NESS & BEAULY FISHERIES TRUST

River Beauly Catchment

Electro-fishing Results 2015

Waterfall on the Breakachy Burn. Photo N. Barker

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1 INTRODUCTION

In the summer and autumn of 2015, the Ness and Beauly Fisheries Trust (NBFT) undertook an extensive programme of electro-fishing in the Beauly catchment. In total, 35 surveys were executed: twenty fully quantitative and fifteen timed. See **Appendix 1** for a visual representation of site locations and **Appendix 2** for individual site photos.

2 ELECTRO-FISHING METHODOLOGY

2.1 FULLY QUANTITATIVE SURVEYS

Back-pack electro-fishing equipment was utilised during the 2015 season. Fully quantitative surveys were carried out and recorded in accordance with the protocols established by the Scottish Fisheries Co-ordination Centre (SFCC). Where practicable, survey areas were isolated by placing stop nets at the upstream and downstream extent of the length to be fished to prevent fish from evading capture and escaping from the area.

The survey area was fished through in a methodical and thorough manner, with fish being retained in water filled buckets. Captured fish were lightly anaesthetised in order to facilitate species identification and accurate fork length measurements (mm). In most cases, the area was fished through a second and third time in an attempt to remove the majority of fish from the area and to provide a depletion curve for each species. By applying stream dimensions such as wetted width along with numbers of fish captured in successive fishing runs to a statistical formula, an estimate fish density (number of fish/100m^2, the Zippin value) was calculated.

2.2 TIME DELINEATED SURVEYS

Timed surveys involved electro-fishing in an upstream direction in a thorough and methodical manner for a set period of time, usually five or ten minutes. At the end of each time period the number and species of fish was recorded and divided by the number of minutes fished provide a catch per unit of effort value (CPUE).

3 DATA ANALYSIS

In their treatment of fully quantitative survey data, NBFT have historically ranked fish densities under the classification scheme described by the SFCC. NBFT now have a sizeable data set in terms of fish

densities within the Beauly catchment. Analysis of these data has enabled NBFT to produce their own classification scheme based purely on data gathered from past fish surveys in the Beauly district. Fish densities were classified by splitting the results of all fully quantitative surveys since 2006 in to quartiles. The quartiles of a set of values are the three points that enable data sets to be divided in to four groups, in this case: poor, moderate, good and excellent. Fish densities with a value of zero were omitted from analysis and were simply classed as absent. **Table 1** below shows the classification scheme for the Beauly catchment.

Table 1 – Density Classification of Juvenile Salmonids on the Beauly Catchment

Salmon Fry (No/100m^2)	Classification	Salmon Parr (No/100m^2)	Trout Fry (No/100m^2)	Classification	Trout Parr (No/100m^2)
0	Absent	0	0	Absent	0
0.1 – 15	Poor	0.1 - 10	0.1 - 2	Poor	0.1 - 1
15.1 – 52	Moderate	10.1 - 21	2.1 – 8	Moderate	1.1 - 4
52.1 – 88	Good	21.1 - 37	8.1 - 25	Good	4.1 – 11
88.1 – 398	Excellent	37.1 - 58	24.1 - 219	Excellent	11.1 – 60

4 RESULTS

4.1 STRATHFARRAR

4.1.1 Culligran Burn (CULL1)

Previous reports by NBFT have highlighted the annual variation of salmon fry density at Site CULL1. Until 2014, salmon fry density ranged from 13/100m^2 to 146/100m^2. The 2015 survey generated a density of 1/100m^2; the lowest ever recorded at CULL1. With each quantitative survey, biologists carry out a site specific habitat survey that enables the Trust to view changes to the site over time. In reviewing this data, it would appear that the site had changed considerably since 2014. This was most pronounced in terms of the substrate matrix changing from a cobble/boulder dominated matrix to one dominated by pebble/gravel and cobbles. Spate conditions in the winter of 2014 may have contributed to 'redd washout'.

Density of salmon parr (1++) has remained more stable (see **Figure 1**). The 2015 result of 28/100m^2 is above average for the site (26/100m^2) and would be classed as 'good' under the NBFT density classification scheme.

Densities of juvenile trout remain stable in low densities. It should be borne in mind that this almost certainly an artefact of site selection as the surveys target juvenile salmon habitat as opposed to trout habitat.

When looking at the age structure of juvenile salmon at CULL1 (see **Figure 2**), it is clear that the most prevalent age group are 1+ parr. A single 2+ salmon parr was captured from the site which would suggest that the majority of salmon will smolt at two years old. This is in line with the results from the scale reading programme of adult salmon from the Farrar catchment where around 53% of the scale samples were seen to have 'smolted' at two years old.

Low numbers of eels were also captured at CULL1 generating a minimum density estimate of 2/100m^2.

Figure 1 – Densities of Juvenile Salmon and Trout from Site CULL1 (Culligran burn)

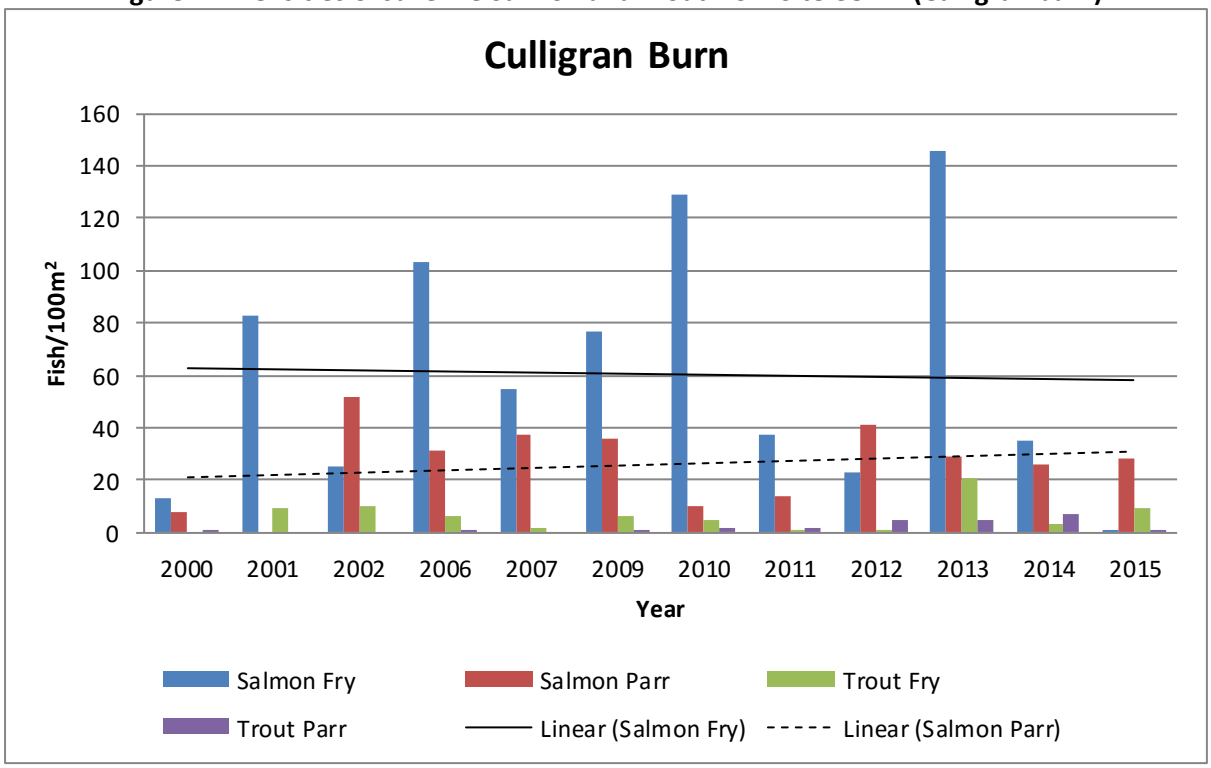
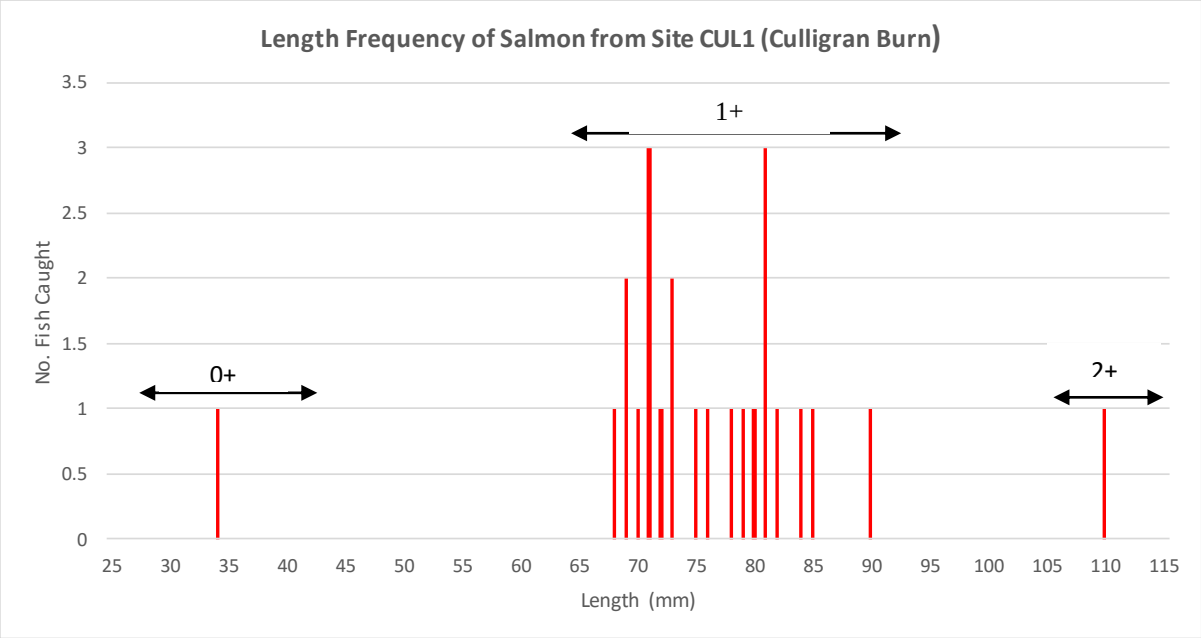


Figure 2 – Length Frequency Histogram of Salmon from Site CULL1.



4.1.2 Uisge Misgeach (UM5 & UM6)

As previously documented, Site UM5 (lower site) is far more suited to salmon fry with its fine substrate matrix composed of gravel/pebble and shallow depth with a flow type tending towards the higher velocity category of run/riffle. The 2015 survey at UM5 generated a salmon fry density of 27/100m^2. This is the lowest density of salmon fry seen at UM5 since 2005 and is below the average density of 47/100m^2. Indeed, it is towards the lower end of the historical range of 7/100m^2 and 97/100m^2. The 2015 salmon fry density for UM5 would be classed as 'moderate'. Again, when examining the site specific habitat data, it would appear that UM5 may have suffered from a degree of redd washout in the winter of 2014. Whilst there was no perceived change in the substrate composition, flow types or water depths, areas of the substrate matrix were described as being 'unstable'. When reviewing the habitat data for UM5, this is the first time the variable has been recorded. It remains to be seen what effect this will have on the Site in years to come.

Density of salmon parr (1++) was also disappointing. The 2015 survey generated a salmon parr density of 3/100m^2; the lowest recorded since 2003 and would be classed as 'poor'. It is entirely possible that high water events may have displaced some of the older year classes of salmon from UM5. Density of juvenile trout remain stable in low numbers.

When examining the age composition of juvenile salmon from UM5, **Figure 4** clearly shows that salmon fry was the most abundant year class. All parr from UM5 were aged 1+. The reason for the lack of 2+ parr from the site remains unclear.

Figure 3 – Densities of Juvenile Salmon and Trout from Site UM5 (Uisge Misgeach – Lower Site)

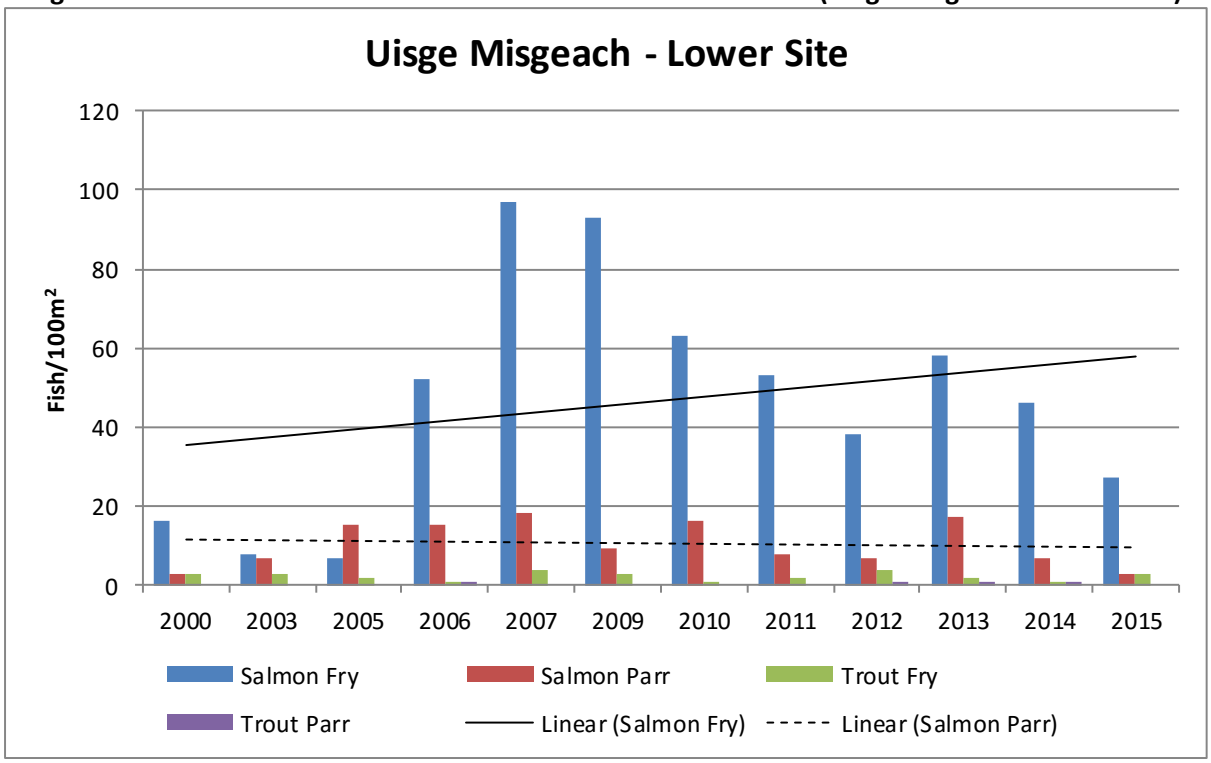
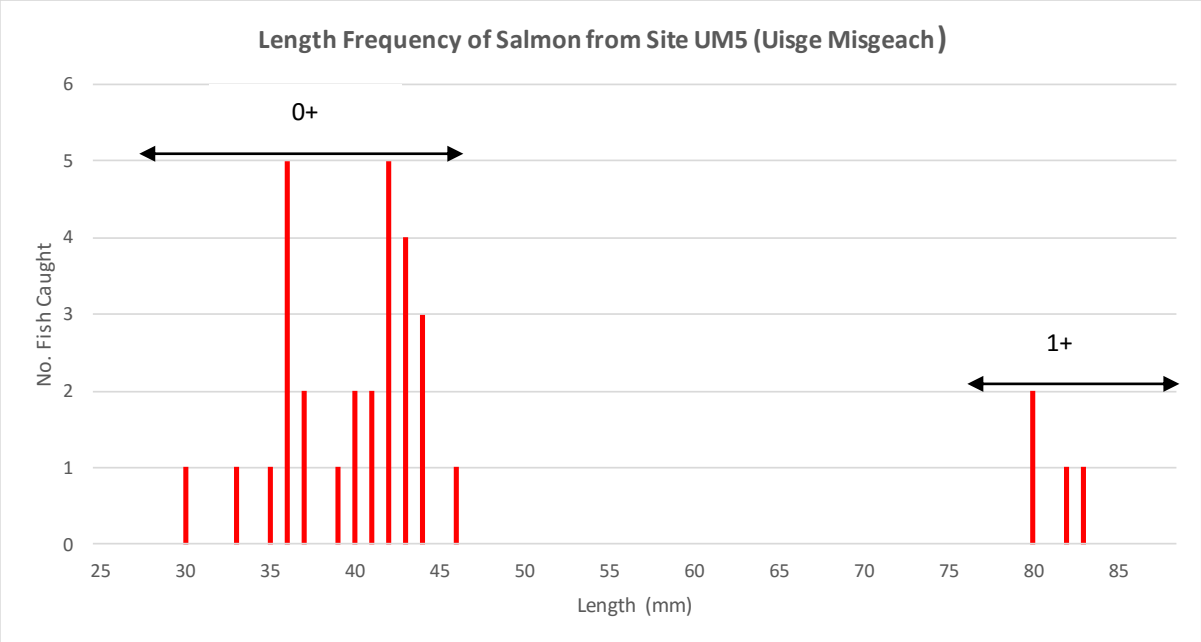


Figure 4 – Length Frequency Histogram of Salmon from Site UM5



In contrast to UM5, Site UM6 is more suited to older year classes of salmon with its larger substrate and very fast flows. The salmon fry density of 28/100m^2 was the highest recorded since 2009 and would be classed as 'moderate' (see **Figure 5**). Indeed, the fry density is towards the upper end of the historical range for the site (0/100m^2 – 51/100m^2) and above the average density of 13/100m^2. This is an interesting result given what was seen at UM5. Reviewing site specific habitat data showed there were no major differences to the habitat at UM6. Whilst spawning media is present at UM6, it is very patchy in its distribution. It would appear that the limited spawning media present at UM6 was well utilised in the winter of 2014.

Age composition of salmon at UM6 was dominated by two year classes: 0+ and 1+ (see **Figure 6**). Numbers of 2+ salmon parr were very low. Reasons behind the low numbers of 2+ may be explained by the decline in salmon fry in recent years.

No other fish species were captured from Uisge Misgeach in 2015.

Figure 5 – Densities of Juvenile Salmon and Trout from Site UM6 (Uisge Misgeach)

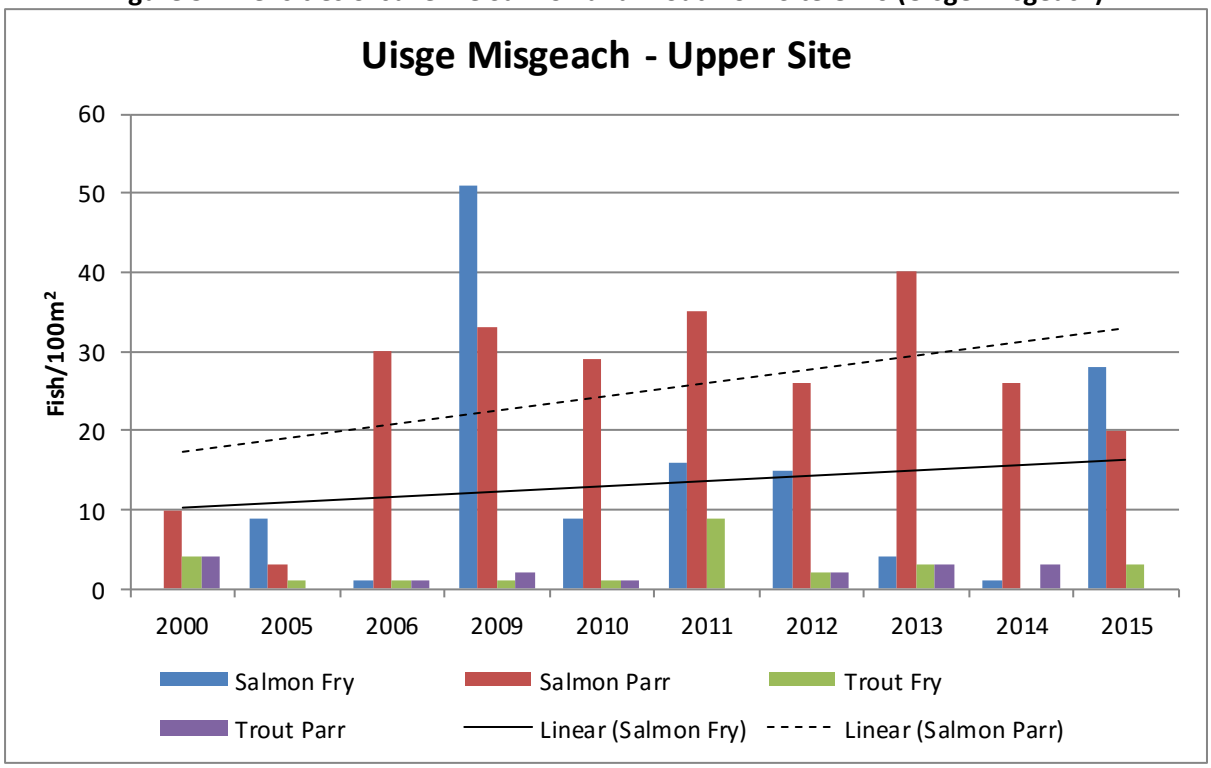
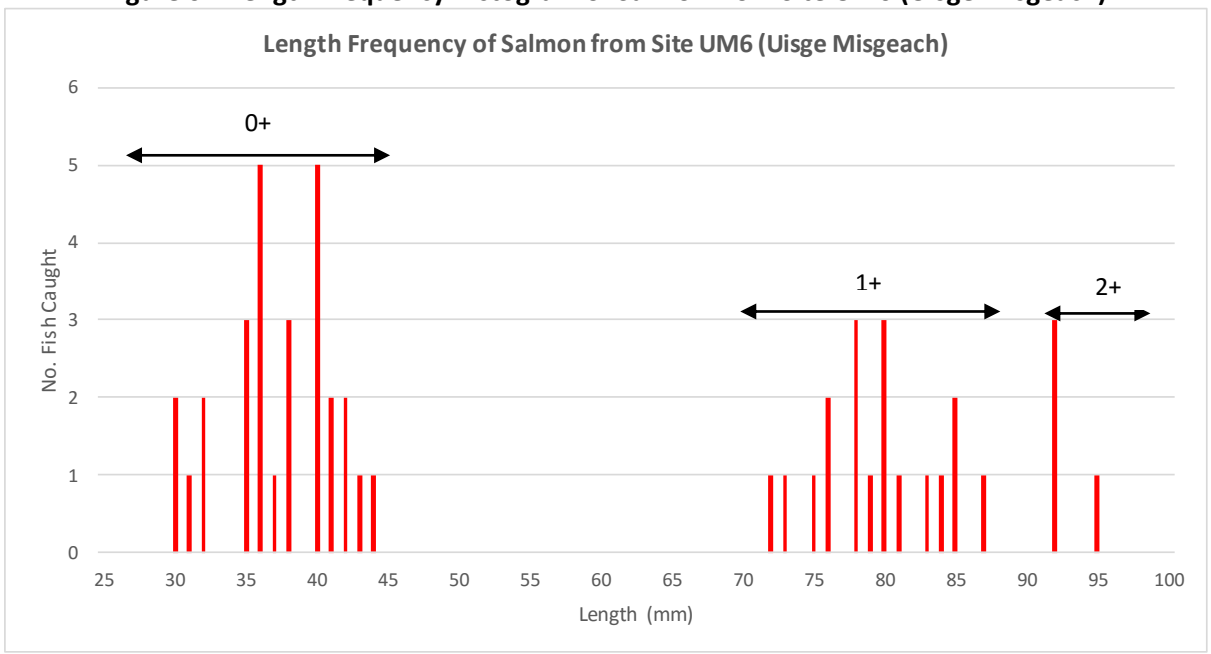


Figure 6 – Length Frequency Histogram of Salmon from Site UM6 (Uisge Misgeach)



4.1.3 Allt Choire a' Mhuillidh (ACM2)

The available habitat at the Allt Choire a' Mhuillidh site presents excellent habitat for older year classes of juvenile salmon and trout with excellent instream and bankside fish cover. Spawning habitat is restricted to the lower 200m of the burn and as such; historical results from ACM2 have been dominated by older year classes of parr. Following a 'good' salmon parr (1++) density of 25/100m^2 in 2014, it is disappointing to note the reduced density of 8/100m^2 generated from the 2015 survey (see **Figure 7**) that would be classed as 'poor'. This result is towards the lower end of the historical range (0/100m^2 – 25/100m^2) and below the average density of 13/100m^2. The site specific habitat survey showed the site to be stable and the precise reasons for the downturn in parr density remains unclear. Salmon fry were recorded as absent in 2015.

Although present in 2015, trout fry and trout parr were observed in low numbers of 3/100m^2 that would be classed as 'poor' and 'moderate' respectively.

Age structure of salmon in 2015 showed two year classes of salmon: 1+ and 2+ (see **Figure 8**). 1+ were clearly the most abundant with very few 2+ salmon parr.

No other fish species were captured from Allt Choire a' Mhuillidh in 2015.

Figure 7 – Densities of Juvenile Salmon and Trout from Allt Choire a' Mhuillidh (ACM2)

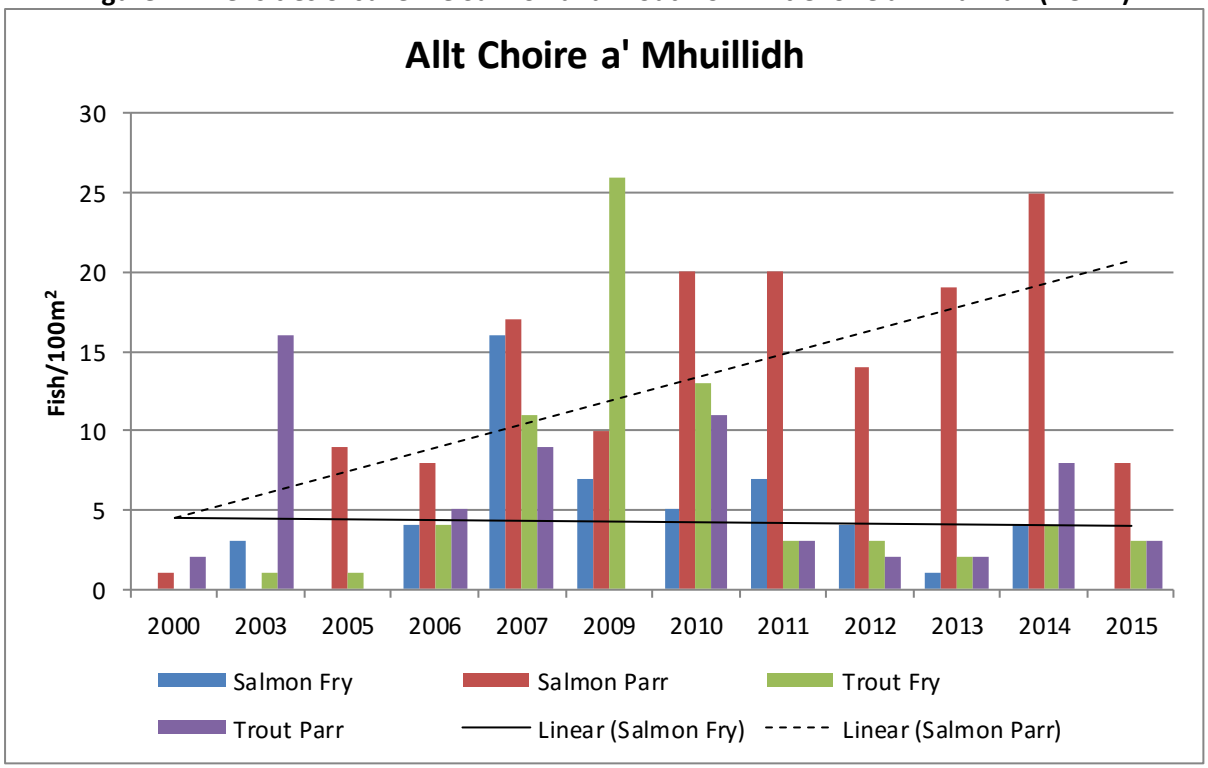
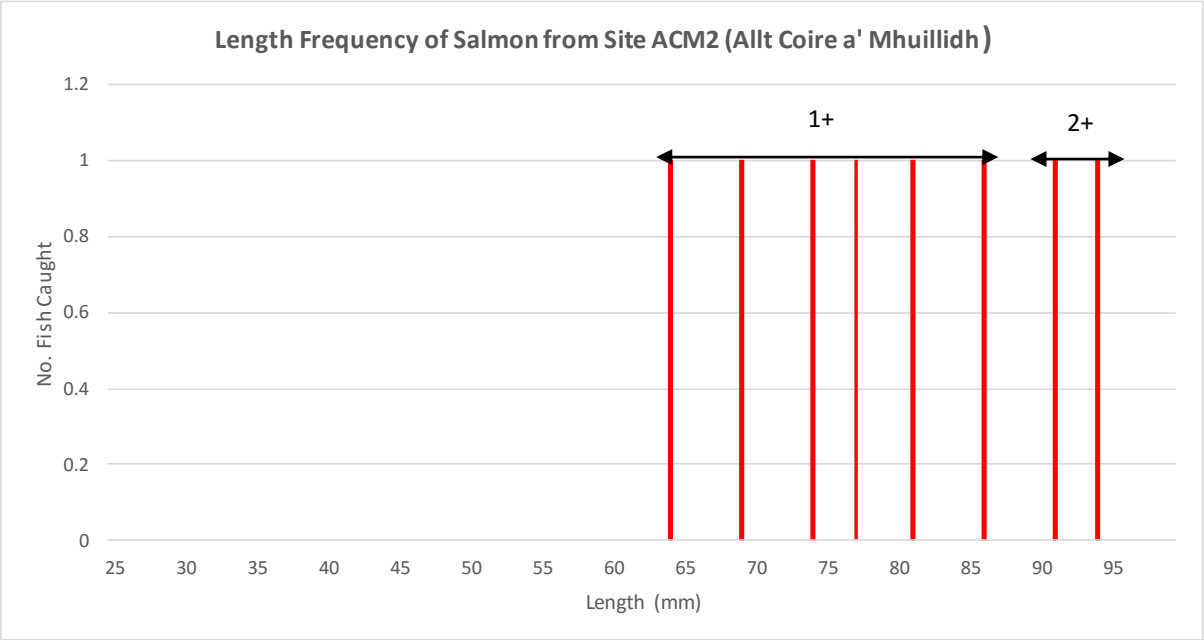


Figure 8 – Length Frequency Histogram of Salmon from Site ACM2 (Allt Choire a' Mhuillidh)



4.1.4 Allt Innis a' Mhuillt (AIM2)

In 2014, the quantitative survey conducted on Allt Innis a' Mhuillt generated a 'good' density of salmon fry. The 2015 survey showed salmon fry to be absent. It would appear that spawning in the vicinity of AIM2 is intermittent. There were no perceived changes to the habitat in 2015 that may suggest redd washout. NBFT intend to monitor this situation closely in the coming years.

In terms of salmon parr (1++) there was a slight increase in numbers from 36/100m^2 in 2014 to 41/100m^2 in 2015. These results are extremely encouraging given that the burn was essentially devoid of juvenile salmon until 2005. The 2015 salmon parr density would be classed as 'excellent'.

Length profiling and examination of scales revealed the presence of two year classes from AIM2 (see **Figure 10**). The most abundant year class were 1+ whilst 2+ accounted for approximately 38% of the total parr captured from AIM2.

No other fish species were captured from Allt Innis a' Mhuillt in 2015.

Figure 9 – Densities of Juvenile Salmon and Trout from Site AIM2 (Allt Innis a' Mhuillt)

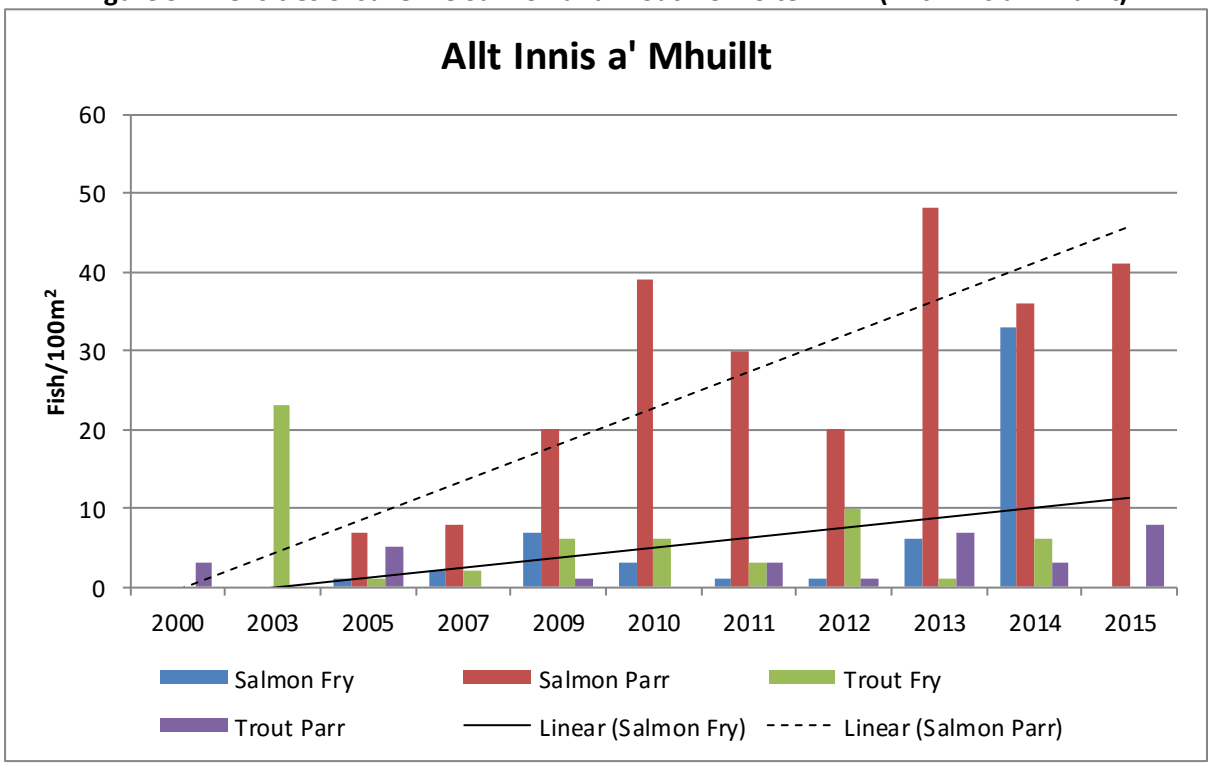
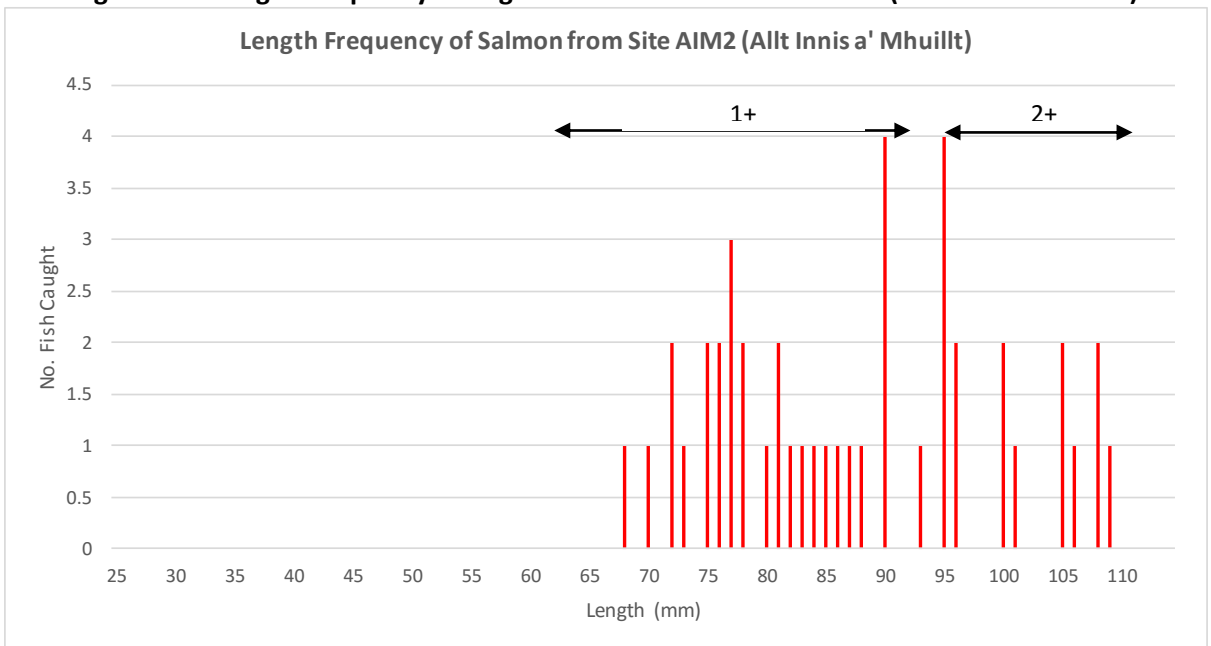


Figure 10 – Length Frequency Histogram of Salmon from Site AIM2 (Allt Innis a' Mhuillt)



4.1.5 Neaty Burn (NEA1)

Despite being very heavily abstracted in its headwaters, the Neaty Burn supports a population of juvenile salmon and trout. **Figure 11** clearly shows that salmon fry density fluctuates year on year. The 2015 salmon fry density of 29/100m^2 is the third lowest result recorded since 2000 yet within the historical range of 0/100m^2 to 117/100m^2. The 2015 salmon fry density would be classed as 'moderate'.

With the exception of 2007, density of salmon parr (1++) have been typically 'poor' or absent. The 2015 density of 3/100m^2 would also be classed as 'poor'. As previously mentioned, the extremely low flows seen at NEA1 and its close proximity to excellent mainstem habitat could go some way in explaining the continued poor densities of salmon parr.

Density of juvenile trout remains very stable in low numbers.

Examination of year classes during the 2015 survey shows two year classes being present: 0+ fry and 2+ parr. The absence of 1+ parr may back up the theory of older year classes of parr leaving their natal stream for the relative sanctuary of the mainstem.

A low density of eels (2/100m^2) was also generated from the 2015 survey at NEA1.

Figure 11 – Densities of Juvenile Salmon and Trout from Site NEA1 (Neaty Burn)

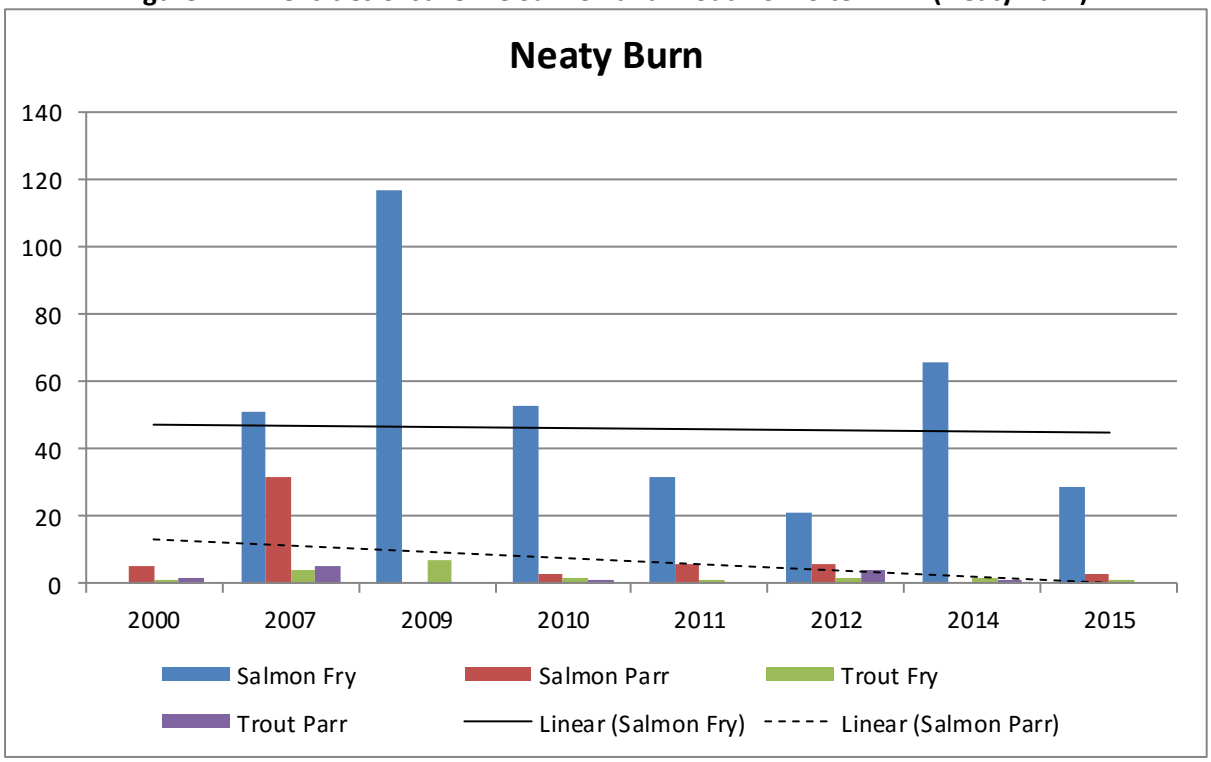
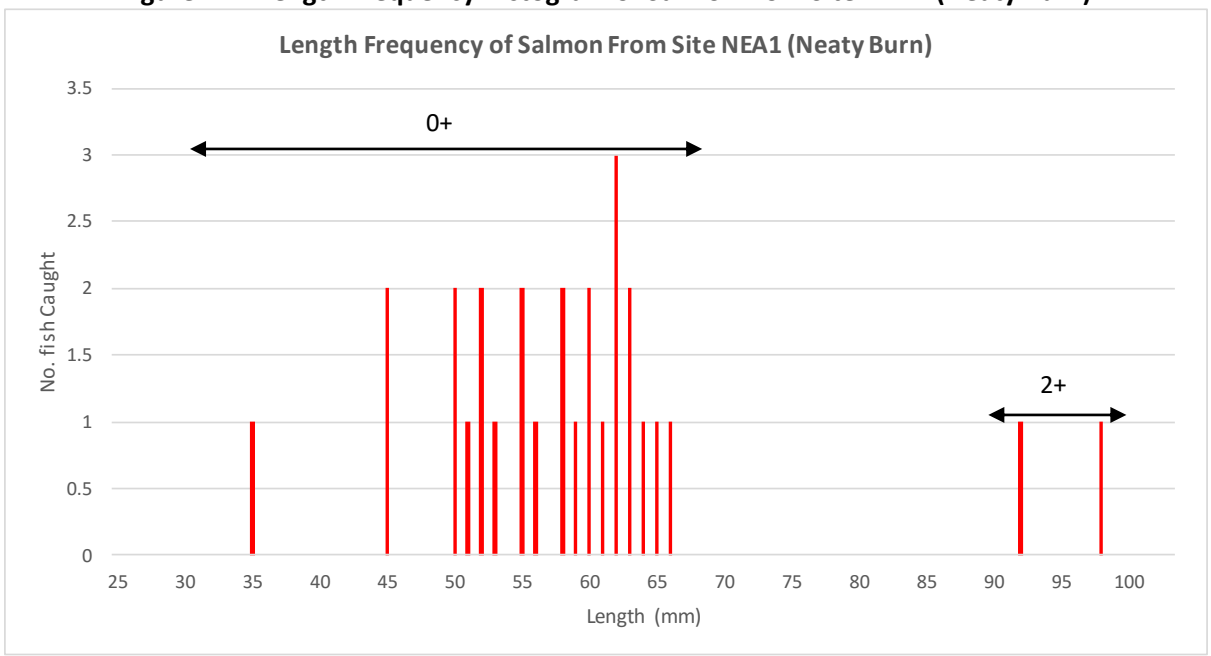


Figure 12 – Length Frequency Histogram of Salmon from Site NEA1 (Neaty Burn)



4.1.6 Deanie Burn (DEA1)

Despite the presence of some excellent juvenile salmon habitat, densities of all year classes of salmon have been absent/poor since surveys began in 2000. 2015 was no exception to this with a single 2+ salmon parr being captured. The 2014 report detailed previous efforts in examining the causes behind the lack of salmon production in the Deanie Burn. Acidic water conditions have essentially been ruled out due to the results gained by Aquateraa Ecology in 2010 and water quality testing in 2012. However, to completely dismiss acidity being the cause; there would be a need to have yearlong water quality testing although the associated costs behind this may prove prohibitive.

Another more probable cause is the lack of flow emanating from the Deanie Burn. Even under very high flows, there is little flow to attract salmon to the burn. NBFT are still seeking a solution to this issue.

Density of juvenile trout remains stable in 'moderate' numbers.

4.2 LOWER BEAULY

4.2.1 Bruiach Burn (BRU2)

Following a 'moderate' density (42/100m^2) of salmon fry in 2014, it was encouraging to record a density of 87/100m^2 that would be classed as 'good'. In 2015, there was evidence that winter floods had changed the bed composition at BRU2 with an influx of some finer gravel and pebble although some larger boulder appears to have been washed out. Whether these flood events had a detrimental impact on fry density remains to be seen. Overall, there appears to be a trend for increasing fry density at BRU2 (see **Figure 13**).

Salmon parr (1++) density also saw an increase from 26/100m^2 in 2014 to 39/100m^2 in 2015. The most recent density would be classed as 'excellent'. The washout of boulders from the does not appear to have affected parr density although NBFT intend to monitor this situation closely in the coming years.

In terms of the age structure of salmon at BRU2, there is almost certainly three year classes present: 0+, 1+ and 2+. NBFT were unable to ascertain the exact 'break point' between 1+ and 2+ parr. The information presented in **Figure 14** should therefore be treated with a degree of caution. What can be said with certainty is that 1+ parr were more abundant than

2+ parr suggesting that most salmon from this area of the Bruiach Burn will smolt at two years old.

Density of trout fry has reduced each year since the very high density observed during the 2013 survey (184/100m^2). The 2015 survey generated a trout fry density of 4/100m^2 that would be classed as 'moderate'. Density of trout parr (1++) also saw a reduction from 13/100m^2 in 2014 to 9/100m^2 in 2015. The most recent trout parr density would be classed as 'good'.

Low numbers of eels were also captured generating a minimum density estimate of 5/100m^2.

Figure 13 – Densities of Juvenile Salmon and Trout from Site BRU2 (Bruiach Burn)

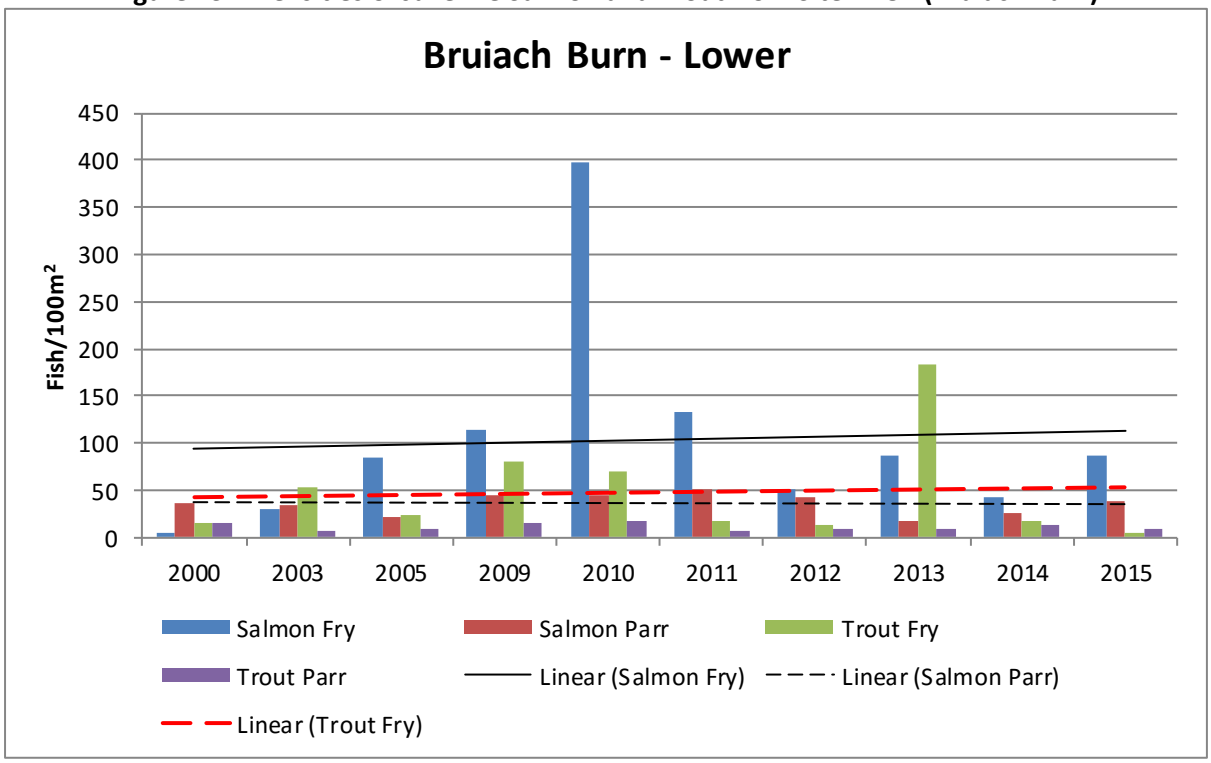
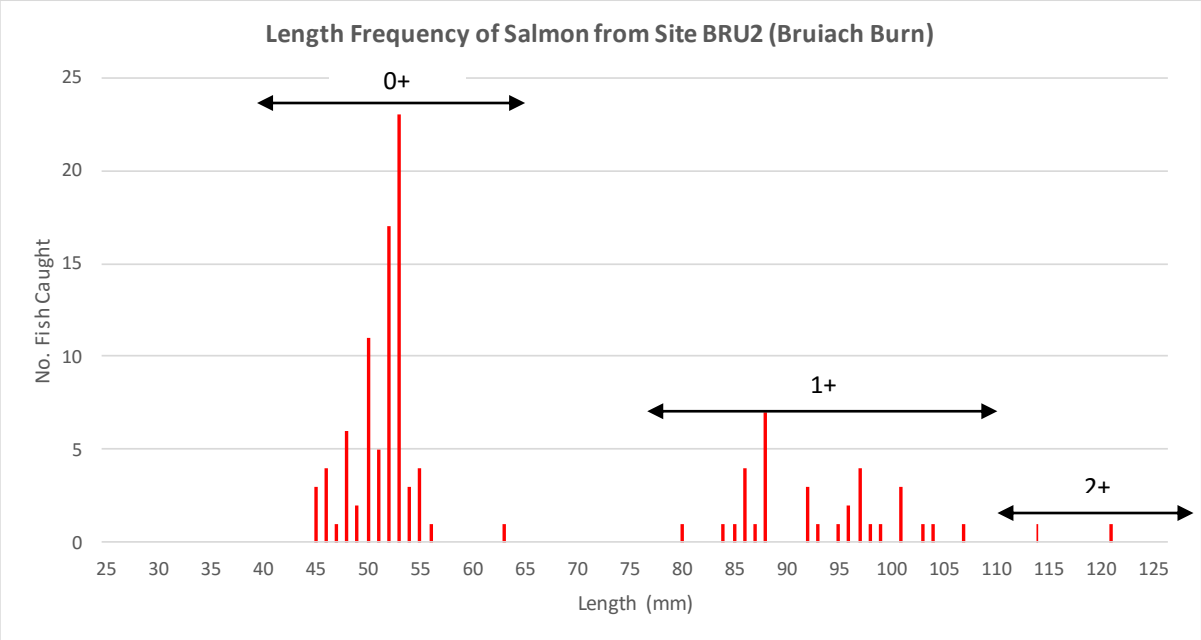


Figure 14 – Length Frequency Histogram of Salmon from Site BRU2 (Bruiach Burn)



4.2.2 Belladrum Burn (BEL3)

For the second year running, Site BEL3 has produced a disappointing density of salmon fry. Although numbers increased from 13/100m^2 in 2014 to 24/100m^2 in 2015; these results are a far cry from what the site has produced in the past (see **Figure 15**). The 2015 salmon fry density would be classed as 'moderate'. Like many of the burns in the Beauly catchment, changes to the site were observed in 2015. The most obvious change at BEL3 was an increase in finer substrate types and a reduction in larger boulders and cobbles. Again, what impact this may have on future stocks remains to be seen.

There was also a slight reduction in salmon parr density from 24/100m^2 in 2014 to 23/100m^2 in 2015. The most recent density would be classed as 'good'.

Like the Bruiach Burn site, three year classes of salmon were recorded: 0+, 1+ and 2+ (see **Figure 16**). The majority of the salmon parr were aged 1+ indicating that most salmon from this area of the Belladrum Burn will smolt at two years old.

Although not as marked as the Bruiach Burn site, there was also a reduction in trout fry density from 52/100m^2 in 2014 to 37/100m^2 in 2015. The 2015 trout fry density would be classed as 'excellent'. Density of trout parr also saw a reduction from 28/100m^2 in 2014 to 11/100m^2 in 2015. The most recent trout parr density would be classed as 'good'.

Eels were present in low numbers of 3/100m^2 whilst a single brook/river lamprey amoecete was also captured.

Figure 15 – Densities of Juvenile Salmon and Trout from Site BEL3 (Belladrum Burn)

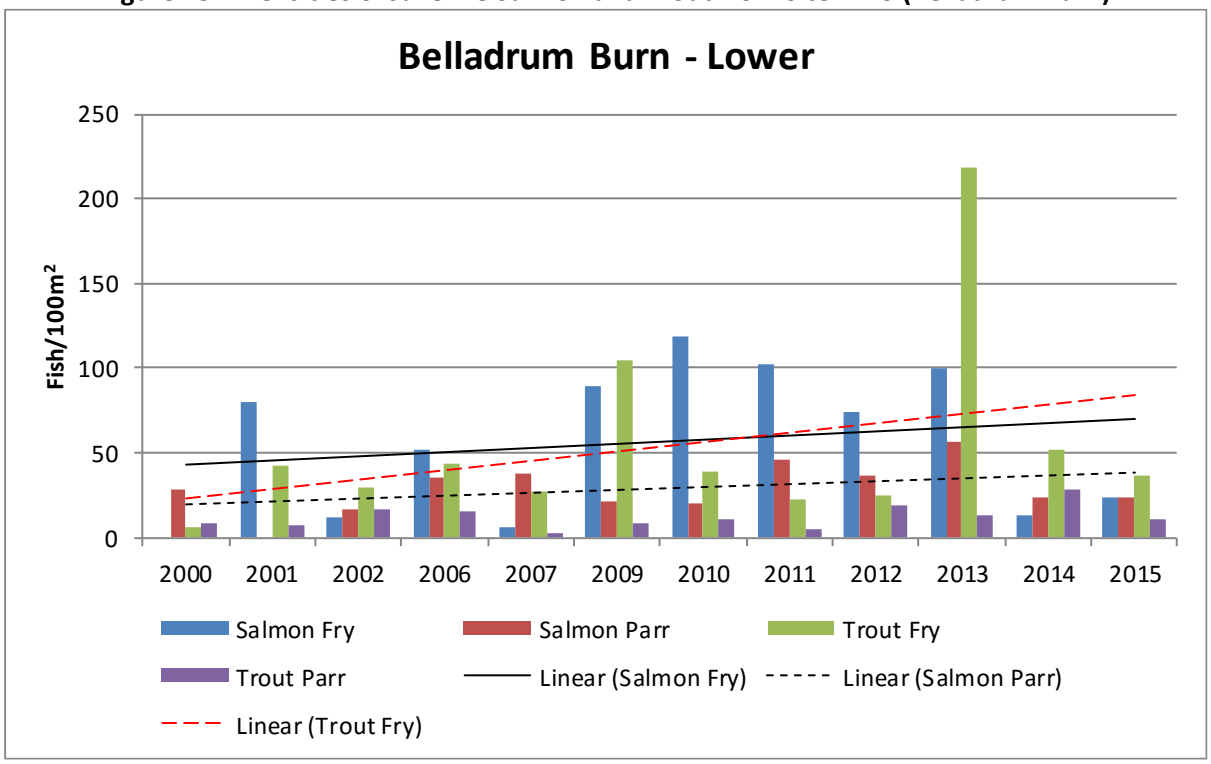
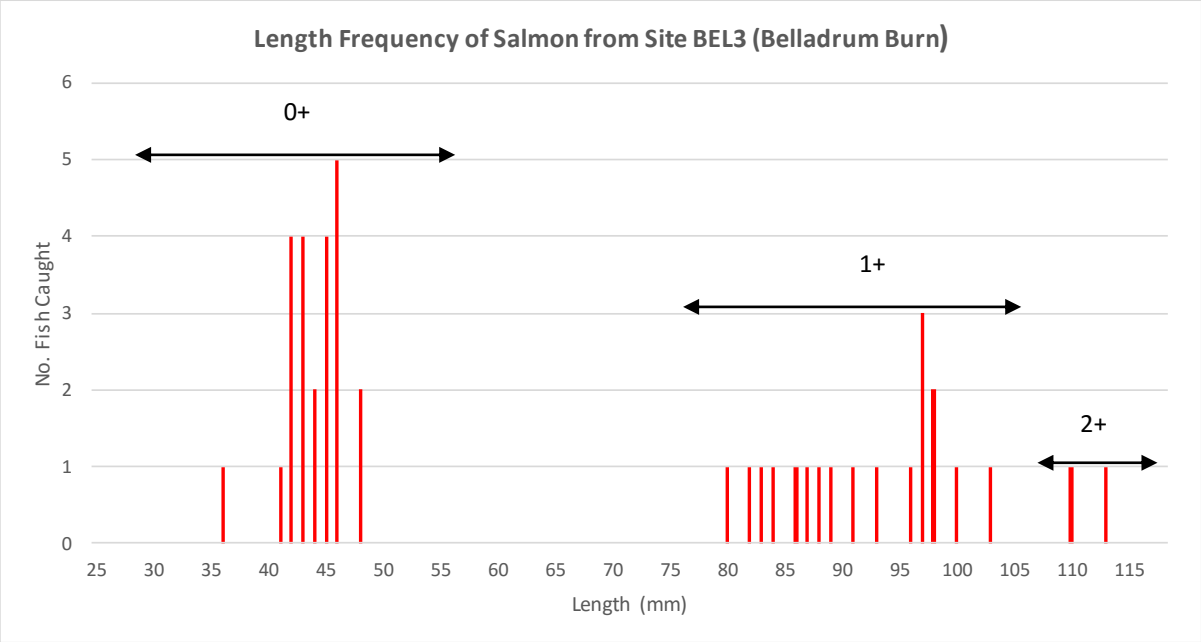


Figure 16 – Length Frequency Histogram of Salmon from Site BEL3 (Belladrum Burn)



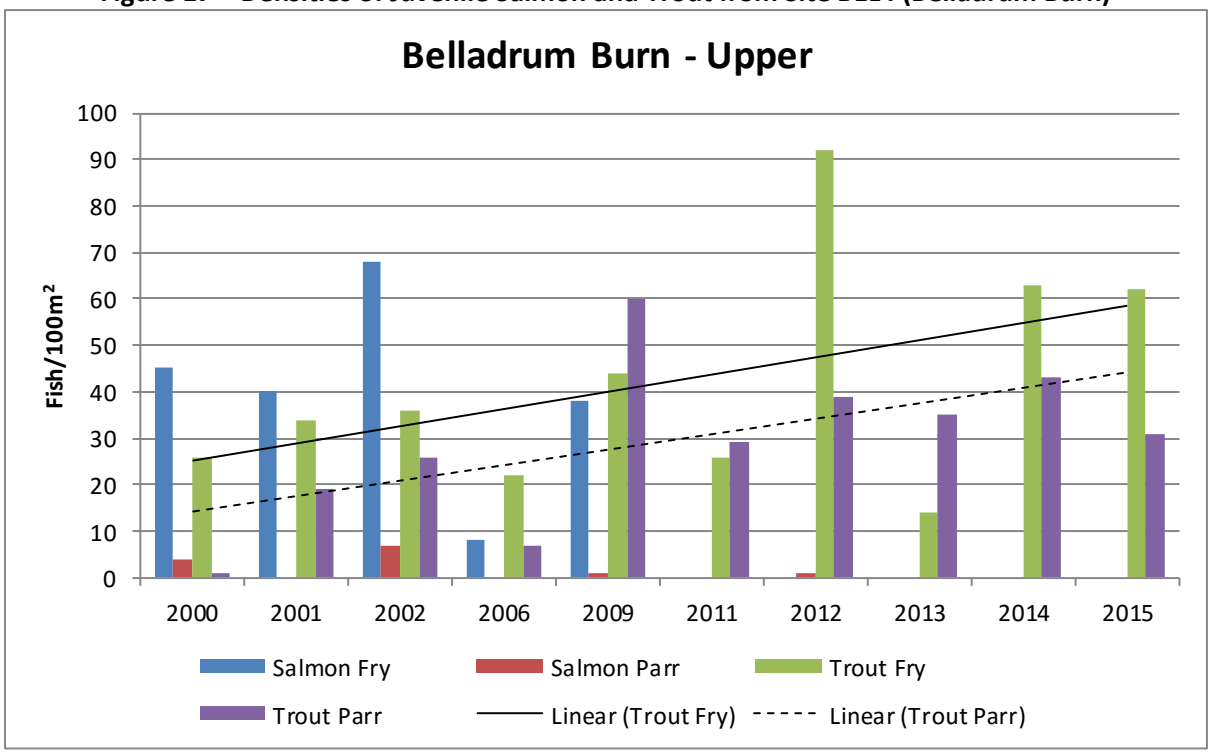
4.2.3 Belladrum Burn (BEL4)

Site BEL4 is the uppermost fully quantitative site on the Belladrum Burn and is upstream of the natural (partial) barrier to fish migration known as the 'Pot and Kettle'. Before 2012, the falls were thought to be a total barrier to salmon migration. No naturally spawned juveniles (the upper Belladrum was stocked until 2009) had been caught in surveys executed upstream of the aforementioned falls. The capture of a single salmon parr in 2012 indicated that under certain flow conditions, salmon may be able to ascend the aforementioned waterfall. However, since then no salmon have been captured in the upper reaches of the Belladrum Burn.

Although there was a reduction in trout fry density between 2015 and 2015, the most recent density of 62/100m^2 would still be classed as 'excellent'. Trout parr density also reduced but the 2015 density of 31/100m^2 would also be classed as 'excellent'. It remains to be seen if the trout captured in the upper Belladrum burn are the progeny of sea trout or resident brown trout.

No other fish species were captured from BEL4 in 2015.

Figure 17 – Densities of Juvenile Salmon and Trout from Site BEL4 (Belladrum Burn)



4.2.4 Belladrum Burn (BEL/TIMED1, BEL/TIMED3, BEL/TIMED7, BEL/TIMED9, BEL/TIMED10)

A series of time delineated surveys were conducted on the Belladrum Burn to ascertain if salmon had ascended the falls mentioned in Section 4.2.3 and gauge habitat utilisation in the areas upstream of the quantitative Site BEL3. Downstream of the 'Pot and Kettle' (BEL/TIMED1, BEL/TIMED3) numbers of salmon parr were very similar to previous surveys with CPUE values of 1.4 and 2.2 respectively. Numbers of salmon fry were lower than those attained from the 2013 surveys with CPUE values of 1.2 and 0.1. These results are to be expected given the relative paucity of fry at BEL3 in 2014 and 2015. No juvenile salmon were captured at the sites upstream of the 'Pot and Kettle' (BEL/TIMED7, BEL/TIMED7, BEL/TIMED10). These results would suggest that the falls continue to act as a barrier to salmon migration.

4.2.5 Culburnie Burn (CUL1)

As with the 2012, 2013 and 2014 surveys at CULB1, density of salmon fry in 2015 was very low (4/100m^2) and would be classed as 'poor'. Unlike the nearby Belladrum and Bruiach Burns, there was no perceived changes to the habitat at CULB1.

Interestingly, the 2015 salmon parr density of 48/100m^2 is the highest ever recorded from the site and would be classed as 'excellent'. The origin of these parr remains unclear but it is entirely possible that some juvenile salmon from the Bruiach Burn may be utilising the habitat in the Culburnie Burn.

Examination of year classes at CULB1 suggest the presence of at least two cohorts: 0+ and 1+. It is possible that a single 2+ parr was present during 2015 although analysis of historical scale reading and length analysis proved inconclusive. The information presented in **Figure 19** should therefore be treated with a degree of caution.

Density of trout fry increased from 45/100m^2 in 2014 to 84/100m^2 in 2015. The most recent result would be classed as 'excellent'. High densities of trout fry such as these would suggest that the fry are the progeny of sea trout as opposed to resident brown trout. Although there was a slight reduction in trout parr density to 10/100m^2 in 2015, the result would still be classed as 'good'.

Eels were also captured at a density of 8/100m^2 whilst a number of brook/river lamprey amoecetes were captured generating a minimum density estimate of 5/100m^2.

Figure 18 – Densities of Juvenile Salmon and Trout from the Site CULB1 (Culburnie Burn)

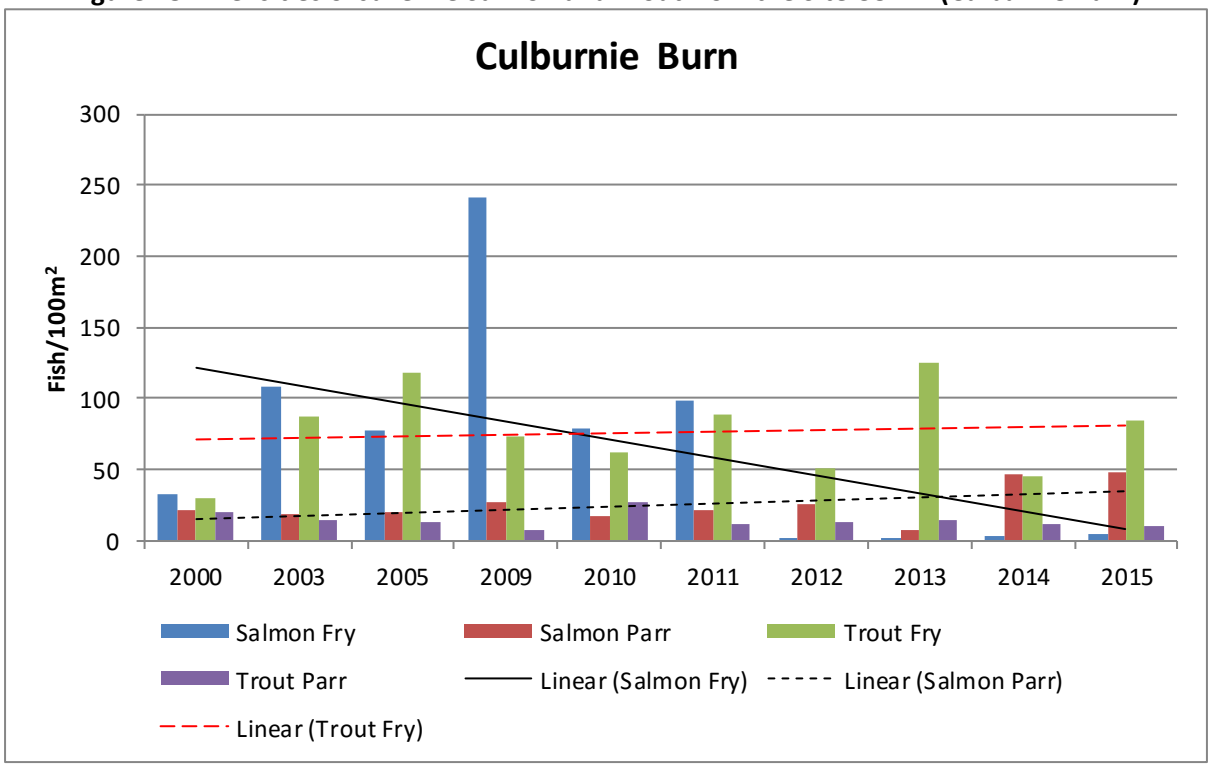
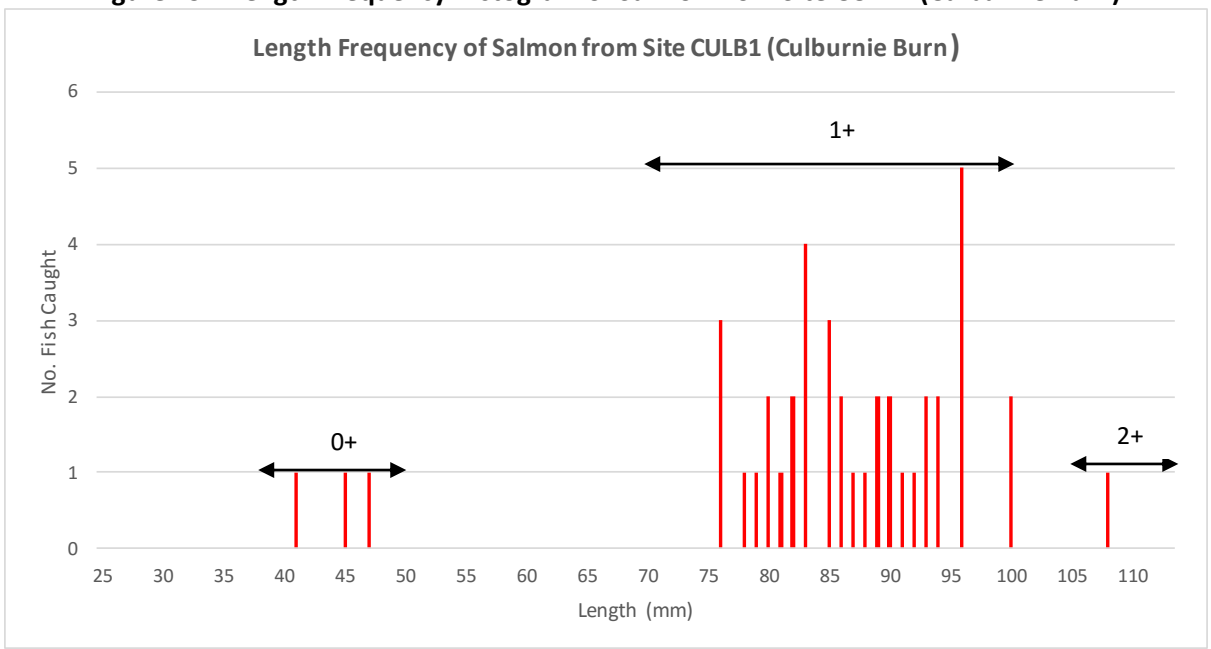


Figure 19 – Length Frequency Histogram of Salmon from Site CULB1 (Culburnie Burn)



4.2.6 Culburnie Burn (CUL/TIMED1, CUL/TIMED2, CUL/TIMED5, CUL/TIMED6, CUL/TIMED7, CUL/TIMED8)

A series of time delineated surveys were conducted to ascertain:

1. Spawning success of salmon along the burn's accessible length;
2. Whether salmon had ascended the former bridge apron

Of the six timed surveys that were conducted, only one site (CULB/TIMED1) yielded salmon fry in low numbers of 0.5/minute. This would suggest that there was very limited salmon spawning in the Culburnie Burn in the winter/autumn of 2014.

Three surveys (CULB/TIMED6, CULB/TIMED7 and CULB/TIMED8) were conducted upstream of the former bridge apron. No salmon fry were captured whilst salmon parr were captured at CULB/TIMED6 and CULB/TIMED7 in low numbers of 0.1/minute and 0.3/minute respectively. When these salmon parr reached this section of the burn is difficult to truly ascertain but would indicate that juveniles can ascend the former barrier to fish migration.

Numbers of trout fry were ostensibly higher than those observed in surveys conducted upstream of the former structure between 2010 and 2012. Between these years no surveys yielded trout fry in numbers greater than 2/minute. In 2015, only two sites yielded numbers lower than this whilst the remaining four provided CPUE values of 2/minute - 3.8/minute. These results would suggest that a greater number of trout ascended the former structure in the winter of 2014.

4.2.7 Black Burn (BLB/TIMED1, BLB/TIMED2, BLB/TIMED4, BLB/TIMED5)

A series of time delineated surveys were executed to ascertain habitat utilisation of salmon and trout in the Black Burn with a view to easing the defunct weir highlighted by NBFT in 2009. Four surveys were conducted downstream of the aforementioned structure and salmon were found to be absent whilst trout fry were found in numbers ranging from 0/minute – 2/minute. Coupled with previous surveys that highlighted the dearth of juvenile salmon on the Black Burn would strongly suggest that the Black Burn is not used a nursery area for salmon.

4.2.8 River Beauly Mainstem (BE2 and BE3)

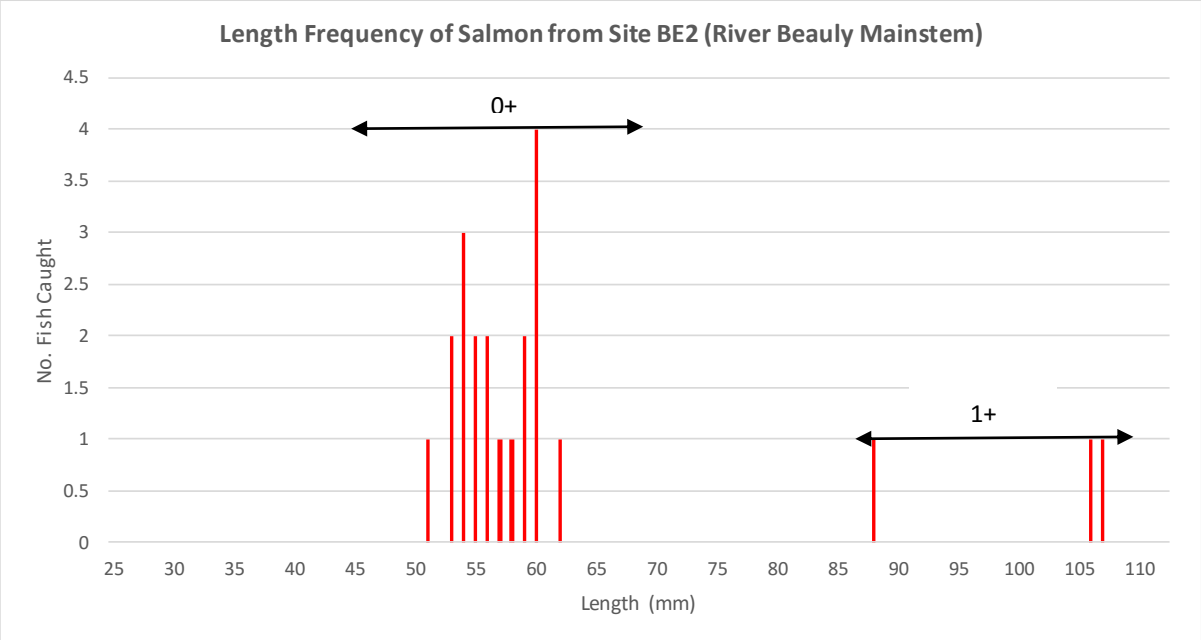
4.2.8.1 Site BE2

Site BE2 is situated on the right bank at the head of the 'Fly Pool'. The habitat in this area is very much suited to salmon fry with its shallow depth, fine substrate and flows that tend towards the high velocity categories of riffle and run. This site was first surveyed in 2014 and showed salmon fry in abundance at a density of 132/100m^2 that would be classed as 'excellent' under the density classification scheme whilst parr were less abundant at 7/100m^2 and would be classed as 'poor'; almost certainly an artefact of the habitat at the site. In 2015, very notable changes were recorded in terms of the habitat at the site. Although the substrate composition had not changed, there was certainly evidence of mass gravel movements resulting in an overall deepening of the site. The 2015 salmon fry density of 45/100m^2 would be classed as 'moderate'. It is entirely possible that this area may be prone to 'redd washout' due to its instability under very high flows. There was also a reduction in salmon parr density to 6/100m^2 that would be classed as 'poor'. NBFT intend to monitor this situation closely in the coming years.

Examination of year class composition revealed two cohorts: 0+ and 1+ (see **Figure 20**). 2+ salmon parr were missing from site BE2.

Good numbers of eels were recorded at BE2 generating a minimum density estimate of 18/100m^2

Figure 20 – Length Frequency Histogram of Salmon from Site BE2



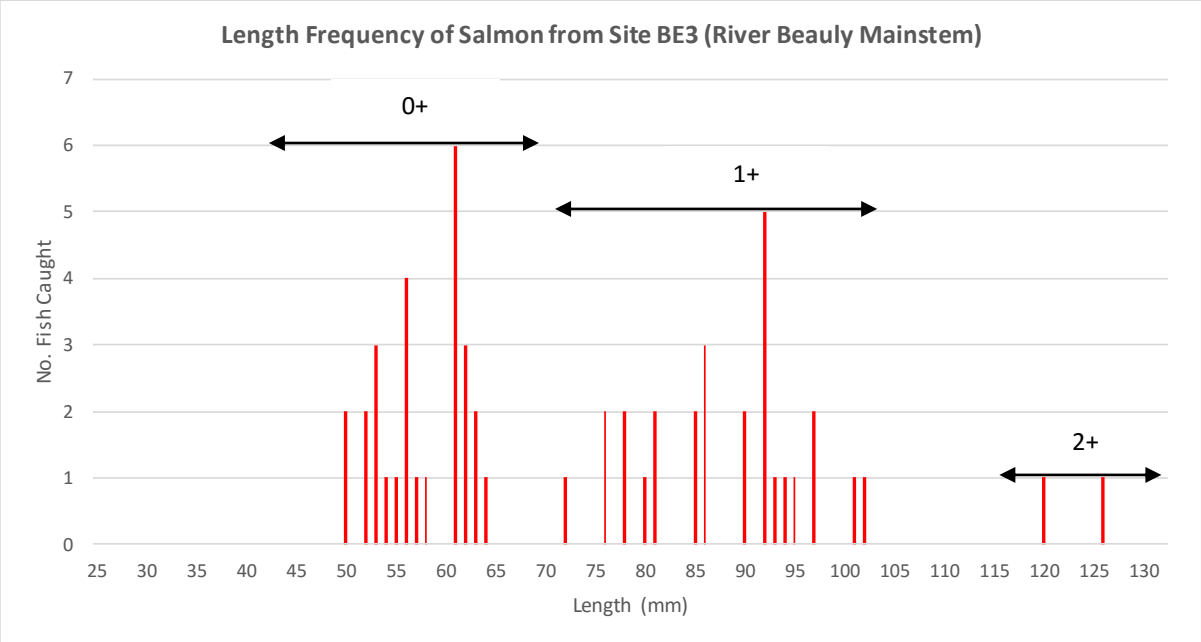
4.2.8.2 Site BE3

Site BE3 is situated on the left bank downstream of the 'Cruives'. Between 2014 and 2015, it was noted that there had been an influx of some larger substrate to the site; almost certainly an artefact of winter spates. This appears to have benefited the older year classes of salmon with an increase in salmon parr (1++) density from 24/100m^2 in 2014 to 44/100m^2 in 2015 that would be classed as 'excellent'. Density of salmon fry also increased to 55/100m^2 in 2015 from 12/100m^2 in 2014. The 2015 salmon fry density would be classed as 'good'.

Examination of year class composition revealed three cohorts: 0+, 1+ and 2+. In terms of salmon, 1+ were clearly the strongest year class (see **Figure 21**). This would suggest that the majority of salmon from the mainstem of the River Beauly will smolt at two years old.

Eels were present at a minimum density estimate of 21/100m.

Figure 21 – Length Frequency Histogram of Salmon from Site BE3



4.3 MIDDLE BEAULY

4.3.1 Breakachy Burn (BRE1)

Being the only notable tributary of the Middle Beauly, the importance of the Breakachy Burn as a nursery area cannot be understated. There is a strong trend for increasing density of salmon fry at Site BRE1 (see **Figure 22**). The 2015 salmon fry density was 243/100m^2 and would be classed as 'excellent'.

Salmon parr density (1++) appears to fluctuate more widely at BRE1 at a range of 2/100m^2 to 48/100m^2. The 2015 density of 15/100m^2 is the fourth lowest value recorded at BRE1 and would be classed as 'moderate'. This is an interesting result given the high density of salmon fry in the last three years. The precise reasons for this remain unclear and NBFT intend to monitor the situation closely.

Examining year classes from BRE1 shows the presence of three cohorts: 0+, 1+ and 2+. 0+ salmon fry are obviously the most dominant. Older year classes were primarily composed of 1+ parr (see **Figure 23**) although as already mentioned, densities of parr are overall ostensibly low for the site.

No other fish species were captured from site BRE1.

Figure 22 – Densities of Juvenile Salmon and Trout from Site BRE1 (Breakachy Burn)

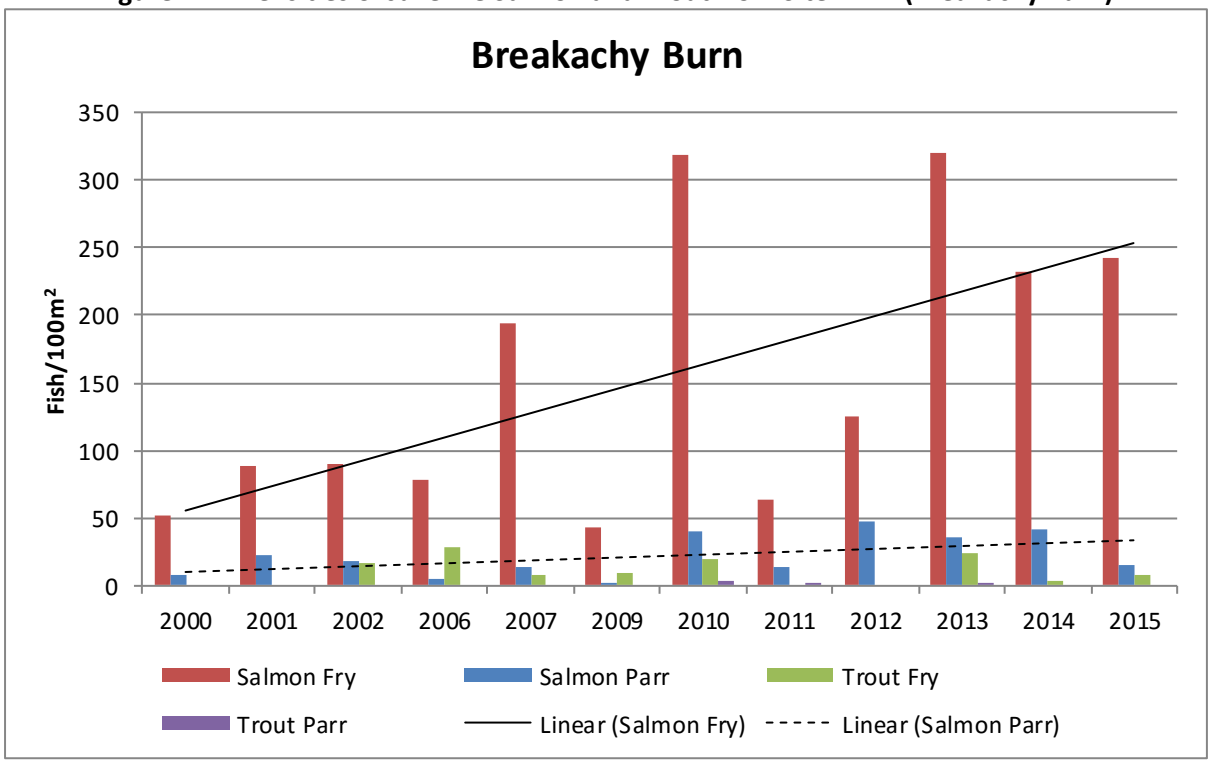
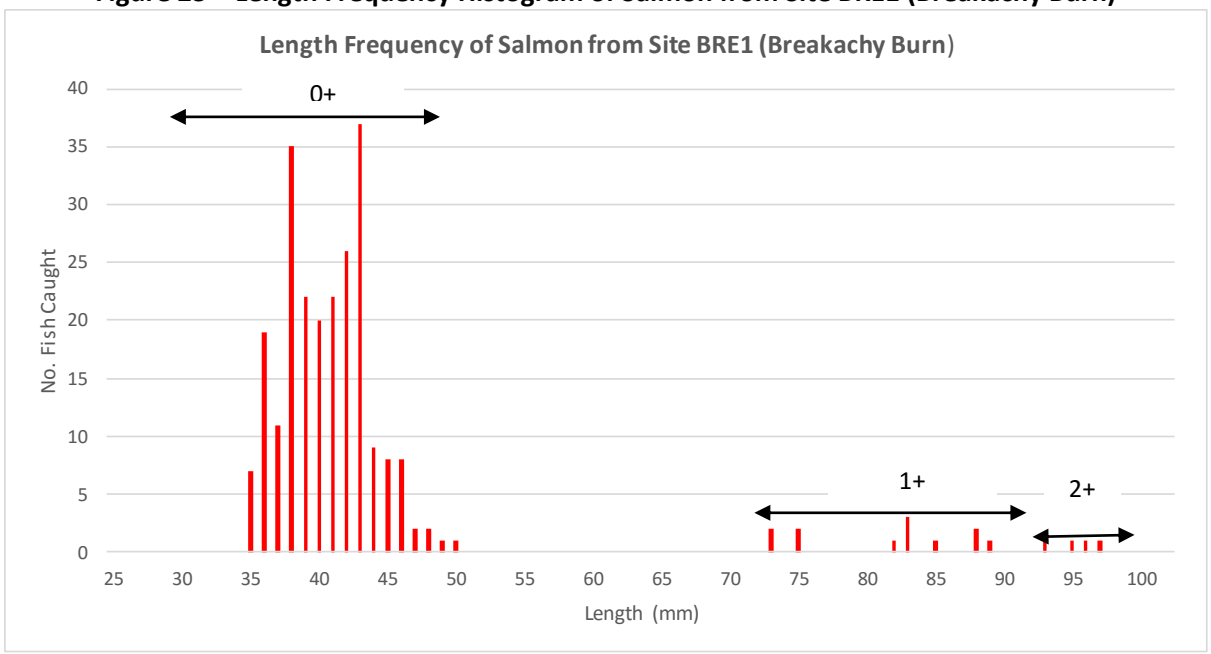


Figure 23 – Length Frequency Histogram of Salmon from Site BRE1 (Breakachy Burn)



4.4 UPPER BEAULY

4.4.1 Eskadale Burn (ESK1)

Between 2011 and 2013, it would appear that the available spawning habitat on the Eskadale Burn was vastly underutilised (see **Figure 24**). 2014 saw a resurgence in fry numbers with a recorded density of 105/100m^2 that would be classed as 'excellent'. It was therefore extremely disappointing to note the 2015 salmon fry density of 17/100m^2 that would be classed as 'moderate'.

Despite low numbers of salmon fry between 2011 and 2013, density of salmon parr (1++) has remained high. The most recent survey generated a salmon parr density of 65/100m^2; the highest ever recorded for the site and would be classed as 'excellent'. It is entirely possible that some of the parr encountered on the Eskadale Burn may have originated from the mainstem of the River Beauly and have entered the burn to utilise the juvenile habitat.

Examination of year classes from ESK1 showed three year classes to be present: 0+, 1+ and 2+ (see **Figure 25**). 0+ salmon are clearly the most abundant. Salmon parr were dominated by 1+, almost certainly an artefact of the strong salmon fry numbers observed in 2014.

Low numbers of eels were also present in 2015 generating a minimum density estimate of 2/100m^2.

Figure 24 – Densities of Juvenile Salmon and Trout from Site ESK1 (Eskadale Burn)

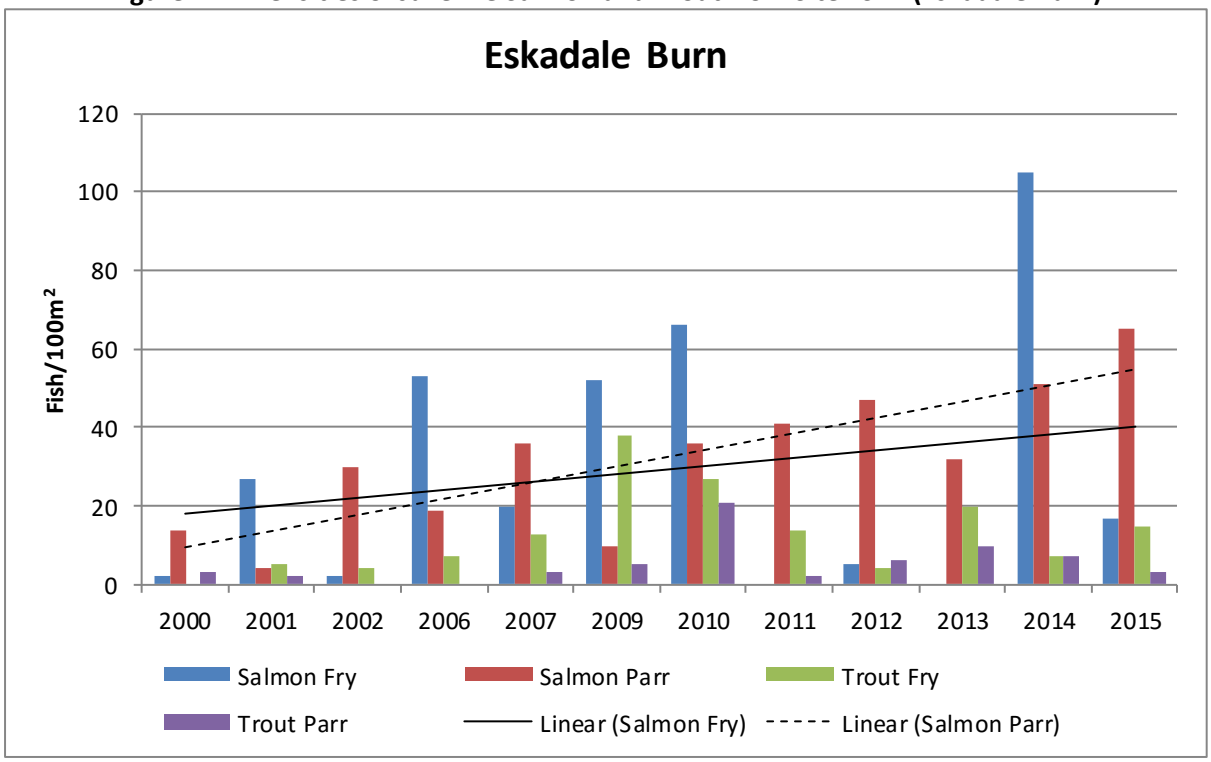
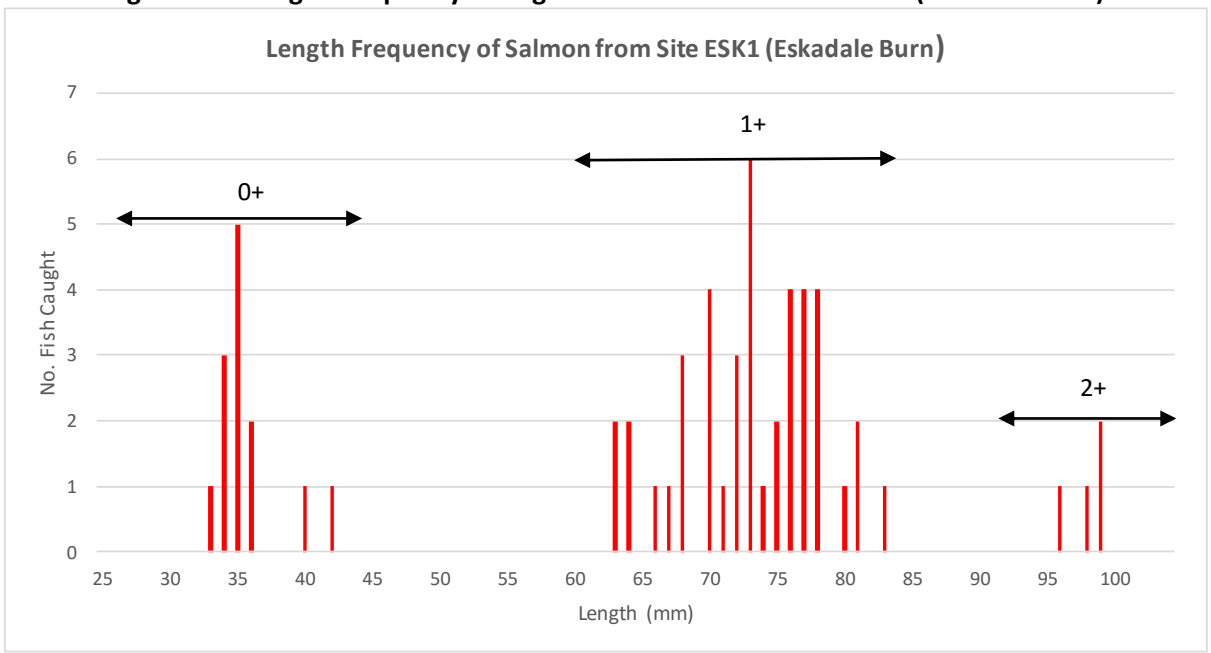


Figure 25 – Length Frequency Histogram of Salmon from Site ESK1 (Eskadale Burn)



4.4.2 Erchless Burn (ERC1)

In 2014, NBFT noted extreme changes to the habitat at Site ERC1 following spate events in the winter of 2013. The 2015 survey noted that the site appears to have stabilised and no major changes were recorded in terms of the substrate matrix, flow types and depths.

The habitat at site ERC1 is more suited to salmon fry with its fine substrate, fast flows and overall shallow depth. This has been reflected in the fry densities since the site was added to the suite of monitoring sites in 2011 (see **Figure 26**). The most recent salmon fry density of 95/100m^2 would be classed as 'excellent'.

Density of salmon parr (1++) has remained quite stable in low numbers ranging from 2/100m^2 to 8/100m^2. This is almost certainly an artefact of the available habitat that favours younger year classes. The 2015 result of 8/100m^2 would be classed as 'poor'.

The 2015 survey also showed trout fry to be in abundance at a density of 57/100m^2. This is the highest density of trout fry ever recorded at the site and would be classed as 'excellent'. It remains to be seen if these trout are the progeny of sae trout or resident brown trout.

When examining year classes of salmon from Site ERC1, the most dominant are 0+ fry. Two year classes of salmon parr were identified: 1+ and 2+ although as already mentioned, numbers were overall very low.

No other fish species were recorded from ERC1 in 2015.

Figure 26 – Densities of Juvenile Salmon and Trout from Site ERC1 (Erchless Burn)

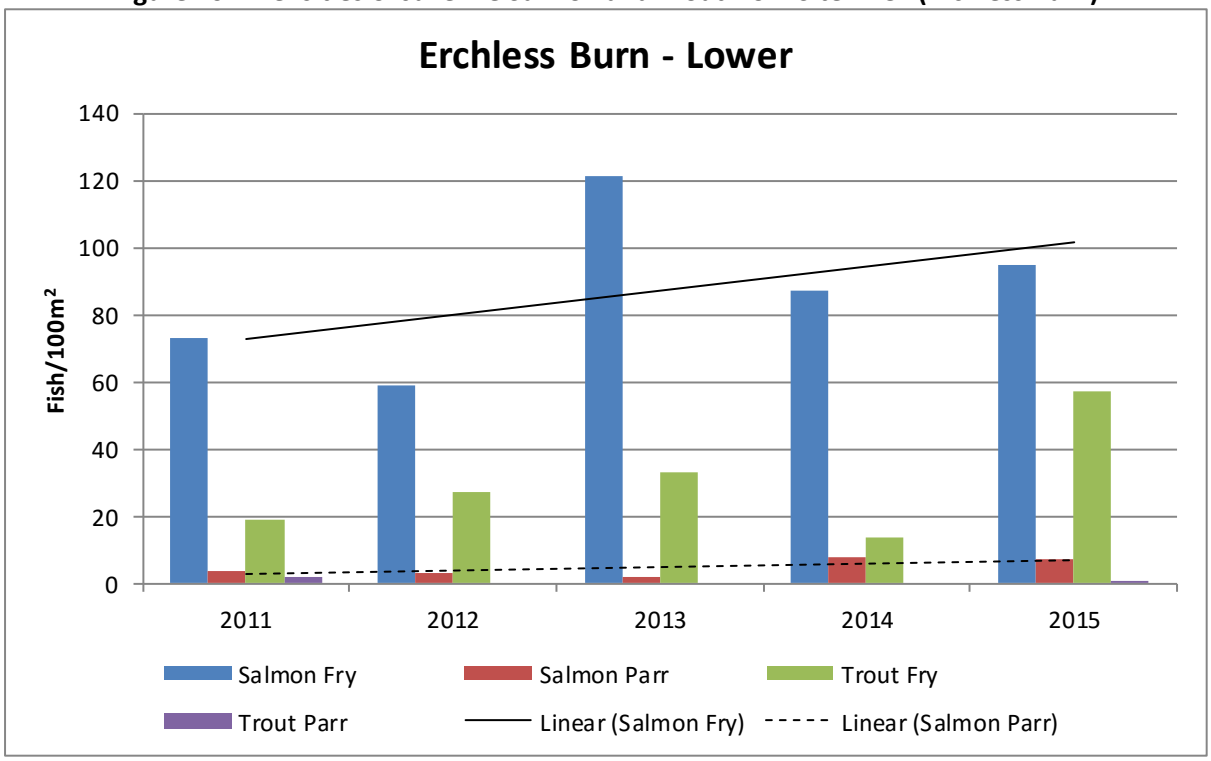
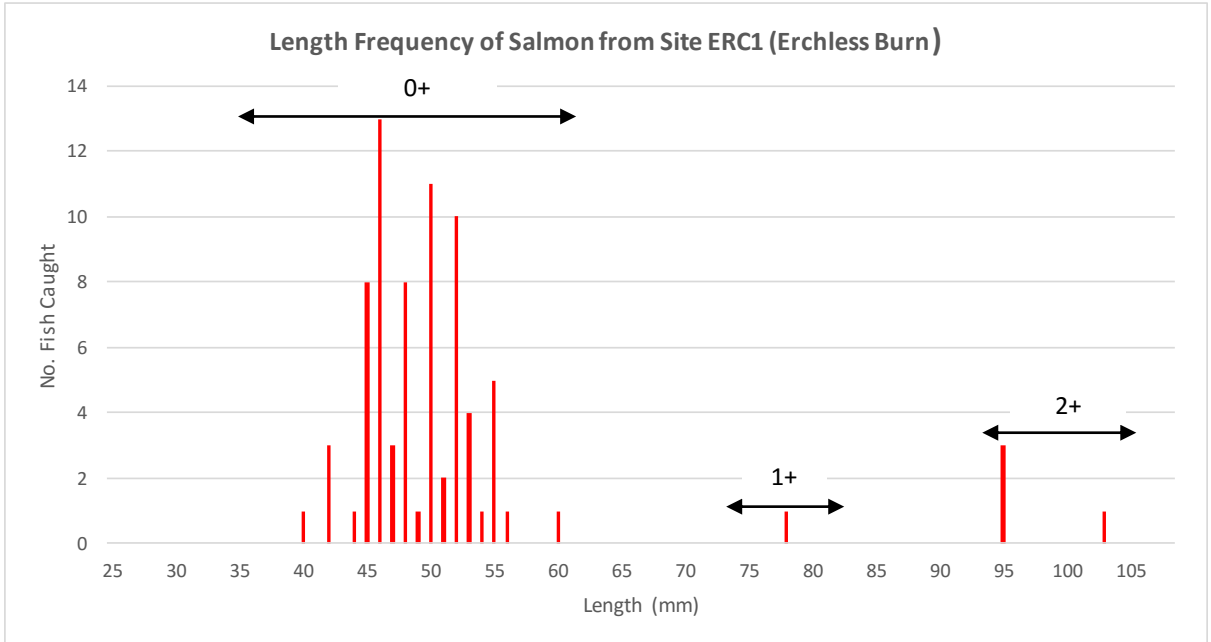


Figure 27 – Length Frequency Histogram of Salmon from Site ERC1 (Erchless Burn)



4.4.3 Erchless Burn (ERC2)

In comparison to the lower site (ERC1), the upper site (ERC2) is more suited to older year classes of salmon with its larger substrate. Before 2015, density of salmon fry ranged from 5/100m^2 to 74/100m^2. Salmon fry were absent from the 2015 survey (see **Figure 28**). Examination of habitat data showed the site to be extremely stable and the precise reasons for the decline in salmon fry from ERC2 remain unclear. However, it should be borne in mind that since the clearance of flood debris from the burn in 2011, large areas of spawning habitat have been made available to adult spawners and it may be that the majority of spawning now takes place in the burn's lower reaches where appropriately sized media is abundant.

Habitat for older year classes of salmon (1++) appeared to be well utilised in 2015 with a recorded density of 28/100m^2; the second highest on record for the site that would be classed as 'good'.

Juvenile trout were less abundant in comparison to ERC1 although the limited spawning media in the vicinity of ERC2 appears to have been utilised. The trout fry density of 7/100m^2 is the second lowest recorded for the site and would be classed as 'moderate'.

Figure 29 clearly shows that 1+ salmon parr were the most abundant year class at Site ERC2. Unfortunately, the precise 'breakpoint' between 1+ and 2+ was not clear and the information presented in **Figure 29** should be treated with a degree of caution. The dominance of 1+ salmon parr would suggest that most salmon of Erchless Burn origin will smolt at two years old.

No other fish species were present at ERC2 in 2015.

Figure 28 – Densities of Juvenile Salmon and Trout from Site ERC2 (Erchless Burn)

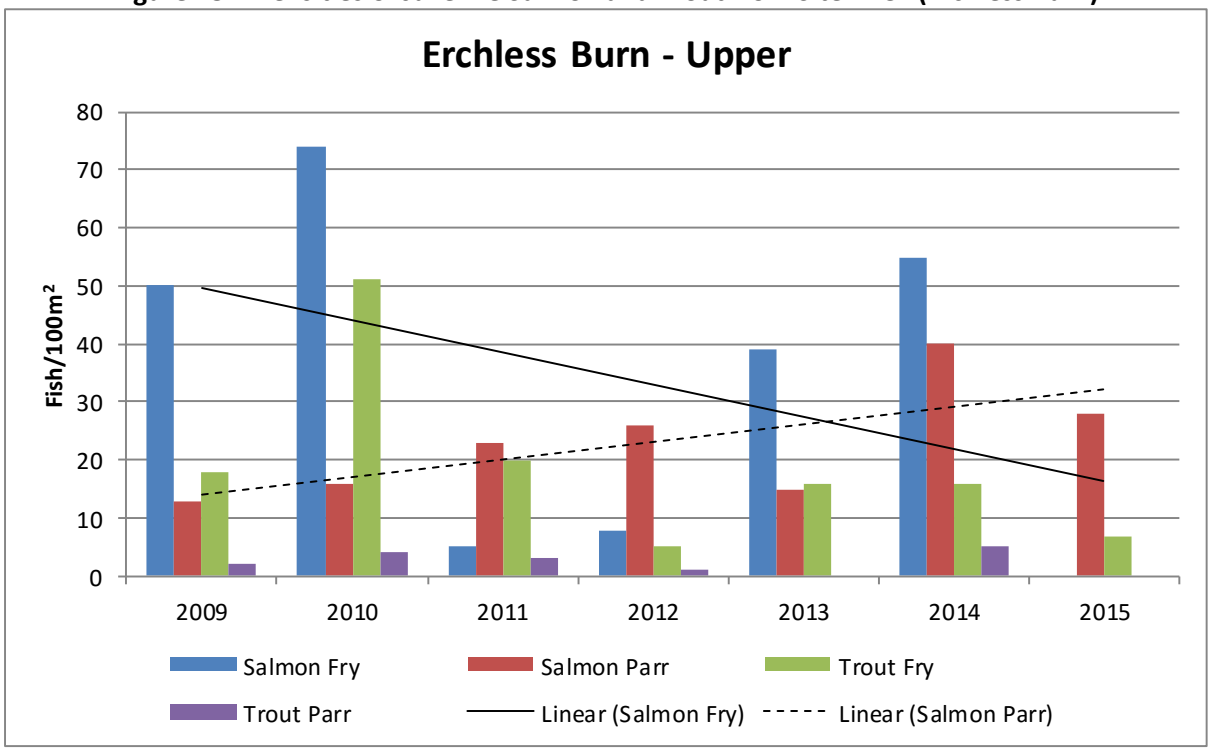
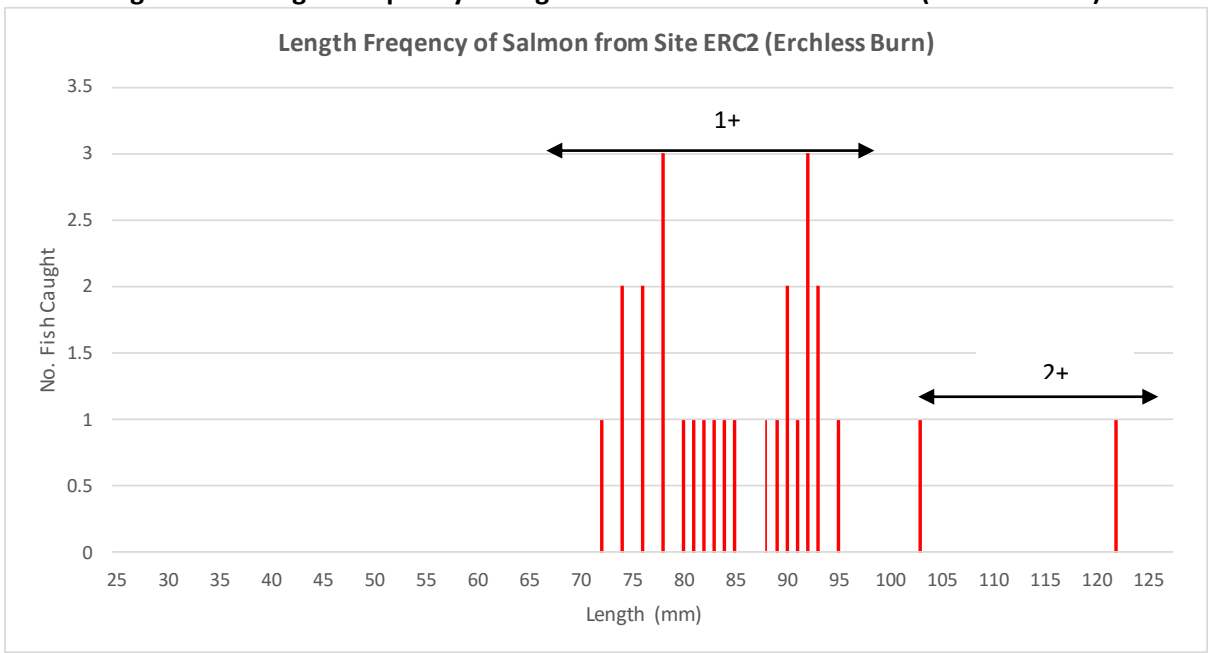


Figure 29 – Length Frequency Histogram of Salmon from Site ERC2 (Erchless Burn)



4.5 RIVER GLASS

4.5.1 Abhainn Deabhag (AD3)

The upper reaches of the River Glass (known as Abhainn Deabhag) contain some of the most productive habitat in the Beauly catchment. The routine monitoring site near to Tomich Village (site AD3) has consistently shown itself to be extremely productive both in terms of salmon fry (0+) and salmon parr (1++).

Although lower than the 2014 density of 140/100m^2 (see **Figure 30**), the 2015 salmon fry density of 84/100m^2 would still be classed as 'good'. The result is towards the upper end of the historical range (8/100m^2 – 140/100m^2) and above the mean density of 75/100m^2.

Since 2002, density of salmon parr (1++) has remained very stable between 32/100m^2 and 52/100m^2. The 2015 salmon parr density of 48/100m^2 would be classed 'excellent'.

When looking at year class strength (see **Figure 31**), 0+ fry are clearly the most abundant. Both 1+ and 2+ salmon parr were present with 1+ being the strongest year class of salmon parr. As with most areas of the Beauly District, the information presented in **Figure 31** would suggest that the majority of salmon will smolt at two years old.

A single eel was also captured in 2015.

Figure 30 – Densities of Juvenile Salmon and Trout from Site AD3 (Abhainn Deabhag)

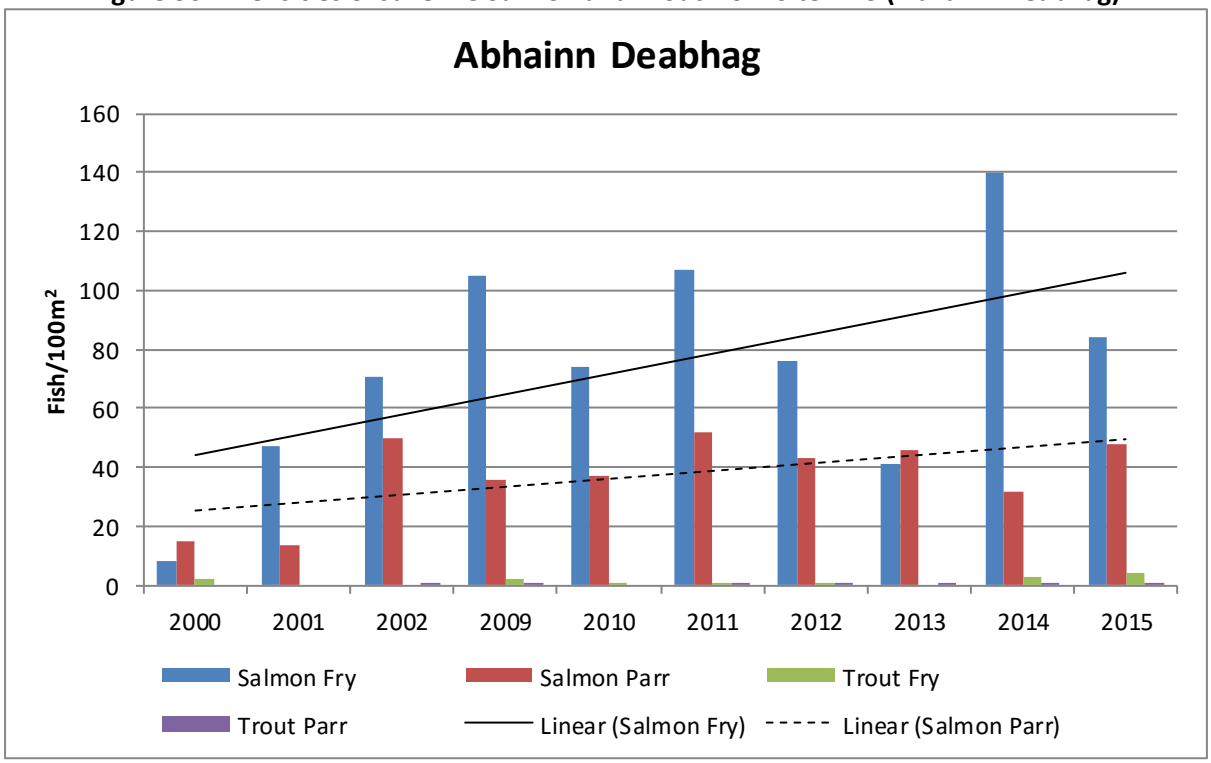
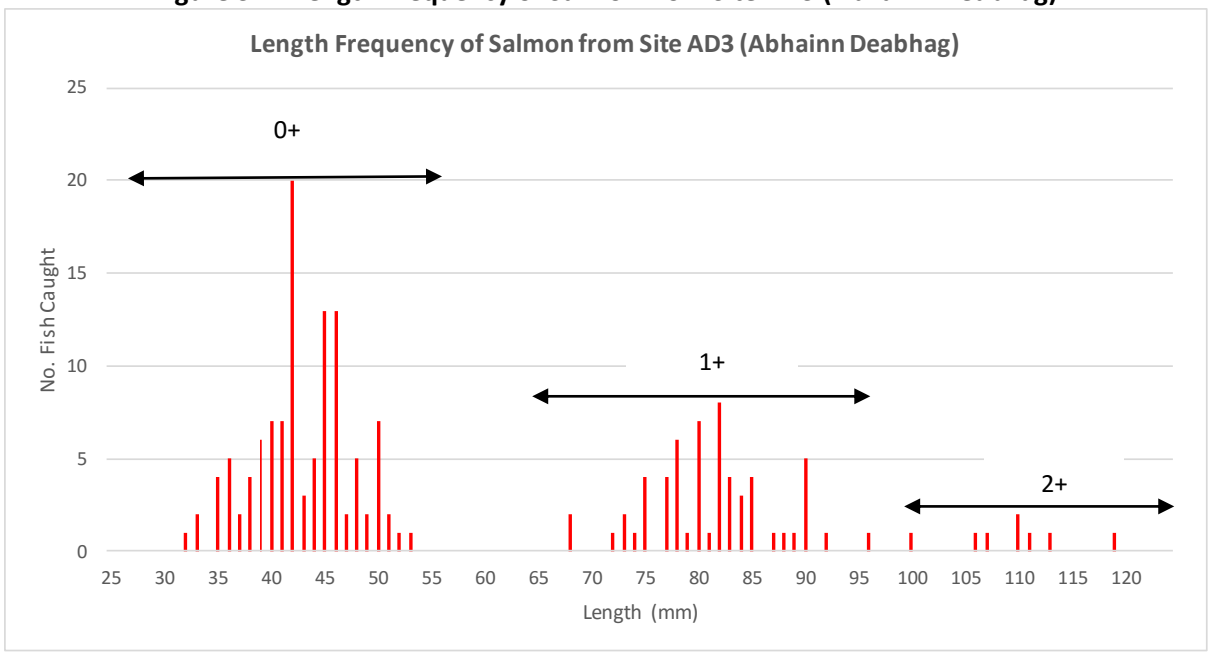


Figure 31 – Length Frequency of Salmon from Site AD3 (Abhainn Deabhag)



4.5.2 Glass Burn (GLB1)

Site GLB1 is situated in the lower reaches of the Glass Burn close to the confluence with the River Glass. The site presents a mixture of habitat suitable for all year classes of juvenile salmon.

The 2015 salmon fry density of 54/100m^2 is the highest ever recorded on the Glass Burn and would be classed as 'good'. There was no evidence in changes to the habitat at GLB1 seen elsewhere in the Beauly catchment.

The 2015 salmon parr density of 31/100m^2 (1++) was marginally higher than the 2014 density of 28/100m^2 and is the second highest ever recorded from the burn. The 2015 result would be classed as 'good'.

Trout fry were less abundant in 2015 when compared to previous years with the density of 12/100m^2 being the lowest on record for the burn. The 2015 trout fry density would be classed as 'good'. It remains to be seen if the trout fry at GLB1 are the progeny of sea trout or resident brown trout.

Figure 33 clearly shows 0+ fry to be the most abundant year class. Both 1+ and 2+ parr were present with 1+ being the strongest cohort. The relatively low number of 2+ parr would suggest that most Glass Burn salmon will smolt at two years old.

A single eel was also captured from GLB1 in 2015.

Figure 32 – Densities of Juvenile Salmon and Trout from Site GLB1 (Glass Burn)

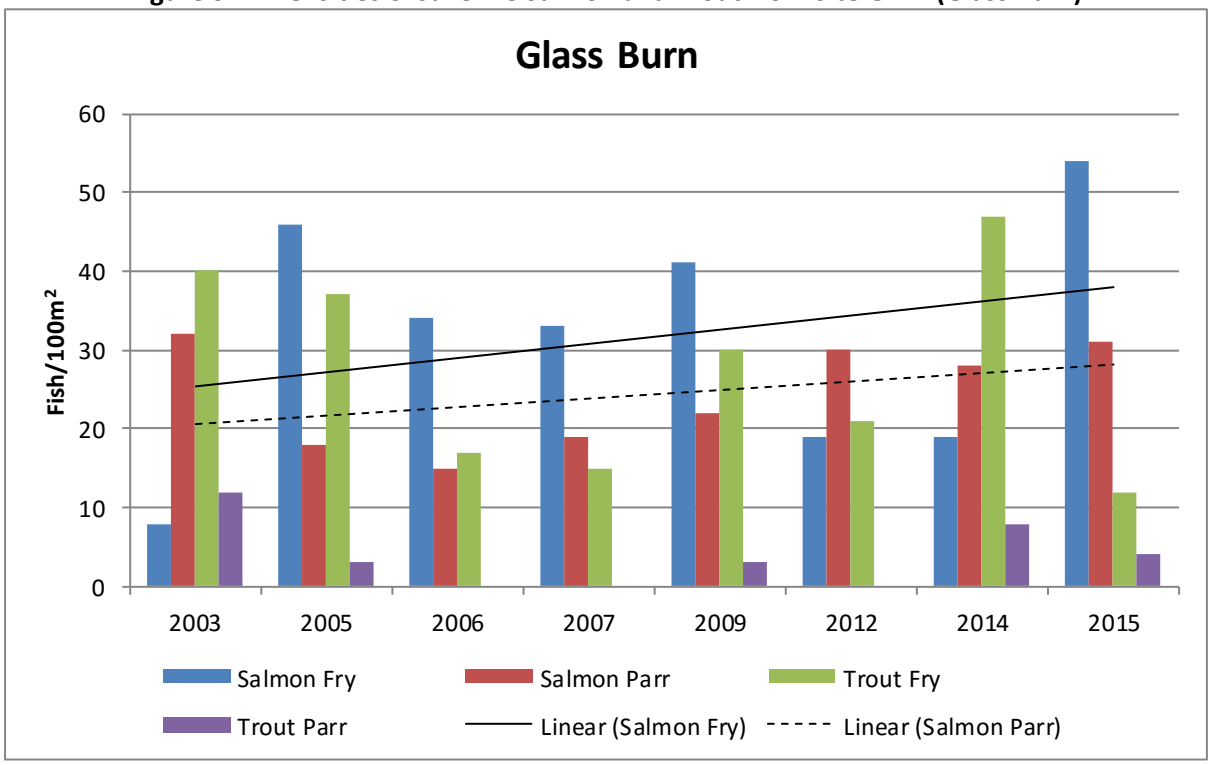
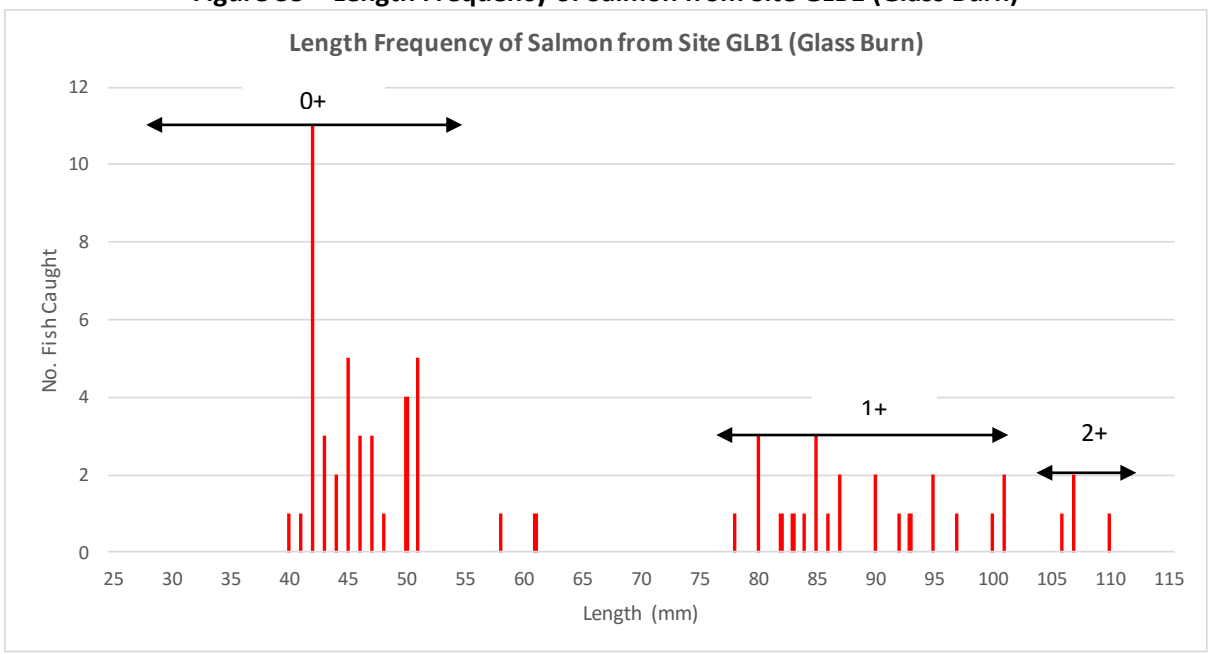


Figure 33 – Length Frequency of Salmon from Site GLB1 (Glass Burn)



4.6 RIVER CANNICH

4.6.1 River Cannich (CAN1)

Site CAN1 is located in an area that presents ostensibly good habitat for older year classes of salmon with its boulder strewn substrate matrix.

Low numbers of salmon fry are to be expected from such a site, yet the 2015 surveys showed salmon fry to be completely absent. This would indicate a dearth of spawning activity in the vicinity of the site in the winter of 2014.

Salmon parr (1++) were more abundant, although numbers are low when compared to other parts of the Beauly catchment. The 2015 salmon parr density of 10/100m^2 would be classed as 'poor'. An increase in coverage of the River Cannich would give a better overall picture of juvenile salmon abundance.

1+ salmon parr were the most numerous at CAN1 (see **Figure 35**). Only three salmon parr were seen to be 2+ indicating that most salmon from the River Cannich will begin their outward migration at two years old.

High numbers of eels were also captured generating a minimum density of 19/100m^2.

Figure 34 – Densities of Juvenile Salmon and Trout from Site CAN1

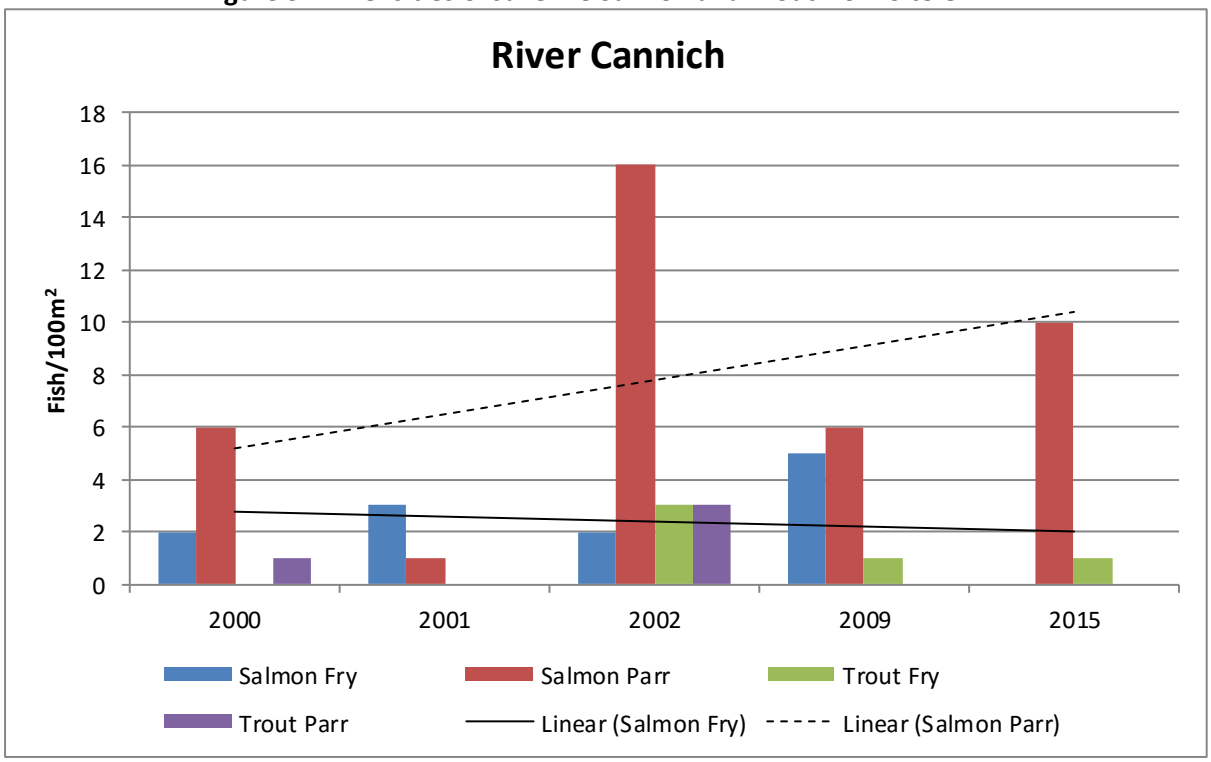
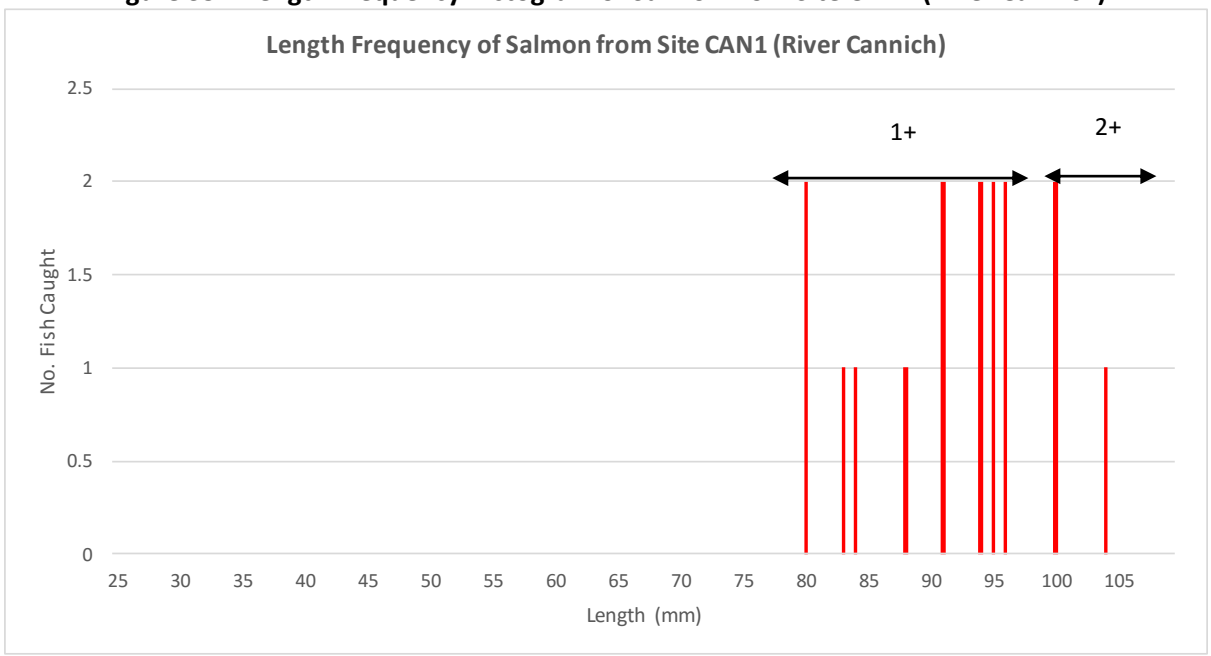


Figure 35 – Length Frequency Histogram of Salmon from Site CAN1 (River Cannich)



5 CONCLUSIONS

The 2015 salmon fry density from CUL1 (Culligran Burn) is the lowest ever recorded. Given the changes to the site recorded in 2015; it is entirely possible that there was a degree of 'redd washout' caused by extreme winter spates. Density of 1++ parr was in line with previous results and above the mean density (61/100m^2) for the site. The lack of 2+ parr may suggest that most salmon of Culligran Burn origin will smolt at two years old.

Site UM5 (Uisge Misgeach) also appears to have been negatively impacted by winter spates with some of the river bed now being classed as 'unstable'. This may have impacted on numbers of salmon fry as the result was the lowest recorded since 2005. Conversely, UM6 had its highest density of salmon fry since 2006 showing that the limited spawning media was well utilised in the winter of 2014. Unlike UM5, there were no major changes to the habitat at UM6. 2+ salmon parr were seen to be missing from UM5 whilst numbers of 2+ parr from UM6 were very low.

Results from site ACM2 (Allt Choire a' Mhuillidh) were disappointing in 2015, with salmon fry shown to be absent and the lowest density of 1++ salmon parr since 2006. There were no changes to the habitat in 2015 and the exact reasons behind the apparent downturn in numbers of juvenile salmon remain unclear.

In 2014, Site AIM2 showed good numbers of salmon fry for the first time since it was 're-watered' in the early 2000's. However, in 2015, fry were seen to be absent from the site indicating that spawning success in the vicinity of AIM2 is intermittent. Conversely, density of salmon parr (1++) was extremely encouraging with the second highest parr density ever recorded on the burn. Both 1+ and 2+ parr were present with 1+ being the strongest cohort.

Salmon fry density from Site NEA1 (Neaty Burn) was the third lowest result recorded for the site. 1+ salmon parr were seen to be missing from the 2015 survey whilst densities of 2+ parr were very low. This may be an indication of parr leaving the burn for the relative sanctuary of the mainstem.

Site DEA1 (Deanie Burn) once again showed salmon fry to be absent. A single salmon parr aged 2+ was captured indicating a severe underutilisation of the habitat at DEA1. The most probable cause behind this is the lack of discernible flow to attract salmon to the burn once they have ascended Beannacharan Dam.

It was heartening to note the increase in salmon fry density from Site BRU2 (Bruiach Burn) in 2015. It should be mentioned that there was evidence of severe gravel movements at the site in 2015. It is unclear if this has negatively impacted salmon fry densities. Salmon parr density (1++) was the highest since 2013. Both 1+ and 2+ were present with 1+ being the most dominant year class of salmon parr.

At Site BEL3 (Belladrum Burn), density of salmon fry was towards the lower end of the historical range (0/100m^2 – 119/100m^2) and below the mean density of 56/100m^2. Like the Bruiach Burn site, there was evidence that the site had changed over the winter period with an influx of fine substrate and a departure of some of the larger cobbles and boulder. It is entirely possible that the site may have suffered from 'redd washout'. A 'good' density of salmon parr (1++) was recorded although the density is towards the lower end of the historical range of 0/100m^2 – 56/100m^2 and below the mean density of 29/100m^2. Two year classes of salmon parr were recorded: 1+ and 2+ with the majority being aged 1+. The upper site (BEL4) showed salmon to be absent. The site is upstream of the waterfall known as the 'Pot and Kettle' and alongside the results of time delineated surveys conducted upstream of the aforementioned natural barrier in 2015 would suggest that it still acts as a barrier to salmon migration. Juvenile trout were abundant at BEL4. It remains to be seen if these trout are the progeny of sea trout or resident brown trout.

Since stocking of artificially reared salmon ceased on the Culburnie Burn, densities of salmon fry have dropped to numbers that would be classed as 'poor'. The 2015 salmon fry density was 4/100m^2 and would be classed as poor. Conversely, density of salmon parr (1++) has increased with the most recent survey generating a density of 48/100m^2 that would be classed as 'excellent'. Results of time delineated surveys conducted along the length of the

Culburnie Burn showed salmon fry in low/absent numbers indicating very little salmon spawning activity in the winter of 2014. The presence of high numbers of salmon parr at CUL1 would suggest that the majority of salmon parr at the site have moved from the Bruiach Burn to occupy the Culburnie Burn. Timed surveys were also conducted upstream of the former bridge apron that was eased in 2014. Whilst no salmon fry were encountered, numbers of juvenile trout appear to have increased.

A series of time delineated surveys were also conducted on the Black Burn. These were carried out to ascertain if salmon were utilising the available habitat. No salmon were captured in any of the surveys whilst juvenile trout were captured at each site. This would suggest that the Black Burn is primarily used as a nursery area for brown and sea trout.

Site BE2 (River Beauly mainstem) showed evidence of extreme gravel movements, presumably an artefact of severe winter spates. This may have impacted on the density of salmon fry which dropped from 132/100m^2 in 2014 to 45/100m^2 in 2015 achieving a density classification of 'moderate'. There was also a slight reduction in salmon parr (1++) density from 7/100m^2 in 2014 to 6/100m^2 in 2015. It should be noted that this almost certainly an artefact of site selection that favours salmon fry. Site BE3 (River Beauly mainstem) also saw some changes to the substrate matrix with an apparent influx of some larger boulder and cobble. This appears to have favoured older year classes of salmon with salmon parr density rising from 24/100m^2 in 2014 to 44/100m^2 in 2015 that would be classed as 'excellent'. Density of salmon fry also increased in 2015 to 55/100m^2 that would be classed as 'good'. The most dominant year class of salmon parr was 1+ indicating most salmon of Beauly origin will smolt at two years old.

The Breakachy Burn (Site BRE1) continues to show itself as an important nursery burn. Salmon fry density was once again classed as 'excellent'. However, salmon parr (1++) were less abundant in comparison to previous surveys despite high densities of fry in the last two years. The precise reason for this remains unclear. 1+ was the most dominant cohort of salmon parr.

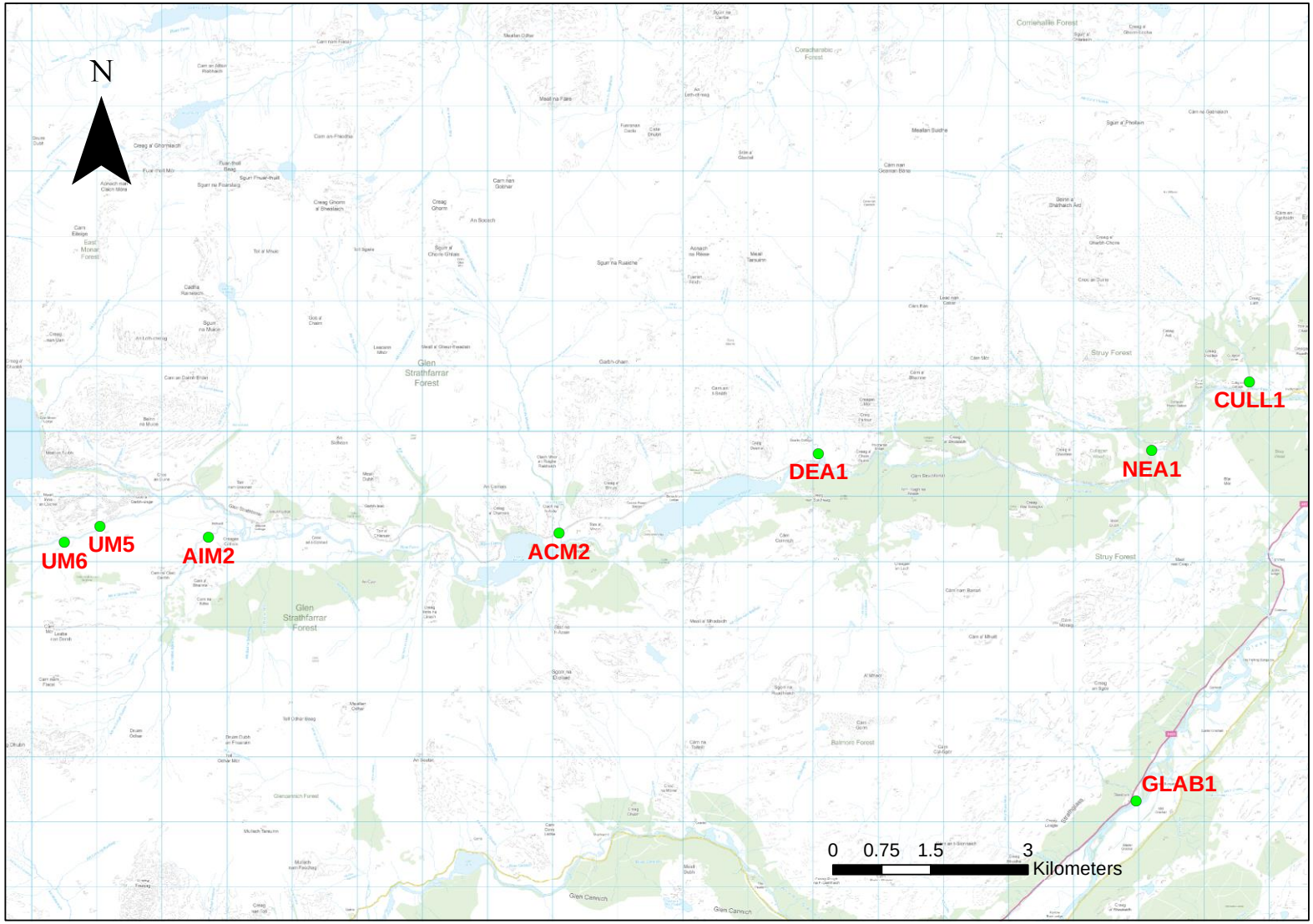
The Eskadale Burn site (ESK1) saw a resurgence in salmon fry density in 2014 yet numbers fell away again in 2015 to a 'moderate' density of 17/100m^2. It would appear that spawning activity on the Eskadale is becoming quite intermittent. Despite this, numbers of salmon parr (1++) have held up well with the 2015 survey generating a density of 65/100m^2; the highest on record for the site. The most dominant year class of salmon parr were aged 1+.

Two sites were the subject of fully quantitative surveys on the Erchless Burn: ERC1 and ERC2. ERC1 saw some changes to the habitat in 2014 but the site appears to have stabilised since then. Salmon fry density in 2015 was 95/100m^2 and would be classed as 'excellent'. Density of salmon parr (1++) has remained stable in low numbers. This is almost certainly an artefact the habitat at the site which favours salmon fry. Salmon fry were absent from ERC2 in 2015 whilst salmon parr density (1++) was classed as 'good'. The site is more suited to older year classes of salmon with its larger substrate. Examination of year classes found 0+ fry to be most abundant whilst older year classes were primarily composed of 1+ salmon parr.

Site AD3 (Abhainn Deabhag) once again showed juvenile salmon in abundance. Although the salmon fry density dropped from 140/100m^2 in 2014 to 84/100m^2 in 2015, fry density would still be classed as 'good'. Density of salmon parr (1++) was the third highest on record for the site at 48/100m^2 and would be classed as 'excellent'. Examination of year classes found three cohorts to be present: 0+, 1+ and 2+. The high numbers of 1+ may suggest that most salmon of Abhainn Deabhag origin will smolt at two years old.

Results from the Glass Burn survey (GLB1) were encouraging with the salmon fry density of 54/100m^2 being the highest on record. A record density of salmon parr (1++) was also recorded at 31/100m^2. Salmon fry and parr densities would both be classed as 'good'. The most dominant year class were 0+ salmon fry whilst older year classes were primarily composed of 1+ parr.

APPENDIX 1


N
CULL1
DEA1
NEA1
UM5
UM6
AIM2
ACM2
GLAB1
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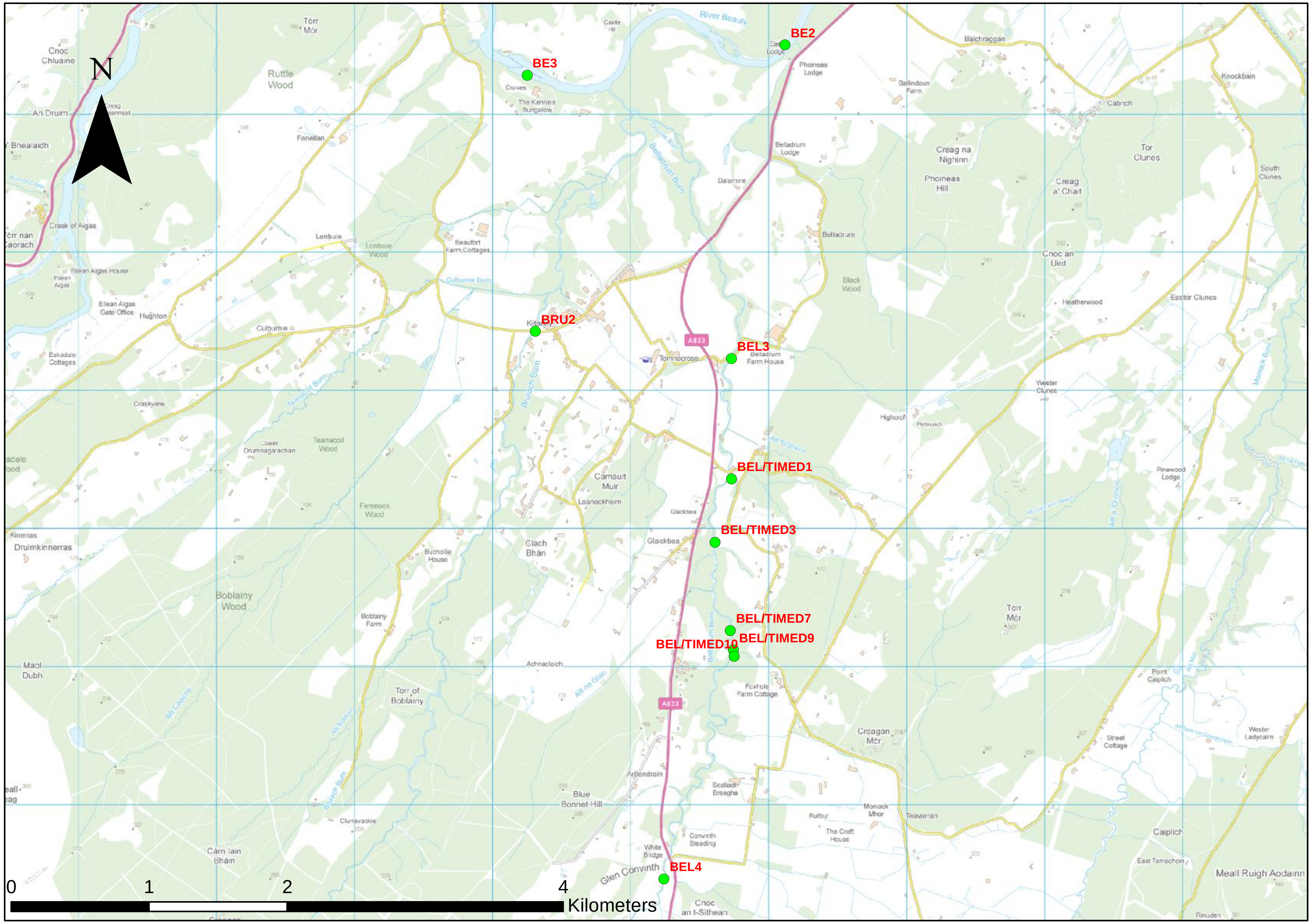
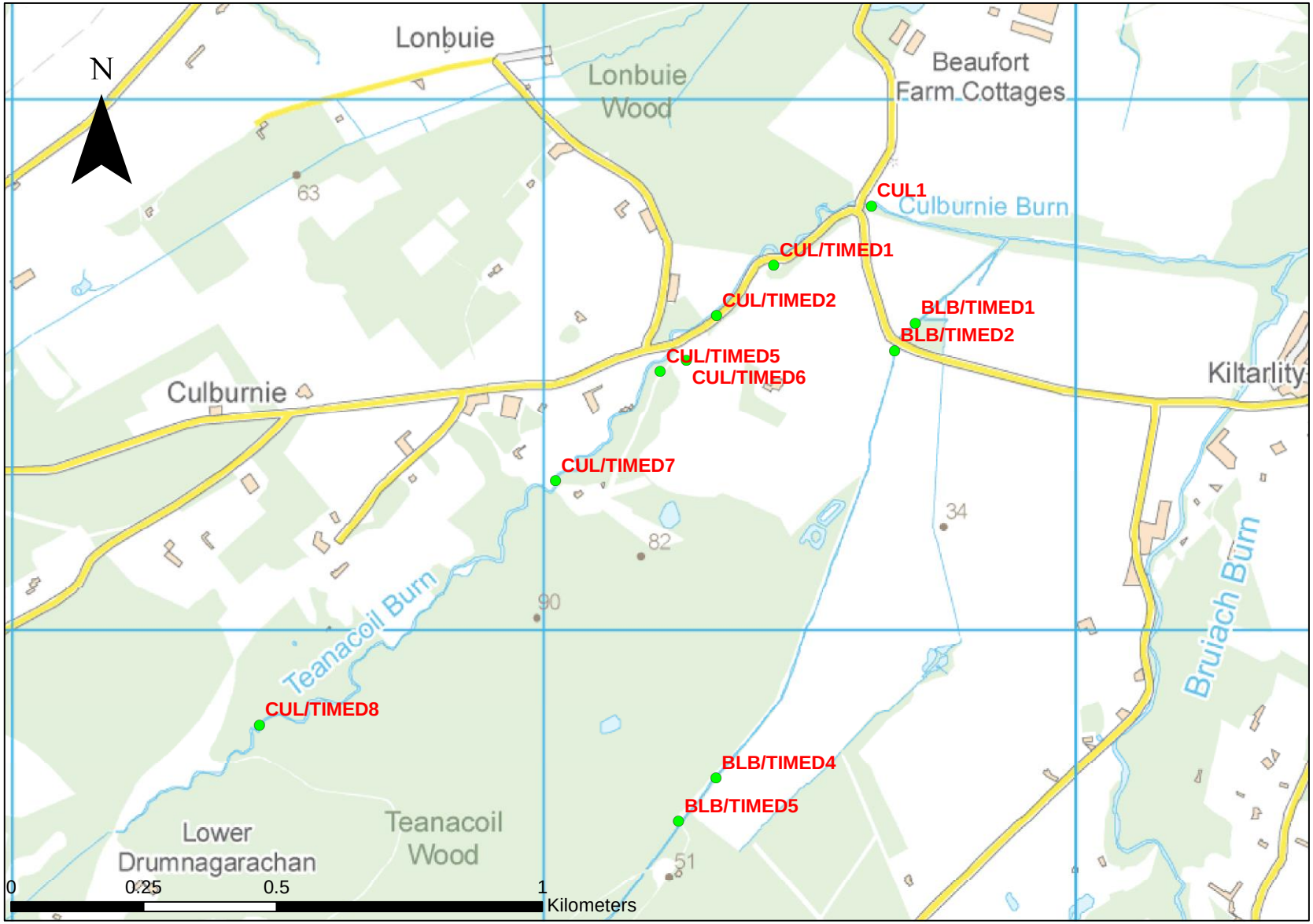
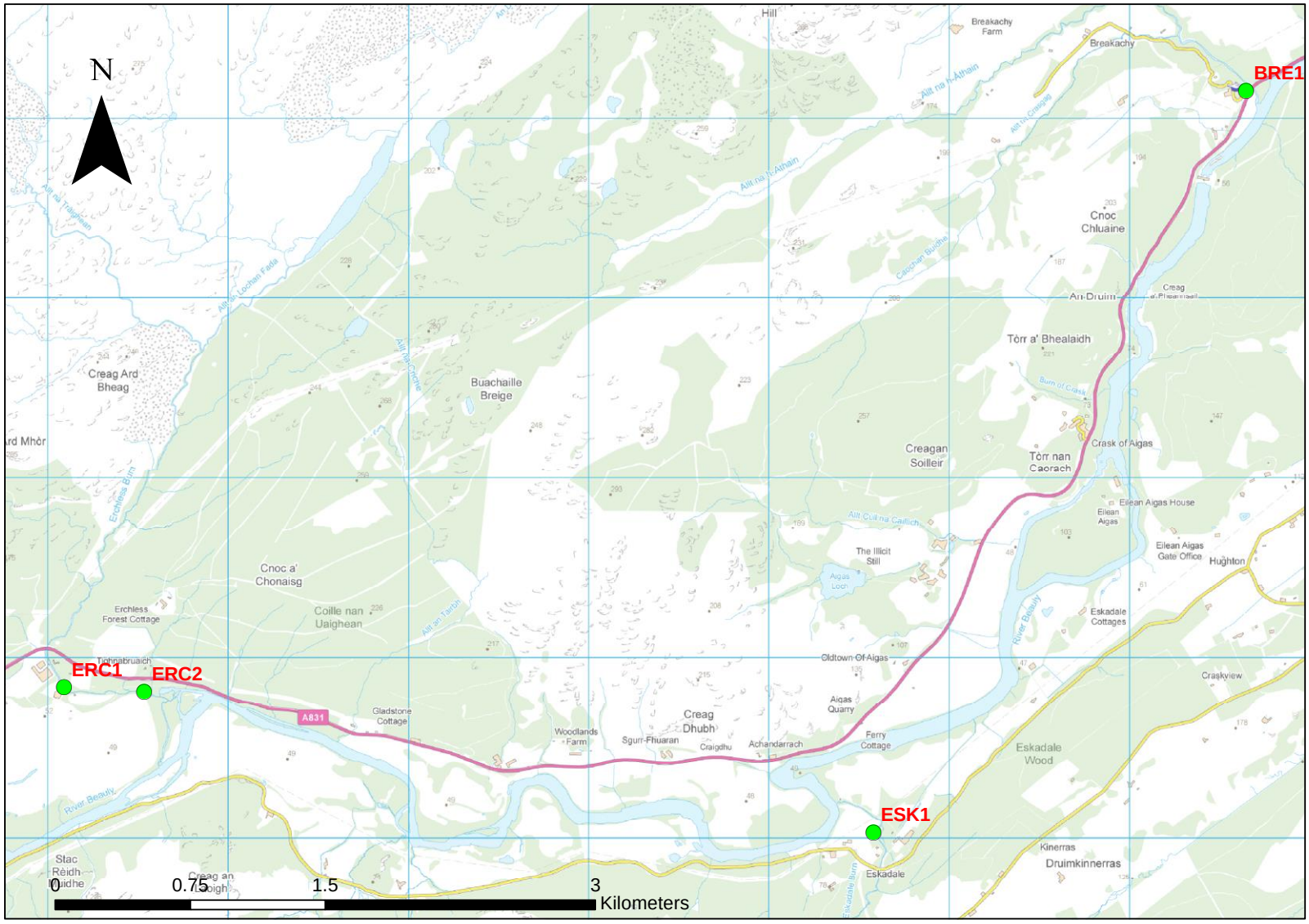
Kilometers
Glen Strathfarrar Forest
Struy Forest
Balmore Forest
Glen Cannich


N
BE2
BE3
BRU2
BEL3
BEL/TIMED1
BEL/TIMED3
BEL/TIMED7
BEL/TIMED9
BEL/TIMED10
BEL4
0
1
2
4
Kilometers


N
Lonbuie
Lonbuie Wood
Beaufort Farm Cottages
Culburnie Burn
Culburnie
Kiltarlity
Bruiach Burn
Teanacoil Burn
Lower Drumnagarachan
Teanacoil Wood
63
82
90
34
51
CUL1
CUL/TIMED1
CUL/TIMED2
CUL/TIMED5
CUL/TIMED6
CUL/TIMED7
CUL/TIMED8
BLB/TIMED1
BLB/TIMED2
BLB/TIMED4
BLB/TIMED5
0
0.25
0.5
1
Kilometers


N
BRE1
ERC1
ERC2
ESK1
Hill
Breakachy Farm
Breakachy
Cnoc Chluaine
An Druim
Tòrr a' Bhealaidh
Creag Ard Bheag
Buachaille Breige
Creagan Soilleir
Tòrr nan Caorach
Crask of Aigas
Eilean Aigas House
Eilean Aigas Gate Office
Hughton
The Illicit Still
Cnoc a' Chonaisg
Coille nan Uaighean
Erchless Forest Cottage
Eskadale Cottages
Oldtown Of Aigas
Craskview
A831
Gladstone Cottage
Woodlands Farm
Creag Dhubh
Sgurr-Fhuaran
Craigdhu
Achandarrach
Aigas Quarry
Ferry Cottage
Eskadale Wood
Kinerras
Druimkinnerras
Eskadale
River Beauly
0
0.75
1.5
3
Kilometers

APPENDIX 2

Plate 1 – Site CULL1 (Culligran Burn)

Plate 2 – Site UM5 (Uisgeach Misgeach)

Plate 3 – Site UM6 (Uisge Misgeach)

Plate 4 – Site ACM2 (Allt Choire a' Mhuillidh)

Plate 5 – Site AIM2 (Allt Innis a' Mhuillt)

Plate 6 – Site NEA1 (Neaty Burn)

Plate 7 – Site DEA1 (Deanie Burn)

Plate 8 – Site BRU2 (Bruiach Burn)

Plate 9 – Site BEL3 (Belladrum Burn)

Plate 10 – Site BEL4 (Belladrum Burn)

Plate 11 – Site BEL/TIMED1 (Belladrum Burn)

Plate 12 – Site BEL/TIMED3 (Belladrum Burn)

Plate 13 – Site BEL/TIMED7 (Belladrum Burn)

Plate 14 – Site BEL/TIMED9 (Belladrum Burn)

Plate 15 – Site BEL/TIMED10 (Belladrum Burn)

Plate 16 – Site CUL1 (Culburnie Burn)

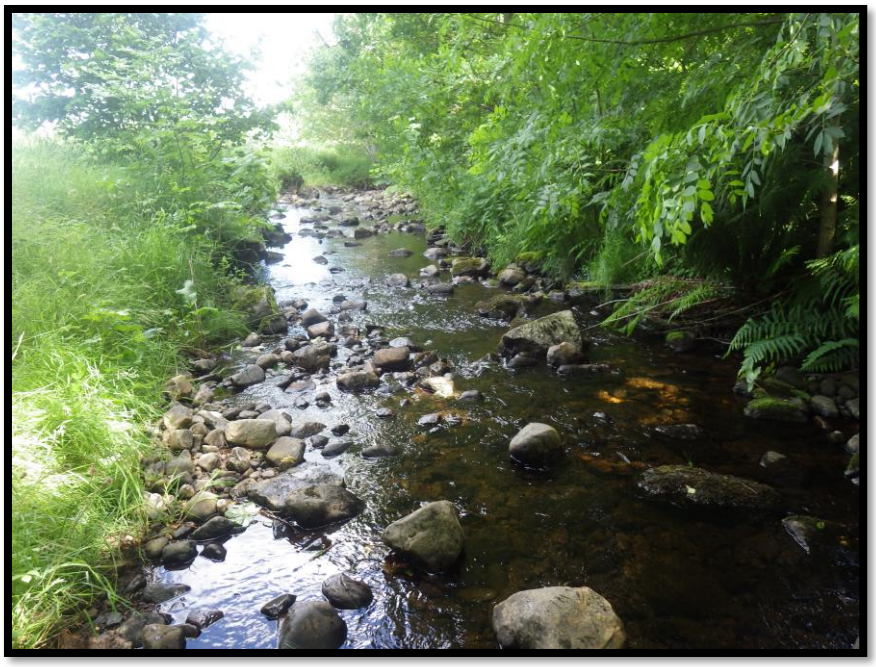


Plate 17 – Site CUL/TIMED6

Plate 18 – Site CUL/TIMED7

Plate 19 – Site CUL/TIMED8

Plate 20 – Site CUL/TIMED9

Plate 21 – Site BLB/TIMED1 (Black Burn)

Plate 22 – Site BLB/TIMED4 (Black Burn)

Plate 23 – Site BE2 (River Beauly Mainstem

Plate 24 – Site BE3 (River Beauly Mainstem)

Plate 25 – Site ESK 1 (Eskadale Burn)

Figure 26 – Site BRE1 (Breakachy Burn)

Plate 27 – Site ERC1 (Erchless Burn)

Plate 28 – Site ERC2 (Erchless Burn)

Plate 29 – Site AD3 (Abhainn Deabhag)

Plate 30 – Site GLB1 (Glass Burn)

Figure 31 – Site CAN1 (River Cannich)