



## The effect of a summer flood on the density of caddisfly (Trichoptera) in the middle reaches of the Shinano River, Japan

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### Abstract

We investigated the response of caddisfly species assemblages in the middle reaches of the Shinano River to a flood that occurred in mid July 2006. Prior to the flood (on Day -22) the population density of total benthic caddisflies was  $8,266.7 \pm 2,392.1$  individuals  $m^{-2}$ . After the flood, by Day 11, the population density had decreased to  $55.6 \pm 55.6$  individuals  $m^{-2}$ . By Day 65, the density of caddis species had recovered to nearly the same level as that recorded before the flood, particularly in the case of *Hydropsyche orientalis* Martynov, the most abundant benthic species. By Day 65 the larvae of this species had reached pre-flood levels. On Day 40 it was noted that the larval population was dominated by final instars, but by Day 65 early instar larvae were dominant and downstream drift consisted mainly of second instars. Moreover, *H. orientalis* adults were constantly collected during the study period and the abundance of adults increased after Day 50. These results suggested that drift and reproduction were the main recolonization mechanisms that contributed to the rapid recovery of benthic caddisfly after the flood.

**Key words:** adult caddisfly, disturbance, drift, *Hydropsyche orientalis*, larval stage, recovery

### Introduction

Succession of benthic macroinvertebrate communities following a physical disturbance has attracted considerable interest (reviewed by Mackay 1992) and is important for understanding the population dynamics of macroinvertebrate communities in lotic ecosystems (e.g., Fisher 1983, Sheldon 1984, Resh *et al.* 1988). In streams and rivers, floods are an important organizing factor that affects benthic macroinvertebrate communities and can result in the creation of open patches in stream beds (Resh *et al.* 1988, Townsend 1989, Lake 2000). A number of field experimental studies have been undertaken to describe colonizing patterns of benthic macroinvertebrates after small-scale manipulation of habitats, such as the introduction of new substrates (reviewed by Hayashi 1991, Mackay 1992). Because of difficulties associated with organizing large-scale manipulation experiments, details of natural regimes of flooding disturbance in streams and rivers are not well known. Investigating the population dynamics of macroinvertebrate communities during flood events represents a ‘natural experiment’ that can be undertaken to accomplish such studies.

Because river basins have often suffered from flood disasters, many streams and rivers in Japan have been modified for the purpose of flood control (Tamai *et al.* 1993, Tamai *et al.* 2000). After the new River Law was established in 1997, conservation and restoration of river environments were added to the objectives of Japanese river management. However, management methods are still