



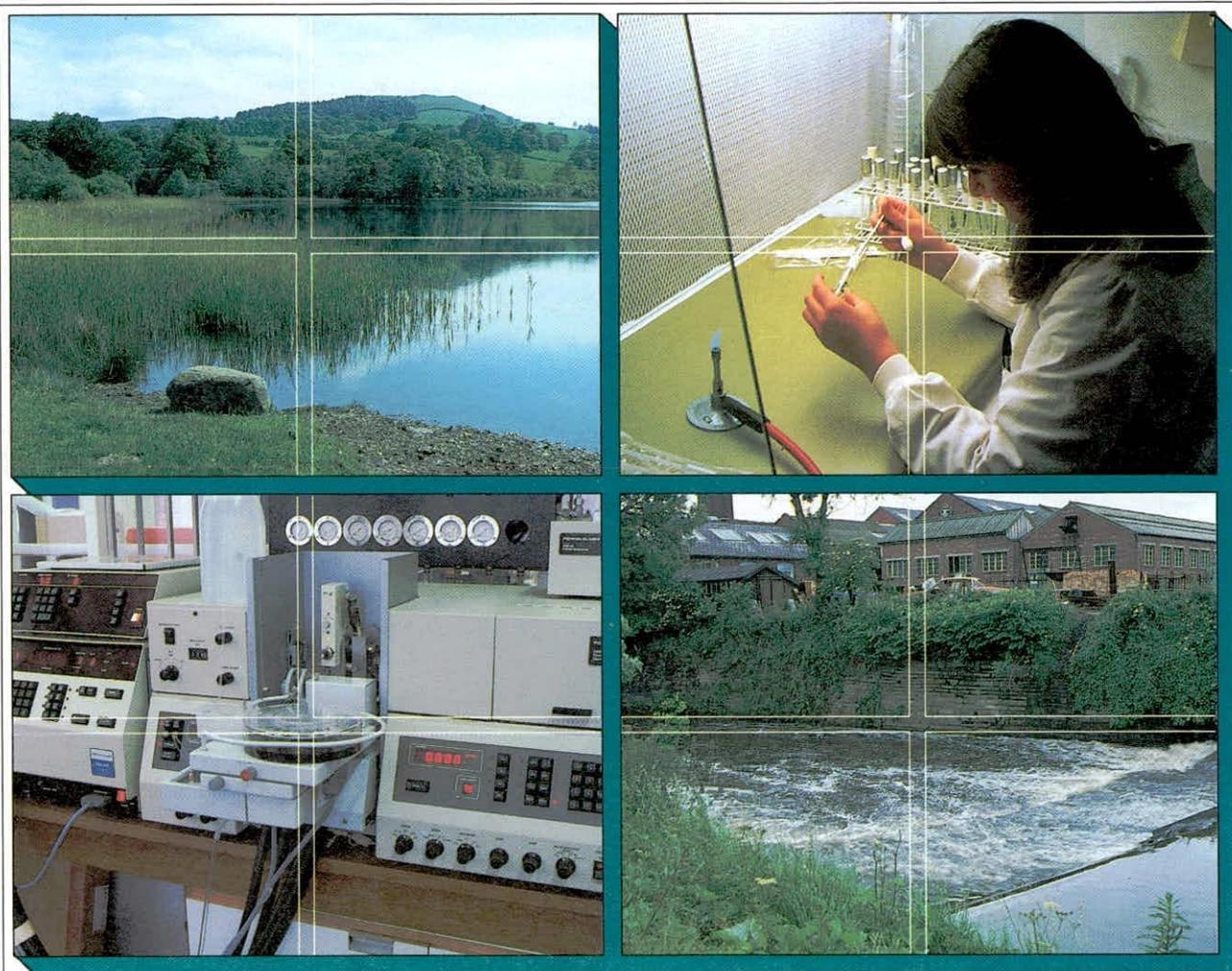
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1996 Survey of the Coarse Fish of the River Tees Interim Report

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Report To: Environment Agency, North East
TFS Project No: T11064f1
IFE Report Ref. No: RL/T11064f1/6



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1996 SURVEY OF THE COARSE FISH OF THE RIVER TEES

Interim Report

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Report Date:	February 1996
Report To:	Environment Agency, North East
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REVIEW OF PROGRESS

The fry survey was carried out in mid June and covered most of the length affected by the Barrage plus areas upstream for comparison. 2500 fry were sampled and identified. Only dace, roach, gudgeon and barbel were of angling interest. No chub fry were found. Numbers of dace fry were higher than in the previous year but roach numbers were lower. This was not expected. It was anticipated that dace spawning sites would become more silted and thus be less suitable. The fact that less than 10% of the dace fry occurred in the lower 12 sections suggests that the Yarm spawning site had indeed been silted up. Roach, however, were expected to do well in the lower flows although it may take longer for them to switch spawning strategies. Roach fry distribution was sporadic with >75% found in 4 sections.

Very few fry were found in the sections below Yarm. These sections were resurveyed in July in case spawning was delayed due to the cold spring and numbers were generally low. No fry were found below Section 4. Chub fry were present but in reduced numbers compared with the previous year.

Two specimens of bream fry were found this year in Section 4. This is a new species to the survey.

Dace fry showed a bimodal size distribution indicating that spawning was interrupted, presumably by cold weather. Chub fry appeared later than usual although the roach and dace (larger size class) fry were of a similar size to other years suggesting that the onset of spawning was not delayed. In general, fry numbers were lower than many other years and 1996 is expected to be a poorer year class as a result.

The adult survey was carried out in early September 1996 mainly by boom boat electric fishing. The site at Low Moor (Section 19) was fished by twin anode wading. This site is above the influence of the barrage.

4246 fish of 13 species were caught and processed. The survey was extended from Thornaby to the barrage (Section 1). This section was split into 5 equally spaced sub-sections each approximately 320 m long.

The number of fish >8 cm, which excludes young of the year was 2682. This is more than double the number caught in 1995. The increase was partly due to the extra water fished but also due to the good recruitment in 1995.

Dace numbers were similar to last year but chub and roach numbers had increased markedly (100% and 50% respectively). The downward trend of flounder numbers has continued, whilst gudgeon and perch numbers have continued to rise.

Dace were found in all sections fished although distribution in terms of numbers per 100 m (from quasi-quantitative estimates) had altered. High densities were found in most sub-sections of Section 1 but lower densities were found in the sections immediately upstream and in the higher sections. Large dace (>20 cm) had decreased in number.

Roach and chub densities were generally higher than last year and both species were widely distributed.

All the major species show high numbers of 1+ fish corresponding to the good year class of 1995. Young of the year were present in lower numbers suggesting that the 1996 year class will be weaker than that of 1995.

No roach young of the year were found below Section 4. This is confirmation of the situation found in the fry survey and is in direct contrast to the situation in 1995 when large numbers of young of the year were found particularly in Sections 1 and 2.

Angling catch data has continued to be collected. The mean catch per angler for the first total post-barrage season (1995/96) showed an increase over recent seasons. The value is significantly greater than that of the 1993/94 pre-barrage season. The stretch above Yarm, which fished no better last year than any other stretch, has shown increased catches this year during the November-February period.

1. SURVEY OF COARSE FISH FRY JUNE 1996

1.1 Introduction

The survey was designed to collect information on the fry of all species of angling importance. This is the second survey since the completion of the barrage. The timing of the survey has in the past been variable due to the conflict between assessing the spawning areas for dace and sampling all species of fry. Dace spawn earlier than most other coarse fish on the R. Tees and become large enough to leave the margins (typical fry habitat) before the eggs of some other species have finished hatching. Last year, the survey was carried out in early June to determine whether the dace had successfully spawned in the now deep slow flowing water at the recognised dace spawning sites. This year, the survey was delayed for two weeks because of the cold spring but the timing was determined to make direct comparisons with the 1995 survey.

1.2 Methods

The fry survey was carried out between the 18 and 20 June 1996. Since the completion of the barrage, micromesh seining has been difficult due to the deep water. Few samples were obtained this year by this method. Most fry were sampled either by random point sampling or target sampling using battery powered back pack electrofishing gear. Target sampling was also performed using a standard FBA pond net. No attempt was made to quantitatively assess abundance.

A description of the method(s) used in each section is given in Appendix 1.

1.2.1 Electrofishing

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 with minimal 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 the river. The number of point samples depended on the number of fry caught. Point samples were either targeted at concentrations of fry or taken at random.

1.2.2 Micromesh seining

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. These were set and hauled in shallow marginal areas of the river, especially from beach gravel shoals.

1.2.3 Hand netting

Fry were often observed to be in shallow water (<5 cm) and hand netting was often found to be a more effective sampling technique. A standard FBA pond net was used to sample discrete shoals in these habitats.

1.3 Results

2500 fish fry of seven species were sampled, although of these only dace, roach, barbel and gudgeon were of angling importance. This number is slightly lower than in 1995. Numbers of each major species are shown in Table 1. Although effort varies between years gross changes can be recognised. This year, in June, no chub fry were found at any site. Dace numbers had increased and this was unexpected. It was anticipated that the spawning gravels would become more silted since the reduction in flow and thus dace spawning would be less successful, especially in the lower sections. In addition, the spring was cold and would be expected to result in a poor year class.

Roach numbers were approximately half those found in 1995. They were expected to do well in the slower flowing sections of the river.

Barbel fry were more numerous than in 1995 but gudgeon fry were present in lower numbers.

The fact that no chub were sampled suggested that not all hatching was complete.

The number of fry of the minor species are given in Table 2. Stickleback numbers were down compared with the previous year but still high compared with pre-barrage years.

Table 1. Number of fry of each species sampled in the R.Tees in June and July 1996

Species	June	July	Total
Barbel	64	0	64
Bream	0	2	2
Chub	0	31	31
Dace	932	20	952
Grayling	0	0	0
Gudgeon	27	21	48
Roach	812	106	918

Table 2. Number of fry of minor species sampled in the R.Tees in June 1996

Species	June	July	Total
Minnow	432	4	436
Stone Loach	177	5	182
Stickleback	60	4	64

1.3.1 Distribution of fry

In general, very few fry were found in the lower sections of the Tees (below Yarm) (Table 3). As in 1995, few fry were found in Sections 1-3. This year, numbers were also low in Sections 6-12. The exception to this was a high catch of roach in Section 5.

These lower sections were expected to be favoured by fry of fish preferring low flow conditions for spawning. This does not appear to have happened.

The species composition of fry in each section is given in Figs 1a and 1b.

The percentage composition of dace was generally higher than in the previous year presumably because there are no chub fry present (Fig 1). Dace fry were present in every section above and including Section 10. Low numbers were found in Sections 4 and 5 (Table 3).

Fig 2 shows the distribution of dace in the study sections. Less than 10% of the dace fry sampled occurred in the lower 12 sections. This shows that the spawning site at Yarm (Section 7) is probably not used to the same extent as before the introduction of the barrage. 40% of the dace fry came from two sections (13 and 20) in approximately equal numbers (Fig 2).

Roach make up a larger proportion of the catch in the upstream sites than they did in 1994, and form nearly all of the catch in sections 5 (>100 fish). The concentration of roach found in the middle sections in 1994 appears to be missing this year (Fig 1 and Table 3). The distribution of fry was sporadic. Four sites produced >75% of the fry (Fig 3). Roach fry were only found in one section of the lower 12 but were present in all other sections. Most fry were present in sections containing flow. The shoal sampled in Section 5 was in a stand of *Glyceria* but otherwise river conditions were similar to other sections in the lower river where no fry were found.

No chub were found in the June survey. In the previous year, over 1000 individuals were caught and they were present in almost all sections sampled.

Table 3. Number of fry of each species found in each section in R. Tees in June 1996

Section	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	25	
Barbel															3				10	39	1	1	10	
Bream																								
Chub																								
Dace			1	5						22	22	10	172	91	79	50	96	10	44	189	22	4	115	
Gudgeon															1	21		5						
Roach			1	159			1						93	10	3	7	169	57	21	37	10	225	19	
Grayling																								
Salmon																								
Rudd																								
Stickleback				3		4					3				5	4	2		22	14				
Flounder																								
Minnow											1		4		4	36	40	50	32	179	39	20	27	
Stone loach												1	1	4	3		6		110	24	15		13	
Bullhead																								

All previous surveys have shown that gudgeon fry have never been found in the lower sections of the river (below Section 12). Since the closure of the barrage, the distribution range has reduced with gudgeon fry only in and above Section 15 in 1995. In June 1996, distribution was again reduced, gudgeon fry being found only in sections 15, 17 and 19 (Table 3).

Barbel form a more significant part of the catch in June 1996 than in the corresponding month in 1995, being found upstream, at sites 15, 19, 20, 21 and 25 (Table 3).

1.3.2 Length frequency distribution

Length frequency histograms are shown for each species (Fig 4) and for dace and roach in each section in Appendices 2 and 3.

The dace show a bimodal length frequency distribution indicating two separate spawning times (Fig 4). The upper modal group are similar in size to the dace fry in June 1995. The fry which resulted from the later spawning were much smaller, having a modal length of 11mm (Fig 4).

Roach were slightly smaller this year, with a modal length of 9mm, as opposed to 11mm last year. More gudgeon were caught last year, but it appears that this year's gudgeon fry are of a similar length.

Barbel were well represented this year and had a modal length of 13 mm.

This year's spawning period appears to have been unusual as it has resulted in two modal size groups of dace fry and no chub fry. The sizes of the larger dace and those of gudgeon and barbel are similar to last year suggesting that the onset of spawning for these species was not delayed. Roach fry in 1996 were smaller than in the previous year and in addition to the total lack of chub, it suggests that spawning time for these species was delayed.

Dace fry from both modal classes appeared in most sections but it is clear that the majority of the first spawning occurred in the upstream sections (Appendix 2). There is no apparent difference in modal size of either class of fry between sections.

Last year, there appeared to be differential growth between sections with larger roach fry being found in the lower sections. This year, there is no differential growth apparent although the smallest individuals were found in the upstream sections (Appendix 3).

1.3.3 July survey

In response to the paucity of fry found in the lower sections of the river and the lack of chub fry, an extra sampling trip was planned for 10 July to concentrate on the fry of the lower river. Numbers of major and minor species caught are shown in Tables 1 and 2. No fry were found below Section 4 and in general, the lower sections of

river (Section 10 and downstream) contained few fry.

Chub were found in low numbers in Sections 6-10 compared to the June 1995 survey (Table 4). they did, however, constitute 80% of the catch in Section 8. Roach were more widely distributed than in the June survey but numbers were still low in comparison with 1995. The large number of roach fry found in Section 5 in June in a discrete area were not apparent in the July survey and may have been more widely distributed from a local spawning.

Gudgeon fry were found in these lower sections for the first time in the survey, ten in each of Sections 5 and 6 (Table 4).

Two bream fry were found in Section 4. This is the first record of this species in the study although it was known from anglers that adult bream were present in Preston Park Pool which is also in Section 4 (Table 4).

From the length frequency distributions for July (Fig 5) it can be seen that the fry have grown considerably. In three weeks the modal size of roach had changed from 9 mm to 17 mm and dace from 11-16 mm for the second spawning. The sizes of the chub fry are similar to those that occurred in June in 1995.

Table 4. Number of fry of each species in each section in the R. Tees in July 1996.

Section	1	2	3	4	4 (ORSU)	5	6	7	8	9	10
Barbel											
Bream				2							
Chub							1	6	19	1	4
Dace						2		1	3	1	13
Gudgeon					1	10	10				
Roach				3		19	21	41		22	
Grayling											
Salmon											
Rudd											
Stickleback				1			2				1
Flounder											
Minnow						2		2			
Stone loach						5					
Bullhead											

2. SURVEY OF ADULT COARSE FISH SEPTEMBER 1995

2.1 Introduction

This is the sixth year that the survey of adult coarse fish has taken place, and the second survey since the completion of the barrage and the subsequent increase in water levels. There was no apparent difference in the amount of submerged or emergent macrophytes since 1995, however, the quantity of filamentous algae had decreased.

In consultation with the Project Officer, it was decided to concentrate effort on Section 1 which was now a new habitat for coarse fish. This section is much longer than other sections (3.2 Km) and for sampling purposes, it was split into 5 sub-sections A-E. Each sub-section was c.320 m in length with a similar distance between sub-sections. A map of Section 1 is given in Appendix 4. All other sections normally fished in the adult survey were sampled except for Section 25. This site was visited once and was being fished by anglers. No other time was available to revisit this site. Section 21 was considered to be above the influence of the barrage and would thus act as a control.

2.2 Methods

2.2.1 Electrofishing

All sites were sampled by electrofishing. Site 21 was waded (twin anode 200 v, 1.9 KvA), and all other sites were electrofished with the boom boat.

The boom boat used 200 v at 10 amps from a 7.5 KvA generator. Each section was fished twice, once along each bank. With the negligible flow there was no necessity to fish in any particular direction and fishing was conducted down one bank and up the other. 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.

2.2.3 Processing

Length measurements were taken from each fish (fork length to the nearest 0.1 cm) and scales for ageing were taken from a representative sample of these. Scales were aged by the EA National Fisheries Laboratory at Brampton. On return of the scales, IFE re-examined a random sample of 10%. Where the number of scales of a species was 5 or less, all scales were re-examined. In addition, older dace and roach were aged if they did not fall into the random samples. In general, there was very good agreement. Out of 62 scales, IFE disagreed on the age of three and these were not used in the length age graphs. A further 15 out of 408 were left out when disagreement on the ageing was evident during back calculation. Information on growth rates from back calculations is not present in this report.

2.3 Results

4246 fish of 13 species were sampled from the lower R. Tees (Table 5). In addition, an estimate of the abundance of eels was made in each section. Sticklebacks were so numerous in Section 1 that it was not cost-effective, in terms of time, to process this species. The increase in numbers caught over the previous year was probably due to the extra length of river sampled in Section 1.

This year, the number of fish >8 cm (taken to exclude young of the year) was 2682. This is more than double the number caught in 1995. This increase was partly due to the extra water fished (700 were sampled from Section 1) but also from a good general recruitment in 1995.

Numbers of dace were similar to last year but both chub and roach numbers had increased substantially (100% and 50% respectively). The downward trend of flounder numbers has continued with numbers only half the 1995 value whilst gudgeon and perch numbers have continued to rise.

One adult salmon, length 74 cm was caught. Scales were read by both IFE and EA and both agree that it was a grilse.

2.3.1 **Distribution of fish**

Species compositions at each site are summarised in Fig 6. Pie charts for each section are shown in Appendix 5.

Quasi-quantitative information expressed as number of fish per 100 m of river for each section is given in Table 6. Comparisons between sections and years may be made only after due regard to the different efficiencies with which each section is fished. Sections are more comparable post-barrage as the variability of factors such as depth and state of tide has been substantially reduced or eliminated.

Dace were found in all sections fished although the distribution as measured in terms of numbers per 100 m of river has altered. Density estimates were high in Section 1 (A-E) except for sub-section B. Densities in Sections 2-5 were lower than in 1995 and those in the middle sections (6-13) were similar to last year. There were reduced densities in the upper sections (14-16 and 21) in comparison with the previous year. Dace are still present in higher densities than either chub or roach and appear to be tolerating the low flow conditions.

Roach were found in all sections except Section 2 where a high density was recorded last year. The density of roach in Section 21 was very high (49.1 fish 100m⁻¹). Generally, roach densities appear higher this year.

Chub were absent from Section 1B, but were present in all other sections. Chub densities generally seem higher than last year. Numbers in Section 1 have increased since 1995, and chub densities in this section are now similar to those of roach.

Table 5. Species list for the R. Tees and number of each species caught - September 1996

Species	Totals
Barbel <i>Barbus barbus</i> (L.)	17
Chub <i>Leuciscus cephalus</i> (L.)	1108
Dace <i>Leuciscus leuciscus</i> (L.)	1713
Eel <i>Anguilla anguilla</i> (L.)	>>500
Flounder <i>Platichthys flesus</i> (L.)	69
Gudgeon <i>Gobio gobio</i> (L.)	306
Ide <i>Leuciscus idus</i> L.	1
Minnow <i>Phoxinus phoxinus</i> (L.)	202
Perch <i>Perca fluviatilis</i> L.	9
Pike <i>Esox lucius</i> L.	1
Roach <i>Rutilus rutilus</i> (L.)	797
Salmon <i>Salmo salar</i> L.	1
Stone loach <i>Barbatula barbatula</i> (L.)	3
Three spined stickleback <i>Gasterosteus aculeatus</i> L.	many
Trout (brown) <i>Salmo trutta</i> L.	19
Total (without eels and stickleback)	4246

Table 6. Number of fish per 100 m found in each section in September 1996

Section	Dace	Roach	Chub
A	19.7	5.8	0.8
B	3.8	0.3	0
C	15.0	8.3	6.9
D	15.9	2.5	3.9
E	15.6	5.8	8.8
2	3.9	0	1.1
3	7.1	0.7	5.2
4	4.6	1.1	2.7
5	11.1	4.2	6.7
6	6.9	0.5	2.0
7	12.2	8.8	8.8
8	19.2	5.3	10.7
9	16.0	7.5	11.2
10	7.9	6.6	7.6
11	9.1	3.8	5.2
12	13.9	9.6	13.0
13	10.3	2.9	16.7
14	3.1	0.4	4.4
15	3.2	0.3	1.9
16	4.8	2.7	12.5
21	12.8	49.1	15.2

2.3.2 Length frequency distribution

The length frequency distribution of each of the major species is presented in Fig 7 and for dace, chub, roach and gudgeon this is also given by section fished (Appendices 6-9).

In 1995, the young of the year were removed from the figure as they were present in such large numbers that the size distribution of older fish was masked. This year, these fish are in the 1+ class and can be seen as a major year class. Young of the year are shown and are present in much lower numbers suggesting that 1996 year classes will be poorer than those of 1995.

There was expected to be a good number of larger dace corresponding to the high number of 8-12 cm fish in 1995. These were not found. A few individuals were found in Sections 1-7, 16 and 21. There was a complete absence of large dace in Sections 8-15. Unlike 1995, young of the year were not found below Section 5, but were found in each section upstream of this. In the June and July fry surveys, very few dace fry were found in the lower sections.

The catch of chub around 10cm length has increased since last year, indicating good survival of the 1995 year class. The 1996 0+ class is small in comparison to 1995 0+ class (Fig 7). Individuals from this class were not caught in sections downstream of Section 8, and are also absent from Section 15. Chub fry were not caught in June, and were not found below Section 6 in July. Larger fish seem to be more numerous in upstream sections, but also appear in Sections 4 and 5. The size distribution of the 6-13 cm cohort is different in Section 7 where there were a preponderance of smaller sized fish (mode 7 mm) and relatively few 9 and 10 mm fish which form the majority of the cohort. The reason for this is unknown.

The catch of young of the year roach was lower than last year, whilst the catch of 8cm group fish was much higher, indicating good survival of the 1995 year class (Fig 7). More fish greater than 10cm were also caught this year, although the number of fish caught that are greater than 20cm has decreased. Some of the largest roach were found in the lowest sections, with the exception of Section 2 where no roach were found (Appendix 8). Young of the year roach were not found below Section 4 (Appendix 8). June and July fry surveys also failed to find any roach fry below Section 4. This is in direct contrast with 1995 when large numbers of young of the year were found particularly in the Sections 1 and 2, many of these fish being 5-6 cm indicating very good growth. This year, relatively few 5-6 cm fish were found anywhere in the river. The general distribution of young of the year is greater than that for fry. They have not migrated any further downstream but Sections 8-12 where no roach fry were found now all have young of the year.

As with dace, roach and chub, the length frequency distribution of gudgeon shows a large cohort corresponding to last year's 0 group fish (Fig 7). Only one gudgeon was found downstream of Section 5 (sub-section C, 15cm category) whilst the majority were found in the Yarm area of the river (Sections 7-10) (Appendix 9 and Fig 8). The fry survey indicated that the spawning areas were not within these sections as fry were

found in Sections 15, 17 and 19 only in June and in Section 5 and 6 (and Section 4 ORSU) in the July survey. Young of the year gudgeon in September were found in Sections 5, 7, 9, 10, 14 and 16, indicating that gudgeon spawning and juvenile habitats are also in different places.

The length frequency data for barbel given in Fig 7 is based mainly on fish from Section 21. Only three barbel were found outside this section. Barbel fry were found as low as Section 10 in the June survey. It is unlikely that these resulted from as high up the river as Section 21 and it is thus expected that very low densities occur lower down the river.

The size distribution of flounder is very similar to last year although numbers are very much lower (Fig 7). This suggests that some individuals are still entering the river, probably through the lock otherwise the smaller length categories would have disappeared by now.

Although perch numbers appear to be increasing, no fry or young of the year were found.

2.3.3 Year class strengths

The length frequency histograms for each age group of dace, chub, roach and gudgeon are shown in Figs 9-12. 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.

Most of the dace caught were 1+ and 2+ (Fig 9). These correspond to the strong year classes of 1994 and 1995, seen last year as 0+ and 1+. This year, numbers of young of the year were low and it is expected to be a poorer year class.

In 1995, very few 2+ were sampled and this corresponds to the fact that only one 3+ was found this year. In general, very few large dace were sampled. The oldest were only 4+ whereas reasonable numbers of 4+, 5+ and 6+ were found in 1995.

In many previous years, chub up to the age of 15+ were caught. This year, as with dace, the older individuals were absent from the samples with fish up to 11+ only being caught (Fig 10). High numbers of 1+, 2+ and 4+ correspond well with high numbers in the appropriate groups last year. Low numbers of 3+ were seen which represents the poor year class of 1993 which has been recognisable in previous years. Numbers of 7+ fish were low compared with numbers of 6+ last year.

In this year's September survey roach up to 6+ were sampled. The good year classes of 1994 and 1995 can be clearly seen as 2+ and 1+ individuals (Fig 11). Young of the year were low in numbers this year and will presumably result in a poorer year class. Very few large roach were caught although these might be expected to be in the deeper water in the lower sections.

Although the size range of each year class of gudgeon is similar to previous years, good and poor year classes cannot be followed through the population as they can with dace, chub and roach. Numbers of 2+ and 3+ in 1996 were higher than the corresponding age groups in 1995 (Fig 12). It is apparent that the number of fish from which scales were taken was too low.

3. TEMPERATURE

Originally, there were four temperature loggers in operation in the lower Tees. The Stockton logger was removed when the marina was shut following closure of the barrage. No new site has been identified. The logger in the Low Worsall ORSU was stolen last year and has not been replaced. The thermistor cable at Low Moor was broken by sheep (presumably) and the logger at Ingleby Barwick Farm, although functioning, is not accurate.

This situation has been discussed with the Project Leader but no solution was reached.

4. ANGLING DATA

4.1 Methods

The system set up for anglers to record data from matches has been reasonably successful this year. Data on individual angler's catches continues to be collected. The total weight of each catch is recorded along with the composition in terms of numbers of each species of fish. Dace, roach and chub have been split into large and small fish, large dace and roach being >6 oz and large chub being >1 lb. Match sheets now include gudgeon, perch and grayling. Also recorded are the position on the river (peg number), and a subjective assessments of the river and weather conditions.

Due to the fluctuations in numbers of anglers fishing each competition, and in particular due to the poor attendances in recent years, the anglers felt that the mean catch per angler was giving a result which was artificially high. The few anglers fishing were given what were expected to be the best pegs and comparisons with previous matches, where many anglers failed to catch anything, may not be valid. In order to address this, the mean catch per angler for the top ten catches in each match was calculated, in addition to the mean catch per angler for all competitors in each match.

4.2 Results

4.2.1 Mean catch per angler

The mean catch per angler was calculated and appended to those of previous years (Appendix 10). The mean catch weight per angler value is not significantly greater than the 94/95 value, but is significantly greater than the 93/94 value, indicating a rise in mean catch weight since 93/94, and a recovery from the decrease in catch weights between 1991 and 1994 (Fig 13). A similar pattern emerges from the mean catch weights of the top ten anglers in each match, with the 1995/96 mean being significantly greater than that of 1993/94 and 1994/95 (Fig 14).

These results represent the first complete angling year since the closure of the barrage.

Catch weights are significant higher than in the two previous years even though the lack of tidal influence has created more available habitat for the fish.

4.2.2 Distribution of catch weights along the river

The mean catch weight per peg for all matches since the closure of the barrage are given in Fig 15. The data are split into four time periods as previously reported. Fish are more widely distributed along the river and fewer blanks are produced. The 'alphabet' pegs were again fishing better than most other pegs during the November - February period (Fig 15). Catch weights in the February - March period were very low with the majority of pegs producing no fish (Fig 15).

5. ANTICIPATED COSTS OF THE WORK IN THE PERIOD UP TO MARCH 1997

The anticipated cost of the work is expected to be £34671.

6. PROGRAMME FOR THE NEXT REPORTING PERIOD

Sampling programmes for fry and adult fish will again take place in the summer and in September respectively. Angling data will continue to be collected.

7. FACTORS LIKELY TO AFFECT THE COMPLETION OF FUTURE WORK

It is possible that adverse weather conditions may delay the sampling programme in the short term but it is unlikely that the completion date of the project will be affected.

FIGURES AND APPENDICES

Figure 1(a) Species composition of fry in the R. Tees in June 1996 at various sites.

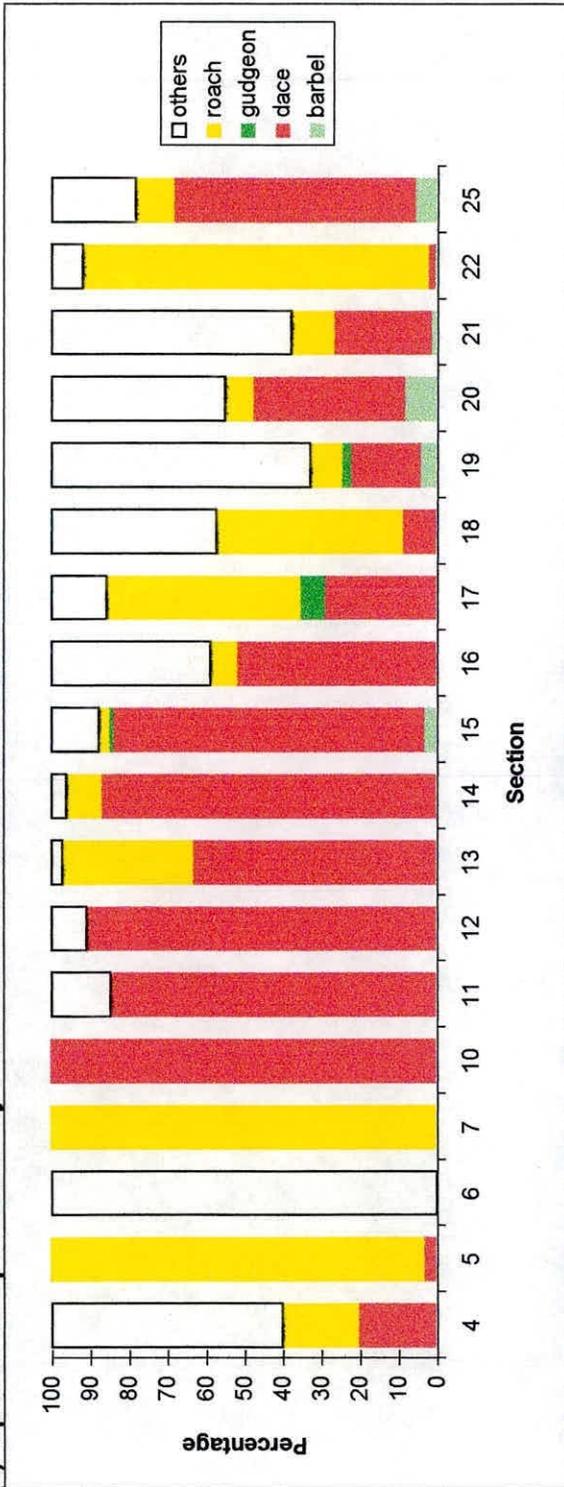


Figure 1(b) Species composition of fry in the R. Tees in June 1996 at various sites. (minnows, stone loach and stickleback removed)

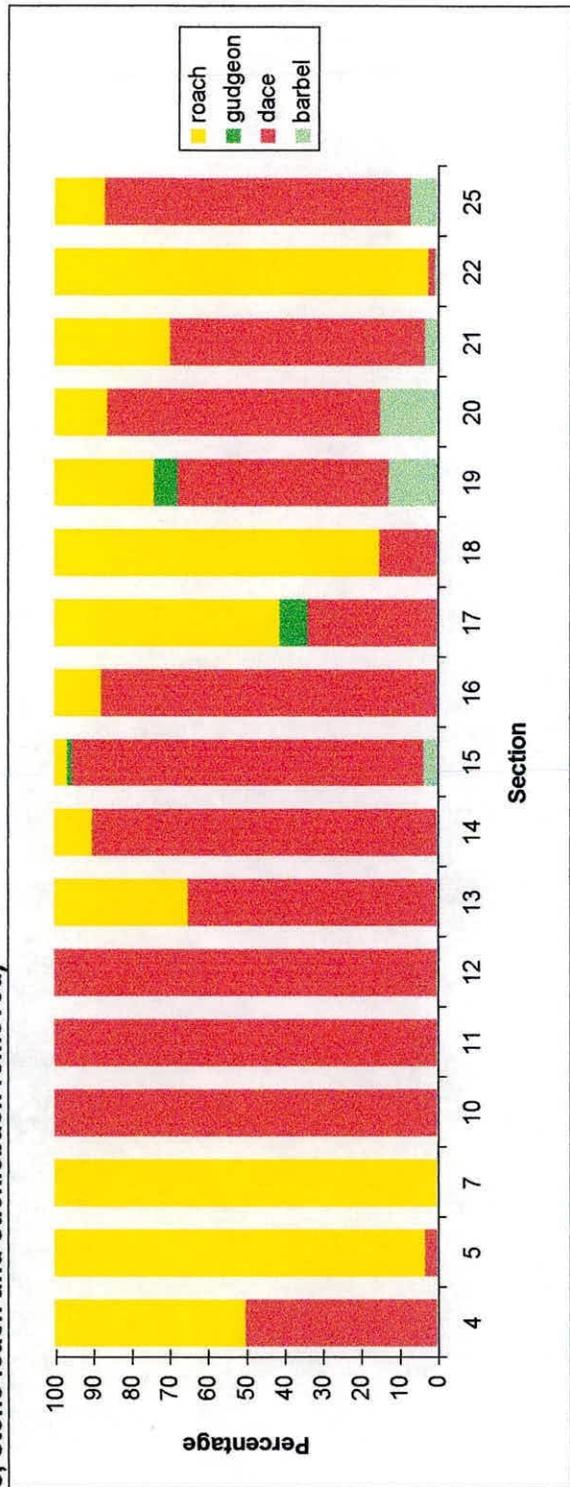


Figure 2. Percentage of dace fry at each site along R.Tees June 1996

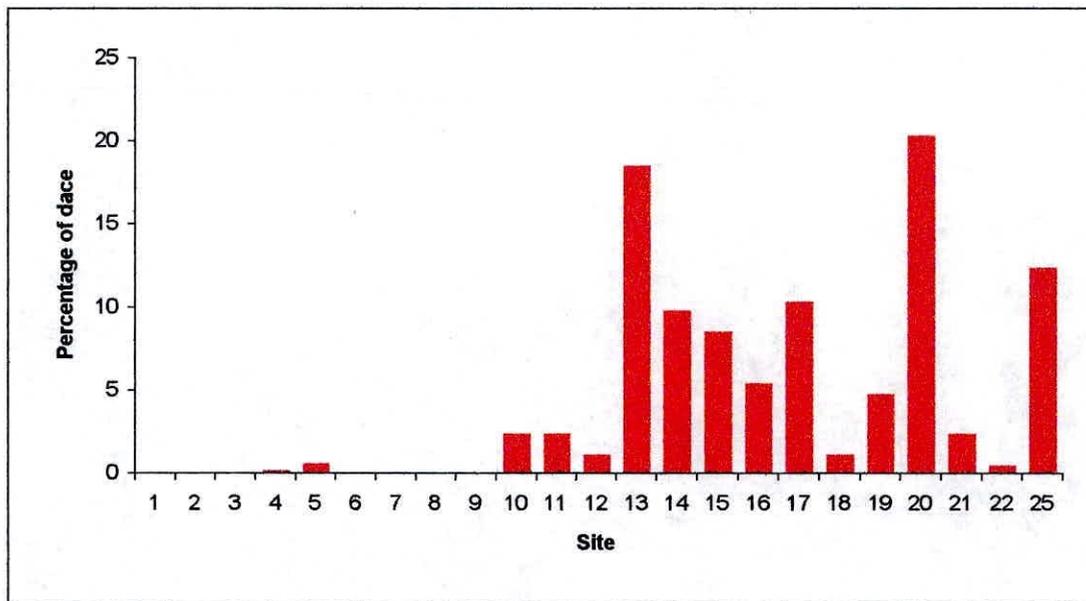


Figure 3. Percentage of roach fry at each site along R.Tees June 1996

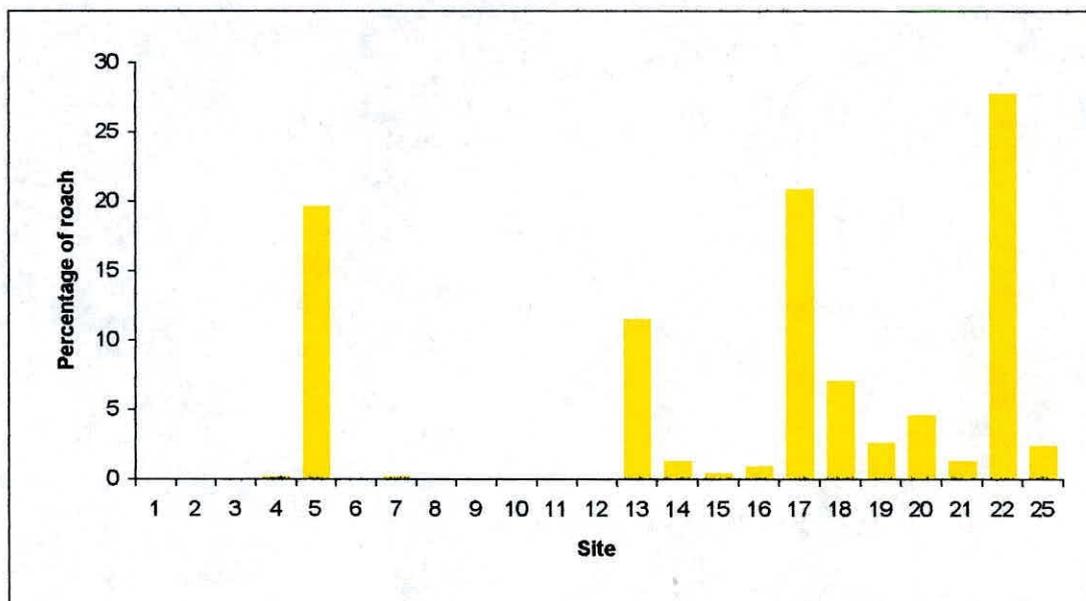


Figure 4 Length frequency histograms for each species of fry in the R.Tees in June 1996

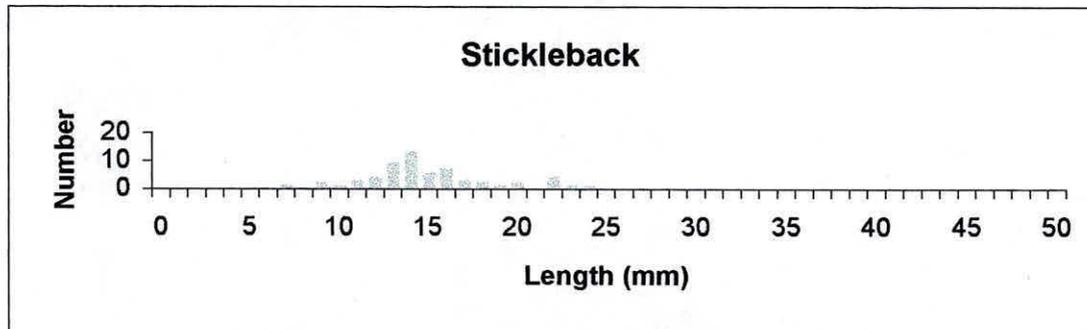
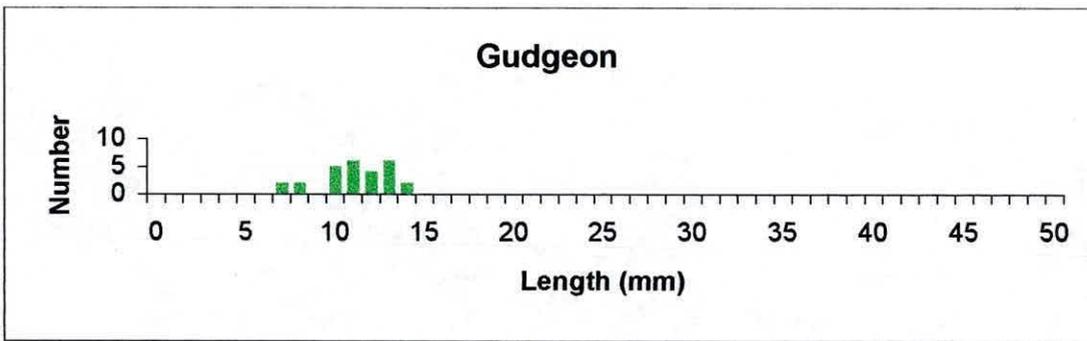
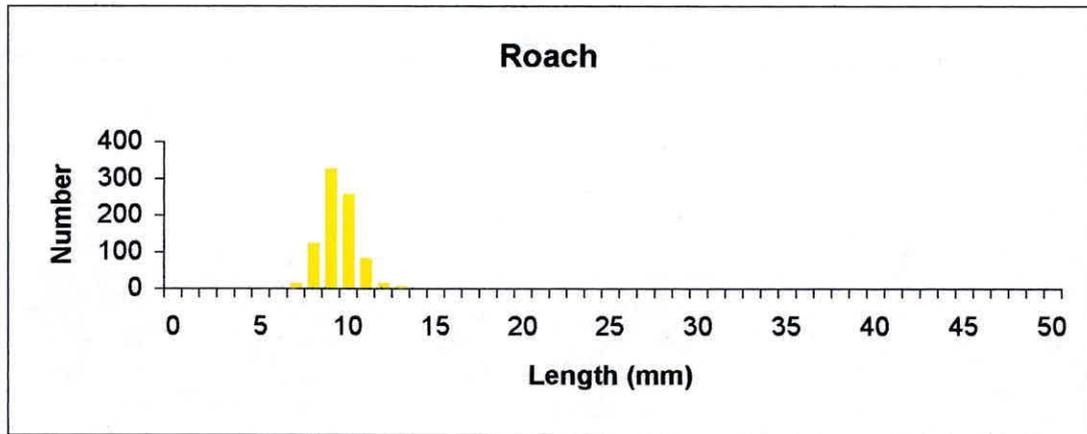
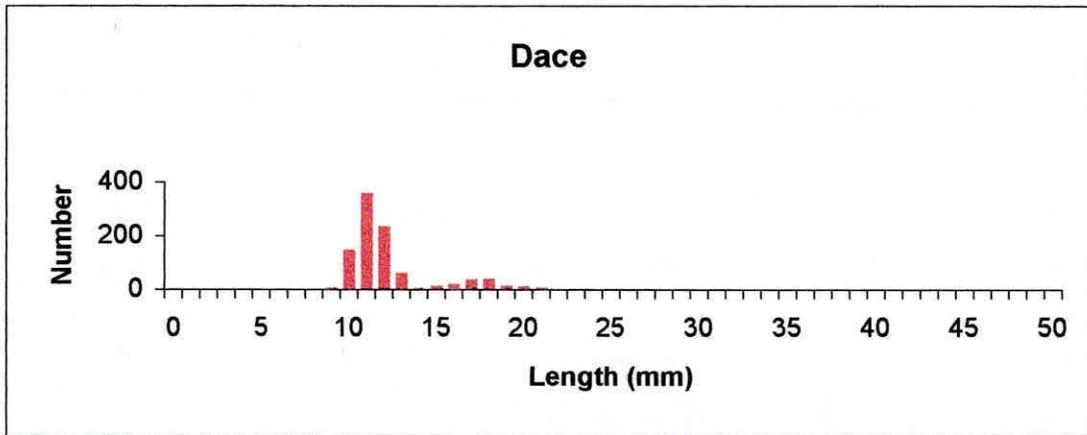


Figure 4 continued

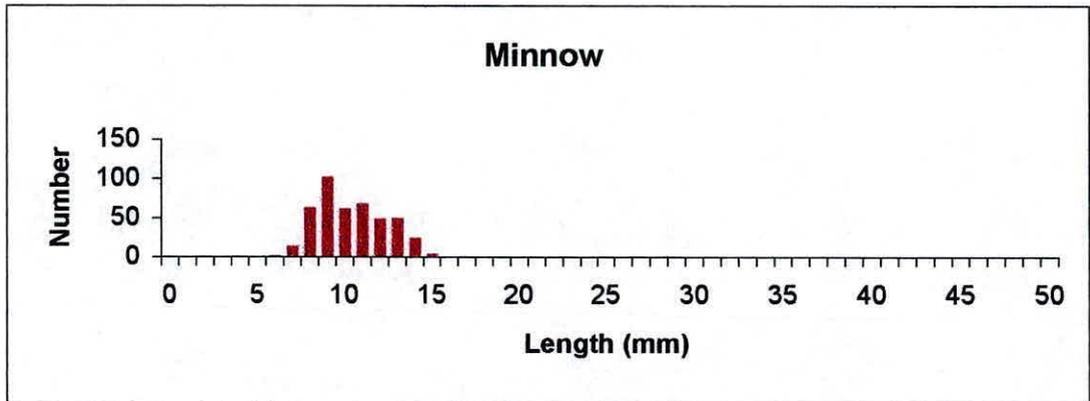
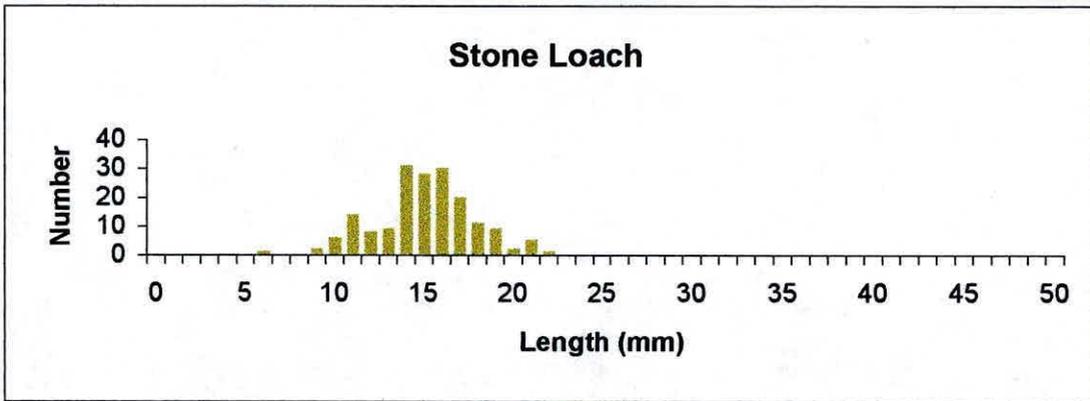
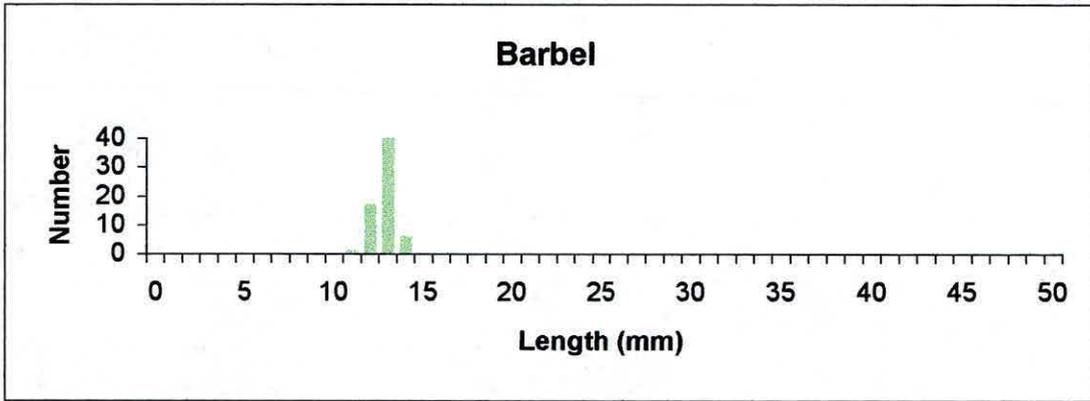


Figure 5 Length frequency histograms for each species of fry in the R.Tees in July 1996

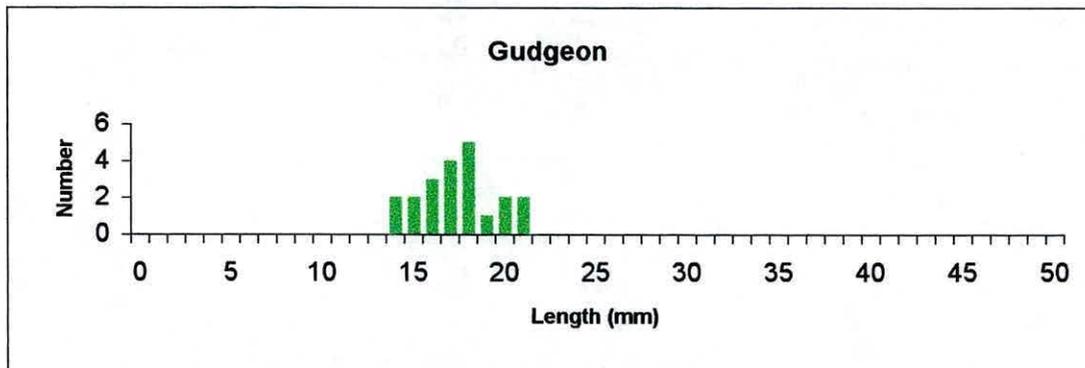
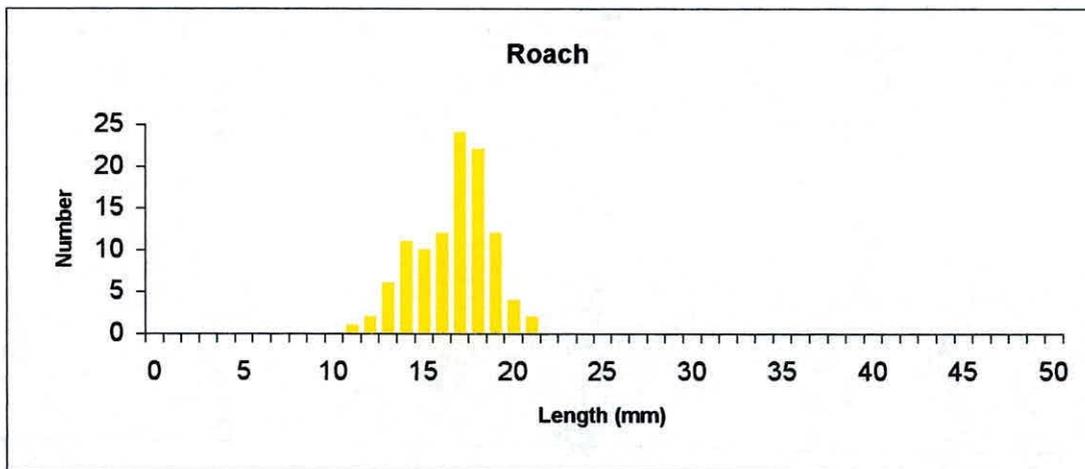
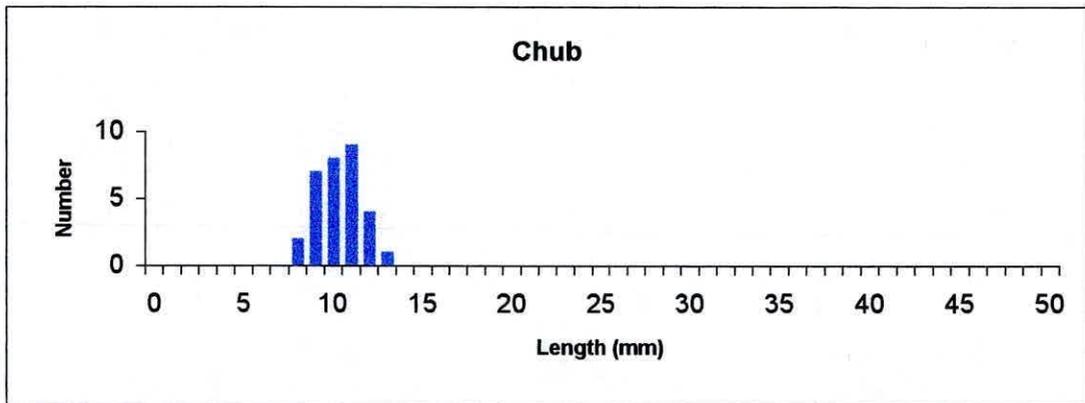
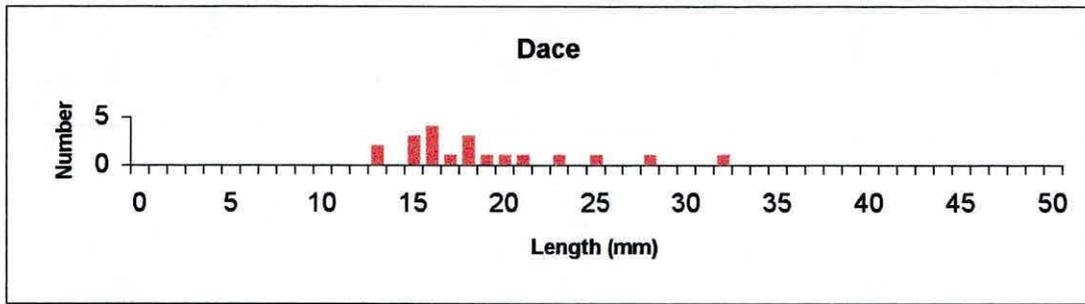


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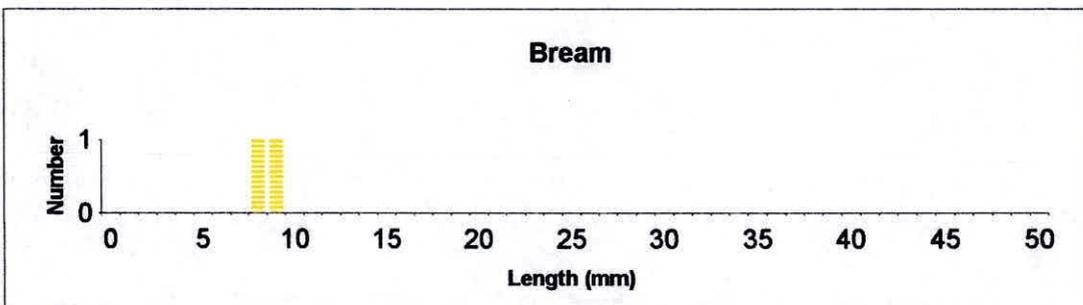
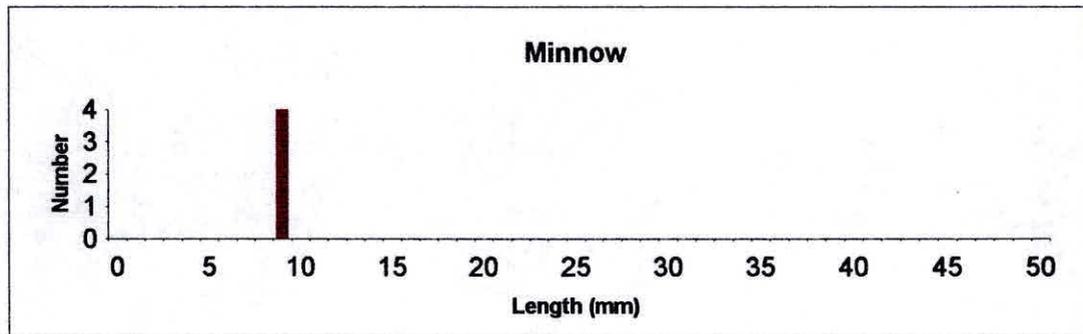
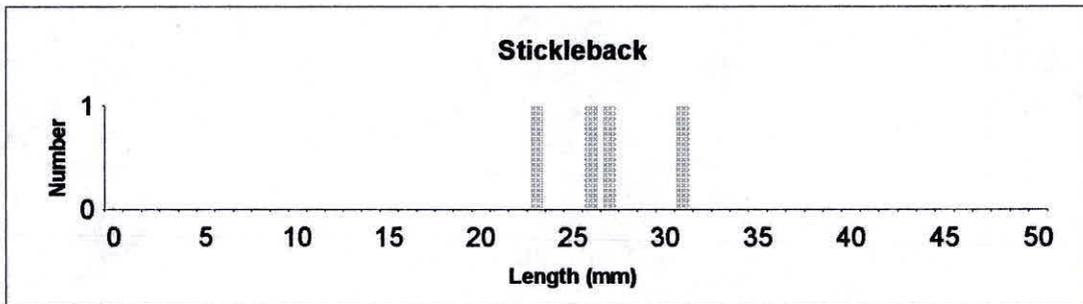
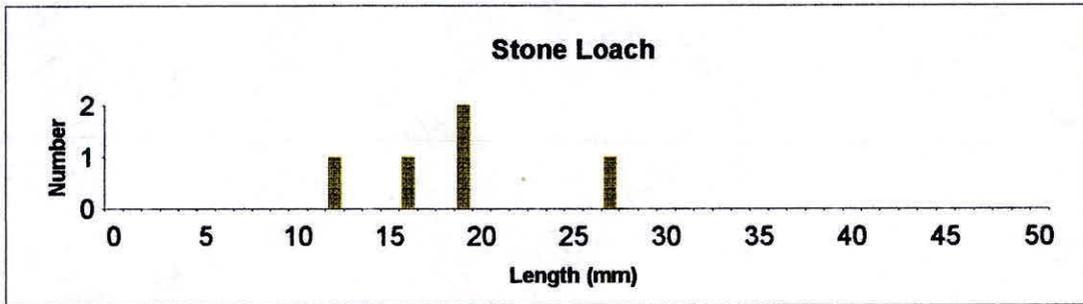


Figure 6 Species composition of fish in the R. Tees in September 1996 at various sites.

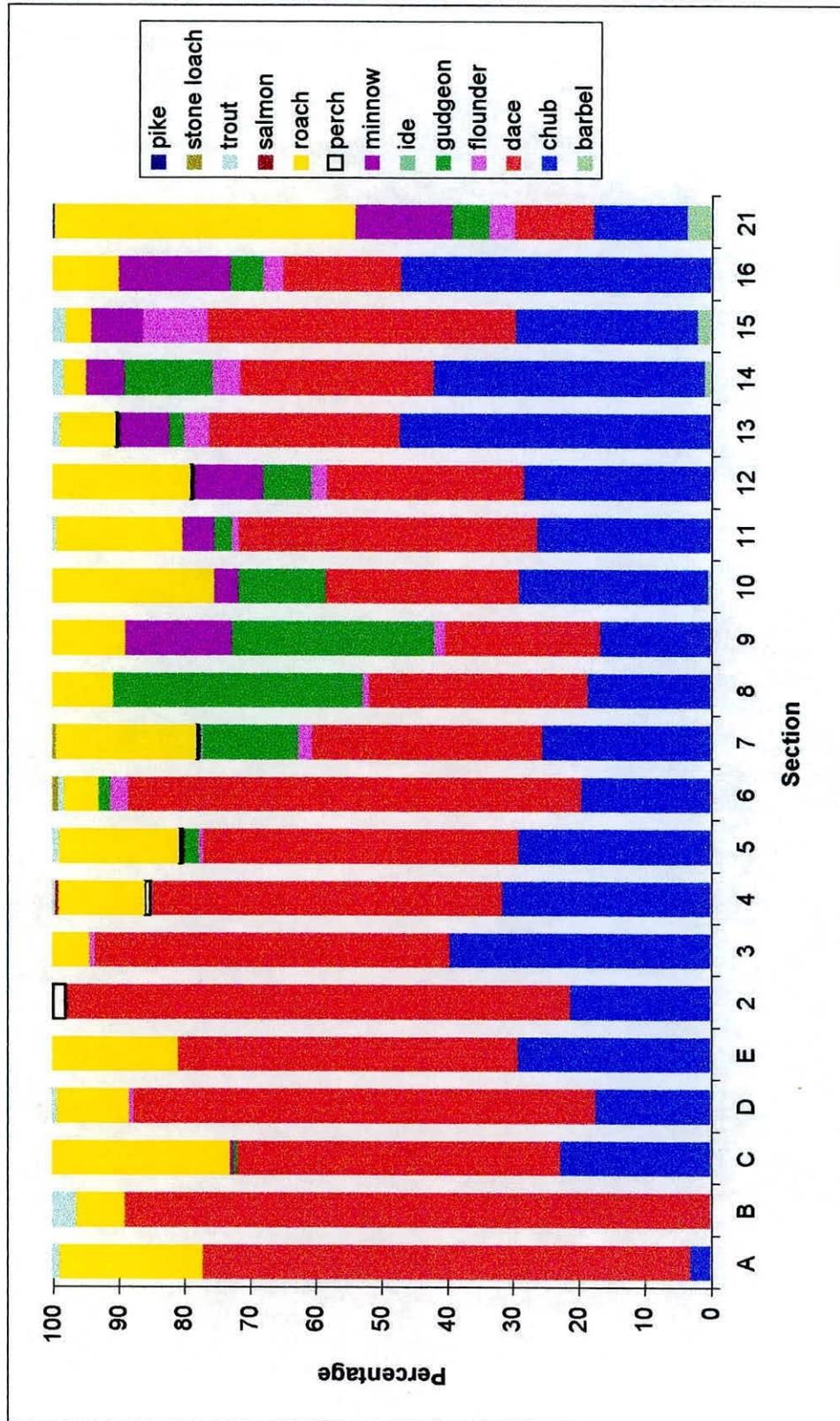


Figure 7 Length frequency histograms for each species of adult fish in the R.Tees in September 1996

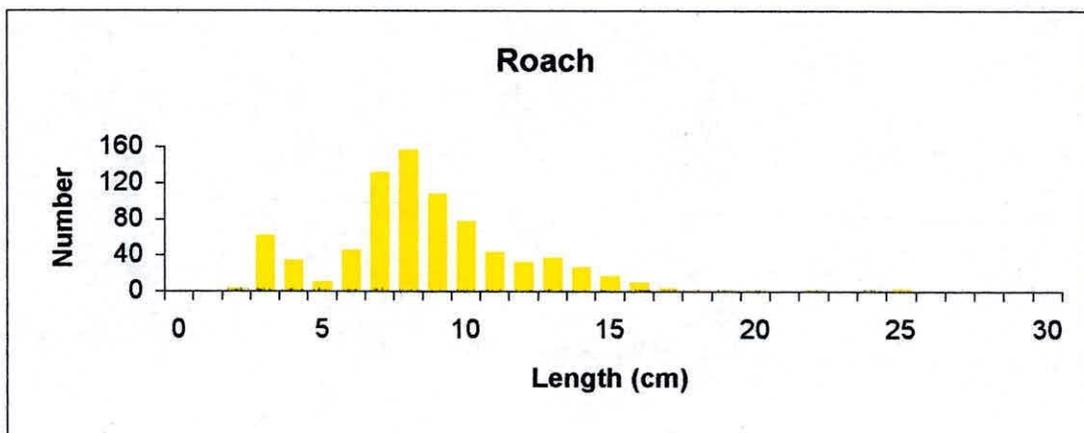
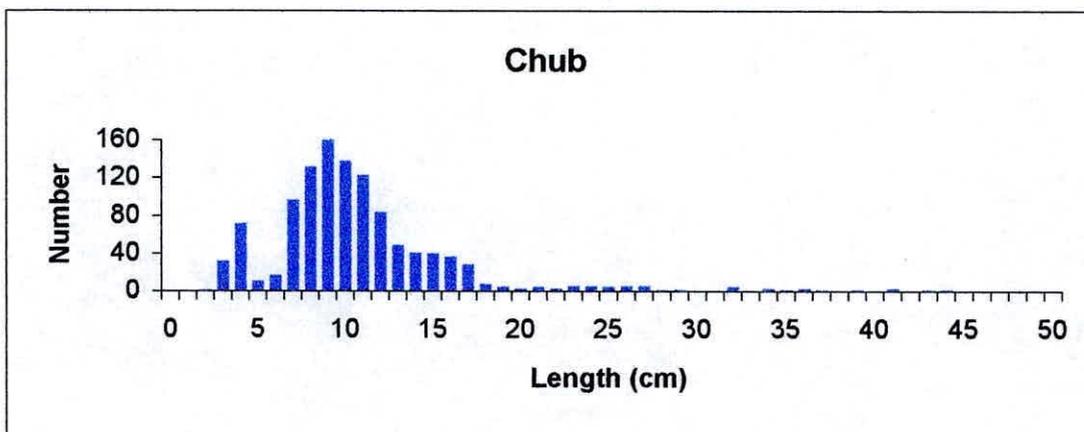
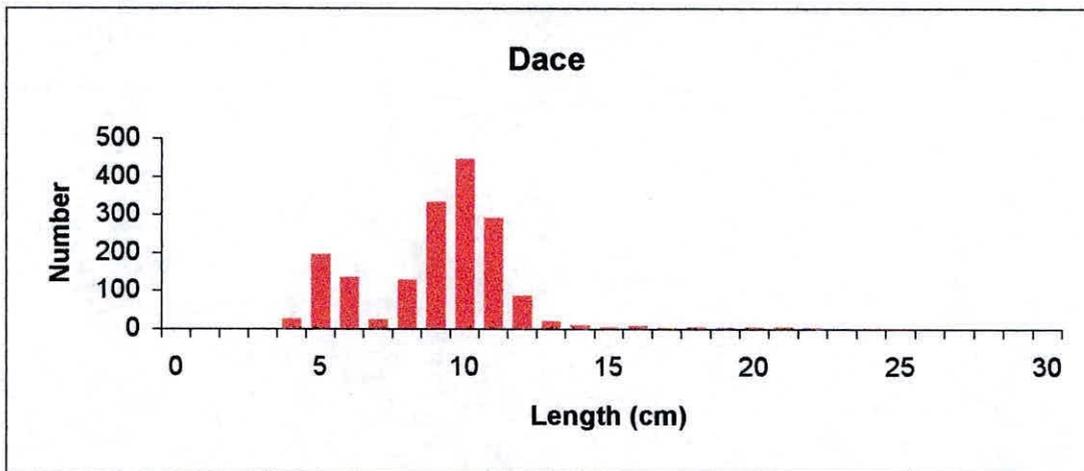


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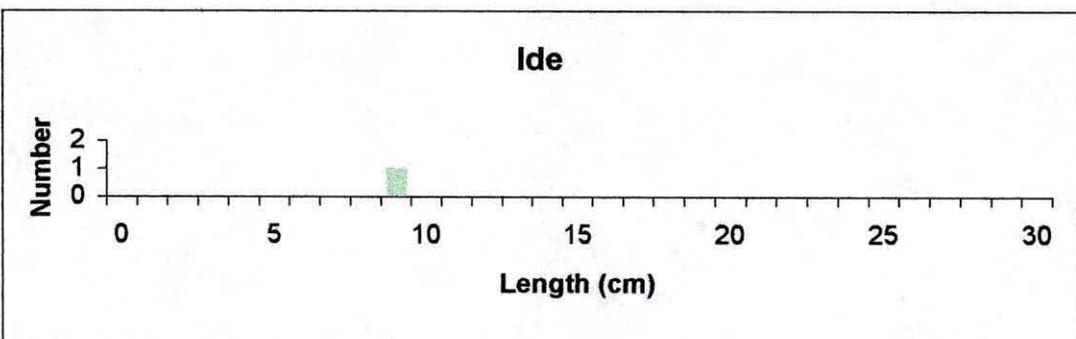
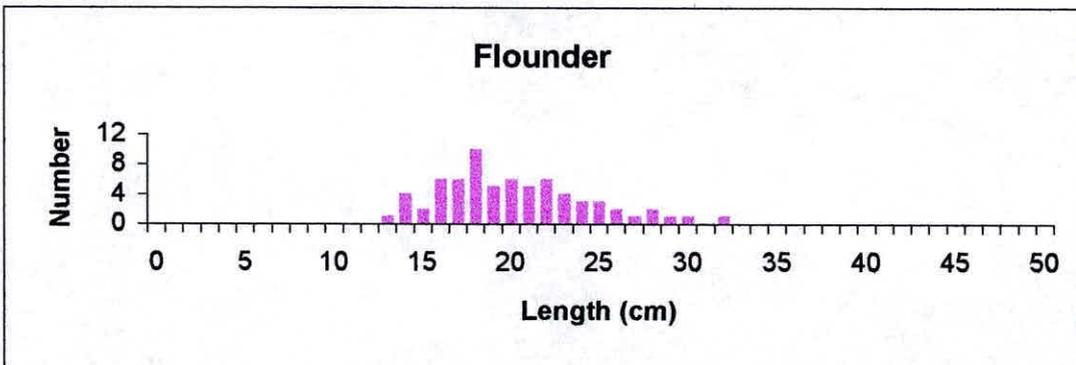
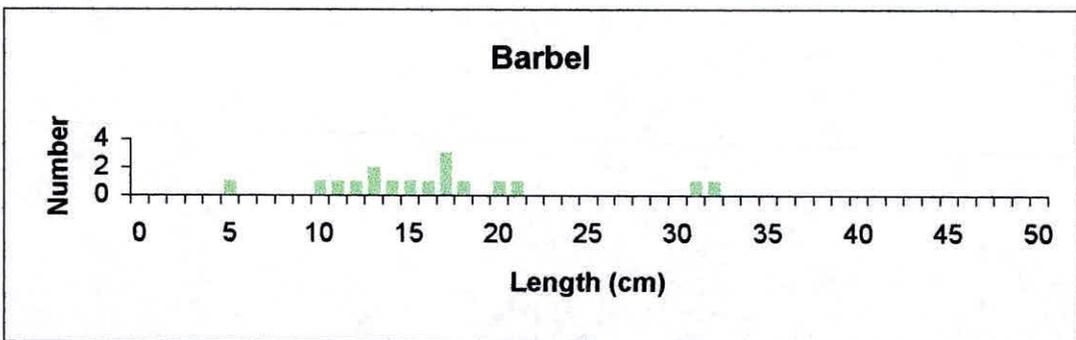
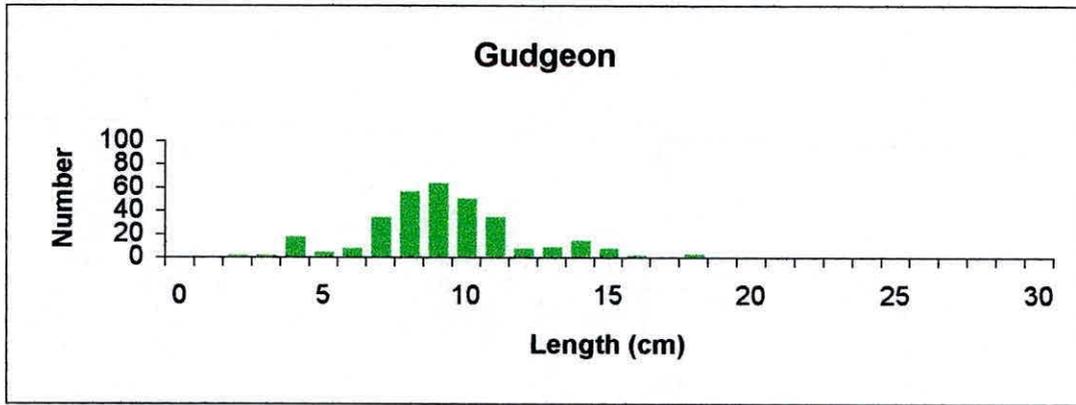


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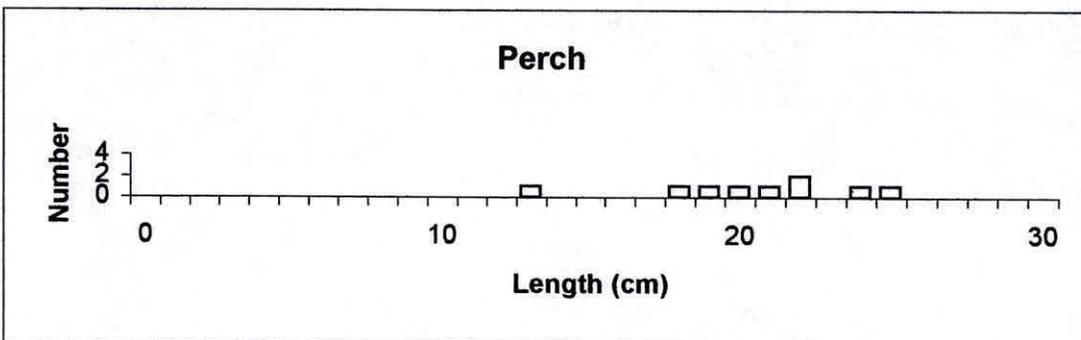
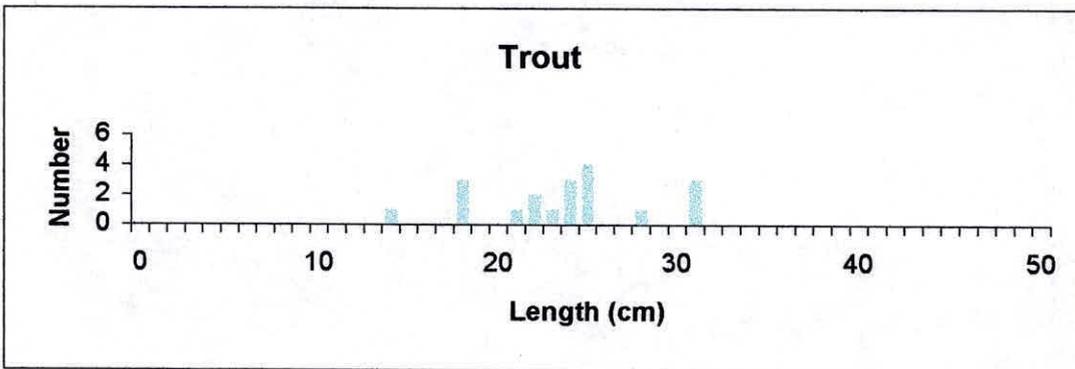
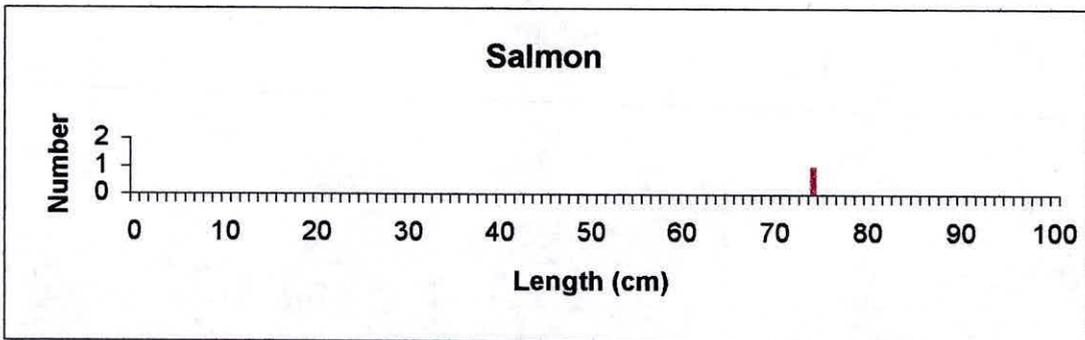
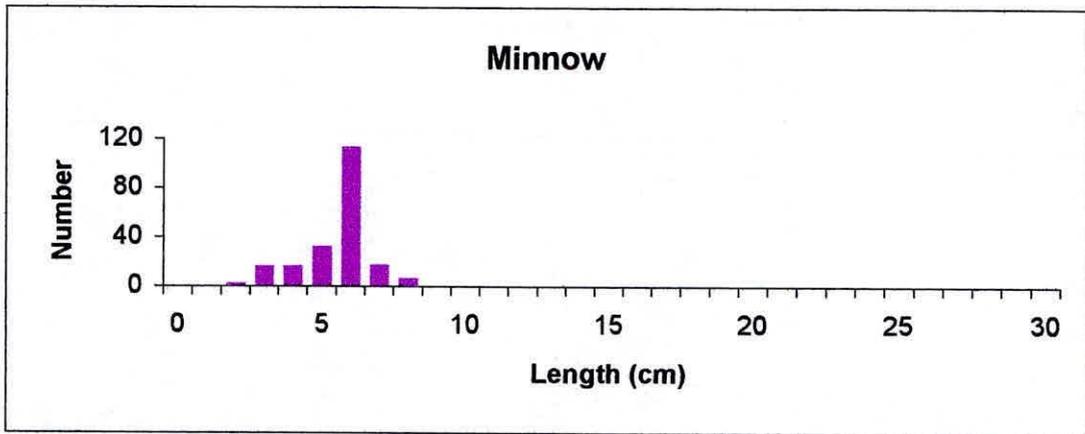


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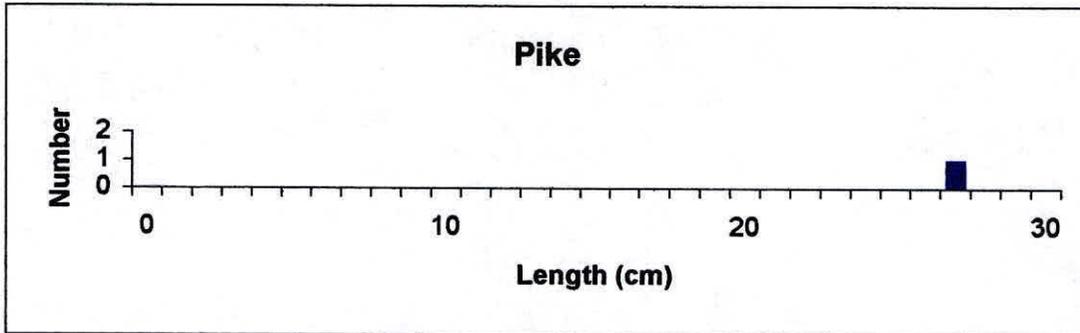
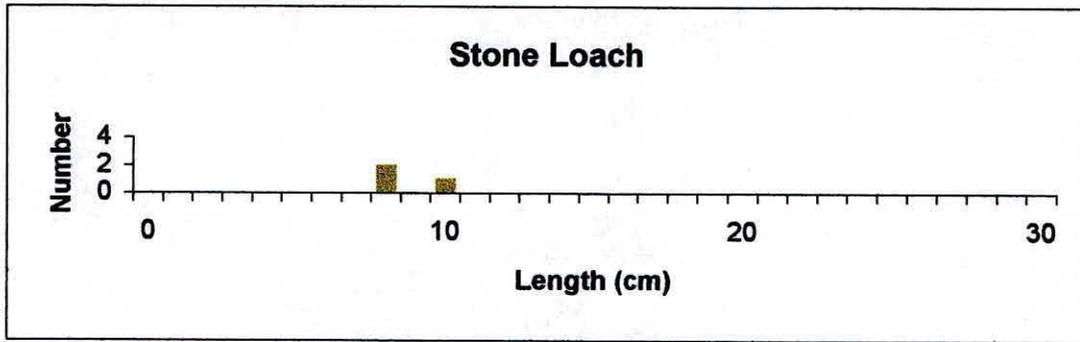


Figure 8 Percentage of gudgeon at each site along R.Tees September 1996

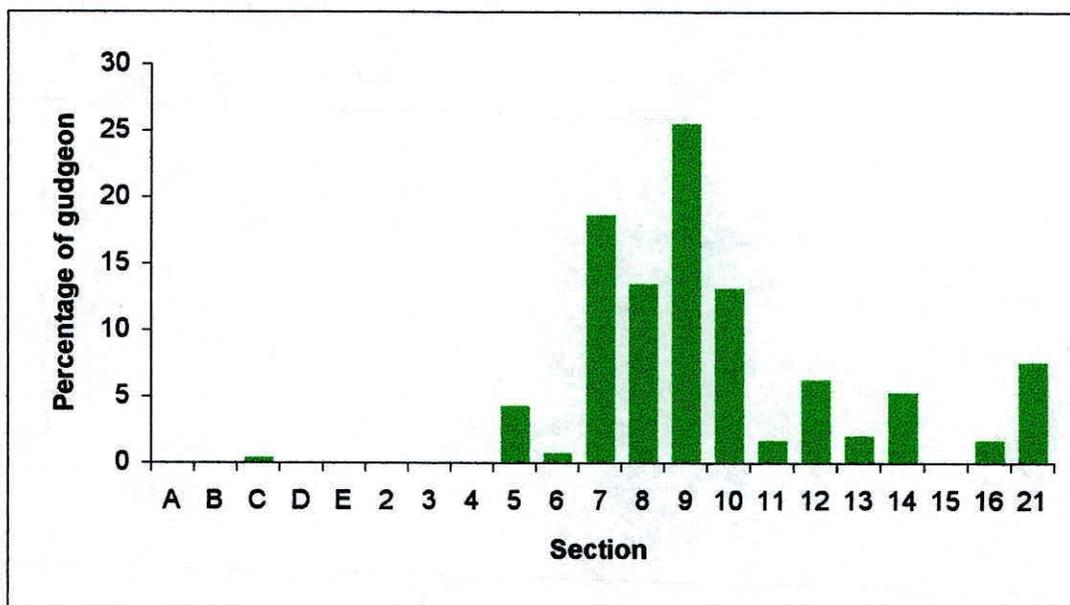


Figure 9 Length by age for dace in the R.Tees in September 1996

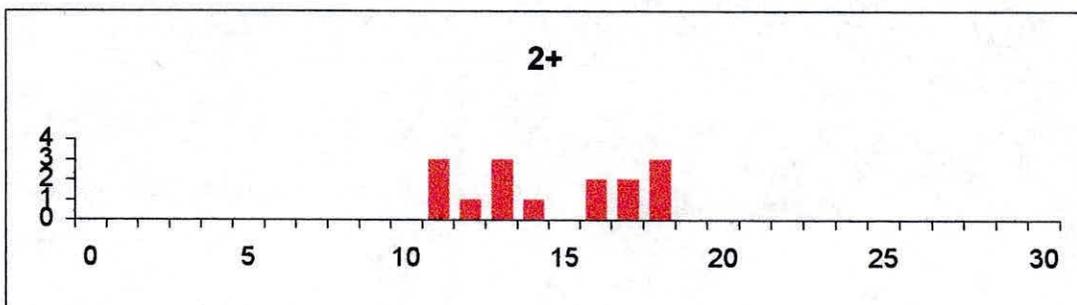
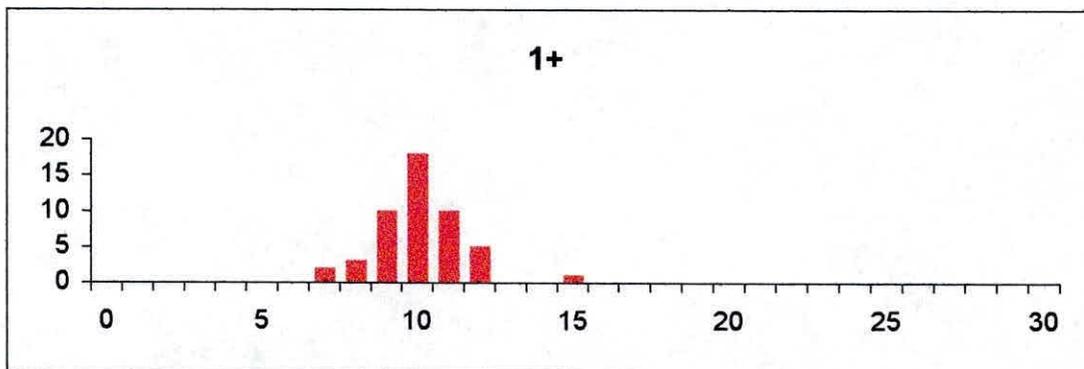
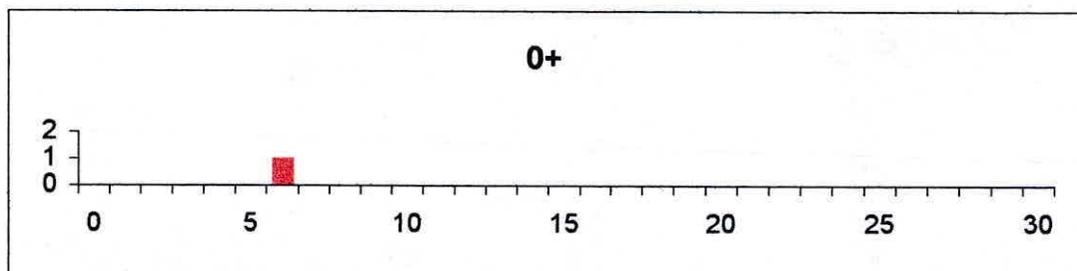
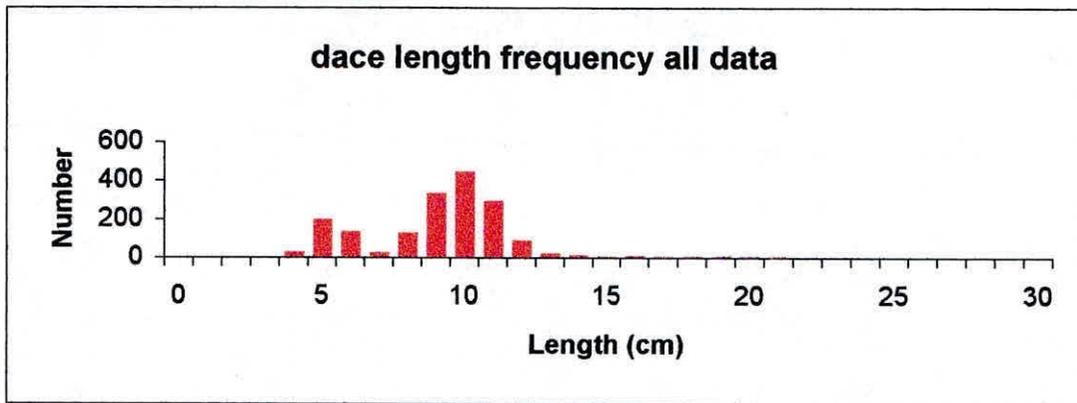


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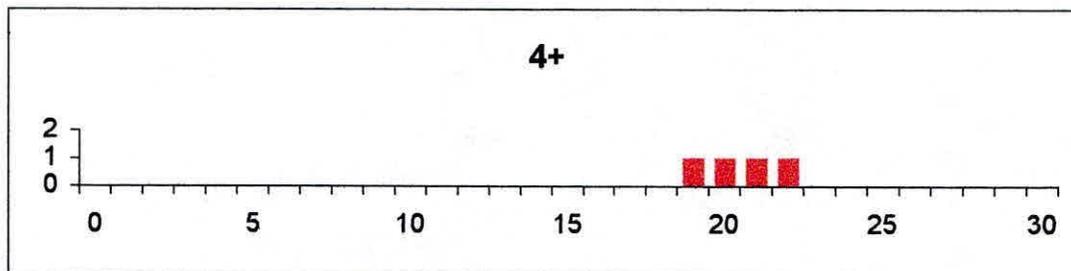
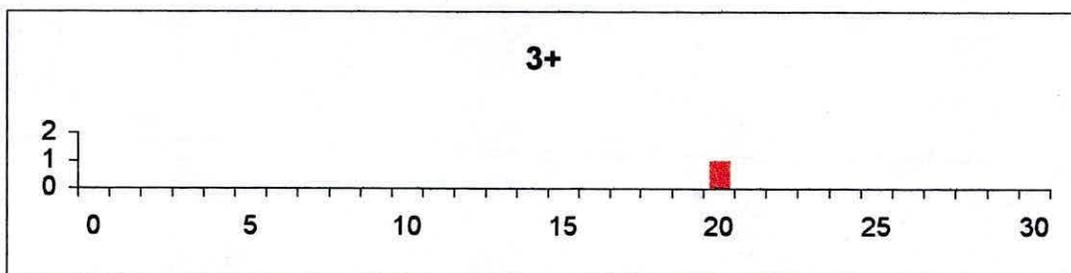


Figure 10 Length by age for chub in the R.Tees in September 1996

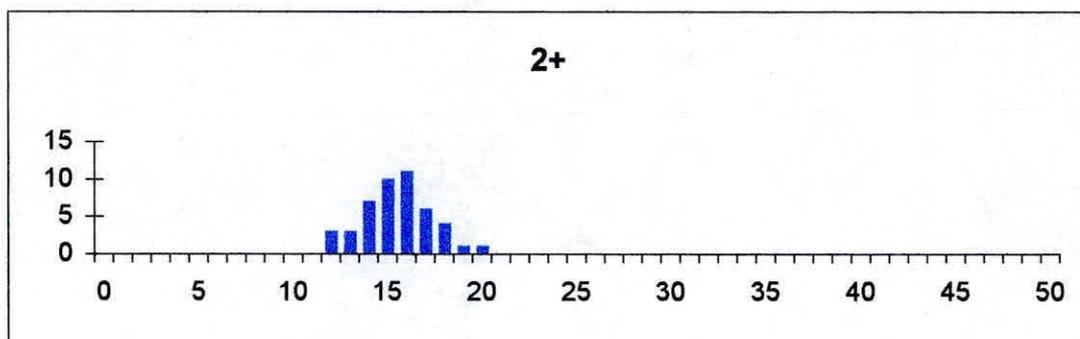
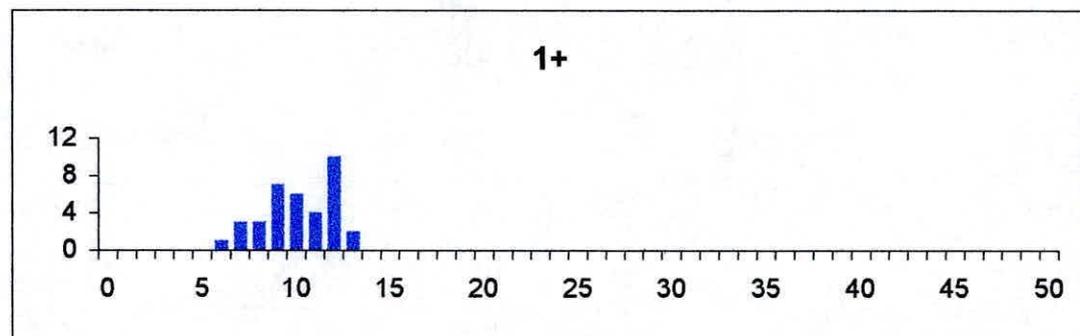
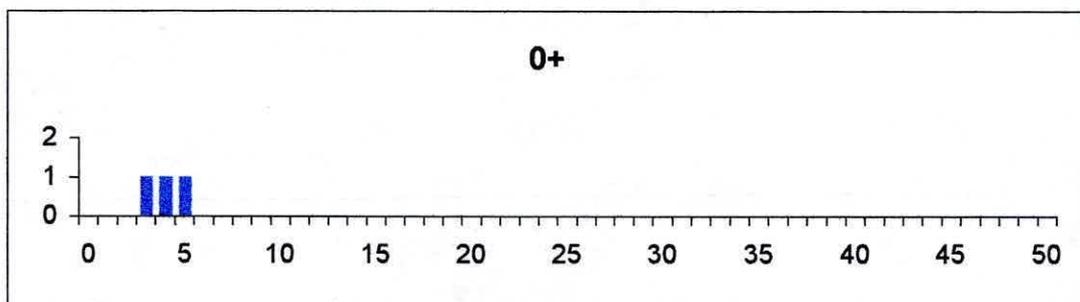
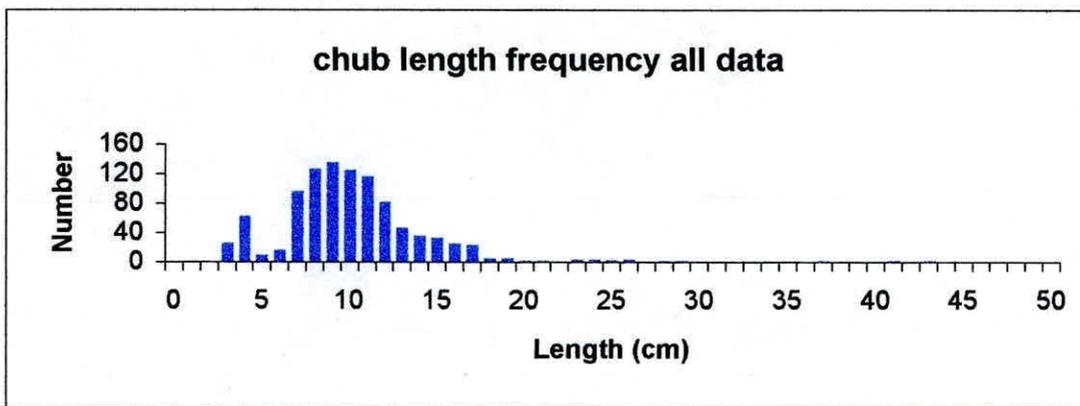


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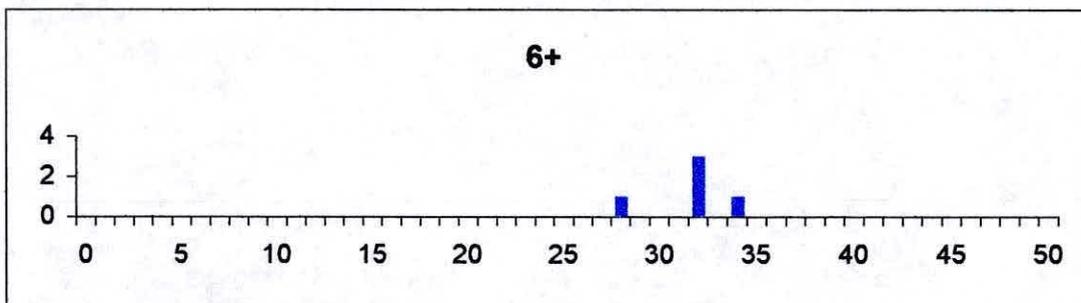
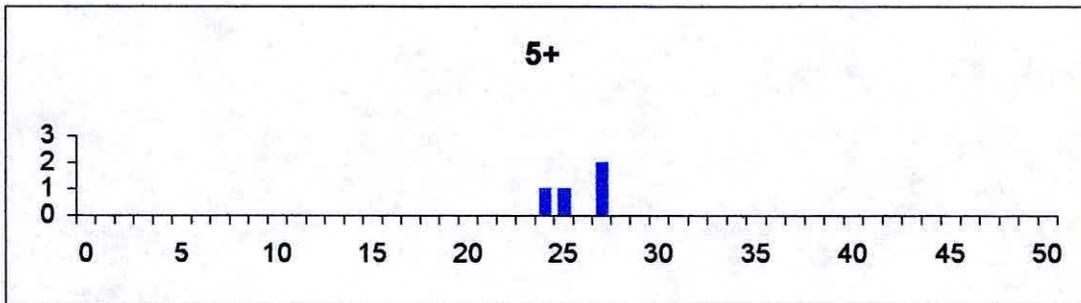
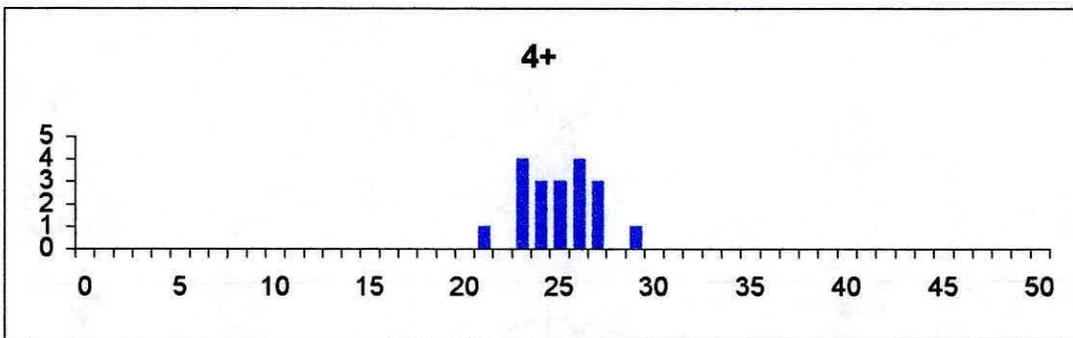
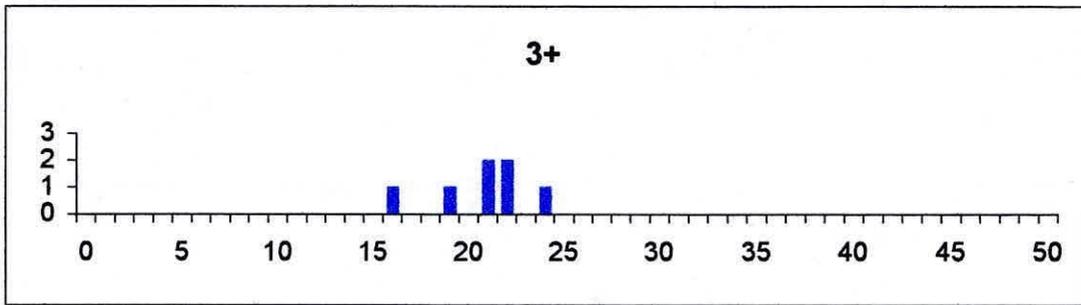


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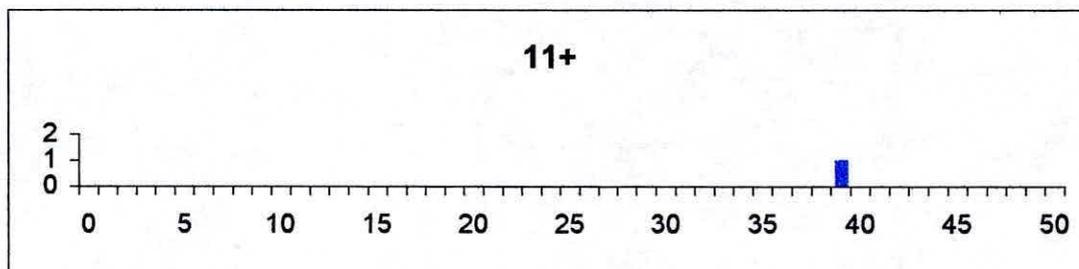
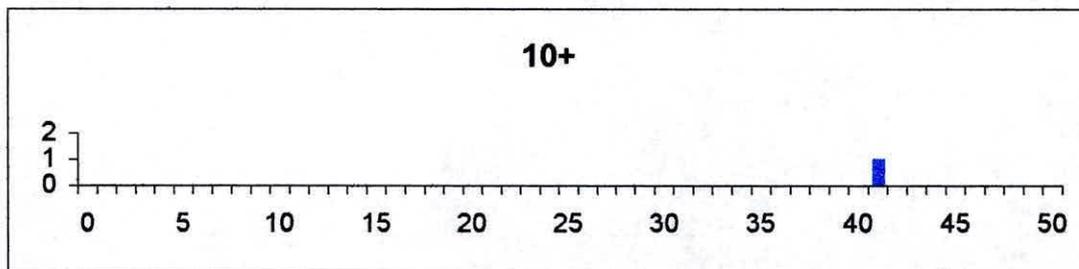
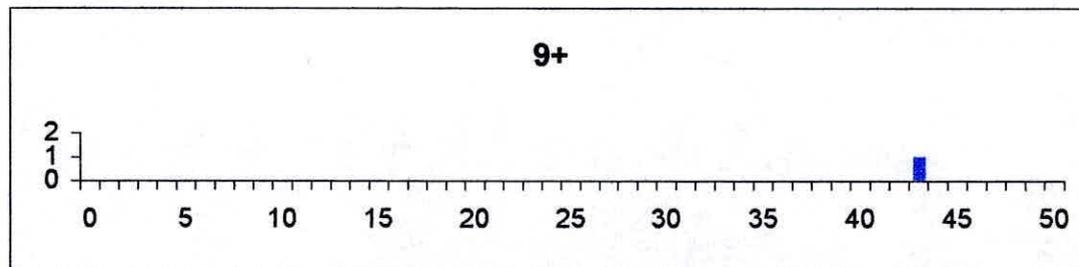
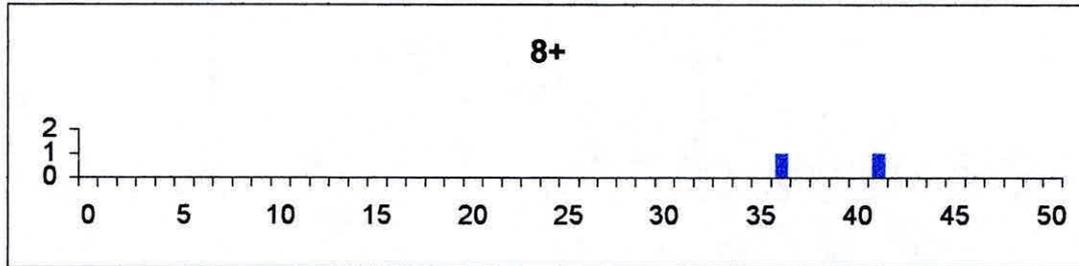
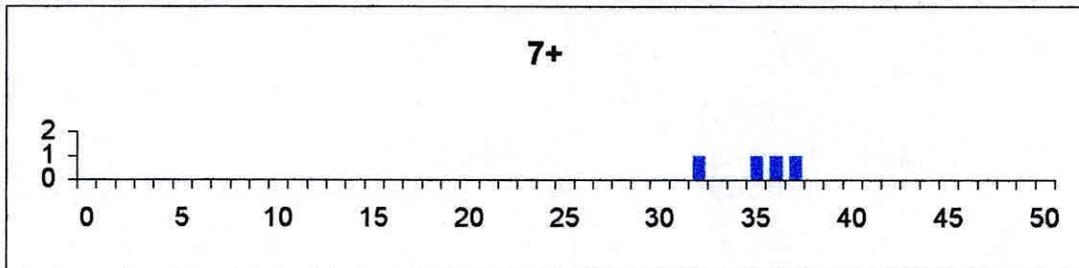


Figure 11 Length by age for roach in the R.Tees in September 1996

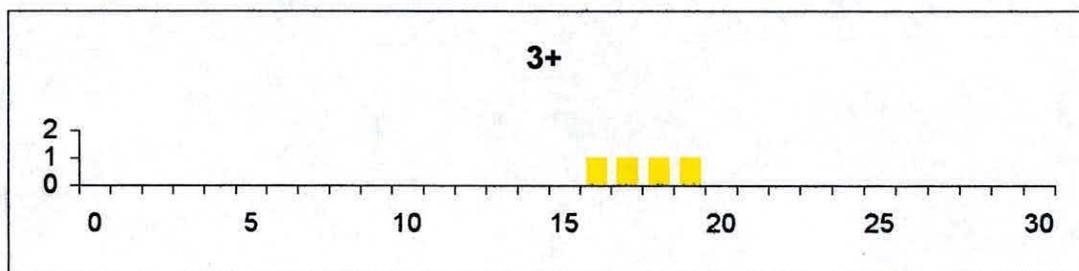
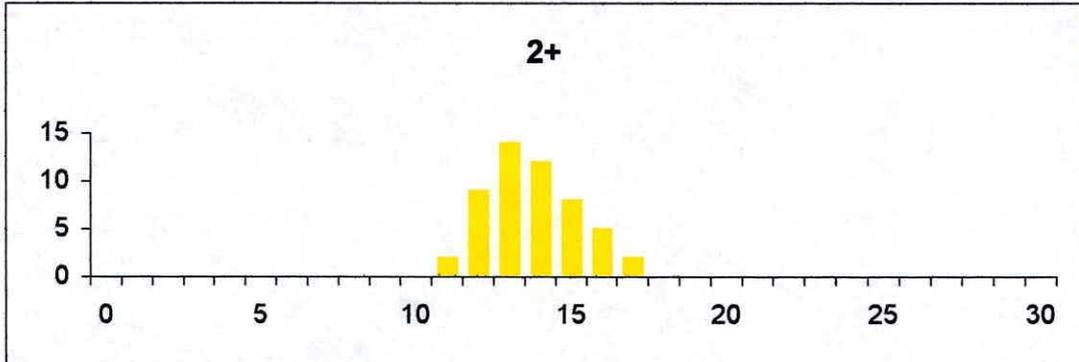
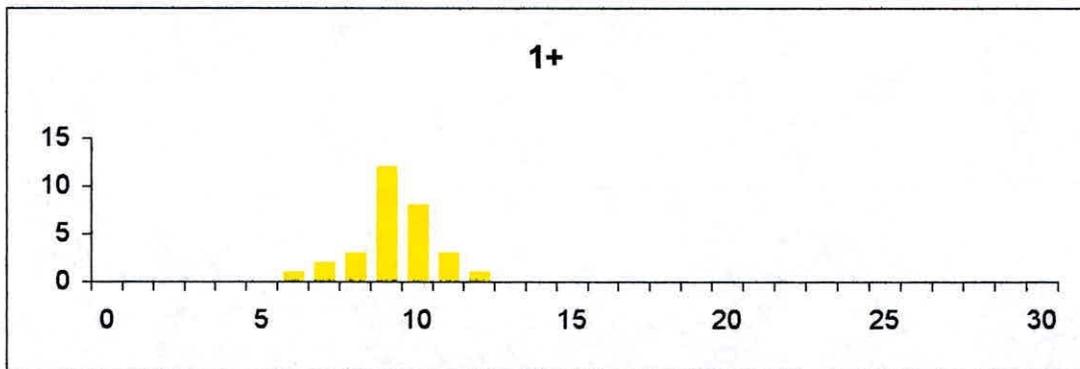
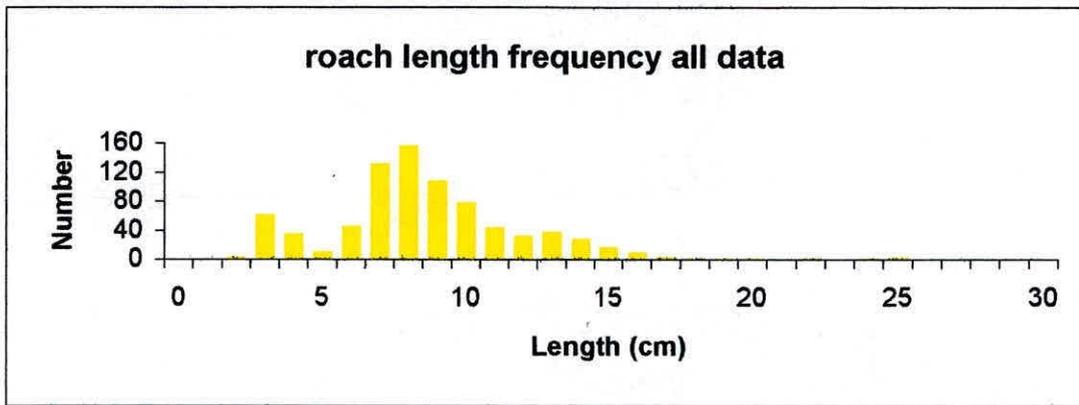


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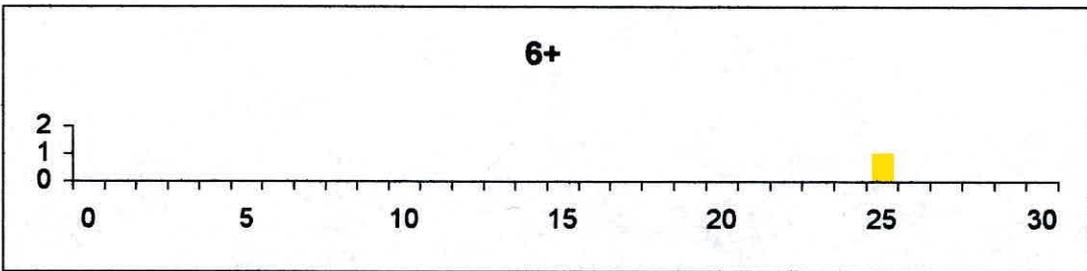
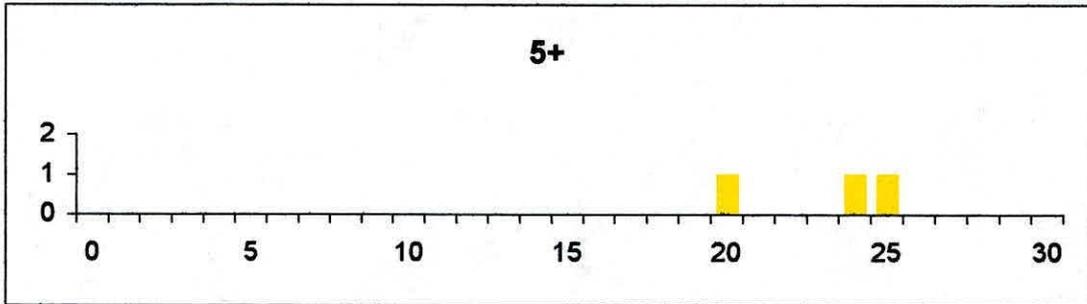
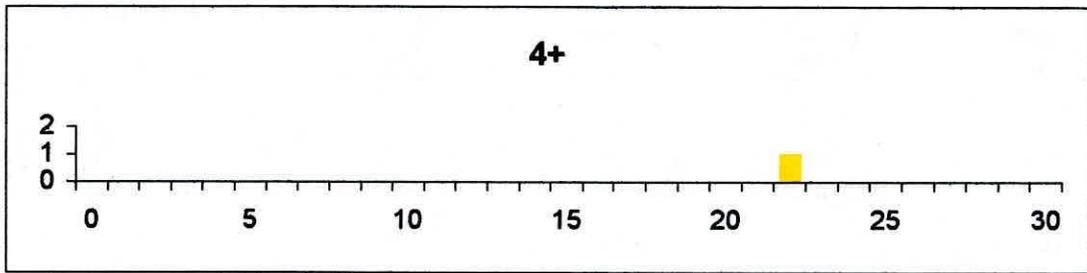


Figure 12 Length by age for gudgeon in the R.Tees in September 1996

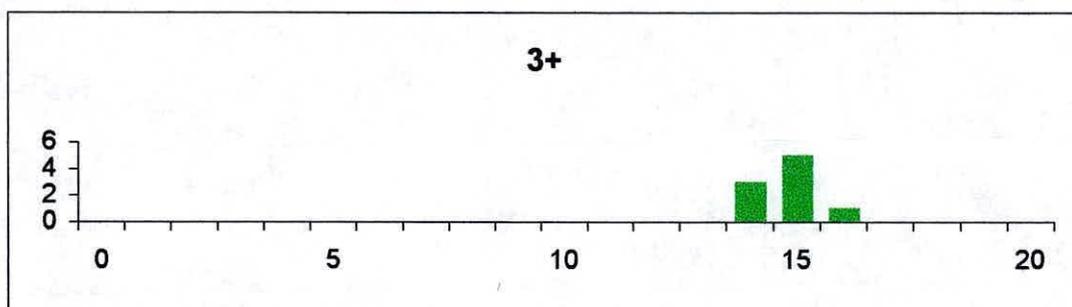
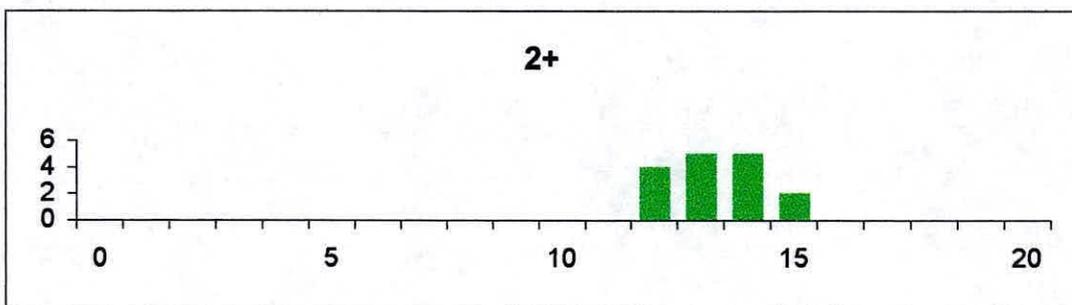
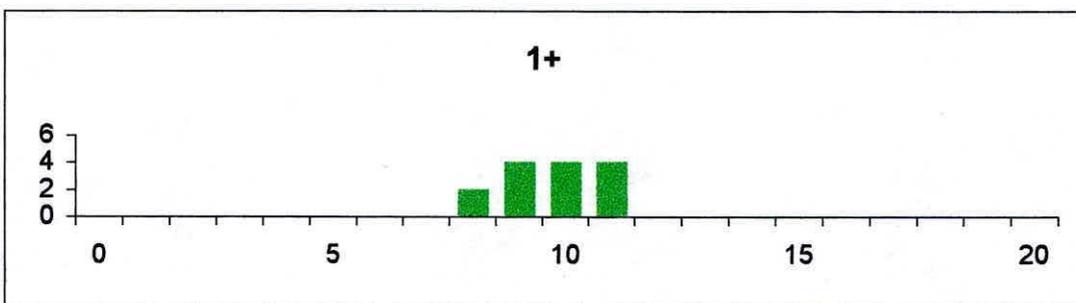
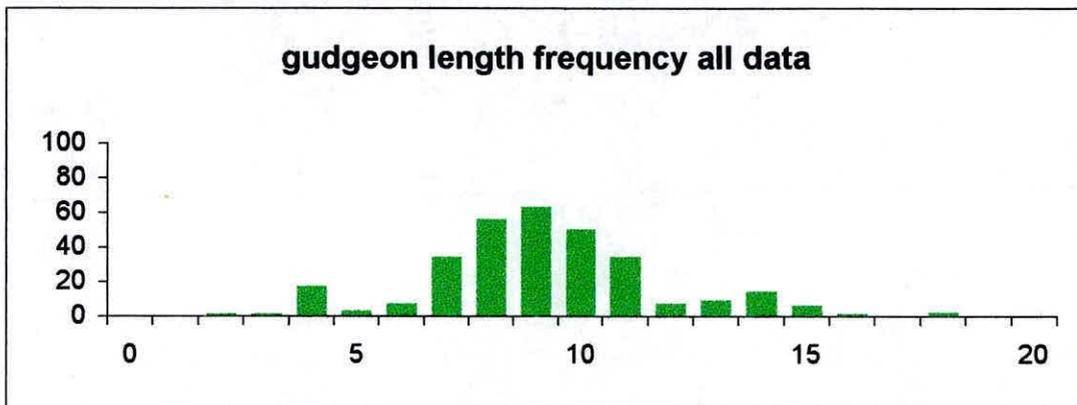


Figure 13 Mean (± 95% CL) catch weight per angler per match for each season in the study period.

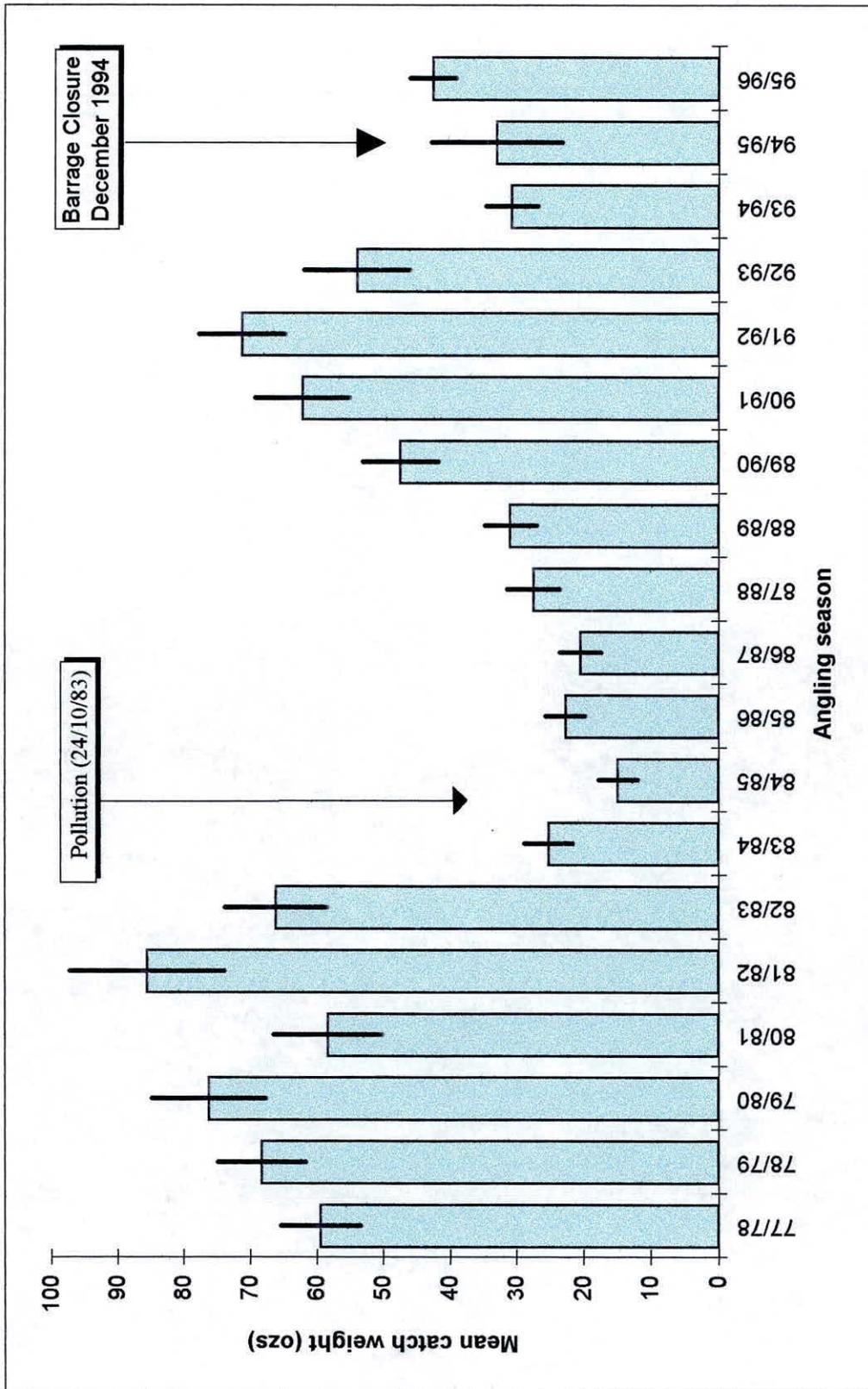


Figure 14 Mean (± 95% CL) catch weight per top ten angler per match for each season in the study period

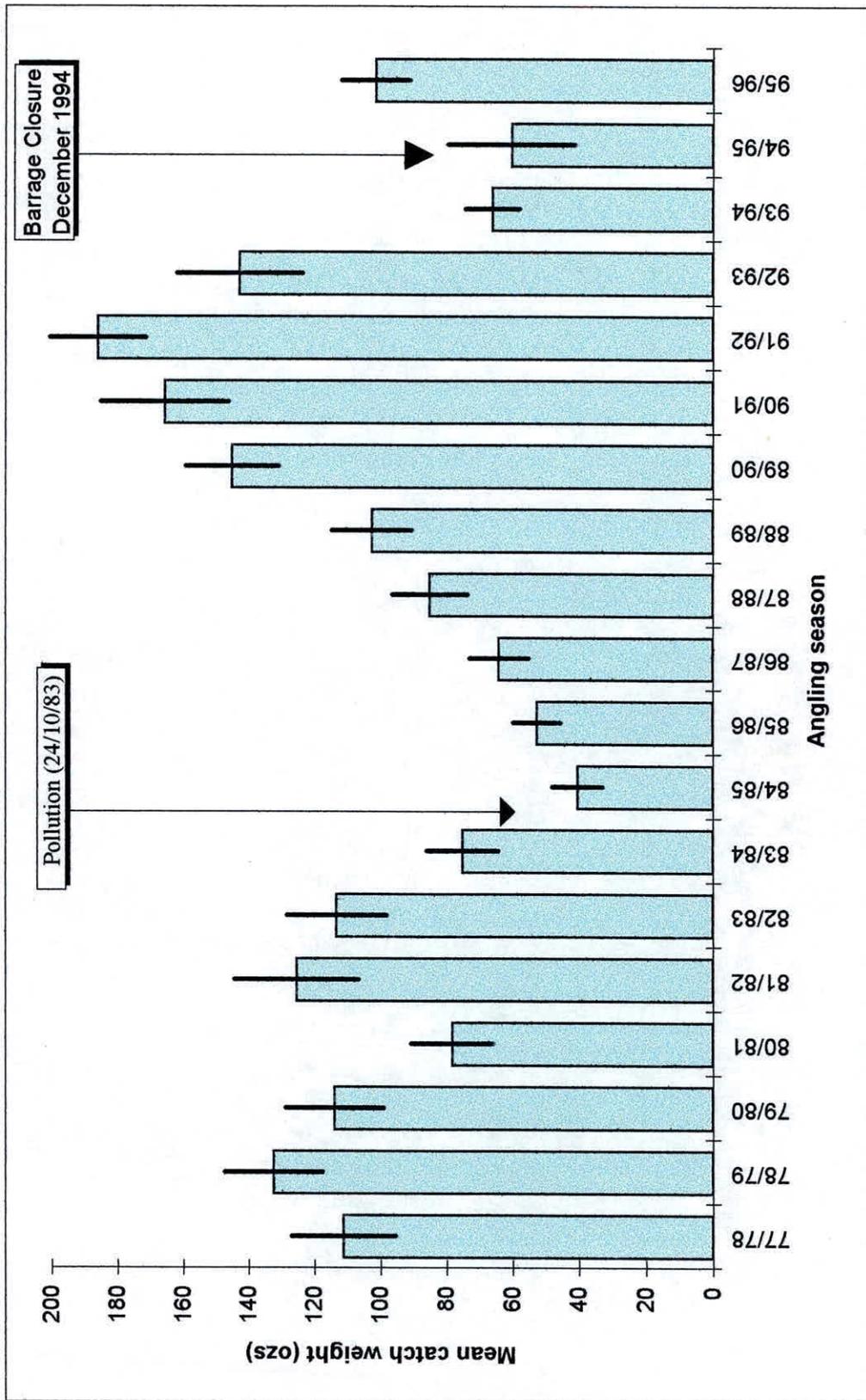


Figure 15 Post - Barrage distribution of catch weights in the River Tees, from years 1994/1995 (post-barrage) and 1995/1996

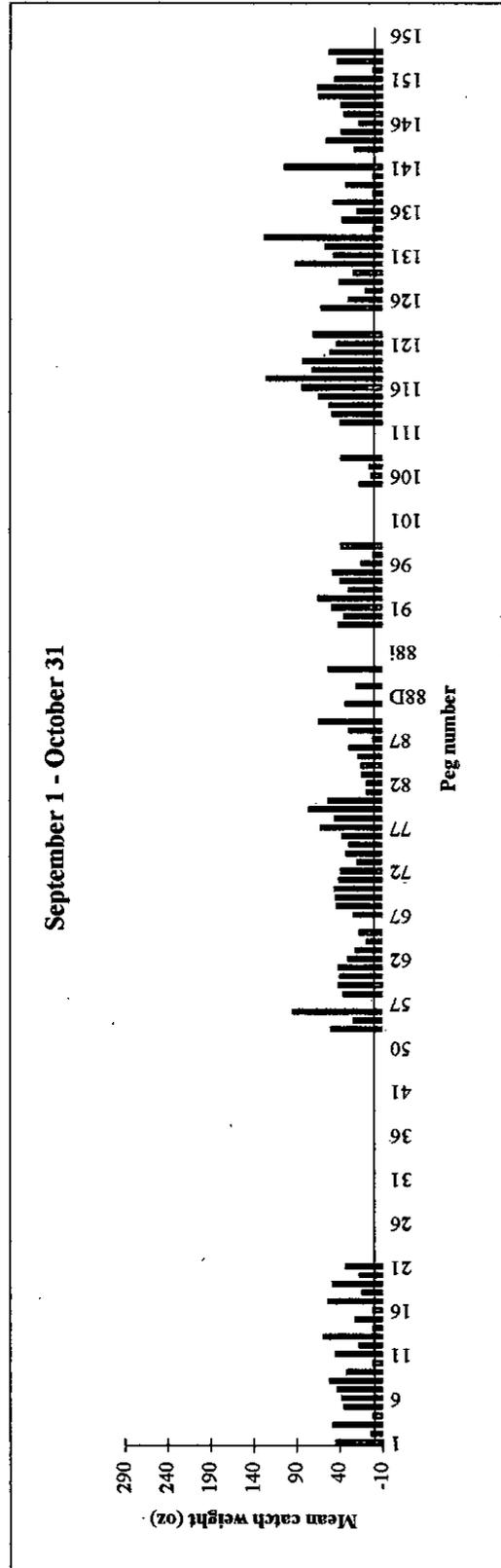
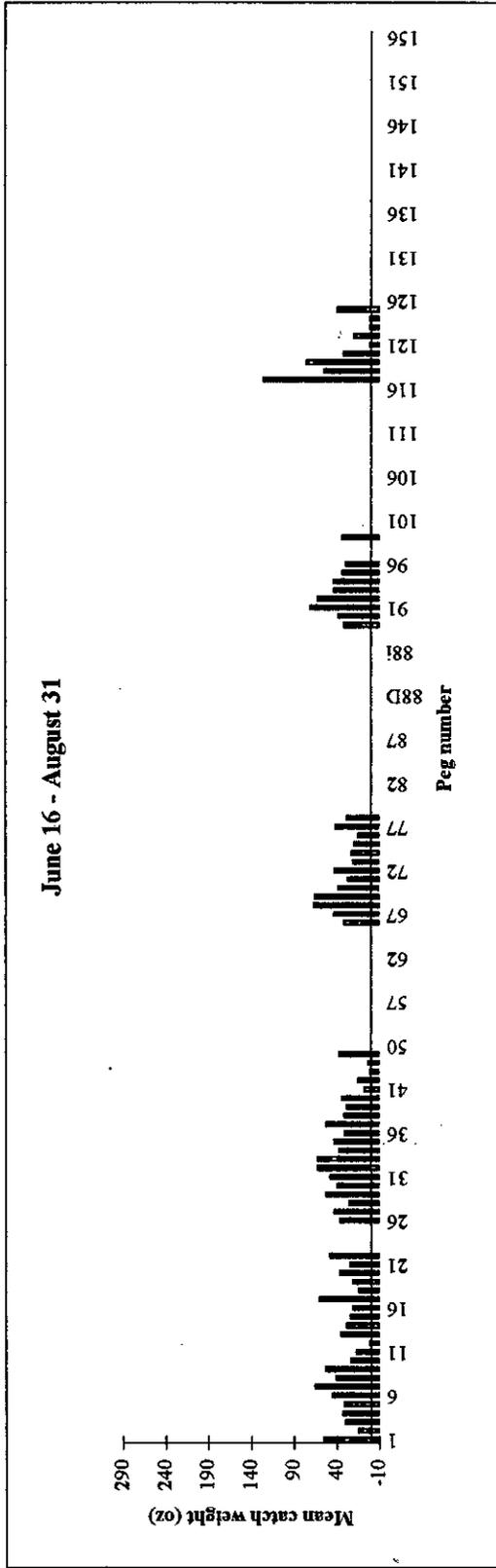
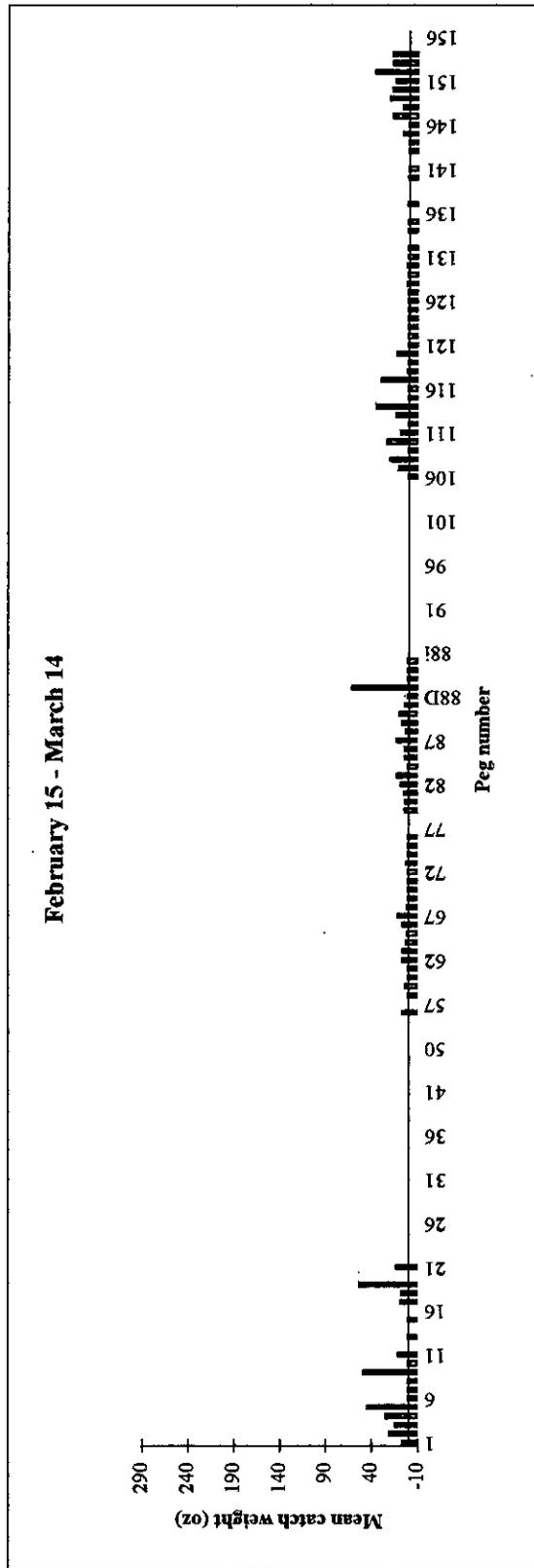
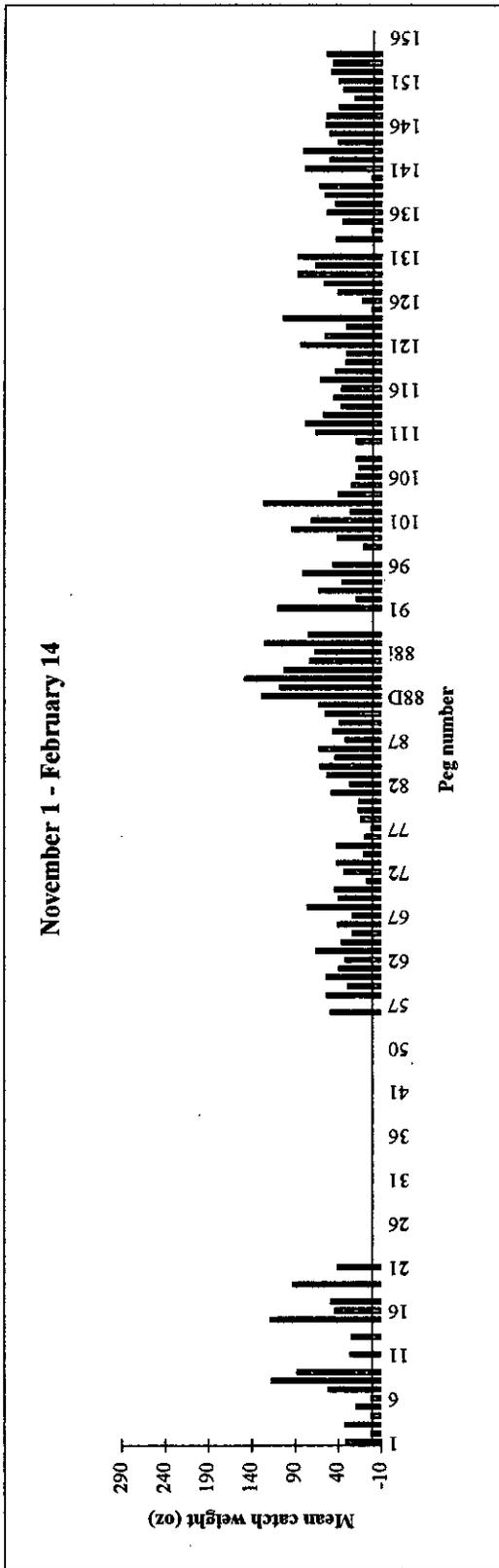


Figure 15 continued



Appendix 1 Description of fry sampling sites: River Tees 18-20 June 1996.

Sampling technique:

S = micro-mesh seine net sample:

P(n) = point sample.

TP(n) = targeted point sample ie fish seen and actively caught using point sample electrofishing gear.

N(n) = hand net sample.

E = Area examined and fish/fry noted, not sampled.

Where (n) = number of samples combined into one sample.

Flow: Unless stated all flows were negligible as from section 18 downstream the river was backed up from the barrage. F0 = zero flow, F3 = Fast flow.

20 June 1996 conditions: Cold & windy day some light showers. Fry just about non-existent.

Section 1 Below Thornaby 20 June 1996 11:45 Hrs.

- E1 Margins of The Holmes ORSU examined. 2 - 0+ Sticklebacks & some >0+ Sticklebacks.
- E2 Total circumference of downstream ORSU examined 2 - 1+ roach seen (one dead and one poorly).
- E3 Slipway at Stockton examined no fry seen but several >0+ sticklebacks, roach and dace.

Section 2 Bassleton Wood 20 June 1996 11:25 Hrs.

- E1 Bassleton Beck. Electrofished c5 m. of margins.
Substrate: Emergent reeds - depth >1m. Shelving mud.
Non fry caught = 1 - 1+ Roach & some >0+ Sticklebacks.
- E2 North bank, shelving area of mud (cattle drink) 10 cm deep.
Non fry caught = 1 - 1+ Roach & some >0+ Sticklebacks.

Section 3 Pipe Bridge 20 June 1996.

- E1 North bank. 30 m. of Emergent reeds and bays in reeds electrofished.
Depth >1m. No fry seen. 1-c.3+ chub, 1-1+ chub & 2-1+ roach seen.
- E2 South bank just downstream of pipe bridge. 20 m. of Emergent reeds electrofished. Depth >1 m. 1-1+ roach & 1-0+ Stickleback.

Section 4 Preston Park 20 June 1996 10:15 Hrs.

- P1(10) North bank. Shelving sand with emergent reeds. Plus 1-1+ chub, 1-1+ roach & >0+ sticklebacks.
- P2(10) South bank. Scallop bays in banks & emergent reeds Substrate: Mud / sand, on steep drop-off.
- E1 Preston Park ORSU. Shelving mud slope, very few marginal plants but some mid-ORSU potamogeton examined. 3/4 of perimeter examined. Very few fish seen (including sticklebacks).
- P3(10) South bank on inside of bend. Shallow shelving mud with emergent vegetation
- E2 South bank. 10 m. of shallow bay and fringing reeds electrofished. Fry caught = 4 - 0+ Stickleback.

19 June 1996 conditions: Cold windy day sun out @ 17:30. Fry very sporadic in occurrence and downstream of section 10 tended to be in odd very aggregated shoals.

Section 5 Barwick Farm 19 June 1996. 16:05 - 16:50.

Logger downloaded temp reading low (?air temp.) Probe lead examined appeared OK.

- P1(5) South bank just upstream of beck by logger. Electrofished 10 m bank, shallow bay plus emergent vegetation. 1 - 0+ loach caught.
- TP2(2) North bank opposite logger position. Very compact shoal of fry. Depth >1m. with emergent glyceria.
- E1 North bank. 25m examined, similar habitat to TP2. Nothing seen.
- P3(10) North bank. 10m bank with emergent reeds electrofished.
- E2 South bank. 100m of emergent reeds and shallow indentations examined. No fry seen.
- E3 South bank. 25m. of bank examined. One shoal of fry seen. Depth >1m with emergent Glyceria.

Section 6 19 June 1996 15:20 - 17:10Hrs.

- E1 North bank in bay downstream of submerged willow tree. Emergent reeds 3 - 0+ Sticklebacks caught.
- P1(10) In mouth of R. Leven. Flow 0. Emergent reeds and shallow margins.
- P2 North bank. Electrofished deep water on margin of reed bed. 2 - 1+ chub & 2- 1+ roach caught. No fry seen.
- E2 North bank. 10m. of bank examined. Deep water with emergent reeds and shallow margins. No fry seen.

Section 7 Below Yarm 19 June 1995 14:30 - 15:00Hrs.

- E1 North bank. 150m. examined for fry. None seen.
- N1 North bank. One fry seen & caught.
- E2 North bank (opposite old tannery) Substrate shelving mud. No fry seen.
- P1 North bank in bay downstream of fallen willow. Emergent & floating vegetation present depth >1m. No fry caught.

Section 8 Between Bridges 19 June 1996 14:20Hrs.

- N1 South bank between bridges. Most (3/4) of bank between bridges examined. Substrate sandy-mud with marginal floating vegetation. 5-0+ Sticklebacks caught.
- N2 North bank 15m upstream of road bridge. No fry seen.

Section 9 19 June 1996 pm

- P1(10) North bank by outlet pipe from water works. Substrate steep mud-banks with emergent reeds. Catch: 1- 0+stickleback, 2 >0+ gudgeon & 2 >0+ minnow.

Extensive search made of roots & margins for eggs & fry, none seen.

Section 10 19 June 1996 13:50Hrs.

- P1(5) South bank in bay between willow & tree stump. Steeply shelving bank (>2m)
Non-fry = 1- 1+ minnow.
- P2(10) South bank by fishing platform. Substrate mud with few emergent reeds.
Non-fry = 4-stickleback, 2-1+chub & 1-stoneloach.
- P3(5) In Nelly's Beck. Deep with branches. One 0+ stickleback, 1-1+chub &
1-1+minnow. Search made of willow roots for eggs, none seen.

Section 11 The Cabins 19 June 1996 13:20Hrs.

- P1(10) North bank by Holme House slipway. Shelving concrete plus mud with
emergent vegetation. Non-fry caught = 4-1+chub, 4->0+minnow, 2->0+loach
& 1>0+stickleback.
- P2(5) North bank. Bay in emergent vegetation. Depth = >1m. Non-fry caught = 2-
1+chub & 1->0+minnow.
- P3(10) South bank. Shallow indent in steep mud bank with emergent reeds (under
pylons). Non-fry caught = 2-1+chub.

Section 12 19 June 1996 12:10 to 12:20Hrs.

- P1(5) North bank (by wooden staging). Depth 30cm. Substrate mud with some
emergent vegetation.
- P2(7) South bank. Shallow area in amongst reeds Depth 30-50 cm Substrate mud with
emergent vegetation. b & 1->0+minnow.

Section 13 19 June 1996 11:40 to 11:50Hrs.

- P1(5) South bank. Bay in reeds. Depth >2m. Steep mud bank with emergent
vegetation and tree stump. 1clump of stickleback eggs, 1-1+chub & 1- >0+
Stickleback.
- P2(5) North bank. Substrate deep water, mud with emergent vegetation. Non-fry
caught = 3->0+minnow.
- P3(5) South bank. Dark shaded area with little emergent vegetation. Non fry caught
= 1->0+loach.
- TN1(3) In branches of fallen willow c.5m downstream of P3. Mud substrate.

Section 14 19 June 1996 11:15 to 11:35Hrs.

- P1(5) North bank. Steep bank with mud substrate.
- P2(5) South bank. Steep mud bank with emergent Phragmites.
- P3(5) North bank. Steep mud bank with trailing willow leaves & branches. 1-1+roach & 1->0+minnow.

Section 15 19 June 1996 10:50Hrs.

- P1(5) North bank. Depth >2m. with emergent reeds. Non-fry caught = 2-1+chub & 3->0+minnow.
- P2(5) Substrate mud with emergent vegetation & overhanging grass. Depth 30cm.
- P3(5) In small beck on south bank. Deep water with mud substrate.

Section 16 Low Worsall 19 June 1996 10:30Hrs.

- P1(5) South bank. Steep mud bank with emergent vegetation.
- P2(10) North bank. Depth >2m with emergent marginal vegetation. Non-fry caught = 1-1+chub.

18th June 1996 conditions: Day warm but overcast. Sun out late afternoon. Water temperature at Low Moor = 17.5 deg.C. Fry all along margins but restricted to <30 cm from emergent, marginal & instream vegetation.

Section 17 18 June 1996 18:00 to 19:00Hrs

- S1 South bank. Shelving gravel (1 m to 0 m) + ?enteromorpha algae.
Non fry caught = 32 chub, 12 dace, 9 gudgeon, 1 roach & 200+ minnow. Only a few fry caught - not kept.
- N1 Same place as S1. Fry targeted
- P1(15) Worsall ORSU. Depth = 60 cm. Soft mud substrate with emergent reeds.
Non fry caught. 1- 1+ roach, 2->gudgeon.
- 3(11) North bank just upstream of large backwater Sandy / shallow substrate with emergent vegetation. Flow = 0.
- P4(12) North bank. In shallow bay area. Mud + algae substrate depth = 30 cm.
- N2(8) South bank. Mud banks on edge of drop-off. Floating algae present.
- P4(8) North bank. Between main river and backwater area. Mud substrate with some emergent phragmites. Depth = 30 cm.

Section 18 18 June 1996 16:00 to 16:20Hrs.

- P1(10) 5 point samples from each bank. Both banks steep mud with some emergent vegetation. Flow=0.
- P2(6) North bank. Substrate mud with emergent reeds, depth >0.5m, flow = 0.
- N1 South bank. Shallow area with myriophyllum & enteromorpha.

Section 19 Fardeanside. 18 June 1996

- TP1(3) South bank. Bay by island Substrate gravel, flow = 0.
- S1 In lee of island in mid-river. Deep bay shelving from 0 - 50 cm. Substrate sand & silt. Flow =0.
- S2 In lee of island in mid-river. Deep bay shelving from 0 - 50 cm. Substrate sand & silt. Flow =1.

Section 20 18 June 1996 13:40 to 14:30Hrs.

- S1 South bank. 10 m length seined. Depth shelving from 0 cm to 1 m. Substrate cobble/gravel. Flow = 2. Non fry caught. 1 - 1+ Dace.
- P1(10) South bank on inside of bend. Flow slight/nil (F1). Substrate mud.
- S2 North bank. 15 m length seined. Substrate coarse gravel with overlying detritus. Depth shelving from 0 - 75 cm. Flow = 1.
- N1(10) In amongst ranunculus & myriophyllum. Depth <0.5m substrate mud, flow =0/1.

Section 21 Below Low Moor weir 18 June 1996 13:00Hrs.

- TP1(3) North bank in shallow margins Substrate sand/silt, slight flow (F1).
- TP2(4) South bank. No flow. Depth 30-40 cm. Substrate mud.

Section 22 Low Moor weir 18 June 1996 11:45Hrs.

Downloaded temperature logger. Replaced broken thermistor.

- S1 Slack in shallow bay downstream of ford. Non-fry caught= 31-1+dace & 11->0+minnow.
- TP1(4) North bank Shallow gravel margins. Flow = 0.

Section 23 Above Low Moor weir 18 June 1996 12:40Hrs.

- P1(10) North bank. In marginal vegetation, depth 50 cm Flow nil
- P1(5) North bank. In marginal vegetation, depth 30 - 40 cm Flow nil.
Plus 5->0+minnows

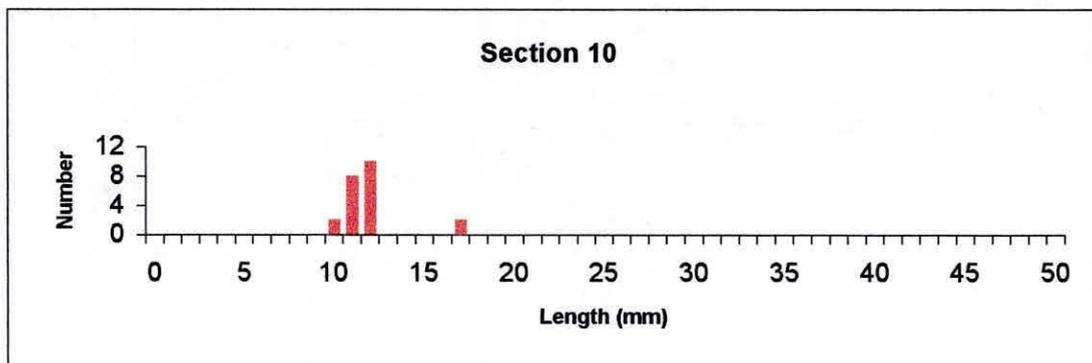
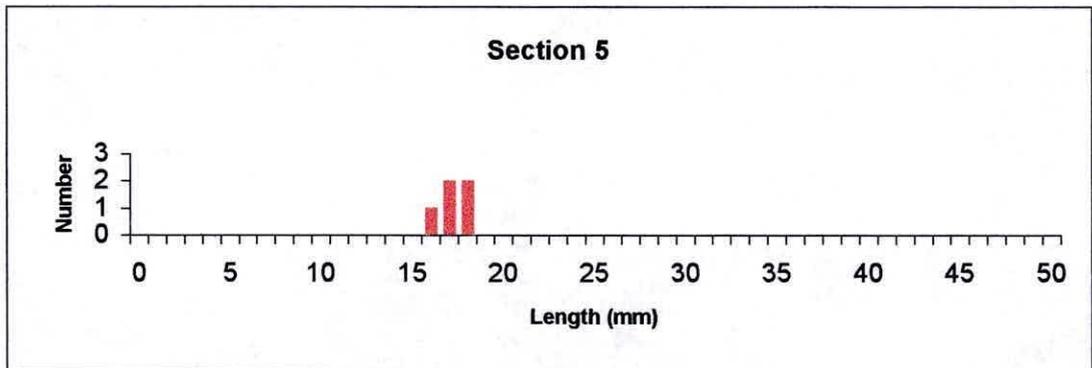
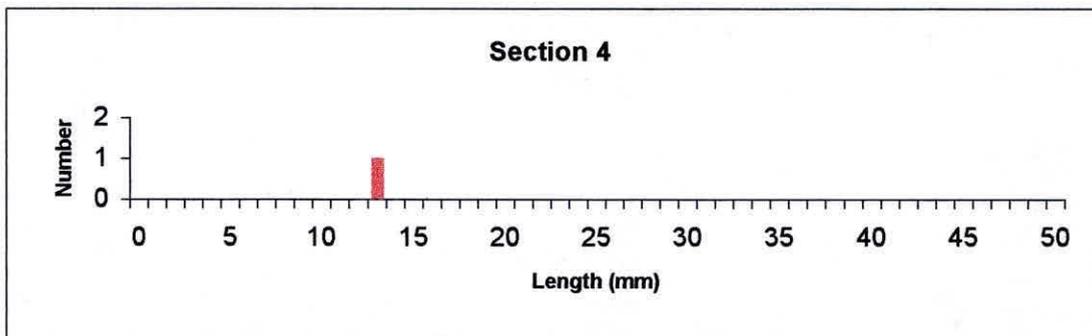
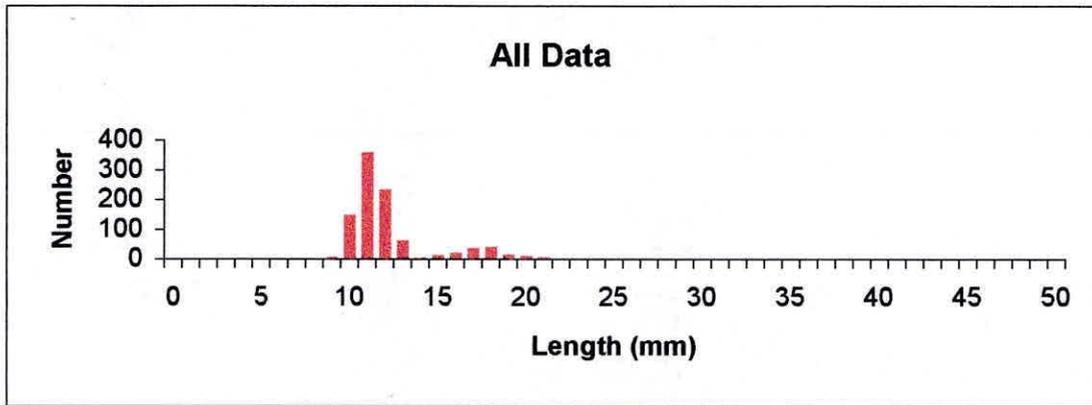
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Section 24 Not Sampled

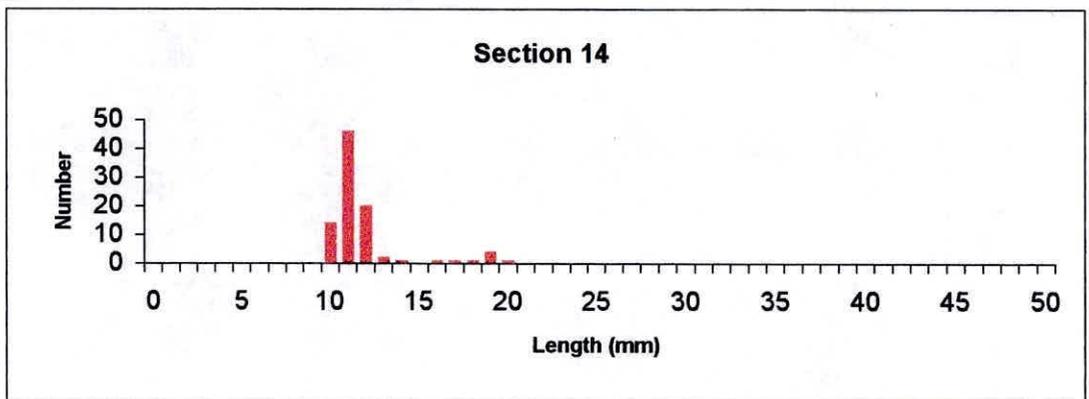
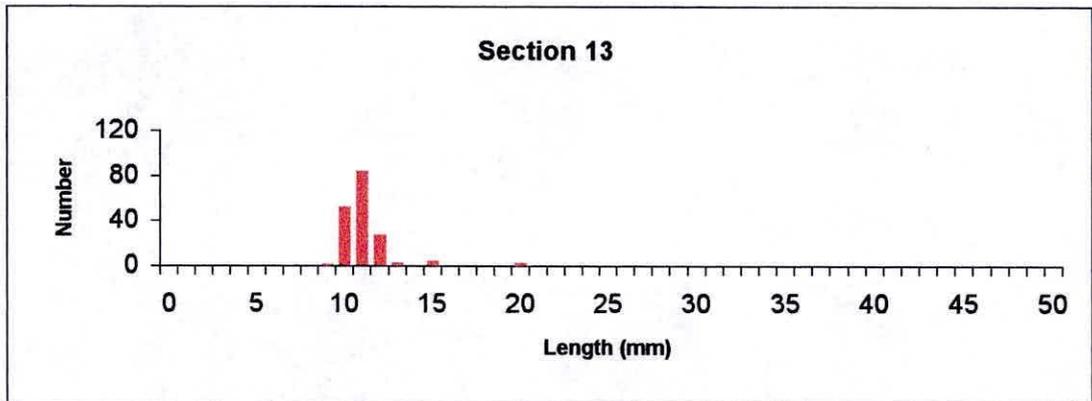
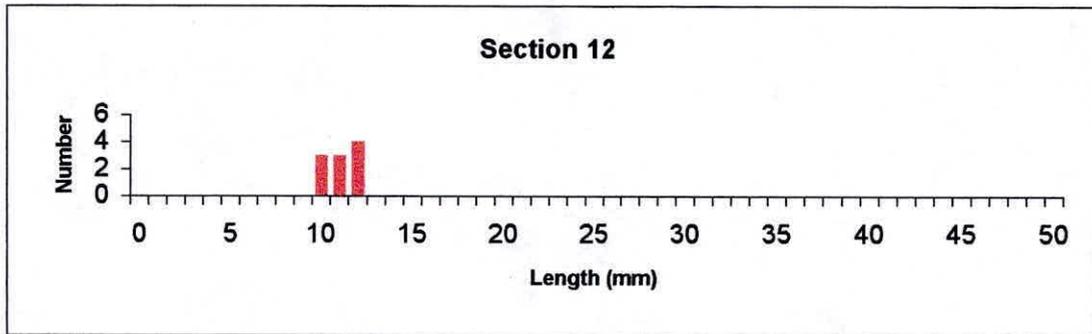
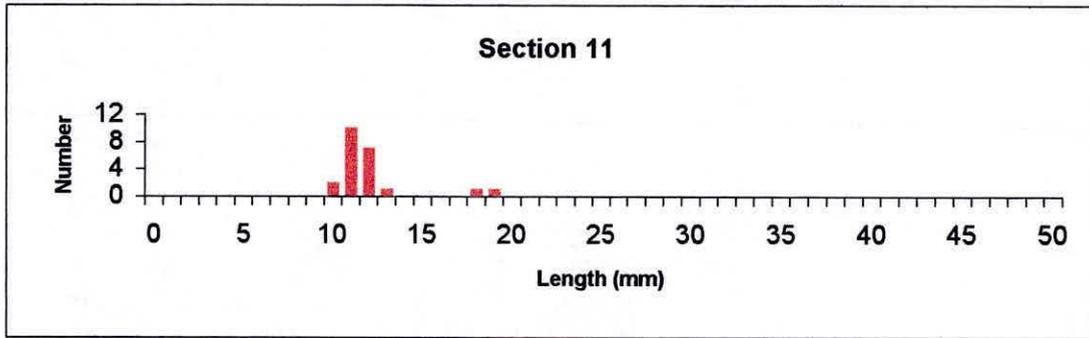
Section 25 Low Dinsdale 18 June 1996 10:15Hrs.

- S1 Slack on edge of flow. Substrate gravel / sand. 9m length seined.
- S2 In shallow marginal area. Substrate gravel / sand. Moderate flow (F3)
- S3 In shallow bay (<10 cm.) in slack backwater (F0).

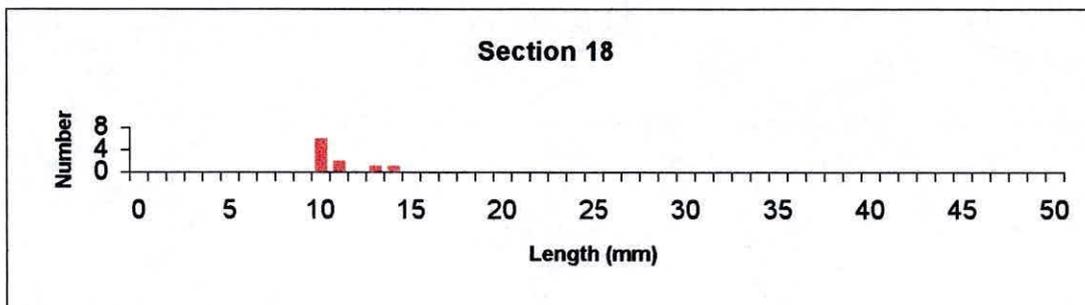
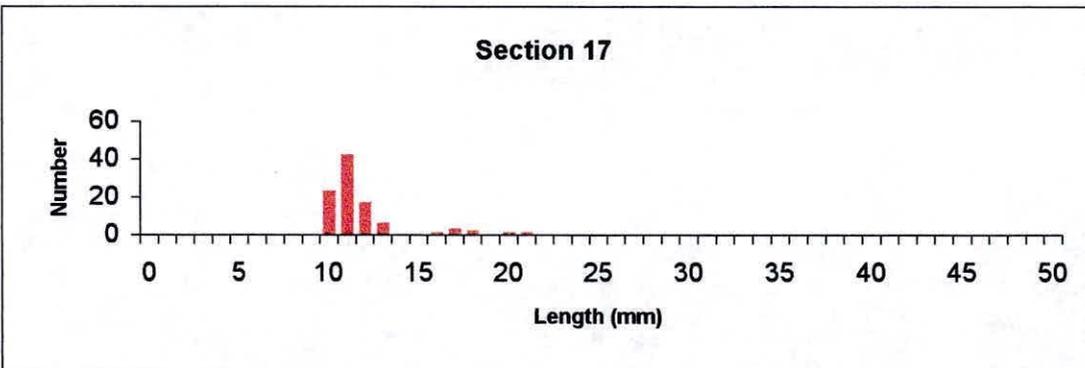
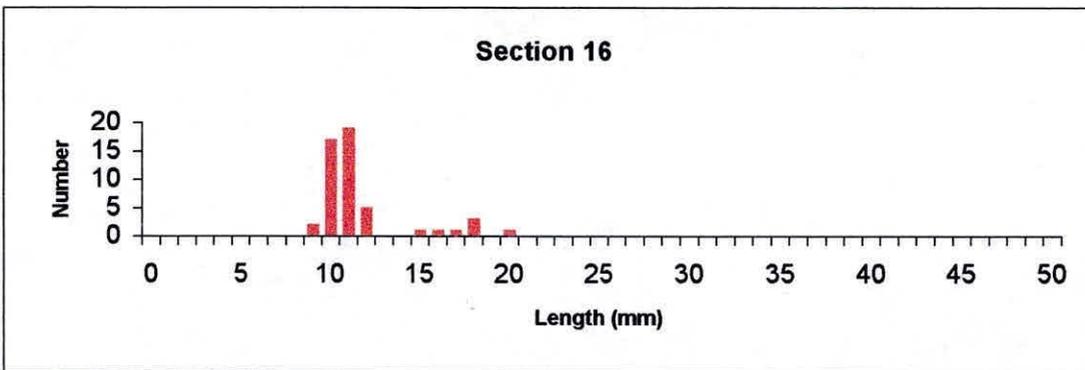
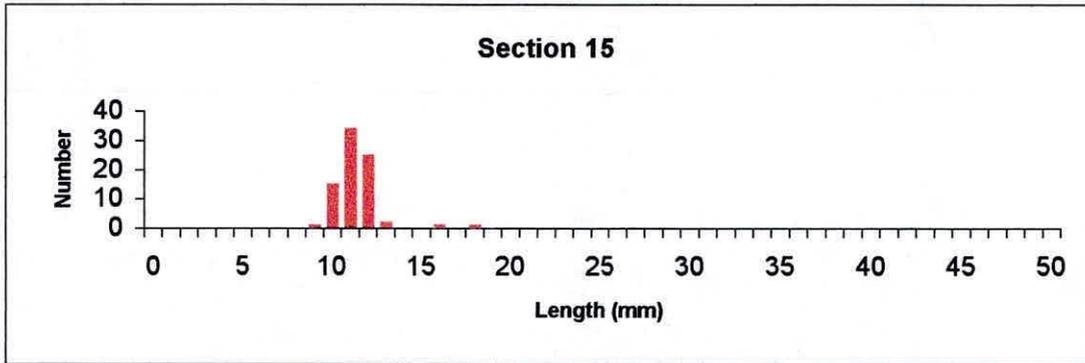
Appendix 2 Length frequency distribution of dace fry in each section of the R.Tees in June 1996



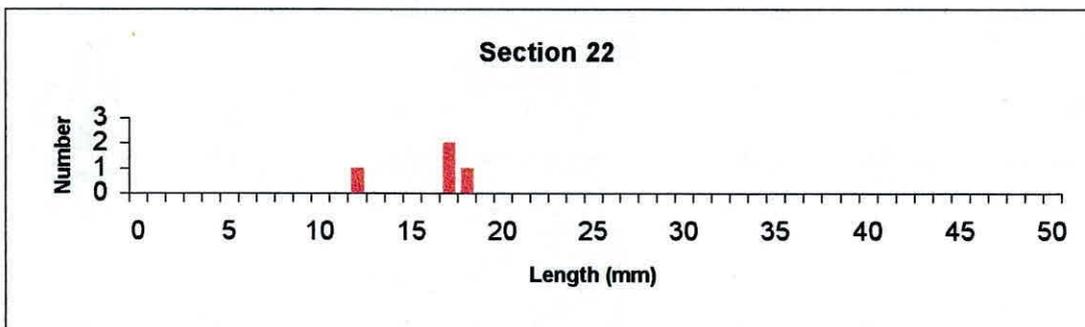
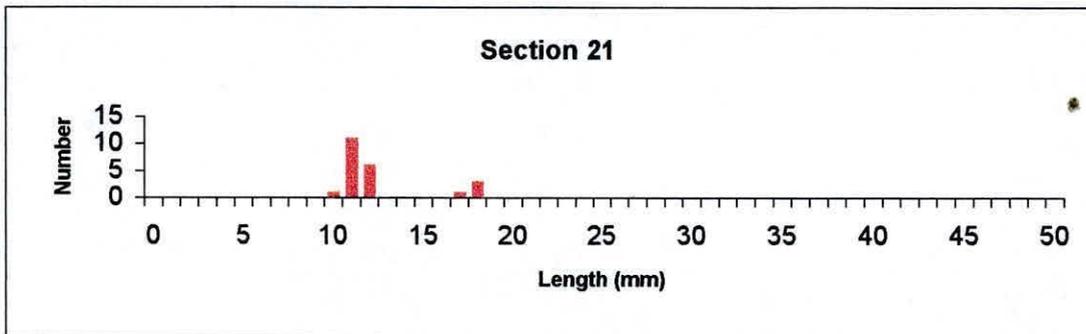
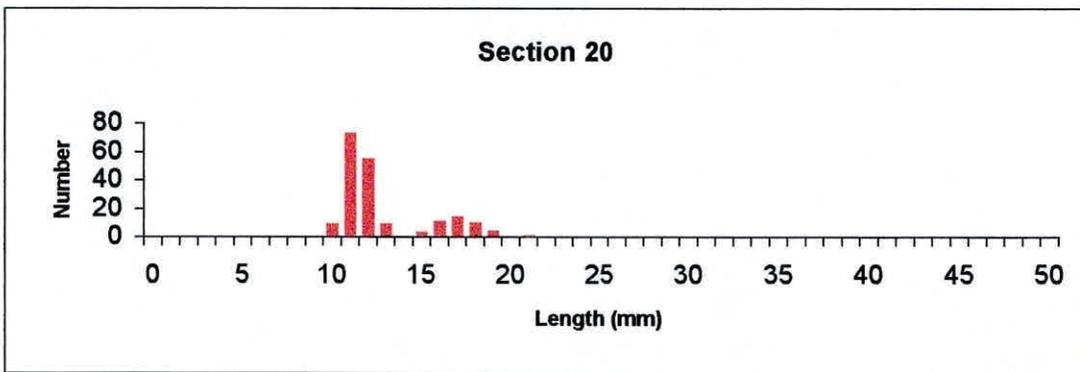
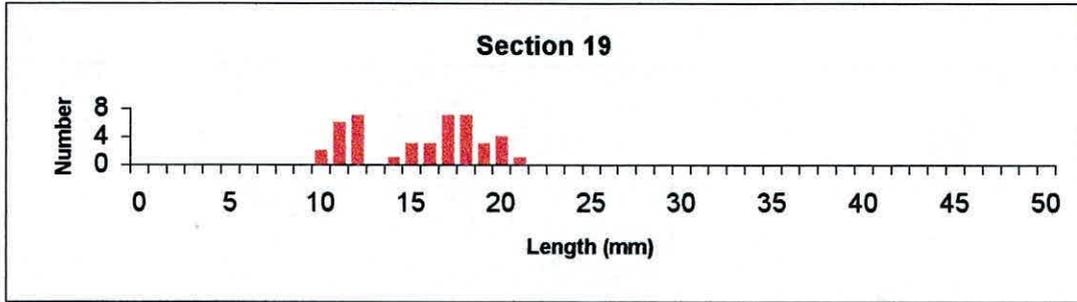
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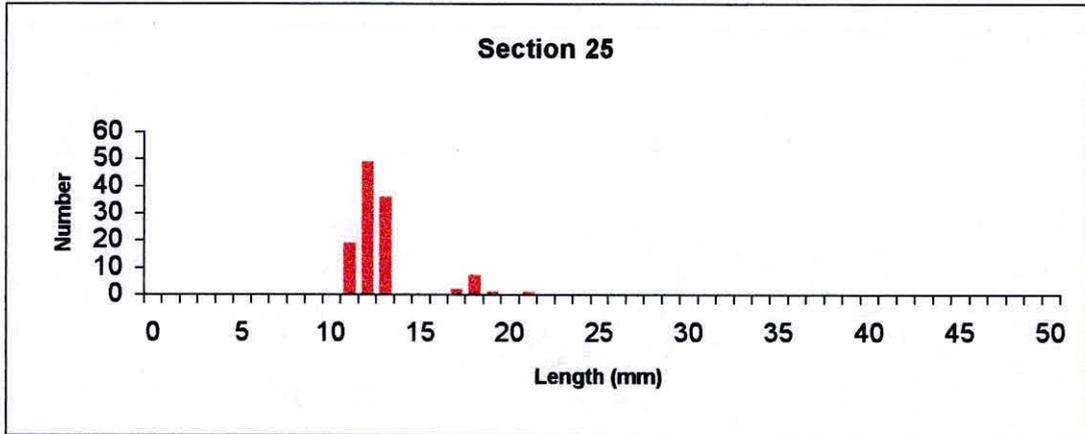
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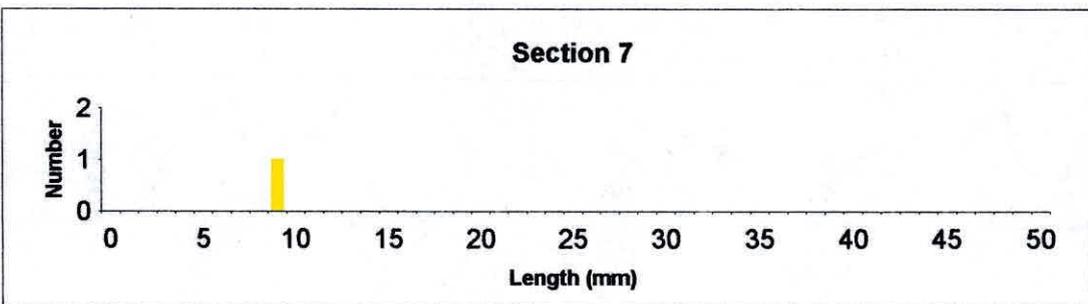
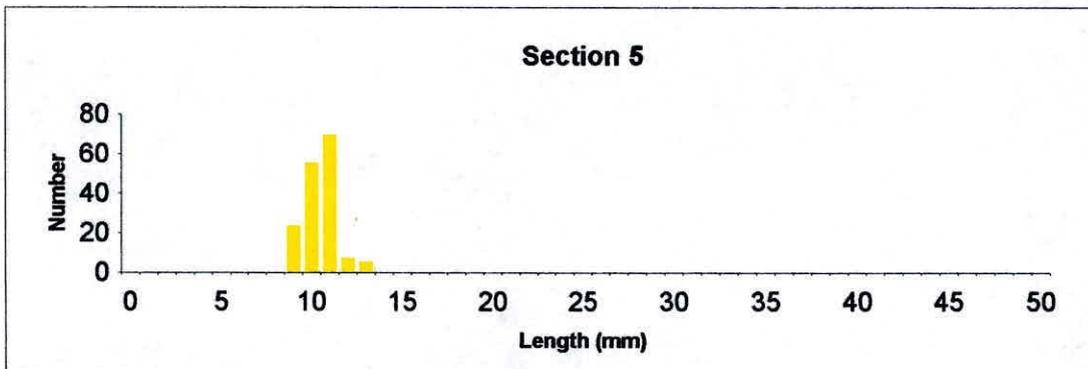
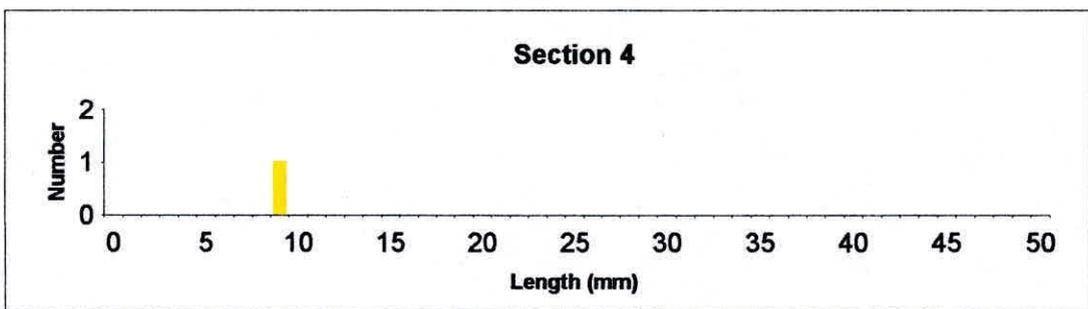
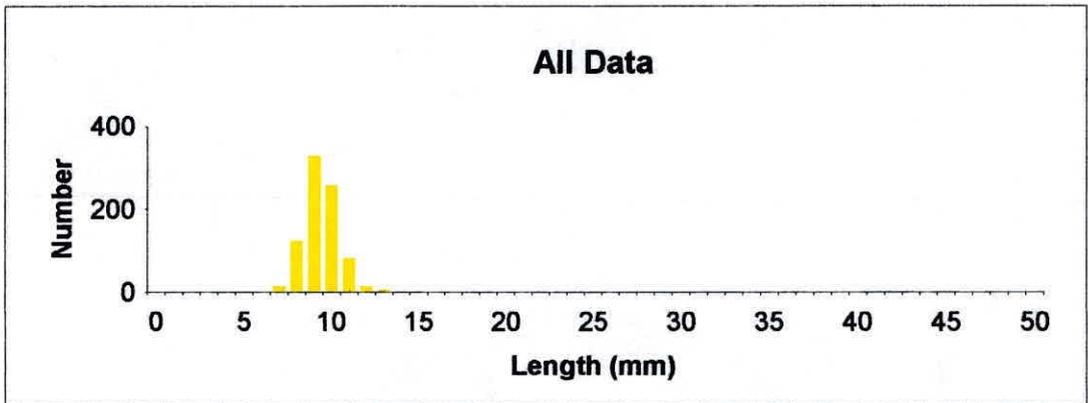
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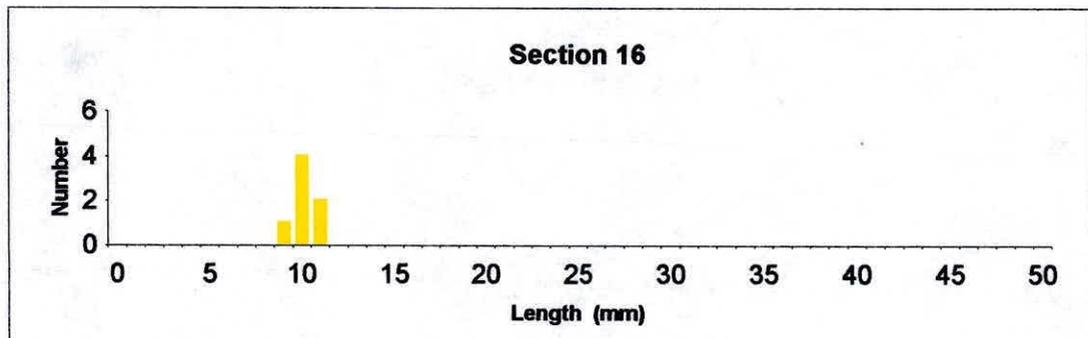
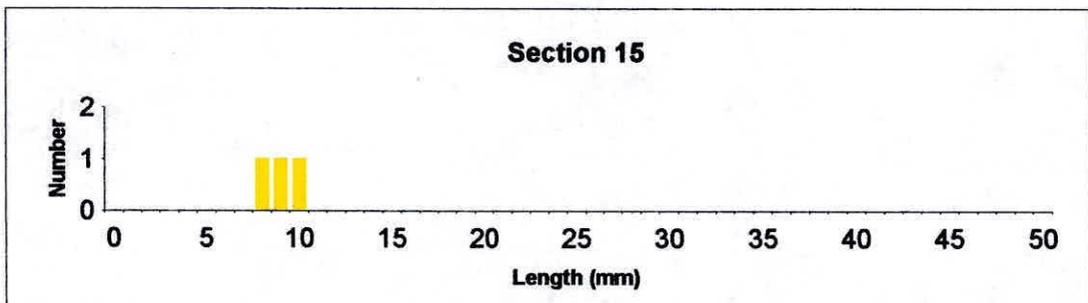
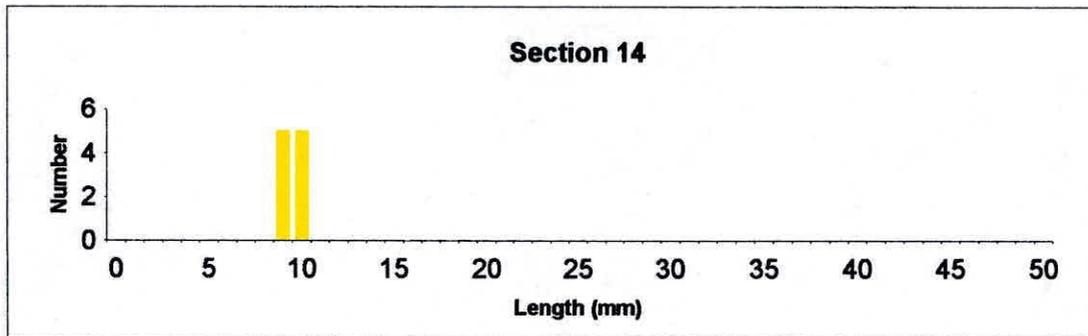
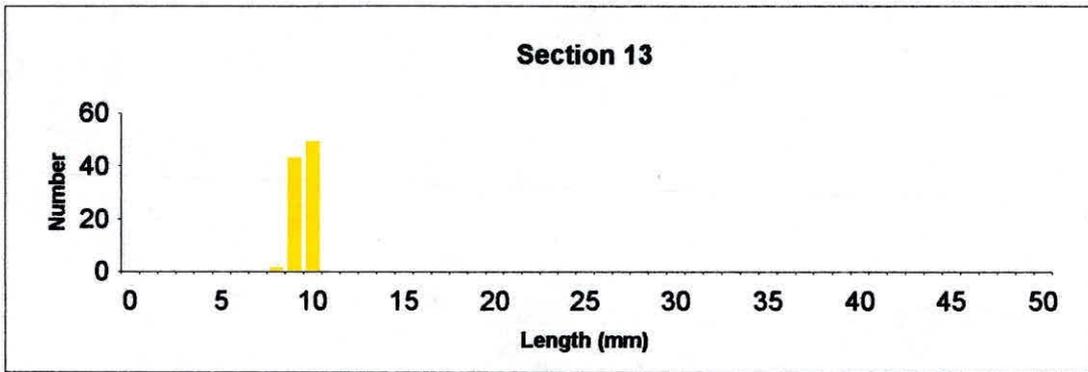
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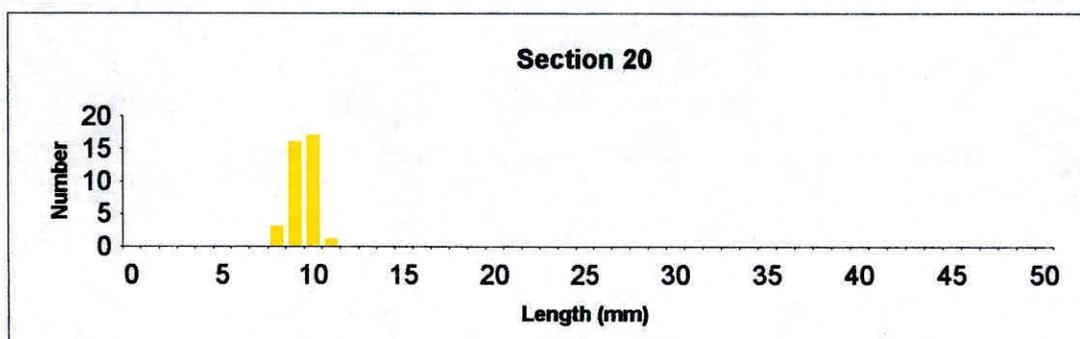
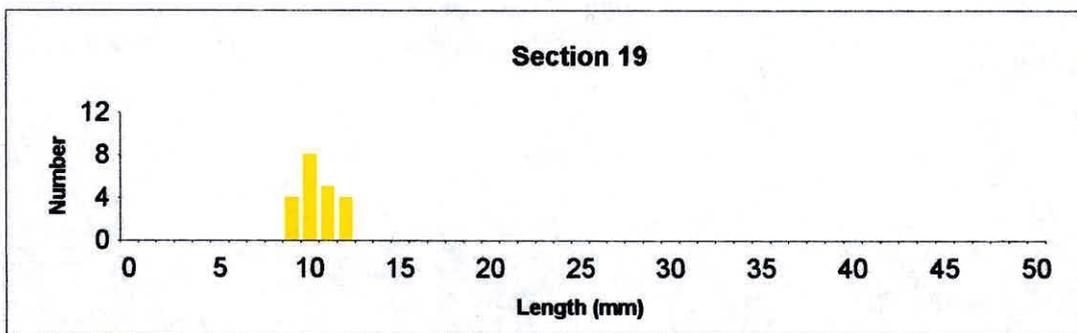
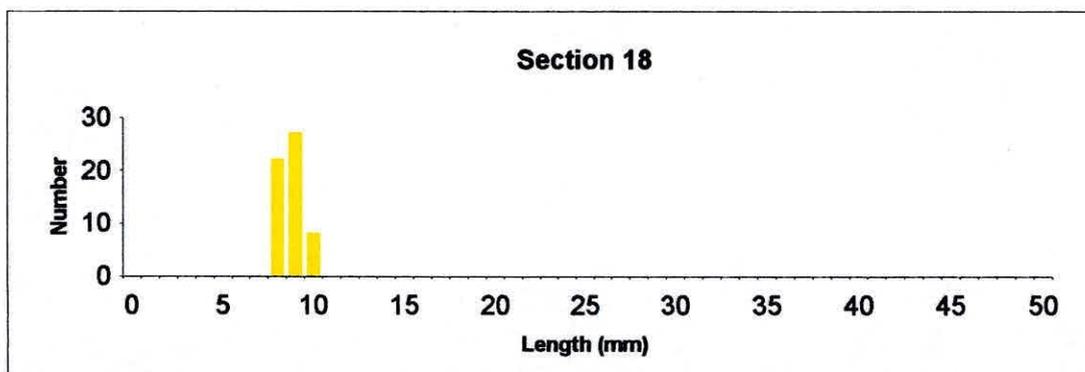
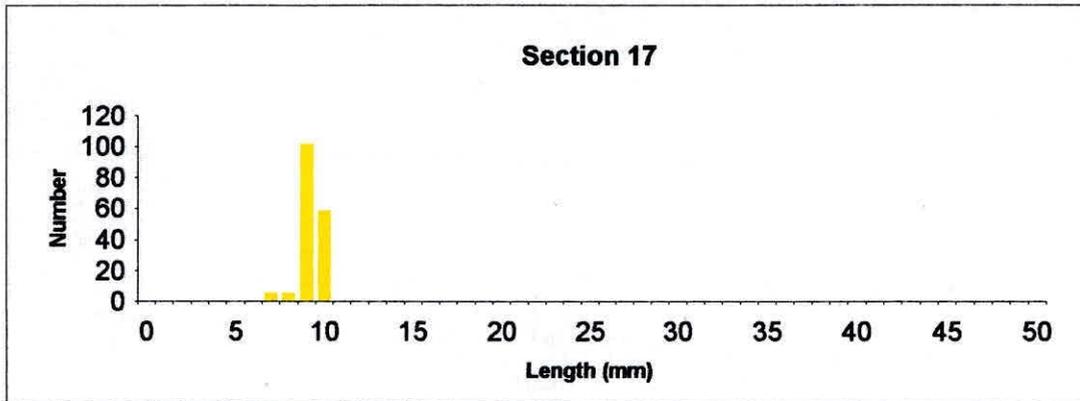
Appendix 3 Length frequency distribution of roach fry in each section of the R.Tees June 1996



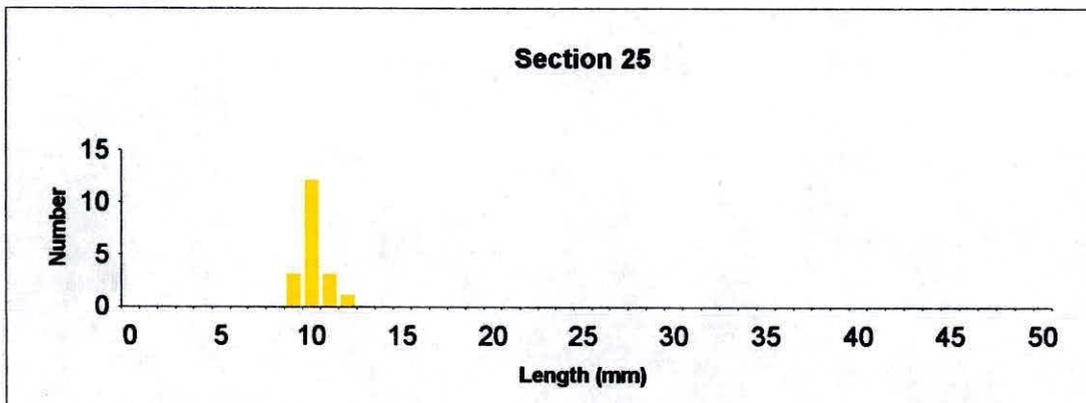
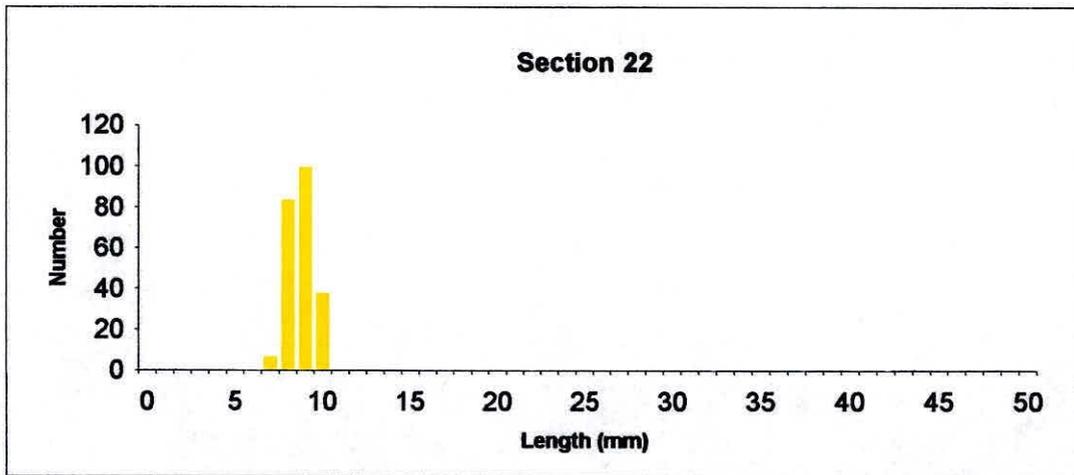
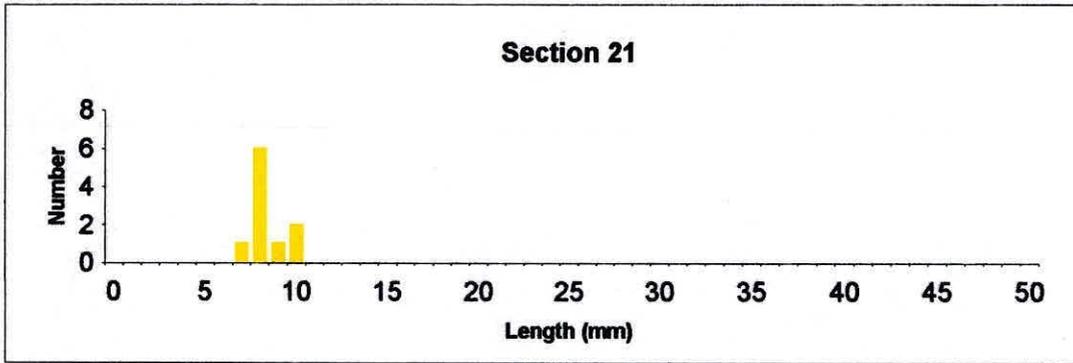
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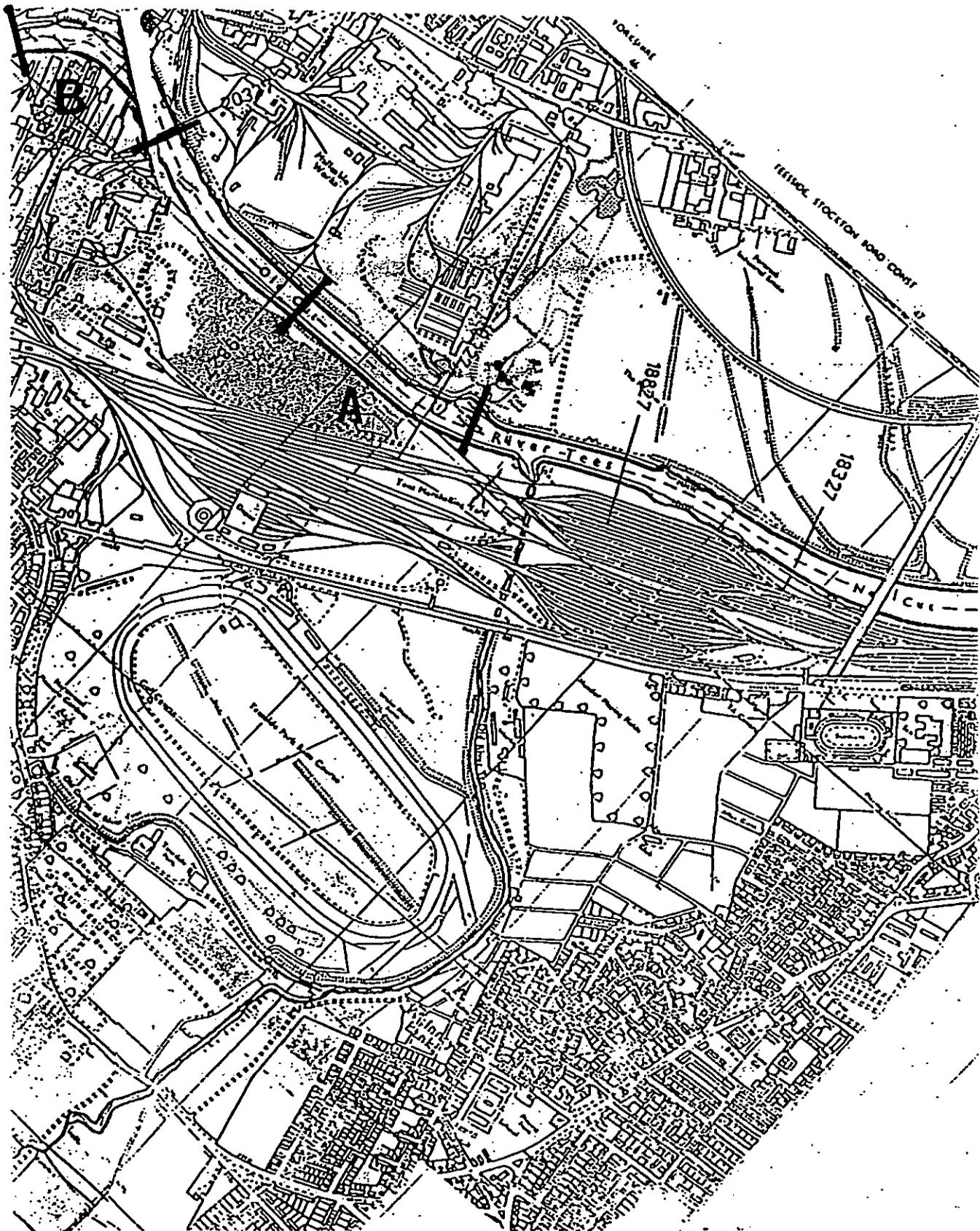
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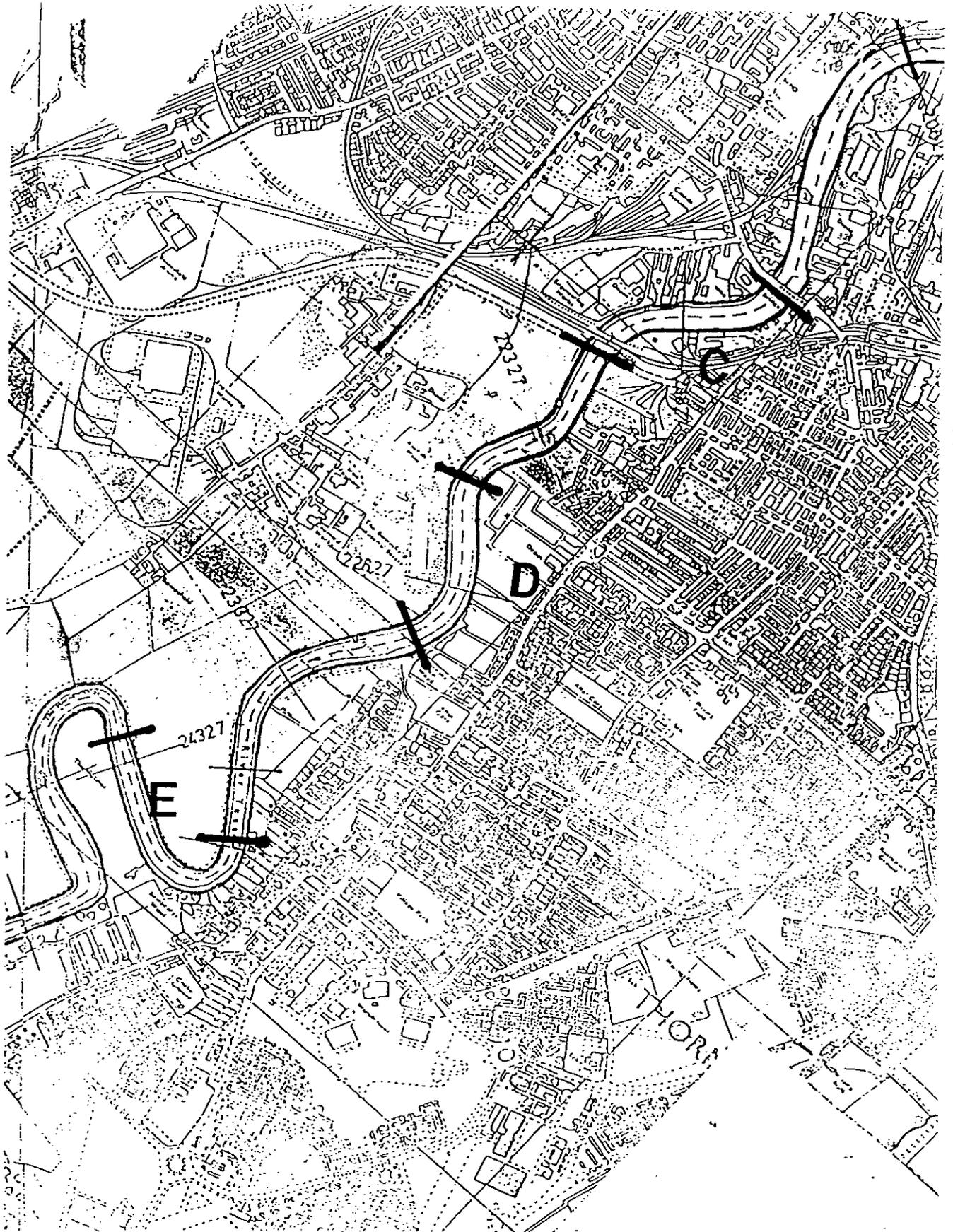


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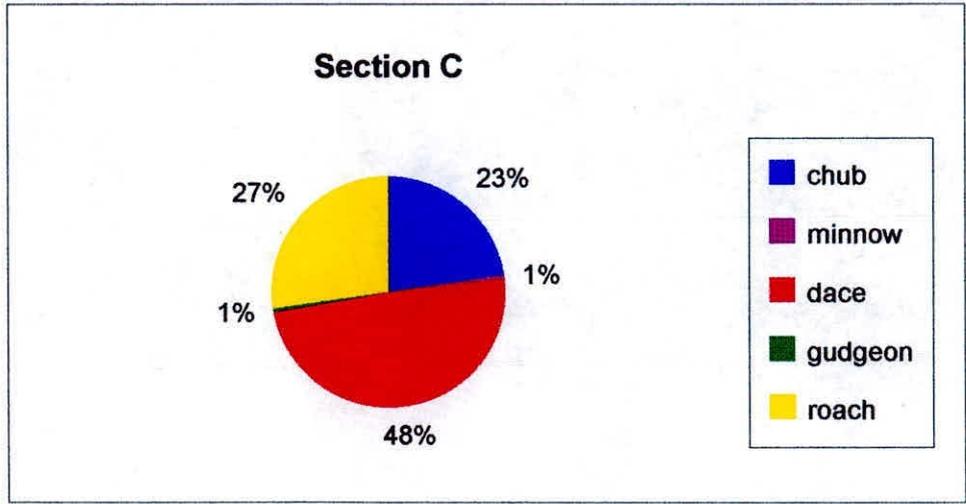
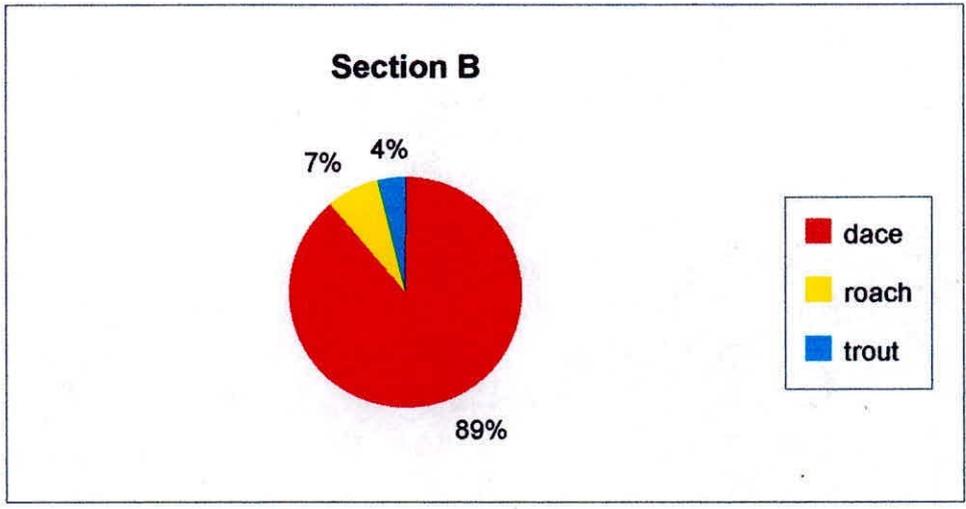
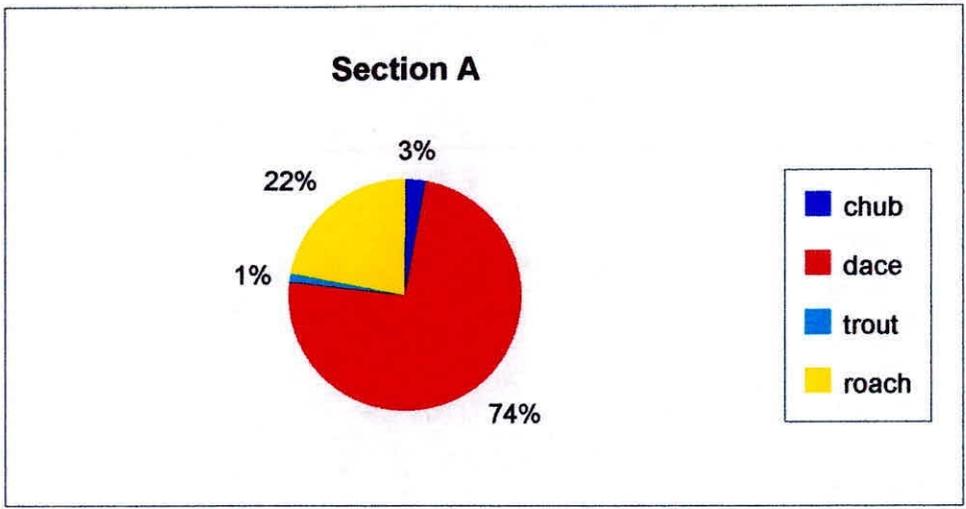


Appendix 4 Map of Section 1 showing the location of sub-sections A to E

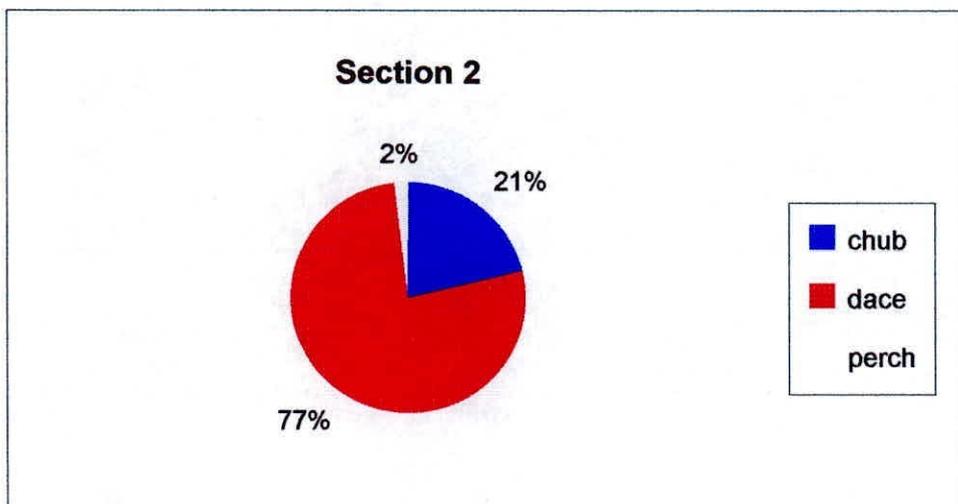
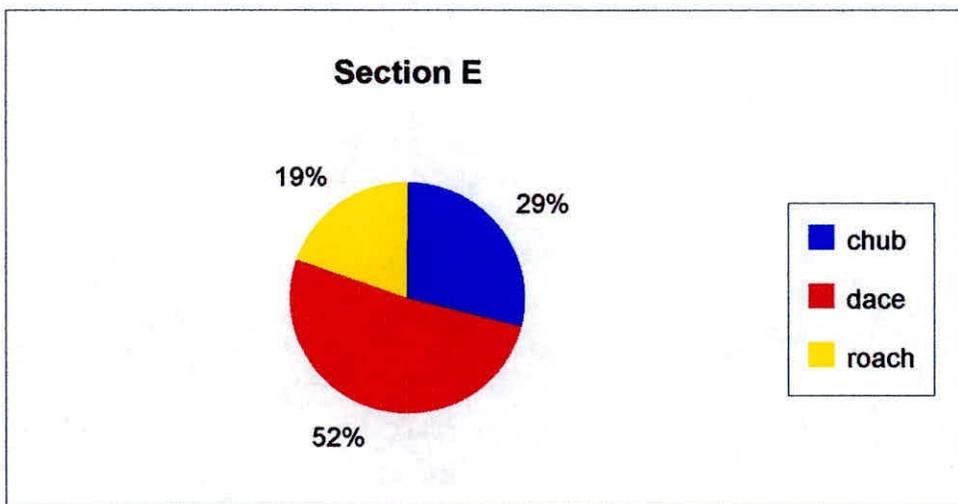
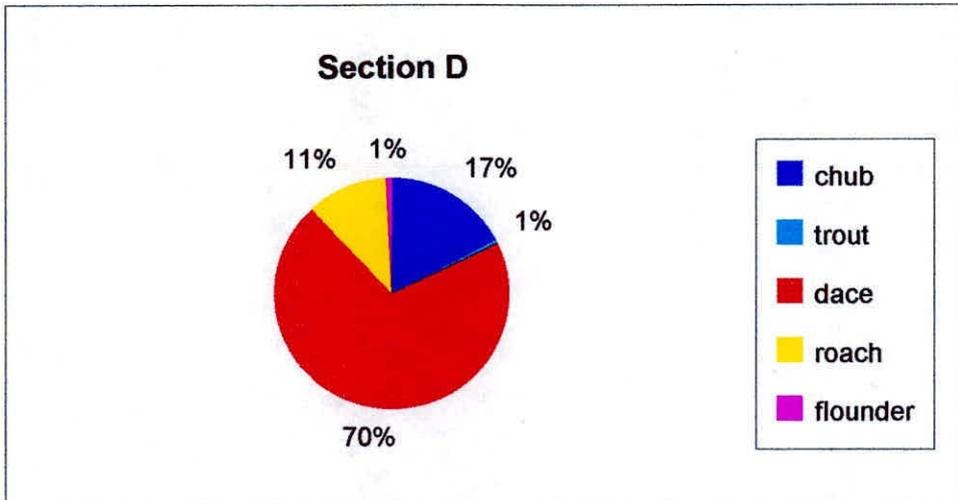




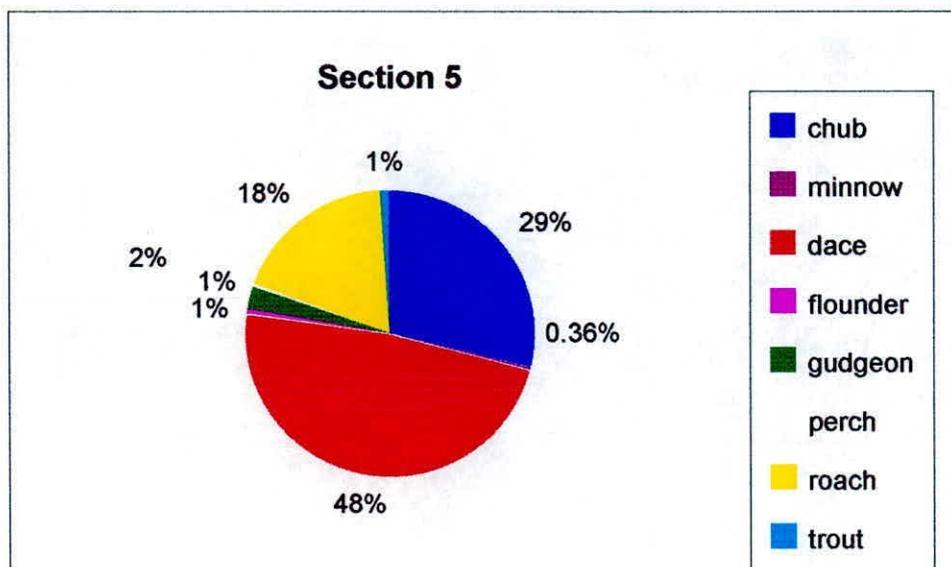
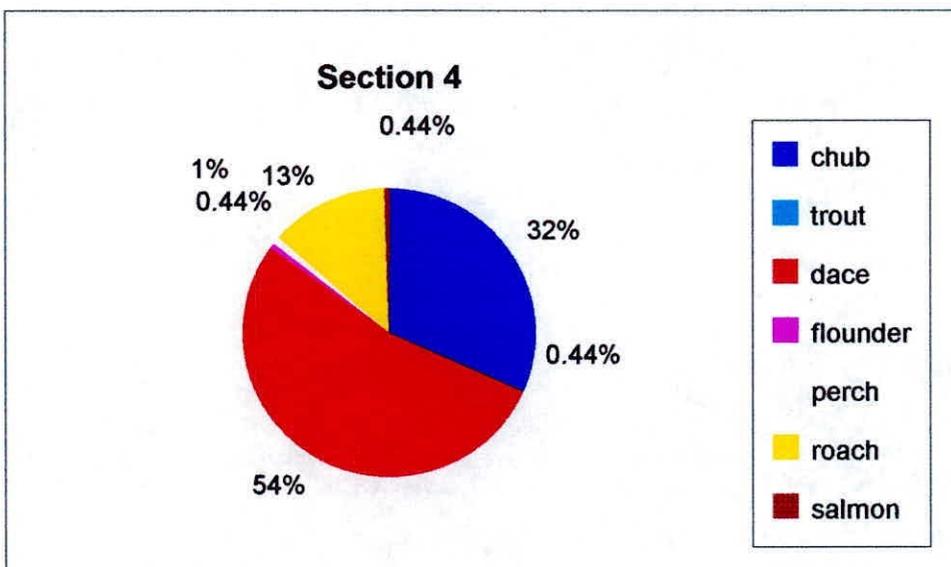
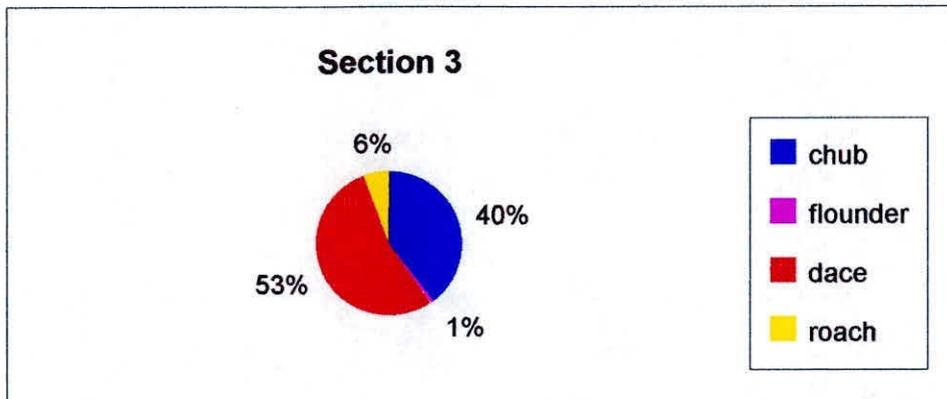
Appendix 5 Species composition of fish in each section in September 1996



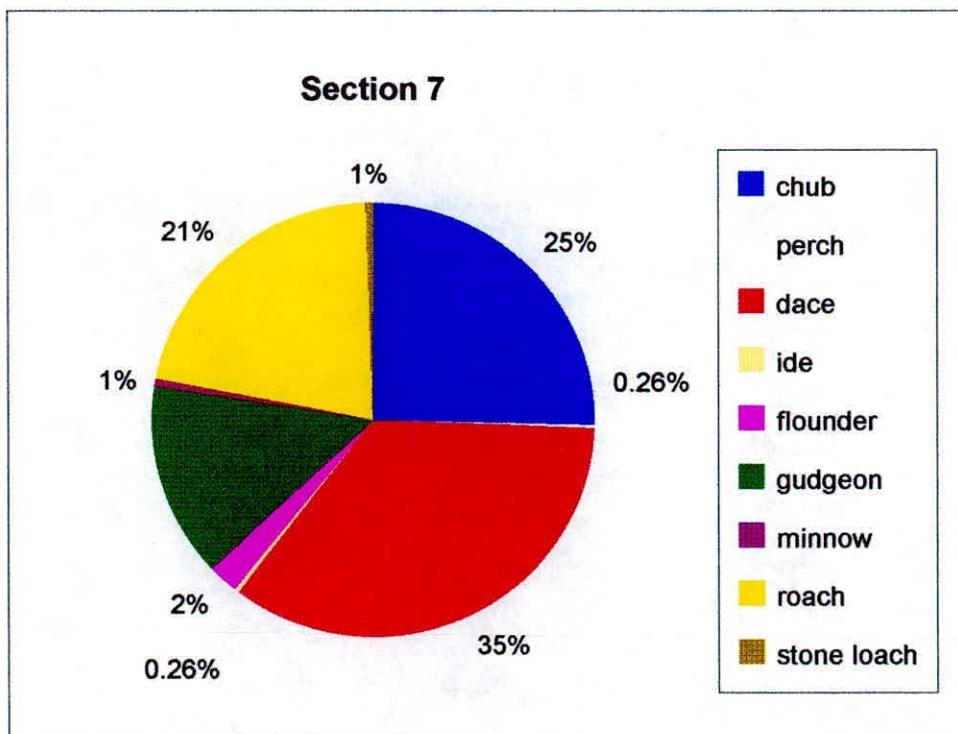
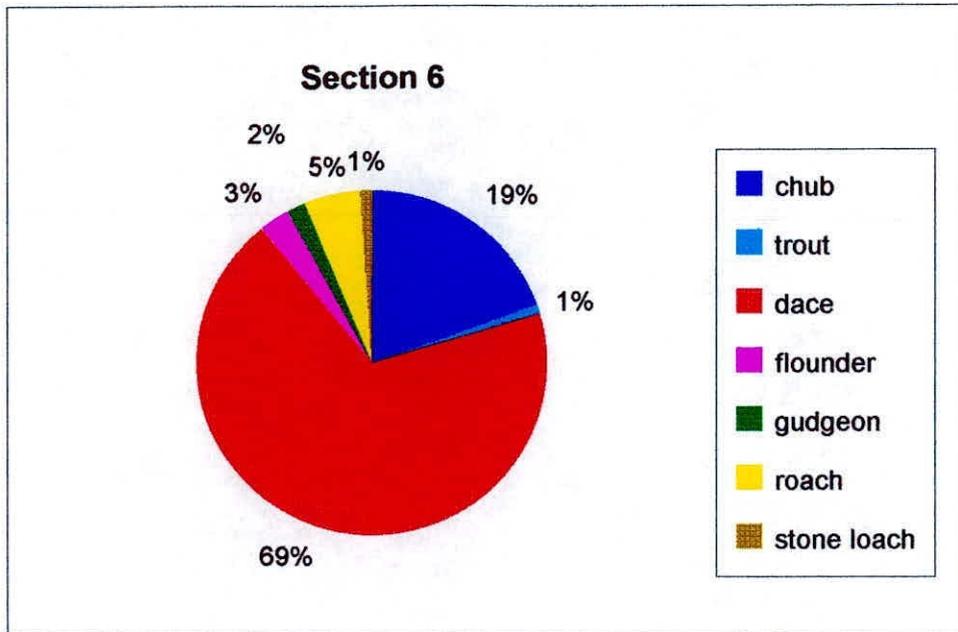
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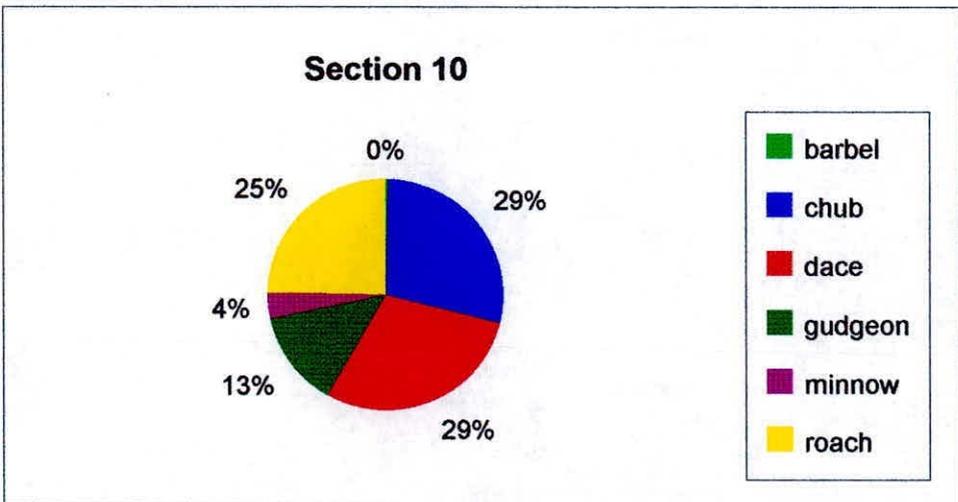
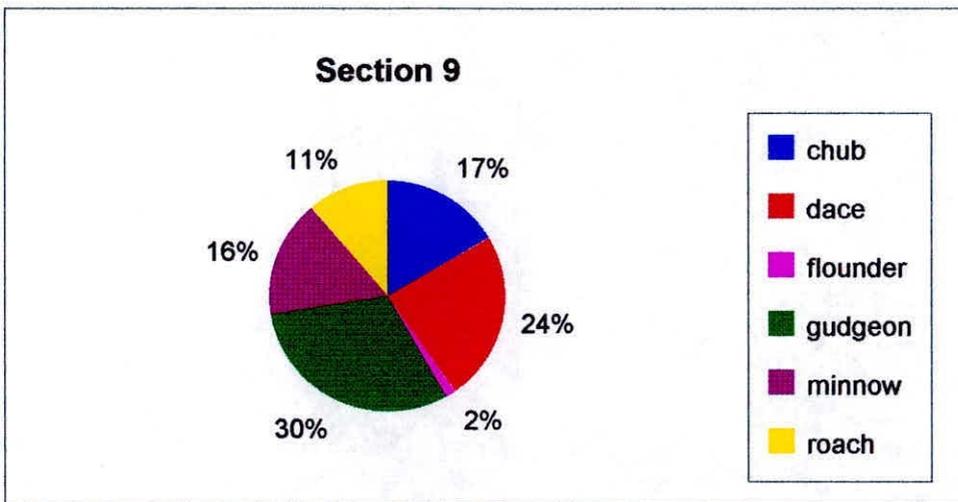
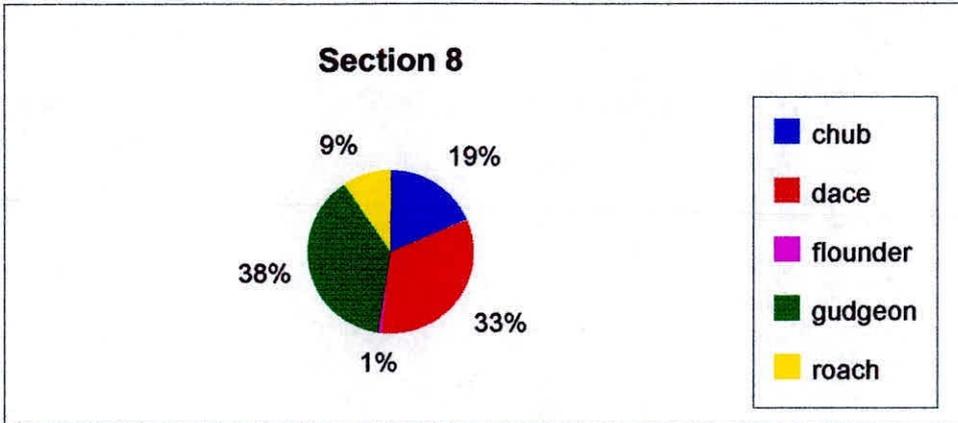
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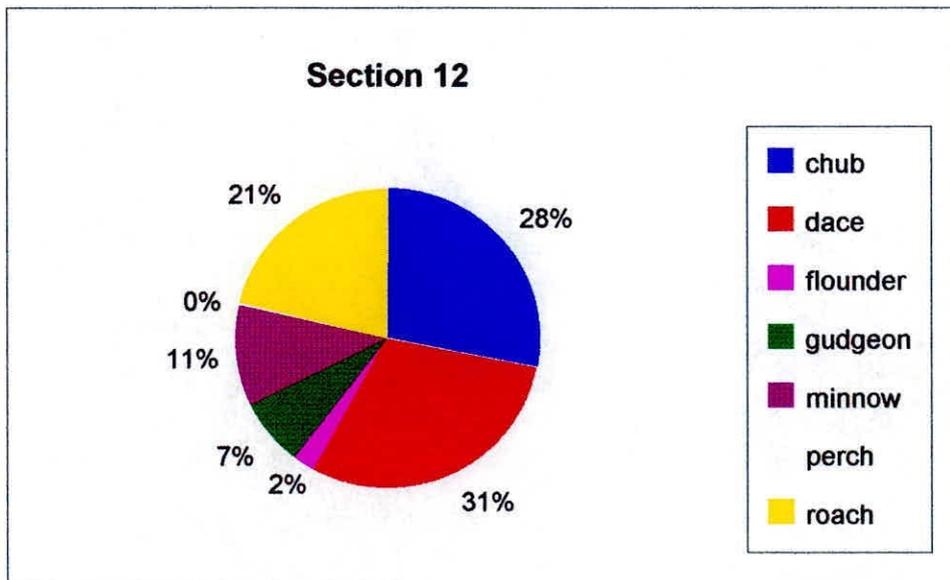
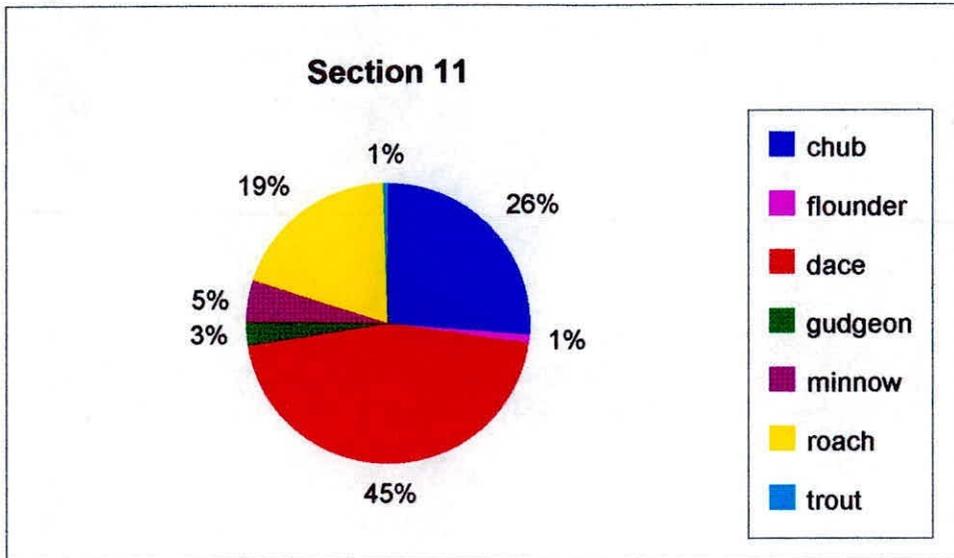
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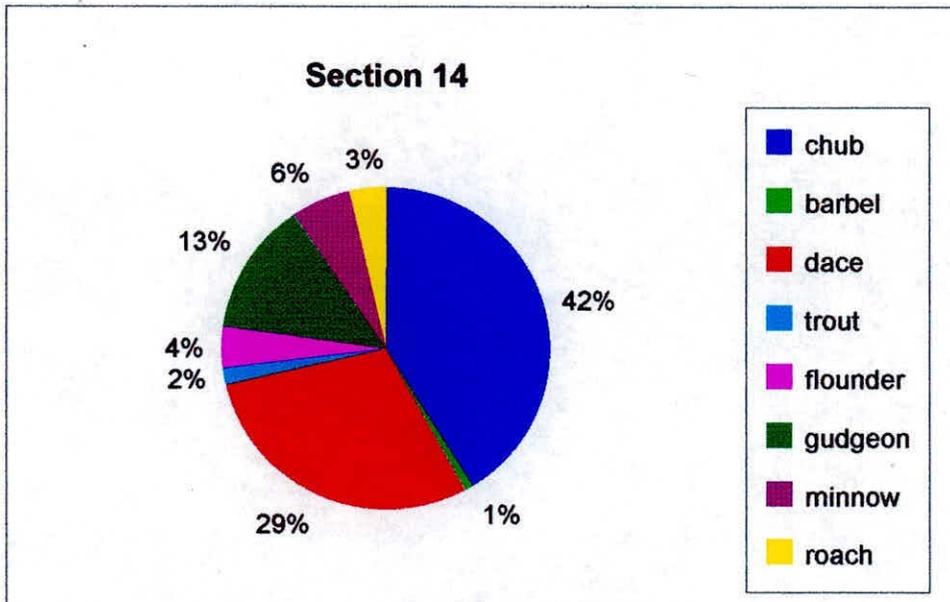
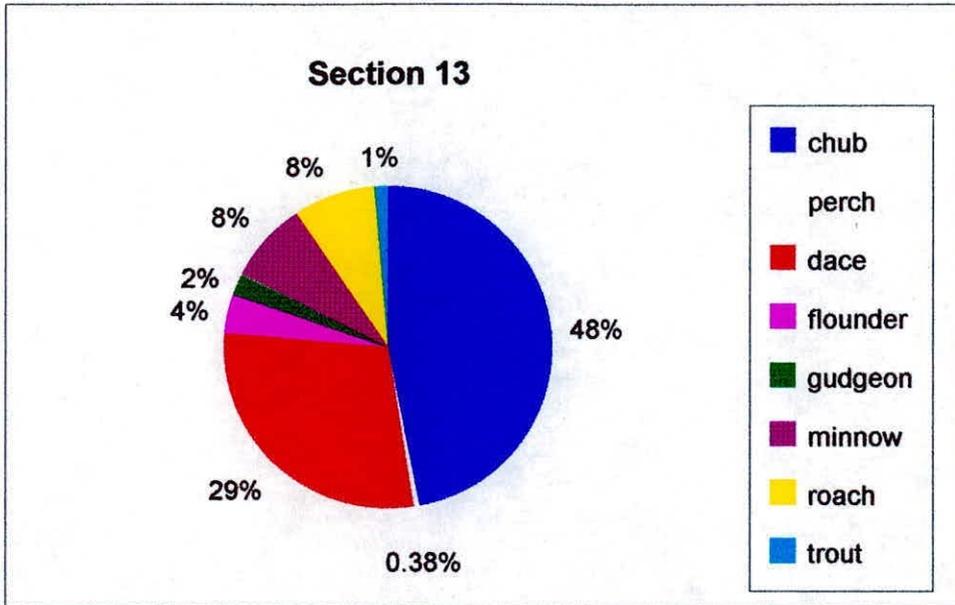
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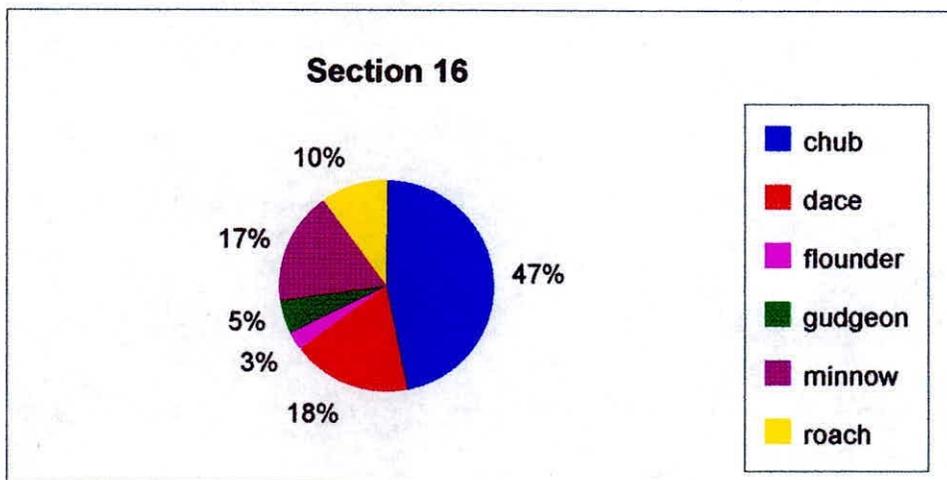
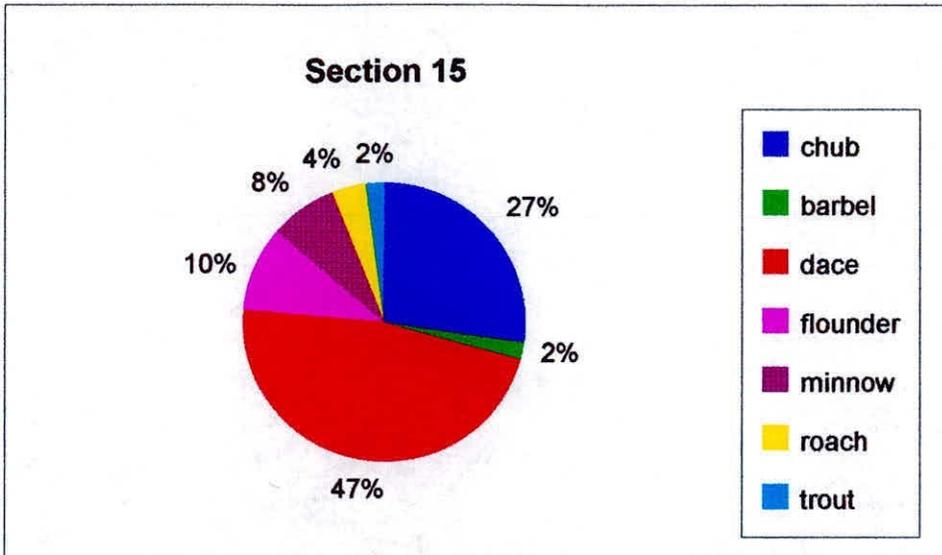
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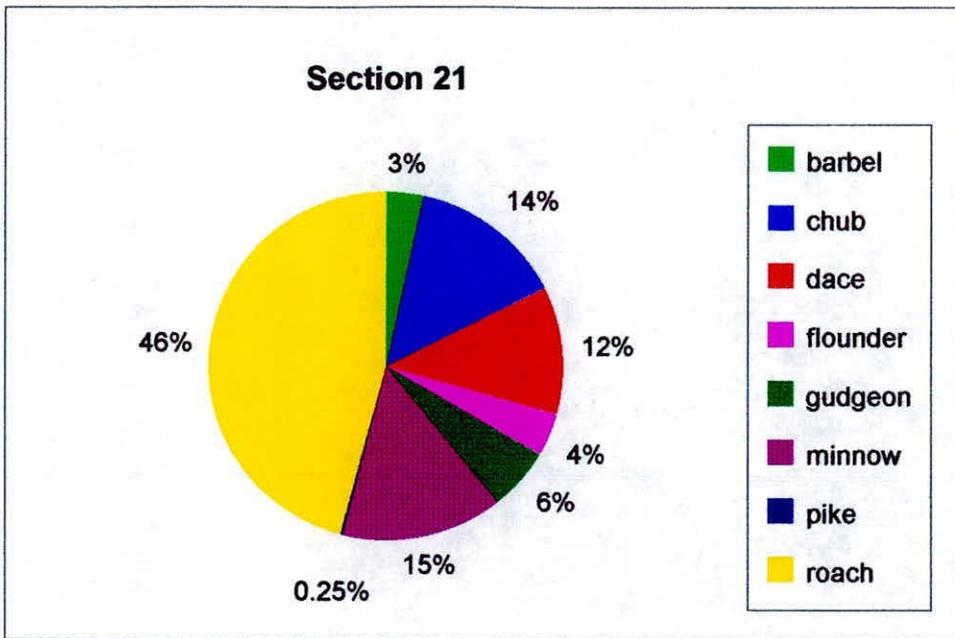
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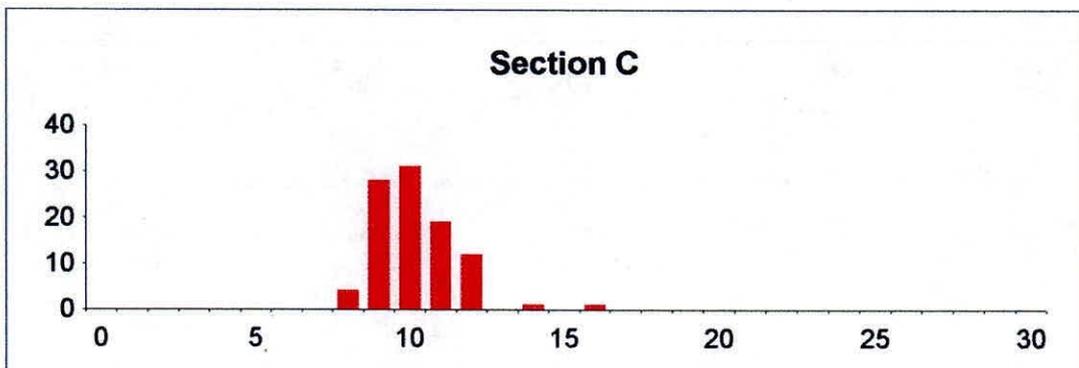
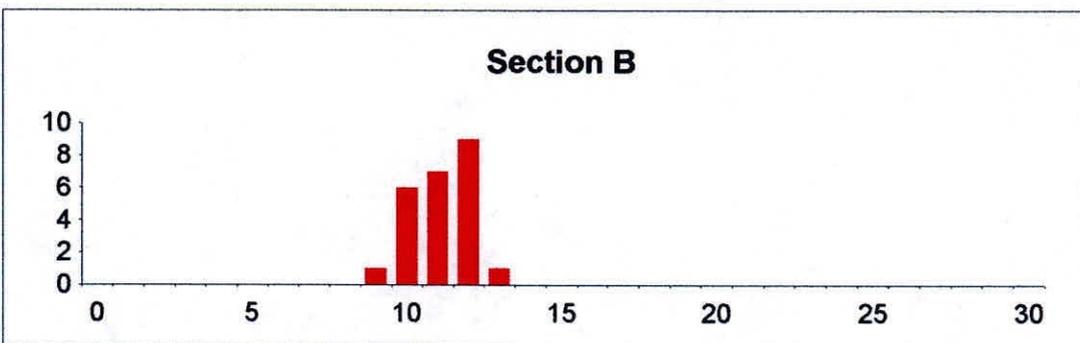
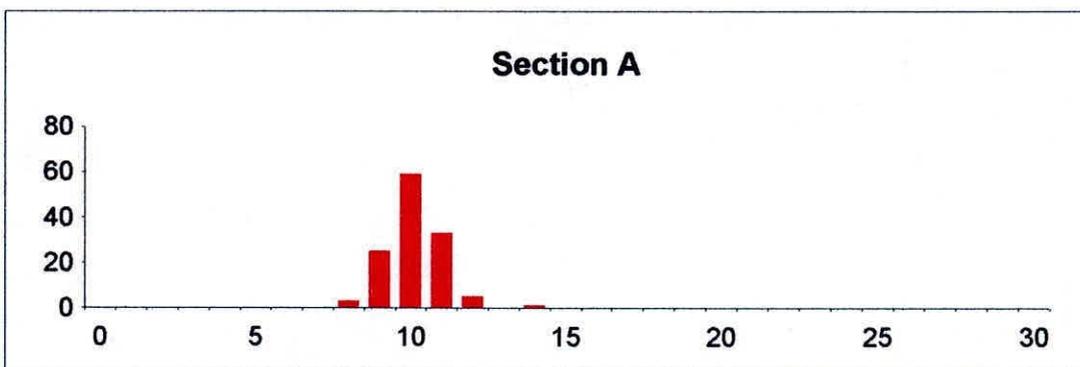
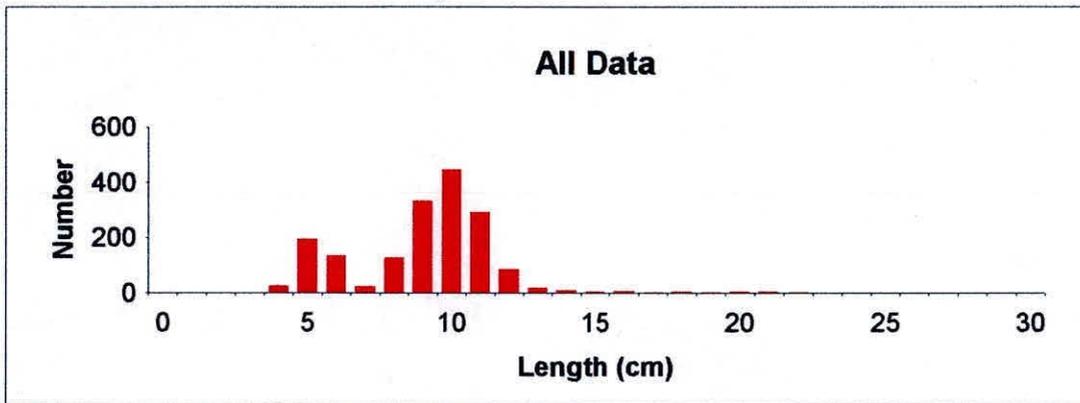
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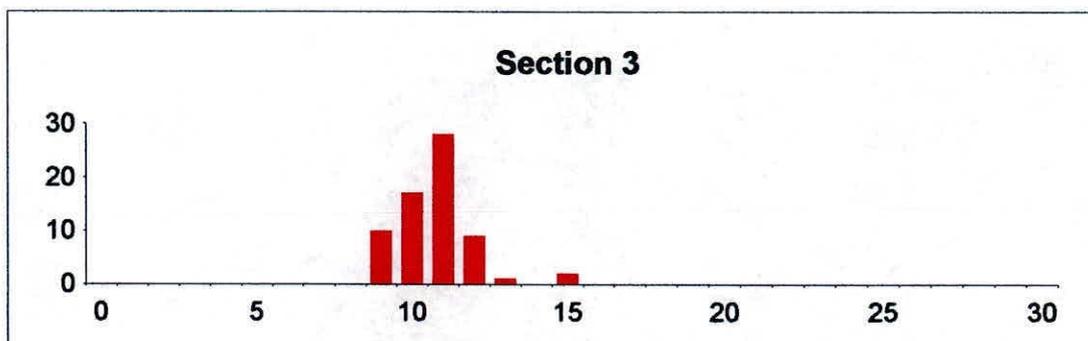
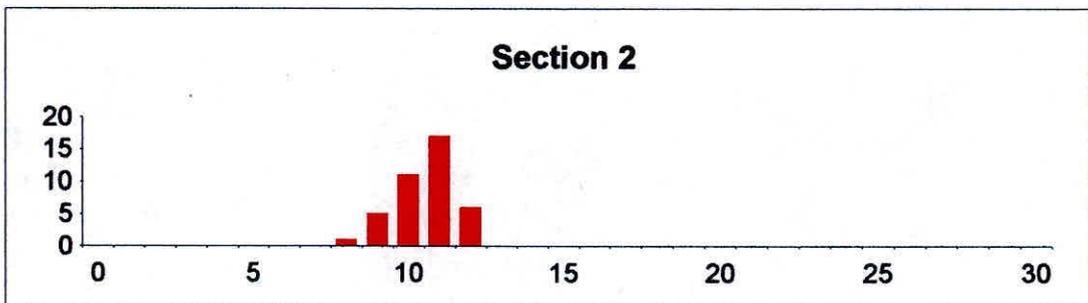
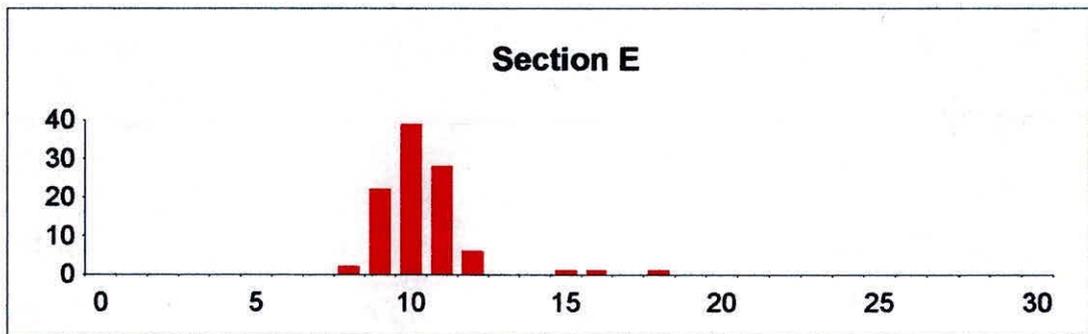
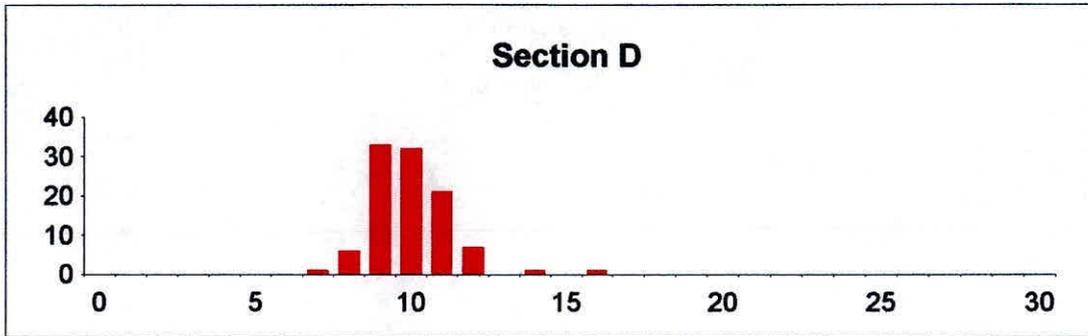
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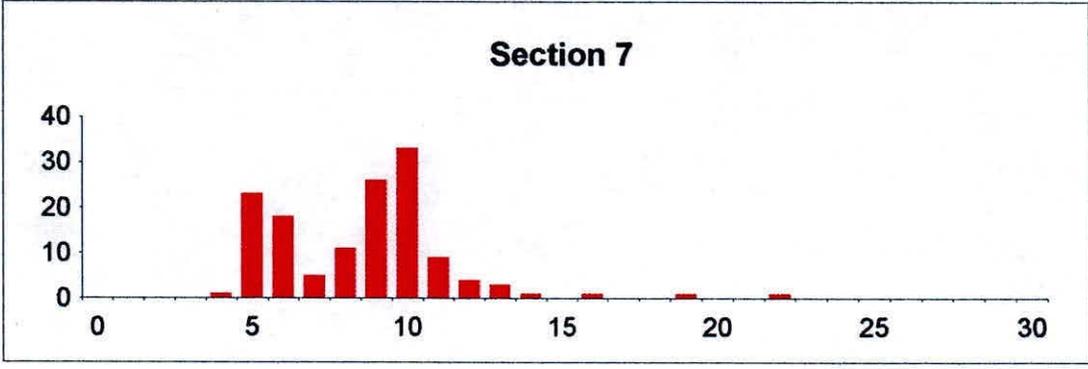
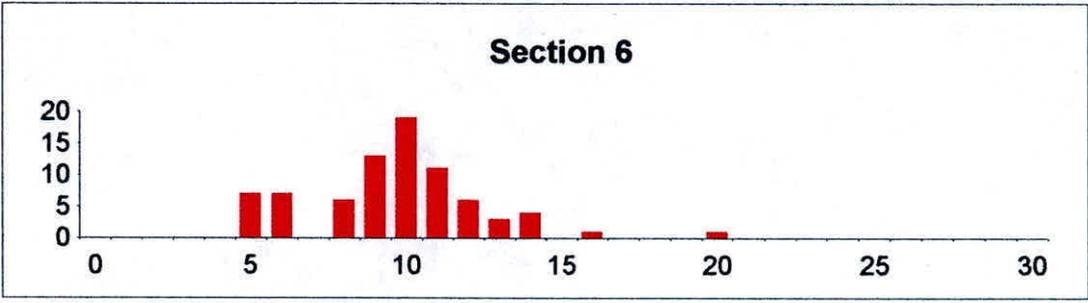
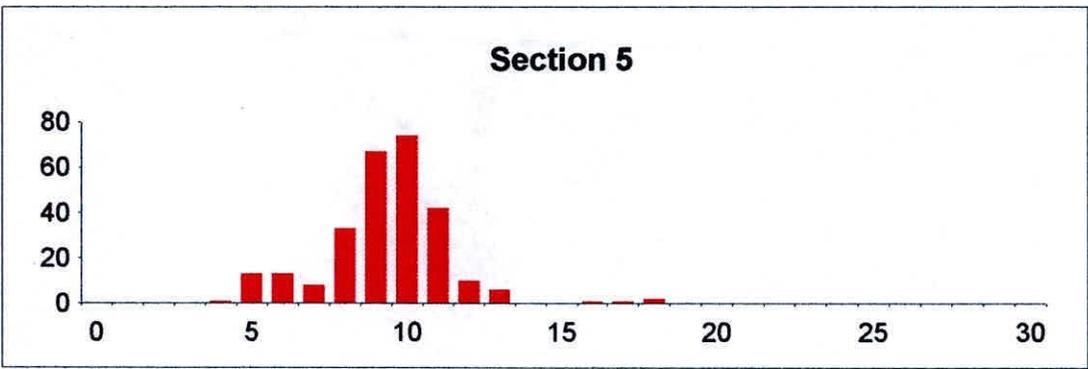
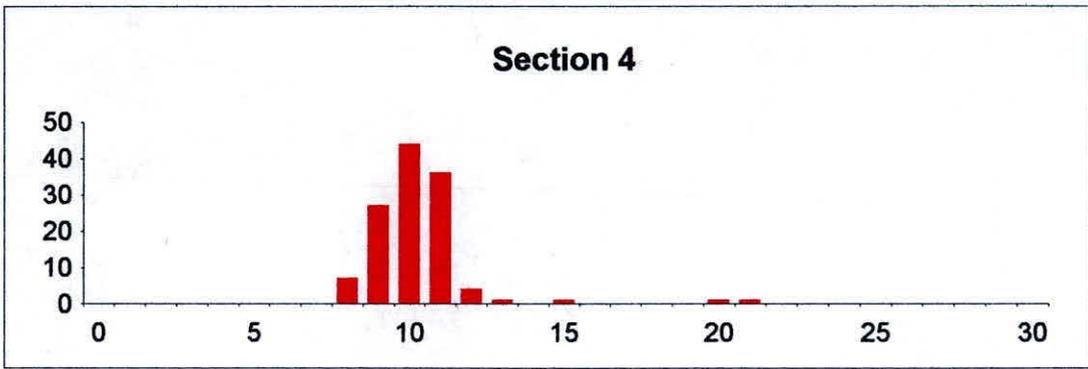
Appendix 6 Length frequency distribution of dace in each section of the R.Tees in September 1996



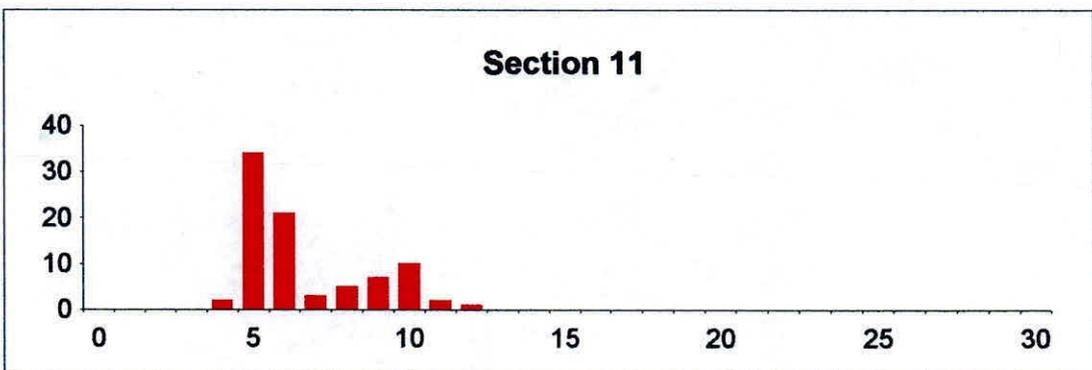
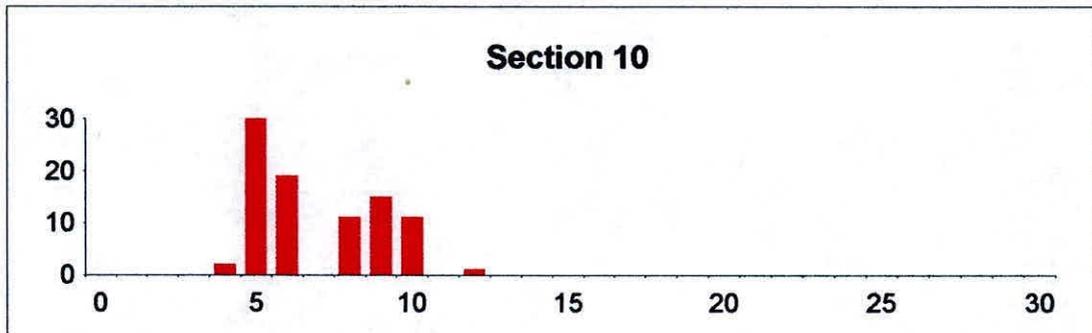
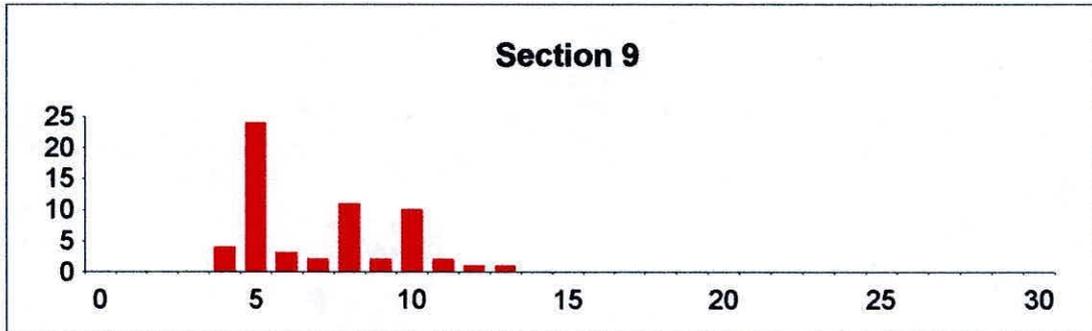
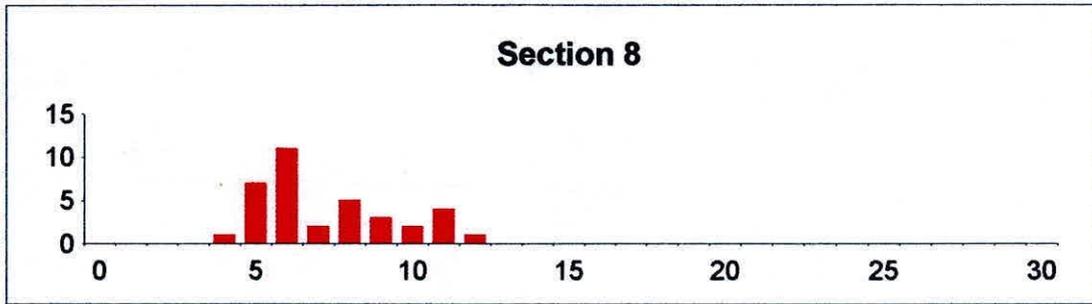
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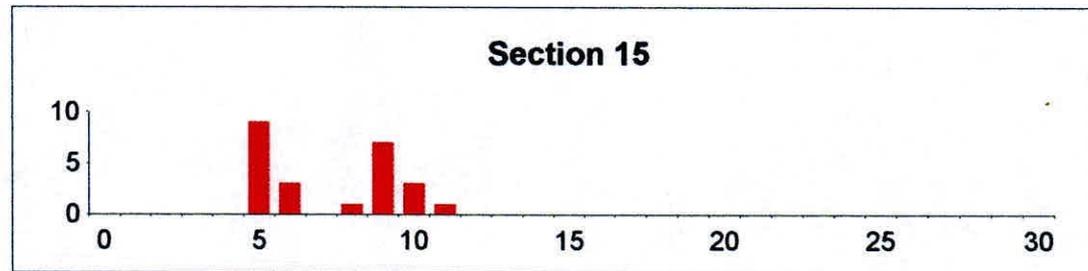
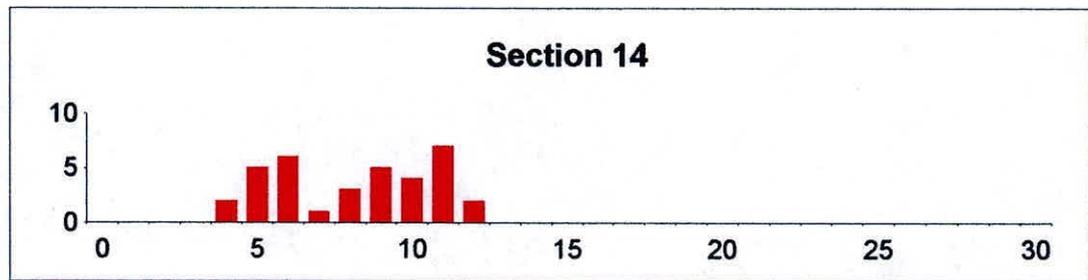
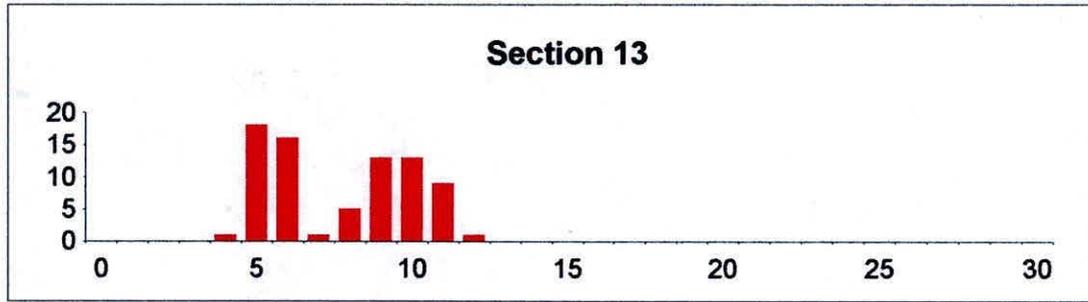
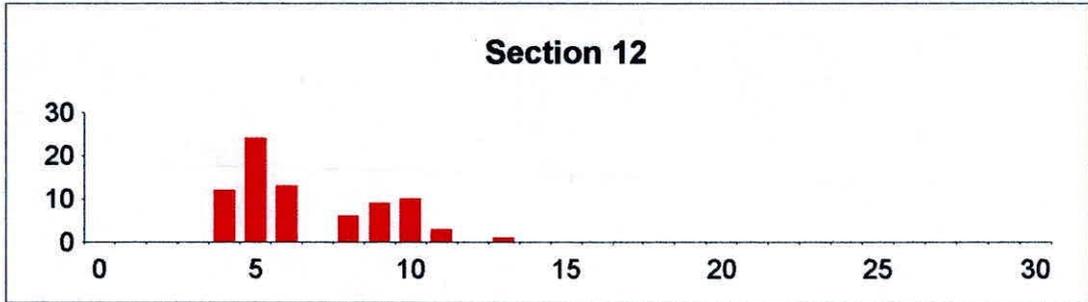
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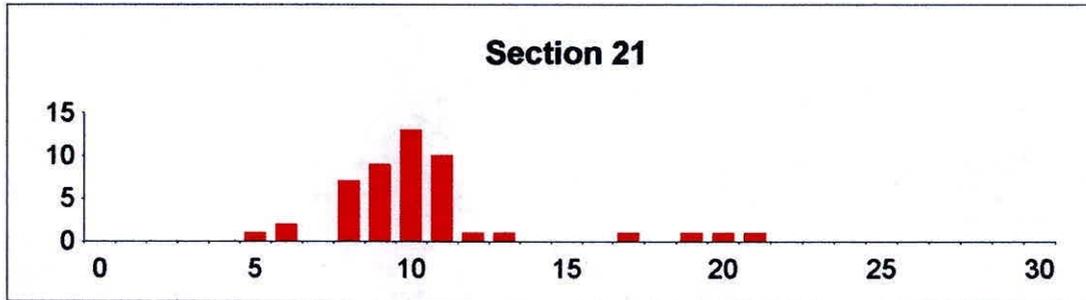
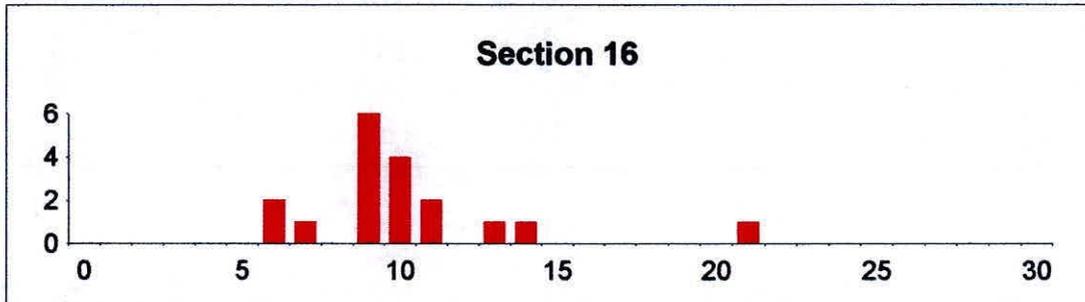
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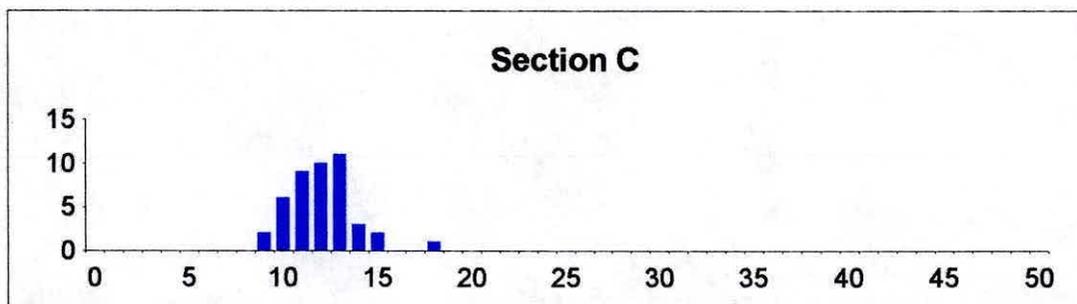
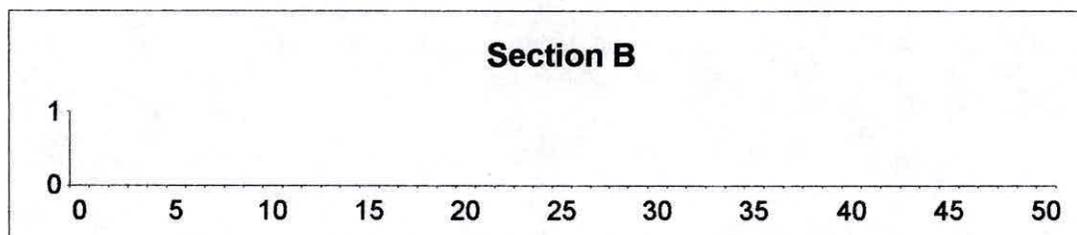
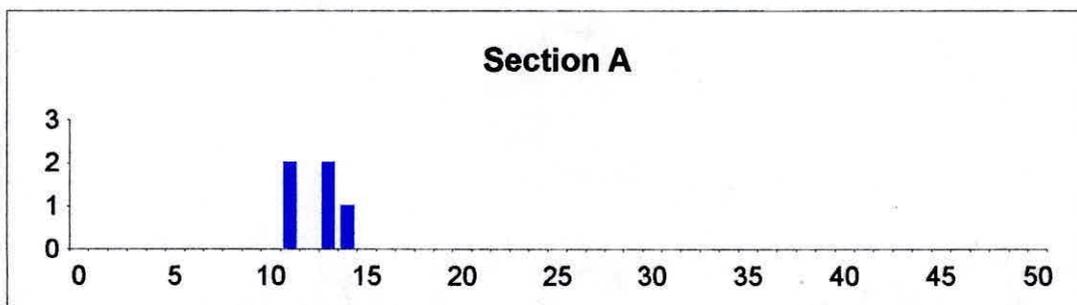
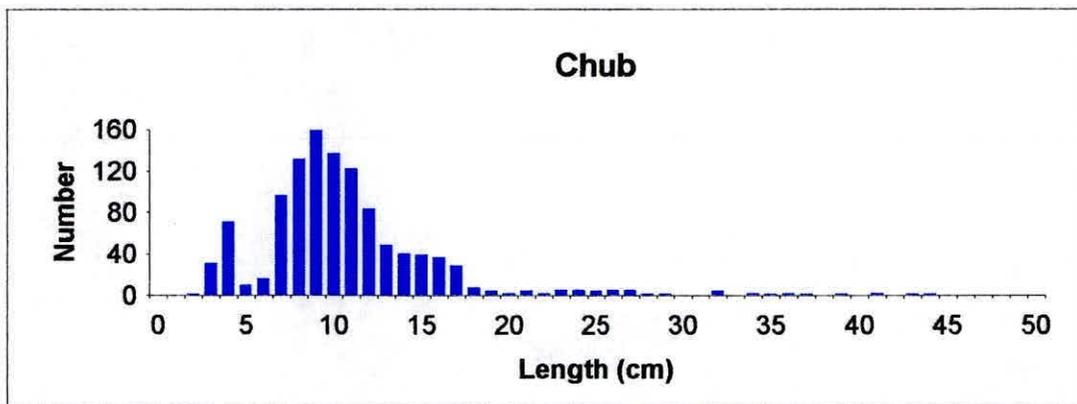
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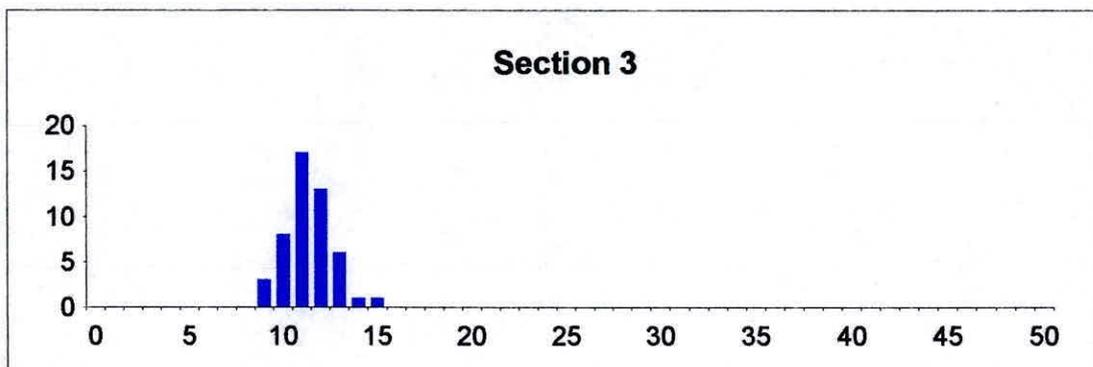
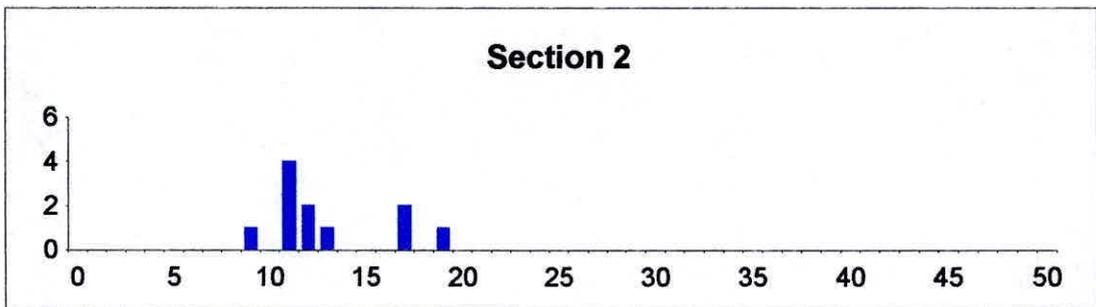
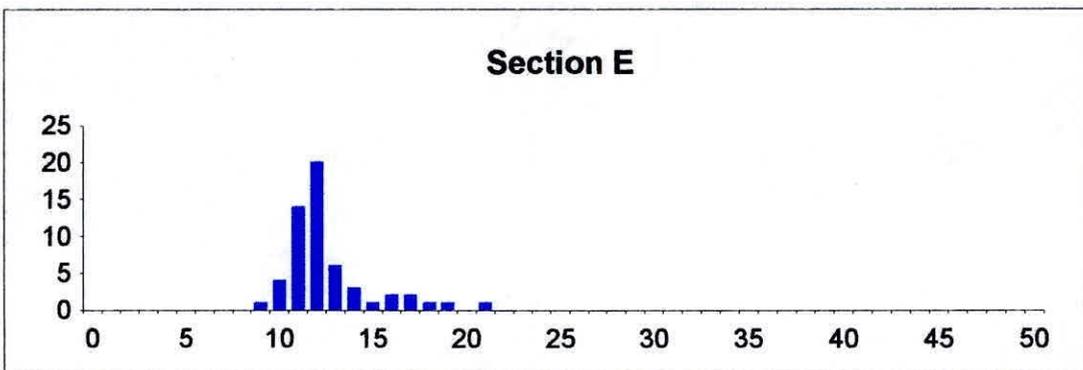
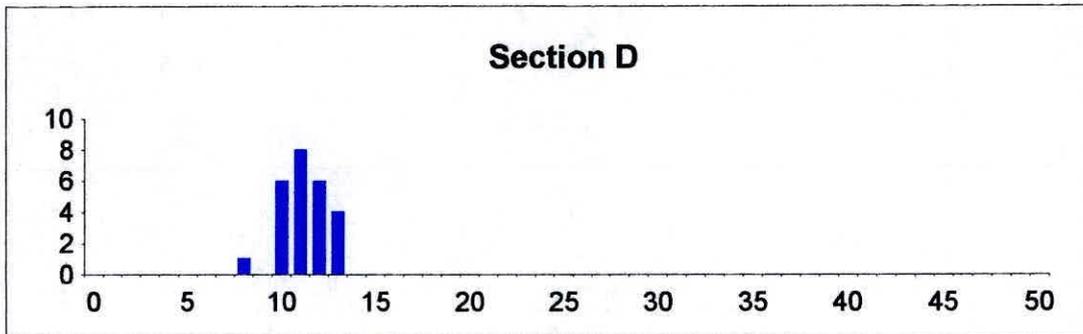
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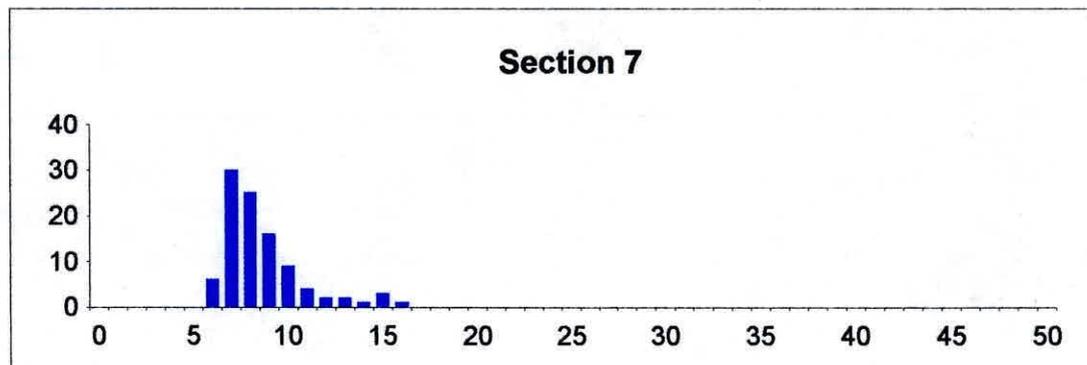
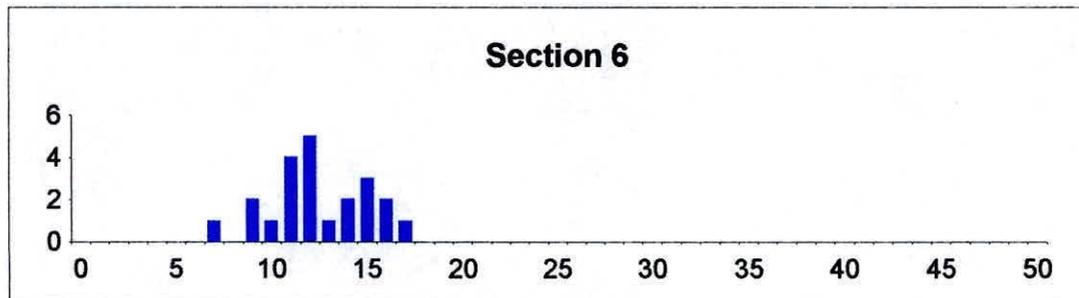
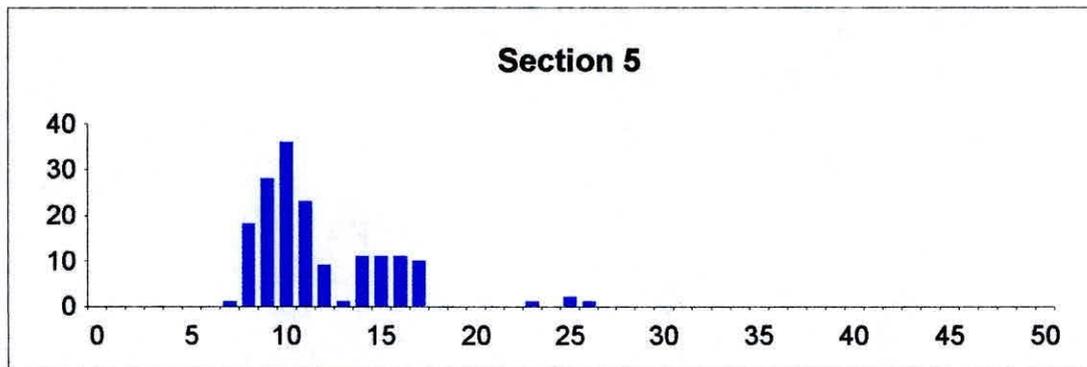
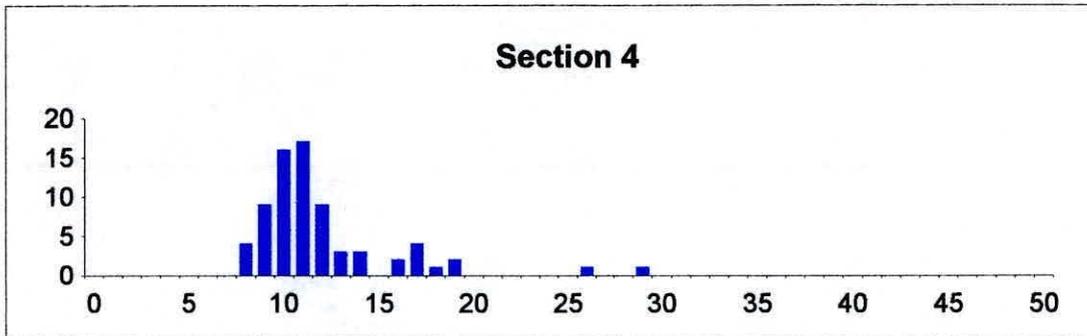
Appendix 7 Length frequency distribution of chub in each section of the R.Tees in September 1996



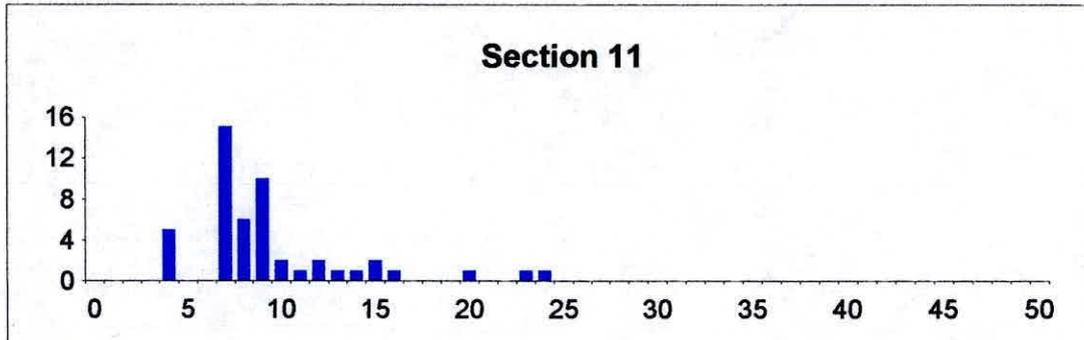
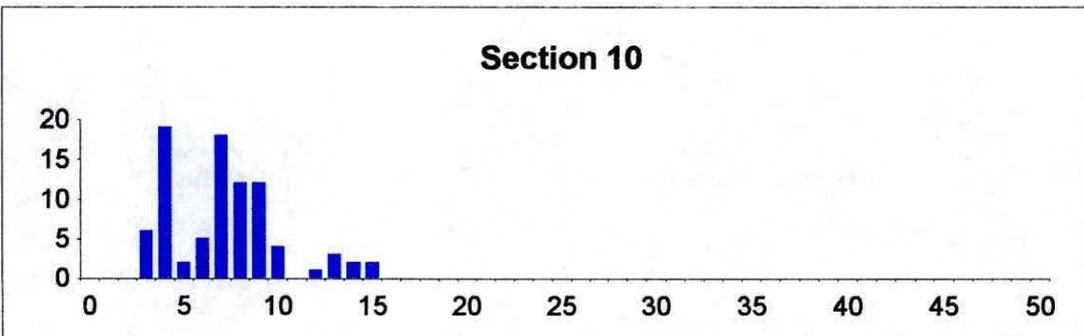
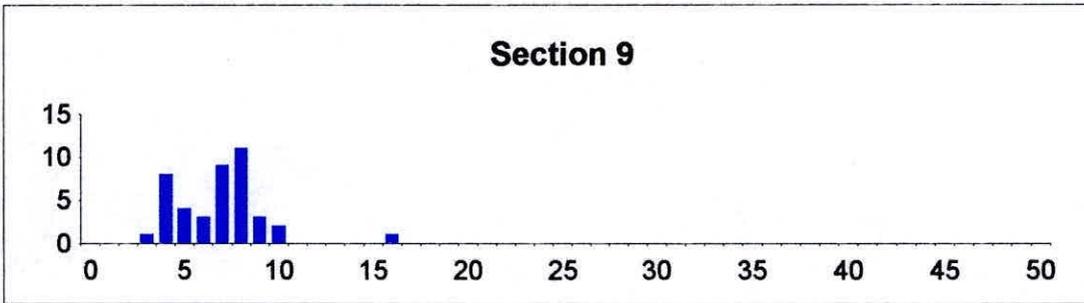
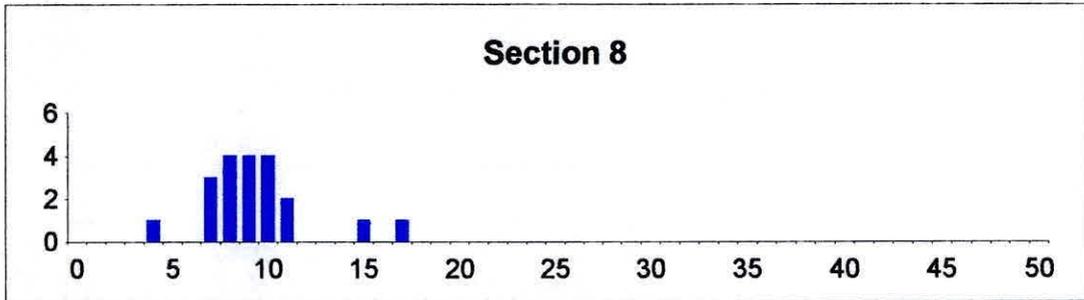
Appendix 7 continued



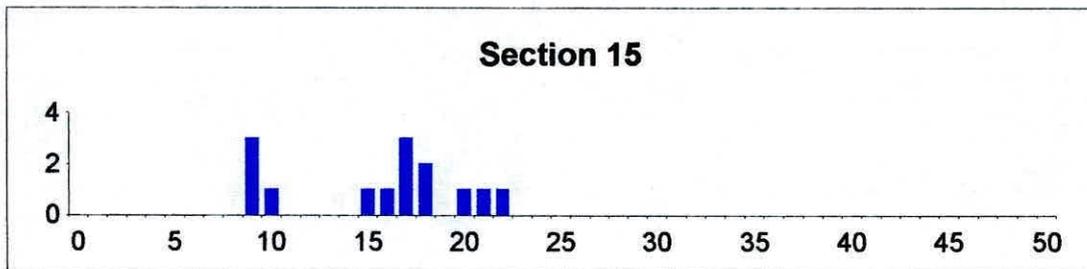
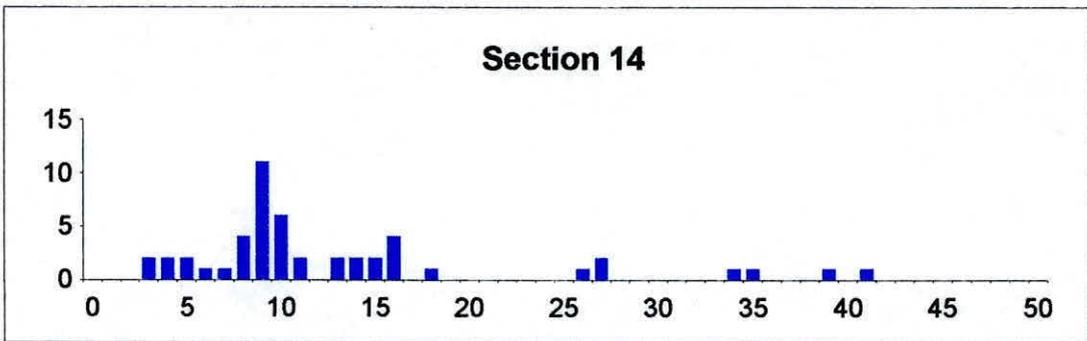
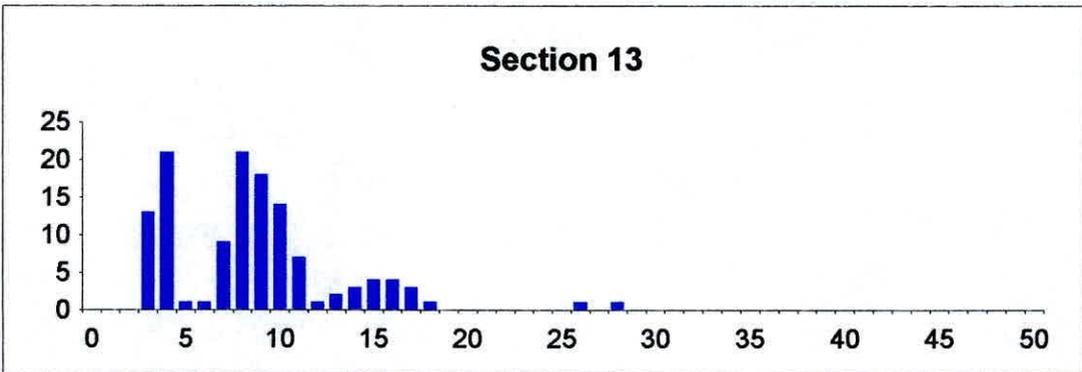
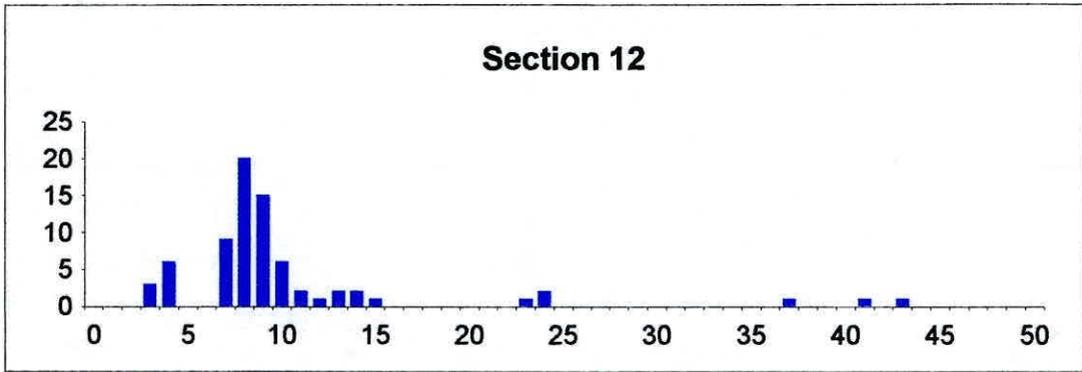
Appendix 7 continued



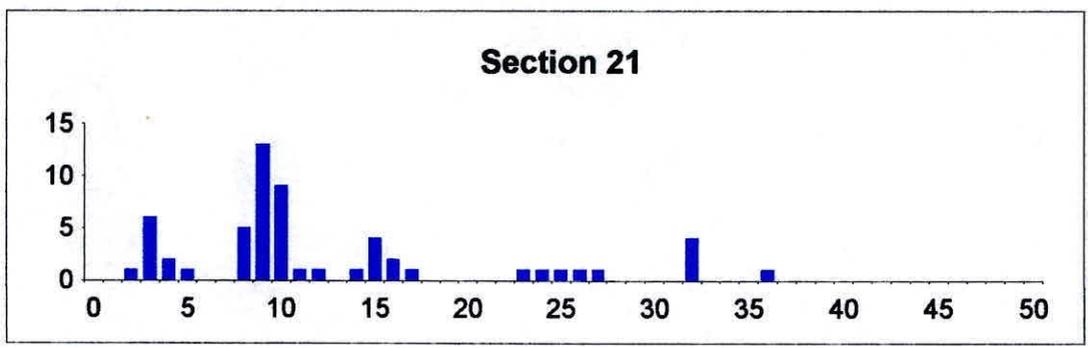
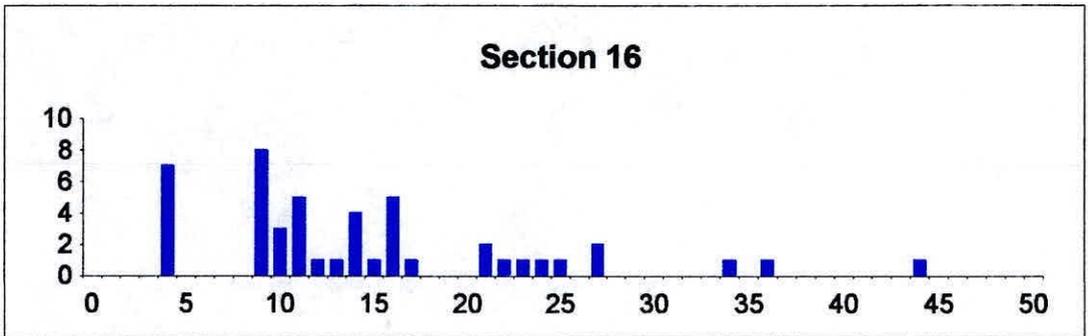
Appendix 7 continued



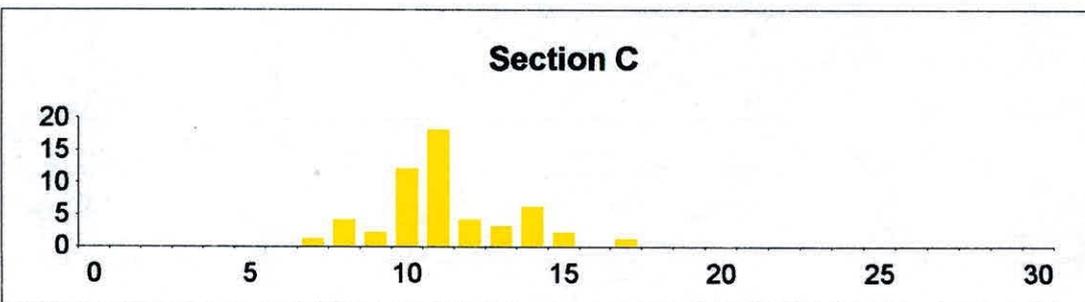
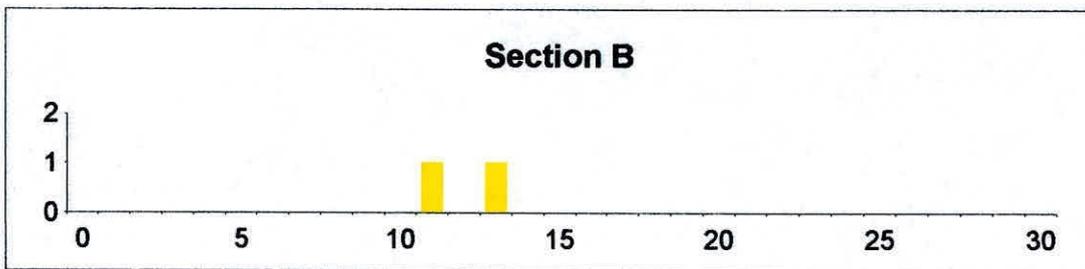
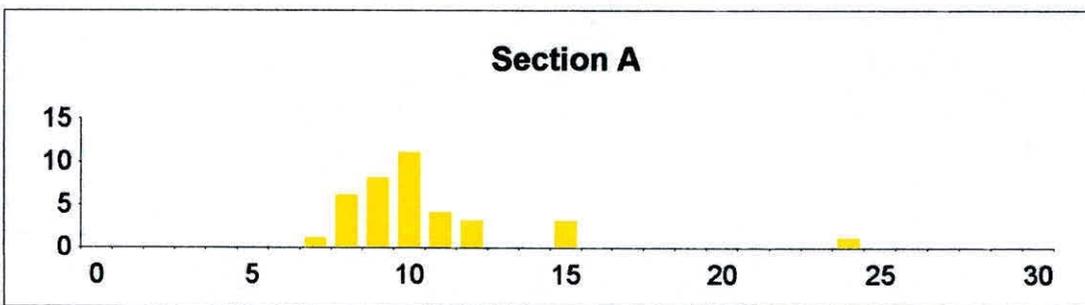
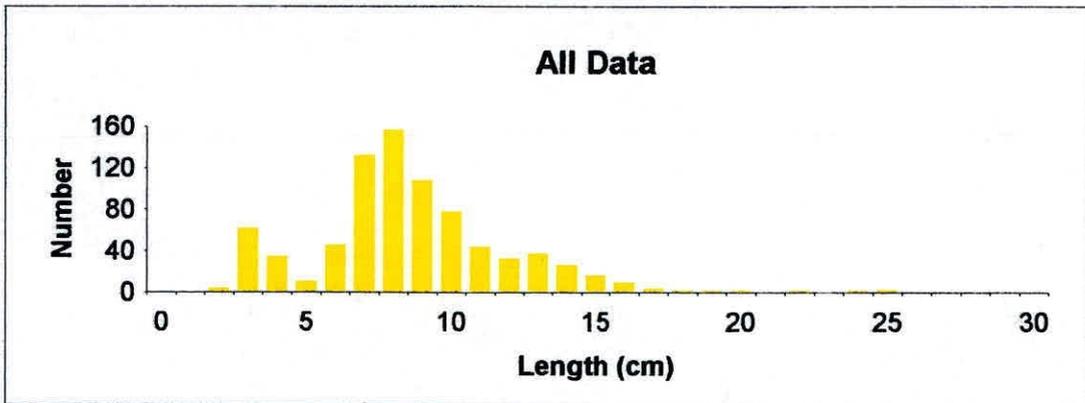
Appendix 7 continued



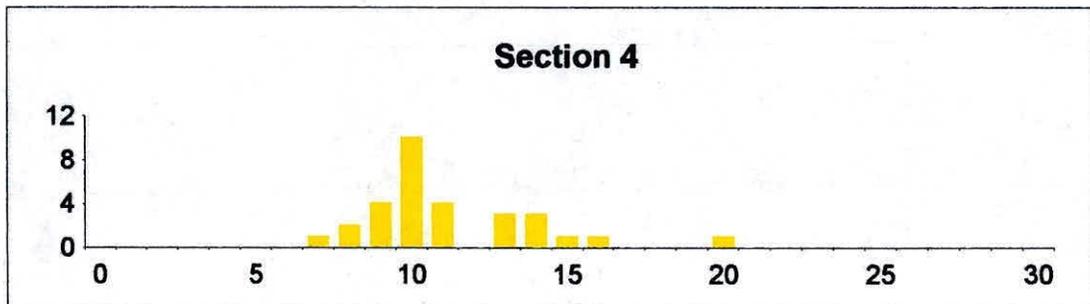
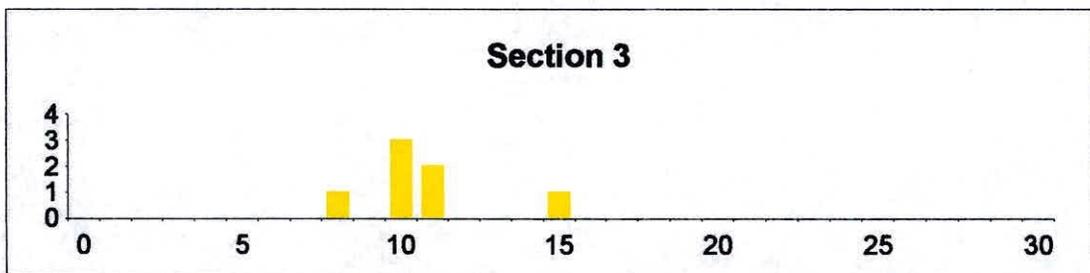
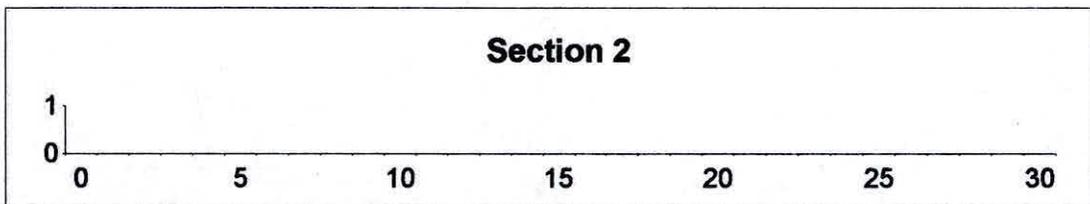
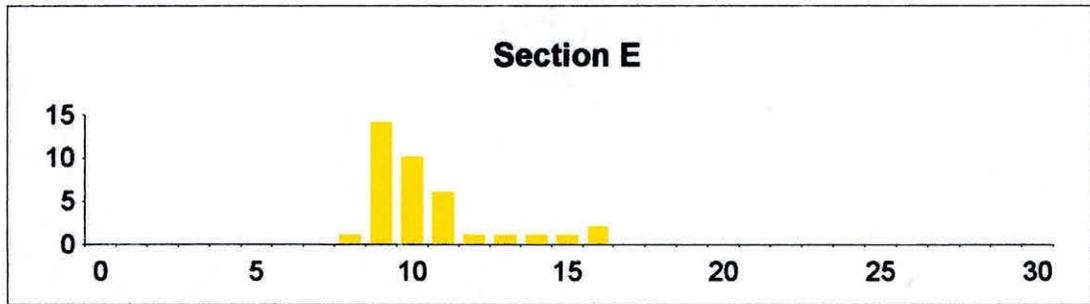
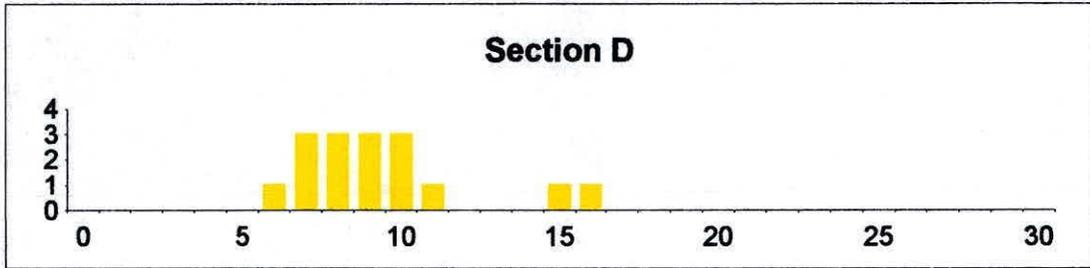
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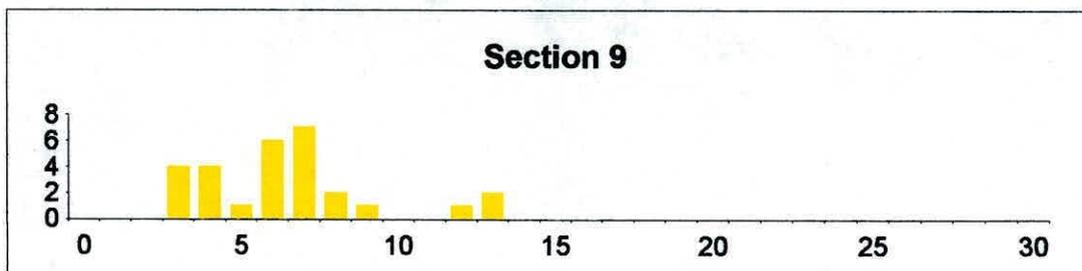
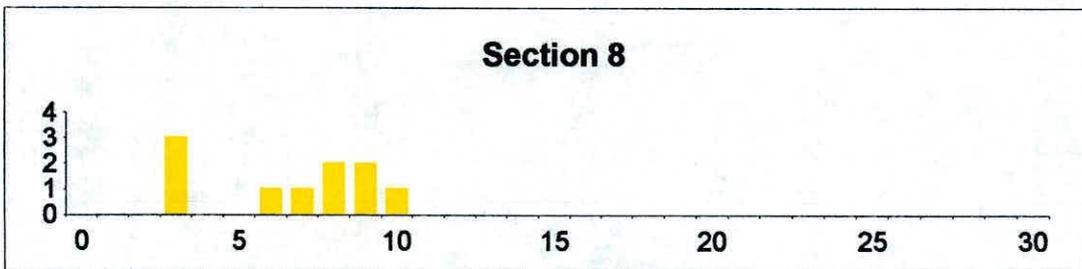
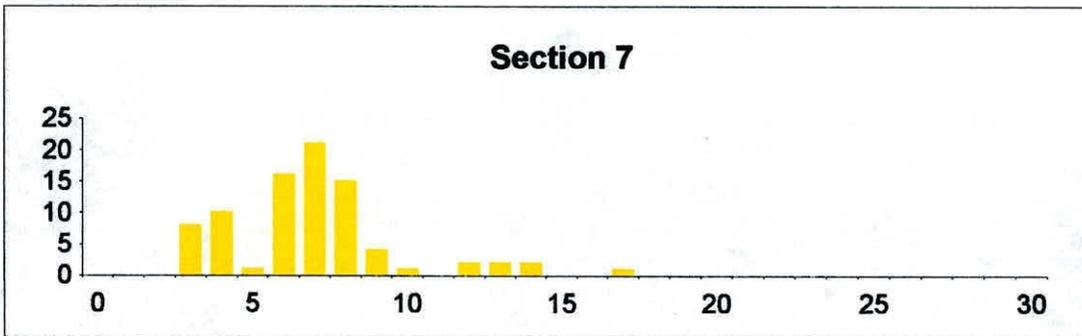
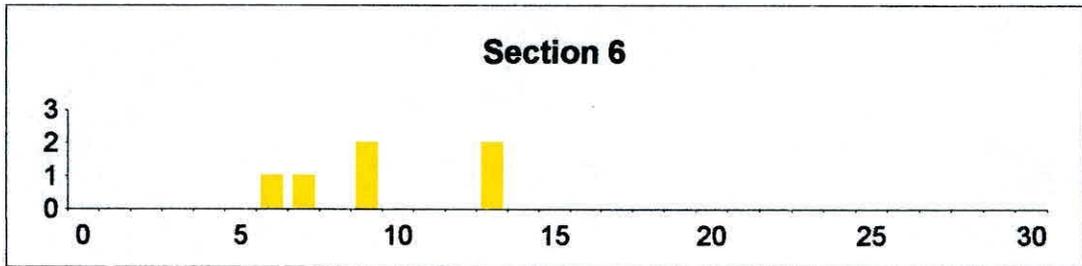
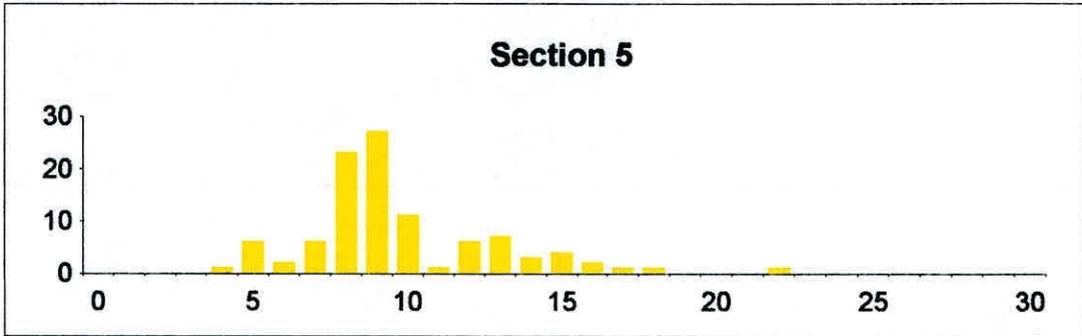
Appendix 8 Length frequency distribution of roach in each section of the R.Tees in September 1996



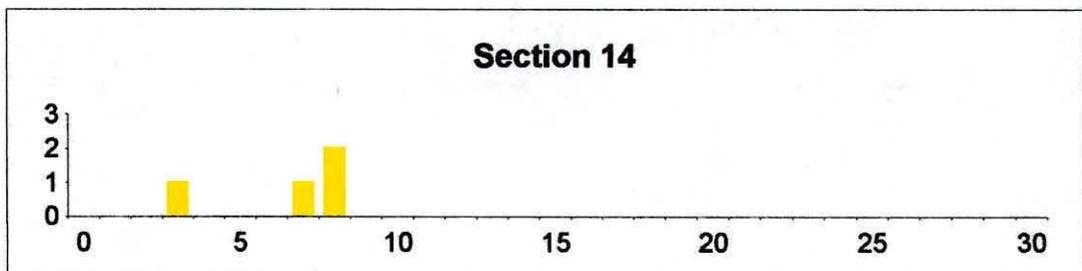
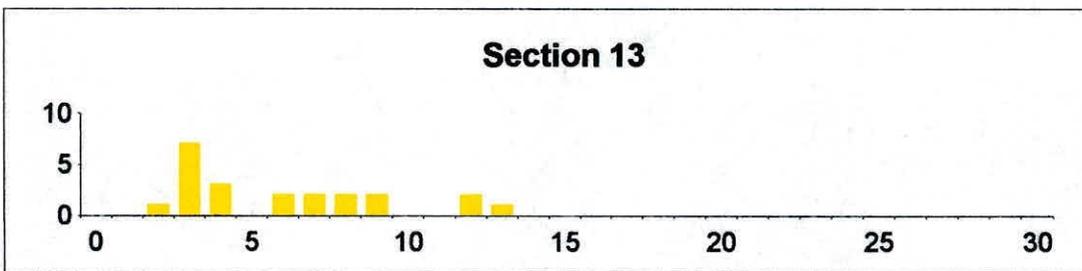
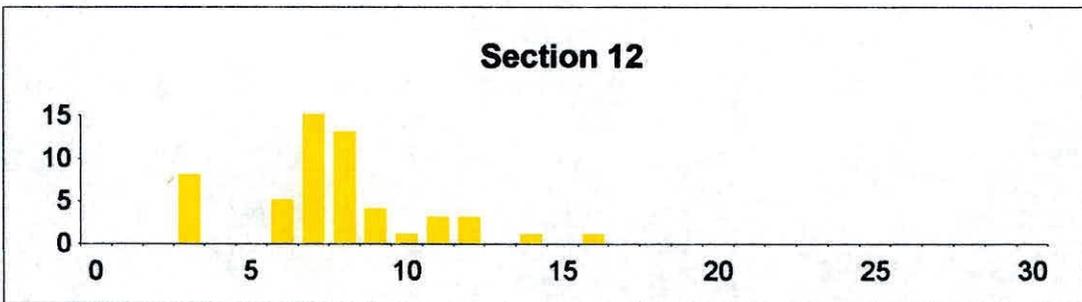
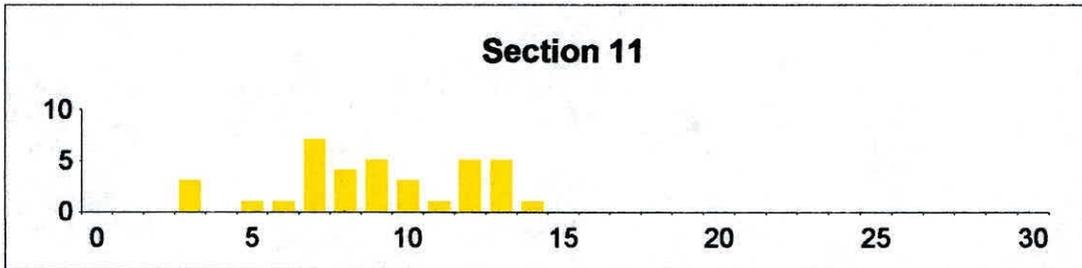
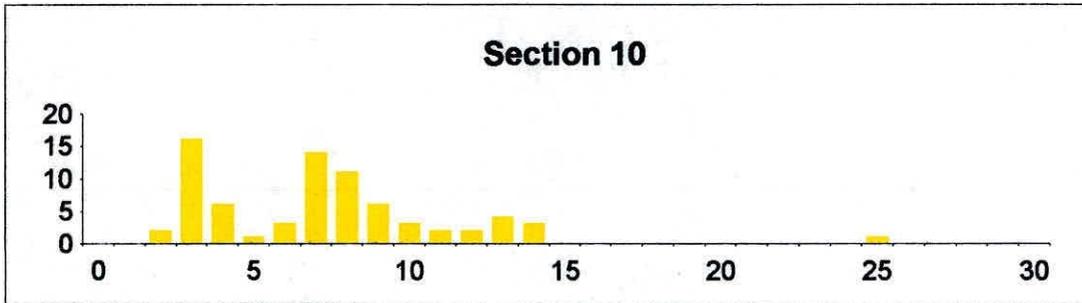
Appendix 8 continued



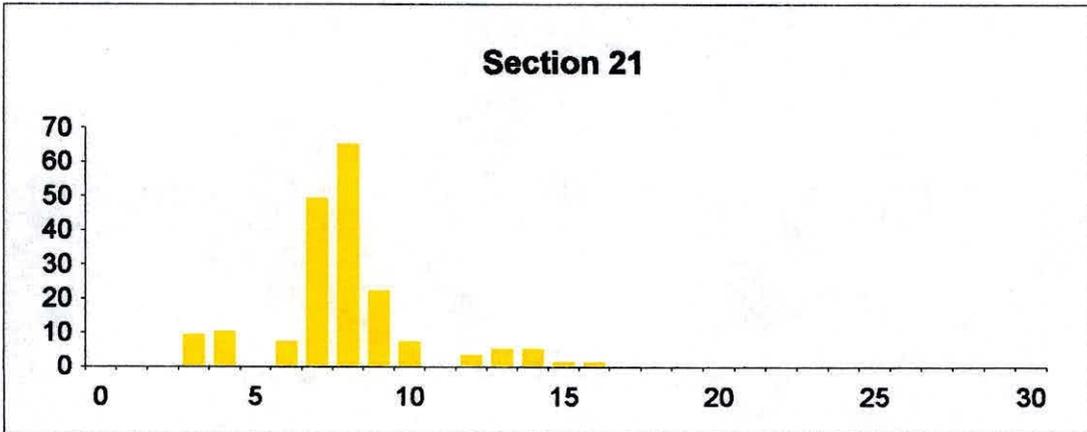
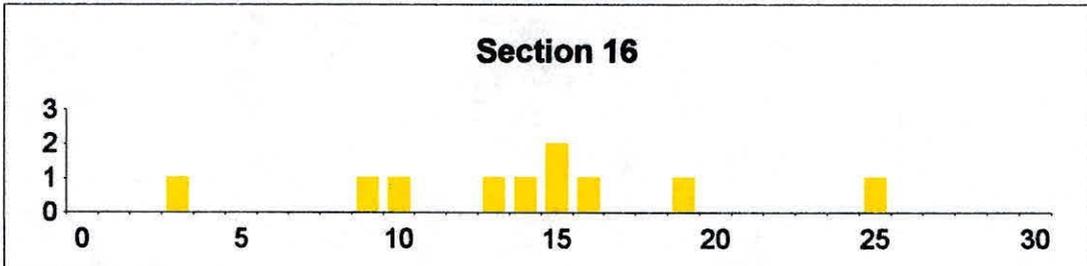
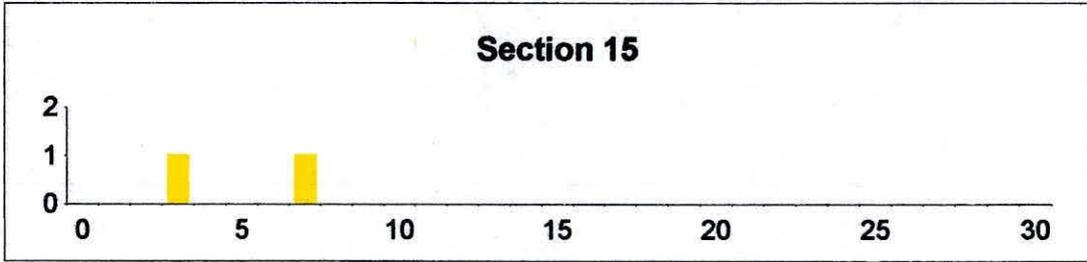
Appendix 8 continued



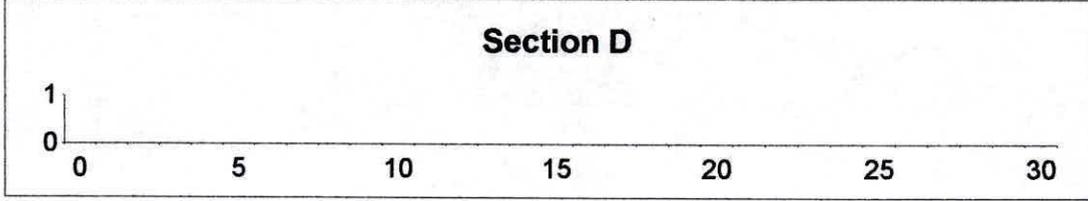
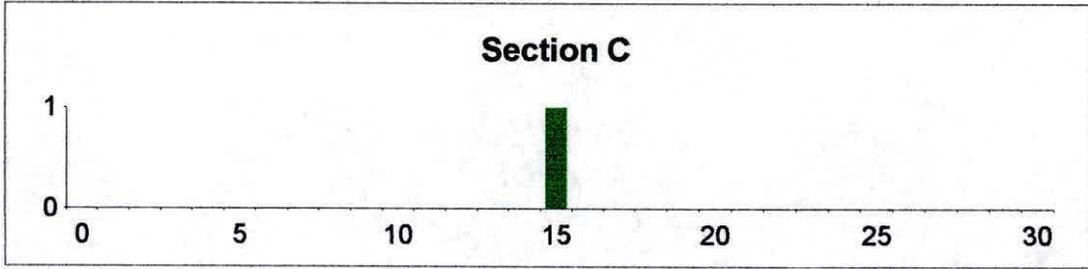
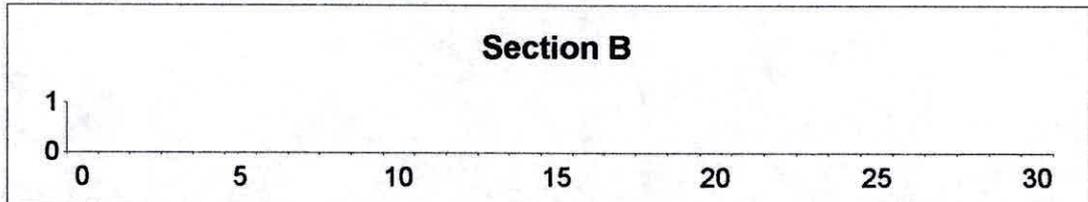
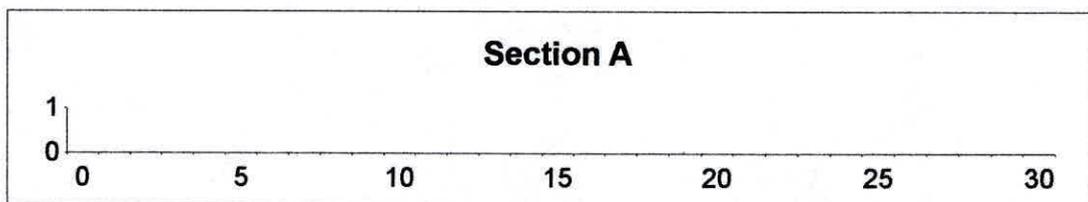
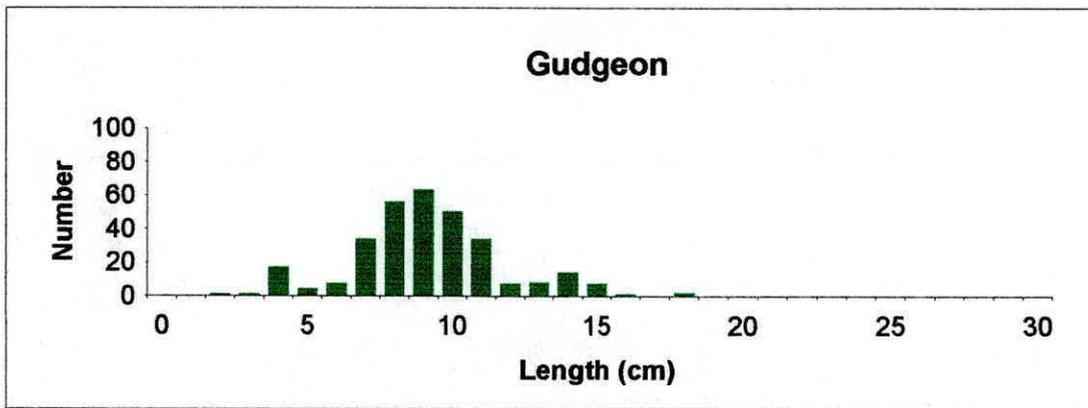
Appendix 8 continued



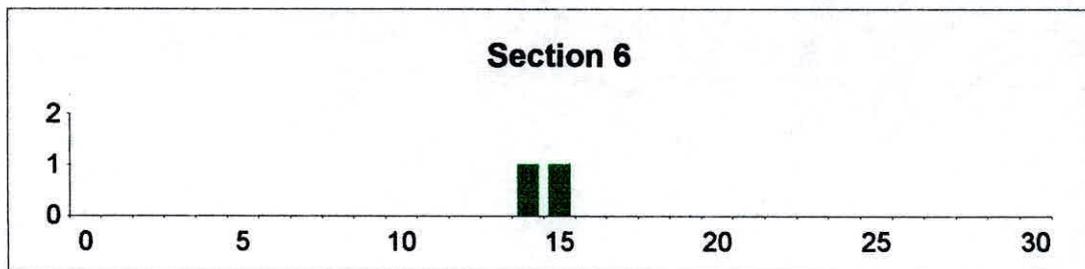
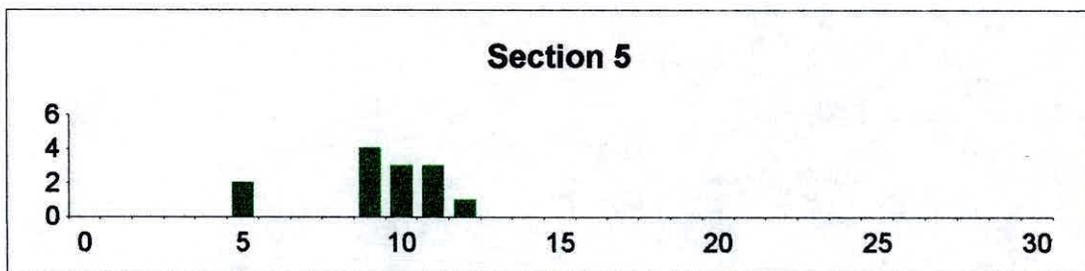
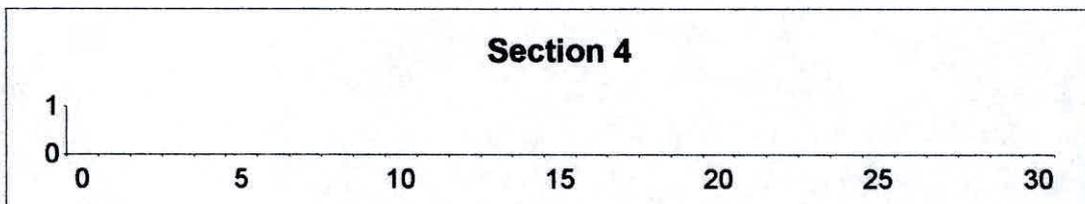
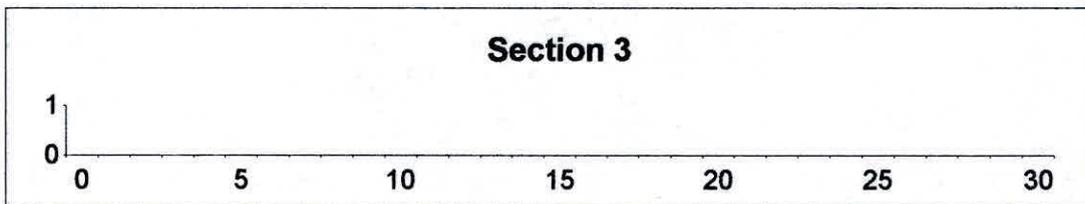
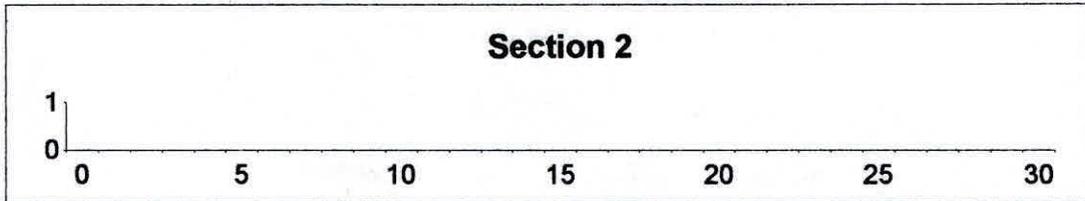
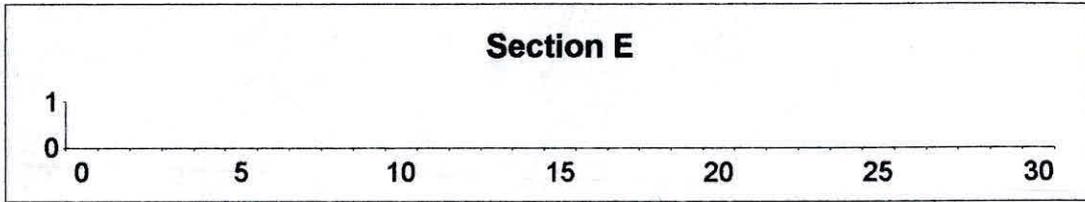
Appendix 8 continued



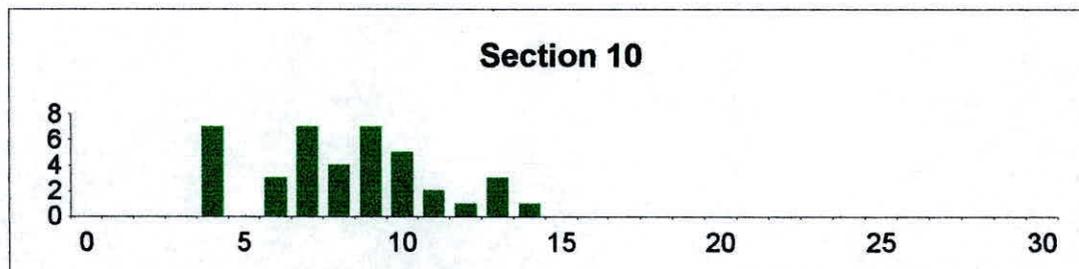
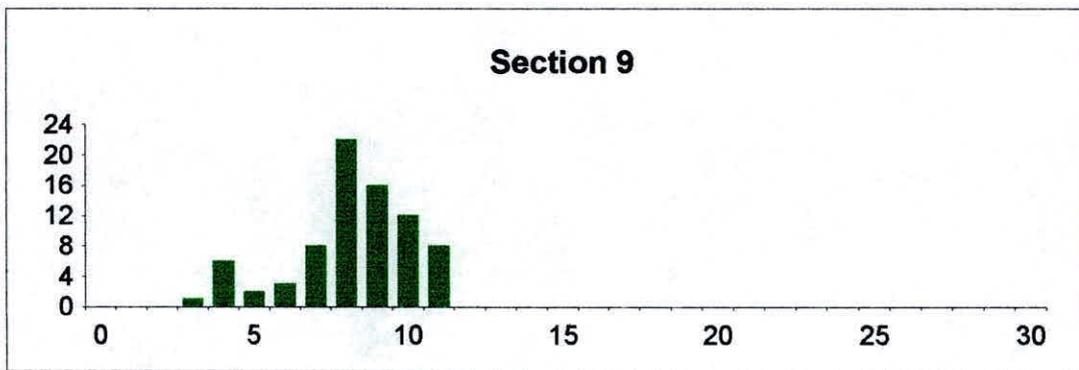
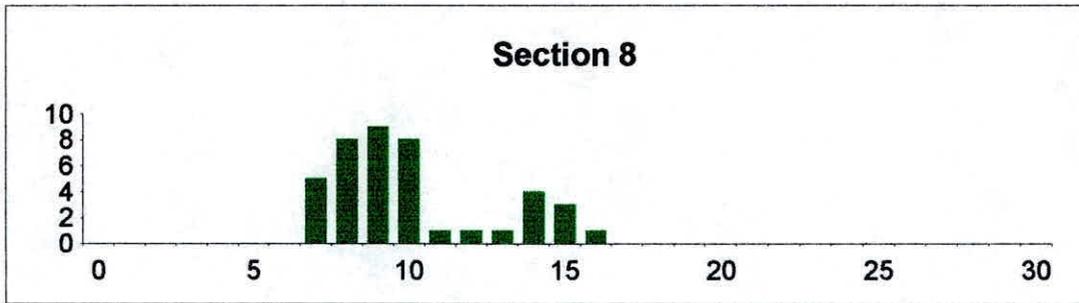
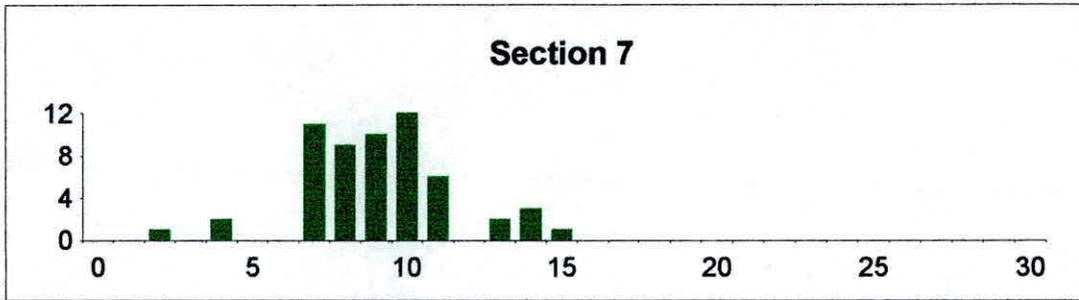
Appendix 9 Length frequency distribution of gudgeon in each section of the R.Tees in September 1996



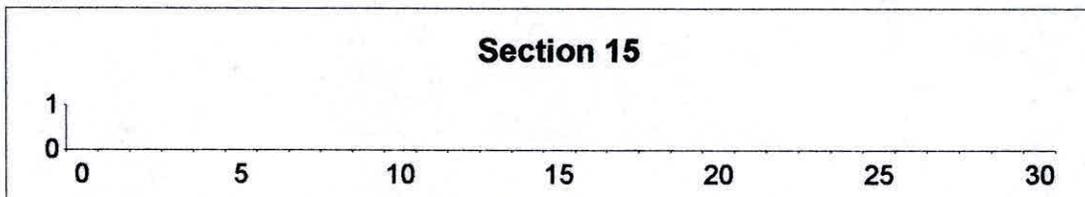
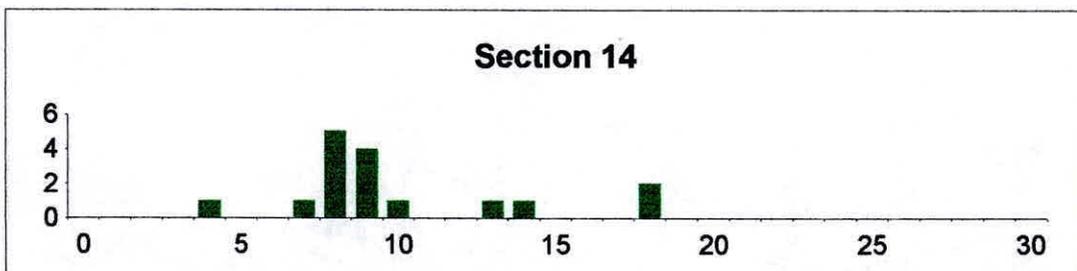
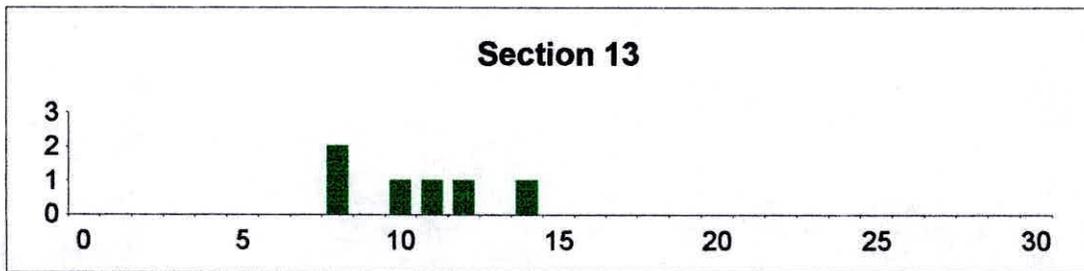
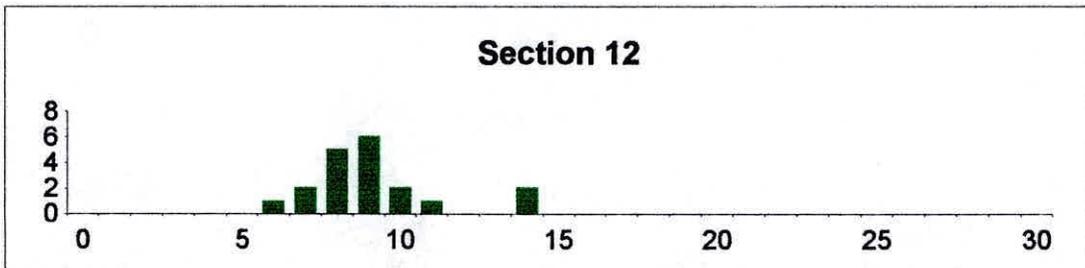
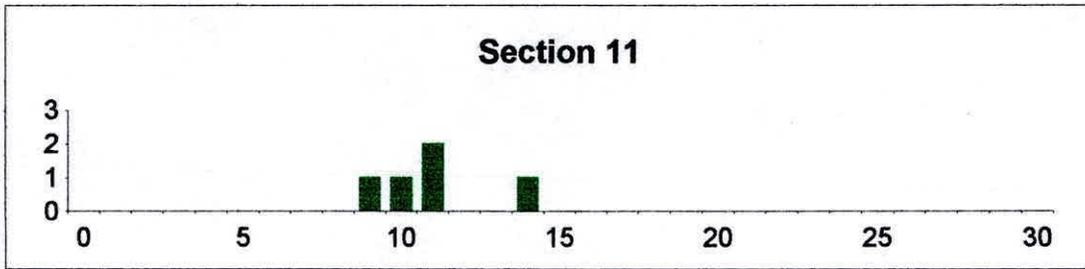
Appendix 9 continued



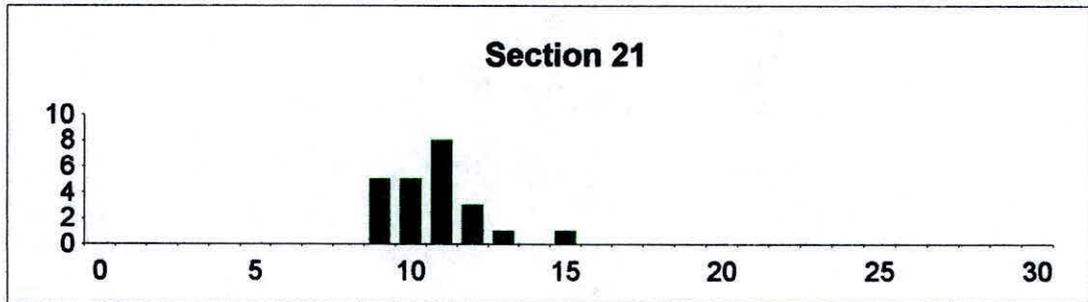
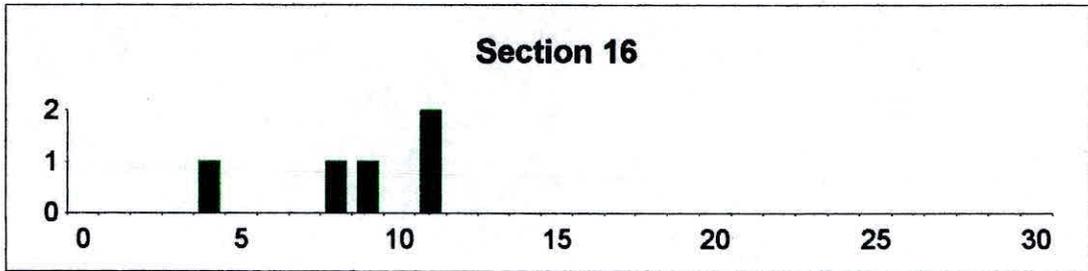
Appendix 9 continued



Appendix 9 continued



Appendix 9 continued



Appendix 10 Results of angling matches 1977-1996. \bar{x} = mean catch per angler per match (ounces) \pm 95% confidence limits; \bar{y} = mean catch per angler per match (ounces) \pm 95% confidence limits for the top ten anglers in each match.

Year	\bar{x}	\bar{y}
1977/78	59.4 \pm 6.0	111.2 \pm 15.7
1978/79	68.3 \pm 6.6	132.5 \pm 15.0
1979/80	76.2 \pm 8.6	113.9 \pm 15.0
1980/81	58.3 \pm 8.2	78.3 \pm 12.5
1981/82	85.5 \pm 11.7	125.5 \pm 18.9
1982/83	66.1 \pm 7.7	113.3 \pm 15.1
1983/84	25.1 \pm 3.6	75.2 \pm 10.9
1984/85	14.8 \pm 2.9	40.5 \pm 7.6
1985/86	22.6 \pm 3.0	52.6 \pm 7.1
1986/87	20.4 \pm 3.1	64.2 \pm 9.0
1987/88	27.4 \pm 4.0	85.2 \pm 11.5
1988/89	30.9 \pm 4.0	102.7 \pm 12.2
1989/90	47.5 \pm 5.7	145.3 \pm 14.2
1990/91	62.1 \pm 7.1	165.8 \pm 19.4
1991/92	85.4 \pm 10.0	186.1 \pm 14.6
1992/93	54.0 \pm 8.0	143.1 \pm 19.1
1993/94	30.7 \pm 4.0	66.3 \pm 8.2
1994/95	33.0 \pm 9.9	60.5 \pm 19.3
1995/96	42.6 \pm 3.5	101.7 \pm 10.5