

# Invercoe River fish and habitat survey

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# Summary

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The road bridge which crosses the bottom of the River Coe at NN098592 is due for repair work and the Highland Council have consulted with Lochaber Fisheries Trust about wild fish in the river. A juvenile fish and fish habitat survey was carried out from just downstream of the bridge up to the road bridge NN 103589 to advise the Highland Councils bridge repair works.

Very few juvenile salmonids were found between the sea up to the sea pool at NN10179,59122. None were recorded in the 150m upstream of Invercoe bridge. The habitat was morphologically suitable for juvenile salmonids but the tidal influence resulted in very low fish numbers. The works are unlikely to have an effect on juveniles. Therefore the largest impact is likely to be on smolts leaving for sea and adults returning to spawn, both of which will be vulnerable to noise, light and vibration disturbance.

## Methods

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### Juvenile fish survey

Electrofishing surveys to assess juvenile fish numbers were carried out following SFCC protocols at six sites in the survey area (Figure 1). Single-run, semi-quantitative electrofishing surveys were carried out at all sites to get a broad picture of fish distribution through the area. Coe6 was closest to the bridge but, despite timing this site at low tide, the conductivity was very high here (due to tidal influence) so the effectiveness of fishing was probably compromised. Coe5 was the closest we could get to the bridge without a compromised effectiveness (due to tidal influence). Other sites were chosen to survey areas of good habitat to give a more general picture of fish populations in the river. Surveys were carried out on 6<sup>th</sup> August when water levels were suitable for effective fishing. Sample site characteristics are provided in the table below (Table 1).

All juvenile salmon and trout caught were measured under anaesthetic and aged based on scale samples taken from a proportion of the catch. Other fish species were recorded. On recovery, all fish were returned to the area of capture. The length and three widths of the stretch of burn fished at each site were measured and a description of the substrate, water depth and flow recorded.

Table 1. Site characteristics

Site Code	Grid ref	Date		Area (m <sup>2</sup> )	Conductivity (μs)
Coe1	210130 759121	06/08/2020	Tail of sea pool. Run and riffle over cobble. Good fry habitat	89.25	33
Coe2	210127 759140	06/08/2020	Fast run and riffle at tail of torrent below sea pool. Good parr habitat	43.2	33
Coe3	210092 759138	06/08/2020	Run and riffle over cobble and boulder, good habitat	46.96	35

Coe4	210048 759156	06/08/2020	Riffle and run at bottom of gravel island, close to fallen trees. Good habitat	119	35
Coe5	210014 759161	06/08/2020	Run and some riffle, good fish habitat 80m upstream from Invercoe bridge	107.25	65
Coe6	209940 759182	06/08/2020	Run at top of island, upstream of invercoe bridge. Good habitat	82.35	230



Figure 1. Electrofishing sites

## Habitat survey

A river habitat survey based on the method of Hendry & Cragg-Hine (1997) was conducted on 6<sup>th</sup> August 2020 between the Invercoe bridge (NGR 209878 759219) mark to the humpback bridge (NGR 210382 758941). Weather conditions during the survey were good with no rain and light winds. A period of low rainfall preceding the survey ensured the water flow was low to medium and areas of streambed were exposed. Habitat types identified during the survey are presented in Table 2.

Table 2. Habitat categories and definitions identified on the River Coe (based on Hendry and Cragg-Hine, 1997).

Category	Definition
Spawning habitat	Stable gravel, uncompacted and with little interstitial silt. Substrate diameter is in the range 1.3 to 10.2cm. Water depth $\leq$ 30cm. Flow type predominantly run or riffle.
Fry habitat	Depth $\leq$ 20cm. Substrate dominated by pebbles and cobbles. Flow type predominantly run and riffle.
Parr habitat	Deeper than fry habitat (20-40cm). Flow type predominantly run or riffle and generally faster than in fry habitat. Substrate mainly cobble and boulder.
Mixed glides	Areas of smooth laminar flow with little surface turbulence. Depth $>$ 30cm. Mixed bed substrate.
Bedrock glides	As above but with bedrock substrate.
Flow constrictions	Physical features that result in a narrowing of the channel and increased velocity and depth.
Obstructions to migration	Impassable falls, weirs, bridge sills and shallow braided river sections that prevent upstream migration.
Torrent	High gradient areas of fast flowing water with a substrate that is predominantly bedrock and boulder (additional category not included by Hendry and Cragg-Hine, 1997)

To support this classification, river width, substrate, water depth and flow type were recorded to provide an objective assessment of the river. These variables were recorded at points where major transitions occurred or a minimum of every 500m. Bank side vegetation and land use in the wider catchment were also recorded. Photographs were taken of significant barriers to migration and the height of barriers and the presence of pools below them described.

Areas of river suitable for brook lamprey spawning and juveniles were identified during the survey. The habitat requirements of lamprey were based on Maitland (2003) and defined as follows:

*Lamprey spawning habitat* - similar to salmonid spawning habitats being composed of gravel substrate  $<$  10cm in diameter with no interstitial silt. Shallow water  $<$  30cm deep.

*Lamprey juvenile habitat* – Substrate predominantly mud, silt or silt and sand often with a high organic content. Low flow rates. Depth usually in the range 10 – 50cm but can be up to 100cm.

The results of the habitat survey were summarised on a map of the River Coe using GIS software. The suitability of areas for juvenile salmonids was mapped by dividing sections of river into the categories defined in Table 3, based on SEPA's guidelines.

Table 3. Habitat types used to summarise survey information on the suitability for salmonids.

Habitat type	Definition
Lamprey habitat	Lamprey spawning or juvenile as defined above
Spawning habitat	Predominantly spawning habitat as defined above
Good Productive habitat	Predominantly fry and parr habitat as defined above
Moderate Productive habitat	Stretch containing some (< 50%) fry and parr habitat in a mosaic or composed of sub-optimal juvenile habitat (eg. Deeper than 50cm, slow flowing or with a high proportion of sand and gravel in substrate)
Poor habitat for juvenile fish	Deep, still areas with less than 20% fry or parr habitat
Bedrock glide	Areas where the streambed is predominantly bedrock
Obstructions	Potentially impassable waterfalls, weirs, bridge sills etc.

## Results

### Juvenile fish

Results from the surveys are presented in Table 4.

No fish were recorded at the site closest to the proposed works, and no salmonids at the site above that (Coe5).

Table 4. Juvenile fish densities. Letters in brackets indicate how densities compare on a national scale (based on the FRS Fisheries Classification Scheme Grades), with A being excellent down to E being very poor.

Site Code	Easting	Northing	Salmon				Trout		Other species
			Fry	Parr	1+	2+	Fry	Parr	
Coe1	210130	759121	2.24 (E)	2.24 (E)	2.24	0.00	0.00	0.00	Eel 17
Coe2	210127	759140	9.26 (D)	0.00	0.00	0.00	0.00	0.00	Eel 3, Flounder 3
Coe3	210092	759138	0.00	0.00	0.00	0.00	0.00	0.00	Eel 2, Flounder 3
Coe4	210048	759156	0.84 (E)	0.00	0.00	0.00	0.00	0.00	Eel 2, Flounder 3

Coe5	210014	759161	0.00	0.00	0.00	0.00	0.00	0.00	Eel 2, Flouder 3
Coe6	209940	759182	0.00	0.00	0.00	0.00	0.00	0.00	None

Salmon fry (salmon between 0 and 1 years old) were found at three of the six sites although the densities were low or very low on a national scale (Table 2). Two salmon parr were found at Coe1, the furthestmost upstream site, at very low densities when compared to a national scale.

No trout were recorded, despite areas suitable for trout being included in the survey.

Eels were present at all but one site and in high numbers at Coe1. Flounder were found at four sites. No lamprey were found during the surveys.

## Habitat survey

The results of the habitat survey are mapped in Figure 2.

Significant areas of the surveyed river were recorded as good or spawning habitat, based on sediment and flow. Some areas of poor juvenile habitat were found where the water was deeper, slow flowing or in the bedrock dominated gorge. These areas are more suitable for adult salmonids.

The area around the Invercoe bridge was classified as good and spawning habitat. However all these results are compromised by the tidal influence which affects all habitats up to the sea pool making it less suitable for juvenile fish. Even at low tide the salinity was too high for salmonids up to 120m above the site of the proposed works.

No lamprey habitat was identified during the survey.

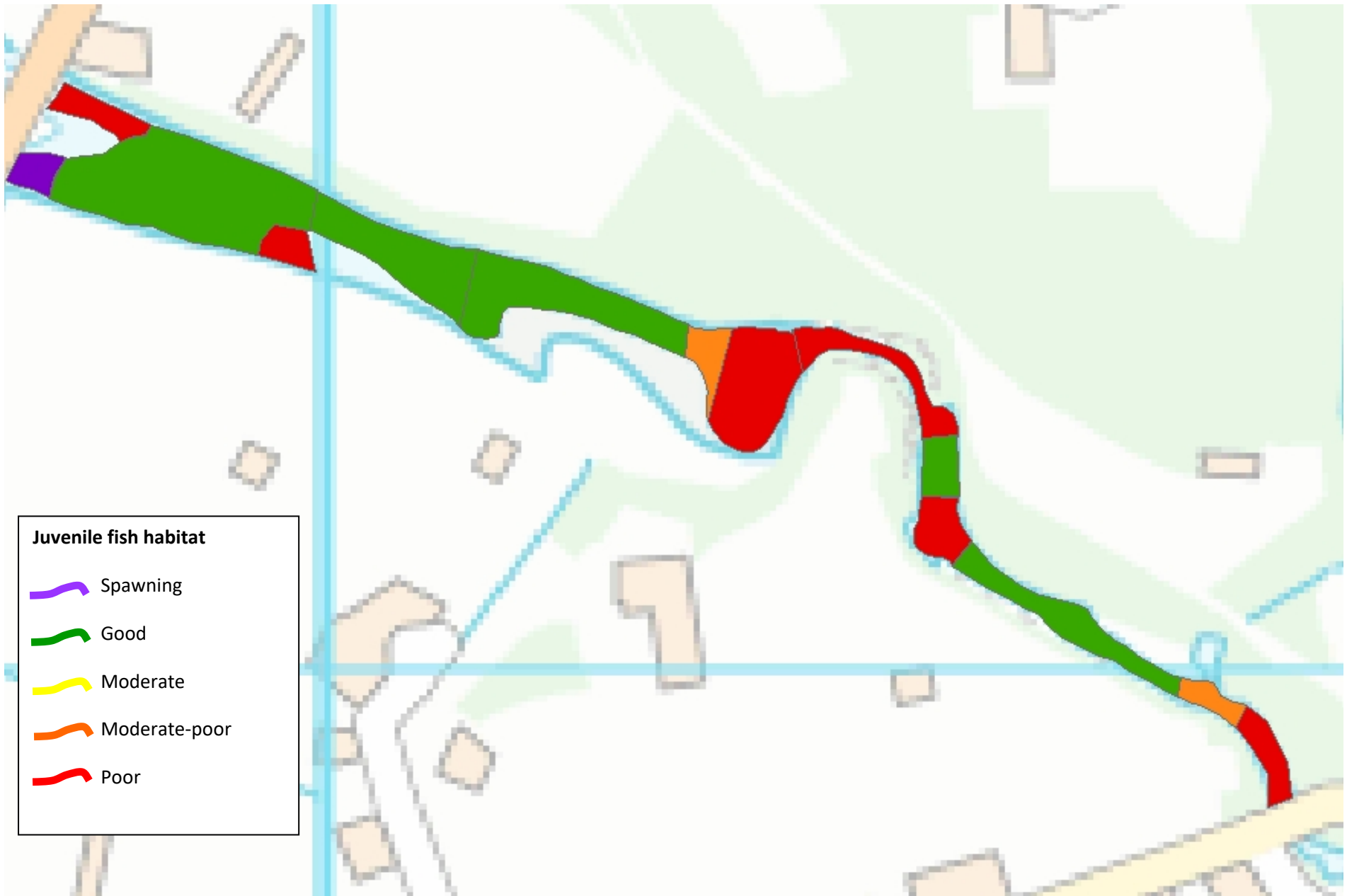


Figure 2. Juvenile salmonid habitat in the River Coe

# Discussion

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It was not possible to survey right down to the Invercoe bridge as conductivity was too high to safely electrofish, even at low tide. No trout and very few salmon were recorded during electrofishing surveys, as the river has tidal influence right up to the sea pool (NN10179, 59122) and juvenile salmonids prefer freshwater. It is possible the small number of fish found within the tidal limit were washed down by floods rather than having been spawned here, and couldn't ascend the significant falls just upstream of the sea pool. The highest numbers of salmon were found at Coe2, even there the densities were low on a national scale.

Although much of the habitat was morphologically suitable for juvenile salmonids, the salt water influence rendered the habitat sub-optimal.

The main concern with any construction works at the bridge is therefore limited to migrating fish: smolts heading out to sea and adult salmonids returning to spawn. Smolts leave the river between April-June and will be heading out to sea mainly at night. They will be very sensitive to light, vibration and noise pollution during this time, so both should be minimised during dusk and dark.

Adult fish will be returning to the river from May to November. They will also be sensitive to vibration, noise and light pollution.

Eels were found in small numbers at most sites, and in relatively good numbers at Coe1, however these are well above the Invercoe bridge so shouldn't be affected by the works.



## Appendix 1 - National Fisheries Classification Scheme Grades

Grade	Description	Density (fish 100m <sup>-2</sup> )			
		Salmon fry	Salmon parr	Trout fry	Trout parr
<b>F</b>	Absent	0	0	0	0
<b>E</b>	Very poor	0.1 - 4.6	0.1 - 2.5	0.1 - 2.4	0.1 - 1.5
<b>D</b>	Poor	4.7 – 10.2	2.6 - 5.0	2.5 – 5.2	1.6 – 3.0
<b>C</b>	Fair	10.3 – 20.2	5.1 – 9.0	5.3 – 12.3	3.1 – 5.5
<b>B</b>	Good	20.3 – 42.0	9.1 – 15.7	12.4 – 30.2	5.6 – 10.3
<b>A</b>	Excellent	≥ 42.1	≥ 15.8	≥ 30.3	≥ 10.4