

Ecological Notes on the Adult Stage of *Graphelmis shirahatai* (NOMURA) (Coleoptera, Elmidae)

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Abstract A rare elmid beetle, *Graphelmis shirahatai* (NOMURA), was abundant in the lower portion of the Hii-kawa River, Shimane Prefecture, Japan. Its ecology and habitat are discussed based on my observations.

Graphelmis shirahatai (NOMURA) is one of the rarest species of the Elmidae in Japan (YOSHITOMI, 2006). NOMURA (1958) described it as *Stenelmis shirahatai* and its two type specimens were collected from Yamagata Prefecture in 1947 and 1954. A few collections have been made from Honshu (Miyagi, Tokyo, Niigata, and Hyôgo), but most records are from the 1940's to 1970's (SATÔ, 1985; TAKAHASHI, 1996). In recent years, YOSHITOMI (1996) found nine adult *G. shirahatai* on driftwood in the River Yahagi-gawa, Aichi Prefecture. YOSHITOMI (2006) stated that *G. shirahatai* should be designated as an endangered species, but determining its status is very difficult because little is known about its ecology.

In 2005, I happened to collect one adult of this species in the Hii-kawa, Shimane Prefecture (HAYASHI & SHIMADA, 2006). I collected and observed *G. shirahatai* along the river in the following year, from January to October 2006. During this investigation, I observed many adults. Here, I will discuss the ecology of *G. shirahatai* adults based on my observations.

Study Area

The Hii-kawa is a relatively large river in Shimane Prefecture, Chûgoku District, Japan. Its mouth is located on the western coast of a brackish lake, Shinji-ko. Coarse sand and granules originating from the granite zone of the Chûgoku Mountain Region characterize the fluvial sediments of the lower area. The river water level changes frequently due to rain and snowfall. The water level is usually low (0–100 cm deep) from late March to October, except during heavy rains in late June. The width of the main channel is about 120–200 m in the lower portion of the river.

I investigated five sites along the lower portion of the Hii-kawa (Fig. 1):

Site 1: Shimamura-chinkabashi, Shimamura-chô, Izumo City, Shimane Pref.: 1a, main channel; 1b, branch channel.

Site 2: Shimamura-hi, Shimamura-chô, Izumo City, Shimane Pref.: branch channel.

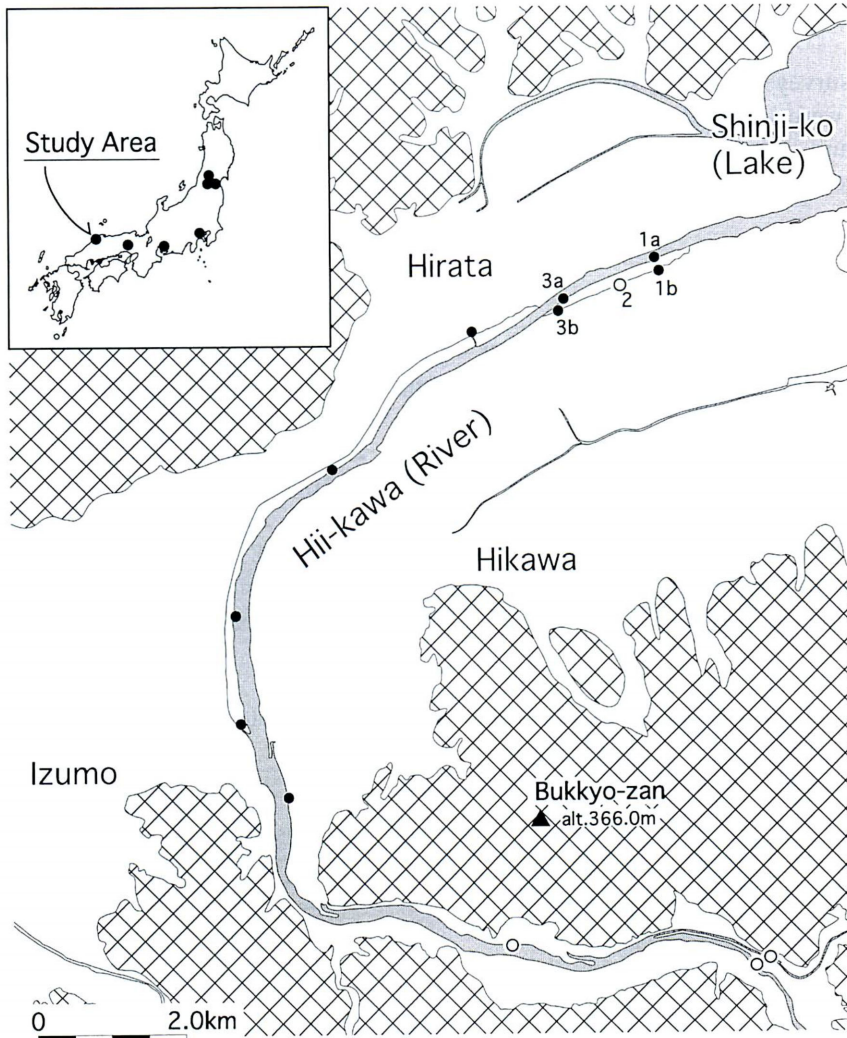


Fig. 1. Study area. Index map showing distribution of *G. shirahatai* in Japan (modified after YOSHITOMI *et al.*, 1999). — 1, Shimamura-chinkabashi, Izumo City; 2, Shimamura-hi, Izumo City; 3, Mizuho-ôhashi, Hikawa-chô. Legends of map: closed circle, *G. shirahatai* was found; open circle, *G. shirahatai* was not found; crossed hatch, hills and mountain region; dark color, river and lake; white, flat (Izumo-heiya).

Site 3: Mizuho-ôhashi, Nakanoshima, Hikawa-chô, Shimane Pref.: 3a, main channel (Figs. 2–4); 3b, branch channel (Fig. 5).

Methods

I surveyed the five sites a total of 34 times from June to October 2006. Elmid beetles were collected by sweeping around the roots of plants (*e.g.*, willows, reeds) using a net and examining driftwood. All adults were collected and the specimens were deposited in the Hoshizaki Institute for Wildlife Protection, Izumo.

Results

Records from the sites

A total of 219 adult *G. shirahatai* were collected from the four sites (Table 1): 4 exs., Site 1a, 20–VIII–2006, M. HAYASHI leg.; 8 exs., ditto, 7–IX–2006; 1 ex., Site 1b, 30–VII–2006, M. HAYASHI leg.; 49 exs., Site 3a, 17–VIII–2006, M. HAYASHI leg.; 26 exs., ditto, 19–VIII–2006; 18 exs., ditto, 26–VIII–2006; 34 exs., ditto, 3–IX–2006; 9 exs., ditto, 12–IX–2006; 2 exs., Site 3b, 14–VII–2006, M. HAYASHI leg.; 1 ex., ditto, 15–VII–2006; 22 exs., ditto, 3–VIII–2006; 15 exs., ditto, 6–VIII–2006; 23 exs., ditto, 10–VIII–2006; 4 exs., ditto, 11–VIII–2006; 3 exs., ditto, 3–IX–2006.

The following data show its non-collecting records from the five sites: Site 3b, 9–I–2006; Site 1b, 21–II–2006; Site 2, 7–V–2006; Site 3b, 4–VI–2006; Site 3b, 13–VI–2006;

Table 1. Collection records of *G. shirahatai* in lower portion of the Hii-kawa. See text and Fig. 1 for site numbers.

Day	JAN			FEB			MAY			JUN					JUL				
	9	21	7	4	13	16	21	24	25	7	8	14	15	30					
Site 1a																			
1b		0					0	0		0				1					
2			0						0										
3a																			
3b	0			0	0	0	0			0		2	1						
Total	0	0	0	0	0	0	0	0	0	0	0	2	1	1					

Day	AUG										SEP					OCT
	1	3	6	8	10	11	17	19	20	26	3	7	12	24	29	14
Site 1a									4			8			0	
1b	0			0												
2																
3a							49	26		18	34	9	0		0	
3b		22	15		23	4					3		0		0	
Total	0	22	15	0	23	4	49	26	4	18	37	8	9	0	0	0



Figs. 2-7. Photographs of *G. shirahatai* and its habitat. — 2-4, Site 3a (2, sandy bed of the Hii-kawa; 3, deep of the river; 4, driftwood); 5, Site 3b; 6-7, *G. shirahatai* on the driftwood.

Site 3b, 16-VI-2006; Site 3b, 21-VI-2006; Site 1b, 21-VI-2006; Site 1b, 24-VI-2006;
 Site 2, 25-VI-2006; Site 3b, 7-VII-2006; Site 1b, 8-VII-2006; Site 1b, 1-VIII-2006; Site
 1b, 8-VIII-2006; Site 3a, 24-IX-2006; Site 3b, 24-IX-2006; Site 1a, 29-IX-2006; Site
 3a, 14-X-2006; Site 3b, 14-X-2006.

Coexisting aquatic beetles

I found 13 species of aquatic beetles from the study sites, as follows: [Hydrophilidae] *Laccobius fragilis* NAKANE; [Elmidae] *Stenelmis nipponica* NOMURA, *Stenelmis vulgaris* NOMURA, *Stenelmis miyamotoi* NOMURA et NAKANE, *Ordobrevia foveicollis* SCHÖNFELDT, *Leptelmis gracilis* SHARP, *Leptelmis parallela* NOMURA, *Optioservus nitidus* NOMURA, *Pseudamophilus japonicus* NOMURA, *Grouvellinus marginatus* (KÔNO), *Zaitzeviaria brevis* (NOMURA), *Zaitzevia awana* (KÔNO); [Dryopidae] *Elmormorphus brevicornis brevicornis* SHARP. Among them, two elmid beetles *S. vulgaris* and *S. miyamotoi* are the commonest species in the studied sites.

Distribution in the Hii-kawa

A continuous sandy bed occurs along the river for more than 20 km from the mouth of the river. This sandy bed is the habitat of *G. shirahatai* (YOSHITOMI, 1996). I found *G. shirahatai* at nine sites, including the five sites surveyed here, but found none from sites further up the river. In the upper river area, the surface of the sandy bed is covered with a thin layer of mud and algae.

Discussion

Adult *G. shirahatai* were found from mid-July to mid-September at the survey sites. I did not observe any missing appendages or mud coating the body, indicating that the adults had eclosed during the current season. No copulating pairs were observed. It is possible that copulation occurs at night.

Most adults were found in depressions on the surface of driftwood and in roots within the current. The adults prefer a relatively strong current because *G. shirahatai* has the largest claw in the Japanese Elmidae; I have not found any individuals in still water. The wood was usually of willow (*Salix* spp.), which is a common tree along the river, and its roots were exposed deep within the river. *Salix* is recognized as the food of *G. shirahatai* adults. However, YOSHITOMI (1996) reported that a driftwood found in the Yahagi-gawa is of cherry, *Prunus* sp.

The habitat of *G. shirahatai* is a river with a sandy bed and riparian willow vegetation. The river current carries driftwood from the forest and washes the sand bed. In the Hii-kawa, fluctuation in the river water level plays an important role in the formation of habitat for *G. shirahatai*.

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要 約

林 成多: アヤスジミゾドロムシ (甲虫目ヒメドロムシ科) の生態学的知見. —— アヤスジミゾドロムシは日本産ヒメドロムシ科のうちでもっともまれな種の一つであり, 1940–1970年代の数例の記録があるほか, 近年では愛知県矢作川での記録があるに過ぎない. 2005年になって島根県の斐伊川下流域から1個体が採集された. そこで, この地域において, 2006年1月から10月まで本種の生息状況について調査を行った. その結果, 斐伊川下流域には多数の個体が生息していることが判明した. 成虫は7月中旬から9月中旬に出現し, 流れのある淵に沈んでいるヤナギの流木や根にみられた. 斐伊川では, マサ土 (花崗岩由来の土砂) からなる砂質の河床が, 河口から20 km以上にわたって分布しているが, 山間部では泥や藻類が砂の表面を覆っていることが多く, 本種を確認できなかった. 今回の観察結果から, 本種の生息環境は, ヤナギなどの河畔林を伴った粗粒砂~細礫を主体とする砂質河床の河川で, 本種の餌である木質物の供給が現地または上流からあり, 流水によって砂が移動して底質に泥や藻類が付着しにくい場所であると考えられる. このような生息環境を形成するうえで, 斐伊川の顕著な水位変動が重要な役割を果たしていると思われる.

References

- HAYASHI, M., & T. SHIMADA, 2006. Records on Elmidae and Dryopidae from eastern area of Shimane Prefecture and Oki Islands, Japan. *Bull. Hoshizaki Green Foundation*, (9): 127–143. (In Japanese.)
- NOMURA, S., 1958. Drei neue *Stenelmis*-Arten aus Japan (Coleoptera, Elmidae). *Ent. Rev. Japan*, 9: 41–45, 1 pl.
- SATŌ, M., 1985. Taxonomic notes on the aquatic Coleoptera of Japan, III. *Coleopterists' News, Tokyo*, (69): 1–5. (In Japanese.)
- TAKAHASHI, T., 1996. *Graphelmis shirahatai* (NOMURA) was collected from Kaibara, Hikami-gun, Hyōgo Pref., Japan. *Kiberihamushi*, 41: 44–45. (In Japanese.)
- YOSHITOMI, H., 1996. Collecting records of *Graphelmis shirahatai* (NOMURA). *Coleopterists' News, Tokyo*, (116): 5. (In Japanese.)
- 2006. Elmidae: Japanese fauna, classification, ecology, endangered species, and collecting methods. *Mori to Mizube no Kotyushi*, 201–214. Tokai Univ. Press, Tokyo. (In Japanese.)
- , A. SHIRAGANE & N. HIKIDA, 1999. The fauna of Elmidae and Dryopidae in the Yahagi River System. *Rept. Yahagi River Institute*, (3): 95–116. (In Japanese.)