

## Four New Species of Trichoptera from Japan

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Four new species of caddisflies are described in this paper; two belong to *Rhyacophilidae* and the others to *Philopotamidae* and *Sericostomatidae*.

### 1. *Rhyacophila nakagawai* sp. nov. (Plate 3)

Head darkish brown, with eight warts; warts clothed with long hairs and bristles. Ocelli present. Eye prominent, larg. Maxillary palpi five-jointed, blackish brown, pubescent; the two basal joints short and stouter than the others, with a few black bristles, the second being the longer; the third and the fourth joints long and slender, nearly equal in length; the fifth one not so long as two preseding, united and still more slender. Labial palpi blackish brown, three-jointed, clothed blackish hairs; the basal joint short and stout; the terminal joint longer than the second one, articulated.

Pronotum blackish brown, warts clothed with long hairs. Mesonotum blackish brown, without wart.

Anterior wing elongated, shorter than the length of the antennae; membrane of the wing darkish grey; there is sparse covering of golden and brown hairs; pterostigma brown, clothed with brown hairs; the venation resembles *R. fuscula*; descoidal cell open; cross-vein of thyridial cell and apical portion of Cu hyaline; wing margin with long hairs.

Posterior wing elongated, darkish grey, clothed with brown hairs; as wide as the width of anterior wing; pterstigma brown, clothed with brown hairs, the venation resembles *R. fuscula*; r-m and cross-vein of thyridial cell hyaline; posterior marign of wing with long brown hairs.

Spurs 3, 4, 4. All tergite darkish brown, clothed with darkish brown hairs; pleurite and sternite lightly brown; pleurite with darkish brown spots. Coxa and tibia darkish brown; tarsus blackish brown; femur lightly brown; spurs darkish brown, claw long, brown. Tibia and tarsus clothed with darkish brown hairs.

The tenth tergite diveded three-lobes; the center of the middle lobes prodeuce in trifed pleat with its margin closely beset with short bristles; the other lobes nearly triangle, apical margin with darkish brown hairs. Clasper two-jointed; the basal joint thicker and longer than the second; the second joint clothed with darkish brown hairs, rounded at the apex. Lower penis cover short, hairy, rounded at the apex.

Measurement : Holotype, body 9mm, anterior wing 9mm, posterior wing 8.5mm.

Holotype : Male (M. 2028) in alcohol ; Riv. Nakagawa, Hōkisawa, Yamakita-machi, Ashigara-gun, Kanagawa Prefecture ; collected by M. Kobayashi.

This species closely resembles *R. fuscula* in the venation of the both wings, but is distinguished from the latter by the struture of the genitalia.

The specific name *nakagawai* came from the collected site.

The type specimens mentioned above are deposited in the Kanagawa Prefecture Museum, Yokohama, Japan.

## 2. *Rhyacophila hayakawai* sp. nov. (Plate 3)

Head brown, with seven warts ; warts with long brown hairs. Ocelli present. Antennae two-thirds of the length of the anterior wing ; the basal joint brown, thick, with long brown hairs ; the second joint brown, thin, one half of the length of the basal one, clothed with short brown hairs ; other joints yellowish brown, thinner than the second one, clothed with short brown hairs ; the basal portion of the each joints brown in the color.

Maxillary palpi five-jointed, yellowish brown ; the first two joints very short, clothed with long brown hairs ; the following joints long, clothed with short brown hairs, cylindrical ; the terminal joint not articulated, acuted at the apex.

Labial palpi three-jointed, yellowish brown, clothed with brown hairs ; the first joint thicker than the other ones ; the basal portion of the second joint thin ; the terminal joint as long as the second one, acuted at the apex.

Pronotum brown, wart with long brown hairs. Mesonotum brown ; mesoscutum with few long brown hairs ; mesoscutellum with long brown hairs ; metascutellum without wart.

Spurs brown, 3, 4, 4 ; meso and meta-pleuron brown ; coxa brown, clothed with pale yellow hairs ; the outside of the femur brown, with pale yellow hairs. Tibia and tarsus pale yellow, clothed with brown hairs ; the each joints of tarsus with short bristle.

Anterior wing pale brown, clothed with brown hairs, with anal cell short and with intercostal vein present, without cross-veins ; the vein brown ; the neuration normal, so that R ends at or anterior to the apex of the wing ; discoidal cell open ; forks nos. 1, 2, 3, 4 and 5 present, R forked at its apex. Thyridial cell present, closed by the hyaline vein ; median cell wanted ; posterior margin with long hairs.

Posterior wing lighter than the anterior wing, clothed with brown hairs ; the vein brown ; forks nos. 1, 2, 3, 4 and 5 present ; discoidal cell open, thyrideal cell present, closed by the hyaline vein ; posterior margin with long hairs.

Abdomen pale brown; tergite with numerous black spots; pleurite with reticulate margin. The ninth segment darkish brown; the lateral plate narrower than the dorsal plate; the lateral lobes of the tenth tergite blackish brown; the basal portion thin, the apical portion divided three-lobes; the lateral lobes almost triangularity, apical margin with blackish brown hairs, the central lobes divided two-lobes. Anal sclerite brown, rounded at the apex. The clasper darkish brown, two-jointed, clothed with short darkish brown hairs; the basal joint broad, upper and apical margin emarginated at the middle portion; the lower parts of the apical joint finger-shaped, inner side of the upper portion with a few bristle.

Measurement: Holotype, body 8.5mm, anterior wing 10mm, posterior wing 8mm.

Holotype: Male (M. 2040) in alcohol; Riv. Hayakawa, Hakone, Kanagawa Prefecture; May 12, 1967; collected by M. Kobayashi.

Paratypes: Four males (M. 2025, 2039, 2045, 2047) in alcohol; Riv. Hayakawa, Hakone, Kanagawa Prefecture; May 12, 1967; collected by M. Kobayashi.

This species closely resembles *R. coreana* in shape of the clasper, but is distinguished from the latter by the shape on the whole of the genitalia.

The specific name *hayakawai* came from the collected site.

The specimens recored in this paper are preserved in the Kanagawa Prefecture Museum, Yokohama, Japan.

### 3. *Micrasema hakonensis* sp. nov. (Plate 4)

Head short, yellowish brown, with two pairs warts; warts large, clothed with long brown hairs. Eye larg, as long as the length of the head. Ocelli absent. Antenna yellowish brown, as long as the wing, the basal joint large, about as long as the head, swollen at the middle portion; the other joint clothed with long brown hairs; the second joint slightly shorter than the basal joint; remaining joints two time of the length of the second one.

Maxillary palpi three-jointed, hairy, yellowish brown; the basal joint shorter than the others; the second and the third ones flexible; third one as long as the second, rounded at the apex.

Labial palpi yellowish brown, hairy; the basal joint thicker and shorter than the remaining ones, the second slightly shorter than the terminal joint, the terminal joint rounded at the apex.

Leg yellowish brown, clothed with long brown hairs; Tibia and tarsus with few bristles; spurs 2, 2, 2. Tergite and sternite brown, with long brown hairs; pleurite whitish yellow, without hair.

Anterior wings densely pubescent; the venation resembles in *M. quadriloba*. Discoidell cell present, closed by hyaline cross-vein, short, deltoides; r-m and the apical portion of Cu<sub>2</sub> hyaline; Cu<sub>1+2</sub> connected with Cu<sub>2</sub> by vein at the apical portion.

Posterior wing densely pubescent; posterior margin with long pubescent; the venation resembles in *M. quadriloba*.

Pronotum, mesonotum and metanotum yellowish brown, without hair. Tergite and sternite yellowish brown; pleurite whitish yellow; the distal portion on the tergite with stiff hairs; sternite hairy. From the beneath, the center of the margin of the sixth segment is produced in slender process. From side, the ninth segment short, distal margin with long, stiff hairs. The tenth segment divided into two pairs lobes; the upper lobes brown, clothed with hairs, the apical margin sinuous, the lower margin bifurcate, forks separated at the base; the lower lobes shorter and smaller than the upper lobes, with hairs, rounded at apex. Penis cover long. Clasper long, the lower margin long, stiff hairs; the apical margin sinuous.

Measurement: Holotype, body 4mm, anterior wing 6mm, posterior wing 4.5mm.

Holotype: Male (M. 2052) in alcohol; Riv. Hayakawa, Hakone, Kanagawa Prefecture; May 12, 1967; collected by M. Kobayashi.

Paratype: Male (M. 2054) in alcohol; Riv. Hayakawa, Hakone, Kanagawa Prefecture; May 12, 1967; collected by M. Kobayashi.

This species closely resembles *M. quadriloba* in the venation of the both wings, but is distinguished from the latter by the structure of the genitalia in the male.

The specific name *hakonensis* came from the collected site.

The specimens recorded in this paper are preserved in the Kanagawa Prefecture Museum, Yokohama, Japan.

#### 4. *Wormaldia nabewarinus* sp. nov. (Plate 4)

Head ochraceous brown; anterior, middle and posteriolateral warts large, clothed with long pale ochraceous hairs. Ocelli present, the distance round blackish brown. Antennae as long as the length of the anterior wing; the basal joint ochraceous, as long as the third one, thicker than the other joints, clothed with long pale brown hairs; the second joint pale brown, shorter than the third one; the other joints blackish brown, each joint as long as the second one.

Maxillary palpi five-jointed, ochraceous, clothed with short pale ochraceous hairs; the first joint short; the second joint slightly shorter than the first one; the

third joint longer than the first and the second ones; the fourth joint as long as the second one; the terminal joint articulated, flexible, slightly longer than the third one.

Labial palpi pale ochreous, the first and the terminal joints clothed with short brown hairs, longer than the other joints.

Thorax pale brown, warts clothed with long pale ochreous.

Leg. pale ochreous, clothed with short ochreous hairs; spurs 2, 4, 4.

Anterior wings pale ochreous, translucent, clothed with brown hairs on the surface; forks 1, 2, 3 and 5 present. Anterior wing with the fork of M anterior to other two, the three forming a triangle, with  $M_3$ -branched. Discoidal and thyridial cell present; cross-veins s, r and m hyaline.

Posterior wing pale ochreous, translucent, clothed with ochreous hairs on the surface; forks 1, 2, 3 and 5 present; Sc branched at apical portion, 2A with apex free;  $M_3$  branched; vein 2A atrophied beyond cross-vein  $A_2$ ;  $R_1$  and  $R_2$  ending some distance apart at wing margin. Discoidal cell presented, closed by hyaline cross-veins; basal vein of M venished.

Tergite of abdomen ochreous, without hairs; pleurite pale ochreous, with long pubescent; sternite ochreous, with ochreous hairs; the seventh sternite with the ventral plate; the ventral plate blackish brown, rounded at the apex, spatula-shaped. The eighth sternite with small, triangular process; tergite with a large spatular process. Genitalia with the two clasper not fused, the ninth segment reduced dorsally by recessed the tenth tergite. The tenth tergite without dorsal flap, but with a dorsal point. Cercus slender, ochreous, rounded at the apex, attached only at the base. Clasper two-jointed, ochreous, clothed with long ochreous hairs; the basal joint shorter than the terminal one; the terminal joint rounded at the apex. Penis, seen from lateral view, covered with the tenth tergite.

Measurement: Holotype, body 5mm, anterior wing 6mm, posterior wing 5mm.

Holotype: Male (M. 2017) in alcohol; Nabewarizawa, Tanzawa, Kanagawa Prefecture; June 4, 1967; collected by M. Kobayashi.

This species closely resembles *W. triangulifera* and *W. subnigra* in color, size and shape of the both wing, but is distinguished from the latter by the venation of the posterior wing, and especially by the structure of the genitalia in male.

The present species is the second record of the genus *Wormalia* from Japan.

The specific name *nabewarunus* came from the collected site.

The specimens recorded in this paper are preserved in the Kanagawa Prefecture Museum, Yokohama, Japan.

## Explanation of Plates 3-4.

Plate 3. Wings and genitalia of *Rhyacophila nakagawai* and *Rhyacophila hayakawai*.

a-b. Wings of *Rhyacophila nakagawai*.

a. Anterior wing.

b. Posterior wing.

c-e. Male genitalia of *Rhyacophila nakagawai*.

c. Lateral veiw.

d. Dorsal veiw.

e. Ventral veiw.

f-h. Male genitalia of *Rhyacophila hayakawai*.

f. Lateral veiw.

g. Dorsal veiw.

h. Ventral veiw.

Plate 4. Head and genitalia of *Micrasema hakonensis* and *Wormaldia nabewarinus*.

a. Head of *Micrasema hakonensis*.

b-d. Male genitalia of *Micrasema hakonensis*.

b. Lateral veiw.

c. Dorsal veiw.

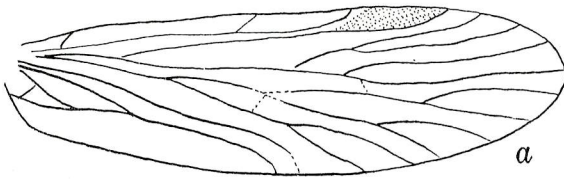
d. Ventral veiw.

e-g. Male genitalia of *Wormaldia nabewarinus*.

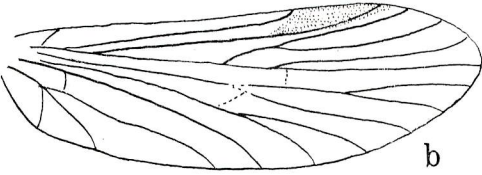
e. Lateral veiw.

f. Dorsal veiw.

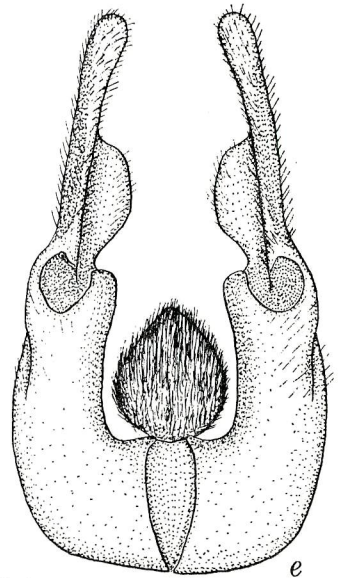
g. Ventral veiw.



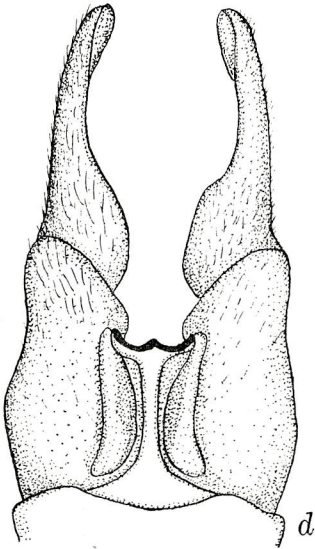
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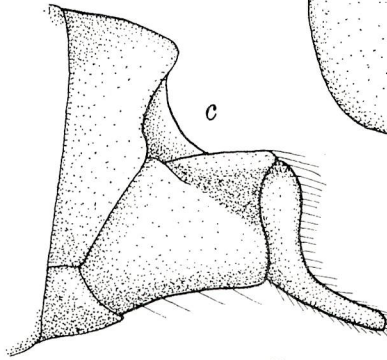
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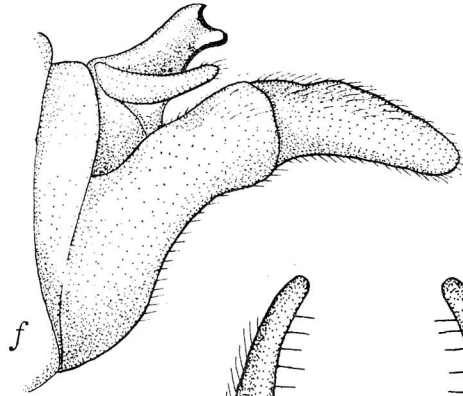
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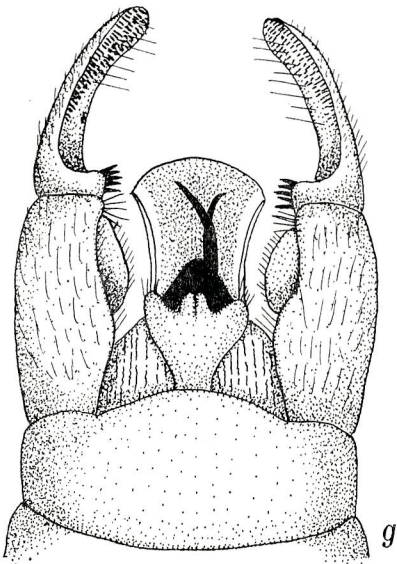
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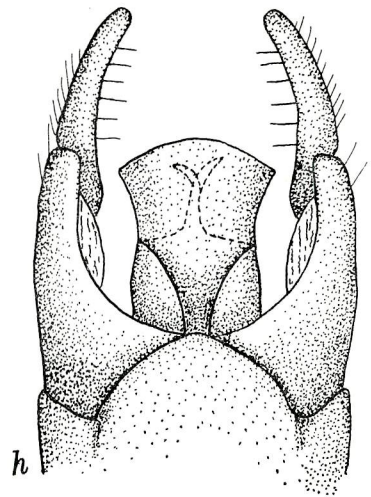
*c*



*f*



*g*



*h*



