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1993 Survey of the coarse fish of the River Tees before construction of the barrage

Interim report

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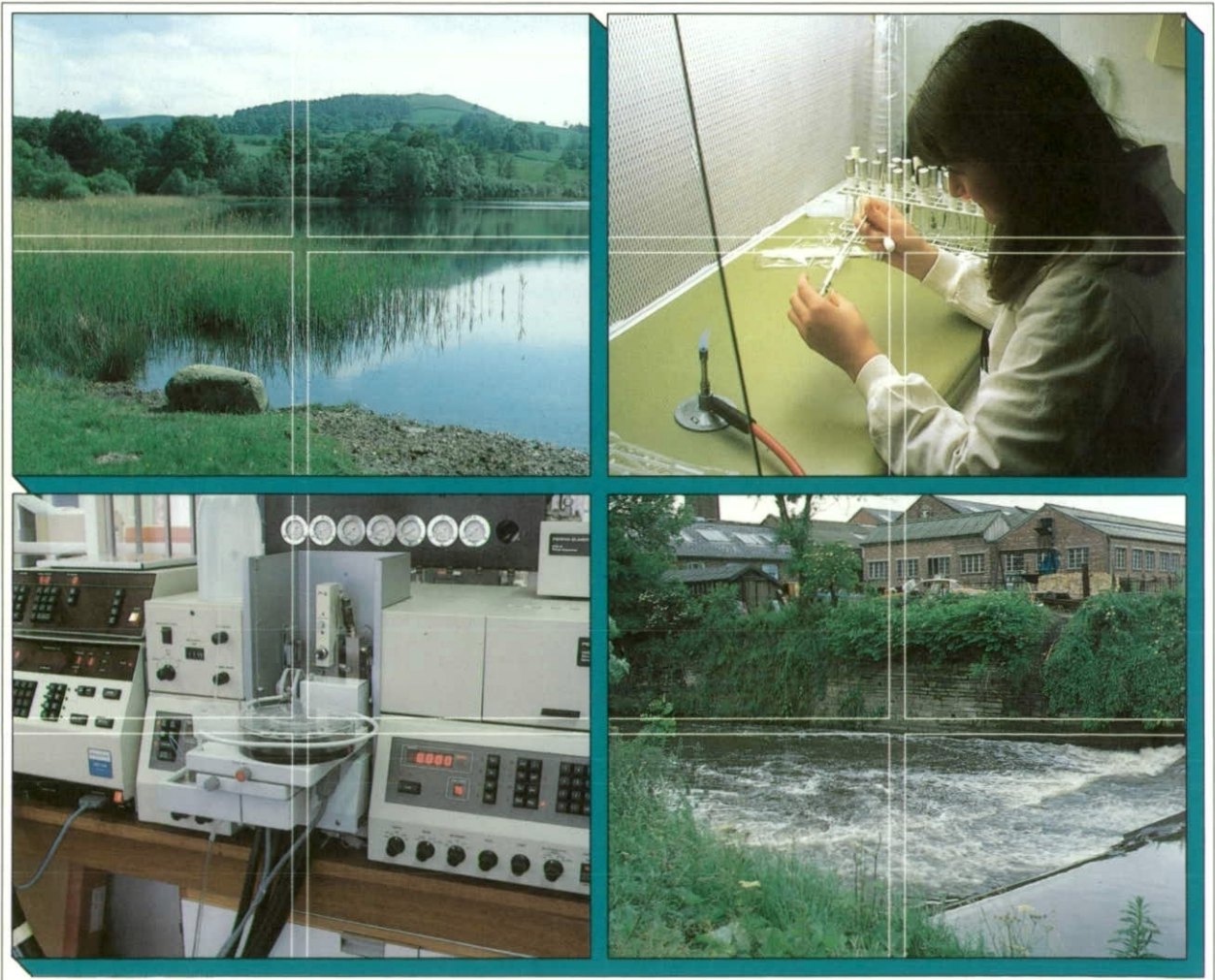
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REVIEW OF PROGRESS

This report covers the period April 1993 to February 1994. The objectives of this year's work were

1. To conduct a survey of the fry of coarse fish to identify spawning sites and species composition and to compare this with the previous year's results.

This was successfully carried out in July and was the third annual survey. Over 5000 fry were sampled by micromesh seine and point sampling electrofishing gear.

2. To conduct a survey of the coarse fish of the R.Tees in the area that is expected to be affected by the barrage. Collect data to add to that of previous years on the species composition, size distribution and age structure of each species prior to the construction of the barrage.

This was successfully carried out in September. Conditions were better than in the previous two years. Over 3000 fish were caught mainly by boom boat electrofishing. The length of each fish was recorded and a representative sample of each species was weighed and scales were taken for age determination. 714 fish were aged.

3. Collect information from angling matches.

This has continued and a system is now in place for anglers to record results.

4. Continue data collection from temperature loggers.

The three temperature loggers are still operational. A further logger has been installed in the completed ORSU and data has been collected since May.

1. FRY SURVEY 1993

1.1 Introduction

The survey was designed to collect information on the fry of all species of angling importance and in particular to concentrate again on determining the main spawning areas of dace. These areas will be compared with those identified from the 1992 survey. The fry surveys should give the first indications of any changes in species composition after the construction of the barrage. In the past two years, minnows, stickleback, stone loach and bullhead have been included in the survey as they often occupy the same habitat as the fry of the main coarse fish species. However, unlike previous years, excessive numbers of minnows were caught which at some sites swamped the numbers of all other fish. For this reason, species composition will only include fish of angling importance and results from previous years will be reworked when all pre barrage results have been collected. Notes will still be made on fish not of angling importance as they may impinge on other species.

1.2 Methods

The survey was conducted in early July and covered most of the length of the river to be affected by the barrage and areas above this for comparison. Effort was concentrated in areas known to contain adult fish (from the 1991 and 1992 surveys) between Preston Park (Section 4) and Low Dinsdale (Section 25). In addition to this, fry surveys were carried out in the lower sections of the river where few adult fish have been found in the past. These areas have been difficult to sample due to their salinity. Consequently it has not been possible to electrofish these areas and sampling of adults has been by traps and gill nets. These methods cover very little area and have suffered from the large amount of drifting debris and snags on the bed of the Tees.

Electrofishing apparatus designed for fry sampling was used. This is battery powered with the anode ring mounted on a telescopic pole so that it can be extended in front of the boat to sample fry before disturbance. The shape and size of the anode allow point sampling, producing a high intensity field that stuns fry in a small area. At each sampling site, up to 10 point samples were taken over a 25 metre length of river. The number of point samples depended on the number of fry caught.

In addition to the electrofishing, a micromesh seine was used in areas where large congregations of fry were expected and where no snags were present.

1.3 Results

Over 3800 0+ fry of all species were sampled and identified. Individuals of every species except minnow were measured. Minnow fry were so abundant that only about 10% were measured. Over 1200 0+ minnows were caught accounting for over 30% of the catch as was the case in 1992. Adult minnows were often released as they appeared in such large numbers at some sites that they swamped the samples. Chub, dace and roach were again the commonest fish caught (Table 1). Dace fry were caught in similar numbers to last year but

numbers of chub and roach were much higher (980 cf 470 and 371 cf 133 respectively). Barbel numbers were slightly increased but gudgeon fry were caught in lower numbers (30 cf 168). Grayling fry were found for the first time along with one specimen of rudd and one of salmon (Table 1).

Table 1. Percentage composition and numbers of each species (of angling interest) of fry sampled in the R. Tees in July 1993. Percentages for 1992 are given for comparison.

Species	Total	1993 Percentage	1992 Percentage
Barbel <i>Barbus barbus</i> (L.)	156	6.1	6.8
Chub <i>Leuciscus cephalus</i> (L.)	980	38.3	25.6
Dace <i>Leuciscus leuciscus</i> (L.)	1010	39.5	51.1
Grayling <i>Thymallus thymallus</i> (L.)	5	0.2	-
Gudgeon <i>Gobio gobio</i> (L.)	30	1.2	9.2
Roach <i>Rutilus rutilus</i> (L.)	371	14.5	7.3
Rudd <i>Scardinius erythrophthalmus</i> (L.)	1	<0.1	-
Salmon <i>Salmo salar</i> L.	1	<0.1	-

Numbers of fish of minor species are given in Table 2. Bullhead and flounder fry were caught this year. Numbers of stone loach were higher than in 1992 and numbers of minnows were up by approximately 25%.

Table 2. Numbers of fry of minor species sampled in the R. Tees in July 1993. Numbers caught in 1992 are given for comparison.

Species	1993	1992
Bullhead <i>Cottus gobio</i> L.	5	-
Flounder <i>Platichthys flesus</i> (L.)	6	-
Minnow <i>Phoxinus phoxinus</i> (L.)	c.1200	873
Stone loach <i>Barbatula barbatula</i> (L.)	73	46
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	6	5

During sampling for fry, 833 individuals of age 1+ or older were caught and measured. Half of these were minnows even though many others were released and not counted. Dace and chub were well represented (173 and 180 respectively), with gudgeon and roach being the other main species (Appendix 1).

1.3.1 Distribution of fry

The species composition in each section sampled is shown in Figs 1-6 and summarised in Fig. 7.

In previous years, fry had been found as low down the river as Section 4 (Preston Park). This year fry were found even further downstream, in Sections 1, 2 and 3. One roach fry was found in Section 1. In Sections 2, quite high numbers of fry were caught, mainly chub, roach and dace. Large numbers of roach fry were found in Section 3 (Appendix 2).

The distribution of dace was different from that of the previous year. In 1992, four sections (7, 8, 17 and 21) had the largest concentrations of dace fry. In 1993, few dace fry were found in Sections 17 and 21. Although dace fry were present in Sections 7 and 8 in reasonable numbers, the main concentrations of fry were lower down the river in Sections 4-6 (Appendix 2).

Chub were found in all sections sampled except Sections 1 and 12. They comprised a high percentage of the fry in most sections. As in 1992, high numbers were found in the upstream sections. In the middle sections the distribution was similar to last year, except for Section 12 (where no chub fry were found in 1993) and Section 14 (where high numbers were found in 1993 but not in 1992).

Roach fry were present in the lower reaches (below the R. Leven) and the upper reaches of the river but virtually absent from the middle reaches. Large numbers of fry were found in Sections 3 and 25. No roach fry were found in Section 17 (Low Worsall) where they were abundant the previous year (Appendix 2).

The large increase in barbel fry noted last year was sustained. Their distribution was wider this year. Most specimens were found in the upper reaches (Sections 17-25) although some were present lower down (Sections 6, 8 and 11).

Gudgeon fry were present in five sections, the furthest downstream being Section 14. The numbers were down on last year due to their absence from Section 21 where in 1992 they comprised 21% of the fry sampled at that site.

Few fry were found in the ORSU (Appendix 2). Six species were present, with gudgeon the most numerous (9 individuals). There were slightly more older fish than fry. Five species were recorded, again gudgeon being the most common (Appendix 1). In all seven species of fish were inhabiting the ORSU.

1.3.2 Length frequency distribution

Length frequency histograms are shown for each species (Fig. 8). Although samples were taken at the same time of year in 1992 and 1993, the modal size of each species of fry is about 10 mm less than in 1992. In many instances, the size difference between 1992 and 1993 was even greater. For instance, the maximum recorded size of barbel was 16 mm less in 1993. This is likely to be a temperature effect. Dace fry were larger than fry of other

species. The size ranges of the other main species, including chub fry, were very similar (Fig. 8).

The length distributions of each species found in significant numbers at each site are shown in Figs 9-12. Little difference can be seen in the size distributions of dace fry along the length of the river (Fig. 9), although there appears to be a shift in size distribution of chub along the length of the river with larger fry generally more abundant in the upstream and downstream sections than in the middle sections (Fig. 10).

In 1992, roach fry were larger in the downstream sections. This is not the case in the present survey. The size distributions in the two sites where large numbers of roach fry were found are similar. These sites are well separated in the river, Section 3 being near the downstream limit of fish presence and Section 25 being the topmost section sampled (Fig. 11).

The size distribution of barbel was similar at all sites where significant numbers were found. There is no evidence of differential size along the length of the river (Fig. 12).

Fig. 1. Species composition of fry in Sections 1-4 in July 1993.

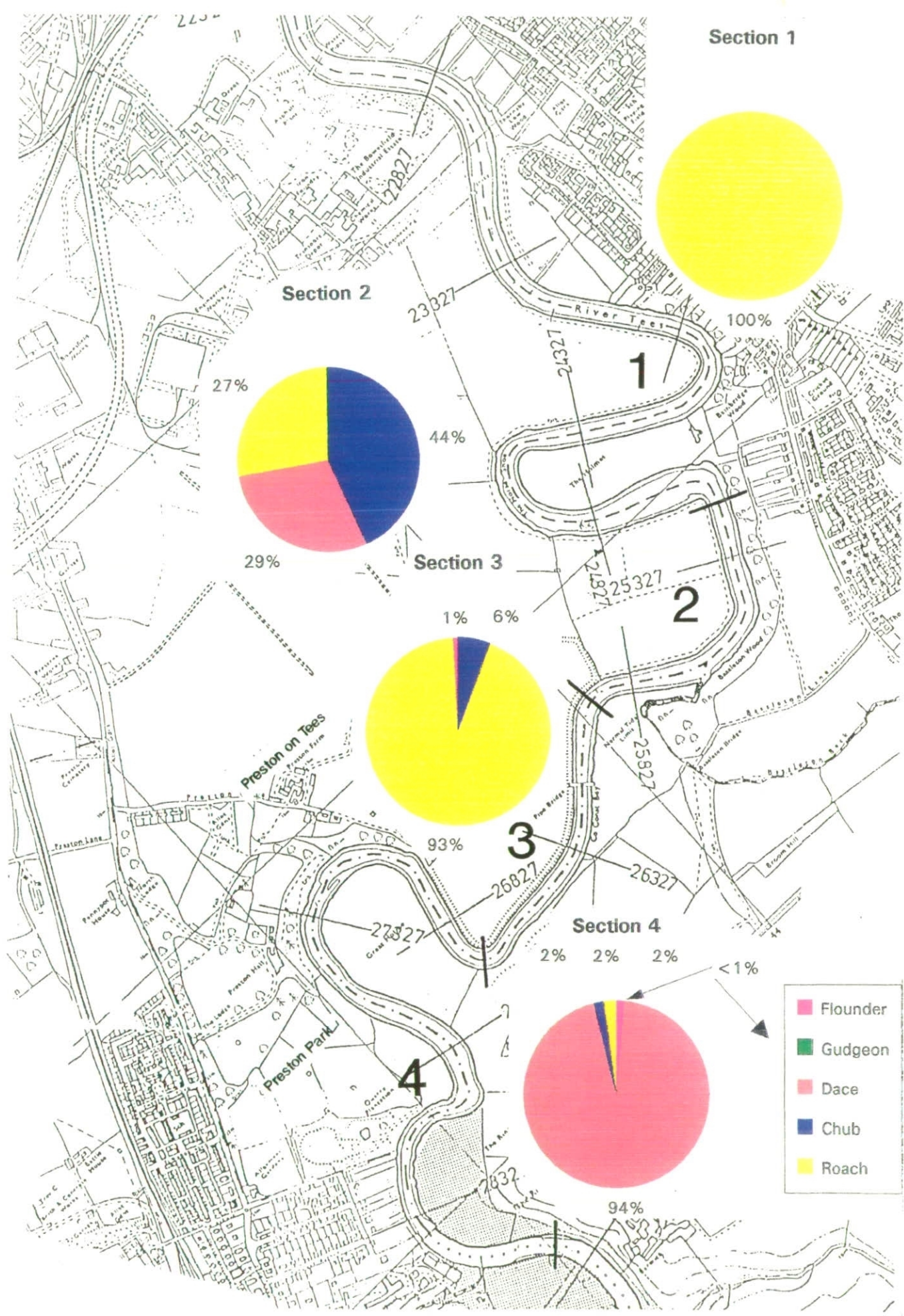


Fig. 2. Species composition of fry in Sections 5-9 in July 1993.

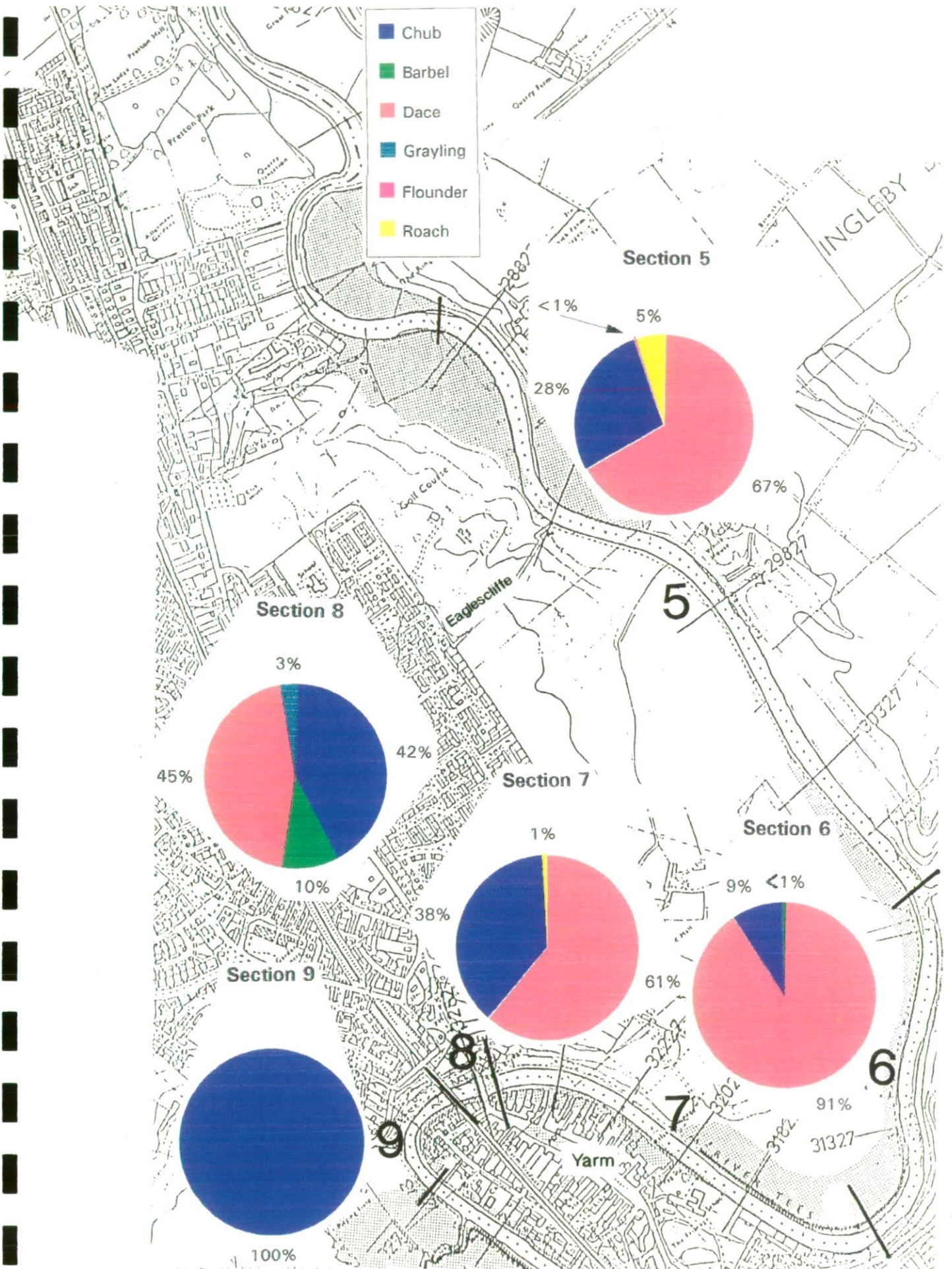


Fig. 3. Species composition of fry in Sections 10-14 in July 1993.

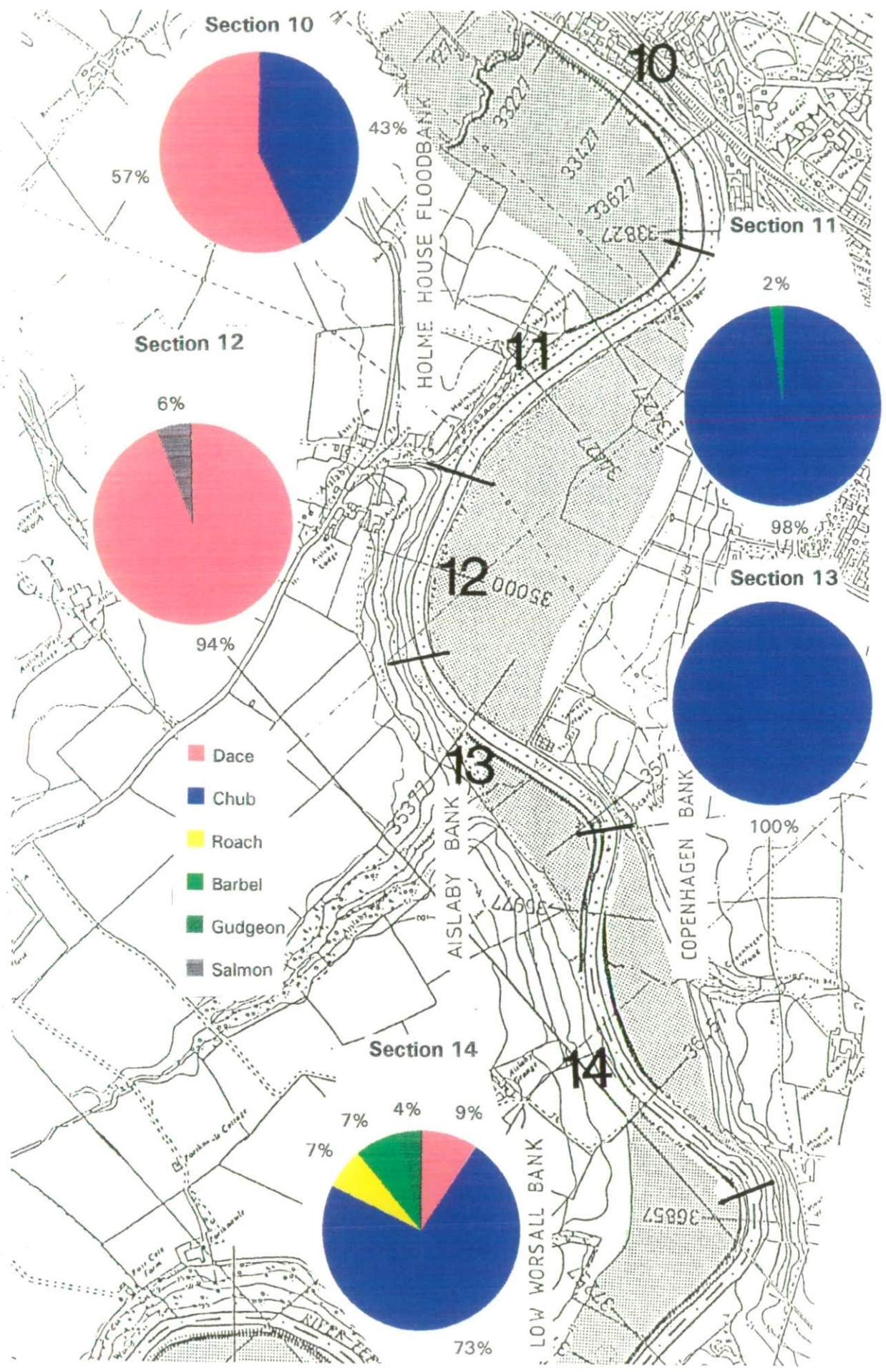


Fig. 4. Species composition of fry in Sections 15-18 in July 1993.

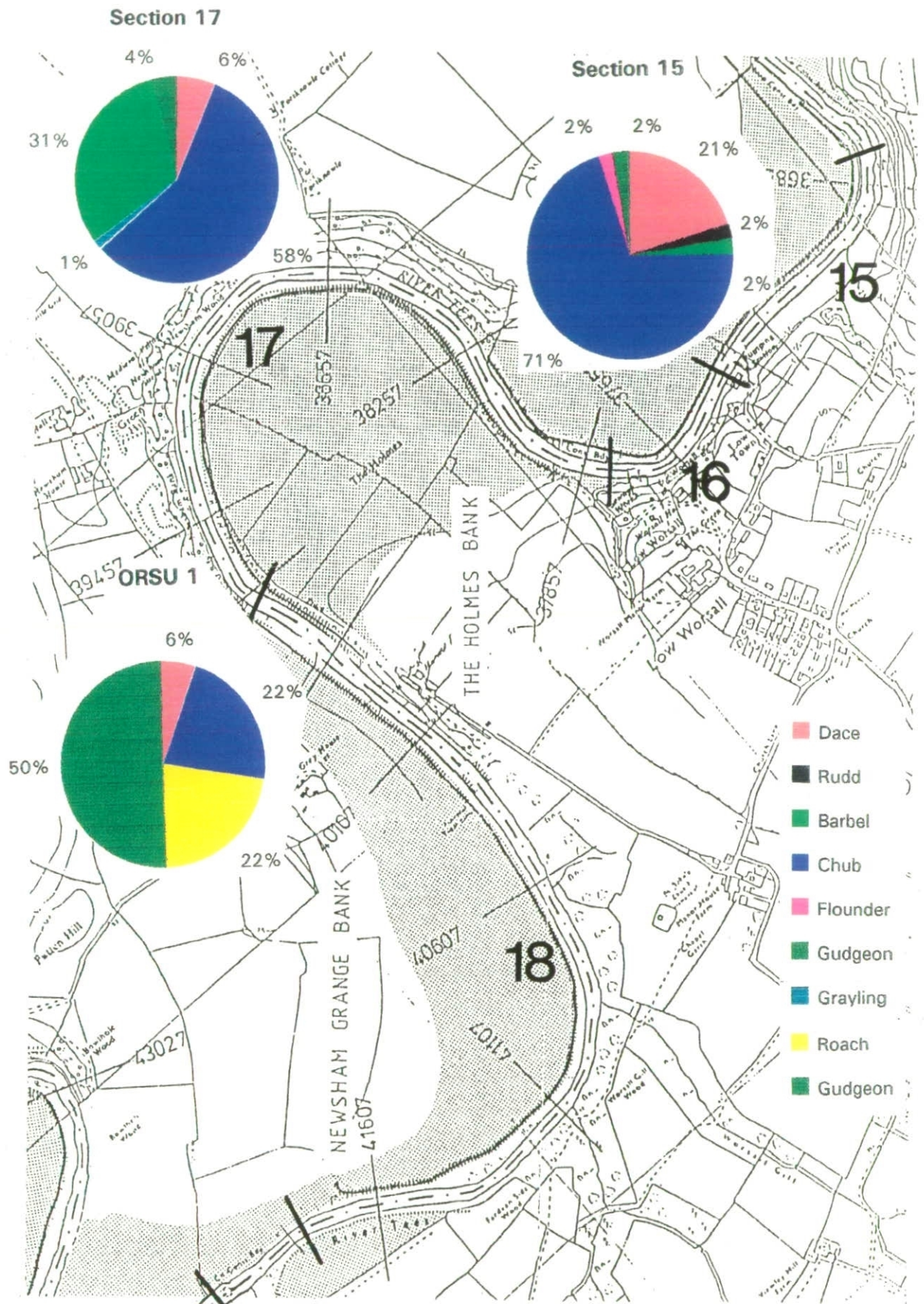


Fig. 5. Species composition of fry in Sections 19-21 in July 1993.

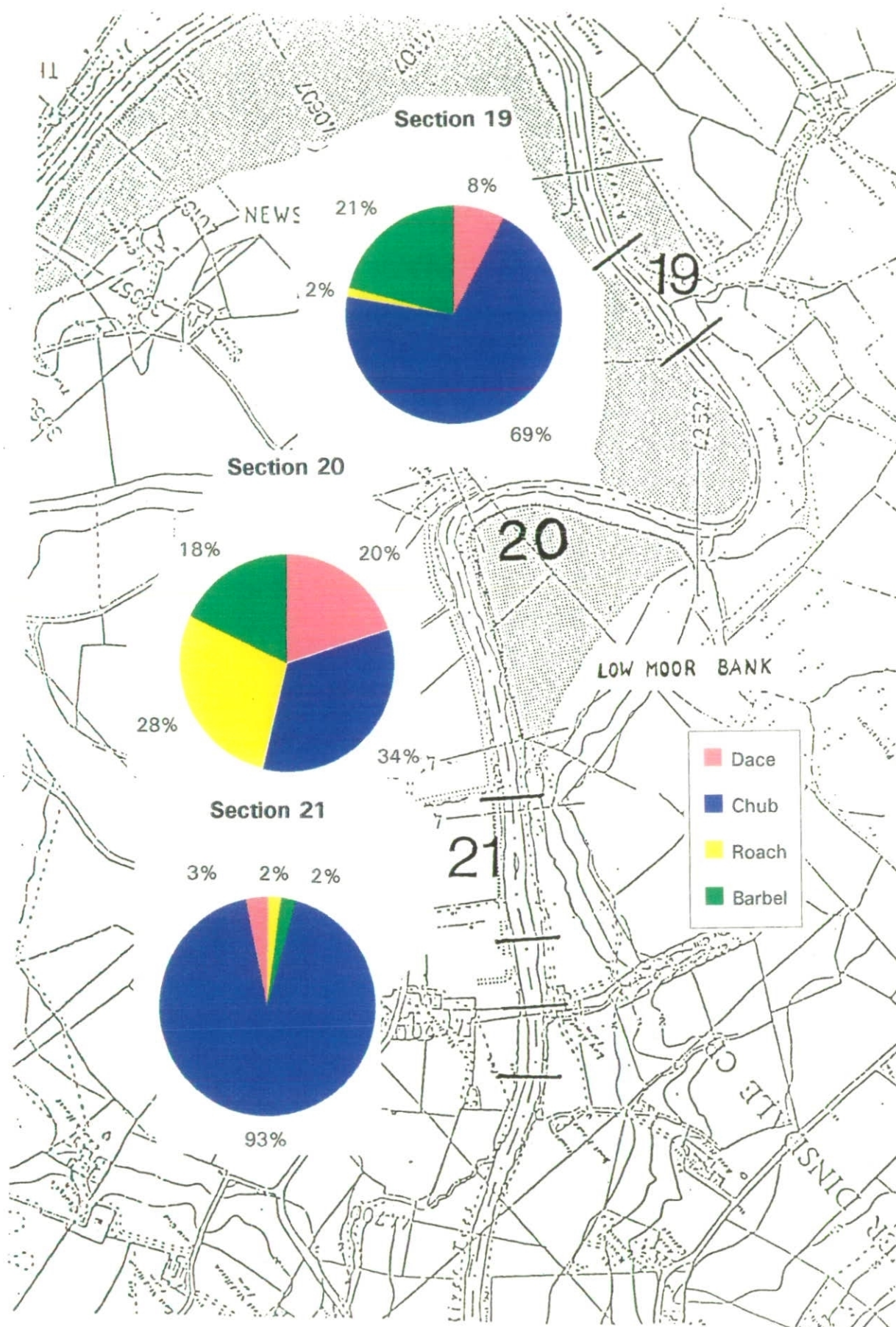


Fig. 6. Species composition of fry in Sections 22-25 in July 1993.

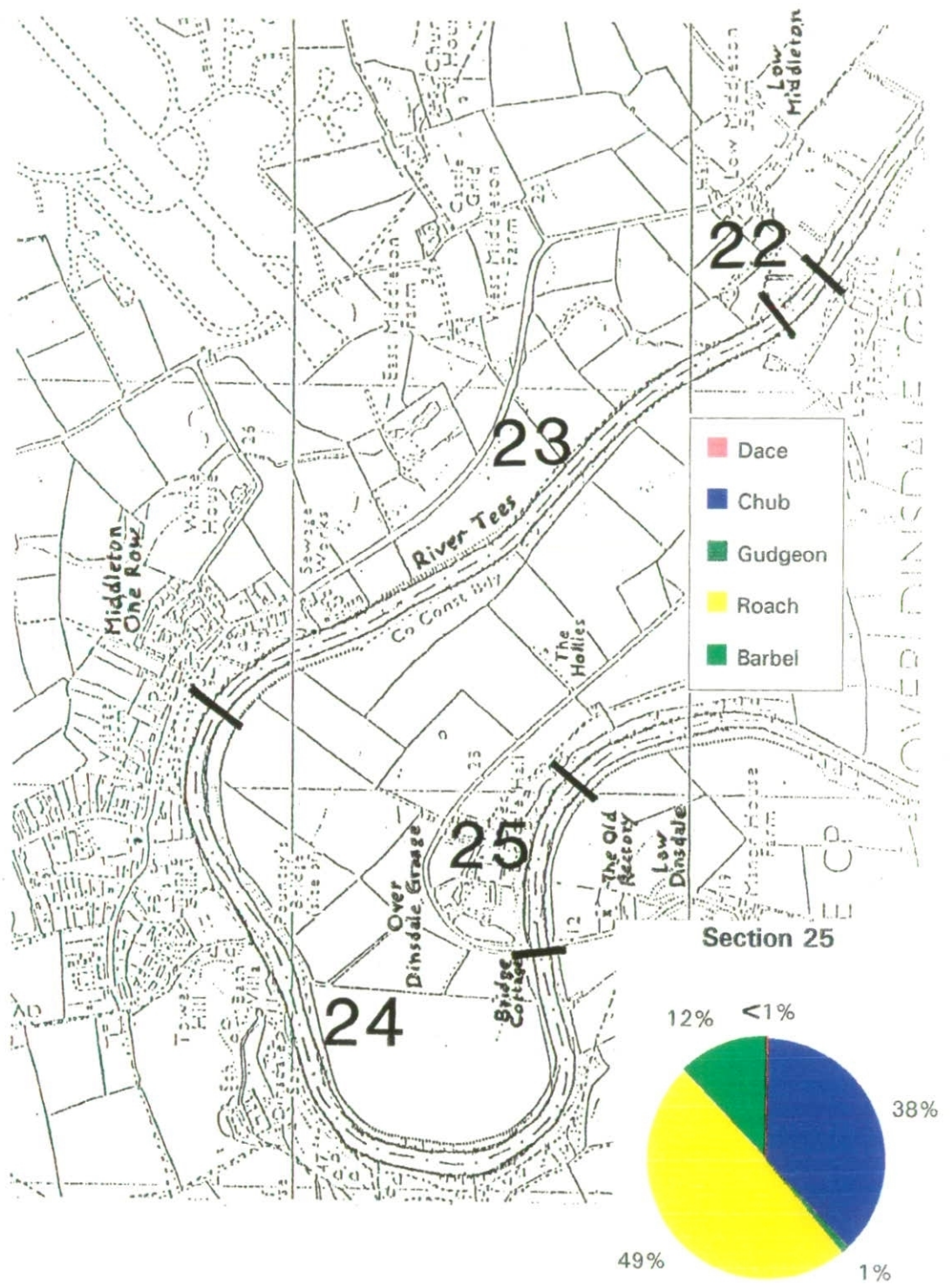


Fig. 7. Species composition of fry in the River Tees in July 1993 by section.

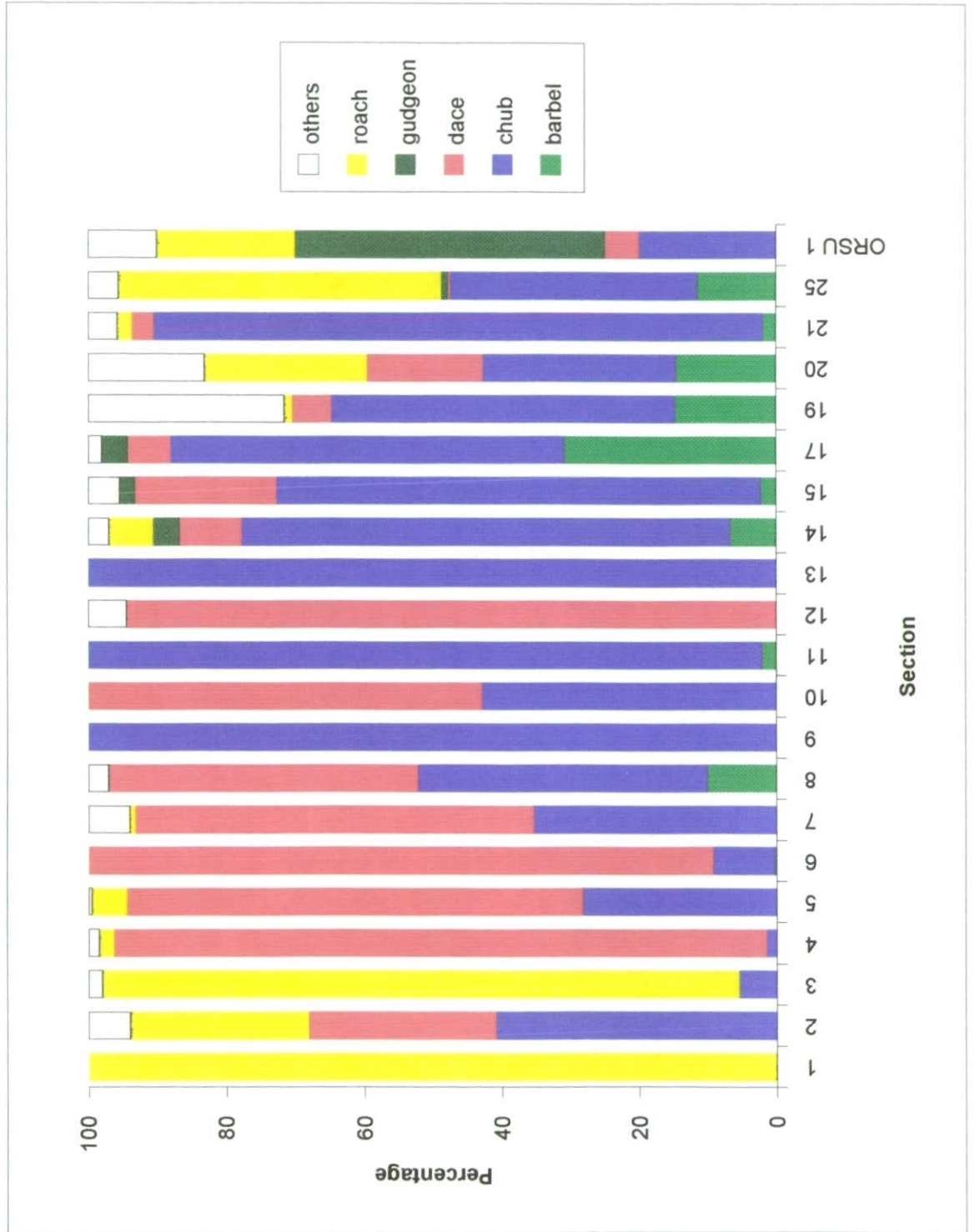


Fig. 8. Length frequency histograms for each species of fry in the R. Tees in July 1993.

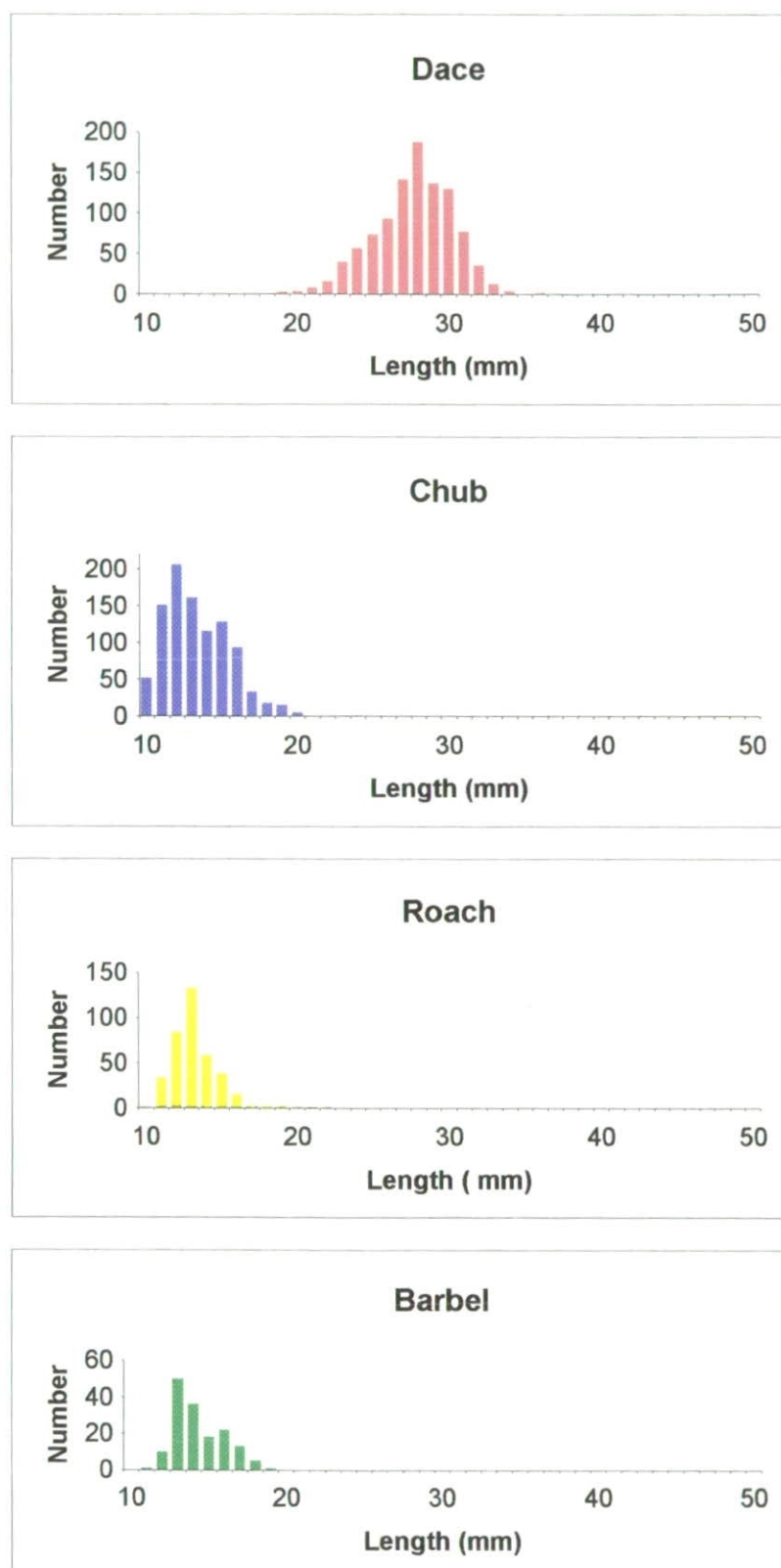


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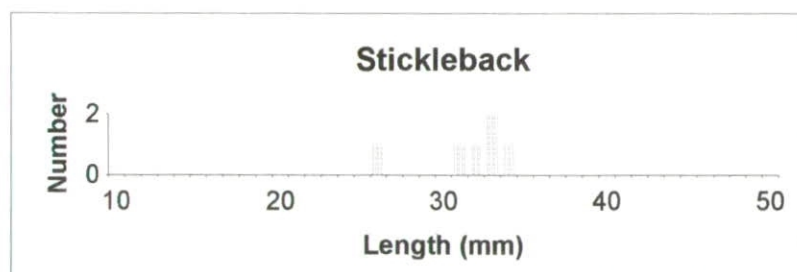
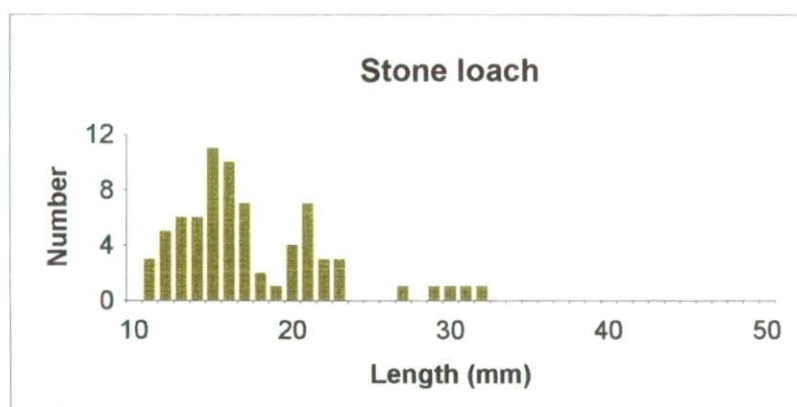
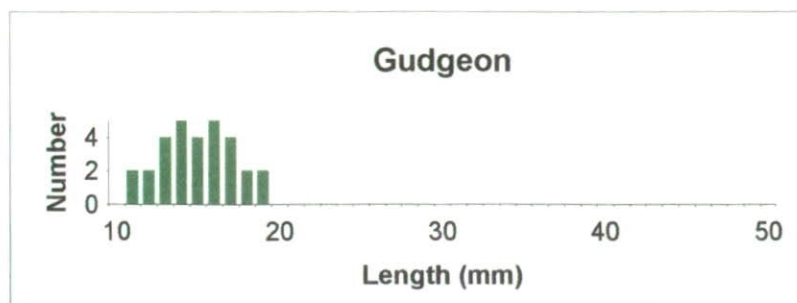


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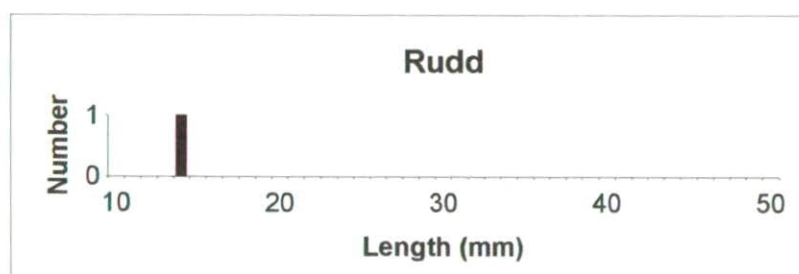
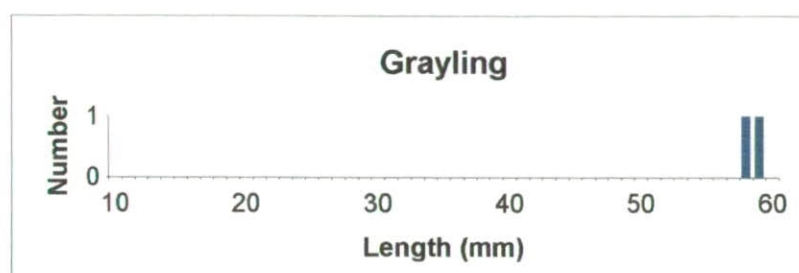
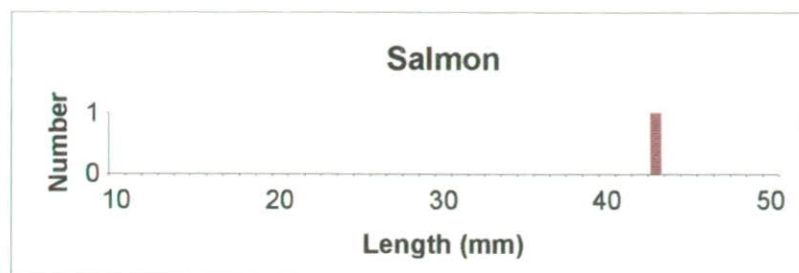


Fig. 9. Length frequency distribution of dace fry in each section of the R. Tees in July 1993.

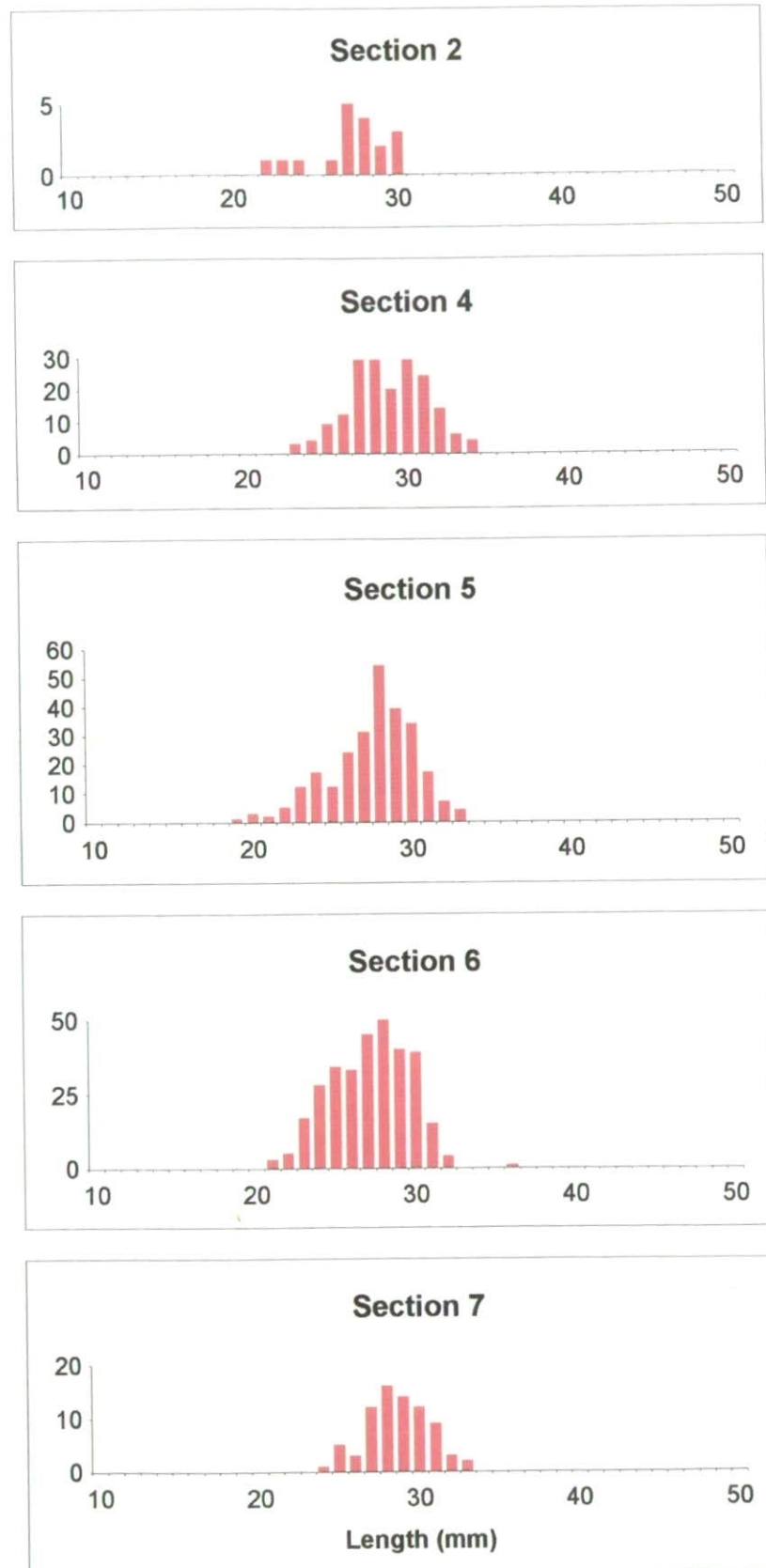


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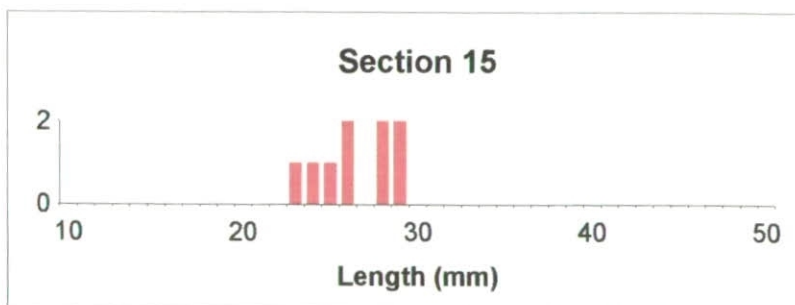
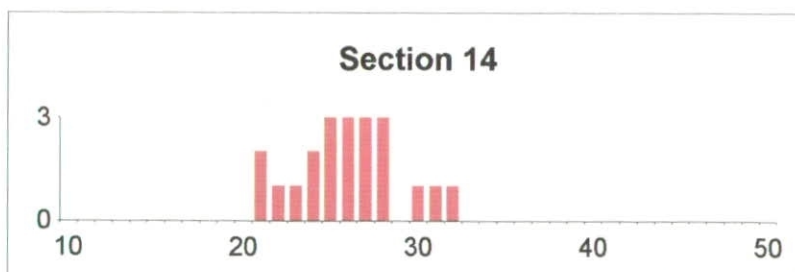
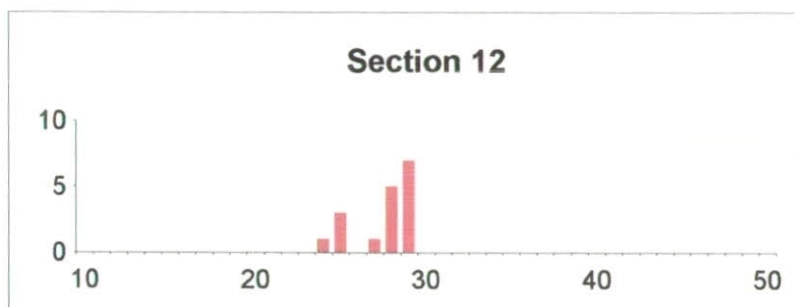
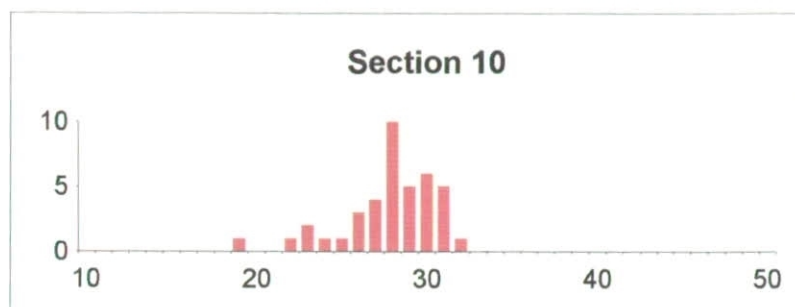
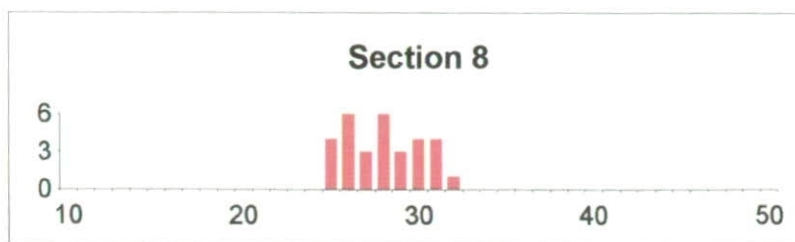


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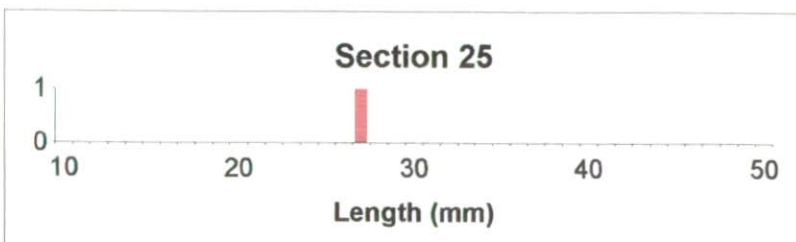
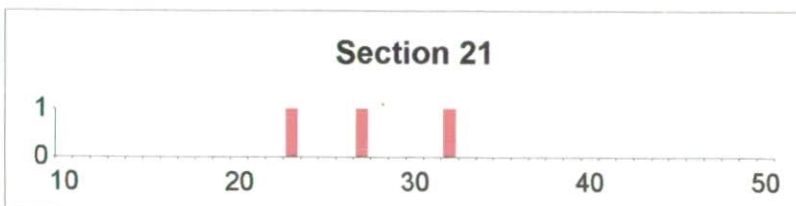
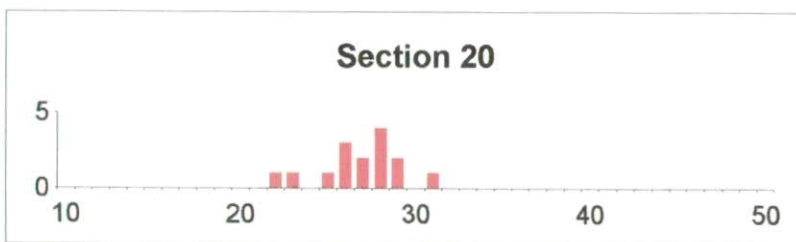
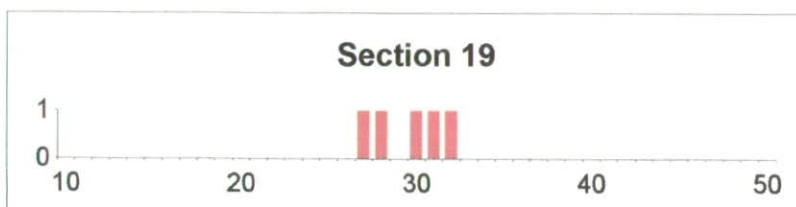
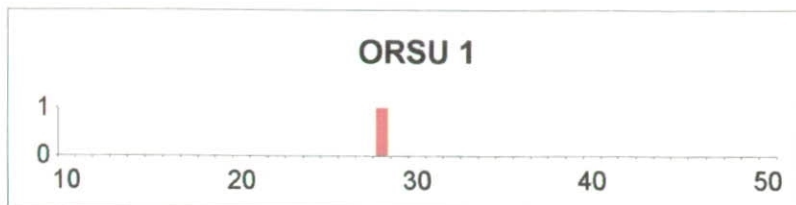
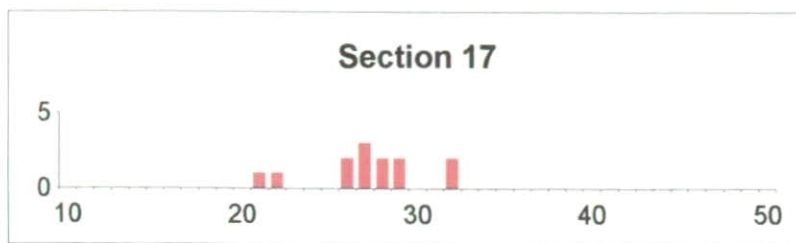


Fig. 10. Length frequency distribution of chub fry in each section of the R. Tees in July 1993.

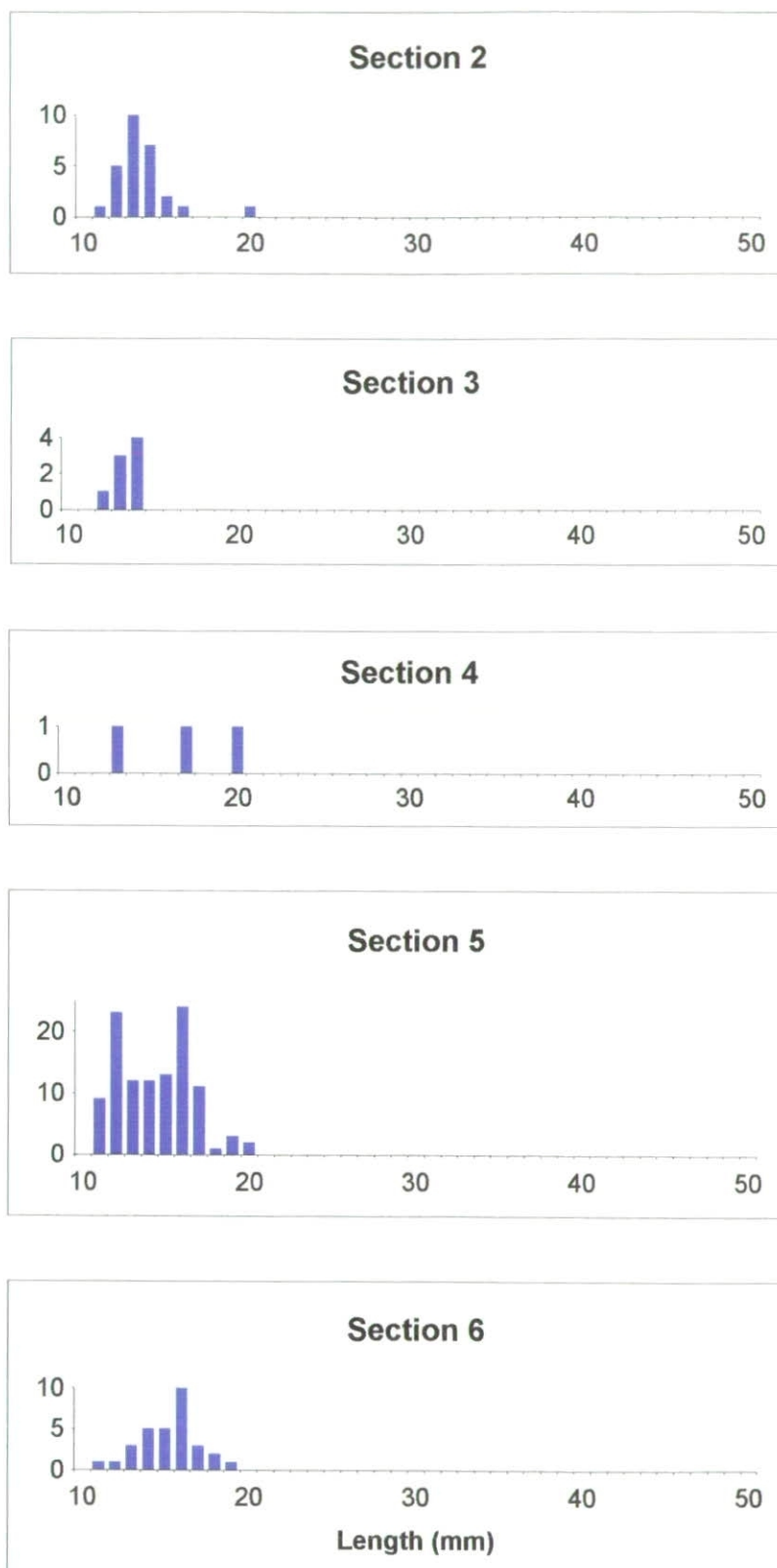


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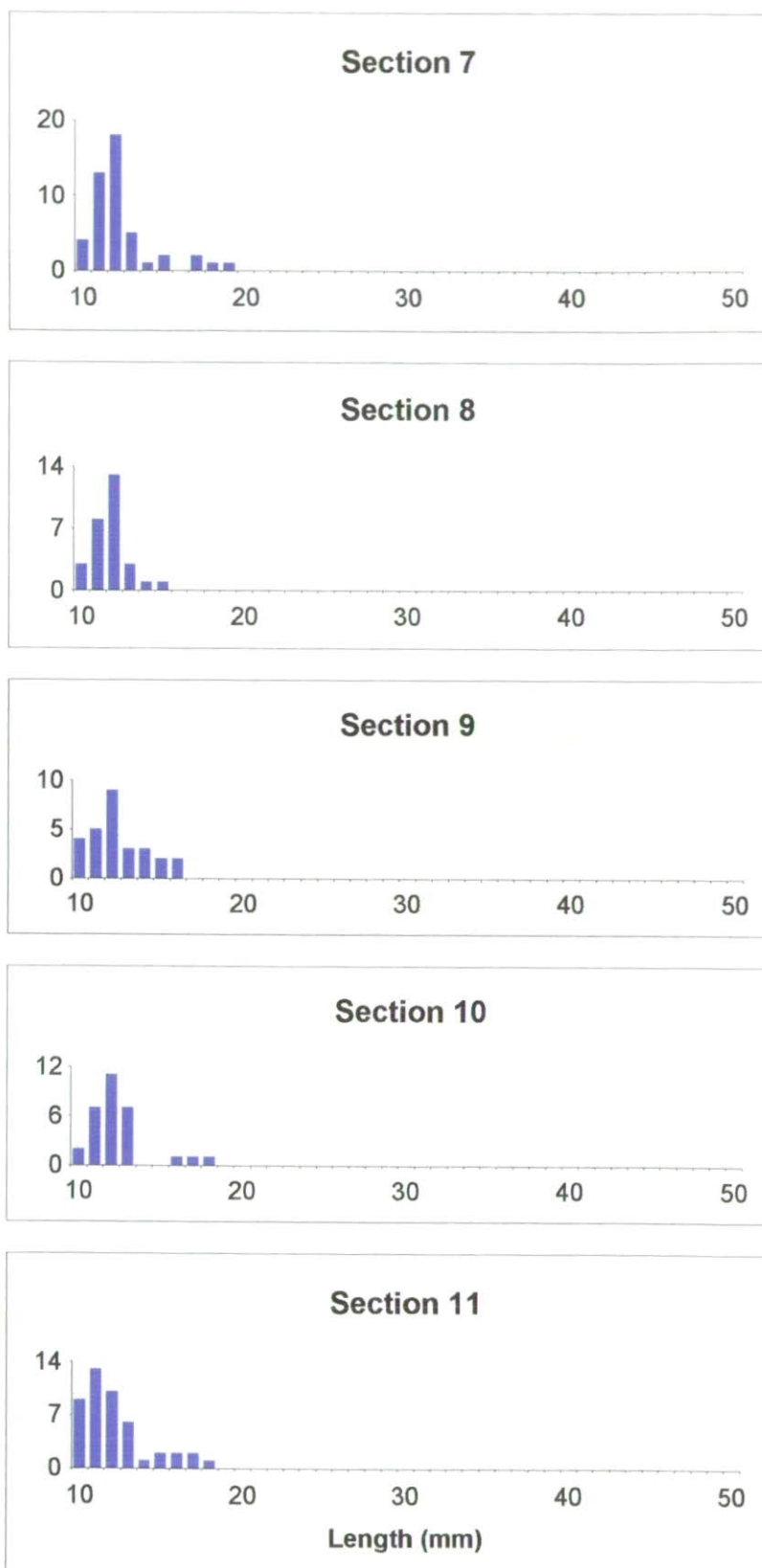


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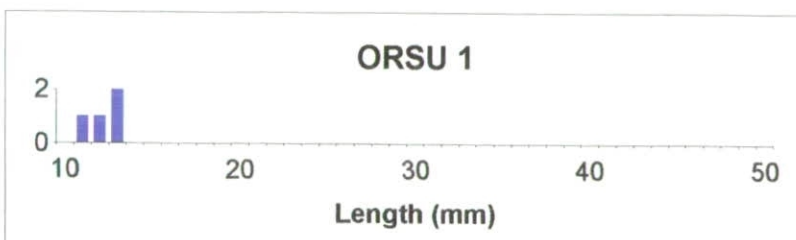
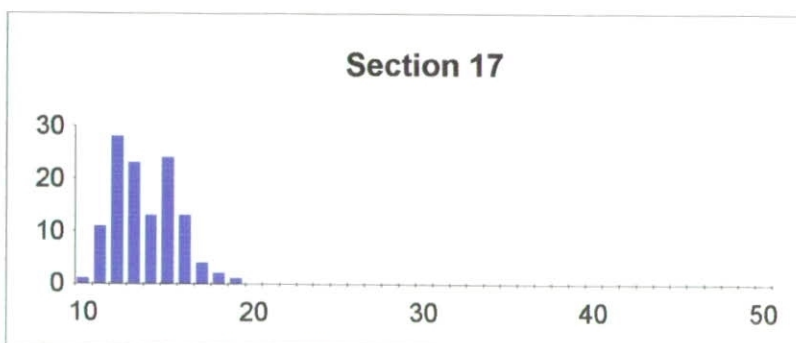
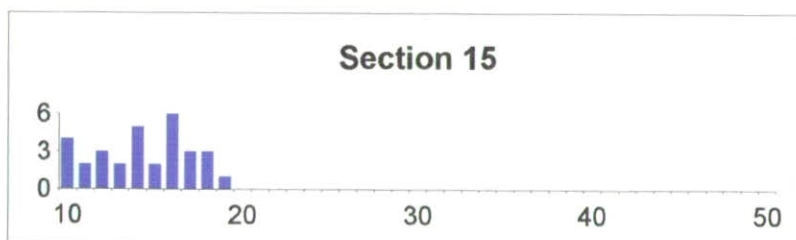
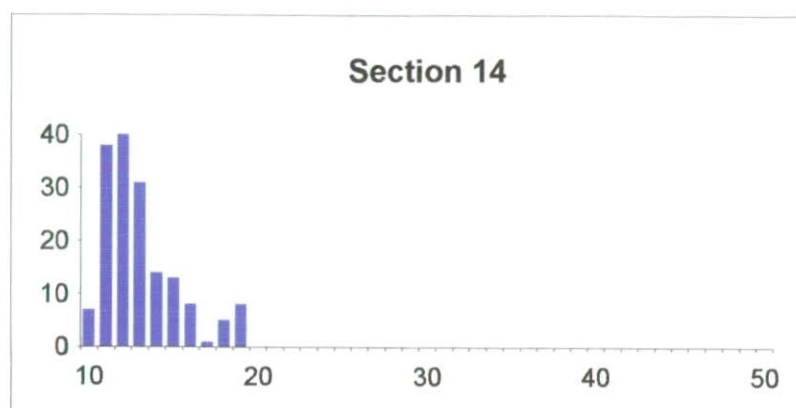
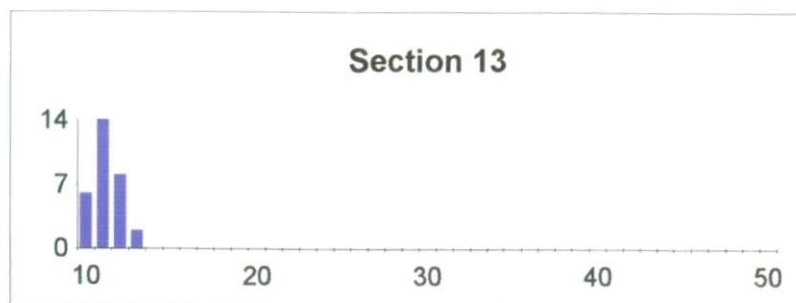


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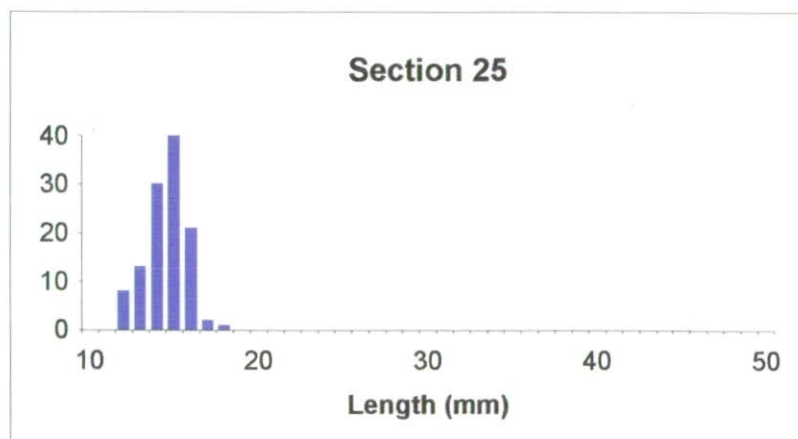
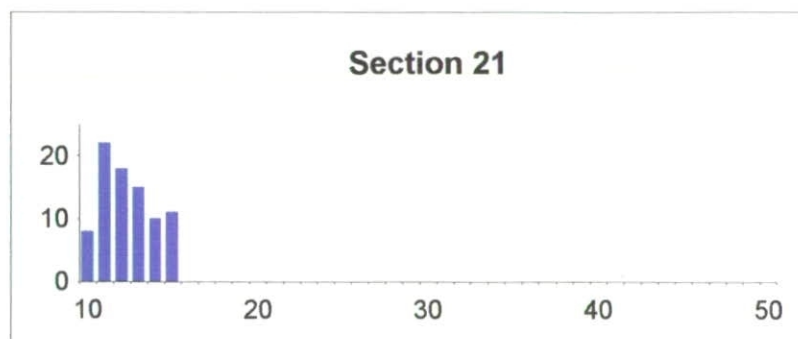
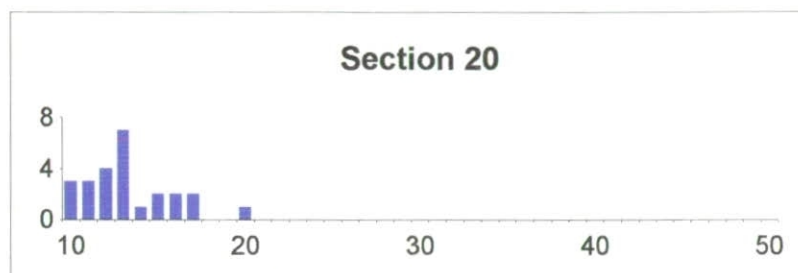
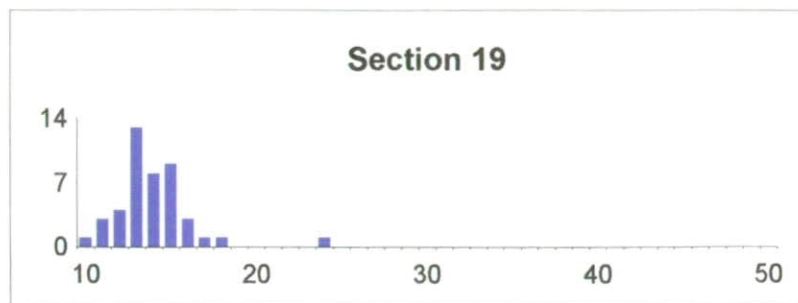


Fig. 11. Length frequency distribution of roach fry in each section of the R. Tees in July 1993.

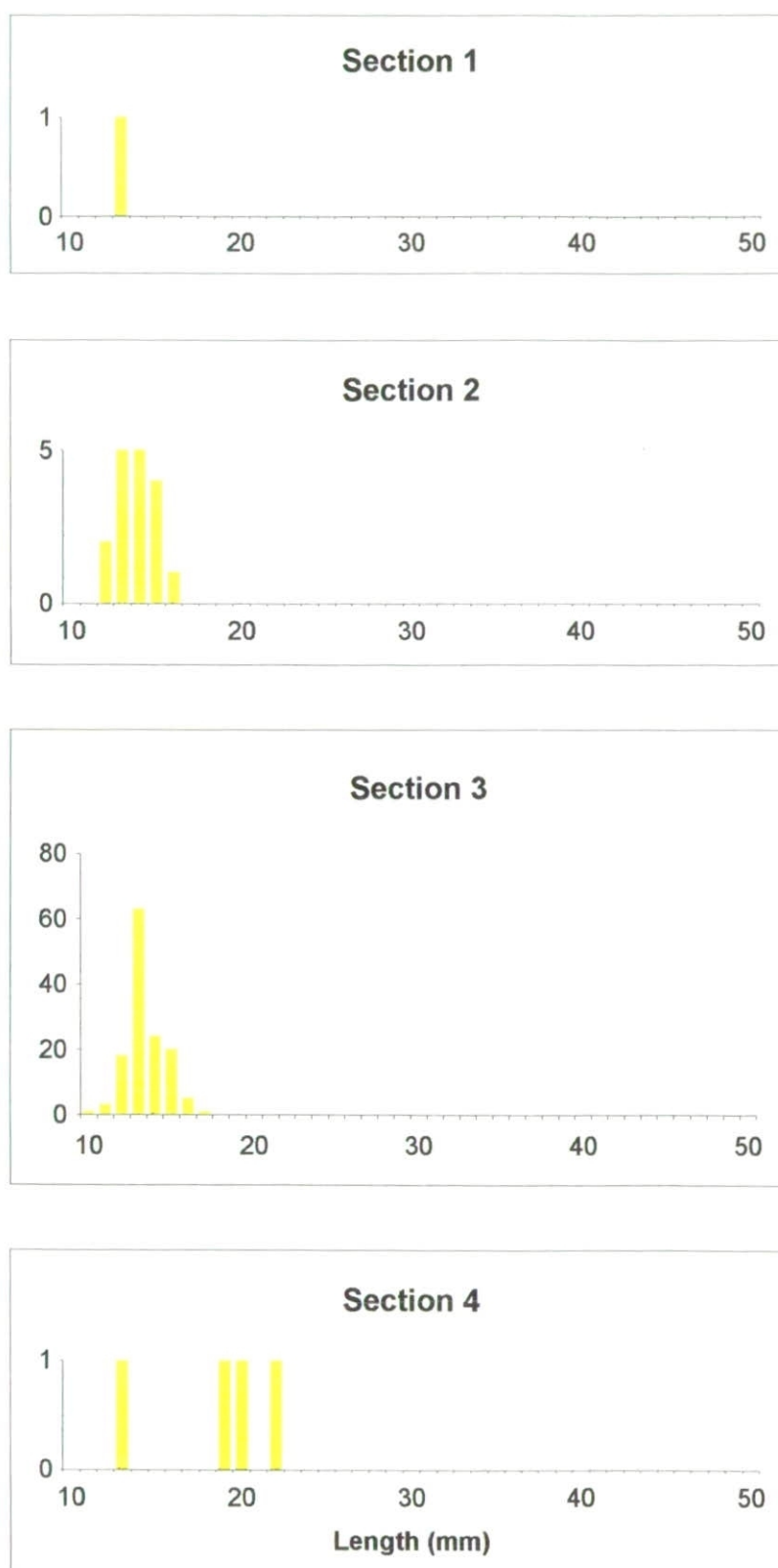


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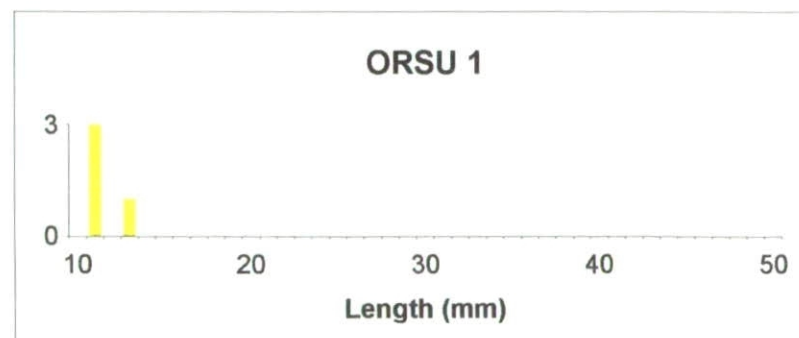
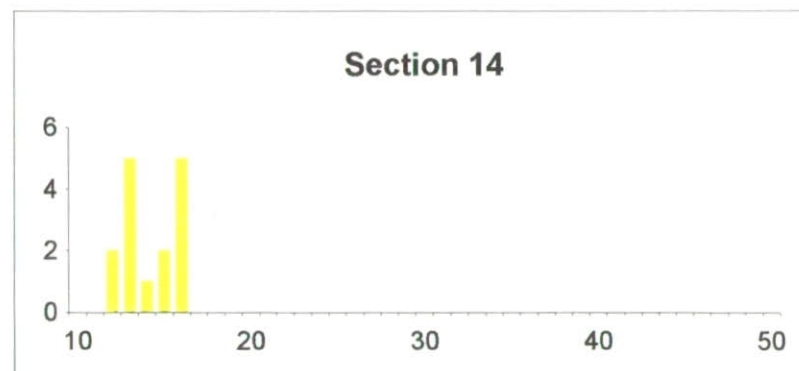
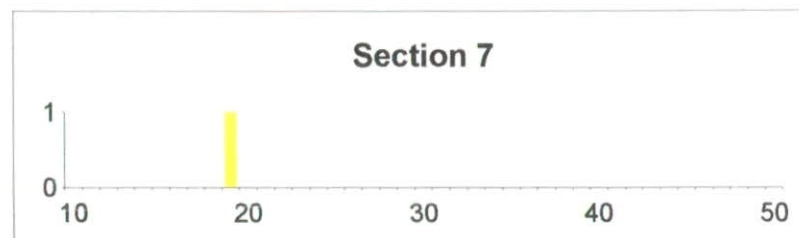
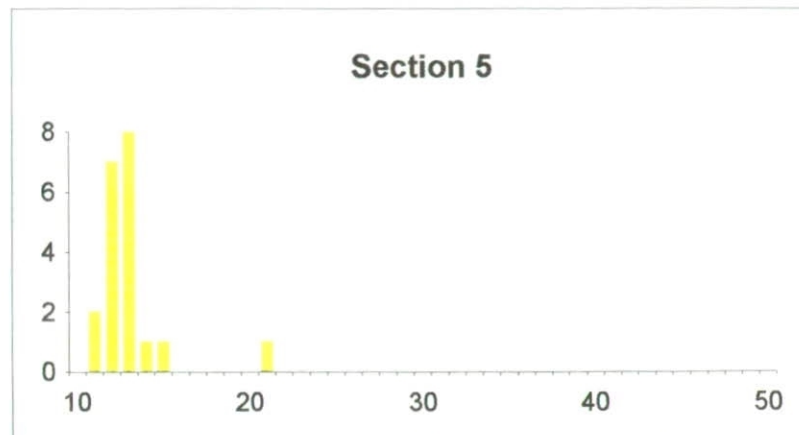


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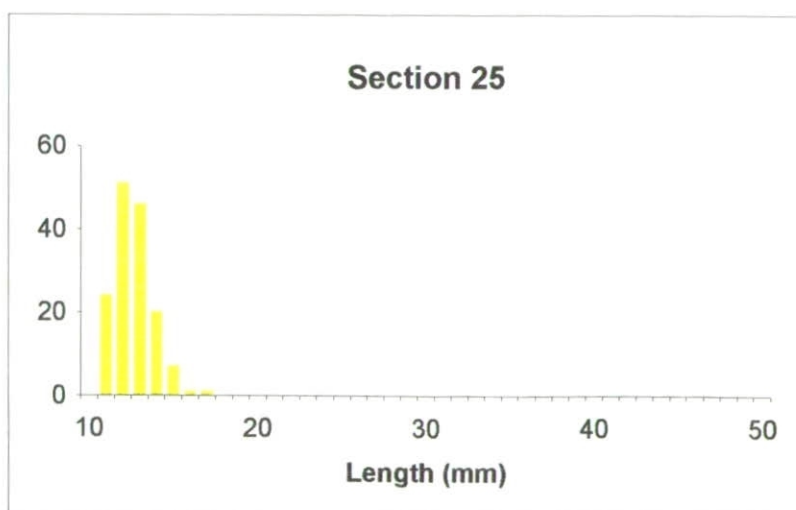
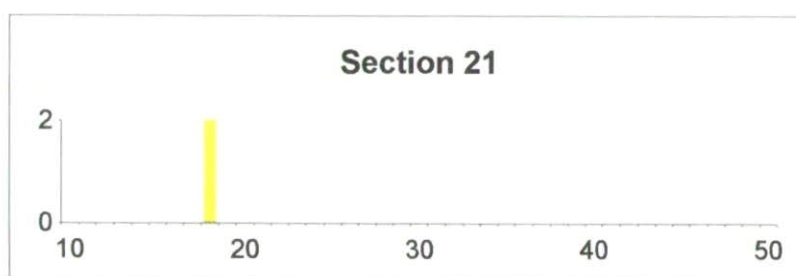
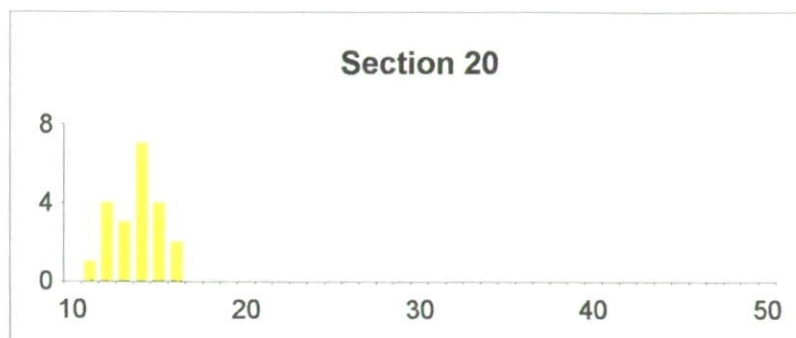
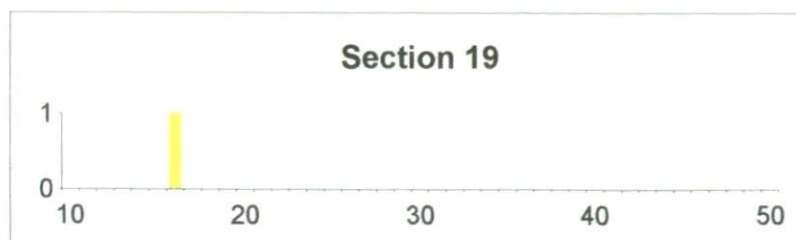


Fig. 12. Length frequency distribution of barbel fry in each section of the R. Tees in July 1993.

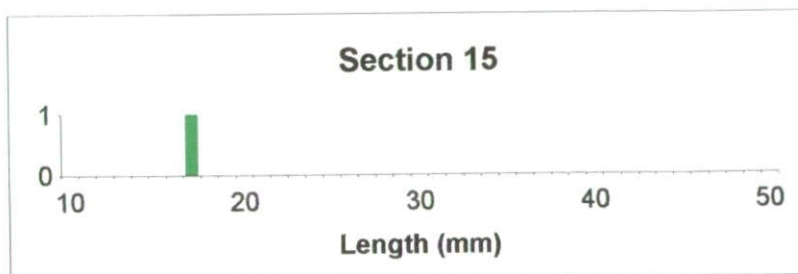
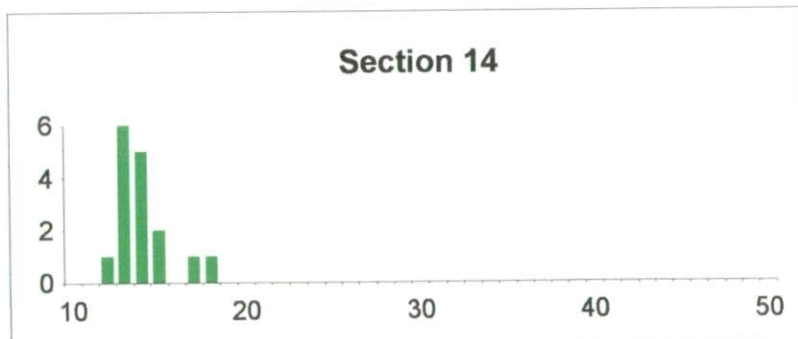
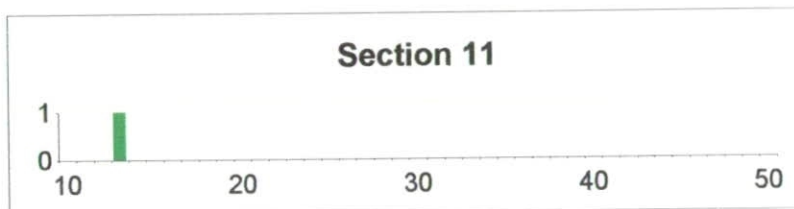
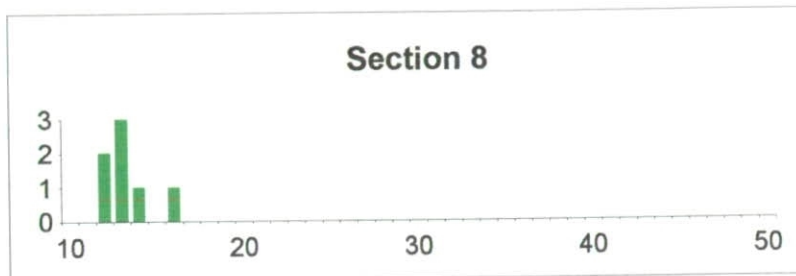
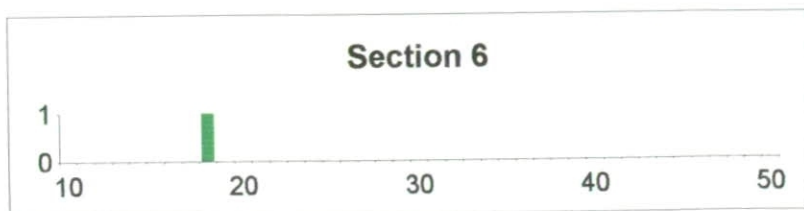
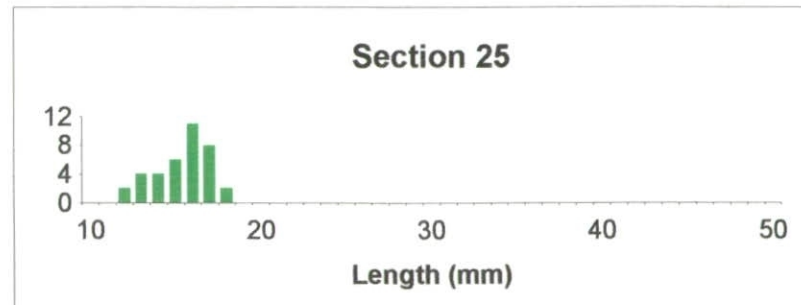
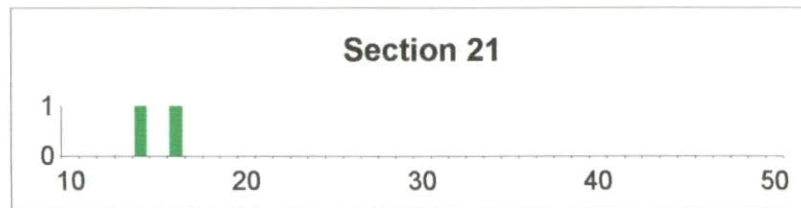
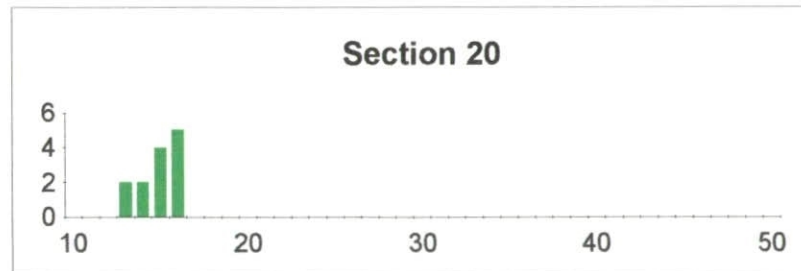
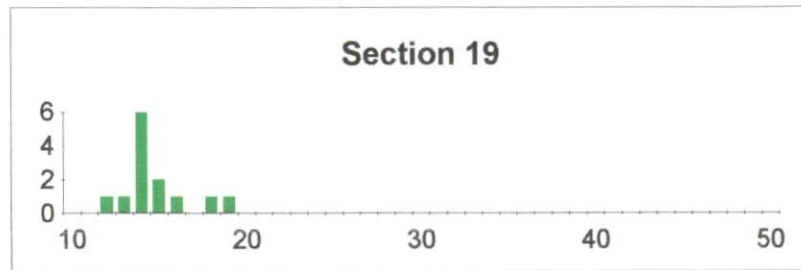
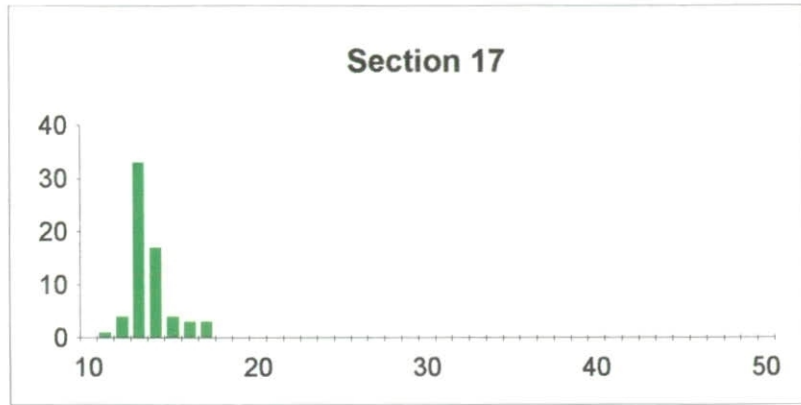


Fig. 12. Continued



2. SURVEY OF COARSE FISH SEPTEMBER 1993

2.1 Introduction

This is the third year that a survey of the coarse fish has been undertaken at this time of the year. It is aimed at increasing the data base of fish populations before the completion of the barrage. It will also be possible to compare the distributions of fish along the length of the river in each year. This may give data on fish movement which added to information received from the marking experiment started this year and to be increased next year will indicate the extent of movement in this part of the R. Tees.

2.2 Methods

2.2.1 Electrofishing

All sites sampled were electrofished in 1993. Sites 19 and 25 were waded (single anode 200 v, 1.9 KvA), the ORSU was electrofished from a dingy with the same gear and all other sites were electrofished with the boom boat. The increased water depth this year allowed boom boat operation in Section 21 for the first time.

The boom boat used 200 v at 10 amps from a 7.5 KvA generator. Each section was fished twice with the flow, once along each bank. Fish from both runs were retained in an oxygenated holding tank and processed as one catch. Fish were released at a distance sufficient to prevent their migration into the next study section before fishing commenced.

2.2.2 Processing

Length measurements were taken from each fish and weight measurements and scales for ageing were taken from a representative sample of these.

2.3 Results

The total number of fish caught in the September survey was ³³⁶⁴3999, which is around 500 more than in the corresponding survey in 1992. The number of fish >8 cm caught in 1993 was 2135 which is substantially greater than the number (850) caught last year. Dace, chub, and roach accounted for approximately two thirds of the catch (Table 3). Gudgeon numbers were similar to last year and numbers of both minnow and flounder were substantially increased.

One roach/chub hybrid was found in Section 4. Its identity was confirmed by examination of the pharyngeal bones. The formula for roach is 5+0-0+6, that is, only one row of five teeth on one side and six on the other. Chub is 5+2-2+5 ie two rows of teeth on each side, the first row with five large teeth on each side and the second row having two small teeth on each side. The formula of the specimen caught was 5+1-0+6, the large teeth of the first row having the same number as roach but the presence of one tooth on the second row indicating that the fish was a hybrid.

Table 3. Species lists for the R. Tees and number of each species caught - September 1993.

Species	Totals
Barbel <i>Barbus barbus</i> (L.)	10
Bullhead <i>Cottus gobio</i> L.	2
Chub <i>Leuciscus cephalus</i> (L.)	620
Dace <i>Leuciscus leuciscus</i> (L.)	1178
Eel <i>Anguilla anguilla</i> (L.)	>>100
Flounder <i>Platichthys flesus</i> (L.)	225
Grayling <i>Thymallus thymallus</i> (L.)	7
Gudgeon <i>Gobio gobio</i> (L.)	305
Minnnow <i>Phoxinus phoxinus</i> (L.)	400
River Lamprey <i>Lampetra fluviatilis</i> (L.)	1
Roach <i>Rutilus rutilus</i> (L.)	594
Roach/Chub hybrid	1
Salmon <i>Salmo salar</i> L.	3
Stone loach <i>Barbatula barbatula</i> (L.)	1
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	9
Trout (brown) <i>Salmo trutta</i> L.	12
Trout (sea) <i>Salmo trutta</i> L.	1

TOTAL = 3369 (EELS NOT COUNTED)

As in 1992, one river lamprey was found, again in Section 21.

Three adult salmon were caught, one each in Sections 5, 7 and 11. Unlike 1992, these fish were stale, having been in the river some time. A salmon parr was found for the first time. This 12 cm fish was in Section 6, an area of the river which is affected by the tide. This is not a part of the river where parr would be expected.

A sea trout (45 cm) was found in Section 14. An angler reported that smaller ones are commonly caught in matches for a short period in early summer in the lower sections (Preston Park area) but are not caught after this. Presumably, most of the fish enter the river at this time and migrate to the upper reaches fairly quickly.

2.3.1 Distribution of fish

Species composition at each site fished is given in Figs 13-18 and summarised in Fig. 19. Site descriptions, fishing method, date, state of the tide, species and number of fish caught in each section are given in Appendix 3.

Semi-quantitative information on number of fish per 100 m of river for each section is given in Table 4. Comparisons between sections and between years may be made only after giving due regard to the different efficiencies with which each section is fished. Factors such as the state of the tide, depth and turbidity all have a marked effect on fishing efficiency.

Dace were found in all sections fished. Unlike the previous two years, densities in the Yarm area (Sections 7-9) and in Section 25 were not high (Table 4). High densities were recorded in Sections 12 and 21 which is the same as last year. Densities of dace in the lower sections in 1993 was higher than in previous years.

Roach were found in all sections fished. Densities in the Yarm area were low, as they were for dace, which is different from 1992. The highest densities were found in Section 19 and in the Aislaby area (Sections 11-13).

Although present in all sections fished, chub were only recorded in low densities in the downstream sections. The highest densities were noted in the top three sections (19, 21 and 25) fished (Table 4). As with dace and roach, the high densities seen at Yarm in previous years were not present this year.

Table 4. Number of fish per 100 m in each section in September 1993.

Section	Dace	Roach	Chub
3	5.1	0.8	0.1
4	7.7	6.9	0.4
5	8.6	2.1	5.1
6	2.2	1.8	4.0
7	5.4	3.2	4.4
8	1.0	0.3	0.6
9	7.3	2.7	6.0
10	2.7	3.8	5.7
11	5.2	9.6	9.0
12	24.5	8.0	2.7
13	15.2	6.7	3.0
14	8.9	1.7	4.7
15	17.9	5.7	5.0
16	14.8	1.0	4.5
19	18.5	14.5	31.5
21	45.4	2.3	12.7
25	2.9	4.9	10.6

2.3.2 Length frequency distribution

The length frequency distribution of each species is presented in Fig. 20 and for certain species this is also given for each section fished (Figs 21-24).

In 1993, young of the year of most species were smaller than in the preceding year in the same month. This is likely to be associated with the lower temperatures in the river this year.

In general, dace young of the year were caught in lower numbers than in 1992 even though conditions were better for catching fish this year (less turbid). Their distribution is in broad agreement with the distribution of fry in July. Main concentrations of young of the year were found in Sections 4, 5, 7 and 11 (Fig. 21). Most fry were found in Sections 4-8. Good numbers of older dace were found in Sections 3 and 4 in 1993 where in previous years very few fish have been sampled (Fig. 21). Section 21 held greater numbers of dace than in previous years. However it must be remembered that this section was fished for the first time by boom boat this year again showing that sampling methods and other factors must be taken into consideration when comparing data from year to year.

Chub young of the year were found in very low numbers although at sizes of only 2-3 cm it is probable that they were in areas not fished by the boom boat. They were most abundant in the ORSU which was fished by a different method (Fig. 22). Fish of 5-10 cm were distributed broadly in agreement with the previous year being abundant in Sections 5, 7, 11 and 12 (Fig. 22). Larger fish were distributed throughout the sampled sections of the river. Generally, they were more abundant in the upstream sections (14 and above). In the lower sections, they were abundant in Sections 5, 6, 7 and 10.

In the previous year, roach young of the year were only found in Sections 5 and 7 in good numbers. In 1993, they were abundant in Section 4 and found in reasonable numbers in Section 19 and in the ORSU. Adult roach were found in most sections (Fig. 23).

Most young of the year gudgeon were found in the ORSU (Fig. 24). Adult fish were found in all sections and were particularly abundant in Sections 11-15 (Fig. 24).

2.3.3 Movement of dace

2.3.3.1 Introduction

One of the main dace spawning sites on the R. Tees is at Yarm where spawning takes place on gravel shallows at certain states of the tide. The anglers perceive this site to be the main source of fish that are caught in the tidal section of the river. IFE have identified several other sites where spawning is likely to occur but it is not known whether fish from these sites migrate as far as the main angling areas. As a first attempt to determine the range of movement of dace in the river, a sample was marked at a spawning site upstream of the effect of the barrage and anglers were asked to record any recaptures.

2.3.3.2 Methods

All dace >10 cm caught at Fardeneside and Low Moor (Sections 19 and 21) on 3 and 5 September 1993 respectively were panjetted with alcian blue near the pelvic fins and released. A sample of 10 panjetted fish was kept and transferred to the experimental hatchery at the Lartington laboratory of the IFE to determine how long the dye would remain visible on the fish. A total of 109 fish were marked by the IFE. In addition 98 dace were marked and released on four days (27-29 July and 5 August). A team from the NRA caught the fish from four sites (Low Moor, Middleton One Row, Neasham and Low Worsall) and they were then marked by IFE staff. A further 10 marked fish were transferred to the Lartington hatchery.

2.3.3.3 Results

At the time of writing, the dye was still visible on the fish. One report of a marked fish has been received. This fish was caught at Aislaby from Section 11 or 12 in January 1994. This fish had moved downstream a distance of several Km and was only 1 Km above the top of the main match angling stretches.

2.3.4 Length weight relationship

Regression analysis of length on weight was carried out for each species occurring in large numbers. The regression equation is

$$\log W = a + b \log L$$

where W = weight (g), a = intercept constant, b = slope and L = length (cm). The values of a and b and r^2 (an indication of the goodness of fit) for each species are given in Table 5. The relationships are shown graphically in Appendix 4.

Table 5. Values of the length weight regressions for major species in the R. Tees, 1993.

Species	a	b	r^2 (%)
Chub	-2.00	3.10	99.2
Dace	-2.31	3.37	98.7
Flounder	-2.10	3.13	99.0
Gudgeon	-2.10	3.19	94.9
Roach	-2.12	3.28	98.6

Values are similar to previous years. These will be compared when all pre barrage data has been collected. Any changes caused by the post barrage conditions may be reflected in the length weight relationships in the future and significant differences will be looked for.

2.3.5 Year class strengths

The length frequency histograms for each age group of chub, dace, roach and gudgeon are shown in Figs 25-28 . Although the same proportion of each age group was not necessarily aged, high numbers of a particular age group can be interpreted as an indication of a strong year class. As the lengths of all fish were recorded it may be better, when all pre-barrage data has been collected, to determine the relative year class strengths from lengths of fish after due consideration of the length age relationship.

As in 1992, chub were caught up to the age of 15+. The good year class seen previously as 2+ and then 3+ can now be seen as 4+ (Fig 25). Large numbers of 5+ fish were caught when comparatively few 4+ fish were aged the previous year. Poor year classes were apparent in year classes 7+ and 8+, corresponding to the poor catches of 6+ and 7+ the previous year.

In contrast to last year, relatively few young of the year dace were caught in the september fishings and the length frequency graph (Fig 26) includes these fish, whereas in 1992 their numbers were so large that they depressed the peaks of successive year classes. No 8+ fish were found in 1993 but all other age classes were represented. Large numbers of 1+ fish were found as can be seen from the length frequency graph for all data although relatively few were aged. This age class was expected to be well represented after the large numbers of 0 group fish which were found the previous September. The 4+ age class was particularly strong in 1993, corresponding to that of 3+ in 1992 and 2+ in 1991.

Roach of all age classes to 7+ were caught in the 1993 survey (Fig 27). As with dace, the length frequency graph for all data shows a large peak corresponding with the size of 1+ fish again this was expected after the large numbers of young of the year found in 1992. The 4+ year class was strong and correlates with the equivalent strong year class seen in the previous two years.

Few young of the year gudgeon were caught in September but large numbers of 1+ fish were present (Fig 28). The 2+ year class was also strong corresponding to last year's well represented 1+ group.

Length age graphs for each of the major species are given in Appendix 5.

Fig. 14. Species composition of adult fish in Sections 5-9 in September 1993.

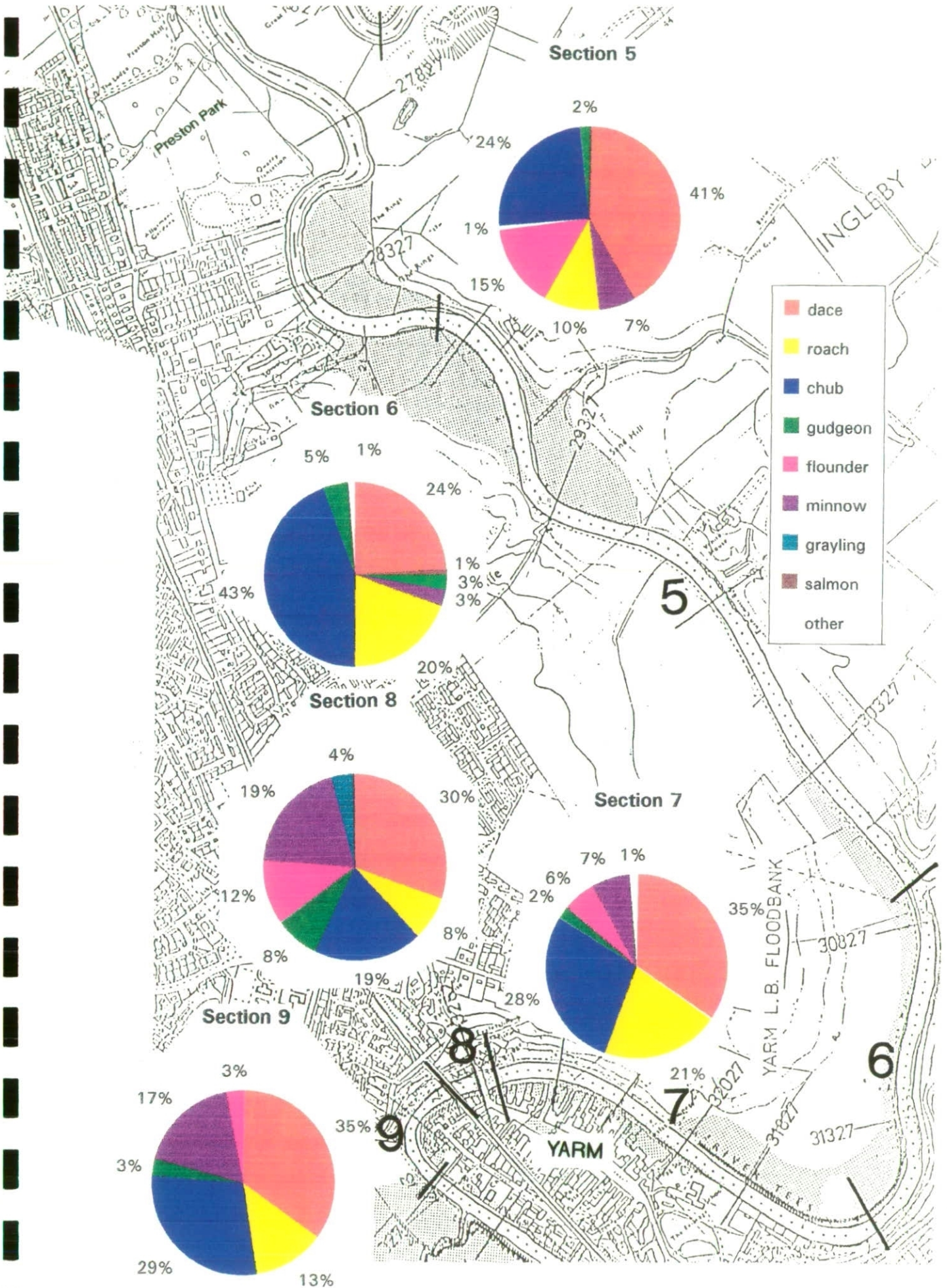


Fig. 15. Species composition of adult fish in Sections 10-14 in September 1993.

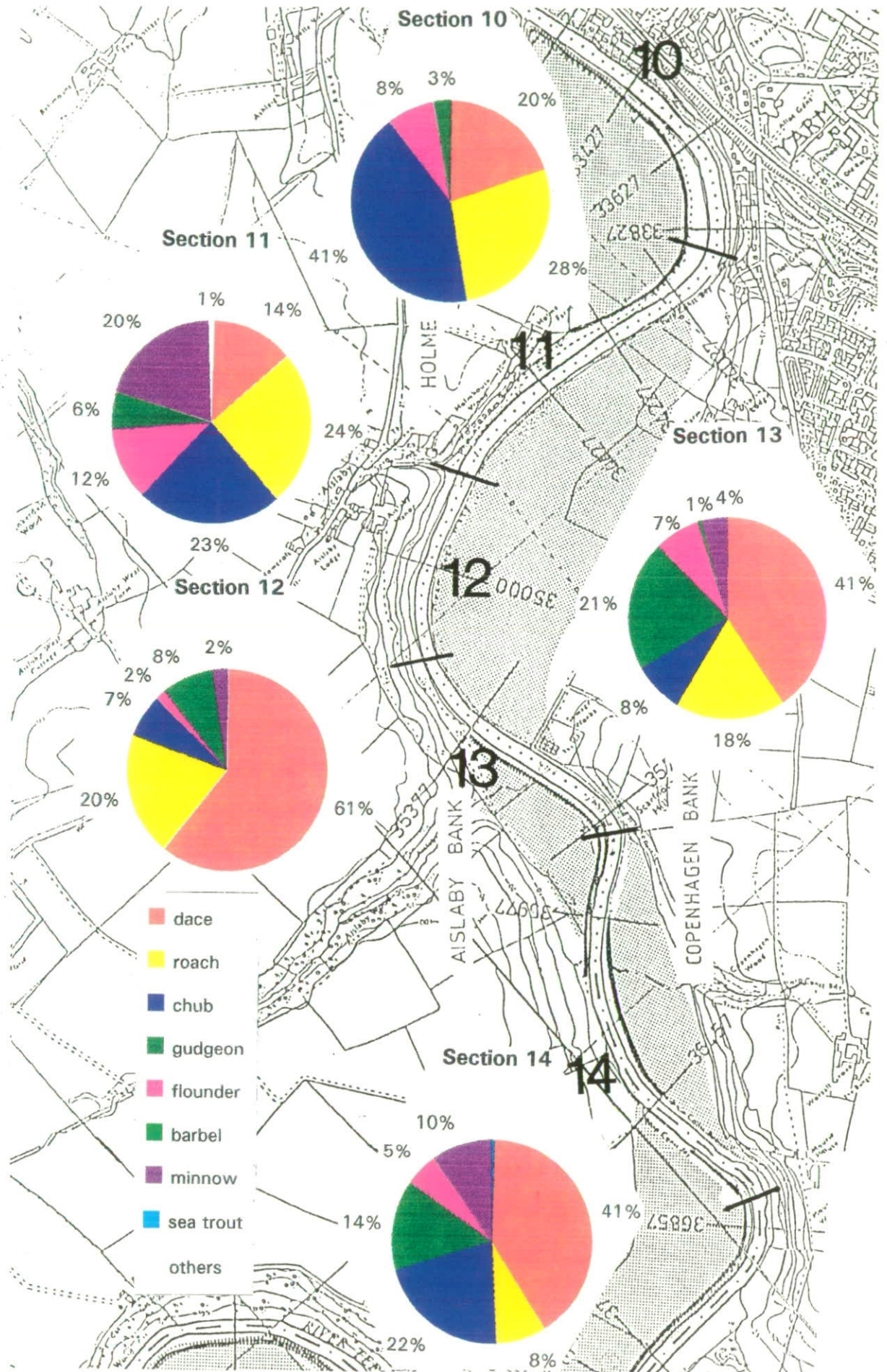


Fig. 16. Species composition of adult fish in Sections 15-18 in September 1993.

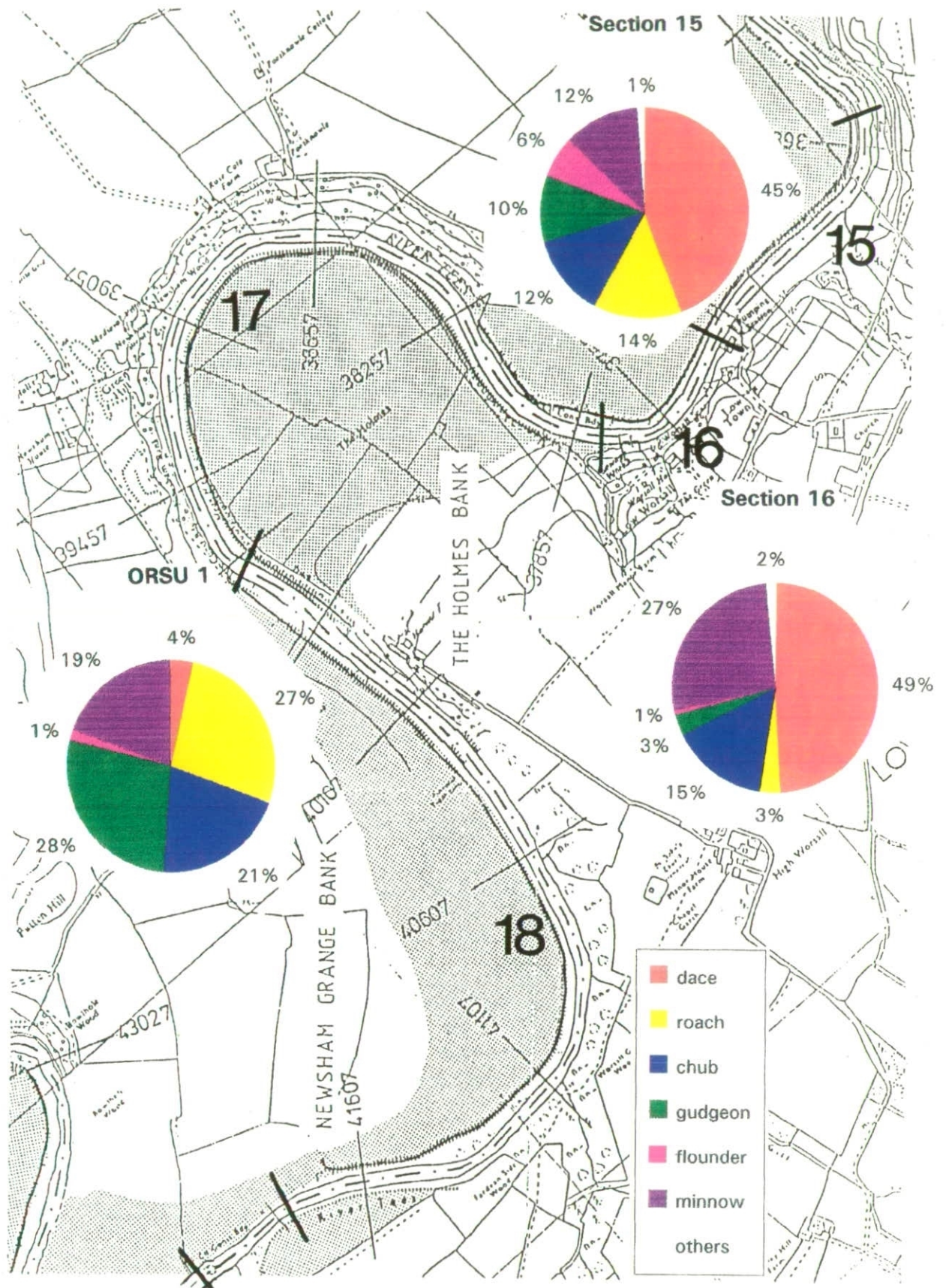


Fig. 17. Species composition of adult fish in Sections 19-21 in September 1993.

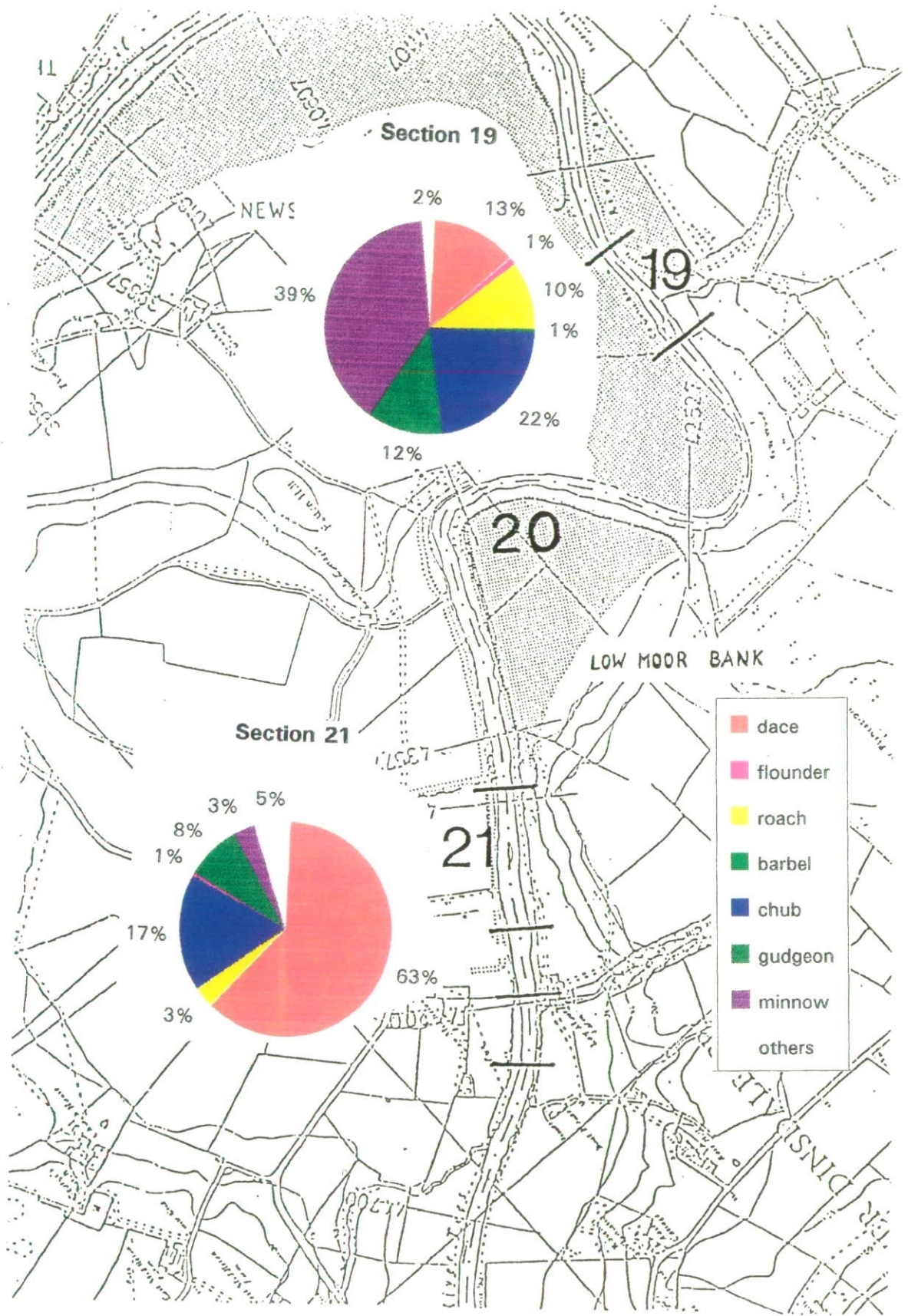


Fig. 18. Species composition of adult fish in Sections 22-25 in September 1993.

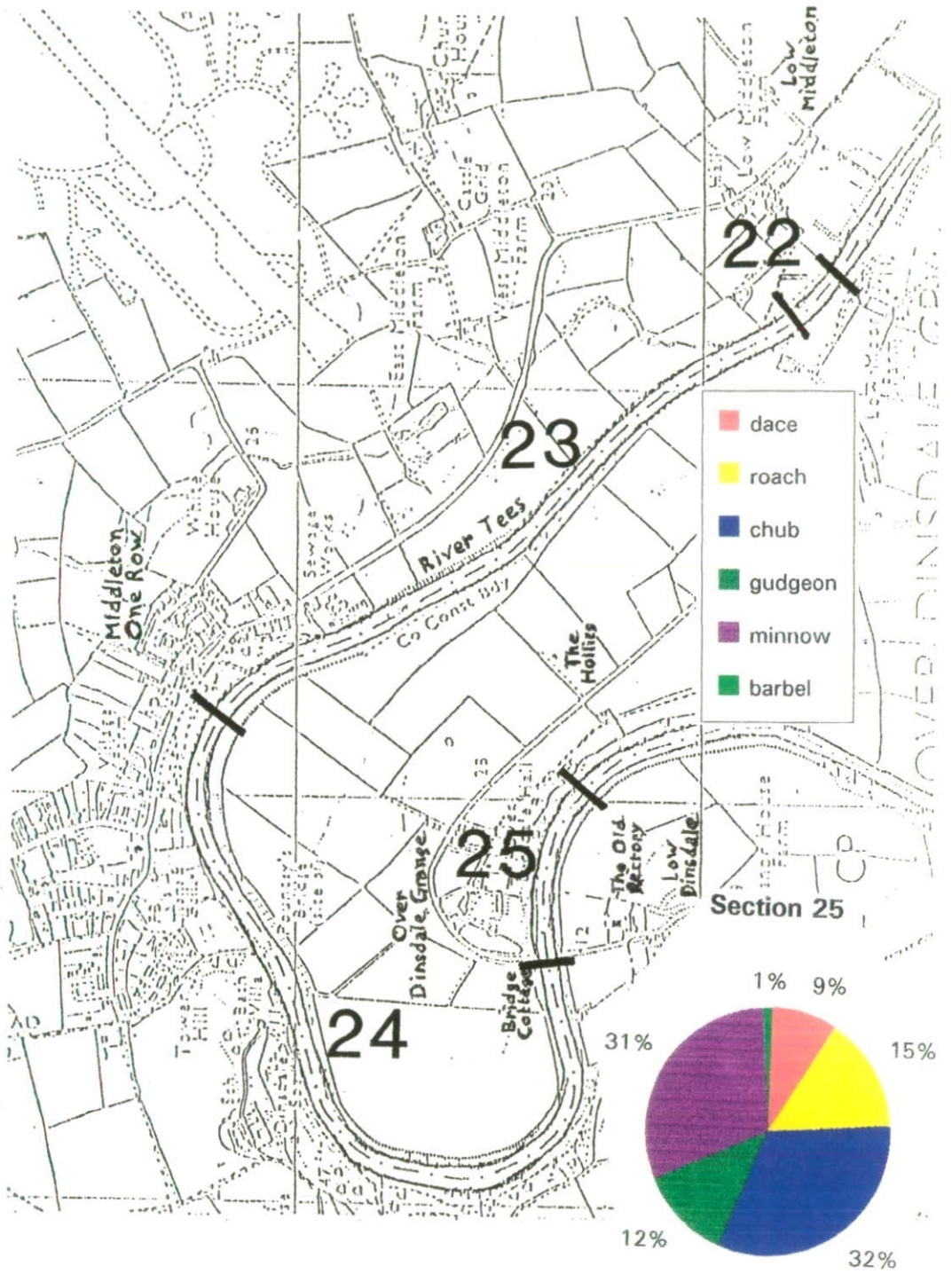


Fig. 19. Species composition of adult fish in the River Tees in September 1993 by section.

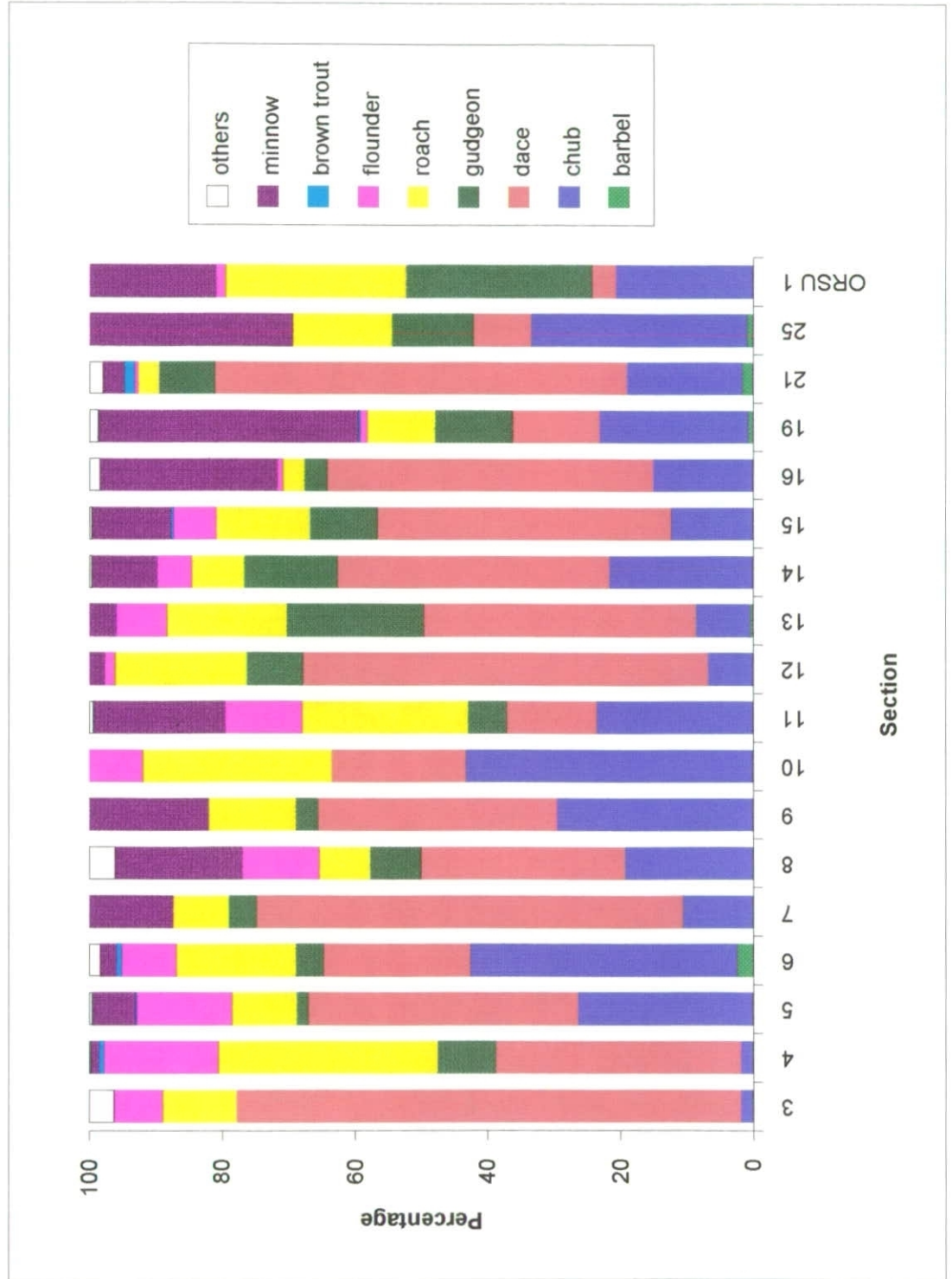


Fig. 20. Length frequency histograms for each species of adult fish in the R. Tees in September 1993.

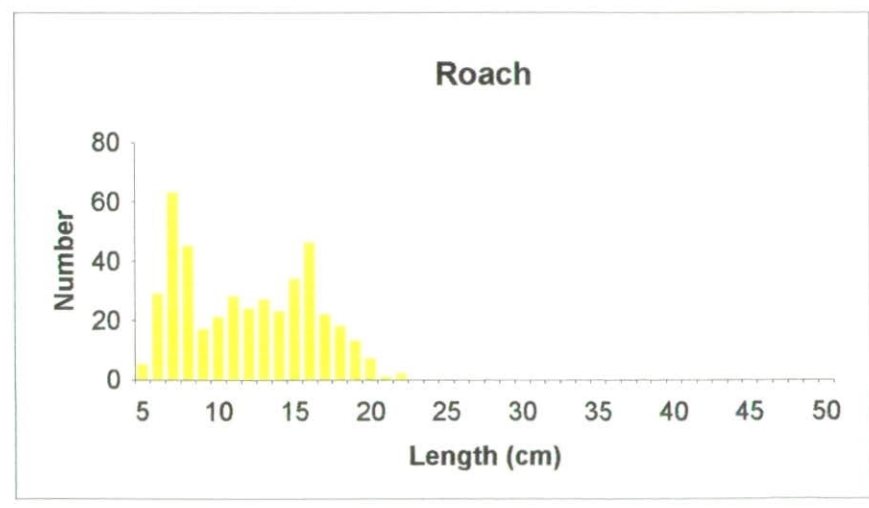
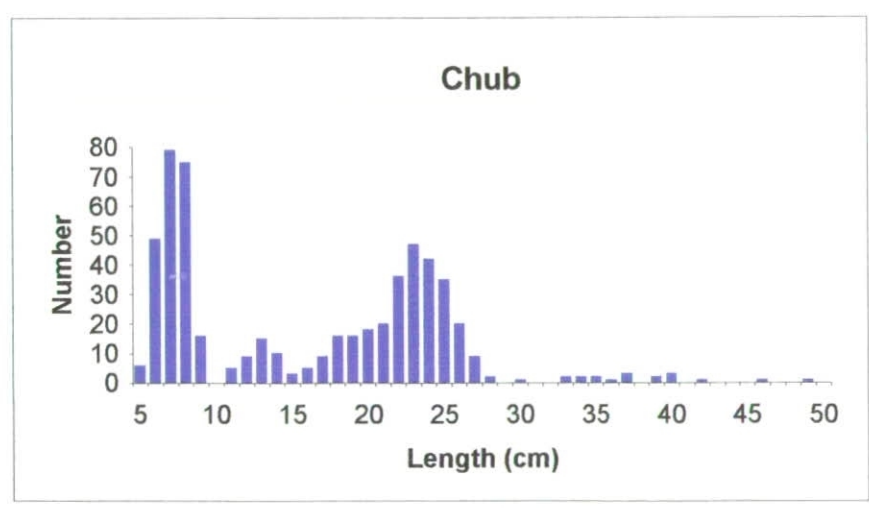
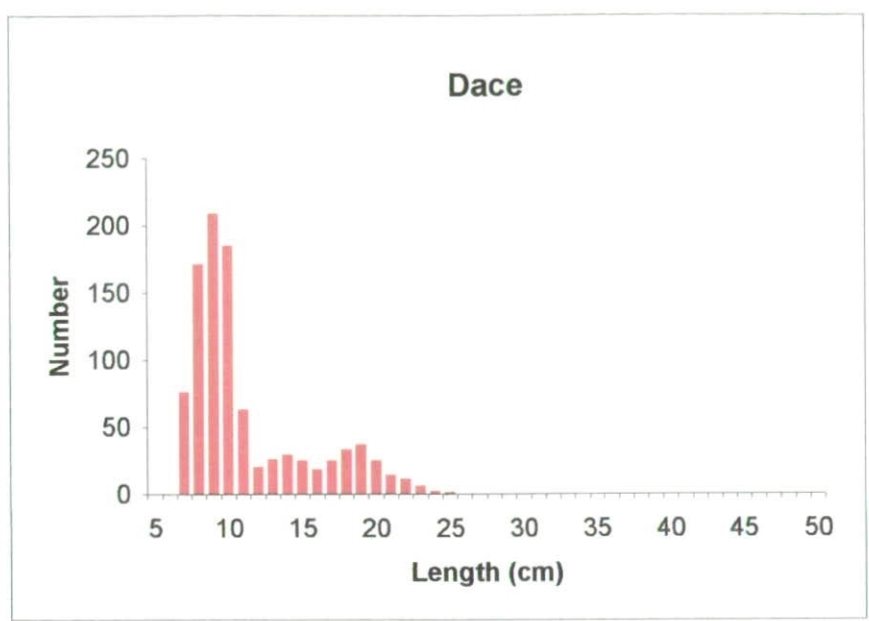


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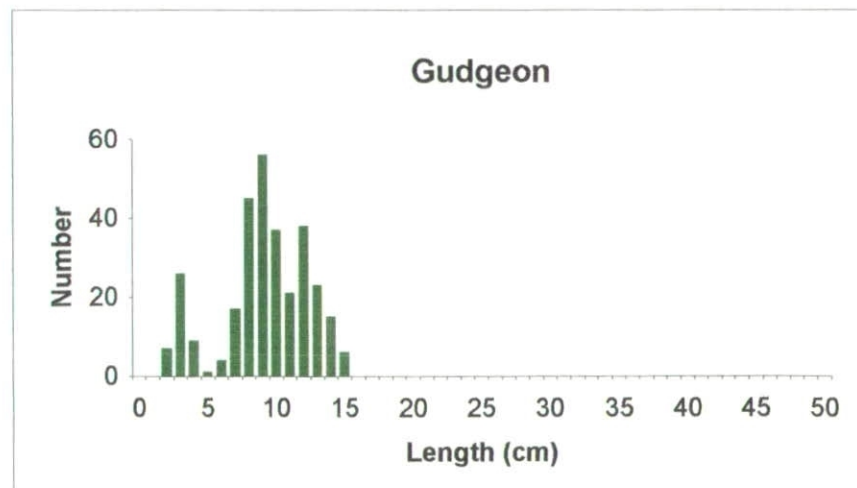
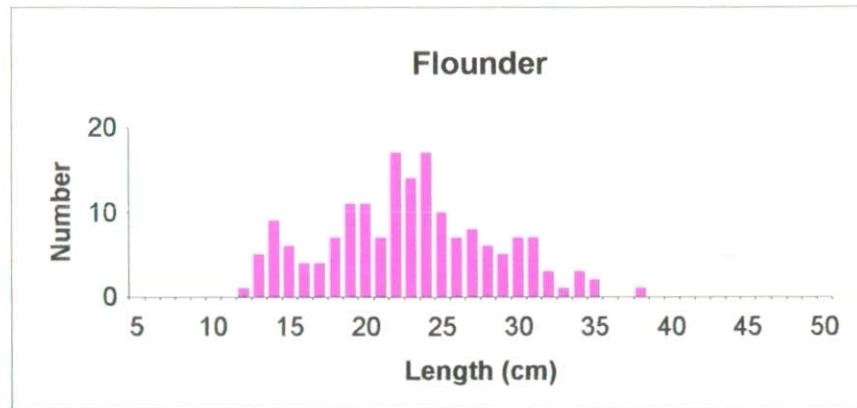


Fig. 21. Length frequency distribution of dace in each section of the R. Tees in September 1993.

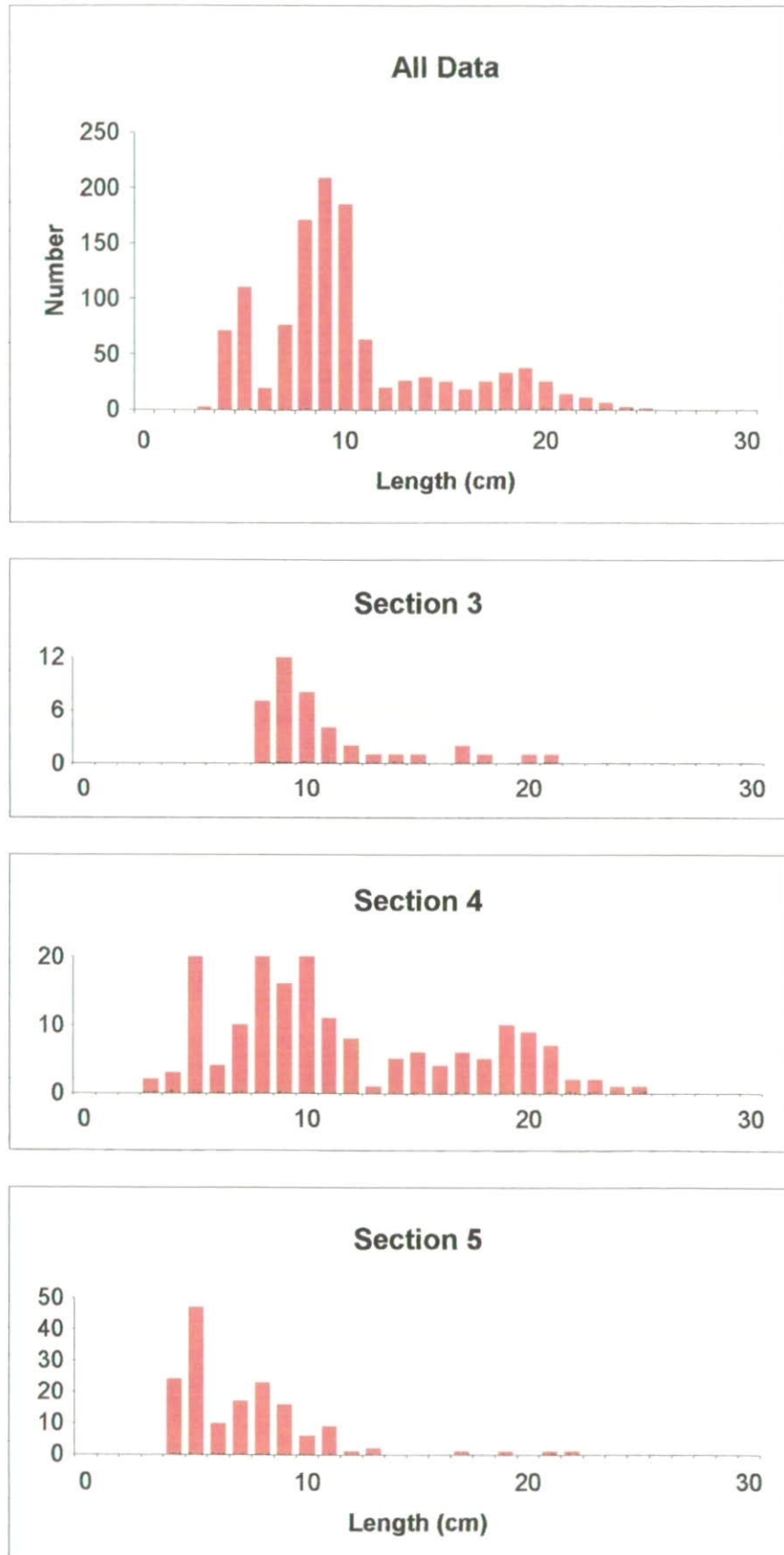


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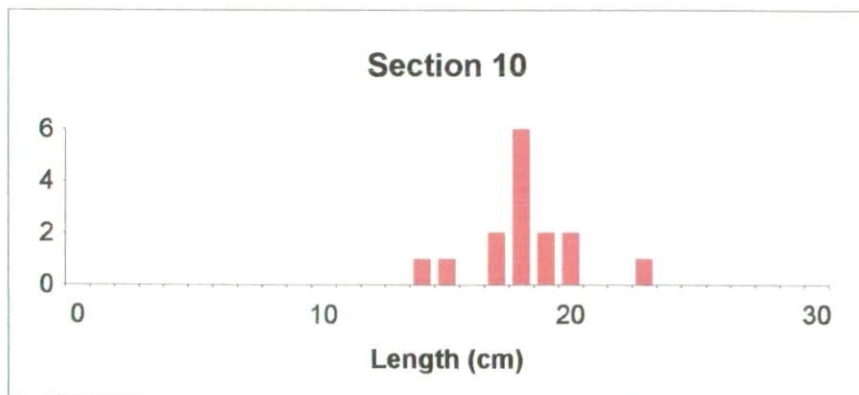
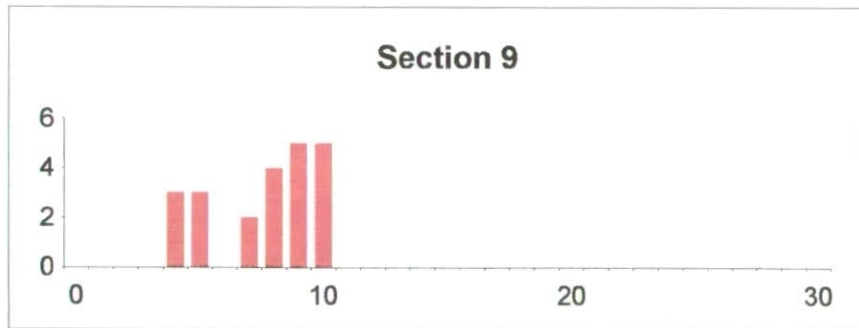
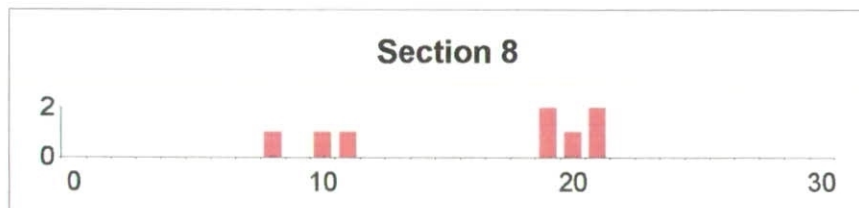
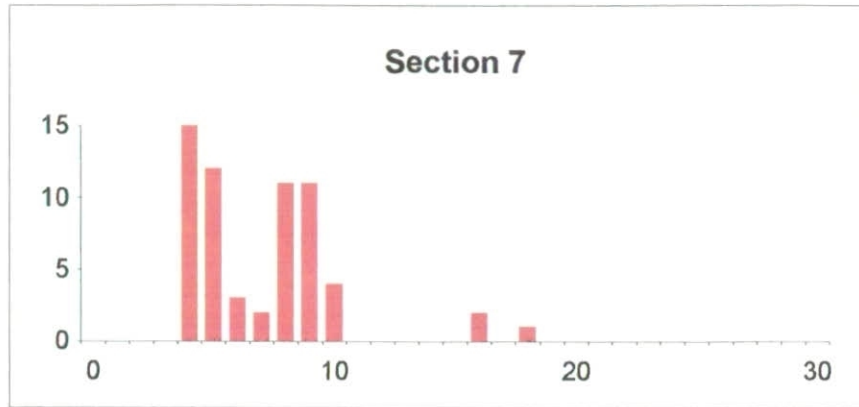
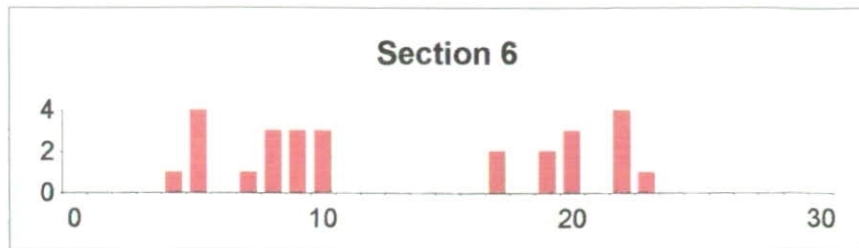


Fig. 21. Continued

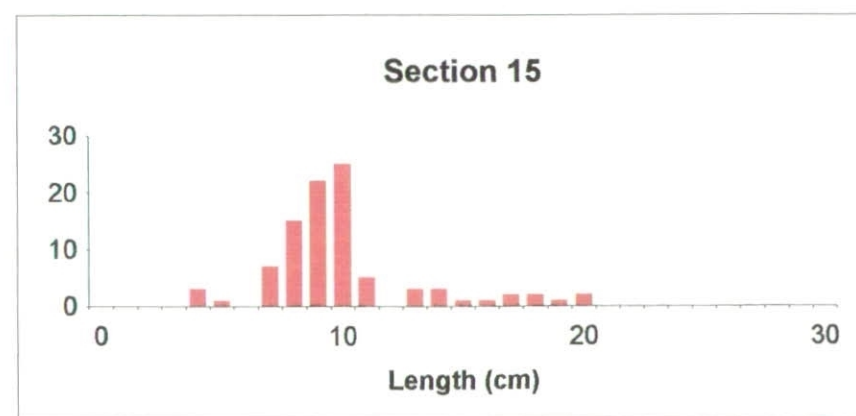
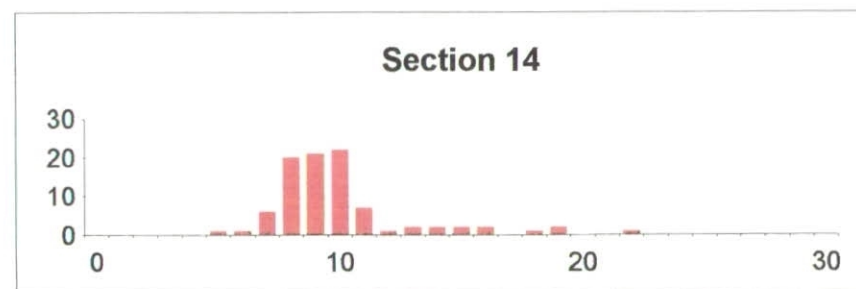
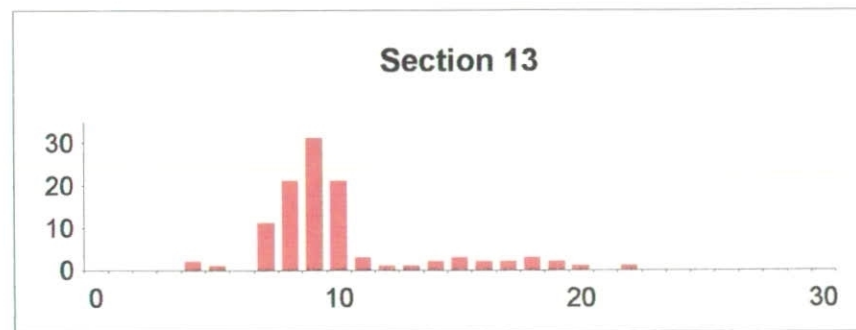
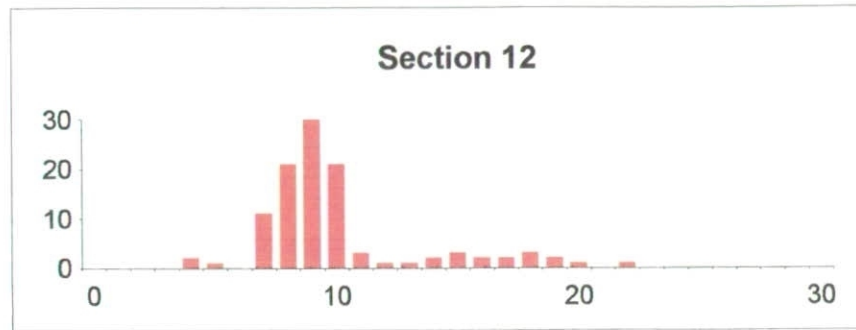
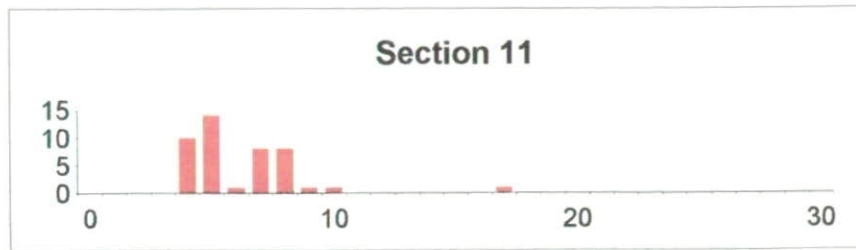


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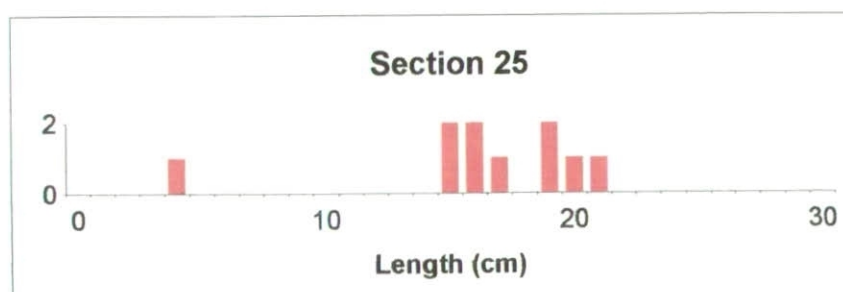
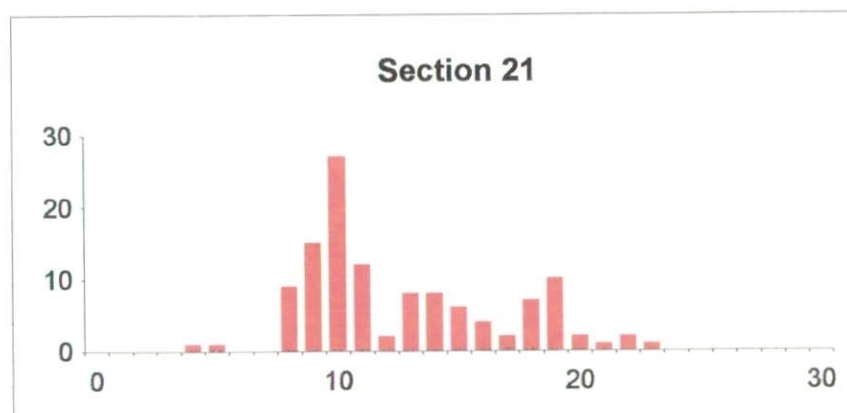
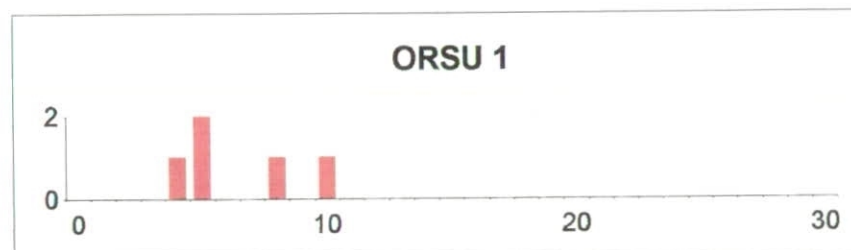
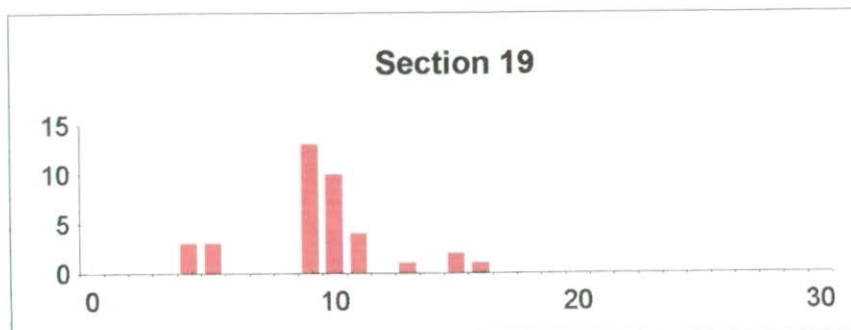
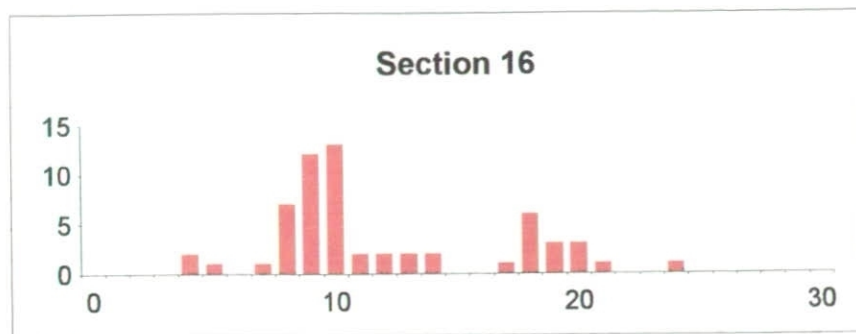


Fig. 22. Length frequency distribution of chub in each section of the R. Tees in September 1993.

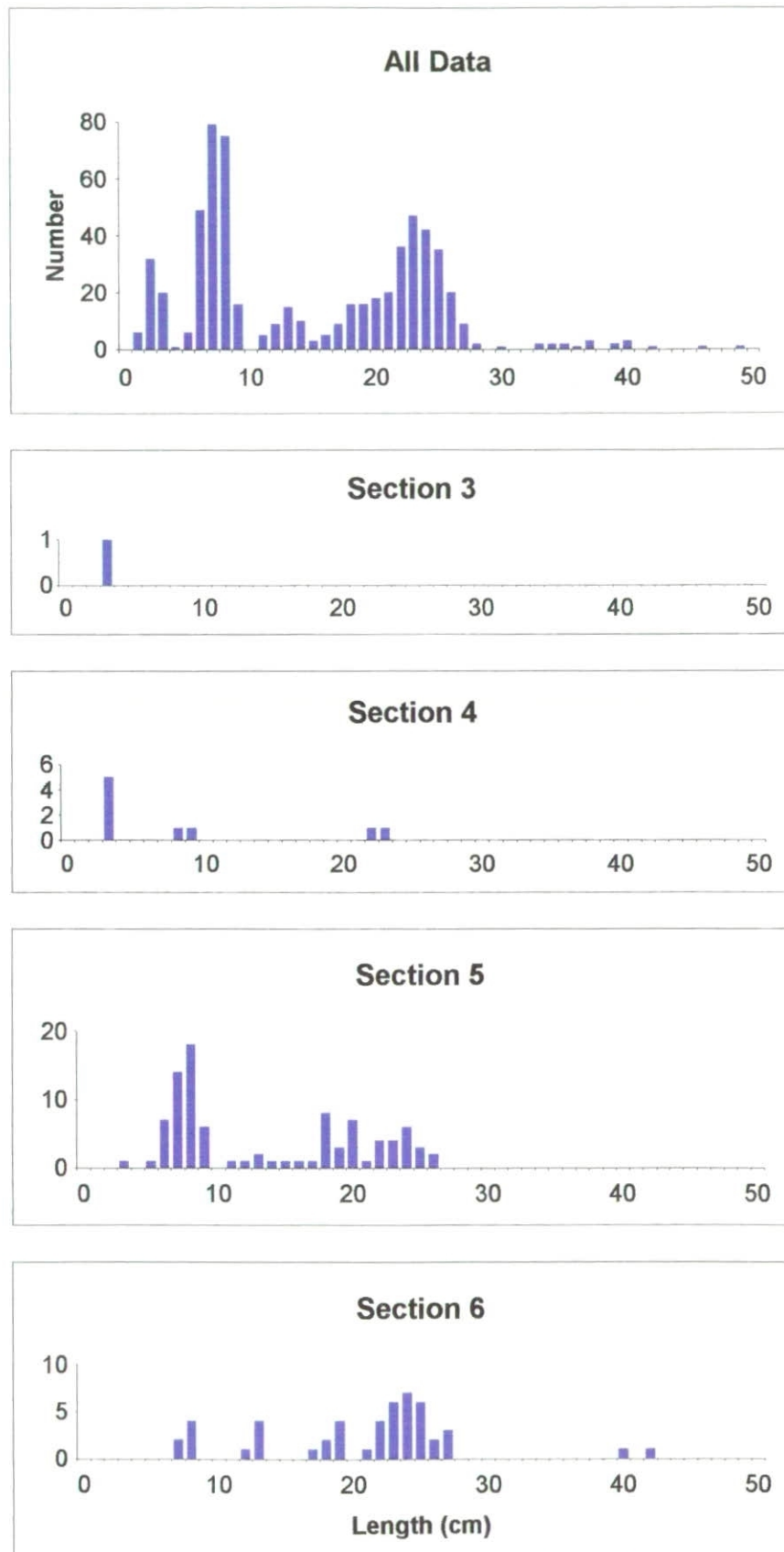


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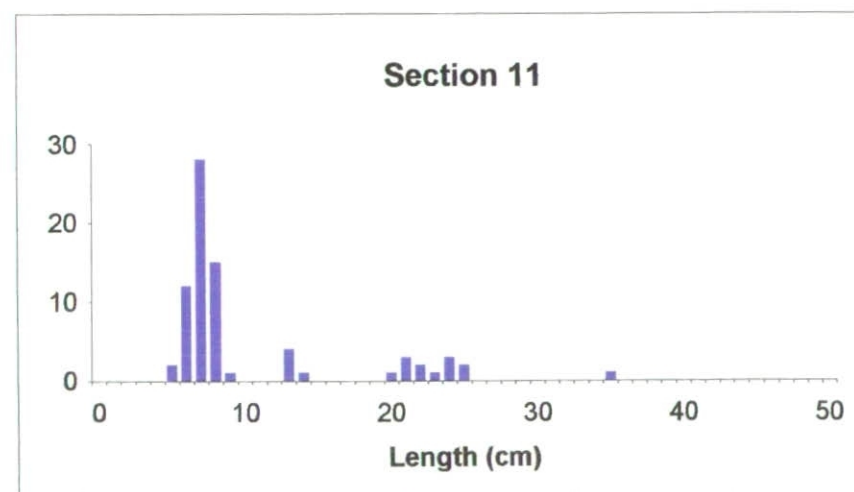
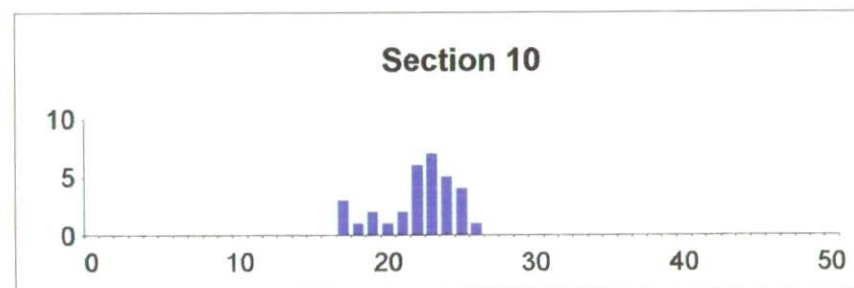
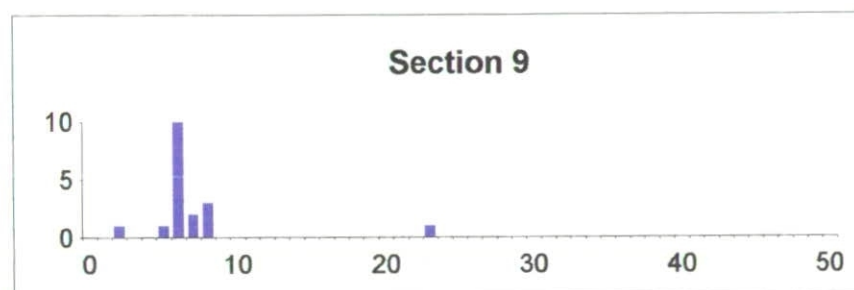
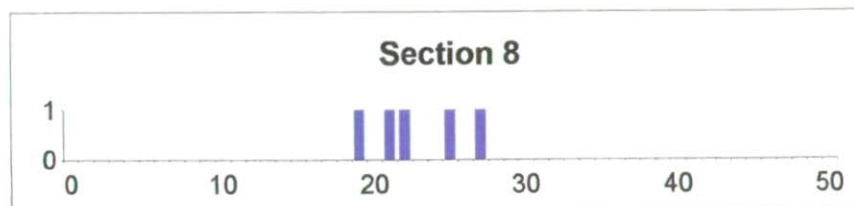
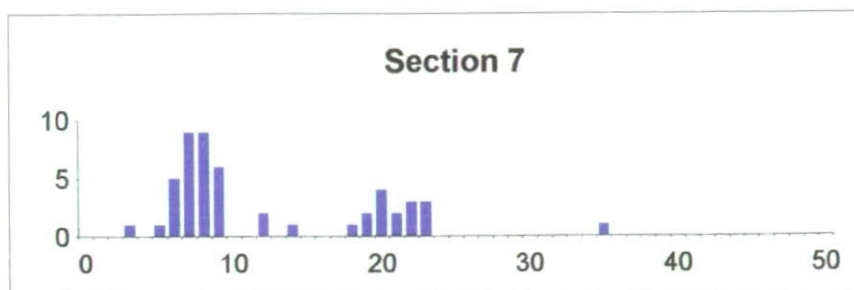


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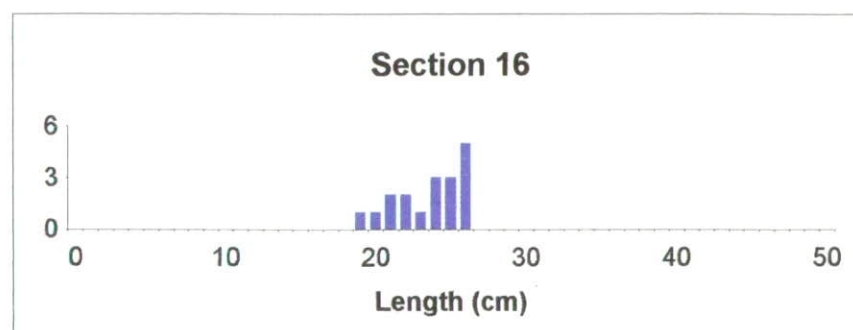
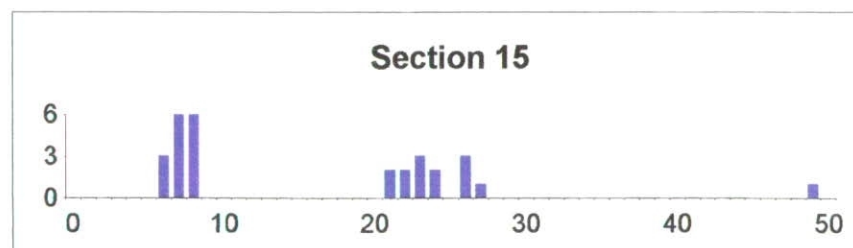
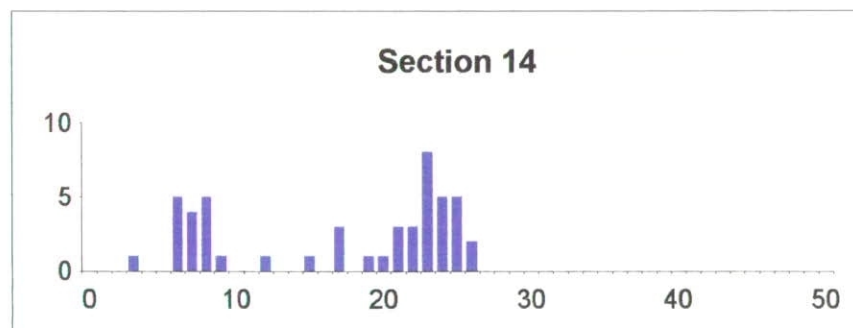
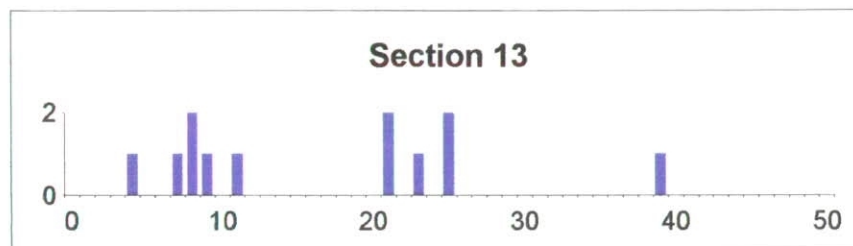
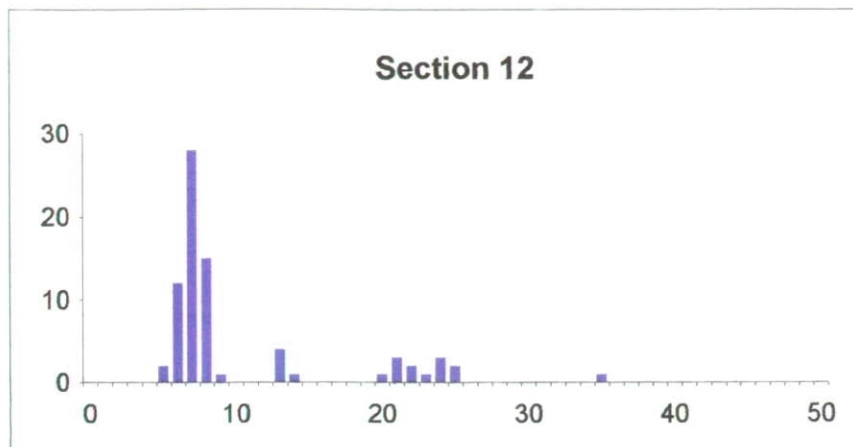


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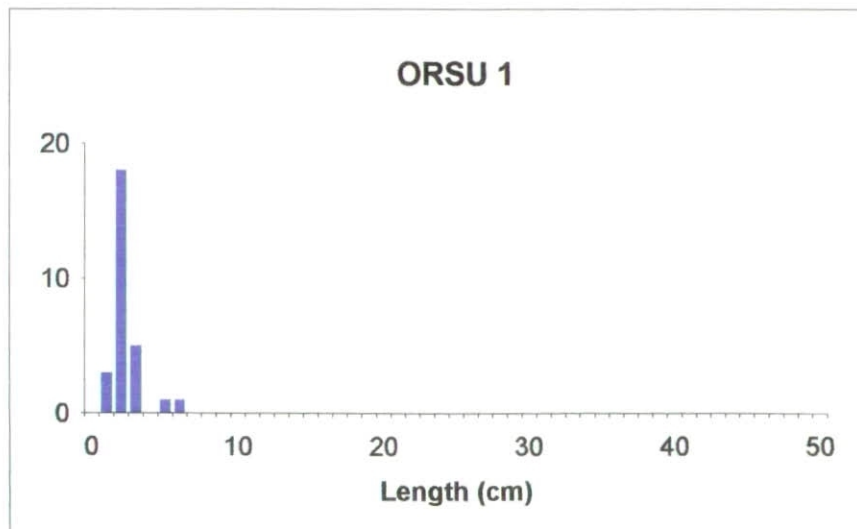
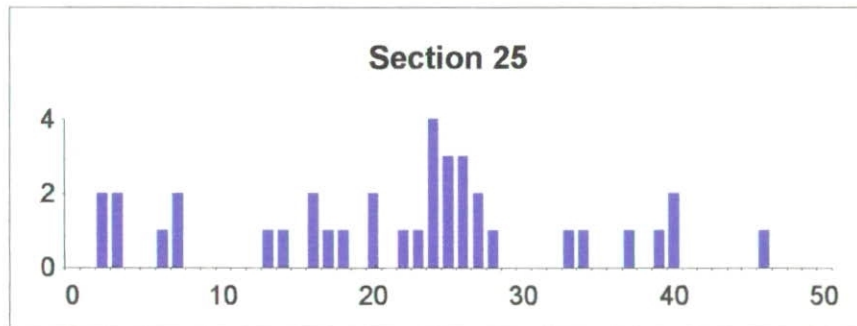
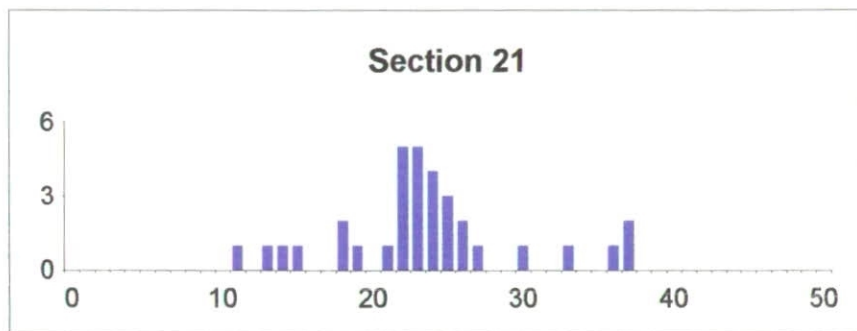
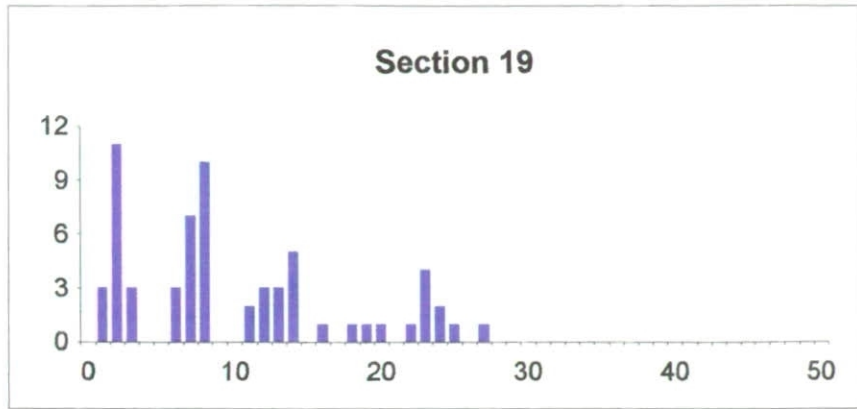


Fig. 23. Length frequency distribution of roach in each section of the R. Tees in September 1993.

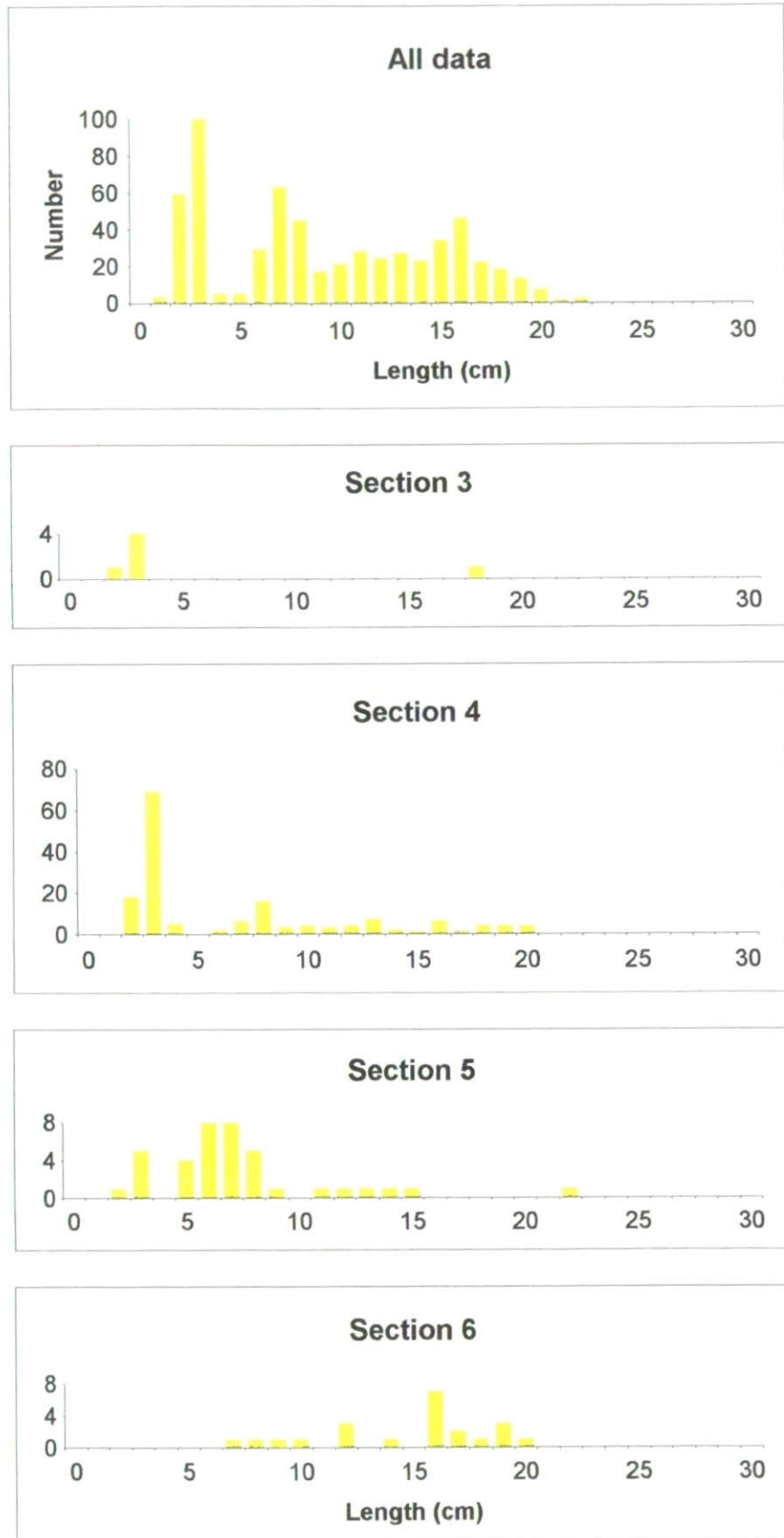


Fig. 23. Continued

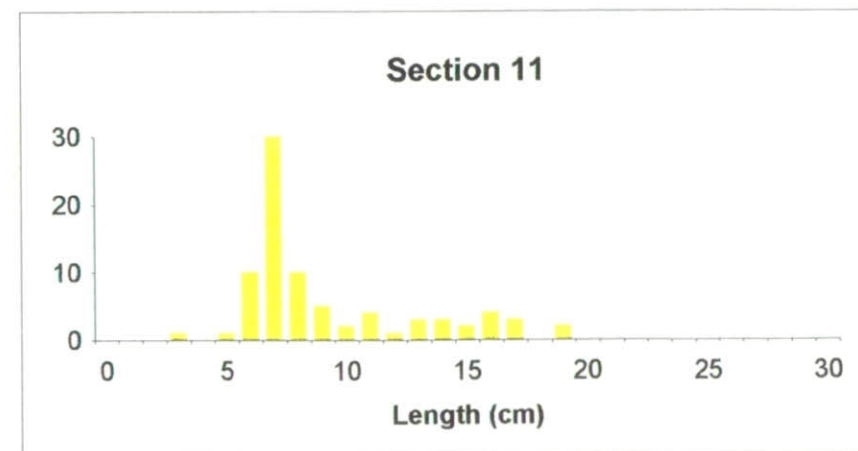
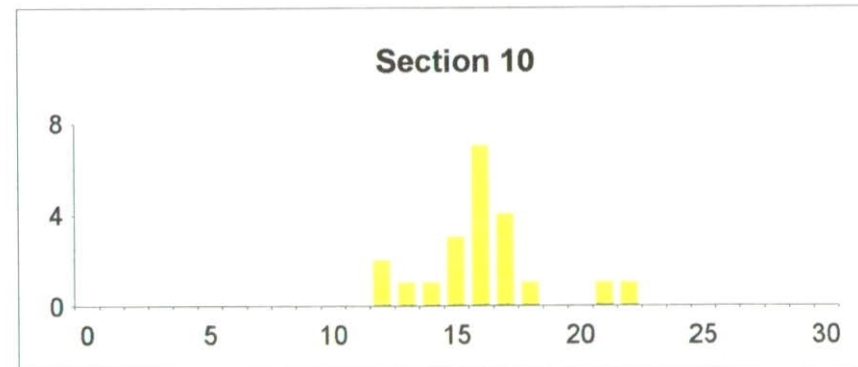
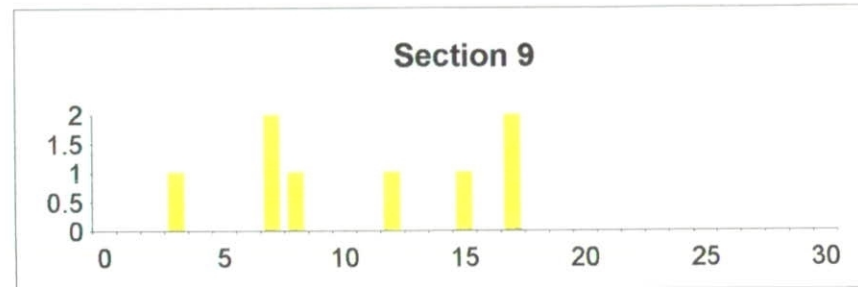
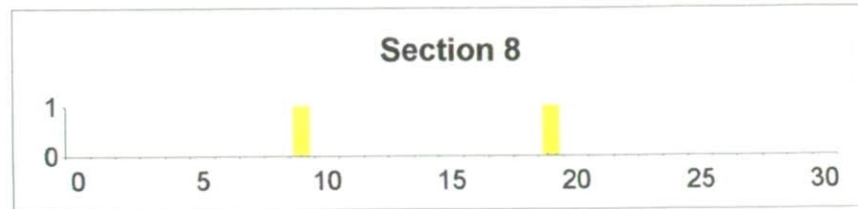
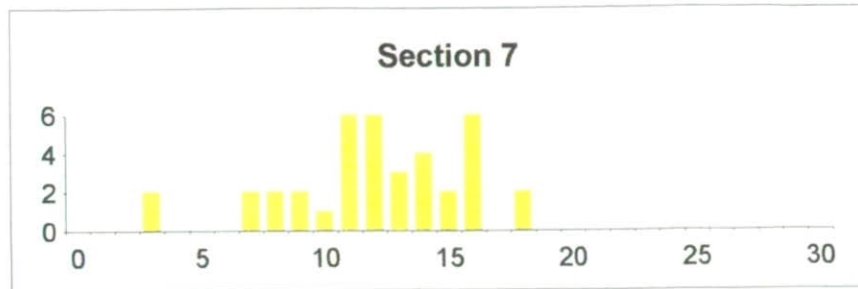


Fig. 23. Continued

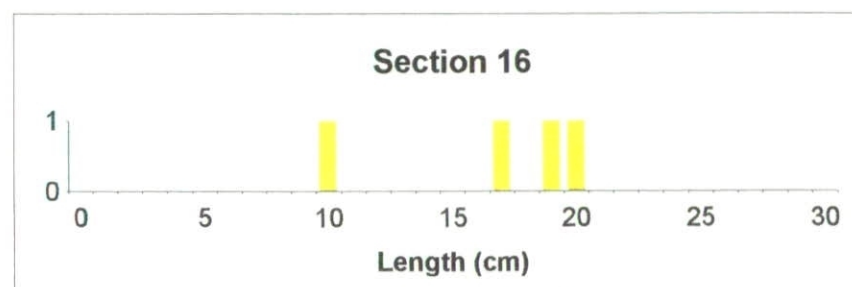
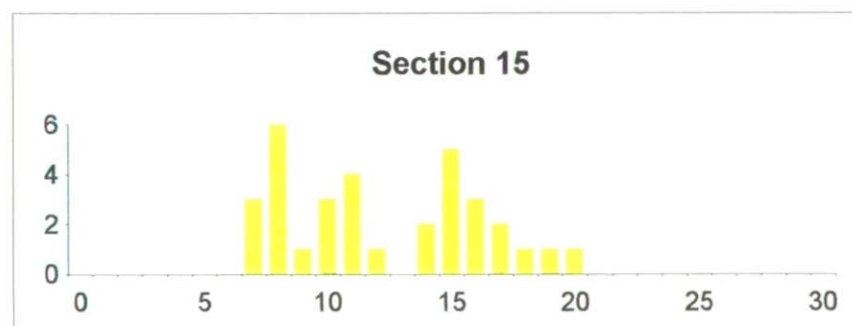
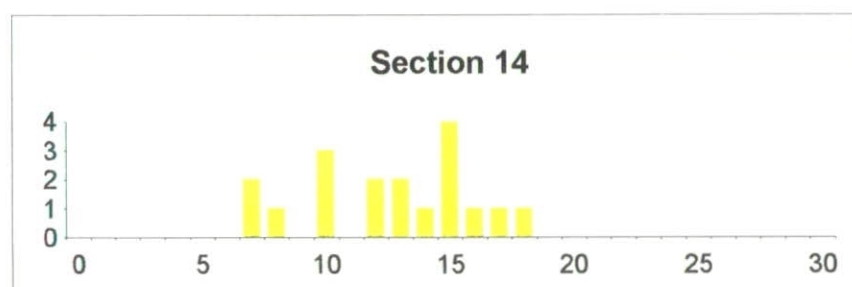
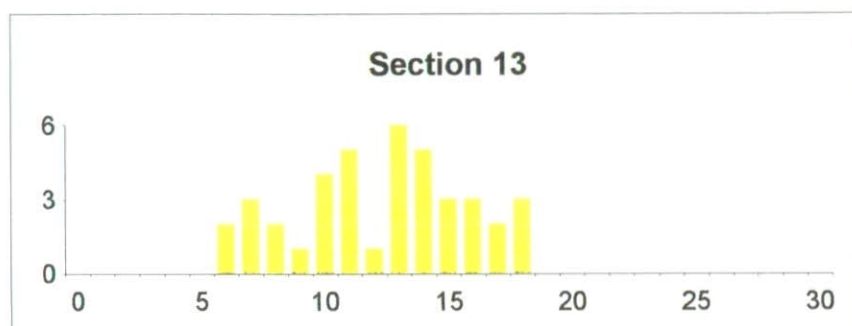
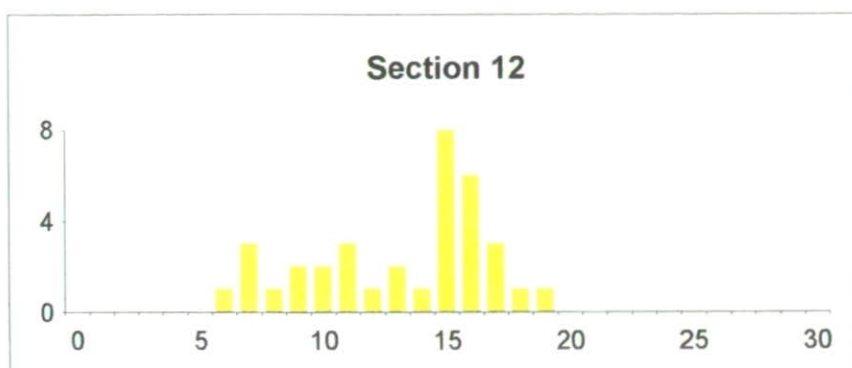


Fig. 23. Continued

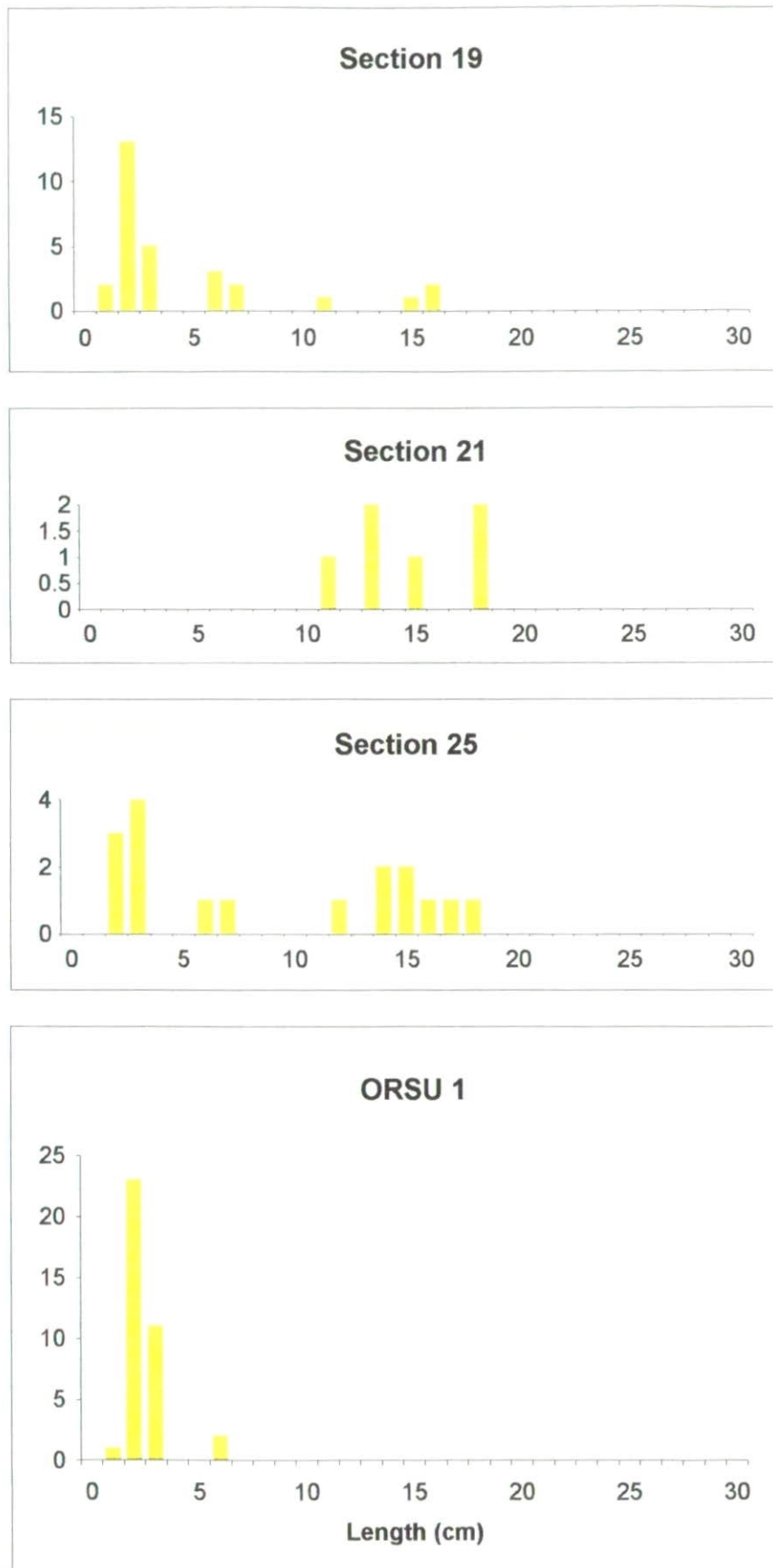


Fig. 24. Length frequency distribution of gudgeon in each section of the R. Tees in September 1993.

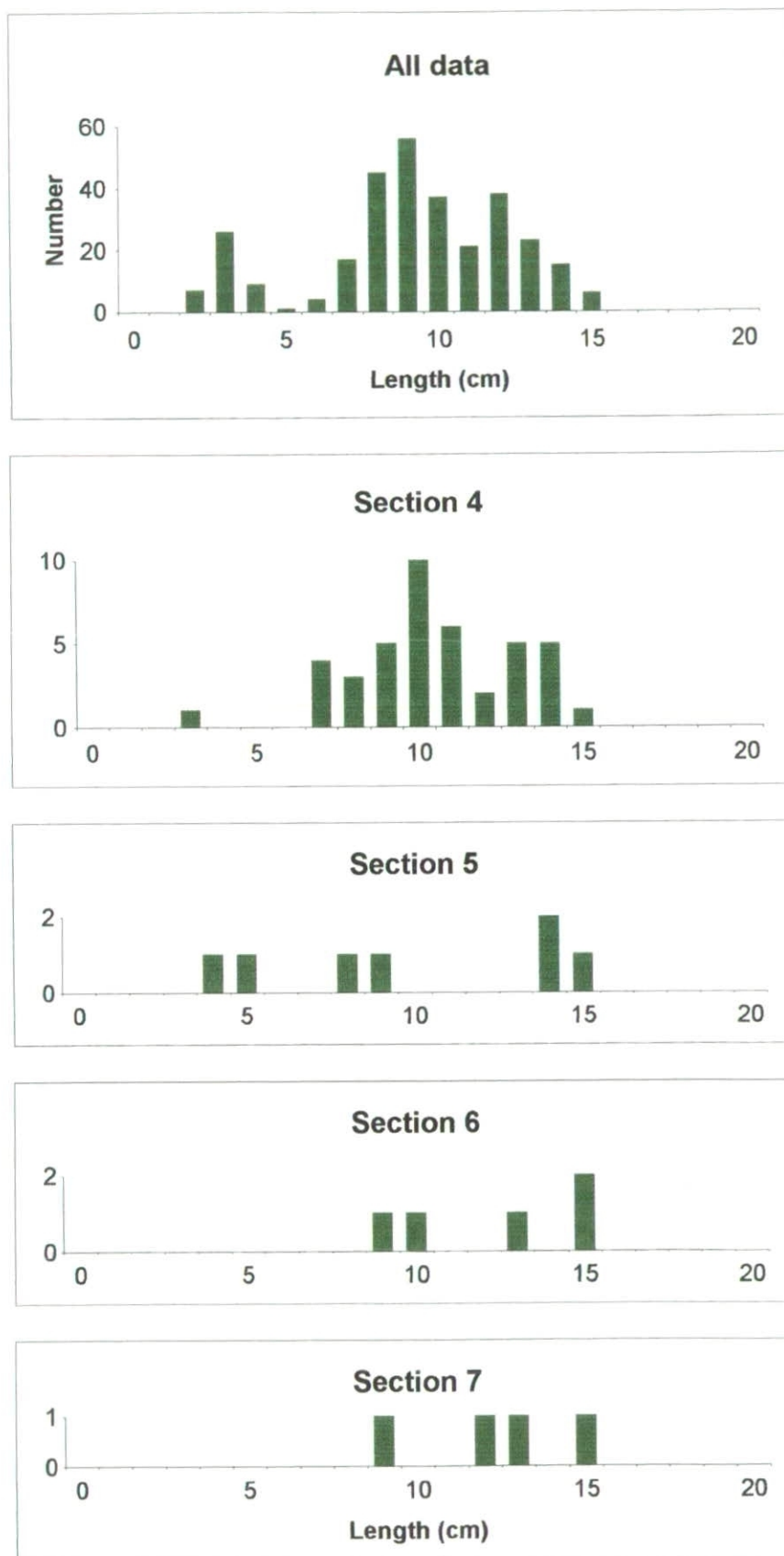


Fig. 24. Continued

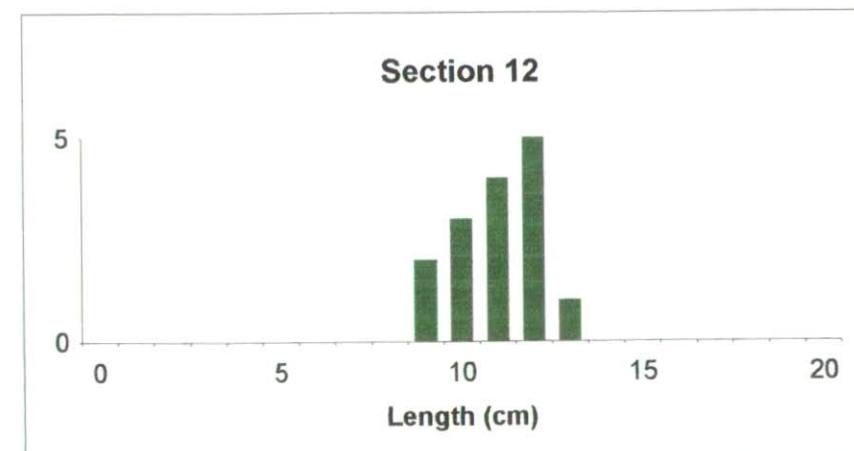
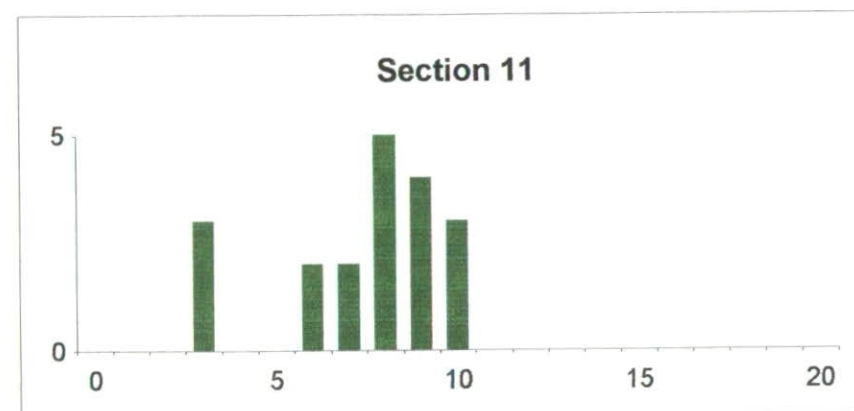
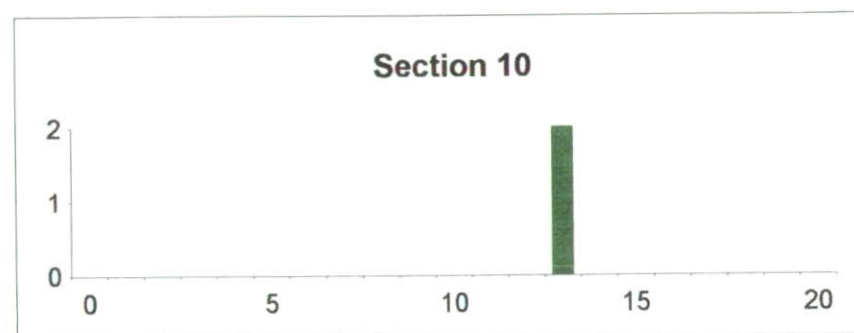
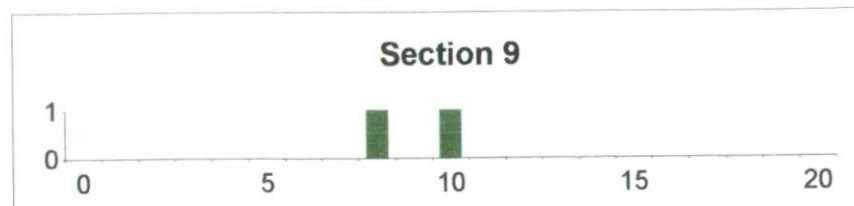
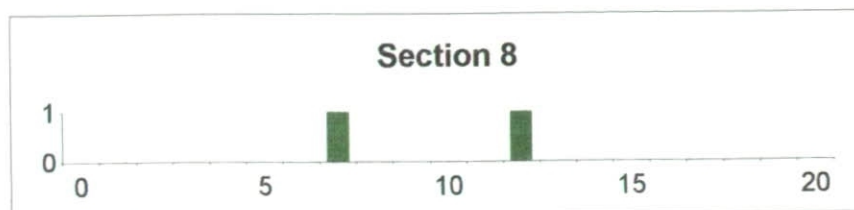


Fig. 24. Continued

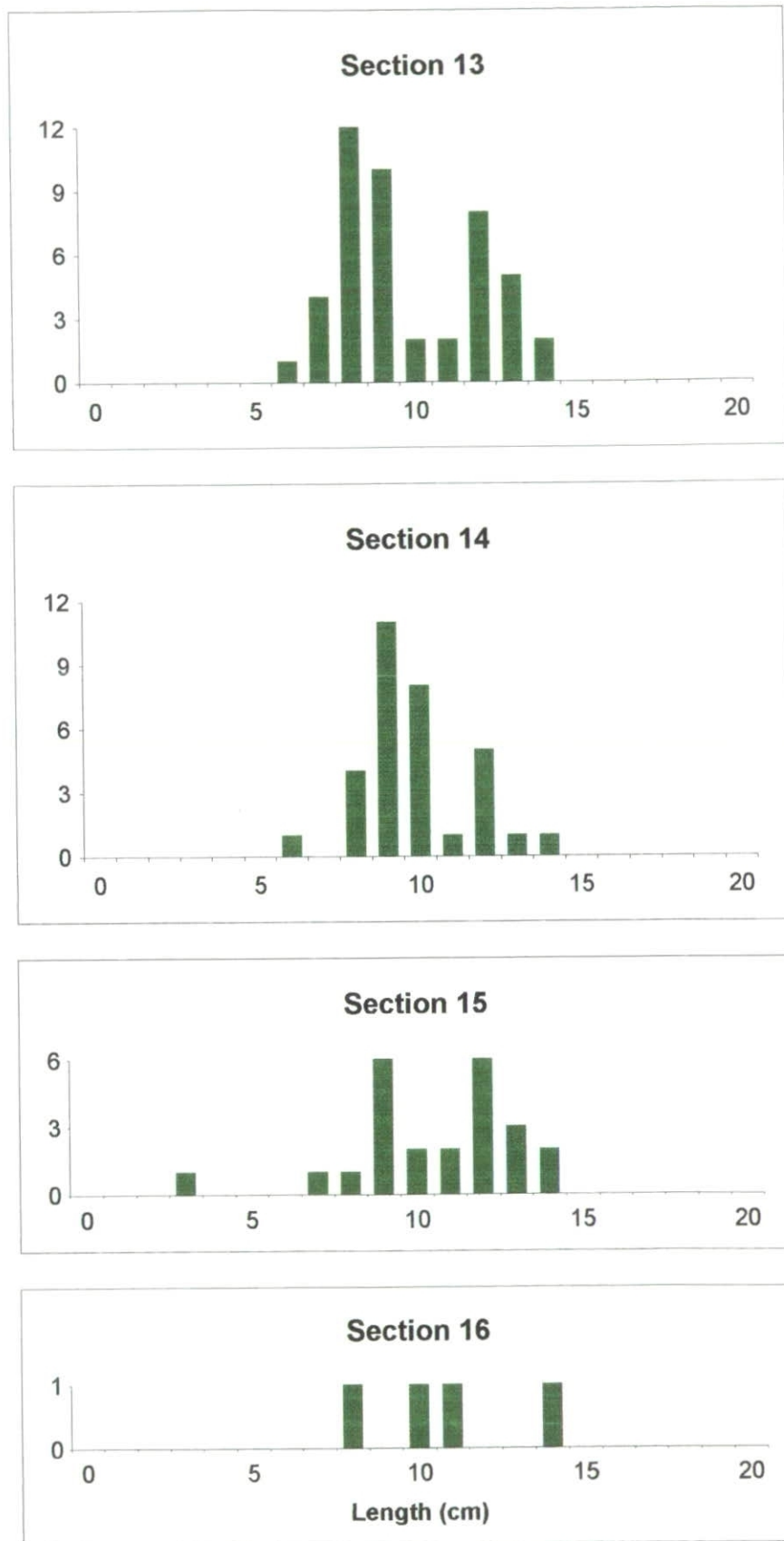


Fig. 24. Continued

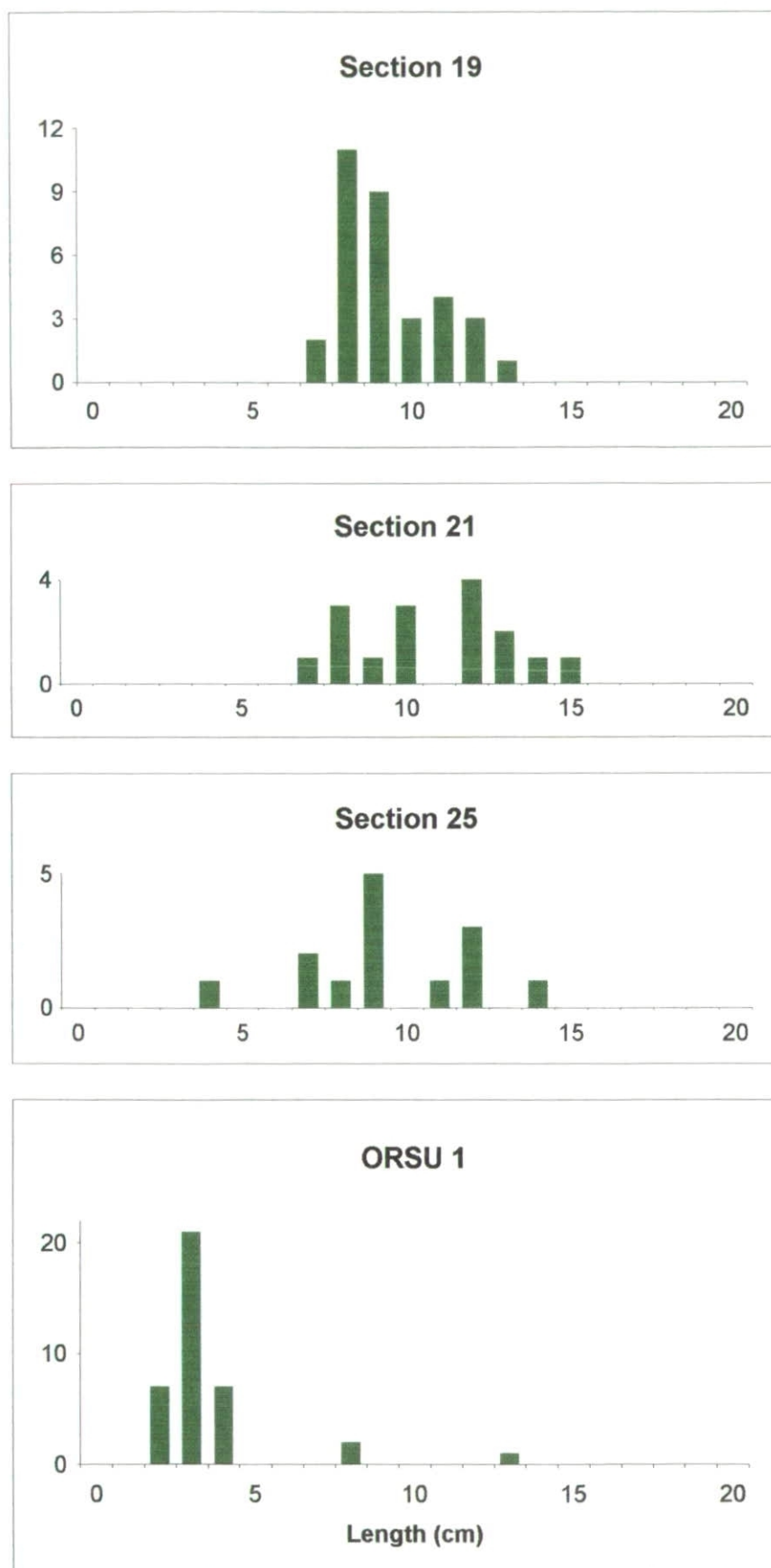


Fig. 25. Length by age for chub in the R. Tees in September 1993.

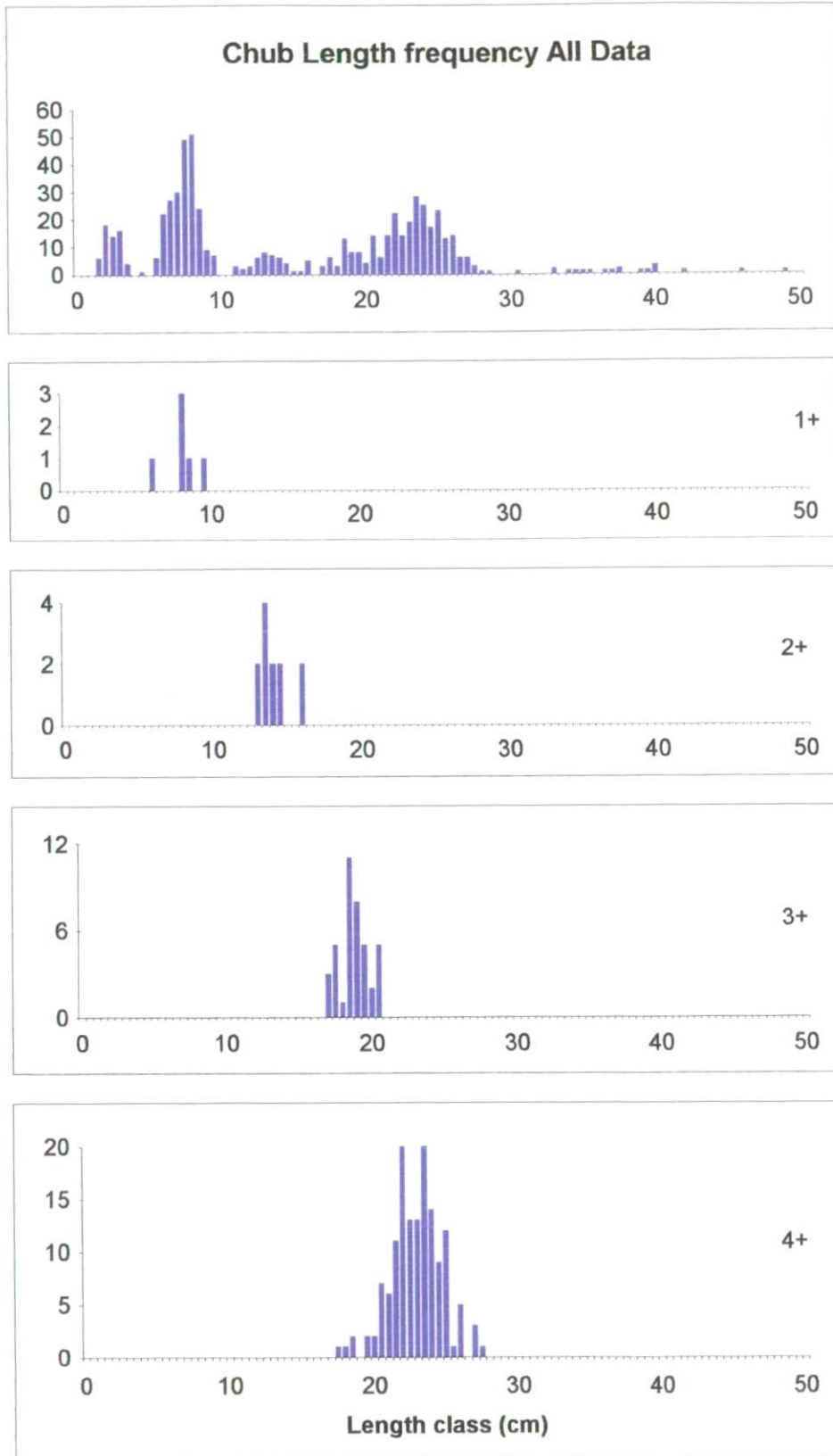


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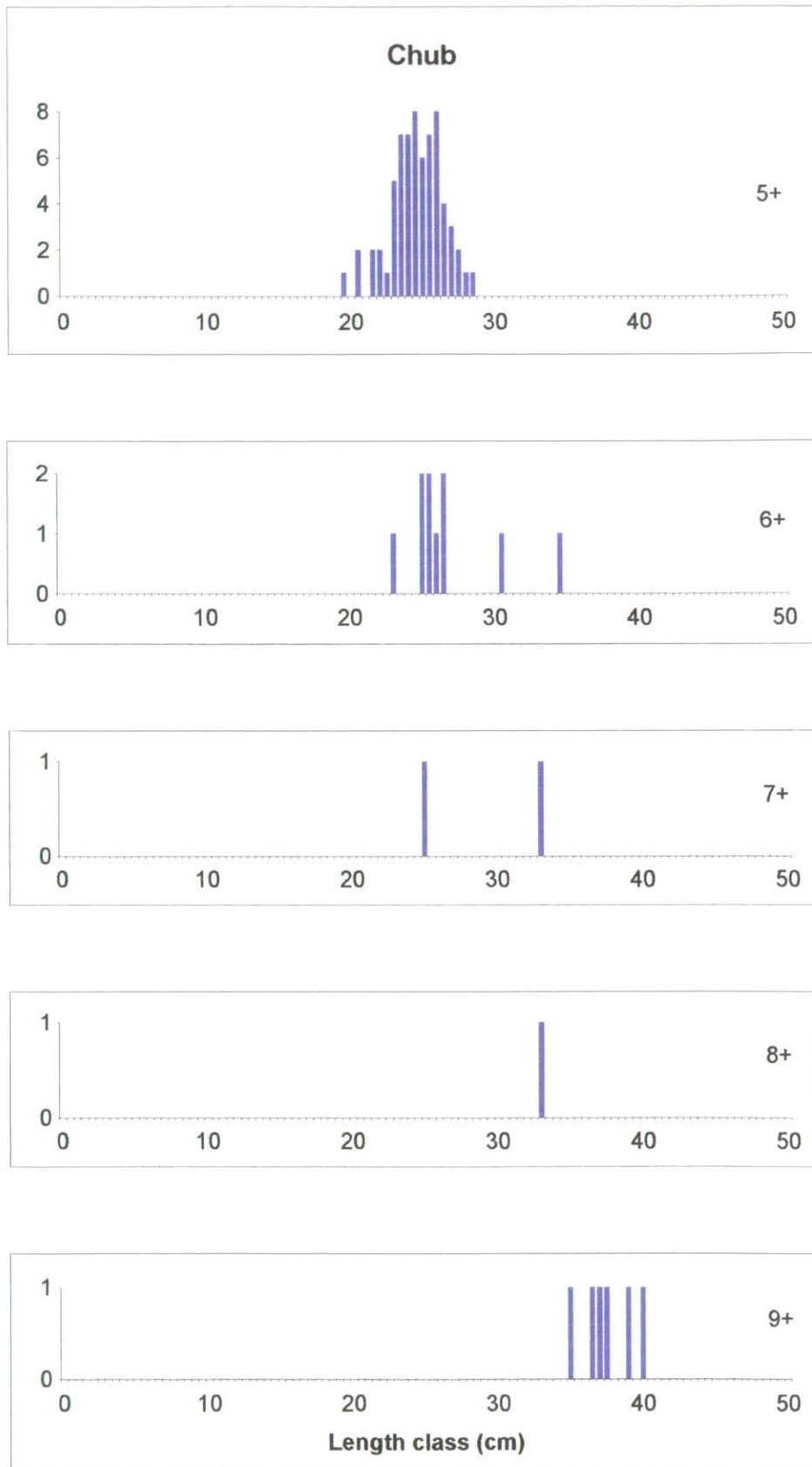


Fig. 25. Continued

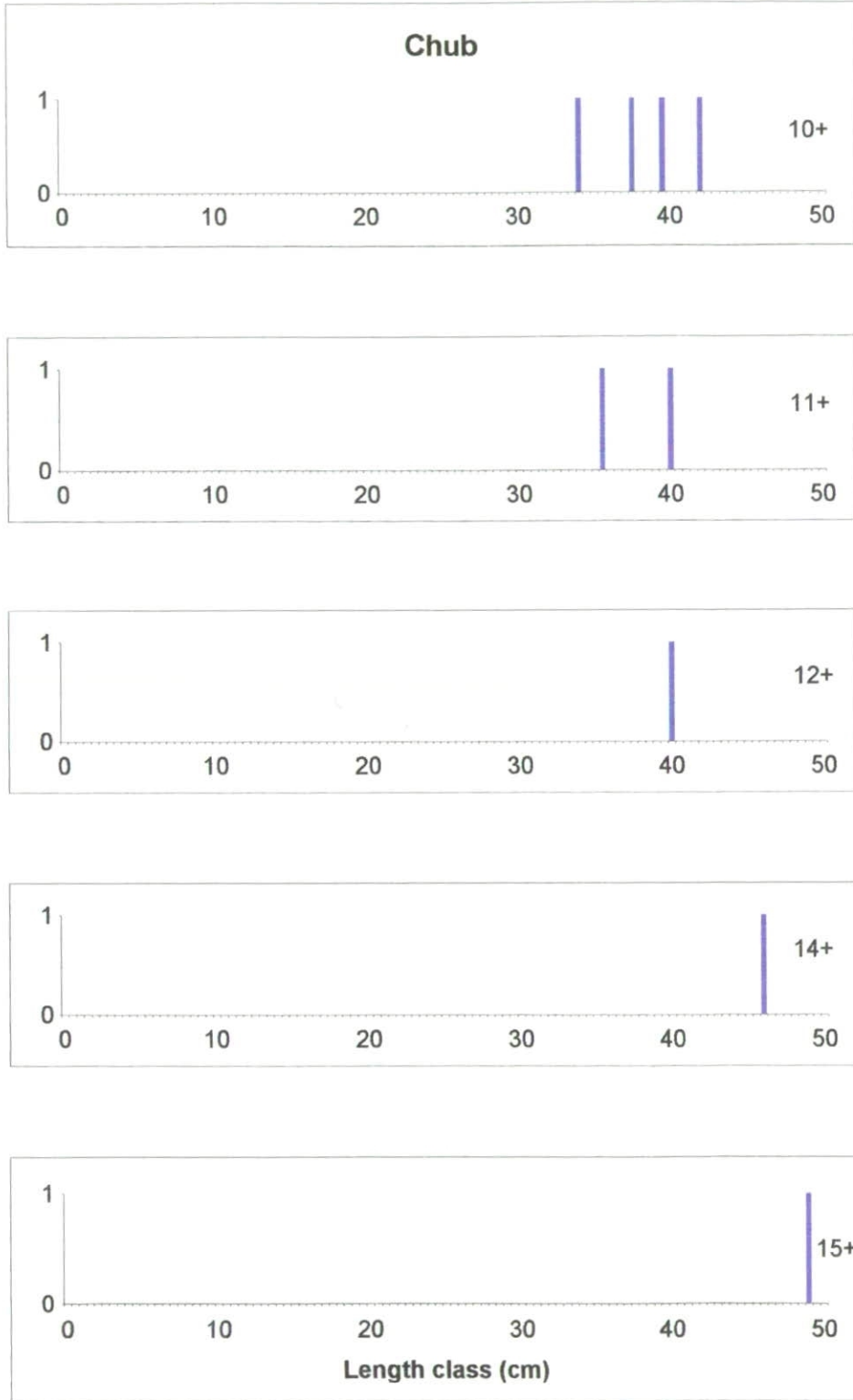


Fig. 26. Length by age for dace in the R. Tees in September 1993.

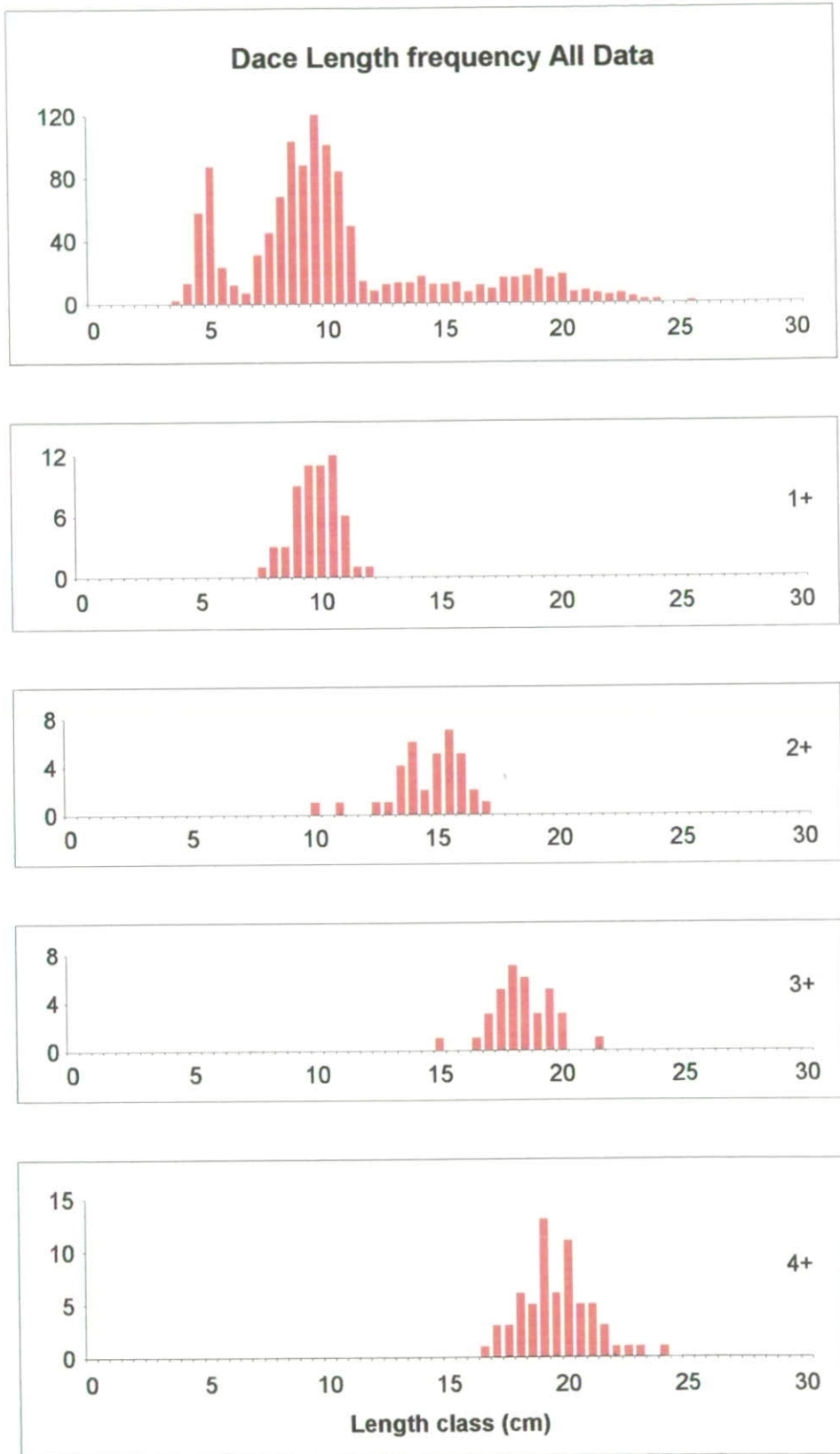


Fig. 26. Continued

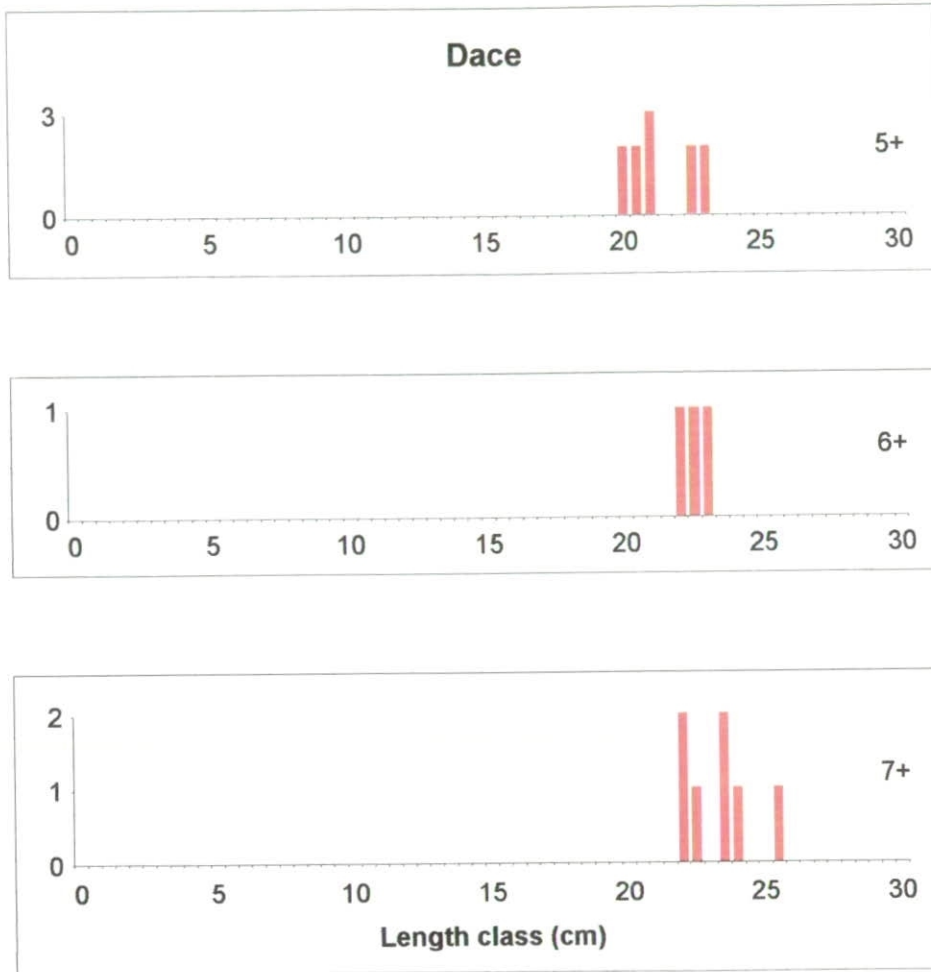


Fig. 27. Length by age for roach in the R. Tees in September 1993.

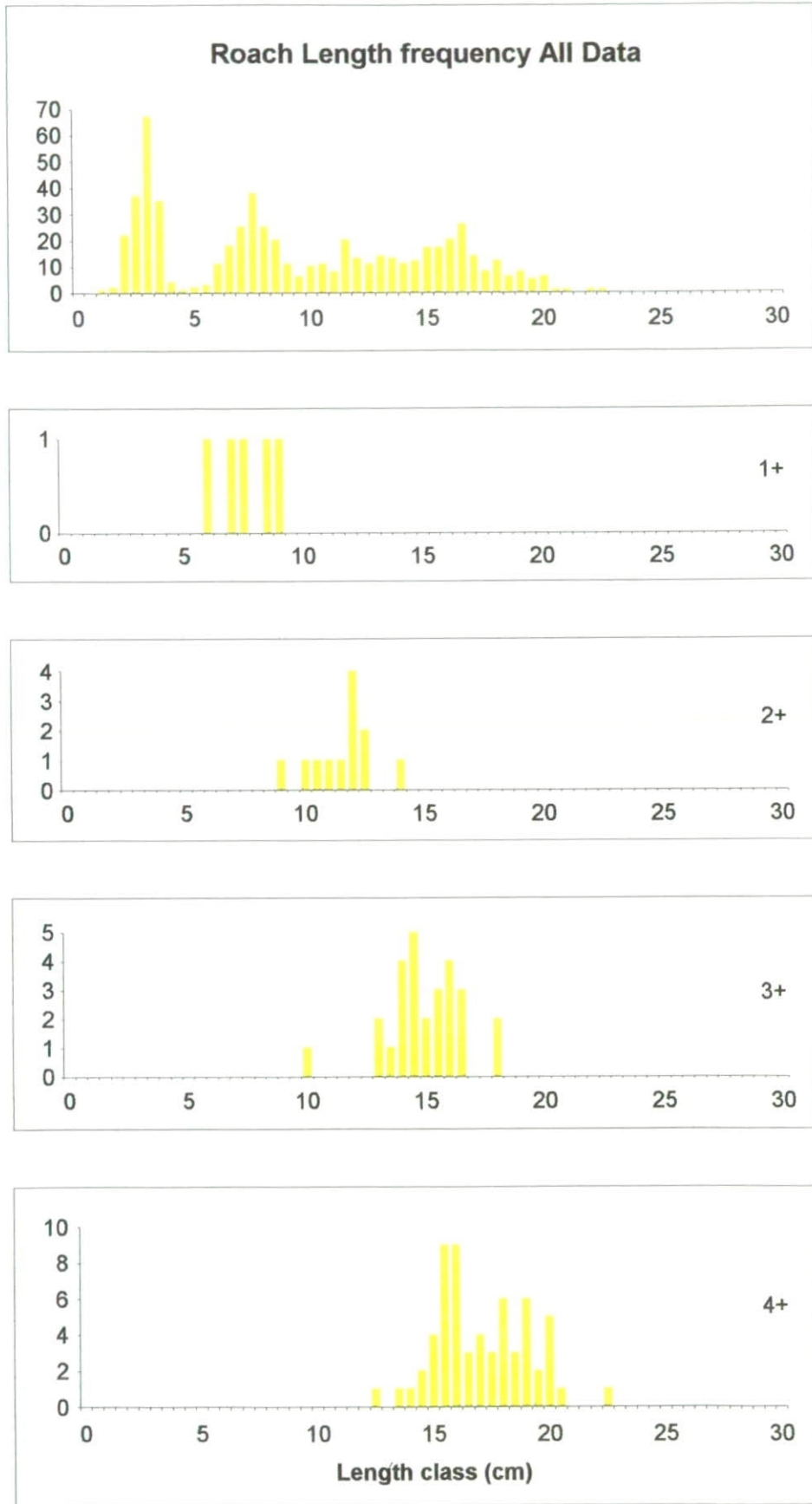


Fig. 27. Continued

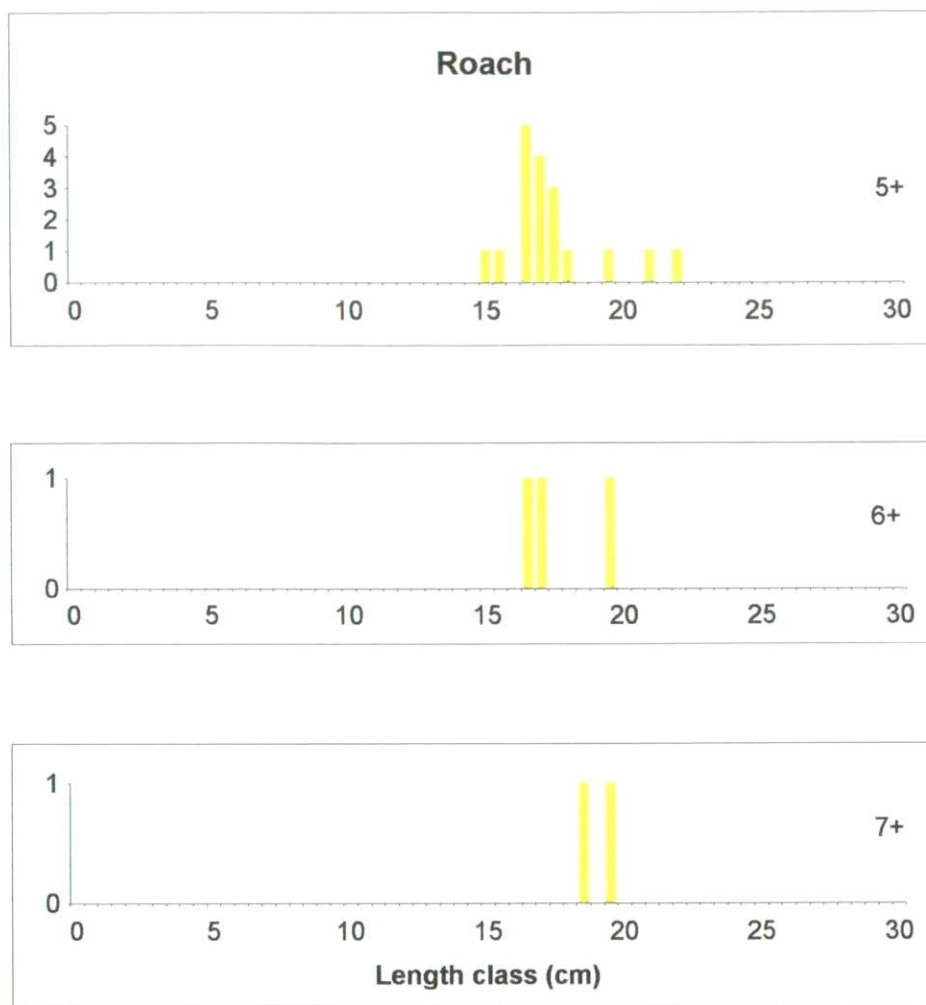
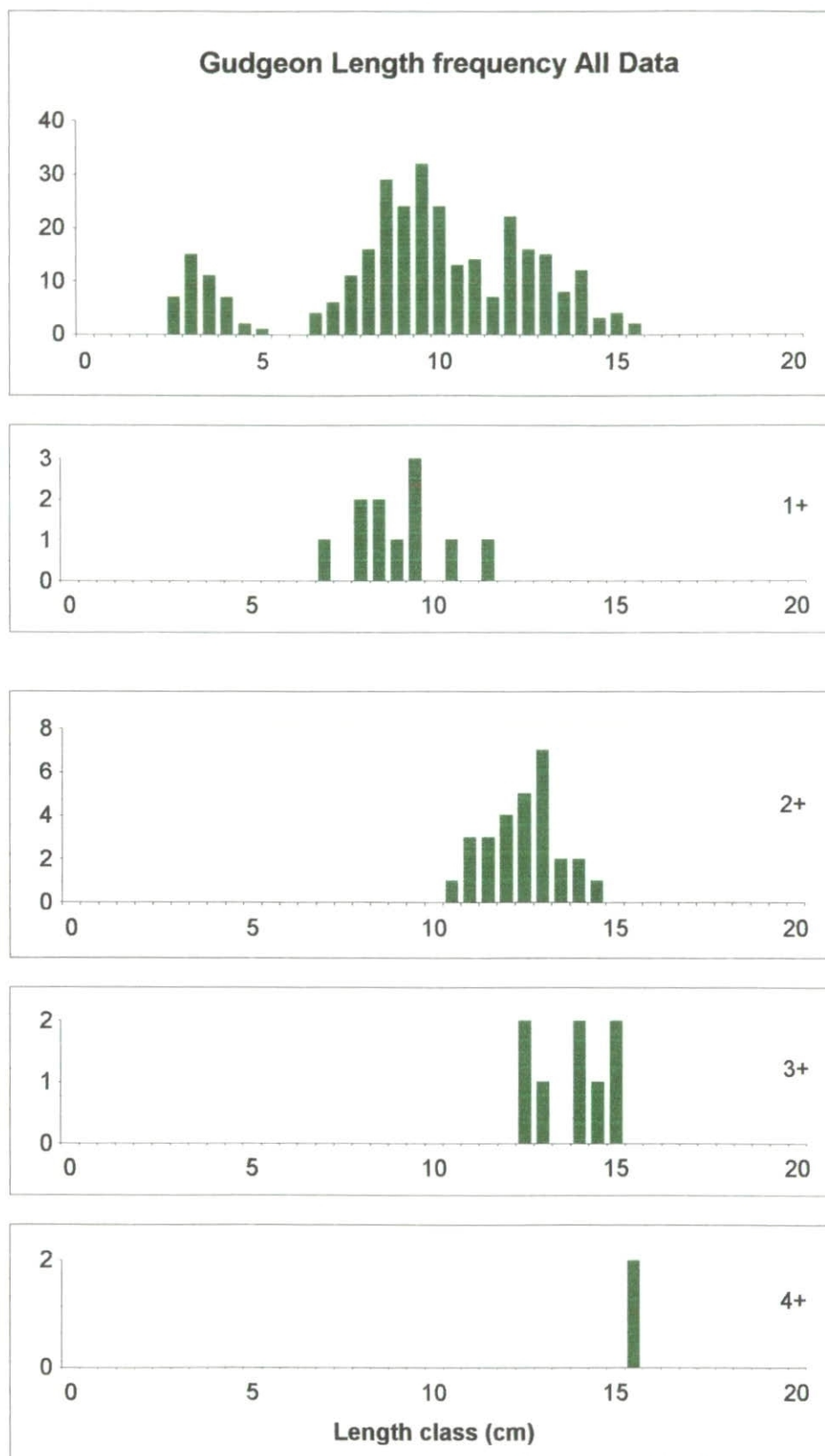


Fig. 28. Length by age for gudgeon in the R. Tees in September 1993.



3. TEMPERATURE

3.1 Introduction

The loggers at Low Moor, Ingleby Barwick and Stockton continue to operate although battery failure at Stockton caused the loss of the September to November data. A logger was set up in the completed ORSU and has been recording since May 1992.

The logger at Stockton has not been moved due to the delay in completion of the barrage. A new site is currently being negotiated and it is hoped to site the logger in a similar area, i.e. within Stockton.

3.2 Results

Monthly means and monthly mean of daily ranges are given in Table 6 with values from the R. Frome in Dorset for comparison. As in previous years, the temperatures at Low Moor and Ingleby Barwick were very similar to each other and higher in the summer than those at Stockton. Temperatures in May to August this year were much colder than in 1992 being on average 1-3°C colder at Low Moor and Ingleby Barwick and 2-4°C at Stockton.

Table 6. Monthly means (°C) and means of daily ranges in the River Tees at a) Low Moor, b) Ingleby Barwick, c) Stockton, d) ORSU1.

	Low Moor		Ingleby Barwick		Stockton		ORSU1		Frome
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean
Dec 92	3.6	0.75	3.6	0.72	5.2	3.20	-	-	6.7
Jan 93	3.1	1.03	3.1	0.93	4.4	2.67	-	-	6.5
Feb	5.0	0.95	4.9	0.67	5.9	1.12	-	-	6.8
Mar	6.2	1.43	6.0	0.80	-	-	-	-	7.4
Apr	9.0	1.40	8.8	0.93	8.6	1.68	-	-	10.6
May	12.0	1.83	11.9	1.36	11.1	2.90	12.1	4.25	13.3
Jun	16.1	1.84	16.0	1.15	13.3	4.98	16.7	6.35	16.7
Jul	16.7	1.72	16.7	0.71	12.7	4.95	17.0	5.41	17.4
Aug	15.1	1.63	15.0	0.82	14.8	1.86	15.5	4.82	17.0
Sep	12.5	1.11	12.5	0.73	-	-	12.9	3.18	14.6
Oct	8.1	0.81	7.9	0.64	-	-	8.8	2.06	11.9
Nov	4.6	0.67	4.6	0.66	-	-	5.0	1.96	8.3

The mean monthly temperature of ORSU1 was very similar to that at Low Moor, values being within a degree since records began in the ORSU in May. The monthly mean of daily ranges, however, was greater than the main river by several degrees. This is expected in a small relatively shallow body of water although in this case it is more complicated as there is also a tidal effect.

3.3 Discussion

The mean temperatures at Low Moor and Ingleby Barwick which represent those at the main spawning areas of the tidally affected Tees were particularly low at spawning time (May-June) being approximately 3°C colder than the previous year. This may have delayed spawning and certainly will have reduced the growth of the fry. This can be seen by comparing the length ranges of fry in July 1993 with those of July 1992 (Table 7). Continued low temperatures in the summer of 1993 will also have affected growth and survival of young of the year. Numbers of 0+ fish caught in September were substantially less than in the previous year and their sizes were significantly smaller. It is expected that the 1993 year class will be correspondingly weak.

Table 7. Length (mm) ranges of fry sampled in July 1992 and 1993 in the R. Tees.

	1992	1993
Dace	28-45	19-34
Chub	10-32	10-20
Roach	14-32	10-22
Barbel	15-35	11-19
Gudgeon	13-37	11-19

4. ANGLING DATA

4.1 Methods

Match survey forms completed by the anglers themselves were collected. On occasions, the anglers were reluctant to fill in the forms. This was usually in poor weather and a certain amount of persuasion was necessary to get the system operating again.

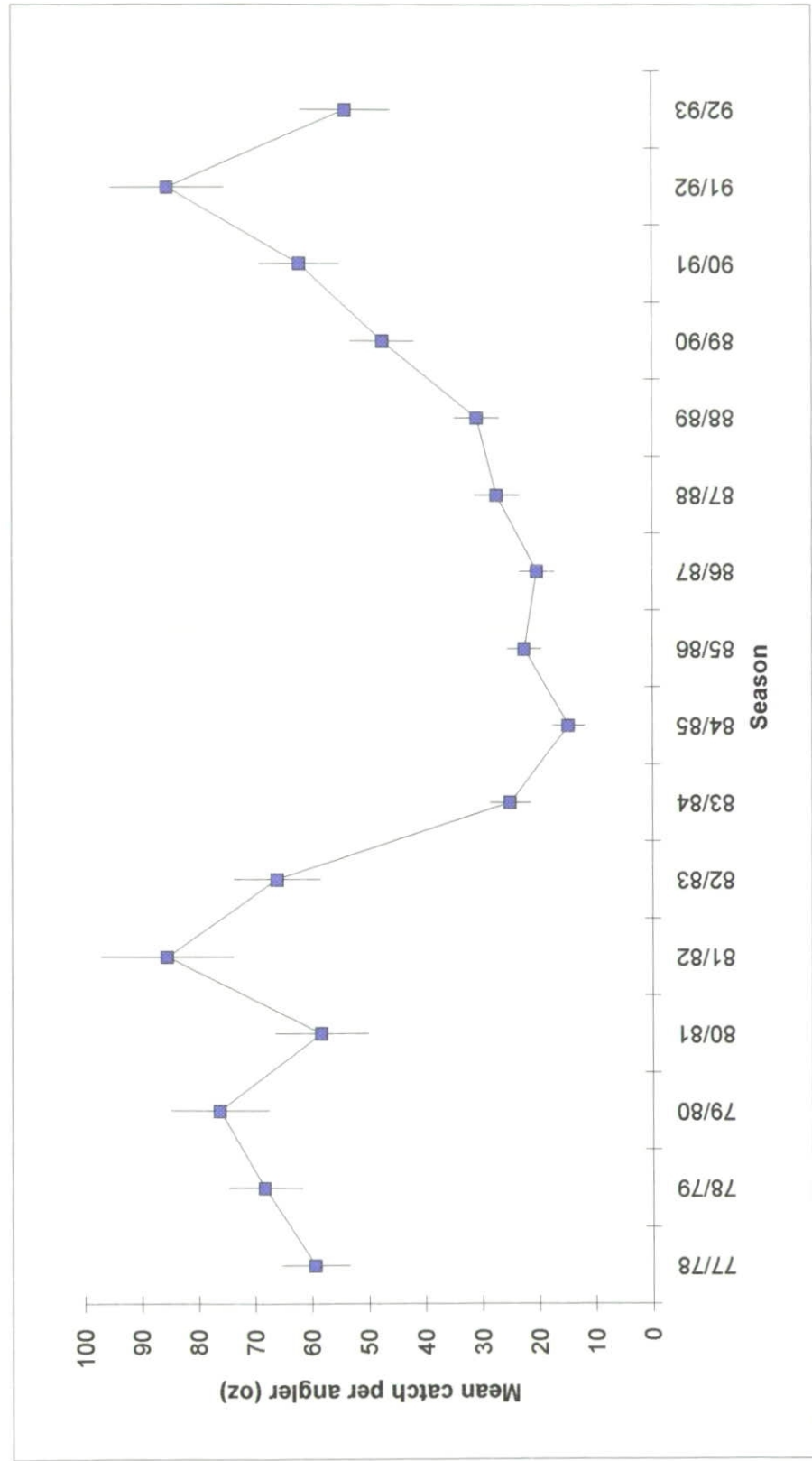
4.2 Results

The mean catch per angler per match was calculated and added to those of previous years (Table 8). Although the 1992/93 figure is the first downturn in the results since the "Hargreaves pollution" on 24 October 1983, the figure is similar to those that occurred prior to the pollution. This is shown graphically in Fig. 29.

Table 8 Results of angling matches 1977-1992. \bar{x} = mean catch per angler per match (ounces) \pm 95% confidence limits

Year	\bar{x}
1977/78	59.4 \pm 6.0
1978/79	68.3 \pm 6.6
1979/80	76.2 \pm 8.6
1980/81	58.3 \pm 8.2
1981/82	85.5 \pm 11.7
1982/83	66.1 \pm 7.7
1983/84	25.1 \pm 3.6
1984/85	14.8 \pm 2.9
1985/86	22.6 \pm 3.0
1986/87	20.4 \pm 3.1
1987/88	27.4 \pm 4.0
1988/89	30.9 \pm 4.0
1989/90	47.5 \pm 5.7
1990/91	62.1 \pm 7.1
1991/92	85.4 \pm 10.0
1992/93	54.0 \pm 8.0

Fig. 29. Mean catch per angler per match \pm 95%CL for Yarm AA club matches on the River Tees 1977 to 1993.



5. COSTS OF WORK DURING THE REPORTING PERIOD (APRIL 1993-FEBRUARY 1994)

Costs of the work are in accordance with the tender document accepted by the Authority namely £29567 (this price has been adjusted for inflation from the original 1990/91 financial year).

6. ANTICIPATED COSTS OF THE WORK IN THE PERIOD UP TO FEBRUARY 1995

Costs for the next reporting period are expected to be in line with Year 5 in the tender proposal dated February 1991 plus an inflation adjustment. The Year 4 work which should have been carried out in this period will now be completed the following year. This has been agreed with the NRA Project Officer and was necessary due to the late completion of the barrage.

7. PROGRAMME FOR THE NEXT REPORTING PERIOD

Fry will be sampled in the summer and the normal September survey of adults will be undertaken.

Collection of temperature data will continue in ORSU1 and at three sites on the main river if possible. The site at Stockton is due for redevelopment and an alternative site has to be negotiated. A temperature logger will be set up in the next ORSU to be completed. New loggers will be needed before any other ORSUs can be monitored.

Data from angling matches will be collected if possible. There will be no student on site for the first time since the start of the project. In the past two years we have been working towards this by devising a system that the anglers are happy with and will follow. In general this has worked well but occasionally, especially in poor weather, they have been reluctant to complete the data sheets but have been persuaded of the benefits on site. This year we will find out if this system will operate without close supervision.

8. FACTORS LIKELY TO AFFECT COMPLETION OF THE WORK ACCORDING TO THE TIMETABLE

Adverse weather conditions is the only likely factor to be considered. Although conditions may delay the sampling programme in the short term, it is unlikely that the completion date of the project will be affected.

9. ACKNOWLEDGEMENTS

Angling data has been collected in the past two years by Robert Ashton and Paul McKinnell. Our thanks also go to Diana Morton for production of the text.

Appendix 1. Number of older fish of each species caught during the fry survey in 1993.

Section	Chub	Roach	Minnow	Gudgeon	Flounder	Dace	Barbel
2	1	-	-	-	-	-	-
4	16	12	5	3	1	3	-
5	9	13	3	4	-	-	-
6	5	-	-	-	-	-	-
7	4	-	15	-	-	2	-
8	7	-	1	2	-	4	-
9	-	-	-	-	-	-	-
10	7	-	5	1	-	7	-
12	52	-	35	8	-	30	1
14	-	-	9	-	-	12	-
15	7	-	12	2	-	31	-
17	9	1	209	7	-	49	-
19	12	-	52	2	-	10	-
20	42	-	51	1	-	18	-
25	-	-	11	-	-	-	-
ORSU1	9	-	3	10	-	9	1
Total	180	26	411	40	1	173	2

Appendix 2. Number of fry of each species found in each section in the R. Tees in July 1993.

Section	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	19	20	21	25	ORSUI
Barbel						1		7			1			16	1	65	13	13	2	37	
Chub		27	8	3	112	31	47	29	28	30	46		32	166	31	120	44	25	84	115	4
Dace		18		183	262	314	77	31	40			17		21	9	13	5	15	3	1	1
Gudgeon														9	1	8				3	9
Rosch	1	17	135	4	20		1							15			1	21	2	150	4
Grayling								2								3					
Salmon												1									
Rudd															1						
Stickleback		4	2																		
Flounder			1	3	1										1						
Minnow					13	12	6	19	1	3	9		8	c.1000	32	111	9	23	11	85	5
Stone loach								8						7	1		25	15	1	14	2
Bullhead					1											1			3		

Appendix 3. Site descriptions and details of fish caught.

SECTION 3

Date fished 4 September 1993
 Area Bend below Great Holme to bend below pipe bridge
 Length 800 m
 NGR NZ434154 - NZ441157
 State of tide Flooding to $\frac{3}{4}$ high slack water
 Time 15.00-17.00
 Fishing method Boom boat
 Site description River lined with reeds. Meadows, few trees.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	1	3.4
Dace <i>Leuciscus leuciscus</i> (L.)	41	8.2-21.5
Flounder <i>Platichthys flesus</i> (L.)	4	23.1-32.7
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)		
Minnow <i>Phoxinus phoxinus</i> (L.)		
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	6	2.3-18.2
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	2	3.6-4.1
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 4

Date fished 4 September 1993 and 6 September 1993
 Area The Rings and Great Holmes
 Length 2280 m
 NGR NZ431147 - NZ434154
 State of tide 4.9.93: Fast ebbing to low slack water then flooding
 6.9.93: Low slack water to flooding
 Time 4.9.93 10.30-14.00, 6.9.93 09.00-10.00
 Fishing method Boom boat
 Site description High banks with meadows and few trees. River lined with reeds.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	9	3.3-23.5
Dace <i>Leuciscus leuciscus</i> (L.)	176	3.5-25.9
Flounder <i>Platichthys flesus</i> (L.)	82	2.6-35.6
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	42	3.5-15.4
Minnow <i>Phoxinus phoxinus</i> (L.)	6	4.7-7.3
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	158	2.4-20.2
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	2	4.1-4.8
Trout (brown) <i>Salmo trutta</i> L.	4	7.6-25.8
Roach/chub hybrid	1	22.5

SECTION 5

Date fished 6 September 1993
 Area Downstream of R. Leven - start of The Rings
 Length 1840 m
 NGR NZ365105 - NZ431147
 State of tide Ebbing from ½ high water
 Time 10.30-13.30
 Fishing method Boom boat
 Site description High banks with meadows. Some trees and shrubs on the banks, very few overhanging the water. High wooded banks at the bottom of the section.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	93	3.1-26.4
Dace <i>Leuciscus leuciscus</i> (L.)	159	4.0-22.6
Flounder <i>Platichthys flesus</i> (L.)	56	6.1-19.1
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	7	4.4-15.5
Minnow <i>Phoxinus phoxinus</i> (L.)	25	4.5-7.9
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	38	2.3-22.9
Salmon adult <i>Salmo salar</i> L.	1	89.5
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	1	4.1
Trout (brown) <i>Salmo trutta</i> L.	1	24.7

SECTION 6

Date fished 6 September 1993
 Area River Leven - large bend upstream
 Length 1240 m
 NGR NZ423122 - NZ430130
 State of tide Flooding to ½ high water
 Time 16.45-17.45
 Fishing method Boom boat
 Site description High banks. Overhanging trees on south bank. Open land on north bank.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)	3	14.4-31.0
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	49	7.3-42.0
Dace <i>Leuciscus leuciscus</i> (L.)	27	4.9-23.5
Flounder <i>Platichthys flesus</i> (L.)		
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	5	9.4-15.6
Minnnow <i>Phoxinus phoxinus</i> (L.)	3	5.7-6.9
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	22	7.5-20.5
Salmon parr <i>Salmo salar</i> L.	1	12.0
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.	1	6.9

SECTION 7

Date fished 7 September 1993
 Area Upstream of Section 6 - Yarm road bridge
 Length 1140 m
 NGR NZ418132 - NZ423122
 State of tide High slack water to slow ebb
 Time 08.30-10.15
 Fishing method Boom boat
 Site description High banks. Yarm on south bank. Open meadows on north bank.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	50	3.2-35.2
Dace <i>Leuciscus leuciscus</i> (L.)	61	4.3-18.3
Flounder <i>Platichthys flesus</i> (L.)	10	6.0-30.2
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	4	9.2-15.0
Minnow <i>Phoxinus phoxinus</i> (L.)	12	5.3-8.0
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	37	3.1-18.6
Salmon adult <i>Salmo salar</i> L.	1	67.8
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	1	2.8
Trout (brown) <i>Salmo trutta</i> L.	1	27.9

SECTION 8

Date fished 7 September 1993
 Area Yarm road bridge - Yarm railway bridge
 Length 80 m
 NGR NZ417132 - NZ418132
 State of tide Ebbing from $\frac{3}{4}$ high water
 Time 10.45-11.15
 Fishing method Boom boat
 Site description High banks. Gravel bar on south bank. Water otherwise deep.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	5	19.8-27.0
Dace <i>Leuciscus leuciscus</i> (L.)	8	8.5-21.4
Flounder <i>Platichthys flesus</i> (L.)	3	7.2-20.5
Grayling <i>Thymallus thymallus</i> (L.)	1	8.5
Gudgeon <i>Gobio gobio</i> (L.)	2	7.6-12.4
Minnnow <i>Phoxinus phoxinus</i> (L.)	5	5.2-6.5
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	2	9.0-19.3
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 9

Date fished 9 September 1993
 Area Yarm railway bridge - upstream to outfall on north bank
 Length 300 m
 NGR NZ415131 - NZ417132
 State of tide Ebbing from ½ high water
 Time 11.20-12.15
 Fishing method Boom boat
 Site description Flood defence construction on south bank. On north, high bank with bushes and herbaceous vegetation.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	18	2.3-23.2
Dace <i>Leuciscus leuciscus</i> (L.)	22	4.3-10.8
Flounder <i>Platichthys flesus</i> (L.)	2	19.8-26.2
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	2	8.0-10.3
Minnow <i>Phoxinus phoxinus</i> (L.)	11	3.6-7.2
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	8	3.1-17.8
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 10

Date fished 7 September 1993
 Area Upstream of section 9 - downstream of section 11
 Length 560 m
 NGR NZ415122 - NZ415131
 State of tide Fast ebbing from ¼ of high water
 Time 12.30-13.30
 Fishing method Boom boat
 Site description High banks. Thin line of trees and shrubs on the north bank, more open on the south bank.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	32	17.1-26.2
Dace <i>Leuciscus leuciscus</i> (L.)	15	14.1-23.4
Flounder <i>Platichthys flesus</i> (L.)	6	17.6-26.8
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	2	13.1-13.4
Minnow <i>Phoxinus phoxinus</i> (L.)		
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	21	12.1-22.4
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 11

Date fished 5 September 1993
 Area Aislaby at The Cabins - bend downstream
 Length 840 m
 NGR NZ407123 - NZ415122
 State of tide Flooding to ½ high water
 Time 15.50-16.50
 Fishing method Boom boat
 Site description High banks. Wooded area

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	76	5.7-35.8
Dace <i>Leuciscus leuciscus</i> (L.)	44	4.4-17.0
Flounder <i>Platichthys flesus</i> (L.)	38	4.9-32.5
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	19	3.1-10.5
Minnnow <i>Phoxinus phoxinus</i> (L.)	64	4.1-7.7
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	81	3.0-19.5
Salmon adult <i>Salmo salar</i> L.	1	83.0
Stone loach <i>Barbatula barbatula</i> (L.)	1	8.6
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 12

Date fished 2 September 1993
 Area Aislaby at The Cabins - middle of 1st bend upstream
 Length 440 m
 NGR NZ405120 - NZ407123
 State of tide Flooding to high slack water
 Time 17.40-18.30
 Fishing method Boom boat
 Site description High banks, meadows with few overhanging trees

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	12	4.7-39.5
Dace <i>Leuciscus leuciscus</i> (L.)	108	4.5-22.5
Flounder <i>Platichthys flesus</i> (L.)	3	20.9-26.1
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	15	9.6-13.1
Minnow <i>Phoxinus phoxinus</i> (L.)	4	5.6-6.3
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	35	6.6-19.8
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 13

Date fished 2 September 1993
 Area Upstream of Aislaby, end of Section 12 - next bend upstream
 Length 600 m
 NGR NZ404114 - NZ405120
 State of tide Flooding to ½ high water
 Time 16.10-16.50
 Fishing method Boom boat
 Site description High banks, meadows with few overhanging trees

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)	1	9.8
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	18	3.5-34.5
Dace <i>Leuciscus leuciscus</i> (L.)	91	5.4-22.1
Flounder <i>Platichthys flesus</i> (L.)	17	6.1-29.0
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	46	7.0-14.6
Minnow <i>Phoxinus phoxinus</i> (L.)	9	5.2-6.6
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	40	6.3-18.6
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 14

Date fished 2 September 1993
 Area End of Section 13 - next bend upstream
 Length 1040 m
 NGR NZ401105 - NZ404114
 State of tide Slack low water to flooding
 Time 13.50-15.15
 Fishing method Boom boat
 Site description High banks, more wooded than sections 12 and 13. Deep water

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	49	3.6-26.3
Dace <i>Leuciscus leuciscus</i> (L.)	93	4.6-20.9
Flounder <i>Platichthys flesus</i> (L.)	12	5.6-27.6
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	32	6.9-14.1
Minnow <i>Phoxinus phoxinus</i> (L.)	23	2.8-6.6
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	18	7.7-18.2
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		
Sea Trout <i>Salmo trutta</i> L.	1	45.1

SECTION 15

Date fished 2 September 1993
 Area Pumping station - bend downstream. Lower limit opposite upstream limit of section 14.
 Length 580 m
 NGR NZ395103 - NZ401105
 State of tide Ebbing to low slack water
 Time 11.20-12.40
 Fishing method Boom boat
 Site description High banks, wooded section. Shallow water with gravel banks

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbatus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	29	6.1-49.1
Dace <i>Leuciscus leuciscus</i> (L.)	104	4.7-23.8
Flounder <i>Platichthys flesus</i> (L.)	15	6.6-31.2
Grayling <i>Thymallus thymallus</i> (L.)	1	22.8
Gudgeon <i>Gobio gobio</i> (L.)	24	3.8-14.5
Minnow <i>Phoxinus phoxinus</i> (L.)	28	4.6-7.0
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	33	7.5-20.0
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.	1	22.8

SECTION 16

Date fished 2 September 1993
 Area Lower Worsall - pumping station
 Length 400 m
 NGR NZ392103 - NZ395103
 State of tide Ebbing from ½ high water
 Time 09.45-10.30.
 Fishing method Boom boat
 Site description Banks less steep. Open meadows upstream with tree cover increasing downstream. Shallow water.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)		
Bullhead <i>Cottus gobio</i> L.	1	5.7
Chub <i>Leuciscus cephalus</i> (L.)	18	19.6-26.8
Dace <i>Leuciscus leuciscus</i> (L.)	59	4.6-24.0
Flounder <i>Platichthys flesus</i> (L.)	1	8.2
Grayling <i>Thymallus thymallus</i> (L.)	1	24.1
Gudgeon <i>Gobio gobio</i> (L.)	4	8.0-14.2
Minnow <i>Phoxinus phoxinus</i> (L.)	32	4.7-6.5
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	4	10.4-20.1
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

SECTION 19

Date fished 5 September 1993
 Area Fardenside Farm to top of second island upstream.
 Length 200 m
 NGR NZ371095 - NZ373095
 State of tide Not affected by the tide.
 Time 11.00-14.00
 Fishing method Single anode wading
 Site description Very high, steep, wooded banks. Uniform area downstream with little macrophyte cover but dense bushes on the bank overhanging the water.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)	2	8.6-9.2
Chub <i>Leuciscus cephalus</i> (L.)	63	1.8-27.4
Dace <i>Leuciscus leuciscus</i> (L.)	37	4.3-16.6
Flounder <i>Platichthys flesus</i> (L.)	3	6.1-28.7
Grayling <i>Thymallus thymallus</i> (L.)	1	23.5
Gudgeon <i>Gobio gobio</i> (L.)	33	7.2-13.1
Minnow <i>Phoxinus phoxinus</i> (L.)	110	1.2-7.2
Roach <i>Rutilus rutilus</i> (L.)	29	1.2-16.6
Rudd <i>Scardinius erythrophthalmus</i> (L.)		
Salmon parr <i>Salmo salar</i> L.		
Salmon smolt <i>Salmo salar</i> L.		
Sea lamprey <i>Petromyzon marinus</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Trout (brown) <i>Salmo trutta</i> L.	1	15.4
Bullhead <i>Cottus gobio</i> (L.)	1	7.4

SECTION 21

Date fished 3 September 1993
 Area Downstream of ford below Low Moor weir
 Length 260 m
 NGR NZ365106 - NZ376104
 State of tide Not affected by the tide
 Time 09.00-09.40
 Fishing method Boom boat
 Site description High banks with some trees on the south bank. Open meadows. A small number of willows overhanging the water on the north bank. Water generally up to 80 cm with deeper pools under overhanging trees. Substratum cobbles/gravel with fine organic sediment in areas of low flow.

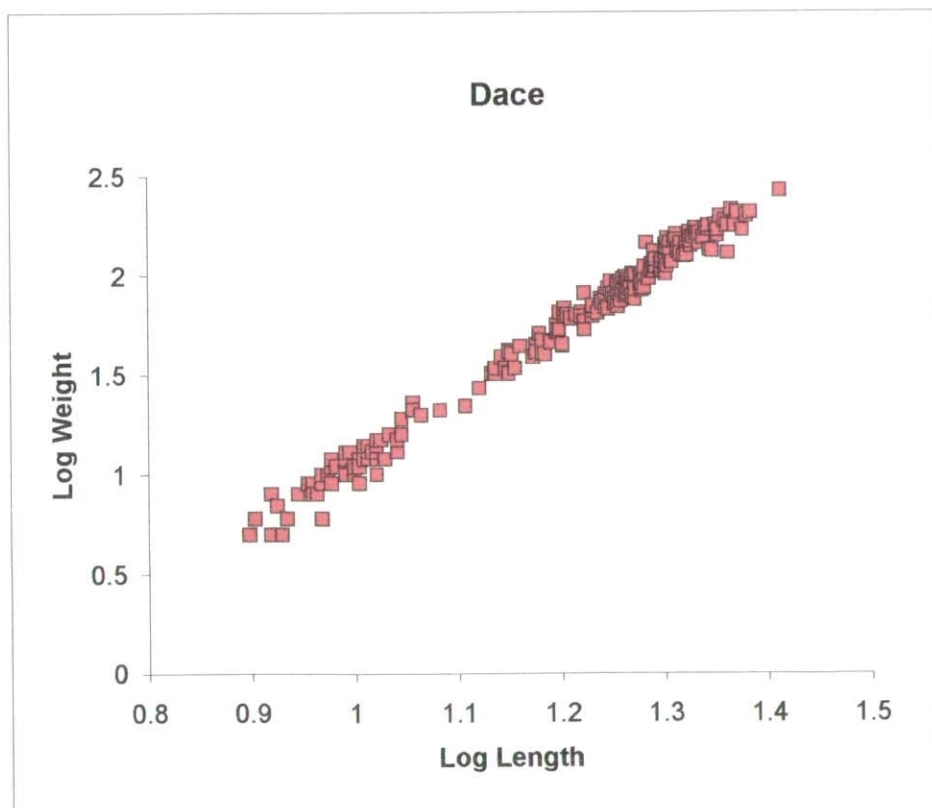
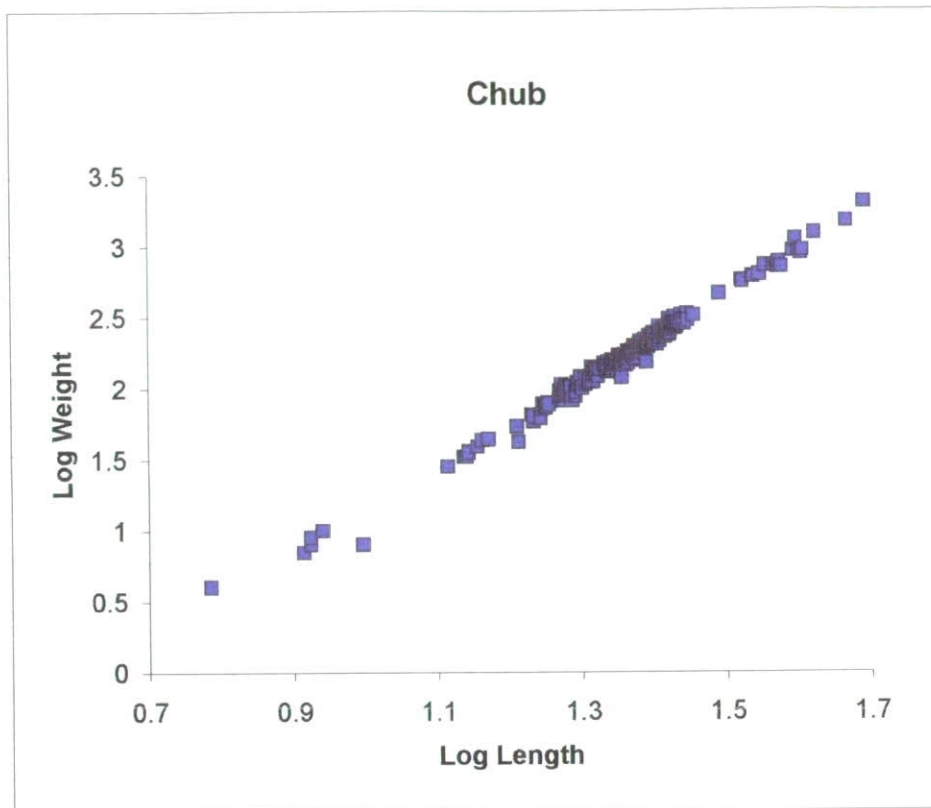
Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)	3	17.6-31.1
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	33	11.4-37.5
Dace <i>Leuciscus leuciscus</i> (L.)	118	4.7-23.0
Flounder <i>Platichthys flesus</i> (L.)	1	29.1
Grayling <i>Thymallus thymallus</i> (L.)	3	22.8-31.5
Gudgeon <i>Gobio gobio</i> (L.)	16	7.0-15.0
Minnow <i>Phoxinus phoxinus</i> (L.)	6	5.0-8.0
River Lamprey <i>Lampetra fluviatilis</i> (L.)	1	30.0
Roach <i>Rutilus rutilus</i> (L.)	6	11.7-18.1
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.	3	22.6-39.8

SECTION 25

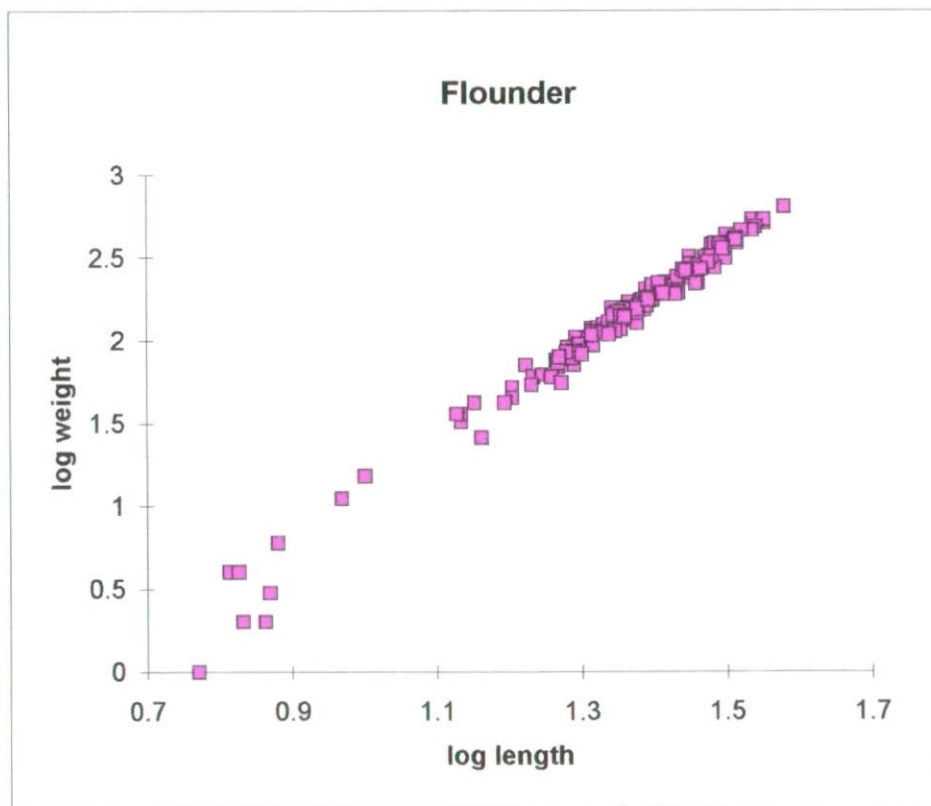
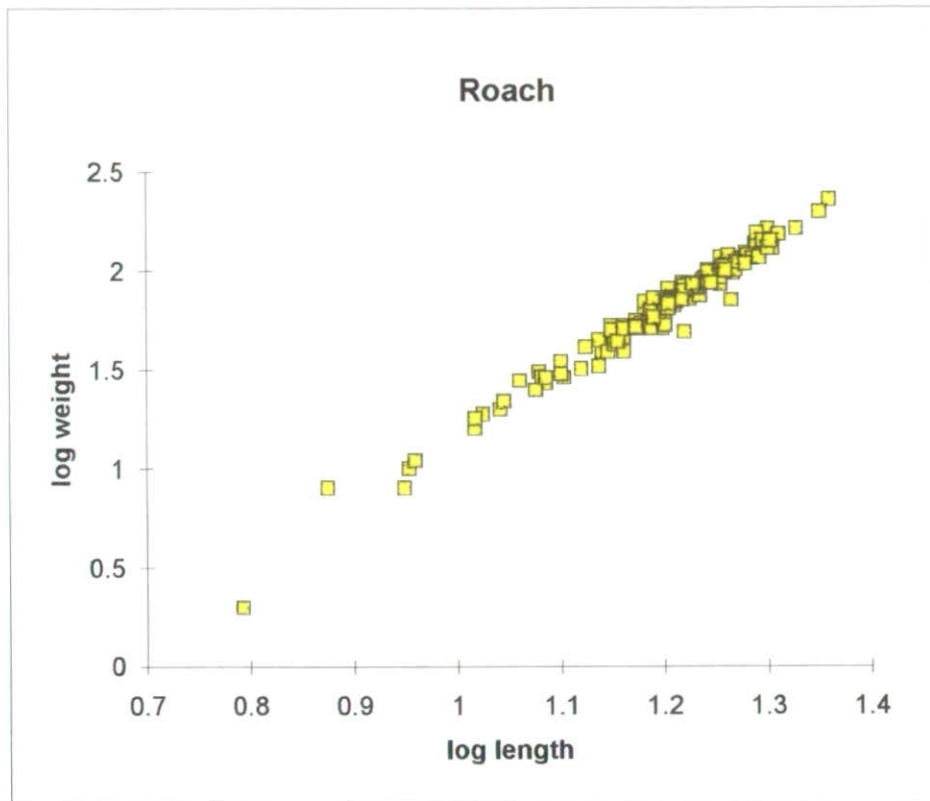
Date fished 3 September 1993
 Area Low Dinsdale toll bridge - first bend upstream
 Length 350 m
 NGR NZ350113 - NZ345114
 State of tide Not influenced by the tide
 Time 14.00-15.00 and 15.20-15.45
 Fishing method Single anode wading
 Site description Fast flowing over bedrock. Gravel banks present in places usually near the bank. Very high wooded banks. Fallen trees in the water often with associated macrophyte debris.

Species	No. of individuals	Size range (cm)
Barbel <i>Barbus barbus</i> (L.)	1	38.5
Bullhead <i>Cottus gobio</i> L.		
Chub <i>Leuciscus cephalus</i> (L.)	37	2.4-46.4
Dace <i>Leuciscus leuciscus</i> (L.)	10	4.5-21.0
Flounder <i>Platichthys flesus</i> (L.)		
Grayling <i>Thymallus thymallus</i> (L.)		
Gudgeon <i>Gobio gobio</i> (L.)	14	4.0-14.0
Minnow <i>Phoxinus phoxinus</i> (L.)	35	2.1-7.0
River Lamprey <i>Lampetra fluviatilis</i> (L.)		
Roach <i>Rutilus rutilus</i> (L.)	17	2.4-18.2
Salmon adult <i>Salmo salar</i> L.		
Stone loach <i>Barbatula barbatula</i> (L.)		
Three spined stickleback <i>Gasterosteus aculeatus</i> L.		
Trout (brown) <i>Salmo trutta</i> L.		

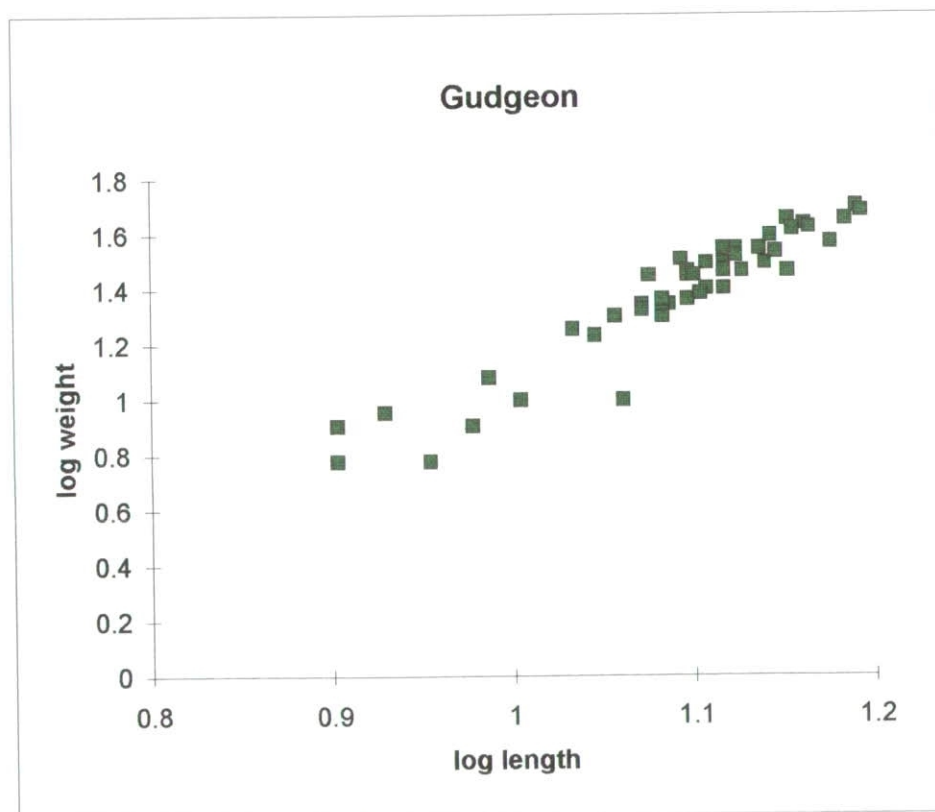
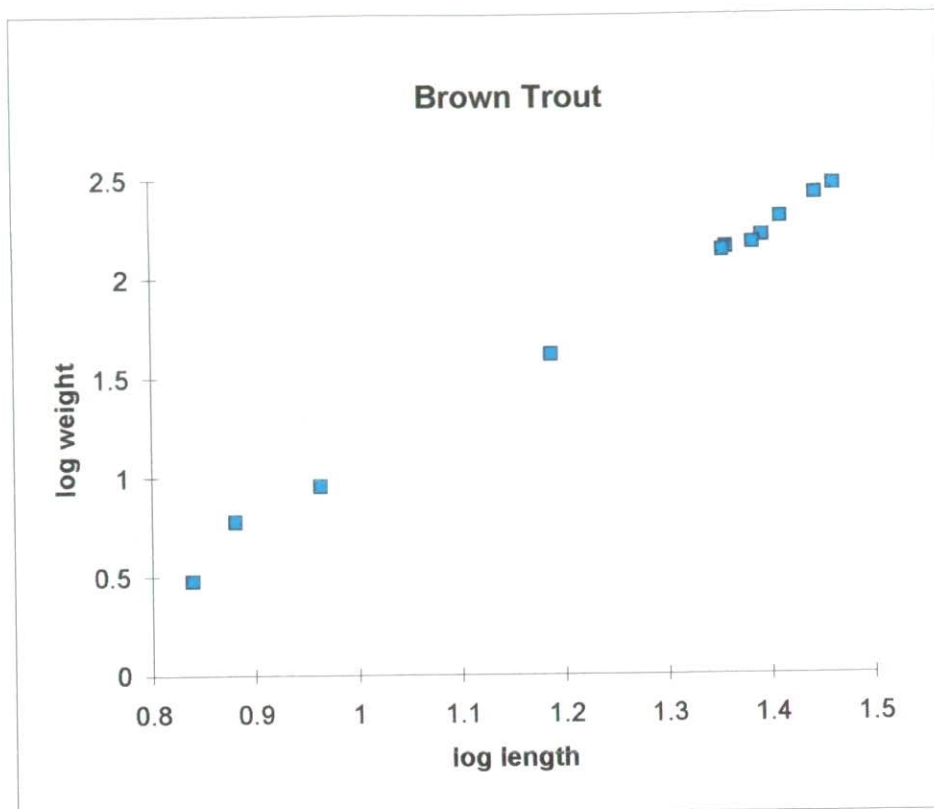
Appendix 4. Length weight relationships for the major fish species in the R. Tees, in September 1993.



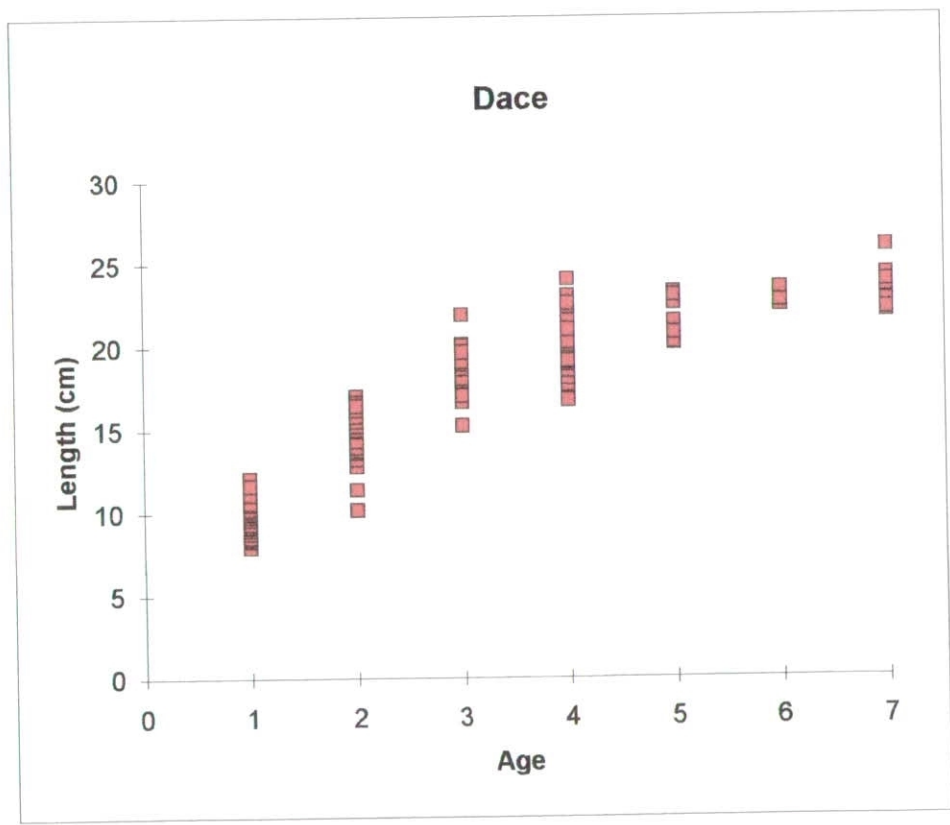
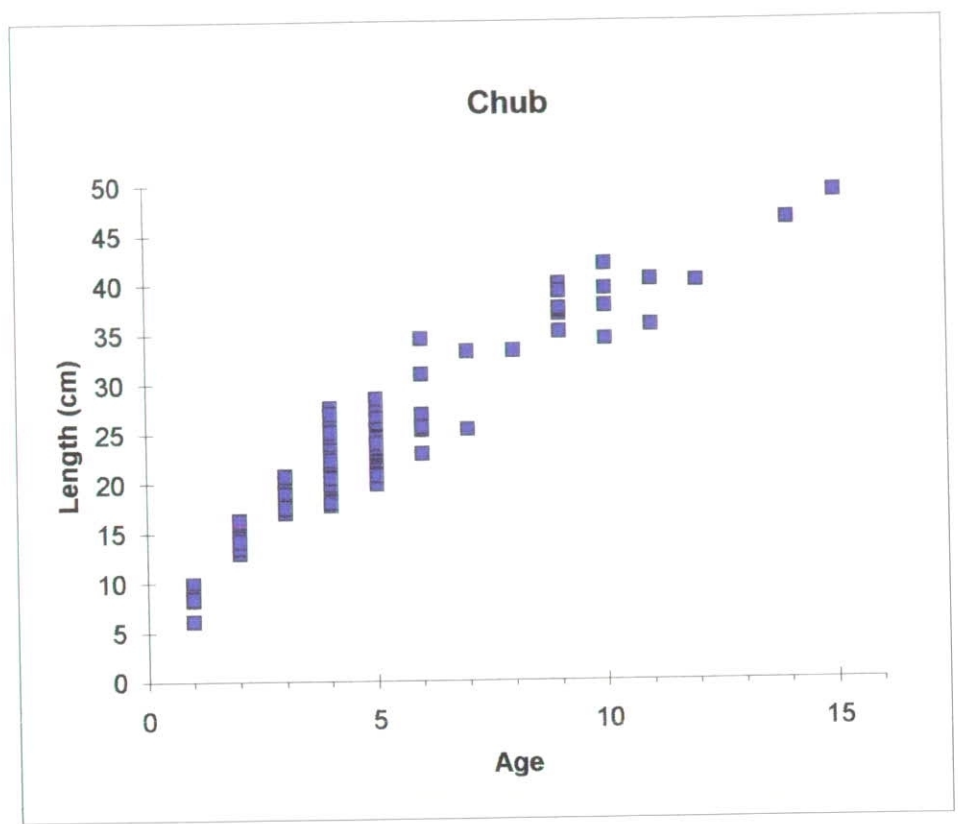
Appendix 4. Continued



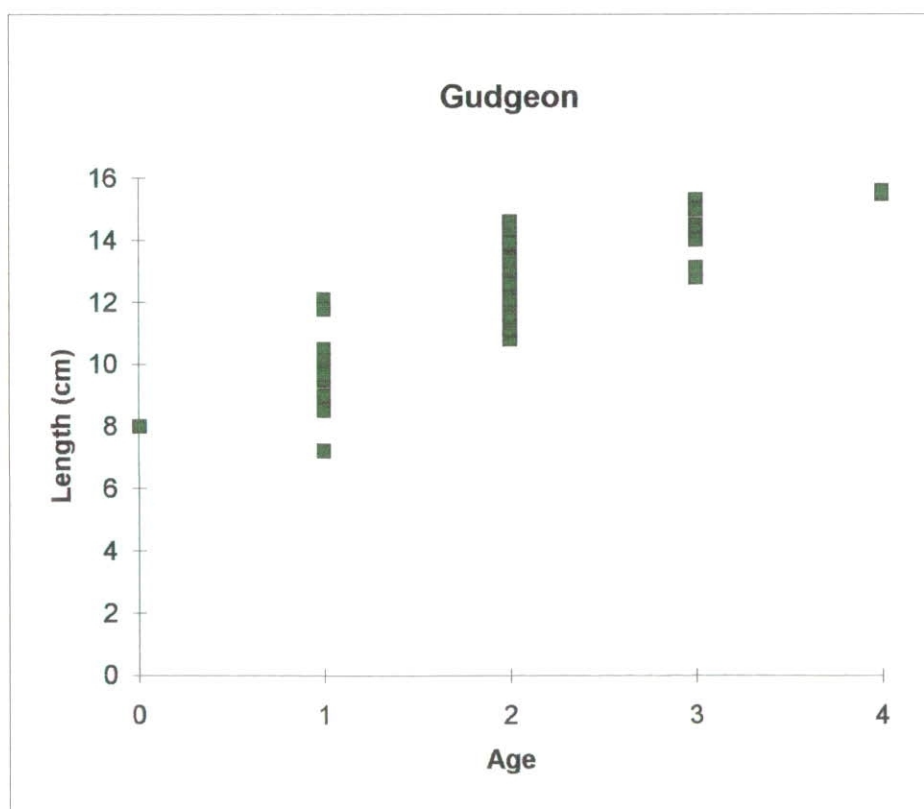
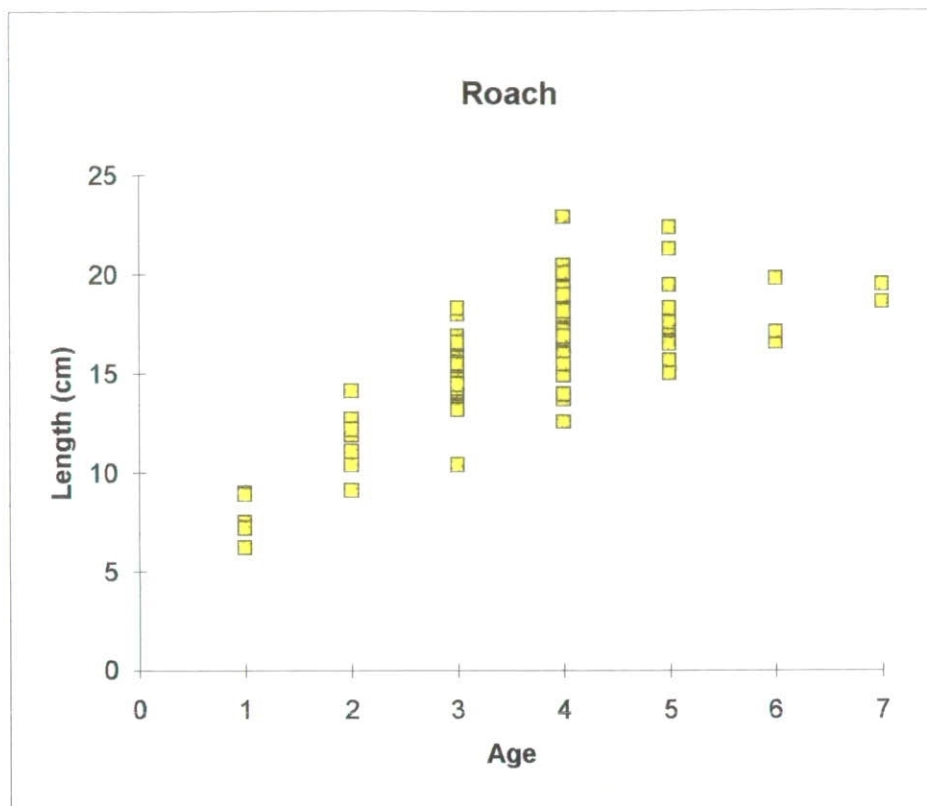
Appendix 4. Continued



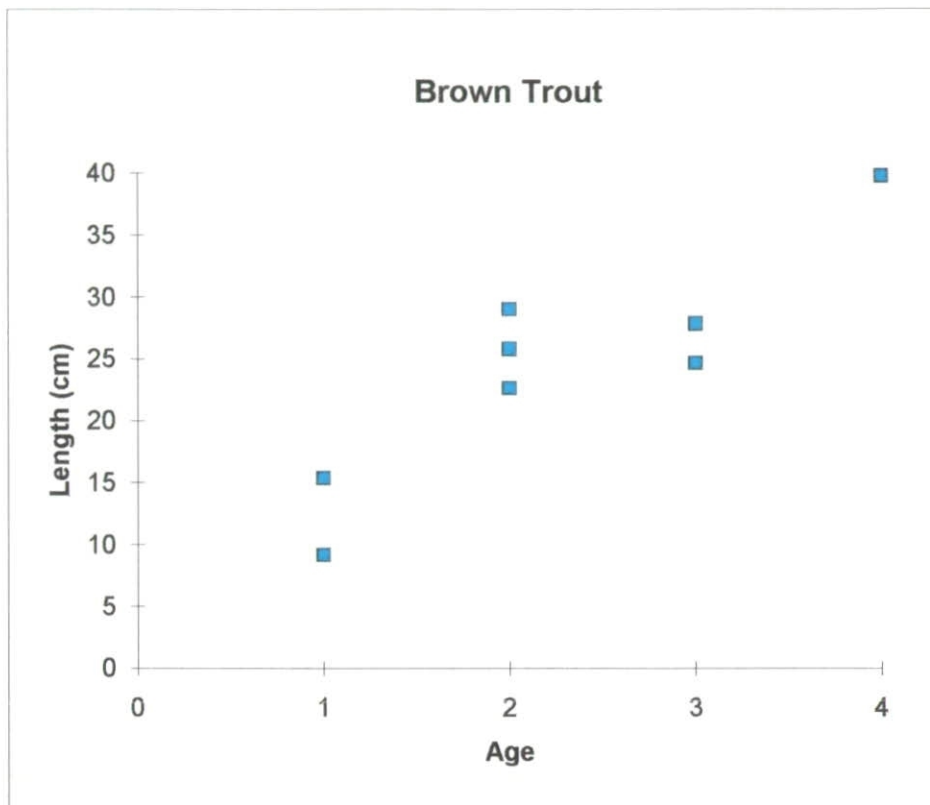
Appendix 5. Length age relationships for the major fish species in the R. Tees , in September 1993.



Appendix 5. Continued



Appendix 5. Continued



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