There is a close relationship between the stream-edge structure and the abundance of aquatic organisms.

Stream-edge plants can be divided into terrestrial (overhanging cover) and aquatic (in-stream cover) parts.

Their presence was found to determine the distribution of aquatic organisms (fish and crustaceans).

In-stream cover slows the stream-edge currents down and provides refuge for aquatic organisms.

The disappearance of in-stream cover severely affects aquatic organisms.

Researcher in charge

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dramatically reduces the amount of fish although overhanging cover has only a slight effect on the distribution of fish.

Result 2

During this experiment, 15 fish species were caught. The species included both fluvial and benthic species, the former included: *Zacco platypus*, *Carassius* sp., and *Gnathopogon elongatus elongatus*, and the latter: *Pseudogobio esocinus esocinus*, *Misgurnus anguillicaudatus*, and *Cobitis* sp. The percentages of these fluvial and benthic fish changed in relation to stream-edge structures (Figure 3). In A, B, and C, fluvial fish accounted for over 70% of all fish species, while in D and E, benthic species accounted for high percentages of over 50%. The disappearance of both in-stream and overhanging cover was found to affect the distribution of fluvial fish species.

Result 3

There were crustaceans living in the experimental stream, such as: *Procambarus clarkii*, *Eriocheir janonicus*, and *Caridina leucosticta*. The biomass of these crustaceans differed among sections more notably than the difference in the quantity of fish (Figure 4). The amount did not differ greatly between A (vegetated bank) and B (in-stream cover), but dropped dramatically in C (overhanging cover) and D (no plants). There were very few crustaceans living in Class E sections with concrete revetment. This study showed that in-stream cover is essential for crustaceans to live.

Discussion

The experiment showed that disappearance of plants from the water's edge affected the distribution of aquatic organisms even when plants still remained on the ground. Stream-edge plants slow down the speed of flow near banks, create cover over stream-edge water, affect other physical conditions, and thus affect the distribution of aquatic organisms. When banks were covered by concrete, the current velocity was as fast as in the middle of the stream, and such conditions inhibited crustaceans from living in that area.

Restoring stream-bank functions

As a part of activities to reform streams into multi-natural forms, plants are being actively planted along streams, especially in the ground. In order to improve the living conditions of aquatic organisms, plants should be also planted in the water, and stream-edges should be improved into a space where plants can grow. Stream-edge plants not only change the physical conditions in water but also serve in various other ways, such as providing food and shade from sunlight. Plants should be kept along the water's edge in a manner appropriate to each stream and stream section.

■ Treatments

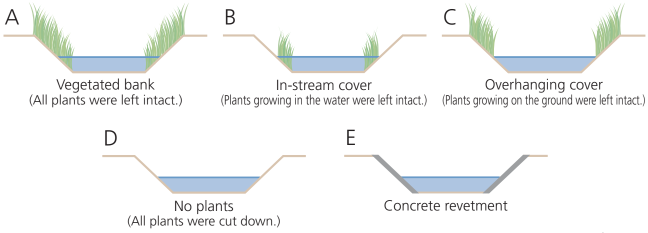

Figure 1

■ Table 1 Characteristics of the section classes

Class	Overhanging cover	In-stream cover	Current velocity near the edge of water
A : Vegetated bank	○	○	Slow
B : In-stream cover	×	○	Slow
C : Overhanging cover	○	×	Intermediate
D : No plants	×	×	Intermediate
E : Concrete revetment	×	×	Fast

■ Stream-bank structure and amount of fish

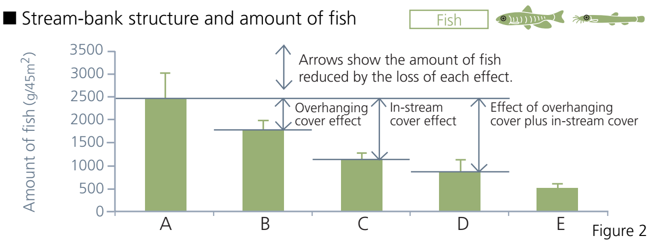

Figure 2

■ Stream-bank structure and kind of fish
(percentage of fluvial and benthic fish)

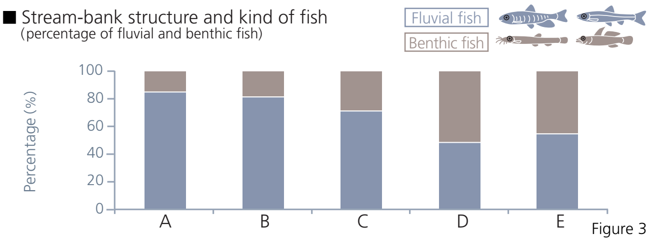

Figure 3

■ Stream-bank structure and amount of crustaceans

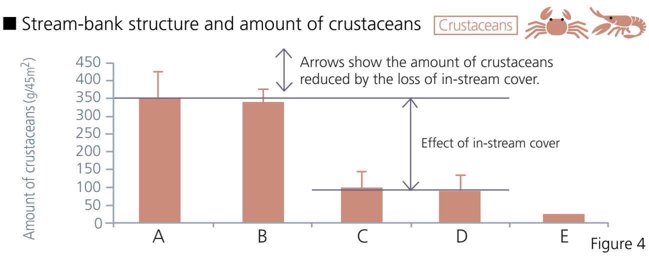

Figure 4

Column

Fish use stream-edge plants in various ways.

Some species of fish use pieces of plants to make nests, while some fish (small fish in general) need the slow-moving waters created by plants to live. There are fish that feed on insects that fall from stream-edge plants, and those that shelter among plants to escape from predatory birds. Understanding these functions of stream-edge plants will enable us to improve habitats for fish. It is therefore important to understand the functions of plants in each stream environment.