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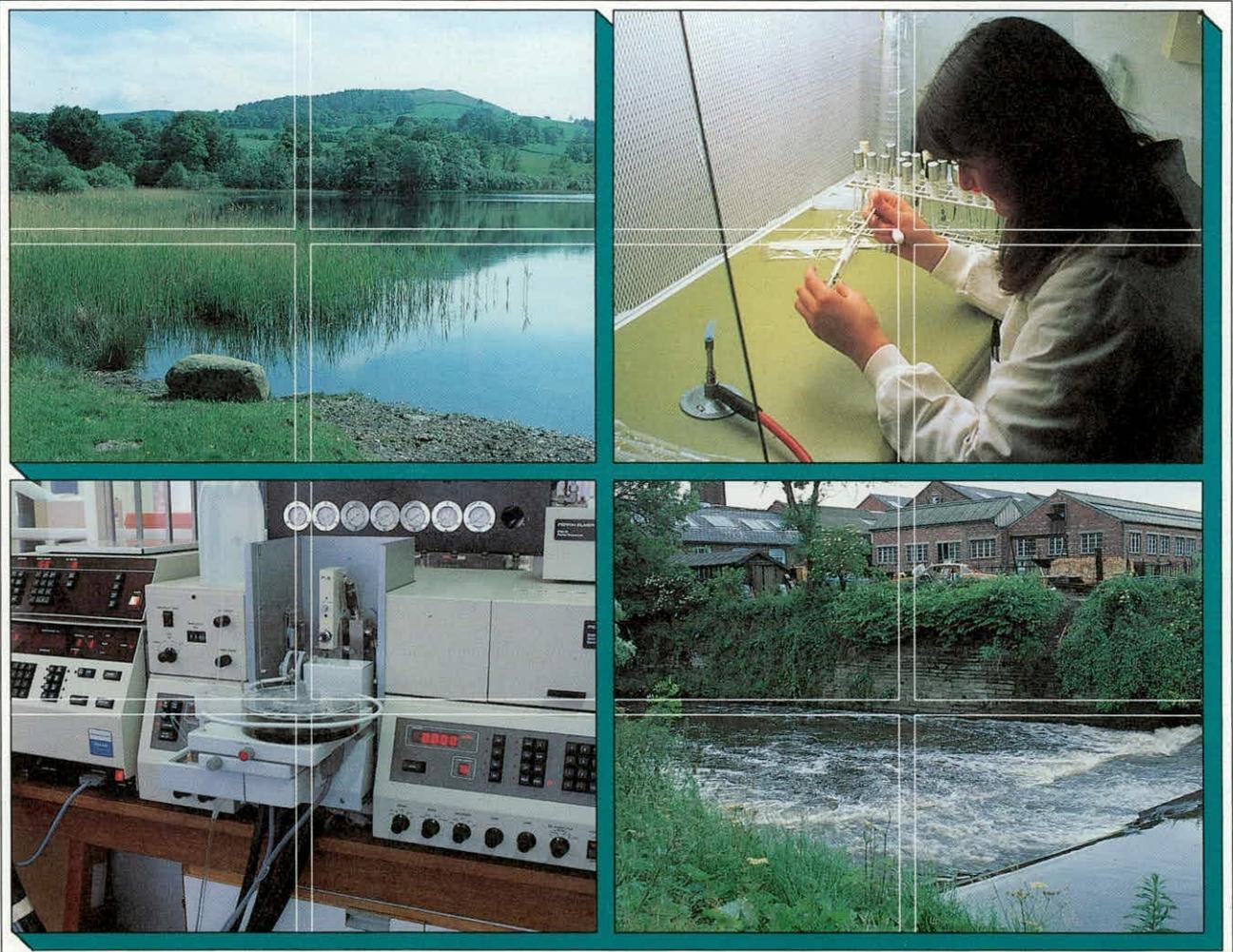
# **Quality audit of biological samples for the 1990 River Quality Survey Tay River Purification Board**

**R.J.M Gunn, BSc**

**J.F. Wright, PhD**

**J.H. Blackburn, BSc**

**M.T. Furse, BSc**





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

Tel: 0929 462314

Fax: 0929 462180

**Quality Audit of Biological Samples**  
**for the 1990 River Quality Survey**  
**Tay River Purification Board**

R.J.M. Gunn, J.F. Wright, J.H. Blackburn & M.T. Furse

Project leader: J.F. Wright  
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## **1. INTRODUCTION**

The 1990 River Quality Survey included the sampling of aquatic macro-invertebrates for biological assessment of river quality throughout the United Kingdom. In England and Wales the survey was undertaken by the National Rivers Authority (NRA), the River Purification Boards (RPBs) sampled in Scotland and the Department of Economic Development (DED) undertook the work in Northern Ireland.

Approximately 7750 sites were surveyed, the majority of which were sampled in spring, summer and autumn. Standard collection procedures were used and the sampling strategy was compatible with RIVPACS (River InVertebrate Prediction And Classification System), which has been developed by the Institute of Freshwater Ecology (IFE). Most of the remaining sites were sampled in a single season only, in order to extend the scope of the survey. For a variety of reasons, a few locations were sampled in just two seasons.

Samples were sorted for the families of macro-invertebrates included in the Biological Monitoring Working Party (BMWP) system. Taxa present were recorded on site data sheets. Sample processing and recording techniques varied from region to region.

In order to undertake this massive programme of fieldwork and sample processing, a large number of new staff were employed by the surveying agencies. In view of the number of staff involved and the variability of sample processing techniques, it was recognised that an independent quality control exercise was necessary to promote a consistently high level of reliability.

The IFE was contracted to undertake an audit of the sample sorting and identification performance of each NRA region, RPB and the DED. This report collates the results of 8 samples audited for Tay RPB. The IFE was not required to perform any statistical analyses nor interpretation of the results of the audit.

## **2. SAMPLE SELECTION**

Nearly all samples from the 1990 River Quality Survey were sent to IFE for storage. They were catalogued on arrival and placed in crates, such that individual samples were readily accessible. A stratified random selection of samples for each sample processor was then made. Selection was undertaken by IFE staff and no selection was made before each sample had been received by IFE. Thus, sample processors had no means of knowing which of their samples would be audited.

The total number of sample processors employed nationally during the survey was considerably higher than that anticipated at the outset. As a consequence, the number of samples audited per processor was limited by the need to keep within the contracted overall total of 700 samples. A minimum of 4 samples was audited per processor, except where individuals processed very few samples or did not process material from each of the 3 seasons.

Sample selection was weighted towards spring samples in order to give early feedback on the blindspots of particular sorters and problems of identification.

### 3. SAMPLE PROCESSING

Biologists processing samples for the 1990 Survey were instructed to sort their samples, ideally within the laboratory, and select examples of each scoring taxon within the BMWP system. In most cases, the invertebrates were placed in a vial of preservative (4% formaldehyde solution or 70% industrial alcohol) and the BMWP taxa were listed on a data sheet. The vial of animals and the sorted material were then returned to the sample container and preservative added. Thus, each sample available to IFE for selection for audit should have included:

- i) a list of the BMWP FAMILIES FOUND IN THE SAMPLE
- ii) a vial containing representatives from each family
- iii) the preserved sample

When these three elements were present, the sequence of operations at IFE was as follows:

- a) The remainder of the sample was sorted and the BMWP families listed
- b) The families contained within the vial were identified and listed
- c) A comparison was made between the RPB listing of families and those identified from the vial by IFE
- d) A comparison was made between the RPB listing of families and those found in the sample by IFE
- e) "Losses" or "gains" from the RPB listing of families were noted. In the case of "gains", each additional family was identified, where possible, to species level, in order to clarify any specific repetitive errors.

For a number of different reasons, some samples did not include a vial containing representative examples of the families listed on the RPB data sheet. These samples were avoided for audit, where possible. When selection of such samples was unavoidable (eg where a particular sorter would otherwise have been excluded from the audit exercise), only operations a), d) and e) above were appropriate.

Several directives were issued to IFE relating to the treatment of BMWP taxa. Terrestrial representatives of BMWP scoring families, animals deemed to have been dead at the time of sampling, cast insect skins, pupal exuviae, empty mollusc shells and tail ends of "living" specimens were to be excluded from the listing of families present. Trichopteran pupae, although not routinely identified by many biologists, were to be included in the listing of families.

#### **4. REPORTING**

The results of each sample audit were recorded on a standard report form (Table 1). For audit samples where a vial of animals was included, the comparison between the RPB listing and the taxa found in the vial by IFE was shown in box A of the report form. Discrepancies could be due to carelessness, misidentifications or errors in completing the RPB data sheet. Families not on the RPB listing but found by IFE in the remainder of the sample were entered in box B of the report form under "additional families". When the families listed as "losses" in section A of the report form were compared with the full list of families recorded in the sample by IFE, some apparent losses from the vial were offset by the presence of those families in the remainder of the sample. These taxa were therefore listed in the "losses" box of section A and the "gains" box of section B and were neither a net loss nor a net gain. In these cases, the families were marked with an asterisk in both boxes. Such errors are noted as "omissions" in the table which summarises the results for each season (Table 2).

Species identifications, state of development (eg adult or larval coleopterans) and the presence of a single representative of a family within the remainder of the sample were recorded in the notes section of the report form. Where the RPB data sheet indicated that a family was noted and released at the site, this was recorded in the notes section but not included as a "loss", even though the family was not found in the vial.

For those samples which did not contain a vial of animals, box A of the report form was not applicable (N/a). Families not on the RPB list but present in the sample were listed in box B under "additional families" as before. Families recorded on the RPB list but not found by IFE were indicated on the left hand side of box B. If the vial of animals was retained by the RPB, entries in this box could include the sole representative of a family which was removed by the RPB, a family seen at the site which escaped or was released (without mention being made on the RPB data sheet), inaccurate identification, the wrong family box being ticked on the RPB data sheet or the family being present in the sample but missed by IFE.

Results of the audits of individual samples are presented in Table 3.

#### **ACKNOWLEDGEMENTS**

Thanks to Mrs Jessica Winder and Mrs Kay Symes for assistance with cataloguing and storage of samples and Mrs Valerie Palmer for typing the manuscript.

TABLE 1. The IFE Report form

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION  RIVER

SEASON  SITE

SORTER  SAMPLE CODE

AQC OF BMWP FAMILIES    A. IN VIAL     B. IN SAMPLE

		LOSSES	GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE		

B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	

NET LOSSES     NET GAINS

NOTES

TABLE 2. The 8 samples audited for Tay RPB, with sample sorter initials and numbers of taxa 'lost', 'gained' and 'omitted'

River	Site	Sorter	Losses	Gains	Omissions
<b>SPRING</b>					
Motray Water	St Michaels	GCM	0	2	0
Eden	Kemback	GCM	0	0	0
Almond	Millhaugh	BEC	0	5	0
Tay	Dalguise	BEC	0	0	0
<b>SUMMER</b>					
Tay	Taymouth Castle	BEC	0	4	0
Brothock Water	Brothock Bridge	GCM	0	2	0
<b>AUTUMN</b>					
West Water	Stoneyford	GCM	0	1	0
Tay	Waulkmill	BEC	0	2	0



**TABLE 3**

**Results of individual sample audits**

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION	Tay RPB	RIVER	Motray Water
SEASON	Spring	SITE	St. Michaels
SORTER	GCM	SAMPLE CODE	NRA12 0533

AQC OF BMWP FAMILIES    A. IN VIAL        B. IN SAMPLE   

		LOSSES	GAINS
<b>A</b>	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	None	None

<b>B</b>	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	1 Glossiphoniidae 2 Heptageniidae

NET LOSSES        NET GAINS   

NOTES

1 Helobdella stagnalis 1 only  
2 Rhithrogena semicolorata/germanica

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION <input style="width: 100%;" type="text" value="Tay RPB"/>	RIVER <input style="width: 100%;" type="text" value="Eden"/>
SEASON <input style="width: 100%;" type="text" value="Spring"/>	SITE <input style="width: 100%;" type="text" value="Kemback"/>
SORTER <input style="width: 100%;" type="text" value="GCM"/>	SAMPLE CODE <input style="width: 100%;" type="text" value="NRA12 0531"/>

AQC OF BMWP FAMILIES    A. IN VIAL     B. IN SAMPLE

		LOSSES	GAINS
<b>A</b>	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE		None	None
<b>B</b>	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE		(This box only completed when no vial supplied with sample)	None

NET LOSSES     NET GAINS

NOTES

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION	Tay RPB	RIVER	Almond
SEASON	Spring	SITE	Millhaugh
SORTER	BEC	SAMPLE CODE	NRA12 0524

AQC OF BMWP FAMILIES    A. IN VIAL        B. IN SAMPLE   

		LOSSES	GAINS
<b>A</b>	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	None	None

<b>B</b>	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	1 Planariidae 2 Hydrophilidae 3 Elmidae 4 Hydropsychidae 5 Leptoceridae

NET LOSSES   

NET GAINS   

**NOTES**

- 1 Polycelis felina
- 2 Hydraena gracilis (adult) + indet larva
- 3 Elmis aenea 1 only
- 4 Hydropsyche siltalai
- 5 Adicella reducta 1 only

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION <input style="width: 100%;" type="text" value="Tay RPB"/>	RIVER <input style="width: 100%;" type="text" value="Tay"/>
SEASON <input style="width: 100%;" type="text" value="Spring"/>	SITE <input style="width: 100%;" type="text" value="Dalguise"/>
SORTER <input style="width: 100%;" type="text" value="BEC"/>	SAMPLE CODE <input style="width: 100%;" type="text" value="NRA12 0545"/>

AQC OF BMWP FAMILIES    A. IN VIAL     B. IN SAMPLE

	LOSSES	GAINS
<b>A</b> <u>VIAL</u>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	BMWP FAMILIES NOT FOUND BY IFE  None	ADDITIONAL FAMILIES FOUND BY IFE  None

<b>B</b> <u>SAMPLE</u>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	BMWP FAMILIES NOT FOUND BY IFE  (This box only completed when no vial supplied with sample)	ADDITIONAL FAMILIES FOUND BY IFE  None
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NET LOSSES                     NET GAINS

NOTES

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION	<b>Tay RPB</b>	RIVER	<b>Tay</b>
SEASON	<b>Summer</b>	SITE	<b>Taymouth Castle</b>
SORTER	<b>BEC</b>	SAMPLE CODE	<b>NRA12 0541</b>

AQC OF BMWP FAMILIES    A. IN VIAL        B. IN SAMPLE   

		LOSSES	GAINS
<b>A</b>	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>None</b>	<b>None</b>

<b>B</b>	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	<b>1 Planariidae</b> <b>2 Ancyliidae</b> <b>3 Caenidae</b> <b>4 Simuliidae</b>

NET LOSSES        NET GAINS   

NOTES

**1 Polycelis felina**  
**2 Ancyclus fluviatilis 1 only**  
**3 Caenis rivulorum 1 only**  
**4 Simulium erythrocephalum 1 only**

# 1990 RIVER QUALITY SURVEY

## AQC - BIOLOGICAL SAMPLES

REGION <span style="border: 1px solid black; padding: 2px;"><b>Tay RPB</b></span>	RIVER <span style="border: 1px solid black; padding: 2px;"><b>Brothock Water</b></span>
SEASON <span style="border: 1px solid black; padding: 2px;"><b>Summer</b></span>	SITE <span style="border: 1px solid black; padding: 2px;"><b>Brothock Bridge</b></span>
SORTER <span style="border: 1px solid black; padding: 2px;"><b>GCM</b></span>	SAMPLE CODE <span style="border: 1px solid black; padding: 2px;"><b>NRA12 0562</b></span>

AQC OF BMWP FAMILIES    A. IN VIAL +    B. IN SAMPLE +

		LOSSES	GAINS
<b>A</b>	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>None</b>	<b>None</b>

<b>B</b>	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	<b>1 Leptophlebiidae</b> <b>2 Simuliidae</b>

NET LOSSES **0**    NET GAINS **2**

NOTES	<b>1 Habrophlebia fusca 1 only</b> <b>2 Simulium aureum group 1 only</b>
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1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	<b>Tay EPB</b>	RIVER	<b>West Water</b>
SEASON	<b>Autumn</b>	SITE	<b>Stoneyford</b>
SORTER	<b>GCM</b>	SAMPLE CODE	<b>NRA12 0586</b>

AQC OF BMWP FAMILIES    A. IN VIAL +    B. IN SAMPLE +

		LOSSES	GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>None</b>	<b>None</b>

B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	<b>1 Simuliidae</b>

NET LOSSES 0    NET GAINS 1

NOTES **1 Simulium variegatum (pupa) 1 only**

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	<b>Tay RPB</b>	RIVER	<b>Tay</b>
SEASON	<b>Autumn</b>	SITE	<b>Waulkmill</b>
SORTER	<b>BEC</b>	SAMPLE CODE	<b>NRA12 0548</b>

AQC OF BMWP FAMILIES    A. IN VIAL     B. IN SAMPLE

		LOSSES	GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>None</b>	<b>None</b>

B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	(This box only completed when no vial supplied with sample)	<b>1 Nemouridae</b> <b>2 Linnephilidae</b>

NET LOSSES     NET GAINS

NOTES  
**1 Protonemura meyeri 1 only**  
**2 Potamophylax latipennis 1 only**

