

FISHERY SURVEY OF THE RIVER YEO CATCHMENT

1. INTRODUCTION

- 1.1 This survey of the catchment was undertaken between April 1993 and September 1993. The rivers surveyed were the Yeo, Wriggle, Sutton Bingham Streams, Cam and Gallica.
- 1.2 The primary aim was to collect fisheries data on the Yeo catchment as part of a 'rolling' survey programme for all catchments in the North Wessex Area of the National Rivers Authority.
- 1.3 It is the first time the catchment has been surveyed in its entirety, the last survey in the catchment being on the upper Yeo between Mudford and Sherborne in 1986.

2. TOPOGRAPHY AND GEOLOGY

- 2.1 The River Yeo, a major tributary of the River Parrett, has its source at Seven Sisters Well, near Charlton Horethorne. From here it falls 100m to its confluence with the Parrett at Langport. Below Ilchester much of the Yeo is artificially embanked, with levels rising to 3m above adjacent fields. The catchment totals 398km².
- 2.2 The River Cam rises near Jack Whites Gibbet, and has a catchment of 45 sq Km. The ground levels in the area vary between 17m and 183m OND at Yeovilton and Bratton Hill respectively.
- 2.3 The Wriggle rises at Batcombe Hill and flows approximately north to the confluence with the River Yeo at Bradford Abbas. It has a catchment of 54.2 km².
- 2.4 The Gallica rises near Melbury Sampford and flows in a northerly direction to its confluence with the Sutton Bingham Stream approximately 5km away. The catchment is 21.5 km².
- 2.5 The Sutton Bingham Streams rise on the ridge of high ground near Corscombe and flow in a northerly direction to converge at Sutton Bingham Reservoir. Below the dam a single stream flows north for approximately 3.5km to its confluence with the Gallica and then continues north to join the Yeo south of Yeovil.
- 2.6 The majority of the Yeo catchment overlies inferior Oolite strata and Fullers Earth clays. Between Bradford Abbas and Yeovil the Yeo itself cuts through sandstone, known as Yeovil Sands. The porous strata which do occur mainly outcrop on hills and slopes or are underlain by clay. The result is a catchment with the flow characteristics of an entirely clay system.
- 2.7 The relationship between the various watercourses is also shown on the map (Appendix 1).

APPENDIX 1

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ENVIRONMENT AGENCY



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3. FLOW

3.1 There is one gauging station in this catchment, at Pen Mill on the River Yeo. Analysis of flow statistics and a comparison with the River Tone are shown in Table 1 and further details are included as Appendix 2.

APPENDIX 2

TABLE 1

FLOW STATISTICS FOR THE R.YEO AT PEN MILL COMPARED WITH THE R.BRUE AT LOVINGTON AND THE R.TONE AT BISHOPS HULL

	YEO	BRUE	TONE
Period of years covered by record	29	27	30
Catchment area above gauging station (sq. kilometres)	213	135	202
Height of highest point of catchment above Ordnance Datum (metres)	265	260	409
Average daily flow in cumecs (a.d.f.)	2.47	1.85	3.03
95 per cent exceeded flow (m ³ /s)	0.32	0.25	0.61
FLOW RANGE percentage of days per year:			
over 4 x a.d.f.	4.5	4	2.5
between 2 x a.d.f. and 4 x a.d.f.	9	9	9
between a.d.f. and 2 x a.d.f.	14.5	17	18.5
between 0.75 a.d.f. and a.d.f.	8	9	10
between 0.5 a.d.f. and 0.75 a.d.f.	11	14.5	17
between 0.25 a.d.f. and 0.5 a.d.f.	23	23.5	31
between 0.125 a.d.f. and 0.25 a.d.f.	26.5	20	11
below 0.125 a.d.f.	3.5	3	1

3.2 Table 1 indicates that the River Yeo like the Brue and the Tone is a flashy river with a high percentage of days when flows are quite low and a significant period when flows are very high. The Yeo differs from the Brue and Tone in more days when flows are extremely low, under 0.125 of the average daily flow.

3.3 The very low flows in the River Yeo are partly caused by the low compensation flow at Sutton Bingham Reservoir. The reservoir and its tributary streams make up 30 square kilometres or 14% of the gauged catchment at Pen Mill.

3.4 The compensation flow of 0.5 million gallons per day (0.026 cumecs) was set when the reservoir was planned. The stream was gauged regularly for four and a half years in the 1940's and flows only dipped under the present compensation flow on approximately 14 days.

3.5 The Ministry of Agriculture, Fisheries and Food considered that the compensation flow should be set at 1 mgd to preserve

the fishery interest. The Avon, Brue and Parrett Fishery Board only withdrew their formal objection to the construction of the reservoir when the promoters agreed that the new water would be stocked with trout and fishing permitted.

4. ABSTRACTION

- 4.1 There are nine abstraction licences from surface waters on the River Yeo itself. Three licences are for industrial uses and five for spray irrigation one of which has a low flow condition. There is one licence for water supply subject to a low flow condition. These abstractions represent 41% of the 95 percentile flow at Pen Mill.
- 4.2 There are four licensed abstractions on tributaries of the Yeo upstream of Pen Mill. Two of the licences are for water supply and two for spray irrigation. Three of these licences are on the Sutton Bingham streams and include the licence to abstract from the reservoir itself. These abstractions represent 80% of the 95 percentile flow at Pen Mill.
- 4.3 There are twelve licensed abstractions on tributaries downstream of Pen Mill. Six licences are for spray irrigation two for water supply, two for amenity, one for industry and one for general agriculture. These abstractions represent 7% of the 95 percentile flow at Pen Mill.
- 4.4 There are several significant abstractions of groundwater for water supply within the catchment, the largest being the Lake borehole between Sherborne and Thornford.

5. IMPOUNDMENTS

- 5.1 The most notable impoundments within the catchments are the dams of Sherborne Lake and Sutton Bingham Reservoir which are both on tributaries of the Yeo.
- 5.2 Sherborne Lake which has an area of 18.8 hectares (47 acres) was designed by Lancelot (Capability) Brown as a feature in Sherborne Castle Estate. About twenty years ago the Lake was dredged and altered by the NRA's predecessors to provide a flood storage area.
- 5.3 Sutton Bingham Reservoir which has an area of 57.4 hectares (142 acres) was built in the early 1950's to supply water to the area around Yeovil. The 13.4 metre high dam retains 2612 Megalitres (575 million gallons)
- 5.4 There are numerous weirs on the River Yeo associated with former mills. Most of the large structures are on the Yeo at Yeovil and downstream to Ilchester. Some of these structures also feed water for summer irrigation on the moors. In recent years a number of small impoundments have been constructed on tributaries of the River Yeo for fisheries, amenity or water abstraction.

5.5 Below Ilchester there are structures at Long Load and Ablake which pen higher summer water levels to irrigate the moors which flank the river. The Yeo above its confluence with the Parrett is also affected by penning on the Parrett at Oath Sluice.

6. WATER QUALITY

6.1 Chemical water quality is shown in Figure WQ1. The middle and lower reaches of the River Yeo are Class 2 as would be expected. The River Wriggle and lower River Cam are Class 1b also as expected. However parts of the upper Yeo, much of the Sutton Bingham Stream and the Gallica Stream are Class 2 where Class 1b would be expected. FIGURE WQ1

6.2 Biological water quality is shown in Figure WQ2. The waters shown are those sampled in 1992. The method of biological assessment checks the observed invertebrate score against that predicted from an analysis of the physical nature of the river at each site. As a result in the lower reaches of rivers the biological quality may be good even if the river is Class 2 chemically. Taking this into account there are some parts of the upper Yeo, the Sutton Bingham Stream and the River Cam where biological quality differs from the chemical quality. FIGURE WQ2

6.3 The EEC Fishery Designation is shown in Figure WQ3. Most of the upper River Yeo part of the upper Cam and all the Sutton Bingham Stream are designated salmonid waters. The lower River Yeo and lower part of the River Cam are designated as cyprinid waters. The River Wriggle and Gallica Stream are not designated. FIGURE WQ3

6.4 The most significant consented discharges within the catchment are those from the sewage treatment works which serve Sherborne and Yeovil.

6.5 There have been only two significant water quality problems affecting fisheries within the catchment during the last two years. In February 1992 a slurry spill affected the Witcomb Bottom Main Drain killing coarse fish in the Drain but not in the Yeo itself. In April 1992 farm effluent discharged to part of the Gallica Stream caused the death of several trout.

7. FISHERY SURVEY METHOD

7.1 Sample sites were chosen by dividing the relevant watercourses into two kilometre lengths which in turn had a hundred metre survey area selected by random number method. Table 2 below lists the sites, their position being displayed on the map in Appendix 1.

TABLE 2

SURVEY SITES

Site	Name	Grid Ref	Date
River Yeo			
SL1D	Below Sherborne Lake	ST646166	29/7/93
Y01F	Castleton Stream Sherborne	ST645166	29/7/93
Y01G	Honeycombe Farm	ST625150	28/7/93
Y01H	Above Lake borehole	ST616145	27/7/93
Y01I	Below Smiths Bridge	ST589141	23/7/93
Y01K	Newton Surmaville	ST566155	15/7/93
Y01L	Pen Mill Gauge	ST574163	20/7/93
Y01M	Over Compton	ST581179	13/7/93
Y01N	Up Mudford	ST580192	08/7/93
Y01O	Above Ashington Bridge	ST568211	29/6/93
Y01P	Manor Farm, Ashington	ST562234	24/6/93
Y01Q*	Above Yeovilton Weir	ST546226	14/5/93
Y01Z	Below Yeovilton Weir	ST544227	06/7/93
Y01R	Below Hainbury Mill	ST527223	23/6/93
Y01S	Great Yard	ST518229	22/6/93
Y01T*	Above Pill Bridge	ST515235	05/5/93
Y02T*	Above Pill Bridge	ST515235	05/5/93
Y01U	Witcomb Drove	ST483234	30/6/93
Y01U*	Witcomb Drove	ST483234	21/4/93
Y02U*	Witcomb Drove	ST483234	21/4/93
Y01V	Below Load Bridge	ST461244	10/6/93
Y01W*	Above Ablake	ST439258	12/5/93
Y02W*	Above Ablake	ST439258	12/5/93
Y01X	Below Ablake	ST439262	08/6/9
River Wriggle			
WR1A	Galpins Farm	ST616048	12/8/93
WR1B	Below Heneford Mill	ST607072	11/8/93
WR1C	Chetnole Church	ST604082	10/8/93
WR1D	Above Mill House, Yetminster	ST600100	19/8/93
WR1E	Above Peters Hole	ST595116	04/8/93
WR1F	Above River Yeo	ST592135	03/8/93
Gallica Stream			
GA1A	Melbury Park	ST579067	24/8/93
GA1B	Above Holt Mill	ST573085	18/8/93
GA1C	Holt Mill	ST570088	18/8/93

GA1D	Above Elsford Bridge	ST568108	17/8/93
Sutton Bingham Stream			
SB1A	Above Merrylands Farm	ST527061	15/9/93
SB1B	Below Merrylands Farm	ST534069	07/9/93
SB1C	Below Sutton Bingham Res'	ST555117	26/8/93
SB1D	Above Stoford	ST565125	25/8/93
SB1M	Above Brackets Coppice	ST514065	02/9/93
SB1N	below Brackets Coppice	ST118077	02/9/93
SB1O	Above Leggs Bridge	ST536089	01/9/93
River Cam			
CA1F	West Camel	ST575246	29/9/93
CA1G	Bridgehampton	ST565240	28/9/93

- 7.2 The sites were sampled either by electrofishing or seine netting (sites marked *) according to conditions.
- 7.3 Electrofishing was carried out using hand held and boat rigged apparatus. This particular boat rigged apparatus was used for the first time on this survey and the results obtained from its use were deemed satisfactory. Pulsed DC was fished upstream at six hundred cycles for both methods. A declining catch method was used to determine populations of fish over 10 cm in length at electrofished sites, with the survey area isolated by the use of stop nets.
- 7.4 In the netted sites it was intended that a probability of capture was worked out by marking the fish captured in the first netting attempt and releasing them in the same section. The ratio of marked fish recaptured would have been used to work out the efficiency. In the event the return of marked fish were negligible and minimum estimates had to be used.
- 7.5 Sites on the River Yeo were in general harder to sample than on the smaller tributaries due to greater depth and thicker weed growth. Site Y01U was initially netted and later electrofished to compare results as the site was relatively deep and wide. Site Y01Q was considered to be inaccurately sampled as there were many submerged obstructions and deep water impounded from the weir. Site SB1C was fished with only one run due to large deposits of silt being disturbed and spoiling visibility.
- 7.6 Planned sites Y01J and SB1E could not be fished due to access problems through arable crops.

8. RESULTS

- 8.1 All fish over 10cm were measured and weighed. The bulk of fish greater than this cut off size had scales removed for ageing. The weight of the majority of fish less than 10cm were recorded but not used in calculations.

8.2 Figures 1 and 2 display the biomass of fish greater than 10cm captured on the Yeo, while figures 3 and 4 show the density. Figures 5 and 6 represent the equivalent for the Sutton Bingham streams as do 7,8 and 9 for the Gallica, Wriggle and Cam respectively. Figure 10 compares results from the site below Sherborne Lake with those from the site below Sutton Bingham Reservoir.

FIGURES 1 & 2
FIGURES 3 & 4
FIGURES 5 & 6
FIGURES 7,8 & 9
FIGURE 10

8.3 Where practicable the scales in figures of biomass and number density have been kept the same or as close as possible to aid direct comparisons.

8.4 Age determination showed that growth for age for most species was slightly lower than the expected standard for those species where a standard growth curve has been devised. Figure 11 shows the situation for roach with a curve derived using a power regression.

FIGURE 11

9. DISCUSSION

9.1 The River Yeo (as described in Sections 2 and 3 above) is a river with extremes of flow. Steep clay banks, smooth bed and lack of cover, makes for a harsh environment for cyprinids. It is also a difficult river to survey in a fisheries context.

9.2 No salmonids were recorded at any sites on the Yeo, which was not surprising given the nature of the habitat. The "salmonid" designation of the stretch of river between Sherborne and Yeovil is made on the basis of water quality, and takes no account of habitat. There is however a marked improvement in the coarse fish numbers captured in this reach in comparison to the 1986 survey. A probable explanation is the gradual recovery of the river from extensive land drainage work carried out here in 1979.

9.3 Several sites that were deemed to have been fished with an acceptable efficiency produced poor results (notably sites K,M and O). All had poor habitat characteristics for cyprinid fish.

9.4 Cyprinid species captured on the Yeo were as to be expected on a watercourse of this nature and were bream, eel, roach, dace, gudgeon, chub, stoneloach, pike, perch and tench.

9.5 The sites from Sherborne to Yeovil revealed a high density of small fish (dace, gudgeon and stoneloach) and naturally gave a small biomass. These sites are high in the catchment, densely overgrown with common reed and shallow, lending themselves to smaller fish species. Relatively large numbers of eels were also recorded at these sites, and represent a high percentage of the catch. Due to the time of year, habitat and ability of eels to colonise most local water courses, high numbers were expected.

9.6 There were high densities of roach, dace, gudgeon and chub found adjacent to Yeovil sewage treatment works. The site

offered a number of good features for these species including potential nutrients from the effluent.

- 9.7 The sites between Yeovil to Yeovilton were poor, with an improvement in densities at the sites at Ilchester. Below here any apparent trends should be treated with caution as catch efficiency was so low at the netted sites.
- 9.8 Results from the Sutton Bingham streams proved interesting. Above the reservoir on the most easterly stream there were only brown trout and stone loach captured, while on the other there was a mixture of trout, stone loach, gudgeon and roach. The habitats of the streams were not dissimilar and neither contained eels.
- 9.9 Below the reservoir there were less trout, a wider diversity of coarse fish species and eels present in large numbers. This suggests that the reservoir is an impassable obstruction to eels. Since the reservoir has been built there has been a dramatic decrease in discharge downstream of the reservoir. When comparing the results of upstream and downstream sites it can be assumed that the streams above the reservoir show characteristics which are no longer apparent downstream.
- 9.10 The Gallica and Wriggle produced very similar biomass and density figures for trout and eels. Both have habitats and gradients that are very comparable, implying that the populations of these species are at an appropriate level for this type of watercourse. The lower reaches of the Wriggle had a wider diversity of cyprinids than on the Gallica as expected from its topographical situation.
- 9.11 The River Cam had only two sample sites which revealed a low density of fish with a high biomass. This transpired through the capture of several large chub, clearly well suited to the environment.
- 9.12 The site below Sherborne Lake had high numbers of eels. This compares closely with the Sutton Bingham Stream below the reservoir. Figure 10 graphically represents the situation and both dams are clearly a major obstruction to eel passage.

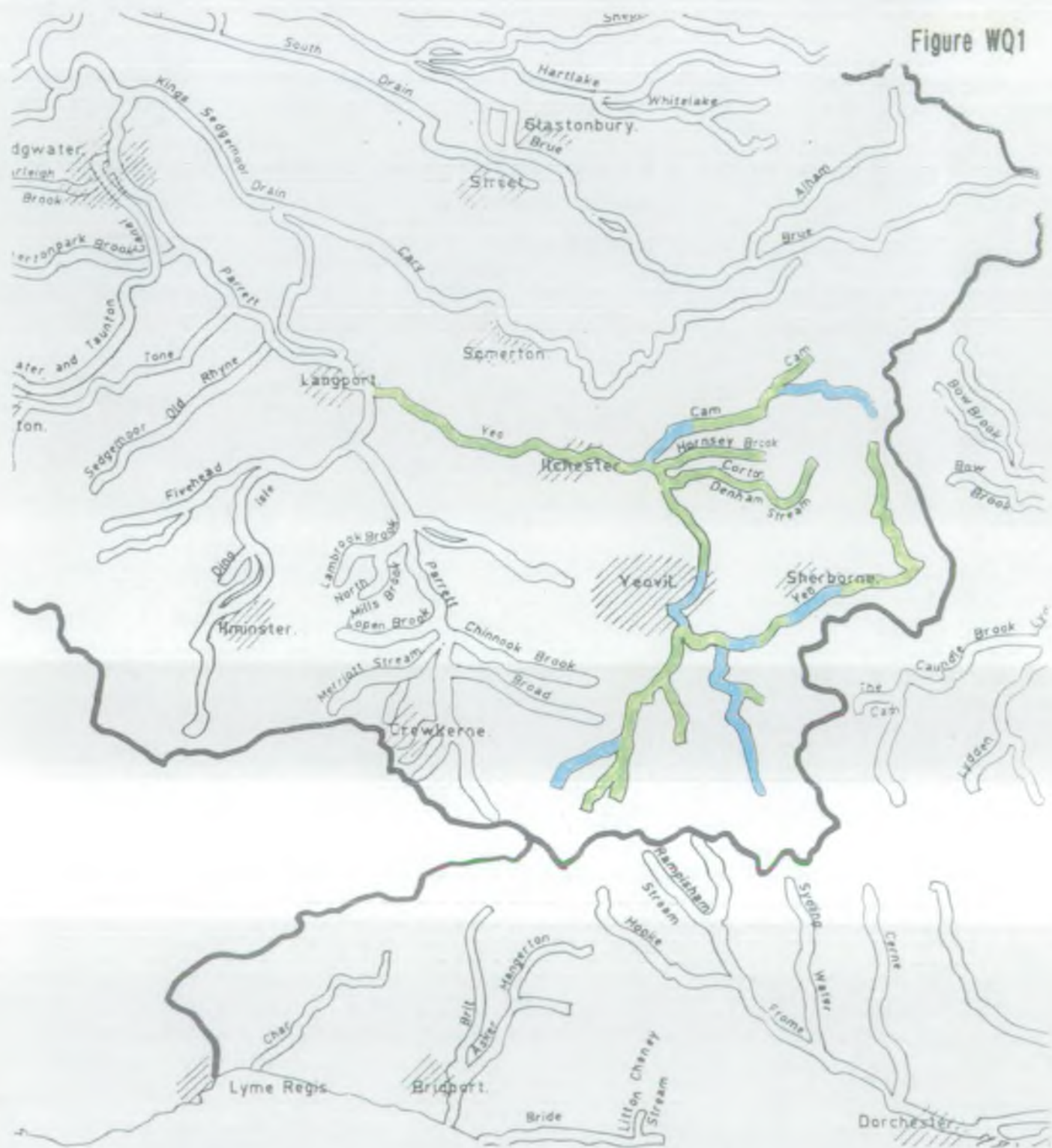
10. CONCLUSIONS

- 10.1 The River Yeo between Sherborne and Bradford Abbas appears to have made a recovery from the land drainage work carried out in 1979. This recovery includes improvement of the substrate and riverine vegetation.
- 10.2 Although results showed fish numbers on the Yeo to be relatively low in comparison with other rivers surveyed in the region, the findings were not expected to be good, given the physical nature of the watercourse.
- 10.3 The efforts made at the netting sites proved unsatisfactory. A future survey on the lower Yeo might be restricted to sites that were proved to be sampled effectively through electrofishing. Our inability to sample deep, wide sites

established the limitations of even the improved electric fishing apparatus to sample certain species in this environment.

- 10.4 The Sutton Bingham reservoir proved to be an impassable obstruction to eels and altered the nature of the downstream reach. An increase in discharge below the reservoir would be advantageous, as would an improvement in water quality. A similar situation prevailed below Sherborne Lake.
- 10.5 The Rivers Wriggle and Gallica and the Sutton Bingham streams had similar densities of salmonids. If the salmonid habitat evaluation system, HabScore, is validated it would be beneficial to use the system on these rivers. This would provide a predicted density of salmonids in such rivers with which future catches would be compared.
- 10.6 There is some potential for habitat improvement notably in the River Yeo and especially between Yeovil and Yeovilton. The use of current deflectors and substrate improvement should both be beneficial.

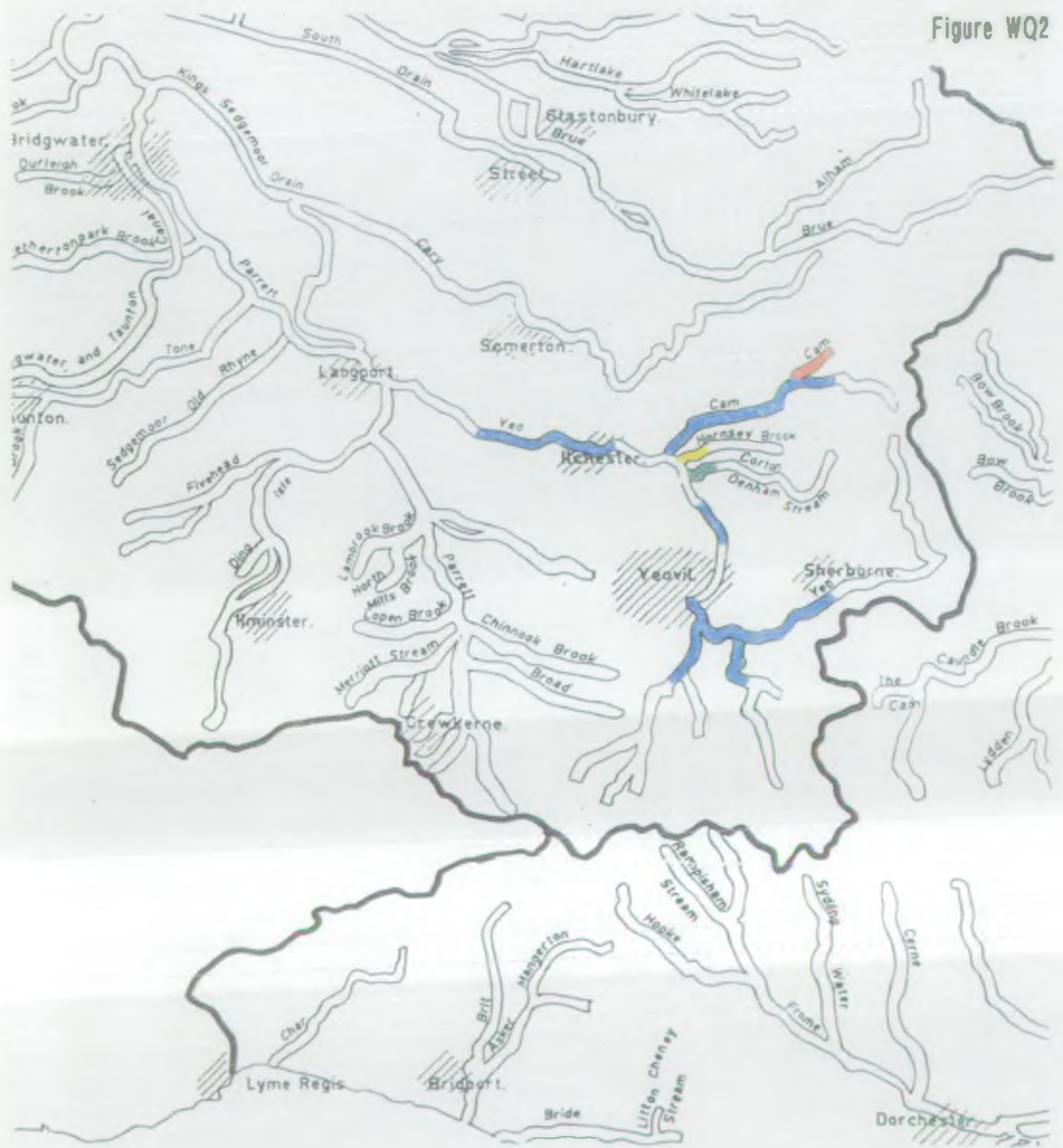
Figure WQ1



Chemical Quality

Good	1a	
	1b	
Fair	2	

Figure WQ2



Biological Quality





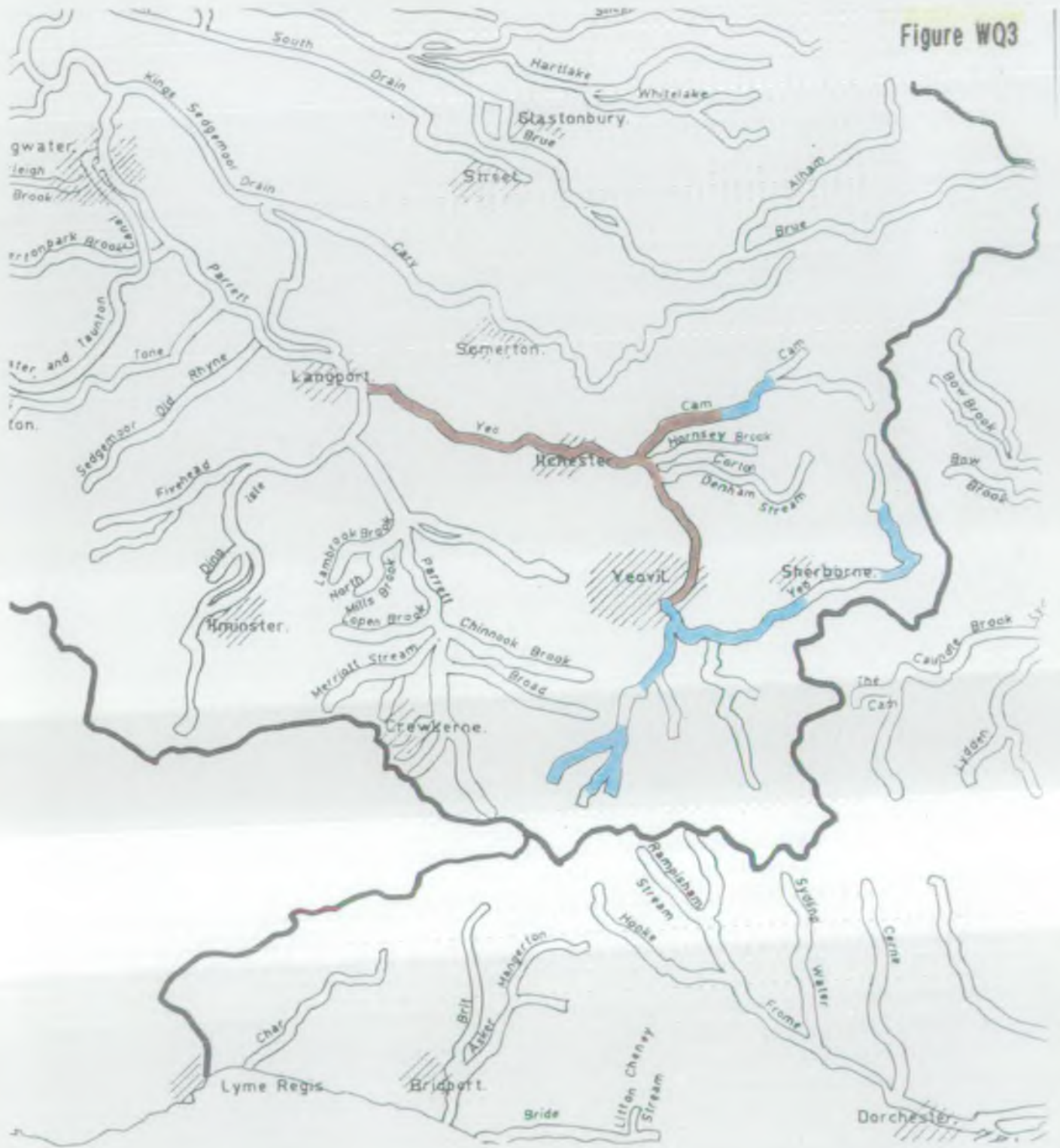
- Good A 
- Moderate B 
- Poor C 
- Very Poor D 

Figure WQ3



EEC Fishery Designation

Salmonid



Cyprinid



River Yeo

Biomass of Fish over 10cm(g/sqm)

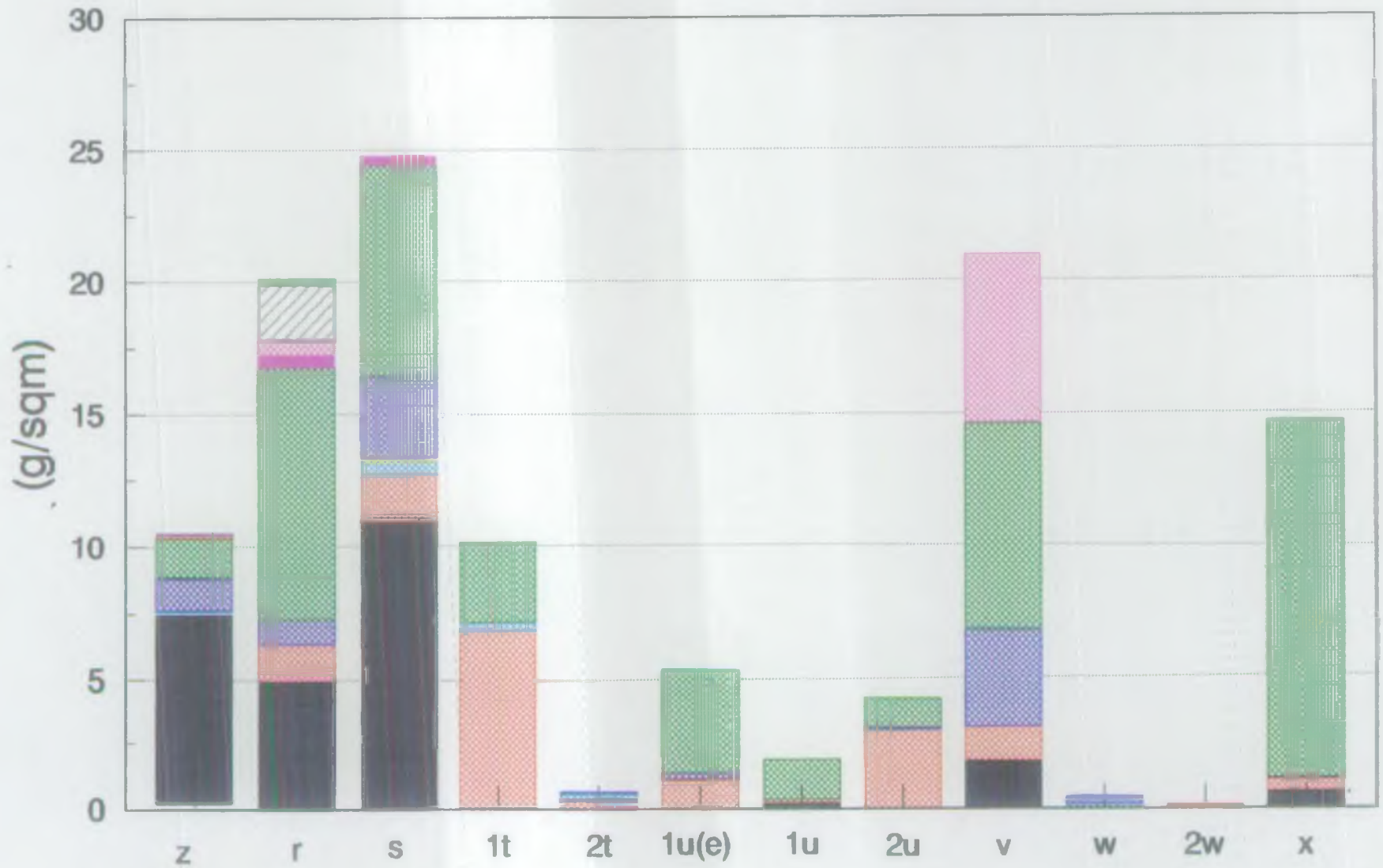


Figure 1

River Yeo

Biomass of Fish over 10cm((g/sqm)

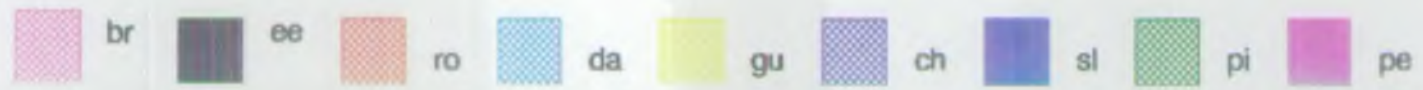
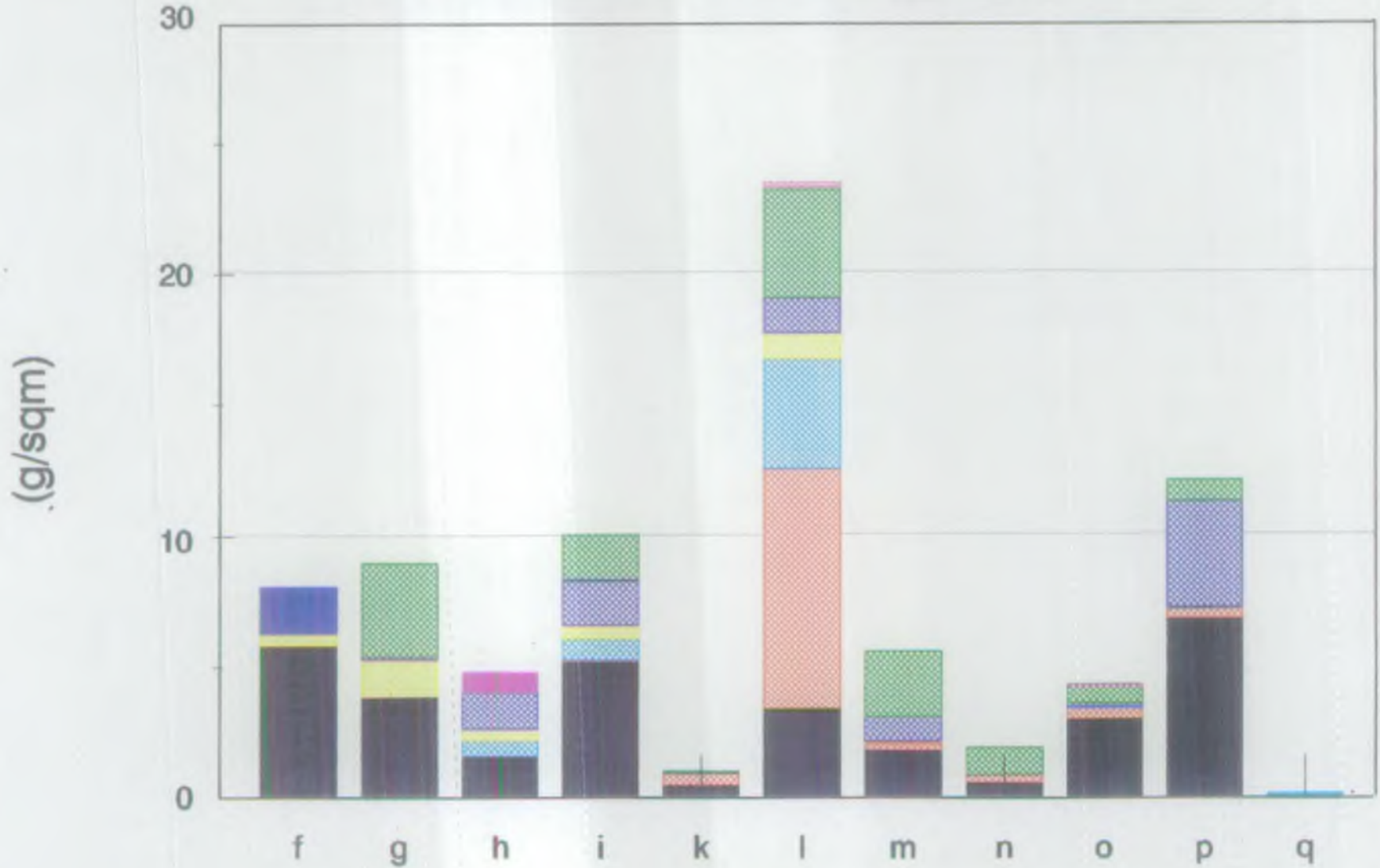


Figure 2

River Yeo

Density of Fish over 10cm(Nos per 100m)

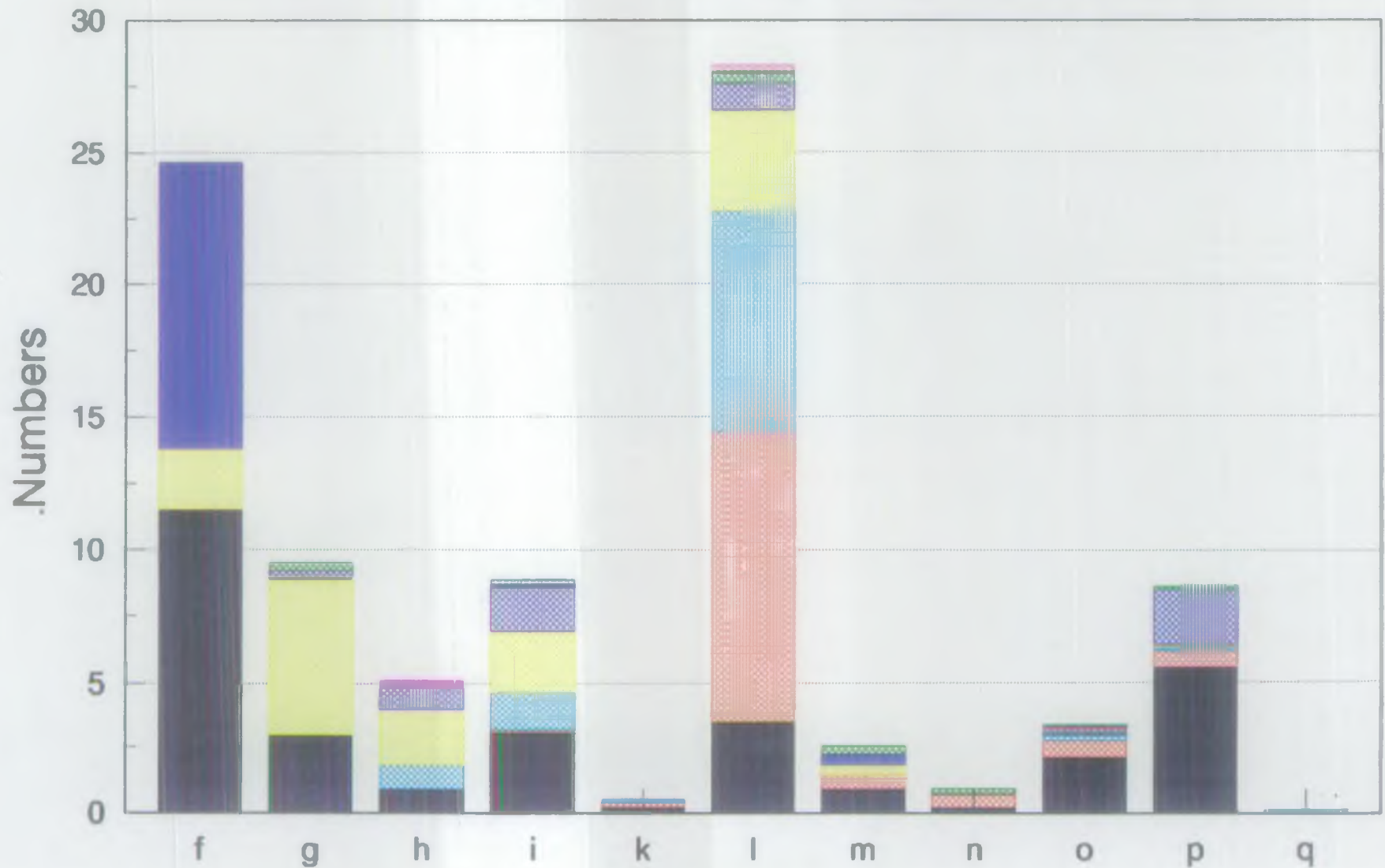


Figure 3

River Yeo

Density of fish over 10cm(Nos per 100m)

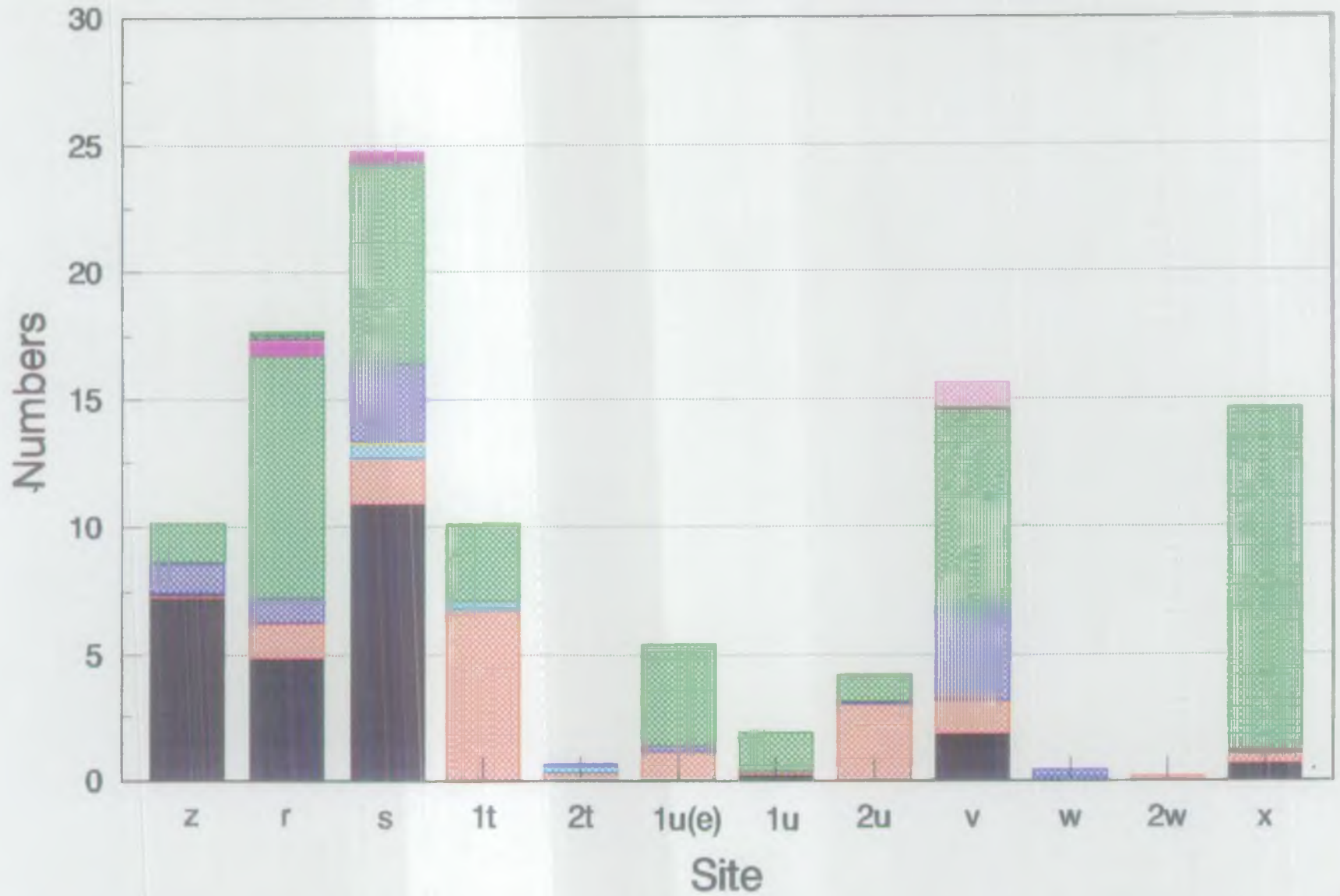


Figure 4

Sutton Bingham Streams

Density Over 10cm(Nos per 100m2)

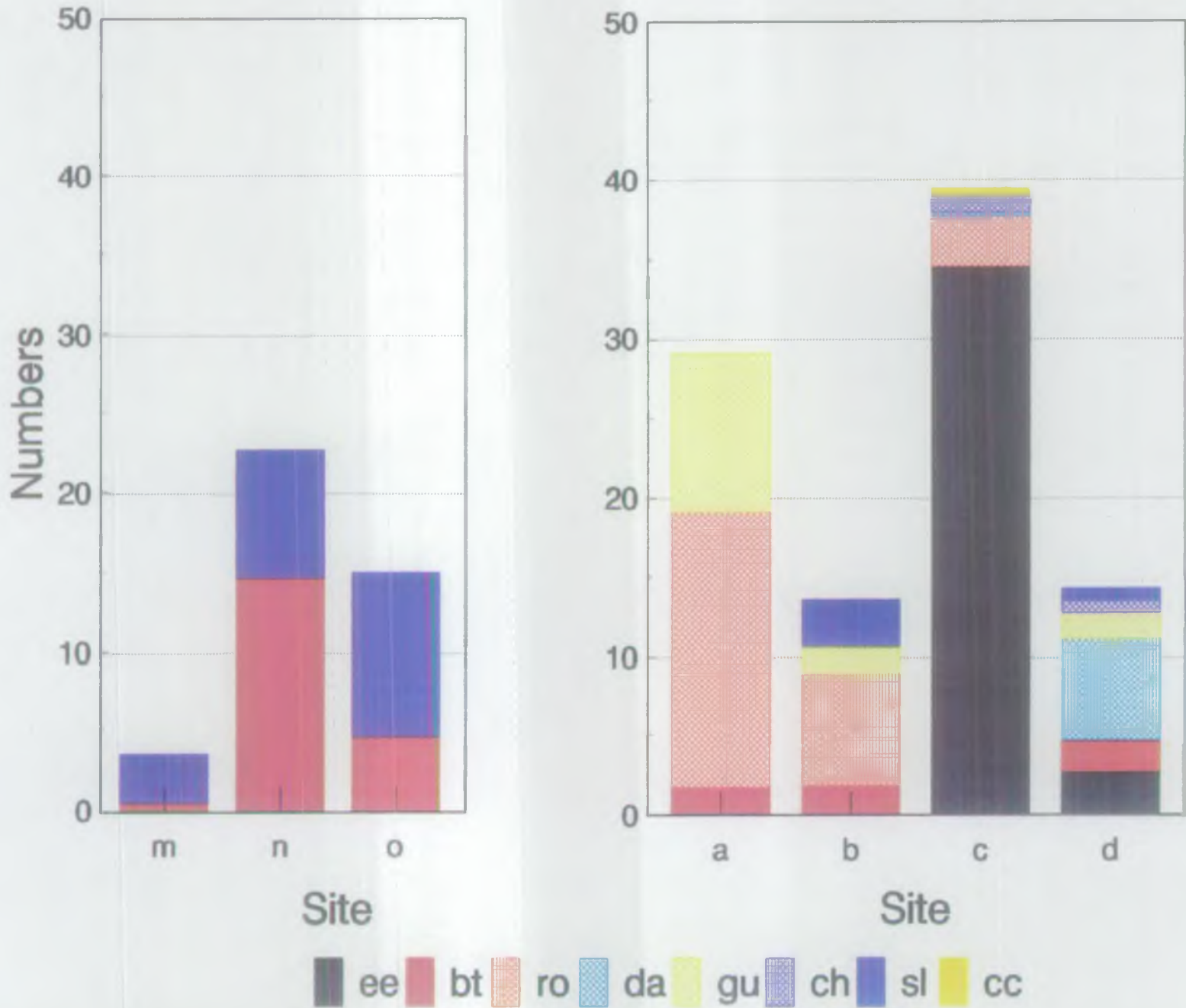
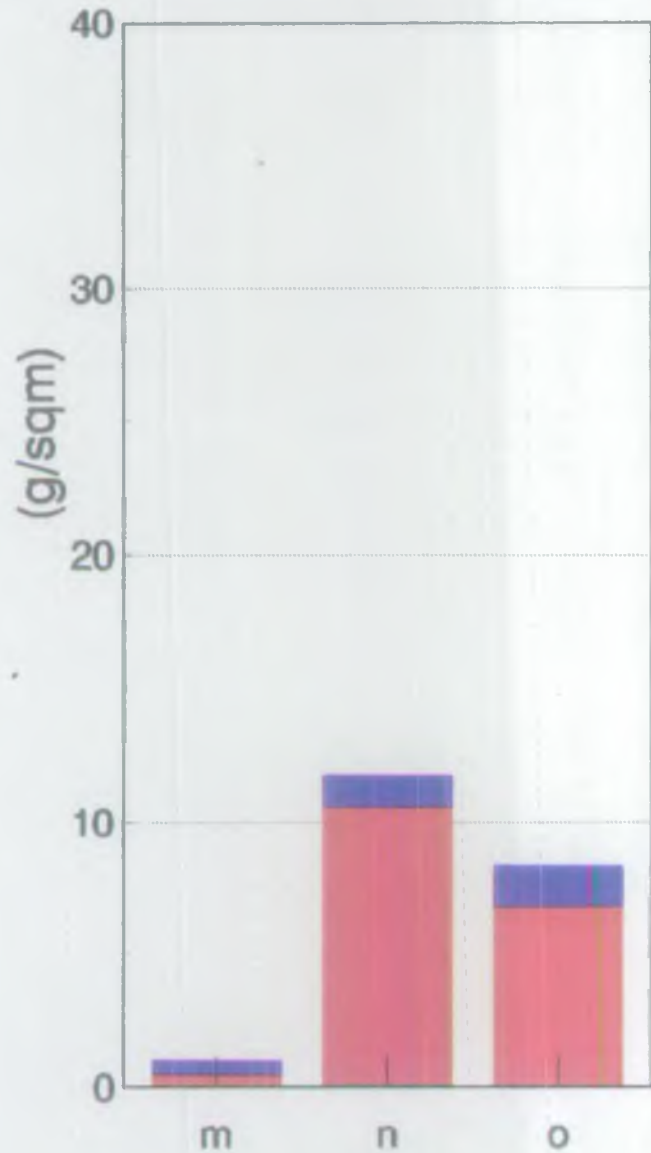


Figure 5

Sutton Bingham Streams

Biomass over 10cm(g/sqm)



Biomass over 10cm(g/sqm)

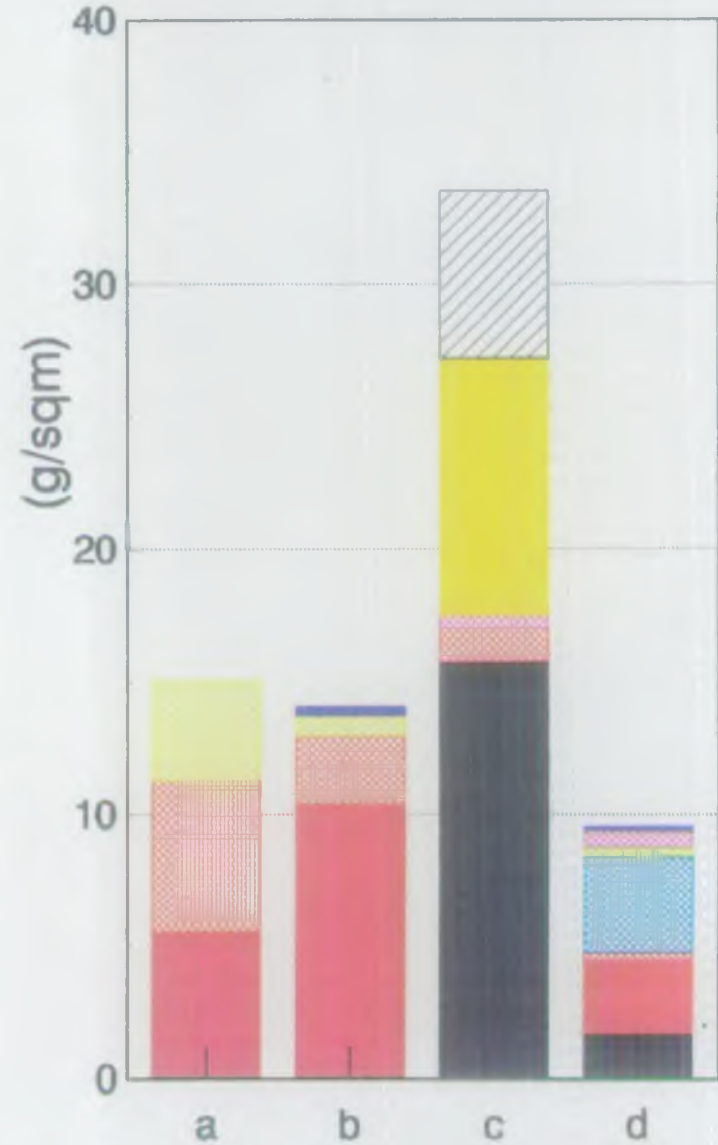
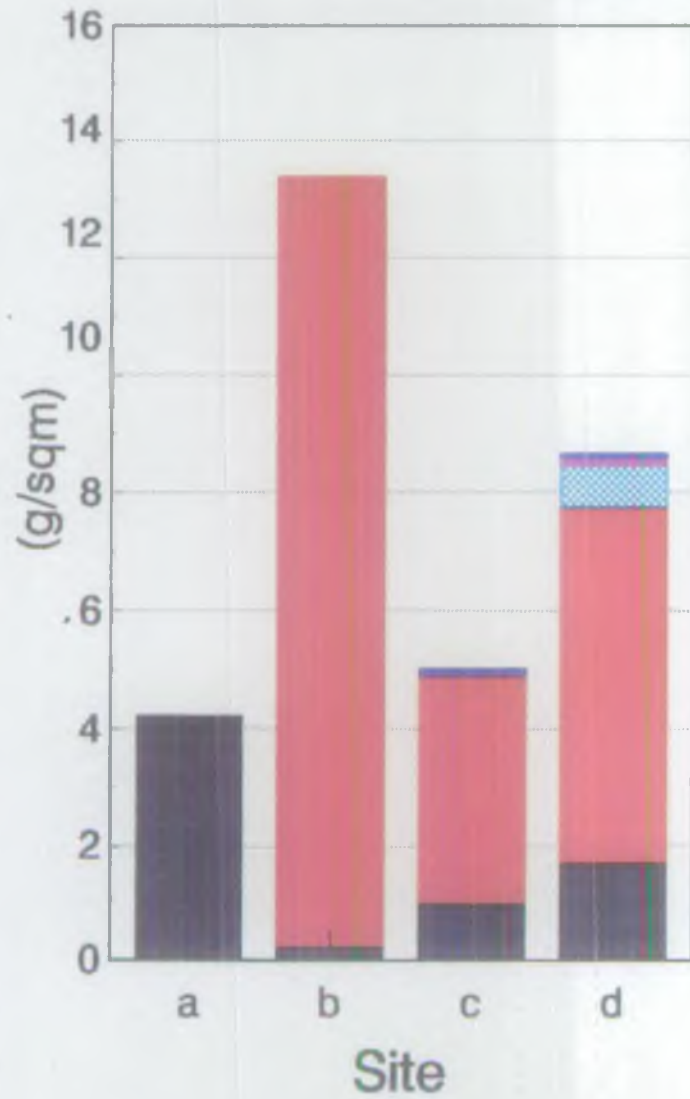


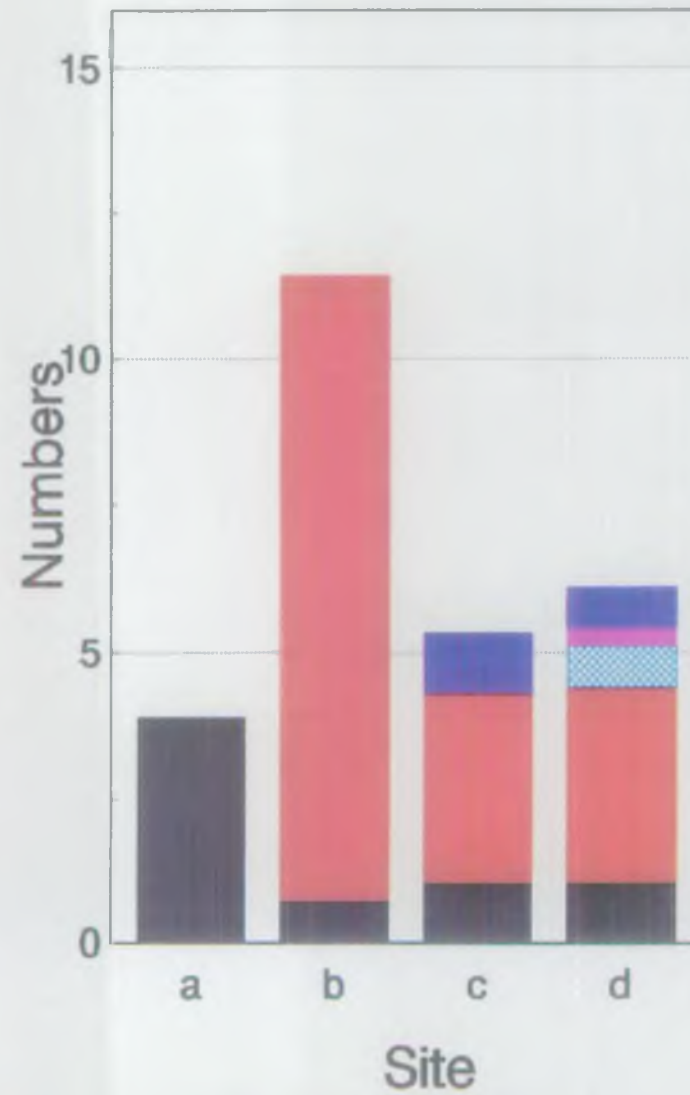
Figure 6

Gallica Stream

Biomass over 10cm(g/sqm)



Density Over 10cm(Nos per 100m2)



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 da
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Figure 7

River Wriggle

Biomass Of Fish (g/sqm)

Density Over 10cm(nos per 100m2)

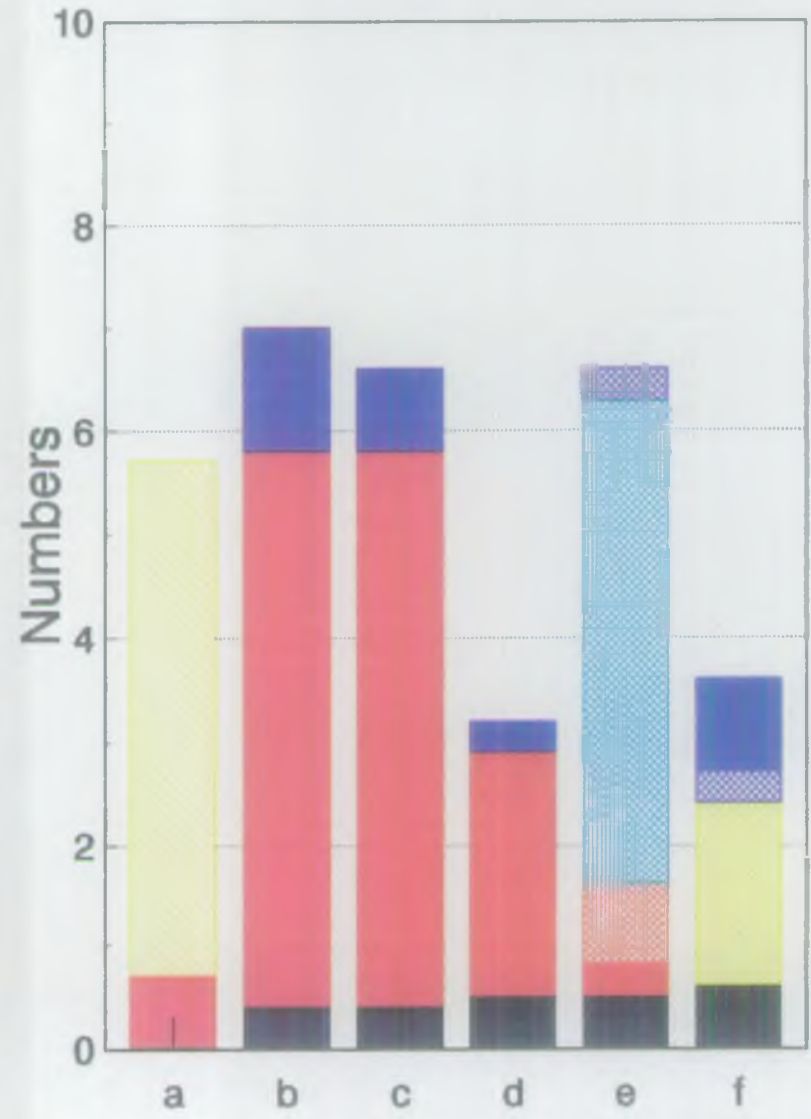
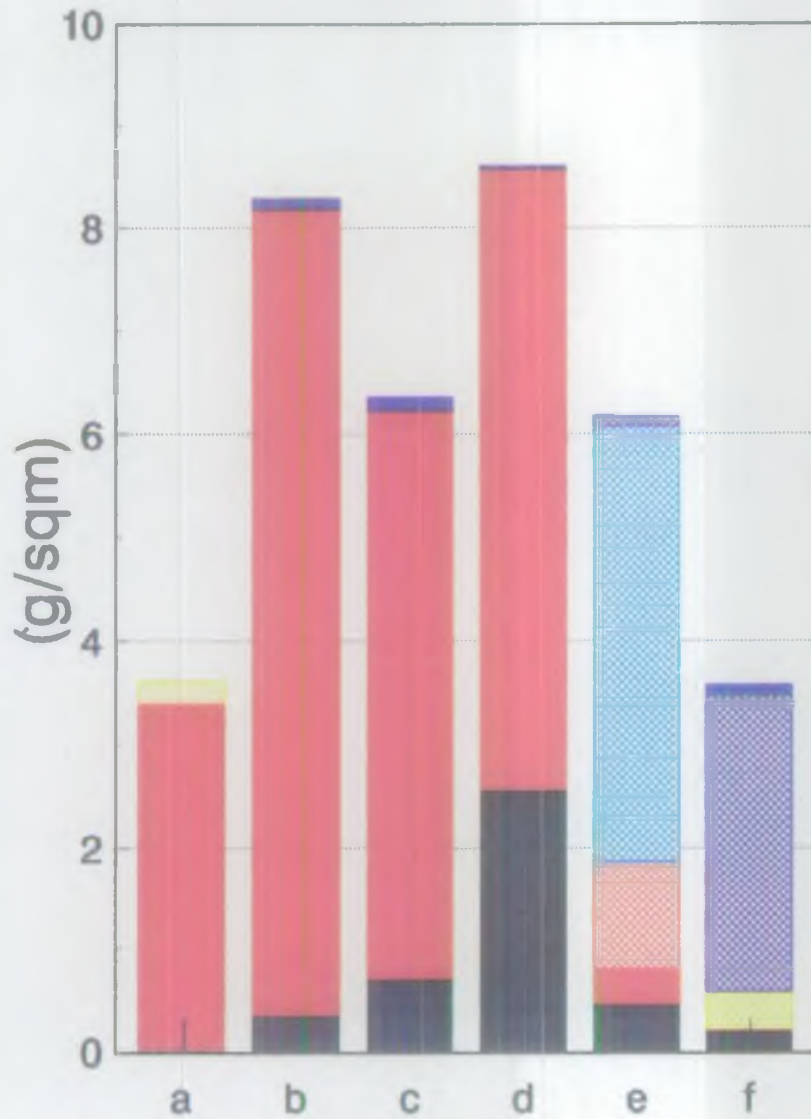
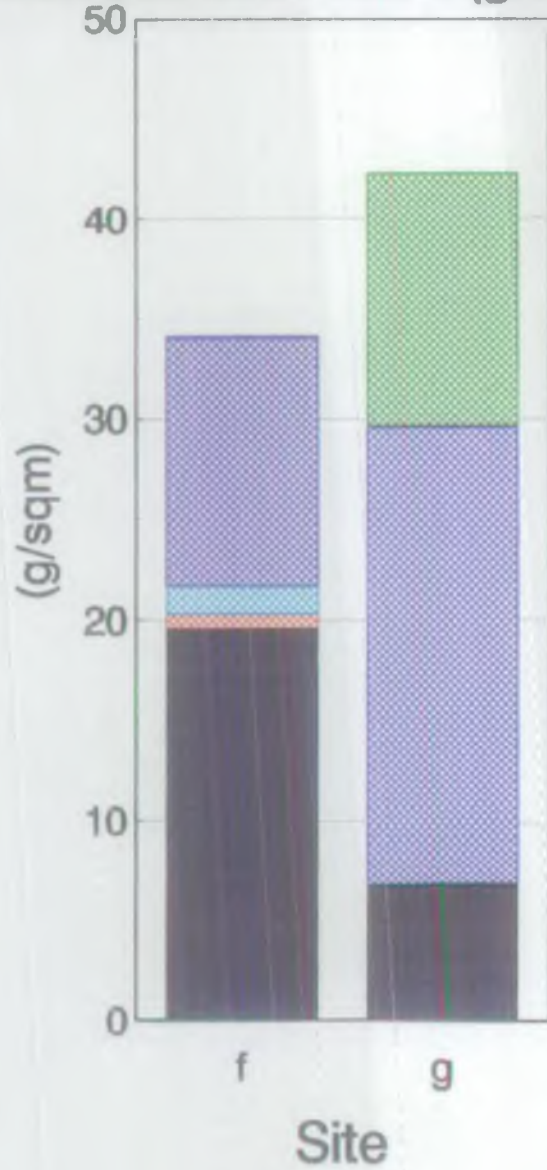


Figure 8

River Cam

Biomass over 10cm (g/sqm)

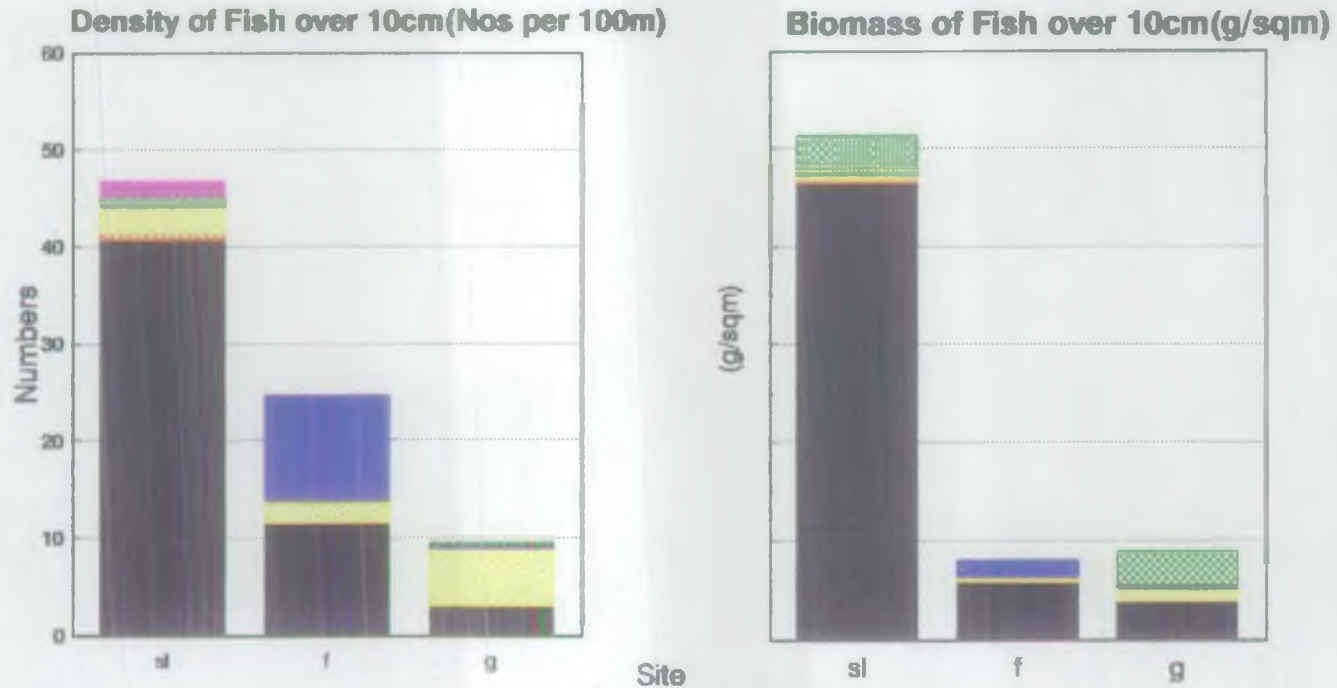


Density Over 10cm (Nos per 100m2)



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Yeo Tributary (Site sl)



Sutton Bingham Streams

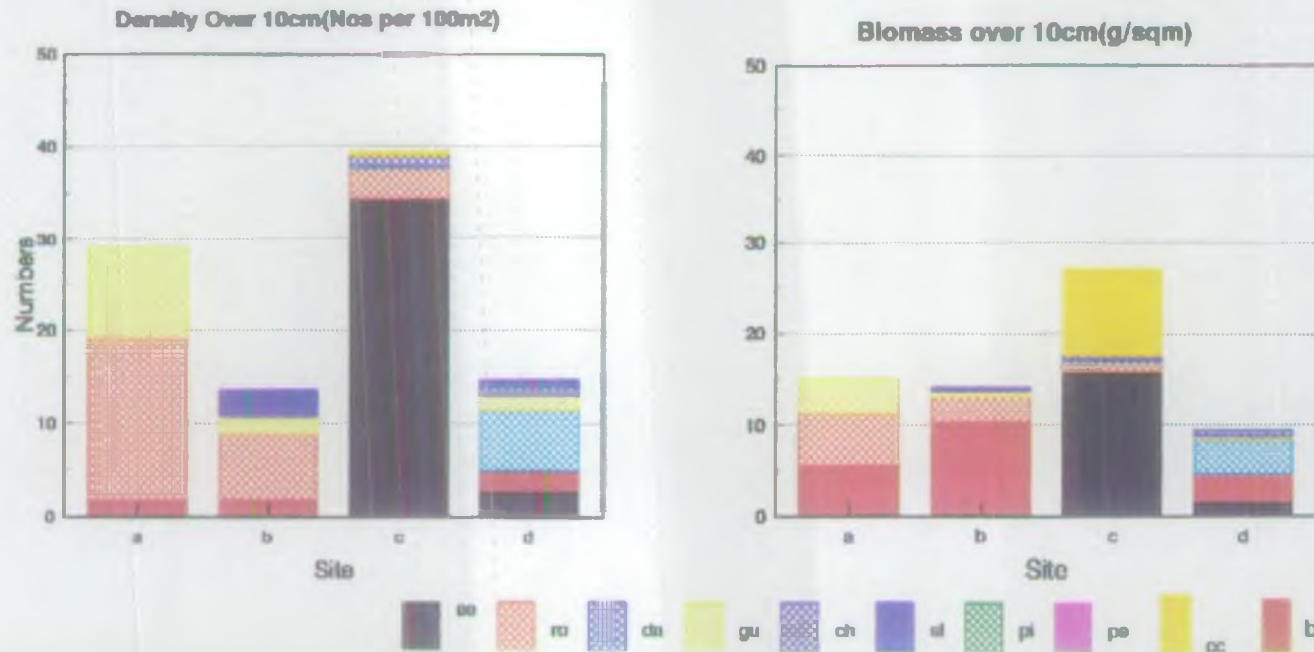


FIGURE 10

River Yeo

Growth of Roach (All sites)

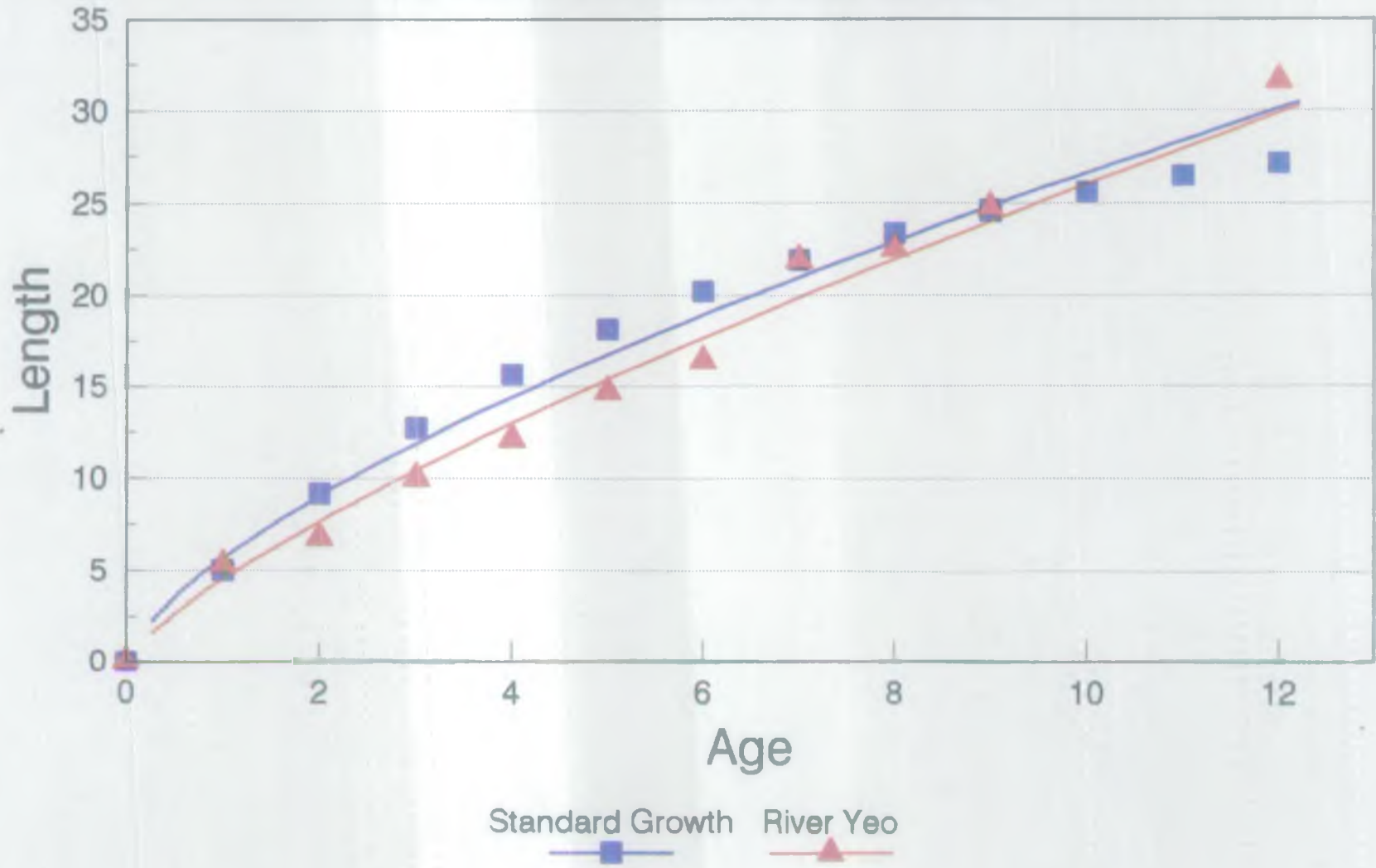


Figure 11



Gauging Station Summary

YEO AT PEN MILL

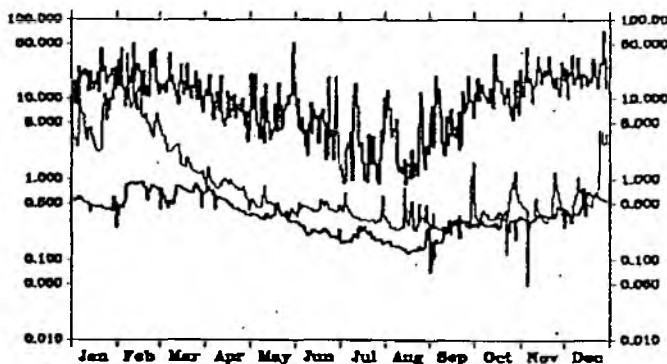
Station Number
052006

Gauged Flows
1963-1991

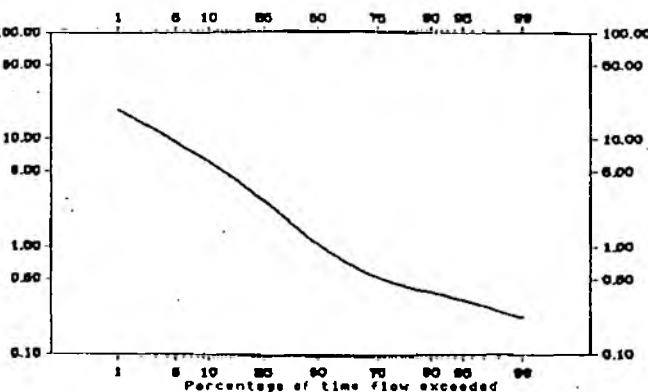
Measuring Authority: NRA - Wessex

Grid Reference: 31 (ST) 573 162

Daily Flow Hydrograph (m^3s^{-1})
Max. and min. daily mean flows from 1963 to 1991
excluding those for the featured year (1990)



Flow Duration Curve (m^3s^{-1})



Flow Statistics

Units: m^3s^{-1} unless otherwise stated

Mean flow	2.47
Mean flow (ls^{-1}/km^2)	11.60
Mean flow ($10^6m^3/yr$)	78.0
Peak flow & date	138.9 27 Dec 1979
Highest daily mean & date	73.0 27 Dec 1979
Lowest daily mean & date	0.048 6 Nov 1971
10 day minimum & end date	0.131 23 Aug 1976
60 day minimum & end date	0.170 28 Aug 1976
10% exceedance	6.213
50% exceedance	1.071
95% exceedance	0.321
Mean annual flood	63.5
Bankfull flow	40.00

Rainfall and Runoff

	Rainfall (mm)			Runoff (mm)		
	Mean	Max/Yr	Min/Yr	Mean	Max/Yr	Min/Yr
Jan	95	177	1974	15	108	1974
Feb	69	140	1974	4	135	1990
Mar	79	141	1981	19	89	1981
Apr	49	116	1966	3	51	1966
May	60	161	1979	23	57	1979
Jun	59	143	1980	5	30	1983
Jul	55	123	1978	20	24	1968
Aug	66	123	1986	21	20	1978
Sep	73	189	1974	8	63	1974
Oct	82	228	1976	9	123	1976
Nov	88	179	1978	33	155	1978
Dec	102	189	1989	21	114	1972
Annual	685	1121	1974	620	531	1974

Catchment Characteristics

Catchment area (km^2)	213.1
Level stn. (mOD)	23.90
Max alt. (mOD)	265
IH Baseflow index	0.40
FSR slope (m/km)	5.50
1941-70 rainfall (mm)	907
FSR stream freq. (junctions/ km^2)	1.27
FSR percentage urban	0

Factors Affecting Flow Regime

- Reservoir(s) in catchment.
- Flow influenced by groundwater abstraction and/or recharge.
- Abstraction for public water supply.

Station and Catchment Description

Crump type triangular cross-section weir for low flows. >1.55 cumecs measured by rated river section (affected by d/s weed growth). Flows >2m inaccurate. All but highest floods contained. 1989 station moved slightly - problems with stilling well, needs rerating. Sutton Bingham Res. in headwaters. Medium/low flows influenced by variable abstractions and compensation.

Geology - Oxford Clay and Great Oolite in upper catchment; Yeovil Sands and Inferior Oolite in lower catchment. Land use - predominantly rural.

Summary of Archived Data

Gauged Flows and Rainfall

Key:	All rain-fall	Some or no rain-fall	01234 56789
All daily, all peaks	A	a	1960s ---eA AAAAA
All daily, some peaks	B	b	1970s AAAAA AAAAA
All daily, no peaks	C	c	1980s AAAAA AAAAA
Some daily, all peaks	D	d	1990s ae
Some daily, some peaks	E	e	
Some daily, no peaks	F	f	
No gauged flow data	e	-	

Naturalised Flows

Key:	01234 56789
All daily, all monthly	A 1960s ---FE EEEEE
Some daily, all monthly	B 1970s EEEEE EEF
Some daily, some monthly	C
Some daily, no monthly	D
No daily, all monthly	E
No daily, some monthly	F
No naturalised flow data	-