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Dee Stock Assessment Programme:  
Annual Report, 1989-1991.

EAN/90/09

Project No. : NO 986

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19th April, 1991.

Circulation :

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## Summary

1. The Dee Stock Assessment Programme (DSAP) commenced in 1989 as an integrated and long term programme to monitor the migratory salmonids (salmon and sea trout) of the River Dee. The programme contains a number of components; these include adult trapping and mark-recapture studies, radio-tracking, automatic fish counting, fishery censuses, and microtagging and juvenile monitoring programmes. This report describes the progress of the DSAP from 1989 to present, and identifies areas for future work.

2. Modifications to the Chester Weir fish trap commenced in August 1990 and were completed at the end of March 1991. Although this aspect of the DSAP has been delayed around 6 months, a near full season of trapping and tagging will still be possible for the mark-recapture and radio-tracking programmes in 1991. The delay has also allowed advances in other areas of the DSAP; in particular, the installation and validation of a new Aquantic fish counter at Manley Hall, practical preparations for the radio-tracking programme, and a further season to develop liaison with fishery concerns - including the anglers census which increased circulation by 55% in 1990.

### 3. Recommendations:

a) Trapping and marking operations should begin as early as possible (April/May) if full use is to be made of the 1991 season with respect to the mark-recapture and radio-tracking programmes.

b) Further attempts should be made to enlarge the anglers logbook and scale sampling programmes. A computer based system for storing and analysing net catch-effort data also needs to be developed.

c) Wild smolt trapping will be carried out in April/May 1991 on two hatchery intake leats on the River Ceiriog, with a view to future microtagging work on this tributary.

d) Tapes from the video evaluation of Manley Hall fish counter need to be analysed early in 1991 in order to further develop the counters' potential.

e) The juvenile monitoring programme will be reviewed, and a revised programme initiated in Summer 1991.

f) Communication with fishery concerns needs to be maintained and improved in the coming months in preparation for the start of the mark-recapture and radio-tracking programmes.

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## 1. Introduction

The Dee Stock Assessment Programme (DSAP) commenced in 1989 as an integrated long term programme to monitor the migratory salmonids (salmon and sea trout) of the River Dee. The study was initiated in response to the conclusions of the Chairmans Working Group (Welsh Water, 1985) which identified the need to collect quantitative data on migratory salmonid stocks and suggested the use of a fixed trapping facility to do this. The DSAP includes the use of such a facility (at Chester Weir), the main function of which will be to provide fish for tagging as part of a mark-recapture exercise aimed at estimating in-season populations on the basis of fishery recaptures. Alongside this, the programme also contains a number of other components (Table 1), each discussed separately within this report.

The principal objective of the DSAP is to provide and interpret long term fishery performance measures for salmon and sea trout resources on the River Dee (eg. stock size and composition, year class strength, catch per unit effort, exploitation, etc.). This information is required to:

- i) establish the status and variability of the resource.
- ii) identify responses to environmental and artificial factors (eg. the fisheries, flow, water quality).
- iii) evaluate the effects of management actions.

Once the programme is fully underway it will have the potential to produce the quality of data on migratory salmonid stocks associated with only three other rivers in the U.K. and Ireland. In this respect, the programme will not only influence approaches to local and regional fisheries investigation and management, but may also be of significance nationally.

This report examines the progress of the DSAP from 1989 to present, and outlines the future direction of the programme.

## 2. Programme components

### 2.1 Chester Weir fish trap: Progress with design and construction.

The existing fish trap at Chester Weir (SJ 407 658) was constructed in 1985 to validate the performance of a fish counter on the same site. The trap is located at the head of the tide but only acts as a partial trap as under conditions of high tide or river flow fish may avoid the trap channel by passing over the weir (4.33m A.O.D.) (Fig. 1). On the highest tides flow is reversed over the weir, a situation which occurs for a few hours each month.

Modifications to the trap commenced in August 1990 and were completed at the end of March 1991 (Table 1); the costs associated with this work are given in Table 2. These modifications improve

the safety and security of the structure and make it more amenable to routine fish capture and tagging operations. The main improvements include the introduction of automatic penstock sluices and a pump facility to control water levels within the trap, replacement and rearrangement of cage work, extension of the existing counter building over the trap channel, and improvements to existing security - including additional fencing and lighting and alarm systems. A summary of progress with this work is given below:

\* Design drawings were completed at the end of November 1989 and following approval for capital expenditure (£108,000), the scheme was put out to tender in January 1990.

\* All bids received (£173,000-204,000) exceeded the construction budget and so approval for additional capital expenditure had to be sought. An increased construction budget of £173,000 was approved in May 1990.

\* As a result of problems associated with increased costs the start of construction was delayed by around five months.

\* Construction was completed at the end of March 1991, (around 7 weeks overdue on the revised schedule). However, work remains to be carried out on the fish pass blocking plate and oversails. This will take place in May/June 1991 and will be paid for from a separate budget to that described in Table 2.

As previously described, when operational the Chester Weir trap will be used to capture adult salmon and sea trout - primarily for tagging (using external tags known as Floy tags) as part of a mark-recapture exercise (N.R.A., in prep.). However, the trap will also serve as a general sampling device - providing fish from which various biological statistics can be recorded (eg. length, weight, sex). It will also supply fish for radio-tagging (Section 2.7) and act as a capture point for microtagged fish (Section 2.5); trap catches may also provide an index of run strength.

## 2.2 Anglers logbook scheme

The anglers logbook scheme was introduced to the Dee in the 1989 season as a means of collecting detailed information on catch and fishing effort (hours fished). The scheme also serves as an important means of communication with anglers, helping to keep them informed of the aims and progress of all aspects of the DSAP and in doing so encourage their co-operation in the various components of the programme. Angler co-operation is important to the success of many aspects of the DSAP, none more so than the mark-recapture exercise whose success may depend on it. The latter is discussed in greater detail in N.R.A. (in prep.).

Of 215 logbooks sent out to anglers in 1989, 115 (54%) were returned; of these returns, 76 were good returns, 16 were spoiled and 23 anglers did not fish at all. In total, 46 salmon and 21 sea trout were caught by participating anglers; from catches declared

through the licence return system this appears to represent around 17% and 28%, respectively, of the total catch of each species in 1989. Although the response to the logbook scheme was encouraging and compares favourably with similar schemes operating elsewhere in Wales, the proportion of the total catch taken by logbook anglers remains fairly low, especially for salmon. In order to have confidence in future mark-recapture estimates of adult populations it is important that a high proportion of returns come from logbook anglers. Accordingly, in 1990 contacts were made with all known fishery owners on the Dee and, as a result, logbooks were circulated to 369 anglers (an increase of 55% on the previous season). Returns from the 1990 season are incomplete at the time of writing.

### 2.3 Net catch monitoring

The existing statutory catch return system operating on the Dee (and throughout the region) provides sufficient information to allow estimates of catch-effort (as catch per tide) to be made; thus, no new catch census was introduced on this fishery. However, a computer based system is required to store and analyse catch and effort data from these returns and needs to be established, initially locally (for the Dee), and in the long term regionally (for all rivers).

### 2.4 Scale sampling

Scale samples from both salmon and sea trout have been supplied by Dee net fishermen for a number of years. This practice was encouraged in the 1990 season with the distribution of scale envelopes to all licencees accompanied by a letter outlining the progress of the DSAP and requesting netsmen to assist in scale sampling and in the reporting of any microtagged fish they may encounter (Section 2.5).

In contrast, no programme of scale sampling existed on the rod fishery in the past, but, as with the net fishery, sampling is essential in order to determine the age composition of returning populations. In fact, sampling from the rod fishery has advantages over that from the net fishery in that it is likely to be less size selective and can be carried out over a longer season. Accordingly, in the 1990 season, Honorary Bailiffs were asked to take scale samples from rod caught fish they encountered and, in return, age details would be reported to any anglers who requested them. In 1991, it is likely that all anglers participating in the logbook scheme will be supplied with scale envelopes, again with ageing details available on request.

Although scale sampling could be carried out on trap caught fish, comprehensive fishery based sampling programmes will reduce the need to sample fish in the trap (except out of season) and thus reduce handling stress.

## 2.5 Microtagging

The Dee is one of several rivers regionally which have been stocked with microtagged salmon since 1986. The microtagging of hatchery reared and wild migratory salmonids provides some insight into the performance of hatchery reared fish and reveals details of the location and relative levels of exploitation in both high seas and inshore fisheries, and in river. In 1989 and 1990, 2382 and 2448 tagged (1 year old) parr/smолts, respectively, were stocked from Maerdy hatchery. Improvements to the hatchery this year were aimed at increasing smolt production capacity to 30,000 one year old fish annually by 1992; in 1991 15-17000 one year old fish will be microtagged and released.

Regular contact with anglers and netsmen through the logbook and scale sampling schemes should improve the reporting rates for microtagged fish. In addition, use of Chester Weir fish trap - as a controlled sampling device - will permit estimates of tag returns to be made. Any future initiative to tag wild smолts on the Dee will allow comparison of return rates with hatchery reared fish - providing further information on the effectiveness of stocking. Work will begin in this direction in 1991 - using modified fyke nets to trap smолts in the intake channels of two fish farms on the River Ceiriog (a major tributary of the Dee) with a view to future microtagging work.

## 2.6 Fish counters

Two fish counters (NSHEB Mk VIII) were in operation on the Dee at the beginning of 1990, one at Chester Weir and one at Manley Hall. The facility at Chester Weir was confined to the trap channel and so would not count fish that avoided the channel by crossing the weir under high tide/river flow conditions. In addition, the accuracy of fish counts under these conditions have been questioned - possibly resulting from fish lingering over the counting zone at flow reversal or high flows (Brassington, 1983), or from changes in the sensitivity of the counter. Brassington (1983) suggested that to avoid any spurious counts a routine editing procedure should be adopted to remove counts recorded during events such as those described above.

The modifications to the Chester Weir trap included removal of the crump weir on which the counter electrode strips were located. This weir has been reconstructed further upstream in the trap channel although, because of the problems associated with operating a fish counter at the Chester Weir site, reinstallation of the counter and strips has not occurred at this stage. Any reinstallation at a later date could be simply achieved by fixing a fibre glass sheet (bearing the strips) to the weir face. As the crump weir lies within the trap channel the weir can be made dry using the penstock sluices.

In contrast to Chester Weir, the counter at Manley Hall appears to have operated fairly successfully since its installation in 1976 although it has been validated only once - at installation (Beach, 1977). This counter was replaced with a more recent model - the Aquantic Logie 2100A, in August, 1990. The latter has a number of important features not possessed by its predecessor including a conductivity compensation feature - which improves counter sensitivity over a range of flows and permits more accurate sizing of fish. Video validation work on this counter was carried out in September 1990, the results of which will be published in a separate report.

Successful operation of a fish counter at Manley Hall will provide valuable information on the number and size composition of fish throughout the year. This information will complement in-season estimates of run size from the mark-recapture programme but will form the best measure of the out-of-season run. It is envisaged that species, size, and age composition data from trap captures and the rod and net fisheries may be used to estimate the contribution of salmon and sea trout to the fish count.

## 2.7 Radio-tracking

A three year radio-tracking study will commence on the Dee in April/May 1991. This will provide information on the movement and behaviour of salmon and sea trout in relation to environmental variables - particularly flow and some water quality parameters. It will also help to establish the effects of Chester Weir trap on fish behaviour, will yield information on the interaction of fish with the fisheries and their spawning distribution, and should provide details important to the interpretation of mark-recapture data.

Freshwater sites for the location of fixed scanners have been determined and, where required, steel security boxes (to house scanner equipment) have been positioned in the catchment. Accommodation needs for tracking staff and equipment will be met by the use of existing facilities at Maerdy hatchery and Buckley depot. Fish for radiotagging are likely to be captured both at the Chester Weir trap and in the estuary, either purchasing fish from netmen or using gear such as jumper nets. Initial contacts indicate that netmen will be open to the fish purchase option - this is likely to involve the draft rather than trammel nets because of the generally better condition of fish caught with the former. Much of the estuary where the draft netting is popular can be easily accessed by road - which should facilitate the location of fish for tagging.

## 2.8 Juvenile monitoring.

Electrofishing surveys for juvenile salmonids have been carried out on the Dee since 1985 as part of the Regional Monitoring Programme (N.R.A., 1990). The results of this programme will be

reviewed shortly in order to determine a network of sites in selected areas of the catchment for annual monitoring. In the long term, this will allow comparison between measures of juvenile and adult population status on the Dee.

## 2.9 Communication and Public relations.

Regular publicity of the aims and achievements of the DSAP, targeting in particular fishery owners, anglers and netmen, is considered an important means of encouraging good relationships with these groups and hence of ensuring the success of the programme. As has already been stressed, the co-operation of fishing concerns will be essential to the success of the mark-recapture programme and in this respect the communicating role of the anglers logbook scheme and scale sampling programmes has been outlined.

In order to gauge the general response of anglers and netmen to the DSAP, a series of public meetings was held early in 1989 involving District and Area Fisheries Officers and the Senior Environmental Appraisal Officer, explaining the aims and objectives of the DSAP and inviting replies. From these meetings, it was judged that the attitude toward the programme was generally favourable and that the programme should proceed. Since this time, a series of other events have occurred at which the subject of the DSAP has been raised; these are listed below:

- \* Presentation given to the Salmon Advisory Committee, September 1989.
- \* Progress reported to the Dee and Clwyd Informal Fisheries Group, February and July, 1990 and February 1991.
- \* Presentation given to the Regional Rivers Advisory Committee, April 1990.
- \* Article in the Summer issue of Glas y Dorlan, 1990.
- \* Trap Scientist present with District and Area Fisheries Officers at a public meeting with Dee fishery owners and anglers, November 1990.
- \* Progress reported to Dee Fishery Association, March 1991.

It is envisaged that communication with fishing concerns will be intensified to coincide with the launch of the mark-recapture and radio-tracking programmes in 1991; this may include articles submitted to the local press and national fishing magazines (eg. Trout and Salmon). Apart from contact with outside organisations, because of the regional significance of the programme a DSAP steering group has been formed which aims to meet regularly through the year. This is made up of a core of members with others invited to attend by virtue of specialist expertise or advice. To date meetings have been held in November 1989 and March, May and December 1990 and February 1991, with the minutes of each meeting circulated to Senior management.

## 2.10 Staff

The Trap Scientist was appointed in July 1989 and was located at the Mold office in October 1989. Provision has been made for employment of an 8-month temporary assistant to the Trap Scientist in 1991, to cover the most intense (Summer-Autumn) period of trapping activity. Staffing of the trapping programme will be reviewed in 1991-92 to make recommendations in the 1992-93 Corporate Plan - as required. (Revenue costs for the DSAP in 1990-91 are given in Table 2.)

The radio-tracking programme will employ a number of full and part time staff contracted for the period of the study although specific details have yet to be determined.

## 3. Conclusions

a) The main effect of the delay in construction of the fish trap at Chester Weir has been to retard the start of the mark-recapture programme. However, even if the original time scale had been adhered to, only a part-season tagging programme would have been possible in 1990. Although this would have given greater opportunity to gain practical experience in trap operation and fish tagging before the start of the first full season of tagging in 1991, under the present scheme the trap will be ready for use in April/May 1991 (Section 2.1) - still allowing a near full tagging season.

b) In practice, the delay in trap construction has permitted other aspects of the programme to develop more fully than would otherwise have been the case. In particular:

i) The installation and validation of the new Logie counter at Manley Hall.

ii) The organisation and execution of practical aspects of the radio-tracking programme well in advance of the start date.

iii) An additional season in which to develop communications with fishing concerns, helping to further publicise the aims and objectives of the DSAP prior to the launch of the mark-recapture and radio tracking programmes (both dependent on the co-operation of anglers and netsmen).

## 4. Recommendations

a) Trapping and tagging should commence as soon as possible (April/May) if full use is to be made of the 1991 season with respect to the mark-recapture programme. Early use of the trap will also be important for the provision of fish for the radio-tracking programme.

- b) Further attempts should be made in 1991 to increase the circulation of the anglers logbook; recently updated records of fishery owners may be of use in this respect.
- c) A computer based system for recording and summarising catch-effort data from the net fisheries needs to be established, initially locally (for the Dee), and in the longer term regionally (for all rivers).
- d) Scale envelopes should continue to be distributed to the netsmen and honorary bailiffs; in addition, all rod fishermen participating in the logbook scheme should be provided with scale envelopes.
- e) Attempts will be made in April/May 1991 to capture wild smolts in two hatchery intake leats on the River Ceiriog, with a view to microtagging wild fish from this river in future.
- f) Video recordings from the Aquatic counter validation work at Manley Hall require analysis before detailed recommendations can be made. This analysis should be carried out early in 1991 in order to progress the counter work.
- g) The juvenile monitoring programme should be reviewed and the revised programme implemented in Summer 1991.
- h) Anglers and net fishermen should be kept up-to-date with the progress of the DSAP, particularly the results of any schemes with which they have been involved. The general publicity of all aspects of the programme should be intensified as the start of the mark-recapture programme approaches.

Table 1. Components of the DSAP, 1990-91.

Components:	Month:													
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
a) Trap construction and operation					Trap construction								Begin trapping and tagging.	
b) Anglers logbook scheme	1990 logbook distribution with 1989 results summary.				1990 logbook return and analysis.				1991 logbook distribution with 1990 results summary.					
c) Scale sampling	1990 scale envelope distribution to rods and nets.				1990 scale sample return and analysis.								1991 scale envelope distribution.	
d) Microtagging	Hatchery smolt tagging at Haerdy.												Wild smolt trapping on the Ceiriog.	
e) Manley Hall fish counter					Logie counter validation: Preparation and execution.				Analysis of video tapes and reporting of results.					
f) Radio-tracking									Siting of scanners and location of security boxes; accomodation needs.				Begin tracking study.	
g) Juvenile monitoring					1990 electrofishing survey.									

Table 2. Capital and revenue expenditure, 1990-91.

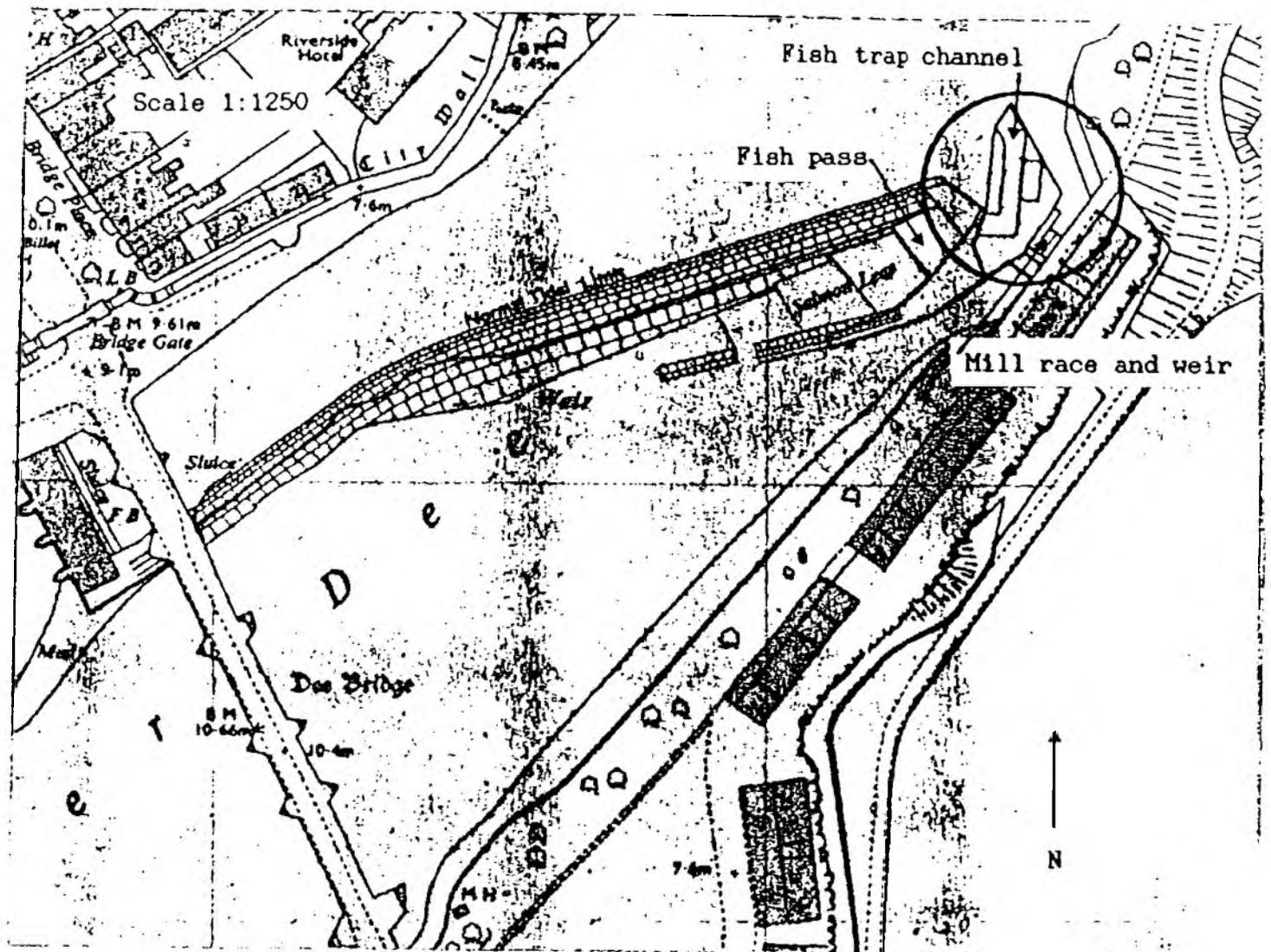
a) Capital costs:	Month:												Total
	A	M	J	J	A	S	O	N	D	J	F	M	
Item:													
i) Trap construction:							14.1	25.5	15.3	21.9	35.8	62.1	174.7K*
ii) Design, contract admin. and supervision:												23.7	23.7K
ii) Logie counter: Purchase and validation.					6.5	1.0	1.0						8.5K
iii) Other items: legal, equipment, etc.			1.7							3.0	1.0	3.7	9.4K
Total			1.7		6.5	1.0	15.1	25.5	15.3	24.9	36.8	89.5	£216.3K**

\* Includes a 2.5% retention fee of £4.4K held by the N.R.A. for 12 months from contract completion.

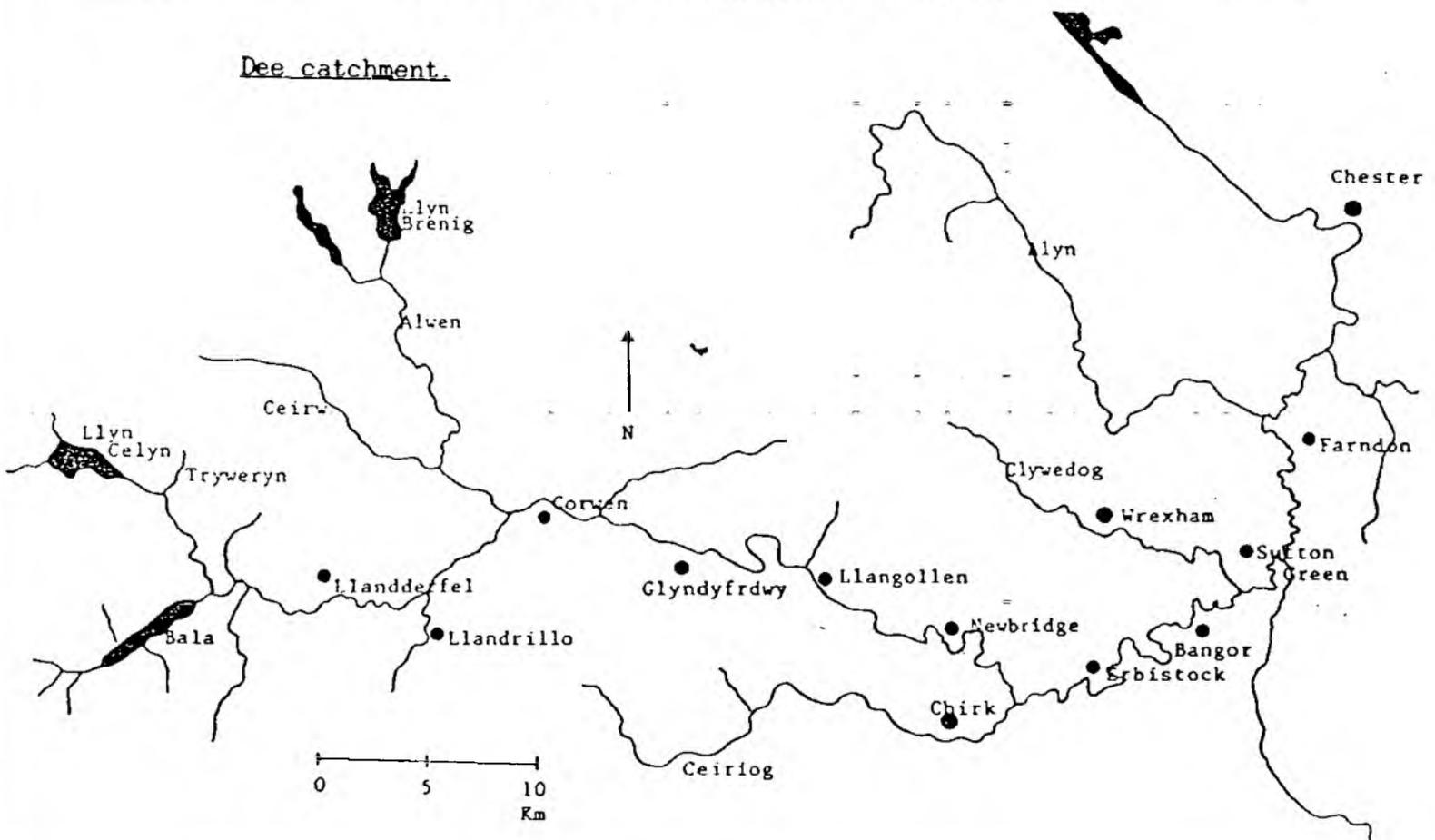
\*\* Includes £10.0K paid from the Water Resources budget for construction work carried out on the mill race

b) Revenue costs:	Annual:
i) Fish Trap Scientist: Salary + oncosts, etc.	16.4
ii) Vehicle	2.5
Total	£18.9K

Fig.1 Location of Chester Weir fish trap.



Dee catchment.



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