

Electrofishing surveys, 2009

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2009 juvenile surveys

Introduction

Electrofishing surveys are designed to assess the juvenile fish populations within a system. The equipment operates by creating an electrical field within the water that at first attracts the fish and subsequently stuns them for a brief period. As the field is restricted in size, the best operating conditions are shallow water within smaller tributaries. While it is possible to sample main stream areas, and this has been done within this survey, the escape rate is higher than that found in the narrower streams. Similarly, a high escape rate is found in exceptionally shallow, stony or weedy areas, where fish can move into the substrate and thus are inaccessible to the nets.

This survey repeats many of the catchments surveyed previously. Where possible all sites were revisited, although some were not accessed due to time and flow constraints, while others were removed from the survey on the basis of the results from the previous survey. Additional sites were added in some instances.

This report summarises the data for each system. Maps giving the location of each site and the densities represented pictorially are available on request. Similarly, length-frequency data for each site are available, together with the length-frequency data for each system as a whole.

Methods

Fish densities were assessed by electrofishing using a backpack supplying pulsed D.C. power over sites marked with string. Fish attracted to the hand-held anode were netted into a bucket and retained. The sites were fished systematically upstream.

All fish were anaesthetised using 2 Phenoxyethanol, identified to species and measured (± 1 mm). Small samples of scales were removed from a proportion of each length range for age determination. The fish were then allowed to recover before returning to the electrofished section. Densities of fish were calculated as minimum estimates, such that a minimum number of fish present per 100 m² could be determined. Water level was not used in the density estimates, although it must be realised that stream conditions will have an impact on the density determined and efficiency of the fishing technique.

Site characteristics were recorded at each site, including bed type, flow and bankside characteristics in accordance with the SFCC protocol.

Results

1. Polla catchment

Table 1.1 gives the grid reference, altitude and location of each site fished. The length, mean width and area fished are presented in Table 1.2, together with minimum estimates of density for salmon and trout fry (0+ years) and parr (>1 year) per 100 m².

Table 1.1 Electrofishing site details

Code	Easting	Northing	Altitude	River	Situation
P2A	238600	954000	20	River Polla, Allt Coire an Uinnseinn	Flood plain
P4A	239100	951800	20	River Polla	By Strabeg House, in trees
P5A	239200	951900	30	River Polla, Allt Odhrsgaraidh	Tributary next to Strabeg House, 50 m from main river
P6A	238500	951500	30	River Polla	On flood plain above Strabeg House. Next to large boulder beyond start of ridge
P7A	238800	952600	20	River Polla	Tributary downstream of loch Bad na h Achlaise
P8A	238800	952400	20	River Polla	Burn running out of loch Bad na h Achlaise, downstream of Strabeg House
P9A	239100	952300	20	River Polla	Tributary downstream of Strabeg House, same bank
P10A	238700	954100	20	River Polla	Tributary on the left bank upstream of the fishing hut by the dam

Table 1.2 A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100 m²

Site code	Length (m)	Average Width (m)	Area (m ²)	Density (100 m ²)			
				Salmon fry	Salmon parr	Trout fry	Trout parr
P2A	18	2.30	41.40	28.99	7.25	14.49	4.83
P4A	8	7.30	58.40	8.56	15.41	1.71	1.71
P5A	14.3	5.53	79.13	30.33	16.43	15.17	3.79
P6A	15	6.23	93.50	8.56	3.21	1.07	1.07
P7A	11.5	1.77	20.32	9.84	0.00	4.92	0.00
P8A	17	1.67	28.33	3.53	3.53	3.53	7.06
P9A	8.5	1.63	13.88	14.41	0.00	21.61	7.20
P10A	9.3	2.00	18.60	10.75	5.38	0.00	5.38

The maximum, minimum and mean densities are given for all sites (Table 1.3). This summarises the data and allows comparisons within the system and with other systems within the west Sutherland area.

Table 1.3 A summary of the densities determined for all sites surveyed

	Minimum	Maximum	Mean
Salmon fry	3.53	30.33	14.37
Salmon parr	0.00	16.43	6.40
Trout fry	0.00	21.61	7.81
Trout parr	0.00	7.20	3.88

Two year classes (0+ - 1+) are discernible within both the salmon and three (0+ - 2+) within the trout populations.

Eels were present in low numbers at P2A, P4A and P5A. Three - spined sticklebacks were found in low density in P10A only. There were no minnows recorded within the system.

An assessment of changes in average densities within the system by time shows that the salmonid densities are variable over the 12 year period, but that the trend is generally one of stability over the period of the surveys.

Discussion

Juvenile salmon populations within this survey are average (parr) or above average (fry) for the west Sutherland area, while trout and below average. This is contrary to the catch records, which show that the Polla is primarily a trout system, although agreeing with the results of previous surveys within the catchment. While it is possible that this reflects the sites surveyed, there is a good distribution throughout the system and the distribution of salmon and trout suggests that the fish are well mixed, thereby not supporting this hypothesis.

From analysis of the historic data it would appear that the total density of salmonids during 2009 is good for the catchment, approaching the maximum density recorded over the past 13 years. This would appear to be the result of a higher than previous density of salmon, while trout densities remain slightly below this level.

2. Loch Innis na Ba Buidhe catchment

Table 2.1 gives the grid reference, altitude and location of each site fished. The length, mean width and area fished are presented in Table 2.2, together with minimum estimates of density for salmon and trout fry (0+ years) and parr (>1 year) per 100 m².

Table 2.1 Electrofishing site details

Code	Easting	Northing	Altitude	River	Situation
LI1	222200	957500	20	Loch Innis na Ba Buidhe tributary	From 2nd meander through gate
LI2A	223000	956900	50	Allt nan Lub Bana	Above bedrock falls, just before bend in river
LI2C	222620	956900	15	Allt nan lub bana	Downstream point 20m from loch, upstream point is top of bend by the top of original channel.
LI3	222600	957000	15	Loch Innis na Ba Buidhe tributary	By track, just above loch

Table 2.2 A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100 m²

Site code	Length (m)	Average Width (m)	Area (m ²)	Density (100 m ²)			
				Salmon fry	Salmon parr	Trout fry	Trout parr
LI1	11.8	0.97	11.41	0.00	0.00	113.97	26.30
LI2A	27	2.90	78.30	0.00	0.00	2.55	12.77
LI2C	15.4	2.60	40.04	0.00	14.99	9.99	9.99
LI3	14.1	1.03	14.57	0.00	0.00	48.04	0.00

The maximum, minimum and mean densities are given for all sites (Table 2.3). This summarises the data and allows comparisons within the system and with other systems within the west Sutherland area.

Table 2.3 A summary of the densities determined for all sites surveyed

	Minimum	Maximum	Mean
Salmon fry	0.00	0.00	0.00
Salmon parr	0.00	14.99	3.75
Trout fry	2.55	113.97	43.64
Trout parr	0.00	26.30	12.27

One year class (1+) is discernible within the salmon population and three year classes (0+ - 2+) within the trout.

Eels were present at all sites with the exception of LI3. Greatest densities were recorded in LI2C. Minnows were only recorded in LI2C. There were no other species recorded within the system.

An assessment of changes in average densities within the system by time shows that the salmonid densities are highly variable over the 11 year period, but are in general increasing. However, parr densities have remained relatively constant, compared to those of fry. Trout show the greatest variability, increasing over time.

Discussion

Trout populations appear to be healthy with fry densities more than double the average for west Sutherland. LI1 has the greatest trout densities, while LI2A continues to have the lowest fry densities of the catchment. This is a reflection of available habitat rather than issues within the trout population itself.

Mean parr densities are also above average for the west Sutherland area, although by 1.5 times rather than 2 times the average. This may reflect the movement of larger fish into the loch as well as habitat availability. This pattern is reflected in each year of the survey and, given the healthy trout populations available, supports this view.

The average densities of salmon within this survey are similar to those found in previous years. The salmon population within the catchment is transitory and likely to be based on fish straying from the neighbouring Rhiconich. That no fry were found may be an indication of the habitat surveyed, but is more likely to reflect the small population.

3. Laxford catchment

Table 3.1 gives the grid reference, altitude and location of each site fished. The length, mean width and area fished are presented in Table 3.2, together with minimum estimates of density for salmon and trout fry (0+ years) and parr (>1 year) per 100 m².

Table 3.1 Electrofishing site details

Code	Easting	Northing	Altitude	River	Situation
L18A	230900	942200	40	River Lone	Downstream of Bridge at Lone
L18B	231100	942300	50	River Lone	300m from Lone bridge on Lone burn just below the row of trees.
L18C	231200	942400	55	Allt Horn	Moorland below the woodland
L19	230700	941700	40	Small tributary before the Lone.	Tributary of the river Laxford.
L20	230700	941600	50	Allt a Chuilinn	50m upstream of the trees From riffle to drop off - deep scour
L26A	229500	939700	50	Hatchery burn	Below Ian's house in the gorse bushes.
L26B	227000	940700	70	Hatchery burn.	Upstream site located in the coniferous plantation.
L36	230900	938200	50	Laxford	Tributary off Loch More, Downstream of bridge until first meander bend.
L53	234700	935900	40	Laxford, boathouse	Below the rough track into Allt a Reinidh

Table 3.2 A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100 m²

Site code	Length (m)	Average Width (m)	Area (m ²)	Density (100 m ²)			
				Salmon fry	Salmon parr	Trout fry	Trout parr
L18A	13	14.27	185.47	13.48	11.32	1.62	2.70
L18B	7	10.03	70.23	8.54	17.09	8.54	0.00
L18C	18	4.67	84.00	32.14	21.43	3.57	1.19
L19	25	1.74	43.50	9.20	4.60	144.83	6.90
L20	11.7	6.10	71.37	18.21	0.00	14.01	4.20
L26A	16.2	5.27	85.32	25.79	28.13	8.20	2.34
L26B	13.2	3.13	41.36	4.84	4.84	2.42	21.76
L36	15	1.83	27.50	0.00	0.00	29.09	50.91
L53	17.5	1.27	22.17	0.00	0.00	58.65	13.53

The maximum, minimum and mean densities are given for all sites (Table 3.3). This summarises the data and allows comparisons within the system and with other systems within the west Sutherland area.

Table 3.3 A summary of the densities determined for all sites surveyed

	Minimum	Maximum	Mean
Salmon fry	0.00	32.14	12.47
Salmon parr	0.00	28.13	9.71
Trout fry	1.62	144.83	30.10
Trout parr	0.00	50.91	11.50

Two year classes (0+ - 1+) are discernible within the salmon and five (0+ - 4+) within the trout populations.

Eels were present at all sites with the exception of L19 and L53. Greatest densities were recorded in L18A. Minnows were recorded in L18B and L19 only, with the greatest densities within L19. There were no other species recorded within the system.

An assessment of changes in average densities within the system by time shows that the salmonid densities are highly variable over the 12 year period. However, parr densities have remained relatively constant, with the greatest variability within the juvenile trout population.

Discussion

The average densities of salmon fry within this survey were at the low end for salmon fry in the Laxford system. However densities of both salmon parr and trout were average to good for the system. This may reflect the sites sampled during this survey, with several of the sites missed as a result of bad weather being primarily salmon fry habitat. All densities are within the range previously recorded for the Laxford, and are above average for the Sutherland area.

As expected, fry densities are greater than parr, demonstrating a balanced and healthy migratory population, where density dependent mortality is in operation. This, together with the changes in the juvenile populations over the past 12 years would suggest that the salmonid population is stable. From this, and previous surveys, the Laxford system would appear to be a mix of salmon and trout, with different parts of the system supporting different species.

4. Clashnessie catchment

Table 4.1 gives the grid reference, altitude and location of each site fished. The length, mean width and area fished are presented in Table 4.2, together with minimum estimates of density for salmon and trout fry (0+ years) and parr (>1 year) per 100 m².

Table 4.1 Electrofishing site details

Code	Easting	Northing	Altitude	River	Situation
TS1A	205611	930862	5	Clashnessie	Below road
TS1B	205564	930654	10	Clashnessie	Up to fence opposite croft
TS2	205538	930563	10	Clashnessie	Over fence opposite croft above TS1B

Table 4.2 A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100 m²

Site code	Length (m)	Average Width (m)	Area (m ²)	Density (100 m ²)			
				Salmon fry	Salmon parr	Trout fry	Trout parr
TS1A	10	2.30	23.00	0.00	0.00	8.70	0.00
TS1B	12.5	2.70	33.75	0.00	0.00	11.85	17.78
TS2	9.7	2.20	21.34	0.00	4.69	0.00	28.12

The maximum, minimum and mean densities are given for all sites (Table 4.3). This summarises the data and allows comparisons within the system and with other systems within the west Sutherland area.

Table 4.3 A summary of the densities determined for all sites surveyed

	Minimum	Maximum	Mean
Salmon fry	0.00	0.00	0.00
Salmon parr	0.00	4.69	1.56
Trout fry	0.00	11.85	6.85
Trout parr	0.00	28.12	15.30

One year class (1+) is discernible within the salmon population and three year classes (0+ - 2+) within the trout.

Eels were present at all sites. Greatest densities were recorded in TS1B. Flounder were also found in TS1A. There were no other species recorded within the system.

Discussion

Clashnessie is historically a trout system. A comparison of trout densities within the system with those within the Sutherland area indicates that the average densities of trout fry were significantly lower in Clashnessie. However trout parr densities were greater, thus demonstrating that this is primarily a function of site selection.

There are a good range of sizes present within the survey, indicating a healthy and well mixed population. A similar mix could be seen in other species, suggesting that the habitat is in good condition. Although the accessible system is relatively short, it contains healthy fish populations. The presence of salmon within the survey was unexpected, but welcome. That only salmon parr were found suggests that the salmon population within the Clashnessie burn is fragile and intermittent.

5. Average for the West Sutherland Fisheries Trust area

The average densities of fish within each catchment are summarised (Table 5.1). This allows a comparison between the catchments, although it should be noted that the temporal changes in density, occasioned by sampling at different times of the year, and habitat differences between catchments are not considered in this table. The timing of sampling is important, with fish moving within the

tributaries as a result of water height and temperature, food availability and size. Thus, sampling after a spate may give a low density as a result of washout, while drought may decrease density as fish move into deeper water to avoid predation or desiccation, or may increase density as a result of concentration in severe cases. Similarly, densities will be greater shortly after hatching, reducing with time as the fish grow and require a larger territory for survival.

Table 5.1 The average densities of salmon and trout per 100 m² within each catchment surveyed

Catchment	Density (100 m ²)			
	Salmon fry	Salmon parr	Trout fry	Trout parr
Polla	14.37	6.40	7.81	3.88
Loch Innis na Ba Buidhe	0.00	3.75	43.64	12.27
Laxford	12.47	9.71	30.10	11.50
Clashnessie	0.00	1.56	6.85	15.30

From Fig 5.1 it can be seen that the length distribution for trout and salmon is similar throughout the area. As expected, there was a greater spread in the length of trout caught compared to salmon, reflecting the presence of resident trout. The largest trout were taken in the Laxford.

The West Sutherland area shows a good mix of salmonid species, with trout and salmon present in all catchments (Fig 5.2). Eels are also common throughout the area, occurring in all of the systems examined. Minnow are also common throughout the area, with the exception of the Polla, while 3-spined stickleback were found only in the Polla.

Discussion

The results from this survey indicate that salmon and trout populations are dispersed throughout the area. Missing year classes were observed in Loch Innis na Ba Buidhe and Clashnessie, with salmon fry absent from the sampling. This probably reflects the transitory nature of the salmon population within these catchments, together with the habitat at the survey sites. Trout populations in all systems had a range of age classes, with populations appearing to be healthy, if small.

When compared to the previous surveys within these systems, the fish densities did not show any discernible pattern, increasing in some systems while decreasing in others. However, they remained within the range found in previous surveys, therefore indicating that there are no current problems within these catchments. Stocking does not form a major part in the management of systems monitored in 2009, with the exception of the Laxford. In the Laxford the system is stocked with salmon in the Lone tributary. However this will not have affected the sites sampled during 2009. Other factors that may affect the results, compared to previous years, include water flow and temperature, with a wet summer affecting sampling efficiency and the ability to reach and survey many of the original sites.

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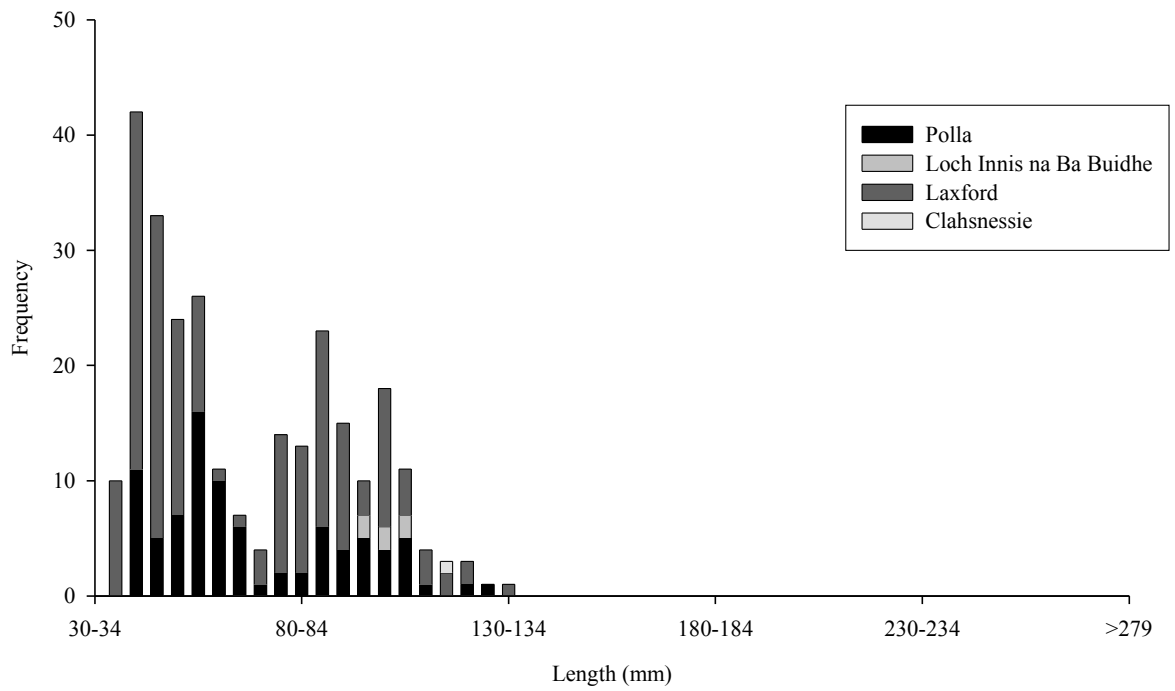


Fig. 5.1a The length - frequency distribution of salmon within the West Sutherland area

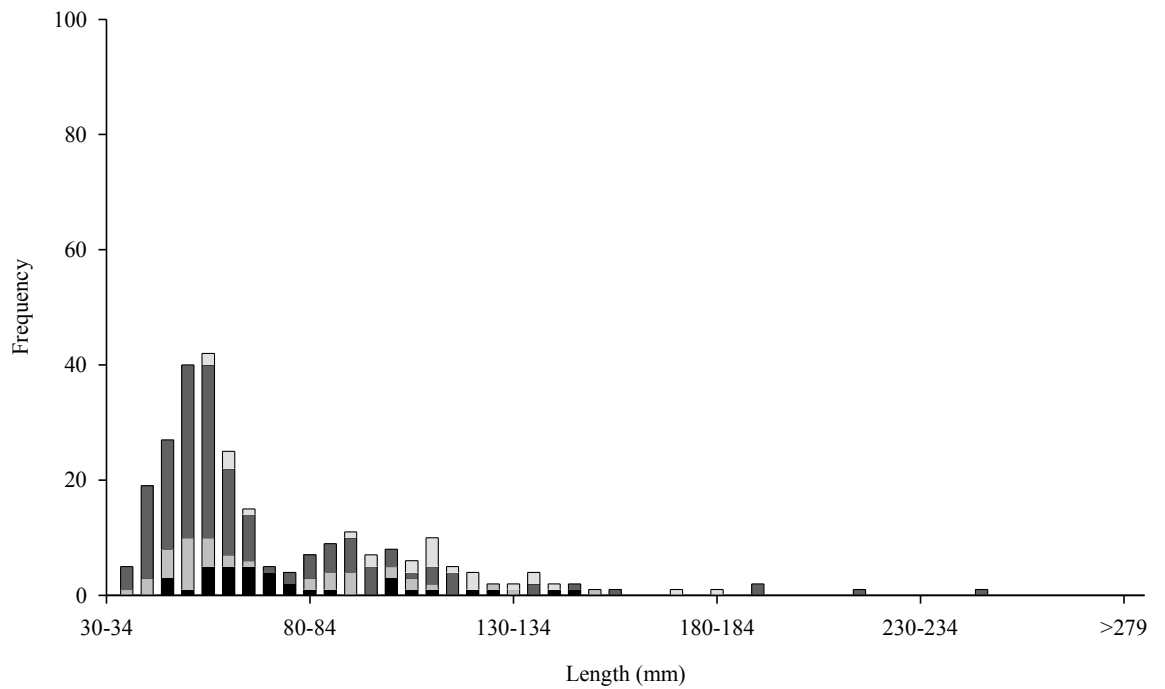


Fig. 5.1b The length - frequency distribution of trout within the West Sutherland area

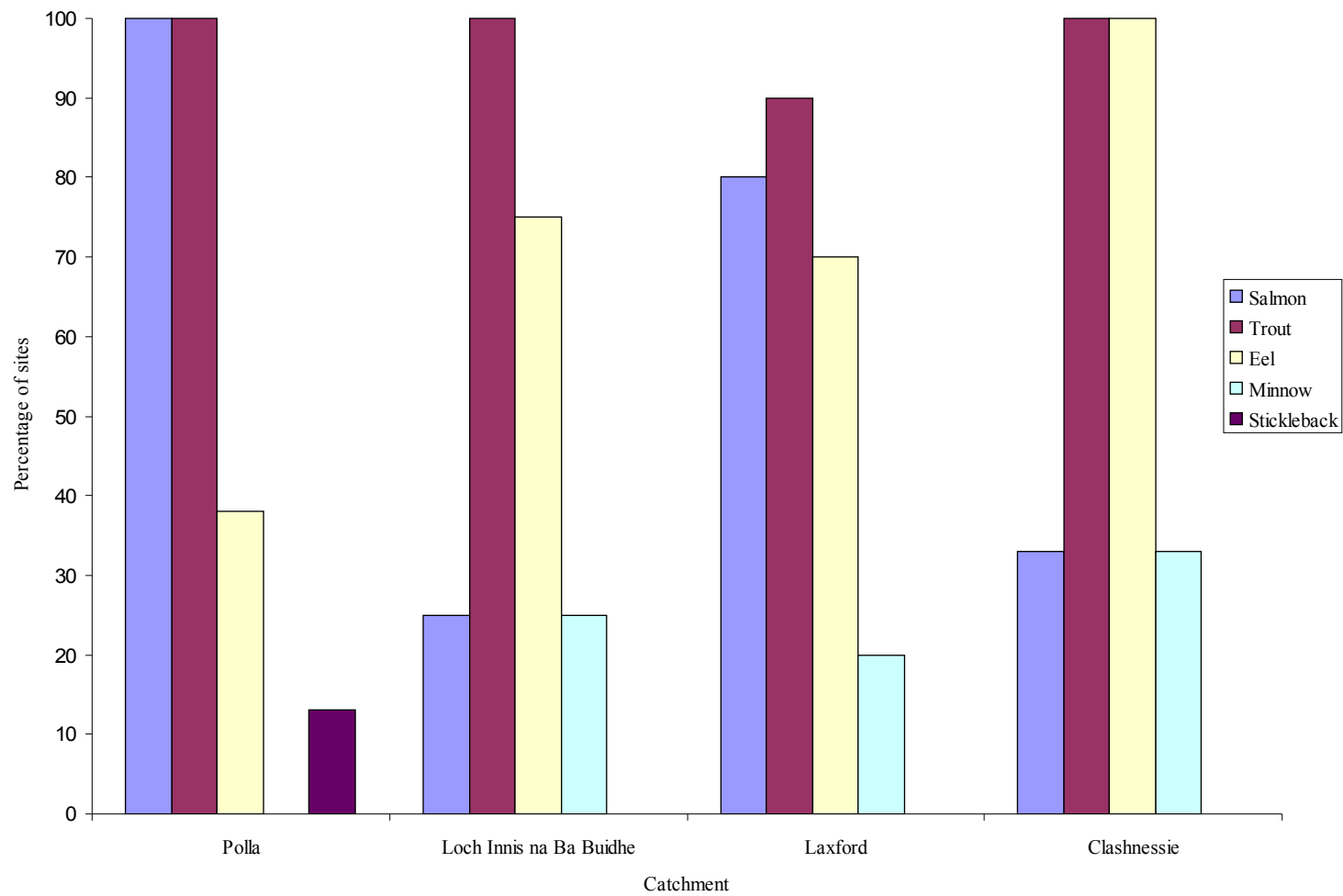


Fig. 5.2 Showing the occurrence of each species within the catchments, as a percentage of the sites surveyed

