



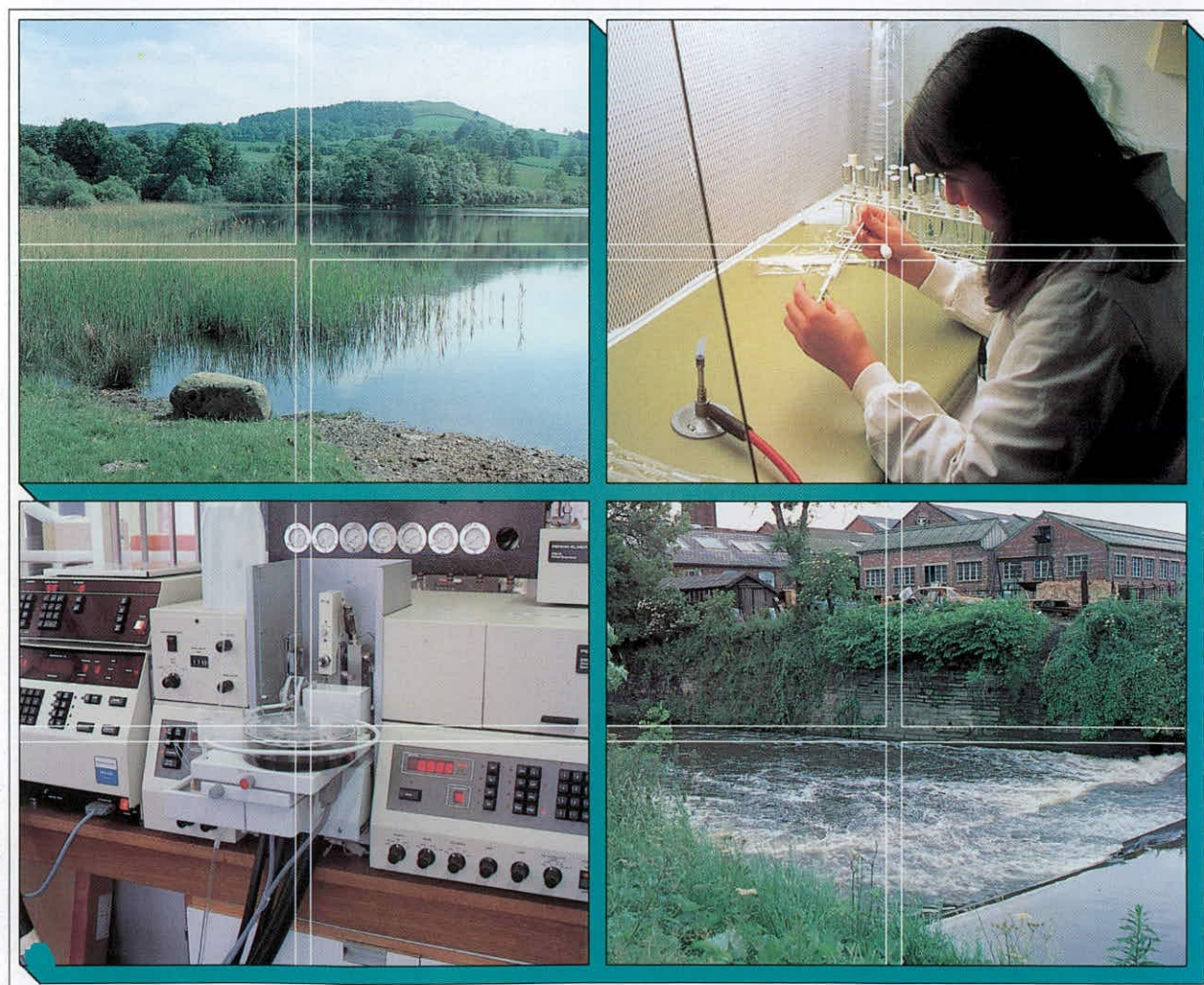
# **An audit of performance in the analysis of biological samples in 1996 SEPA East Region**

**R.J.M. Gunn, BA**  
**J.F. Wright, PhD**

**J.H. Blackburn, BSc**   **J.M. Winder, PhD**  
**K.L. Symes, HND**

Report To:

Scottish Environment Protection Agency, East Region







**Institute of  
Freshwater  
Ecology**

**River Laboratory**  
East Stoke, Wareham  
Dorset BH20 6BB  
United Kingdom

Telephone 01929 462314  
Facsimile 01929 462180

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**R.J.M.Gunn, J.H.Blackburn, J.M.Winder, J.F.Wright & K.L.Symes**

Project Leader:	R.J.M. Gunn
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**Centre for  
Ecology &  
Hydrology**

Institute of Freshwater Ecology  
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## **1. INTRODUCTION**

In 1996 the sampling of aquatic macro-invertebrates for the biological assessment of river quality was carried out throughout the United Kingdom. This task was undertaken by the Environment Agency (EA) in England and Wales, the Scottish Environment Protection Agency (SEPA) in Scotland and the Industrial Research and Technology Unit (IRTU) undertook the work in Northern Ireland.

Each organisation employed standard collection procedures as used in the 1995 General Quality Assessment (GQA) Survey. The sampling strategy was therefore compatible with RIVPACS (River InVertebrate Prediction And Classification System), a computer model developed by the Institute of Freshwater Ecology (IFE). Samples were sorted for the families of macro-invertebrates included in the Biological Monitoring Working Party (BMWP) system. Taxa present were recorded on site data sheets. Although attempts had been made to standardise sample processing and recording techniques, these did vary somewhat from region to region.

In view of the number of staff involved and the variability of sample processing techniques, it was recognised that a quality assurance exercise was necessary to minimise and quantify errors. Each laboratory appointed at least one experienced analyst to act as an internal analytical quality control (AQC) inspector. For most agencies, these inspectors re-sorted about 10% of the laboratory's samples, those samples chosen for re-sorting being selected at random. In addition, IFE was contracted to undertake an independent, external audit of the quality of the laboratory analysis of biological samples for each EA and SEPA region and for IRTU. This commission was consistent with the audit performed by IFE for the National River Quality Surveys in 1990 and 1995 and for the routine biological monitoring of river sites each year between 1991 and 1994. Where samples sent to IFE had been subjected to an internal AQC inspection, the audit provided a measure of the quality of performance of the AQC analyst rather than the primary analyst.

This report presents the results of the audit of 46 samples analysed by SEPA East staff

## **2. SAMPLE SELECTION**

Samples for audit were selected internally by each of the agencies being monitored. The number of samples selected for audit varied between the different agencies and the biologists processing these samples had no prior knowledge of which samples were to be audited. Some agencies only sent to IFE samples that had been processed twice. Others adopted a random selection process, whereby some samples had been analysed just once and some had been re-sorted. 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 EA, SEPA 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 data sheet containing 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, without reference to the data sheet or to the vial of animals, and the BMWP families identified.
- b) The families contained within the vial were identified.
- c) A comparison was made between the listing of families and those found in the sample by IFE.
- d) A comparison was made between the listing of families and those identified from the vial by IFE.
- e) "Losses" or "gains" from the original 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. Single representatives of a "gained" taxon were noted as such.
- f) An error code, selected from a list on the result sheet, was assigned by the IFE auditor for each "loss" or "gain".

Occasionally a sample did not include a vial containing representative examples of the families listed on the data sheet, while some arrived with the vial damaged in transit such that the representative specimens were no longer separated. For these samples, only operations a), c), e) and f) above were appropriate.

Several directives were issued to IFE relating to the treatment of BMWP taxa. Every taxon recorded on the data sheet must be supported by a voucher specimen of that family in the vial (or, for very large specimens, left in the sample). The only exceptions to this rule were the native crayfish, *Austropotamobius pallipes*, the medicinal leech, *Hirudo medicinalis* and the pearl mussel, *Margaritifera margaritifera* (which does not belong to a BMWP family), all of which are protected species. Where possible, IFE gave the benefit of doubt to the analyst in cases of the "loss" of Planariidae, specimens of which have been known to disintegrate in preservative. Animals deemed to have been dead at the time of sampling, cast insect skins, pupal exuviae and empty mollusc shells were to be excluded from the listing of families present. Isolated posterior ends of "living" specimens were not acceptable as records of a taxon. In these cases, thorax plus abdomen was deemed acceptable but abdomen only was deemed unacceptable. Terrestrial representatives of BMWP scoring families were also to be excluded from the audit. For this reason, Clambidae, Chrysomelidae and Curculionidae, which appear in the BMWP list, were excluded for the purposes of the audit since most representatives of these families are, at best, only semi-aquatic. 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 (see Appendix) and sent to the Quality Control Manager. For audit samples where a vial of animals was included, the comparison between the listing of families and the taxa found in the vial by IFE was shown in the section of the report form headed "VIAL". Discrepancies could be due to carelessness, misidentifications or errors in completing the data sheet listing the families present. Families not on the listing but found by IFE in the remainder of the sample were entered in the section of the report form headed "SAMPLE" under "Additional BMWP taxa found by IFE". This section also includes taxa added by the internal AQC analyst. Taxa recorded here represent families missed by the analyst(s) on sorting the sample. When the families listed as "losses" in the first section 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 both as "losses" from the vial and as "gains" from the sample 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".

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 centre section of the report form under "species name".

IFE was asked to interpret each error to provide a possible cause. An error code, selected from a list of options at the foot of each result sheet, was entered against each taxon in the column headed "Presumed cause of error".

For those samples in which the vial of animals was damaged or missing, the "VIAL" sections of the report form were not applicable (N/a). Families not on the list but present in the sample were entered in the section under "SAMPLE" : "Additional taxa" as before. Families recorded on the list but not found by IFE were indicated in the section above this. 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 or the wrong family box being ticked on the data sheet.

The final section of the result sheet summarises the audit, giving details of the numbers of "losses", "gains" and "omissions", together with the net effects on BMWP score and the number of scoring taxa.

## **5. RESULTS**

The results of the audit for the three SEPA East laboratories are summarised in Tables 1 to 3. Table 4 displays the statistics of these audit results centered around the target of acceptability of no more than two missed taxa per sample. These data are presented for each analyst, for each laboratory and for the region as a whole. Table 5 presents data for SEPA East for the net effects of the audit on the BMWP score and number of taxa. This table is again based on the target of no more than two missed taxa per sample. The figure of 13 for an acceptable underestimate of BMWP score is based on twice the average score of all taxa in the BMWP listing (excluding Clambidae, Chrysomelidae and Curculionidae, which are excluded from the audit). This average score is 6.57. Table 6 lists, at family level, the taxa missed in sorting by SEPA East's analysts in the 1996 audit. Table 7 lists the species missed by SEPA East's biologists, as found by the 1996 audit. Tables 8 and 9 list missed taxa at family and species level for all SEPA analysts and Tables 10 and 11 give similar listings for the entire 1996 audit for the whole of the UK.

## **6. ACKNOWLEDGEMENTS**

Grateful thanks to John Murray-Bligh of EA Thames Region, who provided an invaluable service in the development and implementation of improved methodology and in providing helpful advice throughout.



Table 1 The 9 samples audited for the Galashiels Laboratory of SEPA East

River	Site	Analyst	Losses	Gains	Omissions
<b>SUMMER</b>					
Biel Water	West Barns	DC	1	1	0
Tyne	Knowes	JWC	0	1	0
Teviot	d/s Ale Water Foot	JWC	0	5	0
Fenwick Burn	u/s Whitchesters Tributary	JWC	0	1	0
<b>AUTUMN</b>					
Almond	Kirkliston	DC	0	3	0
Ettrick Water	Lindean Gauging Station	DC	1	2	1
Ettrick Water	u/s Selkirk STW	DC	0	3	1
Carron	Carron Bridge	JWC	0	1	0
Teviot	d/s Jedburgh STW	JWC	0	0	0

Table 2 The 14 samples audited for the Perth Laboratory of SEPA East

River	Site	Analyst	Losses	Gains	Omissions
<b>SPRING</b>					
Isla	Wester Cardean	JR/BEC	0	1	1
Almond	Almondbank GS	RG/BEC	0	0	1
Lunan Water	Kirkton Mill	JR	0	0	0
Errochty Water	Kindrochet	RG	0	1	0
<b>SUMMER</b>					
Devon	B908 Bridge	JL	0	3	1
Avondhu Burn	d/s Milton	KB/BEC	0	1	0
Duchray Water	u/s R Forth	KB	1	1	0
<b>AUTUMN</b>					
Cocklemill Burn	A917 Bridge	JL/BEC	0	1	0
Gairney Water	d/s Motorway	SP/BEC	0	2	0
Leven	Balfour Bridge	JL	0	3	0
Kiel Burn	A915 Bridge	JL	0	0	0
Dighty	Balmossie	JR	0	1	0
Allan Water	Bridge of Allan	KB	0	3	0
Balvag	Balquhidder	KB	1	2	0

Table 3      The 23 samples audited for the Riccarton Laboratory of SEPA East

River	Site	Analyst	Losses	Gains	Omissions
SPRING					
Logie Water	u/s River Avon	BOK/NB	0	0	0
Water of Leith	d/s Murrayfield Bridge	SdP/NB	0	0	0
Papana Water	Papple	SdP/NB	0	1	0
Bavelaw Burn	Balleny Farm	SdP/NB	0	1	0
North Esk	Dalkeith	SdP/NB	0	0	0
North Esk	Penicuik House	SdP/NB	0	0	0
Avon	Wallace's Cave	BOK/SdP	0	1	0
Avon	Slamannan Bridge	BOK/SdP	0	0	0
Carron	Denny Industrial Estate	NB/SdP	0	1	0
Almond	d/s Livingston Village	NB/SdP	0	2	0
Almond	Boathouse Bridge	NB/SdP	0	0	0
Killandean Burn	Livingston	NB/SdP	0	2	0
Redside Burn	Carrington Mill	NB/SdP	0	1	0
South Esk	Dalkeith Palace	NB/SdP	0	0	0
AUTUMN					
Bavelaw Burn	Balleny Farm	NB/SdP	0	1	0
North Esk	d/s Lasswade Bridge	NB/SdP	0	0	0
Biel Water	West Barns	NB/SdP	0	0	0
Bonny Water	Bogton	NB/SdP	0	0	0
Carron	Denny Industrial Estate	NB/SdP	0	2	0
Almond	Blackburn	NB/SdP	0	0	0
Avon	Strath House	NB/SdP	0	1	0
Keith Water	Keith Bridge	NB/SdP	0	0	0
South Esk	d/s Gore Water	SdP/NB	0	0	0

Table 4 Statistics of the 1996 audit results for SEPA East

Analyst/Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
<b>Galashiels</b>	<b>9</b>	<b>1.89</b>	<b>0.51</b>	<b>3</b>	<b>33.33</b>	<b>5</b>	<b>2.33</b>	<b>0.58</b>
DC	4	2.25	0.48	2	50.00	3	3.25	0.48
JWC	5	1.60	0.87	1	20.00	5	1.60	0.87
<b>Perth</b>	<b>14</b>	<b>1.36</b>	<b>0.29</b>	<b>3</b>	<b>21.43</b>	<b>3</b>	<b>1.71</b>	<b>0.32</b>
BEC	5	1.00	0.32	0	0.00	2	1.40	0.24
JL	3	2.00	1.00	2	66.67	3	2.33	1.20
JR	2	0.50	0.50	0	0.00	1	0.50	0.50
KB	3	2.00	0.58	1	33.33	3	2.67	0.33
RG	1	1.00	n/a	0	0.00	1	1.00	n/a
<b>Riccarton</b>	<b>23</b>	<b>0.57</b>	<b>0.15</b>	<b>0</b>	<b>0.00</b>	<b>2</b>	<b>0.57</b>	<b>0.15</b>
NB	7	0.29	0.18	0	0.00	1	0.29	0.18
SdP	16	0.69	0.20	0	0.00	2	0.69	0.20
<b>SEPA East</b>	<b>46</b>	<b>1.07</b>	<b>0.17</b>	<b>6</b>	<b>13.04</b>	<b>5</b>	<b>1.26</b>	<b>0.20</b>

Table 5 Net effects of the Audit on BMWP score and number of scoring taxa for SEPA East

Analyst/Group	n	Mean net effect on BMWP score	%samples underestimated by score >13	Maximum underestimate of BMWP score	Mean net effect on no. of taxa	% of samples underestimated by >2 taxa	Maximum underestimate of no. of taxa
<b>Galashiels</b>	<b>9</b>	<b>10.44</b>	<b>33.33</b>	<b>29</b>	<b>1.67</b>	<b>33.33</b>	<b>5</b>
DC	4	12.25	50.00	22	1.75	50.00	3
JWC	5	9.00	20.00	29	1.60	20.00	5
<b>Perth</b>	<b>14</b>	<b>7</b>	<b>28.57</b>	<b>20.00</b>	<b>1</b>	<b>21.43</b>	<b>3</b>
BEC	5	6.00	20.00	15	1.00	0.00	2
JL	3	10.00	66.67	16	2.00	66.67	3
JR	2	5.00	0.00	10	0.50	0.00	1
KB	3	7.67	33.33	20	1.33	33.33	3
RG	1	3.00	0.00	3	1.00	0.00	1
<b>Riccarton</b>	<b>23</b>	<b>2.96</b>	<b>0.00</b>	<b>13</b>	<b>0.57</b>	<b>0.00</b>	<b>2</b>
NB	7	2.14	0.00	10	0.29	0.00	1
SdP	16	3.31	0.00	13	0.69	0.00	2
<b>SEPA East</b>	<b>46</b>	<b>5.61</b>	<b>15.22</b>	<b>29</b>	<b>0.98</b>	<b>13.04</b>	<b>5</b>

Table 6            The families missed by SEPA East Region's analysts

Family	n	% of SEPA East Region's missed taxa in Audit
Lymnaeidae	5	11.36
Hydrophilidae (incl. Hydraenidae)	4	9.09
Sphaeriidae	4	9.09
Nemouridae	3	6.82
Psychomyiidae (incl. Ecnomidae)	3	6.82
Hydrobiidae (incl. Bithyniidae)	2	4.55
Lepidostomatidae	2	4.55
Planariidae (incl. Dugesidae)	2	4.55
Planorbidae	2	4.55
Sericostomatidae	2	4.55
Tipulidae	2	4.55
Ancylidae (incl. Acroloxidae)	1	2.27
Caenidae	1	2.27
Elmidae	1	2.27
Halplidae	1	2.27
Heptageniidae	1	2.27
Hydroptilidae	1	2.27
Leptophlebiidae	1	2.27
Limnephilidae	1	2.27
Oligochaeta	1	2.27
Rhyacophilidae (incl. Glossosomatidae)	1	2.27
Simuliidae	1	2.27
Taeniopterygidae	1	2.27
Valvatidae	1	2.27
<b>TOTAL</b>	<b>44</b>	<b>100.00</b>

Table 7 The species missed by SEPA East Region's analysts

Species	n	% of SEPA East Region's missed species in audit
Pisidium sp.	4	8.70
Hydraena gracilis Germar	3	6.52
Lymnaea peregra (Muller)	3	6.52
Lepidostoma hirtum (Fabricius)	2	4.35
Dugesia polychroa/lugubris	2	4.35
Sericostoma personatum (Spence)	2	4.35
Gyraulus albus (Muller)	2	4.35
Potamopyrgus jenkinsi (Smith)	2	4.35
Psychomyiidae indet	1	2.17
Lymnaea stagnalis (L.)	1	2.17
Nemoura sp.	1	2.17
Paraleptophlebia submarginata (Stephens)	1	2.17
Psychomyia pusilla (Fabricius)	1	2.17
Rhyacophila dorsalis (Curtis)	1	2.17
Simulium (Simulium) ornatum group	1	2.17
Tinodes waeneri (L.)	1	2.17
Valvata piscinalis (Muller)	1	2.17
Ancylus fluviatilis Muller	1	2.17
Protonemura meyeri (Pictet)	1	2.17
Haliphus lineatocollis (Marsham)	1	2.17
Protonemura sp.	1	2.17
Lymnaea sp.	1	2.17
Caenis rivulorum Eaton	1	2.17
Dicranota sp.	1	2.17
Elmis aenea (Muller)	1	2.17
Brachyptera risi (Morton)	1	2.17
Helophorus (Atracthelophorus) brevipalpis Bedel	1	2.17
Antocha vitripennis (Meigen)	1	2.17
Helophorus (Meghelophorus) aequalis Thomson	1	2.17
Hydroptila sp.	1	2.17
Limnebius truncatellus (Thunberg)	1	2.17
Limnephilidae indet	1	2.17
Lumbricidae	1	2.17
Ecdyonurus sp.	1	2.17
<b>TOTAL</b>	<b>46</b>	<b>100.00</b>

Table 8. The families missed by SEPA's analysts in the 1996 audit

Family	n	% of missed taxa for SEPA audits
Hydrophilidae (incl. Hydraenidae)	10	5.85
Caenidae	9	5.26
Lymnaeidae	8	4.68
Planariidae (incl. Dugesiidae)	8	4.68
Psychomyiidae (incl. Ecnomidae)	8	4.68
Simuliidae	8	4.68
Hydroptilidae	7	4.09
Lepidostomatidae	7	4.09
Nemouridae	7	4.09
Sphaeriidae	7	4.09
Elmidae	6	3.51
Sericostomatidae	6	3.51
Goeridae	5	2.92
Rhyacophilidae (incl. Glossosomatidae)	5	2.92
Chloroperlidae	4	2.34
Dytiscidae (incl. Noteridae)	4	2.34
Ephemerellidae	4	2.34
Leptoceridae	4	2.34
Oligochaeta	4	2.34
Ancylidae (incl. Acroloxidae)	3	1.75
Chironomidae	3	1.75
Glossiphoniidae	3	1.75
Gyrinidae	3	1.75
Hydrobiidae (incl. Bithyniidae)	3	1.75
Leptophlebiidae	3	1.75
Leuctridae	3	1.75
Limnephilidae	3	1.75
Polycentropodidae	3	1.75
Heptageniidae	2	1.17
Odontoceridae	2	1.17
Planorbidae	2	1.17
Scirtidae	2	1.17
Taeniopterygidae	2	1.17
Tipulidae	2	1.17
Asellidae	1	0.58
Brachycentridae	1	0.58
Capniidae	1	0.58
Dendrocoelidae	1	0.58
Haliplidae	1	0.58
Hydropsychidae	1	0.58
Perlidae	1	0.58
Perlodidae	1	0.58
Sialidae	1	0.58
Siphonuridae	1	0.58
Valvatidae	1	0.58
<b>TOTAL</b>	<b>171</b>	<b>100.00</b>

Table 9. The species missed by SEPA's analysts in the 1996 audit

Species Description	n	% of missed species for SEPA audits
Hydraena gracilis Germar	9	5.00
Caenis rivulorum Eaton	9	5.00
Hydroptila sp.	7	3.89
Pisidium sp.	7	3.89
Elmis aenea (Muller)	6	3.33
Sericostoma personatum (Spence)	6	3.33
Lepidostoma hirtum (Fabricius)	5	2.78
Lymnaea peregra (Muller)	5	2.78
Ephemerella ignita (Poda)	4	2.22
Oreodytes sanmarkii (Sahlberg)	4	2.22
Psychomyia pusilla (Fabricius)	4	2.22
Silo pallipes (Fabricius)	4	2.22
Chloroperla torrentium (Pictet)	4	2.22
Potamopyrgus jenkinsi (Smith)	3	1.67
Dugesia polychroa/lugubris	3	1.67
Orectochilus villosus (Muller)	3	1.67
Polycelis felina (Dalyell)	3	1.67
Rhyacophila dorsalis (Curtis)	3	1.67
Tinodes waeneri (L.)	3	1.67
Ancylus fluviatilis Muller	3	1.67
Simulium (Simulium) ornatum group	3	1.67
Odontocerum albicorne (Scopoli)	2	1.11
Habrophlebia fusca (Curtis)	2	1.11
Leuctra fusca (L.)	2	1.11
Gyraulus albus (Muller)	2	1.11
Limnebius truncatellus (Thunberg)	2	1.11
Lymnaea sp.	2	1.11
Simulium argyreatum/variegatum	2	1.11
Nemoura cambrica/erratica	2	1.11
Elodes sp.	2	1.11
Orthocladinae	2	1.11
Brachyptera risi (Morton)	2	1.11
Simulium (Nevermannia) cryophilum group	2	1.11
Athripsodes bilineatus (L.)	2	1.11
Enchytraeidae	2	1.11
Crunoecia irrorata (Curtis)	2	1.11
Ecdyonurus sp.	2	1.11
Glossiphonia complanata (L.)	1	0.56
Haliphus lineatocollis (Marsham)	1	0.56
Ameletus inopinatus Eaton	1	0.56
Capnia sp.	1	0.56
Amphinemura sulcicollis (Stephens)	1	0.56
Athripsodes commutatus (Rostock)	1	0.56
Crenobia alpina/Phagocata vitta	1	0.56
Glossiphonia heteroclita (L.)	1	0.56
Dendrocoelum lacteum (Muller)	1	0.56
Athripsodes albifrons/bilineatus	1	0.56
Lumbricidae	1	0.56
Dicranota sp.	1	0.56
Brachycentrus subnubilus Curtis	1	0.56

Table 9 continued

Species Description	n	% of missed species for SEPA
Helobdella stagnalis (L.)	1	0.56
Antocha vitripennis (Meigen)	1	0.56
Ecclisopteryx guttulata (Pictet)	1	0.56
Asellus aquaticus (L.)	1	0.56
Glossosoma sp.	1	0.56
Rhyacophila sp.	1	0.56
Polycentropus flavomaculatus/kingi	1	0.56
Limnephilidae indet	1	0.56
Prosimulium hirtipes/tomosvaryi	1	0.56
Protonemura meyeri (Pictet)	1	0.56
Helophorus (Atracthelophorus) brevipalpis Bedel	1	0.56
Psychomyiidae indet	1	0.56
Polycentropus flavomaculatus (Pictet)	1	0.56
Sialis sp.	1	0.56
Silo sp.	1	0.56
Simulium (Nevermannia) vernum Macquart	1	0.56
Simulium (Simulium) argyreatum Meigen	1	0.56
Simulium sp.	1	0.56
Tanytarsini	1	0.56
Tubificidae	1	0.56
Protonemura sp.	1	0.56
Lymnaea stagnalis (L.)	1	0.56
Helophorus (Meghelophorus) aequalis Thomson	1	0.56
Hydropsyche siltalai Dohler	1	0.56
Leuctra inermis Kempny	1	0.56
Agapetus sp.	1	0.56
Potamophylax cingulatus/latipennis	1	0.56
Valvata piscinalis (Muller)	1	0.56
Polycelis sp.	1	0.56
Nemoura sp.	1	0.56
Nemurella picteti Klapalek	1	0.56
Paraleptophlebia sp.	1	0.56
Paraleptophlebia submarginata (Stephens)	1	0.56
Perla bipunctata Pictet	1	0.56
Perlodes microcephala (Pictet)	1	0.56
Plectrocnemia conspersa (Curtis)	1	0.56
Limnius volckmari (Panzer)	1	0.56
<b>TOTAL</b>	<b>180</b>	<b>100.00</b>



Table 10 Missed families for all samples in the 1996 audit

Family	n	% of missed taxa in 1996 audit
Hydroptilidae	78	5.41
Elmidae	74	5.13
Hydrophilidae (incl. Hydraenidae)	73	5.06
Hydrobiidae (incl. Bithyniidae)	59	4.09
Simuliidae	57	3.95
Planariidae (incl. Dugesiidae)	49	3.40
Psychomyiidae (incl. Ecnomidae)	49	3.40
Caenidae	43	2.98
Tipulidae	41	2.84
Leptoceridae	41	2.84
Sphaeriidae	40	2.77
Halplidae	36	2.50
Lymnaeidae	36	2.50
Planorbidae	35	2.43
Valvatidae	32	2.22
Goeridae	32	2.22
Hydropsychidae	31	2.15
Polycentropodidae	30	2.08
Ancylidae (incl. Acroloxidae)	29	2.01
Glossiphoniidae	29	2.01
Asellidae	29	2.01
Rhyacophilidae (incl. Glossosomatidae)	28	1.94
Physidae	26	1.80
Lepidostomatidae	26	1.80
Limnephilidae	26	1.80
Baetidae	26	1.80
Dytiscidae (incl. Noteridae)	25	1.73
Dendrocoelidae	24	1.66
Sericostomatidae	24	1.66
Nemouridae	22	1.53
Leptophlebiidae	22	1.53
Erpobdellidae	18	1.25
Scirtidae	17	1.18
Coenagriidae	16	1.11
Chloroperlidae	16	1.11
Leuctridae	16	1.11
Ephemerellidae	15	1.04
Heptageniidae	14	0.97
Gyrinidae	14	0.97
Chironomidae	14	0.97
Brachycentridae	11	0.76
Odontoceridae	10	0.69
Perlodidae	10	0.69
Oligochaeta	10	0.69
Taeniopterygidae	10	0.69
Piscicolidae	9	0.62
Sialidae	8	0.55
Calopterygidae	6	0.42
Beraeidae	5	0.35
Corophiidae	5	0.35

Table 10 continued

Family	n	% of missed taxa in 1996 audit
Corixidae	5	0.35
Hydrometridae	4	0.28
Ephemeridae	4	0.28
Gammaridae (incl. Crangonyctidae)	4	0.28
Notonectidae	3	0.21
Molannidae	3	0.21
Dryopidae	3	0.21
Hirudinidae	2	0.14
Phryganeidae	2	0.14
Aphelocheiridae	2	0.14
Perlidae	2	0.14
Unionidae	2	0.14
Philopotamidae	2	0.14
Nepidae	2	0.14
Capniidae	1	0.07
Cordulegasteridae	1	0.07
Gerridae	1	0.07
Gomphidae	1	0.07
Neritidae	1	0.07
Siphonuridae	1	0.07
<b>TOTAL</b>	<b>1442</b>	<b>100.00</b>

Table 11 Missed species for all samples in the 1996 audit

Species	n	% of missed species in 1996 audit
Potamopyrgus jenkinsi (Smith)	58	3.84
Hydroptila sp.	58	3.84
Elmis aenea (Muller)	51	3.38
Hydraena gracilis Germar	38	2.52
Simulium (Simulium) ornatum group	33	2.19
Pisidium sp.	32	2.12
Ancylus fluviatilis Muller	28	1.86
Dendrocoelum lacteum (Muller)	24	1.59
Sericostoma personatum (Spence)	24	1.59
Haliphus sp.	24	1.59
Tinodes waeneri (L.)	24	1.59
Caenis rivulorum Eaton	24	1.59
Asellus aquaticus (L.)	23	1.52
Lepidostoma hirtum (Fabricius)	22	1.46
Valvata piscinalis (Muller)	21	1.39
Lymnaea peregra (Muller)	19	1.26
Polycelis nigra/tenuis	19	1.26
Oulimnius sp.	18	1.19
Caenis luctuosa/macrura	17	1.13
Gyraulus albus (Muller)	17	1.13
Dicranota sp.	16	1.06
Elodes sp.	16	1.06
Chloroperla torrentium (Pictet)	16	1.06
Ephemerella ignita (Poda)	15	0.99
Helobdella stagnalis (L.)	15	0.99
Valvata cristata Muller	14	0.93
Psychomyia pusilla (Fabricius)	14	0.93
Orectochilus villosus (Muller)	13	0.86
Rhyacophila dorsalis (Curtis)	13	0.86
Mystacides azurea (L.)	13	0.86
Hydropsyche siltalai Dohler	13	0.86
Baetis rhodani (Pictet)	13	0.86
Helophorus (Atracthelophorus) brevipalpis Bedel	13	0.86
Orthocladiinae	12	0.80
Leuctra fusca (L.)	12	0.80
Polycentropus flavomaculatus (Pictet)	12	0.80
Physa fontinalis (L.)	12	0.80
Simulium (Eusimulium) aureum group	12	0.80
Hydropsyche sp.	12	0.80
Lymnaea sp.	11	0.73
Polycelis felina (Dalyell)	11	0.73
Brachycentrus subnubilus Curtis	11	0.73
Silo pallipes (Fabricius)	11	0.73
Ithytrichia sp.	11	0.73
Ecdyonurus sp.	10	0.66
Ischnura elegans (Van der Linden)	10	0.66
Glossiphonia complanata (L.)	10	0.66
Odontocerum albicorne (Scopoli)	10	0.66
Pilaria (Pilaria) sp.	10	0.66
Habrophlebia fusca (Curtis)	10	0.66

Table 11 continued

Species	n	% of missed species in 1996 audit
Silo sp.	10	0.66
Piscicola geometra (L.)	9	0.60
Agapetus sp.	9	0.60
Oreodytes sanmarkii (Sahlberg)	9	0.60
Lype sp.	8	0.53
Athripsodes bilineatus (L.)	8	0.53
Limnephilidae indet	8	0.53
Oxyethira sp.	8	0.53
Armiger crista (L.)	8	0.53
Erpobdellidae indet	8	0.53
Oulimnius tuberculatus (Muller)	7	0.46
Paraleptophlebia submarginata (Stephens)	7	0.46
Physa sp.	7	0.46
Physa acuta/heterostropha	7	0.46
Erpobdella octoculata (L.)	7	0.46
Goera pilosa (Fabricius)	7	0.46
Limnius volckmari (Panzer)	7	0.46
Sphaeriidae indet	7	0.46
Nemoura avicularis Morton	6	0.40
Asellus meridianus Racovitza	6	0.40
Isoperla grammatica (Poda)	6	0.40
Coenagriidae indet	6	0.40
Dugesia tigrina (Girard)	6	0.40
Tubificidae	6	0.40
Plectrocnemia conspersa (Curtis)	6	0.40
Baetis vernus Curtis	5	0.33
Taeniopteryx nebulosa (L.)	5	0.33
Athripsodes sp.	5	0.33
Protonemura meyeri (Pictet)	5	0.33
Bathymphalus contortus (L.)	5	0.33
Tipula (Yamatotipula) montium group	5	0.33
Brachyptera risi (Morton)	5	0.33
Athripsodes aterrimus (Stephens)	5	0.33
Plectrocnemia sp.	5	0.33
Anisus vortex (L.)	5	0.33
Dugesia lugubris/polychroa	4	0.27
Planariidae indet	4	0.27
Sialis fuliginosa Pictet	4	0.27
Simulium (Boophthora) erythrocephalum (deGeer)	4	0.27
Ephemera sp.	4	0.27
Crunoecia irrorata (Curtis)	4	0.27
Haliphus lineatocollis (Marsham)	4	0.27
Hydraena riparia Kugelann	4	0.27
Glossosoma sp.	4	0.27
Leuctra inermis Kempny	4	0.27
Hydropsyche angustipennis (Curtis)	4	0.27
Perlodes microcephala (Pictet)	4	0.27
Nemurella picteti Klapalek	4	0.27
Tanytarsini	4	0.27
Glossiphonia heteroclita (L.)	4	0.27

Table 11 continued

Species	n	% of missed species in 1996 audit
<i>Haliphus fluviatilis</i> Aube	4	0.27
<i>Gammarus pulex</i> (L.)	4	0.27
<i>Agraylea multipunctata</i> Curtis	4	0.27
<i>Agabus</i> sp./ <i>Ilybius</i> sp.	4	0.27
<i>Adicella reducta</i> (Mclachlan)	3	0.20
<i>Halesus digitatus/radiatus</i>	3	0.20
<i>Simulium</i> (Nevermannia) <i>cryophilum</i> group	3	0.20
<i>Antocha vitripennis</i> (Meigen)	3	0.20
<i>Heptagenia sulphurea</i> (Muller)	3	0.20
<i>Hydrometra</i> sp.	3	0.20
<i>Simulium</i> (Nevermannia) <i>angustitarse</i> group	3	0.20
<i>Molanna angustata</i> Curtis	3	0.20
<i>Platambus maculatus</i> (L.)	3	0.20
<i>Beraea maurus</i> (Curtis)	3	0.20
<i>Calopteryx</i> sp.	3	0.20
<i>Polycentropus</i> sp.	3	0.20
<i>Calopteryx splendens</i> (Harris)	3	0.20
<i>Notonecta</i> sp.	3	0.20
Chironomini	3	0.20
<i>Limnebius truncatellus</i> (Thunberg)	3	0.20
<i>Corophium curvispinum</i> Sars	3	0.20
<i>Paraleptophlebia</i> sp.	3	0.20
<i>Protonemura</i> sp.	3	0.20
<i>Athripsodes cinereus</i> (Curtis)	3	0.20
<i>Dugesia polychroa/lugubris</i>	3	0.20
<i>Dryops</i> sp.	3	0.20
<i>Drusus annulatus</i> / <i>Ecclisopteryx guttulata</i>	3	0.20
<i>Cloeon dipterum</i> (L.)	3	0.20
<i>Rhyacophila</i> sp.	3	0.20
<i>Limnephilus</i> sp.	3	0.20
<i>Sialis lutaria</i> (L.)	3	0.20
<i>Ecclisopteryx guttulata</i> (Pictet)	2	0.13
<i>Haemopsis sanguisuga</i> (L.)	2	0.13
<i>Brychius elevatus</i> (Panzer)	2	0.13
<i>Adicella/Triaenodes</i> group	2	0.13
Goeridae indet	2	0.13
<i>Beraeodes minutus</i> (L.)	2	0.13
<i>Caenis horaria</i> (L.)	2	0.13
<i>Agabus</i> sp.	2	0.13
<i>Baetis scambus</i> group	2	0.13
<i>Anacaena globulus</i> (Paykull)	2	0.13
<i>Baetis buceratus</i> Eaton	2	0.13
<i>Aphelocheirus aestivalis</i> (Fabricius)	2	0.13
<i>Corophium multisetosum</i> Stock	2	0.13
<i>Austrolimnophila</i> sp.	2	0.13
<i>Erioptera</i> sp.	2	0.13
<i>Amphinemura sulcicollis</i> (Stephens)	2	0.13
<i>Cyrnus trimaculatus</i> (Curtis)	2	0.13
Enchytraeidae	2	0.13
<i>Anabolia nervosa</i> (Curtis)	2	0.13

Table 11 continued

Species	n	% of missed species in 1996 audit
Glossiphoniidae indet	2	0.13
Lymnaea stagnalis (L.)	2	0.13
Ilybius sp.	2	0.13
Laccobius sp.	2	0.13
Leptophlebiidae indet	2	0.13
Limnephilus extricatus McLachlan	2	0.13
Limnophila (Eloeophila) sp.	2	0.13
Silo nigricornis (Pictet)	2	0.13
Hydropsyche contubernalis McLachlan	2	0.13
Pilaria sp.	2	0.13
Lumbriculidae	2	0.13
Lymnaea truncatula (Muller)	2	0.13
Mystacides nigra/longicornis	2	0.13
Nemoura cambrica/erratica	2	0.13
Nemoura sp.	2	0.13
Nepa cinerea L.	2	0.13
Haliplidae indet	2	0.13
Potamonectes sp.	2	0.13
Oulimnius major (Rey)	2	0.13
Phryganeidae indet	2	0.13
Sigara (Subsigara) falleni (Fieber)	2	0.13
Simulium argyreatum/variegatum	2	0.13
Sigara (Sigara) dorsalis (Leach)	2	0.13
Hydrophilidae indet	2	0.13
Helophorus flavipes/obscurus	2	0.13
Helophorus sp.	2	0.13
Tanypodinae	2	0.13
Tinodes waeneri (L.), Lype sp.	2	0.13
Hydraena riparia	2	0.13
Simulium (Simulium) reptans (L.)	2	0.13
Trocheta sp.	2	0.13
Hydrobius fuscipes (L.)	2	0.13
Helophorus (Helophorus) flavipes/obscurus	2	0.13
Polycentropus flavomaculatus/kingi	1	0.07
Bithynia tentaculata (L.)	1	0.07
Ameletus inopinatus Eaton	1	0.07
Sphaerium sp.	1	0.07
Baetis scambus/fuscatus	1	0.07
Potamophylax cingulatus/latipennis	1	0.07
Theodoxus fluviatilis (L.)	1	0.07
Prodiamesinae	1	0.07
Athripsodes commutatus (Rostock)	1	0.07
Baetis sp.	1	0.07
Tipula sp.	1	0.07
Potamonectes depressus/elegans	1	0.07
Polycelis sp.	1	0.07
Cercyon sp.	1	0.07
Anodonta sp.	1	0.07
Simulium (Wilhelmia) equinum (L.)	1	0.07
Anacaena limbata (Fabricius)	1	0.07

Table 11 continued

Species	n	% of missed species in 1996 audit
Simulium (Simulium) argyreatum Meigen	1	0.07
Simulium (Nevermannia) verum Macquart	1	0.07
Pseudanodonta complanata (Rossmassler)	1	0.07
Anacaena bipustulata (Marsham)	1	0.07
Prosimulium hirtipes/tomosvaryi	1	0.07
Simulium sp.	1	0.07
Athripsodes albifrons (L.)	1	0.07
Athripsodes albifrons/bilineatus	1	0.07
Sialis sp.	1	0.07
Riolus subviolaceus (Muller)	1	0.07
Rhithrogena sp.	1	0.07
Psychomyiidae indet	1	0.07
Simulium (Wilhelmia) sp.	1	0.07
Hippeutis complanatus (L.)	1	0.07
Lumbricidae	1	0.07
Capnia sp.	1	0.07
Leptophlebia marginata (L.)	1	0.07
Wormaldia occipitalis (Pictet)	1	0.07
Acroloxus lacustris (L.)	1	0.07
Hydrometra stagnorum (L.)	1	0.07
Planorbidae indet	1	0.07
Gerris (Gerris) lacustris (L.)	1	0.07
Drusus annulatus (Stephens)	1	0.07
Heptagenia lateralis (Curtis)	1	0.07
Heptagenia lateralis (Curtis)	1	0.07
Gomphus vulgatissimus (L.)	1	0.07
Helophorus (Meghelophorus) grandis Illiger	1	0.07
Gyraulus albus (Muller)	1	0.07
Gyrinus sp.	1	0.07
Helophorus (Meghelophorus) aequalis Thomson	1	0.07
Helophorus (Helophorus) minutus Fabricius	1	0.07
Halesus radiatus (Curtis)	1	0.07
Hydrocyphon deflexicollis (Muller)	1	0.07
Colymbetinae indet	1	0.07
Pilaria (Neolimnomyia) sp.	1	0.07
Caenis luctuosa group	1	0.07
Philopotamus montanus (Donovan)	1	0.07
Perla bipunctata Pictet	1	0.07
Oreodytes davisii (Curtis)	1	0.07
Hydroporus tessellatus Drapiez	1	0.07
Limnephilidae	1	0.07
Chloroperla tripunctata (Scopoli)	1	0.07
Dinocras cephalotes (Curtis)	1	0.07
Cordulegaster boltonii (Donovan)	1	0.07
Molophilus sp.	1	0.07
Micronecta sp.	1	0.07
Crenobia alpina/Phagocata vitta	1	0.07
Cyrnus flavidus McLachlan	1	0.07
Lymnaea palustris/truncatula	1	0.07
Dicranota (Dicranota) sp.	1	0.07

Table 11 continued

Species	n	% of missed species in 1996 audit
<i>Lymnaea palustris</i> (Muller)	1	0.07
<i>Dina lineata</i> (Muller)	1	0.07
<i>Ceraclea</i> sp.	1	0.07
<b>TOTAL</b>	<b>1509</b>	<b>100.00</b>



## **APPENDIX**

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

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 24.7.96

WATER-  
COURSE: Biel Water

PRIMARY  
ANALYST: DC

AQC  
ANALYST:

SITE: West Barns

CODE: 5982

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Simuliidae

1

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Planariidae (incl. Dugesiidae)

9

Dugesia polychroa/lugubris 1 only

### SUMMARY OF AUDIT

LOSSES 1

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 26.7.96

WATER-  
COURSE: Tyne

PRIMARY  
ANALYST: JWC

AQC  
ANALYST:

SITE: Knowes

CODE: 4429

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Psychomyiidae (incl. Ecnomidae)

9

Tinodes waeneri (L.)

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 8

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East	LABORATORY: Galashiels	DATE: 1.8.96
WATER-COURSE: Teviot	PRIMARY ANALYST: JWC	AQC ANALYST:
SITE: d/s Ale Water Foot	CODE:	SORT/AQC METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydrobiidae (incl. Bithyniidae)	9
Potamopyrgus jenkinsi (Smith)	
Lymnaeidae	9
Lymnaea peregra (Muller) 1 only	
Planorbidae	9
Gyraulus albus (Muller) 1 only	
Lepidostomatidae	9
Lepidostoma hirtum (Fabricius)	
Sericostomatidae	9
Sericostoma personatum (Spence) 1 only	

### SUMMARY OF AUDIT

LOSSES 0      GAINS 5      OMISSIONS: 0

#### NET EFFECTS:

ON BMWP SCORE 29  
ON NO. OF TAXA 5

- |  |  |  |
|--|--|--|
| 1 No representative of family in vial      | 5 Specimen dead at time of sampling      | 9 Taxon missed in sorting                          |
| 2 Alternative terrestrial specimen in vial | 6 Taxon in vial but not recorded         | 10 Unexplained error                               |
| 3 Posterior end only in vial               | 7 Mis-identification                     | 11 Taxon added in internal AQC                     |
| 4 Empty shell or case or cast skin in vial | 8 Typographical error - wrong box ticked | 12 Recorded taxon that was rejected by AQC analyst |

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 22.7.96

WATER-

COURSE: Fenwick Burn

PRIMARY

ANALYST: JWC

AQC

ANALYST:

SITE: u/s Whitchesters Tributary

CODE:

SORT/AQC

METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydrophilidae (incl. Hydraenidae)

9

Limnebius truncatellus (Thunberg) (a)

Helophorus (Atracthelophorus) brevipalpis Bedel (a)

Helophorus (Meghelophorus) aequalis Thomson (a)

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 5

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 26.9.96

WATER-  
COURSE: Almond

PRIMARY  
ANALYST: DC

AQC  
ANALYST:

SITE: Kirkliston

CODE: 465

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Planariidae (incl. Dugesiidae)	9
Dugesia polychroa/lugubris	
Planorbidae	9
Gyraulus albus (Muller)	
Rhyacophilidae (incl. Glossosomatidae)	9
Rhyacophila dorsalis (Curtis) 1 only	

### SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 15

ON NO. OF TAXA 3

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 8.1.97

WATER-  
COURSE: Ettrick Water

PRIMARY  
ANALYST: DC

AQC  
ANALYST:

SITE: Lindean Gauging Station

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Lymnaeidae 1

Lepidostomatidae \* 1

#### Additional BMWP taxa found by IFE

Gyrinidae 6

Orectochilus villosus (Muller) (1)

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Lepidostomatidae \* 1

Lepidostoma hirtum (Fabricius) 1 only

Sericostomatidae 9

Sericostoma personatum (Spence) 1 only

### SUMMARY OF AUDIT

LOSSES 1

GAINS 2

OMISSIONS: 1

NET EFFECTS:

ON BMWP SCORE 12

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 8.1.97

WATER-  
COURSE: Ettrick Water

PRIMARY  
ANALYST: DC

AQC  
ANALYST:

SITE: u/s Selkirk STW

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Lymnaeidae \*

1

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Lymnaeidae \*

1

Lymnaea peregra (Muller)

Nemouridae

9

Protonemura sp. (juv) 1 only

Psychomyiidae (incl. Ecnomidae)

9

Psychomyia pusilla (Fabricius) 1 only

Limnephilidae

9

Indet Limnephilidae (juv) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 1

NET EFFECTS:

ON BMWP SCORE 22

ON NO. OF TAXA 3

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)



## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 25.9.96

WATER-  
COURSE: Carron

PRIMARY  
ANALYST: JWC

AQC  
ANALYST:

SITE: Carron Bridge

CODE: 3226

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Lymnaeidae

9

Lymnaea sp. (damaged) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 3

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Galashiels

DATE: 1.11.96

WATER-  
COURSE: Teviot

PRIMARY  
ANALYST: JWC

AQC  
ANALYST:

SITE: d/sJedburgh STW

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 7.5.96

WATER-  
COURSE: Isla

PRIMARY  
ANALYST: JR

AQC  
ANALYST: BEC

SITE: Wester Cardean

CODE: 96221

SORT/AQC  
METHOD: Not known

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Hydrophilidae (incl. Hydraenidae) \*

1

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Nemouridae

9

Nemoura sp. (juv) 1 only

Hydrophilidae (incl. Hydraenidae) \*

1

Hydraena gracilis Germar (a) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 1

NET EFFECTS:

ON BMWP SCORE 7

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 15.4.96

WATER-  
COURSE: Almond

PRIMARY  
ANALYST: RG

AQC  
ANALYST: BEC

SITE: Almondbank GS

CODE: 96139

SORT/AQC  
METHOD: Not known

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Simuliidae \*

1

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Simuliidae \*

1

Prosimulium hirtipes/latimicro (p) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 1

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 10.4.96

WATER-  
COURSE: Lunan Water

PRIMARY  
ANALYST: JR

AQC  
ANALYST:

SITE: Kirkton Mill

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 7.5.96

WATER-

PRIMARY

AQC

COURSE: Errochty Water

ANALYST: RG

ANALYST:

SITE: Kindrochet

CODE: 15/1/463/4

SORT/AQC

METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Sphaeriidae

9

Pisidium sp. 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 3

ON NO. OF TAXA 1

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 8.8.96

WATER-  
COURSE: Devon

PRIMARY  
ANALYST: JL

AQC  
ANALYST:

SITE: B908 Bridge

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

#### VIAL

##### BMWP taxa not found by IFE

Glossiphoniidae \* 7

##### Additional BMWP taxa found by IFE

Erpobdellidae 7

Indet Erpobdellidae (juv)

Goeridae 6

Goera pilosa (Fabricius)

#### SAMPLE

##### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

##### Additional BMWP taxa found by IFE

Sphaeriidae 9

Pisidium sp.

Glossiphoniidae \* 7

Glossiphonia complanata (L.)

### SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 1

NET EFFECTS:

ON BMWP SCORE 16

ON NO. OF TAXA 3

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 20.8.96

WATER-  
COURSE: Avondhu Burn

PRIMARY  
ANALYST: KB

AQC  
ANALYST: BEC

SITE: d/s Milton

CODE: 96925

SORT/AQC  
METHOD: Not known

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Lymnaeidae

9

Lymnaea peregra (Muller) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 3

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)



## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 16.7.96

WATER-

PRIMARY

AQC

COURSE: Duchray Water

ANALYST: KB

ANALYST:

SITE: u/s R Forth

CODE: 10/10/56.97

SORT/AQC

METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

Philopotamidae

7

Rhyacophila sp. (juv)

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Oligochaeta

9

Lumbricidae 1 only

### SUMMARY OF AUDIT

LOSSES 1

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE -7

ON NO. OF TAXA 0

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 3.9.96

WATER-  
COURSE: Cocklemill Burn

PRIMARY  
ANALYST: JL

AQC  
ANALYST: BEC

SITE: A917 Bridge

CODE: 961066

SORT/AQC  
METHOD: Not known

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydrophilidae (incl. Hydraenidae)

9

Hydraena gracilis Germar (a) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 5

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 11.9.96

WATER-  
COURSE: Gairney Water

PRIMARY  
ANALYST: SP

AQC  
ANALYST: BEC

SITE: d/s Motorway

CODE: 961086B

SORT/AQC  
METHOD: Not known

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Leptophlebiidae 9

Paraleptophlebia submarginata (Stephens) 1 only

Haliplidae 9

Haliphus lineatocollis (Marsham) (a) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 15

ON NO. OF TAXA 2

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 8.1.97

WATER-  
COURSE: Leven

PRIMARY  
ANALYST: JL

AQC  
ANALYST:

SITE: Balfour Bridge

CODE: 2/10/8

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Valvatidae	9
Valvata piscinalis (Muller)	
Lymnaeidae	9
Lymnaea stagnalis (L.) 1 only	
Psychomyiidae (incl. Ecnomidae)	9
Indet Psychomyiidae (damaged) 1 only	

### SUMMARY OF AUDIT

LOSSES 0    GAINS 3    OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 14

ON NO. OF TAXA 3

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 21.1.97

WATER-  
COURSE: Kiel Burn

PRIMARY  
ANALYST: JL

AQC  
ANALYST:

SITE: A915 Bridge

CODE: 1/120/3.1

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

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Family name	Presumed cause of error (see footnotes)
-------------	---

---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

---

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 9.10.96

WATER-  
COURSE: Dighty

PRIMARY  
ANALYST: JR

AQC  
ANALYST:

SITE: Balmossie

CODE:

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

---

Family name	Presumed cause of error (see footnotes)
-------------	---

---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Heptageniidae

Ecdyonurus sp. 1 only

9

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 10

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East  
WATER-  
COURSE: Allan Water  
SITE: Bridge of Allan

LABORATORY: Perth  
PRIMARY  
ANALYST: KB  
CODE: 8/10/1.98

DATE: 2.10.96  
AQC  
ANALYST:  
SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydrobiidae (incl. Bithyniidae)	9
Potamopyrgus jenkinsi (Smith)	
Nemouridae	9
Protonemura meyeri (Pictet) 1 only	
Lepidostomatidae	9
Lepidostoma hirtum (Fabricius)	

### SUMMARY OF AUDIT

LOSSES 0    GAINS 3    OMISSIONS: 0

#### NET EFFECTS:

ON BMWP SCORE 20  
ON NO. OF TAXA 3

1 No representative of family in vial	5 Specimen dead at time of sampling	9 Taxon missed in sorting
2 Alternative terrestrial specimen in vial	6 Taxon in vial but not recorded	10 Unexplained error
3 Posterior end only in vial	7 Mis-identification	11 Taxon added in internal AQC
4 Empty shell or case or cast skin in vial	8 Typographical error - wrong box ticked	12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Perth

DATE: 5/9/96

WATER-  
COURSE: Balvag

PRIMARY  
ANALYST: KB

AQC  
ANALYST:

SITE: Balquhidder

CODE: 9/10/43.2

SORT/AQC  
METHOD: Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

#### VIAL

##### BMWP taxa not found by IFE

Planariidae (incl. Dugesiiidae)	7
Erpobdellidae - dark, flattened specimen	

##### Additional BMWP taxa found by IFE

Lepidostomatidae	6
Lepidostoma hirtum (Fabricius)	

#### SAMPLE

##### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

##### Additional BMWP taxa found by IFE

Hydrophilidae (incl. Hydraenidae)	9
Hydraena gracilis Germar (a) 1 only	

### SUMMARY OF AUDIT

LOSSES 1

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 10

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)



## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 16.4.96

WATER-  
COURSE: Logie Water

PRIMARY  
ANALYST: BOK

AQC  
ANALYST: NB

SITE: u/s River Avon

CODE: 853

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

---

Family name	Presumed cause of error (see footnotes)
-------------	---

---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

Note: Lymnaeidae? = Lymnaea truncatula (Muller)

---

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 17.4.96

WATER-

COURSE: Water of Leith

PRIMARY

ANALYST: SdP

AQC

ANALYST: NB

SITE: d/s Murrayfield Bridge

CODE: 4174

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 16.4.96

WATER-  
COURSE: Papana Water

PRIMARY  
ANALYST: SdP

AQC  
ANALYST: NB

SITE: Papple

CODE: 4968

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Taeniopterygidae

9

Brachyptera risi (Morton) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 10

ON NO. OF TAXA 1

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 17.4.96

WATER-  
COURSE: Bavelaw Burn

PRIMARY  
ANALYST: SdP

AQC  
ANALYST: NB

SITE: Balleny Farm

CODE: 4210

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Tipulidae

9

Dicranota sp. 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 5

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 3.4.96

WATER-  
COURSE: North Esk

PRIMARY  
ANALYST: SdP

AQC  
ANALYST: NB

SITE: Dalkeith

CODE: 4613

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0      GAINS 0      OMISSIONS: 0

#### NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 4.4.96

WATER-  
COURSE: North Esk

PRIMARY  
ANALYST: SdP

AQC  
ANALYST: NB

SITE: Penicuik House

CODE: 4287

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 16.4.96

WATER-  
COURSE: Avon

PRIMARY  
ANALYST: BOK

AQC  
ANALYST: SdP

SITE: Wallace's Cave

CODE: 3814

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Sphaeriidae

9

Pisidium sp. 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 3

ON NO. OF TAXA 1

- 1 No representative of family in vial
- 2 Alternative terrestrial specimen in vial
- 3 Posterior end only in vial
- 4 Empty shell or case or cast skin in vial

- 5 Specimen dead at time of sampling
- 6 Taxon in vial but not recorded
- 7 Mis-identification
- 8 Typographical error - wrong box ticked

- 9 Taxon missed in sorting
- 10 Unexplained error
- 11 Taxon added in internal AQC
- 12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 16.4.96

WATER-

COURSE: Avon

PRIMARY

ANALYST: BOK

AQC

ANALYST: SdP

SITE: Slamannan Bridge

CODE: 837

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)



## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 10.4.96

WATER-  
COURSE: Carron

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Denny Industrial Estate

CODE: 3725

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

---

Family name	Presumed cause of error (see footnotes)
-------------	---

---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

Lymnaeidae

9

Lymnaea peregra (Muller) 1 only

---

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 3

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 17.4.96

WATER-

PRIMARY

AQC

COURSE: Almond

ANALYST: NB

ANALYST: SdP

SITE: d/s Livingston Village

CODE: 3965

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

Simuliidae

12

Simulium (Simulium) ornatum group (p) 1 only

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Elmidae

9

Elmis aenea (Muller) (l) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 10

ON NO. OF TAXA 2

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 16.4.96

WATER-  
COURSE: Almond

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Boathouse Bridge

CODE: 466

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 17.4.96

WATER-  
COURSE: Killandean Burn

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Livingston

CODE: 4090

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Sphaeriidae	9
Pisidium sp. 1 only	
Simuliidae	9
Simulium (Simulium) ornatum group (p) 1 only	

### SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 8

ON NO. OF TAXA 2

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 3.4.96

WATER-  
COURSE: Redside Burn

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Carrington Mill

CODE: 4393

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydrophilidae (incl. Hydraenidae)

9

Hydraena gracilis Germar (a) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 5

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 3.4.96

WATER-  
COURSE: South Esk

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Dalkeith Palace

CODE: 4359

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 23.10.96

WATER-

PRIMARY

AQC

COURSE: Bavelaw Burn

ANALYST: NB

ANALYST: SdP

SITE: Balleny Farm

CODE: 4210

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Tipulidae

9

Antocha vitripennis (Meigen) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 5

ON NO. OF TAXA 1

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 25.10.96

WATER-

COURSE: North Esk

PRIMARY

ANALYST: NB

AQC

ANALYST: SdP

SITE: d/s Lasswade Bridge

CODE: 4257

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)



## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 25.10.96

WATER-  
COURSE: Biel Water

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: West Barns

CODE: 5982

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0    GAINS 0    OMISSIONS: 0

#### NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 28.11.96

WATER-  
COURSE: Bonny Water

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Bogton

CODE: 1626

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 28.11.96

WATER-  
COURSE: Carron

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Denny Industrial Estate

CODE: 3725

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Ancylidae (incl. Acroloxidae) 9

Ancylus fluviatilis Muller 1 only

Caenidae 9

Caenis rivulorum Eaton

### SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 13

ON NO. OF TAXA 2

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 28.11.96

WATER-

PRIMARY

AQC

COURSE: Almond

ANALYST: NB

ANALYST: SdP

SITE: Blackburn

CODE: 456

SORT/AQC

METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

5 Specimen dead at time of sampling

9 Taxon missed in sorting

2 Alternative terrestrial specimen in vial

6 Taxon in vial but not recorded

10 Unexplained error

3 Posterior end only in vial

7 Mis-identification

11 Taxon added in internal AQC

4 Empty shell or case or cast skin in vial

8 Typographical error - wrong box ticked

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 11.12.96

WATER-  
COURSE: Avon

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Strath House

CODE: 335

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
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### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

Hydroptilidae

9

Hydroptila sp. (p) 1 only

### SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 6

ON NO. OF TAXA 1

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 9.10.96

WATER-  
COURSE: Keith Water

PRIMARY  
ANALYST: NB

AQC  
ANALYST: SdP

SITE: Keith Bridge

CODE: 4494

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
-------------	---

### VIAL

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

#### BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

#### Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample ( no net loss or gain)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA East

LABORATORY: Riccarton

DATE: 10.10.96

WATER-  
COURSE: South Esk

PRIMARY  
ANALYST: SdP

AQC  
ANALYST: NB

SITE: d/s Gore Water

CODE: 583

SORT/AQC  
METHOD: Preserved/Preserved

### RESULTS OF AUDIT

Family name	Presumed cause of error (see footnotes)
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### VIAL

BMWP taxa not found by IFE

None

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

None

### SUMMARY OF AUDIT

LOSSES 0

GAINS 0

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 0

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

Omission (\*) = Recorded, not in vial but found by IFE in sample (no net loss or gain)

**Centre for  
Ecology &  
Hydrology**

Institute of Freshwater Ecology  
Institute of Hydrology  
Institute of Terrestrial Ecology  
Institute of Virology & Environmental Microbiology

**Natural Environment Research Council**