

NRA Thames 99



ENVIRONMENT AGENCY

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FISHERIES SURVEY

1992

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ENVIRONMENT AGENCY



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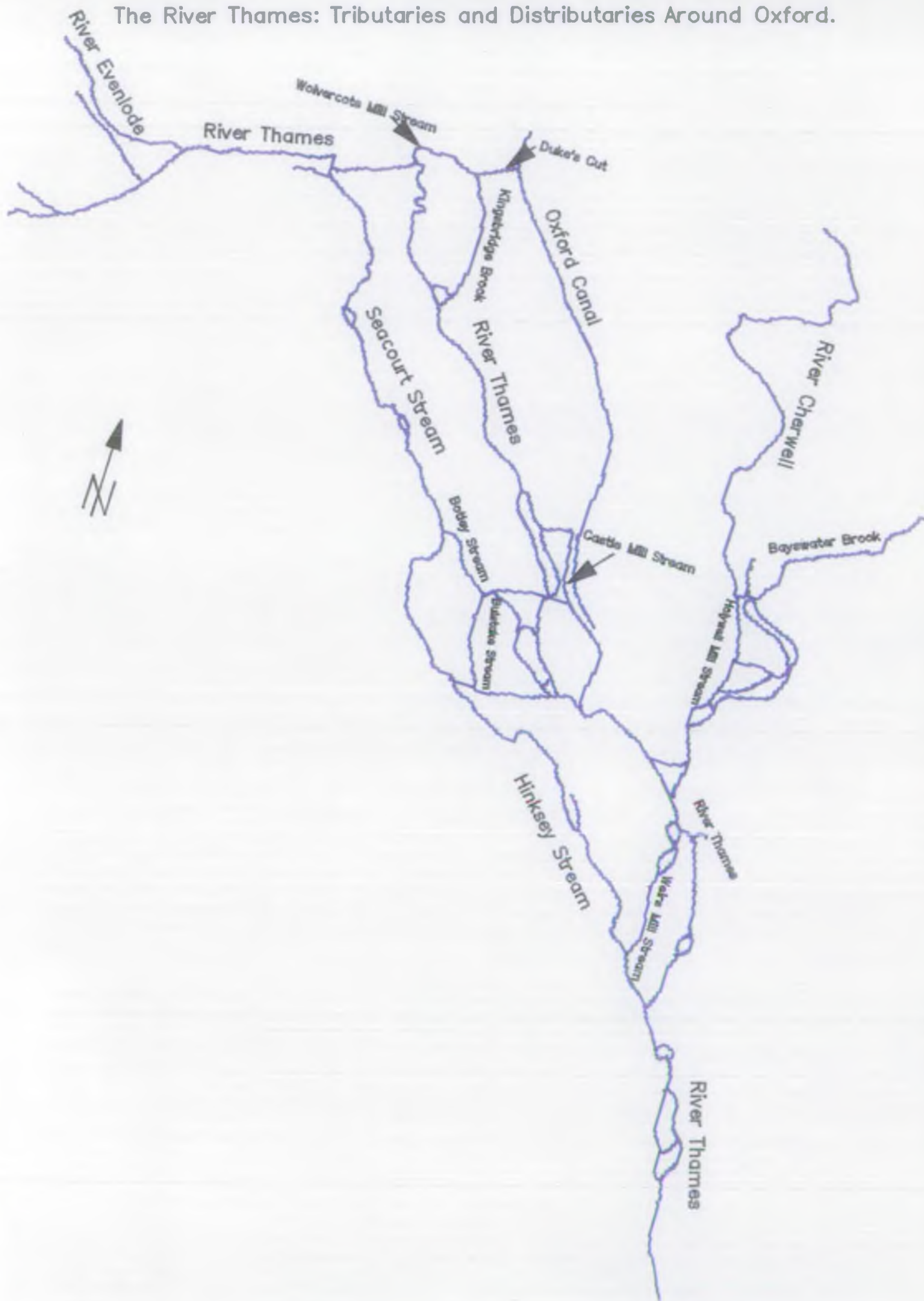
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1.0 SUMMARY

1. Thirteen sites on seven watercourses were surveyed between 8/2/92 and 21/6/92.
2. The two arms of the River Evenlode had natural, stable and self supporting coarse fish populations dependant on consistently good habitat, flow and water quality.
3. The Seacourt Stream held excellent coarse fish populations dependant on suitable habitat, channel profile and flow. Fish populations were lower where the channel had been extensively dredged.
4. The Hinksey Stream had good coarse fish populations despite recent extensive dredging.
5. The Botley Stream had excellent coarse fish populations despite poor habitat. The stream may suffer from localised water quality problems and would benefit from the creation of a two-stage channel.
6. The Bulstake Stream had relatively good fish populations, but was difficult to survey.
7. The Castle Mill Stream held good fish populations with a patchy distribution. Good flow rates in the bottom section held a higher biomass. Water of poorer quality entering from the Oxford Canal may have a detrimental impact on fish biomass.
8. The Wolvercote Mill Stream had poor fish populations above the mill impoundment due to a lack of suitable habitat and possible localised water quality problems. An improvement in flow would have a beneficial impact on fish biomass. Good coarse fish populations were found below the mill impoundment.
9. Fish populations in the River Thames are likely to depend on recruitment from many of these watercourses for recruitment.
10. Any existing natural fisheries habitat must be retained.
11. Where fisheries habitat has been detrimentally affected, habitat enhancement opportunities must be identified and included in future works programmes.

The River Thames: Tributaries and Distributaries Around Oxford.



2.0 INTRODUCTION

The city of Oxford is surrounded by a network of streams that have been developed since medieval times for a variety of reasons including flood relief, defence and milling.

The tributaries include the River Evenlode, River Cherwell and Oxford Canal. The River Evenlode runs off the Cotswolds to join The River Thames near Cassington at 2 confluences (Grid References SP455094 and SP458098 - for the last 1km the river is in 2 channels). Both channels are designated as EC salmonid fisheries and have an RQO (River Quality Objective) of 1B.

The River Cherwell, in Oxford, splits and rejoins several times feeding up to 3 channels in parallel. It joins the River Thames 0.5km downstream of Folly Bridge (SP519053). It is a significant tributary in terms of size and fish populations (River Cherwell Survey 1988/89). It has an RQO of 2A and is an E.C. designated cyprinid fishery.

The Oxford canal joins the Castle Mill Stream (a distributary of the River Thames) 200m North East of Oxford Railway Station (SP505066). It has EC cyprinid fishery designation for much of its length but is not designated at the Oxford end. It has an RQO of 2A.

The River Thames through Oxford has an RQO of 1B and is an EC designated cyprinid fishery. It is excellent for angling with venues such as Medley (Port Meadow) having a national reputation in match fishing circles.

The distributaries of the Thames are loops or channels that split from and rejoin the main river. They receive their flow from the Thames and therefore share the same RQO of 1B and EC cyprinid fishery designation. These distributaries include the Seacourt Stream which is reputedly the original course of the River Thames. It receives its flow from a fixed overspill weir upstream of Kings Weir (SP472101) and benefits from natural/unspoilt habitat for much of its length. It has two distributaries of its own, the Botley Stream and the Hinksey Stream, and joins the Bulstake Stream behind Osney Mead Industrial Estate (SP499054).

The Wolvercote Mill Stream diverges from the Thames just above Kings Weir (SP478104) and is navigable at least as far as the Dukes Cut which provides a connection with the Oxford Canal. It continues as an overlarge impounded watercourse as far as Wolvercote Mill, below which it becomes a smaller more natural channel. It rejoins the Thames near Godstow Lock (SP486093).

The Castle Mill Stream diverges from the Thames at Fiddlers Island (SP500072) and is joined by the Oxford Canal and another distributary of the River Thames approximately 1km downstream. The top end of the Castle Mill Stream is overlarge with very poor instream habitat, however downstream of the prison the habitat is much improved being narrower, shallower and faster flowing.

The Bulstake Stream diverges from the River Thames at the Bathing Place 200m North-West of Oxford Railway Station (SP503066). After 500m the Osney Ditch diverges, another 150m downstream the Botley Stream joins, 1km further it is joined by the Seacourt Stream. The confluence with the River Thames is at the Eastern end of the Osney Mead Industrial Estate (SP507056). Much of the Bulstake Stream is over wide and deep with steep sides, although there are patches of better habitat such as immediately downstream of Binsey Lane bridge.

The Botley Stream is just under 1km long diverging from the Seacourt Stream North of the Botley

Road (SP492068) and joining the Bulstake Stream behind MFI on the Botley Road (SP497064). Flows are normally poor and the channel is dominated by a thick deposit of silt. Habitat is better in the narrower sections.

The Hinksey stream is almost a continuation of the Seacourt Stream diverging at North Hinksey (SP497054) where the Seacourt Stream turns eastward to join the Bulstake Stream. It joins the Weirs Mill Stream near Kennington Roundabout (SP521033). Past engineering/dredging has created a channel that is too large for summer flows and consequently there are problems with macrophyte growth and silt deposition. There are still some sections where the natural bed remains with stony riffles providing valuable habitat.

All of the watercourses mentioned have some angling activity. There is organised angling with a high level of activity on the main River Thames, River Cherwell, River Evenlode, Oxford Canal, and Seacourt Stream. More modest levels of angling are found on the Bulstake Stream, Hinksey Stream, Wolvercote Mill Stream and Castle Mill Stream. The Botley Stream is infrequently fished. Much of these lower levels of activity is due to poor access.

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. This is the first exhaustive fisheries survey undertaken by the NRA Thames Region on the distributaries of the River Thames. The survey was requested by NRA Thames Region Technical Services and paid for by the NRA Thames Region Flood Defence section to be combined with the results of archaeological, biological, conservation and landscape surveys in support of a feasibility study of the management of flood flows around the city of Oxford. The results of this survey will also serve to form the datum against which future changes in fish populations in the river can be 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.

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

4.0 METHODS

4.1 Site Selection.

Thirteen sites were fished between 8/2/92 and 21/6/92. Sites were selected to represent local environmental conditions within the defined water quality zones, taking into account bed topography, known water quality impacts and access considerations.

4.2 Capture and Data Acquisition.

Catch depletion electrofishing techniques using 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 mm. A subsample of up to 40 fish of each species at each site was weighed to the nearest gram.

Minor species such as stone loach (*Noemacheilus barbatulus*), minnow (*Phoxinus phoxinus*), bullhead (*Cottus gobio*), brook lamprey (*Lampetra planeri*) 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 validity of results obtained in the survey section.

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 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.

5.0 RESULTS.

5.100 Site Results.

Results are presented at site level with biomass, density and length frequency graphs. A brief explanatory text appears in the Remarks section of each site report. The code, name and other relevant information for each site investigated in this survey are summarised in Table 5.1 below.

Table 5.1 Summary of Survey Sites.

Site Code	Watercourse	Name	Grid Ref
EVEA	R. Evenlode	Mill Stream, Cassington.	SP453098
EVEB	R. Evenlode	Canal Stream Cassington.	SP454095
OXF1	Seacourt Stream	University Field Station.	SP472099
OXF2	Seacourt Stream	Marley Wood.	SP481081
OXF4	Seacourt Stream	North Hinksey.	SP494057
OXF5	Hinksey Stream	North Hinksey.	SP500053
OXF9	Botley Stream	Botley Stream.	SP496065
OXF0	Bulstake Stream	Binsey Lane.	SP497064
OXFA	Bulstake Stream	Fishing News Books.	SP505056
OXFB	Castle Mill Stream	Jericho.	SP504067
OXFC	Castle Mill Stream	College Gardens.	SP509059
OXFD	Wolvercote Mill St	A34 Road Bridge.	SP586098
OXFE	Wolvercote Mill St	Wolvercote Mill.	SP497098

5.101 SITE REPORT

WATERCOURSE: River Evenlode.
SITE NAME: Mill Stream (Cassington).
SITE CODE: EVEA
LOCATION: 200m downstream of old railway bridge.
N.G.R.: SP454095
DATE FISHED: 8/02/92.
METHOD: Upstream electrofishing, wading, 2 anodes.
R.Q.O.: 1B
EC TARGET
BIOMASS: 15 gm⁻²

HABITAT FEATURES

LENGTH: 129m MEAN WIDTH (RANGE): 3.8m(3-5m) AREA:490m²
MEAN DEPTH (RANGE): 0.8m (0.5-1.7m)
WATER TEMPERATURE: 7°C

SUBSTRATE COMPOSITION (%)

BARE: 1 MUD & SILT: 0 GRAVEL: 99 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

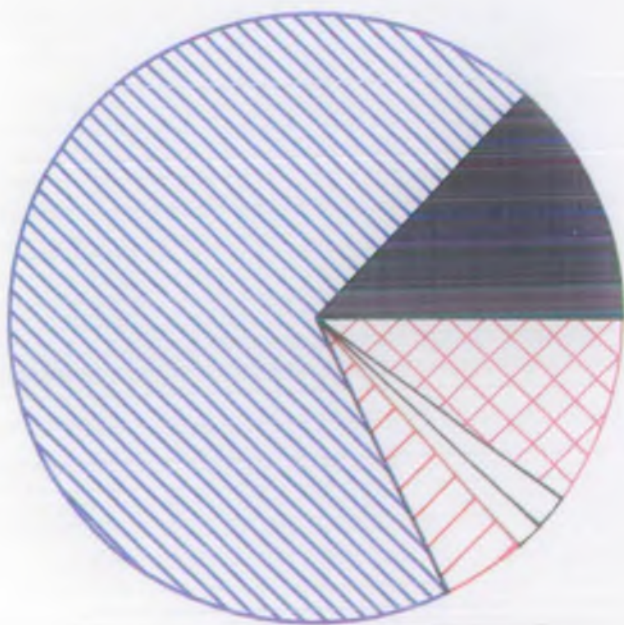
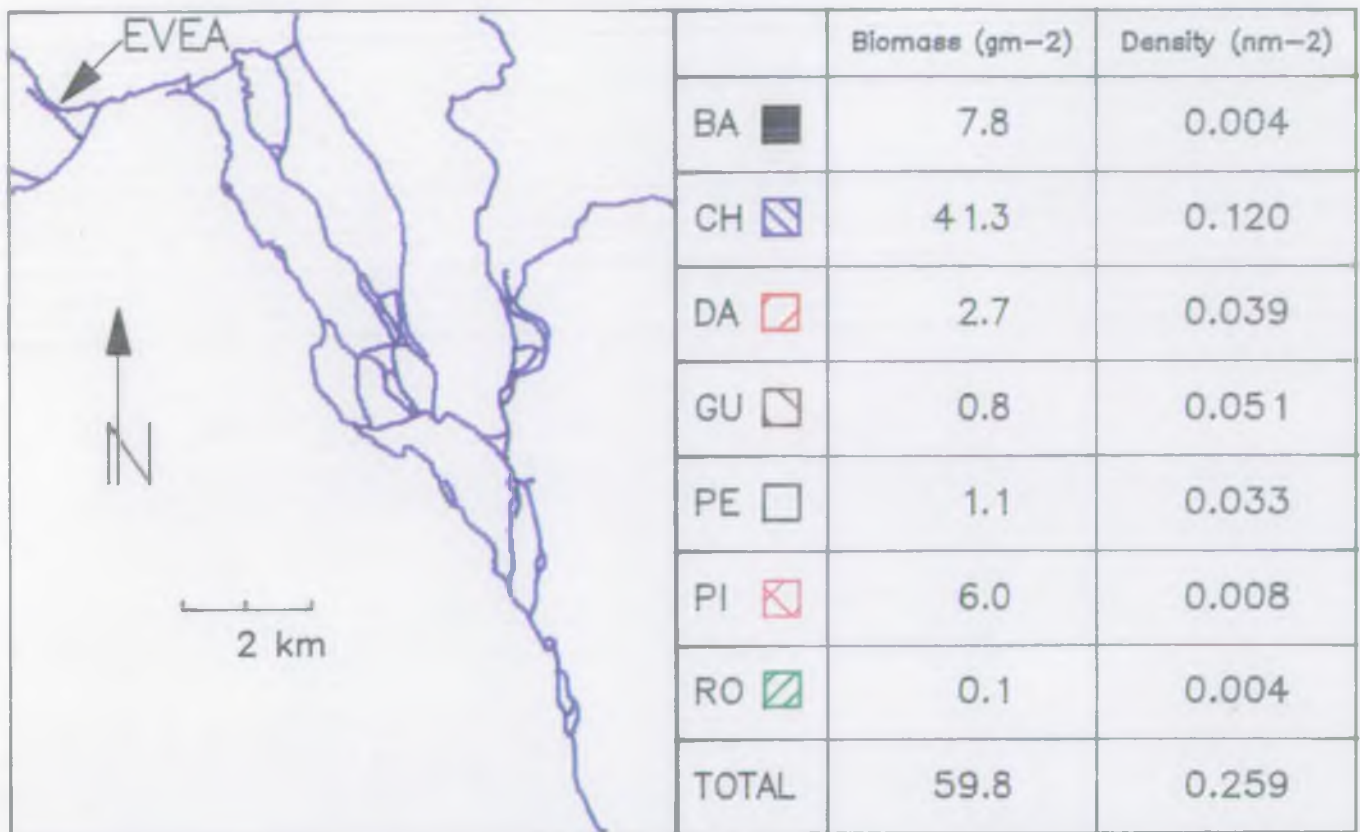
SUBMERGED: 10 FLOATING: 0 EMERGENT: 30 SHADE: 5
DOMINANT PLANT SPECIES(AQUATIC): *Ranunculus*, *Glyceria*.
WATER LEVEL: Normal, fast flowing.
WATER CLARITY: Excellent.
ADJACENT LAND USE: L.B. Permanent Pasture.
R.B. Permanent Pasture.

REMARKS

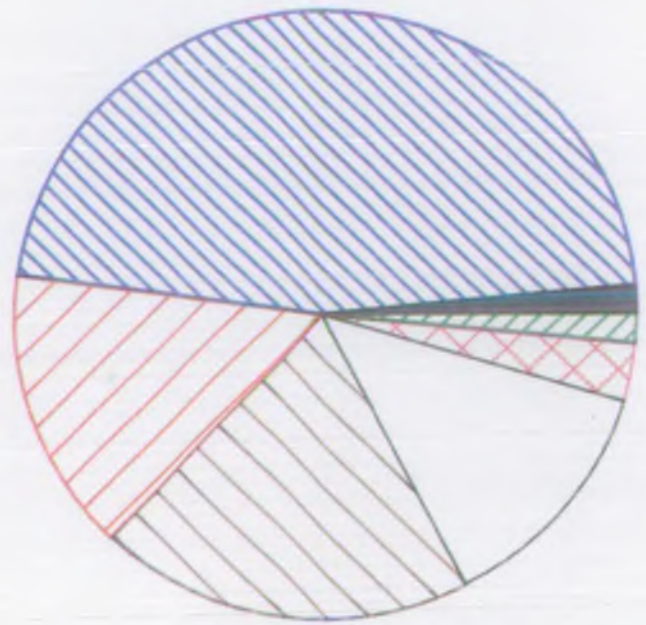
PHYSICAL STRUCTURE OF SITE: Twisting two stage channel with emergent vegetation on the shelf. Main channel generally narrow creating a strong flow. Deep pools with fast shallower almost riffle sections in between.

CATCH: Minnow and bullhead common, stone loach and lamprey present. *Piscicola* present at a low-moderate level. An upstream run of 113m produced 6.7kg (a minimum biomass of 6.9 gm⁻². This compares poorly with the survey section biomass of 59.8 gm⁻² and reflects the poorer habitat of the upstream run.

Site EVEA Biomass and Density.

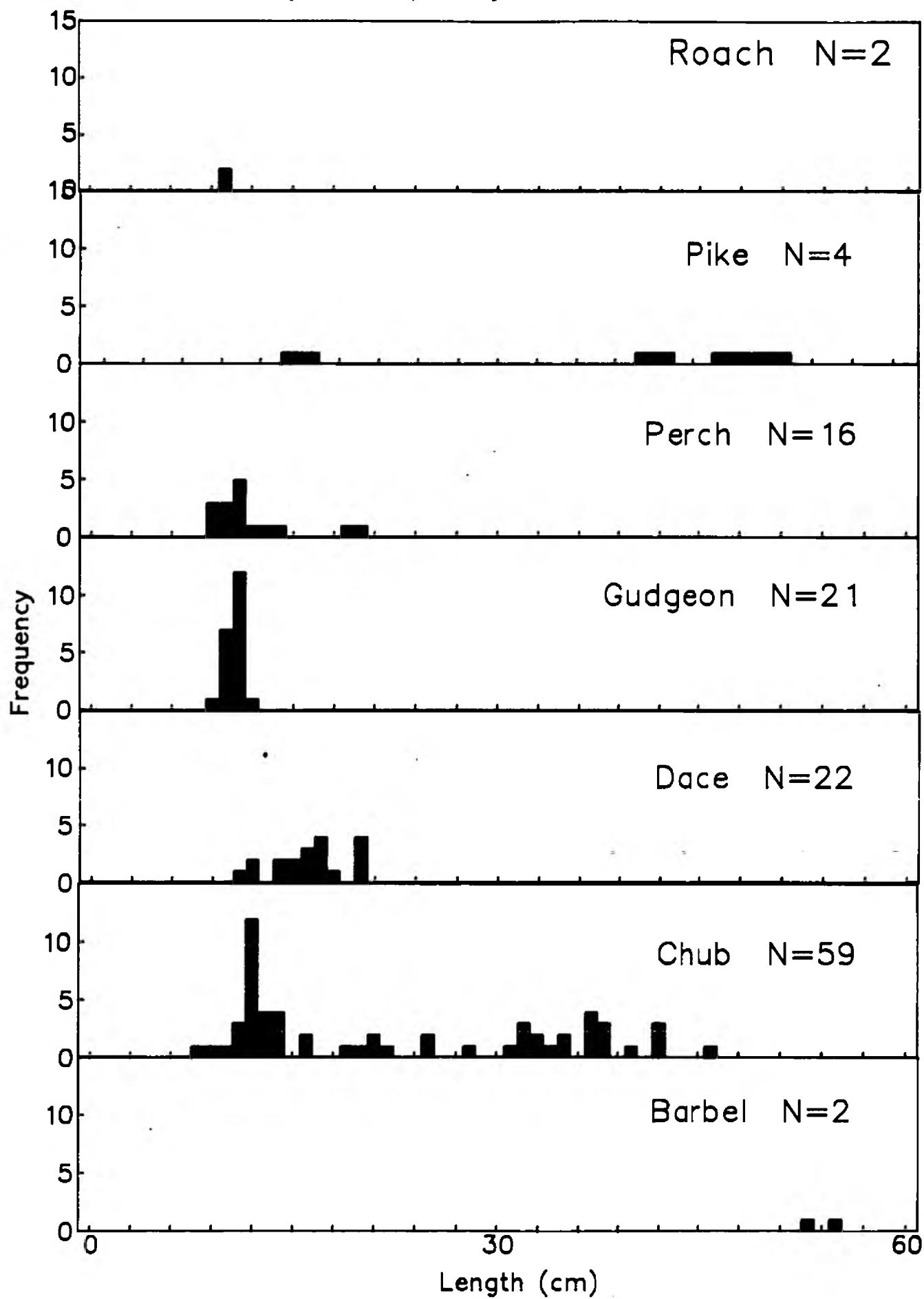


Biomass (gm-2)



Density (nm-2)

Site EVEA Length Frequency.



5.102 SITE REPORT

WATERCOURSE: River Evenlode.
SITE NAME: Canal Stream (Cassington).
SITE CODE: EVEB
LOCATION: 150m upstream of confluence with River Thames.
N.G.R.: SP454095
DATE FISHED: 8/02/92.
METHOD: Upstream electrofishing, wading, 3 anodes.
R.Q.O.: 1B
EC TARGET
BIOMASS: 15 gm⁻²

HABITAT FEATURES

LENGTH: 200m MEAN WIDTH (RANGE): 8.7m(8.2-9.5m) AREA:1740m²
MEAN DEPTH (RANGE): 0.7m (0.5-1.3m)
WATER TEMPERATURE: 7°C

SUBSTRATE COMPOSITION (%)

BARE: 1 MUD & SILT: 0 GRAVEL: 98 STONE: 0 BOULDER: 1

VEGETATION (% COVER)

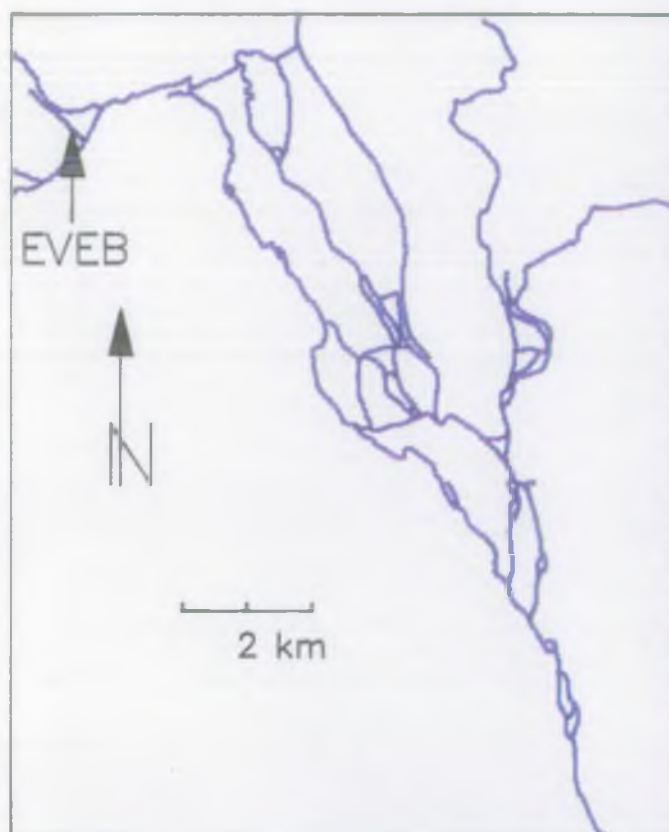
SUBMERGED: 5 FLOATING: 0 EMERGENT: 0 SHADE: 30
DOMINANT PLANT SPECIES(AQUATIC): *Ranunculus*, *Potamogeton pectinatus*.
WATER LEVEL: Normal but fast flowing.
WATER CLARITY: Excellent.
ADJACENT LAND USE: L.B. Permanent Pasture.
R.B. Copse.

REMARKS

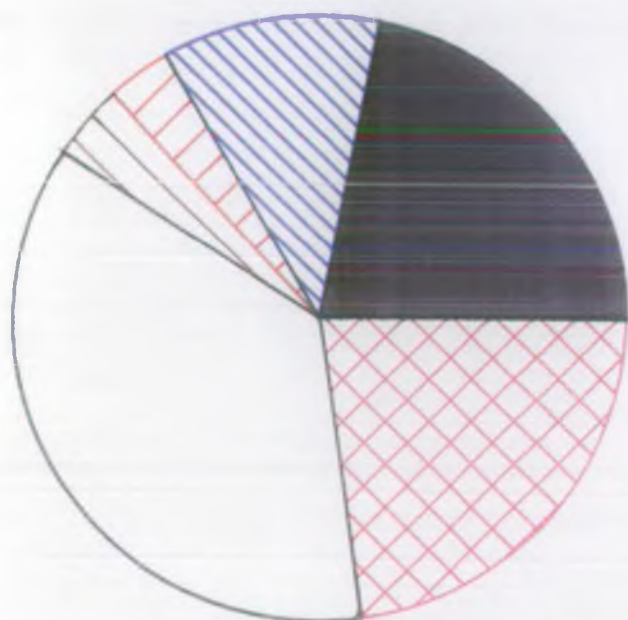
PHYSICAL STRUCTURE OF SITE: Bottom of section had a bend and undulating bed. The top of the section (approx 140m) was straight with steep banks and an even bed.

CATCH: Bullhead and minnow were common, stoneloach present. A good biomass of 53gm⁻² included some quality barbel. Most of the larger fish were caught in the bottom of the section, in the better habitat, suggesting great potential for habitat improvement. The structure of the fish population especially chub recruitment indicate good water quality.

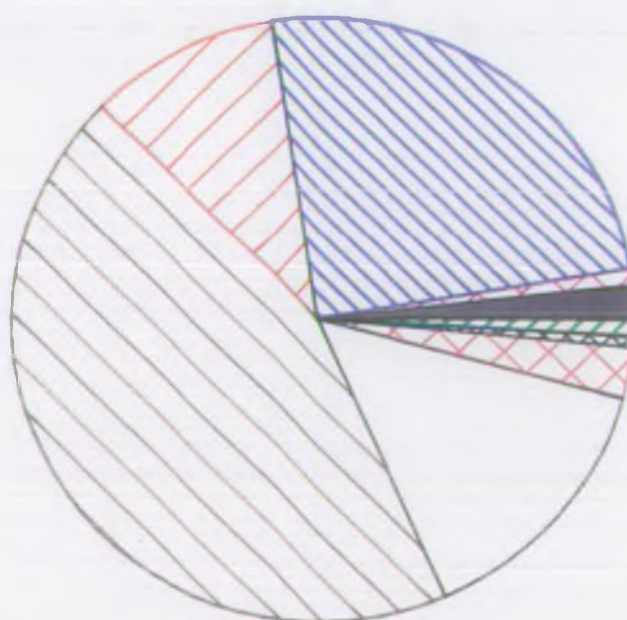
Site EVEB Biomass and Density.



	Biomass (gm-2)	Density (nm-2)
Barbel	11.6	0.006
Bleak	0.0	0.003
Chub	6.1	0.083
Dace	1.8	0.033
Gudgeon	2.1	0.147
Perch	19.5	0.047
Pike	12.0	0.009
Ruffe	0.0	0.002
Roach	0.1	0.003
TOTAL	53.3	0.335

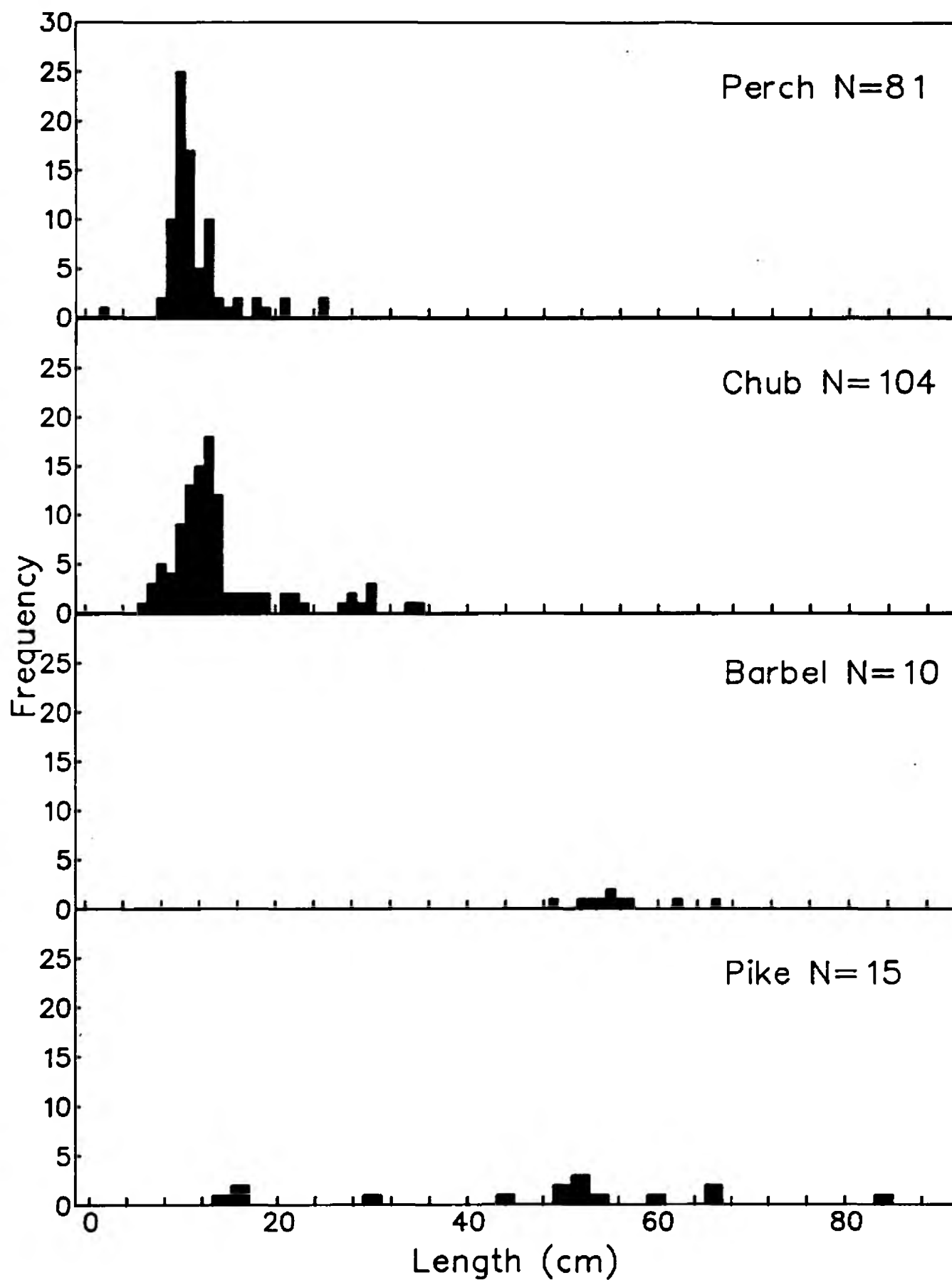


Biomass (gm-2)

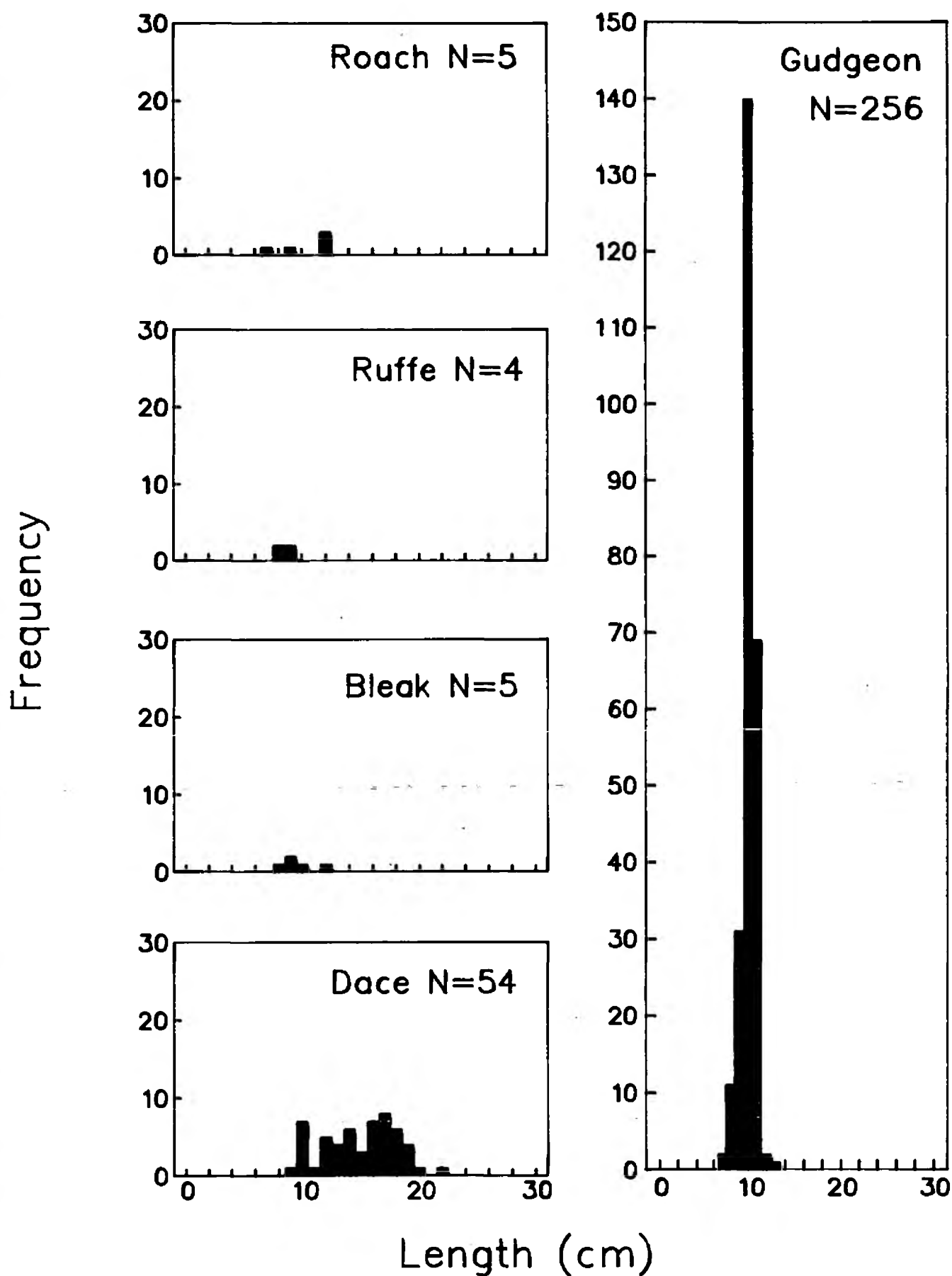


Density (nm-2)

Site EVEB Length Frequency



Site EVEB River Evenlode – Canal stream, Cassington
Length Frequency (continued)



5.103 SITE REPORT

WATERCOURSE: Seacourt Stream.
SITE NAME: University Field Station.
SITE CODE: OXF1
LOCATION: 300m downstream of takeoff from the Thames.
N.G.R.: SP472099
DATE FISHED: 16/02/92
METHOD: Pulsed DC electrofishing, two anodes wading upstream.
RQO: 1B
EC TARGET
BIOMASS: 20 gm²

HABITAT FEATURES

LENGTH: 118m WIDTH: 5.8m AREA: 684.4m²
DEPTH: 0.6m
WATER TEMPERATURE: 6°C

SUBSTRATE COMPOSITION (%)

BARE: 00 MUD & SILT: 40 GRAVEL: 55 STONE: 05 BOULDER: 00

VEGETATION (% COVER)

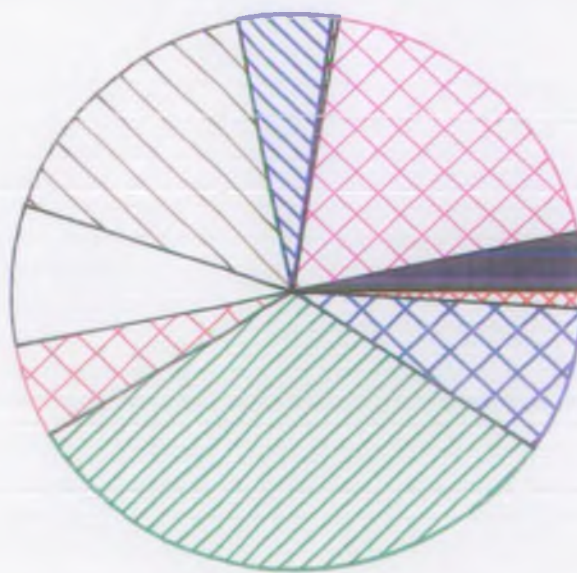
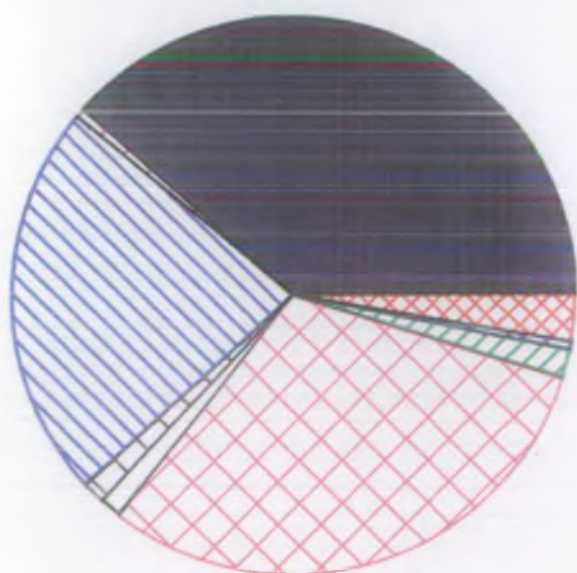
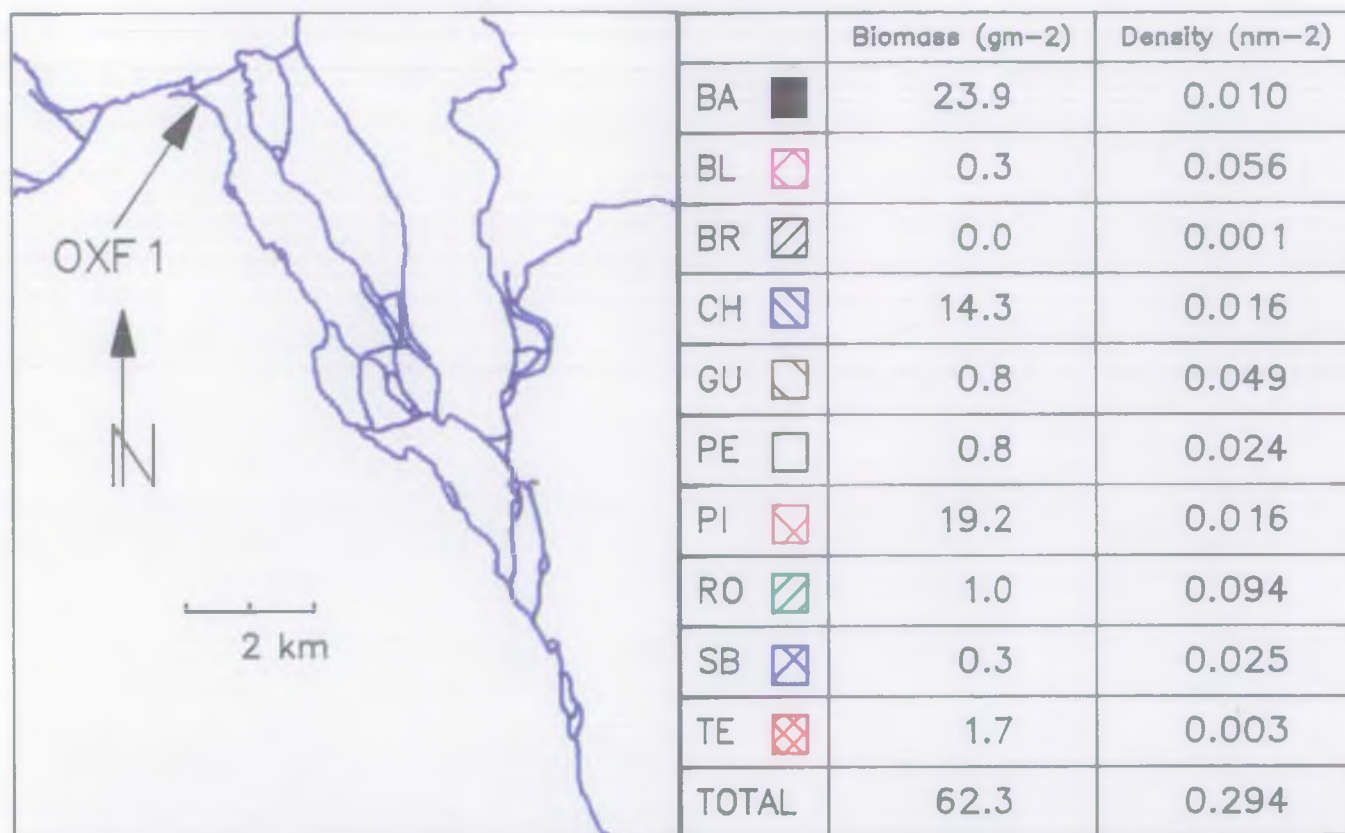
SUBMERGED: 25 FLOATING: 00 EMERGENT: 40 SHADE: 05
DOMINANT PLANT SPECIES: *Ranunculus*, *Glyceria* and *Schoenoplectus*.
WATER LEVEL: Normal.
WATER CLARITY: Normal.
ADJACENT LAND USE: L.B. Permanent pasture.
R.B. Free Range Pigs.

REMARKS

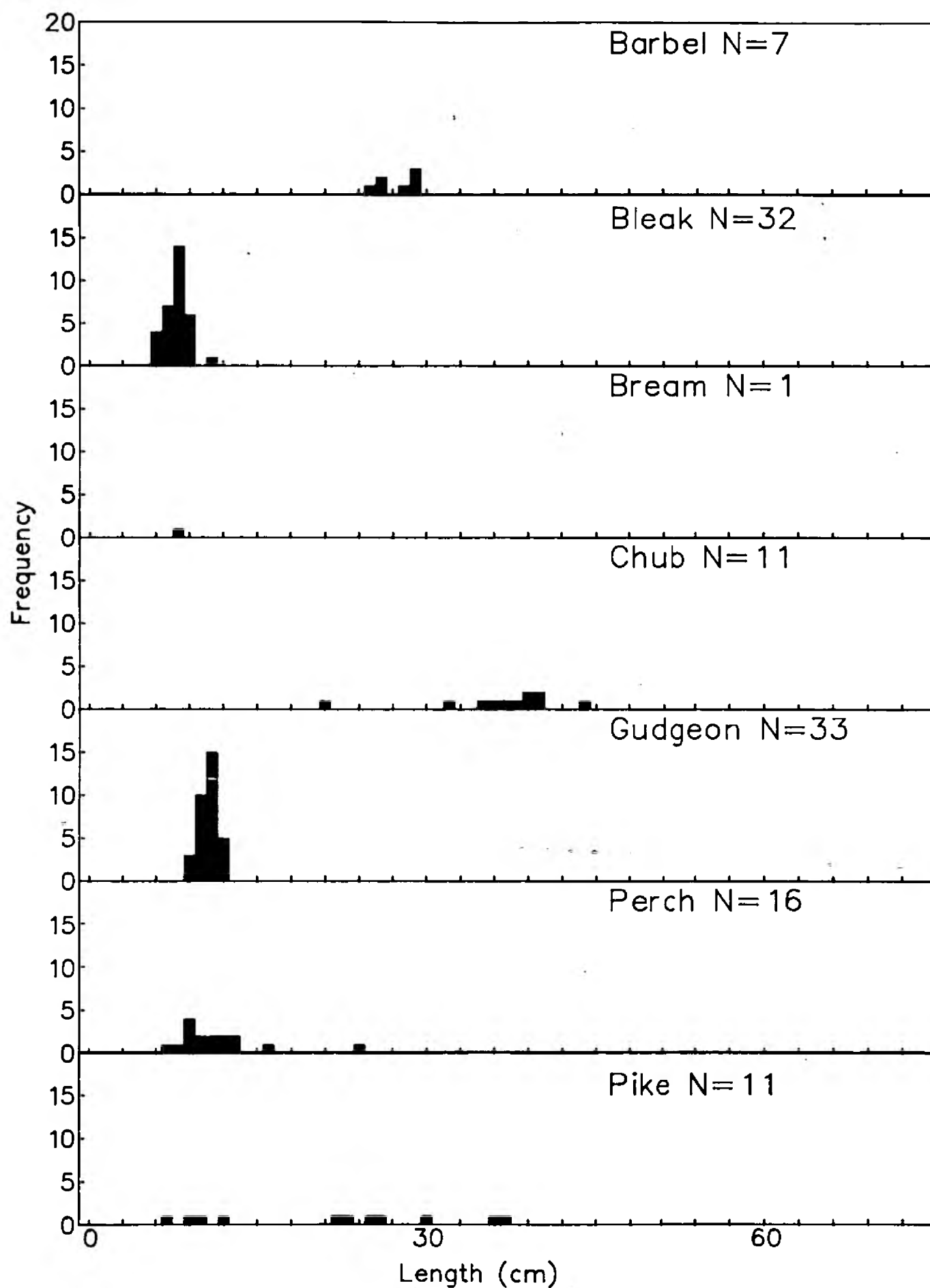
PHYSICAL STRUCTURE OF SITE: A narrow meandering channel with some pools but no riffle. Meanders imparted a good variety of flow regimes with glides, runs and eddies. Good gravel substrate associated with areas of faster moving water. Steep high banks with little shelter or shade.

CATCH: Minnows, stone loach and lamprey present, bullheads common. Most fish were caught in the deeper pools, and all appeared to be in excellent condition. An upstream run of 104m by 5.5m gave 41.5kg, a biomass of 72.6 gm², including a large shoal of specimen bream and several barbel.

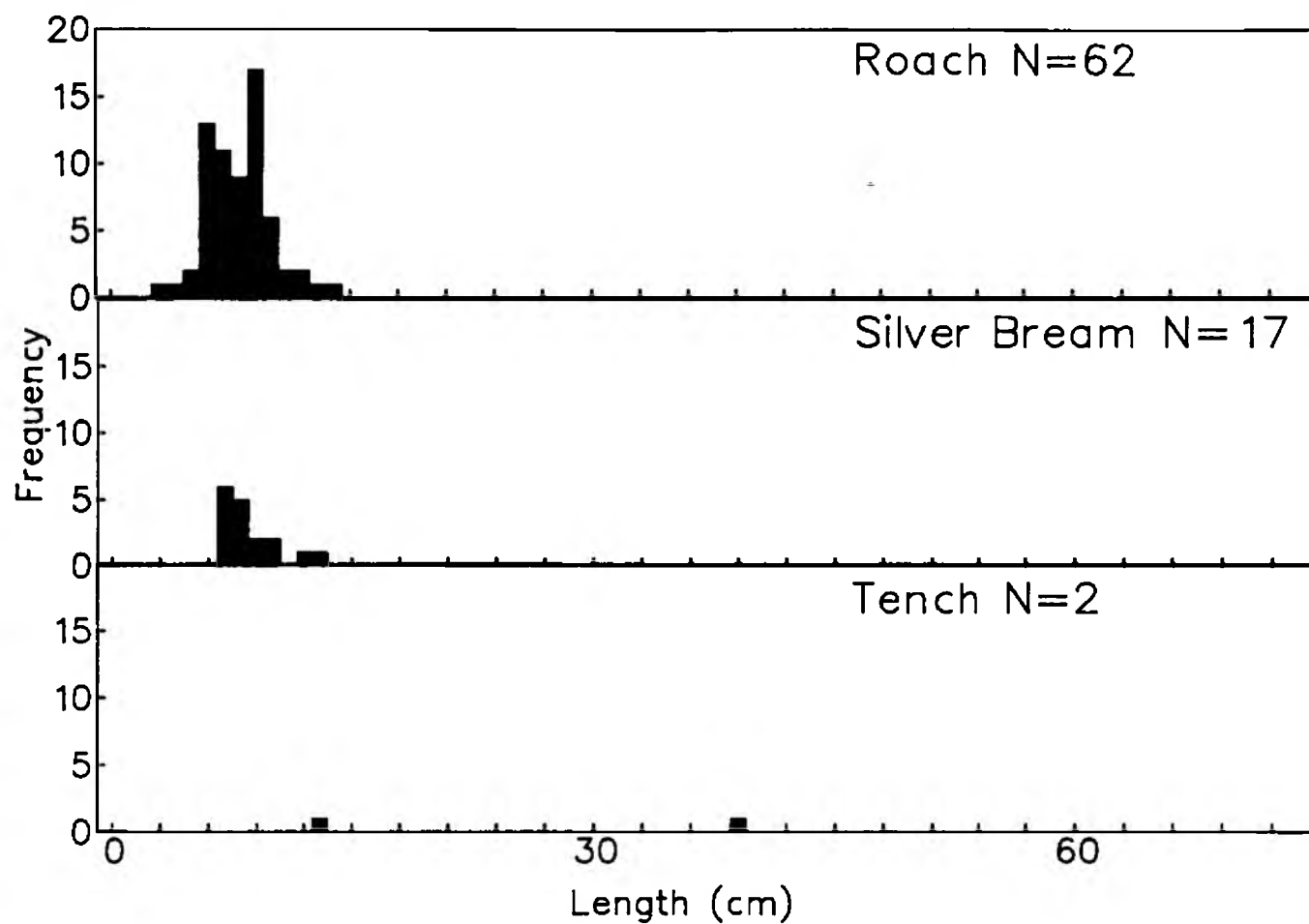
Site OXF 1 Biomass and Density.



Site OXF 1 Length Frequency.



Site OXF 1 Length Frequency.



5.104 SITE REPORT

WATERCOURSE: Seacourt Stream.
SITE NAME: Marley Wood.
SITE CODE: OXF2
LOCATION: Upstream of A34 road bridge.
N.G.R.: SP481081
DATE FISHED: 26/04/92
METHOD: Pulsed DC electrofishing, two anodes wading upstream.
RQO: 1B
EC TARGET
BIOMASS: 20 gm²

HABITAT FEATURES

LENGTH: 130m WIDTH: 6.8m AREA: 884.4m²
DEPTH: 1.0m
WATER TEMPERATURE: 13°C

SUBSTRATE COMPOSITION (%)

BARE: 00 MUD & SILT: 20 GRAVEL: 80 STONE: 00 BOULDER: 00

VEGETATION (% COVER)

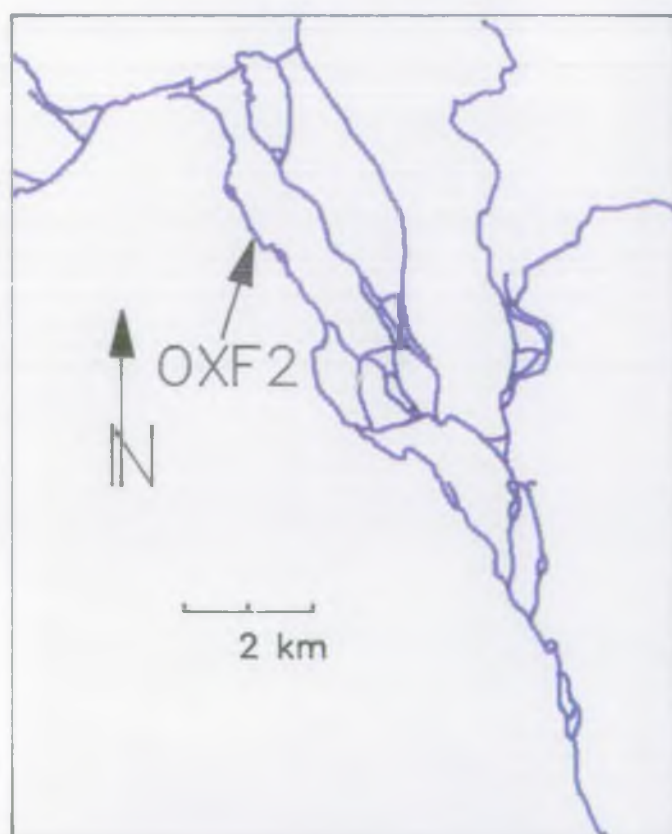
SUBMERGED: 50 FLOATING: 00 EMERGENT: 25 SHADE: 25
DOMINANT PLANT SPECIES: *Ranunculus*, *Glyceria*, *Potamogeton pectinatus*.
WATER LEVEL: Normal.
WATER CLARITY: Normal.
ADJACENT LAND USE: L.B. Permanent pasture.
R.B. Permanent pasture.

REMARKS

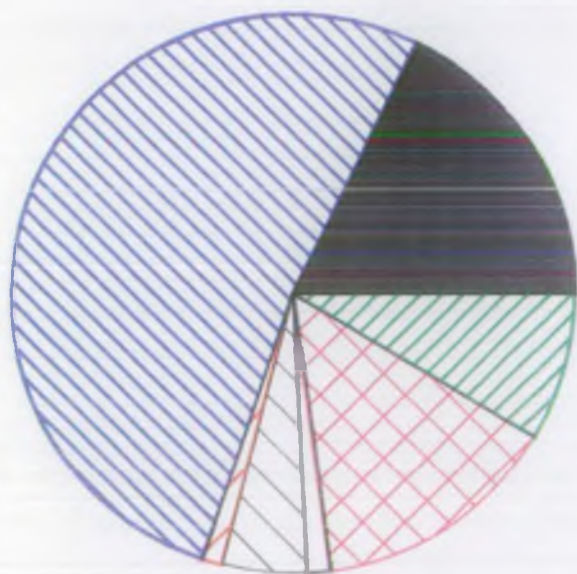
PHYSICAL STRUCTURE OF SITE: A meandering channel with excellent natural pool riffle sequence, a wide range of depths (0.1m to 1.6m), widths and flow regimes. Banks were steep and high with good cover from a variety of bankside scrub species. Clean gravel substrate and excellent instream vegetation make this one of the best sites on the Seacourt Stream.

CATCH: Minnows (in spawning colours) were abundant, stoneloach, stickleback, bullhead and lamprey were present. Large barbel were caught in the deeper pools, the smaller barbel in the *Ranunculus* beds and all other species distributed along the reach. All the fish appeared to be in excellent condition. An upstream run of 110m by 8.2m gave 41.kg of mixed species including some good sized barbel and bream. This equals a biomass of 45.5 gm⁻², which compares well with results for the survey section.

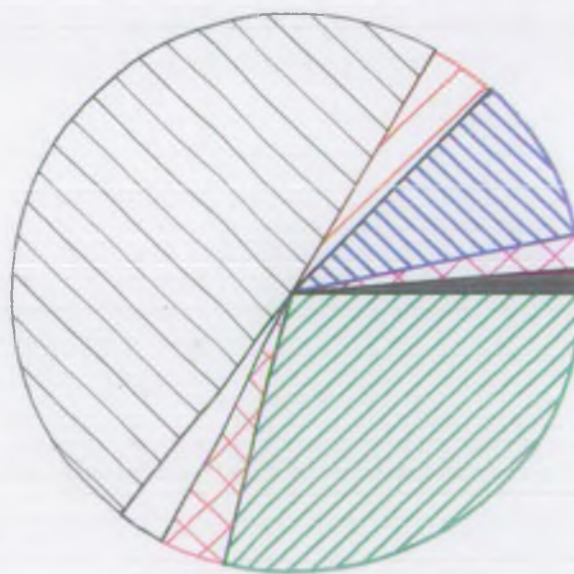
Site OXF2 Biomass and Density.



		Biomass (gm-2)	Density (nm-2)
Barbel	■	11.4	0.007
Bleak	◻	0.1	0.010
Chub	▨	33.7	0.048
Dace	◻	0.7	0.019
Gudgeon	◻	3.2	0.239
Perch	◻	0.8	0.014
Pike	◻	9.3	0.018
Roach	▨	5.5	0.145
TOTAL		64.8	0.501

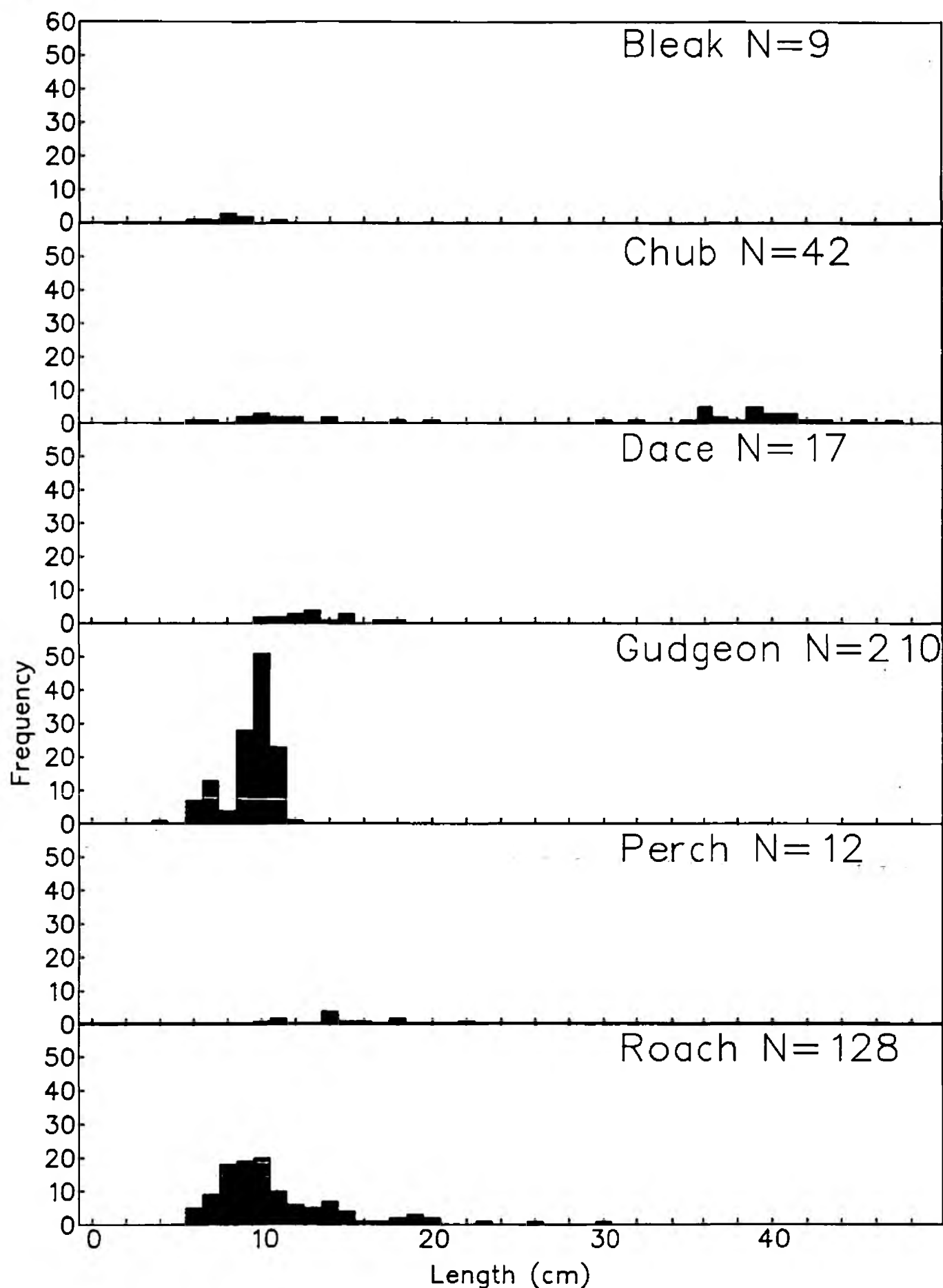


Biomass (gm-2)

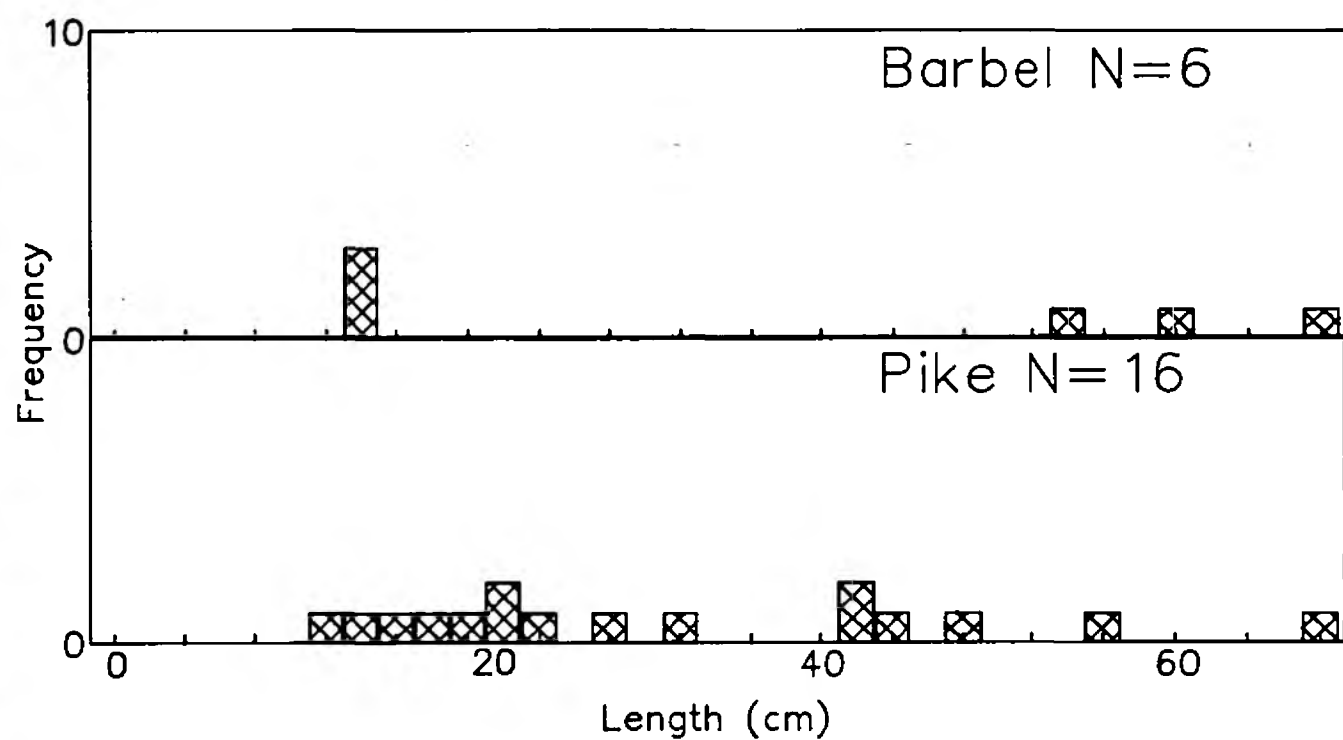


Density (nm-2)

Site OXF2 Length Frequency.



Site OXF2 Length Frequency (continued).



5.105 SITE REPORT

WATERCOURSE: Seacourt Stream.
SITE NAME: North Hinksey.
SITE CODE: OXF4
LOCATION: 10m upstream of rough road (public FP) bridge.
N.G.R.: SP494057
DATE FISHED: 15/3/92
METHOD: Upstream electrofishing from a boat, 2 anodes.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm⁻²

HABITAT FEATURES

LENGTH: 87m MEAN WIDTH (RANGE): 6.8m (6.7-7.0m) AREA: 592m²
MEAN DEPTH 1.0m
WATER TEMPERATURE: 9°C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 99 GRAVEL: 0 STONE: 1 BOULDER: 0

VEGETATION (% COVER)

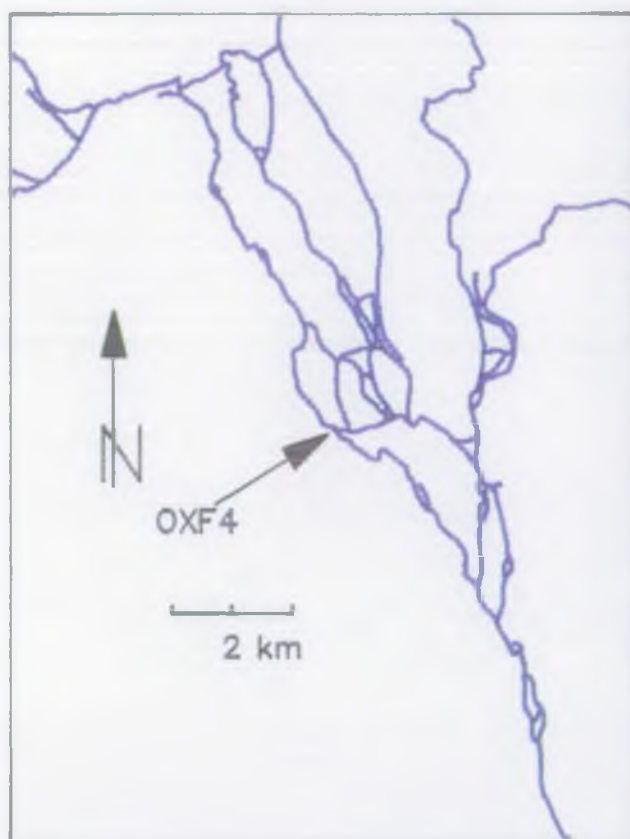
SUBMERGED: 0 FLOATING: 0 EMERGENT: 10 SHADE: 40
DOMINANT PLANT SPECIES (AQUATIC): *Glyceria*.
WATER LEVEL: Normal.
WATER CLARITY: Reasonable until bed disturbed.
ADJACENT LAND USE: L.B. & R.B. Permanent Pasture.

REMARKS

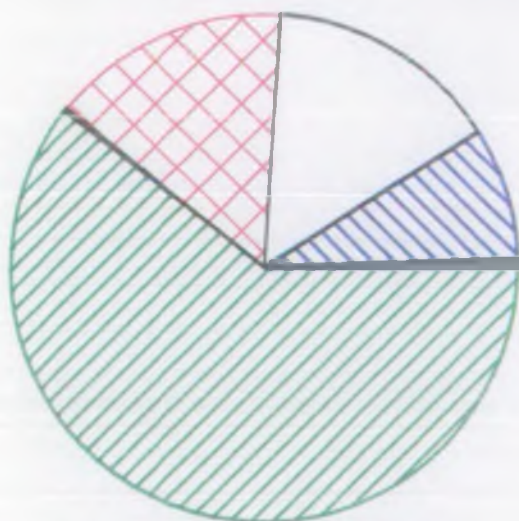
PHYSICAL STRUCTURE OF SITE: Twisty with steep banks. The over-large channel has resulted in the deposition of a deep layer of silt. The lack of vegetation is largely due to the amount of shade. The upstream run section was wider with deeper silt. Shading by trees was virtually 100% and there was no aquatic vegetation.

CATCH: Minnows and cyprinid fry were present. The fish were in good condition. An upstream run of 125m produced 8kg (a minimum biomass of 9 gm²). This poor result is indicative of the poor habitat encountered in the upstream run. It was also likely that fish were swimming ahead of the boat in the relatively shallow water. The survey section biomass was 48.6 gm² and included roach to 1kg, this is indicative of a healthy fishery. Most fish were caught in the emergent vegetation. It should be noted that much of the habitat on the Seacourt stream is better than that encountered at this site.

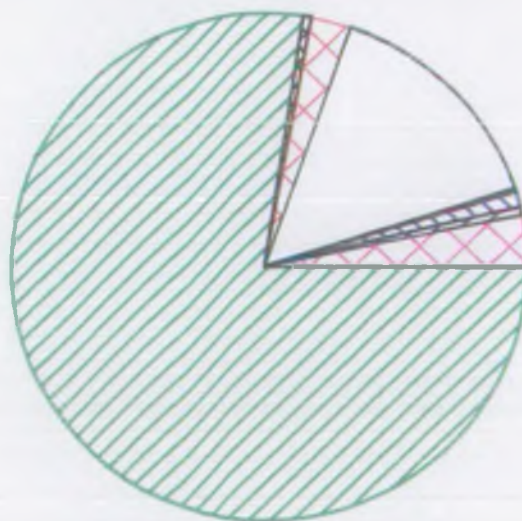
Site OXF4 Biomass and Density



		Biomass (gm-2)	Density (nm-2)
BLEAK		0.2	0.032
BREAM		0.0	0.005
CHUB		4.1	0.010
GUDGEON		0.0	0.002
PERCH		7.3	0.144
PIKE		7.4	0.024
RUFFE		0.1	0.005
ROACH		29.5	0.758
TOTAL		48.6	0.992

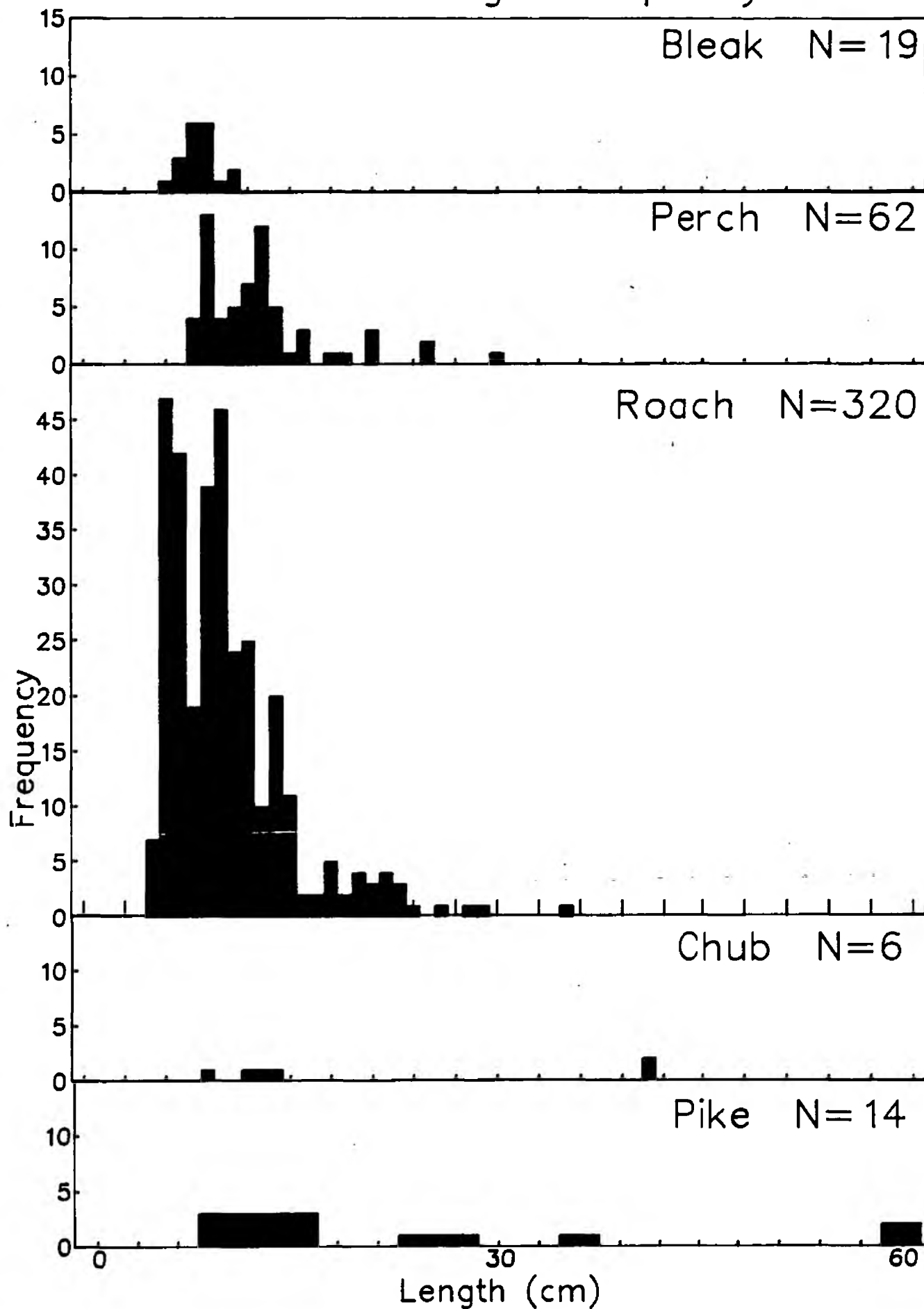


Biomass (gm-2)



Density (nm-2)

Site OXF4 Length Frequency



5.106 SITE REPORT

WATERCOURSE: Hinksey Stream.
SITE NAME: North Hinksey.
SITE CODE: OXF5
LOCATION: Opposite Oxford RFC grounds.
N.G.R.: SP500053
DATE FISHED: 6/3/92
METHOD: Pulsed DC electrofishing, two anodes fished from a boat moving upstream.
RQO: 1B
EC TARGET
BIOMASS: 20 gm²

HABITAT FEATURES

LENGTH: 109m WIDTH: 5.4m AREA: 588.6m²
DEPTH: 1.0m
WATER TEMPERATURE: 10°C

SUBSTRATE COMPOSITION (%)

BARE: 10 MUD & SILT: 90 GRAVEL: 00 STONE: 00 BOULDER: 00

VEGETATION (% COVER)

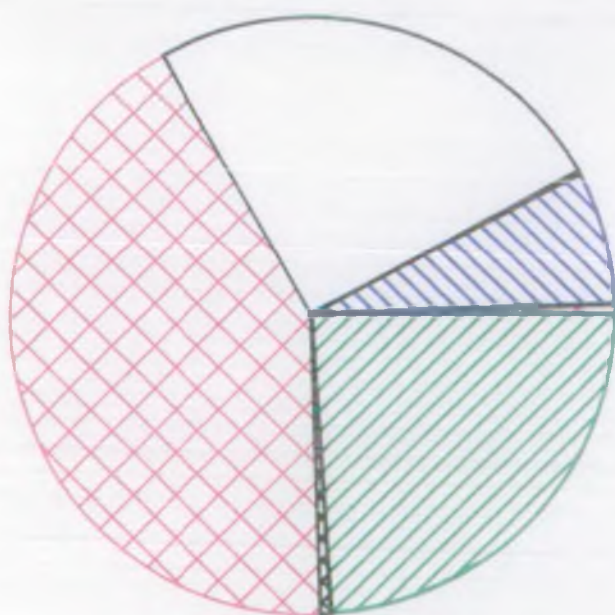
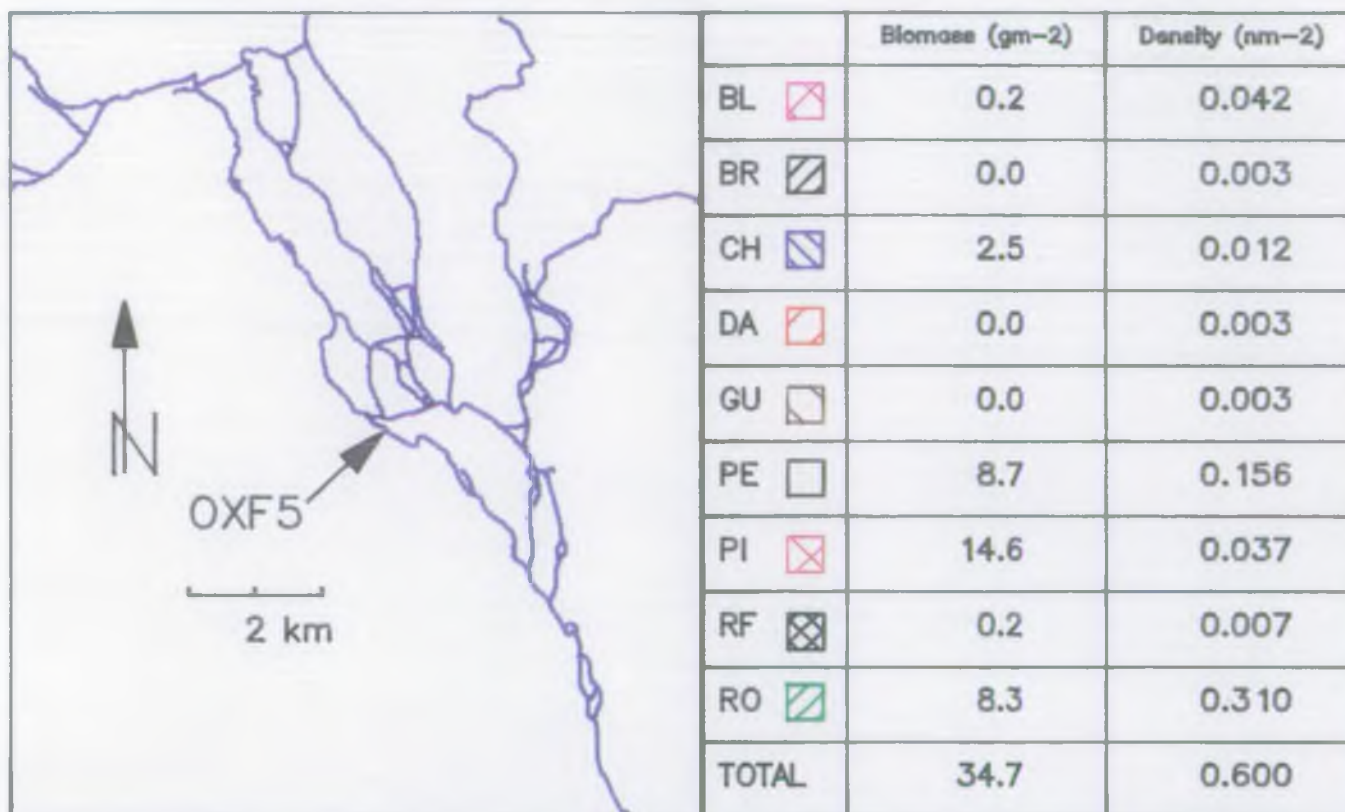
SUBMERGED: 10 FLOATING: 00 EMERGENT: 25 SHADE: 15
DOMINANT PLANT SPECIES: *Nuphar* and *Phalaris*.
WATER LEVEL: Normal.
WATER CLARITY: Normal.
ADJACENT LAND USE: L.B. Permanent pasture.
R.B. Permanent pasture.

REMARKS

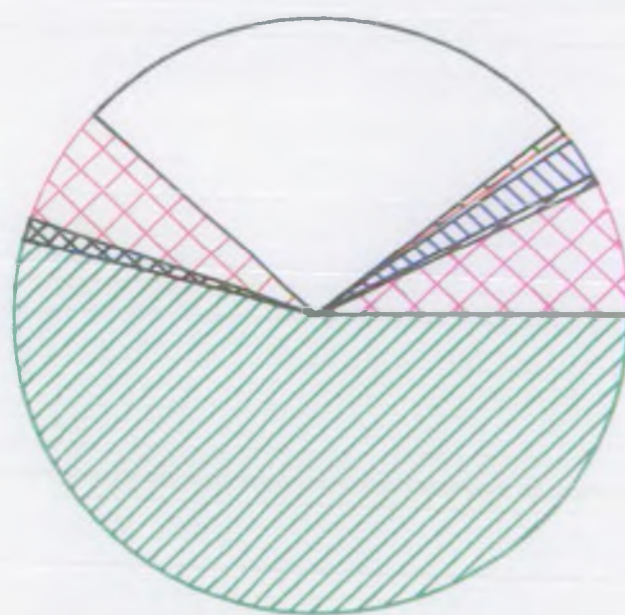
PHYSICAL STRUCTURE OF SITE: A gently meandering site with steep clay banks that had recently been extensively dredged. Two deep pools and scoured banks but other instream features were limited to one well established riffle.

CATCH: Minnows, stone loach and bullheads present. Most fish were caught in one pool immediately downstream of the riffle and all appeared to be in excellent condition. Perch were ripe for spawning. An upstream run of 180m by 5.6m gave 21kg, a biomass of 20.8 gm².

Site OXF5 Biomass and Density.

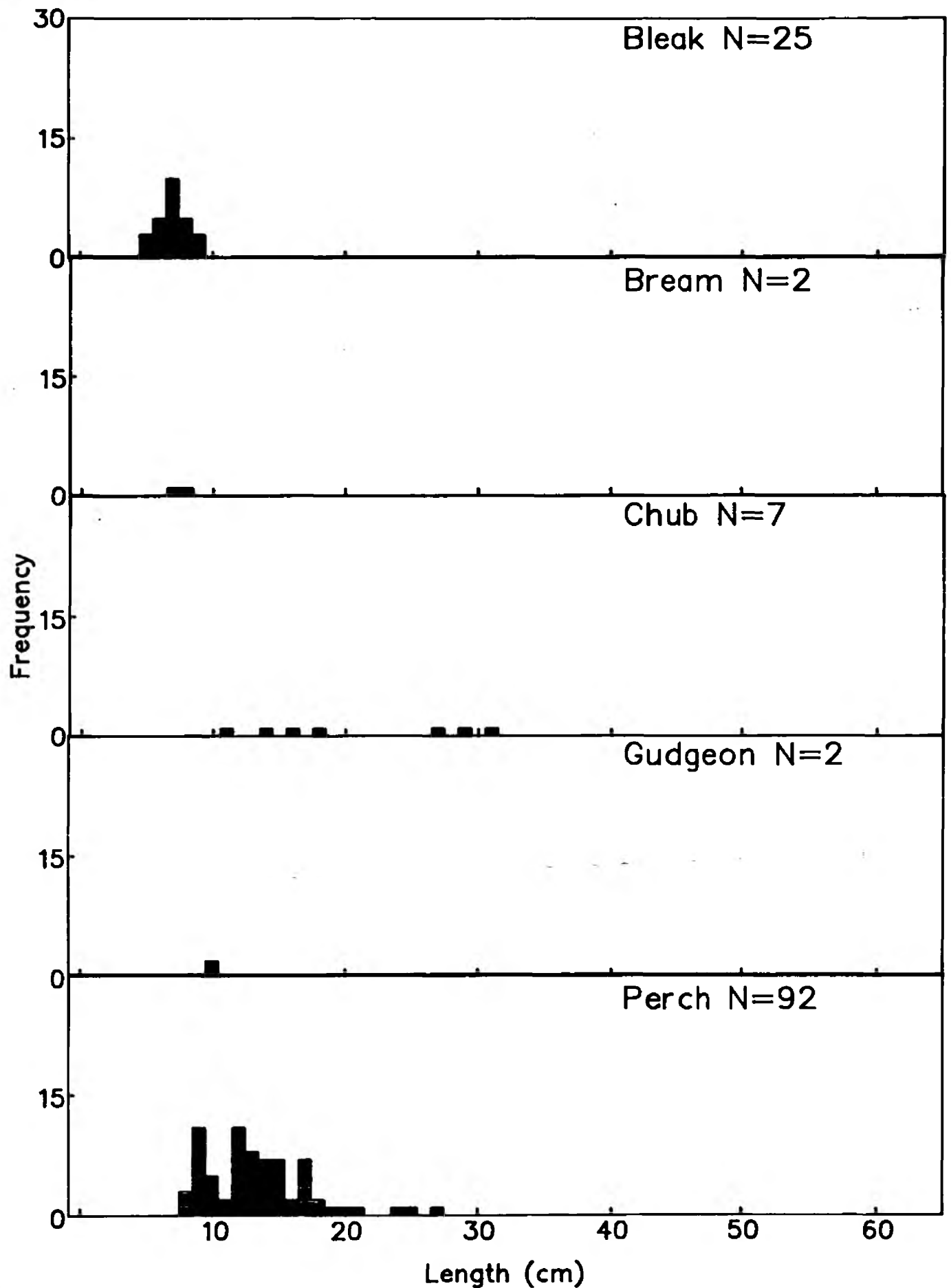


Biomass (gm-2)

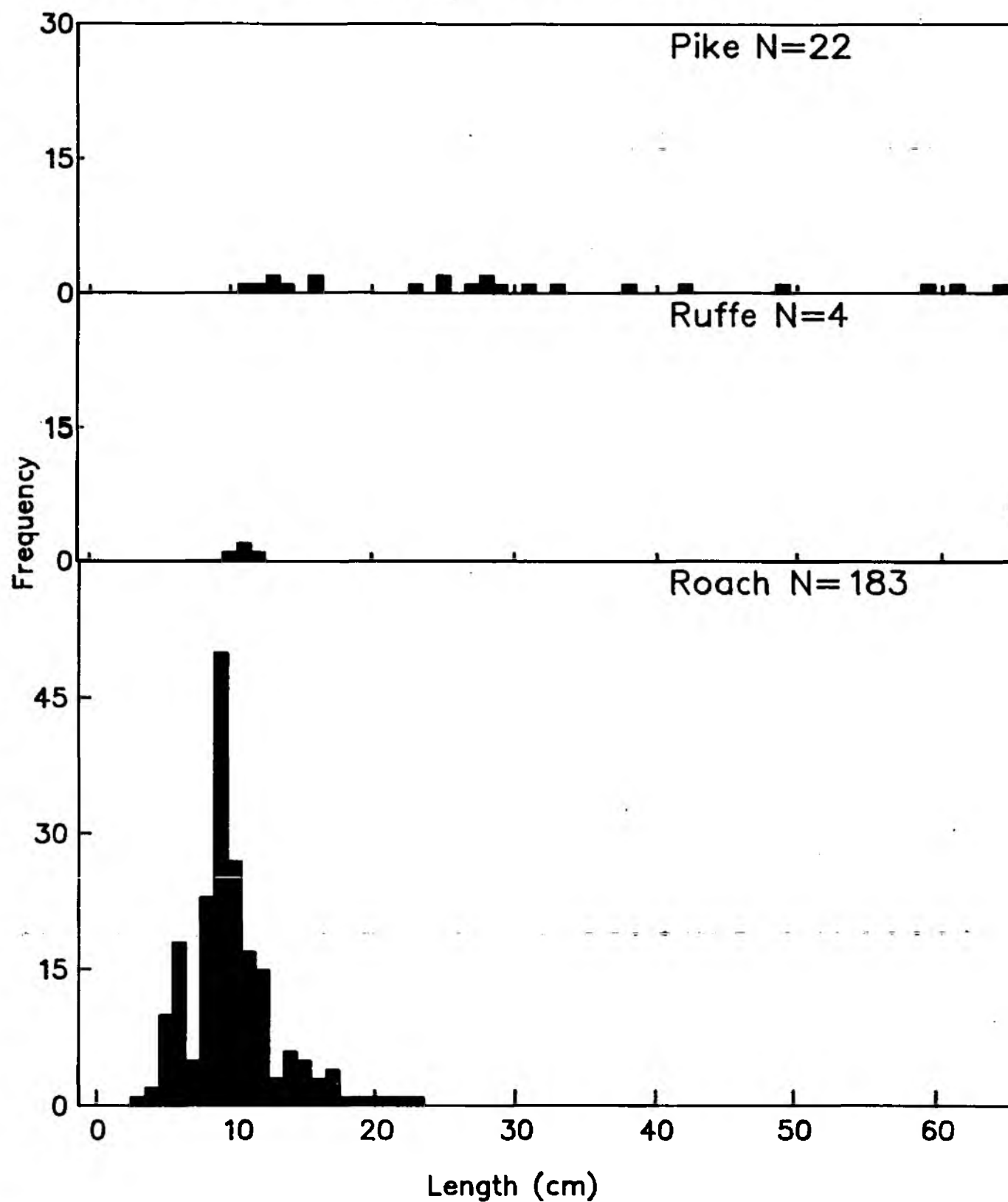


Density (nm-2)

Site OXF5 Length Frequency.



Site OXF5 Length Frequency Continued.



5.107 SITE REPORT

WATERCOURSE: Botley Stream.
SITE NAME: Botley Stream.
SITE CODE: OXF9
LOCATION: 150m upstream of confluence with Bulstake stream.
N.G.R.: SP496065
DATE FISHED: 23/02/92
METHOD: Upstream electrofishing, 2 anodes, from a boat.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm²

HABITAT FEATURES

LENGTH: 120m MEAN WIDTH (RANGE): 6.0m (5.5-6.4m) AREA: 720m²
MEAN DEPTH (RANGE): 1.2m (0.3-1.8m)
WATER TEMPERATURE: 7°C

SUBSTRATE COMPOSITION (%)

BARE: 2 MUD & SILT: 93 GRAVEL: 5 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

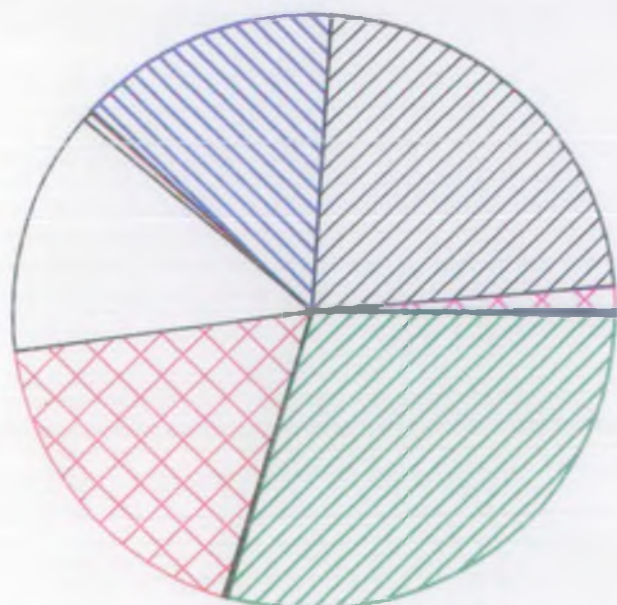
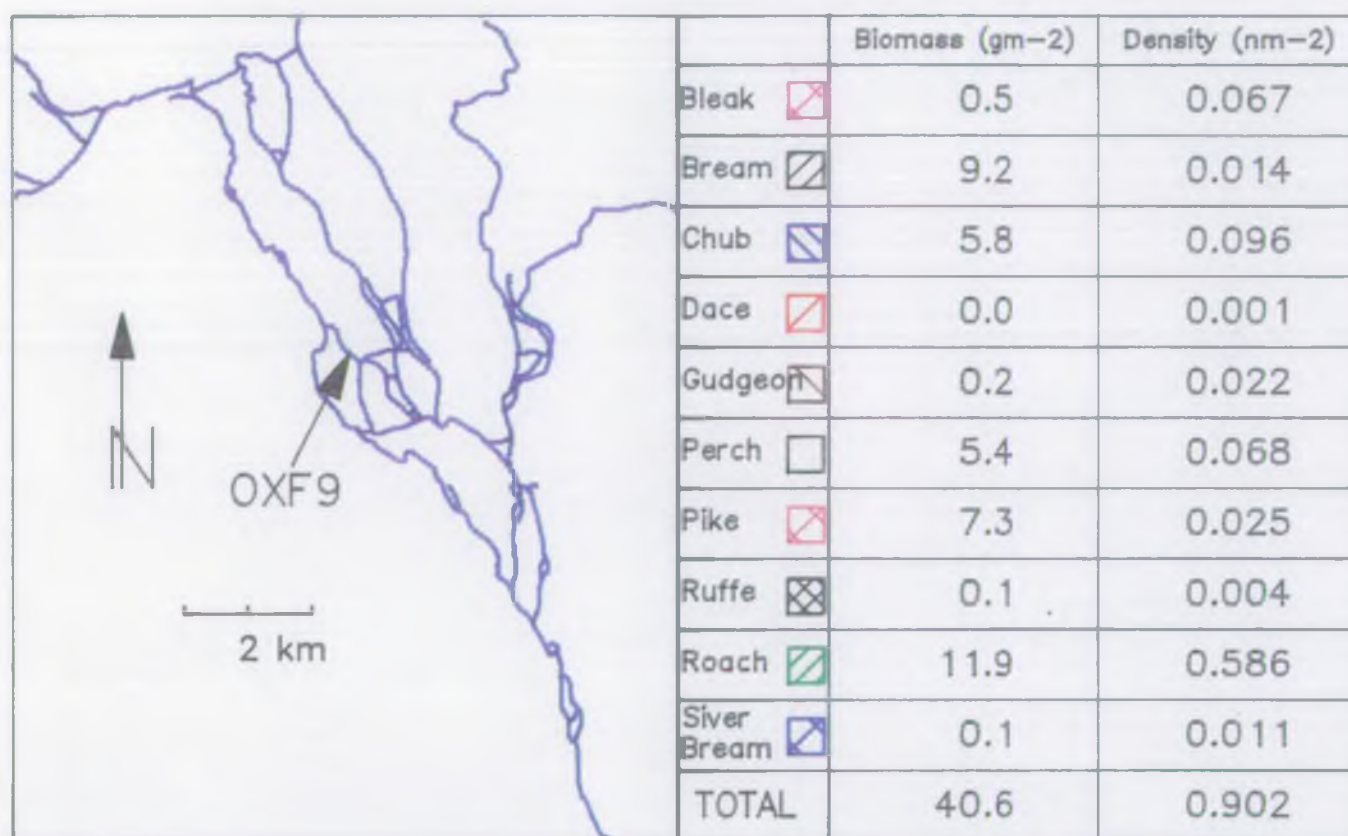
SUBMERGED: 0 FLOATING: 0 EMERGENT: 2 SHADE: 60
WATER LEVEL: Normal (slow flow).
WATER CLARITY: Fair.
ADJACENT LAND USE: L.B. Disused allotments.
R.B. Allotments.

REMARKS

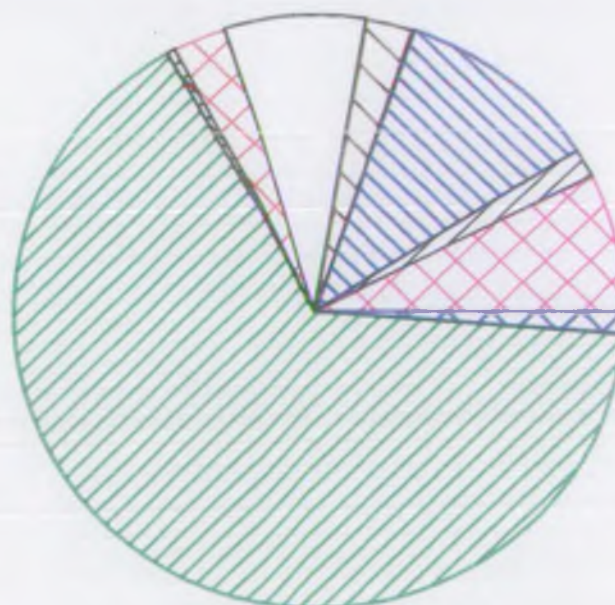
PHYSICAL STRUCTURE OF SITE: Twisty with generally steep banks. Deep silt in many places (worse on upstream run). Good cover provided by overhanging trees and small jetties.

CATCH: Minnows common, bullheads and stone loach present. An upstream run of 140m produced 25kg of fish (despite poor efficiency due to deep silt and a widening of the channel), a minimum biomass of 25.2gm². This confirms the validity of the survey section biomass of 40.6gm². Length frequencies and high fish densities indicate good recruitment. The fish appeared to be in good condition.

Site OXF9 Biomass and Density.

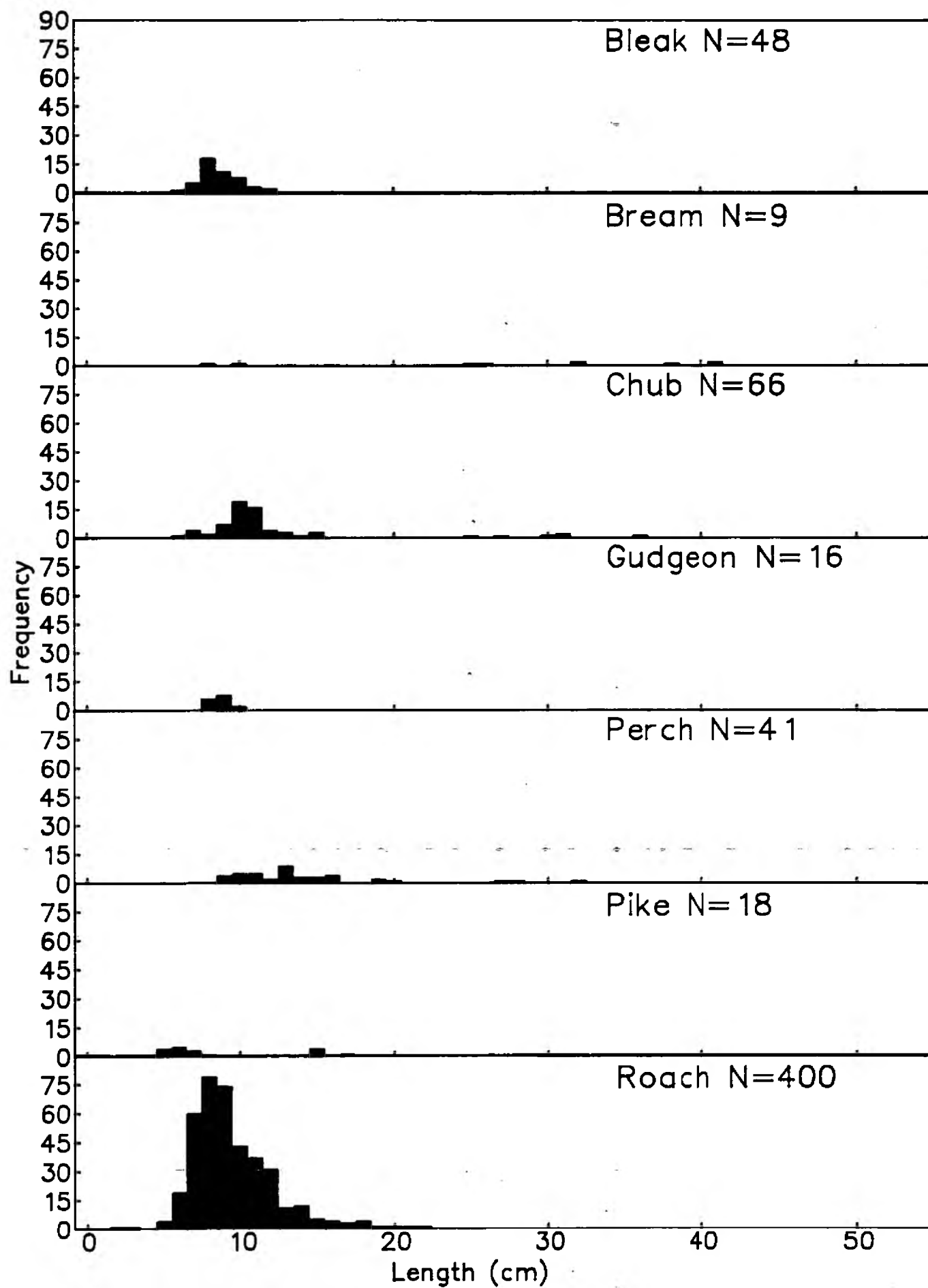


Biomass (nm-2)



Density (nm-2)

Site OXF9 Length Frequency.



5.108 SITE REPORT

WATERCOURSE: Bulstake Stream.
SITE NAME: Binsey Lane.
SITE CODE: OXF0
LOCATION: Between Botley Stream confluence and Binsey Lane bridge.
N.G.R.: SP497064
DATE FISHED: 23/02/92.
METHOD: Upstream electrofishing from a boat, single run.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm⁻²

HABITAT FEATURES

LENGTH: 114m MEAN WIDTH (RANGE): 9.3m (7.7-15.3m) AREA: 1060m²
MEAN DEPTH (RANGE): 1.6m (0.3-2.0m)
WATER TEMPERATURE: 7°C

SUBSTRATE COMPOSITION (%)

BARE: 00 MUD & SILT: 75 GRAVEL: 20 STONE: 05 BOULDER: 00

VEGETATION (% COVER)

SUBMERGED: 2 FLOATING: 0 EMERGENT: 20 SHADE: 35
WATER LEVEL: Normal
WATER CLARITY: Fair
ADJACENT LAND USE: L.B. MFI car park.
R.B. Disused allotments.

REMARKS

PHYSICAL STRUCTURE OF SITE: Straight, mostly deep and slow flowing. Shallow and more stony beneath a small weir at top of section.

CATCH: 25.5kg of fish were caught from a single run (a minimum estimate of 24.1gm²). It was noticeable that there were much fewer fish than in the adjacent Botley stream (OXF9) but the fish were of better quality. Included in the catch were large chub and bream, good roach and tench, and an immaculate fully scaled common carp of 6kg.

5.109 SITE REPORT

WATERCOURSE: Bulstake Stream.
SITE NAME: Fishing News Books.
SITE CODE: OXFA
LOCATION: Upstream from Fishing News Books building.
N.G.R.: SP505056
DATE FISHED: 22/03/92
METHOD: Electrofishing from a boat, motoring upstream and then downstream between stop nets for each run.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm⁻²

HABITAT FEATURES

LENGTH: 100m MEAN WIDTH (RANGE): 9.0m (8.6-9.3m) AREA: 900m²
MEAN DEPTH (RANGE): 1.8m (1.6-2.0m)
WATER TEMPERATURE: 10°C

SUBSTRATE COMPOSITION (%)

BARE: 30 MUD & SILT: 60 GRAVEL: 10 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

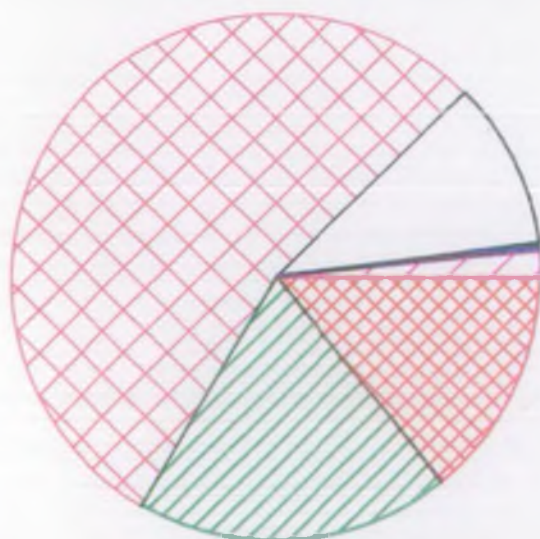
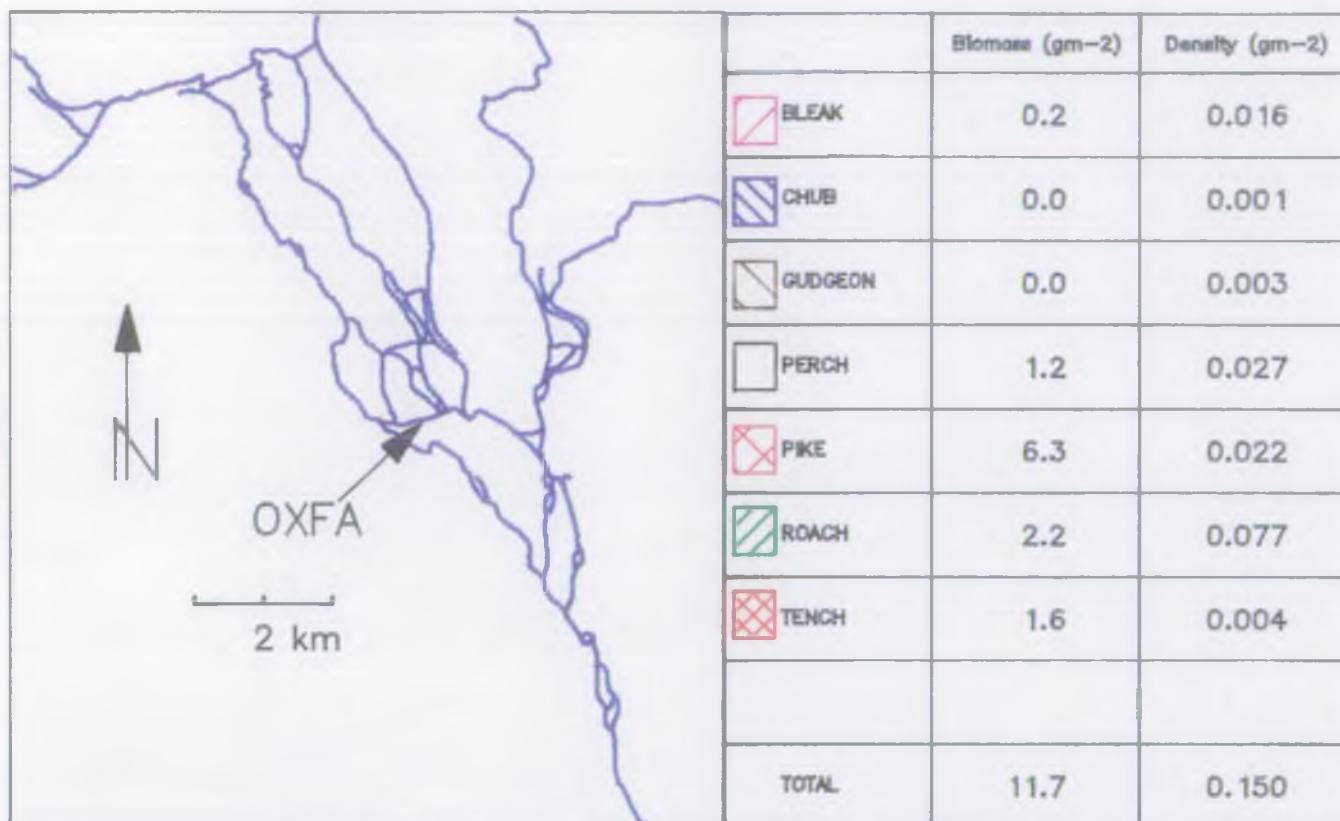
SUBMERGED: 5 FLOATING: 0 EMERGENT: 30 SHADE: 0
DOMINANT PLANT SPECIES (AQUATIC): *Glyceria*.
WATER LEVEL: Normal.
WATER CLARITY: Moderate.
ADJACENT LAND USE: L.B. Lawns and Industrial Estate.
R.B. Permanent Pasture.

REMARKS

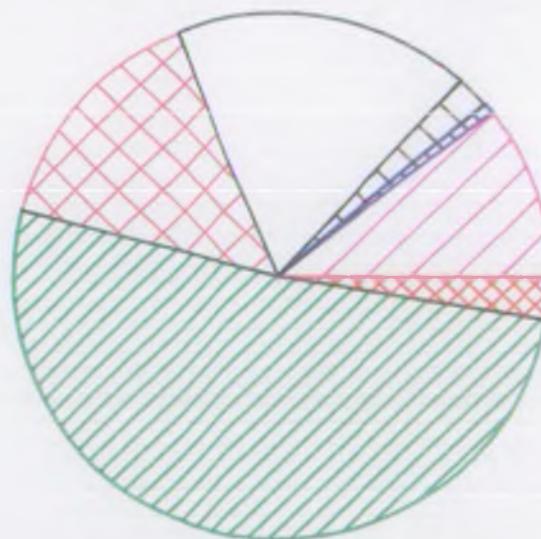
PHYSICAL STRUCTURE OF SITE: Straight. Gently shelving banks above the waterline. Submerged banks were vertical.

CATCH: Minnows and cyprinid fry present. The poor biomass was a minimum estimate and reflects low catch efficiency (5 runs produced 29, 25, 30, 40 and 15 fish respectively), due to the width and depth of the site combined with moderate clarity and bad weather conditions (strong wind and rain). The true biomass value is expected to be significantly greater. A qualitative upstream run of 200m produced similar fish populations to the survey section. Pike of 6.5kg and 11kg were caught in this upstream run.

Site OXFA Biomass and Density

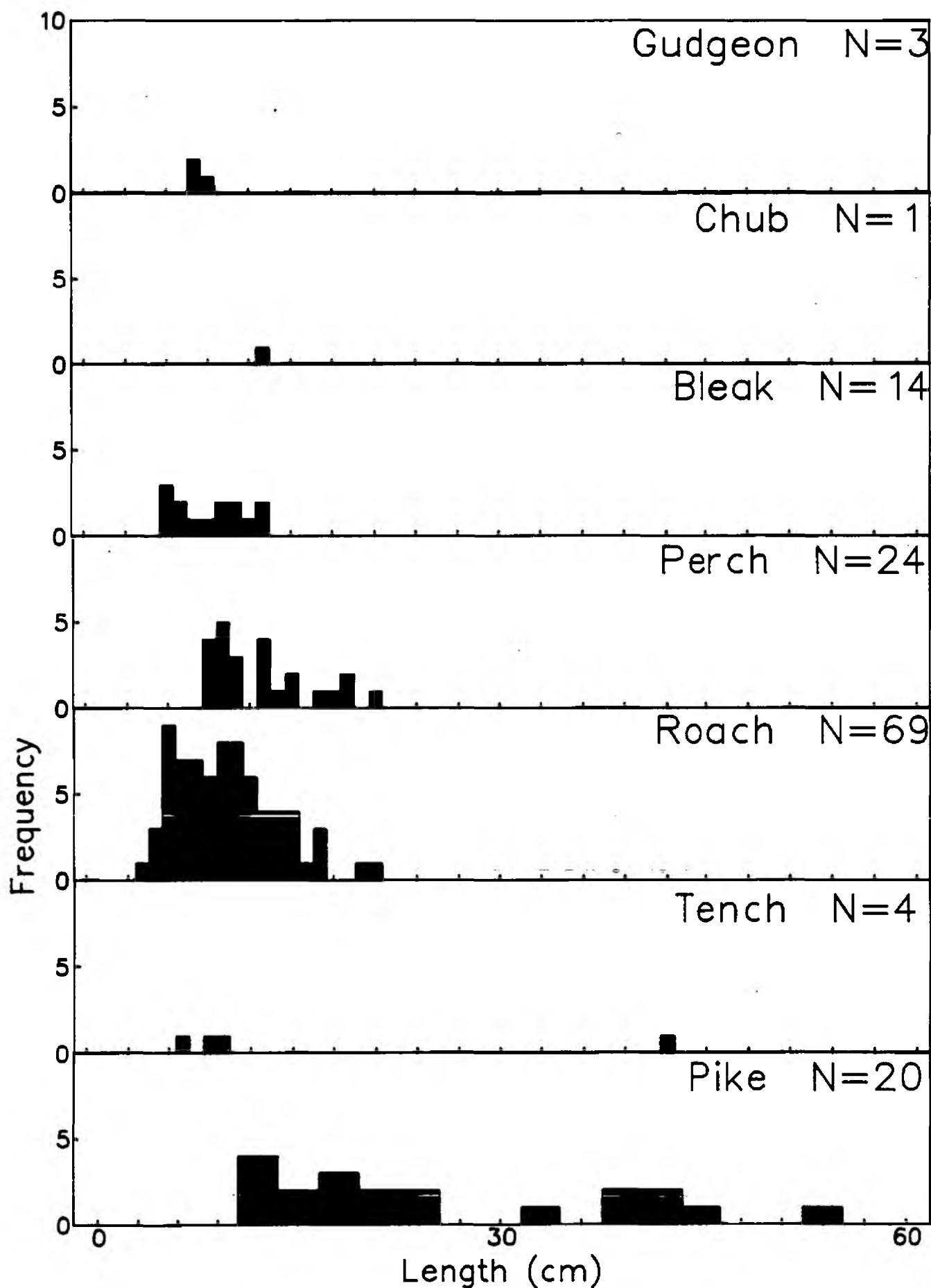


Biomass (gm-2)



Density (nm-2)

Site OXFA Length Frequency



5.110 SITE REPORT

WATERCOURSE: Castle Mill Stream.
SITE NAME: Jericho.
SITE CODE: OXFB
LOCATION: Upstream of Oxford Canal overspill.
N.G.R.: SP504067
DATE FISHED: 21/06/92
METHOD: Boat electrofishing with a central net creating 2 lanes.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm²

HABITAT FEATURES

LENGTH: 82m MEAN WIDTH (RANGE): 11.3m (11-11.5m) AREA: 927m²
MEAN DEPTH (RANGE): 1.7m (1.5-2m)
WATER TEMPERATURE: 19°C

SUBSTRATE COMPOSITION (%)

BARE: 15 MUD & SILT: 85 GRAVEL: 0 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

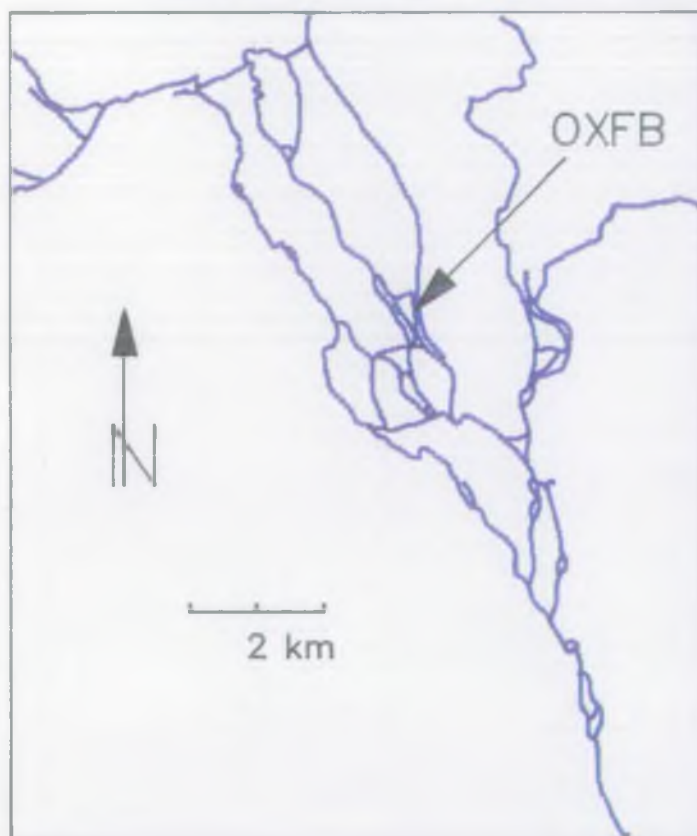
SUBMERGED: 5 FLOATING: 1 EMERGENT: 5 SHADE: 50
DOMINANT PLANT SPECIES (AQUATIC): *Nuphar*.
WATER LEVEL: Normal (almost static).
WATER CLARITY: Moderate.
ADJACENT LAND USE: L.B. Oxford canal towpath.
R.B. Scrub, then railway.

REMARKS

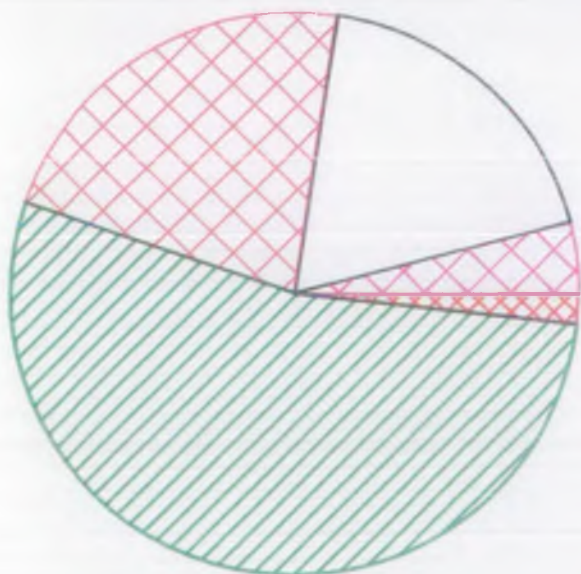
PHYSICAL STRUCTURE OF SITE: Straight, wide and deep. Uniform channel (canal like).

CATCH: The poor biomass of 10.2gm² is indicative of the poor habitat. The majority of the fish were caught in the marginal weed. An upstream run of 120m produced 8.5kg (a minimum estimate of 5.5gm²). Given the poor efficiency of the upstream run with no central or end stop nets, this result is similar to the survey section biomass. It was encouraging to see many small tench in this upstream section. Cyprinid fry were abundant.

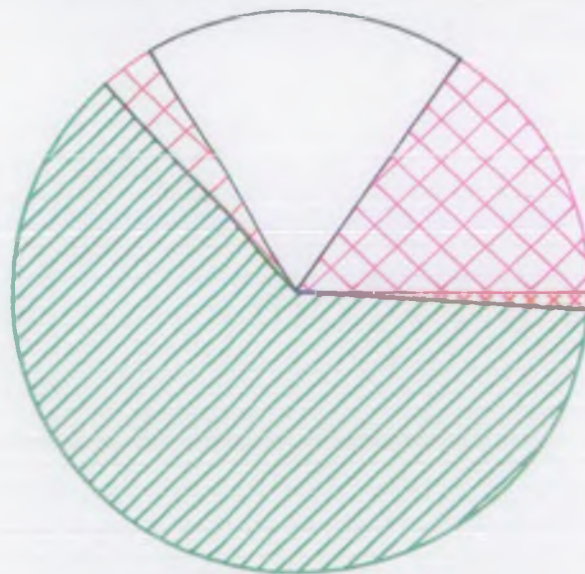
Site OXFB Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Bleak	0.4	0.030
 Perch	1.9	0.035
 Pike	2.3	0.006
 Ruffe	0.0	0.000
 Roach	5.5	0.120
 Tench	0.2	0.002
TOTAL	10.2	0.195

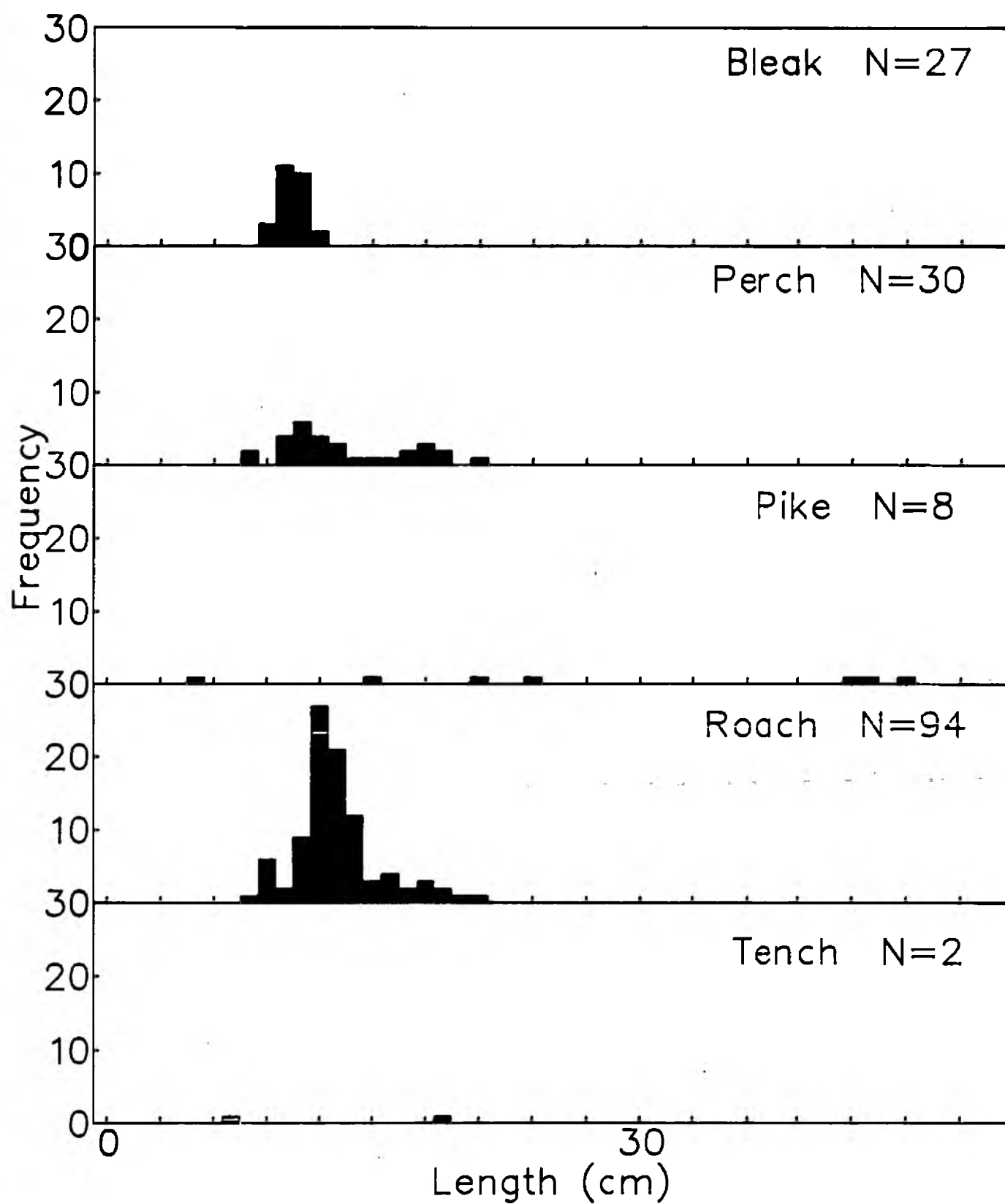


Biomass (gm-2)



Density (nm-2)

Site OXFB Length Frequency



5.111 SITE REPORT

WATERCOURSE: Castle Mill Stream.
SITE NAME: College Gardens.
SITE CODE: OXFC
LOCATION: FE College grounds.
N.G.R.: SP509059
DATE FISHED: 28/03/92
METHOD: Pulsed DC electrofishing, two anodes wading upstream.
EC TARGET
BIOMASS: 20gm²

HABITAT FEATURES

LENGTH: 67m WIDTH: 9.5m AREA: 636.5m²
DEPTH: 0.7m
WATER TEMPERATURE: 8°C

SUBSTRATE COMPOSITION (%)

BARE: 00 MUD & SILT: 05 GRAVEL: 45 STONE: 50 BOULDER: 00

VEGETATION (% COVER)

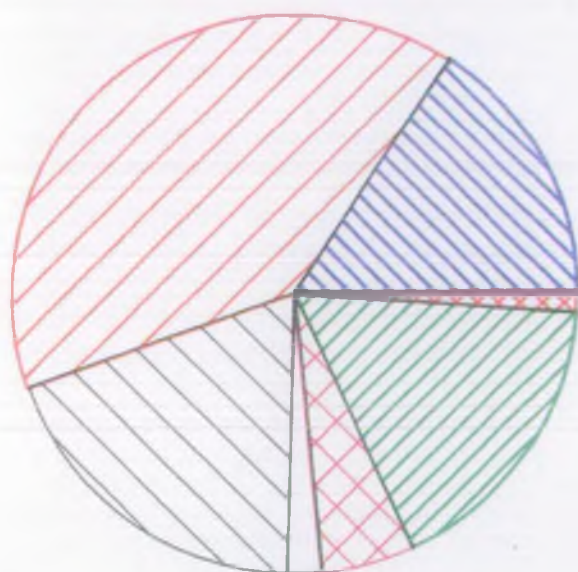
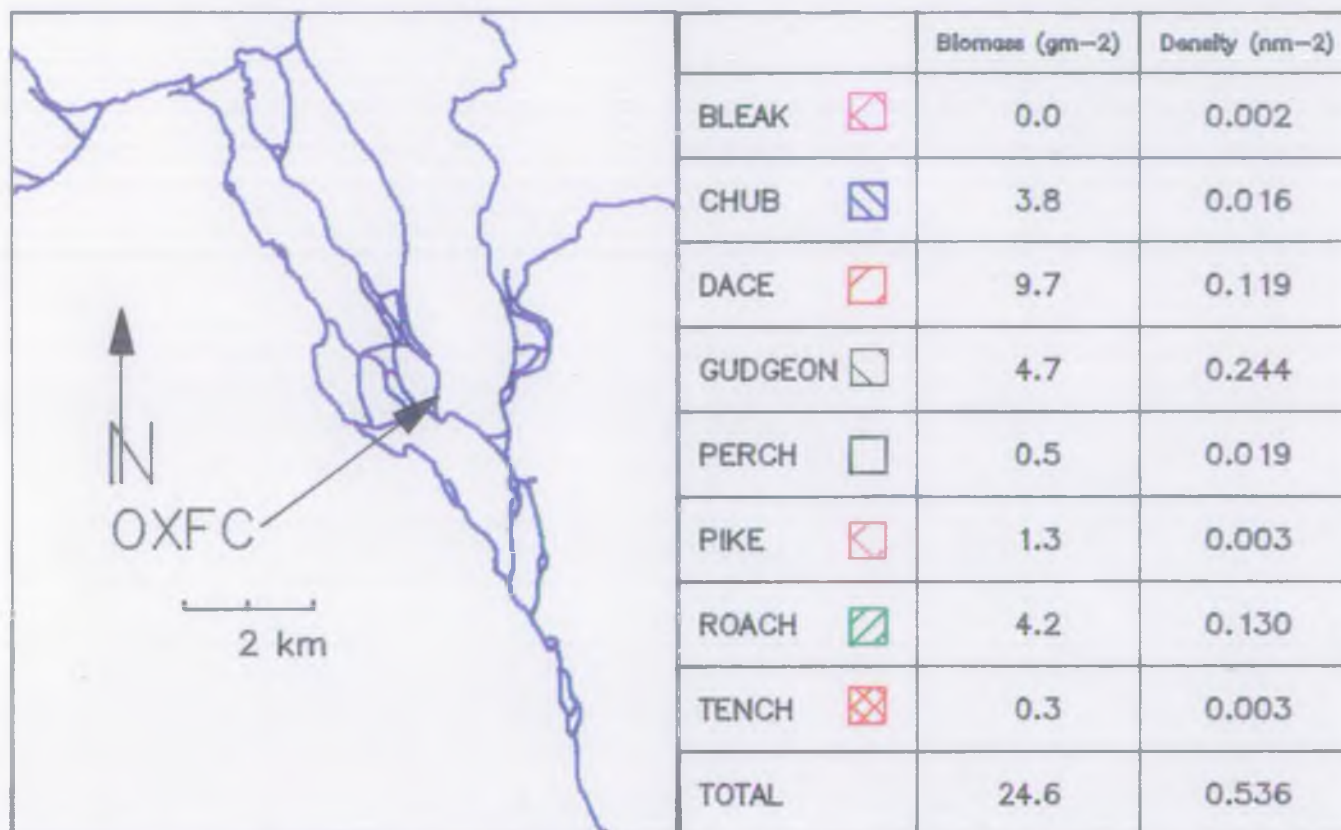
SUBMERGED: 50 FLOATING: 00 EMERGENT: 00 SHADE: 75
DOMINANT PLANT SPECIES: *Cladophora* and *Fontinalis*.
WATER LEVEL: Normal.
WATER CLARITY: Moderate.
ADJACENT LAND USE: L.B. Car Park.
R.B. Ornamental Grounds.

REMARKS

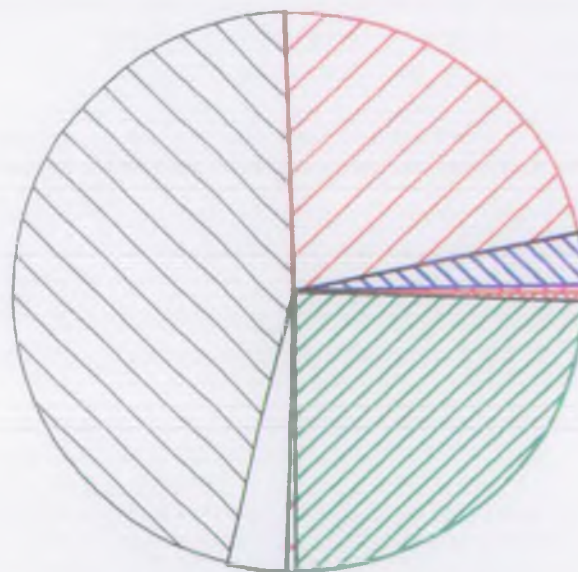
PHYSICAL STRUCTURE OF SITE: A straight, wide, shallow section with trapezoid cross section. Few instream features were present but substrate was very good providing a variety of flow including pool and riffle. Banks were 45° concrete to grass with many ornamental trees providing shade.

CATCH: Minnow, stone loach, lamprey and stickleback were present, bullhead were common. Most fish were caught in a deeper pool around an immersed tree. An upstream run of 80m by 11.5m gave 34kg; a biomass of 37gm², including some large chub and barbel, although many fish escaped in this run.

Site OXFC Biomass and Density.

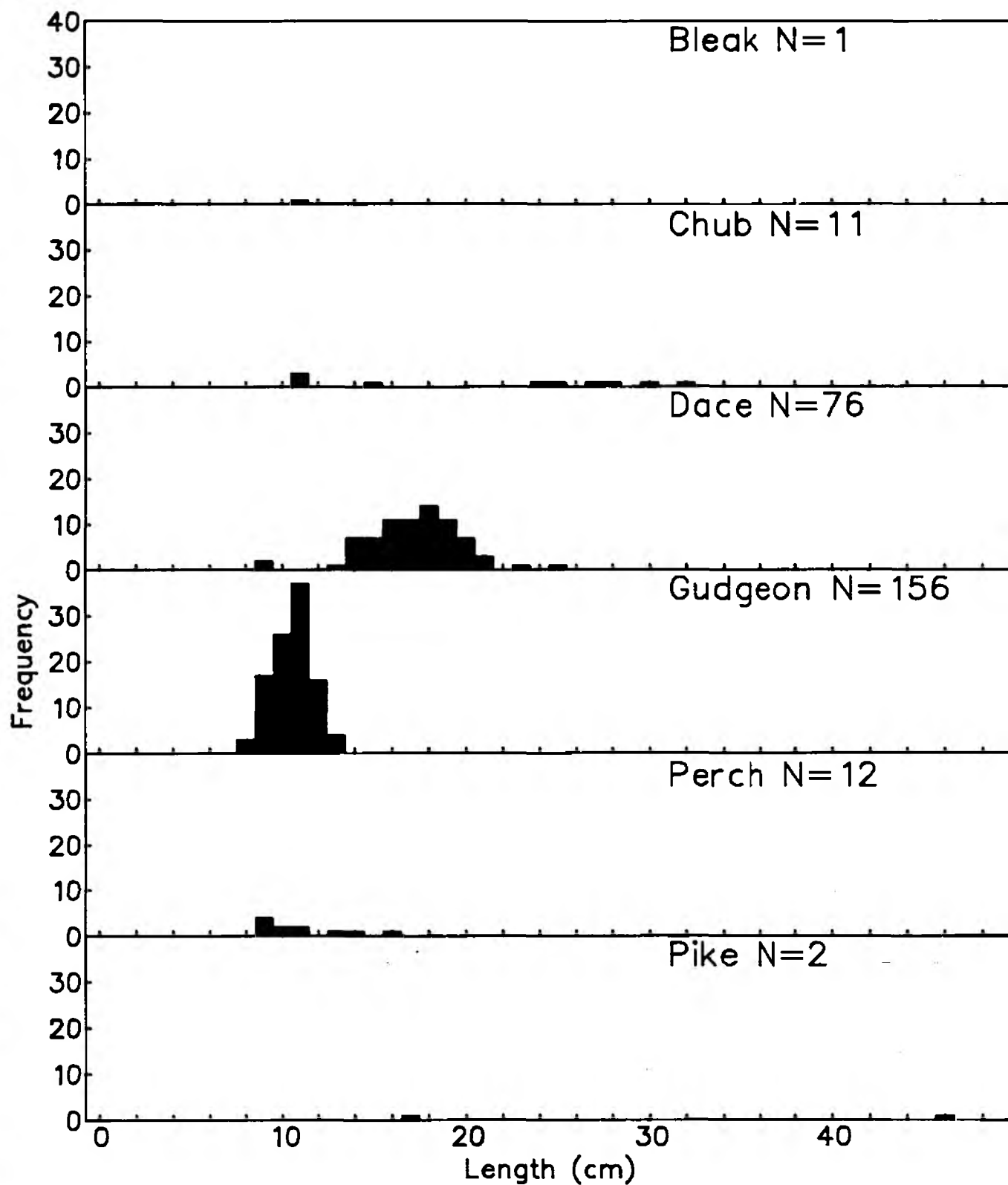


Biomass (gm-2)

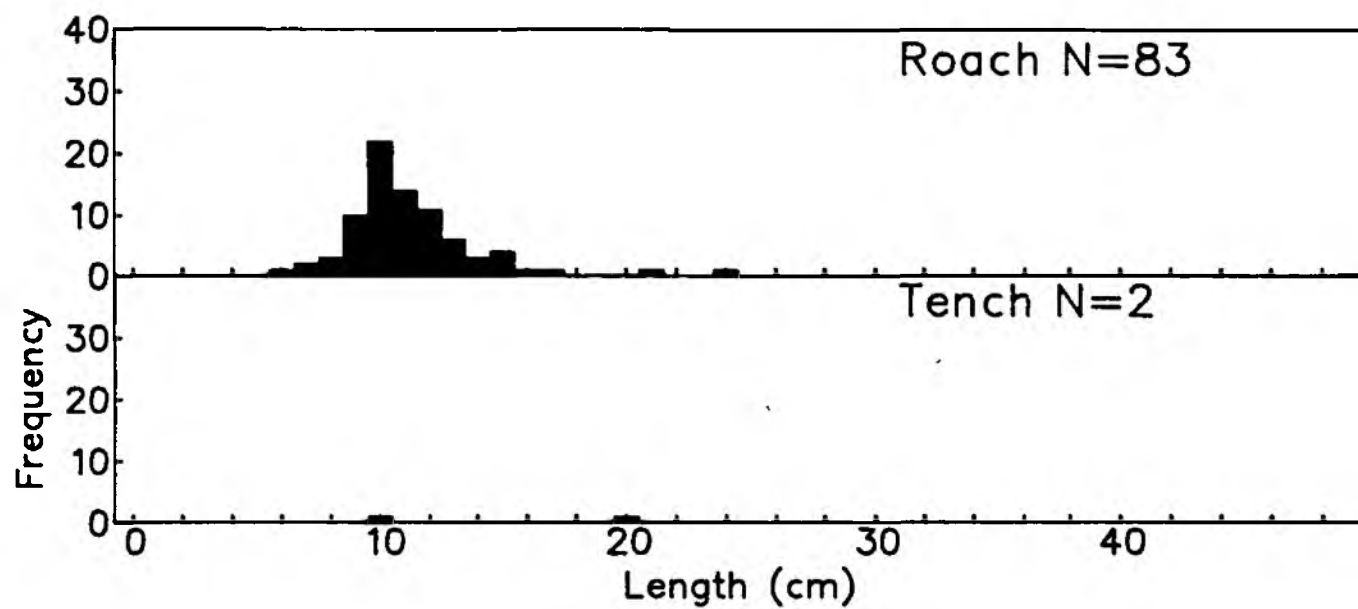


Density (nm-2)

Site OXFC Length Frequency.



Site OXFC Length Frequency (continued).



5.112 SITE REPORT

WATERCOURSE: Wolvercote Mill Stream.
SITE NAME: A34 Road Bridge.
SITE CODE: OXFD
LOCATION: Downstream of A34 road bridge.
N.G.R.: SP486098
DATE FISHED: 17/06/92
METHOD: Pulsed DC electrofishing, two anodes from a boat between two terminal and one central stop-nets.
EC TARGET
BIOMASS: 20 gm²

HABITAT FEATURES

LENGTH: 81 m WIDTH: 11 m AREA: 891 m²
DEPTH: 1.8 m
WATER TEMPERATURE: 19 °C

SUBSTRATE COMPOSITION (%)

BARE: 10 MUD & SILT: 90 GRAVEL: 00 STONE: 00 BOULDER: 00

VEGETATION (% COVER)

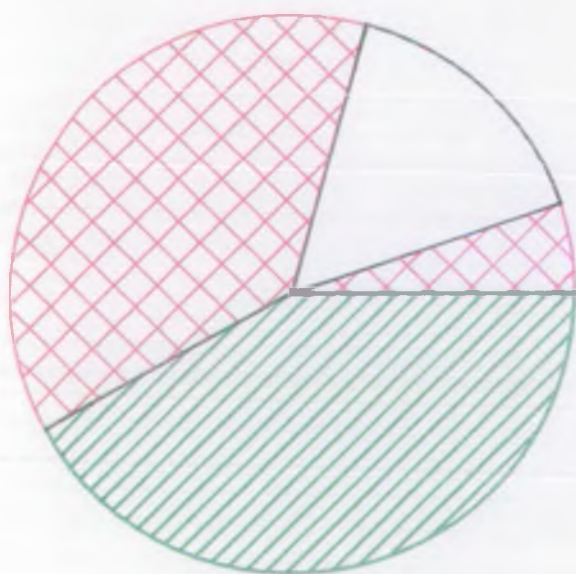
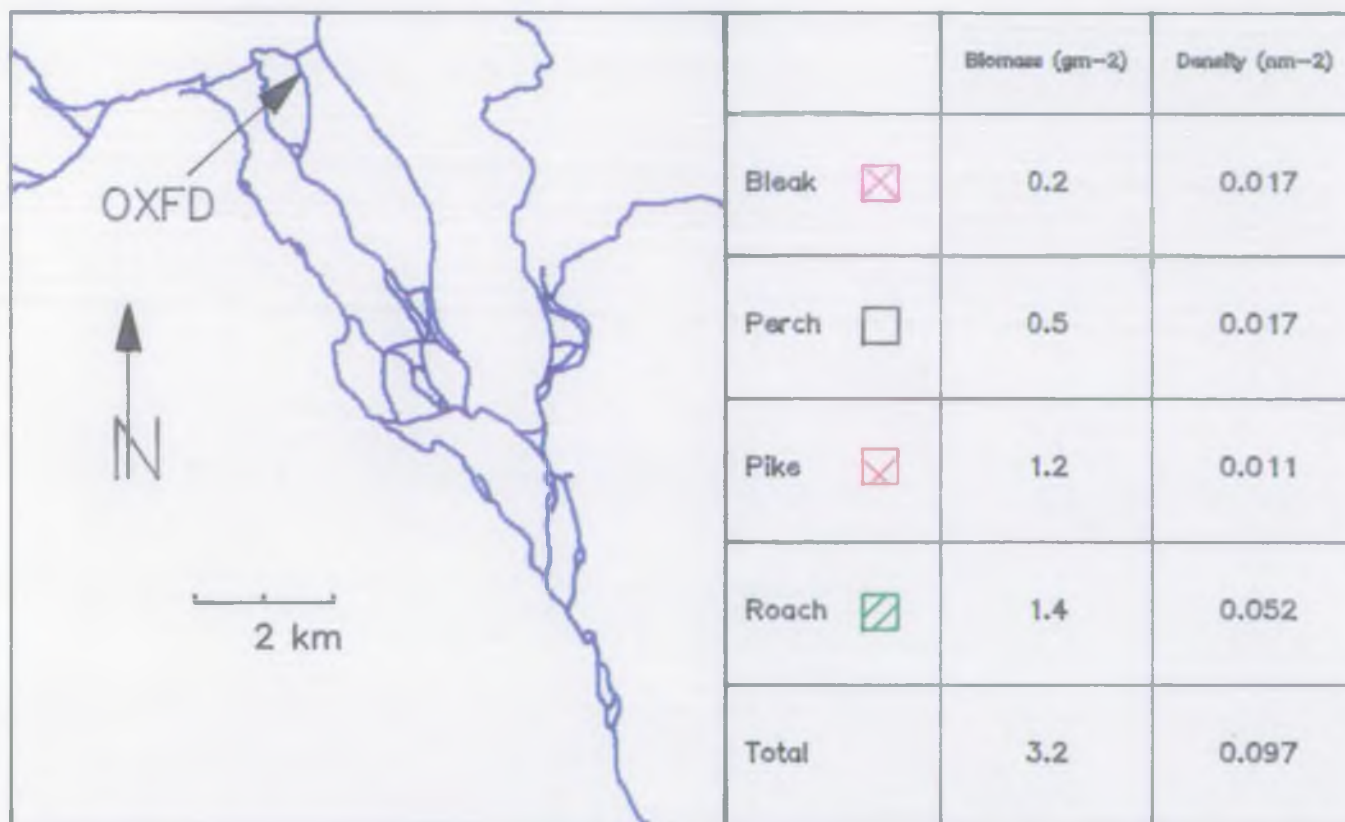
SUBMERGED: 05 FLOATING: 25 EMERGENT: 15 SHADE: 50
DOMINANT PLANT SPECIES: *Nuphar*, *Phalaris*, *Sparganium*.
ADJACENT LAND USE: Left bank unused, right bank grass/meadow.
WATER LEVEL: Normal.
WATER CLARITY: Moderate/Poor.

REMARKS

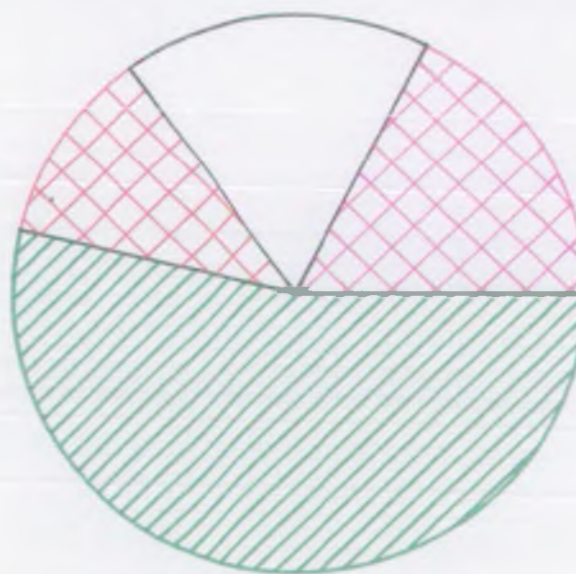
PHYSICAL STRUCTURE OF SITE: A straight, uniform, canalised section impounded by Wolvercote Mill with no instream features, little flow and sheet-pile bank protection in places. The channel was over-wide and encroached by emergent vegetation by up to 25%. Bankside vegetation consisted of willow, hawthorn, poplar and ash.

CATCH: This site fails to meet the NRA Thames Region target biomass for EC designated coarse fisheries and the lack of suitable instream habitat must be a significant factor. One large pike estimated at 7kg escaped from the survey section. None of the minor species appeared to be present, and a downstream run of 11m by 139 m gave 6.5 kg (a biomass of 4.25 gm²) of mixed species including good chub and bream.

Site OXFD Biomass and Density.

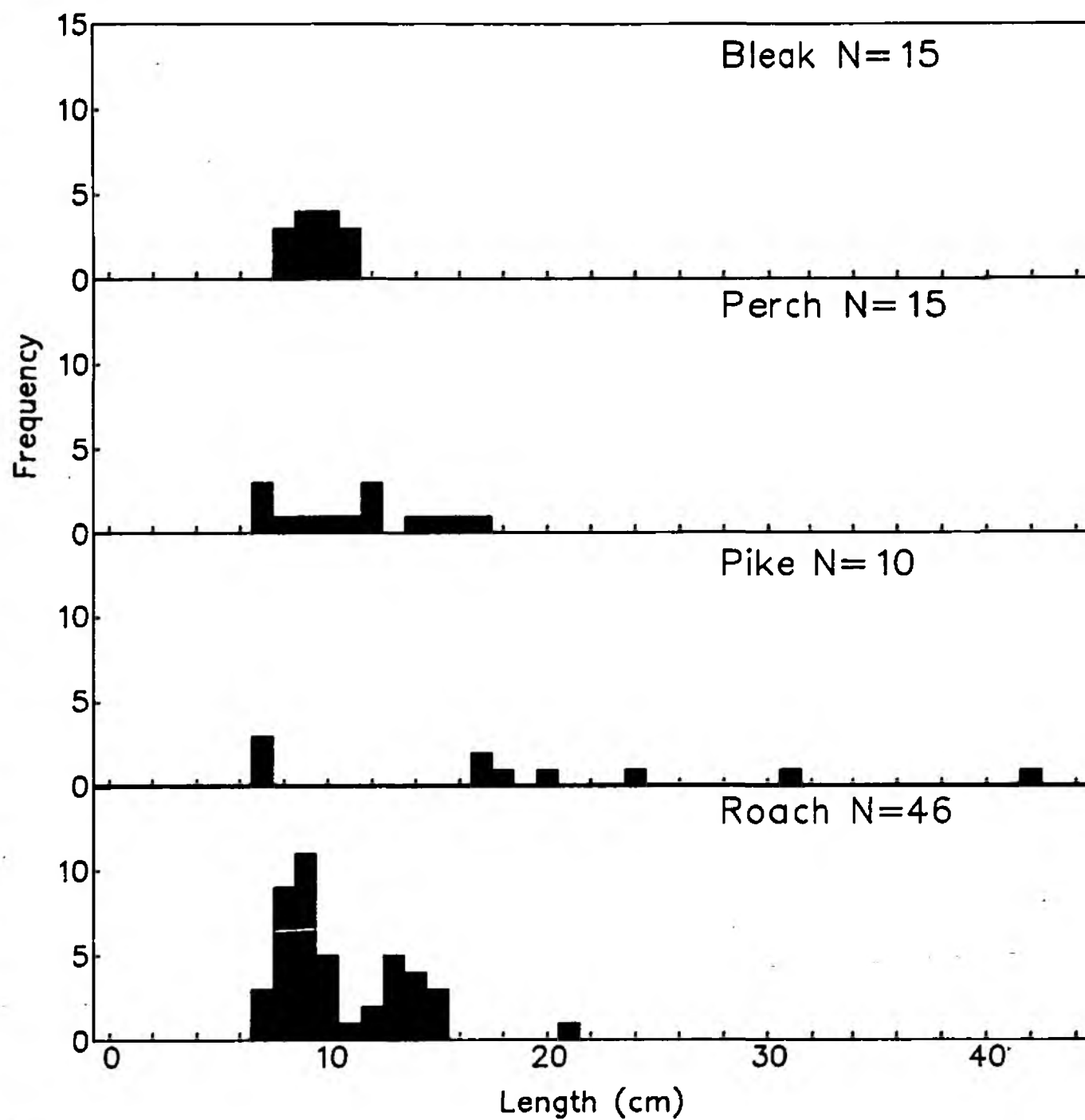


Biomass (gm-2)



Density (nm-2)

Site OXFD Length Frequency.



5.113 SITE REPORT

WATERCOURSE: Wolvercote Mill Stream.
SITE NAME: Wolvercote Mill.
SITE CODE: OXFE
LOCATION: Downstream stop net placed in low level channel 20m above confluence of mill channel and lower channel.
N.G.R.: SP487098
DATE FISHED: 10/5/92
METHOD: Upstream electrofishing, wading, 3 anodes.
R.Q.O.: 1B
EC TARGET
BIOMASS: 20gm²

HABITAT FEATURES

LENGTH: 119m MEAN WIDTH (RANGE): 11m (9.5-13m) AREA: 1309m²
MEAN DEPTH (RANGE): 1.2m (0.5-1.8m)
WATER TEMPERATURE: 13°C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 80 GRAVEL: 20 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

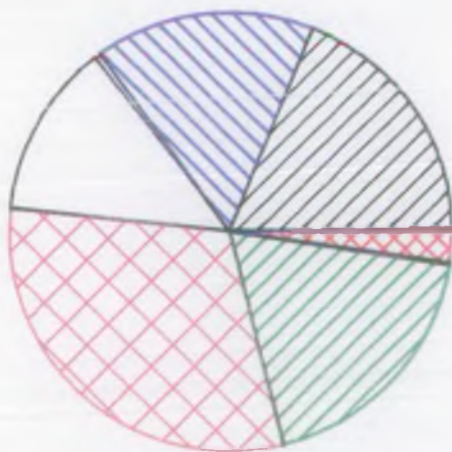
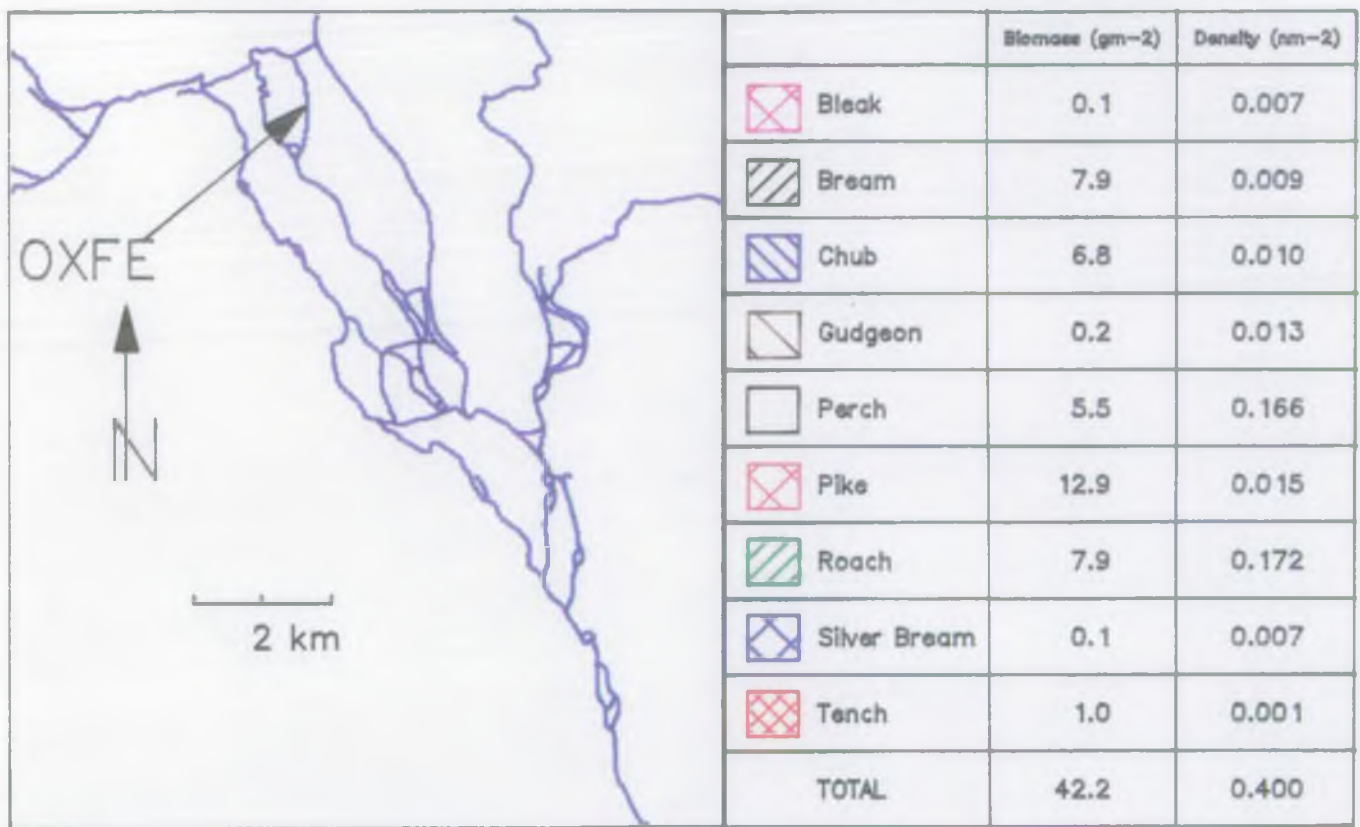
SUBMERGED: 25 FLOATING: 2 EMERGENT: 10 SHADE: 80
DOMINANT PLANT SPECIES (AQUATIC): *Nuphar*, *Iris*, *Glyceria*.
WATER LEVEL: Normal.
WATER CLARITY: Fair/good.
ADJACENT LAND USE: L.B. Wolvercote Mill and premises.
R.B. Pixey Meadow (SSSI).

REMARKS

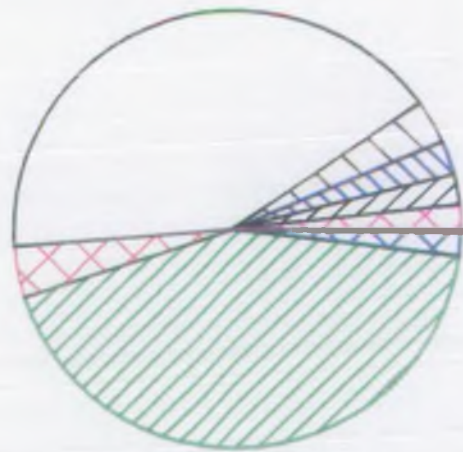
PHYSICAL STRUCTURE OF SITE: Mostly straight and overwide with steep banks. Most of the survey section had complete shading by overhanging trees. The upstream run section was narrower with faster flows, good tree cover but not over-shaded. The upstream run stopped 20m below a large weir. The substrate was poor throughout the section with silt, sand and small amounts of poor gravel.

CATCH: Minnows, stone loach and bullheads present. Many pike were in poor condition probably as a result of spawning. Roach were ready to spawn. The biomass was good at 42.2gm² confirmed by the upstream run which produced 18.5kg from 95m (a minimum biomass of 23.5gm²). The lack of dace and barbel and relatively few chub is indicative of the poor substrate and in particular lack of good spawning gravel.

Site OXFE Biomass and Density

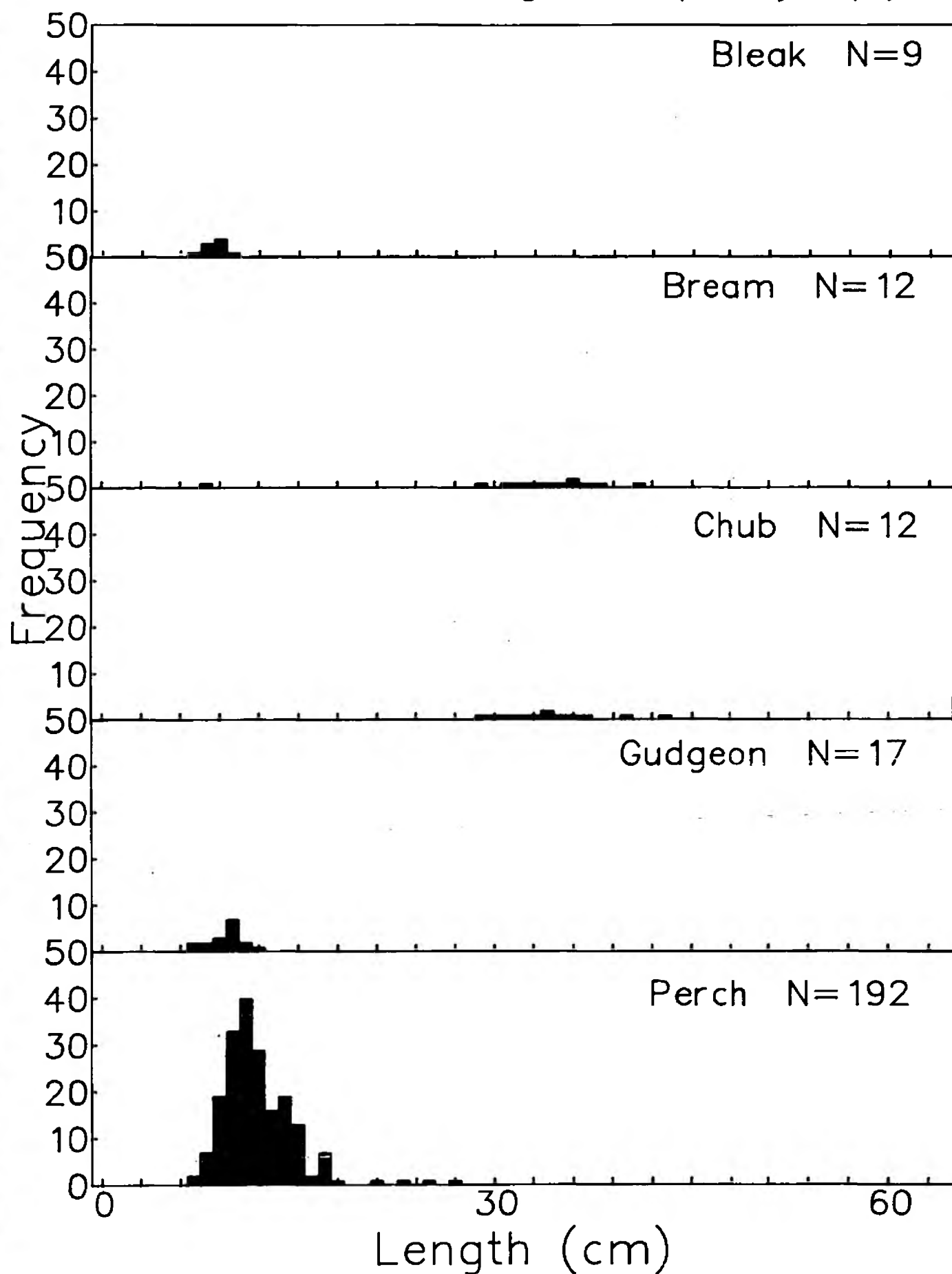


Biomass (gm-2)

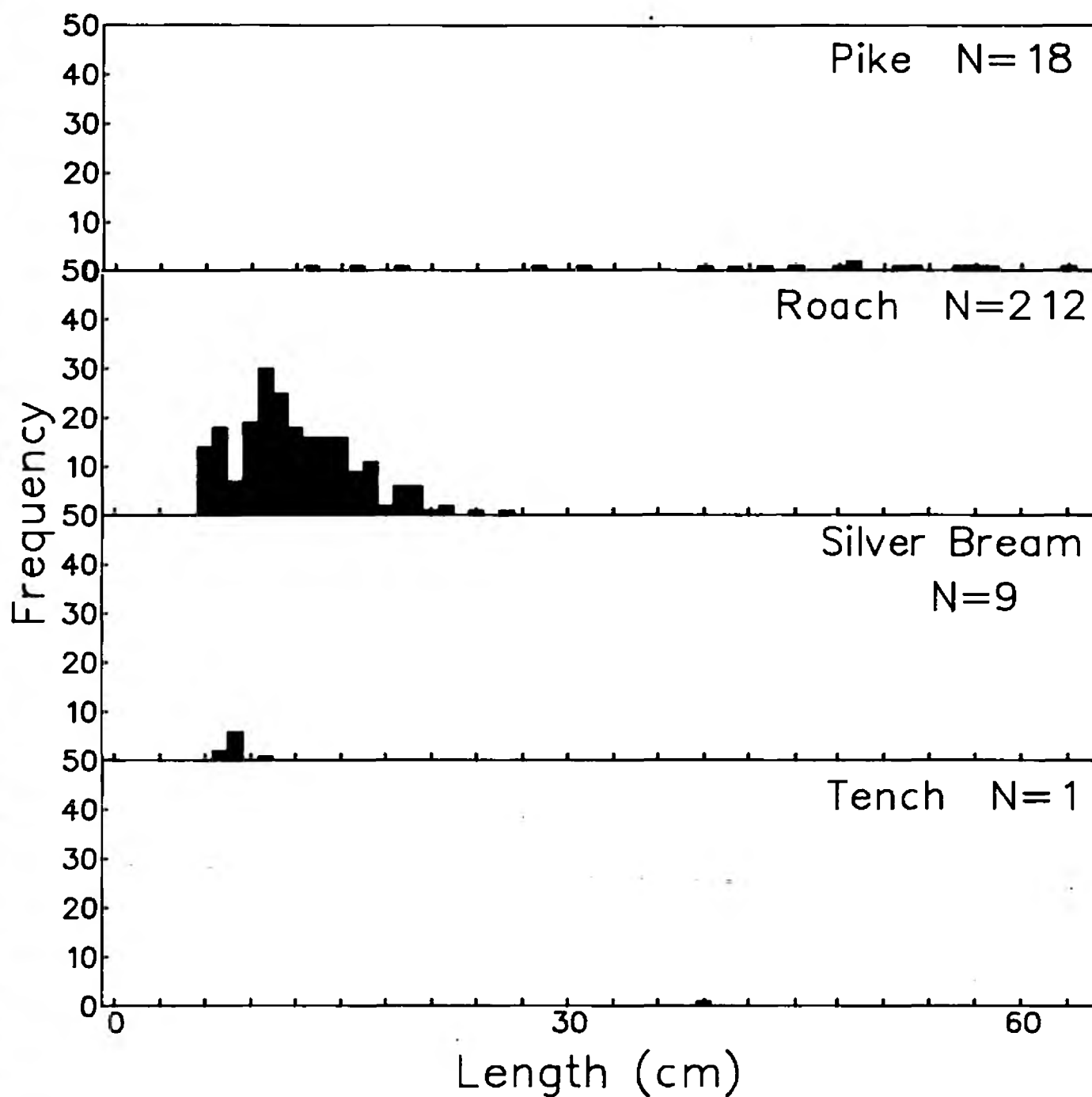


Density (nm-2)

Site OXFE Length Frequency (1)



Site OXFE Length Frequency (2)



6.0 DISCUSSION

6.1 River Evenlode.

There is a marked difference in channel type between the two arms of the River Evenlode; the Mill Stream was largely a natural two-stage channel, meandering with established pools and deep riffles, creating a wide range of widths, depths and flows. The Canal stream was a straight, wide, uniform channel with few instream features as its name suggests. Both channels had a very good flow rates, sufficient to maintain the clean gravel substrate throughout most of each survey site.

Site EVEA (Cassington Mill Stream) produced an excellent biomass (59.8 gm^{-2}) and density (0.259 nm^{-2}) of seven coarse fish species, easily achieving the NRA Thames Region minimum biomass value of 15 gm^{-2} for EC designated salmonid fisheries. The dominant feature of this site was the excellent chub population, covering a range of age and size classes with very good recruitment. The abundance of dace and gudgeon reflects the type of habitat available, and successful recruitment of most species suggests that chronic or sporadic water quality problems have had little influence upon fish populations in this part of the Mill Stream.

The upstream run produced a meagre biomass of 6.9 gm^{-2} of a similar species mix. This can in part be attributed to the markedly poorer habitat of the upstream section, which was over-wide, and slow flowing with a uniform channel profile. The substrate was silt covered gravel, especially under the railway bridge where the stream had been widened.

On the whole the species composition, biomass, density and length frequency results for this site all indicate a natural, stable and self supporting fishery. This is a result of the generally excellent fisheries habitat available, together with the lack of water quality problems.

Site EVEB (Cassington Canal Stream) produced biomass and density results of 59.8 gm^{-2} and 0.259 nm^{-2} , easily passing the NRA target. The catch consisted of nine coarse fish species including a small number of ruffe, bleak and roach. The principal species in terms of biomass were perch (19.5 gm^{-2}), pike (12.0 gm^{-2}), and barbel (11.6 gm^{-2}). It is significant that the two predators (perch and pike) were so abundant, and reflects the presence of a suitable food resource that they were able to utilise. The 12 specimen barbel, and the abundance of gudgeon, chub and dace in the survey section are indicators of the consistently good river flows, water quality and the habitat available.

It is important to note that the majority of fish caught were in a deep scour pool associated with a shallow riffle on a sharp bend in the stream. Instream features such as these are important in providing the variety of habitat zones and types necessary for successful fisheries. Given the already excellent results from this site, with its limited instream features, it is likely that any improvement in habitat would further increase the importance of the stream to fisheries.

6.2 Seacourt Stream.

Three sites were surveyed on the Seacourt Stream between its origin at Godstow and North Hinksey. Much of this has relatively natural habitat, with an established meandering course, pool riffle sequence and a consistently good flow rate, due to its steep gradient and narrow channel. The Seacourt Stream is an EC designated cyprinid fishery, for the reasons outlined in section 2.0, and survey sites should therefore equal or exceed the NRA Thames Region minimum biomass of 20 gm^{-2} .

At the upstream extent of the stream, site OXF1 (300m downstream of the Thames) gave excellent biomass (62.3 gm^{-2}) and density (0.294 nm^{-2}) values, easily passing the target value. The principal species in terms of biomass was barbel (23.9 gm^{-2}), and the site was dominated by large fish. The presence of these fish in the stream is a strong indication of good water quality, consistently good flows and the presence of a clean gravel substrate. Of the ten species caught, roach, tench, bream and silver bream are all species commonly associated with still or slow flowing water, whilst most of the others are usually found in faster flows. This, and the range of ten major and four minor species is a reflection of the variety of habitats available at this site, from fast deep glides to eddies and pools. More species were recorded at this site than any other surveyed in this study.

Length frequencies showed good recruitment. The species spawning habitat requirements were quite varied, with three preferring gravel (barbel, chub, gudgeon) and the remainder preferring plants. Given that most show good recruitment this confirms the range of habitats available and therefore the importance of this site to fisheries. An upstream run of 104 m gave another excellent biomass of 72.6 gm^{-2} mostly of specimen bream, barbel and chub. This result corroborates the results of the survey section.

Site OXF2, upstream of the A34 road bridge at Wytham again produced high biomass and density with figures of 64.8 gm^{-2} and 0.501 nm^{-2} respectively, far exceeding target values. The dominant species in terms of biomass at this site was chub (33.7 gm^{-2}), the population covering a wide range of age and size classes, reflecting a natural, stable population. The most abundant species was gudgeon (0.239 nm^{-2}) with its length frequency showing excellent recruitment. The presence of other gravel spawning species (dace, barbel) showing good recruitment reflects the quality of habitat at this site. Two juvenile barbel (16 cm fork length) were captured, making this one of the very few sites in the Thames (West) area where this size barbel have been found. Large numbers of small roach added to the food resource available to a good pike population, including several larger fish. Perch numbers were low.

An upstream run of 110 m gave a minimum biomass estimate of 45.5 gm^{-2} , dominated by large barbel and bream. Habitat in the upstream run progressed from pool riffle (preferred by barbel) to a deep, slow flowing and straight channel (preferred by bream).

The nature of this site rates it as one of the best and most natural that fisheries staff have encountered in the NRA Thames (West) area in terms of quality of habitat, flow regime and fish populations. The consistently good flows and steep gradient of the site ensures that the gravel substrate remains silt free and allows self sustaining, stable fish populations to thrive.

Site OXF4, the downstream extent of the Seacourt Stream at North Hinksey produced a good biomass (48.6 gm^{-2}) of 8 species although significantly poorer than the previous two sites. The density of 0.992 nm^{-2} is the highest recorded in this survey, and comprised mostly an excellent roach population of 29.5 gm^{-2} and 0.758 nm^{-2} which dominated this site. A healthy population of perch and pike were present, with perch showing very good recruitment. An upstream run of 125 m produced a minimum biomass of only 9 gm^{-2} from a section consisting of very poor habitat.

There is a marked difference between the fish population at this site and those upstream; this site had been extensively dredged in the past, unlike the others surveyed. The channel was deep, over-wide, slow flowing and featureless with steep, 45° banks and thick mud/silt substrate. The effects of these changes are mirrored by the fish species present; those requiring clean gravel for spawning (dace, gudgeon, barbel, chub) are either not present or severely reduced compared to the upstream sites. In addition over widening the channel may create localised water quality problems, especially

during the summer months.

6.3 Hinksey Stream.

The Hinksey stream is essentially a continuation of the Seacourt Stream, downstream of the confluence with the Bulstake Stream at North Hinksey and is an EC designated coarse fishery (see Sect 2).

One site was surveyed, downstream of the confluence of the Bulstake stream at North Hinksey. This site, OXF5, produced good biomass (34.7 gm^{-2}) and density (0.600 nm^{-2}) values easily passing the target. The catch of nine species was dominated by pike (14.6 gm^{-2}) with roach the most abundant species (0.310 nm^{-2}). Recruitment at this site appeared to be good for roach, bleak, pike and perch, with small fish predominant. The stable pike and perch population with a range of age and size classes, reflects the presence of a suitable food resource. This site had recently been extensively dredged, and it is surprising that good population levels should be present following the serious disturbance involved. Dredging had removed all of the natural gravel bed to such an extent that at the upstream extent of the dredge there was a 1 m step in the stream bed up to the original level. It is significant that most fish were caught in the two scour pools remaining. An upstream run of 180m through similar habitat (to the step mentioned above) produced a biomass of 20.8 gm^{-2} .

6.4 Botley Stream.

The Botley Stream divides from the Seacourt Stream and is an EC designated cyprinid fishery (see Sect 2.0).

One site, OXF9, was surveyed on the stream where it bisects the allotments at Binsey. Results were very good (biomass 40.6 gm^{-2} and density 0.902 nm^{-2}) from an outwardly unpromising site characterised by the deep, wide, slow flowing channel with deep silt substrate. The catch of ten species was dominated by roach in both biomass and density (11.9 gm^{-2} and 0.586 nm^{-2}). Most species exhibited successful recruitment, and small fish were predominant.

The large number of bushes, shrubs and structures either overhanging or in the stream had a significant affect; most of the fish were caught around these features, and they are probably the principal reason for the high values. Presence of this type of feature has been linked to improved fish biomass in past NRA fisheries surveys.

6.5 Bulstake Stream.

The stream was surveyed at two sites, site OXF0 being the upstream extent at Binsey Lane Bridge. Due to time restrictions, only a minimum estimate of biomass was made at 24.1 gm^{-2} . The greatest contribution to this value was a single fully scaled mirror carp of 6kg in immaculate condition. The site was characterised by small numbers of large fish, in marked contrast to the adjacent Botley Stream site (OXF9).

Habitat gradually improved from a deep, wide channel with silt substrate at the downstream extent to a stony riffle and pool directly below the weir at Binsey Lane Bridge.

The second site surveyed on the Bulstake Stream, OXFA, situated at Fishing News Books in Osney Industrial Estate produced disappointing values for biomass (11.7 gm^{-2}) and density (0.154 nm^{-2})

which fail the target value. This poor performance can be explained by the limitations of the survey techniques available. The site was deep (1.6m - 2.0m), wide (8.6m - 9.3m) and water clarity poor; all of these factors reduce efficiency of the electrofishing process and also therefore the accuracy of any results generated. Fisheries staff are convinced that the true values for biomass and density were significantly greater at this site.

The catch of seven coarse species consisted mainly of pike (6.3 gm²) and small roach (0.077 nm²). Of these, roach, perch, pike and bleak exhibited good recruitment and a range of age and size classes. A qualitative upstream run produced a similar species mix, including pike of 6kg and 11kg. Habitat quality throughout the reach was moderate, suiting species that prefer slow flowing, deep channels with mud/silt substrate.

6.6 Castle Mill Stream.

The upstream site on the Castle Mill Stream, OXFB, gave a very poor biomass of 10.2 gm² of six species, predominantly roach. Four of the species exhibited reasonable recruitment, and large quantities of cyprinid fry were present. All of the fish were caught around patches of marginal vegetation: these were the only instream features. An upstream run of 120m produced a minimum biomass estimate of 5.5gm², confirming the poor results of the survey section.

Habitat at this site was relatively poor, the channel was very wide (11m - 11.5m), straight and uniform with no instream features. Flow was slow, allowing silt deposition and the formation of a deep silt/mud substrate. It is possible that a flow of water from the Oxford canal via the overflow may have a detrimental impact upon water quality downstream of this site.

The second site on the Castle Mill stream at the College of Further Education campus (OXFC) gave good values for biomass (24.6 gm²) and density (0.536 nm²), passing the target, but falling short of comparable sites on other streams in this survey. The results are dominated by dace (9.7 gm²) and gudgeon (0.244 nm²). A total of eight species were caught. Of these only roach, dace and gudgeon appeared to have established, normal populations.

Habitat at this site was markedly different from OXFB. The channel was wide (9.5m), but shallow (0.7m) and contained between concrete trapezoid banks. Flow was good, sufficient to maintain the substrate predominantly of gravel and stone, and the change in habitat is reflected in the presence of dace at this site.

An upstream run of 83m produced a biomass of 37 gm², including some large chub and barbel, with many fish escaping upstream of the fishing team.

6.7 Wolvercote Mill Stream.

The Wolvercote Mill Stream was surveyed at two sites, above and below the mill impoundment. It is an EC designated cyprinid fishery (see Sect 2).

Site OXFD surveyed the section above the Mill impoundment, downstream of the A34 road bridge. Very poor results for both biomass (3.2 gm²) and density (0.097 nm²) fail to reach the target, with only four species caught, of these only the roach population showed normal recruitment.

Habitat at this site was poor, the stream was very wide (11m) deep (1.8m) with little flow due to the mill impoundment, which would exacerbate any water quality problems arising through water

entering from the canal upstream. There are no significant instream features, and substrate was exclusively mud or silt. A downstream run of 139m gave a biomass of 4.25 gm^{-2} from a similar habitat type.

Results from OXFE; the site below the impoundment, show an interesting difference. A total of nine major and three minor species were caught, giving a biomass of 42.2 gm^{-2} and density of 0.400 nm^{-2} easily passing the target. This site was dominated by the excellent perch and roach populations, both showing excellent recruitment. Pike made up the bulk of biomass (12.9 gm^{-2}) with a range of size and age classes.

Habitat was not significantly different from OXFD, but flows were faster and patches of clear gravel and sand were present. The channel was over-wide (11m) but had a wide range of depths (0.5-1.8m). The flow over the impoundment would be sufficient to improve dissolved oxygen levels in the water and reduce the impact of poorer water quality. An upstream run of 95m gave a biomass of 23.5 gm^{-2} from similar habitat.

7.0 CONCLUSIONS AND RECOMMENDATIONS.

7.1 River Evenlode.

The two arms of the River Evenlode had natural, stable and self supporting coarse fish populations indicating the consistently good river flows, water quality and habitat available. They are likely to be a very important spawning area for many species moving up from the River Thames. The pressures of water users on the Thames have resulted in a reduction of spawning habitat available to many species in the main river. As a result it is probable that fish populations in this important fishery depend upon streams such as these for recruitment. This watercourse should be maintained in its relatively natural state, and any further works must not impinge upon the superior fisheries habitat available. There is scope for further improvement to the Canal Stream, and this should be considered for inclusion in future habitat enhancement programmes.

7.2 Seacourt Stream.

The Seacourt Stream is characterised by good habitat and excellent mixed coarse fish populations, dependent almost exclusively on suitable habitat, channel profile and consistently good flow. There are sections of the stream where the habitat has been altered, reflected by a concomitant reduction in fish biomass. The survey results on this stream confirm the important value of suitable habitat to fisheries success. Again, it is recommended that the excellent fisheries habitat in this stream be maintained, and that any future works do not have a detrimental influence; improvement to the reaches that have been altered detrimentally must be considered.

7.3 Hinksey Stream.

Given the disturbance and change to the habitat caused by the dredging at the site surveyed, the results show a surprisingly successful fish population, although markedly poorer than for the Seacourt Stream. These results would probably be much improved had the channel clearance work not been carried out, and this is likely to be the case for the remaining parts of the Hinksey Stream. In light of this, Fisheries recommend that attention be paid to returning the fisheries habitat to a relatively natural state as a matter of priority.

7.4 Botley Stream.

The Botley Stream appeared to have excellent fish populations despite the apparent paucity of suitable habitat. The significance of instream features and bankside shelter must be considered in any future works to this channel. This stream is also vulnerable to localised water quality problems due to the over wide channel creating low velocities; the creation of a two-stage channel or an increased flow would benefit fisheries, as would any increase in flow velocities. These opportunities for fisheries habitat improvement should be rigorously explored as a matter of priority.

7.5 Bulstake Stream.

Despite the somewhat sketchy information available, it is reasonable to surmise that the fisheries of the Bulstake Stream are relatively good, confirmed by moderate anglers catches. Recruitment appeared to be adequate to maintain a number of species, and a good food resource exists to support some excellent specimen pike. There is scope for the improvement of fisheries habitat, and it is recommended that these opportunities be investigated further with the aim of including them in the future habitat enhancement programme.

7.6 Castle Mill Stream.

The Castle Mill Stream does hold good fish populations, however these appear to be more patchy in their distribution than say the Seacourt Stream. To a great extent this must be due to the

relatively poor habitat, especially along the more urban parts of the stream; the input of water of poorer quality from the canal may also have some effect. Consistently good flow rates in the lower part of this stream are likely to be sufficient to offset some of these problems and may account for improved fish populations in the downstream section. Fisheries recommend that the more urban sections of this stream undergo extensive fisheries habitat improvement works through the recreation of a natural channel type.

7.7 Wolvercote Mill Stream.

The clear disparity between the two sites surveyed show the affect of impoundment of the stream on fish populations. Any improvement in flow at site OXFD would bring about a marked change in fisheries habitat which would be reflected by a gain in fish biomass. Fisheries recommend that strategies to improve flow velocity are implemented in order to improve fish biomass in this watercourse.

8.0 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 L222/1.

NRA Thames Region, River Cherwell Fisheries Survey, 1989/90. V. Lewis 1990.

APPENDIX I

River quality classification

River Class	Quality criteria	Remarks	Current potential uses
1A Good Quality	<p>Class limiting criteria (95 percentile)</p> <p>(i) Dissolved oxygen saturation greater than 80%</p> <p>(ii) Biochemical oxygen demand not greater than 3 mg/l</p> <p>(iii) Ammonia not greater than 0.4 mg/l</p> <p>(iv) Where the water is abstracted for drinking water, it complies with requirements for A2* water</p> <p>(v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)</p>	<p>(i) Average BOD probably not greater than 1.5 mg/l</p> <p>(ii) Visible evidence of pollution should be absent</p>	<p>(i) Water of high quality suitable for potable supply abstractions and for all other abstractions</p> <p>(ii) Game or other high class fisheries</p> <p>(iii) High amenity value</p>
1B Good Quality	<p>(i) DO greater than 60% saturation</p> <p>(ii) BOD not greater than 5 mg/l</p> <p>(iii) Ammonia not greater than 0.9 mg/l</p> <p>(iv) Where water is abstracted for drinking water, it complies with the requirements for A2* water</p> <p>(v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)</p>	<p>(i) Average BOD probably not greater than 2 mg/l</p> <p>(ii) Average ammonia probably not greater than 0.5 mg/l</p> <p>(iii) Visible evidence of pollution should be absent</p> <p>(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</p> <p>(v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS)</p>	Water of less high quality than Class 1A but usable for substantially the same purposes
2 Fair Quality	<p>(i) DO greater than 40% saturation</p> <p>(ii) BOD not greater than 9 mg/l</p> <p>(iii) Where water is abstracted for drinking water it complies with the requirements for A3* water</p> <p>(iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)</p>	<p>(i) Average BOD probably not greater than 5 mg/l</p> <p>(ii) Similar to Class 2 of RPS</p> <p>(iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs</p>	<p>(i) Waters suitable for potable supply after advanced treatment</p> <p>(ii) Supporting reasonably good coarse fisheries</p> <p>(iii) Moderate amenity value</p>
3 Poor Quality	<p>(i) DO greater than 10% saturation</p> <p>(ii) Not likely to be anaerobic</p> <p>(iii) BOD not greater than 17 mg/l. This may not apply if there is a high degree of re-aeration</p>	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	<p>(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.</p> <p>(b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH₄.</p> <p>(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.</p> <p>(d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95 percentile limits.</p> <p>* 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.</p>		

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

<i>Determinand</i>	<i>Salmonid Waters</i>		<i>Cyprinid Waters</i>	
	<i>G</i>	<i>I</i>	<i>G</i>	<i>I</i>
(a) Temperature (max) (b) Temperature rise		$\leq 21.5^{\circ}\text{C}$ $> 1.5^{\circ}\text{C}$		$\leq 28^{\circ}\text{C}$ $> 3^{\circ}\text{C}$
Dissolved oxygen (mg/l O ₂)	50% ≥ 9 100% ≥ 7	50% ≥ 9	50% ≥ 8 100% ≥ 5	50% ≥ 7
pH		6--9		6--9
Suspended solids (mg/l)	≤ 25		≤ 25	
B.O.D. (A.T.U.) (mg/l)	$\leq 5^*$		$\leq 8^*$	
Nitrites (mg/l)	$\leq 0.2^*$		$\leq 0.5^*$	
Non-ionized ammonia (mg/l)	≤ 0.005	≤ 0.025	≤ 0.005	≤ 0.025
Total ammonium (mg/l NH ₄)	≤ 0.04	≤ 1	≤ 0.2	≤ 1
Total residual chlorine (mg/l HC10)		≤ 0.005		≤ 0.005
Zinc (mg/l)		≤ 0.3		≤ 1
Copper (mg/l)	≤ 0.04		≤ 0.04	

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

APPENDIX IV

NRA Fisheries Survey Site Coding System.

The following habitat codes are used by NRA Thames Region Fisheries staff and are based on RQO and EC legislation criteria:-

1 EC Designated Fishery 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 CLF1 - CL = River Cole; F = 1B Coarse; 1 = Individual site.

APPENDIX V

Generic and common names of aquatic plants.

<i>Cladophora</i>	Blanket Weed
<i>Fontinalis</i>	Moss
<i>Glyceria</i>	Sweet Grass
<i>Iris pseudacorus</i>	Yellow Iris
<i>Nuphar</i>	Yellow Water Lily
<i>Phalaris arundinacea</i>	Reed Canary Grass
<i>Potamogeton pectinatus</i>	Fennel Pondweed
<i>Ranunculus sp.</i>	Water Crowfoot
<i>Sparganium sp.</i>	Bur-reed
<i>Schoenoplectus lacustris</i>	Common Club Rush