

# An audit of performance in the analysis of biological samples in 1995 NRA Thames Region: AQC Audit

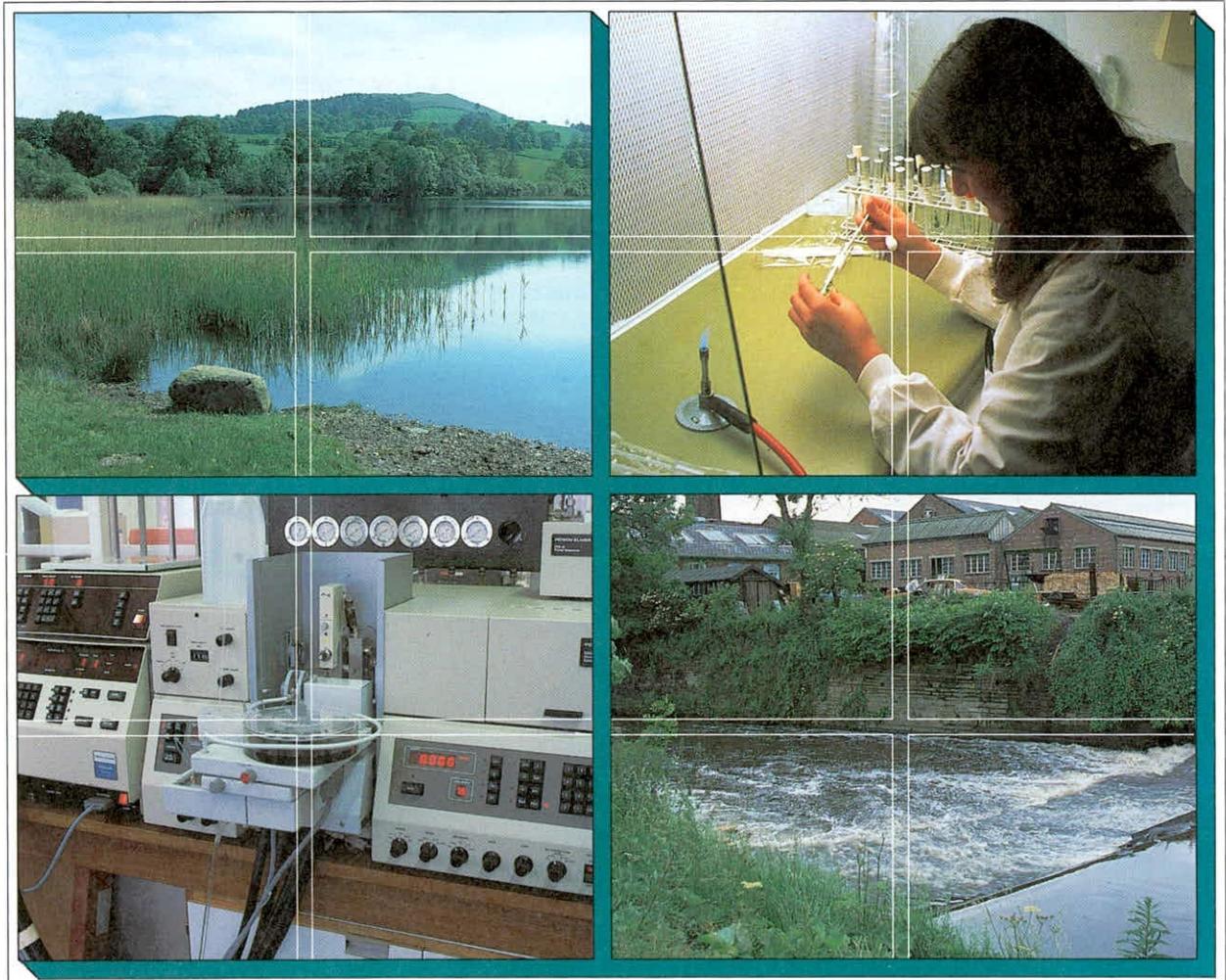
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# **An audit of performance in the analysis of biological samples in 1995. NRA Thames Region: AQC Audit**

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## 1. INTRODUCTION

The 1995 General Quality Assessment (GQA) Survey included the sampling of aquatic macro-invertebrates for biological assessment of river quality throughout the United Kingdom. In England and Wales the survey was undertaken by the National Rivers Authority (NRA), the River Purification Boards (RPBs) sampled in Scotland, the Industrial Research and Technology Unit (IRTU) undertook the work in Northern Ireland and the Government Laboratory covered the Isle of Man (IOM).

The majority of sites surveyed were sampled in two seasons, spring and autumn. Standard collection procedures were used and the sampling strategy was 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 order to undertake this massive programme of fieldwork and sample processing, a large number of staff, many of whom were relatively inexperienced, were employed by the surveying agencies. 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) checker. For most agencies, these checkers 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 NRA region, each RPB, IRTU and IOM. This commission was consistent with the audit performed by IFE for the National River Quality Survey in 1990 and for the routine biological monitoring of river sites each year between 1991 and 1994. This audit was originally intended as a measure of the quality of the AQC analyses and is termed the main audit or AQC audit. The data collected for the 1995 GQA Survey was not adjusted for errors identified by either of the quality assurance procedures. Therefore the NRA contracted IFE to subject their samples to a further audit of the primary analysis (the primary audit) to provide an independent assessment of the quality of the Survey data .

This report presents the results of the 21 AQC'd samples audited for NRA Thames Region and represents a measure of the performance of the AQC analyst rather than that of the primary analyst. The results of the Primary Audit, detailing the performance of primary analysts for all 60 samples for the Region, are reported separately.

## 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 NRA, RPB, IRTU and IOM 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 and sent to the Regional Biologist. Copies of these report forms are presented in the Appendix. 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". 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, the wrong family box being ticked on the data sheet or the family being present in the sample but missed by IFE.

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 AQC audit for Thames Region are summarised by area in Tables 1 and 2. Table 3 displays the statistics of these regional 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 their Area laboratories and for the Region as a whole. Table 4 compares these results for each NRA Region and Area laboratory. Table 5 presents data for Thames Region for the net effects of the AQC 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 compares this BMWP data for each NRA Region and Area laboratory. Table 7 lists the taxa missed in sorting by Thames Region's AQC analysts in the 1995 audit and Table 8 lists all such taxa for the entire 1995 audit (Primary and AQC Audits for NRA regions and Main Audit for other organisations) for the whole of the UK.

## **6. ACKNOWLEDGEMENTS**

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

Table 1. The 13 AQC'd samples audited for the Fobney Mead Laboratory

<b>River</b>	<b>Site</b>	<b>AQC Analyst</b>	<b>Losses</b>	<b>Gains</b>	<b>Omissions</b>
<b>SPRING</b>					
Fishermans Brook	u/s Padworth Brook	006	0	0	0
Coln	Court Farm Bridge	006	2	3	0
Kencot Brook	Alvescot	006	0	2	0
Blackwater	u/s Sandhurst STW	006	1	1	0
Evenlode	d/s Chadlington Stream	006	1	2	0
Farthinghoe Stream	u/s Cherwell	006	0	3	0
<b>AUTUMN</b>					
Blackwater	Lynchford Bridge	014	0	3	0
Ray	Morris Street, Swindon	014	2	0	1
Woodhill Brook	u/s Childrey	014	0	1	0
Oxon Ray	B4027 Bridge, Islip	014	0	0	0
Loddon	u/s Ford, Lands End	014	0	3	1
Lydebank Brook	Ford Lane, East Hendred	014	0	0	0
Emm Brook	Toutley Bridge	014	0	1	0

Table 2. The 8 AQC'd samples audited for the Waltham Cross Laboratory

River	Site	AQC Analyst	Losses	Gains	Omissions
<b>SPRING</b>					
Mimram	Codicote Bottom	DJL	0	1	0
Rom/Beam	Cardrome A125	DJL	0	1	0
Colne	Bushey Mill Lane	JE	0	0	0
Colne Brook	Wraysbury Bridge Station	JE	0	0	0
<b>AUTUMN</b>					
Colne	u/s Thames, Staines	DJL	0	0	0
Brookhouse Brook	Brookhouse	DJL	0	2	0
Cobbins Brook	Paternoster Hill	JE	0	0	0
Gade	u/s GUC	JE	1	0	0

Table 3. Statistics of 1995 AQC Audit results for Thames Region

<b>Analyst/Group</b>	<b>n</b>	<b>Mean gains</b>	<b>Standard error</b>	<b>No. samples &gt;2 gains</b>	<b>% samples &gt;2 gains</b>	<b>Highest no. gains</b>	<b>Mean errors (l+g+o)</b>	<b>Standard error</b>
<b>Fobney Mead</b>	<b>13</b>	<b>1.46</b>	<b>0.35</b>	<b>4</b>	<b>30.77</b>	<b>3</b>	<b>2.08</b>	<b>0.45</b>
006	6	1.83	0.48	2	33.33	3	2.50	0.67
014	7	1.14	0.51	2	28.57	3	1.71	0.60
<b>Waltham Cross</b>	<b>8</b>	<b>0.50</b>	<b>0.27</b>	<b>0</b>	<b>0.00</b>	<b>2</b>	<b>0.63</b>	<b>0.26</b>
DJL	4	1.00	0.41	0	0.00	0	1.00	0.41
JE	4	0.00	0.00	0	0.00	0	0.25	0.25
<b>Thames Region</b>	<b>21</b>	<b>1.10</b>	<b>0.26</b>	<b>4</b>	<b>19.05</b>	<b>3</b>	<b>1.52</b>	<b>0.33</b>
<b>Whole of NRA</b>	<b>287</b>	<b>0.92</b>	<b>0.07</b>	<b>36</b>	<b>12.54</b>	<b>6</b>	<b>1.20</b>	<b>0.08</b>

Table 4. Summary of errors found in 1995 AQC Audit for each NRA Laboratory

Region/Lab.	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
<b>Anglian</b>	<b>33</b>	<b>1.24</b>	<b>0.20</b>	<b>5</b>	<b>15.15</b>	<b>4</b>	<b>1.76</b>	<b>0.25</b>
Central	13	1.23	0.36	2	15.38	4	2.15	0.45
Eastern	13	1.38	0.33	2	15.38	4	1.62	0.33
Northern	7	1.00	0.38	1	14.29	3	1.29	0.52
<b>N'umb &amp; Yorks</b>	<b>30</b>	<b>0.87</b>	<b>0.16</b>	<b>2</b>	<b>6.67</b>	<b>3</b>	<b>1.00</b>	<b>0.19</b>
South Yorkshire	18	0.83	0.20	1	5.56	3	0.94	0.24
Northumbria	2	1.00	0.00	0	0.00	1	1.00	0.00
Dales	10	0.90	0.35	1	10.00	3	1.10	0.41
<b>North West</b>	<b>42</b>	<b>1.19</b>	<b>0.22</b>	<b>10</b>	<b>23.81</b>	<b>6</b>	<b>1.48</b>	<b>0.23</b>
Northern	12	0.75	0.28	1	8.33	3	1.33	0.40
Central	12	0.92	0.38	3	25.00	3	1.00	0.37
Southern	18	1.67	0.40	6	33.33	6	1.89	0.40
<b>Severn-Trent</b>	<b>48</b>	<b>1.19</b>	<b>0.21</b>	<b>8</b>	<b>16.67</b>	<b>6</b>	<b>1.46</b>	<b>0.23</b>
Upper Severn	12	0.75	0.28	1	8.33	3	1.08	0.31
Lower Severn	10	1.60	0.62	3	30.00	5	2.10	0.67
Upper Trent	9	0.78	0.22	0	0.00	2	1.00	0.29
Lower Trent	17	1.47	0.41	4	23.53	6	1.59	0.45
<b>Southern</b>	<b>24</b>	<b>0.38</b>	<b>0.14</b>	<b>1</b>	<b>4.17</b>	<b>3</b>	<b>0.67</b>	<b>0.19</b>
Western	9	0.00	0.00	0	0.00	0	0.22	0.15
Eastern	15	0.60	0.21	1	6.67	3	0.93	0.27
<b>South Western</b>	<b>53</b>	<b>0.51</b>	<b>0.11</b>	<b>1</b>	<b>1.89</b>	<b>3</b>	<b>0.57</b>	<b>0.12</b>
Devon	15	0.73	0.23	0	0.00	2	0.80	0.22
Cornwall	15	0.40	0.21	1	6.67	3	0.40	0.21
North Wessex	14	0.50	0.23	0	0.00	2	0.57	0.23
South Wessex	9	0.33	0.24	0	0.00	2	0.44	0.34
<b>Thames</b>	<b>21</b>	<b>1.10</b>	<b>0.26</b>	<b>4</b>	<b>19.05</b>	<b>3</b>	<b>1.52</b>	<b>0.33</b>
Fobney Mead	13	1.46	0.35	4	30.77	3	2.08	0.45
Waltham Cross	8	0.50	0.27	0	0.00	2	0.63	0.26
<b>Welsh</b>	<b>36</b>	<b>0.89</b>	<b>0.19</b>	<b>5</b>	<b>13.89</b>	<b>3</b>	<b>1.25</b>	<b>0.21</b>
Northern	12	1.50	0.34	3	25.00	3	1.83	0.34
South Western	12	0.58	0.33	2	16.67	3	0.92	0.36
South Eastern	12	0.58	0.23	0	0.00	2	1.00	0.35
<b>Whole of NRA</b>	<b>287</b>	<b>0.92</b>	<b>0.07</b>	<b>36</b>	<b>12.54</b>	<b>6</b>	<b>1.20</b>	<b>0.08</b>

Table 5. Net effects of the AQC Audit on BMWP score and number of scoring taxa

<b>Analyst/Group</b>	<b>n</b>	<b>Mean net effect on BMWP score</b>	<b>% of samples underestimated by score &gt;13</b>	<b>maximum underestimate of BMWP score</b>	<b>Mean net effect on no. of taxa</b>	<b>% of samples underestimated by &gt;2 taxa</b>	<b>Maximum underestimate of no. of taxa</b>
<b>Fobney Mead</b>	<b>13</b>	<b>5.77</b>	<b>23.08</b>	<b>19</b>	<b>1.00</b>	<b>23.08</b>	<b>3</b>
006	6	6.50	16.67	19	1.17	16.67	3
014	7	5.14	28.57	17	0.86	28.57	3
<b>Waltham Cross</b>	<b>8</b>	<b>1.63</b>	<b>0.00</b>	<b>10</b>	<b>0.38</b>	<b>0.00</b>	<b>2</b>
DJL	4	4.75	0.00	10	1.00	0.00	2
JE	4	-1.50	0.00	0	-0.25	0.00	0
<b>Thames Region</b>	<b>21</b>	<b>4.19</b>	<b>14.29</b>	<b>19</b>	<b>0.76</b>	<b>14.29</b>	<b>3</b>
<b>Whole of NRA</b>	<b>287</b>	<b>4.11</b>	<b>11.50</b>	<b>30</b>	<b>0.71</b>	<b>10.80</b>	<b>6</b>

Table 6. Net effects of the AQC Audit on BMWP score and number of scoring taxa for each NRA Area

Analyst/Group	n	Mean net effect on BMWP score	% of 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>Anglian</b>	<b>33</b>	<b>4.42</b>	<b>9.09</b>	<b>17</b>	<b>0.88</b>	<b>12.12</b>	<b>4</b>
Central	13	3.92	15.38	17	0.69	15.38	3
Eastern	13	5.46	7.69	14	1.15	15.38	4
Northern	7	3.43	0.00	8	0.71	0.00	2
<b>N'umb &amp; Yorks</b>	<b>30</b>	<b>4.67</b>	<b>3.33</b>	<b>25</b>	<b>0.80</b>	<b>3.30</b>	<b>3</b>
South Yorkshire	18	4.28	0.00	13	0.78	5.56	3
Northumbria	2	5.00	0.00	5	1.00	0.00	1
Dales	10	5.30	10.00	25	0.80	10.00	3
<b>North West</b>	<b>42</b>	<b>5.64</b>	<b>14.29</b>	<b>24</b>	<b>0.98</b>	<b>21.43</b>	<b>6</b>
Northern	12	2.42	0.00	13	0.42	8.33	3
Central	12	6.50	25.00	24	8.33	25.00	3
Southern	18	7.22	16.67	23	1.44	27.78	6
<b>Severn-Trent</b>	<b>48</b>	<b>5.00</b>	<b>16.67</b>	<b>30</b>	<b>0.98</b>	<b>16.67</b>	<b>5</b>
Upper Severn	12	2.67	8.33	21	0.42	8.33	3
Lower Severn	10	6.60	30.00	30	1.20	30.00	5
Upper Trent	9	4.78	11.11	18	0.78	0.00	2
Lower Trent	17	5.82	17.65	22	1.35	23.53	5
<b>Southern Region</b>	<b>24</b>	<b>0.88</b>	<b>0.00</b>	<b>12</b>	<b>0.08</b>	<b>0.00</b>	<b>2</b>
Western	9	-1.22	0.00	0	-0.22	0.00	0
Eastern	15	2.13	0.00	12	0.27	0.00	2
<b>South Western</b>	<b>53</b>	<b>2.85</b>	<b>11.32</b>	<b>22</b>	<b>0.45</b>	<b>1.89</b>	<b>3</b>
Devon	15	4.07	20.00	15	0.67	0.00	2
Cornwall	15	2.20	6.67	22	0.40	6.67	3
N.Wessex	14	2.93	14.29	16	0.43	0.00	2
S.Wessex	9	1.78	0.00	10	0.22	0.00	1
<b>Thames</b>	<b>21</b>	<b>4.19</b>	<b>14.29</b>	<b>19</b>	<b>0.76</b>	<b>14.29</b>	<b>3</b>
Fobney Mead	13	5.77	23.08	19	1.00	23.08	3
Waltham Cross	8	1.63	0.00	10	0.38	0.00	2
<b>Welsh</b>	<b>36</b>	<b>4.39</b>	<b>19.44</b>	<b>30</b>	<b>0.58</b>	<b>11.11</b>	<b>3</b>
Northern	12	8.67	41.67	20	1.17	16.67	3
S. Western	12	1.92	16.67	30	0.25	16.67	3
S. Eastern	12	2.58	0.00	11	0.33	0.00	2
<b>Whole of NRA</b>	<b>287</b>	<b>4.11</b>	<b>11.50</b>	<b>30</b>	<b>0.71</b>	<b>10.80</b>	<b>6</b>

Table 7. Taxa missed by Thames Region's AQC analysts

<b>Family</b>	<b>n</b>	<b>% of Thames Region's missed taxa in AQC Audit</b>	<b>% of missed taxa in AQC Audit for all NRA Regions</b>
Elmidae	4	18.18	5.17
Baetidae	3	13.64	2.16
Hydropsychidae	2	9.09	2.16
Platycnemididae	1	4.55	0.43
Simuliidae	1	4.55	3.45
Unionidae	1	4.55	0.43
Scirtidae	1	4.55	1.72
Polycentropodidae	1	4.55	3.02
Tipulidae	1	4.55	3.88
Physidae	1	4.55	1.29
Lymnaeidae	1	4.55	2.16
Hydrobiidae (incl. Bithyniidae)	1	4.55	5.17
Ephemerellidae	1	4.55	1.72
Ancylidae (incl. Acroloxidae)	1	4.55	1.29
Haliplidae	1	4.55	1.29
Planariidae (incl. Dugesiidae)	1	4.55	5.17

Table 8. Missed taxa for all samples in 1995 audit

Family	n	% of all missed taxa in 1995 audit
Hydrophilidae (incl. Hydraenidae)	68	5.97
Hydroptilidae	59	5.18
Sphaeriidae	52	4.57
Hydrobiidae (incl. Bithyniidae)	50	4.39
Planariidae (incl. Dugesiidae)	46	4.04
Caenidae	40	3.51
Elmidae	39	3.42
Leptoceridae	39	3.42
Psychomyiidae (incl. Ecnomidae)	39	3.42
Lymnaeidae	33	2.90
Simuliidae	32	2.81
Nemouridae	31	2.72
Limnephilidae	30	2.63
Planorbidae	29	2.55
Haliplidae	28	2.46
Tipulidae	25	2.19
Baetidae	23	2.02
Glossiphoniidae	22	1.93
Goeridae	22	1.93
Leptophlebiidae	22	1.93
Dytiscidae (incl. Noteridae)	21	1.84
Ephemerellidae	20	1.76
Valvatidae	20	1.76
Hydropsychidae	18	1.58
Ancylidae (incl. Acroloxidae)	16	1.40
Asellidae	16	1.40
Leuctridae	16	1.40
Piscicolidae	16	1.40
Rhyacophilidae (incl. Glossosomatidae)	16	1.40
Scirtidae	16	1.40
Sericostomatidae	15	1.32
Gyrinidae	14	1.23
Erpobdellidae	13	1.14
Lepidostomatidae	13	1.14
Polycentropodidae	13	1.14
Chloroperlidae	11	0.97
Odontoceridae	11	0.97
Dendrocoelidae	10	0.88
Heptageniidae	10	0.88

Table 8. (cont.)

<b>Family</b>	<b>n</b>	<b>% of all missed taxa in 1995 audit</b>
Gammaridae (incl. Crangonyctidae)	9	0.79
Taeniopterygidae	9	0.79
Hydrometridae	8	0.70
Oligochaeta	8	0.70
Physidae	7	0.61
Chironomidae	6	0.53
Coenagriidae	6	0.53
Perlidae	6	0.53
Brachycentridae	5	0.44
Calopterygidae	5	0.44
Perlodidae	5	0.44
Sialidae	5	0.44
Beraeidae	4	0.35
Corixidae	4	0.35
Corophiidae	4	0.35
Ephemeridae	4	0.35
Unionidae	4	0.35
Capniidae	3	0.26
Dryopidae	3	0.26
Gerridae	3	0.26
Libellulidae	3	0.26
Siphonuridae	3	0.26
Aphelocheiridae	2	0.18
Neritidae	2	0.18
Platycnemididae	2	0.18
Aeshnidae	1	0.09
Cordulegasteridae	1	0.09
Notonectidae	1	0.09
Philopotamidae	1	0.09
Viviparidae	1	0.09

## **APPENDIX**

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

# EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Thames

LABORATORY: Fobney Mead

DATE: 6.3.95

WATER-COURSE: Fishermans Brook

PRIMARY ANALYST: 016

AQC ANALYST: 006

SITE: u/s Padworth Brook

CODE: PKER.0192

SORT/AQC METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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: Thames

LABORATORY: Fobney Mead

DATE: 15.3.95

WATER-COURSE: Coln

PRIMARY ANALYST: 004

AQC ANALYST: 006

SITE: Court Farm Bridge

CODE: PUTR.0152

SORT/AQC METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	Presumed cause of error (see footnotes)
-------------	-------------------------------------	---

### VIAL

#### BMWP taxa not found by IFE

Dendrocoelidae	Note on data sheet "Seen on stones".	1
Simuliidae	Note on data sheet "Seen on stones".	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

Hydropsychidae	Hydropsyche siltalai 1 only	12
Haliplidae	Haliplus sp. (larva) 1 only	9
Physidae	Physa fontinalis 1 only	9

### SUMMARY OF AUDIT

LOSSES 2

GAINS 3

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: Thames  
WATER-  
COURSE: Kencot Brook  
SITE: Alvescot

LABORATORY: Fobney Mead  
PRIMARY  
ANALYST: 010  
CODE: PUTR.0247

DATE: 22.3.95  
AQC  
ANALYST: 006  
SORT/AQC  
METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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	Lymnaea truncatula 1 only	9
Elmidae	Elmis aenea (larva) 1 only	9

## 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: Thames                                      LABORATORY: Fobney Mead                                      DATE: 10.5.95  
WATER-    PRIMARY    AQC  
COURSE: Blackwater                                      ANALYST: 015    ANALYST: 006  
SITE: u/s Sandhurst STW                                      CODE: PLDR.0006    SORT/AQC  
METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	Presumed cause of error (see footnotes)
-------------	-------------------------------------	---

### VIAL

#### BMWP taxa not found by IFE

Lymnaeidae    Succineidae in vial    7

#### 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

Elmidae    Elmis aenea (adult) 1 only    9

### 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: Thames	LABORATORY: Fobney Mead	DATE: 23.5.95
WATER-COURSE: Evenlode	PRIMARY ANALYST: 017	AQC ANALYST: 006
SITE: d/s Chadlington Stream	CODE: PEVR.0029	SORT/AQC METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	Presumed cause of error (see footnotes)
-------------	-------------------------------------	---

### VIAL

**BMWP taxa not found by IFE**

Hydrophilidae (incl. Hydraenidae)	8
-----------------------------------	---

**Additional BMWP taxa found by IFE**

Hydroptilidae	Hydroptila sp.	8
---------------	----------------	---

### SAMPLE

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

N/a

**Additional BMWP taxa found by IFE**

Unionidae	Anodonta sp. (juvenile) 1 only	9
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### SUMMARY OF AUDIT

**LOSSES 1**

**GAINS 2**

**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: Thames

LABORATORY: Fobney Mead

DATE: 11.5.95

WATER-COURSE: Farthinghoe Stream

PRIMARY ANALYST: 014

AQC ANALYST: 006

SITE: u/s Cherwell

CODE: PCHR.0028

SORT/AQC METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

Ephemerellidae	Ephemerella ignita 1 only	9
Simuliidae	Simulium ornatum group 1 only	9
Baetidae	Baetis vernus 1 only	9

## SUMMARY OF AUDIT

LOSSES 0    GAINS 3

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 19  
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: Thames

LABORATORY: Fobney Mead

DATE: 4.10.95

WATER-  
COURSE: Blackwater

PRIMARY  
ANALYST: 017

AQC  
ANALYST: 014

SITE: Lynchford Bridge

CODE: PLDR.0011

SORT/AQC  
METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

Ancyliidae (incl. Acroloxidae)	Acroloxus lacustris 1 only	9
Elmidae	Elmis aenea, Riolus subviolaceus (larvae)	9
Planariidae (incl. Dugesiiidae)	Polycelis nigra/tenuis 1 only	9

## SUMMARY OF AUDIT

LOSSES 0    GAINS 3    OMISSIONS: 0

### NET EFFECTS:

ON BMWP SCORE 16  
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: Thames

LABORATORY: Fobney Mead

DATE: 3.10.95

WATER-  
COURSE: Ray

PRIMARY  
ANALYST: 016

AQC  
ANALYST: 014

SITE: Morris Street, Swindon

CODE: PUTR.0070

SORT/AQC  
METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	Presumed cause of error (see footnotes)
-------------	-------------------------------------	---

### VIAL

#### BMWP taxa not found by IFE

Oligochaeta *		1
Chironomidae		1
Hirudinidae	Trocheta subviridis (large specimen)	7

#### 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 *	Lumbriculidae 1 only	1
---------------	----------------------	---

### SUMMARY OF AUDIT

LOSSES 2      GAINS 0

OMISSIONS: 1

#### NET EFFECTS:

ON BMWP SCORE -5  
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: Thames

LABORATORY: Fobney Mead

DATE: 11.9.95

WATER-COURSE: Woodhill Brook

PRIMARY ANALYST: 001

AQC ANALYST: 014

SITE: u/s Childrey

CODE: POCR.0034

SORT/AQC METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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	Pilaria (Pilaria) sp. 1 only	9
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## 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

<b>REGION:</b> Thames	<b>LABORATORY:</b> Fobney Mead	<b>DATE:</b> 21.9.95
<b>WATER-COURSE:</b> Oxon Ray	<b>PRIMARY ANALYST:</b> 018	<b>AQC ANALYST:</b> 014
<b>SITE:</b> B4027 Bridge, Islip	<b>CODE:</b> PCHR.0040	<b>SORT/AQC METHOD:</b> Live/Preserved

### RESULTS OF MAIN AUDIT

---

Family name	Species name (where appropriate)	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: Thames

LABORATORY: Fobney Mead

DATE: 21.9.95

WATER-COURSE: Loddon

PRIMARY ANALYST: 010

AQC ANALYST: 014

SITE: u/s Ford, Lands End

CODE: PLDR.0041

SORT/AQC METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	Presumed cause of error (see footnotes)
-------------	-------------------------------------	---

## VIAL

### BMWP taxa not found by IFE

Valvatidae \* 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

Baetidae	Baetis scambus/fuscatus	9
Platycnemididae	Platycnemis pennipes 1 only	9
Polycentropodidae	Polycentropus flavomaculatus	9
Valvatidae *	Valvata piscinalis	1

## SUMMARY OF AUDIT

LOSSES 0

GAINS 3

OMISSIONS: 1

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: Thames

LABORATORY: Fobney Mead

DATE: 24.9.95

WATER-  
COURSE: Lydebank Brook

PRIMARY  
ANALYST: 010

AQC  
ANALYST: 014

SITE: Ford Lane, East Hendred

CODE: PTHR.0136

SORT/AQC  
METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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: Thames

LABORATORY: Fobney Mead

DATE: 18.10.95

WATER-  
COURSE: Emm Brook

PRIMARY  
ANALYST: 018

AQC  
ANALYST: 014

SITE: Toutley Bridge

CODE: PLDR.0118

SORT/AQC  
METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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)

Potamopyrgus jenkinsi

9

## 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: Thames

LABORATORY: Waltham Cross

DATE: 28.3.95

WATER-COURSE: Mimram

PRIMARY ANALYST: JE

AQC ANALYST: DJL

SITE: Codicote Bottom

CODE: PLER.0089

SORT/AQC METHOD: Live/Live

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

Scirtidae	Elodes sp. (larva) 1 only	9
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## 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: Thames

LABORATORY: Waltham Cross

DATE: 10.5.95

WATER-  
COURSE: Rom/Beam

PRIMARY  
ANALYST: JFM

AQC  
ANALYST: DJL

SITE: Cardrome A125

CODE: PRGR.0080

SORT/AQC  
METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

Baetidae	Baetis rhodani 1 only	9
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## SUMMARY OF AUDIT

LOSSES 0    GAINS 1    OMISSIONS: 0

### NET EFFECTS:

ON BMWP SCORE 4  
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: Thames

LABORATORY: Waltham Cross

DATE: 16.3.95

WATER-COURSE: Coine

PRIMARY ANALYST: DJL

AQC ANALYST: JE

SITE: Bushey Mill Lane

CODE: PCNR.0026

SORT/AQC METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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: Thames

LABORATORY: Waltham Cross

DATE: 15.5.95

WATER-

PRIMARY

AQC

COURSE: Colne Brook

ANALYST: DJL

ANALYST: JE

SITE: Wraysbury Bridge Station

CODE: PCNR.0140

SORT/AQC

METHOD: Live/Live

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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)

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Thames

LABORATORY: Waltham Cross

DATE: 21.9.95

WATER-COURSE: Colne

PRIMARY ANALYST: RJC

AQC ANALYST: DJL

SITE: u/s Thames, Staines

CODE: PCNR.0025

SORT/AQC METHOD: Live/Preserved

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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)

# EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Thames

LABORATORY: Waltham Cross

DATE: 30.10.95

WATER-COURSE: Brookhouse Brook

PRIMARY ANALYST: JFM

AQC ANALYST: DJL

SITE: Brookhouse

CODE: PRGR.0005

SORT/AQC METHOD: Live/Live

## RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

Elmidae	Oulimnius sp. (larva) 1 only	9
Hydropsychidae	Hydropsyche angustipennis 1 only	9

## 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: Thames

LABORATORY: Waltham Cross

DATE: 13.9.95

WATER-

PRIMARY

AQC

COURSE: Cobbins Brook

ANALYST: JFM

ANALYST: JE

SITE: Paternoster Hill

CODE: PLER.0022

SORT/AQC

METHOD: Live/Live

### RESULTS OF MAIN AUDIT

Family name	Species name (where appropriate)	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

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: Thames

LABORATORY: Waltham Cross

DATE: 23.11.95

WATER-COURSE: Gade

PRIMARY ANALYST: DJL

AQC ANALYST: JE

SITE: u/s GUC

CODE: PCNR.0055

SORT/AQC METHOD: Live/Preserved

## RESULTS OF MAIN AUDIT

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

**BMWP taxa not found by IFE**

Hydroptilidae

Tiny Limnephilid in vial

7

**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 1    GAINS 0

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)