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## Research article

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# Three new species of the genus *Notosemus* Förster, 1869 (Hymenoptera, Ichneumonidae, Ichneumoninae) from China, with a key to the world species

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**Abstract.** Eight species of the genus *Notosemus* Förster, 1869 (Hymenoptera: Ichneumonidae) are reported, three of which are new to science: *N. albimaculatus* Sheng & Sun, sp. nov. and *N. planus* Sheng & Sun, sp. nov., both collected from Xizang Autonomous Region, SW China, and *N. wugongicus* Sheng & Sun, sp. nov., collected from Jiangxi Province, S China. One new record for China, *N. bohemani* (Wesmael, 1855), was reared from *Zeiraphera griseana* (Hübner, 1789) (Lepidoptera, Tortricidae), a leaf pest of *Larix principis-rupprechtii* Mayr. (Pinaceae) in Ningxia Hui Autonomous Region, NW China. A key to the species of the genus *Notosemus* is provided.

**Keywords.** Oedicephalini, *Notosemus*, new species, *Zeiraphera griseana*, Lepidoptera.

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## Introduction

*Notosemus* Förster, 1869, belonging to the tribe Oedicephalini of the subfamily Ichneumoninae (Hymenoptera: Ichneumonidae), comprised five species until now (Yu *et al.* 2012), of which one is from the Western Palaearctic Region (Kazmierczak 2004; Perkins 1959; Rasnitsyn & Siytan 1981; Riedel *et al.* 2005), one is from the Eastern Palaearctic Region (Gokhman 1993), and three are from the Oriental (Cameron 1903; Gupta 1987; Kusigemati 1986; Tosquinet 1903; Townes *et al.* 1961). One species, *N. polyambonios* Kusigemati, 1986, was previously known from China (Kusigemati 1986). The

diagnostic characters of the genus were described by Kusigemati (1986). Prior to this publication the hosts of *Notosemus*, and of the tribe Oedicephalini, were unknown.

In this paper, three new species, collected from Xizang Autonomous Region, SW China, and Jiangxi Province, S China, and one new Chinese record, reared from *Zeiraphera griseana* (Hübner, 1789) (Lepidoptera, Tortricidae) from Ningxia Hui Autonomous Region, NW China, are reported.

## Material and methods

The cocoons of the host, *Zeiraphera griseana* (Hübner, 1789), were collected, brought to the laboratory and maintained in culture dishes at room temperature by Prof. De-Jia Li (Forestry Pest Control and Quarantine Station of Ningxia Hui Autonomous Region, China). The emerged insects were collected daily.

Types of *Notosemus albimaculatus* Sheng & Sun, sp. nov. and *N. planus* Sheng & Sun, sp. nov., described here, were collected by Dr. Tao Li with entomological nets in the forest of Xizang Autonomous Region. The specimens from Wugongshan National Natural Reserve, Jiangxi Province, were collected with intercept traps (IT) (Li *et al.* 2012) by Dr. Yan-Ping Liang.

The holotype of *Notosemus inornatus* Gokhman, 1993, and specimens of *N. bohemani* (Wesmael, 1855), deposited in the Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia (ZIR), and the holotype of *N. variegatus* (Tosquinet, 1903), deposited in the Institut Royal des Sciences Naturelles de Belgique (IRSNB), were studied. Photos of the holotype of *N. polyamboniosi*, for comparison with Chinese specimens, were taken by Dr. Kyohei Watanabe, Kanagawa Prefectural Museum of Natural History, Japan.

Images were taken with a Leica M205C stereo microscope equipped with LAS Montage MultiFocus. Morphological terminology is mostly based on Gauld (1991).

All types and specimens, except those mentioned above, are deposited in the Insect Museum, General Station of Forest Pest Management (GSFPM), State Forestry Administration, P.R. China.

## Results

Class Hexapoda Blainville, 1816  
Order Hymenoptera Linnaeus, 1758  
Superfamily Ichneumonoidea Latreille, 1802  
Family Ichneumonidae Latreille, 1802  
Subfamily Ichneumoninae Latreille, 1802  
Tribe Oedicephalini Heinrich, 1934  
  
Genus *Notosemus* Förster, 1869

*Notosemus* Förster, 1869: 194. Type-species: *Notosemus dives* Brischke, 1888 (= *Phaeogenes bohemani* Wesmael, 1855).

## Diagnosis

Upper tooth of mandible longer than lower tooth. Gena wide. Occipital carina complete, lower end reaching base of mandible. Areolet truncate above. Tarsal claw simple. Base of area superomedia a little distant from base of propodeum. Propodeal spiracles round or oval. Thyridia very wide, distance between them equal to approximately half the width of each. Lateral sides of second and subsequent

tergites almost parallel. Tergites 6 and 7 weakly to strongly concave apically, medially. Ovipositor sheath almost as long as apical depth of metasoma. Upper and lower valves of ovipositor with distinct ridges.

*Notosemus albimaculatus* Sheng & Sun, sp. nov.

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Figs 1–10

**Diagnosis**

Antenna with 28 flagellomeres, beyond middle slightly widened; apical portion cylindrical. Upper tooth of mandible longer than lower tooth. Subocular sulcus present and distinct. Second tergite with dense, fine punctures, approximately 2.1× as long as maximum width. Face yellowish white, with a small median brown spot. Propodeal spiracle oval, 1.5× as long as wide. Metapleuron mainly dark brown. Hind tarsus brown.

**Etymology**

The specific name is derived from the large white spots on the head and mesosoma.

**Material examined**

**Holotype**

CHINA: ♀, Bomi, 2750 m, Xizang Autonomous Region, 10 Jul. 2013, leg. Tao Li.

**Paratype**

CHINA: 1 ♀, same data as holotype.

**Description**

**Female**

MEASUREMENTS. Body length 7.5 to 8.5 mm. Fore wing length 5.5 to 6.0 mm.

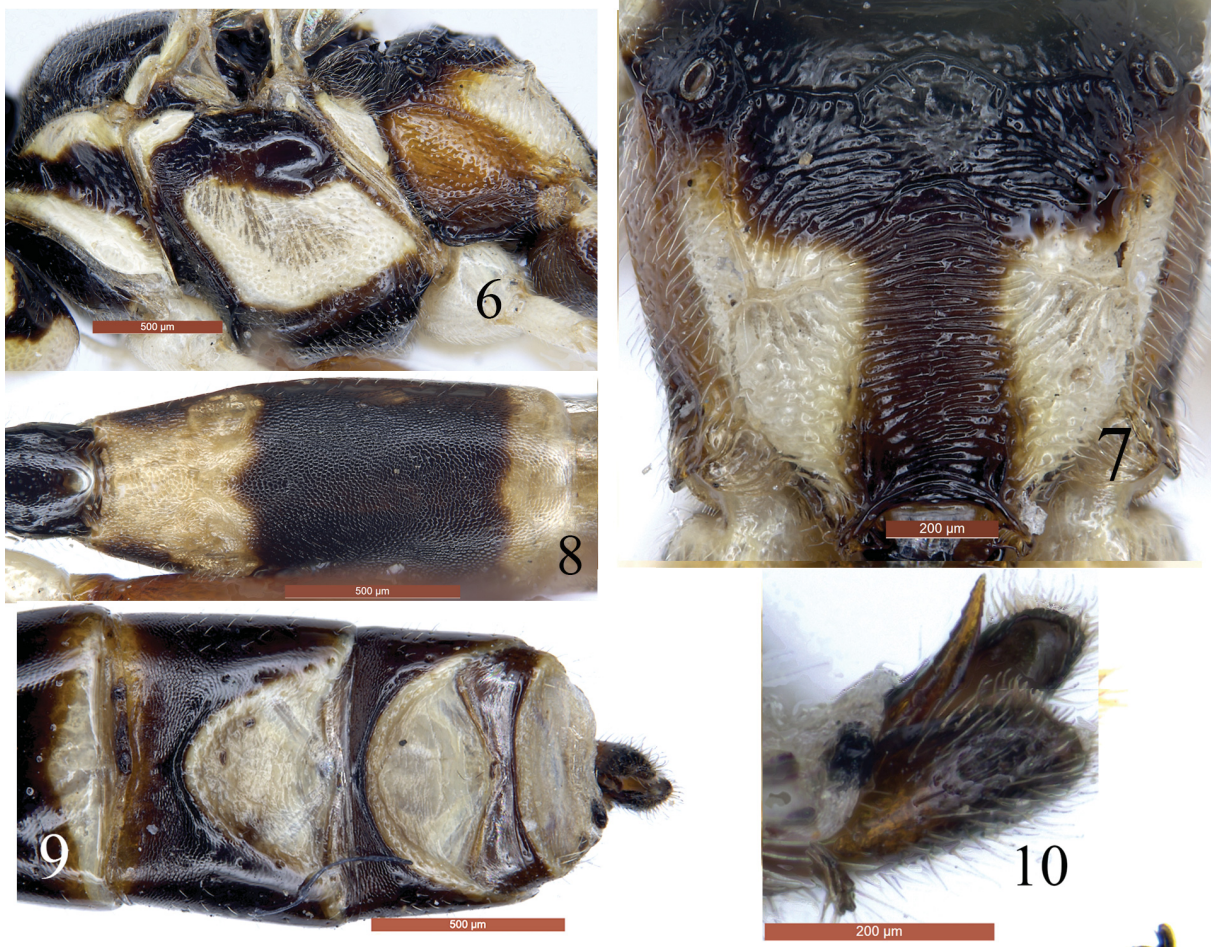
HEAD. Face (Fig. 2) approximately 1.45× as wide as long, with sparse uneven punctures, distance between punctures 1.0–4.0× diameter of puncture; median portion slightly convex; upper margin with even median concavity. Clypeal suture vestigial. Clypeus approximately 2.2× as wide as long, with sculpture as that of face; apical margin with distinct tubercles and fine setae, evenly convex. Mandible with distinct punctures; base deeply concave; upper tooth longer than lower tooth. Subocular sulcus distinct. Malar space 0.7 to 0.8× as long as basal width of mandible. Gena (Fig. 3) evenly longitudinally convex, shiny, with indistinct fine punctures. Vertex (Fig. 4) with distinct irregular fine punctures. Interocellar area with fine longitudinal wrinkles. Postocellar line approximately 0.6× as long as ocular-ocellar line; ocular-ocellar line 1.6× as long as maximum diameter of posterior ocellus. Frons almost flat, with dense punctures, median portion with indistinct oblique longitudinal wrinkles; lower portion concave. Antenna with 28 flagellomeres, beyond median portion slightly widened; apical portion regular, cylindrical. Ratios of lengths from first to fifth flagellomeres: 9.5:7.4:6.7:6.3:5.7. Occipital carina complete, lower end reaching base of mandible.

MESOSOMA. Pronotum smooth, shiny; lateromedian portion with short transverse wrinkles; upper lateral portion slightly convex, with indistinct fine punctures. Epomia distinct. Mesoscutum (Fig. 5) convex; median portion with dense, fine punctures, anterior and lateral portions with weak indistinct punctures. Anterior portion of notaulus distinct, reaching to line between anterior margins of tegulae. Scutoscutellar groove deep, smooth, shiny. Scutellum evenly slanting backward, basal portion with indistinct fine punctures, posterior portion smooth, shiny; lateral carina almost 0.5× length of scutellum. Anterior portion of postscutellum slantingly concave forward; posterior portion transversely convex, with indistinct fine punctures. Median portion of mesopleuron (Fig. 6) with fine, indistinct wrinkles;



**Figs 1–5.** *Notosemus albimaculatus* Sheng & Sun, sp. nov., holotype, ♀ **1.** Habitus, lateral view. **2.** Head, anterior view. **3.** Head, lateral view. **4.** Head, dorsal view. **5.** Mesoscutum and scutellum.

anterior portion behind epicnemial carina, lower and posterior portions with uneven punctures; upper-anterior portion, beneath subalar prominence, with weak, short transverse wrinkles. Speculum large, smooth, shiny. Upper end of epicnemial carina almost reaching subalar prominence. Mesopleural fovea consisting of short, deep horizontal groove. Metapleuron with dense, uneven punctures; juxtacoxal carina complete. Submetapleural carina complete, strong. Wings slightly brownish, hyaline. Fore wing with vein 1cu-a opposite, or almost opposite 1-M. Areolet pentagonal, receiving vein 2m-cu slightly distal of its middle. 2-cu slightly shorter than 2cu-a. Hind wing vein 1-cu about 3.0× as long as cu-a. Ventral profile of hind coxa with dense punctures. Hind femur slightly compressed, inner profile more or less flat. Basal portion of hind tibia slender; apical portion evidently compressed. Ratio of length of hind tarsomeres 1:2:3:4:5 is 20.5:9.8:6.5:3.3:5.4. Claw simple. Propodeum (Fig. 7) with dense transverse wrinkles; basal transverse, lateral longitudinal and pleural carinae complete; basal portion in front of basal transverse carina smooth, shiny. Apical portion of lateral carina of area superomedia absent. Submedian portion of apical transverse carina very faint. Basal portions of area superomedia and area dentipara with weak, short longitudinal wrinkles. Propodeal spiracle elliptical, located at basal 0.1 to 0.2 of propodeum, connected to pleural carina by a carina.



**Figs 6–10.** *Notosemus albimaculatus* Sheng & Sun, sp. nov., holotype. **6.** Mesosoma, lateral view. **7.** Propodeum. **8.** Postpetiole and tergite 2, dorsal view. **9.** Apical portion of metasoma, dorsal view. **10.** Ovipositor.

**METASOMA.** First tergite very slender, 3.1 to 3.6× as long as apical width, almost smooth, shiny; apical portion with weak, fine punctures; spiracle circular, small, evidently convex, located at apical 0.15 of first tergite. Postpetiole convergent posteriorly. Second tergite (Fig. 8) with dense, fine punctures, approximately 2.1× as long as maximum width. Thyridium slightly impressed, approximately 2× wider than distance between them; 1.5× as long as distance to basal margin of second tergite. Third tergite with same sculpture as second tergite; lateral margins parallel, longer than wide; apical margin smooth. Fourth tergite with weak, indistinct punctures; apical half almost smooth, shiny. Tergites 5 and 6 (Fig. 9) with large apical median membranous areas. Dorsal profile of seventh tergite almost entirely membranous. Eighth tergite almost absent. Ovipositor sheath as long as apical depth of metasoma, slightly widened apically. Ovipositor (Fig. 10) slightly curved upwards, upper and lower valves with distinct ridges.

**COLOR** (Fig. 1). Black, except following: face except small median brown spot, clypeus except black apical margin, maxillary and labial palpi except apical segment brown, malar area, gena and wide spot of vertex, lateral portions of frons, anterior spot of scape, flagellomeres 7 to 10 and dorsal profile of 11, anterior and upper-posterior wide bands of pronotum, tegula, subalar ridge, large median spot of mesopleuron, upper division of metapleuron, large posterolateral spots of propodeum, anterior and middle coxae and trochanters, dorsal spot of hind coxa, hind trochanter predominantly, small apical median spot of first tergite, basal and apical transverse bands of tergites 2 to 4, concavities of tergites 5 to 7 white to yellowish white. Subapical narrow transverse band of tergite 4 and basal transverse band of tergite 5 yellow brown. Submedian triangular spots of mesoscutum, scutellum and postscutellum yellow white. Metapleuron except lower portion blackish brown, leg (except mentioned above and basal and apical portions of hind tibia black brown, median darkish yellow, hind tarsus brown) brown to red brown. Pterostigma yellow brown. Veins brown.

#### **Male**

Unknown.

#### **Remarks**

This new species is similar to *N. polyambonios* Kusigemati, 1986, and can be distinguished from the latter by the following combination of characters: upper hind median portion of head slightly concave; antenna with 28 flagellomeres; propodeal spiracle oval, 1.5× as long as wide. *N. polyambonios*: upper hind median portion of head strongly concave; antenna with 39 flagellomeres; propodeal spiracle elongate, 2.7× as long as wide.

*Notosemus planus* Sheng & Sun, sp. nov.

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Figs 11–22

#### **Diagnosis**

Antenna with 39 flagellomeres, apical portion of flagellum distinctly flattened below. Upper tooth of mandible almost as long as lower tooth. Subocular sulcus absent. Maximum diameter of propodeal spiracle approximately 2.0× as long as minimum diameter. Second tergite coriaceous, with indistinct punctures, 1.5× as long as maximum apical width. Face yellowish white, with median longitudinal black band. Metapleuron with large white spot. Hind tarsus yellow brown.

#### **Etymology**

The specific name is derived from the distinctly ventrally flattened apical portion of the antennal flagellum.

**Material examined****Holotype**

CHINA: ♀, Shangcaiuyu, 1690 m, Xizang Autonomous Region, 7 Jul. 2013, leg. Tao Li.

**Description****Female**

MEASUREMENTS. Body length approximately 16.5 mm. Fore wing length approximately 13.5 mm. Antenna length approximately 13 mm.

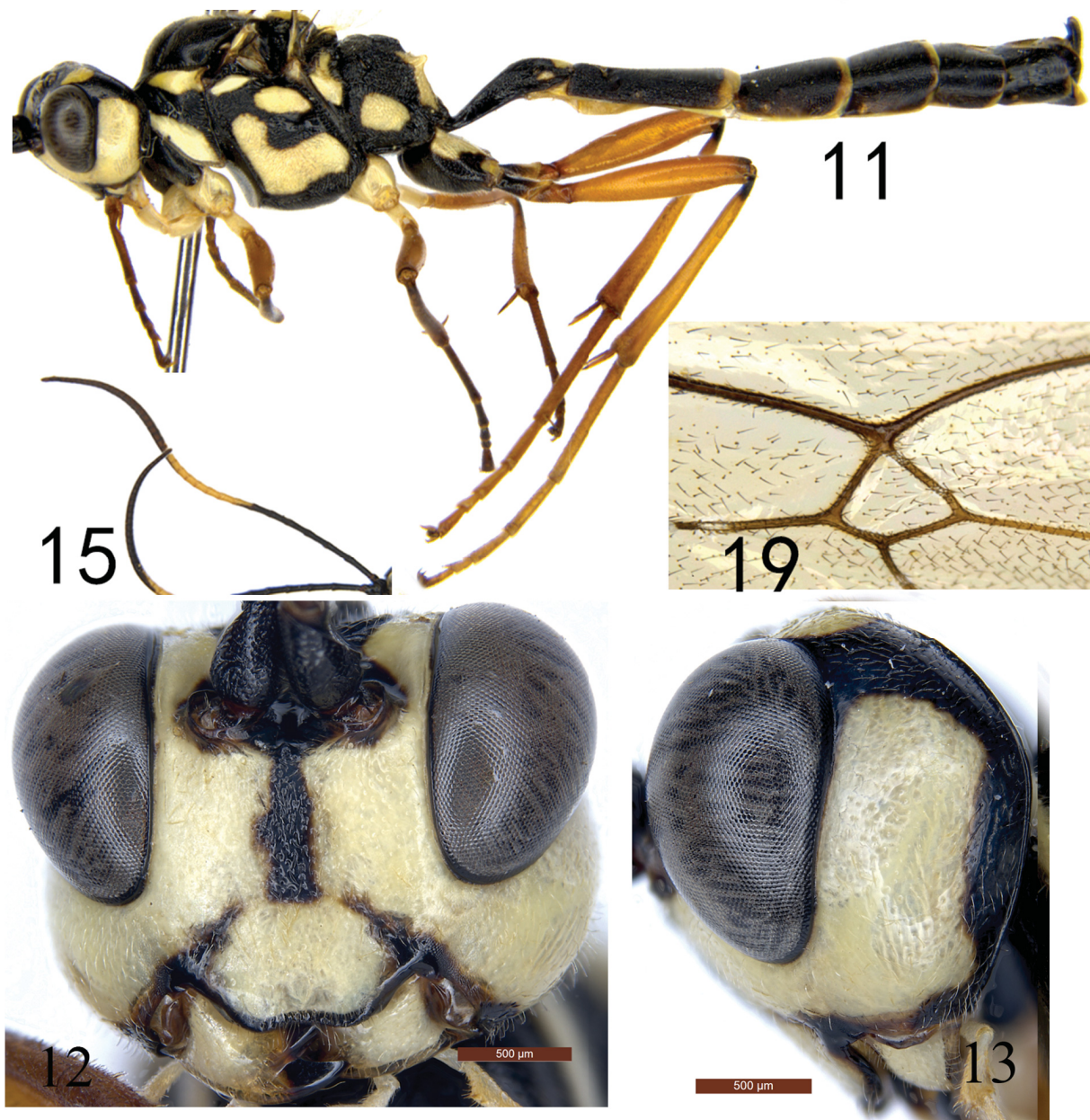
HEAD. Face (Fig. 12) approximately 1.3× as wide as long, evenly convex; with indistinct fine punctures, median portion with irregular, elongate punctures; median portion of upper margin between antennal sockets finely carinate, with a small median tubercle. Clypeal suture shallow, median section indistinct. Clypeus 2.1× as wide as long, basal portion with sculpture as face, apical portion smooth; lateral portion of apical margin oblique straight, median portion slightly evenly concave. Subbase of mandible slightly convex, upper tooth almost as long as lower tooth. Subocular sulcus absent. Malar space approximately 0.6× as long as basal width of mandible. Gena (Fig. 13) widened, evenly convex, smooth, shiny, with sparse, indistinct punctures. Vertex (Fig. 14) shiny, with sparse shallow punctures. Interocellar area with indistinct longitudinal wrinkles, impunctate. Postocellar line approximately 0.5× as long as ocular-ocellar line. Frons with strong transverse wrinkles; lateral and lower portions almost smooth, shiny. Antenna (Fig. 15) with 39 flagellomeres, apical portion distinctly flattened below. Ratios of lengths from first to fifth flagellomeres: 11.5:8.9:8.7:8.5:6.5. Occipital carina complete, lower end reaching base of mandible.

MESOSOMA. Upper portion of pronotum (Fig. 16) with distinct longitudinal wrinkles; latero-posteriorly with dense oblique longitudinal wrinkles; dorso-posteriorly with fine punctures. Mesoscutum (Fig. 17) strongly convex, with irregular punctures; posterior submedian portion smooth. Notaulus anteriorly distinct. Scuto-scutellar groove deep, smooth, shiny. Scutellum shiny, with weak, uneven, fine punctures; lateral carina strong, almost reaching apex of scutellum. Postscutellum transverse, shiny, with indistinct fine punctures; anterior lateral portion deeply concave. Upper anterior and median portions of mesopleuron (Fig. 18) with transverse wrinkles; upper median with indistinct punctures; lower portion slightly shagreened, irregularly finely reticulate. Speculum small. Upper end of epicnemial carina reaching about 0.4 height of posterior margin of pronotum. Metapleuron convex, with dense, ill-defined punctures; anterior margin with short transverse wrinkles. Juxtacoxal carina absent. Juxtacoxal area shiny, with oblique wrinkles dorsally, ventrally with sparse fine punctures. Submetapleural carina complete, strong. Wings brownish hyaline. Fore wing with vein 1cu-a opposite 1-M. Areolet (Fig. 19) quadrangular, receiving vein 2m-cu at anterior 0.35. 2-cu slightly longer than 2cu-a. Hind wing vein 1-cu about 4.0× as long as cu-a; 1-cu reclivous. First tarsomere of hind leg 0.85× as long as second to fifth tarsomeres together except claws. Ratio of length of hind tarsomeres 1:2:3:4:5 is 8.5:3.4:2.7:1.2:2.1. Tarsal claws simple. Propodeum (Fig. 20) irregularly reticulate. Area superomedia almost complete, connecting costula at its anterior 0.35. Lateral longitudinal carina vestigial. Pleural carina complete, strong. Apical transverse carina absent. Propodeal crest strong. Maximum diameter of propodeal spiracle approximately 2.0× as long as minimum diameter.

METASOMA (Figs 21–22). First tergite 3.1 to 3.6× as long as apical width; median dorsal carina absent; dorsolateral carina weak, almost reaching to spiracle; petiole slightly shagreened; postpetiole with longitudinal wrinkles. Lateral sides of tergites 2 to 6 almost parallel. Second tergite coriaceous, with indistinct punctures, 1.5× as long as maximum width; thyridia approximately 1.4× as wide as distance between them, 0.9× as wide as distance to base of second tergite; spiracle located approximately at basal 0.4. Third tergite with same sculpture as second tergite; apically with distinct fine punctures; 0.9× as long as maximum width. Tergites 4 to 6 (Fig. 22) almost shiny. Tergite 4 with sparse, distinct

punctures. Tergites 5 and 6 with large apical median membranous areas. Ovipositor sheath  $0.7\times$  as long as apical depth of metasoma, slightly widened apically. Ovipositor slightly curved upwards, upper and lower valves with distinct ridges.

COLOR (Fig. 11). Black, except following: face except median longitudinal black band, clypeus except black apical margin and black brown along clypeal suture, maxillary and labial palpi, malar area, gena, frons laterally, pronotum anteriorly, tegula, subalar ridge, large upper-median and lower spots of mesopleuron, large median spot of metapleuron, large posterolateral spots of propodeum, anterior and middle coxae and trochanters, dorsal profile of hind coxa, dorsal spot of hind trochanter, small lateral and posterior median spots of postpetiole, white or slightly yellowish white. Flagellomeres



**Figs 11–13, 15, 19.** *Notosemus planus* Sheng & Sun, sp. nov., holotype, ♀. 11. Habitus, lateral view. 12. Head, anterior view. 13. Head, lateral view. 15. Antennae. 19. Areolet.





**Figs 14, 16–18, 20–22.** *Notosemus planus* Sheng & Sun, sp. nov., holotype, ♀. **14.** Head, dorsal view. **16.** Pronotum. **17.** Mesoscutum. **18.** Mesosoma, lateral view. **20.** Propodeum. **21.** Metasoma, dorsal view. **22.** Apical portion of metasoma, lateral view.

7 to 15 dorsally yellow-white; apically, ventrally reddish brown. Lateral spots of vertex, pronotum dorso-posteriorly, posterior margins of tergites 2 to 4 yellowish white. Submedian triangular spots of mesoscutum, scutellum, postscutellum yellow. Fore and mid femora and tibiae ventrally, hind femur, hind tibia except base, hind tarsus yellow brown. Fore and mid tibiae dorsally, fore and mid tarsi dark brown. Membranous areas of tergites 5 and 6 yellow. Median area of pterostigma red-brown. Veins brown black.

#### **Male**

Unknown.

#### **Remarks**

This new species can easily be distinguished from *Notosemus* species by the apically, ventrally flattened antenna (although this is probably not the case for the unknown male), and can be distinguished by the identification key here.

#### *Notosemus bohemani* (Wesmael, 1855)

Fig. 23

*Phaeogenes bohemani* Wesmael, 1855: 429.

#### **Diagnosis**

Propodeum without crest; propodeal spiracle approximately 1.4× as long as wide; first tarsomere of hind leg approximately 0.8× as long as second to fifth tarsomeres together; mesoscutum reddish brown; mesopleuron, except upper margin black, reddish brown; Propodeum entirely black. Hind coxa brown to reddish yellow; hind tarsomeres brownish black to black.

#### **Specimens examined**

CHINA: 2 ♀♀, 6 ♂♂, Wanghuanan, Liupanshan National Natural Reserve, Ningxia Hui Autonomous Region, 29 Jun.–4 Aug. 1990, leg. De-Jia Li; 2 ♀♀, same data, except 31 Jul.–2 Aug. 1991.

#### **Host**

Pupa of *Zeiraphera griseana* (Hübner, 1789) (Lepidoptera, Tortricidae).

#### **Host foodplant**

*Larix principis-rupprechtii* Mayr.

#### **Distribution**

China, Russia, Latvia, Lithuania, France, Finland, Germany, Czechia, Slovakia, the Netherlands, Norway, Poland, Sweden, United Kingdom.

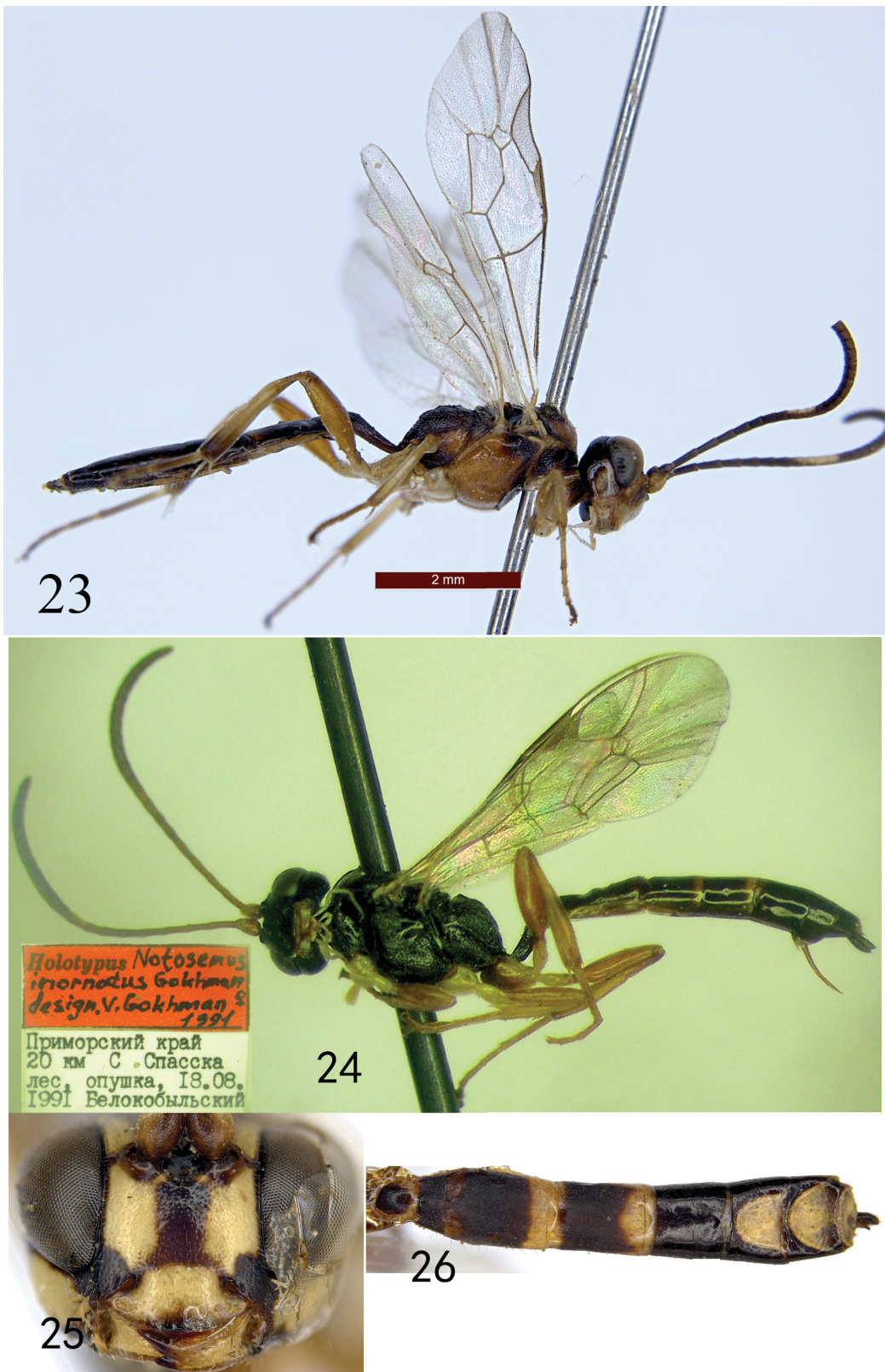
#### *Notosemus inornatus* Gokhman, 1993

Fig. 24

*Notosemus inornatus* Gokhman, 1993: 631.

#### **Diagnosis**

Propodeum without crest. Propodeal spiracle approximately 1.4× as long as wide. First tarsomere of hind leg approximately 0.8× as long as second to fifth tarsomeres together. Mesoscutum reddish brown.



**Figs 23–26.** — 23. *Notosemus bohemani* (Wesmael, 1855), ♀, habitus, lateral view. — 24. *Notosemus inornatus* Gokhman, 1993, holotype, ♀, habitus, lateral view. — 25–26. *Notosemus variegatus* (Tosquinet, 1903), holotype, ♀. 25. Head, anterior view. 26. Metasoma, dorsal view.

Mesopleuron, except upper margin, black to reddish brown. Propodeum entirely black. Hind coxa reddish yellow. Hind tarsomeres brownish black to black.

#### Material examined

##### Holotype

RUSSIA: ♀, Primor'ye Kray, 18 Aug. 1991, leg. Belokobylskij (ZIR).

#### Distribution

Russia.

#### *Notosemus polyambonios* Kusigemati, 1986

*Notosemus polyambonios* Kusigemati, 1986: 30.

#### Diagnosis

Lateral carinae of scutellum extending near apex. Juxtacoxal carina anteriorly distinct. Juxtacoxal area polished, almost impunctate. Propodeal spiracle approximately 2.7× as long as wide. First tarsomere of hind leg 1.0× as long as second to fifth tarsomeres together. Second tergite 1.8× as long as apical width. Posteromedian portions of tergites 6 to 7 largely membranous. A pair of submedian triangular spots of mesoscutum, scutellum except lateral and apical margins dark brown. Lower corner of mesopleuron, a large spot of metapleuron whitish yellow. Propodeum black with whitish yellow large markings on third lateral area. Hind coxa mainly black, hind tarsomeres 2–4 whitish yellow.

#### Distribution

China: Taiwan.

#### *Notosemus variegatus* (Tosquinet, 1903)

Figs 25–26

*Aethecerus variegatus* Tosquinet, 1903: 282.

#### Diagnosis

Apical margin of clypeus evenly convex, with evident notch. Subocular sulcus absent. Postocellar line approximately 1.7× as long as ocular-ocellar line. Frons with a median longitudinal groove. Epomia absent. Mesoscutum with dense fine punctures. Upper end of epicnemial carina reaching subalar prominence. Juxtacoxal carina almost complete. Areolet pentagonal, receiving vein 2m-cu slightly distal of its middle. Hind wing vein 1-cu about 3.0× as long as cu-a. Maximum diameter of propodeal spiracle approximately 1.9× as long as minimum diameter. Second tergite with dense fine punctures, 2.1× as long as maximum width. Tergites 5 and 6 with large apical median membranous areas. Face buff, with wide median longitudinal black-brown band. Apical wide transverse bands of tergites 2 and 3 buff. Hind tarsus dark brown.

#### Specimen examined

##### Holotype

INDONESIA: ♀, Java orient., Mantes Tengger, 1890, leg. H. Fruhstorfer (IRSNB).

#### Distribution

Indonesia.

*Notosemus wugongicus* Sheng & Sun, sp. nov.

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Figs 27–34

**Diagnosis**

Antenna with 34 flagellomeres, beyond middle slightly widened; apically cylindrical. Subocular sulcus absent. Second tergite (Fig. 33) slightly shagreened, with unclear granulose sculpture, approximately 1.7× as long as apical width. Propodeal spiracle oval, 2.1× as long as wide. Metapleuron black, with large median white spot. Hind second to fourth tarsomeres white.

**Etymology**

The specific name is derived from the type locality.

**Material examined**

**Holotype**

CHINA: ♀, Wugongshan, 1350 m, Pingxiang, Jiangxi Province, 10 Jul. 2015, collected by IT.

**Paratypes**

CHINA: 1 ♂, same data as holotype, except 3 Jul. 2015; 1 ♂, same data as holotype, except 7 Oct. 2015; 1 ♀, same data as holotype, except Nov. 2015.

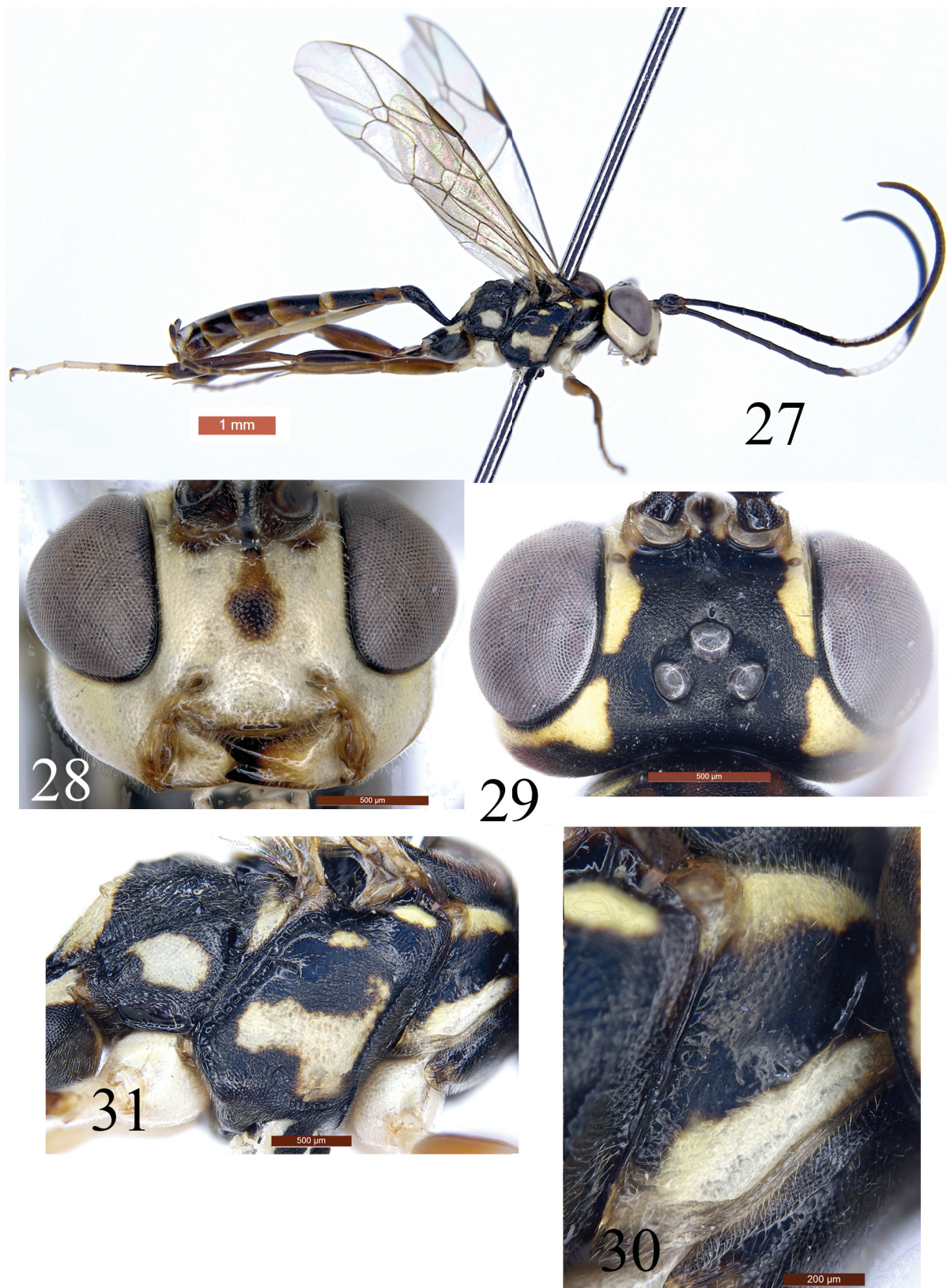
**Description**

**Female**

MEASUREMENTS. Body length approximately 9.8 mm. Fore wing length approximately 7.8 mm.

HEAD. Face (Fig. 28) almost shiny, approximately 1.4× as wide as long, evenly convex, with dense fine punctures; upper margin with even median concavity. Clypeal suture vestigial. Clypeus approximately 2.4× as wide as long, with sculpture as face but punctures relatively sparser; apical margin convex, median 0.25 thick. Upper and lower margins of mandible almost parallel, basally with dense fine punctures, apically with sparse indistinct punctures; upper tooth approximately 1.5× as long as lower tooth. Subocular sulcus absent. Malar space 0.7× as long as basal width of mandible. Gena evenly longitudinally convex, shiny, with sparse, indistinct fine punctures. Vertex (Fig. 29) slightly shagreened. Interocellar area convex, postocellar line approximately 1.6× as long as ocular-ocellar line. Frons almost flat, upper portion with sculpture as vertex, lower median portion smooth, concave. Antenna with 34 flagellomeres, slightly widened beyond middle, apically cylindrical. Ratios of lengths from first to fifth flagellomeres: 9.5:7.4:6.7:6.3:5.7. Occipital carina thin, complete, lower end reaching base of mandible.

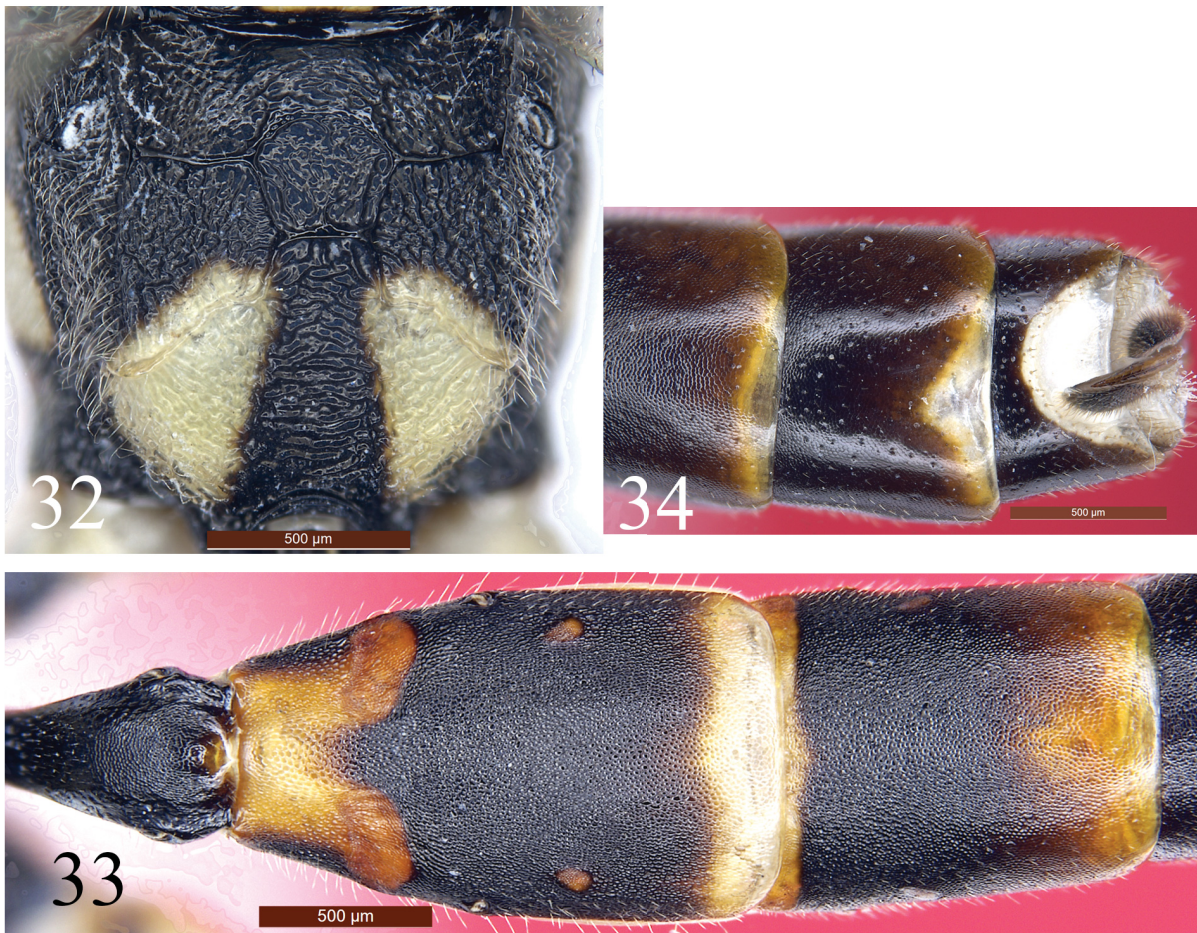
MESOSOMA. Pronotum (Fig. 30) almost smooth, with indistinct fine punctures dorso-posteriorly. Epomia distinct. Mesoscutum convex, shagreened. Notaulus distinct, reaching to line between anterior margins of tegulae. Scutoscutellar groove smooth. Scutellum almost flat, with weak fine punctures; lateral carina approximately 0.7× length of scutellum. Postscutellum almost shiny, evenly transversely convex; anterior margin shallowly concave. Mesopleuron (Fig. 31) slightly shagreened; medially with fine transverse wrinkles; antero-dorsally, beneath subalar prominence, with fine oblique longitudinal wrinkles. Speculum with distinct fine punctures. Upper end of epicnemial carina reaching about 0.5 height of posterior margin of pronotum, distant from front margin of mesopleuron. Metapleuron shagreened, with indistinct, irregular short wrinkles; juxtacoxal carina anteriorly present; juxtacoxal area smooth, shiny. Submetapleural carina complete, strong. Wings slightly brownish, hyaline. Fore wing with vein 1cu-a opposite 1-M. Areolet pentagonal, receiving vein 2m-cu at its middle. 2-cu as long as 2cu-a. Hind wing vein 1-cu about 5.5× as long as cu-a. Ratio of length of hind tarsomeres 1:2:3:4:5 is 8.5:3.4:2.7:1.2:2.1.



**Figs 27–31.** *Notosemus wugongicus* Sheng & Sun, sp. nov., holotype, ♀. 27. Habitus, lateral view. 28. Head, anterior view. 29. Head, dorsal view. 30. Pronotum. 31. Mesosoma, lateral view.

Claw simple. Area superomedia, basal and apical transverse, lateral longitudinal and pleural carinae of propodeum (Fig. 32) complete. Area externa with indistinct fine punctures. Area superomedia, area dentipara with irregular wrinkles. Area posteroexterna with oblique longitudinal wrinkles. Area lateralis with oblique transverse wrinkles. Area petiolaris with dense transverse wrinkles. Propodeal spiracle elliptical, maximum diameter approximately  $2.1\times$  as long as minimum diameter, connected to pleural carina by carina.

METASOMA. First tergite approximately  $3.1\times$  as long as apical width; median dorsal, dorsolateral and ventrolateral carinae absent; petiole with dense fine punctures; postpetiole shagreened, hind margin smooth, sides convergent posteriorly. Tergites 2 to 4 almost parallel-sided. Tergites 2, 3 (Fig. 33) shagreened. Tergite 2 approximately  $1.7\times$  as long as apical width; thyridia approximately  $1.8\times$  as wide as distance between thyridia, about as wide as distance to base of second tergite; spiracle located at basal 0.45. Tergite 3 approximately  $1.3\times$  as long as maximum width. Tergite 4 with sculpture as tergite 3, posteriorly with more or less distinct fine punctures,  $0.9\times$  as long as maximum width. Tergite 5 (Fig. 34) almost shiny, slightly shagreened, with sparse, fine punctures, apical margin with small median membranous area. Tergite 6 slightly shagreened and sparsely punctate, with large apical median membranous area. Ovipositor sheath approximately as long as apical depth of metasoma, slightly widened apically. Ovipositor curved upwards, upper valve with transverse ridges; lower valves with oblique longitudinal ridges.



**Figs 32–34.** *Notosemus wugongicus* Sheng & Sun, sp. nov., holotype, ♀. **32.** Propodeum. **33.** Tergites 1–3, dorsal view. **34.** Apical portion of metasoma, dorsal view.

COLOR (Fig. 27). Black, except following: flagellomeres 8–14 dorsally, hind tarsomere 1 apically, 2–4, and tarsomere 5 basally white. Following yellowish white: face, except small median brown black spot, clypeus, except smooth brown apical margin, mandible, except apical teeth, malar area, gena, except dorso-posteriorly, lateral wide longitudinal band of frons, anterior margin and upper posterior portion of pronotum, small submedian spot of mesoscutum, subalar ridge, large irregular transverse band ventrally on mesopleuron, upper division of metapleuron, large median spot of metapleuron, scutellum, postscutellum, area posteroexterna of propodeum, fore and mid coxae and trochanters, hind coxa dorsally, basally, dorsal spot of hind first trochanter, basal median spot and apical transverse band of tergite 2. Fore and mid legs ventrally, except mentioned above, light brown, dorsally blurry dark brown. Hind trochantellus, hind femur basally and ventrally, hind tibia ventrally on basal half red brown. Hind tibia brown-black basally, dorsally. Thyridia, tergite 3 posteriorly and subsequent tergites more or less dark brown. Pterostigma brown. Veins brown-black.

#### Male

Body length approximately 9.0 mm. Fore wing length approximately 6.5 mm. Antenna with 30 flagellomeres. Fore wing with vein 1cu-a slightly basal to 1-M. Face entirely, mesopleuron except upper margin, mesosternum yellowish white. Propodeum almost entirely dark brown. Hind tarsus brown-black.

#### Remarks

This new species is similar to *N. polyambonios* Kusigemati, 1986 and *N. albimaculatus* Sheng & Sun sp. nov., but can easily be distinguished from *N. polyambonios* by tergite 5 (Fig. 34) slightly shagreened, with sparse, fine punctures, apical margin with very small median membranous area; tergite 5 of *N. polyambonios* smooth, with very large median membranous area. This new species can be distinguished from *N. albimaculatus* sp. nov. by the following combination of characters: tergites 2 (Fig. 33) approximately 1.7× as long as apical width; metapleuron with large median white spot; apical margin of tergite 5 with very small median membranous area; hind tarsomere 1 apically, 2–4, and tarsomere 5 basally white. *N. albimaculatus* sp. nov.: tergite 2 (Fig. 8) approximately 2.1× as long as maximum width; Metapleuron entirely blackish brown; hind tarsus brown.

#### Key to species of *Notosemus* Förster, 1869

1. Head and mesosoma entirely black. Face with dense punctures. Clypeus smooth, with distinct, but very sparse punctures. Speculum large, smooth. Interocellar area with distinct, dense punctures. Ovipositor evenly upcurved. (Palearctic Region) ..... *N. inornatus* Gokhman, 1993  
– Head and mesosoma with extensive red, yellow or white spots. Other characters not as above ..... 2
2. Mesopleuron, mesosternum and propodeum red. Clypeus with dense punctures. Maxillary and labial palpi black. Hind tibia black, basally red. (Oriental Region) ..... *N. rufomaculatus* (Cameron, 1903)  
– Mesopleuron and mesosternum black, brownish yellow, or with white spots. Propodeum black, or with white spots. Other characters not as above ..... 3
3. Propodeum entirely black, without crest. Mesosternum entirely redish or yellowish brown. Hind tarsomeres brownish black to black. (Palearctic Region) ..... *N. bohemani* (Wesmael, 1855)  
– Propodeum with large lateral whitish yellow spot, with crest. Mesosternum entirely black. Hind tarsomeres 2–4 white, whitish yellow or brown ..... 4
4. Propodeal spiracle elongate, 2.7× as long as wide. Tergite 5 with large apical median membranous area. Hind tarsomeres 2–4 whitish yellow. (Oriental Region) .....  
..... *N. polyambonios* Kusigemati, 1986



- Propodeal spiracle oval, 1.6–2.1× as long as wide. Hind tarsomeres brown, if medially white, tergite 5 with very narrow and weak apical median membranous area .....5
- 5. Upper tooth of mandible almost as long as lower tooth. Antenna with 39 flagellomeres, apically distinctly flattened below. Juxtacoxal carina absent. Areolet quadrate. (Oriental Region) .....*N. planus* Sheng & Sun, sp. nov.
- Upper tooth of mandible distinctly longer than lower tooth. Antenna at most with 34 flagellomeres, apically cylindrical. Juxtacoxal carina distinct. Areolet pentagonal .....6
- 6. Frons with dense fine punctures, without median longitudinal groove. Face yellowish white, with a small median brown spot. Mesoscutum with two median yellow or reddish brown spots. Metapleuron mostly reddish brown or with large white spot. Tergite 2 black, basally and apically yellowish white .....7
- Frons with very fine, indistinct punctures and distinct median longitudinal groove. Median longitudinal band of face black. Mesoscutum and metapleuron entirely black. Tergite 2 black, apical 0.2 yellowish white. (Oriental Region) .....*N. variegatus* (Tosquinet, 1903)
- 7. Area superomedia absent or posteriorly open. Tergite 5 with large apical median membranous area. Metapleuron mostly reddish brown. Hind tarsus brown. (Oriental Region) .....*N. albimaculatus* Sheng & Sun, sp. nov.
- Area superomedia complete. Posterior margin of tergite 5 with indistinct apical median transverse membranous area. Metapleuron black with large median white spot (male metapleuron black-brown). Hind tarsomeres 2–4 white. (Oriental Region) .....*N. wugongicus* Sheng & Sun, sp. nov.

## Discussion

The holotype of *Notosemus variegatus* (Tosquinet, 1903) (Fig. 26), a female specimen deposited in IRSNB, was checked. In his description, Tosquinet (1903) recorded it as a male.

The new species, *N. planus* Sheng & Sun, sp. nov., agrees for the larger part with the definition of *Notosemus* as defined by previous authors (Förster 1869; Kusigemati 1986; Townes *et al.* 1961), except that the areolet is pointed above and the antennal flagellum is apically, ventrally flattened, and proved very difficult to place in any genus. The first two authors and Tao Li, the members of our research group, have explored Xizang, Xinjiang, Jiangxi, Guangdong, Anhui, Guangxi, Guizhou, etc., in the Oriental part of China, for years, and only the specimen of *N. planus* Sheng & Sun sp. nov. was collected. It can easily be distinguished from other species of the genus by the unusual characters of the areolet and antennal flagellum.

In China, species of *Notosemus* may be found only at high altitudes, above 1000 m. All specimens, collected in Wugongshan, Jiangxi Province, were gathered by means of yellow intercept traps, which indicates that perhaps *Notosemus* may be attracted by the color yellow.

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