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Adult caddisflies (Trichoptera) collected by a light trap in the Myojin Area in Kamikochi, Chubu Sangaku National Park, Japan

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Abstract: There are few reports of caddisfly fauna in Kamikochi because the location is a special protection zone in the national park. The objective of this study is to clarify the species composition of adult caddisflies by a light trap in Kamikochi. In addition, previous records are reviewed in accordance with the objective of this study. The abundance of adult caddisflies was monitored using a light trap late in May of 2010, late July and September in 2011, and mid-May in 2012. We collected 97 adults representing 20 species of caddisflies in the Myojin area of Kamikochi during the investigation periods. *Asynarchus sachalinensis* Martynov was the dominant species (21.6%), followed by *Neophylax japonicus* Schmid (20.6%) and *Lepidostoma crassicorne* (Ulmer) (11.3%). The present study collected 15 species of caddisflies newly recorded from Kamikochi.

Key words: Trichoptera, adult caddisfly, Kamikochi, species composition, light trap

Introduction

Kamikochi is a part of the Chubu Sangaku National Park which is a highland basin about 1500 m above sea level and ringed by the 2000–3000 m peaks of the North Japan Alps. In 1975, the partial prohibition of private cars started in the upper area of Nakanoyu in order to conserve natural resources. Despite the prohibition, about 1.3 million tourists visit Kamikochi from spring to fall (reviewed by Shimazu, 1999).

Studies of aquatic insect fauna of this area have been very few (e.g. Ueno, 1935; Konno, 2004) because permission is necessary for insect collecting in the special protection zone of the national park (Baba and Hirashima, 1991). In addition, these faunistic studies are mostly based on larval identification. However, aquatic insect larvae are often difficult or impossible to identify by species. Only Odonata (Eda, 1998) and diptera, especially Chironomidae (Sasa and Hirabayashi, 1991, 1993, 1998) and Simuliidae (Saito and Kanayama, 1998), fauna in Kamikochi have been investigated based on the morphological characteristics of adults.

Trichoptera caddisflies represent one of the largest groups of aquatic insects found in the aquatic ecosystems and is important secondary producers (Mackay and Wiggins 1979). The order name Trichoptera is derived from the Latin meaning "hair-wing," referring to the hair covering the wings of the adults (Wiggins, 1996). Since Parlato (1929), the hairy wing of caddisfly has been known as an inhalant allergen throughout the world. Because the larvae of caddisflies are usually abundant in freshwater, the mass emergence of the adults often leads to severe nuisance conditions i.e., obstruction of business, poor visibility, traffic mess, and a very foul odor (Munroe, 1951; Peterson, 1952; Osgood, 1957; Fredeen, 1972). In Japan, massive emergence of caddisflies, *Cheumatopsyche brevilineata* (Iwata), during summer season has much annoyed the citizens beside the Kamo River in Kyoto, so Yagi and Sasakawa (1992) reported on life history and swarming behavior of *C. brevilineata*. Kino and Oshima (1978) extracted the allergen from caddisflies for the first time in Japan, and the immediate hypersensitivity to caddisfly was tested in randomly selected 54 patients with bronchial asthma. Ogino et al. (1990) reported intradermal skin tests with extracts from caddisfly, and 9 (11.3%) of 80 nasal allergic patients showed positive reactions to caddisfly allergen. Seasonal fluctuations of specific IgE antibodies to caddisfly appeared to be similar to those of atmospheric caddisfly allergens (Kino et al., 1987). Tourists around Kamikochi may be exposed to periodic abundance of adult caddisflies. However, studies of adult caddisfly fauna have been few in Kamikochi (reviewed by Uenishi, 2000). In addition, the seasonal abundance of adult caddisflies is unclear. Therefore, it is necessary to investigate species composition and abundance of adult caddisfly in Kamikochi.

Light traps are often used in faunistic studies of adult caddisflies in adjacent aquatic habitats, because the adults are strongly attracted to light (Waringer, 1989).

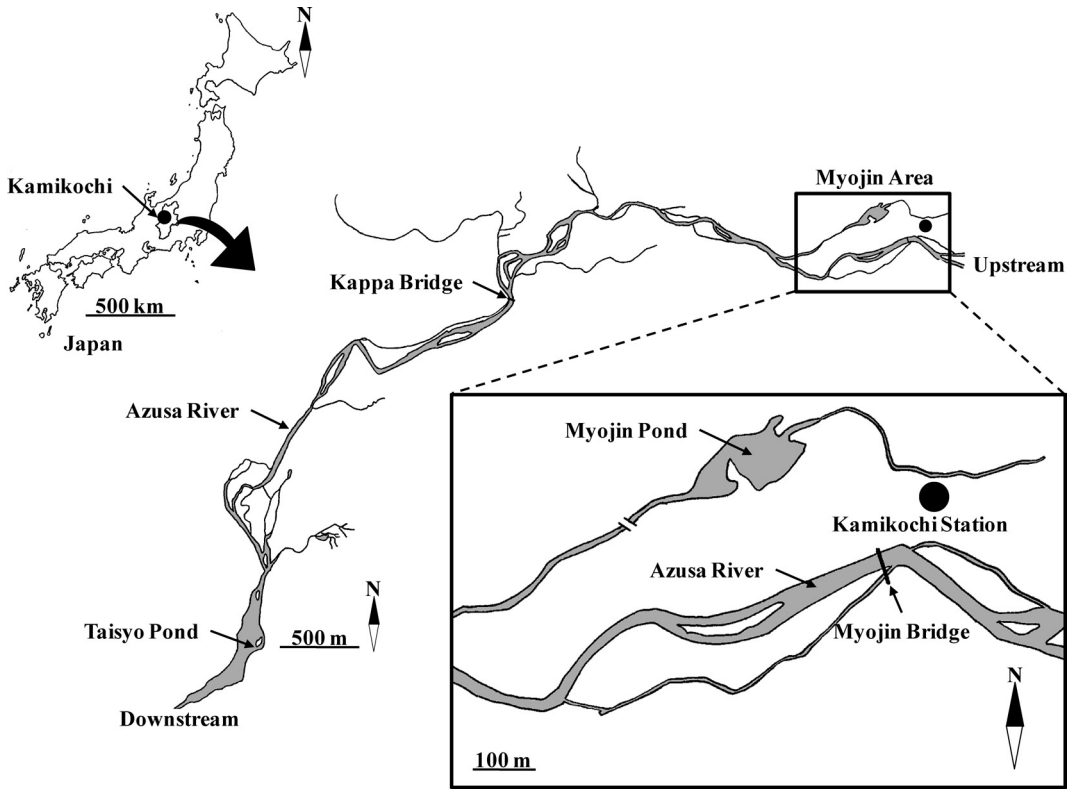

Fig. 1. Map of the Myojin Area in Kamikochi, with locations of sampling site.

In Japan, the species composition, population dynamics and emergence of caddisflies have been investigated using light traps in various aquatic habitats: lakes and marshes (Yoshida and Uenishi, 2001; Kimura et al., 2006, 2007; Ito et al., 2007), rivers (Tanida, 1982; Nozaki, 1988; Nozaki and Gyotoku, 1990; Nishimoto and Nishimoto, 1993; Kimura et al., 2008), and filtration plant (Hirabayashi et al., 2005). The objective of this study is to clarify the species composition of adult caddisflies by a light trap in the Myojin area of Kamikochi.

Materials and Methods

We set up a Nozawa-type light trap at the Kamikochi Station (36°15′N, 137°40′E, asl. 1530 m), Shinshu University, located near the Myojin Bridge (ca. 50 m distance) of the Azusa River (Fig. 1). Equipped with a 6-W black fluorescent lamp, the trap was hung about 1.5 m above ground and activated during the night throughout (15 : 00 on–9 : 00 off, ca. 18 h) in each of the following investigation periods: 21–22 (mean air temperature ranged from 0.8°C to 22.0°C, averaging 8.1±7.2°C,) May 2010, 21–22 (from 15.8°C to 26.5°C, 18.2±3.0°C) and 22–23 (from 13.7°C to 21.7°C, 17.0± 2.4°C) July 2011, 29–30 (from 7.6°C to 19.6°C, 11.7± 3.4°C) September 2011, and 17–18 (from 3.2°C to 14.4°C, 6.4±3.5°C) May 2012. Mean air temperature measured at the Kamikochi Station each activation period (SUIMS, 2013) was used for the meteorological data. Insects that entered the trap were killed with insecticide spray. Adult caddisflies were separated from the other insects, and individual numbers of each species were recorded in the laboratory. Adult caddisflies were identified using Schmid (1998) and Tanida et al. (2005).

Results and Discussion

A total of 97 (male 40, female 57) individuals were collected from 20 species belonging to 12 genera and 9 families (Table 1). In September 2011, we collected a total of 58 individuals/night, followed by July 2011 (21 and 13 individuals/night). While we collected just a few adult caddisflies (from only one species) in May 2010 and 2012, from summer to fall, we collected 8–9 species. The most abundant genus was *Rhyacophila* (4 species), followed by *Lepidostoma* (3 species) and *Apatania* (3 species). In the present study, *Asynarchus sachalinensis* dominated (21 individuals; 22.6%), followed by *Neophylax japonicus* (20 individuals; 20.6%) and *L. crassicorne* (11 individuals; 11.3%). These three species accounted for 53.6% of the overall total. *Asynarchus sachalinensis* and *N. japonicus* adults were only collected in September 2011. *A. sachalinensis* and *L. crassicorne* were recorded from Kamikochi for the first time.

Asynarchus sachalinensis has a univoltine life cycle and adults emerged in June and July with immature ovaries, spent one-two months in terrestrial habitats and matured in September and October in Hokkaido (Ito, 2008). Therefore, there is a possibility that immature adults of *A. sachalinensis* also emerged in early summer

Table 1. List of adult caddisflies in Kamikochi. M = males, F = females.

	21–22 May 2010		21–22 July 2011		22–23 July 2011		29–30 September 2011		17–18 May 2012		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	%
Rhyacophilidae													
Rhyacophila lambakanta Schmid, 1970*							1				1		1.0
R. transquilla Tsuda, 1940*			2	1							2	1	3.1
R. shikotsuensis Iwata, 1927*							1				1		1.0
R. yukii Tsuda, 1942*			1								1		1.0
Glossosomatidae													
Glossosoma altaicum (Martynov, 1914)*								1				1	1.0
G. ussuricum (Martynov, 1934)*				3		1						4	4.1
Hydropsychidae													
Cheumatopsyche infascia Martynov, 1934*						1						1	1.0
Hydropsyche orientalis Martynov, 1934*				1		2						3	3.1
Phryganeidae													
Oligotricha fluvipes (Matsumura, 1904)				1								1	1.0
Brachycentridae													
Micrasema sp.						1						1	1.0
Lepidostomatidae													
Lepidostoma complicatum (Kobayashi, 1968)			1		2	2					3	2	5.2
L. crassicorne (Ulmer, 1907)*			7	2	1	1					8	3	11.3
L. satoi (Kobayashi, 1968)*				1								1	1.0
Limnephilidae													
Asynarchus sachalinensis Martynov, 1914*							6	15			6	15	21.6
Pseudostenophylax ondakensis (Iwata, 1928)*	1		1								2		2.1
Rivulophilus sakaii Nishimoto, Nozaki and Ruiter, 2000*							1	6			1	6	7.2
Apataniidae													
Apatania ishikawai Schmid, 1964*									4		4		4.1
A. nikkoensis Tsuda, 1939*						1	5	1			5	2	7.2
Apatania sp.						1		1				2	2.1
Uenoidae													
Neophylax japonicus Schmid, 1964							6	14			6	14	20.6
Individual No.	1	0	12	9	3	10	20	38	4	0	40	57	100.0
Species	1		9		8		8		1		20		

*: Newly recorded species

in Kamikochi. Further investigations are necessary to collect early summer emergence of adult caddiflies, such as immatures adult of *A. sachalinensis*. *Neophylax japonicus* has a univoltine life cycle and adults emerged from September to November in the middle to upper reaches of the Tama River, Tokyo (Kagaya et al., 1998; Mitsuhashi, 2000). These results suggest that *N. japonicu* emerge from the Japanese mountain rivers and streams in autumn. On the other hand, *L. crassicorne* adults were collected in July 2011. *Lepidostoma crassicorne* adults collected from spring to autumn in Honshu Island (Tani, 1971; Nozaki, 1988; Nishimoto and Nishimoto, 1997). In addition, *L. crassicorne* adults collected in summer in Hokkaido (Ito et al., 2007). The preset study made it clear that *L. crassicorne* emerge at least in summer in Kamikochi.

In Kamikochi, adults of eight species, *Eubasilissa regina* (McLachlan), *Oligotricha fluvipes*, *Semblis melaleuca* (McLachlan), *L. complicatum*, *L. japonicum* (Tsuda), *L. tsudai* (Tani), *Nemotaulius admorsus* (McLachlan) and *Perissoneura paradoxa* McLachlan, have been previously recorded (reviewed by Uenishi, 2000). Furthermore, *Rhyacophila impar* Martynov and *N. japonicus* have been recorded based on morphological characteristics of larvae (Konno, 2004). Larval stages of caddisfly are difficult to identify by species (Wiggins, 1996), leaving some doubt as to species identified in the checklist of caddisflies from Nagano Prefecture (Uenishi, 2000). Only three species, *O. fluvipes*, *L. complicatum* and *N. japonicus*, were common to both past and present studies. Especially, *N. japonicus* were recorded both adults and larvae from Kamikochi. On the other hand, adults of *R. impar* have not yet been collected. Although 4 *Rhyacophila* species were collected in this study, further investigation is necessary to clarify the status of *R. impar*. In the present study, 15 species are newly recorded from Kamikochi that are not included unidentified taxa such as *Micrasema* sp. and *Apatania* sp. (Table 1). In total, at least 24 species including *R. impar* are recognized for the caddisfly fauna of Kamikochi.

This is the first report on the species composition of adult caddisflies by a light trap in Kamikochi. Further follow-up field investigations are necessary to collect more adults by several combined sampling methods (e.g. sweeping method), because the present study was carried out only during five nights. Such methods may well further improve our understanding of the caddisfly fauna in Kamikochi.

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