# Biological Assessment of the Water Quality of the Rivers Funshion and Gradoge in the Vicinity of Discharge from the Dairygold Plant at Mitchelstown

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# 1. INTRODUCTION

The present report by Pascal Sweeney, Consultant Ecologist, was commissioned by Dairygold Cooperative Society Ltd. It consists of the biological assessment of water quality of the River Funshion, upstream and downstream of the treated effluent discharge point, and of the Gradoge River, upstream and downstream of the surface water discharge. Its purpose is to help assess the current impacts on the rivers of these discharges.

The situation is complicated by the fact that the effluent from Irish Water Mitchelstown WWTP discharges to the River Funshion through the same pipe as does the Dairygold treated effluent and this combined discharge is a short distance downstream of the confluence with the Gradoge River. Furthermore, surface water runoff from part of the urban area of Mitchelstown also enters the Gradoge River and the stormwater overflow from the Mitchelstown wastewater treatment plant (WWTP) is also to this river.

The scope of this survey is the assessment of the macroinvertebrate fauna and the establishment of Q-values in accordance with the procedures of the EPA (EPA, 2020). Pascal Sweeney, the author of the current report, has attended ten Q-Scheme inter-calibration events with EPA river biologists and was contracted by EPA to carry out Q-value assessments of Operational and Surveillance Monitoring Sites in every summer from 2012 to 2020, in fulfilment of the needs of the Water Framework Directive monitoring programme.

## 2. SAMPLING SITES

Two sites on the River Funshion (EPA Code 18/F/05) were sampled, one upstream and one downstream of the discharge point. Two sites on the Gradoge River (EPA Code 18/G/13) were also sampled, one upstream and one downstream of the two discharge points. Site co-ordinates and other site information are presented in Appendix 1. Photographs of the sampling sites are shown in Appendix 2.

**Funshion Site 1. 30m downstream Ballyarthur Bridge.** This is the next bridge downstream of EPA Station 0100 (approximately 650m downstream). Results from this site give information on the water quality of the River Funshion upstream of the confluence of the Gradoge River and the discharge point of the combined Dairygold treated effluent and the Irish Water Mitchelstown WWTP effluent.

**Funshion Site 2. Approximately 250m downstream of the treated effluent outfall.** The site is approximately 250m upstream of EPA Station 0200. Results establish the water quality status of the R. Funshion downstream of all discharges from Dairygold, as well as from the Irish Water Mitchelstown WWTP and other urban runoff from Mitchelstown.

**Gradoge Site 1. Approximately 40m upstream of the surface water discharge at the Clonmel road.** Results from this site give information on the water quality of the Gradoge River upstream of surface runoff from the Dairygold plant.

**Gradoge Site 2. Approximately 50m upstream of the confluence with the River Funshion (EPA Station 18/G/13/0200).** Results from this site give information on the water quality of the Gradoge River downstream of the Dairygold surface water discharge, as well as urban surface water runoff from Mitchelstown and the Irish Water Mitchelstown WWTP stormwater outfall.

# 3. METHODOLOGY

Field work was carried out on 17 September, 2020. At all sites, kick sampling of benthic invertebrate fauna, identification of macroinvertebrates and assessment of ecological quality was carried out using the EPA's Quality Rating System (Q-Value), as described in the EPA Standard Operating Procedure for River Monitoring 2020, was carried out. Aquatic macrophytes were assessed at all sites where they occur. Additional information was recorded at each site including general river characteristics and hydromorphological indicators. Photographs were taken with a digital camera.

# 4. RESULTS

Appendix 3 presents the list of macroinvertebrate taxa identified and their relative abundances, in accordance with the EPA Standard Operating Procedure for River Monitoring.

**Macroinvertebrate Community Analysis by Site.**

**Funshion Site 1.** The fauna of this site is dominated by Group C (Relatively Pollution Tolerant) species, the two most abundant taxa being *Baetis rhodani* and Simuliidae. Group A (Very Pollution Sensitive) is represented by low numbers of the flat mayfly nymph, *Rhithrogena sp.*. From Group B (Relatively Pollution Sensitive), the stonefly *Leuctra sp.* is common and a single specimen from the caddis family Glossiphonidae was found. No Group D (Very Pollution Tolerant) taxa were found and tubificid worms from Group E (Most Pollution Tolerant) were present in low numbers. With only a few specimens from Group A and some Group B, no Groups D and few Group E representation in a fauna dominated by Group C, this invertebrate community indicates a Q-value of **Q3-4**.

**Funshion Site 2.** Group C is also dominant here with the mayfly nymph, *Baetis rhodani* the most abundant, while Simuliidae and *Gammarus sp.* are common in occurrence. Group A is represented by low numbers of *Ecdyonurus sp. Leuctra sp.* (Group B) is common in occurrence here also. Single specimens of the leech, *Erpobdella sp.* and the water slater, *Asellus sp.* from Group D were found. This faunal composition with a low representation of Group A, Group C dominant, Groups B and D represented and Group E absent indicates a Q-value of **Q3-4**

**Gradoge Site 1.** The fauna of this site is dominated by Group C species. The two most abundant taxa are *Baetis rhodani* and *Gammarus duebeni*. Group A is represented by low numbers of the flat mayfly *Ecdyonurus sp.*. Group B is represented by a single specimen of *Leuctra sp.* Low numbers of the snail *Radix balthica* from Group D were found and Group E was absent. With low numbers of Group A taxa, a single specimen from Group B, low numbers from Group D and Group E absent in a fauna dominated by Group C, this invertebrate community indicates a Q-value of **Q3-4**.

**Gradoge Site 2.** Groups A and B taxa are absent from this site. Group C dominates, with black-fly larvae (Simuliidae) the most abundant. Group D is poorly represented and Group E is absent. The fauna of this site indicates a Q-value of **Q3**.

The Q-values ascribed to each site in the present survey and the corresponding ecological quality is summarised in Table 1.

**TABLE 1**

**Ecological Quality 2020**

| SITE | Q-value | CURRENT ECOLOGICAL QUALITY |
|---|---|---|
| **Funshion Site 1** | Q3-4 | Moderately Ecological Quality |
| **Funshion Site 2** | Q3-4 | Moderately Ecological Quality |
| **Gradoge Site 1** | Q3-4 | Moderately Ecological Quality |
| **Gradoge Site 2** | Q3 | Poor Ecological Quality |

# 5. CONCLUSIONS

In Table 2, past Q-values recorded by Sweeney Consultancy at these sites can be compared with those recorded in the present survey. Following the good results of 2019, the 2020 results indicate a significant decline to unsatisfactory conditions, starting upstream of any influence of Dairygold discharges to the Gradoge and Funshion.

Macroinvertebrate community analyses indicates a slight decline in biological water quality from Gradoge Site 1 to Gradoge Site 2, but no change in Q-value from Funshion Site 1 to Site Funshion 2.

The biological water quality of the Gradoge declines from moderate to poor ecological quality in the c. 2km between the two sites assessed. However, this cannot conclusively be attributed solely to inputs from Dairygold, as there are other potential sources of impact, such as runoff from the urban area of Mitchelstown also entering the river and the possibility of inputs from the Irish Water Mitchelstown WWTP stormwater overflow during the storms of August 2020.

In the Funshion, the biological water quality remains at the same unsatisfactory moderate ecological quality (Q3-4) at the downstream site as at upstream, despite the inflow of water in poorer condition entering from the Gradoge. This indicates that treated effluent discharge is not having a significant additive effect on the biota of the Funshion at the downstream site.

Compared to previous years, some extra silt was noted at Funshion Site 2. This was almost certainly due to erosion of steep banks, following collapse of trees and exposure of root plates, caused by the storms of August 2020 (Photo 5).

**TABLE 2.**

**Q-values 2010 - 2020**

| Date<br><br>SITE | Sept 2010 | Sept 2012 | Sept 2013 | Sept 2014 | Sept 2015 | Sept 2016 | Sept 2017 | June 2018 | June 2019 | Sept 2020 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Funshion Site 1** | Q3-4 | Q4 | Q3-4 | Q3-4 | Q4 | Q3-4 | Q3-4 | Q4 | Q4 | Q3-4 |
| **Funshion Site 2** | Q3 | Q3-4 | Q3 | Q3-4 | Q3 | Q3-4 | Q3-4 | Q4 | Q4 | Q3-4 |
| **Gradoge Site 1** | Q3-4 | Q3-4 | Q3-4 | Q3-4 | Q3 | Q3-4 | Q3-4 | Q3-4 | Q4 | Q3-4 |
| **Gradoge Site 2** | Q3 | Q3-4 | Q3-4 | Q3-4 | Q3 | Q3 | Q3-4 | Q3-4 | Q4 | Q3 |

# APPENDIX 1

## SAMPLING SITE LOCATIONS and SITE DETAILS

| | |
|---|---|
| Site | Funshion Site 1 |
| Watercourse | River Funshion |
| EPA River Code | 18/F/05 |
| EPA Site Code | None |
| | Downstream of Site 0100 |
| GPS Reading | R8065 1430 |
| Location | 30m downstream Ballyarthur Br. |
| Photograph No. | 1 |
| Wet Width (m) | 10 |
| Sampling depth (m) | 0.2 |
| Flow | Riffle: 50% |
| | Glide: 50% |
| Substrate | Cobble: 50% |
| | Coarse Gravel: 30% |
| | Fine Gravel: 10% |
| | Sand: 10% |
| Instream Vegetation | *Vaucheria sp.*: 10% |
| | *Fontinalis antipyretica*: 5% |
| | *Ranunculus sp.* 10% |
| Shade | Moderate |

| | |
|---|---|
| Site | Funshion Site 2 |
| Watercourse | River Funshion |
| EPA River Code | 18/F/05 |
| EPA Site Code | None |
| | Upstream of Site 0200 |
| GPS Reading | R7941 1363 |
| Location | 330m d/s of treated effluent discharge |
| Photograph No. | 2 |
| Wet Width (m) | 12 |
| Sampling depth (cm) | 0.4 |
| Flow | Riffle: 100% |
| Substrate | Cobble: 20% |
| | Coarse Gravel: 25% |
| | Fine Gravel: 25% |
| | Sand: 20% |
| | Silt: 10% |
| Instream Vegetation | *Vaucheria sp.*: 10% |
| | *Cladophora sp.*: 10% |
| | *Fontinalis antipyretica*: 5% |
| | *Ranunculus sp.* 30% |
| Shade | Light |

| | |
|---|---|
| Site | Gradoge Site 1 |
| Watercourse | Gradoge River |
| EPA River Code | 18/G/13 |
| EPA Site Code | None |
| | Downstream of Site 0100 |
| GPS Reading | R8178 1308 |
| Location | u/s of Clonmel Rd. Surface water discharge |
| Photograph No. | 3 |
| Wet Width (m) | 3 |
| Sampling depth (cm) | 0.4 |
| Flow | Riffle: 80% |
| | Glide 20% |
| Substrate | Cobble: 10% |
| | Coarse Gravel: 250% |
| | Fine Gravel: 25% |
| | Sand: 40% |
| Instream Vegetation | *Cladophora sp.* 1% |
| | *Phalaris arundinacea* 2% |
| | *Fontinalis antipyretica*: 5% |
| | *Callitriche sp.* 1% |
| | *Ranunculus sp.* 10% |
| Shade | Moderate |

| | |
|---|---|
| Site | Gradoge Site 2 |
| Watercourse | Gradoge River |
| EPA River Code | 18/G/13 |
| EPA Site Code | 0200 |
| GPS Reading | R7980 1368 |
| Location | 50m u/s confluence with R. Funshion |
| Photograph No. | 4 |
| Wet Width (m) | 5 |
| Sampling depth (m) | 0.3 |
| Flow | Fast Glide: 100% |
| Substrate | Cobble: 20% |
| | Coarse Gravel: 25% |
| | Fine Gravel: 10% |
| | Sand: 40% |
| | Silt: 5% |
| Instream Vegetation | *Vaucheria sp.*: 10% |
| | *Cladophora sp.*: 5% |
| | *Fontinalis antipyretica*: 5% |
| | *Callitriche sp.* 5% |
| | *Ranunculus sp.* 30% |
| | *Apium nodiflorum* 1% |
| Shade | Light |

# APPENDIX 2

## PHOTOGRAPHS OF SAMPLING SITES

**Photo 1: Funshion Site 1**

**Photo 2: Funshion Site 2**

**Photo 3: Gradoge Site 1**

**Photo 4: Gradoge Site 2**

**Photo 5: Trees windblown by August 2020 storms lying across Funshion between outfall and Funshion Site 2. Exposed root plates on steep bank causing silt runoff.**

# APPENDIX 3

# MACROINVERTEBRATES FAUNAL RESULTS SEPTEMBER 2020

Relative abundance expressed as D: Dominant; N: Numerous; C: Common; F: Few; SS: Single Specimen

| TAXON | Funshion Site 1 | Funshion Site 2 | Gradoge Site 1 | Gradoge Site 2 |
|---|---|---|---|---|
| **Group A** (Sensitive) | | | | |
| *Ecdyonurus sp.* | | F | F | |
| *Rhithrogena sp.* | F | | | |
| **Group B** (Less Sensitive) | | | | |
| *Leuctra sp.* | C | C | SS | |
| Glossosomatidae | SS | | | |
| **Group C** (Relatively Tolerant) | | | | |
| Tricladida | SS | | SS | SS |
| Lumbriculidae | F | | F | F |
| *Potamopyrgus antipodarum* | | | | F |
| *Ancylus fluviatilis* | | F | | |
| Hydracarina | F | SS | F | |
| *Gammarus sp.* | C | C | N | C |
| *Baetis rhodani* | D | D | D | N |
| *Seratella ignita* | | F | F | F |
| Hydropsychidae | | F | | |
| Rhyacophilidae | F | F | | F |
| *Elmis aenea* | F | C | F | |
| *Limnius volckmari* | C | C | F | F |
| Dytiscidae | | | F | |
| Simuliidae | C | C | F | D |
| Chironomidae (ex. *Chironomus*) | F | C | | C |
| **Group D** (Very Tolerant) | | | | |
| Naididae | | | | F |
| *Radix balthica* | | | F | |
| Glossiphonidae | | | | SS |
| *Erpobdella sp.* | | SS | | |
| *Asellus sp.* | | SS | | |
| **Group E** (Most Tolerant) | | | | |
| Tubificidae | F | | | F |
| | | | | |
| **Q-value** | **Q4** | **Q3-4** | **Q3-4** | **Q3** |