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New species of rose gall wasp *Diplolepis* Geoffroy, 1762 (Hymenoptera: Diplolepididae) and its parasitoid *Orthopelma* Taschenberg, 1865 (Hymenoptera: Ichneumonidae) on a rare endemic rose species in Sichuan, China

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Abstract

We describe a new species of rose gall wasp from Sichuan, China, *Diplolepis nezha* Hu, Zhang, McCormack & Fang, **sp. nov.** (Diplolepididae: Diplolepidinae), which induces galls on the rare, endemic rose *Rosa chinensis* var. *spontanea* (Rehder & E.H. Wilson) T.T. Yu & T.C. Ku. In association with these galls, we also describe a new parasitoid species, *Orthopelma aobing* Hu, Zhang, Dal Pos, McCormack & Fang, **sp. nov.** (Ichneumonidae: Orthopelmatinae). DNA barcodes were used to confirm the identities of both new species. We provide updated dichotomous keys incorporating these taxa and briefly discuss their biology in the context of other East Asian species, informed by phylogenetic analyses.

Key words: Diplolepidinae, Rosaceae, *Rosa*, Orthopelmatinae, Darwin wasp

Introduction

The genus *Diplolepis* Geoffrey, 1762 (Cynipoidea: Diplolepididae, Diplolepidinae) consists of around 47 described species, all of which induce galls on *Rosa* L. (Abe *et al.* 2023). Historically, Diplolepididae was classified within Cynipidae as the tribe Diplolepidini (Ronquist *et al.* 2015), but recent phylogenomic studies have placed it as a separate lineage, leading to its reclassification into its own family (Hearn *et al.* 2024). These wasps are mostly found in the Northern Hemisphere, with the highest number of species in North America. The species diversity of *Diplolepis* within Asia is likely much higher than currently known, as they have likely originated from Asia and have subsequently radiated to the Nearctic region along with their host plants (Zhang *et al.* 2019; 2020).

Five species have been documented in mainland China: *D. abei* Pujade-Villar & Wang 2020; *D. hunanensis* Wang, Rui, Liu & Chen, 2013; *D. flaviabdomenis* Wang, Rui, Liu & Chen; *D. minorabdomenis* Wang, Rui, Liu & Chen, 2013; and *D. valtonyci* Zhu, Wang & Pujade-Villar, 2021. Two additional species have also been recorded

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from East Asia: *D. japonica* (Walker, 1874) from Japan, South Korea and possibly China; and *D. ogawai* Abe & Ide, 2023 which is only known from Japan. The host associations and gall structures of four of the seven species are known, all of which induce spherical and unilocular galls: *D. abei* induces densely spiny galls on the branches, buds or leaf veins of *Rosa sertata* Rolfe × *R. rugosa* Thunb. (Pujade-Villar *et al.* 2020); *D. japonica* induces smooth to slightly spiny galls on the upper and lower leaf surfaces and petiole on *R. multiflora* Thunb. and *R. rugosa*. (Yasumatsu & Taketani 1967); *D. ogawai* induces smooth galls on the upper and lower leaf surfaces, sepals, and petioles of *R. hirtula* (Regel) Nakai (Abe *et al.* 2023); and *D. valtonyci* induces smooth to slightly spiny galls on the lower surface of leaves of *R. rugosa* and *R. davurica* Pall (Zhu *et al.* 2021).

Ichneumonid wasps in the genus *Orthopelma* Taschenberg, 1865 (Ichneumonoidea: Ichneumonidae, Orthopelmatinae) are the sole member of this enigmatic subfamily with a Holarctic distribution. All known records indicate that they are idiobiont endoparasitoids of cynipid galls on Rosaceae. Mostly are associated with *Diplolepis* on *Rosa* but *Orthopelma* has also been recorded from *Diastrophus* Hartig, 1840 (Cynipidae: Diastrophini) galls on *Rubus* L. (brambles) in the Nearctic (Yu *et al.* 2016). A total of 12 extant species are known, including eight Palearctic species, three Nearctic species, and one Holarctic species, *Orthopelma mediator* (Thunberg, 1822) (World Ichneumonidae Database, https://worldichneumonidae.com). In East Asia, four species are known: *Orthopelma japonicum* Kusigemati, 1974 and *O. simile* Kusigemati, 1974 from Japan; *O. chinensis* Zhang, 2025 from mainland China; and *O. brevicorne* Morley, 1907, an uncommon species previously described from England that has since also been reported from South Korea (Choi *et al.* 2014) and China (Sun *et al.* 2020). The biologies of two Palearctic species are known: *O. japonicum* attacks galls of *D. japonica* on *R. rugosa* (Kusigemati 1974), while *O. chinensis* attacks an undescribed leaf gall similar to *Diplolepis japonica* on *R. multiflora* (Zhang 2025).

Our ongoing survey of gall wasps in Sichuan has revealed many undescribed gall inducers and their parasitoids in this biodiverse region of southwestern China (Fang *et al.* 2020a 2020b, 2024, 2025). Here we describe a new *Diplolepis* rose gall wasp and an associated *Orthopelma* parasitoid, expanding our understanding of the diverse cynipoid community in this region.

Materials & Methods

Study materials

The rose galls were collected in November 2018 in Sichuan Province, WangCang County, GaoYang Town, MengZi Village, TianXingQiao (32.286N, 106.283E) at an altitude of 510m, and are found on the leaves of *Rosa chinensis var. spontanea* (Rehder & E. H. Wilson) T. T. Yu & T. C. Ku, an endemic and protected rose species in China (Lu *et al.* 2003). Galls were stored in rearing cages under normal lab conditions until emergence of adults. We examined characters using a Leica M205C stereomicroscope illuminated by an incandescent gooseneck lighting system as well as LED illuminators. Measurements were taken using an optical micrometer. Images were taken with a Sony a6000 camera, a Cognysis Stackshot automated rail, and a series of microscope objectives (Nikon BE 4× infinity corrected, Mitutoyo Mplan apo 10×, Olympus UMplan fluor 10×) depending on magnification. 50 to 500 images were combined for each composite photograph using Helicon Focus (v8.3.2). Final output images were edited in FastStone (v 7.7) image viewer, and scale bars added in ImageJ (v 1.54g). We edited images in Adobe Photoshop and prepared plates using Adobe Illustrator (Adobe Inc.). The type materials are deposited in Emeishan Biological Resources Research Station (EBRRS), Emeishan, Sichuan, China (curator Zhiqiang Fang).

Abbreviations and Terminology

We follow morphological terminology based on Hymenoptera Anatomy Ontology (HAO, Yoder *et al.* 2010), along with recent taxonomic works on Cynipidae *s.l.* (Melika 2006) and Ichneumonidae (Broad *et al.* 2018); for cuticular sculpture definitions we referred to Harris (1979). The following abbreviations are used: POL (posterior ocellar length), LOL (lateral ocellar length), OOL (ocular ocellar length), and Fn (flagellomere number, 1–12).

Molecular and Phylogenetic Analysis

Genomic DNA was extracted from one individual each of *D. nezha* and *O. aobing*. We used PCR primers LepF1/LepR1 to amplify the DNA barcode region of the mitochondrial cytochrome c oxidase subunit I (COI) gene following published PCR conditions (Hebert *et al.* 2004; Hajibabaei *et al.* 2005). Amplicons were sequenced using Sanger chemistry by Tsingke Biotechnology, Chengdu, on an ABI3730XL capillary sequencer, and base calling was confirmed using Sequencher 5.4.6. (Gene Codes Corporation). We downloaded publicly available COI sequences of *Diplolepis* and *Orthopelma* species from GenBank and the Barcode of Life Database (BOLD, Ratnasingham & Hebert 2007). We chose *Liebelia fukudae* (Shinji, 1941) as an outgroup for *Diplolepis*, and *Dolichomitus terebrans* (Ratzeburg, 1844) / *Syrphoctonus nigritarsus* (Gravenhorst, 1829) as outgroups for *Orthopelma*. For each clade, we reconstructed a phylogenetic tree using maximum likelihood in IQ-TREE v2.3.6 (Minh *et al.* 2020), with the best evolutionary model determined using ModelFinder (Kalyaanamoorthy *et al.* 2017). Node support was established using 5000 replicates of ultrafast bootstrap (Hoang *et al.* 2018) and the flag "-bnni" was used to reduce the risk of overestimating branch supports due to severe model violations.

Results

The resulting COI sequences are 597bp for *Diplolepis* and 635bp for *Orthopelma*. *Diplolepis nezha* is sister to other Palearctic species that induce galls on leaves or hips (Palearctic Leaf 2 in Zhang *et al.* 2020), which includes *D. valtonyci*, *D. eglanteriae* (Hartig, 1840), *D. japonica*, *D. nervosa* (Curtis, 1838), and undescribed Chinese *Diplolepis* sp1, sp4, and sp5 from Zhu *et al.* (2021) (Fig. 1). *Orthopelma aobing* is sister to an unidentified species of *Orthopelma* collected from the UK (specimen ID BNHMG339-23, 608-23, and 839-23), which is then sister to *O. californicum* Ashmead, 1890 collected from Canada (Fig. 2). The phylogenies support the new species status for both species, and we formally describe them below. The COI sequences for *D. nezha* and *O. aobing* are uploaded onto GenBank with the accession numbers PX070477 and PX070478, respectively.

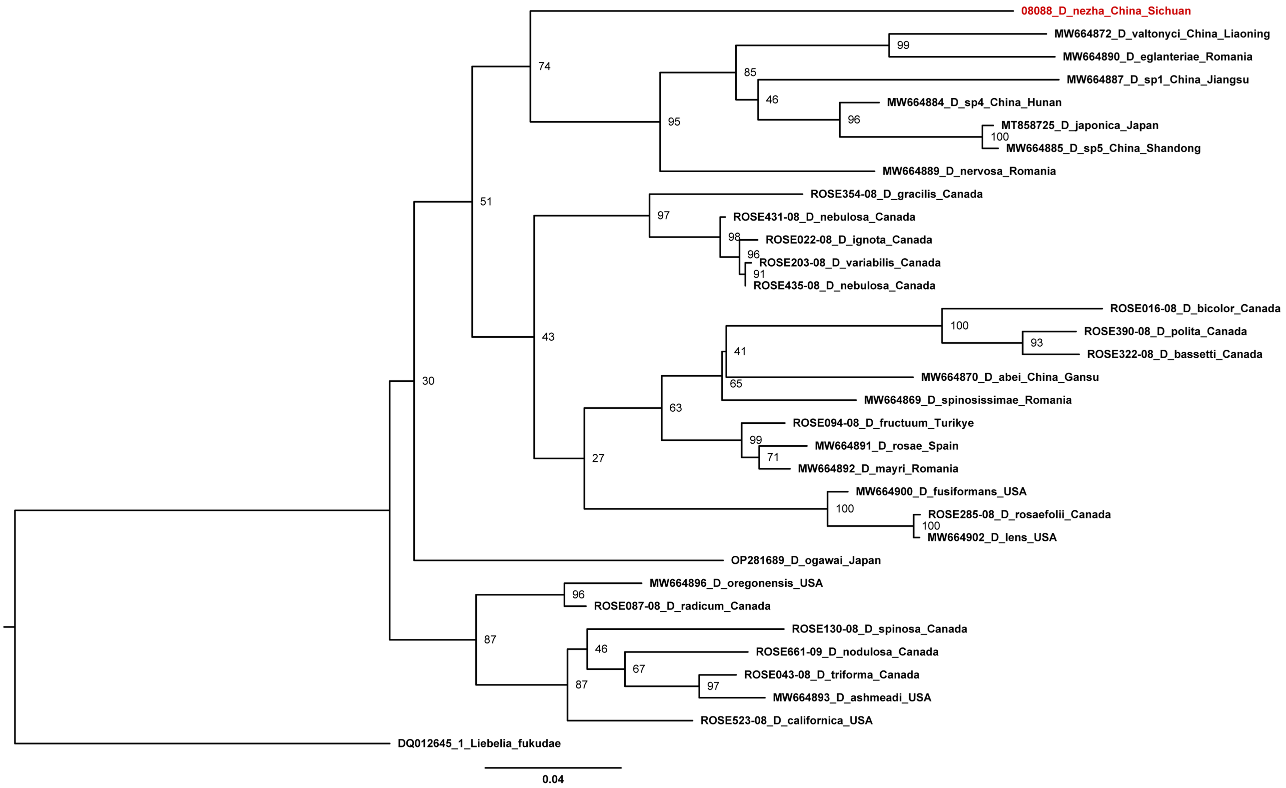

FIGURE 1. Maximum likelihood phylogram of *Diplolepis* mitochondrial DNA COI, along with sampling locality. Numbers at nodes indicate support values estimated in ultrafast bootstrap and scale bar in substitutions per site.

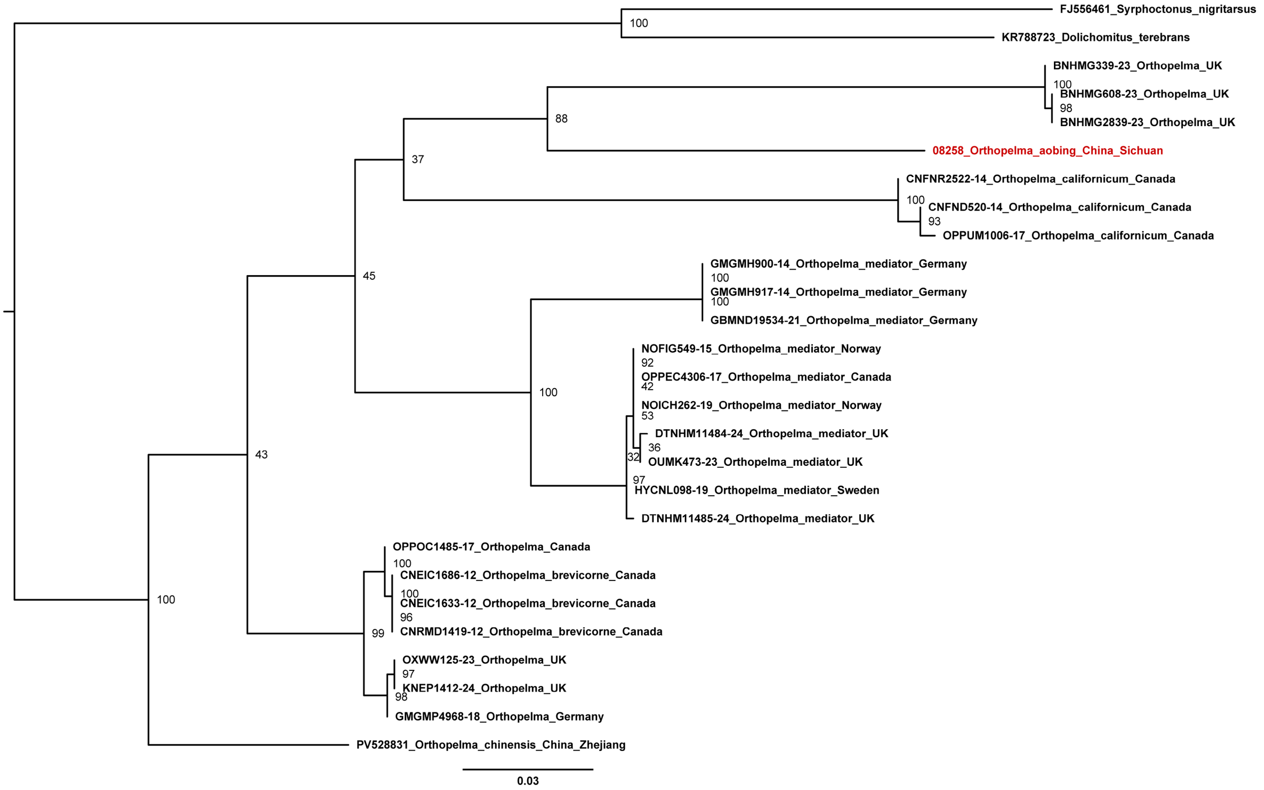

FIGURE 2. Maximum likelihood phylogram of *Orthopelma* mitochondrial DNA COI, along with sampling locality. Numbers at nodes indicate support values estimated in ultrafast bootstrap and scale bar in substitutions per site.

Diplolepis nezha Hu, Zhang, McCormack & Fang, sp. nov.

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Figures 3–5

Materials examined. HOLOTYPE: 1F, **CHINA**: Sichuan Province, WangCang County, GaoYang Town, MengZi Village, TianXingQiao, ex. *Rosa chinensis var. spontanea* (EM-Morpho-186), 32.286N, 106.283E, 510m, gall collected 18.XI.2018 (EM-3399), adult emerged 8.III.2019 (Tube-08089), leg. ZhiQiang Fang. PARATYPE: 1F, same as holotype; deposited at EBRRS.

Diagnosis: *Diplolepis nezha* keys to couplet five of Zhu *et al.* (2021), which includes all known Chinese *Diplolepis* species, and can be separated from all other species with the combination of shorter radial cell (2.1× longer than wide), head trapezoid, and median mesoscutal line present. This species can then be separated from *D. valtonyci* in couplet five, by the presence of a large areolet (the areolet is inconspicuous in *D. valtonyci*), and frons rugose (the frons is coriaceous in *D. valtonyci*).

Description. Female. Body length 3.8 mm (n = 2).

Color. Antenna with scape dark brown basally, apically light brown; pedicel dark brown, flagellomeres black (Fig. 3C). Head and mesosoma black. Mandibles brown, with black tips and labial palpi brown. Legs light brown, tarsi darker and coxae dark brown to orange-brown. Metasoma orange-brown; with anteroventral third and hypopygium darker brown (Fig. 5C). Wings hyaline, infuscated around R1; wing veins distinct, dark brown (Fig. 4B).

Head. Head trapezoid in frontal view, slightly wider than mesosoma in dorsal view, 1.4× as broad as high in frontal view and 2.3× as broad as long in dorsal view. Ratio of POL: OOL: LOL = 3: 2.3: 1 (Fig. 3B). Clypeus pentagonal, broader than high, coriaceous, largely glabrous with setae along the ventral edge, ventrally rounded, not emarginate and without median incision. Gena coriaceous, with piliferous punctures, broadened behind eye in frontal view. Transfacial distance 1.6× longer than height of eye; diameter of antennal toruli 1.3× longer than the distance between them, and distance between torulus and eye margin 1.4× longer than torulus diameter. Inner margins of eyes parallel (Fig. 5A). Frons and vertex coriaceous to rugose extending to ocellar triangle and around lateral ocelli; occiput coriaceous (Fig. 3B).

Antenna. 0.8× as long as body; 14-segmented, 1.7× longer than head plus mesosoma; pedicel slightly longer than broad; Ratio of scape: pedicel: F1–12 is 1.7: 1: 3.7 :2.4 :2.4 :2.3 :2.3 :2.3 :1.7 :1.4 :1.3 :1.3 :1 :1.7 (Fig. 3C).

Mesosoma. Pronotum very narrow, coarsely punctured, almost smooth in the middle and rugulose with some carinae in the basal part. Mesoscutum longer than wide and 2.5× longer than the scutellum, coriaceous, without distinct punctures. Notauli complete, convergent posteriorly; median mesoscutal line present, deep, at least the level of tegulae; parapsidal lines visible, narrow, shining, reaching tegulae; anterior parallel lines shallow, smooth, extending to half the length of the scutum (Fig. 3B). Scutellum wider than long, and the lower part of the scutellum is slightly pointed, dull, rugose with interspaces coriaceous (Fig. 5B). Scutellar foveae absent. Mesopleuron largely setose, with a patch of smooth and shining area posteriorly, with a strong transverse dull rugose furrow. Dorsal axilla smooth. Lateral propodeal area setose, rugose; medial propodeal area delimited by irregularly formed carinae, largely smooth with some horizontal striae (Fig. 5D). Nucha dorsally sulcate.

Fore wing. Pubescent in surface and margin. Radial cell closed, 2.1× longer than wide, Vein Rs straight, 2r curved, but not extending into radial cell. Areolet large, well defined. Rs+M well-marked and reaching M in the lower third (Fig. 4B).

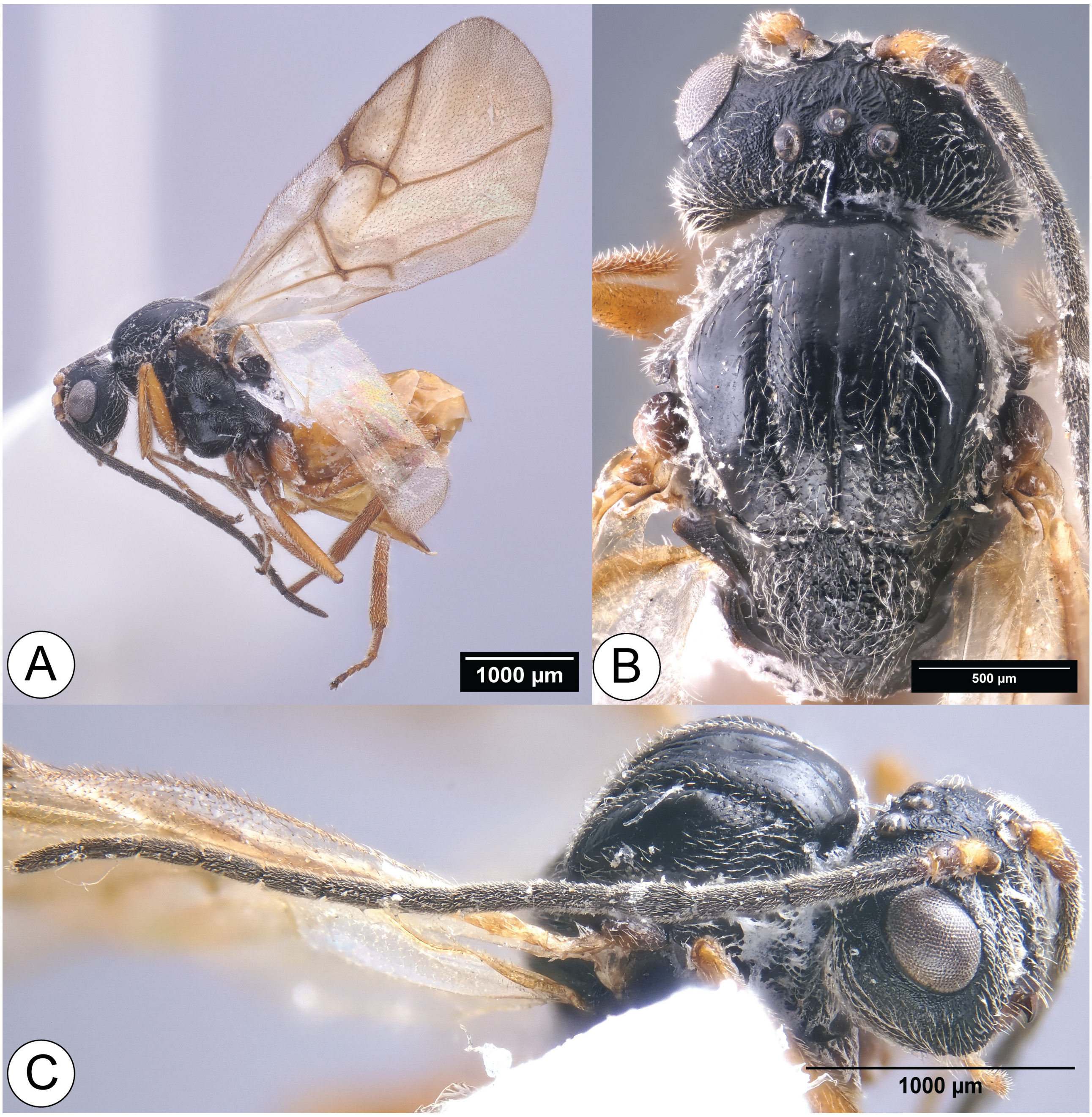

FIGURE 3. *Diplolepis nezha*. **A)** Lateral habitus. **B)** Head + mesosoma in dorsal view. **C)** Antenna.

***Legs*.** Tarsal claws without basal lobe.

Metasoma. Slightly shorter than head plus mesosoma length (0.9×); in lateral view, slightly longer than high. In dorsal view, second metasomal tergite takes up more than half of the metasoma; micropunctures present on all tergites (Fig. 4A). Hypopygium plough-shaped, shining, smooth and large; prominent part of the ventral spine of the hypopygium very thin, 3× longer than broad, with sparse white setae, apical setae short, not extending behind the apex of the spine (Fig. 5C).

FIGURE 4. *Diplolepis nezha*. **A)** Dorsal habitus. **B)** Fore wing.

Male. Unknown.

Gall. Uniocular, integral leaf gall on or close to lateral veins of *R. chinensis var. spontanea*, shape round but flattened in plane of leaf, with central pit in upper and lower surfaces; coloration pale yellow-green; texture shiny and waxy; length 2–3mm, diameter 5–6mm on upper surface, 8–12mm on lower surface (Fig. 5E, 3F). Fresh in October, wasp emergence in March in laboratory conditions.

Etymology. Named after Ne Zha, a rebellious and fiery child-deity in Chinese mythology emerged from a ball of flesh, resembling the round gall this species induces. The name is used as a noun in apposition.

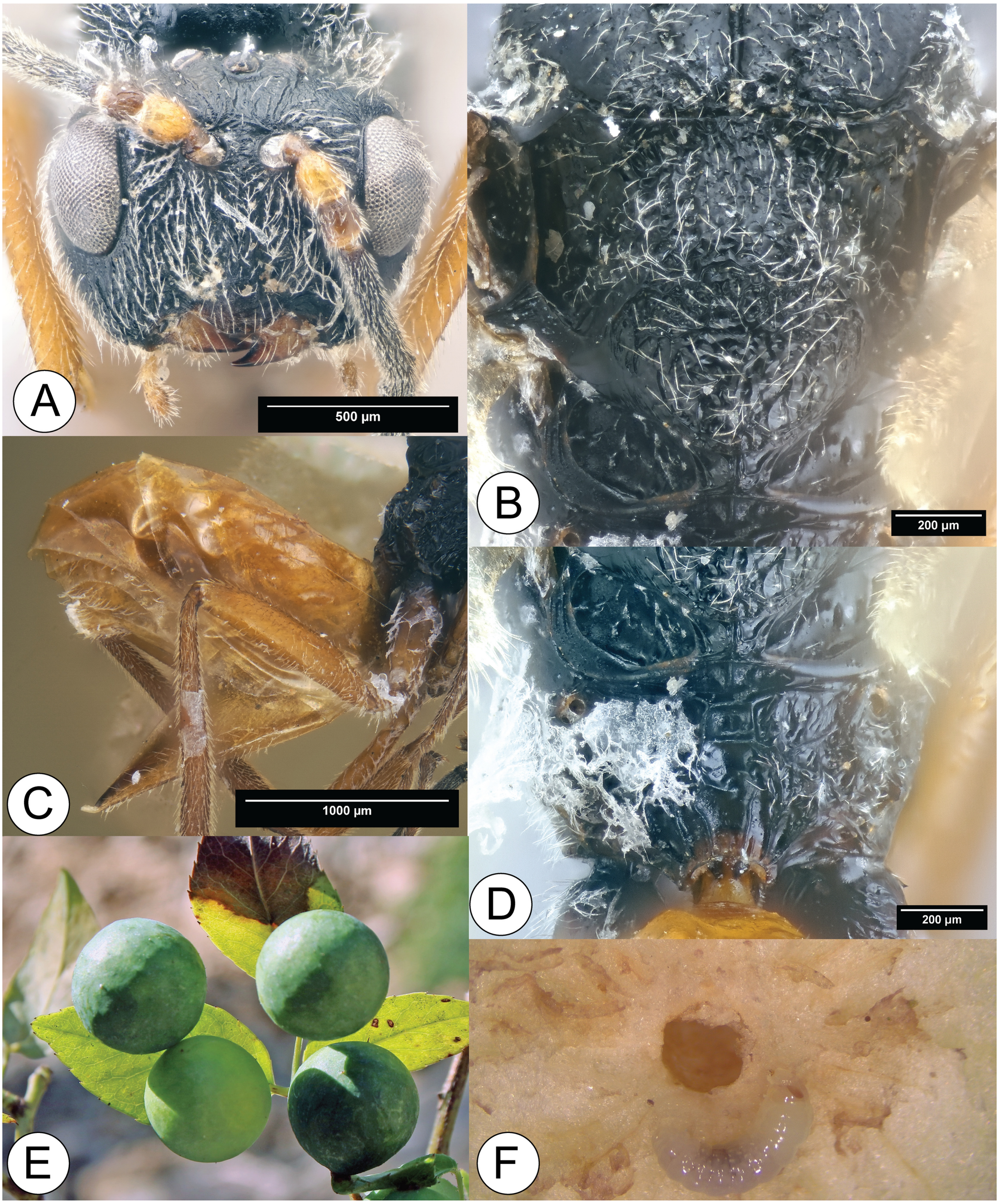

FIGURE 5. *Diplolepis nezha*. **A)** Head in frontal view. **B)** Scutellum. **C)** Metasoma in lateral view. **D)** Propodeum. **E)** Mature galls. **F)** Dissected gall with mature larva.

Key to the species of known Chinese *Diplolepis* (modified from Zhu *et al.* 2021)

1 Radial cell relatively long, at least 2.5× longer than broad **2**
\- Radial cell shorter, around 2.0× longer than broad **3**
2 Radial cell closed, with infuscate veins and 2r vein without projection into the radial cell. Malar distance long, around 0.75× as long as height of compound eye . . . . ***D. flaviabdomenis*** Wang, Liu & Chen
\- Radial cell partially open in anterior margin, without infuscate veins and 2r vein with a projection into the radial cell. Malar distance shorter, around 0.5× as long as compound eye height . . . .***D. abei*** Pujade-Villar & Wang
3 Head strongly transverse in frontal view, at least 1.7× wider than high **4**
\- Head trapezoidal in frontal view, at most 1.5× wider than high. **5**
4 Vertex and mesoscutum smooth and shining. Occiput coarsely punctured . . . . ***D. japonica*** (Walker)
\- Vertex and mesoscutum distinctly alutaceous to coriaceous. Occiput coriaceous . . . . ***D.* nr *japonica***
5\. Head slightly wider than mesosoma (Fig. 3B). Median mesoscutal line present, shallowly impressed, about 1/2 of the entire length of mesoscutum (Fig. 3B). Areolet present or inconspicuous. Occiput rugose to coriaceous (Fig. 3B). Propodeum sparsely setose (Fig. 5D) **6**
\- Head distinctly narrower than mesosoma. Median mesoscutal line absent or only present by a very short depression (extending over 1/10 of mesoscutum length). Areolet present and large. Occiput smooth and shining with striae. Propodeum densely pubescent **7**
6\. Areolet inconspicuous. Frons and occiput coriaceous. . . . .***D. valtonyci*** Zhu, Wang & Pujade-Villar
\- Areolet present and large (Fig. 4B). Frons and occiput rugose to coriaceous (Fig. 3B). China . . . . ***D. nezha*** **sp. n.**
7. Antennae 12-segmented, with scapus and pedicel yellowish-brown. POL around 2.0× longer than OOL. Parapsidal lines absent, almost invisible. Radial cell closed. Third and following metasomal tergites with distinct punctures dorsolaterally. ***D. hunanensis*** Wang, Rui, Liu & Chen
- Antennae 14-segmented, with scapus and pedicel black. POL around 3.0× longer than OOL. Parapsidal lines distinct and extending almost the entire length of mesoscutum. Radial cell completely open in margin. All metasomal tergites without punctures. . . . .***D. minoriabdomenis*** Wang, Rui, Liu & Chen

Orthopelma aobing Hu, Zhang, Dal Pos, McCormack & Fang, sp. nov.

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Figures 6–8

Materials examined. HOLOTYPE: 1F, **CHINA**: Sichuan Province, WangCang County, TianXingQiao S2, MengZi Village, GaoYang Town, ex *Rosa chinensis var. spontanea* (EM-Morpho-186), 32.286N, 106.283E, 510m, gall collected 18.XI.2018 (EM-3399), adult emerged 8.III.2019 (Tube-08309), leg. ZhiQiang Fang. PARATYPE: 1F8M, same as holotype; deposited at EBRRS.

Diagnosis: *Orthopelma aobing* belongs to the *superbum*-group (*sensu* Kasparyan 2011), which comprises three described species: *Orthopelma superbum* Kasparyan, 1984 from Uzbekistan, *O. dodecameron* Kasparyan, 2011 from Kyrgyzstan, and *O. mukriyana* Riedel, 2024 from Iran and Georgia. Members of the *superbum*-group have very short malar space (Fig. 7A), eyes strongly convergent towards clypeus, antennae with 10–11 flagellomeres, apical flagellomere as long as 2–3 preceding segments together (Fig. 7D), and ovipositor sheath about 0.5–0.6× as long as hind tibia (Fig. 6A) (Kasparyan 2011). *Orthopelma aobing* runs to couplet two of Kasparyan's (2011) key to the West Palearctic species of the genus, and it differs from the other members of the *superbum*-group by the following combination of characters: coloration of the pronotum, mesonotum and upper part of mesopleuron (red in *O. superbum* vs. black in *O. aobing*); antenna (black in *O. dodecameron,* reddish-yellow in *O. mukriyana* vs. yellowish-brown in *O. superbum* and *O. aobing*); and number of flagellomeres (12 in *O. mukriyana*, 10–11 in *O. superbum*, *O. dodecameron*, and *O. aobing*). Additional characters to consider: the overall coloration of the head (especially the ventral section) is much lighter than in the other species, with base of mandibles and clypeus yellowish, while the face is dark brown (and not fully black). *Orthopelma aobing* also runs to couplet two of Zhang's (2025) key which includes all known East Asian *Orthopelma* species. However, these species are actually all in the *mediator*-group, which can be distinguished from the *superbum*-group using the characteristics listed above (Kasparyan 2011).

Description. Female. Body length 3.2–4.1 mm (n = 2).

Color. Antenna with ventral side of scape and pedicel light brown, dorsal side plus all flagellomeres brown or yellow (Fig. 7D). Head black; labrum yellow and mandibles light brown with black tips (Fig. 7A). Anterior edge of pronotum with tinge of brown; rest of mesosoma black; fore and mid coxa, all trochanters yellow, fore and mid legs light brown; hind coxa, femur, tibia, and tarsomeres brown (Fig. 6A). Metasomal tergites 1–2 with light brown

FIGURE 6. *Orthopelma aobing*. **A)** Lateral habitus. **B)** Dorsal habitus.

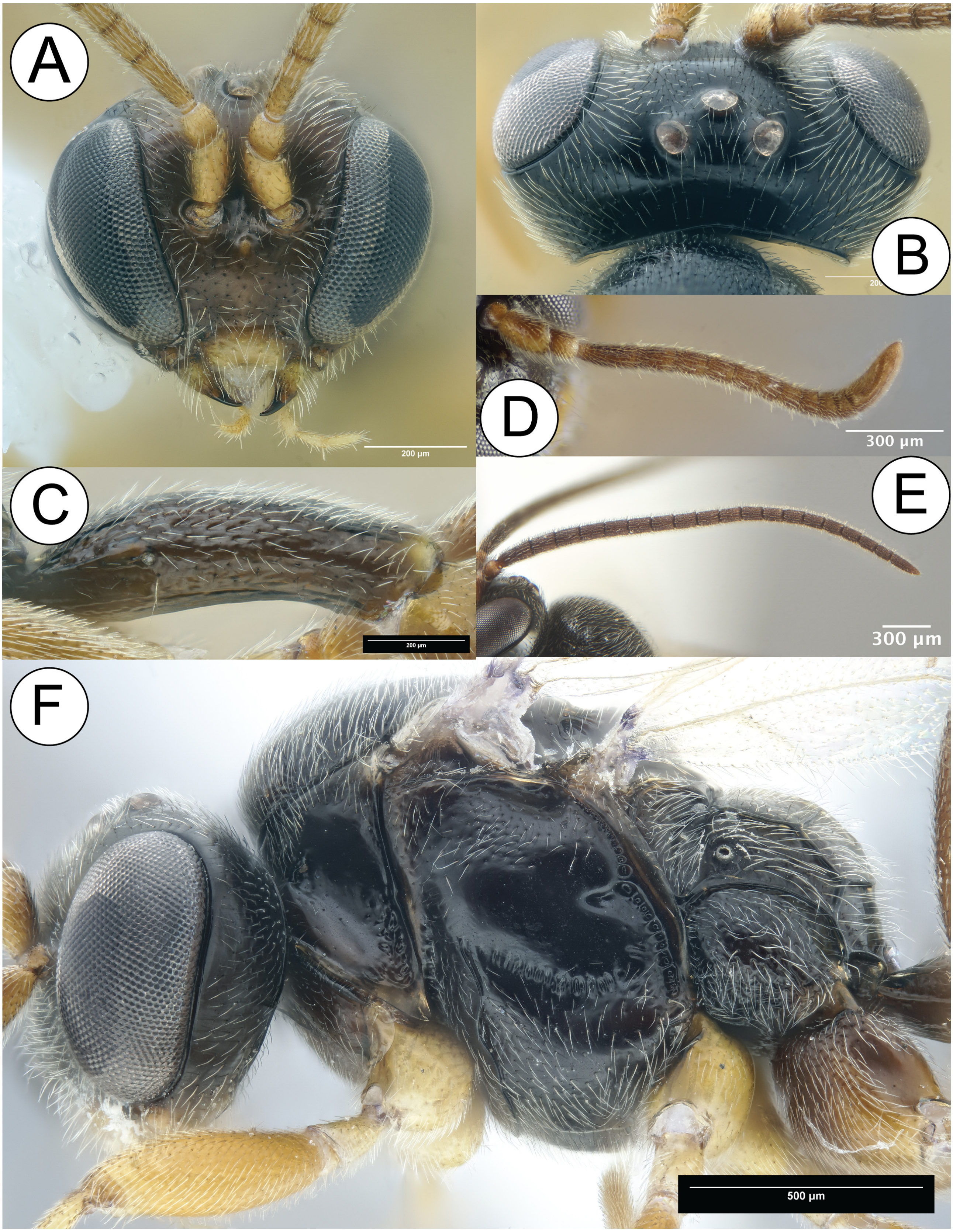

FIGURE 7. *Orthopelma aobing*. **A)** Head in frontal view. **B)** Head in dorsal view. **C)** Petiole in lateral view. **D)** Female antenna. **E)** Male antenna. **F)** Head + mesosoma in lateral view.

infuscation in the anterior edge, petiole and rest of tergites dark brown; ovipositor sheath dark brown (Figs. 6A, 6B, 8C, 8D).

Head. Eyes with inner margins converging strongly ventrally, frons setose (Fig. 7A); transfacial distance between compound eyes and below antennal toruli about 1.6× that of the minimal distance between the lower edge of compound eyes; Malar space 0.45× as long as basal width of mandible; malar groove absent. Ratio of POL: OOL: LOL = 2: 2.3: 1 (Fig. 7B).

Antenna. 12–13-segmented (10–11 flagellomeres), moniliform; apical segment 5.8× that of the preceding segment (Fig. 7D); seven basal flagellomeres combined 1.2× longer than eye. Ratio of scape: pedicel: F1–11 for the holotype female with 13 segments is: 3.9: 2.1: 4.6 :2.8 :2.1 :2 :2.3 :1.9 :1.8 :1.6 :1.2 :1.2 :1 :5.8 (Fig. 7D).

Mesosoma. Pronotum with epomia (Fig. 7F). Mesoscutum smooth, strongly convex anteriorly, densely setose with punctures; notaulus almost absent. Scutellum without transverse carinae (Fig. 8A). Mesopleuron shiny and smooth, setose on the anterodorsal third and ventrally below sternaulus. Sternaulus strong, extending to the posterior

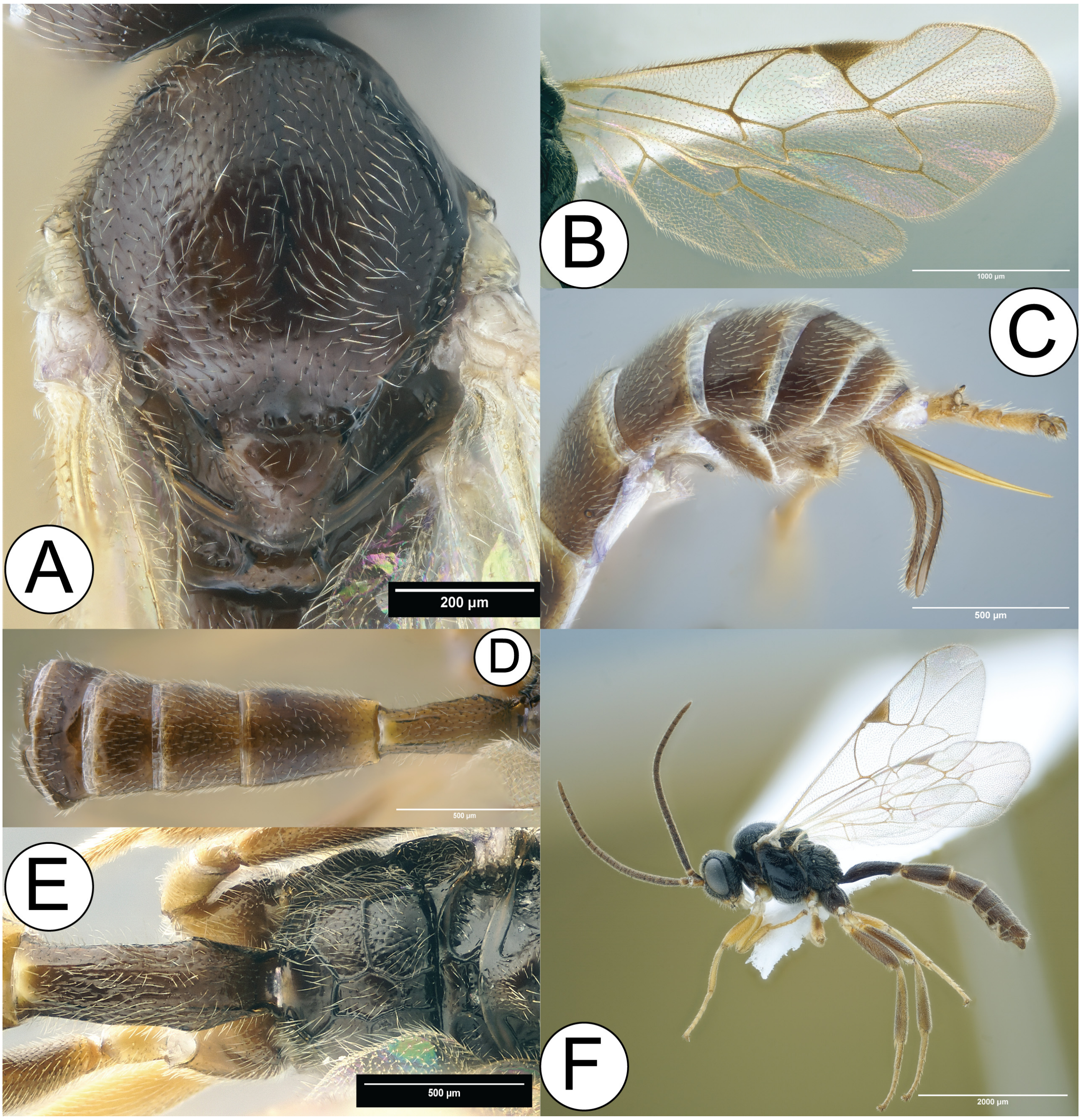

FIGURE 8. *Orthopelma aobing*. **A)** Mesosoma in frontal view. **B)** Fore wing. **C)** Metasoma in lateral view. **D)** Metasoma in dorsal view. **E)** Propodeum + petiole in dorsal view. **F)** Lateral habitus of male.

fifth of mesopleuron. Strobe prominent and deep, reaching about ¼ of the way of the mesopleuron from the posterior edge (Fig. 7F). Propodeum with areola separated from basal area by a shallow basal transverse carina, flask-shaped; constricting centrally and slightly dilated on either sides; areolet 1.2× as long as wide, setose (Fig. 8E). Petiolar area smooth and shiny, hexagonal (Fig. 7C, 6D, 6E).

Legs. Spurs of hind tibia subequal (Fig. 6A).

Fore wing. Fore wing with 1cu-a distad of M; 1cu-a slanted, posteriorly bending perpendicularly to 1-A (Fig. 8B).

Metasoma. Dorsolateral carinae of tergite 1 distinct from base to level of spiracles; ventrolateral carinae complete and strong; tergite 1 2.8× as long as wide; tergite 2 1.7× as long as the width of its hind margin; tergite 3 1.2× as wide as tergite 2, 0.6× as long as tergite 2 (Fig. 8D, 6E). Ovipositor sheath straight, 0.5× as long as hind tibia and 0.8× as long as 2nd tergite (Fig. 8C).

Male. Body length 4.5–5.1 mm (n = 6). Antennae entirely dark brown. Antenna with 21–22 flagellar segments, moniliform; apical segment 1.5–2.4× that of the preceding segment (Fig. 7E) Fore and mid coxae yellowish brown, hind coxa dark brown; all trochanters I brownish with white apical half; all trochanters II entirely yellow. Fore leg yellowish, mid and hind legs brownish, tarsal claw dark brown. Metasomal tergites all dark brown, Sternites 2–6 with whitish-yellow median longitudinal fold (Fig. 8F). Other structural features and coloration similar to females.

Variation. The number of antennae ranges from 12–13 in females, and 21–22 in males.

Biology. Parasitoid of *Diplolepis nezha*, emerging at the same time of the year (March) as host.

Etymology. Named after Ao Bing, the long, slender dragon prince and rival of Ne Zha, symbolizing the parasitoid's role as the gall inducer's adversary. The name is used as a noun in apposition.

Key to the species of female *Orthopelma superbum*-group (modified from Kasparyan 2011 and Karimi *et al.* 2024)

1. Malar space very short. Inner orbits very strongly convergent to clypeus, maximal distance between eyes on frons about 2.5× as great as minimal distance between eyes on lower part of face. Flagellum very short, 10–11-segmented; its segments 1–7 or 1–8 combined as long as maximum diameter of eye; apical flagellomere as long as 2–3 preceding segments together. Ovipositor sheath about 0.5–0.6× as long as hind tibia . . . . **2 [*superbum*-group]**

\- Malar space distinct. Inner orbits rather weakly convergent to clypeus, maximal distance between eyes on frons 1.15–1.5× as great as minimal distance between eyes on lower part of face. Flagellum longer, 13–19-segmented; only three or fore its basal segments combined as long as maximum diameter of eye; apical flagellomere shorter, or sometimes as long as two preceding segments together. Ovipositor sheath usually 0.8–1.5× as long as hind tibia . . . . **[*mediator*-group]—**not treated here

2. Pronotum, mesonotum and upper part of mesopleuron red. Hind tibia white dorsally and darkened ventrally. Uzbekistan . . . . ***O. superbum*** Kasparyan

\- Mesosoma completely black (Figs. 7F, 8A), with only tegulae yellow (one species). Hind tibia yellowish-brown to brown . . **3**

3. First metasomal tergite brown, concolorous with the rest of metasoma (Fig. 8D). Flagellum with 10–11 flagellomeres (Fig. 7D). Base of mandibles and entire clypeus yellowish-brown, face dark brown (Fig. 7A); Antenna brownish yellow (Figs. 6A, 7D). China. . . . . ***O. aobing* sp.n.**

- First metasomal tergite black; metasoma from reddish-brown to brown. Head entirely black; antenna either entirely black or reddish-yellow **4**

4. Flagellum with 12 flagellomeres, seven basal flagellomeres combined 1.25× longer than eye. Minimal width of face 0.6× as wide as maximal width of frons. Fore trochanter yellow or reddish. Malar space 0.45–0.50× as long as width of mandibular base. Iran, Georgia . . . . ***O. mukriyana*** Riedel

- Flagellum with 10–11 flagellomeres, seven basal flagellomeres combined 0.93× longer than eye. Minimal width of face 0.4× as wide as maximal width of frons. Fore trochanter black with yellow apex. Malar space 0.25× as long as width of mandibular base. Kyrgyzstan. . . . .***O. dodecameron*** Kasparyan

Discussion

Extensive sampling is crucial for reconstructing global phylogenetic relationships and conducting biogeographic analyses. In China, the five previously recorded species of *Diplolepis*, as well as undescribed species known only from larvae (Zhu *et al.* 2021), are from eastern (Shandong, Zhejiang, Jiangsu), central (Hunan), northeastern (Liaoning, Jilin, Heilongjiang), and northwestern (Gansu) regions. *Diplolepis nezha* collected from Sichuan represents the first species recorded from southwestern China—a recognized biodiversity hotspot and a major center for both the distribution and diversification of *Rosa*, which supports a wide range of wild rose species and likely harbors additional, undiscovered *Diplolepis* species (Xu 2001, Liu *et al.* 2003). The host of *D. nezha*, *R. chinensis* var. *spontanea*, is a rare, endemic rose species in China that was recently classified as a National Class II Key Protected Wild Plants by the National Forestry and Grassland Administration (Lu *et al.* 2021, http://www.forestry.gov.cn/c/www/lczc/10746.jhtml). It has a limited distribution across central to southwestern China (Liu *et al.* 2003). Given this restricted range, *D. nezha* is also likely to be a threatened species in need of conservation. This situation is similar to that of the recently described *D. ogawai*, which is known only from an endemic host, *R. hirtula*, with a narrow distribution in Hongshu Japan (Abe *et al.* 2023).

In terms of phylogenetic relationships, *D. nezha* is recovered as the sister to all other Palearctic Leaf 2 clade (*sensu* Zhang *et al.* 2020), which includes species that induce spherical, unilocular, leaf galls that range from smooth to very spiny (Fig. 1). This clade includes mostly Eastern Palearctic species, with only two Western Palearctic species (*D. eglanteriae* and *D. nervosa*) that are distantly related to each other. These multiple westward incursions from the Eastern Palearctic suggest a potentially complex biogeography that warrants further study.

The subfamily Orthopelmatinae, among the early-branching lineages of Ichneumonidae (Dal Pos & Sharanowski 2024), has an unresolved biogeographic origin (Barron 1977). *Orthopelma aobing* is the third *Orthopelma* species recorded in mainland China after *O. brevicorne* (Sun *et al.* 2020) and *O. chinensis* (Zhang 2025). It is also the first East Asian/confirmed species from the *superbum*-group to have host and molecular data and is recovered as sister to an unidentified *Orthopelma* species from the UK (Fig. 2). This also constitutes the easternmost record of the *superbum*-group as well as the first species with male specimens, as other species within the group had previously only been discovered in Central Asia and are known only from female specimens (Kasparyan 1984, 2011; Karimi *et al.* 2024). The potentially high yet largely undocumented diversity of potential hosts of *Diplolepis* and *Diastrophus* in Asia may hint at a broader, undiscovered species richness of *Orthopelma* in the region.

Although some studies have suggested an eastern Palearctic origin for Diplolepididae, the absence of comprehensive taxonomic work has hindered further progress (Zhang *et al.* 2020; Abe *et al.* 2023). Regional and global revisions of both *Diplolepis* and *Orthopelma* are urgently needed, as many species descriptions lack diagnostic photographs and molecular data, and key biological traits—such as male morphology and host associations—remain unknown. Combined with the limited accessibility of type specimens, these gaps continue to challenge efforts to produce an integrated and thorough taxonomic synthesis of these groups.

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