Fisheries assessment of Moanmore wind farm, Co. Clare

Prepared by Triturus Environmental Ltd. for

AQUAFACT International Services Ltd.

October 2023

Please cite as:

Triturus (2023). Fisheries assessment of Moanmore wind farm, Co. Clare. Report prepared by Triturus Environmental Ltd. for AQUAFACT International Services Ltd. October 2023.

Table of contents

1.	**Introduction**	**3**
1.1	Background	3
1.2	Fisheries asset of the survey area	4
2.	**Methodology**	**5**
2.1	Fisheries assessment (electro-fishing)	5
2.2	Fisheries habitat	5
2.3	Biosecurity	5
3.	**Results**	**7**
3.1	Fisheries assessment (electro-fishing)	7
4.	**Discussion**	**19**
5.	**References**	**20**

1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by AQUAFACT International Services Ltd. to undertake a baseline fisheries assessment of watercourses in the vicinity of Moanmore wind farm, located approximately 4km north-west of Kilrush, Co. Clare (**Figure 2.1**).

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the proposed development, which comprises;

- erection of 3 no. wind turbines with an overall ground to blade tip height of 150m, with a rotor diameter of 136m and a hub height of 82m and a total generating capacity of 15MW,
- construction of turbine hardstand areas and turbine foundations,
- construction of new internal site access tracks and upgrade of existing site track, to include all associated site drainage,
- construction of 1. no new site entrance along the turbine delivery route with access onto the adjoining local road network (L6132),
- construction of 1 no. temporary construction compound with associated temporary site offices, parking areas and security fencing,
- development of a site drainage network,
- construction of 1 no. 38kV electrical substation with all associated electrical plant and equipment, security fencing, lightening protection, security cameras and gates, and all ancillary structures and works.
- 1 no. permanent spoil storage area,
- all wind farm internal cabling connecting the wind turbines to the electrical substation,
- all works associated with the permanent connection of the wind farm to the national electricity grid comprising a 38kV underground cable in permanent cable ducts from the proposed, permanent, on-site substation and to the existing Tullabrack 110kV ESBN Substation,
- 2 no. flood compensation areas,
- vertical realignment of an existing crest curve on the L6132 local road in order to prevent grounding of abnormal load vehicles during delivery of turbine components,
- ancillary forestry felling to facilitate construction and operation of the development.
- construction of a blade transfer area off the L6132,
- provision of 2 no. biodiversity enhancement areas,
- upgrade of an existing site entrance onto the adjoining local road network (L2034) including the demolition of an existing wall and removal of hedgerow at the site entrance to facilitate abnormal load vehicles during delivery of turbine components and reconstruction of same wall and replanting of hedgerow,
- Landscaping and all associated ancillary works.

In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the proposed project, a catchment-wide electro-fishing survey

across *n*=5 riverine sites was undertaken (**Table 2.1; Figure 2.1**). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, European eel (*Anguilla anguilla*) and lamprey species. The fisheries survey also documented other fish species of lower conservation value and helped to further inform impact assessment and any subsequent mitigation for the project.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the existing Moanmore wind farm. The survey was undertaken on Tuesday 19th September2023

1.2 Fisheries asset of the survey area

The survey sites were located on the Moyasta River (EPA code: 27M04) and a minor tributary, the Moanmore South River (27M14), within the Wood_SC_010 river sub-catchment (**Table 2.1**). The Moyasta River is a short watercourse of c.12km in length which discharges to Poulnasherry Bay in the Shannon Estuary. Poulnasherry Bay forms part of both the Lower River Shannon SAC (002165) and the River Shannon and River Fergus Estuaries SPA (00407).

Whilst fisheries data for the watercourses within the survey area was not available prior to this survey, the downstream connecting Shannon Estuary is known to support a wide range of transitional and marine fish species including Red-listed European eel (*Anguilla anguilla*) and smelt (*Osmerus eperlanus*) (Kelly et al., 2015).

2. Methodology

2.1 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of Moanmore wind farm on the 19th September 2023 following notification to Inland Fisheries Ireland and under the conditions of a Department of the Environment, Climate and Communications (DECC) licence.

Electro-fishing was conducted in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. 40-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

2.2 Fisheries habitat

A fisheries habitat appraisal of all aquatic survey sites was undertaken to establish their fisheries value. The surveys focused on evaluating the spawning, nursery and or holding habitat for salmonids and lamprey species but also considered European eel and other fish species.

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced.

Table 2.1 Location of *n*=5 electro-fishing survey sites in the vicinity of Moanmore wind farm, Co. Clare

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
M1	Moyasta River	27M04	Moanmore Lower	498278	658415
M2	Moyasta River	27M04	Moanmore Lower	497952	658213
M3	Moyasta River	27M04	Moanmore Upper	497136	659205
M4	Moyasta River	27M04	N67 road crossing	495956	658542
M5	Moanmore South River	27M14	Moanmore South	499462	658637

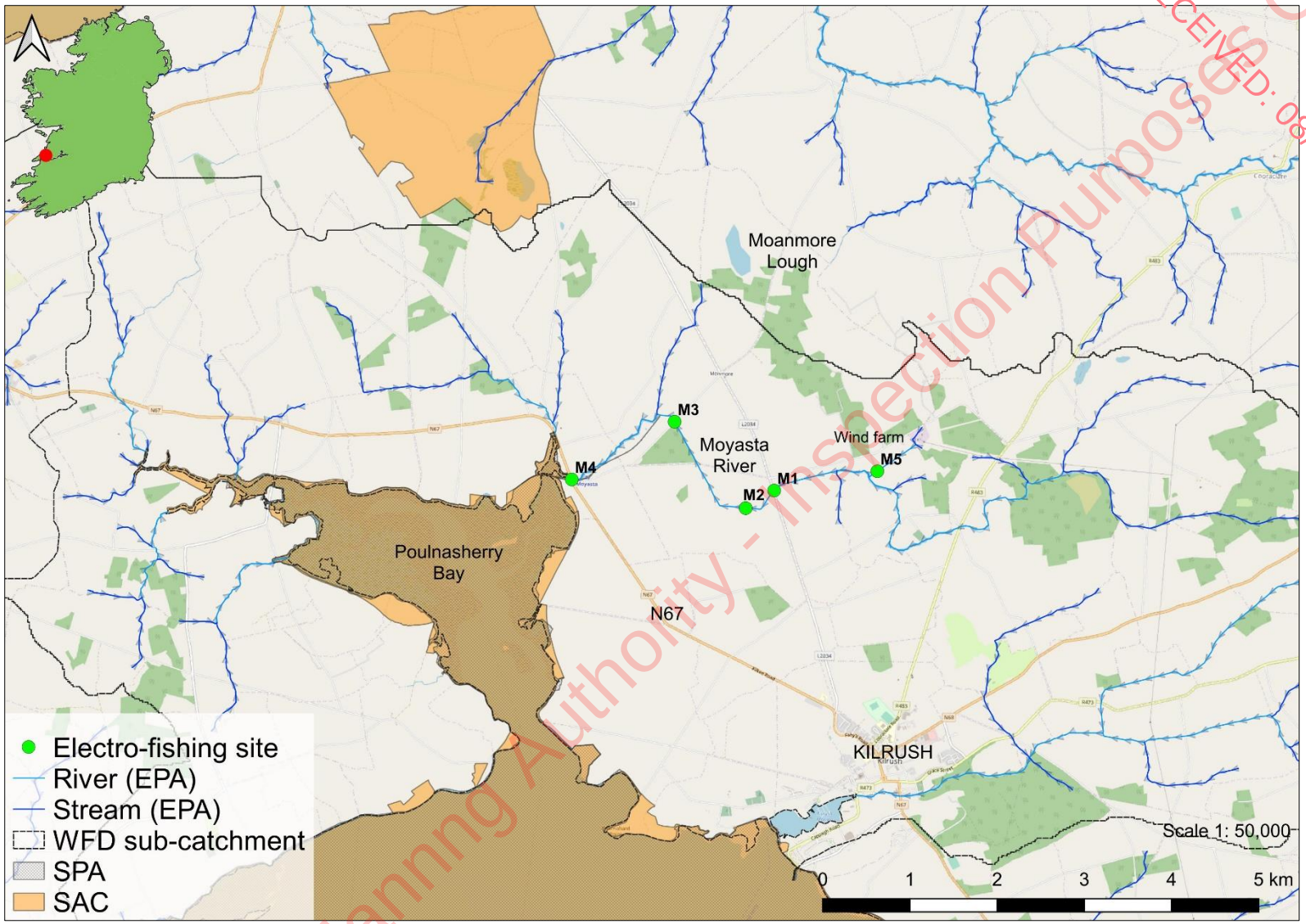

Figure 2.1 Overview of the electro-fishing survey site locations

3. Results

3.1 Fisheries assessment (electro-fishing)

3.1.1 Site M1 – Moyasta River, Moanmore Lower

Site M1 was located on the Moyasta River (27M04) at the L2034 road crossing. The upland eroding spate river (FW1; Fossitt, 2000) had been straightened and deepened historically but demonstrated some instream recovery. The river averaged 7-8m wide and 0.2-0.4m deep with localised deeper areas to 1m. The profile comprised a series of riffle, glide and pools with deeper glide predominating downstream. The substrata were dominated by compacted cobble with frequent boulder and localised areas of sand and mixed gravels. Siltation was moderate overall (higher than expected for river type). Macrophyte growth was sparse with only localised fool's watercress (*Apium nodiflorum*), watercress (*Nasturtium officin*ale) and water pepper (*Persicaria hydropiper*) along the littoral areas. Cover of aquatic bryophytes was moderate with frequent *Leptodictyum riparium* on larger substrata. The riparian areas featured dense scrub supporting blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), grey willow (*Salix cinerea*) and ash (*Fraxinus excelsior*) with localised tunnelling (which provided valuable thermal refugia for fish populations). The site was bordered by semi-improved pasture (GA1) and wet grassland (GS4).

Brown trout (*n*=44) and sea trout (*n*=1) (both *Salmo trutta*) were the only fish species recorded via electro-fishing at site M1 (**Figure 3.1**). The site was of high value for salmonids, supporting a healthy mixed cohort population of brown trout in addition to a low density of migratory sea trout. Despite some moderate suitability for European eel, none were recorded. The high energy, spate channel was unsuitable for lamprey with soft sediment deposits compacted and unsuitable for ammocoete burial.

Figure 3.1 Length frequency distribution recorded via electro-fishing at site M1 on the Moyasta River, September 2023

Plate 3.1 Adult and juvenile brown trout recorded at site M1 on the Moyasta River, September 2023

Plate 3.2 Representative image of site M1 on the upper reaches of the Moyasta River, September 2023

3.1.2 Site M2 – Moyasta River, Moanmore Lower

Site M2 was located on the Moyasta River at an unmapped stream confluence approximately 400m downstream of site M1. The upland eroding spate river (FW1) had been straightened and deepened historically but demonstrated some instream recovery. The river averaged 6-7m wide and 0.2-0.5m deep with localised deeper areas to 1.2m. The profile comprised swift glide and riffle with localised pool. The substrata were dominated by compacted cobble with scattered boulder and locally frequent patches of sand and mixed gravels. Soft sediment accumulations were present along the channel margins but were typically compacted. Siltation was moderate overall (higher than expected for river type). Macrophyte growth was sparse with only localised fool's watercress and watercress with localised instream stands of iris (*Iris psuedacorus*). Cover of aquatic bryophytes was low with only occasional *Leptodictyum riparium*. The riparian areas supported dense scrub dominated by grey willow, bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*) and hedge bindweed (*Calystegia sepium*). The site was bordered by wet grassland (GS4) and semi-improved pasture (GA1) with some livestock poaching pressures.

Brown trout (*n*=33), lamprey (*Lampetra* sp.; Gardiner, 2003) (*n*=2) and three-spined stickleback (*Gasterosteus aculeatus*) (*n*=1) were recorded via electro-fishing at site M2 (**Figure 3.2**). As per site M1 upstream, the site was of high value for salmonids, supporting a healthy mixed cohort population of brown trout and was a good quality nursery despite modifications and siltation pressures. Good quality spawning habitat for both salmonids and lamprey was present (cobble & mixed gravels) but such areas were localised. Deeper glide, pools and scours provided some good holding opportunities for adult salmonids. These areas also provided moderate suitability for European eel, although none were recorded. *Lampetra* sp. ammocoetes were present in marginal soft sediment accumulations although densities were low given (1 per m^2).

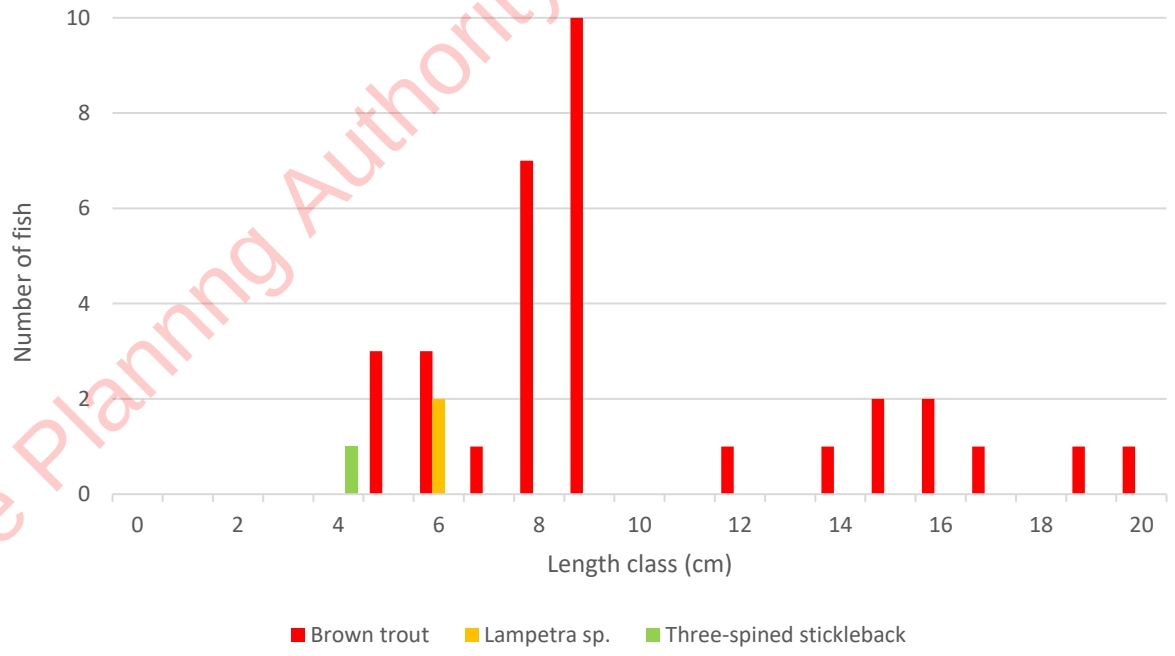

Figure 3.2 Length frequency distribution recorded via electro-fishing at site M2 on the Moyasta River, September 2023

Plate 3.3 *Lampetra* sp. ammocoete and juvenile brown trout recorded at site M2 on the Moyasta River, September 2023

Plate 3.4 Adult brown trout recorded at site M2 on the Moyasta River, September 2023

Plate 3.5 Representative image of site M2 on the Moyasta River, September 2023 (at small stream confluence)

3.1.3 Site M3 – Moyasta River, Moanmore Lower

Site M3 was located on the Moyasta River at the L2036 road crossing. The upland spate channel (FW1) had been straightened and deepened locally but demonstrated some good instream recovery. The river averaged 5-7m wide and >0.5m deep, with localised deeper areas to 1.3m. The profile comprised deep glide and pool (no riffle). The substrata were dominated by compacted cobble and mixed gravels with localised accumulations of sand. The steep marginal slopes featured compacted silt. Boulder was rare. The banks were typically undercut/scoured (characteristic of a spate channel). Given the high average depth, macrophytes were limited to occasional fool's watercress and water mint (*Mentha aquatica*). The aquatic bryophyte *Leptodictyum riparium* was occasional on instream structure. The banks supported abundant reed canary grass (*Phalaris arundinacea*) with abundant bramble, hawthorn, gorse and nettle (*Urtica dioica*). Mature sycamore (*Acer psuedoplatanus*) and grey willow heavily shaded the river downstream of the bridge. The site was bordered by semi-improved pasture (GA1) and wet grassland (GS4) with coniferous afforestation (WD4) bordering the river upstream of the bridge.

Brown trout (*n*=12) and sea trout (*n*=1) were the only fish species recorded via electro-fishing at site M3 (**Figure 3.3**). The site was of highest value as a holding habitat for both resident and migratory salmonids given the predominance of deep glide and pool, with widespread flow refugia by way of undercut/scoured banks. The site was of relatively poor value as a nursery and salmonid spawning habitat. Despite some good suitability for European eel, none were recorded. The soft sediment accumulations present were compacted and thus unsuitable for lamprey although some very limited spawning substrata were present.

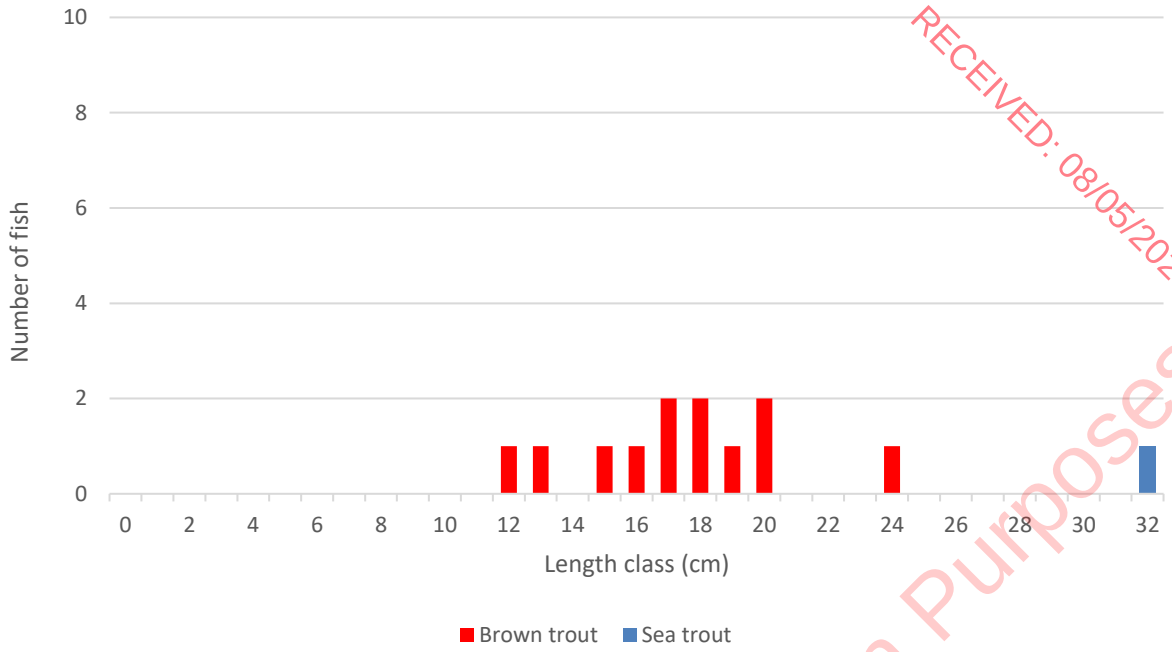

Figure 3.3 Length frequency distribution recorded via electro-fishing at site M3 on the Moyasta River, September 2023

Plate 3.6 Sea trout recorded at site M3 on the Moyasta River, September 2023

Plate 3.7 Representative image of site M3 on the Moyasta River, September 2023

3.1.4 Site M4 – Moyasta River, N67 road crossing

Site M4 was located on the lowermost reaches of the Moyasta River at the N67 road crossing. The tidal river (CW2) had been modified in vicinity of the bridge with boulder revetment along both banks. The channel averaged 6-8m wide and varied from 0.1m to 0.6m deep at low tide. The profile was dominated by tidal glide and riffles with localised pool. The substrata comprised a mix of bedded cobble, gravels and estuarine muds. Given the transitional, modified environment, freshwater macrophytes or aquatic bryophytes were not recorded. The modified banks supported low-lying scrub vegetation and rank grasses.

European eel (*Anguilla anguilla*) (*n*=4), flounder (*Platichthys flesus*) (*n*=15) , sand goby (*Pomatoschistus minutus*) (*n*=16) and three-spined stickleback (*n*=2) were recorded via electro-fishing at site M4 (**Figure 3.4**). The tidal site was of high value as a European eel nursery, as well as other transitional species including flounder. Deeper pool (e.g. under road bridge) provided good quality holding areas for adult European eel and migratory salmonids. The site was not of value as a salmonid or lamprey spawning habitat and the silt accumulations present were unsuitable for lamprey ammocoetes.

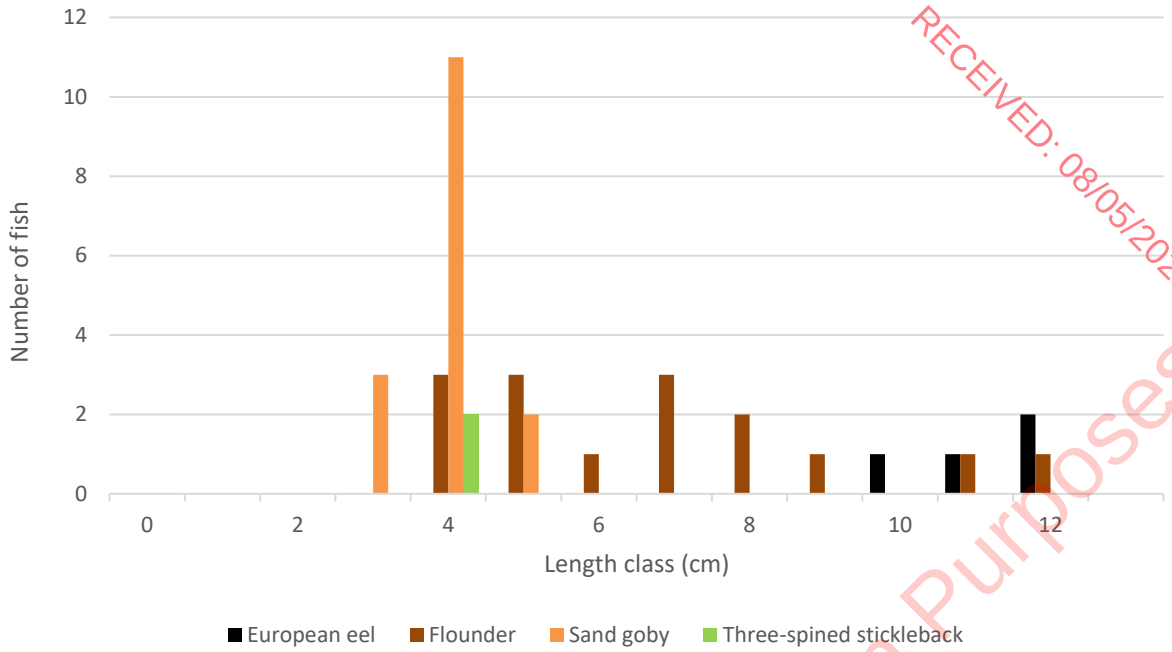

Figure 3.4 Length frequency distribution recorded via electro-fishing at site M4 on the Moyasta River, September 2023

Plate 3.8 Sand goby and juvenile flounder recorded at site M4 on the tidal Moyasta River, September 2023

Plate 3.9 Representative image of site M4 on the Moyasta River, September 2023 (downstream of road crossing)

Plate 3.10 Representative image of site M4 on the Moyasta River, September 2023 (upstream of road crossing)

3.1.5 Site M5 – Moanmore South River, Moanmore Lower

Site M5 was located on the upper reaches of the Moanmore South River (27M14), a tributary of the Moyasta River, adjacent to turbine T3 (Moanmore wind farm). The small upland river (FW1) had been historically straightened and deepened resulting in a narrow, steep-sided channel with poor hydromorphology. The river averaged <1m wide and 0.2-0.3m deep. The profile comprised shallow glide and riffle with occasional pool. The substrata were dominated by compacted gravels and cobble with abundant silt deposits. Several recently excavated/cleared field drains adjoined the river and were contributing to the silt load. The narrow channel supported only sparse macrophyte growth with occasional common duckweed (*Lemna minor*) and rare fool's watercress. Aquatic bryophytes were not recorded. The historically cleared banks supported low-lying scrub vegetation with scattered bramble, iris and hawthorn. The site was bordered by wet semi-improved pasture (GA1) which had been drained.

Brown trout (*n*=2) and three-spined stickleback (*n*=7) were the only fish species recorded via electro-fishing at site M5 (**Figure 3.5**). The site was of poor fisheries value given extensive historical modifications and the generally shallow, heavily silted nature of the river at this location. Whilst a low density of brown trout was recorded, salmonid spawning and nursery habitat was of poor quality. The narrow channel was not of value as a holding habitat for adult salmonids. Despite some low suitability for European eel, none were recorded. The upland site was unsuitable for lamprey.

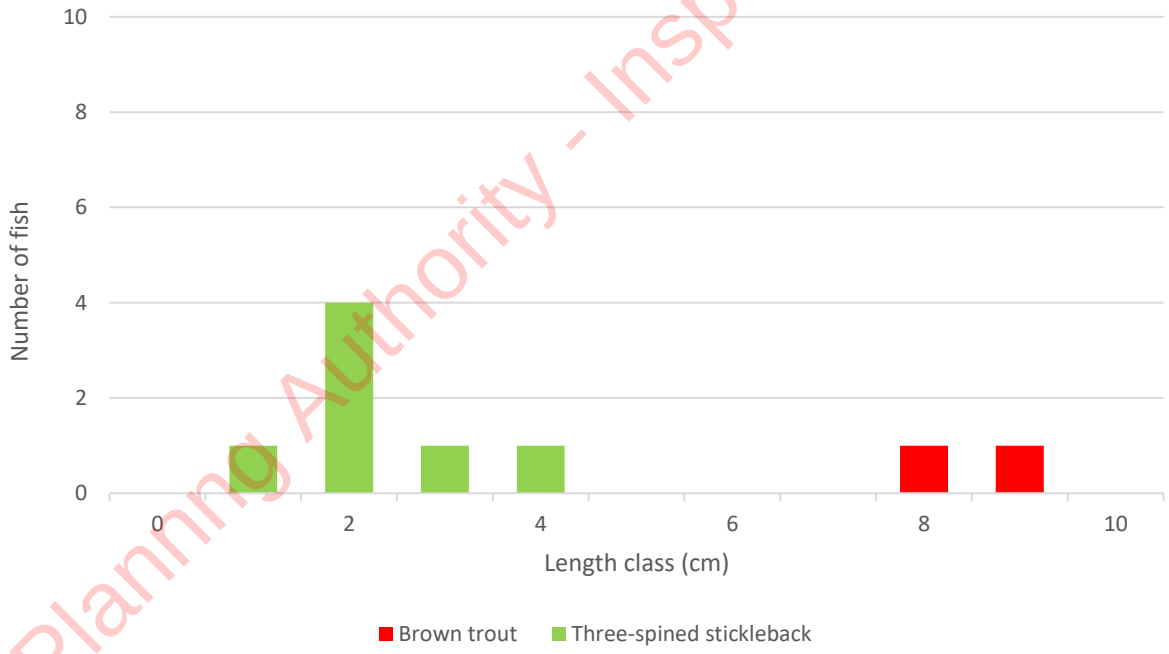

Figure 3.5 Length frequency distribution recorded via electro-fishing at site M5 on the Moanmore South River, September 2023

Plate 3.11 Brown trout and three-spined stickleback recorded at site M5 on the Moanmore South River, September 2023

Plate 3.12 Representative image of site M5 on the Moanmore South River, September 2023

Table 3.1 Fish species densities and abundances recorded at sites in the vicinity of Moanmore wind farm via electro-fishing in September 2023 (values in bold represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density (no. per m^2)						
				Brown trout	Sea trout	*Lampetra* sp.	European eel	Three-spined stickleback	Flounder	Sand goby
M1	Moyasta River	10	280	**0.157 (*n*=44)**	0.004 (*n*=1)	0.000	0.000	0.000	0.000	0.000
M2	Moyasta River	10	270	0.122 (*n*=33)	0.000	**1 per m^2** (*n*=1)	0.000	0.004 (*n*=2)	0.000	0.000
M3	Moyasta River	5	140	0.086 (*n*=12)	**0.007 (*n*=1)**	0.000	0.000	0.000	0.000	0.000
M4	Moyasta River	10	150	0.000	0.000	0.000	**0.027 (*n*=4)**	0.013 (*n*=2)	**0.100 (*n*=15)**	**0.107 (*n*=6)**
M5	Moanmore South River	5	50	0.040 (*n*=2)	0.000	0.000	0.000	**0.140 (*n*=7)**	0.000	0.000

4. Discussion

Despite historical modifications and evident water quality pressures (i.e. siltation, forestry, agriculture), the Moyasta River was found to support a healthy brown trout population, in addition to a low density of anadromous sea trout, lamprey (*Lampetra* sp.) and the ubiquitous three-spined stickleback. The lower (tidal reaches) supported Red-listed European eel as well as common transitional species such as sand goby and flounder.

Whilst the Moyasta River had been locally straightened and deepened, thus reducing its overall fisheries value, some instream recovery had occurred locally and several areas provided good quality salmonid nursery, holding and, to a more limited extent, spawning habitat. Sites M1 and M2 provided better quality nursery and spawning habitat (cobbles and gravels), with site M3 of high value as a holding habitat for migratory and resident adult fish (i.e. deep pool and glide). The Moanmore South River, a heavily modified and silted tributary, provided poor quality salmonid habitat although only a small brown trout population was recorded. In light of these observations, immigration of fish from the downstream-connecting Moyasta River (120m distance) is a likely explanation for the presence of salmonids at site M5.

Despite widespread suitability on the Moyasta River and good connectivity to marine environments, European eel were only recorded from the tidal reaches at site M4. Such transitional sites are invariably of high value as eel nurseries and typically support greater eel numbers compared with upstream catchments (primarily due to superior prey resources). On both a global and Irish scale, the European eel is listed as 'critically endangered' (Pike et al., 2020; King et al., 2011).

Lamprey ammocoetes (likely brook lamprey, *Lampetra planeri*) were recorded at site M2 where localised soft sediment accumulations provided some sub-optimal suitability for larval burial. The Moyasta, and its tributary the Moanmore South River, are small, historically modified upland channels prone to spate and relatively high flow rates and are thus not conducive to the deposition of organic-rich soft sediment required by juvenile lamprey. Although present, densities of *Lampetra* sp. are likely low within the Moyasta River given the inherent spate nature of the watercourse.

5. References

CEN (2003). Water Quality - Sampling of Fish with Electricity. Document CEN EN 14011:2000.

CFB (2008). Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board. Unpublished report.

Gardiner, R. (2003). Identifying lamprey. A field key for sea, river and brook lamprey. Conserving Natura 2000 Rivers, Conservation techniques No. 4. Peterborough. English Nature.

IFI (2010). Biosecurity Protocol for Field Survey Work. Available at http://www.fisheriesireland.ie/Invasive-Species/biosecurity-protocol-for-field-survey-work.html

Kelly, F.L., Connor, L., Matson, R., Coyne, J., Feeney, R., Morrissey, E. & Rocks, K. (2015). Water Framework Directive Fish Stock Survey of Transitional Waters in the Shannon International River Basin District – Shannon Estuary, Fergus Estuary and Limerick Docks 2014. Inland Fisheries Ireland, 3044 Lake Drive, Citywest Business Campus, Dublin 24, Ireland.

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011). Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Matson, R., Delanty, K., Shephard, S., Coghlan, B., & Kelly, F. (2018). Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108.

Pike, C., Crook, V. & Gollock, M. (2020). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2020: e.T60344A152845178. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T60344A152845178.en.

Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.