

# EA WATER QUALITY



ENVIRONMENT  
AGENCY

An audit of performance in the  
analysis of biological samples in 1999  
Environment Agency: Primary Audit

Institute of Freshwater Ecology

CEH Report Ref: C00158/01

An audit of performance in the analysis of biological  
Samples in 1999  
Environment Agency: Primary Audit

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**Statement of Use**

Information in this document is to help biologists in the Agency to identify where analytical errors occur so that they can be reduced or eliminated. Data in the tables provide measures of the accuracy of primary data produced in accordance with the standard methods for the River Invertebrate Prediction and Classification System (RIVPACS) and analysed to the level required for the Biological Monitoring Working Party (BMWP)-score system, including General Quality Assessment. Information in this report may be used to determine statistical confidence limits and the stastical significances of differences between biological samples. This includes comparisons of Observed/Expected (O/E) values and quality bands made by the compare module of RIVPACS III+ and the statistical routine CONCLASS used for GQA surveys.

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## **1. INTRODUCTION**

In 1999 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 (The Agency) 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), a component institute of the Centre for Ecology and Hydrology (CEH). 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. These inspectors re-sorted a random selection of about 10% of the laboratory's samples. In addition, CEH was contracted to undertake an independent, external audit of the quality of the laboratory analysis of biological samples for each Agency 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 between 1996 and 1998. The audit for the Agency comprised two elements. The AQC Audit provided a measure of the quality of performance of the AQC inspectors. The Primary Audit provided an independent assessment of the quality of the data, since this was not adjusted for errors identified by the other quality assurance procedures.

This report presents the results of the audit of 501 samples that were sorted and identified by the Agency's primary analysts. The results of the AQC Audit, detailing the quality of the Agency's internal AQC inspections of 414 samples, are reported separately (Gunn *et al.*, 2000).

## **2. SAMPLE SELECTION**

Samples for audit were selected internally by each of the organisations being monitored. The method of selection used by the Agency is described in Environment Agency (1999). The number of samples selected for audit varied between laboratories and the biologists processing these samples had no prior knowledge of which samples were to be audited. Laboratories were instructed to send to CEH samples that had been processed twice (once for primary analysis and once for internal AQC inspection). Those which analysed an insufficient number of samples throughout the year to provide the requisite number of AQC-inspected samples for the audit sent as many AQC-inspected samples as they could and made up the number with primary samples, which had been analysed just once. Laboratories that analysed samples to species level were permitted to send some samples for species audit instead. These results are not included in this report. 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 organisation, within the limits of the total number of samples that CEH was contracted to audit.

### 3. SAMPLE PROCESSING

The normal protocol for Agency, SEPA and IRTU biologists was to sort their samples within the laboratory and to select examples of each scoring taxon within the BMWP system. The invertebrates were placed in a vial of preservative (70% industrial alcohol or 4% formaldehyde solution) 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. Samples for internal AQC analysis should have been sorted in the same manner as the primary analysis. The AQC inspector's task included confirming the identification of the contents of the vial and the correctness of the data sheet. Any additional taxa found at AQC were to be placed in a separate vial without altering the contents of the primary analyst's vial, although this instruction was not always followed.

Each sample available to CEH for audit should have included:

- i) a data sheet containing a list of the BMWP families found in the sample.
- ii) a vial or vials containing representatives from each family.
- iii) the preserved sample.

When these three elements were present, the sequence of operations at CEH 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(s) were identified.
- c) A comparison was made between the listing of families and those found in the sample by the CEH auditor.
- d) A comparison was made between the listing of families and those identified from the vial(s) by the CEH auditor.
- 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) For each "loss" or "gain" the CEH auditor selected a code from a list at the foot of the result sheet to indicate the most likely cause of the error.

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 CEH 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. 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 Figs 1 & 2) and sent to the Quality Control Manager and the Regional Biologist. 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 CEH 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 CEH in the remainder of the sample were entered in the section of the report form headed "SAMPLE" under "Additional BMWP taxa found in sample". 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 CEH, 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 to highlight this fact. Such errors are noted as "omissions" and were generally caused by an analyst forgetting to place an example of the taxon in the vial, although occasionally, when an animal in the vial had been mis-identified that taxon was subsequently found in the sample by the CEH auditor.

Species identifications, state of development (eg adult or larval coleopterans) and the presence of a single representative of a family were recorded in the centre section of the report form.

CEH 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". Where an error was modified by the findings of the internal AQC inspector, a code to indicate this was selected instead (either code 11 or 12):

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" and "Additional BMWP taxa found in sample", as before. Families recorded on the list but not found by CEH were indicated in the section above this. If the vial of animals had been 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.

Figure 1. An example of a Primary Audit result sheet

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

<b>REGION:</b> Example	<b>LABORATORY:</b> Example	<b>DATE:</b> 01/04/99
<b>WATER-COURSE:</b> Beautiful River	<b>PRIMARY ANALYST:</b> XX	<b>AQC ANALYST:</b> YY
<b>SITE:</b> Utopia	<b>CODE:</b> 0001/AQC01	<b>SORT/AQC</b> <b>METHOD:</b> Live/Preserved

### RESULTS OF PRIMARY AUDIT

<b>Family name</b>	<b>Presumed cause of error (see footnotes)</b>
<b>VIAL</b>	
<b>BMWP taxa not found in vial</b>	
Planorbidae	12
Terrestrial snail in vial	
Baetidae *	1
Limnephilidae	7
<b>Additional BMWP taxa found in vial</b>	
Lepidostomatidae	7
Lepidostoma hirtum (Fabricius)	
<b>SAMPLE</b>	
<b>BMWP taxa not found in sample</b> (for samples where vial is broken or absent)	
N/a	
<b>Additional BMWP taxa found in sample</b>	
Baetidae *	1
Baetis rhodani (Pictet)	
Hydrophilidae (incl. Hydraenidae)	9
Hydraena gracilis Germar (a) 1 only	
Hydroptilidae	11
Hydroptila sp. (p)	
Psychomyiidae (incl. Ecnomidae)	11
Psychomyia pusilla (Fabricius) 1 only	

### SUMMARY OF AUDIT

**LOSSES:** 2    **GAINS:** 4    **OMISSIONS:** 1

**NET EFFECTS:**  
**ON BMWP SCORE** 19  
**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 CEH in sample (no net loss or gain)**

Figure 2. An example of an AQC Audit result sheet

## EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Example	LABORATORY: Example	DATE: 01/04/99
WATER-COURSE: Beautiful River	PRIMARY ANALYST: XX	AQC ANALYST: YY
SITE: Utopia	CODE: 0001/AQC01	SORT/AQC METHOD: Live/Preserved

## RESULTS OF AQC AUDIT

Family name	Presumed cause of error (see footnotes)
<b>VIAL</b>	
<u>BMW P taxa not found in vial</u>	
Baetidae *	1
Limnephilidae	7
<u>Additional BMW P taxa found in vial</u>	
Lepidostomatidae	7
Lepidostoma hirtum (Fabricius)	
<b>SAMPLE</b>	
<u>BMW P taxa not found in sample</u> (for samples where vial is broken or absent)	
N/a	
<u>Additional BMW P taxa found in sample</u>	
Baetidae *	1
Baetis rhodani (Pictet)	
Hydrophilidae (incl. Hydraenidae)	9
Hydraena gracilis Germar (a) 1 only	

## SUMMARY OF AUDIT

LOSSES: 1    GAINS: 2    OMISSIONS: 1

NET EFFECTS:  
ON BMW P 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 CEH in sample (no net loss or gain)

## **5. RESULTS**

The results of the Primary Audit for 1999 for all Agency Regions are presented, Region by Region, in Tables 1 to 58. A summary of the basic audit results in terms of losses, gains and omissions is followed by the statistics of these regional audit results centered on 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. Then follows information on the net effects of the Primary Audit on the BMWP score and number of taxa for the Region's data. These results are 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. Following this are listings for the Region of the taxa missed at family and species levels in the 1999 Primary Audit. Tables 59 and 60 summarise the statistics and effects of the 1999 Primary Audit for the whole of the Agency. Tables 61 and 62 give listings of all taxa, at family and species levels respectively, missed in sorting by the Agency's primary analysts. Tables 63 and 64 give similar listings of taxa missed 5 times or more for the entire 1999 audit for the whole of the UK. Data for the AQC Audit is presented in a separate report (Gunn *et al.*, 2000).

### **Estimating sample biases for the compare module of RIVPACS III+**

The underestimation of the number of BMWP-scoring taxa is termed bias for the purpose of the compare module of RIVPACS III+. An estimate of bias is provided by the net gains (number of gains minus number of losses). The average net gains for each laboratory, Region and the Agency as a whole are listed in Table 60 in the column "mean net effect on no. of taxa". These values may be used directly for RIVPACS. To estimate the bias over a different period to that covered by this audit, it is necessary to refer to the Primary Audit result sheets for individual samples. Note that estimates of bias should be based on the results of at least 20 audited samples. Further instructions are given in Clarke *et al.* (1997).

## **6. ACKNOWLEDGEMENTS**

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

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**AUDIT OF ANGLIAN REGION'S PRIMARY ANALYSTS**

Table 1 The 20 samples audited for Central Area of Anglian Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Great Ouse	Castle Mills	BPM	1	4	0
Pix Brook	Letchworth Res. outlet	BPM	0	0	0
Ouzel	Lovat Bank	BPM	0	2	0
Nar	West Acre Bridge	BPM	0	5	1
Little Ouse	Blo Norton Ford	EIS	0	1	0
Little Ouse	Euston Bridge	EIS	1	3	1
Fentons Lode	Seward Farm Bridge	IMC	0	1	0
Twenty Foot	Hobbs Lot Bridge	IMS	0	3	0
Ouzel	Bletchley	LJS	0	1	0
Grand Union Canal	Bowlers Bridge	LJS	1	0	0
Fancott Brook	Cranford Bridge	LJS	0	2	0
Claydon Brook	Addington	LJS	1	0	1
Old West	Old Stretham PS	MAC	1	0	0
Lark	Tollgate Road Bridge	MAC	0	0	0
Padbury Brook	Stratton Audley Mill	MAC	0	4	0
Wendons Brook	B1383 Bridge	SEH	0	3	0
Cam	Great Chesterford	SEH	0	3	0
Cranbrook Drain	Colne Fen	SEH	0	0	1
Watton Brook	B1077 Bridge	SEH	1	0	0
Flit	Shefford	SEH	0	2	0

Table 2 The 19 samples audited for Eastern Area of Anglian Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Stour	Boxted Mill	CFW	0	0	0
Black Ditch	Hollesley Bridge	CFW	1	0	0
Wid	Buck Bridge	CFW	0	1	0
Wid	d/s Widford Bridge	CFW	0	2	0
Deben	Brandeston Bridge	CFW	0	0	0
Butley Creek	Butley Mill	CFW	0	0	1
Box	Edwardstone Ford	CFW	0	2	0
Gipping	Bramford Mill	CFW	0	2	0
Colne	Lexden Bridge	CFW	0	3	1
Colne	Great Yeldham Bridge	CFW	0	1	0
Mar Dyke	East of Harrow Inn	CFW	0	1	0
Stour	Bures Mill	CSA	0	1	0
Glaven	Hempstead Mill	CSA	0	3	0
Minsmere	A12 Yoxford Bridge	CSA	0	2	0
Waveney	Geldiston Lock	CSA	0	4	0
Fromus	Snape Watering	JCW	0	2	0
Dove	Thorndon Bridge	JCW	0	7	0
Spickets Brook	Scraley Rd	JHS	0	2	0
Holland Brook	Rice Bridge	JHS	0	5	0

Table 3 The 21 samples audited for Northern Area of Anglian Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Louth Canal	Tetney Lock	CLP	0	1	0
Lower Witham	Langrick Bridge	CLP	0	0	1
Lymn/Steeping	Crows Bridge	CLP	0	2	0
Nene	A427 Bridge	CLP	0	1	0
Nene	Orton Staunch	CLP	0	3	0
Welland	Clay Lake	CLP	0	1	0
Welland	Gretton Road Bridge	CLP	0	1	0
Nene	Higham Lock	CLP	0	2	0
Upper Witham	North Hykeham	CLP	1	1	0
Hog Dyke	Old Railway Line	DMB	0	1	0
Town Drain	Old A16	FD	0	1	0
Skitter Beck	Brocklesby Station	FD	0	0	0
Fossdyke Canal	Pyewipe	IMC	0	0	0
Gwash (South)	Gunthorpe	IMC	0	2	0
Winterton Beck	West Halton	IMC	1	2	0
Lymn/Steeping	Crows Bridge	IMC	0	0	0
Laceby Beck	Manor Top Farm	IMC	0	1	0
Louth Canal	Firebeacon	MAC	0	3	0
Orby Drain	Chapel St Leonards	RPC	1	3	0
South Forty Foot	Swingshead Bridge	RPC	0	3	0
Willow Brook North	Pen Green Lane	RPC	0	0	0

Table 4 Statistics of the 1999 Primary Audit for Anglian Region

Analyst/Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
Central	20	1.70	0.36	7	35.00	5	2.20	0.38
BPM	4	2.75	1.11	2	50.00	5	3.25	1.38
EIS	2	2.00	1.00	1	50.00	3	3.00	2.00
IMC	1	1.00	0	0	0	1	1.00	0
IMS	1	3.00	0	1	100.00	3	3.00	0
LJS	4	0.75	0.48	0	0	2	1.50	0.29
MAC	3	1.33	1.33	1	33.33	4	1.67	1.20
SEH	5	1.60	0.68	2	40.00	3	2.00	0.45
Eastern	19	2.00	0.42	5	26.32	7	2.16	0.41
CFW	11	1.09	0.31	1	9.09	3	1.36	0.34
CSA	4	2.50	0.65	2	50.00	4	2.50	0.65
JCW	2	4.50	2.50	1	50.00	7	4.50	2.50
JHS	2	3.50	1.50	1	50.00	5	3.50	1.50
Northern	21	1.33	0.23	4	19.05	3	1.52	0.25
CLP	9	1.33	0.29	1	11.11	3	1.56	0.24
DMB	1	1.00	0	0	0	1	1.00	0
FD	2	0.50	0.50	0	0	1	0.50	0.50
IMC	5	1.00	0.45	0	0	2	1.20	0.58
MAC	1	3.00	0	1	100.00	3	3.00	0
RPC	3	2.00	1.00	2	66.67	3	2.33	1.20
Anglian Region	60	1.67	0.20	16	26.67	7	1.95	0.20

Table 5 Net effects of the Primary Audit on BMWP score and number of scoring taxa for Anglian Region

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
Central	20	<b>6.95</b>	<b>30.00</b>	21	1.40	<b>30.00</b>	<b>5</b>
BPM	4	11.75	50.00	19	-2.50	50.00	5
EIS	2	7.00	0	9	1.50	0	2
IMC	1	5.00	0	5	1.00	0	1
IMS	1	17.00	100.00	17	3.00	100.00	3
LJS	4	2.00	0	12	0.25	0	2
MAC	3	4.33	33.33	21	1.00	33.33	4
SEH	5	7.00	40.00	15	1.40	40.00	3
Eastern	19	<b>11.26</b>	<b>36.84</b>	<b>32</b>	<b>1.95</b>	<b>26.32</b>	<b>7</b>
CFW	11	6.45	27.27	20	1.00	9.09	3
CSA	4	14.75	50.00	23	2.50	50.00	4
JCW	2	21.00	50.00	32	4.50	50.00	7
JHS	2	21.00	50.00	32	3.50	50.00	5
Northern	21	<b>6.14</b>	<b>14.29</b>	<b>20</b>	<b>1.19</b>	<b>14.29</b>	<b>3</b>
CLP	9	7.00	22.22	16	1.22	11.11	3
DMB	1	3.00	0	3	1.00	0	1
FD	2	3.00	0	6	0.50	0	1
IMC	5	3.60	0	13	0.80	0	2
MAC	1	12.00	0	12	3.00	100.00	3
RPC	3	9.00	33.33	20	1.67	33.33	3
Anglian Region	60	<b>8.03</b>	<b>26.67</b>	<b>32</b>	<b>1.50</b>	<b>23.33</b>	<b>7</b>

Table 6 The families missed in sorting by Anglian Region's primary analysts

Family	n	% of Anglian Region's missed families in Primary Audit
Elmidae	9	9.18
Caenidae	8	8.16
Hydroptilidae	6	6.12
Tipulidae	5	5.10
Hydrobiidae (incl. Bithyniidae)	5	5.10
Baetidae	4	4.08
Psychomyiidae (incl. Ecnomidae)	4	4.08
Planariidae (incl. Dugesiidae)	4	4.08
Erpobdellidae	3	3.06
Gammaridae (incl. Crangonyctidae)	3	3.06
Hydrophilidae (incl. Hydraenidae)	3	3.06
Ancylidae (incl. Acrolochidae)	3	3.06
Leptoceridae	3	3.06
Limnephilidae	3	3.06
Planorbidae	3	3.06
Sphaeriidae	3	3.06
Simuliidae	3	3.06
Polycentropodidae	3	3.06
Scirtidae	2	2.04
Glossiphoniidae	2	2.04
Lymnaeidae	2	2.04
Valvatidae	1	1.02
Asellidae	1	1.02
Molannidae	1	1.02
Calopterygidae	1	1.02
Coenagrionidae	1	1.02
Dendrocoelidae	1	1.02
Haliplidae	1	1.02
Ephemeridae	1	1.02
Phryganeidae	1	1.02
Lepidostomatidae	1	1.02
Oligochaeta	1	1.02
Nemouridae	1	1.02
Piscicolidae	1	1.02
Hydrometridae	1	1.02
Physidae	1	1.02
Hydropsychidae	1	1.02
Notonectidae	1	1.02
<b>Total</b>	<b>98</b>	<b>100</b>

Table 7 The species missed in sorting by Anglian Region's primary analysts

Species	n	% of Anglian Region's missed species in Primary Audit
Caenis luctuosa group	6	5.77
Potamopyrgus jenkinsi (Smith)	4	3.85
Oulimnius sp.	3	2.88
Agraylea multipunctata Curtis	3	2.88
Elmis aenea (Muller)	3	2.88
Hydroptila sp.	3	2.88
Oulimnius tuberculatus (Muller)	3	2.88
Erpobdella octoculata (L.)	2	1.92
Elodes sp.	2	1.92
Dicranota sp.	2	1.92
Crangonyx pseudogracilis Bousfield	2	1.92
Lype sp.	2	1.92
Neureclipsis bimaculata (L.)	2	1.92
Hydraena riparia Kugelann	2	1.92
Caenis horaria (L.)	2	1.92
Pisidium sp.	2	1.92
Baetis vernus Curtis	2	1.92
Ancylus fluviatilis Muller	2	1.92
Tipula (Yamatotipula) montium group	2	1.92
Tinodes waeneri (L.)	2	1.92
Simulium (Simulium) ornatum group	2	1.92
Armiger crista (L.)	2	1.92
Cloeon simile Eaton	1	0.96
Erpobdellidae indet	1	0.96
Ephemera danica Muller	1	0.96
Anisus leucostoma (Millet)	1	0.96
Dugesia tigrina (Girard)	1	0.96
Dugesia polychroa group	1	0.96
Dendrocoelum lacteum (Muller)	1	0.96
Caenis robusta Eaton	1	0.96
Asellus aquaticus (L.)	1	0.96
Bithynia tentaculata (L.)	1	0.96
Cloeon dipterum (L.)	1	0.96
Cercyon sp.	1	0.96
Calopteryx splendens (Harris)	1	0.96
Gammarus pulex (L.)	1	0.96
Athripsodes cinereus (Curtis)	1	0.96
Baetis scambus group	1	0.96
Batracobdella paludosa (Carena)	1	0.96
Cyrnus flavidus McLachlan	1	0.96
Molanna angustata Curtis	1	0.96
Tubificidae	1	0.96
Triaenodes bicolor (Curtis)	1	0.96
Tipula sp.	1	0.96
Sphaerium sp.	1	0.96

Table 7 continued

Species	n	% of Anglian Region's missed species in Primary Audit
<i>Simulium (Wilhelmia) sp.</i>	1	0.96
<i>Simulium (Eusimulium) aureum group</i>	1	0.96
<i>Polycentropus flavomaculatus</i> (Pictet)	1	0.96
<i>Polycelis</i> sp.	1	0.96
<i>Polycelis nigra</i> group	1	0.96
<i>Piscicola geometra</i> (L.)	1	0.96
<i>Physa fontinalis</i> (L.)	1	0.96
<i>Phryganea</i> sp.	1	0.96
<i>Notonecta</i> sp.	1	0.96
<i>Hippeutis complanatus</i> (L.)	1	0.96
<i>Ischnura elegans</i> (Van der Linden)	1	0.96
<i>Halesus radiatus</i> (Curtis)	1	0.96
<i>Haliplus</i> sp.	1	0.96
<i>Helobdella stagnalis</i> (L.)	1	0.96
<i>Acrolochus lacustris</i> (L.)	1	0.96
<i>Hydrometra</i> sp.	1	0.96
<i>Nemurella picteti</i> Klapalek	1	0.96
<i>Hydropsyche angustipennis</i> (Curtis)	1	0.96
<i>Mystacides azurea</i> (L.)	1	0.96
<i>Lepidostoma hirtum</i> (Fabricius)	1	0.96
<i>Limnephilidae</i> indet	1	0.96
<i>Limnophilus</i> sp.	1	0.96
<i>Lymnaea peregra</i> (Muller)	1	0.96
<i>Lymnaea truncatula</i> (Muller)	1	0.96
<i>Gyraulus albus</i> (Muller)	1	0.96
<i>Valvata piscinalis</i> (Muller)	1	0.96
<b>Total</b>	<b>104</b>	<b>100</b>

**AUDIT OF MIDLANDS REGION'S PRIMARY ANALYSTS**

Table 8 The 20 samples audited for Upper Severn Area of Midlands Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Stour	Mill Road	1	0	0	0
Stour	Falling Sands	1	0	2	0
Cwm Manor	d/s Mine	7	1	2	0
Morda	Penyllan	7	0	1	0
Tern	Shiffords Bridge	7	0	2	0
Banwy	Newbridge	41	0	3	0
Severn	Montford	41	0	1	0
Clywedog	d/s Dyfrgwm	41	0	2	0
Barbourne Brook	Gheluvelt Park	41	0	4	0
Tern	Walkmill Bridge	48	0	2	0
Teme	Ashford	48	0	3	0
Severn	Felindre	48	0	2	0
Cradley Brook	Shiffords Bridge	48	0	0	0
Teme	Stanford	48	2	5	0
Teme	Ludford Bridge	48	0	4	0
Leigh/Cradley	Mathon	48	1	2	1
Rea Brook	Malehurst	48	0	0	0
Severn	Caerhowel	48	0	3	0
Worcester	Cosford	48	0	3	1
Nant Bradnant	u/s Gorn Mine	48	0	1	0

Table 9 The 20 samples audited for Lower Severn Area of Midlands Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Sowe	Baginton Mill	11	0	0	0
Leadon	Wedderburn Bridge	11	0	6	0
Isbourne	Postlip House	11	0	1	0
Badsey Brook	B4035 Aldington	11	0	3	1
Wymans Brook	u/s Pittville Lakes	39	0	1	1
Frome	Church End	39	0	2	0
Avon	Evesham By-pass	39	0	2	1
Arrow	Lye Meadows	39	0	2	0
Leadon	Elm Bridge	39	0	3	0
Severn	Tewkesbury	39	0	2	3
Alne	Little Alne	39	0	2	0
Chelt	d/s Gloucester Road	39	0	2	1
Wymans Brook	Roman Hackle Avenue	39	0	1	0
Sowe	Baginton Mill	39	0	2	0
Carrant Brook	Ashton under Hill	44	0	0	0
Breach Brook	Vicarage Lane	44	0	0	0
Itchen	Ford Farm	44	0	1	0
Bow Brook	Priest Bridge	44	0	1	0
Sowe	u/s Newdigate	401	0	2	0
Washbourne Brook	Beckford Cross	401	0	1	0

Table 10 The 20 samples audited for Upper Trent Area of Midlands Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Chitlings Brook	Trentvale	3	0	1	0
Pasturefield Dyke	A51 Hixon	3	0	1	0
Churnet	Rocester	3	0	1	0
Coventry Canal	Mancetter	3	1	3	0
Ford Brook	Cartbridge Lane	3	0	2	0
Hamps	Caldon Mill	8	0	2	0
Penk	Lower Green Coven	8	0	1	0
Didgerley Brook	Fillongley Lodge	8	0	1	0
Loxley Brook Tributary	u/s Loxley Farm	8	0	4	0
Wolverhampton Tame	d/s Waddens Brook	8	0	0	0
Doxey Brook	Doxey	8	0	3	0
Tame (Oldbury Arm)	Holloway Bank	8	0	1	0
Dove	Hartington	8	2	2	1
Swarbourn	Yoxall	47	0	1	1
Sketchley Brook	Nuneaton Fields Farm	47	0	2	0
Wem Brook	Gypsy Lane	47	0	1	0
Scotia Brook	St Michaels Road	47	0	3	0
Scotia Brook	Westport Rd	47	0	1	0
Tame	Hopwas	47	0	3	0
Walsall Canal	Moors Mill Lane	47	0	0	0

Table 11 The 20 samples audited for Lower Trent Area of Midlands Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Lady Bank Drain	d/s Sandy Lane PS	5	0	1	0
Smite	Colston Bassett	5	0	3	0
Normanton Brook	d/s Newbold Verdon	5	0	2	0
Braunstone Tributary	u/s Lubbesthorpe Brook	5	0	3	0
Bottesford Beck	Snake Plantation	5	0	2	0
Grace Dieu Brook	d/s Snarrows STW	5	0	1	0
Trib. Radbourne Bk.	d/s Lees	6	0	2	1
Long Whatton Brook	u/s Long Whatton STW	6	0	1	0
Noe	Hope	40	0	7	0
Day Brook	Basford	50	0	1	0
Kirton Tributary	d/s Ings Farm	50	3	1	1
The Beck	Kersall	50	0	6	0
Twyford Brook	d/s Findern STW	50	0	5	0
Maun	Inlet Kingsmill Reservoir	50	0	2	0
Torme	Wadworth Carr	400	0	3	0
Bar Brook	Baslow	400	0	3	0
Ramsley Brook	u/s Worthington STW	400	0	1	0
Eau	Northorpe Station	400	0	1	0
Walling Brook	A60 Bridge	400	0	0	0
Huncote Brook	R.Soar confluence	400	0	0	0

Table 12 Statistics of the 1999 Primary Audit for Midlands 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>Upper Severn</b>	<b>20</b>	<b>2.10</b>	<b>0.31</b>	<b>7</b>	<b>35.00</b>	<b>5</b>	<b>2.40</b>	<b>0.39</b>
1	2	1.00	1.00	0	0	2	1.00	1.00
7	3	1.67	0.33	0	0	2	2.00	0.58
41	4	2.50	0.65	2	50.00	4	2.50	0.65
48	11	2.27	0.47	5	45.45	5	2.73	0.62
<b>Lower Severn</b>	<b>20</b>	<b>1.70</b>	<b>0.30</b>	<b>3</b>	<b>15.00</b>	<b>6</b>	<b>2.05</b>	<b>0.36</b>
11	4	2.50	1.32	2	50.00	6	2.75	1.38
39	10	1.90	0.18	1	10.00	3	2.50	0.34
44	4	0.50	0.29	0	0	1	0.50	0.29
401	2	1.50	0.50	0	0	2	1.50	0.50
<b>Upper Trent</b>	<b>20</b>	<b>1.65</b>	<b>0.24</b>	<b>5</b>	<b>25.00</b>	<b>4</b>	<b>1.90</b>	<b>0.31</b>
3	5	1.60	0.40	1	20.00	3	1.80	0.58
8	8	1.75	0.45	2	25.00	4	2.13	0.61
47	7	1.57	0.43	2	28.57	3	1.71	0.42
<b>Lower Trent</b>	<b>20</b>	<b>2.25</b>	<b>0.42</b>	<b>7</b>	<b>35.00</b>	<b>7</b>	<b>2.50</b>	<b>0.44</b>
5	6	2.00	0.37	2	33.33	3	2.00	0.37
6	2	1.50	0.50	0	0	2	2.00	1.00
40	1	7.00	0	1	100.00	7	7.00	0.00
50	5	3.00	1.05	2	40.00	6	3.80	0.97
400	6	1.33	0.56	2	33.33	3	1.33	0.56
<b>Midlands Region</b>	<b>80</b>	<b>1.93</b>	<b>0.16</b>	<b>22</b>	<b>27.50</b>	<b>7</b>	<b>2.21</b>	<b>0.19</b>

Table 13 Net effects of the Primary Audit on BMWP score and number of scoring taxa for Midlands Region

<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>U. Severn</b>	<b>20</b>	<b>12.35</b>	<b>35.00</b>	<b>31</b>	<b>1.90</b>	<b>35.00</b>	<b>4</b>
1	2	3.00	0	6	1.00	0	2
7	3	7.33	0	13	1.33	0	2
41	4	16.00	50.00	23	2.50	50.00	4
48	11	14.09	45.45	31	2.00	45.45	4
<b>L. Severn</b>	<b>20</b>	<b>9.60</b>	<b>25.00</b>	<b>29</b>	<b>1.70</b>	<b>15.00</b>	<b>6</b>
11	4	12.25	50.00	29	2.50	50.00	6
39	10	11.50	30.00	23	1.90	10.00	3
44	4	3.00	0	7	0.50	0	1
401	2	8.00	0	10	1.50	0	2
<b>U. Trent</b>	<b>20</b>	<b>7.65</b>	<b>15.00</b>	<b>20</b>	<b>1.50</b>	<b>20.00</b>	<b>4</b>
3	5	6.00	0	9	1.40	0	2
8	8	8.38	37.50	20	1.50	25.00	4
47	7	8.00	0	13	1.57	28.57	3
<b>L. Trent</b>	<b>20</b>	<b>11.65</b>	<b>35.00</b>	<b>45</b>	<b>2.10</b>	<b>35.00</b>	<b>7</b>
5	6	8.67	33.33	16	2.00	33.33	3
6	2	6.00	0	7	1.50	0	2
40	1	45.00	100.00	45	7.00	100.00	7
50	5	14.00	40.00	32	2.40	40.00	6
400	6	9.00	33.33	20	1.33	33.33	3
<b>Midlands Region</b>	<b>80</b>	<b>10.31</b>	<b>27.50</b>	<b>45</b>	<b>1.80</b>	<b>26.25</b>	<b>7</b>

Table 14 The families missed in sorting by Midland Region's primary analysts

Family	n	% of Midlands Region's missed families in Primary Audit
Hydroptilidae	12	8.05
Hydrobiidae (incl. Bithyniidae)	11	7.38
Hydrophilidae (incl. Hydraenidae)	10	6.71
Planorbidae	9	6.04
Caenidae	8	5.37
Psychomyiidae (incl. Ecnomidae)	8	5.37
Elmidae	6	4.03
Ancylidae (incl. Acroloxiidae)	6	4.03
Planariidae (incl. Dugesiidae)	6	4.03
Glossiphoniidae	5	3.36
Lepidostomatidae	5	3.36
Valvatidae	5	3.36
Leptoceridae	5	3.36
Simuliidae	5	3.36
Baetidae	4	2.68
Rhyacophilidae (incl. Glossosomatidae)	3	2.01
Dendrocoelidae	3	2.01
Chironomidae	3	2.01
Sphaeriidae	2	1.34
Hydropsychidae	2	1.34
Gyrinidae	2	1.34
Haliplidae	2	1.34
Ephemerellidae	2	1.34
Calopterygidae	2	1.34
Perlidae	2	1.34
Leuctridae	2	1.34
Lymnaeidae	2	1.34
Scirtidae	2	1.34
Tipulidae	1	0.67
Brachycentridae	1	0.67
Corixidae	1	0.67
Beraeidae	1	0.67
Erpobdellidae	1	0.67
Gammaridae (incl. Crangonyctidae)	1	0.67
Goeridae	1	0.67
Oligochaeta	1	0.67
Sericostomatidae	1	0.67
Polycentropodidae	1	0.67
Physidae	1	0.67
Leptophlebiidae	1	0.67
Limnephilidae	1	0.67
Nemouridae	1	0.67
Gerridae	1	0.67
<b>Total</b>	<b>149</b>	<b>100</b>

Table 15 The species missed in sorting by Midlands Region's primary analysts

Species	n	% of Midlands Region's missed species in Primary Audit
<i>Hydroptila</i> sp.	12	7.74
<i>Potamopyrgus jenkinsi</i> (Smith)	10	6.45
<i>Caenis luctuosa</i> group	6	3.87
<i>Lepidostoma hirtum</i> (Fabricius)	5	3.23
<i>Hydraena gracilis</i> Germar	5	3.23
<i>Glossiphonia complanata</i> (L.)	4	2.58
<i>Tinodes waeneri</i> (L.)	4	2.58
<i>Polycelis felina</i> (Dalyell)	4	2.58
<i>Baetis rhodani</i> (Pictet)	3	1.94
<i>Orthocladiinae</i>	3	1.94
<i>Limnius volckmari</i> (Panzer)	3	1.94
<i>Dendrocoelum lacteum</i> (Muller)	3	1.94
<i>Elmis aenea</i> (Muller)	3	1.94
<i>Acrolochus lacustris</i> (L.)	3	1.94
<i>Helophorus</i> ( <i>Atracthelophorus</i> ) <i>brevipalpis</i> Bedel	3	1.94
<i>Simulium</i> ( <i>Simulium</i> ) <i>ornatum</i> group	3	1.94
<i>Ancylus fluviatilis</i> Muller	3	1.94
<i>Valvata piscinalis</i> (Muller)	3	1.94
<i>Lype</i> sp.	2	1.29
<i>Elodes</i> sp.	2	1.29
<i>Isoperla grammatica</i> (Poda)	2	1.29
<i>Haliplus</i> sp.	2	1.29
<i>Ephemerella ignita</i> (Poda)	2	1.29
<i>Lymnaea peregra</i> (Muller)	2	1.29
<i>Bathyomphalus contortus</i> (L.)	2	1.29
<i>Valvata cristata</i> Muller	2	1.29
<i>Anisus vortex</i> (L.)	2	1.29
<i>Armiger crista</i> (L.)	2	1.29
<i>Rhyacophila</i> sp.	2	1.29
<i>Psychomyia pusilla</i> (Fabricius)	2	1.29
<i>Polycelis nigra</i> group	2	1.29
<i>Caenis rivulorum</i> Eaton	2	1.29
<i>Pisidium</i> sp.	2	1.29
<i>Bithynia tentaculata</i> (L.)	2	1.29
<i>Hydraena riparia</i> Kugelann	2	1.29
<i>Athripsodes</i> sp.	1	0.65
<i>Gammarus pulex</i> (L.)	1	0.65
<i>Esolus parallelepipedus</i> (Muller)	1	0.65
<i>Erpobdellidae</i> indet	1	0.65
<i>Calopteryx splendens</i> (Harris)	1	0.65
<i>Baetis</i> sp.	1	0.65
<i>Athripsodes cinereus</i> (Curtis)	1	0.65
<i>Beraea maurus</i> (Curtis)	1	0.65
<i>Brachycentrus subnubilus</i> Curtis	1	0.65

Table 15 continued

Species	n	% of Midlands Region's missed species in Primary Audit
Chironomini	1	0.65
Calopteryx sp.	1	0.65
Corixidae indet	1	0.65
Cyamus trimaculatus (Curtis)	1	0.65
Atripsodes aterrimus (Stephens)	1	0.65
Ochthebius bicolon Germar	1	0.65
Tinodes sp.	1	0.65
Theromyzon tessulatum (Muller)	1	0.65
Simulium (Simulium) argyreatum group	1	0.65
Simulium (Boophthora) erythrocephalum (de Geer)	1	0.65
Silo nigricornis (Pictet)	1	0.65
Sericostoma personatum (Spence)	1	0.65
Rhyacophila dorsalis (Curtis)	1	0.65
Protoneura sp.	1	0.65
Planorbis sp.	1	0.65
Physa sp.	1	0.65
Paraleptophlebia sp.	1	0.65
Hydropsyche angustipennis (Curtis)	1	0.65
Oecetis testacea (Curtis)	1	0.65
Gerris (Gerris) lacustris (L.)	1	0.65
Mystacides azurea (L.)	1	0.65
Micropterna sequax McLachlan	1	0.65
Lumbriculidae	1	0.65
Limnophila (Eloeophila) sp.	1	0.65
Leuctra inermis Kempny	1	0.65
Leuctra geniculata (Stephens)	1	0.65
Hydropsyche sp.	1	0.65
Hippeutis complanatus (L.)	1	0.65
Gyrinus sp.	1	0.65
Gyraulus albus (Muller)	1	0.65
Glossosoma sp.	1	0.65
Orectochilus villosus (Muller)	1	0.65
<b>Total</b>	<b>155</b>	<b>100</b>

## **AUDIT OF NORTH EAST REGION'S PRIMARY ANALYSTS**

Table 16 The 20 samples audited for Dales Area of North East Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Ure	Masham	CJ	0	0	0
Ouse	Acaster Malbis (Sweep)	CJ	1	0	0
Pickering Beck	Site 1 u/s Fish Farm	CJ	0	0	0
Five Hills Beck	Middleton Tyas u/s STW	EA	0	1	0
Wharfe	Boston Spa	JL	0	1	0
Ouse	Scarborough Railway Br	JL	1	1	0
Bow Beck	Ilkley	JL	0	2	0
Ouse	d/s Niddmouth (Airlift)	JL	0	1	0
Bow Beck	d/s March Ghyll Reservoir	JL	0	1	0
Derwent	Forge Valley	SS	1	2	0
Ure	Wensley	SS	0	4	0
Ouse	d/s Moor Monkton (Airlift)	SS	1	3	0
Ure	Apperset	SVS	0	4	0
Mill Beck	Site 1 u/s Welham Fish Farm	SVS	0	4	1
Seven	Site 3 d/s Bridge	SVS	0	3	0
Ouse	d/s A64 Bridge	SVS	0	4	0
Wharfe	Tadcaster	SVS	0	3	0
Ure	Aldwark Toll Bridge (Sweep)	SVS	0	4	0
Wharfe	Tadcaster	SVS	0	2	0
Wharfe	Burnsall	SW	0	0	0

Table 17 The 20 samples audited for Northumbria Area of North East Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Don	Jarrow Cemetery	AG	0	1	0
Till	Tilmouth Park	EC	0	0	0
Brierdene Burn	Whitley Bay	EC	0	2	0
Monkton Burn	u/s Springwell Arches	EWS	0	1	0
Horton Burn	Boghouses	EWS	0	0	0
Ash Gill	Horden Ochre Limit	EWS	0	0	0
Brierdene Burn	d/s Ochre Limit	EWS	0	0	0
Seaton Burn Tributary	East Cramlington ochre limit	EWS	0	1	0
Brierdene Burn	u/s Leachate	EWS	0	0	0
Usworth Burn	Usworth Mixing Zone	EWS	0	0	0
Stanley Burn	St Marys Church u/s leachate	EWS	0	0	0
Stanley Burn	St Marys Church d/s ochre limit	EWS	0	2	0
Gaunless	Ramshaws	EWS	0	3	0
Lewis Burn	u/s Picnic site	EWS	0	3	0
Twizell Burn	B6313 Bridge	FC	0	2	0
Gaunless	Bishops Palace	FC	0	0	0
Castle Eden Burn	u/s A19	FC	0	0	0
Valley Burn	d/s Tudhoe Mill STW	FC	0	1	0
Derwent	Ebchester	VW	0	3	0
Tyne	Wylam	VW	0	2	0

Table 18 The 20 samples audited for Ridings Area of North East Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Broomridings Brook	Seanon Lane	AH	0	0	0
Coley Beck	u/s CSO 113	AM	0	0	0
Loadpit Beck	u/s CSO 128	AM	0	2	0
Little Don	d/s CSO S3	AM	1	1	0
Loadpit Beck	d/s CSO 128	AM	0	2	0
Rother Tributary	u/s Nightingale Close	BM	0	2	0
Frodingham Beck	Frodingham Bridge	FLD	0	3	0
Calder	Elland Bridge	LBS	0	2	0
Aire	Apperley Bridge	LBS	0	2	0
Dove	Darfield	LBS	0	0	0
Drone	Pighills Lane	LBS	0	1	0
Calder	d/s Spen Beck & B6117	LBS	0	0	0
Aire	Saltaire	LBS	0	2	0
Aire	Saltaire	LBS	0	3	0
Calder	Sowerby Bridge	LBS	0	1	0
Flockton Beck	Crows Nest Farm	MR	1	0	1
Swallownest Brook	d/s A57	MR	0	1	0
Knoll Beck	Morrisons	MR	0	3	0
Park Brook	u/s R.Rother	RT	0	3	0
Doe Lea	Erin Pond	RT	1	1	0

Table 19 Statistics of the 1999 Primary Audit for North East Region

Analyst/ Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
Dales	20	2.00	0.34	8	40.00	4	2.25	0.35
CJ	3	0.00	0	0	0	0	0.33	0.33
EA	1	1.00	0	0	0	1	1.00	0
JL	5	1.20	0.20	0	0	2	1.40	0.24
SS	3	3.00	0.58	2	66.67	4	3.67	0.33
SVS	7	3.43	0.30	6	85.71	4	3.57	0.37
SW	1	0.00	0	0	0	0	0.00	0
Northumbria	20	1.05	0.26	3	15.00	3	1.05	0.26
AG	1	1.00	0	0	0	1	1.00	0
EC	2	1.00	1.00	0	0	2	1.00	1.00
EWS	11	0.91	0.37	2	18.18	3	0.91	0.37
FC	4	0.75	0.48	0	0	2	0.75	0.48
VW	2	2.50	0.50	1	50.00	3	2.50	0.50
Ridings	20	1.45	0.25	4	20.00	3	1.65	0.23
AH	1	0.00	0	0	0	0	0	0
AM	4	1.25	0.48	0	0	2	1.50	0.50
BM	1	2.00	0	0	0	2	2.00	0
FLD	1	3.00	0	1	100.00	3	3.00	0
LBS	8	1.38	0.38	1	12.50	3	1.38	0.38
MR	3	1.33	0.88	1	33.33	3	2.00	0.58
RT	2	2.00	1.00	1	50.00	3	2.50	0.50
North East Region	60	1.50	0.17	15	25.00	4	1.65	0.17

Table 20 Net effects of the Primary Audit on BMWP score and number of scoring taxa for North East Region

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
Dales	20	<b>11.05</b>	<b>45.00</b>	26	<b>1.80</b>	<b>35.00</b>	<b>4</b>
CJ	3	-1.67	0	0	-0.33	0	0
EA	1	4.00	0	4	1.00	0	1.00
JL	5	6.80	0	11	1.00	0	2.00
SS	3	16.33	66.67	26	2.33	33.33	4.00
SVS	7	19.86	100.00	25	3.43	85.71	4.00
SW	1	0	0	0	0	0	0
North- umbria	20	<b>7.05</b>	<b>20.00</b>	30	<b>1.05</b>	<b>15.00</b>	<b>3</b>
AG	1	5.00	0	5	1.00	0	1.00
EC	2	5.50	0	11	1.00	0	2.00
EWS	11	7.00	27.27	25	0.91	18.18	3.00
FC	4	2.50	0	6	0.75	0	2.00
VW	2	19.00	50.00	30	2.50	50.00	3.00
Ridings	20	<b>6.85</b>	<b>20.00</b>	18	<b>1.30</b>	<b>20.00</b>	<b>3</b>
AH	1	0	0	0	0	0	0
AM	4	5.50	0	12	1.00	0	2.00
BM	1	15.00	100.00	15	2.00	0	2.00
FLD	1	18.00	100.00	18	3.00	100.00	3.00
LBS	8	7.13	12.50	14	1.38	12.50	3.00
MR	3	4.67	33.33	16	1.00	33.33	3.00
RT	2	5.50	0	9	1.50	50.00	3.00
North East Region	60	<b>8.32</b>	<b>28.33</b>	30	<b>1.38</b>	<b>23.33</b>	<b>4</b>

Table 21 The families missed by North East Region's primary analysts

Family	n	% of North East Region's missed families in Primary Audit
Sphaeriidae	7	8.24
Hydrophilidae (incl. Hydraenidae)	6	7.06
Hydroptilidae	5	5.88
Planariidae (incl. Dugesiidae)	5	5.88
Lepidostomatidae	4	4.71
Goeridae	4	4.71
Psychomyiidae (incl. Ecnomidae)	4	4.71
Dendrocoelidae	3	3.53
Elmidae	3	3.53
Leuctridae	3	3.53
Nemouridae	3	3.53
Limnephilidae	2	2.35
Simuliidae	2	2.35
Piscicolidae	2	2.35
Glossiphoniidae	2	2.35
Leptoceridae	2	2.35
Dytiscidae (incl. Noteridae)	2	2.35
Hydrobiidae (incl. Bithyniidae)	2	2.35
Caenidae	2	2.35
Baetidae	2	2.35
Tipulidae	1	1.18
Chloroperlidae	1	1.18
Chironomidae	1	1.18
Ephemerellidae	1	1.18
Gammaridae (incl. Crangonyctidae)	1	1.18
Brachycentridae	1	1.18
Taeniopterygidae	1	1.18
Sericostomatidae	1	1.18
Hydropsychidae	1	1.18
Rhyacophilidae (incl. Glossosomatidae)	1	1.18
Ancylidae (incl. Acrolochidae)	1	1.18
Polycentropodidae	1	1.18
Valvatidae	1	1.18
Lymnaeidae	1	1.18
Planorbidae	1	1.18
Neritidae	1	1.18
Oligochaeta	1	1.18
Philopotamidae	1	1.18
Physidae	1	1.18
Heptageniidae	1	1.18
<b>Total</b>	<b>85</b>	<b>100</b>

Table 22 The species missed by North East Region's primary analysts

Species	n	% of North East Region's missed species in Primary Audit
<i>Hydraena gracilis</i> Germar	5	5.62
<i>Hydroptila</i> sp.	4	4.49
<i>Polycelis felina</i> (Dalyell)	4	4.49
<i>Pisidium</i> sp.	3	3.37
<i>Lepidostoma hirtum</i> (Fabricius)	3	3.37
<i>Goera pilosa</i> (Fabricius)	3	3.37
Sphaeriidae indet	3	3.37
<i>Elmis aenea</i> (Muller)	3	3.37
<i>Dendrocoelum lacteum</i> (Muller)	3	3.37
<i>Leuctra geniculata</i> (Stephens)	2	2.25
<i>Lype</i> sp.	2	2.25
Nemoura cambrica group	2	2.25
<i>Piscicola geometra</i> (L.)	2	2.25
<i>Caenis rivulorum</i> Eaton	2	2.25
<i>Potamopyrgus jenkinsi</i> (Smith)	2	2.25
<i>Bathyomphalus contortus</i> (L.)	1	1.12
<i>Ancylus fluviatilis</i> Muller	1	1.12
<i>Atripsodes bilineatus</i> (L.)	1	1.12
<i>Hydropsyche</i> sp.	1	1.12
<i>Baetis rhodani</i> (Pictet)	1	1.12
<i>Helophorus</i> ( <i>Atracthelophorus</i> ) <i>brevipalpis</i> Bedel	1	1.12
<i>Helobdella stagnalis</i> (L.)	1	1.12
<i>Baetis vernus</i> Curtis	1	1.12
<i>Glossosoma</i> sp.	1	1.12
<i>Cyrnus trimaculatus</i> (Curtis)	1	1.12
<i>Ephemerella ignita</i> (Poda)	1	1.12
<i>Brachycentrus subnubilus</i> Curtis	1	1.12
<i>Dugesia tigrina</i> (Girard)	1	1.12
<i>Brachyptera risi</i> (Morton)	1	1.12
Chironomini	1	1.12
<i>Chloroperla torrentium</i> (Pictet)	1	1.12
<i>Leuctra nigra</i> (Olivier)	1	1.12
<i>Crangonyx pseudogracilis</i> Bousfield	1	1.12
<i>Crunoecia irrorata</i> (Curtis)	1	1.12
<i>Glossiphonia complanata</i> (L.)	1	1.12
<i>Platambus maculatus</i> (L.)	1	1.12
<i>Valvata cristata</i> Muller	1	1.12
Tubificidae	1	1.12
<i>Tinodes waeneri</i> (L.)	1	1.12
<i>Theodoxus fluviatilis</i> (L.)	1	1.12
Sphaerium sp.	1	1.12
<i>Simulium</i> ( <i>Simulium</i> ) <i>ornatum</i> group	1	1.12
<i>Simulium</i> ( <i>Nevermannia</i> ) <i>cryophilum</i> group	1	1.12
<i>Silo</i> sp.	1	1.12
<i>Sericostoma personatum</i> (Spence)	1	1.12
Rhithrogena sp.	1	1.12

Table 22 continued

Species	n	% of North East Region's missed species in Primary Audit
<i>Leuctra hippopus</i> (Kempny)	1	1.12
<i>Polycelis nigra</i> group	1	1.12
<i>Ithytrichia</i> sp.	1	1.12
<i>Physa</i> sp.	1	1.12
<i>Nemoura avicularis</i> Morton	1	1.12
<i>Mystacides azurea</i> (L.)	1	1.12
<i>Lymnaea peregra</i> (Muller)	1	1.12
<i>Limnophila</i> ( <i>Brachylinnophila</i> ) sp.	1	1.12
<i>Limnius volckmari</i> (Panzer)	1	1.12
<i>Limnephilus lunatus</i> Curtis	1	1.12
<i>Limnephilus affinis/incisus</i>	1	1.12
<i>Wormaldia</i> sp.	1	1.12
<i>Leuctra inermis</i> Kempny	1	1.12
<i>Agabus</i> sp.	1	1.12
<i>Psychomyia pusilla</i> (Fabricius)	1	1.12
<b>Totals</b>	<b>89</b>	<b>100</b>

## **AUDIT OF NORTH WEST REGION'S PRIMARY ANALYSTS**

Table 23 The 20 samples audited for Central Area of North West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Eller Brook	Burscough	AM	1	2	0
Wyre	Cam Beck	AM	0	5	0
Douglas	Poolstoch Brook d/s Scotsmans Flash	BL	1	1	2
Lords Brook	ptc Wyre	BL	0	3	0
Yarrow	Pincock	BL	0	1	0
Brock	Woodplumpton Beck	DL	1	7	0
Cocker	Hole of Ellel Bridge	DL	2	2	0
Walverdon Water	u/s CSO	DL	0	6	0
Fine Janes Brook	Meols Cop Rd	DL	0	0	1
Woodplumpton Brook	Woodplumpton Bridge	EIG	1	1	0
Hillylaid Pool	u/s Royles Brook	HFH	0	0	0
Brinscall Brook	d/s Blackwater	KCh	1	1	0
Barton Brook	Hollowforth	KCo	0	0	0
Tawd	Ashtons	KCo	0	0	0
Barton Brook	Hollowforth	KCx	0	5	0
Douglas	Yellow Brook	KH	1	1	0
Brock	Barton Brook d/s Cardwell Br	KH	1	4	0
Foxhouses Brook	ptc R. Wyre	KH	0	2	0
Yarrow	Syd Brook	KH	0	3	0
Brock	d/s Brock Mill Car Park	KH	0	1	0

Table 24 The 20 samples audited for Northern Area of North West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Tributary from Overwater	NY 255 354	AF	1	1	0
Gill Beck	ptc Ellen at Ireby	AF	1	2	0
Ellen	NY 054 368	AF	0	1	0
Overwater Tributary	NY 255 354	AJ	1	0	0
Lostrigg Beck	Near Bridgefoot	AJ	0	0	0
Derwent	Grange	AJ	0	0	0
Threapland Gill	ptc G. Gooden	AJ	0	1	0
Crummock Beck	Abbeytown	AJ	1	1	0
Sealford Beck	ptc Lupton Beck	BJ	0	2	0
Briggle Beck	Little Salkeld	DS	0	1	0
Lowther	Lowther Bridge	DS	0	2	0
Cumwhitton Beck	NY 500 528	DS	0	0	0
Noonhowe Sike	NY 548 245	DS	0	1	0
Petteril	Southwaite	DS	0	1	0
Peasey Beck	Old Hutton	KMF	2	2	0
Bleng	Wellington Bridge	NTC	0	1	0
Liza	u/s Ennerdale Water	NTC	0	0	0
Worm Gill	ptc R Calder	NTC	0	0	0
Esk	u/s Whahouse Bridge	NTC	0	2	0
Tarn Beck	ptc R Duddon	NTC	1	2	0

Table 25 The 20 samples audited for Southern Area of North West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Roch	u/s Akzo Stream	AG	0	0	0
Ogden	ptc Swinnel Brook	AG	0	8	0
Stanney Brook	ptc Roch	FD	0	3	0
Tonge	ptc Bradshaw Brook	FD	0	0	0
Mersey	u/s Stockport ETW	GD	1	1	0
Dane	u/s Water Street	GM	0	5	0
Gale Brook	Gale Moss	GM	0	1	0
Red Lion Brook	Jodrell Bank	GM	1	2	0
Fairywell Brook	ptc Baguley Brook	LCB	0	0	0
Piethorne Brook	u/s R Beal	LJ	0	2	0
Roch	u/s Summit	LJ	0	2	0
Medlock	d/s Strinesdale Reservoir	MLW	1	5	0
Baguley Brook	ptc Fairywell Brook	MW	0	1	0
Luzley Brook	u/s Royton ETW	MW	0	2	0
Chorlton Brook	ptc R Mersey	MW	0	2	0
Norbury Brook	ptc Poynton Brook	MW	1	3	0
Roch	ptc R Beal	MW	0	2	0
Chorlton Brook	ptc R.Mersey	MW	0	1	0
Irk	Hendam Vale	NR	0	1	0
Irk	ptc Wince Brook	RMM	0	1	0

Table 26 Statistics of the 1999 Primary Audit for North West 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>Central</b>	<b>20</b>	<b>2.25</b>	<b>0.48</b>	<b>7</b>	<b>35.00</b>	<b>7</b>	<b>2.85</b>	<b>0.49</b>
AM	2	3.50	1.50	1	50.00	5	4.00	1.00
BL	3	1.67	0.67	1	33.33	3	2.67	0.88
DL	4	3.75	1.65	2	50.00	7	4.75	1.49
EIG	1	1.00	0	0	0	1	2.00	0
HFH	1	0	0	0	0	0	0	0
KCh	1	1.00	0	0	0	1	2.00	0
KCo	2	0	0	0	0	0	0	0
KCx	1	5.00	0	1	100.00	5	5.00	0
KH	5	2.20	0.58	2	40.00	4	2.60	0.68
<b>Northern</b>	<b>20</b>	<b>1.00</b>	<b>0.18</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1.35</b>	<b>0.25</b>
AF	3	1.33	0.33	0	0	2	2.00	0.58
AJ	5	0.40	0.24	0	0	1	0.80	0.37
BJI	1	2.00	0	0	0	2	2.00	0
DS	5	1.00	0.32	0	0	2	1.00	0.32
KMF	1	2.00	0	0	0	2	4.00	0
NTC	5	1.00	0.45	0	0	2	1.20	0.58
<b>Southern</b>	<b>20</b>	<b>2.10</b>	<b>0.44</b>	<b>5</b>	<b>25.00</b>	<b>8</b>	<b>2.30</b>	<b>0.47</b>
AG	2	4.00	4.00	1	50.00	8	4.00	4.00
FD	2	1.50	1.50	1	50.00	3	1.50	1.50
GD	1	1.00	0	0	0	1	2.00	0
GM	3	2.67	1.20	1	33.33	5	3.00	1.15
LCB	1	0	0	0	0	0	0	0
LJ	2	2.00	0	0	0	2	2.00	0
MLW	1	5.00	0	1	100.00	5	6.00	0
MW	6	1.83	0.31	1	16.67	3	2.00	0.45
NR	1	1.00	0	0	0	1	1.00	0
RMM	1	1.00	0	0	0	1	1.00	0
<b>North West Region</b>	<b>60</b>	<b>1.78</b>	<b>0.23</b>	<b>12</b>	<b>20.00</b>	<b>8</b>	<b>2.17</b>	<b>0.25</b>

Table 27 Net effects of the Primary Audit on BMWP score and number of scoring taxa for North West Region

<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>Central</b>	<b>20</b>	<b>11.00</b>	<b>35.00</b>	<b>36</b>	<b>1.80</b>	<b>35.00</b>	<b>6</b>
AM	2	19.00	50.00	28	3.00	50.00	5
BL	3	4.67	33.33	14	1.33	33.33	3
DL	4	17.50	50.00	36	3.00	50.00	6
EIG	1	3.00	0	3	0	0	0
HFH	1	0	0	0	0	0	0
KCh	1	7.00	0	7	0	0	0
KCo	2	0	0	0	0	0	0
KCx	1	26.00	100.00	26	5.00	100.00	5
KH	5	12.40	40.00	18	1.80	40.00	3
<b>Northern</b>	<b>20</b>	<b>4.55</b>	<b>0</b>	<b>13</b>	<b>0.65</b>	<b>0</b>	<b>2</b>
AF	3	4.00	0	10	0.67	0	1
AJ	5	0.40	0	7	0	0	1
BJ	1	8.00	0	8	2.00	0	2
DS	5	5.80	0	13	1.00	0	2
KMF	1	10.00	0	10	0	0	0
NTC	5	6.00	0	10	0.80	0	2
<b>Southern</b>	<b>20</b>	<b>10.05</b>	<b>20.00</b>	<b>58</b>	<b>1.90</b>	<b>20.00</b>	<b>8</b>
AG	2	29.00	50.00	58	4.00	50.00	8
FD	2	7.50	50.00	15	1.50	50.00	3
GD	1	5.00	0	5	0	0	0
GM	3	13.33	33.33	22	2.33	33.33	5
LCB	1	0	0	0	0	0	0
LJ	2	8.50	0	11	2.00	0	2
MLW	1	21.00	100.00	21	4.00	100.00	4
MW	6	6.83	0	9	1.67	0	2
NR	1	1.00	0	1	1.00	0	1
RMM	1	3.00	0	3	1.00	0	1
<b>North West Region</b>	<b>60</b>	<b>8.53</b>	<b>18.33</b>	<b>58</b>	<b>1.45</b>	<b>18.33</b>	<b>8</b>

Table 28 The families missed in sorting by North West Region's primary analysts

Family	n	% of North West Region's missed families in Primary Audit
Sphaeriidae	6	6.59
Hydrobiidae (incl. Bithyniidae)	6	6.59
Planariidae (incl. Dugesiidae)	6	6.59
Lymnaeidae	5	5.49
Leptoceridae	4	4.40
Dytiscidae (incl. Noteridae)	4	4.40
Ephemerellidae	4	4.40
Hydroptilidae	4	4.40
Sericostomatidae	3	3.30
Baetidae	3	3.30
Caenidae	3	3.30
Nemouridae	3	3.30
Rhyacophilidae (incl. Glossosomatidae)	3	3.30
Limnephilidae	3	3.30
Chloroperlidae	3	3.30
Simuliidae	3	3.30
Gammaridae (incl. Crangonyctidae)	3	3.30
Glossiphoniidae	3	3.30
Tipulidae	2	2.20
Elmidae	2	2.20
Heptageniidae	2	2.20
Leptophlebiidae	2	2.20
Oligochaeta	2	2.20
Goeridae	2	2.20
Planorbidae	1	1.10
Hydropsychidae	1	1.10
Hydrophilidae (incl. Hydraenidae)	1	1.10
Ancylidae (incl. Acroloxidae)	1	1.10
Ephemeridae	1	1.10
Scirtidae	1	1.10
Valvatidae	1	1.10
Leuctridae	1	1.10
Physidae	1	1.10
Asellidae	1	1.10
<b>Total</b>	<b>91</b>	<b>100</b>

Table 29 The species missed in sorting by North West Region's primary analysts

Species	n	% of North West Region's missed species in Primary Audit
<i>Potamopyrgus jenkinsi</i> (Smith)	6	6.25
<i>Pisidium</i> sp.	6	6.25
<i>Ephemerella ignita</i> (Poda)	4	4.17
<i>Gammarus pulex</i> (L.)	3	3.13
<i>Helobdella stagnalis</i> (L.)	3	3.13
<i>Limnephilidae</i> indet	3	3.13
<i>Polycelis felina</i> (Dalyell)	3	3.13
<i>Sericostoma personatum</i> (Spence)	3	3.13
<i>Oreodytes sanmarkii</i> (Sahlberg)	2	2.08
<i>Chloroperla torrentium</i> (Pictet)	2	2.08
<i>Hydroptila</i> sp.	2	2.08
<i>Lymnaea truncatula</i> (Muller)	2	2.08
<i>Caenis rivulorum</i> Eaton	2	2.08
<i>Lymnaea peregra</i> (Muller)	2	2.08
<i>Dicranota</i> sp.	2	2.08
<i>Nemoura cambrica</i> group	2	2.08
<i>Silo pallipes</i> (Fabricius)	2	2.08
<i>Polycelis nigra</i> group	2	2.08
<i>Baetis rhodani</i> (Pictet)	2	2.08
<i>Athripsodes aterrimus</i> (Stephens)	2	2.08
<i>Simulium</i> ( <i>Wilhelmia</i> ) sp.	2	2.08
<i>Rhyacophila dorsalis</i> (Curtis)	2	2.08
<i>Anacaena globulus</i> (Paykull)	1	1.04
<i>Ephemera</i> sp.	1	1.04
<i>Elodes</i> sp.	1	1.04
<i>Elmis aenea</i> (Muller)	1	1.04
<i>Ecdyonurus</i> sp.	1	1.04
<i>Ancylus fluviatilis</i> Muller	1	1.04
<i>Crangonyx pseudogracilis</i> Bousfield	1	1.04
<i>Caenis horaria</i> (L.)	1	1.04
<i>Cloeon dipterum</i> (L.)	1	1.04
<i>Bathyomphalus contortus</i> (L.)	1	1.04
<i>Chloroperla tripunctata</i> (Scopoli)	1	1.04
<i>Athripsodes albifrons</i> (L.)	1	1.04
<i>Ceraclea dissimilis</i> (Stephens)	1	1.04
<i>Baetis vernus</i> Curtis	1	1.04
<i>Asellus aquaticus</i> (L.)	1	1.04
<i>Oligochaeta</i> indet	1	1.04
<i>Triaenodes bicolor</i> (Curtis)	1	1.04
<i>Simulium</i> ( <i>Simulium</i> ) <i>ornatum</i> group	1	1.04
<i>Simulium</i> ( <i>Nevermannia</i> ) <i>cryophilum</i> group	1	1.04
<i>Rhithrogena</i> sp.	1	1.04
<i>Potamonectes depressus</i> (Fabricius)	1	1.04
<i>Polycelis</i> sp.	1	1.04
<i>Physa fontinalis</i> (L.)	1	1.04
<i>Paraleptophlebia</i> sp.	1	1.04

Table 29 continued

Species	n	% of North West Region's missed species in Primary Audit
Ithytrichia sp.	1	1.04
Oulimnius sp.	1	1.04
Gammarus duebeni Liljeborg	1	1.04
Nemurella picteti Klapalek	1	1.04
Lymnaeidae indet	1	1.04
Lumbricidae	1	1.04
Valvata cristata Muller	1	1.04
Leuctra fusca (L.)	1	1.04
Agabus sp.	1	1.04
Hydropsyche siltalai Dohler	1	1.04
Habrophlebia fusca (Curtis)	1	1.04
Glossosoma sp.	1	1.04
Oxyethira sp.	1	1.04
<b>Total</b>	<b>96</b>	<b>100</b>

## **AUDIT OF SOUTHERN REGION'S PRIMARY ANALYSTS**

Table 30 The 20 samples audited for the Hants & Isle of Wight Area of Southern Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Anton	Pond Site	W13	0	0	0
Test	Bridge St, Overton	W13	0	0	0
Wallop Brook	Bossington	W13	0	1	0
Western Court Farm	u/s Macrophyte Channel &	W23	0	3	0
Cress Bed	Pool	W23	0	0	0
Moors Stream	Sand Boils	W23	0	0	0
Cheesemans Bridge Trib	Potwell	W23	0	0	0
Itchen	Easton	W23	0	1	0
Avon Water Tributary	u/s Horticultural Station discharge	W30	0	1	2
Plummers Water	u/s Nursery	W30	0	0	0
Cadland Stream	Calor Site	W30	0	3	0
Canada Stream	Long's Bridge	W30	0	1	1
Test	Overton	W32	0	0	0
Bourne Rivulet	d/s Mary Bourne Cress Farm	W32	1	0	0
Passford Water	Lymington Ampress	W35	0	0	0
Fairbourne Stream	Brook Farm	W35	0	1	0
Dun	Dunbridge	W35	0	1	0
Horton Heath Stream	Maddoxford Farm	W35	0	0	0
Dever	Sutton Scotney	W35	0	0	0
Lymore Stream	Lymore	W35	0	0	0
Plaitford Stream	u/s Plaitford Ford	W35	0	1	0

Table 31 The 20 samples audited for the Kent Area of Southern Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Eden	Delaware Farm	E1	0	0	0
Dudwell	Burwash Weald	E1	0	0	0
Ditton Stream	u/s East Malling	E11	0	1	0
Sissinghurst Stream	Sissinghurst Castle Road	E11	0	3	0
Drainage Ditch	u/s Control site	E11	0	1	0
Mill Stream	d/s Discharge	E19	0	2	0
Sissinghurst Stream	Sissinghurst Castle Rd	E19	0	2	0
Crane Brook	Golfold	E2	0	1	0
Blackbrook Petty Sewer	d/s Wittersham STW	E2	0	1	0
Eden	Popes Lane	E28	0	1	0
Teise	Goudhurst Intake	E28	1	1	0
Pippingford Brook Trib	Mardens Hill	E28	0	3	0
Felbridge Water	Green Wood	E28	0	2	0
Teise	Dundale Farm	E38	0	0	0
Socknersh Stream	Clapsons Bridge	E38	0	3	0
Knell Petty Sewer	A268 Bridge	E38	0	3	0
Medway	East Farleigh	E39	0	3	0
Great Stour	Longport Bridge	E4	0	3	0
Great Stour	Rippers Cross	E4	1	1	0
Darent	Sundridge	E6	0	2	0

Table 32 The 20 samples audited for the Sussex Area of Southern Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Pagham Rife	u/s Harbour Wall	S1	0	1	0
Stanbridge Stream	d/s Petersfield STW	S1	0	1	0
Loxwood Stream	Sydney Farm	S1	0	5	0
Pagham Rife	Runcton Trib	S1	0	1	0
Pagham Rife	d/s Pagham STW	S1	2	1	0
Pevensey Haven	Broadwater	S1	1	5	5
Nursling Stream	u/s Road Bridge	S1	2	6	1
Ashbourne	d/s Shammer Wood GS	S2	0	0	1
Chess Stream	d/s Park Farm	S2	2	3	0
Elbridge Rife	Colworth Farm	S2	0	0	0
Black Ditch	Lyminster	S2	0	2	2
Ouse	d/s Staplefield STW	W31	0	3	0
Powdermill Stream	d/s Pepperling Eye Farm	W31	0	2	0
Ridgewood Stream	A26 Bridge	W31	0	4	0
Uck	d/s Lephams Bridge Stream	W31	0	1	0
Combe Haven	Sheepwash Gates	W31	0	1	0
Adur West	Bines Bridge	W31	0	2	0
Balcorne Lake Stream	d/s Culvert	W33	0	0	1
Black Sewer	d/s Steyning STW	W33	0	0	0
Boldings Brook	d/s Brookhurst Wood LFS	W33	1	1	0

Table 33 Statistics of the 1999 Primary Audit for Southern Region

Analyst/ Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
<b>Hants &amp; I.O.W.</b>	<b>20</b>	<b>0.65</b>	<b>0.21</b>	<b>2</b>	<b>10.00</b>	<b>3</b>	<b>0.85</b>	<b>0.24</b>
W13	3	0.33	0.33	0	0	1	0.33	0.33
W23	4	1.00	0.71	1	25.00	3	1.00	0.71
W30	4	1.25	0.63	1	25.00	3	2.00	0.71
W32	2	0	0	0	0	0	0.50	0.50
W35	7	0.43	0.20	0	0	1	0.43	0.20
<b>Kent</b>	<b>20</b>	<b>1.65</b>	<b>0.24</b>	<b>6</b>	<b>30.00</b>	<b>3</b>	<b>1.75</b>	<b>0.24</b>
E1	2	0	0	0	0	0	0	0
E2	2	1.00	0	0	0	1	1.00	0
E4	2	2.00	1.00	1	50.00	3	2.50	0.50
E6	1	2.00	0	0	0	2	2.00	0
E11	3	1.67	0.67	1	33.33	3	1.67	0.67
E19	2	2.00	0	0	0	2	2.00	0
E28	4	1.75	0.48	1	25.00	3	2.00	0.41
E38	3	2.00	1.00	2	66.67	3	2.00	1.00
E39	1	3.00	0	1	100.00	3	3.00	0
<b>Sussex</b>	<b>20</b>	<b>1.95</b>	<b>0.41</b>	<b>6</b>	<b>30.00</b>	<b>6</b>	<b>2.85</b>	<b>0.65</b>
S1	7	2.86	0.88	3	42.86	6	4.43	1.56
S2	4	1.25	0.75	1	25.00	3	2.50	1.19
W31	6	2.17	0.48	2	33.33	4	2.17	0.48
W33	3	0.33	0.33	0	0	1	1.00	0.58
<b>Southern Region</b>	<b>60</b>	<b>1.42</b>	<b>0.18</b>	<b>14</b>	<b>23.33</b>	<b>6</b>	<b>1.82</b>	<b>0.26</b>

Table 34 Net effects of the Primary Audit on BMWP score and number of scoring taxa for Southern Region

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>Hants &amp; I.O.W.</b>	<b>20</b>	<b>3.45</b>	<b>5.00</b>	<b>21</b>	<b>0.60</b>	<b>10.00</b>	<b>3</b>
W13	3	1.00	0	3	0.33	0	1
W23	4	5.25	0	11	1.00	25.00	3
W30	4	8.50	25.00	21	1.25	25.00	3
W32	2	-1.50	0	0	-0.50	0	0
W35	7	2.00	0	8	0.43	0	1
<b>Kent</b>	<b>20</b>	<b>8.95</b>	<b>25.00</b>	<b>25</b>	<b>1.55</b>	<b>30.00</b>	<b>3</b>
E1	2	0	0	0	0	0	0
E2	2	5.00	0	5	1.00	0	1
E4	2	10.50	50.00	19	1.50	50.00	3
E6	1	12.00	0	12	2.00	0	2
E11	3	8.00	0	13	1.67	33.33	3
E19	2	8.50	0	9	2.00	0	2
E28	4	9.25	25.00	20	1.50	25.00	3
E38	3	13.33	66.67	25	2.00	66.67	3
E39	1	18.00	100.00	18	3.00	100.00	3
<b>Sussex</b>	<b>20</b>	<b>10.35</b>	<b>25.00</b>	<b>32</b>	<b>1.55</b>	<b>25.00</b>	<b>5</b>
S1	7	14.71	42.86	32	2.14	42.86	5
S2	4	5.75	0	12	0.75	0	2
W31	6	13.67	33.33	32	2.17	33.33	4
W33	3	-0.33	0	0	0	0	0
<b>Southern Region</b>	<b>60</b>	<b>7.58</b>	<b>18.33</b>	<b>32</b>	<b>1.23</b>	<b>21.67</b>	<b>5</b>

Table 35 The families missed in sorting by Southern Region's primary analysts

Family	n	% of Southern Region's missed families in Primary Audit
Hydrophilidae (incl. Hydraenidae)	6	8.33
Caenidae	5	6.94
Lymnaeidae	4	5.56
Planorbidae	3	4.17
Libellulidae	3	4.17
Leptophlebiidae	3	4.17
Limnephilidae	3	4.17
Elmidae	3	4.17
Planariidae (incl. Dugesiidae)	2	2.78
Cordulegastridae	2	2.78
Sericostomatidae	2	2.78
Ancylidae (incl. Acroloxiidae)	2	2.78
Tipulidae	2	2.78
Piscicolidae	2	2.78
Dytiscidae (incl. Noteridae)	1	1.39
Dryopidae	1	1.39
Ephemerellidae	1	1.39
Ephemeridae	1	1.39
Dendrocoelidae	1	1.39
Gammaridae (incl. Crangonyctidae)	1	1.39
Chloroperlidae	1	1.39
Chironomidae	1	1.39
Calopterygidae	1	1.39
Beraeidae	1	1.39
Baetidae	1	1.39
Aseillidae	1	1.39
Coenagrionidae	1	1.39
Nepidae	1	1.39
Taeniopterygidae	1	1.39
Sphaeriidae	1	1.39
Simuliidae	1	1.39
Rhyacophilidae (incl. Glossosomatidae)	1	1.39
Psychomyiidae (incl. Ecnomidae)	1	1.39
Physidae	1	1.39
Hydrobiidae (incl. Bithyniidae)	1	1.39
Philopotamidae	1	1.39
Gerridae	1	1.39
Molannidae	1	1.39
Leptoceridae	1	1.39
Valvatidae	1	1.39
Lepidostomatidae	1	1.39
Haliplidae	1	1.39
Goeridae	1	1.39
Phryganeidae	1	1.39
<b>Total</b>	<b>72</b>	<b>100</b>

Table 36 The species missed in sorting by Southern Region's primary analysts

Species	n	% of Southern Region's missed species in Primary Audit
Libellulidae indet	3	4.05
Lymnaea peregra (Muller)	3	4.05
Hydraena gracilis Germar	2	2.70
Ancylus fluviatilis Muller	2	2.70
Caenis horaria (L.)	2	2.70
Caenis luctuosa group	2	2.70
Cordulegaster boltonii (Donovan)	2	2.70
Hippeutis complanatus (L.)	2	2.70
Limnephilidae indet	2	2.70
Oulimnius sp.	2	2.70
Polycelis nigra group	2	2.70
Piscicola geometra (L.)	2	2.70
Sericostoma personatum (Spence)	2	2.70
Ephemera danica Muller	1	1.35
Elmis aenea (Muller)	1	1.35
Dryops sp.	1	1.35
Dendrocoelum lacteum (Muller)	1	1.35
Crangonyx pseudogracilis Bousfield	1	1.35
Simulium (Eusimulum) aureum group	1	1.35
Chloroperla torrentium (Pictet)	1	1.35
Chironomidae indet	1	1.35
Calopteryx splendens (Harris)	1	1.35
Ephemerella ignita (Poda)	1	1.35
Tinodes waeneri (L.)	1	1.35
Habrophlebia fusca (Curtis)	1	1.35
Tipula sp.	1	1.35
Brychius elevatus (Panzer)	1	1.35
Brachyptera risi (Morton)	1	1.35
Beraea pullata (Curtis)	1	1.35
Bathyomphalus contortus (L.)	1	1.35
Baetis rhodani (Pictet)	1	1.35
Asellus aquaticus (L.)	1	1.35
Anisus vortex (L.)	1	1.35
Valvata piscinalis (Muller)	1	1.35
Agapetus sp.	1	1.35
Caenis robusta Eaton	1	1.35
Lepidostoma hirtum (Fabricius)	1	1.35
Phryganea bipunctata Retzius	1	1.35
Paraleptophlebia submarginata (Stephens)	1	1.35
Paraleptophlebia sp.	1	1.35
Nepa cinerea L.	1	1.35
Mystacides azurea (L.)	1	1.35
Molophilus sp.	1	1.35
Molanna angustata Curtis	1	1.35
Lymnaea sp.	1	1.35
Pisidium sp.	1	1.35

Table 36 continued

Species	n	% of Southern Region's missed species in Primary Audit
<i>Gerris</i> sp.	1	1.35
<i>Potamopyrgus jenkinsi</i> (Smith)	1	1.35
<i>Hydraena nigrita</i> Germar	1	1.35
<i>Ischnura elegans</i> (Van der Linden)	1	1.35
<i>Hydraena riparia</i> Kugelann	1	1.35
<i>Hydraena pulchella</i> Germar	1	1.35
<i>Wormaldia</i> sp.	1	1.35
<i>Agabus</i> sp.	1	1.35
<i>Helophorus</i> ( <i>Meghelophorus</i> ) <i>aqualis</i> Thomson	1	1.35
<i>Helophorus</i> ( <i>Atracthelophorus</i> ) <i>brevipalpis</i> Bedel	1	1.35
<i>Physa</i> sp.	1	1.35
<i>Goera pilosa</i> (Fabricius)	1	1.35
<i>Limnephilus lunatus</i> Curtis	1	1.35
<b>Total</b>	<b>74</b>	<b>100</b>

## **AUDIT OF SOUTH WEST REGION'S PRIMARY ANALYSTS**

Table 37 The 20 samples audited for Cornwall Area of South West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Tamar	d/s Small Brook	DS	3	6	1
Camel	u/s Kenningstock Mill	DS	0	5	0
Tavy	u/s Willsworthy Abstraction	DS	2	2	0
Tavy	West Bridge	DS	0	2	0
De Lank	Carkees	JB	0	2	0
Newlyn	Newlyn Bridge	JB	0	0	0
Dunmere Stream	Dunmere	LD	0	3	0
Fal	Tregony Gauging Station	LD	2	1	0
Tamar	Blanchdown	LD	0	1	0
Tamar	Blanchdown	LD	1	1	0
Tavy	Washford	RW	0	1	0
Allen	Trewen Bridge	SG	1	0	0
Connon Stream	Middle of woods	SG	0	0	0
Small Brook	d/s Tributary	SG	2	2	1
Newlyn	Newlyn Bridge	TG	0	0	0
Withey Brook	d/s Bastreet intake	TG	0	1	0
Porth Stream	Rialton Bridge	TG	1	1	1
Fowey	Restormel	TG	0	0	0
Tavy	d/s Willsworthy Leat	TG	0	0	0
Camel	Hendra Barn	UM	1	4	0

Table 38 The 13 samples audited for Devon Area of South West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Teign	u/s SD3	AD	0	1	0
Buckland Stream	d/s SD18	AD	0	1	0
Umbourne Brook	u/s Wilmington Fish Farm discharge	AD	0	0	0
Barnstaple Yeo	d/s Discharge	AD	0	0	0
Chudleigh Knighton Stream	u/s SD1	AD	0	0	0
Aller Brook	Sainsburys	AG	1	2	0
Chudleigh Knighton	u/s SD1 WBB	AG	0	1	0
Limecombe Water	u/s Bale Water confluence	AG	0	2	0
Buckland Stream	u/s SD18	AG	0	2	0
Teign	d/s SD9	AG	0	1	0
Leightly Water	d/s Cottages, u/s Rd Bridge	APH	0	3	0
Teign	u/s SD4, d/s SD3	APH	0	1	1
Leightly Water	Site 1, u/s discharge	APH	0	0	0

Table 39 The 8 samples audited for North Wessex Area of South West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
St Catherines Brook	Ayford Farm Bridge	IJN	0	0	0
Sherston Avon	Easton Grey, Natural riffle	JS	0	3	0
Sherston Avon	Easton Grey, Artificial riffle	JS	0	3	0
Luckington Brook	d/s Fenced Section	JS	0	2	0
St Catherines Brook	Chilcombe Bottom	SS	0	0	0
Tetbury Avon	Slade Farm	SS	0	2	0
St Catherines Brook	Rodney Farm Stream	SS	0	0	0
Tetbury Avon	Brokenborough	SS	0	1	0

Table 40 The 20 samples audited for South Wessex Area of South West Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Fonthill Brook	Tisbury	BJJ	0	0	0
Sem	Sem Hill	CMH	0	2	0
Allen	Didlington	CMH	1	0	0
Allen	u/s All Hallows CBs	CMH	0	1	0
Gussage	Cashmoor	CMH	0	2	0
Fonthill Brook	Hillground Copse	CMH	0	0	0
Lydden	u/s Cannings Court	CMH	0	0	0
Chitterne Brook	Chitterne Church	JB	0	0	0
Chitterne Brook	New Road	JB	0	1	0
Ripley Brook	d/s N. Ripley	JMB	0	2	0
Frome	Burton	LC	0	1	0
Sem	Lower Leigh Farm	LC	0	1	0
Allen	Monkton up Wimborne	LC	0	0	0
Allen	d/s Witchampton Bridge	LC	0	0	0
Gussage Stream	Amen Corner	LC	0	0	0
Bourne	Southgrove Tributary	LC	0	0	0
Bourne	Tidworth	LC	0	0	0
Nine Mile	SU 193 453	LC	0	0	0
Nine Mile River	Sheep Bridge	LC	0	0	0
Fonthill Brook	Kingstead Farm	LC	0	1	0

Table 41 Statistics of the 1999 Primary Audit for South West 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>Cornwall</b>	<b>20</b>	<b>1.60</b>	<b>0.39</b>	<b>4</b>	<b>20.00</b>	<b>6</b>	<b>2.40</b>	<b>0.56</b>
DS	4	3.75	1.03	2	50.00	6	5.25	1.70
JB	2	1.00	1.00	0	0	2	1.00	1.00
LD	4	1.50	0.50	1	25.00	3	2.25	0.48
RW	1	1.00	0	0	0	1	1.00	0
SG	3	0.67	0.67	0	0	2	2.00	1.53
TG	5	0.40	0.24	0	0	1	0.80	0.58
UM	1	4.00	0	1	100.00	4	5.00	0
<b>Devon</b>	<b>13</b>	<b>1.08</b>	<b>0.26</b>	<b>1</b>	<b>7.69</b>	<b>3</b>	<b>1.23</b>	<b>0.30</b>
AD	5	0.40	0.24	0	0	1	0.40	0.24
AG	5	1.60	0.24	0	0	2	1.80	0.37
APH	3	1.33	0.88	1	33.33	3	1.67	0.88
<b>North Wessex</b>	<b>8</b>	<b>1.38</b>	<b>0.46</b>	<b>2</b>	<b>25.00</b>	<b>3</b>	<b>1.38</b>	<b>0.46</b>
IJN	1	0	0	0	0	0	0	0
JS	3	2.67	0.33	2	66.67	3	2.67	0.33
SS	4	0.75	0.48	0	0	2	0.75	0.48
<b>South Wessex</b>	<b>20</b>	<b>0.55</b>	<b>0.17</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0.60</b>	<b>0.17</b>
BJJ	1	0	0	0	0	0	0	0
CMH	6	0.83	0.40	0	0	2	1.00	0.37
JB	2	0.50	0.50	0	0	1	0.50	0.50
JMB	1	2.00	0	0	0	2	2.00	0
LC	10	0.30	0.15	0	0	1	0.30	0.15
<b>South West Region</b>	<b>61</b>	<b>1.11</b>	<b>0.17</b>	<b>7</b>	<b>11.48</b>	<b>6</b>	<b>1.43</b>	<b>0.23</b>

Table 42 Net effects of the Primary Audit on BMWP score and number of scoring taxa for South West Region

<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>Cornwall</b>	<b>20</b>	<b>5.65</b>	<b>20.00</b>	<b>30</b>	<b>0.95</b>	<b>20.00</b>	<b>5</b>
DS	4	16.25	50.00	30	2.50	50.00	5
JB	2	6.50	0	13	1.00	0	2
LD	4	3.75	25.00	15	0.75	25.00	3
RW	1	5.00	0	5	1.00	0	1
SG	3	-0.67	0	3	-0.33	0	0
TG	5	0	0	3	0.20	0	1
UM	1	17.00	100.00	17	3.00	100.00	3
<b>Devon</b>	<b>13</b>	<b>7.08</b>	<b>23.08</b>	<b>25</b>	<b>1.00</b>	<b>7.69</b>	<b>3</b>
AD	5	1.60	0	5	0.40	0	1
AG	5	10.80	40.00	17	1.40	0	2
APH	3	10.00	33.33	25	1.33	33.33	3
<b>N. Wessex</b>	<b>8</b>	<b>5.88</b>	<b>12.50</b>	<b>15</b>	<b>1.25</b>	<b>25.00</b>	<b>3</b>
IJN	1	0	0	0	0	0	0
JS	3	10.33	0	13	2.67	66.67	3
SS	4	4.00	25.00	15	0.50	0	2
<b>S. Wessex</b>	<b>20</b>	<b>2.55</b>	<b>5.00</b>	<b>15</b>	<b>0.50</b>	<b>0</b>	<b>2</b>
BJJ	1	0	0	0	0	0	0
CMH	6	3.33	16.67	15	0.67	0	2
JB	2	2.50	0	5	0.50	0	1
JMB	1	11.00	0	11	2.00	0	2
LC	10	1.50	0	5	0.30	0	1
<b>S. West Region</b>	<b>61</b>	<b>4.97</b>	<b>14.75</b>	<b>30</b>	<b>0.85</b>	<b>11.48</b>	<b>5</b>

Table 43 The families missed in sorting by South West Region's primary analysts

Family	n	% of South West Region's missed families in Primary Audit
Hydrophilidae (incl. Hydraenidae)	10	15.38
Planariidae (incl. Dugesiidae)	10	15.38
Caenidae	5	7.69
Nemouridae	3	4.62
Asellidae	2	3.08
Hydrobiidae (incl. Bithyniidae)	2	3.08
Ancylidae (incl. Acrolochidae)	2	3.08
Hydrometridae	2	3.08
Planorbidae	2	3.08
Heptageniidae	1	1.54
Tipulidae	1	1.54
Beraeidae	1	1.54
Sphaeriidae	1	1.54
Calopterygidae	1	1.54
Chironomidae	1	1.54
Corixidae	1	1.54
Dryopidae	1	1.54
Dytiscidae (incl. Noteridae)	1	1.54
Elmidae	1	1.54
Gammaridae (incl. Crangonyctidae)	1	1.54
Glossiphoniidae	1	1.54
Hydroptilidae	1	1.54
Haliplidae	1	1.54
Piscicolidae	1	1.54
Sialidae	1	1.54
Sericostomatidae	1	1.54
Rhyacophilidae (incl. Glossosomatidae)	1	1.54
Valvatidae	1	1.54
Lepidostomatidae	1	1.54
Leptoceridae	1	1.54
Leptophlebiidae	1	1.54
Leuctridae	1	1.54
Limnephilidae	1	1.54
Lymnaeidae	1	1.54
Odontoceridae	1	1.54
Goeridae	1	1.54
<b>Total</b>	<b>65</b>	<b>100</b>

Table 44 The species missed in sorting by South West Region's primary analysts

Species	n	% of South West Region's missed species in Primary Audit
<i>Hydraena gracilis</i> Germar	8	10.81
<i>Polycelis felina</i> (Dalyell)	6	8.11
<i>Caenis rivulorum</i> Eaton	3	4.05
<i>Crenobia alpina</i> (Dana)	3	4.05
<i>Anisus vortex</i> (L.)	2	2.70
<i>Asellus aquaticus</i> (L.)	2	2.70
<i>Caenis luctuosa</i> group	2	2.70
<i>Gyraulus albus</i> (Muller)	2	2.70
<i>Ancylus fluviatilis</i> Muller	2	2.70
<i>Helophorus</i> ( <i>Atracthelophorus</i> ) <i>brevipalpis</i> Bedel	2	2.70
<i>Hydraena riparia</i> Kugelann	2	2.70
<i>Hydrometra stagnorum</i> (L.)	2	2.70
<i>Potamopyrgus jenkinsi</i> (Smith)	2	2.70
<i>Protonemura</i> sp.	2	2.70
<i>Sericostoma personatum</i> (Spence)	1	1.35
<i>Gammarus pulex</i> (L.)	1	1.35
<i>Elmis aenea</i> (Muller)	1	1.35
<i>Ecdyonurus</i> sp.	1	1.35
<i>Dytiscidae</i> indet	1	1.35
<i>Dryops</i> sp.	1	1.35
<i>Hydraena nigrita</i> Germar	1	1.35
<i>Dicranota</i> sp.	1	1.35
<i>Calopteryx</i> sp.	1	1.35
<i>Sialis nigripes</i> Pictet	1	1.35
<i>Silo pallipes</i> (Fabricius)	1	1.35
<i>Beraea maurus</i> (Curtis)	1	1.35
<i>Athripsodes</i> sp.	1	1.35
<i>Sphaeriidae</i> indet	1	1.35
<i>Tanytarsini</i>	1	1.35
<i>Drusus annulatus</i> (Stephens)	1	1.35
<i>Piscicola geometra</i> (L.)	1	1.35
<i>Odontocerum albicorne</i> (Scopoli)	1	1.35
<i>Nemoura cambrica</i> group	1	1.35
<i>Micronecta</i> sp.	1	1.35
<i>Lymnaea truncatula</i> (Muller)	1	1.35
<i>Leuctra fusca</i> (L.)	1	1.35
<i>Lepidostoma hirtum</i> (Fabricius)	1	1.35
<i>Glossosoma</i> sp.	1	1.35
<i>Hydrophilidae</i> indet	1	1.35
<i>Goera pilosa</i> (Fabricius)	1	1.35
<i>Polycelis nigra</i> group	1	1.35
<i>Valvata piscinalis</i> (Muller)	1	1.35
<i>Polycelis</i> sp.	1	1.35
<i>Helobdella stagnalis</i> (L.)	1	1.35
<i>Haliplidae</i> indet	1	1.35
<i>Habrophlebia fusca</i> (Curtis)	1	1.35
<i>Orthocladiinae</i>	1	1.35
<i>Hydroptila</i> sp.	1	1.35
<b>Total</b>	<b>74</b>	<b>100</b>

## **AUDIT OF THAMES REGION'S PRIMARY ANALYSTS**

Table 45 The 20 samples audited for the Frimley Laboratory of Thames Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Hart	Lea Bridge	307	0	2	0
Beverley Brook	Green Lane	307	0	0	0
Wey (S)	Hammer Vale	307	0	4	0
Pipp Brook	Pixham Lane	307	0	3	0
Cranleigh Waters	Collins Farm	307	1	3	0
Ock (Surrey)	u/s Wey	307	1	3	0
Blackwater	u/s Whitewater	307	0	4	0
Leigh Brook	Leigh Bridge	307	1	1	0
Loddon	Wargrave	307	0	5	0
Whitmoor Common Brook	A320 Bridge	317	0	3	0
Wey (N)	Moor Park Bridge	317	0	2	0
Vyne Stream	d/s Vyne Lake	317	1	0	0
Gatwick Stream	Grattons Park	317	0	0	0
Wey (N)	Mill Court	317	0	0	0
Wandle	Three Arch Bridge	317	0	3	0
Vyne Stream	d/s The Vyne	317	0	5	0
Wandle	King Georges Park	317	0	0	0
Bourne	u/s Thames	MW	0	3	0
Gatwick Stream	u/s Mole	MW	0	3	0
Felthamhill Brook	u/s Portlane Brook	MW	0	4	0

Table 46 The 20 samples audited for the Hatfield Laboratory of Thames Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Beane	Aston End PS	DJL	0	0	0
Old Bourne	u/s Dane End Tributary	DJL	1	2	0
Roding	Broad Bridge	DJL	0	3	0
Mimram	Whitwell	ES	1	1	0
Mimmshall Brook	Waterend	ES	0	3	0
Hounsdon Gutter	Deepdene Court	ES	0	1	0
Pinn	u/s Frays River	ES	0	3	0
Gade	Gade Water Nurseries	ES	0	3	0
Welham Green Bourne	North Mimms	ES	0	2	0
Brookhouse Brook	Brookhouse	ES	1	3	0
Rib	Westmill	JE	0	2	0
Tykes Water	u/s Radlett	JE	0	4	0
Friary Park Stream	d/s SWO	KG	0	1	0
Welham Green Bourne	Station Road	KG	0	0	0
Chess	Water Lane	KG	0	3	0
Mimram	u/s Welwyn Town	KG	0	2	0
Chess	d/s Loudwater	KG	0	4	0
Stort	Cannons Mill Lane	KG	0	2	0
Ash (Lee)	Easneye	KG	1	1	0
Mimmshall Brook	d/s A1081 Bridge	KG	0	2	1

Table 47 The 20 samples audited for the Wallingford Laboratory of Thames Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Lydebank Brook	East Hendred	AJF	0	3	0
Ginge Brook	West Hendred	AJF	0	5	0
Kennet	Ufton Bridge	AJF	0	4	0
Hanwell Brook	u/s Oxford Canal	AJF	2	3	0
Cherwell	Grimsbury	AJF	1	4	0
Sul	Saltney Mead	AJF	1	2	0
Culworth Brook	u/s Cherwell	AJF	1	4	0
Winterbourne	G.S. Bagnor	AJF	0	5	0
Langford Brook	u/s Oxon Ray	JTT	0	6	0
Tramroad Ditch	Wootton Underwood	JTT	0	2	0
Audley Brook	Stratton Audley	JTT	0	6	1
Rissington Ditch	u/s Windrush Loop	JTT	1	4	0
Ray (Oxon)	Fencott Bridge	JTT	0	2	0
Launton Brook	u/s Cutters Brook	JTT	1	2	0
Windrush	Little Barrington	JTT	0	4	1
Moor Ditch	u/s Didcot STW	JTT	1	7	0
Eye	Lower Slaughter	JTT	0	7	0
Hornton Stream	Horley	JTT	1	6	0
Cherwell	Twyford	JTT	1	3	0
Ockley Brook	Souldern Mill	JTT	1	4	0

Table 48 Statistics of the 1999 Primary Audit for Thames Region

Analyst/ Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
Frimley	20	2.40	0.38	12	60.00	5	2.60	0.37
307	9	2.78	0.52	6	66.67	5	3.11	0.51
317	8	1.63	0.68	3	37.50	5	1.75	0.65
MW	3	3.33	0.33	3	100.00	4	3.33	0.33
<b>Hatfield</b>	<b>20</b>	<b>2.10</b>	<b>0.26</b>	<b>8</b>	<b>40.00</b>	<b>4</b>	<b>2.35</b>	<b>0.26</b>
DJL	3	1.67	0.88	1	33.33	3	2.00	1.00
ES	7	2.29	0.36	4	57.14	3	2.57	0.37
JE	2	3.00	1.00	1	50.00	4	3.00	1.00
KG	8	1.88	0.44	2	25.00	4	2.13	0.44
<b>Wallingford</b>	<b>20</b>	<b>4.15</b>	<b>0.36</b>	<b>16</b>	<b>80.00</b>	<b>7</b>	<b>4.80</b>	<b>0.37</b>
AJF	8	3.75	0.37	7	87.50	5	4.38	0.32
JTT	12	4.42	0.56	9	75.00	7	5.08	0.58
<b>Thames Region</b>	<b>60</b>	<b>2.88</b>	<b>0.23</b>	<b>36</b>	<b>60.00</b>	<b>7</b>	<b>3.25</b>	<b>0.24</b>

Table 49 Net effects of the Primary Audit on BMWP score and number of scoring taxa for Thames Region

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
Frimley	20	11.65	50.00	33	2.20	50.00	5
307	9	15.89	77.78	33	2.44	44.44	5
317	8	6.25	25.00	25	1.50	37.50	5
MW	3	13.33	33.33	19	3.33	100.00	4
Hatfield	20	9.65	40.00	26	1.90	35.00	4
DJL	3	7.00	33.33	16	1.33	33.33	3
ES	7	8.86	42.86	19	2.00	42.86	3
JE	2	17.00	50.00	26	3.00	50.00	4
KG	8	9.50	37.50	18	1.75	25.00	4
Wallingford	20	21.10	65.00	50	3.60	70.00	7
AJF	8	17.38	62.50	35	3.13	75.00	5
JTT	12	23.58	66.67	50	3.92	66.67	7
Thames Region	60	14.13	51.67	50	2.57	51.67	7

Table 50 The families missed in sorting by Thames Region's primary analysts

Family	n	% of Thames Region's missed families in Primary Audit
Planorbidae	8	5.19
Valvatidae	8	5.19
Planariidae (incl. Dugesiidae)	8	5.19
Psychomyiidae (incl. Ecnomidae)	8	5.19
Hydrobiidae (incl. Bithyniidae)	8	5.19
Elmidae	6	3.90
Simuliidae	6	3.90
Lymnaeidae	6	3.90
Ancylidae (incl. Acroloxiidae)	6	3.90
Hydroptilidae	5	3.25
Hydropsychidae	5	3.25
Limnephilidae	5	3.25
Haliplidae	4	2.60
Tipulidae	4	2.60
Piscicolidae	4	2.60
Dytiscidae (incl. Noteridae)	4	2.60
Nemouridae	4	2.60
Baetidae	4	2.60
Physidae	4	2.60
Ephemerellidae	3	1.95
Dendrocoelidae	3	1.95
Polycentropodidae	3	1.95
Caenidae	3	1.95
Sphaeriidae	3	1.95
Dryopidae	2	1.30
Erpobdellidae	2	1.30
Glossiphoniidae	2	1.30
Goeridae	2	1.30
Corixidae	2	1.30
Sialidae	2	1.30
Scirtidae	2	1.30
Leptoceridae	2	1.30
Leptophlebiidae	2	1.30
Libellulidae	2	1.30
Rhyacophilidae (incl. Glossosomatidae)	2	1.30
Notonectidae	1	0.65
Beraeidae	1	0.65
Calopterygidae	1	0.65
Lepidostomatidae	1	0.65
Perlidae	1	0.65
Heptageniidae	1	0.65
Leuctridae	1	0.65
Aeshnidae	1	0.65
Hydrophilidae (incl. Hydraenidae)	1	0.65
Coenagrionidae	1	0.65
<b>Total</b>	<b>154</b>	<b>100</b>

Table 51 The species missed in sorting by Thames Region's primary analysts

Species	n	% of Thames Region's missed species in Primary Audit
<i>Potamopyrgus jenkinsi</i> (Smith)	8	4.88
<i>Lype</i> sp.	6	3.66
<i>Armiger crista</i> (L.)	5	3.05
<i>Bathyomphalus contortus</i> (L.)	4	2.44
<i>Piscicola geometra</i> (L.)	4	2.44
<i>Polycelis nigra</i> group	4	2.44
<i>Elmis aenea</i> (Muller)	4	2.44
<i>Ancylus fluviatilis</i> Muller	4	2.44
<i>Valvata piscinalis</i> (Muller)	4	2.44
<i>Lymnaea peregra</i> (Muller)	4	2.44
<i>Simulium</i> ( <i>Simulium</i> ) <i>ornatum</i> group	4	2.44
<i>Valvata cristata</i> Muller	4	2.44
<i>Hydroptila</i> sp.	4	2.44
<i>Ephemerella ignita</i> (Poda)	3	1.83
<i>Pisidium</i> sp.	3	1.83
<i>Hydropsyche angustipennis</i> (Curtis)	3	1.83
<i>Dendrocoelum lacteum</i> (Muller)	3	1.83
<i>Dryops</i> sp.	2	1.22
<i>Limnephilus lunatus</i> Curtis	2	1.22
<i>Limnephilidae</i> indet	2	1.22
<i>Cloeon dipterum</i> (L.)	2	1.22
<i>Libellulidae</i> indet	2	1.22
<i>Mystacides azurea</i> (L.)	2	1.22
<i>Acrolochus lacustris</i> (L.)	2	1.22
<i>Oulimnius</i> sp.	2	1.22
<i>Elodes</i> sp.	2	1.22
<i>Erpobdella octoculata</i> (L.)	2	1.22
<i>Haliplus</i> sp.	2	1.22
<i>Haliplus fluviatilis</i> Aube	2	1.22
<i>Dugesia tigrina</i> (Girard)	2	1.22
<i>Physa fontinalis</i> (L.)	2	1.22
<i>Nemurella picteti</i> Klapalek	2	1.22
<i>Polycelis felina</i> (Dalyell)	2	1.22
<i>Pilaria</i> ( <i>Pilaria</i> ) sp.	2	1.22
<i>Psychomyia pusilla</i> (Fabricius)	2	1.22
<i>Agapetus</i> sp.	2	1.22
<i>Polycentropus flavomaculatus</i> (Pictet)	2	1.22
<i>Simulium</i> sp.	2	1.22
<i>Caenis luctuosa</i> group	2	1.22
<i>Physa</i> sp.	2	1.22

Table 51 continued

Species	n	% of Thames Region's missed species in Primary Audit
<i>Glossiphonia complanata</i> (L.)	1	0.61
<i>Glyphotaelius pellucidus</i> (Retzius)	1	0.61
<i>Agabus</i> sp.	1	0.61
<i>Amphinemura sulcicollis</i> (Stephens)	1	0.61
<i>Anacaena limbata</i> (Fabricius)	1	0.61
<i>Aeshna grandis</i> (L.)	1	0.61
<i>Anisus vortex</i> (L.)	1	0.61
Dytiscidae indet	1	0.61
<i>Baetis vernus</i> Curtis	1	0.61
<i>Calopteryx splendens</i> (Harris)	1	0.61
<i>Dugesia polychroa</i> group	1	0.61
<i>Beraeodes minutus</i> (L.)	1	0.61
<i>Caenis horaria</i> (L.)	1	0.61
<i>Leuctra fusca</i> (L.)	1	0.61
Coenagrionidae indet	1	0.61
<i>Goera pilosa</i> (Fabricius)	1	0.61
<i>Baetis rhodani</i> (Pictet)	1	0.61
<i>Nemoura cinerea</i> (Retzius)	1	0.61
<i>Tinodes waeneri</i> (L.)	1	0.61
<i>Tinodes unicolor</i> (Pictet)	1	0.61
<i>Simulium</i> (Wilhelmia) sp.	1	0.61
<i>Simulium</i> (Eusimulium) aureum group	1	0.61
<i>Silo pallipes</i> (Fabricius)	1	0.61
<i>Sialis lutaria</i> (L.)	1	0.61
<i>Sialis fuliginosa</i> Pictet	1	0.61
Rhithrogena semicolorata group	1	0.61
<i>Potamonectes depressus</i> (Fabricius)	1	0.61
<i>Polycelis</i> sp.	1	0.61
<i>Plectrocnemia conspersa</i> (Curtis)	1	0.61
<i>Paraleptophlebia</i> sp.	1	0.61
<i>Ithytrichia</i> sp.	1	0.61
<i>Notonecta</i> sp.	1	0.61
<i>Habrophlebia fusca</i> (Curtis)	1	0.61
<i>Micronecta</i> ( <i>Micronecta</i> ) <i>poweri</i> (Douglas & Scott)	1	0.61
<i>Metalype fragilis</i> (Pictet)	1	0.61
<i>Lymnaea truncatula</i> (Muller)	1	0.61
<i>Lymnaea palustris</i> (Muller)	1	0.61
<i>Limnophila</i> ( <i>Eloeophila</i> ) sp.	1	0.61
<i>Lepidostoma hirtum</i> (Fabricius)	1	0.61
<i>Isoperla grammatica</i> (Poda)	1	0.61

Table 51 continued

Species	n	% of Thames Region's missed species in Primary Audit
<i>Ilybius</i> sp.	1	0.61
<i>Hydropsyche siltalai</i> Dohler	1	0.61
<i>Hydropsyche contubernalis</i> McLachlan	1	0.61
<i>Hesperocorixa sahlbergi</i> (Fieber)	1	0.61
<i>Helobdella stagnalis</i> (L.)	1	0.61
<i>Helius</i> sp.	1	0.61
<i>Oulimnius tuberculatus</i> (Muller)	1	0.61
<b>Total</b>	<b>164</b>	<b>100</b>

## **AUDIT OF WELSH REGION'S PRIMARY ANALYSTS**

Table 52 The 20 samples audited for Northern Area of Welsh Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Black Brook	u/s Ty Draw Bridge	358	0	4	0
Un-named Tributary	Lobster Pot	359	0	0	0
Singret Brook	Singret Cottage	359	1	2	0
Afon Merddwr	Pentrefoelas	359	2	5	0
Afon Lafar	Pont Lafar	359	0	0	0
Cefni	u/s Livestock Market	359	1	2	0
Afon Alaw	d/s WTW	360	0	4	0
Seiонт	Pen Llyn	376	0	0	0
Seiонт	u/s Pont Crawia Hatchery	376	0	2	0
Afon Seiонт	d/s Hatchery	376	0	0	0
Seiонт	Ponrug, u/s Brickworks	376	0	2	0
Singret Brook	d/s Roadbridge	376	1	1	0
Singret Brook	d/s Manhole, d/s Footbridge	376	0	2	0
Seiонт	Pont Gromlech	377	1	2	0
Nant Henlyn	u/s Bridge	377	0	3	0
Dulas	u/s Spring	382	2	1	0
Shotwick Brook	Site 3	382	2	1	0
Shotwick Brook	Site 1	382	0	0	0
Shotwick Brook	Site 5	382	0	3	0
Shotwick Brook	Site 4	382	0	0	0

Table 53 The 20 samples audited for South Eastern Area of Welsh Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Nant y Felin	Ty Mawr	370	0	2	0
Tributary	d/s Bwlch Gwyn	370	0	2	0
Ebbw Fach	u/s Six Bells Minewater	370	0	1	0
Senni	u/s Usk	370	0	0	0
Catbrook	u/s Wood	375	0	2	0
Lon Farm Tributary	u/s Dulas	375	0	2	0
Dulas	u/s Black Brook	375	0	0	0
Glanaloers Tributary	u/s Dulas	375	1	2	0
Wye	u/s Irfon	375	0	1	0
Arrow	Kington	375	1	0	0
Wye	Rhayader	375	0	1	0
Ithon	u/s Wye	375	0	3	0
Marteg	u/s Wye	375	0	0	0
Dulas	Builth Road	375	0	0	0
Pinsley Brook	West Town	381	0	2	0
Monnow	Alltynrhys	381	2	2	0
Taf Fechan-	u/s Pentwyn Reservoir	381	0	0	0
Taf Fawr	d/s Llwynon WTW	381	0	0	0
Cynon	u/s Cwmpennar	381	0	1	0
Llwyd	u/s Minewaters	381	1	1	0

Table 54 The 20 samples audited for South Western Area of Welsh Region

River	Site	Primary Analyst	Losses	Gains	Omissions
Cwywn Tributary	d/s Asgood Farm discharge	362	0	2	0
Cywlyn Tributary	u/s Discharge	362	1	1	0
Cywlyn	u/s Asgood Tributary	362	0	2	0
Tawe	Ystradgynlais	362	0	3	0
Syfynwy	u/s Presceli WTW	362	0	3	0
Cwm tarw	u/s Gwellystwyth STW	362	1	0	0
St Botolphs	Opposite Pumping Station	380	1	0	0
Hubberston Pill	Lower Thornton	380	1	3	1
Hubberston Stream	u/s Dowty Stream	380	0	2	0
Melindwr	d/s Cwmbrwyno input	380	1	0	0
Clettwr Fach	By Church, u/s Pontsian	380	0	2	0
Killy Willy	d/s Cannisland Stream confluence	380	1	2	0
Clettwr	u/s Rhydowen STW	380	1	0	0
Duar	d/s Bridge Rhydybont Farm	380	0	1	0
Duar Tributary	u/s Tanycoed Cochion	380	0	3	0
Upper Clydach	Pwllawatcyn	NCW	0	2	0
Clydach	u/s Confluence	NCW	1	2	0
Gwenffrwd	u/s Minewater discharges	SB	0	1	0
Afan	Afan Argoed Country Park	SB	0	5	0
Pelenna	Efail Fach	SB	0	4	0

Table 55 Statistics of the 1999 Primary Audit for Welsh Region

Analyst/ Group	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
<b>Northern</b>	<b>20</b>	<b>1.70</b>	<b>0.34</b>	<b>5</b>	<b>25.00</b>	<b>5</b>	<b>2.20</b>	<b>0.41</b>
358	1	4.00	0	1	100.00	4	4.00	0
359	5	1.80	0.92	1	20.00	5	2.60	1.29
360	1	4.00	0	1	100.00	4	4.00	0
376	6	1.17	0.40	0	0	2	1.33	0.42
377	2	2.50	0.50	1	50.00	3	3.00	0
382	5	1.00	0.55	1	20.00	3	1.80	0.73
<b>S. Eastern</b>	<b>20</b>	<b>1.10</b>	<b>0.22</b>	<b>1</b>	<b>5.00</b>	<b>3</b>	<b>1.35</b>	<b>0.26</b>
370	4	1.25	0.48	0	0	2	1.25	0.48
375	10	1.10	0.35	1	10.00	3	1.30	0.37
381	6	1.00	0.37	0	0	2	1.50	0.62
<b>S. Western</b>	<b>20</b>	<b>1.90</b>	<b>0.31</b>	<b>6</b>	<b>30.00</b>	<b>5</b>	<b>2.35</b>	<b>0.28</b>
362	6	1.83	0.48	2	33.33	3	2.17	0.31
380	9	1.44	0.41	2	22.22	3	2.11	0.45
NCW	2	2.00	0	0	0	2	2.50	0.50
SB	3	3.33	1.20	2	66.67	5	3.33	1.20
<b>Welsh Region</b>	<b>60</b>	<b>1.57</b>	<b>0.17</b>	<b>12</b>	<b>20.00</b>	<b>5</b>	<b>1.97</b>	<b>0.19</b>

Table 56 Net effects of the Primary Audit on BMWP score and number of scoring taxa for Welsh Region

<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>Northern</b>	20	<b>6.75</b>	<b>25.00</b>	<b>21</b>	<b>1.20</b>	<b>25.00</b>	<b>4</b>
358	1	21.00	100.00	21	4.00	100.00	4
359	5	5.40	20.00	15	1.00	20.00	3
360	1	21.00	100.00	21	4.00	100.00	4
376	6	6.17	0	13	1.00	0	2
377	2	9.00	50.00	17	2.00	50.00	3
382	5	2.20	20.00	17	0.20	20.00	3
<b>S. Eastern</b>	20	<b>5.60</b>	<b>15.00</b>	<b>24</b>	<b>0.85</b>	<b>5.00</b>	<b>3</b>
370	4	6.50	25.00	15	1.25	0	2
375	10	6.80	20.00	24	0.90	10.00	3
381	6	3.00	0	8	0.50	0	2
<b>S. Western</b>	20	<b>10.45</b>	<b>45.00</b>	<b>30</b>	<b>1.50</b>	<b>25.00</b>	<b>5</b>
362	6	9.17	50.00	18	1.50	33.33	3
380	9	8.56	33.33	27	0.89	11.11	3
NCW	2	12.00	50.00	17	1.50	0	2
SB	3	17.67	66.67	30	3.33	66.67	5
<b>Welsh Region</b>	60	<b>7.60</b>	<b>28.33</b>	<b>30</b>	<b>1.18</b>	<b>18.33</b>	<b>5</b>

Table 57 The families missed in sorting by Welsh Region's primary analysts

Family	n	% of Welsh Region's missed families in Primary Audit
Hydrophilidae (incl. Hydraenidae)	7	8.75
Nemouridae	5	6.25
Hydrobiidae (incl. Bithyniidae)	5	6.25
Planariidae (incl. Dugesiidae)	5	6.25
Sphaeriidae	4	5.00
Simuliidae	3	3.75
Caenidae	3	3.75
Psychomyiidae (incl. Ecnomidae)	3	3.75
Chloroperlidae	3	3.75
Ancylidae (incl. Acroloxiidae)	3	3.75
Lepidostomatidae	3	3.75
Gammaridae (incl. Crangonyctidae)	2	2.50
Ephemerellidae	2	2.50
Elmidae	2	2.50
Dytiscidae (incl. Noteridae)	2	2.50
Limnephilidae	2	2.50
Goeridae	2	2.50
Odontoceridae	2	2.50
Physidae	2	2.50
Planorbidae	2	2.50
Rhyacophilidae (incl. Glossosomatidae)	2	2.50
Dendrocoelidae	1	1.25
Ephemeridae	1	1.25
Beraeidae	1	1.25
Cordulegastridae	1	1.25
Glossiphoniidae	1	1.25
Gyrinidae	1	1.25
Heptageniidae	1	1.25
Hydroptilidae	1	1.25
Taeniopterygidae	1	1.25
Leptophlebiidae	1	1.25
Lymnaeidae	1	1.25
Oligochaeta	1	1.25
Piscicolidae	1	1.25
Scirtidae	1	1.25
Sericostomatidae	1	1.25
Hydropsychidae	1	1.25
<b>Total</b>	<b>80</b>	<b>100</b>

Table 58 The species missed in sorting by Welsh Region's primary analysts

Species	n	% of Welsh Region's missed species in Primary Audit
<i>Hydraena gracilis</i> Germar	6	6.98
<i>Potamopyrgus jenkinsi</i> (Smith)	5	5.81
<i>Polycelis felina</i> (Dalyell)	5	5.81
<i>Pisidium</i> sp.	4	4.65
<i>Chloroperla torrentium</i> (Pictei)	3	3.49
<i>Ancylus fluviatilis</i> Muller	3	3.49
<i>Gammarus pulex</i> (L.)	2	2.33
<i>Ephemerella ignita</i> (Poda)	2	2.33
Limnephilidae indet	2	2.33
<i>Nemoura cambrica</i> group	2	2.33
<i>Odontocerum albicorne</i> (Scopoli)	2	2.33
<i>Gyraulus albus</i> (Muller)	2	2.33
<i>Caenis rivulorum</i> Eaton	2	2.33
<i>Protonemura</i> sp.	2	2.33
<i>Silo pallipes</i> (Fabricius)	2	2.33
<i>Psychomyia pusilla</i> (Fabricius)	2	2.33
<i>Oreodytes sanmarkii</i> (Sahlberg)	2	2.33
<i>Dendrocoelum lacteum</i> (Muller)	1	1.16
<i>Amphinemura sulcicollis</i> (Stephens)	1	1.16
<i>Anacaena lutescens</i> Stephens	1	1.16
<i>Esolus parallelepipedus</i> (Muller)	1	1.16
<i>Ephemera danica</i> Muller	1	1.16
<i>Elodes</i> sp.	1	1.16
<i>Elmis aenea</i> (Muller)	1	1.16
<i>Ecdyonurus</i> sp.	1	1.16
<i>Brachyptera risi</i> (Morton)	1	1.16
<i>Cranoecia irrorata</i> (Curtis)	1	1.16
<i>Armiger crista</i> (L.)	1	1.16
<i>Cordulegaster boltonii</i> (Donovan)	1	1.16
<i>Beraea pullata</i> (Curtis)	1	1.16
<i>Lasiocephala basalis</i> (Kolenati)	1	1.16
<i>Caenis luctuosa</i> group	1	1.16
<i>Aplexa hypnorum</i> (L.)	1	1.16
Oligochaeta indet	1	1.16
<i>Simulium</i> ( <i>Simulium</i> ) <i>omatum</i> group	1	1.16
<i>Simulium</i> ( <i>Simulium</i> ) <i>noelleri</i> Friederichs	1	1.16
<i>Simulium</i> ( <i>Eusimulium</i> ) <i>aureum</i> group	1	1.16
<i>Sericostoma personatum</i> (Spence)	1	1.16
<i>Rhyacophila dorsalis</i> (Curtis)	1	1.16
<i>Polycelis nigra</i> group	1	1.16
<i>Piscicola geometra</i> (L.)	1	1.16
<i>Physa</i> sp.	1	1.16
<i>Hydroptila</i> sp.	1	1.16
<i>Orectochilus villosus</i> (Muller)	1	1.16
<i>Helobdella stagnalis</i> (L.)	1	1.16
<i>Nemoura avicularis</i> Morton	1	1.16

Table 58 continued

Species	n	% of Welsh Region's missed species in Primary Audit
<i>Lymnaea peregra</i> (Muller)	1	1.16
<i>Limnius volckmari</i> (Panzer)	1	1.16
<i>Lepidostomatidae</i> indet	1	1.16
<i>Tinodes waeneri</i> (L.)	1	1.16
<i>Laccobius</i> ( <i>Macrolaccobius</i> ) <i>bipunctatus</i> (Fabricius)	1	1.16
<i>Agapetus</i> sp.	1	1.16
<i>Hydropsyche siltalai</i> Dohler	1	1.16
<i>Hippeutis complanatus</i> (L.)	1	1.16
<i>Paraleptophlebia submarginata</i> (Stephens)	1	1.16
<b>Total</b>	<b>86</b>	<b>100</b>

## **SUMMARY OF PRIMARY AUDIT FOR ENVIRONMENT AGENCY**

Table 59 Statistics of the 1999 Primary Audit for each Agency laboratory

Region/Area	n	Mean gains	Standard error	No. samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (l+g+o)	Standard error
<b>Anglian Region</b>	60	1.67	0.20	16	26.67	7	1.95	0.20
Central	20	1.70	0.36	7	35.00	5	2.20	0.38
Eastern	19	2.00	0.42	5	26.32	7	2.16	0.41
Northern	21	1.33	0.23	4	19.05	3	1.52	0.25
<b>Midlands Region</b>	80	1.93	0.16	22	27.50	7	2.21	0.19
Upper Severn	20	2.10	0.31	7	35.00	5	2.40	0.39
Lower Severn	20	1.70	0.30	3	15.00	6	2.05	0.36
Upper Trent	20	1.65	0.24	5	25.00	4	1.90	0.31
Lower Trent	20	2.25	0.42	7	35.00	7	2.50	0.44
<b>N. East Region</b>	60	1.50	0.17	15	25.00	4	1.65	0.17
Dales	20	2.00	0.34	8	40.00	4	2.25	0.35
Northumbria	20	1.05	0.26	3	15.00	3	1.05	0.26
Ridings	20	1.45	0.25	4	20.00	3	1.65	0.23
<b>N. West Region</b>	60	1.78	0.23	12	20.00	8	2.17	0.25
Central	20	2.25	0.48	7	35.00	7	2.85	0.49
Northern	20	1.00	0.18	0	0	2	1.35	0.25
Southern	20	2.10	0.44	5	25.00	8	2.30	0.47
<b>Southern Region</b>	60	1.42	0.18	14	23.33	6	1.82	0.26
Hants & I.O.W.	20	0.65	0.21	2	10.00	3	0.85	0.24
Kent	20	1.65	0.24	6	30.00	3	1.75	0.24
Sussex	20	1.95	0.41	6	30.00	6	2.85	0.65
<b>S. West Region</b>	61	1.11	0.17	7	11.48	6	1.43	0.23
Cornwall	20	1.60	0.39	4	20.00	6	2.40	0.56
Devon	13	1.08	0.26	1	7.69	3	1.23	0.30
North Wessex	8	1.38	0.46	2	25.00	3	1.38	0.46
South Wessex	20	0.55	0.17	0	0	2	0.60	0.17
<b>Thames Region</b>	60	2.88	0.23	36	60.00	7	3.25	0.24
Frimley	20	2.40	0.38	12	60.00	5	2.60	0.37
Hatfield	20	2.10	0.26	8	40.00	4	2.35	0.26
Wallingford	20	4.15	0.36	16	80.00	7	4.80	0.37
<b>Welsh Region</b>	60	1.57	0.17	12	20.00	5	1.97	0.19
Northern	20	1.70	0.34	5	25.00	5	2.20	0.41
South Eastern	20	1.10	0.22	1	5.00	3	1.35	0.26
South Western	20	1.90	0.31	6	30.00	5	2.35	0.28
<b>Whole of Agency</b>	501	1.74	0.07	134	26.75	8	2.06	0.08

Table 60 Net effects of the 1999 Primary Audit on BMWP score and no. of scoring taxa for each Agency lab.

Region/Area	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
Anglian	60	8.03	26.67	32	1.50	23.33	7
Central	20	6.95	30.00	21	1.40	30.00	5
Eastern	19	11.26	36.84	32	1.95	26.32	7
Northern	21	6.14	14.29	20	1.19	14.29	3
Midlands	80	10.31	27.50	45	1.80	26.25	7
U. Severn	20	12.35	35.00	31	1.90	35.00	4
L. Severn	20	9.60	25.00	29	1.70	15.00	6
U. Trent	20	7.65	15.00	20	1.50	20.00	4
L. Trent	20	11.65	35.00	45	2.10	35.00	7
North East	60	8.32	28.33	30	1.38	23.33	4
Dales	20	11.05	45.00	26	1.80	35.00	4
Northumbria	20	7.05	20.00	30	1.05	15.00	3
Ridings	20	6.85	20.00	18	1.30	20.00	3
North West	60	8.53	18.33	58	1.45	18.33	8
Central	20	11.00	35.00	36	1.80	35.00	6
Northern	20	4.55	0	13	0.65	0	2
Southern	20	10.05	20.00	58	1.90	20.00	8
Southern	60	7.58	18.33	32	1.23	21.67	5
Hants & I.O.W.	20	3.45	5.00	21	0.60	10.00	3
Kent	20	8.95	25.00	25	1.55	30.00	3
Sussex	20	10.35	25.00	32	1.55	25.00	5
South West	61	4.97	14.75	30	0.85	11.48	5
Cornwall	20	5.65	20.00	30	0.95	20.00	5
Devon	13	7.08	23.08	25	1.00	7.69	3
N. Wessex	8	5.88	12.50	15	1.25	25.00	3
S. Wessex	20	2.55	5.00	15	0.50	0	2
Thames	60	14.13	51.67	50	2.57	51.67	7
Frimley	20	11.65	50.00	33	2.20	50.00	5
Hatfield	20	9.65	40.00	26	1.90	35.00	4
Wallingford	20	21.10	65.00	50	3.60	70.00	7
Welsh	60	7.6	28.33	30	1.18	18.33	5
Northern	20	6.75	25	21	1.2	25	4
S. Eastern	20	5.6	15	24	0.85	5	3
S. Western	20	10.45	45	30	1.5	25	5
<b>Whole of Agency</b>	<b>501</b>	<b>8.74</b>	<b>26.75</b>	<b>58</b>	<b>1.51</b>	<b>24.35</b>	<b>8</b>

Table 61 The families missed in sorting by the Agency's Primary Analysts

Family	n	% of Agency's missed families in Primary Audit
Planariidae (incl. Dugesiidae)	46	5.79
Hydrophilidae (incl. Hydraenidae)	44	5.54
Hydrobiidae (incl. Bithyniidae)	40	5.04
Caenidae	37	4.66
Hydroptilidae	34	4.28
Elmidae	32	4.03
Planorbidae	29	3.65
Psychomyiidae (incl. Ecnomidae)	28	3.53
Sphaeriidae	27	3.40
Ancylidae (incl. Acroloxiidae)	24	3.02
Simuliidae	23	2.90
Lymnaeidae	22	2.77
Limnephilidae	20	2.52
Nemouridae	20	2.52
Baetidae	18	2.27
Valvatidae	18	2.27
Leptoceridae	18	2.27
Glossiphoniidae	16	2.02
Lepidostomatidae	16	2.02
Tipulidae	16	2.02
Dytiscidae (incl. Noteridae)	14	1.76
Goeridae	13	1.64
Ephemerellidae	13	1.64
Rhyacophilidae (incl. Glossosomatidae)	13	1.64
Dendrocoelidae	12	1.51
Gammaridae (incl. Crangonyctidae)	12	1.51
Hydropsychidae	11	1.39
Physidae	11	1.39
Piscicolidae	11	1.39
Leptophlebiidae	10	1.26
Sericostomatidae	9	1.13
Haliplidae	9	1.13
Chloroperlidae	8	1.01
Scirtidae	8	1.01
Leuctridae	8	1.01
Polycentropodidae	8	1.01
Oligochaeta	6	0.76
Heptageniidae	6	0.76
Calopterygidae	6	0.76
Chironomidae	6	0.76
Erpobdellidae	6	0.76
Asellidae	5	0.63
Beraeidae	5	0.63
Libellulidae	5	0.63
Corixidae	4	0.50
Dryopidae	4	0.50

Table 61 continued

<b>Family</b>	<b>n</b>	<b>% of Agency's missed families in Primary Audit</b>
Ephemeridae	4	0.50
Gyrinidae	3	0.38
Hydrometridae	3	0.38
Taeniopterygidae	3	0.38
Odontoceridae	3	0.38
Cordulegastridae	3	0.38
Coenagrionidae	3	0.38
Perlodidae	3	0.38
Sialidae	3	0.38
Notonectidae	2	0.25
Brachycentridae	2	0.25
Phryganeidae	2	0.25
Gerridae	2	0.25
Philopotamidae	2	0.25
Molannidae	2	0.25
Nepidae	1	0.13
Aeshnidae	1	0.13
Neritidae	1	0.13
<b>Total</b>	<b>794</b>	<b>100</b>

Table 62 The species missed in sorting by the Agency's Primary Analysts

Species	n	% of Agency's missed species in Primary Audit
Potamopyrgus jenkinsi (Smith)	38	4.51
Hydroptila sp.	27	3.21
Hydraena gracilis Germar	26	3.09
Polycelis felina (Dalyell)	24	2.85
Pisidium sp.	21	2.49
Caenis luctuosa group	19	2.26
Ancylus fluviatilis Muller	18	2.14
Elmis aenea (Muller)	17	2.02
Polycelis nigra group	14	1.66
Lymnaea peregra (Muller)	14	1.66
Ephemerella ignita (Poda)	13	1.54
Lepidostoma hirtum (Fabricius)	12	1.43
Simulium (Simulium) ornatum group	12	1.43
Dendrocoelum lacteum (Muller)	12	1.43
Lype sp.	12	1.43
Piscicola geometra (L.)	11	1.31
Caenis rivulorum Eaton	11	1.31
Armiger crista (L.)	10	1.19
Limnephilidae indet	10	1.19
Valvata piscinalis (Muller)	10	1.19
Tinodes waeneri (L.)	10	1.19
Bathyomphalus contortus (L.)	9	1.07
Sericostoma personatum (Spence)	9	1.07
Gammarus pulex (L.)	8	0.95
Elodes sp.	8	0.95
Valvata cristata Muller	8	0.95
Oulimnius sp.	8	0.95
Helobdella stagnalis (L.)	8	0.95
Baetis rhodani (Pictet)	8	0.95
Helophorus (Atracthelophorus) brevipalpis Bedel	7	0.83
Chloroperla torrentium (Pictet)	7	0.83
Hydraena riparia Kugelann	7	0.83
Psychomyia pusilla (Fabricius)	7	0.83
Nemoura cambrica group	7	0.83
Anisus vortex (L.)	6	0.71
Goera pilosa (Fabricius)	6	0.71
Physa sp.	6	0.71
Mystacides azurea (L.)	6	0.71
Glossiphonia complanata (L.)	6	0.71
Caenis horaria (L.)	6	0.71
Gyraulus albus (Muller)	6	0.71
Acrolochus lacustris (L.)	6	0.71
Silo pallipes (Fabricius)	6	0.71
Hydropsyche angustipennis (Curtis)	5	0.59
Crangonyx pseudogracilis Bousfield	5	0.59
Limnius volckmari (Panzer)	5	0.59
Hippeutis complanatus (L.)	5	0.59

Table 62 continued

Species	n	% of Agency's missed species in Primary Audit
<i>Baetis vernus</i> Curtis	5	0.59
<i>Protonemura</i> sp.	5	0.59
<i>Dicranota</i> sp.	5	0.59
<i>Libellulidae</i> indet	5	0.59
<i>Lymnaea truncatula</i> (Muller)	5	0.59
<i>Asellus aquaticus</i> (L.)	5	0.59
<i>Haliplus</i> sp.	5	0.59
<i>Dryops</i> sp.	4	0.48
<i>Dugesia tigrina</i> (Girard)	4	0.48
<i>Nemurella picteti</i> Klapalek	4	0.48
<i>Limnephilus lunatus</i> Curtis	4	0.48
<i>Paraleptophlebia</i> sp.	4	0.48
<i>Glossosoma</i> sp.	4	0.48
<i>Erpobdella octoculata</i> (L.)	4	0.48
<i>Habrophlebia fusca</i> (Curtis)	4	0.48
<i>Physa fontinalis</i> (L.)	4	0.48
<i>Agabus</i> sp.	4	0.48
<i>Oreodytes sanmarkii</i> (Sahlberg)	4	0.48
<i>Agapetus</i> sp.	4	0.48
<i>Orthocladiinae</i>	4	0.48
<i>Oulimnius tuberculatus</i> (Muller)	4	0.48
<i>Polycelis</i> sp.	4	0.48
<i>Calopteryx splendens</i> (Harris)	4	0.48
<i>Rhyacophila dorsalis</i> (Curtis)	4	0.48
<i>Simulium</i> ( <i>Eusimulium</i> ) <i>aureum</i> group	4	0.48
<i>Simulium</i> ( <i>Wilhelmia</i> ) sp.	4	0.48
<i>Cloeon dipterum</i> (L.)	4	0.48
<i>Sphaeriidae</i> indet	4	0.48
<i>Brachyptera risi</i> (Morton)	3	0.36
<i>Bithynia tentaculata</i> (L.)	3	0.36
<i>Odontocerum albicorne</i> (Scopoli)	3	0.36
<i>Leuctra geniculata</i> (Stephens)	3	0.36
<i>Leuctra fusca</i> (L.)	3	0.36
<i>Agraylea multipunctata</i> Curtis	3	0.36
<i>Ithytrichia</i> sp.	3	0.36
<i>Hydropsyche siltalai</i> Dohler	3	0.36
<i>Athripsodes aterrimus</i> (Stephens)	3	0.36
<i>Ephemera danica</i> Muller	3	0.36
<i>Ecdyonurus</i> sp.	3	0.36
<i>Isoperla grammatica</i> (Poda)	3	0.36
<i>Crenobia alpina</i> (Dana)	3	0.36
<i>Cordulegaster boltonii</i> (Donovan)	3	0.36
<i>Polycentropus flavomaculatus</i> (Pictet)	3	0.36
<i>Brachycentrus subnubilus</i> Curtis	2	0.24
<i>Cyrnus trimaculatus</i> (Curtis)	2	0.24
<i>Dugesia polychroa</i> group	2	0.24
<i>Dytiscidae</i> indet	2	0.24

Table 62 continued

Species	n	% of Agency's missed species in Primary Audit
<i>Calopteryx</i> sp.	2	0.24
<i>Hydrometra stagnorum</i> (L.)	2	0.24
<i>Crunoecia irrorata</i> (Curtis)	2	0.24
<i>Amphinemura sulcicollis</i> (Stephens)	2	0.24
<i>Athripsodes cinereus</i> (Curtis)	2	0.24
<i>Haliphus fluviatilis</i> Aube	2	0.24
<i>Beraea pullata</i> (Curtis)	2	0.24
<i>Caenis robusta</i> Eaton	2	0.24
<i>Erpobdellidae</i> indet	2	0.24
<i>Athripsodes</i> sp.	2	0.24
<i>Esolus parallelepipedus</i> (Muller)	2	0.24
<i>Chironomini</i>	2	0.24
<i>Beraea maurus</i> (Curtis)	2	0.24
<i>Hydraena nigrita</i> Germar	2	0.24
<i>Oligochaeta</i> indet	2	0.24
<i>Molanna angustata</i> Curtis	2	0.24
<i>Pilaria</i> ( <i>Pilaria</i> ) sp.	2	0.24
<i>Nemoura avicularis</i> Morton	2	0.24
<i>Paraleptophlebia submarginata</i> (Stephens)	2	0.24
<i>Rhyacophila</i> sp.	2	0.24
<i>Rhithrogena</i> sp.	2	0.24
<i>Neureclipsis bimaculata</i> (L.)	2	0.24
<i>Simulium</i> sp.	2	0.24
<i>Sphaerium</i> sp.	2	0.24
<i>Limnophila</i> ( <i>Eloeophila</i> ) sp.	2	0.24
<i>Notonecta</i> sp.	2	0.24
<i>Potamonectes depressus</i> (Fabricius)	2	0.24
<i>Simulium</i> ( <i>Nevermannia</i> ) <i>cryophilum</i> group	2	0.24
<i>Orectochilus villosus</i> (Muller)	2	0.24
<i>Tipula</i> ( <i>Yamatotipula</i> ) <i>montium</i> group	2	0.24
<i>Ischnura elegans</i> (Van der Linden)	2	0.24
<i>Wormaldia</i> sp.	2	0.24
<i>Tubificidae</i>	2	0.24
<i>Triaenodes bicolor</i> (Curtis)	2	0.24
<i>Tipula</i> sp.	2	0.24
<i>Leuctra inermis</i> Kempny	2	0.24
<i>Hydropsyche</i> sp.	2	0.24
<i>Chironomidae</i> indet	1	0.12
<i>Platambus maculatus</i> (L.)	1	0.12
<i>Ceraclea dissimilis</i> (Stephens)	1	0.12
<i>Plectrocnemia conspersa</i> (Curtis)	1	0.12
<i>Rhithrogena semicolorata</i> group	1	0.12
<i>Sialis lutaria</i> (L.)	1	0.12
<i>Cercyon</i> sp.	1	0.12
<i>Chloroperla tripunctata</i> (Scopoli)	1	0.12
<i>Sialis fuliginosa</i> Pictet	1	0.12
<i>Brychius elevatus</i> (Panzer)	1	0.12

Table 62 continued

Species	n	% of Agency's missed species in Primary Audit
Planorbis sp.	1	0.12
Tanytarsini	1	0.12
Aeshna grandis (L.)	1	0.12
Anacaena globulus (Paykull)	1	0.12
Anacaena limbata (Fabricius)	1	0.12
Anacaena lutescens Stephens	1	0.12
Tinodes unicolor (Pictet)	1	0.12
Anisus leucostoma (Millet)	1	0.12
Tinodes sp.	1	0.12
Aplexa hypnorum (L.)	1	0.12
Theromyzon tessulatum (Muller)	1	0.12
Batracobdella paludosa (Carena)	1	0.12
Athripsodes albifrons (L.)	1	0.12
Sialis nigripes Pictet	1	0.12
Athripsodes bilineatus (L.)	1	0.12
Simulium (Simulium) noelleri Friederichs	1	0.12
Baetis scambus group	1	0.12
Baetis sp.	1	0.12
Simulium (Simulium) argyreatum group	1	0.12
Simulium (Boophthora) erythrocephalum (de Geer)	1	0.12
Silo sp.	1	0.12
Beraeodes minutus (L.)	1	0.12
Silo nigricornis (Pictet)	1	0.12
Theodoxus fluviatilis (L.)	1	0.12
Helophorus (Meghelophorus) aequalis Thomson	1	0.12
Phryganea bipunctata Retzius	1	0.12
Lumbriculidae	1	0.12
Lumbricidae	1	0.12
Gyrinus sp.	1	0.12
Halesus radiatus (Curtis)	1	0.12
Haliplidae indet	1	0.12
Limnophila (Brachylimnophila) sp.	1	0.12
Limnephilus sp.	1	0.12
Helius sp.	1	0.12
Lymnaea palustris (Muller)	1	0.12
Leuctra nigra (Olivier)	1	0.12
Lymnaea sp.	1	0.12
Hesperocorixa sahlbergi (Fieber)	1	0.12
Leuctra hippopus (Kempny)	1	0.12
Lepidostomatidae indet	1	0.12
Hydraena pulchella Germar	1	0.12
Lasiocephala basalis (Kolenati)	1	0.12
Hydrometra sp.	1	0.12
Laccobius (Macrolaccobius) bipunctatus (Fabricius)	1	0.12
Hydrophilidae indet	1	0.12
Hydropsyche contubernalis McLachlan	1	0.12
Limnephilus affinis/incisus	1	0.12

Table 62 continued

Species	n	% of Agency's missed species in Primary Audit
Molophilus sp.	1	0.12
Coenagrionidae indet	1	0.12
Phryganea sp.	1	0.12
Corixidae indet	1	0.12
Ilybius sp.	1	0.12
Oxyethira sp.	1	0.12
Cyrus flavidus McLachlan	1	0.12
Oecetis testacea (Curtis)	1	0.12
Drusus annulatus (Stephens)	1	0.12
Ochthebius bicolor Germar	1	0.12
Glyphotaelius pellucidus (Retzius)	1	0.12
Nemoura cinerea (Retzius)	1	0.12
Cloeon simile Eaton	1	0.12
Ephemera sp.	1	0.12
Micropterna sequax McLachlan	1	0.12
Micronecta sp.	1	0.12
Micronecta (Micronecta) poweri (Douglas & Scott)	1	0.12
Metatype fragilis (Pictet)	1	0.12
Gammarus duebeni Liljeborg	1	0.12
Lymnaeidae indet	1	0.12
Gerris (Gerris) lacustris (L.)	1	0.12
Gerris sp.	1	0.12
Nepa cinerea L.	1	0.12
<b>Total</b>	<b>842</b>	<b>100</b>

## **MISSED TAXA FOR ALL SAMPLES IN THE 1999 AUDIT**

Table 63 Families missed 5 times or more for all samples in the 1999 Audit

Family	n	% of missed families in 1999 audit
Hydrophilidae (incl. Hydraenidae)	74	5.82
Planariidae (incl. Dugesiidae)	72	5.66
Hydroptilidae	61	4.80
Hydrobiidae (incl. Bithyniidae)	56	4.40
Caenidae	54	4.25
Elmidae	53	4.17
Sphaeriidae	46	3.62
Nemouridae	43	3.38
Psychomyiidae (incl. Ecnomidae)	42	3.30
Planorbidae	41	3.22
Simuliidae	39	3.07
Lymnaeidae	36	2.83
Limnephilidae	35	2.75
Dytiscidae (incl. Noteridae)	30	2.36
Lepidostomatidae	29	2.28
Ancylidae (incl. Acroloxiidae)	29	2.28
Leptoceridae	28	2.20
Valvatidae	27	2.12
Rhyacophilidae (incl. Glossosomatidae)	26	2.04
Glossiphoniidae	25	1.97
Tipulidae	25	1.97
Baetidae	25	1.97
Leuctridae	24	1.89
Hydropsychidae	21	1.65
Goeridae	19	1.49
Ephemerellidae	18	1.42
Dendrocoelidae	18	1.42
Polycentropodidae	17	1.34
Piscicolidae	16	1.26
Leptophlebiidae	16	1.26
Gammaridae (incl. Crangonyctidae)	16	1.26
Chloroperlidae	15	1.18
Physidae	15	1.18
Haliplidae	13	1.02
Sericostomatidae	13	1.02
Asellidae	12	0.94
Taeniopterygidae	11	0.86
Heptageniidae	10	0.79
Calopterygidae	9	0.71
Beraeidae	9	0.71
Scirtidae	9	0.71
Erpobdellidae	8	0.63
Chironomidae	8	0.63
Oligochaeta	8	0.63
Gyrinidae	7	0.55
Ephemeridae	7	0.55
Libellulidae	5	0.39
Corixidae	5	0.39

Table 64 Species missed 5 times or more for all samples in the 1999 Audit

Species	n	% of missed species in 1999 audit
<i>Potamopyrgus jenkinsi</i> (Smith)	53	3.96
<i>Hydroptila</i> sp.	48	3.58
<i>Hydraena gracilis</i> Germar	43	3.21
<i>Polycelis felina</i> (Dalyell)	37	2.76
<i>Pisidium</i> sp.	37	2.76
<i>Elmis aenea</i> (Muller)	28	2.09
<i>Lymnaea peregra</i> (Muller)	25	1.87
<i>Caenis luctuosa</i> group	25	1.87
<i>Lepidostoma hirtum</i> (Fabricius)	23	1.72
<i>Ancylus fluviatilis</i> Muller	23	1.72
<i>Caenis rivulorum</i> Eaton	21	1.57
<i>Simulium</i> ( <i>Simulium</i> ) <i>ornatum</i> group	21	1.57
<i>Polycelis nigra</i> group	20	1.49
<i>Ephemerella ignita</i> (Poda)	18	1.34
<i>Type</i> sp.	17	1.27
<i>Limnephilidae</i> indet	17	1.27
<i>Dendrocoelum lacteum</i> (Muller)	17	1.27
<i>Piscicola geometra</i> (L.)	16	1.19
<i>Armiger crista</i> (L.)	15	1.12
<i>Tinodes waeneri</i> (L.)	15	1.12
<i>Helobdella stagnalis</i> (L.)	14	1.05
<i>Oreodytes sanmarkii</i> (Sahlberg)	14	1.05
<i>Valvata cristata</i> Muller	14	1.05
<i>Chloroperla torrentium</i> (Pictet)	13	0.97
<i>Sericostoma personatum</i> (Spence)	13	0.97
<i>Nemoura cambrica</i> group	12	0.90
<i>Leuctra fusca</i> (L.)	12	0.90
<i>Valvata piscinalis</i> (Muller)	12	0.90
<i>Bathyomphalus contortus</i> (L.)	12	0.90
<i>Helophorus</i> ( <i>Atracthelophorus</i> ) <i>brevipalpis</i> Bedel	12	0.90
<i>Gammarus pulex</i> (L.)	11	0.82
<i>Baetis rhodani</i> (Pictet)	11	0.82
<i>Mystacides azurea</i> (L.)	11	0.82
<i>Oulimnius</i> sp.	11	0.82
<i>Hydraena riparia</i> Kugelann	11	0.82
<i>Amphinemura sulcicollis</i> (Stephens)	11	0.82
<i>Psychomyia pusilla</i> (Fabricius)	11	0.82
<i>Silo pallipes</i> (Fabricius)	10	0.75
<i>Asellus aquaticus</i> (L.)	10	0.75
<i>Rhyacophila dorsalis</i> (Curtis)	10	0.75
<i>Limnius volckmari</i> (Panzer)	10	0.75
<i>Physa</i> sp.	9	0.67
<i>Dicranota</i> sp.	9	0.67
<i>Protonemura</i> sp.	9	0.67
<i>Glossiphonia complanata</i> (L.)	9	0.67
<i>Elodes</i> sp.	9	0.67
<i>Haliplus</i> sp.	8	0.60

Table 64 continued

Species	n	% of missed species in 1999 audit
<i>Brachyptera risi</i> (Morton)	8	0.60
<i>Oulimnius tuberculatus</i> (Muller)	8	0.60
<i>Limnephilus lunatus</i> Curtis	7	0.52
<i>Ithytrichia</i> sp.	7	0.52
<i>Crenobia alpina</i> (Dana)	7	0.52
<i>Caenis horaria</i> (L.)	7	0.52
<i>Paraleptophlebia</i> sp.	7	0.52
<i>Anisus vortex</i> (L.)	7	0.52
<i>Goera pilosa</i> (Fabricius)	7	0.52
<i>Sphaeriidae</i> indet	7	0.52
<i>Hydropsyche angustipennis</i> (Curtis)	7	0.52
<i>Nemurella picteti</i> Klapalek	6	0.45
<i>Agapetus</i> sp.	6	0.45
<i>Erpobdella octoculata</i> (L.)	6	0.45
<i>Dugesia tigrina</i> (Girard)	6	0.45
<i>Baetis vernus</i> Curtis	6	0.45
<i>Crangonyx pseudogracilis</i> Bousfield	6	0.45
<i>Plectrocnemia conspersa</i> (Curtis)	6	0.45
<i>Acrolochus lacustris</i> (L.)	6	0.45
<i>Cloeon dipterum</i> (L.)	6	0.45
<i>Glossosoma</i> sp.	6	0.45
<i>Gyraulus albus</i> (Muller)	6	0.45
<i>Lymnaea truncatula</i> (Muller)	6	0.45
<i>Nemoura avicularis</i> Morton	5	0.37
<i>Hippeutis complanatus</i> (L.)	5	0.37
<i>Atripsodes aterrimus</i> (Stephens)	5	0.37
<i>Hydropsyche</i> sp.	5	0.37
<i>Libellulidae</i> indet	5	0.37
<i>Beraea maurus</i> (Curtis)	5	0.37
<i>Leuctra hippopus</i> (Kempny)	5	0.37
<i>Simulium</i> (Nevermannia) <i>cryophilum</i> group	5	0.37
<i>Rhyacophila</i> sp.	5	0.37
<i>Leuctra inermis</i> Kempny	5	0.37
<i>Hydropsyche siltalai</i> Dohler	5	0.37
<i>Simulium</i> (Wilhelmia) sp.	5	0.37
<i>Polycentropus flavomaculatus</i> (Pictet)	5	0.37
<i>Ephemera danica</i> Muller	5	0.37
<i>Polycelis</i> sp.	5	0.37
<i>Leuctra geniculata</i> (Stephens)	5	0.37
<i>Physa fontinalis</i> (L.)	5	0.37
<i>Ecdyonurus</i> sp.	5	0.37
<i>Orthocladiinae</i>	5	0.37
<i>Orectochilus villosus</i> (Muller)	5	0.37
<i>Agabus</i> sp.	5	0.37
<i>Calopteryx splendens</i> (Harris)	5	0.37