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The caddisfly fauna of a small spring brook in the Jimoto-yusui, Niigata, central Japan

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Abstract

Adult caddisflies were collected from a small spring brook in the Jimoto-yusui by a Malaise trap from 28 March 2011 to 1 April 2012. A total of 684 specimens belonging to 14 species, 12 genera and 11 families were identified, including one new species for science. The most common species was *Lepidostoma kanbaranum* (Kobayashi 1968) (48%), followed by *Oecetis nigropunctata* Ulmer 1908 (16%) and *Phylocentropus shigae* Tsuda 1942 (13%). We here describe a new species, *Plectrocnemia chirotheca*, and redescribe *Phylocentropus shigae*.

Key words: Trichoptera, Malaise trap, new species, description

Introduction

The Jimoto-yusui is one of the spring zones of the Tainai-gawa fan near the Sea of Japan (Fig. 1). There are more than 30 springs and several small brooks in a 1.4 ha wetland. The springs and brooks have unique aquatic animals including endangered fish species (*Pungitius pungitius* (Linnaeus), *Lefua echigonia* Jordan & Richardson, *Lethenteron reissneri* (Dybowski)), however, some of them have decreased in number in recent years. Thus, we started an ecological study of this area as a basis for developing effective conservation measures. In the course of the study, we are surveying the caddisfly fauna. For the first step of this study, we report the trichopteran fauna of this stream based on adults collected with a Malaise trap.

Study area

The study site was set at a small brook near the northern border of this area (Jimoto, Tainai-shi, Niigata, 38°5'39"N, 139°23'22"E, altitude 8 m). The width of the brook was about 120 cm, and the water depth was about 20 cm. The flow was slow (0.13 m/sec in average), and the bottom was covered by plant debris and roots of riparian vegetation (*Alunus japonica* (Thunb.) Steud., *Phragmites australis* (Cav.) Trin. *ex* Steud., *Schoenoplectus triqueter* (L.), *etc*.). The annual average temperatures (and ranges) of water and air measured by temperature loggers (Thermochron iButton DS1921G, Maxim Integrated Products Inc., Sunnyvale, CA, USA) were 11.4°C (7.7–15.5) and 12.3°C (−2.6–28.5), respectively.

Materials and methods

Adult caddisflies were collected with a Townes-style Malaise trap (Townes 1972) from 28 March 2011 to 1 April 2012, and collection jars were changed at approximately two-week intervals. Specimens of *Plectrocnemia chirotheca* sp. nov. and *Phylocentropus shigae* Tsuda collected from the study site on 4 August 2012 and from other areas were also used for the taxonomic study. Male and female genitalia were figured after being cleared in a 10% solution of KOH. All specimens are preserved in 80% ethyl alcohol. Morphological terms mainly follow Schmid (1998) and Arefina *et al*. (2003).

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The depositories of the specimens used in this study are abbreviated as follows: Natural History Museum and Institute, Chiba (CBM); Tainai Kontyu no Ie (TKI); and personal collections of N. Katsuma (NKT), N. Kawase (NKW), and T. Nozaki (TN). In the list of specimens for the study site, only the number of males and/or females, collection period and abbreviations of depositories are provided. Specimens are deposited in the TKI unless indicated otherwise.

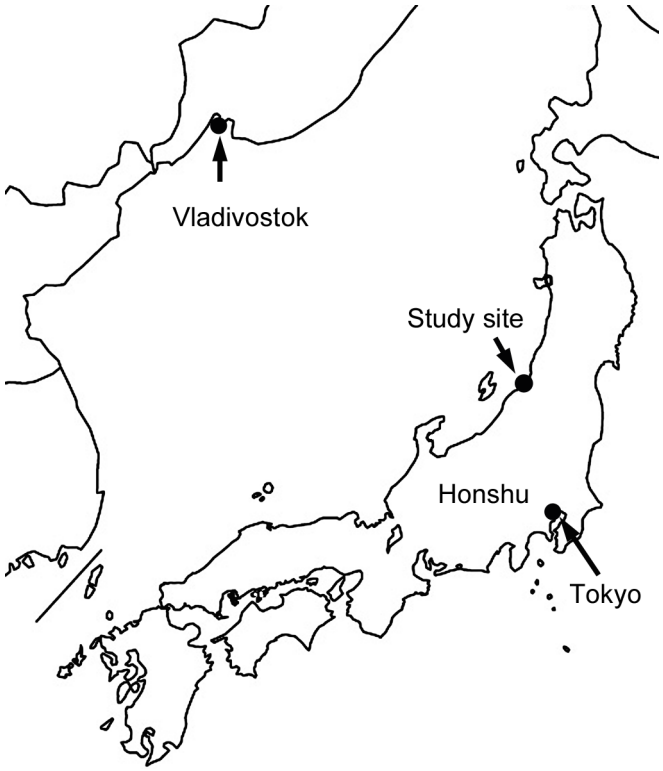

FIGURE 1. Map showing the location of the Jimoto-yusui.

List of caddisflies

Glossosomatidae

***Glossosoma ussuricum* (Martynov 1934)**

Material: 1♂1♀, 15.iii –1.iv.2012.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Kurile Islands, Sakhalin, continental Russia (Siberia, Far East), China (Northeast), Mongolia, Korea.

Hydroptilidae

***Hydroptila phenianica* Botosaneanu 1970**

Material: 1♂2♀ (1♀, 16.ix–2.x.2011; 1♂1♀, 2–15.x.2011).

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima), continental Russia (Far East), Korea.

Dipseudopsidae

***Phylocentropus shigae* Tsuda 1942**

(Figs 2, 3)

Kawase and Morita 2010, 40, recorded from Shiga.

Material: 22♂66♀ (3♀, 1–15.vi.2011; 18♀, 15.vi–2.VII.2011; 15♀, 2–15.vii.2011; 7♂13♀, 15.vii–1.viii.2011); 5♂8♀, 1–15.viii.2011 (CBM); 9♂5♀, 15.viii–1.ix.2011; 1♂2♀, 1–16.ix.2011; 1♀, 16.ix–2.x.2011; 1♀, 2–15.x.2011).

Additional material from other localities: 4 ♂, Kato-zawa, Higashidori-mura, Aomori, 29.vii.1999, N. Kawase (2♂: NKW, 2♂: TN); 2 ♂, Okami, Hitachiota-shi, Ibaraki, 24.vi.2006, N. Katsuma (NKT); 7♂4♀, Momokawa-toge, Kamihayashi, Murakami-shi, Niigata, 2.vi.1997, H. Moriya (TN); 1 male, Nasaka, Minakuchi, Koka-shi, Shiga, 8.v.2009, N. Kawase (NKW).

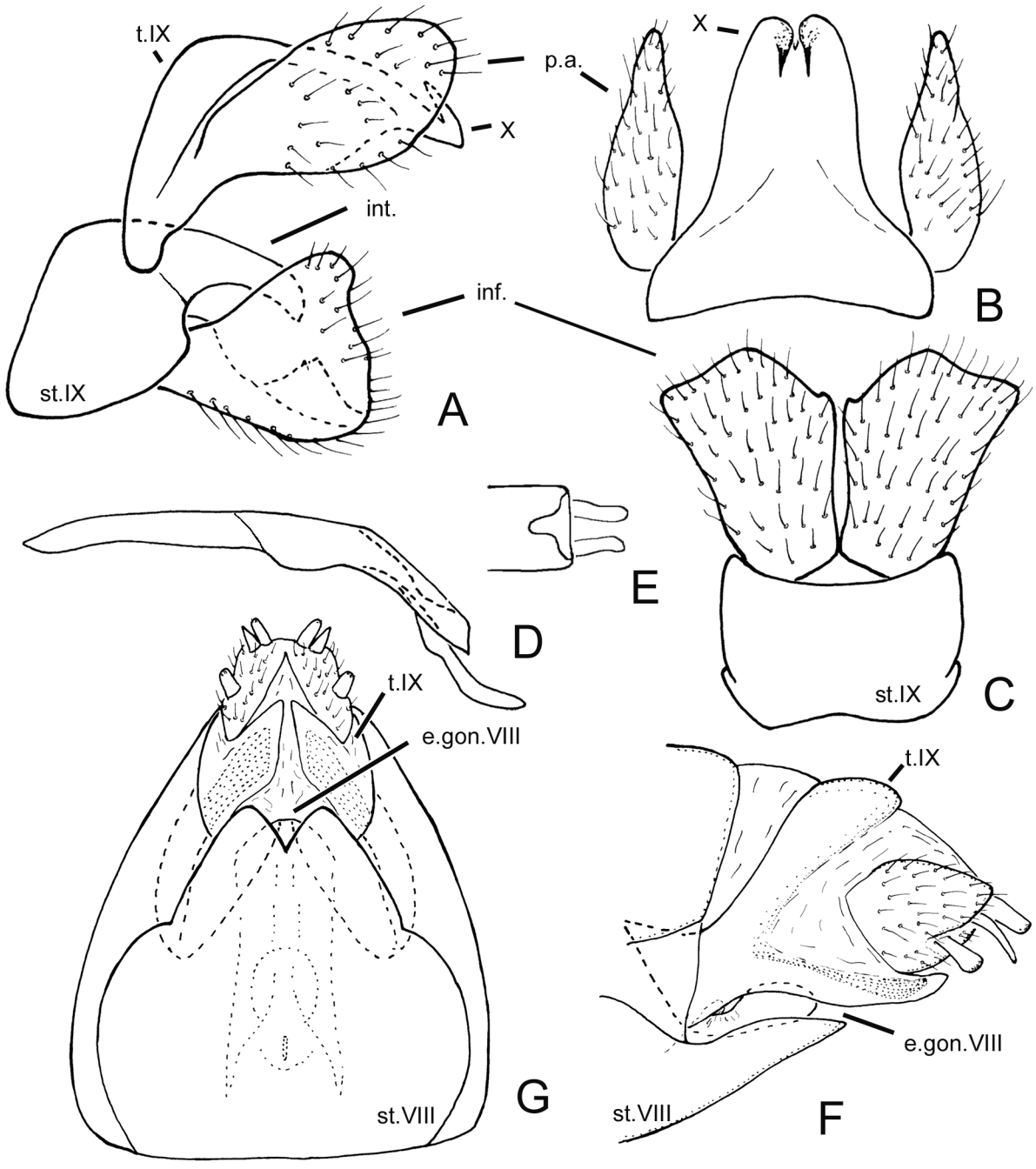

FIGURE 2. *Phylocentropus shigae* Tsuda 1942. A–E, male genitalia: A, left lateral; B, dorsal; C, ventral; D, phallus, left lateral; E, apex of phallus, dorsal. F–G, female genitalia: F, left lateral; G, ventral. Abbreviations: X = segment X; e.gon.VIII = external part of gonopod VIII; inf. = inferior appendage; int. = intermediate appendage; p.a. = preanal appendage; st.VIII = sternum VIII; st.IX = sternum IX; t.IX = tergum IX.

Adult. Head and body dark brown, antennae light brown. Forewings dark brown, with many pale spots on apical half and near posterior margin, 7–10 mm long in male, 8–13 mm long in female. Wing venation typical for genus.

Male genitalia (Figs. 2A–E). Sternum IX round in lateral aspect, rectangular in ventral aspect. Tergum IX short, forming narrow transverse band in lateral aspect, fused with segment X; segment X long triangular in dorsal aspect, posterior margin with pair of acute processes dorsally, apices spine-like recurved anterad. Preanal appendages large oval in lateral aspect. Intermediate appendages large finger-like in lateral aspect, directed ventromesad. Inferior appendages trapezoidal in lateral aspect, each with small triangular process ventromesally. Phallus slender, curved ventrad, with large concavity apicodorsally, with pair of slender processes apicoventrally.

Female genitalia (Figs 2F–G). Sternum VIII large, with pair of triangular lobes posteriorly. Tergum IX large; each ventrolateral part protruding posterad, its apex sharp triangular lobe-like, darkly pigmented. Vaginal apparatus simple, slender in ventral aspect; external part of gonopod VIII round posteriorly in lateral and ventral aspects, visible between lobes of sternum VIII in ventral aspect.

FIGURE 3. Entire preparation and detail, right wings of *Phylocentropus shigae* Tsuda 1942 (Lectotype), dorsal.

Immature stages. A few larvae have been collected from this study site, and will be described in a future work.

Distribution. Japan (Honshu).

Remarks. Tsuda (1942) described this species based on one male and one female collected from Omatsu, Lake Biwa, Shiga Prefecture, central Japan. His description and illustrations of preanal appendages and inferior appendages of the male agree well with those of males examined in this study (Fig. 2A). However, the segment X described by Tsuda (1942, fig.15b) is different from that provided here based on our materials (Figs. 2A, B). Tsuda (1942) said that segment X of his male is small and approximately trapezoidal in dorsal aspect. Recurved, apical spine-like processes were not mentioned in his description. However, we believe that the apex of segment X of Tsuda's male was probably bent down, since two male specimens examined in this study were preserved in a similar state. Although the type series of *P. shigae* was mostly lost except for the right wings with the label (Omatsu, *Phylocentropus*?) (Fig. 3), the size, markings on the forewings and venation of both wings agree with those of materials examined in this study including a male collected from

Shiga Prefecture. Furthermore, no related species belonging to this genus has been recorded from the Japanese Islands. The preparation of the syntype wings is now deposited in the Laboratory of Ecology and Systematics, Graduate School of Science, Osaka Prefecture University. This preparation is here designated the Lectotype of *Phylocentropus shigae* Tsuda.

Polycentropodidae

***Plectrocnemia chirotheca* Nozaki sp. nov.**
(Fig. 4)

Plectrocnemia norikurana: Katsuma 2006, 36, 43, fig. 3, male. Misidentification mentioned by Katsuma (2011).
Plectrocnemia sp. aff. *norikurana*: Katsuma 2011, 67.

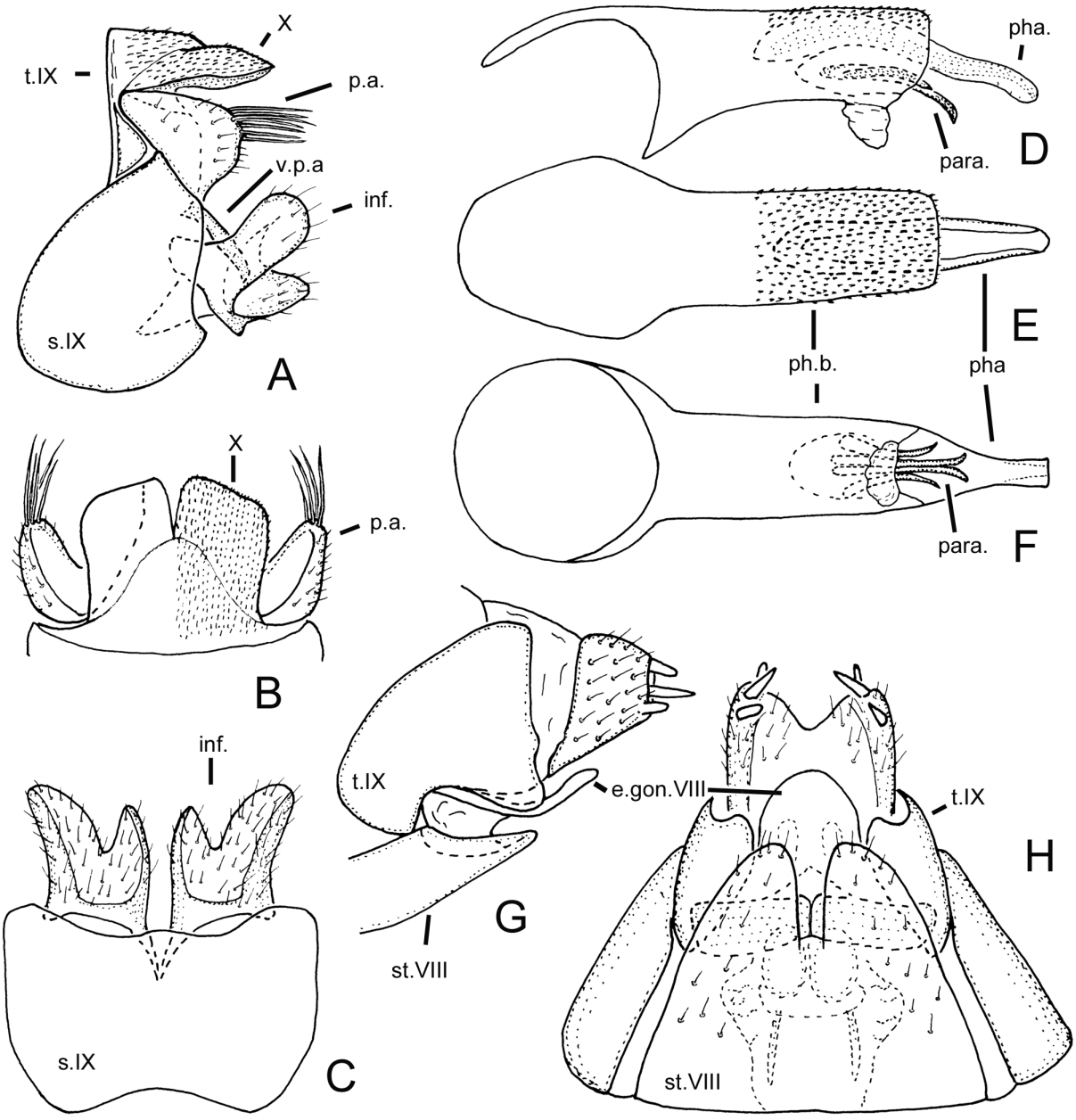

FIGURE 4. *Plectrocnemia chirotheca* n. sp. A–F, male genitalia: A, left lateral; B, dorsal; C, ventral; D, phallus, left lateral; E, same, dorsal; F, same, ventral. G–H, female genitalia: G, left lateral; H, ventral. Abbreviations: para = paramere; pha. = phallicata; ph.b. = phallobase; v.p.a. = ventral process of preanal appendage. Others as in Figure 2.

Holotype. ♂, study site, 4.viii.2012, S. Togashi (Pan trap with a chemical light stick) (CBM-ZI 146566).

Paratypes. 2♂, same data as the holotype (CBM-ZI 146567–146568); 4♀, study site, 15.v–1.vi.2011, S. Togashi & T. Sato (Malaise trap) (CBM-ZI 146569–146572); 2♂1♀, study site, 15.v–1.vi.2011, S. Togashi & T. Sato (Malaise trap) (TN).

Material: 3♀ (2♀, 1–15.vi.2011; 1♀, 1–16.ix.2011).

Additional material from other localities: 2♂, Sazanami, Kitaibaraki-shi, Ibaraki, 17.vi–3.vii.2002, N. Katsuma & T. Inoue (NKT); 1♂2♀, Okami, Hitachiota-shi, Ibaraki, 8.viii.2009, N. Katsuma (NKT)

Diagnosis. This species is similar to *Plectrocnemia norikurana* Tsuda, 1942 and *Plectrocnemia hirayamai* (Matsumura, 1931) in the color pattern of the forewings and in having two pairs of ventral paramere spines, but is easily distinguishable from them by the mitten-like inferior appendages and finger-like ventral processes of the preanal appendages in male.

Adult. Head and body dark brown, antennae light brown, head, pro- and mesothorax with dense black setae dorsally. Forewings dark brown with pale yellow spots, two of them on posterior margin very large, 6.0–7.5 mm long in male, 7.0–9.0 mm long in female. Wing venation typical for genus.

Male genitalia. Sternum IX semicircular in lateral aspect, round anteriorly. Tergum IX with lateral part triangular in lateral aspect; dorsal part semimembranous, fused with semimembranous segment X, both covered by fine dense setae dorsally; segment X bilobed, each lobe rectangular in dorsal aspect. Preanal appendages semicircular in lateral aspect with long stout setae apically; ventral process of each preanal appendage strongly sclerotized, finger-like, directed downward. Inferior appendages mitten-like in both lateral and ventral aspects, each with apicodorsal process larger than apicoventral process. Phallobase large, with wide anterior foramen, with many tiny spines posterodorsally; phallicata slender, parallel-sided apically; two pairs of parameres present ventrally, mesal pair longer.

Female genitalia. Sternum VIII large, bilobed posteriorly, each apex acute in lateral aspect, round in ventral aspect. Tergum IX sclerotized laterally, semitriangular in lateral aspect, membranous dorsally. External part of gonopod VIII large, round apically in ventral view, slender in lateral view; basal part concave dorsally, darkly pigmented.

Immature stages. Unknown.

Etymology. The specific name “chirotheca” (Latin, = glove or mitten) refers to the mitten-like inferior appendages of males.

Distribution. Japan (Honshu).

Japanese name. Jimoto-miyama-iwa-tobikera.

***Plectrocnemia divisa* Ohkawa & Ito 2007**

Material: 3♂9♀ (1♂2♀, 15.vi–2.vii.2011; 1♂2♀, 15.vii–1.viii.2011; 1♂2♀, 1–15.viii.2011; 1♀, 15.viii–1.ix.2011; 2♀, 1–16.ix.2011).

Distribution. Japan (Hokkaido, Honshu).

Hydropsychidae

***Cheumatopsyche brevilineata* (Iwata 1927)**

Material: 1♂1♀ (1♂, 15.v–1.vi.2011; 1♀, 15.vi–2.vii.2011).

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Russia (Far East).

Phryganopsychidae

***Phryganopsyche latipennis* (Banks 1906)**

Material: 31♂31♀ (7♂6♀, 28.iii–15.iv.2011; 4♂, 15.iv–1.v.2011; 2♂1♀, 1–15.v.2011; 2♂2♀, 15.v–1.vi.2011; 5♂4♀, 1–15.vi.2011; 2♂3♀, 15.vi–2.vii.2011; 2♂1♀, 2–15.vii.2011; 1♂, 2–15.x.2011; 2♂2♀, 1–16.xi.2011; 1♂, 16.xi–1.xii.2011; 1♂, 1–15.xii.2011; 1♂, 3–15.ii.2012; 1♂, 15.ii–1.iii.2012; 1♂, 1–15.iii.2012; 3♂8♀, 15.iii–1.iv.2012).

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Russia (Far East), Korea, China, Myanmar, India.

Lepidostomatidae

***Lepidostoma kanbaranum* (Kobayashi 1968)**
Material: 104♂225♀ (10♂34♀, 28.iii–1.iv.2011; 6♂42♀, 15.iv–1.v.2011; 7♂49♀, 1–15.v.2011; 10♂23♀, 15.v–1.vi.2011; 13♂6♀, 1–15.vi.2011; 10♂7♀, 15.iv–2.vii.2011; 4♂4♀, 2–15.vii.2011; 11♂1♀, 15.vii–1.viii.2011; 3♂, 1–15.viii.2011; 10♂, 15.viii–1.ix.2011; 2♂, 1–16.ix.2011; 7♂1♀, 16.ix–2.x.2011; 5♂9♀, 2–15.x.2011; 2♂14♀, 15.x–1.xi.2011; 1♂1♀, 1-16.xi.2011; 9♀, 16.xi–1.xii.2011; 1♂1♀, 15.ii–1.iii.2012; 1♂1♀, 1–15.iii.2012; 1♂13♀, 15.iii–1.iv.2012).
Distribution. Japan (Honshu).

***Lepidostoma tsudai* (Tani 1971)**
Material: 9♂19♀ (1♂4♀, 28.iii–15.iv.2011; 1♂6♀, 15.iv–1.v.2011; 1♂3♀, 1–15.v.2011; 2♂1♀, 15.vi–2.vii.2011; 3♂, 2–15.vii.2011; 1♀, 15.x–1.xi.2011; 1♂1♀, 15.xi–1.xii.2011; 3♀, 15.iii–1.iv.2012).
Distribution. Japan (Honshu, Kyusyu).

Limnephilidae

***Nothopsyche ulmeri* Schmid 1952**
Material: 15♂1♀ (3♂, 15.x–1.xi.2011; 2♂1♀, 1–16.xi.2011; 6♂, 16.xi–1.xii.2011; 4♂, 1–15.xii.2011).
Distribution. Japan (Hokkaido, Honshu).

Apataniidae

***Apatania aberrans* (Martynov 1933)**
Material: 9♂ (4♂, 28.iii–15.iv.2011; 5♂, 15.iii–1.iv.2012).
Distribution. Japan (Hokkaido, Honshu, Kyushu), Kuriles, Sakhalin, Russia (Far East).

Leptoceridae

***Oecetis nigropunctata* Ulmer 1908**
Material: 70♂38♀ (1♂, 15.v–1.vi.2011; 2♂1♀, 15.vi–2.vii.2011; 16♂9♀, 2–15.vii.2011; 10♂11♀, 15.vii–1.viii.2011; 41♂15♀, 1–15.viii.2011; 2♀, 15.viii–1.ix.2011).
Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Europe, Russia, China, Korea.

Molannidae

***Molanna nervosa* Ulmer 1927**
Material: 5♂4♀ (2♂2♀, 15.v–1.vi.2011; 1♂, 1–15.vi.2011; 2♀, 15.vi–2.vii.2011; 1♂, 2–15.vii.2011; 1♂, 15.x–1.xi.2011).
Distribution. Japan (Hokkaido, Honshu).

***Molannodes itoae* Fuller and Wiggins 1987**
Material: 5♂1♀ (2♂, 15.vi–2.vii.2011; 1♀, 15.vii–1.viii.2011; 2♂, 1–15.viii.2011; 1♂, 15.viii–1.ix.2011).
Distribution. Japan (Hokkaido, Honshu), Kuriles, Sakhalin.

Trichoptera fauna of Jimoto-yusui

A total of 684 specimens belonging to 14 species, 12 genera and 11 families were recorded from this brook. Although both the number of species and the number of individuals are not many, one new species, *P. chirotheca*, and a rarely recorded species, *P. shigae*, were collected. The most common species was *L.*

kanbaranum (48%), followed by *O. nigropunctata* (16%) and *P. shigae* (13%). At the study site, the muddy bed of the brook was covered by plant debris and roots of the riparian vegetation; larvae of *L. kanbaranum* were found abundantly in this plant debris and these roots. Although habitats of most species, including *O. nigropunctata* and *P. shigae*, have not yet been surveyed, the caddisfly fauna of this brook must reflect this larval habitat. Further study, especially on the microhabitats of immature stages of each species, will be needed for understanding the aquatic ecosystem in this area.

Acknowledgements

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References

Arefina, T.I., Vshivkova, T.S. & Morse, J.C. (2003) Two new species of the genus *Plectrocnemia* Stephens (Trichoptera: Polycentropodidae) from the Russian Far East. *Aquatic Insects*, 25, 157–167. http://dx.doi.org/10.1076/aqin.25.2.157.14036

Banks, N. (1906) New Trichoptera from Japan, *Proceedings of the Entomological Society of Washington*, 7, 106–113.

Botosaneanu, L. (1970) Trichoptères de la République Démocratique-Populaire de la Corée. *Annales Zoologici*, 27, 275–359.

Fuller, E.R. & Wiggins, G.B. (1987) A new species of *Molannodes* McL. from Hokkaido, Japan (Trichoptera: Molannidae). *Aquatic Insects*, 9, 39–43. http://dx.doi.org/10.1080/01650428709361269

Iwata, M. (1927) Trichopterous larvae from Japan. *Zoological Magazine*, 39, 209–272. [in Japanese]

Katsuma, N. (2006) Ibaraki-ken de saishusareta tobikera-rui no kiroku (dai 2 ho) [Record of caddisflies collected from Ibaraki Prefecture, 2]. *Ruriboshi*, 33, 33–44. [in Japanese]

Katsuma, N. (2011) Takahagi-shi Takinokura-shitsugen no tobikera [Caddisflies collected from the Takinokura marsh, Takahagi-shi, Ibaraki Prefecture]. *Ruriboshi*, 40, 67–68. [in Japanese]

Kawase, N. & Morita, H. (2010) The caddisfly (Insecta, Trichoptera) fauna of the Suzuka Mountains. *Biology of Inland Waters*, 25, 31–50. [in Japanese]

Kobayashi, M. (1968) Notes on the caddisflies of Niigata Prefecture, with seven new species. *Bulletin of the Kanagawa prefectural Museum (Natural Science)*, 1 (1), 1–12 + pls. I–VI.

Martynov, A.V. (1933) On an interesting collection of Trichoptera from Japan. *Annotationes Zoologicae Japonenses*, 14, 139–156.

Martynov, A.V. (1934) *The Trichoptera Annulipalpia of the USSR*. Akademia Nauk, SSSR, Leningrad, 343 pp. [in Russian]

Matsumura, S. (1931) *6000 illustrated insects of Japan Empire*. Tokoshoin, Tokyo, 973 pp. [in Japanese]

Ohkawa, A. & Ito, T. (2007) The genus *Plectrocnemia* Stephens of Japan (Trichoptera; Polycentropodidae). *Limnology*, 8, 183–210. http://dx.doi.org/10.1007/s10201-007-0224-2

Schmid, F. (1952) Le groupe de *Chilostigma*. *Archiv für Hydrobiologie*, 47, 75–163.

Schmid, F. (1998) *The insects and arachnids of Canada*, Part 7. *Genera of the Trichoptera of Canada and adjoining or adjacent United States*. NRC Research Press, Ottawa, 319 pp.

Tani, K. (1971) A revision of the family Lepidostomatidae from Japan (Trichoptera). *The Bulletin of the Osaka Museum of Natural History*, 24, 45–70.

Townes, H. (1972) A light-weight Malaise trap. *Entomological News*, 83, 239–247.

Tsuda, M. (1942) Japanische Trichopteren I. Systematik. *Memoirs of the College of Science*, Kyoto Imperial University, Series B, 17, 239–339.

Ulmer, G. (1908) Japanische Trichopteren. *Deutsche Entomologische Zeitschrift*, 1908, 339–355.

Ulmer, G. (1927) Einige neue Trichopteren aus Asien. *Entomologische Mitteilungen*, 16, 172–183.