



# **An audit of performance in the processing of macro-invertebrate samples in 1994. Forth River Purification Board**

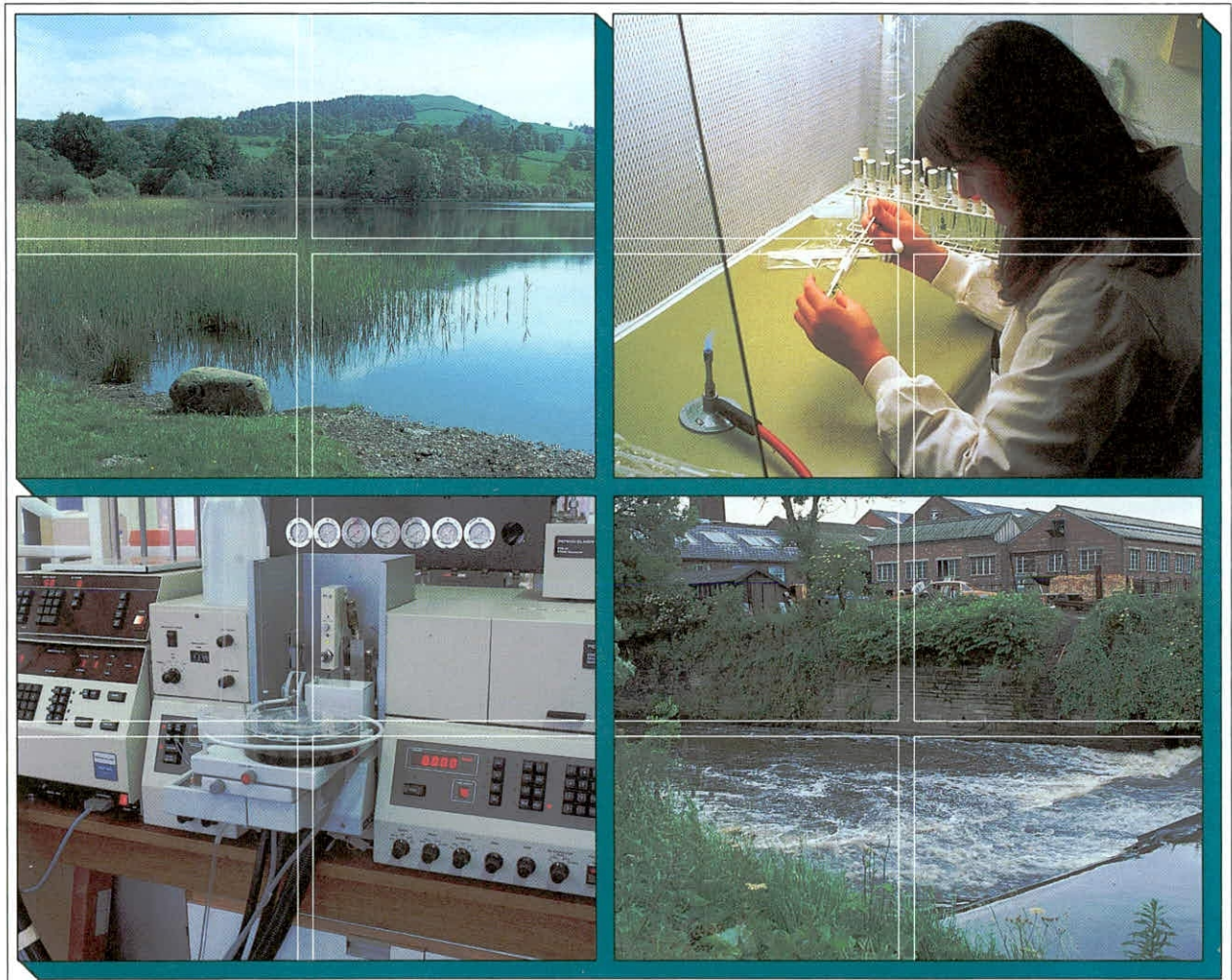
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Report To:  
IFE Report Ref. No:

Forth River Purification Board  
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**An audit of performance in the  
processing of macro-invertebrate  
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Forth River Purification Board**

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## **1. INTRODUCTION**

In 1994 the sampling of aquatic macro-invertebrates for the biological assessment of river quality continued throughout the United Kingdom. This task was undertaken by the National Rivers Authority (NRA) in England and Wales, the River Purification Boards (RPBs) in Scotland and the Industrial Research & Technology Unit (IRTU) in Northern Ireland.

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, several RPBs and the IRTU. This report presents the results of 30 samples audited for Forth River Purification Board. The IFE was not required to perform any statistical analyses nor interpretation of the results of the audit.

Each organisation employed standard collection procedures, as used in the 1990 River Quality Survey, and the sampling strategy was therefore compatible with RIVPACS (River InVertebrate Prediction And Classification System), which has been developed by the Institute of Freshwater Ecology (IFE).

Samples were sorted by NRA, RPB and IRTU personnel 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.

## **2. SAMPLE SELECTION**

Samples for audit were selected internally by each of the agencies being monitored. The biologists processing these samples had no prior knowledge of the samples to be audited.

The manner of sample selection, which biologists would be monitored and the number of audit samples from each season, were left to the discretion of the agency, within the limits of the total number of samples that IFE was contracted to audit.

## **3. SAMPLE PROCESSING**

The normal protocol for NRA, RPB and IRTU biologists was to sort their samples within the laboratory and to 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 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 data sheet. Others arrived with the vial damaged in transit such that the representative examples were no longer separated. For these samples, 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 posterior ends of "living" specimens were to be excluded from the listing of families present. Chrysomelidae and Curculionidae, which appear in the BMWP list, were also to be excluded for the purposes of the audit. 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 Tables which summarise the results for each season (Tables 2, 3 and 4).

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 in which the vial of animals was damaged or missing, box A of the report form was not applicable (N/a). Families not on the list but present in the sample were entered in box B under "additional families" as before. Families recorded on the 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 sorter, entries in this box could include the sole representative of a family which was removed, a family seen at the site which escaped or was released (without mention being made on the data sheet), inaccurate identification, the wrong family box being ticked on the data sheet or the family being present in the sample but missed by IFE.

Results of the audits of individual samples are presented in the Appendix.

TABLE 1. The IFE Report form

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	<input type="text"/>	RIVER	<input type="text"/>
DATE	<input type="text"/>	SITE	<input type="text"/>
SORTER	<input type="text"/>	CODE	<input type="text"/>

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:



TABLE 2. The 11 spring samples audited for Forth RPB.

River	Site	Sorter	Losses	Gains	Omissions
Breich Water	A706 Breich Bridge	HVHT	0	0	0
Carron	Ironworks Bridge	PW	0	3	0
Killandean Burn	Livingston	HVHT	0	2	0
South Esk	d/s Redside Burn	SdP	0	1	0
Carron	Denny Industrial Estate	PW	0	2	0
Cocklemill Burn	A917 Road Bridge	IRF	0	0	0
Esk	Lasswade Bridge	SdP	0	2	0
Kennoway Burn	Durie Vale	IRF	0	3	0
Black Devon	Mary Bridge	BOK	0	0	0
North Queich	Burgher Bridge	BOK	0	3	0
South Queich	Kinross Road Bridge	BOK	0	2	0

TABLE 3 The 9 summer samples audited for Forth RPB.

River	Site	Sorter	Losses	Gains	Omissions
South Esk	d/s Gore Water	SdP	0	0	1
Colstoun Water	u/s Confluence	SdP	0	0	0
Black Devon	Mary Bridge	BOK	0	1	1
Bonny Water	Bogton	PW	0	2	0
Almond	Blackburn	HVHT	0	2	0
Leven	u/s Lothrie Burn	IRF	0	4	0
Leven	d/s Nat. Steel Foundry	IRF	0	2	0
Almond	d/s Dowies Mill Weir	HVHT	0	2	0
Devon	Dollarfield	BOK	0	1	0

TABLE 4 The 10 autumn samples audited for Forth RPB.

River	Site	Sorter	Losses	Gains	Omissions
Carron	Carron Bridge	PW	0	1	0
Water of Chon	Loch Dhu outlet	PW	0	4	0
Duchray Water	u/s R Forth	PW	0	1	0
North Esk	Aughendwny	SdP	0	0	0
Dreel Burn	Anstruther	IRF	1	0	0
Bavelaw Burn	Balleny Farm	SdP	0	0	0
Red Burn	Castlecary	PW	0	0	0
Leven	Auchmuirbridge	IRF	0	3	0
Almond	East Whitburn	HVHT	0	0	0
Barbauchlaw Burn	Balmuir	HVHT	0	1	0

## **APPENDIX**

### **Results of individual sample audits**

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Breich Water
DATE	28.4.94	SITE	A706 Breich Bridge
SORTER	HVHT	CODE	3349 16/270/37.98

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Carron
DATE	11.5.94	SITE	Ironworks Bridge
SORTER	PW	CODE	1615 12/10/8.7

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

- |  |
|--|
| 1 Polycelis felina 1 only<br>2 Chloroperla torrentium 1 only<br>3 Simulium ornatum group (pupa) 1 only |
|--|

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Killandean Burn
DATE	28.4.94	SITE	Livingston
SORTER	HVHT	CODE	4090 16/220/24.42

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Hydropsyche siltalai 1 only 2 Athripsodes sp. (juvenile) 1 only
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	South Esk
DATE	29.4.94	SITE	d/s Redside Burn
SORTER	SdP	CODE	582 20/320/23.07

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 *Odontocerum albicorne*

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Carron
DATE	27.4.94	SITE	Denny Industrial Estate
SORTER	PW	CODE	3725 12/10/19.6

A	<b>VIAL</b>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>BMWP FAMILIES NOT FOUND BY IFE</b>	<b>ADDITIONAL FAMILIES FOUND BY IFE</b>
		None	1 Chloroperlidae

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Chloroperla torrentium 2 Pisidium sp. 1 only
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Cocklemill Burn
DATE	28.4.94	SITE	A917 Road Bridge
SORTER	IRF	CODE	3404 1/90/4.3

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	None

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Esk
DATE	13.5.94	SITE	Lasswade Bridge
SORTER	Sdp	CODE	4257 20/50/15.23

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Amphinemura sulcicollis  
 2 Hydraena gracilis (adult) 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Kennoway Burn
DATE	28.4.94	SITE	Durie Vale
SORTER	IRF	CODE	1412 2/20/4.2

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	1 Planariidae 2 Lymnaeidae 3 Glossiphoniidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

- |   |
|---|
| <p>1 Polycelis felina 1 only<br/>2 Lymnaea peregra, L.truncatula<br/>3 Glossiphonia complanata 1 only</p> |
|---|

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Black Devon
DATE	14.4.94	SITE	Mary Bridge
SORTER	BOK	CODE	4/10/4.5

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	North Queich
DATE	15.4.94	SITE	Burgher Bridge
SORTER	BOK	CODE	2/390/32.4

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Gammarus pulex 1 only 2 Caenis rivulorum 1 only 3 Hydraena gracilis (adult) 1 only
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	South Queich
DATE	15.4.94	SITE	Kinross Road Bridge
SORTER	BOK	CODE	2/310/31.9

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	1 Nemouridae 2 Chloroperlidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Amphinemura sulcicollis 1 only  
2 Chloroperla torrentium

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	South Esk
DATE	21.7.94	SITE	d/s Gore Water
SORTER	SdP	CODE	20/320/19.2

A	VIAL	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	1 Oligochaeta*	None

B	SAMPLE	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 is only completed when no vial is supplied with the sample)	2 Oligochaeta*

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

2 Lumbriculidae

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Colstoun Water
DATE	19.7.94	SITE	u/s Confluence
SORTER	sdp	CODE	22/60/21.11

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	None

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:



EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Black Devon
DATE	17.8.94	SITE	Mary Bridge
SORTER	BOK	CODE	4/10/4.5

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1,3 Empty shell in vial, Potamopyrgus jenkinsi in sample  
 2 Polycelis felina 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Bonny Water
DATE	3.8.94	SITE	Bogton
SORTER	PW	CODE	12/60/15.8

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

<p>1 Dendrocoelum lacteum 2 Ancylyus fluviatilis 1 only</p>
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Almond
DATE	3.8.94	SITE	Blackburn
SORTER	HVHT	CODE	16/10/31.61

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Potamopyrgus jenkinsi 2 Haliplus sp. (larvae)
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Leven
DATE	10.8.94	SITE	u/s Lothrie Burn
SORTER	IRF	CODE	2/10/15.6

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

B	<b>SAMPLE</b>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	<b>BMWP FAMILIES NOT FOUND BY IFE</b>	<b>ADDITIONAL FAMILIES FOUND BY IFE</b>
		(This box is only completed when no vial is supplied with the sample)	1 Asellidae 2 Dytiscidae 3 Hydroptilidae 4 Goeridae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

- |   |
|---|
| 1 Asellus aquaticus 1 only<br>2 Platambus maculatus (larva) 1 only<br>3 Hydroptila sp. 1 only<br>4 Silo sp. (juvenile) 1 only |
|---|

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Leven
DATE	10.8.94	SITE	d/s Nat.Steel Foundry
SORTER	IRF	CODE	2/10/1.6

A	<b>VIAL</b>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>BMWP FAMILIES NOT FOUND BY IFE</b>	<b>ADDITIONAL FAMILIES FOUND BY IFE</b>
		None	1 Hydrobiidae

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Potamopyrgus jenkinsi 2 Physa fontinalis
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Almond
DATE	2.8.94	SITE	d/s Dowies Mill Weir
SORTER	HVHT	CODE	16/10/1.76

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	1 Leuctridae 2 Haliplidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Leuctra fusca 1 only 2 Brychius elevatus (adult) 1 only
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Devon
DATE	11.8.94	SITE	Dollarfield
SORTER	BO'K	CODE	6/10/19.5

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Lymnaea peregra

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Carron
DATE	26.10.94	SITE	Carron Bridge
SORTER	PW	CODE	12/10/28.8

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	1 Planariidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Polycelis felina
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Water of Chon
DATE	18.10.94	SITE	Loch Dhu outlet
SORTER	PW	CODE	10/530/65.12

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

- |  |
|--|
| 1 Pisidium sp. 1 only<br>2 Leptophlebia sp. 1 only<br>3 Oxyethira sp.<br>4 Oecetis testacea 1 only |
|--|

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Duchray Water
DATE	18.10.94	SITE	u/s R.Forth
SORTER	PW	CODE	10/10/56.97

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	1 Chloroperlidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Chloroperla torrentium 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	North Esk
DATE	22.11.94	SITE	Aughendwny
SORTER	SdP	CODE	20/50/26.07

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Dreel Burn
DATE	1.11.94	SITE	Anstruther
SORTER	IRF	CODE	1/30/0.6

A	<b>VIAL</b>  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
		1 Haliplidae	None

B	<b>SAMPLE</b>  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	ADDITIONAL FAMILIES FOUND BY IFE
		(This box is only completed when no vial is supplied with the sample)	None

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Abdomen only of Haliplid larva in vial. IFE instructed not to include posterior ends of specimens for purposes of audit.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Bavelaw Burn
DATE	27.9.94	SITE	Balleny Farm
SORTER	SdP	CODE	18/50/24.21

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

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Red Burn
DATE	25.10.94	SITE	Castlecary
SORTER	PW	CODE	12/110/24.3

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	None

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Leven
DATE	1.11.94	SITE	Auchmuirbridge
SORTER	IRF	CODE	2/10/20.9

A	VIAL	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	1 Valvatidae

B	SAMPLE	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 is only completed when no vial is supplied with the sample)	2 Physidae 3 Caenidae

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

- |  |
|--|
| <p>1 <i>Valvata piscinalis</i><br/>                 2 <i>Physa fontinalis</i> 1 only<br/>                 3 <i>Caenis luctuosa/macrura</i></p> |
|--|

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Almond
DATE	23.11.94	SITE	East Whitburn
SORTER	HVHT	CODE	16/10/34.75

A	VIAL	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	SAMPLE	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 is only completed when no vial is supplied with the sample)	None

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:



EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Forth RPB	RIVER	Barbauchlaw Burn
DATE	24.11.94	SITE	Balmuir
SORTER	HVHT	CODE	14/30/23.76

A	<b>VIAL</b>  Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	<b>BMWP FAMILIES NOT FOUND BY IFE</b>	<b>ADDITIONAL FAMILIES FOUND BY IFE</b>
		None	1 Polycentropodidae

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

\* Taxa recorded on data sheet but absent from vial and found by I.F.E. in sample (omissions)

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1 Neureclipsis bimaculata