River Spey Juvenile Survey 1994

J. Bray and R. Laughton

Spey Research Trust Report No 5/95

Spey Research Trust
121 High Street
Forres
Morayshire
IV36 0AB

December 1995

River Spey Juvenile Survey 1994

J. Bray and R. Laughton

Spey Research Trust
121 High Street
Forres

Summary

A survey of the distribution and population densities of juvenile salmon and trout in the River Spey was implemented in 1990. Further surveys have been carried out annually. As part of the continuing study, this report presents data on the distribution and population densities of salmon and trout at the sites examined in the Spey catchment during 1994.

Spey Research staff surveyed a total of 95 sites, 9 of which were examined twice, in early June and again in September. In addition the results from seven sites surveyed on the River Nethy by SOAFD Freshwater Fisheries Laboratory staff are included bringing the total to 102. Adapting the electro-fishing technique from three fishings per site to one during the 1994 survey resulted in a wider coverage of the catchment than in previous years.

Six varieties of fish were recorded in the survey, of which, salmon and trout were the most widely distributed and were present at 82 sites (80%) and 100 sites (98%) respectively. Eels were common and appeared at 35 sites (34%). Minnows were present at 8 (8%), lampreys at 10 (10%) and rainbow trout were found at one site.

Salmon and trout were distributed throughout the catchment, with salmon absent from areas above obstructions. In general, densities of both species were greater in lower tributaries, Fiddich, Livet, etc than in areas further upstream, Tromie, Truim, etc. Throughout the catchment smaller burns (<5m wide) were found to be important nursery areas for juvenile salmonids. Examples of these are the Mulben Burn, Cromdale Burn and Allt an t-Eileach.

Seasonal variations in year class densities and growth rates were observed. In general 1+ salmon and trout densities declined between early June and September, however no clear trend was evident for older fish. At the end of the growing season, mean lengths of fish in burns at higher altitude were less than those at lower levels. This may be related to water temperature and chemistry.

The 1994 survey completes five years of juvenile surveys. This provides a suitable database to examine yearly trends in the Spey juvenile populations and perhaps begin to relate them to trends in returning adult numbers (catch data) and redd counts. The survey information could also be used to give a rough estimate of the smolt production. Future surveys will expand the database further and address some of these issues.

River Spey Juvenile Survey 1994

J. Bray and R. Laughton

Introduction

A survey of the distribution and population densities of juvenile salmon and trout in the River Spey was implemented in 1990. Further surveys have been carried out annually. Results for the 1990 survey are presented in Laughton (1991) and for the 1991 survey in Laughton (1993).

This report presents data on the distribution and population densities of salmon and trout at the sites examined in the Spey catchment during 1994.

Materials and Methods

The electro-fishing techniques used during the survey are described by Gardiner (1989) and for the Spey in particular by Laughton (1991). However, in 1994 in order to cover the large area of the Spey catchment effectively, the electro-fishing technique was modified from three fishings per site to one. This reduced the amount of time spent at each survey site and enabled a greater number of locations to be examined per year.

This semi-quantitative technique is described by Strange, Aprahamian and Winstone (1989) for juvenile salmonid populations in Welsh rivers and was applied to Spey data by Laughton (in prep).The method relies on regression analysis to relate the population estimates calculated from one electro-fishing run with those obtained from two or more.

The regression statistics for the relationship between the catch after one fishing per site (C_1) and the catch after three (C_3), for each age class of salmon and trout on the River Spey, are presented in Table 1. The regression formulae were applied to the data obtained during the 1994 survey, for example, for 0+ salmon the formula is:

$$C_3 = 1.78C_1 + 0.01$$

Table 1: Regression statistics for the relationship between C_1 and C_3 for salmon and trout on River Spey.

Salmon Age	Slope	Y Intercept	R^2	Trout Age	Slope	Y Intercept	R^2
0+	1.78	0.01	0.95	0+	1.79	-0.02	0.98
1+	1.57	0.02	0.90	1+	1.23	0.04	0.83
2+	1.55	0.003	0.85	2+	0.96	0.03	0.89

Results and Discussion

The results are presented by tributary and the survey sites referred to by serial number within each catchment area; Spey (main stem) = S, Fiddich = F, Avon = A, Dulnain = D, Nethy = N, Druie = Dr, Feshie = Fe, Tromie = T, Calder = C, Truim = Tr, Mashie = M. The smaller burns which enter the Spey downstream of Grantown are referred to as Lower Burns, LB, those entering between Grantown and Laggan are referred to as Middle Burns, MB, while the sites above Spey Dam are referred to as SD.

Spey Research staff surveyed a total of 95 sites, 9 of which were examined twice, in early June and again in September. In addition the results from seven sites surveyed on the River Nethy by SOAFD Freshwater Fisheries Laboratory staff are included bringing the total to 102. The presence of species other than salmon and trout was noted.

A diagram of each tributary and site location is given in Figures 1 to 12. Site details, fish distribution and densities are presented in Tables 2 to 13.

Species Distribution

Six different varieties of fish were recorded in the survey (Tables 2b-13b), salmon (*Salmo salar*), trout (*Salmo trutta*), eel (*Anguilla anguilla*), minnow (*Phoxinus phoxinus*) and lamprey spp. In addition rainbow trout (*Oncorhynchus mykiss*), of hatchery origin, were recorded for the first time in the Alvie Burn.

Salmon and trout were the most widely distributed and were present at 82 sites (80%) and 100 sites (98%) respectively. Eels were common and appeared at 35 sites (34%). Minnows were present at 8 (8%), lampreys at 10 (10%) and rainbow trout were found at one site.

Arctic Charr (*Salvelinus alpinus*), Stickleback (*Gasterosteus aculeatus*) and pike (*Esox lucius*) are also present in the catchment but were not captured at any of the sites examined in 1994.

Salmon and Trout Densities

Densities for each age class of salmon and trout are presented in Tables 2b to 13b.

Four age classes of salmon were found in the catchment. The maximum density for salmon fry was $3.59m^{-2}$ at D5a; 1+, $0.63m^{-2}$ at LB13 and for 2+, $0.78m^{-2}$ at MB6. In addition 3+ salmon parr were found at Dr7 and T12 at low densities, ie one fish per site. Three three year old salmon smolts were found a F3 on the Fiddich during the May visit. This is the first time that smolts have been recorded during Spey juvenile surveys.

Salmon were present at a majority of sites. Their absence was, however, noted at the following: LB12 (although a single fin-clipped 2+ parr from a previous stocking was captured here), N3, C5, MB7e (again a single hatchery reared 2+ parr was found here), MB16c and MB16d which are all above impassable falls. At F8, F9, LB14, T8a (a single fin-clipped 2+ fish present here), T8b, T8c, SD1 and SD2 which although accessible to adult salmon are all above major obstructions such as dams, weirs, etc. Site A9, at 600m altitude and draining hard granitic rocks, may be too severe a habitat for juvenile salmon to establish. Salmon were not found on the lower Alvie Burn sites (MB16a, MB16b). Although there are no obstructions, the burn drains through Loch Alvie and Bogach, an area of marshland, which may present difficulties for migrating adults.

In general the higher densities of salmon were in the lower catchment tributaries while further upstream densities were lower. A number of smaller burns throughout the catchment were also examined this year and these were also found to be important salmon rearing areas.

Four age classes of trout were found in the catchment. The maximum density for trout fry was $5.39m^{-2}$ at F8; 1+, $0.53m^{-2}$ at LB7 and for 2+, $0.36m^{-2}$ at F9. 3+ trout were present at 14 sites

throughout the catchment in low densities (=<0.03m^{-2}).

Trout were absent from only two sites, Tr6 and MB8. At both these sites and at several other sites where trout densities were poor (e.g.N1, Dr4, Fe2, Fe5, T7, T4 and C1), salmon densities were good. Examination of the physical characteristics of these sites indicated that they are all fast flowing riffle with a regular firm cobble bed and little overhanging cover. This highlights the difference in habitat preference between the species.

Trout densities were higher in the lower catchment and in particular the River Dullan, indicating that this tributary offers very good rearing habitat for juveniles. Further upstream good densities were found in the upper Tromie, which may indicate a good stock in the lochs above Seilich Dam, and in a number of the middle burns. Resident populations were found above obstructions and these were generally at low densities.

Rainbow trout were recorded in the 1994 survey for the first time in the Alvie Burn (MB16b). This site is immediately downstream from a commercial hatchery and it seems likely that these fish originated from that source.

Re-Visited Sites

Salmon and Trout Density Changes

Nine sites in the 1994 survey were examined in late May/early June and re-visited in September. This allowed changes in age class densities to be examined. Data for 1+ and 2+ salmon and trout are presented in Figure 13a-d.

From Figure 13a it is evident that six sites showed a decline in 1+ salmon densities between visits, while the remaining three increased. A similar pattern is evident in Figure 13c for 1+ trout. There is no clear pattern for 2+ salmon or trout (Figures 13b and 13d). This may reflect the low numbers of 2+ trout present at the sites studied.

These variations in seasonal density may be due to a variety of factors including, natural mortality and predation. Furthermore as fish grow their habitat requirements change thus they may need to emigrate to a more suitable area. During both the 1991 and 1992 Spey surveys similar trends were observed Laughton (1991, (in prep)). Seasonal variations in juvenile populations have also been noted by Egglishaw and Shackley (1977) on the Shelligan Burn, a tributary of the Tay.

1+ Salmon and Trout Growth

Figures 14a and 14b show the mean length for 1+ salmon and trout determined at the June and

September visits. It is evident from Figure 14a and 14b that differences in growth rates exist within the catchment. Both salmon and trout parr in the Allt an Fhithich (LB2) reached a greater length by September than their contemporaries in the Loin (A13) at much higher altitude. Between these extremes, a range of growth rates was recorded.

A similar pattern was determined on the River Dee by Shackley and Donaghy (1992), who found that salmon parr at higher altitudes were generally smaller than similar age classes lower in the catchment. They suggest that this is closely related to water temperature which results in longer egg hatching times and shorter growing seasons in these higher altitude tributaries.

They also suggest that water chemistry, which reflects underlying geology can affect the growth of juvenile salmonids. Evidence from the 1994 Spey survey tends to support this, with salmon and trout parr in the Ruadh and Druie, which drain predominantly granitic areas, being smaller in September than those in the Livet and Fiddich, which drain chemically richer areas. These trends have been previously observed by Laughton (1993).

Density of Stocked Salmon Fry

During the last few years hatchery reared salmon have been stocked into a number of locations in the Spey catchment where wild salmon are absent. During the 1994 survey these hatchery releases were found at F8 and F9 on the Dullan (stocked in 1994), LB12 on the Allt Chuaich (stocked in 1992), T8a on the upper Tromie (stocked in 1992) and at MB7e on the Raitts Burn (stocked in 1993). At the latter three sites only a single 2+ salmon parr was caught indicating that the rest of stock had smolted and migrated to sea.

Two sites on the Dullan were examined prior to stocking on the 13th of July at Bailemore Bridge and Milton of Laggan. One salmon parr, originating from the 1992 removal experiment carried out on the Tervie was recovered from the Bailemore site, otherwise no salmon fry or parr were recorded.

Approximately 15000 fed fry were transferred from the Knockando hatchery to the River Dullan on the 9th of August and the burn was revisited on 27th of September to determine the initial survival rates. The densities for the two sites are presented in Table 14 and indicate good survival rates.

Table 14: Density of stocked salmon in the River Dullan, Sept 94.

No	Site	Salmon Density (m^{-2})
F8	Bailemore Bridge	1.06
F9	Milton of Laggan	0.66

Conclusions and Recommendations

Adapting the electro-fishing technique from three fishings per site to one during the 1994 survey resulted in a wider coverage of the catchment than in previous years. This survey format is recommended for future years.

Salmon and trout were distributed throughout the catchment, with salmon absent from areas above obstructions. In general, densities of both species were greater in lower tributaries, Fiddich, Livet, etc than in areas further upstream, Tromie, Truim, etc. Throughout the catchment smaller burns (<5m wide) were found to be important nursery areas for juvenile salmonids. Examples of these are the Mulben Burn, Cromdale Burn and Allt an t-Eileach.

Seasonal variations in year class densities and growth rates were observed. In general 1+ salmon and trout densities declined between early June and September, however no clear trend was evident for older fish. At the end of the growing season, mean lengths of fish at higher altitudes were less than those at lower levels. This may be related to water temperature and chemistry.

In order to more accurately assess the seasonal variations in density and growth rates between areas of the catchment, marking of part of the population is required. This would allow a measure of the numbers of parr moving into and out of the survey areas to be explored and in addition the growth of individuals could be examined.

The 1994 survey completes five years of juvenile surveys. This provides a suitable database to examine yearly trends in the Spey juvenile populations and perhaps begin to relate them to trends in returning adult numbers (catch data) and redd counts. The survey information could also be used to give a rough estimate of the smolt production. Future surveys will expand the database further and address some of these issues.

Acknowledgements

The authors gratefully acknowledge the assistance of Phillip Straton who helped with the data processing. We are also grateful to Emily Bridcut and Peter Collen (SOAFD) who supplied data for the additional River Nethy sites (Table 6c), and who along with Ross Gardiner, Dick Shelton and Robert Clerk, provided constructive comments on the text.

Finally a special thanks to the many proprietors, farmers and gamekeepers who allowed access to the study areas and showed a continuing interest in the results.

References

Bridcut, E. and Collen, P. 1995. River Nethy Catchment Project Preliminary Report and Work Programme. SNH Contract SNH/127/95.

Egglishaw, H.J. and Shackley, P.E. 1977. Growth, survival and production of juvenile salmon and trout in a Scottish stream, 1966-75. *Journal of Fish Biology,* 11, 647-672.

Gardiner, W.R. 1989. Tweed juvenile salmon and trout stocks. In: *Tweed Towards 2000: Symposium on the Future Management of the Tweed Fisheries,* (Mills, D., ed.), 105-114.

Laughton, R. 1991. River Spey juvenile survey 1990. *Scottish Fisheries Research Services Report,* 14/91, 8pp.

Laughton, R. 1993. River Spey juvenile survey 1991. *Scottish Fisheries Research Services Report,* 2/93, 8pp.

Laughton, R. 1995. River Spey juvenile survey 1992. *Spey Research Trust Report, 4/95.*

Shackley, P.E. and Donaghy, M.J. 1992. The distribution and growth of juvenile salmon and trout in the major tributaries of the River Dee catchment (Grampian Region). *Scottish Fisheries Research Report*, 51, 19pp.

Strange, C.D., Aprahamian, M.W. and Winstone, A.J. 1989. Assessment of a semi-quantitative electric fishing sampling technique for juvenile Atlantic salmon, *Salmo salar* L., and trout, *Salmo trutta* L., in small streams. *Aquaculture and Fisheries Management*, 20, 485-492.