

# **Influence of current factor to abundance of insect family (Ephemerellidae) at Kurokawa river, Kiso town, Japan**

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## **1. INTRODUCTION**

What is involved in studying the ecology of streams? There are flow considerations. Unlike lentic ecosystems (standing water), stream organisms must adapt to lotic, or moving water conditions. Imagine spending your days in a raging current, clinging to a tree to prevent you from traveling far downstream, leaving hearth and home behind. While many streams may not look like they are raging, if you are mayfly nymph weighing only a few milligrams, the smallest flow can sweep you away. All organisms fated to stream life have adaptations to flow. They may be simply smaller to slip between rocks to escape current. Fish and insects that dwell in currents frequently have a more streamlined shape, which reduces surface friction. Insects especially have evolved ingenious means of surviving and even exploiting stream currents. Some actually have suction-cup type extensions that tether them to the substrate

Aquatic habitats characterized by directional water flow (lotic environments) pose numerous challenges to their inhabitants, including the constant threat of dislodgement and downstream transport. As a result, many organisms exhibit morphological and/or behavioral adaptations that facilitate midwater or benthic station holding in these environments ([Rose L. Carlson and George V. Lauder, 2011](#)).

Except under low flow over flat surfaces, layers of greatly reduced flow appear to be less than 1mm in height, and perhaps less than 200 - 300nm ([Silvester & Sleight, 1985](#); [Statzner & Muller, 1989](#)). Only the smaller invertebrates, and of course microorganisms, would truly lie within a viscous sublayer. Many invertebrate taxa, including those whose flattened shape has long been viscous sublayer, in fact experience complex flows and relatively high shear. For these organisms, size and shape are important mainly because they influence the ratio of inertial to viscous force that the organism experiences, and not because of sheltering from the current. Addition, some family belongs to insect with specific morphology so they could cling close to stone slit.

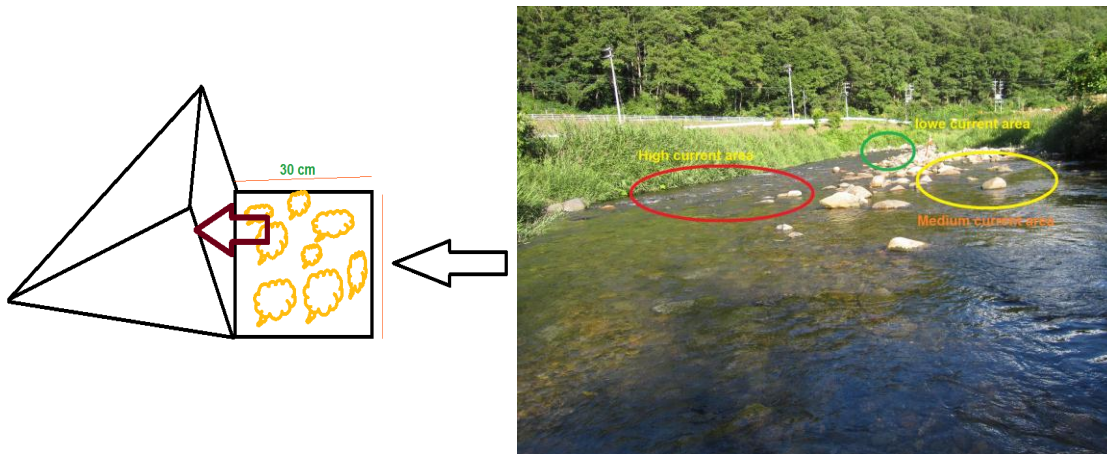
Behavior, functional morphology, and ecology related to body size and distribution and abundance in aquatic insects, with particular reference to (Ephemeroptera: Ephemerellidae). The family Ephemerellidae is interesting taxa belong to insect, Ephemerellidae are known as the Spiny Crawler Mayflies. They are a family of the order

Ephemeroptera. There are 8 genera consisting of a total 90 species (Merritt & Cummins, 1984). Their habitat is lotic-erosional, they are found in all sizes of flowing streams on different types of substrates where there is reduced flow. They are even found on the shores of lakes and beaches where there wave action present. They move by swimming and clinging, they are very well camouflaged. Most species have one generation per year (Voshell, J.R. A., 2002)

In the short-term learning at DIWPA International Field Biology Course - Kiso River, Japan, August 17-24, 2012, I conducted a small study on insect family (Ephemerellidae) to understand the influence of current factor to their abundance.

## 2. MATERIALS AND METHODS

- Location research: Kurokawa river – Kiso town – Japan.
- Time: August 22, 2012
- Collect samples by quadrat (30cm x 30cm) at 14 sites along the stream
- Depth: limited from 15 cm to 25 cm.



*Fig 1. The method and location for collecting samples*

- The locations where we collect samples are in opening area, the samples were collected at three levels of flow: low flow (L), the moderate flow (M) and high flow (H)



Fig 2. Sorting samples and measuring body size of Ephemerellidae

- After sorting insect samples, the number of individuals belonging insects family of Ephemerellidae have been counted to calculate the percentage of Ephemerellidae per total number of insects in each sample.
- Measuring the body size: body length (L), body width (W), and body size index (L/W).

### 3. RESULTS AND DISCUSSION

#### 3.1. Environmental indicators of water

Environmental factors at the sampling points are shown in Figure 3.

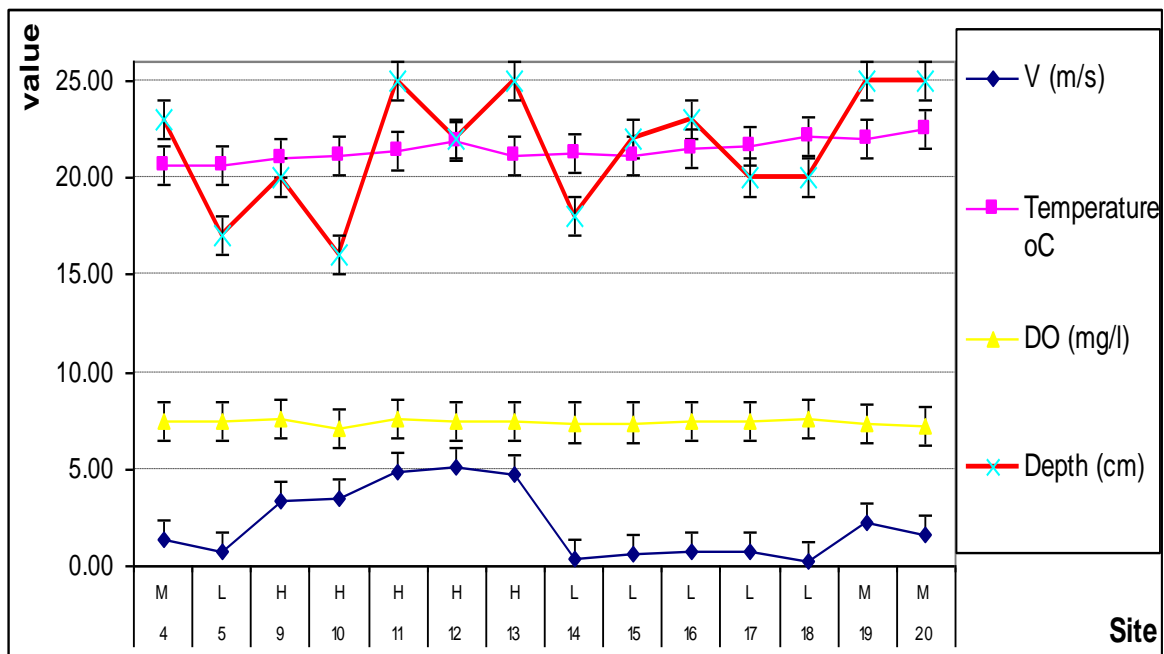


Fig 3: Environmental indicators of water according to the sampling points

- Through the chart number 3, we can see that the element temperature °C and DO (mg/l) at the all sampling pointes does not make much difference.

- The depth factor is limited in the range of 15 to 25 cm.
- The flow element is divided into three different levels:

The sampling points of 5,14,15,16,17,18 are the point with the low flow

The sampling points of 4,9,10,19,20 are the point with the average flow

The number of sampling points 11,12,13 are the point with the high flow

### 3.2. The interrelation between velocity of flow and ratio individuals belong to family (Ephemerellidae)

The correlation between flow and ratio individuals belong to Ephemerellidae family is showed in Figure 4.

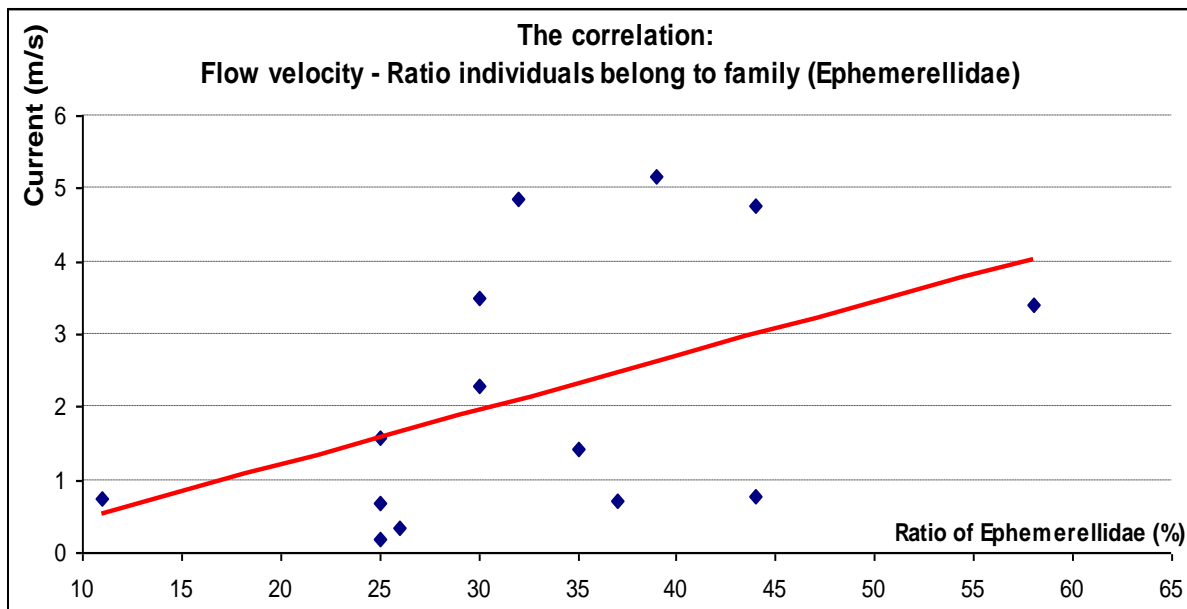


Fig 4: The interrelation between velocity of flow and ratio individuals belong to family (Ephemerellidae)

The percentage number of individuals belong to family (Ephemerellidae) in the total individual insects increases with flow velocity (the correlation index: multiple  $r = 0.52$ ). The habitat of insect family (Ephemerellidae) is lotic-erosional, they are found in all sizes of flowing streams on different types of substrates where there is reduced flow.

The insect family (Ephemerellidae) can live in both places with low flow or high flow, while the other little insects living at the high flow. This is explained that Ephemerellidae with flattened shapes. For these organisms, size and shape are important mainly because they influence the ratio of inertial to viscous force that the organism experiences, and not because of sheltering from the current.

Addition, some family belong to insect with specific morphology so they could cling close to stone slit. The insect family (Ephemerellidae) that dwell in currents frequently have a more streamlined shape, which reduces surface friction.

### 3.3. The interrelation between velocity of flow and body size

The correlation between velocity of flow and body size of Ephemerellidae is shown in Figure 5.

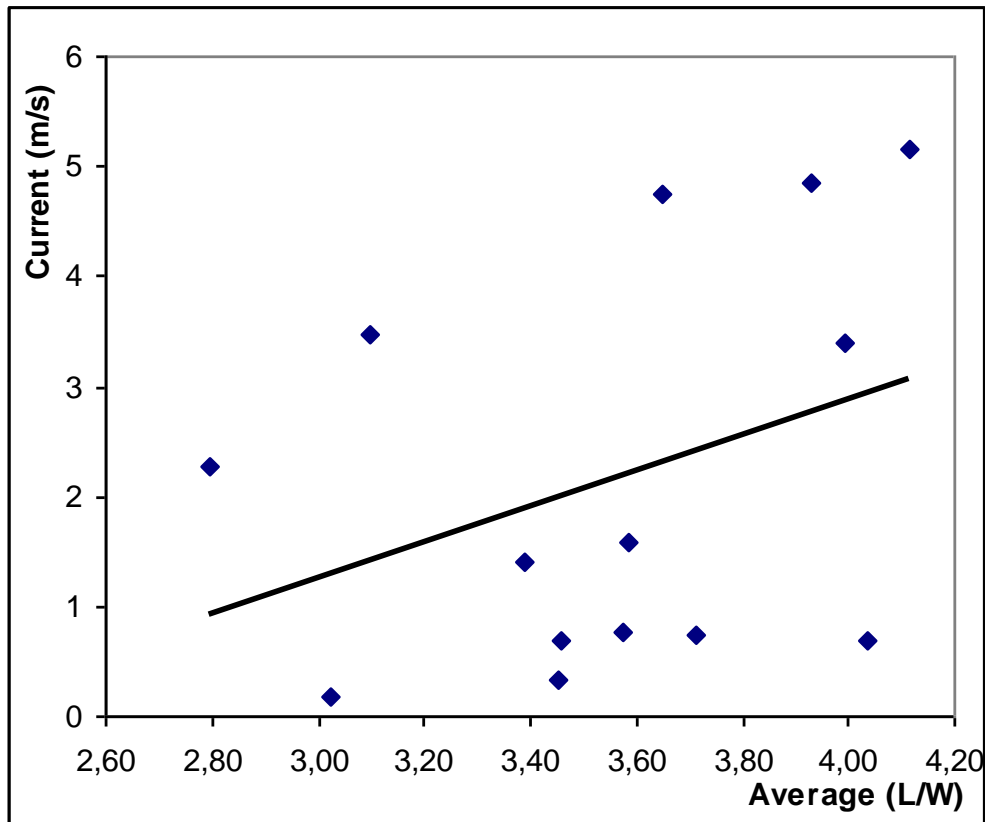


Fig 5: The interrelation between velocity of flow and body size

The body size ratio ( $l/w$ ) of insect family (ephemerellidae) tends to increase with the flow velocity. This is explained that Ephemerellidae with flattened shapes, small individuals tend to live at the low flow, this can be related to the ability to cling to our rocks, the larger individual will be able to sell better on rock.

### 4. CONCLUDING REMARKS

Ephemerellidae even can staying in habitat with lower current or higher current. The size body of Ephemerellidae staying in habitat with low current is bigger than size body of Ephemerellidae staying in habitat with high current.

*Acknowledgement. The studies received the supports from DIWPA International Field Biology Course - Kiso River, August 17 – 24 2012, Center for Ecological Research - Kyoto University, Japan.*

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