

NATIONAL RIVERS AUTHORITY

THAMES REGION

UPPER THAMES AREA

RIVER WYE
FISHERIES SURVEY
1990

HO

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Published April 1992

REF AWY90.



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1.0 SUMMARY.

1. Nine sites were fished with electrofishing equipment between 22/2/90 and 9/5/90.
2. The upper reaches of the Wye from source to High Wycombe sewage treatment works (STW) held negligible fish populations.
3. The site immediately downstream of High Wycombe STW was the only one to support a population where biomass and recruitment of brown trout and roach showed parity with similar rivers.
4. Brown trout populations consisted of older fish and were presumed to be in decline, being replaced at most sites by roach.
5. The Wye is a chalk stream relying on groundwater flow. Flows were lowered by climatic conditions. This was identified as one possible reason for poor fish populations.
6. Measures of water quality give conflicting results and further investigation of this subject would be useful to clarify possible impacts on fisheries.
7. The watercourse is rather featureless in many areas. Fish populations could be improved by the provision or encouragement of instream cover.

2.0 INTRODUCTION.

Figure 2.01 shows the River Wye from source to confluence, including major abstractions, significant discharges, fisheries survey sites, the flow gauging station, water quality sampling points and biological survey sites.

2.1 Description of the Watercourse.

The River Wye rises to the northwest of West Wycombe and flows in a southeasterly direction to West Wycombe House, where it fills a series of three estate lakes. From these lakes it divides into two arms, rejoins and flows underground, rising again in the centre of High Wycombe where the Hughenden Stream also joins. The river divides again to form a linear lake known locally as The Dyke (which is also spring-fed), and an eastern arm that continues in a south easterly direction as the River Wye. Water from The Dyke flows parallel to the Wye and is known as the Wycombe Marsh Brook. The two arms join at Loudwater and turns in a wide arc to the west, until at the confluence with the Thames it is flowing in a south westerly direction.

The river Wye₂ has a total length of 17.61km and a catchment area of 370km². Much of this catchment is industrial or residential development, or steep sided valley with a high proportion of tarmac, concrete or paved ground which gives the river a very flashy flow regime. Much of the original gravel bed has been replaced by trapezoidal concrete channelling and some culverting, especially in the more industrially developed upper reaches. Along some of its length the river is now over-wide and devoid of much natural habitat.

2.2 Geology.

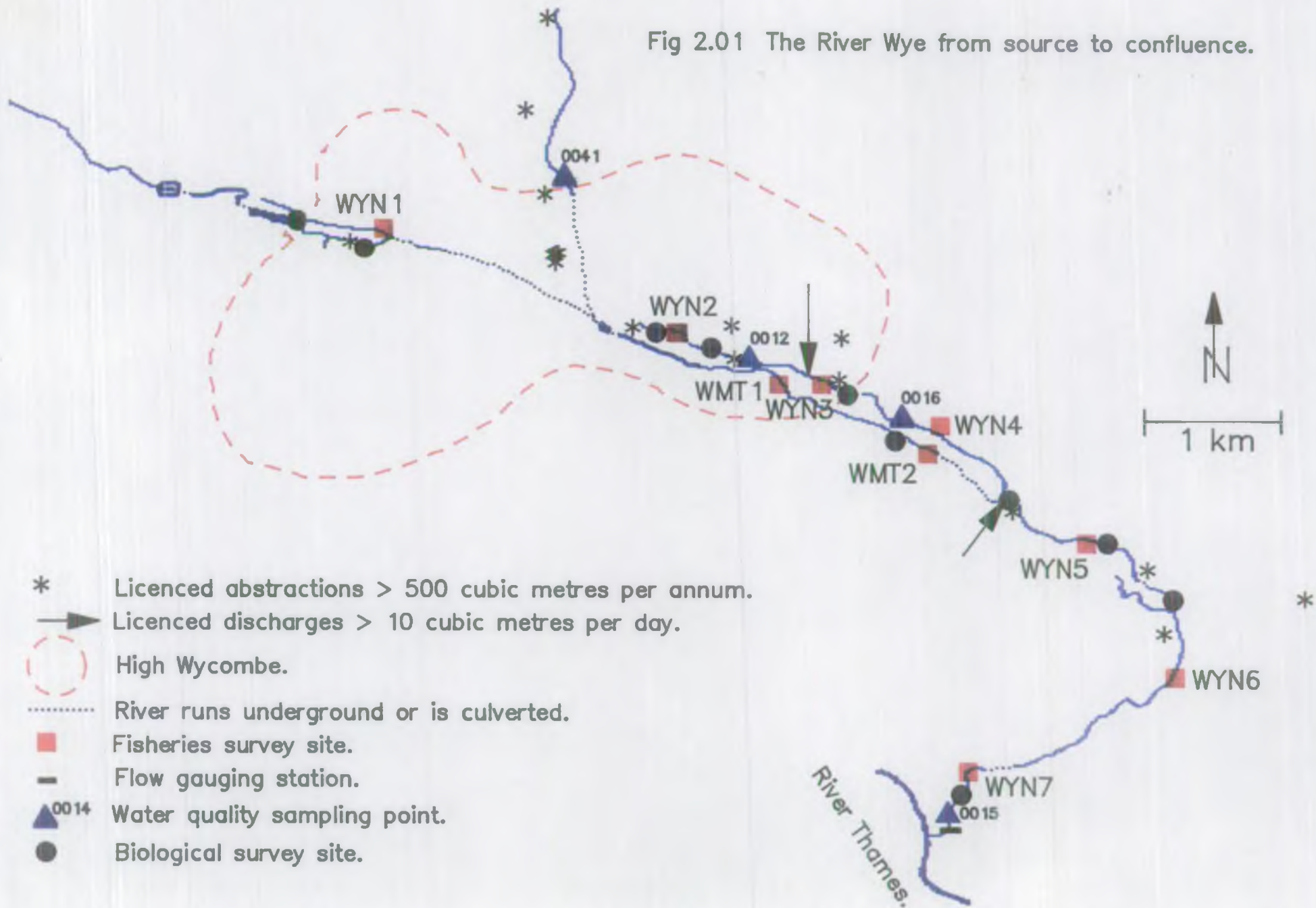
The source of the Wye is a series of springs and seepage lines issuing from middle chalk at West Wycombe. The springs support an ephemeral stream that regularly disappears as the water table falls, becoming established further downstream. The river has incised a deep valley through chalk which is maintained throughout the length of the system. The valley floor is covered with thick alluvium and terrace gravel deposits which are in hydraulic continuity with the river.

The Hughenden stream is generated from a similar chalk valley system and therefore does not affect the river's overall water quality imprint of chalk ground-water.

The river continues in a south easterly direction through High Wycombe flowing down the dip face of the chalk outcrop. To the north west of Loudwater the river flows over the junction of middle and upper chalk, and at Wooburn Green it turns in a south easterly direction where it is accompanied by considerably more alluvial cover, and some terrace gravel development. The Wye continues to the south west along the chalk valley to its confluence with the Thames, where there are extensive alluvial and river terrace deposits.

Flow is dependant on the chalk ground-water table, and as ground-water levels fluctuate, so the amount of base flow recharging to the watercourse varies.

Fig 2.01 The River Wye from source to confluence.



2.3 Hydrology.

Fig 2.31 shows the long term mean and 1989/90 monthly mean flow values for the River Wye at the Hedsor gauging station, 0.25 km from the confluence with the Thames. Annual net river flow for the 1989/90 water year was lower than the long-term mean. Fig 2.32 shows daily flows at Hedsor for the water year 1989/90 and portrays the flashy nature of river flow, due partly to the extent of industrial development in the area (see 2.1). Mean daily river flow at Hedsor gauging station for the water year 1989/90 was 0.892 cumecs. During this time, licensed discharges could amount to a total of 1.01 cumecs, which is 113% of mean daily flow.

2.4 Main Discharges and Pollution Incidents.

Of the 210 reported pollution incidents since 1987, 2 were category 1 (Major), 58 were category 2 (Significant) and 50 were category 3 (Minor). The major causative agents of each recorded incident are noted in Table 2.41 below.

Table 2.41. Pollution Incidents on the River Wye; 1987 to 1990.

N ^o of Incidents	Causative Agent
78	Oil
27	Chemical
9	Sewage
9	Natural
2	Agricultural
68	General
5	Runoff
12	Unknown

Table 2.42 Main Discharges to the River Wye and Hughenden Stream

Site	Max Flow m ³ /day	Conditions SS/BOD/Amm	NGR
R I V E R W Y E			
High Wycombe STW 'A'	94636	15/9/7 mgl ⁻¹	SU885920
Railko Ltd Cooling	654		SU902905
H U G H E N D E N S T R E A M			
Harrisons Ltd Cooling	100		SU864940
Harrisons Ltd Cooling	245		SU86694
Compair Ltd Cooling	336		SU863936

2.5 Fish Mortalities.

Pollution incidents involving fish mortalities have had a significant impact on fish populations in the river in the past ten years, including 5 major fish kills each amounting to a loss of over 500 fish. Since 1987 there have been 7 reported pollution incidents that have resulted in minor fish mortalities. Appendix V gives details of fish mortalities since 1978.

Fig 2.31 River Wye Mean Monthly Flow (CUMECS)
At Hedsor Gauging Station

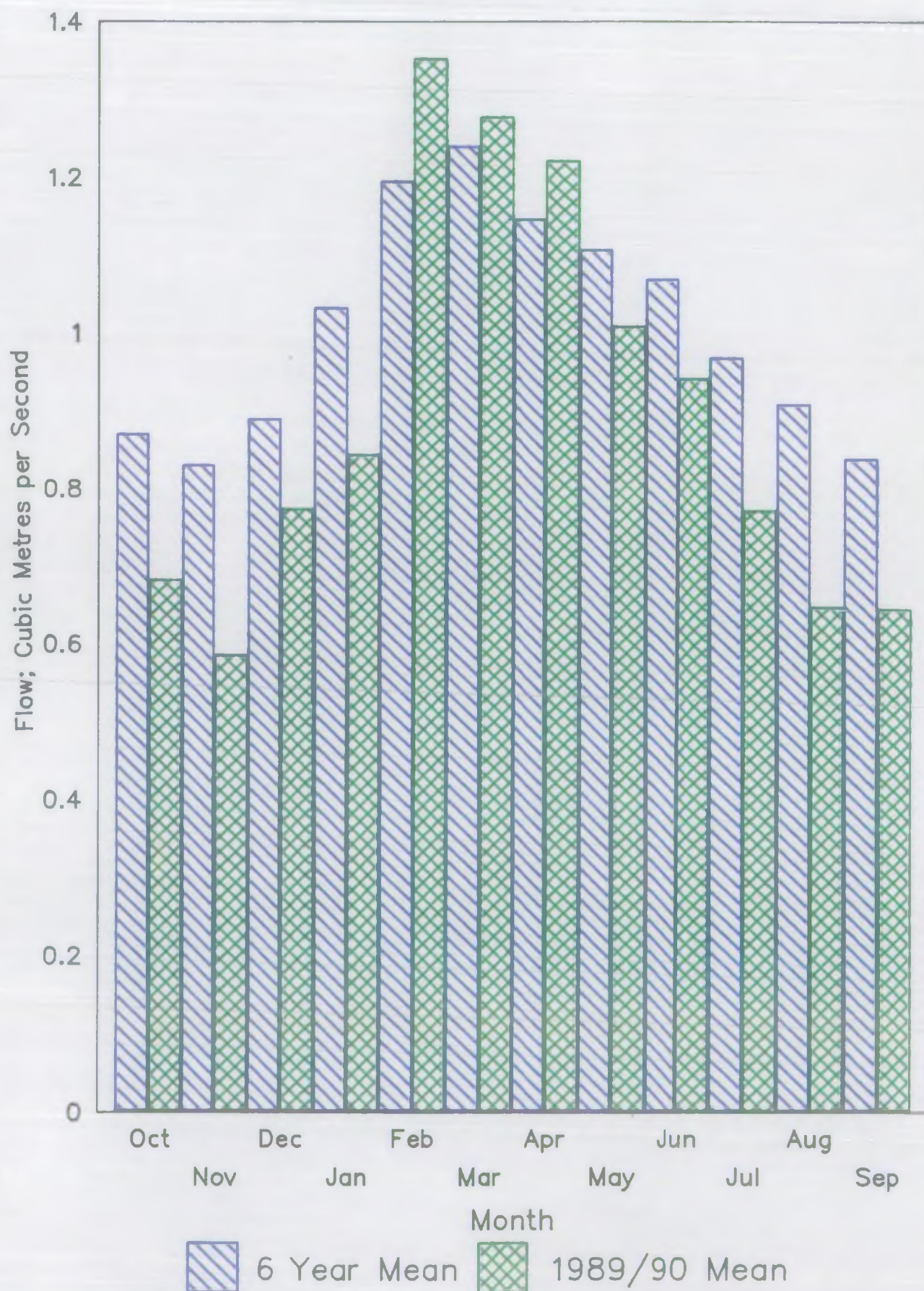
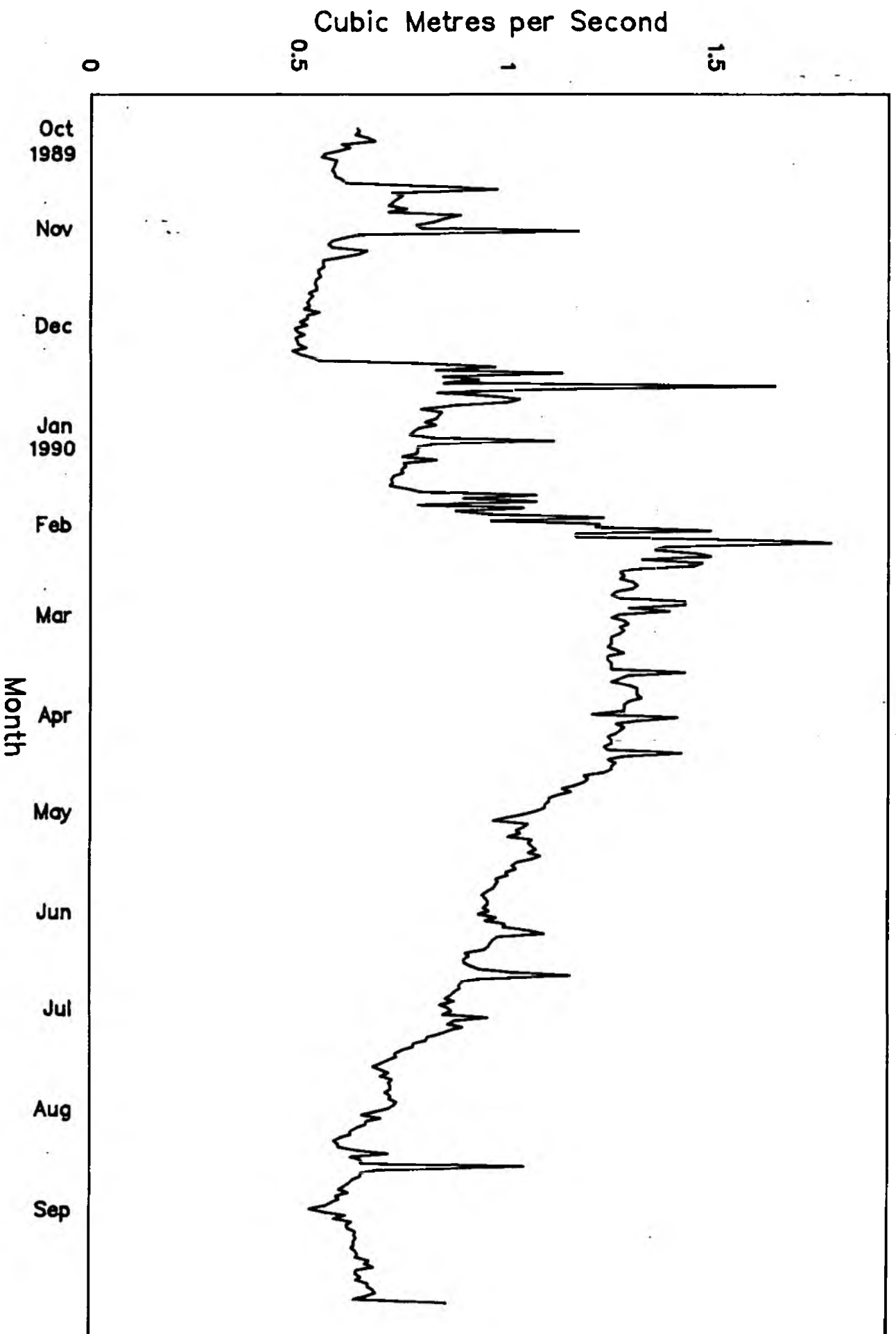
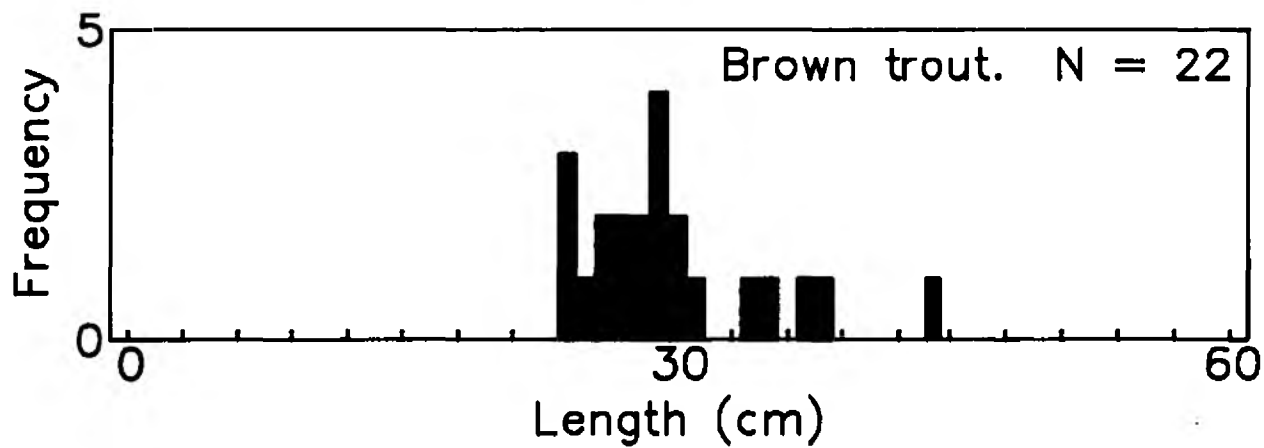


Fig 2.32 River Wye Daily Flow for Water Year 1989/90.



Site WYN4. Length Frequency.



5.17 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN5

SITE NAME: M40 Crossing.

LOCATION: M40 bridge, Wooburn Manor.

N.G.R.: SU906900

DATE FISHED: 19/4/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 4.0 gm-2

HABITAT FEATURES

LENGTH: 155 m

MEAN WIDTH: 7.5 m

AREA: 1162.5 m2

MEAN DEPTH: 0.5m

WATER TEMPERATURE: 12 °C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 25 GRAVEL: 60 STONE: 15 BOULDER: 0

VEGETATION (% COVER)

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

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: - The site was straight, with uniform depth and no pool/riffle or other significant instream features. Substrate was largely gravel and sandstone with some instream Ranunculus sp. and Callitriche sp.

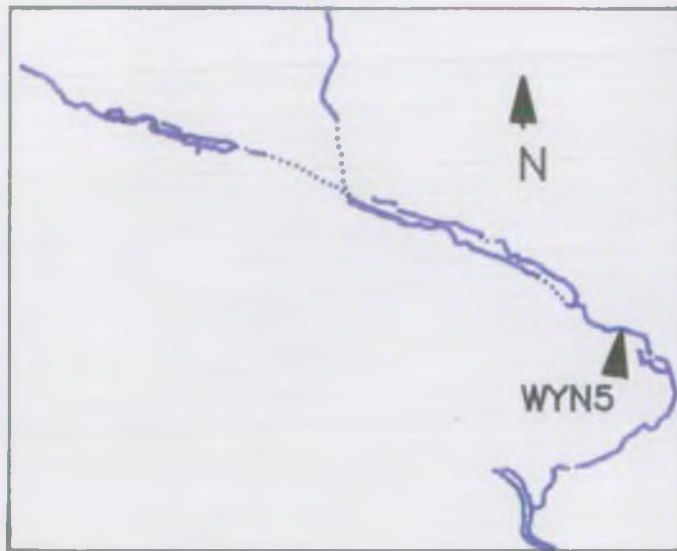
ADJACENT LAND USE: L.B. Retail store.
R.B. N/A




RIPARIAN OWNERS: L.B. Not Available.
R.B. " " "

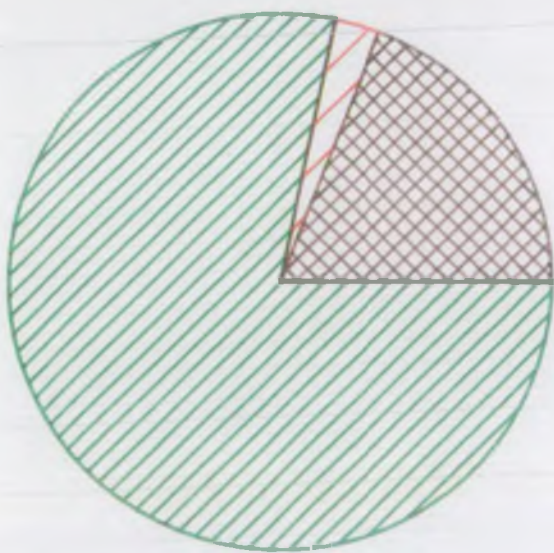
FISHING RIGHTS: L.B. Not Available.
R.B. " " "

COMMENTS: A poor biomass consisting mainly of several year classes of roach, indicating limited recruitment. The single brown trout was likely to be a survivor of past stocking, and it is clear that there has been no recruitment of either trout or dace. This site is 3km downstream of High Wycombe STW, and it is possible that the attendant problems of sewage discharge are influencing fish populations. An upstream run of 90 m by 7.9 m gave a biomass of 7.2 gm-2 of the same species. Several dead fish were found downstream of a surface water outfall that were victims of an unknown pollutant several days earlier.

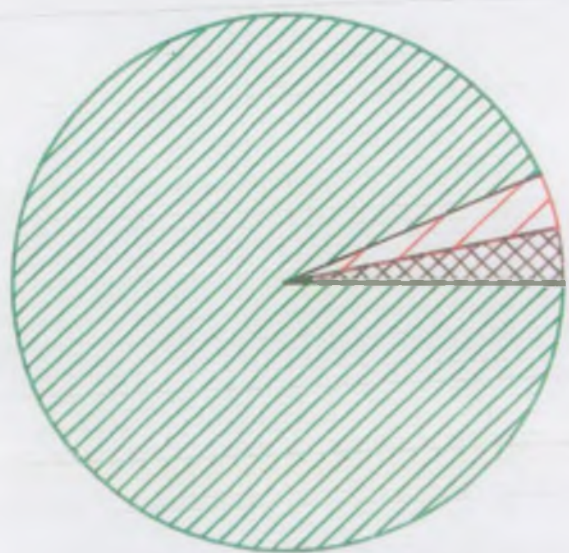
Site WYN5. Biomass and Density.



	Biomass (gm^{-2})	Density (nm^{-2})
 Brown trout	0.8	0.001
 Dace	0.1	0.001
 Roach	3.1	0.028
Total	4.0	0.030

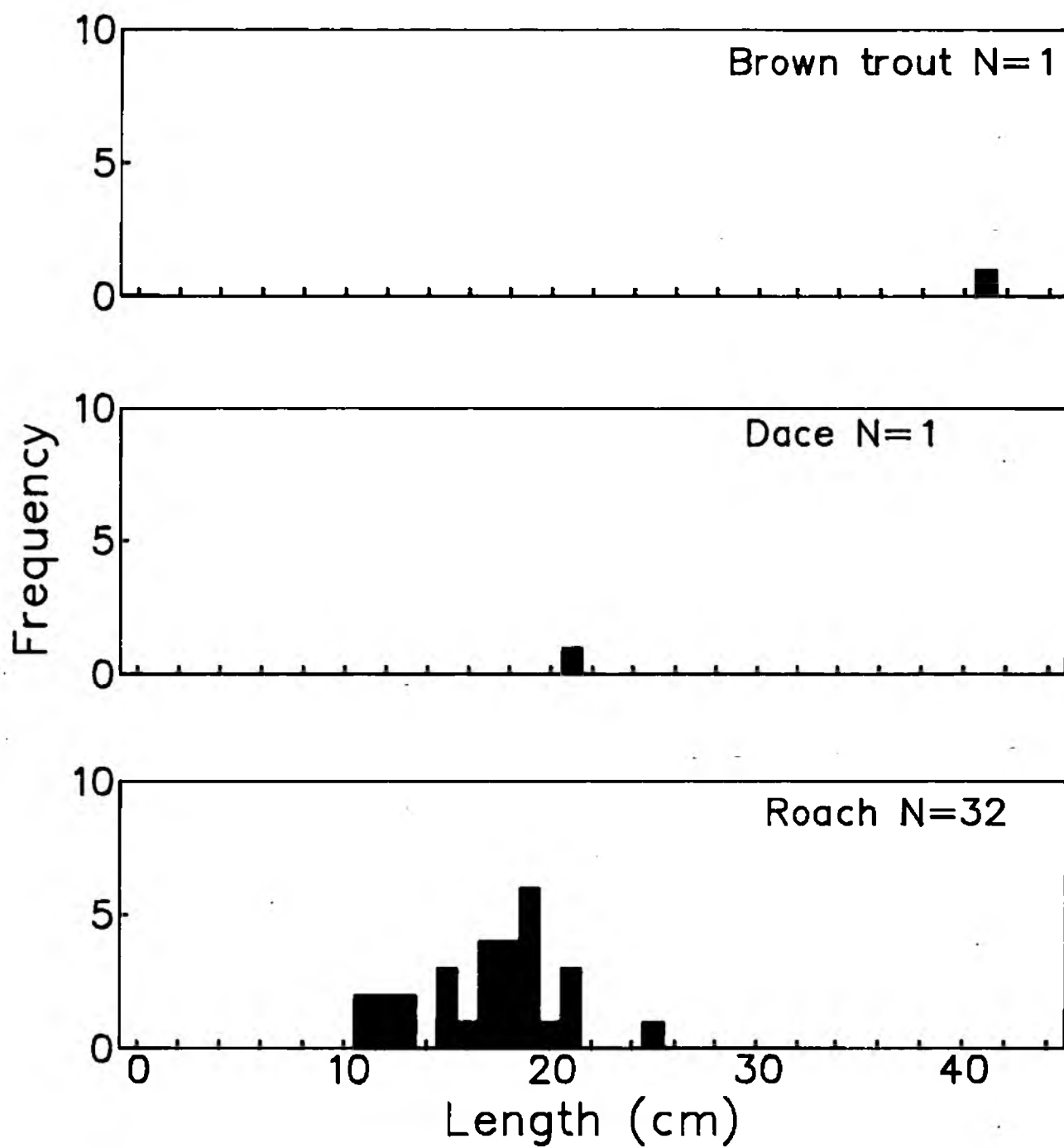


Biomass (gm^{-2})



Density (nm^{-2})

Site WYN5. Length Frequency.



5.18 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN6

SITE NAME: Road Bridge, Wooburn Green.

LOCATION: Wooburn Green.

N.G.R.: SU915885

DATE FISHED: 9/5/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 4.4 gm-2

HABITAT FEATURES

LENGTH: 173 m

MEAN WIDTH: 6.7 m

AREA: 1159.1 m2

MEAN DEPTH: 0.5m

WATER TEMPERATURE: 13 °C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 10 GRAVEL: 50 STONE: 40 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 30 FLOATING: 0 EMERGENT: 5 SHADE: 80

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: Straight section with uniform depth and no pool/riffle or other significant instream features. Substrate was largely gravel and stone with good instream and bankside vegetation, consisting of Ranunculus sp., Callitriche sp., Apium nodiflorum and Sparganium sp.

ADJACENT LAND USE: L.B. Pasture.
R.B. Pasture.


RIPARIAN OWNERS: L.B. Not Available.
R.B. " " "

FISHING RIGHTS: L.B. Not Available.
R.B. " " "

COMMENTS: Very poor biomass consisting only of several year classes of roach. There had been some successful recruitment to the population, but biomass and species diversity fall well short of what would be expected. An upstream run of 108 m by 6.5 m gave a biomass of 3.4 gm-2 of roach and pike. Both bullhead and stickleback were present in the survey and upstream section.

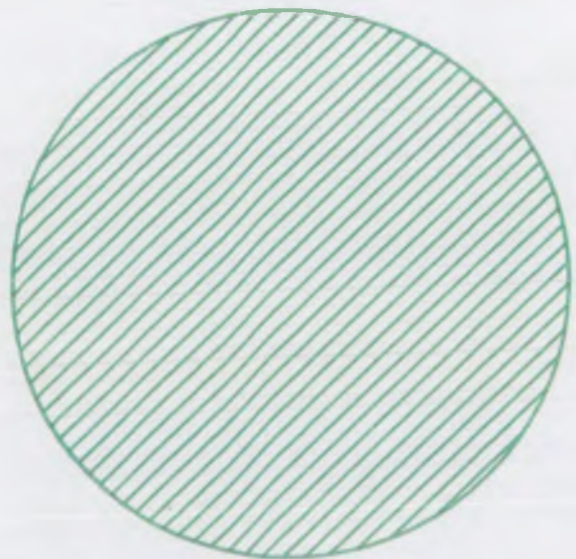
Site WYN6. Biomass and Density.



	Biomass (gm-2)	Density (nm-2)
 Roach	4.4	0.033
Total	4.4	0.033

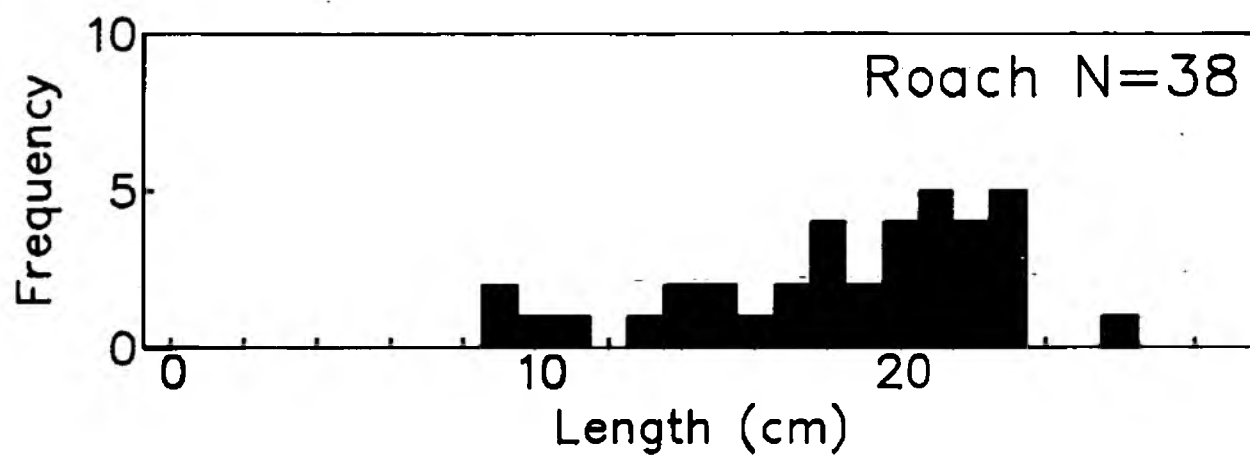


Biomass (gm-2)



Density (nm-2)

Site WYN6. Length Frequency



5.19 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN7

SITE NAME: Furlong Recreation Ground.

LOCATION: Bourne End.

N.G.R.: SU897873

DATE FISHED: 9/5/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 8.2 gm-2

HABITAT FEATURES

LENGTH: 182 m

MEAN WIDTH: 7.3 m

AREA: 1328.6 m²

MEAN DEPTH: 0.5m

WATER TEMPERATURE: 13 °C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 15 GRAVEL: 80 STONE: 5 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 20 FLOATING: 0 EMERGENT: 0 SHADE: 70

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Willow

WATER LEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: Straight section with pool/riffle and deeper runs. Substrate is largely gravel with good instream and bankside vegetation consisting of Ranunculus sp. and Potamogeton pectinatus. Some filamentous algae was present on instream features.

ADJACENT LAND USE: L.B. Industrial Estate.
R.B. Recreation Ground.





RIPARIAN OWNERS: L.B. Wooburn Green Parish Council.
R.B. Industrial properties.

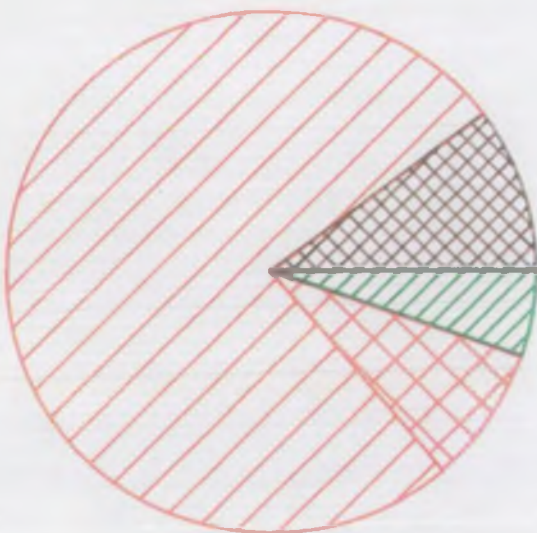
FISHING RIGHTS: L.B. Landowner.
R.B. Not Available.

COMMENTS: Poor biomass consisting largely of several year classes of dace, with associated predators (pike), brown trout and roach. There was no evidence of recruitment to the population and biomass still falls well short of what would be expected, especially at a site so close to the confluence with the Thames and with relatively good habitat. No upstream run was carried out.

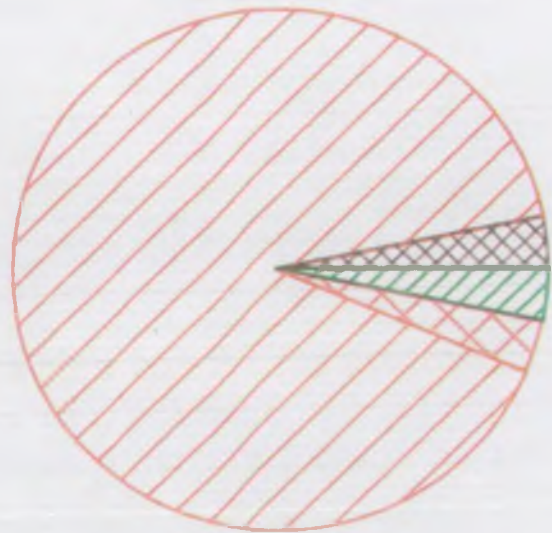
Site WYN7. Biomass and Density.



	Biomass (gm^{-2})	Density (nm^{-2})
 Brown trout	0.6	0.002
 Dace	6.2	0.056
 Pike	0.7	0.002
 Roach	0.4	0.002
Total	6.2	0.060

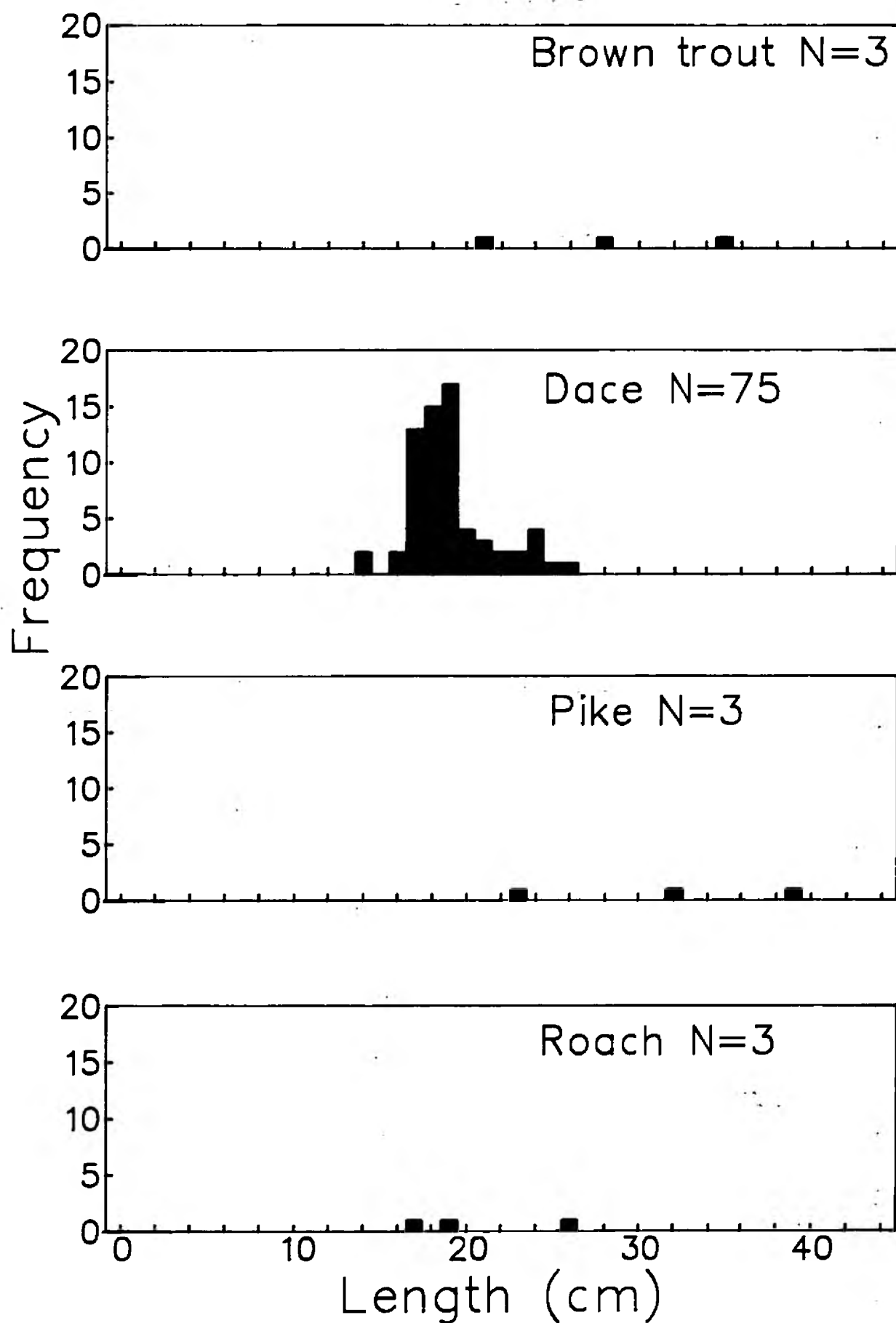


Biomass (gm^{-2})



Density (nm^{-2})

Site WYN7. Length Frequency.



5.2 Survey Results.

Figure 5.21 gives a summary of biomass data and species diversity for each site surveyed. Biomass values are represented by area and species by shading pattern.

5.3 Fish Health.

A total of 25 brown trout were examined for parasite loading and condition. The fish examined were taken from two survey sites; WYN2 (SU874927) upstream of High Wycombe STW and WYN4 (SU895914) downstream of High Wycombe STW. Fish from both sites were found to be in excellent condition with no significant parasite loading. The health examination reports are shown in Appendix VI.

An exercise was carried out in April 1988 to examine samples of fish and Gammarus taken from the River Wye for organochlorine and PCB content. A total of eleven brown trout and Gammarus samples were examined, and the results are presented in Appendix VIIa. These results can be compared with an analysis for specific PCBs in the liver of pike taken from the Wye in 1985, the results of which are shown in Appendix VIIb. These results are not commented upon in this report, however they will form part of further investigations into PCB and Organochlorine levels in fish tissue.

5.4 Water Quality.

Figure 5.41 shows the effluent quality in terms of suspended solids, biochemical oxygen demand and ammoniacal nitrogen for High Wycombe sewage treatment works (STW). A number of individual samples failed certain criteria in 1985 and early 1986, however effluent quality has since improved. Reaches monitored over the period 1985 to 1990 consistently attained an equal or higher quality than RQO, apart from one instance in 1989. This failure was caused by BOD where 4 of 26 samples failed the class 2 limit of 9mg/l.

Table 5.41 River Wye Reach Compliance With RQOs.

Reach	RQO	Class Achieved					
		1985	1986	1987	1988	1989	1990
West Wyc Park to High Wycombe STW (6.54 Km)	2B/ 1B	1B	2A	1A	1A	3	1A
High Wycombe STW to Glorymill Back (4.89 km)	2B/ 1B	2A	1B	1A	1B	2A	1B
Glorymill Back to Thames (4.27 Km)	2B/ 1B	2A	2A	1A	1A	1B	1A

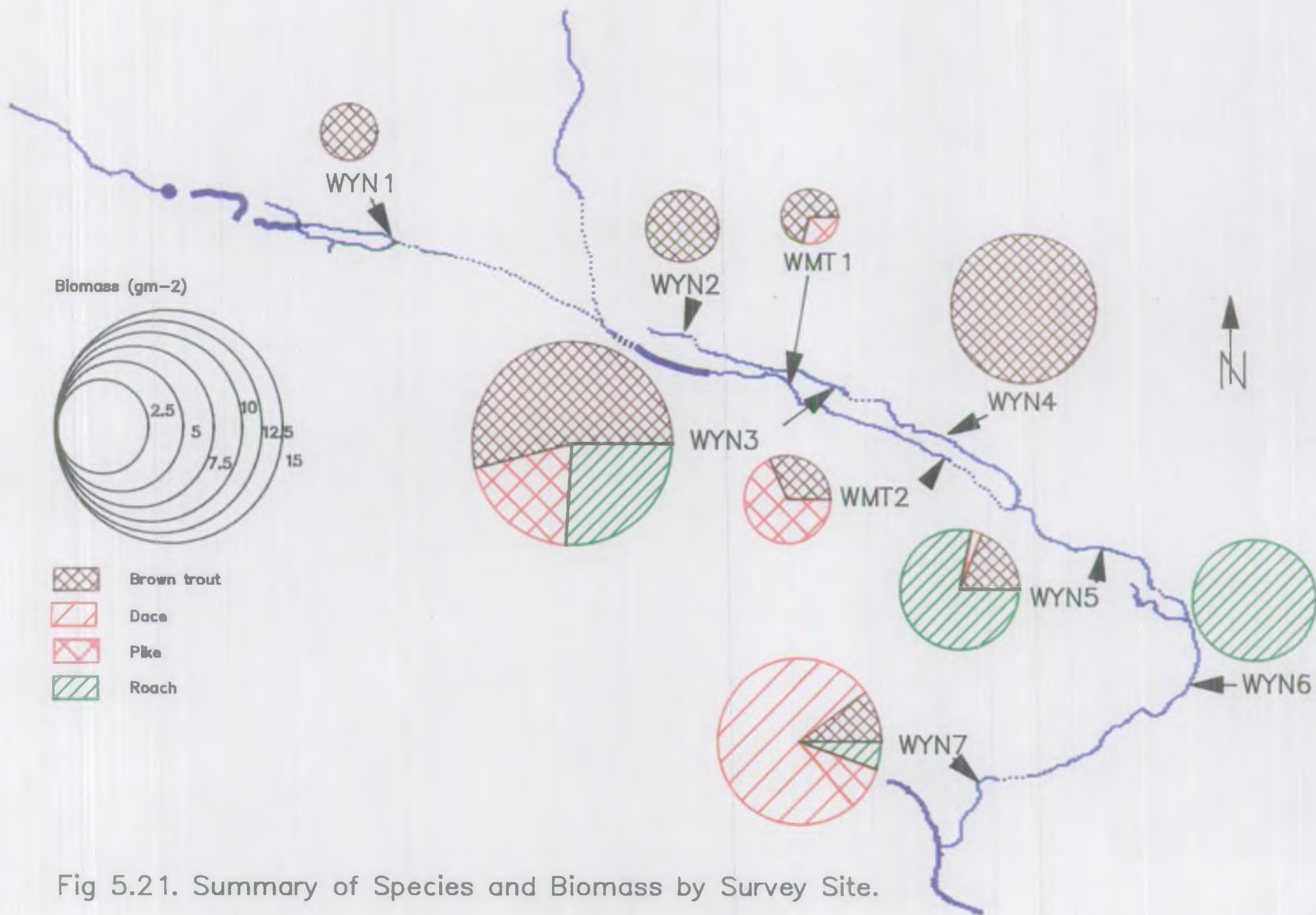
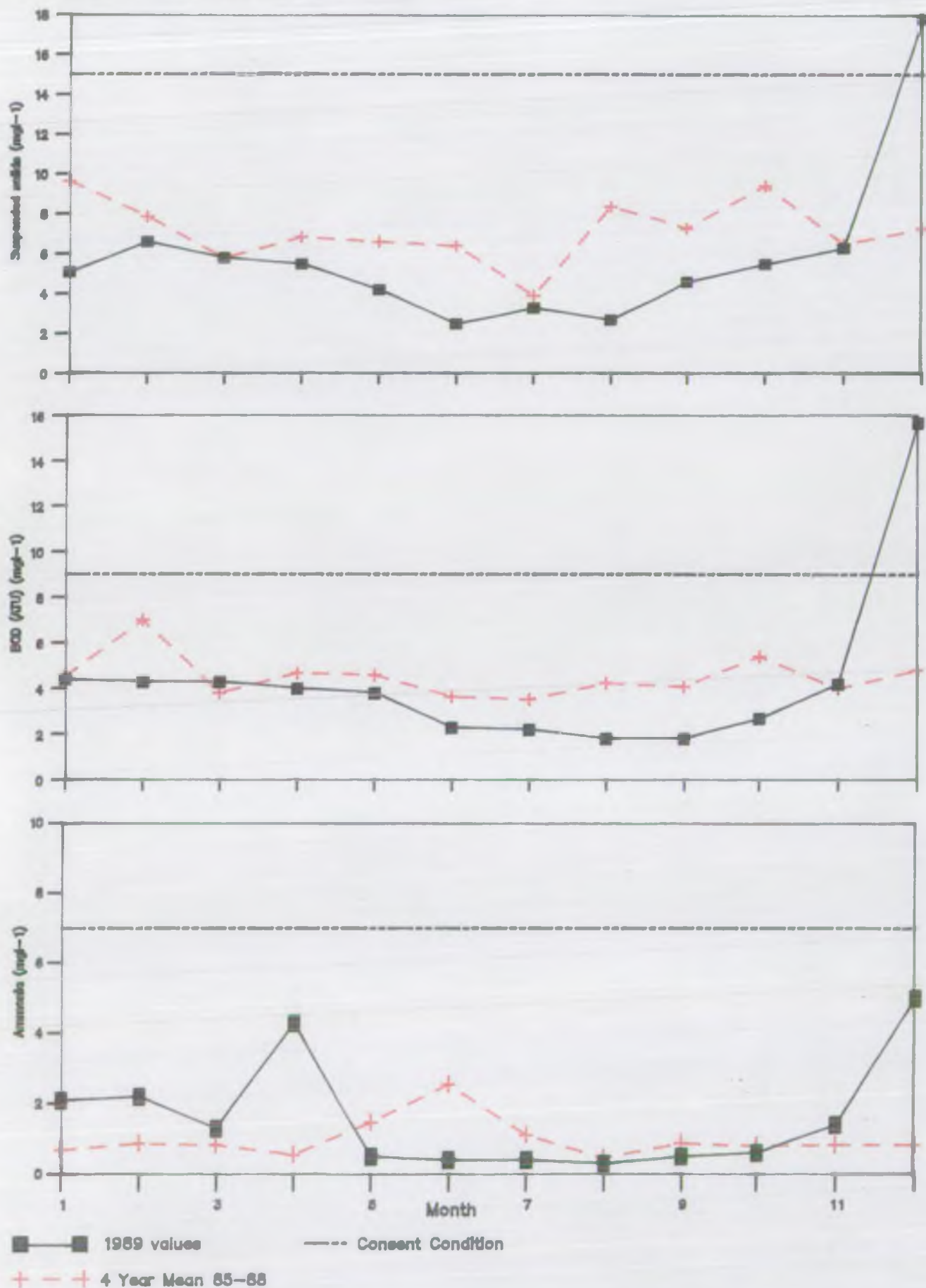


Fig 5.21. Summary of Species and Biomass by Survey Site.

Fig 5.41 High Wycombe STW Effluent Quality.
(4 year mean 85-88 and 1989 values)



5.5 Macroinvertebrates.

Table 5.51 shows results of biological sampling carried out by the Biology Section. These data are also presented in figure 5.51

Table 5.51 BMWP Score, Biotic Class and RQO by Site.

Site No	Date	BMWP Score	Pred BMWP	Biotic Class	RQO
1988					
PWYR.0034	07/09/88	68	178	C	2B
PWYR.0028	07/09/88	59	134	C	2B
PWYR.0025	07/03/88	49	130	D	2B
PWYR.0012	16/02/88	40	149	D	2B
PWYR.0011	16/02/88	27	168	D	2B
PWYR.0016	07/03/88	71	146	C	2B
PWYR.0008	08/07/88	42	164	D	2B
PWYR.0018	08/07/88	15	140	E	2B
PWYR.0033	24/11/88	72	147	C	2B
PWYR.0017	24/11/88	65	129	C	2B
PWYR.0031	24/11/88	63	115	C	2B
PWYR.0029	16/03/88	75	158	C	2B
PWYR.0015	23/03/88	56	175	C	2B
1990					
PWYR.0012	14/05/90	55	149	C	2B
PWYR.0011	14/05/90	30	168	D	2B
PWYR.0015	14/05/90	71	164	C	2B

* For site locations, see Appendix VIII.

Table 5.52 shows changes in and differences between predicted and observed BMWP scores with time for three sites along the River Wye. These data are also presented in figure 5.52.

Table 5.52 BMWP Scores For Three Sites Over Time.

Site No	Date	BMWP Score	Pred BMWP	Biotic Class	RQO
PWYR.0012	22/03/87	51	149	C	2B
	16/02/88	40	149	D	2B
	04/10/89	50	149	D	2B
	14/05/90	55	149	C	2B
PWYR.0011	22/03/87	23	168	D	2B
	16/02/88	27	168	D	2B
	04/10/89	54	168	C	2B
	14/05/90	30	168	D	2B
PWYR.0015	07/01/87	56	160	C	2B
	16/02/88	45	164	D	2B
	04/10/89	71	164	C	2B
	14/05/90	71	164	C	2B

Clearly each site sampled was consistently short of predicted BMWP scores, despite the apparently good effluent quality and RQO results for the river.

Fig 5.51 Biological Monitoring Results 1988 and 1990.

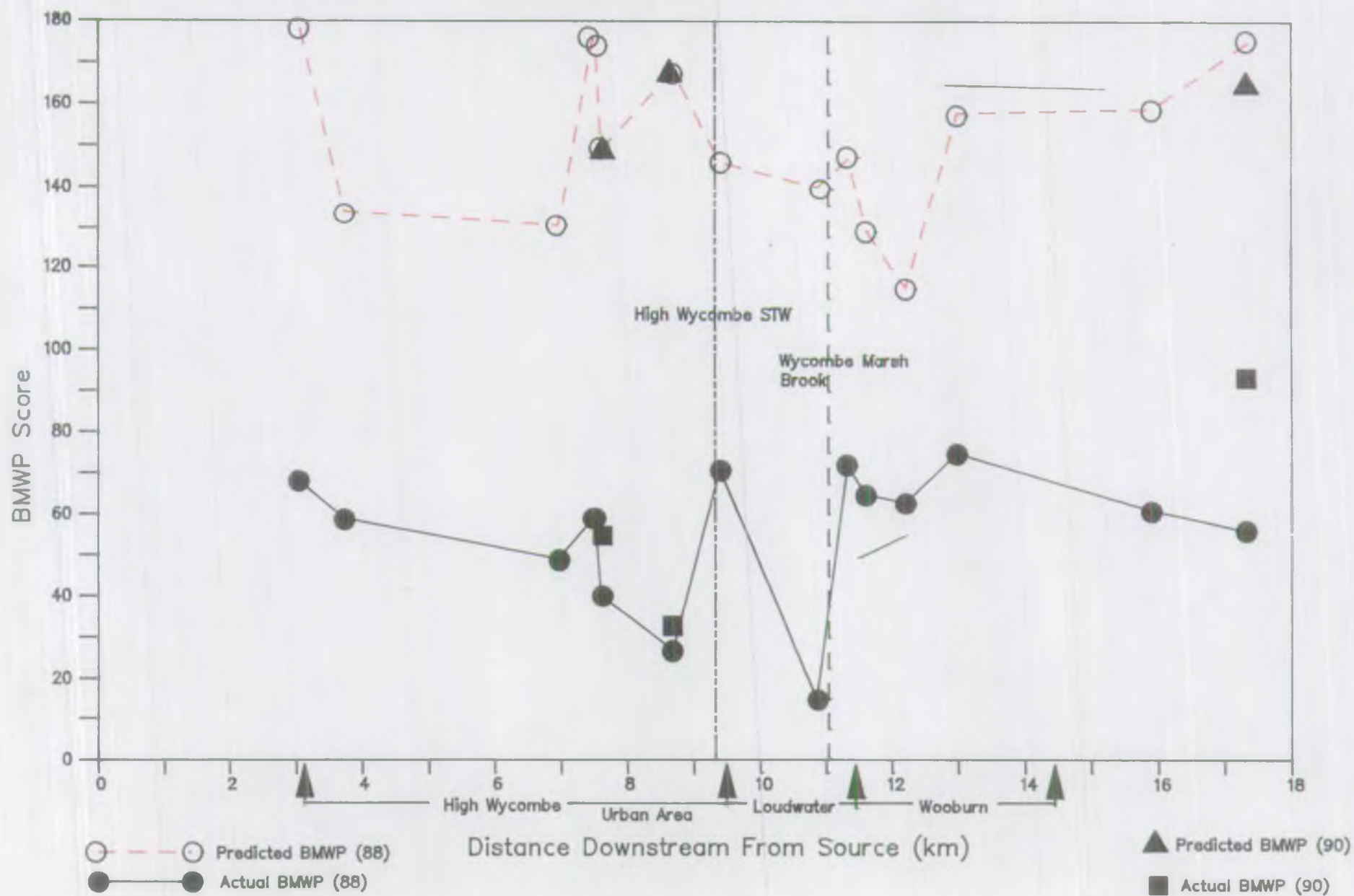
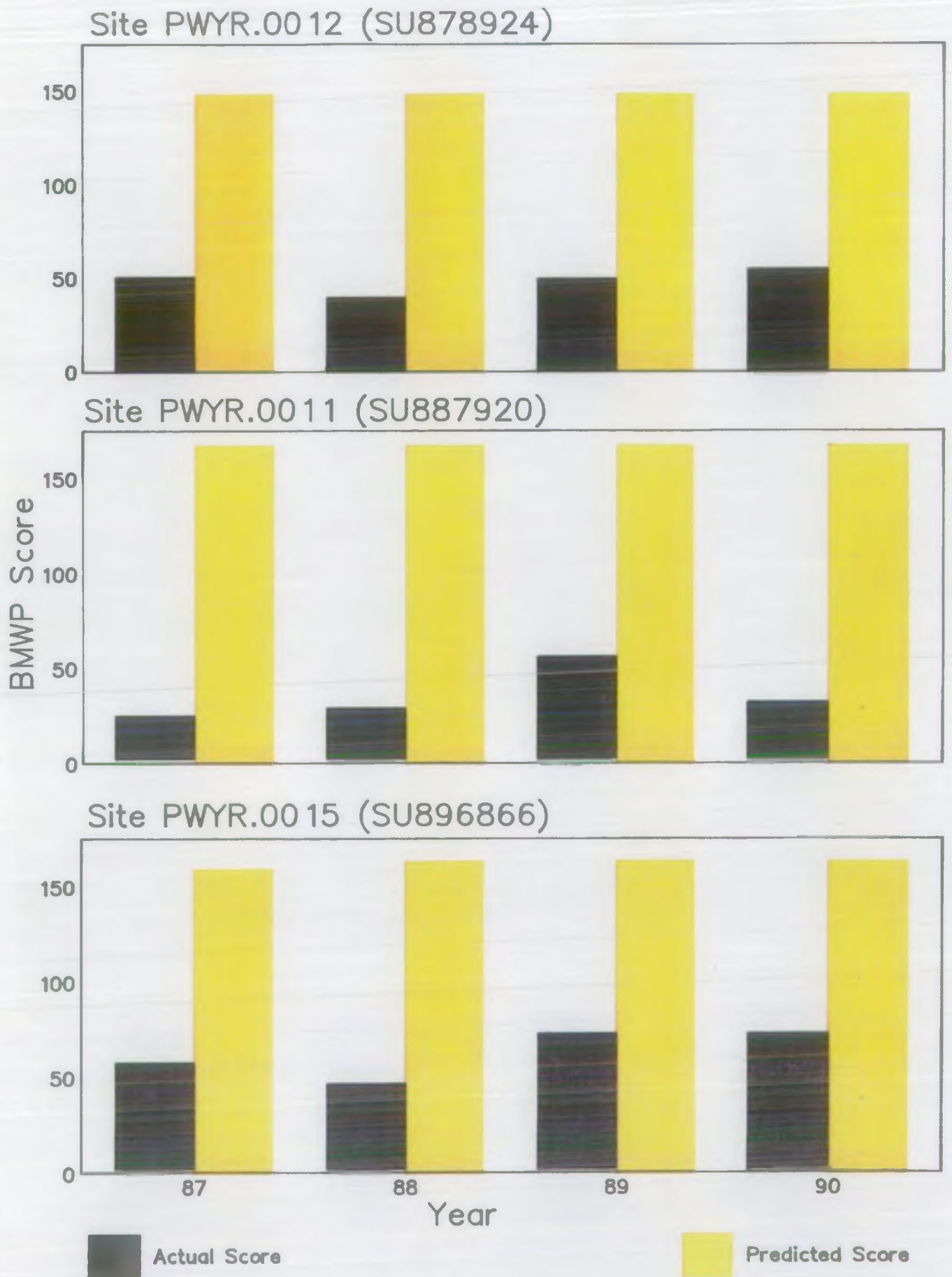


Fig 5.52 Actual BMWP Score vs Predicted Score.



6.0 DISCUSSION.

6.1 Water Quality, Biological Monitoring and Habitat Assessment.

From source to confluence with the Hughenden Stream, the River Wye was ephemeral, relying on groundwater flow. Habitat was largely natural and no obvious flood alleviation works had been carried out. There were no licensed discharges on this section and RQO compliance was met, except for one occasion in 1989. It is disturbing that BMWP scores fell short of predicted scores and had done so for four years prior to this survey. (Note that predicted BMWP scores are habitat dependant, and a high prediction infers good habitat.) This discrepancy can be explained by the nature of the two measures: RQO is based on several parameters that influence chemical water quality (three of which are commonly quoted), whilst BMWP scores reflect water quality perceived by the invertebrate community. RQO sampling, by its nature, can often miss spot pollution incidents that are registered by long-term biological monitoring. There are no obvious reasons why BMWP scores were poor, and clearly this is an area in which fisheries interests would benefit from further investigation.

From the confluence of the Hughenden Stream down to High Wycombe STW the river was permanently established and divided into two arms; the River Wye and the Wycombe Marsh Brook. The Wye had major flood alleviation works carried out in the late 1970's and flows in a trapezoid concrete channel, providing little instream habitat. Industrial development along this reach has reduced bankside shelter, shade and cover. There were no licensed discharges, but the reach has been prone to pollution from surface water runoff of dubious quality and spillages from light industrial units situated along the banks... Chemical water quality results showed the reach exceeding target RQOs but BMWP scores falling short of targets. This is less unexpected than in the upper reaches but suggests that RQO testing may not accurately reflect the way in which overall water quality impinges upon the fauna of the river.

From High Wycombe STW to the confluence with the Wycombe Marsh Brook at Loudwater the river was still divided into two arms. The Wycombe Marsh Brook had no significant discharges and a generally natural habitat with some pool riffle, good bankside vegetation and cover. The Wye, which is larger, had undergone some flood alleviation works in the past and flows in an over-wide concrete trapezoid channel, with little instream habitat for much of its length.

The High Wycombe STW discharge into the Wye contributed significantly to flows, particularly during drier months. (0.28 cumecs or nearly 50% of daily water flow at lowest rates) At the confluence with the Wycombe Marsh Brook there was one discharge of cooling water from Railko plc.

RQO compliance was again met while BMWP scores fell short of their targets, as they had for four years prior to this survey.

The results of BMWP monitoring suggested that sewage effluent discharge significantly affected invertebrate populations downstream. This is due to a drop in dissolved oxygen (DO) coupled with possible direct ammonia toxicity caused by the introduction of relatively large quantities of organic matter to the river.

The effect was less marked downstream of the confluence with the Wycombe Marsh Brook. Enough water is introduced here to dilute the harmful effect and limit its influence to a certain extent. Fisheries interests would benefit from any works that would improve water quality on this reach, particularly with reference to DO.

Over the past few years a proportion of High Wycombe's sewage, all of which was taken from the Wye catchment, has been diverted to Little Marlow STW (which discharges directly into the Thames). At least 0.12 Cumecs (or nearly 25% of DWF) abstracted downstream of the STW are lost from the catchment in this way. The net effect of this has been to reduce the total amount of water available to the River Wye, exacerbating recent low flows caused by short term climatic conditions.

Figure 2.01 shows that some major abstraction points were upstream of the STW discharge. These abstractions may provide a large proportion of water that is either lost from the catchment or returned via the STW. The effect of this would be to take water from the upper reaches of the Wye and therefore reduce minimum flow. The long term intention to improve the Wye fishery will depend on improved flow rates especially in the upper reaches, and the Fisheries Section is keen to see water returned to this catchment.

From Loudwater to the confluence with the Thames, the Wye was well established with a natural bed and some pool riffle sequences. There was good instream habitat with bankside shelter and shade in places. No significant discharges existed along this stretch, and RQO measures had exceeded standards for the past five years. Again BMWP scores fell short of targets and had not significantly changed over the past four years.

There is concern over discrepancies between measures of water quality. RQO results in section 5.4 showed a watercourse with apparently good water quality that had been improving steadily but biological scores were much lower than targets over the whole length of the river. Further investigations are needed into the factors that influence water quality and thereby affect fish and invertebrate populations.

6.2 Fish Biomass and Density.

The three sites surveyed furthest upstream on the Wye (WYN1, WYN2) and on the Wycombe Marsh Brook (WMT1) gave extremely poor results for both biomass and density. There was no evidence of recruitment to this reach. The brown trout population is skewed towards older and larger fish, likely to be survivors of past restocking. An upstream run at site WMT1 gave a biomass of 9.45 gm⁻².

There are serious problems affecting fish populations in this reach of the Wye and its tributary. Similar sites on other rivers suggest that this reach should be capable of holding significant populations of smaller species that are able to compete successfully in this type of habitat.

It is significant that populations of minnows, sticklebacks, stone loach and bullhead were either not present or not abundant at these sites. This tends to reflect the BMWP scores for this reach outlined above.

It is possible that recent low flows caused by climatic conditions meant that the ephemeral part of the river has extended further downstream than in the past.

The site surveyed immediately downstream of the STW (WYN3) gave relatively good results for biomass (12.1 gm^{-2}) and density (0.064 nm^{-2}). However these are still low compared to other rivers. Recruitment to the brown trout population was relatively good, the only site on this survey where that was the case. The roach population also showed successful recruitment and both appeared to be normal and stable, which was surprising considering the paucity of instream features and bankside habitat.

This apparently anomalous situation only exists because of the introduction of sewage effluent and water at this point. The fish can feed on the high organic content of the effluent, but are still able to escape attendant water quality problems by moving upstream of the discharge. Similar results have been noted at sewage discharges on other rivers in the Thames Region (eg. Wiltshire Ray, River Thame, River Cherwell).

The second site surveyed on the Wycombe Marsh Brook (WMT2) gave very poor results for biomass (2.4 gm^{-2}) and density (0.005 nm^{-2}) and only five fish were caught. There was very little instream habitat, but bankside shelter was good.

These results reflect the significant problems that existed for fish populations in the Wycombe Marsh Brook. Although no hydrographic data were available for this tributary, there was evidence that flows had been seriously reduced in the past.

Sites WYN4, WYN5 and WYN6 all gave very poor values for biomass (6.2 gm^{-1} , 4.0 gm^{-1} and 4.4 gm^{-1} respectively) and density (0.018 nm^{-1} , 0.030 nm^{-1} and 0.033 nm^{-1}). Populations consisted of older, larger brown trout at WYN4 and 5 and stable populations of roach at WYN5 and 6. There was no evidence of brown trout recruitment, despite the presence of suitable gravel substrates.

Brown trout eggs and young are particularly sensitive to changes in water quality, requiring clean gravel and a constant flow of water for successful spawning to occur. Water quality considerations outlined above, together with the paucity of suitable habitat and lower than average flows must have affected recruitment to this species in the Wye system. Despite being small, roach populations appeared to be well balanced and showed recruitment with a good mix of year classes.

This species is generally more resilient and can thrive in water quality conditions that would adversely affect brown trout.

The results for the River Wye suggested that significant problems affect fish populations throughout the system. Contributory factors must be low flows during drier months, particularly in the upper reaches, associated with a lack of habitat and apparent water quality problems.

Brown trout were found to be in marked decline: there was no evidence of sufficient recruitment, and the population probably consisted mostly of fish that had been introduced in the past. (See Section 2.6)

Roach populations appeared to be stable; Brown trout populations are skewed to older fish throughout the watercourse and Dace appear only in the lower stretch of the river. Two species, chub and grayling that were stocked quite heavily in the past did not appear in this survey.

6.3 Fish Health.

Results of fish samples taken for analysis indicated that the STW discharge did not appear to be affecting fish health, and all examined were in good condition with no significant parasite loading. These results are surprising given the apparently poor water quality and low fish numbers in the river; factors that affect population levels to this extent are often manifested by either poor fish condition or high parasite infestation.

7.0 CONCLUSIONS.

1. Fish populations in the upper reaches were negligible and in the middle and lower reaches were very poor, consisting largely of older fish. Probable causes include low dry weather flows and lack of suitable habitat.
2. Brown trout populations in the Wye showed no signs of successful recruitment and were presumed to be in decline.
3. Roach populations in the Wye were stable with good recruitment.
4. Health analyses showed fish to be in excellent condition.
5. Chemical and biological measures of water quality gave conflicting results.
7. High Wycombe STW appears to depress invertebrate population levels which will in turn affect fish populations.
8. Diversion of effluent from High Wycombe to Little Marlow STW deprives the watercourse of a flow which could benefit fisheries considerably if it were restored.
9. Much of the upper and middle reaches of the Wye were devoid of natural habitat.

8.0 RECOMMENDATIONS.

1. The upper and middle reaches of the Wye should be considered in future habitat enhancement proposals.
2. The disparity between measures of water quality should be investigated.
3. The reasons for and extent of flow changes in the system should be outlined.
4. The implications to fisheries of the results from PCB and organochlorine analyses should be explored, and opportunities for further investigation identified.

9.0 REFERENCES.

Council of the European Communities, 1978. Directive on the quality of freshwaters needing protection or improvement in order to support fish life. 78/659/EEC. Official Journal of the European Communities, No. L222/1.

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

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

Class 1A - High quality waters

1. Suitable for potable supply at defined abstraction points, and
2. Suitable for all other abstractions, and
3. Suitable for game or any other high class fisheries, (complying with the requirements of Directive 78/659/EEC for salmonid waters), and
4. Of high amenity value.

Class 1B - High quality waters

1. Used for the transport of high proportions of sewage effluent, trade effluent or urban run-off, and
2. Suitable for potable supply at defined abstraction points, and
3. Suitable for all other abstractions, and
4. Suitable for game or any other high class fisheries, (complying with the requirements of Directive 78/659/EEC for salmonid waters), and
5. Of high amenity value.

Class 2A - Fair quality waters

1. Suitable for potable supply after advanced treatment at defined abstraction points, and
2. Suitable for agricultural uses, and
3. Capable of supporting good coarse fisheries, (complying with the requirements of Directive 78/659/EEC for cyprinid waters), and
4. Of moderate amenity value.

Class 2B - Fair quality waters



1. Suitable for potable supply after advanced treatment at defined abstraction points, and
2. Suitable for agricultural uses, and
3. Capable of supporting reasonably good coarse fisheries, and
4. Of moderate amenity value.

Class 3 - Poor quality waters

1. Suitable for low grade industrial use, and
2. Not anaerobic or likely to cause a nuisance, and

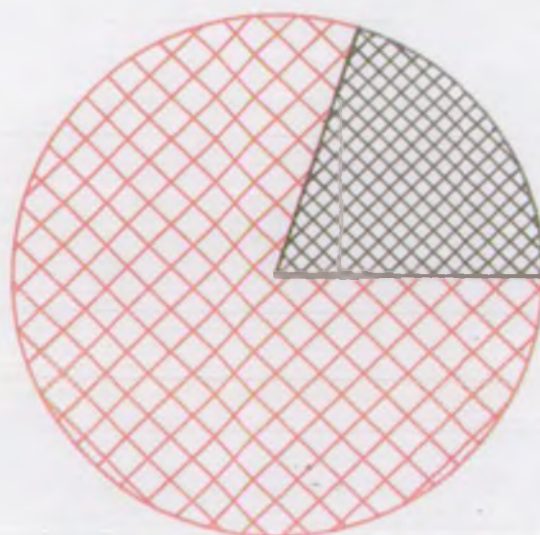
Site WMT 1. Biomass and Density



	Biomass ($\text{gm}-2$)	Density ($\text{nm}-2$)
 Brown trout	0.7	0.002
 Pike	0.3	0.008
Total	1.0	0.010

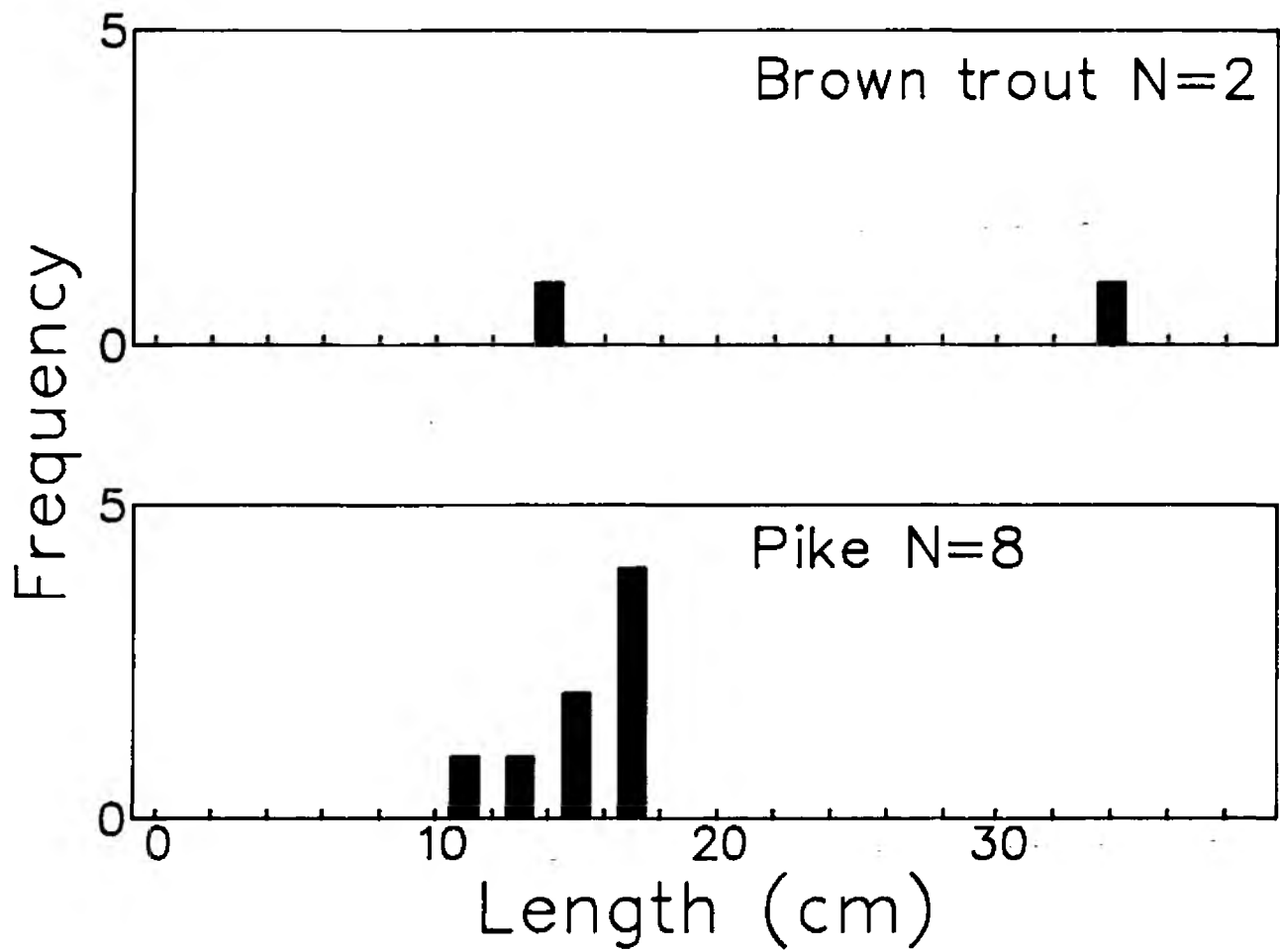


Biomass ($\text{gm}-2$)



Density ($\text{nm}-2$)

Site WMT 1. Length Frequency.



5.14 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN3

SITE NAME: High Wycombe Sewage Treatment Works.

LOCATION: Downstream of High Wycombe STW.

N.G.R.: SU887920

DATE FISHED: 22/2/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 12.1 gm-2

HABITAT FEATURES

LENGTH: 197 m

MEAN WIDTH: 6.6 m

AREA: 1300.2 m2

MEAN DEPTH: 0.5m

WATER TEMPERATURE: 12 °C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

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

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATERLEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: Site was straight, uniform and shallow with no pool/riffle or other significant instream features. Substrate near the outfall was clean gravel, deteriorating downstream to almost exclusively silt and mud. The upstream section had less flow with a substrate comprised largely of silt and mud. There were no instream features or vegetation, and bankside growth and shade were not evident.

ADJACENT LAND USE: L.B. Industrial.
R.B. Footpath.

RIPARIAN OWNERS: L.B. Wycombe District Council.
R.B. Wycombe District Council.

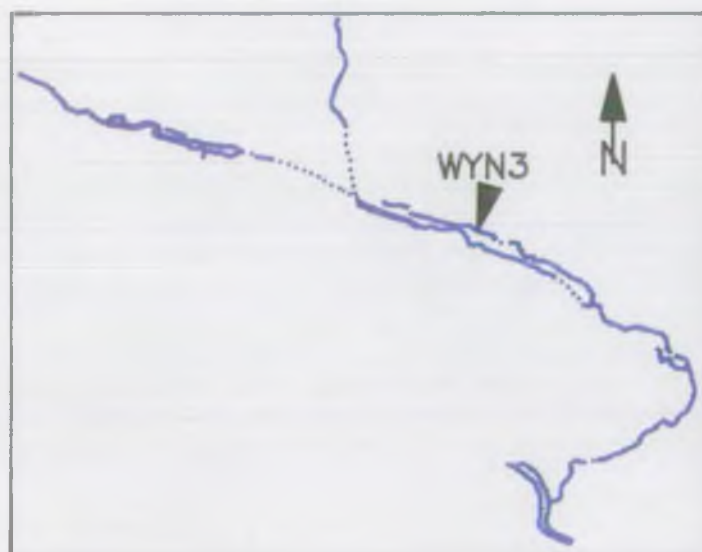
FISHING RIGHTS: L.B. Landowner
R.B. Landowner




COMMENTS: The improvement in biomass, density and species diversity compared to upstream sections could in part be due to the introduction of water (up to 0.28 Cumecs, or 32% of the flow measured at Hedsor) and food material from the sewage treatment works, without the associated problems of low dissolved oxygen levels.

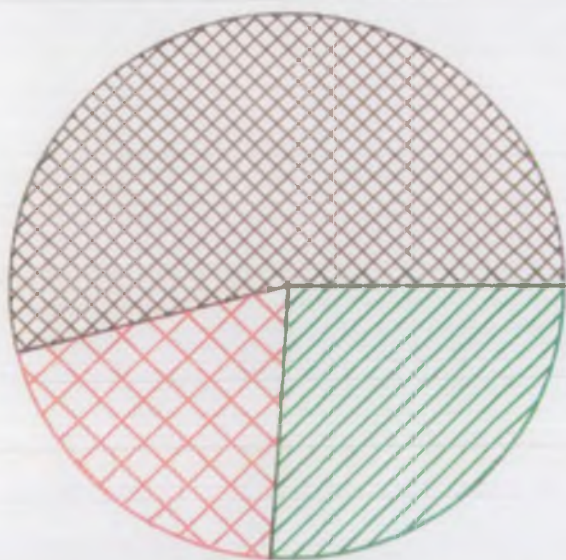
5.14 Site Report. (Continued)

This improvement is surprising considering the lack of suitable bankside and instream habitat and vegetation, and is an indicator of the critical nature of flow rates for this watercourse. There appear to be a reasonable range of year classes for brown trout and roach which suggests successful recruitment in the past.

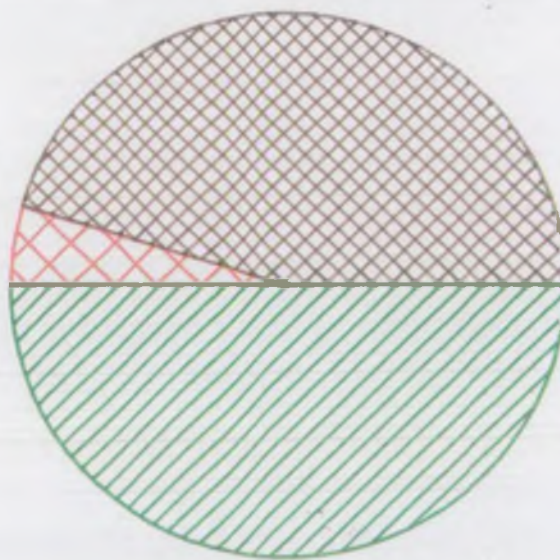
Site WYN3. Biomass and Density.



	Biomass ($\text{gm}-2$)	Density ($\text{nm}-2$)
 Brown trout	6.5	0.029
 Pike	2.4	0.003
 Roach	3.1	0.032
Total	12.1	0.064

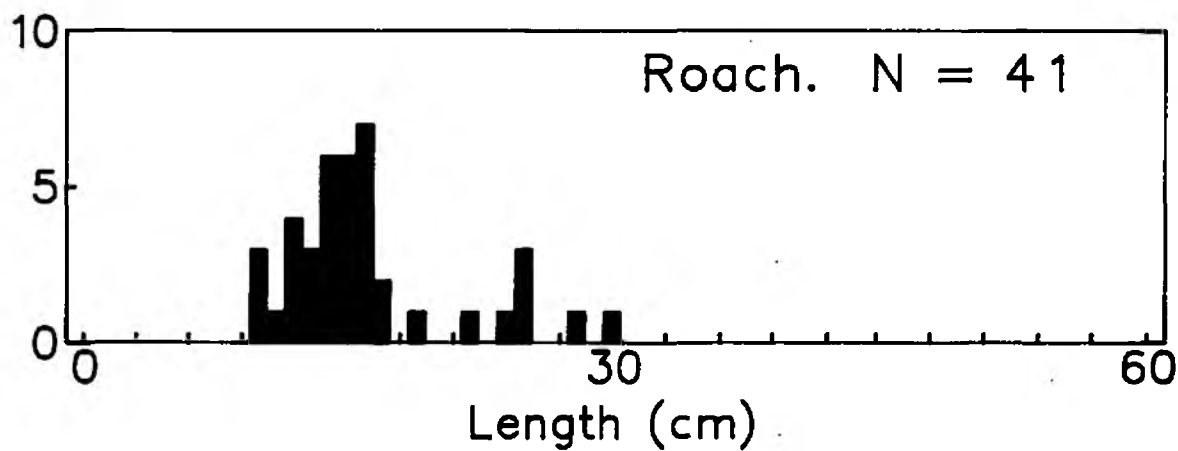
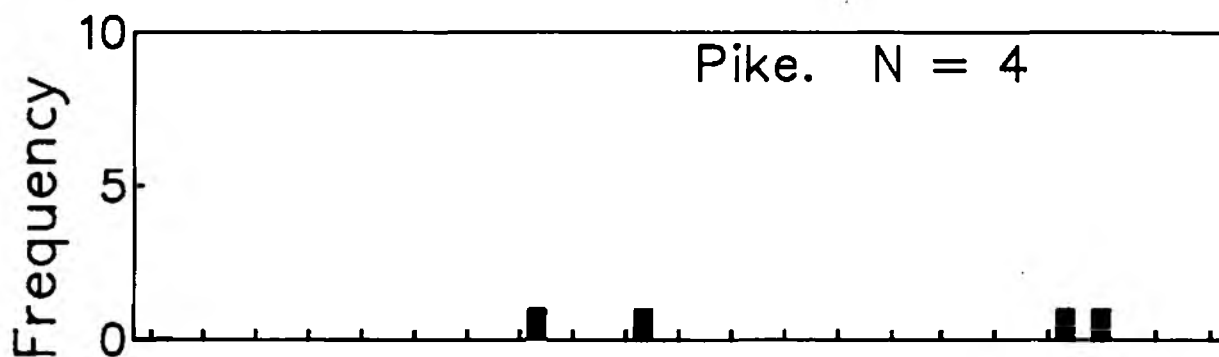
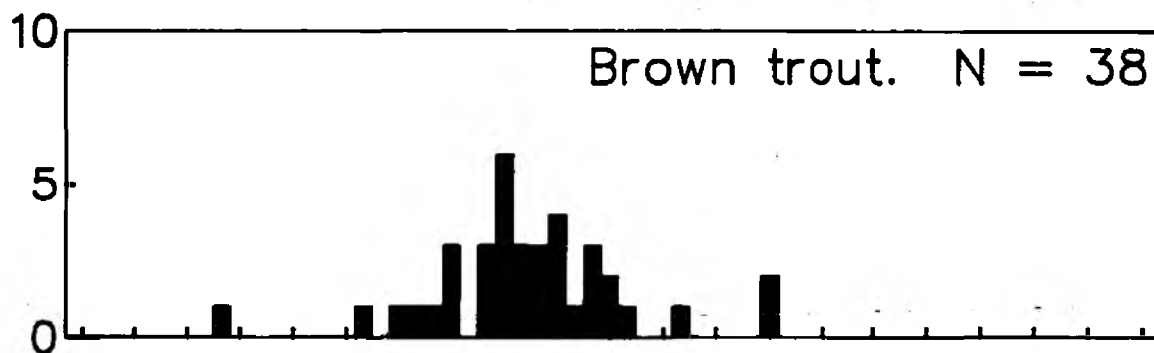


Biomass ($\text{gm}-2$)



Density ($\text{nm}-2$)

Site WYN3. Length Frequency.



5.15 Site Report.

WATERCOURSE: Wycombe Marsh Brook SITE CODE: WMT2

SITE NAME: King's Mead Park

LOCATION: King's Mead Recreation Park, High Wycombe.

N.G.R.: SU896913

DATE FISHED: 19/4/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: None Assigned.

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 2.4 gm-2

HABITAT FEATURES

LENGTH: 188 m

MEAN WIDTH: 5.0 m

AREA: 940.0 m2

MEAN DEPTH: 0.3 m

WATER TEMPERATURE: 12 °C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

SUBMERGED: 25 FLOATING: 0 EMERGENT: 5 SHADE: 70

DOMINANT PLANT SPECIES (AQUATIC): Callitriche sp. and
Myriophyllum spicatum.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Low.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: The site was uniform and shallow with no pools, riffles or significant instream features. Substrate was silt and mud on gravel, indicative of low flows.

ADJACENT LAND USE: L.B. Recreation ground.
 R.B. Road verge.



RIPARIAN OWNERS: L.B. Wycombe District Council.
 R.B. Wycombe District Council.

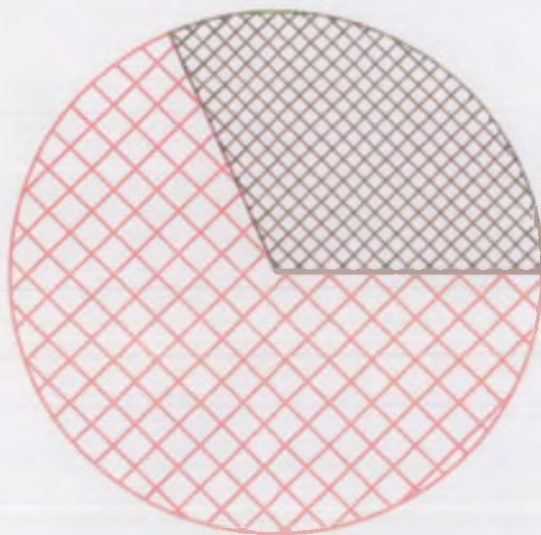
FISHING RIGHTS: L.B. Wycombe District Council
 R.B. Wycombe District Council.

COMMENTS: Both bullhead and stickleback were observed as present in the survey section. An upstream run was not made. The survey section had a very disappointing biomass despite some suitable shelter. There was strong evidence of low flow in the past, which would adversely affect fish populations and provide a stimulus for migration downstream. The abundance of small pike suggests that a suitable food resource exists that these fish are able to exploit, but is not counted in this survey.

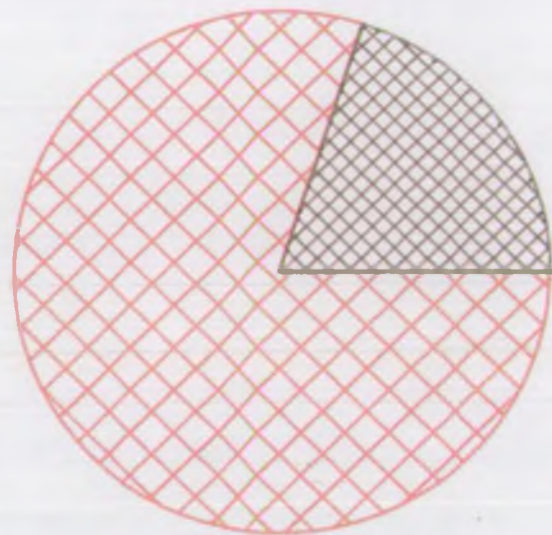
Site WMT2. Biomass and Density.



	Biomass (gm^{-2})	Density (nm^{-2})
 Brown trout	0.7	0.001
 Pike	1.6	0.004
Total	2.4	0.005

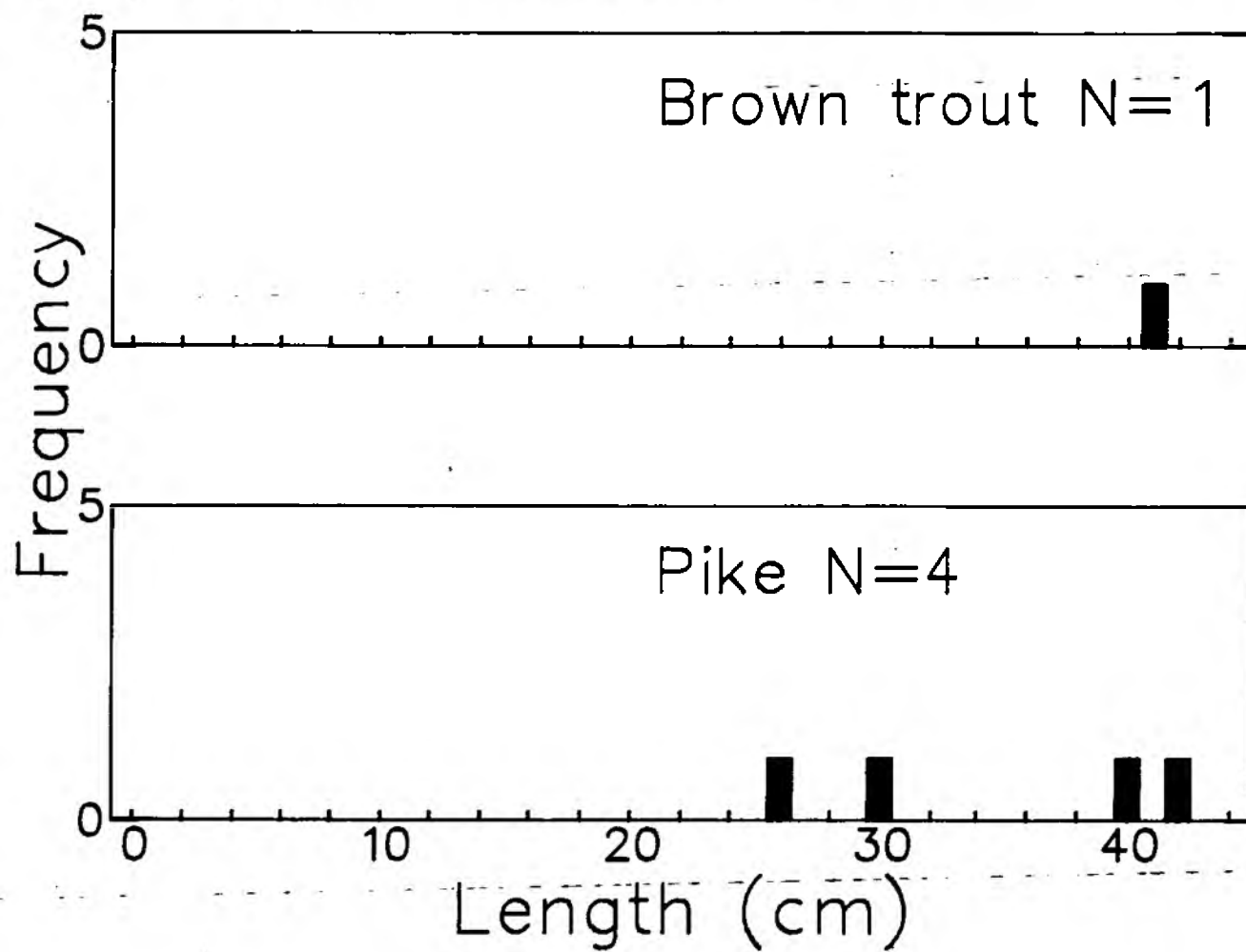


Biomass (gm^{-2})



Density (nm^{-2})

Site WMT2. Length Frequency.



5.16 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN4

SITE NAME: Recreation ground.

LOCATION: Recreation ground, High Wycombe.

N.G.R.: SU895914

DATE FISHED: 12/3/90

METHOD: Upstream electrofishing, wading with three anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 6.2 gm-2

HABITAT FEATURES

LENGTH: 187 m

MEAN WIDTH: 6.5 m

AREA: 1215.5 m2

MEAN DEPTH: 0.4m

WATER TEMPERATURE: 10 °C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

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

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Medium.

PHYSICAL STRUCTURE OF SITE: The site was meandering, of uniform depth with no pool/riffle or other significant instream features. Substrate was largely clean gravel, and reasonable tree cover was present. Water was coloured due to recent rain. The upstream section had similar substrate but with much more silt on the gravel.

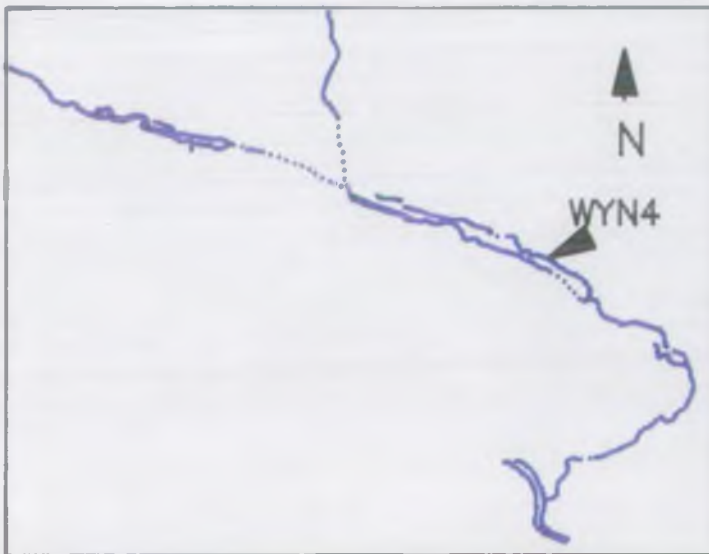
ADJACENT LAND USE: L.B. Gardens.
R.B. Recreation Ground.


RIPARIAN OWNERS: L.B. Wycombe District Council.
R.B. Wycombe District Council.

FISHING RIGHTS: L.B. Landowner
R.B. Landowner

COMMENTS: A very poor biomass consisting of older year classes of brown trout only. There was no evidence of successful recruitment, despite the quantity of clean gravel present. An upstream run of 82 m gave a biomass of 7.5 gm-2 indicating similar conditions throughout the section. Stickleback were recorded present on both survey and upstream sections.

Site WYN4. Biomass and Density



	Biomass (gm^{-2})	Density (m^{-2})
 Brown trout	6.2	0.018
Total	6.2	0.018



Biomass (gm^{-2})



Density (gm^{-2})

2.6 Fisheries Management Work.

In response to major fish kills and specific requests, over 14 500 fish of six species have been stocked into the River Wye and tributaries between 4/11/76 and 11/6/88. These introductions concentrated on the re-establishment of brown trout populations, especially where they had been affected by pollution incidents. All the available information on fish introductions is presented in Appendix V.

The River Wye received limited assistance in the form of habitat improvement in the period between 1985 and 1990, largely as a result of an exhaustive survey and detailed proposals in 1988. The Wycombe Marsh Brook has received some attention with assisted funding during the European Year of the Environment, when a need was identified. Full details of fisheries management and habitat enhancement work where available are given in Appendix V.

3.0 AIMS AND OBJECTIVES.

3.1 Overall Aims of Surveys.

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

3.2 River Classification.

River water quality is classified according to the National Water Council River Quality Objectives 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 N.W.C. classification system and the E.C. Directive appear in Appendices I - III.

The N.R.A. Thames Region have developed a site code classification system based upon the River Quality Objectives (R.Q.O.) and the E.C. Directive. A description of this system appears in Appendix IV.

Fish biomass targets apply within the N.R.A. Thames Region with respect to E.C. designated fisheries, viz:

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

3.3 Specific Aims.

This is the first exhaustive fisheries survey carried out by Thames Region N.R.A on the whole length of the River Wye, and will serve to form the yardstick by which future changes in fish populations in the river are assessed. The aims of the survey are to provide information on fish population abundance, species diversity, distribution and age structure, and comment on factors that have influenced these parameters.

4.0 METHODS.

4.1 Site Selection.

Nine sites were fished between 22/2/90 and 9/5/90. 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 (Noemacheilus 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 were entered into a Husky Hunter data logger. This was later downloaded to a desk top computer 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 site.

4.3 Data Analysis.

The data were processed on the computer using the Fisheries Information System (FINS) software package. Graphics were generated using Lotus Freelance Plus V.3.0, and printed on a Hewlett Packard "Colorpro" colour plotter.

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 are 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) 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 the source of the sample. The 3 main parameters are Biochemical Oxygen Demand (BOD), Ammonia and suspended solids. Routine sample results are held on a register available for public inspection.

4.7 Hydrology.

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

5.0 RESULTS.

5.1 Site results.

Results are presented at site level with biomass, density and length frequency graphs. A brief explanatory text appears in the Comments section of each site report. The code, name and position of each site investigated in this survey are shown in Table 5.01 below.

Table 5.01 Summary of Survey Sites.

Site Code	Name	Grid Ref
WYN1	Fryer's Lane Recreation Ground	SU849938
WYN2	Pann Mill	SU874927
WMT1	High Wycombe STW	SU882920
WYN3	Downstream High Wycombe STW	SU887920
WMT2	King's Mead Park	SU896913
WYN4	Recreation Ground, High Wycombe	SU896914
WYN5	M40 Road Bridge	SU906900
WYN6	Road Bridge Wooburn Green	SU915885
WYN7	Furlong Recreation Ground	SU897873

5.11 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN1

SITE NAME: Fryer's Lane Recreation Ground

LOCATION: Fryer's Lane, High Wycombe. (Left-hand arm of R Wye, downstream of recreation ground ford.)

N.G.R.: SU849938

DATE FISHED: 8/5/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION-TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 1.0 gm-2

HABITAT FEATURES

LENGTH: 102 m

MEAN WIDTH: 3.6 m

AREA: 367.2 m2

MEAN DEPTH: 0.2m

WATER TEMPERATURE: 19 °C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 15 GRAVEL: 70 STONE: 15 BOULDER: 0

VEGETATION (% COVER)

SUBMERGED: 5 FLOATING: 0 EMERGENT: 5 SHADE: 80

DOMINANT PLANT SPECIES (AQUATIC): Apium nodiflorum and Rorippa amphibia.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Excellent.

PHYSICAL STRUCTURE OF SITE: The site was relatively uniform and shallow with very limited pool/riffle. Substrate was largely gravel with some silt and mud incursion, indicative of low flows in the past. Flows were good during the survey, and this has obviously assisted in keeping the gravel beds clear of silt.

ADJACENT LAND USE: L.B. Houses.

R.B. Recreation ground.

RIPARIAN OWNERS: L.B. Wycombe District Council.

R.B. Wycombe District Council.

FISHING RIGHTS: L.B. Landowner

R.B. Landowner


COMMENTS: Bullhead and stickleback were observed as present in the survey section, which had a very disappointing biomass despite the presence of suitable habitat including good shelter and shade. Only four fish of one species were caught at a site where a lot more fish, especially of the younger year classes, would be expected.

5.11 Site Report (Continued)

The high water temperature was due to weather conditions and shallow water. These conditions produce a drop in dissolved oxygen that could stimulate fish to migrate away from the site. An upstream run produced only bullhead and stickleback.

Site WYN 1. Biomass and Density.



	Biomass (gm-2)	Density (nm-2)
 Brown Trout	1.0	0.011
Total	1.0	0.011

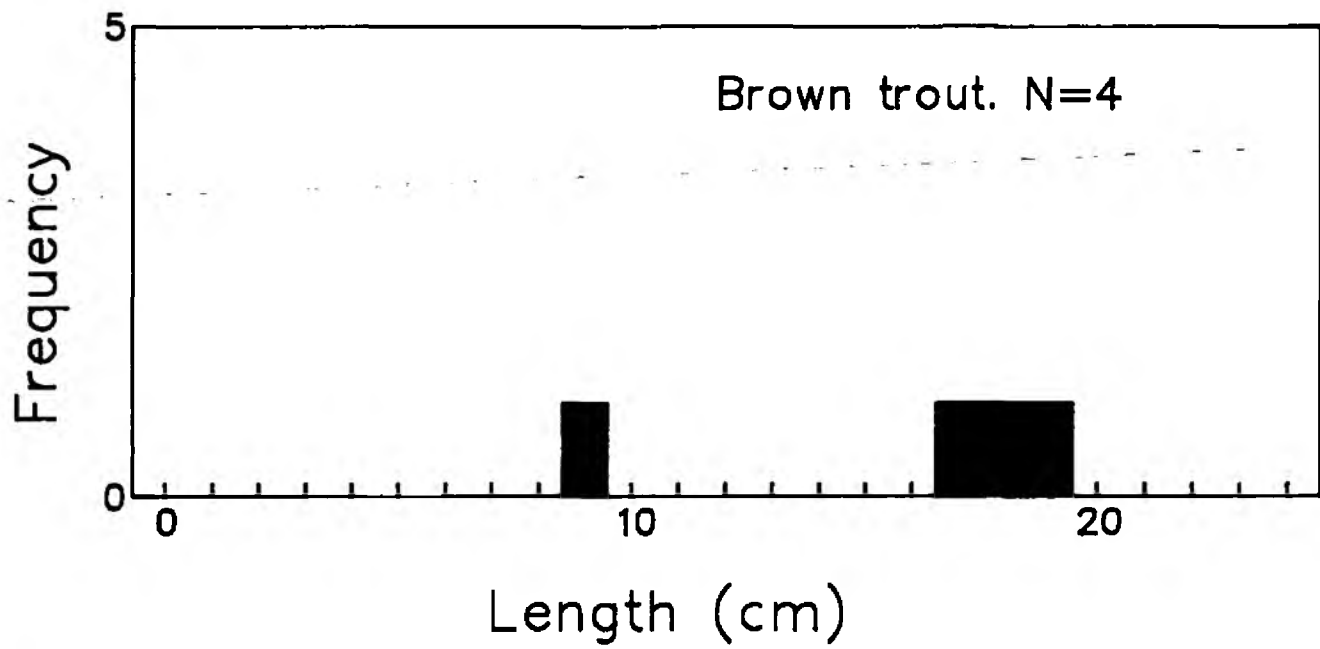


Biomass gm-2



Density nm-2

Site WYN 1. Length-Frequency.



5.12 Site Report.

WATERCOURSE: River Wye

SITE CODE: WYN2

SITE NAME: Pann Mill

LOCATION: Pann Mill, High Wycombe.

N.G.R.: SU874927

DATE FISHED: 12/3/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: 2B

NRA THAMES REGION TARGET BIOMASS: None Assigned.

ESTIMATED BIOMASS: 1.5 gm-2

HABITAT FEATURES

LENGTH: 218 m

MEAN WIDTH: 5.2 m

AREA: 1133.6 m2

MEAN DEPTH: 0.3m

WATER TEMPERATURE: 10 °C

SUBSTRATE COMPOSITION (%)

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

VEGETATION (% COVER)

SUBMERGED: 0 FLOATING: 0 EMERGENT: 0 SHADE: 00

DOMINANT PLANT SPECIES (AQUATIC): None of significance.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: The site was uniform and shallow with no pool/riffle or other significant instream features. Substrate was almost exclusively silt and mud, indicative of low flows. There was evidence that the channel had been overwidened in the past and there had been some further bank poaching. A variety of household refuse was distributed throughout the bed and both banks.

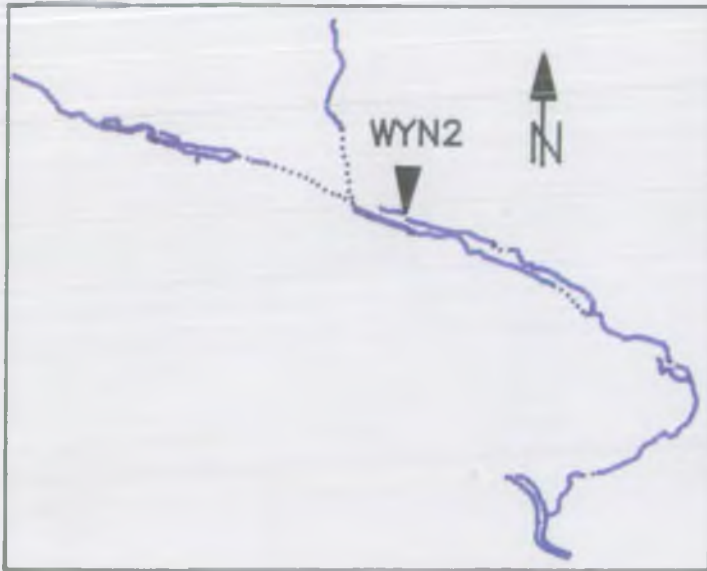
ADJACENT LAND USE: L.B. Road verge.
R.B. Recreation ground.


RIPARIAN OWNERS: L.B. Wycombe District Council.
R.B. Wycombe District Council.

FISHING RIGHTS: L.B. Landowner
R.B. Landowner

COMMENTS: Both bullhead and stickleback were observed as present in the survey section. No upstream run was carried out, although trout, stickleback and bullhead were observed in the upstream section. The survey section had a very disappointing biomass, possessing almost no suitable habitat with no evidence of successful recruitment.

Site WYN2. Biomass and Density.



	Biomass (gm^{-2})	Density (nm^{-2})
 Brown Trout	1.5	0.008
Total	1.5	0.008

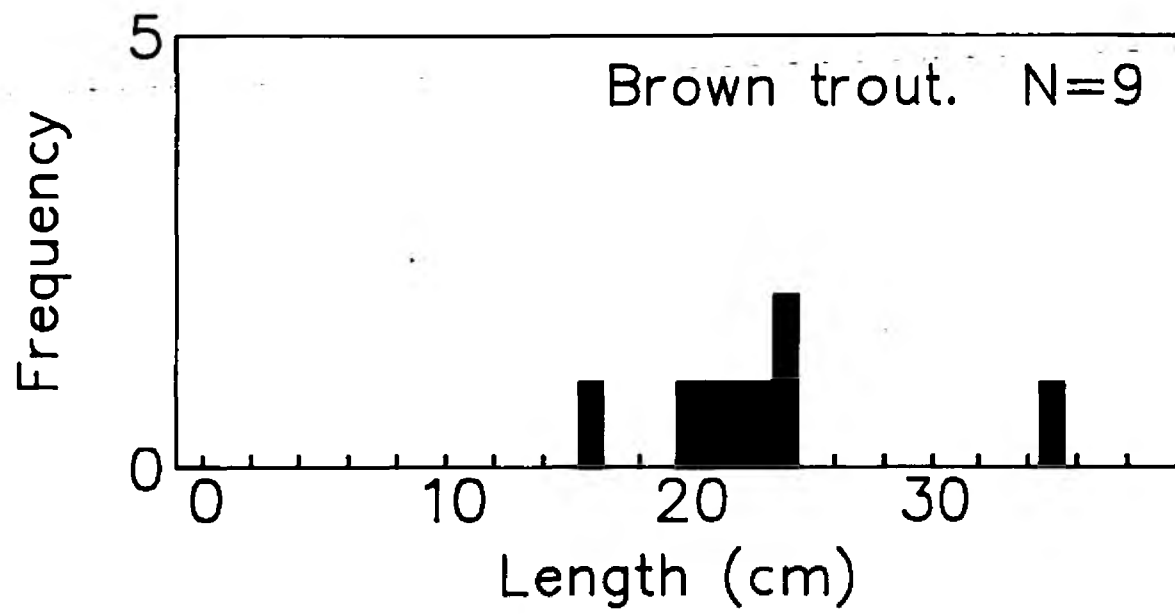


Biomass (gm^{-2})



Density (nm^{-2})

Site WYN2. Length Frequency.



5.13 Site Report.

WATERCOURSE: Wycombe Marsh Brook SITE CODE: WMT1

SITE NAME: High Wycombe Sewage Treatment Works

LOCATION: High Wycombe Sewage Treatment Works.

N.G.R.: SU882920

DATE FISHED: 22/2/90

METHOD: Upstream electrofishing, wading with two anodes.

R.Q.O.: None Assigned

NRA THAMES REGION TARGET BIOMASS: None Assigned

ESTIMATED BIOMASS: 1.0 gm⁻²

HABITAT FEATURES

LENGTH: 213 m

MEAN WIDTH: 4.5 m

AREA: 958.5 m²

MEAN DEPTH: 0.3 m

WATER TEMPERATURE: 12 °C

SUBSTRATE COMPOSITION (%)

BARE: 0 MUD & SILT: 5 GRAVEL: 95 STONE: 0 BOULDER: 0

VEGETATION (% COVER)

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

DOMINANT PLANT SPECIES (AQUATIC): Ranunculus sp.

DOMINANT PLANT SPECIES (BANKSIDE): Grass.

WATER LEVEL: Normal.

WATER CLARITY: Good.

PHYSICAL STRUCTURE OF SITE: The site was uniform and shallow with no pools, riffles or significant instream features. Good gravel substrate exists with some weed cover, however bankside vegetation was poor providing minimal shade and shelter. Both Callitriche sp. and Ranunculus sp. were present.

ADJACENT LAND USE: L.B. Grass and road.
R.B. Grass and road.

RIPARIAN OWNERS: L.B. Thames Water Authority.
R.B. Thames Water Authority.

FISHING RIGHTS: L.B. Owner.
R.B. Owner.

COMMENTS: The survey section had a very disappointing biomass; only ten fish of two species were caught. The paucity of suitable habitat and shelter along this section must be a significant contributory factor. A single upstream run over a distance of 85 m gave a biomass of 9.45 gm⁻² of pike, brown trout and perch. The section was deeper, with instream weed growth and bankside vegetation to provide shelter. This disparity underlines the importance of shelter and shade to fish populations in this river.

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		$\leq 21.5^{\circ}\text{C}$ $\nearrow 1.5^{\circ}\text{C}$		$\leq 28^{\circ}\text{C}$ $\nearrow 3^{\circ}\text{C}$
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 N.R.A. FISH SURVEY SITE CODING SYSTEM

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

1. EEC DESIGNATED WATERCOURSES

Code Description

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

2. RQO WATERCOURSES

Code Description

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

A 2 digit code for a watercourse is combined with the above and an individual site number to provide a unique 4 digit code for each site. Thus WYN1 - WY = River Wye, N = 2/1B (RQO), 1 = individual site.

APPENDIX Va. River Wye Fish Mortalities.

Date	Location	Losses	Details
15/2/78	Wooburn Green	All fish in stretch	Cyanide pollution
18/2/80	SU911880	200 plus fish, mainly brown trout to 1.3kg	0.5ppm Cyanide pollution
4/5/82	Colston House High Wycombe	Large scale, mainly brown trout	Cause not listed
21/6/82	R Wye, High Wycombe	"Fish Mortality" detail not listed	Cause not listed
22/4/83 polln.	Glory Mill	50 plus brown trout	Hypochlorite
5/10/84	Pann Mill to 2km downstream	100 plus brown trout	Chlorine pollution
12/9/86	Mill End Rd	200 brown trout	Cause not listed
1987-90	7 minor fish mortalities recorded by Pollution Officers, none significant enough to be recorded by this department.		

APPENDIX Vb. River Wye Restocking exercises.

Date	Location	Details
4/11/76	SU916890	100 brown trout, 5-20cm
3/5/78	SU837921 SU896914 SU908900 SU895913 SU891915	2000 brown trout fry between these sites
14/11/78	SU915893 SU916885	450kg mixed roach and chub
10/6/80	SU896914 SU908900 SU895913 SU912898 SU916886 SU891915	1000+ brown trout fingerlings between these sites
5/11/81	SU917889	500 grayling 300g+
18/11/81	Motspur Bridge Kingsmead Rd Recr Pk Wooburn Green Recr Pk	515 grayling av 250g
18/2/82	Holtspur Mill	50 rainbow trout fingerlings
18/8/82	High Wycombe	500 brown trout fingerlings
11/3/83	SU895915 SU905875 SU913882 SU905901	250 brown trout between these sites
25/10/83	SU912897 SU889879 SU912897	5000 brown trout fingerlings, 750 brown trout 10-20cm and 100kg mixed chub and dace
10/2/84	North arm Wye	100 brown trout
18/2/84	Hedsor gauge weir	40kg roach to 10cm
21/11/84	Pann Mill	100 brown trout to 30cm
12/7/85	D/S Runnymede	1000 brown trout av 250g
14/10/86	Not noted	500 brown trout to 75g
11/6/88	Hughenden Park	270 rainbow trout

APPENDIX Vc. River Wye Fisheries Habitat Work.

July 1985	River Wye dredged upstream of Pann Mill.
June 1987	Rye Dyke Stream improvements; New bank wall Reseed banks Instream rocks De-silt pools Stone groynes downstream of Pann Mill
March 1988	River survey and habitat improvement recommendations.
April 1988	Pike and Trout samples tested for presence of organo-chlorides and PCBs.
May 1988 of	The Dyke becomes Designated Area under Diseases Fish Order 1988
1989	Soho Mills Wier constructed and bankside tree planting/landscaping.
September 1990	Culvert constructed with sills and notches at Chapel Lane.

APPENDIX VI

N.R.A. - THAMES REGION

BIOLOGY (WEST)

FISH HEALTH EXAMINATION (SUMMARY)

TO: VAUGHAN LEWIS
AREA FISHERIES OFFICER
(UPPER THAMES)

FROM: WILLIAM E YEOMANS
BIOLOGIST

DATE: 2 MAY 1990

TEL: 0734 311422

CC: JOHN STEEL
AREA BIOLOGIST (WEST)

FILE

EXAMINATION REF: WYF(S30)037

DATE RECEIVED: 13 MARCH 1990

DATE COMPLETED: 14 MARCH 1990

EXAMINATION TITLE: RIVER WYE, HIGH WYCOMBE (U/S WYCOMBE S.T.W.)

NATIONAL GRID REF: SU.873.926

REASON FOR EXAMINATION: FISHERIES SURVEY, HEALTH CHECK

GENERAL COMMENTS

Fish in excellent condition with no significant parasite loadings.

William E. Yeomans.

WILLIAM E YEOMANS
BIOLOGIST

APPENDIX VI

EXAMINATION DETAILS

EXAMINATION REF: WYF(S30)037

FISH SPECIES	LENGTH RANGE (cm)	WEIGHT RANGE (g)	AGE RANGE	SEX
Brown Trout	11.6 - 24.6	20.5 - 194.1	(1+)-(3+)	Male Female

PARASITES PRESENT:

FISH SPECIES	NO EXAMINED	PARASITE	LOCATION	PREVALENCE (PERCENTAGE INFESTATION)	INTENSITY (DEGREE OF INFESTATION)
Brown Trout	15	<i>Bunodera luciopercae</i>	Gut lumen	27	Light
		<i>Cystidicola farionis</i>	Swim Bladder	7	Light
		* <i>Dermocystidium</i> sp	Encysted on Gills	87	Light/Moderate
		<i>Echinorhynchus truttae</i>	Gut	27	Light
		* <i>Gyrodactylus</i> spp	Fins	80	Light/Moderate

* May be formally identified retrospectively.

APPENDIX VI

N.R.A. - THAMES REGION

BIOLOGY (WEST)

FISH HEALTH EXAMINATION (SUMMARY)



TO: Vaughan Lewis
Area Fisheries Officer
(Upper Thames)

FROM: - WILLIAM E YEOMANS
BIOLOGIST

DATE: 1 May 1990

TEL: 0734 311422

CC: John Steel
Area Biologist (West)

File

EXAMINATION REF: WYF(S30)038

DATE RECEIVED: 13 March 1990
DATE COMPLETED: 14 March 1990

EXAMINATION TITLE: River Wye, High Wycombe (d/s Wycombe S.T.W.)

NATIONAL GRID REF: SU 895 914

REASON FOR EXAMINATION: Fisheries Survey, Health Check

GENERAL COMMENTS

Fish in excellent condition with no significant parasite loadings.

William E. Yeomans.
WILLIAM E YEOMANS
BIOLOGIST

APPENDIX VI

EXAMINATION DETAILS

EXAMINATION REF: WYF(S30)038

FISH SPECIES	LENGTH RANGE (cm)	WEIGHT RANGE (g)	AGE RANGE	SEX
Brown Trout	24.6-38.2	204.0-617.3	(2+)-(3+)	Male Female

PARASITES PRESENT:

FISH SPECIES	NO EXAMINED	PARASITE	LOCATION	PREVALENCE (PERCENTAGE INFESTATION)	INTENSITY (DEGREE OF INFESTATION)
Brown Trout	10	<i>Cystidicola farionis</i>	Swim Bladder	30	Light
		<i>Dermocystidium</i> sp*	Encysted on Gills	70	Light/ Moderate
		<i>Echinorhynchus truttae</i>	Gut	90	Light
		<i>Gyrodactylus</i> spp*	Fins	90	Light
		<i>Myxobolus</i> sp	Gill Squash	10	Light
		Scyphidian peritrichs	Gills	10	Light

* May be formally identified retrospectively.

APPENDIX VIIa Results of Fish and Gammarus Organochlorine Analyses, 1988.^a

Sample	HCH	PCB ¹	PCP	Organo-tin ²	% Dry Solids
	ug/kg				
1 R Whitewater Brown trout liver	<0.5	<10	<10	<1	22.8
2 R Whitewater Brown trout muscle	<0.5	<10	<10	<1	21.5
3 R Whitewater Chub liver	2	18	<10	1	25.3
4 R Whitewater Chub muscle	<0.5	<10	<10	<1	21.6
5 R. Whitewater <u>Gammarus pulex</u>	<0.7	<20	<10	1	22.7
6 R Wye, Brown trout liver, Site A	<2	<50	<109	<1	31.7
7 R Wye Brown trout muscle, Site A	1	34	<10	<1	21.8
8 R Wye, <u>Gammarus pulex</u> , Site A	<0.5	51	<10	<1	18.8
9 R Wye, Brown trout liver, Site B	18	49	<10	<1	26.7
10 R Wye, Brown trout muscle, Site B	<3	<50	<20	<1	27.1
11 R Wye, <u>Gammarus pulex</u> , Site-B	<0.3	16	<10	<1	19.9

^a Results from David Meek, SAC Scientific, Summerhouse Hill, Cardington, Bedford.

- ¹ As Aroclor 1254
² As TBTO

APPENDIX VIIb Results of Fish and Gammarus Organochlorine Analyses, 1985

Location	Weight Taken g	PCBs as ug/kg Arochlor 1254
Pike Liver, R Wey	2.2571	400
Pike Liver, R Wey	2.4010	730
Pike Liver, R Wey	0.9130	750
Pike liver, R Ray Swindon	2.3880	5920
Pike liver, R Ray	2.4178	240
Chub liver, R Colwell	3.7429	110
Roach, R Mole	1.2100	2090
Pike Liver, R Wye	1.8867	2520
Pike Liver, R Wye	0.7774	3080
Pike Liver, R Wye	0.4853	2770
Pike, R Loddon	4.1800	5950
Pike, R Loddon	7.6333	700
Brown trout, R Enborne	3.0620	<75
Brown trout, R Enborne	5.2744	<50

APPENDIX VIII. Biological Sample Site Codes, Names and Locations.

Code	Name	National Grid Reference.
PWYR.0034	Footbridge, Chapel Lane	SU84109410
PWYR.0028	Sands Middle School	SU84609370
PWYR.9998	Wycombe Police Station	SU86669283
PWYR.9997	Wycombe Council Offices	SU86719276
PWYR.0025	50m Below Pann Mill	SU87209260
PWYR.0009	50m Above Soho Mill	SU91008790
PWYR.0023	Pann Mill	SU90808780
PWYR.9996	Below The Rye SWO	SU87469252
PWYR.0012	Bassetsbury Lane	SU87809240
PWYR.0011	Wycombe Marsh Mill	SU88709200
PWYR.0016	King George V	SU89209150
PWYR.0008	25m d/s Wyc Marsh Brook	SU90209050
PWYR.0018	Station Rd, Loudwater	SU90209070
PWYR.0033	Snakely Mill	SU90209040
PWYR.0017	30m u/s Motorway Bridge	SU90209020
PWYR.0031	U/s Clapton Mill	SU90809000
PWYR.0036	Five Acres, Wooburn	SU91508930
PWYR.0035	50m d/s Glory Mill	SU91558915
PWYR.0029	The Limes, Wooburn Green	SU91408940
PWYR.0030	Cores End, Wooburn	SU90408740
PWYR.0015	Hedsor Gauging Weir	SU89608660

APPENDIX IX. GENERIC AND COMMON NAMES OF AQUATIC PLANTS.

<u>Apium nodiflorum</u>	Fool's Watercress
<u>Callitriche sp.</u>	Water Starwort
<u>Myriophyllum spicatum</u>	Spiked Water-milfoil
<u>Potamogeton pectinatus</u>	Fennel Pondweed
<u>Ranunculus sp.</u>	Water Crowfoot
<u>Rorippa amphibia</u>	Great Yellow-cress
<u>Sparganium sp.</u>	Bur-reed