Environmental Studies on the Ashimori River in Okayama City, Japan

M. Tara

Dept. Environmental Information Studies, Faculty of Environmental Studies, Hiroshima Institute of Technology, Hiroshima 731-5193. Japan.

Abstract

This paper summarizes a poster paper presented at the International Symposium on Water Management held at Deakin University, December 2000. The study was carried out by 14 members of the Science Club of Ashimori Junior High School in Okayama City under the supervision of Principal T Segawa and Director R Noto. The Ashimori River runs through the north-west of Okayama City and has many suitable natural habitats in it for study. However, since 1994 a decline in firefly numbers has been linked to a decline in water quality. We counted aquatic fauna over several years and related it to physico-chemical characteristics of the water. We found some animals indicated better quality water and were principally found in the upper reaches of the river (e.g. Ephemeroptera, Trichoptera), although the number of Ephemeroptera declined over time. Pollution has increased steadily in the river over time.

Introduction

There have been recent curriculum developments in Japan which have promoted introduction of an Integrated Curriculum in which teachers largely control the content and delivery of the curriculum. Environmental education is a most appropriate way of delivering such integrated lessons, and has been advocated through various intergovernmental organisations and conferences, beginning with the UNEP Stockholm declaration of 1972.

Ashimori River is located in the Ashimori rgeion, northwest of Okayama City and has several branches feeding into it, such as the Uita and Hijaka Rivers. Recently there have been concerns about a decline in environmental health of the river – for example, there has been a reduction in firefly numbers. For this reason we commenced a long-term study of the Ashimori River in 1994, comparing aquatic faunas with indicators of pollution, such as water temperature, pH, COD, nitrite, phosphate and tachometry.

Methods and Materials

Studies of aquatic fauna

Fish, insects, molluscs and other invertebrates were collected and counted with the naked eye. Fauna on the bottom of a $25cm^2$ frame quadrat were counted.

Water quality studies

Water temperature was measured using a thermometer. PH was recorded with a Pakku test pH meter. Pakku test kits (Kyoritsu Chemical Check Lab Co.) were also used to test for chemical oxygen demand (COD), nitrite ion mg/l, phosphate ion mg/l. Velocity of flow (m/sec) was measured by timing a floating object across a fixed distance.

Results and Discussion

Aquatic fauna

Table 1lists animals detected in four categories of water: clean, slightly polluted, polluted and a fourth category in which animals were found in all three water types. Ephemeroptera and Trichoptera were especially common in the upper reaches of the rivers which were less polluted. *Semisulcospira libertina* (which feeds on fireflies) was found mainly in the upper reaches also, but was not uniformly found in all such clean waters. Table 2 shows how the total number of Ephermeroptera and Trichoptera changes over time in 12 sampling locations in the Ashimori River. This suggests conditions change with time; the decline in Ephemeroptera and general increase in Trichoptera perhaps mirrored a reduction in water quality.

Chemical data

COD, phosphate and NO^{2-} were higher and pH lower downstream than in the upper reaches of the river system. Over time, COD increased in 22 of the 24 sampling sites, NO^{2-} increased in 15 of 20 sites while phosphate only increased in 7 (of 18) sites. We suggest this indicates a decline in water quality over time.

Actual data for chemical and fauna were presented at the Symposium on Water Management held at Deakin University in the form of a poster.

Table 1. Species indicative of different categories of water quality.

I.   Clean Water.

Pungtungis harzi Herzenstein, Cyprididae
Zacco temminincki (Temminck et Schlegel), Cyprididae
Odontobutis obscura (Temminck et Schlegel), Eleotridae
Acheilognathus limbata (Temminck et Schlegel), Cyprididae
Ephemeroptera
Trichoptera
Mataeopsephus japonicus Matamura, Psephenidae
Odonata
*Potamon (Geothelphusa) dehaani (*White)
Semisulcospira libertina (Gould) Pleuroceridae
Luciola oruciata Motschesky, Lampyridae
Gobitis biwae Sordan et Snyder
Parasilurus asotus (Linnaeus)
Dugesia japonica japonica Duges, Kawakatsu et Ichikawa.

II Slightly Polluted Water

Pseudogobio escocinus (Temminck et Schlegel), Cyprididae
Zacco platypus (Temminck et Schlegel), Cyprididae
Acheilognathus lanceolata (Temminck et Schlegel), Cuprididae
Rhodeus ocellatus smithi (Regan), Cyprinidae
Shigara distanti
Eucarida pandalus
Pseudagrion
Laccotrepes japonicus Scott, Nepidae
Unio douglesiae (Griffith et Pidgeon), Unionidae
Calopteryx atrata Selys

III Polluted Water

Carassius spp.
Pseudorasbora parva (Temminck et Schlegel), Cyprididae
Procambarus clarki (Girard)
Porifera, *Ephydatia mulleri* (Lieberkuhn)
Sinotaia quadrata histrica (Gould)
Radix japonica (jay), Lymnaeidae
Physa acuta Draparnaud, Physidae

IV All sites

Rhinogobius brunneus (Temminck et Schlegel), Gobiidae
Gerris paludum insularis (Motschulsky), Gerridae
Protohermes grandis (Thunberg), Corydalidae

Kamimuria tibialis (Pictet), Perlidae
Larvae of Chironomidae
Corbicula (Gorbiculina) leana Prime, Corbiculidae
Hirudinea