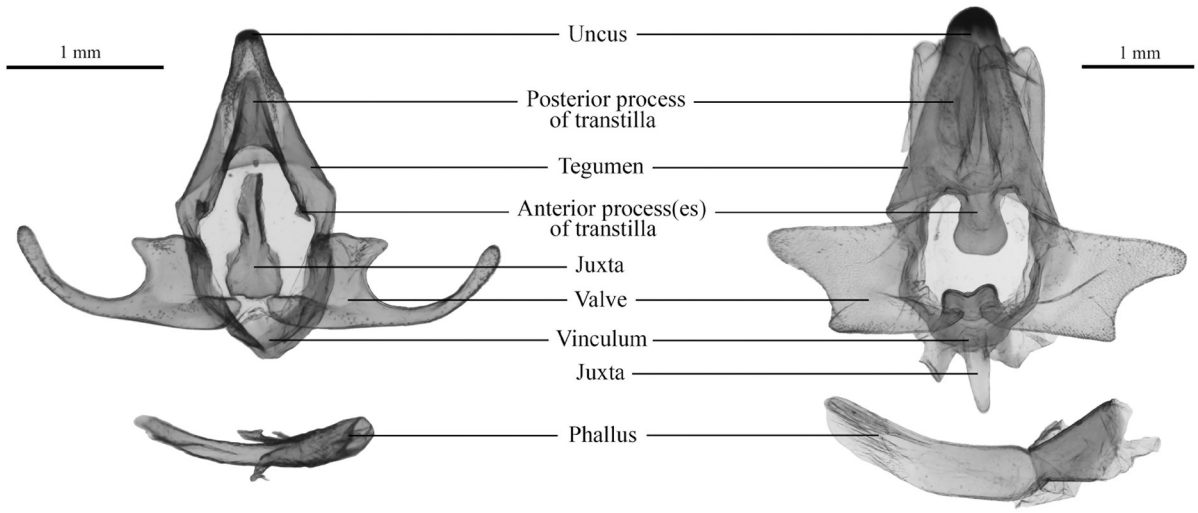

Fig. 1. Terminology of Chrysopolomidae genitalia, showing representatives from subfamily Ectropinae (left) and subfamily Chrysopolominae (right).

for clades was evaluated for BI using posterior probabilities (PP) and ML using non-parametric bootstrapping (BS) with 1000 replicates. Trees were visualised and annotated in FigTree ver. 1.4.4 and Adobe Photoshop ver. 13.0.

Institutional abbreviations

ANHRT = African Natural History Research Trust, Leominster, UK
MfN = Museum für Naturkunde, Berlin, Germany
MNHN = Muséum national d'Histoire naturelle, Paris, France
MWW = Museum Witt, Weiden, Germany (former Museum Witt, Munich, Germany)
NHMUK = Natural History Museum, London, UK
RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium
RMCA = Royal Museum for Central Africa, Tervuren, Belgium
SMHN = Naturhistoriska Riksmuseet, Stockholm, Sweden
ZSM = Zoologische Staatssaammlung München, Munich, Germany

Other abbreviations

BOLD = Barcode of Life Data System
DRC = Democratic Republic of Congo

RESULTS

Phylogenetic analyses

The phylogenetic inferences based on BI and ML overall recovered very similar topologies, whereby there are two distinct lineages within Chrysopolomidae broadly referable to the subfamilies Ectropinae (clade A) and Chrysopolominae (clade B). The slightly better-resolved ML tree is figured in Fig. 2.

Ectropinae s.n. (Fig. 3) was recovered as monophyletic in every analysis with strong support values (BS: 93 and PP: 100) suggesting it is clearly a distinct unit reflective of Hering's (1937) original species' placements and Ectropini sensu Zolotuhin et al. (2014). *Chrysectropa* and *Chrysopolomides* were recovered as monophyletic which is supportive of the clear morphological differences in both the external habitus and genitalia. *Ectropa* was also recovered as monophyletic but with a large divergence between the two clusters (APWD = 8.83 ± 0.09%), and upon further morphological investigation, it has become apparent that one of the clusters pertained to an undescribed genus. *Ectropona* was surprisingly recovered as paraphyletic but morphological assessments confirmed the presence of a second undescribed genus. Both new genera are discussed and described under the Ectropinae section below.

The Chrysopolominae was also recovered as monophyletic in every analysis with strong support values (BS: 57 and PP: 90). All genera within the Chrysopolominae were recovered as monophyletic with the exception of *Scotinocerides* and *Hamartia* which were recovered as polyphyletic. Within the subfamily, two distinct lineages were identified, clade C (*Chrysopoloma*, *Scotinocerides* (partim), *Hamartia*, *Erythropteryx*, and *Strigivenifera*) and clade D (*S. nigrociliata* and *Achrocerides*). The over-

all largest clade (in terms of taxa) existed within clade C, herein referred to as clade E, containing *Scotinocerides* (partim), *Chrysopoloma* and *Hamartia* (partim). Within this clade, two distinct lineages were recovered in both analyses herein referred to as the 'line' and 'spot' clades (note: this feature is only applicable to males). Species in the 'line' clade (referable to *Scotinocerides*) are typically larger and often have a postmedial line on the forewing. It must be noted that this appears to be variable; for example, a specimen with a line (ANLMN8388-21) clustered as identical in DNA barcodes to a specimen without a line (ANLMN8386-21) although this is unsurprising given the known intraspecific variation in external morphology in the Chrysopolomidae (e.g., Taberer 2022).

Species recovered in the 'spot' clade (referable to *Chrysopoloma*) possess a small discal spot on the forewing, sometimes appearing only very faintly, whilst they are also typically smaller in size than those of the 'line'

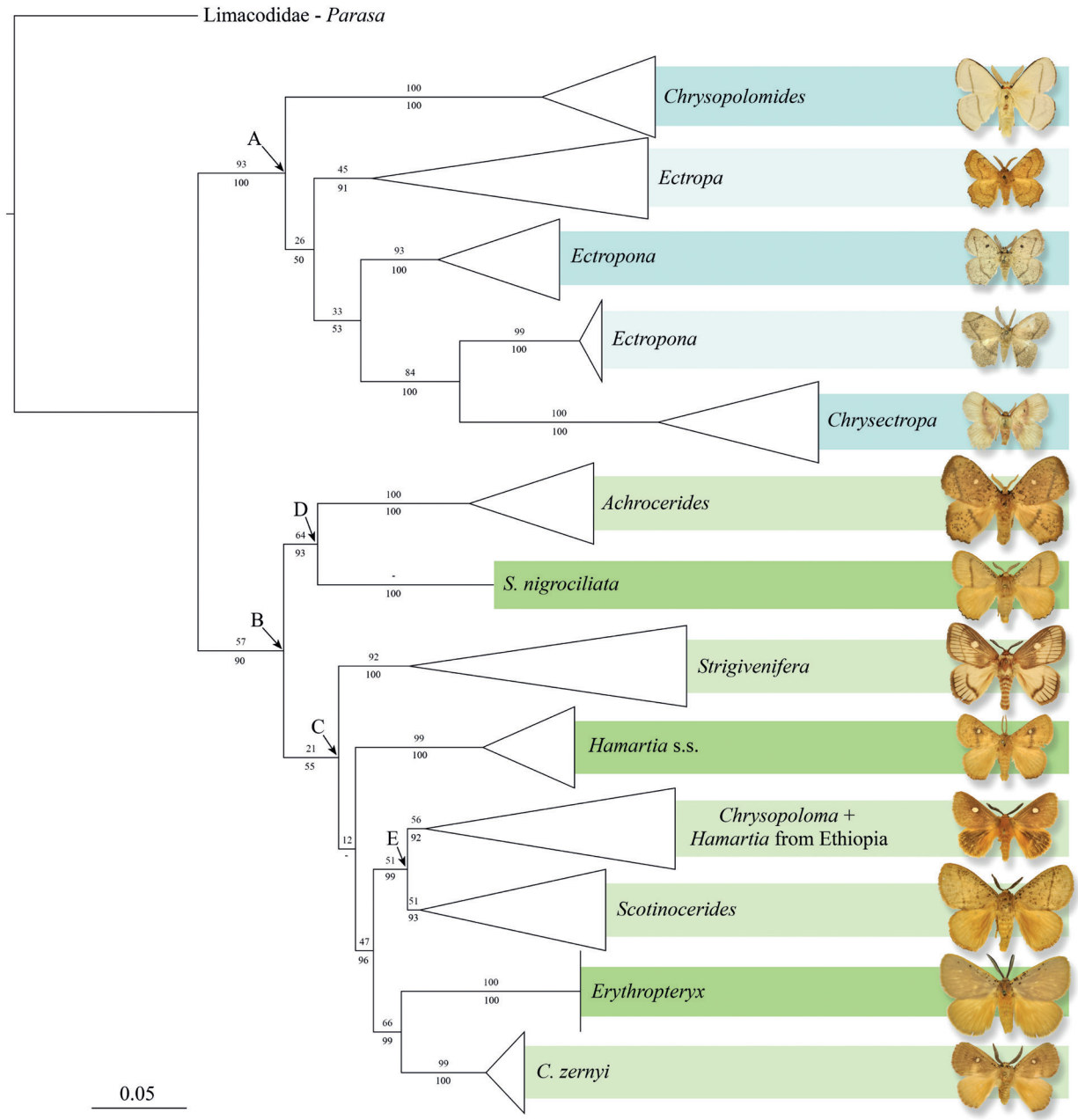

Fig. 2. Phylogenetic tree (Maximum-Likelihood, generated by RAxML from complete sequences of 658 bp CO1-5P obtained in BOLD) of the family Chrysopolomidae with 234 Chrysopolominae and 35 Ectropinae specimens, and a representative outgroup in the family Limacodidae. Posterior probabilities and bootstrap values are provided above and below the branches respectively.

lineage. Interestingly, *Chrysopoloma rudis* (the type species of *Chrysopoloma*) which possesses both a forewing discal spot and a continuous diffuse line on both wings was recovered as sister to all other 'spot' taxa. Part of the sampled *Hamartia* (those taxa from Ethiopia) were recovered within this 'spot' cluster, some specimens also possessing a line on the forewing (e.g., LBEOW2062-11) whilst others do not (e.g., LBEOW2059-11). The recovery of *Hamartia* as a polyphyly was considered surprising at first given these moths are extremely similar in external habitus. However, genitalia dissections revealed that these *Hamartia* taxa from Ethiopia share the typical features of *Chrysopoloma* such as the broad gnathos comprised of two laterally fused lobes as well as the juxta comprising a central process and two lateral processes, and have thus been misplaced. Overall, all members of clade E share very similar genital morphology groundplans, however, the clear partitioning of *Scotinocerides* from *Chrysopoloma*, in combination with distinctive

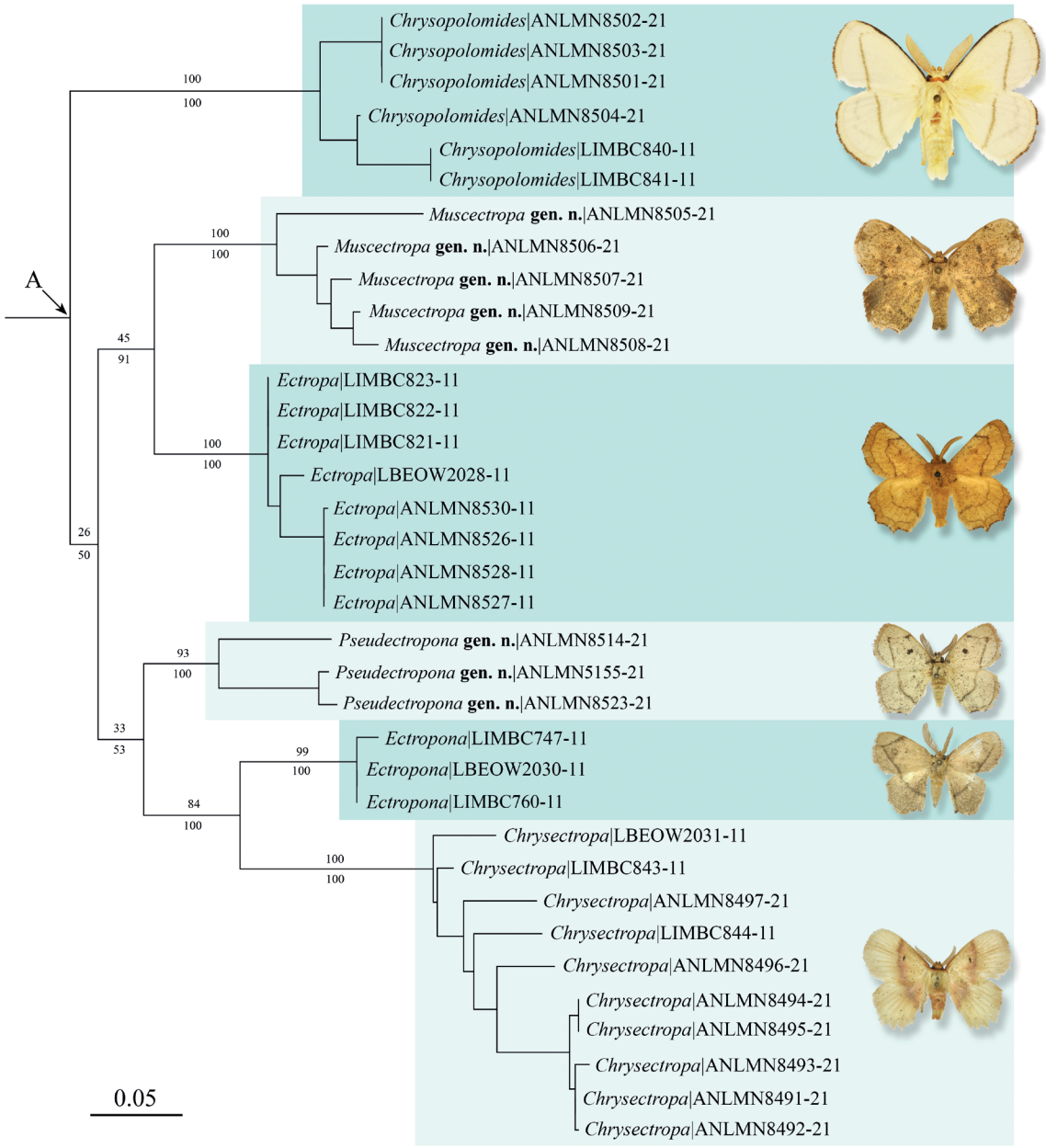

Fig. 3. Phylogenetic tree (Maximum-Likelihood, generated by RAxML from complete sequences of 658 bp CO1-5P obtained in BOLD) of 35 specimens from the subfamily Ectropinae s.n. Posterior probabilities and bootstrap values are provided above and below the branches respectively.

morphological differences as discussed below, supports the existence of two distinct genera.

Erythropteryx and three specimens identified as *Chrysopoloma zernyi* recovered as sister to clade E in both analyses but based on morphological components, the recovery of *C. zernyi* here is considered to be an artefact of phylogenetic analyses based solely on COI, as dissection of one of these specimens showed it clearly belongs to *Chrysopoloma*. However, the generic distinction of *Erythropteryx* is supported by the characteristic male genitalia; the general ground-plan is very similar to that of clade E (and hence it can be assumed they are closely related) but *Erythropteryx* has two extremely long, narrow juxta processes whilst in members of clade E these are markedly shorter.

Hamartia s.s. from South Africa recovered as sister to clade E and *Erythropteryx* + *C. zernyi*. The genital morphology of *Hamartia* s.s. from South Africa were found to be distinct, with a very slender, apically rounded gnathos and a long narrow juxta.

The lineage containing *Strigivenifera* was recovered as sister to all other members of clade C, albeit with weak support in the ML analysis (BS = 12) and as a polytomy in the BI analysis. The placement of *Strigivenifera* relative to other genera of the Chrysopolominae is thus unclear, although based on the phylogenetic inferences as well as morphology it certainly belongs within this subfamily and not Ectropinae.

Finally, clade D contained *S. nigrociliata* + *Achrocerides*, which recovered as sister to all other Chrysopolominae. *Scotinocerides nigrociliata* was recovered as sister to *Achrocerides* and although this species shares similarities in external appearance to *Scotinocerides* s.s., these results support distinctions found in the male genitalia that *S. nigrociliata* belongs to a distinct genus. In addition, this species is distributed in West and Central Africa, whilst all other *Scotinocerides* are restricted to southern and eastern Africa.

The two tribes described by Hering (1937), Chrysopolomini and Achroceridini, were not recovered as monophyletic and lacked support from morphological investigations. The character used to distinguish these two tribes, the number of spurs on the hindtibia, has been shown to be homoplastic and not diagnostic at tribal level.

Taxonomic account

Family Chrysopolomidae Aurivillius, 1895
Entomologisk Tidskrift 16: 116–117.

Key to genera

1. Anterior processes of transtilla not medially fused; generally small-sized **2**
– Anterior processes of transtilla medially fused; generally medium-sized **8**
2. Single posterior process of transtilla; distributed on mainland Africa **3**
– Two posterior processes of transtilla completely separated; restricted to Madagascar .... ***Vietteopoloma*** Hering, 1961
3. Ground colour of body and wings white .... ***Chrysopolomides*** Hering, 1937
– Ground colour of body and wings beige, brown, or grey **4**
4. Both fore- and hindwings scalloped, angularly produced at vein M3 ..... ***Ectropa*** Wallengren, 1863
– Forewing arcuate; hindwing only scalloped near anal margin **5**
5. Medial line on forewing straight or gently arcuate, pinkish-brown .... ***Chrysectropa*** Bethune-Baker, 1911
– Medial line absent; postmedial line on forewing angled or rounded, black, brown or grey **6**
6. Wings heavily speckled with grey scales; postmedial line on forewing curved, weakly defined and zigzagged ..... ***Muscectropa*** gen. n.
– Wings uniform in colour; postmedial line on forewing strongly angled at vein R5 ..... **7**
7. Valve with saccular process ***Pseudectropona*** gen. n.
– Valve lacks saccular process .... ***Ectropona*** Kurshakov & Zolotuhin, 2013
8. Venation on wings clearly defined **9**
– No heavy scaling along veins **10**
9. Wing venation strongly defined with brown, larger in size ..... ***Strigivenifera*** Hering, 193
– Wing venation finely defined with black, smaller in size .....***Diquishia*** Kurshakov & Zolotuhin, 2016
10. Possesses two pairs of hindtibial spurs **11**
– Possesses one pair of hindtibial spurs **13**
11. Presence of forewing discal spot .... ***Achrocerides*** Hering, 1937
– Absence of forewing discal spot **12**
12. Anterior process of transtilla apically obcordate in shape; distributed in southern or eastern Africa..... ..... ***Scotinocerides*** Hering, 1937
– Anterior process of transtilla apically extremely broad, hammerhead-shaped; distributed in West Africa .....***Auripoloma*** gen. n.
13. Presence of forewing discal spot, even if weakly defined; wings beige or brown **14**
– Complete absence of forewing discal spot; forewings greyish-pink .....***Erythropteryx*** Hering, 1937
14. Posterior process of transtilla comprised of two large, medially fused lobes; antennae equal to or less than half the length of forewing .... ***Chrysopoloma*** Bethune-Baker, 1911
– Posterior process of transtilla singular, long, narrow and apically rounded; antennae greater than half the length of forewing; restricted to South Africa .... ***Hamartia*** Hering, 193

Subfamily Ectropinae Hering, 1937
Annals of the Transvaal Museum 17: 236–237.

The subfamily Ectropinae contains mostly small, beige species. In the male genitalia, they possess completely separated anterior processes of the transtilla, a simple juxta and most species also have a narrow valve (with the exception of *Ectropona* species) as well as a longer and larger vesica of the phallus, and are very distinct from the Chrysopolominae. Members of Ectropinae are smaller in size and Hering (1937) also observed that in wing venation, the basal portion of r^{4+5} is mostly absent in Ectropinae but well-developed in Chrysopolominae.

Zolotuhin et al. (2014) transferred the tribe Achroceridini (containing *Strigivenifera* and *Achrocerides*) from Chrysopolominae to Ectropinae, based on reasoning that *Ectropa* possessed "gnathos-like sclerites" in the male genitalia similar to *Strigivenifera* and *Achrocerides*. This is problematic for a number of reasons. Firstly, Zolotuhin et al. (2014) did not include any representatives of Ectropinae in their study believing that *a priori*, it was the "least important" group for their analyses as members of *Strigivenifera* were close in terms of genital morphology; it should be noted that at this point in their review, *Strigivenifera* was still in the subfamily Chrysopolominae. It is also important to consider that all Chrysopolomidae genera possess a gnathos-like transtilla and hence it is probable that Zolotuhin et al. (2014) were referring to the shape of this character being similar in *Ectropa*, *Achrocerides* and *Strigivenifera* and not the presence of the structure itself. If this were the case, the homologous and thus interchangeable use of the terms "gnathos-like sclerites" and "transtilla" in this particular section make it incredibly confusing for the reader and misinterpretations may occur as a result. In order to clarify this issue, the terminology of the genital structures as referred herein are clearly defined and an annotated figure is provided in Fig. 1. The genus *Diquishia* was then described within the tribe Achroceridini in Kurshakov & Zolotuhin (2016), again based on observed similarities with *Strigivenifera* genitalia.

The results of the phylogenetic analyses coupled with further morphological investigations suggest that *Strigivenifera*, *Achrocerides*, and *Diquishia* belong in the Chrysopolominae and are herein transferred back to the subfamily.

Kurshakov & Zolotuhin's (2013a) review of the genus *Ectropa* and description of *Ectropona* provided an excellent contribution to the knowledge of what was previously a monotypic genus, but through further phylogenetic and morphological investigations in this present study, the existence of two further genera has become apparent. Firstly, *Ectropa* was recovered in two clades with very large pairwise distances in the phylogeny as discussed above. One clade comprised the type species of the genus, *E. ancilis* Wallengren, 1863, and *E. alberici* Dufrane, 1945 in the other. Externally, *E. ancilis* has characteristically scalloped hindwings (as also seen in *E. adam* Kurshakov & Zolotuhin, 2013) whilst the hindwings of *E. alberici* are only scalloped at the tornus, similarly to the distinct genus *Ectropona*; the forewings of *E. alberici* are also more rounded than those of *E. ancilis*. *Ectropa alberici* is noticeably larger in size and the wings bear a grey, mottled appearance with only extremely faint postmedial lines compared to the well-defined postmedial lines of *E. ancilis*. In the male genitalia, the clasping apparatus of *E. alberici* is considerably larger, possessing a far narrower and more elongate uncus and a rectangular, plate-like posterior process of the transtilla. The anterior processes of the transtilla of *E. alberici* are considerably longer and more developed than in *E. ancilis*, and the juxta is formed into a shield-like structure compared to the simple juxta of the latter. These morphological characters, coupled with the high divergences found in the DNA barcodes, suggest the existence of a derived member of the subfamily, and thus a new generic name is introduced: *Muscectropa* gen. n.

Ectropona was the only genus to be recovered as paraphyletic within the Ectropinae, a paratype of *E. dargei* Kurshakov & Zolotuhin, 2013, the type species of *Ectropona*, with the BOLD process number LIMBC760-11, clustering separately to three specimens of West African *E. revelli* Kurshakov & Zolotuhin, 2013. Further morphological investigations revealed the male genitalia of *E. dargei* (as well as *E. aarviki* Kurshakov & Zolotuhin, 2013 and *E. kubwe* Kurshakov & Zolotuhin, 2013) to be extremely simplified in comparison to all other Chrysopolomidae, wherein the transtilla lacks apical processes and is comprised of a flat, triangular posterior process and the valve is triangular. The male genitalia of *E. revelli* (and *E. larsa* Kurshakov & Zolotuhin, 2013), however, has a very elongate, pointed posterior process of the transtilla and two short, anterior processes. Perhaps the most distinctive feature to separate *E. revelli* and *E. larsa* from the other three *Ectropona* species is the presence of a saccular process on the valve. Externally, the moths are similar in appearance although the forewing discal spot of *E. revelli* and *E. larsa* is more ovoid or kidney-shaped compared to the rounded discal spot of all other members of *Ectropona*. Whilst Kurshakov & Zolotuhin (2013a) noted the presence of the saccular process in *E. revelli* and *E. larsa* and not in other members of *Ectropona*, the phylogenetic results here strongly suggest these two taxa belong in their own distinct genus; hence, based on the evidence presented above, a new generic name is established for these two species: *Pseudectropona* gen. n.

The placement of the monotypic Madagascan genus *Vietteopoloma* within the Ectropinae is herein maintained. Although not represented in the phylogenetic analyses, *Vietteopoloma* shares several similarities in both the external and genital morphology which support its position within this subfamily. The fore- and hindwing pattern

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and shape is highly reminiscent of *Ectropa*, and the moth is similarly small in size. In the male genitalia, the two posterior processes of the transtilla are completely separated, which is unique within the Ectropinae, although the anterior processes are also separated which is typical of the subfamily. The shape of the phallus is somewhat reminiscent of *Ectropa*, being extremely narrow, strongly sclerotised, and evenly curved whilst the narrow valve which points dorsally at the apex is similar to *Ectropa* and *Chrysectropa*.

The following list comprises the genera and species contained within Ectropinae, with brief genus re-descriptions and diagnoses:

Ectropa Wallengren, 1863
Figs 4, 24
Wiener entomologische Monatschrift 7 (5): 141–142.

Type species. *ancilis* Wallengren, 1863 (by monotypy)
Holotype. ♂.
Type locality. Caffraria orientali [South Africa] (SNHM).

Genus re-description. Small size. Antennae bipectinate, pale beige or golden. Ground colour of head, thorax, abdomen and wings golden-brown or greyish-beige speckled with very small dark brown scales. Forewing broad with scalloped margin angularly produced at vein M3; postmedial line irregularly curved, dark brown or grey; small dark brown or grey discal spot. Distal margin dark brown or dark grey; fringe long, same as ground colour, cilia black in distal quarter. Hindwing scalloped, same colour as forewing, with dark brown or grey postmedial line protruding between veins M2 and Cu1; sometimes with very faint brown discal marking; distal margin dark brown or grey, fringe long, same as ground colour cilia black in distal quarter. Underside. Ground colour and legs golden or greyish-beige; hindtibia with two pairs of spurs. Both wings golden brown or greyish-beige but slightly paler than upperside, postmedial lines of both fore- and hindwings visible; forewing discal spot dark brown, hindwing also with brown discal spot. Male genitalia. Single posterior process of transtilla triangular, rounded apically; paired anterior processes of transtilla narrow, relatively short and completely separated. Valve wide at base and then constricted into a hook, curving dorsally in distal portion. Juxta flat, rectangular. Phallus short, narrow, medially curved.

Diagnosis. *Ectropa* species can be separated from allied taxa based on the scalloped margin of both wings which are strongly produced and angled at vein M3. Within the male genitalia, the combination of the triangular and apically rounded posterior process of the transtilla, the constricted dorsally curved valve and the medially curved phallus are diagnostic for species in this genus.

Distribution. The genus has a disjunct distribution, one species known from South Africa and the other from Tanzania.

Species content
E. ancilis Wallengren, 1863
E. adam Kurshakov & Zolotuhin, 2013

Muscectropa gen. n.
urn:lsid:zoobank.org:act:0F8D69B7-DD29-4920-A6AF-4505C956FECC
Figs 5, 25

Type species. *Ectropa alberici* Dufrane, 1945
Holotype. ♂.
Type locality. Kamituga, DRC (RBINS).

Genus description. Small size. Antennae bipectinate, beige. Ground colour of head, thorax, abdomen and wings pale beige, heavily speckled with small dark grey scales. Forewing broad, rounded, dentate near anal margin; dark grey postmedial line arcuate, ill-defined or incomplete, strongly concave between veins giving it a zig-zagged appearance; discal spot dark grey, rounded or ovoid. Distal margin dark grey, fringe long, same as ground colour, dark grey patch between R2 and R1 of varying size; cilia sometimes dark grey in distal quarter. Hindwing angled just above vein Rs, then scalloped near anal margin; darker grey patch in costal half near distal margin, with faint, zig-zagged postmedial dark grey line; often with rounded, dark grey discal spot. Fringe long, same as ground colour, cilia sometimes black in distal quarter. Underside. Ground colour and legs greyish-beige; hindtibia with two pairs of spurs. Both wings same as upperside, with dark grey postmedial lines and discal spots. Male genitalia. Uncus narrow, elongate, strongly sclerotised apically. Posterior process of transtilla plate-like, rectangular with slight apical depression; anterior processes of transtilla paired, relatively long, narrow. Valve very broad at base then constricted, narrow, and angled dorsally in the distal portion. Juxta very broad, shield-like. Phallus straight, tube-like, with a carinal process ventrally; vesica large, without cornuti but highly scobinate.

Diagnosis. The arcuate, zig-zagged and weakly-defined postmedial band together with the dark grey speckled wings allow the single species of *Muscectropa* to be easily identified. In the male genitalia, the valves are similar to *Ectropa* but in the new genus, the phallus is straight with a carinal process.

Distribution. Distributed throughout the forest belt from Guinea to Nord-Kivu in eastern DRC. Kurshakov & Zolotuhin (2013a) were only aware of specimens from either extreme of its range, however specimens from Cameroon in ANHRT examined as part of this study suggest a continuous distribution.

Etymology. The name of this genus is derived from a combination of the Latin term for moss ('musco') in reference to the mottled, moss-like appearance of the wings

of the type species, and the genus *Ectropa* to which it is closely allied.

Species content

M. alberici (Dufrane, 1945)

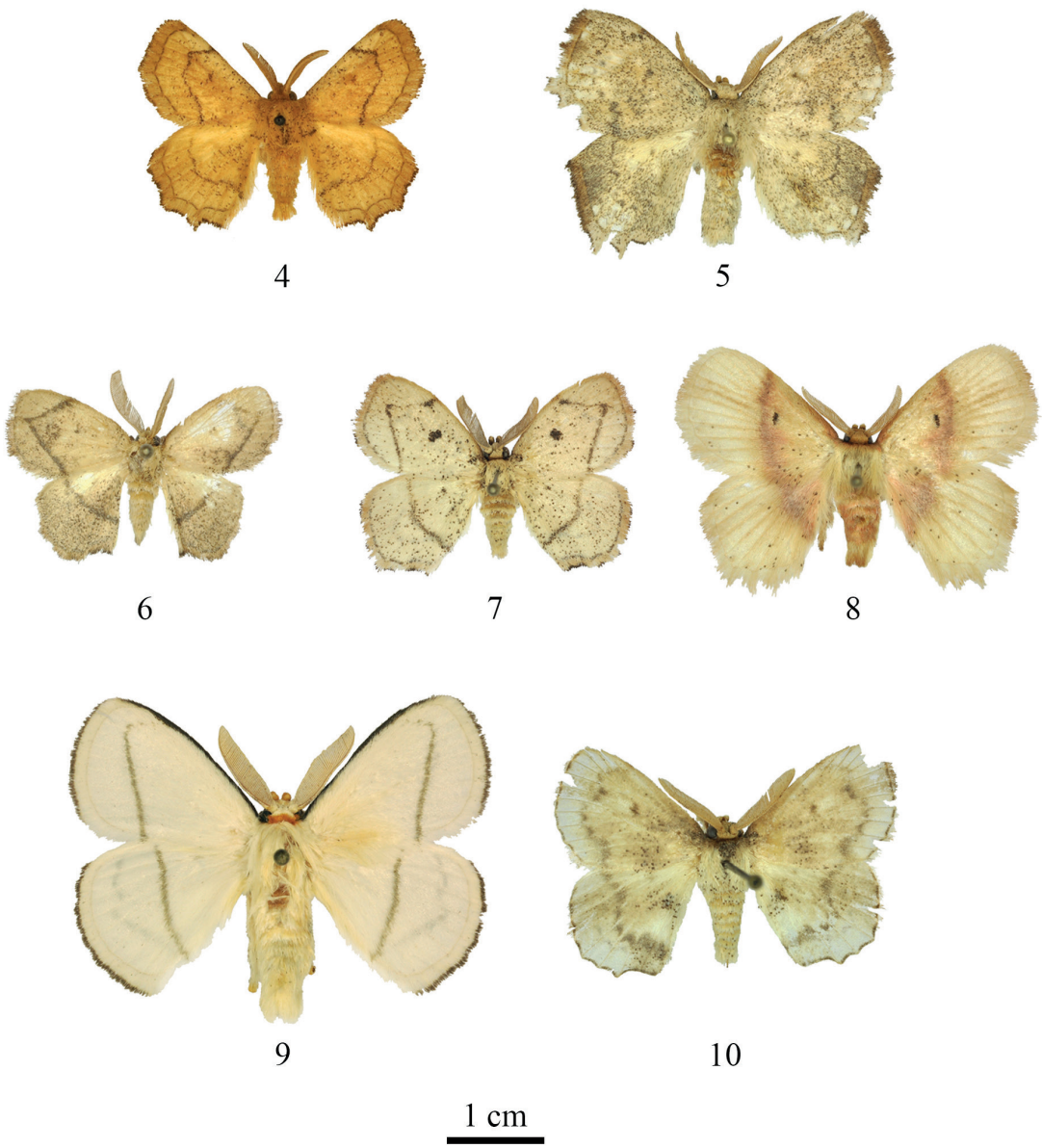
Ectropona Kurshakov & Zolotuhin, 2013
Figs 6, 26
SHILAP Revista de Lepidopterologia 41 (164): 437.

Type species. *Ectropona dargei* Kurshakov & Zolotuhin, 2013 (by original designation)

Holotype. Male.

Type locality. Usambara Mountains, Tanzania (MWW).

Genus re-description. Small size. Antennae bipectinate, beige or pinkish-brown. Ground colour of head, thorax, abdomen and wings beige or pinkish-brown speckled with a few indistinct dark brown scales. Forewing broad, rounded; discal spot rounded. Postmedial line grey to dark brown, sharply angled at vein R5. Distal margin grey or dark brown, fringe long, generally slightly darker than ground colour. Hindwing rounded,



Figs 4–10. Adults. **4**. *Ectropa ancilis*, South Africa (NHMUK). **5**. *Muscectropa alberici*, Ivory Coast (ANHRT). **6**. *Ectropona dargei*, Tanzania (ZSM). **7**. *Pseudectropona revelii*, Liberia (ANHRT). **8**. *Chrysectropa roseofascia*, Ivory Coast (ANHRT). **9**. *Chrysopolomides nivea*, Sierra Leone (ANHRT). **10**. *Vietteopoloma madagascariensis,* Madagascar (MNHN).

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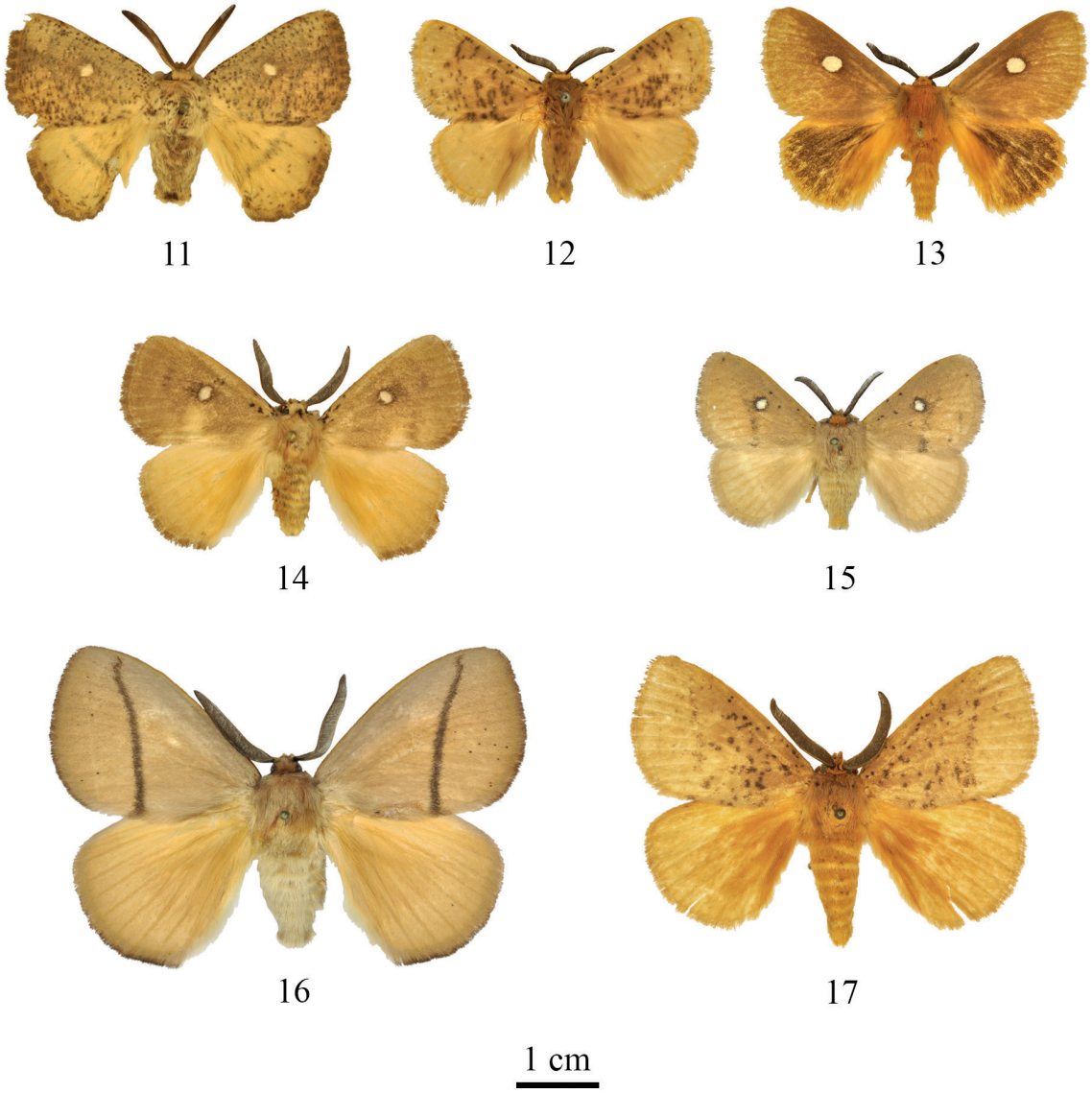
scalloped near anal margin; postmedial line gently arcuate. Fringe long, slightly darker than ground colour, cilia sometimes dark grey in distal quarter. Underside. Ground colour and legs beige or pinkish-brown, hindtibia with two pairs of spurs. Ground colour of wings as upperside, postmedial lines widely convex. Forewing discal spot visible, and discal marking on hindwing also sometimes present. Male genitalia. Single posterior process of transtilla broad triangular; no anterior processes. Valve wide at base, triangular, tapering to a rounded point distally. Phallus very short, with slight curve and large vesica with a single long or group of short cornuti.

Diagnosis. Species of *Ectropona* and *Pseudectropona* both share a very similar habitus with the postmedial line of the forewing sharply angled at vein R5. However, these two sibling genera can easily be separated based on the absence of anterior processes of the transtilla and the broad triangular valves lacking a saccular process in *Ectropona*.

Distribution. Restricted to mountainous regions of eastern Tanzania and south-eastern Kenya.

Species content

E. dargei Kurshakov & Zolotuhin, 2013
E. aarviki Kurshakov & Zolotuhin, 2013
E. kubwe Kurshakov & Zolotuhin, 2013



Figs 11–17. Adults. **11**. *Chrysopoloma rudis*, South Africa (NHMUK). **12**. *Chrysopoloma varia*, Kenya (NHMUK). **13**. *Chrysopoloma bicolor*, South Africa (ANHRT). **14**. *Chrysopoloma zernyi*, Tanzania (ANHRT). **15**. *Chrysopoloma moulini* comb. n., Ethiopia (ZSM). **16**. *Scotinocerides pseudorestricta*, Zambia (ANHRT). **17**. *Scotinocerides fasciata*, Zambia (ANHRT).

Pseudectropona gen. n.

urn:lsid:zoobank.org:act:3B4A0EEC-8B0F-4A90-873C-DD62C344300F

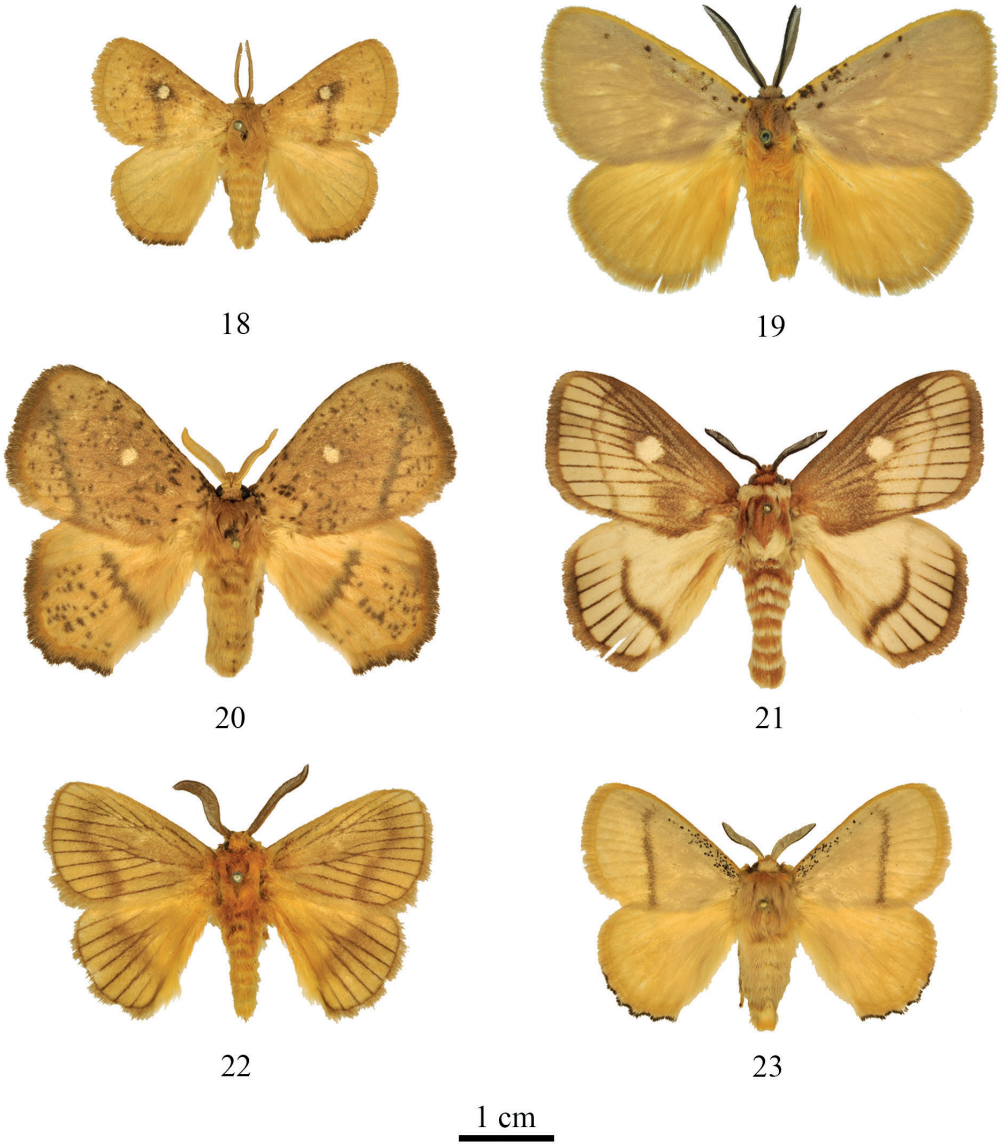
Figs 7, 27

Type species. *Ectropona revelli* Kurshakov & Zolotuhin, 2013

Holotype. ♂.

Type locality. Bo, Sierra Leone (NHMUK).

Genus description. Small size. Antennae bipectinate, beige. Ground colour of head, thorax, abdomen and wings creamy-beige sparsely speckled with dark brown scales. Forewing broad, rounded; discal spot dark brown, ovoid or reniform. Postmedial line dark brown, sharply angled at vein R5. Distal margin weakly dark brown, fringe long, pale brown, cilia sometimes dark brown in distal quarter. Hindwing rounded, scalloped near anal margin; same colour as forewing with very small, rounded discal spot; postmedial line gently arcuate; fringe as in forewing. Underside. Ground colour and legs beige, hindtibia with two pairs of spurs. Both wings with same ground colour as upperside, postmedial lines widely convex. Forewing discal spot visible, and discal marking on hindwing present. Male genitalia. Uncus broad, rectangular, apically flat with slight medial depression. Posterior process of transtilla triangular, slender, long, apically with a rounded point; anterior processes of transtilla



Figs 18–23. Adults. **18**. *Hamartia medora*, South Africa (NHMUK). **19**. *Erythropteryx roseotincta*, DRC (RMCA). **20**. *Achrocerides theorini*, Liberia (ANHRT). **21**. *Strigivenifera eborea*, Sierra Leone (ANHRT). **22**. *Diquishia ansorgei*, Angola (NHMUK). **23**. *Auripoloma nigrociliata* comb. n., Togo (ANHRT).

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paired, short, rounded. Valve tapered, apically rounded, with narrow saccular process on anal margin, setose apically. Juxta broad, short, rounded. Phallus tube-like, curved in proximal third; vesica large, membranous, with cluster of dense, short cornuti.

Diagnosis. As discussed under the very similar *Ectropona* above, *Pseudectropona* species can only be readily identified from the genitalia. In the new genus, the presence of the anterior process of the transtilla and the saccular process of the valve, a synapomorphy of this genus, together with the curved phallus allow for easy identification. Although based on a limited number of specimens, it is possible that the two genera are allopatrically distributed across the Great Rift Valley, *Ectropona* to the east and *Pseudectropona* to the west.

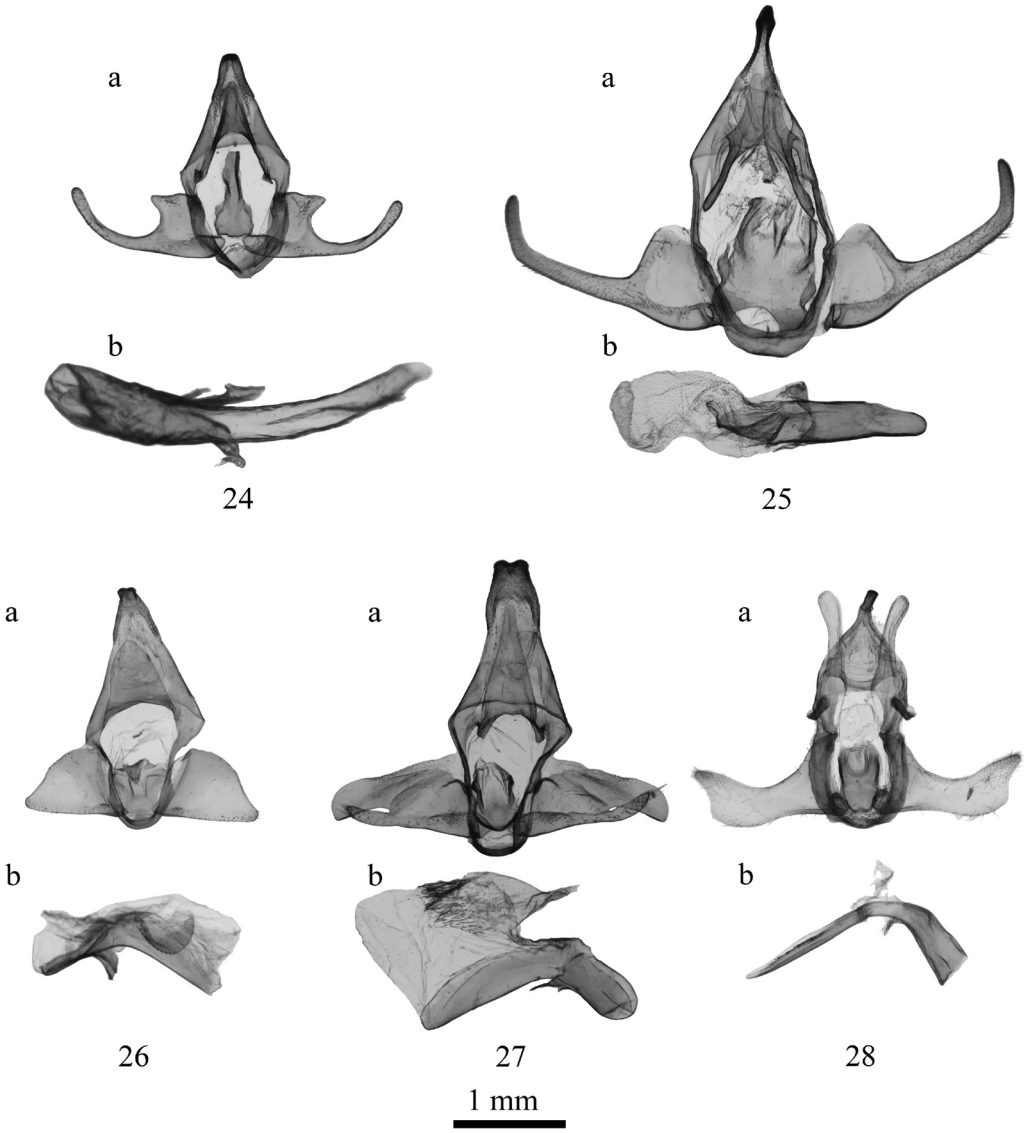
Distribution. Both species in this genus are forest insects although they appear to have a disjunct distribution, the type species found in the Upper Guinean Forests and the other in the easternmost extent of the Congo Basin forests.

Etymology. The new genus name is in reference to the similarities with its sibling genus *Ectropona*.

Species content

P. revelli (Kurshakov & Zolotuhin, 2013)

P. larsa (Kurshakov & Zolotuhin, 2013)



Figs 24–28. Male genitalia (a = clasping apparatus; b = phallus). **24**. *Ectropa ancilis*, South Africa, genitalia slide No. TT 216 (ANHRT). **25**. *Muscectropa alberici*, Ivory Coast, genitalia slide No. TT 214 (ANHRT). **26**. *Ectropona dargei*, Tanzania, genitalia slide No. ZSM Sp. 1596 (ZSM). **27**. *Pseudectropona revelli*, Liberia, genitalia slide No. TT 213 (ANHRT). **28**. *Vietteopoloma madagascariensis*, Madagascar, genitalia slide No. TT 218 (MNHN).

Chrysectropa Bethune-Baker, 1911
Figs 8, 29
Annals & Magazine of Natural History (8) 7 (42): 566–567.

Type species. *Chrysopoloma roseofascia* Aurivillius, 1900 (by original designation)

Syntypes. 1 ♂, 1 ♀.

Type locality. N'Dalla Tando, Angola (NHMUK).

Genus re-description. Small size. Antennae bipectinate, beige. Head, thorax and abdomen yellow-beige. Forewing broad, rounded, creamy beige, sometimes slightly golden, slightly darker patch approximately between veins R4 and M2; sprinkled sparsely with a few tiny black scales. Discal spot extremely small, comprised of a cluster of black scales. Medial line broadened, pinkish-brown, diffuse, very slightly arcuate. Fringe long, same as ground colour. Hindwing rounded, gently scalloped near anal margin, same colour as forewing accentuated with additional tiny black scales. Antemedial line pinkish-brown, diffused, gently arcuate; fringe as in forewing. Underside. Ground colour and legs yellow-beige, hindtibia with two pairs of spurs. Both wings with same ground colour as upperside, sprinkled with tiny black scales; both fore- and hindwing with small oblong black discal spot. Forewing medial line and hindwing antemedial line as on upperside. Male genitalia. Single posterior process of transtilla fairly short, rectangular, with very slight apical depression; paired anterior processes of transtilla extremely short, rounded, completely separated. Valve wide at base, tapered, narrow, curved distally. Juxta broad, flat, with narrow, rounded central process. Phallus short, large vesica with rounded plate of dense, short cornuti.

Diagnosis. The single known species of *Chrysectropa* has a distinctive appearance, with no other Chrysopolomidae displaying a broadened medial band that is pinkish-brown in colour.

Distribution. Widely distributed in West and Central Africa.

Species content

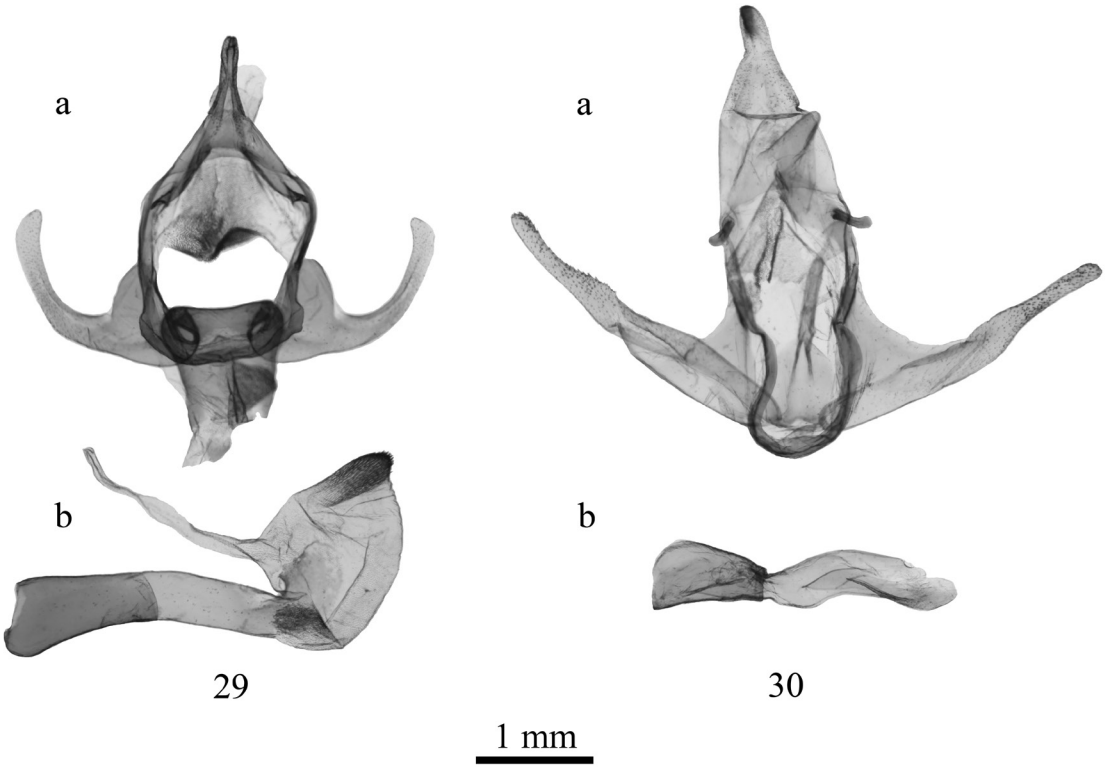
C. roseofascia (Aurivillius, 1900)
= *C. unilinea* Bethune-Baker, 1911

Chrysopolomides Hering, 1937
Figs 9, 30
Annals of the Transvaal Museum 17: 240.

Type species. *Chrysopoloma nivea* Aurivillius, 1903 (by original designation)

Holotype. ♂.

Type locality. Bipindi, Cameroon (MfN).



Figs 29–30. Male genitalia (a = clasping apparatus; b = phallus). **29**. *Chrysectropa roseofascia*, Gabon, genitalia slide No. TT 179 (ANHRT). **30**. *Chrysopolomides nivea*, Liberia, genitalia slide No. TT 107 (ANHRT).

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Genus re-description. Medium size. Antennae bipectinate, white, flagellum beige. Ground colour of head, thorax, abdomen and wings white; collar and palps orange. Forewing broad, outer margin arcuate; costal margin black; postmedial line dark brown, straight, gently kinked between veins R2 and R3. Fringe long, pale cream, cilia dark brown in distal quarter. Hindwing rounded, medial line dark brown, generally straight but with very slight undulation; fringe as in forewing. Underside. Ground colour as upperside, legs orange, hindtibia with one pair of spurs. Forewing with brown, gently undulating postmedial line and dark brown, crescent-shaped discal dash. Hindwing with brown postmedial line, kinked between veins M2 and M3 and small, rounded brown discal spot. Male genitalia. Single posterior process of transtilla relatively short, narrow, rounded; paired anterior processes of transtilla short, bulb-shaped, completely separated. Valve wide at base, tapered, narrow, long, rounded distally, finely scobinate in distal half. Juxta broad at base, with long, narrow, distally rounded central process. Phallus short.

Diagnosis. The single species of *Chrysopolomoides* is unmistakable with no other Chrysopolomidae exhibiting a pearlescent white ground-colour of the wings and body.

Distribution. Widespread in forested regions of West and Central Africa.

Species content

C. nivea (Aurivillius, 1903)

Vietteopoloma Hering, 1961
Figs 10, 28
Bulletin de la Société entomologique de France 65 (9–10): 303.

Type species. *Vietteopoloma madagascariensis* Hering, 1961 (by original designation)

Holotype. ♂.

Type locality. Ambatovositra, Madagascar (MNHN).

Genus re-description. Small size. Antennae bipectinate, beige. Head and palps beige, collar dark brown, thorax and abdomen pale cream speckled with black spots. Forewing broad, rounded, gently scalloped, pale brown near thorax but creamy beige beyond postmedial line, speckled with black spots in proximal half near anal margin, margins dark brown; postmedial line dark brown, arcuate, crenulate, displaced between vein R4 and M1; discal spot diffuse, small, rounded, dark brown; fringe long, beige. Hindwing rounded, gently scalloped, slightly paler than forewing; medial line dark brown, undulate; discal spot small, black, surrounded by black speckling; fringe long, beige. Underside. Ground colour and legs pale beige, hindtibia with two pairs of spurs. Both wings creamy beige, with undulate, brown postmedial lines. Discal spot of both wings small, rounded, brown. Male genitalia. Paired posterior processes of transtilla completely separated, long, narrow, and bulb-shaped apically; paired anterior processes of transtilla short, thin, rounded, and completely separated. Valve moderately wide, pointed dorsally at apex. Juxta short, shield-like. Phallus long, extremely narrow, bent medially.

Diagnosis. *Vietteopoloma madagascariensis* is phenotypically reminiscent of *Muscectropa* species in terms of the rounded postmedial line of the forewing and has affinities with *Ectropa* species based on the shape of the phallus, but the separated posterior processes of the transtilla is a synapomorphy of this genus.

Distribution. Endemic to Madagascar where it is rare; only three specimens, all in MNHN, have been examined as part of this study.

Species content

V. madagascariensis Hering, 1961

Subfamily Chrysopolominae Hering, 1937
Annals of the Transvaal Museum 17: 237–238.

The subfamily Chrysopolominae consists of medium-sized brown or beige moths with broad, rounded wings and bipectinate antennae. In the male genitalia, the most typical feature is the medially fused anterior processes of the transtilla but they also all possess a well-developed juxta.

The two tribes described by Hering (1937), Chrysopolomini and Achroceridini, were not recovered as monophyletic in the DNA analyses and lacked support from morphological investigations. This is unsurprising considering these two tribes were erected based on the numbers of spurs of the hindtibia, Hering (1937) having clearly provided a caveat that this character was "irrelevant for phyletic inferences" and that the tribal divisions were more for "convenience". It has been shown that this character is homoplastic and although not diagnostic at the tribal level, it nevertheless holds true at the generic level throughout Chrysopolomidae. Zolotuhin et al. (2014) however maintained the tribal system based on the similarities of wing pattern, number of tibial spurs and the structure of the transtilla without critically investigating the rather arbitrary nature of Hering's tribes, while Kurshakov & Zolotuhin (2016) used a similar argument to place *Diquisha* within Achroceridini focusing on genital similarities rather than the "spur formula" which was not in keeping with other members of the tribe.

It is possible that from a cursive look, *Strigivenifera* and *Achrocerides* could be placed within the same tribe due to similarities in the male genitalia but these genera did not cluster together in the phylogenetic analyses. Furthermore, it could be surmised that *Diquishia* would be more suited to the tribe Chrysopolomini as opposed to Achroceridini based on distinctions in the external morphology. With the alternative being to erect numerous new tribes, it is concluded herein that Hering's tribal system is unreliable and is thus dismissed.

In the results of the phylogenetic analyses, clade E consisted of *Chrysopoloma* and *Scotinocerides* s.s. In the male genitalia, members of both clusters share many affinities, namely a transtilla with two large, medially fused posterior lobes and two large, medially fused, square or rounded anterior lobes, as well as a juxta comprised of a central process with two lateral processes and a near-identical phallus. A distinction was identified however, whereby the uncus of *Scotinocerides* is noticeably longer and pointier than in the related genus. Externally, all members of clade E are recognisably similar, with broad, rounded, beige wings, although members of *Scotinocerides* are larger and typically possess a postmedial forewing line whilst *Chrysopoloma* display a rounded discal spot. An additional distinctive feature between the two genera can be seen in the number of hindtibia spurs, wherein *Scotinocerides* possesses two pairs whilst *Chrysopoloma*, and indeed all other members of clade C only have one pair. As such, based on the aforementioned evidence, *Scotinocerides* and *Chrysopoloma* are maintained as distinct genera. One taxon, *Chrysopoloma restricta* Distant, 1899 possesses all of the characteristics of *Scotinocerides* and is thus transferred into this genus: *Scotinocerides restricta* (Distant, 1899) comb. n.

The recovery of species of *Hamartia* from Ethiopia within *Chrysopoloma* s.l. in the phylogenetic analyses was considered surprising at first. Despite externally being very similar to *Chrysopoloma* species, these are typically slightly smaller, with a smaller, more defined discal spot and can thus be readily distinguished. However, the male genitalia of these *Hamartia* specimens were found to be identical in structure to *Chrysopoloma*. *Hamartia medora moulini* Rougeot, 1977 is hence raised to species level, and transferred to *Chrysopoloma* thus: *Chrysopoloma moulini* (Rougeot, 1977) comb. n. The taxon *Hamartia paupera johanni* Rougeot, 1977 was described in *Hamartia* despite its nominotypical subspecies having been described as a *Chrysopoloma*; it is hence assumed that Rougeot (1977) implicitly transferred *C. paupera* Hering, 1925 to *Hamartia*. Both *H. p. paupera* and *H. p. johanni* are thus transferred to *Chrysopoloma*: *Chrysopoloma paupera paupera* Hering, 1925 stat. rev., *Chrysopoloma paupera johanni* (Rougeot, 1977) comb. n.

The remaining *Hamartia* species, *H. medora* Hering, 1937 and *H. clarissa* Hering, 1937, were found in both genetic and morphological analyses to be distinct from other *Chrysopoloma*. It is likely that this genus, containing species distributed in southern and eastern South Africa are only found in these regions which exhibit unique fynbos and upland habitats that are home to many endemic taxa.

Scotinocerides nigrociliata was recovered in the DNA analyses as sister to *Achrocerides*. Although this species is close in appearance to *Scotinocerides*, it can be distinguished by the following characters: it is noticeably smaller and more compact than other *Scotinocerides* that possess a postmedial line on the forewing whilst in the male genitalia it possesses a very large, broad transtilla, the valve is much wider at the base and the gnathos lobes are narrower and not fused apically. Based on the position of this taxon in the phylogeny and the markedly different male genitalia, a new genus is founded thus: *Auripoloma* gen. n.

Strigivenifera and *Achrocerides* were recovered in the Chrysopolominae and are quite distinct from the Ectropinae (*contra* Zolotuhin et al. (2014)). In the male genitalia, they possess medially fused anterior processes of the transtilla typical of the Chrysopolominae, whilst the juxta is comprised of two caudal processes. Although *Diquishia* was not included in the phylogenetic analyses, the external morphology (especially that of *D. ansorgei* (Bethune-Baker, 1911) is much more reminiscent of Chrysopolominae than other members of the Ectropinae. For instance, *D. ansorgei* is considerably larger in size than all members of Ectropinae and it also possesses a faint discal spot on the forewing as seen in the vast majority of Chrysopolominae species. In the male genitalia, the anterior processes of the transtilla are medially fused and not separated as in the Ectropinae. However, it is likely that *Diquishia* is a derived genus within Chrysopolominae possessing finely marked black veins on the wings, as well as a uniquely shaped phallus which is extremely broad in the anterior half but strongly constricted medially (both synapomorphies of this genus). In addition, both species of the genus appear to be endemic to Angola.
The following list comprises the genera and species contained within Chrysopolominae, with brief genus re-descriptions and diagnoses:

Chrysopoloma Druce, 1886
Figs 11–15, 31–34
Proceedings of the Zoological Society of London 1886: 410.

Type species. *Lasiocampa rudis* Walker, 1865 (by subsequent designation (Aurivillius, 1895: 118))

Syntypes. 2 ♂♂.

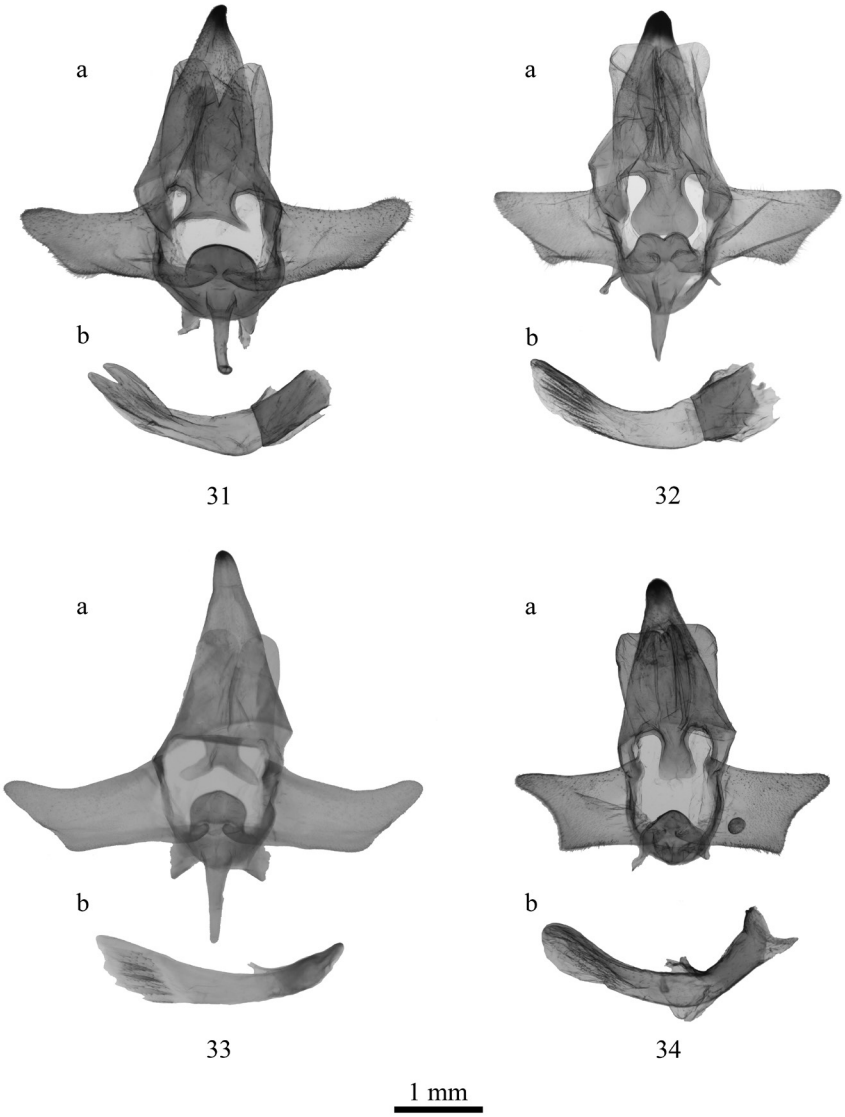
Type locality. Natal, South Africa (NHMUK).

Genus re-description. Medium size. Antennae bipectinate, dark grey to black, flagellum dark beige or black. Ground colour of body and wings uniform pale cream to tawny brown with varying levels of brown or black speckling. Forewing broad with arcuate outer margin; discal spot pale with dark margin, well-defined in most species; indistinct postmedial band in some species. Fringe long, darker than ground colour, occasionally with black interveinal crenulations. Hindwing mostly without markings but may display dark basal sections. Underside. Ground colour similar to upperside but with fewer markings; forewing discal spot often showing through. Legs beige or light orange, sometimes with brown speckling.

Hindtibia with one pair of spurs. Male genitalia. Uncus triangular, apically rounded, paired posterior processes of transtilla closely fused medially, creating a rounded or truncate lobe-like structure with a medial depression. Single, central anterior process of transtilla broad, generally obcordate, varying in length. Valve wide, sometimes slightly medially constricted, with slight concavity on distal edge. Juxta with two pointed lateral processes and longer central process. Phallus moderate length, distally ridged, membranous, with slight medial split; vesica relatively short, membranous.

Diagnosis. Species of *Chrysopoloma* and *Scotinocerides* are very similar in appearance but members of the former are smaller and typically possess a rounded discal spot on the forewing which is absent in the latter. The two genera however can easily be distinguished based on the number of tibial spurs, *Chrysopoloma* with one pair and *Scotinocerides* with two. In the male genitalia, the uncus is triangular, apically rounded and noticeably shorter in *Chrysopoloma* compared to its sibling genus.

Distribution. *Chrysopoloma* species are associated with woodland and forest-savanna mosaic habitats, the majority of species being found in southern and eastern Africa as far north as Ethiopia, with a few species known from further west in Cameroon and Ivory Coast.



Figs 31–34. Male genitalia (a = clasping apparatus; b = phallus). **31**. *Chrysopoloma rudis*, South Africa, genitalia slide No. NHMUK 010317731 (NHMUK). **32**. *Chrysopoloma isabelline*, Zambia, genitalia slide No. TT 182 (ANHRT). **33**. *Chrysopoloma zernyi*, Tanzania, genitalia slide No. TT 192 (ANHRT). **34**. *Chrysopoloma moulini* comb. n., Ethiopia, genitalia slide No. NHMUK 010317735 (NHMUK).

Species content

C. rudis (Walker, 1865)
C. bicolor (Distant, 1897)
C. conspersa (Kirby, 1896)
C. crawshayi Aurivillius, 1904
C. isabellina Aurivillius, 1895
C. moulini (Rougeot, 1977) comb. n.
C. occidens Basquin, 2016
C. pallens Hering, 1925
C. paupera paupera Hering, 1925 stat. rev.
C. paupera johanni (Rougeot, 1977) comb. n.
C. similis Aurivillius, 1895
C. varia varia Distant, 1899
C. varia flavipennis Hering, 1937
C. varia flaviceps Aurivillius, 1901
C. variegata variegata Hering, 1937
C. variegata nigromaculata Hering, 1937
C. zernyi Hering, 1941

Scotinocerides Hering, 1937
Figs 16–17, 35–36
Annals of the Transvaal Museum 17: 241.

Type species. *Chrysopoloma conspurcata* Aurivillius, 1895 (by original designation)

Holotype. ♂.

Type locality. Lindi, Deutsch-OstAfrika [Tanzania] (MfN).

Genus re-description. Medium to large size. Antennae bipectinate, dark grey to black, flagellum dark beige or black. Ground colour of body and wings beige to light brown with varying levels of brown or black speckling. Forewing broad with arcuate outer margin; postmedial line well-defined in most species, light or dark brown, straight or gently concave, sometimes kinked at vein R2. Fringe long, slightly darker than ground colour. Hindwing without markings, generally more yellow in colour than forewing. Underside. Ground colour similar to upperside but with fewer markings; postmedial line often showing through. Legs beige or light orange, sometimes with brown speckling. Hindtibia with two pairs of spurs. Male genitalia. Uncus elongate, pointed apically, paired posterior processes of transtilla fused medially, forming a rounded lobe-like structure with a deep central separation. Single, central anterior process of transtilla broad, generally obcordate, varying in length. Valve wide, sometimes medially constricted, with concavity on distal edge. Juxta with two pointed lateral processes and longer central process. Phallus moderate length, distally ridged, membranous, with slight medial split; vesica relatively short, membranous.

Diagnosis. As discussed under the diagnosis section of *Chrysopoloma*, these two genera are very similar. *Scotinocerides* species are in general a larger insect, possess two pairs of tibial spurs and in the male genitalia, the uncus is elongate and pointed apically.

Distribution. Distributed throughout southern and eastern Africa.

Species content

S. conspurcata conspurcata Aurivillius, 1895
S. conspurcata varioides Hering, 1937
S. fasciata Hering, 1937
S. microsticta Bethune-Baker, 1911
S. pseudorestricta pseudorestricta Hering, 1937
S. pseudorestricta flavina Hering, 1937
S. restricta (Distant, 1899) comb. n.
S. sigma Hering, 1937

Hamartia Hering, 1937
Figs 18, 37
Annals of the Transvaal Museum 17: 248–249.

Type species. *Hamartia medora* Hering, 1937 (by original designation)

Holotype. ♂.

Type locality. Marieps Mountain, South Africa (TMSA).

Genus re-description. Medium size. Antennae bipectinate, beige. Ground colour of head, thorax, abdomen and wings beige speckled with small dark brown scales. Forewing broad, rounded; discal spot white, rounded, outlined in dark brown; medial line dark brown, diffuse often present only from discal spot to anal margin but sometimes completely absent. Fringe long, slightly darker than ground colour. Hindwing without makings; fringe as in forewing but cilia sometimes black in distal portion. Underside. Ground colour beige; hindtibia with one pair of spurs. Fore- and hindwings beige generally without markings; hindwing speckled with brown scale spots. Male genitalia. Single posterior process of transtilla long, narrow, apically rounded; single, central anterior process moderately broad, obcordate. Valve wide, tapered distally to rounded point on costal edge. Juxta rectangular, apically with two short, lateral triangular projections. Phallus moderately long, distally slightly ridged, membranous, with slight medial split; vesica relatively short, membranous.

Diagnosis. In size and general appearance, most noticeably the forewing discal spot, the two *Hamartia* species could be confused with some *Chrysopoloma* species; however, the genital morphology is very distinctive, with a very slender, apically rounded gnathos and a long narrow juxta.

Distribution. Restricted to South Africa.

Species content

H. medora Hering, 1937
H. clarissa Hering, 1937

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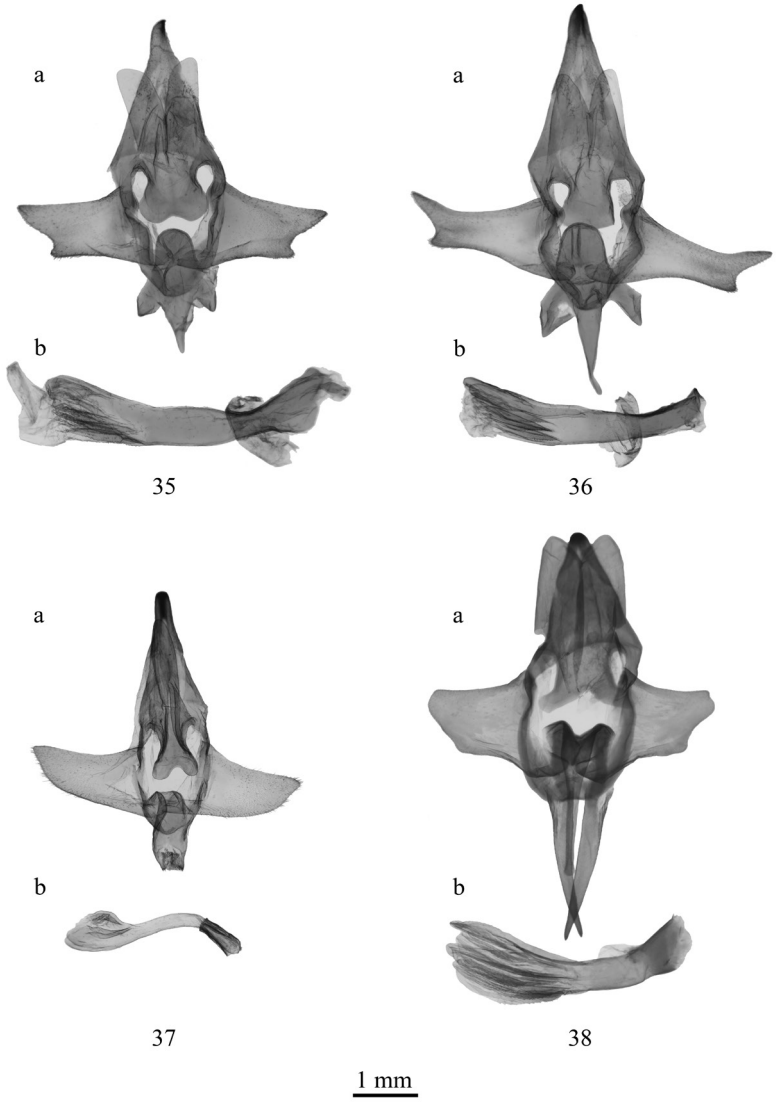
Erythropteryx Hering, 1937
Figs 19, 38
Annals of the Transvaal Museum 17: 247–248.

Type species. *Erythropteryx roseotincta* Hering, 1937 (by original designation)

Holotype. ♂.

Type locality. Elisabethville [Lubumbashi], DRC (RMCA).

Genus re-description. Medium size. Antennae long, black, bipectinate. Head and thorax greyish-pink, abdomen orange. Forewing broad, greyish-pink or beige, speckled with black scales along costal margin. Costal margin orange. Fringe long, same as ground colour; cilia sometimes orange in distal half. Hindwing orange, sometimes tinged with greyish-pink in distal half; fringe as in forewing. Underside. Ground colour uniformly beige or greyish-beige; hindtibia with one pair of spurs; hindwing with black scale spots along costal margin. Male genitalia. Paired posterior processes of transtilla closely fused medially, creating a lobe-like structure with a small medial depression. Single, central anterior process of transtilla broad, obcordate. Valve wide, short, rounded distally and slightly concave. Juxta with two very long, narrow, apically pointed lateral processes and slightly shorter, narrow, apically rounded central process. Phallus moderate length, ridged in distal half, membranous, with slight medial split; vesica short, membranous.



Figs 35–38. Male genitalia (a = clasping apparatus; b = phallus). **35**. *Scotinocerides pseudorestricta*, South Africa, genitalia slide No. TT 184 (ANHRT). **36**. *Scotinocerides fasciata*, Tanzania, genitalia slide No. ZSM Sp. 1597 (ZSM). **37**. *Hamartia medora*, South Africa, genitalia slide No. TT 190 (ANHRT). **38**. *Erythropteryx roseotincta*, DRC, genitalia slide No. TT 205 (RMCA).

Diagnosis. *Erythropteryx* shares affinities with its sister genera *Chrysopoloma* and *Scotinocerides* in terms of its habitus, but the forewing is uniform aside from dark speckling along the costa and it appears to always lack the forewing discal spot, often present in the former and the forewing postmedial line which is a characteristic of the latter. The juxta in the male genitalia of *E. roseotincta* is however very characteristic with two very long lateral processes, which are considerably shorter in members of the aforementioned two genera.

Distribution. The single species in this genus is currently known only from the type locality in Haut-Katanga, DRC. It will almost certainly be present in Zambia but despite reasonably extensive sampling in the Copperbelt, it has not yet been found.

Species content

E. roseotincta Hering, 1937

Achrocerides Hering, 1937
Figs 20, 39
Annals of the Transvaal Museum 17: 241.

Type species. *Chrysopoloma theorini* Aurivillius, 1891 (by original designation)

Syntypes. 2 ♂♂.

Type locality. Gabon [Gabon Estuary at Libreville, Gabon] (SNHM, MfN).

Genus re-description. Medium size. Ground colour beige to tawny-brown, sparsely speckled with black scale spots. Antennae bipectinate, ochreous yellow. Forewing rounded, with pale rounded discal spot; grey postmedial line kinked near outer margin at vein M1; diffuse grey-brown triangular patch on outer margin between veins R3 and M1; hindwing rounded with dentate margin at tornus, grey medial line, speckled with black scale spots in distal half; often with pale, diffuse grey-brown triangular patch on outer margin between veins M1 and M2. Underside. Ground colour of body and wings uniformly pale beige; legs darker and slightly golden; hindtibia with one pair of spurs. Fore- and hindwing with irregular grey scale spots concentrated mostly along the costal margin. Forewing discal spot visible through wing. Diffuse pale grey-brown triangular patch on outer margin between veins R3 and M1 on forewing and between veins M1 and M2 on hindwing. Male genitalia. Paired posterior processes of transtilla long, narrow, pointed apically, fused medially with a membrane; paired anterior processes narrow, moderately long, fused medially with a membrane. Valve wide, truncate, or triangular with distally rounded point. Juxta strongly sclerotised and rounded at base, with two long, apically pointed lateral processes. Phallus relatively long, ridged distally, membranous, with slight medial split; vesica very short, membranous.

Diagnosis. It is possible that members of the genus *Achrocerides* might be confused with *Strigivenifera* species based on their size and the pale forewing discal spot but can easily be distinguished by the lack of fine contrasting scaling along the veins and the presence of blackish-grey speckles on both wings, as well as the dentate margin of the hindwing tornus. In addition, *Achrocerides* species have two pairs of hindtibial spurs whilst only one pair is present in *Strigivenifera* species.

Distribution. Widely distributed in the forested regions of West and Central Africa.

Species content

A. theorini (Aurivillius, 1891)
A. flavoantennata (Berio, 1937)
A. smithi Taberer & Giusti, in prep

Strigivenifera Hering, 1937
Figs 21, 40
Annals of the Transvaal Museum 17: 247

Type species. *Chrysopoloma venata* Aurivillius, 1895 (by original designation)

Holotype. ♂.

Type locality. Lambaréné, Gabon (MfN).

Genus re-description. Medium size. Antennae bipectinate, black. Head ochreous orange, thorax beige with central ochreous orange patch, and abdomen banded with beige and ochreous orange. Forewing broad with rounded apex, ground colour beige, basal half strongly diffused with brown scales; sometimes with brown triangular patch between veins R4 and M2; veins strongly highlighted in brown along their entire length; discal spot pale beige; postmedial band pale brown, kinked at vein M1; fringe long, brown. Hindwing ground colour identical to forewing, veins strongly highlighted in brown beyond the postmedial band. Postmedial band broader than that of forewing, either straight or arcuate; fringe long, brown. Underside. Uniformly beige, legs ochreous orange; hindtibia with one pair of spurs. Male genitalia. Posterior process of transtilla medially split into two relatively narrow, apically rounded processes; anterior processes of transtilla medially fused, narrow, with two thin apically rounded proximo-lateral processes. Valve generally wide, tapered. Juxta strongly sclerotised and rounded at base, with two moderately long, apically pointed lateral processes. Phallus relatively long, membranous distally, sometimes with cornuti-like structures distally.

Diagnosis. *Strigivenifera* species are striking insects, easily distinguished based on the combination of fine brown venation of the wings and a pale forewing discal spot. The only other genus that displays similar venation is *Diquisha*, but the veins are highlighted with black scales, the moths are noticeably smaller and the juxta consists of only a single apically pointed central process.

Distribution. Species of this genus are widely distributed throughout the forests and forest-savanna mosaics of West and Central Africa extending as far south as northern Zambia.

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Species content

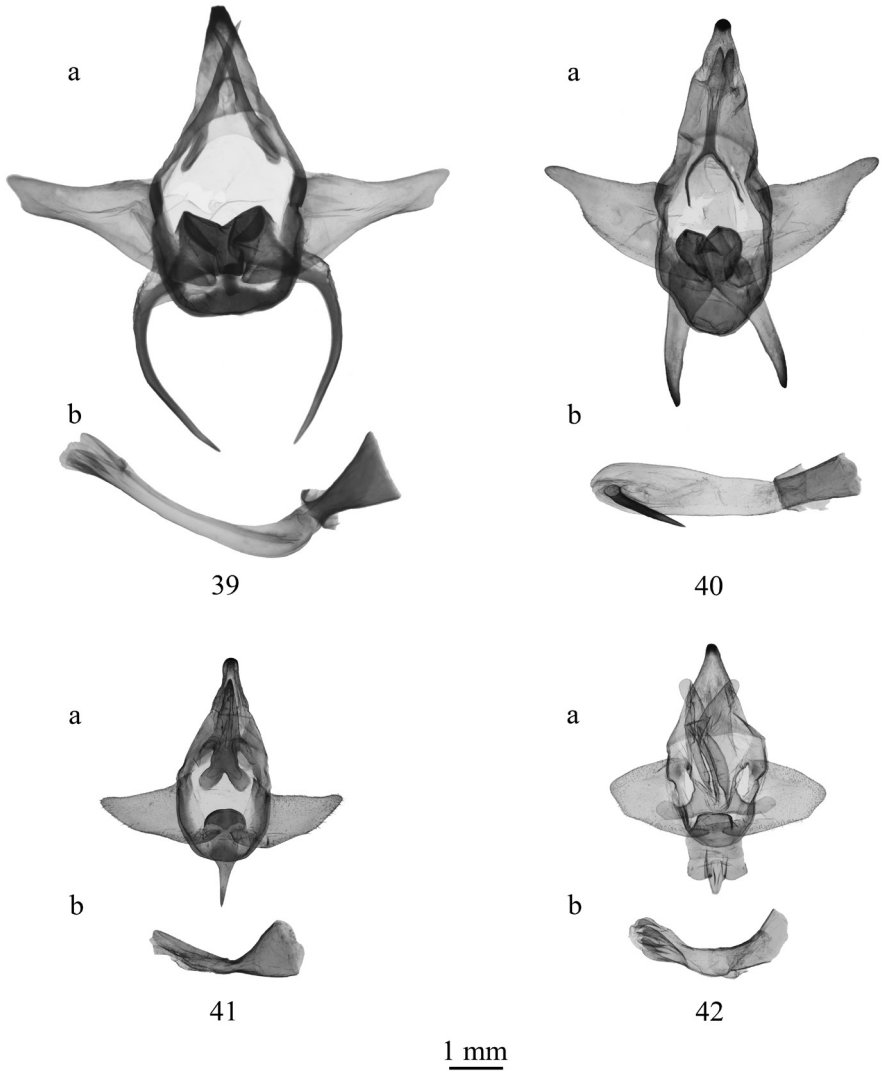
S. venata (Aurivillius, 1895)
S. albidiscalis (Hampson, 1910)
= *S. cruisa* Kurshakov & Zolotuhin, 2013
= *S. livingstonei* Kurshakov & Zolotuhin, 2013
S. bartschi Kurshakov & Zolotuhin, 2013
= *S. tatooifera* Kurshakov & Zolotuhin, 2013
S. eborea Kurshakov & Zolotuhin, 2013
= *S. ocellaris* Kurshakov & Zolotuhin, 2013
S. marina Kurshakov & Zolotuhin, 2013
S. neo Kurshakov & Zolotuhin, 2013
S. oris Kurshakov & Zolotuhin, 2013
S. smithi Taberer, 2022
S. tanja Kurshakov & Zolotuhin, 2013

Diquishia Kurshakov & Zolotuhin, 2016
Figs 22, 41
Entomofauna Zeitschrift für Entomologie 37 (2): 33–40.

Type species. *Diquishia morion* Kurshakov & Zolotuhin, 2016 (by original designation)
Holotype. ♂.

Type locality. N slopes of Mt. Hole, Angola (MWW).

Genus re-description (the unique holotype of the type species could not be examined and the re-description is based on the original description as well as through examination of the congeneric *D. ansorgei*). Medium size. Ground colour of head, abdomen, thorax, wings and fringe dark grey or golden-yellow. Forewing broad, outer margin arcuate; veins highlighted with fine black scaling;



Figs 39–42. Male genitalia (a = clasping apparatus; b = phallus). **39**. *Achrocerides theorini*, Gabon, genitalia slide No. TT 131 (ANHRT). **40**. *Strigivenifera venata*, Gabon, genitalia slide No. TT 119 (ANHRT). **41**. *Diquishia ansorgei*, Angola, genitalia slide No. NHMUK 010317733 (NHMUK). **42**. *Auriopoloma nigrociliata*, Togo, genitalia slide No. TT 187 (ANHRT).

sometimes with faint discal spot and curved postmedial band. Hindwing with evenly arcuate margin, veins highlighted with fine black scaling disappearing weaker in the basal section; sometimes with arcuate, postmedial band. Underside. Ground colour as upperside. Veins highlighted with light brown scales. Hindtibia with one or two pair of spurs (see diagnosis below). Male genitalia. Single posterior process of transtilla relatively narrow, apically rounded; single, central anterior process of transtilla moderately broad, obcordate. Valve wide, tapered. Juxta rounded at base, with slender, apically pointed central process. Phallus relatively short, anteriorly very wide and then medially constricted.

Diagnosis. The type species of *Diquisha* and *D. ansorgei*, which was placed in the same genus based on similar external morphology by Kurshakov & Zolotuhin (2016) are distinctive species, displaying fine black venation on both wings. Kurshakov & Zolotuhin (2016) were unable to study the male genitalia of *D. ansorgei* but upon dissection of several specimens as part of this current study, it appears these two species are congeneric based on the ground-plans, especially the anteriorly very wide phallus. There is however a discrepancy with the number of spurs on the hindtibia in the two species, a character that appears to hold true for every other Chrysopolomidae genus. *Diquishia morion* was said to possess one pair of spurs (Kurshakov & Zolotuhin 2016) yet *D. ansorgei* has two pairs. Based on the photograph of the hind leg of *D. morion* in Kurshakov & Zolotuhin (2016), the tarsi are broken off and it could be surmised that the second pair of spurs may have been damaged and lost. Several individuals of other genera with two pairs of tibial spurs examined as part of this study were observed to possess only three spurs or one pair on one tibia but two pairs on the other, suggesting that at least in pinned museum specimens, these spurs do break off. Although it is unlikely that these two species have different spur formulae, without any further material of *D. morion* it is difficult to come to a confident conclusion with regard this matter.

Distribution. The two species in this genus are restricted to Angola.

Species content

D. morion Kurshakov & Zolotuhin, 2016
D. ansorgei (Bethune-Baker, 1911)

Auripoloma gen. n.

urn:lsid:zoobank.org:act:1C5D6A5B-5BEA-4F7F-B622-1CE1D970FBD1
Figs 23, 42

Type species. *Chrysopoloma nigrociliata* Aurivillius, 1905

Syntypes. 1 ♂, 1 ♀.

Type locality. Hossere Miringi [Nigeria] (MfN).

Genus description. Medium size. Antennae bipectinate, scaling along flagellum yellow in basal third and then dark grey distally. Ground colour of thorax and abdomen beige; head and collar golden. Forewing broad, rounded, grey/silver in basal half and beige distally with straight, dark brown postmedial line, sometimes gently concave along the Cu veins. Small black scale spots along costal margin giving a speckled appearance up to postmedial line. Costal margin golden; fringe long, golden slightly darker than ground colour. Hindwing yellow-beige, fringe long, golden, slightly scalloped towards anal margin; distal portion of cilia black between vein M1 and the anal margin. Underside. Ground colour and legs golden; hindtibia with two pairs of spurs. Both wings beige, with faint postmedial line on hindwing which is slightly expanded towards costal margin; indistinct black scaling along costal margin. Male genitalia. Posterior process of transtilla medially split forming two, relatively thick, apically rounded processes; anterior process of transtilla very broad, apically hammerhead-shaped. Valve very wide, short, gradually tapering, distally rounded with slight concavity on distal edge. Juxta strongly sclerotised, square, with two rounded lateral processes and longer, central process. Phallus relatively short, strongly sclerotised and ridged distally, with short membranous vesica.

Diagnosis. At first glance, the single species of *Auripoloma* with its forewing postmedial line is somewhat reminiscent of *Scotinocerides* species but it is considerably smaller in size and the black fringe near the anal margin is distinctive. In the male genitalia, the *Auripoloma* species possesses a very large, broad transtilla which is apically hammer-head shaped, the valve is much wider at the base and the gnathos lobes are narrower and not fused apically.

Distribution. The single known species of this genus is distributed in the forest-savanna mosaics of West and northern Central Africa.

Etymology. This genus is dedicated to the Swedish entomologist Christopher Aurivillius, who described the family Chrysopolomidae after noticing that *Chrysopoloma* could not be placed in either Lasiocampidae or Limacodidae, and further added ten distinct taxa to the family including the only known species of this genus. The suffix 'poloma' is maintained in reference to *Chrysopoloma*, the genus from which the family name is formed.

Species content

A. nigrociliata (Aurivillius, 1905) comb. n.

Conclusion

This review inferred from phylogenetic and morphological investigations has updated the taxonomy and nomenclature of the Chrysopolomidae thus providing a baseline for future revisional works. It has been shown that the family consists of two distinct and well-supported lineages, the subfamilies Chrysopolominae and Ectropinae, and the true position of the genera *Achrocerides*, *Diqu-*

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ishia, and *Strigivenifera* within the Chrysopolominae has been rectified.

It is worth noting that *Diquishia* and *Vietteopoloma* could not be sampled for the phylogenetic analyses and thus taxon sampling was incomplete; both genera could however confidently be placed in Chrysopolominae and Ectropinae respectively based on morphology. A further limitation was the analyses of only the COI-5P gene fragment with the addition of further gene regions likely to improve the resolution of the phylogeny. However, family-level phylogenetic inferences based on barcodes in other inset groups have been shown to be largely congruent with multi-loci analyses (Ptaszyńska et al. 2012) and the results in the present study are in the most part strongly supported by morphological characters of the genitalia.

The paradox of differing numbers of spurs on the hind-tibia in the congeneric *Diquishia morion* and *D. ansorgei* also requires further investigation, this character having been shown to be unreliable at tribal level but consistent in every other genus in the family.

It will be of great interest to study the genital musculature of true Ectropinae species to see whether there are significant differences from Chrysopolominae which would add further support to the results presented in this study. Although beyond the scope of this work, a full revision of the genus *Chrysopoloma* is much-needed given the high levels of phenotypic variation observed throughout this group and it is believed that there are currently more names than species. In addition, further work is needed on the female Chrysopolomidae to determine what, if any, diagnostic characters they may possess.

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