

Ecological Notes on *Graphelmis shirahatai* (NOMURA) (Coleoptera, Elmidae) and its Habitat in Niigata Prefecture, Honshu, Japan

Yasuyuki IWATA

Division of Sales and Public Information, Sales Department, Newron Sanitar Co., Ltd.,
2633–3 Settaya-machi, Nagaoka-shi, Niigata, 940–1104 Japan
Mail: laccotrephes_1874@yahoo.co.jp

Abstract Adults of *Graphelmis shirahatai* (NOMURA) were collected from five sites in the branches of the Shinano-gawa, Nagaoka-shi, Niigata Prefecture. In this survey, several individuals of *G. shirahatai* were found from the upper stream, in contrast to them being mainly found in the middle and lower streams in previous studies. In addition, their habitat conditions such as water temperature, pH, river depth and width, and flow velocity were also recorded.

Introduction

Graphelmis shirahatai (NOMURA) was described on two specimens from Yamagata Prefecture, Honshu, Japan (NOMURA, 1958). This species was collected from Honshu (Miyagi, Tokyo, Niigata and Hyōgo) between the 1940s and 1970s (SATŌ, 1985; TAKAHASHI, 1996; FUJIWARA, 2009), but from the 1980s to early 1990s, its collection was not recorded. Recently, this species was found in the Yahagi-gawa, Aichi Prefecture (YOSHITOMI, 1996; KAMITE, 2007) and Hii-kawa, Shimane Prefecture (HAYASHI & SHIMADA, 2006; HAYASHI, 2007). It was categorized as a vulnerable (VU) species in the Red List (Ministry of the Environment, 2007).

The late Dr. K. BABA collected this species from Niitsu-shi, Niigata Prefecture in 1965 and

Table 1. Investigation data and obtained species on/in driftwood in each site.

Site number	1			2			3	4		5		
Month/Day (in 2010)	7/8	7/15	7/23	7/19	7/31	8/24	8/6	7/22	8/24	7/15	8/26	9/19
<i>Graphelmis shirahatai</i> (NOMURA)	0 ^a /0 ^b	2/0	0/0	0/0	1/0	0/0	1/0	2/0	1/0	0/0	10/0	0/0
<i>Elmomorphus brevicornis</i> SHARP	1/0	0/0	0/0	9/0	2/0	0/0	0/0	0/0	2/0	0/0	0/0	0/0
<i>Dryopomorphus nakanei</i> NOMURA	0/0	0/0	0/0	3/11	8/1	0/0	0/0	0/0	1/0	0/0	0/0	0/0
<i>Pseudamophilus japonicus</i> NOMURA	24/3	11/3	6/0	105/38	62/3	0/2	0/0	69/0	3/3	6/1	0/6	0/0
Water temperature (°C)	25.6	26.8	27.2	24.3	26.5	27.6	28.8	23.6	25	26.2	29.2	21.9
pH	7.27	7.32	7.34	7.34	7.52	7.67	7.49	7.28	7.51	7.92	8.65	8.11
Depth (cm)	18	24	18	9	4	6	18	16	9	28	14	19
Width of a river (cm)	264	276	288	270	270	264	4,513	221	256	642	670	682
Flow velocity (m/sec)	0.32	0.38	0.38	0.25	0.19	0.15	0.2	0.39	0.35	0.59	0.55	0.67

a: Number of collection adults.

b: Number of collection larvae.



Fig. 1. Adult specimen of *Graphelmis shirahatai*. Scale bar=1.0 mm.

1966 (SATÔ, 1985). It was reported that this species was found in the Agano-gawa in 1994 and in the middle to lower streams of the Shinano-gawa from 1995 to 2005 (MLIT, 2007, 2009).

I investigated the distribution of this species and its habitat along with dryopid and elmid species in the branches of the Shinano-gawa.

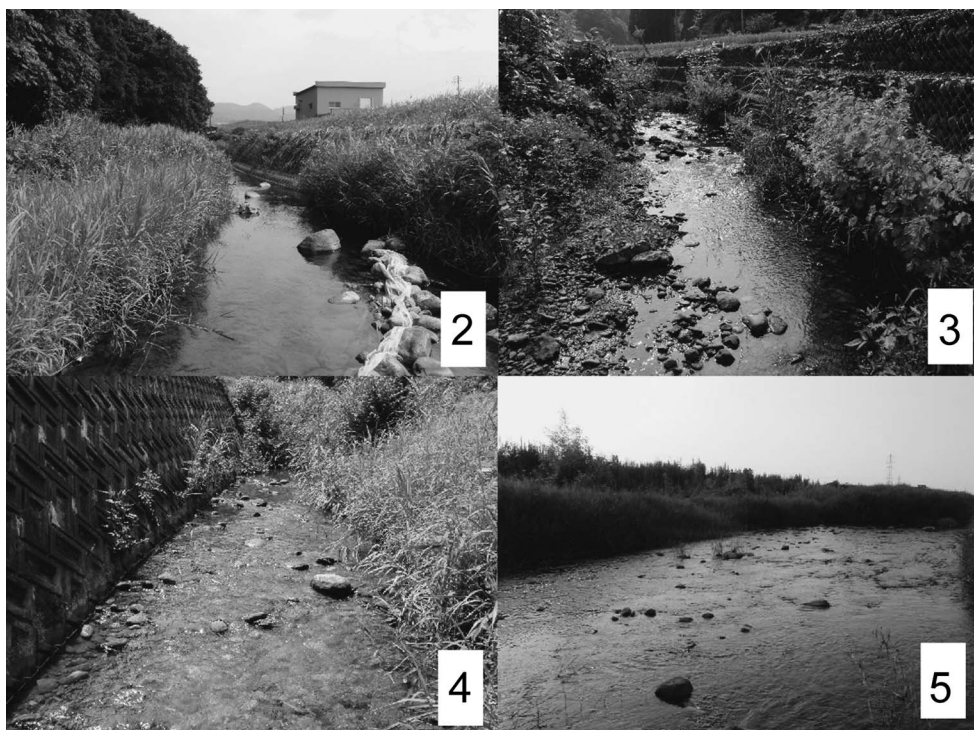
Study Area

I studied five sites in the branches of the Shinano-gawa, Nagaoka-shi, Niigata Prefecture (Table 1). I noted the latitude and longitude of each site from the Geospatial Information Authority of Japan (GSI, 2010).

For each site, I determined the river form type (reach or segment) on the basis of the river morphology (the meander length of the channel and the number of riffle and pool combination), and expressed by alphabet combination according to MIZUNO & GOSE (1993) and TAMAI *et al.* (1993).

Site 1 (Fig. 2): Suyoshi-gawa, Hachibuse-machi (37° 25' 35" N, 138° 52' 41" E); altitude, 50 m; river form type, Bb (part where flow area narrows in mid stream).

Site 2 (Fig. 3): Hakamazawa-gawa, Chiyazawa (37° 20' 32" N, 138° 42' 15" E); altitude, 80 m; river form type, Bb (Aa-Bb type partly exists in upper stream).



Figs. 2–5. Survey sites (2, Site 1; 3, Site 2; 4, Site 4; 5, Site 5).

Site 3: Shibumi-gawa, Kami-tomioka ($37^{\circ}25'20''\text{N}$, $138^{\circ}47'39''\text{E}$); altitude, 25 m; river form type, Bb-Bc (intermediate type between middle and lower stream).

Site 4 (Fig. 4): Kunizawa-gawa, Takeishi, Oguni-machi ($37^{\circ}19'21''\text{N}$, $138^{\circ}40'55''\text{E}$); altitude, 110 m; river form type, Bb (Aa-Bb type partly existing in upper stream).

Site 5 (Fig. 5): Oota-gawa, Muramatsu-machi ($37^{\circ}23'20''\text{N}$, $138^{\circ}51'12''\text{E}$); altitude, 45 m; river form type, Bb (typical midstream).

Methods

Field investigation began in early July and continued until mid September 2010 (Table 1). I collected specimens by examining the surface of driftwood and cutting off the rotten part to expose the inner areas. I also analyzed sand, dead branches, and leaves accumulated on the riverbed by scooping them up from the riverbed. The specimens were preserved in dry condition or fixed in 99% ethanol. The Dryopidae and Elmidae (adults and larvae) specimens obtained in this survey were identified on the basis of the following references: SATÔ (1985), YOSHITOMI *et al.* (1999), YOSHITOMI & SATÔ (2005), HAYASHI (2009) and HAYASHI & SOTA (2010), and online references of HAYASHI (2006) and NOMURA (2000).

I measured the water temperature, pH, depth, width, and flow velocity of the river site; water temperature and pH were measured by using “PORTABLE PH METER PH-009 (III) ATC” (Sato-shoji corporation Co., Ltd.) and pH 6.86 buffer solution (Hanna instruments Ltd.), respectively.

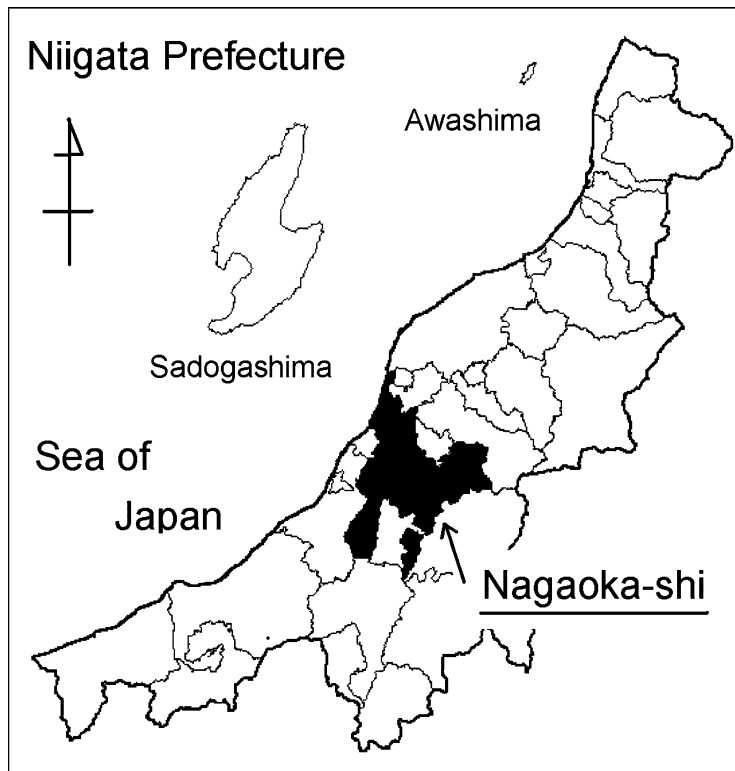


Fig. 6. Map of Niigata prefecture. Using the blank map by the Travel Friend, Zen Tech. (2011).

Results and Discussion

Collection records. I found one dryopid (*Elmomorphus brevicornis* SHARP) and three elmids (*Dryopomorphus nakanei* NOMURA, *Pseudamophilus japonicus* NOMURA and *Graphelmis shirahatai*) adults from the driftwood in the survey sites (Table 1). In this paper, I have emphasized on the new finding of *G. shirahatai* (Fig. 1).

The adults of *G. shirahatai* were collected from five sites between middle July and late August (Table 1). The appearance of the adults was almost similar to that described by HAYASHI (2007) and YOSHITOMI (1996). *Graphelmis shirahatai* larvae were not found during this survey.

Most of the *G. shirahatai* adults were found on the surface of driftwood (Sites 1, 2, 4, and 5; Fig. 7) and on the rotting plywood in the riverbed (Site 5; Fig. 8). This is the first study, to the best of my knowledge, to find this species on the artificially processed wood. Only one adult was obtained from the riverbed in Site 3 by scooping.

Measurement of the parameters at each survey site (river). The natural parameters of the collecting sites at the time of *G. shirahatai* were as follows (Table 1): water temperature, 23.6–29.2°C; pH, 7.28–8.65; depth, 4–24 cm; width of the river, 221–4,513 cm; and flow velocity, 0.19–0.55 m/sec. The pH values found in this survey were within the range of environmental standard values for river water quality, i.e., pH 6.5–8.5 (Ministry of the Environment, 1998) except on August 26, at Site 5 (Table 1).

When I collected this species, both the water temperature and pH were high. However, I was



Figs. 7–8. 7, *Graphelmis shirahatai* adult (red circle) on driftwood; 8, *G. shirahatai* adult (red circle) on rotting plywood.

unable to determine its habitat condition from the measurements because the data were insufficient.

Other species of Dryopidae and Elmidae obtained from driftwood. In the present survey, I collected not only *G. shirahatai* but also one dryopid (*Elmomorphus brevicornis* SHARP) and two elmids (*Dryopomorphus nakanei* NOMURA and *Pseudamophilus japonicus* NOMURA) adults from the surface of driftwood at the survey sites (Table 1). *Dryopomorphus nakanei* and *P. japonicus* larvae were also obtained from driftwood, and *P. japonicus* individuals were observed at most sites. This species is designated as a near threatened (NT) species in the Red List of Japan and Niigata Prefecture (Ministry of the Environment, 2007; Niigata prefecture, 2001). Thus far, *G. shirahatai* was not obtained from the habitats dominated by *P. japonicus*, like the upper stream (Sites 2 and 4).

YOSHITOMI (1996) and HAYASHI (2007) mentioned that the two elmid species *Stenelmis vulgaris* NOMURA and *Stenelmis miyamotoi* NOMURA et NAKANE were often collected with *G. shirahatai* on driftwood; however, in the present survey, these species were not found. According to NOMURA & BABA (1961), both the species were recorded in Niigata Prefecture, though they were not recorded around Nagaoka-shi (Fig. 6). YAMAYA (1988) recorded neither of these two

species in the insect fauna including elmids near Sites 1 and 5.

River morphology of adult habitat. I collected *G. shirahatai* adults not only from the middle to lower stream (Sites 1, 3, and 5) but also from the upper stream (Sites 2 and 4). These habitats have some particular features as follows: (1) the altitude is low, (2) the inclination is gradual, (3) the water volume is low, (4) the flow is not rapid, and (5) the river form type is Bb. In addition to these features, the habitats of *G. shirahatai* probably require abundant supply of food (driftwood).

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要 約

岩田泰幸：新潟県におけるアヤスジミゾドロムシ（コウチュウ目ヒメドロムシ科）の生態的知見と生息環境。——新潟県長岡市を流れる信濃川の支流数カ所からアヤスジミゾドロムシ *Graphelmis shirahatai* を採集したので記録した。本種の生息環境に関する知見は乏しいため、河川の各種測定データを基に、各採集地の生息環境を記録した。また、これまでに確認されていた本種の生息地は、おもに河川の中下流域であったが、今回の調査では細流からも数個体が得られた。

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