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Integrative taxonomy of *Acrapex* stem borers (Lepidoptera : Noctuidae : Apameini): combining morphology and Poisson Tree Process analyses

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Abstract. Ten morphologically similar species of *Acrapex* from eastern and south-eastern Africa belonging to the *A. stygiata* and *A. albivena* groups are reviewed. Six species are described as new: *A. brunneella, A. mitiwa, A. mpika, A. salmona, A. sporobola* and *A. yakoba*. The Poaceae host plants of eight species are recorded; four species, *A. mitiwa. A. subalbissima, A. syscia* and *A. yakoba*, were found developing exclusively on *Imperata cylindrica* (L.) Beauv., (Andropogoneae); two species, *A. sporobola* and *A. salmona*, on *I. cylindrica* and *Sporobolus macranthelus* Chiov. (Zoysieae); and *A. albivena* on *I. cylindrica, Miscanthus capensis* (Nees) Andersson (Andropogoneae) and *Cymbopogon* sp. (Andropogoneae). *Acrapex stygiata* larvae developed on *M. capensis* and *Cymbopogon* sp. The host plants of *A. brunneella* and *A. mpika* remain unknown. We also conducted molecular phylogenetics and molecular species delimitation analyses on a comprehensive sample of 49 specimens belonging to nine of the studied species. Molecular phylogenetics and molecular species delimitation analyses provided additional evidence of the validity of the six newly described species but also suggested a level of hidden biodiversity for one of them.

Additional keywords: *Acrapex*, *Imperata cylindrica*, molecular phylogenetics, molecular species delimitation, Noctuidae, phylogenetics, Poaceae.

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Introduction

Acrapex Hampson, 1894 is a tropical genus of stem borers (Lepidoptera: Noctuidae, Apameini, Sesamiina) that consists of at least 83 species (Poole 1989), of which the great majority (~70 species) is distributed in the Afrotropical region (Moyal 2006). However, five *Acrapex* species described by Laporte

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(1975, 1984) were recently displaced to *Sciomesa* and *Feraxinia* genera (Moyal *et al*. 2010), thus reducing the total number of Afrotropical *Acrapex* species to 65. Until 2000, little was known about *Acrapex* host preferences as specimens had been obtained only from light trap collections. Starting in 2004, extensive surveys were conducted in several sub-Saharan countries, targeting wild habitats rich in Poaceae including open grasslands, forests, banks of streams or rivers and swamps. Poaceae were examined for stem borer infestation and recovered larvae were reared until adult emergence. In addition, light traps were operated in some localities whenever possible. Combining the two collection techniques, we obtained thousands of noctuid stem borer adults and among them several hundred *Acrapex* specimens. Because the genus *Acrapex* is speciose, it is beyond the scope of this paper to review the entire genus. Instead, we focus on a small group of morphologically related species, some of which (*A. albivena, A. subalbissima, A. syscia, A. mitawa*, sp. nov., *A. salmona*, sp. nov., *A. sporobola*, sp. nov., *A. yakoba*, sp. nov.) feed on cogongrass, *Imperata cylindrica* (L.) Beauv., a rhizomatous perennial grass (Jose *et al*. 2002; Holzmueller and Jose 2011), which is widely distributed in tropical and subtropical areas of the world and considered to be one of the world's worst weeds (Holm *et al*. 1977). The specimens we study here belong to a small subset of two (groups B and C) of the four morphological groups that have been defined by Berio (1973) based on male genitalia. Group B (also referred to at the *A. stygiata* group) includes *A. stygiata, A. subalbissima, A. bruneella*, sp. nov. and *A. mpika*, sp. nov. (the last two species collected only in light traps) and is characterised by the following combination of characters: (i) valve very broad at basal half, rounded along ventral margin, suddenly constricted at middle, terminal half becoming spatulate; (ii) base of costal area heavily sclerotised and produced into a narrow long lobe; and (iii) aedeagus straight, of almost even width, terminating in a tubular vesica with a short, stout cornutus. Group C (also referred to at the *A. albivena* group) includes *A. albivena, A. syscia, A. mitawa*, sp. nov., *A. salmona*, sp. nov., *A. sporobola*, sp. nov., and *A. yakoba*, sp. nov. and is characterised by: a flat valve, laminar throughout the extension; valve rather weakly sclerotised, except costal area at basal third, broadly rounded along ventral margin at base, roundly constricted at middle, broadly rounded at apex; and aedeagus simple and crown.

We include, together with the description of the six new species (which have been cross-checked against all *Acrapex* types preserved in the museum to avoid coinage of synonymies), a supplemental description of the four previously described species with female genitalia presented for the first time.

In a complementary way, we also rely on a molecular dataset to explore the species boundaries of the specimens of interest. Such use of multiple sources of information is now commonly referred to as integrative taxonomy (for more information, see Dayrat 2005; Will *et al*. 2005; Padial *et al*. 2010; Schlick-Steiner *et al*. 2010). To do so, we provide a phylogenetic framework for nine of the studied species and four other species representing four other genera *(Busseola* Thurau, 1904, *Pirateolea* Moyal, 2010, *Sciomesa* Tams & Bowden, 1954 and *Sesamia* Guenée, 1852) of the subtribe Sesamiina, through the molecular phylogenetic analysis of a six gene molecular dataset. This allows us to implement a recently developed method of molecular species delimitation which is used to assess the congruence of molecular species clusters with the newly described species.

Materials and methods

Insect samples

Sampling of visually damaged grasses (Poaceae) in eastern and south-eastern Africa was conducted over eight years (2006–2013) to collect the larval stages of noctuid stem borers within their wild host plants (Le Ru *et al*. 2006*a*, 2006*b*). Larvae were reared on artificial diet (Onyango and Ochieng'Odero 1994) until pupation and emergence of adults (Le Ru *et al*. 2006*a*, 2006*b*). A few adult specimens were also collected in light traps. See Table 1 for collection locations.

DNA extraction and sequencing

For this study, a total of 49 specimens belonging to the group of interest was selected for the molecular analyses. In addition, we included representatives of four other genera in the subtribe Sesamiina as outgroups based on the results of a recent molecular study (Toussaint *et al*. 2012). DNA was extracted from hind legs using Qiagen DNAeasy tissue kits (Qiagen, Hilden, Germany). PCR amplifications were conducted for four mitochondrial gene fragments, a 658 bp region of the cytochrome oxidase I (COI), 977 bp of the cytochrome *b* (Cytb), 352 bp of the ribosomal 12S RNA (12S), and 421 bp of the ribosomal 16S RNA (16S). Two nuclear gene regions were also sequenced, 835 bp of the 28S rDNA (28S), and 1240 bp of the elongation factor-1a (EF1a). For both genes, we used the primers and settings detailed in Kergoat *et al*. (2012). Resulting PCR products were processed by the French sequencing centre Genoscope using a BigDye v3.1 sequencing kit and Applied 3730xl sequencers. Both strands were sequenced for all specimens to minimise PCR artefacts and ambiguities. Sequences of complementary strands were edited and reconciled using Geneious v5.1 software (available at: www.geneious.com/). All the sequences generated in this study were deposited in GenBank (see Table S1, available as Supplementary material, for the accession numbers). Unlike the sequences of coding genes (COI, Cytb, and EF1a), the sequences of ribosomal genes (12S, 16S and 28S) were variable in length. Their alignment was accomplished using MUSCLE (Edgar 2004) with default option settings. For all protein-coding genes, we used Mesquite 2.75 (available at: www.mesquiteproject.org) to check the coding frame for possible errors or stop codons. The combination of the six gene fragments resulted in a combined matrix of 53 specimens and 4683 aligned characters.

Phylogenetic analyses

Phylogenetic analyses were conducted using maximum likelihood (ML) and Bayesian inference (BI). For ML and BI, we carried out partitioned analyses (Nylander *et al*. 2004) using one partition per gene fragment. For each partition, the best-fit substitution model was selected with jModelTest (Posada 2008) using the corrected Akaike information criterion (AICc; Posada and Buckley 2004).

Maximum likelihood analyses were performed with RAxML ver. 7.0.8 (Stamatakis 2006). The best tree was obtained using a

heuristic search implementing 100 random-addition replicates. Clade support was then assessed using non-parametric bootstrap values (BV) (1000 replicates were used). Nodes supported by BV ≥70% were considered as strongly supported following Hillis and Bull (1993). Bayesian inference analyses were carried out using BEAST ver. 1.7.5 (Drummond *et al*. 2012). Two distinct runs were carried out with 50 million generations and trees sampled every 5000 generations. In a conservative way, we used a burn-in-period of 12.5 million generations per run. Convergence of runs was assessed by examining the effective sample size (ESS) of parameters with Tracer ver. 1.5 (available from http://beast.bio.ed.ac.uk/Tracer). Clade support was directly provided by the posterior probabilities (PP) estimates, with nodes supported by PP ≥0.95 considered as strongly supported (Erixon *et al*. 2003).

To determine putative molecular species clusters in our dataset, we used the recently developed Poisson tree processes (PTP) method (Zhang *et al*. 2013). This method does not require an ultrametric tree as input; instead the PTP model uses branch lengths to estimate the mean expected number of substitutions per site between two branching events. The model assumes that each substitution has a small probability of generating a speciation event; hence the number of substitutions between species is expected to be significantly higher than those within species (Zhang *et al*. 2013). The model then implements two independent classes of Poisson processes (one describing speciation and the other describing within species branching events) and searches for transition points between inter- and the intra-species branching patterns. The latter allows determination of molecular species clusters, which may be used as a potential line of evidence in an integrative taxonomy framework (Dayrat 2005; Padial *et al*. 2010; Schlick-Steiner *et al*. 2010; Riedel *et al*. 2013). That said, it is important to point out that these species clusters are putative; furthermore, similarly to that of other molecular species delimitation methods, the PTP procedure is not error-free and is to be used with caution with unbalanced or single-gene datasets (Zhang *et al*. 2013). The corresponding analysis was conducted on the web server for PTP (available at http://species.h-its.org/ptp/) using the best ML tree resulting from the RAxML analysis (Zhang *et al*. 2013).

Morphological study

Genitalia were dissected after immersion of the end of the abdomen in a boiling 10% potash bath for a few minutes, then cleaned, immersed in absolute alcohol for a few minutes and mounted on slides in Euparal (after separating the aedeagus from the rest of the genitalia in the male). Specimens were identified by comparison with types housed in several museums, the Natural History Museum, London (BMNH), the Ditsong National Museum of Natural History (DNMH), South Africa and the Museo Civico di Storia Naturale (MCSN), Milan. Types of new species were deposited in the Museum National d'Histoire Naturelle (MNHN) in Paris, France, except *Acrapex brunneella*, sp. nov., which was already deposited in the Natural History Museum (BMNH) in London. When possible, paratypes were deposited in the Ditsong National Museum of Natural History (DNMH), South Africa, and in the National Museum of Kenya (NMK) in Nairobi, Kenya.

The species we studied belonged to two very different morphological groups based on male genitalia as defined by Berio (1973). We decided to treat the two morphological groups separately for morphological comparison purposes; the first one named group *stygiata* considering *A. stygiata* was the first species of the group described by Hampson in 1910 and the second one named group *albivena* considering *A. albivena* was the first species of the group described by Hampson in 1910.

Results

Phylogenetic and molecular species delimitation analyses

Substitution models belonging to the general time reversible family (assuming gamma rate heterogeneity) were selected for each gene by the AICc. Both ML and BI partitioned analyses generated a similar topology (see Fig. 1). Overall, the corresponding tree is well supported as most interspecific nodes are supported by BV ≥70% and PP ≥0.95. All the species for which more than one specimen was sampled are recovered monophyletic with a high support. Two major species groups can be distinguished. The first one includes *A. stygiata*, *A. subalbissima* and individuals of the newly described *A. mpika*. The second group includes a clade of two species (*A. syscia* and the newly described *A. sporobola*), which clusters together with a larger clade that encompasses *A. albivena* and the specimens from three newly described *Acrapex* species (*A. mitawa*, *A. salmona* and *A. yakoba*). Regarding molecular species delimitation, the PTP analysis revealed ten putative species clusters (see Fig. 1). For eight species (*A. albivena*, *A. mitawa*, *A. mpika*, *A. salmona*, *A. stygiata*, *A. subalbissima*, *A. syscia* and *A. yakoba*), the molecular species delimitation approach was congruent with the morphological assignation with the exception of *A. sporobola*, for which the PTP analysis indicated two putative species clusters for the three sampled individuals.

Discussion

Systematics

Of the 10 species treated here, it is clear from both morphological and phylogenetic results that four species (*A. brunneella*, *A. mpika*, *A. stygiata* and *A. subalbissima*) belong to the *Acrapex stygiata* group (i.e. group B, Berio 1976) and six species (*A. albivena*, *A. syscia*, *A. salmona*, *A. mitawa*, *A. yakoba* and *A. sporobola*) belong to the *Acrapex albivena* group (i.e. group C, Berio 1976). Six new species were recognised, two belonging to the *A. stygiata* group (*A. brunneella* and *A. mpika*) and four belonging to the *A. albivena* group (*A. mitawa*, *A. salmona*, *A. sporobola* and *A. yakoba*). Our phylogenetic analysis also confirmed the relationships advanced by Berio (1976) based on the morphology of male genitalia. The use of a combined approach based on morphology and molecular species delimitation analyses allowed us to assess with confidence the boundaries of new species in the genus *Acrapex*. In addition, the molecular species delimitation analyses suggest some level of cryptic genetic diversity in the newly described *A. sporobola*, which could potentially represent two distinct species. That said, it is worth highlighting that we only managed to sequence three specimens for this species.

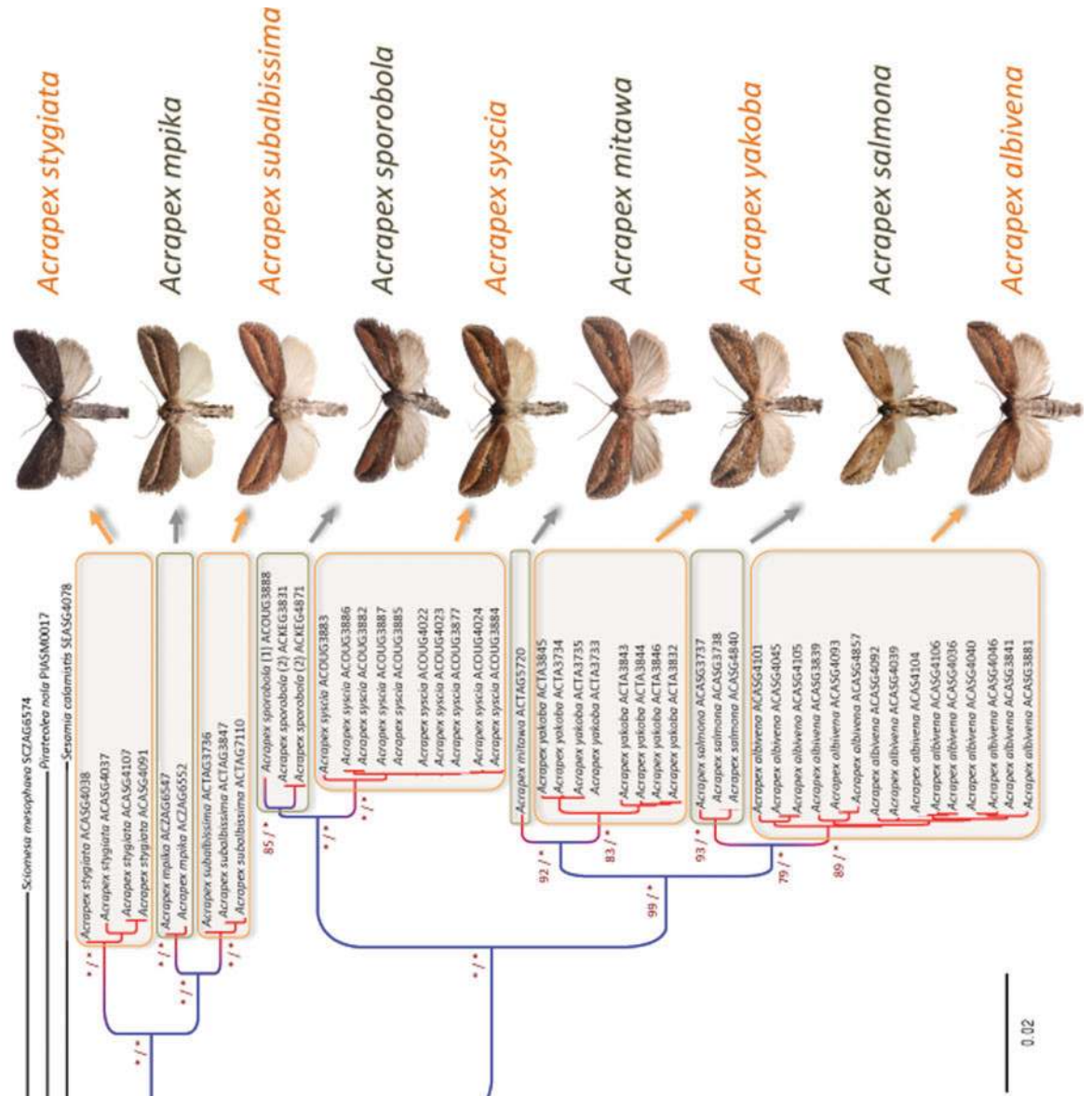

Fig. 1. Maximum likelihood tree resulting from the analysis of the combined dataset. Support of major nodes is provided by BV and PP (asterisks indicate a BV of 100% or a PP of 1.0), as the ML tree is completely congruent with the Bayesian tree. For the group of interest we used coloured frames to highlight the distinct *Acrapex* species. On the right, corresponding adult habitus are also included for illustrative purpose. Results of the PTP analysis are provided using coloured branches. Putative molecular species are indicated using transitions between blue-coloured branches to red-coloured branches. For the only case (*A. salmona*) in which two distinct putative species clusters are inferred we added numbers into brackets to indicate the assignation of specimens to a specific species cluster.

Therefore we cannot exclude the hypothesis that the additional species cluster of *A. sporobola* results from an undersampling artefact. Because undersampling can potentially biases the results of species delimitation analyses (Papadopoulou *et al*. 2008; Lohse 2009; Lim *et al*. 2012), we think that the decision to describe only one species (i.e. *A. sporobola*) is a conservative choice.

Among the *A. stygiata* group, we found two male forewing colours, the dark forewing colour (*A. mpika* and *A. stygiata*) and the buff forewing colour (*A. brunneella* and *A. subalbissima*); however, species identification is much easier based on male genitalia, in particular the basal half of the valve (which is more-or-less elongated or rounded depending on the species), and the juxta (for which morphology is very characteristic for each of the four species treated in this paper). In spite of its taxonomic value, juxta morphology was not considered by Berio (1976).

Among the *A. albivena* group, two sub-groups can be distinguished: the sub-group *albivena* with the veins of the costal area of the forewings adorned with white scales (*albivena, salmona, mitawa* and *yakoba*); and the sub-group *syscia* with the veins without any irroration (*syscia* and *sporobola*). Species identification is straightforward within these groups by comparing the shape of the ventral margin at the base of the valves, the ratio between length and width of the valves, and the penis and juxta morphology.

Until now, females were described only for *A. subalbissima* (Berio 1976) without reference to the genitalia. However, as realised by Pierce (1942), the female genitalia provide good characters for species identification even if sclerotised structures are less developed than in males. Of the10 species treated here, females of eight species are described, including their genitalia. For all species treated here, females are very similar in appearance to that of males and are generally the same size as the males, but with forewings paler and more elongated at the apex. Within the present species, female genitalia allow a clear separation of the *A. stygiata* group and the *A. albivena* group: the former is characterised by a globular corpus bursae (*subalbissima* and *mpika*) adorned with two elongated signa and by an antrum strongly sclerotised and divided into two bean-shaped lateral plates; the latter by a corpus bursae without signa and by a narrow, band-like post-vaginal plate.

The eight *Acrapex* species collected in the field as larvae from host-plants were morphologically very similar; ground colour pinkish buff without any markings, with head red-brown, thoracic shield more or less concolorous with head, caudal plate brown and pinacula paler than caudal plate. The *A. examinis* larva described by Swezey (1927) is slightly different from the larvae described here, but clearly all recorded *Acrapex* larvae belong to the *Sesamia*-like species as defined by Le Ru *et al*. (2006*b*).

The results presented here highlight the complexity of *Acrapex* systematics, notably the limitations of morphological taxonomy based upon only one life stage (such as adult moths), in particular when only one sex is available. From the time of Tams and Bowden (1953), male genitalia have been considered as the main criterion for grouping species in Sesamiina genera.

The male genitalia of the ten *Acrapex* species treated here clearly segregate between two distinct groups as pointed out by Berio (1973). This is further illustrated in the case of *A. brunneella*, which was first described by Strand (1916) as an aberration of *A. brunnea* based on wing pattern, then as a paler form of *A. stygiata* based on both wing pattern and male genitalia (Fletcher 1961). The current study demonstrates the importance of the integration of morphological studies, ecological information and molecular data. Furthermore, it also shows that female genitalia must be taken into account for a complete resolution of the taxonomy of *Acrapex* and more generally of the subtribe Sesamiina. We recently showed that among *Busseola* species, female genitalia are more informative than male genitalia for the separation of *B. nairobica*, *B. phaia* and *B. segeta* (Felix *et al*. 2013).

Host-plant associations

Prior to this study, very little was known about the host-plant associations of *Acrapex* spp., as there were only two records in the literature: *Acrapex examinis* (Meyrick) from *Panicum torridum* Gaudich. (Paniceae) in Hawaii (Swezey 1927), and a misidentified *A. syscia* from *S. macranthelus* (Zoysieae) in Kenya (Le Ru *et al*. 2006*b*). In addition, *Acrapex azumai* Sugi was very recently recorded from cogongrass (Andropogoneae) in Japan (Takasu *et al*. 2014). Our results are consistent with previous host-plant records of *Acrapex*, which are all from Poaceae. Moreover, our results suggest a high diversity of *Acrapex* associated with grasses in the tribe Andropogoneae, as the eight species in our study with host records were all found in grasses in this tribe (*Imperata cylindrica*, *Cymbopogon* sp. and *Miscanthus capensis*), although two of the eight species were also found in a grass in the tribe Zoysieae (*Sporobolus macranthelus*). The feeding habit of *Acrapex* larvae has been recorded for *A. examinis* (Swezey 1927) and more recently for *A. azumai* (Takasu *et al*. 2014). The feeding habits of the eight *Acrapex* species we collected as larvae are very similar to that of the ones reported for *A. examinis* and *A azumai*, with the typical symptom of plant attack as death of the central tiller, often referred to as 'dead heart'. In addition, we speculate that *Acrapex* larvae typically fed on more than one stem before completing their development, as previously suggested by Swezey (1927: p. 180): '*larvae apparently migrate from one stem to another, for in many bored stems with* '*dead hearts*' *not enough eating had been done to suffice for the growth of the larva*'. Finally, all the taxa we cover, with the exception of *A. brunneella* for which there is no information on habitat associations, are markedly hygrophilous species found along banks of streams, rivers and marshes. Until recently, nearly all *Acrapex* species recorded in literature were collected from light traps and were known from very few localities. Most of species was reported from only one sub-region in Africa (East, Austral, Central or West), suggesting a high rate of endemic species in each sub-region. The restricted distributions and host-plant associations of the ten *Acrapex* species considered in our study confirm the high rate of endemism of *Acrapex* in Africa. During the last ten years, we have collected almost 60 000 stem borer larvae from nearly 180 different host plants in 1200 localities belonging to 16 sub-Saharan countries, and therefore the limited geographic ranges and host plant affinities reported in our study cannot be attributed to sampling bias or insufficient sampling. Moreover, our results

suggest that most *Acrapex* species are probably specialist feeders on one or only a few grasses. In general, noctuid stem borers with the most extensive geographic distributions are the most polyphagous (Le Ru *et al*. 2006*b*; Moyal *et al*. 2010), and none of these widely distributed, polyphagous species belongs to the genus *Acrapex*.

Taxonomy

Group *stygiata: A. stygiata*

Acrapex brunneella Le Ru, sp. nov.

(Figs 2*A*, *C*, 7*A*, *E*, 11)

urn:lsid:zoobank.org:act:26C86B98-A055-47E4-BFA8-FF176702CCA5

Acrapex brunnea ab. brunneella Strand, 1916: Neue Nebenformen exotischer Heterocera. – Archiv für Naturgeschichte 82(A) (3): 147–157 (comb. nov.)

Material examined

Holotype. Male, Uganda: Mulema, 5000 Ft, May 1903, Noctuidae genitalia slide N° 2459, Doggett, W.L. coll., 1904–23, BMNH, London.

Paratype. **MALAWI** (Nyasaland): Mlanje Plateau, 6500 Ft, Dec 1913, Neave S.A. coll., 1M, Noctuidae genitalia slide N° 2474.

Description

Male (Fig. 2*A*, *B*): antennae ochraceous–buff, filiform and slightly ciliate, flagellum adorned dorsally with fuscous scales, palpus light ochreous–buff; colour of head, thorax and forewing light ochreous–buff; head and prothorax strongly tinged with fuscous; eyes fuscous. Legs light ochreous–buff, buff in inner surface. Forewing: costal area broadly irrorated with fuscous scales, diffusely edged on the lower side and extended beyond the upper median with all the veins of the ground colour; irrorated median area extended on distal side to termen, ending obliquely well before termen; no transverse lines, a narrow fuscous longitudinal area from the base to the termen with veins in that area and below irrorated with fuscous. Fringe ochraceous–buff adorned with a narrow buff line and a narrow fuscous line. Hindwing white, veins irrorated with ochreous–buff scales, costa and apex slightly suffused with fuscous scales; fringe white adorned with a thick white line and a narrow fuscous line. Underside of forewing with white ground-colour suffused with fuscous scales, more densely suffused on the costal area, apex and termen; Underside of hindwing white with costa and apex suffused with fuscous scales and veins irrorated with ochreous–buff scales.

Wingspan: 23–25 mm (2 males)

Male genitalia (Fig. 7*A*, *E*): uncus long and narrow, tapering to a fine point and tufted with long hair on the upperside; valves very broad at basal half; terminal half spatulate. Terminal half weakly sclerotised and basal half more sclerotised with a broad sacculus; costal area at base heavily clerotized and produced into a narrow long lobe, roundly pointed and curved inwardly; the juxta large, oblong elongated pear-shaped without sclerotisation at the base with a long and wide sclerotised neck very shortly bifid. Aedeagus straight, terminating in a tubular vesica with a stout, broadly based, pointed cornutus.

Bionomics

Biology unknown.

Distribution

Uganda and Malawi. The two records are from Afromontane (Mosaic no 19) vegetation mosaic (White 1983) (Fig. 11).

Remarks

Easily separated from *A. stygiata* and *A. mpika* by the forewing which is ochreous–buff in *stygiata* and fuscous in *mpika*; separated from *A. subalbissima* by having a juxta much larger and wider.

Etymology

Named after the *ab. brunnella* name given by Strand (1916).

Acrapex mpika Le Ru, sp. nov.

(Figs 2*D–G*, 7*B*, *F*, 9*A*, 11)

urn:lsid:zoobank.org:act:BC9F0363-11AA-47E8-9119-57A8C2E6ADD9

Material examined

Holotype. Male, Zambia: Northern: Mpika, 12°04.288′S, 31°17.155′E, 1423 m, 15 March 2012, B. Le Ru leg., 1M gen. prep. LERU Bruno/G579, MNHN, Paris.

Paratypes. **ZAMBIA: North-Western:** Rwanko Azi, 12°13.212′S, 25°39.064′E, 1413 m, 20 March 2012, ex light trap, B. Le Ru leg., 1F gen. prep. LERU Bruno/G116), 1M gen. prep. LERU Bruno/G124, 4M, MNHN, Paris; **Northern:** Chalwe, 10°26.395′S, 29°30.039′E, 1295 m, 23 March 2012, B. Le Ru leg., 1M, MNHN, Paris.

Description (Fig. 2*D–F*)

Both male and female are similar, the female paler than the male; antennae ochreous–buff, filiform in both sexes and slightly ciliate in males, flagellum adorned dorsally with fuscous scales, palpus fuscous; head and base of thorax fuscous, thorax becoming gradually buff; eyes fuscous. Legs fuscous ringed with white, black fuscous in inner surface; abdomen grey irrorated with fuscous scales. Forewing; ground-colour bright fuscous with costal area irrorated with brown fuscous and white scales, more diffuse on the lower side; irrorated buff median area extended on distal side to termen; no transverse lines. The cell is externally adorned with some black markings, variable in extent and intensity; a longitudinal fuscous fascia from base along lower margin of cell ending to an oblique line of four black triangular markings variable in extent. A curved postmedial row of spots, each spot located on the veins; fringe fuscous adorned with a narrow white line. Hindwing: ground colour white, veins slightly irrorated with fuscous scales, costa and apex slightly suffused with fuscous scales; fringe white adorned with a narrow light fuscous line. Underside of the forewing with ground-colour grey, uniformly suffused with fuscous scales and some white scales on the costal area. Underside of hindwing white suffused with fuscous scales on costa, apex and termen; veins slightly irrorated with fuscous scales.

Wingspan: 23–25 mm (males) ($n = 7$); 24 mm (females) ($n = 1$).

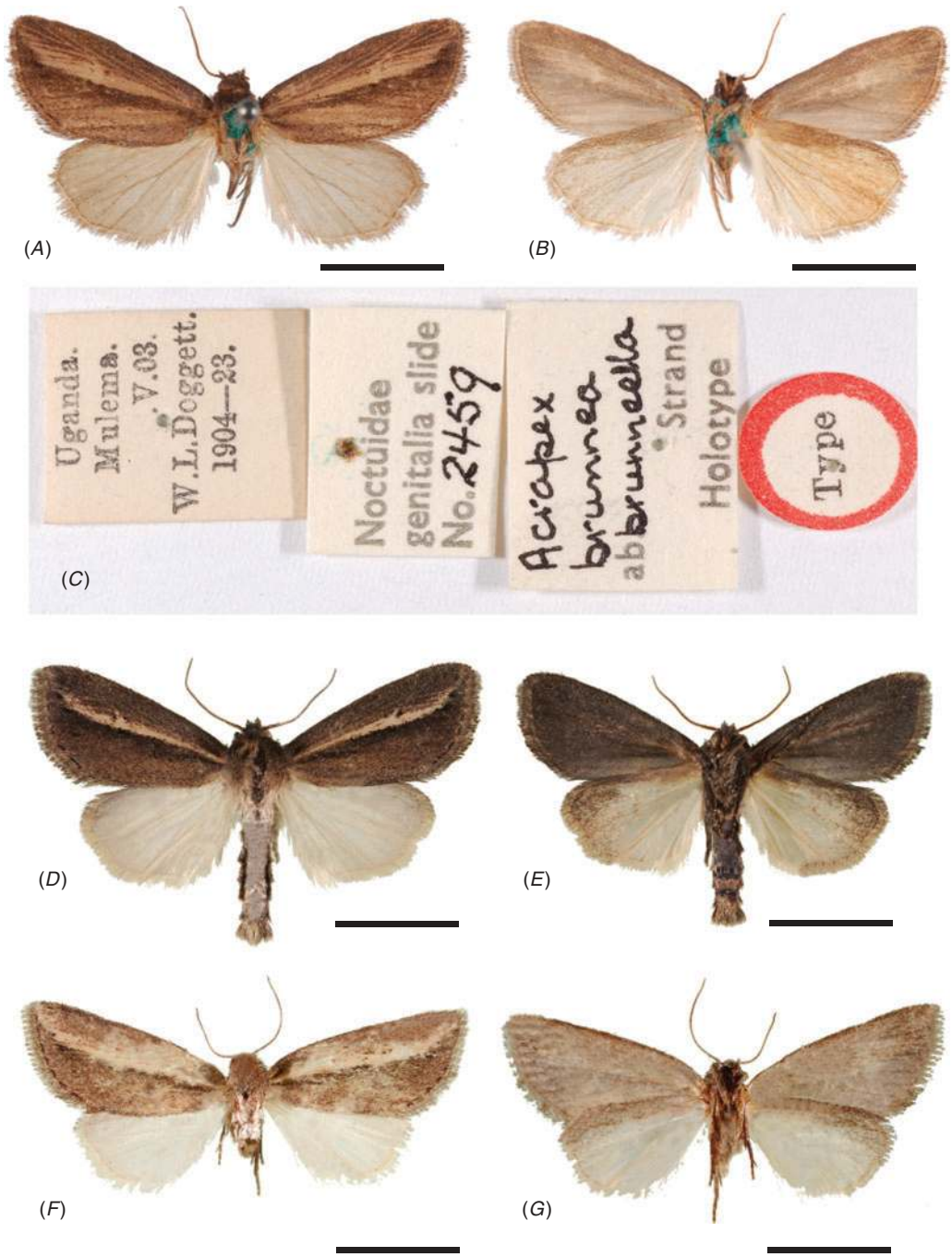

Fig. 2. Adults of *Acrapex* species. (*A–C*) *A. brunneella*: (*A*) male upper side, (*B*) male under side, (*C*) original labels from BMNH. (*D–G*) *A. mpika*: (*C*) male upper side, (*D*) male under side; (*E*) female upper side, (*F*) female under side. Scale bar = 5 mm.

Male genitalia (Fig. 7*B*, *F*): uncus narrow and long tapering in a very fine and long point, tufted with long hair on upperside; valves with terminal half weakly sclerotised and basal half better sclerotised with a broad sacculus; base of the costal area with a pronounced protuberance and a narrow long duck-billed lobe, slightly curved inwardly; juxta oblong elongated pear-shaped without sclerotisation at the base with a long and very narrow sclerotised neck slightly bifid at the apex. Aedeagus long, strongly curved in the middle, terminating in a tubular vesica with a stout, broadly based, strongly curved and pointed cornutus.

Female genitalia (Fig. 9*A*): corpus bursae short and globular with two small elongated signa; ductus bursae about the same length as corpus bursae, without sclerotisation near the bursa, globular near the ostium with a strongly sclerotised connection. Antrum sclerotised, with two bean-shaped lateral plates separated in their middle with a deep depression; the posterior lip v-shaped

and the anterior u-shaped; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide (2.1 times longer than wide) with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Bionomics

Biology unknown. The moths were caught in a light trap in grasslands near marshes.

Distribution

Zambia, Northern and North-west Province. Moths were found in wet Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) vegetation mosaic (White 1983) (Fig. 11).

Remarks

Forewing fuscous like *A. stygiata* but the species may easily be separated after the male genitalia; the upper part of the juxta is sclerotised and bifid in *A. stygiata* whereas there is no sclerotised area in *mpika;* also basal half of valves much more globular in *mpika* than in *stygiata*; corpus bursae with two small elongated signa in *A. mpika* whereas there are no signa in *A. stygiata.*

Etymology

Named after the town of Mpika in Zambia.

Acrapex stygiata (Hampson)

(Figs 3*A–D*, 7*C*, *G*, 9*B*, 10*A*, 11)

Calamistis stygiata Hampson, 1910: Cat. Lep. Phal. ix. p.278, pl. cxliii., fig. II (sp. nov.).

Busseola stygiata (Gaede), 1935: Seitz Gross-Schmett. xv. P. 95, pl. 10 (comb. nov.).

Busseola stygiata (Hampson), Janse, 1939: The moths of South Africa. p. 307–435, pl. xxxi., 8, fig 87, pl. xx., 6 (taxonomy).

Acrapex stygiata (Hampson), Fletcher, 1961: Noctuidae, Ruwenzori expedition 1952, p. 116 (comb. nov.); Poole, 1989: Noctuidae; *Lepidopterorum catalogus* (Lepidopterorum Catalogus New Series, Fasc. 118), Parts 1 and 2 (catalogue).

Material examined

Holotype. Male, South Africa: Transvaal: Piet Retief, 15 Sept 1903, R. Crawshay leg. (1903–314), gen. prep. 2275, BMNH, London.

Other material examined. **SOUTH AFRICA: Kwazulu–Natal:** Karkloof River, 29°13.416′S, 30°02.456′E, 1128 m asl, 24 Nov 2009, ex larva (in stem of *Miscanthus capensis* (Nees) Andersson), B. Le Ru leg., 1F gen. prep. LERU Bruno/G344, MNHN, Paris; Eston Beaumont, 29°55.102′S, 30°37.222′E, 673 m, 25 Nov 2009, ex larva (in stem of *Cymbopogon sp*), B. Le Ru leg., MNHN, Paris ; 1M, 1M gen. Prep. LERU Bruno/G342; Waterford, 29°50.471′S, 39°08.523′E, 1124 m, 27 Nov 2009, B. Le Ru leg., 1F, MNHN, Paris; Schevers Farm, 29°10.448′S, 30°21.243′E, 1053 m, 27 Nov 2009, ex larva (in stem of *Miscanthus capensis* (Nees) Andersson), B. Le Ru leg., 1M gen. prep. LERU Bruno/G343, MNHN, Paris.

Supplementary description

The male was described in sufficient detail by Hampson (1910) and Janse (1939). The female is described here for the first time; it looks very similar to that of the male, however the general shape of the female's forewing is more elongated at the apex that that of the male. Additions to two previous descriptions (Fig. 3*A–D*): antennae fuscous, filiform in both sexes and slightly ciliate in males, flagellum adorned dorsally with fuscous scales, palpus fuscous. Forewing: in some specimens a longitudinal ochreous-brown fascia from apex to before end of cell, sometimes reaching the base, getting narrower to the base; in some specimens the fuscous ground colour is suffused with ochreous-brown scales. Fringe fuscous adorned successively with a narrow white line, a thick fuscous line, another narrow white line and 7 black elongated markings at the base. Hindwing; white to buff, with veins, costa and apex strongly suffused with fuscous scales; fringe white to buff with a narrow basal white or buff line highlighted at the base with a narrow black line. Underside of the forewing uniformly grey; in some specimens suffused with brown scales. Underside of hindwing white uniformly suffused with fuscous scales but more densely on costa and apex.

Wingspan: 26–27 mm (males) ($n = 3$); 27–29 mm (females) ($n = 2$).

Male genitalia (Fig. 7*C*, *D*): the male genitalia was described by Janse (1939) with sufficient detail; however in addition to the information provided by Janse, the juxta is oblong, elongated, pear-shaped without sclerotisation at the base with a short wide sclerotised neck shortly bifid.

Female genitalia (Fig. 9*B*): corpus bursae short and globular without signa; ductus bursae without sclerotisation, about the same length as corpus bursae, narrow near the bursa and wide and globular near the ostium, the junction with the ostium bulb-shaped and slightly sclerotised. Antrum strongly sclerotised, the posterior lip straight and slightly leaning on the back, the anterior lip w-shaped; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*A*): length, 25–30 mm, width, 3.0 mm; head smooth, brown, prothoracic shield pale yellow brown; body with ground colour buff, dorsally suffused with pink, pinacula brown and caudal plate black. Young larvae are very similar in appearance to that of mature ones.

Bionomics

Acrapex stygiata is a markedly hygrophilous species inhabiting grasses along banks of streams, rivers and marshes. Larvae were collected at the bottom of young stems of *Miscanthus capensis* (Nees) Andersson and *Cymbopogon* sp. stems, always solitary. Typically, plants exhibiting signs of infestation by *A. stygiata* larvae have a curled, brown, central leaf. Damaged stems had a small hole (ca. 2 mm diameter) located ~10 cm from ground level. Stems found with damage but no stemborer also had a larger hole near the bottom of the stem just above the junction of the stem and the rhizome. We suspect that the small holes at the top of the stem were borer entry holes while the larger holes at bottom of the stem were exit holes. No pupae were found in stems, and therefore borers probably pupate in the soil near exit holes. Based on the small amount of nutrients available in most stems, we suspect that one borer may feed on multiple stems before pupating.

Distribution

South Africa in Kwazulu–Natal, Mpumalanga, Limpopo and North West regions (Fig. 11). It has been found in Afromontane (Mosaic no 19), transition from Afromontane

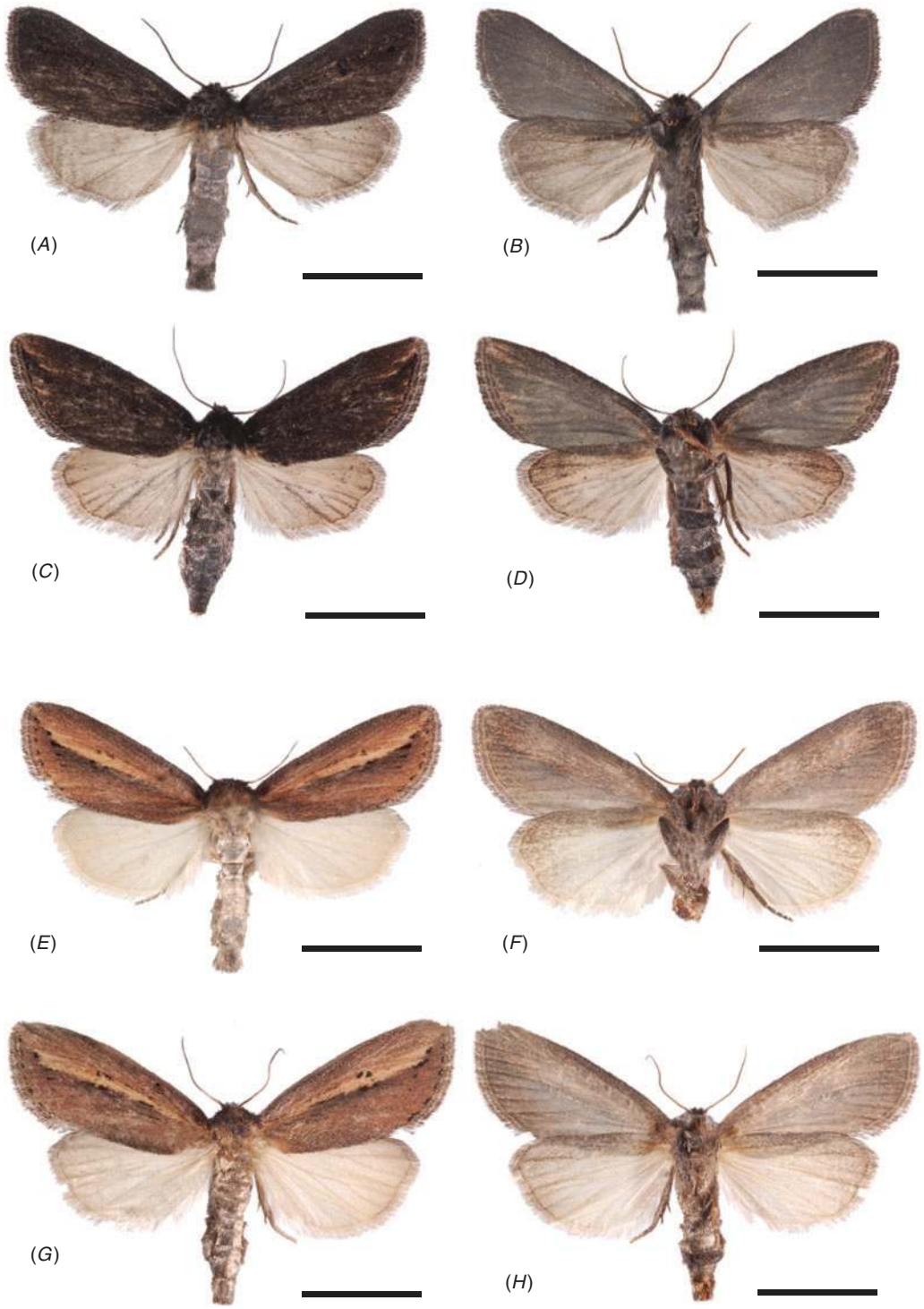

Fig. 3. Adults of *Acrapex* species. (*A–D*) *A. stygiata*: (*A*) male upper side, (*B*) male under side; (*C*) female upper side, (*D*) female under side. (*E–H*) *A. subalbissima*: (*E*) male upper side, (*F*) male under side; (*G*) female upper side, (*H*) female under side. Scale bar = 5 mm.

scrub forest to Highveld grassland (Mosaic no 20), Highveld grassland (Mosaic no 58) and wetter Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) vegetation mosaics (White 1983).

Remarks

Fletcher (1961) recorded *A. stygiata* from Uganda and Nyasaland and listed *Acrapex brunnea* Hampson, 1910 (tom. cit. p 318,

ab.2.) and *Acrapex brunnea* ab. *brunneella* Strand 1916 (Arch. Naturgesh., 82 A2:87) as synonyms. We did not find the male specimen collected by Fletcher in Uganda, Ibanda, 4700 Ft, however careful cross checking of both adults and genitalia slides kept in the BMNH, clearly indicate these two taxa are not synonyms of *A. stygiata*. The first taxon belongs to *A. brunnea* as described first by Hampson (1910) and later with description of genitalia by Janse (1939). The second taxon is not related to *Acrapex brunnea* but belongs to a new species related to *A. stygiata* but with clear morphological differences in both wing pattern and genitalia.

Acrapex subalbissima Berio

(Figs 3*E–H*, 7*D*, *H*, 9*C*, 10*B*, 11)

Acrapex subalbissima Berio, 1973: Nuove species e generi di noctuidae africane e asiatiche e note sinonimiche. Parte II. Annali del museo civico di storia naturale « Giacomo Doria », p 150, fig. 34 (sp. nov.); Poole, 1989: Noctuidae; *Lepidopterorum catalogus* (Lepidopterorum Catalogus New Series, Fasc. 118), Parts 1 and 2 (catalogue).

Material examined

Holotype. Male, Tanzania: Iringa region: Kipengere Mountain, Ikonda, 07 Apr 1971, 1M, gen. prep. Berio N° 5080, MCSN, Milan. Allotype: TANZANIA, Ikonda, 01 Apr 1971, 1F, MCSN, Milan.

Paratypes. **TANZANIA: Ikonda**: 10 Mar – 04 Apr 1971, 3M, 9F, MCSN, Milan.

Other material examined. **TANZANIA: Iringa region,** Uzungwa Mountain, Musonza, 08°06.090'S, 35°56.421'E, 1789 m, 24 Mar 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1M, 4F, 2F gen. prep. LERU Bruno/G345-G346, 1M gen. prep. LERU Bruno/G347, MNHN, Paris.

Redescription (Fig. 3*e–h*)

Both male and female are very similar; antennae ochreous–buff, filiform in both sexes and slightly ciliate in males, flagellum adorned dorsally with fuscous scales, palpus fuscous; head and base of thorax fuscous brown heavily suffused with white scales, thorax becoming gradually ochreous–buff; eyes fuscous. Legs fuscous brown ringed with white and suffused with white scales, black fuscous in inner surface; abdomen grey brow. Forewing; ground-colour ochreous–buff with costal area irrorated with fuscous scales, diffusely edged on the lower side and extended beyond the upper median with all the veins of the ground colour; irrorated buff median area extended on distal side to termen; no transverse lines. The cell is externally adorned with some black markings, variable in extent and intensity; a longitudinal fuscous fascia from base along lower margin of cell ending to an oblique line of four black triangular markings variable in extent. The inner margin irrorated with fuscous scales. A curved postmedial row of spots, each spot located on the veins; fringe fuscous adorned with a narrow white line. Hindwing: ground colour white, veins slightly irrorated with ochreous–buff scales, fringe white adorned with a narrow light buff line. Underside of forewing with white ground-colour suffused with fuscous scales, more densely suffused on the costal area, apex and termen; Underside of hindwing white with costa and apex suffused with fuscous scales and veins irrorated with fuscous scales.

Wingspan: 23–25 mm (males) ($n = 4$); 23–26 mm (females) ($n = 7$).

Male genitalia (Fig. 7*D*, *H*): uncus very similar to that of *A. stygiata*; valves very broad at basal half but more thickset, almost globular, than in *stygiata*; terminal half spatulate like in *A. stygiata*, terminal half weakly sclerotised and basal half more sclerotised with a broad sacculus; costal area at base heavily sclerotised and produced into a narrow long lobe, roundly pointed and curved inwardly very similar to that of *A. stygiata*; the juxta is similar with that of *A. stygiata*; oblong, elongated pear-shaped without sclerotisation at the base but shorter than in *A. stygiata* with a shorter and narrower sclerotised neck than in *stygiata* and longly bifid. Aedeagus long, curved in the middle, terminating in a tubular vesica with a stout, broadly based, curved and pointed cornutus.

Female genitalia (Fig. 9*C*): corpus bursae short and globular with two small, elongated signa; ductus bursae about the same length as corpus bursae, without sclerotisation near the bursa and slightly sclerotised near the ostium. Antrum sclerotised, with two bean-shaped lateral plates separated in the middle by an incomplete fissure; the posterior lip y-shaped and the anterior u-shaped; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide (2.2 times longer than wide) with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*B*): length, 20–25 mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield yellow buff; body with ground colour yellow buff, dorsally suffused with pink, pinacula and caudal plate yellow buff. Young larvae are very similar to that of mature ones.

Bionomics

Like *A. stygiata, A. subalbissima* is a markedly hygrophilous species found on banks of streams and rivers. Larvae were collected at the bottom of stems of cogongrass, always solitary like *A. stygiata*; for the biology refer to *A. stygiata.*

Distribution

Tanzania in Kipengere and Uzungwa mountains (Fig. 11). Records are from Afromontane (Mosaic no 19) vegetation mosaic (White 1983).

Remarks

Forewing ochreous–buff like *A. brunneella* but the species may easily be separated after the male genitalia; the juxta is much larger and wider in *A. brunneella* than in *A. subalbissima*; also basal half of valves much more globular in *A. subalbissima* than in *A. brunneella*.

Group ***albivena: A. albivena***

Acrapex albivena Hampson

(Figs 4*A–D*, 8*A*, *F*, 9*D*, 10*C*, 11)

Acrapex albivena Hampson, 1910: Cat. Lep. Phal. ix. p. 318, pl. cxliv., fig. 12 (sp. nov.). Gaede, 1935: Seitz Gross-Schmett. xv. p. 97, pl. 10 (catalogue); Janse, 1939: The moths of South Africa. p. 307–435, pl. xxxi., 13, fig 89, pl. xx., 14 (taxonomy); Poole, 1989: Noctuidae; *Lepidopterorum catalogus* (Lepidopterorum Catalogus New Series, Fasc. 118), Part 1 and 2 (catalogue).

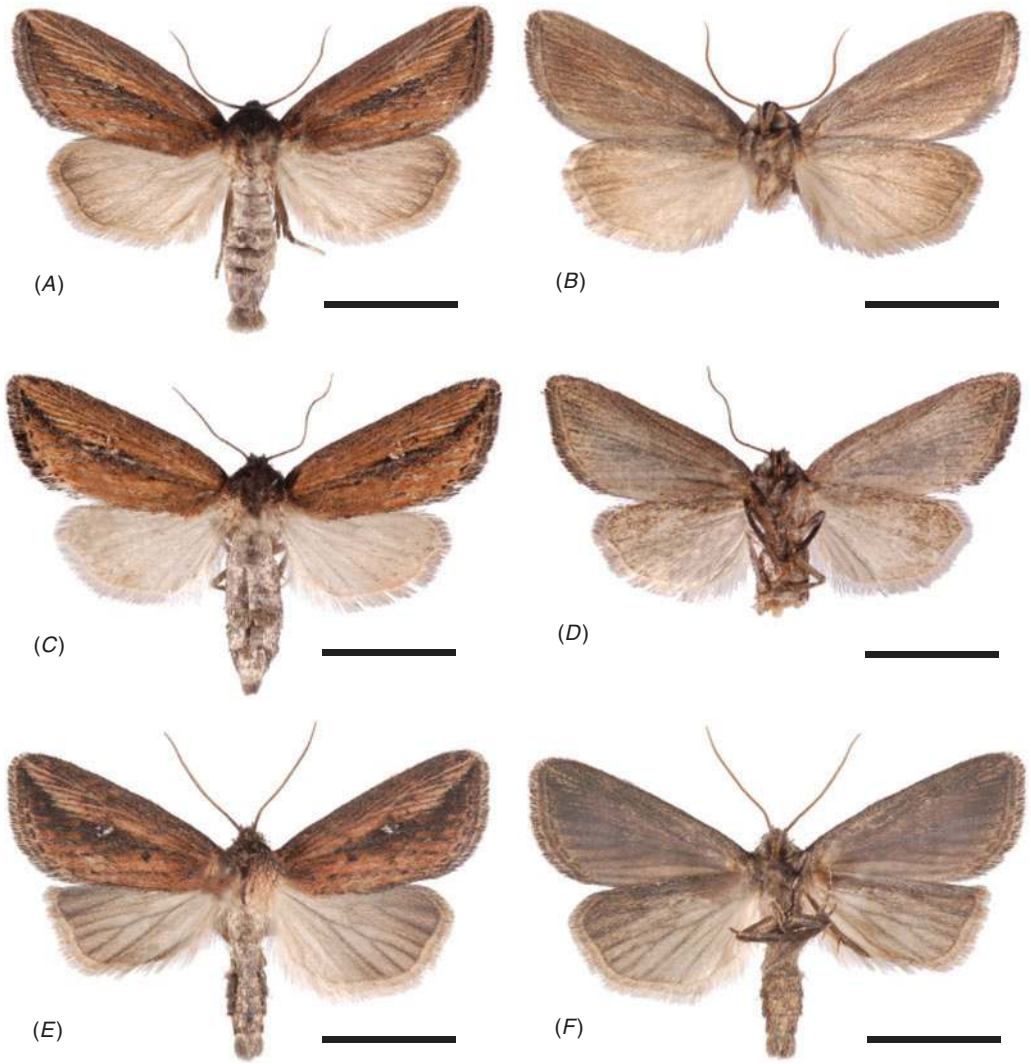

Fig. 4. Adults of *Acrapex* species. (*A–D*) *A. albivena*: (*A*) male upper side, (*B*) male under side; (*C*) female upper side, (*D*) female under side . (*E–F*) *A. mitawa*: (*E*) male upper side, (*F*) male under side. Scale bar = 5 mm.

Material examined

Holotype. Male, South Africa: Transkei: 99.26, Miss F. Barrett, 1M, Noctuidae genitalia slide N° 2462, BMNH, London.

Other material examined. **SOUTH AFRICA: Kwazulu–Natal:** Durban, Bowker coll., 1M, Noctuidae genitalia slide N° 2473, BMNH, London; Eston Beaumont, 29°55.102'S, 30°37.222'E, 673 m, 03 Feb 2009, ex larva (in stem of *Cymbopogon* sp.), B. Le Ru leg., 2M, 5F, 3M gen. prep. LERU Bruno/G332-G337-G467, 1F gen. prep. LERU Bruno/G333; Eston Beaumont, 29°55.102'S, 30°37.222'E, 673 m, 03 Feb 2009, ex larva (in stem of *Miscanthus capensis* (Nees) Andersson), B. Le Ru leg., 1M, 1F, 1F gen. prep. LERU Bruno/G334; Mwati, 29°48.324′S, 30°06.244′E, 1043 m, 27 Nov 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1M,1M gen. prep. LERU Bruno/G339, 1F gen. prep. LERU Bruno/G340; Waterford, 29°50.471'S, 30°08.523'E, 1124 m, 27 Nov 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 2M, 1M gen. prep. LERU Bruno/G341.

Supplementary description

The female is described here for the first time. It is similar in appearance to that of the male, however the general shape of the female forewing is more elongated at the apex than in the male. Additions to the two previous descriptions (Hampson 1910; Janse 1939) (Fig. 4*A–D*): antennae ochreous, filiform in both sexes and slightly ciliate in males, flagellum adorned dorsally with black scales, palpus fuscous, eyes fuscous. Legs fuscous ringed with white, black fuscous on inner surface; abdomen grey irrorated with fuscous scales. Forewing: ground-colour ochreous suffused with fuscous scales in the costal area, white scales in other areas and with the veins adorned with white scales highlighted with fuscous scales; reniform indicated by few white scales, preceded by some black scales, sometimes absent; a longitudinal black-fuscous fascia along lower external margin of the cell, then ending obliquely to apex; in line with the oblique part of the black fascia, 3 black marks on each of the 3 veins CuA1, CuA2 and 1A +2A; a postmedial row of black elongated spots between the veins; fringe fuscous brown adorned with a narrow ochreous line. Hindwing: ground colour white, veins slightly irrorated with fuscous scales, terminal area more heavily suffused with fuscous scales; male hindwing more suffused with fuscous scales than

female hindwing; fringe white adorned with a narrow fuscous line. Underside of the forewing with ground-colour ochreous brown, uniformly suffused with fuscous scales and some white scales in the costal area. Underside of hindwing white suffused with fuscous scales on costa, apex and termen; veins slightly irrorated with fuscous scales.

Wingspan: 23–26 mm (males) ($n = 13$); 24–26 mm (females) ($n = 9$).

Male genitalia (Fig. 8*A*, *F*): the description of male genitalia was made by Janse (1939); additional description: uncus long and narrow, tapering in a blunt point, tufted with hairs on the upper half; the juxta rounded without sclerotisation at the base with a short wide sclerotised neck very shortly bifid; aedeagus slightly curved, short and stout, manica with a two-lobed sclerotisation, almost one-third length of the aedeagus, vesica without cornuti.

Female genitalia (Fig. 9*D*): corpus bursae short and globular without signa; ductus bursae without sclerotisation, ~1.5 the length of corpus bursae, widening on the ostium side, ending in a narrow sclerotised ring. Antrum narrow band-like slightly leaning on the back; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide (2 times longer than wide) with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*C*): length, 20–25 mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield yellow buff; body with ground colour yellow buff, dorsally suffused with pink, pinacula and caudal plate yellow buff. Young larvae are very similar to that of mature ones.

Bionomics

Acrapex albivena is a markedly hygrophilous species found of banks of streams, rivers and marshes. We found *A. albivena* larvae in the same wetlands habitats as *A. stygiata*, but *A. albivena* was more common; they were collected from *Miscanthus capensis* (Nees) Andersson, *Cymbopogon* sp. and cogongrass stems. For the biology refer to *A. stygiata.*

Distribution

South Africa in Kwazulu–Natal, Mpumalanga, Free State, Eastern and Western Cape regions and Zimbabwe in Manicaland (Fig. 11). The species was found in Afromontane (Mosaic no 19), transition from Afromontane scrub forest to Highveld grassland (Mosaic no 20), Highveld grassland (Mosaic no 58), wetter Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) and Cape shrubland (Fynbos) (Mosaic no 50) vegetation mosaics (White 1983).

Remarks

Janse (1939) indicated that *A. albivena* is very similar to, if not the same species as, to that of *A. hemiphlebia* Hampson 1914, however reporting: '*I regret to say that I have so far been unable to secure the reference to the original description of this species*'. Having seen the original description of *A. hemiphlebia* by Hampson and the type specimen (both adult and genitalia) preserved in BMNH, we can definitely conclude that *A. albivena* is not the same species as *A. hemiphlebia*, which belongs to the *Acrapex unicolora* species group. Specimens of *Acrapex hemiphlebia* described by Janse (1939) either belong to a new species to be named or correspond to a particular form of *A. albivena*; its taxonomic status will be investigated in a future study. Janse's misidentification was noted by Fletcher (1961).

Acrapex mitawa Le Ru, sp. nov.

(Figs 4*E*, *F*, 8*B*, *G*, 10*D*, 11)

urn:lsid:zoobank.org:act:C80C77CA-FED5-4BDC-A93E-4DD74A09CA3C

Material examined

Holotype. Male, Tanzania: Ruvuma region: Mitawa, 11°07.356′S, 34°54.463′E, 1480 m, 03 Jun 2010, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., gen. prep. LERU Bruno/G331, MNHN, Paris.

Description (Fig. 4*E, F*)

Male: antennae bright fuscous dorsally and buff ventrally, filiform and slightly ciliate, flagellum adorned dorsally with fuscous scales, palpus fuscous, eyes fuscous. Head and base of thorax fuscous tinged with buff, thorax becoming gradually buff. Legs fuscous, ringed with buff, black fuscous in inner surface; abdomen fuscous irrorated with buff scales. Forewing: ground-colour ochreous, suffused with buff and fuscous scales, more heavily in the costal area; reniform indicated by few white scales, surrounded with black scales; a longitudinal black fuscous median fascia along lower external margin of the cell, ending obliquely at the apex; the veins to the apex suffused with buff scales, the veins below the cell adorned with fuscous, white and black scales; a postmedial row of black elongated spots between the veins; fringe fuscous externally, buff suffused with black internally. Hindwing: ground colour white suffused with fuscous scales, veins suffused with fuscous scales, costa and apex more heavily suffused with fuscous scales; fringe white suffused with fuscous and adorned with a narrow fuscous line. Underside of the forewing with ground-colour fuscous, suffused with buff scales on the costal area. Underside of hindwing white uniformly suffused with fuscous scales but more heavily on costa and apex; veins irrorated with fuscous scales.

Wingspan: 23 mm (male) ($n = 1$).

Male genitalia (Fig. 8*B*, *G*): uncus long and narrow, tapering in truncate apex, tufted with hairs on the upper half; valves resembling those of *albivena*, with a length/width ratio of 2.1, rounded along ventral margin but with a more open-angle at base, less constricted at middle, broadly rounded at apex with a corona, ventral surface covered with papillated bristly short hairs; aedeagus short and stout, manica with a two-lobed sclerotisation strongly rounded at tip, almost one quarter length of the aedeagus, vesica without cornuti.

Larvae L5 instar (Fig. 10*D*): length, 20–25mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield very pale buff; body with ground colour pink suffused with buff, pinacula and caudal plate pale buff. Young larvae are very similar to that of mature ones.

Bionomics

It is a hygrophilous species of banks of streams, rivers and marshes. Larvae were collected in cogongrass stems. For the biology of larvae refer to *A. stygiata.*

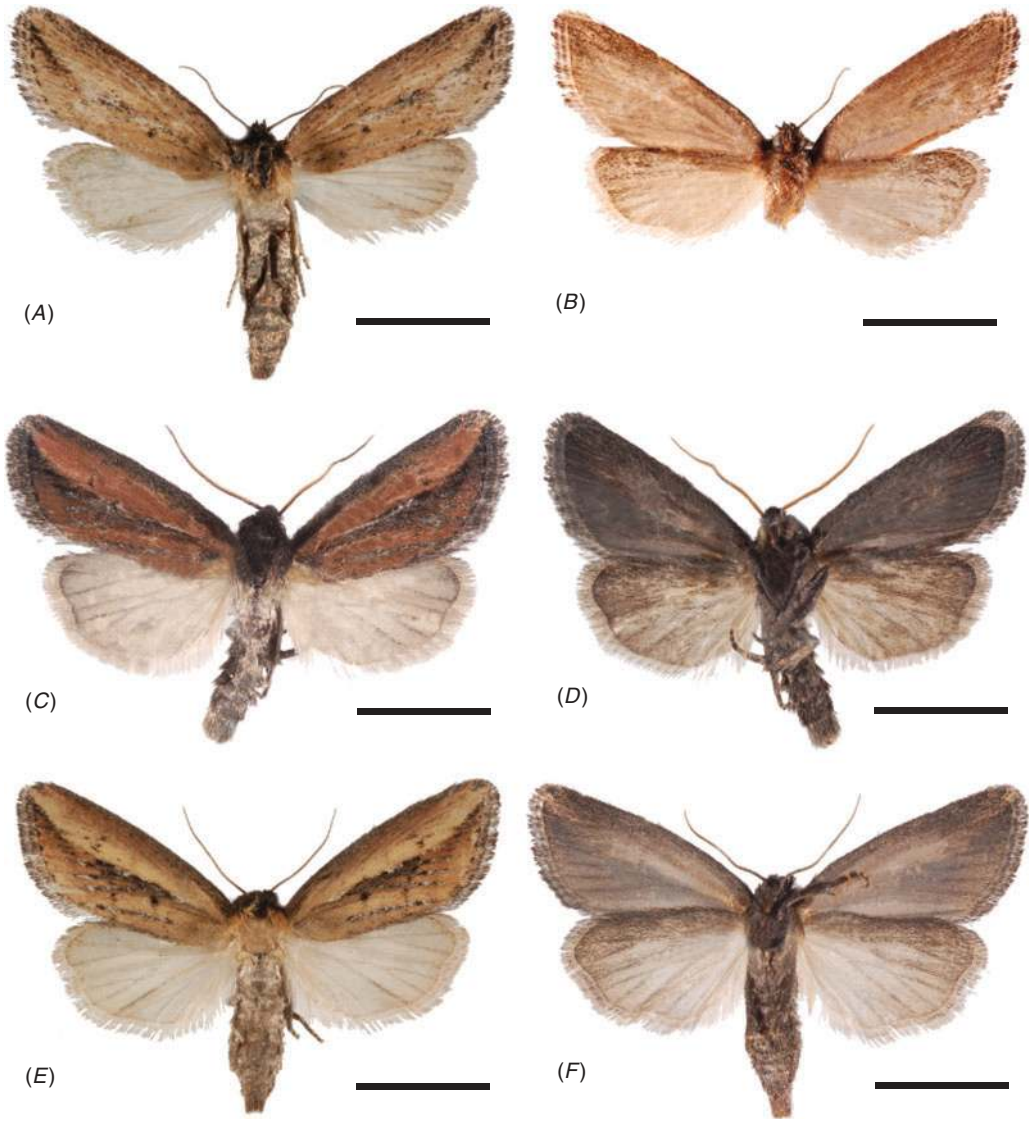

Fig. 5. Adults of *Acrapex* species. (*A, B*) *A. salmona*: (*A*) female upper side, (*B*) female under side. (*C–F*) *A. sporobola*: (*C*) male upper side, (*D*) male under side; (*E*) female upper side, (*F*) female under side. Scale bar = 5 mm.

Distribution

Tanzanian, Ruvuma region, south of Songea area (Fig. 11). The species was found in wet Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) vegetation mosaic (White, 1983).

Remarks

Acrapex mitawa is externally very similar to that of *albivena*; separation of the species is only possible with the genitalia, much more compact in *mitawa* with a length/width ratio of 2.1 compared to 2.5 for *A. albivena*; also the two-lobed sclerotisation of the manica much more rounded at tip in *mitiw*a compared to *A. albivena*.

Etymology

Named after the village of Mitawa in Tanzania.

Acrapex salmona Le Ru, sp. nov.

(Figs 5*A*, *B*, 9*E*, 10*E*, 11)

urn:lsid:zoobank.org:act:F30661B5-8115-411B-886D-032A7FA22055

Material examined

Holotype. Female, South Africa: North West region: Ventersdorp, 26°18.078′S, 26°49.746′E, 1488 m, 02 Feb 2007, ex larva (in stem of *Sporobolus macranthelus* Chiov.), B. Le Ru leg., gen. prep. LERU Bruno/G508, MNHN, Paris.

Description (Fig. 5*A, B*)

Female: antennae buff, filiform, flagellum adorned dorsally with fuscous scales, palpus fuscous, eyes fuscous; head and base of thorax brown-black, thorax becoming gradually salmon. Legs salmon ringed with fuscous, bright fuscous on inner surface; ground-colour of abdomen salmon with fuscous areas. Forewing:

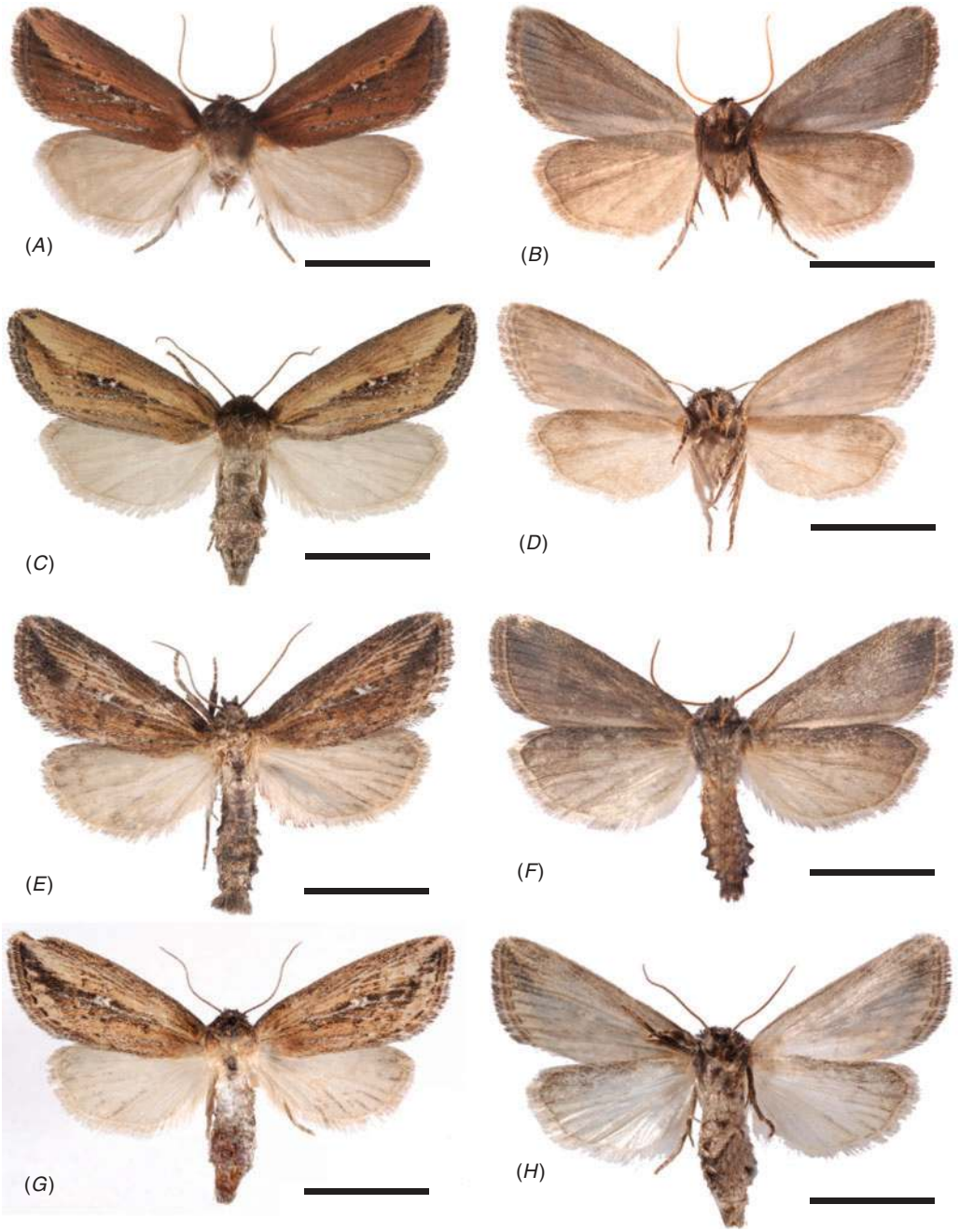

Fig. 6. Adults of *Acrapex* species. (*A–D*) *A. misysciaa*: (*A*) male upper side, (*B*) male under side, (*C*) female upper side, (*D*) female under side. (*E–H*) *A. yakobaa*: (*E*) male upper side, (*F*) male under side; (*G*) female upper side, (*H*) female under side. Scale bar = 5 mm.

ground-colour salmon slightly suffused with ochreous, fuscous and black scales, more heavily on the costal area; reniform indicated by few white scales, preceded by some black scales; a longitudinal and narrow white-fuscous median fascia along lower external margin of the cell, ending obliquely black to apex; the veins below the cell adorned with white, fuscous and black scales; a postmedial row of black elongated spots between the veins; fringe salmon-fuscous. Hindwing: ground colour white, veins slightly suffused with fuscous scales, costal, apex and termen more heavily suffused with fuscous scales; fringe white adorned with a narrow salmon line. Underside of the forewing with ground-colour bright ochreous suffused with brown-fuscous scales on the costal and apex margin areas. Underside of hindwing white suffused with fuscous scales but more heavily on costa, apex and termen; veins slightly irrorated with fuscous scales.

Wingspan: 24 mm (female) ($n = 1$).

Female genitalia (Fig. 9*E*): corpus bursae elongated ovoid without signa; ductus bursae short about one third the length of

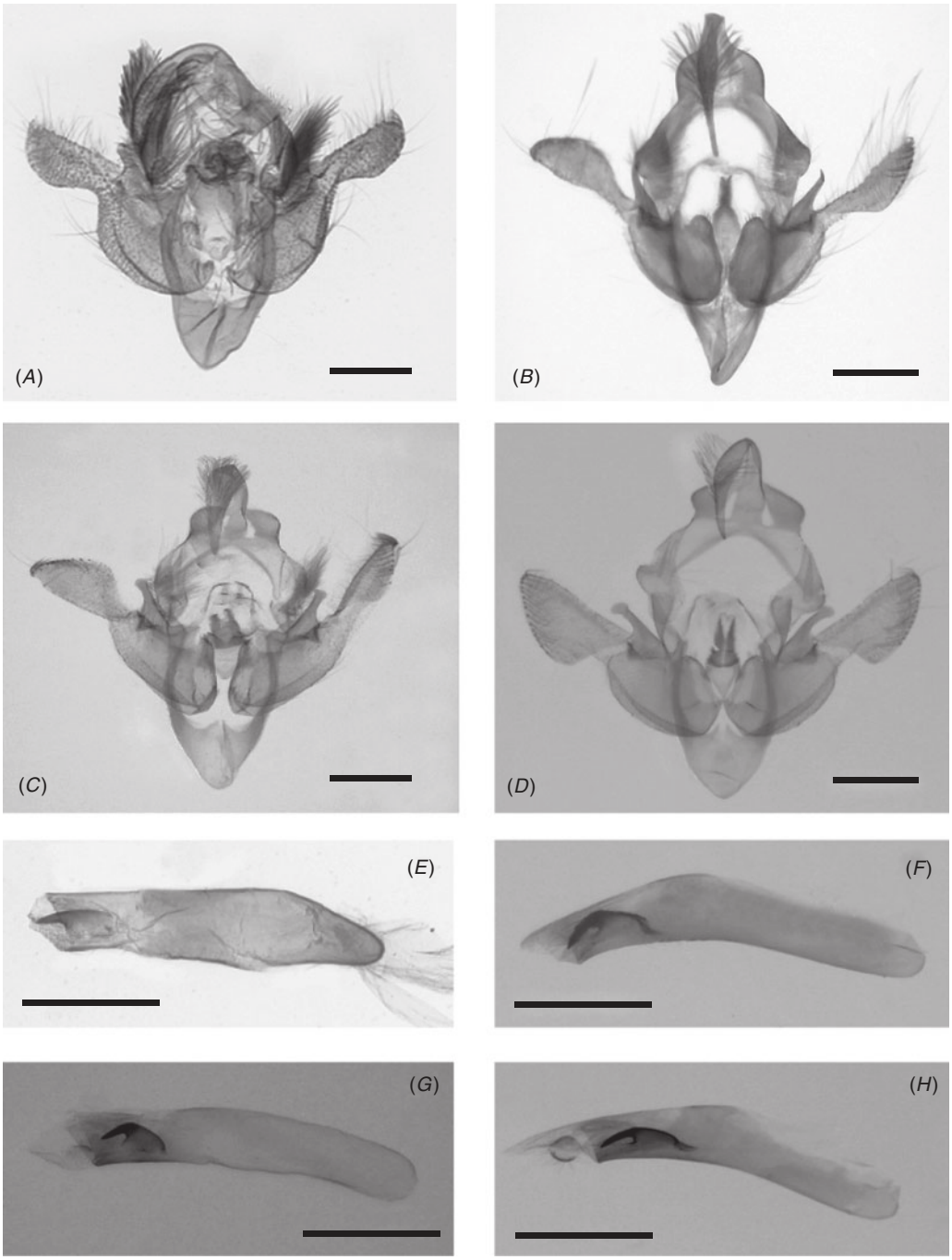

Fig. 7. Male genitalia of *Acrapex* species. (*A*, *E*) *A. brunneella*. (*B*, *F*) *A. mpika a*. (*C*, *G*) *A. stygiata*. (*D*, *H*) *A. subalbissima*. Scale bar = 0.5 mm.

corpus bursae without sclerotisation at base, widening on the ostium side, ending in a narrow sclerotised ring similar to that of *albivena*. Antrum narrow band-like without sclerotisation, slightly leaning on the back; anterior apophyses as long as posterior ones; ovipositor lobes 2.4 times longer than wide, with dorsal surface bearing numerous short ands stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*E*): length, 20–25 mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield very pale; body with ground colour yellow buff, heavily suffused with pink, pinacula and caudal plate bright brown. Young larvae are very similar to that of mature ones.

Bionomics

Similar to that of previous species, *A. salmona* is a hygrophilous species found on banks of marshes. Larvae were collected in *Sporobolus macranthelus* Chiov. and cogongrass stems. For the biology of larvae collected on cogongrass, refer to *A. stygiata*. The

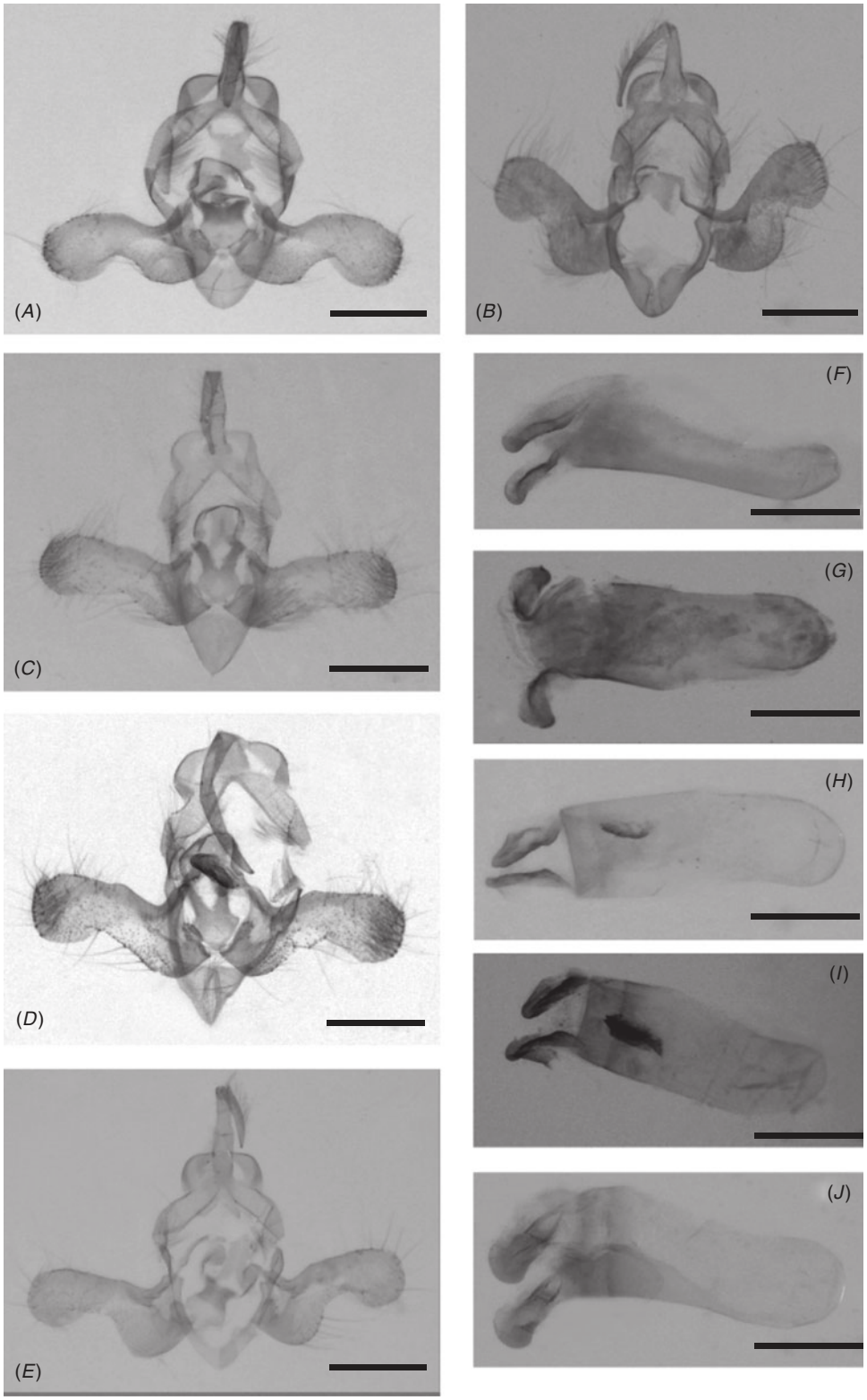

Fig. 8. Male genitalia of *Acrapex* species. (*A*, *F*) *A. albivena*. (*B*, *G*) *A. mitawa*. (*C*, *H*) *A. sporobola*. (*D*, *I*) *A. syscia*. (*E*, *J*) *A. yakoba*. Scale bar = 0.5 mm.

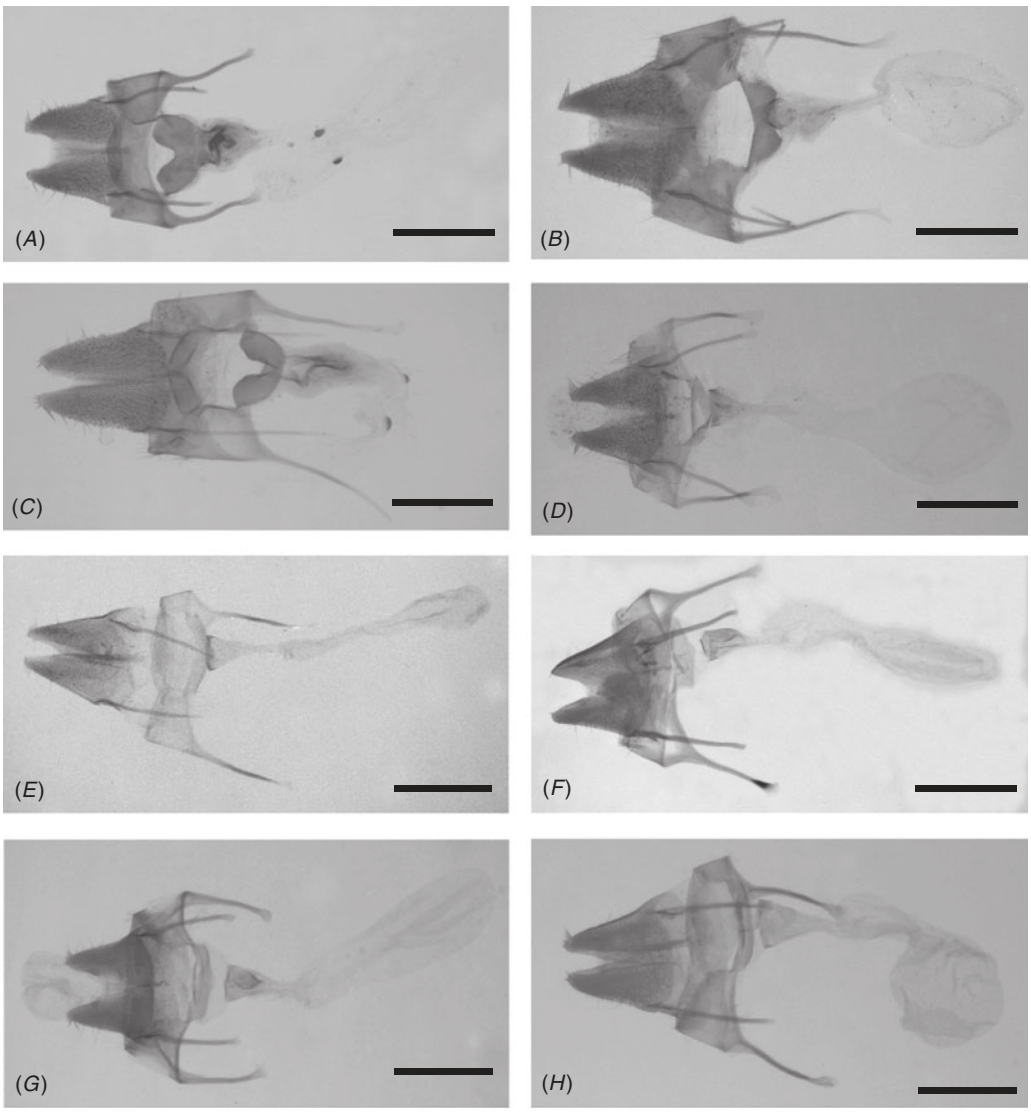

Fig. 9. Female genitalia of *Acrapex* species. (*A*) *A. mpika*. (*B*) *A. stygiata*. (*C*) *A. subalbissima.* (*D*) *A. albivena*. (*E*) *A. salmon*. (*F*) *A. sporobola.* (*G*) *A. syscia. (H*) *A. yakoba.* Scale bar = 1 mm.

biology of the larvae collected from *S. macranthelus* was different; larvae were found at the top of young flowering stems, usually at the bottom of the inflorescence, always solitary. Typically, stems exhibiting signs of infestation by *A. salmona* larvae presented dead heart inflorescences. Damaged stems had a small hole (ca. 2 mm diameter) located ~10–20 cm below the top of the inflorescence; we did not observed any additional holes as seen in infested cogongrass. No pupae were found in stems, and therefore borers probably pupate in the soil. Like in cogongrass, we suspect that one larva may feed on multiple stems before pupating.

Distribution

South Africa in North-west region (Fig. 11). The species was found in wetter Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) vegetation mosaic (White 1983).

Remarks

Acrapex salmona is very similar to that of *A. albivena*. Forewings of *A. salmona* females are paler than *A. albivena* and the veins of the later in the costal and apex areas are adorned with white scales. Post-vaginal plate without sclerotisation in *A. salmona* and wider than in *A. albivena*; ovipositor lobes longer in *A. salmona* than in *A. albivena*.

Etymology

Named after the ground colour of the upperside of the forewing.

Acrapex sporobola Le Ru, sp. nov.

(Figs 5*C–F*, 8*C*, *H*, 9*F*, 10*F*, 11)

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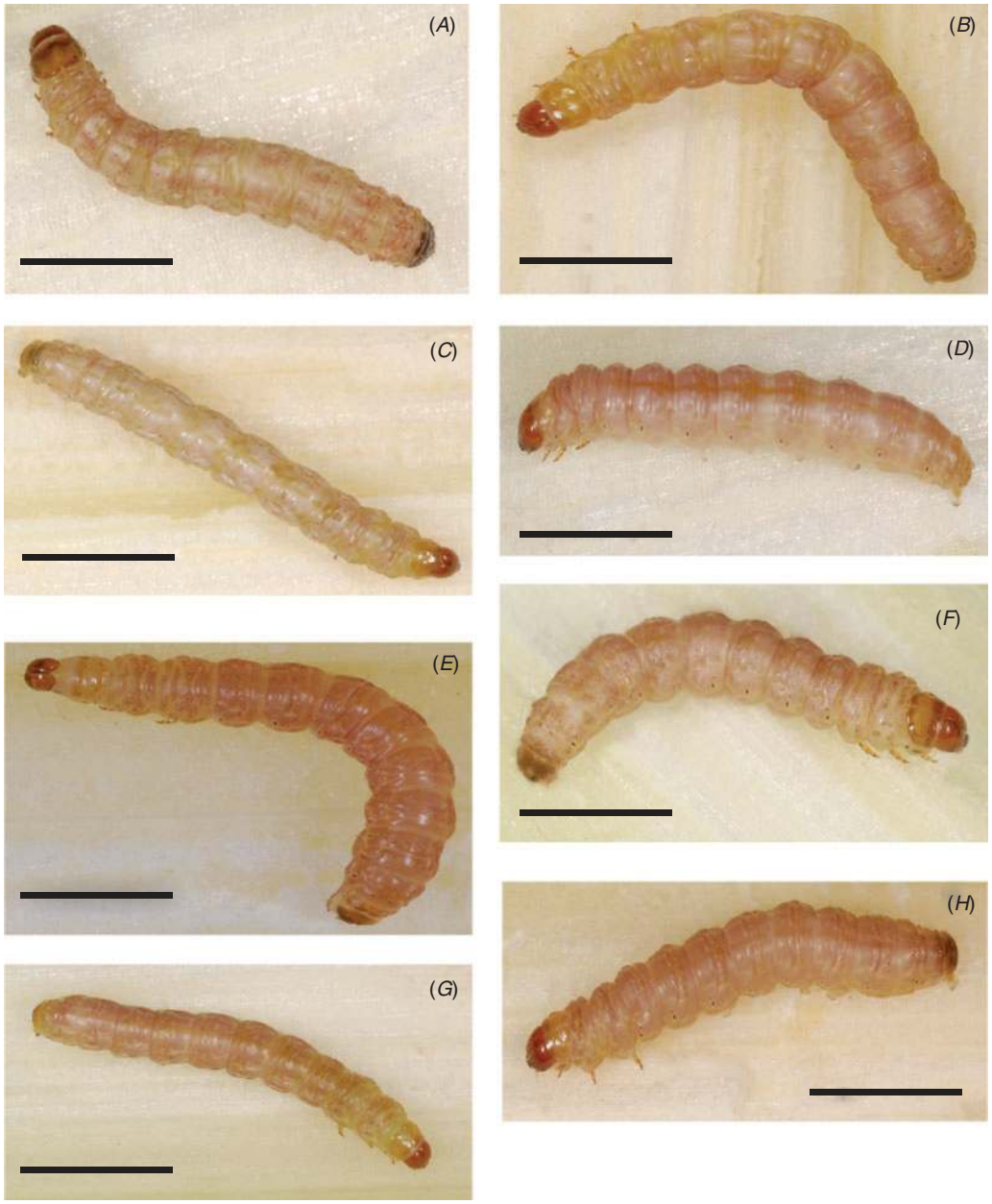

Fig. 10. Last instar larvae of *Acrapex* species. (*A*) *A. stygiata*. (*B*) *A. subalbissima*. (*C*) *A. albivena*. (*D*) *A. mitawa*. (*E*) *A. salmon*. (*F*) *A. sporobola*. (*G*) *A. syscia*. (*H*) *A. yakoba*. Scale bar = 5 mm.

Material examined

Holotype. Male, Kenya: Central: Ruiru, 00°05.459′S, 36°54.671′E, 1568 m, May 2005, ex larva (in stem of *Sporobolus macranthelus* Chiov.), B. Le Ru leg., gen. prep. LERU Bruno/G50, MNHN, Paris.

Paratypes. Same locality as holotype, 2M May 2005, 3F May 2005, 1F May 2005, gen. prep. LERU Bruno/G51, 1F Dec 2010, gen. prep. LERU Bruno/G357, 1M Dec 2010, gen. prep. LERU Bruno/G359, MNHN, Paris; same data as holotype, 1M May 2005, 1F Dec 2010, NMK, Kenya.

Description (Fig. 5*C–F*)

Both sexes look similar, however the general shape of the female forewing is more elongated at the apex than in the male and is paler; antennae bright fuscous dorsally and buff ventrally, filiform and slightly ciliate in the male; flagellum adorned dorsally with black scales, palpus fuscous black, eyes fuscous. Head and base of thorax black, thorax becoming gradually fuscous in male; head and base of thorax fuscous tinged with buff, thorax becoming gradually buff in female. Legs fuscous ringed with buff, black fuscous on inner surface; abdomen fuscous irrorated with buff scales. Forewing: ground-colour ochreous brown in male, buff in female, suffused with fuscous scales in the costal area in male, with ochreous and fuscous scales in the female; reniform indicated by few white scales, surrounded by some black scales, sometimes absent; a longitudinal black-brown median fascia

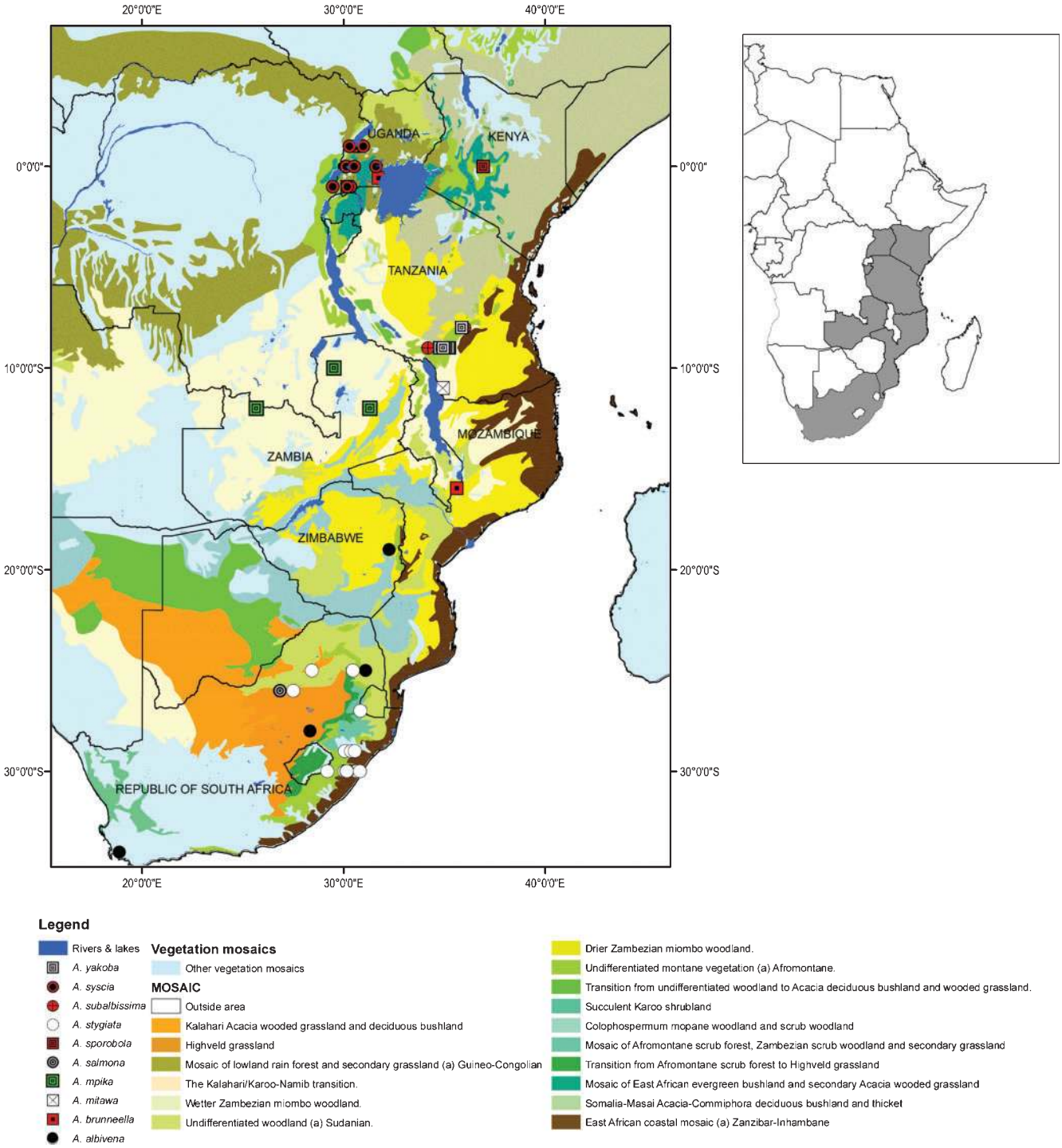

Fig. 11. Distribution map of *Acrapex* species.

along lower external margin of the cell, variable in area, ending obliquely at apex; the veins below the cell adorned with white, fuscous and black scales; a postmedial row of black elongated spots between the veins; fringe fuscous externally, black fuscous internally in male, fuscous and buff in female. Hindwing: ground colour white suffused with fuscous scales, veins irrorated with fuscous scales, apex more heavily suffused with fuscous scales; fringe white with some fuscous scales, adorned with a narrow fuscous line. Underside of the forewing with ground-colour fuscous-black suffused with fuscous scales in male, bright fuscous suffused with buff scales in female. Underside of hindwing white uniformly suffused with fuscous scales but

Table 1. Localities at which specimens of the *Acrapex stygiata* and *albivena* groups were collected

Country	Locality	Latitude	Longitude	Altitude (m.a.s.l.)	*Acrapex* species
Kenya	Ruiru	00°05′11″S	36°54′40″E	1568	*A. sporobola*
Malawi	Mlanje Plateau	15°58′47″S	35°35′50″E	1850	*A. brunneella*
DRC	Rutshuru	01°11′07″S	29°26′28″E	1800	*A. syscia*
South Africa	Arc-Sgi	28°10′08″S	28°18′40″E	1628	*A. albivena*; *A. stygiata*
	Buttelspoort	25°45′28″S	27°29′16″E	1260	*A. stygiata*
	Clausthal	30°15′08″S	30°48′26″E	21	*A. albivena*
	Eston Beaumont	29°55′06″S	30°37′13″E	673	*A. albivena*
	Finchley-Woodburn Estate	30°14′48″S	30°01′04″E	951	*A. albivena*; *A. stygiata*
	Karkloof River	29°13′25″S	30°02′27″E	1128	*A. stygiata*
	Lydenburg	25°05′29″S	30°26′30″E	1433	*A. stygiata*
	Minerva Game Reserve	29°47′16″S	30°11′09″E	1584	*A. albivena*
	New Hanover	29°21′14″S	30°32′03″E	750	*A. stygiata*
	Nwati	29°48′19″S	30°06′15″E	1043	*A. albivena*; *A. stygiata*
	Nylstroom	24°42′07″S	28°24′28″E	1179	*A. stygiata*
	Oak Hotel- Byrne	29°49′09″S	30°10′25″E	1069	*A. albivena*; *A. stygiata*
	Piet Retief	27°00′15″S	30°48′28″E	1269	*A. stygiata*
	Rustfontein	30°26′27″S	29°10′36″E	1505	*A. albivena*; *A. stygiata*
	Schevers farm	29°10′28″S	30°21′14″E	1053	*A. stygiata*
	Stellenbosh	33°55′11″S	18°51′21″E	136	*A. albivena*
	Umkomaas	30°12′03″S	30°47′23″E	37	*A. stygiata*
	Ventersdorp	26°18′03″S	26°49′45″E	1488	*A. salmona*
	Water Ford	29°50′29″S	30°08′32″E	1124	*A. albivena*; *A. stygiata*
	White River	25°18′26″S	31°04′17″E	652	*A. albivena*
Tanzania	Chai	09°27′08″S	35°0934″E	1737	*A. yakoba*
	Dabaga	08°01′32″S	35°51′07″E	1832	*A. yakoba*
	Debulidi	09°13′44″S	34°56′24″E	1757	*A. yakoba*
	Iboya 1	09°25′27″S	35°03′41″E	1664	*A. yakoba*
	Iboya 2	09°25′27″S	35°04′31″E	1656	*A. yakoba*
	Iboya 3	09°25′21″S	35°05′03″E	1664	*A. yakoba*
	Idofi	08°48′11″S	34°50′34″E	1629	*A. yakoba*
	Ihang′ana	09°19′32″S	35°14′16″E	1510	*A. yakoba*
	Ikonda	09°15′21″S	34°10′17″E	2200	*A. subalbissima*
	Kabulube	09°16′16″S	34°57′56″E	1681	*A. yakoba*
	Kidegembye	09°16′24″S	34°58′15″E	1652	*A. yakoba*
	Mitawa	11°07′21″S	34°54′27″E	1480	*A. mitawa*
	Mtakuja	09°15′24″S	35°10′34″E	1624	*A. yakoba*
	Musonza 1	08°06′05″S	35°56′25″E	1789	*A. subalbissima*
	Musonza 2	08°09′01″S	35°58′57″E	1582	*A. subalbissima*
	Musonza 3	08°08′39″S	35°58′50″E	1550	*A. subalbissima*
	Ngonwa	09°29′39″S	35°03′08″E	1662	*A. yakoba*
	Njombe	09°19′32″S	34°45′40″E	1852	*A. yakoba*
	Nyalithi	09°16.11″S	34°57′43″E	1705	*A. yakoba*
	Yakobi	09°24′41″S	34°56′22″E	1693	*A. yakoba*
	Yakobi 2	09°23′35″S	34°55′38″E	1657	*A. yakoba*
Uganda	Ankole 2	00°24′56″S	30°06′35″E	1597	*A. syscia*
	Fort Portal	00°39′09″N	30°16′27″E	1480	*A. syscia*
	Ibanda	00°07′20″S	30°30′14″E	1832	*A. syscia*
	Kalinzu Forest 2	00°23′16″S	30°05′06″E	1459	*A. syscia*
	Katanga	00°22′02″S	30°06′43″E	1447	*A. syscia*
	Kiyoko	00°20′56″S	31°35′18″E	1203	*A. syscia*
	Kyogyera	00°33′28″S	30°19′36″E	1525	*A. syscia*
	Mukole	00°45′15″N	30°43′43″E	1384	*A. syscia*
	Mulema	00°34′05″S	31°43′05″E	1219	*A. brunneella*
	Ntuntu-Nyehara forest	00°41′53″N	30°32′51″E	1568	*A. syscia*
	Nyamalunda	00°53′09″N	30°57′09″E	1250	*A. syscia*
	Nyongozi	00°45′25″S	30°18′35″E	1455	*A. syscia*
	Rukondo	00°42′04″S	30°09′55″E	1485	*A. syscia*; *A. sporobola*
Zambia	Chalwe	10°26′24″S	29°30′02″E	1295	*A. mpika*
	Mpika	12°04′17″S	31°17′09″E	1423	*A. mpika*
	Rwanko Azhi	12°13′12″S	25°39′03″E	1413	*A. mpika*
Zimbabwe	Mt Chirinda	19°14′23″S	32°14′13″E	–	*A. albivena*

more heavily on costa, apex and termen; veins irrorated with fuscous scales.

Wingspan: 23–24 mm (males) ($n = 5$); 23–25 mm (females) ($n = 6$).

Male genitalia (Fig. 8*C*, *H*): uncus long and narrow, tapering in truncate apex, tufted with hairs on the upper half; valves similar to that of *A. albivena* but less rounded along ventral margin at base, slightly constricted at middle but not rounded, broadly rounded at apex with a corona, ventral surface covered with papillated bristly short hairs; the juxta slightly pyriform without sclerotisation at the base, with a short wide sclerotised neck longly bilobate, each lobe curved to the exterior, the same width along the full length, with the apex truncate; aedeagus short and massive, three times as long as its shortest width, manica with a two-lobed sclerotisation, less than one third length of the aedeagus, vesica with an elongated cornutus shorter than the manica lobe, plate-like without acuminated edge.

Female genitalia (Fig. 9*F*): corpus bursae elongated ovoid without signa; ductus bursae about one third length of corpus bursae, not sclerotised on bursa side, widening and sclerotised on the ostium side. Antrum narrow band-like, slightly sclerotised and leaning on the back; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide (less than 2 times longer than wide) with dorsal surface bearing numerous short ands stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*F*): length, 20–25 mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield very buff-brown; body with ground colour buff, suffused with pink, pinacula pale buff and caudal plate brown. Young larvae are very similar to that of mature ones.

Bionomics

Acrapex sporobola is a markedly hygrophilous species of banks of streams, rivers and marshes. *Acrapex sporobola* larvae were found in one locality in Western Uganda in cogongrass stems and in one locality in Central Kenya in *Sporobolus macranthelus* stems. For the biology refer to *A. stygiata* for larvae collected on cogongrass and to *A. salmona for* those ones collected in *Sporobolus.*

Distribution

Central Kenya Central and western Uganda (Fig. 11). The species was found in Afromontane (Mosaic no 19) and transitional East African evergreen bushland and secondary Acacia wooded grassland (Mosaic no 45) vegetation mosaics (White 1983).

Remarks

Acrapex sporobola is very similar to that of *A. syscia*. The females of both species cannot be separated morphologically. Only males can be differentiated at genitalia level; the external margin of the constricted middle of the valves forming an elbow bend in *A. syscia*, absent or attenuated in *sporobola*; the two lobes of the juxta narrowing to the apex in *A. syscia*, with the same width along the all length in *sporobola*; the cornutus on the vesica is much smaller in *A. sporobola* than in *A. syscia*. The close relationships of the two species is also supported by the results of the molecular analyses, which groups the two species with a very high level of support (BV of 100% and CPP of 1.0).

Etymology

Named after the host-plant *Sporobolus macranthelus* in Kenya.

Acrapex syscia Fletcher

(Figs 6*A–D*, 8*D*, *I*, 9*G*, 10*G*, 11)

Acrapex syscia Fletcher, 1961: Noctuidae, Ruwenzori expedition 1952. P. 215, figs 264- 265 (sp. nov.); Poole, 1989: Noctuidae; *Lepidopterorum catalogus* (Lepidopterorum Catalogus New Series, Fasc. 118), Part 1 and 2 (catalogue).

Material examined

Holotype. Male, Uganda: Ruwenzori Range: Ibanda, 4700 ft, 04–12 Sep 1952, Fletcher coll., Ruwenzori Exped. B. M. 1952–566, Noctuidae genitalia slide N° 2464, BMNH, London.

Paratypes. Same data as holotype, 2M, Noctuidae genitalia slide N° 2432–2465, BMNH, London.

Other material examined. **UGANDA: Fort Portal:** 5000 ft, Dec 1934–Jan1935, Edwards coll., 1M, BMNH, Londres. **RDC:** Rutshuru, Kilinga, Jun 1936, 1M, gen. prep. Berio N° 5100, MCSN, Milan. **UGANDA:** Kyogyera, 00°33.453'S, 30°19.593', 1525 m, 14 May 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1F gen. prep. LERU Bruno/G351, 1F, MNHN, Paris; Ntuntu, 00°41.870′S, 30°32.858′E, 1568 m, 17 May 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1F gen. prep. LERU Bruno/G353, 1M gen. prep. LERU Bruno/G354, 1M, 1F, MNHN, Paris; Nyongozi, 00°45.437'S, 30°18.580'E, 1455 m, 12 May 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1M gen. prep. LERU Bruno/G468, 2F, MNHN, Paris.

Supplementary description

The female is described here for the first time, it looks similar to that of the male, however the general shape of the female forewing is more elongated at the apex than in the male and is paler. Additions to previous description (Fig. 6*a–d*): antennae ochreous, filiform in both sexes and almost serrate in males, flagellum adorned dorsally with black scales, palpus fuscous, eyes fuscous. Legs fuscous brown ringed with white, black fuscous on inner surface; abdomen fuscous irrorated with ochreous scales. Forewing: ground-colour ochreous in male, ochreous–buff in female, suffused with fuscous and white scales in the costal area and with areas between veins suffused with brown scales; reniform indicated by few white scales, preceded by some black scales, sometimes absent; a longitudinal black-brown median fascia along lower external margin of the cell, variable in area, widening to the termen and ending obliquely at apex; the veins below the cell adorned with white, fuscous and black scales; a postmedial row of black elongated spots between the veins; fringe black fuscous. Hindwing: ground colour white to white, veins slightly irrorated with fuscous scales, termen more heavily suffused with fuscous scales; male hindwing more suffused with fuscous scales than female hindwing; fringe bright fuscous in male, white in female, adorned with a narrow fuscous line. Underside of the forewing with ground-colour fuscous- brown, suffused with fuscous and white scales on the costal and apex areas. Underside of hindwing white uniformly suffused with fuscous scales but more heavily on costa, apex and termen; veins slightly irrorated with fuscous scales.

Wingspan: 23–25 mm (males) ($n = 13$); 23–25 mm (females) ($n = 9$).

Male genitalia (Fig. 8*D*, *I*): the description of male genitalia was made by Fletcher (1961); additional description: uncus long and narrow, tapering in truncate apex, tufted or not with hairs on the upper half; valves similar to that of *albivena* but less rounded along ventral margin at base, not roundly constricted at middle, broadly rounded at apex, the external margin of the constricted middle forming an elbow bend; the juxta slightly pyriform without sclerotisation at the base, with a short, wide, sclerotised neck longly bilobate, each lobe slightly curved to the exterior and narrowing to the apex almost truncate; aedeagus short and massive, three times as long as its shortest width, manica with a two-lobed sclerotisation, less than one third length of the aedeagus, vesica with an elongated cornutus same length as the manica lobe, ending with two small teeth.

Female genitalia (Fig. 9*G*): corpus bursae elongated ovoid without signa; ductus bursae about one-third length of corpus bursae, non sclerotised on bursa side, widening and sclerotised on the ostium side. Antrum narrow band-like, slightly sclerotised and leaning on the back; anterior apophyses as long as posterior ones; ovipositor lobes relatively short and wide (less than 2 times longer than wide) with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*G*): length, 20–25 mm, width, 2.5 mm; head smooth, orange brown, prothoracic shield very pale buff; body with ground colour white, slightly suffused with pink, pinacula pale buff and caudal plate brown. Young larvae are very similar to that of mature ones.

Bionomics

Similar to that of previous species, *A. syscia* is a markedly hygrophilous species of banks of streams, rivers and marshes. *A. syscia* larvae were common in Western Uganda in cogongrass stems. For the biology refer to *A. stygiata.*

Distribution

Western Uganda and eastern Democratic Republic of Congo (Fig. 11). The species was found in Afromontane (Mosaic no 19), transitional East African evergreen bushland and secondary *Acacia* wooded grassland (Mosaic no 45) and lowland rain forest and secondary grassland (Mosaic no 11) vegetation mosaics (White 1983).

Remarks

In contrast to *A. albivena*, the veins of the coastal area of the forewings of *A. syscia* are not adorned with white scales. The sclerotised neck of the juxta is longly bilobate in *A. syscia* whereas it is shortly bilobate in *A. albivena*; post-vaginal plate much more developed and wide in *A. albivena* than in *A. syscia*.

Acrapex yakoba Le Ru, sp. nov.

(Figs 6*E–H*, 8*E*, *J*, 9*H*, 10*H*, 11)

urn:lsid:zoobank.org:act:F939DDB0-343D-4AF4-BD27-999785E90131

Material examined

Holotype. Male, Tanzania: Iringa region: Yakobi, 09°24.688′S, 34°56.374′E, 1693 m, 11 March 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., gen. prep. LERU Bruno/G327, MNHN, Paris.

Paratypes. Same data as holotype, 2M, 3F, 1M gen. prep. LERU Bruno/G466, 2F gen. prep. LERU Bruno/G328–564, MNHN, Paris; same data as holotype, 2M, 2F, NMK, Kenya; Idofi, 08°48.185′S, 34°50.570′E, 1629 m, 14. Mar 2009, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 2M, 3F, 1M gen. prep. LERU Bruno/G329, MNHN, Paris; Njombe, 09°19.548′S, 34°45.698′E, 1852 m, 1 Mar 2008, ex larva (in stem of *Imperata cylindrica* (L.) P. Beauv.), B. Le Ru leg., 1M gen. prep. LERU Bruno/G326, MNHN, Paris.

Description (Fig. 6*e–h*)

Males and females look similar, however the general shape of the female forewing is more elongated at the apex than in the male and is paler; antennae bright fuscous dorsally and buff ventrally, filiform in both sexes and slightly ciliate in males, flagellum adorned dorsally with fuscous scales, palpus fuscous, eyes fuscous. Head and base of thorax brown-black tinged with buff, thorax becoming gradually buff. Legs fuscous, ringed with buff, buff on the inner surface; abdomen fuscous irrorated with ochreous scales. Forewing: ground-colour buff in both sexes, suffused with ochreous and fuscous scales, more heavily in the costal area; reniform indicated by few white scales, preceded by some black scales, sometimes absent; a longitudinal black median fascia along lower external margin of the cell, variable in area, ending obliquely at the apex; the veins below the cell adorned with white, fuscous and black scales; a postmedial row of black elongated spots between the veins; fringe fuscous externally, buff suffused with black internally. Hindwing: ground colour white to white, veins slightly irrorated with fuscous scales, costa and apex more heavily suffused with fuscous scales; male hindwing much more suffused with fuscous scales than female; fringe white suffused with fuscous and adorned with a narrow fuscous line. Underside of the forewing with ground-colour fuscous, suffused with white scales in the costal area. Underside of hindwing white uniformly suffused with fuscous scales but more heavily on costa and apex; veins slightly irrorated with fuscous scales.

Wingspan: 24–26 mm (males) ($n = 10$); 25–28 mm (females) ($n = 8$).

Male genitalia (Fig. 8*E*, *J*): uncus long and narrow, tapering to a fine point, tufted with hairs on the upper half; valves similar to that of *albivena*, rounded along ventral margin but with a tight angle at base, roundly constricted at middle, the external margin of the constricted middle forming an elbow bend like in *A. syscia*, broadly rounded at apex with a corona, ventral surface covered with papillated bristly short hairs; the juxta rounded without sclerotisation at the base, with a short sclerotised neck, very shortly bilobate, each lobe slightly curved to the exterior; aedeagus slightly curved, short and stout, manica with a two-lobed sclaerotization strongly rounded at tip, almost one third length of the aedeagus, vesica without cornuti.

Female genitalia (Fig. 9*H*). Corpus bursae long, globular at the tip, ovoid at the base, without signa; ductus bursae about one third length of corpus bursae, non sclerotised on bursa side, widening and ending in a narrow sclerotised ring on the ostium side. Antrum narrow band-like slightly sclerotised, leaning on the back and adorned with a very narrow and strongly sclerotised plate in the middle; anterior apophyses as

long as posterior ones; ovipositor lobes 2.3 times longer than wide, with dorsal surface bearing numerous short and stout setae, the ventral side of each lobe curved and tooth-shaped.

Larvae L5 instar (Fig. 10*H*): length, 20–25 mm, width, 2.5 mm.; head smooth, orange brown, prothoracic shield very pale buff; body with ground colour buff, heavily suffused with pink, pinacula and caudal plate brown. Young larvae are very similar to that of mature ones.

Bionomics

It is a hygrophilous species of banks of streams, rivers and marshes Larvae were collected in cogongrass stems; for the biology of larvae refer to *A. stygiata.*

Distribution

Tanzania, Iringa region in Njombe area (Fig. 11). The species was found in wetter Zambezian miombo woodland (dominated by *Brachystegia*, *Julbernardia* and *Isoberlinia*) (Mosaic no 25) vegetation mosaic (White 1983).

Remarks

Acrapex yakoba is externally similar to that of *A. albivena*, however ground colour of forewings is ochreous in *A. albivena* and buff in *A. yakoba*; the neck of the juxta is wider in *A. albivena* than in *A. yakoba*; the two-lobed sclerotisation of the manica are much more strongly rounded in *A. yakoba* than in *A. albivena*. Post-vaginal plate wider and less sclerotised in *A. yakoba*; ovipositor lobes shorter and wider in *A. albivena*.

Etymology

Named after the village of Yakobi in Tanzania.

Final considerations

This study documented six new species of *Acrapex* in two species groups. Considering that *Acrapex* is by far the most diverse genus of the Sesamiina with at least 83 species (71 known species in Africa), it seems very likely the *Acrapex* species diversity in Sub-Saharan Africa is greatly underestimated. Among the many *Acrapex* specimens collected by our team during the last ten years from both host-plants and in light traps, many additional new species have been collected and will be described in future papers. The new information presented here on the ecology and taxonomy of noctuid stem borers not only increases our knowledge of insect biodiversity in Africa, but may also have application for biological control of cogongrass in the south-eastern USA, where it is highly invasive. Historically, gramineous weeds have not been considered good targets for biological control because of a perceived lack of specialised insect herbivores (Bernays 1985; Tscharntke and Greiler, 1995; Massey *et al*. 2006) and the high economic value of crop grasses (Wapshere 1990; Pemberton 2002). However, investigations on several weedy grasses, including *Phragmites australis* (Cav.) Trin ex Steudal (Tewksbury *et al*. 2002), *Spartina alterniflora* Loisel (Grevstad *et al*. 2003), *Arundo donax* L. (Goolsby and Moran 2009; Goolsby *et al*. 2009), and *Hymenachne amplexicaulis* (Rudge) Nees (Diaz *et al*. 2009, 2010) have demonstrated the presence of specialised insect herbivores. Moreover, an investigation in Java identified a specialist stem-galling cecidoymid on cogongrass (Mangoendihardjo 1980). In the present study, seven of the *Acrapex* species examined fed on cogongrass, and four of them (*A. mitawa, A. subalbissima, A. syscia, A. yakoba*) were found exclusively on cogongrass, despite sampling of several other grasses concurrently at the same locations. Similarly, in Japan *A. azumai* is thought to feed exclusively on cogongrass (Takasu *et al*. 2014). Thus, one or more *Acrapex* spp. may have value as biological control agents. As with all introduced weed biological control agents in the USA, extensive host range testing in a quarantine laboratory, would be required before approval for field release.

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