




## *Nymphomyia aijuanae* sp. nov.—a new species of archaic nymphomyiids (Diptera: Nymphomyiidae) from Oriental China

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The family Nymphomyiidae was separated from other dipterous insects following the discovery of *Nymphomyia alba* Tokunaga from Central Honshu of Japan (Tokunaga 1932). At the present time there are 9 extant species of the genus *Nymphomyia* Tokunaga, 1932 in the world, including *N. alba* Tokunaga, 1932 (Japan, Russian Far East—Kunashir Island), *N. walkeri* Ide, 1964 (East Canada and USA), *N. brundini* Kevan, 1970 (East Himalaya), *N. levanidovae* Rohdendorf et Kalugina, 1974 (Russian Far East—South Primorye and upper streams of Bikin River), *N. rohdendorfi* Makarchenko, 1979 (Russian Far East—Primorye Territory, Amur River basin, Kolyma River basin, Chokotka Region), *N. dolichopeza* Courtney, 1994 (Eastern USA), *N. holoptica* Courtney, 1994 (Hong Kong; Borneo), *N. kaluginae* Makarchenko, 2013 (Russian Far East—Zeya River basin of Amur River basin), *N. kannasatoi* Makarchenko et Gunderina, 2014 (Japan—Honshu, Russian Far East—South Sakhalin) (Courtney 1994; Makarchenko 2013; Makarchenko *et al.* 2014; Yavorskaya & Makarchenko 2015; Makarchenko & Gunderina 2019; Makarchenko 2022). Additionally, pupal exuviae of *Nymphomyia* were discovered in Northern Mongolia, Altai (Hayford & Bouchard 2012) and larvae of *N. rohdendorfi* were found in Altai Mountainous Country of Russia (Yanygina & Makarchenko 2023). Two fossil species are also known, *N. succina* Wagner, Hoffsins et Hoffsins, 2000 from the Eocene (Baltic amber) (Wagner *et al.* 2000) and *Nymphomyia alissae* Wagner et Müller, 2020 from Cretaceous (Burmese amber) (Wagner & Müller 2020), as well as subfossil larvae of *N. gr. rohdendorfi* known from Onon Lake of Irkutsk Region (Enushenko & Makarchenko 2019).

Below we describe a new species *Nymphomyia aijuanae* sp. nov. based on adult males and females, which represents the tenth extant species in the world, and also the second nymphomyiid species in China.

### Material and methods

The adults were cleared in 10% KOH and slide-mounted in Euparal and polyvinyl lactophenol. The morphological terminology used below generally follow Courtney (1994) and Makarchenko & Gunderina (2012). The photographs were taken using an Axio Lab.A1 (Karl Zeiss) microscope with an AxioCam ERc5s digital camera, and then stacked using Helicon Focus software. The final illustrations were post-processed for contrast and brightness using Adobe® Photoshop® software.

Holotype and some paratypes are deposited in the Life Science and Technology College, Jinan University, Guangzhou, China and some paratypes are kept in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Vladivostok, Russia.

### Taxonomy

*Nymphomyia aijuanae* Makarchenko et Tang, sp. nov.

<http://zoobank.org/NomenclaturalActs/9526CE0B-557F-4830-B5F8-F06F811A886A>

(Figs 1–12)

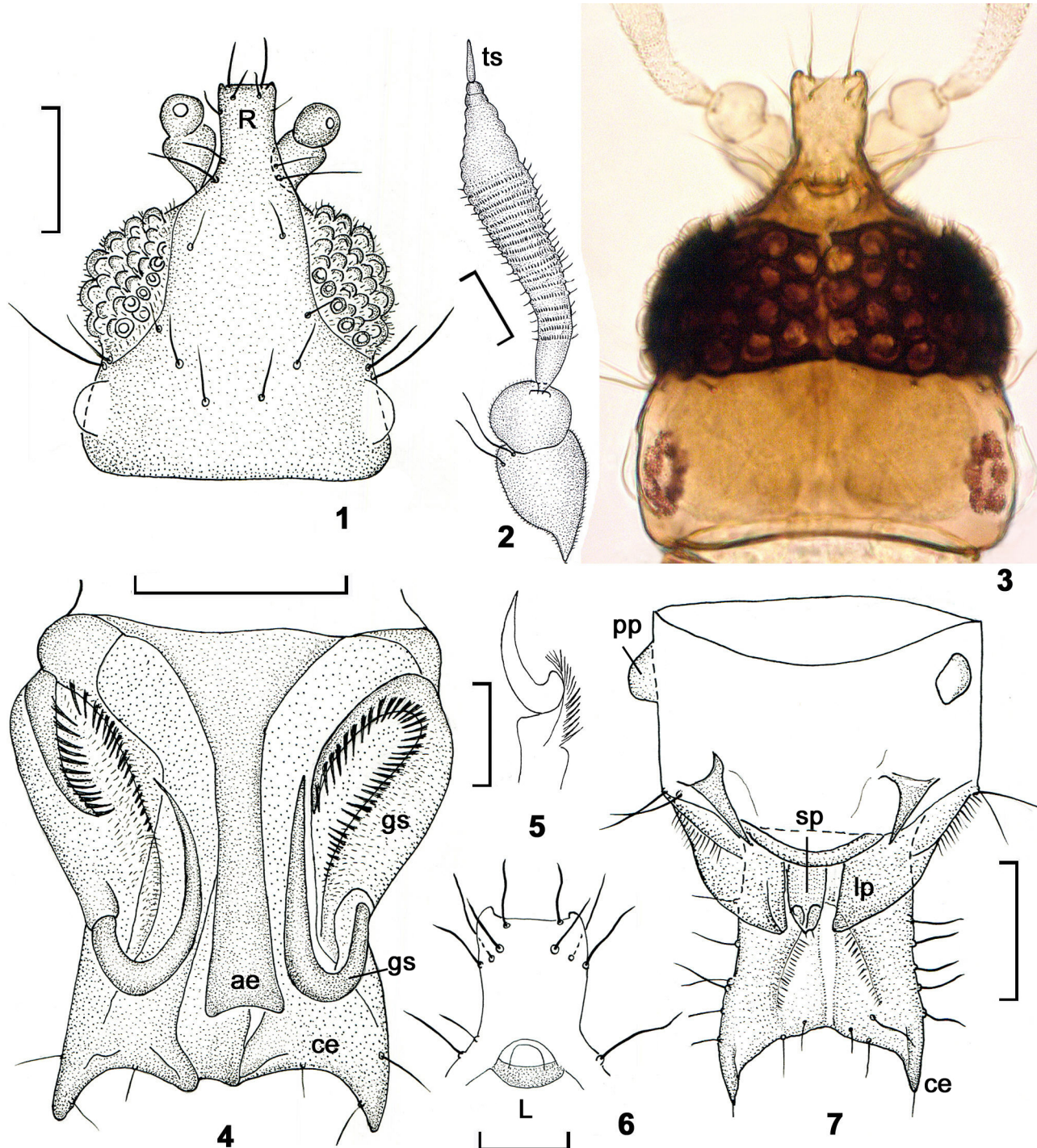
**Type material.** Holotype, CHINA: Fujian Province, Wuyi Mountain National Park, Tongmu Village, swept at the dawn

over a bridge across a small stream, 05.VIII.2014, leg. Hongqu Tang. Paratypes: 4 adult males, 3 adult females, the same data as holotype.

**Derivatio nominis.** The species epithet *aijuanae* recognizes HQ's former student Aijuan Liao from University of Lausanne who transported the type material from Asia to Europe during the pandemic era.

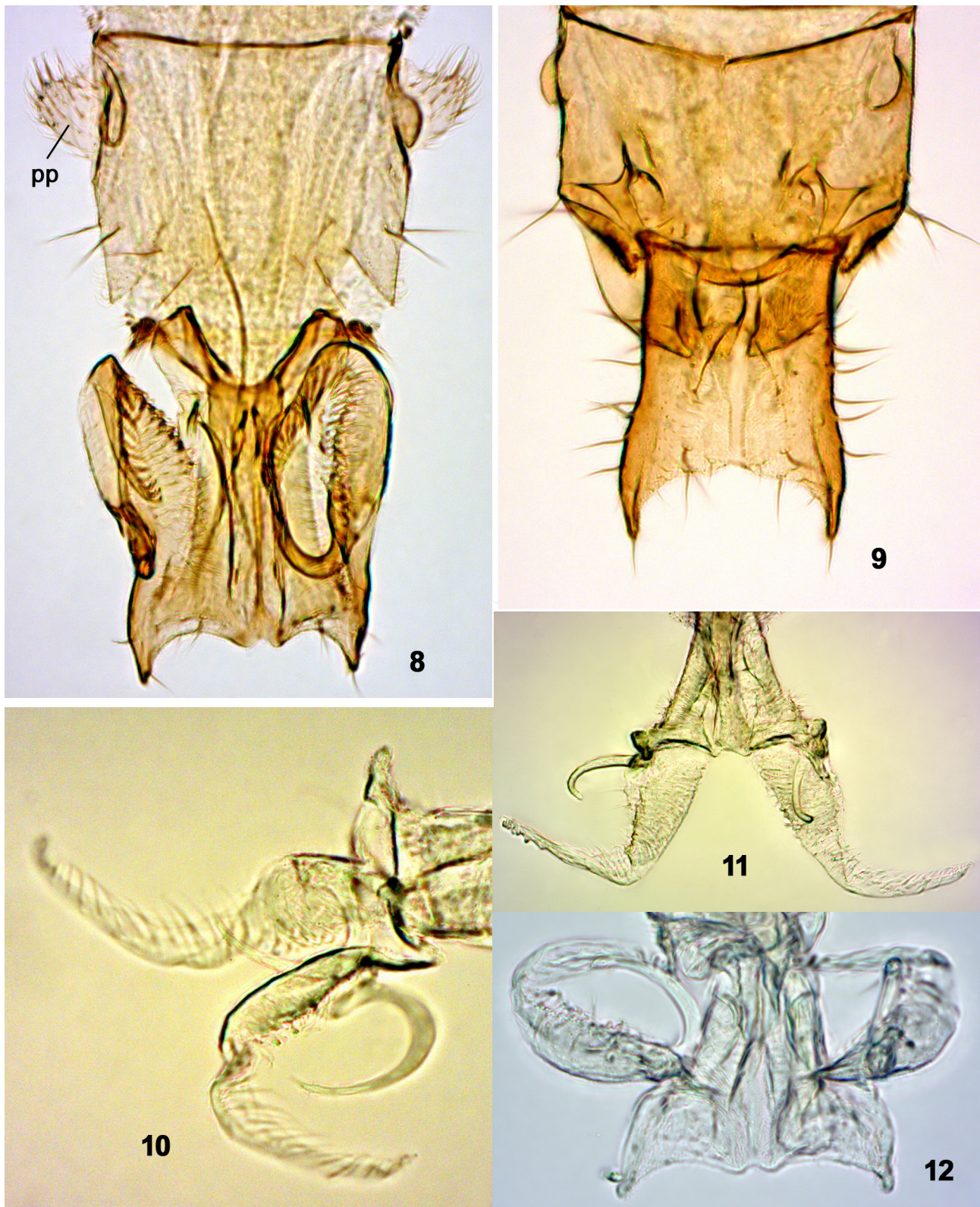
#### Description

**Adult male** (n=5, except when otherwise stated). Pale grey, weak chitinated. Total length 1.61–1.86 mm. Total length/wing length 1.30–1.67.



**FIGURES 1–7.** Adult male (1–6) and female (7) of *Nymphomyia aijuanae* sp. nov. 1, head in dorsal view; 2, antenna; 3, head in ventral view; 4, 7, terminalia in ventral view; 5, fore-tarsal claw; 6, rostrum and labium in ventral view. ae—aedeagus; ce—cerci; gs—gonostylus; pp—paratergal projections; sp—sternite IX median process; lp—sternite IX lateral process; ts—terminal antennal sensilla; R—rostrum; L—labium. Scale bar for Figs 1, 4, 6–7—50 µm; for Figs 2, 5—20 µm.





**FIGURES 8–12.** Adult male (8, 10–12) and female (9) of *Nymphomyia aijuanae* sp. nov. 8, terminalia with gonostylus in folded state; 9, terminalia in ventral view; 10, gonostylus in expanded state, lateral view; 11–12, terminalia with gonostylus in expanded state, ventral view. Abbreviations are the same as in Figs 1–7.



Head 140–164  $\mu\text{m}$  long and 118–140  $\mu\text{m}$  wide, gradually narrowed anteriorly and ends rostrum (Figs. 1, 3), which truncate, dorsally with 3–4 pairs of setae. Compound eyes with microtrichiae, on the dorsal side of the head are wide apart (Fig. 1), distance between them in 2.2–2.3 times width of the end of rostrum. Ommatidia of compound eyes contiguous ventrally, contact between three pairs of facets (Fig. 3). Antenna 122–134  $\mu\text{m}$  long, with two rounded basal segments, 1<sup>st</sup> segment 28–33  $\mu\text{m}$  long, 2<sup>nd</sup> segment 18  $\mu\text{m}$  long, 3<sup>rd</sup> segment long (82–88  $\mu\text{m}$ ), slightly extended to the top, with apical terminal sensilla 9  $\mu\text{m}$  long (Fig. 2); antenna 0.74–0.82 times shorter than head. Labium as in Figs 3, 6, laterally without setae.

Thorax length 0.40–0.46 mm, which carrying a pair of boomerang-shape wings, halteres and 3 pairs of legs; wing length 1.15–1.31 mm, maximum width 0.15–0.16 mm, with reduced venation, on the edge with whip-shape setae 0.21–0.30 mm long; halteres 0.16 mm long. Empodium of foretarsus short, not extending beyond apex of tarsal claws; claws with prominent basal tooth (Fig. 5). Structure of legs and thorax are the same as *N. alba* described in detail by Tokunaga (1935).

Terminalia (Figs 4, 8, 10–12). Abdomen 1.2–1.4 mm long. Segment VII with pair of small tubercles in anterolateral part, 6–8  $\mu\text{m}$  long. Tergite VIII in posterolateral angles with patch of short setae. Segment VIII anterolaterally with 2 pairs of short paratergal projections. First pair as bare small protrusions in the form of tubercles, 16  $\mu\text{m}$  long. Second pair in form of rounded triangular projections covered with short strong setae, 28–32  $\mu\text{m}$  long (Fig. 8). Last abdominal segment dorsally with cerci, in ventral side with of gonocoxites, gonostylus and aedeagus; gonocoxites and cerci fused indistinctly. Cerci distally expanded, ending in two finger-like projections. Aedeagus length of 68–70  $\mu\text{m}$  long, with straight or slightly concave apex (Fig. 4). Gonostylus with two branches—bare sickle-shaped, 44–68  $\mu\text{m}$  long and serrate elongated, 52–72  $\mu\text{m}$  long, slightly curved, with numerous setae along the inner edge (Figs 4, 8); gonostylus is folded at rest (Figs 4, 8), and straightens out during flight and copulation (expanded state) (Figs 10–12).

**Adult female** (n = 3, except when otherwise stated) in general similar to male. Total length 1.67–1.84 mm. Total length/wing length 1.47–1.60.

Head length 131–157  $\mu\text{m}$ , width—130–132  $\mu\text{m}$ . Compound eyes with microtrichiae, on the dorsal side of the head are wide apart. The distance between the compound eyes dorsally 2.3–2.5 times the width of the end of the rostrum. Ommatidia of compound eyes contiguous ventrally, contact between three pairs of facets. Antenna 122–148  $\mu\text{m}$  long; antenna 0.93–0.95 times shorter than the head.

Thorax length 0.40 mm. Wing length 1.13–1.15 mm, maximum width 0.15–0.16 mm. Edge with whip-shape setae 0.21–0.30 mm long; halteres 0.18 mm long.

Terminalia (Figs 7, 9). Segment VII with pair of small tubercles in anterolateral part. Segment VIII with pair of small lateral paratergal projection 8–12  $\mu\text{m}$  long. Tergite VIII in posterolateral angles with patch of short setae. Sternite VIII posterolaterally with pair of wedge-shaped projections 30–32  $\mu\text{m}$  long. Sternite IX median process elongated, with a rounded top, 44  $\mu\text{m}$  long. Sternite IX lateral processes wide triangular, 34–36  $\mu\text{m}$  long. Cerci distally expanded, ending in narrow projection, at top of which there is seta 12–16  $\mu\text{m}$  long.

**Diagnosis.** Adult (male and female). Rostrum truncate, dorsally with 3–4 pairs of setae. Compound eyes with microtrichiae, ommatidia contiguous ventrally, contact between three pairs of facets. Antenna 0.74–0.82 times shorter than head, with one apical terminal sensilla. Labium laterally without setae. Empodium of foretarsus short, not extending beyond apex of tarsal claws; claws with prominent basal tooth.

Male terminalia. Segment VII with pair of small tubercles in anterolateral part. Tergite VIII in posterolateral angles with patch of short setae. Segment VIII anterolaterally with 2 pairs of short paratergal projections, from which first pair as bare small protrusions in the form of tubercles, second pair in form of rounded triangular projection covered with short strong setae. Cerci distally expanded, ending in two finger-like projections. Aedeagus with straight or slightly concave apex. Gonocoxites fused broadly to cerci. Gonostylus with two branches—bare sickle-shaped, sclerotized one, and serrate, elongated, slightly curved another, with numerous setae along the inner edge; gonostylus is folded at rest and extends out (expanded state) during flight and copulation.

Female terminalia. Segment VII with pair of small tubercles in anterolateral part. Segment VIII with pair of small lateral paratergal projections. Tergite VIII in posterolateral angles with patch of short setae. Sternite VIII posterolaterally with pair of wedge-shaped projections. Sternite IX median process elongated, with rounded top. Sternite IX lateral processes wide triangular. Cerci distally expanded, ending in narrow projection, at top of which there is seta.

Adults of a new species are closely related to *N. holoptica* from Hong Kong. Males of both species have bifurcate gonostylus, but *N. holoptica* with branches of gonostylus which similar shape as curved lobes and same sizes. Segment VIII anterolaterally with one pair of short paratergal projections in form of tubercles. *N. aijuanae* **sp. nov.** with branches



of gonostylus of different sizes and lengths. One branch bare sickle-shaped, second branch more long, elongated, slightly curved, with numerous setae along the inner edge. Segment VIII anterolaterally with 2 pairs of short paratergal projections, from which first pair (ventral one) as bare small protrusions in the form of tubercles, second pair in form of rounded triangular projections covered with short strong setae. Females separate in different shapes and sizes of cerci, structure of sternites VIII–IX and tergite VIII. So, sternite VIII of new species posterolaterally with pair of wedge-shaped projections which are absent in *N. holoptica*.

**Ecology and distribution.** Adults were collected near a small stream in Wuyi Mountain National Park, Tongmu Village of Fujian Province (Figs 13–14), located at an altitude of about 800 m a.s.l., with water temperatures 11.1–12.5 °C, conductivity 9.0–13.5 µS/cm, pH 6.45–6.95; substrate of stream bed is mainly some cobble and pebble.



**FIGURES 13–14.** Locality of *Nymphomyia aijuanae* sp. nov. CHINA: Fujian Province, Wuyi Mountain National Park, Tongmu Village, unnamed stream (Photos by Hongqu Tang).

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