



## SECTION 3: THE FISHES OF THE TWEED AND THE EYE

### C.5: **Grayling** *Thymallus thymallus*



Photo C.5.1: The Grayling

The Grayling family, the Thymallidae, contains only six species, all living in the northern sectors of Europe, Asia and America, from 40° to 70° North. There is only one species in Europe, which like all the other species, prefers cool, well-oxygenated, flowing water, though in Scandinavia, it is found in lochs and in the fresher parts of the Baltic Sea. It can, however, thrive at oxygen levels low enough for Trout to feel distress. The name "Thymallidae" refers to their supposed scent, resembling that of the herb Thyme, and they do indeed have a faint smell of that sort, best detected from a number of them than from an individual. The Grayling is the only native European Salmonid to spawn in spring, and though the young emerge from the gravel, after an incubation of only 20 to 30 days, at about the same time as autumn spawned Trout and Salmon, they more than match them for growth in their first year, reaching 100 –120mm. Growth is also rapid in their second year when they typically reach 175-200mm, still generally outgrowing Trout, though once maturity is reached at three years old or so, growth becomes much slower. Adults typically weigh from 1 to 2 lbs and large females can produce 10,000 eggs. The spring spawning habit and fast juvenile growth appear to be adaptations for living in Arctic areas, where shallow riffles can freeze solid in winter and insect life appears in abundance as soon as the thaw sets in. The ability of the Grayling to feed through even the coldest winter is probably another adaptation to Arctic conditions.

The characteristic feature of the Grayling is the large dorsal fin, the base of which is much longer than the head; this fin is particularly large in mature males and can therefore be used to identify sex. The scales are large, and in obvious rows and the scattered black spots form unique patterns which can be used to identify individual fish. Grayling are generally found in shoals and do not appear to hold individual territories in running water as Trout do. Their diet is of aquatic invertebrates, though they can feed heavily at the surface on emerging insects or on flying adults.

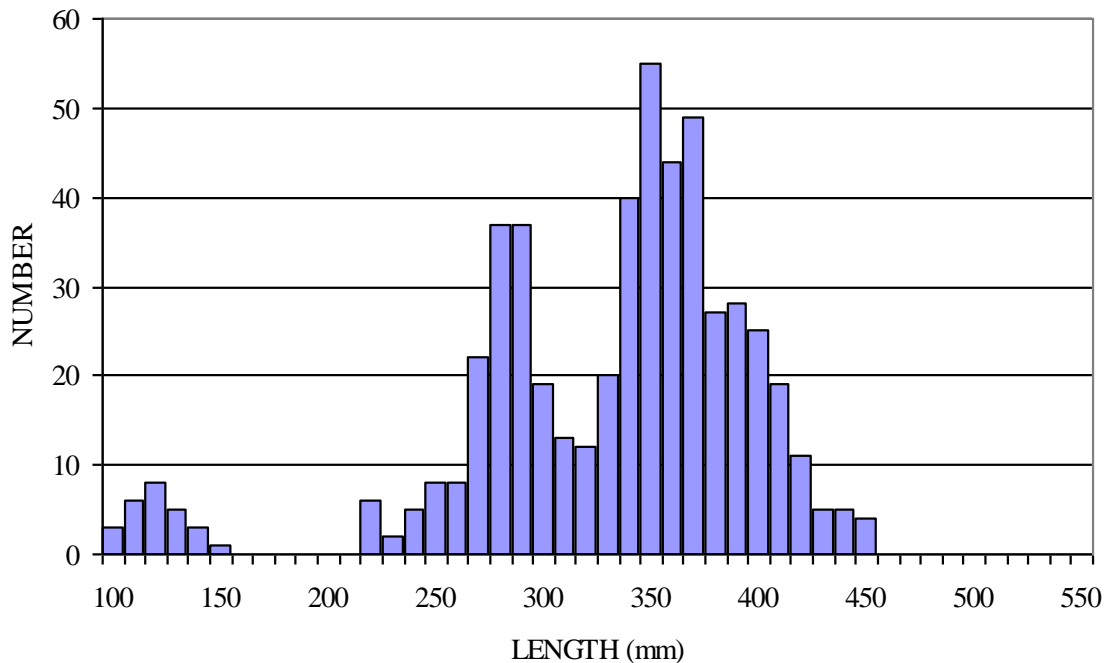


**Grayling on Tweed:** The species was introduced from the south of England to a pond at Monteviot in the early 1850's by the then Marquis of Lothian with the intention of introducing them to the river to be a winter sport fish, but a flood released them first (Bolam, G., 1919). Their spread is recorded in the same reference as: -

- 1855 First Grayling caught in the Teviot. Regarded as having been an escape from the Monteviot pond
- 1862 T.T. Stoddart catches the first Grayling he had ever seen in any Borders river, on the Teviot
- 1864 Grayling caught lower down the Teviot and in the Jed
- 1868 Grayling of 14.5" (355mm) caught on the Tweed at Kelso
- 1876 Grayling of 18.5" (470mm) taken on the Tweed at Kelso, 7<sup>th</sup> December. Becoming numerous around Kelso
- c. 1876 Grayling beginning to appear in the fish shops of Berwick, mainly supplied by the nets at Twizel (on the lower Till)
- c. 1889 Grayling becoming fairly numerous in the Till from about Ford downwards
- 1890 Grayling first noticed around Wooler and in the Glen
- c. 1896 Grayling reach Beany and Ingram on the Breamish
- 1896 Several small Grayling taken from the College Burn at Kirknewton

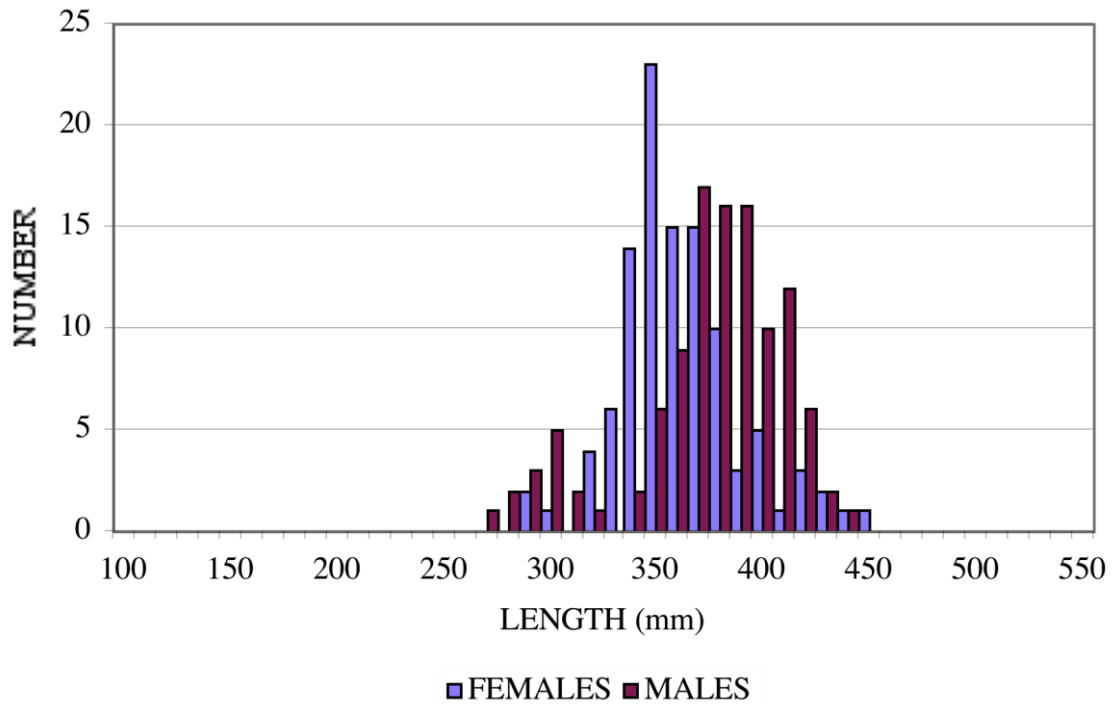
That they had spread to the upper Tweed by the beginning of the 20<sup>th</sup> century is shown by a sample of scales taken from a Grayling caught at Walkerburn on the 21<sup>st</sup> July, 1917, which has been presented to the Tweed Foundation by the FRS Marine Laboratory, Aberdeen. It is possible that the cauld at Walkerburn, noted as being a difficult passage even for Salmon, was the upper limit of their distribution until it was demolished in 1964.

**Sizes of Grayling on Tweed:** The sizes of 392 Grayling caught by anglers from 1992 to 2004 are shown in Graph C.5.1. Most measurements are from fish caught and killed in the Earlston Grayling competitions from 1992 to 2000. Since the competition became "Catch and Release" in 2001, measurements are taken from samples kept in keep-nets for tagging, scale-taking, etc.



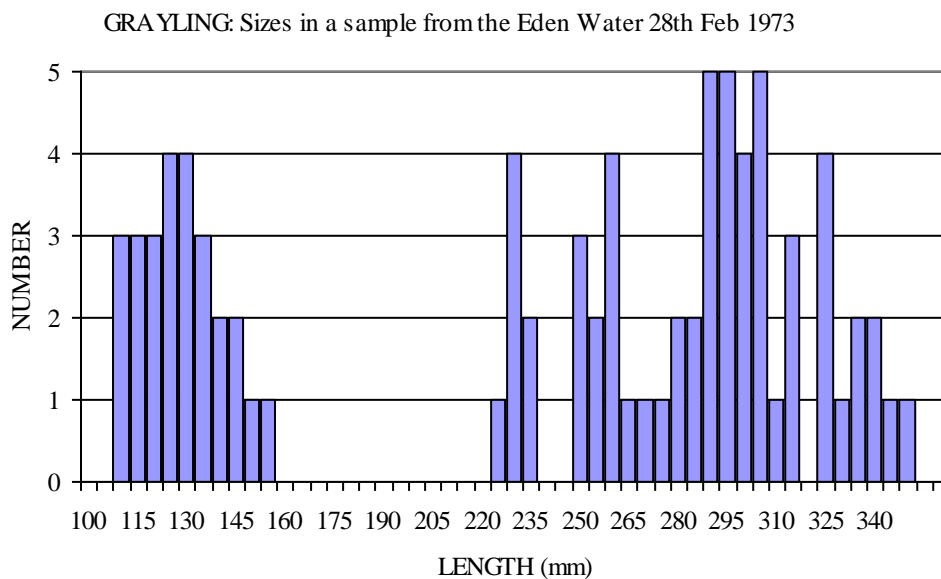
Graph C.5.1: Sizes of Grayling on the middle Tweed

That there are differences in the sizes and growth of the sexes is shown in Graph C.5.2, where the lengths of 106 female and 111 male Grayling from the sample shown in Graph C.5.1 are given. Immature fish, and those not identified to sex by inspection of the gonads are not included. The average size of these male Grayling was 376mm and of the females, 363mm, but it is clear that males predominate in the large size classes.



Graph C.5.2: The sizes of male and female Grayling caught by anglers on the middle Tweed

Obviously, these angling samples do not include younger and smaller Grayling, but these can be seen in a sample electro-fished from the Eden Water (Greendale, 1975) and shown in Graph C.5.3. The smallest – and youngest – group of fish were classed as “0+” although the sample was taken in February because the winter band had not yet formed in their scales. The fish around 240mm were aged as 1+.



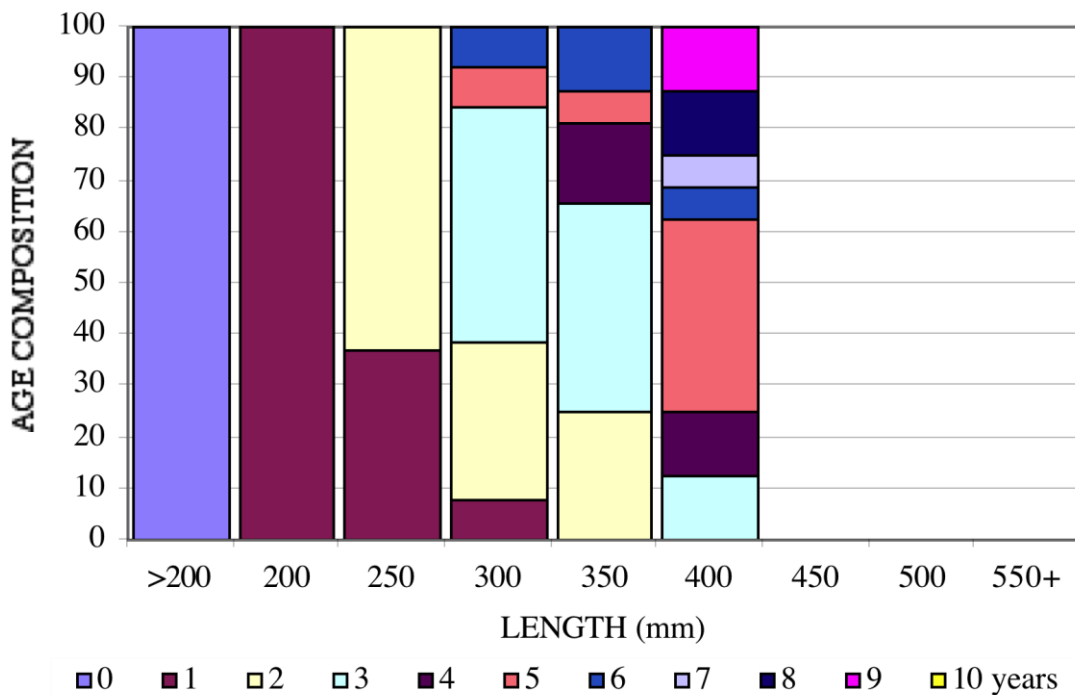
Graph C.5.3: A sample of Grayling electro-fished from the Eden Water at Ednam, 28<sup>th</sup> February 1973



The gap between them and the 0+ showing that growth is still very fast in the second year. The very rapid growth of Grayling in their first year is shown by the fact they had reached up to 150mm after just 10 months growth; a Trout would not generally have reached such a length until the end of its second summer, after around 17 months growth.

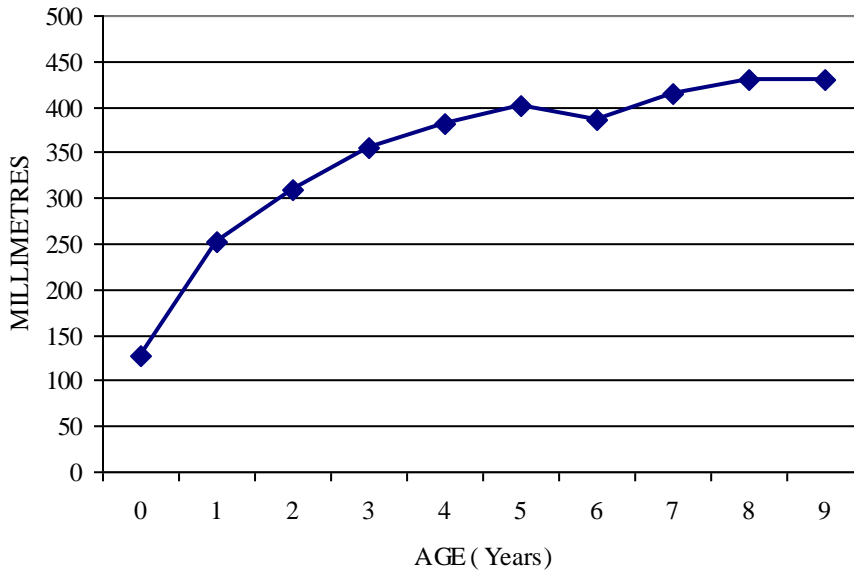
**Specimen Grayling on Tweed:** The present Scottish record for Grayling (as recognised by the Scottish Federation for Coarse Angling) was caught on the upper Tweed, around Stobo, on the 13<sup>th</sup> of February 1994 and weighted 3lbs 1oz. However, a larger fish, of 3lbs 7oz was taken in England, on the Glen on the 11<sup>th</sup> of January 1998 which was a minimum of eight years old.

**Ages of Grayling on Tweed:** As Graph C.5.4 shows, the age composition of smaller size groups is quite clear – all under 200mm are 0 years old (i.e. have not passed their first winter), all from 201 to 250 are 1 year old, as well as about one third of fish 250-299mm in length, while the rest of these are 2. At larger sizes, the age composition becomes more complicated, with a wider range of ages being found for fish in the same size groups: In size class 401-450mm, for example, fish of seven different ages can be found.



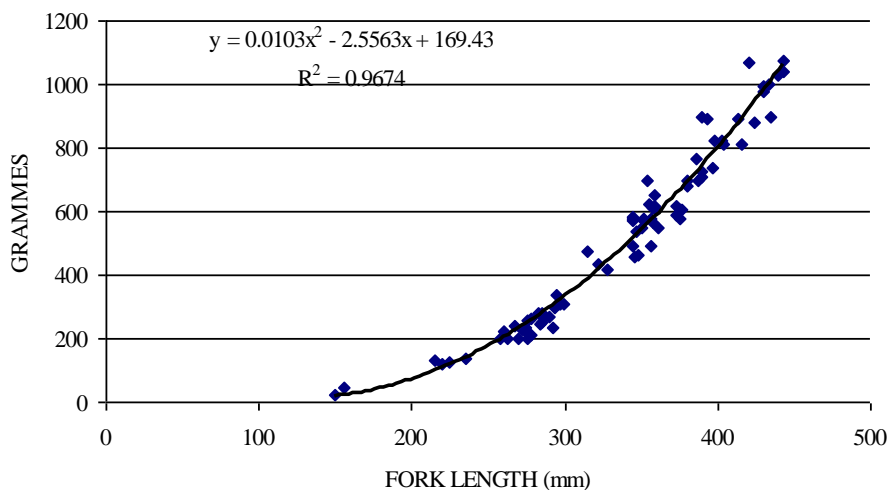
Graph C.5.4: The age composition of different size groups of Tweed Grayling

The reason for this “piling up” of age groups in large size classes is clearly shown in Graph C.5.5, which gives the average length for each age group of Grayling. While young fish clearly have very rapid growth, it is much slower for older, mature, fish – from 5 to 9 years old, average length increases by less than 50mm.



Graph C.5.5: The average lengths for the different ages of Tweed Grayling

**Length-Weight Relationship of Tweed Grayling:** As shown in Graph C.5.6, once the period of rapid growth is over, by the time the fish reach 300mm or so in length, weight and length increase at similar rates, giving a straight relationship between the two.

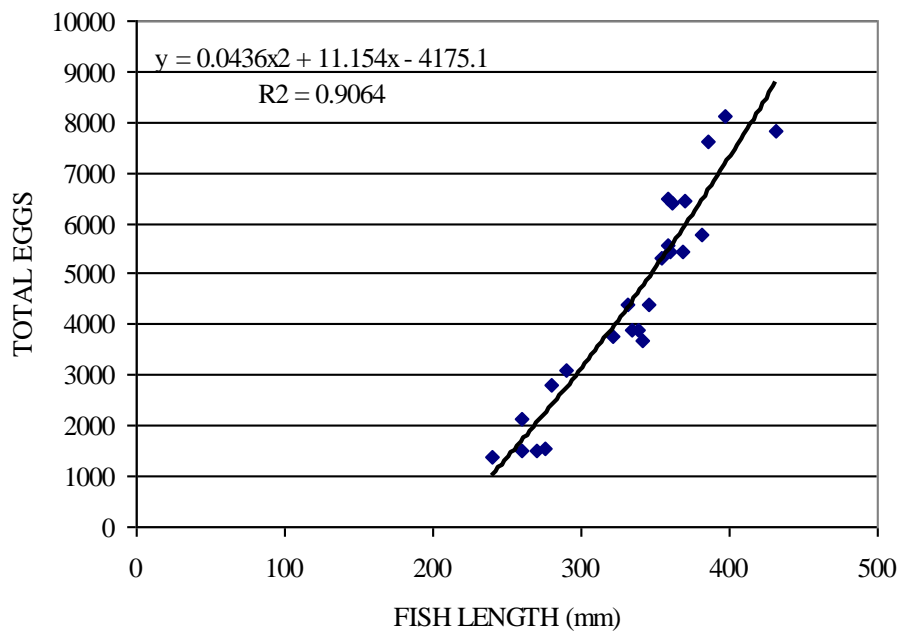


Graph C.5.6: The length-weight relationship of Tweed Grayling

However, as no data is available as yet for Grayling over 450mm in length, it is not known if this 1:1 relationship continues for larger fish. A table giving the average weights for Grayling up to 500mm in length is given at the end of this section, as an aid for "Catch and Release" anglers.



**Fecundity of Grayling on Tweed:** There have been two studies which included counts of the number of eggs in Tweed Grayling: Burns (1973), using fish from the Oxnam and Eden, and Kerr (1992) using fish from the Tweed at Leaderfoot and Kelso, and from the Teviot at Kelso. Their results are plotted in Graph C.5.7 from which it can be seen that a newly mature Grayling of around 250mm in length will have just over 1,000 eggs, while a female around 400mm long will have around 8,000. There is some evidence that fecundity of Grayling declines with age, so it cannot be assumed that the almost straight-line relationship between size and number of eggs would continue as fish become older and larger than those used to produce these results.



Graph C.5.7: The Fecundity of Tweed Grayling

**Spawning and Hatching of Grayling on Tweed:** Little has been formally recorded of Grayling spawning sites on Tweed, though these are made obvious by the chasing and fighting of the males that turn up some days before the females. Sites are known on the Leader at Drygrange and the Oxnam at Crailing, but there must be many others. At the Drygrange site, the Grayling spawn at exactly the same place in April, at the tail of a pool, that Salmon spawn at in winter. Eggs from a female taken from the Eden Water were incubated artificially by Burns (1976): hatching started after 16 days at an average water temperature of 11.4°C and took 4 days to complete. The larvae were, on average, 6.8mm long 2 days after hatching; 16.4mm after 9 days and 18.3 after 12 days.

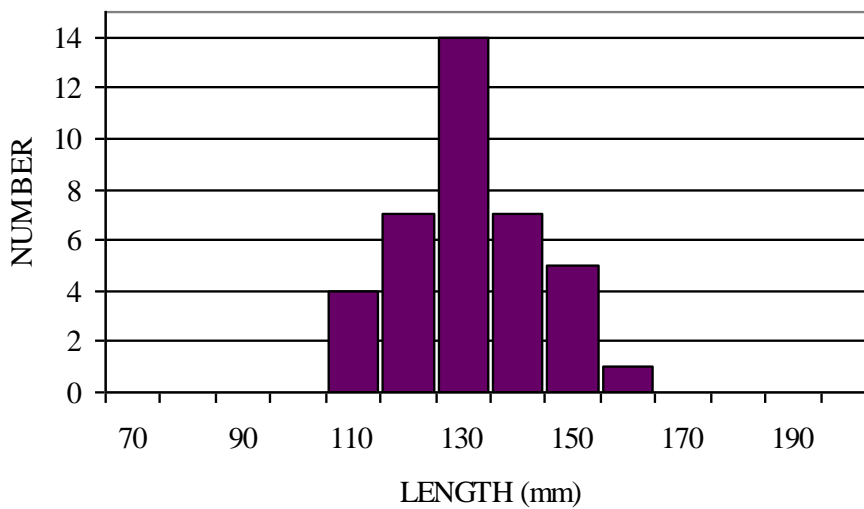
**Juvenile Grayling on Tweed:** These are taken by anglers fishing for Salmon and Trout throughout the year so some, at least, must be sharing the same habitat. Little is known of their habits; they presumably live in shoals, but there are no reports of these. Anglers fishing for Trout catch them along with juvenile Salmon and Trout, so some, at least, must be sharing the same habitat.



Photo C.5.2: A Grayling fry from the Leader Water in September. It is already the size of many one year old Trout and Salmon. Grayling fry are regularly electro-fished during surveys for Trout and Salmon

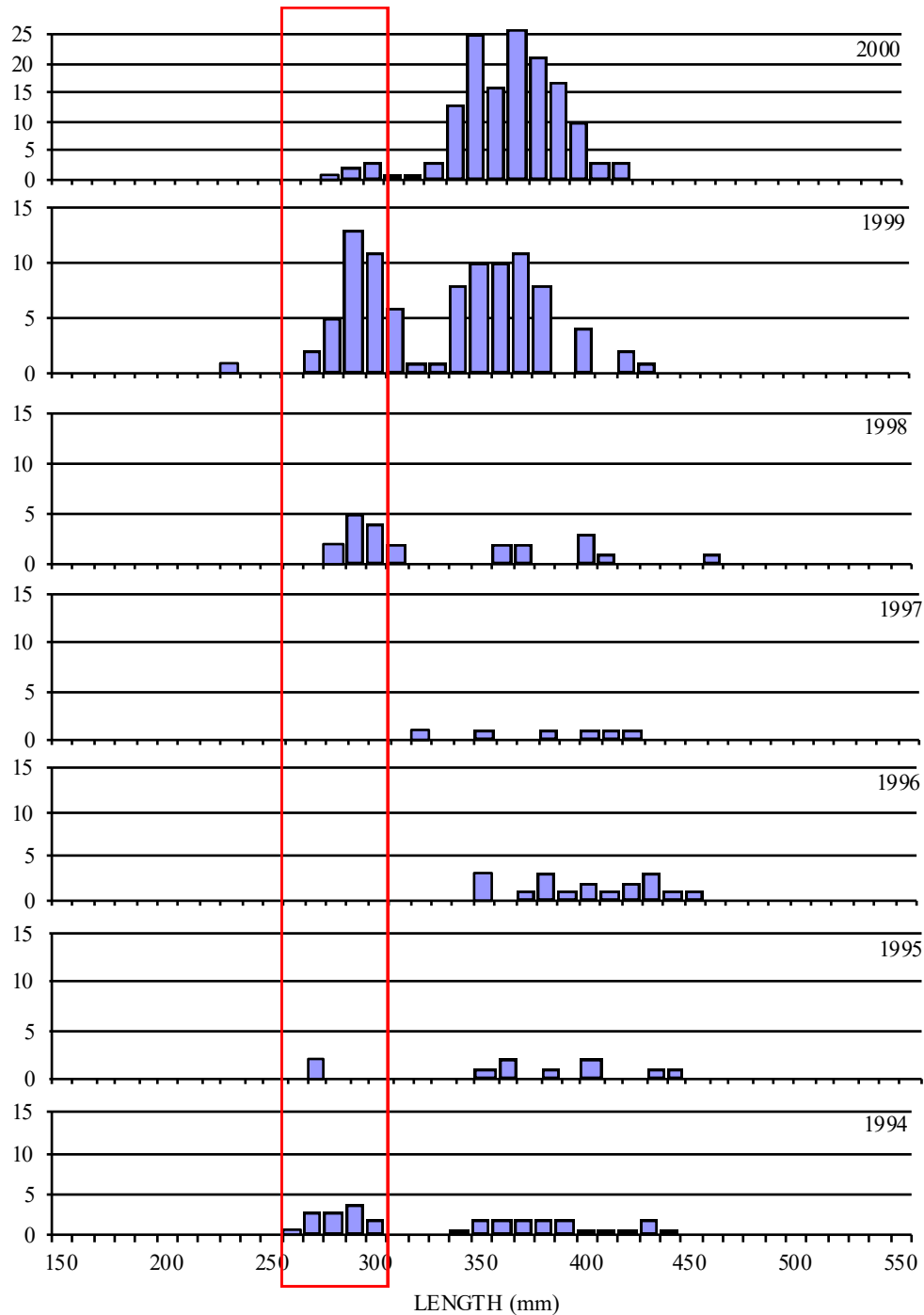
Juvenile Grayling are caught during electro-fishing for Salmon and Trout juveniles in summer: they have been found in the Biggar, Lyne, Gala (below the Skinworks Cauld), Leader, Teviot, Ale, Jed, Oxnam and Kale Waters and on the Till in the Wooler Water (Harthope Burn). The lower Eden and Leet have also produced juveniles. Of all these waters, the lower Leader is the most regular site for finding them, but even there, it is only a few individuals that are captured in amongst the Salmon and Trout. There are no cases, as yet, of shoals of juvenile Grayling being found during electro-fishing. The sizes found in June are from 55 to 65mm, in July, around 70mm and in September, around 100mm. The largest sample to date of juvenile Grayling has actually come from a trout trap on the Turfford Burn, on the lower Leader, where in early November (Graph C.5.8) from which it can be seen that they have grown to be around 130mm, the size of a one year old Trout, at just 7 months or so old.

#### GRAYLING: Juveniles in Autumn



Graph C.5.8: The sizes of juvenile Grayling trapped in the Turfford Burn in early November 2002-3

**Variability of Recruitment on Tweed:** As Graph C.5.9 shows, the numbers of small fish caught in the Earlston Grayling competition in early January each year are very variable. In 1996 and 1997 no fish in the 250-299mm size class (the smallest class usually appearing in these catches) were caught, and in 1995, only 2. By comparison, in 1999 they were the largest size class caught. These 250-300mm fish are mainly two years old, with some one year olds, and represent the recruitment of young fish to the adult stock. It appears though, that this recruitment can fail almost completely in some years, presumably because of poor conditions for fry and parr or because of some difficulty with spawning or hatching. As Grayling are spring spawners, with a very short period in the gravel as eggs, it is possible that water temperatures are just not suitable for their breeding in some years.



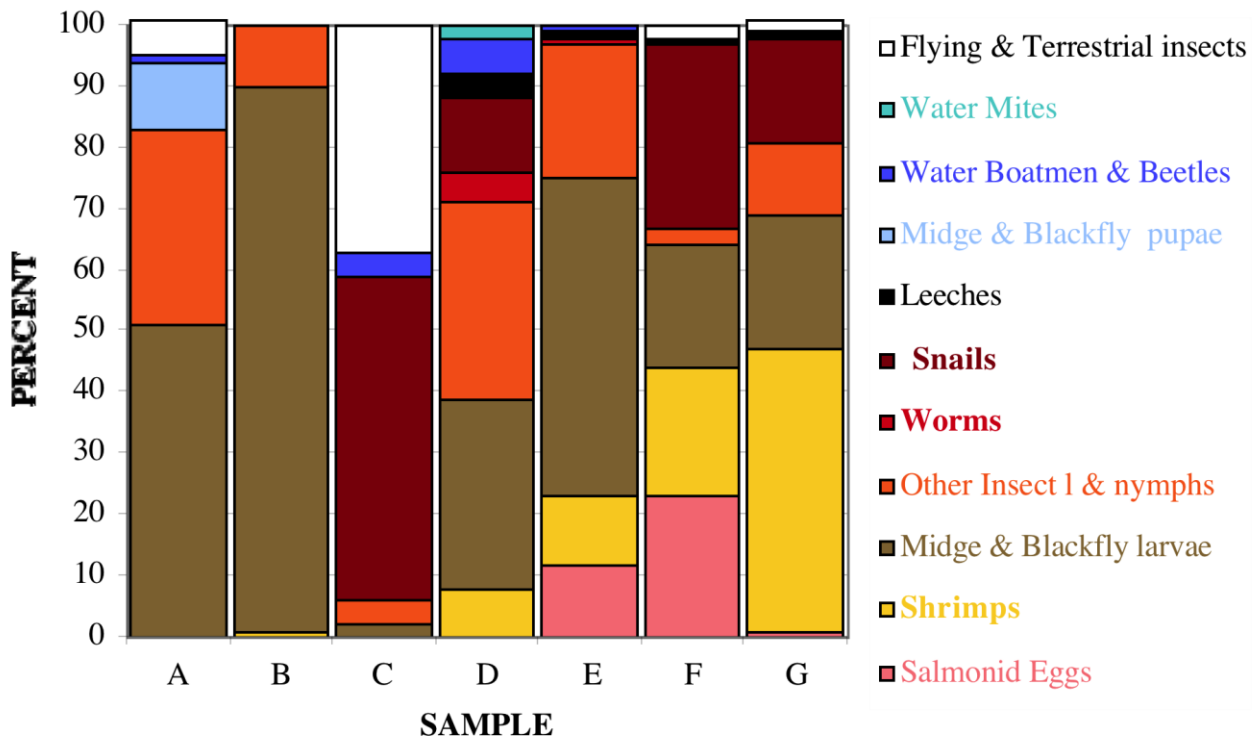
Graph C.5.9: Variability in the numbers of young Grayling caught in the Earlston Competitions 1994-2000

**Diet of Grayling on Tweed:** There have been several studies of the diet of Tweed Grayling, the earliest being that of Isobel Radforth, published in 1940. Results in such studies are generally presented in two different ways to overcome the difficulty caused when large numbers of small prey items are eaten: if only numbers are given as the results then a misleading impression can be given as large numbers of small items may only amount to quite small total amounts. Conversely, one or two large items, though only present in small numbers may represent substantial amounts of the food eaten. The first way that results are commonly





presented therefore is as "Percent Composition of Diet", where all the prey items are totalled up, and the number in each distinct category is presented as a total of all the items eaten. The other way is "Percent Occurrence" where the number of stomachs a prey category is found in is presented as a percentage of the total number of stomachs examined. The first therefore shows the proportions of prey categories eaten while the second shows the frequency with which they are eaten.

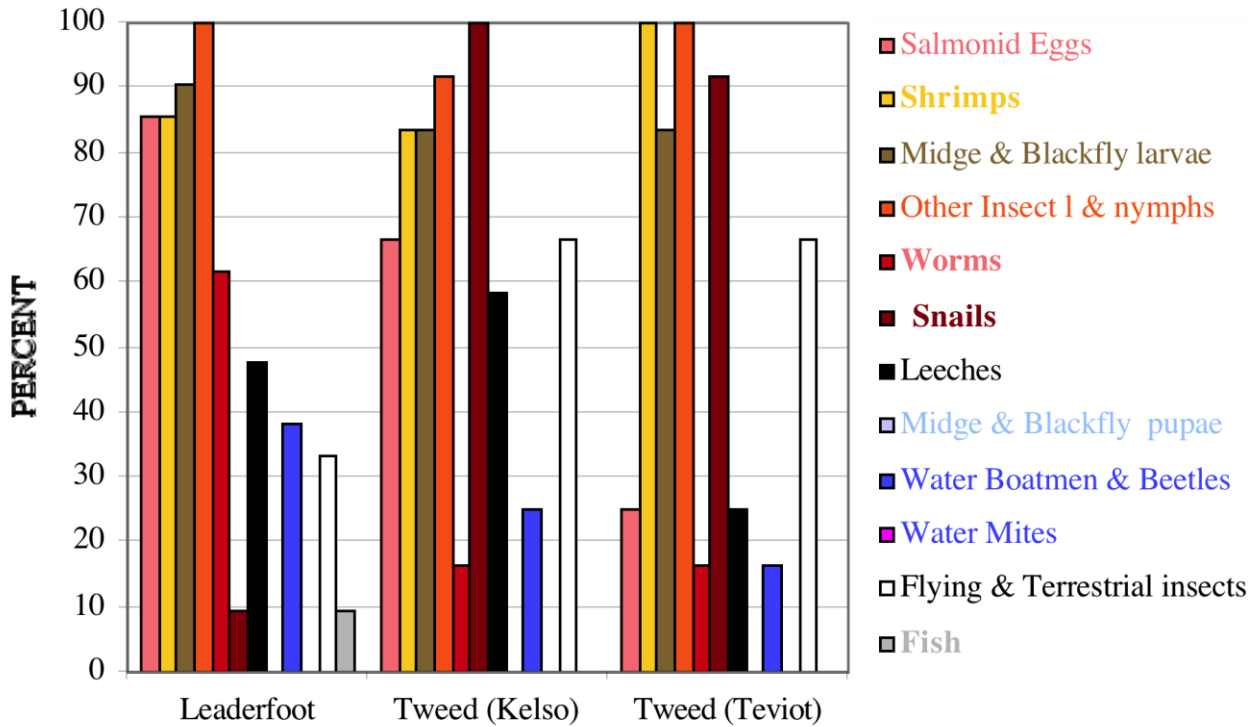


Samples are from:

| Ref. | Source of Sample             | Date     | Sample size | Author          |
|------|------------------------------|----------|-------------|-----------------|
| A    | Lower Tweed, Ladykirk        | Sep 1938 | 50          | Radforth, 1940  |
| B    | Eden Water at Ednam          | Feb1973  | 12          | Greendale, 1975 |
| C    | Eden Water at Ednam          | Feb1973  | 10          | Greendale, 1975 |
| D    | Lower Tweed, Norham          | Mar 1974 | 9           | Starkie, 1975   |
| E    | Leader & Tweed at Leaderfoot | Jan 1992 | 27          | Kerr, 1992      |
| F    | Tweed at Kelso               | Jan 1992 | 12          | Kerr, 1992      |
| G    | Teviot at Kelso              | Jan1992  | 12          | Kerr, 1992      |

Graph C.5.10: The percent composition of diet in the stomachs of eight samples of Tweed Grayling

In this diagram, animals from the bottom are shown in shades of red, brown and orange; those that live in mid-water in shades of blue and flying and terrestrial insects that the fish would find at the surface, in white. It can immediately be seen therefore, that Grayling are very much bottom feeders, the only exception being for the sole summer sample, taken on the Eden in August, where almost 40% of the food items must have been taken on the surface. Midge and Blackfly larvae, both very small animals, dominate most of the samples. The fifty stomachs examined by Radforth (1940) contained 7,918 midge larvae in all – the second greatest total was for small water beetle larvae (2,385) and the third was for Baetis (Mayfly) nymphs, at 2,078. All three January 1992 samples contained Salmon eggs, as January is an active period for Salmon spawning in the middle Tweed: one stomach contained 180 eggs and another, 159. This is not, however, evidence of the robbing of Salmon redds, many eggs are lost during spawning and lie around in the substrate, while the buried eggs are at far too great a depth for Grayling to uncover.

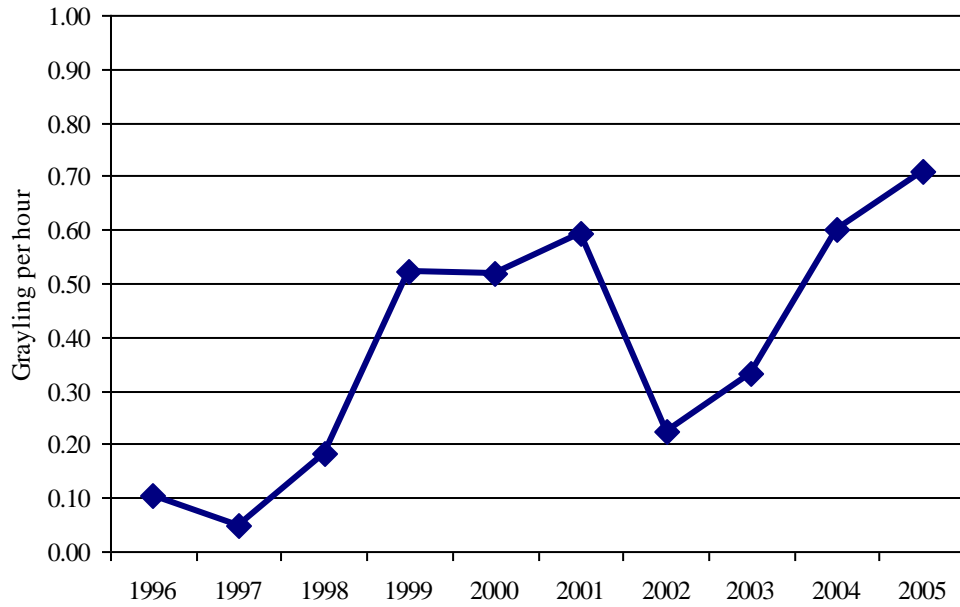


Graph C.5.11: The percent occurrence of diet in the stomachs of three samples of Grayling taken in January 1992

As it is much more difficult to standardise Percentage Occurrence data from different studies, only data from the January 1992 samples are shown here. From these it can be seen that mid-water and surface animals are, in fact, relatively frequent in the diet despite the low proportion of the total diet that they form (as shown in Graph C.5.10). All the bottom animal categories, other than worms, occur at 80 to 100% levels and in two out of the three, the large black Horse Leech (*Haemopsis sanguisuga*) was found in around 50% of stomachs: this leech is commonly found under stones just at the water's edge. In two of the samples, Salmon eggs occurred in over 60% of stomachs and in 20% of the third sample. A category that shows up in this analysis but did not in the Percent Composition is Fish: two of the 1992 Leaderfoot sample had unidentifiable fish remains, one male Grayling of 380mm length had eaten four individuals and another male of 320mm a single one. These are not particularly large Grayling, so it would appear that fish could be taken by a large segment of the population.

**Grayling as Prey on Tweed:** Grayling are taken by fish-eating birds. A 1972-73 study of the stomach contents of 26 Cormorants shot on the lower Tweed found 8 Grayling amongst the 137 individual fish of all sizes that had been eaten (MacIntosh, 1978).

**Angling Catch Rates of Tweed Grayling:** The best data for these come from the annual Earlston Grayling competition, held on the second Saturday of January and now a major event. As shown in Graph C.5.12, rates can be rather variable, from a low of 0.05 fish per hour's fishing effort (= 1 fish per 20 hours fishing effort) in 1996 to 0.59 per hour (= 1hr 42mins fishing effort to catch one fish). The low catch rates of 1996-98 reflect a period of poor recruitment of young fish into the adult population as shown in Graph C.5.12.



Graph C.5.12: Catch rates of Grayling in the Earlston competitions



Photo C.5.3: Grayling fry, Walkerburn, July 2006



| <u>Fork Length</u> | <u>Average Weight</u> | <u>Fork Length</u> | <u>Average Weight</u> |
|--------------------|-----------------------|--------------------|-----------------------|
| mm                 | gms                   | mm                 | gms                   |
| <b>200</b>         | <b>77</b>             | <b>350</b>         | <b>549</b>            |
| 205                | 86                    | 355                | 573                   |
| 210                | 95                    | 360                | 597                   |
| 215                | 105                   | 365                | 621                   |
| 220                | 115                   | 370                | 646                   |
| 225                | 125                   | 375                | 671                   |
| 230                | 136                   | 380                | 697                   |
| 235                | 148                   | 385                | 724                   |
| 240                | 160                   | 390                | 750                   |
| 245                | 172                   | 395                | 778                   |
| <b>250</b>         | <b>185</b>            | <b>400</b>         | <b>806</b>            |
| 255                | 199                   | 405                | 834                   |
| 260                | 213                   | 410                | 863                   |
| 265                | 227                   | 415                | 892                   |
| 270                | 242                   | 420                | 922                   |
| 275                | 258                   | 425                | 952                   |
| 280                | 274                   | 430                | 983                   |
| 285                | 290                   | 435                | 1015                  |
| 290                | 307                   | 440                | 1046                  |
| 295                | 325                   | 445                | 1079                  |
| <b>300</b>         | <b>343</b>            | <b>450</b>         | <b>1112</b>           |
| 305                | 361                   | 455                | 1145                  |
| 310                | 380                   | 460                | 1179                  |
| 315                | 399                   | 465                | 1213                  |
| 320                | 419                   | 470                | 1248                  |
| 325                | 440                   | 475                | 1283                  |
| 330                | 461                   | 480                | 1319                  |
| 335                | 482                   | 485                | 1355                  |
| 340                | 504                   | 490                | 1392                  |
| 345                | 526                   | 495                | 1429                  |

*Table of average lengths and weights of Tweed Grayling*

