

Two new species in the *formosana* group of *Pachyprotasis* (Hymenoptera: Tenthredinidae) from China

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Abstract: The species of *formosana* group in *Pachyprotasis* Hartig from Yunnan and Tibet of China are investigated. Two new species are described: *Pachyprotasis lushuiensis* Zhong, Li & Wei sp. nov., *P. linzhiensis* Zhong, Li & Wei sp. nov. A key to all species in the *Pachyprotasis formosana* group from China is updated.

Key words: Symphyta; Tenthredinoidea; sawfly; taxonomy

中国方颜叶蜂属环角种团 *Pachyprotasis formosana* group 二新种 (膜翅目: 叶蜂科)

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摘要: 记述来自中国云南及西藏方颜叶蜂属环角种团 *Pachyprotasis formosana* group 2 新种: 泸水方颜叶蜂 *P. lushuiensis* Zhong, Li & Wei sp. nov. 和林芝方颜叶蜂 *P. linzhiensis* Zhong, Li & Wei sp. nov.。编制了方颜叶蜂属环角种团 18 种分种检索表。

关键词: 广腰亚目; 叶蜂总科; 叶蜂; 分类

Introduction

Specimens of *Pachyprotasis* Hartig, 1837 belong to the most frequently collected sawflies in China. More than 220 species of *Pachyprotasis* have been recognized (Zhong *et al.* 2018). Zhong & Wei (2010) provided a key to separate the *Pachyprotasis formosana* group from other species-groups of *Pachyprotasis* based on the following characters: apex of antennae white or with white ring, the apex of the two apical flagellomeres sometimes black, and the underside of the white articles sometimes striped with black; articles 3–5 black, rarely and only in the male, pale along the underside.

Accepted 31 August 2019. Published 25 December 2019. Published online 12 December 2019.

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Sixteen species of the *formosana* group have previously been recorded, all of which were described from India, Myanmar and China: *P. rufipleuris* Malaise, 1945; *P. versicolor* Cameron, 1876; *P. fopingensis* Zhong & Wei, 2010; *P. birmanica* Forsius, 1935; *P. tuberculata* Malaise, 1945; *P. bicoloricornis* Wei & Nie, 2002; *P. maculoannulata* Zhong & Wei, 2010; *P. emdeni* (Forsius, 1931); *P. alboannulata* Forsius, 1935; *P. sikkimensis* Saini & Kalia, 1989; *P. formosana* Rohwer, 1916; *P. rubribuccata* Malaise, 1945; *P. multilineata* Malaise, 1945; *P. nigricoxis* Zhong & Wei, 2010; *P. nanlingia* Wei, 2006; *P. altantennata* Zhong & Wei, 2010. In this study, two new species namely, *P. lushuiensis* Zhong, Li & Wei sp. nov. and *P. linzhiensis* Zhong, Li & Wei sp. nov. belonging to this species group collected from Yunnan and Tibet in China are described. A key to all known species from China in this species group is updated.

Material and methods

The specimens were examined with a Motic-DM-143 stereomicroscope. Images of adults were taken with a Keyence VHX-5000 digital camera. Images of genitalia were taken with a Nikon NI-SSR digital camera. All images were further processed with Adobe Photoshop CS 11.0.

Terminology of sawfly genitalia follows Ross (1945), Viitasaari (2002) and Zhong & Wei (2012) and wing venation follows Zhong & Wei (2012).

Specimens examined during this study are deposited in the Insect Collection of the Central South University of Forestry and Technology, Changsha, China (CSCS).

Taxonomy

Key to species of *Pachyprotasis formosana* group

1. Supra-antennal tubercles distinctly raised 2
- Supra-antennal tubercles absent or indistinctly raised 3
2. Thorax red, the mesonotal lateral lobes and most of metanotum and metasternum black; a paired spot on metasternum and a sometimes missing spot in front on each side of the mesopleura white. Punctures on mesopleura fine, scattered. Myanmar *P. rufipleuris* Malaise
- General color of thorax black, without red; mesonotum and metanotum with yellowish white spots; other white parts are: large L shape spot on middle of mesepisternum, outer side of mesepimeron, pectus. Punctures on mesopleura rather large, distinct. China (Yunnan, Tibet); Myanmar; India *P. versicolor* Cameron
3. Anal cell of hind wing not petiolate 4
- Anal cell of hind wing petiolate 6
4. Hind tarsi white except base of tarsomere 1 and tarsomeres 5, which are black; basal 2/5 of metafemur white; apex of median mesoscutal lobe with an arrow-head shaped white spot 5
- Hind tarsi black, without white; metafemur black except extremely white base; median mesoscutal lobe black, without white. China (Yunnan) *P. lushuiensis* Zhong, Li & Wei **sp. nov.**
5. Apex of antennae white, but ventral side of flagellomere 9 dark brown in the male; white spots on tergites 1–7 discrete; metatibiae black, dorsal part of hind tibia just before apex with white spots. China (Shaanxi) *P. fopingensis* Zhong & Wei
- Apex of flagellomere 6 and all of flagellomere 7 black, flagellomeres 8 and 9 white; white spots on tergites

- 1–7 continuous, metatibiae black, without white spot. China (Guizhou); Myanmar; India *P. birmanica* Forsius
6. Pectus black or yellowish white, without red 7
- Pectus, tergite 3 except laterally red; face raised into a subpyramidal tubercle exactly between the antennae. Burma *P. tuberculata* Malaise
7. Hind legs black or yellowish white, without red 8
- Hind legs reddish brown 12
8. Last or last two flagellomeres white 9
- Last or last two flagellomeres black, in the male ventral side of antennae sometimes pale or pale brown ... 10
9. Mesoscutellum without middle furrow; dorsal spots on tergites 2–7 discrete in the female, in the male dorsal spots on tergites confluent; whole of flagellomeres 1–2 and basal half of flagellomere 3 black in the female, ventral sides of antennomeres 1–5 white in the male; serrulae not flat; punctures on mesepisternum fine, interspaces strongly shining, without microsculpture. China (Guizhou) *P. bicoloricornis* Wei & Nie
- Top of mesoscutellum with deep middle furrow; spots on dorsal side of tergites 3–7 confluent; ventral sides of flagellomeres 1–4 yellowish white; serrulae flat; mesepisternum with distinct microsculpture, punctures minute and shallow. China (Hubei) *P. maculoannulata* Zhong & Wei
10. Flagellomere 1 shorter than flagellomere 2 11
- Flagellomere 1 longer than flagellomere 2; punctures on and around frontal area coarse and dense; mesoscutellum pyramidally raised and without sharp lateral carinas, apex with a broad and shallow longitudinal incision; metatibiae black, middle part with a broad white ring. China (Sichuan) *P. emdeni* (Forsius)
11. Punctures on head extremely minute; mesoscutellum entirely pale and lateral ridges also pale; abdomen impunctate; antennae black, antennomeres 3–4 white in the female; scapus and pedicel ventrally, antennomeres 3–5 except dorsal surfaces and basal part of antennomere 6 white in the male, lancet with protruding teeth, middle serrula with 9–11 posterior sub-basal teeth. China (Zhejiang, Henan, Hunan, Sichuan, Yunnan); Myanmar; India *P. alboannulata* Forsius
- Head with large, distinct punctures; mesoscutellum pale except its posterior slope and lateral ridges, which are black; abdomen with distinct, isolated punctures on lateral sides of tergites 3–6; apical 3/5 of antennomere 3, antennomeres 4–5 white in the female; lancet with small, indistinct protruding teeth, middle serrula with 19–20 posterior subbasal teeth. India *P. sikkimensis* Saini & Kalia
12. Mesepisternum with broad white band, central part of pectus white 13
- Mesepisternum and pectus black, without white 16
13. Flagellomere 1 shorter than flagellomere 2 14
- Flagellomere 1 much longer than flagellomere 2; apex of flagellomeres 4 and the last 3 flagellomeres white; mesepisternum with a large longitudinal white band; head shining, the middle area with distinct and dense punctures; punctures on mesepisternum large, distinct and space between punctures with distinct microsculpture. China (Zhejiang, Fujian, Taiwan, Sichuan) *P. formosana* Rohwer
14. Last two flagellomeres black; head polished and strongly shining, mostly impunctate 15
- Last three flagellomeres white; head on and around the frontal area with separate, distinct punctures; surface between the larger punctures with faint microsculpture. Myanmar *P. rubribuccata* Malaise
15. Body length 8 mm in female; hind tarsomeres 2–5 red brown; mesepisternum with broad white band. India *P. multilineata* Malaise
- Body length 11.5 mm in female; hind tarsomeres 2–5 white, without red; mesepisternum without broad white band, only base with small white spot. China (Tibet) *P. linzhiensis* Zhong, Li & Wei **sp. nov.**
16. Hind coxa yellow or yellowish brown, only base with a small black spot; flagellomere 1 longer than or equal to flagellomere 2, the last three flagellomeres white 17

- . Hind coxa entirely black; flagellomere 1 shorter than flagellomere 2; the last two flagellomeres black. China (Yunnan)..... *P. nigricoxis* Zhong & Wei
17. Apex of flagellomere 4 and the last three flagellomeres white; posterior margins of all tergites white; veins and stigma blackish brown; punctures on frontal area deep, distinct; median fovea pit-like. China (Jiangxi, Zhejiang, Fujian, Guangxi, Hunan, Sichuan, Guizhou)..... *P. nanlingia* Wei
- . Apex of flagellomere 3, flagellomere 4 except basal half on dorsal side, all of flagellomeres 5–7 white; tergites 1–6 completely black; costa, subcosta, R1 and base of stigma brown, other part of stigma and remaining veins blackish brown; punctures on frontal area shallow; median fovea absent. China (Hubei)..... *P. altantennata* Zhong & Wei

1. ***Pachyprotasis lushuiensis* Zhong, Li & Wei sp. nov.** (Figs. 1, 2)

Female (Figs. 1A, 1B). Body length 10.0 mm. Black, yellowish white are: face below antennal sockets, lower 2/3 of inner orbits, hind orbits, two separate spots on posterolateral side of postocellar area, apical 1/2 of flagellomere 4, flagellomeres 6–7, lateral margin and apex of pronotum, base of tegulae, spot on center of mesoscutellum, an anterior spot on lower part of mesepisternum, a minute spot on lateral side of mesepimeron, tergites 10; labrum yellowish brown, clypeus dark brown, posterolateral side yellowish white; legs black, white are: all trochanters and base of femora, front sides of four front legs, a large anterior spot on outer side of metacoxa. Wings pale infuscate, hyaline; stigma and veins blackish brown.

Punctures on labrum and clypeus minute, indistinct; punctures on dorsal part of head extremely minute, surface between punctures microsculptured, strongly shining; mesonotum densely punctured, matted; punctures on upper corner of mesepisternum a little large, dense and distinct, while ones on lower part minute and dense; outer side of mesepimeron with dense and minute punctures and sculptures, sub-shining; punctures on metepisternum extremely minute, those on metepimeron minute and sparse, surface between punctures microsculptured, strongly shining; center of mesoscutellum polished without puncture, lateral side with a few large and shallow punctures; sculptures on mesoscutellar appendage distinct, shining; punctures on middle part of tergites indistinct, those on lateral sides minute, shallow, surface between punctures with microsculptures and oily luster; outer side of hind coxa with dense and moderate punctures.

Labrum small and with squarely pointed anterior margin; clypeus roundly incised to 1/3 of its middle length, lateral lobes acute; malar space narrower than diameter of median ocellus; inner margins of eyes distinctly convergent downwards (Fig. 1C); frontal area distinctly below level of eyes, supra-antennal tubercles and frontal ridges insignificant; median fovea pit-like, supra-antennal pit deep; interocellar furrow deep, postocellar furrow wide and shallow; postocellar area flat, broader than long by 11: 6, lateral furrows shallow and divergent backwards; head slightly narrowed behind eyes (Fig. 1D). Antenna slightly shorter than thorax and abdomen together, first flagellomere longer than 2nd flagellomere by 13: 11 (Fig. 1E). Mesoscutellum prismatic, flat, lateral carina acute, mesoscutellar appendage with acute middle carina. Metatarsomere 1 longer than following 4 tarsomeres together, claw with inner tooth much longer than outer tooth. Front wing with middle petiole of anal cell slightly longer than half length of basal anal cell, equal to vein R+M; hind anal cell not petiolate. Ovipositor sheath slightly shorter than metatarsomere 1 by 21: 23 in lateral view, apical sheath longer than basal sheath. Lancet with 26 annuli, middle serrulae with 2 anterior and 8–10 posterior subbasal teeth (Figs. 1F, 1G).

Male. (Only differences from the female are described). Body length 9.5 mm. Labrum and clypeus yellowish white; malar space equal to diameter of median ocellus; inner margins of eyes slightly convergent downwards; flagellum strongly compressed (Figs. 2A–2E). Gonoforcep and penis valve as in Figs. 2F, 2G.

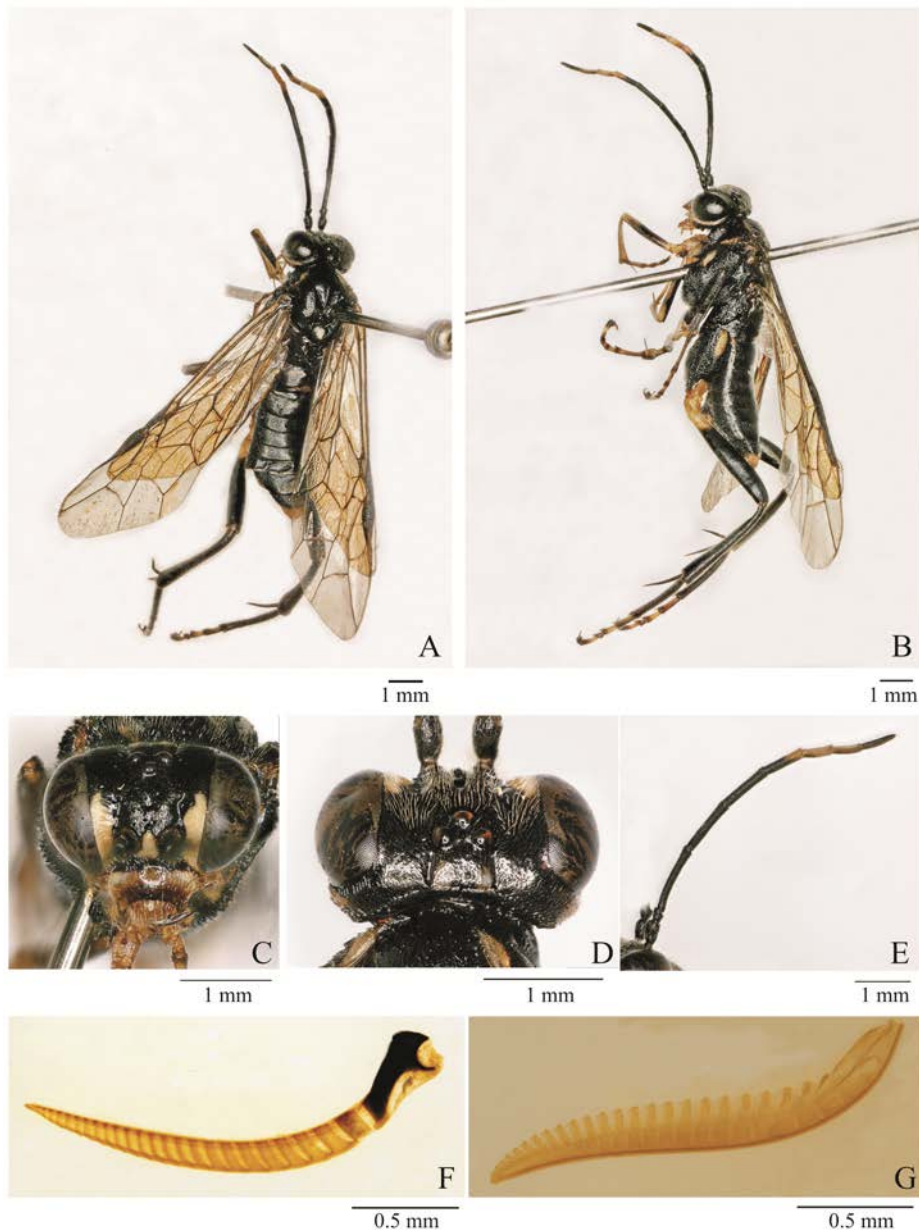


Figure 1. *Pachyprotasis lushuiensis* Zhong, Li & Wei sp. nov. ♀, holotype. A. Adult female, dorsal view; B. Adult female, lateral view; C. Head, frontal view; D. Head, dorsal view; E. Antenna, lateral view; F. Lance; G. Lancet.

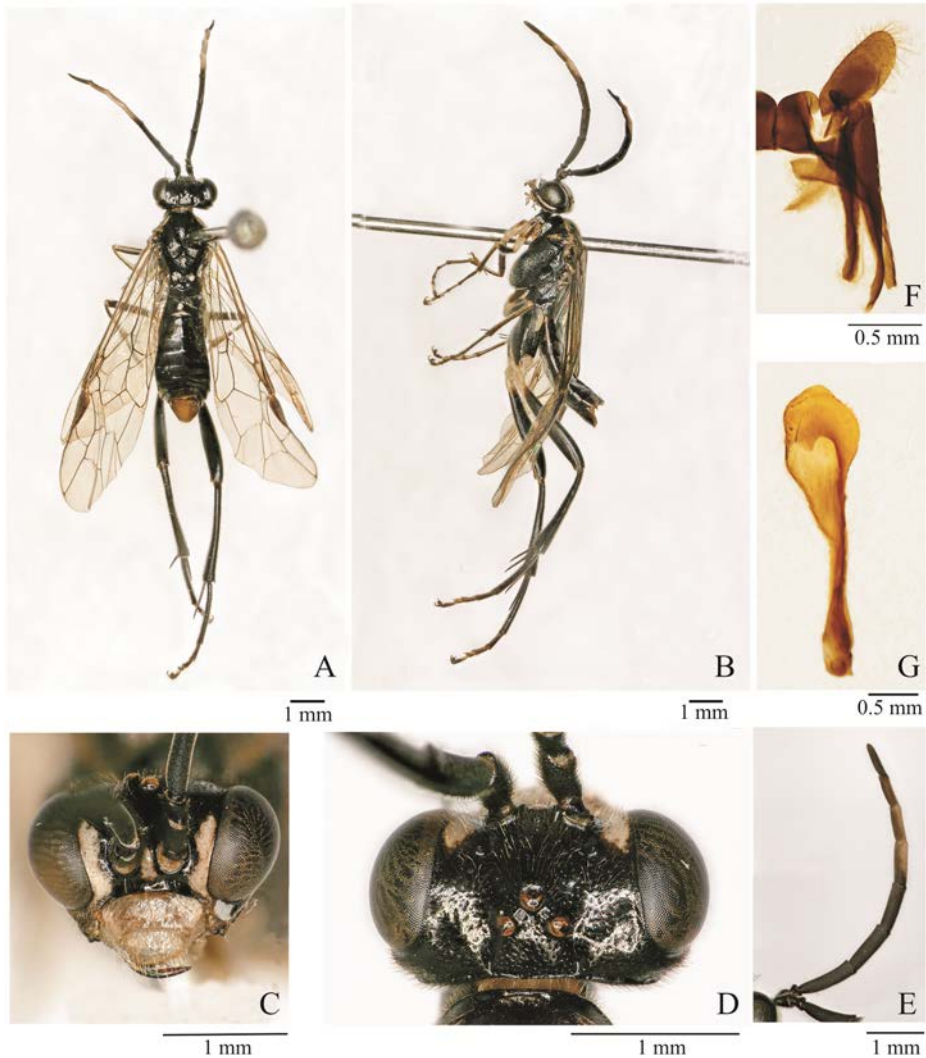


Figure 2. *Pachyprotasis lushuiensis* Zhong, Li & Wei sp. nov. ♂, paratype. A. Adult male, dorsal view; B. Adult male, lateral view; C. Head, frontal view; D. Head, dorsal view; E. Antenna, lateral view; F. Harpe and parapenis; G. Penis valve.

Holotype. ♀, **China**, Yaojiaping, Lushui County, 98°42'E, 25°48'N, alt. 2550 m, Yunnan Province, 03-VI-2009, Wei XIAO leg. **Paratypes.** 1♀1♂, same data as the holotype.

Etymology. The specific epithet refers to the type locality, Lushui County.

Distribution. China (Yunnan).

Remarks. *Pachyprotasis lushuiensis* is similar to *P. birmanica eburnipes* Forsius, 1935. They are the species in *formosana* group which anal cell of hind wing not petiolate, but the former can be easily recognized from the latter by: hind tarsi black, without white; basal white part of metafemur shorter than 1/10 of the length; median mesoscutal lobe black, without white; postocellar area black, posterolateral side with two separate white spots in female. In latter species, hind tarsi white, except base of tarsomere 1 and tarsomeres 5, which black; basal

white part of metafemur longer than $2/5$ of the length; apex of median mesoscutal lobe with an arrow-head shaped white spot; postocellar area white, without black.

2. *Pachyprotasis linzhiensis* Zhong, Li & Wei sp. nov. (Fig. 3)

Female (Figs. 3A, 3B). Body length 11.5 mm. Black, yellowish white are: clypeus, face below antennal sockets, lower of inner orbits continuous with hind orbits, inner side of inner orbits continues with a spot on temple, ventral sides of scape and pedicel, flagellomeres 4–5, basal $3/5$ of flagellomere 6, lateral margin of pronotum, basal half of tegulae, lateral part of mesonotal middle lobe, center of pectus, central spot on mesonotal lateral lobe, mesoscutellum, mesoscutellar appendage, metascutellum, an anterior spot on lower part of mesepisternum, upper margin of mesepimeron, apex of metepimeron, narrow triangular spot on each posterior part of tergum, deflexed lateral sides on posterior part of all terga, spots near spiracle of all terga, apex of all sterna, lower part of ovipositor apical sheath; labrum yellow brown, anterior part of clypeus dark brown. Legs reddish brown, yellowish white are: four front coxae, spot on outer part of metacoxa, all trochanters, metatarsus from base of tarsomere 2 to extremely apex of tarsomere 5. Wings pale infusate, hyaline; costa brown, stigma and remaining veins blackish brown.

Punctures on labrum and clypeus minute, shallow and sparse; punctures on dorsal part of head minute, shallow and sparse; surface between punctures polished and strongly shining, microsculpture absent; mesonotum densely punctured, distinctly shining; punctures on upper corner of mesepisternum a little large, dense and distinct, ones on lower part a little minute, surface between punctures with dense microsculpture, indistinctly shining; outer side of mesepimeron with dense and distinct sculptures, matted; punctures on metepisternum minute and dense, sub-shining, punctures on metepimeron minute and sparse, sculptured indistinct, strongly shining; center of mesoscutellum polished without punctures, lateral side with a few large and shallow punctures; sculptures and punctures on mesoscutellar appendage indistinct, strongly shining; punctures on middle part of tergites indistinct, those on lateral sides large, shallow and sparse, surface between punctures with microsculptures and oily luster; outer side of hind coxa with dense and distinct punctures.

Labrum large and with squarely pointed anterior margin; clypeus truncately incised to $2/5$ of its middle length, lateral lobes acute; malar space slightly wider than diameter of median ocellus; inner margins of eyes convergent downwards (Fig. 3C); frontal area distinctly below level of eyes, supra-antennal tubercles and frontal ridges insignificant; median fovea ditch-like, extends to median ocellus, antennal furrow ditch-like, shallow; interocellar furrow deep, postocellar furrow shallow, indistinct; postocellar area elevated, broader than long by 3: 2, lateral furrows shallow and divergent backwards; head indistinctly narrowed behind eyes (Fig. 3D). Antenna shorter than thorax and abdomen together, first flagellomere shorter than 2nd flagellomere by 29: 33 (Fig. 3E); mesoscutellum elevated, prismatic, lateral carina acute, mesoscutellar appendage with acute middle carina. Metatarsomere 1 distinctly longer than following 4 tarsomeres together, claw with inner tooth longer than outer tooth. Front wing with middle petiole of anal cell slightly longer than half length of basal anal cell, distinctly longer than vein R+M; petiole of anal cell on hind wing distinctly shorter than half of vein cu-a. Ovipositor sheath distinctly shorter than metatarsomere 1 by 22: 25 in lateral view, apical sheath longer than basal sheath, apical margin rounded in lateral view. Lancet with 22 annuli,

middle serrulae with 2 anterior and 12–14 posterior subbasal teeth (Figs. 3F, 3G).

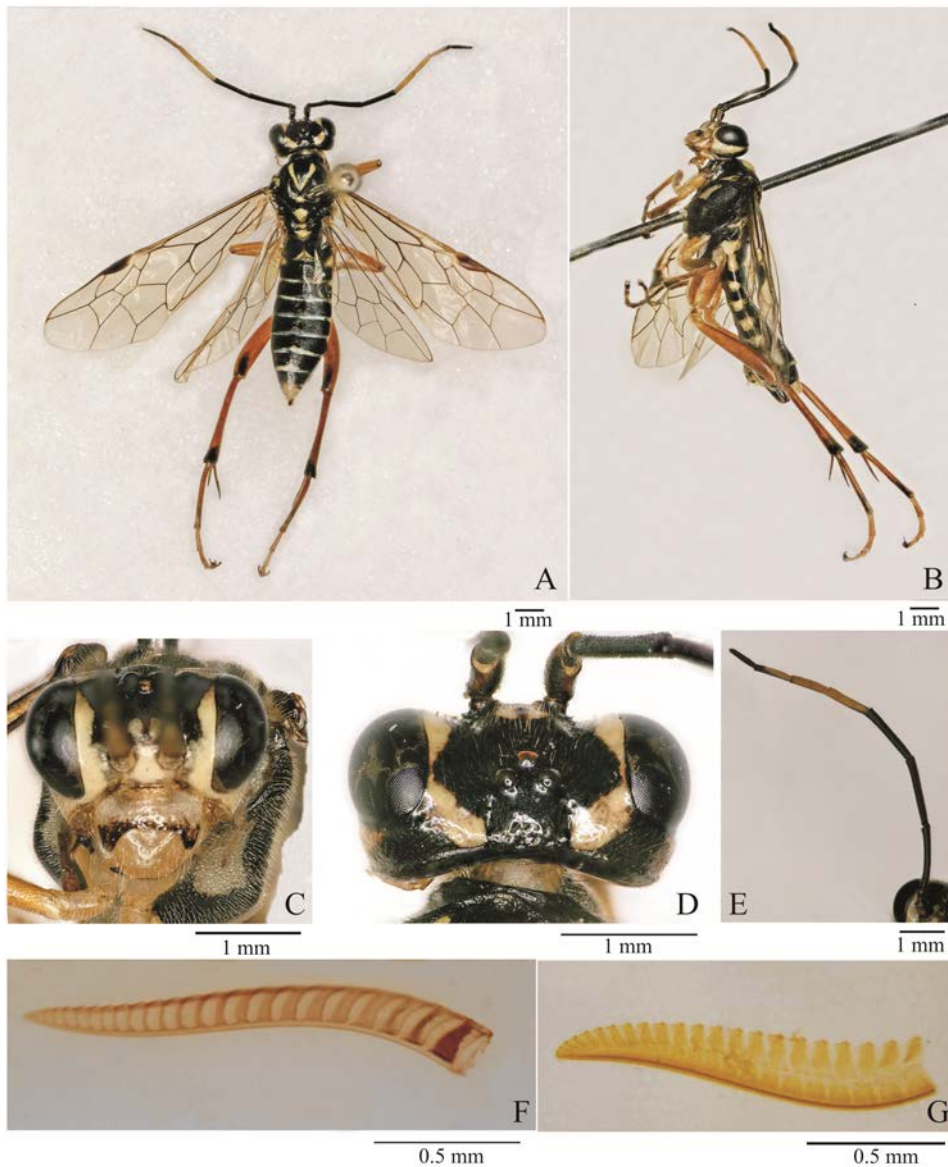


Figure 3. *Pachyprotasis linzhiensis* Zhong, Li & Wei sp. nov. ♀, holotype. A. Adult female, dorsal view; B. Adult female, lateral view; C. Head, frontal view; D. Head, dorsal view; E. Antenna, lateral view; F. Lance; G. Lance.

Holotype. ♀, **China**, Linzhi City, 94°28'E, 29°34'N, alt. 2572 m, Xizang Autonomous Region (Tibet), 12-VI-2009, Zejian LI leg.

Male. Unknown.

Etymology. The specific epithet refers to the type locality, Linzhi City.

Distribution. China (Tibet).

Remarks. *Pachyprotasis linzhiensis* is similar to *P. allantenate* Zhong & Wei, 2010 but

can be easily recognized from the latter by: metacoxa red brown, extreme base black; lateral part of mesonotal middle lobe entirely white; anterior part of clypeus dark brown; posterior part of each tergum with a narrow white triangle spot; apex of flagellomere 6, flagellomere 7 totally black. In latter species, metacoxa white, without black; lateral part of mesonotal middle lobe black in anterior part; central part of clypeus dark brown; terga black, without white; last four flagellomeres white.

Acknowledgments

This research was supported by the National Special Construction Agriculture Technology System of China (CARS-44-SYZ 13) and Zhejiang Provincial Natural Science Foundation of China under Grant (LY18C040001).

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