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An Audit of Performance in the Analysis of Biological Samples in 1998 SEPA West Region

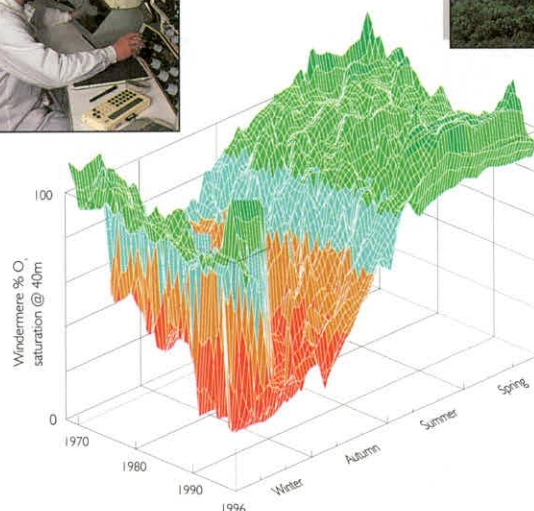
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Report To:
IFE Report Ref. No:

Scottish Environment Protection Agency, West Region
RL/T04071R7/21



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Report Date:	June 1999
Report To:	Scottish Environment Protection Agency, West Region
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1. INTRODUCTION

In 1998 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. For each site the taxa present were recorded on a standard data sheet. 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 and again in 1996 and 1997. 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.

This report presents the results of the audit of 40 samples analysed by staff employed in the two laboratories of SEPA West Region.

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 two SEPA West laboratories are summarised in Tables 1 and 2. Table 3 displays the statistics of these audit results centred 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 4 presents data for SEPA West 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. Tables 5 and 6 list, at family and species level respectively, the taxa missed in sorting by SEPA West's analysts in the 1998 audit. Tables 7 and 8 list missed taxa at family and species level for all SEPA analysts and Tables 9 and 10 give similar listings for the entire 1998 audit for the whole of the United Kingdom.

6. ACKNOWLEDGEMENTS

Grateful thanks to John Murray-Bligh of the Environment Agency's Thames Region, who provided an invaluable assistance in the development of the audit methodology and who has been a reliable source of helpful advice throughout.

Table 1 The 32 samples audited for the East Kilbride Laboratory of SEPA West

River	Site	Analyst	Losses	Gains	Omissions
Pow Burn	u/s Gryfe confluence	KA	1	1	0
Torra/Duich	A846 Bridge	KA	0	0	0
Locher Water	d/s Tannery	KA	1	0	0
South Calder Water	Brigbrae Mill Bridge	KA	0	0	1
Locher Water	u/s Tannery	LM	0	0	0
Pow Burn	A79 Bridge	LM	0	2	0
Rotten Calder	Generals Bridge	LM	0	1	0
Luggie Water	North Myvot Farm	LM	1	1	0
Endrick Water	Overglinns	LM	0	0	1
Kittoch	d/s Fairfield	MC	0	1	0
Avon Water	Linthaugh	MC	0	0	0
Glazert Water	u/s Hospital	MC	0	1	0
Lugar Water	d/s Underwood STW	MC	0	0	0
Allander Water	d/s Milngavie STW	MC	0	0	0
Barr Water	Glenbarr	MT	0	0	0
Garnock	d/s Dalgarven	MT	0	0	0
Water of Girvan	u/s Knockdon Bridge	MT	1	1	0
Irvine	Hurlford	MT	0	1	0
Gryfe	Crosslee Bridge	MT	1	1	0
Little Eachaig	u/s A815 Bridge	MT	0	1	0
Water of Girvan	u/s Dowhail	RW	0	0	1
Thorntonhall Burn	u/s Taits Thornton Septic Tank	RW	0	2	0
Breakerie Water	Lephenstrath	RW	1	1	0
Cur	Bridgend	RW	0	1	0
Orchy	d/s Loch Tulla	RW	0	1	0
Irvine	d/s Industrial Estate	RW	0	2	0
Kames Burn	d/s Hatchery	SC	0	2	0
North Calder	Carnbroe Bridge	SD	0	1	0
Doon	u/s Waterside	SD	0	3	0
Black Cart Water	Milliken Park	SD	0	3	0
North Calder	Wester Moffat Farm	SD	0	1	0
Garnock	d/s Dalry	SD	0	0	0

Table 2 The 8 samples audited for the Dumfries Laboratory of SEPA West

River	Site	Analyst	Losses	Gains	Omissions
Cluden Water	Irongray	AB	0	0	0
Moffat Water	u/s Selcoth New F/F	AB	0	0	0
Gelston Burn	u/s Gelston STW	BR	0	1	0
Killantrae Burn	Killantrae Burn	BR	0	1	0
Tarff Water	u/s Ringford STW	BR	0	2	0
Buckland Burn	u/s Mutehill	ML	0	1	1
Ecclefechan Burn	u/s Kirkconne Hall STW	ML	1	0	0
Water of Fleet	Gatehouse of Fleet	ML	0	0	0

Table 3 Statistics of the 1998 audit results for SEPA West

Analyst/Group	n	Mean gains	Standard error	No samples >2 gains	% samples >2 gains	Highest no gains	Mean errors (l+g+o)	Standard error
Dumfries	8	0.63	0.26	0	0	2	0.88	0.30
AB	2	0	0	0	0	0	0	0
BR	3	1.33	0.33	0	0	2	1.33	0.33
ML	3	0.33	0.33	0	0	1	1.00	0.58
East Kilbride	32	0.88	0.15	2	6.25	3	1.16	0.16
KA	4	0.25	0.25	0	0	1	1.00	0.41
LM	5	0.80	0.37	0	0	2	1.20	0.37
MC	5	0.40	0.24	0	0	1	0.40	0.24
MT	6	0.67	0.21	0	0	1	1.00	0.37
RW	6	1.17	0.31	0	0	2	1.50	0.22
SC	1	2.00	0	0	0	2	2.00	0
SD	5	1.60	0.60	2	40.00	3	1.60	0.60
SEPA West	40	0.83	0.13	2	5.00	3	1.10	0.14
Whole of SEPA	105	1.09	0.16	8	7.62	11	1.35	0.17

Table 4 Net effects of the audit on BMWP score and number of scoring taxa

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
Dumfries	8	2.50	0	10	0.50	0	2
AB	2	0	0	0	0	0	0
BR	3	6.67	0	10	1.33	0	2
ML	3	0	0	3	0	0	1
East Kilbride	32	5.31	12.50	24	0.69	6.25	3
KA	4	1.00	0	7	-0.25	0	0
LM	5	4.80	0	12	0.60	0	2
MC	5	1.40	0	5	0.40	0	1
MT	6	3.33	0	10	0.33	0	1
RW	6	8.17	16.67	16	1.00	0	2
SC	1	17.00	100.00	17	2.00	0	2
SD	5	9.80	40.00	24	1.60	40.00	3
SEPA West	40	4.75	10.00	24	0.65	5.00	3
Whole of SEPA	105	6.60	15.24	71	0.96	6.67	11

Table 5 The families missed by SEPA West Region's analysts in the 1998 audit

Family	n	% of SEPA West's missed families
Hydrophilidae (incl. Hydraenidae)	4	13.79
Caenidae	3	10.34
Chloroperlidae	3	10.34
Leptoceridae	3	10.34
Psychomyiidae (incl. Ecnomidae)	2	6.90
Rhyacophilidae (incl. Glossosomatidae)	2	6.90
Baetidae	1	3.45
Dendrocoelidae	1	3.45
Dytiscidae (incl. Noteridae)	1	3.45
Elmidae	1	3.45
Gammaridae (incl. Crangonyctidae)	1	3.45
Hydropsychidae	1	3.45
Limnephilidae	1	3.45
Nemouridae	1	3.45
Planariidae (incl. Dugesiidae)	1	3.45
Planorbidae	1	3.45
Simuliidae	1	3.45
Taeniopterygidae	1	3.45
Total	29	100

Table 6 The species missed by SEPA West Region's analysts in the 1998 audit

Species	n	% of SEPA West's missed species
<i>Caenis rivulorum</i> Eaton	3	9.09
<i>Hydraena gracilis</i> Germar	3	9.09
<i>Chloroperla torrentium</i> (Pictet)	3	9.09
<i>Agapetus</i> sp.	2	6.06
<i>Psychomyia pusilla</i> (Fabricius)	2	6.06
<i>Athripsodes aterrimus</i> (Stephens)	2	6.06
<i>Elmis aenea</i> (Muller)	1	3.03
<i>Rhyacophila</i> sp.	1	3.03
<i>Simulium</i> (<i>Simulium</i>) <i>ornatum</i> group	1	3.03
<i>Polycelis nigra</i> group	1	3.03
<i>Oreodytes</i> sp.	1	3.03
Limnephilidae indet	1	3.03
<i>Hydropsyche siltalai</i> Dohler	1	3.03
<i>Amphinemura sulcicollis</i> (Stephens)	1	3.03
<i>Gammarus pulex</i> (L.)	1	3.03
<i>Baetis rhodani</i> (Pictet)	1	3.03
<i>Dendrocoelum lacteum</i> (Muller)	1	3.03
<i>Crangonyx pseudogracilis</i> Bousfield	1	3.03
<i>Chloroperla tripunctata</i> (Scopoli)	1	3.03
<i>Athripsodes bilineatus</i> (L.)	1	3.03
<i>Athripsodes cinereus</i> (Curtis)	1	3.03
<i>Brachyptera risi</i> (Morton)	1	3.03
<i>Bathynomphalus contortus</i> (L.)	1	3.03
<i>Helophorus</i> (<i>Atracthelophorus</i>) <i>brevipalpis</i> Bedel	1	3.03
Total	33	100

Table 7 The families missed by all SEPA's analysts in the 1998 audit

Family	n	% of missed families for SEPA audits
Hydrophilidae (incl. Hydraenidae)	10	9.17
Lymnaeidae	6	5.50
Nemouridae	6	5.50
Chloroperlidae	5	4.59
Planariidae (incl. Dugesiidae)	5	4.59
Rhyacophilidae (incl. Glossosomatidae)	5	4.59
Simuliidae	5	4.59
Caenidae	4	3.67
Ephemerellidae	4	3.67
Leptoceridae	4	3.67
Taeniopterygidae	4	3.67
Ancylidae (incl. Acroloxidae)	3	2.75
Elmidae	3	2.75
Lepidostomatidae	3	2.75
Leptophlebiidae	3	2.75
Leuctridae	3	2.75
Planorbidae	3	2.75
Polycentropodidae	3	2.75
Sphaeriidae	3	2.75
Brachycentridae	2	1.83
Dytiscidae (incl. Noteridae)	2	1.83
Hydropsychidae	2	1.83
Hydroptilidae	2	1.83
Limnephilidae	2	1.83
Oligochaeta	2	1.83
Psychomyiidae (incl. Ecnomidae)	2	1.83
Tipulidae	2	1.83
Baetidae	1	0.92
Deңdrocoelidae	1	0.92
Gammaridae (incl. Crangonyctidae)	1	0.92
Goeridae	1	0.92
Haliplidae	1	0.92
Heptageniidae	1	0.92
Hydrobiidae (incl. Bithyniidae)	1	0.92
Odontoceridae	1	0.92
Perlidae	1	0.92
Physidae	1	0.92
Siphonuridae	1	0.92
Total	109	100

Table 8 The species missed by all SEPA's analysts in the 1998 audit

Species	n	% of missed species for SEPA audits
Hydraena gracilis Germar	7	5.88
Chloroperla torrentium (Pictet)	5	4.20
Lymnaea peregra (Muller)	5	4.20
Agapetus sp.	4	3.36
Ephemerella ignita (Poda)	4	3.36
Caenis rivulorum Eaton	4	3.36
Elmis aenea (Muller)	3	2.52
Ancylus fluviatilis Muller	3	2.52
Pisidium sp.	3	2.52
Brachycentrus subnubilus Curtis	2	1.68
Limnephilidae indet	2	1.68
Crenobia alpina (Dana)	2	1.68
Lepidostoma hirtum (Fabricius)	2	1.68
Hydroptila sp.	2	1.68
Brachyptera risi (Morton)	2	1.68
Lymnaea truncatula (Muller)	2	1.68
Simulium (Simulium) ornatum group	2	1.68
Amphinemura sulcicollis (Stephens)	2	1.68
Athripsodes cinereus (Curtis)	2	1.68
Athripsodes aterrimus (Stephens)	2	1.68
Protonemura meyeri (Pictet)	2	1.68
Psychomyia pusilla (Fabricius)	2	1.68
Rhyacophila sp.	2	1.68
Dicranota sp.	1	0.84
Gammarus pulex (L.)	1	0.84
Amphinemura standfussi Ris	1	0.84
Ecdyonurus sp.	1	0.84
Dinocras cephalotes (Curtis)	1	0.84
Gyraululus albus (Muller)	1	0.84
Enchytraeidae	1	0.84
Dendrocoelum lacteum (Muller)	1	0.84
Crunoecia irrorata (Curtis)	1	0.84
Chloroperla tripunctata (Scopoli)	1	0.84
Crangonyx pseudogracilis Bousfield	1	0.84
Antocha vitripennis (Meigen)	1	0.84
Habrophlebia fusca (Curtis)	1	0.84
Hydropsyche siltalai Dohler	1	0.84
Brachyptera sp.	1	0.84
Bathyomphalus contortus (L.)	1	0.84
Baetis rhodani (Pictet)	1	0.84
Athripsodes bilineatus (L.)	1	0.84

Table 8 continued

Species	n	% of missed species for SEPA audits
Armiger crista (L.)	1	0.84
Aplexa hypnorum (L.)	1	0.84
Anacaena globulus (Paykull)	1	0.84
Protonemura sp.	1	0.84
Hydrobius fuscipes (L.)	1	0.84
Polycelis nigra group	1	0.84
Polycelis sp.	1	0.84
Polycentropus flavomaculatus (Pictet)	1	0.84
Polycentropus sp.	1	0.84
Plectrocnemia conspersa (Curtis)	1	0.84
Prosimulium hirtipes/latimucro	1	0.84
Paraleptophlebia sp.	1	0.84
Rhyacophila dorsalis (Curtis)	1	0.84
Silo sp.	1	0.84
Simulium (Simulium) argyreatum group	1	0.84
Simulium (Simulium) noelleri Friederichs	1	0.84
Simulium (Wilhelmia) sp.	1	0.84
Siphonurus lacustris Eaton	1	0.84
Potamopyrgus jenkinsi (Smith)	1	0.84
Leuctra fusca (L.)	1	0.84
Helophorus (Atrathelophorus) brevipalpis Bedel	1	0.84
Hydraena riparia Kugelann	1	0.84
Hydropsyche pellucidula (Curtis)	1	0.84
Taeniopteryx nebulosa (L.)	1	0.84
Ilybius sp.	1	0.84
Polycelis felina (Dalyell)	1	0.84
Leptophlebiidae indet	1	0.84
Haliphus sp.	1	0.84
Leuctra inermis Kempny	1	0.84
Leuctra sp.	1	0.84
Limnius volckmari (Panzer)	1	0.84
Naididae	1	0.84
Odontocerum albicorne (Scopoli)	1	0.84
Oreodytes sp.	1	0.84
Laccobius (Macrolaccobius) bipunctatus (Fabricius)	1	0.84
Total	119	100

Table 9 Missed families for all samples in the 1998 audit

Family	n	% of missed families in 1998 audit
Hydroptilidae	61	5.82
Planariidae (incl. Dugesiidae)	46	4.39
Sphaeriidae	45	4.29
Caenidae	44	4.20
Elmidae	40	3.82
Planorbidae	38	3.63
Limnephilidae	35	3.34
Psychomyiidae (incl. Ecnomidae)	35	3.34
Hydrophilidae (incl. Hydraenidae)	34	3.24
Lymnaeidae	32	3.05
Simuliidae	32	3.05
Ancylidae (incl. Acroloxidae)	31	2.96
Hydrobiidae (incl. Bithyniidae)	30	2.86
Glossiphoniidae	28	2.67
Baetidae	28	2.67
Leptoceridae	27	2.58
Nemouridae	27	2.58
Haliplidae	24	2.29
Tipulidae	22	2.10
Hydropsychidae	22	2.10
Dytiscidae (incl. Noteridae)	19	1.81
Gammaridae (incl. Crangonyctidae)	18	1.72
Lepidostomatidae	17	1.62
Goeridae	17	1.62
Polycentropodidae	17	1.62
Chloroperlidae	16	1.53
Ephemerellidae	16	1.53
Asellidae	15	1.43
Valvatidae	15	1.43
Sericostomatidae	14	1.34
Oligochaeta	14	1.34
Leptophlebiidae	14	1.34
Rhyacophilidae (incl. Glossosomatidae)	12	1.15
Taeniopterygidae	12	1.15
Beraeidae	12	1.15
Dendrocoelidae	11	1.05
Leuctridae	10	0.95
Piscicolidae	10	0.95
Physidae	10	0.95
Gyrinidae	10	0.95
Erpobdellidae	9	0.86

Table 9 continued

Family	n	% of missed families in 1998 audit
Scirtidae	8	0.76
Coenagrionidae	7	0.67
Libellulidae	7	0.67
Chironomidae	7	0.67
Hydrometridae	5	0.48
Corixidae	4	0.38
Sialidae	4	0.38
Notonectidae	4	0.38
Odontoceridae	4	0.38
Perlidae	3	0.29
Heptageniidae	3	0.29
Ephemeridae	3	0.29
Gerridae	3	0.29
Philopotamidae	3	0.29
Calopterygidae	3	0.29
Brachycentridae	3	0.29
Unionidae	3	0.29
Neritidae	2	0.19
Siphonuridae	1	0.10
Capniidae	1	0.10
Perlodidae	1	0.10
Total	1048	100

Table 10 Missed species for all samples in the 1998 audit

Species	n	% of missed species in 1998 audit
Hydroptila sp.	39	3.55
Pisidium sp.	39	3.55
Potamopyrgus jenkinsi (Smith)	30	2.73
Ancylus fluviatilis Muller	27	2.46
Elmis aenea (Muller)	26	2.37
Caenis luctuosa group	23	2.09
Polycelis nigra group	22	2.00
Lymnaea peregra (Muller)	21	1.91
Hydraena gracilis Germar	21	1.91
Baetis rhodani (Pictet)	21	1.91
Limnephilidae indet	19	1.73
Simulium (Simulium) ornatum group	17	1.55
Ephemerella ignita (Poda)	16	1.46
Haliphus sp.	15	1.36
Lype sp.	15	1.36
Caenis rivulorum Eaton	15	1.36
Sericostoma personatum (Spence)	14	1.27
Glossiphonia complanata (L.)	14	1.27
Gyraulus albus (Muller)	14	1.27
Gammarus pulex (L.)	13	1.18
Helobdella stagnalis (L.)	12	1.09
Lepidostoma hirtum (Fabricius)	12	1.09
Asellus aquaticus (L.)	12	1.09
Chloroperla torrentium (Pictet)	12	1.09
Valvata cristata Muller	11	1.00
Dendrocoelum lacteum (Muller)	11	1.00
Brachyptera risi (Morton)	10	0.91
Hydropsyche siltalai Dohler	10	0.91
Piscicola geometra (L.)	10	0.91
Habrophlebia fusca (Curtis)	9	0.82
Polycelis felina (Dalyell)	9	0.82
Armiger crista (L.)	9	0.82
Ithytrichia sp.	9	0.82
Plectrocnemia conspersa (Curtis)	8	0.73
Tinodes waeneri (L.)	8	0.73
Psychomyia pusilla (Fabricius)	8	0.73
Orectochilus villosus (Muller)	8	0.73
Oulimnius tuberculatus (Muller)	8	0.73
Oxyethira sp.	8	0.73
Hydropsyche sp.	8	0.73
Silo pallipes (Fabricius)	7	0.64

Table 10 continued

Species	n	% of missed species in 1998 audit
Caenis horaria (L.)	7	0.64
Elodes sp.	7	0.64
Oreodytes sanmarkii (Sahlberg)	6	0.55
Dicranota sp.	6	0.55
Libellulidae indet	6	0.55
Lumbriculidae	6	0.55
Potamonectes depressus (Fabricius)	6	0.55
Acroloxus lacustris (L.)	6	0.55
Erpobdella octoculata (L.)	6	0.55
Beraeodes minutus (L.)	6	0.55
Polycentropus flavomaculatus (Pictet)	6	0.55
Bathyomphalus contortus (L.)	6	0.55
Athripsodes aterrimus (Stephens)	6	0.55
Agapetus sp.	6	0.55
Sphaeriidae indet	6	0.55
Goera pilosa (Fabricius)	6	0.55
Athripsodes cinereus (Curtis)	6	0.55
Crangonyx pseudogracilis Bousfield	5	0.45
Crenobia alpina (Dana)	5	0.45
Anisus vortex (L.)	5	0.45
Hippeutis complanatus (L.)	5	0.45
Nemoura avicularis Morton	5	0.45
Oulimnius sp.	5	0.45
Mystacides azurea (L.)	5	0.45
Limnius volckmari (Panzer)	5	0.45
Lymnaea truncatula (Muller)	5	0.45
Lymnaea sp.	5	0.45
Haliphus lineatocollis (Marsham)	5	0.45
Chloroperla tripunctata (Scopoli)	5	0.45
Beraea maurus (Curtis)	5	0.45
Physa sp.	5	0.45
Baetis vernus Curtis	5	0.45
Protonemura sp.	5	0.45
Nemurella picteti Klapalek	4	0.36
Polycelis sp.	4	0.36
Valvata piscinalis (Muller)	4	0.36
Tubificidae	4	0.36
Brychius elevatus (Panzer)	4	0.36
Dugesia polychroa group	4	0.36
Naididae	4	0.36

Table 10 continued

Species	n	% of missed species in 1998 audit
Lepidostomatidae indet	4	0.36
Tipula (Yamatotipula) montium group	4	0.36
Simulium (Wilhelmia) sp.	4	0.36
Rhyacophila sp.	4	0.36
Notonecta sp.	4	0.36
Odontocerum albicorne (Scopoli)	4	0.36
Athripsodes sp.	4	0.36
Leuctra fusca (L.)	4	0.36
Laccobius (Macrolaccobius) bipunctatus (Fabricius)	4	0.36
Simulium (Simulium) noelleri Friederichs	4	0.36
Tipula sp.	4	0.36
Leuctra sp.	3	0.27
Limnephilus lunatus Curtis	3	0.27
Hydropsyche pellucidula (Curtis)	3	0.27
Hydrometra stagnorum (L.)	3	0.27
Pyrrhosoma nymphula (Sulzer)	3	0.27
Agraylea multipunctata Curtis	3	0.27
Amphinemura sulcicollis (Stephens)	3	0.27
Anodonta sp.	3	0.27
Antocha vitripennis (Meigen)	3	0.27
Asellus meridianus Racovitza	3	0.27
Simulium (Eusimulium) aureum group	3	0.27
Athripsodes bilineatus (L.)	3	0.27
Silo sp.	3	0.27
Rhyacophila dorsalis (Curtis)	3	0.27
Lymnaea stagnalis (L.)	3	0.27
Brachycentrus subnubilus Curtis	3	0.27
Planaria torva (Muller)	3	0.27
Micronecta sp.	3	0.27
Calopteryx splendens (Harris)	3	0.27
Physa acuta group	3	0.27
Drusus annulatus (Stephens)	3	0.27
Orthocladinae	3	0.27
Planariidae indet	3	0.27
Nemoura cambrica group	3	0.27
Dinocras cephalotes (Curtis)	3	0.27
Gammarus sp.	2	0.18
Agabus sp.	2	0.18
Agraylea sp.	2	0.18
Anacaena bipustulata (Marsham)	2	0.18

Table 10 continued

Species	n	% of missed species in 1998 audit
<i>Glossiphonia heteroclita</i> (L.)	2	0.18
<i>Cyrnus flavidus</i> Mclachlan	2	0.18
<i>Baetis scambus</i> group	2	0.18
<i>Athripsodes albifrons</i> (L.)	2	0.18
<i>Cloeon dipterum</i> (L.)	2	0.18
<i>Ephemera</i> sp.	2	0.18
Chironomidae indet	2	0.18
Erpobdellidae indet	2	0.18
<i>Bithynia tentaculata</i> (L.)	2	0.18
<i>Gerris</i> sp.	2	0.18
<i>Simulium</i> (<i>Boophthora</i>) <i>erythrocephalum</i> (de Geer)	2	0.18
<i>Wormaldia</i> sp.	2	0.18
Leptophlebiidae indet	2	0.18
<i>Leuctra geniculata</i> (Stephens)	2	0.18
<i>Micropterna</i> sp.	2	0.18
<i>Mystacides nigra</i> (L.)	2	0.18
<i>Nemoura cinerea</i> (Retzius)	2	0.18
<i>Ischnura elegans</i> (Van der Linden)	2	0.18
<i>Ormosia</i> sp.	2	0.18
<i>Limnephilus</i> sp.	2	0.18
<i>Paraleptophlebia submarginata</i> (Stephens)	2	0.18
<i>Sialis</i> sp.	2	0.18
<i>Protonemura meyeri</i> (Pictet)	2	0.18
<i>Ilybius</i> sp.	2	0.18
<i>Planorbis carinatus/planorbis</i>	2	0.18
<i>Potamophylax cingulatus/latipennis</i>	2	0.18
<i>Planorbis</i> sp.	2	0.18
<i>Nephrotoma</i> sp.	2	0.18
<i>Hydrometra</i> sp.	2	0.18
<i>Hydraena testacea</i> Curtis	2	0.18
<i>Hydraena riparia</i> Kugelann	2	0.18
<i>Triaenodes bicolor</i> (Curtis)	2	0.18
<i>Tinodes unicolor</i> (Pictet)	2	0.18
<i>Theromyzon tessulatum</i> (Muller)	2	0.18
<i>Tinodes rostocki</i> Mclachlan	2	0.18
<i>Heptagenia sulphurea</i> (Muller)	2	0.18
<i>Theodoxus fluviatilis</i> (L.)	2	0.18
<i>Hydropsyche angustipennis</i> (Curtis)	2	0.18
<i>Beraea pullata</i> (Curtis)	1	0.09
Prodiamesinae	1	0.09

Table 10 continued

Species	n	% of missed species in 1998 audit
<i>Agabus guttatus</i> (Paykull)	1	0.09
<i>Adicella reducta</i> (Mclachlan)	1	0.09
<i>Prosimulium hirtipes/latimucro</i>	1	0.09
<i>Potamophylax cingulatus</i> (Stephens)	1	0.09
<i>Baetis</i> sp.	1	0.09
<i>Sialis fuliginosa</i> Pictet	1	0.09
<i>Sialis lutaria</i> (L.)	1	0.09
<i>Silo nigricornis</i> (Pictet)	1	0.09
<i>Trocheta subviridis</i> Dutrochet	1	0.09
<i>Amphinemura standfussi</i> Ris	1	0.09
<i>Anabolia nervosa</i> (Curtis)	1	0.09
<i>Tanytarsini</i>	1	0.09
<i>Taeniopteryx nebulosa</i> (L.)	1	0.09
<i>Sympetrum</i> sp.	1	0.09
<i>Siphonurus lacustris</i> Eaton	1	0.09
<i>Simulium</i> (Nevermannia) <i>cryophilum</i> group	1	0.09
<i>Potamonectes</i> sp.	1	0.09
<i>Aplexa hypnorum</i> (L.)	1	0.09
<i>Simulium</i> sp.	1	0.09
<i>Simulium</i> (<i>Simulium</i>) <i>reptans</i> (L.)	1	0.09
<i>Amphinemura</i> sp.	1	0.09
<i>Simulium</i> (<i>Simulium</i>) <i>argyreatum</i> group	1	0.09
<i>Anacaena globulus</i> (Paykull)	1	0.09
<i>Simulium</i> (Nevermannia) <i>lundstromi</i> (Enderlein)	1	0.09
<i>Ceraclea nigronervosa</i> (Retzius)	1	0.09
<i>Hydrobius fuscipes</i> (L.)	1	0.09
<i>Leuctra inermis</i> Kempny	1	0.09
<i>Enallagma cyathigerum</i> (Charpentier)	1	0.09
<i>Enchytraeidae</i>	1	0.09
<i>Ephemera danica</i> Muller	1	0.09
<i>Esolus parallelepipedus</i> (Muller)	1	0.09
<i>Hydrophilidae</i> indet	1	0.09
<i>Physa fontinalis</i> (L.)	1	0.09
<i>Hydrocyphon deflexicollis</i> (Muller)	1	0.09
<i>Diamesinae</i>	1	0.09
<i>Glossiphoniidae</i> indet	1	0.09
<i>Glossosoma</i> sp.	1	0.09
<i>Glyptotaelius pellucidus</i> (Retzius)	1	0.09
<i>Gyrinidae</i> indet	1	0.09
<i>Gyrinus</i> sp.	1	0.09

Table 10 continued

Species	n	% of missed species in 1998 audit
Halesus radiatus (Curtis)	1	0.09
Helophorus (Atrathelophorus) brevipalpis Bedel	1	0.09
Gerris (Gerris) lacustris (L.)	1	0.09
Philopotamus montanus (Donovan)	1	0.09
Brachyptera sp.	1	0.09
Platambus maculatus (L.)	1	0.09
Caenis luctuosa (Burmeister)	1	0.09
Pilaria (Pilaria) sp.	1	0.09
Callicorixa praeusta (Fieber)	1	0.09
Capnia bifrons (Newman)	1	0.09
Helius sp.	1	0.09
Ecdyonurus sp.	1	0.09
Chaetopteryx villosa (Fabricius)	1	0.09
Nemouridae indet	1	0.09
Perlodes microcephala (Pictet)	1	0.09
Paraleptophlebia sp.	1	0.09
Coenagrionidae indet	1	0.09
Orthotrichia sp.	1	0.09
Crunoecia irrorata (Curtis)	1	0.09
Oreodytes sp.	1	0.09
Polycentropus sp.	1	0.09
Cercyon sp.	1	0.09
Total	1099	100

APPENDIX

Results of individual sample audits

AUDIT RESULTS FOR EAST KILBRIDE LABORATORY

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA West

LABORATORY: East Kilbride

DATE: 05/05/98

WATER-
COURSE: Pow Burn

PRIMARY
ANALYST: KA

AQC
ANALYST:

SITE: u/s Gryfe confluence

CODE: 98/353

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Planorbidae

7

Zonitidae in vial

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Chloroperlidae

9

Chloroperla torrentium (Pictet) 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

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 West

LABORATORY: East Kilbride

DATE: 16/06/97

WATER-
COURSE: Torra/Duich

PRIMARY
ANALYST: KA

AQC
ANALYST:

SITE: A846 Bridge

CODE: 97/504

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West
WATER-
COURSE: Locher Water

LABORATORY: East Kilbride
PRIMARY
ANALYST: KA

DATE: 03/03/98
AQC
ANALYST:
SORT/AQC
METHOD: Preserved

SITE: d/s Tannery

CODE: 98/116

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Planorbidae

2

Discus rotundatus (Endodontidae) in vial

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

None

SUMMARY OF AUDIT

LOSSES 1 GAINS 0 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 West

LABORATORY: East Kilbride

DATE: 25/02/98

WATER-
COURSE: South Calder Water

PRIMARY
ANALYST: KA

AQC
ANALYST:

SITE: Brigbrae Mill Bridge

CODE: 98/112

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Hydrobiidae (incl. Bithyniidae) *

1

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Hydrobiidae (incl. Bithyniidae) *

1

Potamopyrgus jenkinsi (Smith)

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

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 West

LABORATORY: East Kilbride

DATE: 03/03/98

WATER-
COURSE: Locher Water

PRIMARY
ANALYST: LM

AQC
ANALYST:

SITE: u/s Tannery

CODE: 98/114

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 16/11/98

WATER-
COURSE: Pow Burn

PRIMARY
ANALYST: LM

AQC
ANALYST:

SITE: A79 Bridge

CODE: 98/957

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Rhyacophilidae (incl. Glossosomatidae) 9

Agapetus sp. 1 only

Hydropsychidae 9

Hydropsyche siltalai Dohler 1 only

SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 12

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 West
WATER-
COURSE: Rotten Calder

LABORATORY: East Kilbride
PRIMARY
ANALYST: LM

DATE: 19/02/98
AQC
ANALYST:
SORT/AQC
METHOD: Preserved

SITE: Generals Bridge

CODE: 98/90

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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
- 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 West

LABORATORY: East Kilbride

DATE: 28/04/98

WATER-
COURSE: Luggie Water

PRIMARY
ANALYST: LM

AQC
ANALYST:

SITE: North Myvat Farm

CODE: 98/285

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Planorbidae

2

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Hydrophilidae (incl. Hydraenidae)

9

Helophorus (Atracthelophorus) brevipalpis Bedel (a) 1 only

SUMMARY OF AUDIT

LOSSES 1

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 2

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 West
WATER-
COURSE: Endrick Water

LABORATORY: East Kilbride
PRIMARY
ANALYST: LM

DATE: 06/05/98
AQC
ANALYST:
SORT/AQC
METHOD: Preserved

SITE: Overglinns

CODE: 98/358

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Leuctridae *

1

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Leuctridae *

1

Leuctra fusca (L.)

Leuctra inermis Kempny

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 West

LABORATORY: East Kilbride

DATE: 14/04/98

WATER-
COURSE: Kittoch

PRIMARY
ANALYST: MC

AQC
ANALYST:

SITE: d/s Fairfield

CODE: 98/241

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

Chironomidae

6

Orthocladiinae

Tanypodinae

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

None

SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 2

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 West

LABORATORY: East Kilbride

DATE: 07/07/98

WATER-
COURSE: Avon Water

PRIMARY
ANALYST: MC

AQC
ANALYST:

SITE: Linthaugh

CODE: 98/563

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 08/07/98

WATER-
COURSE: Glazert Water

PRIMARY
ANALYST: MC

AQC
ANALYST:

SITE: u/s Hospital

CODE: 98/575

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Dytiscidae (incl. Noteridae)

9

Oreodytes sp. (l) 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 West

LABORATORY: East Kilbride

DATE: 17/09/98

WATER-
COURSE: Lugar Water

PRIMARY
ANALYST: MC

AQC
ANALYST:

SITE: d/s Underwood STW

CODE: 98/825

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 13/10/98

WATER-

COURSE: Allander Water

PRIMARY

ANALYST: MC

AQC

ANALYST:

SITE: d/s Milngavie STW

CODE: 98/945

SORT/AQC

METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 26/08/98

WATER-
COURSE: Barr Water

PRIMARY
ANALYST: MT

AQC
ANALYST:

SITE: Glenbarr

CODE: 98/705

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 11/08/98

WATER-
COURSE: Garnock

PRIMARY
ANALYST: MT

AQC
ANALYST:

SITE: d/s Dalgarnen

CODE: 98/675

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: East Kilbride

DATE: 18/05/98

WATER-
COURSE: Water of Girvan

PRIMARY
ANALYST: MT

AQC
ANALYST:

SITE: u/s Knockdon Bridge

CODE: 98/436

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Asellidae

2

Terrestrial Isopod in vial

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Hydrophilidae (incl. Hydraenidae)

9

Hydraena gracilis Germar (a) 1 only

SUMMARY OF AUDIT

LOSSES 1

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 2

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 West

LABORATORY: East Kilbride

DATE: 25/03/98

WATER-
COURSE: Irvine

PRIMARY
ANALYST: MT

AQC
ANALYST:

SITE: Hurlford

CODE: 98/201

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Leptoceridae

9

Athripsodes bilineatus (L.)

Athripsodes cinereus (Curtis)

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 West

LABORATORY: East Kilbride

DATE: 31/08/98

WATER-
COURSE: Gryfe

PRIMARY
ANALYST: MT

AQC
ANALYST:

SITE: Crosslee Bridge

CODE: 98/751

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Valvatidae 7

Additional BMWP taxa found in vial

Planorbidae 7

Planorbis carinatus/planorbis

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

None

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

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 West

LABORATORY: East Kilbride

DATE: 29/04/98

WATER-

COURSE: Little Eachaig

PRIMARY

ANALYST: MT

AQC

ANALYST:

SITE: u/s A815 Bridge

CODE: 98/328

SORT/AQC

METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Psychomyiidae (incl. Ecnomidae)

9

Psychomyia pusilla (Fabricius) 1 only

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 West

LABORATORY: East Kilbride

DATE: 31/08/98

WATER-
COURSE: Water of Girvan

PRIMARY
ANALYST: RW

AQC
ANALYST:

SITE: u/s Dowhail

CODE: 98/735

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Glossiphoniidae *

3

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Glossiphoniidae *

3

Glossiphonia complanata (L.)

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 West

LABORATORY: East Kilbride

DATE: 10/07/98

WATER-

COURSE: Thorntonhall Burn

PRIMARY

ANALYST: RW

AQC

ANALYST:

SITE: u/s Tait's Thornton Septic Tank

CODE: 98/599

SORT/AQC

METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Baetidae

9

Baetis rhodani (Pictet)

Caenidae

9

Caenis rivulorum Eaton 1 only

SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 11

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 West

LABORATORY: East Kilbride

DATE: 20/05/98

WATER-
COURSE: Breakerie Water

PRIMARY
ANALYST: RW

AQC
ANALYST:

SITE: Lephenstrath

CODE: 98/453

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Oligochaeta

1

Nematoda in vial

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Psychomyiidae (incl. Ecnomidae)

9

Psychomyia pusilla (Fabricius) 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

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 West

LABORATORY: East Kilbride

DATE: 29/04/98

WATER-
COURSE: Cur

PRIMARY
ANALYST: RW

AQC
ANALYST:

SITE: Bridgend

CODE: 98/324

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Chloroperlidae

9

Chloroperla torrentium (Pictet)

Chloroperla tripunctata (Scopoli)

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 West

LABORATORY: East Kilbride

DATE: 29/04/98

WATER-
COURSE: Orchy

PRIMARY
ANALYST: RW

AQC
ANALYST:

SITE: d/s Loch Tulla

CODE: 98/314

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Simuliidae

9

Simulium (Simulium) ornatum group (p) 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 West

LABORATORY: East Kilbride

DATE: 25/03/98

WATER-
COURSE: Irvine

PRIMARY
ANALYST: RW

AQC
ANALYST:

SITE: d/s Industrial Estate

CODE: 98/205

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Gammaridae (incl. Crangonyctidae)	9
Crangonyx pseudogracilis Bousfield	
Gammarus pulex (L.)	
Leptoceridae	9
Athripsodes aterrimus (Stephens) 1 only	

SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 16

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 West

LABORATORY: East Kilbride

DATE: 12/03/97

WATER-
COURSE: Kames Burn

PRIMARY
ANALYST: SC

AQC
ANALYST:

SITE: d/s Hatchery

CODE: 97/157

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Caenidae	9
Caenis rivulorum Eaton 1 only	
Chloroperlidae	9
Chloroperla torrentium (Pictet) 1 only	

SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 17

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 West
WATER-
COURSE: North Calder
SITE: Carnbroe Bridge

LABORATORY: East Kilbride
PRIMARY
ANALYST: SD
CODE: 98/886

DATE: 29/09/98
AQC
ANALYST:
SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Elmidae

9

Elmis aenea (Muller) (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 West

LABORATORY: East Kilbride

DATE: 16/04/98

WATER-
COURSE: Doon

PRIMARY
ANALYST: SD

AQC
ANALYST:

SITE: u/s Waterside

CODE: 98/260

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Planariidae (incl. Dugesiidae)	9
Polycelis nigra group	
Caenidae	9
Caenis rivulorum Eaton 1 only	
Hydrophilidae (incl. Hydraenidae)	9
Hydraena gracilis Germar (a) 1 only	

SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 17

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 West

LABORATORY: East Kilbride

DATE: 16/03/98

WATER-
COURSE: Black Cart Water

PRIMARY
ANALYST: SD

AQC
ANALYST:

SITE: Milliken Park

CODE: 98/138

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Nemouridae	9
Amphinemura sulcicollis (Stephens) 1 only	
Limnephilidae	9
Limnephilidae indet (juv) 1 only	
Leptoceridae	9
Athripsodes aterrimus (Stephens) 1 only	

SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 24

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 West

LABORATORY: East Kilbride

DATE: 23/03/98

WATER-
COURSE: North Calder

PRIMARY
ANALYST: SD

AQC
ANALYST:

SITE: Wester Moffat Farm

CODE: 98/190

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

Asellidae

6

Asellus aquaticus (L.)

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

None

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 West

LABORATORY: East Kilbride

DATE: 11/08/98

WATER-
COURSE: Garnock

PRIMARY
ANALYST: SD

AQC
ANALYST:

SITE: d/s Dalry

CODE: 98/674

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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)

AUDIT RESULTS FOR DUMFRIES LABORATORY

EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: SEPA West

LABORATORY: Dumfries

DATE: 15/04/98

WATER-
COURSE: Cluden Water

PRIMARY
ANALYST: AB

AQC
ANALYST:

SITE: Irongray

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West

LABORATORY: Dumfries

DATE: 08/02/99

WATER-
COURSE: Moffat Water

PRIMARY
ANALYST: AB

AQC
ANALYST:

SITE: u/s Selcoth New F/F

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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 West
WATER-
COURSE: Gelston Burn
SITE: u/s Gelston STW

LABORATORY: Dumfries
PRIMARY
ANALYST: BR
CODE:

DATE: 01/02/99
AQC
ANALYST:
SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Rhyacophilidae (incl. Glossosomatidae)

9

Agapetus sp.

Rhyacophila sp. (juv)

SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 0

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 West

LABORATORY: Dumfries

DATE: 31/03/98

WATER-
COURSE: Killantrae Burn

PRIMARY
ANALYST: BR

AQC
ANALYST:

SITE: Killantrae Burn

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Planorbidae

9

Bathyomphalus contortus (L.)

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 West

LABORATORY: Dumfries

DATE: 11/02/99

WATER-
COURSE: Tarff Water

PRIMARY
ANALYST: BR

AQC
ANALYST:

SITE: u/s Ringford STW

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Dendrocoelidae	9
Dendrocoelum lacteum (Muller)	
Hydrophilidae (incl. Hydraenidae)	9
Hydraena gracilis Germar (a)	

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
- 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 West

LABORATORY: Dumfries

DATE: 20/05/98

WATER-
COURSE: Buckland Burn

PRIMARY
ANALYST: ML

AQC
ANALYST:

SITE: u/s Mutchill

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Heptageniidae * 1

Additional BMWP taxa found in vial

Asellidae 6

Asellus aquaticus (L.)

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

Heptageniidae * 1

Rhithrogena sp.

SUMMARY OF AUDIT

LOSSES 0

GAINS 1

OMISSIONS: 1

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 West

LABORATORY: Dumfries

DATE: 02/02/99

WATER-
COURSE: Ecclefechan Burn

PRIMARY
ANALYST: ML

AQC
ANALYST:

SITE: u/s Kirkconnie Hall STW

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

Lymnaeidae

7

Succineidae in vial

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

None

SUMMARY OF AUDIT

LOSSES 1 GAINS 0

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 West

LABORATORY: Dumfries

DATE: 14/05/98

WATER-
COURSE: Water of Fleet

PRIMARY
ANALYST: ML

AQC
ANALYST:

SITE: Gatehouse of Fleet

CODE:

SORT/AQC
METHOD: Preserved

RESULTS OF AUDIT

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

VIAL

BMWP taxa not found in vial

None

Additional BMWP taxa found in vial

None

SAMPLE

BMWP taxa not found in sample (For samples where vial is broken or absent)

N/a

Additional BMWP taxa found in sample

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)

