

**National Rivers Authority**

**Environmental Consultancy Support  
Exe/Axe Water Resources**

## **Comparison of Ecological Data**

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Client: **National Rivers Authority**

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## 0. SUMMARY

The National Rivers Authority (NRA) and South West Water Services Ltd (SWWSL) invertebrate surveys undertaken in the River Axe during the summer and autumn of 1992 are not strictly comparable. Of the total of twelve sample sites investigated, five in the NRA survey and seven in the SWWSL survey, only four are close to each other: Upper Bruckland, Lower Bruckland, Whitford Bridge and Nunford Dairy. However, the locations of these four sites are different in the two surveys so that the NRA and SWWSL Higher Bruckland sites are over 300 m apart.

In addition to the problems due to differing sample sites, additional sources of difference between the two surveys relates to the valid identification of species and families and slightly different times of sampling.

The total number of species recorded in the two surveys at the four geographically similar sites is broadly similar except at Upper Bruckland. This difference may be due to the 300 m difference in location in the NRA survey compared to the SWWSL survey.

Despite the overall similarity in numbers of species recorded there are marked differences in the kinds of species recorded at each location. These differences are reflected in the numbers of families, BMWP and ASPT scores at each location. It is not possible to isolate the causes of the differences between the surveys from different sample sites and inconsistent identification of species and different sample times.

The differences between the two surveys can be primarily ascribed to the different habitats sampled at the slightly different locations of the sample sites. The differences between the surveys are less than the differences within surveys due to seasonal effects when comparing summer with autumn.

## 1. INTRODUCTION

### 1.1 BACKGROUND

South West Water Services Ltd (SWWSL) has applied to the National Rivers Authority (NRA) for a licence to abstract an increased quantity of water from the River Axe at Whitford Bridge. The NRA has retained WS Atkins to undertake a review of available information relating to the proposed abstraction. This review is presently being undertaken.

In order to evaluate the impact on the proposed abstraction licence both the NRA and SWWSL have undertaken ecological surveys of the River Axe. This report provides a comparison of the NRA<sup>1</sup> and SWWSL<sup>2</sup> data sets.

### 1.2 TERMS OF REFERENCE

In a letter of 20 November (ref: JMBL369) the NRA requested that the SWWSL data set be compared and contrasted with the NRA data set. It was noted that SWWSL's survey might identify more species but that the NRA survey was the result of a more intensive sampling regime.

### 1.3 AVAILABLE DATA

#### 1.3.1 NRA River Axe Water Resources Scheme. Macroinvertebrate Study

This survey consisted of five sampling sites; two on the Bruckland Stream and three on the River Axe. Two separate surveys of these sites were undertaken in the summer and autumn of 1992. A mixture of three sampling methodologies was employed at each site: a single three minute kick where possible with one minute search, up to five active quantitative Aston 0.05 m<sup>2</sup> cylinder two minute samples and a thirty minute search. Samples were preserved in 10% formalin and identified to lowest practical taxonomic level. These data were presented in summary form as BMWP and ASPT scores and as number of families per site and species in each sample.

#### 1.3.2 SWWSL Axe Valley Water Resources Scheme. Macroinvertebrate Study

This survey consisted of seven sampling sites; four on the Bruckland Stream and three on the River Axe. Two separate surveys of these sites were undertaken in the summer and autumn of 1992. A mixture of two sampling methodologies was employed at each site: a single three minute kick and one minute search combined followed by three, two minute 0.05 m<sup>2</sup> active cylinder samples. Species were identified to the lowest practical taxonomic level. These data were presented in summary form as BMWP and ASPT scores and species in each sample.

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<sup>1</sup> River Axe Water Resources Scheme. Biological Study; Macroinvertebrate Study.

<sup>2</sup> Axe Valley Water Resource Scheme: Summer and Autumn 1992 (NRA reference RP-PCA-1328AO-100(01)).

## 2. THE DATA

### 2.1 DATA LIMITATIONS

#### 2.1.1 Site Locations

Of the total of twelve sites investigated in the two surveys, four from both surveys can be considered to be comparable.

| SWWSL                 |              | NRA             |              |
|-----------------------|--------------|-----------------|--------------|
| Location              | NGR          | Location        | NGR          |
| Reservoir             | SY 2890 9375 | Upper Bruckland | SY 2867 9359 |
| Higher Bruckland Farm | SY 2845 9340 |                 |              |
| Haye Farm             | SY 2765 9290 | Lower Bruckland | SY 2705 9295 |
| Lower Bruckland       | SY 2707 9295 | Whitford Bridge | SY 2645 9555 |
| U/S Whitford Bridge   | SY 2650 9560 |                 |              |
| Whitford Bridge       | SY 2625 9540 | Nunford Dairy   | SY 2611 9463 |
| Nunford Footbridge    | SY 2615 9475 | Axe Bridge      | SY 2593 9265 |

The comparable sites, using NRA terminology, are: Upper Bruckland, Lower Bruckland, Whitford Bridge and Nunford Dairy.

#### 2.1.2 Sampling Methodology

A total of three sampling methods were used of which two methods, active cylinder sampling and kick sampling, are comparable. The NRA, but not SWWSL, employed a thirty minute search at each site.

#### 2.1.3 Date of Sampling

The two surveys were not undertaken on the same dates during the summer and autumn. This would be expected to result in noticeable differences in the two surveys due to the short life cycles of the invertebrates under consideration.

### 2.2 COMPARISON AT SPECIES LEVEL

#### 2.2.1 Species Numbers

The number of species recorded at each comparable site in both summer and autumn using the three methodologies is presented below.

**Number of species recorded at each comparable site using different sampling techniques:**

**Whitford Bridge**

**Summer 1992**

|                         | <b>NRA</b> | <b>SWWSL</b> |
|-------------------------|------------|--------------|
| 3 min kick              | 47         | 37           |
| 3 min kick plus 3 cores | 50 (+3)    | 59 (+22)     |
| 3 min kick plus 5 cores | 56 (+9)    | -            |
| 30 min search           | 67 (+20)   | -            |

**Autumn 1992**

|                         |          |          |
|-------------------------|----------|----------|
| 3 min kick              | 41       | 45       |
| 3 min kick plus 3 cores | 51 (+10) | 62 (+17) |
| 3 min kick plus 5 cores | 65 (+24) | -        |
| 30 min search           | 77 (+36) | -        |

**Nunford Dairy**

**Summer 1992**

|                         | <b>NRA</b> | <b>SWWSL</b> |
|-------------------------|------------|--------------|
| 3 min kick              | 44         | 46           |
| 3 min kick plus 3 cores | 53 (+9)    | 61 (+15)     |
| 3 min kick plus 5 cores | 55 (+11)   | -            |
| 30 min search           | 64 (+20)   | -            |

**Autumn 1992**

|                         |          |          |
|-------------------------|----------|----------|
| 3 min kick              | 36       | 37       |
| 3 min kick plus 3 cores | 45 (+9)  | 60 (+23) |
| 3 min kick plus 5 cores | 51 (+15) | -        |
| 30 min search           | 64 (+28) | -        |

**Upper Bruckland**

**Summer 1992**

|                         | <b>NRA</b> | <b>SWWSL</b> |
|-------------------------|------------|--------------|
| 3 min kick              | 25         | 34           |
| 3 min kick plus 3 cores | 30 (+5)    | 46 (+12)     |
| 3 min kick plus 5 cores | 32 (+7)    | -            |
| 30 min search           | 35 (+10)   | -            |

**Autumn 1992**

|                         |          |          |
|-------------------------|----------|----------|
| 3 min kick              | 19       | 28       |
| 3 min kick plus 3 cores | 25 (+6)  | 43 (+15) |
| 3 min kick plus 5 cores | 27 (+8)  | -        |
| 30 min search           | 36 (+17) | -        |

| Lower Bruckland<br>Summer 1992 | NRA      | SWWSL    |
|--------------------------------|----------|----------|
| 3 min kick                     | 22       | 37       |
| 3 min kick plus 3 cores        | 32 (+10) | 44 (+7)  |
| 3 min kick plus 5 cores        | 38 (+16) | -        |
| 30 min search                  | 48 (+26) | -        |
| <b>Autumn 1992</b>             |          |          |
| 3 min kick                     | 39       | 30       |
| 3 min kick plus 3 cores        | 47 (+8)  | 44 (+14) |
| 3 min kick plus 5 cores        | 48 (+9)  | -        |
| 30 min search                  | 52 (+13) | -        |

The three minute kick sample combined with a one minute search used by SWWSL generally resulted in more species being recorded than the three minute kick and one minute search employed by the NRA.

When the active cylinder samples were taken into account, that is the number of species from three kicks and three cylinder samples, this trend was more pronounced with more species recorded by SWWSL.

When all the five cylinder samples collected by the NRA are taken into account, the NRA survey consistently contained fewer species when compared to the SWWSL survey.

Finally when the thirty minute search undertaken by the NRA, but not by SWWSL, is included in the species counts, then the number of species is typically higher for the NRA survey.

When all sampling methods are taken into account the total number of species identified by NRA is of the same order but slightly more than that identified by SWWSL. These differences between the two surveys are a reflection of a number of variables including slightly different sample locations, different sample dates, the opinions of different taxonomic experts and finally real differences between surveys.

#### Main invertebrate differences in samples taken by the NRA and SWWSL

Species which appear to be under recorded by NRA / over recorded by SWWSL:

- Baetis rhodani*
- Baetis scambus*
- Brachycentrus subnubilus*
- Simulium sp*
- Hydrocarina* (not recorded by NRA)
- Asellus sp*
- Calopteryx splendens* (not recorded by NRA)
- Bithynia tentaculata*
- Sigara dorsalis*
- Velia caprai* (not recorded by NRA)



Species which appear to be under recorded by SWW / over recorded by NRA:

*Ephemerella ignita* (in River Axe samples)  
*Cheumatopsyche lepida*  
*Hydropsyche contubernalis*  
*Limnius volckmari*  
*Hydropsyche angustipennis*  
*Hydropsyche siltatai*  
*Ecdyonurus sp*  
*Elmis aenea*

The NRA survey indicates that the most abundant caddis larvae in the Axe and Bruckland Stream are *Hydropsyche sp* and *Cheumatopsyche lepida*, whereas SWWSL found *Brachycentrus subnubilus* most abundant in their survey work. The NRA samples contained mayflies *Ephemerella ignita* and *Ecdyonurus sp* in greater quantities than SWWSL, whose samples contained larger numbers of *Baetis rhodani* and *Baetis scambus*. Beetles (*Elmis sp* and *Limnius sp*) are recorded in greater numbers by the NRA, whereas the water beetles *Velia caprai* and *Sigara dorsalis* are more abundant in the SWWSL samples. Other species recorded as being more abundant by SWWSL are *Simulium sp*, the dragonfly larva *Calopteryx splendens*, the mollusc *Bithynia sp* and the crustacean *Asellus sp*.

These differences may be actual differences or errors of identification. It is not possible to define which of the two sources of difference is the more important.

## 2.3 COMPARISON AT FAMILY, BMWP AND ASPT SCORES LEVEL

### 2.3.1 Family Level

A comparison of numbers of families recorded at each location was undertaken by back calculating the number of families at each SWWSL site from the BMWP and ASPT scores.

|                        | No of Families (kick sample) |       |
|------------------------|------------------------------|-------|
|                        | NRA                          | SWWSL |
| <b>Whitford Bridge</b> |                              |       |
| Summer 1992            | 32                           | 27    |
| Autumn 1992            | 30                           | 27    |
| <b>Nunford Dairy</b>   |                              |       |
| Summer 1992            | 33                           | 33    |
| Autumn 1992            | 26                           | 30    |
| <b>Upper Bruckland</b> |                              |       |
| Summer 1992            | 24                           | 23    |
| Autumn 1992            | 23                           | 19    |

|                        |    |    |
|------------------------|----|----|
| <b>Lower Bruckland</b> |    |    |
| Summer 1992            | 27 | 23 |
| Autumn 1992            | 33 | 20 |

The number of families recorded in the kick samples for the NRA survey was generally higher than for the SWWSL survey.

As for the species composition (Section 2.2.2) it is not possible to ascribe this source of difference to either an actual difference or an error in identification.

### 2.3.2 BMWP and ASPT Scores

#### (a) All Sites

The BMWP and ASPT scores as derived from the kick samples are presented below:

#### BMWP and ASPT Scores (from kick samples)

|                         |      | NRA  | SWWSL |
|-------------------------|------|------|-------|
| <b>Whitford Bridge</b>  |      |      |       |
| Summer                  | BMWP | 190  | 150   |
|                         | ASPT | 5.94 | 5.56  |
| Autumn                  | BMWP | 178  | 145   |
|                         | ASPT | 5.17 | 5.37  |
| <b>Nunford Dairy</b>    |      |      |       |
| Summer                  | BMWP | 189  | 180   |
|                         | ASPT | 5.73 | 5.46  |
| Autumn                  | BMWP | 128  | 159   |
|                         | ASPT | 4.92 | 5.3   |
| <b>Higher Bruckland</b> |      |      |       |
| Summer                  | BMWP | 146  | 142   |
|                         | ASPT | 6.08 | 6.17  |
| Autumn                  | BMWP | 138  | 109   |
|                         | ASPT | 6.0  | 5.74  |
| <b>Lower Bruckland</b>  |      |      |       |
| Summer                  | BMWP | 146  | 133   |
|                         | ASPT | 5.41 | 5.70  |
| Autumn                  | BMWP | 188  | 118   |
|                         | ASPT | 5.7  | 5.9   |

The scores for both BMWP and ASPT vary between the NRA and the SWWSL surveys. Each of the locations are discussed below.

(b) Individual Sites

(i) Whitford Bridge

The summer BMWP score for the NRA sample is higher at 190 than the SWWSL score of 150, although there is little difference in the ASPT (5.94 and 5.56 respectively). The autumn BMWP score was also higher for the NRA sample (178 and 145), but the ASPT was similar. The two samples compared are the NRA sample at 300 m upstream of Whitford Bridge, and the SWWSL sample 400 m upstream of Whitford Bridge.

The summer kick samples showed the following main differences:

|                                  | NRA  | SWWSL             |
|----------------------------------|------|-------------------|
| <i>Gyraulus albus</i>            | None | Abundant (51-100) |
| <i>Sphaerium sp</i>              | 328  | Common (11-50)    |
| <i>Gammarus pulex</i>            | None | Abundant (51-100) |
| <i>Baetis buceratus</i>          | 27   | None              |
| <i>Baetis rhodani</i>            | None | Abundant (51-100) |
| <i>Ephemerella ignita</i>        | 816  | Common (11-50)    |
| <i>Leuctra fusca</i>             | 11   | Abundant (51-100) |
| <i>Cheumatopsyche lepida</i>     | 92   | None              |
| <i>Hydropsyche contubernalis</i> | 57   | None              |
| <i>Brachycentrus subnubilus</i>  | 7    | Abundant (51-100) |
| <i>Simulium ornatum sp</i>       | None | Abundant (51-100) |

Smaller differences include:

|                                  | NRA  | SWWSL             |
|----------------------------------|------|-------------------|
| <i>Valvata piscinalis</i>        | None | Common (11-50)    |
| <i>Potamopyrgus jenkinsi</i>     | 15   | None              |
| <i>Oligochaeta</i>               | None | Common (11-50)    |
| <i>Hydracarina</i>               | None | Occasional (4-10) |
| <i>Asellus aquaticus</i>         | None | Common (11-50)    |
| <i>Baetis muticus</i>            | None | Common (11-50)    |
| <i>Leuctra geniculata</i>        | 136  | Common (11-50)    |
| <i>Calopteryx splendens</i>      | None | Common (11-50)    |
| <i>Limnius volckmari</i>         | 45   | None              |
| <i>Oulimnius tuberculatus</i>    | 19   | None              |
| <i>Hydroptila sp</i>             | 20   | None              |
| <i>Hydropsyche angustipennis</i> | 22   | None              |
| <i>Althripsodes cinereus</i>     | 29   | None              |
| <i>Simulium angustitarse</i>     | 9    | None              |

Main differences in invertebrates in the autumn samples are:

|                             | NRA  | SWWSL                |
|-----------------------------|------|----------------------|
| <i>Bithynia tentaculata</i> | 2    | Abundant (51-100)    |
| <i>Lymnaea peregra</i>      | 2    | Abundant (51-100)    |
| <i>Sphaerium sp</i>         | None | Very abundant (>100) |
| <i>Asellus aquaticus</i>    | 7    | Abundant (51-100)    |
| <i>Baetis rhodani</i>       | None | Very abundant (>100) |
| <i>Baetis scambus</i>       | None | Abundant (51-100)    |

Smaller differences include:

|                                  | NRA  | SWWSL             |
|----------------------------------|------|-------------------|
| <i>Theodoxus fluviatilis</i>     | 14   | None              |
| <i>Pisidium sp</i>               | 133  | Common (11-50)    |
| <i>Baetis vernus</i>             | None | Common (11-50)    |
| <i>Ecdyonurus sp</i>             | 17   | None              |
| <i>Calopteryx splendens</i>      | None | Common (11-50)    |
| <i>Sigara dorsalis</i>           | None | Common (11-50)    |
| <i>Elmis aenea</i>               | 42   | Occasional (4-10) |
| <i>Limnius volckmari</i>         | 40   | Occasional (4-10) |
| <i>Hydropsyche contubernalis</i> | 50   | Occasional (4-10) |
| <i>Brachycentrus subnubilus</i>  | 119  | Common (11-50)    |

(ii) Nunford Dairy

The two sampling sites are about 100 m apart. The summer BMWP is approximately the same for both samples, with a slightly higher ASPT for the NRA sample. In the autumn there was a higher BMWP and ASPT recorded by SWWSL.

In the summer samples, the following main differences in invertebrates recorded occur:

|                                  | NRA  | SWWSL                |
|----------------------------------|------|----------------------|
| <i>Theodoxus fluviatilis</i>     | 11   | Very abundant (>100) |
| <i>Bithynia tentaculata</i>      | 11   | Very abundant (>100) |
| <i>Sphaerium sp</i>              | None | Abundant (50-100)    |
| <i>Pisidium sp</i>               | 44   | None                 |
| <i>Gammarus pulex</i>            | 368  | Common (11-50)       |
| <i>Ephemerella ignita</i>        | 392  | Occasional (4-10)    |
| <i>Leuctra geniculata</i>        | 78   | Rare (1-3)           |
| <i>Calopteryx splendens</i>      | None | Common (11-30)       |
| <i>Gerris lacustris</i>          | None | Common (11-50)       |
| <i>Sigara dorsalis</i>           | None | Common (11-50)       |
| <i>Cheumatopsyche lepida</i>     | 67   | None                 |
| <i>Hydropsyche angustipennis</i> | 33   | None                 |
| <i>Hydropsyche contubernalis</i> | 122  | Occasional (4-10)    |
| <i>Hydropsyche pellucidula</i>   | None | Common (11-50)       |
| <i>Athripsodes</i>               | 22   | None                 |
| <i>Simulium equinum</i>          | None | Very abundant (>100) |
| <i>Chironomidae</i>              | None | Abundant (51-100)    |

Smaller differences include:

|                                 | NRA  | SWWSL             |
|---------------------------------|------|-------------------|
| <i>Glossiphonia complanata</i>  | 2    | Common (11-50)    |
| <i>Hydracarina</i>              | None | Common (11-50)    |
| <i>Asellus aquaticus</i>        | None | Common (11-50)    |
| <i>Baetis buceratus</i>         | 178  | Common (11-50)    |
| <i>Elmis aenea</i>              | 118  | Common (11-50)    |
| <i>Limnius volckmari</i>        | 97   | Occasional (4-10) |
| <i>Hydroptila sp</i>            | 42   | Occasional (4-10) |
| <i>Brachycentrus subnubilus</i> | 29   | Abundant (51-100) |

The main differences in the autumn samples are:

|                                  | NRA  | SWWSL             |
|----------------------------------|------|-------------------|
| <i>Potamopyrgus jenkinsi</i>     | 219  | None              |
| <i>Ancylus fluviatilis</i>       | 39   | None              |
| <i>Baetis rhodani</i>            | None | Abundant (51-100) |
| <i>Baetis scambus sp</i>         | None | Abundant (51-100) |
| <i>Aphelocheirus aestivalis</i>  | None | Abundant (51-100) |
| <i>Elmis aenea</i>               | 94   | None              |
| <i>Limnius volckmari</i>         | 86   | Rare (1-3)        |
| <i>Hydropsyche contubernalis</i> | 60   | None              |
| <i>Chironomidae</i>              | 2    | Common (11-50)    |

Others are:

|                                 | NRA  | SWWSL             |
|---------------------------------|------|-------------------|
| <i>Hydracarina</i>              | None | Common (11-50)    |
| <i>Ecdyonurus</i>               | 12   | None              |
| <i>Caerus luctuosa</i>          | 1    | None              |
| <i>Calopteryx splendens</i>     | None | Common (11-50)    |
| <i>Sigara dorsalis</i>          | None | Common (11-50)    |
| <i>Haliplus fluviatilis</i>     | None | Occasional (4-10) |
| <i>Orectochilus villosus</i>    | None | Occasional (4-10) |
| <i>Brachycentrus subnubilus</i> | 144  | Common (11-50)    |

(iii) Higher Bruckland

The summer 1992 BMWP and ASPT are similar in both surveys, but the autumn BMWP/ASPT is slightly higher in the NRA survey.

The summer survey results from the three minute kick sampling were very different for the following invertebrates:

|                    | NRA  | SWWSL                |
|--------------------|------|----------------------|
| <i>Oligochaeta</i> | None | Abundant (51-100)    |
| <i>Hydracarina</i> | None | Abundant             |
| <i>Simuliidae</i>  | 2    | Very abundant (>100) |

Other discrepancies were as follows:

|                                | NRA  | SWWSL                |
|--------------------------------|------|----------------------|
| <i>Glossiphonia complanata</i> | 1    | Common (11-50)       |
| <i>Baetis rhodani</i>          | 3    | Abundant (51-100)    |
| <i>Velia caprai</i>            | None | Common (11-50)       |
| <i>Dicranota</i>               | 5    | Common (11-50)       |
| <i>Chironomidae</i>            | 61   | Very abundant (>100) |

The autumn results differed considerably for the following invertebrates:

|                              | NRA  | SWWSL                |
|------------------------------|------|----------------------|
| <i>Potomopyrgus jenkinsi</i> | None | Very abundant (>100) |
| <i>Hydracarina</i>           | None | Common (11-50)       |
| <i>Dixa nubilipennis</i>     | None | Abundant (51-100)    |
| <i>Simulium equirium</i>     | None | Abundant (51-100)    |
| <i>Simulium ornatum</i>      | None | Very abundant (>100) |

Other discrepancies include:

|                    | NRA | SWWSL             |
|--------------------|-----|-------------------|
| <i>Rhithrogena</i> | 10  | None              |
| <i>Ecdyonurus</i>  | 32  | Rare (1-3)        |
| <i>Chironomid</i>  | 3   | Abundant (51-100) |

In most of these cases the NRA samples appear to contain none of certain invertebrates present in the SWWSL samples at this point, but they did contain higher numbers of *Rhithrogena sp* and *Ecdyonurus sp*.

(iv) Lower Bruckland

The summer BMWP is slightly higher in the NRA sample, but the ASPT is slightly lower. In the autumn, the NRA BMWP is much higher at 188 as opposed to 118 for the SWWSL sample, but the ASPT is very similar.

The summer kick sample results for the Lower Bruckland Stream were very different for the following invertebrates:

|                                | <b>NRA</b>                            | <b>SWWSL</b>         |
|--------------------------------|---------------------------------------|----------------------|
| <i>Potamopyrgus jenkinsi</i>   | None (but 157 in one cylinder sample) | Abundant (51-100)    |
| <i>Pisidium sp</i>             | 2                                     | Common (11-50)       |
| <i>Oligochaeta</i>             | 4                                     | Abundant (51-100)    |
| <i>Velia caprai</i>            | None                                  | Common (11-50)       |
| <i>Oreodytes sanmarkii</i>     | None                                  | Common (11-50)       |
| <i>Hydropsyche pellucidula</i> | None                                  | Common (11-50)       |
| <i>Chironomid</i>              | 18                                    | Very abundant (>100) |

They also differed for the following:

|                                 | <b>NRA</b> | <b>SWWSL</b>         |
|---------------------------------|------------|----------------------|
| <i>Baetis rhodani</i>           | 35         | Very abundant (>100) |
| <i>Ephemerella ignita</i>       | 69         | Very abundant (>100) |
| <i>Brachycentrus subnubilus</i> | 1          | Common (11-50)       |

The autumn kick sample results show the following differences:

|                              | <b>NRA</b> | <b>SWWSL</b>         |
|------------------------------|------------|----------------------|
| <i>Potamopyrgus jenkinsi</i> | 219        | None                 |
| <i>Ancylus fluviatilis</i>   | 39         | None                 |
| <i>Baetis verus</i>          | None       | Abundant (51-100)    |
| <i>Simulium equinum</i>      | None       | Very abundant (>100) |

Other notable differences include:

|                               | <b>NRA</b> | <b>SWWSL</b>         |
|-------------------------------|------------|----------------------|
| <i>Ecdyonurus sp</i>          | 21         | Rare (1-3)           |
| <i>Elmis aenea</i>            | 237        | Common (11-50)       |
| <i>Limnius volckmarii</i>     | 90         | Common (11-50)       |
| <i>Hydropsyche siltalai</i>   | 146        | Common (11-50)       |
| <i>Sericostoma personatum</i> | 33         | Occasional (4-10)    |
| <i>Chironomid</i>             | 140        | Very abundant (>100) |

Again, the NRA summer sample contained fewer representatives of the listed invertebrates, but greater numbers in the case of *Potamopyrgus jenkinsi* and *Ancylus fluviatilis*, *Ecdyonurus sp*, *Elmis aenea*, *Limnius volckmari*, *Hydropsyche siltalai*, and *Sericostoma personatum* in the autumn sample only.

### 3. CONCLUSIONS

- (a) The sampling strategy employed in the two surveys is not strictly comparable. In particular the locations of the sampling sites are different between the two surveys.
- (b) Despite the differing sampling strategy the total number of species recorded by the two surveys is similar.
- (c) There is a marked difference in the number of species recorded at Higher Bruckland which may be due to the NRA and SWWSL sample sites being 300 m apart, habitat differences and timing of the surveys.
- (d) A qualitative assessment of the species identified in the two surveys suggests a number of anomalies with apparent over and under emphasis of several species in each of the surveys.
- (e) The kick sample data indicate that more families were identified during the NRA survey than during the SWWSL survey. This difference can be ascribed to real differences, difference in sample location, differing sample times and errors in identification.
- (f) At Whitford Bridge the NRA BMWP scores are higher than SWWSL BMWP scores. The NRA score therefore indicates a better quality river than the SWWSL score. This difference may be an actual difference related to differing sample site locations or errors in identification. The ASPT scores for the two surveys are similar.
- (g) At Nunford Dairy the surveys report similar summer BMWP scores. The ASPT scores and the autumn BMWP scores differ. As for Whitford Bridge this may be due to actual differences due to differing sample locations or errors in identification.
- (h) Notwithstanding the observation in (c) above, at Higher Bruckland the two surveys produce similar scores for both BMWP and ASPT.
- (i) There are marked differences in the BMWP scores for the two surveys at Lower Bruckland. The ASPT scores are broadly similar.
- (j) The observed differences between BMWP and ASPT scores across surveys and between seasons cannot be tested statistically. However, the difference between surveys in any season, eg comparing summer NRA and SWWSL results, is typically less than the difference between seasons in any survey, eg comparing summer and autumn results for the NRA survey. The observed difference due to the effect of different surveys is less than the effect due to season.



#### 4. RECOMMENDATIONS

- (a) The NRA and SWWSL surveys should not be considered to constitute a single, intercomparable data set.
- (b) The sampling locations for the long term baseline and monitoring surveys should coincide with the NRA locations discussed in this report. These locations to be chosen in preference to SWWSL's sites as the future monitoring is likely to be undertaken by the NRA.
- (c) The NRA data presented in this report should therefore constitute part of the baseline data set against which abstraction can be assessed.
- (d) The SWWSL survey sampled slightly different sample locations and should only be used for comparison purposes with the NRA survey.

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