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A review of *Peratophyga* Warren, 1894 in China, with descriptions of two new species (Lepidoptera: Geometridae, Ennominae)

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Abstract

The genus *Peratophyga* Warren, 1894 in China is reviewed. Six species are recognized, of which *P. crista* **sp. nov.** and *P. recta* **sp. nov.** are described. *P. hyalinata grata* (Butler, 1879) is restored to specific rank as *P. grata* (Butler, 1879) **stat. rev.** *P. grata totifasciata* Wehrli, 1923 **comb. nov.** is proposed. *P. xanthyala* (Hampson, 1896) and *P. grata grata* (Butler, 1879) are newly recorded for China. Two species are transferred from *Peratophyga* to the genus *Stegania* Guenée, 1845: *S. castaneostriata* (Yazaki & Wang, 2004) **comb. nov.** and *S. modesta* (Yazaki & Wang, 2004) **comb. nov.** A key to Chinese *Peratophyga* and diagnoses for Chinese species are provided. Illustrations of external features and genitalia are presented.

Key words: taxonomy, morphology, distribution, *Stegania*, new species, new combinations

Introduction

The genus *Peratophyga* was described by Warren (1894) on the basis of *Acidalia aerata* Moore, 1868 from India, which was later considered to be a junior synonym of *Idaea hyalinata* Kollar, 1844 by Wehrli (1939). The genus name *Peratophyga* Swinhoe, 1894 (described at May 11) was homonym and junior objective synonym of *Peratophyga* Warren, 1894 (described at April 16). Additionally, Holloway (1994) considered *Euctenostega* Prout, 1916 to be a junior synonym of *Peratophyga*. He also provided the diagnostic characters for *Peratophyga*: the forewing M_2 is stalked with M_1 at the anterior angle of cell; a kidney-shaped fovea is often present at the base of the male forewing. *Peratophyga* is currently treated in the tribe Cassymini within the subfamily Ennominae, as it has some typical features of Cassymini: the forewing veins are reduced in number; the tuft of scales are present on the third sternite of the male abdomen; in the male genitalia, the valva has a long narrow and curved dorsal process (Holloway 1994).

The species of *Peratophyga* are mainly distributed in Southeast and East Asia. Parsons *et al.* (1999) listed 14 species in *Peratophyga*. Up to the present, 16 species of the genus *Peratophyga* have been recognized, with five species recorded in China (Warren 1905; Prout 1915; Wehrli 1923, 1939; Yazaki & Wang 2004). However, following study of material obtained during recent expeditions and re-examination of the collection in IZCAS, it has become apparent that new species need to be described, and the taxonomy needs to be revised.

The purposes of this paper are: to describe two new species, *P. crista* **sp. nov.** and *P. recta* **sp. nov.**, to restore *P. hyalinata grata* (Butler, 1879) to specific rank as *P. grata* (Butler, 1879) **stat. rev.**; to newly combine *P. hyalinata totifasciata* Wehrli, 1923 with *P. grata* (Butler, 1879); to newly record one species, *P. xanthyala* (Hampson, 1896) and one subspecies, *P. grata grata* (Butler, 1879) for China; to transfer *P. castaneostriata* Yazaki & Wang, 2004 and *P. modesta* Yazaki & Wang, 2004 to the genus *Stegania* Guenée, 1845; to review all known Chinese *Peratophyga* species and determine their diagnostic characters; and to provide a key for their determination and illustrations of external features and genitalia. As a result six species and two subspecies of *Peratophyga* are recorded for the fauna of China and 17 species worldwide.

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Materials and methods

Specimens of *Peratophyga* were mainly from the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS); the Sun Yat-sen University, Guangzhou, China (SYSU); the South China Agricultural University, Guangzhou, China (SCAU); the Natural History Museum, London, United Kingdom (BMNH); the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK). Terminology for wing venation followed the Comstock-Needham System (Comstock 1918) as adopted for Geometridae by Scoble (1992) and Hausmann (2001), and that of the genitalia was based on Pierce (1914, reprint 1976), Klots (1970) and Nichols (1989). Photographs of the moths were taken using a digital camera. Composite images were generated using Auto-Montage software version 5.03.0061 (Synoptics Ltd). The plates were compiled using Adobe Photoshop.

Peratophyga Warren, 1894

Peratophyga Warren, 1894 (April 16), *Novit. zool.*, 1: 407. Type species: *Acidalia aerata* Moore, 1868, by original designation.
Peratophyga Swinhoe, 1894 (May 11), *Trans. ent. Soc. Lond.*, 1894: 204. Type species: *Acidalia aerata* Moore, 1868. [Junior homonym and junior objective synonym of *Peratophyga* Warren, 1894 April 16.]
Euctenostega Prout, 1916, *Novit. zool.*, 23: 38. Type species: *Euctenostega hypsicyma* Prout, 1916.

Generic characters. Antennae bipectinate, serrate or filiform in male, filiform in female. Frons not protruding. Labial palpi extending slightly beyond frons. Hind tibia with two pairs of spurs in both sexes, dilated and with hair-pencil in male. Outer margin of forewing smooth, that of hindwing often smooth, sometimes forming a sharp protrusion at end of M_3 (in *P. xanthyala* (Hampson, 1896) and *P. oblectata* Prout, 1929). Frenulum well developed. Forewing with a basal elliptic fovea in male except in *P. hypsicyma* (Prout, 1916) and *P. hypsidesma* Holloway, 1994. Wings usually pale yellow, with dark bands outside postmedial lines; postmedial lines often protruding inwards among M veins and below CuA_2, with sparse spots inside. Forewing with R_1 diverging from R_2 near end of Sc and then anastomosing with Sc to end, $R_{3–5}$ arising before anterior angle of cell, M_2 often arising from anterior angle of cell, or sometime close to M_1 and arising from above middle of discocellulars (e.g. *P. flavomaculata* Swinhoe, 1902 and *P. recta* **sp. nov.**). Tuft of scales present on male sternite III. Male genitalia with triangular uncus; gnathos connected at middle and with median process short to long, often rounded apically; valva bifurcate, forming a strong dorsal process and a ventral lobe, dorsal process bearing long setae at terminal half, slightly curved outwards or strongly angled, ventral lobe often triangular, incurved terminally; saccus rounded; coremata not developed; vesica of aedeagus often with two cornuti (basal one spinous terminally, e.g. *P. grata* **stat. rev.**, *P. crista* **sp. nov.**, *P. venetia* Swinhoe, 1902 and *P. bifasciata* Warren, 1905, and *P. xanthyala*), sometimes with one cornutus (long and narrow, with spines on lateral sides, e.g. *P. trigonata* (Walker, 1861), *P. beta* Holloway, 1994 and *P. alluvialis* Holloway, 1994 or short and spinous, e.g. *P. hyalinata* (Kollar, 1844)), or with three cornuti (one of them shaped as a sclerotized disc, the other bulbous, e.g. *P. spilodesma* Prout, 1934), sometimes without cornuti, (e.g. *P. recta*. **sp. nov.**). Female genitalia with apophyses anteriores about one-half length of apophyses posteriores; lamella postvaginalis and lamella antevaginalis well developed; ostium and ductus bursae sometimes sclerotized; corpus bursae often oval, membranous, bearing a signum; signum variable in shape.

Diagnosis. The genus *Peratophyga* is externally similar to *Stegania* Guenée, 1845 and *Zamarada* Moore, 1887, but it can be distinguished by the following characters: the forewing M_2 arises from above middle of discocellulars, while in *Stegania* and *Zamarada*, it arises from the middle of the discocellulars; the postmedial lines of all wings are remote from the outer margins, while in *Stegania*, they are closer to the outer margins. In the male genitalia, the cornuti take different forms but never a bundle of spines as in *Stegania*; the coremata are absent in *Peratophyga* but well developed in *Zamarada*.

Distribution. China, Japan, Korean Peninsula, Southeast Asia, Afghanistan.

Remarks. After examining the holotypes of *P. castaneostriata* Yazaki & Wang, 2004 and *P. modesta* Yazaki & Wang, 2004 (the both deposited in SCAU), we found that these two species well agree with the genus *Stegania* Guenée, 1845 in the following characters: the forewing M_1 arises from the middle of the discocellulars; the postmedial lines of all wings are very close to the outer margins; the cornuti of the male genitalia are composed of a bundle of spines. Therefore we transfer them to that genus (*Stegania castaneostriata* **comb. nov.** and *Stegania*

modesta **comb. nov.**). Holloway (1994) reviewed the Bornean species of *Peratophyga* and divided the genus into five species groups. After examining the Chinese *Peratophyga* species, we find that *P. hyalinata*, *P. grata* **stat. rev.** and *P. crista* **sp. nov.** fall into *hyalinata* group, and are recognizable by the semihyaline wings and the triangular ventral lobe of the valva; *P. xanthyala* falls into *xanthyala* group, and is characterized by having the facies similar to that of *Zamarada* species and a tapering and incurved ventral lobe of the valva; *P. recta* **sp. nov.** and *P. bifasciata* do not appear to *trigonata* group, as they have the almost triangular and symmetric ventral lobe of the valva. So, here we propose a new species group, the *bifasciata* group, including *P. recta* **sp. nov.**, *P. bifasciata* and *P. flavomaculata*.

Key to Chinese *Peratophyga* species

1. Outer margin of hindwing forming a sharp protrusion at end of M_3 ..... ***P. xanthyala***
   Outer margin of hindwing smooth, without protrusion 2
2. Forewing with M_2 arising from above middle of discocellulars, close to M_1 ..... ***P. recta* sp. nov.**
   Forewing with M_2 arising from anterior angle of cell or shortly stalked with M_1 3
3. Hind wing with pale yellow scales inside antemedial lines; dorsal process of valva in male genitalia angled towards base ..... ***P. bifasciata***
   Hind wing with greyish brown scales inside antemedial lines; dorsal process of valva in male genitalia angled above middle 4
4. All wings with pale yellow scales between medial and postmedial lines 5
   All wings with pale greyish brown scales between medial and postmedial lines ..... ***P. crista* sp. nov.**
5. Medial line of forewing wavy ..... ***P. hyalinata***
   Medial line of forewing forming a tooth on M_3 ..... ***P. grata* stat. rev.**

Peratophyga hyalinata (Kollar, 1844)

Figs. 1, 2, 18, 19, 27, 34

Idaea hyalinata Kollar, 1844, *in* Kollar & Redtenbacher, *in* Hügel, *Kaschmir und das Reich der Siek*, 4: 491. Holotype ♂, India: Himalayas, Massooree (BMNH).

Acidalia aerata Moore, 1868, *Proc. zool. Soc. Lond.*, 1867 (3): 643. Syntypes ♂, ♀, India: Darjeeling (BMNH). (Treated as a junior synonym of *P. hyalinata* by Prout (1930))

Zamarada ionephela Wiltshire, 1966, *Z. wien. ent. Ges.*, 51 (9–11): 148, pl. 12, fig. 17. Holotype ♂, Afghanistan: Nuristan. (Treated as a junior synonym of *P. hyalinata* by Parsons *et al.* (1999))

Peratophyga hyalinata: Wehrli, 1939, *in* Seitz, *Gross-Schmett. Erde*, 4 (Suppl.): 293.

Diagnosis. The external characters of the species are similar to those of *P. grata* as follows: the forewing M_1 and M_2 are stalked at anterior angle of cell; the wing colour is greyish brown between the bases and the medial lines on all wings; the forewing antemedial line is pale yellow and broadening on the costa; the pale greyish brown bands outside the medial lines of all wings are indistinct and discontinuous; the fringes of all wings are pale yellow. However, *P. hyalinata* can be distinguished by the following characters: the forewing discal spot is more indistinct; the medial line of each wing is wavy, while in *P. grata*, it forms a tooth on M_3; the greyish brown bands outside the postmedial lines of all wings are narrower. The most distinct differences are in the male genitalia: the ventral lobe of the valva is broadly triangular with a pointed apex, the vesica has only basal cornutus. However, in *P. grata*, the ventral lobe of the valva has a long curved projection apically; the vesica has both an apical and basal cornutus. In the female genitalia, the lamella postvaginalis in *P. hyalinata* is band-like, the lamella antevaginalis is broader and curved and the ductus bursae is only sclerotized posteriorly, whereas in *P. grata*, the lamella postvaginalis is elliptical and the posterior margin is concave medially, the lamella antevaginalis is narrower and straight, and the ductus bursae is mostly sclerotized.

Material examined. INDIA (BMNH): 1♂ (syntype of *Acidalia aerata*), Himalayas, Darjeeling, coll. Moore. **CHINA: Hubei** (IZCAS): 1♀, Shennongjia, 950 m, 18.VII.1980; 1♂, Xingshan, Longmenhe, 1350 m, 14.VI.1993, coll. Li Hongxing. **Sichuan** (IZCAS): 1♂, Luding, Xinxing, 1900 m, 13.VI.1983, coll. Wang Shuyong; 16♂6♀, Mt. Emei, Qingyinge, 800–1000 m, 17.IV–1.V, 23.VI, 18.VII, 15–18.IX.1957, coll. Huang Keren and Zhu Fuxing; 2♂, Dukou, 13–14.VI.1981, coll. Zhang Baolin. **Yunnan** (IZCAS): 2♂3♀, Lijiang, Yushuizhai, 2680 m, 21.VI.2009, coll.

FIGURES 1–17. Adults of *Peratophyga* (2X). 1–2. *P. hyalinata* (Yunnan). 1, male; 2, ditto, underside; 3–5. *P. grata grata*. 3, female, syntype (Japan); 4, male (Heilongjiang); 5, ditto, underside; 6–8. *P. grata totifasciata*. 6, male, syntype (Jiangxi); 7, male (Fujian); 8, ditto, underside; 9–10. *P. crista* **sp. nov.**, holotype (Hainan). 9, male; 10, ditto, underside; 11–12. *P. recta*. **sp. nov.**, holotype (Yunnan); 11, male; 12, ditto, underside; 13–15. *P. bifasciata*. 13, male, holotype (Hainan); 14, male (Hainan); 15, ditto, underside; 16–17. *P. xanthyala*. 16, female (Tibet); 17, ditto, underside.

Han Hongxiang and Yang Chao; 3♂, Lijiang, 23.V.1980, coll. Zhong Tiesen and Song Shimei; 7♂, Lijiang, Yulongshan, 21.VI–3.VIII.1962, coll. Song Shimei; 1♂, Lijiang, Yulongxueshan, 2750 m, 16–17.V.2011, coll. Yang Xiushuai and Wang Ke; 1♂, Heqing, Beiya, 2400 m, 15.V.1980; 1♀, Yunlong, Zhibenshan, 2350 m, 24.VI.1981, coll. Wang Shuyong; 4♂, Yingjiang, 1700 m, 14–16.IV.1980, coll. Gao Ping *et al.*; 3♂, Tengchong, Heinitang, 1930 m, 28–30.V.1992, coll. Xue Dayong; Tengchong, Houqiao, 1680 m, 31.V–1.VI.1992, coll. Xue

Dayong; 2♂, Tengchong, Danzha Linchang, 2500 m, 2–4.VI.1992, coll. Xue Dayong; 10♂, Tengchong, Dahaoping, 2020 m, 24–26.V.1992, coll. Xue Dayong; 2♂, same locality, 5–7.VIII.2007, coll. Lang Songyun and Xue Dayong; 1♂, Baoshan, Bawan, 1040 m, 8–10.VIII.2007, coll. Xue Dayong; 1♂, Baoshan, Baihualing, 1520 m, 11–13.VIII.2007, coll. Wu Chunguang; 1♂, Yimen, 15.V.1980, coll. Fa Zhaoyan; 1♂1♀, Kunming, Dongchuan, 2300 m, 9.VII.1980, coll. Zhang Kaiyou; 1♂, Kunming, Shuanglong, 2100 m, 11.VIII.2006, coll. Ma Rong; 7♂, Jinping, Hetouzhai, 1700 m, 9–16.V.1956, coll. Huang Keren; 1♂, Mangshi, 4.V.1980, coll. Shang Jinwen. **Tibet** (IZCAS): 2♂2♀, Bomi, Yi'ong, 2300 m, 14–22.VIII.1983, coll. Han Yinheng; 8♂1♀, Nyingchi, Bayi, 2999 m, 1–3.VIII.2006, coll. Lang Songyun; 1♂, Nyingchi, Shang Zuyü, 1960 m, 21–23.VIII.2005, coll. Wang Xuejian; 1♂, Markam, 3180 m, 8.VIII.1982, coll. Chai Huaicheng; 1♀, Gyirong, Resuo, 17.VIII.1984, coll. Yan Zhaoxing; 2♂, Nyalam, Zham, 2250 m, 12–18.V.1974, coll. Zhang Xuezhong; 1♀, same locality, 2200 m, 9.V.1966, coll. Wang Shuyong. **Szechuan [Sichuan]** (SYSU): 1♀, Omei shan, 2900–3060 m, 11.VIII.1940, coll. J.L. Gressitt. **Kweichow [Guizhou]** (SYSU): 1♀, Teengyin to Tau-chi, 850 m, 14.VII.1940, coll. J.L.Gressitt.

Distribution. China (Hubei, Sichuan, Guizhou, Yunnan, Tibet), India, Nepal, Myanmar, Vietnam, Afghanistan.

Biological notes. The larva of *P. hyalinata* was described by Sevastopulo (1946, as *aerata*) and Singh (1957). *Hypericum sp.* (Hypericaceae) was recorded as a host-plant in India by Sevastopulo (1946).

***Peratophyga grata* (Butler, 1879) stat. rev.**

Figs. 3–8, 20–22, 28, 29, 35, 36

Ephyra grata Butler, 1879, *Ann. Mag. nat. Hist.*, (5) 4: 438. Syntype (s), Japan: Yokohama (BMNH).

Peratophyga hyalinata grata: Prout, 1930, *Novit. zool.*, 35: 315.

Peratophyga hyalinata Kollar, sensu Fang, 2003, *Butterfly and Moth Fauna of Lushan*: 272, fig. 245, pl.49: 26.

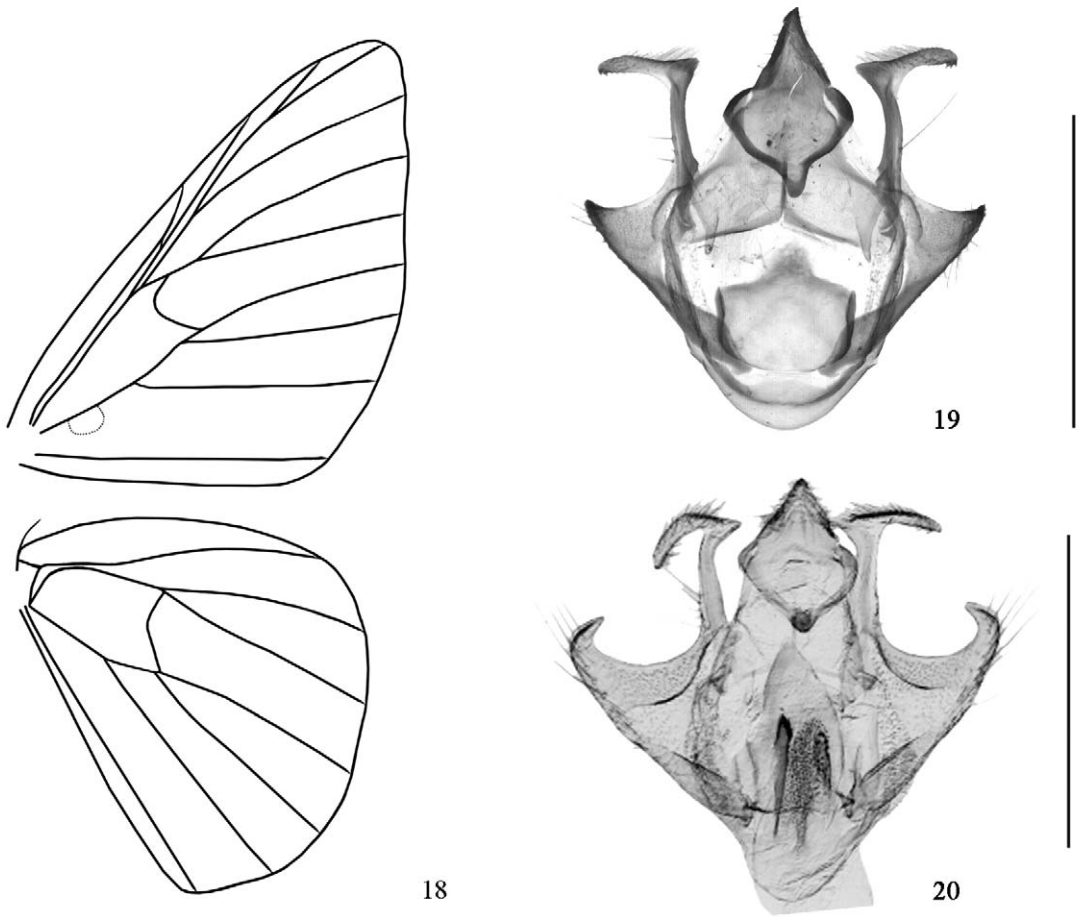
Peratophyga hyalinata Kollar, sensu Xue & Han, 2005, *in* Yang, *Insect fauna of Middle-West Qinling Range and South Mountains of Gansu Province*: 622.

Diagnosis. The diagnostic characters are given under the previous species. The male genitalia of the species are close to those of *P. venetia* and *P. crista* **sp. nov.** *P. grata* can be distinguished by the following characters: the inner process at the right angle of the dorsal process of the valva is longer than that of *P. venetia*, but shorter than that of *P. crista* **sp. nov.**; the ventral lobe of the valva is long and slightly acute distally, while in *P. venetia* it is short and truncate terminally, and rounded with a small acute dorsal process in *P. crista* **sp. nov.** The female genitalia differ from those of *P. venetia* and *P. crista* **sp. nov.** in the lamella antevaginalis lacks lateral triangular processes.

Material examined. JAPAN (BMNH): 1♀ (syntype), Yokohama; 1♂, Tochimotosaitama, 21.VI.1952, coll. T. Haruta, ex. Inoue coll. BMNH.1992-71, Inoue slide no. 4665; 1♀, Takao-san, 15.VII.1950, coll. H. Inoue, ex. Inoue coll. BMNH.1992-71, Inoue slide no. 4666. **CHINA**: **Kiangsi [Jiangxi]** (BMNH): 1♂1♀ (syntypes of *P. hyalinata totifasciata*), Brit. Mus. 1962-360. **Heilongjiang** (IZCAS): 1♂, Xiaoling, 30.VI.1937. **Liaoning** (IZCAS): 2♂, Qingyuan, 30.VII.1954. **Henan** (IZCAS): Lushi, Shiziping, 1000 m, 30.V.2000, coll. Yu Haili. **Shaanxi** (IZCAS): 1♀, Liuba, Miaotaizi, 1350 m, 21.VII.1998, coll. Yao Jian. **Gansu** (IZCAS): 1♂, Kangxian, Qinghe, Linchang, 1400 m, 9.VII.1999, coll. Wang Hongjian; 1♀, Kangxian, Yangba, Linchang, 1000 m, 11.VII.1999, coll. Zhu Chaodong; 5♂, Wenxian, Fanba, 800 m, 26.VI.1998, coll. Yao Jian. **Qinghai** (IZCAS): 2♂, Huzhu, Beishan, 2300 m, 20.V.1992, coll. Xue Dayong. **Jiangxi** (IZCAS): 1♀, Guling, 19.VIII.1933, coll. O. Piel; 2♀, Doushui, 29.VI.1985, coll. Song Shimei. **Hunan** (IZCAS): Hengshan, 1980. **Fujian** (IZCAS): 5♂4♀, Chong'an, Xingcun, Sangang, 740 m, 24.V–27.VI.1960, coll. Zhang Yiran; 1♀, same locality, 4.VIII.1960, coll. Zhang Yiran; 1♂, Guadun, 2.VII.1982, coll. Jiang Fan; 1♂, Chong'an, Chengguan, 240 m, 30.VI.1960, coll. Zuo Yong; 1♀, Mt. Wuyi, 12.VIII.1989, coll. Song Shimei. **Guangxi** (IZCAS): 2♂, Longsheng, Baiyan, 1150 m, 20.VI.1963, coll. Wang Chunguang. **Guangdong** (SYSU): 3♂1♀, Renhua, Danxiashan, 408 m, coll. Chen Haidong and He Fengxia, 15–19.IV.2008; 1♀, Guangzhou, Honam island, P'an-yu, 6.VI.1936, coll. Y.C.Ng. **Shandong [Shantung]** (ZFMK): 1♂, Tai-shan, 1550 m, 11.VI.1934, coll. H. Höne. **Zhejiang [Chekiang]** (ZFMK): 1♂, Wenchow, VI.1939, coll. H. Höne.

Distribution. China (Heilongjiang, Liaoning, Shandong, Henan, Shaanxi, Gansu, Qinghai, Zhejiang, Jiangxi, Hunan, Fujian, Guangdong, Guangxi), Japan, Korean Peninsula.

Biological notes. The larva and pupa were described by Hori (1927, as *aerate*) and *Hypericum patulum* (Hypericaceae) was recorded as a hostplant in Japan. The hostplant record was cited by Sato & Nakajima (1975, as *hyalinata grata*).



FIGURES 18–20. 18. Venation of *P. hyalinata*. 19–20. Male genitalia of *Peratophyga*. 19, *P. hyalinata* (Yunnan); 20, *P. grata grata* (with aedeagus) (Inoue slide no. 4665, Japan). Scale bar = 1 mm.

Remarks. Parsons *et al.* (1999) listed three subspecies under *P. hyalinata*: *P. hyalinata hyalinata* (Kollar, 1844), *P. hyalinata grata* (Butler, 1879) and *P. hyalinata totifasciata* Wehrli, 1923. After examining the types of *Ephyra grata* Butler, 1879 and *P. hyalinata totifasciata* Wehrli, 1923 and a long series of material from China and the neighbouring regions, we find that the external and genital features of *P. hyalinata* are quite different from those of *Ephyra grata* and *P. hyalinata totifasciata*. Thus we restore *P. hyalinata grata* to specific rank and newly combine *P. hyalinata totifasciata* with *P. grata*. There are two subspecies of *P. grata* distributed in China, *P. grata grata* and *P. grata totifasciata* (*Peratophyga hyalinata* var. *totifasciata* Wehrli, 1923, *Dt. ent. Z.*, Iris, 37: 66, pl. 1, fig. 6, 17. Syntype(s), China: Kiangsi (BMNH)). The former is distributed in Japan and the Korean Peninsula and is recorded here for the first time from Heilongjiang and Liaoning (Figs 3–5, 20, 21, 28, 35); the latter is distributed in Shandong, Henan, Shaanxi, Gansu, Qinghai, Zhejiang, Jiangxi, Hunan, Fujian, Guangdong, and Guangxi (Figs 6–8, 22, 29, 36), and can be distinguished from the former by the smaller inner process at the angle of the dorsal process of the valva.

***Peratophyga crista* Jiang, Xue & Han sp. nov.**
Figs. 9, 10, 23, 30, 37

Peratophyga venetia Swinhoe, sensu Heppner & Inoue, 1992, *Lepidoptera of Taiwan*, 1 (2): 112.
Peratophyga venetia Swinhoe, sensu Wang, 1998, *Geometer Moths of Taiwan*, 2: 32.
Peratophyga venetia Swinhoe, sensu Ades & Kendrick, 2004, *Hong Kong Fauna: A Checklist of Selected Taxa*: 32.

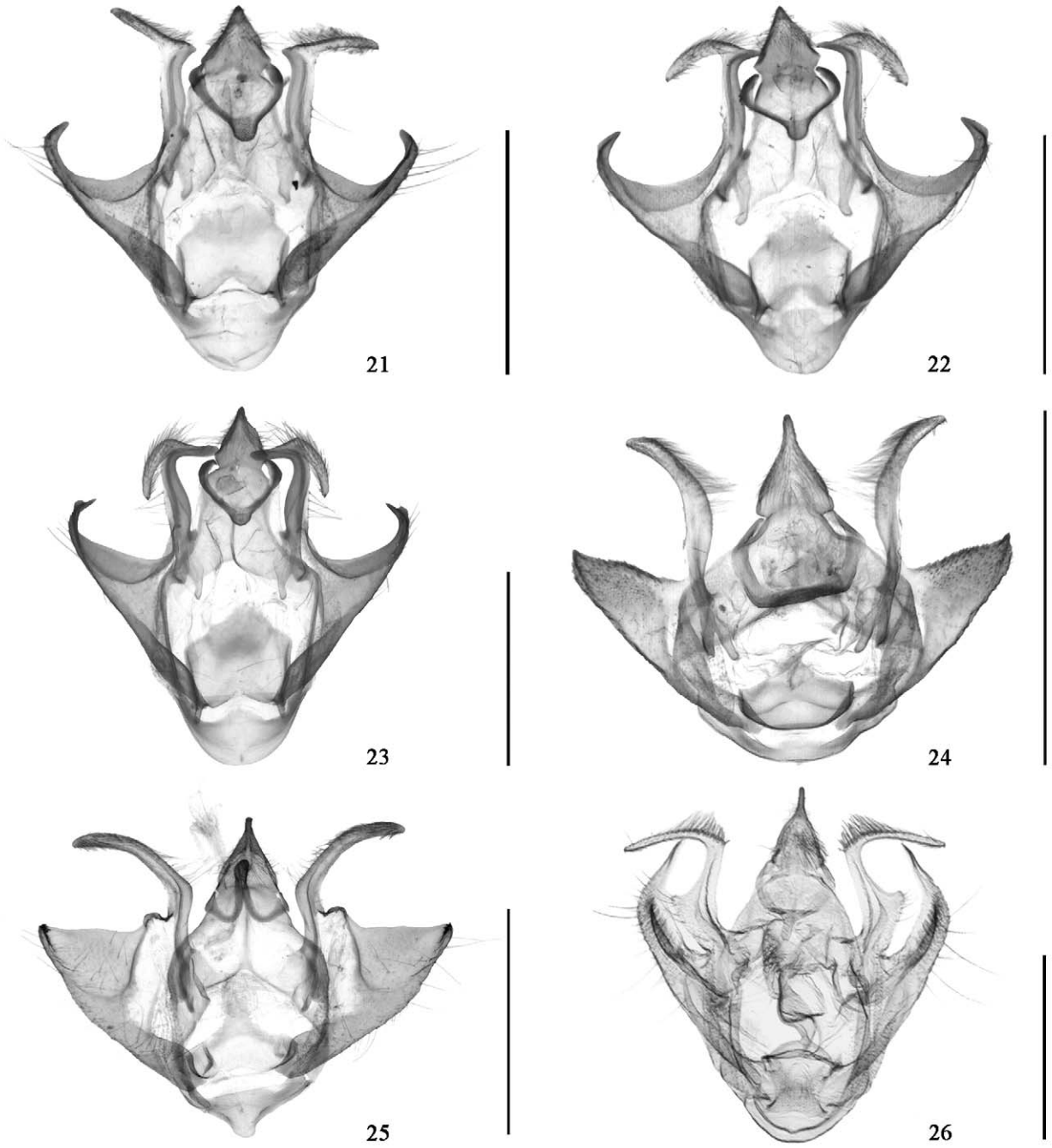
Description. *Head.* Antennae yellow with blackish grey scales dorsally, serrate with long ciliations in male, filiform in female. Frons dark brown, bottom margin yellow, not protruding. Labial palpi yellow mottled with dark

brown scales, extending slightly beyond frons. Vertex yellow. *Thorax*. Patagia dark grey, bottom margin yellow. Tegula and dorsum grey. Hind tibia with two pairs of spurs in both sexes, dilated with hair-pencil in male. Forewing length: male and female 13–15 mm. Outer margin of all wings smooth. All wings pale greyish brown and semihyaline from bases to postmedial lines, blackish brown from postmedial lines to outer margins. Forewing with costa pale yellowish brown with scattered greyish brown scales; antemedial and medial lines pale yellowish brown, wavy, often indistinct; discal spot dark grey, shortly linear; postmedial line blackish brown, incurved between M veins and below CuA_2; a row of blackish brown spots present inside postmedial line; submarginal line yellowish brown, indistinct, forming a large patch on costa; terminal line blackish brown, indistinct; fringes pale yellowish brown mixed with blackish brown. Hindwing with discal spot smaller and more indistinct than on forewing; medial line pale yellowish brown, wavy, more distinct than on forewing; other striations similar to those of forewing. Underside pale yellow; discal spot of forewing black, almost oblong, larger and more distinct than on hindwing; areas between postmedial lines and outer margins of all wings black. Forewing with a basal elliptical fovea in male; M_2 arising from anterior angle of cell, sometimes shortly stalked with M_1, varying individually. *Abdomen.* Abdominal segments pale yellow scattered with dark grey scales. Tuft of scales present on male sternite III. *Male genitalia.* Uncus triangular, slightly subulate. Gnathos with small, rounded apically median process. Dorsal process of valva shaped like head of a long-beaked bird with a long crest facing inwards; basal three-fifths of process strongly sclerotized, then bent inwards in a right angle into a long process on inner side; terminal two fifths of process weakly sclerotized, folded back from end of sclerotized part, slightly curved and with long setae, and with a tiny spine at tip; ventral lobe of valva almost triangular, incurved apically, the extreme apex rounded and with a small and acute process dorsally. Juxta tapered terminally. Saccus rounded. Aedeagus short and tapered at apex; vesica coarse and with two cornuti, spinous terminally, basal cornutus longer and narrower than distal one. *Female genitalia.* Lamella postvaginalis oval with outer edges strongly curved, posterior margin concave medially; lamella antevaginalis long and ribbon-like, with a pair of triangular processes laterally. Ostium bursae sclerotized. Ductus bursae sclerotized, about two-thirds length of corpus bursae. Corpus bursae elliptical; signum oval, with many marginal and several central teeth, marginal teeth on one side longer than those on the other side.

Diagnosis. The species is difficult to distinguish from *P. venetia* on external characters. However, the male genital structures differ substantially: the dorsal process of the valva is bent inwards into a projection as long as the terminal process outside of the angle in the new species, whereas it forms only a short spine on the inner side of the angle in *P. venetia*; the apical part of the ventral lobe of the valva is rounded and forms a small acute process dorsally, while in *P. venetia*, it is gently curved to a truncate apex. In the female genitalia, the posterior margin of the lamella postvaginalis is more concaved and the triangular processes on the lamella antevaginalis are boarder than those of *P. venetia*.

Material examined. Holotype, ♂, **CHINA: Hainan** (IZCAS): Baisha, Yacha, Langyacun, 230 m, 2.V.2009, coll. Yan Keji. Paratypes: **Guangdong** (IZCAS): 1♀, Guangzhou, 29.V.1973, coll. Zhang Baolin. **Hainan** (IZCAS): 3♀, Danzhou, 140–150 m, 15–17.V.2007, coll. Chen Fuqiang; 1♀, Baisha, Yacha, Langyacun, 230 m, 2.V.2009, coll. Yan Keji; 1♀, Baisha, Yinggeling, Nankai, Fanglaocun, 790 m, 13.IV.2010, coll. Jiang Nan; 1♂, Baisha, Yinggezui, 611 m, 6–7.V.2009, coll. Chen Fuqiang; 10♂3♀, Baisha, Nankai, Nanmaola, 1261 m, 10–14.V.2009, coll. Chen Fuqiang and Yan Keji; 2♂2♀, Baisha, Hongkan Shuiku, 553 m, 3–5.V.2009, coll. Chen Fuqiang and Yan Keji; 1♂, Qiongzhong, Limuling, 620 m, 14.V.2007, coll. Lang Songyun; 1♂, Qiongzhong, Limushan, Qijiacun, 657 m, 6–7.IV.2010, coll. Jiang Nan; 2♀, Changjiang, Shilu, Shuiku, 132 m, 14.V.2007, coll. Chen Fuqiang; 1♀, Wuzhishan, Shuiman, 730–900 m, 10.V.2007, coll. Lang Songyun; 4♂, Wanning, 60 m, 21–27.V, 22–24.VII.1963, coll. Zhang Baolin; 1♀, Wanning, Xinglong, 41 m, 21.III.2008, coll. Lang Songyun; 1♀, Lingshui, Diaoluoshan, 260 m, 5.V.2007, coll. Lang Songyun; 2♀, Jianfengling, 7.VI.1973, coll. Chen Yixin; 4♂, same locality, 14–28.IV.1978, coll. Zhang Baolin; 1♀, same locality, 21.V.1982, coll. Gu Maobin; 1♀, same locality, 7.IV.1982, coll. Liu Yuanfu; 2♂, same locality, 6.V.1983, coll. Wang Chunling and Gu Maobin; 2♂, same locality, 22.IX.1983, coll. Liu Yuanfu; 1♂, Ledong, Jianfengling, Tianchi, 808 m, 18.V.2009, coll. Yan Keji; 2♀, same locality, 982 m, 23–26.XI.2008, coll. Li Jing. **Guangxi** (IZCAS): 3♂2♀, Jinxiu, Luoxiang, 200–400 m, 14–15.V.1999, coll. Han Hongxiang and Liu Dajun; 1♂, Wuzhou, 4.VII.1990, coll. Yang Shengping; 1♂, Nanning, Linkesuo, 110 m, 26.IV.1984, coll. Zhang Jiajun; 7♂5♀, Pingxiang, 230 m, 8–17.VI.1976, coll. Zhang Baolin; 3♀, Shangsi, Hongqi Linchang, 300 m, 27–28.V.1999, coll. Li Wenzhu *et al.*; 1♂3♀, Fangcheng, Banba, 550 m, 4.VI.2000, coll. Yao Jian and Li Wenzhu; 1♂2♀, Fangcheng, Fulong, 200–350 m, 23–24.V.1999, coll. Ke Xin and Li Wenzhu; 1♀, Napo, Beidou, 550 m, 9.IV.1998, coll. Zhou Haisheng; 1♂, Longzhou, Nonggang, 330 m,

15.VI.2000, coll. Yao Jian. **Yunnan** (IZCAS): 2♂, Ruili, Dengga, 900–980 m, coll. Xue Dayong; 1♂, Cangyuan, 790 m, 20.V.1980, coll. Shang Jinwen; 5♂, Hekou, Xiaonanxi, 200 m, 7–11.VI.1956, coll. Huang Keren *et al*. **Guangdong** (SYSU): 3♂1♀, Fengkai, Yanshuitian, 2–6.V.2011, coll. Zhang Dandan and Tong Bo; 1♀, same locality, 6.IX.2011, coll. Yang Lijun and Liao Junlei; 3♂1♀, Guangzhou, Honam island, P'an-yu, 20.III, 9–11.VII.1936, coll. Y.C.Ng.; 2♂, Dongwan, Lianhuashan, 120 m, 21.IV.2004, coll. Zhang Dandan and Pang Hong; 1♂1♀, Heshan, 26–27.VIII.2002, coll. Liu Guilin; 1♂, same locality, 10.X.2002. **Taiwan** (ZFMK): 2♂2♀, Tien-Hsiang (Hualien Co.), 600 m, 20.VI.1993, coll. F. Aulombard & J. Plante.



FIGURES 21–26. Male genitalia of *Peratophyga*. 21, *P. grata grata* (Heilongjiang); 22, *P. grata totifasciata* (Gansu); 23, *P. crista* **sp. nov.** (Hainan); 24, *P. recta*. **sp. nov.** (Yunnan); 25, *P. bifasciata* (Hainan); 26, *P. xanthyala* (Malaysia). Scale bar = 1 mm.

Distribution. China (Taiwan, Guangdong, Hainan, Hongkong, Guangxi, Yunnan).

Etymology. The species named on the basis of Latin word *crista*, which means crest or crown, referring to the shape of the terminal part of the dorsal process of the valva.

Remarks. Anthony Galsworthy has showed us a slide of the male genitalia of a Hong Kong specimen which he dissected long ago and identified as "*P. venetia*". We agree with Galsworthy that the male gentital features of the specimen are in fact identical with *P. crista* sp. nov. So, we consider the record of *P. venetia* from Hong Kong as misidentification, and add Hong Kong to the range of *P. crista* sp. nov. As for the record of *P. venetia* from Taiwan, with help from Dieter Stüning, we examined the specimens from Taiwan in ZFMK, which were previously identified as *P. venetia*. We find that the genital features of those specimens were identical to *P. crista* sp. nov. So, we consider Heppner & Inoue (1992) and Wang (1998)'s records of *P. venetia* as misidentifications. But as pointed by Stüning in private communication, the Taiwan specimens are somewhat different from the material from other regions in the yellower areas between the medial lines and the postmedial lines of all wings. Thus, we suspect that the Taiwan specimens probably represent a subspecies of *P. crista* sp. nov. However, further studies for deciding the clear systematic position of the Taiwan material is needed. Wang (1998) also recorded that "*P. venetia*" in Hainan, but we did not find any material of true *P. venetia* from Hainan, so we consider the record of *P. venetia* from Hainan as misidentification.

***Peratophyga recta* Jiang, Xue & Han sp. nov.**
Figs. 11, 12, 24, 31, 38

Description. *Head*. Antennae pale yellow dorsally, filiform in both sexes. Frons dark brown, upper margin yellow, not protruding. Labial palpi dark brown, extending slightly beyond frons. Vertex yellow. *Thorax.* Patagia yellow. Tegula and dorsum black. Hind tibia with two pairs of spurs in both sexes, dilated and with hair-pencil in male. Forewing length: male 8–9 mm; female 9–10 mm. Outer margins of all wings smooth. All wings pale yellow, black between bases and medial lines and between postmedial lines and outer margins. Forewing with a wavy yellow band present on basal half of costa; medial line black, almost straight; postmedial line black, wavy, often protruding inwards among M veins and below CuA_2; fringes black; hindwing without a wavy yellow band on costa; protrusions among M veins and below CuA_2 of postmedial line less distinct than those on forewing; other striations similar to those of forewing. Underside similar to upperside, discal spot of forewing short and linear, more distinct than that of upperside. Forewing with a basal elliptical fovea in male; M_2 arising from above middle of discocellulars, close to M_1. *Abdomen.* Abdominal segments blackish brown. Tuft of scales present on male sternite III. *Male genitalia.* Uncus triangular, narrowed apically, with setae dorsally. Gnathos with short and very broad, rounded apically median process. Valva with slightly broadened medially dorsal process, terminal half gently curved outwards and bearing long setae; ventral lobe almost triangular, spinous in terminal half, pointed distally. Juxta short and broad, almost triangular terminally. Saccus short and broad, rounded. Aedeagus short with two thorn-like processes near terminal part at one side, (subapical one smaller); vesica without cornuti. *Female genitalia.* Lamella postvaginalis narrow and short, strongly sclerotized, posterior margin slightly concave; lamella antevaginalis broad and band-like, weakly sclerotized. Ostium bursae sclerotized laterally. Ductus bursae sclerotized posteriorly, barely differentiated from corpus bursae. Corpus bursae elliptical; signum almost triangular, without marginal spines in anterior half.

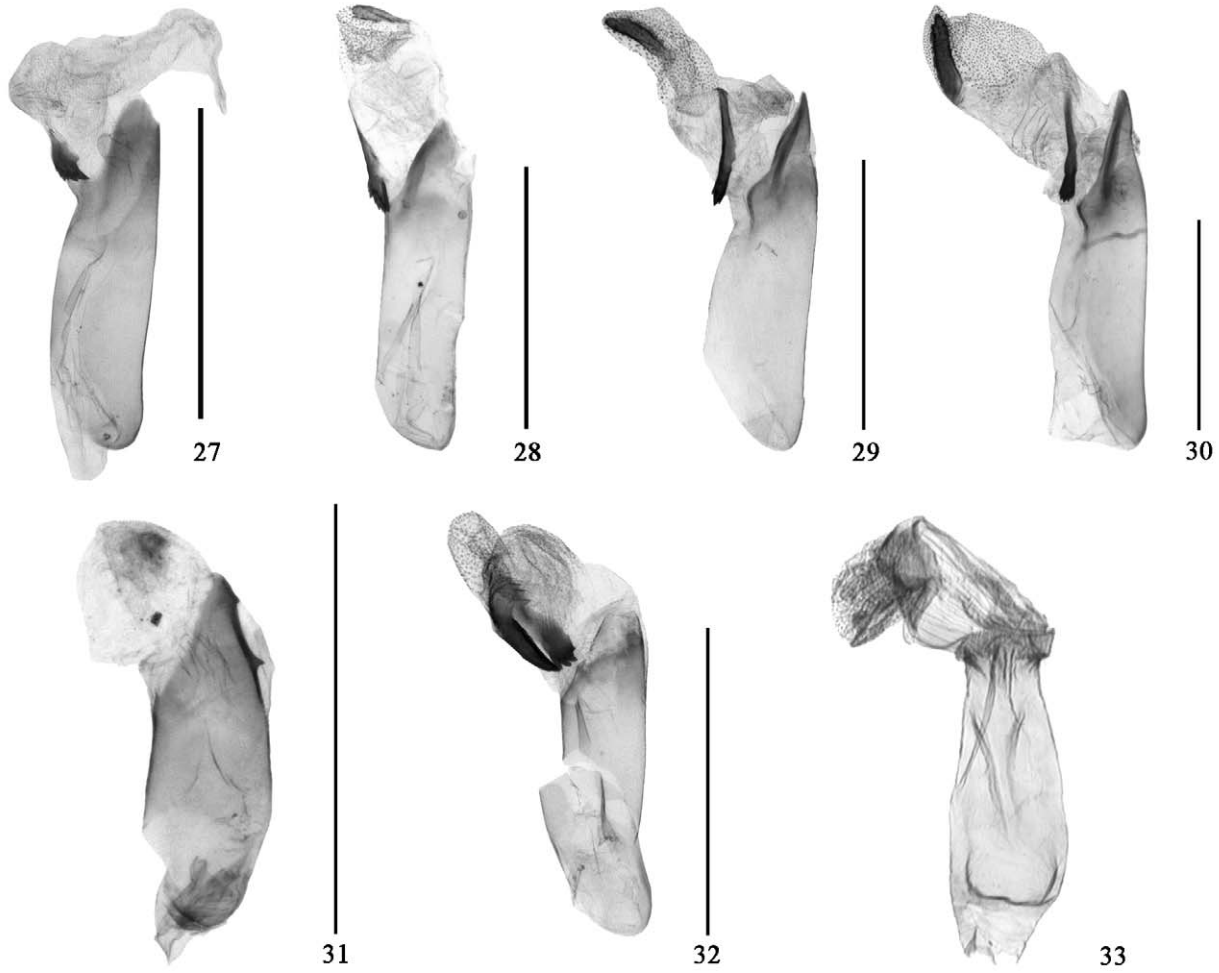
Diagnosis. This species can be separated from *P. bifasciata* on the basis of following characters: the wavy yellow band is present on the basal half of the forewing costa; the basal area of hind wing is black, while it is pale yellow in *P. bifasciata*; the forewing submarginal line forms a pale yellow patch on the costa in *P. bifasciata*, which is absent in *P. recta* **sp. nov.** The male genitalia differ from those of *P. bifasciata* as follows: the median process of the gnathos is broader and shorter; the dorsal process of the valva is broadened medially and not angled in the basal quarter; the ventral lobe of the valva is spinous in terminal half, which has several small spines distally and a small rounded process at the base of the dorsal margin in *P. bifasciata*; the saccus is rounded, while in *P. bifasciata*, it bears a small nipple-like protrusion; the aedeagus has two thorn-like processes, which is absent in *P. bifasciata*; the vesica has no cornuti, while in *P. bifasciata*, it has two cornuti, one a stout spine-like process, the other an oblong scobinate sclerite with small spines terminally. The female genitalia differ from those of *P. bifasciata* in the following characters: the lamella postvaginalis is much smaller and more strongly sclerotized, while in *P. bifasciata*, it is almost semicircular and concave at the middle of the posterior margin; the lamella antevaginalis is broad and band-like, rather than a pair of oval lobes in *P. bifasciata*; the ostium bursae is strongly sclerotized laterally, but not sclerotized in *P. bifasciata*; the signum is almost triangular in the anterior half, while in *P.*

bifasciata, it is almost quadrate. The male genitalia of the species are also similar to *P. flavomaculata* (Borneo), but it can be distinguished by the following characters: the terminal part of the uncus is narrower; the median process of the gnathos and the medial part of the dorsal process of the valva are broader; the ventral lobe of the valva and the saccus are shorter.

Material examined. Holotype, ♂, **CHINA: Yunnan** (IZCAS): Ruili, Dengga, 980 m, 6–8.VI.1992, coll. Xue Dayong. Paratypes: **Guangxi** (IZCAS): 1♂, Longrui, 18.V.1984, coll. Song Shimei; 1♂, Fangcheng, Banba, 550 m, 4.VI.2000, coll. Yao Jian. **Yunnan** (IZCAS): 1♂, Mangshi, 1200 m, 5.V.1980, coll. Gao Ping; 2♂, Ruili, Dengga, 980 m, 6–8.VI.1992, coll. Xue Dayong; 1♀, Hekou, 100 m, 5.VI.1956, coll. Huang Keren *et al.*; 4♂, Hekou, Xiaonanxi, 200 m, 10.VI.1956, coll. Huang Keren *et al.*; 1♂, Xishuangbanna, Bubang, 700 m, 14.IX.1993, coll. Xu Huanli; 1♀, Xishuangbanna, Yunjinghong, 650 m, 7.VII.1958, coll. Meng Xuwu.

Distribution. China (Guangxi, Yunnan).

Etymology. The species named on the basis of Latin word *rectus*, which means straight, referring to the medial lines of all wings.



FIGURES 27–33. Aedeagus of *Peratophyga*. 27, *P. hyalinata*; 28, *P. grata grata* (Heilongjiang); 29, *P. grata totifasciata* (Gansu); 30, *P. crista* **sp. nov.** (Hainan); 31, *P. recta*. **sp. nov.** (Yunnan); 32, *P. bifasciata* (Hainan); 33, *P. xanthyala* (Malaysia). Scale bar = 1 mm.

Peratophyga bifasciata Warren, 1905

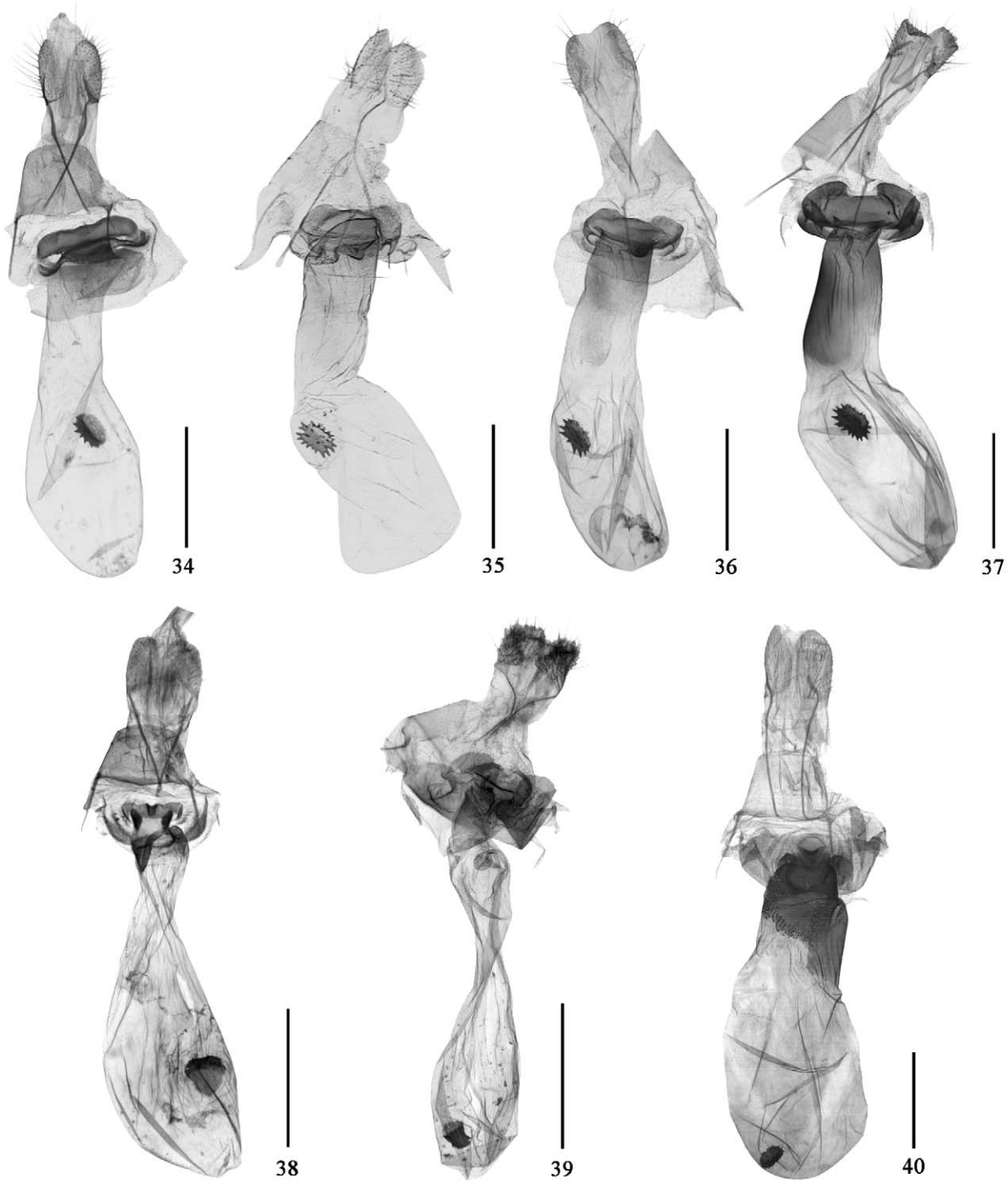
Figs. 13–15, 25, 32, 39

Peratophyga bifasciata Warren, 1905, *Novit. zool.*, 12: 13. Holotype ♂, China: Hainan, Cheng Mai (BMNH).

Diagnosis. The diagnostic characters are given under the previous species.

Material examined. CHINA: Hainan (BMNH): 1♂ (holotype), Cheng-Mai, VIII.1902, Rothschild Bequest, B.M. 1939-1, BMNH(E)#1008409. **Hainan** (IZCAS): 1♀, Baisha, Yinggezui, 611 m, 6–7.V.2009, coll. Yan Keji; 1♂3♀, Baisha, Hongkan Shuiku, 553 m, 3–5.V.2009, coll. Chen Fuqiang and Yan Keji; 2♂, Baisha, Yuanmen, Hongkan Shuiku, 531 m, 23–25.XI.2009, coll. Yang Chao; 1♀, Wanning, 60 m, 21.V.1963, coll. Zhang Baolin; 1♂, Wuzhishan, Shuiman, 730–900 m, 9.V.2007, coll. Han Hongxiang; 1♀, Jianfengling, 31.V.1984, coll. Gu Maobin. **Guangxi** (IZCAS): 1♂, Wuzhou, Hebin, 8.VI.1989, coll. Yang Shenping; 1♀, Luchuan, Wenquan, Zhongxing, 198 m, 10.IV.2011, coll. Yang Xiushuai. **Yunnan** (IZCAS): 1♂, Xishuangbanna, Bubang, 700 m, 14.IX.1993, coll. Xu Huanli.

Distribution. China (Hainan, Guangxi, Yunnan).



FIGURES 34–40. Female genitalia of *Peratophyga*. 34, *P. hyalinata* (Yunnan); 35, *P. grata grata* (Inoue slide no. 4666, Japan); 36, *P. grata totifasciata* (Jiangxi); 37, *P. crista* **sp. nov.** (Hainan); 38, *P. recta* **sp. nov.** (Yunnan); 39, *P. bifasciata* (Guangxi); 40, *P. xanthyala* (Tibet). Scale bar = 1 mm.

***Peratophyga xanthyala* (Hampson, 1896), new record for China**
Figs. 16, 17, 26, 33, 40

Zamarada xanthyala Hampson, 1896, *Fauna Br. India* (Moths), 4: 553. Syntypes ♂, ♀, India: Sikkim; Malaysia: Sabah, Sandakan. (BMNH)
Peratophyga xanthyala: Prout, 1929, *Bull. Hill Mus.*, 3 (1): 48.

Diagnosis. On the basis of wing pattern, this species is close to *P. oblectata* Prout, 1929 (Moluccas), but it can be distinguished by the following characters: the reddish brown bands above the anal margins of all wings are broader, extending to CuA_2; the hindwing postmedial line is less strongly protruding outwards between M_3 and CuA_2; the hindwing submarginal line is more distinct.

Material examined. INDIA (BMNH): 1♂ (syntype), Sikkim, coll. J.G. Pilcher. **MALAYSIA** (BMNH): 1♂, Sarawak, Gunong Mulu Nat. Park, R.G.S. Exped. 1977-8, J.D. Holloway *et al.*, B.M. 1978-206, Site 1. January, Camp 4, Mulu 1790 m, 452463, lower montane (moss) forest. MV-canopy. **CHINA: Tibet** (IZCAS): 1♀, Mêdog, 1091 m, 23.VIII.2006, coll. Lang Songyun.

Distribution. China (Tibet), India (Sikkim), Malaysia.

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