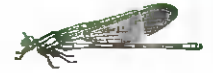


Appendix 4: Biological Water Quality Assessment of The River Camac

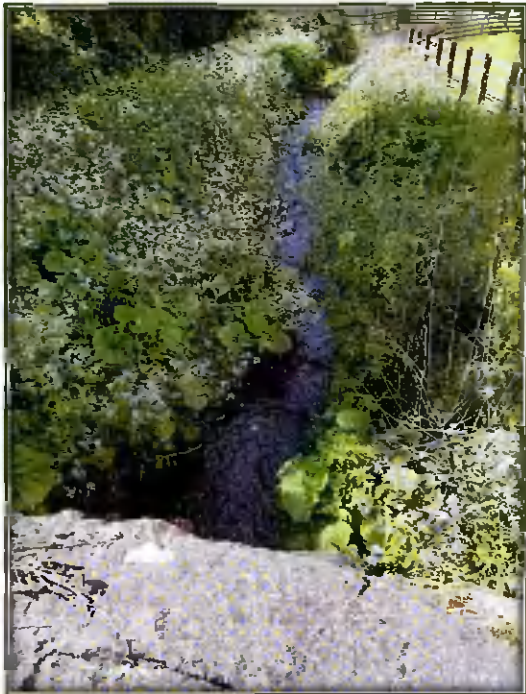


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BIOLOGICAL WATER QUALITY ASSESSMENT OF THE RIVER CAMAC, SAGGART, CO. DUBLIN



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c/o Rowan Engineering Consultants Ltd.
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Co. Meath

May 2021

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2 METHODOLOGY

2.1 PERSONNEL

This ecological assessment was carried out by Noreen McLoughlin, BA, MSc, MCIEEM, of Whitehill Environmental. Noreen has an honours degree in Zoology and an MSc in Freshwater Ecology from Trinity College, Dublin and she has been a full member of the Chartered Institute of Ecology and Environmental Management for 15 years. Noreen has over 17 years' experience as a professional ecologist in Ireland.

2.2 BIOLOGICAL ASSESSMENT

SAMPLE COLLECTION

Biological water quality assessment was carried out at three separate locations on the River Camac. These locations are summarised in Table 2 and illustrated in Figure 1.

Station No.	Description	Location
1	Upstream	X703457 Y726019
2	Midstream	X703356 Y726089
3	Downstream	X703302 Y726180

Table 2 – Stations Sampled as Part of this Assessment



Figure 1 – Map Identifying Stations Sampled as Part of this Assessment

1 INTRODUCTION

1.1 BACKGROUND

In May 2021, Whitehill Environmental was commissioned by Rowan Engineering Consultants Ltd. to undertake an assessment of the biological water quality of a watercourse in Saggart, Co. Dublin. Samples were taken at three locations along this river.

1.2 Q VALUE ASSESSMENT

Along with other parameters (fish, morphology, chemistry), the Q value is used to determine the ecological status of the waterbody, which is an action required under the obligations set out in the EU Water Framework Directive. Under this Directive, all water bodies are required to meet good status within a certain time period. Ireland is now in the second cycle of the Water Framework Directive and therefore good status should be achieved in all water bodies by the end of this current cycle, i.e., 2021. If a waterbody is unlikely to achieve this status, then it is deemed to be *At Risk*. Table 1 summaries the Q values in relation to Water Framework Directive status.

Q Value	WFD Status	Pollution Status	Condition
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

Table 1 – Q Rating in Relation to WFD Status

Fieldwork was carried out on May 18th by trained personnel from Rowan Engineering Consultants Ltd. The three proposed sites chosen proved suitable and safe for sampling. Samples were then subsequently preserved in ethanol delivered to Whitehill Environmental on the 22nd May.

At each station, the surrounding habitats were noted along with other parameters such as water flow, stream depth and the predominance of vegetation. All samples were taken with a Freshwater Biological Association approved hand held sweep net with a mesh diameter of 500µm. At all stations, a two minute kick sample (the travelling kick) method was taken, which ensures that all habitats within a riffle area are sampled. Samples were deposited in a tray on the bank of the river. Bigger stones were washed and any macro-invertebrates clinging to the stones were removed and placed in the tray. Once the debris in the sample was removed, the sample containing the macro-invertebrates and the finer substrates were placed into containers and preserved with isopropyl alcohol.

Once the samples were delivered to Whitehill Environmental, all macro-invertebrates were removed from the sample, identified to the appropriate taxonomic level and then counted.

Q VALUE

Based on the relative abundance of indicator species, the Q value was determined for the sites in accordance with the biological assessment procedure used by the Environmental Protection Agency (Toner *et al.* 2005). The method categorises invertebrates into one of five different groups based on their sensitivity or tolerance to pollution. Group A are the most sensitive forms, Group B are less sensitive, Group C are tolerant, Group D are very tolerant and Group E are the most tolerant. Overall, the higher the biological diversity and the greater the abundance of invertebrate species that are sensitive to organic pollution, then the higher the water quality is assumed to be and the higher the Q value assigned to that sampling station.

The relative abundance of each group of invertebrates in the samples was assigned as follows:

- Present (1/2 individuals)
- Scarce/Few (<1%)
- Small Numbers (<5%)
- Fair Numbers (5-10%)
- Common (10-20%)
- Numerous (25-50%)
- Dominant (50-75%)
- Excessive (>75%)

3 RESULTS OF THIS ASSESSMENT

Results of the biological water quality monitoring are summarised in Table 4.

Station	Q Value & Status	Status
1 – Upstream	Q ₃₋₄	Moderate
2 – Midstream	Q ₄	Good
3 – Downstream	Q ₄	Good

Table 4 – Summary of Findings of the Biological Water Quality Assessment

SAMPLING SITE 1 – UPSTREAM

Physical Characteristics and Field Observations



Figure 2 – Map Identifying Sample Site 1 (Upstream).

Biological Assessment and Q Rating

The total number of organisms obtained in this sample was 358. Overall, biodiversity in the sample was moderately high. The sample was dominated by taxa from Group C and these are moderately tolerant of pollution. This group comprised 86% of the total faunal assemblage and this is considered excessive for the purpose of the Q assessment. Within

Group C, no single taxon dominated. The most prevalent Group C organisms in the sample and the most prevalent overall included freshwater shrimp from the genus *Gammarus* and the mayfly larvae *Baetis rhodani*. It was noted that two *Gammarus* species were present, i.e., the native shrimp *Gammarus duebeni* and the invasive *Gammarus pulex*. Other Group C taxa included the snail *Lymnaea truncatula* and caseless caddis from the Hydropsychidae family.

The most sensitive taxa are those in Group A and these occurred here in small numbers. They were represented by the flattened mayfly *Rhitrogena semicolorata* and stoneflies from the Chloroperlidae family. Group B taxa are slightly more tolerant and these occurred in fair numbers in the sample. They were represented by caseless caddis from the Limnephilidae and Sericostomatidae families. The most tolerant taxa from Group D and E were absent.

Overall, based on the relative abundance of the indicator groups, the diversity in the sample, the occurrence of Group C taxa in excessive numbers and the presence of Group A in small numbers and Group B in fair numbers, this station was assigned a tentative Q₄, i.e., good ecological status. Under the requirements of the Water Framework Directive, this is unsatisfactory. Any reduction in the proportion of Group A here would reduce this station to moderate status.

SAMPLING SITE 2 – MID-STREAM

Physical Characteristics and Field Observations



Figure 3 – Map Identifying Sample Site 2 (Midstream).

Biological Assessment and O Rating

The total number of organisms obtained in this sample was 126. Overall, biodiversity in the sample was moderate. Group C taxa was again the most prevalent taxa in the sample and it occurred in excessive numbers. Gammarus species had the highest abundance and overall they comprised over 35% of the total faunal assemblage. Caseless caddis from the Hydropsychidae family were also common. The most sensitive Group A taxa were common in this sample. This group was represented by the mayfly *Rhitrogena semicolorata*, along with three families of stoneflies (Perlidae, Perlodidae and Chloroperlidae). Groups D and E were absent in this sample.

Overall, based on the relative abundance of the indicator groups and the occurrence of Group C taxa in excessive numbers and the fact that Group A was well represented with three different taxa, this sample as assigned a Q₄, i.e., good ecological status. Under the requirements of the Water Framework Directive, this is satisfactory.

SAMPLING SITE 3 – DOWNSTREAM

Physical Characteristics and Field Observations



Figure 4 – Map Identifying Sample Site 3 (Downstream).

Biological Assessment and Q Rating

The total number of organisms obtained in this sample was 465. Overall, biodiversity in the sample was moderate. Group C taxa was the dominant group in this sample but it did not occur in excessive numbers. Gammarus species were the dominant taxa overall. Species were mixed and included *Gammarus duebeni* and *Gammarus pulex* and recruitment of juveniles was high. Other common Group C taxa included the mayfly *Baetis rhodani* and the snail *Lymnaea truncatula*. Group A taxa occurred here in fair numbers and they were represented by the mayfly *Rhitrogena semicolorata* along with stoneflies from the Chloroperlidae family. Group B taxa were numerous in the sample and they were mostly represented by small cased caddis larvae from the Glossosomatidae family. Group D taxa were present in small numbers in this sample.

Overall, based on the relative abundance of the indicator groups and the fact that Group C were dominant, that Group B were numerous and that Group A occurred in fair numbers, this was assigned a Q₄, i.e., good ecological status. Under the requirements of the Water Framework Directive, this is satisfactory.

4 DISCUSSION AND RECOMMENDATIONS

Overall, based on the results as part of this survey, it can be concluded that the ecological status of this water body at all stations is good as all stations were assigned a Q4. Looking within Group 4, currently the ecological status of Station 1 (upstream) is the most vulnerable, with downstream the least vulnerable. The upstream station has the lowest proportion of sensitive Group A taxa, followed by midstream with the downstream station having the highest proportion of sensitive taxa.

5 APPENDIX I- RESULTS OF MONITORING

Sampling Site 1 - Upstream

Indicator Group	Taxon	Number	%
Group A	Total No.	13	3.6
(Very sensitive)	Plecoptera		
	Chloroperlidae	5	1.4
	Ephemeroptera		
	<i>Rhitrogena semicolorata</i>	8	2.2
Group B	Total No.	34	9.5
(Moderately sensitive)	Cased Trichoptera		
	Limnephilidae	1	0.3
	Sericostomatidae	15	4.1
	Glossosomatidae	10	2.8
	Ephemeroptera		
	<i>Baetis muticus</i>	8	2.2
Group C	Total No.	309	86.3
(Moderately tolerant)	Amphipoda		
	Gammarus sp	90	25.1
	Ephemeroptera		
	<i>Baetis rhodani</i>	86	24
	<i>Ephemerella ignita</i>	1	0.3
	Diptera		
	Dicranota	5	1.4
	Stratiomyidae	1	0.3
	Coleoptera		
	Elminthidae	11	3
	Platyhelminthes		
	Triclad	1	0.3
	Gastropoda		
	<i>Lymnaea truncatula</i>	103	28.7
	Cased Trichoptera		
	Polycentropodidae	1	0.3
	Hydropsychidae	8	2.2
	Rhyacophilidae	2	0.5
Group D	Absent		
(Very tolerant)			
Group E	Absent		
(Most tolerant)			
Not Assigned to Group			
	Oligochaetes		
	Naidinae	2	0.5
Total			258
Q Value	Q₄ – Good Status		

Sampling Site 2 - Midstream

Indicator Group	Taxon	Number	%
Group A			
(Very sensitive)	Total No.		
	Plecoptera		
	Chloroperlidae	1	0.8
	Perlidae	1	0.8
	Perlodidae	4	3.2
	Ephemeroptera		
	<i>Rhitrogena semicolorata</i>	12	9.5
Group B			
(Moderately sensitive)	Total No.		
	Cased Trichoptera		
	Limnephilidae	1	0.8
	Glossosomatidae	1	0.8
Group C			
(Moderately tolerant)	Total No.		
	Amphipoda		
	Gammarus sp	45	35.7
	Ephemeroptera		
	<i>Baetis rhodani</i>	7	5.6
	Diptera		
	Dicranota	3	2.4
	Chironomidae	1	0.8
	Tipula	1	0.8
	Coleoptera		
	Elminthidae	4	3.2
	Platyhelminthes		
	Triclad	2	1.6
	Gastropoda		
	<i>Lymnaea truncatula</i>	10	7.9
	Cased Trichoptera		
	Polycentropodidae	2	1.6
	Hydropsychidae	20	15.8
	Rhyacophilidae	6	4.7
Group D			
(Very tolerant)	Absent		
Group E			
(Most tolerant)	Absent		
Not Assigned to Group			
	Oligochaetes		
	Naidinae	5	4
Total		126	
Q Value	Q₄ – Good Ecological Status		

Sampling Site 2 - Midstream

Indicator Group	Taxon	Number	%
Group A	Total No.		
(Very sensitive)	Plecoptera		
	Chloroperlidae	4	0.9
	Ephemeroptera		
	<i>Rhitrogena semicolorata</i>	29	6.2
Group B	Total No.		
(Moderately sensitive)	Cased Trichoptera		
	Limnephilidae	3	0.6
	Sericostomatidae	5	1.1
	Glossosomatidae	109	23.4
Group C	Total No.		
(Moderately tolerant)	Amphipoda		
	Gammarus sp	248	53.3
	Ephemeroptera		
	<i>Baetis rhodani</i>	26	5.6
	Diptera		
	Dicranota	1	0.2
	Simuliidae	1	0.2
	Chironomidae	1	0.2
	Coleoptera		
	Elminthidae	3	0.6
	Platyhelminthes		
	Triclad	2	0.4
	Gastropoda		
	<i>Lymnaea truncatula</i>	20	4.3
	Cased Trichoptera		
	Polycentropodidae	1	0.2
	Hydropsychidae	2	0.4
Group D	Absent	5	1.1
(Very tolerant)	Lamellibranchiate		
	Sphaeriidae (Pisidium)	3	0.6
	Hirudinea		
	Erpobdellidae	1	0.2
	Gastropoda		
	<i>Lymnaea peregra</i>	1	0.2
Group E	Absent		
(Most tolerant)			
Not Assigned to Group		31	1.1
	Oligochaetes		
	Lumbriculidae	31	1.1
Total			
Q Value	Q4 – Good Ecological Status		