

NATIONAL RIVERS AUTHORITY

THAMES REGION

UPPER THAMES AREA

RIVER RAY, OXON

FISHERIES SURVEY

1989

HD

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Contents

1. Summary
2. Introduction
 - 2.1. Description of watercourse
 - 2.2. Geology and Hydrology
 - 2.3. Main discharges
 - 2.4. Mortalities
 - 2.5. Summary of previous fishery management
 - 2.6. Summary of previous fishery surveys
3. Aims and Objectives
 - 3.1. Overall aims of surveys
 - 3.2. River classification
 - 3.3. Specific aims
4. Methods
 - 4.1. Site selection
 - 4.2. Capture and data acquisition
 - 4.3. Data analysis
 - 4.4. Health examination
 - 4.5. Macroinvertebrates
 - 4.6. Water quality
 - 4.7. Hydrology
5. Results
 - 5.1. Site results
 - Arncott (RYQ3)
 - Merton (RYQ5)
 - Langford Brook (LAP2)
 - Langford Brook confluence (RYQ6)
 - Charlton on Otmoor (RYQ7)
 - Oddington (RYQ9)
 - Old River Ray confluence (RYQ0)
 - Islip (RYQA)
 - 5.2. Survey results
 - 5.3. Fish health
 - 5.4. Water quality
 - 5.5. Macroinvertebrates
6. Discussion
7. Recommendations
8. References
9. Appendices
 - (i) Classification of river quality
 - (ii) River Quality Objectives
 - (iii) E.C. directive list of determinands
 - (iv) NRA Fish survey site coding system
 - (v) Fish health
 - (vi) Fish mortalities, re-stockings, previous fishery surveys
 - (vii) Summary of Biomass at each site

1. SUMMARY

The River Ray could support a good coarse fishery in the section between Merton STW outfall and the confluence with the River Cherwell. Survey sites at the upstream and downstream ends of this section produced excellent biomasses and included quality fish, showing the potential of the River Ray.

The River Ray has been extensively modified by land drainage creating a Fenland drain type of habitat.

The main problem on the River Ray, particularly for the fish populations is the poor water quality caused by effluent from sewage treatment works. The largest of these is Bicester STW which is at present a derogated works.

The effluent from Bicester STW has a deleterious effect on the fish populations downstream. Water quality gradually improves further downstream and fish populations are correspondingly improved.

Fig 2.1 Map of River Ray



- – Consented Discharges (> 100 cu.m./day)
- (1) Grendon Underwood STW (2) Charndon STW
 - (3) Marsh Gibbon STW (4) Launton STW
 - (5) Merton STW (6) Bicester STW
 - (7) Weston on the Green STW (8) Islip STW

➔ – Fishery Survey Sites

INTRODUCTION

2.1.DESRIPTION OF WATERCOURSE

The source of the River Ray is near Quainton (Grid reference SP 740213), from where it flows 32km in a generally south-westerly direction, to its confluence with the River Cherwell at Islip (SP 523137). It is generally slow flowing with a gradient of 1 in 580. The main tributary is the Langford Brook which joins just above Charlton on Otmoor.

2.2.GEOLOGY AND HYDROLOGY

The geology of the River Ray catchment is predominantly clay with a few outcrops of Cornbrash. This determines the flow characteristics of the River Ray, causing it to be very flashy with prolonged flooding in winter, and nearly static during a dry summer. The low flow velocities are made worse by the overwidened and overdeepened channel throughout much of its length. This is particularly noticeable on Otmoor, where land drainage work has drastically lowered the water table. Flow data on the River Ray is limited to 1 site in the upper reaches (Grendon Underwood), but more monitoring is planned at new weirs from Charlton on Otmoor downstream.

2.3.MAIN DISCHARGES

There are numerous Sewage Treatment Works (STWs) discharging to the River Ray and its tributaries. 8 of these works discharge over 100cu.m/day. The largest is at Bicester which discharges an average of 10800cu.m/day, into the Langford Brook. This is a derogated works, that is its consent standards have been relaxed in the short term, while improvements are made to enable it to meet the original consent standards. The derogated consent is 50/40/15 (suspended solids/BOD/NH₄) and the discharge has a dilution factor of only 1 in 2 during low flows.

The new section of the M40 presently under construction includes bridges over the River Ray and Langford Brook just above their confluence. Polluting discharges have occurred as a result of the construction and there will be a slight risk of pollutions from the motorway drainage when opened for traffic.

2.4.MORTALITIES

The only major fish kill of recent years was the result of agricultural silage and slurry, and probably caused 100% mortality in the section between the Langford Brook confluence and the weir at Charlton on Otmoor. Numbers killed would have been higher if the fish population had not already been depressed by generally poor water quality.

2.5.SUMMARY OF PREVIOUS FISHERY MANAGEMENT

There has been no fisheries management work or restocking on the River Ray in recent years. This is due to the continuing water quality problem. The Langford Brook has had some small weirs created, which are successfully raising oxygen levels.

2.6.SUMMARY OF PREVIOUS FISHERY SURVEYS

Previous surveys were conducted in 1979 and 1985, but only on a qualitative basis. The stretch from the Langford Brook confluence downstream to Charlton gates was surveyed on both occasions. The 1985 survey showed a marked deterioration. The results are not comparable to the present survey because of the differences in methodology.

3. AIMS AND OBJECTIVES

3.1.OVERALL AIMS OF SURVEYS

The National Rivers Authority (NRA) 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 5 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 River Quality Objectives 1978 (RQO), (as amended by Thames Water Authority 1987).

Under the European Community Directive (78/659/EEC), some river zones are designated as capable of supporting either salmonid or cyprinid fish (Further details of the N.W.C. classification and the E.C. directive appear in the appendices).

The NRA Thames region have developed a site code classification system based upon the RQO and the E.C. directive (Appendix VII)

Fish biomass targets apply within the NRA Thames Region with respect to E.C.designated fisheries, viz:-

Cyprinid - 20g/sq.m

Salmonid - 15g/sq.m

3.3.SPECIFIC AIMS

The particular aim of the River Ray survey was to investigate the effects of the derogated discharge at Bicester STW.

In addition we were concerned about the effects of the extensive land drainage works.

4 METHODS

4.1 SITE SELECTION

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 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. Scale samples from the shoulder of up to 3 fish from each 1cm size class were taken for age estimation.

Minor species such as stoneloach (Neomacheilus barbatulus), minnow (Phoxinus phoxinus) and bullhead (Cottus gobio) were noted for relative abundance.

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

All data acquired in the field was entered into a Husky Hunter data logger. This was later down loaded to a desk top computer.

Single electrofishing runs were made immediately upstream of the site (where practicable), with the aim of assessing the validity of results obtained in the survey site.

4.3 DATA ANALYSIS

The data was processed on the computer using the Fisheries Information System (FINS) software package. Graphics were generated using Freelance Plus V.3.0.

Age analysis was carried out using the following convention; fish in year class 1 are between 1 and 2 years old, fish in year class 2 are between 2 and 3 years old, etc. The assumed birth date varies according to species.

4.4 HEALTH EXAMINATION

A representative sample of fish were examined by a fish biologist for parasitic fauna. Where appropriate, tissue samples were analysed for heavy metals and pesticides.

4.5 MACROINVERTEBRATES

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

Invertebrate samples tend to reflect the physico-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 (BMWP) scoring system. Results obtained were compared to scores predicted for the site if it were unpolluted.

4.6 WATER QUALITY

River Quality Objectives (RQO) are set according to present water quality conditions and the uses to which the river is subjected. Discharge consents are determined by the RQO and by the total load of pollutants. 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 the source of the sample. The 3 main parameters are Biological Oxygen Demand (BOD), Ammonia and suspended solids. Routine sample results are held on a register available for public inspection.

4.7 HYDROLOGY

Data was obtained from the Water Resources Department of the NRA. Flow rates were measured at gauging weirs with minimum, mean and maximum flows being recorded on a daily basis. Monthly and annual figures are also calculated.

Until recently there was only 1 gauging station on the River Ray. Unfortunately, this was at Grendon Underwood, too far upstream of our survey sites to be of value. In January 1990, five new loggers were put into service on the lower end of the River Ray. These should provide very useful information for the future.

SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Arncott

SITE CODE: RYQ3

LOCATION: Upstream of road bridge, Arncott

N.G.R.: SP 608184

DATE FISHED: 23/8/89

METHOD: Upstream electrofishing, wading, 2 anodes

R.Q.O.: 3 E.E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 73m MEAN WIDTH (RANGE): 3.5m (3.4-3.6m)

AREA: 256sqm MEAN DEPTH (RANGE): 0.5m (0.4-0.6m)

WATER TEMPERATURE: 19 degrees C

SUBSTRATE COMPOSITION (%)

BARE: 90 MUD & SILT: 10 GRAVEL: 0 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 80 FLOATING: 90 EMERGENT: 10 SHADE: 5

PLANT SPECIES(Emergent): Sparganium dominant. Carex.
Butomus. Saggitaria. Apium. Alisma

PLANT SPECIES(Floating): Potamogeton natans. Nuphar. Lemna

PLANT SPECIES(Submerged): Elodea

WATER LEVEL: Low(virtually no flow) WATER CLARITY: Clear

PHYSICAL STRUCTURE OF SITE: Straight, almost canalised, 45 degree slope banks. Overwide channel leading to excessive weed growth.

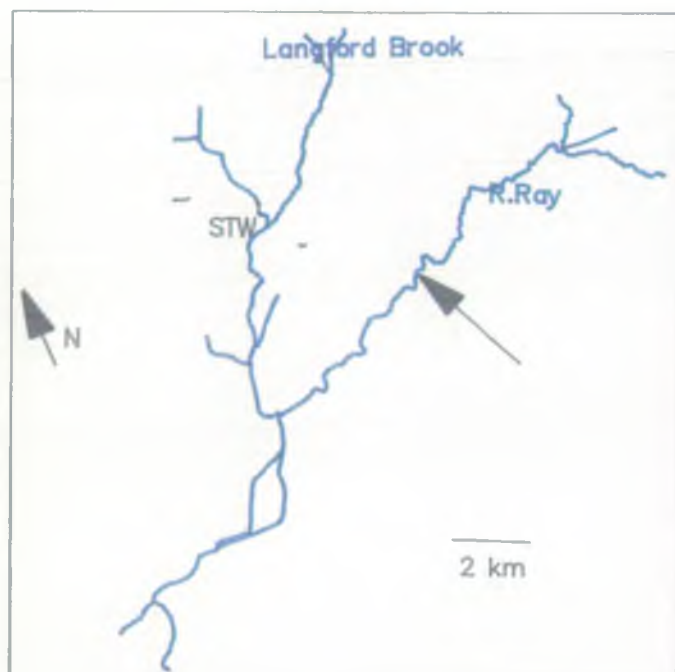
ADJACENT LAND USE: L.B. & R.B. Permanent pasture



RIPARIAN OWNERS: L.B. & R.B. Mrs Burgess

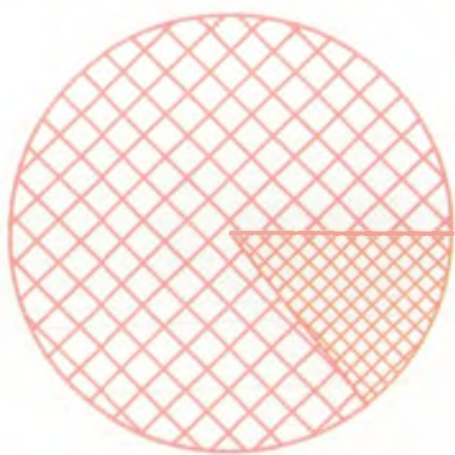
FISHING RIGHTS: L.B. & R.B. Mrs Burgess

COMMENTS: No upstream run due to abundant vegetation and overhanging tree branch. Small numbers of cyprinid fry were observed. There was an abundance of invertebrates. The River Ray has been heavily modified for land drainage and the resultant paucity of habitat is probably responsible for the poor biomass of 4.3g/sqm. There is also a lack of diversity with the site being dominated by small pike.

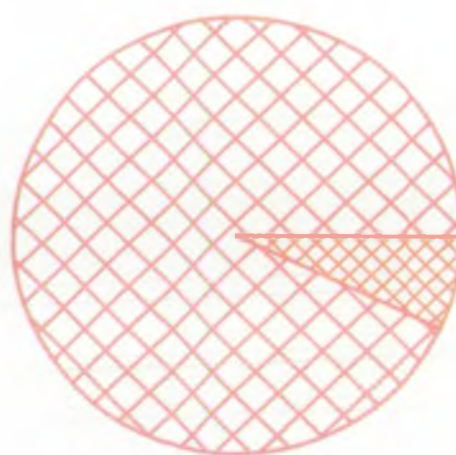
Site RYQ3 (Arncott) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Pike	3.7	0.054
 Tench	0.6	0.004
TOTAL	4.3	0.058

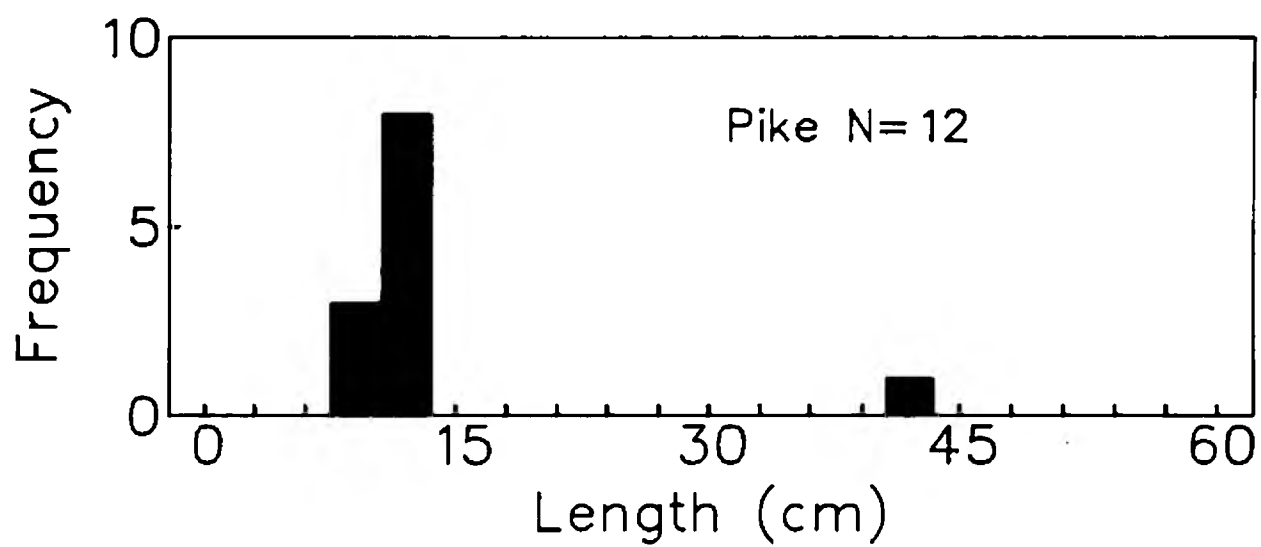


Biomass



Density

Site RYQ3 (Arncott) Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Merton SITE CODE: RYQ5

LOCATION: Immediately downstream of Merton STW

N.G.R.: SP 587175 DATE FISHED: 7/3/90

METHOD: Upstream electrofishing, wading, 2 anodes. N.B. 3 anodes could be used. Boat fishing would be necessary in summer when higher water levels are retained.

R.Q.O.: 3 E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 135m MEAN WIDTH (RANGE): 7.6m (7.5-7.7m)

AREA: sqm 1026sqm MEAN DEPTH (RANGE): 1.1m (0.9-1.5m)

WATER TEMPERATURE: 10degrees C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

SUBMERGED: 10 FLOATING: 0 EMERGENT: 5 SHADE: 0

DOMINANT PLANT SPECIES(AQUATIC): Nuphar (Summer'89 there was 100% cover from Lemna)

WATER LEVEL: Low WATER CLARITY: Good

PHYSICAL STRUCTURE OF SITE: Canalised, mostly straight with 45degrees sloping banks. Culverted STW outfall at upstream limit of site.

ADJACENT LAND USE: L.B. Permanent pasture
" " " R.B. Arable


RIPARIAN OWNERS: L.B. & R.B. Mr Calcutt

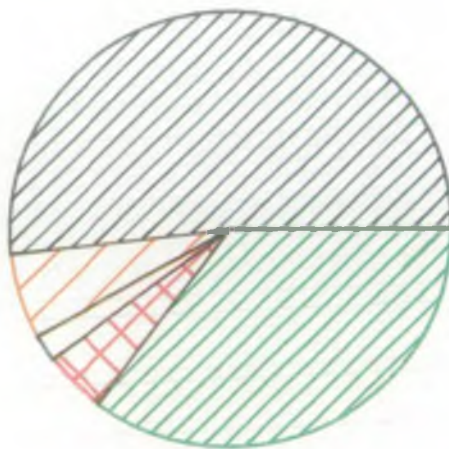
FISHING RIGHTS: L.B. & R.B. Mr Calcutt

COMMENTS: Minnows present. Masses of fry present especially roach. Some fish had lesions and there was a moderately high infestation of Blackspot. The biomass was extremely high at 91.7g/sqm (not including the huge numbers of fish below 6cm in length). Recruitment is obviously good. The fish were tightly shoaled, and it is likely that sections of river above and below the shoal would have had significantly lower biomasses.

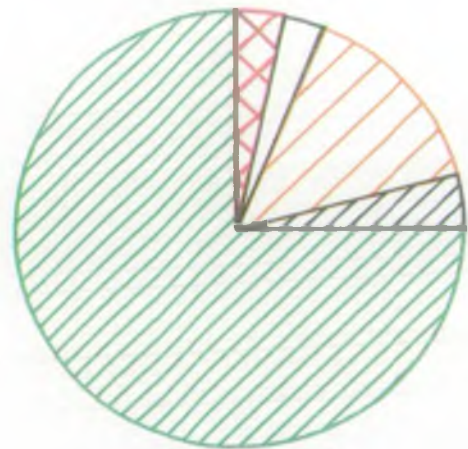
Site RYQ5 (Merton) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Bleak	0.0	0.001
 Bream	47.5	0.035
 Dace	5.8	0.131
 Gudgeon	0.0	0.001
 Perch	1.8	0.025
 Pike	4.3	0.031
 Roach	32.2	0.666
TOTAL	91.6	0.890

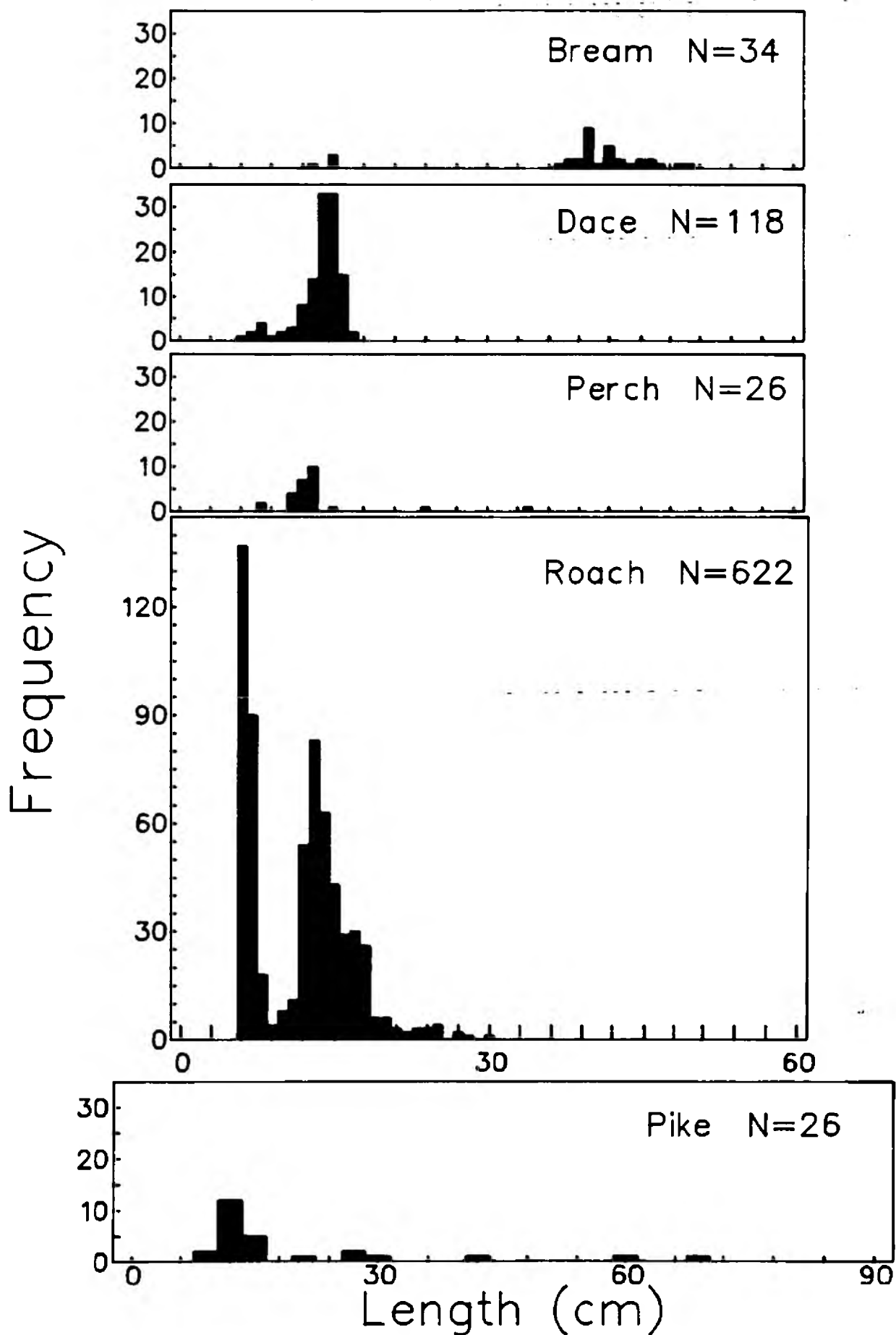


Biomass



Density

Site RYQ5 (Merton) Length Frequency



SITE REPORT

WATERCOURSE: Langford Brook

SITE NAME: Langford Brook SITE CODE: LAP2

LOCATION: Short distance upstream of Islip to Merton road

N.G.R.: SP 565170

DATE FISHED: 26/10/89

METHOD: Upstream electrofishing, wading, 2 anodes, 2 runs

R.Q.O.: 3/2 E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 116m MEAN WIDTH (RANGE): 5.2m (5.0-5.7m)

AREA: 603sqm MEAN DEPTH (RANGE): 0.4m (0.2-0.6m)

WATER TEMPERATURE: 13 degrees C

SUBSTRATE COMPOSITION (%)

BARE: 29 MUD & SILT: 70 GRAVEL: 1 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 2 FLOATING: 0 EMERGENT: 30 SHADE: 10

PLANT SPECIES(AQUATIC): Sparganium dominant
Callitriche, Elodea present

WATER LEVEL: Low/normal WATER CLARITY: Reasonable

PHYSICAL STRUCTURE OF SITE: Meandering, dredged channel with relatively level bed. 45 degree gradient on both banks.

ADJACENT LAND USE: L.B. Arable
" " " R.B. Permanent pasture








RIPARIAN OWNERS: L.B. Mr Calcutt
" " R.B. Mr Calcutt (tenant Mr J.Honour)

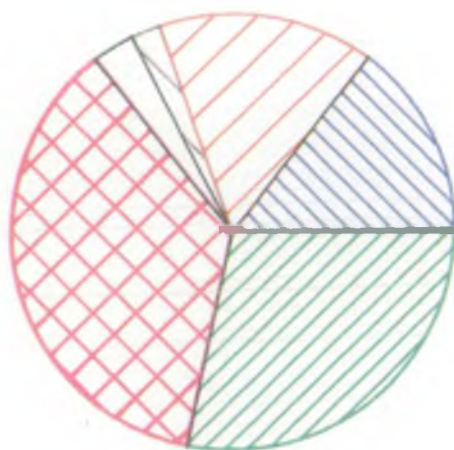
FISHING RIGHTS: L.B. & R.B. Mr Calcutt

COMMENTS: Thousands of 1st year roach fry as well as fry of other species. Stoneloach common. The biomass of fish was 20.4g/sqm, this does not include fish below 6cm long. It appears that this is an excellent spawning/nursery site. The brook receives effluent from Bicester S.T.W. but is able to support a fishery due to the relatively constant flow. Re-aeration is assisted by small weirs and riffles. There is some silt but not as much as in the River Ray below the confluence (site RYP6).

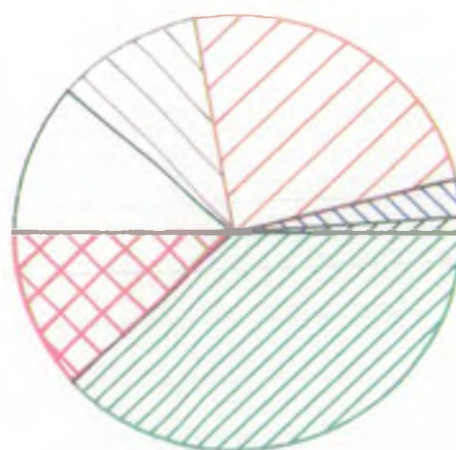
Site LAP2 (Langford Brook) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Bream	0.1	0.003
 Chub	3.0	0.007
 Dace	3.2	0.060
 Gudgeon	0.4	0.027
 Perch	0.6	0.028
 Pike	7.4	0.030
 Roach	5.7	0.095
TOTAL	20.4	0.252

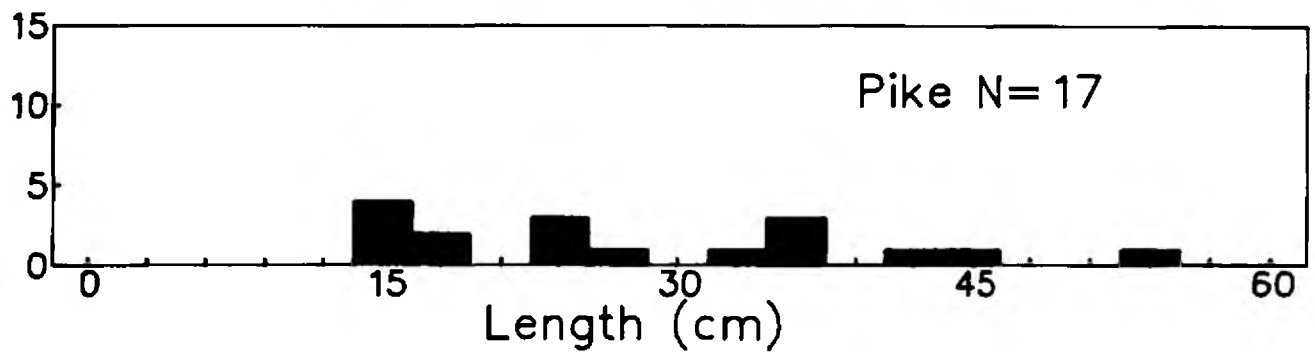
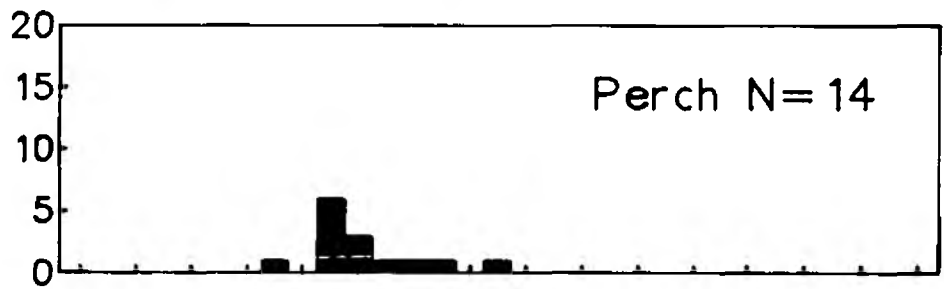
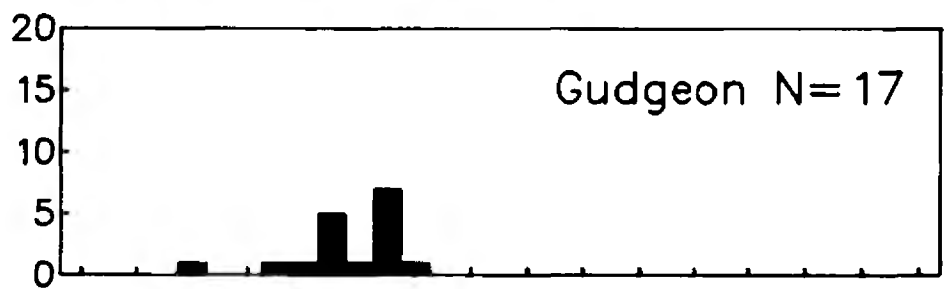
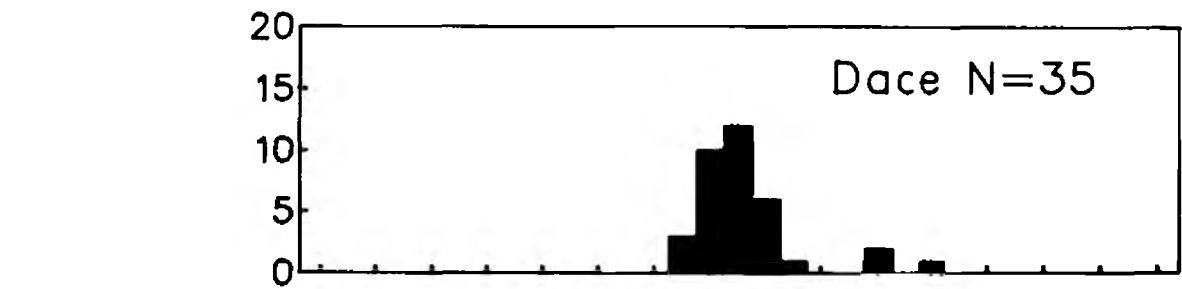


Biomass



Density

Site LAP2 (Langford Brook) Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Langford Brook Confluence SITE CODE: RYQ6

LOCATION: Immediately downstream of Langford Brook
confluence

N.G.R.: SP 570167

DATE FISHED: 26/10/89

METHOD: Electrofishing, 2 boats, 4 anodes, 3 runs (each
'run' included fishing upstream then downstream between the
stop nets)

R.Q.O.: 3 E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 125m MEAN WIDTH (RANGE): 10.4m (10.3-10.5m)

AREA: 1300sq.m MEAN DEPTH (RANGE): 1.5m (1.4-1.9m)

WATER TEMPERATURE: 13 degrees C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

SUBMERGED: 30 FLOATING: 10 EMERGENT: 5 SHADE: 0

DOMINANT PLANT SPECIES(AQUATIC): Nuphar, Lemna, Sparganium,
Schoenoplectus

WATER LEVEL: Very poor flow WATER CLARITY: Clear

PHYSICAL STRUCTURE OF SITE: Overwide, canalised. Survey
section was straight. Approximately 18 inches of black
smelly (anaerobic) silt nearer to the confluence.

ADJACENT LAND USE: L.B. & R.B. Permanent pasture

RIPARIAN OWNERS: L.B. Mr Calcutt
" " R.B. Mr C.Cooper

FISHING RIGHTS: L.B. Mr Calcutt
" " R.B. Mr C.Cooper

SITE REPORT - RYQ6 (continued)


COMMENTS: Stoneloach were present. Many of the roach had blackspot. There was an abundance of snails. We fished for a short distance upstream and caught a number of quality pike and perch. The habitat was much better above the Langford Brook confluence being narrower with a clean bed and more natural banks.

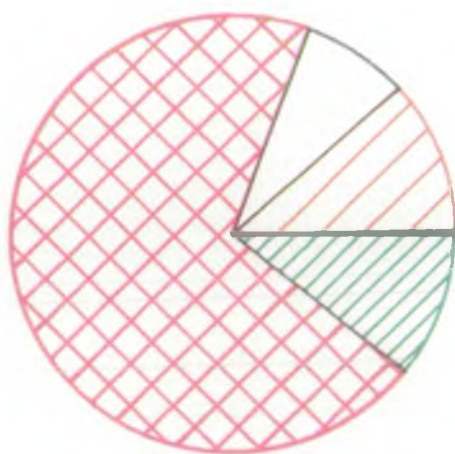
The survey site biomass was 17.9g/sqm which is lower than the target for cyprinid waters (20g/sqm N.R.A. Thames Region current levels of service). The biomass was composed largely of small pike. The generally poor fish population is probably due to poor habitat and water quality. The water quality is generally poor due to Bicester S.T.W. which discharges to the Langford Brook. The Brook is generally fast flowing and so maintains reasonable oxygen levels. Suspended solids brought down by the Langford Brook are deposited when they reach the slow, overwide River Ray. As a result oxygen levels in the River Ray can fall dramatically in summer. The site also suffered from a farm pollution in June '87 which killed a significant number of fish.

Another factor in 1989 has been the construction of the M40 which crosses the River Ray a short distance upstream of this site. The river has at various times been impounded, abstracted and received polluting discharges without consent, by the Motorway contractors.

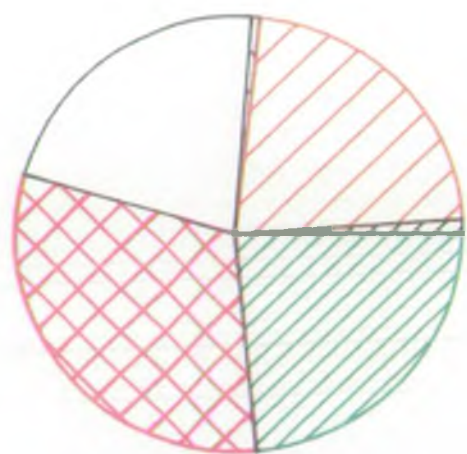
Site RYQ6 (Langford Brook Confluence) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Bream	0.1	0.002
 Dace	2.0	0.041
 Gudgeon	0.1	0.001
 Perch	1.4	0.040
 Pike	12.5	0.057
 Roach	1.9	0.043
TOTAL	17.9	0.207

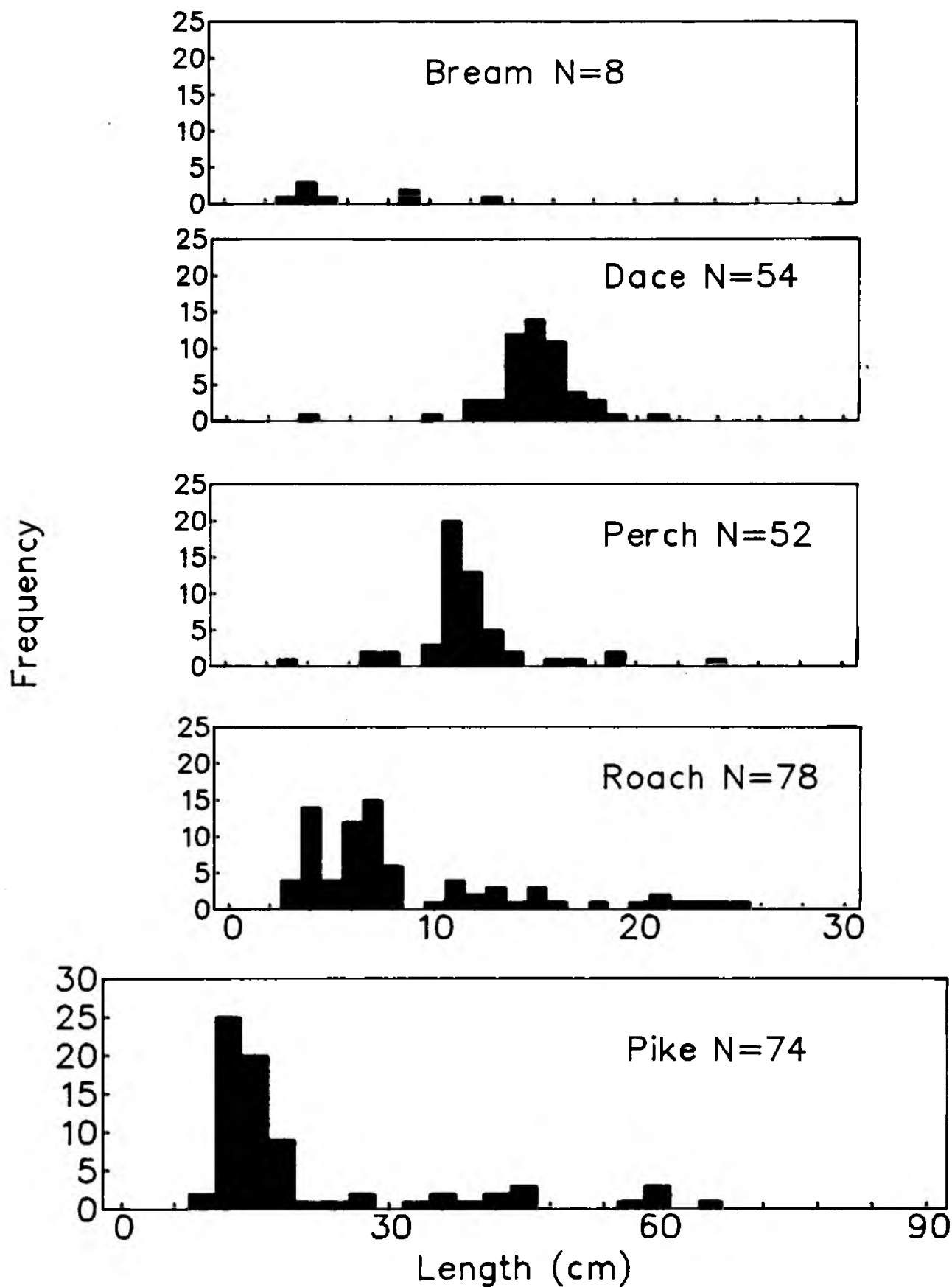


Biomass



Density

Site RYQ6 (Langford Brook Confluence)
Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Charlton on Otmoor SITE CODE: RYQ7

LOCATION: Downstream of new weir on "new" River Ray

N.G.R.: SP 565156

DATE FISHED: 7/03/90

METHOD: Upstream electrofishing, wading, 2 anodes.

R.Q.O.: 3 E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 100m MEAN WIDTH (RANGE): 6.0m (5.5-7.5m)

AREA: 600sqm MEAN DEPTH (RANGE): 1.1m (0.7-1.4m)

WATER TEMPERATURE: 10 degrees C

SUBSTRATE COMPOSITION (%)

BARE: 40 MUD & SILT: 58 GRAVEL: 1 STONE: 1 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 0 FLOATING: 0 EMERGENT: 10 SHADE: 20

DOMINANT PLANT SPECIES(AQUATIC): Sparganium

WATER LEVEL: Normal WATER CLARITY: Slightly turbid

PHYSICAL STRUCTURE OF SITE: Straight, with steep sloping banks. New concrete weir at upstream limit of section.

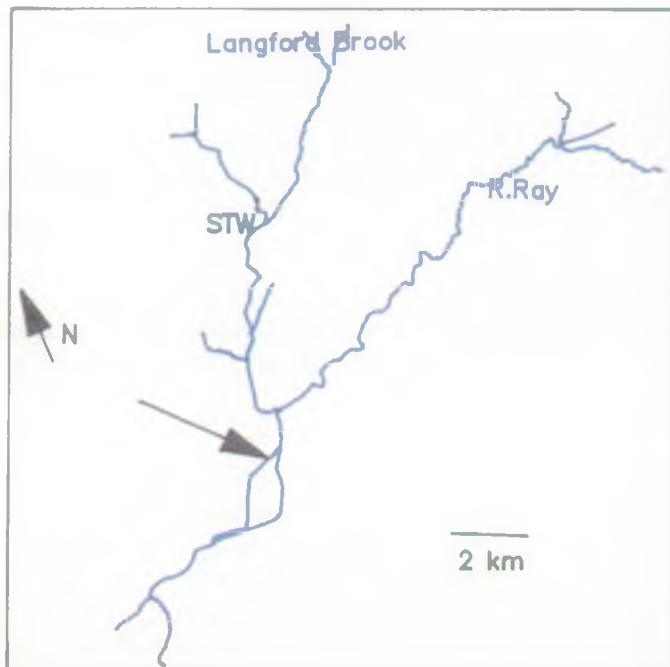
ADJACENT LAND USE: L.B. Stone track
" " " R.B. Permanent pasture







RIPARIAN OWNERS: L.B. Oxon County Council (Bridle road)
" " R.B. Mr Cooper, West View Farm

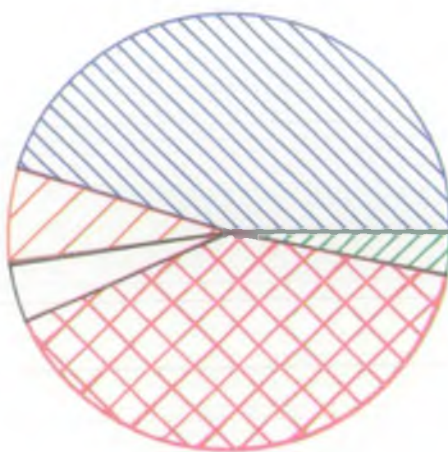
FISHING RIGHTS: L.B. Oxon C.C.
" " R.B. Mr Cooper

COMMENTS: Stoneloach present. The habitat in this section is poor with machine-cut 45 degree banks and no bends. The biomass of 8.2g/sqm is low, and well below the target of 20g/sqm for cyprinid sites (NRA-Thames region -current levels of service). The weir does provide aeration, and a much higher biomass would be expected in the summer months when Oxygen levels on the River Ray can be critical. This phenomenon was observed in a previous survey in 1985.

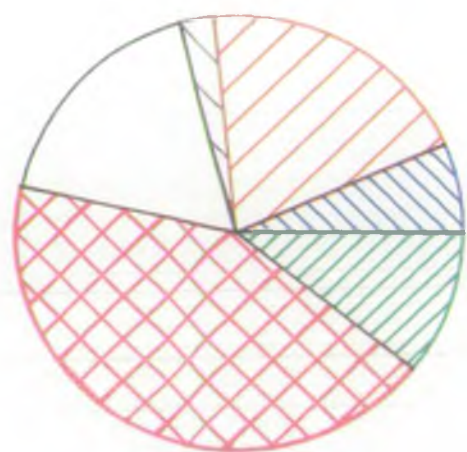
Site RYQ7 (Charlton on Otmoor) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Chub	3.7	0.005
 Dace	0.6	0.015
 Gudgeon	0.0	0.002
 Perch	0.3	0.013
 Pike	3.3	0.032
 Roach	0.3	0.008
TOTAL	8.2	0.075

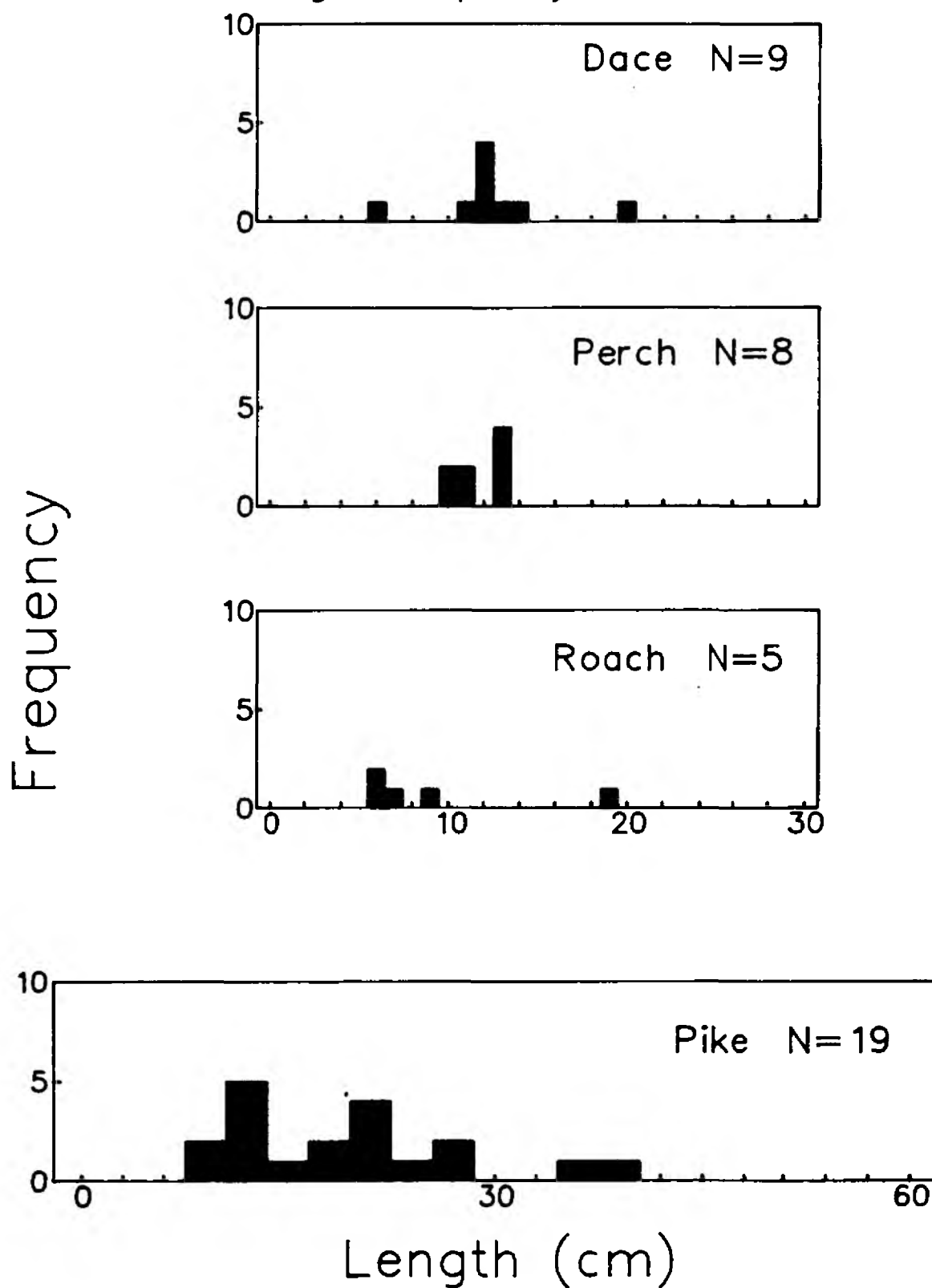


Biomass



Density

Site RYQ7 (Charlton on Otmoor)
Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Oddington

SITE CODE: RYQ9

LOCATION: Upstream of new weir, Logg Farm, Oddington

N.G.R.: SP 547143

DATE FISHED: 11/4/90

METHOD: Electrofishing from a boat, 2 anodes. The section was fished upstream and then downstream for each run.

R.Q.O.: 3

E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 127m

MEAN WIDTH (RANGE): 11.6m (10-14m)

AREA: 1473sqm

MEAN DEPTH (RANGE): 1.8m (1.5-2.3m)

WATER TEMPERATURE: 11degrees C

SUBSTRATE COMPOSITION (%)

BARE: 50 MUD & SILT: 30 GRAVEL: 0 STONE: 20 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 10 FLOATING: 0 EMERGENT: 30 SHADE: 5

DOMINANT PLANT SPECIES(EMERGENT): Glyceria, Scirpus

DOMINANT PLANT SPECIES(SUBMERGED): Nuphar

WATER LEVEL: High-due to raising of adjustable weir, but poor flow.

WATER CLARITY: Good

PHYSICAL STRUCTURE OF SITE: Canalised with 1 bend. Stones on river bed, probably from old weir structure.

ADJACENT LAND USE: L.B. Scrub and rough pasture

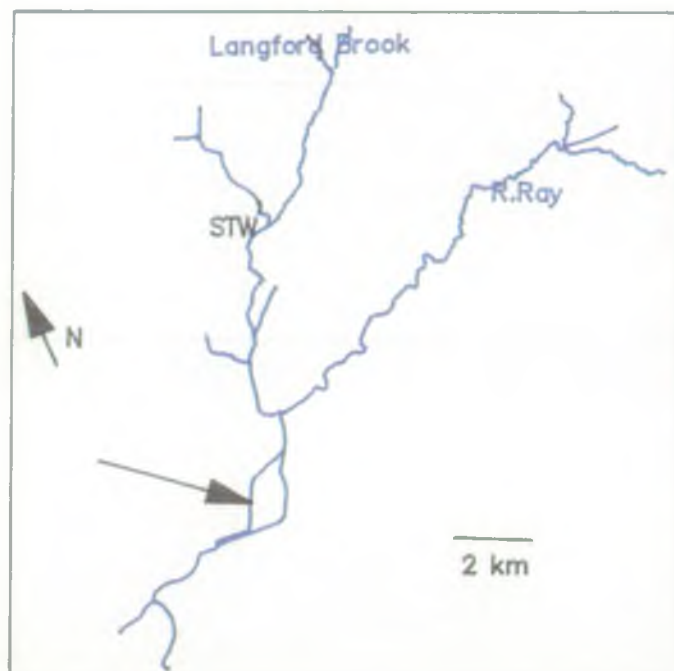
" " " R.B. Permanent pasture


RIPARIAN OWNERS: L.B. & R.B. Mr J.Smith, Logg Farm

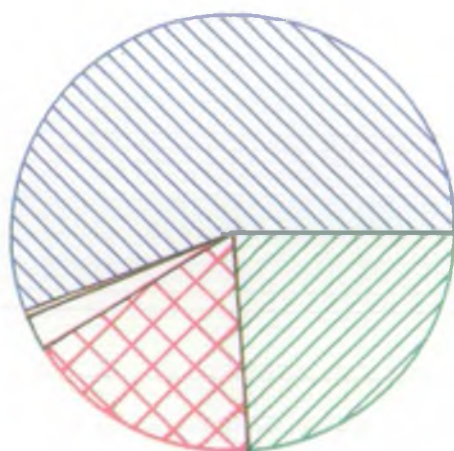
FISHING RIGHTS: L.B. & R.B. Mr Smith

COMMENTS: An upstream run of 236m by 10.2m produced 7.5kg, (a biomass of 3.1g/sqm). Most of the fish were in one shoal, and we failed to catch a single fish in a 100m section. This emphasises the patchy nature, and the mobility of the fish in the River Ray. The survey site biomass of 17.6g/sqm is below the target of 20g/sqm for a cyprinid site. The upstream run biomass suggests that the survey section result was atypical. Minnows were common, stoneloach and cyprinid fry were present. Many of the roach were nearly ready for spawning and some perch were shedding milt. Fish leaches Piscicola were present on a number of fish.

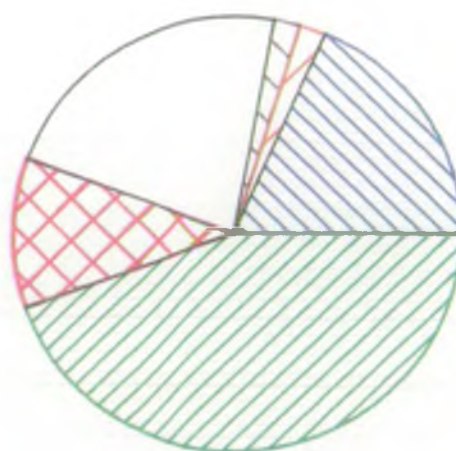
Site RYQ9 (Oddington) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Chub	9.8	0.010
 Dace	0.1	0.001
 Gudgeon	0.0	0.001
 Perch	0.4	0.012
 Pike	3.1	0.006
 Roach	4.2	0.024
TOTAL	17.6	0.054

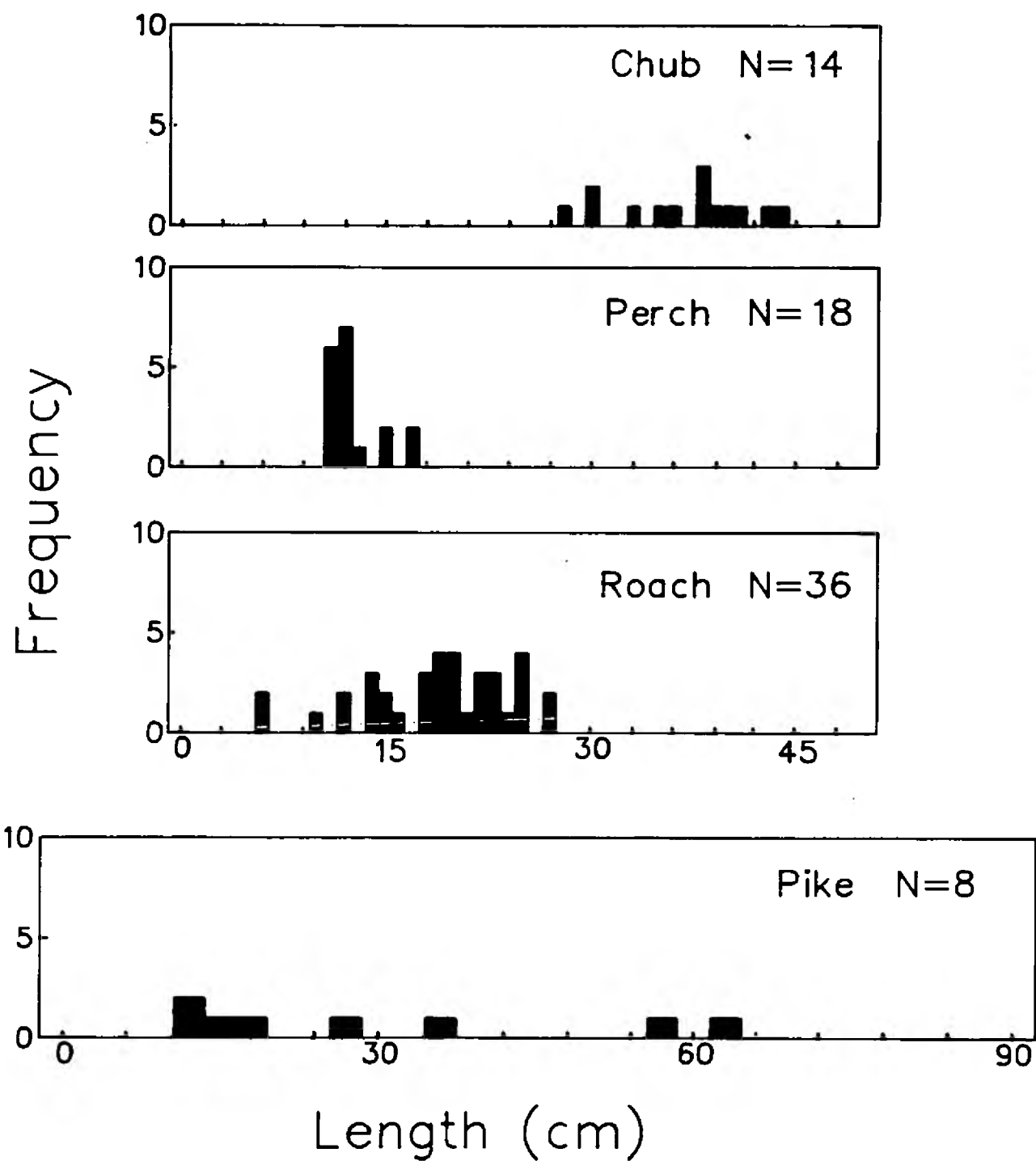


Biomass



Density

Site RYQ9 (Oddington) Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Old River Ray confluence SITE CODE: RYQ0

LOCATION: The confluence of the old River Ray and the new River Ray

N.G.R.: SP 543142

DATE FISHED: 8/5/90

METHOD: Upstream electrofishing, wading, 2 anodes

R.Q.O.: 3

E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 111m

MEAN WIDTH (RANGE): 9m (8-11m)

AREA: 999sqm

MEAN DEPTH (RANGE): 1.3m (1.1-1.6m)

WATER TEMPERATURE: 20 degrees C

SUBSTRATE COMPOSITION (%)

BARE: 70 MUD & SILT: 30 GRAVEL: 0 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 30 FLOATING: 10 EMERGENT: 30 SHADE: 15

DOMINANT PLANT SPECIES(AQUATIC): Scirpus. Nuphar

WATER LEVEL: Normal, but very poor flow

WATER CLARITY: Clear

PHYSICAL STRUCTURE OF SITE: Canalised profile with steep banks, even bed and overwide channel. The survey section was straight, the upstream run had several bends. The habitat is recovering with time, as the bankside vegetation matures, and the emergent vegetation narrows the channel. The latter results in a stronger centre flow and less silt deposition.

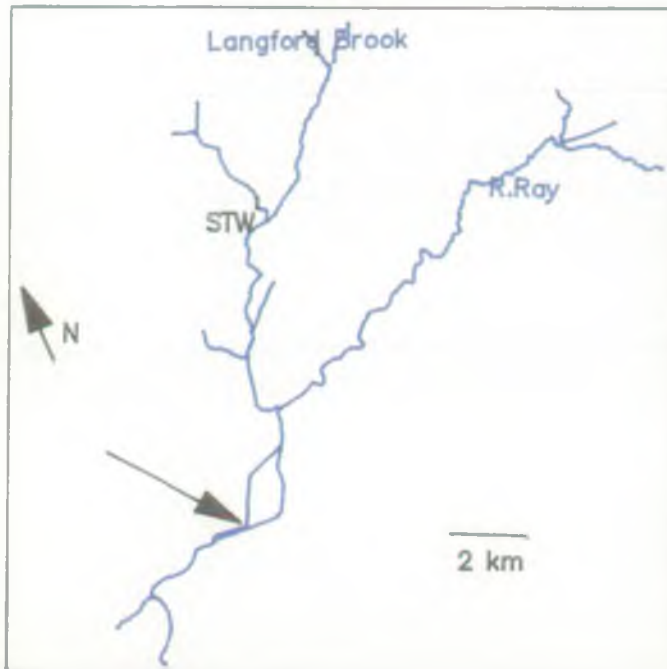
ADJACENT LAND USE: L.B. Scrub and permanent pasture
" " " R.B. Arable and permanent pasture








RIPARIAN OWNERS: L.B. & R.B. Mr J.Smith

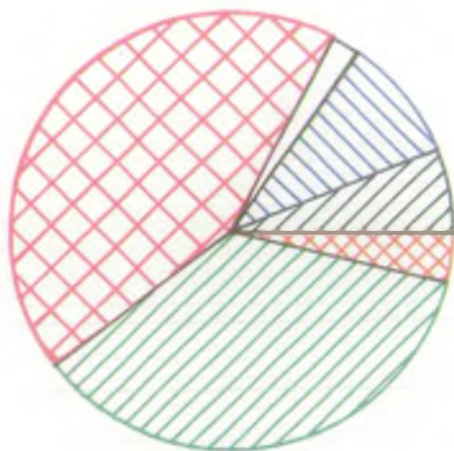
FISHING RIGHTS: L.B. & R.B. Mr Smith

COMMENTS: Minnows were present and roach fry common. An upstream run of 185m produced 11kg of fish (a biomass of 8.5g/sqm). The upstream section was deeper than the survey section. Allowing for the reduced efficiency would suggest a true upstream biomass of between 15 and 20g/sqm. The survey section had a biomass of 20g/sqm which just meets the target for a cyprinid water. The results are better than those obtained at the next 3 sites upstream. This is probably due to the better habitat, and the improved water quality. (This site is a reasonable distance downstream of Bicester STW)

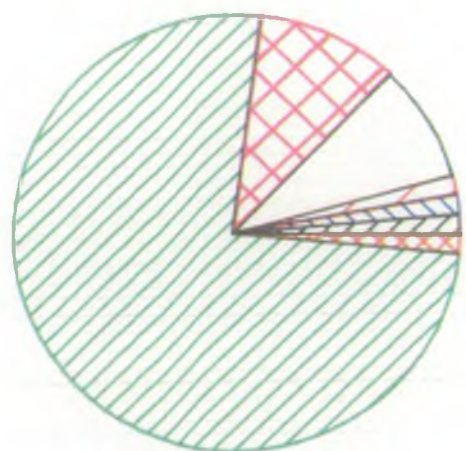
Site RYQ0 (Old River Ray Confluence) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Bream	1.2	0.001
 Chub	1.8	0.001
 Dace	0.1	0.001
 Perch	0.4	0.006
 Pike	8.6	0.007
 Roach	7.1	0.052
 Tench	0.7	0.001
TOTAL	20.0	0.071

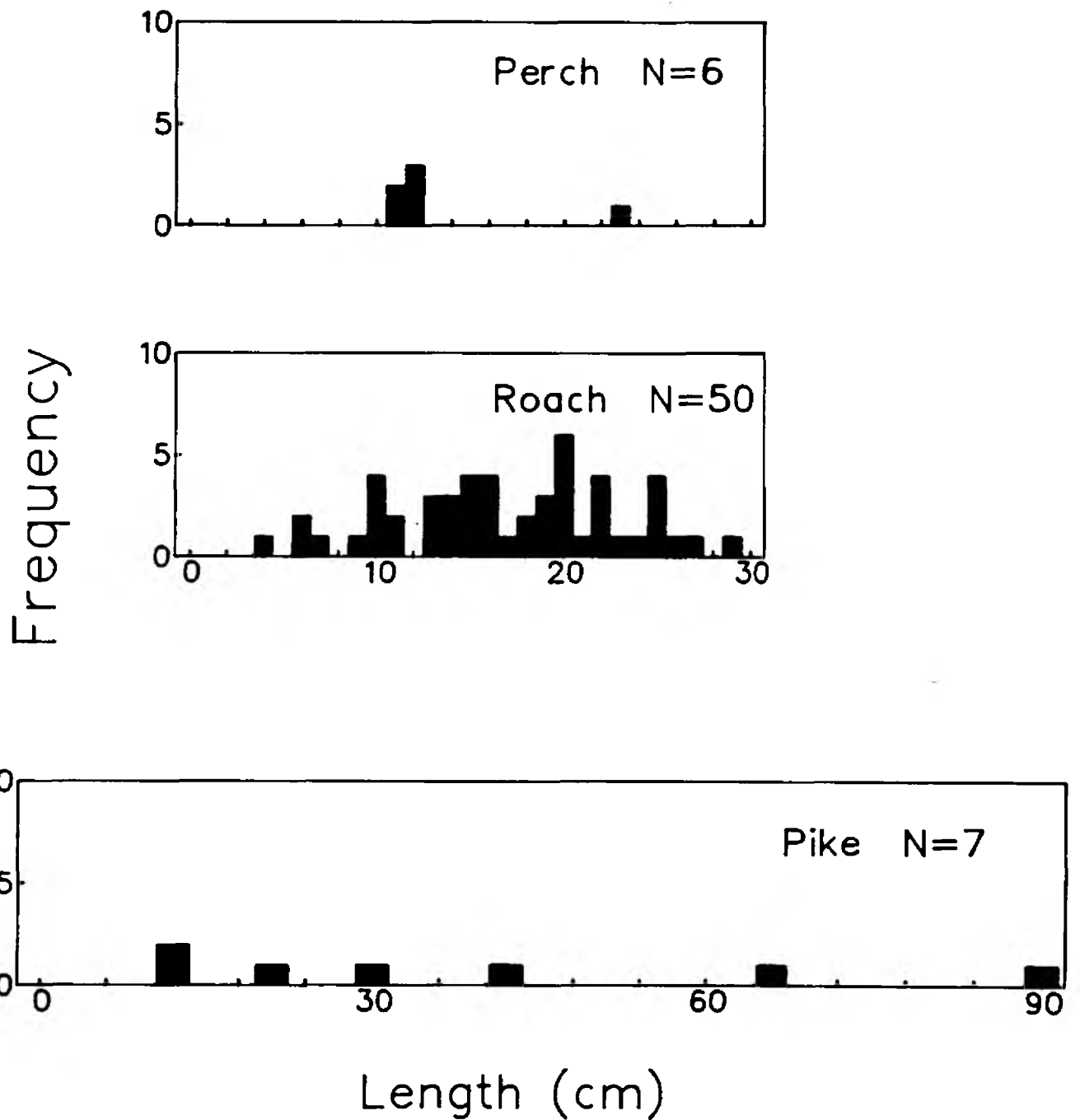


Biomass



Density

Site RYQ0 (Old River Ray Confluence)
Length Frequency



SITE REPORT

WATERCOURSE: River Ray (Oxon)

SITE NAME: Islip

SITE CODE: RYQA

LOCATION: Upstream of road bridge

N.G.R.: SP 529138

DATE FISHED: 14/9/89

METHOD: Upstream electrofishing, wading, 2 anodes
(Technical problem - should have been 3 anodes), 3 runs

R.Q.O.: 3

E.C. TARGET BIOMASS: N/A

HABITAT FEATURES

LENGTH: 85m

MEAN WIDTH (RANGE): 12.0m (10.0-14.0m)

AREA: 1020sqm

MEAN DEPTH (RANGE): 1.1m (1.0-1.5m)

WATER TEMPERATURE: 15degrees C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

SUBMERGED: 5 FLOATING: 20 EMERGENT: 5 SHADE: 60

DOMINANT PLANT SPECIES(AQUATIC): Sparganium, Nuphar

WATER LEVEL: Little flow

WATER CLARITY: Clear

PHYSICAL STRUCTURE OF SITE: Straight, other than one bend.
Over wide and over deep, but good cover from overhanging
trees. Upstream habitat is narrower with more abundant weed
growth.

ADJACENT LAND USE: L.B. Permanent pasture

" " " R.B. Small copse and meadow

RIPARIAN OWNERS: L.B. Mr J.Sherrell

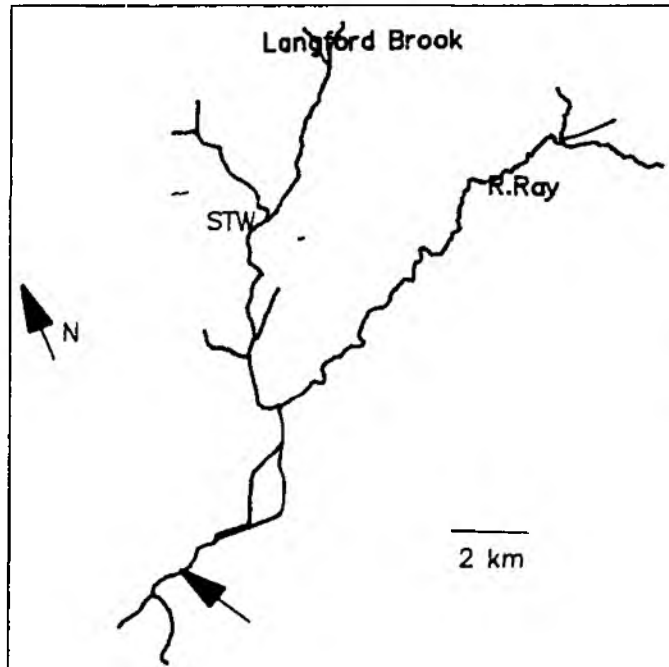
" " R.B. Mr Bill Henman






FISHING RIGHTS: L.B. Mr J.Sherrell

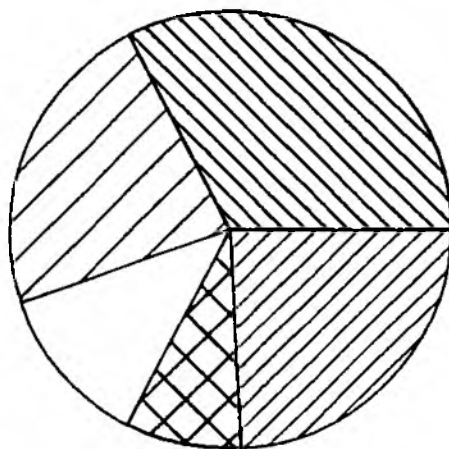
" " R.B. Oxford Angling and Preservation Society

COMMENTS: An upstream run of 57m produced 12.5kg, mostly
quality roach (a biomass of 54.7g/sqm). In the survey
section, roach and dace fry were common. The biomass of
13.1g/sqm fails to meet the target of 20g/sqm. However
the site is frequently inhabited by a shoal of large
chub, which were not present on the day of the survey. In
addition, the excellent results from the upstream run
indicate that this is a good fishery.

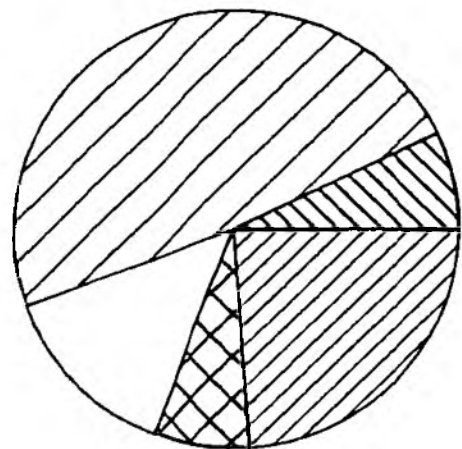
Site RYQA (Islip) Biomass and Density



	Biomass (gm-2)	Density (nm-2)
 Chub	4.3	0.007
 Dace	3.0	0.047
 Perch	1.6	0.013
 Pike	1.1	0.007
 Roach	3.1	0.023
TOTAL	13.1	0.097

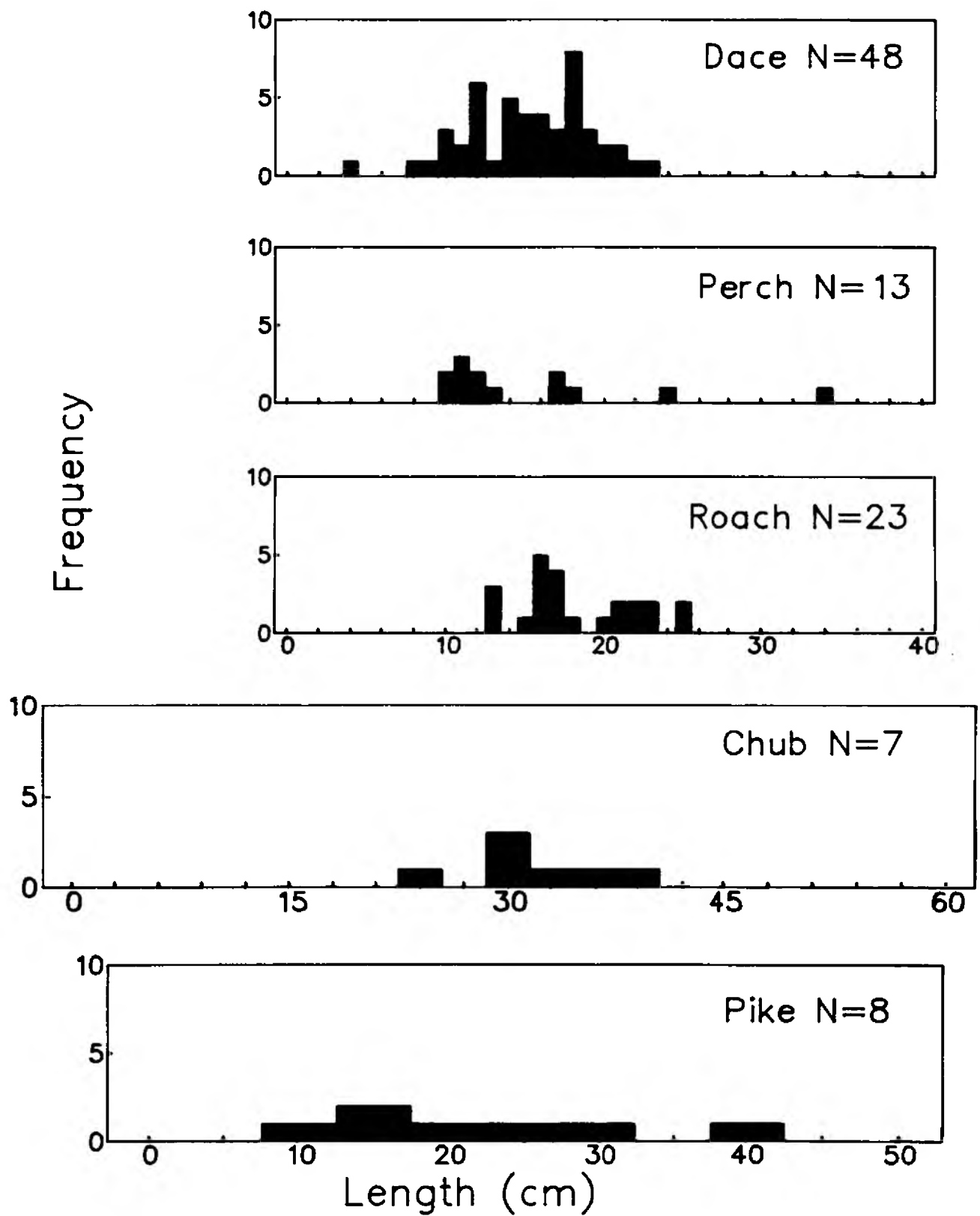


Biomass



Density

Site RYQA (Islip) Length Frequency



5.2. SURVEY RESULTS

GROWTH CURVES

Growth rates were broadly comparable to the standards particularly for roach, dace and pike. The growth curve for chub is erratic, almost certainly due to small sample size.

The growth curve for bream is interesting in that it suggests fast growth in the large fish. However this can be at least partly explained by the date of capture of the larger fish which was in March, i.e. almost a complete growing season after a nominal birthday of May/June.

5.3. FISH HEALTH

The fish sample for this survey was taken from the site at the confluence of Old River Ray and the New River Ray (RYQ0).

The biologist reported the fish as being in good condition with a varied parasite population but loadings were insignificant.

The water quality at this site is generally better than at sites nearer to the STW discharge, and the fish caught just below the Langford Brook confluence (site RYQ6) appeared to be in poorer condition.

Fig 5.2.1 Growth Curve for Dace

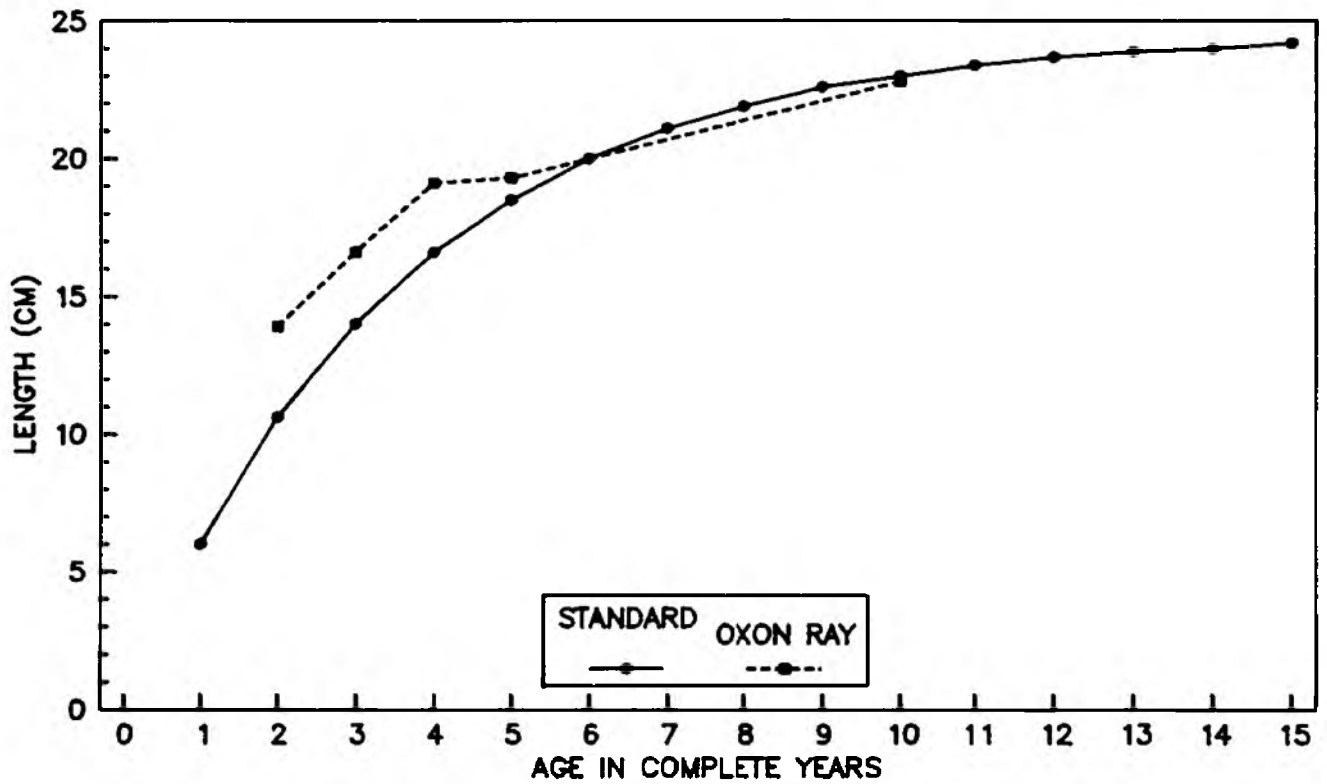


Fig 5.2.2 Growth Curve for Chub

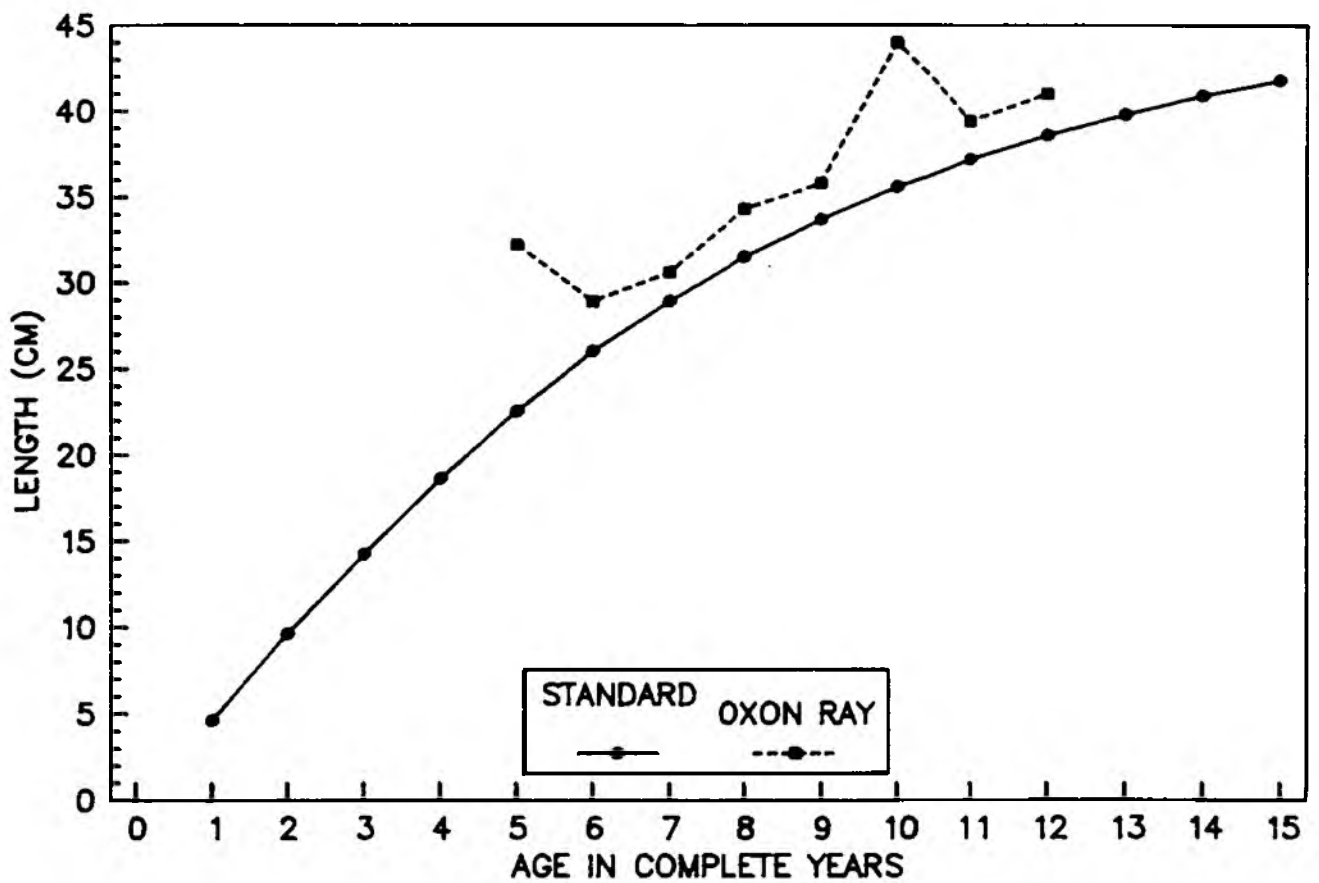


FIG. 5.2.3 Growth Curve for Bream

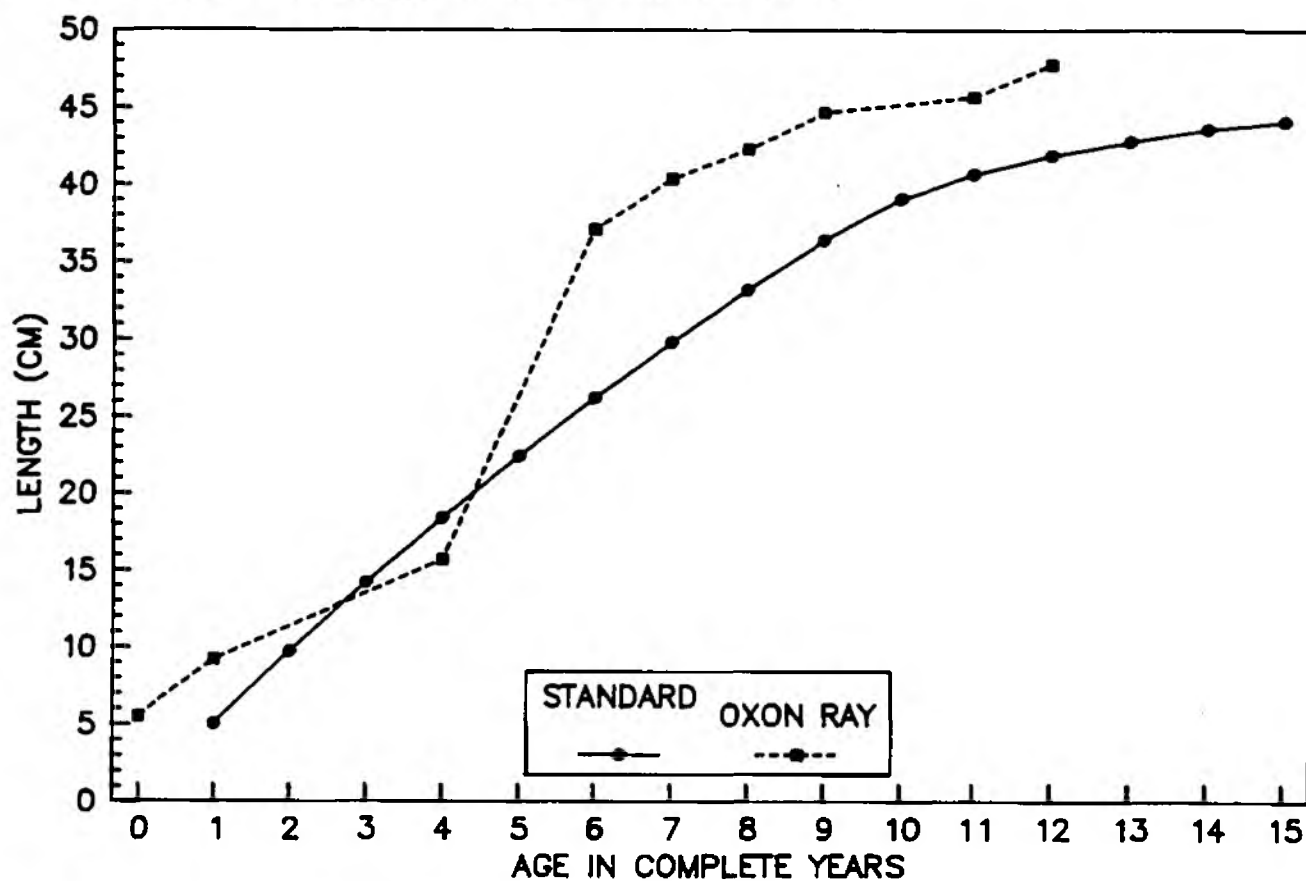


FIG. 5.2.4 Growth Curve for Roach

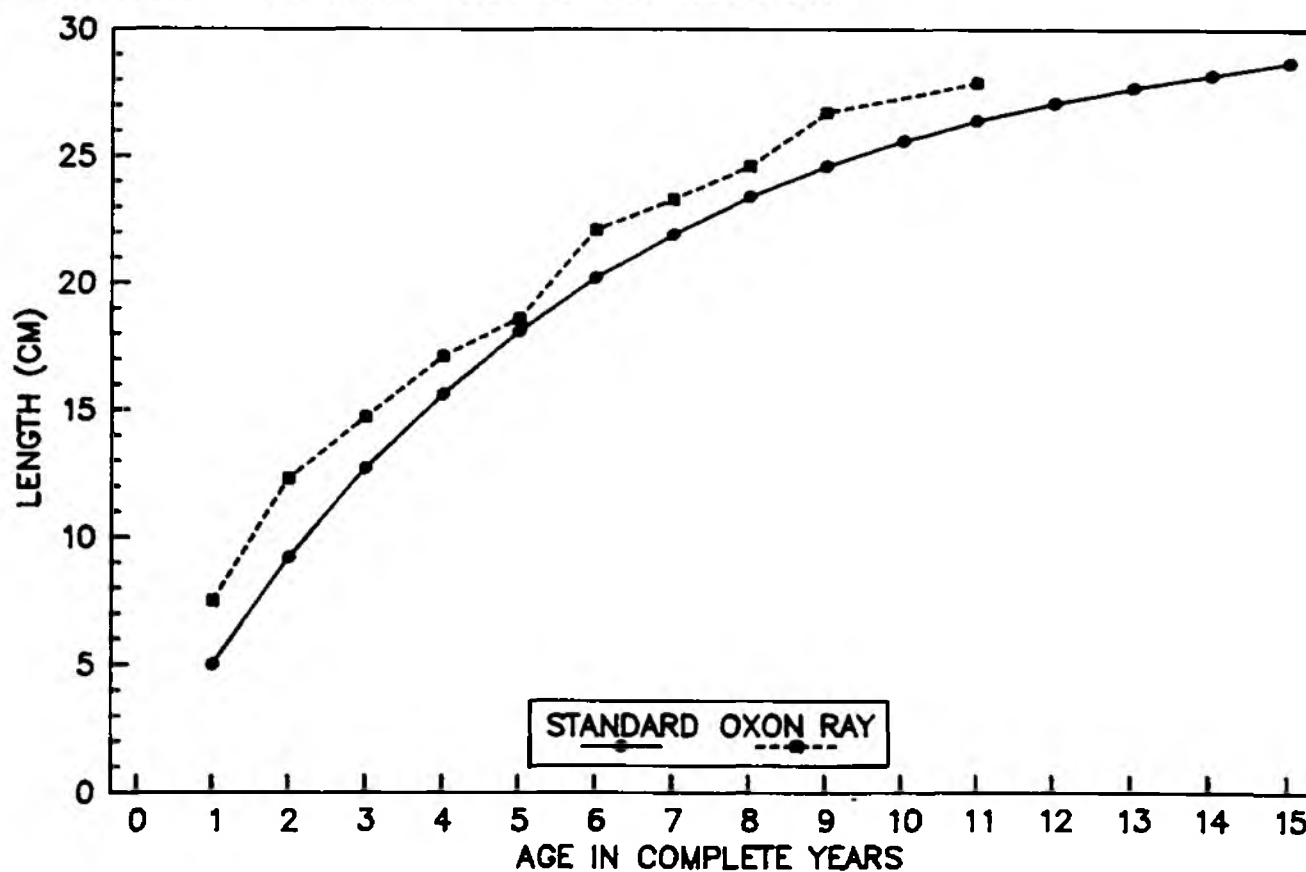
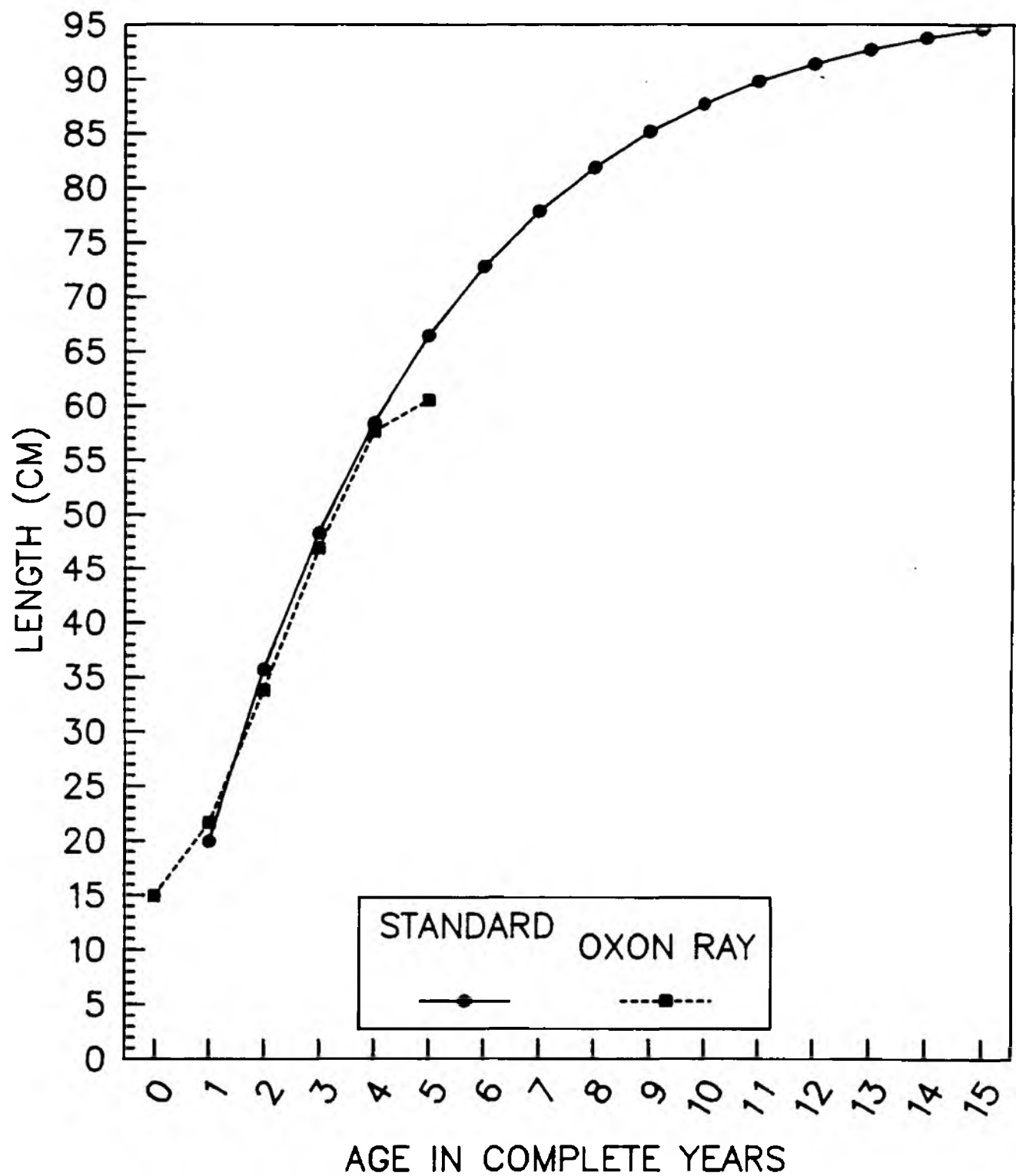


FIG. 5.2.5 Growth Curve for Pike



5.4. WATER QUALITY

Fig. 5.4.1 shows that the effluent from Bicester STW was of a poor quality in 1979. It had deteriorated further in 1989, particularly in respect of ammoniacal nitrogen, and was no longer complying with its consent standards. The derogated standard presently set for Bicester STW will be changed to a standard of 25/12/8 when improvement works are complete. Dilution by the Langford Brook is approximately 1 in 2 during low summer flows. As Bicester expands, the volume of effluent will increase and the dilution factor will decrease. It is also proposed to divert sewage previously treated at Merton STW to Bicester STW.

Bicester STW has a dramatic effect on the water quality of the Langford Brook. In 1989 samples taken below the works (Wendlebury crossing) compared to samples taken above the works (A41) show a 4-fold increase in mean BOD, and a twentyfold increase in ammoniacal nitrogen. The River Ray itself also shows a deterioration in water quality below the confluence of the Langford Brook. (Merton STW also discharges into the section of river between the 2 sample points and will also have some influence on water quality). B.O.D. increases twofold and mean oxygen concentrations are 11% lower.

There is a noticeable trend of water quality improvement further downstream on the River Ray as the natural biological processes clean up the river. The aerating action of 2 weirs assist this process.

Above Bicester STW on the Langford Brook and above the Langford Brook confluence on the River Ray, water quality is also affected by a number of smaller STWs either discharging directly or via smaller tributaries.

5.5. BIOLOGICAL MONITORING

The limited amount of data available from macroinvertebrate monitoring is shown in Fig. 5.5.1.

Scores are significantly lower than predicted, especially on the Langford Brook. This is presumed to be the result of poor water quality.

Fig 5.4.1. BICESTER STW EFFLUENT QUALITY
(1979 & 1989)

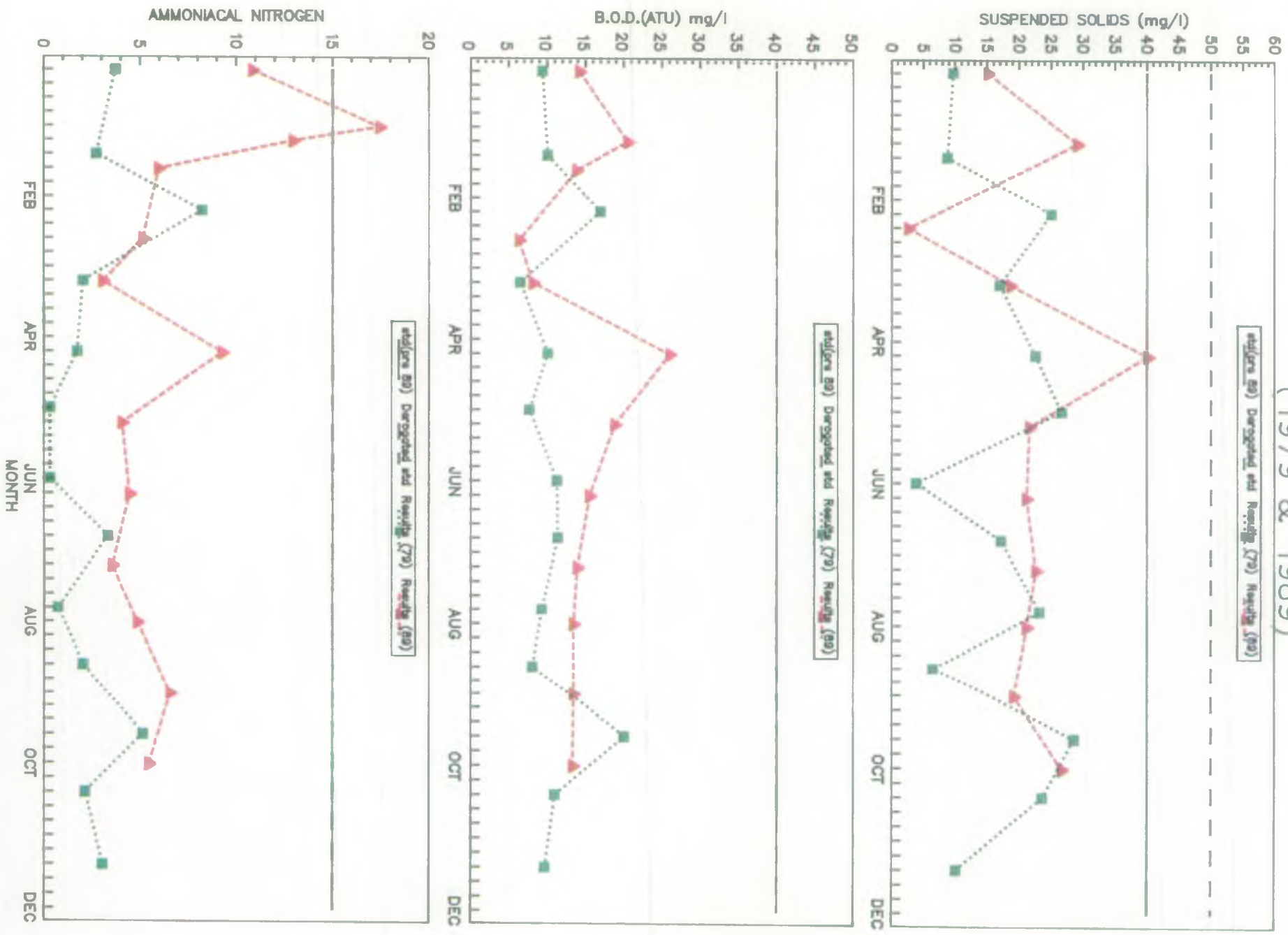
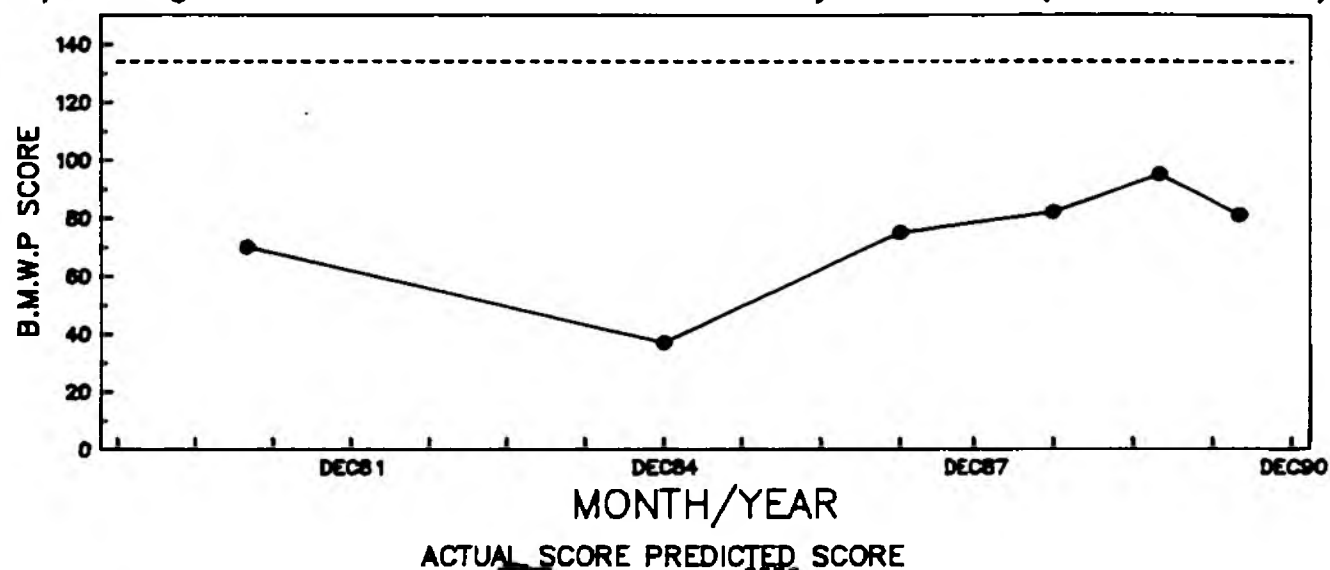
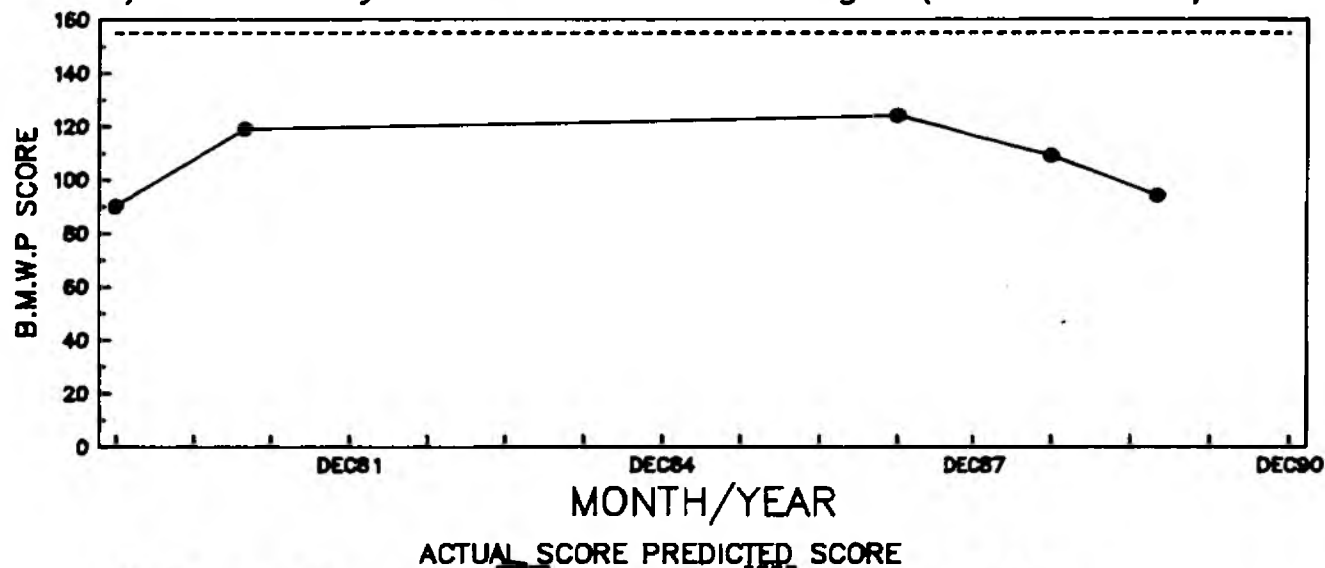


FIG.5.5.1 BIOLOGICAL MONITORING RESULTS 1979-90

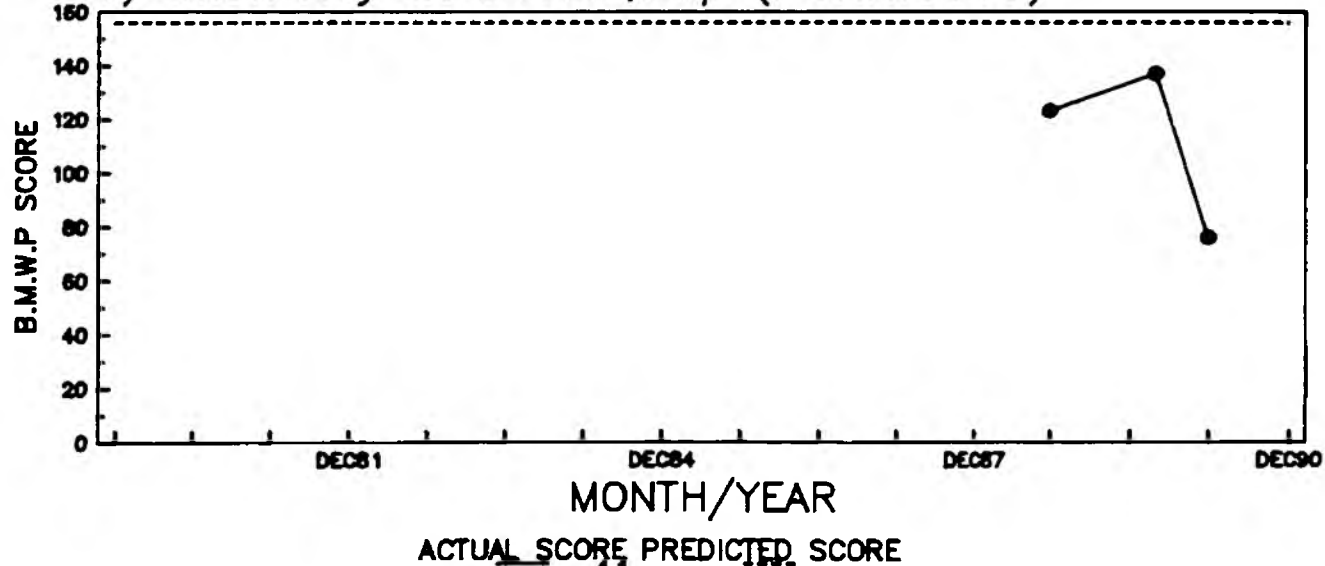
a) Langford Brook above Oxon Ray, Merton (PCHR.0030)



b) Oxon Ray at Fencott rd Bridge (PCHR.0041)



c) Oxon Ray at B4027, Islip (PCHR.0040)



6. DISCUSSION

The upper River Ray from source to Merton STW outfall (approximately 21km) was extremely difficult to survey due to extremely low summer flows and excessive vegetation. Fish are present throughout most of this length as observed from the bankside and from local knowledge.

Only 1 site was fished in this section, the biomass was poor and dominated by small pike.

The river changes at Merton STW due to the increased size of river and the assured flow. The site below the outfall produced an incredible 91.6g/sqm of fish, the majority of which were caught immediately below the outfall. It is likely that this result is not typical of the section and that further downstream fish populations would be much lower. This phenomenon of high fish density directly below STW outfalls has been observed on previous surveys including the Wiltshire Ray at Swindon STW, the River Wye at High Wycombe, the River Thames at Aylesbury and the River Cherwell at Banbury.

The Langford Brook site just achieves the target biomass for a cyprinid fishery of 20g/sqm almost certainly because the Langford Brook is relatively swift flowing and has small weirs to provide re-aeration. It was noticeable that there were few larger fish in the Langford Brook, most were in the 0+ or 1+ age groups.

The swift flowing Langford Brook carried the effluent from Bicester STW to the confluence with the River Ray. At this point the River Ray is over-wide and deep. There is consequently a tendency for this poor quality water to stagnate and also drop its load of suspended solids. This results in a thick layer of black anaerobic mud and low D.O. levels, particularly in summer. 17.7g/sqm of fish were caught in the site below the Langford Brook confluence. This was dominated by pike and small fish. By contrast, a qualitative look upstream of the confluence produced some excellent quality fish including specimen pike and perch.

At Charlton-on-Otmoor, dissolved oxygen levels are raised by the weir. However, only 8.2g/sqm of fish were caught. This may be due to the poor habitat and that the site was fished after a period of high flows (fish on the River Ray appear to be highly mobile - see later). Many fish which reside here may have swum downstream to avoid the strong current in the narrow section below the weir.

At Logg Farm the biomass was 17.6g/sqm, however the upstream run showed one of the problems of the River Ray. At least 100m of river did not yield a single fish, then a fairly large shoal of medium sized roach was encountered. The fish do appear to be highly mobile and frequently in tight shoals. This effect was less noticeable at sites/ sections with good habitat.

Below the confluence of the Old River Ray and New River Ray, the biomass attained the target for a cyprinid site of 20g/sqm. This improvement probably reflects the improvements in water quality.

At Islip the upstream run was the more representative biomass (see site report) at 54.7g/sqm (minimum estimate) reflecting the further improvement in water quality. Although the channel is too wide, habitat is generally

much improved at this site.

Sewage treatment works effluent comprises a high percentage of the dry weather flow in the River Ray. This factor, combined with canalisation and very low summer flows has a drastic effect on water quality.

The habitat of the River Ray has been impoverished by; creation of a new straighter channel as in the New River Ray, canalisation of existing channels, and manipulation of water levels by various weirs or other structures. It has become a land drain, similar to rivers and drains in the East Anglian Fens and the Somerset levels. Many of these waters support excellent fisheries with valuable wildlife resources.

The River Ray could support a good fishery if water quality were improved. This is shown by the survey results at Merton and Islip.

At present the river quality objective for the entire length of the River Ray is only Class 3. An actual water quality of Class 3 will not support a good coarse fishery and consideration of this factor should be borne in mind when reviewing water quality standards.

Bicester STW is by far the largest discharge into the Ray catchment, and its effect on the River Ray has caused concern for many years. In 1986 and 1987 complaints were received from angling interests on the river and from the Fisheries Consultative Committee. Within Thames Water, Fisheries and Pollution staff voiced concerns over the Ray and the need for an extensive study of the catchment. The Senior Fisheries Officer for the Upper Thames area voiced concern over the inadequacy of the new standards to be set for Bicester STW. These were 25mg/l suspended solids, 12mg/l BOD and 8mg/l of ammoniacal nitrogen, and were to be achieved after improvement works due for completion in late 1988. This timescale was not adhered to, and hence Bicester STW was derogated. The new standards set for after 1/4/90 (Stage 2) are still only 25/12/8. The town of Bicester is expanding rapidly and so the volume of sewage effluent will increase. This will further reduce the dilution of the effluent. The NRA will need to allow for these factors when reviewing the consent.

The habitat degradation is due to land drainage/flood defence work. The flat gradient, and predominantly surface run-off origin of the water, create a river that floods easily and regularly. Habitat improvements must be planned carefully, in co-operation with the flood defence department of the NRA. Additional tree cover and instream features would be of considerable benefit to the habitat.

At Charlton-on-Otmoor, it is likely that fish migrate downstream to avoid strong flows. It would be advantageous to the fishery to create flow variation in this straight section with groynes or other structures.

At Oddington, upstream of the new weir, there is the remains of an old stone structure (presumably the old weir) which creates diversity in the river bed. We caught a relatively large number of chub in the vicinity of this structure, this was the highest biomass of chub from any of the survey sites on the River Ray.

Land drainage and flood defence engineering over many years has led to a

paucity of river bed habitat. Stones and/or boulders could be placed on the bed to create diversity of habitat. Another idea worthy of consideration would be the creation of reefs, using natural or semi-natural materials e.g. bricks, clay pipes, boulders, etc. This would be most appropriate in wide deep sections such as downstream of the Langford Brook confluence.

Manipulation of the new weir structures would enable summer water levels to be lowered. This would reduce retention times and help to prevent stagnation, which would be beneficial to the fishery. However, the lower water levels may cause problems for livestock water supply. It may also lower the water table on Otmoor, thus affecting the diverse fauna and flora (part of Otmoor is designated as a Site of Special Scientific Interest).

7. RECOMMENDATIONS

1. The survey results show that fish populations in the River Ray are deleteriously affected by poor water quality...Significant improvements in the fish population are likely to occur if the water quality is improved.
2. Bicester STW, as the largest discharger to the River Ray system, has the most significant effects on water quality. Achieving a good quality effluent at Bicester STW would be essential for the maintenance and improvement of the fishery.
3. Habitat improvements, including groynes, reefs, bed improvements and tree planting should be considered, and discussed with flood defence engineers.
4. Water level management could be of benefit to the fishery but may have implications for farmers and wildlife. Discussions on this matter would be necessary before any proposals were put forward.

8. REFERENCES

1. The 8th Report of the Royal Commission on Sewage Disposal (1912).
2. 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.
3. Hickley, P. and Dexter, K.F. 1979. A comparative index for quantifying growth in length of fish. Fishery Management 10(4) 147-151.
4. National Rivers Authority - Thames Region 1989. A fisheries survey of the River Cherwell. Internal Report.
5. NRA Thames Region 1990. A fisheries survey of the River Ray (Wilts). Internal Report.
6. Thames Water 1987. A fisheries survey of the River Thame. Internal Report.
7. NRA Thames Region. Fisheries survey of the River Wye (unpublished data).

APPENDIX I

River quality classification

River Class	Quality criteria	Remarks	Current potential uses
1A Good Quality	<p>Class limiting criteria (95 percentile)</p> <ul style="list-style-type: none"> (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) 	<ul style="list-style-type: none"> (i) Average BOD probably not greater than 1.5 mg/l (ii) Visible evidence of pollution should be absent 	<ul style="list-style-type: none"> (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	<ul style="list-style-type: none"> (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) 	<ul style="list-style-type: none"> (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	<ul style="list-style-type: none"> (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) 	<ul style="list-style-type: none"> (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 	<ul style="list-style-type: none"> (i) Waters suitable for potable supply after advanced treatment (ii) Supporting reasonably good coarse fisheries (iii) Moderate amenity value
3 Poor Quality	<ul style="list-style-type: none"> (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	<ul style="list-style-type: none"> (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 NH₄. (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. <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		$\leq 21.5^{\circ}\text{C}$ $\geq 1.5^{\circ}\text{C}$		$\leq 28^{\circ}\text{C}$ $\geq 3^{\circ}\text{C}$
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 HClO)		≤ 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 N.R.A. FISH SURVEY SITE CODING SYSTEM

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

1.EEC DESIGNATED WATERCOURSES

<u>Code</u>	<u>Description</u>
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.RDO WATERCOURSES

<u>Code</u>	<u>Description</u>
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 SH01 - SH=Shill brook, 0=2(RDO), 1=individual site.

Appendix v

N.R.A. - THAMES REGION

BIOLOGY (WEST)

FISH HEALTH EXAMINATION (SUMMARY)

TO: VAUGHAN LEWIS
AREA FISHERIES OFFICER
(UPPER THAMES)

FROM: WILLIAM YEOMANS
BIOLOGIST

DATE: 29 OCTOBER 1990

TEL: 0734 311422

CC: JOHN STEEL
AREA BIOLOGIST
(WEST)

FILE

EXAMINATION REF: WYF(S30)045

DATE RECEIVED: 8 MAY 1990

DATE COMPLETED: 26 OCTOBER 1990

EXAMINATION TITLE: RIVER RAY (OXON). AT LOGG FARM, ODDINGTON

NATIONAL GRID REF: SP 543 142

REASON FOR EXAMINATION: FISHERIES SURVEY

GENERAL COMMENTS

Fish in good condition but sample sizes small.

Parasite populations varied but loadings generally insignificant.

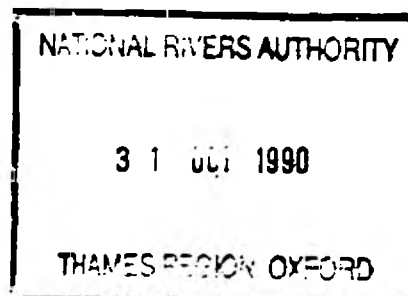
Myxobolus sp widespread but at low intensities.

CONCLUSION

No parasitological problems with the fish examined.

William E. Yeomans.

WILLIAM E YEOMANS
BIOLOGIST



EXAMINATION DETAILS

EXAMINATION REF: WYF(S30)045

FISH SPECIES	LENGTH RANGE (cm)	WEIGHT RANGE (g)	AGE RANGE	SEX
Dace	13.3 - 15.4	32.7 - 50.8	(1+)-(2+)	Male Female
Perch	17.7 - 21.5	88.5 - 137.2	(1+)-(2+)	Male
Pike	17.3 - 32.8	41.3 - 247.9	(1+)-(2+)	Male
Roach	11.7 - 26.4	29.7 - 350.3	(1+)-(4+)	Male Female

PARASITES PRESENT:

FISH SPECIES	NO EXAMINED	PARASITE	LOCATION	PREVALENCE (PERCENTAGE INFESTATION)	INTENSITY (DEGREE OF INFESTATION)
Dace	6	<i>Myxobolus sp</i>	Encysted on gills	33	Light
		<i>Diplostomum sp</i>	Lens	33	Light
		<i>Proteocephalus torulosus</i>	Gut	17	Light
Perch	2	<i>Acanthocephalus lucii</i>	Gut	100	Light/Moderate
Pike	2	<i>Myxobolus sp</i>	Gill Squash	50	Light
		<i>Henneguya sp</i>	Gill Squash	50	Light
		<i>Triaenophorus nodulosus</i>	Liver/Gut	50	Light
Roach	9	<i>Myxobolus sp</i>	Gill	78	Light/Moderate
		<i>Diplostomum sp</i>	Lens	22	Light
					Cont/...

...cont

PARASITES PRESENT:

FISH SPECIES	NO EXAMINED	PARASITE	LOCATION	PREVALENCE (PERCENTAGE INFESTATION)	INTENSITY (DEGREE OF INFESTATION)
		<i>Posthodiplostomum cuticola</i>	Skin	56	Light
		Unidentified Digenean	Gut?	11	Light
		<i>Dactylogyrus sp</i>	Gills	56	Light
		Unidentified Nematode	Gut?	11	Light
		Unidentified Acanthocephalan	Gut	11	Light

Appendix vi

Fish Mortalities

26/5/87 River Ray between Langford Brook confluence and new weir at Charlton on Otmoor.

Cause:-Silage and slurry pollution.

Losses:-Over 100 fish greater than 10cm long (roach, bream, tench, pike) and several hundred bullheads, gudgeon, small perch and ruffe.

5/6/87 Launton Brook

Cause:-Silage pollution

Losses:-2 pike, 30 sticklebacks observed (actual losses much greater but unseen due to dense weed growth)

Restocking

None, due to water quality problems.

Fishery Surveys

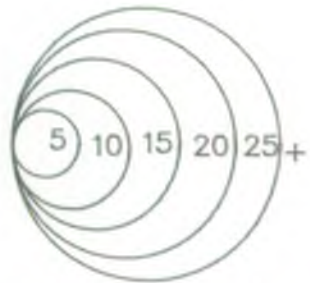
The section between the Langford Brook confluence and Charlton gates was surveyed using a boat with an electrofishing boom on two occasions with the following results.

	<u>1979</u>	<u>1985</u>
Roach	259	60
Tench	10	0
Dace	10	0
Pike	11	0
Crucian carp	4	0
Rudd	5	0

In addition on 21/5/85 the survey continued below the weir at Charlton on Otmoor where the following fish were observed.

	<u>20+cm</u>	<u>10-20cm</u>	<u>0-10cm</u>
Roach	54	283	15
Dace	19	25	5
Pike	6	13	8
Perch	0	2	0
Gudgeon	0	0	2
Rudd	7	0	0
Tench	5	0	0

SUMMARY OF BIOMASS FOR EACH SITE



biomass(g/sq.m.)

- Bloat
- Bream
- Dace
- Gudgeon
- Perch
- Pike
- Roach
- Chub
- Tench

