On the genus *Chrysolyda* Shinohara (Hymenoptera: Pamphiliidae) with description of a new species

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Abstract: *Chrysolyda* Shinohara, 2002 is a small Eastern Asian genus of Pamphiliidae with two known species. In this paper, *Chrysolyda* is redescribed based on new material. *Chrysolyda qinlingia* Hu & Wei **sp. nov.** from Qinling Mountain, Shaanxi, China is described. And *Chrysolyda leucocephala* Takeuchi, 1938 is redescribed and illustrated. A key to species of *Chrysolyda* is provided.

Key words: Pamphilioidea; Pamphiliinae; East Asia; China; key

细脉扁蜂属 *Chrysolyda* Shinohara 暨一新种（膜翅目：扁蜂科）

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摘要：细脉扁蜂属 *Chrysolyda* Shinohara, 2002 是扁蜂科的 1 个小属，已知 2 种，均分布于东亚地区。本文重新描述了细脉扁蜂属和白头细脉扁蜂 *Chrysolyda leucocephala* Takeuchi, 1938 的形态特征，并记述分布于中国秦岭地区的细脉扁蜂属 1 新种：秦岭细脉扁蜂 *Chrysolyda qinlingia* Hu & Wei **sp. nov.**。提供了细脉扁蜂属种检索表。

关键词：扁蜂总科；扁蜂亚科；东亚；中国；检索表

Introduction

Takeuchi (1938) described a peculiar species of Pamphiliidae, *Pamphilius leucocephala* Takeuchi, 1938, from Hokkaido and Kyushu of Japan and noted that the species lacks a basal preapical spur on middle and hind tibiae and has special body coloration. This species was placed into *Pamphilius* but Takeuchi (1938) stated that a new genus might need to be established for the species. Shinohara (2002) established *Chrysolyda* Shinohara, 2002 for *Pamphilius leucocephala* Takeuchi and pointed out another peculiar character of the genus: the vein 1r1 very short and clearly thinner than other veins. Shinohara & Wei (2012) recorded the genus from Hunan Province of China and described *Ch. yunshanica* Shinohara, 2012, a second species of the genus.

Here we report a third species of *Chrysolyda* and provide a key to the known species of the genus. *Chrysolyda leucocephala* (Takeuchi, 1938) is also redescribed and illustrated.

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Material and methods

Specimens were examined with a Motic-SMZ-171 stereomicroscope. Images of adults were taken with a Nikon D700 digital camera and a Leica Z16APO microscope. Images were focus-stacked using Helicon Focus (HeliconSoft, Kharkiv, Ukraine) and further processed with Adobe Photoshop CS 11.0. The terminology of genitalia follows Ross (1945) and terminology of wing venation follows Niu and Wei (2010) except for m-cu being replaced as 1m-cu, and stigma as pterostigma. The holotype and paratype of the new species are deposited in the Asian Sawfly Museum, Nanchang, China (ASMN). Specimens of other species examined in this research are deposited in the National Museum of Nature and Science, Ibaraki, Japan (NSMT), ASMN and the Laboratory of Systematic Entomology, Hokkaido University (SEHU).

Abbreviations used in the text are as follows: OCL—the distance between a lateral ocellus and the hind margin of the head; OOL—the distance between an eye and a lateral ocellus; POL—the distance between the mesal margins of the two lateral ocelli.

Taxonomy

Genus *Chrysolyda* Shinohara, 2002

Chrysolyda Shinohara, 2002: 372.

Type species. *Pamphilius leucocephala* Takeuchi, 1938. By original designation.

Description. Length 7.5–12 mm; dorsum of head and of thorax as well as venter of abdomen in female creamy white with some black maculae, body otherwise largely black; clypeus roundly convex at middle but without sharp middle carina, anterior margin roundly protruding (Fig. 2E); left mandible with an angulate middle tooth, right mandible tridentate, middle tooth acute but much shorter than inner tooth (Fig. 1I); eyes small and ovate, distance between them about twice longest axis of eye (Fig. 1H); malar space flat, not longer than diameter of median ocellus, without specialized spine and fovea; facial crest and ocular crest absent (Figs 1H, 2E), occipital carina developed (Fig. 2G); frons roundly convex without crest; head roundly narrowed behind eyes in dorsal view (Figs 1H, 2C); antenna short and with 18–21 antennomeres, total length about as long as head and thorax together, antennomere 3 as long as or shorter than antennomere 1, antennomere 2 much longer than broad, antennomere 3 1.3–2.4 times as long as antennomere 4 (Figs 1B, 2H); fore tibia without preapical spur, inner side with a row of flattened spines, inner apical spur broad and curved, apex with a broad ventral lobe and an acute dorsal process; middle and hind tibia with 2 slender preapical spurs and lacking a basal preapical spur, apical spurs of hind tibia broad and much shorter than apical breadth of tibia; metabasitarsus as long as following 3 tarsomeres together, pulvilli small, pulvillus on tarsomere 1 about 0.25 times the length of tarsomere; claw without basal lobe but clearly broadened toward base, inner tooth shorter than but close to apical tooth (Figs 1G, 2D); wings whitish or yellowing tinged with infuscate maculae which is distinct in hind wing (Figs 1C, 1D, 3A); apical margin with distinct longitudinal wrinkles but without marginal spines (Fig. 2A), spines on hind wing membrane clearly denser than on fore wing; pterostigma narrow, about 2.5–3 times as long as broad, apex truncate (Figs 1C, 2A); veins largely yellowish or creamy white; cell C broad, vein Sc with two branches, Sc1 meeting vein

C at line of first abscissa of vein M; vein 1r1 short and much thinner than other veins, inner dorsal corner of cell 1Rs quite acute (Figs 1C, 2A); vein Sc entire in hind wing (Fig. 1D); sternum 7 in female without oblique carina; penis valve broad and flat, valviceps ovate.

Distribution. Eastern Asia.

Host plant and larva. Unknown.

Diagnosis. Dorsum of head and of thorax as well as venter of abdomen in female creamy white with some black maculae, body otherwise largely black; wings whitish or yellowish hyaline with infuscate maculae; pterostigma narrow, truncate at apex and bicolored, veins largely whitish; vein 1r1 quite short and much thinner than other veins; left mandible tridentate; middle and hind tibia lacking a basal preapical spur; hind tarsus much shorter than hind tibia; claw without basal lobe though broadened toward base, inner tooth close to and slightly shorter than apical tooth.

Remarks. This genus is one of the three rarest genera of Pamphiliidae and is a member of Pamphiliini of Pamphiliinae. Shinohara (2002) discussed the differences between *Chrysolyda* and other genera of the subfamily. An unpublished study on the phylogeny of Pamphiliidae based on mitochondrial and nuclear genomes suggests that *Chrysolyda* is one of the three monophyletic genera of Pamphiliini and it is probably a sister group of *Onycholyda* + *Pamphilius* (Niu *et al*., in preparation).

Chrysolyda is quite rare and are seldom collected in field. The host plant and larval stages are unknown. The origination and migration of the genus with the three species remains to be a problem. Within the three known species, *Ch. yunshanica* from Hunan seems to us that it is possibly closer to *Ch. leucocephala* from Northeast Asia as shown by the shorter antennomere 3, the largely infuscate hind wing, the sheath with pale spines and an elongated appendage, the very sparse spines on the wing membrane, etc. *Ch. qinlingia* also shares some characters with *Ch. yunshanica*: the fore wing with narrow apical infuscate macula, the apical half of pterostigma black, the abdominal sterna 5–7 creamy white with roundish black maculae, the abdominal terga largely smooth, the temple with a distinct black macula. The relationship among the three species needs further study, especially the molecular phylogeny of the genus.

Including the new species described in this paper, three species have been found in *Chrysolyda*. They can be identified by the following key.

Key to species

1. Fore wing without apical infuscate macula, hind wing largely but weakly infuscate; basal third of pterostigma yellowish white, apical two thirds brownish black; cell 1M short, 1.35 times as long as broad; anal petiole of hind wing as long as cu-a (Fig. 2A); cells C entirely glabrous, cell 1Sc sparsely pilose with about 40 spines; female temple and clypeus white without black macula (Fig. 2C); antennomere 3 in female 1.5–1.7 times as long as antennomere 4 (Fig. 2H); basal five abdominal terga in female distinctly microsculptured; ventral margin of ovipositor sheath concave, appendage of sheath broad and long, about 1.5 times as long as broad (Fig. 2F); sterna 5 largely and lateral 0.3 of sterna 6–7 black (Fig. 2B). Northeast Asia (Japan) ……*Ch. leucocephala*

-. Apical margin of forewing with distinct infuscate macula (Figs 1C, 3A), hind wing partly or largely smoky (Figs 1D, 2A); pterostigma black in apical half and yellow brown in basal half (Figs 1C, 3A); cell 1M in fore wing about 1.5–1.75 times as long as broad; temple with a distinct black macula (Figs 1H, 3A); antennomere 3 in female 1.6–2.3 times as long as antennomere 4; abdominal terga in female smooth,

without distinct microsculpture; anal petiole of hind wing shorter than cu-a; sterna 5–7 largely creamy white with isolated lateral black macula (Fig. 2K); ventral margin of ovipositor sheath straight or appendage pad-like (Fig. 1E). China ……2

2. About apical third of cell 3Rs in female fore wing infuscate, hind wing distinctly infuscate except for extreme base and narrow anterior margin (Fig. 3A); cell C in fore wing glabrous, without spines; postocellar area clearly broader than long; upper of hind orbit without black macula; antennomere 3 in female 1.6–1.8 times as long as antennomere 4; cell 1M in fore wing narrow, about 1.75 times as long as broad; lower apical corner of cell 1R1 rectangular; ventral margin of female sheath straight with pale brown spines, appendage elongate, about 2.5 times as long as broad. China (Hunan) ……*Ch. yunshanica*

-. About apical two thirds of cell 3Rs in fore wing infuscate (Fig. 1C); hind wing largely yellowish tinged, with narrow apex and anal area deeply smoky (Fig. 1D); posterior half of cell C in fore wing with many spines; postocellar area as broad as long (Fig. 1H); upper of hind orbit with a black macula; antennomere 3 in female 2.4 times as long as antennomere 4 (Fig. 1B); cell 1M in fore wing about 1.5 times as long as broad; lower apical corner of cell 1R1 obtuse; ventral margin of female sheath shallowly concave with blackish brown spines, appendage pad-like, very short. China (Shaanxi) ……*Ch. qinlingia* **sp. nov.**

1**.** ***Chrysolyda qinlingia*** **Hu & Wei sp. nov.** (Fig. 1)

http://zoobank.org:pub:8D9AC0D1-6393-4A8E-82D7-2BA79993F1B9

Description. Female. Holotype. Body length 10 mm (Fig. 1).

Head creamy white, dorsum with a large black macula covering entire frons, most of postocellar area, inner half of upper inner orbit and upper margin of supraclypeal area (upper frons); upper hind orbit with an irregular black macula (Fig. 1H), clypeus with a roundish black macula just below toruli, mandibles except for basal fifth (Fig. 1I) and labium except for glossae black; antenna black except for base of scape. Dorsum of thorax creamy white; pronotum with three roundish black maculae, the middle one small and lateral two maculae much larger; mesonotum with four roundish black maculae, the posterior one smaller than other three; parapsis largely and posttergite (mesoscutellar appendage) except for narrow anterior margin black (Fig. 1A); metanotum, propleura and prosternum, mesopleuron except for narrow upper margin, mesosternum and metapleuron entirely, black. Abdomen black, narrow lateral margins of terga 3–5, broad lateral margins of terga 6–8, a basal small middle macula on tergum 7 and broad middle macula on tergum 8, terga 9 and 10 entirely (Fig. 1J), narrow margins of ventral fold of terga 2–4, ventral fold of terga 5–7 except for a middle roundish macula, narrow lateral side of sternum 4, sterna 5–7 except for a large lateral black macula, and ovipositor sheath creamy white (Fig. 1K). Legs black, extreme base of each basitarsus yellowish brown. Hairs on dorsum of head and thorax blackish brown, spines on sheath blackish brown to black (Figs 1E, 1F). Fore wing largely yellowish brown, paler toward base, broad apical margin deeply infuscate, pterostigma yellowish brown, apical half black; veins largely whitish (Fig. 1C). Hind wing largely yellowish brown, basal part and narrow anterior margin whitish, narrow apical margin infuscate, anal area deeply smoky (Fig. 1D).

Head smooth, shiny; anterior of clypeus and postocellar area with some large and sparse punctures, punctures on frons and middle of inner orbit slightly denser; dorsum of thorax and of abdomen smooth and strongly shiny, without distinct puncture and microsculpture; lateral of thorax and venter of abdomen densely microsculptured, sculptures on apical sterna gradually weakened.

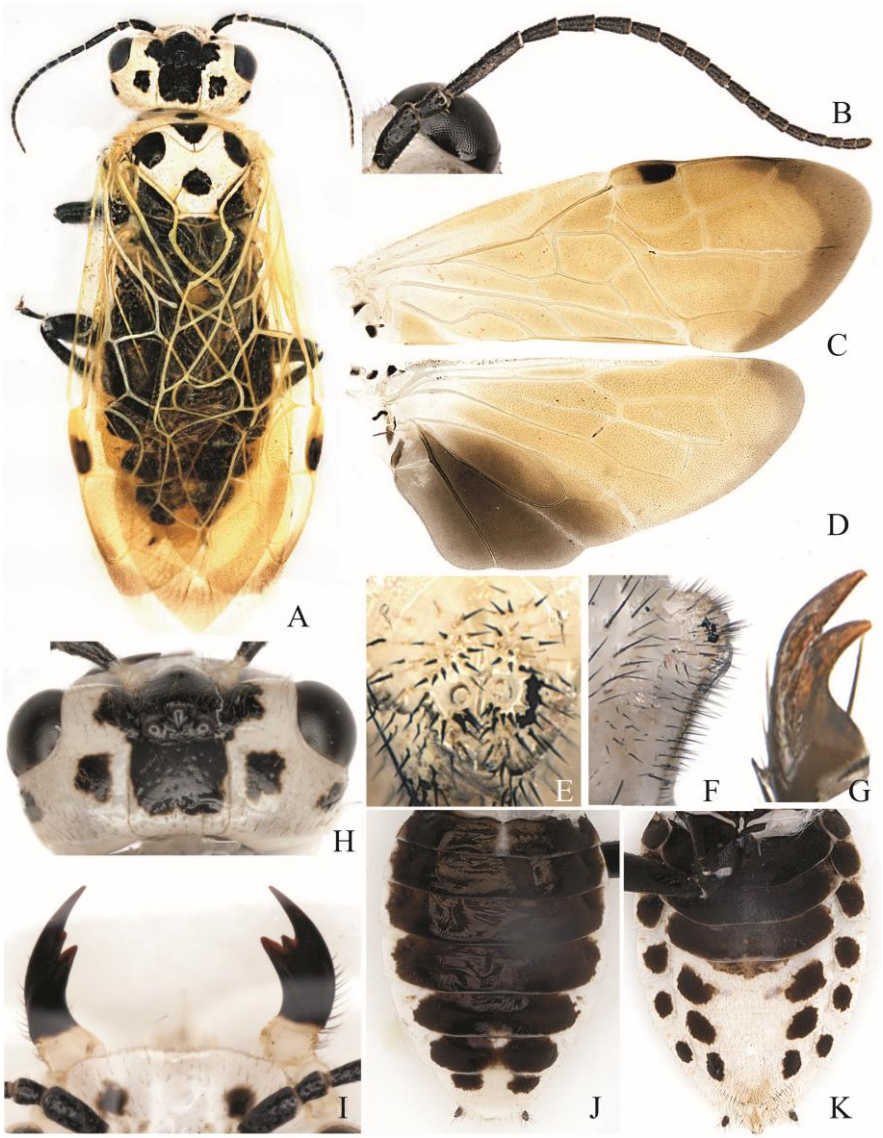

Figure 1. *Chrysolyda qinlingia* **sp. nov.**, ♀, holotype. A. Adult, dorsal view; B. Antenna; C. Fore wing; D. Hind wing; E. Ovipositor sheath, caudal view; F. Ovipositor sheath, lateral view; G. Claw; H. Head, dorsal view; I. Clypeus and mandibles; J. Abdomen, dorsal view; K. Abdomen, ventral view.

Anterior margin of clypeus weakly and roundly protruding; mandibles as in Fig. 1I; malar space as long as diameter of lateral ocellus, 0.5 times as long as pedicellum; dorsum of supraclypeal area (upper frons) weakly convex, without peak or carina, middle fovea obscure; postocellar furrow deep, interocellar furrow and circular furrow of anterior ocellus distinct, transverse suture indistinct; head clearly narrowed behind eyes in dorsal view, postocellar area as long as broad, lateral furrows deep and straight, parallel to each other (Fig. 1H); occipital carina extending to upper margin of hind orbit; hairs on dorsum of head slightly longer than diameter of median ocellus, apex curved; antenna with 19 antennomeres, length ratio of basal

five antennomeres as 31 : 10 : 31 : 13 : 12, pedicellum 1.8 times as long as broad (Fig. 1B). Mesoscutellum flat; hairs on mesopleuron distinctly curved and as long as diameter of median ocellus; hairs on mesonotum very short, mostly shorter than radius of median ocellus. Hind tibia 1.6 times as long as hind tarsus, inner apical spur of hind tibia 0.8 times as long as apical breadth of tibia; metabasitarsus distinctly compressed laterally, as long as following 3 tarsomeres together; claw as in Fig. 1G. Posterior half of cell C and most of cell Sc1 densely pilose; apical half of fore wing distinctly pilose, length of spines about as long as middle breadth of vein 1r-m; cell 1M about 1.5 times as long as broad; lower apical corner of cell 1R1 obtuse (Fig. 1C); hind wing with apical petiole of anal cell 0.8 times as long as cu-a, spines on membrane denser than those of fore wing (Fig. 1D). Middle suture of tergum 2 distinct; apex of the ovipositor apical sheath roundly protruding, ventral margin shallowly incised (Fig. 1F), appendage very short and pad-like (Fig. 1G).

Male. Unknown.

Variation. No variation was observed.

Holotype. ♀, **China**, Shaanxi, Xi'an, Huyi District, Taiping Forest Park, 108°39′15″E, 33°55′368″N, alt. 943 m, 21-VI-2019, leg. Qingbo HUO, Yue SHEN & Liangdong SONG. **Paratype**. 1♀, same data as holotype.

Etymology. The species is named after the type locality, Qinling Mountain.

Diagnosis. This new species is similar to *Chrysolyda yunshanica* Shinohara, 2012 but differs from it by the following: the broad apical margin of fore wing infuscate, the apical two thirds of cell 3Rs with macula; the hind wing largely yellowish hyaline, the extreme base and narrow anterior margin whitish, the narrow apical margin and anal area deeply infuscate; the posterior half of cell C and most of cell Sc1 pilose; the apical half of fore wing distinctly pilose, length of spines about as long as middle breadth of vein 1r-m; the postocellar area as broad as long; the upper hind orbit with a black macula; the antennomere 3 as long as scape and 2.4 times as long as antennomere 4; the cell 1M about 1.5 times as long as broad; the lower apical corner of cell 1R1 obtuse; the apex of the ovipositor apical sheath roundly protruding, ventral margin shallowly incised with blackish spines, the appendage very short and pad-like.

2. ***Chrysolyda leucocephala*** **Takeuchi, 1938** (Fig. 2)

Pamphilius leucocephala Takeuchi, 1938: 217, 219–220.

Chrysolyda leucocephala: Shinohara, 2002: 374.

Description. Female, not type. Body length 8.5 mm.

Head creamy white, dorsum with a black macula covering entire frons, most of postocellar area and upper margin of supraclypeal area; upper hind orbit with an irregular small black macula (Fig. 2C), mandibles except for basal fifth and labium except for glossae black; antenna black except for base of scape (Fig. 2H). Dorsum of thorax creamy white; pronotum largely white with a small roundish middle black macula, lateral lobes black except for narrow margin (Fig. 2G); mesonotum with four roundish black maculae; parapsis largely and posttergite entirely black (Fig. 2A); metanotum, propleura and prosternum, mesopleuron except for narrow upper margin, mesosternum and metapleuron entirely, black (Fig. 2B). Abdomen black, narrow lateral margins of terga 2–4, broad lateral margins of terga 5–7, a small middle triangular macula on tergum 6–7, tergum 8 except for two small maculae, terga

9 and 10 entirely (Fig. 2B), narrow margins of ventral fold of terga 2–4, broad margins of ventral fold of terga 5–7, narrow lateral side of sterna 4–5, narrow posterior margin of sternum 5, sterna 6–7 except for a large lateral black macula, and ovipositor sheath creamy white (Fig. 2B). Legs black, extreme base of each basitarsus yellowish brown. Hairs on dorsum of head and thorax blackish brown, spines on sheath pale brown (Fig. 2F). Fore wing whitish hyaline, posterior margin slightly darker, pterostigma largely brownish black, anterior margin and basal third yellowish brown, other veins largely whitish; hind wing largely and weakly infuscate, basal part and narrow anterior margin whitish, apex paler (Fig. 2A).

Head smooth, shiny; anterior of clypeus, frons, upper inner orbit and postocellar area with some large and sparse punctures; dorsum of thorax smooth and strongly shiny, without distinct puncture and microsculpture; basal terga 1–5 distinctly microsculptured, apical terga gradually changing to smooth, lateral of thorax and venter of abdomen densely microsculptured, sculptures on apical sterna gradually weakened.

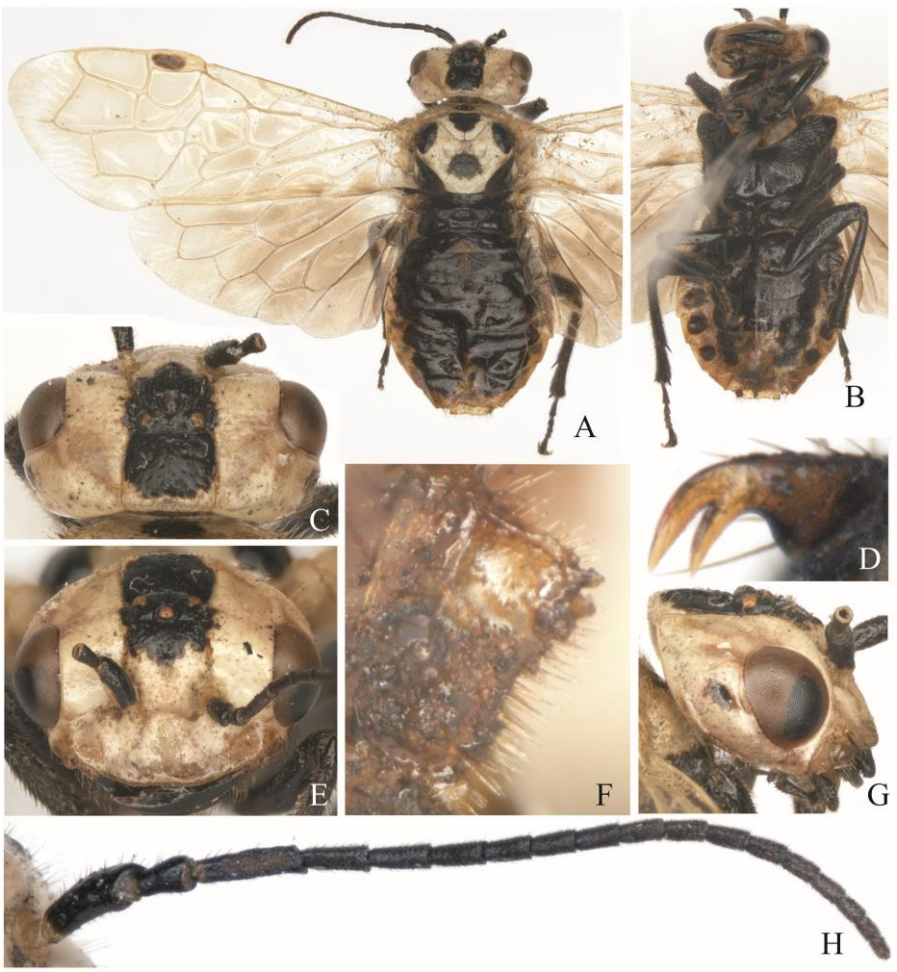

Figure 2. *Chrysolyda leucocephala*, ♀. A. Adult, dorsal view; B Adult, ventral view; C. Head, dorsal view; D. Claw; E. Head, anterior view; F. Ovipositor sheath, lateral view; G. Head, lateral view; H. Antenna.

Anterior margin of clypeus distinctly and roundly protruding (Fig. 2E); malar space as long as diameter of lateral ocellus, 0.4 times as long as pedicellum; dorsum of supraclypeal area (upper frons) weakly convex, without peak or carina, middle fovea obscure; postocellar furrow deep, interocellar furrow and circular furrow of anterior ocellus distinct, transverse suture indistinct; head clearly narrowed behind eyes in dorsal view, postocellar area about as long as broad, lateral furrows deep and straight, parallel to each other (Fig. 2C); occipital carina extending to upper margin of hind orbit (Fig. 2G); hairs on dorsum of head slightly longer than diameter of median ocellus, apex curved; antenna with 18–19 antennomeres, length ratio of basal five antennomeres: 30 : 10 : 23 : 14 : 13, pedicellum 1.8 times as long as broad (Fig. 2H). Mesoscutellum flat; hairs on mesopleuron distinctly curved and about 1.3 times diameter of median ocellus; hairs on mesonotum very short, mostly slightly shorter than diameter of median ocellus. Hind tibia 1.67 times as long as hind tarsus, inner apical spur of hind tibia 0.7 times as long as apical breadth of tibia; metabasitarsus distinctly compressed laterally, as long as following 3 tarsomeres together; claw as in Fig. 2D. Cell C glabrous, most of cell Sc1 very sparsely pilose with about 40 spines; apical half of fore wing shortly and sparsely pilose, length of spines shorter than middle breadth of vein 1r-m; cell 1M short and broad, about 1.35 times as long as broad; lower apical corner of cell 1R1 almost rectangular; hind wing with apical petiole of anal cell as long as cu-a (Fig. 2A). Middle suture of tergum 2 distinct; apex of the ovipositor apical sheath roundly protruding, ventral margin shallowly incised, appendage distinct, longer than broad (Fig. 2F).

Male. Body length 8 mm; similar to female except for: head above antennae except for inner orbit, mesonotum entirely black; sterna 5–7 entirely or largely black. Genitalia not dissected.

Variation. Postocellar area in holotype longer than broad; antenna with 18–19 antennomeres.

Specimens examined. ♀, **Japan**, Hokkaido, Sapporo, 01-VI-1927, T. Uchida leg. 1♂ (paratype), **Japan**, Kyushu, Fukuoka Prefecture, Hikosan, 04-V-1937, K. Yasumatsu leg. [The senior author checked the holotype female and paratype male in the Takeuchi Entomological Collection in 2013. Now this type is kept in NSMT]. 1♀, **Japan**, Hokkaido, Sapporo, 29-V-1986, S. Kudo leg., 0000051217, Sys. Ent., Hokkaido Univ., Japan [SEHU].

Distribution. East Siberia; South Korea; Japan (Shinohara & Lee 1997).

Diagnosis. Fore wing creamy white without apical infuscate macula, hind wing largely but weakly infuscate, pterostigma largely brownish black with anterior margin and basal third yellowish white, cell 1M in fore wing about 1.35 times as long as broad, the lower apical corner of cell 1R1 obtuse, cells C entirely glabrous, cell Sc1 with about 40 spines; the petiole of hind anal cell as long as vein cu-a; temple entirely white without black macula; the 5th abdominal sterna largely in female and lateral 0.3 of sterna 6–7 black; the female antennomere 3 much shorter than scape and 1.5–1.7 times as long as antennomere 4; the abdominal terga 1–5 microsculptured; the ventral margin of ovipositor sheath concave, appendage of sheath broad and long, about 1.5 times as long as broad.

3. ***Chrysolyda yunshanica*** **Shinohara, 2012** (Fig. 3)

Chrysolyda yunshanica Shinohara, 2012: 60.

Description. Detailed description see Shinohara & Wei (2012) except for following notes:

basal ring of mandibles and of scape creamy white; black maculae below toruli and on upper hind orbit present or absent; fore wing with a narrow apical infuscate macula in female, basal two third of cell 3Rs not infuscate (Fig. 3A); the apical infuscate macula broader, occupying apical two thirds of cell 3Rs in male (Fig. 3B); malar space as long as diameter of median ocellus and 0.5 times the length of pedicellum; fore wing with cell Sc1 sparsely pilose, cell 1M narrow and long, about 1.75 times as long as broad, the lower apical corner of cell 1R1 rectangular, spines on apical half of wing membrane sparse, shorter than middle breadth of vein 1r-m; lower margin of ovipositor sheath straight with pale spines, appendage of sheath slender and long, about 2.5 times as long as broad, apex round.

Figure 3. *Chrysolyda yunshanica*. A. Adult female, holotype, dorsal view; B. Adult male, paratype, dorsal view.

Specimens examined. 1♀ (Holotype), **China**, Hunan, Wugang, Mt. Yunshan, alt. 1200 m, 26°39′N, 110°37′E, 09-IV-2010, A. Shinohara (ASMN). 1♂ (Paratype), **China**, Hunan,

Wugang, Mt. Yunshan, alt. 1250 m, 26°39′N, 110°37′E, 13–19-IV-2011, A. Shinohara (ASMN). 1♀, **China**, Hunan, Wugang, Mt. Yunshan, Yunfengge, 110°37.169′E, 26°38.983′, alt. 1170 m, 14-IV-2013, leg. Zejian LI; 1♀, **China**, Hunan, Wugang, Mt. Yunshan, 110°37′27"E, 26°39′3"N, alt. 1129 m, 30-III-2019, leg. Meicai WEI & Lin LIU (ASMN).

Distribution. China (Hunan).

Diagnosis. This species differs from the other two species in this genus by the following characters: the apical third of the cell 3Rs in female distinctly infuscate, hind wing largely infuscate except for extreme base and narrow anterior margin in both sexes; fore wing with cell C entirely glabrous but cell Sc1 sparsely pilose, spines on apical half of fore wing sparse, shorter than middle breadth of vein 1r-m; the postocellar area broader than long; upper hind orbit without black macula; the female antennomere 3 shorter than scape and 1.6–1.8 times as long as antennomere 4; cell 1M narrow and long, about 1.75 times as long as broad; the lower apical corner of cell 1R1 rectangular; the ventral margin of sheath straight and the appendage long and narrow, about 2.5 times as long as broad.

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