NATIONAL RIVERS AUTHORITY
THAMES REGION.

RIVER MOLE DEROGATION
FISHERIES SURVEY
THAMES METROPOLITAN
1989

S.COLCLOUGH (AREA FISHERIES OFFICER)
C.DUTTON (FISHERIES OFFICER)
N.FOULKES (FISHERIES OFFICER)
J.LYONS (FISHERIES ASSISTANT)

COMPILED BY: N.FOULKES

Ref: CM089

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

I am extremely grateful to the following people, for the assistance they provided to me, in the preparation of this survey report.

Members of the Waltham Cross Fisheries East Team, for assistance with the fieldwork.

David Van Beesten (Flood Defence Engineer, Lower Thames).

Mike Hoare (Senior Groundwater Protection Officer, Crossness).

Liz Vincent (Scientist, Catchment Control, Reading).

Paul Greaves (District Pollution Officer, Guildford).

Richard Ashby Crane (Biologist, Fobney).

Paul Logan (Senior Biologist, Fobney).

Alan Butterworth (Senior Fisheries Officer West, Guildford).

John Sutton (Area Fisheries Officer, Guildford).

Roy Ballinger (River Mole Preservation Ass. & Leatherhead D.A.S.).

John Davies (Horley Piscatorial Society).

and to anyone whom I have forgotton that helped in any way.

1. SUMMARY

Seven sites were fished above and below three major STW discharges at Crawley, Horley and Esher, between October 1989 and May 1990. These sites were compared with six almost identical sites completed during the 1986 survey (Ref. CM086).

Good quality mixed coarse fisheries were found below Crawley, with fair to good recruitment observed in the dace, roach and gudgeon. The dominant species were roach, dace, chub, gudgeon and eel. Brown trout, brook lamprey, common bream, perch, pike, pumpkinseed, rudd, tench, common carp, bleak and ruffe were also present. The minor species, minnow, bullhead, stoneloach and three spined stickleback were also observed. During the 1990 survey, fish biomasses were higher than at all comparable 1986 sites. Species diversity has improved with up to fourteen species present at one site.

Only one of the three EC designated, cyprinid fisheries achieved the internally set target of 20 gms/m^2 (MOJB/Old Mole Channel). Both MOJA and MOJC (u/s and d/s of STW), which are 25-26 metre wide, 2.0 metre deep trapezoidal channels, with little or no instream macrophytes, failed, MOJA by a wide margin. Channel topography and lack of instream macrophytes are perceived as the reason for the failures.

At the three non EC designated sites, on the Lower Gatwick Stream and Upper Mole, biomasses ranged from 16.44 gms to 40.59 gms. Of more consequence, was the fact that recruitment could be observed in some of the major riverine species. During the 1986 survey these sites were noted as lacking in recruitment.

Chemical water quality has not deteriorated, and appears to be more consistent than in the past. Water quality compliance is high. The macroinvertebrate data splits the seven sites of the survey into two distinct sections. The four sites on the Gatwick Stream/Upper Mole fall well below their predicted biotic scores and are influenced by discharges and the increasing urbanisation of the area. The three sites on the Mole/Ember Flood Alleviation Scheme (FAS) which largely agree with their

predicted biotic scores.

Further improvements can be expected at the upper four sites as both Horley and Crawley STW's have recently undergone major refurbishment and the discharge from Gatwick Airport will evetly be treated at Crawley Since July 1989, there have been no significant fish mortalities on the Mole or its tributaries.

The fish communities found at comparable sites, during surveys reported during 1967, 1982 and 1986 are broadly similar to those of 1990. However when the major riverine species are considered subtle changes are occurring. Because of recent lack of flow and the consequent lack of dilution of treated sewage effluent, roach are dominating at six of the seven 1990 sites. Dace are regarded as effluent tolerant and are usually associated with the faster flowing sections of the river. They are becoming dominant on the Lower Gatwick Stream and Upper Mole sections of the river. The chub population is in decline. Recruitment is poor and the only remaining substantial population is to be found on the Old Mole Channel and this is composed of older fish.

Brown Trout are dominant at the Upper Gatwick Stream Site (GSFA). This is an important relict, local population, which is self maintaining. A new species, brook lamprey appears to be colonising the Gatwick Stream. The alien species pumpkinseed are establishing themselves in the Gatwick Stream and in the Upper Mole. Eels now penetrate the main river as far as Horley Weir. Their numbers and size ranges appear to be increasing. Stocking on the Lower Gatwick Stream/Upper Mole seems to have been on unqualified success.

A number of environmental factors are perceived as having a significant effect upon fisheries.

i) the whole catchment is suffering from low flows and reduced dilution of treated sewage effluent.

ii) the Upper Gatwick Stream has problems with accelerating urbanisation.

iii) the Lower Gatwick Stream/Upper Mole has problems with STW effluents,

winter run-off from Gatwick Airport, urban run-off and downstream impoundments.

iv) In the Mole/Ember FAS channel topography and lack of instream macrophytes are major constraints.

2. INTRODUCTION

2.1. Description of the Watercourse

The River Mole is one of the major tributaries of the Thames. The Mole catchment covers 487 km^2 (5%) of the Thames catchment and contributes 6% of the freshwater discharge at Teddington. (This contribution has risen considerably during the extremely dry conditions experienced during 1989-90).

The Mole rises from numerous springs and seepages near to Rusper, West Sussex (105m O.D) and flows for 80.3km before joining the Thames at East Molesey (10m O.D).

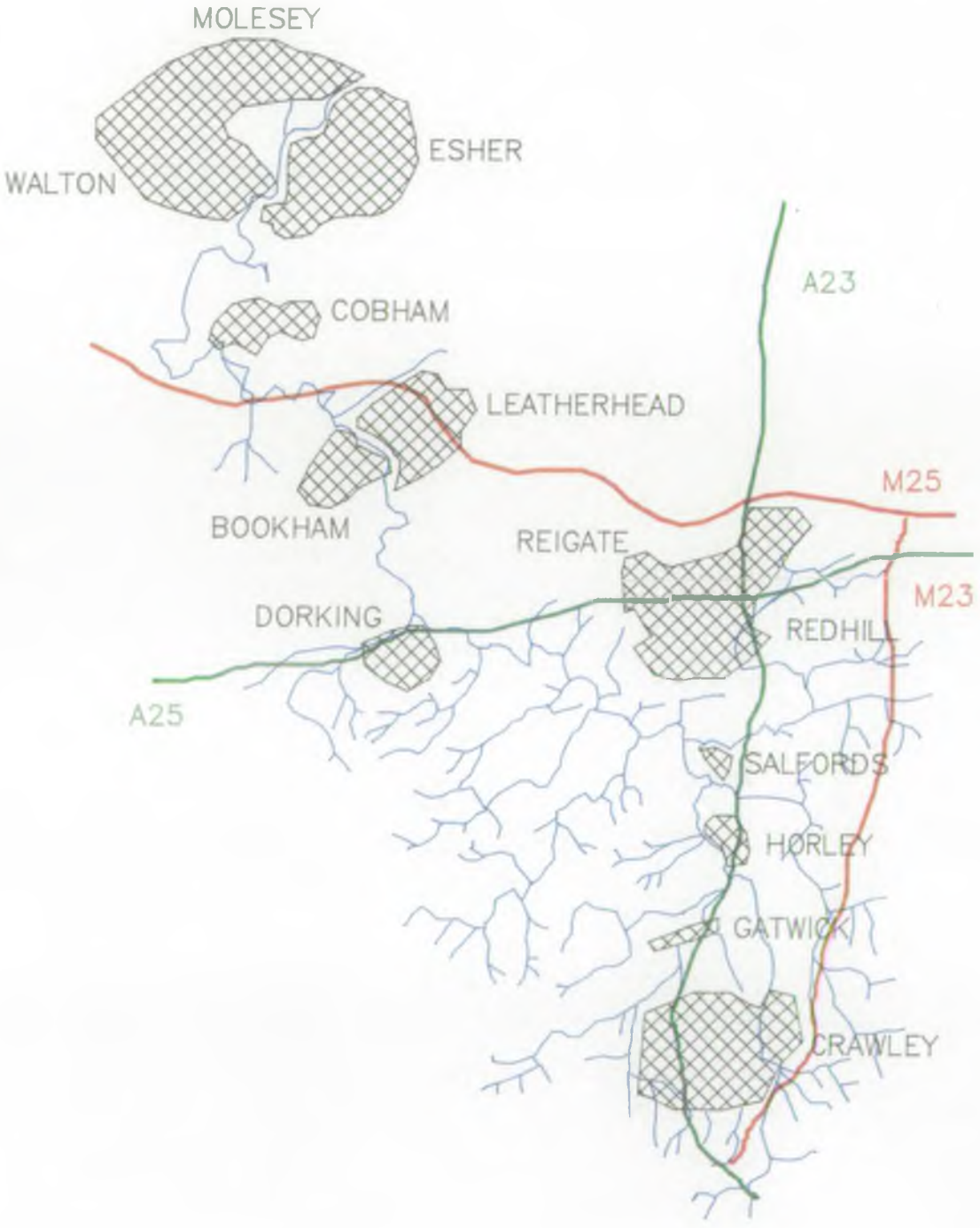
From its source the Mole flows in a north easterly direction, skirting Crawley underneath part of Gatwick Airport and around its margin, to its confluence with the Gatwick Stream, to the West of Horley. The river then flows north and north-west, past Salfords and the Reigate/Redhill conurbation. At Dorking the river turns north, passing through the Mole Gap in the North Downs and gradually swings north-west again, whilst passing through Bookham and Leatherhead and skirting Cobham. The river finally swings to the north-east whilst passing through the most heavily urbanised areas in the Mole valley, consisting of Walton, Molesey and Esher. The river discharges to the freshwater Thames, below Hampton Court Bridge. (See Fig. 1 for a map illustrating the major roads and urban areas of the Mole).

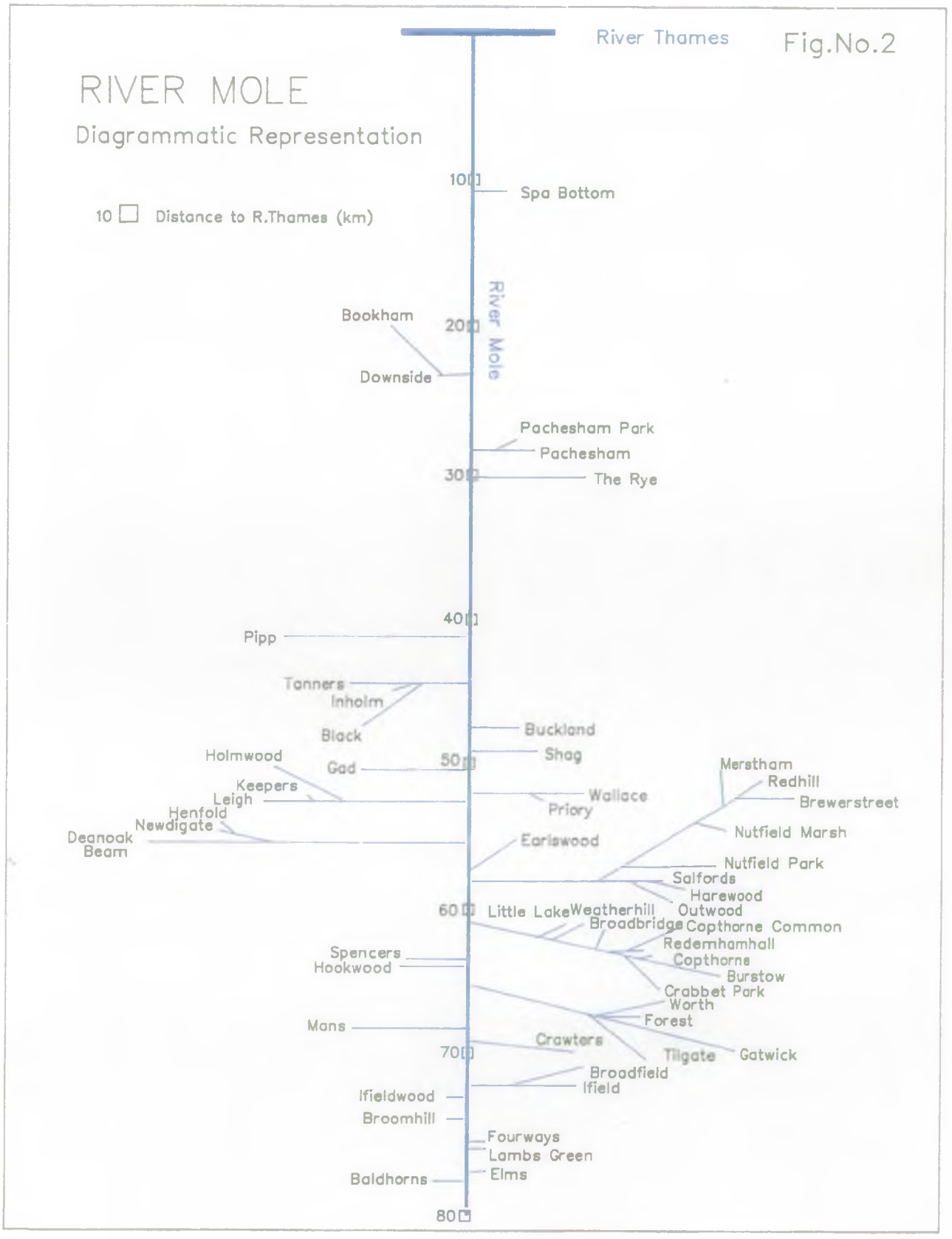
River gradients are steepest above Gatwick Airport and through the Mole Gap (Dorking to Leatherhead). Elsewhere gradients are normally less than 0.6m/km. Tributary gradients vary between 2.95-20.52m/km. In streams with the steepest gradients the majority of the fall is in the first few kilometres.

The majority of the Mole's tributaries are to be found upstream of Dorking. There are eight major tributaries in this area i.e. (Pipp, Tanners, Gad, Leigh, Deanoak, Salfords, Burstow and Gatwick). The Deanoak almost completely dried out in 1990. Additionally there are in excess of forty named minor watercourses (See Fig.2 R. Mole diagrammatic

RIVER MOLE
Major Urban Areas

Fig.No.1




River Thames
Fig.No.2
RIVER MOLE
Diagrammatic Representation
10 Distance to R.Thames (km)
River Mole
Spa Bottom
Bookham
Downside
Pachesham Park
Pachesham
The Rye
Pipp
Tanners
Inholm
Black
Buckland
Shag
Holmwood
Gad
Keepers
Leigh
Henfold
Newdigate
Deanoak
Beam
Wallace
Priory
Earlswood
Merstham
Redhill
Brewerstreet
Nutfield Marsh
Nutfield Park
Salfords
Harewood
Outwood
Little Lake
Weatherhill
Broadbridge
Copthorne Common
Redemhamhall
Copthorne
Burstow
Crabbet Park
Worth
Forest
Gatwick
Tilgate
Spencers
Hookwood
Mans
Crawters
Broadfield
Ifield
Ifieldwood
Broomhill
Fourways
Lambs Green
Elms
Baldhorns
10
20
30
40
50
60
70
80

representation). There has been considerable mineral extraction in the Mole Valley. These operations are at Nutfield Marsh (fullers earth and sand), the North Downs between Dorking and Redhill (chalk), Buckland (high grade silica sand) and in the Hersham/Molesey area (sand and gravel). Only the latter are close to the main river, and the majority of worked out pits are used for landfill. There are major water supply reservoirs (T.W.A. Utilities) in the Walton/Molesey area. These are the Walton Group, Queen Elizabeth II and Island Barn. Clay extraction, often for local use and of some antiquity, has left the Upper Mole Catchment pitted with small ponds and lakes.

The Mole and its tributaries have been heavily used as a power source. Old mill structures can be seen at many places along the main river. Notable examples are at Cobham Weir and Downside Mill. Equally important were the mills on the tributaries, where a legacy of mill-ponds have been left. Notable examples are to be found on the Pipp Brook. i.e. the Mill Pond/Dorking, Milton Court Lakes and the Rookery Lakes.

Landscaping and ornamental lakes have played their part in altering the Mole catchment. Minor watercourses and brooks were dammed to form waters such as Gatton Park Lakes (ascribed to 'Capability Brown') and the Tilgate Lakes, once owned by Sir Malcolm Campbell.

The present phase of 'water feature' construction has much to do with the Common Agricultural Policy, (C.A.P) farming economics and increasing demands for more stillwater fishing in the area. Unfortunately to meet this demand much of value is being destroyed. Old ponds are being cleared out and enlarged and many small, 'on-stream' lakes are being created, much to the detriment of the many minor watercourses in the Mole.

The upper river is typical of a southern clay catchment watercourse. With an impoverished flora and fauna and very subject to spates. The spate-like characteristics of the upper river are exaggerated by the imposition of Crawley and Gatwick Airport on its headwaters and the growing urbanisation along the A23 between Horley and Redhill. Urban storm run-off has become a significant factor here, and there is always the danger of single acute pollution incidents.

Below Dorking the situation improves, and from Dorking to below Cobham, flora and fauna improves and the river has the aspect of a chalk-type river. From Cobham to Albany Bridge, Esher the rivers reverts to clay catchment. From Albany Bridge downstream the original course of the river has been obliterated to form the Mole/Ember flood alleviation scheme. This was originally in response to severe flooding experienced during 1968 when 10,000 properties around Molesey were affected.

25% of the catchment is urban. Urban densities are highest around Walton, Esher and Molesey and in the upper catchment along the A23 from Redhill to Crawley. Wooded areas account for 8% of the catchment, with major woodland areas to the south of Crawley and to the north and south of Dorking. The remaining areas are agricultural with pasture dominanting in the Weald Clay and arable in the rest. Recent changes in Common Agricultural Policy (C.A.P) will render some of the agricultural enterprises non-viable in the short-term.
Intense development pressures, especially around Gatwick Airport, dictate in the medium to long-term, that some of this land will be used for speculative building and leisure activities.

The main River Mole has been significantly altered by river engineering works at two sites. These are around Gatwick Airport and from Hersham to Molesey i.e. the Mole - Ember Flood Alleviation Scheme. Both works have been to the detriment of fisheries. (N.B. Further diversion works are proposed around Gatwick Airport. The Mole F.A.S. was of a more sensitive nature than the Ember F.A.S., as most of the original channel remained). Some of the remaining main river has been subject to resectioning and realignment (i.e. for M25 works at Stoke D'Abernon), all of which have some fishery cost. However, the majority of it retains its original course.

Realignment of many minor watercourses, has reduced many to featureless ditches. Some of the major tributaries have been resectioned to cope with the above and now provide an impoverished habitat for fish.

Increasing urbanisation in the Mole Valley has caused degradation of minor watercourses, through realignment and culverting.

2.2. Geology and Hydrogeology

The River Mole arises from two main sources. One is in the numerous springs and seepages from sandstone and limestone horizons in the Weald Clay in the area of Rusper, West Sussex. The second source is from groundwater discharge in the upper Tunbridge Wells sands in the area to the south of Crawley. The run off to be expected from a predominantly clay catchment contributes a varying component to the flow dependent on climatic conditions.

The two sources merge near Horley and continue north-west across the Weald Clay and Lower Greensand outcrops to Dorking, where there are significant flow additions from springs to the north of Dorking. The Mole flows through a gap in the scarp, solution features are present in the bed, between Pixham and Mickleham. At Leatherhead the river flows across Lower London Tertiary deposits and continues northwards to the Thames at East Molesey.

Superficial deposits of flood plain alluvium mainly occur in the lower reaches of the river.

Groundwater is abstracted from both Lower Greensand and Chalk principally in the Leatherhead and Dorking region. River flows remain unaffected by these abstractions.

(Fig. 3 illustrates the Geology of the Mole Catchment, Figs.4-6 are hydrographs from 3 gauging stations at Horley, Kinnersley Manor and Esher, adjacent to survey sites).

RIVER MOLE GEOLOGY

Fig.No.3

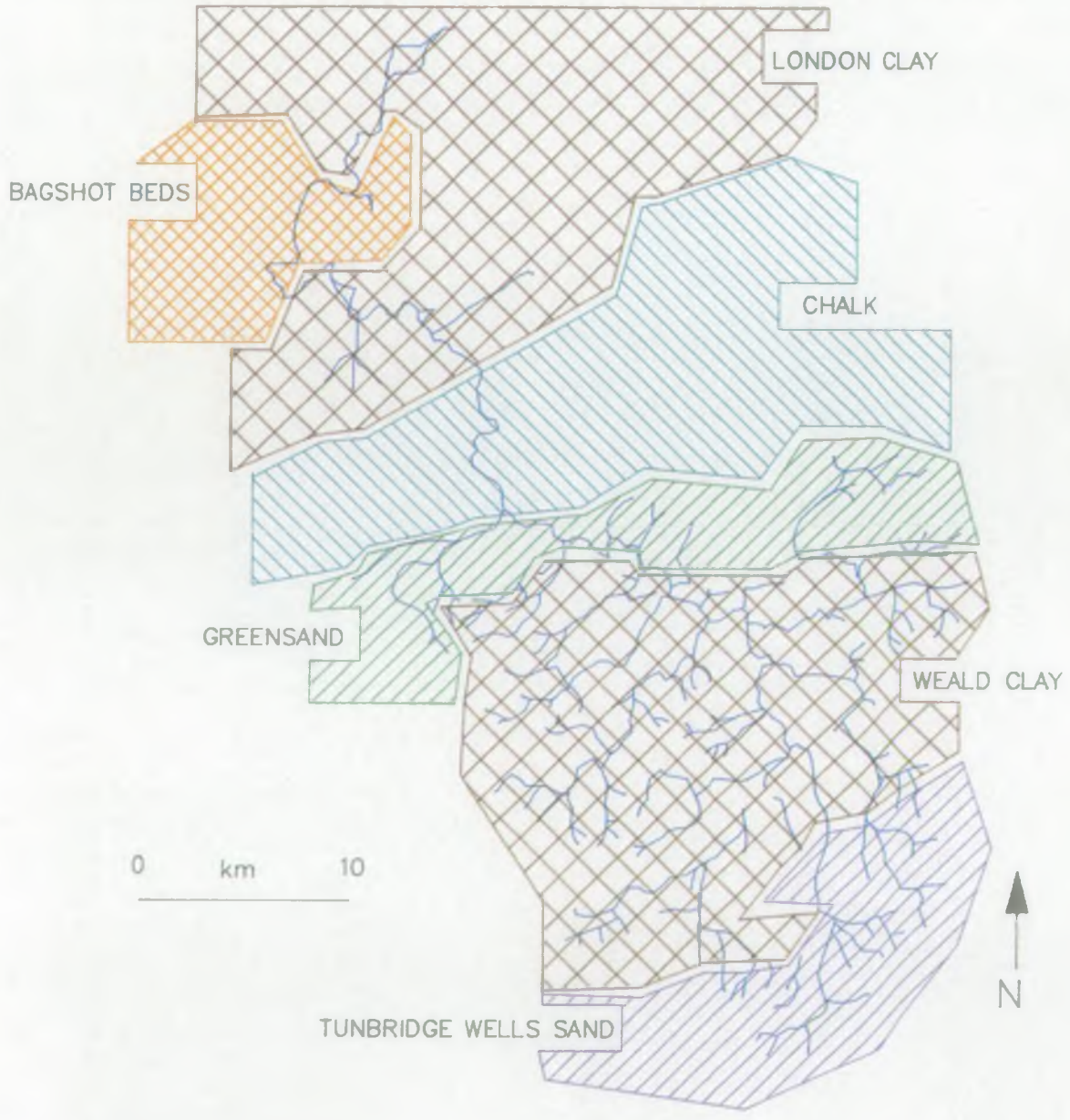


Fig.No.4

RIVER MOLE SURVEY(CM089)
Horley Gauging Station
Monthly water flow data

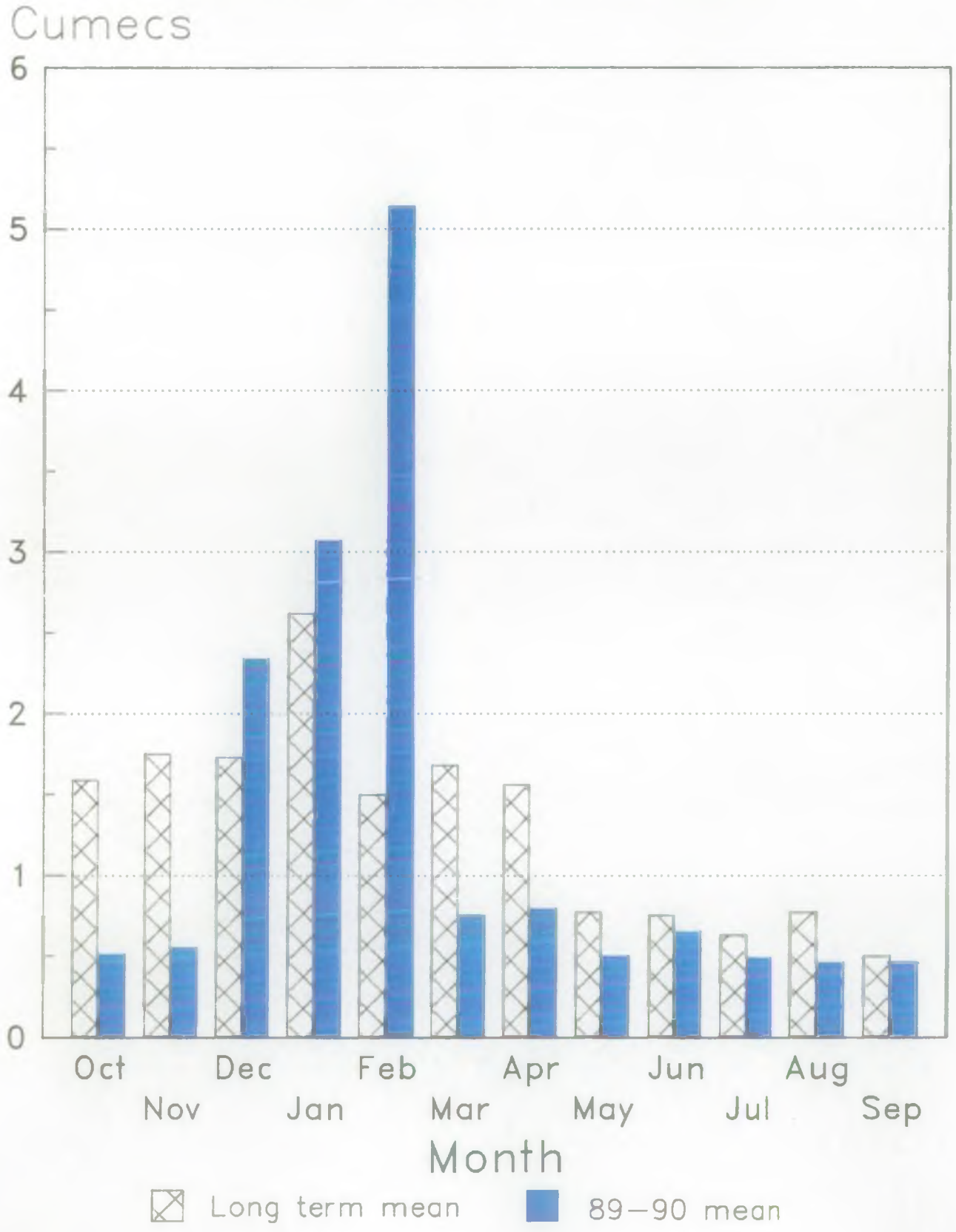


Fig.No.5

RIVER MOLE SURVEY(CM089)
Kinnersley Manor Gauging Station
Monthly water flow data

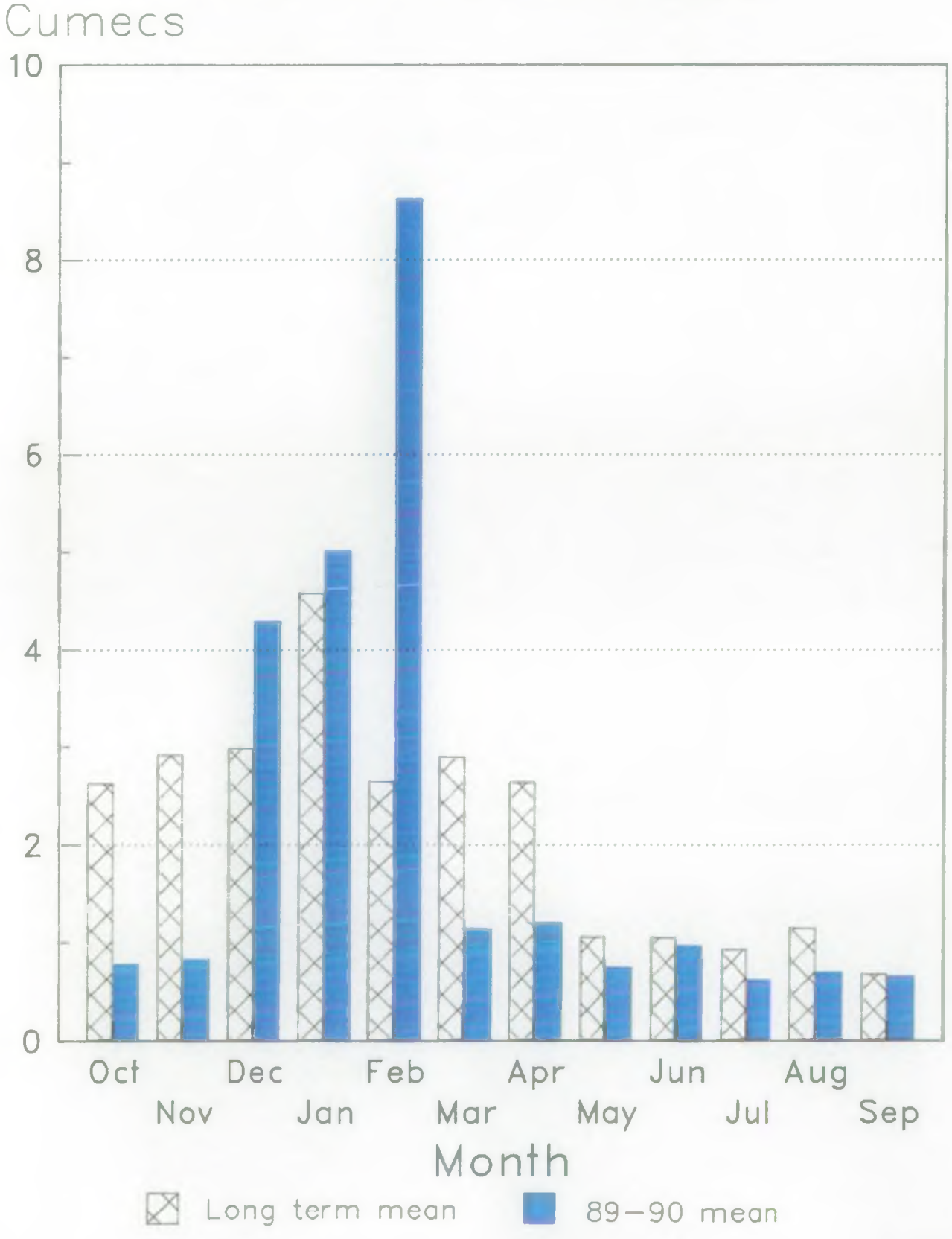
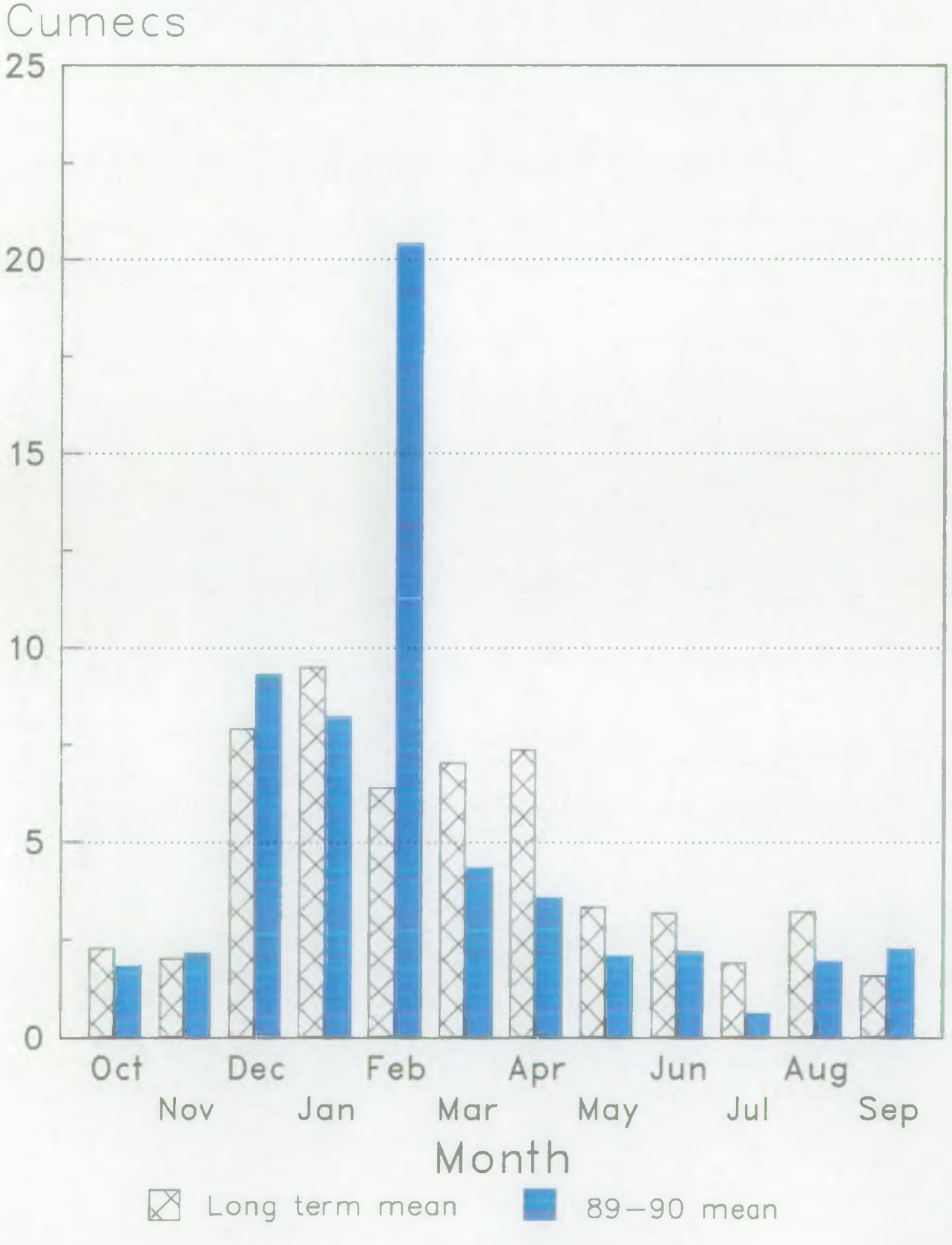


Fig.No.6

RIVER MOLE SURVEY(CM089)
Esher Gauging Station
Monthly water flow data



2.3 Main discharges

Works:- CRAWLEY

Volume:- 99600 m^3/day (under dry weather conditions)

Grid Reference:- TQ28824022

Comments:- A complicated sewage treatment works, formed from two actual works and having three seperate discharges. All of the outfalls have seperate discharge consents.

Crawley S.T.W. No. 1 Outfall

	S.S.	B.O.D.	NH3 - (Mgms/Litre)	Comments
Conditions:-	65	40	20	Interim related consent. Duration 31/3/91. Only to be used when flow 47300 or No.2 out of use.
Conditions:- from 1 May	40	20	12	After 1/4/91.
from 1 Dec.	40	20	30	

Crawley S.T.W. No. 2 Outfall

Conditions:- 1 May	10	7	12	For flow 47300 No. 1 and No.3
1 Dec.	10	6	30	Outlets come into use.

Crawley S.T.W. No. 3 Outfall

Conditions:- 1 May	40	20	12	Only to be used when flow 47300
1 Dec.	40	20	30	or No.2 out of use.
'Upper Tier Consents:-	195	120	40	(Pass or fail Oct.'89-Sept.'90 for all samples). 'Upper Tier failures' for S. Solids and B.O.D.

Works:- HORLEY

Volume:- 6061m^3/day (until 31.3.91)
6500m^3/day (from 1.4.91)

Grid Reference:- TQ26714367

Horley S.T.W.

	S.S.	B.O.D.	NH3 - (Mgms/Litre)	Comments
Conditions:-	65	25	25	Until 31.3.91
Conditions:-	30	15	25	After 1.4.91
'Upper Tier Consents:-	195	75	50	(Pass or fail Oct.'89-Sept.'90) 'Upper Tier failure' B.O.D.

Other Restrictions:- No more than 7 micrograms per litre of total Cadmium.

Works:- ESHER

Volume:- 28100m^3/day (until 31.8.90)
35200m^3/day (after 1.9.90) under dry weather conditions.

Grid Reference:- TQ134666.

Esher S.T.W.

		S.S.	B.O.D.	NH3 - (Mgms/Litre)	Comments
Conditions:-	1 May	25	12	4	
	1 Dec.	25	20	6	
'Upper Tier Consents:-					
	1 May	105	48	10	(Pass or fail Oct.'89-Sept.'90)
	1 Dec.	120	66	14	Passed.

Gatwick Airport is the most important non-STW discharge to the main river. The discharge is of most concern during the winter, when de-icing chemicals are used. The discharge is flow regulated.

The Crawley STW discharge, constitutes the major component of the flow of the Gatwick Stream during low flow periods. During dry summers the combined discharges of Crawley & Horley STW's account for approximately 90-95% of river flow at Kinnersley Manor gauging station.

Historically the failure of major STW's to meet their consent conditions, has lead to reaches of the River Mole failing their RQO's. A review was instigated in 1986 and identified the following problems:

i) An increase in BOD and Ammonical Nitrogen in the Mole above the Gatwick Stream. This reach had consistently failed during the winter for the last 3 to 4 years.

ii) A dissolved oxygen sag in the middle Mole at Kinnersley Manor and for some distance downstream.

iii) Problems in maintaining the standard for the EC designated cyprinid fishery from Leatherhead downstream.

iv) Rising sludge problems in the Ember Flood Relief Channel due to deposition of solids from Esher STW as a result of low current velocities.

There have been some recent improvements. Management strategies have alleviated the problems with rising sludge in the Ember Channel. A series of mild winters has avoided problems with BOD and Ammonical Nitrogen in the Mole above the Gatwick Stream, but the potential threat remains. The D.O. sag at Kinnersley Manor remains. Major redevelopment work has occurred at both Horley and Crawley STW's.

Finally, it should be emphasised that it was the relaxation of consents at Crawley, Horley and Esher STW's in 1989 that provided the main impetus for this survey.

STOP PRESS

After the recent cold weather experienced in Feb. 1990, Gatwick Airport used de-icers. These accummulated in Pond D, u/s Gatwick/Mole confluence and were gradually released to main river (M.R). Without sufficient dilution, 'sewage fungus' became apparent from Pond D to Meath Green Bridge on the Mole (a distance of some 5 kilometres). Fish were seen in distress, but fortunately an increase in rainfall diluted the polluting matter and dispersed most of the sewage fungus. No mortality was observed and water quality did not decline substantially, although damage has been done to the macroinvertebrate biota in the Gatwick Stream and the Mole.

2.4 POLLUTION INCIDENTS

As with any heavily populated catchment the River Mole suffers from a wide variety of pollution incidents. The Biological Status Report (1988) records 130 incidents in the first 10 months of 1988. Some 90 biologically significant incidents were monitored during the period (1986-1988). Farm wastes, sewage discharges and oil spills were the most numerous the majority occurring in the tributaries of the upper catchment. Streams running through Crawley and Reigate (Gatwick/Salfords) suffered from most types of pollution. Whereas those entering from the Western, more rural areas (i.e. Leigh, Deanoak), suffer mainly from farm wastes.

Of the significant incidents, 29 were regarded as important and attended by Biology, mostly in the upper catchment. The majority were single acute events. Repeat acute events are the most significant biologically. These include oil pollution of the Salfords Stream; rising sludge below Esher STW; de-icing chemicals below Gatwick Airport; farm wastes in the Deanoak and Shag Brooks; poor effluent quality downstream of Horley and Copthorne STW's and losses of oil and bitumen to the Copthorne streams.

Between 1.5.89-31.5.90 186 incidents were recorded by Pollution Control Of these 7 were regarded as major (category 1) pollutions, 45 were significant (category 2) and 134 minor (category 3).

Of the 186 incidents during this period, Biology regard 27 as being of

biological significance. Where the causes are known, sewage discharges, oil and chemical spills are the most numerous. All but one occurred upstream of Dorking. The number of biologically significant farm waste discharges has declined.

Of the 27 significant incidents, 7 were regarded as important and attended by biology. Most of these were single acute events. The most consistent repeat acute event was the poor effluent quality downstream of Horley S.T.W.

To put the Biology and Pollution Control incidents into context, many of them were of a minor nature. For example, during 1988, Metropolitan Fisheries only recorded four mortalities on the Mole or its tributaries. Three of these were minor incidents, with under 50 fish being killed on each occasion. The fourth incident was due to raw sewage entering a private trout lake on the Wallace Brook. This resulted in the deaths of 400 rainbow trout.

Between the 1.5.89-31.5.90 only six mortalities were recorded on the Mole. Four of the six events were minor, with under 60 fish being killed during each event. The remaining two incidents involved over 100 fish in each case.

Finally a note of caution should be introduced about 'minor incidents'. All pollution incidents exact some cost from the environment. The effects of a 'minor incident' on a tributary is relatively more severe than the same incident on the main river (i.e. the loss of 50 fish from a tributary, may represent a significant fraction of the tributary's fish population).

2.5 FISH MORTALITIES

The 1986 River Mole Fisheries Survey recorded all significant fish mortalities between April 1982-July 1986. During this time some 1550 kilos (12,000 fish) were killed, the majority in the upper catchment. There were two serious incidents. The first took place on September 1983, on the Mole between Gatwick and Horley, when a discharge from the Duracell battery company killed an estimated 1 tonne of fish. The second in July

1985 when Crawley STW failed killing an estimated 150 kilos of fish on the Gatwick Stream/Mole to Horley and displacing many more. The effects were felt d/s to Kinnersley Manor, a distance of over 9 kilometres.

For gross effects such as fish kills, sewage treatment works discharges, farm wastes and chemical spills are the most important causes. STW failures and chemical spills being more important on the main river and farm wastes on the tributaries.

A list of significant mortalities from July 1986 until December 1990 is given in Appendix VI.

Comparing this to the data from 1982-86, it can be seen that mortalities have fallen by roughly two thirds to 511 kilos (3350 fish). The reduction in mortalities is even more remarkable when it is realised that 300kg in the later period relates to one incident in a put and take trout fishery. No significant mortalities have been recorded on the Mole or its tributaries from July 1989 through to December 1990.

Apart from the mortality at the 'put and take' trout fishery, the most significant mortalities on the Mole between July 1986-December 1990 were, during July 1987 when the Horley STW failed, killing an estimated 100 kilos of fish, and between May and July 1989 when 13 kilos of fish were killed between Horley and Sidlow on the Mole as the result of Horley STW failing and presumed 'urban storm run off'.

As during the 1982-86 period, by far the largest killer of fish was raw or partially treated sewage, but farm wastes and chemical spills also killed fish in significant numbers. STW failures were again more important on the main river and raw sewage, farm wastes and chemical spills on the tributaries.

2.6 FISHERIES MANAGEMENT HISTORY

Before the mid 1950's all the fishing on the River Mole was in private hands, and few organised coarse fishing clubs existed. A successful stocked trout fishery, did exist, at Stoke D'Abernon. A consistent feature of the river before and during this time, was its disappearance

into a series of swallowholes between Dorking and Mickleham during periods of low summer flows. (Increasing urbanisation around Crawley and Redhill, has resulted in increased flows of treated sewage effluent to the main river. The last recorded incident of this kind occurred during the drought of 1976, when much of the river stopped flowing). During the 1970's Dutch Elm Disease destroyed many of the elms that formerly lined the river banks. During this period dace dominated angling catches Stretches of the river in the Fetcham area were thought to contain some of the best dace fishing in the South (with fish of a high average size, 3/4lb). Chub were present and pike were not perceived to be numerous. A good match weight on the Mickleham stretch of the Mole was 4lbs (R. Ballinger pers. comm).

In 1960-61, the movements and population densities of Roach and Gudgeon in the River Mole, between Flanchford and Sidlow Bridges were studied by MAFF (Stott, 1967). Gudgeon and roach were the commonest species. Dace and chub were fairly common and perch, rudd, tench and carp were occasionally seen. Fish densities, estimated by electrofishing and trapping ranged between 0.4-4.2/m^2 for roach and 0.3-2.8/m^2 for gudgeon. Roach below 9cms were not used in his estimates, and he concluded that as large numbers of small fish were seen, the densities found were considerable under estimates of the true situation.

The Thames Water Authority commenced work in the Mole Valley in 1975. A contemporary account of the fisheries since that date now follows.

During the drought of 1976, the River Mole upstream of Dorking was almost static for a period of months. Between Dorking and Leatherhead, the river disappeared into the many 'swallow-holes' and the fish population was either removed or wiped out. Downstream of Leatherhead, the river's flow reappeared and no major fish losses were recorded. By the end of 1976, much of the Upper Mole Catchment would have had a much reduced fish population.

Following reports of a considerable deterioration in angling success between Betchworth and Horley, a Thames Water survey was undertaken, between 1979 and 1980. The survey was conducted using single, long upstream fishings, some of them at Stotts' original sites. All values

quoted were minimum estimates. Roach were dominant at all sites. Dace were the next most common species, followed by gudgeon. Perch, chub, common and crucian carp and occasional rudd and pike were also present. It appeared that the river supported a diverse fish population, but few roach of less than 10cms were taken. Small fish of other species were also scarce. Fish densities had crashed by a factor of 100, when compared to Stott's data, 20 years previously. It was thought that there might be several causes implicated in this decline; increased rapidity of run off, overshading by marginal shrubs, lack of macrophyte growth and poor water quality affecting juvenile fish.

During the late seventies and early eighties the Guildford area's perception of the Mole was as follows. The fishery upstream of Horley Weir was thought to be very poor. Between Horley Weir and Horley STW outfall, fish were plentiful. During low-flow periods fish would not remain behind Betchworth Weir. Downstream of Pixham Weir (Dorking), fish stocks were thought to be good or very good and exceptional for chub downstream of Hersham Royal Mills. (This latter fishery was largely obliterated during the construction of the Mole/Ember F.A.S).

In 1982 Metropolitan Fisheries, Thames Water took over responsibility for fisheries in the Mole catchment, and were receiving a steady stream of complaints about the state of the fishing from clubs between Horley and Betchworth. It was therefore decided to augment these fisheries by stocking. To this end 2875 kilos of fish were stocked into the Non-EC designated stretches of the river by TWA and the angling clubs. Angling reports indicated that some restocking work especially upstream of Sidlow Bridge was of a very temporary value. The mortality record indicated that during the same period, in the Non-EC designated stretch of the river, some 1223 kilos of fish were killed. Following concern from Leatherhead DAS about their Kinnersley Manor fishery, an electrofishing survey was conducted between Kinnersley Manor and Horley STW in July 1984. No live fish were found for 750 metres upstream of the weir and only an estimated 1700 fish were seen in the entire length (an estimated 3 kilometres) of the survey. Roach and dace dominated with smaller numbers of bream, perch and pike and a few carp, tench, rudd and chub. The roach and dace showed limited recruitment.

During 1985-86 Thames Water Authority initiated a 5 year rolling programme of riverine fish population surveys to establish baseline data for each major watercourse. The findings of the 1986 Mole survey were:-

1) Within the EEC designated fishery d/s of River Lane, Leatherhead (RQO.2A), three sites failed the internal target biomass of 20 gm^{-2}. These were at Stoke D'Abernon (MOH1) biomass 10.6gm^{-2} and (MOH2) 5.2gm^{-2}, and the Ember Flood Relief Channel (MOJ3) 5.6gm^{-2}.

2) In the non-designated fishery (RQO.2B) results were mixed. Biomasses were only 5.8gm^{-2} at MON1 (Mole u/s Gatwick Stream) and 5.3gm^{-2} at MON3 (Flanchford). Results were better at MON2 (Sidlow Bridge) 13.7gm^{-2}, MON4 (Brockham) 11.8gm^{-2}, MON5 (Norbury Park) 15.4gm^{-2}.

3) At MOP1 (u/s Horley STW),(RQO3) the biomass was high at 24.8gm^{-2}. This site is well oxygenated being d/s of Horley Weir, restocking had occurred upstream of the weir, and localised displacement of fish had occurred, following pollution incidents.

4) Growth and the health of fish was fair to good at all sites. Recruitment was good in the designated fishery, fair at Norbury Park (MON 5), but poor further upstream.

5) Three out of five tributaries surveyed had a low or negligible biomass. These were the Burstow Stream (BTP1) - RQ03, the Salfords Stream (SSN1) - RQO2B and the Gatwick Stream (GSP1 and GSF1) - RQO's 3 and 1B.

The Pipp Brook (PPT2) 12.8gm^{-2}/RQOX and the Earlswood Stream (EWT1) 14.2gm^{-2}/RQOX had good biomasses and were presumed to act as nursery streams for the main river.

Self supporting populations of Brown trout were discovered on the Pipp Brook at Sonde's Place and on the Gatwick Stream at Rickmans Green.

6) A review of the mortality and restocking record for the main river (M.R) above Leatherhead when associated with the observed poor

recruitment, indicates that the fisheries of this river section were partially maintained by regular stocking.

7) River realignments on the M.R. at Gatwick and Esher were believed to have had adverse effects upon the fisheries of these sections.

The 1986 River Mole survey recommended the following courses of action:-

1) That further survey work needed to be done in the upper river, above Leatherhead, to ascertain the reasons for low biomasses and poor recruitment.

2) That the provision of off-stream recruitment and supplementation units (O.S.R.U's) might assist recruitment and provide refuges during times of high flow.

3) That restocking suitable tributaries with juvenile , dace and roach might assist poor natural recruitment that was found in the upper river.

4) That future engineering schemes should give some thought to environmentally sensitive designs.

After the survey poor water quality was identified as having a major impact on the fisheries of the upper river. As well as the gross effects of incidents such as Authority STW breakdowns, other more subtle and chronic effects were having an impact on the fish population. There were Spring and Summer peaks of unionised ammonia which could have a particularly serious effect on the eggs and fry of fish.

The main achievement of the report has been to highlight the fishery problems of the Upper Mole Catchment to other functions. In 1988 Biology conducted an intensive survey of the whole Mole catchment, and their findings largely mirrored the findings of the 1986 Fisheries Survey. Horley and Crawley STW's have been upgraded and the British Airports Authority have agreed to pipe surface water run-off from Gatwick Airport to Crawley STW for further treatment. Most of the tributaries and M.R. now attain a chemical water quality comfortably exceeding their R.Q.O.

(Environmental Quality Report/Nov. '90, Appendix VIII).

The Fisheries Section has maintained the fishery between the Gatwick and Salfords Stream confluence by stocking 32,000 fish, weighing nearly a metric tonne and valued at over £14,000 (see Appendix V). These fish were mainly roach, chub and dace, together with numbers of barbel, bream, perch and carp.

To assist poor recruitment in the upper, non-EEC designated river, the Gatwick Stream, Salfords stream, Leigh Brook and Tanners Brook have received over 6,500 juvenile chub, dace and roach, weighing over 110 kilos and valued at nearly £5,000.

The proposal for 'off-stream recruitment units' (O.S.R.U's) has been addressed by ourselves and the River Mole Preservation Association (R.M.P.A). Finance is a constraint here, as is the fact that the Upper Mole is heavily eroding, and the O.S.R.U's cannot function as they were meant to. However there is merit in the concept as a fish refuge during high flows. Non-river connected O.S.R.U's already exist on the Mole and a few have been planned. Opportunities also exist for turning ox-bow features or redundant sections of the river into such units.

Where chemical water quality and flows are acceptable, the manipulation of in-stream and marginal habitats, and the removal of obstructions to fish passage may provide useful recruitment to the main river. Recently this concept has been applied to the Earlswood Stream an effluent carrier, some 3 kilometres long and identified during the 1986 survey as a dace nursery stream. Co-operation between fisheries, conservation, land drainage and pollution control has resulted in stub groynes and riffle weirs being put into overwidened sections, marginal vegetation retention during dredging, coppicing and tree-planting where appropriate. Perhaps the most important feature of the scheme is the discussion with the riparian owner about the removal of a weir 1 kilometre upstream of the main river. This will provide a further 2 kilometres of nursery area.

Preliminary assessments have been made of the bottom of the Salfords Stream, and the Rye, below Leatherhead for habitat improvement schemes. There can be no doubt that there is much scope for such works in the

major tributaries and in the main river itself.

Recent involvement of fisheries in the planning process has been used to protect sensitive fisheries, e.g. at the proposed Forge Farm Industrial Park near Crawley, which contains a self maintaining and possibly, relict population of Brown Trout. Consultation can also be used to enhance planning proposals which have impacts on local watercourses e.g. a gravel spawning area has been built into the Gatwick Stream where a major fuel pipeline crosses it.

Angling success can give an indication of the health of a river. During June 1989 Leatherhead and District A.S. informed us, that during their first six hour match of the season, on the River Mole at Norbury Park, Mickleham, the winning weight was 64lbs 5ozs, of mainly medium sized chub. Second place was taken with 38lb of chub, and this beat the previous match record by 15lbs. (contrast this with the situation in the 60's and early 70's when 4lbs of fish, from the Mickleham stretch was regarded as a good catch). During the same time reports of even larger match and pleasure catches were received from the stretches through Cobham (Cobham Court A.S. waters). In the upper river, especially upstream of Flanchford Bridge, during the early 1980's match and pleasure catches could be measured in ounces or at best a few pounds. Regular fish mortalities, and poor, or non-existant recruitment meant that maintaining a fish population was something of an achievement. However by the late 1980's things had begun to change. We are very grateful to Horley Piscatorial Society, who fish the Mole from Gatwick down to Sidlow Bridge and assist with matches down as far as Betchworth Weir, for much detailed observation on the current state of the fishery in that area.

During May 1990, tens of thousand of fry were reported through the Meath Green Stretch of the River Mole. During July 1990, the same phenomena was reported at the Longbridge section of the Mole, Horley. During August 1990, the numbers of fry at Meath Green was again commented on, together with the fact that match weights had doubled from 1.5lbs to 3.4lbs (mainly roach and dace). In October 1990 consistent catches of 3-5lbs fish were taken from the Longbridge stretch, together with an exceptional catch of 12lbs 11ozs (consisting of large bream, roach, rudd and small carp). In November 1990, 35lbs of bream and carp were taken by two anglers at

Sidlow and a 17 1/2lb all roach catch from Longbridge. In December 1990 a 100 peg Charity Match was fished from Longbridge to Betchworth Weir. The results were totally unexpected and quite illuminating. The match was won with 33lbs 10ozs of bream, chub, roach and dace from Meath Green. Second place was taken with all roach catch of 26lbs 50ozs, upstream of Sidlow Bridge and third with an all dace catch of 23lbs 14ozs from Flanchford. Most people caught something. A second match was fished in January 1991, weights were not as spectacular, and the river was low, clear and cold, but yet again nearly everyone caught something, except above Betchworth Weir.

It can be seen that improvements in chemical water quality in the upper river coupled with an evolving fish stocking programme, have produced something of a renaisance in the fisheries of the upper river. However threats are still in evidence. The Crawley-Redhill conurbation is becoming increasingly urban in nature and there is always the possibility of a single acute pollution incident, which could negate all the good work undertaken to date. In the lower sections of the river, angling success is largely dependant on an increasingly aged chub population. This population will decline, producing a vacuum which will be filled by dace or roach.

A map of the river depicting salient features appears in Fig. 7.

Fig.7 RIVER MOLE SURVEY (CM089) SURVEY MAP.

3. AIMS AND OBJECTIVES

3.1 OVERALL AIMS OF SURVEYS

The National Rivers Authority has a statutory obligation to maintain, improve and develop inland fisheries. To assist in meeting this obligation, NRA - Thames Region Fisheries staff have engaged upon a 5 year rolling programme of riverine fish population surveys to establish baseline data for each major watercourse in the Thames catchment. (This survey is in fact non-routine - see specific aims).

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

Further details of the N.W.C. classification system and the E.C. Directive appear in Appendices I-III.

The NRA Thames Region have developed a site code classification system based upon the River Quality Objectives and the E.C. Directive. A description of this system appears in Appendix VII.

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

Cyprinid - 20 gm/m^2
Salmonid - 15 gm/m^2

3.3 SPECIFIC AIMS

a) Post privatisation, sewage treatment works at Crawley, Horley and Esher had their consents to discharge treated sewage effluent to the Rivers Mole and Ember and the Gatwick Stream temporarily relaxed.

The main purpose of this survey was to provide a description of the fish populations, upstream and downstream of these works, for reference purposes.

b) As practically all the sites used during this survey, were identical with sites used during the River Mole - 1986 survey, it was decided to compare and contrast the findings of the two surveys.

c) To evaluate the success of reinstatement and enhancement stocking, principally undertaken in the tributaries and main river, upstream of Flanchford Bridge.

d) The 1986 survey was the first major quantitative riverine survey on the Mole. As such little in the way of background or historical detail was provided. An attempt has been made to rectify this situation.

4. METHODS

4.1 SITE SELECTION

7 sites were fished between 11.10.89 and 30.5.90.

Sites were selected from the River Mole 1986 survey, directly upstream and downstream of the three sewage treatment works. These sites were originally chosen to represent local environmental conditions within the defined water quality zones, taking into account topography known water quality impacts and access considerations.

4.2 CAPTURE AND DATA ACQUISITION

Catch depletion electrofishing techniques using pulsed D.C. gear (Arofisher) was applied at five of the seven sites and operated within enclosed areas of approximately 100m in length. 3 runs were fished at each of these five sites.

Electrofishing was impractical on the River Ember Flood Relief Channel, with a mean width over 25.0m and a mean depth over 2.0m. A 50m length was stop netted off, in both cases, using 30 x 3m stop-nets. The enclosed area was then carefully netted 3 times in each case using a 100 x 4m seine-net, having a 'bag' of 9.5 mm bar mesh.

All fish captured were enumerated by species and measured (fork length to the nearest mm). Subsamples of up to 40 fish of each species, at each site were weighed to the nearest gram. No scale samples were taken for age estimation.

Minor species such as stoneloach (Neomacheilus barbatulus), Minnow (Phoxinus phoxinus), and bullhead (Cottus gobio) were merely noted if present.

Relevant site details were taken and appear later in the site reports.

All data acquired in the field was entered into a Huskey Hunter data

logger. This was later down loaded to a Compaq 286 microcomputer.

Single electrofishing runs of 250m plus were made adjacent to two of the seven sites, in order to test how typical the site fish populations actually were of those in the local area.

4.3 DATA ANALYSIS

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

As no scale samples were taken no age analysis was attempted.

4.4 HEALTH EXAMINATION

No fish were presented for health examination.

4.5 MACROINVERTEBRATES

NRA Biology staff are engaged upon a biological monitoring programme for the main watercourses in the region. Macroinvertebrate data from this source is presented in this report (Section 5.5, Table 2). Invertebrate samples tend to reflect the physicochemical variations which occur in the river and this provides a means of monitoring the aquatic environment on a continuous basis.

A means of evaluating the macroinvertebrates has been developed based upon the Biological Monitoring Working Party (BMWP) scoring system, which relates scored results to river quality.

4.6 WATER QUALITY

Water quality data for the period October 1989 to September 1990 was retrieved from the NRA Thames Region archive. This data was compiled by the Environmental Quality Pollution Control Section from samples collected at Reach Assessment Points (R.A.P), by routine sampling and by Automatic Quality Monitoring Stations (A.Q.M.S), from sites throughout the Mole.

Sampling points and their relative locations to fish survey sites used in the current survey are given below (and can be found on Fig. 7).

R.A.P.	N.G.R.	Nearest Fish Survey Site
Gatwick Stream at Tinsley Bridge	TQ292397	Gatwick Stream u/s Crawley STW (GSFA).
Gatwick Stream above confluence with Mole	TQ276424	Gatwick Stream d/s Crawley STW (GSPA).
Mole u/s Horley STW	TQ267436	
Mole at Wick Farm	TQ270450	u/s Horley STW (MOPA)
Mole at Kinnersley Manor	TQ263463	
Mole at Flanchford Bridge/Leigh	TQ234480	u/s Sidlow Bridge (MONB)
		River Ember FAS u/s Esher STW (MOJA)
Mole at Royal Mills Esher	TQ131656	Old Mole Channel (MOJB)
Mole above Thames	TQ154683	River Ember FAS d/s Esher STW (MOJC)

N.G.R.	Distance of Fish Survey Site from the R.A.P. (in metres)
TQ292396	within 150
TQ284420	within 750
	within 100
TQ268435	approx. 2000
	approx. 1000
TQ262469	approx. 4000
TQ134665	approx. 1000
TQ135674	approx. 1500
TQ135666	approx. 3000

5. RESULTS

5.1 SITE RESULTS

Results for the present River Mole Fisheries Survey 1990 (Ref: CM089) are presented and compared with the River Mole Fisheries Survey 1986 (Ref:CM086). Figs. 8-42. In both cases this takes the form of a site report, biomass and density summaries and relevant length/frequency histograms for each site. The distance of seperation, of the 1986 and 1990 sites, and reasons for them, are noted in the Site Reports/Additional Comments.

Fig. 8

SITE REPORT

WATERCOURSE Gatwick Stream

SITE NAME Gatwick Stream u/s Crawley S.T.W.

SITE CODE GSFA

LOCATION D/S of Forge Farm Abbatoir & Bridge, Rickmans Green.

N.G.R. TQ292396

DATE FISHED 16.11.89

METHOD 2 Anodes u/s 3 catch depletion

RQO 1B EC DESIGNATED STATUS None

EEC TARGET BIOMASS None

ESTIMATED BIOMASS 2.76 gm/m^2

LENGTH 131.7m

WIDTH RANGE 2.5-4.9m MEAN WIDTH 3.8m

DEPTH RANGE 0.05-0.45m MEAN DEPTH 0.19m

PHYSICAL STRUCTURE Eroding riffle & pool system between steep clay banks.

SUBSTRATE COMPOSITION 10% Bare, 30% Sand, Mud & Silt, 50% Gravel, 10% Stone.

AQUATIC VEGETATION 5% Elodea/Callitriche, 5% emergent juncus.

BANKSIDE VEGETATION 70% shading due to Alder/Hazel/Oak & grasses.

ADJACENT LAND USE

LB Rough grazing pasture RB Rough grazing pasture

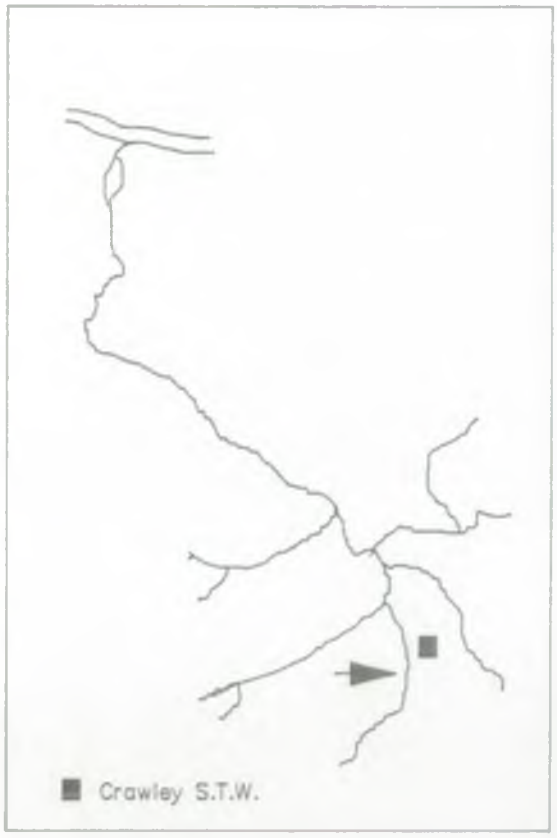
WATER TEMPERATURE $7^{O}C$

ADDITIONAL COMMENTS

Sparse populations of minnow, bullhead, stoneloach and 3-spined stickleback present. Of special interest is the single Brook Lamprey found (the first record on the Mole). Also the sparse, but recruiting Brown Trout population. This population is possibly a relict, wild-population, having a distinctive and uniform colouration pattern. Unfortunately the whole of this section is under threat of development, from the 'Gatwick Business Park' Mitigation stratagies have been discussed with the firms consultants, but recently changed. Further disruption to the stream is being caused by the 'Maidenbower' project. An extremely large housing estate. No u/s or d/s runs done. The 1990 site is

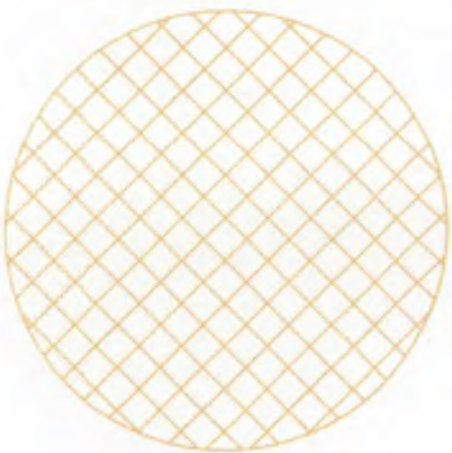
adjacent to the 1986 site, which was abandoned because of fallen trees and accumulated debris.

GATWICK STREAM U/S CRAWLEY S.T.W.(GSFA) Fig.No.9
BIOMASS AND DENSITY (1990).

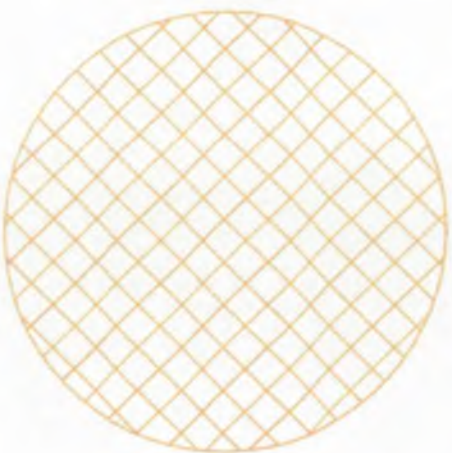


	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	–	–
Dace	–	–
Roach	–	–
Perch	–	–
Pike	–	–
B.Trt	2.76	0.016
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	–	–
Gud'n	–	–
Other	–	–
Ruffe	–	–
TOTAL	2.76	0.016

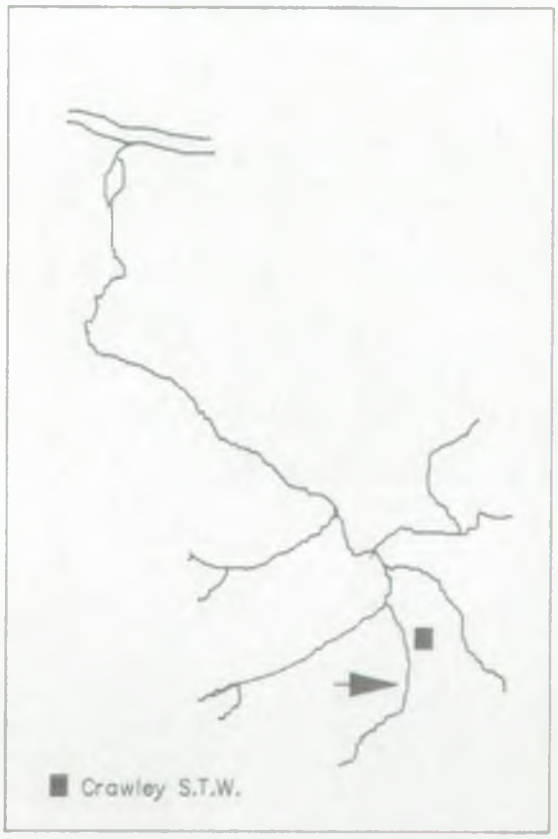
Biomass



Density

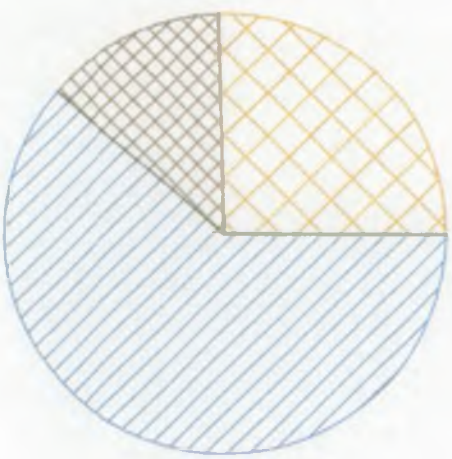


GATWICK STREAM U/S CRAWLEY S.T.W.(GSF 1) Fig.No. 10
BIOMASS AND DENSITY (1986).

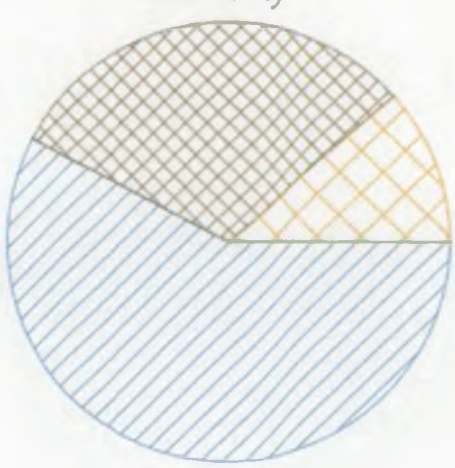


	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	–	–
Dace	–	–
Roach	0.90	0.015
Perch	–	–
Pike	–	–
B.Trt	0.40	0.003
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	–	–
Gud'n	0.20	0.008
Other	–	–
Ruffe	–	–
TOTAL	1.50	0.026

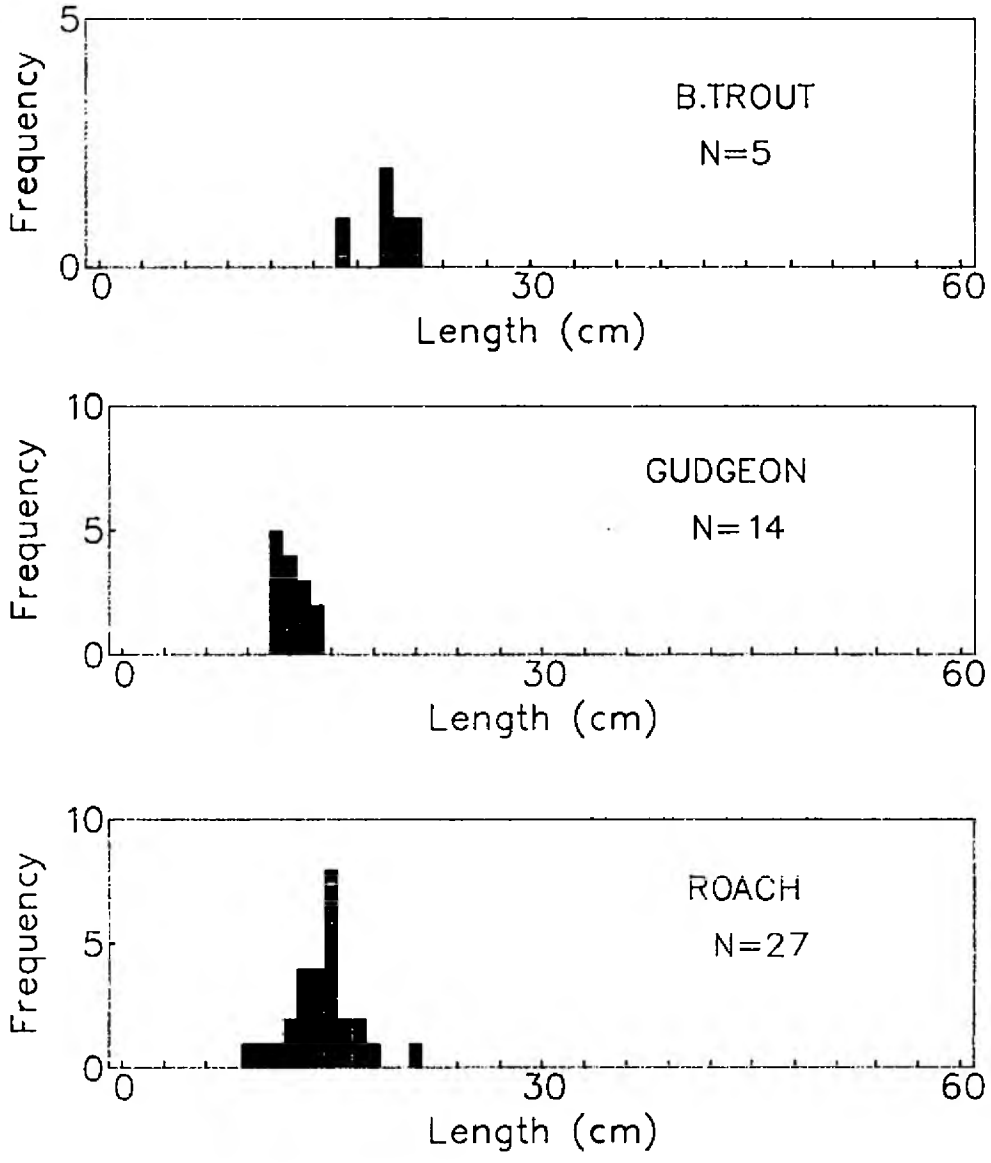
Biomass



Density



GATWICK STREAM U/S CRAWLEY S.T.W.(GSF 1) Fig.No.11
LENGTH-FREQUENCY FOR ALL SPECIES (1986).



GATWICK STREAM, FORGE FARM, RICKMANS GREEN (GSFA)

A very low biomass present. Recruitment only observed in the brown trout. This population is possibly a relict, wild population of uniform characteristics. Sparse populations of minnow, bullhead, stoneloach and 3-spined stickleback observed. A single brook lamprey was also taken.

COMPARISON WITH (GSF1) - 1986

The roach and gudgeon found at GSF1 in 1986, are completely absent at GSFA in 1990. Brook Lamprey were absent at GSF1 in 1986. The Brown Trout population although numerically small has increased in biomass, density and size range. There is definite evidence of recruitment in the population. Spined loach and 3-spined sticklebacks have appeared since the GSF1 -1986 survey.

Fig. 12

SITE REPORT

WATERCOURSE Gatwick Stream

SITE NAME Gatwick Stream d/s Crawley S.T.W.

SITE CODE GSPA

LOCATION u/s Bridge off Riverside Road, d/s/ Gatwick Lake,Horley

N.G.R. TQ284420

DATE FISHED 11.10.89

METHOD 2 Anodes, u/s 3 catch depletion

RQO 3 **EC DESIGNATED STATUS** None

EEC TARGET BIOMASS None

ESTIMATED BIOMASS 40.59gm/m^2

LENGTH 108m

WIDTH RANGE 4.2 - 6.3 m **MEAN WIDTH** 5.0m

DEPTH RANGE 0.15 - 0.8 m **MEAN DEPTH** 0.4m

PHYSICAL STRUCTURE Eroding riffle & pool between steep clay banks

SUBSTRATE COMPOSITION 30% Mud & Silt, 70% Gravel + urban debris

AQUATIC VEGETATION 20% emergent, 20% floating, 40% submerged

BANKSIDE VEGETATION 40% shade would be higher except for flood defence

ADJACENT LAND USE

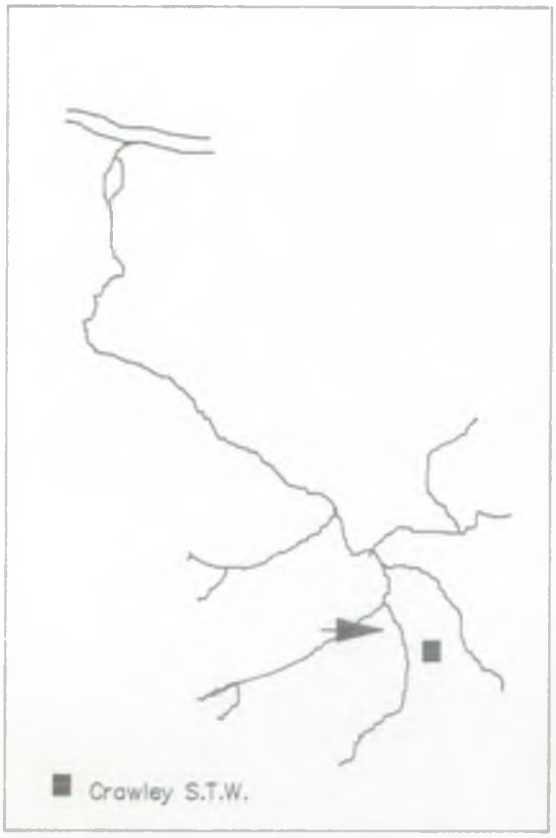
LB Amenity Park **RB** Amenity Park

WATER TEMPERATURE 9°C

ADDITIONAL COMMENTS

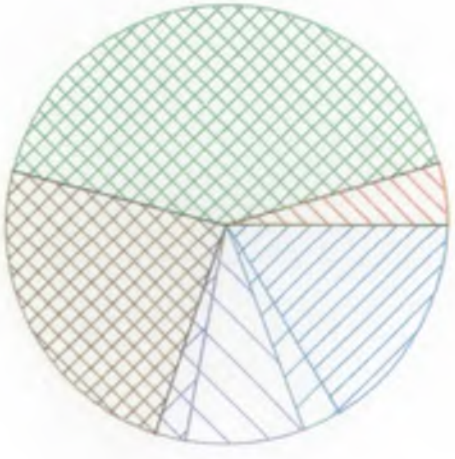
Substantial minnow shoals were seen as well as spined loach, 3-spined sticklebacks, (eels, 20cms) and bream. Many of the roach and dace captured were haemorrhaging. The 'small eels' may have been misidentified, and may in fact have been adult brook lamprey, but none were taken. No u/s or d/s run was undertaken. The 1990 site partially overlaps the 1986 site. The upper portion of the 1986 site was abandoned because of access constraints.

GATWICK STREAM D/S CRAWLEY S.T.W.(GSPA) Fig.No.13
BIOMASS AND DENSITY (1990).



	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	1.85	0.013
Dace	16.85	0.246
Roach	6.60	0.183
Perch	0.93	0.002
Pike	3.52	0.002
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	–	–
Gud'n	9.70	0.439
Other	1.14	0.057
Ruffe	–	–
TOTAL	40.59	0.942

Biomass



Density

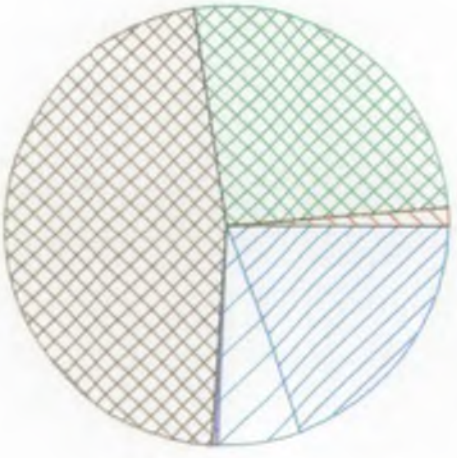


Fig.No. 14

GATWICK STREAM D/S CRAWLEY S.T.W.(GSPA)
LENGTH–FREQUENCY FOR ALL SPECIES (1990).

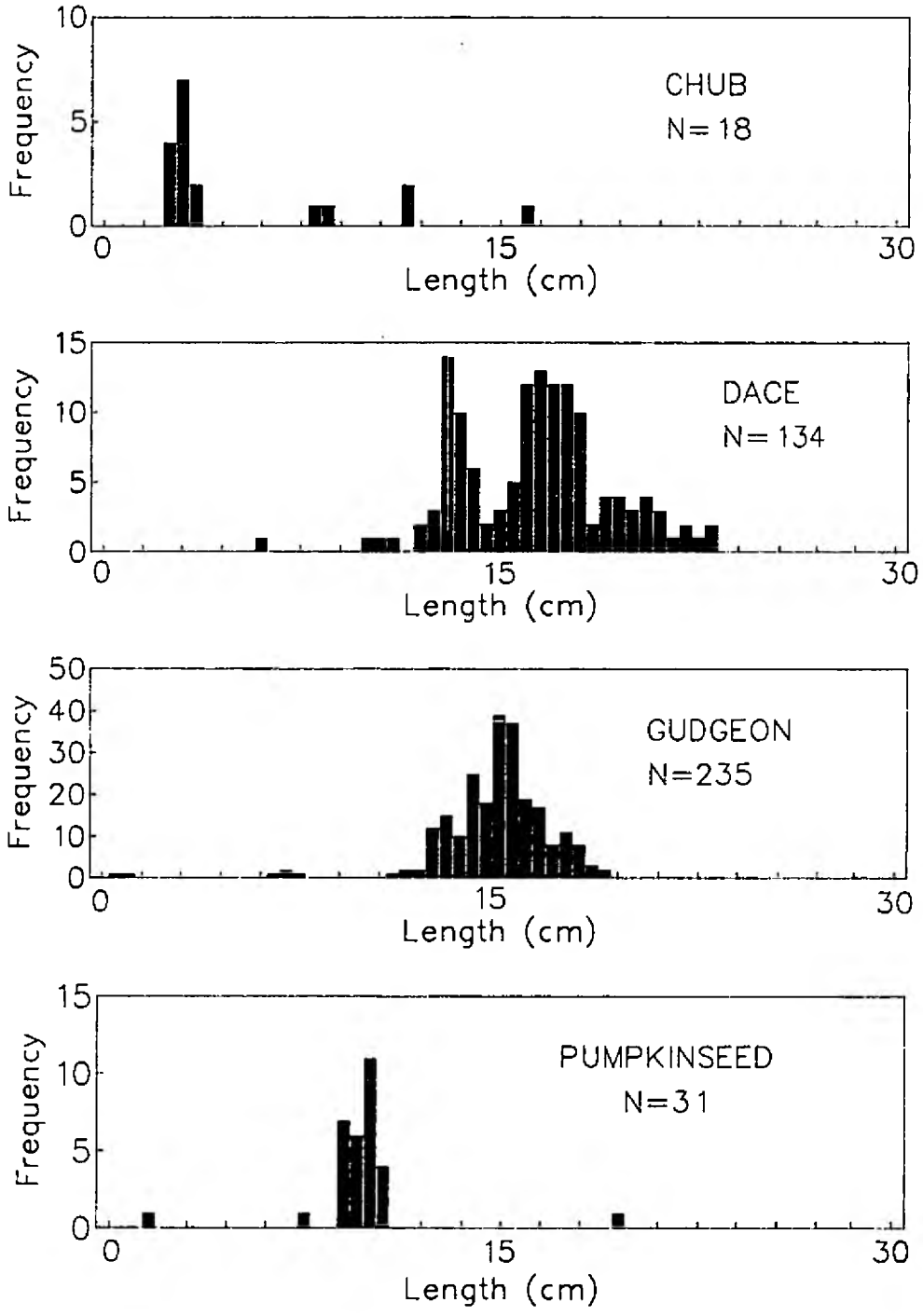
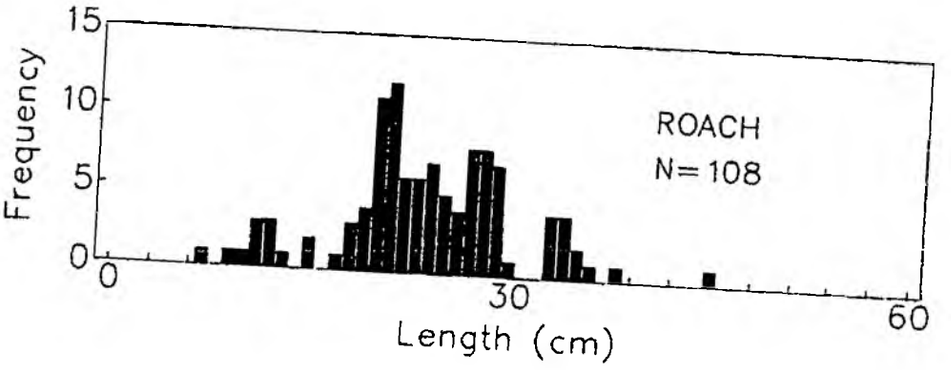
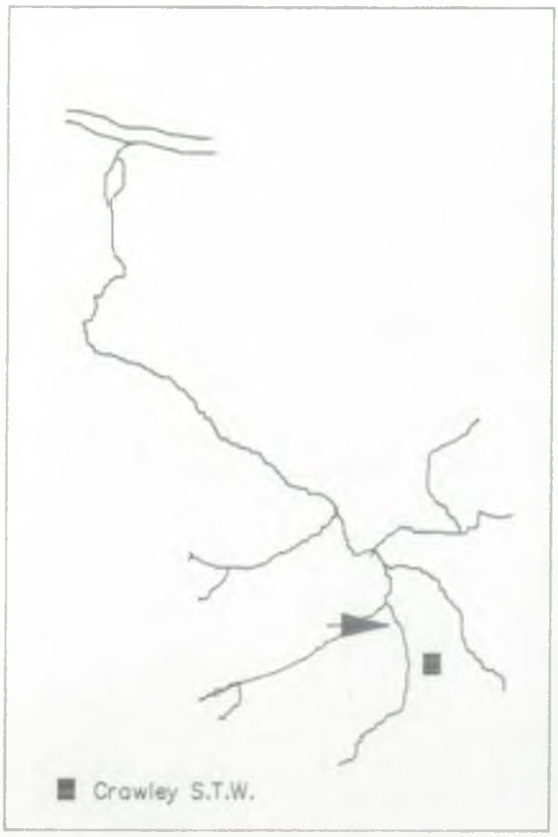


Fig.No.15

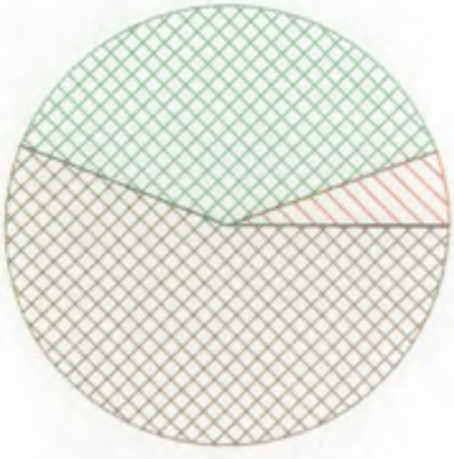


GATWICK STREAM D/S CRAWLEY S.T.W.(GSP 1) Fig.No.16
BIOMASS AND DENSITY (1986).

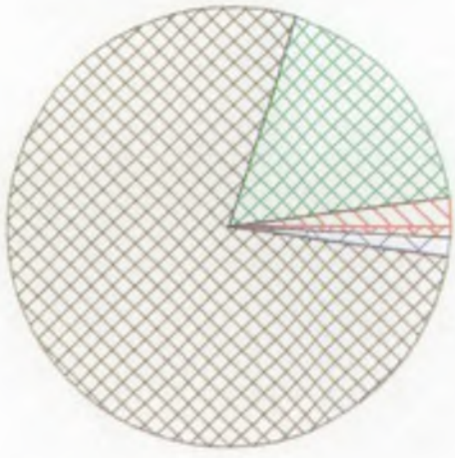


	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	0.40	0.008
Dace	3.00	0.067
Roach	–	–
Perch	< 0.1	0.005
Pike	–	–
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	–	–
Gud'n	4.40	0.287
Other	–	–
Ruffe	–	–
TOTAL	7.90	0.367

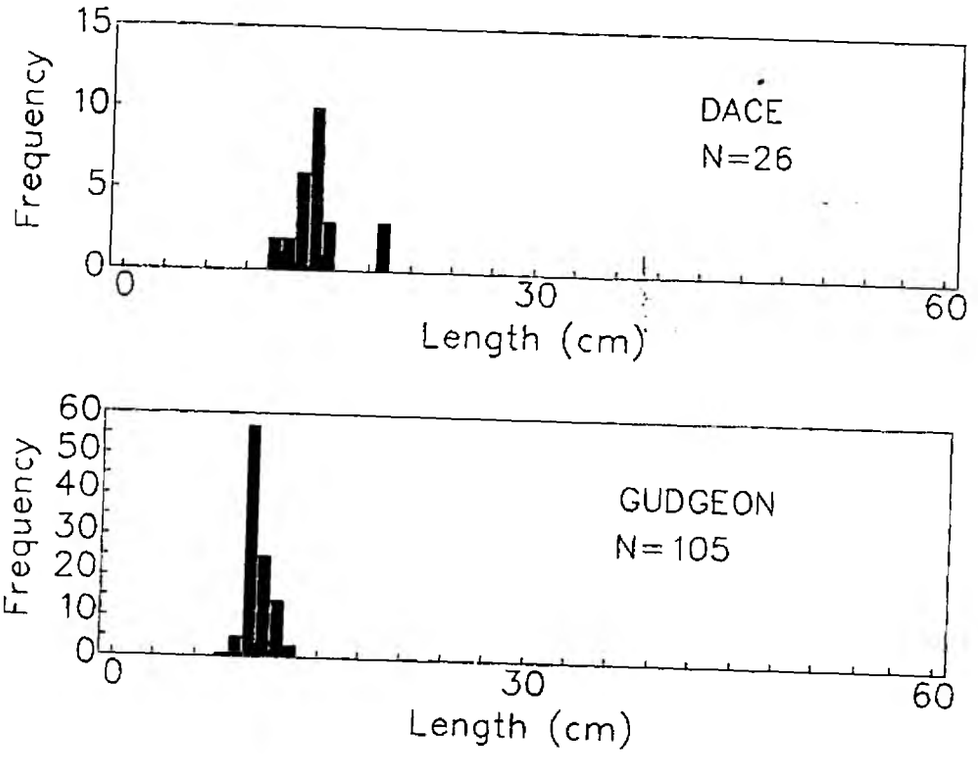
Biomass



Density



GATWICK STREAM D/S CRAWLEY S.T.W.(GSP1) Fig.No.17
LENGTH–FREQUENCY FOR ALL SPECIES (1986).



GATWICK STREAM D/S CRAWLEY S.T.W. (GSPA) - 1990

A very high biomass of fish was present, especially for such a small stream, downstream of a major S.T.W. the population is dominated by gudgeon, dace and roach, all of which are recruiting strongly, together with the minnow populations. There is evidence of recruitment in the chub and pumpkinseed populations (this population is almost certainly maintained by illegal introductions from the adjacent Gatwick Lake, which has a high density of these N. American aliens) Bream, Perch, Pike, Stoneloach and 3-spined sticklebacks were recorded as present. The eels (20cm) recorded as present but not captured, may in fact have been mature Brook Lampreys.

COMPARISON WITH (GSP1) - 1986

GSPA - 1990 compares very favourably with GSP1 - 1986. This is due to the fact that the Crawley S.T.W. failed, and wiped out the Gatwick Stream/River Mole in this area, prior to the 1986 survey. However during GSP1 - 1986 remnant populations of the dace and gudgeon were found, indicating the former strength of these populations. Chub, perch, rudd, spinedloach and minnow were also noted as present. During GSPA - 1990 it was apparent that the fish population had increased dramatically in both biomass, density and size range. Additional species had appeared such as pike, roach, pumpkinseed, bream, 3-spined sticklebacks and the 'eels'. Rudd had disappeared. Heavy 'maintainance' stocking with stillwater roach and bream seems to have succeeded in this area. 'Enhancement' stocking with chub and particularly dace, has in the latter case, produced a strong self-maintaining population. The effects of the previous two years dace stocking can be graphically seen in the length/frequency histogram for this species.

Fig. 18 SITE REPORT

WATERCOURSE River Mole

SITE NAME u/s Horley S.T.W. outfall

SITE CODE MOPA

LOCATION 100m u/s Horley STW outfall/d/s Mill Lane

N.G.R. TQ268435

DATE FISHED 15.5.90

METHOD 2 Anodes u/s 3 catch depletion

RQO 3 EC DESIGNATED STATUS None

EEC TARGET BIOMASS None

ESTIMATED BIOMASS 34.95 gms/m^2

LENGTH 82m

WIDTH RANGE 5-7.4m MEAN WIDTH 6.63m

DEPTH RANGE 0.15m-1.7m MEAN DEPTH 0.6m

PHYSICAL STRUCTURE Eroding,sinous riffle & pool between 3m high banks

SUBSTRATE COMPOSITION Clean clay bed, 10% gravel

AQUATIC VEGETATION 50% Cladophera/Spirogyra, 10% Elodea, Callitriche & Nuphar.

BANKSIDE VEGETATION Grasses, nettles, Himalayan Balsam 30% shade from Crack Willow & Oak

ADJACENT LAND USE

LB Pasture RB Infill of old STW/scrub

WATER TEMPERATURE 12^{o}C

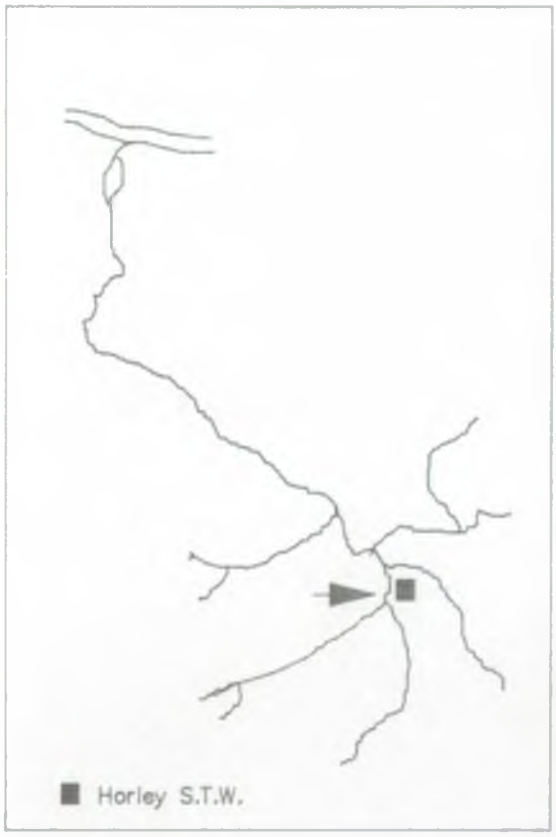
ADDITIONAL COMMENTS

Minnow, 3-spined stickleback and spined loach were also present. A single pumpkinseed was also taken this almost certainly came from Gatwick Lake. Site 100m u/s STW discharge. Low water conditions, so high efficiency of capture. High numbers 10 day old cyprinid fry in margins possibly roach. Low frequency of haemorrhage on roach and dace condition of fish high. U/s run, more chub seen, many more dace and at least three year classes. Many perch seen from 6-35cms. More small bream around 15cms and at least four pike from 30-55cms. 1 Rudd at 30cms found in the weirpool. All main species showing some evidence of recruitment. The 1990 and 1986 sites partially overlap. Again the upper part of the 1986 site

was abandoned because of access constraints.

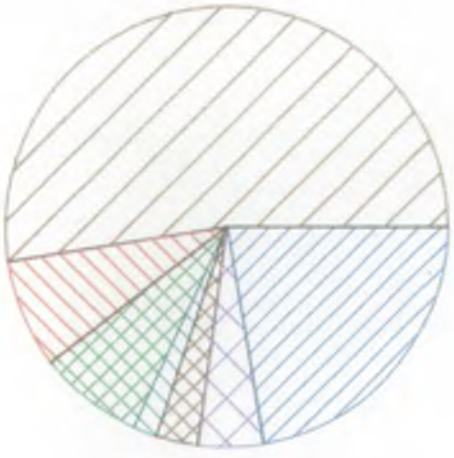
U/S HORLEY S.T.W. OUTFALL (MOPA)
BIOMASS AND DENSITY (1990).

Fig.No.19



	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	2.79	0.011
Dace	2.67	0.043
Roach	7.73	0.174
Perch	1.64	0.02
Pike	–	–
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	0.62	0.002
Bream	18.31	0.035
Gud'n	1.06	0.069
Other	–	–
Ruffe	–	–
TOTAL	34.95	0.386

Biomass



Density

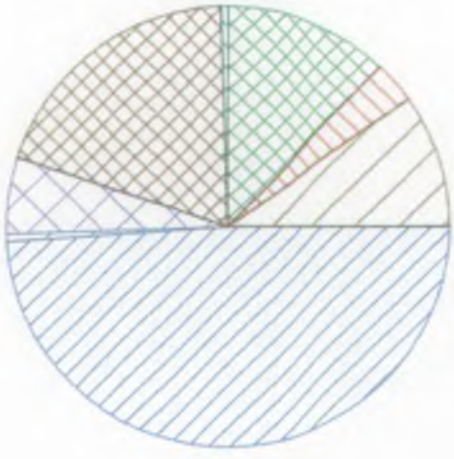
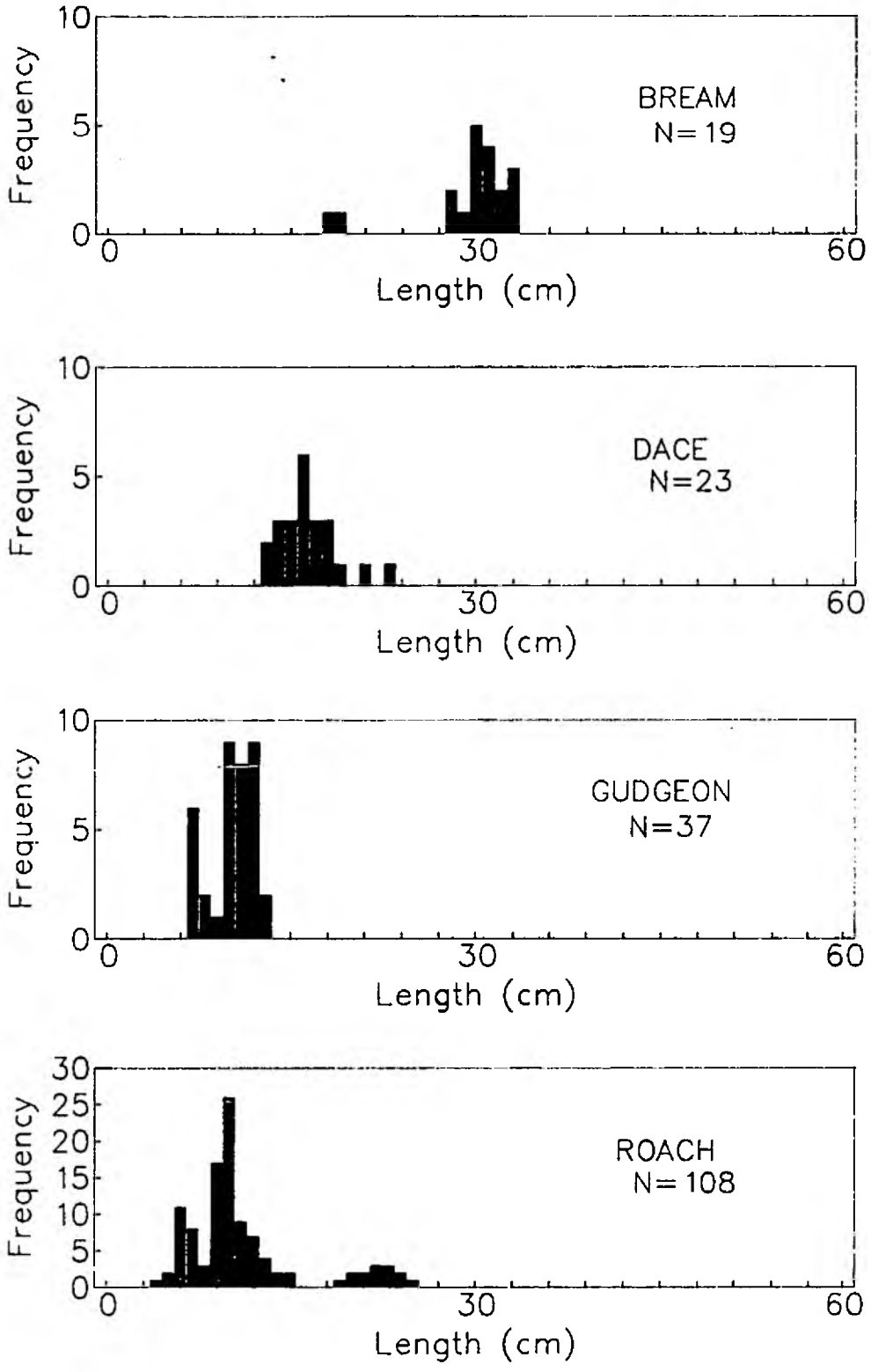


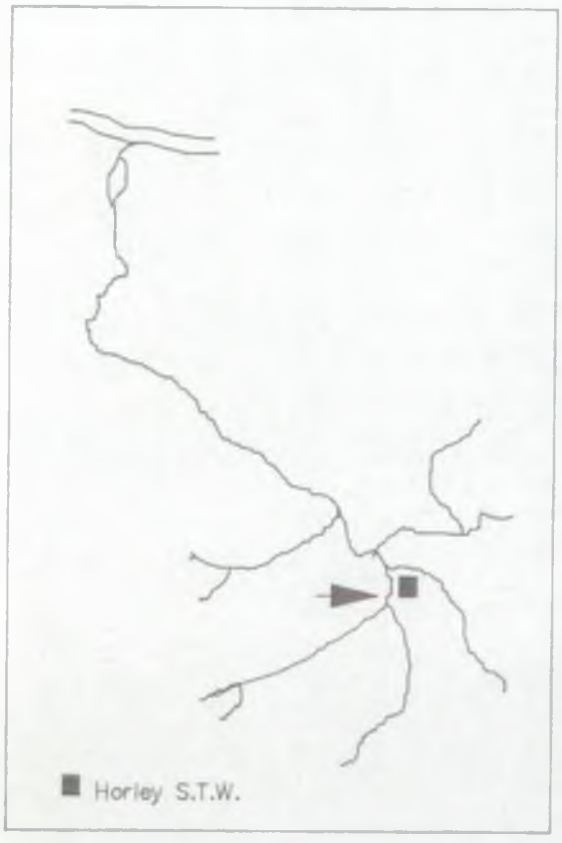
Fig.No20

U/S HORLEY S.T.W. OUTFALL (MOPA)
LENGTH–FREQUENCY FOR ALL SPECIES (1990).



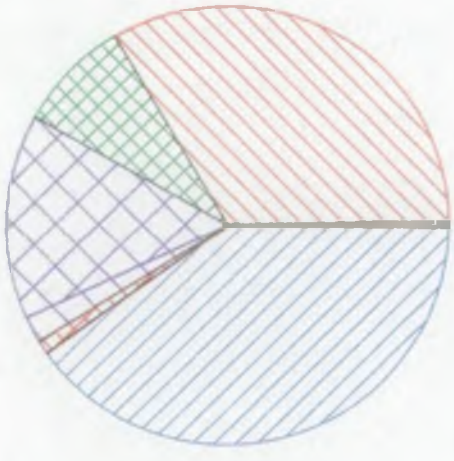
U/S HORLEY S.T.W. OUTFALL (MOP 1)
BIOMASS AND DENSITY (1986).

Fig.No.21



	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	8.20	0.074
Dace	2.00	0.019
Roach	9.70	0.198
Perch	3.73	0.044
Pike	0.40	0.001
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	0.09	0.002
Gud'n	–	–
Other	0.54	0.005
Ruffe	–	–
TOTAL	24.67	0.343

Biomass



Density

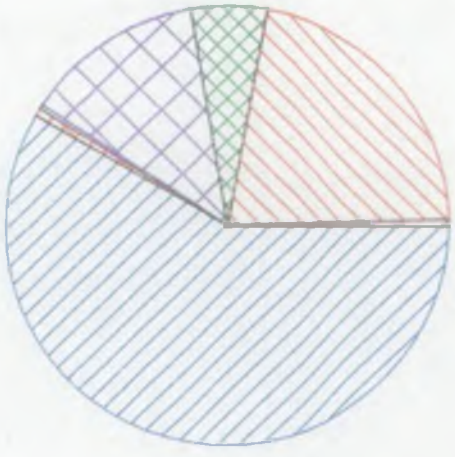
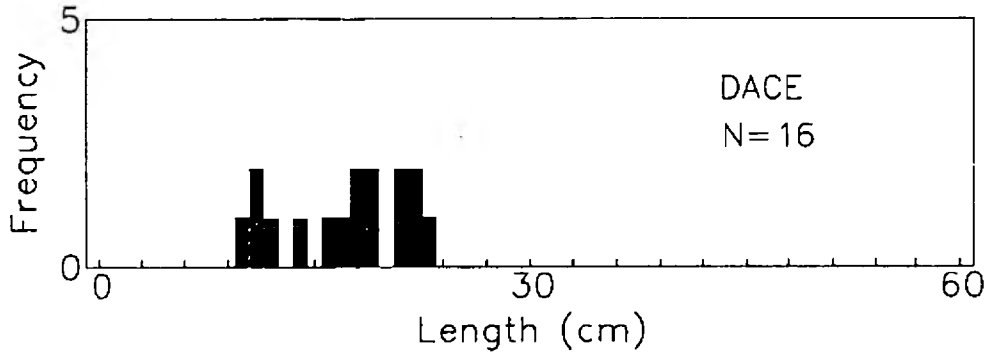
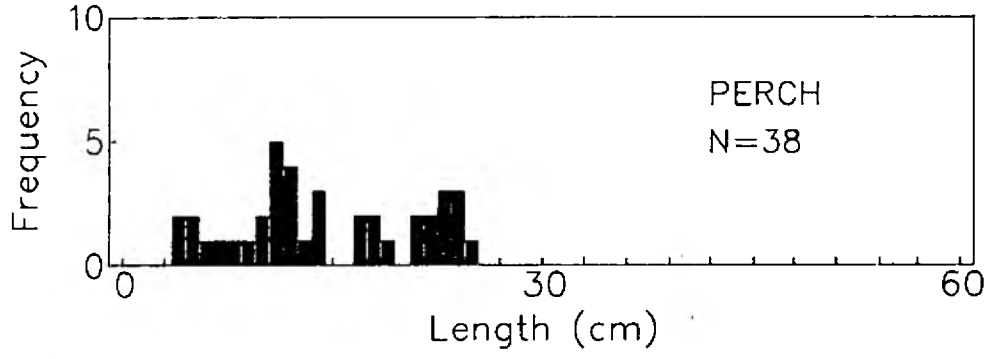
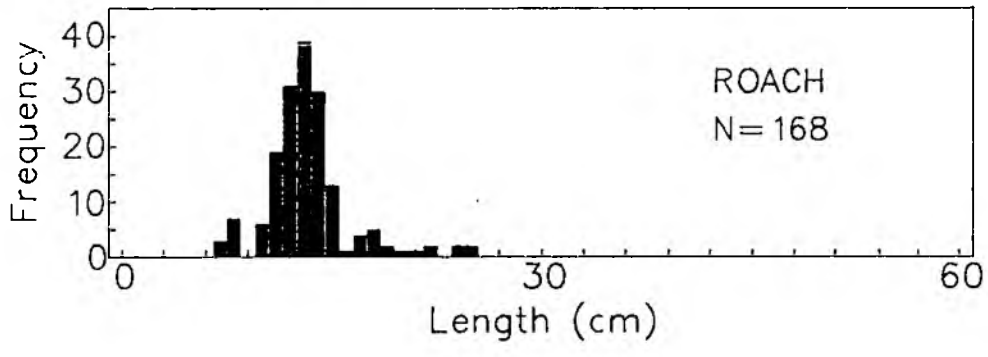


Fig.No.22

U/S HORLEY S.T.W. OUTFALL (MOP 1)
LENGTH–FREQUENCY FOR ALL SPECIES (1986).







U/S HORLEY S.T.W. OUTFALL (MOPA - 1990)

The site contained a high biomass of fish. 52.4% of it was composed of large bream of around (30cms), reflecting past stocking strategies, with large numbers of stillwater roach and bream. Species diversity was good with fourteen species present at the site, or found during the upstream run. Strong recruitment can be seen in the roach population. Dace recruitment although not strong at the site, appears to be good, from the upstream run. There is evidence of recruitment in the chub, gudgeon and perch populations. Pike, eel, rudd, pumpkinseed, minnow, 3-spined stickleback and spined loach were also present. This site could not have been fully described without the u/s run.

COMPARISON WITH MOP1 - 1986

Although biomass has increased at MOPA -1990 (mainly due to the large bream component), density remains similar to that found in MOP1 - 1986. Species diversity is also similar, MOP1 - 1986 had twelve species, pumpkinseed and 3-spined stickleback were the additions at MOPA -1990. The most encouraging trend is the improvement in recruitment. At MOPA -1990 roach recruitment is stronger (i.e. more fish of less than 10cms are present) than during the MOP1 -1986. Large numbers of fingerling dace were seen during the upstream run. At MOPA -1990 the gudgeon population also seems to be recruiting.

From the evidence of the site data and u/s runs, both the perch and chub populations, during both surveys seem to be similar and also recruiting to some extent.

Fig. 23 SITE REPORT

WATERCOURSE River Mole

SITE NAME u/s Sidlow Bridge

SITE CODE MONB

LOCATION Site u/s A217 Dovers Green Road

N.G.R. TQ262469

DATE FISHED 17.5.90

METHOD 3 Anodes upstream 3 catch depletion

RQO 2B EC DESIGNATED STATUS None

EEC TARGET BIOMASS None

ESTIMATED BIOMASS 16.44 gms/m^2

LENGTH 118m

WIDTH RANGE 7.7-10.1m MEAN WIDTH 8.9m

DEPTH RANGE 0.5-1.25m MEAN DEPTH 0.84m

PHYSICAL STRUCTURE Eroding, glide & pool site, between 2m high, 45% sloping banks.

SUBSTRATE COMPOSITION 90% Sand/silt (upto 30cms deep), 10% Gravel.

AQUATIC VEGETATION 40% submerged, 15% floating (Nuphar, sparganium, Potomageton)

BANKSIDE VEGETATION 20% emergent (sweet flag) & Blackthorn scrub 20% shade

ADJACENT LAND USE

LB Pasture RB Pasture

WATER TEMPERATURE 12°C

ADDITIONAL COMMENTS

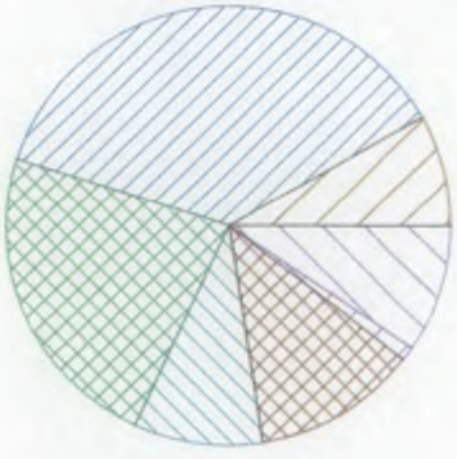
Almost identical to 1985-86 site, but miss deeper u/s hole, which is now too deep to wade. Chub at 7cms, tench at 6cms, 3-spined stickleback and spined loach were recorded as present. Water low, very coloured and an obvious smell of treated sewage effluent 10% haemorrhage on dace and roach and scale loss. D/S run to Earlswood stream confluence produced a similar population and two chub of 25 and 35cms a few larger perch to 25cms and more tench. Carp were seen but not captured. Many young dace seen in the Earlswood Stream.

U/S SIDLOW BRIDGE (MONB)
BIOMASS AND DENSITY (1990).

Fig.No.24

	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	–	–
Dace	3.76	0.073
Roach	6.02	0.162
Perch	0.17	0.002
Pike	1.52	0.001
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	1.54	0.002
Bream	1.35	0.005
Gud'n	1.96	0.092
Other	–	–
Ruffe	–	–
TOTAL	16.44	0.365

Biomass



Density

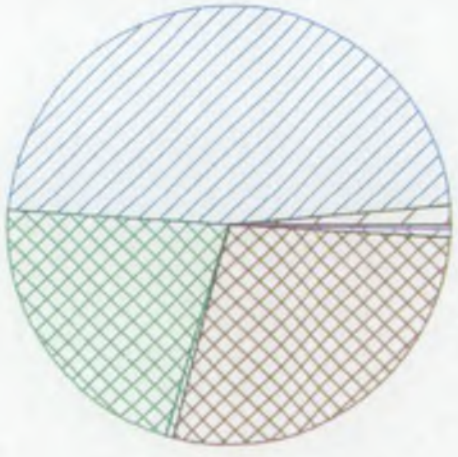
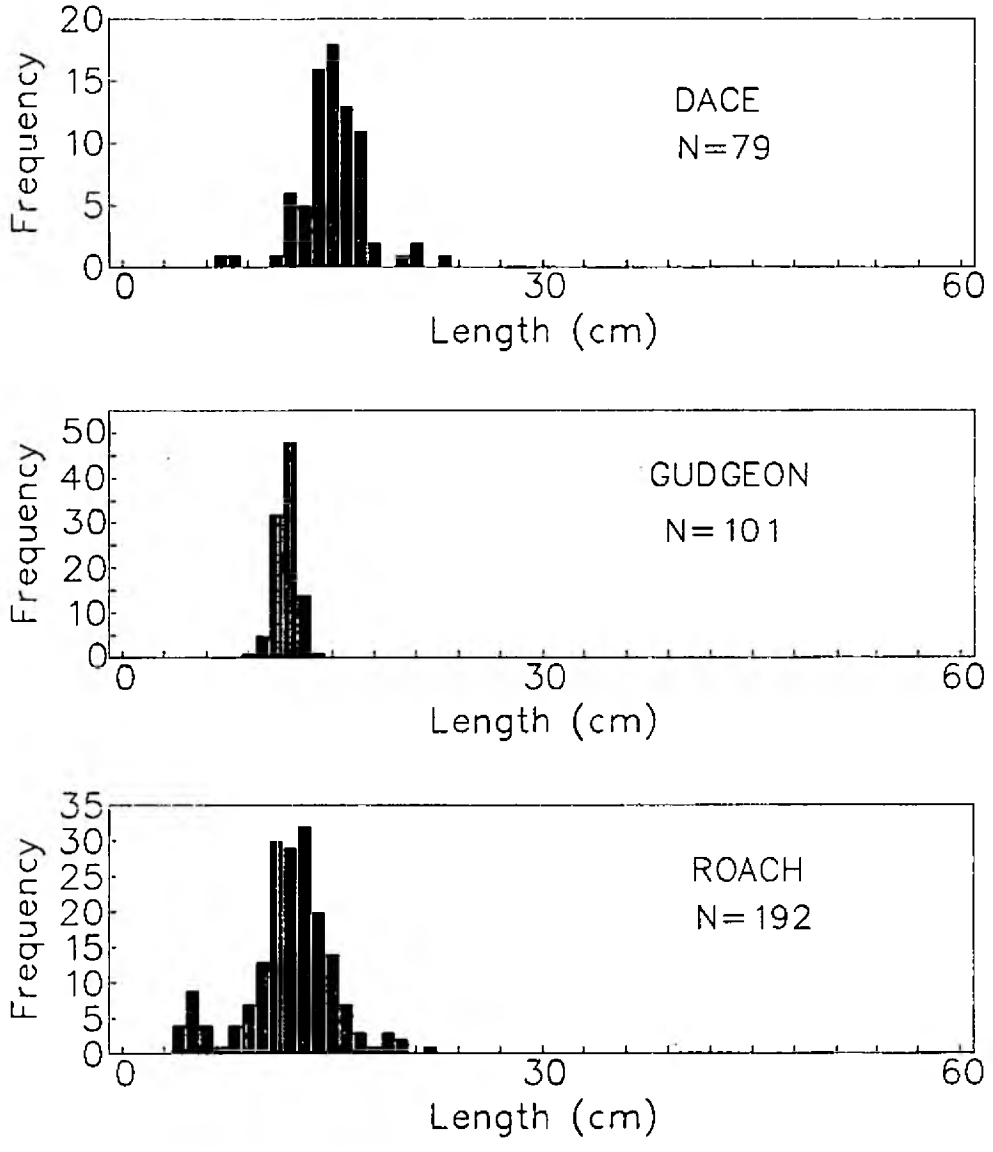


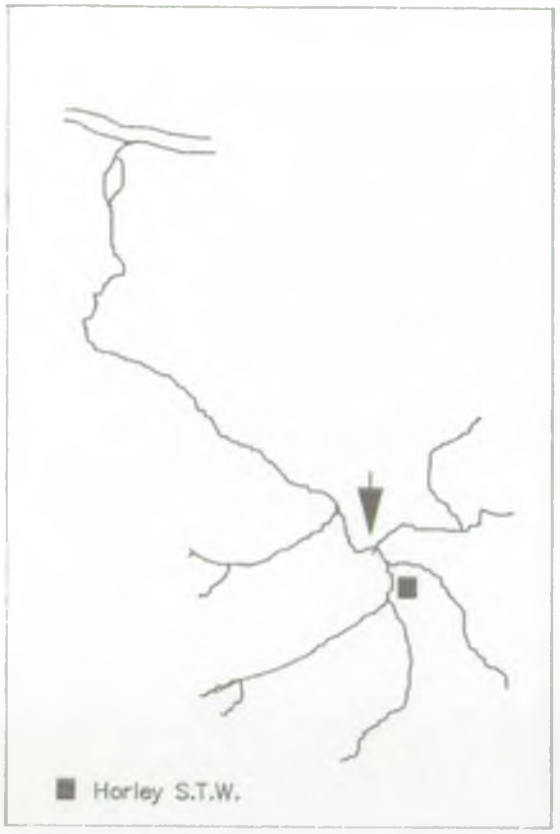
Fig.No.25

U/S SIDLOW BRIDGE (MONB)
LENGTH–FREQUENCY FOR ALL SPECIES (1990).



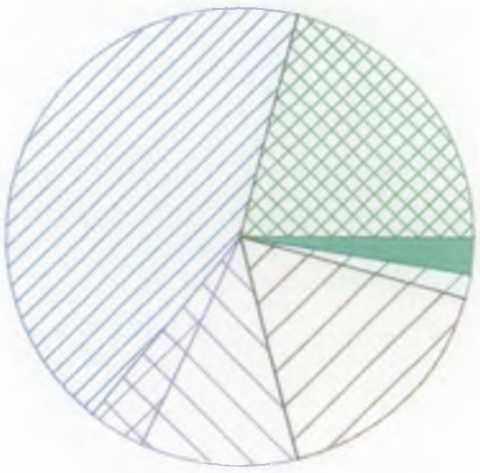
U/S SIDLOW BRIDGE (MON2)
BIOMASS AND DENSITY (1986).

Fig.No.26



	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	–	–
Dace	2.88	0.031
Roach	5.87	0.042
Perch	5.54	0.007
Pike	1.48	0.001
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	–	–
Bream	2.29	0.015
Gud'n	–	–
Other	0.26	0.004
Ruffe	–	–
Carp	0.35	0.001
TOTAL	13.65	0.101

Biomass



Density

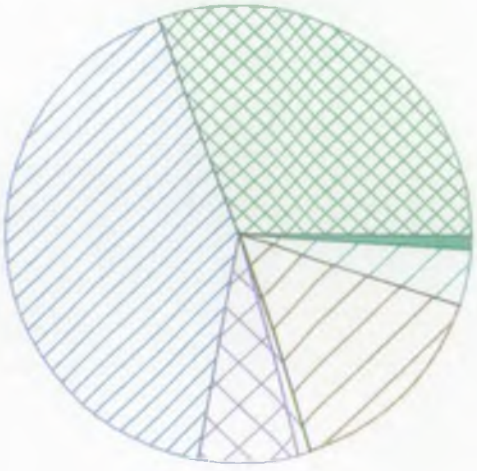
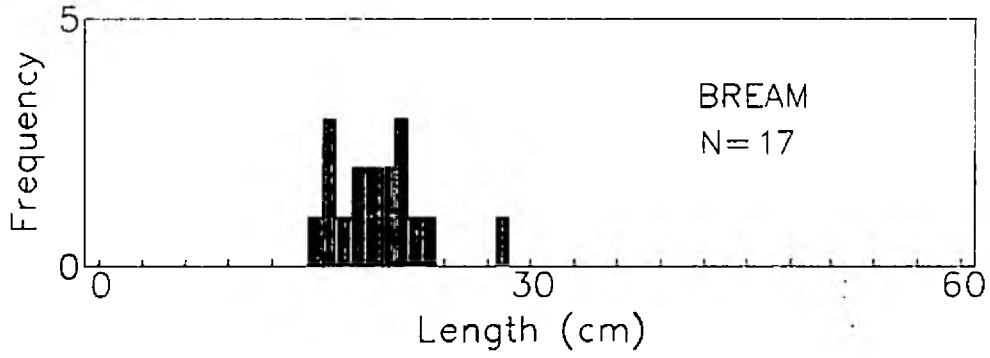
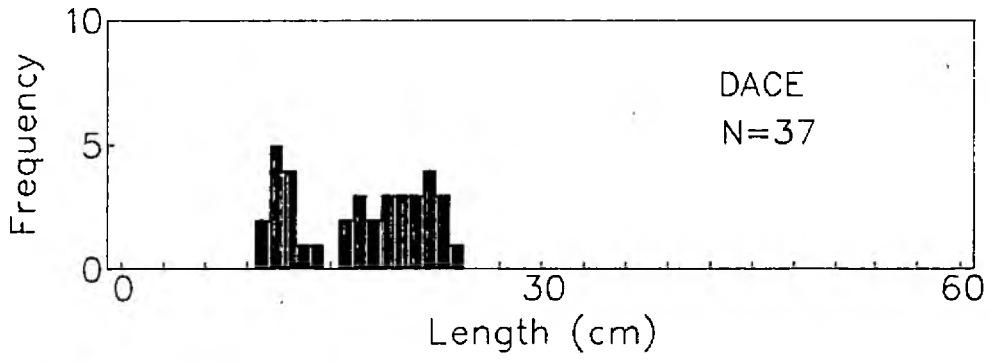
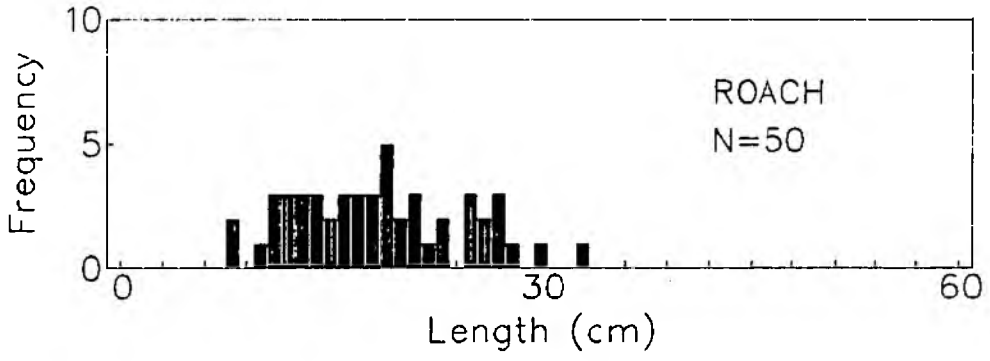


Fig.No.27

U/S SIDLOW BRIDGE (MON2)
LENGTH–FREQUENCY FOR ALL SPECIES (1986).







RIVER MOLE U/S SIDLOW BRIDGE (MONB - 1990)

A moderate biomass of fish was present, but this included large numbers of young fish. Species diversity looks good with twelve species present, but over half the major species are represented by only one or two individuals. The site is dominated by roach which are recruiting strongly. There is evidence of recruitment in the dace and gudgeon populations. The bream population is represented by a few individuals between 20-30cms, probably 'wash-outs' associated with high flows, or pollution incidents. At the site and on the downstream run tench of 6 and 25cms were seen and larger carp were seen but not taken. These fish are probably associated with an old mill-pool at Sidlow Bridge. The chub and perch populations are minimal. Two large silver eels, pike, spined loach and 3-spined stickleback were also present. D/S run typical of what was found at the site.

COMPARISON WITH (MON2 - 1986)

Both sites have a similar biomass of fish but MON2 - 1986 has a much lower density of fish indicating a larger/older population. Species diversity at the two sites was similar i.e. 13 species were found at MON2 - 1986. However again over half the major species are represented by one to three individuals. Crucian carp and rudd were present during the 1986 survey but have since disappeared. Chub have appeared in the 1990 survey.

Roach and dace were dominant in the population during the 1986 survey, but both species had poor recruitment and the populations contained a high proportion of old large fish. The 1990 survey showed a decline in the bream and perch components of the population.

Fig. 28

SITE REPORT

WATERCOURSE River Ember

SITE NAME Ember Flood Channel u/s Esher S.T.W.

SITE CODE MOJA

LOCATION 250m u/s Esher STW outfall

N.G.R. TQ134665

DATE FISHED 22.5.90

METHOD Attempted 3 nettings with 100x4m between 30x3m stopnets abandoned because of snags. Catch 1 & 2 minimum estimate.

RQO 2A **EC DESIGNATED STATUS** Cyprinid

EEC TARGET BIOMASS 20 gms/m^2

ESTIMATED BIOMASS 0.605 gms/m^2

LENGTH 54.0m

WIDTH RANGE Uniform **MEAN WIDTH** 26.0m

DEPTH RANGE Uniform **MEAN DEPTH** 2.0m

PHYSICAL STRUCTURE Uniform Trapezoidal Flood Relief Channel

SUBSTRATE COMPOSITION Light mud & silt on gravel bottom

AQUATIC VEGETATION Minimal

BANKSIDE VEGETATION 20% Bankside cover, Water Iris/Rush/Grasses)

ADJACENT LAND USE

LB	Access roads with maintained grassland	**RB**	Access roads with maintained grassland

WATER TEMPERATURE 12°C

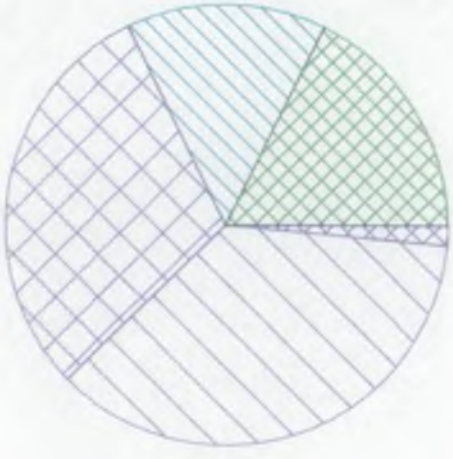
ADDITIONAL COMMENTS

Netting between stop-nets is less efficient than electrofishing and was expected to produce a low biomass. However difficulties with snags at MOJA produced the lowest recorded biomass of the survey. Biomasses at both sites reflect the uniform and sterile nature of this flood relief channel. Recorded biomass differences between the two sites, MOJA and MOJB may reflect food availability below the STW outfall. A new site. Bleak, gudgeon and roach were also present.

EMBER FLOOD CHANNEL U/S ESHER S.T.W.(MOJA) Fig.No.29
BIOMASS AND DENSITY (1990).

	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	–	–
Dace	0.10	0.001
Roach	–	–
Perch	0.18	0.014
Pike	0.21	0.001
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	0.09	0.001
Bream	–	–
Gud'n	–	–
Other	–	–
Ruffe	0.01	0.001
TOTAL	0.61	0.022

Biomass



Density

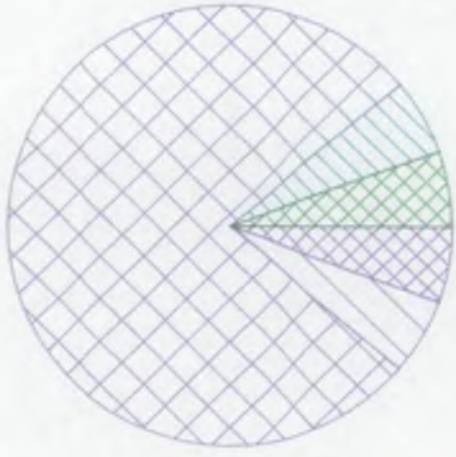
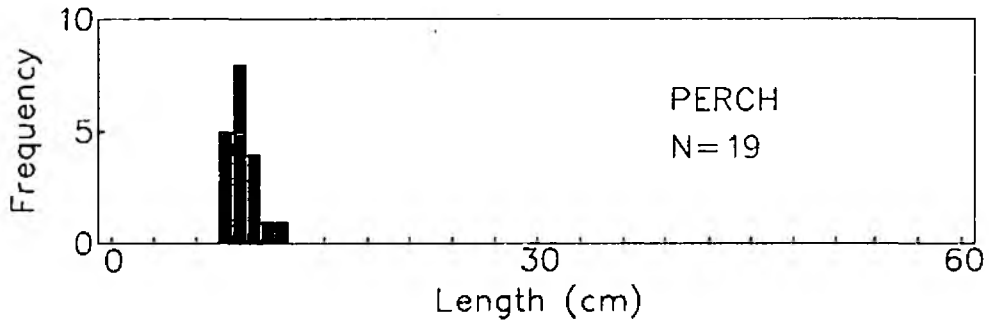


Fig.No.30

EMBER FLOOD CHANNEL U/S ESHER S.T.W. (MOJA)
LENGTH–FREQUENCY FOR PERCH (1990).



EMBER FLOOD RELIEF CHANNEL U/S ESHER S.T.W. (MOJA - 1990)

A wide and fairly deep site restricted fishing to netting between stop nets. The net snagged a number of times, and this must be part of the reason for the low biomass and density recorded at the site. However other observations indicate that at certain times of the year the low biomass/densities found are typical of this particular stretch. This situation can be accounted for by the uniform and sterile nature of the flood relief channel and the added attraction of abundant food d/s of the STW outfall.

The majority of the fish taken at the site were juveniles, with roach up to 7.1cms, perch up to 12.5cms ruffe up to 9.1cms and pike up to 27.3cms. Bleak, dace, gudgeon and eel were also present. The site was numerically dominated by roach and perch. Recruitment of some of the species is taking place in this stretch as hundreds of mature roach have been observed spawning on the remaining gravels at Hersham Royal Mills (a relatively undamaged section of the old channel system). Some contribution to the population may be made by 'wash-outs' from further upstream.

As this is a new site, there is no previous data with which to compare it.

Fig. 31

SITE REPORT

WATERCOURSE River Mole

SITE NAME Old Mole Channel

SITE CODE MOJB

LOCATION u/s Ray Road, West Molesey (adjacent Island Barn Res)

N.G.R. TQ135674

DATE FISHED 30.5.90

METHOD 3 Anodes upstream 3 catch depletion

RQO 2A EC DESIGNATED STATUS Cyprinid

EEC TARGET BIOMASS $20gm/m^2$

ESTIMATED BIOMASS $39.08\ gm/m^2$

LENGTH 92.0m

WIDTH RANGE 15.4-16.0m MEAN WIDTH 15.7m

DEPTH RANGE 1.1 - 1.35 m MEAN DEPTH 1.15 m

PHYSICAL STRUCTURE Mature artifical channel, R.B. vertical concrete

SUBSTRATE COMPOSITION 75% silt 25% gravel.

AQUATIC VEGETATION 20% submerged, 10% floating, 40% emergent (encroaching reed beds)

BANKSIDE VEGETATION 20% shade, L.B. Alder, Willow, Elderberry R.B. grasses/scrub

ADJACENT LAND USE

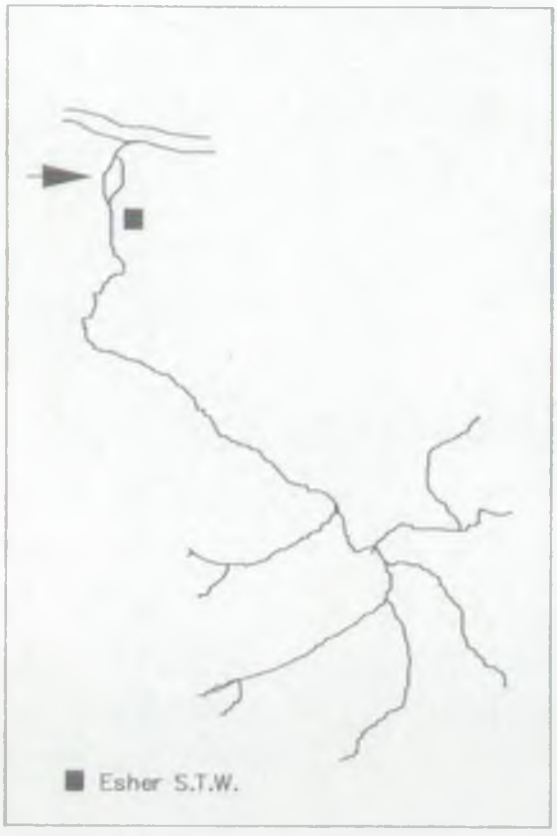
LB Derelict sand workings RB Reservoir/Pasture

WATER TEMPERATURE $12^{o}C$

ADDITIONAL COMMENTS

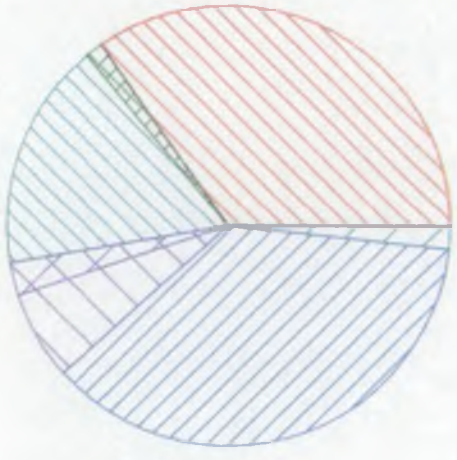
Gudgeon and one tench of 34.0cms were also present. Water clarity not good because of suspended solids. Uniformly deep, therefore it is not surprising that minor species were not seen. 10% of the roach have shallow ulcers. Large numbers of Argulus present. The site is identical to the '85-'86 site except that 20 metres of the u/s end is now too deep to fish. No u/s or d/s run attempted.

OLD MOLE CHANNEL (MOJB) Fig.No.32
BIOMASS AND DENSITY (1990).



	BIOMASS (gm-2)	DENSITY (nm-2)
Chub	13.51	0.029
Dace	0.49	0.01
Roach	14.25	0.09
Perch	0.94	0.025
Pike	2.52	0.01
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	6.54	0.05
Bream	–	–
Gud'n	–	–
Other	0.65	0.001
Ruffe	0.001	0.001
TOTAL	39.08	0.255

Biomass



Density

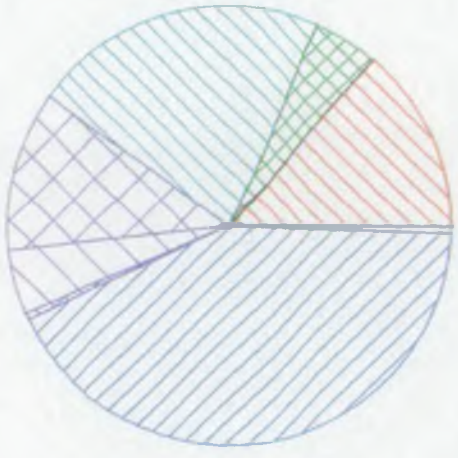


Fig.No.33

OLD MOLE CHANNEL (MOJB)
LENGTH–FREQUENCY FOR ALL SPECIES (1990).

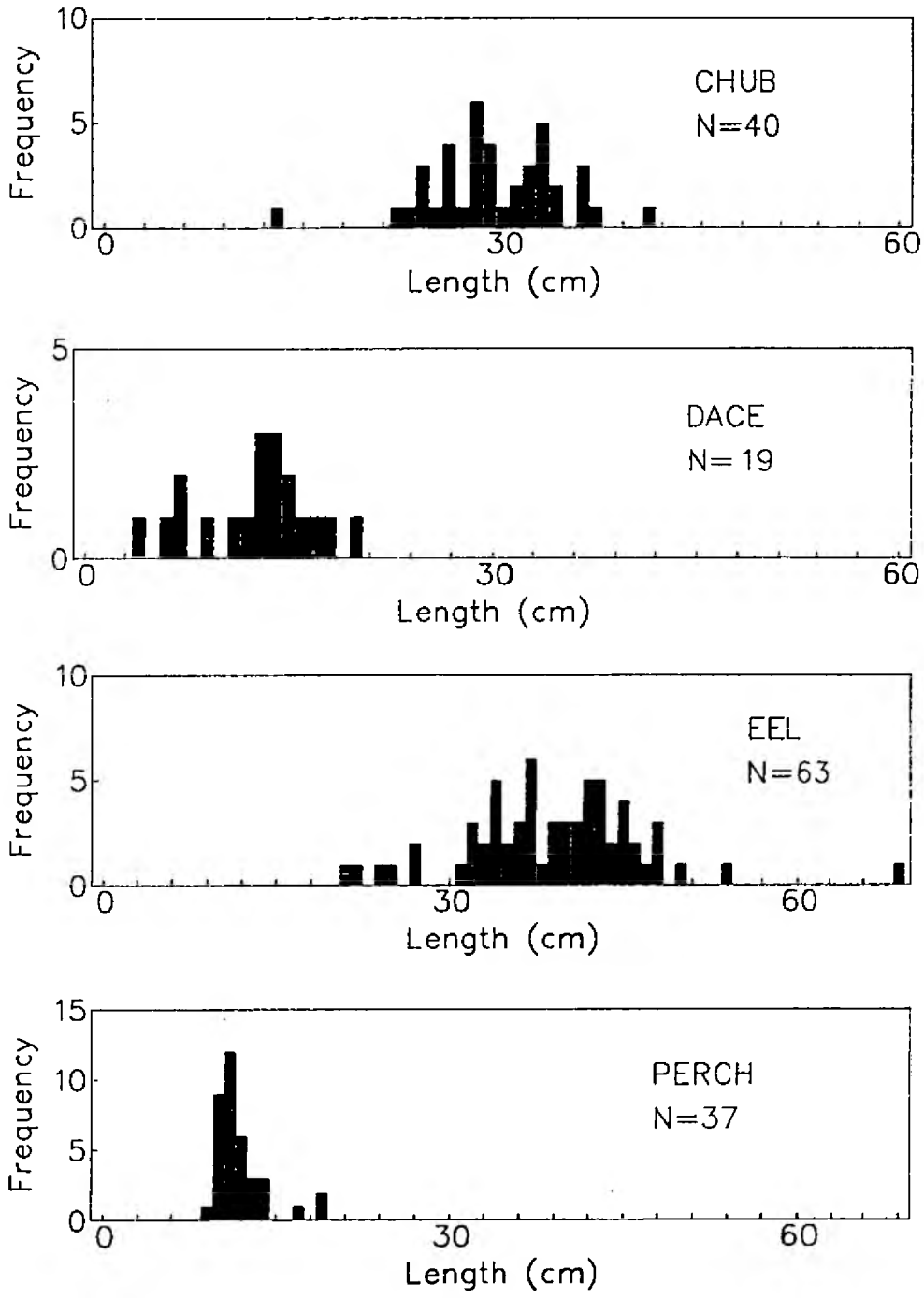
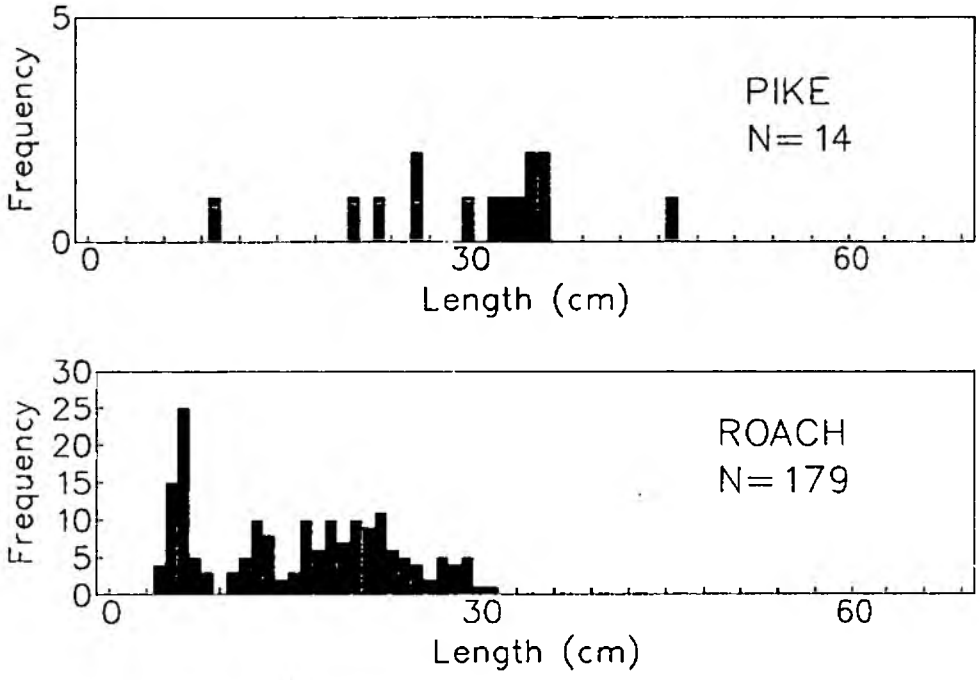
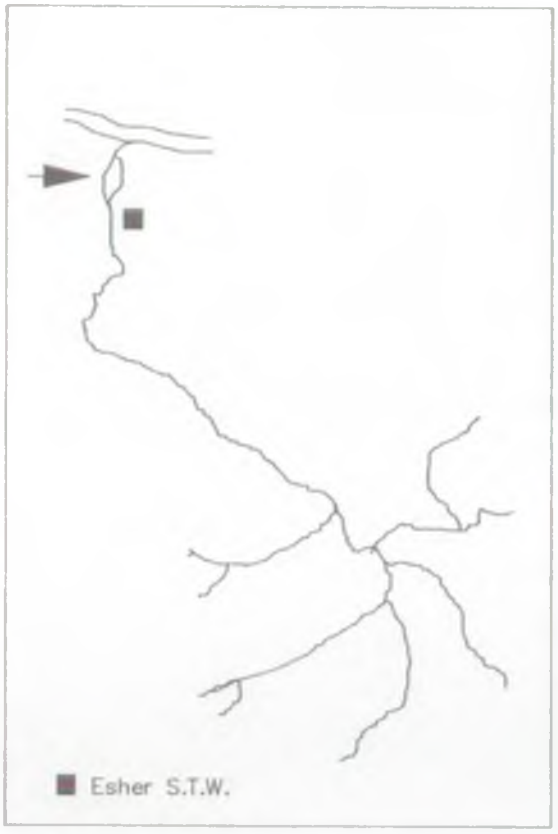


Fig.No.34


PIKE
N= 14
Frequency
5
0
0
30
60
Length (cm)
ROACH
N= 179
Frequency
30
25
20
15
10
5
0
0
30
60
Length (cm)

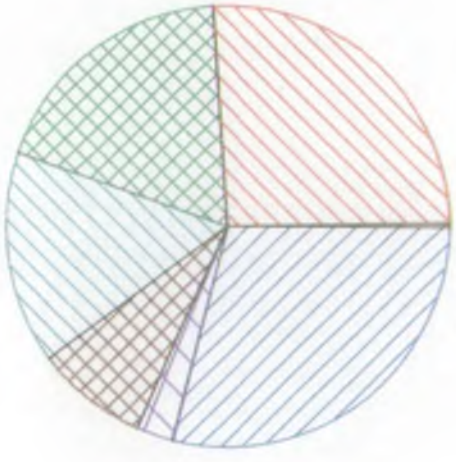
OLD MOLE CHANNEL (MOJ2)
BIOMASS AND DENSITY (1986).

Fig.No.35



	BIOMASS (gm-2)	DENSITY (nm-2)
Chub	8.02	0.148
Dace	5.78	0.094
Roach	8.96	0.079
Perch	0.16	0.002
Pike	0.68	0.002
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	4.86	0.061
Bream	0.10	0.002
Gud'n	2.52	0.179
Other	–	–
Ruffe	0.03	0.002
TOTAL	31.10	0.574

Biomass



Density

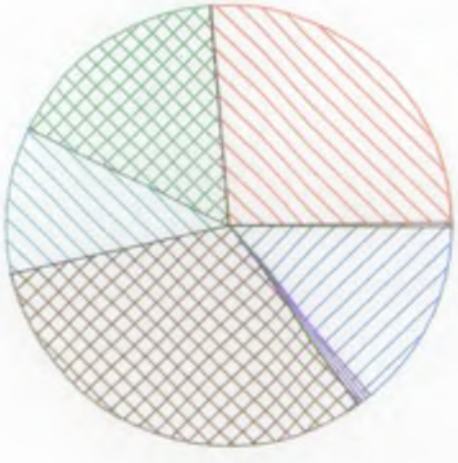


Fig.No.36

OLD MOLE CHANNEL (MOJ2)
LENGTH–FREQUENCY FOR ALL SPECIES (1986).

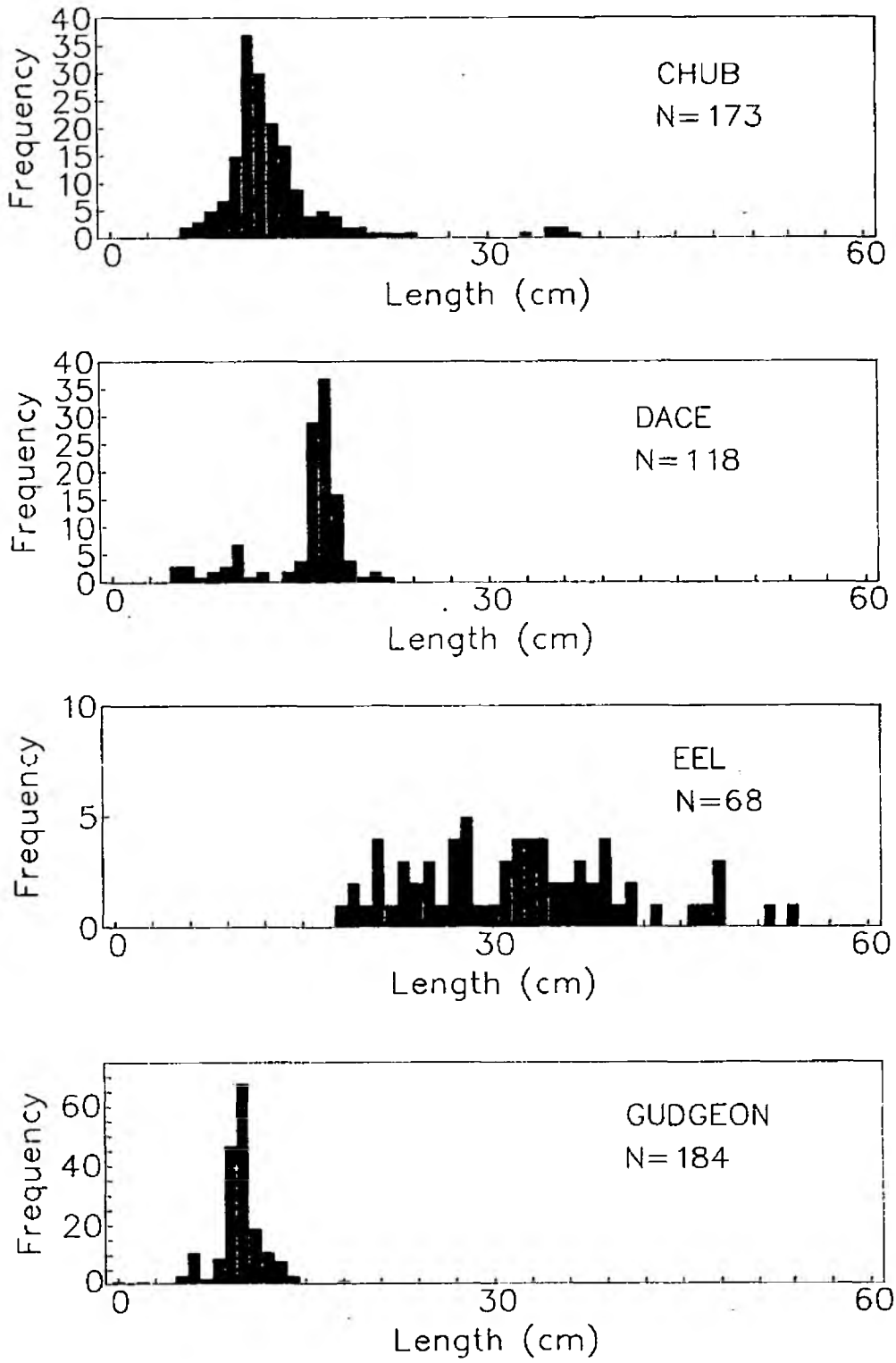
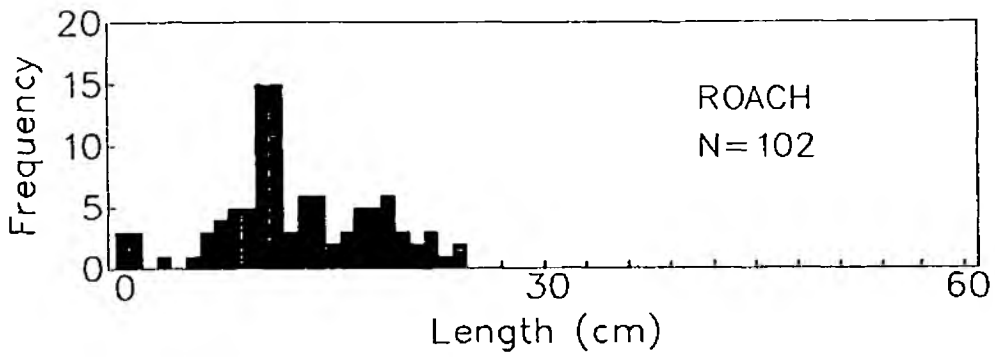


Fig.No.37



OLD MOLE CHANNEL (MOJB - 1990)

A high biomass of fish was present together with a moderate density. The population was dominated by medium sized fish. Species diversity was fair with nine species present.

The population is dominated by roach, eel and chub. Recruitment is strong in the roach population and there is evidence of recruitment in the perch, dace and pike population. The chub are mainly large, older fish with little evidence of recruitment. Gudgeon and tench were also present.

The lack of minor species and numbers of gudgeon can probably be explained by poor water clarity and the uniform depth of the site (approx. 1.2m).

COMPARISON WITH (MOJ2 - 1986)

Before any comparison is made it should be borne in mind that the water level was dropped from 1.2m to 30cm during the 1986 survey. This makes electrofishing more efficient and makes the capture of minor species/smaller fish easier. During the 1986 survey biomass was similar and high, fish density was found to be higher than in the MOJB - 1990 survey (some of this can be accounted for by the high numbers of gudgeon taken). Species diversity at MOJ2-1986 was higher, with eleven species present. The additional species were bream and spined loach.

The situation when comparing populations at species level is very interesting. In 1986 roach had a strong, recruiting population, and were just dominant in the population. By 1990 roach had become totally dominant in the population with good recruitment and a broad length/age range. Chub which were co-dominant in the 1986 survey with a young, strongly recruiting population had by 1990 become a population dominated by older/larger fish in the (20-40cm class) with little recruitment. The dace population had considerably decreased in the 1990 survey, but was still showing signs of recruitment. The strong gudgeon population found in 1986 was not recorded, probably due to differing depth and clarity conditions previously noted. Perch and pike had shown a moderate increase during the 1990 survey and were showing signs of recruitment. (The eel

population was high during both surveys and is probably under represented in the 1990 survey).

Fig. 38

SITE REPORT

WATERCOURSE River Ember

SITE NAME Ember Flood Channel d/s Esher STW

SITE CODE MOJC

LOCATION 250m d/s Esher STW outfall

N.G.R. TQ135666

DATE FISHED 22.5.90

METHOD 3 nettings with 100x4m net, between 30x3m stopnets

RQO 2A EC DESIGNATED STATUS Cyprinid

EEC TARGET BIOMASS 20 gms/m^2

ESTIMATED BIOMASS 11.02 gms/m^2

LENGTH 44.0m

WIDTH RANGE Uniform MEAN WIDTH 25.3m

DEPTH RANGE Uniform MEAN DEPTH 2.0m

PHYSICAL STRUCTURE Uniform Trapazoidal Flood Relief Channel

SUBSTRATE COMPOSITION Sewage sludge/silt on gravel base

AQUATIC VEGETATION Minimal

BANKSIDE VEGETATION 3% shade, 10% bankside cover, Water Iris, Rush, Grasses.

ADJACENT LAND USE

LB	Access Roads with maintained Grassland	RB	Access Roads with maintained grassland

WATER TEMPERATURE 12°C

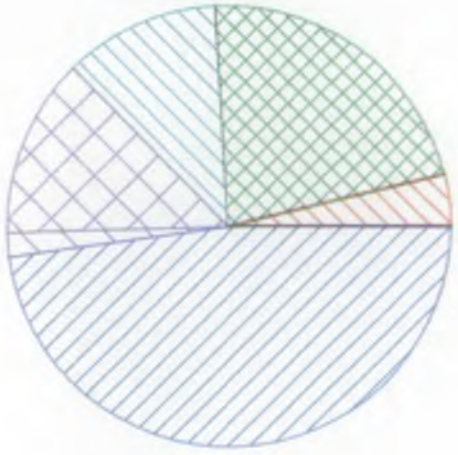
ADDITIONAL COMMENTS

Adjacent but slightly d/s of original '85-'86 survey site. Ruffe, gudgeon and bleak were also present at the site. Less bankside cover. Plenty of sludge and chironimids in net, some of the fish with ulceration. 1990 site moved to take account of known snags.

EMBER FLOOD CHANNEL D/S ESHER S.T.W.(MOJC) Fig.No.39
BIOMASS AND DENSITY (1990).

	BIOMASS (gm-2)	DENSITY (nm-2)
Chub	0.42	0.001
Dace	2.43	0.041
Roach	5.25	0.059
Perch	1.45	0.006
Pike	0.19	0.001
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	1.26	0.005
Bream	–	–
Gud'n	–	–
Other	0.01	0.001
Ruffe	–	–
TOTAL	11.02	0.118

Biomass



Density

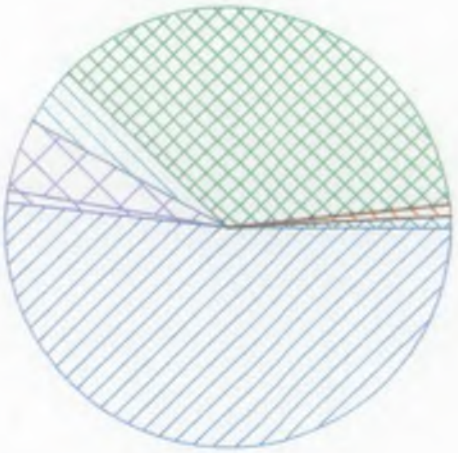
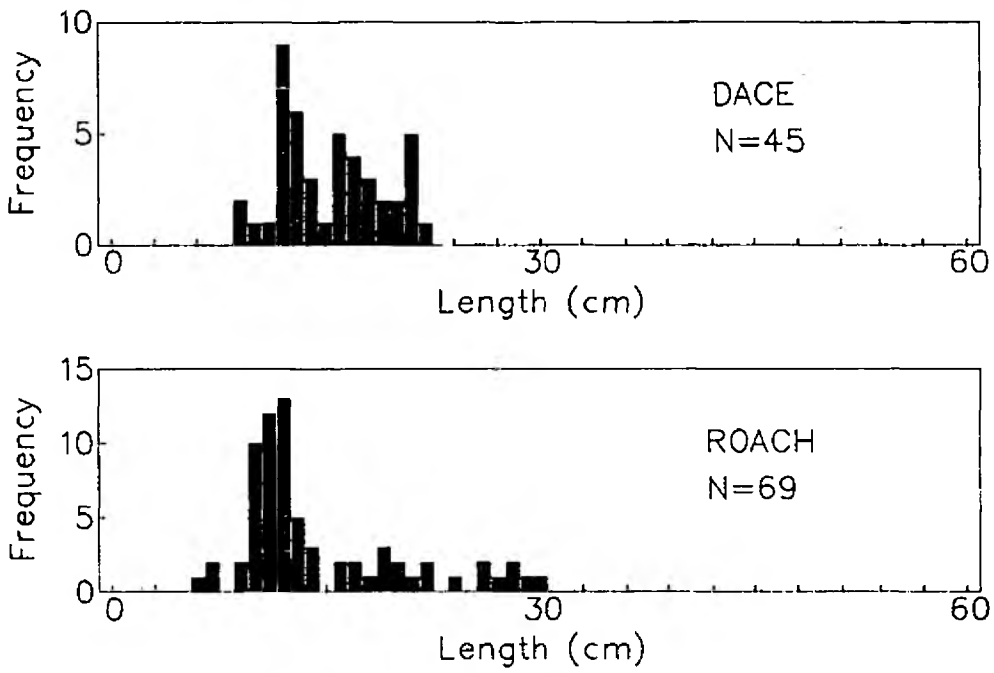


Fig.No.40

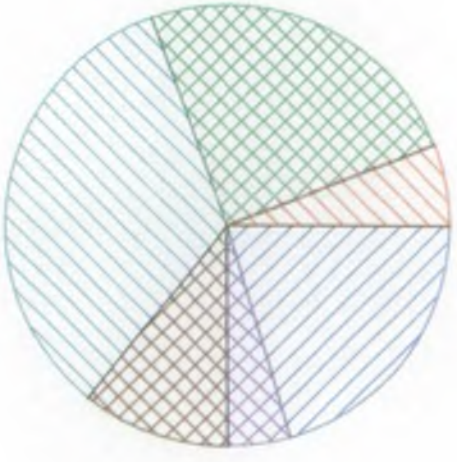
EMBER FLOOD CHANNEL D/S ESHER S.T.W. (MOJC)
BIOMASS AND DENSITY FOR ALL SPECIES (1990).



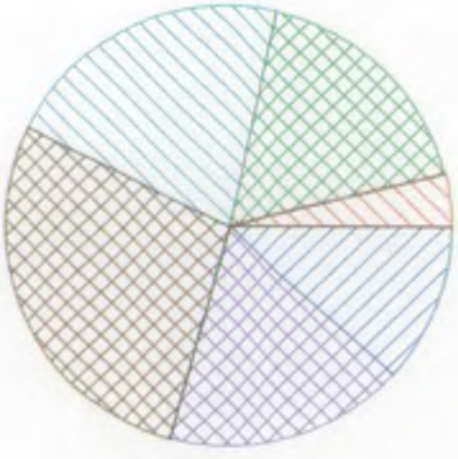
EMBER FLOOD CHANNEL D/S ESHER S.T.W.(MOJ3) Fig.No.41
BIOMASS AND DENSITY (1986).

	BIOMASS (gm−2)	DENSITY (nm−2)
Chub	0.34	0.004
Dace	1.38	0.018
Roach	1.15	0.012
Perch	–	–
Pike	–	–
B.Trt	–	–
R.Trt	–	–
Orn'l	–	–
Eel	1.89	0.022
Bream	–	–
Gud'n	0.61	–
Other	–	–
Ruffe	0.25	0.018
TOTAL	5.62	0.107

Biomass



Density



EMBER FLOOD CHANNEL D/S ESHER S.T.W.(MOJ3) Fig.No.42
LENGTH–FREQUENCY FOR ALL SPECIES (1986).

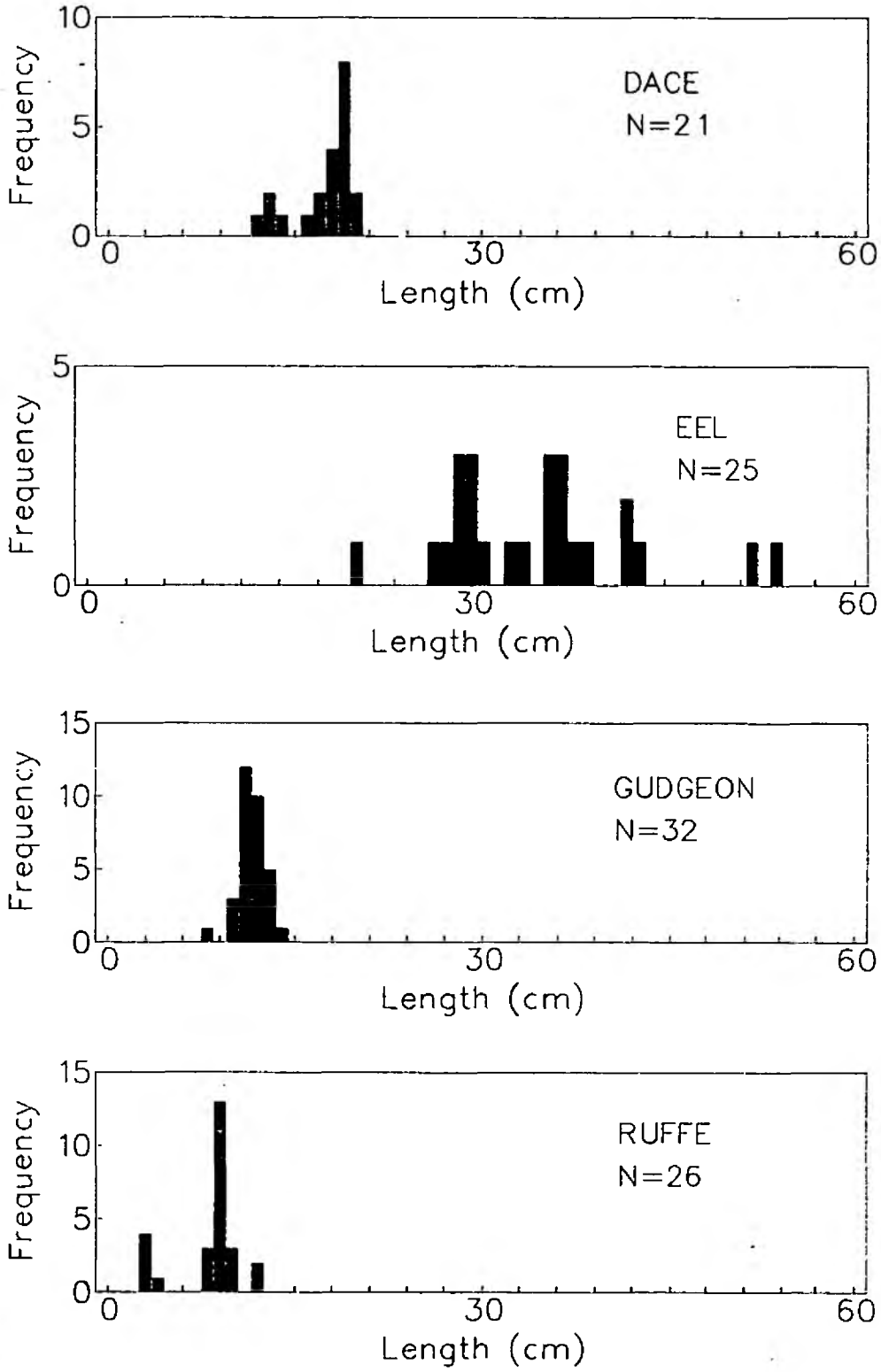
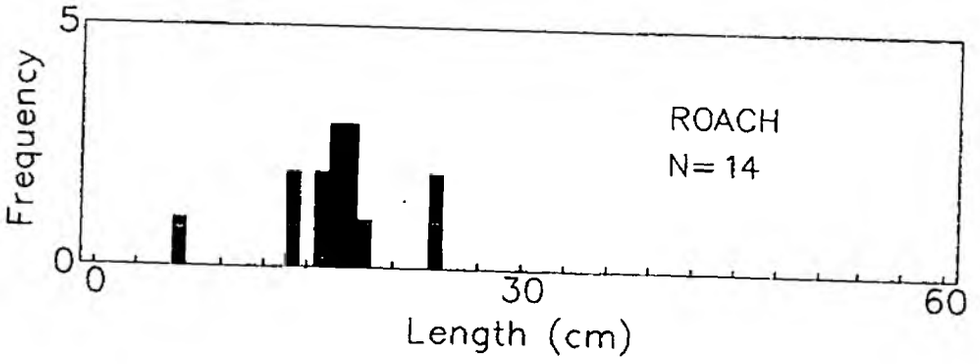


Fig.No.43



EMBER FLOOD RELIEF CHANNEL D/S ESHER S.T.W. (MOJC - 1990)

At this site both biomass and density are low. This reflects the difficulties of netting a wide and fairly deep (2.0m) uniform channel, between stop nets. Many of the fish taken were above 10cms in length. Contrast this with the situation found u/s of the works. (MOJA - 1990) where the majority of the fish taken were juveniles of below 10cms. Species diversity at this site was fair with nine species present. Roach and dace are the dominant component of the population. Recruitment is fair in the roach population and may be occurring in the dace and perch populations. The chub was a single, large individual. Other species such as pike, bleak, gudgeon and ruffe are represented by juveniles. Eels are also present.

COMPARISON WITH (MOJ3 - 1986)

Biomass has doubled, when compared to the 1986 survey, but fish density has remained the same. This may reflect the virtual absence of minor species such as gudgeon and ruffe in 1990. Species diversity was poor in 1986, with only seven species. Pike, perch and bleak were found in 1990, minnow were present in 1986, but not during 1990. Recruitment and species composition have undergone dramatic changes. In 1986 little recruitment could be observed in any of the species apart from gudgeon and ruffe. In 1990 the roach had fair recruitment, and a much better length/frequency distribution. The dace population may also be recruiting, and again had a better length/frequency distribution, than in 1986. The small chub population found in 1986 had almost gone and the eel population of 1986 was much reduced.

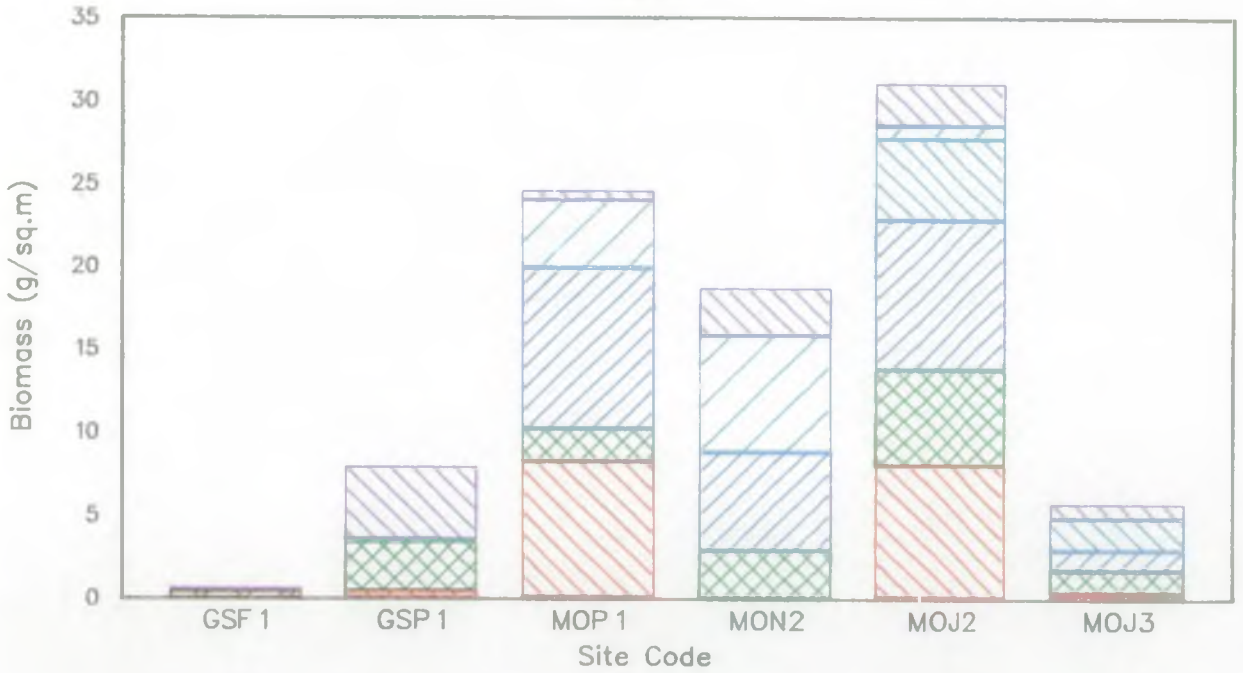
FIGURE 44. AN EXPLANATION OF THE SITE NOTATION

All of the following sites are identical pairs or adjacent to the original site and are comparable. They were first surveyed in 1986 and again in 1990; (GSP1/GSPA/MOP1/MOPA/MON2/MONB/MOJ2/MOJB/MOJ3/MOJC). MOJA is a new survey site.

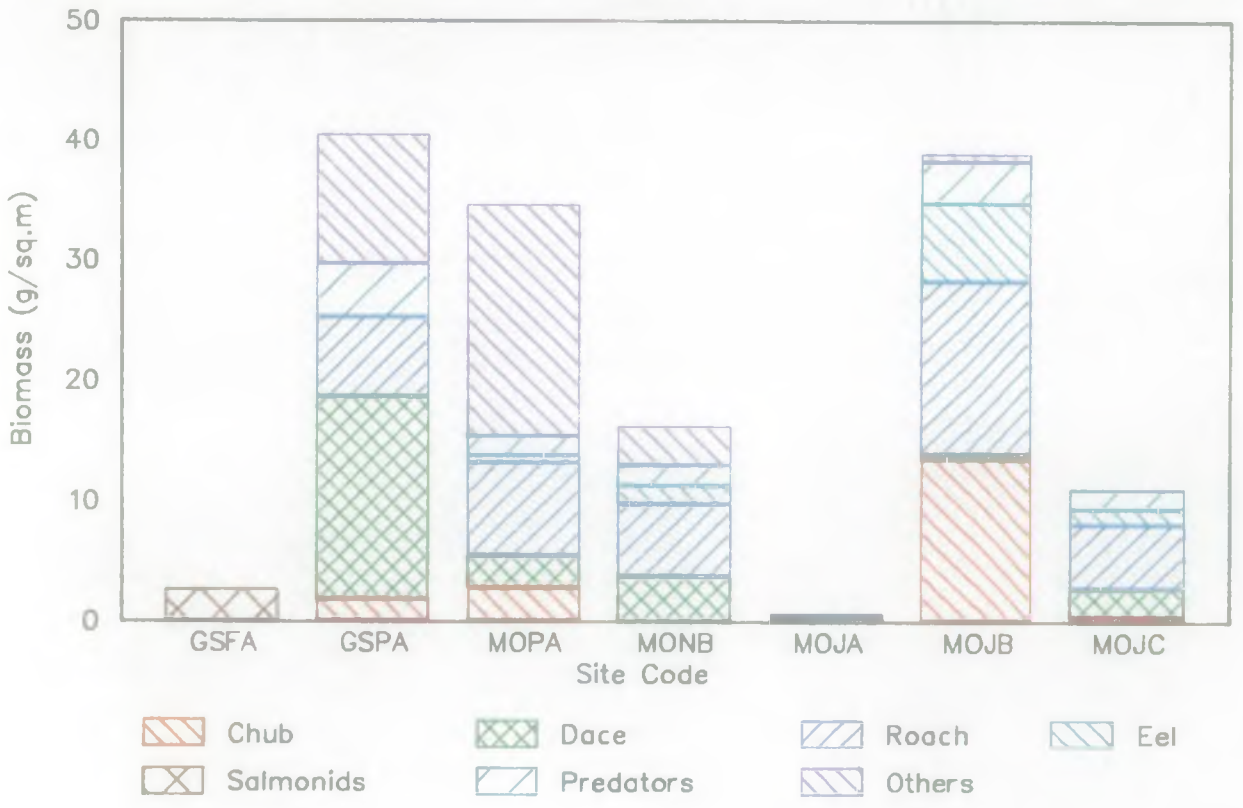
Fig.No.44

RIVER MOLE FISHERIES SURVEY
Biomass comparison for all sites

1986



1990



5.2 SURVEY RESULTS

Figure 44 shows the estimated biomasses present at 6 of the sites from the 1986 Mole survey, and the 7 sites fished during the current survey. Apart from MOJA (R.Ember FAS u/s Esher STW), all the sites are identical or adjacent to the original site and comparable and were fished using similar methods. Comparisons of the surveys at the site level can be made with some confidence.

For detailed comparisons of the two surveys (1986 and 1990) please see the site reports, (comparisons, pages 45-86). For additional information on the 1990 fisheries survey, please see site reports (additional comments, pages 40-79).

All comparable sites show an increase in fish biomass, some of a spectacular nature (i.e. Gatwick Stream d/s, Horley STW 7.90-40.59gms-2). See Fig. 43.

During the 1990 survey fish densities increased or remained the same at three out of the four sites fished, on the Upper Mole/Gatwick Stream. An encouraging trend when compared with the 1986 Mole survey's hilighting of lack of recruitment in this area.

Species diversity has increased at four of the six comparable sites.

When recruitment is considered by species for the upper river sites it can be seen that recruitment for the dace, roach and gudgeon populations is fair to good, whereas the chub population appears to be in decline. On the lower river sites, dace and roach recruitment is fair to strong, whereas chub recruitment is negligible and the gudgeon population has almost disappeared.

The brown trout population of the upper Gatwick Stream exhibits fair recruitment. A single brook lamprey was found in association with this population.

Eels were recorded at all five of the Mole sites surveyed during 1990.

Eels have now penetrated the river as far as Horley Weir. (The previous highest record was from the Earlswood Stream, d/s of the Sidlow Bridge site during 1986). The eel population appears to be increasing in both numbers and size.

5.3 FISH HEALTH

No fish were presented for health examination.

5.4 WATER QUALITY

The Environmental Quality Pollution Control section of the NRA monitor compliance of water quality against the established River Quality Objectives. Compliance data for the period October 1989 - September 1990 is given below in Table I.

Table I

River Mole - October 1989 - September 1990

Reach	Length(kms)	River Quality Objectives	Class Achieved
Gatwick Stream Pease Pottage - Crawley STW	(14.160)	1B	1B
Gatwick Stream Gatwick Pond E-Mole	(2.770)	3	2B
Mole Gatwick Stream-Horley STW	(2.060)	3	3
Mole Horley STW - Salfords Stream	(5.470)	3	2B
Mole Salfords Stream - Shag Brook	(8.880)	2B	2B
Mole D'side Mill Str to Ember	(21.780)	2A	1B
Mole Ember to Thames	(0.480)	2A	1B

Sampling Points		Pass/Fail
Gatwick Stream at Tinsley Green	1B	Pass
Gatwick Stream above confluence with Mole	3	Pass
Mole u/s Horley STW	3	Pass
Mole at Wick Farm	3	Pass
Mole at Kinnersley Manor	3	Pass
Mole at Flanchford Bridge/Leigh	2B	Pass
Mole at Royal Mills/Esher	2A	Pass
Mole above Thames	2A	Pass

Taxa List for PMLR.0013 Gatwick Stream At Tinsley Bridge, Tinsley Green TQ29203970
11 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01	01	01	01	01	01	01
Day	03	01	02	12	07	25	06 -	30	26	27	05
Month	Feb	May	Jul	Sep	Oct	Jul	Apr	Jan	Mar	Jun	Nov
Year	1983	1984	1985	1986	1986	1987	1988	1989	1990	1990	1990
*Non Routine Sample											
Sample Number	0053	0068	0112	0114	0153*	0234	0079	0015	0169	0447	0906*
EPHEMERELLIDAE			*			*					
NEMOURIDAE	*										
LIMNEPHILIDAE	*	*								*	
VIVIPARIDAE		*****									
ANCYLIDAE	***		**	**			**	**		*	
GAMMARIDAE			**		*						
CORIXIDAE				*							
DYTISCIDAE					*						
ELMIDAE			*			*					
TIPULIDAE				*	*	*	*	*	*		*
BAETIDAE	*										
HYDROBIIDAE	***	**	**	**	*	**	**	**	**	****	*****
LYMNAEIDAE	**	***	*	**	*	**	*	***	**	**	****
PHYSIDAE									**	*	***
SPHAERIIDAE		*	*	*	*	*	*	**	**		**
GLOSSIPHONIIDAE	*			**	*	*	**	*	*	*	*
ERPOBDELLIDAE	*		*		*	*	*	*		*	*
ASELLIDAE			*	*	*	*					*
CHIRONOMIDAE	**		**	**	*	**	*	**	**	**	*
OLIGOCHAETA	*****	*****	***	*	*	**	**	***	**	**	***
HYDRACARINA			*	*	*						
NAIDIDAE	*****	*****	**	*							
TUBIFICIDAE	*****	**	***	*	*	**					
BMWP Score	39	23	45	34	37	41	29	29	23	31	29
Pred. BMWP Score					153	168	168	168	168	168	168
BMWP/Pred BMWP					0.24	0.24	0.17	0.17	0.14	0.18	0.17
ASPT	3.90	3.83	4.09	3.40	3.36	3.73	3.22	3.22	2.88	3.44	2.90
Predicted ASPT							5.66	5.66	5.66	5.66	5.66
ASPT/Pred ASPT							0.57	0.57	0.51	0.61	0.51
Biotic Class	D	D	D	D	D	D	D	D	D	D	D

Table 2

River Mole Survey 1990
Common Aquatic Invertebrates found at Biological Sampling Sites, Nearest to the Fish Survey Sites

The invertebrates are listed in order of increasing tolerance to pollution.
Abundance is reported as * = present to **** = very abundant

N.B. The predicted scores are based on an F.B.A. model which involves 11 environmental characteristics.

Taxa List for PMLR.0011 Gatwick Stream Above Mole TQ27604240
11 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01	01	01	01	01	01	01
Day	21	09	02	12	02	06	30	26	27	05	06
Month	Aug	Jul	Jul	Sep	Feb	Apr	Jan	Mar	Jun	Nov	Mar
Year	1979	1980	1985	1986	1987	1988	1989	1990	1990	1990	1991
*Non Routine Sample											
Sample Number	0068	0050	0113*	0113	0012*	0080	0016	0170	0449	0905*	0066*
CALOPTERYGIDAE				*		**					
LIMNEPHILIDAE						*					
ANCYLIDAE		**		*		*	*				
GAMMARIDAE		*		*		*	*		*	**	
COENAGRIIDAE										*	
NEPIDAE				*							
HALIPLIDAE	*			*					**		
HYDROPSYCHIDAE				*	*	*					
SIMULIIDAE		**		**	*						*
VALVATIDAE			*								
HYDROBIIDAE	**	**									
LYMNAEIDAE	***	***		*					*	*	
SPHAERIIDAE	**	*			*	*		*		*	*
GLOSSIPHONIIDAE		**		*		*	**	*	*	*	
ERPOBDELLIDAE	*	*		*	*	**	**	**	*	*	**
ASELLIDAE		**		***	*	**	***	**	***	***	***
CHIRONOMIDAE	**	****	**	**	*	**	***	**	**	***	*
OLIGOCHAETA	**	***	***	*	*	**	*	*	**	***	*
CERATOPOGONIDAE											**
ENCHYTRAEIDAE	*										
HYDRACARINA		*									
LUMBRICULIDAE		**									
NAIDIDAE					*						
NEMATODA		*									
PSYCHODIDAE		*									
TUBIFICIDAE	**	***	***	*	*						
BMWP Score	20	38	6	55	22	47	24	15	26	30	17
Pred. BMWP Score					123	123	123	123	123	123	108
BMWP/Pred BMWP					0.18	0.38	0.20	0.12	0.21	0.24	0.16
ASPT	2.86	3.45	2.00	4.23	3.14	4.27	3.43	2.50	3.25	3.33	2.83
Predicted ASPT						4.95	4.95	4.95	4.95	4.95	5.00
ASPT/Pred ASPT						0.86	0.69	0.51	0.66	0.67	0.57
Biotic Class	D	D	E	C	D	D	D	E	D	D	D

Taxa List for PMLR.0037 Mole Below Horley Weir TQ27004330
11 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01	01	01	01	01	01	01
Day	21	10	12	04	02	17	06	30	31	09	06
Month	Aug	Jul	Sep	Nov	Feb	Jul	Apr	Jan	May	Jan	Mar
Year	1979	1985	1986	1986	1987	1987	1988	1989	1989	1990	1991
*Non Routine Sample											
Sample Number	0070	0115*	0118	0187*	0013*	0219*	0082	0018	0144*	0006*	0067*
CALOPTERYGIDAE			*								
ANCYLIDAE								**			
GAMMARIDAE				*			*	*		**	**
COENAGRIIDAE			*						*	*	
HALIPLIDAE	*										
DYTISCIDAE	*										
HYDROPSYCHIDAE	**										
TIPULIDAE	*					*					
SIMULIIDAE			**						*		
PLANARIIDAE			*				*	*	*	*	
HYDROBIIDAE	**						*		*		
LYMNAEIDAE	***	*		*	*	*	*	**	*	*	
PLANORBIDAE	**		**	*		*		*	*	*	
SPHAERIIDAE	**	*	**	*	*	*	*	*	*	*	*
GLOSSIPHONIIDAE	**		**	*	*	*	*	*		*	*
HIRUDIDIDAE				*							
ERPOBDELLIDAE	**		**	*	*	*	**	**	*	**	*
ASELLIDAE			**	*	*	*	**	***		***	***
CHIRONOMIDAE	**	**	**	*	*	*	**	**	*	**	*
OLIGOCHAETA	**	**	*	*	*	*	**	*	*	**	*
CERATOPOGONIDAE											**
CRANGONYCTIDAE	*										
HYDRACARINA						*					
NAIDIDAE			*		*						
TUBIFICIDAE	**	**	*	=	*	*					
BMWP Score	46	9	42	30	18	26	32	38	34	38	21
Pred. BMWP Score				176	176	168	155	155	155	159	100
BMWP/Pred BMWP				0.17	0.10	0.15	0.21	0.25	0.22	0.24	0.21
ASPT	3.54	2.25	3.82	3.00	2.57	2.89	3.20	3.45	3.40	3.45	3.00
Predicted ASPT							5.26	5.26	5.29	5.29	4.70
ASPT/Pred ASPT							0.61	0.66	0.64	0.65	0.64
Biotic Class	D	E	D	D	D	D	D	D	D	D	D

Taxa List for PMLR.0035 Mole At Wick Farm, Horley TQ27004500
11 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01	01	01	01	01	01	01
Day	03	10	09	06	14	31	09	26	27	05	07
Month	Feb	Jul	Feb	Apr	Mar	May	Jan	Mar	Jun	Nov	Mar
Year	1984	1985	1987	1988	1989	1989	1990	1990	1990	1990	1991
*Non Routine Sample											
Sample Number	0029	0116*	0022	0083	0055	0145*	0005*	0172	0450	0908*	0070*
ANCYLIDAE	*****										
HYDROPTILIDAE	**										
GAMMARIDAE	*****			*	*		*	*	**	***	**
COENAGRIIDAE								*		*	
GERRIDAE									*		
CORIXIDAE										**	
HALIPLIDAE									*	*	
HYDROPHILIDAE									*		
SIMULIIDAE									***		*
PLANARIIDAE				*				*	*	*	
HYDROBIIDAE	**										
LYMNAEIDAE	**			*							
PLANORBIDAE					*						*
SPHAERIIDAE	***	*	*	**	***	*	**	*	*	**	**
GLOSSIPHONIIDAE	*	*		**	***	*	*		*	*	*
ERPOBDELLIDAE	*	*	**	**	***	*	**	**	*	**	**
ASELLIDAE	***		**	*	****	*	***	***	***	****	***
CHIRONOMIDAE	**	*	***	**	**	*	***	***	**	*	*
OLIGOCHAETA	**	*	*	**	*	*	**	*	**	**	**
CERATOPOGONIDAE											*
DUGESIIDAE	***										
HYDRACARINA	*										*
NAIDIDAE	**	*									
TUBIFICIDAE	**	*	*								*
BMWP Score	39	12	12	29	24	15	21	29	46	42	29
Pred. BMWP Score			153	153	153	168	156	153	153	153	108
BMWP/Pred BMWP			0.08	0.19	0.16	0.09	0.13	0.19	0.30	0.27	0.27
ASPT	3.55	2.40	2.40	3.22	3.00	2.50	3.00	3.63	3.83	3.82	3.22
Predicted ASPT				5.00		5.40	5.07	5.00	5.00	5.00	5.00
ASPT/Pred ASPT				0.64		0.46	0.59	0.73	0.77	0.76	0.64
Biotic Class	D	E	E	D	D	E	D	D	D	D	D

Taxa List for PMLR.0032 Mole Sidlow Bridge TQ25804710
7 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01	01	01
Day	20	12	09	24	09	08	14
Month	Aug	Nov	Mar	Jan	Feb	Apr	Mar
Year	1979	1980	1982	1984	1987	1988	1989
*Non Routine Sample							
Sample Number	0065	0093	0019	0023	0023	0092	0056
CALOPTERYGIDAE		*				*	
ANCYLIDAE		*		**			*
GAMMARIDAE	*	***	**	***	*	*	*
COENAGRIIDAE		*			*		
CORIXIDAE	*						
HALIPLIDAE	**	**	*				
DYTISCIDAE	*	*					
HYDROPSYCHIDAE		*		*			
SIMULIIDAE			*				*
PLANARIIDAE			*	*		*	*
BAETIDAE	*						
HYDROBIIDAE	**	*					
LYMNAEIDAE	**	**		*		*	
PLANORBIDAE	**						
SPHAERIIDAE	**	**				*	*
GLOSSIPHONIIDAE		*	*	*	**	*	**
HIRUDIDIDAE		*					
ERPOBDELLIDAE	**	*	**	***	**	**	**
ASELLIDAE	****	****	**	***	*	**	*
CHIRONOMIDAE	***	**	**	*	**	*	**
OLIGOCHAETA	**	***	****	**	*	**	*
CERATOPOGONIDAE		**					
CRANGONYCTIDAE	***	**	*				
HYDRACARINA				*			
NAIDIDAE				**			
TUBIFICIDAE	**	***	****	**	*		
BMWP Score	46	65	33	37	26	37	37
Pred. BMWP Score					143	143	143
BMWP/Pred BMWP					0.18	0.26	0.26
ASPT	3.54	4.06	3.67	3.70	3.71	3.70	3.70
Predicted ASPT						4.90	
ASPT/Pred ASPT						0.76	
Biotic Class	D	C	D	D	D	D	D

Taxa List for PMLR.0026 Mole At Flanchford Bridge, Leigh TQ23404800
4 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01
Day	10	26	06	15
Month	Aug	Jan	Sep	May
Year	1979	1983	1989	1990
*Non Routine Sample				
Sample Number	0057	0035	0281*	0345*
PHRYGANEIDAE	*			
CALOPTERYGIDAE	*		*	
LIMNEPHILIDAE			*	*
ANCYLIDAE	**	***	*	
GAMMARIDAE	****	***	**	*
COENAGRIIDAE				*
CORIXIDAE	*		*	*
HALIPLIDAE	***		*	*
DYTISCIDAE	*		*	
TIPULIDAE	*	*		
SIMULIIDAE				*
PLANARIIDAE		*		*
DENDROCOELIDAE		**		*
BAETIDAE			*	*
SIALIDAE	**		***	
HYDROBIIDAE		*		
LYMNAEIDAE	**		*	
PLANORBIDAE	*			*
SPHAERIIDAE	***			*
GLOSSIPHONIIDAE	*	*	*	*
ERPOBDELLIDAE	**	*	**	*
ASELLIDAE	****	**	***	*
CHIRONOMIDAE	***	***	**	*
OLIGOCHAETA	***	****	**	*
ACROLOXIDAE	**			
CERATOPOGONIDAE	*			
CRANGONYCTIDAE	**			
DUGESIIDAE		*		
HYDRACARINA	**			
LUMBRICULIDAE	**			
NAIDIDAE		***		
TUBIFICIDAE	***	****		
BMWP Score	75	42	65	66
Pred. BMWP Score			150	151
BMWP/Pred BMWP			0.43	0.44
ASPT	4.41	3.82	4.33	4.13
Predicted ASPT			4.90	4.92
ASPT/Pred ASPT			0.88	0.84
Biotic Class	C	D	C	C

Taxa List for PMLR.0031 Mole At Royal Mills, Esher TQ13106560
5 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01
Day	15	22	18	22	15
Month	Aug	Jul	Mar	Mar	May
Year	1979	1980	1982	1984	1990
*Non Routine Sample					
Sample Number	0063	0057	0025	0061	0344*
HEPTAGENIIDAE		*			
EPHEMERELLIDAE	**	**			
EPHEMERIDAE		*	*		
LEPTOCERIDAE	**	*	**	**	**
CALOPTERYGIDAE		*	*		
PSYCHOMYIIDAE		*			
CAENIDAE		**	**	**	**
NEMOURIDAE			*		
POLYCENTROPIDAE	**	**			
LIMNEPHILIDAE			*		*
NERITIDAE	*	*	*		
ANCYLIDAE	**	**	**	*	**
HYDROPTILIDAE	**	***			***
UNIONIDAE	*		*		*
GAMMARIDAE	****	***	**	**	**
COENAGRIIDAE			*		*
GERRIDAE					*
NOTONECTIDAE					*
CORIXIDAE	*				
HALIPLIDAE	*		*		
DYTISCIDAE	*				**
ELMIDAE	**	**	**		*
HYDROPSYCHIDAE	***	**	***	***	*
TIPULIDAE	*		*		*
SIMULIIDAE	****	****	****	*	**
PLANARIIDAE					**
DENDROCOELIDAE	*			*	**
BAETIDAE	****	***	**		**
VALVATIDAE	**	**	**		**
HYDROBIIDAE	***	***	***	*	**
LYMNAEIDAE	**	*	**		***
PHYSIDAE	*	*			
PLANORBIDAE	*	**	**		**
SPHAERIIDAE	****	****	****	**	***
GLOSSIPHONIIDAE	**	**	*	*	*
ERPOBDELLIDAE	**	**	**	*	***
ASELLIDAE	**	**	***	**	***
CHIRONOMIDAE	****	****	*	**	***
OLIGOCHAETA	**	***	***	***	**
ACROLOXIDAE			**	*	
BITHYNIIDAE	***	**	**	*	
BMWP Score	131	143	135	62	130
Pred. BMWP Score					139
BMWP/Pred BMWP					0.94
ASPT	4.68	5.30	5.00	4.33	4.64
Predicted ASPT					4.62
ASPT/Pred ASPT					1.00
Biotic Class	B	B	B	C	B

.. Cont

Taxa List for PMLR.0031 Mole At Royal Mills, Esher TQ13106560
5 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01
Day	15	22	18	22	15
Month	Aug	Jul	Mar	Mar	May
Year	1979	1980	1982	1984	1990
*Non Routine Sample					
Sample Number	0063	0057	0025	0061	0344*
CERATOPOGONIDAE			*		
CRANGONYCTIDAE	**		**		
DUGESIIDAE	*		*	*	
HYDRACARINA	***		**	*	
LUMBRICULIDAE	**		**	*	
NAIDIDAE				*	
NEMATODA			*		
OSTRACODA			*		
SYRPHIDAE	*				
TUBIFICIDAE	**	***	***	***	
BMWP Score	131	143	135	62	130
Pred. BMWP Score					139
BMWP/Pred BMWP					0.94
ASPT	4.68	5.30	5.00	4.33	4.64
Predicted ASPT					4.62
ASPT/Pred ASPT					1.00
Biotic Class	B	B	B	C	B

Taxa List for PMLR.0022 Mole Above Thames TQ15406830
5 Samples taken previous to 20/03/1991

Biology Area	01	01	01	01	01
Day	17	27	15	24	05
Month	May	Jun	May	Aug	Nov
Year	1988	1989	1990	1990	1990
*Non Routine Sample					
Sample Number	0138	0170	0325	0654*	0902*
LEPTOCERIDAE	*	*	**	**	*
CALOPTERYGIDAE			*		
PSYCHOMYIIDAE			*		*
CAENIDAE	**		**	**	**
POLYCENTROPIDAE			*		*
LIMNEPHILIDAE			*	*	
VIVIPARIDAE		*	*	*	
ANCYLIDAE		*		*	*
HYDROPTILIDAE					*
UNIONIDAE					*
GAMMARIDAE	*	*		***	**
COENAGRIIDAE	*	*	*		*
GERRIDAE		*		*	
NOTONECTIDAE		*			
CORIXIDAE		*	*	*	**
HALIPLIDAE				*	*
DYTISCIDAE	*	*	**	*	
PLANARIIDAE			*	*	*
BAETIDAE				***	**
SIALIDAE		*		*	*
PISCICOLIDAE	*	*	*	*	*
VALVATIDAE		*	**	**	***
HYDROBIIDAE		**	***	***	**
LYMNAEIDAE		*	***	***	**
PHYSIDAE		*		**	***
PLANORBIDAE			*		*
SPHAERIIDAE	*	*	**	**	***
GLOSSIPHONIIDAE	*		*	*	*
ERPOBDELLIDAE	*	*			
ASELLIDAE	*		**	**	***
CHIRONOMIDAE	**	***	***	***	**
OLIGOCHAETA	**	**	***	**	**
CERATOPOGONIDAE	*				
HYDRACARINA	*	*			
OSTRACODA		*			
BMWP Score	53	83	102	103	116
Pred. BMWP Score	166	173	173		173
BMWP/Pred BMWP	0.32	0.48	0.59		0.67
ASPT	4.42	4.37	4.86	4.48	4.64
Predicted ASPT	4.70	5.53	5.53		5.53
ASPT/Pred ASPT	0.94	0.79	0.88		0.84
Biotic Class	C	C	B	B	B

6. DISCUSSION

The water quality and macroinvertebrate data presented in the results describes a complex and sometimes contradictory picture, especially when attempting to relate the factors they describe to the fisheries present.

The water quality record for the period states that all the RQO reaches (varying from 1B to 3 in this survey) achieved or bettered their objectives. (See Table I). However, over 10 kilometres of the river, from the Gatwick Stream (Pond E) to the Mole's confluence with the Salfords Stream has a RQO of 3, not a challenging target (see Appendices I-III).

The macroinvertebrate data (See Table 2) indicates that the sections of the Mole/Gatwick stream surveyed by fisheries, can be split into two distinct biological sections:

i) The Upper Mole down to Sidlow Bridge and the entire Gatwick Stream, which has a biotic class D (BMWP range 16-50).

ii) The Mole/Ember below Hersham Royal Mills, which has a biotic class B (BMWP range 101-150).

The fisheries survey data indicates high class fisheries, with respect to biomass, species diversity and recruitment, for much of the Gatwick Stream and Upper Mole. This is not the case at the Lower Mole sites. The apparent contradiction between the fisheries data and the water quality/biological data can be explained by considering the in-stream habitat. This is relatively untouched at the Upper Mole sites, but has been dramatically changed along much of the Ember flood alleviation channel.

To illustrate this important point an attempt shall be made to describe the fisheries that were surveyed 'by River Quality Reach' by considering water quality, biological data, topography and other environmental constraints which may be important.

Gatwick Stream (Pease Pottage - Crawley STW) RQO (1B), class achieved 1B. Biologically it is a biotic class D. (BMWP range 16-50) when it should be a biotic class A (BMWP score 150+). The fisheries site (GSFA) is dominated by a low biomass of recruiting brown trout, together with a single Brook Lamprey. The water quality and presence of brown trout indicate a water of good quality. The macroinvertebrate biotic class does not. The site is down stream of large housing estates in Crawley, and more are being built further upstream, on the 'Maidenbower' scheme. So in the short term, the stream is suffering silt depositon, especially during high flows and in the long term, increased variable quality urban run-off. Where the stream has not been 'developed', monocultures of alder line both banks, completely shading the stream and any marginal, or submerged macrophytes. The site itself is under threat from development. The continued presence of this brown trout population is a tribute to its resilience.

The Gatwick Stream (Crawley STW - Mole) has an RQO3, and actually achieves a 2B. Biologically it is a biotic class D. (BMWP range 16-50), when it should be a biotic class B (BMWP range 101-150). The fisheries site (GSPA) exhibits a high biomass, density and diversity of fish, especially for a small stream, downstream of a major STW. Dace, roach and gudgeon dominate the population and all of these species show strong recruitment. Good flows from the STW, combined with reasonable velocities and a stream which still has riffle and pool features ensure that the ammonia and oxygen demand is not significantly exerted until the effluent reaches the confluence with the Mole. From here until Horley Weir the river is impounded and slow and may also receive de-icer discharges from Gatwick Airport during the winter. This section has an RQO of 3 and achieves a class 3 and is probably one of the worst sections of the main river.

The Mole (Horley STW - Salfords Stream) has an RQO3 and achieves a 2B. Biologically it is a biotic class D (BMWP range 16-50) when it should be a biotic class A (BMWP score 150+). The fisheries site (MOPA) exhibits a high biomass and diversity of fish species.

Recruitment is strong in the roach population and may be taking place in the dace, chub, gudgeon and perch populations. The site is d/s of a major weir and riffle and upstream of Horley STW and is not typical of the

reach. It has always been noted as an area where fish congregate and it definitely benefits from fish that are displaced over Horley Weir.

A site d/s at Wick Farm (Meath Green Farm) would give a better reflection of the fish population. During low flow periods, upto 90% of the river flow at Kinnersley Manor gauging weir can be treated sewage effluent. Lower river velocity behind such impoundments increases problems with oxygen demand. Fish actively avoid these areas during low flows.

In the short term the class 3 stretches of the Gatwick Stream/R. Mole can only be considered to be marginal fisheries, notwithstanding the 1990 survey results. The redevelopment of Horley STW and the ongoing work at Crawley promise more consistent water quality. The proposed directing of surface water from Gatwick Airport, to Crawley STW should eliminate winter problems with de-icers entering the main river. The impact of these was emphasised during February and March 1991, when some 5 kilometres of main river from pond D to Meath Green Bridge, were covered in 'sewage fungus' (Sphaerotilus natans). Fortunately higher river flows allowed water quality to be maintained. However, as the above problems recede, others associated with increasing urbanisation and impoundments at Horley and Kinnersley Manor, need to be addressed.

The Mole (Salfords Stream - Shag Brook) has an RQO of 2B and achieves it. Biologically it is a biotic class D (BMWP range 16-50) and should be a biotic class B (BMWP range 101-150). The fisheries site (MONB)exhibits a moderate biomass and density of fish with fair species diversity. The roach are recruiting strongly and there may be recruitment in the dace and gudgeon. The fish population, reflects the topography of the site, which is a long glide, between two deep pools. The most encouraging aspects of the site are a comparative (1986/1990) increase in fish densities and evidence of recruitment.

The Mole/Ember (Downside Mill Stream - Thames) has a RQO of 2A and actually achieves a 1B. Biologically it is a class B, occasionally dropping to C, at both sites (BMWP range 101-150). The fisheries sites are MOJA and MOJC, on the R. Ember Flood Alleviation Scheme, upstream and downstream of the S.T.W. and MOJB on the Old Mole Channel. All three are EC designated Fisheries and only one MOJB, actually achieves the

internally set target of 20gms^{-2}. MOJA fails by a considerable margin (0.605gms^{-2}). Even allowing for the problems encountered at MOJA and C when trying to obtain a sample (i.e. netting between stop-nets), it must be remembered that all three sites have excellent water quality and good correlations between predicted and observed macroinvertebrate data. The factor that accounts for the poor biomasses in the flood alleviation channel is almost certainly topography and lack of cover. The flood channel is wide, deep and lacks instream macrophytes, whereas the Old Mole Channel has macrophytes, a semi-natural channel and a high and diverse fish population.

The same channel, two kilometres downstream has a reduced depth, good instream macrophytes and a good chub population. The Old Ember Channel, which is still a semi natural channel also has good instream macrophytes and substantial chub populations.

Since 1988-1989, the river has experienced dry autumns and hot, dry summers. This has resulted in long periods of low flow and less dilution of treated sewage effluent. Many minor tributaries and some major ones such as the Deanoak Brook have completely failed. Reduced flows and reduced peak flows should mean that species that cannot tolerate high flow velocities should be expanding and this is exactly what has been observed.

At all the 1990 sites, except (GSFA) which is brown trout dominated and (MOJA) where juvenile roach are present, roach are recruiting strongly and are the dominant, or co-dominant species. The species is usually associated with static or slow flowing waterbodies. Roach are also regarded as pollution tolerant fish, and do not need gravels upon which to spawn (an advantage in the Weald Clay Catchment of the Upper Mole).

The effects of declining flows and effluent dilution on the dace component of the population is less clear cut. In 1990 no dace were found at the brown trout dominated section of the Gatwick Stream.

Dace are regarded as effluent tolerant, need gravel for spawning and are associated with the faster flowing sections of the river. These criteria are to be found on the Lower Gatwick Stream and Mole sites, and here the

dace are recruiting and either dominant, or co-dominant. On the Lower Mole/Ember sites dace recruitment is either not occurring or is very limited and the population is in decline. Reasons for this may be suboptimal habitat, inter specific competition between the dace and an old/large chub population, and a booming roach population. Limited spawning gravels may also be having an effect.

The chub population is in decline. At four of the seven sites fished chub are absent or represented by a few individuals. Recruitment is poor at the remaining sites and the only substantial population is to be found on the Old Mole Channel (MOJB) and here the population is almost exclusively composed of old (20-40 cm) fish. It is believed that for good chub recruitment, gravels, good water quality and reasonable flows are essential. Inter specific competition between the roach population and the chub may also be a factor. Gravels are limited on the upper and lower river sites, and on the upper river water quality is poor.

The perceived environmental/man-made constraints on the river reaches are:-

i) Upper Gatwick Stream; short term, siltation due to development and urban run off.

ii) Lower Gatwick Stream/Upper Mole reaches; STW effluent , Gatwick Airport run off (deicers during the winter), urban run off and impoundments at Horley and Kinnersley Manor.

iii) Mole/Ember Flood Alleviation Scheme (F.A.S.); Channel topography and d/s Esher Works, suspended solid deposition.

iv) (i) to (iii) are all suffering from the consequences of low flows.

In spite of the above, since the 1986 survey, there has been:-

a) An increase in biomass at all comparable sites.

b) An increase in species diversity at the sites.

c) Improvements in recruitment, especially at the Upper River Sites, which were highlighted in the '86 survey for their poor performance.

At the upper Gatwick Stream site (GSFA), the brown trout population is expanding slightly and recruiting. From this site a new species, the brook lamprey, may be colonising the Lower Gatwick Stream. An unwanted alien species, the pumpkinseed has established itself at the lower Gatwick Stream site (GSPA) and at the Horley Weir site (MOPA).

The eel population is still colonising the river and has now reached Horley Weir. Its size range and numbers appear to be increasing.

On the RQO3 reaches of the Gatwick Stream (d/s of Crawley STW) to the Mole (confluence with the Salfords Stream) the Metropolitan area stocking strategy seem to have been an unqualified success. At the three fisheries survey sites, within these reaches biomass, recruitment and species diversity has increased. Anecdotal information from the angling club concerned, indicates strong recruitment throughout the stretch and recent angling catches reinforce the impression of good fish populations.

The Metropolitan area stocking strategy has tended to react to gross pollutions on the Lower Gatwick Stream/Upper Mole in the following way,in the past:-

i) Following a large mortality, large numbers of small to medium sized stillwater roach, bream and perch have been reintroduced to the affected stretches. This is usually at the request of pollution control for 'monitoring' purposes.

ii) If available riverine species such as dace, roach and chub, with an emphasis on larger fish are stocked to the main river.

iii) Recently as juvenile dace and chub have become available, these have been annually stocked to main river riffle/glide sites and to suitable tributaries.

When comparing the mortality record for the 1986 and 1990 surveys, it can be seen that the numbers and weight of fish lost in the upper river has

fallen to a third of that seen previously (i.e. from 1550 kilos (12,000 fish) - 1986, to 511 kilos (3350 fish) -1990). Barring any further large scale losses, 'monitoring' and maintainance stocking should not now be necessary. However, the annual introductions of juvenile dace and chub to the upper main river and tributaries should be continued for the forseeable future. Proposed mitigation schemes in conjunction with Flood Defence and Conservation may eventually make even this unnecessary.

The historic species distribution of the main riverine species in the upper river is as follows. Stott (1967) found that roach and gudgeon were dominant species between Flanchford and Sidlow Bridges with dace and gudgeon sub-dominant. Butterworth (1982) found that the same two species were dominant, above Betchworth, d/s and u/s Sidlow Bridge and at Wick Farm. Dace were sub dominant below Sidlow Bridge and chub had become uncommon below Sidlow Bridge, only present above it and absent at Wick Farm. Neither author mentions the presence of eels at any of their sites. At the Sidlow Bridge site in 1986 and 1990, roach were dominant with dace and gudgeon sub dominant and chub absent. At the Horley site in 1986 chub were dominant (an artifact due to displacement) with roach, dace and gudgeon sub dominant. By 1990 roach had become dominant. The historical record and recent surveys, tend to suggest that chub have never been a common fish u/s of Sidlow Bridge. Efforts to establish a chub population here should perhaps be discontinued?

The Gatwick Stream sites are representative of the local river but this is not the case at the site above Horley STW (MPOA). As previously noted (pg. 101), sites at Wick Farm (Meath Green Farm) and perhaps Horley Swimming Baths would be more appropriate.

The u/s Sidlow Bridge site (MONB) is a long glide between two deep pools. The club(Horley P.S) inform us that this is the worst section for fishing of their entire stretch. A deeper section, which includes a deeper, but wadeable hole, would give a more accurate description of this stretch.

MOJB (Old Mole Channel) accurately reflects this reach and probably describes the situation on the Old Ember channel and the shallower/weeded sections of the Ember F.A.S.. MOJA and MOJC (above and below Ember STW) reflects the local conditions in this weedless trapezoidal channel. One

of these sites could have been more usefully placed further downstream where channel width is the same, but depth less and macrophyte growth better. A large chub population has been observed here.

This survey describes the fish populations around three major Sewage Treatment Works and covers perhaps one third of the River Mole and one major tributary. It is relevant to consider briefly how it may reflect conditions in the rest of the Mole system. Because of low flows, the roach population is probably going from strength to strength. The low flow situation might be causing the chub population to fail to recruit and the non-recruiting old, chub population may be depressing the dace population. A combination of these factors could be at work. There is insufficient information on the remaining tributaries, to speculate as to their current status.

7. CONCLUSIONS

1) The Gatwick Stream/Upper Mole and some of the Lower Mole sites support a good mixed coarse fishery with roach, dace, chub, gudgeon and eel predominant. Recruitment is fair to good for the main species encountered, except chub. Biomass is higher than at all comparable 1986 sites. Species diversity has improved.

2) Since 1986 fish mortalities have fallen by two-thirds, when compared with data from the period 1982-86. No significant mortalities have been recorded, on the Mole or its tributaries from July 1989 through to December 1990. Since 1986 biotic indices have remained steady or shown some improvement. From 1989, chemical water quality has not deteriorated and appears to be more consistent than in the past.

3) Brown trout are dominant at the upper Gatwick Stream site. This population is relict, but is self-maintaining and expanding in spite of increasing urbanisation.

4) A new species, Brook Lamprey, appears to be colonising the Gatwick Stream. An alien species, pumpkinseed, is establishing itself in the Gatwick Stream and at Horley Weir, as a result of illegal introductions from Gatwick Lake.

5) Eels now penetrate up to Horley Weir. Their numbers and size range appears to be increasing.

6) Of the three EC designated sites, (u/s and d/s Esher STW) two failed to meet the internally set biomass target of 20gm/m2. The reason for these failures is channel topography and lack of macrophyte cover.

7) A number of environmental factors are perceived as having a significant deleterious effect upon fisheries.

i) The whole catchment is suffering from low flows and reduced dilution of treated sewage effluent.

ii) The upper Gatwick Stream has problems with on-going urbanisation.

iii) The lower Gatwick Stream/Upper Mole has had problems with STW effluents. The situation at present has not deteriorated and appears to be more consistent than in the past. These reaches are also affected by Gatwick Airport run off (during the winter), urban run off and d/s impoundments.

iv) In the Ember flood alleviation channel topography is a major problem. Here water quality is good (1B) and biological indices high, but fish populations are negligible to poor.

8) For certain major riverine species (i.e. Roach, Dace) water quality is not of paramount importance, but river velocity and channel topography can become so(i.e. large biomasses of such fish are present in the RQ03 stretches of the Lower Gatwick Stream /Upper Mole).

9) Restocking on the lower Gatwick Stream/Upper Mole seems to have been an unqualified success.

10) There is evidence to suggest that some of the survey sites used, do not give an accurate impression of the river reaches they are supposed to represent.

8. RECOMMENDATIONS

1) The factors restricting the establishment of self-maintaining populations of the major riverine species needs to be well researched. A river cannot be said to be a healthy environment if only pollution tolerant fish species are thriving (i.e. the absence or presence of certain pollution intolerant fish species such as chub may help in setting the new concept of E.Q.O's (Environmental Quality Objectives).

2) The assumed relict population of Brown Trout on the Upper Gatwick Stream is an important local population and needs adequate protection. The Local Planning Authority, Crawley Borough Council need to be made aware of this fact.

3) The gauging weirs at Horley and Kinnersley Manor present a total barrier to fish movement and they also have deleterious, water quality effects upstream. Fish passes, suitable for coarse fish would be an improvement. Instream habitat mitigation schemes, such as the installation of stub groynes/riffle weirs may increase oxygenation and river velocity locally in these impounded RQO3 reaches. However the area is subject to flooding and there may be flood defence and riparian owner objections, to this course of action. Gravels could be emplaced d/s Kinnersley Manor Weir.

4) The Ember F.A.S. presents a barrier to fish movement, so fish passes suitable for the more active coarse fish are important. It is probable that only the deeper, impounded sections of the FAS have low fish biomasses. The Old Mole Channel Site, the old Ember Channel, and the shallower sections of the FAS (i.e. below Island Barn Reservoir) have good macrophyte growth and good fish populations. Lowering the deeper impounded sections to enable macrophyte colonisation would improve the habitat. Gravels could be emplaced below the many weir structures. Efforts should be made to establish more aquatic marginals.

5) Many sections of the Gatwick Stream have prolific alder growths. Sections of these should be pollarded. In the more urban sections it may be wiser to retain this cover, so as to protect the Brown Trout

population from too much interference.

6) Increasing urbanisation is a fact of life in the Upper Mole Valley. Some of it can be dealt with through the planning process, active pollution monitoring and sensitive instream mitigation works. However there will be an unavoidable loss of instream quality. This should be brought to the attention of the Local planning authorities with the intention of promoting the particular need for fisheries/conservation awareness in this area.

7) Large scale monitoring/maintainance stocking should be abandoned on the Lower Gatwick Stream/Upper Mole as recruiting fish populations now exist. Enhancement stocking with juvenile dace and chub should be continued in these reaches and adjoining tributaries.

8) For the future Mole surveys the following sites should be repositioned.

i) MOPA (Mole u/s Horley STW) is not typical of the reach, and has always been noted as an area where fish congregate. Sites at Horley swimming baths (u/s Horley Weir) or at Meath Green Farm (d/s Horley STW) would give a more realistic impression of the fish population.

ii) MONB (Mole u/s Sidlow Bridge) is a long glide between two very deep pools and is not typlical of the reach. A deeper section, which includes a deep, but wadeable pool, would give a more accurate description of this stretch.

iii) MOJA and MOJC (Ember F.A.S. u/s and d/s Esher STW) reflect the local conditions in this deep, weedless trapezoidal channel. The MOJC site could have been more usefully place downstream, where channel width is the same, but depth less, and macrophyte growth abundant.

9) The Mole's major tributaries should be the subject of a full scale fishery survey.

Major changes appear to be taking place in the species composition of the

riverine fish stock of the main river from Sidlow Bridge to Hersham Royal Mills.

A further survey is also necessary here and both should be programmed into the next survey cycle.

9. REFERENCES

1) Stott. B. 1967. The Movements and population densities of Roach (Rutilus Rutilus (L)) and Gudgeon (Gobio Gobio (L)) in the River Mole. J. Anim. Ecol. 36. 407-423.

2) Butterworth. A.J. 1982. River Mole Fishery Surveys. Internal TWA Report.

3) Thames Water, 1986. River Mole Fisheries Survey. (Ref. CM086). Internal Report.

4) Thames Water, 1988. River Mole, Biological Status Report. Internal Report.

5) Vigar. K. 1990. A Report of 12 months placement with the Metropolitan Fisheries Section of the National Rivers Authority - Thames Region. (September '89-September '90). Internal Report.

6) National Rivers Authority - Thames Region, 1989. River Darent, Fisheries Survey. (Ref: CDA87). Internal Report.

7) National Rivers Authority - Thames Region, 1990. Reviews of those fish population surveys conducted by Metropolitan Fisheries during the period September 1985-April 1990. Internal Report. (Ref: CREV90).

8) National Rivers Authority - Thames Region, 1991. Format of Survey Reports. Working Group Report. Internal Report.

9) Thames Water, 1986. River Mole Fisheries Survey (Ref: CM086). Unpublished raw data.

10) Foulkes. N.J. 1985-86 and 1989-90. Personal Diaries.

11) Brookes. A. 1988. Channelized Rivers. Perspectives for Environmental Management. John Wiley & Sons.

APPENDIX I

N.W.C/E.I.F.A.C. PARAMETERS

CLASSIFICATION OF RIVER QUALITY

River Class	Quality criteria	Remarks	Current potential uses
	Class limiting criteria (95 percentile)		
1A	(i) Dissolved oxygen saturation greater than 80%. (ii) Biochemical oxygen demand not greater than 3mg/l. (iii) Ammonia not greater than 0.4 mg/l. (iv) Where the water is abstracted for drinking water, it complies with requirements for A2** water. (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 1.5 mg/l. (ii) Visible evidence of pollution should be absent.	(i) Water of high quality suitable for potable supply abstractions and for all other abstractions. (ii) Game or other high class fisheries. (iii) High amenity value.
1B	(i) DO greater than 60% saturation. (ii) BOD not greater than 5 mg/l. (iii) Ammonia not greater than 0.9 mg/l. (iv) Where water is abstracted for drinking water, it complies with the requirements for A2** water. (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 2 mg/l. (ii) Average ammonia probably not greater than 0.5 mg/l. (iii) Visible evidence of pollution should be absent. (iv) Waters of high quality which cannot be placed in Class 1A because of 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	(i) DO greater than 40% saturation. (ii) BOD not greater than 9 mg/l. (iii) Where water is abstracted for drinking water, it complies with the requirements for A3** water. (iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 5mg/l. (ii) Similar to Class 2 of RPS. (iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs.	(i) Waters suitable for potable supply after advanced treatment. (ii) Supporting reasonably good coarse fisheries. (iii) Moderate amenity value.
3	(i) DO greater than 10% saturation. (ii) Not likely to be anaerobic. (iii) BOD not greater than 17 mg/l*.	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	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 objective is simply to prevent nuisance developing.

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

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

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

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

* This may not apply if there is a high degree of re-aeration.

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

APPENDIX II

River Quality Objectives

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 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 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 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

EXTRACT FROM E.E.C. DIRECTIVE 78/659

LIST OF DETERMINANDS

Determinand	*Salmonid Waters*		*Cyprinid Waters*	
	G	*I*	*G*	*I*
(a) Temperature (max) (b) Temperature rise		$\leq$ 21.5°C $>$ 1.5°C		$\leq$ 28°C $>$ 3°C
Dissolved oxygen (mg/l O_2)	50% $\geq$ 9 100% $\geq$ 7	50% $\geq$ 9	50% $\geq$ 8 100% $\geq$ 5	50% $\geq$ 7
pH		6–9		6–9
Suspended solids (mg/l)	$\leq$ 25		$\leq$ 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)	$\leq$ 0.005	$\leq$ 0.025	$\leq$ 0.005	$\leq$ 0.025
Total ammonium (mg/l NH_4)	$\leq$ 0.04	$\leq$ 1	$\leq$ 0.2	$\leq$ 1
Total residual chlorine (mg/l HClO)		$\leq$ 0.005		$\leq$ 0.005
Zinc (mg/l)		$\leq$ 0.3		$\leq$ 1
Copper (mg/l)	$\leq$ 0.04		$\leq$ 0.04	

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

APPENDIX IV

Site Codes and Locations

Site Code	R.Q.O.	EEC Designation	Location	N.G.R.	Date Surveyed
GSFA	1B	None	Gatwick Stream u/s Crawley STW.	TQ292396	16.11.89
GSPA	3	None	Gatwick Stream d/s Crawley STW.	TQ284420	11.10.89
MOPA	3	None	R.Mole u/s Horley STW	TQ268435	15.5.90
MONB	2B	None	R.Mole u/s Sidlow Bridge	TQ262469	17.5.90
MOJA	2A	C	R.Ember F.A.S. u/s Esher STW	TQ134665	22.5.90
MOJB	2A	C	Old R. Mole Channel	TQ135674	30.5.90
MOJC	2A	C	R. Ember F.A.S. d/s Esher STW	TQ135666	22.5.90

APPENDIX V

R. MOLE RESTOCKING 1987

Area	Date	Source	Site	Species	No.
ME	24.04.87	Barn Elms Filterbeds	R.Mole Esher	Ro/Br/Ca	320
ME	17.11.87	R.Darent,Eynsford	R.Mole Meath Green	Da/Ro/Ch	120
ME	11/12/87	R.Darent, Lullingstone	R.Mole Meath Green & Earlswood St.	Da/Ro/Ch	735
ME	11.12.87	R.Darent, Lullingstone	R.Mole Gatwick Stream	Ro	1000
ME	22.02.88	Humberside Fisheries	R.Mole Meath Green	Ro/Pe	2000
ME	01.12.88	Fullers Earth Pit	R.Mole Sidlow Bridge	Ro	7500
ME	01.12.88	"	R.Mole Longbridge	Ro	4800
ME	06.12.88	Fobney Fish Farm	Mole Pixham-Cobham,Gatwick & Salfords	Barbel	100
ME	16.12.88	Fobney Fish Farm	R.Mole Meath Green,Gatwick & Salfords	Ch	495
ME	16.12.88	Fobney Fish Farm	R.Mole,Meath Green	Da	255
ME	16.12.88	Fobney Fish Farm	R.Mole Meath Green	Ca	50
ME	17.12.88	Fullers Earth Pit	R.Mole Longbridge	Ro	660
ME	25.4.89	QEII Res.	R.Mole Stoke D'Abernon	Bt	113
ME	10.11.89	Fobney Fish Farm	Salfords St.	Da	400
ME	10.11.89	Fobney Fish Farm	Leigh Brook	Da	400
ME	18.01.90	Fobney	R.Mole Cobham-Pixham	Barbel	95
ME	18.01.90	Fobney	Salfords Str.	Ch	350
ME	18.01.90	Fobney	Leigh Brook	Ch	350

Size (cms)	Tot.Wt (kms)	Av.Wt. (gms)	Reason	Value	Acquired
10-35	195	609.4	Rei	780	F
15-50	34.5	287.5	Rei	140	C
8-50	41.2	56.1	Rei	185.4	C
4-5	1.8	1.8	Rei	0	C
10-15	100	50	Rei	440	B
7-20	114	15.2	Req	2500	F
7-20	73	15.2	Req	1600	F
20-25	18	180	Rei	320	R
12-15	23	46.5	Rei	700	R
12-15	6	23.5	Rei	135	R
15	5	100	Req	45	R
8-25	10	15.1	Rei	200	F
25-45	28	247.8	Req	150	R
8-14	5.2	13	Rei	240	R
8-14	5.2	13	Rei	240	R
25	12.4	130.5	Enh	320	R
10-15	7	20	Enh	350	R
10-15	7	20	Enh	350	R

Area	Date	Source	Site	Species
ME	18.01.90	Fobney	Tanners Brook	Ch
ME	07.03.90	Wandsworth Com.	Mole,Meath Green	Ro
ME	07.03.90	"	"	Pe
ME	07.03.90	"	"	Br/Ro/Da Ch
ME	23.03.90	Hopfield Fish.	"	Co/Br
ME	24.08.90	Stamford Grn. Pond	Mole,Horley Weir	Cru/Ca
ME	29.10.90	QEII Res.	Mole. Longbridge	Ghost Ca
ME	16.11.90	Fobney	Salfords St.	Da
ME	16.11.90	Fobney	Tanners Br.	Da
ME	16.11.90	Fobney	Mole Gatwick - Horley	Ch
ME	16.11.90	Fobney	Tanners Br.	Ch
ME	16.11.90	Fobney	Salfords St.	Ch
ME	16.11.90	Fobney	Mole/Horley	Da
ME	16.11.90	Fobney	Gatwick St. Horley	Ch
ME	16.11.90	Fobney	Leigh Brook	Ch
ME	16.11.90	Fobney	R.Mole Pixham-Cobham	Barbel
ME	16.11.90	Fobney	Leigh Brook	Da
ME	16.11.90	Fobney	Mole-Sidlow	Ch
				TOTALS:

No.	Size (cms)	Tot.Wt (kms)	Av.Wt. (gms)	Reason	Value	Acquired
200	10-15	4	20	Rei	200	R
7206	5-15	126	17.5	Req	1400	C
182	6-10	3.6	19.8	Req	27	C
261	8-20	32.6	124.9	Req	52	C
400	15-40	138.0	345	MO1	1000	B
120	7-55	31.7	264.2	Req	140	F
45	35	20	444.5	Res	70	R
550	10	5.5	10	Enh	300	R
200	10	2	10	Enh	120	R
660	10-15	15.2	23	Enh	660	R
200	10-15	4.6	23	Enh	200	R
300	10-15	6.9	23	Enh	300	R
700	10	7	10	Enh	420	R
330	10-15	7.6	23	Enh	330	R
300	10-15	6.9	23	Enh	300	R
225	25.30	45	200	Enh	400	R
550	10	5.5	10	Enh	300	R
200	10-15	4.6	23	Enh	200	R
32372		1175	36.3		15114.4	

APPENDIX VI

RIVER MOLE FISH MORTALITIES 1986-1990

Area	Date	Location	Species	Number	Size(cms)	Tot.Wt.(kgms)	Value(£)	Cause
ME	11.08.86	Cottesmore Golf Course Ponds, Trib.of Broadfield Ifield.	Pumpkinseeds Roach	100's	10 25	10-20	-	Unknown herbicide suspected.
ME	01.02.87	Mole Gatwick	Ro.Da.Ch.	100	12-30	10	50	Discharge Gatwick Airport.
ME	03.07.87	Mole Horley	Ro.Da.Ch.	1000	10-35	100	450	Horley Works
ME	26.07.87	Holmwood trib. (Bonds Pond).	Ru.Cru.	50	10-30	5	20	Silage
ME	29.07.87	Pipp Brok,Dorking	Ro.S3	50	5-15	1	4	Phenolic discharge (Old Gas Works)
ME	02.09.87	Earlswood Lakes (Earlswood Brook).	Ro.	200	2-17	2	20	Storm water run off.
ME	08.09.87	Henfold Lakes (on Leigh Brook).	Ro.	600	5-20	30	180	Farm Waste.
ME	16.05.88	Earlswood Lakes (Earlswood Brook).	Ro.Br.	50	10-15	0.6	1.5	Run off from golf course
ME	16.05.88	R.Ember FAS	Ro.Ch.	30	10-25	1.5	3.3	Low D.O. in flood channel.
ME	02.11.88	Private Lake Flanchford (on Wallace Brook).	Rt.	400	30-45	300	900	Failure pumping sewage.
ME	19.12.88	R.Mole/Horley	Ro.	50	10	0.5	5	Unknown recent restocking nearby.
ME	09.05.89	Earlswood Lakes (Earlswood Stream)	Carp	10	30-45	20	106	Unknown not reported for 10 days.
ME	21.5.89	R.Mole/Meath Green	Ro.Br.Te. Da.Pe.	100	10-30	5	50	Horley STW failure.
ME	07.07.89	R.Mole/Horley	Ro.	30	15	3	7	Low D.O. Urban run off.
ME	11.07.89	Tanners Brook	Da/Ch.	60	10-30	9	50	Farm Wastes.
ME	01.07.89	R.Mole/Sidlow	Ro.Da.	100	10-20	5	25	Low D.O. urban run off.
ME	16.07.89	Dorking Mill Pond (Pipp Brook)	Ro.	15	15-35	3	18	Unknown but herbicide suspected.
TOTALS:				3350		511		

Upto December 1990 there were no significant mortalities on the River Mole.

APPENDIX VII

Habitat codes used by NRA fisheries, based upon RQO and EEC fisheries legislation criteria

Watercourses with both EEC designation and NWC quality Objectives		Watercourses with NWC quality objectives only	
Code	Description	Code	Description
A	1A Salmonid	G	1A
B	1A Cyprinid	H	1B
C	1B Salmonid	K	2A
D	1B Cyprinid	L	2B
E	2A Salmonid	M	3
F	2A Cyprinid	N	4
		O	Unclassified

e.g. CODF refers to CO = Colne D = RQO and EEC designation
F = site on Colne

The system is extended to provide a coding for each whole survey this:-

DCO88 D = Thames East
CO = Colne Survey
88 = 1988

APPENDIX VIII

RIVER QUALITY ASSESSMENT : OCTOBER 1989 TO SEPTEMBER 1990

GUILDFORD DISTRICT

RIVER	REACH	
BALDHORNS BROOK	Source	to Mole
BOOKHAM BROOK	Effingham Can.	to D'side Mill Str
BOURNE	Woburn Park	to Thames
BOURNE (NORTH)	Source	to Chertsey STW
BOURNE (NORTH)	Chertsey STW	to Bourne
BOURNE (SOUTH)	West End Common	to Bourne
BOVENEY DITCH	Roundmoor Ditch	to Thames
BURSTOW STREAM	Crawley Down	to Burstow STW
BURSTOW STREAM	Burstow STW	to Mole
CAKER STREAM	Source	to Wey (N)
CHALVEY DITCH	Slough	to Thames
COLLINS BROOK	Withy Copse	to Cranleigh Water
COMPTON STREAM	Compton	to Wey
CRANLEIGH WATERS	Ellen's Green	to Collins Brook
CRANLEIGH WATERS	Collins Brook	to Water Bridge
CRANLEIGH WATERS	Water Bridge	to Cranleigh STW
CRANLEIGH WATERS	Cranl'gh STW	to Wey
CRAWTERS BROOK	Crawley	to Mole
DATCHET COMMON BROOK	Upton Lake	to Thames
EARLSWOOD BROOK	Earlswood	to Mole
FARNHAM PARK TRIB.	Hog Hatch	to Wey (N)
GATWICK STREAM	Peas Pottage	to Crawley STW
GATWICK STREAM	Crawley STW	to Gatwick Pond E
GATWICK STREAM	Gatwick Pond E	to Mole
HALE BOURNE	Berks Golf Cse	to Bourne (S)
HOLMWOOD STREAM	Source	to Leigh Brook
LEIGH BROOK	Source	to Mole
MOLE	Source	to Gatwick Pond B
MOLE	Gatwick Pond B	to Gatwick Pond D
MOLE	Gatwick Pond D	to Gatwick Stream
MOLE	Gatwick Stream	to Horley STW
MOLE	Horley STW	to Salfords Stream
MOLE	Salfords Stream	to Shag Brook
MOLE	Shag Brook	to Dorking STW

LENGTH (Kms)	SAMPLE POINT	RQO	CLASS ACHIEVED
1.930		2B	NoSPT
4.450		2B	NoSPT
1.060	BOURNE US THAMES	1B	2A
14.770	BOURNE N, THORPEGREEN BR	1B	1A
6.330	BOURNE N, HAMPERSTONE BR	2A	2B
22.200	BOURNE S, MIMBRIDGE CHOBHAM	1B	1B
1.100	BOVENEY DT US THAMES	3	3
11.700	BURSTOW STR, SHIPLEY BR HORLEY	3	3
4.760	BURSTOW STR, HEATHGREEN BR	3	2A
5.670	CAKER STREAM ABOVE ALTON STW	2B	1A
5.500	CHALVEY DT US THAMES	1B	1B
1.880	COLLINS BK, COLLINS FM	X	3
4.300		2B	NoSPT
5.390	CRANLEIGH WTRS US COLLINS FM	2B	2A
2.730	CRANLEIGH WTRS, COLLINS FM	2B	3
6.350	CRANLEIGH WTRS, ELMBRIDGE	2A	1B
11.770	CRANLEIGH WTRS, RUN CMMN	1B	2A
6.590	CRAWTERS BK, LOWFIELD HEATH	X	2A
18.430	DATCHET COMMON BK US THAMES	1B	1A
3.180	EARLSWOOD BK US MOLE	X	2B
3.430	FARNHAM PARK TRIBUTARY ABOVE WEY (N)	2B	2B
14.160	GATWICK STR, TINSLEY BR	1B	1B
0.200	GATWICK STR US PND E	3	2B
2.770	GATWICK STR US MOLE	3	2B
15.550	HALE BOURNE, HALEBOURNE LANE	1B	2A
4.970	HOLMWOOD STREAM BELOW HOLMWOOD STW	2B	2A
11.600	LEIGH BK, LEIGH BR	2B	1A
11.250	MOLE US GATWICK AIRPORT	2B	1A
3.140	MOLE, TIMBERHAM BR GATWICK	2B	1B
0.200	MOLE US GATWICK STR	2B	2A
2.060	MOLE US HORLEY STW	3	3
5.470	MOLE, KINNERSLEY MANOR	3	2B
8.880	MOLE, FLANCHFORD BR	2B	2B
7.780	MOLE US DORKING STW	2B	2A

RIVER QUALITY ASSESSMENT : OCTOBER 1989 TO SEPTEMBER 1990

GUILDFORD DISTRICT

RIVER	REACH			LENGTH (Kms)
MOLE	Dorking STW	to	Riv Lane Leath	11.070
MOLE	Riv Lane Leath	to	D'side Mill Str	8.110
MOLE	D'side Mill Str	to	Ember	21.780
MOLE	Ember	to	Thames	0.480
MYEE STREAM	Long Cross	to	Bourne (N)	2.440
MYRKE DITCH	Upton Park	to	Thames	1.880
OAKHANGER STREAM	Selborne	to	Slea	6.900
OCK (SURREY)	Hambledon	to	Wey	6.940
OCKHAM MILL STREAM	Wey	to	Wey	2.870
PIPP BROOK	Coldharbour	to	Mole	11.440
REDHILL BROOK	Whitehill	to	Salfords Stream	12.360
ROUNDMOOR DITCH	Burnham STW	to	Boveney Ditch	4.200
SALFORDS STREAM	Source	to	Mole	12.080
SALT HILL STREAM	Stoke Poges	to	Chalvey Ditch	7.860
SLEA	Worldham	to	Oakhanger Str	4.700
SLEA	Oakhanger Str	to	Wey (South)	5.770
STANFORD BROOK	Henley Pk. Lake	to	Rickford Mill	5.170
STANFORD BROOK	Rickford Mill	to	Wey	12.630
THAMES	Source	to	Swill Brook	11.150
THAMES	Swill Brook	to	Cerney Wick Bk	3.550
THAMES	Cerney Wick Bk	to	Key	3.950
THAMES	Key	to	Ray	1.450
THAMES	Ray	to	Share Ditch	7.350
THAMES	Share Ditch	to	Bydemill Brook	3.820
THAMES	Bydemill Brook	to	Coln	2.870
THAMES	Coln	to	Shifford Weir	22.530
THAMES	Shifford Weir	to	Bablock Hythe	12.410
THAMES	Bablock Hythe	to	Evenlode	7.970
THAMES	Evenlode	to	Castle Mill Str	9.270
THAMES	Castle Mill Str	to	Cherwell	1.360
THAMES	Cherwell	to	Sandford Lock	4.410
THAMES	Sandford Lock	to	Ock	8.510
THAMES	Ock	to	Thame	15.240
THAMES	Thame	to	Goring STW	14.230

SAMPLE POINT	RQO	CLASS ACHIEVED
MOLE, RIVER LANE LEATHERHEAD	2B	1B
MOLE, STOKE D'ABERNON BR	2A	1B
MOLE, ROYAL MILLS ESHER	2A	1B
MOLE US THAMES	2A	1B
	X	NoSPT
MYRKE DT US THAMES	2B	2A
OAKHANGER STREAM ABOVE SLEA	1B	1A
OCK ABOVE WEY	1A	1A
	2B	NoSPT
	2A	NoSPT
REDHILL BK, KINGS MILL LANE	2B	1A
ROUNDMOOR DT, LAKE END DORNEY	3	3
SALFORDS STR US MOLE	2A	1B
SALT HILL STR DS MONTEM LANE	1B	1B
	X	NoSPT
	1B	NoSPT
STANFORD BK, RICKFORD MILL	2B	2A
STANFORD BROOK AT SMARTS HEATH LANE	2A	1A
THAMES, SOMERFORD KEYNES BR	1B	1A
THAMES, WATERHAY BR ASHTON KNS	1B	1A
THAMES, CRICKLADE	1B	1A
THAMES AT EYSEY	1B	1A
THAMES, CASTLE EATON	2A	3
THAMES, HANNINGTON BR	2A	2A
THAMES, INGLESHAM	2A	2A
THAMES, BUSCOT INTAKE	2A	1B
THAMES, NEWBRIDGE	1B	1A
THAMES, FARMOOR INTAKE	1B	1A
THAMES, TROUT INN GODSTOW	1B	1A
THAMES, FOLLY BR OXFORD	1B	1A
THAMES, DONNINGTON BR OXFORD	2A	1A
THAMES, RADLEY COLLEGE	2A	1B
THAMES, DAYS LOCK	1B	1B
THAMES, WALLINGFORD BR	1B	1B

NATIONAL RIVERS AUTHORITY –THAMES REGION FISHERIES AREA (EAST).

Additional copies of this report are available priced £ 40.00 each (colour) or £ 20.00 (black & white). Please complete the details set out below and return this form, together with your remittance made payable to "National Rivers Authority – Thames Region" to:–

Senior Fisheries Officer (East)
National Rivers Authority –Thames Region
Aspen House, The Grange
Crossbrook Street
Waltham Cross, Herts. EN8 8HE.

Name _____

Organisation _____

Address _____

_____

_____ Post Code _____

No. of colour copies required @ £ each ..... = £ .....

No. of black & white copies @ £ each ..... = £ .....

Postage = £ 2.00

Total = £ .....

(please do not send cash).

Address they are to be sent if different from above

_____

_____

_____

_____ Post Code _____

Other Fishery Survey Reports are available. Details and costs of these can be obtained by writing to the above address or by telephone to: LEA VALLEY (0992) 645047

Please allow 28 days for delivery.

River Mole Derogation Survey(CMO89) 1991 NF/JR/FG 1