

# An audit of performance in the processing of macro-invertebrate samples APEM Ltd

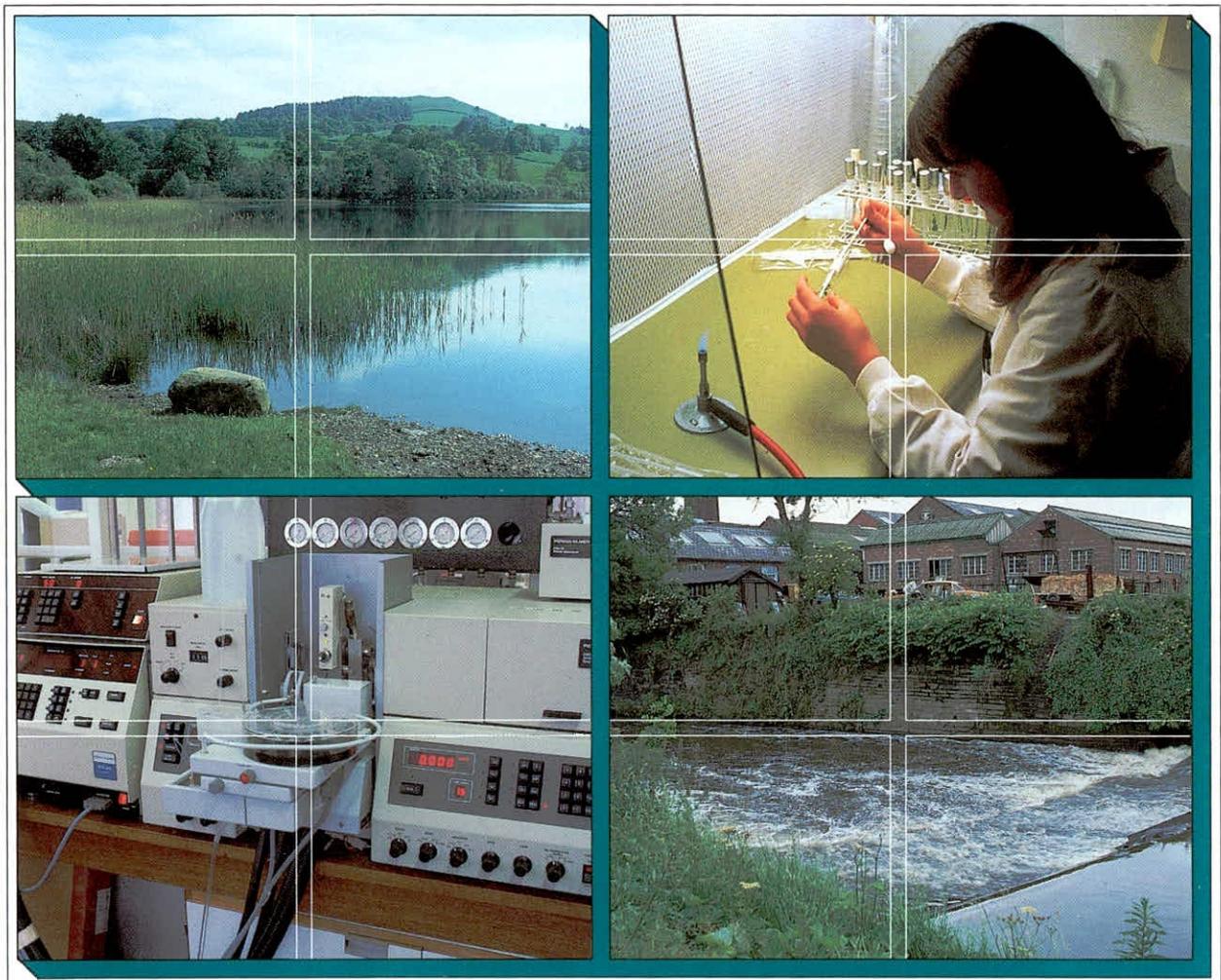
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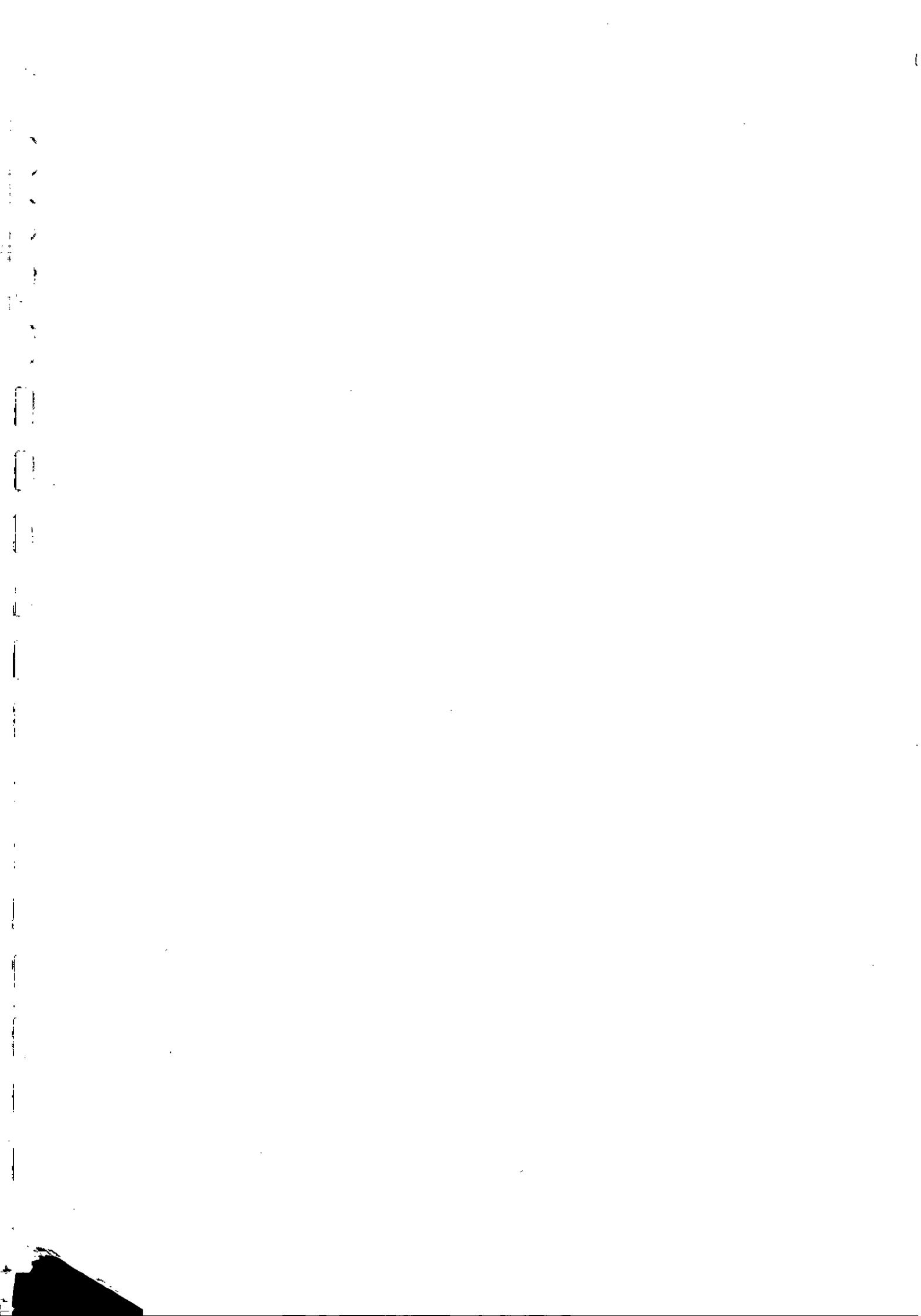
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Report To:  
IFE Report Ref. No:

NRA Northumbria Area, Northumbria & Yorkshire Region  
RL/T04071h1/10







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# **An audit of performance in the processing of macro-invertebrate samples. APEM Ltd.**

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Report To:	NRA Northumbria Area, Northumbria & Yorkshire Region
IFE Report Ref. No:	RL/T04071h1/10

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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. Northumbria Area of NRA Northumbria & Yorkshire Region employed the consultants APEM Ltd to analyse many of their routine samples. This report presents the results of an audit of 32 samples analysed by APEM Ltd. 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 APEM listing of families and those identified from the vial by IFE
- d) A comparison was made between the APEM listing of families and those found in the sample by IFE
- e) "Losses" or "gains" from the APEM 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 APEM 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 APEM data sheet. Families not on the APEM 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 APEM 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.

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 32 APEM-analysed samples audited for Northumbria Area.

<b>River</b>	<b>Site</b>	<b>Sorter</b>	<b>Losses</b>	<b>Gains</b>	<b>Omissions</b>
Allen	Cupola	MT	0	1	0
Derwent	u/s Bolts Burn	MT	0	2	0
Wear	Wolsingham	PL	0	0	0
Beamish	Harehope	PL	0	1	0
Wear	Lambton	MT	0	1	0
Middlehope Burn	Westgate	MT	0	2	0
Millstone Burn	Canada	BB	0	1	0
Coquet	Coquet Lodge	BB	0	1	1
Wear	Finchale Park	BB	1	1	0
Hetton Burn	d/s Hazelrigg	BB	0	0	0
Coquet	Warkworth Ford	BB	1	0	0
Coquet	Low Alwinton	BB	0	0	0
Aln	Abberwick	BB	0	2	0
Eglington Beck	Shipley	BB	0	0	0
Woller Water	d/s Wooler STW	BB	0	1	0
Harthope Burn	Coronation Wood	BB	0	0	0
Coquet	Weldon	BB	0	0	0
Font	Mitford	BB	0	1	0
South Low	Hunting Hall	BB	0	1	0
Font	New Biggin Farm	BB	0	1	0
Sills Burn	Rochester	BB	0	0	0
Wansbeck	Lower Angerton	BB	0	0	0
Hart Burn	Hartburn	BB	0	1	0
Haltwhistle Burn	A69 Bridge	BB	0	1	0
Medburn	Medburn	BB	0	0	0
Elwick Burn	Near Eastington	BB	0	0	0
Seaton Burn	Six Mile Road Bridge	BB	0	1	0
Woller Water	Coldgate Mill	BB	0	0	0
Dry Burn	Lowick Mill	BB	0	0	0
Eglington Beck	Battle Bridge	BB	0	0	0
Blyth	Ogler Bridge	BB	0	0	0
Haydon	A189 Bridge	BB	0	0	0

**APPENDIX**

**Results of individual sample audits**

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Allen
DATE	16.8.94	SITE	Cupola
SORTER	MT	CODE	NRA02 1680

<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	1 Sphaeriidae

<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:

1 Pisidium sp.

Non-scoring taxa: Limnophora sp. (Muscidae) found in vial

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Derwent
DATE	26.7.94	SITE	u/s Bolts Burn
SORTER	MT	CODE	NRA02 1410

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 Caenidae 2 Lepidostomatidae

\* 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 Caenis rivulorum 1 only  
 2 Lepidostoma hirtum 1 only

Non-scoring taxa: Empididae found in sample

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Wear
DATE	10.8.94	SITE	Wolsingham
SORTER	PL	CODE	NRA02 2170

<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:

Non-scoring taxa: Empididae found in vial, Ceratopogonidae and Limnophora sp. (Muscidae) found in sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Beamish
DATE	3.8.94	SITE	Harehope
SORTER	PL	CODE	NRA02 0080

<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 Sialidae

\* 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 Sialis sp. (juvenile), anterior end, 1 only

Non-scoring taxa: Empididae found in vial, Rhagionidae (entered on data sheet) not in vial although present in sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Wear
DATE	28.6.94	SITE	Lambton
SORTER	MT	CODE	NRA02 2070

<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 Elmidae

\* 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 *Elmis aenea* (adults + larvae), *Limnius volckmari* (larvae)

Non-scoring taxa: Empididae found in vial, Rhagionidae (entered on data sheet) not in vial although present in sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Middlehope Burn
DATE	16.8.94	SITE	Westgate
SORTER	MT	CODE	NRA02 2810

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 Caenidae 2 Perlodidae

\* 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 Caenis rivulorum 1 only  
 2 Perlodes microcephala (anterior end) 1 only

Non-scoring taxa: Empididae found in vial, Rhagionidae (entered on data sheet) not in vial although present in sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Millstone Burn
DATE	25.8.94	SITE	Canada
SORTER	BB	CODE	NRA02 0620

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

\* 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 sp. (juvenile) 1 only

Non-scoring taxa: Muscidae (Limnophora sp) found in vial, Rhagionidae (entered on data sheet) not present in vial or sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Coquet
DATE	26.8.94	SITE	Coquet Lodge
SORTER	BB	CODE	NRA02 0400

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 Sphaeriidae*	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 Sphaeriidae* 3 Baetidae

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

NET LOSSES  NET GAINS  OMISSIONS

NOTES:

1,2 Empty shell in "taxa" vial, Sphaerium sp. present in other vial and sample.  
 3 Baetis scambus/fuscatus 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Wear
DATE	28.6.94	SITE	Finchale Park
SORTER	BB	CODE	NRA02 2090

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 Planariidae	2 Dendrocoelidae

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:

2 Dendrocoelum lacteum
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Hetton Burn
DATE	25.7.94	SITE	d/s Hazelrigg
SORTER	BB	CODE	NRA02 0147

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:

Non-scoring taxa: Succineidae and posterior end of Dixidae found in vial

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Coquet
DATE	26.8.94	SITE	Warkworth Ford
SORTER	BB	CODE	NRA02 0410

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 Erpobdellidae	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:

1 Extended Helobdella stagnalis in vial
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EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Coquet
DATE	23.8.94	SITE	Low Alwinton
SORTER	BB	CODE	NRA02 0480

<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:

Non-scoring taxa: Empididae found in vial, Rhagionidae (entered on data sheet) not present in vial or sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Aln
DATE	22.6.94	SITE	Abberwick
SORTER	BB	CODE	NRA02 0330

A	VIAL	BMW P FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMW P families listed on sample data sheet and ii) BMW P families found in VIAL by IFE	None	None

B	SAMPLE	BMW P FAMILIES NOT FOUND BY IFE	ADDITIONAL FAMILIES FOUND BY IFE
	Differences between: i) BMW P families listed on sample data sheet and ii) BMW P families found in SAMPLE by IFE	(This box is only completed when no vial is supplied with the sample)	1 Leptophlebiidae 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 Habrophlebia fusca 1 only  
2 Athripsodes bilineatus 1 only

Non-scoring taxa: Ceratopogonidae found in sample.

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Eglington Beck
DATE	22.6.94	SITE	Shipley
SORTER	BB	CODE	NRA02 0370

<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	Northumbria (APEM)	RIVER	Wooler Water
DATE	3.8.94	SITE	d/s Wooler STW
SORTER	BB	CODE	NRA02 0120

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 Baetidae

\* 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 Baetis rhodani 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Harthope Burn
DATE	25.7.94	SITE	Coronation Wood
SORTER	BB	CODE	NRA02 0140

<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	Northumbria (APEM)	RIVER	Coquet
DATE	23.8.94	SITE	Weldon
SORTER	BB	CODE	NRA02 0440

<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	Northumbria (APEM)	RIVER	Font
DATE	8.9.94	SITE	Mitford
SORTER	BB	CODE	NRA02 0860

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

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

\* 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 Orectochilus villosus (larva) 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	South Low
DATE	4.8.94	SITE	Hunting Hall
SORTER	BB	CODE	NRA02 0230

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 Baetidae

\* 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 Baetis rhodani 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Font
DATE	9.8.94	SITE	New Biggin Farm
SORTER	BB	CODE	NRA02 0880

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 Elmidae

\* 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 Elmis aenea (adult) 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Sills Burn
DATE	30.8.94	SITE	Rochester
SORTER	BB	CODE	NRA02 2000

<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	Northumbria (APEM)	RIVER	Wansbeck
DATE	17.11.94	SITE	Lower Angerton
SORTER	BB	CODE	NRA02 0810

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	Northumbria (APEM)	RIVER	Hart Burn
DATE	22.11.94	SITE	Hartburn
SORTER	BB	CODE	NRA02 0890

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 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:

1 Caenis rivulorum 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Haltwhistle Burn
DATE	14.7.94	SITE	A69 Bridge
SORTER	BB	CODE	NRA02 1730

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 Taeniopterygidae

\* 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 Brachyptera sp. (juvenile) 1 only

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Medburn
DATE	3.11.94	SITE	Medburn
SORTER	BB	CODE	NRA02 1080

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	Northumbria (APEM)	RIVER	Elwick Burn
DATE	27.10.94	SITE	Near Eastington
SORTER	BB	CODE	NRA02 0280

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	Northumbria (APEM)	RIVER	Seaton Burn
DATE	8.11.94	SITE	Six Mile Road Bridge
SORTER	BB	CODE	NRA02 1120

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 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 Physa sp. (without shell) 1 only  
Non-scoring taxa: Empididae not present in vial or sample

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Wooler Water
DATE	26.10.94	SITE	Coldgate Mill
SORTER	BB	CODE	NRA02 0130

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	Northumbria (APEM)	RIVER	Dry Burn
DATE	27.10.94	SITE	Lowick Mill
SORTER	BB	CODE	NRA02 0240

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	Northumbria (APEM)	RIVER	Eglington Beck
DATE	11.10.94	SITE	Battle Bridge
SORTER	BB	CODE	NRA02 0380

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	Northumbria (APEM)	RIVER	Blyth
DATE	14.10.94	SITE	Ogle Bridge
SORTER	BB	CODE	NRA02 0950

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:

Non-scoring taxa: Nematoda, Psychodidae found by IFE in sample

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES - 1994

REGION	Northumbria (APEM)	RIVER	Haydon
DATE	14.10.94	SITE	A189 Bridge
SORTER	BB	CODE	NRA02 0750

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: