NATIONAL RIVER AUTHORITY
THAMES REGION
UPPER THAMES AREA

GREAT BROOK FISHERIES SURVEY

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Compiled by E.Hopkins
Published December 1992
Ref.AGB92

CONTENTS

1.0 SUMMARY

During the period 26.6.92 to the 16.7.92 a total of four sites were surveyed by electric fishing.

The Great Brook is designated under E.C. fisheries directive 78/659/EEC as a cyprinid fishery. Two of the sites failed to achieve their biomass targets of $20gm^{-2}$. The two remaining sites easily exceeded this target.

The Great Brook is a man made channel, extensively modified in the past for flood defence purposes, with a detrimental effect on habitat especially along the lower reaches.

The water quality on the Great Brook showed a compliance with River Quality Objectives (RQO) in all cases, with biological monitoring results supporting these findings.

2.0 INTRODUCTION

Figure 2.1 shows the Great Brook from its source off the River Thames to its confluence. Survey sites, water quality sampling points, biological survey sites and abstraction points are also shown.

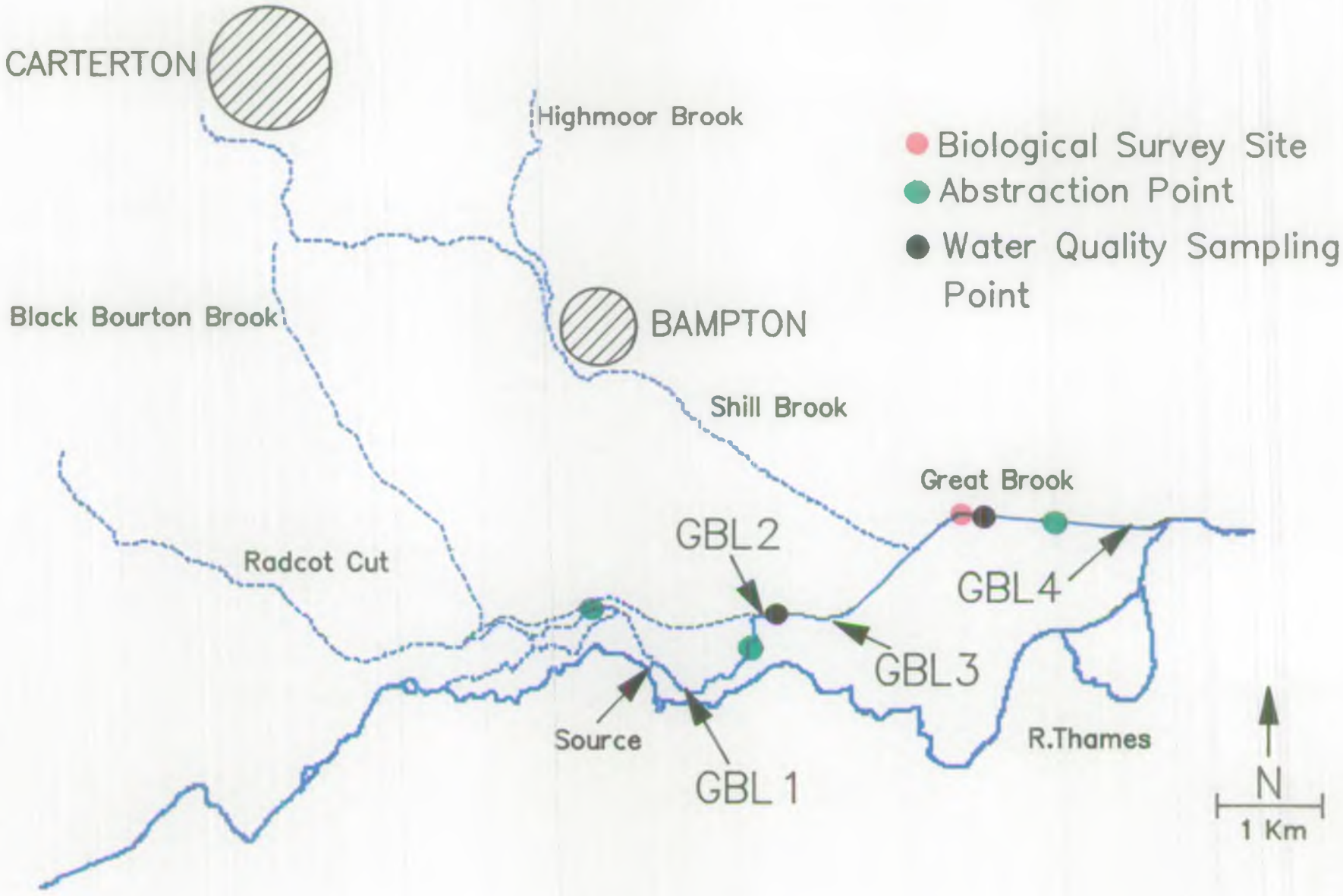
2.1 DESCRIPTION OF WATERCOURSE

The Great Brook is a distributary of the River Thames. The Brook starts above Rushey weir on the River Thames (SP321004). From here it flows south east and after 100m is joined by the Radcot Cut. After 1km the channel heads north east where it is crossed by the Isle of White road bridge (SP334008). The Brook then flows in a easterly direction and after 1.5km it is joined by the Shill Brook (SP348015), it then continues eastwards to its confluence with the River Thames (SP374017).

2.2 GEOLOGY OF THE GREAT BROOK

The geology of the Great Brook is mainly of jurassic origin, consisting of Oxford Clays and Kellaway Beds.

Fig 2.1 Great Brook Catchment



2.3 WATER QUALITY

River water quality is classified to the National Water Council (NWC) River Quality objectives (RQO) 1978. Further details of these are presented in Appendix I. The Great Brook is classified as below:

LOCATION OF REACH	LENGTH OF REACH	RQO
Source to confluence	6.4km	1B/1A

Major water bodies affecting the Great Brook:-

NAME	SECTION	LENGTH	RQO
Radcot Cut	St.Johns to the Gt.Brook	12.4km	1B
Shill Brook	Source to Carterton	8.9km	E
Shill Brook	Carterton to Carterton STW	3.5km	1B
Shill Brook	STW to Gt.Brook	8.9km	2B

2.4 MAIN DISCHARGES

There are no consented discharges into the Great Brook. However there are two large discharges into the Shill Brook from Carterton STW and Bampton STW, resulting in a RQO of 2B entering the Great Brook.

2.5 LAND DRAINAGE WORK

The Great Brook was last dredged in 1987/8. In 1979 a control sluice was installed at the head of the brook to replace the previous redundant sluice 500m downstream.

2.6 FISHERY MANAGEMENT AND HABITAT WORK

There has been no fishery management or habitat work carried out on the Great Brook.

2.7 POLLUTION INCIDENTS AND FISH MORTALITIES

Although there have been a number of pollution incidents on the Great Brook and adjoining water bodies there have been no reports of fish mortalities in the past five years.

3.0 AIMS AND OBJECTIVES.

3.1 Overall Aims of Surveys.

The National Rivers Authority has a statutory obligation to maintain, improve and develop inland fisheries. To assist in meeting this obligation, NRA Thames Region fisheries staff have engaged upon a five year rolling programme of riverine fish population surveys to establish baseline data for each major watercourse in the Thames catchment.

3.2 River Classification.

River water quality is classified according to the National Water Council (NWC) River Quality Objectives (RQO) 1978 (as amended by Thames Water Authority 1987).

Under European Community Directive (78/659/EEC), river zones are designated as capable of supporting either salmonid or cyprinid fish.

Further details of the NWC classification system and the EC directive appear in Appendices I-III.

The NRA Thames Region have developed a classification system based upon the River Quality Objectives and the EC directive. A description of this system appears in Appendix IV.

Fish biomass targets apply within the NRA Thames Region with respect to EC designated fisheries, viz:

Cyprinid	20 gm^{-2}
Salmonid	15 gm^{-2}

3.3 Specific Aims

This is the first exhaustive fisheries survey undertaken by the NRA Thames Region on the whole length of the Great Brook, and will serve to form the datum against which future changes in fish populations in the river are compared. The aims of this survey are to provide information on fish populations, species diversity and distribution, and comment on factors that may have influenced these parameters.

4.0 METHODS

4.1 Site Selection.

Four sites were fished between 26/6/92 and 16/7/92. Sites were selected to represent local environmental conditions, taking into account bed topography, known water quality impacts (see 5.4) and access considerations.

4.2 Capture and Data Acquisition.

Catch depletion electrofishing techniques using non-independently switched pulsed DC equipment were employed at each site and operated within enclosed sections of approximately 100m in length. Two or more runs were fished at each site depending on the catch efficiency. All fish captured were enumerated by species and the fork length was measured to the nearest millimetre (mm). A subsample of up to 40 fish of each species at each site was weighed to the nearest gram (g). Scale samples from the shoulder of up to three fish of each 1cm size class were taken for age estimation.

Minor species such as stoneloach (*Noemacheilus barbatulus*), minnow (*Phoxinus phoxinus*), bullhead (*Cottus gobio*), and stickleback (*Gasterosteus aculeatus*) were noted for relative abundance.

Other relevant site details were taken and appear in the site reports.

All data acquired in the field were entered into a Husky Hunter data logger. This was later downloaded to a Novell Network file server for subsequent analysis.

Single qualitative electrofishing runs were made immediately upstream of the site where practical, with the aim of assessing the applicability of the results from the survey section over a greater area.

4.3 Data Analysis.

The data were processed on the network using the Fisheries Information System (FINS) software package. Graphics were generated using Lotus Freelance v4.0 and printed on a Hewlett Packard "Colorpro" colour plotter.

4.4 Macroinvertebrates.

NRA Biology staff are engaged upon a biological monitoring programme of the main watercourses in the region. Macroinvertebrate data from this source are presented in this report.

Invertebrate samples tend to reflect the physio-chemical variations which occur in the river and this provides a means of monitoring the aquatic environment on a continuous basis. The results were evaluated using the Biological Monitoring Working Party scoring system. Results obtained were compared to scores predicted for the site if it were unpolluted.

4.5 Water Quality.

River quality objectives (RQO) were set according to existing water quality conditions and the uses of the river. Discharge consents are determined in order to meet the RQO. NRA Pollution Officers take routine samples from consented discharges to monitor compliance with consent conditions, and from river points to assess that the RQO is being met. River and discharge samples are also taken following reports of pollution.

The samples are analysed for different parameters depending on its source. The three main parameters are Biochemical Oxygen Demand (BOD), Ammonia (measured as Ammoniacal Nitrogen) and suspended solids. Routine sample results are held on a register available for public inspection.

4.6 Hydrology.

Hydrological data is not available, as there are no gauging weirs on the Great Brook. Flow regimes are dependent on the River Thames via a fixed crest over spill above Rushey lock (SP323001). Additional flows also enter the Brook from the Radcot Cut and the Shill Brook.

5.0 RESULTS

Results are presented at site level with biomass, density and length frequency graphs. A brief explanatory text appears in the comments section of each site report. The site code, name and location of each site investigated appears in table 5.1 below.

SITE CODE	NAME OF SITE	LOCATION
GBL1	Rushey Meadow	SP326003
GBL2	Isle Of White Bridge	SP333009
GBL3	Chimney Lane	SP338008
GBL4	Shifford	SP370017

5.11 SITE REPORT

WATERCOURSE: Great Brook
SITE NAME: Rushey Meadow
SITE CODE: GBL1
LOCATION: Upstream of weir
NGR: SP326003
DATE FISHED: 16th July 1992
METHOD: Pulsed DC electrofishing,
TARGET
BIOMASS: 20 gm^{-2}

HABITAT FEATURES
LENGTH: 81m WIDTH: 6m AREA: 486m^2 DEPTH: 1m
WATER TEMPERATURE: 18 °C
WATER LEVEL: Normal
WATER CLARITY: Good
FLOW RATE: Slow

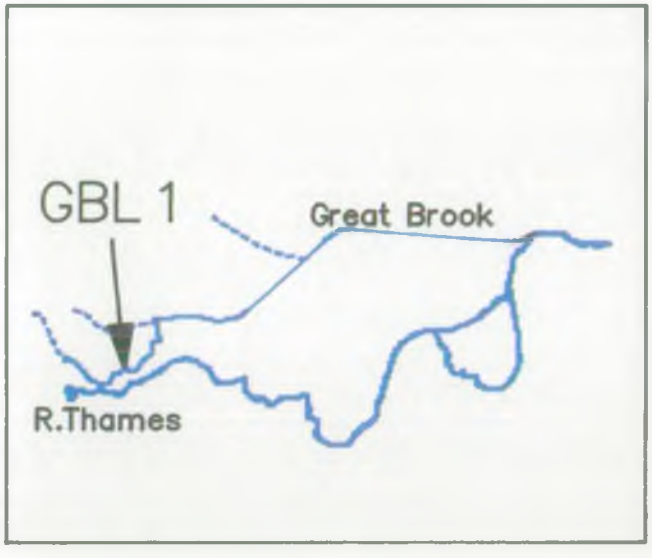
SUBSTRATE COMPOSITION (%)
BARE: 0 MUD & SILT: 90 GRAVEL: 10 STONE: 0 BOULDER: 0

VEGETATION (% COVER)
SUBMERGED: 30 FLOATING: 5 EMERGENT: 65 SHADE: 0
DOMINANT PLANT SPECIES: *Elodea, Glyceria, Phalaris, Veronica.*
ADJACENT LAND USE: Both banks arable

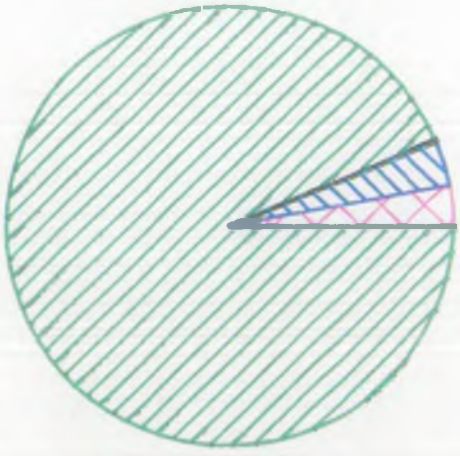
REMARKS
PHYSICAL STRUCTURE OF SITE: A straight, uniform and overwidened channel with a poor substrate over the majority of the survey section, the exception being directly above the sluice where natural encroachment had narrowed the channel and increased flows. Instream habitat appeared poor. The upstream habitat was deeper and slower with more macrophyte cover.

CATCH: This site produced a disappointing biomass of 15.4 gm^{-2} which fails to meet the NRA Thames Region target biomass for EC designated cyprinid fisheries. The upstream run only produced a biomass of 5.8gm^{-2}. Coarse fish fry, sticklebacks and minnows were present.

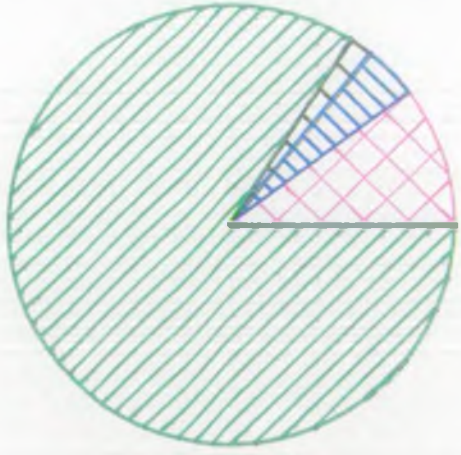
Site GBL 1 Rushey Meadow
Biomass and Density



	Biomass (gm−2)	Density (nm−2)
BLEAK	0.5	0.047
CHUB	0.5	0.018
GUDGEON	0.0	0.008
ROACH	14.4	0.384
SILVER BREAM	0.0	0.002
TOTAL	15.4	0.459

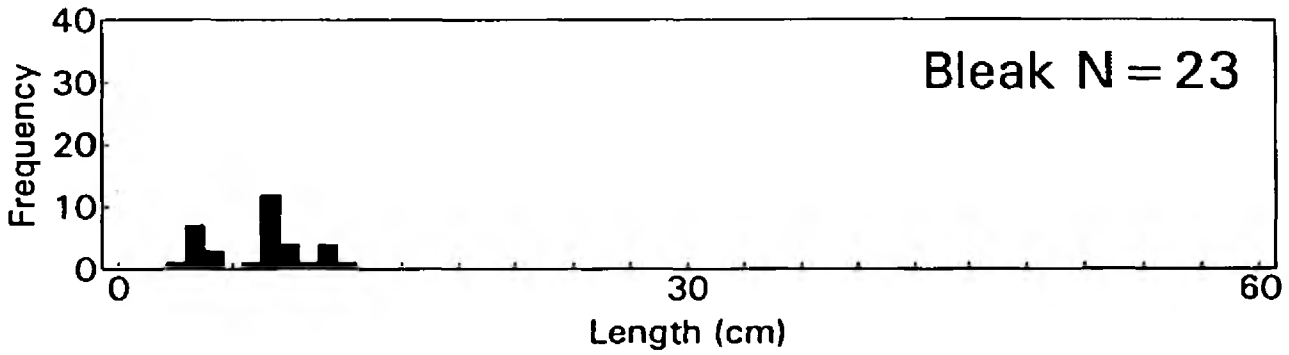


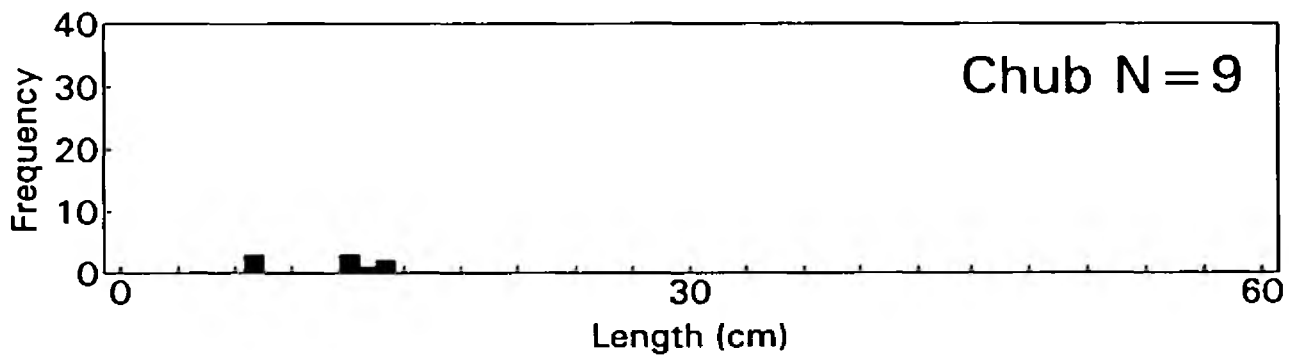
Biomass (gm−2)

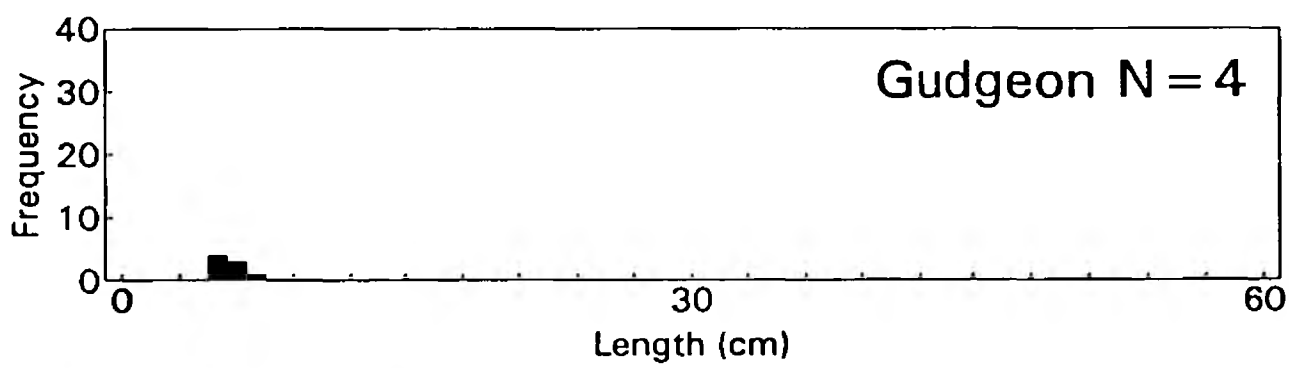


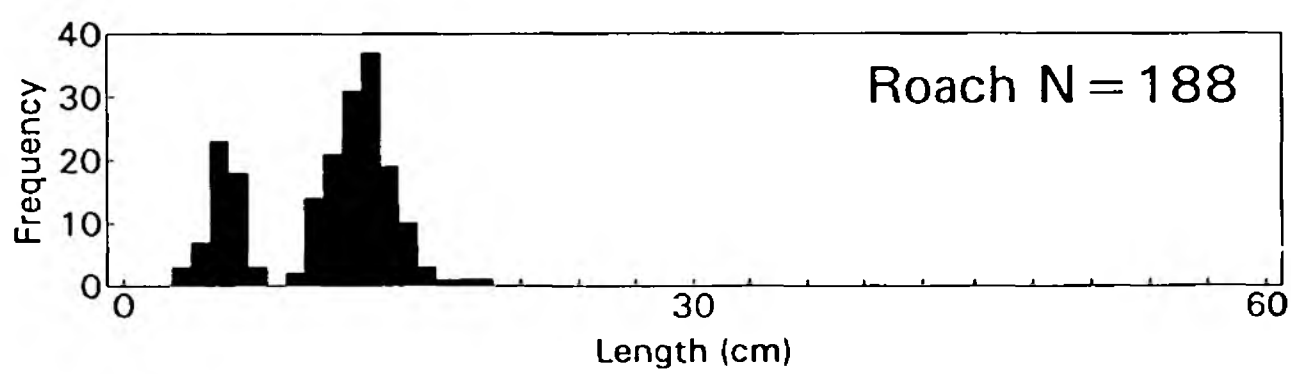
Density (nm−2)

SITE GBL1. LENGTH FREQUENCY









5.12 SITE REPORT

WATERCOURSE: Great Brook
SITE NAME: Isle Of Wight Bridge
SITE CODE: GBL2
LOCATION: Upstream of bridge
NGR: SP333009
DATE FISHED: 23rd June 1992
METHOD: Pulsed DC electrofishing,
TARGET
BIOMASS: 20 gm^{-2}

HABITAT FEATURES
LENGTH: 105m WIDTH: 5.8m AREA: 609m^2 DEPTH: 0.3m
WATER TEMPERATURE: 18 °C
WATER LEVEL: Normal
WATER CLARITY: Excellent
FLOW RATE: Fast

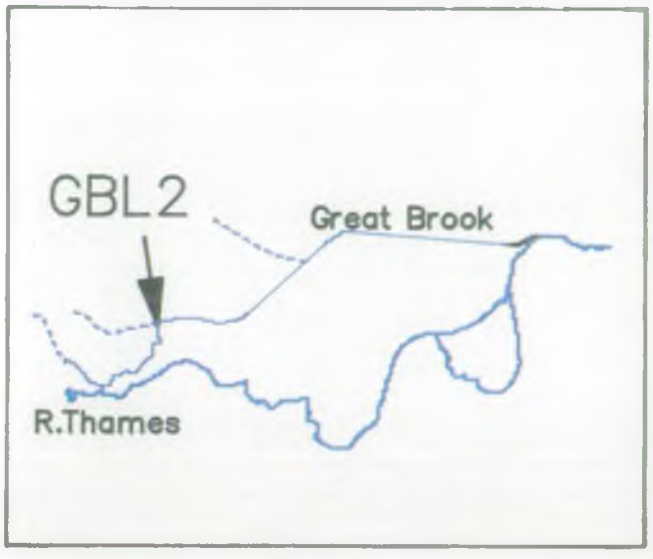
SUBSTRATE COMPOSITION (%)
BARE: 0 MUD & SILT: 10 GRAVEL: 90 STONE: 0 BOULDER: 0

VEGETATION (% COVER)
SUBMERGED: 15 FLOATING: 5 EMERGENT: 45 SHADE: 0
DOMINANT PLANT SPECIES: *Ranunculus, Cladophora, Phalaris, Glyceria, Typha, Myosotis.*
ADJACENT LAND USE: Left bank permanent pasture.
Right bank arable

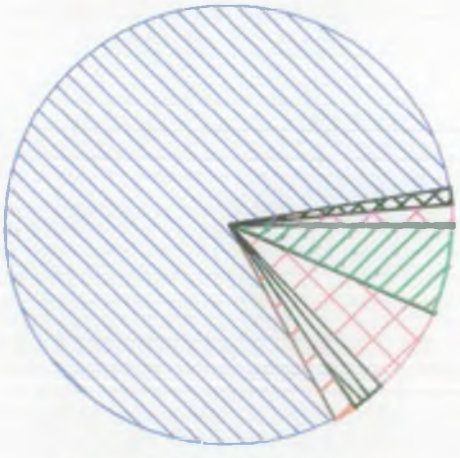
REMARKS
PHYSICAL STRUCTURE OF SITE: A straight shallow section with overhanging vegetation providing the majority of cover.

CATCH: This site produced a very good biomass of 55.7 gm^{-2} which easily exceeds the NRA Thames Region target biomass for EC designated cyprinid fisheries. Minnows were abundant and bullheads, stoneloach and lampreys were present.

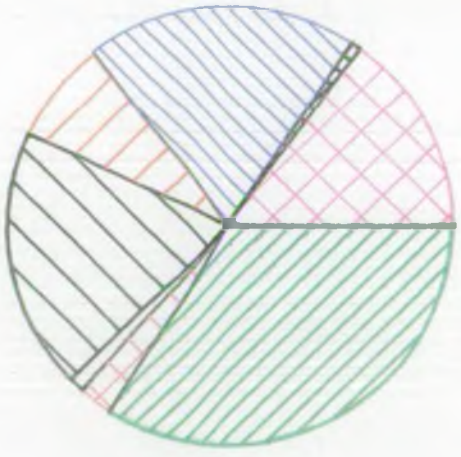
Site GBL2 Isle Of White Bridge
Biomass and Density



	Biomass (gm−2)	Density (nm−2)
BLEAK	0.9	0.066
BROWN TROUT	0.6	0.003
CHUB	44.5	0.087
DACE	0.9	0.033
GUDGEON	0.7	0.084
PERCH	0.6	0.005
PIKE	3.6	0.011
ROACH	3.6	0.149
TOTAL	55.4	0.438

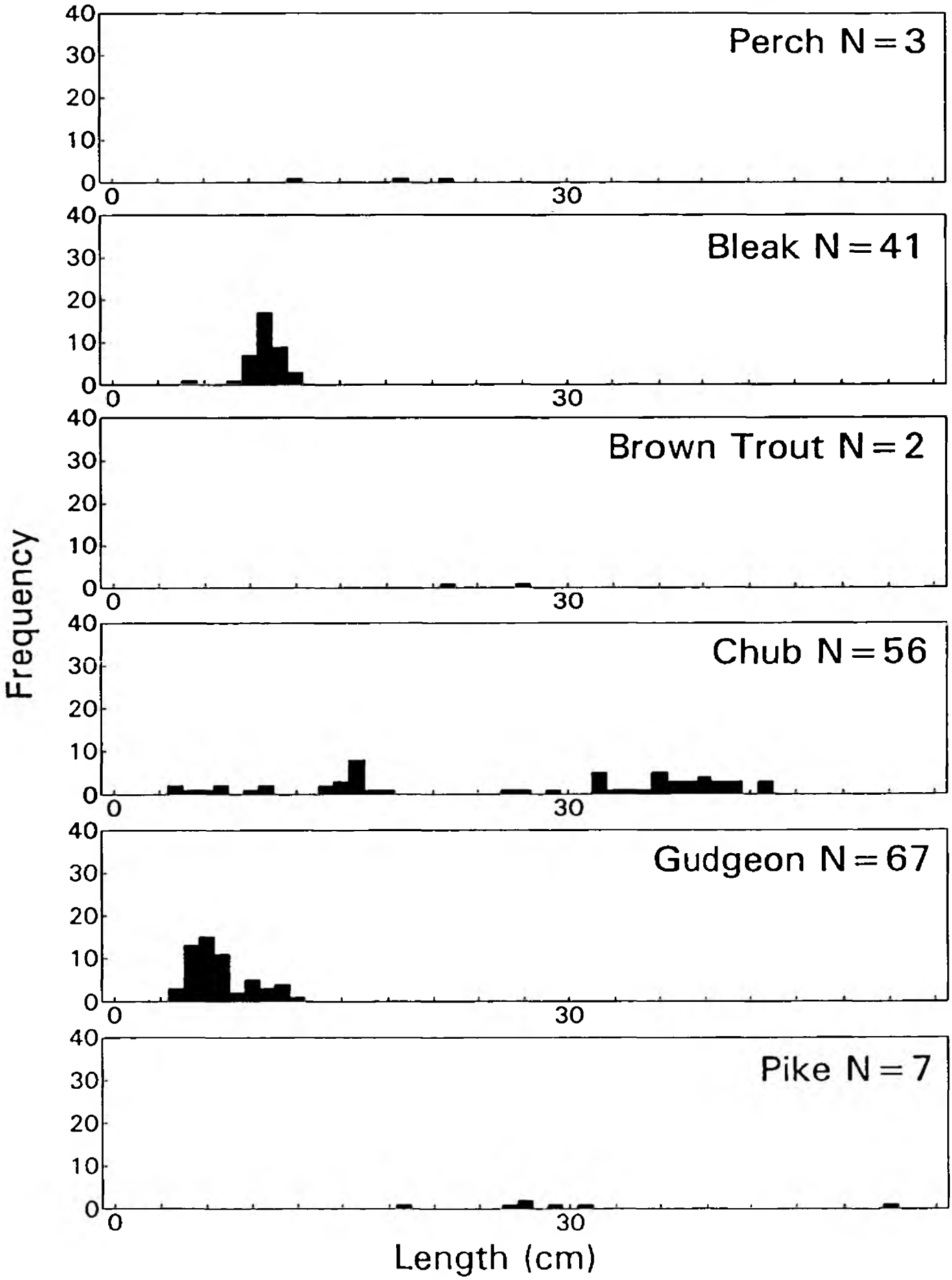


Biomass (gm−2)

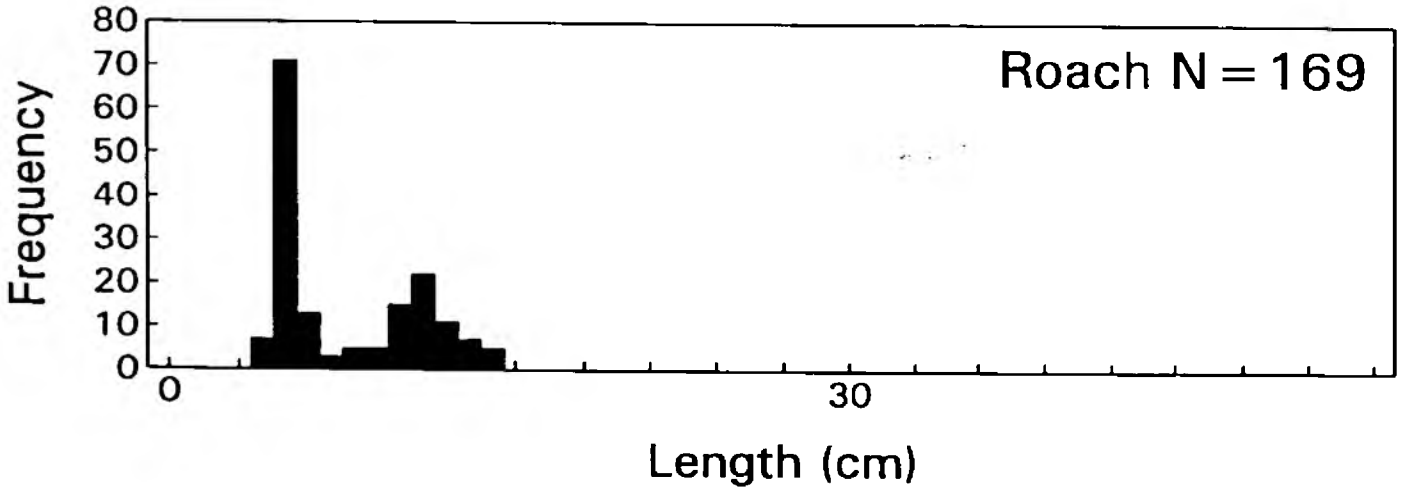


Density (nm−2)

SITE GBL2.LENGTH FREQUENCY



SITE GBL2. LENGTH FREQUENCY



5.13 SITE REPORT

WATERCOURSE: Great Brook
SITE NAME: Chimney lane
SITE CODE: GBL3
LOCATION: 0.5km downstream of bridge
NGR: SP338008
DATE FISHED: 30th June 1992
METHOD: Pulsed DC electrofishing
TARGET
BIOMASS: 20gm^{-2}

HABITAT FEATURES
LENGTH: 143m WIDTH: 7.2m AREA: 1029.6m^2 DEPTH: 1m
WATER TEMPERATURE: 23°C
WATER LEVEL: Low-normal
WATER CLARITY: Good
FLOW RATE: Moderate

SUBSTRATE COMPOSITION (%)
BARE: 1 MUD & SILT: 95 GRAVEL: 4 STONE: 0 BOULDER: 0

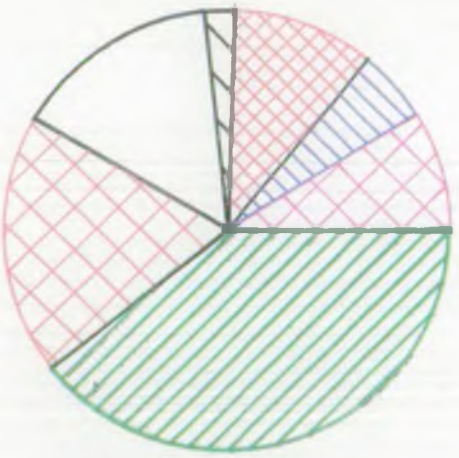
VEGETATION (% COVER)
SUBMERGED: 10 FLOATING: 25 EMERGENT: 35 SHADE: 10
DOMINANT PLANT SPECIES: *Nuphar, Phalaris, Lemna, Schoenoplectus, Potamogeton.*
ADJACENT LAND USE: Left bank arable.
Right bank road and permanent pasture.

REMARKS
PHYSICAL STRUCTURE OF SITE: A straight section with depth variations from 0.4-1.3m. Heavily colonised by aquatic macrophytes. The section covered by the upstream run was shallow and fast with the substrate being predominantly gravel.

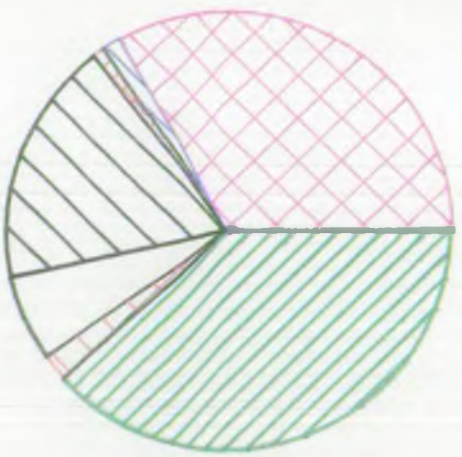
CATCH: This site produced a biomass of 19.0 gm^{-2}. This just fails to meet the NRA Thames Region target biomass for EC designated cyprinid fisheries. Bullheads and lampreys were present, Minnows and cyprinid fry were abundant. The upstream run produced a biomass of 10.2 gm^{-2}.

Site GBL3 Chimney Lane
Biomass and Density

	Biomass (gm−2)	Density (nm−2)
BLEAK	1.7	0.116
CHUB	1.0	0.005
EEL	2.0	0.003
GUDGEON	0.4	0.063
PERCH	2.8	0.022
PIKE	3.7	0.007
ROACH	7.5	0.134
TOTAL	19.1	0.350

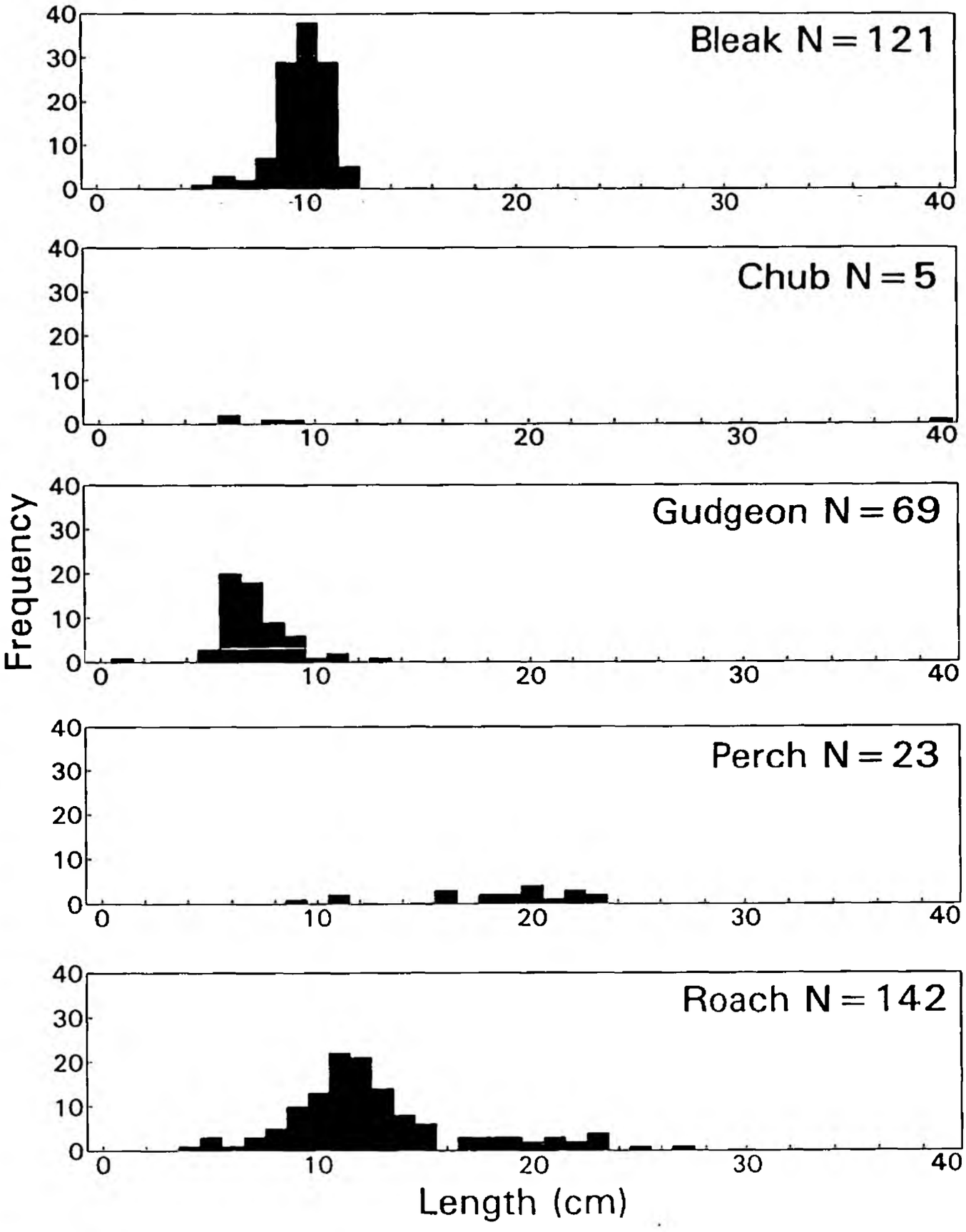


Biomass (gm−2)

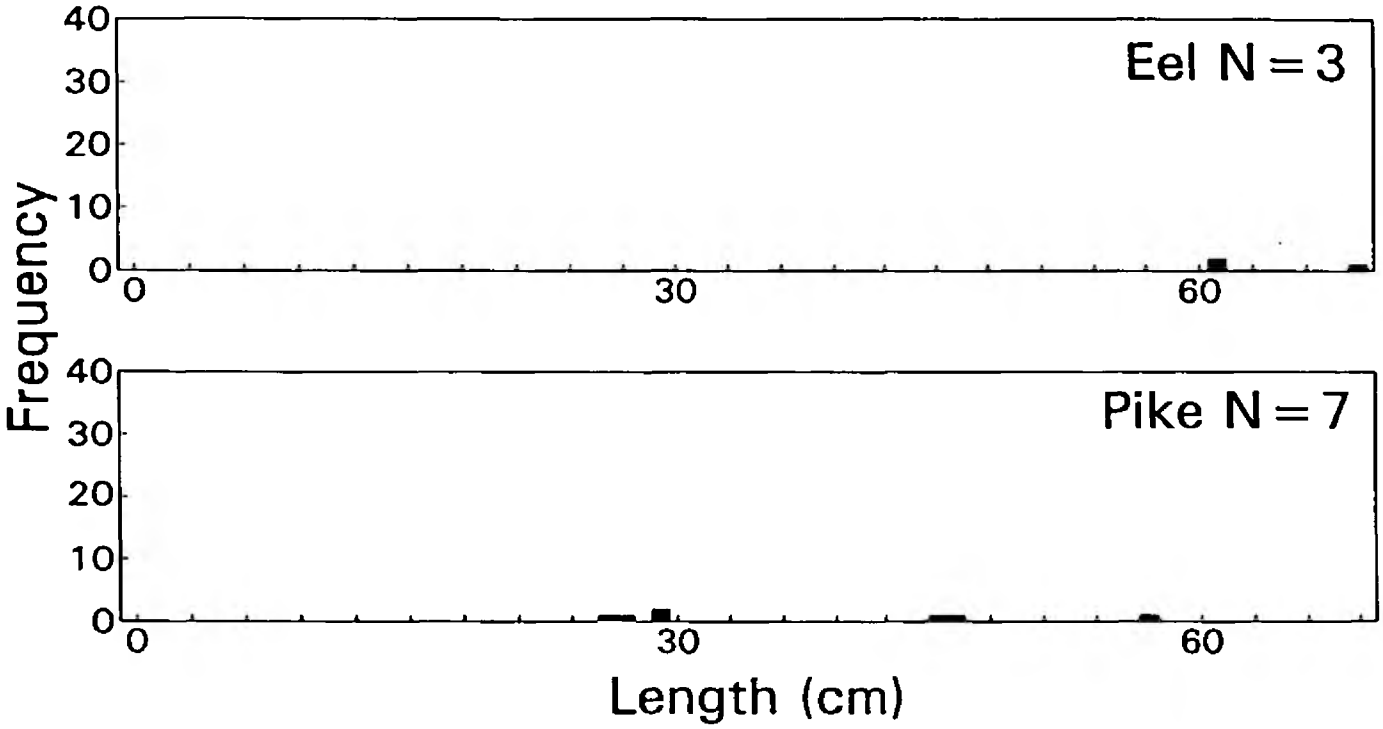


Density (nm−2)

SITE GBL3. LENGTH FREQUENCY



SITE GBL3. LENGTH FREQUENCY



5.14 SITE REPORT

WATERCOURSE: Great Brook
SITE NAME: Shifford
SITE CODE: GBL4
LOCATION: 400m upstream of confluence with R.Thames
NGR: SP370017
DATE FISHED: 7th July 1992
METHOD: Pulsed DC electrofishing
TARGET
BIOMASS: 20 gm^{-2}

HABITAT FEATURES
LENGTH: 74m WIDTH: 6.1m AREA: 451.4m^2 DEPTH: 0.4m
WATER TEMPERATURE: 16°C
WATER LEVEL: Normal-High
WATER CLARITY: Excellent
FLOW RATE: Fast

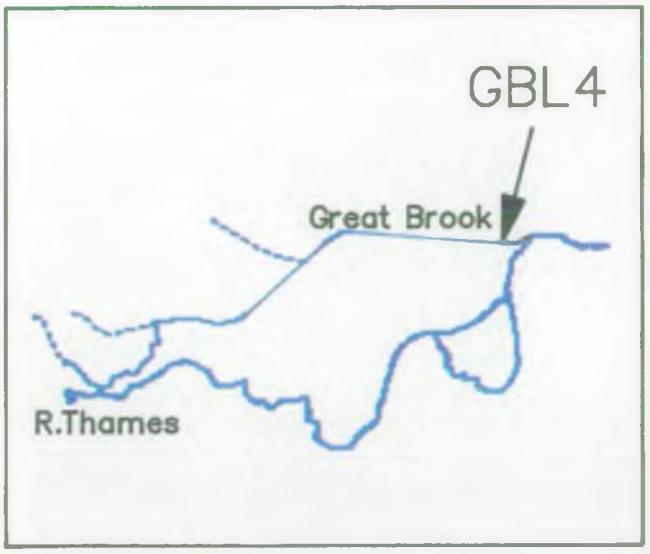
SUBSTRATE COMPOSITION (%)
BARE: 0 MUD & SILT: 5 GRAVEL: 95 STONE: 0 BOULDER: 0

VEGETATION (% COVER)
SUBMERGED: 2 FLOATING: 1 EMERGENT: 40 SHADE: 0
DOMINANT PLANT SPECIES: *Phalaris, Myriophyllum, Lemna, Callitriche, Myosotis, Rorippa.*
ADJACENT LAND USE: Right bank arable.
Left bank pasture.

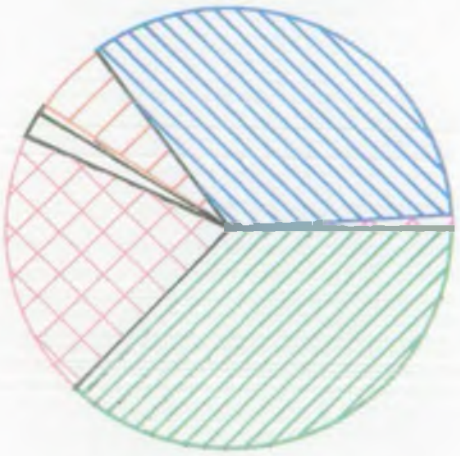
REMARKS
PHYSICAL STRUCTURE OF SITE: A straight, overwide section, heavily encroached by emergents forming a two-stage channel. Depth variations from 0.3-0.5m.

CATCH: This site produced an excellent biomass of 90.6gm^{-2}. This easily exceeds its target as does the upstream run which produced a biomass of 45.2gm^{-2}. Minnows, bullheads and cyprinid fry were present.

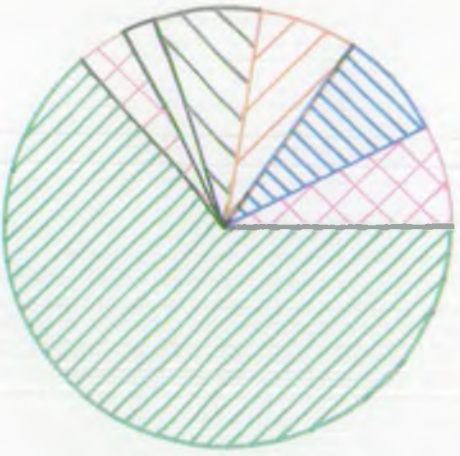
Site GBL4 Shifford
Biomass and Density



	Biomass (gm-2)	Density (nm-2)
BLEAK	0.9	0.073
CHUB	30.9	0.078
DACE	4.9	0.069
GUDGEON	0.6	0.078
PERCH	1.8	0.022
PIKE	17.9	0.036
ROACH	33.6	0.624
TOTAL	90.6	0.980

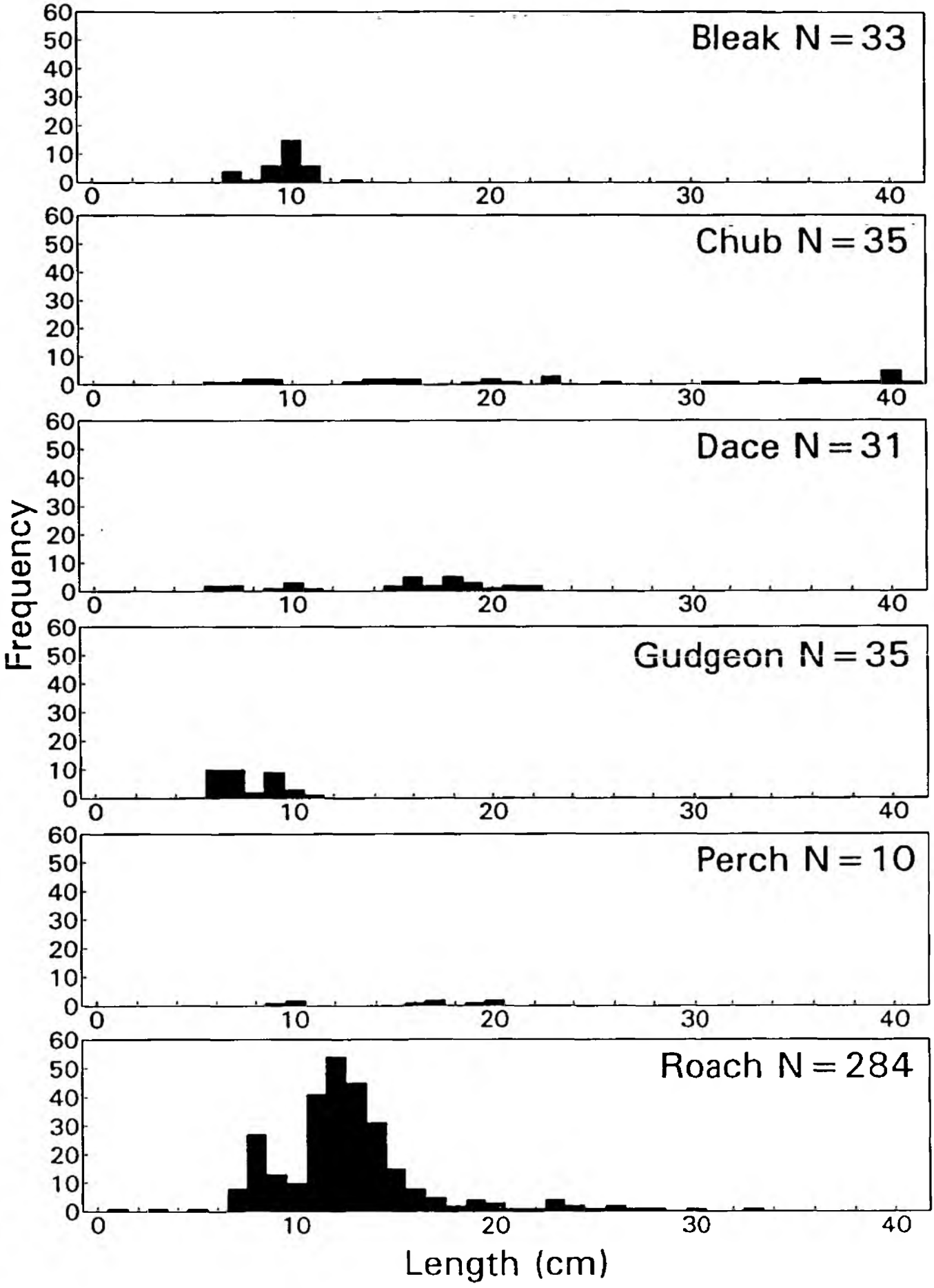


Biomass (gm-2)

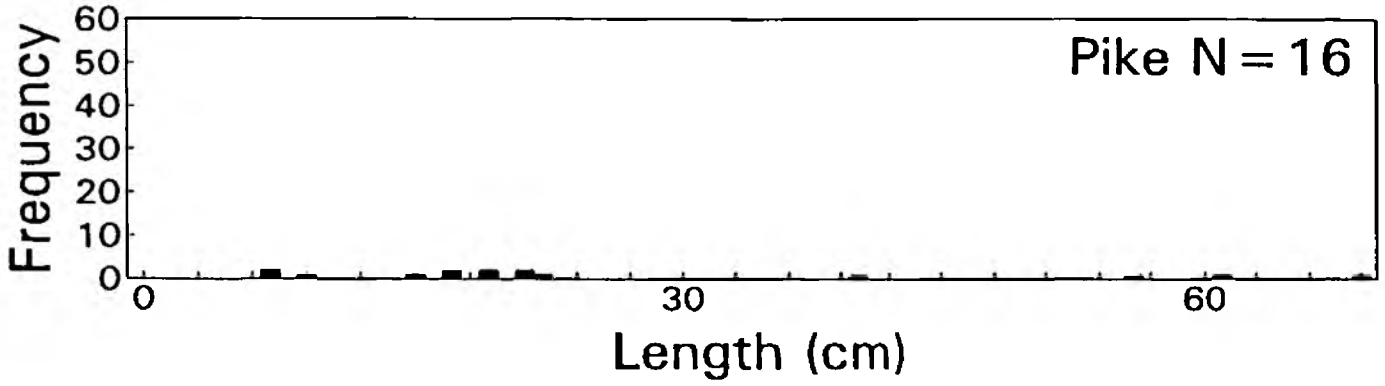


Density (nm-2)

SITE GBL4. LENGTH FREQUENCY



SITE GBL4. LENGTH FREQUENCY



5.2 SURVEY RESULTS

A summary diagram of the biomass and species composition is presented in figure 5.21.

5.3 PREVIOUS FISHERIES SURVEYS

There has been no fisheries survey work carried out on the Great Brook prior to this survey.

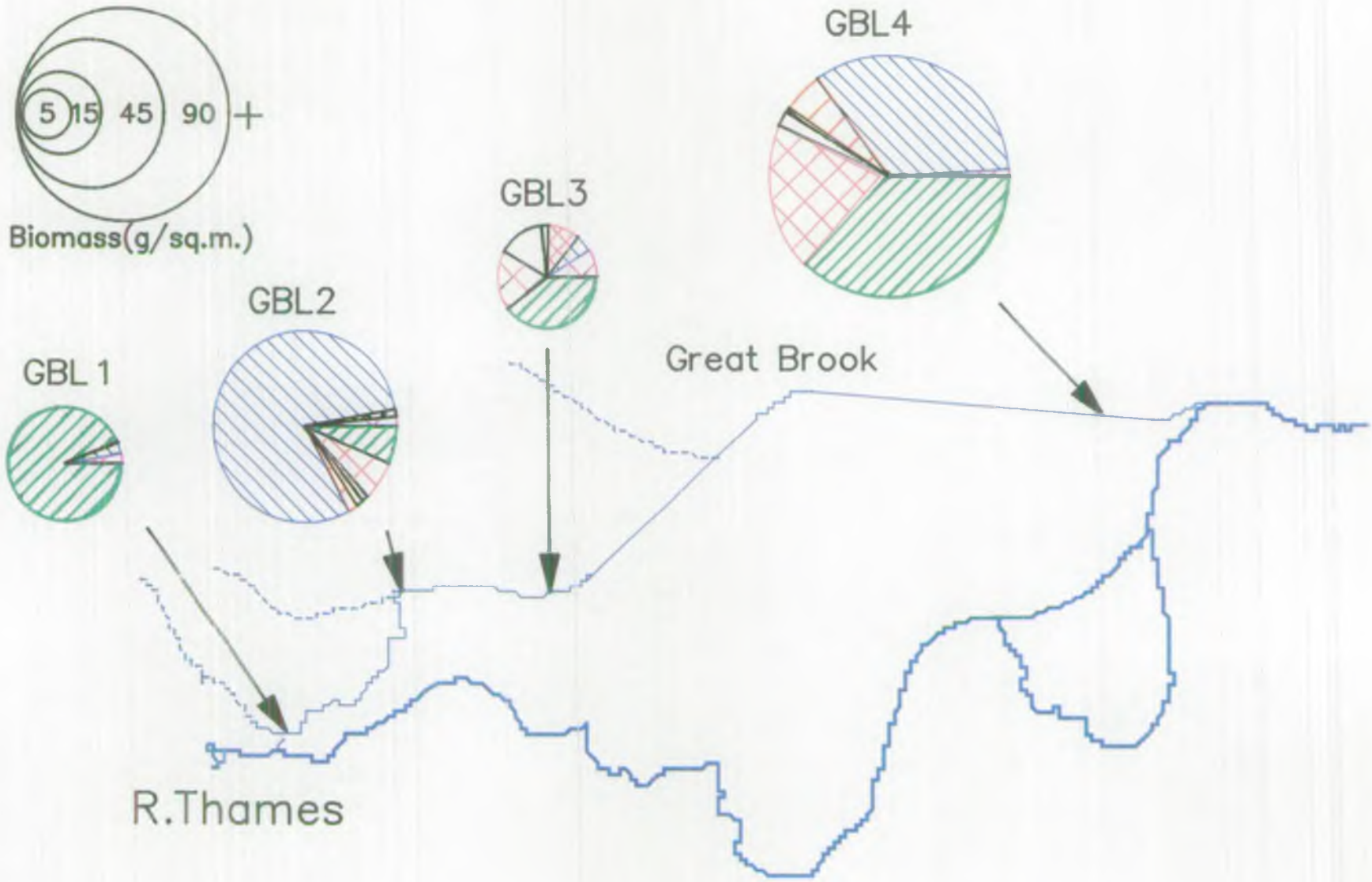
5.4 WATER QUALITY RESULTS

The Great Brook is a short section of river whose water quality is governed by its source (R.Thames) and the inflows from the Radcot Cut and the Shill Brook. River quality assessments for the Great Brook from 1980 to March 1992 show a compliance with its 1B/1A designation, see table below:

YEAR	R.Thames to Shill Br.	Shill Br. to R.Thames
1980	-	1A
1981	-	1B
1982	-	1A
1983	1B	1B
1984	1B	1B
1985	1A	1B
1986	1A	1B
1987	1A	1B
1988	1A	1B
1989	1B	1B
1990	1B	1B
1991	1B	1B
1992	1A	1B

The RQO designation for the River Thames above the source is 2A/1B. The Radcot Cut is designated 1B; therefore these inflows should have no detrimental effect on water quality. The Shill Brook however has a lower RQO (2B) than that of the Great Brook, however there appears to be a sufficient dilution factor to allow the Great Brook to acheive 1B. There is no water quality data downstream of Bampton STW which makes it impossible to evaluate the impact accurately.

FIG.5.21 SUMMARY OF BIOMASS FOR EACH SITE



5.5 MACROINVERTEBRATES

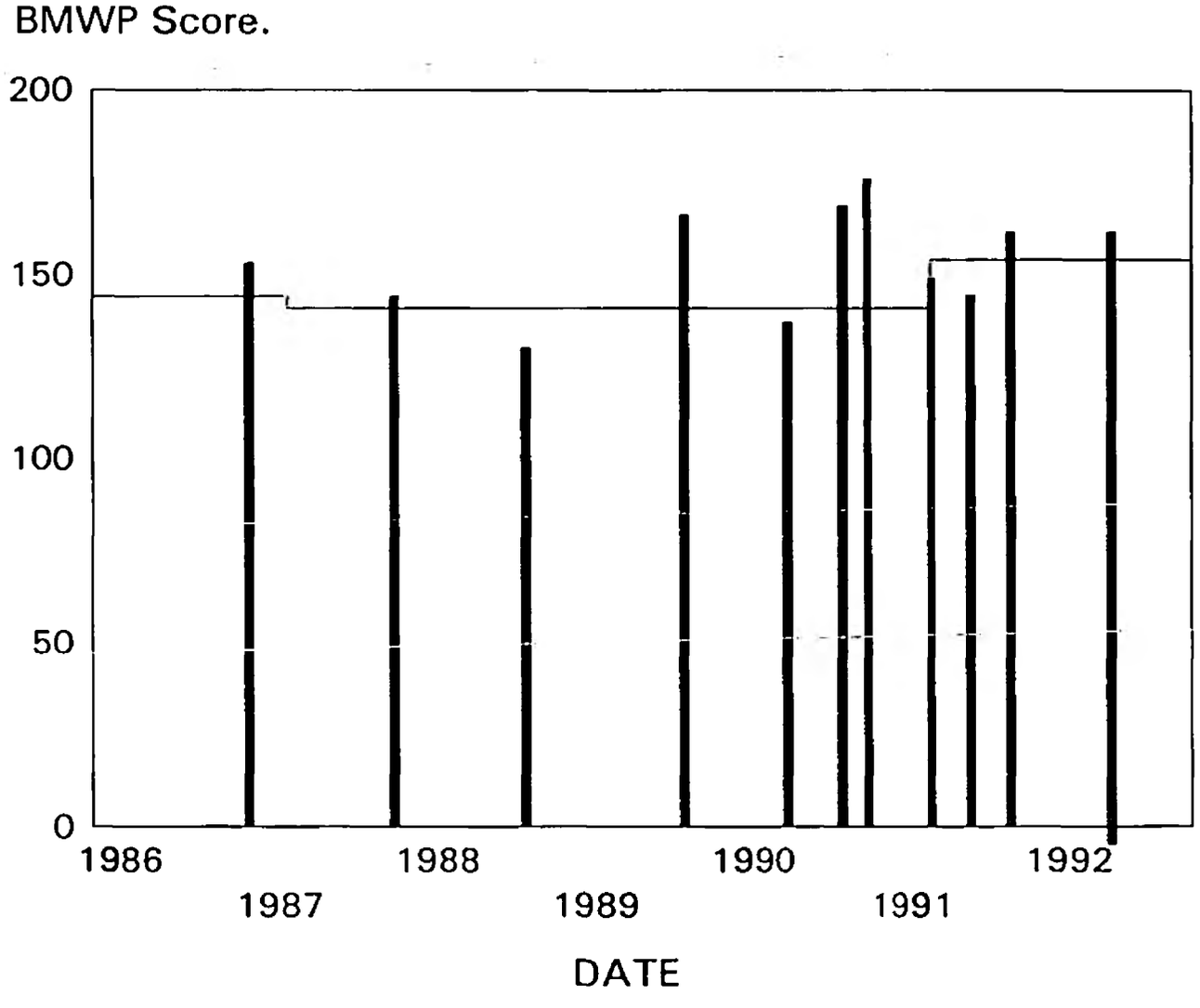
Biological monitoring was carried out at the following site;

CODE	NAME/LOCATION	NGR
PUTR0051	Gt.Brook at Chimney Lane	SP35100180

SAMPLE DATE	ACTUAL BMWP SCORE	PREDICTED BMWP SCORE	BIOTIC CLASS
14.11.86	153	144	A
16.09.87	144	141	B
01.08.88	130	141	B
09.08.89	166	141	A
24.04.90	137	141	B
16.08.90	168	141	A
03.10.90	176	141	A
04.03.91	148	141	B
19.06.91	144	154	B
16.09.91	161	154	A
09.04.92	162	154	A

The results of this site are presented graphically in fig 5.51

FIG 5.51 BIOLOGICAL MONITORING ON THE GREAT BROOK



6.0 DISCUSSION

The site at Rushey Meadow (GBL1) was poor in habitat over the majority of the length; the substrate consisting mainly of mud and silt except directly above the old sluice where velocities increase and the majority of fish were caught. The survey site produced a low biomass of 15.6 grams per square metre (gm^{-2}) with a minimum estimate of $5.8gm^{-2}$ directly upstream of the site. The population was dominated by roach with a biomass of 14.4 gm^{-2} and a density of 0.384 fish per square metre (nm^{-2}). Length frequencies show satisfactory recruitment for both roach and bleak, with the species diversity at this site being the lowest recorded on the survey. The failure of this site to meet its NRA minimum biomass target for EC designated cyprinid fisheries is probably due to the lack of instream cover and the slower flows associated with impounded sections.

The second site, above the Isle of White bridge (GBL2) produced a high biomass of $55.7gm^{-2}$. This is a direct reflection of the good instream habitat with diverse macrophyte cover and the higher flow regimes over a good gravel substrate. The population was dominated for biomass and density respectively by chub ($44.5gm^{-2}$) and roach ($0.149nm^{-2}$). Length frequency for chub indicates a wide range of size and therefore age classes present. There is excellent recruitment of roach at this site; data on bleak and gudgeon also indicate good recruitment. Twelve species were recorded including brown trout.

The survey site at Chimney Lane (GBL3) is a straight and overwide section, heavily encroached with macrophytes; substrate was poor over the majority of the site. A biomass of $19.1gm^{-2}$ was recorded, failing to meet its biomass target by a very small margin. However the upstream run produced $10.16gm^{-2}$, although this is of a similar ratio as the biomasses recorded at GBL4 ($96gm^{-2}$, $45.19gm^{-2}$) the shallow depth and lack of instream cover made efficiency very high and the minimum estimate recorded is probably close to the true biomass. The population was dominated by roach ($7.5gm^{-2}$, $0.134nm^{-2}$). The length frequencies show stable populations of roach, bleak and gudgeon with good recruitment. The only biological monitoring data for the Great Brook is at this site (PUTR0051) the results of which confirm the good quality shown by chemical monitoring.

The site at Shifford (GBL4) was similar to GBL3 with the channel being straight and overwide. However habitat was greatly enhanced by the large amount of encroaching emergent vegetation effectively narrowing the channel, increasing velocities and keeping the predominantly gravel substrate silt free. The survey section produced an excellent biomass of $90.96gm^{-2}$. The upstream run had similar habitat and achieved a biomass of $45.19gm^{-2}$. The population was dominated by roach ($33.6gm^{-2}$, $0.624nm^{-2}$) and chub ($30.9gm^{-2}$). This is a significant spawning site not only for the Brook's native populations but also probably for the River Thames, where suitable spawning habitat is more scarce. Any removal of the emergent vegetation would have a detrimental result on this excellent site.

The water quality results on the Great Brook show compliance with its river quality objective of 1B, this is to be expected due to the Brook's short length and constant supply from the River Thames. There is no evidence of discharges or abstractions having a detrimental effect on the Brook.

The Great Brook can be compared with a similar waterbody, the Seacourt Stream. Both are distributaries of the R.Thames, have similar water quality, are easily colonised from the Thames and both have natural and modified channel types. Results from the survey carried out on the Seacourt Stream in 1992 showed a marked difference in biomass and species diversity between the faster flowing narrower channel that occurs at the top of the stream and the overwide, slower flowing and featureless stretches lower down. This difference also appears on the Great Brook sites with the more favourable habitat and faster flows supporting higher biomasses and more diverse populations. Those sites with slower flows and poor habitat tended to be dominated by roach.

The governing factors on the Great Brook are its dependence on the Thames for water quality and flow regimes. This combined with the poor habitat available from a man made channel designed to alleviate flooding, limits the ability of the Brook to hold stable populations over much of its length.

7.0 CONCLUSION

The Great Brook is capable of supporting an exceptional biomass and diverse fish population. This capability is at present compromised by habitat quality in some areas.
It appears that the Brook is also an important spawning and nursery site for the River Thames. It is vital that this point be emphasised with regards to planning future maintainance work. There is considerable scope to upgrade those sections of the Brook currently less valuable as a habitat provided this can be done without loss of essential flood discharge capacity.

8.0 RECOMMENDATIONS

Consultations with flood defence should be carried out with a view to designing habitat improvements to enable the brook to achieve its full potential as a fishery wherever possible. Time and resources should be sought for this within the business plan.
Further survey work should be carried out to monitor the effects of the enhancements.

9.0 REFERENCES

Council of the European Communities, 1978. Directive on the quality of freshwaters needing protection or improvement in order to support fish life. 78/659/EEC. Official journal of the European communities, No. L22/1.

Hickley, P. and Dexter, K.F., 1979. A comparative index for quantifying growth in length of fish. Fishery Management 10 (4), 147-151.

Killingbeck, A. 1989. The Shill Brook Fisheries Survey. REF AHS89.

APPENDIX I

River quality classification

River Class	Quality criteria	Remarks	Current potential uses
	Class limiting criteria (95 percentile)		
1A Good Quality	(i) Dissolved oxygen saturation greater than 80% (ii) Biochemical oxygen demand not greater than 3 mg/l (iii) Ammonia not greater than 0.4 mg/l (iv) Where the water is abstracted for drinking water, it complies with requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 1.5 mg/l (ii) Visible evidence of pollution should be absent	(i) Water of high quality suitable for potable supply abstractions and for all other abstractions (ii) Game or other high class fisheries (iii) High amenity value
1B Good Quality	(i) DO greater than 60% saturation (ii) BOD not greater than 5 mg/l (iii) Ammonia not greater than 0.9 mg/l (iv) Where water is abstracted for drinking water, it complies with the requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 2 mg/l (ii) Average ammonia probably not greater than 0.5 mg/l (iii) Visible evidence of pollution should be absent (iv) Waters of high quality which cannot be placed in Class 1A because of the high proportion of high quality effluent present or because of the effect of physical factors such as canalisation, low gradient or eutrophication (v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS)	Water of less high quality than Class 1A but usable for substantially the same purposes
2 Fair Quality	(i) DO greater than 40% saturation (ii) BOD not greater than 9 mg/l (iii) Where water is abstracted for drinking water it complies with the requirements for A3* water (iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 5 mg/l (ii) Similar to Class 2 of RPS (iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs	(i) Waters suitable for potable supply after advanced treatment (ii) Supporting reasonably good coarse fisheries (iii) Moderate amenity value
3 Poor Quality	(i) DO greater than 10% saturation (ii) Not likely to be anaerobic (iii) BOD not greater than 17 mg/l. This may not apply if there is a high degree of re-aeration	Similar to Class 3 of RPS	Waters which are polluted to an extent that fish are absent or only sporadically present. May be used for low grade industrial abstraction purposes. Considerable potential for further use if cleaned up
4 Bad Quality	Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times	Similar to Class 4 of RPS	Waters which are grossly polluted and are likely to cause nuisance
X	DO greater than 10% saturation		Insignificant watercourses and ditches not usable, where the objective is simply to prevent nuisance developing

Notes

(a) Under extreme weather conditions (eg flood, drought, freeze-up), or when dominated by plant growth, or by aquatic plant decay, rivers usually in Class 1, 2 and 3 may have BODs and dissolved oxygen levels, or ammonia content outside the stated levels for those Classes. When this occurs the cause should be stated along with analytical results.

(b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH_4.

(c) In most instances the chemical classification given above will be suitable. However, the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases, the quality classification of the water should be down-graded on the basis of biota actually present, and the reasons stated.

(d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95 percentile limits.

* EEC category A2 and A3 requirements are those specified in the EEC Council Directive of 16 June 1975 concerning the Quality of Surface Water Intended for Abstraction of Drinking Water in the Member State.

APPENDIX II N.R.A. - THAMES REGION. RIVER QUALITY OBJECTIVE PARAMETERS

Class 1A - High quality waters

1. Suitable for potable supply at defined abstraction points, and

2. Suitable for all other abstractions, and

3. Suitable for game or any other high class fisheries, (complying with the requirements of Directive 78/659/EEC for salmonid-waters), and

4. Of high amenity value.

Class 1B - High quality waters

1. Used for the transport of high proportions of sewage effluent, trade effluent or urban run-off, and

2. Suitable for potable supply at defined abstraction points, and

3. Suitable for all other abstractions, and

4. Suitable for game or any other high class fisheries, (complying with the requirements of Directive 78/659/EEC for salmonid waters), and

5. Of high amenity value.

Class 2A - Fair quality waters

1. Suitable for potable supply after advanced treatment at defined abstraction points, and

2. Suitable for agricultural uses, and

3. Capable of supporting good coarse fisheries, (complying with the requirements of Directive 78/659/EEC for cyprinid waters), and

4. Of moderate amenity value.

Class 2B - Fair quality waters

1. Suitable for potable supply after advanced treatment at defined abstraction points, and

2. Suitable for agricultural uses, and

3. Capable of supporting reasonably good coarse fisheries, and

4. Of moderate amenity value.

Class 3 - Poor quality waters

1. Suitable for low grade industrial use, and

2. Not anaerobic or likely to cause a nuisance, and

3. Capable of supporting a restricted aquatic flora and fauna.

N.B. Not required to be capable of supporting a viable fishery.

Class 4 - Bad quality waters

1. Likely to cause a nuisance.

2. Flora and fauna absent or restricted to pollution tolerant organisms.

Class X - Insignificant watercourses

1. Watercourses, not usable, and not placed in Classes 1A to 4 above.

2. Capable of supporting a restricted flora and fauna, and

3. Not likely to cause a nuisance.

APPENDIX III E.C. WATER QUALITY CRITERIA FOR FISHERIES

LIST OF DETERMINANDS

Determinand	*Salmonid Waters*		*Cyprinid Waters*	
	G	*I*	*G*	*I*
(a) Temperature (max) (b) Temperature rise		$\leqslant$ 21.5°C $\not>$ 1.5°C		$\leqslant$ 28°C $\not>$ 3°C
Dissolved oxygen (mg/l O_2)	50% $\geqslant$ 9 100% $\geqslant$ 7	50% $\geqslant$ 9	50% $\geqslant$ 8 100% $\geqslant$ 5	50% $\geqslant$ 7
pH		6--9		6--9
Suspended solids (mg/l)	$\leqslant$ 25		$\leqslant$ 25	
B.O.D. (A.T.U.) (mg/l)	$\leqslant$ 5*		$\leqslant$ 8*	
Nitrites (mg/l)	$\leqslant$ 0.2*		$\leqslant$ 0.5*	
Non-ionized ammonia (mg/l)	$\leqslant$ 0.005	$\leqslant$ 0.025	$\leqslant$ 0.005	$\leqslant$ 0.025
Total ammonium (mg/l NH_4)	$\leqslant$ 0.04	$\leqslant$ 1	$\leqslant$ 0.2	$\leqslant$ 1
Total residual chlorine (mg/l HC10)		$\leqslant$ 0.005		$\leqslant$ 0.005
Zinc (mg/l)		$\leqslant$ 0.3		$\leqslant$ 1
Copper (mg/l)	$\leqslant$ 0.04		$\leqslant$ 0.04	

* *The revised G-values that have been set by the U.K. government*

APPENDIX IV N.R.A. FISH SURVEY SITE CODING SYSTEM

The following habitat codes are used by NRA (Thames region) Fisheries staff, and are based on RQO and EEC legislation criteria:-

1.EEC DESIGNATED WATERCOURSES

Code	Description
A	1A Salmonid
B	1A Coarse
C	1A/1B Salmonid
D	1A/1B Coarse
E	1B Salmonid
F	1B Coarse
G	2/1B Salmonid
H	2/1B Coarse
I	2 Salmonid
J	2 Coarse

2.RQO WATERCOURSES

Code	Description
K	1A
L	1A/1B
M	1B
N	2/1B
O	2
P	3/2
Q	3
R	4/3
S	4
T	Unclassified

A 2 digit code for a watercourse is combined with the above and an individual site number to provide a unique 4 digit code for each site. Thus OCF1 - OC = River Ock, F = 1B Coarse, 1 = individual site.