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Revision of the genus *Prosimulium* Roubaud
(Diptera : Simuliidae) of Japan IV
The subgenus *Helodon* Enderlein

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Abstract: A description of a new species belonging to the subgenus *Helodon* Enderlein designated by Peterson is given with its illustrations. This is only a species of the subgenus *Helodon* found from Japan.

In 1970, Peterson modified the diagnosis of the genus *Helodon* given by Enderlein (1921) and Rubzov (1960), and accepted this as a new subgenus of the genus *Prosimulium*. The modifications done by attaching importance to the characters of its genitalia are summarised as follows:

Female. Ovipositor lobe short, not reaching anal lobe, distally rounded or subtruncate. Spermatheca usually elongate, delicate and lightly pigmented, with a small differentiated circular area, or none, at junction with spermathecal duct. Arms of genital fork broad, expanding distally into a rather heavily sclerotized plate which is never wrinkled or denticulate.

Male. Ventral plate compressed dorsoventrally but dorsal surface convex, with a median furrow or convexity, lip short and slender or none. Median sclerite Y-shaped, stem short, usually broad, flattened.

Larva. Median tooth of hypostomium about as high or higher than highest lateral teeth. Postgenal cleft biarcuate or subrectangular with a faint anterior margin. Lateral plate of proleg narrow, with a weak indication of vertical portion.

As the result of such modifications, the subgenus *Helodon* became a well-defined segregate from others of the genus *Prosimulium* and was given an evolutionally advanced rank next to the subgenus *Prosimulium* among this genus.

Ono (1976) regarded the present species as *Helodon multicaulis* (Popov, 1968) and gave a revision. Although there are a few errors and omissions about its characters in his revision, really, this species appears to resemble closely *P. (H.) multicaulis* which is known to us only from the original description. However, the former species can be differentiated from the latter in longer arms of ventral plate, less tapering dististyle, and U-shaped incision of median sclerite on male genitalia, in longer cercus on female genitalia and in lower median tooth of larval hypostomium. Unless the main characters of *P. multicaulis* were misdescribed by Popov (1968), such differences are considered to be enough to separate the former from the latter as an independent species among Prosimuliids that often tend to raise easily allopatric, or sibling speciations.

Then, a description by regarding this as a new species is given here.

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Prosimulium (Helodon) kamui
new species

Helodon multicaulis, Ono, 1976, *Res. Bull. Obihiro Univ.*, 10:263; not Popov (1968)

Description

Female. General body color brown to black. Length: body, 5.2–5.8 mm; wing, 5.7–6.2 mm.

Head dark brown, greyish pollinose. Frons brown, narrow, at vertex about two times as wide as at narrowest point and slightly more than $1/8$ as wide as head; at narrowest point about $1/6$ – $1/7$ as wide as long, and less than $1/10$ as wide as head; sparsely covered with short, decumbent, yellowish-grey pile that is more erect ventrally, interspersed along margin with longer, black hairs. Clypeus lighter than frons; slightly longer than wide; rather densely covered with semi-erect, pale yellow pile, much of which is directed dorsally, interspersed with a few brown hairs. Occiput with moderately long, yellowish-grey pile; posterior margin of eye with long, stout, black hairs that are bent forward over eye. Antenna 11-segmented, rather long, slender; flagellum dark brown except for basal $1/4$ of first segment lighter brown; scape and pedicel mostly bright brown; all segments with dark brown pile. Mandible with about 40 serrations. Blade of maxilla with 30–36 retrorse teeth. Distal two segments of palpus pale greyish-brown, third segment darkest brown, with greyish pollinosity; hairs mostly blackish-brown but mixed with some pale yellowish-grey hairs; fifth segment about $1/4$ longer than third. Sensory vesicle large, about $1/2$ as long as its segment, dorsally situated; neck distinct, arising from about half of vesicle, directed anterodorsally and slightly broadening at mouth. Median distal space of cibarium moderately deep, U-shaped; dorsolateral arms slender, rather weakly sclerotized except for distal margin which is more heavily sclerotized.

Thorax dark brown, with a faint pale grey pollinosity that is more distinct along anterior and lateral margin. Pronotum with moderately long semi-erect yellowish-grey pile; humerus conspicuously whitish-grey

pollinose. Scutum often bright brown on medial and posterior regions, darkened laterally, three narrow, pale brown vittae often visible on dorsum in posterior view; covered with short, recumbent, golden yellow pile, posterior region with dense, long, semi-erect, anterior directed, golden yellow pile and often interspersed with some dark hairs. Scutellum yellow; rather densely covered with long, semi-erect, golden yellow pile and interspersed with some dark hairs. Post-scutellum pale brown medially, darkened laterally, tinged with a faint grey pollinosity. Pleuron lighter than scutum, whitish-grey pollinose; pleural membrane pale brown, mottled posteriorly, with a distinct whitish-grey pollinosity; mesepimeral tuft of moderately long, yellow pile. Wing membrane lightly fumose; veins pale brownish-grey; hairs on stem vein blackish-brown, sometimes mixed with a few pale yellow hairs; fringe of calypter and alar lobe yellow. Halter pale yellowish-grey, darkened apically, with pale grey hairs. Legs rather uniformly pale yellowish-brown except for tarsi which are more brown; coxae, apices of segments and bases of tibiae dark brownish; covered with dark brown pile, and a few yellow hairs often present on basal parts of femora and tibiae; hind basitarsus about 7 to 8 times as long as wide. Claw strongly curved, basal tooth moderately broad, extending about one-fourth length of claw.

Abdomen yellowish-grey to blackish-brown, becoming darker posteriorly; tergites shining or subshining, III–V slightly reduced, II–IV dark brown laterally, becoming lighter medially, V–VII mostly dark greyish-brown except for anteromedial regions lighter, VIII–IX completely dark blackish-brown, hind margins of II–VIII dull yellow; all tergites sparsely covered with short, golden yellow hairs, intermixed with some dark brown hairs; pleural regions more densely covered with longer, yellow hairs. Basal fringe of long, pale yellow pile. Genitalia as in Fig. 1. Anal lobe short, projecting slightly beneath cercus, posteroventral margin slightly concave; lightly setose. Cercus subrectangular, about twice as wide as long; posteroventral margin rounded. Ovipositor lobes short, inner margins nearly parallel-

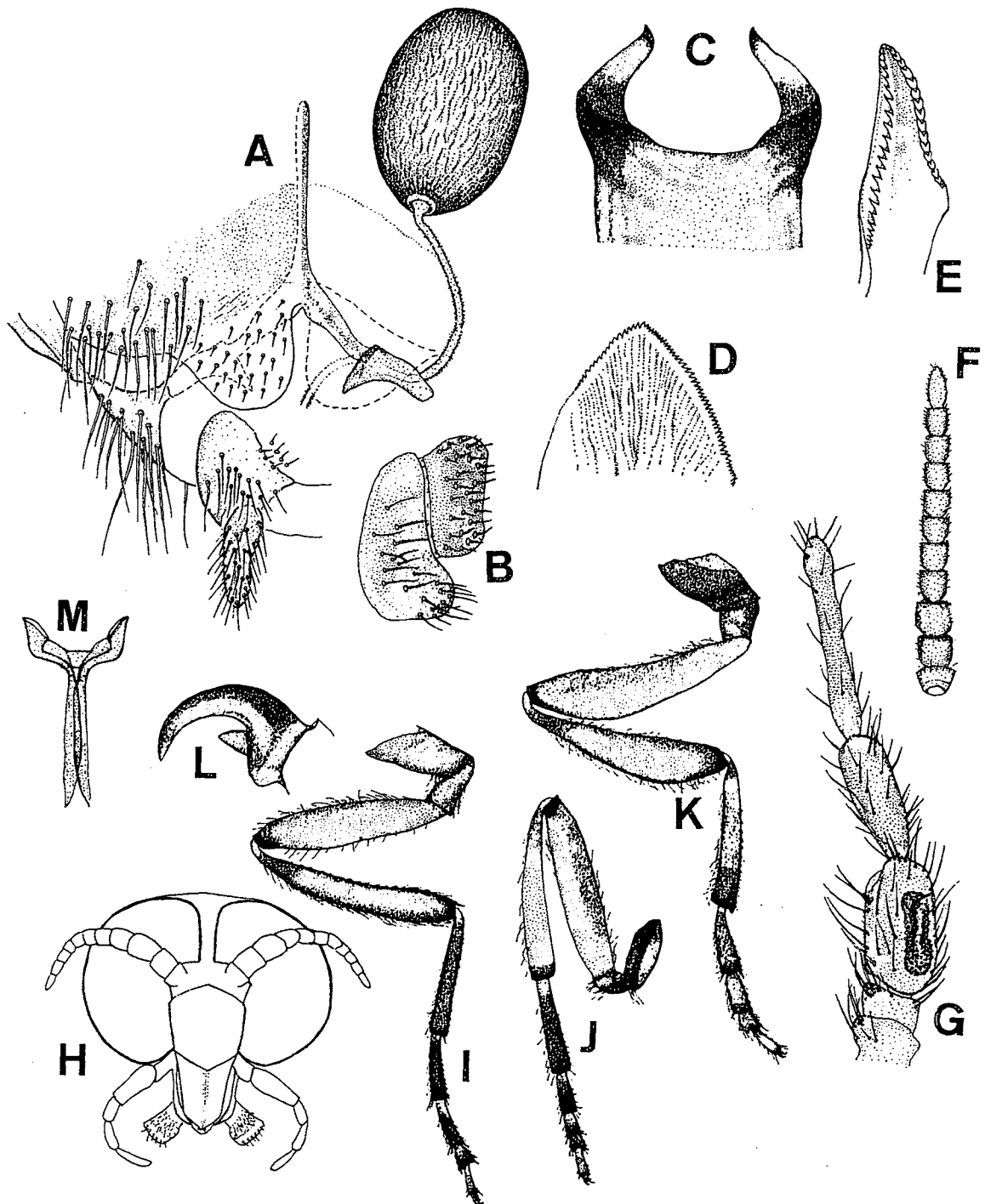


Fig. 1 *Prosimulium (Helodon) kamui* n. sp. female

A: genitalia, B: anal lobe and cercus, C: cibarium, D: mandible, E: maxilla, F: antenna, G: palpus and sensory vesicle, H: head in front view, I: front leg, J: middle leg, K: hind leg, L: hind claw, M: furcasternum

sided, lightly sclerotized, rounded at inner distal margins; with a few setae. Arms of genital fork comparatively broad basally, becoming slightly narrower toward apices, expanding distally into subtriangular plates which are rather broadly connected with tergite IX. Spermatheca rather elongate, bag-shaped, moderately pigmented, with a finely striate pattern instead of a reticulate

pattern.

Male. General body color brown to black. Length: body, 4.2-5.3 mm; wing, 4.6-5.6 mm.

Frons and clypeus with erect black hairs that often have pale brownish or greyish tips. Occiput with long, pale yellow hairs laterally and blackish-brown hairs dorsally. Antenna long and slender, brownish black,

scape and pedicel dark brown; flagellum lighter brown except for distal $3/4$ of first segment dark brown, hairs black. Palpus brownish-grey, distal two segments lighter brownish grey; hairs brownish-black; segment V about $1/4$ longer than segment III. Sensory vesicle about $1/3$ to $1/4$ as long as its segment; neck short, arising from anterior margin, terminating in a round mouth.

Pronotum greyish-brown often tinged with black; with pale yellow pile. Scutum brownish-black with an underlying bright brown along posterior and lateral margins; moderately covered with short, recumbent, yellowish-grey pile that is longer postero-medially. Scutellum greyish-yellow, with long, pale greyish-yellow hairs, some of which have black bases, occasionally a few entirely dark hairs present. Postscutellum brightly brown, tinged with brownish-black along margins, subshining. Pleuron brightly brown, densely greyish pollinose anteriorly and mottled with patches darker brown; pleural membrane greyish-yellow, flecked with brownish-black to black; mesepimeral tuft yellowish-brown. Wing membrane hyaline; veins yellowish- to greyish-brown; hairs on stem varying from yellowish-grey to black; base of costa with mixed yellow and black hairs; rest of hairs on veins black; fringe of calypter and alar lobe yellowish-brown to brown. Halter yellowish-grey to brown, flecked with dark greyish-brown; hairs pale brown. Coxae yellowish-brown to blackish-brown, with pale yellow to brownish hairs; trochanter and femora pale yellow, with mixed pale yellow and brown hairs, femora darkened distally; tibiae more brownish and darkened at both ends, with yellowish- and brownish-grey hairs; tarsi yellowish-brown to black, with brownish-black hairs, tarsal brush black; basal two hind tarsal segments slightly swollen; basitarsus about 5 times as long as broad.

Abdomen brownish black except for pleural regions which are pale yellow; tergites lightly pollinose, subshining, hind margins yellowish-grey; moderately covered with brownish-black pile and some yellowish-brown hairs; hairs of basal fringe greyish-yellow with brown bases; tergite X about twice as long as broad. Genitalia as in

Fig. 2. Basimere slightly longer than broad. Distimere rather long and slender about $4/5$ as long as basimere, at base about $1/2$ as wide as long, slightly tapering distally, slightly curving; apex blunt with three to four terminal spines. Ventral plate broad and rather flattened, convex dorsally; with a shallow, median depression and a low ventral lip in posterior view; in ventral view, apicolateral corners not produced laterally so that both sides are nearly parallel; apical margin slightly convex, ventral lip short, ventrally rounded in lateral view; basal arms about $4/5$ as long as body, extending in parallel; stem of median sclerite short, about as wide as dorsal depression of ventral plate, arms short, rather broad, sharply bending anteriorly at apex, moderately sclerotized. Plate of endoparameral organ moderate in size, broad, subquadrate and moderately sclerotized.

Pupa. Length 5.5–6.8 mm. Respiratory organ (Fig. 2) 2.35–3.25 mm, about as long as thorax, consisting of 3 stout, non-annulate, yellowish-brown to dark brown clubs arising from a short, rather slender stalk that is covered with minute spicules; dorsal club longest, most swollen at base, often dividing into a long, moderately swollen trunk, and a short more swollen trunk, the former one bearing about 30–35 slender filaments, the latter bearing about 35–40 slender filaments; ventral club moderately swollen, simple with about 75–80 slender filaments; lateromedial club usually shortest, moderately swollen, simple, with about 55–60 slender filaments; filaments mostly single, occasionally dichotomous distally, as long or slightly longer than club, and with numerous shallow, transverse furrows; total number of filaments varying from about 190 to 220. Head covered with slightly raised granules; antenna of female extending to hind margin of head; antenna of male extending about two-thirds distance to hind margin of head. Dorsum of thorax slightly but distinctly rugose on anterior $1/2$ or more and with numerous slightly raised, irregular granules laterally; rest of thorax smooth; a few trichomes present. Tergites III–IV each with 8 larger, anteriorly directed spines along posterior margin; tergites V–IX each with a row of short, fine, posteriorly

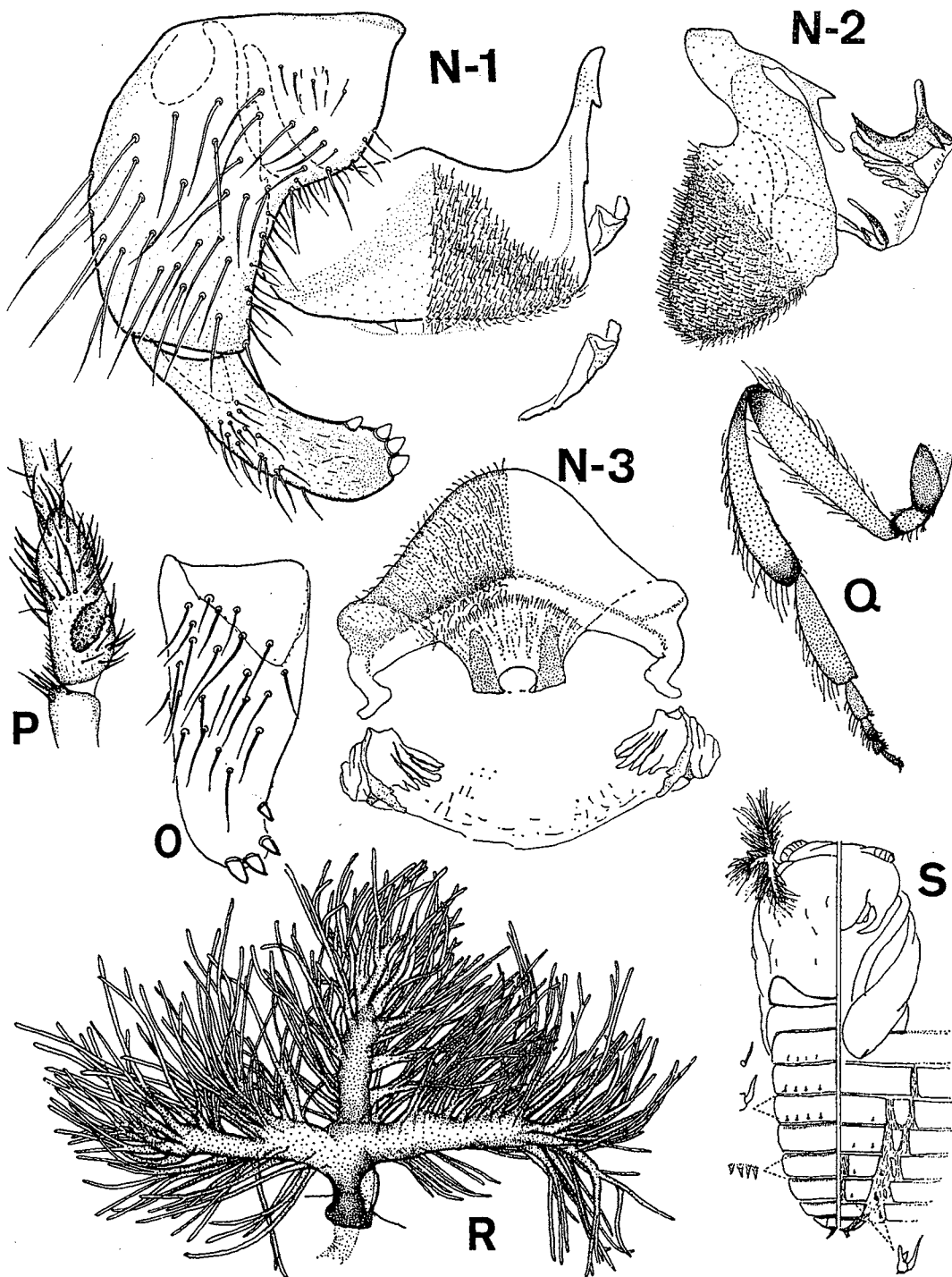


Fig. 2 *Prosimulium (Helodon) kamui* n. sp.

N-Q: male, R, S: pupa, N-1: genitalia, ventral view, N-2: ventral plate, lateral view, N-3: ventral plate, posterior view, O: dististyle, dorsal view, P: sensory vesicle, Q: hind leg, R: respiratory organ, S: pupal skin (right half: ventral view, left half: dorsal view)

directed spines near anterior margin; VIII-IX with, at most, a few tiny setae. Caudal spines long, basally swollen, slightly curved, anteriorly directed and divergent apically; each with a moderately long, slender seta at base. Sternite IV with a small hook on each side, sternites V-VII each with two large

medial hooks on each side, lateral ones of these of VI-VII lying in pleural membrane. Cocoon a moderately thick, loosely woven sleeve to which pebbles often adhere, frequently covering all of pupa except respiratory organ, but sometimes covering just distal 1/2 of abdomen.

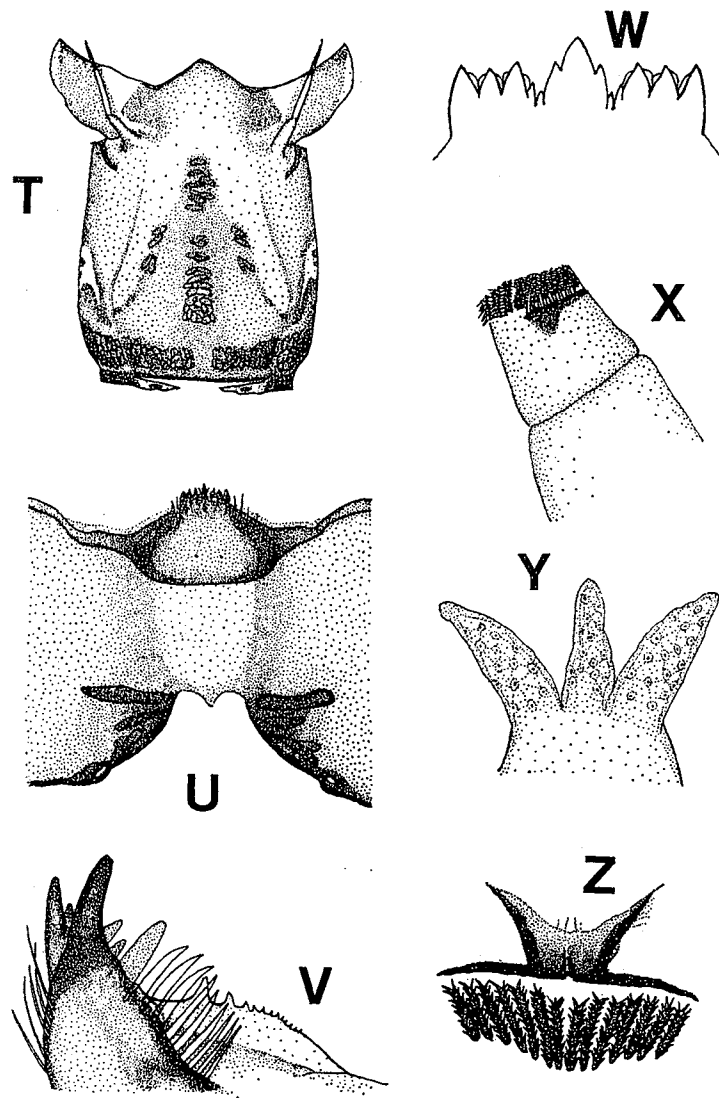


Fig. 3 *Prosimulium (Helodon) kamui* n. sp. larva.

T: head capsule, dorsal view, U: head capsule, ventral view, V: apical part of mandible, W: hypostomium, X: proleg, lateral view, Y: anal gill, Z: anal sclerite

Larva. Length 8.4–9.8 mm. Body greyish-yellow to dark greyish-brown, often last three or four segments lighter; occasionally intersegmental lines greyish-white. Head capsule (Fig. 3) yellowish-brown to dark reddish-brown, cephalic apotome more yellowish anteromedially; head spots dark and usually distinct, first posterolateral spot, at most, faint; spots surrounded by a slightly darkened area; eye spots rather small, closely surrounded by a clear area; small spot anteroventral to eye usually discernible. Antenna about as long as stalk of cephalic fan; proportions of segments about 10:18:9:1. Cephalic fan with 32–38 (average 36) primary rays. Hypostomial teeth as in Fig. 3; median tooth slightly inclined, higher than highest sublateral teeth; lateral tines

about as high as highest sublateral teeth; outer lateral teeth slightly lower than highest sublateral teeth; sublateral teeth flanged. Postgenal cleft distinctly biarcuate, about 2.5 times as wide as deep, lateral margins extending in more parallel more apically, broadly sclerotized; apical margin lightly sclerotized. Postgenal bridge longer than hypostomium. Inner subapical ridge of mandible with 7–10 variably sized serrations. Maxillary palpus 2.5–3.0 times as long as wide at base. Lateral plate of proleg a narrow, sclerotized, horizontal bar with a very short development of the vertical portion (Fig. 3). Rectal gill simple, with comparatively thickened wall, many pale brown spots scattered on surfaces of lobes (Fig. 3). Rectal setulae few and minute, or absent. Anterodorsal

arms of anal sclerite slightly shorter than posteroventral arms. Posterior circlet consisting of 12-18 hooks in 94-102 rows.

Holotype. Male (reared), in alcohol solution, Type NSMT-I-Dipt. No. 04232, National Science Museum, Tokyo, Japan.

Type locality. Makomanai Stream (altitude 500 m), Sapporo, Hokkaido, Japan, pupa collected at August 16, 1975, by T. Okazawa.

Allotype. Female (reared), in alcohol solution, Type NSMT-I-Dipt. No. 04233, National Science Museum, Tokyo, Japan, same data except for August 21, 1975.

Paratypes. Five males and one female (all reared), in alcohol solution, Type NSMT-I-Dipt. No. 04234-04239, National Science Museum, Tokyo, Japan, same data except for female collected at August 21, 1975.

Ten larvae in alcohol solution, Type NSMT-I-Dipt. No. 04240, National Science Museum, Tokyo, Japan, same data except for July 29, 1977.

Records. Material examined. Makomanai Stream (altitude 500 m), Sapporo, Hokkaido, 16-VIII-1975, (many larvae, pupae and 8 reared males), 21-VIII-1975, (many pupae and 4 reared females), 29-VII-1977, (many larvae), T. Okazawa; Soranuma Stream (altitude about 700 m), Sapporo, Hokkaido, 15-VIII-1979, (many larvae, pupae and 1 reared male), T. Okazawa.

Other records. Yamada Stream, Shikaribetsu, Shikaoi, Hokkaido, 18-VII-1974, (many larvae, pupae and 11 reared females and 10 males); the upper stream of Saru River near Nissho Pass, Hidaka, Hokkaido, 28-VII-1974, H. Ono.

Remarks. This species is closely related to *P. multicaulis* and the features separating the former from the latter have been already discussed on the head of this paper. Also, this species most closely resembles *P. onychodactylum* Dyar and Shannon among the subgenus *Helodon* of Canada and Alaska, in narrow female frons, genital structures of both sexes, essential structures of pupal respiratory organ and larval hypostomium. But, the more rounded, distal margins of ovipositor lobe, 3-4 apical spines on dististyle, respiratory organ consisting of 3 non-annulate clubs and outer lateral teeth slightly lower than highest sublateral teeth on larval hypo-

stomium are distinguishable characters from the each stage of the latter. The female of this species does not exhibit a reduction in size of the eyes and a shortening of the mouth-parts like those of *P. (H.) clavatum* or *P. (H.) perspicum*.

Biological notes. This species occurs in rapid, relatively broad, mountain streams (more than 500 m above sea level) of Hokkaido. The larvae begin to hatch from mid April and to pupate from early August. The adults emerge from mid August to early September. Then, this species appears to be univoltine and to overwinter at the egg stage. According to the report by Ono (1976), the pupation and the emergence of this species become earlier (10-15 days) than above dates under higher water temperatures ranging from 8 to 13°C during June to August. The larvae and pupae are found on grasses and stones submerged into streams. The females in Makomanai Valley, Sapporo, were non-anthropophilic.

Japanese name. Haiiro-natsu-ohbuyu.

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摘 要

日本産 genus *Prosimulium* Roubaud (Diptera: Simuliidae) の再検討 IV
subgenus *Helodon* Enderlein

小野 (1976) は、本種 (わが国で *Helodon* 亜属に属する唯一の種) を *Helodon multicaulis* (Popov, 1968) とみなして、その再記載を行った。 *Prosimulium*

(*Helodon multicaulis* Popov (原記載を通じてのみ知り得る種) は、幼虫の垂下唇の中央歯が本種より顕著に突き出る点、雌の外部生殖器を構成する尾葉が本種より細い点、雄の外部生殖器の ventral plate の basal arm が本種より短く、median sclerite の柄も短くて末端の切れ込みが逆V字形である点、また雄の把握器末節が本種より尖っている点などで明瞭に相違する。その他、小あごの歯の数も変異のわくをこえて多い。これら重要な

形質についての差は、本種を *P. (H.) multicaulis* とは別の独立種とみなすのに十分な根拠を与えている。そこで本種を *Prosimulium (Helodon) kamui* n. sp. とし、雌成虫、雄成虫、蛹および幼虫を記載した。

なお、*Helodon* に対して、ナツオオブユ亜属、また本種に対してハイイロナツオオブユの和名をそれぞれ提唱する。