

# River Nairn Juvenile Fish Survey 2010

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# 1. Introduction

## 1.1 The Nairn Catchment

The River Nairn originates near Carn Ghriogair in the Monadhliath at approx 800m above sea level. It flows largely for approx 54km (36miles) north east to meet the Moray Firth at Nairn, the largest settlement along the river. The main tributaries are the River Brin, River Farnack, Craggie Burn and Cawdor Burn although there are several other smaller burns. Loch Duntelchaig is the only major loch draining into the Nairn although some smaller still waters are also present. Loch Duntelchaig is also used for public water supply.

The geology of the Nairn catchment is dominated by schists and gneisses in the upper river while some Old Red Sandstone is present in the lower reaches along with glacial and alluvial deposits. Moorland and substantial commercial conifer plantations are present in the headwaters while arable farming is more prevalent in the lower reaches.

The river flow is monitored by SEPA at their Firhill gauging station in Nairn and the mean daily flow is  $5.53\text{m}^3\text{s}^{-1}$ . Water quality is also monitored by SEPA and in general water quality is good throughout the catchment. The River Nairn has a catchment size of  $313\text{km}^2$  and an average annual rainfall of 940mm.

The catchment is entirely within the Local Authority administration of Highland Council. The area can be classed as a low population density area with Nairn (pop 8,600) being the only sizeable town within the catchment.

## 1.2 Fish Species in the Nairn Catchment

Native species include Atlantic salmon (*Salmo salar*); Brown/sea trout (*Salmo trutta*); Eel (*Anguilla Anguilla*); Brook lamprey (*Lampetra planeri*) Flounder (*Platichthys flesus*). Non-native species (Historical Introductions) include Northern pike (*Esox lucius*) and Perch (*Perca fluviatilis*) and more recent introductions include Rainbow trout (*Oncorhynchus mykiss*) and Brook Trout (*Salvelinus fontinalis*).

An adult Sea lamprey (*Petromyzon marinus*) has been observed in the river in recent years and River Lamprey (*Lampetra fluviatilis*) may also be present although recent surveys did not confirm this (Era 2004). Pike and perch are present in Loch Dumtelchaig and are probably introduced some time ago.

So the Nairn is similar to many Highland rivers supporting only a limited range of fish species and the preservation of this limited fish fauna should be a key management target rather than attempting to broaden the species list through introductions of non-natives.

Salmon and sea trout management is by the Nairn District Salmon Fishery Board and the river supports a good salmon fishery with rod catches showing an increase in recent years. Sea trout are also captured although recent years have shown a decline in catch. Brown trout are also fished for but little data on catches exist.

### 1.3 Fish Population Information

A very limited amount of electro-fishing data is available for the Nairn. A site near the bridge at Faillie (NH 71199 38002) was surveyed by SEPA staff in September 2008 (Table 1). Their results indicated that salmon and trout were present along with eels and lamprey. Three age classes of salmon 0+, 1+ and 2+ were found. The densities of salmon 0+ and trout indicated a healthy population.

**Table 1: Juvenile salmon and trout densities from River Nairn electro-fishing site, September 2008 (data supplied by A. Duguid, SEPA).**

|                                  | Salmon 0+ | Salmon Parr | Trout 0+ | Trout Parr |
|----------------------------------|-----------|-------------|----------|------------|
| Density<br>(100m <sup>-2</sup> ) | 123.85    | 13.95       | 2.79     | 1.26       |
| Standard Error                   | 3.41      | 0.27        | 0.12     | 0.18       |

Scottish Fisheries Co-ordination Centre electro-fishing training sessions were held on the River Farnack, near Inverarnie Bridge during the late 1990s and although fish population density data was not determined, salmon, trout and eels were all recorded as present. Currently no further data on juvenile salmon and trout within the Nairn is available.

Trout and salmon are likely to dominate in the fish fauna of the Nairn but eels, lamprey have also been reported (*pers comm.* A. Duguid SEPA). More detailed data on the lamprey

population is provided by Era (2004) from a national survey of lamprey populations. Their findings indicated that lampreys were present and that these were mostly Brook Lamprey. However, some were not identified to species level so River and/or Sea lamprey could also be present. Further information is desirable.

The recently published Nairn Fisheries Management Plan (Laughton 2010) highlighted the need for better data on fish populations (FMP Action 3.1), this survey aims to provide basic data on the juvenile fish species present within the Nairn and its tributaries and their relative abundance.

## 2. Methods

Juvenile surveys following the SFCC quantitative protocols (SFCC 2007) were proposed for the Nairn survey. In summary survey sites to be selected reflecting the range of available river habitat and a wetted area of approximately 100m<sup>2</sup> was marked out using stop nets or ropes at either end. Electro-fishing would have commenced from the lower end of the site to the top and each site would have been fished either once or three times to determine fish densities. Details of substrate and riparian vegetation along with surrounding land use have also been recorded for each site. Electrofishing surveys are generally best carried out in July to September but a period of wet weather leading to higher water levels and staff illness during the proposed survey period forced a rethink to this approach.

A timed electro-fishing approach was implemented (SFCC, 2007), this is a quicker approach and allows more locations to be examined giving good distribution data. Relative abundance can also be gained. Each survey site was fished for 10mins then the numbers of capture fish were divided by the time fished and catch per unit effort (CPUE) was calculated.

The captured fish were anaesthetized, identified, measured (fork length, mm), and a small scale sample retained for age determination. The fish were then allowed to recover in fresh water and returned to the site.

To shorten survey time further additional data for each survey location was limited to the following; Instream Habitat was scored from the following list None/Poor/Moderate/Good/Excellent; Conductivity/River Temperature and Time were recorded; Access for Fish: all obstructions were recorded; Bankside Vegetation and Land use data; Water level and clarity data. Each site was given a unique code and photographed to allow re-orientation to the site in future surveys.



3. Results

3.1 Site Locations

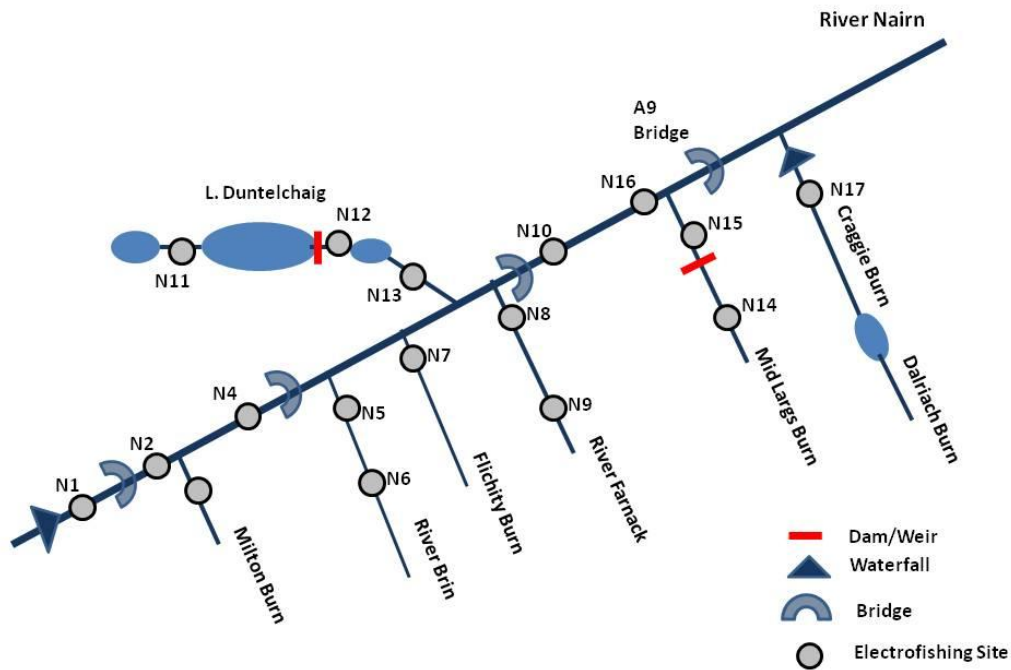


Figure 2: Schematic map indicating the locations of electrofishing sites in the upper River Nairn and tributaries during 2010.

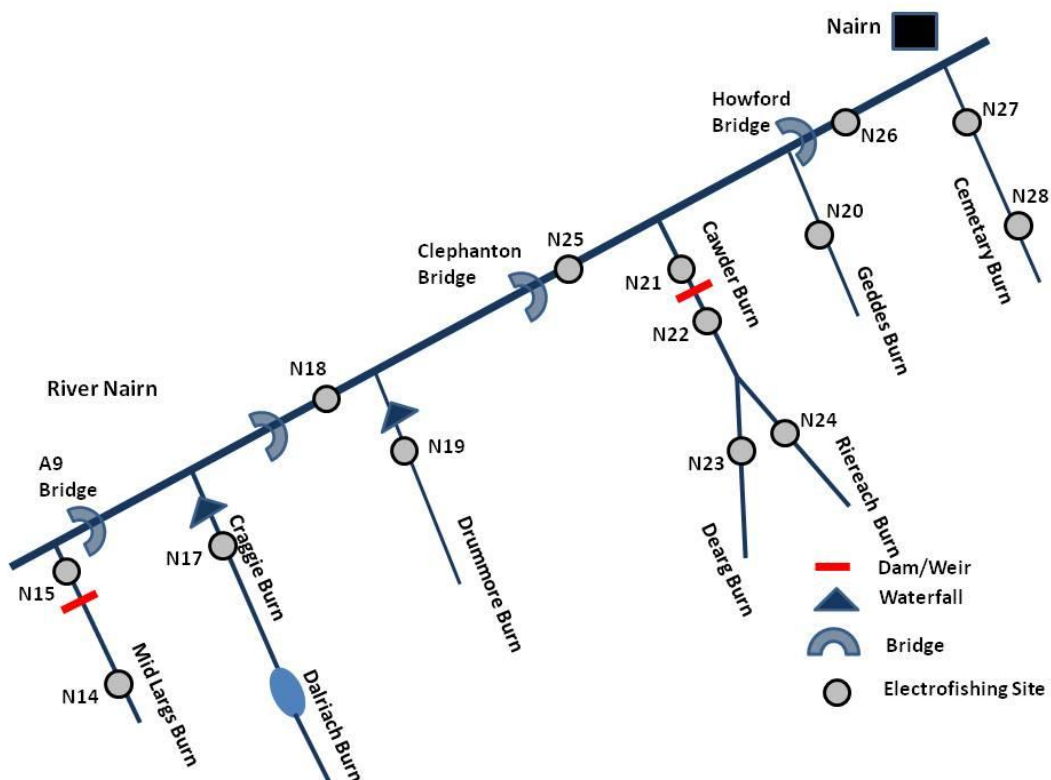


Figure 1: Schematic map indicating the locations of electrofishing sites in the lower River Nairn and tributaries during 2010.

**Table 2a: Site locations for electrofishing sites completed on the mainstem Nairn during 2010.**

| Site | Easting | Northing | Alt (m) | River | Situation                                      | Date     |
|------|---------|----------|---------|-------|--|----------|
| N26  | 287550  | 854000   | 20      | Nairn | 50m down from Howford bridge.                  | 08/10/10 |
| N25  | 284750  | 850150   | 40      | Nairn | 50m up from Clepharton road bridge.            | 08/10/10 |
| N18  | 274333  | 843035   | 100     | Nairn | Down from Nairnside bridge                     | 07/10/10 |
| N16  | 270700  | 837600   | 160     | Nairn | 1km up from Faillie bridge.                    | 07/10/10 |
| N10  | 268615  | 835200   | 170     | Nairn | 50m down from bridge B861                      | 03/10/10 |
| N4   | 264919  | 827921   | 210     | Nairn | 100M up from Elrig bridge                      | 28/09/10 |
| N2   | 262657  | 825802   | 250     | Nairn | Ruined cottage 500m down from bridge Aberarder | 28/09/10 |
| N1   | 262995  | 824115   | 300     | Nairn | 1km up from B851 bridge                        | 28/09/10 |

**Table 1b: Site locations for electrofishing sites completed on the Nairn tributaries during 2010.**

| Site | Easting | Northing | Alt (m) | River                       | Situation  | Date     |
|------|---------|----------|---------|-----------------------------|--|----------|
| N3   | 264030  | 826338   | 240     | Milton burn                 | Milton farm  | 28/09/10 |
| N5   | 266400  | 828750   | 215     | Brin                        | 100m up from bridge                                | 28/09/10 |
| N6   | 266240  | 826580   | 270     | Brin                        | 100m up from Achvraid                              | 28/09/10 |
| N7   | 267050  | 829450   | 210     | Filchity burn               | 200m up from road bridge                           | 03/10/10 |
| N8   | 268655  | 833755   | 170     | Farnack                     | 10m down from Inverarnie Bridge                    | 03/10/10 |
| N9   | 269750  | 830350   | 390     | Farnack                     | Above bridge on Aarbole road                       | 03/10/10 |
| N12  | 265000  | 831975   | 210     | Burn from Duntelchaig       | Below Loch Duntelchaig                             | 06/10/10 |
| N11  | 259850  | 829800   | 220     | Burn above Duntelchaig      | Between Duntelchaig and Loch Ceo Glais             | 06/10/10 |
| N13  | 265950  | 832950   | 205     | Burn from Loch a' Chlachain | Dunlichty graveyard                                | 06/10/10 |
| N14  | 271300  | 837250   | 150     | Mid Lairgs burn             | 100m up from Quarry road bridge                    | 06/10/10 |
| N15  | 270800  | 837600   | 160     | Mid Lairgs burn             | 500m down from Fort Augustus road bridge B851      | 06/10/10 |
| N17  | 273540  | 839280   | 190     | Craggie burn                | Beside the arches                                  | 07/10/10 |
| N19  | 276400  | 843900   | 155     | Drummore burn               | Down from bridge at track to Drummore of Clava     | 07/10/10 |
| N21  | 284750  | 850100   | 55      | Cawdor burn                 | Down from footbridge below fish ladder Cawdor burn | 08/10/10 |
| N22  | 284750  | 849700   | 70      | Cawdor burn                 | 30m above fish pass Cawdor burn.                   | 08/10/10 |
| N23  | 283000  | 847350   | 140     | Dearg burn                  | Wester Barevan bridge                              | 08/10/10 |
| N24  | 285500  | 847450   | 150     | Riereach burn               | 50m up fm Glenoullie bridge                        | 08/10/10 |
| N20  | 288750  | 853050   | 30      | Geddes burn                 | Upstream from bridge at Raitloan                   | 07/10/10 |
| N27  | 289300  | 855800   | 10      | Cemetery burn               | Balmakeith port bridge, Granny Barbour road        | 08/10/10 |

|     |        |        |    |               |                      |          |
|-----|--------|--------|----|---------------|----------------------|----------|
| N28 | 291400 | 856250 | 15 | Cemetery burn | Up from Mill bridge. | 08/10/10 |
|-----|--------|--------|----|---------------|----------------------|----------|

Figures 1 and 2 provide a schematic map of the relative positions of the electrofishing sites completed on the mainstem Nairn and its tributaries during 2010 while Tables 2a and 2b provide OS grid references, altitude and date of electrofishing for each site. From Figures 1 and 2 it is evident that a good coverage of the Nairn catchment was achieved with a good spread of sites on the mainstem and all significant tributaries examined. In total 10 sites were examined on the mainstem Nairn and a further 18 examined on the tributaries.

### 3.2 Fish Distribution

**Table 2: Fish distribution for the River Nairn mainstem and tributary electrofishing sites 2010.**

| Nairn       | No of Sites | Salmon Fry | Salmon Parr | Trout Fry | Trout Parr | Eel | Lamprey | Stickleback |
|-------------|-------------|------------|-------------|-----------|------------|-----|---------|-------------|
| Mainstem    | 8           | 8          | 8           | 5         | 3          | 2   | 2       | 1           |
| Tributaries | 20          | 10         | 10          | 17        | 16         | 2   | 1       | 2           |
| Total       | 28          | 18         | 18          | 20        | 18         | 4   | 3       | 3           |

The distribution of salmon, trout and other fish is illustrated in Table 3. Salmon fry and parr were present at 18 (64%) of the sites examined. Distribution of salmon was better in the mainstem than in the tributaries with 100% of the mainstem sites containing salmon fry or parr compared with only 50% of the tributary sites. Trout distribution showed the opposite pattern with only 5 sites (63%) producing trout fry and 3 sites (38%) showing older trout on the mainstem, while on the tributaries 17 sites (85%) produced trout fry and 16 sites (80%) provided older age classes.

Three other species were captured including eels at 4 sites, lampreys at 3 sites and 3-spined-sticklebacks at 3 sites. The lampreys captured were all identified as Brook lampreys.

### 3.3 Obstructions to Fish Passage

Access and instream habitat influence the distribution of fish. From Figures 1 and 2 it is evident that six sites on the tributaries were above waterfalls or man-made obstacles which affect adult salmon and sea trout access. Sites N17 and N19 on the Craggie Burn (see Figure 4) and Drummore Burn are both above waterfalls and salmon were absent and unlikely that sea trout would ascend. Site N14 on the Mid Lairgs Burn is upstream from a concrete bridge apron (see Figure 5) which is likely to prevent adult salmon and sea trout access. The weir and waterfall on the Cawder Burn will also prevent adult fish access (sites N22, N23, N24) and so only resident trout populations were found at these sites. A dam is present at the outflow from Loch Duntelchaig (see Figure 6) but this is fitted with a fish ladder. However, no salmon and low numbers of trout were present in the small burn between Loch Ceo Glas and Loch Duntelchaig (site N11).



### 3.3.1 Natural Obstructions

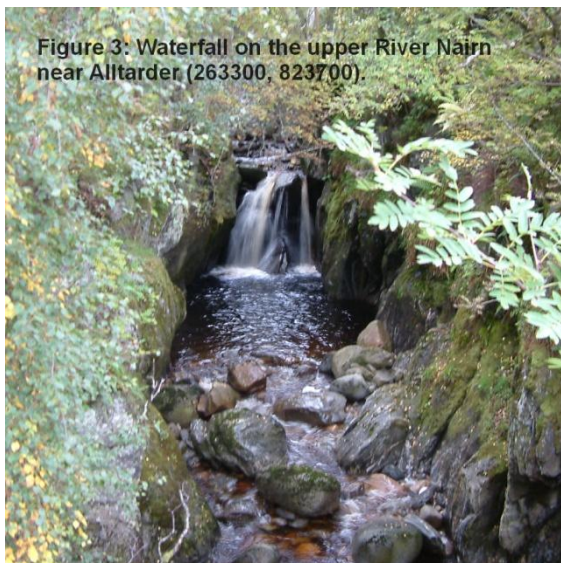


Figure 3: Waterfall on the upper River Nairn near Alltarder (263300, 823700).

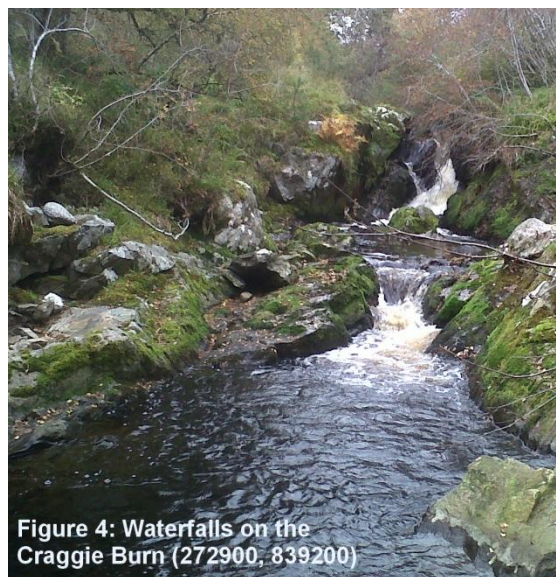


Figure 4: Waterfalls on the Craggie Burn (272900, 839200)

The River Nairn above the upper waterfall (Figure 3) near Alltarder (263300, 823700) was not examined. The waterfall is too high for salmon and sea trout to ascend and although the stream gradient rises steeply upstream from the falls it is likely that a resident trout population will be present. Further investigation would be worthwhile.

Two other waterfalls were observed, on the lower reaches of the Craggie Burn (Figure 4) (272900, 839200) and the Drummore Burn (no photo) (276800, 844600). Both were significant obstacles to salmon and sea trout migration and it is unlikely that adults will ascend them. Trout were present above both waterfalls at sites F17 and F19, respectively.

### 3.3.2 Man-Made Obstructions

#### *Mid Lairgs Burn: Bridge Apron and Culvert*

Two made obstructions were recorded during the survey. Figure 5 illustrates a concrete bridge apron underneath a bridge over the Mid Lairgs Burn. The bridge is part of the access road to a quarry. The apron is a concrete construction and forms a step on the downstream edge of approximately 1m in height. Water flows over the concrete and through two culverts. Adult salmon and sea trout would have difficulty in ascending the structure and water depths across the concrete platform would be too shallow at most flows. However, at higher flows it made be possible to access the step towards the left bank. A full assessment of the obstacle would be beneficial using SEPA barrier methodology and then consider remedial options.

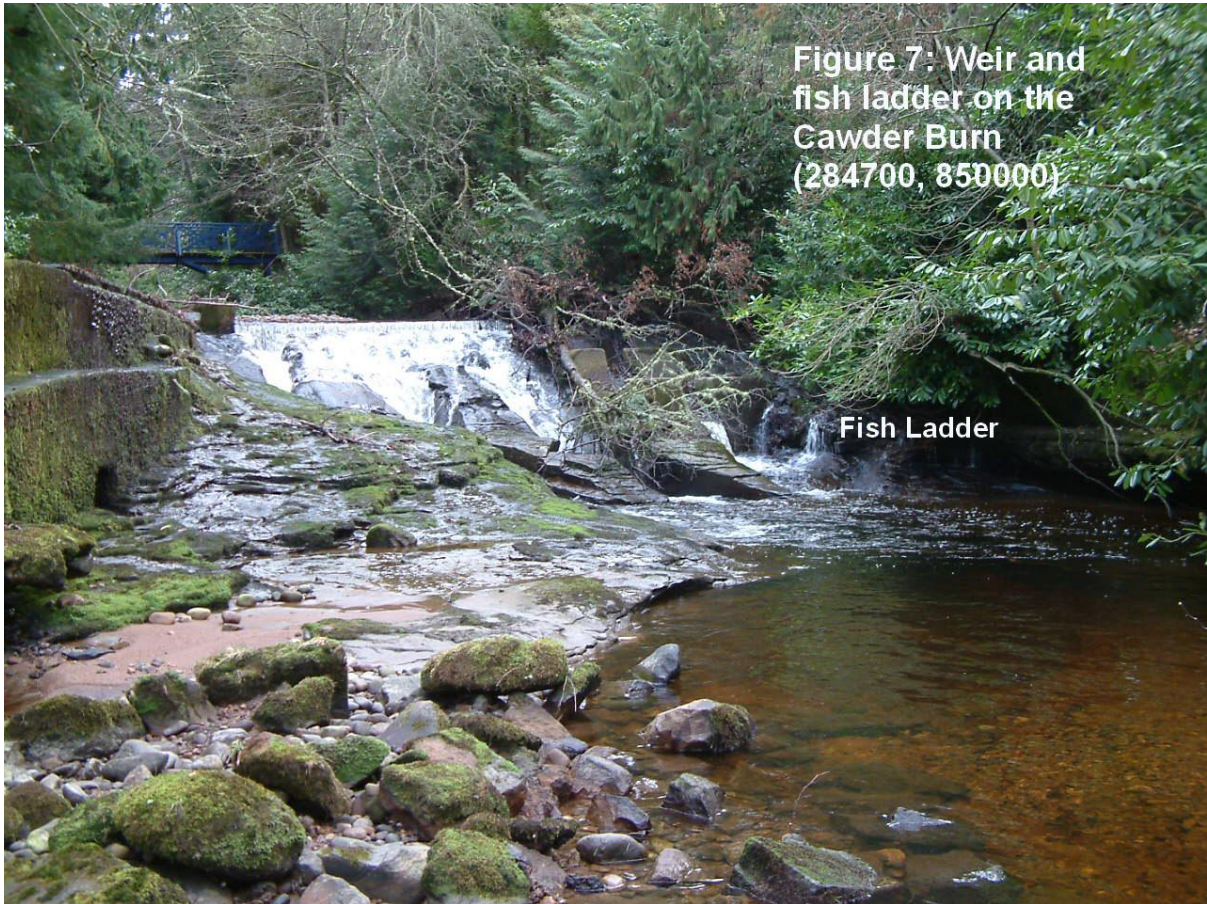


*Loch Duntelchaig: Dam and Fish Ladder*

A dam is present across the outflow from Loch Duntelchaig and is fitted with a fish pass (Figure 6). The ladder looks suitable for adult salmon and sea trout passage. There is only a limited length of river above the loch and no salmon were present. The passage of smaller trout and other fish species such as eels to and from the Loch may be more important and whether the current ladder would be effective for this is not clear.



*Cawder Burn: Weir and Fish Ladder*



A weir is present on the Cawder Burn (284700, 850000) which supplies water to the Brackla Distillery. The weir is built on top of a natural waterfall. Adult salmon and sea trout are unable to ascend this structure. There is a fish ladder on the left hand side but it is a poor design and fish would have difficulty ascending it. Again a full assessment of the obstacle using the SEPA barrier methodology and development of remedial options is desirable.

### 3.4 Habitat

Prior to electrofishing commencing the instream cover for salmonids aged one year or older was recorded for each survey site using SFCC (2007) criteria as follows;

**None** - No cover: Stream bed composed entirely of fine uniform particles (silt, sand, gravel, pebbles) or continuous hard surfaces (bedrock, concrete). No cover from aquatic vegetation.

**Poor** - Little cover: Stream bed composed predominantly of fine to medium particles (gravel, pebbles and cobbles), little or no cover from aquatic vegetation.

**Moderate** - Moderate cover: Stream composed of a mix of particle sizes (gravel to boulders) and/or with some areas of Good cover substrate (pebbles, cobbles and boulders), which may or may not have some aquatic vegetation cover.

**Good** - Good cover: Stream composed mainly of medium to large size substrate (pebbles, cobbles and boulders) and/or with some aquatic vegetation cover.

**Excellent** - Excellent cover: Stream composed predominantly of large size substrate (cobbles and boulders) and/or with extensive aquatic vegetation cover

Summary results for the sites examined along the mainstem and tributaries are presented in Table 4.

**Table 3: Summary of instream habitat recorded at mainstem and tributary survey sites, River Nairn 2010.**

|             | Instream Habitat |      |          |      |      |
|-------------|------------------|------|----------|------|------|
|             | Excellent        | Good | Moderate | Poor | None |
| Mainstem    | 1                | 3    | 3        | 1    | 0    |
| Tributaries | 4                | 11   | 2        | 1    | 2    |

Table 4 indicates that most of the areas surveyed along the mainstem and tributaries were in the upper three habitat ratings, Excellent/Good/Moderate; this indicates that there will be sufficient instream habitat for older salmon and trout parr.

The seven mainstem sites which had excellent to moderate instream habitat all had salmon parr present but older trout distribution was patchy with only three of the sites producing trout. Site, N4, on the mainstem (N4) was scored with poor habitat but a few salmon parr were present as were one or two older trout.

Nineteen tributary sites had excellent to moderate instream habitat and at the 11 of these sites which are accessible to salmon, parr were present at 10 sites. Salmon fry and parr were absent from the small burn between Loch Ceo Glas and Loch Duntelchaig (site N11). Site N9 had some salmon parr present but no salmon 0+ so this may well be the upper limit of salmon in the River Farnack. Trout parr were present at 16 of the 17 sites being absent from site N11, on the burn between Loch Ceo Glas and Loch Duntelchaig.

In the three sites (N7, N12, N27) on the tributaries indicated poor or no instream habitat, N7 on the Flichity Burn did have salmon 0+ present and a range of trout age classes present. The burn has been straightened over the years and dug out regularly to facilitate field drainage. There is little substrate left in the lower reaches with the bed consisting of silt and sand. At the time of the survey the vegetation along the banks was well grown and coupled with plants within the burn this provided some habitat for the fish. Sites N12 on the burn between Loch Duntelchaig and Loch a'Chlachain and N27 on the Cemetery Burn (Figure 8) both had no salmon present and the latter had no trout. Both burns are low in gradient and the substrate was almost entirely sand and silt with little or no vegetation available. The Cemetery Burn (Figure 8) has also been extensively canalised and dredged for agricultural drainage and suitable fish habitat is lacking along most of the lower reaches. However, salmon and trout were found further upstream at site N28 indicating that some adults do still access the burn.

**Figure 8: Cemetery Burn near EF site N27.**



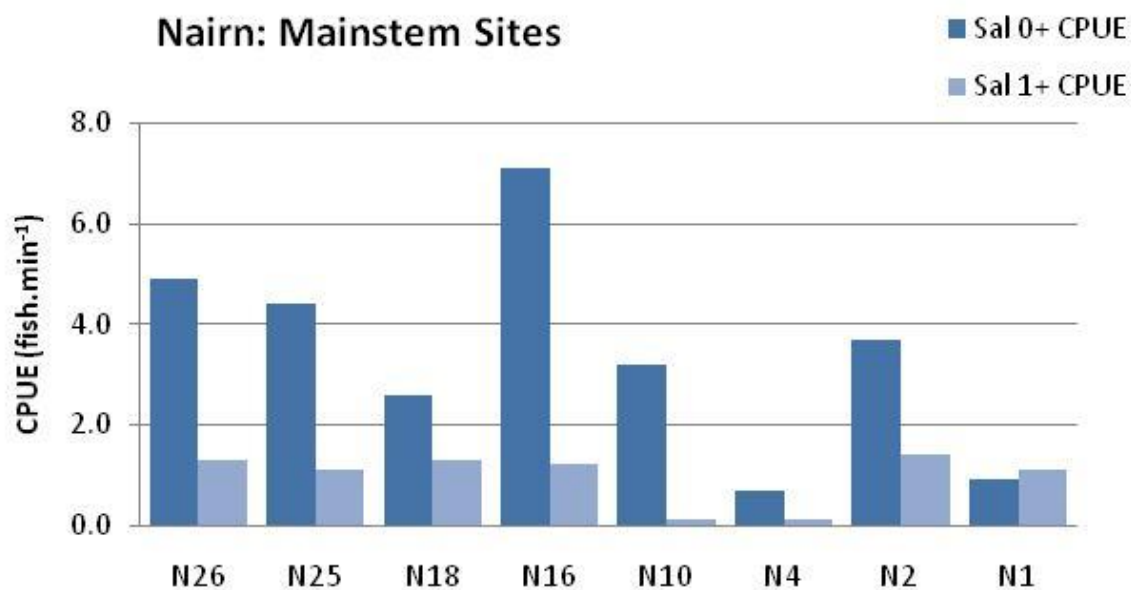
### 3.5 Fish Abundance

Relative fish abundance was determined by dividing the number of fish caught by the time fished ( $\text{fish}\cdot\text{min}^{-1}$ ) to provide an index of catch per unit effort (CPUE). The data for the mainstem Nairn sites are presented in Table 5 and Figures 9 and 10. The data for the tributaries is presented in Table 6 and Figures 11, 13 and 14.

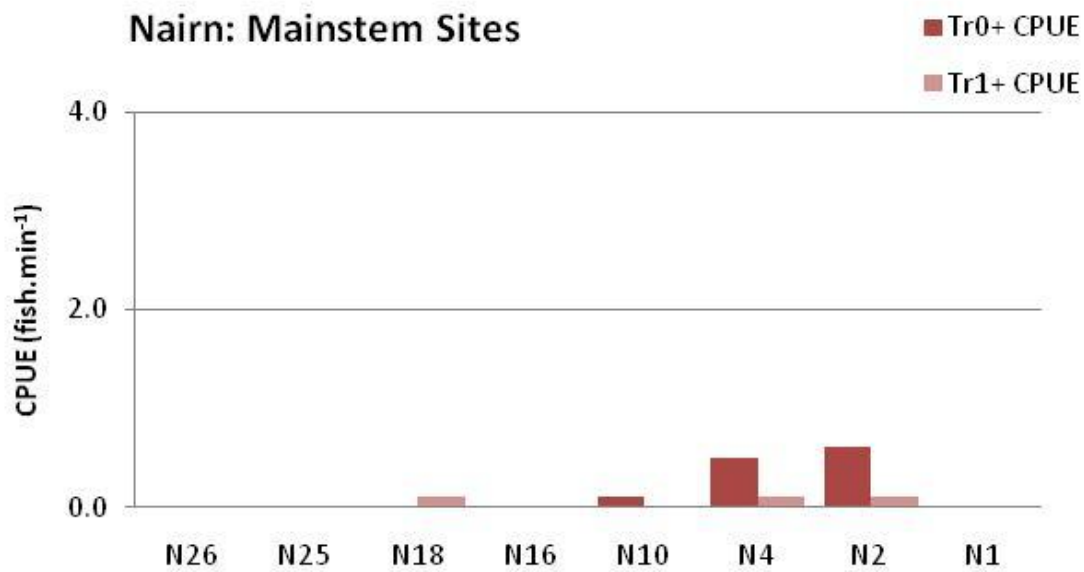
#### 3.5.1 Mainstem

**Table 4: Catch per Unit Effort (CPUE) ( $\text{fish}\cdot\text{min}^{-1}$ ) for salmon and trout at the mainstem electrofishing sites on the River Nairn, 2010.**

| Site | Salmon ( $\text{fish}\cdot\text{min}^{-1}$ ) |      |      | Trout ( $\text{fish}\cdot\text{min}^{-1}$ ) |      |      |      |
|------|--|------|------|---|------|------|------|
|      | 0+   | 1+   | 2+   | 0+  | 1+   | 2+   | 3+   |
| N26  | 4.90   | 1.30 | 0.00 | 0.00  | 0.00 | 0.00 | 0.00 |
| N25  | 4.40   | 1.10 | 0.00 | 0.00  | 0.00 | 0.00 | 0.00 |
| N18  | 2.60   | 1.30 | 0.00 | 0.00  | 0.10 | 0.00 | 0.00 |
| N16  | 7.10   | 1.20 | 0.10 | 0.00  | 0.00 | 0.00 | 0.00 |
| N10  | 3.20   | 0.10 | 0.10 | 0.10  | 0.00 | 0.00 | 0.00 |
| N4   | 0.70   | 0.10 | 0.10 | 0.50  | 0.10 | 0.00 | 0.10 |
| N2   | 3.70   | 1.40 | 0.00 | 0.60  | 0.10 | 0.00 | 0.00 |
| N1   | 0.90   | 1.10 | 0.40 | 0.00  | 0.00 | 0.00 | 0.00 |
| Mean | 3.44   | 0.95 | 0.09 | 0.15  | 0.04 | 0.00 | 0.01 |



**Figure 9: Catch per Unit Effort (CPUE) ( $\text{fish}\cdot\text{min}^{-1}$ ) for salmon at the mainstem electrofishing sites on the River Nairn, 2010.**



**Figure 10: Catch per Unit Effort (CPUE) (fish.min<sup>-1</sup>) for trout at the mainstem electrofishing sites on the River Nairn, 2010.**

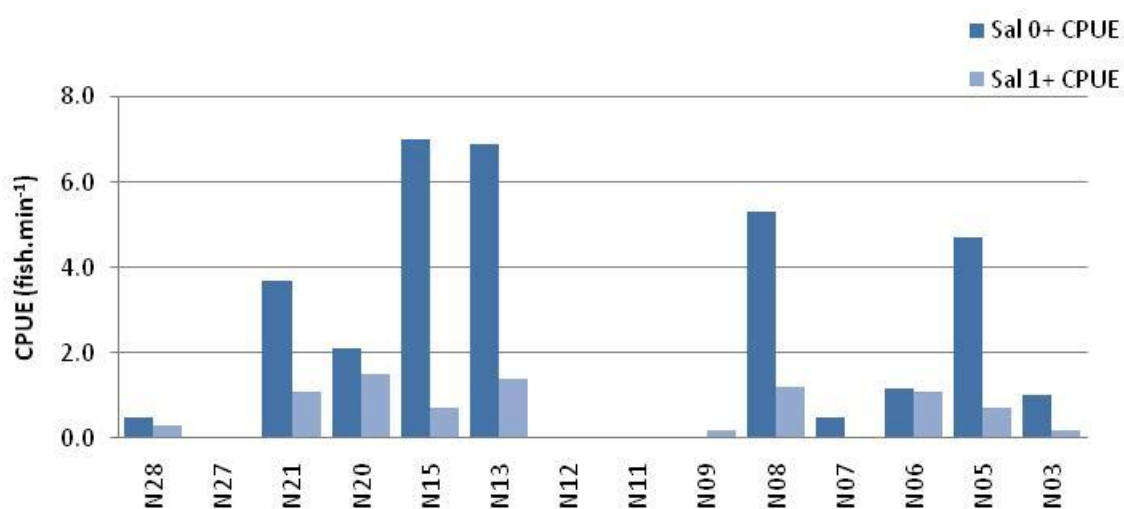
Eight sites on the mainstem Nairn and juvenile salmon were present at all eight sites indicating that suitable habitat for spawning and the juvenile life stages for salmon was present throughout the length of the mainstem. Four age classes of salmon were present including 0+, 1+ and 2+, and a single 3+ salmon found at site N8. Table 5 and Figure 9 show the CPUE for salmon. Mean CPUE for salmon 0+ was 3.4fish.min<sup>-1</sup> and for salmon 1+ of 0.95fish.min<sup>-1</sup>. Table 5 indicates that salmon 2+ were present at four survey locations (N16, N10, N4 and N1) and mean CPUE was 0.09fish.min<sup>-1</sup>.

Table 5 and Figure 10 indicate that catches of juvenile trout in the mainstem were much lower than for salmon and catches were limited to a few sites. Trout 0+ were present at three sites (N10, N4, N2) and mean CPUE was 0.15fish.min<sup>-1</sup>. Trout 1+ were also present at three sites (N18, N4, N2) and mean CPUE was 0.04fish.min<sup>-1</sup>. No 2+ trout were captured but a 3+ trout was captured at N4. One adult sea trout (440mm) was captured at N18.

### 3.5.2 Tributaries

**Table 5: Catch per Unit Effort (CPUE) (fish.min<sup>-1</sup>) for salmon and trout in the tributary electrofishing sites on the River Nairn, 2010. Sites (N14, N17, N19, N22, N23, N24) are above impassable waterfalls and man-made obstruction and are indicated by the shaded rows.**

| Site | Salmon (fish.min <sup>-1</sup> ) |     |     | Trout (fish.min <sup>-1</sup> ) |     |     |     |
|------|----------------------------------|-----|-----|---------------------------------|-----|-----|-----|
|      | 0+                               | 1+  | 2+  | 0+                              | 1+  | 2+  | 3+  |
| N3   | 1.0                              | 0.2 | 0   | 0.6                             | 0.2 | 0.1 | 0   |
| N5   | 4.7                              | 0.7 | 0   | 0.2                             | 0   | 0   | 0   |
| N6   | 1.2                              | 1.1 | 0   | 0.9                             | 0.2 | 0   | 0   |
| N7   | 0.5                              | 0   | 0   | 1.0                             | 0.2 | 0.2 | 0   |
| N8   | 5.3                              | 1.2 | 0.9 | 0.3                             | 0.1 | 0   | 0   |
| N9   | 0                                | 0.2 | 0.2 | 0.3                             | 0   | 0.1 | 0.2 |
| N12  | 0                                | 0   | 0   | 0.1                             | 0   | 0   | 0   |
| N11  | 0                                | 0   | 0   | 0.9                             | 0   | 0   | 0   |
| N13  | 6.9                              | 1.4 | 0   | 0.6                             | 0   | 0.1 | 0   |
| N14  | 0                                | 0   | 0   | 3.4                             | 1.2 | 0   | 0   |
| N15  | 7                                | 0.7 | 0   | 0.9                             | 0   | 0.6 | 0   |
| N17  | 0                                | 0   | 0   | 1.5                             | 1.1 | 0.1 | 0.5 |
| N19  | 0                                | 0   | 0   | 0.2                             | 1.1 | 0.1 | 0.1 |
| N21  | 3.7                              | 1.1 | 0.3 | 0                               | 0   | 0.1 | 0   |
| N22  | 0                                | 0   | 0   | 0.5                             | 0.6 | 0.3 | 0   |
| N23  | 0                                | 0   | 0   | 0.1                             | 0.1 | 0.1 | 0.1 |
| N24  | 0                                | 0   | 0   | 0                               | 0.1 | 0.3 | 0.1 |
| N20  | 2.1                              | 1.5 | 0   | 1.2                             | 0.2 | 0   | 0   |
| N27  | 0                                | 0   | 0   | 0                               | 0   | 0   | 0   |
| N28  | 0.5                              | 0.3 | 0   | 0.2                             | 0.1 | 0.2 | 0   |



**Figure 11: Catch per Unit Effort (CPUE) (fish.min<sup>-1</sup>) for 0+ and 1+ salmon on the tributary sites which are accessible to adult salmon within the River Nairn 2010.**

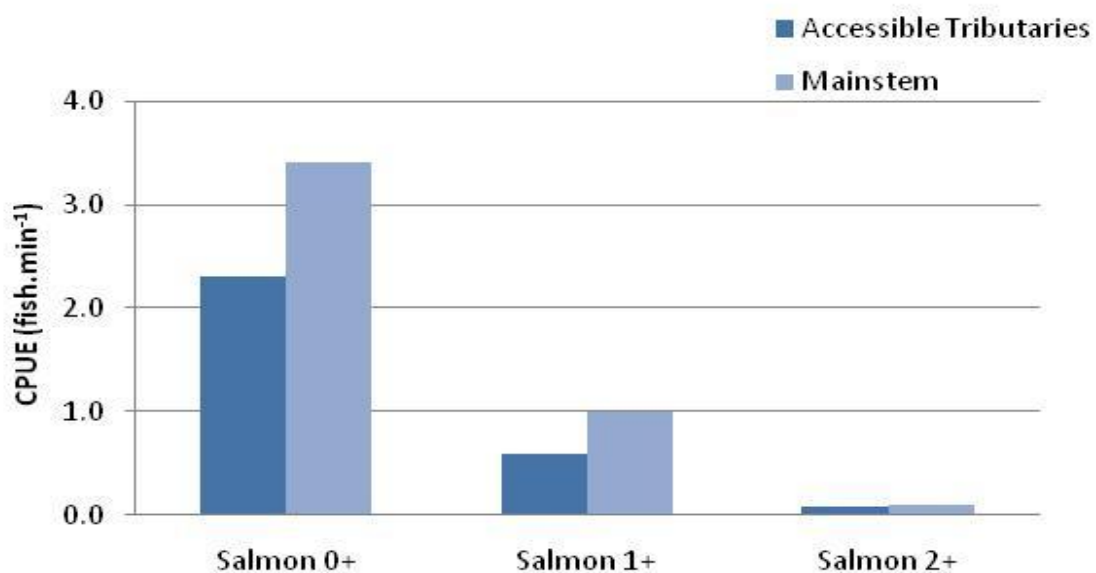


Table 6 provides the CPUE data for the survey sites examined throughout the tributaries of the River Nairn. Six sites were above impassable waterfalls and man-made obstructions and these are indicated in Table 6, for the analysis of juvenile salmon CPUE these sites are omitted and only the accessible sites are included in Figure 11. From Figure 11 it is evident that at three of the sites salmon were completely absent and the reasons for this have already been discussed (see section 3.3). Mean CPUE for salmon 0+ was 2.30fish.min<sup>-1</sup> and for salmon 1+ was 0.60fish.min<sup>-1</sup> (Table 7). Salmon 2+ were present at three sites (N21, N9, N8) and mean CPUE was 0.09fish.min<sup>-1</sup> (Table 7).

**Table 6: Mean CPUE (fish.min<sup>-1</sup>) for salmon 0+, 1+ and 2+ from mainstem electrofishing sites and tributary sites accessible to adult salmon on the River Nairn, 2010.**

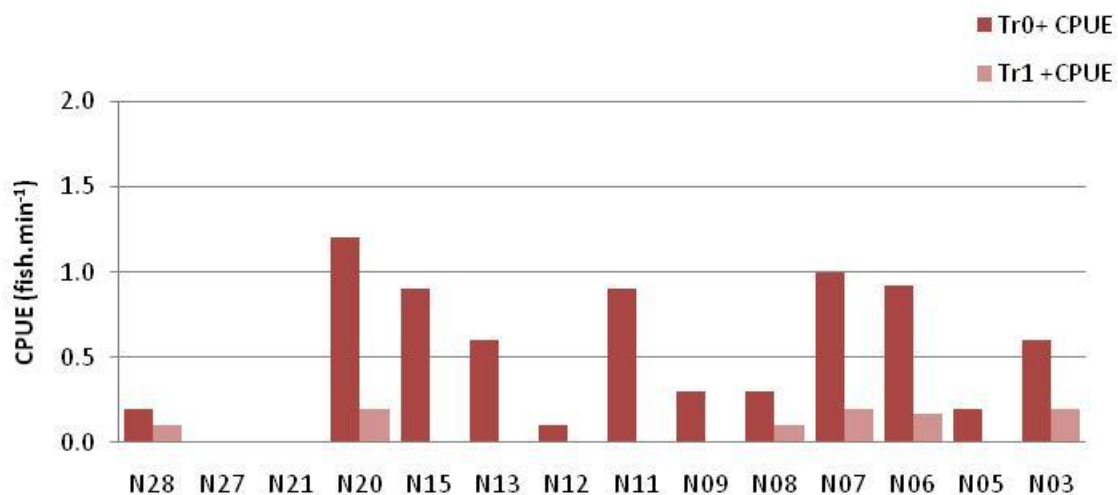
|                        | Mean CPUE (fish.min <sup>-1</sup> ) |           |           |
|------------------------|-------------------------------------|-----------|-----------|
|                        | Salmon 0+                           | Salmon 1+ | Salmon 2+ |
| Accessible Tributaries | 2.30                                | 0.60      | 0.09      |
| Mainstem               | 3.40                                | 1.00      | 0.10      |

Table 7 and Figure 12 compares the mean CPUE determined from electrofishing sites along the mainstem Nairn with the mean CPUE from sites accessible to adult salmon on the tributaries. It is evident from Figure 12 that mean CPUE is higher for salmon 0+ and salmon 1+ in the mainstem than in the tributaries. CPUE for salmon 2+ was much lower than the other age classes and similar in both the mainstem and the tributaries.



**Figure 12: Mean CPUE (fish.min<sup>-1</sup>) from mainstem electrofishing sites and tributary sites accessible to adult salmon on the River Nairn, 2010.**

Four age classes (0+, 1+, 2+ and 3+) of trout were captured in the tributaries, In general CPUE for each age class was lower than the equivalent salmon age class. Table 6 and Figure 13 provide the CPUE data for the survey sites examined throughout the tributaries of the River Nairn. Six sites were above impassable waterfalls and man-made obstructions and these are indicated in Table 6, for the initial analysis of juvenile trout CPUE these sites are omitted and only the accessible sites are included in Figure 13. From Figure 13 it is evident that at two of the sites (N27, N21) trout 0+ and 1+ were absent. Indeed trout were

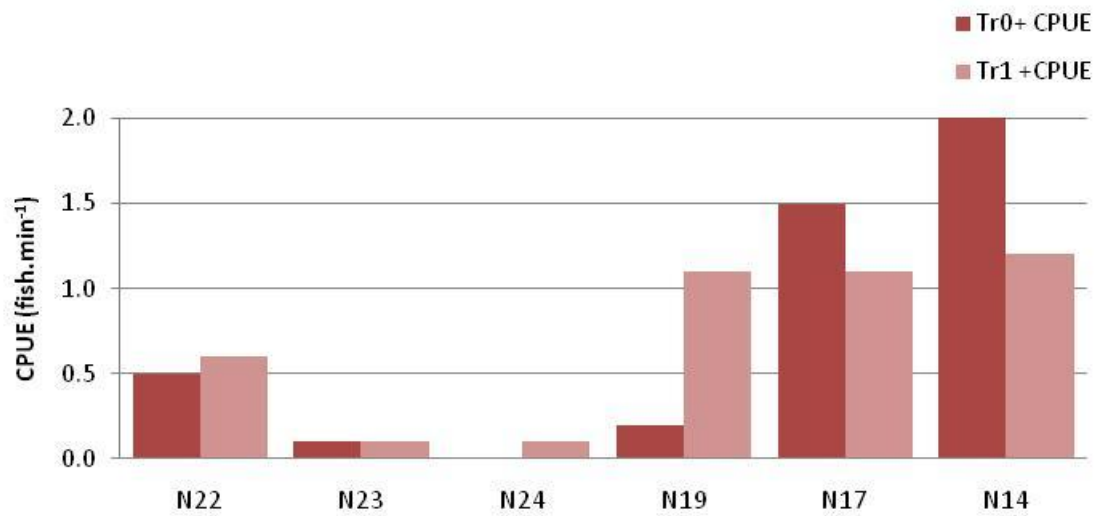


completely absent at N27 due to poor habitat (see section 3.4) while an older 2+ trout was captured at N21. Trout 0+ were present at the remaining sites and CPUE varied considerably (Figure 13), mean CPUE was 0.52fish.min<sup>-1</sup>. Trout 1+ were present at six sites and mean CPUE was 0.07fish.min<sup>-1</sup>, 2+ trout were present at seven sites and mean CPUE was 0.10fish.min<sup>-1</sup> and two 3+ trout were captured at N9.

The CPUE for the six sites surveyed in the tributaries above waterfalls and man-made obstructions is also presented in Table 6 and shown graphically in Figure 14. Trout 0+ were present at five of the sites and mean CPUE was 0.98fish.min<sup>-1</sup>, trout 1+ were present at all six sites and mean CPUE was 0.55fish.min<sup>-1</sup>, trout 2+ were present at five sites and mean CPUE was 0.19fish.min<sup>-1</sup>, and 3+ trout were at four sites giving a mean CPUE of 0.10fish.min<sup>-1</sup>. In general trout populations above the obstacles appeared to be in good condition.

The mean CPUE from electrofishing sites along the mainstem Nairn with the mean CPUE from sites accessible to sea trout and the sites above the obstructions is compared in Table 8 and Figure 15. It is evident from Figure 15 that mean CPUE is higher for all age classes of trout in the tributaries than in the mainstem. However, Table 8 and Figure 15 also show that

mean CPUE for each age class of trout was higher above the tributary obstructions than below.



**Figure 14:** Catch per Unit Effort (CPUE) (fish.min<sup>-1</sup>) for 0+ and 1+ trout on the tributary sites above waterfalls and man-made obstructions within the River Nairn 2010. F

**Table 8:** Mean CPUE (fish.min<sup>-1</sup>) for trout 0+, 1+, 2+ and 3+ from mainstem electrofishing sites and tributary sites on the River Nairn, 2010.

|                          | Mean CPUE (fish.min <sup>-1</sup> ) |          |          |          |
|--------------------------|-------------------------------------|----------|----------|----------|
|                          | Trout 0+                            | Trout 1+ | Trout 2+ | Trout 3+ |
| Mainstem                 | 0.15                                | 0.04     | 0.00     | 0.01     |
| Accessible Tributaries   | 0.52                                | 0.07     | 0.10     | 0.01     |
| Inaccessible Tributaries | 0.98                                | 0.55     | 0.19     | 0.10     |

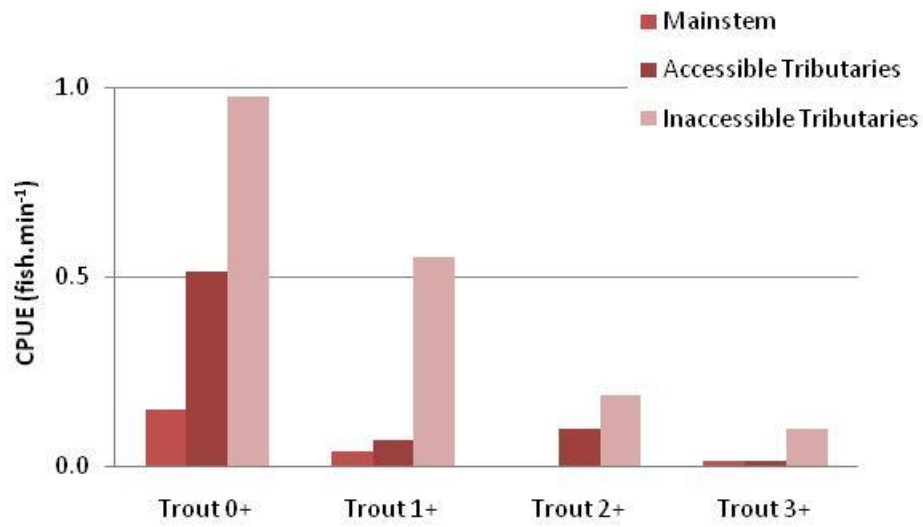


Figure 15: Mean CPUE (fish.min<sup>-1</sup>) for juvenile trout from mainstem electrofishing sites and tributary sites on the River Nairn, 2010.

#### 4. Discussion

The current survey indicated that salmon and trout were present throughout the River Nairn and its tributaries. Four age classes 0+, 1+, 2+ and 3+ were captured for each species. 0+ and 1+ were the most abundant age classes with 3+ salmon and trout limited to a few single individuals.

Salmon were found in the mainstem from the falls at Alltarder down to Nairn. Salmon were also present in most tributaries with the Brin and Farnack showing very good numbers. Trout were widespread in the catchment although they were less prevalent in the mainstem than salmon. Eels, Brook lamprey and 3-spined-stickleback were also caught at a few locations during the 2010 survey.

A number of obstructions to fish passage were identified in a previous habitat survey of the Nairn by Mackay (2000) and their effect on fish passage was examined further during the current survey.

In the Craggie and Drummore burns access was limited by waterfalls and no salmon were found above the falls. After inspection of both waterfalls it seemed unlikely that sea trout would ascend either. However, the trout numbers above the Craggie falls were very good indicating a healthy spawning population.

Within the Duntelchaig system the current survey did not find salmon beyond Loch a' Chlachain. There is a Dam on Loch Duntelchaig fitted with a fish ladder but some further inspection of the facility maybe worthwhile to ensure it is passable for all migratory fish.

A weir plus waterfall on the Cawder Burn also limited the upstream range of salmon and this is a more difficult structure. The weir has been built along the top of the waterfall to provide water for the Brackla distillery. An attempt to build a fish pass in the structure has also been made. No salmon were found above the structure and low numbers of trout indicating they would be a resident population with no sea trout input. Clearly improving access through a better fish pass or removal of the weir would open up considerable spawning and juvenile habitat for both salmon and sea trout. However, the waterfall may have provided a natural impassable barrier to salmon and sea trout before the weir was added. Further assessment of the structure is recommended.

An additional barrier to migration was found under a bridge on the Mid Lairgs Burn. This consisted of a one metre high concrete bridge apron and on initial inspection it was considered impassable to salmon and sea trout although under certain flow conditions sea trout may ascend at the left bank side. The electrofishing site (N14) upstream produced no salmon but very good numbers of trout 0+ and 1+ so there may be some access above the structure by sea trout. However, the habitat was excellent with good undercut banks and draped vegetation providing ideal cover for young trout. Further assessment of the apron using SEPA barrier methodology is required and then development of remedial options to improve fish access.

Poor habitat also affected fish numbers in one particular tributary, the Cemetery Burn. This burn has been subjected to canalisation and dredging over the years and much of the

natural substrate has been lost. It was particularly bad in the lower reaches as it flows through Nairn and no fish were found at the survey site. Further upstream some pockets of better fish habitat still remained and both salmon and trout were found. Clearly salmon and trout still utilise the burn but returning the burn to its original state would be a huge task. However, it may be worth exploring further.

The current survey utilised a timed electrofishing approach due to delays caused by wet weather during late summer 2010. The technique allowed good coverage of the catchment and also provided some information on relative abundance using catch per unit effort (CPUE). The mainstem of the Nairn is clearly an important spawning and rearing area for salmon. The CPUE data also indicated that the two larger tributaries the Brin and the Farnack are also important. Salmon were also found in good abundance in the lower reaches of the burn from Loch a'Chlachan, the Cawder Burn below the weir, the Mid Lairgs Burn and the Flichity Burn. A good catch was also evident in the Geddes Burn despite the reports of American signal crayfish in the burn although none were observed in the current survey. So in general salmon are accessing all the areas available and where good spawning and juvenile habitat is present good numbers of fish are found.

The pattern for trout was different. In general CPUE for trout was lower than for salmon when equivalent age classes were compared. Trout were limited in the mainstem although it is highly likely the deeper pools in the mainstem will harbour larger brown trout and sea trout. Most of the trout were caught in the tributaries which offer more typical trout habitat, undercut banks, tree roots and draped vegetation. The smaller burns such as the Flichity, Milton and Geddes often produced good catches which was encouraging given that they have all been straightened and dredged for agricultural drainage purposes. Indeed some dredging of the Nairn and Milton Burn junction had been undertaken shortly before the current survey leading to significant loss of substrate. Ensuring any further dredging is stopped or carried out in a more fish sympathetic way and raising awareness among local farmers and estate managers of the importance of these burns for trout populations is a high priority.

One surprising finding from the survey was the CPUE for trout was higher above the waterfalls and obstructions than below. This may indicate some sea trout influence on the Mid Lairgs Burn but otherwise it was a rather surprising result since resident populations usually have a smaller size at spawning and therefore fewer eggs leading to less fry the following year.

In general the Nairn and its tributaries appear to have a healthy stock of salmon and trout. There is some room for improvement through encouraging better agricultural practises and removal of some man-made structures to improve fish access.

## 5. Recommendations

Electrofishing provides a useful insight into the current status of fish populations within a river and through time information on trends in the population and smolt outputs can be calculated. Problem areas where stocks are limited, or damaged due to natural or man-made events can also be identified and some remedial actions can be considered. The current survey indicated that juvenile salmon and trout stocks were well distributed throughout the catchment and abundance was also encouraging. The current survey used a

quick timed electrofishing approach to cover the catchment in a limited time. The approach provided a good over view of the rivers stocks but to add value in the future a establishing a set of core of sites to provide population density data would be beneficial. This could be visited regularly and provide estimates of smolt output and trends in population. However, yearly electrofishing surveys are expensive to maintain and perhaps a three or five year programme may be more appropriate.

Most of the accessible habitat was utilised by salmon and trout however, there some areas where access could be improved, Cawder Burn, Mid Lairgs Burn and also where land management practices could also be improved.

1. Devise plan for future electrofishing surveys,
2. Review problematic access points and develop remedial actions if possible and appropriate,
3. Identify areas with damaged or degraded habitat and develop remedial plans.



## 6. Acknowledgements

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