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ORIGINAL ARTICLE

Taxonomic review of East Palearctic species of *Synergus* section I, with description of a new species from China (Hymenoptera: Cynipidae: Cynipinae)

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Abstract A taxonomic review is provided for the Section I of the inquiline gallwasp genus *Synergus*, including the description of a new species from China, *S. deqingensis* Pujade-Villar, Wang & Chen **sp. nov.** and redescription of all previously known species of the section from the that region. *Synergus jezoensis* Uchida & Sakagami, 1948, a species previously considered of uncertain status from Japan, is treated herein as a valid species, and is redescribed and reported for the first time from China. *Andricus mukaigawae* (Mukaigawa, 1913) and its inquiline, *S. japonicus*, are reported for the first time from China. A key is provided to all four East Palearctic species in Section I of *Synergus*.

Key words Cynipidae, inquiline, *Synergus*, taxonomy, China.

1 Introduction

The genus *Synergus* Hartig, 1840 is a member of the tribe Synergini in the gall wasp family Cynipidae (Hymenoptera: Cynipoidea), and species of this genus do not induce plant galls but living as inquilines in the galls. Recently, the supposed inquiline nature of all Synergini has been contradicted by the recent work on three species: *Synergus itoensis* Abe, Ide & Wachi (Abe *et al.*, 2011); *Saphonecrus hupingshanensis* Liu, Yang & Zhu (because of rearing of the galls in two consecutive years did not yield any other cynipid wasp as potential host) (Liu *et al.*, 2012); and a new species unpublished (probably also gall inducer) (Bernardo *et al.*, in press). The genus *Synergus* was subdivided into two sections (Mayr, 1872). The species of Section I have a more or less broad band of punctures posteriorly on the fused metasomal tergites 2+3, and the species of Section II have only a small dorso-posterior patch of punctures on the fused metasomal tergites 2+3 or lack such punctures completely. This division is apparently artificial, and it does not reflect the phylogenetic relationship in the genus because of considering the extent of patch of micropunctures on the syntergite "relatively labile evolutionarily". Consequently, it was suggested that Mayr's division should be abandoned altogether (Ács *et al.*, 2010). Nonetheless, the classification is useful for the taxonomy of species in the genus (Pénzes *et al.*, 2012).

A total of 109 species of *Synergus* is known from Holarctic and Neotropical Regions (Pénzes *et al.*, 2012), of which 40 species are from the Palaearctic, including 30 from the West Palearctic (Pujade-Villar *et al.*, 2003; Sadeghi *et al.*, 2006) and 10 from the East Palearctic (*A. atamiensis* Ashmead, 1904; *S. chinensis* Melika, Ács & Bechold, 2004; *S. gifuensis*

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Ashmead, 1904; *S. hakonensis* Ashmead, 1904; *S. itoensis* Abe, Ide & Wachi, 2011; *S. iwatensis* Shinji, 1941; *S. japonicus* Walker, 1874; *S. jezoensis* Uchida & Sakagami, 1948; *S. mizunarae* Shinji, 1840; *S. xialongmeni* Melika, Ács & Bechold, 2004). Three East Palearctic species (*S. gifuensis*, *S. japonicus* and *S. jezoensis*), which belong to section I, were all from Japan.

In this paper, we provide a taxonomic review of the known species of this section in the East Palearctic, including the description of a new species from China and a redescription of all three previously known species from the area. *S. jezoensis*, which is indicated the uncertainty of status (Abe *et al.*, 2007), is also reported from China for the first time. Finally, a key of all four East Palearctic species in Section I of *Synergus* is provided.

2 Materials and methods

All the specimens from China used in this study are from the Hymenoptera Collection, Zhejiang University, Hangzhou, China (ZJU). The Chinese material was collected using sweeting net in field. Types of all species in this study were examined, including the type material of *S. jezoensis* Uchida & Sakagami, deposited in the Entomological Institute of Hokkaido University (EIHU, Sapporo, Japan) (Now named the Systematic Entomology of Hokkaido University (SEHU) of the Hokkaido University Museum or Graduate School of Agriculture (HU)), the type of *S. gifuensis* Ashmead, deposited in the National Museum of Natural History, Smithsonian Institution (USNM, Washington DC, USA), and the type of *S. japonicus* Walker, deposited in the Natural History Museum (NHM, London, UK). Additional materials examined in this study were sent to authors by Dr. Abe from Kyushu University, Japan (KU) and Dr. Buffington from USNM.

Terminology of cynipid gallwasp morphology follows Liljeblad and Ronquist (1998) and Melika (2006). Abbreviations for the forewing venation follows Ronquist and Nordlander (1989) and cuticular surface terminology followed Harris (1979). Measurements and abbreviations used here include: F1–F12, first and subsequent flagellomeres; post-ocellar distance (POL) is the distance between the inner margins of the posterior ocelli; ocellar–ocular distance (OOL) is the distance from the outer edge of the posterior ocellus to the inner margin of the compound eye; LOL, the distance between lateral and frontal ocelli. The width of the forewing radial cell was measured from the margin of the wing to the vein Rs.

Descriptions and measurements were made under a Leica MZ 12.5 stereomicroscope (Wetzlar, Germany), and photos were taken by a digital camera (Q-Imaging, Micropublisher 3.3 RTV) attached to a Leica MZ APO stereomicroscope (Wetzlar, Germany) using Synoptics Auto-Montage version 5.0 software.

The type specimens described here are deposited in the Hymenoptera Collection of ZAFU and Collection of Dr. J. Pujade-Villar, University of Barcelona (UB).

3 Taxonomy

Key to species of *Synergus* Section I from East Palearctic

1. Frontal carinae absent (Fig. 2); F1 in females weakly curved medially and slightly expanded apically (Fig. 4). Male with F1 expanded distally and apically and 3.0 times as long as pedicellum (Fig. 6) ..... ***S. deqingensis* sp. nov.**
   Frontal carinae present (Figs 8–9, 12–13); F1 in females cylindrical (Figs 18–19, 23). Male with F1 expanded only distally, and if it expanded both distally and apically, then F1 always less than 3.0 times the length of pedicellum (Figs 16–17, 23, 28) 2
2. Hypopygium of female large (Fig. 26); F1 of males not expanded basally (Fig. 28); F1 of females about three times as long as pedicelum and F2 slightly incised medially (Fig. 23); fused metasomal tergites 2+3 without setae ..... ***S. jezoensis***
   Hypopygium of female small (Figs 11–15); F1 of males expanded apically and basally (Figs 16–17); F1 of females about twice as long as pedicelum and F3 cylindrical (Figs 18–19); fused metasomal tergites 2+3 with a patch of setae antero-laterally (Figs 11–15) 3
3. Head oval in front view (Fig. 20); lower face with a strong median carina raised above striae in lateral view. Pedicellum longer than wide (Figs 27, 29); median mesoscutal impression short, reaching only to the middle of the scutum and sometimes abruptly broadened posteriorly (Fig. 10); scutelar foveae rugose (Fig. 10); fused metasomal tergites 2–3 of females somewhat incised apically (Fig. 11) ..... ***S. gifuensis***

Head triangular in front view (Fig. 13); lower face with a relatively weak median carina not raised above striae in lateral view; pedicellum as long as wide (Figs 17, 19). median mesoscutal impression almost percurrent (Fig. 14); scutellar foveae alutaceous (Fig. 14); fused metasomal tergites 2-3 of females conspicuously incised apically (Fig. 15) ..... ***S. japonicus***

***Synergus deqingensis* sp. nov.** (Figs 1–7)

Holotype ♀, China, Fatou, Deqing, Zhejiang, 27 May 1995, leg. Jun-Hua He, designated by Yi-Ping Wang, deposited in ZJU. Paratypes: 6♀, 3♂, same data as holotype, leg. Xue-Xin Chen & Jun-Hua He, 2♂ and 5♀ deposited in ZJU, 1♂ and 1♀ deposited in UB.

Diagnosis. This species differs from all other '*Synergus* species of section I in the lack of frontal carinae. The species can be further separated from all other Eastern Palearctic species of the section using the above key.

Description. Length. Female 2.2 mm, male1.8 mm.

Color. Female (Fig. 7): head blackish brown or black, except mandible yellow basally and dark brown distally; antenna uniformly dark yellow; mesosoma black except tegula dark reddish; coxa of legs blackish brown, trochanters reddish brown, and femur dark yellow basally and pale yellow apically; metasoma dark red basally and blackish red apically; wing hyaline, with distinct yellowish veins. Male: head pale yellow except vertex and frons dark brown, legs yellow, metasoma dark red, mesoscutum blackish brown or black and mesopleuron brown.

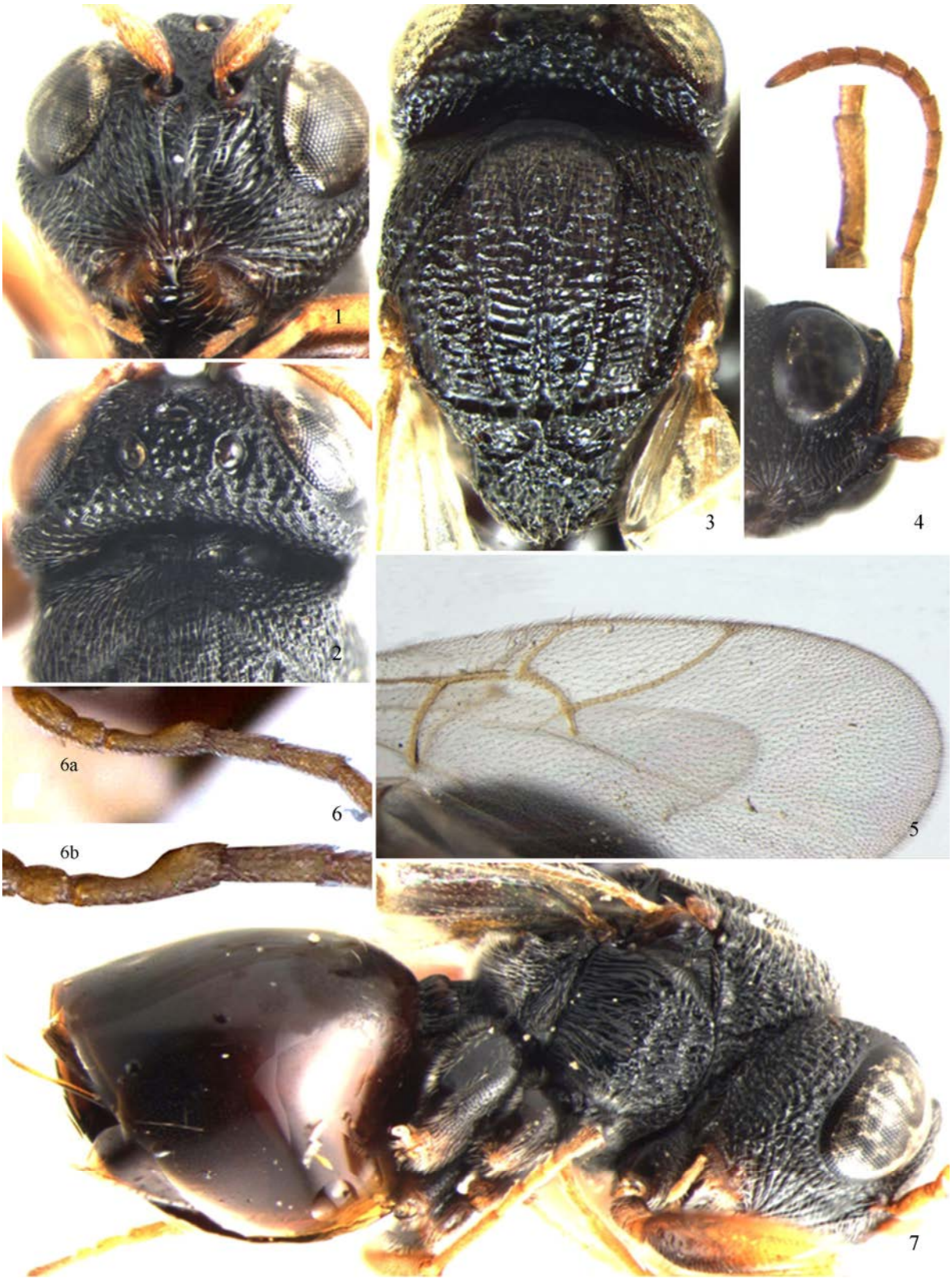
Head (Figs 1–2). Head strongly punctuate with interspaces coriaceous, 1.3 times as wide as high in front view, with dense setae, 2.3 times as wide as long medially in dorsal view, and as wide as mesoscutum. Gena strongly punctuate with interspaces coriaceous, slightly expanded behind eye, visible in front view, narrower than cross diameter of eye. Malar space finely coriaceous, with densely delicate striate radiating from clypeus, 0.7 times as long as height of eye. POL: LOL: OOL=7: 5: 4. Transfacial distance 1.3 times as long as the maximum height of eye; diameter of antennal torulus 1.3 times as long as distance between them, distance between torulus and eye margin as long as diameter of torulus. Inner margins of eyes parallel. Face finely coriaceous, with dense striate radiating from clypeus, reaching antennal toruli and eyes, median area narrow with two blunt longitudinal carinae. Clypeus with striae; anterior tentorial pits small but distinct; epistomal sulcus and clypeo-pleurostomal line indistinct, ventral margin of clypeus almost straight, not medially incised. Frons, vertex and occiput strongly punctuate with interspaces coriaceous, lateral frontal carinae and medial carina absent.

Antenna. Female (Fig. 4). Antennae 14-segmented, slightly longer than head plus mesosoma; pedicel subquadrangular, 1.3 times as long as wide; F1 2.6 times as long as pedicel, and 1.4 times as long as F2, weakly curved medially and slightly expanded apically; relative lengths of antennal segments from scape to F12, 10: 5: 13: 9: 8: 8: 7: 6: 6: 6: 5: 5: 5: 9. Male (Fig. 6). Antenna incomplete, with only 6 segments remaining; first flagellomere 3.0 times as long as pedicel, 1.5 times as long as second flagellomere; antennal formula 18: 10: 30: 19: 18: 18.

Mesosoma (Figs 3, 7). Mesosoma weakly convex, 1.25 times as long as maximum height in lateral view, with dense setae. Pronotum finely coriaceous and setose; setae longer and denser laterally. Mesoscutum rugose and setose, slightly longer than wide in dorsal view, with interrupted transverse carinae. Notauli complete, well-impressed along entire length, weakly convergent posteriorly; median mesoscutal line long, extending to 1/2 - 3/5 of the entire length of mesoscutum; parapsidal lines distinctly impressed and extending to 3/4 of entire length of mesoscutum; antero-median parallel lines distinct and extending to 1/4 of entire length of mesoscutum. Transscutal articulation deep and narrow. Scutellum trapezoid, rounded and slightly broadened posteriorly, finely rugose, with dense long setae postero-laterally. Scutellar foveae deeply impressed and shinning smooth. Mesopleuron including specullum with distinct longitudinal striation, shinning; acetabular carina delimiting a very narrow setose area laterally; mesopleural triangle densely setose. Metapleural sulcus reaching mesopleuron at 4/5 of its height in lateral view. Subaxillular bar as high as metanotal trough. Lateral propodeal carinae distinct, parallel and slightly divergent anteriorly. Median propodeal areas rugose and densely setose. Nucha short and sulcate laterally. Hind tarsal claw with small basal lobe and tooth.

Wing (Fig. 5). Fore wing longer than body, margin with short cilia; radial cell of fore wing 2.3 times as long as maximum width, veins Rs and R1 reaching wing margin and radial cell closed; areolet distinct and large; vein Rs+M indistinct but visible, reaching basalis at about the middle.

Metasoma (Fig. 7). Metasoma slightly longer than head plus mesosoma, 1.5 times as long as height in lateral view; fused tergite 2+3 with sparse pale setae antero-laterally, posterior patch of micropunctures covering 1/3 of its entire length, slightly short of reaching the ventral margin of syntergite; posterior margin of syntergite hardly incised dorsal-medially; prominent part of ventral spine of hypopygium short.



Figs 1–7. *Synergus deqingensis* **sp. nov.** 1. Head, frontal view. 2. Head, dorsal view. 3. Mesosoma, dorsal view. 4. Antenna of female and detail of F1. 5. Forewings. 6. Part of antenna of male and detail of first flagellomere. 7. Lateral body.

Distribution. China (Zhejiang).

Biology. Unknown.

Etymology. The new species is named after the type locality, Deqing in Zhejiang Province.

***Synergus gifuensis* Ashmead, 1904** (Figs 8–11, 16, 18)

Type material examined. Holotype ♀, deposited in USNM, with following labels: "Y. Nawa, Gifu Japan, det 1902" (white label handwritten), "Type no 7307 USMN" (red label), "*Synergus gifuensis* & Ash." (white label handwritten).

Additional material. 4♂, 6♀, Chohabaru, Oita, Japan), ex. *Andricus kashiwaphilus* galls of the unisexual generation, (26.03.1986) May 1986, leg. Y. Abe; 1♀, Yamanashi, Japan, June 1948, letter "A", USNM 2017203 (*Synergus gifuensis* Ashm., det Weld-84). 1♀, Yamanashi, Japan), June 1949, letter "A", USNM 2017203.

Diagnosis. The species is very similar to *S. hayneanus* in morphology and color, but differs from the latter by a combination of the following features: (1) presence of transverse ridges between lateral carinae of propodeum (absent in *S. hayneanus*); (2) the pilosity of fused segments 2+3 with a patch of hairs, compared to a row of hairs in *S. hayneanus*; (3) extended band of micropunctures of metasomal syntergite incomplete, slightly short of reaching the ventral margin (complete in *S. hayeanus*); (4) the lower face with a strong median carina raised above striae in lateral view; (5) the shape of F1 and the chromatic characteristics of head in males different (details in description below). *S. reinhardi* is the only West Palearctic species with a strong median carina raised above striae in lateral view on lower face, but *S. gifuensis* differs from *S. reinhardi* in: (1) extended band of micropunctures of metasomal syntergite incomplete, slightly short of reaching the ventral margin (complete in *S. reinhardi*); (2) pedicellum longer than broad (globose in *S. reinhardi*); (3) face of males yellowish (black on *S. reinhardi*); (4) radial cell short, 2.3 times as long as wide (longer in *S. reinhardi*, 2.6-2.8 times as long as wide).

Redescription. Length. Female 2.7–3.2 mm (one female 2.3), male 2.5–3.0 mm.

Color. Female. Head black, except a small dark-red area around the mouth and around the compound eyes, which sometimes cover the entire face; mandibles yellow with teeth dark; antennae testaceous; mesosoma black, legs dark; coxae black or dark brown; femora brown to dark brown, tibia and tarsus lighter; wings hyaline, veins clear; metasoma reddish brown to dark brown. Male. Head amberous except dorsal area black; coxae partially amberinus.

Head (Figs 8–9). In frontal view 1.2 times as wide as high, and in dorsal view about twice as wide as long. Face with strong carinae radiating from clypeus and a stronger median carina distinctly elevated than other carinae in lateral view. Malar space 0.7 times the height of compound eye. Transfacial line almost as long as height of compound eye. Torulus diameter slightly greater than distance between margin of torulus and compound eye, and distance between toruli much smaller than diameter of torulus (2: 5). Frons densely punctate; lateral frontal carinae present with some ramifications near lateral ocellus. Vertex and occiput strongly punctate with interspaces coriaceous. POL: LOL: OOL= 6: 3: 3 (in males 8: 4: 3), diameter of ocellus 4 in both sexes. Gena slightly expanded behind eye, punctate with interspaces coriaceous.

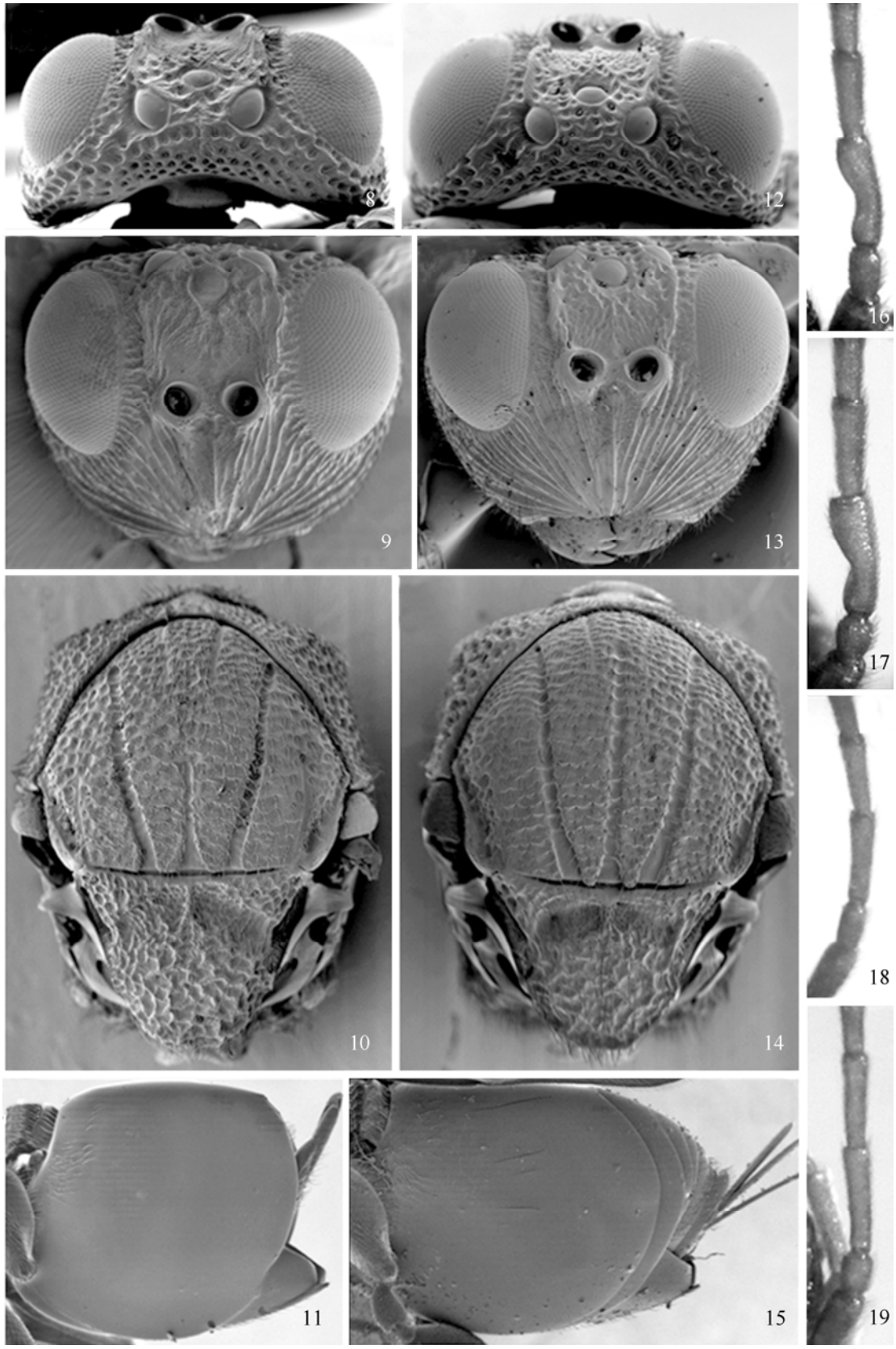
Antenna. Female (Fig. 18). Pedicellum about 2.0 times as long as wide; F1 cylindrical, sligthly broader distally; antennal formula 8: 5: 9: 7: 7: 7: 6: 6: 6: 5: 5: 4: 4: 6. Male (Fig. 16). F1 curved and more expanded distally than basally; antennal formula 7: 5: 11: 9: 8: 8: 7: 7: 6: 6: 5: 5: 5: 5: 5.

Mesosoma (Fig. 10). Subsquare in lateral view. Pronotum with lateral carina, laterally rugose, with some strongly carinae inferiorly. Mesoscutum strongly transversely carinate with interespaces coriaceous. Notauli wide, strongly impressed, percurrent; medial mesoscutum line reaching 1/2 to 3/5 of the length of the mesoscutum. Mesopleuron entirely striate. Scutellum rugose, interspaces coriaceous; scutellar foveae large and oblique, separated by a median carina, pubescent; lateral propodeal carinae straight, delimiting a squared pubescent and coriaceous area, with a median longitudinal carina and a few transverse carinae. Metanotum narrow medially.

Forewings. Pubescents. Radial cell about 2.3 times as long as maximum width. Areolet present; vein Rs curved; vein Rs+M inconspicuous.

Metasoma (Fig. 11). Similar in length to mesosoma. Fused segment 2+3 not incised dorso-distally, with a patch of setae antero-laterally; apical patch of micropunctures extending to 2/5 of its entire length of metasoma, slightly short of reaching the ventral margin of syntergite; subsequent tergites punctured; hypopygium shinning, without setae or punctures. Ventral spine of hypopygium very short.

Distribution. Japan.



Figs 8–19. *Synergus gifuensis* and *S. japonicus*. 8–11, 16, 18. *S. gifuensis*. 12–15, 17, 19. *S. japonicus*. 8, 12. Head, dorsal view. 9, 13. Head, frontal view. 10, 14. Mesosoma, dorsal view. 11, 15. Metasoma, lateral view. 16–17. First and second flagellomeres of male antenna. 18–19. First flagellomere of female antenna.

Biology. Abe (1990) referred to the species as *Synergus japonicus* type B. According to Abe, the species is univoltine and arrhenotokous, and adults emerge from unisexual galls of *Andricus mukaigawae* in early June and females subsequently oviposite in newly formed host galls. Galls of *A. mukaigawai* inhabited by *S. gifuensis* inquilines is larger than the same type of galls inhabited by *S. japonicus*, and the inquiline larval cells are usually separated by a woody wall inside the host gall (Abe, 1990, 1992; Pujade-Villar *et al.*, 2002). In addition, specimens of this species have also been reared from the galls of the unisexual generation of *Andricus kashiwaphilus* (see specimen data above)

***Synergus japonicus* Walker, 1874 New record to China** (Figs 12–15, 17, 19)

Type material examined. Holotype ♀, deposited in NHM, with following labels: "2b2" (white label handwritten), "Japan, Coll. F. Walker. 1913-71" (white label impressed), "Type" (round and white impressed label with red colour in the margin), "*Synergus japonicus*" (white label handwritten), "B. M. Type Hym., 7.109" (white label).

Additional material. 5♂, 5♀, Chohabaru, Oita, Japan, ex. Galls of the unisexual generation of *Andricus kashiwaphilus*, April 1986, leg. Y. Abe. 2♀, Yamanashi, Japan), June 1950, (*Synergus watensis* (Shingi) (= *jezoensis* U + S) det unknown-48), letter "B", USNM 2017203. 1♀, Yamanashi, Japan), June 1950, letter "B", USNM 2017203. 3♀, Boshi, Youxian, Hunan, China, 26 April 1993) April 1993, ex. *Andricus mukaigawae* on *Quercus serrata*, leg. Zhi-Wei Liu.

Diagnosis. The species is very similar to *S. hayneanus* in morphology and color, but differs from the latter by a combination of the following characters: (1) gena slightly expanded laterally; (2) transverse carinae of mesoscutum heavier and more spaced apart; (3) presence of central carinae between lateral carinae of propodeum (absent in *S. hayneanus*); (4) extent of pilosity of fused segments 2+3, with a patch of hair in *S. japonicas* (with a row of hairs in *S. hayneanus*); (5) the extended band of micropunctures of metasomal syntergite incomplete, slightly short of reaching the ventral margin; (6) the shape of F1 and the chromatic characteristics of head in males different (details in description below).

Redescription. Length. Female 2.6–3.8 mm (one specimen 2.3), male 2.2–2.9 mm.

Color. Female. Head black except a small area dark red around the mouth and near the compound eyes; mandibles yellow, the first tooth red and the rest black; antennae testaceous: mesosoma black; legs dark, coxae black or dark brown, femur brown to dark brown, tibia and tarsus lighter; wings hyaline, veins yellowish; metasoma brown or reddish brown. Male. Head basically amberous , dorsally black; coxae I, II and sometimes the coxae III yellowish-brown; veins darker.

Head (Figs 12–13). In frontal view, about 1.3 times as wide as height, and in dorsal view about twice as wide as long. Face with strong carinae radiating from clypeus, median carina not raised. Malar space slightly more than 0.5 times the height of compound eye. Transfacial line only slightly shorter than height of compound eye. Toruli diameter equal to the distance between the margin of torulus and margin the compound eye (sligthly longer in males), and distance between toruli sligtly smaller than its diameter (narrower in males). Frons densely punctate. Frontal carina present. Vertex and occiput strongly punctate with interspaces coriaceous. POL: LOL: OOL= 8: 4: 3 (in males 9: 4: 4), diameter of occelus 4 in proportion (3 in males). Gena slightly expanded behind eye, punctate with interspaces coriaceous.

Antenna. Female (Fig. 19). Pedicellum slightly longer than wide; F1 cylindrical, slightly broader distally; antennal formula 9: 4: 11: 10: 10: 10: 8: 8: 7: 6: 5: 5: 5: 9. Male (Fig. 17). F1 curved and more expanded distally than basally; antennal formula 6: 3: 11: 9: 8: 7: 7: 6: 6: 5: 5: 5: 4: 4: 4.

Mesosoma (Fig. 14). Subsquare in lateral view. Pronotum robust with lateral carina, laterally rugose, and strongly carinate inferiorly. Mesoscutum strongly transversely carinate with interespaces coriaceous (much less obvious and hardly impressed in males). Notauli wide, strongly impressed, percurrent; medial scutum line long, almost percurrent. Mesopleuron entirely longitudinally carinated. Scutellum rugose, interspaces coriaceous; scutellar foveae large and oblique, separated by a incomplete median carina, and coriaceous and pubescent; lateral propodeal carinae straight, delimiting a squared pubescent and coriaceous area, with a median longitudinal carina and a few transverse carinae.

Forewings. Pubescent. Radial cell around 2.2 times as long as wide. Areolet inconspicous (more distinct in males); vein Rs curved; vein Rs+M indistinct.

Metasoma (Fig. 15). Longer than mesosoma. Fused segment 2+3 strongly incised dorso-distally with a patch of setae antero-laterally; apical patch of micropunctures extending to 1/3 length of metasoma, slightly short of reaching the ventral margin of syntergite; subsequent tergites punctured; hypopygium shinning, without setae and punctures only with a few puncures apically. Ventral spine of hypopygium very short.

Variation. One small female specimen deposited in USNM (collected June 1950) has areolet missing, coxae similarly colored as legs, and the reddish area surrounding mouth is more extended in face and genae.

Distribution. China (Hunan), Japan.

Biology. The species, which was referred to as *Synergus japonicus* type A by Abe (1990), is arrhenotokous and bivoltine (Abe, 1990), and may have a third generation in the summer (Abe, 1992). The first generation emerges in May from the galls of the unisexual generation of *Andricus mukaigawae* and the second generation emerges in June from the galls of the bisexual generation of *Biorhiza nawai*. Two consecutive emergences from *B. nawai* may be observed sometimes in the spring or a prolonged emergence may occur from spring throughout summer. Galls of *A. mukaigawai* infected with *S. japonicus* inquilines were smaller compared with those, infected with *S. gifuensis* and the inquiline larval cells are separated by a membranous wall inside the host gall (Abe, 1990, 1992). Although there were evidences suggesting that *S. japonicas* females may oviposit in host galls already infected with *S. gifuensis*, the two species are reproductively isolated from each other by ethological barrier (Abe 1992). Collection data (see above) indicate that the species can also exploit the galls of the unisexual generation of *Andricus kashiwaphilus*.

***Synergus jezoensis* Uchida & Sakagami, 1948** (Figs 19–30)

Type material examined. Lectotype ♂, deposited in EIHU (designated here), labels (Fig. 29). Paralectotypes: 1♂, 2♀, bearing same labels as lectotype.

Diagnosis. The species differs from all other *Synergus* species in having unusually large hypopygium. Otherwise, morphologically, it resembles the European species *S. reinhardi* and *S. hayneanus*. It can be distinguished from both latter species by having: (1) less extensive patch of micropunctures of metasoma, not reaching the ventral margin of metasoma as in *S. reinhardi* and *S. hayneanus*; (2) almost percurrent medial mesoscutal line; (3) much broader malar space, 0.9 times as long as height of compound eye (0.5 in *S. reinhardi* and *S. hayneanus*). It can be further separated from *S. reinardi* by: (1) median carina in lower face not so strong as to be visible in lateral view and (2) head reddish brown (black in *S. reinhardi*), and from *S. hayneanus* by its longer radial cell.

Aditional material. 3♀, 1♂, Jingning, Zhejiang, 9 July 1980, leg. Han-Lin Chen. 2♀ and 1♂ deposited in ZAFU; 1♀ deposited in UB.

Redescription. Length. Female 3.4 mm; male 2.5 mm.

Color. Head largely yellow to brown except mandible dark brown distally, frons, interocellar area and vertex dark brown medially and reddish brown laterally; antenna yellow except scapus light brown; mesosoma reddish brown except tegula bright yellow. Female coxa, trochanter and basal half of femur pale brown, apical half of femur, tibia and tarsus pale yellow; male legs uniformly pale yellow. Metasoma reddish brown, except for prominent part of ventral spine of hypopygium pale yellow. Wing hyaline, with distinct pale yellow veins.

Head (Figs 19–21, 24). Head round-shaped, 1.6 times as wide as height in front view, 2.4 times as wide as medial long in dorsal view. Vertex and upper face finely coriaceous and sparsely setose. Gena foveate-rugose, distinctly expanded behind eye, visible in front view, narrower than cross diameter of eye. Malar space finely coriaceous, with dense delicate striae radiating from clypeus, 0.6 times as long as height of eye. POL: LOL: OOL=12: 6: 6 (diameter of ocellus equal to OOL) in female and 10: 4: 2 (diameter of ocellus two times as wide as OOL) in males. Transfacial distance 1.4 times as long as height of eye; diameter of antennal torulus 1.1 times as long as distance between them, distance between torulus and eye margin 1.2 times as long as diameter of torulus. Inner margins of eyes parallel. Lower face finely coriaceous, with striae radiating from clypeus and reaching to antennal toruli and eyes, median elevated area narrow and without carina. Clypeus striate; anterior tentorial pits small, but distinct, epistomal sulcus and clypeo-pleurostomal line absent, ventral margin almost straight. Frons dull coriaceous with heavy punctures, lateral frontal carina weak, interocellar area, vertex and occiput dull, coriaceous, and heavily punctate.

Antenna. Female (Fig. 25). 14-segmented, slightly longer than head plus mesosoma; pedicel subglobal, 1.1 times as long as wide, F1 hardly curved medially, 2.3 times as long as pedicel, and 1.1 times as long as F2; relative lengths of antennal segments from scape to F12 as 13: 6: 14: 12: 12: 12: 12: 9: 9: 8: 6: 5: 5: 10. Male (Figs 22, 28). antennae 15-segmented, F1 curved and somewhat excavated medially; relative lengths of antennal segments from scape to F13 as 4: 2: 6: 4.5: 4.5: 4: 4: 4: 3.5: 3.5: 3.5: 3: 3: 3: 2.5.

Mesosoma (Figs 24–25). Mesosoma weakly convex, 1.3 times as long as height in lateral view, with dense pale setae. Pronotum rugose, interspaces finely coriaceous and setose, setae denser and longer laterally; lateral pronotal carina present.

Figs 20–31. *Synergus jezoensis*. 20. Head, frontal view. 21. Male head, dorsal view. 22. Female head, lateral view. 23. First flagellomere of male antenna. 24. Antenna of female and detail of first antennomeres. 25. Head and mesosoma, lateral view. 26. Mesosoma, dorsal view. 27. Female metasoma, lateral view. 28. Detail of distal part of female metasomal. 29. First and second flagellomeres of antenna male. 30. Forewings. 31. Labels of lectotype.

Mesoscutum slightly longer than width, with strong transverse carinae, interspaces alutaceous and setose. Notauli complete, deeply impressed along entire length, weakly convergent posteriorly; median mesoscutal impression long and visible, extending to almost length of mesoscutum, parapsidal lines deeply impressed and extending to 1/2 length of mesoscutum; antero-median signum distinct and extending to 1/5 length of mesoscutum. Transscutal articulation deep and wide. Scutellum trapezoid, slightly overhanging metanotum, rounded and slightly broadened posteriorly, rugose with interspaces coriaceous, with dense long setae. Scutellar foveae transversely ovate, deeply impressed, separated by a narrow carina in the middle, bottom coriaceous and nude. Mesopleuron including speculum with strongly interrupted longitudinal striations (with a transversal smooth area in males); acetabular carina delimiting a very narrow smooth area laterally; mesopleural triangle with dense white setae. Metapleural sulcus extending to 3/5 height of mesopleuron in lateral view; subaxillular bar as high as metanotal trough. Lateral propodeal carinae distinct and parallel. Median propodeal area weakly rugose, with dense white setae. Nucha short and sulcate laterally.

Legs. Tarsal claws with large basal lobe and tooth.

Wing (Fig. 29). Fore wing longer than body, margin with short cilia; veins Rs and R1 reaching margin; radial cell of fore wing closed, 2.3 times as long as wide; areolet barely visible, vein Rs+M weakly marked and extending to 1/2 distance between areolet and basal vein, projecting to basalis before the middle.

Metasoma (Figs 26–27). Metasoma slightly longer than head plus mesosoma, 1.1 times as long as height in lateral view; syntergite sparsely setose antero-laterally, with apical patch of micropunctures extending to less than 1/3 length of metasoma, slightly short of reaching the ventral margin of syntergite; subsequent tergites and hypopygium shinning smooth and without setae; hypopigyum very long; prominent part of ventral spine of hypopygium very short.

Distribution. China (Zhejiang), Japan.

Biology. Unknown.

4 Discussion

Section I of *Synergus*, defined by the presence of a posterior band of minute punctures in the fused metasomal tergites 2+3, comprises 12 species in the Palearctic Region. Among these species, those species from Western Palearctic all have a complete band that reaches the ventral margin of the syntergite. However, in all species of the Section I from Eastern Palearctic, including *S. deqingenesis* described herein, this band of minute punctures does not reach the ventral margin of the syntergite, leaving a narrow glabrous area along the ventral margin.

Based on DNA sequence data, phylogenetic analysis showed that the Western and Eastern Palearctic species could not be divided into separate groups (Acs *et al.*, 2007). However, the conclusion was based on sampling from both Section I and Section II species. As the diversity of gall wasps from the Orient and the East Palearctic, including the genus *Synergus*, become better known (Abe *et al.*, 2007; Melika *et al.*, 2004; Melika *et al.*, 2005; Liu *et al.*, 2012; Pénzes *et al.*, 2012) and more balanced species sampling from the entire range of the genus, including Nearctic, is possible, the relationship between morphological distinction and molecular phylogeny will eventually become better understood. Even then, the taxonomy and classification of the genus *Synergus*, and many other groups of cynipid wasps, will continue to utilitarian, depending on morphological features.

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