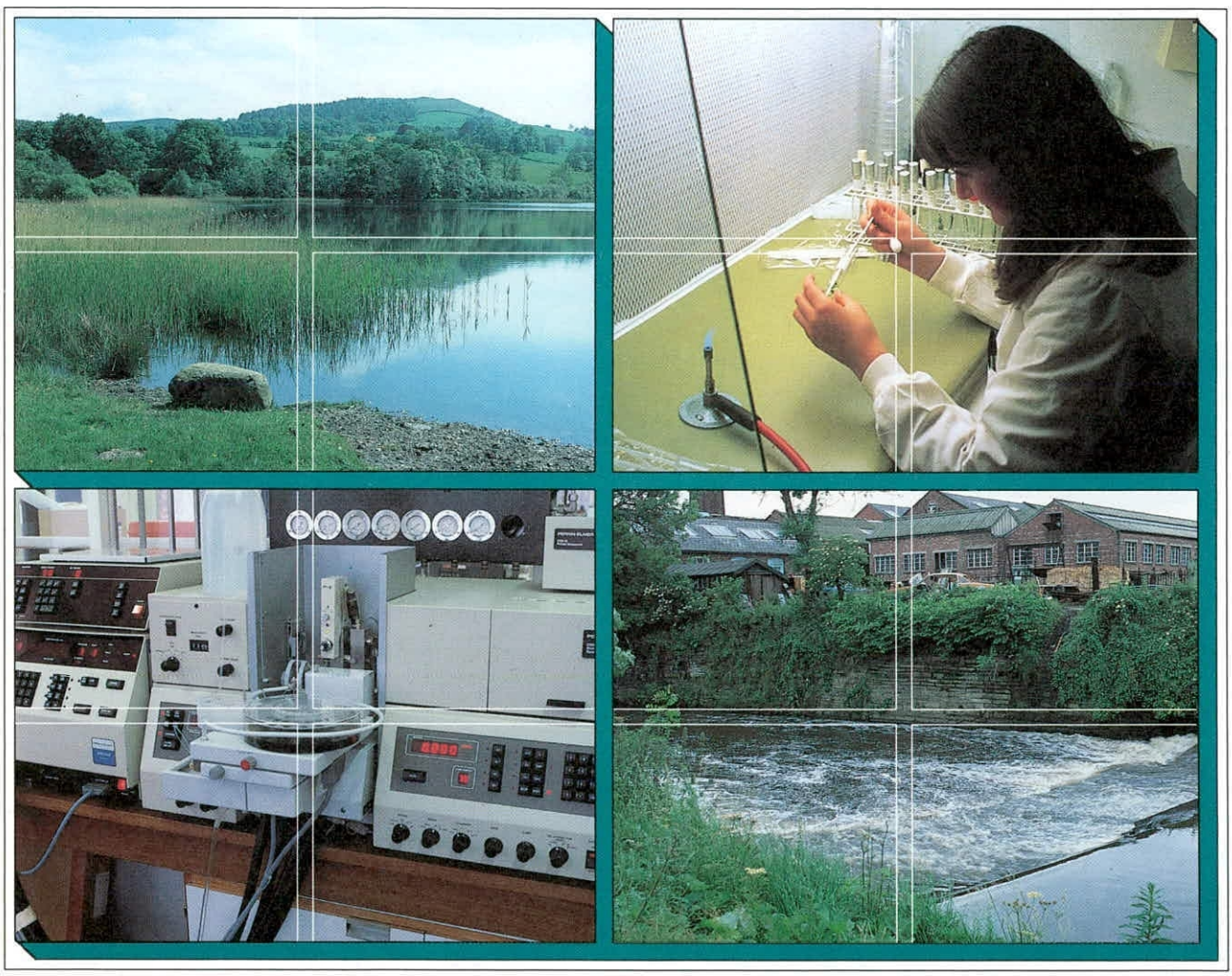
Institute of Freshwater Ecology

# The occurrence of selected chemical pollutants (Simazine, Lindane and Permethrin) in river fish Progress Report December 1991

M. Ladle PhD



Natural Environment Research Council

INSTITUTE OF FRESHWATER ECOLOGY
**River Laboratory, East Stoke, Wareham, Dorset BH20 6BB**

Tel: 0929 462314
Fax: 0929 462180

# The occurrence of selected chemical pollutants (Simazine, Lindane and Permethrin) in river fish Progress Report December 1991

**M. Ladle**

Project leader: M. Ladle
Report date: December 1991
Report to: Department of the Environment

Contract No:
IFE Report Ref: RL/T11053p5
TFS Project No: T11053p5



The Institute of Freshwater Ecology is part of the Terrestrial and Freshwater Sciences Directorate of the Natural Environment Research Council.

## OBJECTIVES

1. To review the known occurrence of Simazine, Lindane and Permethrin in river fish.

2. To analyse fish species and/or age groups selected on the basis of spatial and temporal occurrence in order to determine the concentrations and variability of Simazine, Lindane and Permethrin in river fish.

3. To assess the significance of river fish in the environmental cycling of pesticides and to make recommendations on the role of fish in setting water quality standards.

### Intended approach

#### 1991-92

A literature review of the occurrence of Simazine, Lindane and Permethrin in freshwater, anadromous or catadromous fish and appropriate food organisms. The review will serve to highlight insufficiencies in data currently available in this field and to focus the work to the undertaken.

Sampling sites will be selected in relation to the known occurrence of target pesticides. In selection of the sampling sites the results of the National Rivers Authority's nationwide survey of the occurrence of red list substances in rivers (results to be available mid 1991) will be taken into account.

Preliminary samples of fish will be taken to coincide with periods of high run-off from land. Gut contents will be analysed and compared with published information. As far as possible the selected fish species will represent a cross-section of different feeding behaviours.

Methods for determination of the target pesticides in fish flesh will be tested and verified, having selected the best technique for extraction and measurement. The suitability of fish livers as the source of pesticides for this purpose will be assessed and the possibility of selecting other tissues and/or organs as the source explored. The analysed pesticide concentrations will be expressed in relation to the lipid fraction of the tissue/organ.

#### 1992-93

This will be the main period of fish sampling and pesticide analysis, including assessments of age, size and gut contents.

#### 1993-4

Analysis of fish flesh will continue in Year 3 and the results will be compared with published data if this is available.

Statistical analysis and interpretation of the results and production of the final report.

## PROGRESS

Work on this project commenced in July 1991.

A survey of the literature relating to the relevant pesticides has been initiated and references are being compiled on a PROCITE data base which will permit easy access, annotation and cross referencing of information. It is already apparent that the great majority of available information relates to toxicity expressed in the form of $LT_{50}$s etc. It is possible that reported high tolerance levels in certain invertebrates (eg hydropsychid caddis) may provide a clue as to the most suitable fish (eg predators of tolerant invertebrates) to be examined.

Dace were obtained from the River Avon, Hampshire and salmon from the River Frome, Dorset in order to test the analytical methods which will be applied in the present study. The fish were dissected and the livers frozen to be subsequently spiked with the selected pesticides in order to assess detection limits. Fish liver was tentatively chosen as a suitable tissue to examine for the presence of accumulated pesticide residues.

Generally the limits of measurement related to extracted solutions (injected sample concentration) of simazine, lindane and permethrin using the available (Monkswood) methodology are between 0.92 and 0.05 mg $l^{-1}$. In practice this will require concentrations of approximately 1000 µg $g^{-1}$ in fish tissue to provide meaningful comparisons.

Relatively high levels of pesticide "spikes" were used in the present tests; 1024 to 1228 µg $kg^{-1}$. Injected concentrations however approached the limits of reliable quantitation for lindane and cis-permethrin. The (Monkswood) method was unsuitable for simazine but a modified technique has now been developed and appears to be giving satisfactory results. The method sensitivity could be improved by use of high proportions of the extract at each stage in the clean up, and by concentration of the final cleaned eluate prior to injection. Sensitivity might be increased by as much as a factor of 20. This would give reliable quantitation limits of around 50 µg $kg^{-1}$.

Before final selection of sites for this study additional information regarding the occurrence of red list substances is awaited.