

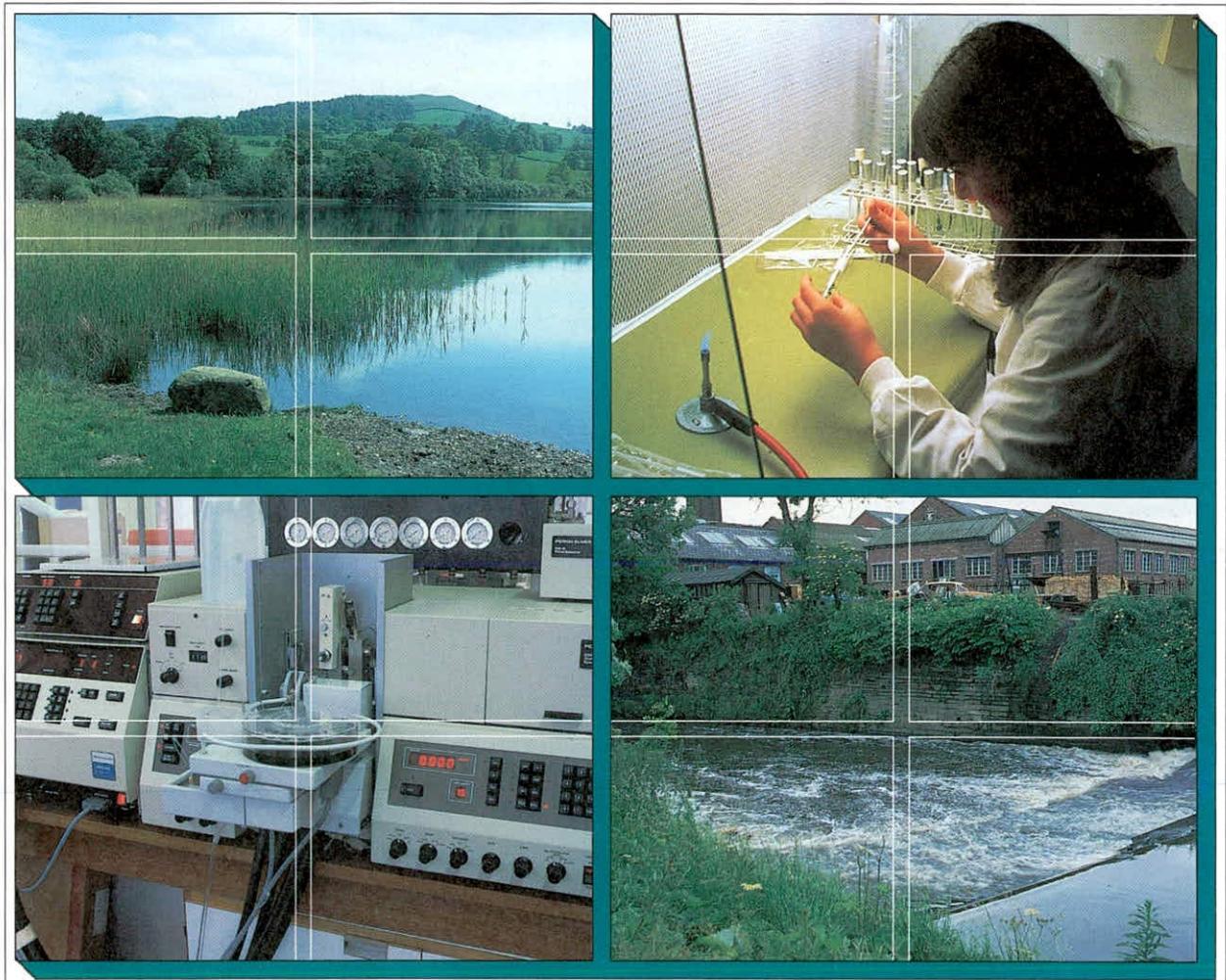
# An audit of performance in the analysis of biological samples Ecosurveys Ltd

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# **An audit of performance in the analysis of biological samples Ecosurveys Ltd**

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## **1. INTRODUCTION**

Ecosurveys Ltd were contracted by Yorkshire Water plc to undertake a biological survey of a number of sites on rivers in their area of operation. The work was carried out under the guidance of North East Region of the Environment Agency (EA) to ensure that standard field and laboratory protocols were observed.

The samples were collected using a three minute kick/sweep technique. They were sorted for macro-invertebrates in the laboratory and all specimens found were identified to species level where possible. Taxa were recorded on site data sheets. In order to assess the standard of the analysis, a quality assurance exercise was necessary to minimise and quantify errors. The Institute of Freshwater Ecology (IFE) was contracted to undertake an independent, external audit of the quality of the laboratory analysis. Although the identification undertaken by Ecosurveys Ltd extended to species level, the audit required of IFE was restricted to presence/absence of BMWP families. This commission was consistent with the audit performed by IFE each year since 1990 on routine NRA/EA biological samples.

This report presents the results of the two samples audited for Ecosurveys Ltd.

## **2. SAMPLE SELECTION**

Samples for audit were selected at random by North East Region of the EA after all the samples had been analysed and preserved. The two samples chosen for audit were sent direct to IFE by Ecosurveys Ltd and represented approximately 10% of the total analysed for the survey. The samples were from the River Tees at Low Coniscliffe NGR NZ248136 (coarse and fine fraction in separate jars) and Holwick Head NGR NY889284 (fine fraction only, the coarse fraction having been discarded, after analysis, by Ecosurveys Ltd)

## **3. SAMPLE PROCESSING**

The protocol used by Ecosurveys Ltd was to separate samples into coarse and fine fractions, sort them in the laboratory and remove all macro-invertebrates found. Specimens were identified to species level where possible and the abundances of each taxon noted. The invertebrates were placed in a vial of preservative (70% industrial methylated spirit) and the taxa listed, with abundances, on a data sheet. The vial of animals and the sorted material were then returned to the sample container and preservative added. Thus, each sample available to IFE for audit included:

- i) a data sheet containing a list of the taxa found in the sample.
- ii) a vial containing representatives of each taxon.
- iii) the preserved sample.

With these three elements present, the sequence of operations at IFE was as follows:

- a) The remainder of the sample was sorted, without reference to the data sheet or to the vial of animals, and the BMWP families identified.
- b) The families contained within the vial were identified.
- c) A comparison was made between the listing of families and those found in the sample by IFE.
- d) A comparison was made between the listing of families and those identified from the vial by IFE.
- e) "Losses" or "gains" from the original listing of families were noted. In the case of "gains", each additional family was identified, where possible, to species level, in order to clarify any specific repetitive errors. Single representatives of a "gained" taxon were noted as such.
- f) An error code, selected from a list on the result sheet, was assigned by the IFE auditor for each "loss" or "gain".

Several directives were issued to IFE relating to the treatment of BMWP taxa. Every taxon recorded on the data sheet must be supported by a voucher specimen of that family in the vial (or, for very large specimens, left in the sample). The only exceptions to this rule were the native crayfish, *Austropotamobius pallipes* (Lereboullet), the medicinal leech, *Hirudo medicinalis* L. and the pearl mussel, *Margaritifera margaritifera* (L.) (which does not belong to a BMWP family), all of which are protected species. Where possible, IFE would give the benefit of doubt to the analyst in cases of the "loss" of Planariidae, specimens of which have been known to disintegrate in preservative. Animals deemed to have been dead at the time of sampling, cast insect skins, pupal exuviae and empty mollusc shells were to be excluded from the listing of families present. Isolated posterior ends of "living" specimens were not acceptable as records of a taxon. In these cases, thorax plus abdomen was deemed acceptable but abdomen only was deemed unacceptable. Terrestrial representatives of BMWP scoring families were also to be excluded from the audit. For this reason, Clambidae, Chrysomelidae and Curculionidae, which appear in the BMWP list, were excluded for the purposes of the audit since most representatives of these families are, at best, only semi-aquatic. Trichopteran pupae, although not routinely identified by many biologists, were to be included in the listing of families.

#### 4. REPORTING

The results of each sample audit were recorded on a standard report form. Copies of these report forms are presented in the Appendix. The comparison between the listing of families and the taxa found in the vial by IFE was shown in the section of the report form headed "VIAL". Discrepancies could be due to carelessness, misidentifications or errors in completing the data sheet listing the families present. Families not on the listing but found by IFE in the remainder of the sample were entered in the section of the report form headed "SAMPLE" under "Additional BMWP taxa found by IFE". Taxa recorded here represent families missed by the analyst on sorting the sample. When the families listed as "losses"

in the first section of the report form were compared with the full list of families recorded in the sample by IFE, some apparent losses from the vial were offset by the presence of those families in the remainder of the sample. These taxa were therefore listed both as "losses" from the vial and as "gains" from the sample and were neither a net loss nor a net gain. In these cases, the families were marked with an asterisk in both boxes. Such errors are noted as "omissions".

Species identifications, state of development (eg adult or larval coleopterans) and the presence of a single representative of a family within the remainder of the sample were recorded in the centre section of the report form under "species name". IFE was asked to interpret each error to provide a possible cause. An error code, selected from a list of options at the foot of each result sheet, was entered against each taxon in the column headed "Presumed cause of error". 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. The results of the audit are summarised in Table 1. Additional errors that were noted by the IFE auditor are listed in Table 2.

Table 1. Summary of results at BMWP level for the two samples audited for Ecosurveys Ltd

River	Site	Losses	Gains	Omissions
Tees	Holwick Head	1	1	0
Tees	Low Coniscliffe	0	2	0

Table 2. Additional information and/or errors found by IFE at audit

Site	Taxon claimed by Ecosurveys Ltd	Taxon found by IFE
Holwick Head	Hirudinea	Lumbricidae (anterior end)
	Clinocerinae	<i>Wiedemannia</i> sp. only in vial
	<i>Simulium (Simulium)</i> sp.	<i>Simulium (Simulium) argyreatum</i> group (using current nomenclature)
	<i>Simulium ornatum</i> group	<i>Simulium aureum</i> group
Low Coniscliffe	<i>Hydropsyche contubernalis</i>	<i>Cheumatopsyche lepida</i>
	Sp. indet. Leptoceridae	<i>Ceraclea anulicornis</i>
		<i>Mystacides azurea</i>
		<i>Athripsodes albifrons/bilineatus</i>
	<i>Oulimnius</i> sp.	<i>Riolus subviolaceus</i>
	<i>Simulium</i> sp.	<i>Simulium ornatum</i> group
		<i>Simulium reptans</i>
	<i>Simulium aureum</i> group	Not found in vial or sample
Ceratopogonidae pupae	Chironomidae pupae	

## **APPENDIX 1**

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

# EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Ecosurveys Ltd

LABORATORY: Spilsby

DATE: 6.8.96

WATER-COURSE: Tees

PRIMARY ANALYST: AG

AQC ANALYST:

SITE: Holwick Head

CODE:

SORT/AQC METHOD: Not known

## RESULTS OF AUDIT

<u>Family name</u>	<u>Presumed cause of error (see footnotes)</u>
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### VIAL

BMWP taxa not found by IFE

Hydropsychidae

4

Additional BMWP taxa found by IFE

None

### SAMPLE

BMWP taxa not found by IFE

(For samples where vial is broken or absent)

N/a

Additional BMWP taxa found by IFE

Limnephilidae

9

Drusus annulatus/Ecclisopteryx

## SUMMARY OF AUDIT

LOSSES 1

GAINS 1

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 2

ON NO. OF TAXA 0

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

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

# EXTERNAL AUDIT OF BIOLOGICAL SAMPLES

REGION: Ecosurveys Ltd

LABORATORY: Spilsby

DATE: 6.8.96

WATER-  
COURSE: Tees

PRIMARY  
ANALYST: AG

AQC  
ANALYST:

SITE: Low Coniscliffe

CODE:

SORT/AQC  
METHOD: Not known

## RESULTS OF AUDIT

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

#### BMWP taxa not found by IFE

None

#### Additional BMWP taxa found by IFE

None

### SAMPLE

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

N/a

#### Additional BMWP taxa found by IFE

Hydrobiidae (incl. Bithyniidae)	9
Potamopyrgus jenkinsi (Smith)	
Psychomyiidae (incl. Ecnomidae)	9
Psychomyia pusilla (Fabricius) 1 only	

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## SUMMARY OF AUDIT

LOSSES 0

GAINS 2

OMISSIONS: 0

NET EFFECTS:

ON BMWP SCORE 11

ON NO. OF TAXA 2

1 No representative of family in vial

2 Alternative terrestrial specimen in vial

3 Posterior end only in vial

4 Empty shell or case or cast skin in vial

5 Specimen dead at time of sampling

6 Taxon in vial but not recorded

7 Mis-identification

8 Typographical error - wrong box ticked

9 Taxon missed in sorting

10 Unexplained error

11 Taxon added in internal AQC

12 Recorded taxon that was rejected by AQC analyst

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

## **APPENDIX 2**

**The data sheets supplied by Ecosurveys Ltd**

Site: Holwick Head

Survey Date: 6/8/1996

Watercourse: River Tees

Grid Reference: NY889284

SPECIES	FAMILY	ABUNDANCE	COMMENTS
sp. indet.	Oligochaeta	2	
sp. indet.	Hirudinea	1	Damaged
<i>Ancylus fluviatilis</i>	Ancylidae	448e	
<i>Lymnaea peregra</i>	Lymnaeidae	128e	
<i>Gammarus pulex</i>	Gammaridae	few	
sp. indet.	Hydracarina	4	
<i>Leuctra fusca</i>	Leuctriidae	4	
<i>Ecdyonurus</i> sp.	Heptageniidae	6	
<i>Perla bipunctata</i>	Perlidae	1	
<i>Baetis rhodani</i>	Baetiidae	9	<i>Baetis</i> generally abundant (224e). Only specimens with tails intact identified
<i>Baetis scambus</i>	Baetiidae	4 +	<i>Baetis</i> generally abundant (224e). Only specimens with tails intact identified
<i>Ephemerella ignita</i>	Ephemerellidae	32e	
<i>Brachycentrus submutilus</i>	Brachycentridae	1	Case only
<i>Hydropsyche</i> sp.	Hydropsychidae	1	Head only
<i>Hydroptila</i> sp.	Hydroptilidae	3	
<i>Athripsodes</i> sp.	Leptoceridae	1	First instar
<i>Rhyacophila dorsalis</i>	Rhyacophilidae	4	
<i>Limnius volckmari</i>	Elmidae	26	Larvae (24) and adults (2)
<i>Elmis aenea</i>	Elmidae	3	Larvae (2) and adults (1)
<i>Oulimnius</i> sp.	Elmidae	5	Larvae (3) and adults (2)
<i>Esolus parallelepipedus</i>	Elmidae	6	Larvae (3) and adults (3)
<i>Dicranota</i> sp.	Limoniidae	3	
sp. indet.	Chironomidae	Not Counted	
<i>Atherix ibis</i>	Athericidae	3	
<i>Clinocerinae</i>	Empidoidea	2	Larvae (2)
<i>Wiedemannia bistigma</i>	Empidoidea	3	
<i>Simulium (Simulium)</i> sp.	Simuliidae	23 +	Larvae (22) and pupae with 6 gill filaments
<i>Simulium ornatum</i> gp.	Simuliidae	1	

Site: Low Coniscliffe

Survey Date: 6/8/1996

Watercourse: River Tees

Grid Reference: NZ248136

SPECIES	FAMILY	ABUNDANCE	COMMENTS
<i>Ancyclus fluviatilis</i>	Ancyliidae	1155e	
<i>Pisidium</i> sp.	Sphaeriidae	21e	
sp. indet.	Hydracarina	42e	
<i>Gammarus pulex</i>	Gammaridae	1	
<i>Ephemerella ignita</i>	Ephemerellidae	73e	
<i>Baetis rhodani</i>	Baetiidae	16	<i>Baetis</i> generally abundant (861) in sample - only specimens with tails intact identified.
<i>Baetis scambus</i>	Baetiidae	6	<i>Baetis</i> generally abundant (861) in sample - only specimens with tails intact identified.
<i>Heptagenia sulphurea</i>	Heptageniidae	1	
<i>Ecdyomurus</i> sp.	Heptageniidae	38	
<i>Leuctra fusca</i>	Leuctridae	23	
<i>Rhyacophila dorsalis</i>	Rhyacophilidae	3	Larvae & pupa
<i>Brachycentrus submutilus</i>	Brachycentridae	84e	
<i>Hydropsyche contubernalis</i>	Hydropsychidae	5+	
<i>Hydropsyche pellucidula</i>	Hydropsychidae	20+	
<i>Hydroptila</i> sp.	Hydroptilidae	21e	
sp. indet.	Leptoceridae	2	First instar
<i>Limnius volckmari</i>	Elmidae	10	Adults ) and larvae (1)
<i>Elmis aenea</i>	Elmidae	11	Adults (6) and larvae (5)
<i>Oulimnius</i> sp.	Elmidae	1	Larva
<i>Esolus parallelepipedus</i>	Elmidae	13	Adults (6) and larvae (7)
sp. indet.	Chironomidae	378e	Includes <i>Rheotanytarsus</i>
<i>Antocha vitripennis</i>	Limoniidae	3	
<i>Simulium equinum</i>	Simuliidae	1+	Pupal case
<i>Simulium</i> sp.	Simuliidae	12	Larvae
<i>Simulium aureum</i> gp.	Simuliidae	1	Pupa
<i>Atherix ibis</i>	Athericidae	6	
sp. indet.	Ceratopogonidae	8	Pupa & pupal cases
<i>Phoxinus phoxinus</i>	Pisces	-	Minnow

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