# Variables Determining the Response of Invertebrate Species to Toxicants

## A Case Study on the River Meuse

**ACADEMISCH PROEFSCHRIFT**

ter verkrijging van de graad van doctor aan de Universiteit van Amsterdam op gezag van de Rector Magnificus prof. dr. J.J.M. Franse ten overstaan van een door het college voor promoties ingestelde commissie, in het openbaar te verdedigen in de Aula der Universiteit op dinsdag 6 april 1999, te 13:00 uur

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# Chapter I

## GENERAL INTRODUCTION

A century ago the large rivers in Europe were still characterized by a high faunal biodiversity. Especially benthic communities were rich in invertebrate species, but nowadays many populations have virtually collapsed in several rivers. Concomitantly, few ubiquitous species are blooming. Also the fish fauna has much declined, notably the migratory species have been eradicated in many river systems. Today, ecological recovery and rehabilitation of aquatic ecosystems have become major objectives of many governments. For some rivers, like the Rhine, international rehabilitation programmes have been established which aimed at restoring water quality so that formerly existing species may return, safeguarding river water as a source of drinking water, and reducing pollution of the river sediment (IKSR, 1987). Although a few typical riverine insects returned to the Rhine recovery proceeds slowly, while in other rivers, where no such rehabilitation schemes are in operation, recovery has not even commenced.

In order to restore the original biodiversity of disturbed rivers it is essential to know how species'can benefit from improving environmental conditions and which environmental requirements are to be fulfilled. However, decisions on measures are hampered by a lack of knowledge on the autecology and the sensitivity to toxicants of many aquatic macrofauna species. This information is crucial, because most large rivers harbour habitats that are modified in many respects and at the same time many different water quality parameters indicate deteriorated conditions for aquatic life.

The lack of information on the specific requirements of macrofauna species to many environmental factors hampers the interpretation of data on the distribution of aquatic invertebrates severely. This scientific problem confronts also the water management with a dilemma: is there perspective for massive nature development programmes recreating interconnected habitats or is water quality to be further improved by reducing the input of toxicants and nutrients? Van Urk et *al.* (1993) observed that a decrease in concentrations of insecticides in the River Rhine coincided with the reappearance of the caddisfly *Hydropsyche contubernalis*, whereas Neumann (1990) suggested that the recolonization of this species was due to increasing oxygen levels. This example clearly demonstrates that