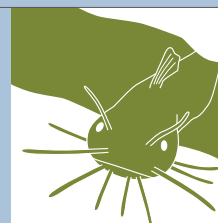


column

Nekogigi
(bagrid catfish;
Pseudobagrus
ichikawai)

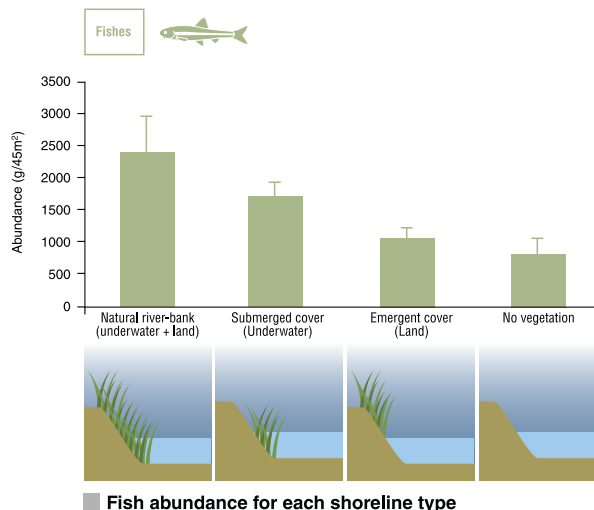
Nekogigi is a catfish species designated as a natural monument. They live in gaps beneath boulders.



Study 1

Underwater cover provide a suitable habitat for fishes

Shoreline plants can be divided into those growing above (land cover) and below (underwater cover) the water surface. In a study on the relationship between plant removal methods and the presence of fish species, underwater cover provided a greater contribution to fish presence than land cover. This was attributed mainly to the attenuation of flow at the shoreline by underwater vegetation. Based on results of field studies and the swimming ability of fish larvae and juveniles, flow velocities up to about 10 cm/s provide suitable fish habitat. It is therefore important for the conservation and restoration of shorelines to provide areas where shoreline flow velocities are below this level. The restoration method described in Study 3 was designed based on the results of these studies.

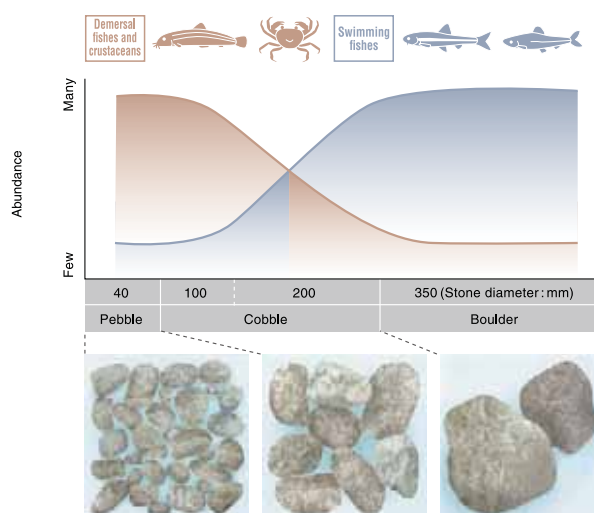


■ Fish abundance for each shoreline type

Study 2

Fishes and crustaceans have different habitat gap-size preferences

Spaces between stones (gaps) along shorelines provide suitable habitat for both fishes and crustaceans. The size of these gaps depends on the diameter of the stones, and the physical environment of the gaps changes according to the gap size. We investigated the effects of stone size (pebble, cobble, and boulder) on the presence of fishes and crustaceans. The results indicated that as the size of stones increased, the dominant fish species tended to change from demersal species, such as *Gnathopogon elongatus* and *Pseudorasbora parva*. The population size of the crustacean *Eriocheir japonica* tended to decrease as the size of stones increased. Subsequent studies have suggested that the gap preference of different species is influenced by the characteristics of the physical environment of individual gaps as well as by the depth of the river channel and the flow velocity.



■ Habitat preference for each stone size

Study 3

Proposal of restoration methods

In collaboration with the Iwate Office of Rivers and National Highways, we developed and implemented new shoreline restoration techniques in the short-cut channel of the Satetsu River of the Kitakami River system in Iwate Prefecture. The river channel in the restored section had been straightened, resulting in fast-flowing water and a monotonous riverbed environment. In order to restore this river section, we reduced the flow velocity by installing a group of wooden piles and we created gaps and slow-flowing backwaters (*wando*) by installing stone groynes. Within 6 months of completing the project, we confirmed that the fish diversity was similar to that in the natural sections of the Satetsu River. In addition to the restoration of the physical environment, the growth of benthic and epiphytic algae and the establishment of the macroinvertebrate community in the restoration area, owing to the retention of fallen trees and fine particulate organic matter (food for fishes), are factors that contributed to a relatively rapid recovery of the system.



■ Layout of structures in the restoration techniques