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A revision of the *Apamea fasciata* (Leech, 1900) species complex (Noctuidae, Xyleninae, Apameini)

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Abstract: The *Apamea fasciata* (Leech, 1900) species complex is revised, five new species, *A. norbertkeili* (Nepal), *A. stangelmaieri* (Nepal), *A. bernhardmayi* (India, Khasis), *A. ploessli* (Taiwan) and *A. ericmetzleri* (Nepal) are described.

Keywords: *Apamea fasciata* - species complex - new species - Himalayan-Sino-Taiwanese region.

INTRODUCTION

The curiosity of the *Apamea fasciata* (Leech, 1900) complex is most expressive in the mirror of the taxonomic constraints of the entire clade including the *fasciata* group. The species complex has long been treated as a single species (e.g. Chang, 1991; Chen, 1999; Draudt, 1950; Fu & Tzuoo, 2002, 2004; Hampson, 1908; Hreblay *et al.*, 1998; Owada, 1992; Warren, 1911; Zilli *et al.*, 2005) despite the clearly recognisable differences in the genitalia of both sexes of the otherwise externally often confusingly similar species. Moreover, the species of the *fasciata* group represent two parallel lineages the existence of whose have been first documented only during the monographic treatment of the *Apamea* generic complex (Zilli *et al.*, 2009), together with the separation of *A. herczigi* Zilli, Varga, Ronkay & Ronkay, 2009 from *A. fasciata* (Leech, 1900). It is worth to note that the externally also somewhat similar Taiwanese endemic species, *A. ikerfasciata* Zilli, Varga, Ronkay & Ronkay, 2009 represents another, as yet monobasic, species group being rather remote taxonomically from the *fasciata* group.

The subsequent study was initiated by the investigations on certain historical southern Himalayan *Apamea* material in the NHM London from the Khasia Hills and NW India, and the new materials from Taiwan but the results remained still unpublished.

The final impulse for the clarification of the remarkably higher taxonomic diversity of the species complex was the establishment of the Jacques Plante Noctuidae Collection Project which targeted the identification of all

specimens preserved in this large collection harboured in the MHN Geneva. The detailed study of the specimens of the *Apamea fasciata* group proved the distinctness of the southern Himalayan populations formerly identified as *fasciata* from the typical population occurring in Sichuan and pinpointed the sympatric occurrence of three closely related taxa of the group in Nepal. In summary, the *Apamea fasciata* complex includes altogether seven closely related species belonging to two parallel lineages, five of which are new for the science and are described below. The 8th species of this clade, *A. ikerfasciata*, is considered as the supposed outgroup of the *Apamea fasciata* species group within the genus *Apamea* Ochsenheimer, 1816.

It is important to note that the genitalia of the true *A. fasciata* (type locality: China, Sichuan) have never been illustrated and are published here correctly for the first time. The genitalia plate 115 in the 3rd volume of the Witt Catalogue (Zilli *et al.*, 2009) illustrates in reality its sister species, *A. norbertkeili* sp. n.

MATERIAL AND METHODS

The method of surveys was traditional taxonomic, based on materials of state museums and private collections, electronic databases and large set of digitalised microscopic slides. We revised the comprehensive type material and other important voucher specimens from several internationally important European collections (see: Abbreviations).

The genital dissections were made by the technique

published by Robinson (1976), with certain modifications (Fibiger & Goater, 1997). Potassium hydroxide (15% solution KOH) was used to macerate the full abdomen. The cleaned genital capsule, everted vesica and female copulatory organ were dehydrated in 96 % ethanol; the weakly sclerotized structures were stained with eosin red or chlorazol black then mounted to Euparal.

The habitus of the specimens was photographed with a Nikon D90 camera; the images of the genitalia slides were taken partly by a Nikon Eclipse 80i photomicroscope with Nikon DS-Fi2 digital camera. The images are preserved in the photo catalogue of the Heterocera Ltd, Budapest and the image database of the Museum d'histoire naturelle, Geneva.

Terminology of genitalia follows Zilli *et al.* (2009).

ABBREVIATIONS

AZ – slide of Alberto Zilli;

BJ – slide of János Babics;

GYP – genitalia slide of Péter Gyulai;

HNHM – Hungarian Natural History Museum, Budapest, Hungary;

LG – slide of Gyula M. László;

MH – slide of Márton Hreblay;

MHNG – Muséum d'histoire naturelle, Geneva, Switzerland;

MHNG-ENTO – Individual identity code number of the Entomological Collection of the Museum d'histoire naturelle, Geneva;

NHM UK – Natural History Museum (formerly British Museum, Natural History), London, United Kingdom;

NHMW – Naturhistorisches Museum, Vienna, Austria;

NMNS – National Museum of Natural Sciences, Taichung, Taiwan;

RL – genitalia slide of László Ronkay;

VZ – genitalia slide of Zoltán Varga;

ZFMK – Zoologisches Forschungsmuseum Alexander Koenig (formerly AKM), Bonn, Germany;

ZSM – Zoologische Staatssammlung, Munich, Germany.

TAXONOMIC PART

The proper taxonomic position of the *fasciata* species group within the genus *Apamea* (subgenus *Apamea*) is discussed by Zilli *et al.* (2009). The species complex includes externally often confusingly similar species belonging to two main lineages distinguished by the configuration of the genitalia of both sexes. The first group (the *fasciata*-lineage, containing the type species) is characterised by the distally curved aedeagus (phallus) having short, globular vesica armed by 1-2 subbasally positioned, broad-based cornuti and often with a third, small, finely bulbed ventral spine in the males and by the narrow, ring-like antrum fused with the broadly calyculate

and short ductus bursae having strong, sclerotised internal crests and ribs in the female copulatory organ (Figs 1-6). The second group (the *herczigi*-lineage) possesses more elongated vesica with the ventral, bulbed cornutus sitting on a tubular, medium-long diverticulum in the males, more distinctly produced antrum and more elongated, rather tubular ductus bursae in the females, having more sclerotised, longitudinally cristate-ribbed posterior and variably large and inflated, also ribbed-rugose antero-lateral section, positioned oppositely with shortly subconical appendix bursae (Figs 7-12).

It is worth to note that the female genitalia features display much more conspicuous differences between the two lineages and the closely related species than the males; the only exception is the *fasciata-norbertkeili* species pair where the female genitalia of the two species are rather similar while the armature of the carina penis and the vesica show clearly recognisable differences (see the Figs 1-4).

The synopsis of the *Apamea fasciata* species group is as follows:

***fasciata* lineage**

fasciata (Leech, 1900)

norbertkeili sp. n.

stangelmaieri sp. n.

***herczigi* lineage**

bernhardmayi sp. n.

ploessli sp. n.

ericmetzleri sp. n.

herczigi Zilli, Varga, Ronkay & Ronkay, 2009

Apamea fasciata (Leech, 1900)

Figs 1-2, 13-14

Xylophasia fasciata Leech, 1900: 68.

Type material examined: Lectotype male, “Chia-Kou-Ho, 1700 ft. A.E. Pratt coll., July 1889”, slide No. LG3048m (coll. NHM UK). – Paralectotypes: 1 male, 1 female, “Pu-tsu-Fang, 9820 ft., Native coll. June & July 1890”; slide No. LG3049f (coll. NHM UK).

Diagnosis: *Apamea fasciata* resembles externally mostly to its allopatric twin-species, *A. norbertkeili* and *A. herczigi* by its narrow, on both sides laced inner area of marginal field with less prominent whitish ashy grey suffusion. There are no diagnostic external features between *A. fasciata* and the darker, less whitish-grey marked specimens of *A. norbertkeili* but they are well-separable by the genitalia of both sexes. *Apamea fasciata* is better distinguished from the other three Himalayan species, *A. stangelmaieri*, *A. bernhardmayi* and *A. ericmetzleri*, from the first by its larger size (wingspan 37-39 mm vs 33-36 mm, respectively) and more elongated forewings with much weaker pale

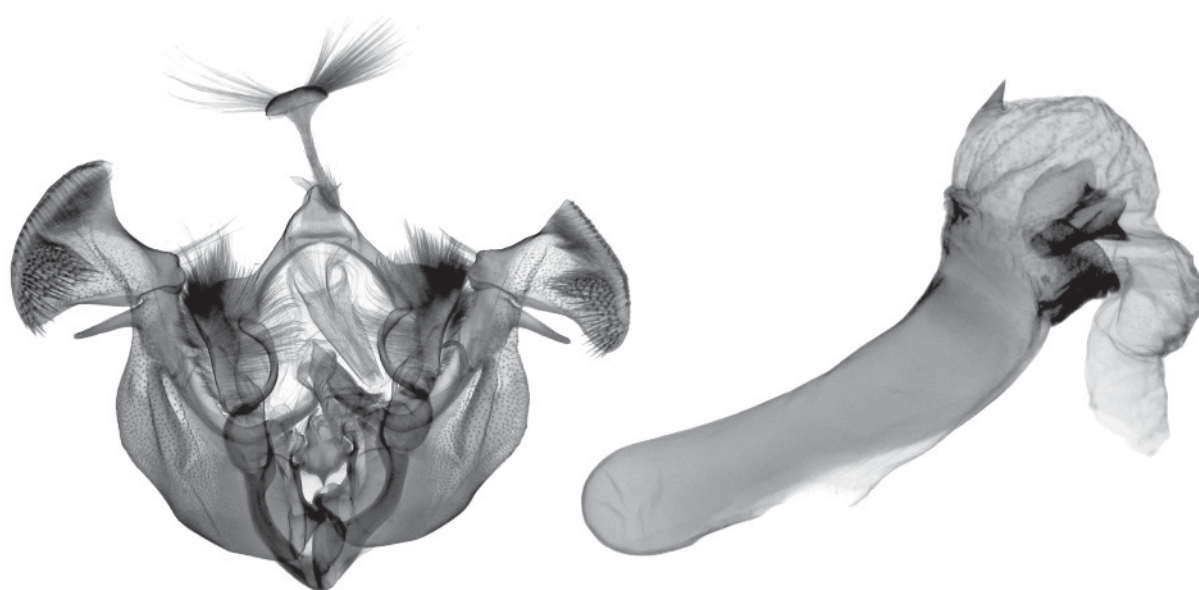


Fig. 1. *Apamea fasciata* (Leech, 1900), genitalia, LG3048m, Lectotype, China, Sichuan.



Fig. 2. *Apamea fasciata* (Leech, 1900), genitalia, LG3049f, Paralectotype, China, Sichuan.

greyish areas; from the latter two species by its broader and less elongated, apically less pointed forewings and more extensive pale grey suffusion of the basal area.

It is worth to note that the known specimens have a rather uniform external appearance; their forewing pattern is almost invariable.

The male genitalia of *A. fasciata* (Fig. 1.) differ conspicuously from those of the other two species of the *fasciata* lineage by the prominent, heavily sclerotised dorsal carinal tooth and the smooth, short ventral carinal extension of aedeagus. This feature is unique within the entire species complex, all other known members have smooth, unspecialised dorsal carinal plate and much stronger ventral carinal process with variously developed spine(s). The vesica is armed by a large, broad-based

and two smaller, conical cornuti, that of *A. norbertkeili* (Fig. 3) has two large, broad-based cornuti and a smaller but strong conical spine, while that of *A. stangelmaieri* (Fig. 5) is armed by one or two large broad-based thorns. The clasping apparatuses of *A. fasciata* and *A. norbertkeili* are also different in certain features as the cucullus of *A. fasciata* is more symmetrically developed and axe-shaped with more convex outer margin, the digitus is longer and more pointed and the juxta has narrower, more evenly rounded basal (ventral) section with more prominent ventro-medial spine.

The female genitalia of *A. fasciata* (Fig. 2) are very similar to those of *A. norbertkeili* (Fig. 4), they differ in the shape and size of the ovipositor and the sclerotised inner plates of the antrum-ductus bursae complex. In the ovipositor,

the papillae anales of *A. fasciata* are shorter and less robust than in *A. norbertkeili*, the apophyses anteriores are shorter and thinner and the internal sclerotized plates of ductus bursae are larger, more flattened, extending to the anterior end of the large semiglobular organ. The anal papillae of *A. fasciata* are proportionally shorter but broader than those of *A. stangelmaieri* (Fig. 6), the antrum-ductus bursae complex is remarkably larger, proximally more rounded and the internal sclerotised plates are less symmetrical and less quadrangular than in *A. stangelmaieri*.

Distribution: Sino-Tibetan. The species seems to be restricted to the SE Tibetan high mountains in Sichuan.

***Apamea norbertkeili* sp. n.**

Figs 3-4, 15-16

Holotype: Male, Nepal, Annapurna Himal, Noma pasture, 11 km SE Jomsom, 4000 m, 28°44,5'N, 83°48'E, 17-18.JUL.1995, leg. G. Csorba, Gy.M. László & G. Ronkay; slide No. RL12935m (coll. G. Ronkay, NHMW).

Paratypes

Nepal. West Nepal. 1 ♀, 21 km N of Dailekh, 3400 m, 1-2.AUG.1996, leg. M. Hreblay & B. Szin, MHNG-ENTO-0067520 (coll. MHNG). – 1 ♀, 20 km N of Dailekh, 3000 m, 03.AUG.1996, leg. M. Hreblay & B. Szin, MHNG-ENTO-0067519 (coll. MHNG).

Annapurna Himal. 1 ♂, 1 ♀, with same data as holotype, slide No. RL12938f (coll. G. Ronkay, NHMW). – 1 ♀, Thadung, 5 km SE Jomsom, 3450 m, 28°46'N, 83°46'E, 09.JUL.1995, leg. G. Csorba, Gy. M. László & G. Ronkay, slide No. RL12937f (coll. G. Ronkay, NHMW). – 1 ♀, Banthanti, 2500 m, 28°22,5'N, 83°43'E, 25.JUL.1995, leg. Gy. M. László & G. Ronkay, slide No. AZ1319f (coll. G. Ronkay, NHMW). – 1 ♀, Deorali, 3100 m, 83°43'E, 28°24'N, 5-6.OCT.1994, leg. G. Csorba & L. Ronkay (coll. HNHM).

Ganesh Himal. 1 ♂, 3 km SE from Somdang, 3450 m, 25.JUL.1995, 28°11'N, 83°13'E, leg. M. Hreblay & T. Csövári, MHNG-ENTO-0067545, slide No. HM8220m (coll. MHNG).

Solu Khumbu Himal. 1 ♂, Tragsindha Pass, 3000 m, 04.JUL.1993, leg. M. Hreblay & G. Csorba, slide No. RL12936m (coll. G. Ronkay, NHMW). – 2 ♀, from same locality and data, MHNG-ENTO-0067509, 0067511 (coll. MHNG). – 1 ♀, 12 km E of Lukla, Yak Kharka, 4000 m, 30.JUN.1993, leg. M. Hreblay & G. Csorba, MHNG-ENTO-0067512 (coll. MHNG). – 3 ♂, 1 ♀, Lukla, 2800 m, 02.JUL.1993, leg. M. Hreblay & G. Csorba, MHNG-ENTO-0067507, 0067508, 0067510, and 0067546 (slide RL13057m) (coll. MHNG).

Diagnosis: *Apamea norbertkeili* is the most widespread and externally most variable species of the *A. fasciata* species complex; the other known members of the

species group display no remarkable variation in the forewing colouration and pattern. It differs externally from *A. fasciata* by its on average larger size (wingspan 37-42 mm vs 37-39 mm, respectively) and more elongated wings, otherwise there are specimens of the new species which can be distinguished from *A. fasciata* only by the study of the genitalia. The forewing ground colour of the new species varies from rather pale reddish-brown to deep brown, rarely entirely pale brownish coloured specimens also can be found. The intensity of the pale whitish-grey basal and marginal suffusion is also variable from the weak or even subtle greyish shade to the prominently bluish ash-grey covering.

Apamea norbertkeili is separable from the partly sympatrically occurring *A. stangelmaieri* by its large size (wingspan 37-42 mm vs 33-36 mm), more elongated and slightly more pointed forewings with generally weaker pale basal and submarginal suffusion, and by the darker, more intensely brown suffused hindwings having sharper defined transverse line and discal spot on both surfaces. It differs from the also partly sympatric relative, *A. ericmetzleri* (and also the allopatric *A. bernhardmayi*) by its broader, less pointed forewings and the different shape of the light marking of the basal area; in addition, the latter species is larger in size, the largest known member of the group by its wingspan 42-45 mm.

The male genitalia of the new species (Fig. 3) differ conspicuously from those of *A. fasciata* (Fig. 1) by the position of the carinal thorn as it is ventral in *A. norbertkeili* but dorsal in *A. fasciata*. The clasping apparatuses of the two species are also different, the cucullus of *A. norbertkeili* is more elongated and more asymmetrical, the ventral part is longer and slenderer and the outer margin is almost straight, not strongly convex as in *A. fasciata*. In addition, the juxta of *A. norbertkeili* is basally broader and more quadrangular than that of *A. fasciata*. The vesica of *A. norbertkeili* is armed by two large, broad-based cornuti and a small but strong, conical cornutus; from the armature of the vesica of *A. stangelmaieri* (Fig. 5) the conical spine is absent.

The female genitalia of *A. norbertkeili* (Fig. 4) differ from those of the very similar *A. fasciata* (Fig. 2) by the stronger, more elongated and basally (proximally) less dilated papillae anales, the longer apophyses anteriores and the shorter, more rugose-folded internal sclerotized plates of ductus bursae. The anal papillae of *A. norbertkeili* are proportionally longer and stronger than those of *A. stangelmaieri* (Fig. 6), the antrum-ductus bursae complex is larger and proximally more rounded, and the internal sclerotised plates are less symmetrical and not reaching the anterior extremity of the organ as in *A. stangelmaieri*.

Distribution: Southern Himalayan. The known range of the species is extending from the western third of Nepal to the Kanchenjunga Himal bordering the Sikkim region of India. Univoltine summer species with rather long flight

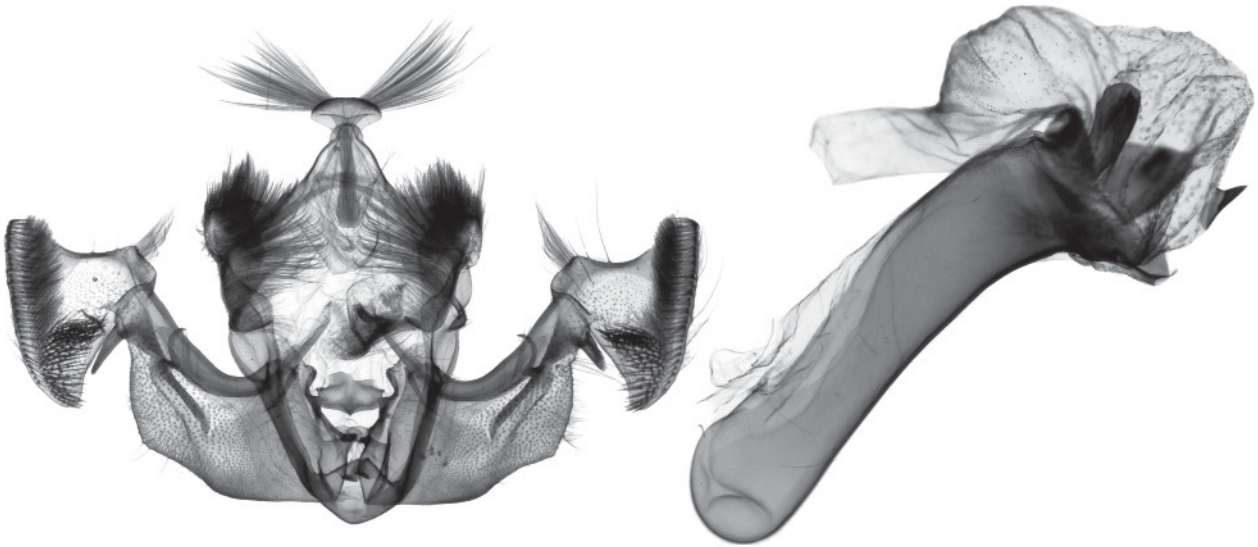


Fig. 3. *Apamea norbertkeili* sp. n., genitalia, RL12935m, Holotype, Nepal, Annapurna Himal.

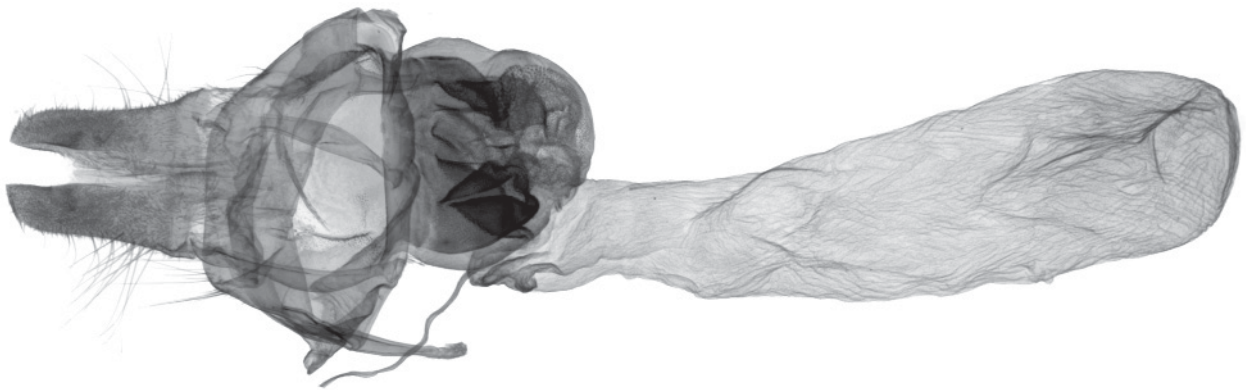


Fig. 4. *Apamea norbertkeili* sp. n., genitalia, MHNG-ENTO-0067512, Paratype, Nepal, Solu Khumbu Himal.

period, the majority of the specimens were collected in June and July but a rather fresh specimen was found at the beginning of October in the Annapurna range. The moths inhabit the high and very high altitude regions from the upper edge of the forest belt (ca 2800 m) to the subalpine grasslands up to 4000 m elevations.

Etymology: The new species is dedicated to Norbert Keil (Dachau, Germany), explorer of the Eurasiatic Noctuoidea fauna with special reference to the central Tien Shan region.

Remarks: The holotype of *A. norbertkeili* is erroneously illustrated in the 3rd volume of the Witt Catalogue (Zilli *et al.*, 2009: 208, plate 54, fig. 7) as *A. fasciata*. From the paratypes of *A. norbertkeili*, four specimens are shown on this plate as *A. fasciata* in figs 8-11.

Apamea stangelmaieri sp. n.

Figs 5-6, 17-18

Holotype: Female, “Nepal, 4 km SW of Kalinchok peak, 3000 m, 07.VIII.1995, 86°01'E, 27°24'N, leg. Márton Hreblay & Tibor Csöväri”, MHNG-ENTO-0067517 (coll. MHNG).

Paratypes

Nepal. Rolwaling Himal, Kalinchok area. 4 ♀, with same data as holotype, MHNG-ENTO-0067513, 0067514, 0067515, and 0067516 (coll. MHNG). – 1 ♀, 6 km SW of Kalinchok peak, 3160 m, 27°23'N, 86°00'E, 6.AUG.1995, leg. T. Csöväri & M. Hreblay, slide No. RL12940f (coll. T. Csöväri, Budapest). – 1 ♀, 6 km NNE of Muldi (Murree) 2835 m, 05.AUG.1995, 27°23'N, 85°58'E, leg. M. Hreblay & T. Csöväri, MHNG-ENTO-0067518 (coll. MHNG). – 1 ♀, with same locality and data, slide No. RL9650f (coll. T. Csöväri, Budapest).

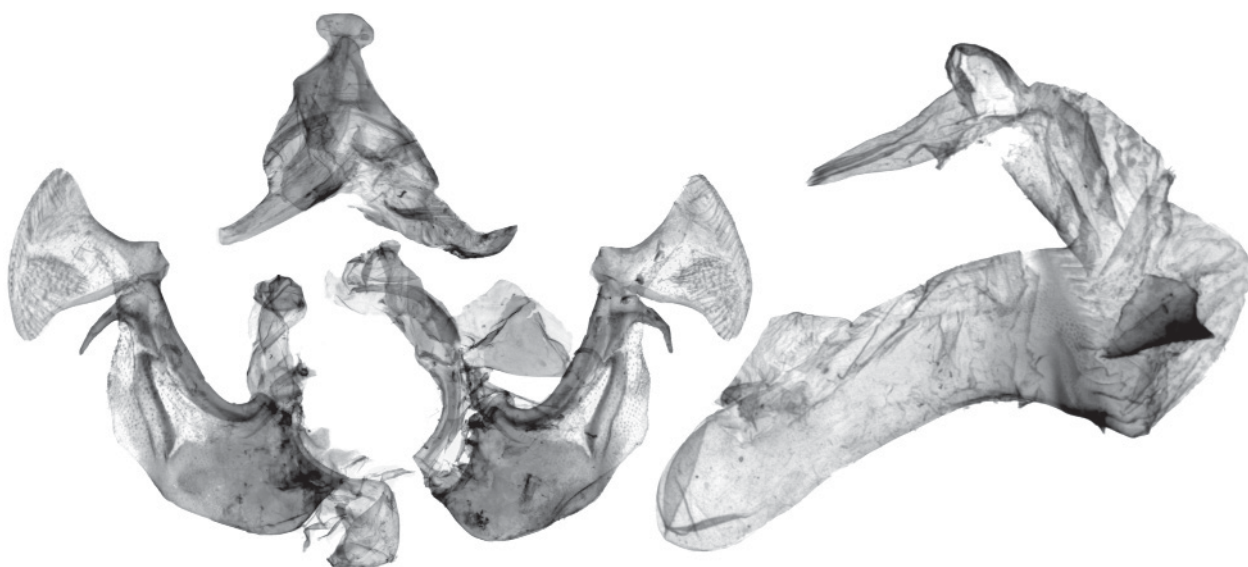


Fig. 5. *Apamea stangelmaieri* sp. n., genitalia, MHNG-ENTO-0067506, Paratype, India, West Bengal.

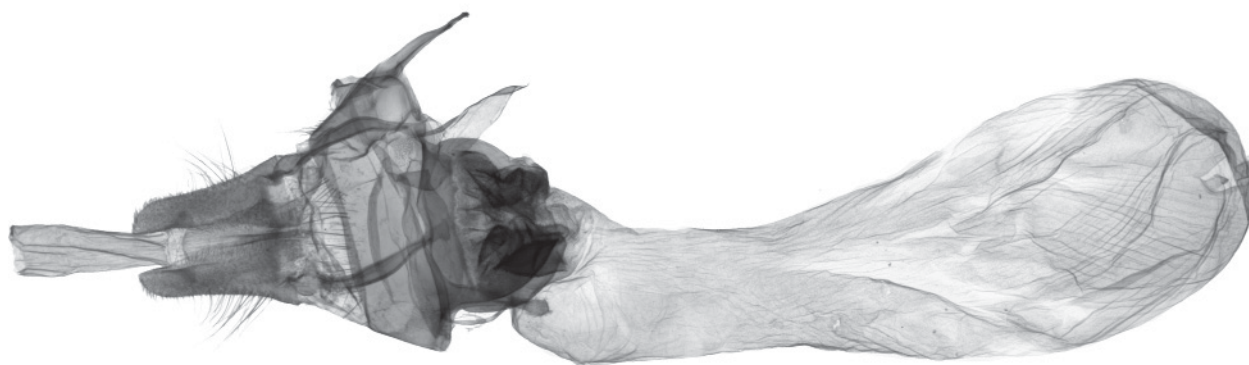


Fig. 6. *Apamea stangelmaieri* sp. n., genitalia, MHNG-ENTO-0067518, Paratype, Nepal, Kalinchok Himal.

Kanchenjunga Himal. 1 ♂, 2 km S of Ghunsa, 3600 m, 24.JUN.1998, leg. B. Benedek & M. Hreblay, Slide No. AZ1320m (coll. HNHM).

India. West Bengal. 1 ♂, Tiger Hill, 2573 m, MHNG-ENTO-0067506 (coll. MHNG).

Diagnosis: *Apamea stangelmaieri* is easily separable from the other members of the species complex by its comparatively shorter and broader, apically finely rounded forewings, the most extensive and generally unicolorous pale bluish ashy-grey basal and submarginal suffusion and the palest hindwings; this is the smallest continental Asiatic species of the *Apamea fasciata* species group with its wingspan 33–36 mm.

The male genitalia of *A. stangelmaieri* (Fig. 5) can be distinguished from *A. fasciata* (genitalia Fig. 1) and *A. norbertkeili* (Fig. 3) by the armature of the vesica which is composed from one or two robust, broad-based

cornutus (cornuti) while the other two species have, besides the two large cornuti a third, subbasal, conical cornutus. *Apamea stangelmaieri* differs also from the two relatives by the configuration of the distal end of aedeagus which is less curved than in the other two taxa and the carinal tooth is positioned ventrally while it is dorsal in *A. fasciata*.

The female genitalia of *A. stangelmaieri* (Fig. 6) are similar to those of *A. fasciata* (Fig. 2) and *A. norbertkeili* (Fig. 4) but the antrum-ductus bursae complex is considerably smaller, rather cup-shaped, lacking the rounded anterior (proximal) lobe, therefore the rather symmetrical internal sclerotised plates exceed the anterior edge of ductus bursae.

Distribution: The new species has a rather limited range in the eastern part of the southern Himalayan massif in Nepal and India, extending from the

Kalinchok area (east from Kathmandu) through the Kanchenjunga massif to the Darjeeling region in West Bengal. The moths are on the wing in the midsummer period, inhabiting the medium-high forested belts between 2500–3000 m altitudes.

Etymology: The new species is dedicated to Günter Stangelmaier (Villach, Austria), famous explorer of the European and western Asiatic Noctuoidea fauna.

Remarks: A male paratype of *A. stangelmaieri* is erroneously illustrated in the 3rd volume of the Witt Catalogue (Zilli *et al.*, 2009: 208: plate 54, fig. 6) as *A. fasciata* and its proper locality is in the Kanchenjunga Himal (see above in the list of paratypes).

Apamea bernhardmayi sp. n.

Figs 7, 21–22

Holotype: Female, “Khasis. Nat. Coll.”, “Collectio H. J. Elwes”, “NHMUK 010354066” (with QR code), slide No. RL11771f (coll. NHM UK).

Paratypes

India. Khasia Hills (Khasis). 2 ♀, “Euplexia fasciata Leech”, “6444 Khasia Hills”, “NHMUK 010354066” and “NHMUK 010354068” (with QR codes) (coll. NHM UK).

Diagnosis: The new species occurring in the Khasia Hills represents the largest known member of the species group; its wingspan is 41–45 mm. *Apamea bernhardmayi* has, comparing with the other species of the group, the longest and apically most pointed forewings with the weakest light greyish markings, reduced to the narrow stripe in the submedian fold, the narrow inner part of marginal field, the light patch of termen and the thin subterminal line.

The female genitalia of *A. bernhardmayi* (Fig. 7) are most similar to those of the insular sister species, *A. ploessli* (Figs 8, 9) due to their narrow but broad, collar-like antrum and long, partly tubular, partly swollen and rugose-ribbed ductus bursae. *Apamea bernhardmayi*

differs from *A. ploessli* by its slenderer ovipositor with anteriorly less dilated papillae anales, weaker apophyses anteriores, longer and much stronger ribbed swollen anterior (proximal) section of ductus bursae extending further into posterior tubular section of corpus bursae aside appendix bursae, and the more membranous, less scobinate-wrinkled appendix bursae.

Distribution: The new species is supposedly endemic to the Khasia Hills. Nothing more is known about the habitat or the phenology, only the locality is given on the specimens collected more than hundred years ago.

Etymology: The new species is dedicated to Mr Bernhard May (Munich, Germany), explorer of the Eurasiatic moth fauna with special reference to the Mediterranean region and the central Tien Shan massif.

Apamea ploessli sp. n.

Figs 8–9, 23–24

Holotype: Female, “TAIWAN, HOHANSHAN, Hualien Co., Alt. 3300 m, 19/21-VI-1993, F. Aulombard et J. Plante”, MHNG-ENTO-0067523 (coll. MHNG).

Paratypes

Taiwan. Hualien County. 3 ♀, with same data as holotype, MHNG-ENTO-0067524, 0067525, and 0067526 (coll. MHNG).

Ilan County. 1 ♀, Suyuan, near Pinan, at the road 7/1, 1550 m, 09.MAY.1997, leg. Gy.M. László & G. László (coll. G. Ronkay, NHMW). – 1 ♀, from the same site, 06.JUN.1997, leg. B. Herczig & L. Ronkay (coll. G. Ronkay, NHMW).

Taoyuan County. 1 ♀, Ming Chyr Forest Recreation Area, 1160 m, 17–18.APR.1997, leg. Gy. Fábrián & S. Kovács, slide No. RL9957f (coll. Gy. Fábrián, Budapest; paratype of *A. herczigi*). – 1 ♀, from same locality, 08–09.JUL.1997, leg. S.T. Kovács (coll. S.T. Kovács, Szeged; paratype of *A. herczigi*).

Nantou County. 1 ♀, 5 km N of Shihmen, Hohuan Pass, 3000 m, 22.SEP.2006, leg. H.R. Tzuoo (coll. H.R. Tzuoo, Puli; paratype of *A. herczigi*). – 1 ♀, Shenmu, 1200 m,



Fig. 7. *Apamea bernhardmayi* sp. n., genitalia, RL11771f, Holotype, Khasis.

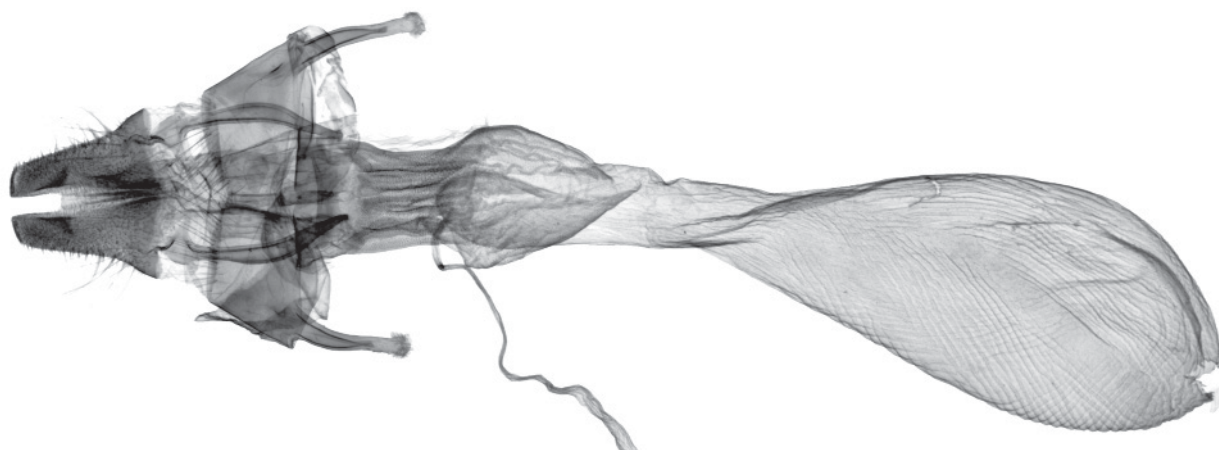


Fig. 8. *Apamea ploessli* sp. n., genitalia, MHNG-ENTO-0067524, Paratype, Taiwan.

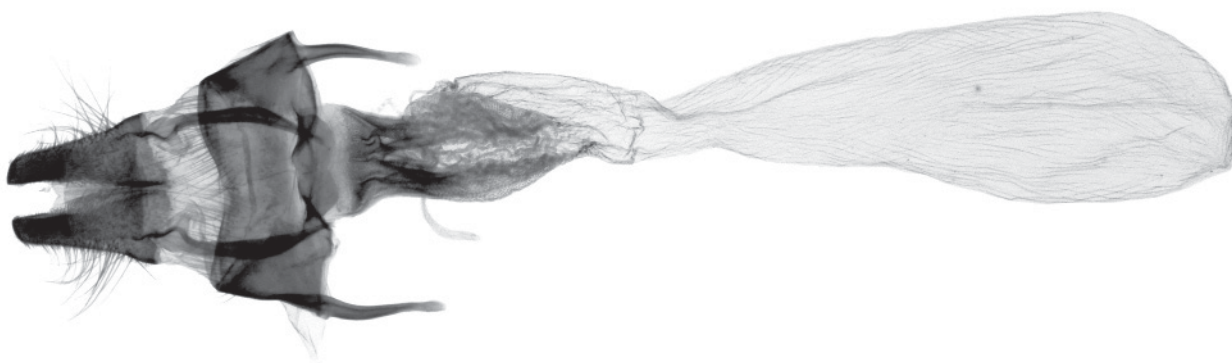


Fig. 9. *Apamea ploessli* sp. n., RL9957f, genitalia, Paratype, Taiwan.

24.SEP.1994, leg. H.R. Tzuoo (coll. H.R. Tzuoo, Puli; paratype of *A. herczigi*).

Chiayi County. 1 ♀, Fenchifu, 25-26.MAY.1986, leg. C.S. Lin, No. 65-91 (coll. NMNS, paratype of *A. herczigi*).

Diagnosis: *Apamea ploessli* is the insular sister species of *A. bernhardmayi* despite the easily recognisable external differences. It is smaller in size than its twin species (wingspan 35-39 mm vs 41-45 mm, respectively), having broader and apically less pointed forewings with prominent basal and submarginal bluish ashy-grey suffusion. It resembles mostly *A. norbertkeili* and *A. stangelmaieri* but the characteristic straight grey patch in the submedian fold and the less variegated dark red-brown median area (and the locality data) help in the separation of *A. ploessli* from the externally similar relatives.

The female genitalia of *A. ploessli* (genitalia Figs 8-9) differ from those of *A. bernhardmayi* (genitalia Fig. 7) by the anteriorly remarkably broader papillae anales, the thicker apophyses posteriores, the shorter ductus bursae with shorter and less ribbed-rugose swollen

anterior (proximal) section and the stronger scobination of appendix bursae. These two species are easily distinguished by the female genitalia from the other two members of the *A. herczigi* lineage by the entirely tubular, anteriorly swollen ductus bursae while the anterior section of ductus bursae is enlarged and laterally dilated towards the posterior tubular part of corpus bursae and appendix bursae in *A. ericmetzleri* and *A. herczigi* (Figs 10 and 12, respectively).

Distribution: Endemic to Taiwan. The new species inhabits the meso-montane and montane forest belts between 1200-3300 m altitudes. The phaeology data would suggest a bivoltine rather than univoltine life cycle as the moths are on the wing from April to the beginning of July and in September and the species was found above 3000 m elevations in June and in September.

Etymology: The new species is dedicated to Bernhard Plössl (Innsbruck, Austria), explorer of the Eurasiatic Noctuoidea fauna with special reference to the central Tien Shan region and Iran.

Remarks: The species has long been confused with *A. herczigi*, the other Taiwanese endemic member of the *fasciata* species complex, therefore the type series of the latter taxon is mixed. The two species are, however, easily distinguished by their external features, too (see Figs 23, 24 and 27,28), therefore the proper identification does not require the study of the genitalia.

It is worth to note that the male of *A. ploessli* is still unknown, despite the intensive collectings in the montane forest regions of Taiwan. It appears as a common feature of the species group, the majority of the collected specimens are females and three of the four members of the *herczigi* lineage are known only by the female sex.

***Apamea ericmetzleri* sp. n.**

Figs 10, 25-26

Holotype: Female, Nepal, Ganesh Himal, Khurpudanda pass, NE slope, 28°10,5'N, 85°12'E, 36-3700 m, 13-16. MAY.1995, leg. Gy. Fábrián & L. Ronkay, slide No. RL12939f (coll. G. Ronkay, NHMW).

Paratype

China. 1 ♀, Sichuan, Kinfushan, MAY-JUN.1929, coll. H. Becker, slide No. RL12967f (coll. NHMW).

Diagnosis: *Apamea ericmetzleri* is the continental Himalayan-Sino-Tibetan twin species of *A. herczigi* despite the rather conspicuous differences in their external appearance. It can be distinguished from the partly sympatrically occurring *A. norbertkeili* by its narrower and longer wings with somewhat more pointed forewings and the characteristic arcuate bluish-grey basal patch composed from a submedian stripe and the filling of the lower half of the double antemedial line; from *A. bernhardmayi* by the less pointed wings and the more prominent light greyish markings. Wingspan 38-41 mm.

The female genitalia of *A. ericmetzleri* (Fig. 10) are easily separable from those of *A. herczigi* (Fig. 12) by the longer and straighter, less heavily sclerotised tubular

posterior section of ductus bursae and the conspicuously larger, laterally widely expanded rugose-ribbed swollen anterior section which covers the entire appendix bursae. The other two related species of the *herczigi* lineage have entirely straight, anteriorly swollen and much less ribbed-rugose ductus bursae and membranous-scobinate appendix bursae.

Distribution: Himalayan-Sino-Tibetan. The Nepalese holotype was collected in the subalpine zone above the shrubby *Rhododendron* belt in the Ganesh Himal, in an early spring aspect, together with the overwintering Himalayan Xyleninae species and the freshly emerged Orthosiini taxa. The habitat of the Sichuan specimen is unknown but it was also collected in the early spring.

Etymology: The new species is dedicated to Eric Metzler (Alamogordo, New Mexico, USA), expert of the Nearctic Noctuoidea.

Remarks: The new species has long been confused with the other two Himalayan relatives and the recognition of the distinctness of the Khasia Hills species intended the detailed investigation of the specimens having longer and narrower, apically more pointed forewings.

The two known specimens are found in two remote areas in the Himalayan-Sino-Tibetan region. Their female genitalia show certain differences but the material is insufficient to decide whether these differences are due to the individual variation or the two populations represent two distinct taxa, therefore the two specimens are treated here as conspecific.

***Apamea herczigi* Zilli, Varga, Ronkay
& Ronkay, 2009**

Figs 11-12, 27-28

Apamea herczigi Zilli, Varga, Ronkay & Ronkay, 2009: 108, figs 30: 3-4, 54: 13-16, 116.

Type material examined: Holotype ♂, Taiwan, Nantou County, 5 km N Shihmen, Hohuan Pass, 3000 m,

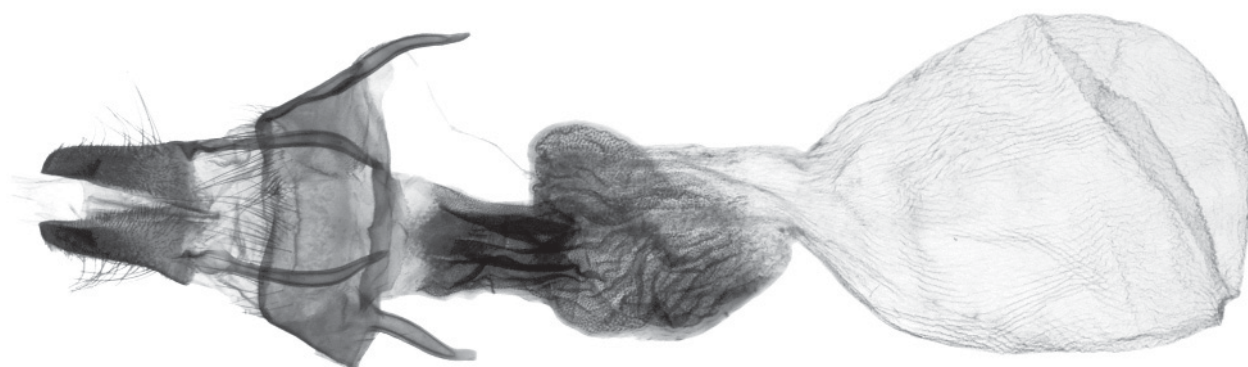


Fig. 10. *Apamea ericmetzleri* sp. n., RL12939f, genitalia, Holotype, Nepal, Ganesh Himal.

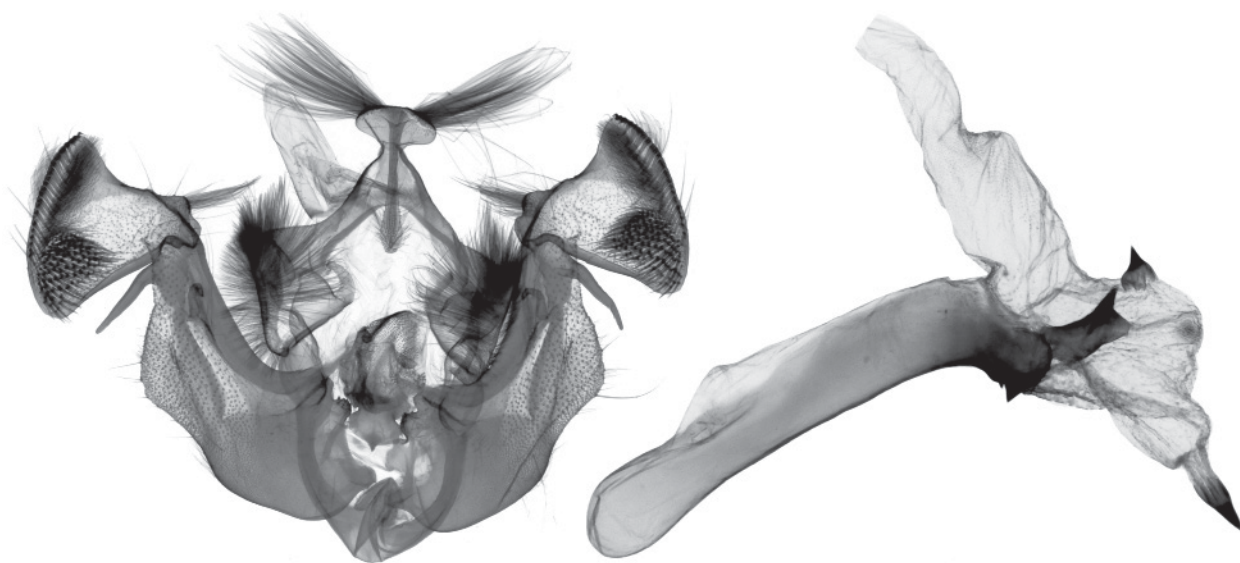


Fig. 11. *Apamea herczigi* Zilli, Varga, Ronkay & Ronkay, 2009, genitalia, BJ883m, Holotype.

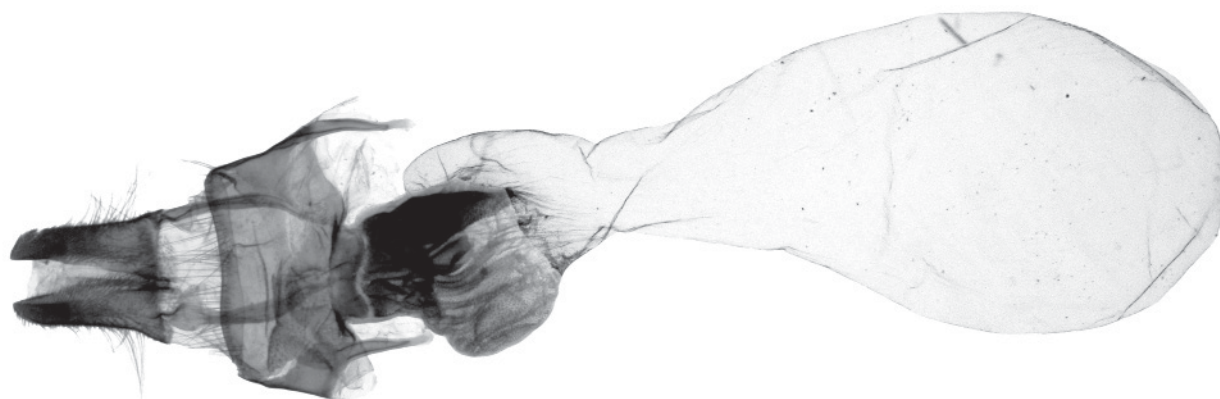


Fig. 12. *Apamea herczigi* Zilli, Varga, Ronkay & Ronkay, 2009, genitalia, RL9956m, Paratype, Taiwan.

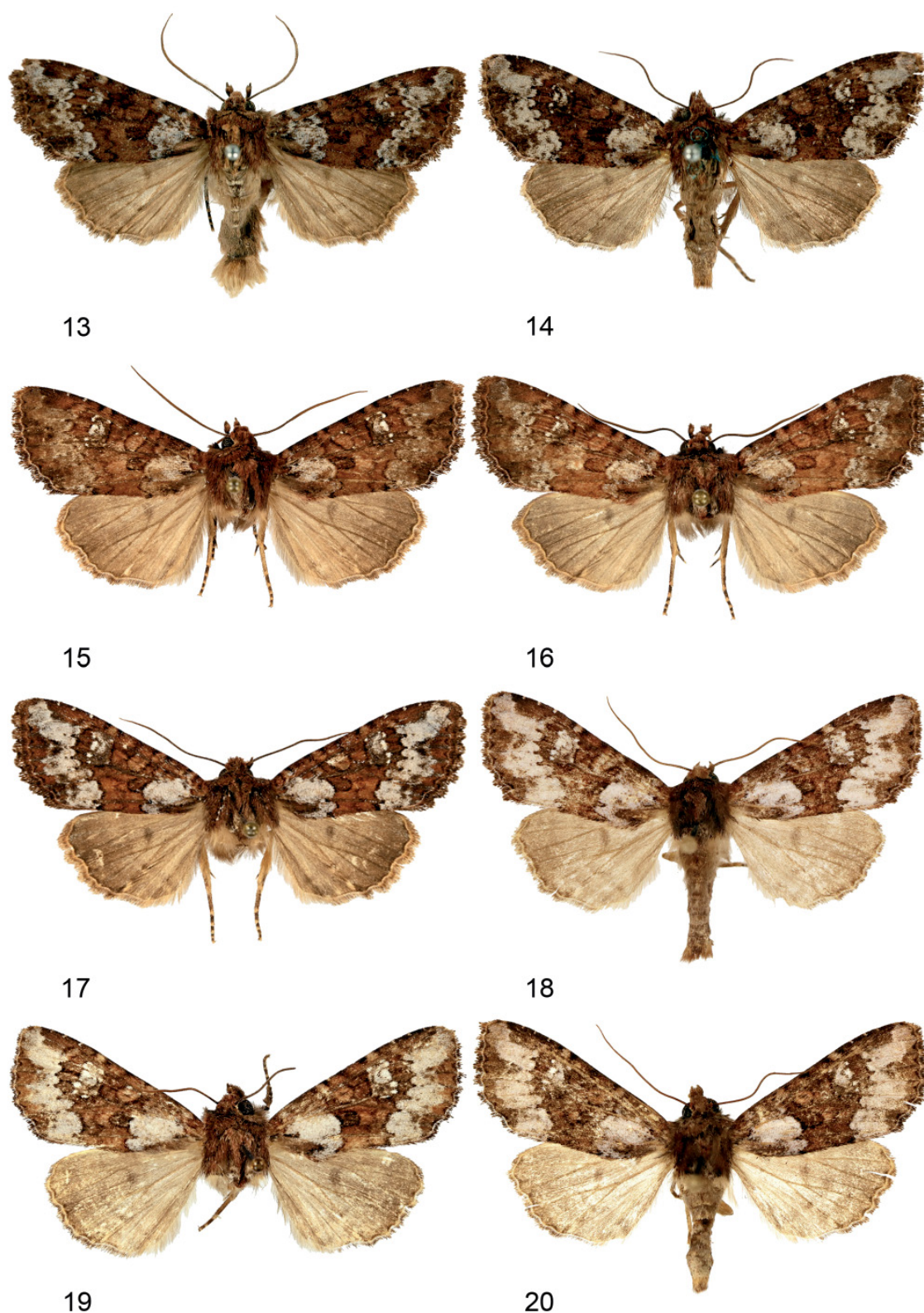
12.JUL.1996, leg. G. Csorba & L. Németh, slide No. BJ883m (coll. G. Ronkay, NHMW). The slide number of the holotype is erroneously published in the original description as “BJ880” but correctly indicated as “BJ883” on the genitalia plate 116 (Zilli *et al.*, 2009: 334).

Paratypes. Taiwan. Nantou County. 3 ♀, with same data as holotype, slide Nos AZ1322f, BJ884f, and RL9956f (coll. HNHM, Gy. Fábrián, Budapest & G. Ronkay, NHMW). – 1 ♀, 5 km SW Tayüling, 3000 m, 24°09'N, 121°17'E, 08-09.JUL.1997, leg. T. Csöväri & L. Mikus, slide No. RL9649f (coll. T. Csöväri, Budapest). Taoyuan County. – 1 ♀, Ming-Chyr Forest Recreation Area, 1160 m, 13-14.JUL.1996, leg. G. Csorba & L. Németh, slide No. BJ885f (coll. G. Ronkay, NHMW).

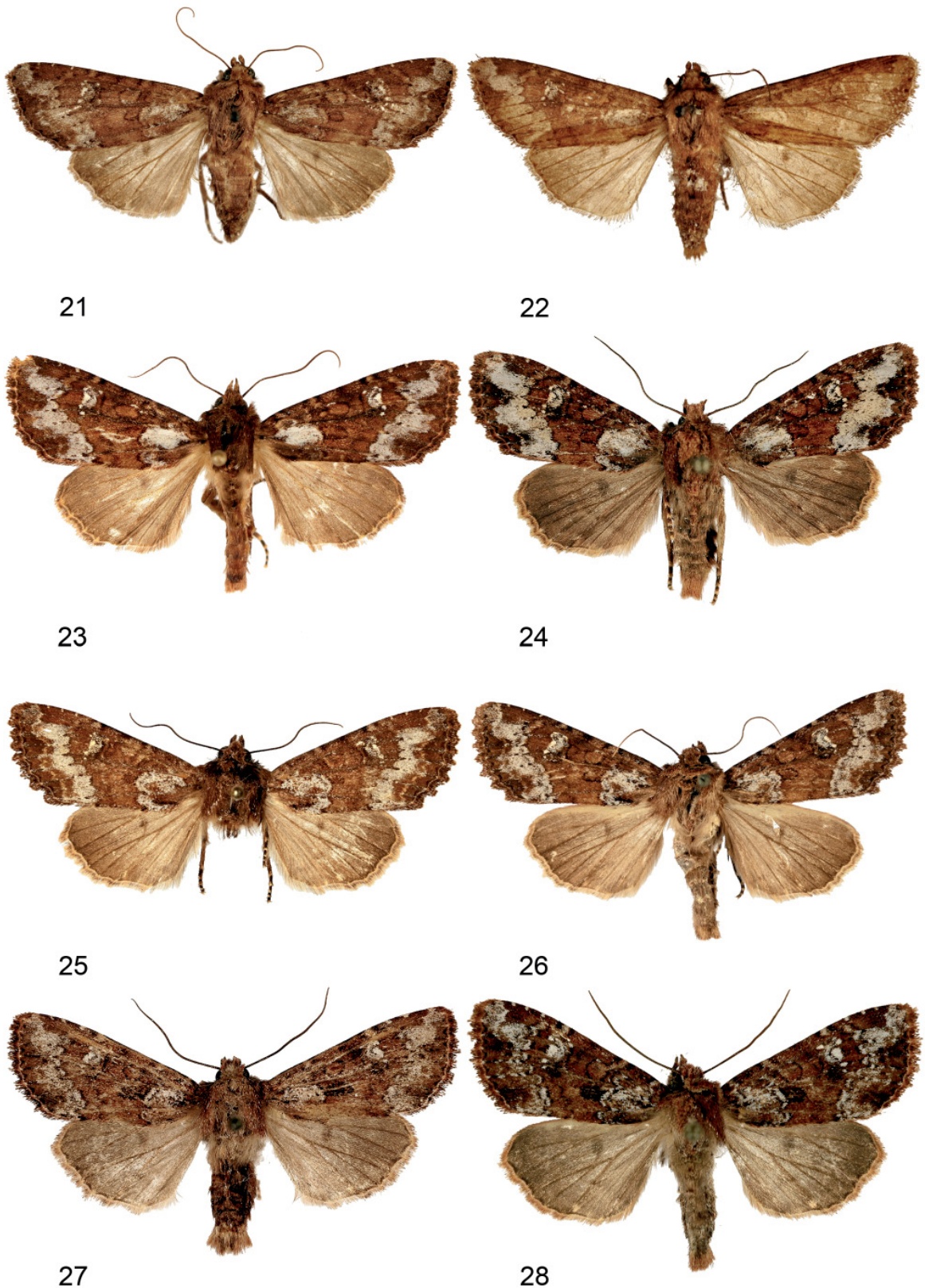
Additional material examined:

Taiwan. Hualien County. 1 ♀, Hohuanshan, 3300 m, 19-21.JUL.1993, leg. F. Aulombard & J. Plante, MHNG-ENTO-0067561 (coll. MHNG). – 1 ♀, Tayuling, Road to Hohuanshan, 3000 m, 21.JUN.1993, leg. F. Aulombard & J. Plante, MHNG-ENTO-0067562 (coll. MHNG).

Diagnosis: *Apamea herczigi* is the Taiwanese sister-species of *A. ericmetzleri* though it resembles externally mostly the Chinese *A. fasciata*. It differs from its continental relative by its smaller size due to its shorter and broader, apically less pointed forewings (wingspan 34-37 mm, vs 38-41 mm), and the more indistinct, less dense pale bluish-grey irroration on a more uniform brown ground. This diffuse and weak, less contrasting pale grey forewing pattern is a specific feature of *A. herczigi*, a somewhat similar composition of the



Figs 13-20. (13) *Apamea fasciata* (Leech, 1900), ♂, Lectotype, China, Sichuan (wingspan 39 mm). (14) *Apamea fasciata* (Leech, 1900) ♀, Paralectotype, China, Sichuan (wingspan 37 mm). (15) *Apamea norbertkeili* sp. n., ♂, Holotype, Nepal, Annapurna Himal (wingspan 41 mm). (16) *Apamea norbertkeili* sp. n., ♂, Paratype, Nepal, Annapurna Himal (wingspan 39 mm). (17) *Apamea norbertkeili* sp. n., ♀, Paratype, Nepal, Annapurna Himal (wingspan 37 mm). (18) *Apamea stangelmaieri* sp. n., ♀, Holotype, Nepal, Kalinchok Himal (wingspan 33 mm). (19) *Apamea stangelmaieri* sp. n., ♀, Paratype, Nepal, Kalinchok Himal (wingspan 35 mm). (20) *Apamea stangelmaieri* sp. n., ♀, Paratype, Nepal, Kalinchok Himal (wingspan 34 mm).



Figs 21-28. (21) *Apamea bernhardmayi* sp. n., ♀, Holotype, Khasis (wingspan 45 mm). (22) *Apamea bernhardmayi* sp. n., ♀, Paratype, Khasis (wingspan 42 mm). (23) *Apamea ploessli* sp. n., ♀, Holotype, Taiwan (wingspan 38 mm). (24) *Apamea ploessli* sp. n., ♀, Paratype, Taiwan (wingspan 37 mm). (25) *Apamea ericmetzleri* sp. n., ♀, Holotype, Nepal, Ganesh Himal (wingspan 38 mm). (26) *Apamea ericmetzleri* sp. n., ♀, Paratype, China, Sichuan (wingspan 41 mm). (27) *Apamea herczigi* Zilli, Varga, Ronkay & Ronkay, 2009, ♂, Holotype, Taiwan (wingspan 35 mm). (28) *Apamea herczigi* Zilli, Varga, Ronkay & Ronkay, 2009, ♀, Paratype, Taiwan (wingspan 35 mm).

forewing pattern can be recognised only in the Indian Himalayan *A. bernhardmayi*.

The diagnostic features of the male genitalia (Fig. 11) are, in comparison with the species of the *A. fasciata* lineage, the stronger, distally more dilated uncus, the strongly dentate ventral and flat, rounded dorsal prominence of clavus, the wider, more rounded ventral half of the cucullus and the structure of the aedeagus and the vesica. The aedeagus is longer, thinner and straighter, the ventral part of the carina is more curved, forming large, sclerotised dentate plate, the vesica is more projecting forward and ventrally, and is armed by a large and broad-based subbasal cornutus and two much smaller, bulbed cornuti, one of them terminating a tubular postero-ventral diverticulum.

The female genitalia of *A. herczigi* (Fig. 12) differ from those of *A. ericmetzleri* (Fig. 10) by the much shorter but stronger sclerotised tubular posterior section of ductus bursae and the smaller and laterally less expanded rugose-ribbed swollen anterior section which does not cover the entire appendix bursae as in its sister taxon.

Distribution: Endemic to Taiwan. The species inhabits the medium-high and high forest belts of the island; the adults are on the wing in the midsummer period.

Remarks: The type series of *A. herczigi* is mixed with the preceding Taiwanese species in the original description; see also under the Remarks of *A. ploessli*. *Apamea herczigi* is the only species of the *herczigi* lineage which is represented by both sexes; the male and the female are practically identical externally.

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