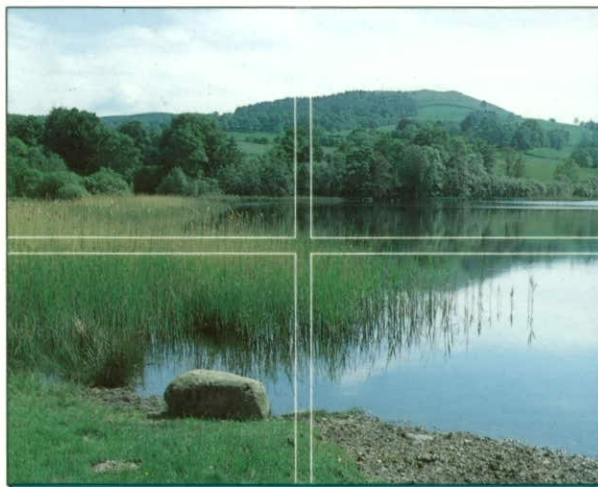




Institute of
Freshwater
Ecology

An audit of performance in the processing of macro-invertebrate samples in 1991. Forth River Purification Board

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**An audit of performance in the processing
of macro-invertebrate samples in 1991.
Forth River Purification Board**

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Project leader:	J.F. Wright
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1. INTRODUCTION

In 1991 the sampling of aquatic macro-invertebrates for the biological assessment of river quality continued throughout the United Kingdom. In England and Wales this task 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.

The majority of sites were sampled in spring, summer and autumn. Standard collection procedures, as used in the 1990 River Quality Survey, were retained 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). For a variety of reasons, a few locations were sampled in just one or two seasons.

Samples were sorted by NRA, RPB and DED 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.

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. As in 1990, the IFE was contracted to undertake an audit of the sample sorting and identification performance of each NRA region, several RPBs and the DED. 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.

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 DED 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. 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 Table 2 which summarises the results.

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.

ACKNOWLEDGEMENTS

Thanks to Mike Furse for help and advice, to Kay Symes and Angela Matthews for assistance with cataloguing and storage of samples and to Valerie Palmer and Diana Morton for typing the manuscript.

TABLE 1. The IFE Report form

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	<input type="text"/>	RIVER	<input type="text"/>
DATE	<input type="text"/>	SITE	<input type="text"/>
SORTER	<input type="text"/>	SAMPLE CODE	<input type="text"/>
AQC OF BMWP FAMILIES		A. IN VIAL	<input type="checkbox"/>
		B. IN SAMPLE	<input type="checkbox"/>

		LOSSES	CAINS
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 CAINS

NOTES

TABLE 2. The 30 samples audited for Forth RPB, with sample sorter initials and numbers of taxa 'lost', 'gained' and 'omitted'

River	Site	Sorter	Losses	Gains	Omissions
Dalhousie Burn	Confluence	SdP	0	1	0
Water of Chon	Loch Dhu outlet	DH	0	2	0
Allanwater	Kinbuck	DH	1	1	0
Teith	Heathershot	DH	0	2	0
Carron	Carron Bridge	DH	0	2	0
Biel Water	Biel Mill	SdP	0	1	0
Fullarton Water	B6372 Bridge	SdP	0	1	0
Birns Water	Confluence	SdP	0	2	0
Tyne	West Mills Weir	SdP	0	2	0
Murieston Water	Mid Calder	HT	0	2	0
Avon	Torphichen Road Bridge	HT	0	0	0
Middleton South Burn	Borthwick	SdP	0	2	0
North Esk	D/s Firth House	HT	0	1	0
Avon	U/s Linlithgow Viaduct	HT	0	1	0
Water of Leith	Murrayfield	HT	0	5	0
Killandean Burn	U/s Almond confluence	HT	0	1	0
North Queich	Burgher Bridge	BO'K	0	3	0
Duchray Water	U/s R. Forth	DH	0	0	0
Forth	Drip Bridge	DH	0	1	0
Tyne	Sandys Mill	BO'K	0	1	0
Avon	U/s Logie Water	BO'K	0	0	0
Humbie Water	Humbie Mill	BO'K	0	1	0
Devon	Crook Farm	IRF	0	0	0
Gairney Water	D/s Motorway	BO'K	0	2	0
Redside Burn	Carrington Mill	BO'K	0	1	0
Kennoway Burn	Durie Vale	IRF	0	1	0
Leven	Auchmuirbridge	IRF	0	1	0
Leven	U/s Lothine Burn	IRF	0	1	0
Devon	B908 Bridge	IRF	0	1	0
Leven	Balfour Bridge	IRF	0	4	0

APPENDIX

Results of individual sample audits

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Dalhousie Burn**

DATE **24.4.91**

SITE **Confluence**

SORTER **SdP**

SAMPLE CODE **20/340/14.97**

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	None	None
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 Hydrobiidae

NET LOSSES

0

NET GAINS

1

NOTES

1 Potamopyrgus jenkinsi

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	Water of Chon
DATE	23.5.91	SITE	Loch Dhu outlet
SORTER	DH	SAMPLE CODE	10/530/65.12

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

LOSSES		GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	ADDITIONAL FAMILIES FOUND BY IFE
		None
B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	ADDITIONAL FAMILIES FOUND BY IFE
	(This box only completed when no vial supplied with sample)	1 Nemouridae 2 Lepidostomatidae

NET LOSSES NET GAINS

NOTES

1 Nemoura cinerea, Amphinemura sulcicollis
2 Lepidostoma hirtum 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Allanwater**

DATE **23.4.91**

SITE **Kinbuck**

SORTER **DH**

SAMPLE CODE **8/10/12.73**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

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

NET LOSSES **1**

NET GAINS **1**

NOTES

2 Hydraena gracilis (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Teith**

DATE **23.4.91**

SITE **Heathershot**

SORTER **DH**

SAMPLE CODE **9/10/1.88**

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
	None	None
Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE		

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

NET LOSSES **0**

NET GAINS **2**

NOTES

1 Athripsodes cinereus 1 only
2 Sericostoma personatum 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	Carron
DATE	7.5.91	SITE	Carron Bridge
SORTER	DH	SAMPLE CODE	12/10/28.8

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	None	None

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

NET LOSSES

NET GAINS

NOTES

1 Polycelis felina 1 only
2 Hydraena gracilis (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Biel Water**

DATE **8.5.91**

SITE **Biel Mill**

SORTER **SdP**

SAMPLE CODE **23/230/5.3**

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
		None
		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	ADDITIONAL FAMILIES FOUND BY IFE
		(This box only completed when no vial supplied with sample)	1 Planariidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Polycelis felina

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Fullarton Water**

DATE **24.4.91**

SITE **B6372 Bridge**

SORTER **SdP**

SAMPLE CODE **20/440/30.92**

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	None	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 Dytiscidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Oreodytes sanmarkii (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Birns Water**

DATE **8.5.91**

SITE **Confluence**

SORTER **SdP**

SAMPLE CODE **22/220/27.46**

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
	None	None
Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE		

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

NET LOSSES **0**

NET GAINS **2**

NOTES

1 Potamopyrgus jenkinsi 1 only
2 Caenis rivulorum

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Tyne**

DATE **7.5.91**

SITE **West Mills Weir**

SORTER **SdP**

SAMPLE CODE **22/10/18.71**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Rhyacophilidae 2 Lepidostomatidae

NET LOSSES **0**

NET GAINS **2**

NOTES

1 Glossosoma sp. (pupa) 1 only
2 Lepidostoma hirtum 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	Murieston Water
DATE	17.5.91	SITE	Mid Calder
SORTER	HT	SAMPLE CODE	16/130/20.01

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

LOSSES		GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	ADDITIONAL FAMILIES FOUND BY IFE
		None
B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	ADDITIONAL FAMILIES FOUND BY IFE
	(This box only completed when no vial supplied with sample)	1 Hydrophilidae 2 Leptoceridae

NET LOSSES NET GAINS

NOTES

1 Hydraena gracilis (adult) 1 only
2 Athripsodes bilineatus 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	Avon
DATE	29.5.91	SITE	Torphichen Road Bridge
SORTER	HT	SAMPLE CODE	14/10/19.68

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

		LOSSES	GAINS
A	<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	<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

NET LOSSES NET GAINS

NOTES

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	Middleton South Burn
DATE	24.4.91	SITE	Borthwick
SORTER	SdP	SAMPLE CODE	20/400/25.96

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	None	None

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 Hydrobiidae 2 Dytiscidae

NET LOSSES NET GAINS

NOTES

1 Potamopyrgus jenkinsi
2 Oreodytes sanmarkii (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION	Forth RPB	RIVER	North Esk
DATE	14.5.91	SITE	D/s Firth House
SORTER	HT	SAMPLE CODE	20/50/25.13

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	None	None

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

NET LOSSES NET GAINS

NOTES

1 Polycelis felina 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Avon**

DATE **29.5.91**

SITE **U/s Linlithgow Viaduct**

SORTER **HT**

SAMPLE CODE **14/10/13.17**

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
	None	None
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	

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

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Asellus aquaticus 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Water of Leith**

DATE **23.5.91**

SITE **Murrayfield**

SORTER **HT**

SAMPLE CODE **18/10/8.75**

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	None	None

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 Leptophlebiidae 2 Caenidae 3 Hydrophilidae 4 Sericostomatidae 5 Tipulidae

NET LOSSES **0**

NET GAINS **5**

NOTES

- 1 Paraleptophlebia submarginata 1 only
- 2 Caenis rivulorum 1 only
- 3 Hydraena gracilis (adults)
- 4 Sericostoma personatum 1 only
- 5 Antocha vitripennis 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Killandean Burn**

DATE **16.5.91**

SITE **U/s Almond Confluence**

SORTER **HT**

SAMPLE CODE **16/220/24.42**

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	None	None
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 Ephemerellidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Ephemerella ignita 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **North Queich**

DATE **30.5.91**

SITE **Burgher Bridge**

SORTER **BO'K**

SAMPLE CODE **2/390/32.4**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	ADDITIONAL FAMILIES FOUND BY IFE
		None
B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	ADDITIONAL FAMILIES FOUND BY IFE
	(This box only completed when no vial supplied with sample)	1 Hydrobiidae 2 Caenidae 3 Leptoceridae

NET LOSSES **0**

NET GAINS **3**

NOTES

1 Potamopyrgus jenkinsi 1 only
2 Caenis rivulorum 1 only
3 Athripsodes albifrons 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Duchray Water**

DATE **23.5.91**

SITE **U/s River Forth**

SORTER **DH**

SAMPLE CODE **10/10/56.97**

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	None	None

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 **0**

NET GAINS **0**

NOTES

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Forth**

DATE **24.5.91**

SITE **Drip Bridge**

SORTER **DH**

SAMPLE CODE **10/10/0.7**

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	None

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 Perlidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Dinocras cephalotes 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Tyne**

DATE **8.5.91**

SITE **Sandy's Mill**

SORTER **BO'K**

SAMPLE CODE **22/10/13.25**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Hydrobiidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Potamopyrgus jenkinsi

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Avon**

DATE **29.5.91**

SITE **U/s Logie Water**

SORTER **BO'K**

SAMPLE CODE **14/10/21.88**

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
		None	None
	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
		(This box only completed when no vial supplied with sample)	None
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE		

NET LOSSES **0**

NET GAINS **0**

NOTES

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Humbie Water**

DATE **8.5.91**

SITE **Humbie Mill**

SORTER **BO'K**

SAMPLE CODE **22/270/35.08**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS	
A	<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	<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 1 Caenidae
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NET LOSSES **0**

NET GAINS **1**

NOTES

1 Caenis rivulorum 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Devon**

DATE **28.5.91**

SITE **Crook Farm**

SORTER **IRF**

SAMPLE CODE **Not known**

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	None	None

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 **0**

NET GAINS **0**

NOTES

1991 RIVER QUALITY SURVEY

AQC -- BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Gairney Water**

DATE **30.5.91**

SITE **D/s Motorway**

SORTER **BO'K**

SAMPLE CODE **2/260/31.3**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Hydrobiidae 2 Hydrophilidae

NET LOSSES **0**

NET GAINS **2**

NOTES

1 Potamopyrgus jenkinsi 1 only
2 Hydraena gracilis (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Redside Burn**

DATE **24.5.91**

SITE **Carrington Mill**

SORTER **BO'K**

SAMPLE CODE **20/420/23.27**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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
		ADDITIONAL FAMILIES FOUND BY IFE
		None

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	ADDITIONAL FAMILIES FOUND BY IFE
		(This box only completed when no vial supplied with sample)	1 Hydrophilidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Hydraena gracilis (adult) 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Kennoway Burn**

DATE **28.5.91**

SITE **Durie Vale**

SORTER **IRF**

SAMPLE CODE **Not known**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Sphaeriidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Pisidium sp. 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Leven**

DATE **23.5.91**

SITE **Auchmuirbridge**

SORTER **IRF**

SAMPLE CODE **2/10/20.9**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<u>VIAL</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in VIAL by IFE	ADDITIONAL FAMILIES FOUND BY IFE
	None	None
B	<u>SAMPLE</u>	BMWP FAMILIES NOT FOUND BY IFE
	Differences between: i) BMWP families listed on sample data sheet and ii) BMWP families found in SAMPLE by IFE	ADDITIONAL FAMILIES FOUND BY IFE
	(This box only completed when no vial supplied with sample)	1 Planorbidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Gyraulus albus 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Leven**

DATE **23.5.91**

SITE **U/s Lothine Burn**

SORTER **IRF**

SAMPLE CODE **2/10/15.6**

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	None	None

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 Asellidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Asellus aquaticus

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Devon**

DATE **28.5.91**

SITE **B908 Bridge**

SORTER **IRF**

SAMPLE CODE **Not known**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Planariidae

NET LOSSES **0**

NET GAINS **1**

NOTES

1 Polycelis nigra/tenuis 1 only

1991 RIVER QUALITY SURVEY

AQC - BIOLOGICAL SAMPLES

REGION **Forth RPB**

RIVER **Leven**

DATE **22.5.91**

SITE **Balfour Bridge**

SORTER **IRF**

SAMPLE CODE **2/10/8**

AQC OF BMWP FAMILIES A. IN VIAL **+**

B. IN SAMPLE **+**

LOSSES		GAINS
A	<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	<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 1 Planorbidae 2 Sphaeriidae 3 Perlodidae 4 Hydrophilidae

NET LOSSES **0**

NET GAINS **4**

NOTES

- 1 Bathyomphalus contortus 1 only
- 2 Pisidium sp.
- 3 Isoperla grammatica 1 only
- 4 Hydraena gracilis (adult) 1 only