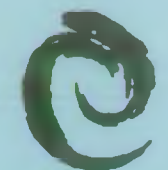


ENVIRONMENTAL PROTECTION



NRA

National Rivers Authority

South West Region

**ROADFORD SCHEME
ENVIRONMENTAL MONITORING
1991/92**

Roadford Fisheries
Liaison Committee

21 April 1992

GORDON H BIELBY BSc
Regional General Manager

C V M Davies
Environmental Protection
Manager

NATIONAL RIVERS AUTHORITY - SOUTH WEST REGION

ROADFORD FISHERIES LIAISON COMMITTEE - 21 APRIL 1992

ROADFORD FISHERIES AND ENVIRONMENTAL INVESTIGATIONS - REPORT 1991/92

A. RIVER TAMAR

FISHERIES

1. Gunnislake Trap

The trap is located in the Cornish Pass of the fishing weir at Gunnislake, approximately 1km downstream of Gunnislake abstraction point. Trapping operations began on 2 May 1991 and continued until 1 August 1991. As in previous years, agreement was reached with the representatives of the TTFA to enable operation of the trap for a maximum of 2 x 24 hour periods per week.

During this 3 month period the trap was operated for 27 x 24 hour sessions. The total catches of adult salmon and sea trout were 141 and 293 fish respectively. Figures 1 - 2 and Tables 1 - 2 show the annual and monthly catches of salmon and sea trout for the years 1987 - 1991 inclusive. Two separate age components for each species have been detailed.

The decline in catches of salmon and sea trout recorded in the Tamar stocks in 1990 was repeated during 1991. In general, the overall catches of grilse and school peal were less than average, while the catches of two sea winter salmon and older sea trout were above average. The dramatic reduction in the grilse component was a salient feature of stocks in all rivers, both regionally and nationally.

Overall, the majority of salmon and sea trout were trapped during the hours of darkness, ie. 63% and 53% respectively for each species. The maximum catches in any 24 hour period were 25 salmon and 24 sea trout. Among salmon the maximum catch occurred in late July while the corresponding catch for sea trout was in May.

The majority of salmon were fresh run and supported sea lice. The percentages of fish in each age group with sea lice infestations were:-

<u>Species/Age Group</u>	<u>Sea Lice (untailed and tailed)</u>	<u>Tailed Sea Lice</u>
Grilse	67%	9%
Two sea winter	62%	18%
School Peal	78%	9%
Old Sea Trout	83%	21%

Figures 3 and 4 describe the numbers and timing of salmon and sea trout caught in Gunnislake trap during 1991.



Trapping at Gunnislake ceased on 1 August 1991 due to the commencement of site work associated with the installation of the fish counter.

2. Gunnislake Fish Counter

On 7 August 1991 work began on the Cornish Fish Pass at Gunnislake Weir. The aims of this contract were:-

- a. To remove all the existing timber baulks and iron work associated with the fish pass and to totally refurbish the structure using traditional materials.
- b. To undertake extensive modifications of the exit channel from the fish pass, including an extension to the channel which will house the open channel electronic fish counter.

During the refurbishment and reconstruction of the pass a temporary fish pass was fabricated in the historic canal, which by-passes the main weir structure. Both salmon and sea trout were observed using the temporary pass during the period.

Associated works were undertaken on the right bank with the installation of gabion units, clearance of selected trees/shrubs and the installation of the new instrumentation hut. The interior of the hut was refurbished and new work surfaces and racking installed in readiness for the electronic equipment.

The fish counter, Aquantic 1700A Logie-single channel, was delivered and is currently in storage at Pennygillam Depot.

The majority of the civil engineering works were completed in late September. Certain in-channel works were scheduled for early October. These works included the installation of a temporary electrode counting face, modification of the timber baulks and the completion of the concrete structure which will support the electrode arrays. The temporary dam and seal in the new channel was removed on 4 October 1991 (14.47 hours) following a request by the fishing and riparian interests. The pass was to remain operational until the end of the fishing season (ie. 14 October 1991). All scheduled work on the new channel was subsequently cancelled and the contractor vacated the site.

A penstock was installed at the upstream end of the new channel in late October. This manually operated gate obviates the need for the temporary sand bags to seal the channel when the final civil works are recommenced.

The temporary fish pass, fabricated in the historic canal was removed in late October. The steel piling and temporary bridge was removed from site in February 1992 to permit the fishery syndicate to flush Gunnislake Pool prior to the 1992 fishing season.

Overall there has been little progress to report since November 1991. A major problem arose regarding a "way-leave" for the electricity supply.

This issue was resolved in February 1992.

An electrically powered Rotork is required on the penstock before the electrode array can be installed and modifications made to the fish pass.

Outstanding project issues to be resolved:-

- a. Resolve Way-leave issues.
- b. Install mains electricity.
- c. Install wiring sockets, lighting and heating in hut.
- d. Fit Rotork motor to penstock.
- e. Fit concrete wing and electrode array into fish pass.
- f. Modify baulk timbers in fish pass.
- g. Connect counter to electrodes and test.
- h. Clear site and landscape area.
- i. Remove steel piling in canal and remove temporary bridge.
- j. Repair security fence on perimeter to island.
- k. Prepare gantry to support validation equipment.

3. Estuary Netting - Cothele

The Fisheries Science Unit in conjunction with the services of a full-time netsman operated their own seine net during the weekly close-time. The net was operated for a 4 month period, June - September, with the original aim of releasing 50 salmon into the upper estuary. The behaviour of these radio tagged fish will supply valuable information on the movement from the upper estuary, through the freshwater-marine interface and past the abstraction point.

Catches of salmon were not as high as anticipated due to the reduction in the availability of grilse. In total some 27 salmon were released. The numbers of salmon released per month; period June - September were 3, 7, 2, and 15 fish respectively. All netting sessions were targeted at the low water tidal conditions specifically 3 hours to low water and the first flood tide. A total of 33 netting sessions were undertaken over the 4 months.

4. Radio Tagging/Tracking

A total of 57 salmon were tagged and released into the upper reaches of the Tamar Estuary. In addition to the 27 salmon released at Cothele a further 30 salmon were trapped at Gunnislake trap and displaced. These fish were released approximately 1km downstream of Gunnislake Weir at Morwell Wood.

Note: Additional fish were required from the trap to coincide with the agreed programming of enhanced flows and hydrogeneration releases. Maximum releases of 172 ML/d were scheduled for August and September 1991.

The movement of the radio tagged salmon were monitored using a network of automatic listening stations located at strategic locations along the main stem Tamar. A total of 14 stations were deployed between Morwellham and St

Leonards. Priority was given to movements out of the tidal reach and past the abstraction point. All stations were removed from the river in phases between mid December and early January. The automatic listening stations were programmed to scan the allocated frequency range every 5 minutes. Fish passage information was recorded on a paper printout and audio-cassette tape. All information must be corroborated before reporting can be undertaken. As a result, full analysis will not be available until mid 1992.

The recorded final locations of the 57 radio-tagged salmon released in 1991 were:-

- (i) Salmon released into the estuary at Cothele, total of 27 salmon.
 - a. Four salmon remained in the saline environment of the upper estuary, located downstream of Morwellham. These fish were not detected entering the freshwater zones of either the Tamar or Tavy.
 - b. Thirteen salmon migrated upstream to Gunnislake Weir, but no fish progressed into the river. One of these fish was caught by an angler, while the final destination of 6 fish remains unknown. Of the remaining 6 salmon, all migrated downstream into the lower estuary and were subsequently recorded entering the River Tavy and migrating upstream through the river.
 - c. Three salmon moved out of the upper estuary and migrated into the River Tavy.
 - d. Seven salmon migrated out of the tide, over Gunnislake Weir and into the river. These fish were distributed throughout the main stem Tamar and River Lyd.
- (ii) Salmon released from Morwell Wood ie. 30 salmon displaced from Gunnislake Weir.
 - a. Nineteen salmon migrated out of the tide, over Gunnislake Weir and into the river. The majority of these fish moved upstream within a few days of being displaced, completing their primary active migration and remaining in the lower reaches. As in previous years, migration upstream was only resumed in the autumn in readiness for spawning. Prior to the removal of the automatic listening stations in December, most of these fish were tracked onto the spawning grounds. Of the 19 salmon, 4 fish entered the River Inny, 3 fish entered the River Lyd, 4 fish migrated upstream of Launceston, 7 fish were located in the mid-reaches of the Tamar and 1 salmon was caught by an angler.
 - b. Eleven salmon remained detected between the point of release and Gunnislake Weir. Some of these fish migrated downstream into the upper estuary. One fish was caught by a commercial net. The final location of the remainder is unknown.

As detailed in the 1991 work programme, a limited radio tracking study was undertaken in the Lyd sub-catchment. A total of 6 salmon were selected from Milford trap (R. Thrushel) and displaced to Greystone Bridge on the main stem Tamar. Salmon in an advanced stage of sexual maturity were not used.

Eight automatic listening stations were deployed in the Lyd sub-catchment to study the migration patterns of the salmon.

The recorded final location of the 6 salmon were:-

- a. One salmon returned to the River Thrushel, passing upstream through Milford trap.
- b. Three salmon returned to the River Thrushel, and remained downstream of the Wolf/Thrushel confluence. Each fish migrated into the lower reaches of both rivers.
- c. One salmon migrated upstream to St Leonards, remaining in the main river.
- d. One salmon remained in the vicinity of Greystone Bridge before finally migrating downstream.

5. Fish Traps of the Lyd Sub-catchment

Trapping facilities remained operational at Cookworthy (R. Wolf) and Milford (R. Thrushel) during the period. Both traps are located approximately 200 - 300m upstream of the joint confluence. With Roadford Reservoir located on the River Wolf priority was given to the operation of the two-way trap at Cookworthy. This trap facility remained fully operational since 1 April 1991. The efficiency of this trap has improved significantly due to the regulatory effect of the reservoir on the natural flow regime.

In 1991, the total catches of adult salmonids at the two traps were:-

a. Cookworthy	Salmon	1
	Sea trout	11
	Brown trout	80
b. Milford	Salmon	11
	Sea trout	83
	Brown trout	310

The first sea trout was caught at Cookworthy in September when the River Wolf was benefitting from an enhanced flow regime. Overall, catches of each species increased from October onwards, peaking in November. As in 1990, the number of sea trout and brown trout trapped at Milford were greater than the catches at Cookworthy. This latter trend is contrary to the general trends recorded in previous years, prior to the regulation of the River Wolf.

Trapping efficiency at both sites was affected by flooding out of the trap installations caused by natural spates and special releases. The timing and size of these few natural spates coincided with the peak availability of salmonids migrating upstream onto the spawning grounds. This resulted in many fish being undetected.

6. Electrofishing

A total of 28 sites were surveyed on the rivers Wolf, Thrushel and Lyd between 29 July and 4 September 1991. Tables 3a - 3d show the densities (nos/100m²) of salmon and trout, 0+ and >1+, recorded at each site during the 1991 survey and compare the results with the historic data base.

Recruitment of wild salmon in the Wolf has improved, with reasonably high densities of fry and parr. However densities of wild trout were similar to pre-dam construction levels. Overall densities of stocked salmon and trout were low and did not reflect the level of stocking undertaken in recent years. The results from the electrofishing surveys and records of trap catches at Cookworthy suggest that the mortality of the stocked component is exceptionally high in freshwater. Predation by herons is considered to be the main reason for the losses and not factors such as water quality, lack of food etc. Various ways are being considered to protect the stocked fish in the early days of release, including the use of artificial releases to aid the distribution throughout the River Wolf.

7. Redd Counts

A detailed, redd count and distribution survey was undertaken in the Lyd Sub-catchment. As in previous years, specific river zones were identified and rated, with priority zones receiving most attention.

During the 1991 spawning season, 4 visits were made to the high priority river sections, period 28 November 1991 to 2 January 1992.

Observations:-

<u>Area Surveyed</u>	<u>Total Number of Redds</u>	
	<u>Salmon</u>	<u>Sea trout</u>
River Wolf:		
Upstream of Cookworthy Trap	16	48
Downstream of Cookworthy Trap	25	9
River Thrushel:		
Wrixhill Br. - Wolf confluence	15	15
Wolf confluence - Lyd confluence	26	4

River Lyd:

Lydford Gorge - Coryton Mill	73	22
Coryton Mill - Thrushel confluence	105	31
Thrushel confluence - Lydford	36	5

Considering the 'poor' run of adult salmonids throughout 1991, spawning distribution and density was good.

The enhanced flows in the River Wolf significantly improved the spawning potential of this tributary. Adult salmon were observed spawning at Rixon Bridge in late November and "salmon size" redds were observed in the river adjacent to the water quality monitoring station immediately downstream of the reservoir. No salmon were observed upstream of the Kellacott confluence in 1990, when only the compensation flow was released.

8. Enhanced Flows in the River Wolf

A programme of enhanced flows for fisheries and environmental benefits was agreed. The required pattern of steady releases and artificial freshets were released as and when requested. The first artificial freshets were released at the end of the fishing season in mid and late October. Three smaller and shorter duration releases were made in mid-late November. The freshets were also used to accommodate additional engineering tests on the scour valve and turbines.

Preliminary observations suggest that the programme of enhanced flows benefitted the spawning distribution and success of salmon and sea trout in the River Wolf. Further refinements to the programme will be required in future years, based on the ongoing monitoring programme.

9. Catch Returns

Lower Tamar, Endsleigh and Arundell Arms Fishery Owners are to be approached in order to request access to the catch statistics for 1990 and 1991. These historic private records have been invaluable and the computer files should be updated.

10. Sedimentation Study - Loughborough University

The field work associated with Phase 5 of this study was completed in late October/early November. The objective of this study was to "establish the long term significance of substrate sedimentation, to monitor the effects of the changed flow and sediment transport regimes that were introduced by the impoundment of the reservoir and to assess the geomorphological and sedimentological effects of the reservoir releases and their ecological implications".

The conclusions of this study are:-

- a. During the dam construction and basin clearance phase, siltation of the gravels was recorded. However, over the past two years the

substrate quality has improved at most sites. At the two sites nearest to the dam, the percentage of fines (sub 2mm) has declined from a high of 16% to less than 13%.

- b. There is no evidence of either degradation at the sites immediately downstream of the dam or the expected siltation at the side downstream of the Kellacott tributary.
- c. Two sites in the lower reaches of the Wolf, had not improved and contained about 20% sub 2mm sediment. This is related to local sources and is not directly attributed to the reservoir. The possible local source is likely to be disturbance and erosion of bank materials exaggerated by human or animal activities.

The final report has now been completed.

WATER QUALITY

1. Continuous Water Quality Monitors

Five fixed site water quality monitors are currently being operated in relation to the Roadford water resources environmental impact assessment. Four of these monitors are located in the Tamar Catchment ie. St. Leonard's (River Tamar), Lifton Park (River Lyd), Newbridge and Rexon Cross (River Wolf).

In May 1991, a programme of refurbishment of these monitors was commenced by NRA SW due to poor accuracy and reliability of the existing equipment. The programme was identified by the Environmental Protection Manager to be undertaken in 1991/92 as part of the Roadford study by the Freshwater Investigations Team (FWIT).

The monitors are visited weekly for calibration, validation and maintenance. However, the frequency of visits increase if faults occur with any of the instrumentation.

The capital costs for the refurbishment of the monitors have been met by NRA South West.

a) Newbridge - River Wolf

Prior to the refurbishment of the monitor which took place in July and August 1991 data was stored on 5¼" floppy disks and then uploaded from the disks via a BBC computer to the ICL system for archiving. However, the data collected during 1991 prior to the installation of the new monitoring equipment is considered to be unreliable due to constant equipment failure.

Since the refurbishment, the monitor has been recording dissolved oxygen, temperature, pH, conductivity and turbidity at 15 minute intervals. An ammonia monitor was also installed during April 1992. The percentage running time of the monitor is now 94.1%. Data from the monitor is collected every week and monthly graphs and compliance with water quality

standards are produced. Graphs are available for September 1991 onwards. Examples of monthly graphs for Newbridge are appended to the back of this report.

The monitor at Newbridge together with a portable monitor at Lifton and continuous sampling was used to assess the effect of scour valve releases on downstream water quality. A report is currently being written.

The monitor at Newbridge will be used to assess the impact of Roadford operations for the period 1992/93.

b) Rexon Cross - River Wolf

This monitor was decommissioned on 6 November 1991 due to a series of reoccurring faults and unavailability of replacement parts. The monitor was faulty approximately 60% of the time. Data collected prior to this date is held on the ICL system and 5¼" floppy disks. No data from this site has been collected since 6 November 1991.

This monitor is to be shut down and removed. The site will then be restored to its original state.

c) Lifton - River Lyd

This monitor was decommissioned on 6 November 1991. Data collected prior to this date is held on the ICL system and 5¼" floppy disks. The refurbishment of this monitor is due to commence in May 1992. Validation will follow this refurbishment in late May 1992.

The monitor at Lifton Park will record continuously every 15 minutes, dissolved oxygen, temperature, pH, conductivity, turbidity and ammonia. Data from the monitor will be collected every week and monthly graphs and compliance with water quality standards will be produced. Graphs will be available from June 1992 onwards.

This monitor will be used to assess the impact of Roadford operations for the period 1992/93.

d) St. Leonard's - River Tamar

Data from this site prior to the refurbishment is stored on 5¼" floppy disks and archived on the ICL system. Post refurbishment the data has been stored on IBM 3½" disks.

An ammonia monitor was added to the site during 1991/1992 as part of the installation programme identified in May 1991.

The monitor at St. Leonard's records continuously every 15 minutes, dissolved oxygen, temperature, pH, conductivity, turbidity and ammonia. In general, since the refurbishment, the monitor has been operational for 96.5% of the time. The ammonia monitor has been operational for 88.6% of the time. Data from the monitor is collected every week and monthly graphs

and compliance with water quality standards are produced. Graphs are available for September 1991 onwards.

This monitor will not be used in the Roadford study for the period of 1992/93.

2. Invertebrate Programme

a) Quantitative sampling programme

Invertebrate samples were collected from 28 sites on the River Tamar and tributaries in Spring and Autumn.

The samples were collected from the main bed of the stream only. At all sites, this was a stony riffle, and the stream was shallow.

The samples were collected using a cylinder sampler of standard Aston pattern, but constructed from heavier gauged steel. Each sample comprised three replicate sub-samples. Data from each sub-sample has been recorded separately. Samples collected by cylinder sampler are standardised by area of river bed (the cylinder covers an area of 0.9m^2), however an additional degree of standardisation has been applied to samples collected in this survey (from 1985) in that sampling is limited to 2 minutes for each replicate.

b) Qualitative sampling programme

Invertebrate samples were taken from 5 sites on the River Wolf, Thrushel and Lyd, and two smaller tributaries.

The samples were collected using a standard long-handled pond-net with a 1mm mesh, using a 2 minute kick method. Replicates were not taken.

Kick samples provide a more comprehensive species list than cylinder samples, particularly at sites where there are habitats other than stony riffles.

3. Water Quality Computing

A computer based river quality model has been developed for the River Tamar. It is proposed that this model will be used to assess the potential impact of various management options available in relation to water resource developments linked to Roadford. Calibration, validation and updating of this model has been ongoing during 1991/92.

An impulse feature is currently being developed in order to predict time of travel of dispersion of contaminants.

WATER RESOURCES

A limited programme of hydrological data gathering was undertaken during 1991/92. This information is available to support the work of other functions.

Two spot gaugings were taken in 1991/92 in order to provide the information necessary to validate any estimates of flows produced for sites downstream of the abstraction.

No detailed analysis of data has been undertaken and no other special hydrological monitoring has taken place during 1991/92. Flow information has been continuously monitored at NRA gauging stations.

B. RIVER TAVY

FISHERIES

A radio tracking study was undertaken to investigate the movement of salmon from the Tavy Estuary, over Lopwell Dam and into the river system, specifically in relation freshwater flows and tidal conditions.

The aim of this pilot study was to release at least 20 salmon during the period June - August. The Fisheries Science Unit worked alongside the commercial netsmen, purchasing the best condition salmon for radio tracking purposes.

As experienced on the River Tamar, catches of salmon were not as high as anticipated due to the reduction in the availability of the grilse run. In addition, a netting restriction was imposed on the commercial fishermen during 1991 which significantly reduced both the catch and fishing effort. This resulted in only 13 salmon being released. The monthly totals for the period June to August were 4, 4 and 5 fish respectively. A total of 30 netting sessions were attended to Maristow Quay during the 3 months.

As on the River Tamar, the movements of the radio-tagged salmon were monitored using a network of automatic listening stations. A total of eight stations were deployed between Lopwell Dam and Mary Tavy. The information derived from this programme must be corroborated before reporting can commence. As a result full analysis will not be available until mid 1992.

In summary, the final detected locations of the 13 salmon released into the Tavy Estuary were:-

- a. Four salmon remained undetected, and did not migrate into the freshwater zones of either the Tavy or Tamar.
- b. Six salmon migrated upstream into the river, of which 2 fish were caught by anglers. Three of the 6 salmon were tracked to the River Walkham, 2 fish migrated upstream of Abbey Weir and one fish remained in the reach downstream of Abbey Weir. (Observations of one particular salmon revealed that after release at Maristow Quay, it migrated downstream into the Tamar and was detected at Morwellham. This salmon then retraced its "original steps" and re-entered the River Tavy. It migrated upstream of Abbey Weir before being caught by an angler).
- c. Three salmon migrated into the Tamar Estuary and were detected at Gunnislake. Two fish migrated upstream past Gunnislake Weir. Of these fish, one entered the River Lyd while the other returned to the estuary and was caught by a commercial net.

In the previous section, reference was made to the fact that 9 salmon, tagged in the Tamar Estuary, had entered the River Tavy. The final location of these fish were:-

- a. Two salmon migrated into the River Walkham.
- b. Five salmon were recorded in the reach between Doublewaters and Abbey Weir.
- c. Two salmon remained in the reach between Lopwell Dam and Denham Bridge.

It is known that in most estuaries there exists mixed stocks of salmon and sea trout. This was evident in 1991 by the interplay of Tamar and Tavy released fish. Only by further study can the degree of mixing be quantified. Unfortunately the overall knowledge of migration patterns of salmonids in all estuaries is minimal.

Preliminary assessment of the data suggests that the presence of Lopwell Dam, the operation of the abstraction, and the flow regime of 1991 did not prevent or significantly impede salmon migration.

WATER QUALITY

1. Continuous Water Quality Monitors

No continuous water quality monitors were planned to be installed in the River Tavy Catchment in 1991/92.

2. Invertebrate Programme

No specific invertebrate sampling was planned to be undertaken during 1991/1992.

3. Water Quality Computing

No water quality computing was planned to be undertaken in the River Tavy for 1991/92.

WATER RESOURCES

A limited programme of hydrological data gathering was carried out in 1991/92 to support the work of other functions. A programme of current meter gaugings was undertaken in order to provide the data to produce a relationship between flows at Ludbrook river gauging station and flows over Lopwell Dam of different river levels and rates of abstraction.

Three sites were gauged between Ludbrook gauging station and Lopwell Dam in September 1991. Lopwell Dam is downstream of the SWWSL's abstraction.

A second series of gaugings were undertaken on the River Tavy during March 1992. In addition to the sites previously measured it was also possible to

measure the total flow in the Tavy immediately downstream of the SWSL's abstraction at Lopwell Dam.

No detailed analysis of the data has been undertaken and no other special hydrological monitoring has taken place during 1991/92. Flow information has been continuously monitored at the NRA gauging stations.

C. RIVER PLYM

FISHERIES

The salmon and sea trout stocks of the River Plym are dependent upon the productive nursery area of the Meavy. The timing and extent of spill from Burrator Reservoir is believed to be important to salmonid production. In order to gain a better understanding of these two factors a survey of salmonid redds was undertaken between December 1990 and January 1991. Figure 5 shows the salmon and sea trout spawning observations recorded on the River Meavy 1990/91. This work was complemented by an electrofishing survey undertaken in 1991.

A total of 12 sites were surveyed on the River Meavy between 11 - 23 September 1991. Tables 4a and 4b show the densities (nos/100m²) of salmon and sea trout, 0+ and >1+, recorded at each site during the survey and compare the results with the historic database.

Preliminary assessment of the data suggests that the distribution of spawning adults and the success of salmonid production was not significantly impaired by the timing and extent of the spill from Burrator Reservoir in the winter of 1990. This statement is based on the fisheries evidence and the records of Burrator storage. In 1990 and 1991 records show that the reservoir was first drawn down in early March 1990, with the lowest level recorded in October. Due to a dry winter the reservoir did not recharge and was 86% full at the end of December 1990. In the first week of 1991 Burrator was 100% full. The first draw down in 1991 was at the end of April. It refilled and spilled during mid July but was subsequently drawn down.

The programme of juvenile surveys and redd counts instigated in 1991 will be repeated annually until 1995. Detailed analysis will be undertaken and a series of necessary actions recommended. This programme will be supported by analysis of statutory, and possibly private, catch returns for the rods ie. both salmon and sea trout.

The second year of this programme commenced in November 1991 with the spawning observations. Table 5 shows the numbers of new salmonid redds recorded along the River Meavy and located within nominated reaches. To date 52 salmon redds and 96 sea trout redds have been recorded. (In the period 22.11.91 - 21.1.92, seven visits were made to the Meavy). Peak spawning for both species occurred in late November 1991. No significant numbers of late run salmon have materialised in the River Meavy this year. Observations will continue into February and the data documented.

WATER QUALITY

1. Continuous Water Quality Monitors

No continuous water quality monitors were planned to be installed in the River Plym Catchment in 1991/92.

2. Invertebrate Programme

No specific invertebrate sampling was planned to be undertaken during 1991/1992.

3. Water Quality Computing

No water quality computing was planned to be undertaken in the River Plym for 1991/92.

WATER RESOURCES

No specific work was planned to be undertaken during 1991/92.

D. RIVERS TORRIDGE & TAW

FISHERIES

1. Radio Tagging/Tracking

This project commenced in July following agreement of funding from South West Water. With the assistance of two commercial netsmen, netting in the Torridge Estuary began on 9 July.

As the season progressed netting sites in the combined Taw/Torridge estuary were included in an effort to increase the catch rate. Over the period up to 27 September, thirty-eight netting sessions were carried out, resulting in the capture of seven salmon for tagging. This catch rate was disappointing, but may be a reflection of the level of salmon stock returning in the summer. An earlier start to the project would have helped if spring fish were more plentiful. It is noteworthy that commercial net catches have been very low throughout the region in 1991.

Of the seven salmon tagged, five migrated into freshwater. Four of these fish were recorded passing over Beam Weir and on past the abstraction point at Torrington. Tracking continued through the spawning period, when two of the fish moved into the upper Torridge and two moved up the R. Okement.

Two fish were recorded at Chapelon (abstraction point) on the R. Taw, but one of these eventually ascended the R. Torridge. The ratio of Torridge to Taw fish was unexpectedly high, but may be an artefact of the small sample.

The results of this year's study have been collated for presentation to SWWS together with the results of the limited work undertaken in 1988. Further interpretation of data has ceased, pending instructions from Babbie, Shaw and Morton (for SWWS).

2. Fish Counter

Initial design work for the Beam Weir fish counter proceeded as planned, with a view to installation in 1992/93. Engineers from NRA North West Region have been consulted on the initial design, and have agreed to provide expert advice for the completion of design work as soon as possible. Arrangements for access and electricity supply to the Beam Weir site are progressing.

A package of computer hardware and software is under development for analysis of fish counter data in relation to flow and water quality.

WATER QUALITY

1. Continuous Water Quality Monitors

Five fixed site water quality monitors are currently being operated in relation to the Roadford water resources environmental impact assessment. One of these monitors is located in the Torridge Catchment at Cockshilhays.

In May 1991, a programme of refurbishment of the monitors was commenced by NRA SW due to poor accuracy and reliability of the existing equipment. The programme was identified by the Environmental Protection Manager to be undertaken in 1991/92 as part of the Roadford study by the Freshwater Investigations Team (FWIT). An ammonia monitor was also added as part of the refurbishment proposed during the 1991/92 period.

The monitor has been visited weekly for calibration, validation and maintenance. However, the frequency of visits increase if faults occur with any of the instrumentation.

The capital costs for the refurbishment of the monitors have been met by NRA South West.

The monitor at Cockshilhays has been run continuously since 31 March 1991 except for a period of 2 weeks when the monitor was refurbished. Data prior to the refurbishment is stored on 5¼" floppy disks and archived on the ICL system and is considered unreliable. Post refurbishment, the data has been stored on IBM 3½" floppy disks.

The monitor at Cockshilhays records continuously every 15 minutes, dissolved oxygen, temperature, pH, conductivity and turbidity. An ammonia monitor was also installed during April 1992. In general, since the refurbishment, the monitored has been operational for 100% of the time. Data from the monitor is collected every week and monthly graphs and compliance with water quality standards are produced. Graphs are available for September 1991 onwards.

An additional continuous monitor will be located upstream of Beam Weir.

2. Invertebrate Programme

No specific invertebrate sampling was planned to be undertaken in the River Torridge Catchment during 1991/92.

3. Water Quality Computing

A computer based river quality model is being developed for the River Torridge system. It is proposed that this model will be used to predict the impact on water quality of scenarios proposed in relation to the Roadford water resource scheme. Calibration, validation and updating of this model is ongoing. Problems have been encountered with disparities between observed and predicted nitrate levels. Further calibration and

validation work should resolve these problems.

WATER RESOURCES

A limited programme of hydrological data gathering was carried out in 1991/92 to support the work of other functions.

A series of current meter gaugings were undertaken in order to provide the data necessary to provide a relationship between flows at Torrington river gauging station, flows past SWWSL's intake and flows over Beam Weir. Gauging was undertaken at different river flows and rates of abstraction to establish the impact of changes in discharge over the intervening reach.

In September nine sites were gauged between Town Mills gauging station and Beam Weir. In February 1992, a second set of gaugings were undertaken. Unfortunately, the main River Torridge was not gaugable due to the depth and speed of flow although the tributary inputs gauged in September were remeasured.

No detailed analysis of the data has been undertaken and no other special hydrological monitoring has taken place during 1992. Flow information has been continuously monitored at the NRA gauging stations.

E. ENVIRONMENTAL MONITORING PROGRAMME

NRA draft requirements for the six river catchments were produced on 4 October 1991 and forwarded to SWWS.

Since then discussions have taken place with SWWS and their consultants Babbie, Shaw and Morton to determine the programme for 1992/93. Costings for the monitoring were provided by the NRA.

[SS.CM.RLC]HS_280192_JLM_5FEB.WP

TABLE 1. Number of Grilse and 2 Sea Winter Salmon Caught Each Month at Gunnislake Trap. Period 1987 - 1991

YEAR	MONTH	GRILSE	2 SEA WINTER	TOTAL
<u>1987</u>	April	0	0	0
	May	0	1	1
	June	62	11	73
	July	142	11	153
	August	40	2	42
	September	8	2	10
	October	8	0	8
	November	0	0	0
	TOTAL	260	27	287
<u>1988</u>	April	0	13	13
	May	1	26	27
	June	4	13	17
	July	312	25	337
	August	100	3	103
	September	6	0	6
	October	2	0	2
	November	1	0	1
	TOTAL	426	80	506
<u>1989</u>	March	0	1	1
	April	0	6	6
	May	0	17	17
	June	7	19	26
	July	29	4	33
	August	156	8	164
	September	51	5	56
	October	40	9	49
	November	5	0	5
	TOTAL	238	69	357
<u>1990</u>	May	0	24	24
	June	50	33	83
	July	90	13	103
	August	50	4	54
	September	15	2	17
	October	42	4	46
	TOTAL	247	80	327
<u>1991</u>	May	2	24	26
	June	8	30	38
	July	65	12	77
	TOTAL	75	66	141

TABLE 2. Number of School Peal and Older Age Classes of Sea Trout Caught each Month at Gunnislake Trap. Period 1987 - 1991.

YEAR	MONTH	SCHOOL PEAL	OLDER SEA TROUT	TOTAL
<u>1987</u>	May	0	10	10
	June	170	138	308
	July	839	24	863
	August	54	0	54
	September	7	0	7
	October	15	1	16
	November	3	0	3
	TOTAL	1088	173	1261
<u>1988</u>	April	0	10	10
	May	0	51	51
	June	113	244	357
	July	382	166	548
	August	22	8	30
	September	4	4	8
	October	12	11	23
	November	2	6	8
	TOTAL	535	500	1035
<u>1989</u>	March	0	0	0
	April	0	2	2
	May	2	33	35
	June	181	335	516
	July	506	62	568
	August	92	3	95
	September	46	8	54
	October	18	3	21
	November	2	3	5
	TOTAL	847	449	1296
<u>1990</u>	May	0	24	24
	June	36	200	236
	July	313	73	386
	August	83	4	87
	September	1	0	1
	October	7	3	10
	TOTAL	440	304	744
<u>1991</u>	May	0	78	78
	June	10	71	81
	July	119	15	134
	TOTAL	129	164	293

TABLE 3a. SALMON DENSITIES : NOS/100m²

RIVER CATCHMENT	1972		1975	
	0+	>1+	0+	>1+
<u>River Lyd</u>				
Lydford	1.8	4.5	-	-
Coryton	7.4	4.6	-	-
Greenlanes	-	-	-	-
Sydenham	0.4	3.7	10.5	1.0
Chillaton	-	-	-	-
Sydenham (Quither Brook)	-	-	-	-
Spry Farm	3.0	8.9	-	-
Lifton Playing Field	-	-	-	-
Langham	-	-	-	-
Lifton Park	0.3	6.2	-	-
u/s Gatherley	-	-	-	-
d/a Gatherley	-	-	-	-
<u>Piver Thrushel</u>				
Oatnell	-	-	-	-
Great Burrow	0.2	2.0	-	-
Wrixhill Bridge	-	-	-	-
Thrushelton	0.9	1.9	-	-
Lowermills	-	-	-	-
Townleigh	-	-	-	-
Hayne Mill	Nil	0.7	-	-
d/s Hayne Bridge	-	-	-	-
Tinhay	-	-	-	-
Tinhay Bridge	-	-	-	-
<u>River Wolf</u>				
Eworthy	-	-	-	-
Germansweck	-	-	-	-
Toft	Nil	0.3	-	-
Shop	-	-	-	-
Slew Wood	-	-	-	-
d/s Slew	-	-	-	-
Broadwood	-	-	-	-
Rexon	Nil	2.2	-	-
d/s Kellacott	-	-	-	-
Lower Cookworthy	-	-	-	-
u/s Cookworthy Trap	-	-	-	-
Cookworthy	-	-	-	-
Wolf Confluence	-	-	-	-
<u>Kellacott Stream</u>				
Upcott Mill	-	-	-	-
Drowns Mill	-	-	-	-
<u>Hennard Stream</u>				
Hennard Stream	-	-	-	-

[illegible]

TABLE 3b. SALMON DENSITIES : NOS/100m²

RIVER CATCHMENT	1986		1987		1988		1989		1990		1991	
	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+
<u>River Ird</u>												
Lydford	19.6	6.6	86.3	6.8	79.9	9.7	68.0	9.0	122.0	3.0	52.39	6.55
Coryton	-	-	-	-	-	-	-	-	203.0	4.1	-	-
Green Anes	19.3	7.2	96.3	7.3	66.0	3.7	144.0	5.0	162.0	1.0	130.81	19.50
Sydenham	22.4	3.0	83.9	7.0	50.0	5.2	155.0	6.0	183.0	1.0	129.77	10.53
Chillaton	-	-	-	-	-	-	-	-	-	-	-	-
Sydenham (Quither Brook)	-	-	-	-	-	-	-	-	46.5	0.9	-	-
Spry Farm	-	-	66.6	30.7	74.1	20.8	52.0	12.0	95.0	3.0	133.71	9.60
Lifton Playing Field	-	-	-	-	64.2	7.7	42.0	16.0	30.0	11.0	103.83	22.43
Langham	-	-	-	-	-	-	-	-	-	-	-	-
Lifton Park	-	-	6.4	3.2	36.2	3.4	10.0	2.0	6.0	2.0	40.65	2.37
u/s Gatherley	-	-	-	-	167.3	24.8	82.0	14.0	27.0	2.0	101.29	12.92
d/s Gatherley	-	-	-	-	58.8	1.6	30.0	5.0	14.0	1.0	76.50	2.77
<u>River Thrushel</u>												
Oatnell	-	-	-	-	-	-	-	-	-	-	-	-
Great Burrow	-	-	-	-	-	-	-	-	-	-	-	-
Wrixhill Bridge	-	-	2.2	0.8	7.0	1.5	1.0	1.0	8.0	1.0	18.18	3.03
Thrushelton	-	-	-	-	20.4	0.7	1.0	N11	37.0	1.0	50.70	2.01
Lowermills	-	-	0.2	1.2	2.1	N11	-	-	-	-	-	-
Townleigh	-	-	-	-	11.7	0.7	6.0	3.0	21.0	1.0	12.72	2.42
Hayne Mill	0.3	0.6	1.1	N11	0.6	0.3	-	-	-	-	-	-
d/s Hayne Bridge	-	-	-	-	-	-	10.0	1.0	9.0	1.0	16.43	2.86
Tinhay	0.5	5.7	61.9	3.3	19.6	8.7	42.0	13.0	32.0	2.0	105.98	6.07
Tinhay Bridge	-	-	-	-	66.0	3.5	144.0	17.0	129.0	4.0	180.0	9.13
<u>River Wolf</u>												
Eworthy	-	-	N11	N11	N11	N11	N11	4.0	N11	N11	-	-
Germansweek	N11	9.4	0.8	0.4	23.0	N11	N11	13.0	N11	1.0	-	-
Toft	N11	17.8	7.0	0.5	54.9	0.4	N11	1.0	-	-	-	-
Shop	N11	3.7	2.3	N11	8.6	1.6	N11	N11	-	-	-	-
Slew Wood	-	-	-	-	8.5	0.8	6.0	3.0	-	-	-	-
d/s Slew	-	-	-	-	-	-	-	-	4.0	1.0	N11	3.86
Broadwood	N11	17.6	8.8	5.9	25.2	4.8	23.0	6.0	-	-	-	-
Rexon	N11	4.1	14.0	0.5	50.0	0.8	20.0	1.0	5.0	N11	N11	0.36
d/s Kellacott	-	-	-	-	-	-	8.0	3.0	1.0	2.0	14.06	1.61
Lower Cookworthy	-	-	-	-	14.2	2.0	7.0	3.0	N11	N11	2.80	0.70
u/s Cookworthy Trap	-	-	-	-	-	-	-	-	90.0	2.0	22.15	3.62
Cookworthy	0.2	0.9	26.9	0.9	29.0	3.5	25.0	4.0	43.0	1.0	97.10	6.84
Wolf Confluence	-	-	-	-	-	-	39.0	7.0	50.0	2.0	62.87	9.09
<u>Kellacott Stream</u>												
Upcott Mill	-	-	-	-	10.5	N11	N11	4.0	N11	N11	NIL	2.64
Drowns Mill	-	-	-	-	2.6	N11	3.0	N11	2.0	N11	1.01	N11
<u>Hennard Stream</u>												
Hennard Stream	-	-	-	-	-	-	-	-	N11	N11	-	-

TABLE 3c. TROUT DENSITIES : NOS/100m²

RIVER CATCHMENT	1972		1975		1976		1978		1984		1985	
	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+
<u>River Lyd</u>												
Lydford	7.7	10.0	-	-	-	-	18.4	9.1	6.4	10.2	-	-
Coryton	9.5	11.2	-	-	-	-	-	-	28.1	22.0	-	-
Greenlanes	-	-	-	-	-	-	-	-	5.9	13.4	-	-
Sydenham	0.9	5.3	0.9	12.5	1.0	4.6	6.8	3.4	0.8	9.0	-	-
Chillaton	-	-	-	-	-	-	-	-	36.0	17.2	-	-
Sydenham (Quithre Brook)	-	-	-	-	-	-	-	-	1.4	20.5	-	-
Spry Farm	0.2	8.9	-	-	-	-	-	-	2.6	2.1	-	-
Lifton Playing Field	-	-	-	-	-	-	-	-	-	-	-	-
Langham	-	-	-	-	-	-	-	-	11.9	9.9	-	-
Lifton Park	N11	0.9	-	-	-	-	0.8	6.3	-	-	-	-
u/s Gatherley	-	-	-	-	-	-	-	-	-	-	-	-
d/s Gatherley	-	-	-	-	-	-	-	-	-	-	-	-
<u>River Thrushel</u>												
Oatnell	-	-	-	-	-	-	-	-	6.0	20.0	-	-
Great Burrow	N11	18.0	-	-	-	-	9.4	12.9	N11	10.6	-	-
Wrixhill Bridge	-	-	-	-	-	-	N11	6.4	0.4	12.3	-	-
Thrushelton	0.3	13.0	-	-	N11	4.8	-	-	N11	12.4	-	-
Lowermills	-	-	-	-	-	-	-	-	N11	10.1	-	-
Townleigh	-	-	-	-	-	-	-	-	-	-	-	-
Hayne Mill	N11	5.0	-	-	-	-	1.0	15.4	0.3	8.5	-	-
d/s Hayne Bridge	-	-	-	-	-	-	-	-	-	-	-	-
Tinney	-	-	-	-	-	-	-	-	-	-	-	-
Tinney Bridge	-	-	-	-	-	-	-	-	-	-	-	-
<u>River Wolf</u>												
Evorthy	-	-	-	-	-	-	-	-	-	-	-	-
Germanswook	-	-	-	-	-	-	31.5	7.6	10.9	10.2	14.4	6.5
Toft	0.3	17.4	-	-	-	-	4.2	9.0	5.2	9.0	2.4	3.3
Shop	-	-	-	-	-	-	3.1	21.7	0.4	5.3	1.1	5.4
Slew Wood	-	-	-	-	-	-	-	-	-	-	-	-
d/s Slew	-	-	-	-	-	-	-	-	-	-	-	-
Broadwood	-	-	-	-	-	-	1.9	8.9	N11	1.2	0.4	0.4
Rexon	N11	1.7	-	-	N11	4.8	0.8	8.7	1.4	1.8	1.2	2.4
d/s Kellacott	-	-	-	-	-	-	-	-	-	-	-	-
Lower Cookworthy	-	-	-	-	-	-	-	-	-	-	-	-
u/s Cookworthy Trap	-	-	-	-	-	-	-	-	-	-	-	-
Cookworthy	-	-	-	-	-	-	0.8	1.7	0.2	1.1	0.4	1.5
Wolf Confluence	-	-	-	-	-	-	-	-	-	-	-	-
<u>Kellacott Stream</u>												
Upcott Mill	-	-	-	-	-	-	-	-	-	-	-	-
Drowns Mill	-	-	-	-	-	-	-	-	-	-	-	-
<u>Hennard Stream</u>												
Hennard Stream	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 3d. TROUT DENSITIES NOS/100m²

RIVER CATCHMENT	1986		1987		1988		1989		1990		1991	
	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+	0+	>1+
<u>River Lyd</u>												
Lydford	0.9	1.6	3.4	15.5	13.3	11.7	23.0	22.0	18.0	9.0	52.06	12.12
Coryton	-	-	-	-	-	-	-	-	13.8	17.8	-	-
Greenlanes	3.9	6.6	5.7	7.6	5.9	7.1	4.0	9.0	5.0	3.0	10.50	12.30
Sydenham	5.2	12.4	0.8	6.5	3.3	7.0	2.0	4.0	3.0	5.0	3.97	4.77
Chillaton	-	-	-	-	-	-	-	-	-	-	-	-
Sydenham (Quilther Brook)	-	-	-	-	-	-	-	-	15.0	22.8	-	-
Spry Farm	-	-	0.2	1.7	0.3	3.6	N11	1.0	1.0	N11	0.74	1.23
Lifton Playing Field	-	-	-	-	3.6	4.9	1.0	12.0	N11	2.0	N11	1.74
Langham	-	-	-	-	-	-	-	-	-	-	-	-
Lifton Park	-	-	N11	0.9	N11	1.8	1.0	3.0	N11	1.0	N11	0.22
u/s Gatherley	-	-	-	-	N11	2.8	1.0	2.0	N11	1.0	N11	0.57
d/s Gatherley	-	-	-	-	NIL	NIL	NIL	2.0	NIL	1.0	0.20	0.59
<u>River Thrushel</u>												
Oatnell	-	-	-	-	-	-	-	-	-	-	-	-
Great Burrow	-	-	-	-	-	-	-	-	-	-	-	-
Wrixhill Bridge	-	-	0.8	10.9	NIL	6.3	NIL	7.0	1.0	4.0	2.12	11.82
Thrushelton	-	-	-	-	NIL	2.9	NIL	NIL	NIL	3.0	0.50	6.02
Lowermills	-	-	NIL	6.3	0.2	10.6	-	-	-	-	-	-
Townleigh	-	-	-	-	1.9	8.1	5.0	22.0	2.0	9.0	3.03	6.96
Hayne Mill	0.3	7.4	2.4	4.7	0.6	11.4	-	-	-	-	-	-
d/s Hayne Bridge	-	-	-	-	-	-	1.0	11.0	NIL	6.0	0.36	9.64
Tinhay	1.4	9.8	NIL	4.7	1.0	8.6	4.0	6.0	NIL	3.0	0.18	3.13
Tinhay Bridge	-	-	-	-	0.4	1.8	5.0	3.0	NIL	1.0	0.57	1.14
<u>River Wolf</u>												
Exworthy	-	-	73.2	2.4	60.0	1.5	33.0	NIL	NIL	NIL	-	-
Germanweck	0.4	13.7	32.8	6.3	28.8	12.6	19.0	27.0	NIL	6.0	-	-
Toft	1.0	13.1	5.4	15.7	13.7	11.9	3.0	8.0	-	-	-	-
Shop	0.4	9.5	2.0	16.2	0.3	12.4	NIL	27.0	-	-	-	-
Slew Wood	-	-	-	-	0.8	3.0	14.0	3.0	-	-	-	-
d/s Slew	-	-	-	-	-	-	-	-	5.0	2.0	11.20	2.32
Broadwood	N11	13.6	0.5	11.3	N11	5.4	6.0	1.0	-	-	-	-
Rexon	1.5	7.4	N11	12.2	0.4	6.6	4.0	4.0	1.0	3.0	2.86	1.07
d/s Kellacott	-	-	-	-	-	-	3.0	3.0	N11	2.0	2.77	3.00
Lower Cookworthy	-	-	-	-	N11	4.4	2.0	5.0	N11	3.0	0.35	3.15
u/s Cookworthy Trap	-	-	-	-	-	-	-	-	N11	8.0	1.36	5.88
Cookworthy	N11	0.5	N11	0.5	N11	0.8	2.0	3.0	N11	1.0	0.33	2.28
Wolf Confluence	-	-	-	-	-	-	1.0	8.0	1.0	2.0	5.72	2.86
<u>Kellacott Stream</u>												
Upcott Mill	-	-	-	-	12.8	3.5	16.0	4.0	3.0	4.0	13.72	2.64
Drowns Mill	-	-	-	-	2.6	N11	5.0	8.0	N11	3.0	2.02	4.10
<u>Hennard Stream</u>												
Hennard Stream	-	-	-	-	-	-	-	-	1.0	3.0	-	-

TABLE 4a. SALMON DENSITIES : NOS/100m²

RIVER CATCHMENT	1971		1982		1989		1991	
	0+	≥1+	0+	≥1+	0+	≥1+	0+	≥1+
<u>River Meavy</u>								
Burrator	-	-	-	-	-	-	Nil	19.16
Yeo Farm	-	-	58.4	4.4	2.1	9.7	11.67	17.83
Marchams Cross	44.8	27.0	-	-	-	-	47.02	16.53
Meavy	-	-	-	-	-	-	29.63	13.45
Gratton	53.6	17.5	162.7	24.7	55.1	6.3	35.60	19.94
Olderwood	-	-	-	-	-	-	10.83	18.64
Chub Tor	-	-	110.3	19.7	16.7	3.1	48.80	16.40
Hoo Meavy	-	-	-	-	-	-	69.61	5.44
Clear Brook	-	-	139.9	24.3	8.6	17.8	19.27	27.95
Goodameavy	14.9	21.1	170.4	52.4	78.6	40.3	47.46	33.36
Dewerstone	-	-	-	-	-	-	41.91	18.94
<u>Lovaton Stream</u>								
Lovaton	Nil	Nil	Nil	10.2	1.0	0.5	Nil	0.75

JL 7.9.91.

TABLE 4b. TROUT DENSITIES : NOS/100m²

RIVER CATCHMENT	1971		1982		1989		1991	
	0+	≥1+	0+	≥1+	0+	≥1+	0+	≥1+
<u>River Meavy</u>								
Burrator	-	-	-	-	-	-	7.32	17.07
Yeo Farm	-	-	66.5	21.6	24.0	16.3	16.86	19.78
Marchams Cross	n.s.	9.4	-	-	-	-	12.82	21.37
Meavy	-	-	-	-	-	-	65.19	5.70
Gratton	n.s.	8.8	207.4	43.5	42.3	28.4	84.07	17.47
Olderwood	-	-	-	-	-	-	57.42	15.36
Chub Tor	-	-	142.29	26.8	30.6	38.2	83.20	40.80
Hoo Meavy	-	-	-	-	-	-	18.39	13.89
Clear Brook	-	-	154.7	33.0	21.9	19.8	17.64	12.48
Goodameavy	n.s.	25.0	117.4	21.3	31.6	25.9	17.24	12.09
Dewerstone	-	-	-	-	-	-	36.36	22.73
<u>Lovaton Stream</u>								
Lovaton	n.s.	18.5	295.9	52.6	148.1	23.8	104.89	32.33

/JD/27.9.91.

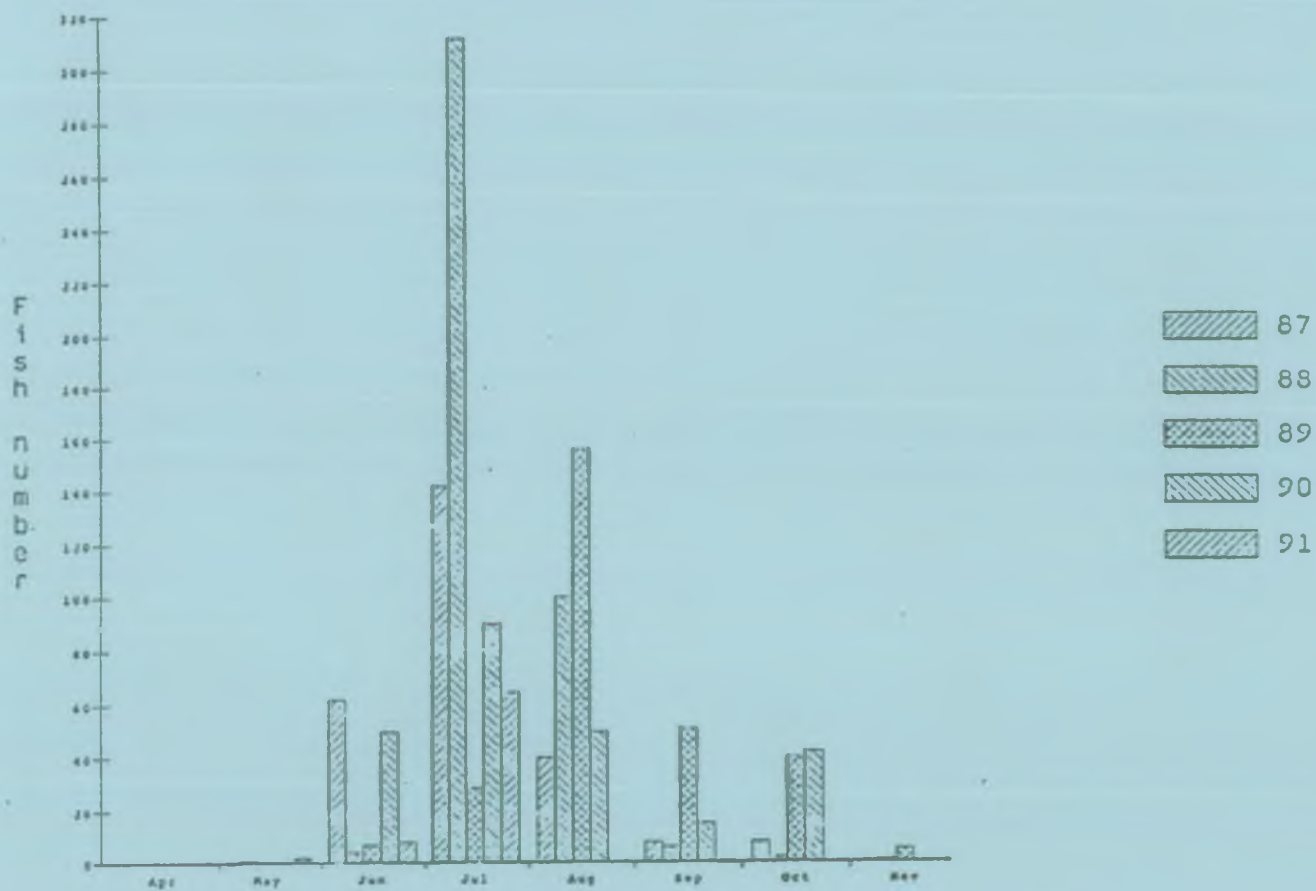
TABLE 5.

Salmon and Sea Trout Spawning Observations on the River Meavy
1991/1992

<u>Location of Section</u>	<u>Total Number of Salmon and Sea Trout Redds</u>	
	<u>Salmon</u>	<u>Sea Trout</u>
Burrator Reservoir to Higher Meavy Bridge	3	5
Higher Meavy Bridge to Gratton Ford Bridge	9	32
Gratton Ford Bridge to Clearbrook Bridge	21	38
Clearbrook Bridge to Goodameavy Bridge	8	12
Goodameavy Bridge to Shaugh Bridge	11	9
	<hr/>	<hr/>
TOTAL	52	96

FIGURE 1.

Grilse caught at Gunnislake trap



2 sea-winter salmon caught at Gunnislake trap

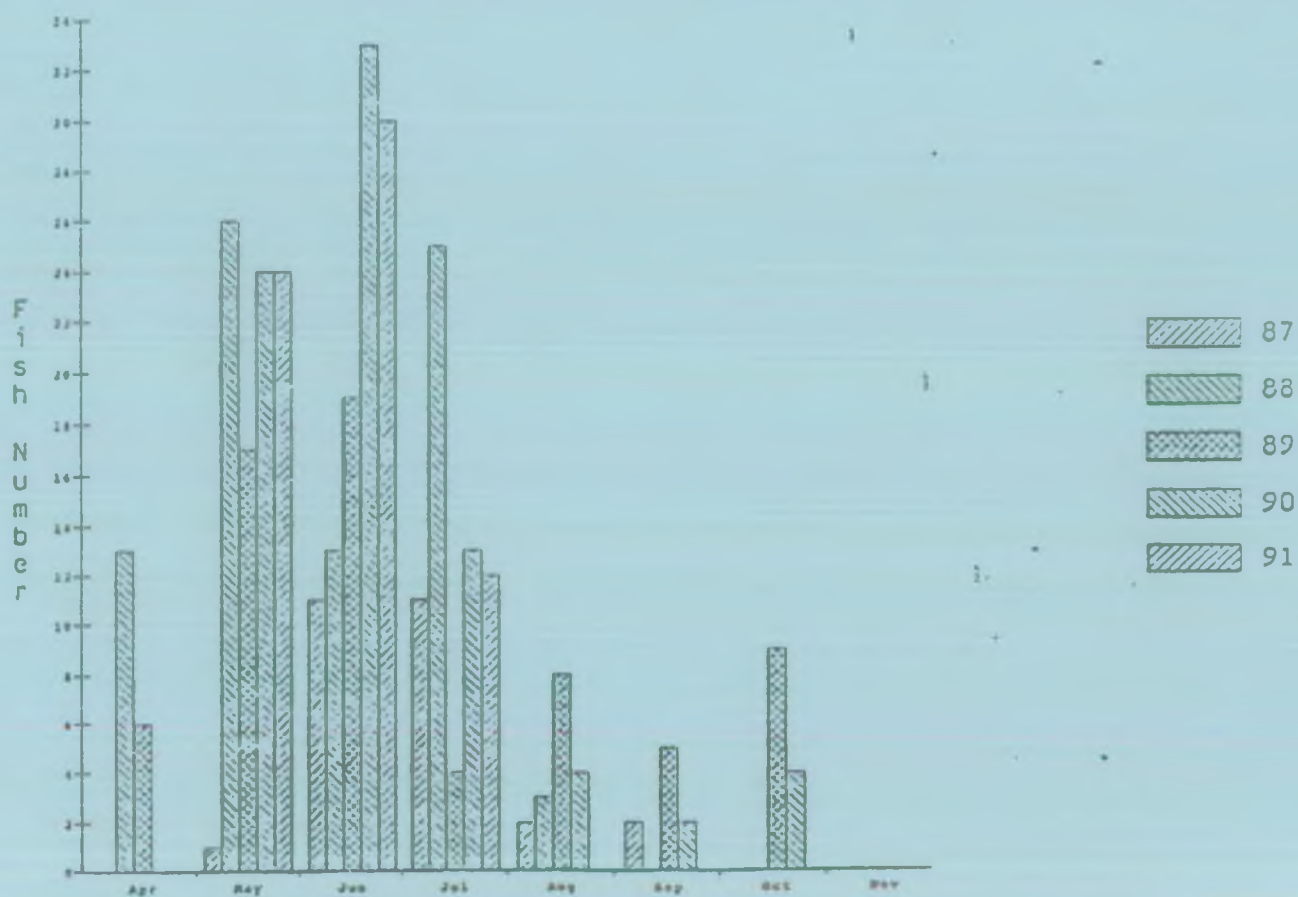
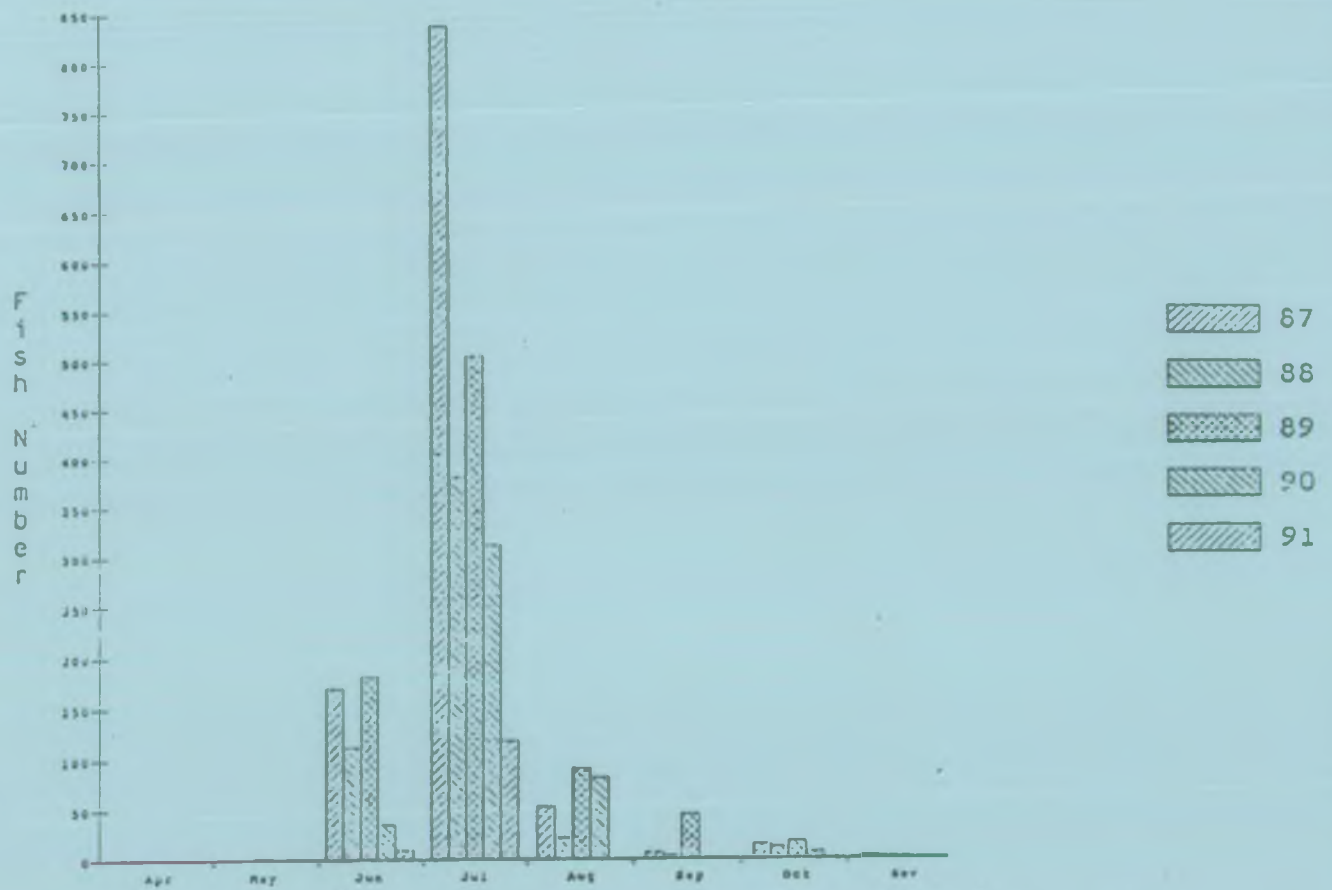


FIGURE 2.

School peal caught at Gunnislake trap



Older seatrout caught at Gunnislake trap

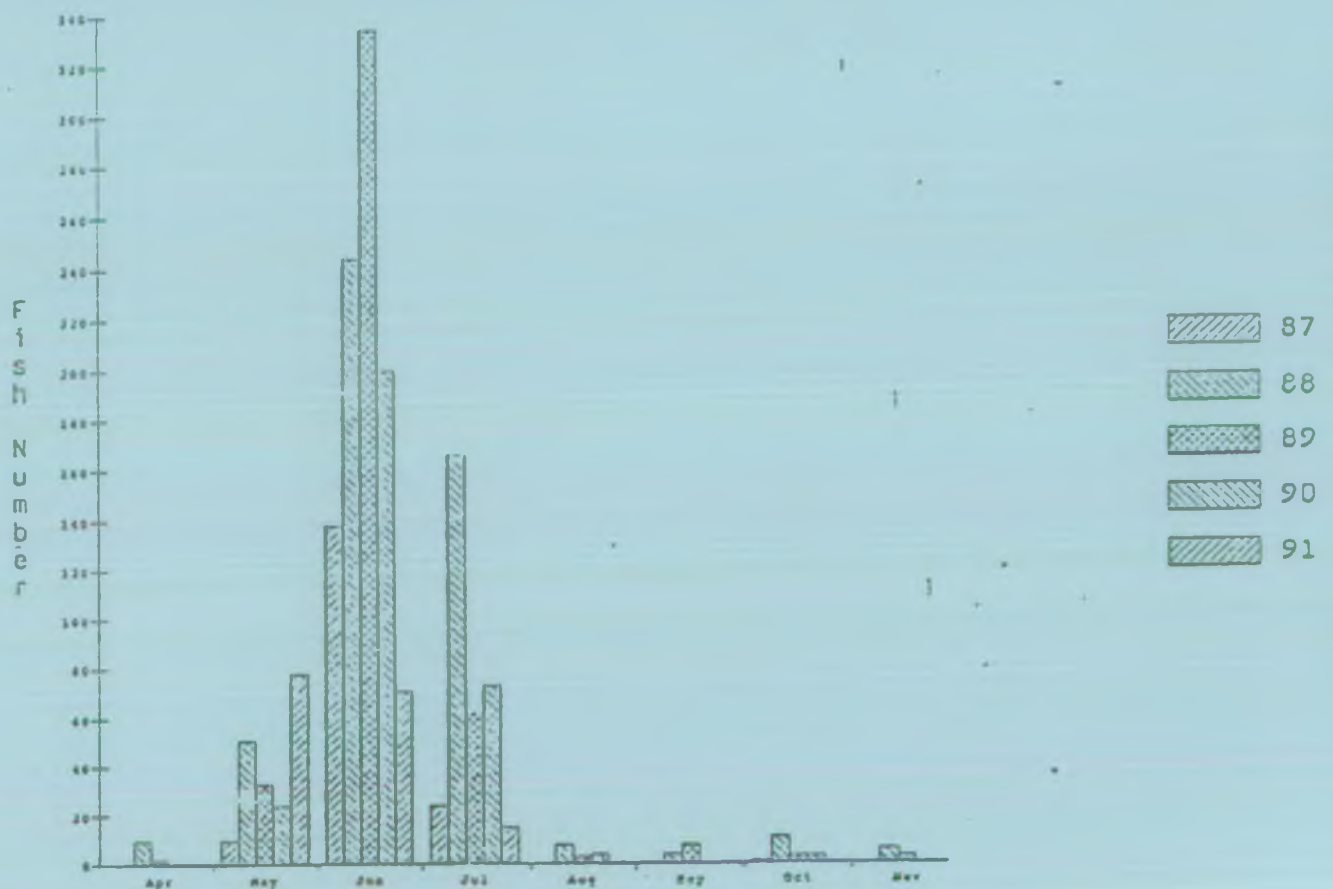


FIGURE 3. Daily Catch of Salmon at Gunnislake Trap, DMF at Gunnislake G.S. and Tidal Cycle, 1991.

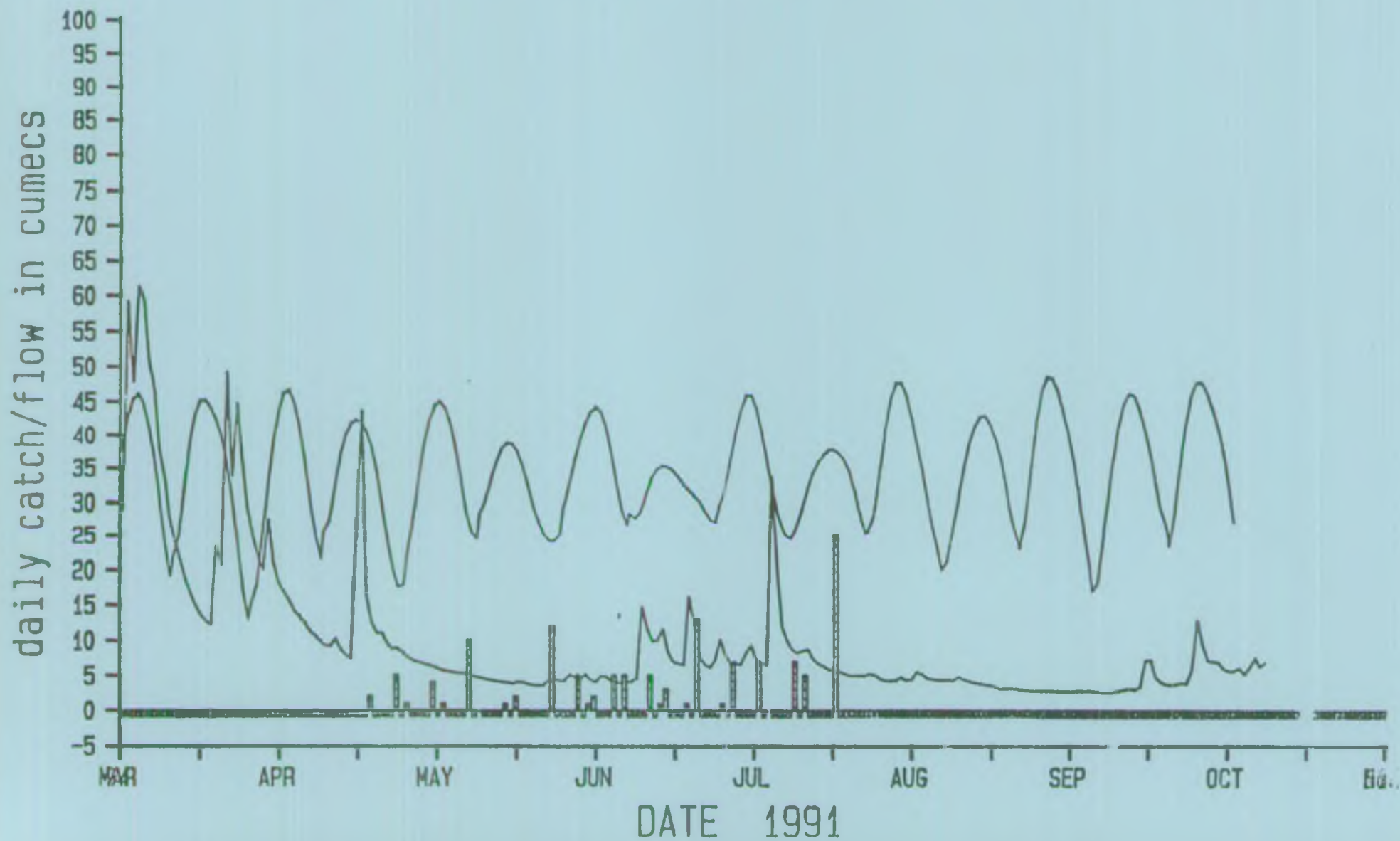


FIGURE 4. Daily Catch of Sea Trout at the Gunnislake Trap, DMF at Gunnislake G.S. and Tidal Cycle, 1991.

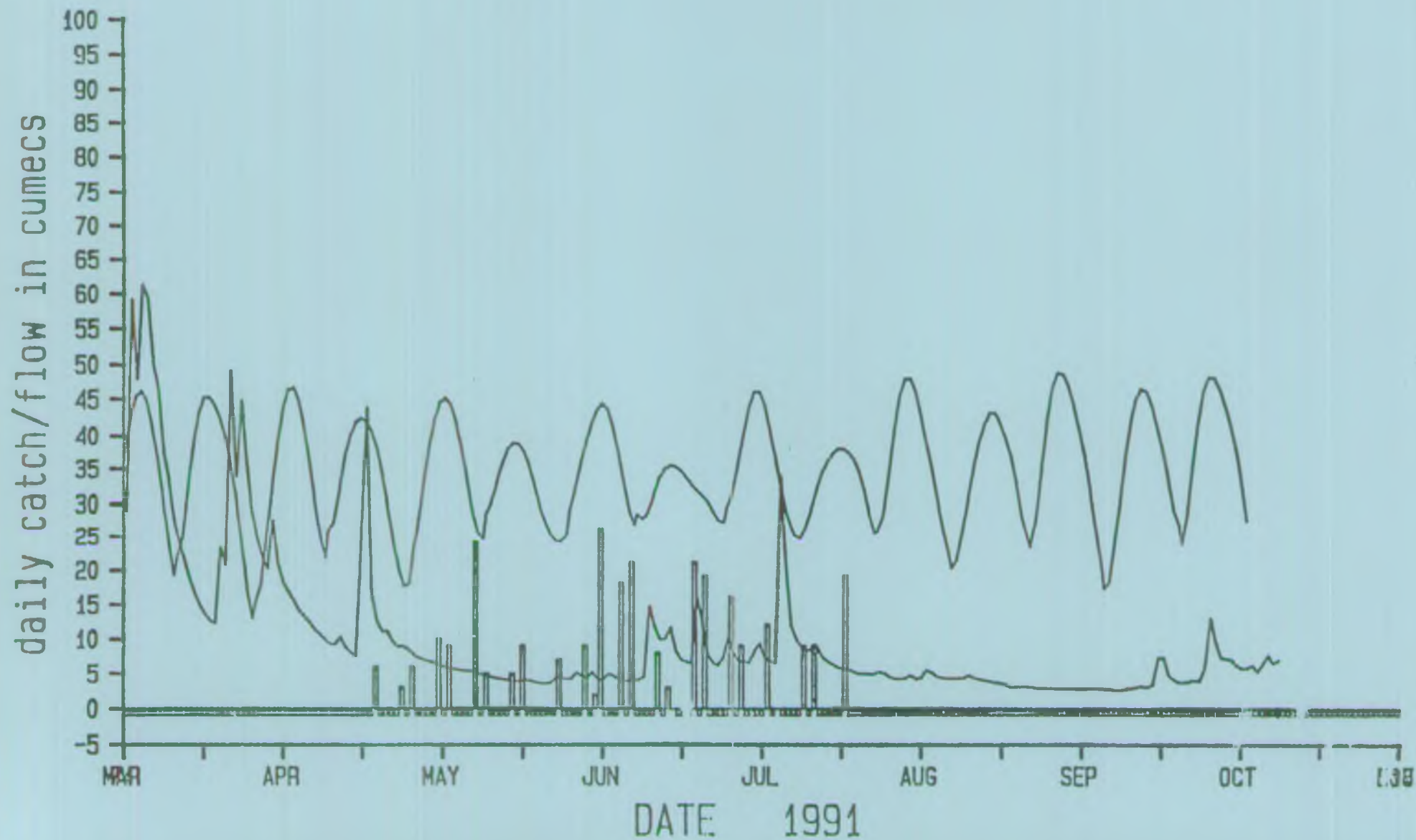


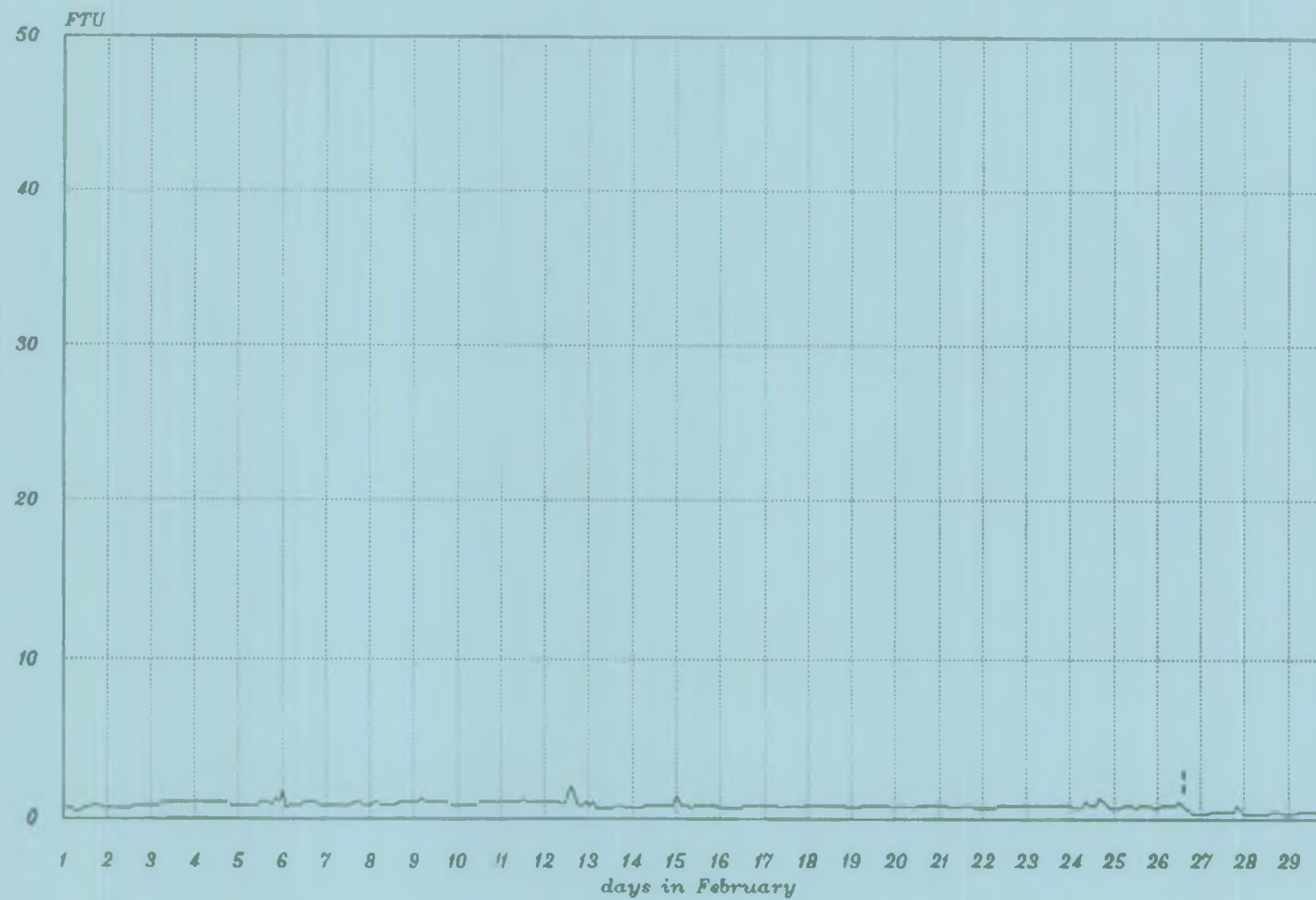
FIGURE 5.

1990 Salmon and Sea Trout Spawning Observations on the River Meavy

SECTION	LOCATION OF SECTION	NUMBER OF REDDS RECORDED ON 1ST SURVEY 12.12.90.		NUMBER OF NEW REDS RECORDED ON 2ND SURVEY 16.1.91.		TOTAL NUMBER OF SALMON & SEA TROUT OBSERVED ON R. MEAVY (1990 SEASON)	
		SL	ST	SL	ST	SL	ST
A	Burrator Reservoir to Higher Heavy Bridge	2	3	2	0	4	3
B	Higher Heavy Bridge to Gratton Ford Bridge	9	13	4	0	13	13
C	Gratton Ford Bridge to Clearbrook Bridge	10	16	9	1	19	17
D	Clearbrook Bridge to Goodameavy Bridge	2	5	1	0	3	5
E	Goodameavy Bridge to Shaugh Bridge	7	4	1	0	8	4
	TOTALS	30	41	17	1	47	42

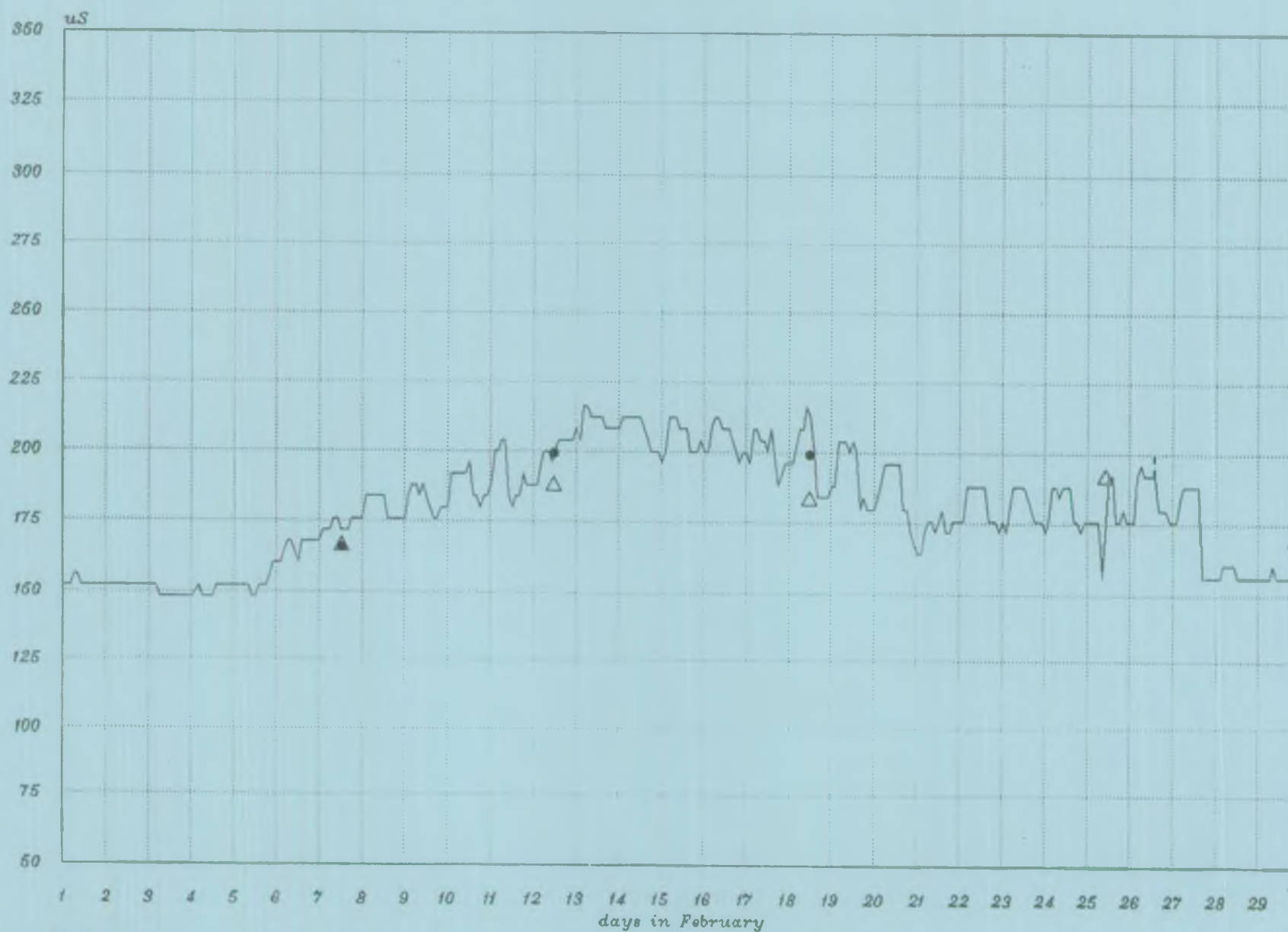


*Newbridge, Turbidity
February 1992*



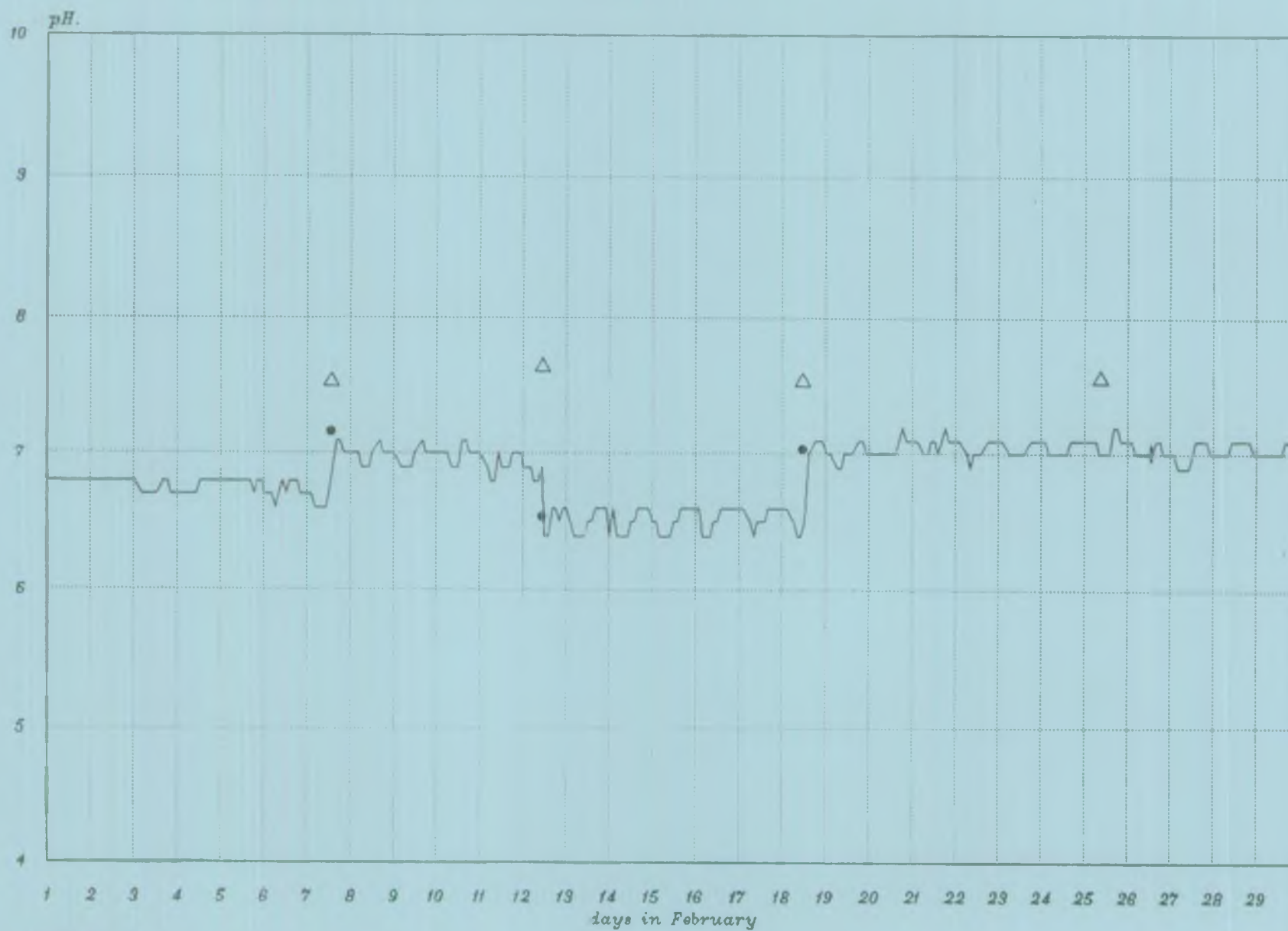
| calibration

Newbridge, Conductivity
February 1992



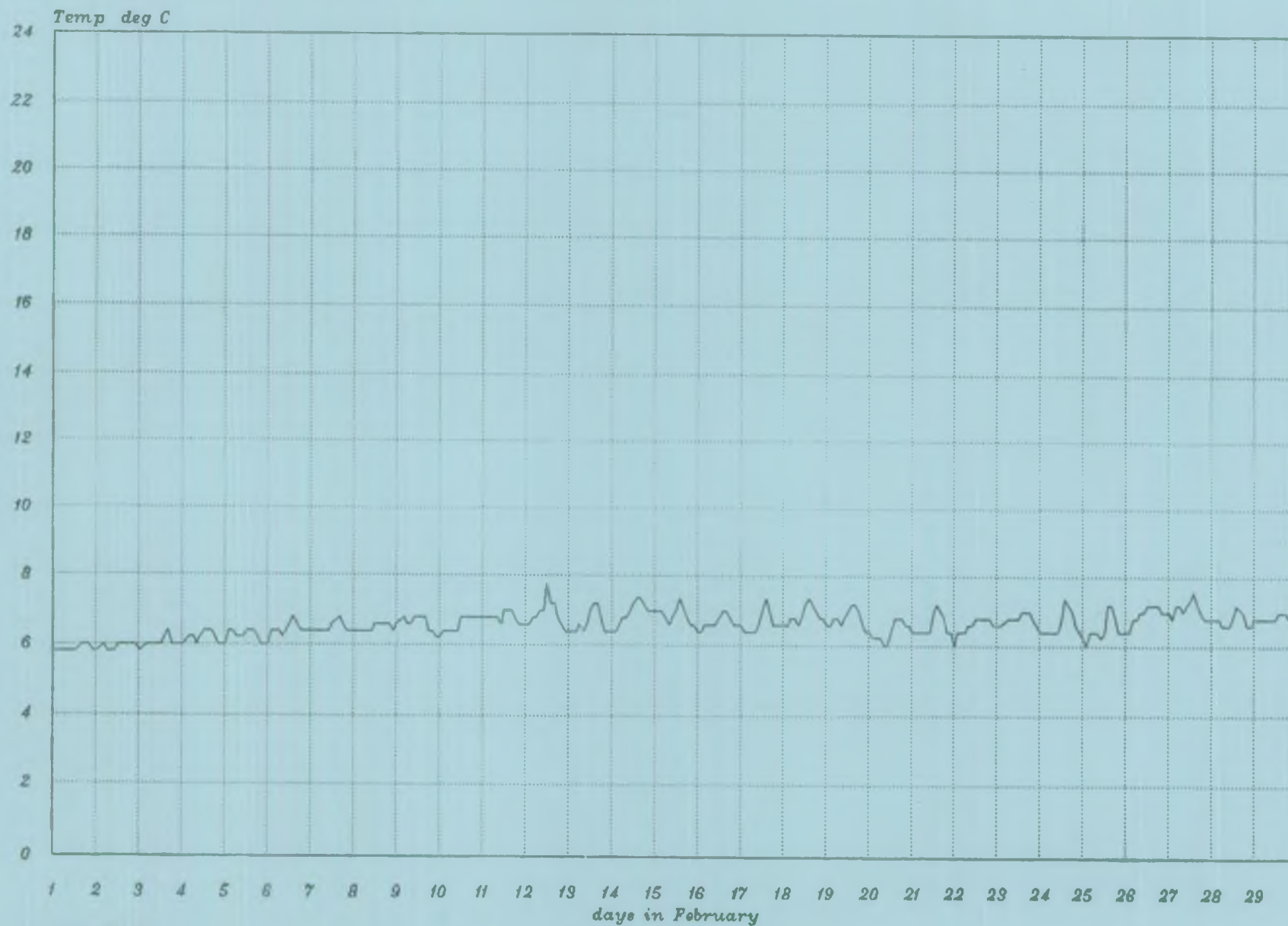
● validation
● calibration
△ laboratory

Newbridge, pH
February 1992



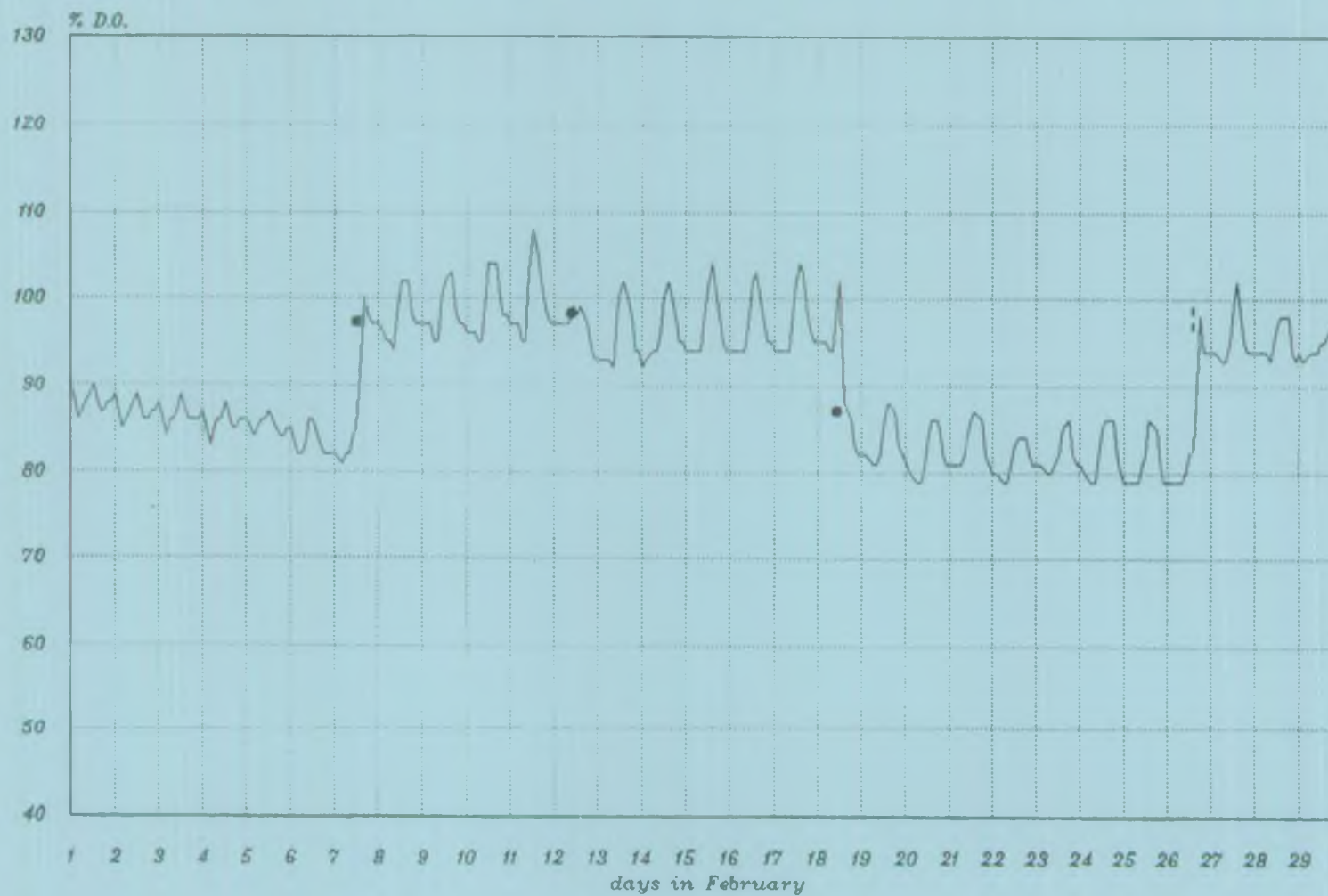
● validation
○ calibration
△ laboratory

Newbridge, Temperature
February 1992



validation
calibration
laboratory

Newbridge, Dissolved Oxygen %
February 1992



• validation
| calibration