

# **The effect of heavy metal pollution on salmonid populations in the River Thee, Co. Galway**

## **Abstract**

The aim of this study was to establish the variation in salmonid populations and relate this to heavy metal pollution along the course of an Irish lowland river. Fish communities were sampled on the River Thee, Co. Galway. The variation in fish populations was examined in relation to both heavy metal pollution and physical habitat variation. 10 sites were sampled along the course of the River Thee and at each site electrofishing was carried out along with macro-invertebrate sampling. The results show a high level of between-site variation in the salmonid community parameters and physical habitats. The macro-invertebrate results indicate a zone of low heavy metal contamination (upper 5 sites) and high heavy metal contamination (lower 5 sites). However, the variability between sites suggests it is difficult to assign the variation in fish populations solely to either the presence of heavy metal pollution or physical habitat variation.

## **Introduction**

There are many methods available for the assessment of water quality. Historically, the monitoring of aquatic ecosystems has been based on chemical measures of water quality (Metcalf-Smith, 1994). However, current views are that chemical monitoring does not provide sufficient information to enable meaningful conclusions to be drawn (Metcalf-Smith, 1994; Wright *et al.*, 1994). Consequently, there has been an increase in the use of biological approaches to water quality assessment. It is possible to use any group of organisms to examine the biological condition of a river, and many attempts have been made using both flora and fauna (Armitage *et al.*, 1983). Fish communities are often used as an indicator of high water quality areas, especially salmonids (trout and salmon), as these individuals have extremely specific water quality requirements (Bauer and Ralph, 2001).

It is possible to use salmonid communities as an assessment of pollution and fish are ideal indicators of heavy metal contamination in aquatic systems because they occupy different trophic levels and are different sizes and ages (Burger *et al.*, 2002). However, many studies have indicated that salmonid populations are influenced heavily by the complex physical habitat of the river. Therefore, it is essential that the physical habitat of the river be investigated along with potential influence of heavy metal pollution on the salmonid communities. This research was carried out on the River Thee, Co. Galway, a system that is subject to inputs of heavy metals throughout the lower stretches.

## **Materials and methods**

### **Site selection**

The River Thee in Co. Galway was chosen as the study river. Electrofishing was chosen to obtain a representative sample of the fish assemblage at each sampling site. A total of 10 sites were sampled for fish during March 1997. Stop nets were used to enclose each site prior to sampling (Lehane 2000). Electrofishing was carried out in order to gain population estimates using the removal/depletion fishing method. At all sites, 3 fishing runs were

carried out. Electrofishing was carried out collecting all fish from one pass/run. The length (cm) and weight (g) of the caught fish were measured. The fish were allowed to recover prior to placing them downstream of the stop nets and repeating the operation a further two times.

Physical parameters were also recorded at each site. The composition of streambed substrate was estimated; the proportion and species composition of both in-stream and marginal macrophytes were recorded; the mean wetted width was calculated; depth and velocity readings were taken. Discharge was also calculated for each site.

### **Data analysis**

Population estimates for salmonid fish were obtained for each site, which were subsequently used in the calculation of salmonid densities. Following this, biomass was also calculated for each site. The variation in salmonid densities and biomass between sites is shown graphically. The relationship between physical habitat variables and the salmonid fish populations were examined using correlation co-efficients.

### **References**

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