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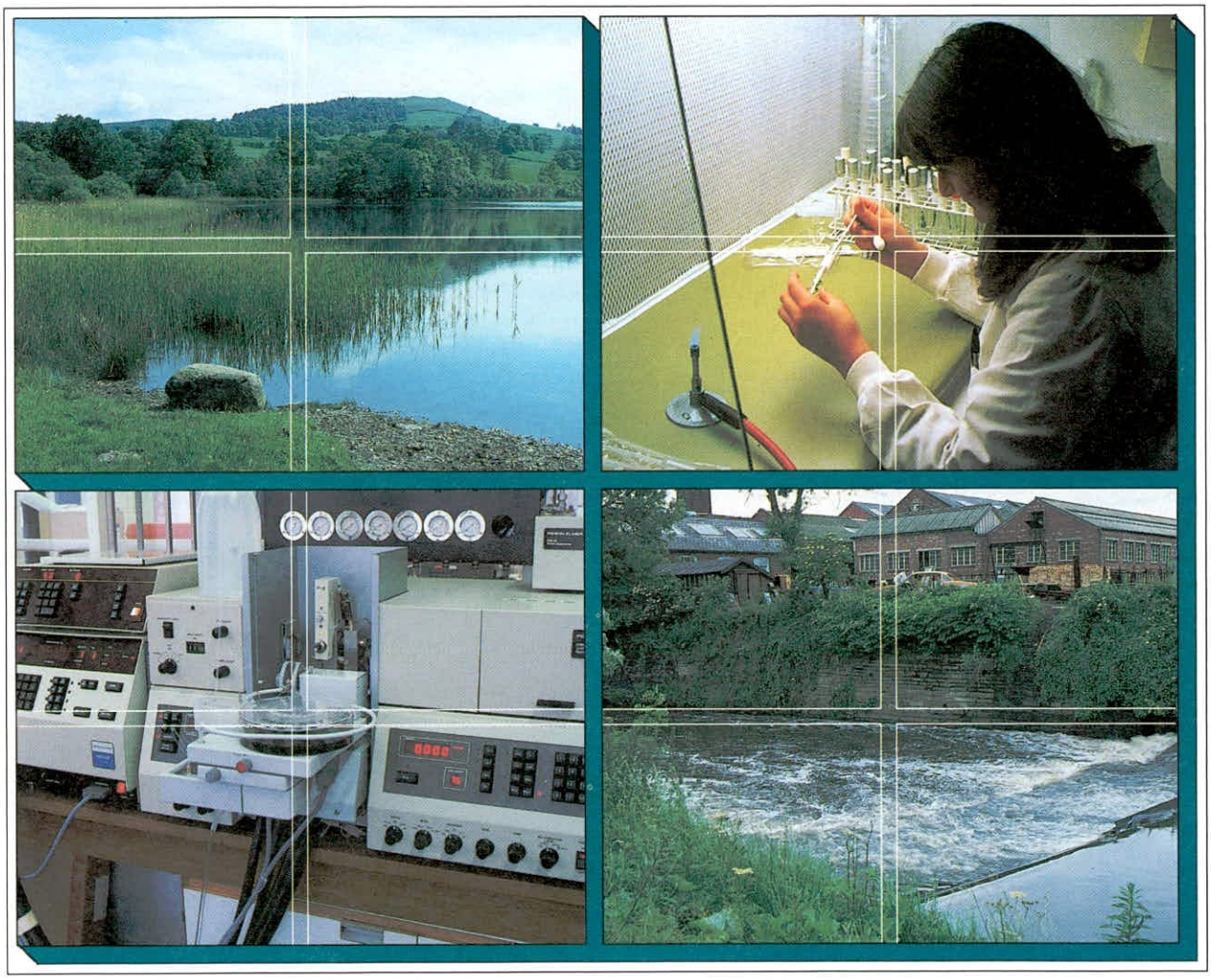

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INTRODUCTION

This report on the invertebrates of two tributaries of the River Itchen has been produced as part of a joint MAFF/EA 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. The objective is to compare the invertebrate communities in the wooded and open sites and if significantly greater biomasses are found in the open sites then to open the canopy in the wooded sections with a view to increasing the production of invertebrates and subsequently, the production of juvenile salmonids feeding on these invertebrates.

This is the second series of samples taken from the two tributaries by MAFF staff. Samples were taken in October 1996. 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 m^2 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) and adding the number from Tube B. Although adding the number from Tube B is not strictly correct, the error is small compared to that from the sub-sampling itself and it does have the advantage of ensuring that the most complete family list is complied for each sample (otherwise those present in small numbers and not appearing in the fraction considered would be missed).

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 5 and 8 October 1996 inclusive.

All benthic samples were sub-sampled and the fractions picked were as follows:

Blackbridge A	One eighth
Blackbridge B	One sixteenth
Falloden A	One eighth
Falloden B	One quarter

The families found at each site are shown in Tables 1-4 respectively for the sites as listed above. In addition, the number 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. It can be immediately seen from non-overlapping confidence limits that there is a significant difference between the wooded and open sites of the Blackbridge stream with more invertebrates in the open sites. A t test was performed on the biomass data from the Falloden stream. The analysis was performed twice assuming first equal and secondly unequal variances. In both cases $t = 2.10$ and $p < 0.05$. This indicates a significant difference between the wooded and open sites with a greater biomass of invertebtrates in the open sites as was the case for the Blackbridge stream.

Table 1 List of invertebrate families and numbers found from samples at Site A (wooded) on the Blackbridge stream on 8 October 1996

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae		1		17		1		8			8				
Leptophlebiidae															
Ephemerellidae						1		1				1			1
Ephemeridae															
Leuctridae						8									
Odontoceridae		1	1	8						1	1	1	1		
Leptoceridae										8					
Goeridae		1						8			9	9			
Lepidostomatidae															
Sericostomatidae				1											
Calopterygidae															
Psychomyiidae		1													
Caenidae						8			1						
Rhyacophilidae						8							1		
Polycentropodidae															
Limnephilidae						1				16					
Ancylidae								1			8		8		
Hydroptilidae															
Gammaridae	24	88	56	104	48	384	80	64	104	208	160	64	224	80	8
Dytiscidae															
Gyrinidae											8	8	8		
Elmidae	80	105	113	152	64	160	72	137	88	129	241	89	280	40	1
Chrysomelidae												8			
Hydropsychidae	1		1	8				9	1	9				16	
Tipulidae	1	1		8	1	8	9	1	1	8	16	9	16		
Simuliidae															
Planariidae															
Dendrocoelidae						1	1					1			
Baetidae				2	24				1	9	24	1	8		
Piscicolidae															
Hydrobiidae															
Sphaeriidae				1											
Glossiphonidae			1	1		8	8	8	1		1				
Erpobdellidae			1			1							8		
Asellidae															
Chironomidae					8				16		8			8	
Oligochaeta	8		16	16		56	8	16	9	32	89	1	56		
Empidae															
Ceratopogonidae															
Curculionidae															
Nematoda	8														
Muscidae						1									

Table 1 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae	9		16	1			8	8	8		16	8		16	
Leptophlebiidae															
Ephemerellidae									1						
Ephemeridae															
Leuctridae															
Odontoceridae	1	1	2	17	1							1			
Leptoceridae	8														
Goeridae	1	8	8				9			1					
Lepidostomatidae															
Sericostomatidae							1								
Calopterygidae															
Psychomyiidae															
Caenidae															
Rhyacophilidae					8										
Polycentropodidae														8	
Limnephilidae		8				1			8					8	
Ancylidae											1				
Hydroptilidae															
Gammaridae	80	136	312	120	112	32	56	104		144	104	24	56	416	104
Dytiscidae															
Gyrinidae															
Elmidae	51	208	169	176	121	33	240	104	120	82	57	72	96	89	18
Chrysomelidae															
Hydropsychidae		2			8	1	8	1	8					24	
Tipulidae		1	9		1	1	18	8	1		9		16		
Simuliidae							16	8					8	8	
Planariidae														8	
Dendrocoelidae		8												8	
Baetidae			8			8		8						16	
Piscicolidae													1		
Hydrobiidae															
Sphaeriidae		8													
Glossiphonidae	1		1						1	1				9	
Erpobdellidae			9		1		16	8			8			8	
Asellidae									1					8	
Chironomidae	1			9			9		8					16	
Oligochaeta	8	24	40	25	33	8	120	17	16		24	32	72	64	17
Empidae															
Ceratopogonidae															
Curculionidae															
Nematoda															
Muscidae	1								8						

Table 2 List of invertebrate families and numbers found from samples at Site B (open) on the Blackbridge stream on 7 October 1996

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae			16												
Leptophlebiidae															
Ephemerellidae		17		16	1	1		33		65		1	17	16	1
Ephemeridae															
Leuctridae															
Phryganeidae				1											
Odontoceridae					1		1	16		1	1				17
Leptoceridae															
Goeridae								1				17	1		
Lepidostomatidae															
Sericostomatidae				18		34		17	16					1	
Caenidae					16										
Rhyacophilidae		1	1		1	1	17	17	17	16	17	34	2	1	17
Polycentropodidae															
Limnephilidae				16		2			16	1				2	16
Ancylidae					1		16								
Hydroptilidae															
Gammaridae	1	400	208	416	144	96	144	592	336	176	192	368	64	272	160
Dytiscidae		1		16						1					
Gyrinidae															
Elmidae	1	48			97		48	225	32	97	48	97	114	16	65
Chrysomelidae												1			
Hydropsychidae						33		1				33			
Tipulidae					1		1	17		1			1		
Simuliidae					16	65		128	64	145		1		16	
Planariidae				16											
Dendrocoelidae				16	1	1	16	1				16			
Baetidae		64	65	16	34	33	145	16	96	17	51	34	66	1	49
Piscicolidae															
Hydrobiidae															
Physidae		16		16								1			
Sphaeriidae															
Glossiphonidae	1	17		33			1	16	1	17	1	1		16	1
Erpobdellidae		1	1	18	1	1	1	34		16	1	1	17		
Asellidae		16													
Chironomidae	16	65		48		18		48	16	50	1			16	
Oligochaeta	48	336	64	177	32		32	80	48	65	1	32	16	32	16
Empidae															
Ceratopogonidae				16											
Curculionidae															
Nematoda															
Hydiidae				1											

Table 2 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae						16						1			
Leptophlebiidae															
Ephemerellidae	32	16			1		34	1	16	1	1	2	33	1	1
Ephemeridae							1								
Leuctridae															
Phryganeidae							1								
Odontoceridae		18	1	2		1		1	2	2		16		1	
Leptoceridae					16				16						
Goeridae			16						1	1				2	17
Lepidostomatidae															
Sericostomatidae	1	1	1		1	16			16		2				
Caenidae															
Rhyacophilidae	1	17	1	16	33	18	18	1	17	17			16	34	1
Polycentropodidae					1										
Limnephilidae	17		16		1				33		32		36		2
Ancylidae				1										1	
Hydroptilidae															
Gammaridae	768	464	176	160	480	481	288	464	432	432	208	113	48	384	48
Dytiscidae	18				34		32		1				16		
Gyrinidae												1			
Elmidae	82	97	49	64	97	288	97	34	32	177	209	18	178	416	80
Chrysomelidae															
Hydropsychidae	1					1	1				1			1	
Tipulidae		1	1	1		33			16		1			1	1
Simuliidae	16		1		64	48	96	17	208		32		48	16	64
Planariidae			1												
Dendrocoelidae							16							1	
Baetidae	48	97	67	33	114	132	128	98	65	98	34	17	51	36	34
Piscicolidae									1						16
Hydrobiidae															
Physidae															
Sphaeriidae	1		1		1										
Glossiphonidae	1		1		2	16							1	1	1
Erpobdellidae	2	16	1		33			1	17		16		1	1	1
Asellidae													16		
Chironomidae	64		16	17	49		32	32			16	32	64		
Oligochaeta	304	256	128	96	144	160	64	33	32	32	144	80	17	48	64
Empidae															
Ceratopogonidae															
Curculionidae															
Nematoda															
Hydiidae															

Table 3 List of invertebrate families and numbers found from samples at Site A (open) on the Falloden stream on 6 October 1996

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae	1					8						8			
Leptophlebiidae															8
Ephemerellidae			1		1		9		8		16				9
Leuctridae													8		
Odontoceridae				1					24				8	1	8
Leptoceridae															
Goeridae	8	8		1	17	10	1	1	16	8			8	1	1
Lepidostomatidae															
Sericostomatidae															
Caenidae				8	8	8									
Rhyacophilidae	9	10	24	9	1	9		9	9	18	41	9		25	16
Polycentropodidae	16						18				9		8		1
Limnephilidae				8							9		8		1
Ancylidae	17	8		8	8										
Hydroptilidae															
Gammaridae	65	312	144	240	248	136	40	128	16	168	25	88	112	224	56
Haliplidae															
Dytiscidae											8				8
Gyrinidae												8			
Elmidae	184	344	168	257	201	152	32	80	41	65	152	24	40	80	113
Hydropsychidae	65	24	184	40	56	25	26	8			33	8	80	41	9
Tipulidae				10					17						
Simuliidae	264		184	8		8	25		64		360		32		144
Planariidae				8											
Dendrocoelidae	1	1		8			1				8		24		
Baetidae	2	98	8	42	41	51	40	9	82	58	80	107	8	51	32
Piscicolidae							1		8		16				17
Hydrobiidae													8		8
Lymnaeidae													1		
Physidae															1
Sphaeriidae											1				
Glossiphoniidae	1			1	1		9		1		8		1	1	17
Erpobdellidae	9	24	25	17	1	1	48		1	17	19	8	41	1	25
Asellidae					8		1				9			1	
Chironomidae	32	8	120	16	16		104	8	32	72	104	24	24	32	81
Oligochaeta	40	32	25	72	64	32	104	32	129	40	192		73	40	152
Nematoda															
Ceratopogonidae															
Ostracoda															
Psychododae															
Cladocera															
Rhabdocoela															
Empididae	8														
Succincidae			8												
Muscidae					8		8							8	
Collembola															

Table 3 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae								8							8
Leptophlebiidae			8												
Ephemerellidae				2		1		8	1			24			8
Leuctridae															8
Odontoceridae								8				8		8	
Leptoceridae				16		1						8			
Goeridae	10	8	10	1				10	1				25		9
Lepidostomatidae															
Sericostomatidae		1						8						1	
Caenidae		16									8				
Rhyacophilidae	10	17		16	16	48		1	16	16	8	41	16		9
Polycentropodidae		1	16	8		8									
Limnephilidae		1	9					8					1		
Ancylidae		16					1		24		8		8	1	
Hydroptilidae															
Gammaridae	81	153	96	32	16	48	32	328	128	136	128	144	104	48	136
Haliplidae			8			8				16	1				
Dytiscidae				8											
Gyrinidae						8									
Elmidae	17	136	58	24	9	40	16	184	64	57	96	56	64	48	24
Hydropsychidae		41	2	17	16	105	24	177	33	442	16	384	1	136	48
Tipulidae											8				1
Simuliidae		113		48	8	120	1	120		120	8	240	8	120	40
Planariidae														8	
Dendrocoelidae		8	8				1	16	8						16
Baetidae	57	16	17	20	32	24	29	89	40	27	35	49	40	73	26
Piscicolidae	1	2	8	8				16		8		8		1	
Hydrobiidae														1	
Lymnaeidae						1	1								
Physidae				8								8			
Sphaeriidae															
Glossiphoniidae		1	8	25	1	1		1	8	1		9		8	
Erpobdellidae	1	17	8		24	3		17	1	9		9		9	1
Asellidae					8	8			8	16		8		32	57
Chironomidae	24	40	104	24	16	64	8	128	16	104	9	168	16	104	40
Oligochaeta	41	80	112	56	80	80	24	96	48	32	88	120	56	104	88
Nematoda					8										
Ceratopogonidae			8												8
Ostracoda															
Psychododae															
Cladocera															
Rhabdocoela															
Empididae										16					
Succincidae															
Muscidae					8	8		17				8		8	
Collembola										8					

Table 4 List of invertebrate families and numbers found from samples at Site B (wooded) on the Falloden stream on 5 October 1996.

	Site number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Heptageniidae											4			9	
Leptophlebiidae			4										8	4	
Ephemerellidae		8	4	4			1						4		
Leuctridae															
Odontoceridae					1				4						
Leptoceridae															
Goeridae	5	4	22	40	14	2		36	5	24	5	1		8	6
Lepidostomatidae															
Sericostomatidae		2		1											
Caenidae			4											4	
Rhyacophilidae	1		8		1			1	9		1		4	1	
Polycentropodidae															
Limnephilidae			1												
Ancylidae	28	8	16	24		4		12	5	4	24	12		8	8
Hydroptilidae															
Gammaridae	204	29	68	72	28	76	16	92	36	52	76	92	52	480	60
Haliplidae		4													
Dytiscidae		6													
Gyrinidae				5											
Elmidae	176	72	128	213	168	76	212	64	69	212	60	72	32	224	24
Chrysomelidae														4	4
Curculionidae														4	
Hydropsychidae		1	4		1				4		4	1	1	4	1
Tipulidae	4		10	5		6			6	20	8	4		1	8
Simuliidae		1									1		1		
Planariidae														4	
Dendrocoelidae		4										1		4	
Baetidae	12	4	23	15		10		8	4	8			2	9	8
Sialidae		1													
Piscicolidae		4							4					4	
Hydrobiidae			4												
Sphaeriidae		1		4				1							
Glossiphoniidae		9		1	1	4	1	4		4	1		4		1
Erpobdellidae		10	4	20	13	4	5	4	1	4	12	8	4	32	
Asellidae	4			4						1			1		
Chironomidae	4	24		4	4	4			4		8		8	8	
Oligochaeta	124	117	56	116	88	64	72	16	76	52	56	32	28	124	24
Ceratopogonidae		4													
Empida															
Nematoda			4	4							4				
Muscidae				4											
Succincidae													4		
Hydracarina															

Table 4 (cont)

	Site number														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Heptageniidae		1										1	1		
Leptophlebiidae		4				8									
Ephemerellidae									1						
Leuctridae															
Odontoceridae	4												8		
Leptoceridae															
Goeridae	1	9	19			36	10	24	24			5	1	2	5
Lepidostomatidae															
Sericostomatidae			4												
Caenidae	4			4		4	4					4	4	4	
Rhyacophilidae		1		12	1	4	5			4	1	4	10	12	2
Polycentropodidae						9		8							
Limnephilidae	4														
Ancylidae	4	16		4	4	12	6		1	4		4	12		5
Hydroptilidae															
Gammaridae	80	248	88	84	16	92	144	100	164	112	40	104	233	100	140
Haliplidae								4							
Dytiscidae															
Gyrinidae			4												
Elmidae	80	96	84	120	9	73	96	156	105	56	32	116	220	172	80
Chrysomelidae								4							
Curculionidae															
Hydropsychidae	1			4		28		1	4		4		9		5
Tipulidae		8		5			5	5	6	8		1	8	10	5
Simuliidae	4	20		4							1	40	25		11
Planariidae													4		
Dendrocoelidae						1									
Baetidae	6	17		17	4	8	6	9	29	10	4	29	8	17	
Sialidae															
Piscicolidae								4							
Hydrobiidae															
Sphaeriidae															
Glossiphoniidae	4				4	4	4	12	4	5				4	
Erpobdellidae	1	17	4	1	1	9		4	9	5	1	8	8	4	6
Asellidae		1				1	1							4	4
Chironomidae	4				5	12	8		1			4	4		4
Oligochaeta	24	12	48	44		8	24	28	24	36	12	20	80	65	56
Ceratopogonidae															
Empida										4					
Nematoda								4							
Muscidae													4		
Succincidae															
Hydracarina								4							

Table 5 BMWP values for each sample at each site

SAMPLE	Falloden A BMWP	Falloden B BMWP	Blackbridge A BMWP	Blackbridge B BMWP
1	79	49	22	17
2	54	96	54	52
3	48	89	33	31
4	96	76	62	74
5	72	52	22	74
6	63	45	79	64
7	73	28	25	55
8	40	48	61	91
9	75	68	38	50
10	38	44	53	73
11	85	68	67	41
12	47	46	66	72
13	89	64	52	51
14	59	105	18	60
15	110	50	21	53
16	42	74	57	76
17	97	75	57	61
18	77	40	57	86
19	87	54	34	46
20	44	36	42	88
21	84	84	33	71
22	42	59	62	75
23	107	63	44	53
24	70	60	51	104
25	53	40	24	58
26	58	36	36	63
27	81	71	32	53
28	58	91	26	61
29	75	54	71	85
30	91	57	12	70
MEAN	**69.80**	**60.73**	**43.70**	**65.79**

Table 6 ASPT values for each sample at each site

SAMPLE	Falloden A ASPT	Falloden B ASPT	Blackbridge A ASPT	Blackbridge B ASPT
1	9.9	6.1	7.3	3.4
2	6.8	13.7	13.5	6.5
3	6.0	12.7	6.6	5.2
4	12.0	10.9	10.2	9.3
5	9.0	7.3	5.5	10.6
6	9.0	6.4	13.2	9.1
7	9.1	5.6	6.3	7.9
8	5.7	6.9	6.2	11.4
9	9.4	8.5	5.4	6.3
10	4.8	7.2	8.8	9.1
11	10.6	9.7	9.6	5.1
12	6.7	9.2	13.2	10.3
13	11.1	8.0	7.4	7.3
14	7.4	13.1	6.0	7.5
15	13.8	8.3	7.0	7.6
16	5.3	9.3	9.5	9.5
17	12.1	10.7	9.5	8.7
18	9.6	8.0	9.5	10.8
19	10.9	9.0	6.8	6.6
20	6.3	6.0	7.0	11.0
21	10.5	10.5	6.6	10.1
22	7.0	7.4	10.3	10.7
23	13.4	9.0	7.3	6.6
24	8.8	8.6	8.5	13.0
25	7.6	6.7	6.0	9.7
26	9.7	6.0	7.2	7.9
27	10.1	8.9	8.0	8.8
28	8.3	11.4	6.5	7.6
29	10.7	7.7	8.9	12.1
30	11.4	7.1	4.0	10.0
MEAN	**9.10**	**8.66**	**8.06**	**8.96**

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

SAMPLE	Falloden A weight (g)	Falloden B weight (g)	Blackbridge A weight (g)	Blackbridge B weight (g)
1	0.3896	0.3920	0.0664	0.0240
2	0.6600	0.2004	0.0864	0.4416
3	0.6112	0.2932	0.0992	0.4320
4	0.7744	0.5952	0.208	0.3584
5	0.5720	0.1996	0.0584	0.2192
6	0.2184	0.1632	0.3376	0.5072
7	0.4872	0.2456	0.0688	0.2928
8	0.2832	0.2312	0.1872	1.0752
9	0.2192	0.1808	0.1392	0.5136
10	0.3264	0.3356	0.284	0.3072
11	0.5416	0.2336	0.572	0.2032
12	0.1952	0.1744	0.1312	0.6752
13	0.6152	0.2444	0.312	0.1312
14	0.4088	1.0252	0.0768	0.4384
15	0.4184	0.1596	0.0696	0.3760
16	0.1872	0.3344	0.0656	0.8496
17	0.3536	0.4048	0.3832	0.6592
18	0.4016	0.2400	0.4032	0.3344
19	0.2200	0.1964	0.2072	0.1728
20	0.2120	0.0144	0.2144	0.6512
21	0.3264	0.4236	0.0328	0.7200
22	0.1040	0.3060	0.3032	0.5312
23	0.9760	0.3512	0.3584	0.6880
24	0.2400	0.2864	0.3408	0.6288
25	0.4664	0.2048	0.2536	0.5328
26	0.2944	0.0968	0.1176	0.4032
27	0.4168	0.2448	0.068	0.1120
28	0.1888	0.5268	0.1496	0.2480
29	0.6112	0.2704	0.5152	0.6864
30	0.2160	0.2236	0.2024	0.1712
TOTAL	**11.94**	**8.80**	**6.31**	**13.38**
MEAN	**0.40**	**0.29**	**0.21**	**0.45**
95%CL	**0.07**	**0.07**	**0.05**	**0.09**
BIOMASS	**7.96**	**5.87**	**4.21**	**8.92**

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