Conwy Fisheries Monitoring Programme
Annnual Report 1990
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CONTENTS

SUMMARY

1. This report describes the Conwy Fisheries Monitoring Programme in 1990.

2. No overall significant changes were detected in the juvenile salmonid populations in 1990. However, salmon and trout populations in the Nant y Goron dropped to the lowest recorded levels.

3. Total catches per hour of adult sea trout (0.018) and salmon (0.026) were lower than 1989 but still within the range of previous years' data (1982-1989) (range 0.01-0.053 for salmon and 0.008-0.028 for sea trout).

4. Scale sampling efficiency for rod (9.9%) and net (5.9%) caught salmon in 1989 was low. Sampling efficiency for sea trout was good for nets (18.8%) and the highest recorded (1978-88) for rods (30.4%).

5. No smelt spawning activity was observed during 1990. However, good numbers of juvenile smelt were caught in the estuary during a seine net survey in July.

6. The distribution and abundance of non-salmonids remained similar to previous years.

7. Recommendations for the future of the programme are made:

   a. Continue monitoring at present levels until at least 1992.

   b. Review stocking in 1991 to avoid areas of poor water quality.

   c. Monitor stocking success by electrofishing additional sites in Upper Conwy.

1. INTRODUCTION

This report (the fifth Annual Report) describes the results of the Conwy Fisheries Monitoring Programme in 1990 and follows a similar format to previous reports (FTUN 1987 and 1988 and EAU 1989 and 1990).

2. METHODS

All methodology has been fully described previously (FTUN 1987). The annual electrofishing survey was carried out between 26th July, 1990, and 22nd October, 1990.

In late 1990, 7 sites above the Conwy Falls were semi-quantitatively electro-fished to check upon the survival of stocked salmon and sea trout fry.

The habitat quality of each of these 7 sites, as well as the 3 quantitative sites on the Nant y Foel, was assessed using the HABSCORE technique (see manual, in prep.). To use this method, habitat and catchment features are measured, and empirical models use this data to predict the numbers of fish expected under pristine conditions. This is expressed as a Habitat Quality Score (HQS) and the Habitat Utilisation Index (HUI), which is a measure of the extent to which the habitat is used by salmonids and is proportional to the difference between the observed density and HQS. For use with the HABSCORE models, the semi-quantitative results were converted to quantitative densities using the relationships derived by Strange et al (WWA 1988).

3. RESULTS

3.1. Juvenile Salmonids

The results of the annual electrofishing survey are given in Appendices 1a, b and c.

3.1.1. Within site variation

Population estimates for 1990 were compared to running mean estimates (1982-89) using an index based on a t-test for comparing a single observation with the mean of a sample (see EAN 1990 for details of test).

3.1.1.1. Quantitative sites

Trout population estimates were below running mean estimates (1982-1989) at more than 60% of sites (61% for 0+, 83% for 1+; Table 1a). The Nant y Goron was particularly poor, with significantly low 0+ populations at 5 sites and only one 1+ population above the running mean. All sites on the Roe showed very low 1+ populations. Salmon populations were below running mean estimates (1982-1989) at more than 40% of sites (47% 0+, 59% for 1+; Table 1a). The Nant y Goron was again especially poor, with all sites below running means and 1+ populations particularly low (parr were absent at NG5 and NG6).

3.1.1.2. Semi-quantitative sites

Trout fry densities decreased at 44% of sites (Table 1b) while 1+ densities decreased at 67% of sites. Trout populations increased significantly at CY1 (0+) and decreased significantly at CF1 (0+). Salmon fry densities decreased at 50% of sites and 1+ densities decreased at 67% of sites. Salmon densities increased significantly at Lg2 (0+) and decreased significantly at CY3 (1+).

General patterns of abundance at all semi-quantitative sites are shown in Fig.1.

3.1.2. Within Subcatchment variation

3.1.2.1. Tributaries

Within subcatchment densities are displayed in Fig.2.

Trout and salmon densities (0+ and 1+) on the Nant y Goron were the lowest recorded (since 1985).

Trout and salmon fry densities on the Lledr increased to the highest recorded (1985-1989). Parr (1+) salmon and trout densities were lower than the previous year but still within recorded limits.

Trout and salmon fry densities on the Roe were within recorded limits. Trout parr (1+) continued a steady declining trend to a new lowest recorded density. Salmon parr densities were also the lowest ever recorded, following a very gradual decline since 1986.

Trout fry densities on the Nant y Foel were the lowest recorded.

3.1.2.2. Main River

Spatial patterns of 0+ trout and salmon abundance in 1990 were similar to those in previous years (1986-1989) with the highest densities in the lower reaches (0-5km) (Fig.3).

Actual densities were amongst the lowest ever recorded, especially in the upper reaches (>5km). This may partly be due to the late fishing of some sites.

3.1.3. Stocked Fry Survival

3.1.3.1. Electrofishing

The electrofishing results are shown in Appendix 1d.

On the main River Conwy, no trout fry were caught and >0+ trout were only caught at CY7. Numbers of salmon (0+ and >0+) were low at CY5 and CY6 but good at CY7.

On the Eidda, low numbers of 0+ and >0+ trout and salmon were caught at Ei 1 but only >0+ trout were caught at Ei 2.

Low numbers of trout were caught at sites C11 and C12 on the Caletwr. No salmon fry were caught at C11 but 21 were caught at C12.

3.1.3.2. Habscore

The results of the HABSCORE analysis are shown in Table 4 as HUI (Group) values (see HABSCORE manual, in prep.).

The results for the stocked sites show that all observed densities were below expected. However, results were only significantly low in two cases: for 0+ trout on the Eidda and Caletwr. Trout fry densities on the Nant y Foel (brown trout only) were also significantly low.

3.2. Adult Salmonids

3.2.1. Angling Census

Results for the angling census for 1990 and previous years are shown in Tables 3a and b.

Total catches per hour of sea trout (0.018) and salmon (0.026) were slightly lower than those for 1989 (Table 3a and Fig.4a) but were

still reasonable compared to previous years' data (1982-1989).

The peak monthly catch rates occurred in April for salmon (0.0392) and September for Sea Trout (0.0486), with no sea trout caught until July (Table 3b and Fig.4b).

A total of 60 anglers (24% of those targeted in the survey) returned their census forms. Of these, 34 anglers (13%) provided useful information (i.e. catch and hour data) and 18 returns contained insufficient data to be useful. The remaining 8 did not fish the Conwy at all.

3.2.2. Scale Sampling

Scale sampling efficiency in 1989 (Appendix 4) for rod caught salmon (9.9%) was low but for sea trout (30.4) was the highest recorded (1978-88).

Scale sampling efficiency in 1989 (Appendix 4) for net caught salmon (5.9%) was lower than recent years whilst that for sea trout (18.8%) was good.

3.3. Additional species

3.3.1. Smelt

No incidence of smelt spawning was reported in 1990. However, in July 1990, juvenile smelt were caught in seine nets at 2 sites in the estuary during a bass survey (EAN/90/08).

Approximately 50 to 100 fish were caught per haul. A netsman reported catching half a dozen adults during the year (pers.comm. NCC).

3.3.2. Other species

The distribution of non-salmonids was similar to that described previously (FTUN 1987 and 1988, and EAN 1989 and 1990).

The eel (Anguilla anguilla L.) was generally recorded as fair to abundant in abundance, but only as few on the Lledr. Minnow (Phoxinus phoxinus L.) were generally recorded as fair to abundant when found on the Lledr.

3.4. Stocking

95,697 salmon fry and 31,624 sea trout fry were stocked into the Conwy from the Cae Du hatchery during April and May 1990 (Appendix 3).

4. DISCUSSION

4.1. Juvenile Salmonids

The Conwy suffered an extended period of severe drought for the second year running during 1990. Some of the tributaries on the eastern side of the catchment appeared to be the worst affected in terms of flow, eg. sections of the Afon Gallt-y-gwg dried up completely.

The Nant y Goron was one of the tributaries which suffered very low flows for a long period. Large reductions were seen in juvenile trout and salmon populations at virtually all sites on this tributary.

The general pattern for juvenile salmon and trout on the other tributaries was one of fry (0+) populations above the running means and parr (1+) populations below the running means. A greater proportion of trout populations were below running means than salmon populations.

Drought conditions are known to reduce juvenile abundance in small streams (Aprahamian, 1986; Elliott, 1987), but the reasons why this effect was only apparent on the Nant y Goron are unclear. Water quality of this stream will be investigated further in 1991.

Figure 5 looks at the stages of tunnel construction that could potentially have had the greatest impact on migratory salmonids. The figure shows which population groups would have been affected and when any impact might be detected, either from juvenile sampling or adult catches.

If the tunnel trench dredging during 1989 had affected adult migration up the Conwy, this may have been detected in 1990 in the population levels of their progeny i.e. 0+ fish. As reported last year (EAN/90/3), angler rod catch per unit effort in 1989 compared

favourably with previous years. In 1990, with the exception of the Nant y Goron, 0+ populations were generally above the running mean estimates. The very low fry densities (salmon & trout) found at the main river fry sites may partly be due to the late sampling date of some of these sites.

The HABSCORE results indicated that fry populations in the Nant y Foel were significantly lower than expected. This may indicate a problem with fry survival although this seems unlikely given the good parr populations. It may be that the trout are using tributary streams for spawning or that the trout population as a whole produces few fry which have a high survival rate.

The survey of sites on the upper Conwy, Caletwr and Eidda found low densities of salmon and trout. The low densities found are likely to be due to the poor water quality in this part of the Conwy catchment. (WWA 85/4, WWA N/9/88).

4.2. Adult salmonids

Figure 5 shows that during 1990 there were 3 main potential impacts upon immigrant adult salmonids i.e. the clearance of sediments and sandjetting of foundation sands, the application of locking fill and loading fill and the application of scour. Any impact of these operations on the immigrant adults might have been expected to show up in the rod catch data. The rod catch per unit effort for salmon and trout was lower than the previous 2 years but still reasonable compared to previous data (1982 onwards).

4.3. Smelt

The capture of juvenile smelt in the Conwy estuary was an encouraging sign, being the first confirmation in recent years of successful spawning in the river.

5. CONCLUSIONS

5.1. Compared to running means no overall significant changes were detected in the juvenile salmonid populations in 1990 or in the adult rod catches per unit effort.

5.2. Salmon and trout populations in the Nant y Goron dropped to the lowest recorded levels, possibly due to the severe drought experienced for the second year in succession, but this is not proven. The drought in 1990 did not appear to have any other significant effects on juvenile populations or immigrant adults.

6. RECOMMENDATIONS

6.1. To be confident of detecting any impact upon the migratory salmonid populations, fisheries monitoring needs to continue at present levels until at least 1992.

6.2. Stocking should be reviewed in 1991 to avoid stocking in rivers with either poor water quality and hence low survival, e.g. Caletwr, or possibly near-pristine brown trout populations, e.g. Nug and Twllan.

6.3. Further additional sites should be elecrofished in the upper Conwy to monitor stocking success.

6.4. All other components of the monitoring programme should continue in their existing forms.

TABLE 1. WITHIN-SITE POPULATION ESTIMATES, 1990, COMPARED TO RUNNING MEAN ESTIMATES (1982-89)

a. QUANTITATIVE SITES

SITE	SAMPLE SIZE 1982-89	0+ TROUT mean	1990	t-ratio	1+ TROUT mean	1990	t-ratio	0+ SALMON mean	1990	t-ratio	1+ SALMON mean	1990	t-ratio
Mq1	5	80	11	-13**	4	0	-73	155	24	-18**	19	2	-13**
Mq3	8	48	8	-96	10	3	-88	57	38	-16	21	5	-90
Mq4	8	138	22	-12**	31	7	-11**	70	26	-50	21	8	-76
Mq5	5	135	21	-12**	15	3	-61	29	21	-5	9	0	-15**
Mq6	5	119	22	-15**	11	8	-21	39	21	-21	4	0	-58
Mq8	5	104	91	-7	12	10	-10						
Mq8a	3	76	33	-52	12	17	27						
Mq8b	3	38	19	-27**	20	14	-21						
R1	5	36	71	35	16	7	-93	68	44	-26	23	5	-11**
R2	8	58	63	5	5	0	-86	57	88	28	8	10	10
R3	8	134	147	6	19	1	-90	131	319	51	25	33	42
R3a	4	165	66	-55	8	3	-55	260	201	-12	49	12	-25**
R3b	4	247	206	-9	31	5	-93	134	482	33	49	57	29
Ld1	6	25	17	-72	10	6	-39	76	69	-9	45	69	29
Ld3	6	10	63	54	8	3	-22	285	534	41	44	35	-10
Ld3a	4	11	19	14	5	1	-34	195	279	21	15	12	-8
Ld4	5	15	32	63	6	10	21	12	143	12**	5	7	7
Ld5	8	15	21	18	22	9	-60	37	46	11	25	34	21
Ld6	5	19	40	40	10	5	-67	92	239	42	49	42	-10
Gb1	8	14	23	49	19	15	-26	3	6	18	2	2	2
MFa	4	33	3	-78	43	34	-46						
MF1	5	24	22	-3	30	30	1						
MF3	5	34	25	-19	38	48	18						

NOTE: ** indicates an estimate that is significantly different to the running mean, taking into account the variation between the previous years' estimates

b. SEMI-QUANTITATIVE SITES

SITE	SAMPLE SIZE 1982-89	0+ TROUT mean	1990	t-ratio	1+ TROUT mean	1990	t-ratio	0+ SALMON mean	1990	t-ratio	1+ SALMON mean	1990	t-ratio
Lg1	5	.2	.2	1	.2	0	-14	2.7	4.4	21	2.0	2.6	12
Lg2	5	9.2	11.4	19	1.6	.9	-33	4.4	19.2	11488	2.7	3.2	7
Cy1	5	1.4	12.4	11488	.3	.29	0	18.7	12.1	-36	1.4	.1	-75
Cy3	5	1.4	.3	-46	.4	0	-16	4.9	4.6	-4	3.6	1.1	-14288
Gy1	5	31.0	44.3	32	15.0	15	0						
Gy2	5	9.9	2.96	-51	3.3	0	-46						
Du1	5	14.0	10.6	-34	8.5	14.1	48	3.6	22.9	58	5.6	4.7	-10
Cf1	5	4.8	1.67	-11088	2.4	1.3	-28	12.7	12.5	-1	8.4	2.9	-42
MD1	6	47.2	53.9	7	22.6	19.2	-9						

NOTE: 88 indicates an estimate that is significantly different to the running mean, taking into account the variation between the previous years' estimates

TABLE 2

WITHIN SITE VARIATION; QUANTITATIVE SITES, 1982-90.

		0+ TROUT		1+ TROUT		0+ SALMON		1+ SALMON	
TRIBUTARY:	SITE	n	C.V.	n	C.V.	n	C.V.	n	C.V
NANT Y GORON	Ng1	6	.286	6	.457	6	.209	6	.275
	Ng3	9	.216	9	.197	9	.194	9	.255
	Ng4	9	.250	9	.190	9	.253	9	.174
	Ng5	6	.299	6	.279	6	.420	6	.287
	Ng6	6	.223	6	.186	6	.326	6	.294
	NgB	6	.189	6	.220				
ROE	R1	6	.246	6	.087	6	.248	6	.217
	R2	9	.192	9	.264	9	.191	9	.188
	R3	9	.194	9	.242	9	.236	9	.081
	R3a	5	.238	5	.250	5	.271	5	.194
	R3b	5	.239	5	.287	5	.356	5	.060
LLEDR	Ld1	7	.070	7	.233	7	.123	7	.148
	Ld3	7	.360	7	.319	7	.164	7	.327
	Ld3a	5	.318	5	.413	5	.107	5	.238
	Ld4	6	.197	6	.193	6	.498	6	.204
	Ld5	9	.258	9	.222	9	.187	9	.170
	Ld6	6	.249	6	.152	6	.242	6	.193
	Gb1	9	.124	9	.110	9	.422	9	.448
NANT Y FOEL	NFa	5	.412	5	.076				
	NF1	6	.239	6	.109				
	NF3	6	.194	6	.138				

n = NO. OF YEARS DATA.

TABLE 3a

CATCH EFFORT DATA: CONWY ANGLING CENSUS 1982-1990.

i, SALMON (ANGLERS FISHING FOR SALMON ONLY OR BOTH SPECIES):

YEAR	NO. ANGLERS	TOTAL CATCH(C)	DECLARD CATCH	% DECLARD CATCH	HOURS(H) FISHED	TOTAL C PER H	HOURS FISHED PER ANGLER: MEAN	S.D.	MONTHLY CATCH PER HOUR: MEAN	S.D.	OCCASI FISHED
82	16	73	401	18	1366.8	.053	85.4	89.4	.058	.129	235
83	16	39	478	8	1805.8	.022	112.9	102.5	.027	.120	419
84	7	7	272	3	684.3	.010	97.8	71.6	.012	.060	132
85			401								
86	69	120	472	25	3727.6	.032	54.0	72.5	.045	.164	735
87	50	77	413	19	3708.8	.021	74.2	106.5	.020	.087	790
88	50	156	733	21	4185.4	.037	83.7	106.4	.042	.169	885
89	36	54	342	16	1851.5	.029	51.4	76.7	.039	.140	363
90	28	75			2893.3	.026	103.3	98.3	.026	.082	488

ii, SEA TROUT (ANGLERS FISHING FOR SEA TROUT ONLY OR BOTH SPECIES):

YEAR	NO. ANGLERS	TOTAL CATCH(C)	DECLARD CATCH	% DECLARD CATCH	HOURS(H) FISHED	TOTAL C PER H	HOURS FISHED PER ANGLER: MEAN	S.D.	MONTHLY CATCH PER HOUR: MEAN	S.D.	OCCASI FISHED
82	14	19	323	6	735.0	.026	52.5	76.8	.030	.103	129
83	12	12	422	3	1161.6	.010	96.8	83.4	.006	.031	293
84	7	4	230	2	510.3	.008	72.9	60.7	.010	.059	95
85			390								
86	58	52	608	9	2924.9	.018	50.4	65.2	.020	.083	603
87	41	33	794	4	2032.3	.016	49.6	61.5	.014	.066	488
88	42	72	479	15	2567.9	.028	61.1	64.9	.038	.128	568
89	28	20	224	9	972.5	.021	34.7	41.9	.026	.110	218
90	18	26			1447.8	.018	80.4	67.6	.022	.089	244

TABLE 3b

MONTHLY CATCH EFFORT DATA: COUNTY ANGLING CENSUS, 1990.

i, SALMON (ANGLERS FISHING FOR SALMON ONLY OR BOTH SPECIES):

MONTH	NO. ANGLERS	TOTAL CATCH(C)	DECLARD CATCH	% DECLARD CATCH	HOURS(H) FISHED	TOTAL C PER H	HOURS FISHED PER ANGLER: MEAN	S.D.	MONTHLY CATCH PER HOUR: MEAN	S.D.	OCCASIONS FISHED(n)
MAR	3	0			32.50	.0000	10.83	4.01	.0000	.0000	9
APR	1	2			51.00	.0392	51.00	.00	.0417	.1072	14
MAY	9	0			80.25	.0000	8.92	6.06	.0000	.0000	25
JUN	16	4			364.00	.0110	22.75	17.78	.0119	.0744	74
JUL	17	4			324.50	.0123	19.09	16.05	.0116	.0483	64
AUG	17	16			451.25	.0355	26.54	21.34	.0418	.0974	71
SEP	22	19			632.25	.0301	28.74	28.69	.0333	.0905	102
OCT	22	23			762.50	.0302	34.66	23.20	.0325	.0899	128
UNKNOWN	1	7			195.00	.0359	195.00	.00	.0359	.0000	1
TOTAL	28	75			2893.25	.0259	103.33	98.33	.0262	.0820	488

ii, SEA TROUT (ANGLERS FISHING FOR SEA TROUT ONLY OR BOTH SPECIES):

MONTH	NO. ANGLERS	TOTAL CATCH(C)	DECLARD CATCH	% DECLARD CATCH	HOURS(H) FISHED	TOTAL C PER H	HOURS FISHED PER ANGLER: MEAN	S.D.	MONTHLY CATCH PER HOUR: MEAN	S.D.	OCCASIONS FISHED(n)
MAR	0	0			.00	.0000	.00	.00	.0000	.0000	0
APR	0	0			.00	.0000	.00	.00	.0000	.0000	0
MAY	4	0			30.00	.0000	7.50	3.32	.0000	.0000	7
JUN	9	0			167.50	.0000	18.61	11.00	.0000	.0000	33
JUL	12	3			230.00	.0130	19.17	12.03	.0187	.1010	49
AUG	13	5			289.50	.0173	22.27	20.10	.0123	.0748	45
SEP	15	16			329.50	.0486	21.97	19.42	.0637	.1423	54
OCT	13	2			401.25	.0050	30.87	24.51	.0072	.0389	56
UNKNOWN	0	0			.00	.0000	.00	.00	.0000	.0000	0
TOTAL	18	26			1447.75	.0180	80.43	67.59	.0218	.0892	244

TABLE 4

a. HABSCORE group HUI results for upper Conwy and tributaries

RIVER	TROUT 0+	TROUT >0+	SALMON 0+	SALMON >0+
CONWY	-.85	-.52	-.44	-.35
EIDDA	-2.33	-.81	-.88	-.92
CALETWR	-2.02	-1.17	-.71	-1.06
N-Y-FOEL	-3.46	1.79	N/A	N/A

NB: HUI = 0 when observed = expected
HUI < 0 when observed < expected

b. HABSCORE classifications for upper Conwy and tributaries

RIVER	TROUT 0+	TROUT >0+	SALMON 0+	SALMON >0+
CONWY	NS	NS	NS	NS
EIDDA	*	NS	NS	NS
CALETWR	**	NS	NS	NS
N-Y-FOEL	***	NS		

NB : NS = Not significant. An increasing number of stars corresponds to increasing significance.

Fig. 1 Annual variation in salmonid densities (0+ and >0+ fish) at semi-quantitative sites, 1982-1990.

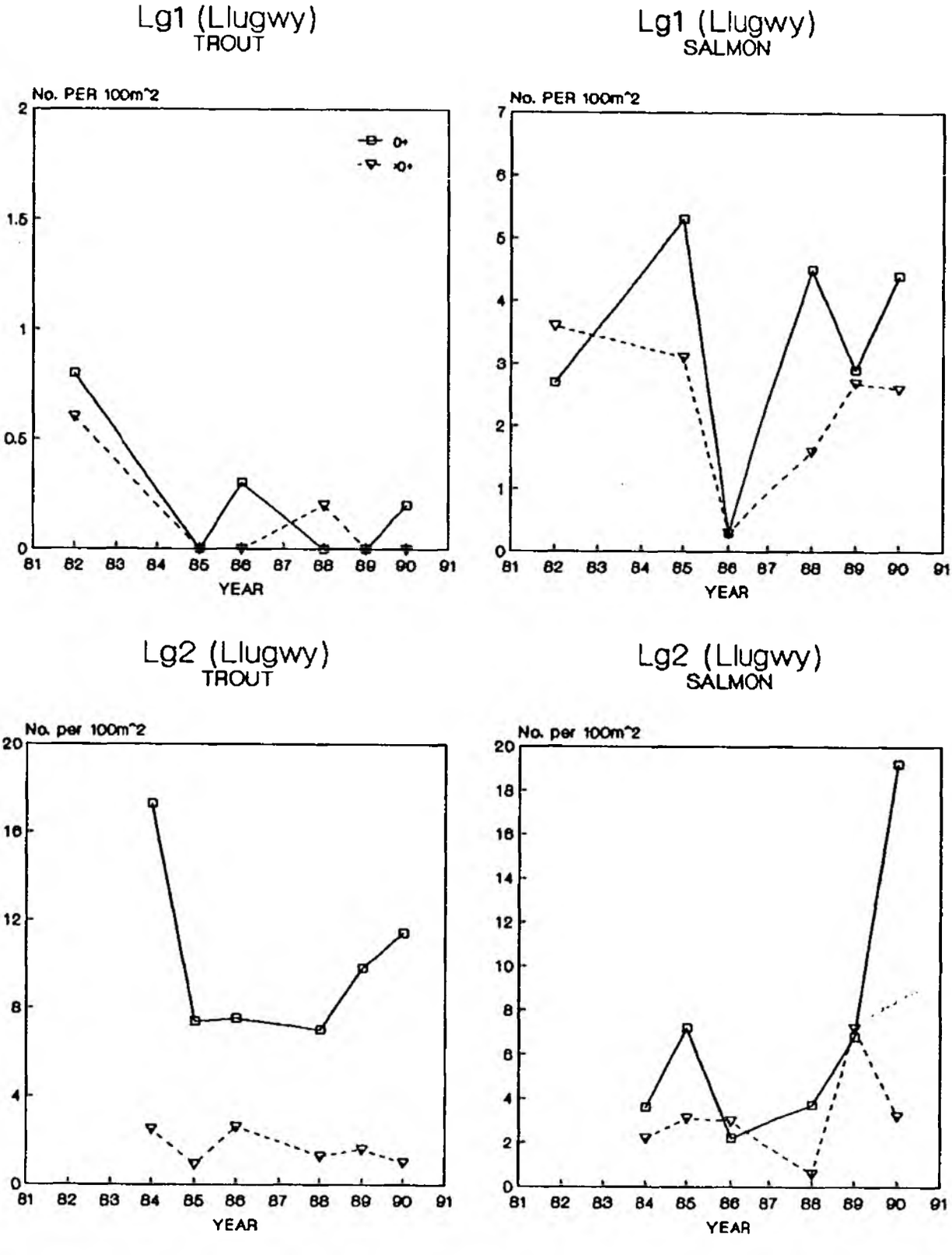
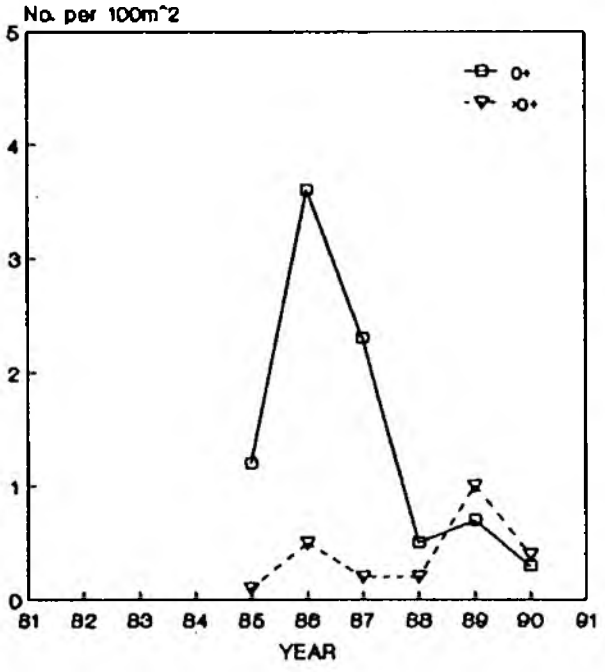


Fig.1 (Continued)

Cy1 (Conwy)
TROUT



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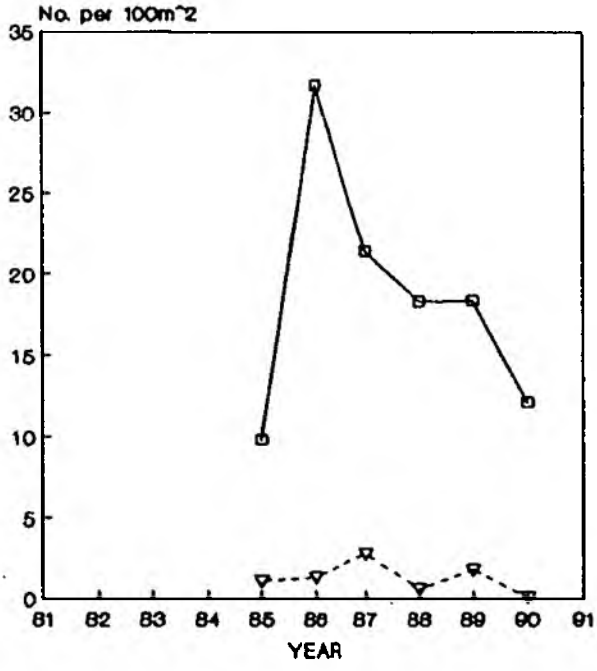

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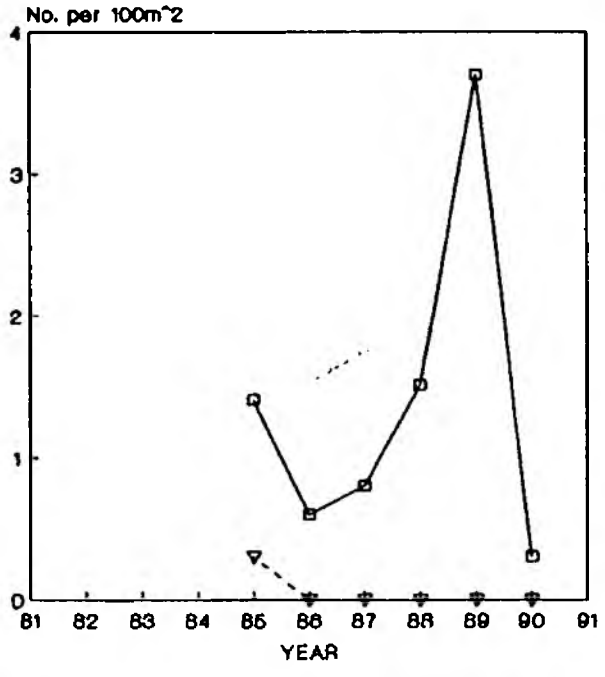


Cy3 (Conwy)
SALMON

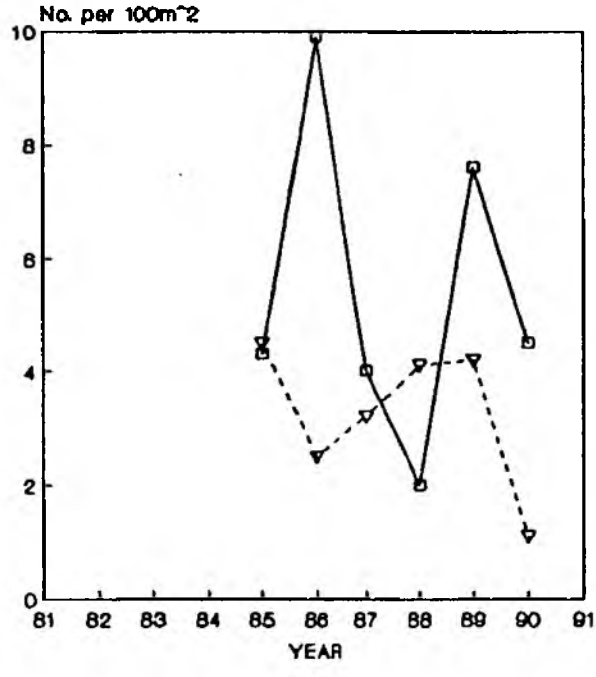
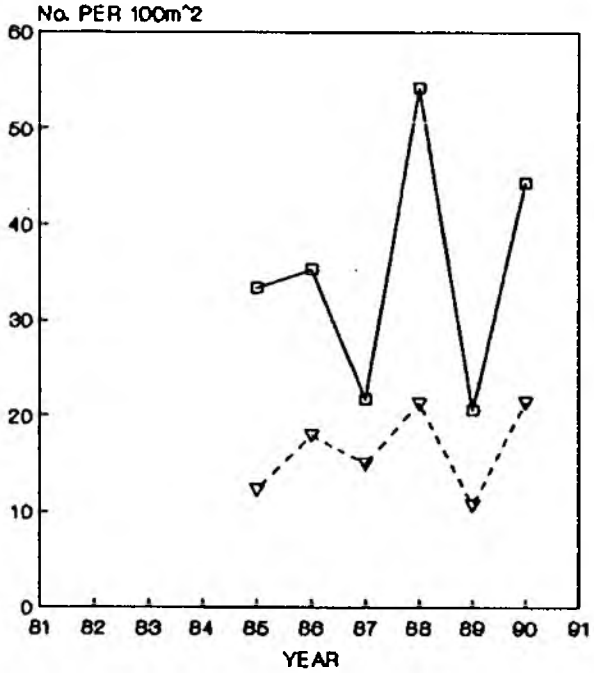
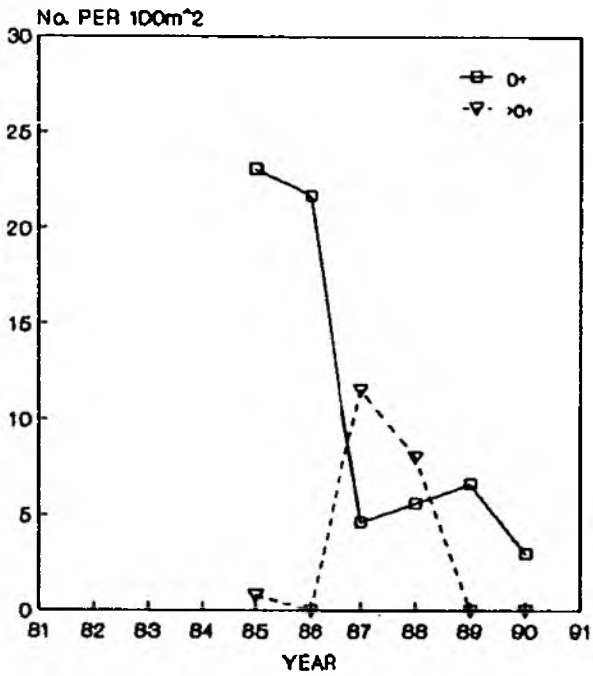


Fig.1 (Continued)

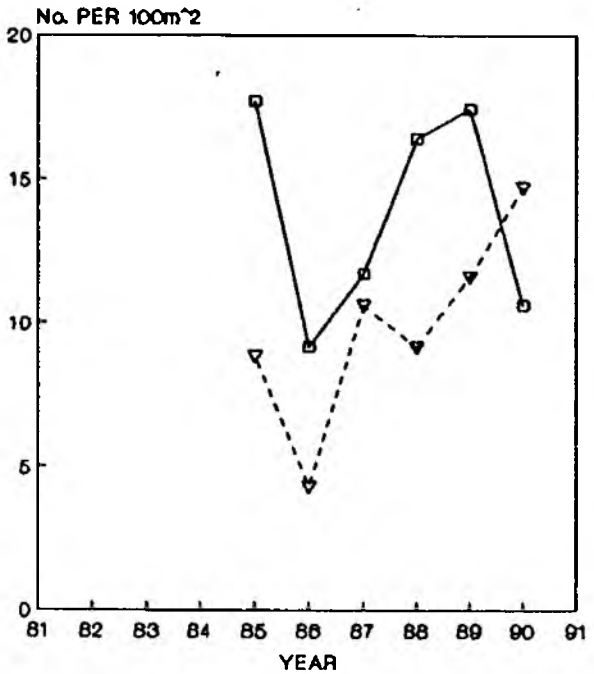
Gy1 (Gyffin)
TROUT



Gy2 (Gyffin)
TROUT



Du1 (Dulyn)
TROUT



Du1 (Dulyn)
SALMON

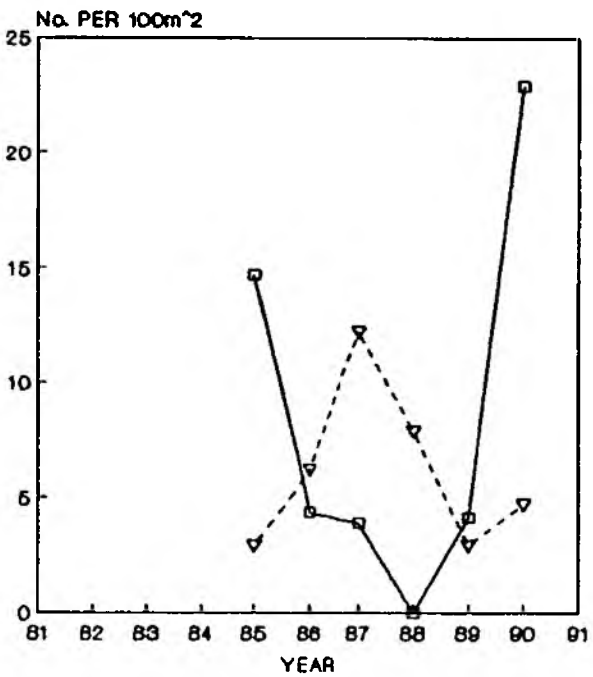
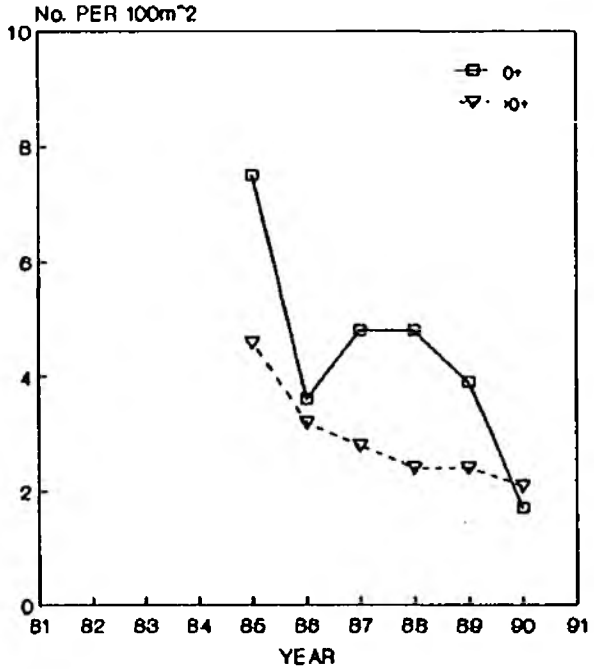
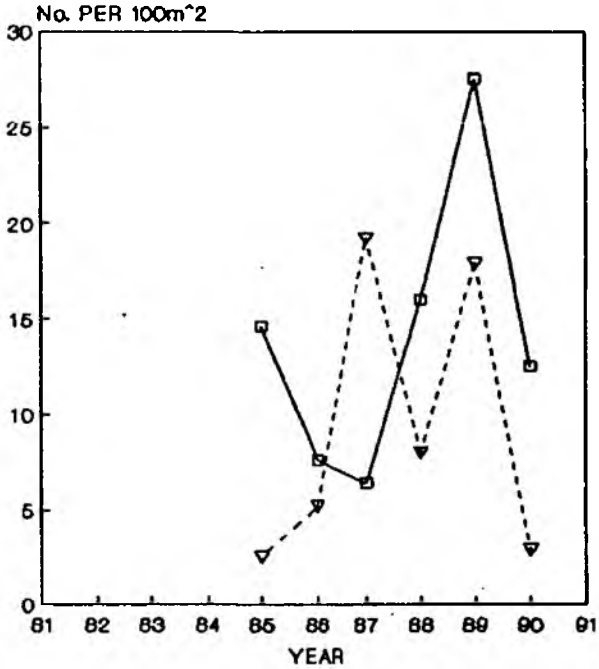


Fig.1 (Continued)

Cf1 (Crafnant)
TROUT



Cf1 (Crafnant)
SALMON



ND1 (Nant y Garreg Ddu)
TROUT

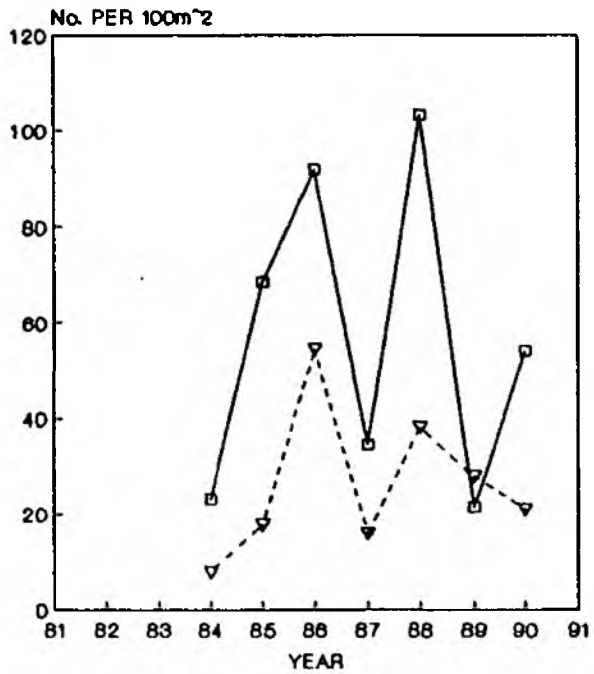


Fig.2 Annual variation in salmonid densities on four Conwy tributaries, 1985-90

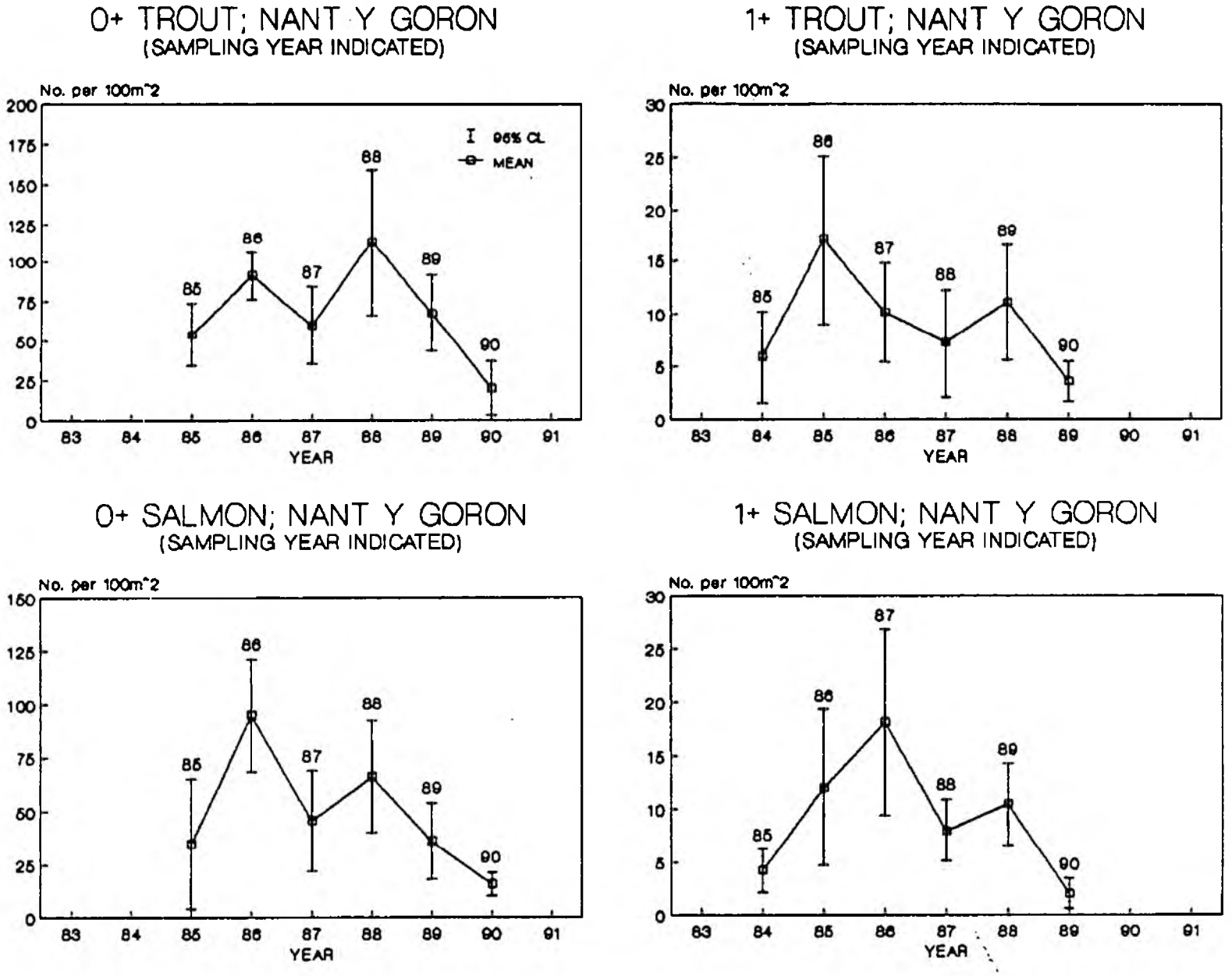
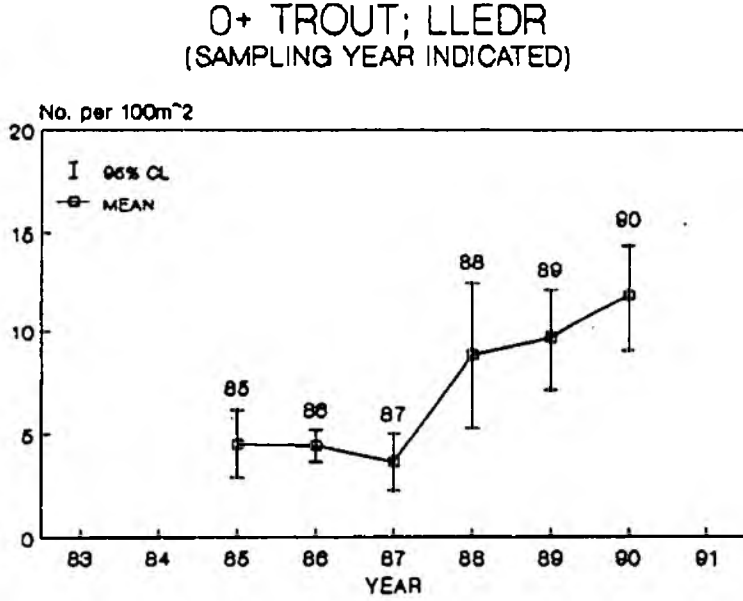
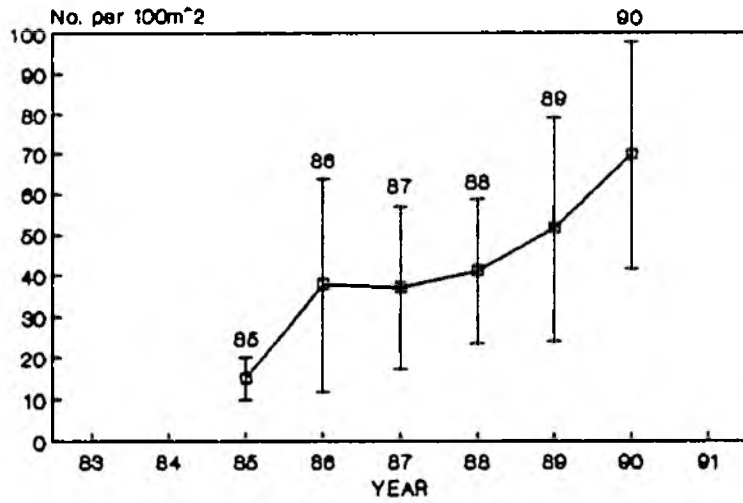
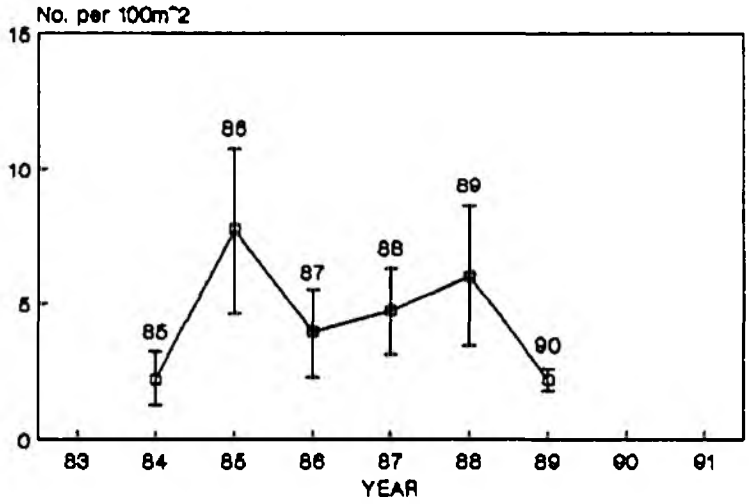


Fig.2 (Continued)





1+ TROUT; LLEDR
(SAMPLING YEAR INDICATED)



1+ SALMON; LLEDR
(SAMPLING YEAR INDICATED)

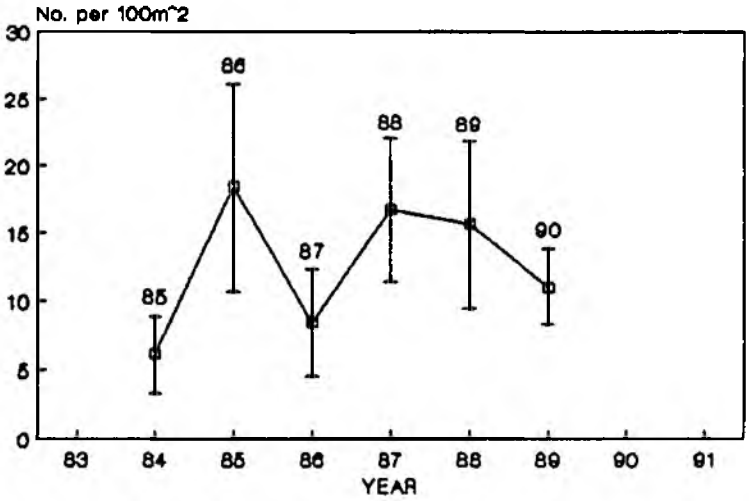
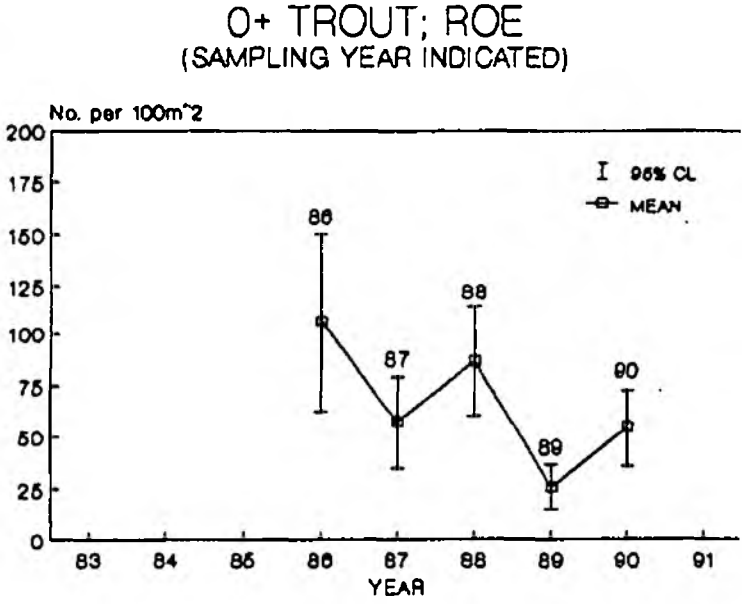
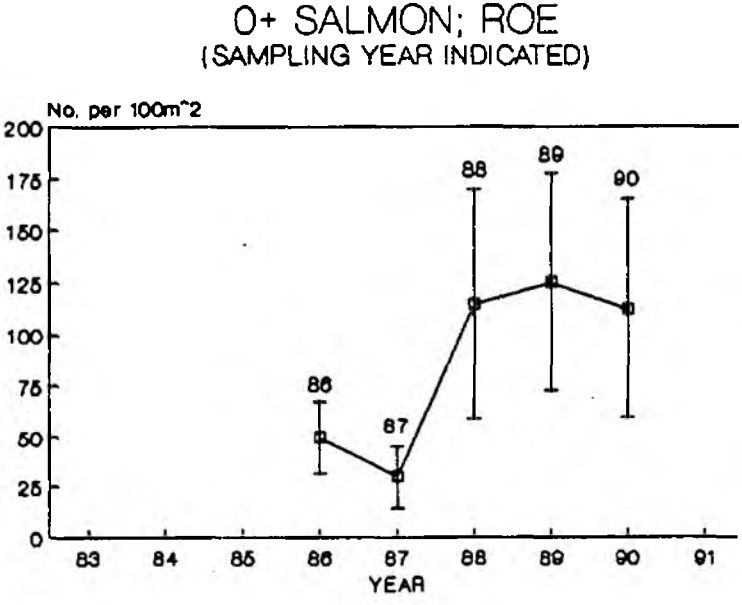
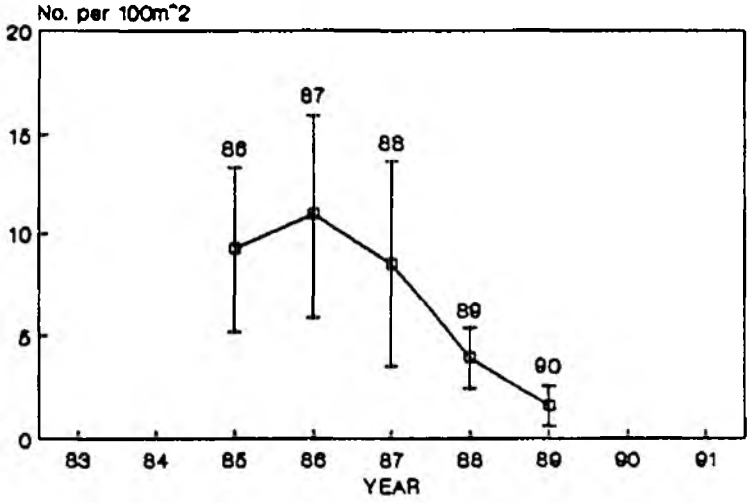


Fig.2 (Continued)





1+ TROUT; ROE
(SAMPLING YEAR INDICATED)



1+ SALMON; ROE
(SAMPLING YEAR INDICATED)

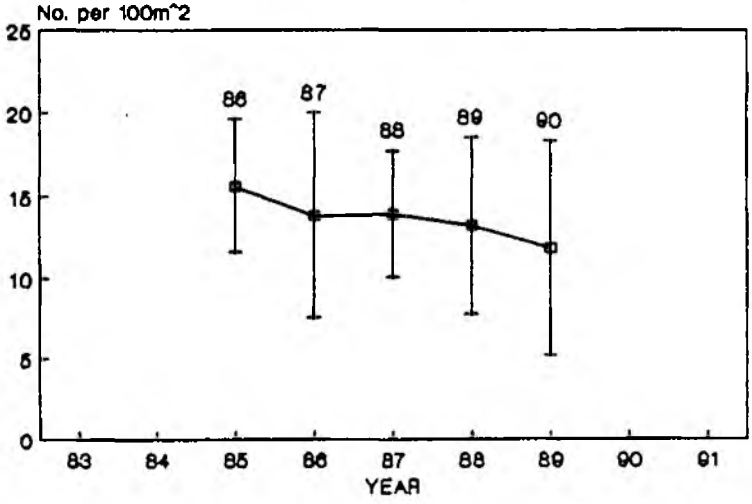
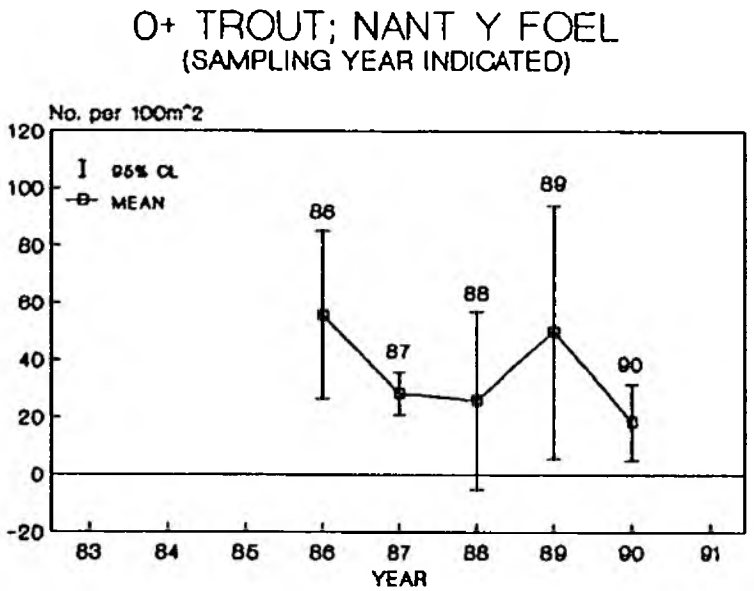


Fig.2 (Continued)



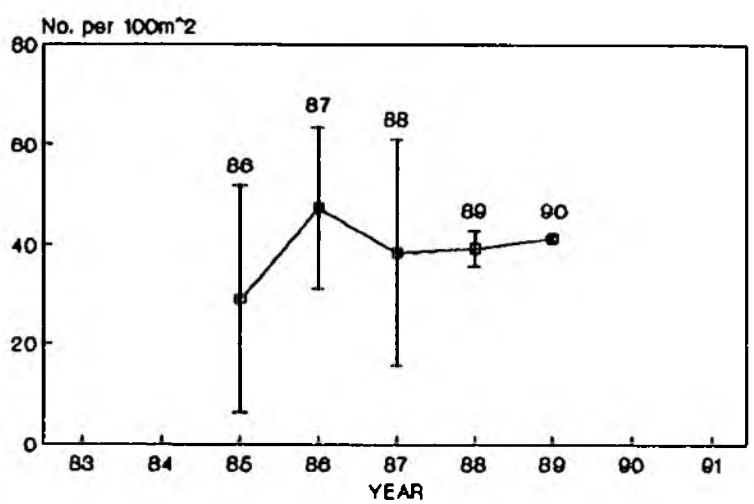
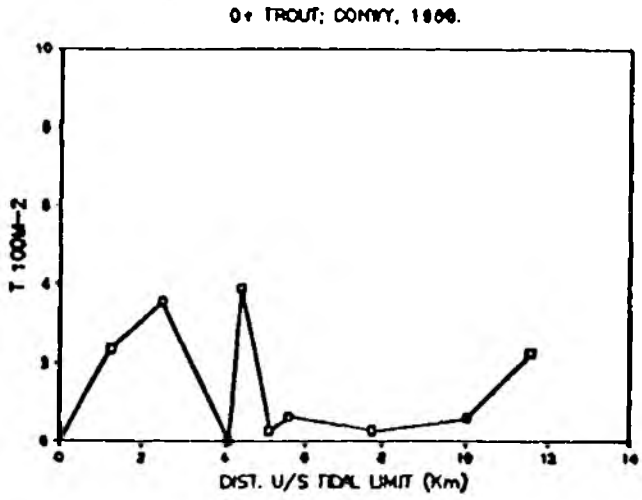
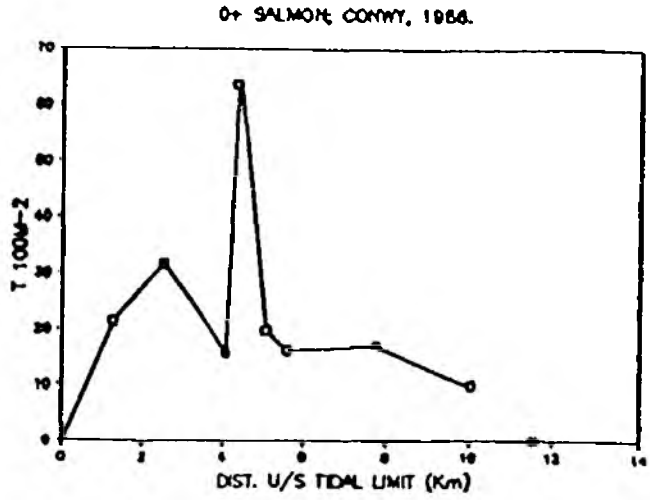
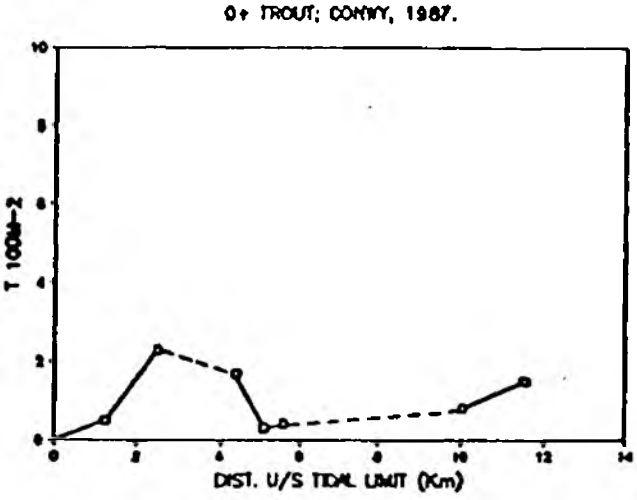
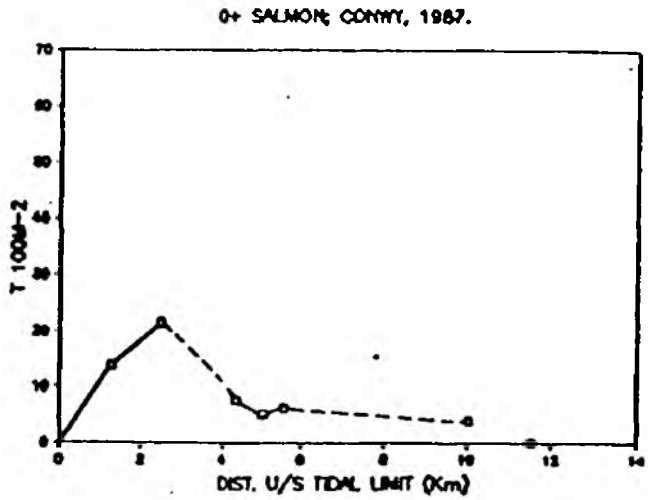


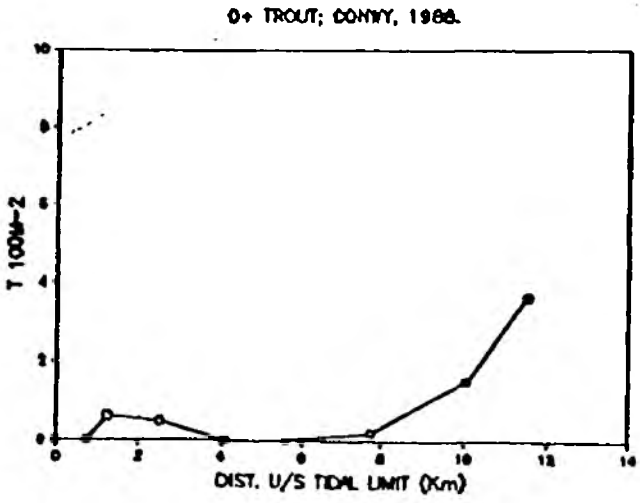
Fig.3 Variation in salmon and trout fry densities on the main river Conwy, semi-quantitative sites, 1986-1990











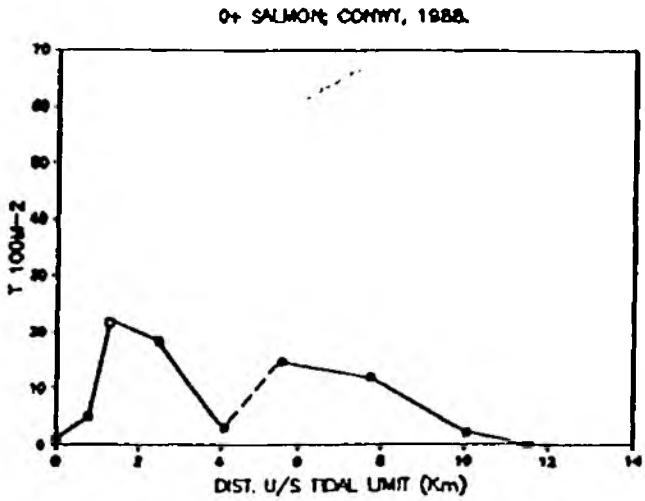


Fig.3 (Continued)

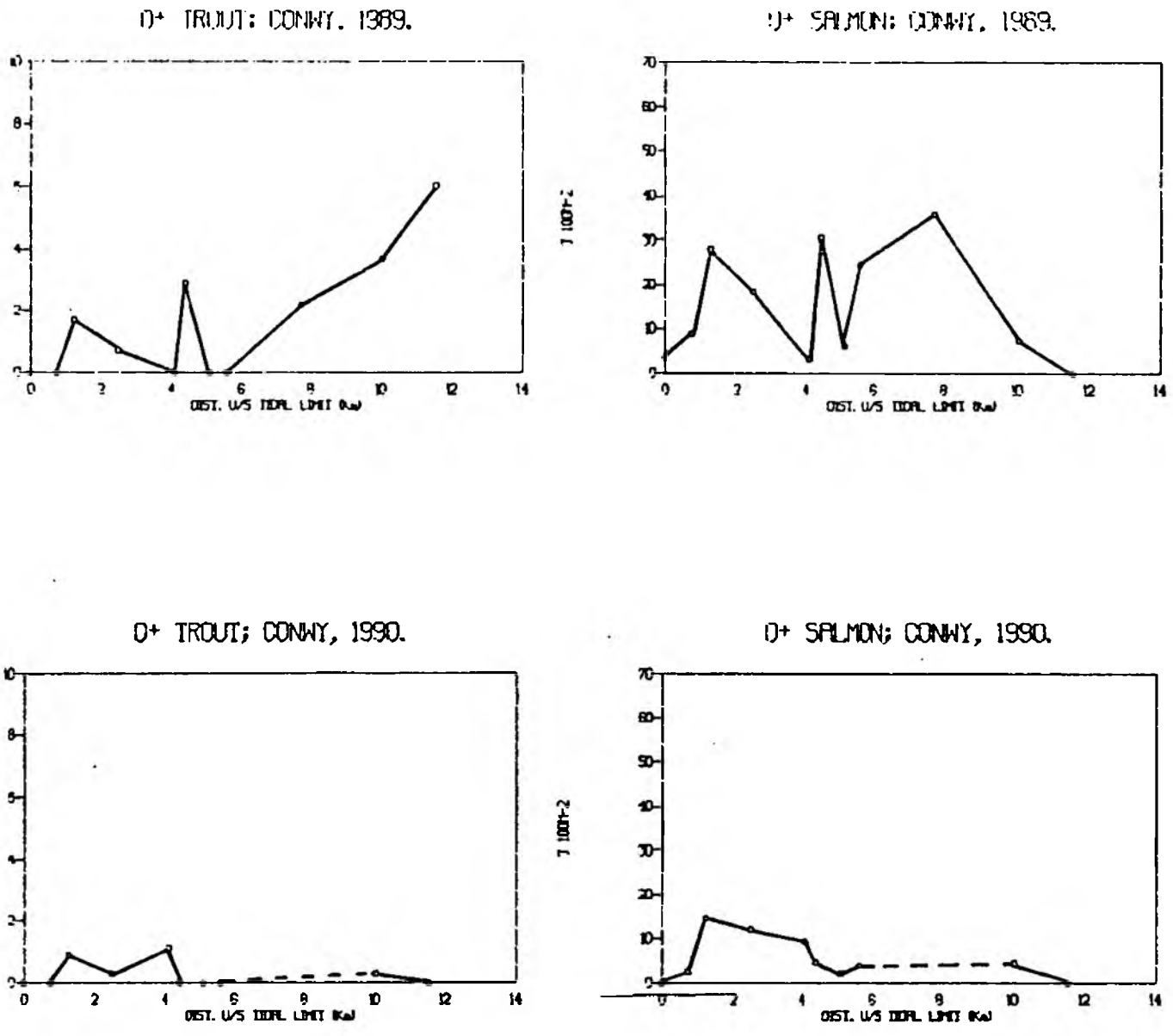
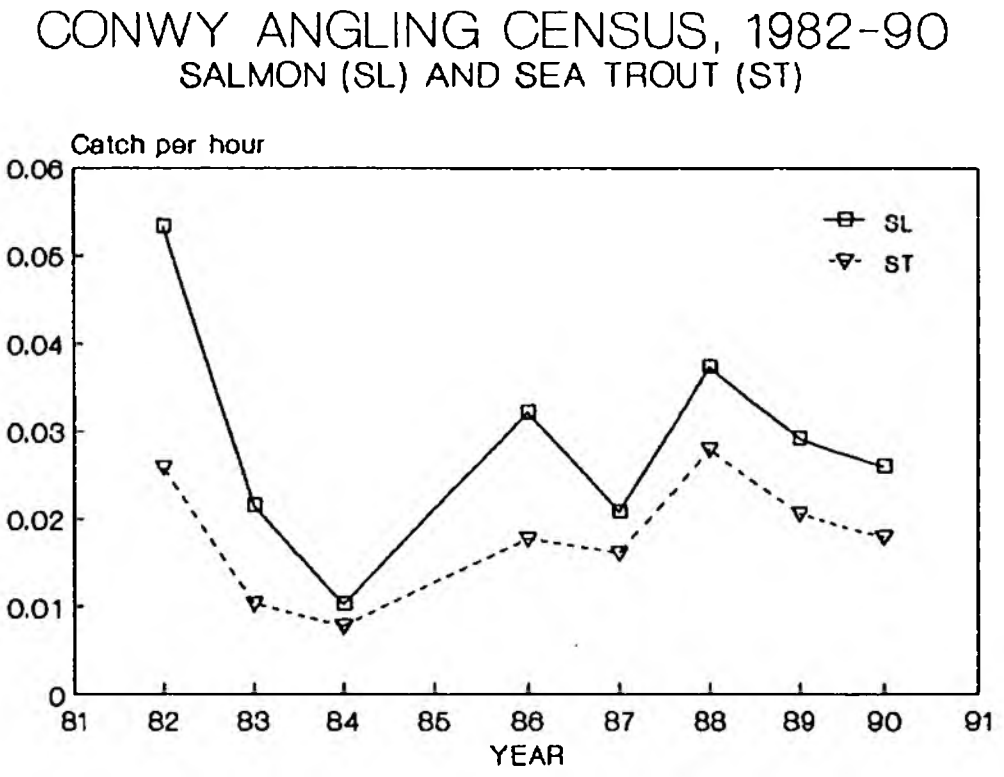


Fig.4 Annual (1982-90 and monthly (1990) variation in angling c.p.u.e. for salmon and sea trout on the Conwy



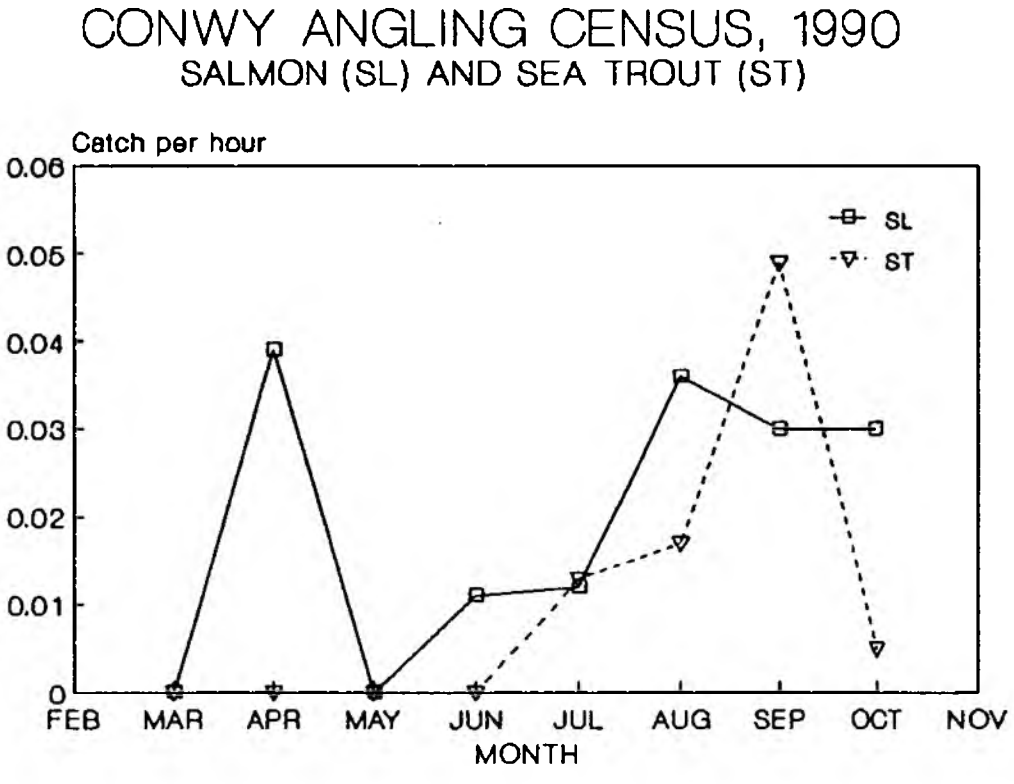
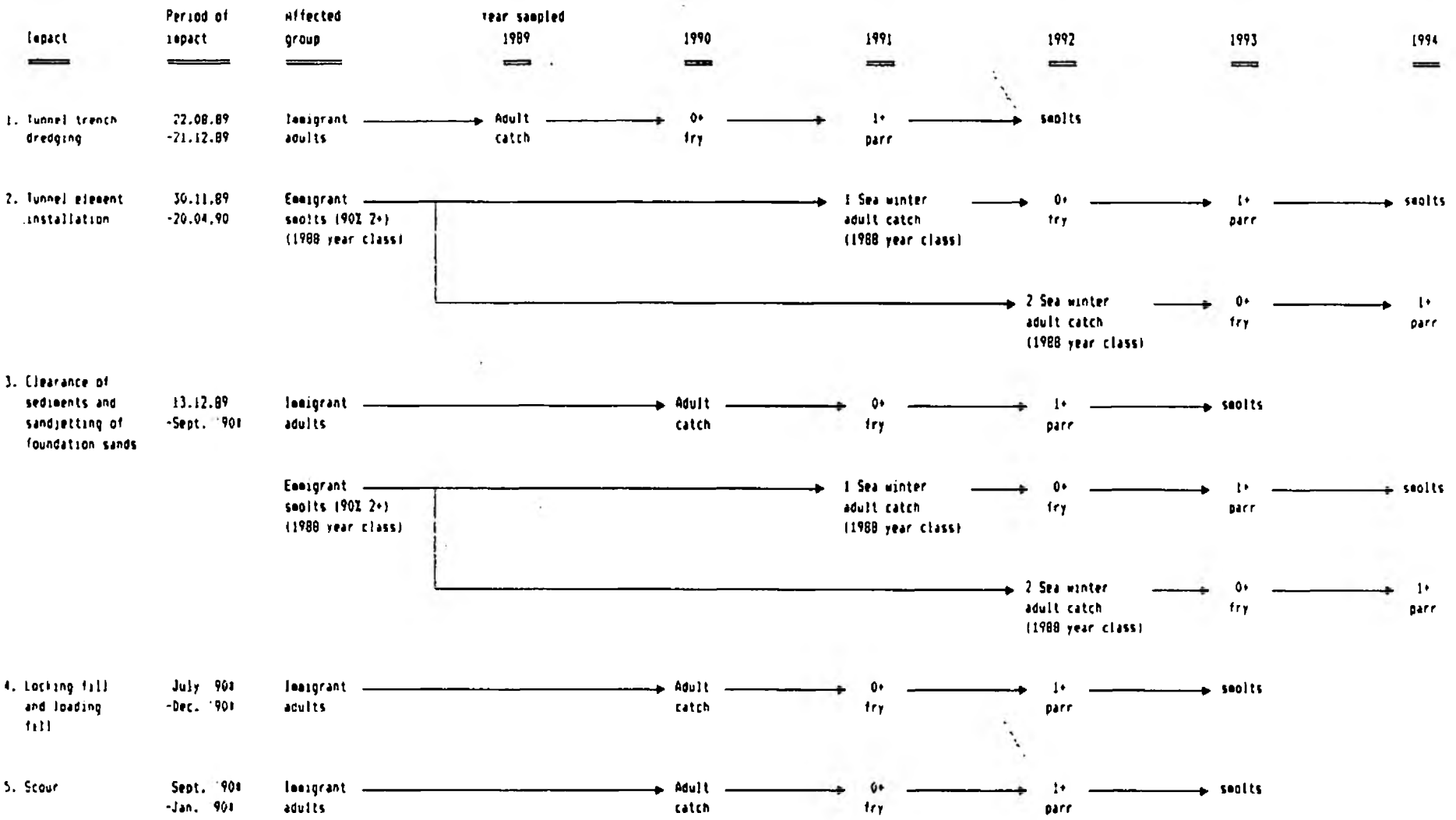


Fig. 5 The potential impact of the Conwy tunnel construction on immigrant and emigrant salmonid populations and their progeny and the sampling of the affected populations



* = projected dates

APPENDIX 1a

TROUT AND SALMON DENSITIES, QUANTITATIVE SITES; CONWY ELECTROFISHING SURVEY, 1990.

		DENSITY (N 100M-2):								DENSITY (N 100M-2):							
		0+ TROUT:		1+ TROUT:		2+ TROUT:		>2+ TROUT:		0+ SALMON:		1+ SALMON:		2+ SALMON:		>2+ SALMON:	
SITE	DATE	Xi	95%CL	Xi	95%CL	Xi	95%CL	Xi	95%CL	Xi	95%CL	Xi	95%CL	Xi	95%CL	Xi	95%CL
NG1	05.09.90	9.5	.00	.0	_	.0	_	.0	_	26.0	.00	2.2	.00	.0	_	.0	_
NG3	05.09.90	5.4	6.53	2.0	.00	1.3	.00	.0	_	25.6	9.66	3.4	.00	.0	_	.0	_
NG4	06.09.90	9.4	.00	3.0	.00	.4	.00	.0	_	11.1	.00	3.4	.00	.0	_	.0	_
NG5	07.09.90	14.1	.00	2.0	.00	.0	_	.0	_	4.7	.00	.0	_	.0	_	.0	_
NG6	07.09.90	17.1	.00	6.2	.00	.0	_	.0	_	16.3	5.09	.0	_	.0	_	.0	_
NG8	23.08.90	98.4	3.79	10.8	.00	.0	_	.0	_	.0	_	.0	_	.0	_	.0	_
NG8a	23.08.90	31.4	4.09	16.2	.00	1.0	.00	.0	_	.0	_	.0	_	.0	_	.0	_
NG8b	10.09.90	23.0	.00	17.0	.00	3.6	.00	1.2	.00	.0	_	.0	_	.0	_	.0	_
R1	14.08.90	37.6	5.65	3.7	.00	.0	_	.0	_	23.3	2.08	2.6	.00	.0	_	.0	_
R2	15.08.90	37.8	1.35	.0	_	.0	_	.0	_	52.9	3.45	6.0	.00	.0	_	.0	_
R3	16.08.90	79.0	17.06	.5	.00	.5	.00	.5	.00	171.5	40.51	17.7	15.95	.0	_	.0	_
R3a	10.09.90	29.8	2.12	1.4	.00	.0	_	.0	_	90.7	4.70	5.4	.00	.0	_	.0	_
R3b	24.08.90	82.7	19.12	2.0	.00	.0	_	.0	_	193.6	48.42	22.9	2.92	.0	_	.0	_
Ld1	07.08.90	6.9	.00	2.4	.00	.0	_	.0	_	28.0	8.29	19.5	2.09	.0	_	.0	_
Ld3	03.08.90	22.6	1.69	1.1	.00	.4	.00	.4	.00	191.7	7.81	12.6	.89	.0	_	.0	_
Ld3a	01.08.90	6.3	3.38	.3	.00	.0	_	.3	.00	93.0	11.52	4.0	.97	.0	_	.0	_
Ld4	31.07.90	8.9	.66	2.8	.00	.0	_	.0	_	39.7	10.60	1.9	.00	.0	_	.0	_
Ld5	30.07.90	7.8	.92	3.4	.00	.7	.00	.0	_	17.1	4.99	12.7	2.21	.0	_	.0	_
Ld6	30.07.90	13.3	3.81	1.7	.94	.0	_	.0	_	79.7	21.96	14.0	6.32	.0	_	.0	_
Gb1	13.08.90	20.2	.00	13.2	.00	4.4	.00	2.6	.00	5.3	.00	1.8	.00	.0	_	.0	_
NFa	08.08.90	3.9	.00	44.7	.00	9.2	.00	.0	_	.0	_	.0	_	.0	_	.0	_
NF1	08.08.90	29.3	.00	40.0	.00	8.0	.00	.0	_	.0	_	.0	_	.0	_	.0	_
NF3	09.08.90	20.8	21.22	40.0	1.91	2.5	.00	.0	_	.0	_	.0	_	.0	_	.0	_

APPENDIX 1b

TROUT AND SALMON DENSITIES. SEMI-QUANTITATIVE SITES;

CONWY ELECTROFISHING SURVEY. 1990.

TOTAL CATCH (T) 100M-2:

SITE	DATE	TROUT: 0+	TROUT: >0+	SALMON: 0+	SALMON: >0+
Cy1	04.09.90	.3	.4	12.1	.1
Cy3	04.09.90	.3	.0	4.5	1.1
Lg1	07.08.90	.2	.0	4.4	2.6
Lg2	26.07.90	11.4	1.0	19.2	3.2
Gy1	17.08.90	44.3	21.4	.0	.0
Gy2	17.08.90	3.0	.0	.0	.0
ND1	17.08.90	53.9	20.8	.0	.0
Du1	22.08.90	10.6	14.7	22.9	4.7
Cf1	22.08.90	1.7	2.1	12.5	2.9

APPPENDIX Ic

0+ TROUT AND SALMON DENSITIES, SEMI-QUANTIATIVE FRY SITES;

CONWY ELECTROFISHING SURVEY, 1990.

TOTAL CATCH (T) 100M-2:

SITE	DATE	0+ TROUT	0+ SALMON
Cy(i)	19.10.90	.0	.0
Cy(ii)	28.08.90	.0	2.6
Cya	28.08.90	.9	14.6
Cy2a	13.08.90	1.1	9.4
Cy2b	22.10.90	.0	4.6
Cy2c	22.10.90	.0	2.3
Cy2d	22.10.90	.0	3.9
Cy2e	NOT FISHED		
Cy3a	19.10.90	.0	.0

APPENDIX 1d

TROUT AND SALMON DENSITIES, SEMI-QUANTITATIVE SITES;

UPPER CONWY ELECTROFISHING SURVEY, 1990.

TOTAL CATCH (T) 100M-2:

SITE	DATE	TROUT: 0+	TROUT: >0+	SALMON: 0+	SALMON: >0+
Cy5	3.12.90	.4	.6	1.2	1.0
Cy6	3.12.90	.0	.0	3.6	.0
Cy7	3.12.90	.0	.6	9.0	2.9
Ei1	29.11.90	.7	2.6	.7	2.6
Ei2	29.11.90	.0	3.8	.0	.0
Cl1	27.9.90	.8	1.9	.4	1.5
Cl2	27.9.90	.9	3.6	20.9	.0

Appendix 2. Within subcatchment variation in trout and salmon densities (N $100m^2$) : Conwy. 1985-1990.

a. 0+ trout

i) Nant y Goron

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	53.8	91.0	59.8	112.7	67.4	20.2	67.5
95% CL	19.30	14.55	23.43	45.91	24.42	16.78	26.20
n	6	6	6	6	6	6	36
CV	.183	.082	.200	.208	.180	.420	.198

ii) Roe

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		106.3	57.2	87.0	26.2	54.6	66.3
95% CL		43.91	22.58	27.33	10.73	18.11	26.94
n		5	5	5	5	5	25
CV		.211	.202	.160	.210	.170	.207

iii) Lledr

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	4.5	4.4	3.6	8.9	10.1	11.8	7.2
95% CL	1.64	.81	1.35	3.38	2.37	2.66	2.21
n	5	5	5	5	5	5	30
CV	.188	.095	.194	.193	.120	.120	.156

iv) Nant y Foel

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		55.7	28.4	25.8	49.8	18.5	35.6
95% CL		30.49	7.72	30.60	44.46	14.23	28.65
n		3	3	3	3	3	15
CV		.279	.139	.606	.460	.390	.410

Appendix 2 continued :

b. 1+ trout

i) Nant y Goron

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	5.9	17.0	10.1	7.2	11.1	3.6	9.1
95% CL	4.09	7.79	4.65	5.04	5.33	1.90	5.38
n	6	6	6	6	6	6	36
CV	.357	.234	.234	.357	.250	.270	.300

ii) Roe

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		9.3	10.9	8.6	4.0	1.6	6.9
95% CL		4.2	5.07	5.06	1.37	.99	4.24
n		5	5	5	5	5	25
CV		.231	.236	.300	.180	.320	.315

iii) Lledr

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	2.2	7.7	3.9	4.7	6.2	2.2	4.5
95% CL	.91	3.03	1.53	1.54	2.46	.41	2.00
n	5	5	5	5	5	5	30
CV	.211	.202	.200	.167	.200	.100	.227

iv) Nant y Foel

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		29.0	47.4	38.4	39.4	41.3	39.1
95% CL		23.43	17.05	23.63	3.94	3.89	21.82
n		3	3	3	3	3	15
CV		.412	.183	.314	.050	.050	.285

Appendix 2 continued :

c. 0+ salmon

i) Nant y Goron

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	34.6	94.8	45.6	66.3	35.9	15.4	48.8
95% CL	30.44	25.9	23.59	24.33	17.63	5.47	22.68
n	5	5	5	5	5	5	30
CV	.449	.139	.264	.187	.250	.180	.237

ii) Roe

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		49.7	29.9	114.7	125.5	112.1	86.4
95% CL		17.27	15.06	55.22	52.50	52.02	42.51
n		5	5	5	5	5	25
CV		.177	.257	.246	.210	.240	.251

iii) Lledr

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	14.8	37.8	37.0	41.0	51.5	69.6	42.0
95% CL	5.23	26.45	20.37	17.78	27.58	28.13	22.40
n	5	5	5	5	5	5	30
CV	.180	.357	.281	.221	.270	.210	.272

Appendix 2 continued :

c. 1+ salmon

i) Nant y Goron

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	4.2	12.0	18.1	8.0	10.5	2.0	9.1
95% CL	1.99	7.12	8.26	2.70	3.74	1.36	5.28
n	5	5	5	5	5	5	30
CV	.240	.304	.233	.173	.180	.350	.295

ii) Roe

	1985	1986	1987	1988	1989	1990	TOTAL
Mean		15.6	13.8	13.9	13.2	11.8	13.6
95% CL		3.79	6.04	3.66	5.32	6.45	5.79
n		5	5	5	5	5	25
CV		.124	.223	.135	.210	.280	.216

iii) Lledr

	1985	1986	1987	1988	1989	1990	TOTAL
Mean	6.1	18.4	8.4	16.7	15.6	11.0	12.7
95% CL	2.67	7.90	3.93	5.19	6.05	2.74	5.45
n	5	5	5	5	5	5	30
CV	.223	.219	.240	.158	.200	.130	.219

NB. All estimates are based on the following groups of sites only:
Nant y Goron: Ng1, Ng3, Ng4, Ng5, Ng6, Ng8 (site Ng8 included for trout only)
Roe: R1, R2, R3, R3a, R3b
Lledr: Ld1, Ld3, Ld4, Ld5, Ld6
Nant y Foel: NFa, NF1, NF3.

APPENDIX 3 - CONWY STOCKING PROGRAMME 1990

Salmonid Fry

A. UPPER CONWY

1. Main River Conwy		Salmon	Sea Trout
a) Iwrch confluence (SH 828 524) to Tai Duon (SH 838 516)			
Date:	17.4.90	8,346	0
	17.5.90	0	4,000
b) Merddwr confluence (SH 856 512) to Ysbyty Ifan Bridge (SH 842 488)			
Date:	23.4.90	38,071	0
	23.5.90	0	8,202
2. Merddwr			
a) Conwy confluence (SH 856 512) to Cadnant confluence (SH 863 513)			
Date:	23.4.90	7,529	0
	21.5.90	0	3,000
	22.5.90	0	1,000
b) Cadnant confluence (SH 862 513) to Nant y Creau tributary (SH 879 513)			
Date:	23.4.90	10,118	0
	21.5.90	0	6,000
3. Nug and Twllan			
a) u/s Merddwr confluence (SH 892 509 - SH 989 525)			
Date:	23.4.90	2,000	0
	6.5.90	990	0
	17.5.90	0	2,000
4. Eidda			
a) Conwy confluence (SH 839 515) to Pont Eidda (SH 835 504)			
Date:	6.5.90	3,000	0
	17.5.90	0	922
5. Caletwr			
a) u/s Pon Caletwr (SH 858 492)			
Date:	23.4.90	3,000	0

B. LOWER CONWY

1. Main River Lledr

a) (SH 737 523)		
Date: 21.5.90	2,378	0
b) (SH 789 538)		
Date: 21.5.90	2,000	0
c) (SH 697 542)		
Date: 21.5.90	1,000	0
d) SH 715 516)		
Date: 23.5.90	0	1,500
e) SH 745 527		
Date: 23.5.90	0	1,000
f) (SH 775 537)		
Date: 23.5.90	0	1,000

2. Lledr Tributaries

a) Afon Diwaunedd (SH 685 535)		
Date: 17.4.90	7,423	0
b) Afon Ystymiau (SH 733 544)		
Date: 21.5.90	3,000	0
c) Afon Gwybernant (SH 779 534)		
Date: 23.4.90	1,871	0

3. Oaklands Stream

a) (SH 807 586)		
Date: 5.5.90	1,000	0
17.5.90	0	1,000

4. b) Bodnant (Hiraethlin)

a) Date: 5.5.90	3,971	0
21.5.90	0	2,000

APPENDIX 4

a. SCALE SAMPLING EFFICIENCY FOR SALMON AND SEA TROUT ON THE CONWY (AS A PERCENTAGE OF THE DECLARED ANNUAL ROD CATCH), 1978-89.

	SALMON:			SEA TROUT:		
YEAR	TOTAL ROD CATCH	SCALE SAMPLE	PERCENT CATCH	TOTAL ROD CATCH	SCALE SAMPLE	PERCENT CATCH
1978	502	271	54.0	266	0	.0
1979	266	104	39.1	475	30	6.3
1980	380	146	38.4	496	40	8.1
1981	405	170	42.0	411	10	2.4
1982	401	140	34.9	323	21	6.5
1983	478	112	23.4	422	16	3.8
1984	272	14	5.2	230	0	.0
1985	401	136	33.9	390	30	7.7
1986	472	81	17.2	608	6	1.0
1987	413	113	27.4	794	135	17.0
1988	733	69	9.4	479	42	8.8
1989	342	34	9.9	224	68	30.4
TOTALS	5065	1390	27.4	5118	398	7.8

b. SCALE SAMPLING EFFICIENCY FOR SALMON AND SEA TROUT ON THE CONWY (AS A PERCENTAGE OF THE DECLARED ANNUAL NET CATCH), 1978-89.

	SALMON:			SEA TROUT:		
YEAR	TOTAL NET CATCH	SCALE SAMPLE	PERCENT CATCH	TOTAL NET CATCH	SCALE SAMPLE	PERCENT CATCH
1978	61	0	.0	21	0	.0
1979	60	0	.0	53	0	.0
1980	91	0	.0	93	0	.0
1981	112	1	.9	58	1	1.7
1982	161	0	.0	85	1	1.2
1983	336	0	.0	119	0	.0
1984	253	1	.4	212	1	.5
1985	106	0	.0	61	2	3.3
1986	148	11	7.4	76	5	6.6
1987	95	6	6.4	113	22	19.5
1988	146	10	6.9	109	22	20.2
1989	186	11	5.9	69	13	18.8
TOTALS	1755	40	2.3	1069	67	6.3

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