Appendix 8.4: Fisheries Habitat Survey

CREACHAN WIND FARM

APPENDIX 8.4

FISHERIES HABITAT SURVEY

DECEMBER 2025

Prepared By:

Mhor Environmental Ltd

73 Bellshill Road
Motherwell
North Lanarkshire
ML1 3SJ

T +44 (0)1698 526 317 l **E** info@mhorenvironmental.co.uk
W www.mhorenvironmental.co.uk

Registered in Scotland No. SC623684

On Behalf of:

ERM (Environmental Resources Management)

2nd Floor Exchequer Court
33 St. Mary Axe
London
EC3A 8AA

Registered in England & Wales No. 01014622

QA	Name	Date	Signature
Author	LK, Mhor Environmental Ltd	15/12/2024	By email.
Reviewer	NW, ERM	07/02/2024	By email

TABLE OF CONTENTS

1 INTRODUCTION 5
1.1 Background 5
1.2 Site Description 5
1.3 Objectives 5
1.4 Sampling Locations 6
1.5 Consultation 7
1.6 Barriers to Migration 7

2 METHODS 7
2.1 Desktop Study 7
2.2 Dates and Survey Conditions 8
2.3 Survey Limitations 8
2.4 Fisheries Habitat Survey Methods 8
2.5 Habitat Requirements 10
2.5.1 Salmonids 10
2.5.2 Lampreys 10
2.5.3 Eel 11
2.5.4 Freshwater Pearl Mussel (FWPM) 11

3 RESULTS 12
3.1 Desktop Study Results 12
3.1.1 NatureScot SiteLink website 12
3.1.2 SEPA Water Classification Hub website 12
3.1.3 Marine Scotland MAPS NMPi (National Marine Plan interactive) website 13
3.1.4 National Biodiversity Network (NBN) 13
3.2 Fish Habitat Survey Results 13

4 EVALUATION OF RESULTS 17

APPENDIX A: FIGURES 19

APPENDIX B: PHOTOGRAPHS 20

1 INTRODUCTION

1.1 Background

This Technical Report presents the methods and results of the Fisheries Habitat Survey (FHS) undertaken to provide baseline ecological information for the proposed Creachan Wind Farm, hereafter referred to as 'the Proposed Development'. Mhor Environmental Ltd was commissioned by ERM on behalf of RWE (the 'Client') to undertake a Fisheries Habitat Survey in October 2024.

The following terminology is used throughout this technical report:

- **The Proposed Development**: the whole physical process involved in the development of land at Creachan Wind Farm, including construction and operation (not a piece of land or an area);
- **The Development Site**: the proposed area of land, provided by the client, within which all development works for the project will take place (shown as the redline boundary in **Figure 1, Appendix A**).

1.2 Site Description

The Development Site lies within the Strath Rusdale valley, 16km northwest of Alness, Easter Ross, Scotland (Appendix A). There are two main watercourses within the Development Site. The largest of the two is the Alness River which flows east along the edge of the Development Site Boundary into the Cromarty Firth. The other main watercourse flows into the Alness River and is split into two sections Black Water middle section (Allt an Dubh) and Black Water middle section (Abhaim Glac an t-Seilich). Details are provided below:

- Alness River - Cromarty Firth to Strone is a river (ID: 20156) in the River Alness catchment of the Scotland river basin district. The main stem is approximately 14.4 kilometres in length.
- Black Water is a river (ID: 20159) in the River Alness catchment of the Scotland river basin district. The main stem is approximately 15.7 kilometres in length.

In addition to the main watercourses, there are numerous smaller burns and drains which cross the Development Site and flow into the Black Water and eventually to Alness River.

The Development Site is dominated by moorland, peatland with areas of deep peat, acidic grasslands, scrub and estate owned land with livestock and forestry plantation, some of which has been recently felled. There are also extensive access tracks within the Development Site associated with the forestry. Additional access tracks will be installed during the construction phase within the MDA. All watercourses included in this survey are within the River Cromarty Firth catchment which fall under the control of the Cromarty Firth District Salmon Fishery Board (DSFB).

1.3 Objectives

The aim of the FHS was to provide a detailed assessment of watercourse bankside and habitat quality along the Alness River, Black Water, Allt na Seasgaich and various other burns that have the potential to be impacted by the proposed development, to obtain detailed information regarding the suitability of watercourses for sensitive fish species within and in close proximity to the Development Site. Detailed information obtained from the FHS will provide an accurate and robust baseline on which to base the Environmental Impact Assessment (EIA).

The purpose of the FHS was to:

- Provide a baseline Fisheries Habitat report to assess salmonid (Atlantic Salmon *Salmo salar* and sea/brown trout *Salmo trutta*) Utilisation Potential and Habitat

Quality of watercourses within the Development Site, including an assessment and searches for lampreys (*Lampetra Sp.*), eel (*Anguilla anguilla*) and freshwater pearl mussel (*Margaritifera margaritifera*) habitat. Methods adopted are detailed in section 2 of this report;

- To determine the requirement for further surveys (including targeted electrofishing surveys); and
- Use the baseline information for future comparison studies, potentially required during the Proposed Development construction and post-construction phases.

1.4 Sampling Locations

A total of twenty-two Sampling Locations (SL) selected were assessed for fisheries habitat potential. However, access was restricted at SL CR19 to CR22 (as detailed further in Section 2.3). All SLs are presented in Table 1 (below). SLs were selected using aerial imagery / ordinance survey software and based on professional opinion and the confirmed Development Site Boundary information provided by the client.

Table 1: FHS Sampling Locations

SL Code*	Watercourse	Downstream Location (Grid Reference)	Upstream Location (Grid Reference)
CR1	Allt na Moine	NH 60607 74157	NH 60568 74172
CR2	Alness River	NH 60628 74138	NH 60609 74116
CR3	Black Water (Allt an Dubh)	NH 57869 76501	NH 57848 76530
CR4	Allt Bad na h-Achlaise	NH 56456 77260	NH 56425 77234
CR5	Allt Cnoc an Ruigh Choinich	NH 55219 78550	NH 55179 78525
CR6	Allt Loch Bad a Bhathaich	NH 54979 78915	NH 54891 78904
CR7	Black Water (Abhaim Glac an t-Seilich)	NH 56110 78922	NH 56099 78960
CR8	Allt Coire na Criche	NH 55146 78967	NH 55108 78996
CR9	Unnamed tributary of Allt Loch Bad a Bhathaich	NH 54844 79048	NH 54845 79084
CR10	Unnamed tributary of Allt Loch Bad a Bhathaich	NH 55109 79120	NH 55115 79162
CR11	Unnamed tributary of Black Water (Abhaim Glac an t-Seilich)	NH 56117 79662	NH 56032 79709
CR12	Unnamed tributary of Black Water (Abhaim Glac an t-Seilich)	NH 56160 79903	NH 56138 79972
CR13	Allt Coire na Cloiche	NH 56233 80347	NH 56243 80354

SL Code*	Watercourse	Downstream Location (Grid Reference)	Upstream Location (Grid Reference)
(control)			
CR14	Black Water (Abhaim Glac an t-Seilich)	NH 56215 80368	NH 56205 80387
CR15	Unnamed tributary of Black Water (Abhaim Glac an t-Seilich)	NH 55360 80980	NH 55202 80988
CR16	Unnamed tributary of Black Water (Abhaim Glac an t-Seilich)	NH 54718 81284	NH 54666 81242
CR17	Allt Coire a Chapuill	NH 54572 81511	NH 54511 81466
CR18	Black Water (Abhaim Glac an t-Seilich)	NH 53031 82831	NH 53011 82846
CR19	Allt a Chlaiginn	NH 51975 78385	NH 51995 78434
CR20	Allt Sron Fhearchair	NH 50824 78451	NH 50874 78481
CR21	Allt Cnoc a Bholla	NH 50464 78582	NH 50518 78644
CR22	Allt na Cuinneige Bige	NH 48579 80496	NH 48619 80553

**CR annotates Creachan Wind Farm*

See Figure 1 (Appendix A) for a map showing the SLs and Appendix B for photographs.

1.5 Consultation

An email was sent to the Cromarty Firth District Salmon Fishery Board requesting information on the watercourses within and adjacent to the Development Site. At the time of writing this report no response was received.

1.6 Barriers to Migration

Various waterfalls downstream of some SLs we recorded and are considered a barrier to fish migration within the Development Site. See section 3.1.3.2 for details.

2 METHODS

2.1 Desktop Study

A detailed desktop study was undertaken to identify any statutory, non-statutory or designated/classified sites, relevant to the aquatic environment, within 2km of the Development Site.
The following web-based sources were utilised for this:

- NatureScot (trading name of Scottish Natural Heritage) website[1] - information provided covered the location of any designated sites, statutorily protected species or habitats;

[1] www.gateway.snh.gov.uk (accessed online 19/11/2024)

- Scottish Environment Protection Agency (SEPA) website[2] - information provided covered classified and designated waterbodies under the Water Framework Directive (WFD) and Freshwater Fish Directive (FFD);
- Marine Scotland MAPS NMPi website[3] – information provided on Atlantic salmon *Salmo salar* and Sea trout records. Information/ location of barriers to migratory species.
- National Biodiversity Network (NBN)[4] – information provided covered localised species records, and focused on legally protected and ecologically significant species; and
- Google Earth[5] – satellite imagery provided detailed maps used during fieldwork.

2.2 Dates and Survey Conditions

FHSs were conducted between the 12th and 14th October 2024. Survey weather conditions were overcast, with moderate water levels, and good water clarity. Heavy rain, in the afternoon, raised water levels to high on the 13th October.

2.3 Survey Limitations

It was not possible to secure landowner permission to four proposed survey locations: CR19, CR20, CR21 and CR22, which were situated upstream of Loch Morie on the Abhainn na Glasa; and west of the Development Site. This was beyond the control of the project but not considered to be significant limitation as other watercourses within the Development Site (including downstream receptors on the Abhainn Glac an t-Seilich and the Black Water), as shown on **Figure 1, Appendix A**.

During the survey, high water prevented access to three survey locations: CR2 (Allness River), CR14 (Abhainn Glac an t-Seilich) and CR18 (Abhainn Glac an t-Seilich). This was not considered a significant limitation as it was still possible to assess other watercourses within the Development Site (including downstream receptors on the Abhainn Glac an t-Seilich and the Black Water) were accessible to help characterise survey findings.

Two photographs (Plate 3 and Plate 17, Appendix B) corrupted after being taken during the surveys and were not recoverable. This is not considered a significant limitation due to both SLs (CR2 and CR9) having a photograph either upstream or downstream to characterise the locations.

2.4 Fisheries Habitat Survey Methods

A FHS was carried out by Leigh Kelly BA MRes MIFM of Mhor Environmental Ltd (SFCC Qualified Electrofishing Team Lead and Salmonid Habitat Surveyor). During the October 2024 field survey, a combination of methods developed by Hendry and Cragg-Hine[6] and those developed for the river/FHSing[7],[8] were adopted. Fisheries Habitat Quality (FHQ) was assessed using the habitat characteristics observed and a score ranging from poor to good was given to each sampling location. Fish Utilisation Potential (FUP) was also assessed based on other environmental factors including barriers to fish migration, water quality and connectivity to migratory routes. FUP was scored between low and high.

[2] www.sepa.org.uk (accessed online 19/11/2024)

[3] www.marinescotland.atkinsgeospatial.com/nmpi/ (accessed online 19/09/2024)

[4] www.searchnbn.net (accessed online 02/11/2024)

[5] http://earth.google.co.uk (accessed online 14/11/2024)

[6] Hendry K, Cragg-Hine D (1997) - A Guidance Manual. APEM Ltd, Fisheries Technical Manual 4, R & D Technical Report W44, Version 1.0/07-97. R & D Project 603.

[7] Environment Agency (2003) - River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual: Environment Agency, Bristol.

[8] SFCC (2007) - Fisheries Management SVQ – Habitat Surveys Training Course Manual.

During the field survey the watercourse and the surrounding habitats were characterised and assessed according to the following criteria:

- Predominant channel substrate and flow-types;
- Habitat features;
- Modifications to the channel and banks;
- Channel vegetation types;
- Vegetation structure of the banks and banktop; and
- Land-use.

The habitat was then defined as described in Table 2 (below).

Table 2: Fisheries Habitat Classification

Habitat Type*	Classification
Spawning habitat	Stable gravel up to 30 cm deep that is not compacted or contains excessive silt. Substrate size with a diameter of 1.3 to 10.2 cm.
Salmon Fry (0+) habitat	Shallow (<20 cm) and fast flowing water indicative of riffles and runs with a substrate dominated by gravel and cobbles.
Salmon Parr (1+) habitat	Riffle-run habitat that is generally faster and deeper than fry habitat (20-40 cm). Substrate consists of boulder, cobbles and gravels.
Trout Fry (0+) habitat	Slow to medium flowing shallow water with a substrate dominated by pebbles and smaller cobbles, often concentrated at stream margins.
Trout Parr (1+) habitat	Variety of substrate sizes; undercut banks, tree roots, big rocks; deeper, slower water.
Lamprey spawning habitat	Stable gravel up to 30 cm deep that is not compacted or contains excessive silt (but may contain some sand). Substrate size varies from gravels to pebbles.
Juvenile lamprey habitat	Optimal: Stable fine sediment or sand ≥15 cm deep with low water velocity and the presence of organic detritus/plant material. Sub-optimal: Shallow sediment (<15 cm deep), often patchy and interspersed among coarser substrate.
Freshwater Pearl Mussel	Small sand patches stabilised amongst large stones or boulders in fast-flowing streams and rivers.
Eel Habitat	Variety of habitats including streams, rivers, and muddy or silt-bottomed lakes during their freshwater stage.
Glides	Smooth laminar flow with little surface turbulence and generally greater than 30 cm deep.
Pool	No perceptible flow. Shallow pool ≤0.3 m – Deep pool >0.3 m
Flow constrictions	Physical features providing a narrowing of the channel resulting in increased velocity and depth.
Obstructions to migration	Impassable falls, weirs, bridge sills etc. shallow braided river sections preventing upstream migration during low flows.

** If significant amounts of different habitat types were found to co-exist in the same section, these habitat classifications were adequately described. For example, in the case of salmonids, fry and parr habitat is classified as juvenile habitat. Where parr habitat is mentioned this refers to habitat that has principally been identified as habitat more suited to parr than fry, however habitually contains a lower quantity of fry habitat and habitat which is suited to both fry and parr. Salmonid definitions in Table 2 are adapted from SFCC Habitat Manual (2007i) and Hendry & Cragg Hine (1997), lamprey from Maitland (2003), freshwater pearl mussel from Hastie et al (2000).*

2.5 Habitat Requirements

2.5.1 Salmonids

The physical habitat requirements of juvenile salmonids have been subject to a considerable amount of detailed study[6] [9] [10] [11]. Trout and salmon spawn in late autumn and early winter, depositing their eggs in redds which they excavate in gravel and pebble substrates. Spawning depth can range from 5 cm to 90 cm[12], but it is likely that habitat is selected on the basis of suitable substrate and flow rather than depth per se.

Eggs are often deposited in areas of accelerating flow, such as the tails of pools and glides, upstream from riffles. However, in upland streams eggs may be deposited in any areas of gravel that can be physically moved. A good supply of oxygen is essential for eggs to develop and this is facilitated by a flow of water through the gravel. Clogging with fine sediment such as silt and fine sand reduces water flow resulting in egg mortality due to lack of oxygen. Egg survival is also affected by redd 'washouts' during winter spates – the direct, physical, scouring out of eggs from the gravel. Substrate stability, the dynamics of water flow and the weather all determine the extent of siltation and washouts. After hatching the young fry remain in the gravel as alevins, absorbing nutrient from the remaining yolk sac.

On emergence, usually between March and early May, the young fry disperse from the redds and set up territories which they defend aggressively. Salmon fry prefer fast flows (>30 cm/s) and favour areas with surface turbulence (riffle habitat). They require a rough bed of pebble, cobble and gravel. Trout fry prefer areas of relatively low velocity water near the streambed and often inhabit slower flows than salmon fry. Cover from stones, plants or debris is required and good cover is essential for maintaining high fry densities.

Salmon that have survived their first winter (parr) prefer deeper water than fry (typically 15-40 cm) and a coarser substrate often consisting of pebbles, cobbles and boulders. Trout parr generally favour areas of relatively low current speed where cover is available. Juvenile trout are often to be found in cover alongside the banks, in undercuts, among tree roots or in marginal vegetation. Cover remains important for adult trout and salmon particularly in smaller streams. In larger rivers and lochs this may be less important, as deep water provides refuge.

2.5.2 *Lampreys*

A review of lamprey ecology is provided by Maitland (2003)[13]. Adult lampreys aggregate to spawn and extrude their eggs into 'nests' excavated in the riverbed. Suitable spawning substrate varies between species. Brook lampreys spawn in areas of coarse sand and gravel while the larger species select areas of gravel, pebble and cobble. After hatching the young lamprey larvae, known as ammocoetes, drift downstream with the current. They settle in nursery habitat consisting of fine, soft substrate in well oxygenated, slow flowing water.

The ammocoetes are blind and feed on fine particulate matter such as diatoms, algae and bacteria. Ammocoetes spend several years in this muddy nursery habitat before metamorphosing (or transforming) from larval to adult form. The larvae of river and brook

[9] Crisp, D.T. 1993. The environmental requirements of salmon and trout in fresh water. Freshwater Forum, 3(3): 176-201.

[10] Klemetsen, A., Amundsen, P-A, Dempson, J.B., Jonsson, B., Jonsson, N., O'Connell, M.F. and Mortensen, E. 2003. Atlantic salmon Salmo salar L., brown trout Salmo trutta L. and Arctic charr Salvelinus alpinus (L.): a review of aspects of their life histories. Ecology of Freshwater Fish, 12, 1-19.

[11] Youngson, A & Hay, D. 1996 The Lives of Atlantic Salmon. An illustrated account of the life-history of Atlantic salmon. Swan Hill Press, Shrewsbury

[12] Neary, J.P. 2006. Use of Physical Habitat Structure to Assess Stream Suitability for Brown Trout: A Case Study of Three Upland Scottish Streams. Ph.D. Thesis, University of Stirling, October 2006.

[13] Maitland, P.S. 2003. Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

lamprey are indistinguishable from one another. Following transformation, it becomes possible to distinguish between them on the basis of morphology and colouration[14].

Upstream migrating lampreys may be prevented from reaching spawning grounds by both natural and man-made barriers. They are weak jumpers, so can be prevented from moving upstream by relatively low vertical barriers.

2.5.3 Eel

Eel habitat requirements have received less attention than those of salmonid fish. Tesch (1977)[15] suggests that so long as temperature and oxygen requirements are met, there are few stretches of water that are not suitable for eels. The main requirement for eels is cover, as they are averse to light and require suitable refuges during daylight hours. Eels of different size show different substrate preferences. Larger eels require large hollows, crevices or weed beds whereas small eels are sometimes abundant in cobble substrates, where they can burrow between the stones. Tree stumps, roots and other large structures provide ideal cover for eels. Eel diet is diverse, but the majority of diet consists of benthic species[16]. Migratory pathways can be severely impacted by barriers, both man-made and natural[17].

2.5.4 Freshwater Pearl Mussel (FWPM)

The FWPM is one of the longest living invertebrates known, surviving for over 100 years, and growing to between 12 - 15 cm in length[18]. The mussels live in fast-flowing rivers and streams, where they are found half buried in sand or gravel and often between boulders. They are very sensitive to any kind of pollution including siltation and agricultural land use changes and the success of their breeding cycle depends on the presence of their host species, salmonid fish[18].

FWPM have a short parasitic larval phase on the gills of suitable host fish (salmonids). The larvae (glochidia) of FWPM are very host-specific and, as far as is known, can only complete their development on Atlantic salmon *(Salmo salar L.)* or brown trout (*Salmo trutta L.*), usually 0+ fish (fry in their first year after hatching).

Declines in salmonid host populations are not considered to be the only factor in the general decline of FWPM over the past 50–100 years[19], with land use changes and continued exploitation through pearl mussel harvesting also contributing to it decline. However, although very little is known about the mussel-host relationship, long-term survival clearly depends on host availability, and there is concern those recent significant changes in wild salmonid stocks may threaten mussel populations[20].

[14] Gardiner R (2003). Identifying Lamprey. A Field Key for Sea, River and Brook Lamprey. Conserving Natura 2000 Rivers Conservation Techniques Series No. 4. English Nature, Peterborough.

[15] Tesch, F. W. 1977. The Eel, Biology and Management of Anguillid Eels. John Wiley and Sons, New York.

[16] Moriarty, C.M. 1978. Eels: A Natural and Unnatural History. David & Charles, Newton Abbot. 192pp

[17] Mouton, A.M., Huysecom, S., Buysse, D. et al. Optimisation of adjusted barrier management to improve glass eel migration at an estuarine barrier. J Coast Conservation 18, 111–120 (2014).

[18] Hastie LC & Young MR (2003). Conservation of the Freshwater Pearl Mussel 2. Relationship with Salmonids. Conserving natura 2000 Rivers Conservation Techniques Series No.3. English Nature, Peterborough.

[19] Young MR & Williams JC (1983). The status and conservation of the freshwater pearl mussel in Great Britain. Biological Conservation 25, 35–52

[20] Hastie LC & Cosgrove PJ (2001). The decline of migratory salmonids: a new threat to pearl mussels in Scotland. Freshwater Forum 15, 85–96.

3 RESULTS

3.1 Desktop Study Results

3.1.1 *NatureScot SiteLink website*

No statutory designated sites, associated with Salmonids or other fish species, are present within a 2km radius of the Development Site.

3.1.2 SEPA Water Classification Hub website[21]

Three watercourses within and in close proximity to the Development Site are classified and designated under the Water Framework, the Alness River, Black Water and Abhainn na Glasa. The latest available information is detailed below and presented in Table 3:

- Alness River - Cromarty Firth to Strone is a river (ID: 20156), in the River Alness catchment of the Scotland river basin district. The main stem is approximately 14.4 kilometres in length. The water body has been designated as not heavily modified, mid-altitude, small and siliceous in nature. There are currently no pressures identified on this water body. Associated protected areas River Ness - Freshwater Fish (Existing).
- Black Water is a river (ID: 20159), in the River Alness catchment of the Scotland river basin district. The main stem is approximately 15.7 kilometres in length. The water body has been designated as not heavily modified, mid-altitude, medium and siliceous in nature. There are currently no pressures identified on this water body. Associated protected areas River Ness - Freshwater Fish (Existing).
- Abhainn na Glasa - Loch Morie to source is a river (ID: 20158), in the River Alness catchment of the Scotland river basin district. The main stem is approximately 20.5 kilometres in length. The water body has been designated as not heavily modified, mid-altitude, medium and siliceous in nature. There are currently no pressures identified on this water body. Associated protected areas River Ness - Freshwater Fish (Existing).

Table 3: Water Classification Data

Parameters	2022 Data		
	Alness River	**Black Water**	**Abhainn na Glasa**
Overall status	Good	Good	Good
Pre-HMWB status	Good	Good	Good
Overall ecology	Good	Good	Good
Biological elements	High	Good	High
Fish	High	High	High
Fish barrier	High	High	High
Hydromorphology	High	Good	High
Morphology	High	Good	High
Overall hydrology	Good	Good	High
Modelling hydrology	Good	High	High

[21] https://www.sepa.org.uk/data-visualisation/water-classification-hub/ (accessed online 04/11/2024)

Hydrology (medium/ high flows)	High	High	High
Hydrology (low flows)	Good	High	High
Water Quality	High	Good	Good

3.1.3 Marine Scotland MAPS NMPi (*National Marine Plan interactive)*[22] website

3.1.3.1 Salmon and Sea Trout – Scottish Salmon Rivers data

Three records are available for Atlantic salmon or Sea trout within the watercourses present within the Development Site. The Alness River, Black Water and Abhainn Toll a' Choin are classified as supporting populations of both species.

3.1.3.2 Barriers to Fish Migration

Four records detailing barriers to fish migration are available on the Marine Scotland National Marine Plan Interactive Map[3]. These barriers are considered likely to significantly impact upstream migration through various watercourses detailed in this report. Further information is presented in Table 4:

Table 4: Barriers to Fish Migration

Watercourse	Grid Reference	Barrier Type	SL Impacted
Black Water	NH 58931 74975	Natural – impassable	CR3 to CR18
Allt Loch Bad a Bhathaich	NH 55837 78610	Natural - impassable	CR6, CR9 and CR10
Allt Coire a Chapuill	NH 54500 81450	Natural - impassable	CR17
Abhaim Glac an t-Seilich	NH 53553 82339	Natural - impassable	CR18

3.1.4 National Biodiversity Network (NBN)

Twelve records are available for Atlantic salmon, twenty-nine for brown / sea trout, four for eel and none for freshwater pearl mussel within the watercourses surveyed during this survey. Various other records are available within the catchment but out with the SLs.

3.2 Fish Habitat Survey Results

Table 5 presents a summary of the prominent habitat characteristics recorded at each SL during the FHS (October 2024).

Table 5: FHS Results

SL Code	FUP	FHQ	SL Characteristics
CR1	High	Good	**Juvenile salmonid habitat.** Watercourse flows into the Alness River. Good salmonid habitat. Considered suitable for Atlantic salmon if upstream migration is possible. Flow type predominantly run / riffle sequences with step pools upstream. Average wet width 2.1m.

[22] https://marinescotland.atkinsgeospatial.com/nmpi/ (accessed online 05/11/2024)

SL Code	FUP	FHQ	SL Characteristics
			Depth ranging between <10 cm – 30 cm. Cobble / pebble with limited boulder and gravel deposits. Good instream cover. Land use is broadleaf woodland. Modified embankment and bridge. Unlikely to support freshwater pearl mussel.
CR2	High	Good	**Adult and juvenile salmonid habitat.** **Very high water reduced survey effort** Watercourse flows into the Cromarty Firth. Good salmonid habitat. Large watercourse considered suitable for Atlantic salmon and Sea trout. Spate conditions with flow type predominantly cascade / torrent. Wet width ranging between 18m – 21m. Depth ranging between <50 cm – 120 cm. Cobble / boulder with pebble / gravel deposits. Bedrock outcrop in places. Excellent instream cover. Land use is broadleaf woodland and bridge. Potential to support freshwater pearl mussel however DSFB should be consulted on species.
CR3	Moderate	Moderate	**Parr salmonid habitat.** Watercourse flows into the Alness River. Moderate salmonid habitat. Considered suitable for Atlantic salmon and Sea trout if upstream migration is possible. Flow type predominantly glide / run sequences. Average wet width 5.7m. Depth ranging between <40 cm – 60 cm. Cobble / pebble with boulder and gravel deposits. Moderate instream cover. Land use is woodland strip, scrub and rough pasture with grazing. Unlikely to support freshwater pearl mussel however DSFB should be consulted on species.
CR4	Moderate	Moderate	**Parr salmonid habitat.** Watercourse flows into the Black Water. Moderate salmonid habitat. Considered sub-optimal for Atlantic salmon and Sea trout if upstream migration is possible. Flow type predominantly run with step pools. Average wet width 1.1m. Depth ranging between <10 cm – 30 cm. Pebble / gravel with boulder and cobble in places. Moderate instream cover. Land use is felled forestry. Unlikely to support freshwater pearl mussel.
CR5	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Debris throughout watercourse (trees). Flow type predominantly run / cascade sequences with step pools. Average wet width 0.75m. Depth ranging between <10 cm – 30 cm. Mainly bedrock with boulder. Poor instream cover. Land use is felled forestry and steep gully / bedrock outcrops. Not considered suitable for freshwater pearl mussel.
CR6	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Impassable waterfall downstream. Flow type predominantly run. Average wet width 0.50m. Depth ranging between <10 cm – 20 cm.

SL Code	FUP	FHQ	SL Characteristics
			Peat substrate with vegetation throughout. Poor instream cover. Land use is forestry. Abundant insect life recorded on surface of water. Not considered suitable for freshwater pearl mussel.
CR7	High	Good	**Adult and juvenile salmonid habitat.** Watercourse flows into the Alness River (Abhaim Glac an t-Seilich forms upstream section of Black Water). Good salmonid habitat. Considered suitable for Atlantic salmon and Sea trout if upstream migration is possible. Flow type predominantly run / riffle / glide sequences. Wet width ranging between 12m – 15m. Depth ranging between 20 cm – 80 cm. Boulder with cobble and pebble / gravel deposits. Bedrock upstream. Excellent instream cover. Land use is felled forestry and moorland. Sub-optimal habitat for freshwater pearl mussel however DSFB should be consulted on species.
CR8	High	Good	**Juvenile salmonid habitat.** Watercourse flows into the Black Water. Good salmonid habitat. Considered suitable for Atlantic salmon and Sea trout if upstream migration is possible. Flow type predominantly run / cascade sequences with step pools upstream. Average wet width 2.2m. Depth ranging between 20 cm – 40 cm. Substrate is predominantly cobble, with pebble / gravel deposits and limited boulder / bedrock. Good instream cover. Land use is broadleaf woodland. Modified embankment and bridge. Unlikely to support freshwater pearl mussel.
CR9	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Impassable waterfall downstream. Flow type predominantly run. Average wet width 0.50m. Depth ranging between <10 cm – 20 cm. Peat substrate with dense vegetation throughout. Poor instream cover. Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR10	Low / Moderate	Poor / Moderate	**Salmonid parr habitat.** Watercourse flows into the Black Water. Impassable barrier downstream (waterfall). Flow type predominantly run / glide with step pools throughout. Various small waterfalls within section. Average wet width 0.9m. Depth ranging from <10 – 20 cm. Predominantly pebble / gravel with cobble. Limited boulder. Moderate instream cover. Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR11	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Flow type predominantly run with limited glide. Average wet width <0.5m. Depth approx. <10 cm. Peat substrate. Poor instream cover.

SL Code	FUP	FHQ	SL Characteristics
			Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR12	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Flow type predominantly run with limited glide. Average wet width <0.5m. Depth approx. <10 cm. Gravel / silt substrate. Poor instream cover. Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR13 (Control)	High	Good	**Juvenile salmonid habitat.** Watercourse flows into the Black Water. Good salmonid habitat. Considered suitable for Atlantic salmon and Sea trout if upstream migration is possible. Flow type predominantly run / glide sequences with step pools upstream. Wet width range between 2.7m to 4.6m. Depth ranging between 10 cm – 50 cm. Substrate is predominantly boulder / cobble, with mix of pebble / gravel deposits and bedrock. Good instream cover. Land use is felled forestry, scrub / willow and moorland. Sub-optimal habitat for freshwater pearl mussel however DSFB should be consulted on species.
CR14	High	Good	**Adult and juvenile salmonid habitat.** Watercourse flows into the Alness River. Good salmonid habitat. Large watercourse considered suitable for Atlantic salmon and Sea trout. Spate conditions with flow type predominantly cascade / torrent. Wet width ranging between 5m – 8m. Depth ranging between 20 cm – 50 cm. Substrate is predominantly boulder / cobble, with mix of pebble / gravel deposits and bedrock. Excellent instream cover. Land use is felled forestry, scrub / willow and moorland. Potential to support freshwater pearl mussel however DSFB should be consulted on species.
CR15	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Flow type predominantly run. Average wet width <0.5m. Depth approx. <10 cm. Peat / silt substrate. No defined channel in places. Poor instream cover. Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR16	Low	Poor	Watercourse flows into the Black Water. Poor salmonid habitat. Flow type predominantly run. Average wet width <0.5m. Depth approx. <10 cm. Peat / silt substrate. No defined channel in places. Poor instream cover.

SL Code	FUP	FHQ	SL Characteristics
			Land use is forestry and scrub. Not considered suitable for freshwater pearl mussel.
CR17	Moderate	Moderate	**Salmonid parr habitat.** Watercourse flows into the Black Water. Flow type predominantly run / glide with step pools throughout. Large impassable waterfall within section. Average wet width 1.3m. Depth ranging from <10 – 30 cm. Predominantly bedrock / boulder with cobble / pebble deposits downstream. Moderate instream cover. Land use is felled forestry and moorland. Not considered suitable for freshwater pearl mussel.
CR18	High	Good	**Adult and juvenile salmonid habitat.** Watercourse flows into the Alness River. Upper reaches of the Black Water. Good salmonid habitat. Large watercourse considered suitable for Atlantic salmon and Sea trout if upstream migration is possible. Spate conditions with flow type predominantly cascade / torrent. Wet width ranging between 4.2m – 5.4m. Depth ranging between 20 cm – 80 cm. Substrate is predominantly boulder / cobble, with bedrock outcrops and accumulation of pebble / gravel in places. Good instream cover. Land use is felled forestry and moorland. Potential to support freshwater pearl mussel however DSFB should be consulted on species.
CR19-22	No Access Permitted		

4 EVALUATION OF RESULTS

The habitat quality of the SLs ranged between poor and good in terms of supporting salmonid populations. However, the connectivity between the watercourses throughout the catchment is significantly affected by barriers to fish migration located in the downstream section of the Black Water. Habitat connectivity is integral to survival of migratory salmonids, successful migration upstream and downstream is required to support populations of migratory fish species[23][24]. It is considered that all watercourses within the SLs, where suitable habitat was recorded, may only contain brown trout due to barriers. However, this can only be determined by undertaking an electrofishing survey.

Eleven sites (CR1, CR2, CR3, CR4, CR7, CR8, CR10, CR13, CR14, CR17 and CR18) had suitable combinations of flow types, depths and variable substrates providing moderate / good habitat for juvenile salmonids.

Seven sites (CR5, CR6, CR9, CR11, CR12, CR15 and CR16) were poorer in quality and considered not to be suitable for fish due to various habitat characteristics.

[23] Hendry K & Cragg-Hine D (2003). Ecology of the Atlantic Salmon. Conserving Natura 2000 Rivers Ecology Series No.7.English Nature, Peterborough.

[24] Willem B. Buddendorf, et al (2019). Integration of juvenile habitat quality and river connectivity models to understand and prioritise the management of barriers for Atlantic salmon populations across spatial scales. STOTEN 655, 557-566.

Four sites (CR19, CR20, CR21 and CR22) could not be surveyed due to landowner restrictions.