Best wishes
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The Winter Macrobenthos of the Clogh River System, Northern Ireland

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ABSTRACT

A winter survey of a small upland river system, the Clogh River, Northern Ireland, was conducted to appraise the macroinvertebrate community in light of a reportedly declining fishery. Plecoptera were more abundant at the higher elevation sites; Ephemeroptera were more abundant at lower elevations; and Trichoptera were widely distributed but never abundant. With reference to functional feeding groups, grazers/scrapers and collectors were widely distributed at all elevations, while most shredders were found at higher elevation sites. The transition from dependence on allochthonous to autochthonous energy inputs, based on the composition of the community, appeared to occur approximately at the 1-2 stream order boundary. This is probably due to the sparse riparian vegetation and lack of shading on most stretches of this river.

INTRODUCTION

The Clogh River system rises on the Antrim Plateau (approx. 500m a.s.l.)in an area of upland blanket bog and then flows mainly through areas of clay loam to join the River Main at Glarryford (Higgins 1988). The total length of the system is approximately 35 km and it drains a large section of the upper River Main catchment (Fig.1). The River Main catchment is underlain by Tertiary basalts with superimposed glacial features. Land use in the area is largely agricultural. A winter survey of the macroinvertebrates of the Clogh River was undertaken in 1988-89 to assess the availability of suitable food for fish, particularly in response to reports of a decline in angling returns on the River Main system.

METHODS

A preliminary survey of the macroinvertebrates at ten collection sites was undertaken in November 1988, using 5-min kick samples. A more extensive survey was then done in January 1989 with a single Surber sample (area $0.1m^2$) at each of 15 sites. Collection sites were located in riffles to minimize the influence of differences in substrate. Except for site 2, which was sandy, all stations had substrates of well-sorted gravel with small amounts of interstitial sand and scattered cobbles and clasts. Samples were preserved in formalin at the time of collection. In the laboratory, samples were rinsed in a 250μ sieve and any large stones were scrubbed gently under running water. Animals were sorted in a white tray and identified using standard works. Animals were assigned to functional feeding groups following Giller and Twomey (1993); because of uncertainty about the mode of feeding of many Chironomidae, the chironomids were not categorized.

RESULTS AND DISCUSSION

A total of 53 taxa were identified during the kick sample survey, distributed among the groups as shown in Table 1. Abundance of animals was greatest in the middle stretch of the river system, largely due to the ephemeropteran, *Rhithrogena semicolorata* (Curtis). Plecoptera were mainly found in the middle and upper reaches, Ephemeroptera were most abundant in the middle while Trichoptera and Coleoptera (particularly *Elmis aenea* (Muller)) were distributed throughout the system. Simuliidae and Chironomidae peaked in the lower reaches.

While the Surber survey (Table 2) revealed 74 taxa, the apparent increase

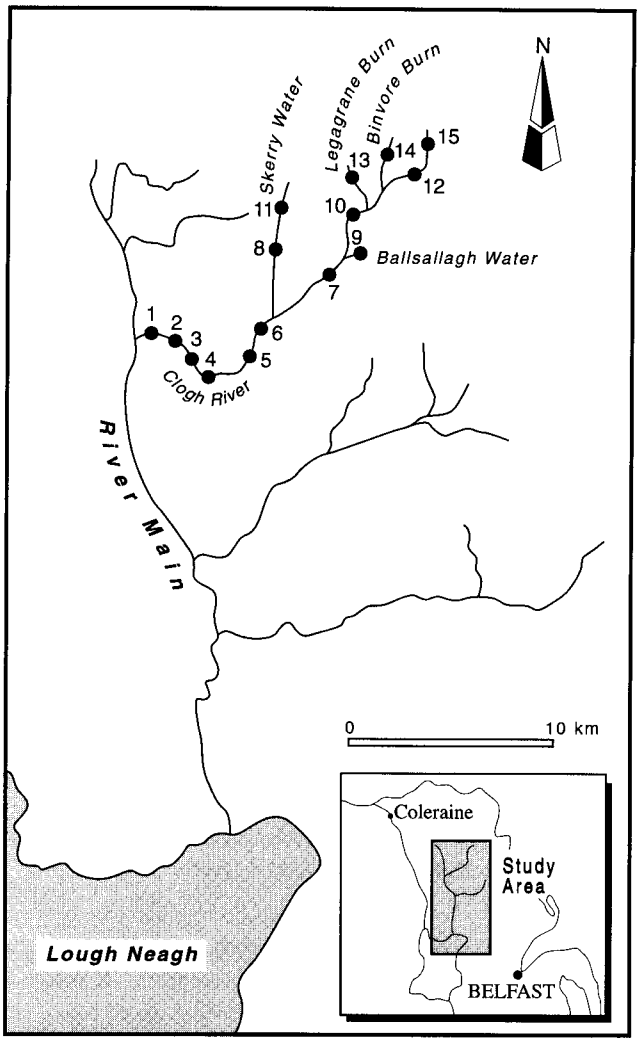

Figure 1. Location of the Clogh River system and position of sampling sites.

Table 1. Abundance of animals in kick samples (number per 5- min kick) collected in November 1988 from the Clogh River and its tributaries.

	Site Number									
	1	**2**	**4**	**5**	**6**	**8**	**9**	**10**	**11**	**15**
Plecoptera	0	0	2	14	10	25	28	101	21	47
Ephemeroptera	5	6	40	112	103	288	15	53	204	10
Trichoptera	5	10	2	12	17	10	10	42	28	3
Coleoptera	10	39	8	17	27	27	10	25	57	10
Simuliidae	1	37	54	0	3	0	1	1	4	0
Chironomidae	25	10	28	10	1	2	0	21	3	1
Mollusca	9	19	3	12	3	0	1	0	3	0
Oligochaeta	0	8	83	7	126	13	7	0	1	3
Other	4	14	5	8	30	7	6	25	1	0
Total	59	143	205	192	324	372	78	268	322	74

Table 2. Abundamce of animals in Surber samples (number m^{-2}) collected in January 1989 from the Clogh River and its tributaries.

Site Number ->	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Protonemura meyeri		20							20	10	280	270			
Protonemura praecox											60				
Amphinemura sulcicollis		30	90						10	30	400	250			10
Isoperla grammatica	60	430	400	110	180	70	30	50	70	60	280	10		40	80
Chloroperla torrentium		10			40	30		10	20		50			50	20
Leuctra inermis										10		140			130
Other Plecoptera											10			30	
Rhithrogena semicolorata	630	270	30	270	380	490	380	790	650	1160	330		140		30
Baetis rhodani	1110	1130	200	440	370	310	320	440	90	420	310	90	40	60	40
Other Ephemeroptera	20	10	20	40								10			10
Hydropsyche instabilis	10	10						10	10	50	180				
Hydropsyche siltalai	10	60	780					10				60			
Rhyacophila dorsalis	190	70	190	80	70		20			50					
Rhyacophila munda		80	30									20			
Limnephilidae				10		50	70			10		10			
Other Trichoptera		20	30	10				10		30	30			50	10
Elmis aenea	1830	320	6980		60		30	10	40	150	510	320			
Limnius volckmari		100	430	20	10	20	70	30	40	40	10	70			
Oulimnius sp.	50	20	100						10		80	80			
Other Coleoptera	20		10		10							10			10
Simulium brevicaule type	10			10	130	40	10	20	170	640		110			10
Simulium ornatum	100	7500		60											
Simulium nitidifrons		3020	90												
Simulium erythrocephalum		230													
Simulium (Wilhelmia) sp.	30	90	20												
Simulium sp.	30		130							10			20	10	
Chironomidae	360	790	8730	390	1430	10	0	20	0	40	50	300	0	250	10
Other Diptera	90	270	680	70	10	20	20	20	0	0	40	40	20	50	10
Gammarus duebeni	10	470	30	10	10							70		200	
Ancylastrum fluviatile	990		270	160	50					260	20			60	10
Pisidium sp.		140	80						10					20	
Other Molluscа		20													
Hirudinea		30	40	10										20	
Phagocata vitta			20						10			40		10	10
Oligochaeta	530	3510	2160	1820	660	470	390	20	100	90	150	240	20	70	35
Total number m-2	6050	18650	21550	3510	3410	1510	1340	1440	1250	3060	2790	2140	240	920	425

over the kick sample survey was due to more precise identification of the Simuliidae and Chironomidae. Making allowance for this, the number of taxa is again 53 although the constituent taxa were not identical. Two sites, 2 and 3, had by far the greatest numerical abundance, three times that of any other site, mainly because of the presence of large numbers of Simuliidae, Chironomidae, Oligochaeta, and *Elmis aenea*. The fauna at site 3, predominantly Chironomidae and *Elmis aenea*, may reflect disturbance as drainage work involving both the river bed and banks had been undertaken immediately above this site in 1988. There was some evidence of a longitudinal species pattern in the Simuliidae with *Simulium brevicaule* in the upper river (though not the small tributaries) being replaced by *Simulium ornatum* Meigen and *Simulium nitidifrons* Edwards downstream. The distribution of groups was similar to that of the kick sample survey, although Plecoptera, particularly *Isoperla grammatica* (Poda), were present at all the sites and Ephemeroptera were well represented at the lower sites by *Baetis rhodani* (Pictet). Plecoptera were most abundant at the higher elevation sites, though not in the very small tributaries. Ephemeroptera were present throughout the system but were most abundant at lower elevations. Trichoptera were widespread but never abundant. In both surveys, Simuliidae were most numerous at site 2 and Oligochaeta at sites 4 and 6. This probably relates to differences in substrate in the former case, as site 2 had a distinctly finer sediment than the other sites. Oligochaeta were generally more abundant in lower reaches.

The standard water quality assessments in the U.K., BMWP (Biological Monitoring Working Party) and ASPT (Average Score Per Taxon) scores (Armitage *et al.* 1983), were applied to the survey findings (Table 3). BMWP scores from the

Table 3. Biological Monitoring Working Party (BMWP) and Average Score Per Taxon (ASPT) values for all sites.

Site	BMWP [a] Score		ASPT [b]	
	Kick	Surber	Kick	Surber
1	63	71	5.9	5.5
2	70	107	4.7	5.6
3		106		5.6
4	83	86	5.2	5.7
5	101	71	5.9	5.9
6	95	62	5.9	6.2
7		64		6.4
8	102	64	6.8	5.8
9	78	75	6.0	6.2
10	76	79	6.3	6.1
11a	83	84	5.9	6.5
11b		82		6.3
12		94		5.9
13		20		4.0
14		84		5.6
15	92	76	6.6	6.3

[a] BMWP scores above 60 generally indicate a suitable water quality based on the occurrence of pollution sensitive taxa; scores below 50 suggest a degree of pollution.

[b] ASPT scores range from 0 to 10, with values above 5.0 indicating fairly good water quality.

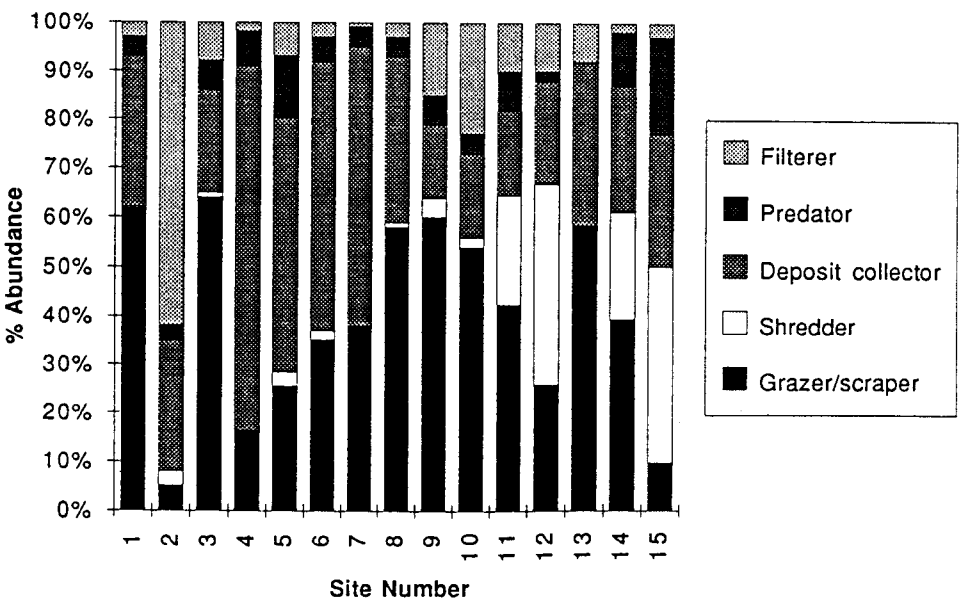

Figure 2. Relative abundance of functional feeding groups along the Clogh River system.

kick samples were generally higher than those from the Surber samples as a larger range of habitats was sampled with the former method but the differences were not statistically significant. No trend was evident along the river with this measure. ASPT scores showed a better agreement between surveys and a general pattern along the river system. Except for the two very small burns (sites 13 and 14), the upstream sites all had relatively high ASPT values. The downstream Clogh River sites had slightly higher scores.

The total number of taxa found during this survey (82) compared well with that found in other Irish waters by Fahy (1975) in the Altahoney River system in Co. Mayo (86) and by Giller and Twomey (1993) in a second-order stream in the River Blackwater system in Co. Cork (69). It would have been even higher if all the Chironomidae and Oligochaeta had been identified to species. It was also of the same order as indicated by Armitage *et al.* (1975) for four high altitude streams in Northern England. Some of the major groups of animals appeared under-represented in species compared to the English systems, but this was probably due to two factors. The winter season generally harbors fewer species, and Irish fauna is typically less diverse than British. For instance, Ireland has only 58% of the Plecoptera species occurring in Britain (Costello 1988), 70% of the Chironomidae (Murray and Ashe 1983), and 73% of the Trichoptera (O'Connor 1987). The distribution of the main groups conformed to the expected and that found in other streams.

The greater abundance of shredders in the higher reaches of the system (32% average compared to 1.7% at downstream sites) was in accordance with predictions of the river continuum concept (Vannote *et al.* 1980), as was the stability in the proportion of predators throughout the system - between 0 and 13%, except at site 15 (Fig. 2). The large proportion of predators there was due to high numbers of *Isoperla grammatica*. There was also evidence of a greater number of scraper/grazers in the middle levels, sites 8-10. At site 1 *Elmis aenea*, a scraper/grazer, accounted for nearly one-third of the total animals. At site 3 Chironomidae, although not included in the functional group analysis, were over one-third of the total. Most of these would be in the deposit/collector category. The influence of sediment was clearly shown at site 2, where filterers were predominant and very few shredders or grazers were present. It would seem that the transition from a shredder-dominated community, or from dependence on allochthonous energy inputs to autochthonous sources, was approximately at the stream order 1/2 boundary and that this was probably due to the lack of shading in most stretches of this system and the sparse riparian vegetation.

The BMWP and ASPT values generally fell within the ranges regarded as representing good to fairly good water quality. The variety of taxa, abundance of species, array of functional food groups, and the biological indicators (BMWP and ASPT) all indicated a healthy and diverse community structure, even in winter. It is therefore unlikely that the blame for poor fish stocks in the Clogh River system lies with the food source provided by the macroinvertebrate community.

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