



River Maigue Catchment Instream Biodiversity: Crayfish & Otters 2018



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**River Maigue
Instream Biodiversity, Crayfish & Otters
2018**



**Prepared for
The Maigue Trust**

by

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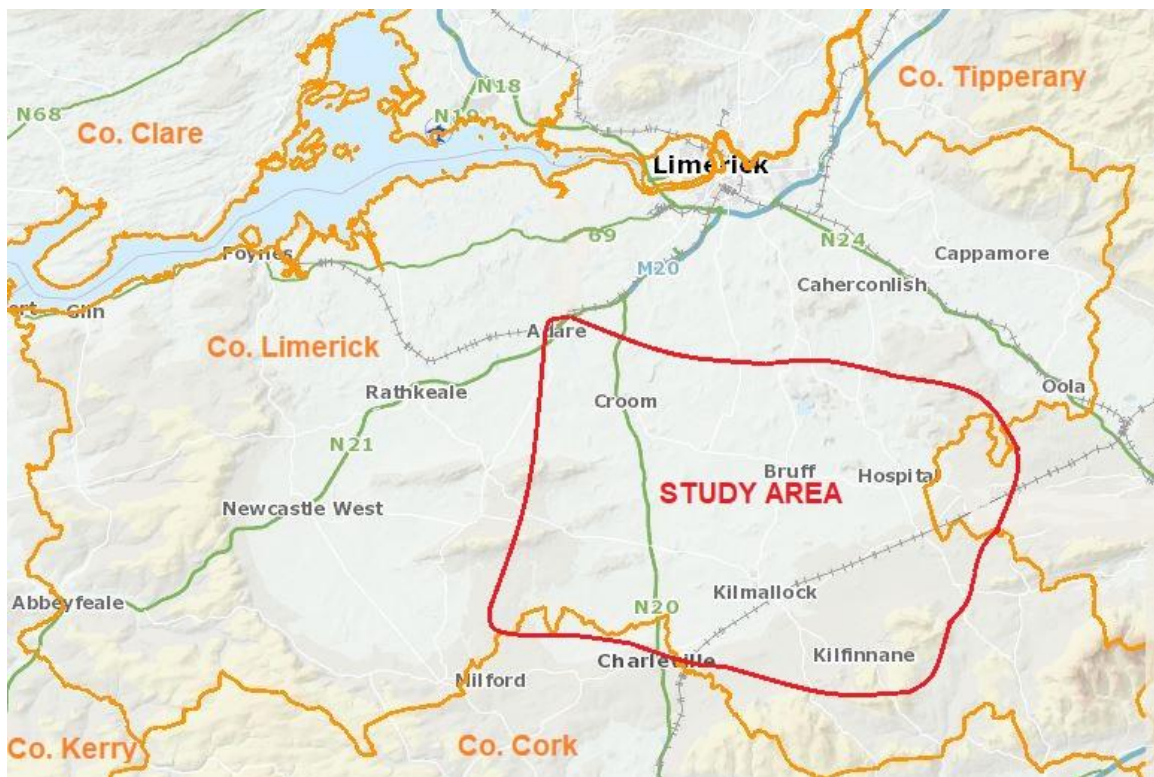
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1. INTRODUCTION

The purpose of the present report, prepared by Pascal Sweeney of Sweeney Consultancy, is a biological assessment of the River Maigue catchment, from headwaters to freshwater tidal conditions at Adare, Co. Limerick (Figure 1), to establish the biodiversity of the freshwater macroinvertebrate fauna and macrophyte flora, the status of the population of the protected white-clawed crayfish and the distribution of otters. This assessment was commissioned by The Maigue Trust.

Figure 1. Study Area Map



The River Maigue and its principal tributaries drain an area of 1020 km², predominantly in Co. Limerick. Seventeen fish species have been recorded from the River Maigue catchment; a high level of fish biodiversity by national standards. Among these are brook lamprey and Atlantic salmon, both of which are listed in Annex II of the Habitats Directive. White-clawed crayfish and otter, both of which are listed in Annex II, also occur in the catchment. The rivers of the Maigue catchment are generally highly

productive because of the underlying geology. An electrofishing survey carried out by Inland Fisheries Ireland (IFI) in 2009 in the lower Maigue found that brown trout, the principal fish species in the catchment, had a very fast growth rate, but fish population densities were low. Arterial drainage work, carried out in the 1970s, altered the natural character of the catchment rivers. These works, and deterioration in water quality in the 1980s and '90s, have had a negative impact on fish and river ecology in general. Despite this, many areas have since recovered well. The potential of the Maigue catchment in supporting self-sustaining and diverse fish and invertebrate populations has long been recognized, as evidenced by the significant capital investment in river enhancement measures undertaken by the Office of Public Works (OPW) and IFI over the last decade, in order to improve river habitat in the catchment. Underpinning these measures has been a general improvement in water quality in parts of the catchment in recent years.

Freshwater macroinvertebrates are visible to the human eye and can be found in the benthic environments of river beds. As these macroinvertebrates live in the water for all or part of their lives, the species composition of the fauna at any location is strongly influenced by prevailing physical and chemical conditions. Some species are adapted to live in low pH, high energy mountain streams, while others require slower flow and harder water. Some species need high dissolved oxygen levels to survive, while others can tolerate reduced oxygen levels. Differences in the habitat and micro-habitat requirements of species results in greater biodiversity. Most of the Maigue catchment is lowland, but there are also some upland streams in the southern part of the catchment, increasing the diversity of freshwater habitat types. For most macroinvertebrate groups, records for Co. Limerick are generally quite sparse, compared to most other counties, particularly the neighbouring counties of Kerry, Clare, Tipperary and Cork. Within Co. Limerick, there is a greater concentration of records for several freshwater macroinvertebrate groups, e.g. caddis, stoneflies and mayflies, in the north-eastern part of the county, i.e. in the Mulkear River catchment. This can be seen in the species records on the National Biodiversity Data Centre (NBDC) website (www.biodiversityireland.ie).

A change in the physical or chemical environment may change the composition and abundance of macroinvertebrate communities. Because macroinvertebrates are long-lived and of known sensitivity to pollution they can provide an assessment of water quality based on a single sample in a manner not possible with a small number of chemical samples. Several biological indices have been developed worldwide, based on the composition of river benthic macroinvertebrate communities. In the Republic of Ireland, the main such index is the Q-value method, developed by the Environmental Protection Agency (EPA) and used in the River Biological Monitoring Programme, with sites throughout the country assessed on a three-year cycle. Macroinvertebrate communities are ascribed values from Q1 (grossly polluted) to Q5 (pristine quality), with intermediate values (e.g. Q3-4) also used.

Aquatic macrophytes are plants visible to the naked eye. The macrophyte taxa included in the present study are vascular plant (submerged and emergent), aquatic mosses (Bryophyta) and aquatic liverworts (Marchantiophyta). Water velocity, substrate type, water chemistry and shade are factors affecting species abundance and composition. The occurrence of vascular plants throughout Co. Limerick is well described by Reynolds (2013). Mosses and liverworts are less well recorded.

The White-clawed Crayfish (*Austropotamobius pallipes* (Lereboullet, 1858)) is the only native European crayfish and is listed in Annex II of the EU Habitats Directive (92/43/EEC) and is protected under the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1990. The distribution of Crayfish in Ireland is limited to lowland (below 220m) lakes, rivers and streams with underlying carboniferous limestone (Reynolds 1998). Demers *et al.* (2005) show the White-clawed Crayfish to be well distributed in the Maigue catchment and the NBDC website (accessed 04/12/18) shows records of the species at 29 locations on the Maigue main channel and several tributaries. While these records give some indication of occurrence, information on population size and structure is important in the conservation of this protected species.

The Otter (*Lutra lutra*) is also listed in Annex II of the EU Habitats Directive (92/43/EEC) and protected under the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1990. Whilde (1993) listed the Irish population as “Vulnerable” in the Irish Mammal Red-data book, but stated that Ireland has long been considered to hold one of the most important otter populations remaining in Western Europe, where many other otter populations have significantly declined. The 2004/2005 Otter Survey of Ireland (Bailey and Rochford, 2006) found that, while 70.48% of sites surveyed had signs of otters, there was a 17.72% overall decrease in positive records between 1981 and 2005 and a 4.72% decrease in positive records between 1991 and 2005. The report recommends national otter surveys on a 10-year cycle, but concentrating on the Special Areas of Conservation (SACs) for which otter is a Qualifying Interest. But only the tidal section of the Maigue, downstream of Adare, is included in the Lower River Shannon SAC. The 2010/2012 National Otter Survey of Ireland (Reid et al., 2013) highlights errors and bias in the methodologies used in previous surveys and concludes that otters are widespread throughout Ireland.

2. METHODOLOGY

2.1 SAMPLING SITES

Sampling for biodiversity assessments and crayfish and checking for signs of otter presence was carried out at 30 sites throughout the Maigne catchment (Figure 2). Sites chosen included a variety of riverine habitats from headwaters in uplands and lowlands, to fast and slower flowing larger rivers, and down to tidal freshwaters at Adare. The 30 sampling site locations are mapped in Figure 3 and site location details are presented in Table 1. Photographs of the sampling sites are presented in Appendix 1.

Figure 2. Sampling Site Locations

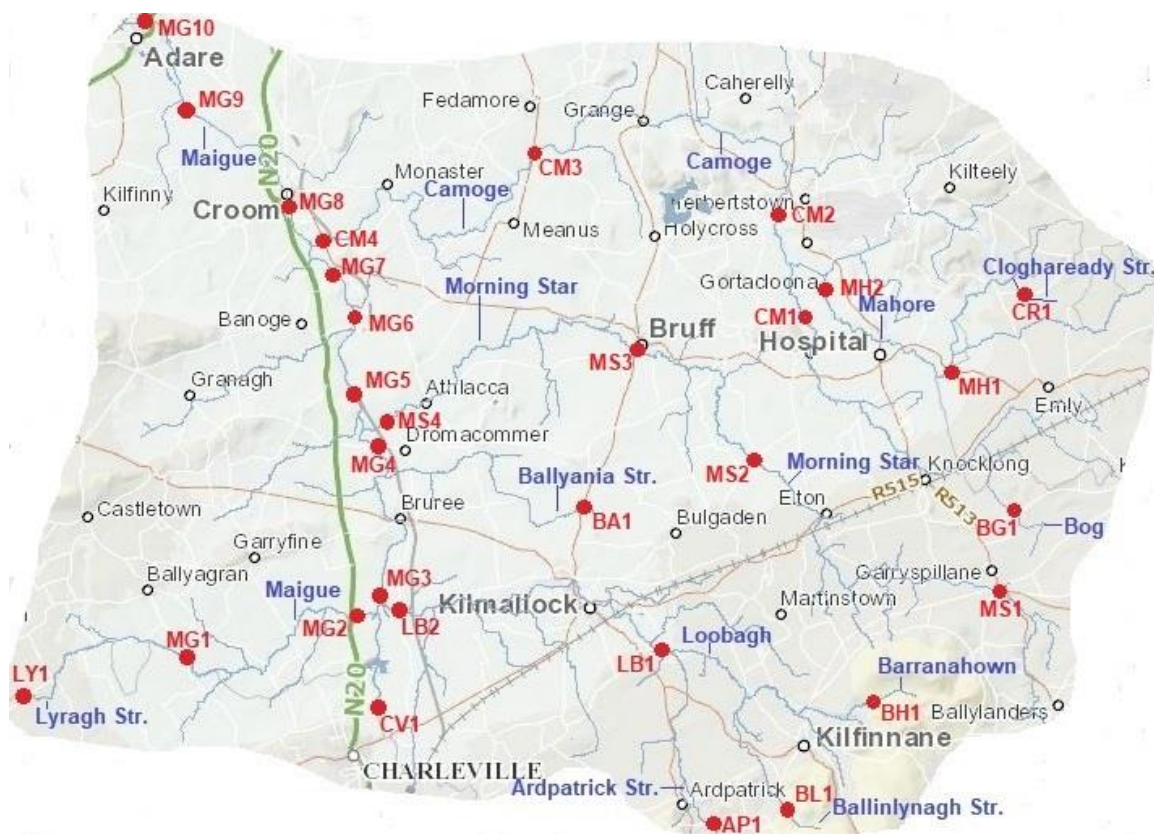


Table 1: Sampling Sites.

River/Stream	Tributary of	Site	Grid Ref (ING)	Location Description	Photo
Maigue	Shannon	MG1	R48020 25882	Drewscourt Br.	4
Maigue	Shannon	MG2	R53415 27284	Creggane Br. on N20	5
Maigue	Shannon	MG3	R54358 27982	d/s of confluence of Loobagh. u/s new Kerry Foods outfall	6
Maigue	Shannon	MG4	R54066 32871	Bridge W of Dromacommer	7
Maigue	Shannon	MG5	R53552 34408	Glenma Td. Down field opposite end of lane.	8
Maigue	Shannon	MG6	R53486 36909	Across from house at end of lane d/s bridge right bank	9
Maigue	Shannon	MG7	R52773 38510	Cherrygrove Br., SW Tullovin	10
Maigue	Shannon	MG8	R51225 40704	d/s weir, u/s Croom	11
Maigue	Shannon	MG9	R47986 43786	Bridge N Derryvinnane	12
Maigue	Shannon	MG10	R46798 46599	Adare Br. (d/s)	13
Lyragh Str.	Maigue	LY1	R42749 24678	Bridge on Limerick-Cork border	14
Charleville Str.	Maigue	CV1	R54164 24222	Lane beside WWTP	15
Loobagh	Maigue	LB1	R63163 26359	Riversfield Br.	16
Loobagh	Maigue	LB2	R55016 27463	Garrose Br.	17
Ardpatrick Str.	Loobagh	AP1	R64879 20519	u/s of bridge in Sunville Upper Td.	18
Ballinlyna Str.	Loobagh	BL1	R68141 20427	Ballinlyna Br.	19
Barranahown	Loobagh	BH1	R70268 24471	At timber footbridge on walking route	20
Ballyania Str.	Maigue	BA1	R60986 30934	Knockahardy Br. on R512	21
Morning Star	Maigue	MS1	R74275 28162	Bridge E of Pinker's Cross	22
Morning Star	Maigue	MS2	R66494 32413	Gormanstown Br.	23
Morning Star	Maigue	MS3	R62686 35951	Bruff Bridge	24
Morning Star	Maigue	MS4	R54357 33543	Bridge u/s Maigue confluence	25
Camoge	Maigue	CM1	R68154 37070	Gortacloona Br.	26
Camoge	Maigue	CM2	R67315 40339	Bridge SW Herbertstown	27
Camoge	Maigue	CM3	R59337 42256	Bridge on R511	28
Camoge	Maigue	CM4	R52497 39524	Bridge on R516	29
Bog	Camoge	BG1	R75138 30643	Castlejane Br.	30
Mahore	Camoge	MH1	R68955 37990	O'Carroll's Br.	31
Mahore	Camoge	MH2	R72887 35211	Bridge on R516	32
Cloghaready Str.	Mahore	CR1	R76017 37906	Bridge at W corner of Cloghaready Td.	33

2.2 BIODIVERSITY

2.2.1 Macroinvertebrates

The macroinvertebrate sampling was carried out in late April/early May, to coincide with the period of highest invertebrate taxonomic diversity. At each of the 30 sampling sites, notes on the physical habitat were first recorded and pH was measured using a Eutech PCTestr Meter. Descriptive information for each macroinvertebrate sampling site is presented in Appendix 2.

Macroinvertebrate samples were collected, following the Standard Operating Procedure for River Biological Monitoring Field Sampling Surveys (EPA, 2018a). A two-to-three-minute macroinvertebrate kick sample (Photo 1, Appendix 1) was collected, preferably from faster flowing riffle habitat. A further one-minute hand search was carried out to locate macroinvertebrates that remained attached to the underside of the cobbles. Where riffle habitat was not available, or where the water level was too high to safely enter the channel, a dredge sample with a pond net was taken. The entire sample was placed in a white tray on the river bank. All macroinvertebrates were identified to the lowest taxonomic level possible with the naked eye or using a magnifying eyepiece and the relative abundance for each taxon within the total fauna was recorded on the SACFOR Scale. Invertebrates that could not be fully identified by this method were preserved in alcohol and stored for later identification under dissecting and, where necessary, compound microscopes and using the identification keys listed in the Reference Section (Appendix 9). For each taxon recorded, the Water Framework Directive (WFD) Status Group was noted:

WFD Status Group A: Most pollution sensitive

WFD Status Group B: Pollution sensitive

WFD Status Group C: Relatively pollution tolerant

WFD Status Group D: Pollution tolerant

WFD Status Group E: Most pollution tolerant

A Q-value was assigned based on the relative abundances of taxa in the different WFD Status Groups found, in accordance with standard methodology (EPA, 2018a). River typology and seasonality were considered when assigning the Q-value status.

2.2.2 Macrophytes

The macrophyte assessment was carried out in August, to coincide with the period of maximum plant growth. Relevant habitat information for the 30 macrophyte survey sites are presented in Appendix 2. At each sampling sites, macrophytes from a 100m length of watercourse were identified on-site, with the aid of a magnifying eyepiece, where necessary, and using the identification keys listed in the Reference Section (Appendix 9). Liverworts and mosses that could not be fully identified on the bankside were retained for later identification under microscopes.

Because of extreme phenotypic plasticity, morphological reduction and frequent hybridisation among several common species of water crowfoot, including *Ranunculus peltatus*, *Ranunculus penicillatus subsp. penicillatus* and *R. penicillatus subsp. pseudofluitans*, the term *Ranunculus* subgenus *Batrachium* agg., which has become widely accepted, e.g. Weekes et al (2017), is used here. For some other taxa, e.g. some liverworts and starworts, species-level identification is only possible at certain reproductive stages.

The percentage of the river channel covered by each taxon was estimated and abundances were rated on the SACFOR Scale.

2.3 CRAYFISH

In August, after the females had dropped their hatchlings, the white-clawed crayfish population was assessed in a licensed survey (Licence No. C27/2018). The survey methodology followed Peay (2003). This involves firstly, a selection of five patches of habitat at each site that appear to be favourable for crayfish and can be physically searched. The habitat patch is an area within a sampling site that a surveyor decides has a

suitable combination of in-channel habitat and flow conditions to support crayfish. The size of the habitat patch may vary, but is not less than 1 m² and may be up to about 20 m². A search is made of 10 potential refuges in each habitat patch. The individual refuge within a patch is the basic unit of survey. It is usually a boulder (>25 cm) or large cobble (15–25 cm), but may be any other feature that offers relatively stable shelter for one crayfish, or sometimes several, such as macrophytes, tree roots, or an accumulation of large gravel or rubble. The aim is to find relatively stable, individual refuges that have the highest probability of being used by crayfish. Details were recorded at each site of the environmental conditions at the time of survey and the features of each patch surveyed (Appendix 3). Working upstream to minimise disturbance of silt, each stone was lifted, using a viewing-aid with a perspex bottom, while holding a pond-net downstream to catch crayfish, particularly juveniles that might escape-swim in that direction (Photo 2, Appendix 1). The majority of crayfish exposed were caught by hand, with some escape-swimming with a thrust of the tail into the pond-net, but others escaping completely. Numbers of escaped adult and juvenile crayfish were counted. Where other stones lay beneath a boulder or large cobble, these were lifted too and counted as a single refuge. All crayfish caught were counted, sexed (Photo 3, Appendix 1), the length of the carapace (hard exoskeleton covering the head and thorax) was measured and signs of disease were checked for. The relative abundance of crayfish was determined, based on the average number of crayfish per 10 refuges searched, as per Peay (2003).

To prevent the spread of crayfish plague (*Aphanomyces astaci*), which produces free-swimming zoospores that are specific to crayfish and can be carried in water and mud, and on damp equipment, biosecurity measures were strictly adhered to. As the spores remain viable only when damp, all equipment that had previously been in contact with water or sediments from other river catchments was cleaned of mud, sprayed with an anti-fungal agent (Virkon® Aquatic solution) and thoroughly dried prior to the Mauge fieldwork. Following the Mauge fieldwork, the same biosecurity measures were applied prior to the use of the equipment in other river catchments.

2.4 OTTER

The otter survey was carried out in late April/early May, before strong growth of riparian vegetation that can obscure signs of otter presence. At each site, a 100m stretch of channel was surveyed for signs of otter presence (prints, spraints, holts/couching sites), as described by Bang & Dahlstrom (2004). Additional observations were made during the August site visits. Photographs were taken where evidence is found. The suitability of the habitat for otters was estimated, based on Chanin (2003).

3. RESULTS

3.1 Biodiversity

3.1.1 Macroinvertebrates

A total of 110 macroinvertebrate taxa were identified from the 30 samples taken throughout the Maigne catchment. These are listed in Appendix 4, with notes on distribution and ecological requirements. In some cases, where taxonomic names have recently been changed from those given in the identification keys, the updated names are used.

Seven of the taxa found were not previously recorded in Co. Limerick: two segmented worms (*Nais pardalis* and *Nais variabilis*), one stonefly (*Diura bicaudate*) and four caddisflies (*Cheumatopsyche lepida*, *Lype reducta*, *Ithytricha sp.* and *Wormaldia sp.*)

Appendix 5 lists the relative abundances of taxa collected at each sampling site. The two most ubiquitous species (27 sites each) are the mayfly nymph, *Baetis rhodani* (Large Dark Olive to anglers) and the freshwater shrimp, *Gammarus duebeni*.

3.1.1.1 Q-values

Q-values, based on the relative abundances of the WFD Status Groups, and taking habitat conditions into account, are given Appendix 5. Ecological status corresponding to each Q-value, in accordance with the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009) are:

Q5; Q4-5: High

Q4: Good

Q3-4: Moderate

Q3; Q2-3: Poor

Q2; Q1-2; Q1: Bad

The Q-values ascribed to all sites surveyed, in accordance with the standard EPA Q-scheme methodology (EPA, 2018a), together with current ecological status, are shown in Table 2. Also in Table 2, it is indicated where the invertebrate community composition places it towards the upper or lower end of the Q-value category.

Table 2: Q-values.

River/Stream	Site	Q-value	Ecological Status
Maigue	MG1	3-4	Moderate
Maigue	MG2	3-4	Moderate
Maigue	MG3	4	Good
Maigue	MG4	3-4	Moderate
Maigue	MG5	3-4 upper	Moderate
Maigue	MG6	3-4	Moderate
Maigue	MG7	3-4	Moderate
Maigue	MG8	3-4	Moderate
Maigue	MG9	3	Poor
Maigue	MG10	3	Poor
Lyragh Str.	LY1	3-4	Moderate
Charleville Str.	CV1	3 upper	Poor
Loobagh	LB1	4	Good
Loobagh	LB2	4	Good
Ardpatrick Str.	AP1	5	High
Ballinlyna Str.	BL1	4-5	High
Barranahown	BH1	4-5	High
Ballyania Str.	BA1	3	Poor
Morning Star	MS1	4	Good
Morning Star	MS2	4	Good
Morning Star	MS3	3-4 upper	Moderate
Morning Star	MS4	4	Good
Camoge	CM1	3-4	Moderate
Camoge	CM2	3-4 upper	Moderate
Camoge	CM3	3-4	Moderate
Camoge	CM4	3-4 upper	Moderate
Bog	BG1	3	Poor
Mahore	MH1	4 lower	Good
Mahore	MH2	3-4	Moderate
Cloghaready Str.	CR1	3-4	Moderate

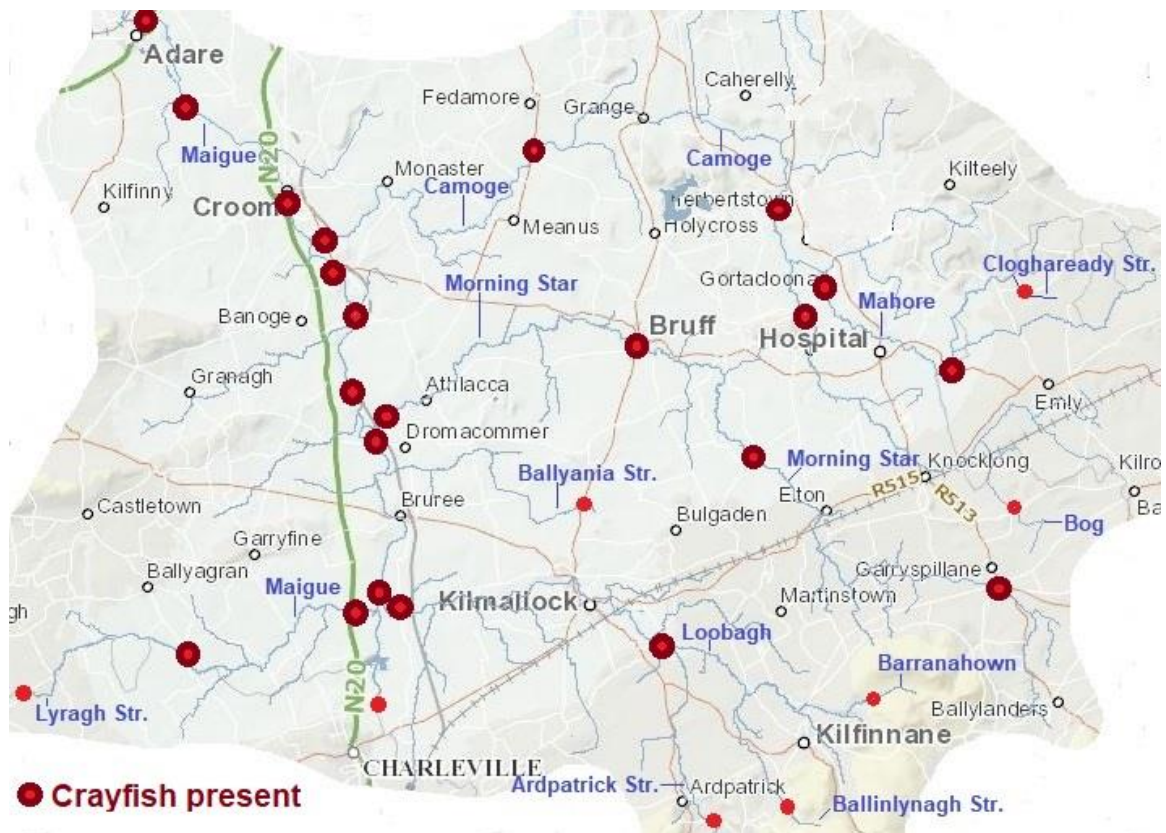
3.1.2 Macrophytes

A total 40 macrophyte taxa were identified from the 30 sites surveyed throughout the Maigne catchment. These are listed in Appendix 6, with relative abundances given for each taxon. No rare species or species not previously recorded in Co. Limerick were found. The most ubiquitous species is Common Duckweed (*Lemna minor*), which was found at 23 sites.

3.2 Crayfish

Results of the crayfish survey are presented in Appendix 7. Of the 30 sites included in this survey, there was no crayfish habitat in the channels of three sites in August 2018, due to a lack of water after a prolonged period of drought. The habitat in the Barranahown is also completely unsuitable for crayfish, due to low pH and calcium levels. Of the remaining 26 sites, crayfish were present at 22 (Figure 3). These sites were in the Maigne, Loobagh, Morning Star, Camoge and Mahore. A total of 249 crayfish was recorded from these 22 sites. 70 of these were juveniles, mostly of the 2017 year-class. The hatchlings of 2018 were generally too small to be found by the standard methodology and only three individuals of carapace length 10mm, or smaller, were caught, the smallest of which had a carapace length of 8mm (Photo 35, Appendix 1). The largest crayfish caught was a male of carapace length 47mm at Site MG1 (Photo 36, Appendix 1).

Figure 3. White-clawed Crayfish Presence



The standard method of grading the abundance of crayfish (Peay, 2003) is based on the average number per 10 refuges at individual sites, as follows:

Average no. per 10 refuges	Population abundance
>5	A: Very High
$\geq 3, \leq 5$	B: High
$\geq 1, < 3$	C: Moderate
$> 0, < 1$	D: Low
0	E: Absent or undetected

Maigue catchment sites with crayfish present are rated by these criteria in Table 3.

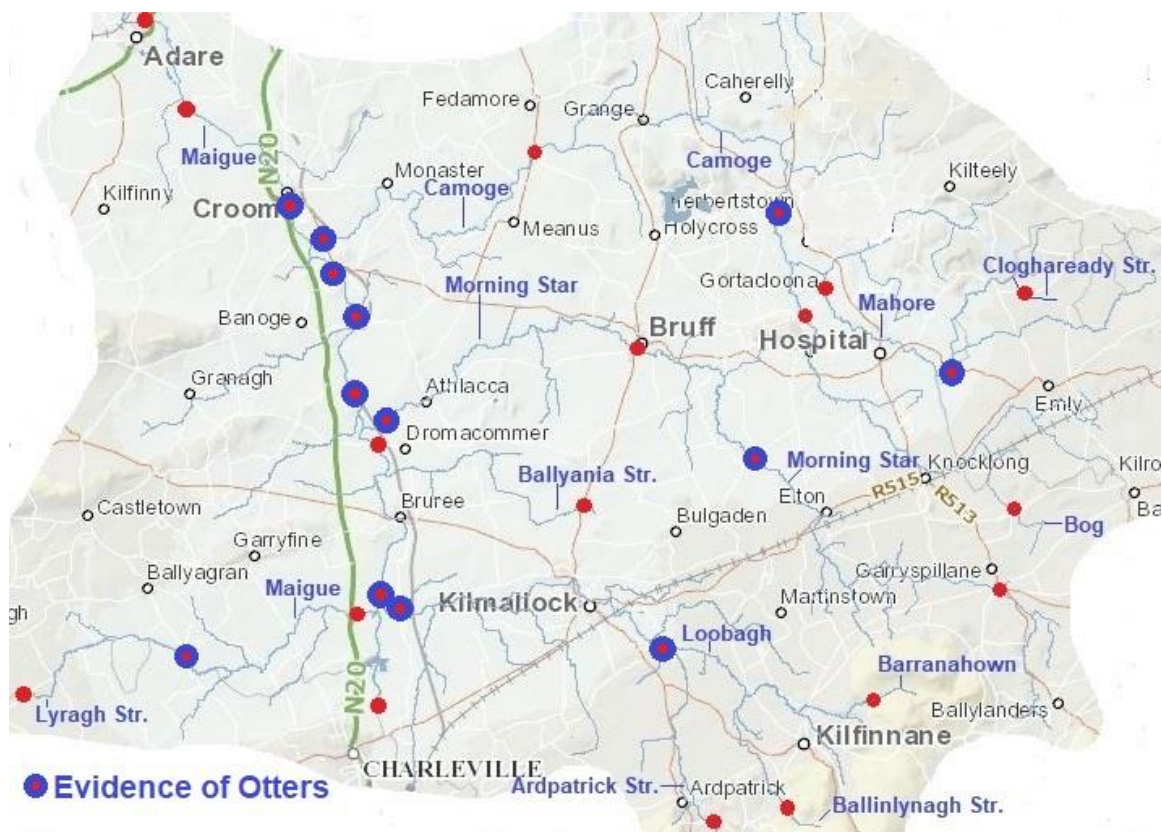
Table 3: White-clawed Crayfish population Abundances.

River/Stream	Site	Average No. Per 10 Refuges	Population Abundance
Maigue	MG1	2.0	Moderate
Maigue	MG2	2.8	Moderate
Maigue	MG3	0.6	Low
Maigue	MG4	1.8	Moderate
Maigue	MG5	5.2	Very High
Maigue	MG6	1.0	Moderate
Maigue	MG7	4.4	High
Maigue	MG8	2.8	Moderate
Maigue	MG9	1.8	Moderate
Maigue	MG10	1.0	Moderate
Loobagh	LB1	3.8	High
Loobagh	LB2	3.2	High
Morning Star	MS1	0.6	Low
Morning Star	MS2	1.8	Moderate
Morning Star	MS3	1.8	Moderate
Morning Star	MS4	1.8	Moderate
Camoge	CM1	1.4	Moderate
Camoge	CM2	1.0	Moderate
Camoge	CM3	1.6	Moderate
Camoge	CM4	5.0	High
Mahore	MH1	4.0	High
Mahore	MH2	0.4	Low

3.3 Otters

Results of the otter survey are presented in Appendix 8. Of the 30 sites included in this survey, there was evidence of otters, mainly in the form of spraints (Photo 37) and prints (Photo 38), at 14 sites (Figure 4). These sites were in the Maigne, Loobagh, Morning Star, Camoge and Mahore.

Figure 4. Evidence of Otter Presence



A holt was found in the bank at Site MG8 (Photo 39). Bank erosion here has exposed part of the entrance tunnel.

4. CONCLUSIONS

4.1 Discussion

Good instream biodiversity was recorded, with 110 macroinvertebrate taxa and 40 macrophyte taxa. While all the macrophytes had previously been recorded in Co. Limerick, seven of the macroinvertebrate taxa are new records for the county. As most of these taxa are not particularly rare on a national level, these new records illustrate a general lack of recording in the county by taxonomists expert in the different macroinvertebrate groups. Unlike the situation with plant species, where recording is carried out in an organised way throughout the country, under the direction of the Botanical Society of Britain and Ireland, recording of macroinvertebrates is dependant on the efforts of individual taxonomists, mostly working alone.

The seven new records for the county are:

Nais pardalis. A tiny worm, fairly common in the Killarney Lakes, but otherwise only known from a small stream in Dublin and the shore of L. Unshin in Co. Donegal (Sweeney, 2016). Its size makes it difficult to find, particularly in preserved samples.

Nais variabilis. Another tiny worm that has been found at several locations in Kerry (Killarney Lakes and upper parts of several estuaries) and in a small stream in South Co. Dublin (Sweeney, 2016). The distribution in Kerry, combined with the present record suggests that it might be present at other locations in Co. Limerick.

Diura bicaudata. This fairly rare stonefly has a circum-polar distribution and is considered to be a glacial relict (Costello, 1988). As it is typically found in mountain streams above an altitude of 200m, there are relatively few possible sites at which it could be found in Co. Limerick. Most of the Irish records for this species are from the Wicklow Mountains (Feeley *et al.*, 2016).

Cheumatopsyche lepida. This caddis is fairly common in medium to large lowland rivers, such as the Barrow, Nore, Suir, Liffey and Munster Blackwater (O'Connor, 2015). The larva is quite large, very distinctive and easy to identify.

Lype reducta. The larvae of this small caddis species can be difficult to find, as they burrow in rotting timber. The NBDC website shows 11 records for *L. reducta* for the country.

Ithytricha sp. There are two species of this distinctive genus of very small caddis present in Ireland, but identification keys for larvae only include *I. lamellaris* and not the rare *I. clavata*, which is known only from adults collected in Kerry (O'Connor, 2015). The NBDC website shows 50 records for *I. lamellaris* for the country.

Wormaldia sp. Adults of three species of this genus have been collected in Ireland, but identification keys for larvae only include two, *W. occipitalis* and *W. subnigra*. The specimens found in the present survey are probably *W. occipitalis*, as this is the species arrived at in the key and as the third species, *W. mediana*, is known from only four sites in Ireland (O'Connor, 2015).

The freshwater gammarid shrimp, *Gammarus duebeni*, and the mayfly nymph, *Baetis rhodani*, are the most abundant species overall as is commonly the case in Irish rivers, other than in high velocity mountain rivers with low pH. All *Gammarus duebeni* found in Ireland belong to the subspecies *Gammarus duebeni celticus*. Another gammarid shrimp, found at one site each on the Maigne and the Camoge, is the non-native *Crangonyx pseudogracilis*, a North American species that has spread to many locations in Ireland since it was first recorded in 1975 in the Phoenix Park ponds in Dublin (Holmes, 1975). A third gammarid shrimp, *Gammarus zaddachi*, recorded at Site MG10, is mainly an estuarine species, frequently found in freshwater at or near high spring tide level (Hough and Naylor, 1992).

Surprisingly, *Serratella ignita*, the sub-imago of which is known to anglers as the Blue-winged Olive and which is usually widespread in Irish rivers, was found at only eight sites. At five of the sites sampled in the present survey where no *Serratella ignita* nymphs were found, the NBDC website shows records for this species. Missing completely from the invertebrate samples was *Baetis scambus*, which is known to anglers as the Small Dark Olive. There are three locations for this species shown for the Maigne catchment on

the NBDC website. These records correspond to locations given in Kelly-Quinn & Bracken (2000). Two of these records (one from the Maigne and one from the Camoge - Site CM4 of the present survey) date from the 1935-1947 period and the third, on the Loobagh, dates from 1996. The results of the present survey suggest a possible decline in the occurrence of both *Serratella ignita* and *Baetis scambus* in recent years.

The New Zealand mud snail, *Potamopyrgus antipodarum*, which has been in Ireland since the 1890's (Kerney, 1999), was found at 21 sites.

The non-native Canadian Waterweed, *Elodea canadensis*, which was first recorded in Ireland in 1836 (Moore and More, 1866) and which Reynolds (2013) reports as being fairly widespread in Co. Limerick and locally abundant in slow-flowing or still lowland waters, including in the Maigne catchment, was only found at one of the sites surveyed in this study (MG10). The *Elodea* genus is classified as invasive and included on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011).

The biological water quality status, assessed by the Q-scheme method, shows 20 of the 30 sites assessed to be in unsatisfactory condition (Moderate or Poor quality). Three sites on upper tributaries (AP1, BL1 and BH1) are High-quality (Q4-5 or Q5), i.e. 10% of the sites assessed. Nationally, the percentage of high-quality sites was at 17% in the 2014-2017 period, compared to 31.6% in the 1987–1990 period (EPA, 2018b). Pristine conditions (Q5) were recorded in the Ardpatrick Stream (Site AP1). The importance of a site like this is illustrated by the fact that EPA recorded Q5 at only 30 of its 2,305 sites monitored throughout the state in the 2014-2017 period (EPA, 2018b).

The white-clawed crayfish (*Austopotamobius pallipes*), also called the Atlantic stream crayfish, is listed by the IUCN as 'endangered'. The Maigne catchment holds a good population of this species, particularly in parts of the main Maigne channel, the Loobagh and the lower end of the Camoge. Of the 22 sites at which crayfish were found, the

NBDC website does not show crayfish records for 11 of these locations. The uppermost site on the Maigne main channel at which crayfish were found (Site MG1) is approximately 9km farther upstream than records for this river on the NBDC website. Of the individuals sexed (Photo 3), there was a fairly even split between male and female (60 male, 61 female), as would be expected in a healthy population.

There is a good size range in the population, from small juveniles to large adults, indicating a healthy breeding population, with the smallest specimen caught having a carapace length of 8mm (Photo 35) and the largest having a carapace length of 47mm (Photo 36). Although slightly larger specimens have been found in Irish lakes (Julian Reynolds, *pers comm.*), this is close to the largest size to which white-clawed crayfish will grow in rivers. For example, of 746 white-clawed crayfish measured from Italian rivers (Ghia, 2015), the largest had a carapace 46mm long. The total length of a crayfish with a 47mm carapace is approximately 10cm. White-clawed crayfish are fully mature at around 3 years and 5cm total length. Then, with one or two moults per year thereafter, and a moult increment of up to 10%, a 10cm crayfish would be at least 7 years old, and possibly a few years older.

No disease was detected in any of the crayfish caught. The crayfish population of the Maigne has so far remained free of crayfish plague (*Aphanomyces astaci*). To date, there have been seven confirmed outbreaks of this disease in Ireland since it was first detected in Co. Cavan in 2015. This includes an outbreak in the River Deel, Co. Limerick. As the Maigne flows to saline waters, it is isolated from other catchments with crayfish populations. This could be important for the conservation of the species if plague continues to spread through Irish river systems, devastating their crayfish populations, as has happened in the Suir, Barrow, Bann and several tributaries of the Shannon. The Nore population crashed in 2001, with crayfish plague suspected, but not proven. The only expanding crayfish population in Ireland recorded in recent years is in the Munster Blackwater (Sweeney and Sweeney, 2017).

Porcelain Disease, caused by the protozoan *Thelohania contejeani*, is reported by Peay (2003) as typically infecting 0.1% to 3% of individuals in crayfish populations, making them infertile. No evidence of this disease was found in any of the 159 crayfish caught and examined in the Maigue catchment.

Demers *et al.* (2005), based on data from the EPA River Monitoring Programme, suggest that crayfish prefer waters of Q3-4 to Q4. A very high population abundance was found Site MG5, where a Q-value towards the upper end of Q3-4 was recorded, which corresponds with this assessment.

The Eurasian otter (*Lutra lutra*), listed by the IUCN as ‘near threatened’, is monitored throughout Europe. In Ireland, the known range of the otter increased by 31% from 1993-2006 to 2007-11, with the most recent published population estimate of 7,800 breeding females (Reid *et al.*, 2013). The NBDC website shows records of otters throughout most of the Maigue catchment. However, of the 14 sites at which evidence of otter presence was found, the NBDC website does not show otter records for 8 of these locations. This includes the location of the holt found in the bank of the Maigue main channel, upstream of Croom, at Site MG8.

Overall, this study has significantly increased available data on species biodiversity and distribution (particularly macroinvertebrates) in the Maigue catchment. It establishes the current distribution, size and structure of the protected white-clawed crayfish population in the catchment. It also adds to the knowledge of otter distribution.

4.2 Recommendations

4.2.1 Biodiversity

Past dredging of the larger channels of the Maigue catchment has diminished diversity of substrate and flow types. This, in turn has reduced the variety of micro-habitat types and the suitability of large sections of the river for a variety of biota, particularly invertebrates. This situation could be improved by river enhancement works of the types described by O'Grady (2006), including the use of boulder deflectors and the introduction of gravels, where appropriate.

There are some sections of riverbank where erosion is occurring. This can lead to deposition of silt on gravels, clogging up interstitial spaces and reducing micro-habitat availability for some invertebrates. On riverbanks where erosion is a problem, soft engineering works, such as willow-weaving could be considered.

Microhabitat availability is also impacted by some long unshaded stretches of river, with little bankside shrub and tree cover (see Photos 5; 23; 28; 29). In addition, some aquatic insects require bankside shrubs/trees for their adult stages. Planting of willow or alder would improve this situation.

4.2.2 Non-native Invasive Species

One non-native macrophyte, *Elodea canadensis*, and two non-native macroinvertebrates, *Potamopyrgus antipodarum* and *Crangonyx pseudogracilis*, were found in the present survey. The former two are well established and are unlikely to spread further. *Crangonyx pseudogracilis* is tolerant of lower dissolved oxygen levels than is *Gammarus duebeni*, and is therefore included in Group D (Relatively Pollution Tolerant) in the EPA Q-value methodology (EPA 2018a). Predation on this small gammarid by the larger *Gammarus duebeni* (McNeil *et al.*, 1999), limits its spread less well oxygenated waters. Therefore, a spread of this species that would very significantly impact on native fauna in the Maigue catchment seems unlikely.

Gammarus duebeni celticus is coming under threat from the introduced *G. pulex*, which has replaced it in the north-eastern part of Ireland (Dick *et al.*, 1993). To date, the distribution of *G. pulex* is limited to Ulster and Leinster. The NBDC website shows two records of the non-native *Gammarus pulex* on watercourses that join the tidal section of the Maigue. On questioning, the provider of these records, who has little expertise in freshwater crustacea, acknowledged that they are erroneous and will have them deleted from the website. However, a continuation of the gradual spread of *G. pulex* throughout Ireland is likely if precautions to avoid accidental introductions to other locations are not taken.

Another amphipod crustacean of Ponto-Caspian origin that has invaded parts of continental Europe and has reached Britain is *Dikerogammarus villosus*, a species that, due to its highly predatory behaviour towards a wide variety of macroinvertebrate taxa and fish, has been called the ‘killer shrimp’. There are no records of this species in Ireland yet. However, it could be inadvertently introduced, causing significant impacts.

Apart from gammarid shrimps, there are a few other invasive macroinvertebrates that could negatively impact on the native fauna, if they were to be introduced to the Maigue catchment. The zebra mussel (*Dreissena polymorpha*) arrived in freshwater parts of the River Shannon in 1994 or earlier (Minchin & Moriarty, 1998). It was recorded in Bunlicky Lake, to the west of Limerick City in 2001 (*pers. obs.*). The Asian clam (*Corbicula fluminea*) was first found at the lower end of the River Barrow in Co. Carlow in 2010 (Sweeney, 2009). It has since spread to other rivers, including the Shannon. Either of these bivalves, which are listed as invasive species in the Third Schedule of Section 42 (1) of, the European Communities (Birds and Natural Habitats) Regulations 2011, could be inadvertently introduced to the Maigue catchment.

To prevent the accidental introduction of invasive species that would negatively impact on local flora and fauna, anglers or other river users should be made aware of the threat of

such introductions and the relevant biosecurity measures. Such measures include drying of footwear, angling gear (particularly nets) and canoes/kayaks that have been in contact with water from other catchments. The general public should also be advised not to dispose of the contents of aquaria into waterbodies.

4.2.3 Protection of White-Clawed Crayfish Population

The most likely possible vector for the introduction of crayfish plague to the Maigue catchment would be equipment (angling gear, footwear, canoes/kayaks) that is damp from use in waterbodies where plague is present. To protect the crayfish population from plague, it is important that anglers and other river users are made aware of the risks and that they take adequate biosecurity measures. As the spores of *Aphanomyces astaci* (the crayfish plague fungus) remain viable only when damp, all equipment that had previously been in contact with water or sediments from other river catchments must be cleaned of mud, sprayed with an anti-fungal agent (e.g. Virkon® Aquatic solution) or a strong saline solution and thoroughly dried prior to the contact with the water in the Maigue catchment.

4.2.4 Protection of Otter Population

Crayfish form a major component of the diet of otters in the Maigue catchment, as evidenced by the contents of spraints found (see Photo 37). Therefore, if crayfish plague were to impact the crayfish population here, there would be a knock-on effect on the otters, which would have to modify their diet, probably increasing fish consumption. This is an additional reason for the adherence to biosecurity measures to prevent crayfish plague introduction.

Otter hunting, although illegal, still takes place along some Irish rivers, in the guise of “mink hunting”. While this is currently not a problem on the Maigue, it does occur on the nearby River Deel (Liam Lenihan, NPWS, *pers. comm.*). Any incident of otter hunting should be reported to the relevant authorities (NPWS and An Garda Síochána).

4.2.5 Water Quality

As two-thirds of the sites surveyed for biological water quality are classified as being in unsatisfactory condition, there is considerable scope for improvement. Some possible negative impacts arising from towns and villages could be rectified by upgrading of wastewater treatment plants, where these are inadequate. However, the major pressure on water quality in this catchment is clearly from diffuse agricultural runoff. Implementation of basic good farming practice throughout the catchment could improve this situation. This includes fencing livestock away from watercourses, maintenance of adequate buffer zones along watercourses flowing by slurry/fertiliser spreadlands and only applying the amount of slurry in which the nutrients can be taken up by the grass or other crop.

APPENDIX 1 PHOTOGRAPHS

Photo 1: Kick-sampling



Photo 2: Crayfish surveying



Photo 3: Male crayfish with appendages modified as copulatory organs for introducing the spermatophore to the female. Female with wide abdomen for carrying the brood.



Photo 4: Site MG1



Photo 5: Site MG2



Photo 6: Site MG3



Photo 7: Site MG4



Photo 8: Site MG5



Photo 9: Site MG6



Photo 10: Site MG7



Photo 11: Site MG8



Photo 12: Site MG9



Photo 13: Site MG10



Photo 14: Site LY1



Photo 15: Site CV1



Photo 16: Site LB1



Photo 17: Site LB2



Photo 18: Site AP1



Photo 19: Site BL1



Photo 20: Site BH1



Photo 21: Site BA1



Photo 22: Site MS1



Photo 23: Site MS2



Photo 24: Site MS3



Photo 25: Site MS4



Photo 26: Site CM1



Photo 27: Site CM2



Photo 28: Site CM3



Photo 29: Site CM4



Photo 30: Site BG1



Photo 31: Site MH1



Photo 32: Site MH2



Photo 33: Site CR1



Photo 34: Oil barrage at bridge east of Pinker's Cross (Morning Star) on 24/08/18



Photo 35: Crayfish: 8mm carapace



Photo 36: Crayfish: 47mm carapace



Photo 37: Otter spraint full of crayfish remains at Site MG6



Photo 38: Otter print in bankside mud at Site MG9



Photo 39: Otter holt at Site MG8



APPENDIX 2 MACROINVERTEBRATE SAMPLING SITE DETAILS

(water levels as at the April/May sampling event)

Watercourse	Maigue
Site Code	MG1
Exact Sample Location	Drewscourt Bridge, upstream.
Photograph	4
Wet Width (m)	6
Sampling depth (m)	0.3
Flow Type	Riffle 80% Glide 20%
Velocity	Moderate to Fast
pH	7.8
Substratum	Boulder 5% Cobble 40% Large Gravel 30% Small Gravel 20% Sand 5%
Shade	Partial shade
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG2
Exact Sample Location	Creggane Bridge on N20, downstream
Photograph	5
Wet Width (m)	6
Sampling depth (m)	0.5
Flow Type	Glide 100%
Velocity	Slow to Moderate
pH	7.9
Substratum	Large Gravel 25% Small Gravel 25% Sand 25% Silt 25%
Shade	None
Sampling method	Dredge with pond net

Watercourse	Maigue
Site Code	MG3
Exact Sample Location	2 nd field downstream of Loobagh confluence.
Photograph	6
Wet Width (m)	10
Sampling depth (m)	1.5
Flow Type	Glide 100%
Velocity	Slow to Moderate
pH	8.2
Substratum	Cobble 30% Large Gravel 10% Small Gravel 20% Sand 20% Silt 20%
Shade	Light
Sampling method	Dredge from bankside with long-handled net.
Comments	Macroinvertebrate sampling was done prior to the construction of the new Kerry Foods outfall on the left bank.

Watercourse	Maigue
Site Code	MG4
Exact Sample Location	Bridge west of Dromacommer
Photograph	7
Wet Width (m)	30
Sampling depth (m)	20
Flow Type	Riffle 100%
Velocity	Moderate to Fast
pH	8.2
Substratum	Cobble 30% Large Gravel 30% Small Gravel 30% Sand 10%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG5
Exact Sample Location	Down from end of lane along old railway track on eastern side.
Photograph	8
Wet Width (m)	18
Sampling depth (m)	35
Flow Type	Riffle 100%
Velocity	Fast
pH	8.3
Substratum	Cobble 60% Large Gravel 25% Small Gravel 10% Sand 5%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG6
Exact Sample Location	Across field from house at end of lane downstream of bridge, right hand side.
Photograph	9
Wet Width (m)	18
Sampling depth (m)	40
Flow Type	Riffle 100%
Velocity	Fast
pH	8.3
Substratum	Cobble 50% Large Gravel 30% Small Gravel 15% Sand 5%
Shade	Light
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG7
Exact Sample Location	Cherrygrove Br., southwest of Tullovin, 15m downstream.
Photograph	10
Wet Width (m)	25
Sampling depth (m)	0.4
Flow Type	Riffle 100%
Velocity	Fast
pH	8.3
Substratum	Cobble 50% Large Gravel 30% Small Gravel 20%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG8
Exact Sample Location	Downstream of weir, upstream of Croom.
Photograph	11
Wet Width (m)	35
Sampling depth (m)	50
Flow Type	Riffle 50% Glide 50%
Velocity	Moderate to Fast
pH	8.4
Substratum	Cobble 50% Large Gravel 20% Small Gravel 10% Sand 10% Silt 10%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Maigue
Site Code	MG9
Exact Sample Location	Bridge north of Derryvinnane, upstream
Photograph	12
Wet Width (m)	40
Sampling depth (m)	1.0
Flow Type	Glide 100%
Velocity	Slow to Moderate
pH	8.6
Substratum	Large Gravel 40% Small Gravel 40% Silt 20%
Shade	None
Sampling method	Dredge with long-handled net from bankside.

Watercourse	Maigue
Site Code	MG10
Exact Sample Location	Adare Br., downstream
Photograph	13
Wet Width (m)	80
Sampling depth (m)	40
Flow Type	Freshwater tidal
Velocity	Moderate at low tide
pH	8.6
Substratum	Cobble 50% Large Gravel 30% Small Gravel 15% Silt 5%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Lyragh Stream
Site Code	LY1
Exact Sample Location	Bridge on Limerick-Cork border, upstream
Photograph	14
Wet Width (m)	1
Sampling depth (m)	25
Flow Type	Glide 100%
Velocity	Slow to Moderate
pH	7.9
Substratum	Cobble 5% Sand 40% Silt 55%
Shade	Moderate
Sampling method	Standard kick and stone wash
Comments	This watercourse was dry when visited in August.

Watercourse	Charleville Stream
Site Code	CV1
Exact Sample Location	Beside lane on south side of wastewater treatment plant
Photograph	15
Wet Width (m)	1
Sampling depth (m)	0.1
Flow Type	Riffle 50% Glide 50%
Velocity	Moderate
pH	7.9
Substratum	Large Gravel 5% Small Gravel 40% Sand 30% Silt 25%
Shade	Heavy
Sampling method	Standard kick and stone wash

Watercourse	Loobagh
Site Code	LB1
Exact Sample Location	Riversfield Br., upstream (downstream of wastewater treatment plant.
Photograph	16
Wet Width (m)	8
Sampling depth (m)	0.4
Flow Type	Riffle 50% Glide 50%
Velocity	Moderate to Fast
pH	8.0
Substratum	Cobble 15% Large Gravel 35% Small Gravel 25% Sand 25%
Shade	Light
Sampling method	Standard kick and stone wash
Comments	Salmon parr and brook lamprey in kick-sample

Watercourse	Loobagh
Site Code	LB2
Exact Sample Location	Garrose Br., upstream
Photograph	17
Wet Width (m)	14
Sampling depth (m)	0.4
Flow Type	Riffle 70% Glide 30%
Velocity	Moderate to Fast
pH	8.1
Substratum	Boulder 5% Cobble 5% Large Gravel 20% Small Gravel 10% Sand 10% Silt 5%
Shade	Light
Sampling method	Standard kick and stone wash
Comments	Bat droppings under bridge.

Watercourse	Ardpatrick Stream
Site Code	AP1
Exact Sample Location	Upstream of bridge in Sunville Upper Td.
Photograph	18
Wet Width (m)	2.5
Sampling depth (m)	0.2
Flow Type	Riffle 60% Glide 40%
Velocity	Moderate to Fast
pH	7.5
Substratum	Boulder 5% Cobble 30% Large Gravel 30% Small Gravel 30% Sand 5%
Shade	None
Sampling method	Standard kick and stone wash
Comments	Downstream of the bridge, the right bank was badly poached by horses.

Watercourse	Ballinlyna Stream
Site Code	BL1
Exact Sample Location	Ballinlyna Br., upstream.
Photograph	19
Wet Width (m)	0.5
Sampling depth (m)	0.1
Flow Type	Riffle 100%
Velocity	Fast
pH	7.6
Substratum	Cobble 10% Large Gravel 40% Small Gravel 30% Sand 15% Silt 5%
Shade	None
Sampling method	Standard kick and stone wash
Comments	This watercourse was dry when visited in August.

Watercourse	Barranahown
Site Code	BH1
Exact Sample Location	At timber footbridge on walking route.
Photograph	20
Wet Width (m)	3
Sampling depth (m)	0.2
Flow Type	Cascade: 10% Riffle 70% Pool 20%
Velocity	Fast
pH	6.6
Substratum	Boulder 50% Cobble 30% Large Gravel 10% Small Gravel 5% Sand 5%
Shade	Partial shade
Sampling method	Standard kick and stone wash x 2
Comments	Sampling time doubled because of paucity of fauna.

Watercourse	Ballyania
Site Code	BA1
Exact Sample Location	Knockahardy Br. on R512, upstream
Photograph	21
Wet Width (m)	2
Sampling depth (m)	0.05
Flow Type	Riffle 50% Glide 50%
Velocity	Slow to Moderate to Fast
pH	8.0
Substratum	Cobble 10% Large Gravel 40% Small Gravel 30% Silt 20%
Shade	Partial Shade
Sampling method	Standard kick and stone wash

Watercourse	Morning Star
Site Code	MS1
Exact Sample Location	Bridge east of Pinker's Cross, downstream
Photograph	22
Wet Width (m)	4.5
Sampling depth (m)	0.3
Flow Type	Riffle 70% Glide 30%
Velocity	Moderate
pH	7.8
Substratum	Cobble 5% Large Gravel 50% Small Gravel 30% Sand 10% Silt 5%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Morning Star
Site Code	MS2
Exact Sample Location	Bridge northeast of Gormanstown, upstream.
Photograph	23
Wet Width (m)	6
Sampling depth (m)	0.3
Flow Type	Riffle 80% Glide 20%
Velocity	Moderate to Fast
pH	8.0
Substratum	Cobble 30% Large Gravel 30% Small Gravel 30% Sand 30%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Morning Star
Site Code	MS3
Exact Sample Location	Bruff Br.
Photograph	24
Wet Width (m)	15
Sampling depth (m)	0.2
Flow Type	Riffle 100%
Velocity	Moderate to Fast
pH	8.2
Substratum	Cobble 40% Large Gravel 30% Small Gravel 15% Sand 5% Silt 10%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Morning Star
Site Code	MS4
Exact Sample Location	Bridge upstream of Maigue confluence, downstream.
Photograph	25
Wet Width (m)	10
Sampling depth (m)	0.4
Flow Type	Riffle 100%
Velocity	Fast
pH	8.4
Substratum	Cobble 50% Large Gravel 30% Small Gravel 20%
Shade	Light
Sampling method	Standard kick and stone wash

Watercourse	Camoge
Site Code	CM1
Exact Sample Location	50m upstream of Gortacloona Br.
Photograph	26
Wet Width (m)	9
Sampling depth (m)	0.4
Flow Type	Riffle 100%
Velocity	Fast
pH	8.0
Substratum	Boulder 25% Cobble 25% Large Gravel 20% Small Gravel 15% Sand 15%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Camoge
Site Code	CM2
Exact Sample Location	Bridge southwest of Herbertstown, downstream
Photograph	27
Wet Width (m)	9
Sampling depth (m)	0.4
Flow Type	Riffle 70% Glide 30%
Velocity	Moderate to Fast
pH	8.2
Substratum	Cobble 5% Large Gravel 50% Small Gravel 40% Silt 5%
Shade	Partial shade
Sampling method	Standard kick and stone wash

Watercourse	Camoge
Site Code	CM3
Exact Sample Location	50m downstream of bridge on R511
Photograph	28
Wet Width (m)	12
Sampling depth (m)	0.8
Flow Type	Glide %
Velocity	Moderate
pH	8.3
Substratum	Large Gravel 30% Small Gravel 40% Silt 30%
Shade	None
Sampling method	Dredge sample using long-handled net from bank.

Watercourse	Camoge
Site Code	CM4
Exact Sample Location	Bridge on R516, upstream
Photograph	29
Wet Width (m)	15
Sampling depth (m)	0.45
Flow Type	Riffle 500% Glide 50%
Velocity	Moderate to Fast
pH	8.3
Substratum	Cobble 50% Large Gravel 25% Small Gravel 15% Sand 5% Silt 5%
Shade	None
Sampling method	Standard kick and stone wash

Watercourse	Bog
Site Code	BG1
Exact Sample Location	Castlejane Br., downstream
Photograph	30
Wet Width (m)	2.5
Sampling depth (m)	0.3
Flow Type	Riffle 50% Glide 50%
Velocity	Moderate
pH	7.8
Substratum	Cobble 25% Large Gravel 30% Small Gravel 30% Silt 15%
Shade	Heavy
Sampling method	Standard kick and stone wash

Watercourse	Mahore
Site Code	MH1
Exact Sample Location	O'Carroll's Bridge, downstream.
Photograph	31
Wet Width (m)	8
Sampling depth (m)	0.3
Flow Type	Riffle 100%
Velocity	Moderate to Fast
pH	8.0
Substratum	Cobble 50% Large Gravel 30% Small Gravel 15% Silt 5%
Shade	Light
Sampling method	Standard kick and stone wash

Watercourse	Mahore
Site Code	MH2
Exact Sample Location	Bridge on R516, downstream
Photograph	32
Wet Width (m)	6
Sampling depth (m)	40
Flow Type	Riffle 30% Glide 70%
Velocity	Moderate
pH	8.2
Substratum	Large Gravel 35% Small Gravel 15% Sand 30% Silt 20%
Shade	Light
Sampling method	Standard kick and stone wash

Watercourse	Cloghaready Stream
Site Code	CR1
Exact Sample Location	Bridge at western corner of Cloghaready townland. Upstream of bridge in garden of cottage.
Photograph	33
Wet Width (m)	0.5
Sampling depth (m)	0.2
Flow Type	Glide 100%
Velocity	Slow
pH	7.7
Substratum	Small Gravel 20% Silt 80%
Shade	Partial shade
Sampling method	Dredge with pond net
Comments	There was only some standing water in the channel in August.

APPENDIX 3

CRAYFISH SURVEY SITE DETAILS

Watercourse: Maigue

Site: MG1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	1x3	Riffle	cobble (6.5-25cm)
Patch 2	2x2	Glide	cobble (6.5-25cm)
Patch 3	3x2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 4	3x2	Glide	cobble (6.5-25cm)
Patch 5	2x2	Glide	cobble (6.5-25cm) boulder (>25.6cm)

Watercourse: Maigue

Site: MG2

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 2	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 3	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 4	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 5	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt

Watercourse: Maigue

Site: MG3

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2x2	Glide	boulder (>25.6cm)
Patch 2	2x2	Glide	boulder (>25.6cm)
Patch 3	2x2	Glide	boulder (>25.6cm)
Patch 4	2x2	Glide	boulder (>25.6cm)
Patch 5	2x2	Glide	boulder (>25.6cm)

Sampled across upstream end of new boulder and cobble fill at new Kerry Foods outfall.

Watercourse: Maigue

Site: MG4

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	4x4	Glide	cobble (6.5-25cm)
Patch 2	4x4	Glide	cobble (6.5-25cm)
Patch 3	4x4	Glide	cobble (6.5-25cm)
Patch 4	4x4	Glide	cobble (6.5-25cm)
Patch 5	4x4	Glide	cobble (6.5-25cm)

Watercourse: Maigne
Site: MG5

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X2	Riffle	cobble (6.5-25cm)
Patch 2	3X2	Riffle	cobble (6.5-25cm)
Patch 3	4X2	Riffle	cobble (6.5-25cm)
Patch 4	3X2	Riffle	cobble (6.5-25cm)
Patch 5	4X2	Riffle	cobble (6.5-25cm)

Watercourse: Maigne
Site: MG6

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X3	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 2	3X3	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 3	3X3	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 4	3X3	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 5	3X3	Glide	cobble (6.5-25cm) boulder (>25.6cm)

Watercourse: Maigne
Site: MG7

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	4X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 2	4X4	Riffle	cobble (6.5-25cm)
Patch 3	4X4	Riffle	cobble (6.5-25cm)
Patch 4	4X4	Glide	cobble (6.5-25cm)
Patch 5	4X4	Glide	cobble (6.5-25cm) boulder (>25.6cm)

Watercourse: Maigne
Site: MG8

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X3	Glide	boulder (>25.6cm)
Patch 2	2X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 3	3X2	Glide	boulder (>25.6cm)
Patch 4	2X2	Glide	cobble (6.5-25cm)
Patch 5		Glide	cobble (6.5-25cm)

Watercourse: Maigue

Site: MG9

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt, with occasional small cobble
Patch 2	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt, with occasional small cobble
Patch 3	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt, with occasional small cobble
Patch 4	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt, with occasional small cobble
Patch 5	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt, with occasional small cobble

Watercourse: Maigue

Site: MG10

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Tidal. Riffle at low tide.	gravel (21.6-6.5cm) cobble (6.5-25cm)
Patch 2	2X2	Tidal. Riffle at low tide.	cobble (6.5-25cm) boulder (>25.6cm)
Patch 3	2X2	Tidal. Riffle at low tide.	cobble (6.5-25cm)
Patch 4	2X2	Tidal. Riffle at low tide.	cobble (6.5-25cm)
Patch 5	2X2	Tidal. Riffle at low tide.	gravel (21.6-6.5cm) cobble (6.5-25cm)

Watercourse: Lyragh Stream

Site: LY1

No water. No crayfish habitat

Watercourse: Charleville Stream

Site:

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X1	Glide	cobble (6.5-25cm)
Patch 2	3X1	Riffle	cobble (6.5-25cm)
Patch 3	3X1	Riffle	cobble (6.5-25cm)
Patch 4	5X0.3	Run	Tree roots
Patch 5	5X0.3	Run	Tree roots

Watercourse: Loobagh

Site: LB1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X1	Glide	cobble (6.5-25cm)
Patch 2	3X1	Glide	cobble (6.5-25cm)
Patch 3	5X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 4	5X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 5	3X3	Riffle	cobble (6.5-25cm) boulder (>25.6cm)

Watercourse: Loobagh

Site: LB2

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Glide	cobble (6.5-25cm)
Patch 2	2X2	Glide	cobble (6.5-25cm)
Patch 3	2X2	Glide	cobble (6.5-25cm)
Patch 4	3X2	Riffle	cobble (6.5-25cm)
Patch 5	3X2	Riffle	cobble (6.5-25cm)

Watercourse: Ardpatrick Stream

Site: AP1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Glide	cobble (6.5-25cm)
Patch 2	2X2	Glide	cobble (6.5-25cm)
Patch 3	2X2	Glide	cobble (6.5-25cm)
Patch 4	2X2	Glide	cobble (6.5-25cm)
Patch 5	2X2	Glide	cobble (6.5-25cm)

Watercourse: Ballinlyna Stream

Site: BL1

No water. No crayfish habitat

Watercourse: Barranahown

Site: BH1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 2	2X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 3	2X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 4	2X3	Pool	cobble (6.5-25cm) boulder (>25.6cm)
Patch 5	2X4	Pool	cobble (6.5-25cm) boulder (>25.6cm)

Watercourse: Morning Star
Site: MS1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 2	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 3	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 4	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 5	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt

There was an oil spill upstream of the bridge. Floating oil barriers in place (Photo). A little oil escaping.

Watercourse: Morning Star
Site: MS2

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	1X3	Riffle	boulder (>25.6cm)
Patch 2	1X3	Riffle	boulder (>25.6cm)
Patch 3	2X2	Glide	cobble (6.5-25cm)
Patch 4	2X2	Glide	cobble (6.5-25cm)
Patch 5	3X2	Glide	cobble (6.5-25cm)

Watercourse: Morning Star
Site: MS3

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X2	Riffle	cobble (6.5-25cm)
Patch 2	4X3	Riffle	cobble (6.5-25cm)
Patch 3	3X3	Riffle	cobble (6.5-25cm)
Patch 4	4X2	Riffle	cobble (6.5-25cm)
Patch 5	3X3	Riffle	cobble (6.5-25cm)

Watercourse: Morning Star
Site: MS4

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	4X2	Glide	cobble (6.5-25cm)
Patch 2	4X2	Glide	cobble (6.5-25cm)
Patch 3	2X2	Riffle	cobble (6.5-25cm)
Patch 4	2X2	Riffle	cobble (6.5-25cm)
Patch 5	2X2	Riffle	cobble (6.5-25cm)

Watercourse: Camoge
Site: CM1

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Glide	boulder (>25.6cm)
Patch 2	2X2	Riffle	cobble (6.5-25cm)
Patch 3	2X2	Riffle	cobble (6.5-25cm)
Patch 4	2X2	Riffle	cobble (6.5-25cm)
Patch 5	3X2	Glide	cobble (6.5-25cm)

Watercourse: Camoge**Site: CM2**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 2	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 3	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 4	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt
Patch 5	5X0.3 dredge sample	Glide	Dredge in gravel/sand/silt

Watercourse: Camoge**Site: CM3**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	5X3	Glide	gravel (21.6-6.5cm) cobble (6.5-25cm)
Patch 2	5X3	Glide	gravel (21.6-6.5cm) cobble (6.5-25cm)
Patch 3	6X3	Glide	gravel (21.6-6.5cm) cobble (6.5-25cm)
Patch 4	3X3	Glide	gravel (21.6-6.5cm) cobble (6.5-25cm)
Patch 5	4X3	Glide	gravel (21.6-6.5cm) cobble (6.5-25cm)

Watercourse: Camoge**Site: CM4**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	2X2	Glide	cobble (6.5-25cm)
Patch 2	2X2	Glide	cobble (6.5-25cm)
Patch 3	2X2	Glide	cobble (6.5-25cm)
Patch 4	2X2	Glide	cobble (6.5-25cm)
Patch 5	2X2	Glide	cobble (6.5-25cm)

Watercourse: Bog**Site: BG1**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	10X2.5	V. Slow Glide	cobble (6.5-25cm)
Patch 2	10X2.5	V. Slow Glide	cobble (6.5-25cm)
Patch 3	10X2.5	V. Slow Glide	cobble (6.5-25cm)
Patch 4	10X2.5	V. Slow Glide	cobble (6.5-25cm)
Patch 5	10X2.5	V. Slow Glide	cobble (6.5-25cm)

Watercourse: Mahore**Site: MH1**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 2	3X2	Glide	cobble (6.5-25cm) boulder (>25.6cm)
Patch 3	2X2	Riffle	cobble (6.5-25cm)
Patch 4	2X2	Riffle	cobble (6.5-25cm)
Patch 5	2X2	Glide	cobble (6.5-25cm)

Watercourse: Mahore**Site: MH2**

	Extent (l x w patch, m)	Flow type	Refuges searched
Patch 1	3X2	Glide	cobble (6.5-25cm)
Patch 2	3X2	Glide	cobble (6.5-25cm)
Patch 3	4X2	Glide	<i>Sparganium erectum</i>
Patch 4	4X2	Glide	<i>Sparganium erectum</i>
Patch 5	4X2	Glide	<i>Sparganium erectum</i>

Watercourse: Cloghaready Stream**Site: CR1**

No flowing water. Pools c. 2cm deep between damp patches of channel.

No crayfish habitat.

APPENDIX 4

MACROINVERTEBRATE SPECIES LIST, ECOLOGY AND DISTRIBUTION

<u>TAXON</u>	<u>ECOLOGY AND DISTRIBUTION</u>
PLATYHELMINTHES	
Tricladida (Flatworms)	
<i>Polycelis nigra</i>	Common in slow-flowing and still water habitats
NEMATODA (Roundworms)	
	Several species occurring in low numbers in various freshwater habitats. Very difficult to identify.
ANNELIDA	
Oligochaeta (Segmented worms)	
<i>Limnodrilus hoffmeisteri</i>	Common and abundant; often in polluted waters
<i>Lumbriculus variegatus</i>	Widespread and common in rivers and lakes throughout Ireland.
Lumbricidae	Mostly terrestrial. Some species can live for several days in water.
<i>Nais elinguis</i>	Widespread, usually associated with slightly to moderately enriched conditions.
<i>Nais pardalis</i>	A rare species in Ireland. Apart from several records around the Killarney Lakes, only known from a stream in Dublin and a lake shore in Donegal. This is the first record of this species in Co. Limerick.
<i>Nais variabilis</i>	Most Irish records are from Co. Kerry, where it occurs in the Killarney Lakes and in the upper parts of several estuaries. It has also been recorded from a stream in south Co. Dublin. This is the first record of this species in Co. Limerick.
<i>Psammoryctides barbatus</i>	Common and frequent; rivers with sandy substrata, occasionally where polluted
<i>Rhyacodrilus coccineus</i>	Widely distributed in Irish rivers, usually associated with unpolluted conditions
<i>Stylaria lacustris</i>	Very common and widely distributed in a variety of habitats
<i>Stylogrilus heringianus</i>	Widespread. Mainly found in unproductive habitats
<i>Tubifex tubifex</i>	Common and abundant; often in polluted waters.
Hirudinea (Leeches)	
<i>Erpobdella octoculata/testacea</i>	Common and widespread in productive waterbodies. Usually occurring at low densities
<i>Glossiphonia complanata</i>	Common and widespread in productive waterbodies.
<i>Helobdella stagnalis</i>	Common and widespread in productive waterbodies.
MOLLUSCA (Molluscs)	
Gastropoda (Snails and limpets)	
<i>Ancylus fluviatilis</i>	Common on hard surfaces in moderate to fast-flowing rivers
<i>Bithynia tentaculata</i>	Common and widespread in productive waterbodies
<i>Potamopyrgus antipodarum</i>	Southern hemisphere species present in Ireland since the early 20 th century. Common, often very abundant in many habitats.
<i>Radix balthica</i>	Common and widespread. Tolerant of moderately polluted conditions.
<i>Theodoxus fluviatilis</i>	Common in lowland hard-water rivers.

Bivalvia (Mussels)*Anodonta anatina*

The Duck Mussel (*Anodonta anatina*) is fairly widely distributed in lowland rivers and lakes, but has been badly impacted in some waterbodies by invasion of the Zebra Mussel (*Dreissena polymorpha*). Listed as IUCN “Vulnerable”

Pisidium nitidum

Widespread in still and slow-flowing waters.

Pisidium personatum

Widespread in still and slow-flowing waters.

CHELICERATA**Hydrachnidae (Water mites)**

A ubiquitous, but taxonomically difficult family, as there are over 900 European species, of which 218 were recorded in Ireland in 1944. Very little work has been carried out on Irish water mites since then.

CRUSTACEA (Crustaceans)**Amphipoda (Shrimps)***Crangonyx pseudogracilis*

Invasive North American species, first recorded in Ireland in 1975. Now widespread in rivers, lakes and ponds.

Gammarus duebeni

Common in Ireland in a wide range of freshwater habitats.

Gammarus zaddachi

Common in the lower end of the freshwater reaches of rivers.

Isopoda (Water slaters)*Asellus aquaticus*

Common in still or slow-flowing waters amongst bottom debris

Astacidae (Crayfish)*Austropotamobius pallipes*

Locally abundant in relatively hard, mineral rich waters. Legally protected.

INSECTA (Insects)**Odonata (Dragonflies & Damselflies)****Damselflies)***Calopteryx splendens*

The Banded Jewelwing Damselfly (*Calopteryx splendens*) is widely distributed in rivers and streams with a muddy bottom and slow flow.

Ephemeroptera (Mayflies)*Baetis rhodani*

Common and abundant in streams and small rivers.

Alainites muticus

Widespread, but less common than *B. rhodani*. Typical of smaller watercourses with stony substrata.

Caenis luctuosa

Common and widespread in moderate to slow-flowing rivers and in lakes.

Caenis rivulorum

Fairly common in moderate to slow-flowing rivers. Less widespread than *C. luctuosa*.

Ecdyonurus dispar

Common in riffle areas of clean stony streams and rivers.

Ecdyonurus insignis

Found in riffle areas of clean stony streams and rivers. Less common than *E. dispar* and *E. venosus*.

Ecdyonurus venosus

Common in riffle areas of clean stony streams and rivers.

Ephemera danica

“The Mayfly”, in angling terms.

Heptagenia sulphurea

Widespread. Found mostly in lowland rivers. Intolerant of pollution.

semicolorata

Widespread and common. Found in riffle areas of clean streams and small to medium-sized rivers.

Serratella ignita

The sub-imago of this species is known to anglers as the Blue-winged Olive and the imago is known as the Sherry Spinner. Common and widespread in productive lowland rivers, occurring mostly in running waters, often amongst vegetation.

Plecoptera (Stoneflies)*Amphinemura sulcicollis*

Widespread in streams, particularly in moss and leaf-packs.
Tolerant of acidic conditions

Brachyptera risi

Common and widespread in the southwest, east and northwest of Ireland. Found mainly in acidic streams at high altitudes.

Diura bicaudata

A rare species of high-altitude streams. Tolerant of acidic conditions. This is the first record of this species in Co. Limerick.

Isoperla grammatica

Common in riffle areas of clean stony streams and small rivers.

Leuctra fusca

Widespread and common. Found among gravels of streams and small to medium-sized rivers, but also among mosses, macrophytes and organic matter.

Leuctra hippopus

Widespread and common. Found among gravels of streams and small to medium-sized rivers, but also among mosses, macrophytes and leaf-packs. Tolerant of acidic conditions

Leuctra inermis

Widespread and common. Found in streams and small rivers.
Tolerant of acidic conditions.

Siphonoperla torrentium

Common and widespread in shallow riffles of clean rivers and streams

Hemiptera (Bugs)*Sigara dorsalis*

A fairly common and widespread water boatman.

Trichoptera (Caddis flies)*Agapetus orchipes*

Widespread and common in rivers.

Athripsodes albifrons

Widespread in rivers. Less common than *A. cinereus*

Athripsodes cinereus

Widespread and common in rivers and lakes.

Cheumatopsyche lepida

Widespread in fast flow of larger rivers.

Drusus annulatus

This is the first record of this species in Co. Limerick

Glossosoma boltoni

Widespread and common in rivers

Goera pilosa

Widespread and common in rivers

Halesus radiatus

Widespread and common in rivers with stony substrata

Hydropsyche angustipennis

Widespread and common in rivers

Fairly widespread in middle to lower reaches of Irish rivers. Less common here than *H. pellucidula*.

Hydropsyche instabilis

Fairly widespread in Irish rivers. Less common than *H. pellucidula* and *H. siltali*.

Hydropsyche pellucidula

Widespread and very common in middle to lower reaches of Irish rivers.

Hydropsyche siltali

Widespread and very common in upper reaches of Irish rivers.

Ithytrichia sp.

An uncommon genus of caddis, but with a fairly widespread distribution in Irish rivers. Two species (*I. lamellaris* and *I. clavata*) have been identified as adults, but identification keys do not separate the larvae. *I. clavata* is rare.

Lepidostoma hirtum

This is the first record of this genus in Co. Limerick

Common and widespread in moderate to slow flow in rivers and also in lakes.

Limnephilus flavicornis

Widespread and common in middle to lower reaches of Irish rivers.

Limnephilus lunatus

Widespread and very common in middle to lower reaches of Irish rivers.

Limnephilus rhombicus

Widespread and common in middle to lower reaches of Irish rivers.

Lype reducta

A fairly rare species. Larvae can be difficult to find, as they burrow on rotting timber. This is the first record of this species in Co. Limerick.

Plectrocnemia geniculata

Widespread and common in rivers.

Polycentropus flavomaculatus

Widespread and very common in rivers.

Potamophylax latipennis

Widespread and very common in middle to lower reaches of Irish rivers.

Psychomyia pusilla
Rhyacophila dorsalis
Rhyacophila munda
Sericostoma personatum

Tinodes waeneri
Wormaldia sp.

Widespread and common in rivers.
 Less common than *R. dorsalis*
 Burrowing species common and widely distributed in lakes and rivers.
 Widespread and common in rivers and lakes.
 A fairly common genus of caddis. Three species (*W. occipitalis*, *W. subnigra* and *W. mediana*) have been identified as adults, but identification keys only include the larvae of the former two species. *W. mediana* is rare, found in Co. Kerry.
 This is the first record of this genus in Co. Limerick

Tipulidae (Crane flies)

Dicronota sp.
Tipula sp.

Widespread in rivers. Usually at low abundance.
 Widespread in rivers. Usually at low abundance

Ceratopogonidae (Biting midges)

Bezzia sp.

Widespread in rivers and lakes.

Simuliidae (Black-flies)

Simulium sp.

Widespread and very common in rivers. Can reach very high abundances in enriched conditions.

Tabanidae (Horseflies)

Larvae mostly terrestrial, but sometimes found in slow-flowing channels

Chironomidae (Non-biting midges)

Ablabesmyia sp.
Brillia sp.
Cricotopus sp.
Cryptochironomus sp.
Diamesa sp.
Endochironomus sp.
Eukiefferiella sp.
Heterotrissocladius sp.
Micropsectra sp.
Microtendipes sp.
Orthocladius sp.
Parametriocnemus sp.
Paratanytarsus sp.
Polypedilum sp.
Potthastia sp.
Prodiamesa sp.
Psectrocladius sp.
Stictochironomus sp.
Tanytarsus sp.
Tvetenia sp.

Common and widespread in a variety of freshwater habitats.
 Common and widespread in rivers.
 Very common and widespread in a variety of freshwater habitats.
 Common and widespread in a variety of freshwater habitats.
 Common and widespread in a variety of freshwater habitats.
 Common and widespread. More so in lakes than rivers.
 Common and widespread in rivers.
 Common and widespread in rivers.
 Common and widespread. More so in rivers than lakes.
 Common and widespread. More so in lakes than rivers.
 Very common and widespread in a variety of freshwater habitats.
 Common and widespread in rivers.
 Common and widespread. More so in lakes than rivers.
 Common and widespread. More so in lakes than rivers.
 Common and widespread in a variety of freshwater habitats.
 Common and widespread in a variety of freshwater habitats.
 Common and widespread. More so in lakes than rivers.
 Common and widespread. More so in lakes than rivers.
 Common and widespread in rivers

Coleoptera (Beetles)

Agabus bipustulatus
Brychius elevatus
Elmis aenea
Helophorus brevipalpis
Hydroporus palustris
Limnius volckmari
Nebrioporus depressus
Orectochilus villosus

Common and widespread in slow-flowing rivers.
 Common and widespread in moderate to slow-flowing rivers.
 Very common in riffle sections of rivers throughout Ireland.
 Common and widespread in moderate to slow-flowing rivers.
 Common and widespread in moderate to slow-flowing rivers.
 Very common in riffle sections of rivers throughout Ireland.
 Common and widespread in moderate to slow-flowing rivers.
 Common and widespread in moderate to slow-flowing rivers.

APPENDIX 5 MACROINVERTEBRATE RESULTS BY SITE

SACFOR Abundance Scale:

S = Superabundant	>80%
A = Abundant	40-79%
C = Common	20-39%
F = Frequent	10-19%
O = Occasional	5-9%
R = Rare	<5%

MAIGUE

	MG1	MG2	MG3	MG4	MG5	MG6	MG7	MG8	MG9	MG10	WFD STATUS GROUP
NEMATODA (Roundworms)						R					C
ANNELIDA											
Oligochaeta (Segmented worms)											
<i>Limnodrilus hoffmeisteri</i>									R	R	E
<i>Lumbriculus variegatus</i>						O			C	C	C
<i>Nais elinguis</i>							R			R	D
<i>Stylaria lacustris</i>						R				R	D
<i>Stylogdrilus heringianus</i>	R			C	O		R				C
<i>Tubifex tubifex</i>		O							R		E

	MG1	MG2	MG3	MG4	MG5	MG6	MG7	MG8	MG9	MG10	WFD STATUS GROUP
INSECTA (Insects)											
Odonata (Dragonflies & Damselflies)											
<i>Calopteryx splendens</i>		R	R								B
Ephemeroptera (Mayflies)											
<i>Baetis rhodani</i>	S	O	F	C	A	C	S	A		O	C
<i>Alainites muticus</i>	R	R	R	R		O	O	O			B
<i>Caenis luctuosa</i>		R		R		R				R	C
<i>Caenis rivulorum</i>			R				O		F		C
<i>Ecdyonurus dispar</i>							R				A
<i>Ecdyonurus venosus</i>	O				R			O			A
<i>Ecdyonurus sp.</i>			O	R							A
<i>Ephemera danica</i>		R		R							A
<i>Heptagenia sulphurea</i>	R		C		O	O	R	R			A
<i>Serratella ignita</i>	R	O									C
Hemiptera (Bugs)											
<i>Sigara dorsalis</i>			R								C
Trichoptera (Caddis flies)											
<i>Athripsodes cinereus</i>								R			B
<i>Cheumatopsyche lepida</i>								R			C
<i>Glossosoma boltoni</i>		R									B
<i>Hydropsyche angustipennis</i>		R									C
<i>Hydropsyche instabilis</i>								R			C
<i>Hydropsyche pellucidula</i>			R	R	R	R	R				C
<i>Hydropsyche siltali</i>							R				C
<i>Polycentropus flavomaculatus</i>	R										C
<i>Potamophylax latipennis</i>	R				R						B
<i>Rhyacophila dorsalis</i>					R		R				C

	MG1	MG2	MG3	MG4	MG5	MG6	MG7	MG8	MG9	MG10	WFD STATUS GROUP
Simuliidae (Black-flies)											
<i>Simulium sp.</i>						R	R	R			C
Ceratopogonidae (Biting midges)											
<i>Bezzia sp.</i>					R	R			R	O	C
Chironomidae (Non-biting midges)											
<i>Ablabesmyia sp.</i>								R			C
<i>Brillia sp.</i>									R		C
<i>Cricotopus sp.</i>						R					C
<i>Cryptochironomus sp.</i>				O						C	C
<i>Endochironomus sp.</i>										R	C
<i>Eukiefferiella sp.</i>					R						C
<i>Micropsectra sp.</i>	R				O	R					C
<i>Microtendipes sp.</i>			R		R				O		C
<i>Orthocladius sp.</i>				R		R	O				C
<i>Parametriocnemus sp.</i>									R		C
<i>Paratanytarsus sp.</i>			R								C
<i>Polypedilum sp.</i>										R	C
<i>Tanytarsus sp.</i>									R		C
<i>Tvetenia sp.</i>		O									C
Coleoptera (Beetles)											
<i>Brychius elevatus</i>								R			C
<i>Elmis aenea</i>		R		R							C
<i>Limnius volckmari</i>		O								R	C
<i>Nebrioporus depressus</i>									R		C
<i>Orectochilus villosus</i>						R		R			C
Q-rating	3-4	3-4	4	3-4	3-4	3-4	3-4	3-4	3	3	

Lyragh Stream

	LY1	WFD STATUS GROUP
Hirudinea (Leeches)		
<i>Helobdella stagnalis</i>	R	D
CHELICERATA		
Hydrachnidae (Water mites)	F	C
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	R	C
Isopoda (Water slaters)		
<i>Asellus aquaticus</i>	C	D
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	C	C
Trichoptera (Caddis flies)		
<i>Limnephilus lunatus</i>	C	B
<i>Potamophylax latipennis</i>	C	B
Simuliidae (Black-flies)		
<i>Simulium sp.</i>	R	C
Chironomidae (Non-biting midges)		
<i>Prodiamesa sp.</i>	R	C
<i>Psectrocladius sp.</i>	C	C
Coleoptera (Beetles)		
<i>Brychius elevatus</i>		C
Q-rating	Q3-4, taking habitat into account	

Charleville Stream

	CV1	WFD STATUS GROUP
ANNELIDA		
Oligochaeta (Segmented worms)		
<i>Limnodrilus sp. (immature)</i>	R	E
MOLLUSCA (Molluscs)		
Gastropoda (Snails and limpets)		
<i>Potamopyrgus antipodarum</i>	O	C
Bivalvia (Mussels)		
<i>Pisidium nitidum</i>	R	D
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	A	C
Isopoda (Water slaters)		
<i>Asellus aquaticus</i>	O	D
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	F	C
Trichoptera (Caddis flies)		
<i>Limnephilus rhombicus</i>	R	B
<i>Plectrocnemia geniculata</i>	R	C
<i>Sericostoma personatum</i>	R	B
Tipulidae (Crane flies)		
<i>Tipula sp</i>	R	C
Chironomidae (Non-biting midges)		
<i>Psectrocladius sp.</i>	R	C
Q-rating	3	

Loobagh

	LB1	LB2	WFD STATUS GROUP
ANNELIDA			
Oligochaeta (Segmented worms)			
<i>Nais variabilis</i>		R	D
<i>Rhyacodrilus coccineus</i>	R		E
<i>Stylodrilus heringianus</i>	C	R	C
MOLLUSCA (Molluscs)			
Gastropoda (Snails and limpets)			
<i>Ancylus fluviatilis</i>	R	R	C
<i>Potamopyrgus antipodarum</i>	O	C	C
<i>Theodoxus fluviatilis</i>		R	C
CRUSTACEA (Crustaceans)			
Amphipoda (Shrimps)			
<i>Gammarus duebeni</i>	R		C
INSECTA (Insects)			
Ephemeroptera (Mayflies)			
<i>Baetis rhodani</i>	F	C	C
<i>Alainites muticus</i>		R	B
<i>Caenis rivulorum</i>		R	C
<i>Ecdyonurus dispar</i>	R		A
<i>Ecdyonurus venosus</i>		C	A
<i>Ephemera danica</i>	R		A
<i>Heptagenia sulphurea</i>		O	A
<i>Rhithrogena semicolorata</i>	A		A
<i>Serratella ignita</i>		R	C
Plecoptera (Stoneflies)			
<i>Isoperla grammatica</i>	R		A
Trichoptera (Caddis flies)			
<i>Agapetus orchipes</i>	R		B
<i>Hydropsyche pellucidula</i>	R		C
<i>Potamophylax latipennis</i>	R		B
<i>Rhyacophila dorsalis</i>	R		C
<i>Sericostoma personatum</i>	R		B
Tipulidae (Crane flies)			
<i>Dicronota sp.</i>	R		C
Simuliidae (Black-flies)			
<i>Simulium sp.</i>		O	C
Chironomidae (Non-biting midges)			
<i>Endochironomus sp.</i>		R	C
<i>Orthocladius sp.</i>		R	C
<i>Potthastia sp.</i>		R	C
<i>Tveteria sp.</i>		R	C
Coleoptera (Beetles)			
<i>Limnius volckmari</i>	R		C
Q-rating	Q4	Q4	

Ardpatrick Stream

	AP1	WFD STATUS GROUP
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	F	C
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	F	C
<i>Ecdyonurus venosus</i>	F	A
<i>Rhithrogena semicolorata</i>	A	A
Plecoptera (Stoneflies)		
<i>Brachyptera risi</i>	C	A
<i>Isoperla grammatica</i>	R	A
<i>Leuctra inermis</i>	R	B
<i>Siphonoperla torrentium</i>	R	A
Trichoptera (Caddis flies)		
<i>Drusus annulatus</i>	R	B
<i>Hydropsyche instabilis</i>	R	C
<i>Rhyacophila dorsalis</i>	R	C
Coleoptera (Beetles)		
<i>Elmis aenea</i>	R	C
<i>Helophorus brevipalpis</i>	R	C
<i>Limnius volckmari</i>	R	C
Q-rating	Q5	

Ballinlyna Stream

	BL1	WFD STATUS GROUP
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	C	C
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	R	C
<i>Alainites muticus</i>	R	B
<i>Ecdyonurus sp.</i>	R	
<i>Rhithrogena semicolorata</i>	C	A
Plecoptera (Stoneflies)		
<i>Amphinemura sulcicollis</i>	R	A
<i>Brachyptera risi</i>	O	A
<i>Isoperla grammatica</i>	O	A
<i>Leuctra inermis</i>	R	B
Trichoptera (Caddis flies)		
<i>Drusus annulatus</i>	R	B
<i>Sericostoma personatum</i>	R	B
Tipulidae (Crane flies)		
<i>Dicronota sp.</i>	R	C
<i>Tipula sp</i>	R	C
Simuliidae (Black-flies)		
<i>Simulium sp.</i>	R	C
Q-rating	Q4-5	

Barranahown

	BH1	WFD STATUS GROUP
ANNELIDA		
Oligochaeta (Segmented worms)		
<i>Rhyacodrilus coccineus</i>	R	E
MOLLUSCA (Molluscs)		
Bivalvia (Mussels)		
<i>Pisidium personatum</i>	R	D
CHELICERATA		
Hydrachnidae (Water mites)	R	C
INSECTA (Insects)		
Plecoptera (Stoneflies)		
<i>Amphinemura sulcicollis</i>	R	A
<i>Diura bicaudata</i>	C	A
<i>Leuctra hippopus</i>	O	B
<i>Leuctra inermis</i>	R	B
<i>Siphonoperla torrentium</i>	C	A
Trichoptera (Caddis flies)		
<i>Hydropsyche siltali</i>	R	C
<i>Tinodes waeneri</i>	R	C
Simuliidae (Black-flies)		
<i>Simulium sp.</i>	C	C
Chironomidae (Non-biting midges)		
<i>Cricotopus sp.</i>	O	C
<i>Heterotrissocladius sp.</i>	R	C
Coleoptera (Beetles)		
<i>Limnius volckmari</i>	R	C
Q-rating	Q4-5	

Ballyania Stream

	BA1	WFD STATUS GROUP
PLATYHELMINTHES		
Tricladida (Flatworms)		
<i>Polycelis nigra</i>	R	C
ANNELIDA		
Oligochaeta (Segmented worms)		
<i>Limnodrilus hoffmeisteri</i>	C	E
<i>Tubifex sp. (immature)</i>	R	E
Hirudinea (Leeches)		
<i>Erpobdella octoculata/testacea</i>	R	D
MOLLUSCA (Molluscs)		
Gastropoda (Snails and limpets)		
<i>Potamopyrgus antipodarum</i>	C	C
<i>Radix balthica</i>	R	D
CHELICERATA		
Hydrachnidae (Water mites)	O	C
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	C	C
Isopoda (Water slaters)		
<i>Asellus aquaticus</i>	C	D
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Caenis luctuosa</i>	R	C
Tipulidae (Crane flies)		
<i>Tipula sp</i>	R	C
Chironomidae (Non-biting midges)		
<i>Cricotopus sp.</i>	O	C
<i>Polypedilum sp.</i>	R	C
<i>Psectrocladius sp.</i>	R	C
<i>Tvetenia sp.</i>	R	C
Q-rating	Q3	

Morning Star

	MS1	MS2	MS3	MS4	WFD STATUS GROUP
NEMATODA (Roundworms)			R		
ANNELIDA					
Oligochaeta (Segmented worms)					
<i>Lumbricidae</i>	R	R			C
<i>Nais pardalis</i>			R		D
<i>Stygodrilus heringianus</i>		O	R		C
<i>Tubifex sp. (immature)</i>	R	R	R		E
Hirudinea (Leeches)					
<i>Helobdella stagnalis</i>				R	D
MOLLUSCA (Molluscs)					
Gastropoda (Snails and limpets)					
<i>Ancylus fluviatilis</i>	R	R			C
<i>Potamopyrgus antipodarum</i>	O		F	O	C
<i>Theodoxus fluviatilis</i>			R		C
CHELICERATA					
Hydrachnidae (Water mites)			C		C
CRUSTACEA (Crustaceans)					
Amphipoda (Shrimps)					
<i>Gammarus duebeni</i>	R	C	F	R	C
Isopoda (Water slaters)					
<i>Asellus aquaticus</i>	R	R		R	D
INSECTA (Insects)					
<i>Baetis rhodani</i>	A	C	C	A	C
<i>Alainites muticus</i>		R	R	O	B
<i>Caenis luctuosa</i>				R	C
<i>Caenis rivulorum</i>			R		C
<i>Ecdyonurus dispar</i>				R	A
<i>Ecdyonurus venosus</i>	R	R	O	O	A
<i>Heptagenia sulphurea</i>		R		F	A
<i>Rhithrogena semicolorata</i>	A	C			A
<i>Serratella ignita</i>				R	C
Plecoptera (Stoneflies)					
<i>Isoperla grammatica</i>	R				A
Trichoptera (Caddis flies)					
<i>Drusus annulatus</i>	R				B
<i>Lepidostoma hirtum</i>			R		B
<i>Hydropsyche pellucidula</i>		O		R	C
Tipulidae (Crane flies)					
<i>Dicronota sp.</i>		R			C
Ceratopogonidae (Biting midges)					
<i>Bezzia sp.</i>		R			C

	MS1	MS2	MS3	MS4	WFD STATUS GROUP
Simuliidae (Black-flies)					
<i>Simulium sp.</i>		R			C
Chironomidae (Non-biting midges)					
<i>Cricotopus sp.</i>				R	C
<i>Cryptochironomus sp.</i>				O	C
<i>Micropsectra sp.</i>				R	C
<i>Orthocladius sp.</i>		R	F		C
<i>Psectrocladius sp.</i>	R				C
Coleoptera (Beetles)					
<i>Brychius elevatus</i>		R			C
<i>Elmis aenea</i>	R	R	R		C
<i>Limnius volckmari</i>		R			C
<i>Orectochilus villosus</i>	R				C
Q-rating	4	Q4	Q3-4	Q4	

Camoge

	CM1	CM2	CM3	CM4	WFD STATUS GROUP
ANNELIDA					
Oligochaeta (Segmented worms)					
<i>Lumbriculus variegatus</i>		R			C
<i>Psammoryctides barbatus</i>		R			E
<i>Stylodrilus heringianus</i>	R		R		C
MOLLUSCA (Molluscs)					
Gastropoda (Snails and limpets)					
<i>Ancylus fluviatilis</i>				R	C
<i>Potamopyrgus antipodarum</i>	O	C	C	O	C
<i>Theodoxus fluviatilis</i>		R	R	R	C
Bivalvia (Mussels)					
<i>Pisidium nitidum</i>	R				D
CHELICERATA					
Hydrachnidae (Water mites)		O			C
CRUSTACEA (Crustaceans)					
Amphipoda (Shrimps)					
<i>Crangonyx pseudogracilis</i>			C		D
<i>Gammarus duebeni</i>	C	C	O	R	C
Isopoda (Water slaters)					
<i>Asellus aquaticus</i>	R	R			D
INSECTA (Insects)					
Ephemeroptera (Mayflies)					
<i>Baetis rhodani</i>	F	C	C	A	C
<i>Alainites muticus</i>	R		O	O	B
<i>Caenis luctuosa</i>				R	C
<i>Caenis rivulorum</i>			R		C
<i>Ecdyonurus venosus</i>	R	O	R	O	A
<i>Heptagenia sulphurea</i>				R	A
<i>Serratella ignita</i>	R		R		C
Trichoptera (Caddis flies)					
<i>Athripsodes albifrons</i>		R			B
<i>Athripsodes cinereus</i>		R			B
<i>Halesus radiatus</i>	R				B
<i>Hydropsyche pellucidula</i>	R				C
<i>Hydropsyche siltali</i>	R			R	C
<i>Ithytrichia sp.</i>		R			B
<i>Lype reducta</i>	R				C
<i>Plectrocnemia geniculata</i>				R	C
Ceratopogonidae (Biting midges)					
<i>Bezzia sp.</i>				R	C
Simuliidae (Black-flies)					
<i>Simulium sp.</i>	A	C			C

	CM1	CM2	CM3	CM4	WFD STATUS GROUP
Chironomidae (Non-biting midges)					
<i>Cricotopus sp.</i>				R	C
<i>Micropsectra sp.</i>				F	C
<i>Microtendipes sp.</i>	R		R		C
<i>Orthocladius sp.</i>				O	C
<i>Tvetenia sp.</i>		R			C
Coleoptera (Beetles)					
<i>Brychius elevatus</i>				F	C
<i>Elmis aenea</i>	O				C
<i>Limnius volckmari</i>	O			R	C
<i>Orectochilus villosus</i>	R				C
Q-rating	3-4	3-4	3-4	3-4	

Bog

	BG1	WFD STATUS GROUP
PLATYHELMINTHES		
Tricladida (Flatworms)		
<i>Polycelis nigra</i>	R	C
ANNELIDA		
Oligochaeta (Segmented worms)		
<i>Stylodrilus heringianus</i>	R	C
<i>Tubifex tubifex</i>	O	E
MOLLUSCA (Molluscs)		
Bivalvia (Mussels)		
<i>Pisidium nitidum</i>	F	D
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	C	C
Isopoda (Water slaters)		
<i>Asellus aquaticus</i>	C	D
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	C	C
Trichoptera (Caddis flies)		
<i>Wormaldia sp.</i>	R	C
Simuliidae (Black-flies)		
<i>Simulium sp.</i>	R	C
Chironomidae (Non-biting midges)		
<i>Cricotopus sp.</i>	R	C
Coleoptera (Beetles)		
<i>Limnius volckmari</i>	R	C
<i>Orectochilus villosus</i>	R	C
Q-rating	Q3	

Mahore

	MH1	MH2	WFD STATUS GROUP
ANNELIDA			
Oligochaeta (Segmented worms)			
<i>Lumbriculus variegatus</i>		F	C
<i>Stylodrilus heringianus</i>	O		C
<i>Tubifex sp. (immature)</i>		R	E
Hirudinea (Leeches)			
<i>Glossiphonia complanata</i>		R	D
<i>Helobdella stagnalis</i>		R	D
MOLLUSCA (Molluscs)			
Gastropoda (Snails and limpets)			
<i>Bithynia tentaculata</i>		R	C
<i>Potamopyrgus antipodarum</i>		O	C
CRUSTACEA (Crustaceans)			
Amphipoda (Shrimps)			
<i>Gammarus duebeni</i>	C	C	C
Isopoda (Water slaters)			
<i>Asellus aquaticus</i>	R	O	D
Astacidae (Crayfish)			
<i>Austropotamobius pallipes</i>	R		C
INSECTA (Insects)			
Ephemeroptera (Mayflies)			
<i>Baetis rhodani</i>	C	A	C
<i>Alainites muticus</i>	R		B
<i>Caenis luctuosa</i>	R		C
<i>Ecdyonurus insignis</i>	C		A
<i>Ecdyonurus sp.</i>		R	A
<i>Serratella ignita</i>	C		C
Trichoptera (Caddis flies)			
<i>Halesus radiatus</i>	R		B
<i>Limnephilus lunatus</i>		F	B
<i>Polycentropus flavomaculatus</i>	R		C
<i>Potamophylax latipennis</i>		F	B
<i>Sericostoma personatum</i>		R	B
Simuliidae (Black-flies)			
<i>Simulium sp.</i>		F	C
Chironomidae (Non-biting midges)			
<i>Microtendipes sp.</i>	R		C
Coleoptera (Beetles)			
<i>Brychius elevatus</i>		R	C
<i>Elmis aenea</i>	O	F	C
<i>Orectochilus villosus</i>		R	C
Q-rating	Q4	Q3-4	

Cloghaready Stream

	CR1	WFD STATUS GROUP
ANNELIDA		
Oligochaeta (Segmented worms)		
<i>Lumbriculus variegatus</i>	O	C
MOLLUSCA (Molluscs)		
Bivalvia (Mussels)		
<i>Pisidium nitidum</i>	O	D
CHELICERATA		
Hydrachnidae (Water mites)	R	C
CRUSTACEA (Crustaceans)		
Amphipoda (Shrimps)		
<i>Gammarus duebeni</i>	C	C
Isopoda (Water slaters)		
<i>Asellus aquaticus</i>	C	D
INSECTA (Insects)		
Ephemeroptera (Mayflies)		
<i>Baetis rhodani</i>	F	C
Trichoptera (Caddis flies)		
<i>Limnephilus flavicornis</i>	F	B
<i>Limnephilus rhombicus</i>	F	B
Tabanidae (Horseflies)	R	C
Chironomidae (Non-biting midges)		
<i>Micropsectra sp.</i>	O	C
<i>Microtendipes sp.</i>	R	C
<i>Tvetenia sp.</i>	R	C
Coleoptera (Beetles)		
<i>Hydroporus palustris</i>	R	C
Q-rating	Q3-4, taking habitat into account	

Lyragh Stream

There was no water in the channel when surveyed on 20/08/2018

	LY1
Iridaceae	
<i>Iris pseudacorus</i>	F
Umbelliferae	
<i>Apium nodiflorum</i>	R
<i>Oenanthe crocata</i>	O

Charleville Stream

	CV1
Marchantiophyta	
<i>Pellia sp.</i>	R

Loobagh

	LB1	LB2
Bryophyta		
<i>Fontinalis antipyretica</i>	R	F
<i>Hygroamblystegium fluviatile/tenax</i>		
<i>Leptodictyum riparium</i>		R
<i>Platyhypnidium riparioides</i>		R
<i>Thamnobryum alopecurum</i>		
Gramineae		
<i>Agrostis stolonifera</i>	R	
<i>Phalaris arundinacea</i>	O	F
Cyperaceae		
<i>Schoenoplectus lacustris</i>		R
Lemnaceae		
<i>Lemna minor</i>	R	R
Potamogetonaceae		
<i>Potamogeton crispus</i>	R	
Sparganiaceae		
<i>Sparganium erectum</i>		R
<i>Sparganium emersum</i>		R
Scrophulariaceae		
<i>Veronica beccabunga</i>	R	
Umbelliferae		
<i>Apium nodiflorum</i>	O	
<i>Oenanthe crocata</i>	R	
Haloragaceae		
<i>Myriophyllum spicatum</i>	F	A
Cruciferae		
<i>Nasturtium officinale</i>	R	
Ranunculaceae		
<i>Ranunculus</i> subgenus <i>Batrachium</i> agg.	R	F

Ardpatrick Stream

	AP1
Bryophyta	
<i>Platyhypnidium riparioides</i>	R
Gramineae	
<i>Agrostis stolonifera</i>	R
Lemnaceae	
<i>Lemna minor</i>	R
Umbelliferae	
<i>Apium nodiflorum</i>	C
Cruciferae	
<i>Nasturtium officinale</i>	
<i>Rorippa palustris</i>	

Ballinlyna Stream

There was no water in the channel when surveyed on 20/08/2018

	BL1
Gramineae	
<i>Agrostis stolonifera</i>	A
Scrophulariaceae	
<i>Veronica beccabunga</i>	F
Asteraceae	
<i>Senecio aquaticus</i>	R

Barranahown

	BH1
Marchantiophyta	
<i>Scapania undulata</i>	
Bryophyta	
<i>Schistidium rivulare</i>	

Ballyania Stream

	BA1
Gramineae	
<i>Phalaris arundinacea</i>	C
Lemnaceae	
<i>Lemna minor</i>	O
<i>Lemna trisulca</i>	R
Labiatae	
<i>Mentha aquatica</i>	R

Umbelliferae	
<i>Apium nodiflorum</i>	F

Morning Star

	MS1	MS2	MS3	MS4
Bryophyta				
<i>Fontinalis antipyretica</i>		R	R	
<i>Hygroamblystegium fluviatile/tenax</i>		R	O	
<i>Platyhypnidium riparioides</i>			O	
Gramineae				
<i>Agrostis stolonifera</i>			R	
<i>Phalaris arundinacea</i>	C	A	R	F
Lemnaceae				
<i>Lemna minor</i>	R	R	R	R
<i>Lemna trisulca</i>				
Potamogetonaceae				
<i>Potamogeton crispus</i>		F		
Sparganiaceae				
<i>Sparganium erectum</i>	R	R	R	R
Callitrichaceae				
<i>Callitriche spp.</i>				R
Labiatae				
<i>Mentha aquatica</i>				R
Umbelliferae				
<i>Apium nodiflorum</i>	R	R	R	O
<i>Berula erecta</i>	O			
<i>Oenanthe crocata</i>			R	
Cruciferae				
<i>Nasturtium officinale</i>	R			
Ranunculaceae				
<i>Ranunculus</i> subgenus <i>Batrachium</i> agg.	A	R		R

Camoge

	CM1	CM2	CM3	CM4
Bryophyta				
<i>Fontinalis antipyretica</i>	O			
<i>Hygroamblystegium fluviatile/tenax</i>	R	R		
<i>Leptodictyum riparium</i>	R			
<i>Thamnobryum alopecurum</i>		R		
Gramineae				
<i>Agrostis stolonifera</i>	R		R	R
<i>Phalaris arundinacea</i>	A	O	R	F
Lemnaceae				
<i>Lemna minor</i>	R	R	R	R
<i>Spirodela polyrhiza</i>			R	
Iridaceae				
<i>Iris pseudacorus</i>				R
Sparganiaceae				
<i>Sparganium erectum</i>	R	O	F	O
<i>Sparganium emersum</i>			C	
Callitrichaceae				
<i>Callitriche spp.*</i>	O			
Labiatae				
<i>Mentha aquatica</i>				R
Scrophulariaceae				
<i>Veronica anagallis-aquatica</i>	R			R
Umbelliferae				
<i>Apium nodiflorum</i>	O			R
Hippuridaceae				
<i>Hippurus vulgaris</i>			R	
Haloragaceae				
<i>Myriophyllum spicatum</i>		S	C	
Cruciferae				
<i>Nasturtium officinale</i>	R			R
Ranunculaceae				
<i>Ranunculus</i> subgenus <i>Batrachium</i> agg.	R			R
Nymphaeaceae				
<i>Nuphar lutea</i>		R	R	

*probably *Callitriche platycarpa*, but ripe fruits required for reliable identification.

Bog

No macrophytes – heavy shade

Mahore

	MH1	MH2
Marchantiophyta		
<i>Pellia sp.*</i>	R	
Bryophyta		
<i>Fontinalis antipyretica</i>	R	
<i>Leptodictyum riparium</i>	R	
Gramineae		
<i>Phalaris arundinacea</i>	F	C
Lemnaceae		
<i>Lemna minor</i>	R	O
Potamogetonaceae		
<i>Potamogeton crispus</i>	O	F
Sparganiaceae		
<i>Sparganium erectum</i>		A
<i>Sparganium emersum</i>		R
Umbelliferae		
<i>Apium nodiflorum</i>	R	
<i>Berula erecta</i>		R
Haloragaceae		
<i>Myriophyllum spicatum</i>	F	

*probably *Pellia endiviifolia*, but sex organs required for definite identification.

Cloghaready Stream

Pools of standing water with no flow on 24/08/2018

	CR1
Umbelliferae	
<i>Apium nodiflorum</i>	S
<i>Berula erecta</i>	O
Cruciferae	
<i>Nasturtium officinale</i>	O
Ranunculaceae	
<i>Caltha palustris</i>	O

APPENDIX 7

CRAYFISH RECORDS

A: *Austropotamobius pallipes*

J: Juvenile– sex not distinguishable

F: Female

M: Male

JX: Juvenile escaped

AX: Adult Escaped

Catchment	Maigue		River	Maigue			Site reference	MG1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	32	None	No	No	Patch 1	Standard	
2	A	M	47	None	No	No	Patch 2	Standard	
3	A	F	32	None	No	No	Patch 2	Standard	
4	A	F	38	None	No	No	Patch 2	Standard	
5	A	M	27	None	No	No	Patch 3	Standard	
6	A	M	25	None	No	No	Patch 4	Standard	
7	A	JX	-	-	-	-	Patch 5	Standard	
8	A	M	29	None	No	No	Patch 5	Standard	
9	A	F	29	None	No	No	Patch 5	Standard	
10	A	F	22	None	No	No	Patch 5	Standard	

Catchment	Maigne		River	Maigne			Site reference	MG2	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	J	17	None	No	No	Patch 1	Dredge	
2	A	J	17	None	No	No	Patch 1	Dredge	
3	A	J	18	None	No	No	Patch 1	Dredge	
4	A	J	17	None	No	No	Patch 1	Dredge	
5	A	J	17	None	No	No	Patch 1	Dredge	
6	A	J	18	None	No	No	Patch 1	Dredge	
7	A	J	18	None	No	No	Patch 2	Dredge	
8	A	J	17	None	No	No	Patch 2	Dredge	
9	A	J	14	None	No	No	Patch 3	Dredge	
10	A	J	17	None	No	No	Patch 4	Dredge	
11	A	J	17	None	No	No	Patch 4	Dredge	
12	A	J	18	None	No	No	Patch 4	Dredge	
13	A	J	17	None	No	No	Patch 5	Dredge	
14	A	J	17	None	No	No	Patch 5	Dredge	

Catchment	Maigne		River	Maigne			Site reference	MG3	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	AX	-	-	-	-	Patch 3	Standard	
3	A	AX	-	-	-	-	Patch 4	Standard	

Sampled across upstream end of new boulder and cobble fill at new Kerry Foods outfall. Not ideal for searching as there is too much refuge among stones below.

Catchment	Maigue		River	Maigue			Site reference	MG4	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	M	29	None	No	No	Patch 1	Standard	
3	A	M	29	None	No	No	Patch 2	Standard	
4	A	JX	-	-	-	-	Patch 3	Standard	
5	A	F	25	None	No	No	Patch 3	Standard	
6	A	AX	-	-	-	-	Patch 4	Standard	
7	A	M	24	None	No	No	Patch 4	Standard	
8	A	M	28	None	No	No	Patch 5	Standard	
9	A	F	26	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Maigue			Site reference	MG5	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	32	None	No	Yes	Patch 1	Standard	
2	A	M	29	None	No	No	Patch 1	Standard	
3	A	F	28	None	No	No	Patch 1	Standard	
4	A	M	25	None	No	No	Patch 1	Standard	
5	A	M	20	None	No	No	Patch 1	Standard	
6	A	M	21	None	No	No	Patch 1	Standard	
7	A	F	20	None	No	No	Patch 2	Standard	
8	A	AX	-	-	-	-	Patch 2	Standard	
9	A	JX	-	-	-	-	Patch 2	Standard	
10	A	M	28	None	No	No	Patch 2	Standard	
11	A	M	20	None	No	No	Patch 2	Standard	
12	A	M	27	None	No	No	Patch 3	Standard	
13	A	F	26	None	No	No	Patch 3	Standard	
14	A	M	25	None	No	No	Patch 3	Standard	
15	A	F	22	None	No	No	Patch 3	Standard	
16	A	J	10	None	No	No	Patch 3	Standard	
17	A	J	10	None	No	No	Patch 3	Standard	
18	A	JX	-	-	-	-	Patch 4	Standard	
19	A	JX	-	-	-	-	Patch 4	Standard	
20	A	M	28	None	No	No	Patch 4	Standard	
21	A	F	26	None	No	No	Patch 4	Standard	
22	A	F	26	None	No	No	Patch 4	Standard	
23	A	AX	-	-	-	-	Patch 5	Standard	
24	A	M	32	None	No	No	Patch 5	Standard	
25	A	F	29	None	No	No	Patch 5	Standard	
26	A	M	25	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Maigue			Site reference	MG6	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	23	None	No	No	Patch 2	Standard	
2	A	AX	-	-	-	-	Patch 3	Standard	
3	A	M	27	None	No	No	Patch 4	Standard	
4	A	JX	-	-	-	-	Patch 5	Standard	
5	A	F	25	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Maigue			Site reference	MG7	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	JX	-	-	-	-	Patch 1	Standard	
3	A	M	31	None	No	No	Patch 1	Standard	
4	A	F	19	None	No	No	Patch 1	Standard	
5	A	AX	-	-	-	-	Patch 2	Standard	
6	A	M	28	None	No	No	Patch 2	Standard	
7	A	AX	-	-	-	-	Patch 3	Standard	
8	A	AX	-	-	-	-	Patch 3	Standard	
9	A	M	26			No	Patch 3	Standard	
10	A	F	23	None	No	No	Patch 3	Standard	
11	A	JX	-	-	-	-	Patch 4	Standard	
12	A	M	28	None	No	No	Patch 4	Standard	
13	A	M	24	None	No	No	Patch 4	Standard	
14	A	M	22	None	No	No	Patch 4	Standard	
15	A	F	20	None	No	No	Patch 4	Standard	
16	A	F	20	None	No	No	Patch 4	Standard	
17	A	JX	-	-	-	-	Patch 5	Standard	
18	A	JX	-	-	-	-	Patch 5	Standard	
19	A	M	27	None	No	No	Patch 5	Standard	
20	A	F	26	None	No	No	Patch 5	Standard	
21	A	F	25	None	No	No	Patch 5	Standard	
22	A	F	21	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Maigue			Site reference	MG8	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	F	29	None	No	No	Patch 1	Standard	
3	A	J	9	None	No	No	Patch 1	Standard	
4	A	JX	-	-	-	-	Patch 2	Standard	
5	A	M	25	None	No	No	Patch 2	Standard	
6	A	F	22	None	No	No	Patch 2	Standard	
7	A	AX	-	-	-	-	Patch 3	Standard	
8	A	J	17	-	-	-	Patch 3	Standard	
9	A	M	26	None	No	No	Patch 3	Standard	
10	A	F	25	None	No	No	Patch 3	Standard	
11	A	JX	-	-	-	-	Patch 4	Standard	
12	A	F	21	None	No	No	Patch 4	Standard	
13	A	M	24	None	No	No	Patch 5	Standard	
14	A	F	23	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Maigue			Site reference	MG9	
Date	29/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	20	None	No	No	Patch 1	Dredge	
2	A	F	24	None	No	No	Patch 1	Dredge	
3	A	M	21	None	No	No	Patch 2	Dredge	
4	A	F	23	None	No	No	Patch 2	Dredge	
5	A	F	28	None	No	Yes	Patch 3	Dredge	
6	A	F	22	None	No	No	Patch 3	Dredge	
7	A	J	16	None	No	No	Patch 4	Dredge	
8	A	M	26	None	No	No	Patch 5	Dredge	
9	A	J	16	None	No	No	Patch 5	Dredge	

Catchment	Maigue		River	Maigue			Site reference	MG10	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	21	None	No	No	Patch 1	Standard	
2	A	JX	-	-	-	-	Patch 1	Standard	
3	A	M	25	None	No	No	Patch 2	Standard	
4	A	F	19	None	No	No	Patch 2	Standard	
5	A	AX	-	-	-	-	Patch 3	Standard	

Catchment	Maigue		River	Lyragh Stream			Site reference	LY1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
Channel Dry. No crayfish habitat.									

Catchment	Maigue		River	Charleville Stream			Site reference	CH1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No crayfish found									

Catchment	Maigne		River	Loobagh			Site reference	LB1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	M	28	None	No	No	Patch 1	Standard	
3	A	J	19	None	No	No	Patch 1	Standard	
4	A	J	17	None	No	No	Patch 1	Standard	
5	A	AX	-	None	No	No	Patch 2	Standard	
6	A	M	29	None	No	No	Patch 2	Standard	
7	A	M	29	None	No	No	Patch 2	Standard	
8	A	JX	-	-	-	-	Patch 3	Standard	
9	A	AX	-	-	-	-	Patch 3	Standard	
10	A	AX	-	-	-	-	Patch 3	Standard	
11	A	JX	-	-	-	-	Patch 4	Standard	
12	A	AX	-	-	-	-	Patch 4	Standard	
13	A	M	23	None	No	No	Patch 4	Standard	
14	A	M	39	None	No	No	Patch 4	Standard	
15	A	AX	-	-	-	-	Patch 5	Standard	
16	A	AX	-	-	-	-	Patch 5	Standard	
17	A	JX	-	-	-	-	Patch 5	Standard	
18	A	JX	-	-	-	-	Patch 5	Standard	
19	A	J	18	None	No	No	Patch 5	Standard	

Catchment	Maigne		River	Loobagh			Site reference	LB2	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	JX	-	-	-	-	Patch 1	Standard	
2	A	M	28	None	No	No	Patch 1	Standard	
3	A	F	28	None	No	No	Patch 1	Standard	
4	A	F	27	None	No	No	Patch 1	Standard	
5	A	AX	-	-	-	-	Patch 2	Standard	
6	A	AX	-	-	-	-	Patch 2	Standard	
7	A	JX	-	-	-	-	Patch 3	Standard	
8	A	M	33	None	No	No	Patch 3	Standard	
9	A	F	28	None	No	No	Patch 3	Standard	
10	A	M	34	None	No	No	Patch 4	Standard	
11	A	F	25	None	No	No	Patch 4	Standard	
12	A	F	25	None	No	No	Patch 4	Standard	
13	A	AX	-	-	-	-	Patch 5	Standard	
14	A	JX	-	-	-	-	Patch 5	Standard	
15	A	M	34	None	No	No	Patch 5	Standard	
16	A	F	30	None	No	No	Patch 5	Standard	

Catchment	Maigne		River	Ardpatrick Stream			Site reference	AP1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No crayfish found									

Catchment	Maigne		River	Ballinlyna			Site reference	BL1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
Channel Dry. No crayfish habitat.									

Catchment	Maigue		River	Barranahown			Site reference	BH1	
Date	20/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No crayfish found									

Catchment	Maigue		River	Ballyania			Site reference	BA1	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No crayfish found									

Catchment	Maigue		River	Morning Star			Site reference	MS1	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	J	19	None	No	No	Patch 1	Standard	
2	A	J	18	None	No	No	Patch 2	Standard	
3	A	J	19	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Morning Star			Site reference	MS2	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	33	None	No	Yes	Patch 1	Standard	
2	A	J	18	None	No	No	Patch 1	Standard	
3	A	JX	-	-	-	-	Patch 2	Standard	
4	A	M	25	None	No	No	Patch 3	Standard	
5	A	F	28	None	No	No	Patch 4	Standard	
6	A	F	29	None	No	No	Patch 4	Standard	
7	A	M	34	None	No	No	Patch 5	Standard	
8	A	JX	-	-	-	No	Patch 5	Standard	
9	A	JX	-	-	-	No	Patch 5	Standard	

Catchment	Maigue		River	Morning Star			Site reference	MS3	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	38	None	No	No	Patch 1	Standard	
2	A	F	28	None	No	No	Patch 1	Standard	
3	A	M	29	None	No	No	Patch 2	Standard	
4	A	M	30	None	No	No	Patch 2	Standard	
5	A	M	32	None	No	No	Patch 3	Standard	
6	A	J	18	None	No	No	Patch 3	Standard	
7	A	F	27	None	No	No	Patch 4	Standard	
8	A	J	18	None	No	No	Patch 5	Standard	
9	A	J	19	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Morning Star			Site reference	MS4	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	28	None	No	No	Patch 1	Standard	
2	A	JX	-	-	-	-	Patch 2	Standard	
3	A	F	24	None	No	No	Patch 4	Standard	

Catchment	Maigue		River	Camoge			Site reference	CM1	
Date	27/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	J	8	None	No	No	Patch 2	Standard	
2	A	M	30	None	No	No	Patch 3	Standard	
3	A	F	28	None	No	No	Patch 3	Standard	
4	A	M	29	None	No	No	Patch 4	Standard	
5	A	JX	-	-	-	-	Patch 4	Standard	
6	A	AX	-	-	-	-	Patch 5	Standard	
7	A	JX	-	-	-	-	Patch 5	Standard	

Catchment	Maigue		River	Camoge			Site reference	CM2	
Date	27/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	J	15	None	No	No	Patch 1	Standard	
2	A	F	32	None	No	No	Patch 2	Standard	
3	A	J	16	None	No	No	Patch 4	Standard	
4	A	J	17	None	No	No	Patch 4	Standard	
5	A	J	17	None	No	No	Patch 5	Standard	

Catchment	Maigue		River	Camoge			Site reference	CM3	
Date	27/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	JX	-	-	-	-	Patch	Standard	
3	A	M	33	None	No	No	Patch	Standard	
4	A	F	29	None	No	No	Patch	Standard	
5	A	JX	-	-	-	-	Patch	Standard	
6	A	AX	-	-	-	-	Patch	Standard	
7	A	JX	-	-	-	-	Patch	Standard	
8	A	JX	-	-	-	-		Standard	

Catchment	Maigne		River	Camoge			Site reference	CM4	
Date	22/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	AX	-	-	-	-	Patch 1	Standard	
2	A	M	31	None	No	No	Patch 1	Standard	
3	A	F	28	None	No	No	Patch 1	Standard	
4	A	M	22	None	No	No	Patch 1	Standard	
5	A	F	21	None	No	No	Patch 1	Standard	
6	A	AX	-	-	-	-	Patch 2	Standard	
7	A	AX	-	-	-	-	Patch 2	Standard	
8	A	M	24	None	No	No	Patch 2	Standard	
9	A	F	20	None	No	No	Patch 2	Standard	
10	A	J	16	None	No	No	Patch 2	Standard	
11	A	AX	-	-	-	-	Patch 3	Standard	
12	A	JX	-	-	-	-	Patch 3	Standard	
13	A	M	29	None	No	No	Patch 3	Standard	
14	A	F	25	None	No	No	Patch 3	Standard	
15	A	AX	-	-	-	-	Patch 4	Standard	
16	A	JX	-	-	-	-	Patch 4	Standard	
17	A	M	28	None	No	No	Patch 4	Standard	
18	A	F	24	None	No	No	Patch 4	Standard	
19	A	F	24	None	No	No	Patch 4	Standard	
20	A	F	22	None	No	No	Patch 4	Standard	
21	A	JX	-	-	-	-	Patch 5	Standard	
22	A	JX	-	-	-	-	Patch 5	Standard	
23	A	M	26	None	No	No	Patch 5	Standard	
24	A	F	25	None	No	No	Patch 5	Standard	
25	A	F	29	None	No	No	Patch 5	Standard	

Catchment	Maigne		River	Bog			Site reference	BG1	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No crayfish found									

Catchment	Maigue		River	Mahore			Site reference	MH1	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	33	None	No	No	Patch 1	Standard	
2	A	M	32	None	No	No	Patch 1	Standard	
3	A	F	24	None	No	No	Patch 1	Standard	
4	A	JX	-	-	-	-	Patch 1	Standard	
5	A	JX	-	-	-	-	Patch 1	Standard	
6	A	AX	-	-	-	-	Patch 2	Standard	
7	A	AX	-	-	-	-	Patch 2	Standard	
8	A	J	15	None	No	No	Patch 2	Standard	
9	A	M	35	None	No	No	Patch 3	Standard	
10	A	F	32	None	No	No	Patch 3	Standard	
11	A	J	10	None	No	No	Patch 3	Standard	
12	A	M	30	None	No	No	Patch 4	Standard	
13	A	F	27	None	No	No	Patch 4	Standard	
14	A	F	27	None	No	No	Patch 4	Standard	
15	A	F	26	None	No	No	Patch 4	Standard	
16	A	J	18	None	No	No	Patch 4	Standard	
17	A	M	28	None	No	No	Patch 5	Standard	
18	A	F	27	None	No	No	Patch 5	Standard	
19	A	JX	-	-	-	-	Patch 5	Standard	
20	A	JX	-	-	-	-	Patch 5	Standard	

Catchment	Maigue		River	Mahore			Site reference	MH2	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
1	A	F	27	None	No	No	Patch 1	Standard	
2	A	JX	-	-	-	-	Patch 2	Standard	

Catchment	Maigue		River	Cloghaready Stream			Site reference	CR1	
Date	24/08/2018		Surveyors	Pascal Sweeney			Sheet no.	1	
Record no.	Species	Sex	Carapace length, mm	Disease	Breeding	Moult	Sub-site location ref.	Catch method	
No flow. Channel with shallow pools of standing water only . No crayfish habitat.									

APPENDIX 8

OTTER PRESENCE EVIDENCE

Station	Prints	Sprints	Holt/Couching Site/Slide	No Evidence of Otters	Habitat Quality for Otters
MG1	Prints under bridge 30/04/18				Good
MG2				No Evidence	Poor No bankside cover
MG3		Sprint on new rip-rap bankside reinforcement 24/08/18			Fair-Good But sparse bankside cover
MG4				No Evidence	Fair-Good
MG5	Prints in bankside mud/sand 30/04/18				Fair-Good But sparse bankside cover
MG6	Prints in bankside mud/sand 30/04/18	Sprints with crayfish remains 30/04/18 & 22/08/18			Fair-Good
MG7	Prints in bankside sand 04/05/18	Sprints with crayfish remains on weir 22/08/18			Fair-Good
MG8		Sprint with crayfish remains 22/08/18	Holt in right bank. Entrance tunnel exposed by bank erosion. Photo 39		Good
MG9	Prints in bankside mud 22/08/18				Fair-Good
MG10				No Evidence	Fair Some human disturbance
LY1				No Evidence	Poor Too small
CV1				No Evidence	Poor Too small
LB1	Prints under bridge 27/04/18				Good
LB2	Prints at Bridge 30/04/18	Sprints on rock and bridge shelf 24/08/18	Slide upstream of bridge 30/04/18		Good
AP1				No Evidence	Poor Too small
BL1				No Evidence	Poor Too small

Station	Prints	Sprints	Holt/Couching Site/Slide	No Evidence of Otters	Habitat Quality for Otters
BH1				No Evidence	Poor Little prey.
BA1				No Evidence	Poor Too small
MS1				No Evidence	Poor-Fair Dredged. Little bankside cover
MS2		Sprint on rock 24/08/18			Fair Cover poor
MS3				No Evidence	Fair Some human disturbance
MS4		Sprint on rock 30/04/18			Fair-Good But sparse bankside cover
CM1				No Evidence	Poor-Fair Little cover
CM2		Sprint on rock 03/05/18			Fair Dredged and sparse bankside cover
CM3				No Evidence	Poor-Fair Little cover
CM4		Sprint with crayfish remains on bridge shelf 22/08/18			Fair Sparse bankside cover upstream
BG1				No Evidence	Poor Too small
MH1		Sprint with crayfish remains 27/08/18			Good but dogs in adjacent farmyard.
MH2				No Evidence	Fair
CR1				No Evidence	Poor Too small

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