Institute of Freshwater Ecology

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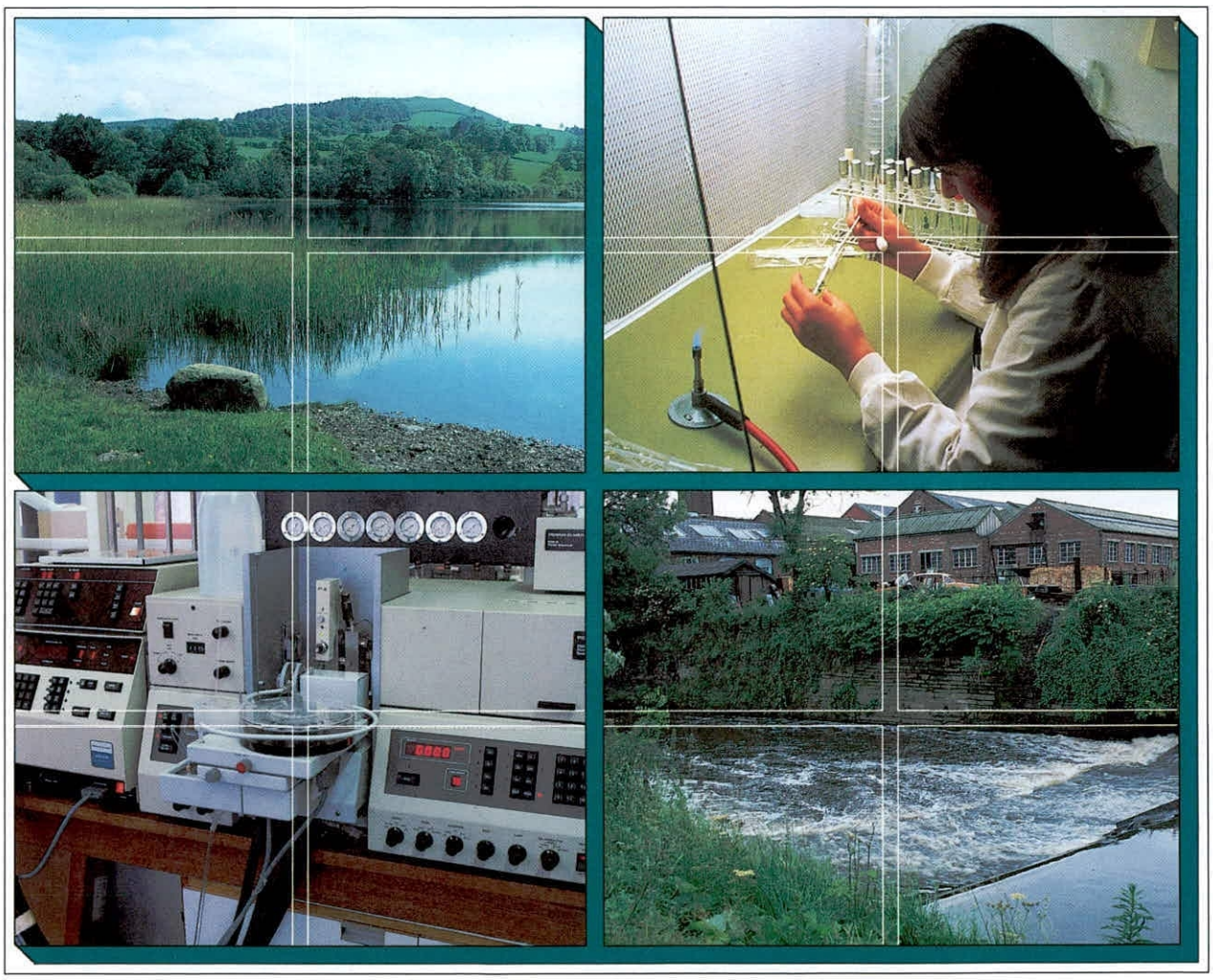

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Quality Audit of Biological Samples for the 1990 River Quality Survey Tweed River Purification Board

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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 Tweed 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

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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	VIAL 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	ADDITIONAL FAMILIES FOUND BY IFE
B	SAMPLE 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

NET LOSSES ☐ NET GAINS ☐

NOTES

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

River	Site	Sorter	Losses	Gains	Omissions
SPRING					
Teviot Water	B711 Bridge	SB	0	2	0
Ale Water	Ale Water Foot	SB	0	8	0
Tweed	Dawyck	JWC	0	3	0
Tweed	Innerleithen Bridge	JWC	0	0	0
SUMMER					
Teviot Water	B711 Bridge	JWC	0	1	0
Whiteadder Water	Above Ninewells	SB	0	2	0
AUTUMN					
Tweed	U/s Drygrange Viaduct	JWC	0	2	0
Leader Water	Leader Water Foot	SB	0	1	0

TABLE 3

Results of individual sample audits

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Teviot Water
SEASON	Spring	SITE	B711 Bridge
SORTER	SB	SAMPLE CODE	NRA12 0040

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 1 Hydrophilidae 2 Tipulidae

NET LOSSES [0] NET GAINS [2]

NOTES

1 Hydraena gracilis, Hydraena rufipes
2 Dicranota sp. 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Ale Water
SEASON	SPring	SITE	Ale Water Foot
SORTER	SB	SAMPLE CODE	NRA12 0046

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 1 Dendrocoelidae 2 Sphaeriidae 3 Asellidae 4 Chloroperlidae 5 Gyrinidae 6 Hydroptilidae 7 Leptoceridae 8 Lepidostomatidae

NET LOSSES [0] NET GAINS [8]

NOTES

1 Dendrocoelum lacteum 1 only
2 Pisidium sp. 1 only
3 Asellus aquaticus
4 Chloroperla torrentium
5 Orectochilus villosus (larva) 1 only
6 Ithytrichia sp. 1 only
7 Athripsodes sp. 1 only
8 Lepidostoma hirtum

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Tweed
SEASON	Spring	SITE	Dawyck
SORTER	JWC	SAMPLE CODE	NRA12 0002

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 1 Taeniopterygidae 2 Leptoceridae 3 Sericostomatidae

NET LOSSES [0] NET GAINS [3]

NOTES

1 Brachyptera risi 1 only
2 Athripsodes sp. 1 only
3 Sericostoma personatum 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Tweed
SEASON	Spring	SITE	Innerleithen Bridge
SORTER	JWC	SAMPLE CODE	NRA12 0004

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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

NET LOSSES [0] NET GAINS [0]

NOTES

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Teviot Water
SEASON	Summer	SITE	B711 Bridge
SORTER	JWC	SAMPLE CODE	NRA12 0040

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 **1 Nemouridae**

NET LOSSES [0] NET GAINS [1]

NOTES: **1 Amphinemura sp. (juvenile) 1 only**

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	**Tweed RPB**	RIVER	**Whiteadder Water**
SEASON	**Summer**	SITE	**Above Ninewells**
SORTER	**SB**	SAMPLE CODE	**NRA12 0063**

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 **1 Valvatidae** **2 Gyrinidae**

NET LOSSES **0** NET GAINS **2**

NOTES

1 Valvata cristata
2 Orectochilus villosus (larva) 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	**Tweed RPB**	RIVER	**Tweed**
SEASON	**Autumn**	SITE	**U/s Drygrange Viaduct**
SORTER	**JWC**	SAMPLE CODE	**NRA12 0008**

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 **1 Physidae** **2 Chironomidae**

NET LOSSES [0] NET GAINS [2]

NOTES

1 Physa fontinalis 1 only
2 Microtendipes sp. 1 only

1990 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Tweed RPB	RIVER	Leader Water
SEASON	Autumn	SITE	Leader Water Foot
SORTER	SB	SAMPLE CODE	NRA12 0036

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

		LOSSES	GAINS
A	VIAL 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	SAMPLE 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 **1 Chironomidae**

NET LOSSES [0] NET GAINS [1]

NOTES: **1 Tanypodinae, Orthocladiinae**


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