# 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/cooling water discharges. 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 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.

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, 2017). Pascal Sweeney, the author of the current report, has attended seven 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 2017, in fulfilment of the needs of the Water Framework Directive monitoring programme.

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# 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 Mitchelstown WWTP effluent.

**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 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/cooling water discharges, as well as urban surface water runoff from Mitchelstown.

## 3. METHODOLOGY

Fieldwork was carried out on 26 June, 2018. At all sites, kick sampling of benthic invertebrate fauna, identification of macroinvertebrates and assessment of ecological status was carried out using the EPA's Quality Rating System (Q-Value), as described in the EPA Standard Operating Procedure for River Monitoring 2017, 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.** While the fauna of this site is dominated by Group C (Relatively Pollution Tolerant) species, with *Baetis rhodani* and *Gammarus duebeni* the most abundant species present, five species from Group A (Very Pollution Sensitive) are present. However, of these five Group A species, only the flat mayfly nymph, *Rhithrogena sp.*, is common in occurrence, meaning that the site cannot qualify for a Q-value of Q4-5. On the Q-value scale, this site it is at the upper end of **Q4**.

**Funshion Site 2.** Group C is also dominant here, and Group A is represented by low numbers of three species. A few specimens of tubificid worms from Group E (Most Pollution Tolerant) were also found. This faunal composition just qualifies for a Q-value of **Q4.**

**Gradoge Site 1.** Three Group A species were found here, but only a few nymphs of *Ecdyonurus sp.* and single specimens of *Rhithrogena sp.* and *Isoperla sp*. Group B (Less Pollution Sensitive) is absent. Group C dominates the fauna, while only single specimens from both Group D and Group E were found. The low representation of Group A in a fauna dominated by Group C indicates a Q-value of **Q3-4**.

**Gradoge Site 2.** The fauna of this site is very similar to that of Gradoge Site 1 and is also indicative of a Q-value of **Q3-4**.

The Q-values ascribed to each site in the present survey and the corresponding ecological status, defined in accordance with the European Communities Environmental Objectives (Surface Waters) Regulations 2009 is summarised in Table 1.

**TABLE 1.**

| SITE | Q-value | CURRENT ECOLOGICAL STATUS |
|---|---|---|
| **Funshion Site 1** | Q4 | Good Ecological Condition |
| **Funshion Site 2** | Q4 | Good Ecological Condition |
| **Gradoge Site 1** | Q3-4 | Moderate Ecological Condition |
| **Gradoge Site 2** | Q3-4 | Moderate Ecological Condition |

## 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.

**TABLE 2.**

| SITE | Q-value 2010 | Q-value 2012 | Q-value 2013 | Q-value 2014 | Q-value 2015 | Q-value 2016 | Q-value 2017 | Q-value 2018 |
|---|---|---|---|---|---|---|---|---|
| **Funshion Site 1** | Q3-4 | Q4 | Q3-4 | Q3-4 | Q4 | Q3-4 | Q3-4 | Q4 |
| **Funshion Site 2** | Q3 | Q3-4 | Q3 | Q3-4 | Q3 | Q3-4 | Q3-4 | Q4 |
| **Gradoge Site 1** | Q3-4 | Q3-4 | Q3-4 | Q3-4 | Q3 | Q3-4 | Q3-4 | Q3-4 |
| **Gradoge Site 2** | Q3 | Q3-4 | Q3-4 | Q3-4 | Q3 | Q3 | Q3-4 | Q3-4 |

The Q-values show no change in biological water quality from Funshion Site 1 to Funshion Site 2, or from Gradoge Site 1 to Gradoge Site 2. However more detailed analysis of the macroinvertebrate communities of the Funshion sites indicates a slight disimprovement from Site 1 to Site 2, but staying within the Q4 bracket.

While the ecological condition of the section of the Gradoge from upstream of the Dairygold plant to the confluence with the Funshion is currently unsatisfactory (below the target level of Q4 required by the EU Water Framework Directive), this problem in the Gradoge clearly arises from upstream of any influence from potential influence from Dairygold.

The combined discharge of the Dairygold treated effluent and the Mitchelstown WWTP effluent appears to be having a very slight impact on faunal community in the Funshion downstream of the outfall, but not sufficient to cause a decline in Q-value between the two sites assessed. This is the first occasion since recording began here in 2010 that Q4 was recorded at Funshion Site 2.

# 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: 100% |
| Substrate | Cobble: 60% |
| | Coarse Gravel: 20% |
| | Fine Gravel: 10% |
| | Sand: 10% |
| Instream Vegetation | *Cladophora sp.* 2% |
| | *Batrachospermum sp.* 1% |
| | *Fontinalis antipyretica*: 2% |
| | *Platyhypnidium riparoides*: 1% |
| | *Lemna minor*: 2% |
| | *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) | 0.2 |
| Flow | Riffle: 100% |
| Substrate | Cobble: 30% |
| | Coarse Gravel: 30% |
| | Fine Gravel: 25% |
| | Sand: 10% |
| | Silt: 5% |
| Instream Vegetation | *Lemanea sp.* 5% |
| | *Cladophora sp.* 2% |
| | *Fontinalis antipyretica*: 3% |
| | *Phalaris arundinacea* 1% |
| | *Ranunculus sp.* 70% |
| | *Apium nodiflorum* 1% |
| 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 | 40m u/s of Clonmel Rd. Surface water discharge |
| Photograph No. | 3 |
| Wet Width (m) | 3 |
| Sampling depth (cm) | 0.2 |
| Flow | Riffle: 50% |
| | Glide 50% |
| Substrate | Cobble: 10% |
| | Coarse Gravel: 40% |
| | Fine Gravel: 30% |
| | Sand: 20% |
| Instream Vegetation | *Cladophora sp.* 1% |
| | *Fontinalis antipyretica*: 1% |
| | *Phalaris arundinacea* 3% |
| | *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) | 0.25 |
| Flow | Fast Glide: 100% |
| Substrate | Cobble: 40% |
| | Coarse Gravel: 30% |
| | Fine Gravel: 15% |
| | Sand: 5% |
| | Silt: 10% |
| Instream Vegetation | *Cladophora sp.* 2% |
| | *Fontinalis antipyretica*: 2% |
| | *Callitriche sp.* 2% |
| | *Ranunculus sp.* 30% |
| | *Potamogeton crispus* 5% |
| | *Apium nodiflorum* 3% |
| Shade | Light |

# APPENDIX 2

## PHOTOGRAPHS OF SAMPLING SITES

**Funshion Site 1**

**Funshion Site 2**

**Gradoge Site 1**

**Gradoge Site 2**

# APPENDIX 3
# MACROINVERTEBRATES FAUNAL RESULTS JUNE 2018

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 | F | F |
| *Rhithrogena sp.* | C | F | SS | F |
| *Heptagenia sp.* | | | | SS |
| *Isoperla sp.* | F | F | SS | |
| *Chloroperla sp.* | SS | | | |
| *Perla sp.* | SS | | | |
| **Group B** (Less Sensitive) | | | | |
| *Leuctra sp.* | | SS | | |
| Limnephilidae | | | | SS |
| Lepidostomatidae | | SS | | |
| *Sericostoma personatum* | F | SS | | |
| **Group C** (Relatively Tolerant) | | | | |
| Lumbricidae | | | SS | F |
| Lumbriculidae | F | | SS | |
| *Gammarus sp.* | N | C | D | D |
| *Baetis rhodani* | N | D | C | C |
| *Seratella ignita* | C | N | N | N |
| Hydropsychidae | F | F | F | |
| Rhyacophilidae | | F | SS | F |
| *Elmis aenea* | F | F | F | C |
| *Limnius volckmari* | F | C | F | C |
| *Dicronota sp.* | | SS | F | |
| Dytiscidae | | | | SS |
| Gyrinidae | | | | |
| Simuliidae | F | C | | F |
| Chironomidae (ex. *Chironomus*) | F | C | F | F |
| **Group D** (Very Tolerant) | | | | |
| *Helobdella sp.* | SS | | | |
| *Erpobdella sp.* | | SS | | |
| *Pisidium sp.* | | | | F |
| *Radix balthica* | | | SS | |
| **Group E** (Most Tolerant) | | | | |
| Tubificidae | | F | SS | SS |
| | | | | |
| **Q-value** | **Q4** | **Q4** | **Q3-4** | **Q3-4** |