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Year-Class Strengths and Recruitment in a Grayling Population - 1997 Sampling

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Report to: Environment Agency, South West Region
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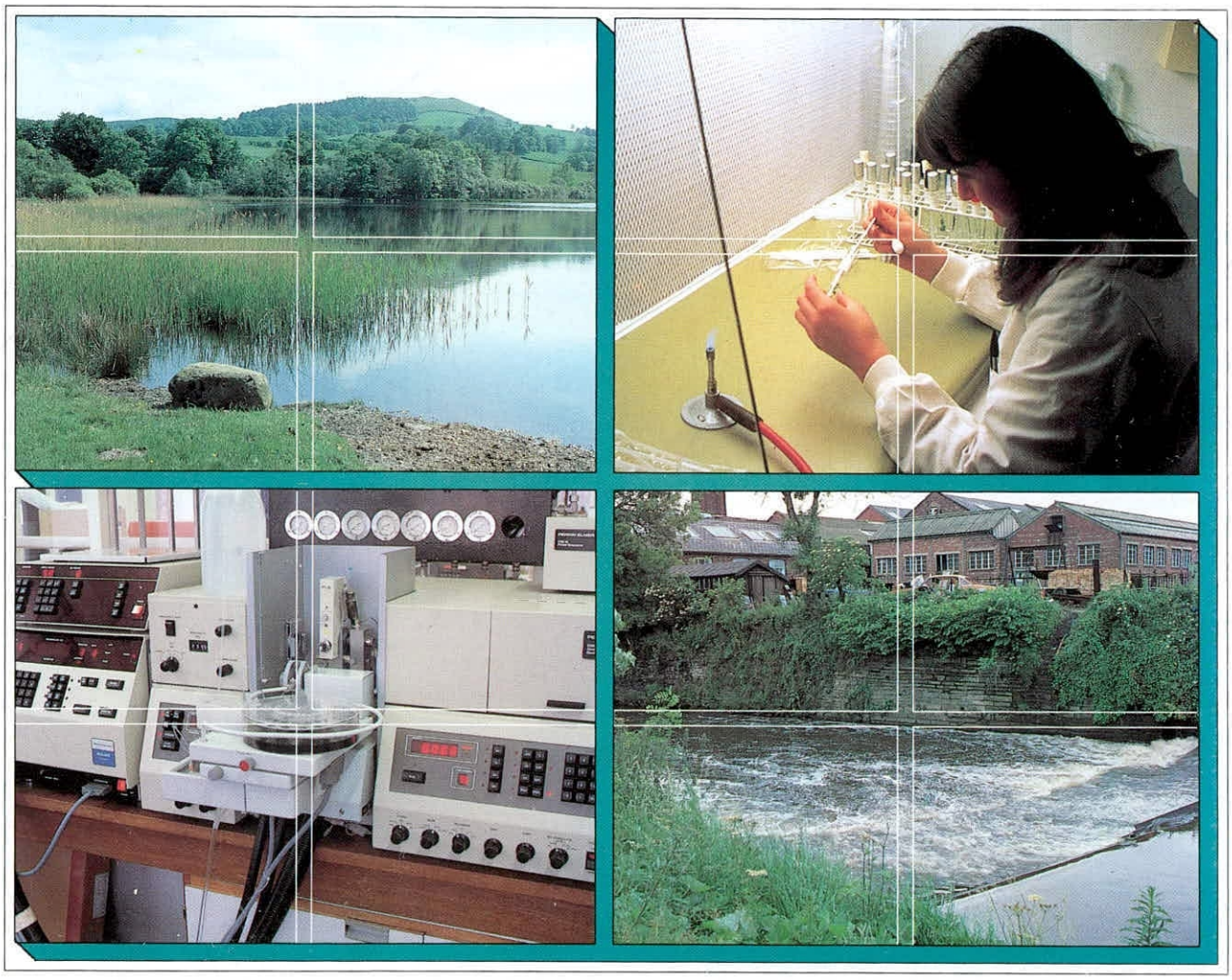

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Year-Class Strengths and Recruitment in a Grayling Population - 1997 Sampling

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Report Date:	February 1998
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Centre for Ecology & Hydrology
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1. Introduction

Methods for resolving water resource issues for fish have improved in recent years with the advent of a number of hydrological and habitat based models, such as PHabSim. However, these models are not designed to predict the impacts of variations in flow or other environmental factors on fish populations directly.

Most modelling of the man-made impacts on riverine fish populations in this country concerns trout *Salmo trutta* and salmon. *Salmo salar* However, grayling *Thymallus thymallus*, a comparatively understudied fish species, are numerically dominant in large areas of the middle reaches of chalk streams and other rivers. Indeed Huet's original zonation scheme of rivers, afforded a complete zone to grayling. These areas are often subject to the impacts of abstraction, impoundment and other forms of regulation, and grayling are thus a well suited species to study because they are abundant and in most cases less manipulated than trout.

In 1996 the Institute of Freshwater Ecology in collaboration with the Grayling Society Research Fund, Piscatorial Society and Environment Agency commenced a study of the grayling population at 12 sites on the River Wylye, with the following objectives.

2. Objectives

- To quantify fluctuations in recruitment and year-class strength in a grayling population.
- To develop predictive relationships between various environmental factors, including flow levels and the measured fluctuations in year-class strength.
- To model recruitment in a grayling population and to develop a conceptual model for other grayling populations.

This document reports the catches of fish from the second year sampling carried out on 6 and 7 October 1997. Comparisons of each year's catches will be made after the 1998 catches when the project is due for review.

3. Methods

On 6 and 7 October 1997 the Piscatorial Society completed single pass electric fishing surveys on 12, 200m sections of the River Wylye between Heytesbury and Stockton (Fig. 1). All grayling were captured in nets, measured in length and a sample had scales removed for age analysis. All fish were returned to the river alive.

The following environmental measures have or are being collected:-

Local habitat features for each site including width, depth, habitat type and cover.

Measures of flow from the guaging weir at Stockton

Measures of air temperature.

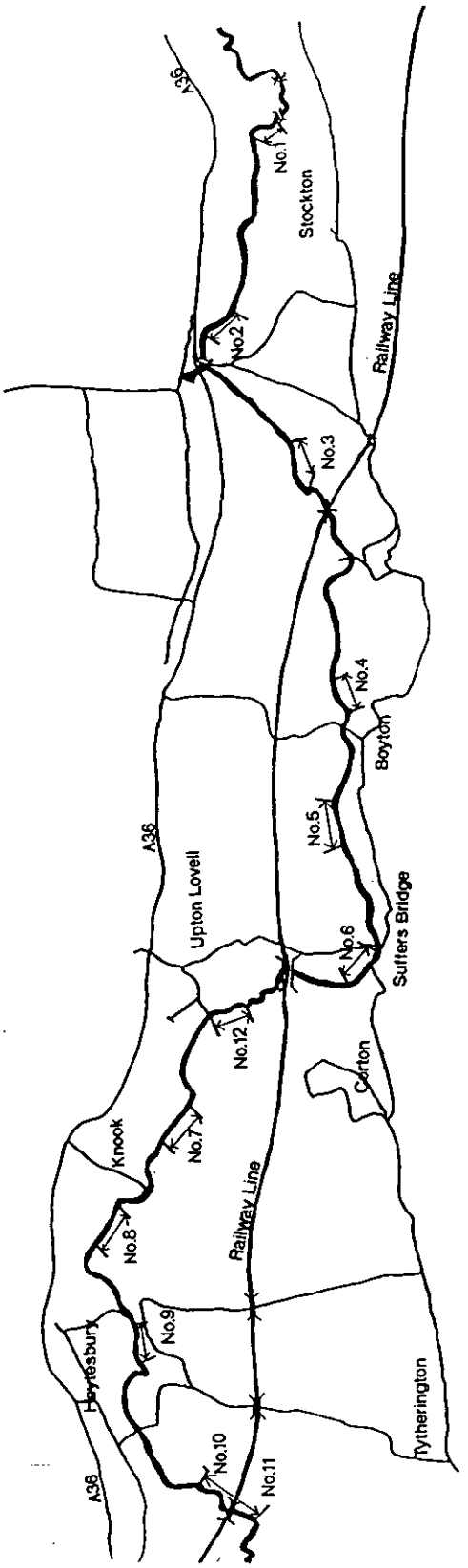

Figure 1. Map of the River Wylye identifying the 12 sites where the grayling population was sampled.

4. Results

In total 707 grayling were captured split between 6 year classes (Table 1). The numbers of fish in each year-class did not decline linearly with age and more fish were captured from the 1996 year-class than from the 1997 year-class and more from the 1994 year-class than the 1995 year-class.

Table 1. The numbers and mean sizes of grayling in each year-class captured from 12 sites on the River Wylye in October 1997.

Yearclass	Number of grayling captured	Mean length (mm) ± S.E.
1997	206	141 ± 1.95
1996	287	227 ± 2.23
1995	94	282 ± 4.2
1994	100	313 ± 5.3
1993	18	319 ± 12.6
1992	2	326 ± 8.6
Total	707	

The 1997 year-class could be separated by size from the other year-classes, but there was considerable overlapping of size amongst the other age groups (Fig. 1).

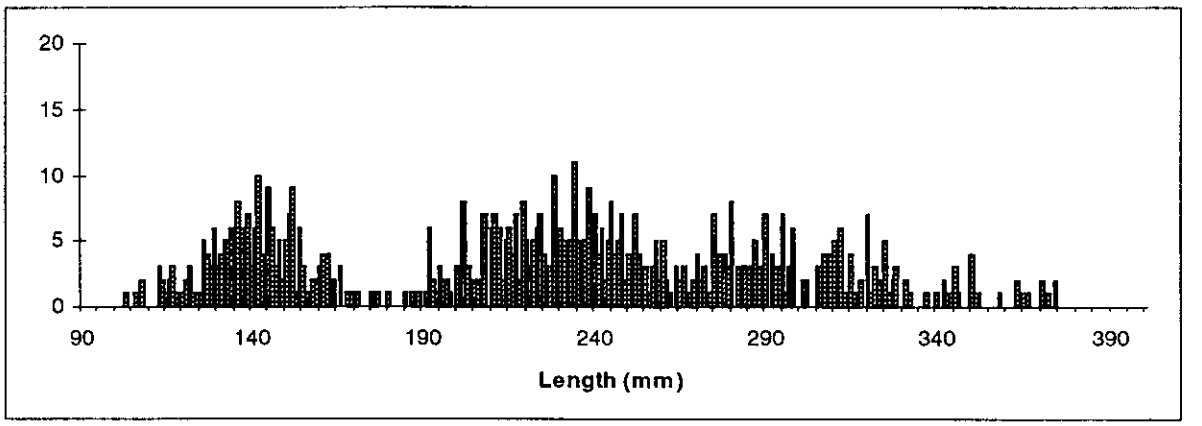

Figure 2. Length frequency histogram of grayling captured at 12 sites on the River Wylye in October 1997

5. Discussion

One of the biggest problems with sampling grayling populations by electric fishing is that the 0+ fish are often under represented. There is probably not much doubt that the efficiency of capture for these fish will be different than for the older fish but it was encouraging that such a large number were captured again as in the October 1996 sampling (Ibbotson 1997).

Since single pass electric fishing techniques provide no estimate of absolute population size it is necessary to calculate indices of year-class strength by comparing the % numbers of fish from a particular year's hatch summed over the years they appear in the catches divided by the mean % number for each age group summed for the life-span of the grayling. In this population calculation of the index value for each year-class will only comprise data from, at best, four years for each age class, since once the fish reach 4 years of age they contribute very little to the grayling population in terms of number (Table 1). This means there is a risk that sampling error in one year will have a significant impact on the value of that index. However, the consistency of capturing a greater number of fish in the 1994 year class than the 1995 year-class between two sampling years would suggest that the 1994 year-class is stronger than the 1995 one. This increases confidence that there are detectable differences in year-class strengths from year to year

6. References

Ibbotson, A.T. 1997 Year-class strengths and recruitment in a grayling population. Report to Environment Agency, South West Region, 5pp

APPENDIX A

Individual lengths (mm) of all grayling captured at 12 sites on the River Wylye in October 1997

Site 1 Glebe Farm		
113		307
127		307
129		309
132		310
138		312
141		315
142		320
145		322
145		325
146		325
149		331
150		340
150		344
151		352
152		358
152		370
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Site 2 Stockton		
113		320
114		326
116		328
135		328
140		343
161		345
162		350
deformed 166		350
180		366
185		374
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311		
315		
318		

Site 3 Lower Boyton		
134		264
135		295
136		295
145		315
146		332
148		342
152		350
152		363
154		374
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Site 4 Lower Boyton Bridge						
108		224				
121		227				
129		229				
187		231				
189		232				
192		232				
192		233				
192		233				
193		233				
195		234				
195		235				
195		236				
196		237				
197		237				
198		238				
200		240				
201		242				
202		242				
202		243				
202		245				
202		246				
202		271				
203		272				
207		282				
208		288				
208		290				
210		295				
210		298				
210		298				
211		301				
211		308				
212		310				
213		320				
213		325				
214		331				
214		342				
214		346				
215		351				
216		363				
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Site 5 Middle Boyton The Heronry			
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Site 6 Upper Boyton Suffers Bridge			
127			
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Site 7 Lower Knook		
108		234
117		240
120		245
122		257
126		265
127		267
129		278
131		280
132		292
132		337
133		370
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Site 8 Knook Car Park		
133		288
138		290
139		292
146		294
150		297
193		305
208		308
212		309
214		310
215		322
216		328
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Site 9 Heytesbury Mill		
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Site 10 Parsonage below Viaduct			
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Site 11 Parsonage above viaduct		
103		318
113		320
121		321
122		323
124		327
126		365
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Site 12 Upton Lovell		
106		230
114		230
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