

Taxonomic revision and biogeography of *Micraglossa* Warren, 1891 from laurel forests in China (Insecta: Lepidoptera: Pyraloidea: Crambidae: Scopariinae)

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> Abstract

Micraglossa Warren, 1891 is investigated from China, where this genus approaches its northernmost occurrence. Specimens were available from 48 Chinese localities, and additional material from nearby countries has been investigated in order to analyse the distribution of the species. Altogether, 620 individuals (351♂♂, 269♀♀) were investigated. As a result, ten species of *Micraglossa* are now recorded from China. Four of them are described as new from China: *M. michaelshafferi* sp.n. (also from Thailand), *M. zhongguoensis* sp.n. (also from Vietnam), *M. nana* sp.n. (also from Vietnam) and *M. beia* sp.n. Two species, *M. flavidalis* Hampson, 1907 and *M. beia* sp.n. are known only from China. Three species originally described from India and one species originally described from Japan are now recorded for the first time from other countries: *M. straminealis* (Hampson, 1903) from China and Nepal, *M. aureata* Inoue, 1982 from China, *M. oenealis* Hampson, 1897 from Nepal and *M. scoparialis* Warren, 1891 from Pakistan, Nepal and Vietnam, the latter two were previously recorded from China. *M. manoi* Sasaki, 1998, originally described from Taiwan, is now recorded for the first time from continental China as well as from Nepal. All species are described in detail and keys for their identification are provided, separately for males and females. Wing pattern and male and female genitalia are illustrated for all species. Lectotypes are designated for *M. straminealis* and *M. oenealis*. Mapping the Chinese records of *Micraglossa* against climate data illustrates that frost below a mean minimum temperature of the coldest month (January) of -10°C is not tolerated. Therefore, the northern limit of distribution of this taxon is marked by the -10°C isotherm. We discuss the link between *Micraglossa* and the laurel and oreotropic forests in Asia, and to a larval feeding habit in cushions of mosses and liverworts. Further local research is necessary to identify biotic and abiotic requirements for the occurrence of *Micraglossa* species more precisely.

> Key words

Lepidoptera, Scopariinae, new species, China, biogeography.

1. Introduction

Scopariinae is composed of about 550 described species worldwide. The moths have wing spans from 9–32 mm and can be best defined by their unique and very uniform pattern elements of the forewings (Nuss 1999, 2005; Nuss et al. 2010). This ‘scoparine wing pattern’ consists of an antemedian line which is connected with two antemedian stigmata, the proximal discoidal stigma and the cubital stigma. At the distal

end of the discoidal cell lies a third stigma, the distal discoidal stigma, which is characteristically ‘X’ or ‘8’ shaped. Distally to this stigma runs the postmedian line from anterior to posterior margin of wing. The postmedian line always has a dent towards the distal discoidal stigma. Near the termen lies the subterminal line which often forms an ‘X’ together with the postmedian line. The forewing pattern is usually composed

of black, grey and brown scales with some mixture of ochre scales. However, moths of *Micraglossa* Warren, 1891 have strikingly golden or silvery glossy scales on the dorsal parts of the body, including the forewings. These scales can be used to easily distinguish *Micraglossa* species from most other Scopariinae.

Micraglossa contains 11 described species, occurring from India (*M. scoparialis* Warren, 1891, *M. oenealis* Hampson, 1897, *M. straminealis* (Hampson, 1903)), China (*M. flavidalis* Hampson, 1907, *M. manoi* Sasaki, 1998), Japan (*M. aureata* Inoue, 1982), the Philippines (*M. tagalica* Nuss, 1998) throughout the mountain rain forests of tropical Asia towards New Guinea (*M. convatalalis* Klunder van Gijen, 1913, *M. cupritincta* Hampson, 1917, *M. tricitra* (Meyrick, 1930)) and Queensland (*M. citrochroa* (Turner, 1908)). However, more than 35 undescribed species are known from these regions (NUSS 1999).

Phylogenetic relationships of *Micraglossa* are not well understood. The scopariine wing pattern, their golden shining dorsal scales on head, thorax and forewings, upright labial palpi, strongly sclerotised setae at the mesal wall of valva as well as the streak-like signum in the wall of the corpus bursae are shared by the scopariine *Gibeauxia gibeauxi* Leraut, 1998 from French Guiana (NUSS 1999). Thus, the New World *G. gibeauxi* and the Old World *Micraglossa* might be sister-taxa, but their relationships within Scopariinae still require investigation. In this context it is noteworthy that the structure of *Micraglossa* copulatory organs is reminiscent of Crambinae, especially with respect to the dorsally domed tegumen by which uncus and gnathos usually come into lateral position in permanent slides. MUNROE (1958) suggested to separate three further genera from *Micraglossa* for species occurring in New Guinea. However, he did not provide arguments in support of or published on this splitting.

In this paper, the taxonomy and biogeography of *Micraglossa* from China is investigated, which points to the northernmost occurrences of *Micraglossa* species.

Material and methods

For the present revision of *Micraglossa*, we investigated moths collected throughout China by Herrmann Höne between 1932 and 1940 and Houhun Li and his students since 1983. An overview of the collecting localities in China is given in Tab. 1. Geographic coordinates were taken from LEWIS & GEELAN (1994) and DI (2007) and converted into decimal coordinates for cartographic illustration using DIVA GIS 5.2 (HUMANS et

al. 2001, 2005a). Climate data were taken from Worldclim 1.3 (HIJMAN et al. 2004, 2005b). Morphological terminology follows NUSS (2005). Genitalia were prepared and mounted according to the standards suggested by ROBINSON (1976). The genitalia of several additional specimens have been investigated routinely and stored in microvials that are pinned with the specimen. Images of the genitalia have been taken using the microscope NIKON Eclipse 600 with the digital camera ZEISS AxioCam MRc5. Images of the moths were taken using the digital camera NIKON D40x.

Abbreviations

BMNH	Natural History Museum, London
coll.	collection
LWC	Weichun Li
MTD	Museum für Tierkunde Dresden
NKUM	Insect Collection, College of Life Sciences, Nankai University, Tianjin
prep. gen.	preparation of genitalia
q.v.	quod vide (which see)
RMNH	Nationaal Natuurhistorisch Museum, Leiden
RYD	Yingdang Ren
YHL	Haili Yu
ZFMK	Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn
ZMHB	Museum für Naturkunde, Berlin
ZSM	Zoologische Staatssammlung München

Results

Micraglossa Warren, 1891

Type species. *Micraglossa scoparialis* Warren, 1891, by original designation and monotypy.

Description. Forewing length 4.0–10.0 mm. Head, thorax and forewings dorsally covered with golden shiny scales. Some species with inconspicuous golden or silvery shiny scales. Ventrally body glossy, white scaled.

Head. Globular; frons flat; fronto-clypeus covered by narrow tight-fitting scales; vertex with loose-fitting, narrow-elongate scales, posteriorly interrupted by transverse row of spatulate scales. Ocelli present. Chaetosemata present, each consisting of only three to five hair-like scales, situated laterally of row of upright directed, pale yellow scales at posteriormost

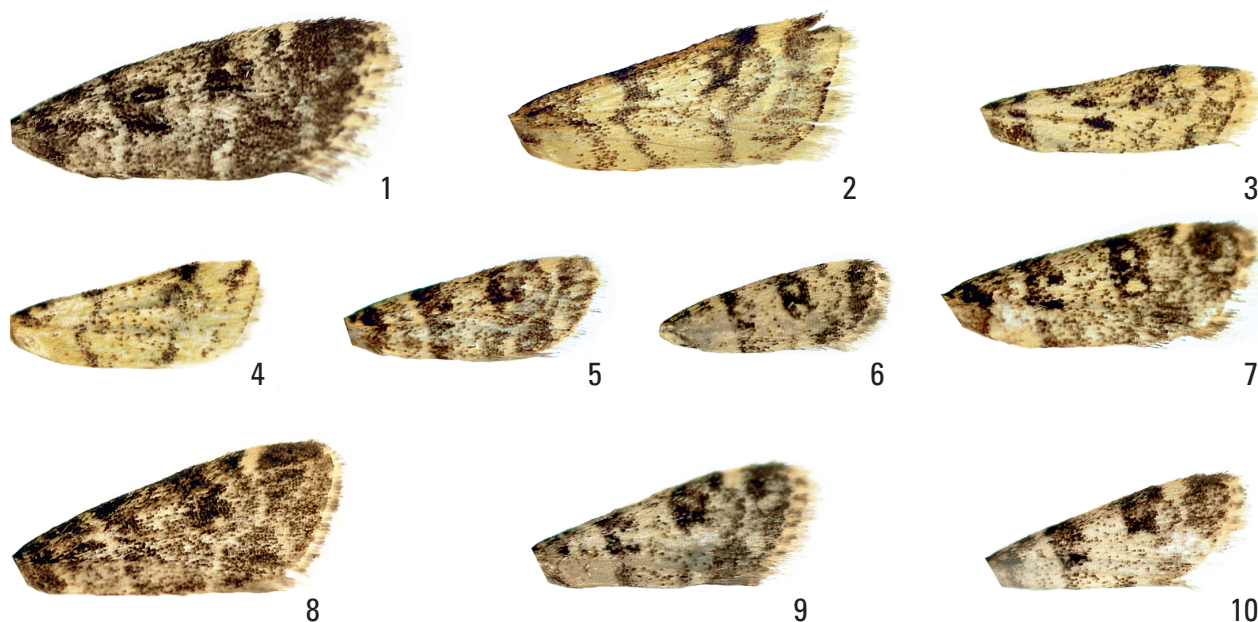
Tab. 1. Overview of Chinese localities where *Micraglossa* specimens have been collected (province names given in bold) with geographical coordinates in decimal system.

Locality	eastern Longitude	northern Latitude
Gansu , Wen County, Bifenggou, 860 m	104,6666	32,9166
Tianshui, Dangchuan Forestry Center, 1342 m	105,9666	34,4166
Shaanxi , Ankang, Hualongshan, 800 m	109,5500	31,9833
Baihe, Qianpo, 200 m	110,0778	32,8216
Henan , Lushi, Shiziping, 1700 m	111,0500	34,0333
Song County, Baiyunshan, 1400 m	112,0333	34,0166
Neixiang, Baotianman, 1350 m	111,8333	33,1333
Anhui , Yuexi, Wenquan	116,3666	30,8666
Huoshan County, Mozitan	116,4166	31,4000
Jiangsu , Nanjing (= Nanking), Longtan (= Lungtan)	118,7833	32,0500
Shanghai	121,3666	31,1000
Xizang (= Tibet) , Bomi	95,7500	29,9333
Motuo (= Mêdog), Hanmi, 2380 m	95,4333	29,4333
Sichuan , Emeishan, Qingyin'ge	103,1833	29,5833
Wolong, 1900–2008 m	103,8000	31,3333
Baoxing, Fengtongzhai, 1600 m	102,8333	30,4000
Mabian, Yonghong, 900 m	103,1666	28,8333
Tianquan, Labahe, 1300 m	102,8833	30,0833
Hubei , Wufeng, Houhe, 1100 m	110,6166	30,2166
Hefeng, Shayuan, 1260 m	109,8666	29,9166
Xianfeng, Pingbaying, 1280 m	109,1666	29,7500
Shennongjia, Bajiaomiao, 1100 m	110,7166	31,7333
Changyang	111,2000	30,5333
Zhejiang , Taishun, Wuyanling, 1000 m	119,7500	27,5833
Lishui, Longquan, Fengyangshan, 1470 m	119,9833	28,5000
Tianmushan, 500–1500 m	119,7166	30,2666
Wenzhou (= Wenchow)	120,6666	28,0333
Yunnan , Lijiang (= Li-Kiang), 3000 m	100,2666	26,8500
Longling, Xiaoheishan, 2300 m	98,6666	24,5500
Weishan, Weibaoshan, 2200 m	100,3333	25,2500
Guizhou , Leishan County, Fangxiang Town, 900 m	108,0666	26,4000
Mayanghe, 430–700 m	108,7000	28,4666
Xishui, Linjiang, 500–1200 m	106,1500	28,3166
Chishui, Suoluo, 240–500 m	105,6166	28,4833
Fanjingshan, Huixiangping, 530–2200 m	108,6833	27,9000
Jiangkou, Huixiangping, 1700 m	108,8166	27,7166
Daozhen County, 600–1350 m	107,6000	28,8833
Rongjiang County, Xiaodanjiang, 680 m	108,5191	25,9006
Guangxi , Rongshui County, 579–1350 m	109,1500	25,0833
Yongfu, Qinmu Village, 160 m	109,8333	24,9833
Hunan , Hengshan	112,6666	27,3000
Xinhua County, Weishan Town, Yantang Village	111,3666	27,7166
Guangdong , Xinyi, Dawuling, 1000 m	110,9000	22,3333
Hongkong , Kadoorie Farm, 240–455 m	114,4833	22,6500
Fujian , Wuyishan, Guadun, 1100 m	117,9666	27,7500
Taiwan , Meifeng, Nantou County	120,7000	23,9000
Taipei County, Wulai, Bao-Qing Temple	121,5333	24,8500
Kaohsiung County, Jongjhihguan, 131 km post	120,9000	23,2833

vertex. Labial and maxillary palpi with outer sides with various scaling of gold and brown; inner sides are whitish-yellow. Labial palpi often bend upright, sometimes porrect. Maxillary palpi brush like scaled, upright. Proboscis basally scaled. Scapus enlarged; flagellomeres always dorsally scaled.

Thorax. Patagium with large spatulate scales; tegulae with small spatulate scales; mesothorax with small,

narrow scales, posteriorly with larger spatulate scales. Characteristic fore wing pattern of Scopariinae with three black stigmata (proximal discoidal, cubital and distal discoidal stigmata) and three golden transverse lines (antemedian, postmedian and subterminal). Antemedian and postmedian lines black edged towards median area; antemedian line distally with proximal discoidal and cubital stigmata, collectively called an-



Figs. 1–10. Forewings of *Micraglossa* species. **1:** *M. manoi*, ♀, Guizhou province, Fanjingshan, Huixiangping, 1700 m, 1.vi.2002, leg. Xipu Wang (prep. gen. LWC 06241). **2:** *M. straminealis*, ♀, Sichuan Province, Baoxing, Fengtongzhai, 1600 m, 3.viii.2004, leg. Yingdang Ren (prep. gen. LWC08173). **3:** *M. michaelshafferi*, ♀, Xishui, Linjiang, 500 m, 27.ix.2000, leg. Haili Yu (prep. gen. LWC08052). **4:** *M. aureata*, ♂, Nantou Hueisun Exp. Forest, 600 m, 25.–27.iv.1999, leg. Mey & Ebert. **5:** *M. oenealis*, ♂, Guizhou Province, Fanjingshan, Heiwan, 530 m, 2.vi.2002, leg. Xipu Wang (prep. gen. LWC06244). **6:** *M. zhongguoensis*, ♂, Zhejiang Province, Tianmushan, Houshanmen, 500 m, 16.viii.1999, leg. Houhun Li et al. (prep. gen. LWC07361). **7:** *M. beia*, ♀, Daozhen, Dashahe, 1350 m, 24.viii.2004, leg. Yunli Xiao (prep. gen. LWC06247). **8:** *M. flavidalis*, ♂, Yunnan Province, Weishan, Weibaoshan, 2200 m, 20.vii.2001, leg. Houhun Li et Xipu Wang (prep. gen. LWC06136). **9:** *M. nana*, ♀, Lishui, Longquan, Fengyangshan, 1470 m, 25.vii.2007, leg. Qing Jin (prep. gen. LWC08039). **10:** *M. scoparialis*, ♂, Guizhou Province, Daozhen County, Xiannvdong, 600 m, 17.viii.2004, leg. Yunli Xiao (prep. gen. LWC05057).

temedial stigmata, round to streak like and connected or disconnected with antemedial line. Distal discoidal stigma 'X'- or '8'-shaped, usually connected with black spot at costa. Postmedian line with small dentation towards distal discoidal stigma and meeting costa with enlarged spot, making dentation inconspicuous. Postmedian and subterminal lines usually forming an X, but sometimes not connected. Hindwing uniform white or brown scaled, with thin brown line at termen. Male frenulum with one acanthus, female frenulum with two to three acanthae. Male retinaculum of all species treated in this paper with hamus. Legs chequered yellow and brown.

Abdomen. In some species, intersegmental membranes dorsally adorned with tiny spines in both sexes. Tympanal organ with bulla tympani open; tympanum and conjunctivum at an angle, tympanum inner side generally medially convex and posteriorly concave, posterior edge of tympanum exceeding about half of second tergite; tympanal case bean-shaped; pons tympani slender; praecinctorium well distally bilobed; puteolus tympani and venula secunda absent.

♂ **genitalia.** Similar to Crambinae as well as the scopariine genera *Gibeauxia* and *Helenoscopia* Nuss, 1999 with tegumen mostly narrow and dorsally domed. Uncus elongated, gnathos strongly sclerotised, distally pointed and hook-shaped. Mesal wall of

valva variously equipped with long setae and thorns. Vinculum generally narrow 'U'-shaped. Phallus varying in length and diameter as well as in composition of cornuti; ductus ejaculatorius leaving phallus dorsally more or less close to anterior tip.

♀ **genitalia.** Always without appendix bursae, corpus bursae membranous, with needle-like thorns in wall; some species with one or two streak-like or round signa, usually with small thorns or dentations at their edges. Ductus bursae membranous with smoothly sclerotised colliculum. Segment VIII always short; papillae anales triangular, posteriorly not notched.

Sexual dimorphism. Flagellomeres of males prismatic, of females cylindrical and thinner than those of females. Usually females slightly larger, with darker forewings and hindwings entirely grey-brown; males with white hindwings, grey-brown suffusion restricted towards termen.

Life history. Larvae of the Japanese *M. aurata* were recorded to live in a cushion of the moss *Trachycystis microphylla* (Doz. et Molk.) Lindb. (Mniaceae) and the liverworts *Plagiochila sciophila* Nees (Plagiochilaceae) and *Radula japonica* (Radulaceae). Feeding of one larva has been observed on *Plagiochila sciophila* (MURASE 2005). Adults of *Micraglossa* are nocturnal and are attracted to artificial lights.

Key to Chinese *Micraglossa* species based on the male abdomen

1. Intersegmental membranes dorsally adorned with tiny spines (Fig. 11) 2
 - Intersegmental membranes dorsally not adorned with tiny spines 4
2. Valva dorso-basally not covered with setae and medially at two thirds with conspicuously sclerotised spine (Fig. 13a) *M. straminealis*
 - Valva throughout covered with setae, without sclerotised spine (Figs. 14a, 15a) 3
3. Uncus without protuberance, phallus with 14 cornuti, some cornuti attached to a sclerotised, ovate shield-shaped base, opening for ductus ejaculatorius at subbasal tip of phallus (Fig. 14) *M. michaelshafferi*
 - Uncus with small triangular protuberance, phallus with 5 cornuti, none attached, opening for ductus ejaculatorius at basal tip of phallus (Fig. 15) *M. aureata*
4. Valva with hook at posterior part of sacculus and phallus with two ovate sclerotisations to which cornuti are attached (Fig. 12) *M. manoi*
 - Valva without hook and phallus with differently shaped cornuti, but without ovate sclerotisation 5
5. Valva with strong sclerotised bristles close to their medio-ventral edge, phallus with deciduous cornuti 6
 - Valva without bristles, phallus with or without deciduous cornuti 9
6. Phallus thick, posterior opening with ring of eight or more thorn-like cornuti 7
 - Phallus slender, at its posterior opening exteriorly with 1–3 sclerotised thorns, dorsally attached with spinous membrane (Fig. 16) *M. oenealis*
7. Deciduous cornuti in phallus arising from one point 8
 - Deciduous cornuti arranged in one row (Fig. 17) *M. zhongguoensis*
8. Ventral edge of valva with 1–2 bristles (Fig. 18) *M. beia*
 - Ventral edge of valva with 4–6 bristles (Fig. 19) *M. flavidalis*
9. Phallus without deciduous cornuti (Fig. 21) *M. scoparialis*
 - Phallus with deciduous cornuti (Fig. 20) *M. nana*

Key to Chinese *Micraglossa* species based on the female abdomen

1. Intersegmental membranes dorsally adorned with tiny spines (Fig. 11); corpus bursae densely adorned with well developed spines making it opaque in transmitted light 2
 - Intersegmental membranes dorsally not adorned with tiny spines; corpus bursae membranous, at most adorned with tiny spines and still transparent in transmitted light 4
2. Corpus bursae with rounded signum, ductus seminalis arising at median part of ductus bursae (Fig. 25) *M. aureata*
 - Corpus bursae without signum, ductus seminalis arising at posterior part of ductus bursae 3
3. Ductus bursae not looped, sac-like enlarged posterior to corpus bursae, folded anterior to colliculum, antrum conspicuously funnel shaped (Fig. 23) *M. straminealis*
 - Ductus bursae with one loop posterior to corpus bursae, posteriorly straight, with more or less constant diameter throughout (Fig. 24) *M. michaelshafferi*
4. Antrum wider than long 5
 - Antrum thinner than long 7
5. Ductus seminalis arising at middle of ductus bursae (Fig. 30) *M. nana*
 - Ductus seminalis arising close to antrum 6
6. Corpus bursae with two elongated signa; posterior edge of antrum laterally bent anteriorly (Fig. 28) *M. beia*
 - Corpus bursae with one elongated signum, sometimes with second, small and round signum; posterior edge of antrum straight (Fig. 29) *M. flavidalis*
7. Ductus bursae without loop; signum round 8
 - Ductus bursae with one loop posterior to corpus bursae; signum elongated 9
8. Antrum conspicuously enlarged, much wider than ductus bursae (Fig. 22) *M. manoi*
 - Antrum not enlarged, as wide as ductus bursae (Fig. 26) *M. oenealis*
9. Ductus seminalis arising at posterior fourth of ductus bursae (Fig. 31) *M. scoparialis*
 - Ductus seminalis arising at posterior third of ductus bursae (Fig. 27) *M. zhongguoensis*

Micraglossa manoi Sasaki, 1998

Figs. 1, ♂ 12, ♀ 22

Micraglossa manoi Sasaki, 1998: 200, figs. 15, 18, 36, 46.

Type material. Holotype (by original designation): ♂ (genitalia not dissected), “Holo-1 type”, “[one label in Japanese]”, [CHINA:] “Taiwan | Meifeng | Nantou Hsien | 6.viii.1994 | T. Mano”, “Inoue Coll. | B.M. 1992-71”, “*Micraglossa manoi* | Sasaki | Holotype”, BMNH. – Paratype: ♀ (genitalia not dissected), Taiwan, Nantou Hsien, Lushan, 2300 m, 6.viii.1996, T. Mano leg., BMNH.

Other material examined, 11♂, 8♀. **CHINA, Taiwan:** 2♂, Kaohsiung County, Jongjhihguan, 131 km post, 23°17.229'N 120°53.777'E, 1934 m, 12.viii.2008, G. Martin & D.L.J. Quicke, BMNH. **Guizhou:** 1♂, 1♀ Fanjingshan, Huixiangping, 1700 m, 1.vi.2002, leg. Xipu Wang (prep. gen. LWC06241, 06242); 1♂ Fanjingshan, Jingding, 2200 m, 30.v.2002, leg. Xipu Wang (prep. gen. LWC06198); NKUM. **NEPAL:** 6♂, 3♀, Kathmandu Valley, Godavari, 1600–1800 m, 31.v.–05.vi.1967, leg. W. Dierl, Forster & Schacht; 1♂, 2♀, Prov. 1 East, Pultschuk, 2300–2500 m, 12.–13.vi.1967, leg. W. Dierl, Forster & Schacht; 1♀, Prov. 3 East, Jubing, 1600 m, 08.v.1964, leg. W. Dierl; 1♀, Tamba Khosi Valley, 2600 m, 10.v.1962, leg. G. Ebert & H. Falkner, ZSM.

Redescription. Forewing length ♂ (n = 12) 6.5–8.0 mm, ♀ (n = 9) 6.5–8.0 mm.

Head. Fronto-clypeus covered by brown scales; vertex with yellow scales, posteriorly interrupted by row of brown spatulate scales. Labial palpi porrect, dark brown, with yellow distally of basal segment, medio-laterally on second segment and distally on distal segment; scales loose-fitting and basally directed downwards, elsewhere tight-fitting. Maxillary palpi dark brown, with yellow at distal parts of basal and distal segments. Basal part of proboscis laterally scaled pale yellow, medially dark brown. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus covered by black scales.

Thorax (Fig. 1). Patagium and tegulae covered by dark brown scales. Mesothorax dorsally covered by brown scales; ventrally white. Forewings with ground colour white, inconspicuously shining yellow, densely suffused with dark brown to black scales; basal area at base and at costa blackish brown; antemedian line whitish, slightly angled medially; proximal discoidal stigma ovate, sometimes not connected with antemedian line, cubital stigma streak-like, connected with antemedian line; distal discoidal stigma ‘X’-shaped, connected with black spot at costa; postmedian line whitish, meeting costa and dorsum nearly rectangularly, slightly dentate towards distal discoidal stigma, then slightly ‘S’-bent towards dorsum; subterminal line whitish, forming ‘X’ together with postmedian line; subterminal area densely suffused with dark brown to black scales; fringe of males yellow with

brown line medially, of females basally chequered yellow and brown, distally whitish, with grey line. Hindwings of both sexes with fringe pale yellow with median brown line.

Abdomen. Intersegmental membranes without tiny spine.

♂ **genitalia** (Fig. 12). Uncus triangular, posteriorly elongated and bent downwards, distally pointed in lateral view; anteriorly broad, posteriorly tapering to distally rounded tip in ventral view. Gnathos slender, slightly longer than uncus, distal extension ventrally ‘C’-shaped, dorsally with raised sclerotisations basally and medially, distally pointed and slightly bent downwards. Valva with dorsal edge concave, posteriorly round and ventrally slightly concave medially; sacculus dorso-distal with sclerotised hook; mesal wall of valva covered with long setae from close to baso-dorsal edge towards posterior side of sclerotised hook of sacculus and posterior edge of valva. Juxta ventrally shield-shaped, dorsally elongated, distally round. Phallus short and thick, about two times longer as its widest diameter; anteriorly thin, gradually becoming thicker towards posterior end; vesica with two groups of cornuti, each group positioned on sclerotised, ovate shield-shaped base about 400 µm in length; each group with 4–6 large cornuti arranged in row, with 1–2 small cornuti anteriorly and 13–15 small cornuti posteriorly.

♀ **genitalia** (Fig. 22). Corpus bursae globular, membranous, with small, round, dentate signum. Ductus bursae straight, anteriorly broad, becoming gradually thinner towards middle part, sac-like and enlarged towards antrum; antrum large, bilobed, strongly sclerotised. Apophyses anteriores about 2 × as long as segment VIII. Apophyses posteriores about 3 × as long as papillae anales.

Diagnosis. Among Chinese *Micraglossa* species, *M. manoi* is unique in morphology of genitalia by (1) long dorsal extension of juxta, (2) in vesica, by two ovate shield-shaped sclerotisations to which cornuti are attached and (3) by largely bilobed antrum. Two ovate shield-shaped sclerotisations in the vesica are also present in an undescribed *Micraglossa* species from Papua New Guinea (Nuss 1999: fig. 52), which, however, has no spine dorso-distally on the sacculus and the valva is only medially covered with long setae.

Distribution. *M. manoi* was described from Taiwan and is here recorded for the first time from continental China (Guizhou province) as well as from Nepal, occurring at altitudes of 1600 m and higher.

Remarks. Specimens from Taiwan are darker coloured with the antemedian stigmata connected with each other, males have less cornuti, and the female

ductus bursae is medially not as narrow as specimens from Guizhou. Future investigations based on more specimens may show whether these differences are intraspecific or interspecific variation. Additional specimens from Taiwan were recorded by SASAKI (1999: 15).

Micraglossa straminealis (Hampson, 1903)

Figs. 2, ♂ 13, ♀ 23

Scoparia straminealis Hampson, 1903: 213.

Type material. Lectotype (hereby designated): ♂, “Holotype”, “Type”, [INDIA:] “Simla 1 7000 ft. 1 Jul. '97. 1 Pilcher.”, “99-206.”, “*Scoparia straminealis* type ♂ Hmps”, “Pyrallidae Brit. Mus. Slide No. 3798”, BMNH. – Paralectotype: 1 exp. “Simla. 1 7000 ft. 1 Sep. '98. 1 Pilcher.”, “99-21”, BMNH.

Other material examined. 1♂, 2♀. CHINA, Sichuan: 1♀, Baoxing, Fengtongzhai, 1600 m, 3.viii.2004, leg. Yingdang Ren (prep. gen. LWC08173); 1♂, Tianquan, Labahe, 1300 m, 29.vii.2004, leg. Yingdang Ren (prep. gen. LWC06208), NKUM. NEPAL: 1♀, Prov. 3 East, Jiri, 2000 m, 13.viii.1964, leg. W. Dierl, ZSM.

Redescription. Forewing length ♂ (n = 2) 6.0 mm, ♀ (n = 2) 7.0 mm.

Head. Dorsally covered by pale yellow scales. Labial palpi porrect, basally pale yellow, ventrally with loose-fitting scales directed downwards, remaining parts of labial palpi with tight-fitting scales; median and distal parts pale brown. Maxillary palpi pale brown. Proboscis basally pale yellow. Flagellomeres with row of blackish brown scales basally and row of pale yellow scales distally, giving antenna black and yellow chequered pattern; scapus covered by pale yellow scales.

Thorax (Fig. 2). Spatulate scales of patagium yellow, some scales with brown tips. Tegulae covered anteriorly by spatulate, brown scales, posteriorly by yellow scales. Mesothorax dorsally pale yellow, ventrally yellowish white. Forewing with ground colour pale golden shining with grey pattern elements; basal area suffused grey; antemedian line rectangular, grey edged towards median area; antemedian stigmata small, ovate, connected with antemedian line; distal discoidal stigma ‘X’-shaped, outer branch connected with grey spot at costa; postmedian line ‘S’-shaped from costa towards dorsum, with grey spot distally at costa; subterminal line inconspicuous, forming ‘X’ together with postmedian line; subterminal area weakly suffused grey; termen edged by thin, grey line; fringe basally pale yellow, distally white. Fringe of hindwings in males white, in females basally dark brown, distally pale brown.

Abdomen. Intersegmental membranes dorsally adorned with tiny spines in both sexes.

♂ **genitalia** (Fig. 13). Uncus laterally slightly convex; posteriorly spatulate, distally round. Gnathos slender, slightly longer than uncus, at distal third with dorsal dentated protuberation, distally pointed. Tegumen broad, longer than gnathos. Dorsal and ventral edges of valva nearly parallel-sided, ventral side slightly concave, posteroventrally tapering and terminating into posterodorsally pointed tip; sacculus terminating at two thirds of valva medially into slender, sclerotised hook. Juxta large, shield-shaped, with dorsal triangular elongation and tip pointed. Phallus slightly curved; vesica with cluster of about 25 large spine-like cornuti, with several smaller cornuti at their base.

♀ **genitalia** (Fig. 23). Corpus bursae globular, structure of wall divided into two halves separated by membranous line, each half densely covered with needle-like spines; one half with large spines throughout, other half with tiny spines throughout but larger spines in its middle, giving impression of round signum. Ductus bursae globularly enlarged posterior to corpus bursae, then slightly bent, membranous, wrinkled; conspicuously thickened and folded posterior to insertion of ductus seminalis; colliculum smoothly sclerotised, merged seamlessly with sclerotised and conspicuously funnel-shaped antrum, latter with wall slightly granulated; membrane around ostium bursae granulated. Apophyses anteriores 3 × as long as segment VIII. Apophyses posteriores 2 × longer than papillae anales.

Diagnosis. *M. straminealis*, *M. michaelshafferi* and *M. aureata* are distinguished from all Chinese *Micraglossa* species by their pale golden colouration of the forewings. However, in *M. straminealis* and *M. aureata* the colour is lemon-yellow with grey pattern elements while in *M. michaelshafferi* it is darker yellow with black pattern elements. Also, *M. straminealis* and *M. aureata* have the fronto-clypeus, vertex, and scapus covered with pale yellow scales, but *M. michaelshafferi* has the fronto-clypeus with spatulate scales at the posterior end of the vertex and the scapus brown.

In the male genitalia the three species show a narrow valva and a group of cornuti, but *M. straminealis* has the valva posteriorly pointed, the mesal wall dorsobasally without setae, and with a sclerotised hook at two thirds medially, exceeding the dorsal edge of the valva. The tegumen and juxta are conspicuously large in comparison to all other known *Micraglossa* species. In contrast, *M. michaelshafferi* and *M. aureata* have the valva posteriorly round, its mesal wall covered with setae throughout but without a sclerotised hook. The tegumen and juxta are smaller, like in other *Micraglossa* species.

In the female genitalia, *M. straminealis*, *M. aureata* and *M. michaelshafferi* share a corpus bursae that is divided by a membranous fold into two parts, each

part densely covered with spines, by a colliculum which is seamlessly fused with the antrum. However, in *M. straminealis*, the ductus bursae is sac-like, enlarged posteriorly to the corpus bursae and conspicuously folded before insertion with the ductus seminalis; the antrum is conspicuously funnel shaped. In contrast, the ductus bursae of *M. michaelshafferi* and *M. aureata* have more or less a constant diameter to the ostium bursae.

Distribution. *M. straminealis* was described from India and is here recorded for the first time from the Chinese province of Sichuan as well as from Nepal.

Remarks. We hereby designate the lectotype of *M. straminealis* in order to preserve nomenclatural stability, which became necessary due to the discovery of the similar *M. michaelshafferi* sp.n. (see below).

Micraglossa michaelshafferi sp.n.

Figs. 3, ♂ 14, ♀ 11, 24

Type material. Holotype: ♂, **CHINA, Guangdong:** Xinyi, Dawuling, 1000 m, 8.viii.2003, leg. Dandan Zhang (prep. gen. LWC06246), NKUM. – Paratypes 12♂, 40♀: **CHINA, Anhui:** 1♂, 8♀, Yuexi, Wenquan [ca. 500 m], 7., 16., 18.viii.1995, 25.vii.1996, leg. Xiangfu Hu (prep. gen. LWC06219, 07365); 1♂, Huoshan County, Mozitan [ca. 500 m], 12.viii.2004, leg. Jiasheng Xu et Jialiang Zhang, NKUM. **Guizhou:** 5♂, Leishan County, Fangxiang Town, 900 m, 13.ix.2005, leg. Jialiang Zhang (prep. gen. LWC06243, 08051), MTD, NKUM; 1♂, 1♀, Mayanghe, Daheba, 430 m, 9.–10.vi.2007, leg. Xicui Du (prep. gen. LWC07359, 07369); 1♀, Mayanghe, Lijiaba, 700 m, 30.ix.2007, leg. Hui Zhen, NKUM; 1♂, 28♀, Xishui, Linjiang, 500–550 m, 24.–29.ix.2000, leg. Haili Yu (prep. gen. LWC05067, 06016, 06226, 06230, 07491, 07492, 08026, 08052), MTD, NKUM; 2♀, Xishui, Linjiang, 500 m, 31.v.2000, leg. Yanli Du, NKUM. **Zhejiang:** 1♂, Province, West Tianmushan, 23.ix.1932, leg. H. Höne (prep. gen. LWC09026), ZFMK. **THAILAND:** 2♂, Khao Yai National Park, Khao Khejo, 1., 6.ix.1986, 1140 m and 1070 m, leg. G. S. Robinson, B.M. 1986-299, BMNH.

Etymology. The name *michaelshafferi* is in honour of the late Michael Shaffer (July 6, 1936–March 23, 2009), who contributed profoundly to systematic research on Pyraloidea for more than 30 years by curating the largest pyraloid collection in the world, the Natural History Museum London, and by maintaining and expanding the card index of the world pyraloid species that is now available via LepIndex (www.nhm.ac.uk).

Description. Forewing length ♂ (n = 13) 4.0 mm, ♀ (n = 40) 4.0–5.0 mm.

Head. Fronto-clypeus brown, vertex pale yellow, posteriorly interrupted by brown spatulate scales. Labial palpi bent upright, chequered blackish brown ba-

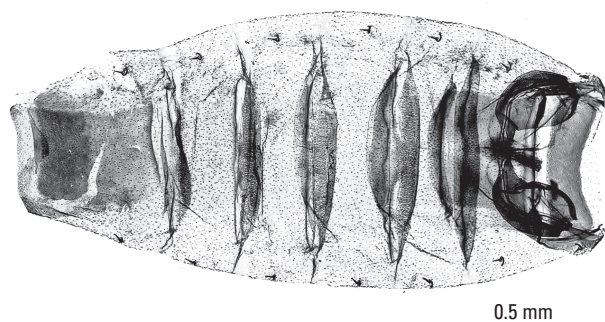


Fig. 11. Abdomen of *M. michaelshafferi*, ♀, Xishui, Linjiang, 500 m, 27.ix.2000, leg. Haili Yu (prep. gen. LWC08052).

sally and pale yellow distally at each segment; scales tight-fitting, but medioventrally long downwards directed. Maxillary palpi basally and distally dark brown, medially pale yellow. Proboscis basally pale yellow. Flagellomeres with row of blackish brown scales basally and row of pale yellow scales distally, giving antenna black and yellow chequered pattern; scapus covered by blackish brown scales.

Thorax (Fig. 3). Patagium and tegulae blackish brown. Mesothorax dorsally covered by mixture of brown and pale yellow scales; ventrally glossy white, suffused with some blackish brown scales, especially at mesocoxae. Forewing with ground colour golden shining, slightly suffused with black scales; basal area with dominant black suffusion; antemedian line golden, broad and straight, with black spot towards median area at costa; antemedian stigmata streak-like, not connected with antemedian line and proximal discoidal stigma closer to antemedian line than cubital stigma; distal discoidal stigma 'X'-shaped, distinct from black spot situated in angle of costa and postmedian line; the latter golden, meeting costa rectangularly, dentate towards distal discoidal stigma, running straight towards dorsum and parallel to termen. Subterminal line reduced to two pale yellow spots close to apex and tornus, rest of subterminal area densely suffused with black scales; in females, area between postmedian line and golden apical spot black; termen edged by thin, brown line; fringe golden-yellow, basally weakly chequered with brown. Fringe of hindwings of both sexes white with brown line medially.

Abdomen (Fig. 11). Intersegmental membranes dorsally adorned with tiny spines in both sexes.

♂ genitalia (Fig. 14). Uncus anteriorly broad, medially and posteriorly narrow, with tip round in ventral view; triangular, tapering to pointed tip and bent downwards in lateral view. Gnathos slender, slightly longer than uncus, posterior half granular dorsally, straight, tip pointed and hooked downwards. Valva anteriorly with dorsal and ventral edges nearly parallel-sided, posteriorly slightly tapering, distally round. Juxta ventrally round, dorsally with short elongation. Phal-

lus slightly bent posteriorly, with 14 cornuti, which in some individuals are attached to a sclerotised, ovate, shield-shaped base.

♀ *genitalia* (Fig. 24). Corpus bursae globular, structure of wall divided into two halves separated by membranous line, each half densely adorned with needle-like spines; one half with thicker spines, in centre of latter area, spines connected to each other at their base by stronger sclerotisation of corpus bursae wall. Ductus bursae thin, with one loop and one fold posterior to corpus bursae; colliculum smoothly sclerotised and seamlessly fused with sclerotised antrum, with lateral protuberance before ostium bursae; membrane around ostium bursae adorned with many tiny spines. Apophyses anteriores 3 × as long as segment VIII. Apophyses posteriores 2 × as long as papillae anales.

Diagnosis. *M. michaelshafferi* is similar to *M. straminealis*, q.v. *M. michaelshafferi* is also similar to *M. aureata*, but it can be separated in male genitalia by the gnathos without a protuberance, the juxta dorsally with short elongation, the phallus with fourteen cornuti and some of them are attached, the opening of the ductus ejaculatorius is subterminal in male genitalia; in female genitalia the corpus bursae is without signum, the ductus bursae is thin, anteriorly with one loop, a lateral protuberance is present before the ostium bursae, and the ductus seminalis arises at the posterior part of the ductus bursae. In contrast, the gnathos of *M. aureata* has a triangular protuberance, its juxta is not elongated, the phallus has five cornuti and all of them free, the opening of the ductus ejaculatorius is terminal; its corpus bursae has a round signum, the ductus bursae is thick, without a loop and protuberance before ostium bursae, and the ductus seminalis arises at the anterior part of the ductus bursae.

Distribution. Known from the Chinese provinces of Anhui, Zhejiang, Guizhou and Guangdong. Outside China known from Thailand.

Micraglossa aureata Inoue, 1982

Figs. 4, ♂ 15, ♀ 25

Micraglossa aureata Inoue, 1982: 314, pl. 36 fig. 56, pl. 300 fig. 13, pl. 302 fig. 12.

Type material. ♂, “Holo-1 type”, [JAPAN:] “Shiratani | Yakushima | 25.vii.1974 | H. Inoue”, “Inoue Coll. | B.M. 1992-71”, “Type status | verified | K. Buckmaster 1993”, “Holotype | *Micraglossa aureata* | Inoue (1982)”, “Type | Photographed | in Colour”, BMNH. – Paratypes, 22♂ and ♀: Yakushima and Okinawa Is., BMNH.

Other material examined, 2♂, 1♀. CHINA, Taiwan: 1♂, Nantou Hueisun Exp. Forest, 22.–24.x.1998, leg. Mey & Ebert

(prep. gen. LWC09070); 1♂, Nantou Hueisun Exp. Forest, 600 m, 25.–27.iv.1999, leg. Mey & Ebert; 1♀, Nantou Hueisun Exp. Forest, 650 m, 24.–29.x.1998, leg. Mey & Speidel (prep. gen. LWC09075, ♀), ZMHB.

Redescription. Forewing length ♂ (n = 2) 4.5–5.0 mm, ♀ (n = 1) 5.0 mm.

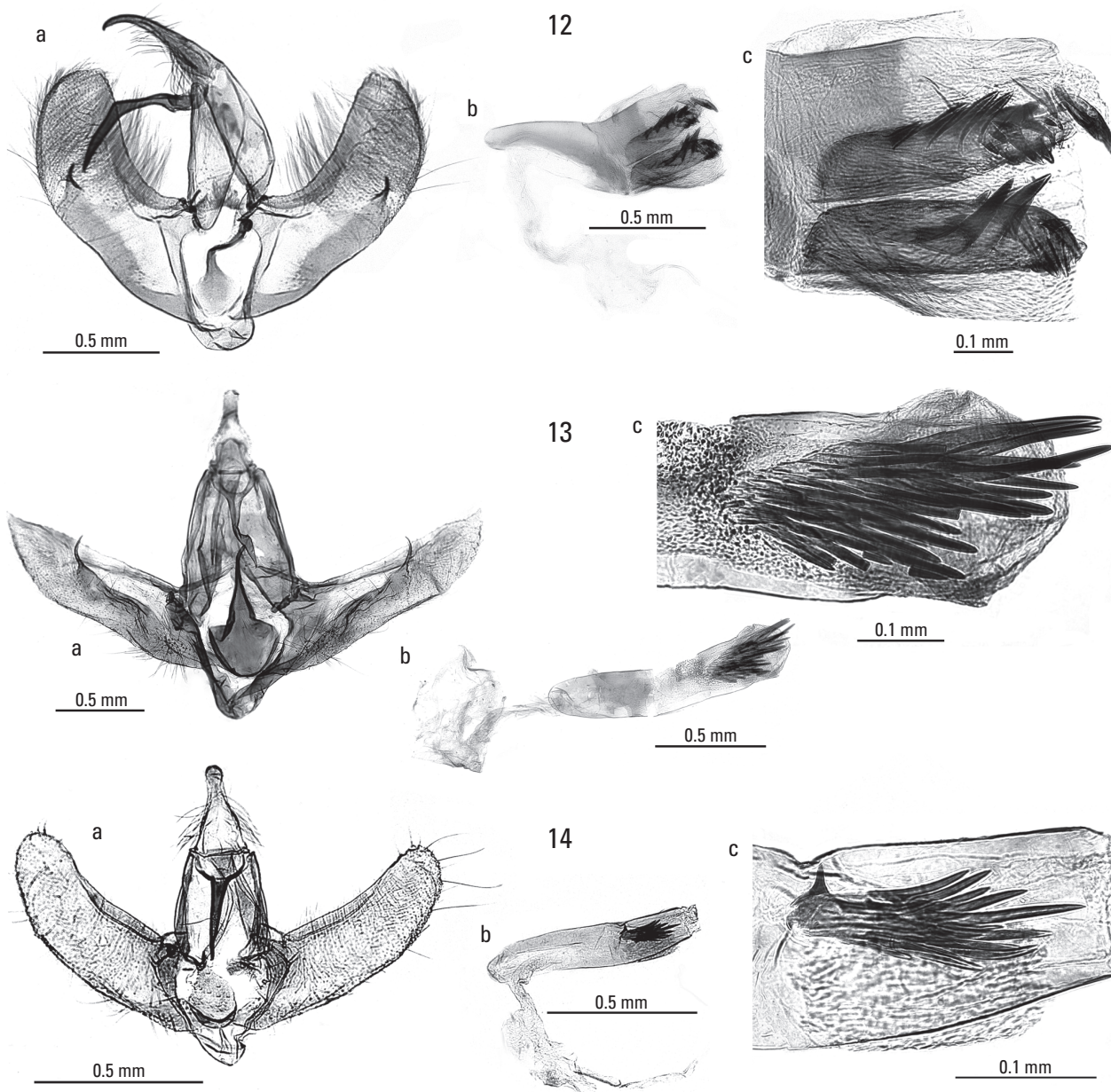
Head. Fronto-clypeus and vertex with golden-yellow scales. Labial palpi bent upright, golden-yellow except for outer sides of second and third segments covered by pale brown scales. Maxillary palpi golden-yellow, outer sides brown. Proboscis basally scaled golden. Flagellomeres with row of blackish brown scales basally and row of pale-yellow scales distally, giving antenna black and yellow chequered pattern; scapus pale yellow.

Thorax (Fig. 4). Patagium and mesothorax covered by golden-yellow scales. Tegulae anterior half covered by blackish brown, posterior half covered by golden-yellow scales. Forewing with ground colour golden-yellow, slightly suffused with pale brown scales on basal and medial areas, basal area with blackish brown stripe at base; antemedian line golden, broad and incurved, outside lined pale brown; antemedian stigmata inconspicuous; distal discoidal stigma ‘X’-shaped, pale brown, distinct from black spot situated in angle of costa and postmedian line; latter golden, broad, inner side lined pale brown, dentated near costa, outcurved at anterior two fifths from costa, slightly incurved near dorsum. Subterminal line golden, inner side lined pale brown, paralleled with termen; termen edged by thin, pale brown line; fringe golden-yellow. Fringe of hindwings of both sexes golden-yellow.

Abdomen. Intersegmental membranes dorsally adorned with tiny spines in both sexes.

♂ *genitalia* (Fig. 15). Uncus slightly convex, tapering to pointed and hooked distal tip. Gnathos slender, slightly longer than uncus, distally pointed and hooked; distal dorsal edge with small broad triangular protuberance, inner margin of protuberance armed with tiny dentations. Tegumen slightly shorter than gnathos. Valva basally broad, tapering to rounded apex, dorsal and ventral edges slightly concave medially. Juxta ovate, shield-shaped, posterior edge slightly convex medially. Phallus short and thick, about two thirds length of valva; opening of ductus ejaculatorius at anterior tip of phallus; vesica with one small and four tiny, spine-like cornuti.

♀ *genitalia* (Fig. 25). Corpus bursae ovate, wall divided into two parts, separated by membranous line, larger part densely adorned with long needle-like spines, smaller part densely wrapped with tiny spines; signum round, composed by thorns, situated within part with small spines. Ductus bursae weakly sclerotized, thick and straight except posterior to corpus bursae with membranous, pleated and slightly curved part, medial part slightly swollen; ductus seminalis



Figs. 12–14. Male genitalia of *Micraglossa* species. a: segment IX with appendages; b: phallus; c: cornuti. **12:** *M. manoi*, prep. gen. LWC06242. **13:** *M. straminealis*, prep. gen. LWC06208. **14:** *M. michaelshafferi*, prep. gen. LWC06243.

arising at anterior part of ductus bursae; lateral margins of antrum straight. Apophyses anteriores about $3 \times$ as long as segment VIII. Papillae anales ovate, about half as long as apophyses posteriores.

Diagnosis. *M. aureata* is similar to *M. straminealis* and *M. aureata michaelshafferi*, q.v.

Distribution. Known from Chinese Taiwan. Outside China known from Japan.

Remarks. *M. aureata* is here recorded for the first time from China.

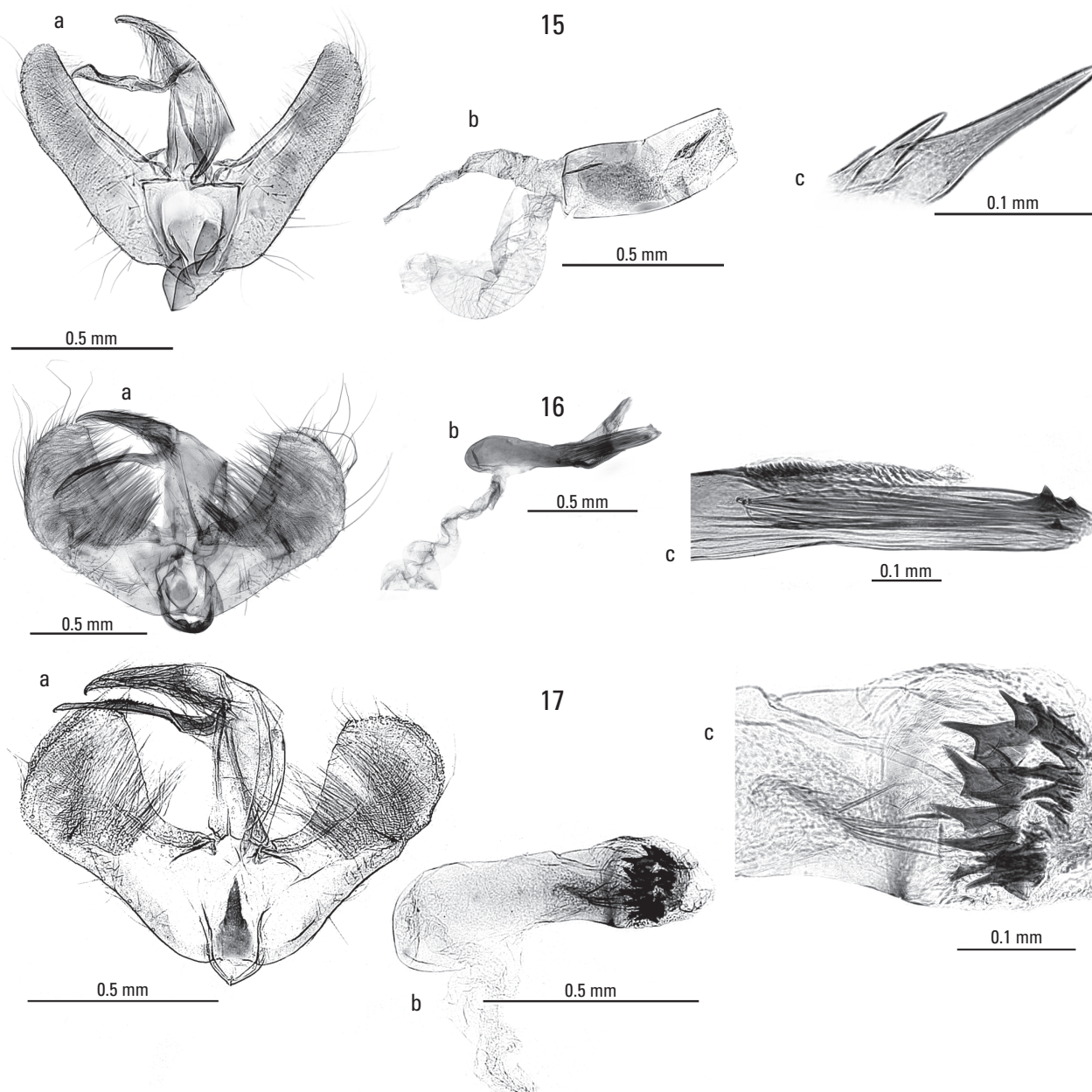
Micraglossa oenealis Hampson, 1897

Figs. 5, ♂16, ♀26

Micraglossa oenealis Hampson, 1897: 224–225.

Type material. Lectotype (hereby designated): ♂, “Holotype”, “Type”, [INDIA:] “Khasis | April 1894 | Nat. Coll”, “*Micraglossa | aenealis* [sic] | type. ♂ Hmps.”, “Pyrallidae | Brit. Mus. | Slide No. | 3607”, BMNH.

Other material examined, 20♂, 3♀. **CHINA, Guizhou:** 1♂, Fanjingshan, Heiwan, 530 m, 2.vi.2002, leg. Xinqu Wang (prep. gen. LWC06244), MTD. 1♂, Leishan, Fangxiang Town, 900 m, 14.ix.2005, leg. Jialiang Zhang (prep. gen. LWC06237); 1♂, Xishui, Linjiang, 500 m, 3.vi.2000, leg. Yanli Du; 1♂, Chishui, Suoluo, 240 m, 22.ix.2000, leg.

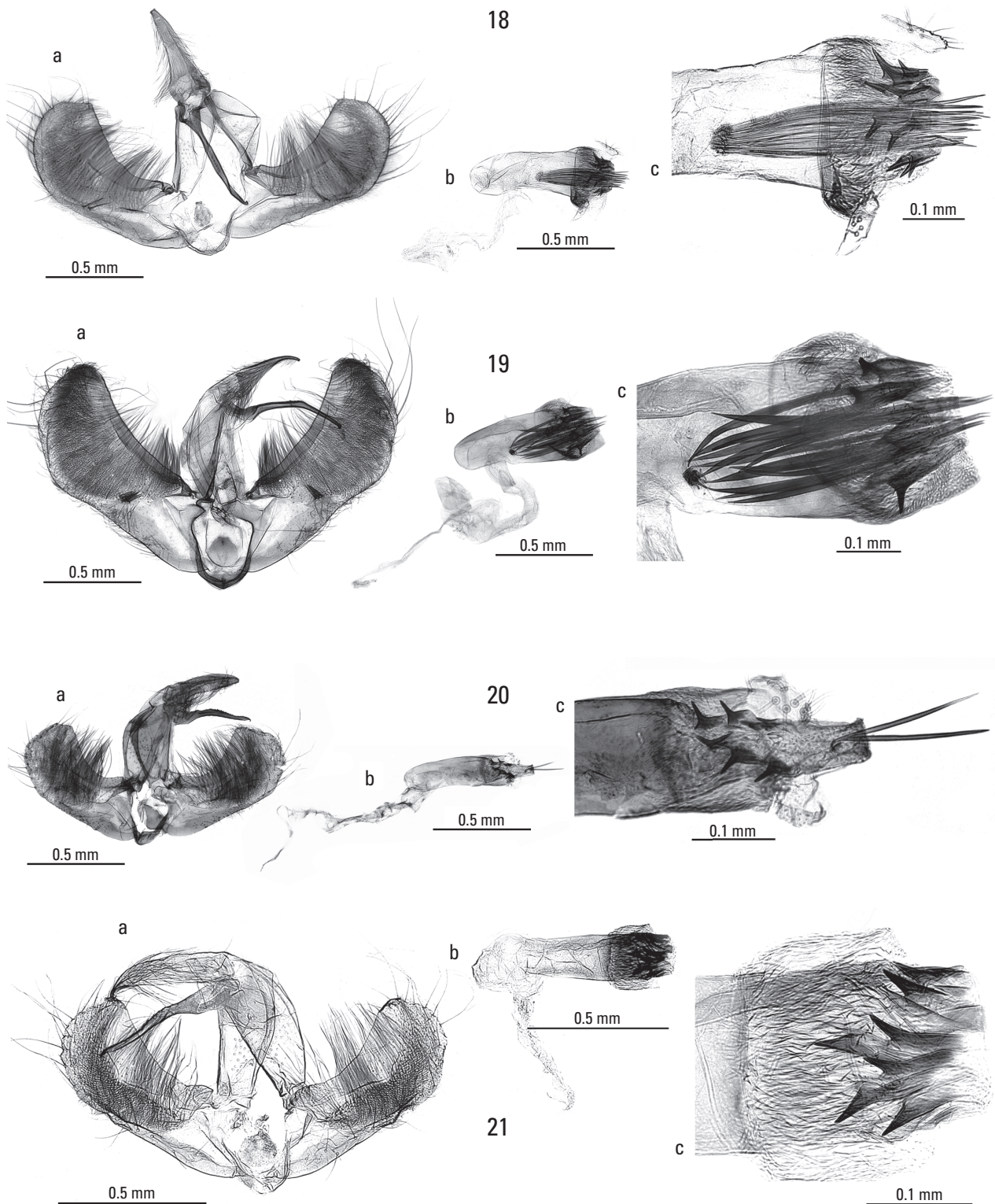


Figs. 15–17. Male genitalia of *Micraglossa* species. a: segment IX with appendages; b: phallus; c: cornuti. **15:** *M. aureata*, prep. gen. LWC09070. **16:** *M. oenealis*, prep. gen. LWC07507, cornuti were taken by slide no. LWC06015. **17:** *M. zhongguoensis*, prep. gen. LWC06227.

Haili Yu (prep. gen. LWC06015); 3♂, 1♀, Daozhen County, Dashahe, 1350 m, 24.viii.2004, leg. Yunli Xiao (prep. gen. LWC06221, 06236, 07507, 08187); 1♂, Daozhen County, Guo Village, 1300 m, 21.viii.2004, Yunli Xiao (prep. gen. LWC07452), 1♀, Rongjiang County, Xiaodanjiang, 680 m, 16.ix.2005, leg. Jialiang Zhang (prep. gen. LWC07449), NKUM. **Taiwan:** 1♂, Taipei County, Wulai, Bao-Qing Temple, 24°51.124'N 121°32.243'E, 640 m, 18.v.2007, G. Martin & D. L. J. Quicke, BMNH. 7♂, Nantou Hueisun Exp. Forest, 1100 m, 22.–24.iv.1998, 22.–24.x.1999, leg. Mey & Ebert (prep. gen. LWC09071, 09082); 1♀, Nantou Hueisun Exp. Forest, 650 m, 24.–29.x.1998, leg. Mey & Speidel (prep. gen. LWC09083), ZMHB. **NEPAL:** 3♂, Kathmandu Valley, Godavari, 1600–1800 m, 06.–10.vi.1967, leg. W. Dierl, Forster & Schacht; 2♂, Prov. 3 East, Jubing, 1600 m, 08.v.1964, leg. W. Dierl, ZSM.

Redescription. Forewing length ♂ 4.5–5.0 mm ($n = 22$), ♀ ($n = 3$) 4.5–5.0 mm.

Head. Fronto-clypeus covered by silvery shining scales; vertex with pale yellow scales, posteriorly interrupted by row of dark brown spatulate scales. Labial palpi upright, each segment basally brown and distally whitish; basal segment with loose-fitting, downwards directed scales, remaining segments with tight-fitting scales. Maxillary palpi brown and white chequered. Proboscis basally scaled white. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus covered by black scales.



Figs. 18–21. Male genitalia of *Micraglossa* species. a: segment IX with appendages; b: phallus; c: cornuti. **18:** *M. beia*, prep. gen. LWC06110. **19:** *M. flavidalis*, prep. gen. LWC08034. **20:** *M. nana*, prep. gen. LWC07451. **21:** *M. scoparialis*, prep. gen. LWC06222.

Thorax (Fig. 5). Patagium and tegulae dark brown. Mesothorax dorsally pale golden shining, ventrally white. Forewing ground colour golden shining, slightly suffused with black scales; basal area with two yellow spots basally, followed by broad golden band;

antemedian line golden, slightly oblique, black edged towards median area; antemedian stigmata small or inconspicuous, connected with antemedian line; distal discoidal stigma 'X' to '8'-shaped, connected with black spot at costa; postmedian line golden, bent 'S'-

shaped from costa towards dorsum, meeting costa rectangularly with large, golden spot, dentation towards distal discoidal stigma inconspicuous, meeting dorsum rectangularly; subterminal line golden, medially not connected with postmedian line; subterminal area densely suffused black; fringe basally golden, medially brown, distally whitish. Hindwings termen with thin brown line; fringe white with brown line medially.

Abdomen. Intersegmental membranes without tiny spines.

♂ **genitalia** (Fig. 16). Uncus narrow, triangular, distally tapering, distally flat and slightly downcurved in lateral view; but blunt in ventral view. Gnathos slender, longer than uncus, dorsally dentate, distally tapering with slightly downwards directed tip. Valva with dorsal edge conspicuously concave, posterodorsally angled or rounded; sacculus slender and nearly straight, dorsodistally with 1–2 bristles; posterior edge of valva round. Juxta ovate. Phallus thin; at about two thirds dorsally with densely spinous membrane; exteriorly, close to posterior opening with 1–3 sclerotised thorns; vesica with several long, needle-like, deciduous cornuti arising from one point in middle of phallus.

♀ **genitalia** (Fig. 26). Corpus bursae globular, membranous, with tiny spines; ovate signum with four rows of spines. Ductus bursae membranous, thin, curved; ductus seminalis arising at posterior part of ductus bursae; colliculum slightly longer than antrum; antrum straight, as thick as colliculum, with dense scobination. Apophyses anteriores about 3 × as long as segment VIII. Papillae anales ovate, apophyses posteriores slightly longer than papillae anales.

Diagnosis. Among Chinese *Micraglossa* species, *M. oenealis* is unique in the presence of the spinous membrane dorsally attached to the phallus.

Distribution. Known from the Chinese provinces of Guizhou and Taiwan and recorded for the first time from Nepal.

Remarks. *M. oenealis* has been recorded as *M. aenealis* (misspelling) from Taiwan by SASAKI (1998: 200, figs. 14 (adult from Taiwan), 20 (holotype), 26 (drawing of holotype genitalia)) and from Fujian Province by SONG (2003: 191, fig. 234), but the illustrations of the male genitalia provided by these two authors are insufficient to confirm the species identification. *M. oenealis* has been also recorded by CARADJA & MEYRICK (1935: 35) from Zhejiang Province, West Tianmushan, and from the Khasi Hills in India. SASAKI (1998) mentioned females from Taiwan and India, but these were not available for study.

We hereby designate a lectotype for *M. oenealis* in order to fix its status as the name-bearing type of this

species. In the original description, HAMPSON (1897) used the term “type” (in singular), but he also did so in cases of which more than one specimen is available (cf. *M. straminealis*). The specimen designated here as lectotype was figured by SASAKI (1998: fig. 20).

Micraglossa zhongguoensis sp.n.

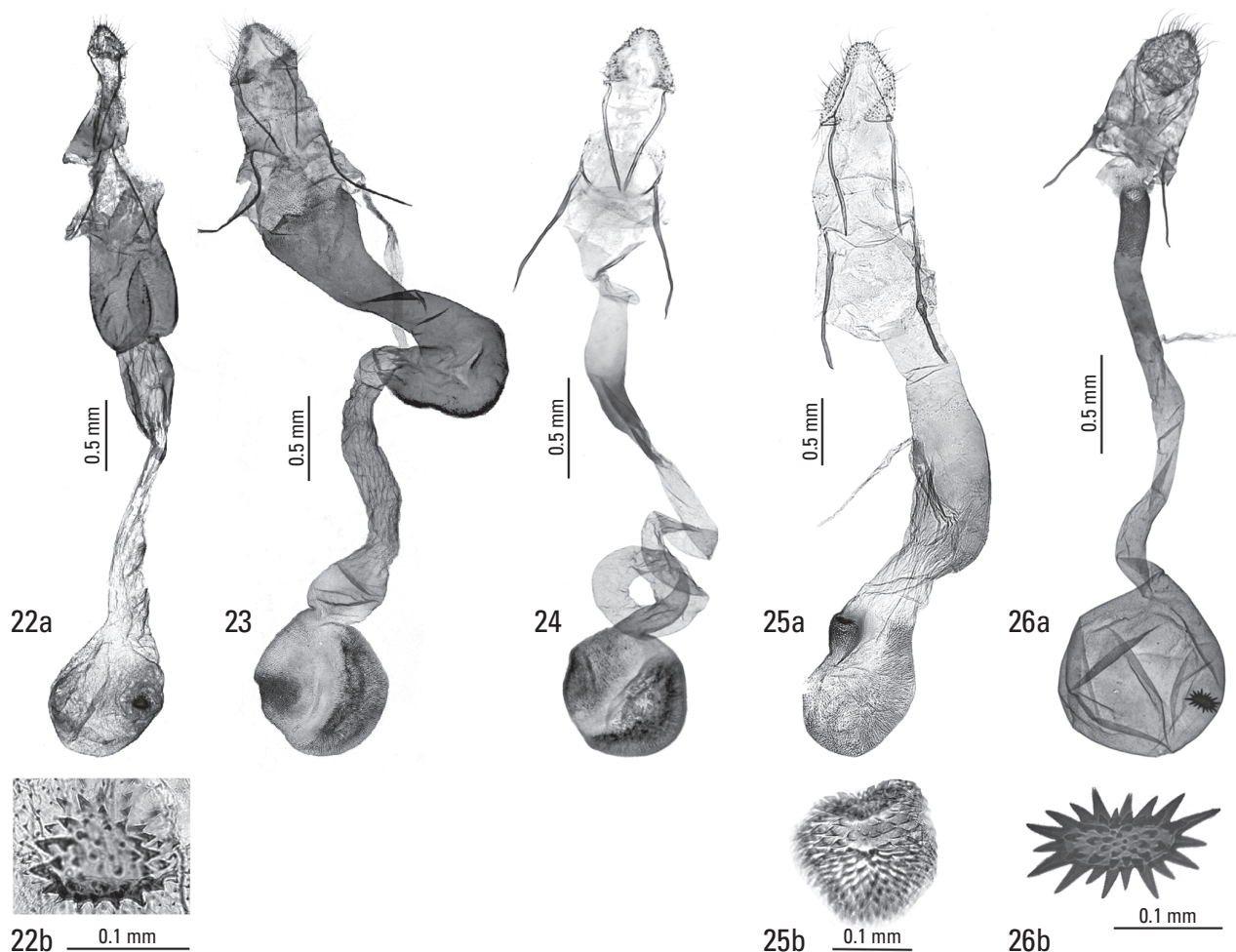
Figs. 6, ♂ 17, ♀ 27

Type material. Holotype: ♂, **CHINA, Hong Kong:** Kadoorie Farm, 340–455 m, 14.iv.2007, leg. Houhun Li et al. (prep. gen. LWC07336), NKUM. – Paratypes, 132♂, 23♀: **CHINA, Shaanxi:** 1♂, Ankang, Hualongshan, Pingjiangxing Village, 800 m, 4.vii.2003, leg. Haili Yu (prep. gen. LWC08036); 1♀, Baihe, Qianpo, 200 m, 16.v.1994, leg. Jin Zhou (prep. gen. LWC08182); **Anhui:** 4♂, 1♀, Huoshan County, Moztan, 12.viii.2004, leg. Jiasheng Xu et Jialiang Zhang (prep. gen. LWC06144, 07366), NKUM. **Jiangsu:** 2♀, Nanjing, Longtan, 7.v.1933, leg. H. Höne; **Shanghai:** 1♂, 28.viii.–6.ix.1932, leg. H. Höne, ZFMK. **Sichuan:** 1♂, Emeishan, Qingyin’ge, 27.v.1957, leg. Leyi Zheng et Hanhua Cheng (prep. gen. LWC07488), NKUM. **Zhejiang:** 2♂, Tianmushan, Houshanmen, 500 m, 16.viii.1999, leg. Houhun Li et al. (prep. gen. LWC07361, 08185), MTD, NKUM. 90♂, 7♀, West Tianmushan, 16.vi.–7.x.1932, leg. H. Höne (prep. gen. LWC09018, 09019, 09027, 09028); 1♂, Mountains south of Wenzhou, 22.ix.1940, leg. H. Höne; **Yunnan:** 1♂, Lijiang, 3000 m, 7.ix.1934, leg. H. Höne (prep. gen. LWC09020), ZFMK. **Guizhou:** 1♂, Leishan, Fangxiang Town, 900 m, 13.ix.2005, leg. Jialiang Zhang (prep. gen. LWC08188); 1♀, Mayanghe, Lijiaba, 700 m, 30.ix.2007, leg. Hui Zhen (prep. gen. LWC08004), NKUM. 1♂, 2♀, Xishui, Linjiang, 500–550 m, 25.–26.ix.2000, leg. Haili Yu (prep. gen. LWC06197, 06227, 07373), MTD, NKUM. 1♂, Xishui, Pinghe, 1200 m, 1.vi.2000, leg. Yanli Du (prep. gen. LWC07357), NKUM. 2♂, 3♀, Chishui, Suoluo, 240 m, 21.ix.2000, leg. Haili Yu (prep. gen. LWC06228, 06239, 07450), MTD, NKUM. 4♂, Chishui, Suoluo, 390–500 m, 27.v.–3.vi.2000, leg. Yanli Du (prep. gen. LWC07363); 1♂, Fanjingshan, Heiwan, 530 m, 2.vi.2002, leg. Xinpui Wang; 3♂, Daozhen County, Dashahe, Xiannvdong, 600 m, 28.v.2004, leg. Shulian Hao (prep. gen. LWC06220); 4♂, Daozhen County, Dashahe, Xiannvdong, 600 m, 17.–18. viii.2004, leg. Yunli Xiao (prep. gen. LWC06234); **Guangxi:** 1♂, Yongfu, Qinmu Village, 160 m, 2.v.2008, leg. Li Zhang et Hui Zhen (prep. gen. LWC08082), NKUM. **Hunan:** 7♂, 2♀, Hengshan, 21.iv.–14.viii.1933, leg. H. Höne, ZFMK. 1♀, Xinhua County, Weishan Town, Yantang Village, 6.viii.2004, leg. Yunli Xiao (prep. gen. LWC08178), NKUM. **VIETNAM:** 1♂, Vinh Phuc, Tam Dao, begin of stairs to TV tower, 1000 m; UTM: 48Q WJ671730 (GPS WGS84); 28.ix.2003, leg. C. vd Berg et E. J. v. Nieukerken, RMNH / EvN no: 2003136 (prep. gen. LWC08136); 5♂, 3♀, 50 km north of Hanoi, Tam Dao, 23., 31.iii., 01.iv.1995, leg. W. Mey, ZMHB.

Etymology. The name ‘*zhongguo*’ is derived from the Chinese word ‘Zhongguo’ for ‘China’, referring to the occurrence of the species in many Chinese provinces.

Description. Forewing length ♂ (n = 133) 5.0–6.0 mm, ♀ (n = 23) 5.0–7.0 mm.

Head. Fronto-clypeus shining brown; vertex pale yellow, anteriorly mixed with some brown scales, pos-



Figs. 22–26. Female genitalia of *Micraglossa* species. **22:** *M. manoi*, prep. gen. LWC06241. **23:** *M. straminealis*, prep. gen. LWC08173. **24:** *M. michaelshafferi*, prep. gen. LWC08052. **25:** *M. aureata*, prep. gen. LWC09075. **26:** *M. oenealis*, prep. gen. LWC07449.

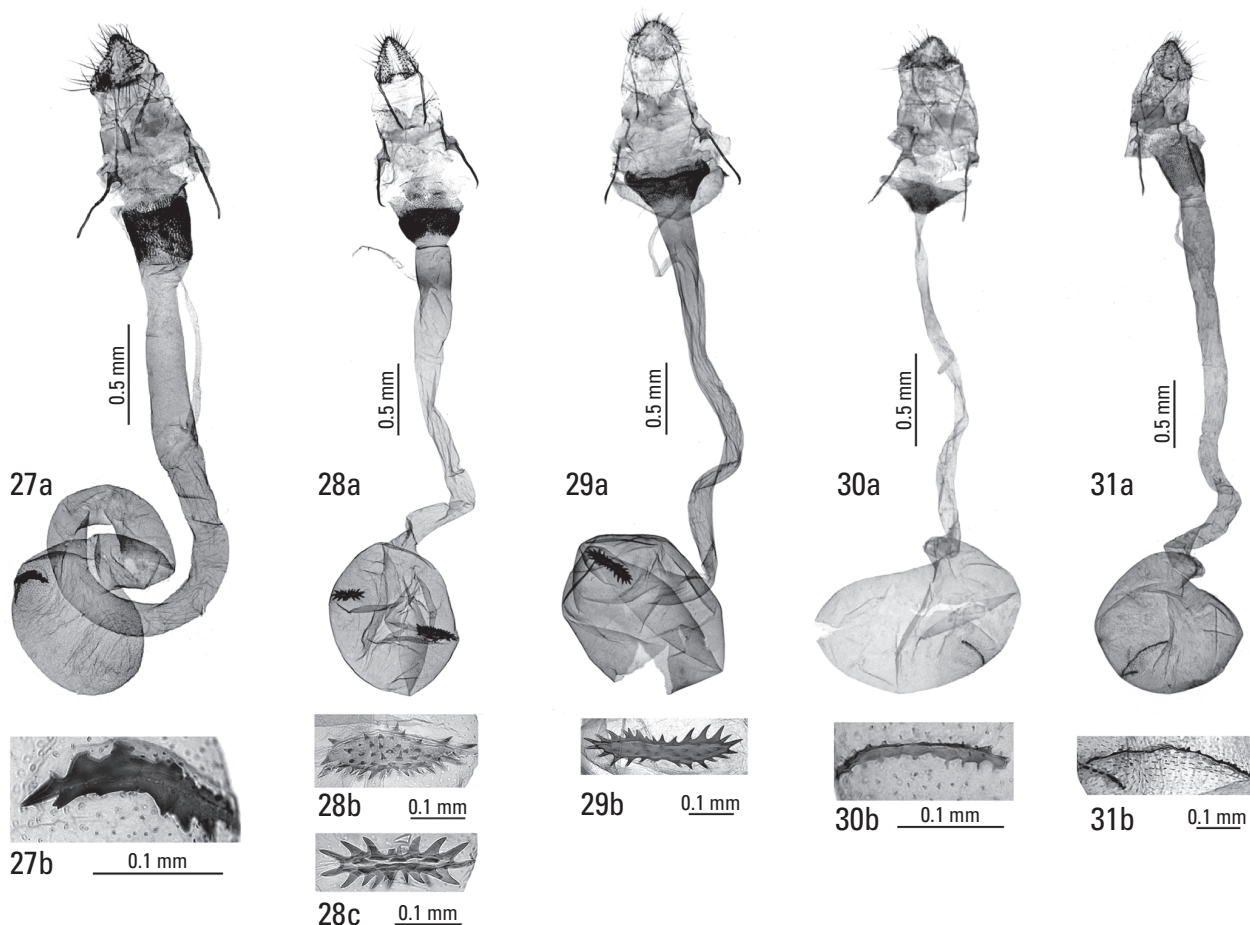
teriorly interrupted by triangular patch of tight-fitting, dark brown, spatulate scales. Labial palpi upright, ventrobasally with loose-fitting scales directed downwards, remaining parts with tight-fitting scales; basal two segments basally pale brown, distally whitish yellow; third segment dark brown, tip whitish yellow. Maxillary palpi with first and second segments basally pale brown and distally whitish yellow; third segment dark brown with tip pale yellow. Proboscis basally scaled white. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus covered by blackish brown scales.

Thorax (Fig. 6). Patagium and tegulae dark brown. Mesothorax dorsally pale yellow; ventrally white. Forewing with ground colour golden, suffused with black scales; basal area basally with two black spots, then dominantly golden; antemedian line thin and straight; antemedian stigmata black, spot-like, connected with antemedian line; distal discoidal stigma black, 'X'-shaped, connected with black spot at costa; postmedian line with golden spot at costa and inconspicuous

dentation towards distal discoidal stigma, then 'S'-bent towards dorsum, meeting dorsum rectangularly; subterminal line forming 'X' together with postmedian line; subterminal area densely suffused black; fringe basally chequered pale yellow and brown, followed by yellow; grey line and white lines. Hindwings of male with fringe white, with grey-brown line medially; fringe of females white with grey line medially.

Abdomen. Intersegmental membranes without tiny spines.

♂ **genitalia** (Fig. 17). Uncus narrow, triangular, posteriorly elongated; distally flat and hooked downwards in lateral view, but blunt in ventral view. Gnathos slender, slightly longer than uncus, dorsally dentate; distally pointed and hooked downwards. Valva with dorsal edge conspicuously concave and broadly sclerotised, posterodorsally angled; saccus slender and slightly concave, dorsodistally with 1–2 elongated bristles; posterior edge of valva round. Juxta ventrally round, dorsally elongated and distally gradually tapering to pointed tip. Phallus medially slightly constricted, with two groups of cornuti: (1) 10–14



Figs. 27–31. Female genitalia of *Micraglossa* species. **27:** *M. zhongguoensis*, prep. gen. LWC07366. **28:** *M. beia*, prep. gen. LWC08040. **29:** *M. flavidalis*, prep. gen. LWC08037. **30:** *M. nana*, prep. gen. LWC07372. **31:** *M. scoparialis*, prep. gen. LWC08029.

thorn-like cornuti arranged in ring close to posterior opening of phallus; (2) anterior group of four deciduous needle-like cornuti.

♀ genitalia (Fig. 27). Corpus bursae globular to ovate, membranous, with elongated signum edged with dentations. Ductus bursae with one loop posterior to corpus bursae; posteriorly straight towards antrum; colliculum smoothly sclerotised, long, stretching along one third of ductus bursae; antrum densely wrapped with spines. Apophyses anteriores 2 × as long as segment VIII. Apophyses posteriores 2 × as long as papillae anales.

Diagnosis. *M. zhongguoensis* is similar to *M. beia* and *M. flavidalis* by the following: thorn-like cornuti arranged in a ring close to the posterior opening of the phallus, presence of deciduous cornuti, and presence of bristles dorsodistally on sacculus. However, as opposed to *M. beia* and *M. flavidalis*, the thorn-like cornuti are not densely surrounded by small, needle-like cornuti and the deciduous cornuti do not arise from a round porous sclerotised plate situated proximally

within the phallus. In the female genitalia, *M. zhongguoensis* has only one signum in the corpus bursae, the ductus bursae has a loop posterior to corpus bursae, and the colliculum is long. In contrast, *M. beia* and some specimens of *M. flavidalis* have two signa in the corpus bursae, but the ductus bursae never has a loop and the colliculum is short.

Distribution. In China known from the provinces of Shaanxi, Anhui, Jiangsu, Shanghai, Sichuan, Zhejiang, Yunnan, Guizhou, Hunan, Hong Kong. Outside China known from northern Vietnam.

Micraglossa beia sp.n.

Figs. 7, ♂18, ♀28

Type material. Holotype, ♂, **CHINA: Zhejiang:** Tianmushan, Laodian, 1140 m, 17.viii.1999, leg. Houhun Li et al. (prep. gen. LWC06041), NKUM. – Paratypes, 56♂, 43♀: **CHINA: Zhejiang:** 4♂, 5♀, same data as holotype (prep. gen. LWC08193, 08196), NKUM. 1♂, Lishui, Longquan, Fengyangshan, 1470 m,

25.vii.2007, leg. Qing Jin (prep. gen. LWC08184), MTD. 2♂, 2♀, Tianmushan, Xianrending, 1500 m, 18.viii.1999, leg. Houhun Li et al. (prep. gen. LWC07362, 08192), NKUM. 2♂, 1♀, West Tianmushan, 25.vii.–7.ix.1932, leg. H. Höne (prep. gen. LWC09017), ZFMK. **Gansu:** 1♀, Tianshui, Dangchuan Forestry Center, 1342 m, 28.vii.2006, leg. Xinpui Wang et Xiangfeng Shi (prep. gen. LWC08197); **Henan:** 1♀, Lushi, Shiziping, 1700 m, 20.vii.2001, leg. Dandan Zhang (prep. gen. LWC06248); 8♂, 5♀, Song County, Baiyunshan, 1400 m, 14.–17.viii.2008, leg. Houhun Li et al. (prep. gen. LWC08151, 08194, 08195); 2♂, Neixiang, Baotianman, 1350 m, 13.vii.1998, leg. Houhun Li (prep. gen. LWC07358); **Xi-zang:** 3♂, 3♀, Motuo, Hanmi, 2380 m, 9.viii.2003, leg. Xinpui Wang et Huaijun Xue. (prep. gen. LWC06179, 07343, 07360); **Sichuan:** 5♀, Baoxing, Fengtongzhai, 1600 m, 2.–3.viii.2004, leg. Yingdang Ren (prep. gen. LWC07341, 08002, 08181); 1♂, 1♀, Mabian, Yonghong, 1500 m, 23.vii.2004, leg. Yingdang Ren; **Hubei:** 3♂, 7♀, Wufeng, Houhe, 1000–1100 m, 10.–11.vii.1999, leg. Houhun Li et al. (prep. gen. LWC06036, 06235); 8♂, 7♀, Hefeng, Shayuan, 1260 m, 15.–18.vii.1999, leg. Houhun Li et al. (prep. gen. LWC06030, 06034); 4♂, 4♀, Xianfeng, Pingbaying, 1280 m, 21.–22.vii.1999, leg. Houhun Li et al. (prep. gen. RYD04025, YHL00204); 1♂, 1♀, Shennongjia, Bajiaomiao, 1100 m, 19.vii.2003, leg. Shulian Hao (prep. gen. LWC06110, 06111); **Guizhou:** 1♂, Jiangkou, Huixiangping, 1700 m, 29.vii.2001, leg. Houhun Li et Xinpui Wang, NKUM. 1♀, Daozhen, Dashuhe, 1350 m, 24.viii.2004, leg. Yunli Xiao (prep. gen. LWC06247), MTD. **Guangxi:** 1♀, Rongshui County, Peixiu Village, 579 m, 13.vii.2004, leg. Jiasheng Xu (prep. gen. LWC08040); **Fujian:** 18♂, 3♀, Wuyishan, Guadun, 1100 m, 29.–31.vii.2008, leg. Weichun Li, Yongling Sun et Haiyan Bai (prep. gen. LWC08168, 08189), NKUM.

Etymology. The name *beia* is derived from the Chinese word ‘bei’ for ‘north’ and refers to the northernmost known occurrence of any *Micraglossa* species.

Description. Forewing length ♂ (n = 59) 6.0–8.0 mm, ♀ (n = 48) 6.0–8.5 mm.

Head. Fronto-clypeus brown to silvery; vertex pale yellow, anteriorly mixed with brown to silver scales, posteriorly with row of dark brown spatulate scales. Labial palpi upright, basal segment with loose-fitting, downwards directed scales, basally brown, distally white; second and third segments with tight-fitting scales, second segment pale yellow with brown basally and distally, distal segment basally dark brown, distal pale yellow. Maxillary palpi basally and distally pale yellow, medially brown. Proboscis basally scaled white. Antenna partly brown and yellow chequered, partly with continuous brown scales dorsally; scapus dark brown to black.

Thorax (Fig. 7). Patagium dark brown. Tegulae anteriorly and medially with brown scales, posteriorly with basally white and distally pale brown scales. Mesothorax dorsally with anteriorly narrow, silver and posteriorly broad, brown scales. Forewing ground colour pale to intensive golden, suffused with black; basal area basally with two black spots; antemedian line straight, oblique; antemedian stigmata black, streak-like, both connected with antemedian line; distal dis-

coidal stigma ‘X’- to ‘8’-shaped, filled pale yellow and connected with black spot at costa; postmedian line meeting costa at right angle, inconspicuously dentate towards distal discoidal stigma, then bent, meeting dorsum at oblique angle; subterminal line forming ‘X’ together with postmedian line; subterminal area suffused black; fringe basally chequered yellow and brown, distally white. Hindwing of both sexes with termen with thin brown line; fringe basally pale yellow, followed by pale brown line, distally white.

Abdomen. Intersegmental membranes without tiny spines.

♂ *genitalia* (Fig. 18). Uncus elongate, triangular; tip blunt in ventral view, but flat and slightly down-curved in lateral view. Gnathos slender, slightly longer than uncus, slightly downcurved, mediodistally with minute dentations, tip pointed and slightly hooked downwards. Valva with dorsal edge strongly sclerotised and conspicuously concave, posteriorly angled; ventral edge straight, sacculus smoothly sclerotised, dorsodistally with 1–2 bristles; posterior edge of valva round. Juxta ovate shield-shaped. Phallus medially slightly constricted, posterior part with greatest diameter; opening for ductus ejaculatorius at about one third from anterior tip of phallus; phallus with three groups of cornuti: (1) posterior part inside covered densely with numerous tiny, needle-like spines; (2) more than twelve thorn-like cornuti; (3) about twenty long needle-like deciduous cornuti, two-thirds as long as phallus, arising from small, round porous sclerotised plate situated proximally within phallus.

♀ *genitalia* (Fig. 28). Corpus bursae globular, membranous, smooth, only with some parts adorned with tiny, needle like spines of less than 8 µm in length; two long signa, situated in corpus wall opposite to each other, each signum with two to six rows of varying numbers of spines. Ductus bursae membranous, long and thin, slightly curved or straight from corpus bursae towards antrum; ductus seminalis arising in posterior part of ductus bursae; colliculum only slightly longer than antrum; antrum short and broad, densely adorned with granules, posterior edge laterally bent anteriorly. In several specimens, corpus bursae and ductus bursae with several male deciduous cornuti. Apophyses anteriores about 3 × as long as segment VIII. Apophyses posteriores slightly longer than papillae anales.

Diagnosis. *Micraglossa beia* is similar to *M. flavidalis* with which it occurs syntopically and synchronously. *M. beia* has the postmedian line of forewing less oblique towards thorax and with lesser distance to subterminal line at dorsum. In the male genitalia, *M. beia* with the edge of the valva dorsally conspicuously concave, broadly sclerotised and the posterodorsal edge is angled; ventral edge of valva straight, dorsodistal edge of sacculus with 1–2 bristles. In contrast, *M. flavidalis*

has the edge of valva dorsally nearly straight, thinly sclerotised and the posterodorsal edge round; ventral edge of valva slightly concave and dorsodistal edge of sacculus with 4–6 bristles.

In the female genitalia, *M. beia* with two elongated signa in corpus bursae and posterior edge of antrum laterally bent towards the anterior. *M. flavidalis* usually with one elongated signum, some females with a second, but smaller and rounded signum; posterior edge of antrum straight.

Distribution. *Micraglossa beia* occurs from the eastern edges of the Tibetan Plateau through central to southeastern China. It is known from the Chinese provinces of Xizang, Sichuan, Guizhou, Henan, Hubei, Fujian, Gansu, Zhejiang and Guangxi.

Micraglossa flavidalis Hampson, 1907

Figs. 8, ♂19, ♀29

Micraglossa flavidalis Hampson, 1907: 20.

Type material. Holotype (by monotypy), ♂, “Holotype”, “Type”, [CHINA:] “Chang Yang | A. E. Pratt Coll. | Aug 1888”, “Leech Coll. | 1900 – 64.”. “*Micraglossa flavidalis* | type ♂. Hmps.”, “Pyralidae | Brit. Mus. | Slide No. | 3587”, BMNH.

Other material examined. 14♂, 61♀. **CHINA, Gansu:** 1♀, Wen County, Bifenggou, 860 m, 10.vii.2005, leg. Haili Yu (prep. gen. LWC08180); **Shaanxi:** 1♂, Ankang, Hualongshan, Pingniutoudian, 800 m, 2.vii.2003, leg. Haili Yu (prep. gen. LWC08034); 2♀, Ankang, Hualongshan, Pingjiangxing Village, 800 m, 4.vii.2003, leg. Haili Yu (prep. gen. LWC08037); **Henan:** 1♀, Song County, Baiyunshan, 1400 m, 15.viii.2008, leg. Houhun Li et al. (prep. gen. LWC08153); **Sichuan:** 2♂, 4♀, Baoxing, Fengtongzhai, 1600 m, 2.–3.viii.2004, leg. Yingdang Ren (prep. gen. LWC06050, 08001, 08191); 1♂, 1♀, Mabian, Yonghong, 900–1200 m, 21.–22.vii.2004, leg. Yingdang Ren (prep. gen. LWC07487, 08190); 2♀, Tianquan, Labahe, 1300 m, 28.–29.vii.2004, leg. Yingdang Ren (prep. gen. LWC07342), NKUM. **Hubei:** 6♂, 22♀, Hefeng, Shayuan, 1260 m, 15.–18.vii.1999, leg. Houhun Li et al. (prep. gen. LWC05050, 05066, 06033, 06152, 06218); 1♂, 22♀, Wufeng, Houhe, 1000–1100 m, 8.–12.vii.1999, leg. Houhun Li et al. (prep. gen. LWC05079, 05080, 05081, 05082, 06147), MTD, NKUM. 6♀, Xianfeng, Pingbaying, 1280 m, 21.–22.vii.1999, leg. Houhun Li et al. (prep. gen. LWC06001, RYD04024); 2♂, Shengnongjia, Songbai Town, 1200–1400, 17.vii.2003, leg. Shulian Hao (prep. gen. LWC06101, 06109), NKUM. **Yunnan:** 2♂, Weishan, Weibaoshan, 2200 m, 20.vii.2001, leg. Houhun Li et Xipu Wang (prep. gen. LWC06136), MTD.

Redescription. Forewing length ♂ (n = 16) 5.5–7.5 mm, ♀ (n = 61) 6.0–7.0 mm.

Head. Fronto-clypeus brown; vertex with pale yellow, loose-fitting scales, posteriorly interrupted by row of dark brown, spatulate, tight-fitting scales. Labial palpi upright, basal segment with loose-fitting, downwards directed scales, basally brown, distally white; second segment with tight-fitting, ventrally slightly

loose-fitting, downwards directed, brown, laterally pale yellow scales; third segment with tight-fitting scales throughout, brown, distally pale yellow. Maxillary palpi brown; basal part with tight-fitting scales, distally with narrow white ring; distally pale yellow. Proboscis basally scaled white. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus blackish brown.

Thorax (Fig. 8). Patagium dark brown. Tegulae anteriorly and medially brown, posteriorly with basally white and distally pale brown scales. Mesothorax dorsally with narrow brown-silver scales. Forewing with ground colour pale to intensive golden, suffused with black; basal area basally with two black spots; antemedian line straight, oblique; antemedian stigmata black, streak-like, both connected with antemedian line; distal discoidal stigma ‘X’- to ‘8’-shaped, filled pale yellow and connected with black spot at costa; postmedian line meeting costa at right angle, inconspicuously dentate towards distal discoidal stigma, then conspicuously ‘S’-shaped, meeting dorsum at right angle; subterminal line forming ‘X’ with postmedian line, with relatively large distance from each other at dorsum; subterminal area suffused black; fringe basally pale yellow, medially silver-brown, distally white. Hindwing of both sexes with termen with thin brown line; fringe as in forewings.

Abdomen. Intersegmental membranes without tiny spines.

♂ **genitalia** (Fig. 19). Uncus triangular, elongated, tip blunt in ventral view, but flat and slightly downcurved in lateral view. Gnathos slender, slightly longer than uncus, anterior arms upcurved, medio-dorsally with minute dentations, posterior extension slightly downcurved, tip pointed and slightly hooked downwards. Valva with dorsal edge straight or slightly concave, strongly sclerotised; ventral edge medially slightly concave, posterior edge round; sacculus dorsodistally with 4–6 bristles. Juxta round, shield-shaped. Phallus straight; opening for ductus ejaculatorius at about one third from anterior tip; vesica with three groups of cornuti: (1) posterior part densely adorned with numerous short needle-like spines; (2) 8–12 thorn-like cornuti with elongated base; (3) cluster of long needle-like deciduous cornuti, two-thirds as long as phallus, arising from small, round, porous sclerotised plate situated proximally.

♀ **genitalia** (Fig. 29). Corpus bursae globular, membranous; two thirds of corpus adorned with needle-like spines of 4–7 µm in length, one third adorned with thorn-like spines of 3–11 µm length; elongate signum with 2–5 rows of spines situated within part with smaller spines. Four females (prep. gen. LWC05050, 05066, 05080, 06147) bearing 16 to 38 enlarged thorns opposite to elongate signum of cor-

pus bursae, connected with each other at their bases. Ductus bursae membranous, thin, curved, moderately enlarged towards antrum; ductus seminalis arising at posterior part of ductus bursae; colliculum only slightly longer than antrum; antrum short and broad, densely adorned with granules, its posterior edge straight. Apophyses anteriores about $3 \times$ as long as segment VIII. Papillae anales triangular, apophyses posteriores about $2.5 \times$ as long as papillae anales. Several specimens bear deciduous cornuti inside corpus bursae and ductus bursae.

Diagnosis. *Micraglossa flavidalis* is similar to *M. beia*, q.v.

Distribution. *Micraglossa flavidalis* occurs at the eastern edge of the Tibetan Plateau and in central China. Records are known from the provinces of Gansu, Shaanxi, Henan, Sichuan, Hubei, Guizhou and Yunnan.

Remarks. The identity of *M. flavidalis* is difficult to verify because the genitalia slide of the holotype contains only the anterior seven segments of the abdomen, and segment 8 and the genitalia are missing. The abdominal intersegmental membranes are without tiny spines. The holotype is a male that can be verified by prismatic flagellomeres and white hindwings. Among those Chinese species without spines in intersegmental membranes, the holotype of *M. flavidalis* externally corresponds with a number of specimens having somewhat broader forewings, with the antemedian line straight, oblique; the 'X' formed by the postmedian and subterminal lines has large interspaces; the costal half of the postmedian line and the posterior half of the subterminal line together form a rather straight line. All these specimens are here treated as *M. flavidalis* and the description provided above is derived from the specimens collected between 1999–2008.

M. flavidalis has been also recorded by CARADJA & MEYRICK (1935: 35) from Hunan Province, Hengshan ("Höngshan") and Guangdong Province, Lianping [Lienping, "Lackbaumpass"]. These specimens have not been investigated for this study.

Micraglossa nana sp.n.

Figs. 9, ♂20, ♀30

Type material. Holotype: ♂, CHINA, Guizhou: Xishui, Pinghe, 1200 m, 1.v.2000, leg. Yanli Du (prep. gen. LWC07451), NKUM. – Paratypes, 36♂, 44♀: CHINA, Guizhou: 1♀, same data as holotype (prep. gen. LWC08079); 7♂, 8♀, Xishui, Linjiang, 500–550 m, 24.–29.ix.2000, leg. Haili Yu (prep. gen. LWC06003, 06224, 06225, 07368, 07370), NKUM.

3♀, Leishan, Fangxiang Town, 900 m, 13.ix.2005, leg. Jialiang Zhang (prep. gen. LWC07371, 07372), MTD, NKUM. 14♀, Chishui, Suoluo, 240 m, 21.–23.ix.2000, leg. Haili Yu (prep. gen. LWC06229, 06238, 06240, 08027, 08176); 1♀, Chishui, Suoluo, 390 m, 29.v.2000, leg. Yanli Du; 1♂, 1♀, Fangjinshan, Heiwan, 530 m, 2.vi.2002, leg. Xipu Wang (prep. gen. LWC07367, 08186), NKUM. **Sichuan:** 1♂, 2♀ Emeishan, 4,000–4,500 ft., 11.vii., 9.viii.1929, G. M. Franck, M.M. 1961–549, BMNH. **Zhejiang:** 1♂, Taishun, Wuyanling, 1000 m, 3.viii.2005, leg. Yunli Xiao (prep. gen. LWC07456), NKUM. 17♂, 9♀, Lishui, Longquan, Fengyangshan, 1470 m, 25.–31.vii.2007, leg. Qing Jin (prep. gen. LWC07457, 08039, 08042), MTD, NKUM. **Guangxi:** 1♂, Rongshui County, Peixiu Village, 579 m, 13.vii.2004, leg. Jiasheng Xu (prep. gen. LWC08003); 6♂, 5♀, Rongshui, Antai Town, Baiping, 1350 m, 14.vii.2004, leg. Jiasheng Xu (prep. gen. LWC07458, 08041), NKUM. **VIETNAM:** 2♂, Lao Cai, Province, Hoang Lien Song, Phan Xi Pang, NW slopes near Sin Chai, 2100 m, UTM: 48Q UK745687, 16., 18.ix.2003, leg. C. vd Berg et E. J. v. Nieuwerkerken, EvN no: 2003060 and 2003079 (prep. gen. LWC09022, 09025), RMNH.

Etymology. The name *nana* is derived from the Chinese word 'nan' for 'south', referring to the distribution in southern provinces of China.

Description. Forewing length ♂ (n = 37) 5.0–6.0 mm, ♀ (n = 44) 5.0–6.0 mm.

Head. Fronto-clypeus brown, suffused with silver; vertex with pale yellow scales, posteriorly interrupted by brown scales. Labial palpi bent upright; basally covered by brown, loose-fitting scales directed downwards; medially and distally with tight-fitting scales, medially pale-brown, distally dark-brown. Maxillary palpi short, dark brown, with pale yellow on distal part of basal and entire distal segment. Proboscis basally scaled pale yellow. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus black.

Thorax (Fig. 9). Patagium and tegulae dark brown. Mesothorax dorsally covered by brown scales, suffused with silver glossy scales; ventrally white. Forewing with ground colour glossy silver; along costa black, with interruptions at antemedian and postmedian lines as well as in some specimens at middle of median area; basal area with two black spots; antemedian line yellowish white, straight, antemedian stigmata streak-like, connected with antemedian line; distal discoidal stigma 'X'-shaped, connected with black spot at costa; postmedian line yellowish white, meeting costa at right angle, slightly dentate towards distal discoidal stigma, towards dorsum bent 'S'-shaped, meeting dorsum at nearly right angle; subterminal line pale yellow, connected with postmedian line, together forming 'X'; subterminal area densely suffused black; fringe basally pale yellow, chequered with pale brown, distally pale white. Hindwing of male with fringe pale yellow basally,

white distally; hindwing of female with fringe as in forewing.

Abdomen. Intersegmental membranes without tiny spines.

♂ **genitalia** (Fig. 20). Uncus narrow, triangular, posteriorly elongated; distally flat in lateral view, but blunt in ventral view. Gnathos slightly longer than uncus, dorsally dentate and groove-shaped medially; with pointed and hooked tip. Valva with dorsal edge conspicuously concave and broadly sclerotised, posterodorsally angled; sacculus slender and nearly straight, without bristle; posterior edge of valva round. Juxta nearly triangular in shape, basally round and distally pointed. Phallus straight, with two groups of cornuti: (1) 6–12 thorn-like cornuti situated close to phallic apodeme and surrounded by numerous, needle-like spines; (2) 1–3 deciduous needle-like spines situated proximally in vesica.

♀ **genitalia** (Fig. 30). Corpus bursae globular to ovate, membranous, with streak-like signum. Ductus bursae thin and long, with fold posterior to corpus bursae; ductus seminalis arising at middle of ductus bursae; antrum 0.2–0.5 broader than long; densely adorned with granules. Apophyses anteriores 3 × as long as segment VIII. Apophyses posteriores 2 × as long as papillae anales. Corpus bursae sometimes containing 1–3 deciduous needle-like cornuti.

Diagnosis. *M. nana* is similar to *M. scoparialis*. In the male genitalia the thorn-like cornuti attached in the vesica are close to the posterior opening of the phallus and bristles are absent at the posterodorsal edge of the sacculus. In females the corpus bursae has one thin, streak-like signum and a fold beyond the corpus bursae. However, *M. nana* usually has less thorn-like cornuti and there are no small, needle-like cornuti at their base. Further, *M. nana* has deciduous cornuti, which are absent in *M. scoparialis* and the dorsodistal edge of the valva is angled, while it is round in *M. scoparialis*. In females, *M. nana* has the ductus bursae very thin with the colliculum about one-third the length of the ductus bursae, but *M. scoparialis* has the ductus bursae thicker and the colliculum about as short as antrum. In *M. nana*, the antrum is always wider than long, but in *M. scoparialis* it is always as long as wide as or longer than wide. Deciduous cornuti of *M. nana* are different from those of *M. beia* and *M. flavidalis* by absence of round porous sclerotised plate to which these cornuti are attached in the vesica as well as from those of *M. zhongguoensis* which are attached to vesica in a line, instead of a point.

Distribution. Known from the Chinese provinces of Guizhou, Zhejiang and Guangxi. Outside China known from Vietnam.

Micraglossa scoparialis Warren, 1891

Figs. 10, ♂21, ♀31

Micraglossa scoparialis Warren, 1891: 66.

Type material. Holotype (by monotypy): ♀, “Holotype”, “Type”, [INDIA:] “Darjeeling”, “Zell. Coll. I 1884.”, “Ind. orient. I Stt.”, “♀ I Pyralidae I Brit. Mus. I Slide No. I 3605”, “Holotype I *Micraglossa scoparialis* I Warren I det. M. Shaffer, 1996”, BMNH.

Other material examined, 53♂, 37♀. **CHINA, Guizhou:** 2♂, Daozhen County, Xiannvdong, 600 m, 17.viii.2004, leg. Yunli Xiao (prep. gen. LWC05057), MTD, NKUM. 1♂, Daozhen County, Dashahe, 1350 m, 25.v.2004, leg. Shulian Hao (prep. gen. LWC06245); 3♂, 1♀, Daozhen County, Guo Village, 1300 m, 20.–21.viii.2004, leg. Yunli Xiao (prep. gen. LWC08028); 2♀, Daozhen County, Dashahe, 1350–1370 m, 24.–25.viii.2004, leg. Yunli Xiao; **Shaanxi:** 1♀, Ankang, Hualongshan, Pingniutoudian, 800 m, 2.vii.2003, leg. Haili Yu (prep. gen. LWC08035); **Xizang:** 1♂, Bomi, 12.vi.1983, leg. Houhun Li (prep. gen. LWC07453); **Sichuan:** 1♂, Wolong, 2008 m, 26.vii.2005, leg. Haili Yu (prep. gen. LWC07509); 4♀, Wolong, 1900 m, 7.–9.viii.2004, leg. Yingdang Ren (prep. gen. LWC06171); 1♂, 5♀, Baoxing, Fengtongzhai, 1600 m, 2.–3.viii.2004, leg. Yingdang Ren (prep. gen. LWC06182, 08198), NKUM. **Hubei:** 13♂, 11♀, Wufeng, Houhe, 1000–1100 m, 8.–12.vii.1999, leg. Houhun Li et al. (prep. gen. LWC06035, 06148, 06222, 06223, 08029), MTD, NKUM. 1♀, Hefeng, Shayuan, 1260 m, 15.vii.1999, leg. Houhun Li et al. (prep. gen. LWC06233); **Yunnan:** 2♂, Longling, Xiaoheishan, 2300 m, 10.viii.2005, leg. Yingdang Ren (prep. gen. LWC07364); 1♂, Weishan, Weibaoshan, 2200 m, 20.vii.2001, leg. Houhun Li et Xinpu Wang (prep. gen. LWC06140), NKUM. **PAKISTAN:** 2♂, 1♀, NW-Frontier, Murree, 1700 m, 29.vii.1979, leg. W. Thomas; 1♂, Kaghan Valley, Indus Kohistan, Naran, 2400–2800 m, 21.–22.vii.1979, leg. W. Thomas, MTD. **NEPAL:** 10♂, 6♀ Kathmandu Valley, Godavari, 1600–1800 m, 31.v.–10.vi., 05.–07.viii.1967, leg. W. Dierl, Forster & Schacht; 1♂, 1♀, Prov. 1 East, Pultschuk, 2300–2500 m, 12.–16.vi.1967, leg. W. Dierl, Forster & Schacht; 5♂, 1♀, Prov. no. 2 East, Bhandar, below Thodung, 2200 m, 2.viii.1964, leg. W. Dierl; 1♂, 1♀, same data, but Jiri, 2000m, 10., 13.viii.1964; 1♂, Prov. 3 East, Jubing, 1600 m, 11.v.1964, leg. W. Dierl; 1♀, same data, but Junbesi, 2750 m, 25.–31.vii.1964, 1♂, Tampa Khosi Valley, 2600 m, 09.v.1962, leg. G. Ebert & H. Falkner, ZSM. **VIETNAM:** 4♂, Lao Cai, Province, Phan Xi Pang, near Sapa, mountain forest, 1950 m, 19.–23.vi.1999, leg. A. Kallies, MTD. 3♂, Phan Xi Pang, Hoang Lien Song, NW slopes near Sin Chai, 2100 m, UTM: 48Q UK745687, 19.ix.2003, leg. C. vd Berg et E. J. v. Nieuwerkerken, EvN no: 2003008 (prep. gen. LWC08135, 09003). 1♀, same data, but pass north of Phan Xi Pang, 8 km WNW Sapa, 2000 m, UTM 48Q 738723, 01.xi.2001, leg. E. J. v. Nieuwerkerken & S. Koster, EvN no: 2001305, RMNH. 1♂, Sa Pa, Okui-ho, 1100 m, 24.–25.iii.1995, leg. W. Mey, ZMHB.

Redescription. Forewing length ♂ (n = 55) 5.0–6.0 mm, ♀ (n = 38) 5.0–7.0 mm.

Head. Fronto-clypeus pale yellow; vertex with pale yellow scales, posteriorly interrupted by row of brown spatulate scales. Labial palpi upright, with mixture of pale yellow and brown scales; scales basally elongated, directed downwards, medially and distally tight-fitting. Maxillary palpi brown with pale yellow ring medially and pale yellow distally. Proboscis ba-

sally scaled white, suffused with a few brown scales. Flagellomeres with row of dark brown scales basally and row of pale yellow scales distally, giving antenna brown and yellow chequered pattern; scapus covered by pale brown to dark brown scales.

Thorax (Fig. 10). Patagium dark brown. Tegulae anteriorly brown, posteriorly greyish. Mesothorax dorsally with narrow, brown and grey scales; ventrally glossy white. Forewing with ground colour pale golden, slightly suffused with black; basal area mostly black; antemedian line straight, slightly angled near costa; antemedian stigmata black, streak-like, connected with antemedian line; distal discoidal stigma black, 'X'-shaped, connected with black spot at costa; postmedian line with golden spot at costa; meeting costa and dorsum at right angle; inconspicuous denatation towards distal discoidal stigma, then 'S'-bent towards dorsum; subterminal line towards costa narrow, towards dorsum broad, forming 'X' together with postmedian line; subterminal area densely suffused with dark brown scales; fringe basally chequered pale yellow and brown, distally white. Hindwing of both sexes with fringe basally with thin, pale yellow line, medially with pale brown line and distally white.

Abdomen. Intersegmental membranes without tiny spines.

♂ **genitalia** (Fig. 21). Uncus narrow, posteriorly elongated; in lateral view distally flat and bent downwards, but blunt in ventral view. Gnathos slender, slightly longer than uncus; mediodorsally dentate; with pointed and hooked tip. Valva with dorsal edge conspicuously concave and broadly sclerotised; posterodorsally angled; sacculus slender and straight, without bristle; posterior edge of valva round. Juxta round, dorsally with small protuberance. Phallus straight; vesica with 10 thorn-like cornuti close to posterior opening of phallus, surrounded by numerous small, needle-like cornuti. No deciduous cornuti were found, neither in males nor in females.

♀ **genitalia** (Fig. 31). Corpus bursae globular, membranous, with long, narrow, streak-like signum. Ductus bursae with loop posterior to corpus bursae, then slightly curved; ductus seminalis arising at about one fourth anterior to ostium bursae; colliculum long, smoothly sclerotised; antrum as long as wide or slightly longer than wide by factor of 1.0–1.3, densely adorned with granules. Apophyses anteriores about $2.5 \times$ as long as segment VIII. Apophyses posteriores about $2 \times$ as long as papillae anales.

Diagnosis. *M. scoparialis* is similar to *M. nana*, q.v.

Distribution. Known from the Chinese provinces of Shaanxi, Sichuan, Xizang, Hubei, Guizhou, and Yunnan. Outside China known from Pakistan, Nepal and Vietnam.

Remarks. *M. scoparialis* is here recorded for the first time from Pakistan, Nepal and Vietnam. In China it has been also recorded by CARADJA (1925: 335) and CARADJA & MEYRICK (1934: 156) from Lianping in Guangdong province, by CARADJA (1931: 208) from Guanxian ("Kwanhsien", 31°01'N 103°40'E) in Sichuan province, by CARADJA (1938: 251) from West Tianmushan in Zhejiang province and by SONG & HE (1997: 1165) from the Three Gorges of the Yangtze River, in Sichuan province. These specimens have not been investigated for this study. HAMPSON (1897: 224) provided drawings of wing pattern, venation and head.

Biogeographical considerations

This taxonomic work revises the genus *Micraglossa* from the northernmost part of its distribution in China and adjacent areas. It reveals that 10 out of the 15 described species of *Micraglossa* occur in China, but we have seen specimens of two more undescribed species (not described herein because only females were available).

No record is available for a *Micraglossa* species occurring both in continental China and Japan. *M. aurata* is only known from Japan and Taiwan, but. *M. manoi*, originally described from Taiwan, is now also recorded from continental China as well as from Nepal. The known distribution of *M. beia* and *M. flavidalis* is restricted to the continental part of China, but based on their wide ranges, they might be expected to occur in countries southwest of China. The remaining six species are recorded from the continental part of China and at least from one adjacent continental country.

These ten species are the known *Micraglossa* species occurring in the northernmost part of the distribution of *Micraglossa*. This northern distribution extends from Pakistan, India and Nepal along the southwest facing slopes of the Himalaya through the central and southern provinces of continental China and the northern parts of Thailand and Vietnam to Japan and Taiwan. This geographical region is largely linked with the occurrence of evergreen broad leaf forests (= laurel forests). In China, these forests are characterised by, e.g., Lauraceae (*Actinodaphne*, *Beilschmiedia*, *Cinamomum*, *Cryptocarya*, *Persea*, *Phoebe*), Fagaceae (*Castanopsis*, *Lithocarpus*, *Quercus*), Magnoliaceae (*Magnolia*, *Manglietia*, *Michelia*) and Podocarpaceae. These laurel forests originally covered an area of about one million square kilometres in lowlands as well as lower altitudes of the mountains. From Central Nepal

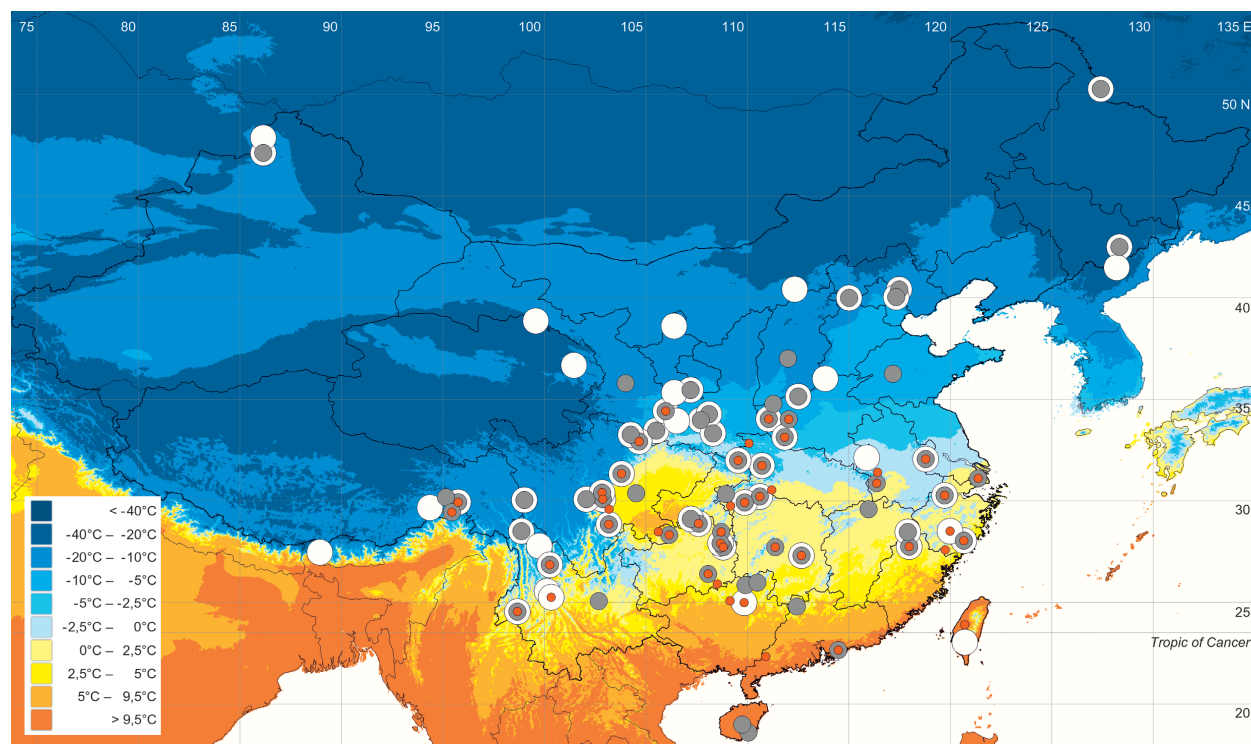


Fig. 32. Map of China showing the localities where Scopariinae are recorded and the mean minimum temperature of the coldest month (January) of the year. White circles: *Eudonia*; grey circles: *Scoparia*; red circles: *Micraglossa*.

to Yunnan, laurel forests are growing at altitudes of 1,000 to 2,500 m. They also occur in Korea and Japan. In laurel forests of Asia precipitations are influenced by monsoons. Due to the high precipitation, there is a rich growth of epiphytes, dominated by bryophytes (HÄMET-AHTI et al. 1974; WALTER & BRECKLE 1991; SCHROEDER 1998; BRECKLE 2002; POTT 2005).

As far as it is known bryophytes are a main food source for scopariine larvae, with some feeding on lichens and angiosperms. However, life histories are still unknown for the majority of species (NUSS 1999). For *Micraglossa*, a single life history observation is available by MURASE (2005) from Japan, who reported that the larvae of the Japanese *M. aureata* live in cushions of the moss *Trachycystis microphylla* and the liverworts *Plagiochila sciophila* Nees and *Radula japonica* and that one larva fed on *Plagiochila sciophila*. Similar to the known feeding habit of *Eudonia* Billberg, 1820, the larvae live inside bryophyte-cushions in a silken tunnel. Thus, mosses and/or liverworts growing in laurel forests are probably the habitat and food source of *Micraglossa* larvae.

Further south, in tropical Asia and Queensland, *Micraglossa* species occur in mountain rain forests (= oreotropical forests), but not in tropical rain forests of the lowlands (MUNROE 1958; NUSS 1998, 1999). These oreotropical forests show a dominance of Fagaceae (also with *Castanopsis*, *Lithocarpus* and *Quercus*), and a rich growth of epiphytes due to high precipitation. Their altitudinal range stretches from 1,000

to 3,900 m, depending on altitude of mountains and latitude. Asian laurel forests and oreotropical forests are also similar because they do not experience frost below -10°C (SCHROEDER 1998). From these climatic and vegetational observations of similarity one would expect that *Micraglossa* species are distributed northwards to where -10°C is the average minimum isotherme of the coldest month of the year. We tested this by mapping all 98 Chinese localities from where we have seen Scopariinae against the mean minimum temperatures in the coldest month of the year (January) (Tab. 1, Fig. 32). For Scopariinae, we separate the map illustration into three parts, the two worldwide distributed taxa *Eudonia* Billberg, 1820 and *Scoparia* Haworth, 1811 and the Asian-Australian *Micraglossa*. The latter is known from 48 localities in China. Among them the northernmost locality is that of a female of *Micraglossa beia* taken in Gansu Province, Tianshui, at 1,342 m altitude and $34^{\circ}25'\text{N}$ latitude. This and several other records of *Micraglossa* are situated at latitudes and altitudes where frost occurs during winter. The map illustrates that mean minimum temperatures down to -10°C are tolerated. These data suggest that *Micraglossa* is not a warm-tropical, but a temperate-tropical taxon, though frost tolerance might vary among species. The available data suggests that the occurrence of *Micraglossa* species throughout tropical Asia is linked to Asian laurel and oreotropical forests, and both *Micraglossa* and these forest formations tolerate slight frost. However, further local

research will be necessary to identify more precisely the biotic and abiotic requirements for individual *Micraglossa* species as well as to describe the largely unstudied diversity of the group between southern China and northern Australia

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