

EA WATER QUALITY

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

Institute of Freshwater Ecology

CEH Report Ref: C00158/02



ENVIRONMENT
AGENCY

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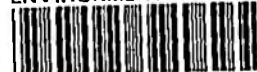
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Statement of Use

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 data produced in the Agency's internal Analytical Quality Control (AQC) scheme. This covers samples analysed 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 (GQA). Information in this report may be used to determine the AQC parameters used in individual laboratories as well as for estimating errors in the primary data form information obtained from AQC inspections.

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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 414 samples that were internally AQCD by Agency staff. The results of the Primary Audit, detailing the quality of the primary analysis of 501 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) 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

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 PRIMARY AUDIT

Family name	Presumed cause of error (see footnotes)
<u>VIAL</u>	
<u>BMWP taxa not found in vial</u>	
Planorbidae	12
Terrestrial snail in vial	
Baetidae *	1
Limnephilidae	7
<u>Additional BMWP taxa found in vial</u>	
Lepidostomatidae	7
Lepidostoma hirtum (Fabricius)	
<u>SAMPLE</u>	
<u>BMWP taxa not found in sample</u> (for samples where vial is broken or absent)	
N/a	
<u>Additional BMWP taxa found in sample</u>	
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)
<u>VIAL</u>	
<u>BMWP taxa not found in vial</u>	
Baetidae *	1
Limnephilidae	7
<u>Additional BMWP taxa found in vial</u>	
Lepidostomatidae	7
Lepidostoma hirtum (Fabricius)	
<u>SAMPLE</u>	
<u>BMWP taxa not found in sample</u> (for samples where vial is broken or absent)	
N/a	
<u>Additional BMWP 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 BMWP SCORE 8
ON NO. OF TAXA 1

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

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

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

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

5. RESULTS

The results of the 1999 AQC Audit for all Agency Regions are presented, Region by Region, in Tables 1 to 57. 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 an average 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 AQC Audit on the BMWP score and number of taxa for the Region's data. These results are again based on the target of an average 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 AQC Audit. Tables 58 and 59 summarise the statistics and effects of the 1999 AQC Audit for the whole of the Agency. Tables 60 and 61 give listings of all taxa, at family and species levels respectively, missed in sorting by the Agency's AQC inspectors. Tables 62 and 63 give similar listings of taxa missed 5 times or more for the entire 1999 audit for the whole of the UK. Data for the Primary 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) for the Primary Audit. Values are listed in the Primary Audit report (Gunn *et al.*, 2000) and can be used directly for RIVPACS. When basing bias on results from internal AQC inspections, it is necessary to add the net gains owing to errors made in AQC inspection to the net gains reported by the AQC. Errors made in AQC inspection 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". To estimate the bias over a different period to that covered by this audit, the value in Table 60 can still be used if the quality of AQC inspection is consistently good for the period under consideration (mean number of gains should be no more than 0.5, see Table 59). If the AQC inspection was of poor or varying quality, it is necessary to refer to the individual AQC Audit result sheets for individual audit 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 AQC INSPECTORS

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

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

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

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

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

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

Table 4 Statistics of the 1999 AQC 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	0.55	0.17	0	0	2	1.05	0.23
EIS	5	0.40	0.24	0	0	1	0.40	0.24
IMC	1	0	0	0	0	0	1.00	0
LJS	3	0.33	0.33	0	0	1	1.00	1.00
SEH	6	0.50	0.34	0	0	2	1.17	0.48
WTC	5	1.00	0.45	0	0	2	1.60	0.40
Eastern	19	0.84	0.23	2	10.53	3	1.05	0.31
CFW	7	1.00	0.53	2	28.57	3	1.29	0.75
CSA	3	0.33	0.33	0	0	1	0.67	0.33
JCW	2	1.50	0.50	0	0	2	1.50	0.50
JHS	7	0.71	0.29	0	0	2	0.86	0.40
Northern	21	0.43	0.13	0	0	2	0.67	0.19
CLP	3	0	0	0	0	0	0.33	0.33
IMC	12	0.42	0.15	0	0	1	0.67	0.22
RPC	6	0.67	0.33	0	0	2	0.83	0.48
Anglian Region	60	0.60	0.10	2	3.33	3	0.92	0.14

Table 5 Net effects of the AQC Audit on BMWP score and no. 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	0.90	0	11	0.25	0	2
EIS	5	2.40	0	7	0.40	0	1
IMC	1	-4.00	0	-4	-1.00	0	-1
LJS	3	0	0	0	0	0	0
SEH	6	-1.67	0	5	0	0	1
WTC	5	4.00	0	11	0.80	0	2
Eastern	19	4.05	5.26	14	0.68	5.26	3
CFW	7	5.00	14.29	14	0.71	14.29	3
CSA	3	0	0	3	0	0	1
JCW	2	7.50	0	12	1.50	0	2
JHS	7	3.86	0	12	0.71	0	2
Northern	21	1.48	0	10	0.24	0	1
CLP	3	-1.67	0	0	-0.33	0	0
IMC	12	2.33	0	10	0.25	0	1
RPC	6	1.33	0	5	0.50	0	1
Anglian Region	60	2.10	1.67	14	0.38	1.67	3

Table 6 The families missed in sorting by Anglian Region's AQC inspectors

Family	n	% of Anglian Region's missed families in AQC Audit
Hydroptilidae	3	8.82
Psychomyiidae (incl. Ecnomidae)	3	8.82
Polycentropodidae	3	8.82
Hydrobiidae (incl. Bithyniidae)	3	8.82
Caenidae	3	8.82
Planorbidae	2	5.88
Elmidae	2	5.88
Lymnaeidae	2	5.88
Hydrophilidae (incl. Hydraenidae)	2	5.88
Calopterygidae	1	2.94
Coenagrionidae	1	2.94
Gammaridae (incl. Crangonyctidae)	1	2.94
Haliplidae	1	2.94
Limnephilidae	1	2.94
Sphaeriidae	1	2.94
Notonectidae	1	2.94
Oligochaeta	1	2.94
Piscicolidae	1	2.94
Simuliidae	1	2.94
Leptoceridae	1	2.94
Total	34	100

Table 7 The species missed in sorting by Anglian Region's AQC inspectors

Species	n	% of Anglian Region's missed species in AQC Audit
Potamopyrgus jenkinsi (Smith)	3	8.57
Lymnaea peregra (Muller)	2	5.71
Caenis luctuosa group	2	5.71
Hydraena riparia Kugelann	2	5.71
Hydroptila sp.	2	5.71
Lype sp.	2	5.71
Neureclipsis bimaculata (L.)	2	5.71
Haliphus sp.	1	2.86
Anisus leucostoma (Millet)	1	2.86
Armiger crista (L.)	1	2.86
Athripsodes cinereus (Curtis)	1	2.86
Caenis horaria (L.)	1	2.86
Tinodes waeneri (L.)	1	2.86
Calopteryx splendens (Harris)	1	2.86
Crangonyx pseudogracilis Bousfield	1	2.86
Ischnura elegans (Van der Linden)	1	2.86
Halesus radiatus (Curtis)	1	2.86
Oulimnius tuberculatus (Muller)	1	2.86
Simulium (Simulium) ornatum group	1	2.86
Agraylea multipunctata Curtis	1	2.86
Polycentropus flavomaculatus (Pictet)	1	2.86
Tubificidae	1	2.86
Pisidium sp.	1	2.86
Piscicola geometra (L.)	1	2.86
Notonecta sp.	1	2.86
Oulimnius sp.	1	2.86
Cyrmus flavidus McLachlan	1	2.86
Total	35	100

AUDIT OF MIDLANDS REGION'S AQC INSPECTORS

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

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

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

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

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

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

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

River	Site	AQC Inspector	Losses	Gains	Omissions
Noe	Hope	5	0	4	0
Lady Bank Drain	d/s Sandy Lane PS	5	0	1	0
Day Brook	Basford	5	0	0	0
Smite	Colston Bassett	5	0	2	0
Ramsley Brook	u/s Worthington STW	5	1	0	0
Bar Brook	Baslow	5	0	2	0
Torne	Wadworth Carr	5	0	1	0
Kirton Tributary	d/s Ings Farm	5	0	0	0
Walling Brook	A60 Bridge	5	0	0	0
Braunstone Tributary	u/s Lubbesthorpe Brook	5	0	1	0
Normanton Brook	d/s Newbold Verdon	5	0	1	0
Huncote Brook	R. Soar confluence	5	0	0	0
Eau	Northorpe Station	5	0	1	0
The Beck	Kersall	5	0	1	0
Bottesford Beck	Snake Plantation	5	0	0	0
Trib. Radbourne Bk.	d/s Lees	5	0	0	0
Grace Dieu Brook	d/s Snarrows STW	5	0	0	0
Long Whatton Brook	u/s Long Whatton STW	5	1	1	0
Twyford Brook	d/s Findern STW	5	0	2	0
Maun	Inlet Kingsmill Reservoir	5	0	1	0

Table 12 Statistics of the 1999 AQC Audit for Midlands 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
Upper Severn	20	0.25	0.10	0	0	1	0.50	0.18
1	20	0.25	0.10	0	0	1	0.50	0.18
Lower Severn	20	0.55	0.17	1	5.00	3	0.65	0.20
11	20	0.55	0.17	1	5.00	3	0.65	0.20
Upper Trent	20	0.85	0.20	1	5.00	3	1.00	0.24
3	20	0.85	0.20	1	5.00	3	1.00	0.24
Lower Trent	20	0.90	0.23	1	5.00	4	1.00	0.23
5	20	0.90	0.23	1	5.00	4	1.00	0.23
Midlands Region	80	0.64	0.09	3	3.75	4	0.79	0.11

Table 13 Net effects of the AQC Audit on BMWP score and number of scoring taxa for Midlands 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
U. Severn	20	0.45	0	7	0	0	1
1	20	0.45	0	7	0	0	1
L. Severn	20	3.10	0	11	0.55	5.00	3
11	20	3.10	0	11	0.55	5.00	3
U. Trent	20	3.00	0	13	0.70	5.00	3
3	20	3.00	0	13	0.70	5.00	3
L. Trent	20	5.20	15.00	27	0.85	5.00	4
5	20	5.20	15.00	27	0.85	5.00	4
Midlands Region	80	2.94	3.75	27	0.53	3.75	4

Table 14 The families missed in sorting by Midland Region's AQC inspectors

Family	n	% of Midlands Region's missed families in AQC Audit
Planorbidae	5	11.36
Planariidae (incl. Dugesiidae)	4	9.09
Hydroptilidae	3	6.82
Caenidae	3	6.82
Elmidae	3	6.82
Gyrinidae	2	4.55
Hydrobiidae (incl. Bithyniidae)	2	4.55
Hydrophilidae (incl. Hydraenidae)	2	4.55
Lepidostomatidae	2	4.55
Simuliidae	2	4.55
Leptoceridae	2	4.55
Psychomyiidae (incl. Ecnomidae)	1	2.27
Calopterygidae	1	2.27
Chironomidae	1	2.27
Corixidae	1	2.27
Dendrocoelidae	1	2.27
Hydropsychidae	1	2.27
Glossiphoniidae	1	2.27
Haliplidae	1	2.27
Nemouridae	1	2.27
Beraeidae	1	2.27
Lymnaeidae	1	2.27
Valvatidae	1	2.27
Leptophlebiidae	1	2.27
Rhyacophilidae (incl. Glossosomatidae)	1	2.27
Total	44	100

Table 15 The species missed in sorting by Midlands Region's AQC inspectors

Species	n	% of Midlands Region's missed species in AQC Audit
Hydroptila sp.	3	6.38
Caenis luctuosa group	3	6.38
Polycelis felina (Dalyell)	3	6.38
Armiger crista (L.)	2	4.26
Helophorus (Atracelophorus) brevipalpis Bedel	2	4.26
Lepidostoma hirtum (Fabricius)	2	4.26
Limnius volckmari (Panzer)	2	4.26
Gyrinus sp.	1	2.13
Tinodes waeneri (L.)	1	2.13
Athripsodes aterrimus (Stephens)	1	2.13
Athripsodes sp.	1	2.13
Bathyomphalus contortus (L.)	1	2.13
Beraea maurus (Curtis)	1	2.13
Bithynia tentaculata (L.)	1	2.13
Simulium (Simulium) ornatum group	1	2.13
Calopteryx sp.	1	2.13
Corixidae indet	1	2.13
Dendrocoelum lacteum (Muller)	1	2.13
Elmis aenea (Muller)	1	2.13
Esolus parallelepipedus (Muller)	1	2.13
Hydropsyche sp.	1	2.13
Glossosoma sp.	1	2.13
Polycelis nigra group	1	2.13
Halipus sp.	1	2.13
Anisus vortex (L.)	1	2.13
Simulium (Boophthora) erythrocephalum (de Geer)	1	2.13
Valvata cristata Muller	1	2.13
Rhyacophila dorsalis (Curtis)	1	2.13
Protonemura sp.	1	2.13
Lymnaea peregra (Muller)	1	2.13
Ochthebius bicolon Germar	1	2.13
Orectochilus villosus (Muller)	1	2.13
Orthocladinae	1	2.13
Paraleptophlebia sp.	1	2.13
Planorbis sp.	1	2.13
Potamopyrgus jenkinsi (Smith)	1	2.13
Glossiphonia complanata (L.)	1	2.13
Total	47	100

AUDIT OF NORTH EAST REGION'S AQC INSPECTORS

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

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

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

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

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

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

Table 19 Statistics of the 1999 AQC 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	0.70	0.21	1	5.00	3	0.80	0.22
CJ	3	2.00	0.58	1	33.33	3	2.33	0.67
EA	11	0.55	0.25	0	0	2	0.64	0.24
JL	5	0.40	0.24	0	0	1	0.40	0.24
SW	1	0	0	0	0	0	0	0
Northumbria	20	0.60	0.20	1	5.00	3	0.60	0.20
EC	4	1.00	0.71	1	25.00	3	1.00	0.71
EWS	3	0.67	0.33	0	0	1	0.67	0.33
FC	11	0.36	0.20	0	0	2	0.36	0.20
JL	1	2.00	0	0	0	2	2.00	0
VW	1	0	0	0	0	0	0	0
Ridings	20	1.25	0.22	2	10.00	3	1.35	0.21
JB	10	1.30	0.40	2	20.00	3	1.30	0.40
RJJ	4	1.25	0.25	0	0	2	1.50	0.29
VH	6	1.17	0.31	0	0	2	1.33	0.21
North East Region	60	0.85	0.12	4	6.67	3	0.92	0.13

Table 20 Net effects of the AQC 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	3.80	10.00	20	0.65	5.00	3
CJ	3	11.00	33.33	20	2.00	33.33	3
EA	11	3.09	9.09	17	0.45	0	2
JL	5	1.80	0	5	0.40	0	1
SW	1	0	0	0	0	0	0
Northumbria	20	3.90	10.00	30	0.60	5.00	3
EC	4	8.25	25.00	30	1.00	25.00	3
EWS	3	2.33	0	4	0.67	0	1
FC	11	2.45	9.09	17	0.36	0	2
JL	1	11.00	0	11	2.00	0	2
VW	1	0	0	0	0	0	0
Ridings	20	6.35	10.00	15	1.20	10.00	3
JB	10	5.60	10.00	14	1.30	20.00	3
RJJ	4	7.50	0	13	1.00	0	2
VH	6	6.83	16.67	15	1.17	0	2
North East Region	60	4.68	10.00	30	0.82	6.67	3

Table 21 The families missed in sorting by North East Region's AQC inspectors

Family	n	% of North East Region's missed families in AQC Audit
Hydroptilidae	4	8.33
Sphaeriidae	4	8.33
Hydrophilidae (incl. Hydraenidae)	4	8.33
Planariidae (incl. Dugesiiidae)	3	6.25
Elmidae	3	6.25
Dendrocoelidae	2	4.17
Simuliidae	2	4.17
Baetidae	2	4.17
Psychomyiidae (incl. Ecnomidae)	2	4.17
Limnephilidae	2	4.17
Nemouridae	2	4.17
Hydrobiidae (incl. Bithyniidae)	1	2.08
Heptageniidae	1	2.08
Goeridae	1	2.08
Ephemerellidae	1	2.08
Dytiscidae (incl. Noteridae)	1	2.08
Caenidae	1	2.08
Glossiphoniidae	1	2.08
Hydropsychidae	1	2.08
Leuctridae	1	2.08
Valvatidae	1	2.08
Lymnaeidae	1	2.08
Physidae	1	2.08
Piscicolidae	1	2.08
Rhyacophilidae (incl. Glossosomatidae)	1	2.08
Sericostomatidae	1	2.08
Taeniopterygidae	1	2.08
Tipulidae	1	2.08
Leptoceridae	1	2.08
Total	48	100

Table 22 The species missed in sorting by North East Region's AQC inspectors

Species	n	% of North East Region's missed species in AQC Audit
Hydroptila sp.	4	8.00
Pisidium sp.	3	6.00
Hydraena gracilis Germar	3	6.00
Elmis aenea (Muller)	3	6.00
Polycelis felina (Dalyell)	2	4.00
Dendrocoelum lacteum (Muller)	2	4.00
Dugesia tigrina (Girard)	1	2.00
Ephemerella ignita (Poda)	1	2.00
Glossiphonia complanata (L.)	1	2.00
Lymnaea peregra (Muller)	1	2.00
Caenis rivulorum Eaton	1	2.00
Limnephilus lunatus Curtis	1	2.00
Goera pilosa (Fabricius)	1	2.00
Helophorus (Atracthelophorus) brevipalpis Bedel	1	2.00
Brachyptera risi (Morton)	1	2.00
Hydropsyche sp.	1	2.00
Baetis vernus Curtis	1	2.00
Leuctra hippopus (Kempny)	1	2.00
Limnephilus affinis/incisus	1	2.00
Glossosoma sp.	1	2.00
Piscicola geometra (L.)	1	2.00
Tinodes waeneri (L.)	1	2.00
Sphaeriidae indet	1	2.00
Simulium (Simulium) ornatum group	1	2.00
Simulium (Nevermannia) cryophilum group	1	2.00
Sericostoma personatum (Spence)	1	2.00
Rhithrogena sp.	1	2.00
Potamopyrgus jenkinsi (Smith)	1	2.00
Limnius volckmari (Panzer)	1	2.00
Platambus maculatus (L.)	1	2.00
Baetis rhodani (Pictet)	1	2.00
Physa sp.	1	2.00
Nemoura cambrica group	1	2.00
Nemoura avicularis Morton	1	2.00
Mystacides azurea (L.)	1	2.00
Lype sp.	1	2.00
Valvata cristata Muller	1	2.00
Limnophila (Brachylimnophila) sp.	1	2.00
Polycelis nigra group	1	2.00
Total	50	100

AUDIT OF NORTH WEST REGION'S AQC INSPECTORS

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

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

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

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

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

River	Site	AQC Inspector	Losses	Gains	Omissions
Baguley Brook	ptc Fairywell Brook	AG	0	0	0
Mersey	u/s Stockport ETW	AG	0	1	0
Luzley Brook	u/s Royton ETW	AG	0	2	0
Irk	ptc Wince Brook	AG	0	1	0
Dane	u/s Water Street	AG	0	1	0
Chorlton Brook	ptc R Mersey	AG	0	1	0
Norbury Brook	ptc Poynton Brook	AG	0	1	0
Chorlton Brook	ptc R. Mersey	AG	0	0	0
Stanney Brook	ptc Roch	KA	0	1	0
Roch	u/s Akzo Stream	KA	0	0	0
Tonge	ptc Bradshaw Brook	KA	0	0	0
Gale Brook	Gale Moss	KA	0	0	0
Roch	ptc R Beal	KA	0	1	0
Red Lion Brook	Jodrell Bank	KA	0	1	0
Irk	Hendam Vale	KA	0	1	0
Fairywell Brook	ptc Baguley Brook	KA	0	0	0
Piethorne Brook	u/s R Beal	KA	0	2	0
Roch	u/s Summit	KA	0	1	0
Medlock	d/s Strinesdale Reservoir	KA	0	2	0
Ogden	ptc Swinnel Brook	RMM	0	1	1

Table 26 Statistics of the 1999 AQC Audit for North West 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	0.65	0.23	1	5.00	4	1.20	0.31
AM	3	1.00	0.58	0	0.00	2	1.33	0.88
EIG	3	0.33	0.33	0	0.00	1	0.67	0.33
HFH	6	1.33	0.61	1	16.67	4	2.17	0.79
KCh	8	0.13	0.13	0	0.00	1	0.63	0.26
Northern	20	0.25	0.10	0	0.00	1	0.65	0.20
AJ	12	0.42	0.15	0	0.00	1	0.83	0.30
NC	1	0.00	0.00	0	0.00	0	0.00	0.00
NTC	7	0.00	0.00	0	0.00	0	0.43	0.20
Southern	20	0.85	0.15	0	0.00	2	0.90	0.16
AG	8	0.88	0.23	0	0.00	2	0.88	0.23
KA	11	0.82	0.23	0	0.00	2	0.82	0.23
RMM	1	1.00	0.00	0	0.00	1	2.00	0.00
North West Region	60	0.58	0.10	1	1.67	4	0.92	0.14

Table 27 Net effects of the AQC Audit on BMWP score and number of scoring taxa for North West 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	1.55	5.00	14	0.25	5.00	3
AM	3	4.33	0.00	10	0.67	0.00	1
EIG	3	0.00	0.00	7	0.00	0.00	1
HFH	6	3.50	16.67	14	0.83	16.67	3
KCh	8	-0.38	0.00	7	-0.25	0.00	0
Northern	20	-0.60	0.00	10	-0.15	0.00	1
AJ	12	0.50	0.00	10	0.00	0.00	1
NC	1	0.00	0.00	0	0.00	0.00	0
NTC	7	-2.57	0.00	0	-0.43	0.00	0
Southern	20	4.85	5.00	15	0.85	0.00	0
AG	8	4.63	0.00	10	0.88	0.00	2
KA	11	4.55	9.09	15	0.82	0.00	2
RMM	1	10.00	0.00	10	1.00	0.00	1
EA North West	60	1.93	3.33	15	0.32	1.67	3

Table 28 The families missed in sorting by North West Region's AQC inspectors

Family	n	% of North West Region's missed families in AQC Audit
Hydroptilidae	3	10.34
Nemouridae	3	10.34
Dytiscidae (incl. Noteridae)	2	6.90
Ephemerellidae	2	6.90
Hydrobiidae (incl. Bithyniidae)	2	6.90
Baetidae	1	3.45
Chloroperlidae	1	3.45
Elmidae	1	3.45
Gammaridae (incl. Crangonyctidae)	1	3.45
Heptageniidae	1	3.45
Asellidae	1	3.45
Leptoceridae	1	3.45
Valvatidae	1	3.45
Leuctridae	1	3.45
Limnephilidae	1	3.45
Lymnaeidae	1	3.45
Oligochaeta	1	3.45
Planariidae (incl. Dugesiidae)	1	3.45
Rhyacophilidae (incl. Glossosomatidae)	1	3.45
Simuliidae	1	3.45
Sphaeriidae	1	3.45
Hydrophilidae (incl. Hydraenidae)	1	3.45
Total	29	100

Table 29 The species missed in sorting by North West Region's AQC inspectors

Species	n	% of North West Region's missed species in AQC Audit
Nemoura cambrica group	2	6.90
Potamopyrgus jenkinsi (Smith)	2	6.90
Ephemerella ignita (Poda)	2	6.90
Oreodytes sanmarkii (Sahlberg)	2	6.90
Asellus aquaticus (L.)	1	3.45
Athripsodes aterrimus (Stephens)	1	3.45
Baetis rhodani (Pictet)	1	3.45
Chloroperla tripunctata (Scopoli)	1	3.45
Ecdyonurus sp.	1	3.45
Gammarus pulex (L.)	1	3.45
Hydroptila sp.	1	3.45
Ithytrichia sp.	1	3.45
Leuctra fusca (L.)	1	3.45
Anacaena globulus (Paykull)	1	3.45
Lymnaea peregra (Muller)	1	3.45
Valvata cristata Muller	1	3.45
Nemurella picteti Klapalek	1	3.45
Oligochaeta indet	1	3.45
Oulimnius sp.	1	3.45
Oxyethira sp.	1	3.45
Pisidium sp.	1	3.45
Polycelis felina (Dalyell)	1	3.45
Rhyacophila dorsalis (Curtis)	1	3.45
Simulium (Wilhelmia) sp.	1	3.45
Limnephilidae indet	1	3.45
Total	29	100

AUDIT OF SOUTHERN REGION'S AQC INSPECTORS

Table 30 The 2 AQCd samples audited for the Hants & Isle of Wight Area of Southern Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Anton	Pond Site	W9	0	0	0
Dun	Dunbridge	W9	0	0	0

Table 31 The 14 AQCd samples audited for the Kent Area of Southern Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Great Stour	Longport Bridge	E1	0	0	0
Teise	Dundale Farm	E1	0	0	0
Crane Brook	Golford	E1	0	1	0
Socknersh Stream	Clapsons Bridge	E1	0	1	0
Medway	East Farleigh	E1	0	0	0
Sissinghurst Stream	Sissinghurst Castle Road	E1	0	3	0
Ditton Stream	u/s East Malling	E1	0	0	0
Sissinghurst Stream	Sissinghurst Castle Road	E1	0	0	0
Knell Petty Sewer	A268 Bridge	E28	0	1	0
Blackbrook Petty Sewer	d/s Wittersham STW	E28	0	0	0
Mill Stream	d/s Discharge	E28	0	0	0
Drainage Ditch	u/s Control site	E28	0	0	0
Great Stour	Rippers Cross	E28	1	0	0
Darent	Sundridge	E28	0	1	0

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

River	Site	AQC Inspector	Losses	Gains	Omissions
Black Sewer	d/s Steyning STW	W15	0	0	0
Boldings Brook	d/s Brookhurst Wood LFS	W15	0	0	0
Stanbridge Stream	d/s Petersfield STW	W15	0	1	0
Ashbourne	d/s Shammer Wood GS	W15	0	0	1
Chess Stream	d/s Park Farm	W15	2	2	0
Pagham Rife	Runcton Trib	W15	0	0	0
Uck	d/s Lephams Bridge Stream	W15	0	0	0
Pevensey Haven	Broadwater	W15	0	2	1
Combe Haven	Sheepwash Gates	W15	0	0	0
Adur West	Bines Bridge	W15	0	0	0
Balcombe Lake Stream	d/s Culvert	W26	1	0	0
Ouse	d/s Staplefield STW	W26	0	0	0
Powdermill Stream	d/s Pepperling Eye Farm	W26	0	0	0
Pagham Rife	u/s Harbour Wall	W26	0	0	0
Loxwood Stream	Sydney Farm	W26	0	1	0
Ridgewood Stream	A26 Bridge	W26	0	1	0
Pagham Rife	d/s Pagham STW	W26	1	0	0
Elbridge Rife	Colworth Farm	W26	0	0	0
Nursling Stream	u/s Road Bridge	W26	1	0	0
Black Ditch	Lyminster	W26	0	1	0

Table 33 Statistics of the 1999 AQC 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
Hants & I.O.W.	2	0	0	0	0	0	0	0
W9	2	0	0	0	0	0	0	0
Kent	14	0.50	0.23	1	7.14	3	0.57	0.23
E1	8	0.63	0.38	1	12.50	3	0.63	0.38
E28	6	0.33	0.21	0	0	1	0.50	0.22
Sussex	20	0.40	0.15	0	0	2	0.75	0.24
W15	10	0.50	0.27	0	0	2	0.90	0.46
W26	10	0.30	0.15	0	0	1	0.60	0.16
Southern Region	36	0.42	0.12	1	2.78	3	0.64	0.16

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
Hants & I.O.W.	2	0	0	0	0	0	0
W9	2	0	0	0	0	0	0
Kent	14	2.36	0	13	0.43	7.14	3
E1	8	3.50	0	13	0.63	12.50	3
E28	6	0.83	0	5	0.17	0	1
Sussex	20	1.80	5.00	14	0.15	0	2
W15	10	2.60	10.00	14	0.30	0	2
W26	10	1.00	0	10	0	0	1
Southern Region	36	1.92	2.78	14	0.25	2.78	3

Table 35 The families missed in sorting by Southern Region's AQC inspectors

Family	n	% of Southern Region's missed families in AQC Audit
Planariidae (incl. Dugesiidae)	2	15.38
Taeniopterygidae	1	7.69
Piscicolidae	1	7.69
Phryganeidae	1	7.69
Leptoceridae	1	7.69
Lepidostomatidae	1	7.69
Hydrophilidae (incl. Hydraenidae)	1	7.69
Ephemeridae	1	7.69
Elmidae	1	7.69
Dytiscidae (incl. Noteridae)	1	7.69
Dendrocoelidae	1	7.69
Baetidae	1	7.69
Total	13	100

Table 36 The species missed in sorting by Southern Region's AQC inspectors

Species	n	% of Southern Region's missed species in AQC Audit
Polycelis nigra group	2	15.38
Piscicola geometra (L.)	1	7.69
Phryganea bipunctata Retzius	1	7.69
Mystacides azurea (L.)	1	7.69
Lepidostoma hirtum (Fabricius)	1	7.69
Hydraena riparia Kugelann	1	7.69
Ephemera danica Muller	1	7.69
Elmis aenea (Muller)	1	7.69
Dendrocoelum lacteum (Muller)	1	7.69
Cloeon dipterum (L.)	1	7.69
Brachyptera risi (Morton)	1	7.69
Agabus sp.	1	7.69
Total	13	100

AUDIT OF SOUTH WEST REGION'S AQC INSPECTORS

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

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

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

River	Site	AQC Inspector	Losses	Gains	Omissions
Aller Brook	Sainsburys	AD	0	1	0
Chudleigh Knighton	u/s SD1 WBB	AD	1	0	0
Leighty Water	d/s Cottages, u/s Road Bridge	AD	0	0	0
Limecombe Water	u/s Bale Water confluence	AD	0	1	0
Teign	u/s SD4, d/s SD3	AD	0	0	0
Teign	d/s SD9	AD	0	0	0
Leighty Water	Site 1, u/s discharge	AH	1	0	0
Barnstable Yeo	d/s Discharge	AJH	0	0	0
Buckland Stream	u/s SD18	APH	0	1	0
Buckland Stream	d/s SD18	APH	0	0	0
Umbourne Brook	u/s Wilmington Fish Farm discharge	APH	0	0	0
Teign	u/s SD3	LB	0	1	0
Chudleigh Knighton Stream	u/s SD1	LMB	0	0	0

Table 39 The 7 AQCD samples audited for North Wessex Area of South West Region

River	Site	AQC Inspector	Losses	Gains	Omissions
St Catherines Brook	Chilcombe Bottom	AB	0	0	0
St Catherines Brook	Rodney Farm Stream	AB	0	0	0
Sherston Avon	Easton Grey, Natural riffle	AB	0	1	0
Sherston Avon	Easton Grey, Artificial riffle	AB	0	0	0
Tetbury Avon	Slade Farm	WO	0	0	0
Tetbury Avon	Brokenborough	WO	0	0	0
Luckington Brook	d/s Fenced Section	WO	0	1	0

Table 40 The 10 AQCD samples audited for South Wessex Area of South West Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Frome	Burton	PRH	0	0	0
Chitterne Brook	Chitterne Church	PRH	0	0	0
Chitterne Brook	New Road	PRH	0	1	0
Sem	Lower Leigh Farm	PRH	0	0	0
Allen	Monkton up Wimborne	PRH	0	0	0
Allen	u/s All Hallows CBs	PRH	0	1	0
Gussage Stream	Amen Corner	PRH	0	0	0
Bourne	Tidworth	PRH	0	0	0
Nine Mile River	Sheep Bridge	PRH	0	0	0
Fonthill Brook	Hillground Copse	PRH	0	0	0

Table 41 Statistics of the 1999 AQC Audit for South West 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
Cornwall	20	0.45	0.14	0	0	2	0.70	0.19
DS	3	0.33	0.33	0	0	1	1.33	0.88
JMB	4	0.25	0.25	0	0	1	0.50	0.50
SG	1	0.00	0.00	0	0	0	0.00	0.00
TG	12	0.58	0.19	0	0	2	0.67	0.19
Devon	13	0.31	0.13	0	0	1	0.46	0.14
AD	6	0.33	0.21	0	0	1	0.50	0.22
AH	1	0.00	0.00	0	0	0	1.00	0.00
AJH	1	0.00	0.00	0	0	0	0.00	0.00
APH	3	0.33	0.33	0	0	1	0.33	0.33
LB	1	1.00	0.00	0	0	1	1.00	0.00
LMB	1	0.00	0.00	0	0	0	0.00	0.00
North Wessex	7	0.29	0.18	0	0	1	0.29	0.18
AB	4	0.25	0.25	0	0	1	0.25	0.25
WO	3	0.33	0.33	0	0	1	0.33	0.33
South Wessex	10	0.20	0.13	0	0	1	0.20	0.13
PRH	10	0.20	0.13	0	0	1	0.20	0.13
South West Region	50	0.34	0.07	0	0	2	0.48	0.10

Table 42 Net effects of the AQC Audit on BMWP score and number of scoring taxa for South West 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
Cornwall	20	2.00	0	10	0.25	0	2
DS	3	-2.67	0	0	-0.33	0	0
JMB	4	-0.50	0	0	0.00	0	0
SG	1	0.00	0	0	0.00	0	0
TG	12	4.17	0	10	0.50	0	2
Devon	13	1.31	0	10	0.15	0	1
AD	6	1.67	0	10	0.17	0	1
AH	1	-5.00	0	-5	-1.00	0	-1
AJH	1	0.00	0	0	0.00	0	0
APH	3	2.33	0	7	0.33	0	1
LB	1	5.00	0	5	1.00	0	1
LMB	1	0.00	0	0	0.00	0	0
N. Wessex	7	1.29	0	5	0.29	0	1
AB	4	1.25	0	5	0.25	0	1
WO	3	1.33	0	4	0.33	0	1
S. Wessex	10	1.00	0	5	0.20	0	1
PRH	10	1.00	0	5	0.20	0	1
South West Region	50	1.52	0	10	0.22	0	2

Table 43 The families missed in sorting by South West Region's AQC inspectors

Family	n	% of South West Region's missed families in AQC Audit
Planariidae (incl. Dugesiidae)	2	13.33
Sphaeriidae	1	6.67
Sericostomatidae	1	6.67
Piscicolidae	1	6.67
Nemouridae	1	6.67
Limnephilidae	1	6.67
Leptoceridae	1	6.67
Lepidostomatidae	1	6.67
Hydrophilidae (incl. Hydraenidae)	1	6.67
Hydrobiidae (incl. Bithyniidae)	1	6.67
Halplidae	1	6.67
Glossiphoniidae	1	6.67
Calopterygidae	1	6.67
Caenidae	1	6.67
Total	15	100

Table 44 The species missed in sorting by South West Region's AQC inspectors

Species	n	% of South West Region's missed species in AQC Audit
Sphaeriidae indet	1	6.67
Sericostoma personatum (Spence)	1	6.67
Protonemura sp.	1	6.67
Potamopyrgus jenkinsi (Smith)	1	6.67
Polycelis nigra group	1	6.67
Polycelis felina (Dalyell)	1	6.67
Piscicola geometra (L.)	1	6.67
Lepidostoma hirtum (Fabricius)	1	6.67
Hydraena riparia Kugelann	1	6.67
Helobdella stagnalis (L.)	1	6.67
Halplidae indet	1	6.67
Drusus annulatus (Stephens)	1	6.67
Calopteryx sp.	1	6.67
Caenis rivulorum Eaton	1	6.67
Athripsodes sp.	1	6.67
Total	15	100

AUDIT OF THAMES REGION'S AQC INSPECTORS

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

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

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

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

Table 47 Statistics of the 1999 AQC 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	1.30	0.27	3	15.00	4	1.40	0.27
307	7	1.00	0.53	1	14.29	4	1.14	0.55
317	11	1.09	0.21	0	0	2	1.18	0.18
MW	2	3.50	0.50	2	100.00	4	3.50	0.50
Hatfield	20	0.70	0.18	1	5.00	3	0.85	0.21
DJL	13	0.69	0.24	1	7.69	3	0.77	0.23
JE	7	0.71	0.29	0	0	2	1.00	0.44
Wallingford	0	-	-	-	-	-	-	-
Thames Region	40	1.00	0.17	4	10.00	4	1.13	0.17

Table 48 Net effects of the AQC 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	6.80	25.00	17	1.20	15.00	4
307	7	3.86	14.29	17	0.86	14.29	4
317	11	7.18	18.18	17	1.00	0	2
MW	2	15.00	100.00	16	3.50	100.00	4
Hatfield	20	2.85	0	11	0.60	5.00	3
DJL	13	2.92	0	11	0.62	7.69	3
JE	7	2.71	0	7	0.57	0	1
Wallingford	0	-	-	-	-	-	-
Thames Region	40	4.83	12.50	17	0.90	10.00	4

Table 49 The families missed in sorting by Thames Region's AQC inspectors

Family	n	% of Thames Region's missed families in AQC Audit
Elmidae	3	8.11
Valvatidae	3	8.11
Hydropsychidae	3	8.11
Simuliidae	2	5.41
Planorbidae	2	5.41
Planariidae (incl. Dugesiidae)	2	5.41
Glossiphoniidae	2	5.41
Lymnaeidae	2	5.41
Hydrobiidae (incl. Bithyniidae)	2	5.41
Ancylidae (incl. Acroloxidae)	2	5.41
Limnephilidae	1	2.70
Baetidae	1	2.70
Beraeidae	1	2.70
Caenidae	1	2.70
Erpobdellidae	1	2.70
Lepidostomatidae	1	2.70
Leptophlebiidae	1	2.70
Nemouridae	1	2.70
Notonectidae	1	2.70
Physidae	1	2.70
Piscicolidae	1	2.70
Rhyacophilidae (incl. Glossosomatidae)	1	2.70
Tipulidae	1	2.70
Leptoceridae	1	2.70
Total	37	100

Table 50 The species missed in sorting by Thames Region's AQC inspectors

Species	n	% of Thames Region's missed species in AQC Audit
<i>Elmis aenea</i> (Muller)	2	5.13
<i>Ancylus fluviatilis</i> Muller	2	5.13
<i>Armiger crista</i> (L.)	2	5.13
<i>Valvata piscinalis</i> (Muller)	2	5.13
<i>Potamopyrgus jenkinsi</i> (Smith)	2	5.13
<i>Hydropsyche angustipennis</i> (Curtis)	2	5.13
<i>Helobdella stagnalis</i> (L.)	1	2.56
<i>Helius</i> sp.	1	2.56
<i>Glossiphonia complanata</i> (L.)	1	2.56
<i>Erpobdella octoculata</i> (L.)	1	2.56
<i>Hydropsyche contubernalis</i> McLachlan	1	2.56
<i>Dugesia polychroa</i> group	1	2.56
<i>Lymnaea peregra</i> (Muller)	1	2.56
<i>Cloeon dipterum</i> (L.)	1	2.56
<i>Caenis luctuosa</i> group	1	2.56
<i>Beraeodes minutus</i> (L.)	1	2.56
<i>Dugesia tigrina</i> (Girard)	1	2.56
<i>Oulimnius tuberculatus</i> (Muller)	1	2.56
<i>Valvata cristata</i> Muller	1	2.56
<i>Simulium</i> sp.	1	2.56
<i>Simulium</i> (<i>Simulium</i>) <i>ornatum</i> group	1	2.56
<i>Polycelis</i> sp.	1	2.56
<i>Piscicola geometra</i> (L.)	1	2.56
<i>Lepidostoma hirtum</i> (Fabricius)	1	2.56
<i>Paraleptophlebia</i> sp.	1	2.56
<i>Agapetus</i> sp.	1	2.56
<i>Oulimnius</i> sp.	1	2.56
<i>Notonecta</i> sp.	1	2.56
<i>Nemurella picteti</i> Klapalek	1	2.56
<i>Mystacides azurea</i> (L.)	1	2.56
<i>Lymnaea truncatula</i> (Muller)	1	2.56
<i>Limnephilidae</i> indet	1	2.56
<i>Physa</i> sp.	1	2.56
Total	39	100

AUDIT OF WELSH REGION'S AQC INSPECTORS

Table 51 The 8 AQCd samples audited for Northern Area of Welsh Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Seiont	Pont Gromlech	376	1	2	0
Shotwick Brook	Site 5	376	0	2	0
Afon Merddwr	Pentrefoelas	376	1	3	0
Singret Brook	Singret Cottage	377	1	0	0
Un-named Tributary	Lobster Pot	377	0	0	0
Seiont	Pen Llyn	377	0	0	0
Singret Brook	d/s Manhole, d/s Footbridge	377	0	1	0
Seiont	u/s Pont Crawia Hatchery	377	0	1	0

Table 52 The 10 AQCd samples audited for South Eastern Area of Welsh Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Arrow	Kington	370	1	0	0
Glanaloers Tributary	u/s Dulas	370	1	1	0
Catbrook	u/s Wood	370	0	0	0
Monnow	Alltrynrhys	370	2	1	0
Cynon	u/s Cwmpennar	370	0	0	0
Taf Fawr	d/s Llwynon WTW	370	0	0	0
Wye	Rhayader	370	0	1	0
Ithon	u/s Wye	370	0	1	0
Tributary	d/s Bwlch Gwyn	375	0	0	0
Senni	u/s Usk	375	0	0	0

Table 53 The 10 AQCd samples audited for South Western Area of Welsh Region

River	Site	AQC Inspector	Losses	Gains	Omissions
Clydach	u/s Confluence	361	1	2	0
Cywyn Tributary	u/s Discharge	361	0	0	0
Hubberston Pill	Lower Thornton	361	1	0	1
Clettwr Fach	By Church, u/s Pontsian	361	0	0	0
Duar Tributary	u/s Tanycoed Cochion	361	0	0	1
Hubberston Stream	u/s Dowty Stream	362	0	1	0
Duar	d/s Bridge Rhydybont Farm	362	0	1	0
Cywyn	u/s Asgood Tributary	W27	0	1	0
Pelenna	Efail Fach	W27	0	2	0
Afan	Afan Argoed Country Park	W27	0	0	0

Table 54 Statistics of the 1999 AQC 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
Northern	8	1.13	0.40	1	12.50	3	1.50	0.50
376	3	2.33	0.33	1	33.33	3	3.00	0.58
377	5	0.40	0.24	0	0	1	0.60	0.24
South Eastern	10	0.40	0.16	0	0	1	0.80	0.33
370	8	0.50	0.19	0	0	1	1.00	0.38
375	2	0	0	0	0	0	0	0
South Western	10	0.70	0.26	0	0	2	1.10	0.31
361	5	0.40	0.40	0	0	2	1.20	0.58
362	2	1.00	0	0	0	1	1.00	0
W27	3	1.00	0.58	0	0	2	1.00	0.58
Welsh Region	28	0.71	0.16	1	3.57	3	1.11	0.21

Table 55 Net effects of the AQC Audit on BMWP score and number of scoring taxa for Welsh 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
Northern	9	3.22	0	12	0.67	0	2
	1	0	0	0	0	0	0
376	3	7.33	0	12	1.67	0	2
377	5	1.40	0	5	0.20	0	1
S. Eastern	10	-0.30	0	6	0	0	1
370	8	-0.38	0	6	0	0	1
375	2	0	0	0	0	0	0
S. Western	10	5.10	10.00	20	0.50	0	2
361	5	0.80	0	7	0	0	1
362	2	8.50	0	10	1.00	0	1
W27	3	10.00	33.33	20	1.00	0	2
Welsh Region	28	2.75	3.57	20	0.39	0	2

Table 56 The families missed in sorting by Welsh Region's AQC inspectors

Family	n	% of Welsh Region's missed families in AQC Audit
Sphaeriidae	2	13.33
Planariidae (incl. Dugesidae)	2	13.33
Simuliidae	1	6.67
Nemouridae	1	6.67
Limnephilidae	1	6.67
Lepidostomatidae	1	6.67
Hydroptilidae	1	6.67
Hydrophilidae (incl. Hydraenidae)	1	6.67
Goeridae	1	6.67
Ephemeridae	1	6.67
Dendrocoelidae	1	6.67
Chloroperlidae	1	6.67
Ancylidae (incl. Acroloxidae)	1	6.67
Total	15	100

Table 57 The species missed in sorting by Welsh Region's AQC inspectors

Species	n	% of Welsh Region's missed species in AQC Audit
Polycelis felina (Dalyell)	2	12.50
Pisidium sp.	2	12.50
Simulium (Simulium) noelleri Friederichs	1	6.25
Silo pallipes (Fabricius)	1	6.25
Protonemura sp.	1	6.25
Nemoura cambrica group	1	6.25
Limnephilidae indet	1	6.25
Lasiocephala basalis (Kolenati)	1	6.25
Hydroptila sp.	1	6.25
Hydraena gracilis Germar	1	6.25
Ephemera danica Muller	1	6.25
Dendrocoelum lacteum (Muller)	1	6.25
Chloroperla torrentium (Pictet)	1	6.25
Ancylus fluviatilis Muller	1	6.25
Total	16	100

SUMMARY OF AQC AUDIT FOR ENVIRONMENT AGENCY

Table 58 Statistics of the 1999 AQC Audit for each Agency region and laboratory

Region/Area	n	Mean gains	Standard error	No.samples >2 gains	% samples >2 gains	Highest no. gains	Mean errors (1+g+o)	Standard error
Anglian	60	0.60	0.10	2	3.33	3	0.92	0.14
Central	20	0.55	0.17	0	0	2	1.05	0.23
Eastern	19	0.84	0.23	2	10.53	3	1.05	0.31
Northern	21	0.43	0.13	0	0	2	0.67	0.19
Midlands	80	0.64	0.09	3	3.75	4	0.79	0.11
Upper Severn	20	0.25	0.10	0	0	1	0.50	0.18
Lower Severn	20	0.55	0.17	1	5.00	3	0.65	0.20
Upper Trent	20	0.85	0.20	1	5.00	3	1.00	0.24
Lower Trent	20	0.90	0.23	1	5.00	4	1.00	0.23
North East	60	0.85	0.12	4	6.67	3	0.92	0.13
Dales	20	0.70	0.21	1	5.00	3	0.80	0.22
Northumbria	20	0.60	0.20	1	5.00	3	0.60	0.20
Ridings	20	1.25	0.22	2	10.00	3	1.35	0.21
North West	60	0.58	0.10	1	1.67	4	0.92	0.14
Central	20	0.65	0.23	1	5.00	4	1.20	0.31
Northern	20	0.25	0.10	0	0	1	0.65	0.20
Southern	20	0.85	0.15	0	0	2	0.90	0.16
Southern	36	0.42	0.12	1	2.78	3	0.64	0.16
Hants & I.O.W.	2	0	0	0	0	0	0	0
Kent	14	0.50	0.23	1	7.14	3	0.57	0.23
Sussex	20	0.40	0.15	0	0	2	0.75	0.24
South West	50	0.34	0.07	0	0	2	0.48	0.10
Cornwall	20	0.45	0.14	0	0	2	0.70	0.19
Devon	13	0.31	0.13	0	0	1	0.46	0.14
North Wessex	7	0.29	0.18	0	0	1	0.29	0.18
South Wessex	10	0.20	0.13	0	0	1	0.20	0.13
Thames	40	1.00	0.17	4	10.00	4	1.13	0.17
Frimley	20	1.30	0.27	3	15.00	4	1.40	0.27
Hatfield	20	0.70	0.18	1	5.00	3	0.85	0.21
Wallingford	0	-	-	-	-	-	-	-
Wales	28	0.71	0.16	1	3.57	3	1.11	0.21
Northern	8	1.13	0.40	1	12.50	3	1.50	0.50
South Eastern	10	0.40	0.16	0	0	1	0.80	0.33
South Western	10	0.70	0.26	0	0	2	1.10	0.31
Whole Agency	414	0.64	0.04	16	3.86	4	0.85	0.05

Table 59 Net effects of the 1999 AQC Audit on BMWP score and number of scoring taxa for each Agency region and laboratory

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	2.10	1.67	14	0.38	1.67	3
Central	20	0.90	0	11	0.25	0	2
Eastern	19	4.05	5.26	14	0.68	5.26	3
Northern	21	1.48	0	10	0.24	0	1
Midlands	80	2.94	3.75	27	0.53	3.75	4
U. Severn	20	0.45	0	7	0	0	1
L. Severn	20	3.10	0	11	0.55	5.00	3
U. Trent	20	3.00	0	13	0.70	5.00	3
L. Trent	20	5.20	15.00	27	0.85	5.00	4
North East	60	4.68	10.00	30	0.82	6.67	3
Dales	20	3.80	10.00	20	0.65	5.00	3
Northumbria	20	3.90	10.00	30	0.60	5.00	3
Ridings	20	6.35	10.00	15	1.20	10.00	3
North West	60	1.93	3.33	15	0.32	1.67	3
Central	20	1.55	5.00	14	0.25	5.00	3
Northern	20	-0.60	0	10	-0.15	0	1
Southern	20	4.85	5.00	15	0.85	0	2
Southern	36	1.92	2.78	14	0.25	2.78	3
Hants & I.O.W.	2	0	0	0	0	0	0
Kent	14	2.36	0	13	0.43	7.14	3
Sussex	20	1.80	5.00	14	0.15	0	2
South West	50	1.52	0	10	0.22	0	2
Cornwall	20	2.00	0	10	0.25	0	2
Devon	13	1.31	0	10	0.15	0	1
N. Wessex	7	1.29	0	5	0.29	0	1
S. Wessex	10	1.00	0	5	0.20	0	1
Thames	40	4.83	12.50	17	0.90	10.00	4
Frimley	20	6.80	25.00	17	1.20	15.00	4
Hatfield	20	2.85	0	11	0.60	5.00	3
Wallingford	0	-	-	-	-	-	-
Wales	28	2.75	3.57	20	0.39	0	2
Northern	9	3.22	0	12	0.67	0	2
S. Eastern	10	-0.30	0	6	0	0	1
S. Western	10	5.10	10.00	20	0.50	0	2
Whole Agency	414	2.83	4.59	30	0.48	3.38	4

Table 60 The families missed in sorting by the Agency's AQC inspectors

Family	n	% of Agency's missed families in AQC Audit
Planariidae (incl. Dugesiidae)	16	6.81
Hydroptilidae	14	5.96
Elmidae	13	5.53
Hydrophilidae (incl. Hydraenidae)	12	5.11
Hydrobiidae (incl. Bithyniidae)	11	4.68
Caenidae	9	3.83
Planorbidae	9	3.83
Sphaeriidae	9	3.83
Nemouridae	9	3.83
Simuliidae	9	3.83
Leptoceridae	8	3.40
Limnephilidae	7	2.98
Lymnaeidae	7	2.98
Valvatidae	6	2.55
Psychomyiidae (incl. Ecnomidae)	6	2.55
Lepidostomatidae	6	2.55
Glossiphoniidae	5	2.13
Piscicolidae	5	2.13
Hydropsychidae	5	2.13
Baetidae	5	2.13
Dendrocoelidae	5	2.13
Dytiscidae (incl. Noteridae)	4	1.70
Rhyacophilidae (incl. Glossosomatidae)	4	1.70
Haliplidae	3	1.28
Calopterygidae	3	1.28
Ephemerellidae	3	1.28
Polycentropodidae	3	1.28
Ancylidae (incl. Acroloxidae)	3	1.28
Tipulidae	2	0.85
Sericostomatidae	2	0.85
Beraeidae	2	0.85
Physidae	2	0.85
Chloroperlidae	2	0.85
Heptageniidae	2	0.85
Oligochaeta	2	0.85
Notonectidae	2	0.85
Ephemeridae	2	0.85
Gammaridae (incl. Crangonyctidae)	2	0.85
Leuctridae	2	0.85
Goeridae	2	0.85
Gyrinidae	2	0.85
Leptophlebiidae	2	0.85
Taeniopterygidae	2	0.85
Erpobdellidae	1	0.43
Corixidae	1	0.43
Coenagrionidae	1	0.43
Chironomidae	1	0.43
Asellidae	1	0.43
Phryganeidae	1	0.43
Total	235	100

Table 61 The species missed in sorting by the Agency's AQC inspectors

Species	n	% of Agency's missed species in AQC Audit
Hydroptila sp.	11	4.51
Potamopyrgus jenkinsi (Smith)	10	4.10
Polycelis felina (Dalyell)	9	3.69
Elmis aenea (Muller)	7	2.87
Pisidium sp.	7	2.87
Caenis luctuosa group	6	2.46
Lymnaea peregra (Muller)	6	2.46
Piscicola geometra (L.)	5	2.05
Armiger crista (L.)	5	2.05
Polycelis nigra group	5	2.05
Dendrocoelum lacteum (Muller)	5	2.05
Lepidostoma hirtum (Fabricius)	5	2.05
Hydraena riparia Kugelann	4	1.64
Simulium (Simulium) ornatum group	4	1.64
Nemoura cambrica group	4	1.64
Valvata cristata Muller	4	1.64
Hydraena gracilis Germar	4	1.64
Oulimnius sp.	3	1.23
Limnephilidae indet	3	1.23
Helophorus (Atracthelophorus) brevipalpis Bedel	3	1.23
Glossiphonia complanata (L.)	3	1.23
Limnius volckmari (Panzer)	3	1.23
Mystacides azurea (L.)	3	1.23
Ephemerella ignita (Poda)	3	1.23
Ancylus fluviatilis Muller	3	1.23
Tinodes waeneri (L.)	3	1.23
Protonemura sp.	3	1.23
Lype sp.	3	1.23
Caenis rivulorum Eaton	2	0.82
Athripsodes aterrimus (Stephens)	2	0.82
Athripsodes sp.	2	0.82
Baetis rhodani (Pictet)	2	0.82
Brachyptera risi (Morton)	2	0.82
Valvata piscinalis (Muller)	2	0.82
Ephemera danica Muller	2	0.82
Hydropsyche angustipennis (Curtis)	2	0.82
Calopteryx sp.	2	0.82
Cloeon dipterum (L.)	2	0.82
Helobdella stagnalis (L.)	2	0.82
Haliphus sp.	2	0.82
Glossosoma sp.	2	0.82
Dugesia tigrina (Girard)	2	0.82
Hydropsyche sp.	2	0.82
Notonecta sp.	2	0.82
Oreodytes sanmarkii (Sahlberg)	2	0.82
Physa sp.	2	0.82
Sericostoma personatum (Spence)	2	0.82

Table 61 continued

Species	n	% of Agency's missed species in AQC Audit
Paraleptophlebia sp.	2	0.82
Sphaeriidae indet	2	0.82
Oulimnius tuberculatus (Muller)	2	0.82
Neureclipsis bimaculata (L.)	2	0.82
Rhyacophila dorsalis (Curtis)	2	0.82
Nemurella picteti Klapalek	2	0.82
Chloroperla tripunctata (Scopoli)	1	0.41
Chloroperla torrentium (Pictet)	1	0.41
Corixidae indet	1	0.41
Crangonyx pseudogracilis Bousfield	1	0.41
Silo pallipes (Fabricius)	1	0.41
Simulium (Boophthora) erythrocephalum (de Geer)	1	0.41
Caenis horaria (L.)	1	0.41
Cymus flavidus Mclachlan	1	0.41
Simulium (Nevermannia) cryophilum group	1	0.41
Bithynia tentaculata (L.)	1	0.41
Calopteryx splendens (Harris)	1	0.41
Athripsodes cinereus (Curtis)	1	0.41
Agapetus sp.	1	0.41
Agraylea multipunctata Curtis	1	0.41
Anacaena globulus (Paykull)	1	0.41
Tubificidae	1	0.41
Anisus leucostoma (Millet)	1	0.41
Anisus vortex (L.)	1	0.41
Beraea maurus (Curtis)	1	0.41
Simulium sp.	1	0.41
Beraeodes minutus (L.)	1	0.41
Simulium (Wilhelmia) sp.	1	0.41
Simulium (Simulium) noelleri Friederichs	1	0.41
Baetis vernalis Curtis	1	0.41
Polycelis sp.	1	0.41
Bathyomphalus contortus (L.)	1	0.41
Rhithrogena sp.	1	0.41
Asellus aquaticus (L.)	1	0.41
Lasiocephala basalis (Kolenati)	1	0.41
Polycentropus flavomaculatus (Pictet)	1	0.41
Orectochilus villosus (Muller)	1	0.41
Hydropsyche contubernalis Mclachlan	1	0.41
Agabus sp.	1	0.41
Oligochaeta indet	1	0.41
Oxyethira sp.	1	0.41
Ithytrichia sp.	1	0.41
Helius sp.	1	0.41
Leuctra fusca (L.)	1	0.41
Leuctra hippopus (Kempny)	1	0.41
Limnephilus affinis/incisus	1	0.41
Limnephilus lunatus Curtis	1	0.41

Table 61 continued

Species	n	% of Agency's missed species in AQC Audit
Limnophila (Brachylimnophila) sp.	1	0.41
Nemoura avicularis Morton	1	0.41
Ochthebius bicolon Germar	1	0.41
Esolus parallelepipedus (Muller)	1	0.41
Dugesia polychroa group	1	0.41
Ischnura elegans (Van der Linden)	1	0.41
Ecdyonurus sp.	1	0.41
Lymnaea truncatula (Muller)	1	0.41
Platambus maculatus (L.)	1	0.41
Orthoclaadiinae	1	0.41
Erpobdella octoculata (L.)	1	0.41
Drusus annulatus (Stephens)	1	0.41
Gammarus pulex (L.)	1	0.41
Phryganea bipunctata Retzius	1	0.41
Goera pilosa (Fabricius)	1	0.41
Gyrinus sp.	1	0.41
Halesus radiatus (Curtis)	1	0.41
Haliplidae indet	1	0.41
Planorbis sp.	1	0.41
Total	244	100

MISSED TAXA FOR ALL SAMPLES IN THE 1999 AUDIT

Table 62 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. Acroloxidae)	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 63 Species missed 5 times or more for all samples in the 1999 Audit

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

Table 63 continued

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