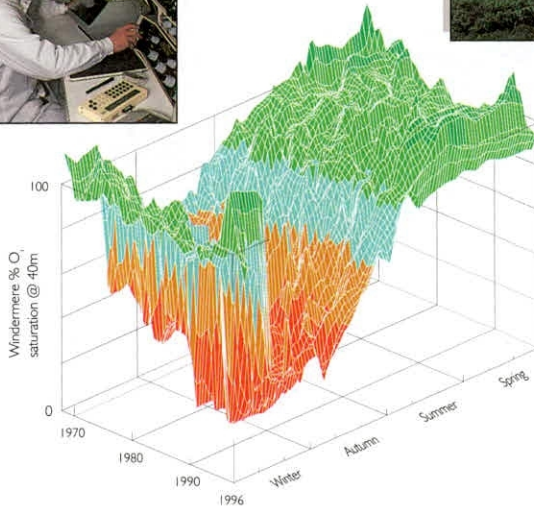
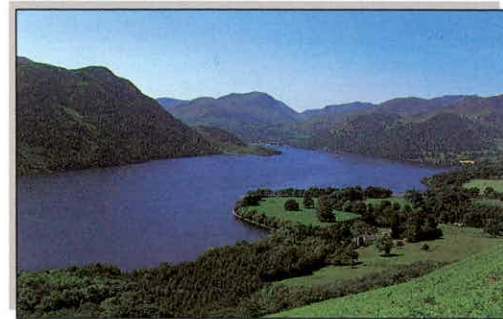


**MACROINVERTEBRATE SAMPLING OF WOODED AND OPEN SECTIONS OF
TRIBUTARIES OF THE R. ITCHEN - MAY 1998**

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INTRODUCTION

This report on the invertebrates of two tributaries of the River Itchen has been produced as part of a joint CEFAS/Environment Agency study on the production of juvenile salmonids. Two sites, one wooded and one open, from each of two tributaries were chosen for study and the invertebrate fauna were sampled at each site. In 1996, benthic samples taken in May and October showed a significantly greater biomass in the open sections than in the wooded sections.

In an effort to increase the invertebrate production of the wooded sections, the canopy was opened at the wooded sites, Blackbridge A and Falloden B, in December 1996. The samples analysed in this report were taken by CEFAS staff in May 1998 and represent the third series of samples taken since the canopy was opened.

The timing of the sampling was chosen so that the faunal communities could be compared with those expected by using the RIVPACS database if this proved necessary.

IFE were contracted to receive the preserved samples from the four sites, sort and identify the invertebrates to family level and determine the biomasses present at each site.

METHODS

Two Surber samplers of area 0.05 m² were supplied and 30 benthic samples were taken from each site. Subsequently, 120 samples were sorted and invertebrates identified to family level. Each sample was sorted by placing a portion in a tray divided into 16 sections by marks on the base. The number of invertebrates was quickly surveyed and a convenient subsample was decided upon by experience. The same proportion of each sample from a particular site was picked to simplify the statistics. Portions of each subsample were picked until the whole sample had been examined. In addition to picking the determined fraction, the rest of the sample was scanned for invertebrate families not present in that fraction. In this way, a complete family list can be acquired without the need to pick out every individual animal. The invertebrates from each sample were picked into two vials, one for the fraction picked completely (Tube A) and one for the rest of the sample (Tube B). These invertebrates were then identified to family level and the total number of animals of each family was determined by multiplying the number in Tube A by the appropriate factor (1/fraction). Extra families found in Tube B were added to the family list to ensure that the most complete family list is compiled for each sample (otherwise those present in small numbers and not appearing in the fraction considered would be missed).

Invertebrate samples were dried in a fan assisted oven at 60°C for 3 hours and weighed to 4 sig figs after cooling in a desiccator.

Although not strictly within the terms of the contract, some simple analysis has been completed. BMWP and ASPT values are given as well as biomass values.

RESULTS

Samples were taken between 14 and 17 May 1997 inclusive.

All benthic samples were sub-sampled and one sixteenth of each sample was picked for biomass estimates.

The families found at each site are shown in Tables 1-4. In addition, the numbers of animals of each family in each sample are given.

BMWP values for each sample at each site are given in Table 5 and results for ASPT values in Table 6.

Biomass estimates are given in Table 7 and means and 95% CLs are also given. The confidence limits of the means in both streams overlap between wooded and open sites. A t test was therefore performed on the biomass data from both streams. In each stream, the open site had a higher biomass than the previously wooded site although there was no significant difference between sites (Falloden $t=1.34$, $p = 0.18$, Blackbridge, $t = 1.97$, $p = 0.054$).

These results continue the sequence of increasing biomass in the previously wooded sites, following the opening of the canopy when compared with the open sites. It is concluded that the opening of the canopy has significantly increased the biomass and production of invertebrates as a whole. The data need reanalysing in terms of the known food preference of salmon parr.

Table 1 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae	1	1		1		32	1	32	16	16	1	1		80	16
Leptophlebiidae															
Ephemerellidae	224	32	640	432	272	368	432	224	352	208	528	16	96	128	800
Ephemeridae									1					16	
Leuctridae		64	32			32		48		16	16	16		32	16
Odontoceridae		16		1	16	1		16		1	1			1	
Leptoceridae											16				
Goeridae				1		1				1				16	
Lepidostomatidae									1		16		16		1
Sericostomatidae			16	16			1			1					16
Calopterygidae															
Psychomyiidae															
Caenidae		1	32		48	16			16	32	16	1		1	48
Rhyacophilidae	1	1	16	16		1	16	16	1	16	48		32	32	16
Polycentropodidae										1					
Limnephilidae	16		16		16		16		1		1		1		1
Ancylidae		48		16								16			
Hydroptilidae															
Gammaridae	112	304	496	304	144	304	352	144	240	448	192	32	1	640	512
Haliplidae											16				
Elmidae	64	384	96	384	32	48	128	176	48	288	96	32		304	128
Chrysomelidae															
Hydropsychidae		1	1			16	1		1	1	16			48	16
Tipulidae		32		1		1		64		16	16	1		32	
Simuliidae		32	32		16	48	272			16	16			16	32
Planariidae			16												
Dendrocoelidae									16						
Baetidae	32	144	32	144	128	368	240	144	48	80	208	1		16	192
Piscicolidae															
Hydrobiidae								16		16	16	16		32	48
Lymnaeidae					1				1						
Glossiphonidae	16				16	16									1
Erpobdellidae	1	1	16	1		1		16		1	1	1	16	16	16
Asellidae	1	16		16	64		16							16	
Chironomidae	272	16	448	80	80	96	400	32	448	64	416	32	96	16	912
Oligochaeta	624	48	272	64	240	16	48	48	144	80	96	1	32	16	192
Hydracarina				16											
Empididae										32				16	
Ceratopogonidae															
Curculionidae	16														
Nematoda		16									16				

Table 2 List of invertebrate families and numbers found from samples at Site B (open) on the Blackbridge stream on 16 May 1998

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae	1	1	16		1	1	1		1			16	32		
Leptophlebiidae															
Ephemereleidae	112	32	384	224	608	48	528	304	64	912	816	640	112	160	352
Ephemeridae	1		1	16					16					1	16
Leuctridae	16	1				16			32	32		32	64	16	
Phryganeidae															
Odontoceridae	16	16	1		16	16						16	1	32	1
Leptoceridae															
Goeridae		1				1									1
Lepidostomatidae												1			
Sericostomatidae	16	16		1	1		16			1	16				
Psychomyiidae															
Caenidae	1	16		16	16	1	16			16	32	1		64	1
Rhyacophilidae		16	1			80	16	1	16	1		16	32	16	1
Polycentropodidae												1			
Limnephilidae	1			1			1					16	1		1
Ancylidae		48													
Hydroptilidae															16
Gammaridae	624	160	688	512	1376	544	2000	928	320	1904	1344	1632	1584	656	1968
Dytiscidae															
Elmidae	80	112	96	48	192	160	208	64	1	112	240	96	80	64	144
Scirtidae	1														
Chrysomelidae															
Hydropsychidae	1				1	1	1	1	16	32	32	1	1		1
Tipulidae	1	16				16	1	16	16	1	16		32	1	48
Simuliidae			80		112	16	16	128			80	1			32
Planariidae	32	16			48	16	16	64		16	32	1	96	32	
Dendrocoelidae		16			16		16	16			16				
Baetidae	336	224	256	16	416	176	240	272	192	160	320	160	560	176	240
Piscicolidae												1			
Planorbidae						16									
Hydrobiidae		16						16							48
Physidae												1			
Sphaeriidae															
Glossiphoniidae			1	1		1	1				32			1	
Erpobdellidae	1			32		16	16		1	1					1
Asellidae	1			1	16				1	32		16			
Chironomidae	160		176	16	208	48	160	240	16	1008	528	576	48	16	160
Oligochaeta	192	80	384	288	448	16	272	112	48	48	48	64	272	128	336
Empidae			16										32		
Ceratopogonidae	16						32				16				
Curculionidae											16	1			
Nematoda									1					16	
Hydracarina					16					32		16			

Table 3 List of invertebrate families and numbers found from samples at Site A (open) on the Falloden stream on 15th May 1998

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae						32	1	16	16		16		16		
Ephemerellidae	1			16		1					1	1	1	1	48
Ephemeridae	16							16			1				
Odontoceridae	48	1					1		48	1	32	32	1	16	1
Goeridae	1	1		80	1	1	112	48	1	48		16	32		16
Sericostomatidae	32		1					16	1	16	16		32	1	1
Caenidae								32			16				16
Rhyacophilidae	32		16	1		1	1	16	16		16	16	16	48	16
Limnephilidae	48				16						1		16	48	48
Ancylidae	1			16			1								
Hydroptilidae													1		
Gammaridae	64	1	128	160	32	160	256	240	144	128	64	48	80	32	144
Dytiscidae															1
Gyrinidae	1		1				16		1						
Elmidae	112	256	128	432	32	256	448	736	272	656	320	192	352	288	48
Hydropsychidae	16							1	1	1	1	1	80	128	
Tipulidae	1	1		1			1	16		1		1			
Simuliidae	1360	16	192	1	1	96	1		1392		2256	96	1104	2176	368
Planariidae	16			32	1	16	48	16	1	32	48	16	48	16	48
Dendrocoelidae	16	1	1	1		32	1	1	16	16			1	16	16
Baetidae	64	32	16	144	1	1	144	48	48	16	64	96	80	32	64
Sialidae													32		16
Piscicolidae	1								1					32	
Valvatidae															16
Hydrobiidae				1				1	1		1				
Lymnaeidae											1			1	
Physidae	1										16	1	32	32	16
Planorbidae													1		1
Sphaeriidae	16										16				
Glossiphoniidae	1						1				1			1	1
Erpobdellidae	16	1				1	16	16	1	16	1	1	1	16	1
Asellidae	64	1	32	16	1	32	112	16	48	48	128	1	192	144	64
Chironomidae	144	1	64	48	1	32	64	32	128		224	64	560	1056	368
Oligochaeta	256	16	48	176	1	112	128	112	112	192	480	32	384	368	768
Nematoda	1								1		32	16			1
Hydridae											16			32	
Hydracarina				1		1			1		16			16	
Chrysomelidae				1											
Ceratopogonidae												1			
Empididae	1						16				16				
Stratiomyidae				1											
Indet beetle larva					16										
Zonitidae						1					1				

Table 3 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae	16			1			16	32	64		1		48		32
Ephemerellidae	32	32	16		48			1	16				1		16
Ephemeridae					1										1
Odontoceridae	48	32		16	64	1	1	32	16	1		16	48	16	16
Goeridae	16	32			1			32				1			
Sericostomatidae		64			1	1	1								32
Caenidae								16					32		
Rhyacophilidae	16	16	1	1	1	16	48	16	80	16	16	1	96	1	16
Limnephilidae		48	1		1										1
Ancylidae															1
Hydroptilidae	1														
Gammaridae	272	96		160	144	240	112	240	240	48	16	16	656	16	80
Dytiscidae															
Gyrinidae			1						1						
Elmidae	576	256	112	432	64	128	192	256	352	128		144	272	32	240
Hydropsychidae	1	80		16		16	112	16	96	1	1	16	304		80
Tipulidae	1	1	1		1	1		1		1				16	1
Simuliidae	16	448	864	80	1200	2912	3184	192	2288		112	176	1504	16	416
Planariidae	16	16	16	48	48	32	64	160	336	48	64	1	64		96
Dendrocoelidae	16	1	16	32	32	16		64	32				32		1
Baetidae	128	32	16	80	48	32	48	48	1	48	1	32	32	16	32
Sialidae					1										
Piscicolidae		16			1	16			1		1				
Valvatidae								1	16				1		16
Hydrobiidae						1									1
Lymnaeidae		16				16							1		
Physidae		160			32	1			32						48
Planorbidae		1	1		1		1								16
Sphaeriidae		1													48
Glossiphoniidae		1			16				16						16
Eripodellidae	48	16	32	1	16	1	1	1	16	1	1	1	1		16
Asellidae	96		64	32	64	144	160	112	432	64	32	64	112	1	256
Chironomidae	96	272	208	96	240	96	192	144	144		112		64	32	96
Oligochaeta	176	160	416	64	352	112	96	160	336	192	1	176		1	32
Nematoda		16			16	16		16							
Hydridae															
Hydracarina									16					16	32
Chrysomelidae					16							16			
Ceratopogonidae				16	16							16			16
Empididae															
Curculionidae															
Indet beetle larva															
Sisyridae									16						

Table 4 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae		16				1				32					16
Leptophlebiidae															
Ephemerellidae	1	16	16	48	1	1	16		1		1		16	1	1
Ephemeridae		1	16	16			16		1		1				
Odontoceridae	16	80	1	1	64	1	64	16	16	1	96	16	96	1	80
Leptoceridae															
Goeridae	48	1	1		1	32		48			48	48		64	32
Brachycentridae				16											
Sericostomatidae		64		1	1	1	16				32		1		1
Psychomyiidae															
Caenidae						48								16	16
Rhyacophilidae	1	16	16	1	1	1	16	1	16	1	1			16	1
Limnephilidae				32	1										
Ancylidae	16			16			1					1			1
Gammaridae	64	32	128	80	48	96	256	80	176	48	48	16	112	144	128
Dytiscidae				1			16								
Gyrinidae															
Elmidae	576	176	320	176	480	960	832	272	336	1152	1008	240	288	384	1104
Hydropsychidae		1		1			160	16	1		32	1	32	1	
Tipulidae	1					1			1	16				1	1
Simuliidae		608	352	544	16	80	864	64	16	16			###	80	48
Planariidae	16	16	16	16	96	64	176		48	1	144		1	16	32
Dendrocoelidae	16	32	48		64	16	64		1	1	96	16	1	16	16
Baetidae	48	48	192	1	112	48	48	64	144	96	64	64	32	192	224
Sialidae		1	1	16			1								
Piscicolidae							16						16		
Valvatidae															
Hydrobiidae													1	16	
Lymnaeidae															
Physidae		1		32			16								
Planorbidae	16	16		1	1		1				32			1	1
Sphaeriidae				16		16	16						1		
Glossiphoniidae	48	32		16	1	1	32		16		48	1	1		1
Erpobdellidae	16	16	16	16	1		48	16	16	16	1	16	1	16	16
Asellidae	64	32	1	32	32	48	272	1	16	16	144		80		64
Chironomidae	16	96	48	176	16	32	896	16	64	16	112	1	96	112	16
Oligochaeta	192	240	96	112	240	624	240	96	128	288	320	112	176	48	80
Nematoda	16	16					16		16	16		16			16
Psychodidae				16			1								
Hydridae				16			16						16		
Ceratopogonidae			1			16		1	1		16				16
Empididae							16				1				

Table 5 BMWP values for each sample at each site in May 1998

SAMPLE	Falloden A BMWP	Falloden B BMWP	Blackbridge A BMWP	Blackbridge B BMWP
1	122	129	91	118
2	89	130	87	114
3	121	123	79	73
4	112	153	111	71
5	101	98	78	88
6	100	112	105	111
7	117	103	103	100
8	128	115	73	63
9	150	113	91	81
10	97	117	47	83
11	123	143	56	87
12	96	128	83	114
13	128	133	72	80
14	134	131	91	108
15	126	92	96	90
16	104	137	61	70
17	96	135	99	100
18	132	169	87	96
19	105	110	92	86
20	142	155	76	115
21	123	108	103	84
22	121	118	75	100
23	115	116	76	85
24	105	131	92	70
25	129	100	120	88
26	121	145	125	90
27	110	139	72	117
28	89	148	46	54
29	111	131	116	83
30	117	144	108	108
MEAN	115	127	87	91

Table 6 ASPT values for each sample at each site in May 1998

SAMPLE	Faloden A ASPT	Faloden B ASPT	Blackbridge A ASPT	Blackbridge B ASPT
1	5.3	5.6	5.7	6.2
2	5.6	5.6	6.2	6.7
3	5.8	5.6	6.1	6.1
4	5.3	5.9	6.5	5.5
5	5.6	5.8	6.5	5.9
6	6.7	5.9	6.2	5.8
7	5.9	5.4	6.4	5.5
8	6.1	6.1	5.2	4.8
9	6.0	5.4	5.3	5.8
10	5.7	6.2	5.2	5.5
11	5.9	6.2	5.6	5.4
12	5.6	5.6	5.5	6.0
13	5.6	6.0	6.0	6.1
14	6.1	5.9	5.7	6.3
15	5.5	5.4	6.0	5.6
16	5.5	5.7	5.1	5.4
17	5.3	5.9	5.8	5.6
18	6.3	5.8	5.8	5.6
19	5.5	5.8	6.1	5.7
20	5.9	5.9	5.4	6.1
21	5.6	5.7	6.1	6.0
22	5.8	5.9	5.8	5.9
23	5.8	5.5	5.8	6.1
24	5.8	5.4	6.1	5.8
25	5.9	5.3	6.3	5.5
26	5.8	5.8	6.2	5.6
27	5.5	6.0	5.5	5.8
28	5.6	5.9	5.7	6.0
29	5.6	5.7	6.1	5.5
30	5.9	6.0	6.0	6.7
MEAN	5.7	5.8	5.9	5.8

Table 7 Biomass estimates (individual, means and 95% CLs) at each site with mean biomasses expressed as g per metre squared in May 1998

SAMPLE	Falloden A weight (g)	Falloden B weight (g)	Blackbridge A weight (g)	Blackbridge B weight (g)
1	1.1088	0.7088	0.7424	1.3008
2	1.1088	2.4000	0.4992	0.4272
3	1.1664	0.8560	0.7728	0.6992
4	1.952	2.8832	0.3632	1.0720
5	0.1456	1.1088	0.3680	1.0080
6	0.5136	0.5952	1.0032	0.8240
7	0.8624	1.1392	0.3952	2.4832
8	0.9808	0.6192	0.4384	1.3040
9	0.992	0.8896	0.3712	0.6560
10	0.8352	0.6176	0.2560	4.9392
11	0.7008	1.0720	0.4976	1.9536
12	0.6352	0.8848	0.2976	3.4640
13	1.0576	1.0912	1.2720	2.5824
14	1.0384	0.7280	1.4896	0.3120
15	1.632	0.6672	0.3456	1.9728
16	1.8336	1.9424	0.5184	2.6944
17	1.2192	0.9600	2.2688	2.3904
18	2.3568	3.0016	0.9952	1.4528
19	1.1104	0.6128	0.5952	1.1264
20	0.384	1.0912	0.4176	0.6928
21	3.1232	1.2240	0.4336	1.4688
22	1.1856	1.4240	0.6256	1.3168
23	0.3504	1.2528	2.1872	0.2288
24	0.3632	1.4688	4.6816	0.4944
25	0.6928	1.5232	0.5296	1.3488
26	0.9168	1.2576	0.6736	0.3328
27	0.7344	1.4384	0.0624	1.8336
28	0.3488	0.9168	0.2240	0.1120
29	0.3968	1.1808	1.9232	0.4256
30	0.3648	1.1568	1.4448	0.9824
TOTAL	30.11	36.71	26.69	41.90
MEAN	1.00	1.22	0.89	1.40
95%CL	0.24	0.23	0.34	0.40
BIOMASS	20.07	24.47	17.80	27.93

