IONTAOBHAS TAIGHDE BRADAN na h-EIREANN

IONCORPORTHA

(The Salmon Research Trust of Ireland Incorporated)

Sponsored by Arthur Guinness & Sons P.L.C.

and the Minister for Fisheries & Forestry.

ANNUAL REPORT

No. XXVIII

Report for the year ended 31st December, 1983

COMMITTEE OF MANAGEMENT

[illegible]

(Chairman)

W. M. Hutson

Dr. I. R. Moore

(as Nominee of the Chairman of Arthur Guinness & Sons, P.L.C.)

J. Power

Miss [illegible] Twomey

(as Nominees of the Minister for Fisheries and Forestry)

Prof. Maire Mulcahy

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(Elective Members)

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J. Diffley	Beltra Co-operative Society,
E. Kilroy	Estuary Netsman
M. Maguire	Newport Anglers' Club
F. Mumford-Smith	Newport House Hotel
P. Quinn	Clew Bay Oyster Co-operative Society
P. Sweeney	Commercial Fishing and Chandlery

STAFF

D. J. Piggins, Ph.D., B.Sc.	Director
T. F. Cross, Ph.D., B.Sc.	Assistant Director
C.P.R. Mills, M.Sc., B.Sc.	Biologist
Miss G. O'Donnell, B.Sc.	Temporary Biologist
D. T. Quigley, B.Sc.	Technician/Junior Biologist
Mrs. L. A. Mills, B.Sc.	Administrative Assistant

A. Nixon	Field Assistant (Foreman)
T. Lavelle	Field Assistant
P.J. Bryce	Field Assistant
T. Keane	Field Assistant
R. G. Mallet, F.C.A., F.C.I.S.	Secretary
C. J. McGrath, B.E., A.M.I.C.E.I.	Consultant Engineer

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REPORT FOR THE YEAR ENDING 31st DECEMBER, 1983

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GLOSSARY

The Annual Report was prepared as follows:-

DJP : Section A1-5 & 7.

TFC : Section E.

CPRM: Section B2 & 5, C1, 2, & 3(iv), Section D.

DTQ : Section A6 B1,3-8, C3(i)-(iii) & 4.

Thanks are due to Lesley Mills, Gerard Rogan and Gearoid Henry for collating data.

SECTION A: GENERAL

1. Committee of Management.

The composition of the Committee of Management (Chairman: Dr.T.K. Whitaker) remained unchanged during 1983.

2. Consultative Committee.

The Committee membership remained unchanged in 1983, with the exception that [illegible]chard Mears attended the meeting on [illegible]t 19, representing Newport Anglers' Club, in place of Mr. Martin Maguire. Subjects discussed included the excellent catches of spring fish in Lough Beltra, the use of monofilament netting, the exploitation of grilse stocks by drift nets and the progress of oyster rehabilitation work in Clew Bay.

3. Personnel.

Miss Geraldine O'Donnell resigned with effect from February 5 to take up a post as Pollution Control Officer for Waterford Town Council and was not replaced. Ms. Teresa Maguire worked as Temporary Laboratory Assistant from April 11 to September 3, when she resigned to begin an M.Sc. course. Mr. Gerard Rogan was appointed to the post, with effect from September 5. Mr. Declan Quigley was appointed Junior Biologist with effect from August 29.

Dr. T. F. Cross (Assistant Director) resigned with effect from September 30 to take up a post as College Lecturer at University College, Cork. This vacancy remained unfilled in 1983, pending clarification of future funding levels. Mr. Declan Quigley now occupies the Salmon Leap bungalow and has taken on the additional responsibility of attending to the upstream and downstream traps.

Four students (Jane Dorman, Shaun Leonard, Alan Drumm and Gerard Rogan) were employed as Temporary Scientific Assistants during the summer period.

summer water temperatures were the highest experienced to date, in that over a period of almost 8 weeks the midnight temperature was higher than 18°C, reaching 23°C in mid-July (see Figure 1).

Table 1. Monthly rainfall totals (mm) and annual totals (mm) for 1971-83.

January	204.2		1971	1174.3	46.2"
February	84.7		72	1275.4	50.2
March	201.4		73	1468.7	57.8
April	93.1		74	1573.2	61.9
May	90.8		75	1299.6	51.2
June	43.3		76	1266.7	49.8
July	41.4	129.5	77	1579.7	62.2
August	44.8		78	1592.2	62.7
September	176.0		79	1653.3	65.1
October	260.3		80	1792.1	70.6
November	82.4		81	1646.8	64.8
December	173.5		82	1609.6	63.4
Total	1495.9 (58.9")		83	1495.9	58.9
			Average	1494.4	58.8

6. pH of rainfall and Mill Race water.

In view of recent publicity on acid rainfall and its effects on freshwater bodies in northern Europe and America, it was decided to monitor the pH of both the rainfall and the Mill Race water supply.

The monitoring programme began in November, 1982 (see *Ann. Rep. XXVII*) and since then, samples have been analysed on a regular basis. Details of pH measurements during 1983 are shown in Table 2.

Table 2. pH of rainfall and Mill Race water.

	Rainfall			Mill Race		
Month	Max	Min	Mean	Max	Min	Mean
January	6.65	6.00	6.39	6.72	6.25	6.51
February	7.10	5.60	6.46	6.88	6.30	6.49
March	6.82	5.88	6.23	7.00	6.20	6.63
April	6.65	5.80	6.33	7.30	6.50	6.85
May	6.36	5.75	6.00	7.80	6.30	6.74
June	6.80	5.70	6.28	7.00	6.10	6.69
July	7.20	6.00	6.58	7.20	6.50	6.86
August	6.40	5.90	6.10	7.10	6.70	6.87
September	7.05	6.20	6.65	7.65	6.52	6.97
October	7.10	6.42	6.82	7.15	6.95	7.06
November	6.85	6.69	6.81	7.30	6.35	7.03
December	6.80	6.25	6.62	7.45	6.60	7.07
			6.44			6.81

7. Visits and communications.

Dr. Cross attended a meeting of the Population Genetics Group held in Birmingham in January and a meeting of the Irish Geneticists Group in Cork in March, where he presented a paper on sea trout migratory behaviour. He also attended a seminar arranged by the South Western Regional Fisheries Board in Kenmare and read a paper on the status of salmon stocks.

Mr. Mills attended angling promotions organised by Bord Failte in Northern Ireland (March) and in England (September), where literature and presentations advertising Burrishoole Fishery were displayed. He also attended the SWRFB Seminar in Kenmare, noted above.

The Director prepared a paper for a hearing of the European Parliament, on "Conservation of the Atlantic salmon", held in Brussels during June. The paper was presented by Dr. Cross.

Dr. Cross wrote an article for the Salmon and Trout Magazine (Vol.226,

pp65-67) entitled "How genetics help solve problems of salmon biology".

The Director has joined the Scientific Advisory Panel of the Atlantic Salmon Trust.

SECTION B: SALMONID REARING

1. FISH REARED FROM GRILSE OVA

Three groups of fish were reared in 1983:-

Table 3 . Grilse ova hatched in 1981.

Original stock of eyed ova (1981)	:	43,366
No. of 0+ parr (December, 1981)	:	24,949 (57.5% survival
No. of 1+ smolts produced	:	16,490 (66% of populati
No. smolts sold (1982)	:	8,476
No. of 1+ smolts released (1982)	:	8,014
No. of 1+ parr (December, 1982)	:	5,061
No. of 2+ smolts released (1983)	:	4,864

Table 4 . Grilse ova hatched in 1982.

Original stock of eyed ova (1982)	:	50,040
No. of 0+ parr (December, 1982)	:	32,608 (65.2% survival
No. of 1+ smolts produced	:	15,331 (47% of popul
No. of 1+ pre-smolts sold (1983)	:	11,239
No. of 1+ smolts released (1983	:	4,092
No. of 1+ parr sold (1983)	:	16,292

Table 5 . Grilse ova hatched in 1983.

Original stock of eyed ova (1983)	:	59,990
No. of 0+ parr (December, 1983)	:	36,746 (61.3% survi

2. GRILSE OVA LAID DOWN IN 1983

Collection of grilse broodstock commenced on October 8. All fish were transported from the Salmon Leap or Mill Race traps to the broodstock holding raceways at Treanlaur. Thirty nine male and three female grilse died after jumping out of the raceway through a hole which had formed in the covering screen during a 24 hour period. A further three fish (2 males and 1 female) died after stripping. Four male fish were released early after developing fungal infections and by mid-January, at the end of stripping, most males were infected.

A total of 104 females and 85 males were used in hatchery operations. Fish were anaesthetised before stripping and a sample was weighed and measured. In 1983, the actual condition factor of the female broodstock averaged 1.00, compared with 1.03 in 1982 and 1.05 in 1981 (1.00 = standard factor). Using volumetric estimates, there were 376,007 ova at the fertilised egg stage and this figure will be checked by actual counts at the eyed egg stage. Stripping commenced on December 1, and only 56% of all females had been stripped by the end of this month. Their gonadal maturation may have been retarded by the higher than average water temperatures recorded during November and December. All kelts were tested with the coded-wire tag detector and then released directly into Lough Furnace.

Table 6 . Grilse fecundity values (as green eggs).

No. of females	:	104
Vol. of ova produced	:	71.79 litres
No. of ova produced	:	376,007
No. of ova per fish	:	3,615
No. of ova per litre	:	5,238
Av. weight of female fish	:	2.42 kg
No. of ova per kg weight	:	1,494

3. FISH REARED FROM TWO-SEA-WINTER FISH OVA.

Two groups of fish were reared in 1983:-

Table 7 Two-sea-winter fish ova hatched in 1981.

Original stock of eyed ova (1981)	:	20, 676
No. of 0+ parr (December, 1981)	:	9,984 (48.3% survival)
No. of 1+ pre-smolts sold (1982)	:	1,523
No. of 1+ smolts released (1982)	:	2,942
Proportion of 1+ smolts produced 82/83	:	4,465 (44.7%)
No. of 1+ parr (December, 1982)	:	2,764
No. of 2+ smolts released (1983)	:	2,730

Table 8 . Two-sea-winter fish ova hatched in 1982.

Original stock of eyed ova (1982)	:	20,000
No. of 0+ parr (December, 1982)	:	11,747 (58.7% survival)
No. of 1+ smolts released (1983)	:	3,228 (27.5% of 1+ population
No. of 1+ parr (December, 1983)	:	7,813

No two-sea-winter fish ova were laid down in 1983.

4. FISH REARED FROM SEA TROUT OVA.

Two groups of fish were reared in 1983:-

Table 9 . Sea trout ova hatched in 1982.

	Burrishoole	Connemara
Original stock of eyed ova (1982)	9,005	21,150
No. of 0+ fish (December, 1982)	992 (11%)	4,554 (21.5%
No. of 1+ smolts released (1983)	42	1,259
No. of 1+ fish (December, 1983)	61	2,735

A total of 1,301 1+ smolts was released in late April, 1983. The remaining 1+ fish (4,053) were divided between a pond in Furnace (2,090) and a cage in L. Furnace (1,963) in early July, 1983. These fish will be reared to the 2+ smolt stage in 1984.

Table 10 . Sea trout ova hatched in 1983.

Original stock of eyed ova (1983)	:	23,813
No. of 0+ fish (December, 1983)	:	35 (0.15% survival)

A major mortality took place at the mid-alevin stage. No causative organism was i lated and it seems that the problem may be congenital. Mortalities continued through the "first-feeding fry" stage.

5. SEA TROUT OVA LAID DOWN IN 1983.

Sea trout ova were obtained from three sources in 1983:-

Approximately 10,000 sea trout ova were collected from Waterville stock by the South Western Regional Fishery Board. These ova were incubated

in the Sheen Falls hatchery to the eyed egg stage before being transported by rail to the Salmon Research Trust Furnace hatchery on December 20. 9,708 eggs were counted on arrival and hatching commenced three days later.

After disease-free certification of the broodstock and acquisition of an licence, a consignment of 18,081 eyed sea trout eggs were collected from the Welsh Water Authority. These eggs were derived from just three female sea trout (weights: 3.4; 3.6; 5.6 kgs), trapped on the River Dwyfwir in Gwynedd. 5,160 of these eggs were laid down at the Treanlaur hatchery, the remaining 12,921 at the Furnace hatchery.

Lastly, a small number of both wild and reared/ranched Burrishoole sea trout were stripped. 2,852 of the ova obtained were laid down at the Furnace hatchery and 2,655 at the Treanlaur hatchery.

Table 11 . Burrishoole sea trout fecundity values (green eggs).

No. of female fish	:	6
Vol. of ova produced	:	0.92 litres
No. of ova produced	:	5,507
No. of ova per female	:	918
No. of ova per litre	:	5,986

These values reflect the larger size of the ova and females in 1983, compared with mean values of 799 ova per female and 7272 ova/litre for the years 1980-82 inc.

The survival rates of eggs derived from Burrishoole and Connemara stocks of sea trout havebeen very low in recent years. By utilising different stocks (Welsh, Waterville and Burrishoole), rearing at two separate hatcheries (Furnace and Treanlaur) and experimenting with rearing methods, it is hoped to determine the cause of earlier losses.

6. FISH REARED FROM BROWN TROUT OVA.

Table 12 . Brown trout ova hatched in 1983.

Original stock of eyed ova (1983)	:	2,087
No. of 0+ fish (December, 1983)	:	301 (14.4% survival)

High mortalities also occurred amongst the brown trout at the mid-alevin stage. As with the sea trout, no causative agent was isolated.

7. DETAILS OF SMOLT RELEASES IN 1983.

Table 13.

Group:	A	B	C	D	E	F	G
Parentage	2SW	G	G	2SW	G	G	ST
Age	1+	1+	1+		2+	2+	1+
Date released	May 19	May 19	May 19	May 2	May 2	May 2	April 20
No. released	3228	1917	2175	2730	2672	2192	1301
Av. length (cm)	15.4	14.6	14.6	18.6	18.7	18.8	16.8
Av. weight (g)	37.5	32.6	32.6	81.1	82.7	93.3	64.5
Av. C.F.	1.02	1.05	1.05	1.32	1.30	1.41	1.36
Microtagged	yes	yes	yes	yes	yes	yes	no
Adipose finclip	yes	yes	yes	yes	yes	yes	yes
Other marks	panjet left pelvic	panjet left pectoral	brand "U"	brand "X"	panjet caudal pedumcle	panjet left anal	Carlin tag

All smolts were given a 5-day prophylactic treatment with "Flumequil" prior to release. Group F were also morpholine-imprinted before their release.

Totals of smolts released

1+ 2SW	:	3228	2+ 2SW	:	2730
1+ G	:	4092	2+ G		4864
		7320		:	7594
Overall	:	14,914			

8. INVESTIGATIONS OF MORTALITIES AND THERAPEUTIC TREATMENTS.

Despite the low water conditions and high water temperatures (23°C in July) during the summer of 1983, mortalities among juvenile salmonids were generally lower than in 1982.

(i) Salmon

a) 1+ and 2+ smolts released in May, 1983.

In contrast to 1982, no outbreaks of furunculosis were detected among the 1+ or 2+ smolt populations between January and May. In addition, *Papilloma* infections were not evident. However, small losses occurred due to *Saprolegnia* infections of both pectoral and caudal fins. The majority of those fish affected by *Saprolegnia* were sexually precocious males. Regular flush treatments with Malachite Green combined with the culling of infected fish, were successful in controlling the spread of fungal infections.

b) 1+ parr.

No serious mortalities were experienced among the 1+ parr populations during the spring or early summer. Low level losses were attributable to *Saprolegnia* infections as described above. Parasitic infestations with *Costia* and *Trichodina* during May necessitated several treatments with formalin (165 ppm) but very few losses occurred.

It would appear that the combined stress of low water levels and high water temperatures in July and August contributed to the repeated outbreaks of furunculosis experienced at this time. The strain of *Aeromonas salmonicida* isolated was sensitive to "Flumequil". The relatively mild weather conditions in December coincided with a further outbreak of furunculosis but the overall mortalities were lower than in 1982.

c) Fry.

No serious mortalities were experienced with salmon fry either at hatching or at first feeding and mortalities remained at a low level throughout the year.

However, some losses occurred in May as a result of parasitic infestation of the gills with *Costia* and *Trichodina*. Regular bath treatments with salt (1%) and formalin (100 ppm) were successful in controlling these parasites.

A minor outbreak of myxobacterial gill disease was recorded in June but losses were reduced with repeated bath treatments with "Furanace" (1 ppm). Losses for the remainder of the year were due primarily to myxobacterial tail rot. A reduction in pond densities combined with good hygiene practice helped control these infections.

Table 14 summarises the main disease problems affecting juvenile salmon during 1983.

Table 14. Summary of main disease problems affecting juvenile salmon during 1983.

Month	Hatchery fry	0+ fish*	1+ fish	2+ fish
January			*Saprolegnia*	*Saprolegnia*
February			*Saprolegnia*	*Saprolegnia*
March			*Saprolegnia*	*Saprolegnia*
April			*Saprolegnia*	*Saprolegnia*
May	*Costia*		*Costia*	
	Trichodina		*Trichodina*	
June	Myxobacterial		-	
	Gill disease			
July	*Costia*		Furunculosis	
	Trichodina			
August		-	Furunculosis	
September		-	-	
October		Myxobacterial	-	
		tail rot		
November		Myxobacterial	-	
		tail rot		
December		Myxobacterial	Furunculosis	
		tail rot		

* Hatchery fry moved to outdoor ponds in late July.

(ii) Sea trout.

a) 1+ Burrishoole and Connemara sea trout smolts released in 198 .

No serious losses were experienced with the 1+ sea trout smolt population between January and April.

b) 1+ sea trout.

The low water levels and high water temperatures experienced in July and August probably contributed to the serious outbreaks of furunculosis that began at this time among the 1+ sea trout parr. There were recurrent outbreak of furunculosis in both the pond and cage reared sea trout throughout the summer months and up until the end of October. The strain of *Aeromonas salmonicida* isolated was sensitive to "Flumaquil" but the sea trout were more refractive to treatment than the 1+ salmon parr. Very few losses occured in November and December.

c) Sea trout fry.

As in the past three years, heavy losses were experienced with the Burrishoole sea trout fry in 1983. High mortalitiesoccurred at the mid-alevin stage and at first feeding.

No causative organism of the heavy losses was isolated. Successive treatments with salt (1%) and "Furanace" failed to bring the mortalities under control at the fry stage. Problems were also experienced with getting the fry to accept commercial feed. Attempts were made to feed natural plankton and live *Artemia* nauplia but although the fry appeared to accept these foods, sufficient quantities could not be obtained or produced. Only 35 fish survived to the end of their first winterand it seems likely that these early mortalities in sea trout alevins are congenital in origin, since salmon alevins are unaffected under similar conditions.

6) Brown trout fry.

Similar difficulties were experienced with the brown trout as with the sea trout. Heavy mortalities occurred both at the mid-alevin and first feeding stages. No causative agent was identified and the fish failed to respond to successive bath treatments with salt (1%) and "Furanace" (1 ppm).

SECTION 2: CENSUS WORK ON FISH MOVEMENTS

1. WILD SALMON

(i) Upstream movements

a) Timing and numbers.

A total of 29 two-sea-winter fish (2SW) were counted through the upstream traps in 1983, an increase of 8 fish over the 1982 season. Two 2SW fish were counted upstream in April, 8 in May, 10 in June, 2 in July, 5 in September and one each in October and December.

The run of wild maiden grilse improved by 24% compared with 1982, but the total of 545 was still below the averages recorded for the years 1970-74 and 1975-79 (see Table). The first grilse was recorded in the traps on June 14 and reasonable numbers of grilse passed upstream during the remainder of the month and in early July. Low water levels during the remainder of July and August prevented any further upstream movement. Angling catches on L. Furnace during this period indicated that relatively large numbers of grilse were waiting for favourable conditions to migrate upstream. When water levels rose in early September, the bulk of the run (55.5%) was recorded, with only 12% of the total being counted from October 1 to December 31. 63% of the total run was counted through the Salmon Leap trap and 37% at the Mill Race, a higher than average proportion of the run using the Salmon Leap as an upstream migration route.

b) Net-marked salmon

A total of 34.6% of all wild 2SW fish were net marked, the earliest record of a net mark being in May.

Net marks were found on over 20% of all wild grilse during June and July but were rarely seen after this time. The frequency of net marks was slightly reduced at 10.9% of the total run in 1983, compared

with 13.7% in 1982. However, these frequencies are likely to be underestimates as wild fish are not handled or removed from the water when counted through the traps. In addition, no fish were available for examination in August when net-marks have been noted in other years.

Table 15 . Incidence of net-marked wild grilse in traps.

	% incidence	Marked/Total
June	25.4	18/71
July	21.4	24/112
August	-	0/0
September	5.8	18/313
October	1.9	1/52
November	-	0/7
December	-	0/5

c) Spawning escapement

The policy of not planting out ova or early feeding fry was continued in 1983. This is to allow more accurate monitoring of survival rates from naturally spawned ova, derived from the calculated maximum spawning escapement of wild and reared salmon.

Table 16 gives the comparative escapements of wild salmon and grilse through the traps since 1970, expressed as the five year averages for 1970-74 and 1975-79, with the relevant annual totals for 1980 onwards. Details of earlier annual escapements (1970-79) may be found in *Ann. Rep. XXIV*, Table 8.

Table 16 . Comparative escapements of wild salmon and grilse.

	Mill Race		Salmon Leap		Total	
Year	Salmon	Grilse	Salmon	Grilse	Salmon	Grilse
1970-74	7	630	7	515	14	1145
1975-79	9	278	27	425	36	703
1980	28	278	21	359	49	637
1981	21	177	43	149	64	326
1982	6	200	15	245	21	445
1983	3	207	26	353	29	560

The total of 560 grilse includes 15 previously-spawned grilse.

Table 17 shows the monthly percentages of the combined total runs of grilse through the traps, again expressed as five year averages for 1970-74 and 1975-79, with annual totals for 1980 onwards. Figures in parentheses are the actual monthly totals of wild, maiden grilse.

Table 17 . Monthly proportions of the grilse run.

	1970-74	1975-79	1980	1981	1982	1983	
May	-	1.0	-	1.5	-	-	
June	5.8	15.6	28.6	14.1	28.1	12.8	(70)
July	18.9	17.7	40.8	45.2	4.1	20.0	(109)
August	26.8	24.1	8.5	15.0	51.5	-	
September	25.5	26.2	16.5	15.0	3.6	55.5	(302)
October	17.6	13.7	3.7	5.8	9.4	9.5	(52)
November	4.8	1.4	1.1	2.5	3.0	1.3	(7)
December	0.6	0.3	0.8	0.9	0.2	0.9	(5)

Details of the trap counts, rod catches on L. Feeagh, escapements and maximum spawning stock for wild and reared fish are given in Table 18 . The usual deduction of 5% has been made for natural mortalities, poaching and disease etc. Table 19 gives comparative figures for spawning stocks of previous years.

Table 18 . Spawning stocks of salmon and grilse.

	Wild grilse (1SW) and previously spawned grilse	Wild salmon (2SW)	Reared fish
Counted through traps	560	29	246
Rod caught L. Feeagh	24	-	11
Hatchery use	-	-	193
Estimated mortalities (5%)	28	1	12
Escapements	505	28	30
Maximum spawning stock	563		

Table 19 . Comparative spawning stock

	Maximum escapement	Reared fish component
1970-74 (average)	1126	140
1975-79 (average)	725	42
1980	650	22
1981	440	85
1982	446	54
1983	563	30

Maximum spawning escapement in 1983 increased by over 25% compared with 1981 and 1982.

d) Survival from broodyear ova to smolts and grilse.

The wild grilse in 1983 were largely the product of the 1979 brood year which had a total escapement of 926, including 72 reared fish. These latter fish are assumed to have spawned normally, there being no evidence otherwise. In succeeding calculations (see *Ann. Rep. XIX, 1976*, for original data parameters), a range of 50-55% females and 4000-4115 ova per female is assumed. An average and a minimum figure can then be calculated for ova deposition in the winter of 1979/80 (see Table 20). The resultant 1983 grilse total was 592 (trap count 560 plus Furnace rod caught 47, minus 15 previous spawners).

Table 20 . Survival from ova to grilse.

Spawning escapement in 1979	926 (including reared fema
No. of females	499-549
Ova deposition	1,996,000-2,259,100
No. of smolts produced in 1982	10,460
Survival: ova to smolt	0.52-0.46%
No. of returning grilse in 1983	592
Survival: smolt to grilse	5.7%
Survival to grilse per grilse female	1.28-1.16 *

* A value of 2.0 is required for a self-sustaining population.

The ranges in values for comparable survival are available for ten brood year classes beginning with 1970. Values for 1970-74 are expressed as the five year average in Table 21 . Full details for those years are given in Table 15, *Ann. Rep. XXVI, 1981.*

Table 21. Comparative survival rates.

Brood-year class	% survival rates: ova to smolt	Survival rates to grilse per grilse female
1970-74	0.48-0.62	1.42-1.75
1975	0.52-0.63	2.03-2.37
1976	0.50-0.57	1.60-1.80
1977	0.78-0.83	0.93-1.02
1978	0.85-0.95	1.77-1.96
1979	0.50-0.56	1.16-1.28

The % survival rate ova to smolts was lower for the 1979 broodstock year class than for those of 1977 and 1978.
Possibly, the deposition of larger numbers of ova in 1979 resulted in a greater mortality associated with higher population densities during the early development of this year-class.

The 1979 survival rate from grilse female spawner to adult grilse of the succeeding generation dropped to the second lowest value yet recorded (see Table 21). At 1.16 - 1.28, this value was only just over half that necessary for a self-sustaining population.

(ii) Downstream movements

a) Smolts: Timing and numbers

The first salmon smolt appeared in the traps on April 5, but significant numbers did not migrate downstream until late April and the main run occured between May 10 and May 20. As in 1982, 70% of the total was counted at the Salmon Leap trap.

The overall smolt total was 9,508 but this included 125 dead fish (105 found dead in traps and 20 sacrificed for experimental purposes), so that the effective total released was 9383. The relevant spawning escapement which produced these smolts was that of 1980, which was average in number at 650. The survival rate from ova to smolt was approximately 0.62 - 0.73% which is in the middle range by comparison with survival rates from other years.

b) Survival of salmon smolts

The following values were derived from the known numbers of salmon smolts counted through the traps each year and the total stock of returning wild adults in the two succeeding years. The adult stock comprised the count of wild maiden grilse through the traps, plus the rod catch of wild grilse from L. Furnace and the returns of 2SW fish in the following year. Table 22 gives the 5-year averages for 1970--4 and 1975-79, with annual values for the following four years.

Table 22 . Salmon smolt survival rates to adult.

	Trap count	Furnace rod catch	2SW fish	Total	Relevant smolt total	% survival
1970-74	1146	120	31	1297	13,183	9.8
1975-79	700	62	35	797	11,397	7.3
1980	637	10	64	711	8,276	8.6
1981	305	17	21	343	11,203	3.1
1982	438	41	29	508	9,434	5.4
1983	545	47	N/A	592*	10,381	5.7

* Survival to grilse only; spring and summer fish not due until 1984.

The reduced survival rates of the past three years reflect the high levels of marine exploitation, particularly by legal and illegal coastal drift-nets.

c) Tagging of salmon smolts

No wild salmon smolts were tagged in 1983, both as a conservation measure and in order not to affect the smolt sampling programme.

d) Sampling of salmon smolts

To determine the age structure, mean length and weight of the wild salmon smolt population, 5 samples of approximately 60 smolts were collected between May 6 and May 26. The expected total number of smolts was estimated and the samples were taken at 5 [illegible]r intervals during the run. The fish were anaesthetised measured to the nearest mm, weighed to the nearest g and a small sample of scales removed from the shoulder; after recovery, they were released.

Age categories were determined by scale reading viz. 1A, 1B, 2A, 2B, 3A and 3B (the figures indicate lifespan in years; the letters indicate growth type). A-type smolt scales show no growth after the end of their final winter in freshwater whereas B-type smolt scales exhibit more widely spaced circuli outside the final winter band of circuli, denoting spring growth before migration. In Table 23, these age categories have been reduced to 3 year classes, with the percentage age composition, average length, weight and condition factor given for each sample.

Table 23 . Percentage age composition and sizes of wild salmon smolts.

Sample	N	% smolt age composition 1	2	3	Av. Length (cm)	Av. Weight (g)	C.F.
1	60	0	100	0	13.1	22.1	0.97
2	51	2	94.1	3.9	13.9	27.8	1.03
3	60	1.8	96.5	3.5	13.9	27.1	1.00
4	60	7.1	92.9	0	13.8	26.4	1.00
5	65	6.3	[illegible]	7.9	14.4	29.6	0.99
Mean:		3.6	93.2	3.2	13.8	26.6	1.00

As in 1982, the average length and weight of the 5 samples fluctuated, but no relationship could be determined between early and late samples. The mean condition factor of the smolts in 1983 was slightly higher than that recorded in previous samples. Average length and weight of the total 1983 sample was similar to that recorded in 1977, 1981 and 1982, as shown in Table 24.

Table 24 .

Year	Sample No.	Av. Length (cm)	Av. Weight (g)	Av. C.F.
1977	180	14.1	27.0	0.97
1981	272	13.8	26.4	0.97
1982	301	14.0	27.2	0.95
1983	297	13.8	26.6	1.00

The percentage smolt age composition of the 1983 sample was also similar to that recorded in previous years.

Table 25 .

Year	% smolt age composition 1	2	3
1977	9.0	84.7	6.3
1981	3.7	90.8	5.5
1982	3.0	92.4	4.6
1983	3.6	93.2	3.2

Table 26. The average weight (in g) of different age categories in 1983 compared with those recorded in 1977, 1981 and 1982

	Age Categories					
Year	1A	1B	2A	2B	3A	3B
1977	-	24.6	28.6	27.3	32.0	37.0
1981	-	24.0	27.9	26.2	27.9	29.8
1982	19.6	20.3	28.5	26.6	27.8	29.1
1983	-	18.3	26.8	27.0	32.6	37.5

Again in 1983, there was no significant difference between the mean weight of 2A and 2B type smolts at migration and, as before, the proportion of smolts exhibiting A type growth tended to decrease as the run progressed, whilst the proportion exhibiting B type growth increased. The average weight of 1B type smolts was lower than that recorded previously, whilst that of 3A and 3B fish was greater than in 1981 and 1982 but similar to the 1977 sample.

e) Diurnal timing of salmon smolt migration.

The wild salmon smolt run was monitored to determine the diurnal timing of downstream migration. Sampling over a 24 hour period was carried out 6 times at both the Salmon Leap and Mill Race traps. Two sampling programmes were used, smolts being counted at either 6 or 2 hourly intervals.

6 hourly samples

The data obtained from the two periods of 2 hourly samples can be amalgamated to give 6 hourly samples, making a total of 6 x 6 hourly samples.

During the first sample (May 3), peak numbers of smolts migrated downstream between 11.00 and 24.00 hours. However, during the second and third samples (May 10 and 14), at the peak of the run, migration

took place mainly between 12.00 and 18.00 hours. In the fourth sample (May 15) smolts migrated steadily between 12.00 and 24.00 hours, whilst in the fifth sample (May 17) peak migration took place between 12.00 and 18.00, with lesser numbers migrating throughout the night. Relatively few smolts were recorded during the sixth sample (May 25), highest numbers being counted during the daytime.

In 1983, the main smolt run took place slightly later than in 1981 and 1982. However, as before, the majority of the smolts (73%) migrated downstream over a short period of time (May 9-18). The pattern of diurnal migration varied slightly from that previously recorded. Early migrants moved downstream by day and night and the peak of the run occurred mainly during daylight hours, as in previous years. However, during the latter part of the smolt run daylight migration predominated, whereas in 1981 and 1982, migration took place mainly by night.

2 hourly samples

These indicated more precisely the diurnal timing of the run. In the first sample (May 10) during the early part of the run, peak numbers of smolts were recorded at 24.00 hours. The second sample (May 13) during the peak run showed greatest downstream movement of smolts between 12.00 and 14.00 hours and 18.00 and 20.00 hours. As in 1982, no 2 hourly sample was carried out at the end of the run as there were too few smolts to yield significant results.

A similar pattern in the diurnal rising of downstream migration has now been recorded for three consecutive years: 1981, 1982 and 1983.

f) Salmon kelts.

Table 27 . Timing of salmon kelt run.

	Counted through traps
December 1982	9
January 1983	34

February	6	
March	158	
April	17	
Total	224	incl. 11 finclipped = 213 wild kelts

The majority of the kelt run (70.5%) migrated downstream in March at the Salmon Leap. As usual, almost all the kelts marked by UDN/fungal infections were noted in December, January and February; 82% of the run was clean and well-mended. Survival of the spawning escapement dropped slightly to 50%

Table 28 . Comparison of annual kelt runs.

	A	B	C	D	E
1975-79	75	18	14	30	8.1
1980	90	30	6	48	6.9
1981	69	15	8	33	16.5
1982	85	13	5	54	7.0
1983	82	18	7	50	13.5

A : % healthy kelts in kelt run

B : % males in kelt population

C : % lightly marked with fungus

D : % survival of spawning escapement

E : % recaptures of previously spawned grilse in first year

Of the 178 wild kelts tagged (92% at the Salmon Leap), 24 recaptures were made (13.5%), including 7 in the Irish drift-net fishery and 1 each by the Newport River estuary draft net and a rod on L. Furnace. The survival rate from kelt to second spawner was almost double that of 1982. As in 1982, one female fish was recaptured returning for a third spawning. It was first tagged as a kelt on March 10, 1982 at a length of 61.5cm. It was recaptured in the Salmon Leap trap on August 30

at a length of 70.0cm passing upstream to spawn and again on March 30, 1983 moving downstream as a twice spawned kel. (no length recorded). The final recapture was made at the Mill Race trap on September 4, 1983 at a length of 73.5cm.

Growth as seen from tagged kelt stage to return to freshwater averaged 7.6 cm in length, over an average period of 13. days (range 84-180 days) As in 1982, the absence period was longer than usual due probably to low water levels inhibiting upstream movements during July and August.

One long absence (over 12 months) previously spawned fish was detected in 1983. This fish was first tagged as a kelt measuring 68.0 cm on April 13, 1982 at the Mill Race downstream trap. It was recaptured at the Salmon Leap upstream trap on September 4, 1983, measuring 83.0 cm.

g) Ulcerative Dermal Necrosis/Fungal Infections - Downstream 1983.

There was an overall increase in the incidence of UDN/fungal infections among the downstream migrating kelts during the 1982/83 spawning season. In December, January and February, the relevant proportions were:- 14% clean, 35% lightly marked and 51% heavily infected. However, during the major part of the run, in March and April, only one diseased kelt was observed.

Upstream 1983.

Three grilse with UDN/fungal infectious were observed in the upstream traps in November but no further signs of the disease were seen in December. Four upstream migrating fish were infected by papilloma.

2. RIVER SLAZE.

(i) Salmon recaptures.

a) Recaptures of wild reared grilse.

197 maiden reared grilse were recaptured from a release of 17,814 smolts in 1982, giving an overall survival rate of 1.10%, compared with 1.54% for the previous year.

The overall survival rate of 1.10% from reared smolt to maiden grilse may be compared with the 3.72% survival rate to adult of wild unmarked smolts. The wild fish survived better by a factor of 3.4 which is similar to that recorded in previous years.

Only 0.91% of all 1+ reared smolts survived to adult in 1983. 2+ reared smolts had a survival rate of 2.73%. The former rate is [illegible] recent years.

b) Recaptures of 2-sea winter reared fish.

Only one small summer fish was recaptured in 1983. This fish was derived from a 2+ smolt of grilse parentage in 1981 (2.2+). The fish had a fork length of 78.0 cm and was recaptured in the Mill race upstream trap during early September. The parents of this small summer fish (2SW) were line-bred grilse for six preceding generations.

c) Recaptures of previously-spawned reared grilse.

There were four recaptures of this category of reared fish in 1983, all short absence fish, derived from 1982/83 spawners. Three were caught in the Salmon Leap trap and one at the Mill Race.

Table 20.

	Original data:		Recapture data:		
Tag no.	Date tagged	length(cm)	Date	Length(cm)	Place
00266	26.9.82	60.0	17.9.83	66.0	SL Trap
RVB + finclip- no tag	-	-	17.9.83	70.0	SL Trap

00343	25.4.83	63.0	18.9.83	70.5	SL Trap
L397	19.3.83	59.5	18.9.83	65.5	MR Trap

d) Fish unidentifiable by scale reading or brand-marks.

The ages of 9 fish were unidentifiable in 1983, having no visible brand (NVB) and no readable scales. The majority of these fish were male fish recaptured late in the season (November and December). A further ten fish were classified by brand-mark only as scale samples had not been taken at capture or were unreadable. The proportion of fish with no visible brands was 17.8% in 1983, lower than that recorded in 1982. Similar proportions of 1 and 2+ smolts were NVB's.

e) Recapture totals.

The return rates of reared maiden grilse and 2-sea winter fish in 1983 are set out in Table 30 .

Table 30 . Recaptures from reared smolts released in 1981 and 1982.

	Smolt age	Year of release	Number released	Brand	Returned as: G	2SW	% recapture
1.	2+ G	1981	11,024	N, L, NVB, pan-jet, dorsal f/c	136	1	1.24
2.	1+ 2SW	1982	2,942	K	9	N/A	0.31
3.	1+ G	1982	8,015	S	91	N/A	1.14
	2+ G	1982	6,913	V, T, O	188	N/A	2.72

The above table excludes the 9 fish having no visible brands and no readable scal
The 239 recaptures of maiden grilse (excluding 4 previous spawners) were recorded as follows:-

Mill Race traps	:	117
Salmon Leap traps	:	133
Furnace rods	:	48

Roughly equal proportions of the recaptures were made at the Salmon Leap and Mill Race traps, in contrast to 1982, when 66% of the reared grilse

migrated upstream by the Salmon Leap.

f) Relative survival rates.

Reared smolt survival rates since 1966 are shown in Table 31 .

Table 31 . Relative survival rates of 1+ and 2+ smolts.

Year	Smolts released	Number recaptured	% overall recaptured	% 2+ smolts	% 1+ smolts
1966-70*av.	13,647	342	2.32	3.12	1.66
1971-75 av.	8,809	270	2.81	3.62	1.99
1976-80 av.	15,171	224	1.47	1.47	1.35
1981	10,705	221	2.06	2.29	1.46
1982	18,926	253	1.34	1.23	1.47
1983	17,870	298	1.66	2.72	0.91
			1.94	2.31	1.42

* Mill Race Trap only.

Note that the above survival rates refer only to return to river of grilse and make no allowance for unreported reared grilse taken by coastal nets (see section on coded-wire tag recovery programme).

g) Timing of wild and reared grilse returns.

Table 32 shows that the 1983 run of reared grilse was, as in previous years, later than that of wild grilse. A sizeable proportion (32.8%) of all wild grilse (c.f. 4.2% reared fish) migrated upstream before the start of low-water conditions in mid-July. The drought prevented both wild and reared grilse migrating upstream during late July and August. Initially, almost equal proportions of wild and reared grilse (55.5 and 55%) were counted through the traps in September, but larger numbers of reared grilse than wild continued to migrate upstream in October, November and December.

Table 32 . Timing of maiden wild and reared grilse returns.

	Wild grilse %	Reared grilse %
June	12.8	-
July	20.0	4.2
August	-	-
September	53.5	55.0
October	9.5	28.8
November	1.3	7.1
December	0.9	4.9

h) Summary of selective breeding programme.

To summarise the results of the selective breeding programme since 1966, the total returns (excluding previous spawners) can be divided into the following categories:-

Smolt parentage	Grilse	2SW fish	Pregrilse
2SW	183(87.1)	27(12.9)	0
Grilse	4575(98.3)	71(1.5)	8
2SW+Grilse	147(96.1)	6(3.9)	0

Recaptures from 2SW parentage smolts released in 1982 may be expected in 1984. In the summary above, "pre-grilse" refers to fish which return to freshwater after less than one year at sea, usually in the summer after release as smolts. "2SW fish" includes both small spring and small summer fish.

(ii) Size, condition factors and sex ratio of reared grilse.

The mean fork length of reared grilse of both sexes derived from 1+ smolts was 61.4 cm in 1983, whilst those derived from 2+ smolts were larger, having a mean fork length of 63.8 cm. Male adult reared fish were slightly larger than female. Grilse from 1+ smolts had an average length of 62.4 cm and those from 2+ smolts, 64.3 cm.

A sample of 43 reared rod-caught grilse had a condition factor of 1.00 as did the reared fish broodstock used for hatchery purposes and measured in December. The condition factor of wild rod caught grilse in 1983 was 1.01.

Using the condition factor of 1.00 obtained from the rod caught sample, the average weight of trap caught reared grilse (whose length only is measured) may be estimated:-

2.3 kg (5.08 lbs) from 1+ smolts

2.6 kg (5.72 lbs) from 2+ smolts

The largest grilse which returned in 1983 was:

Male : 77.0 cm : 4.57 kg (10.05 lbs) : condition factor 1.00

The sex ratio in 1983 was similar to that recorded in previous years:

Grilse from 1+ smolts : 52% females, 48% males.

Grilse from 2+ smolts : 55% females, 45% males.

(iii) Rod catches.

A total of 48 reared grilse were caught in L. Furnace during 1983 (50.5% of the total rod catch). As in 1982, the relatively large catch of reared fish can be attributed to the low water conditions during July and August which concentrated fish in L. Furnace.

A larger than usual number of reared grilse (11) were caught on L. Feeagh in 1983. This represented 31.4% of the total salmon catch recorded from that lake. Most of these fish were caught during September when flood conditions allowed upstream migration into L. Feeagh.

(iv) Salmon broodstock for artificial rearing and natural reproduction.

A total of 193 reared fish was collected for hatchery purposes, leaving a theoretical maximum of 30 reared fish to spawn naturally.

(v) Detection of coded-wire tags in adult salmon broodstock.

172 reared grilse collected as broodstock were tested (alive, anaesthetised) for coded-wire tags and 41 positive results were recorded. This tag detection rate in live fish of 23.8% may be compared with the proportion of smolts released with coded-wire tags which was 11%. However, brand reading showed that 22% of all reared grilse recaptured in freshwater were O brands (the brand applied to coded-wire tagged smolts). Thus, the tag detection rate and brand reading gave very similar results.

A random sample of 39 dead fish (which jumped out of the broodstock pond and were asphyxiated) gave 7 positive results when passed through the coded-wire tag detector. After coring the nasal cartilage of the 7 positives, all were found to contain coded-wire tags.

(vi) Net marked reared salmon.

A total of 12.8% of all trap caught reared fish were net marked in 1983, slightly greater than the 10.9% recorded for wild grilse.

Table 33 . Incidence of net marked reared grilse in traps.

	% incidence	Marked/total
June	-	-
July	18.2	2/11
August	-	-
September	18.1	25/138
October	6.8	5/73
November	-	-
December	-	-

As with wild grilse, the earlier run of reared grilse had a higher proportion of net marks (see Table 33). Also, some rod caught reared grilse (22.9%) were net marked when trap caught, possibly because the dead rod-caught fish were more closely examined.

(vii) Reared grilse caught in coastal nets.

The coded-wire tag detection programme sampling grilse and salmon in the coastal drift net fishery was continued by the Fisheries Research Centre, Abbotstown, in 1983.

Only 1,957 2+ smolts were tagged by this technique at the Salmon Research Trust in 1982. Sampling was carried out by Fisheries Research Centre personnel at landing places around the coast of Ireland between June 10 and July 21, 1983. The detection rate of S.R.T.I. coded-wire tagged reared grilse was 1.94% (a total of 38 grilse from 1,957 coded-wire tagged smolts). However, when raising factors (calculated by dividing the number of salmon in the recorded catch by the number of fish examin were applied, the estimated proportion of tagged fish taken by drift nets increased to 5.2%.

Assuming no differential mortality of coded-wire and non-coded-wire tagged smolts, then 5.2% of all SRTI 2+ reared smolts released in 1982 (6913 fish) would have been caught in coastal nets - a total of 359 adult fish.

Since the return to the native river of reared grilse derived from 2+ smolts was 151 trap caught and 38 rod caught on L. Furnace, this total of 189 may be compared with the estimated total of 359 caught in coastal drift nets. This gives an exploitation rate of 65.5% of reared grilse derived from 2+ smolts. A further 12.9% of trap-caught and 22.9% of rod-caught reared grilse observed in the fishery had net-marks.

The recaptures of reared grilse were reported from:-

Mayo	:	37%
Donegal	:	55%
Galway	:	5.3%
South of Galway Bay	:	2.6%

In 1983, the highest proportion of the recaptures was made in the Donegal drift net area. Only 3 fish (7.9%) were recaptured from areas south of the parent river.

The data embodied in this section was kindly supplied by Mr. John Browne, Fisheries Research Centre, Dept. of Fisheries and Forestry, Dublin.

(viii) Morpholine experiment.

a) Imprinting of smolts:-

On March 15, 2,205 experimental fish (2+ salmon parr) were adipose fin-clipped and panjetted to the left of the anal fin. After marking, these fish were put into a release pond at Furnace. 2,704 2+ salmon parr drawn from the same stock were placed in an adjacent release pond after being adipose fin-clipped and panjetted on the caudal peduncle. Sample measurments of the two groups showed the experimentals to have a mean length of 18.8 cm and the controls 18.7 cm.

A drip mechanism consisting of a modified Mariotte bottle was set to dispense morpholine (the imprinting chemical) to the experimental fish on March 26. Sufficient imprinting chemical was delivered over a 24 hour period to give a steady state concentration of approximately 5×10^{-5} ml of morpholine/litre of pond water. This concentration of imprinting chemical has been determined as being detectable by *Salmo salar* (Scholtz et al., 1975. Fish Management Report No. 80. Dept. of Natural Resources, Madison, Wisconsin).

On May 2, after 38 days imprinting, 2,192 experimentals were released from their pond into L. Furnace. The 2,672 controls were released at the same time.

b) Attraction of imprinted adult salmon on their return to freshwater.

2,438 experimental salmon parr were imprinted with morpholine in 1982, whilst a control group of 2,518 fish were reared under similar conditions but not artificially imprinted (see *Ann. Rep. XXVII*). Fish from both groups returned to freshwater during the summer of 1983 as grilse. The experimental fish were identified by a T brand and adipose fin-clip whilst the controls had adipose fin-clips and V brands.

A morpholine drip (modified Mariotte bottle) was located inside the Mill Race upstream trap, the objective being to attract a greater proportion of the imprinted than non-imprinted fish to migrate via this trap. In 1982, the morpholine drip was located at the Salmon Leap upstream trap and more imprinted fish migrated upstream through the Salmon Leap than non-imprinted. However, in the same year, two-thirds of all reared grilse used the Salmon Leap as a route of upstream migration and the proportion of reared grilse using the Salmon Leap has tended to increase during recent years. It was therefore considered that by placing the drip on the Mill Race, any effectiveness of the morpholine drip in attracting artificially imprinted fish could be more conclusively shown.

The drip concentration giving a steady state concentration of 5×10^{-4} ml of morpholine per litre of water was calculated at 5 different water heights and adjusted to the existing water height as necessary. The drip was started on July 11, when reared grilse first started to migrate upstream and continued until December 21. The drip was not operational during 27 days and on a further 32 days the drip rate was slower than calculated, probably due to blockage of the 0.5 mm diameter capillary tube by fine particulate matter. Results are based on those days when the drip was working correctly and delivering the appropriate steady state concentration.

Table 34. Numbers of experimental and control fish migrating upstream via the Mill Race or Salmon Leap trap.

	No. of experimentals	No. of controls
Mill Race trap (morpholine drip)	4	12
Salmon Leap trap (no morpholine drip)	11	7

The results obtained do not indicate that the morpholine drip had a specific attraction for imprinted fish, as only 27% of the experimentals migrated upstream by the Mill Race trap.

The proportion of all reared grilse that used the Salmon Leap as a route of upstream migration decreased in 1983 to 53.8% (see Table 35).

Table 35 . Proportion of wild and reared grilse at the Salmon Leap.

Year	% wild grilse	% reared grilse
1970-74	43.0	23.8
1975-79	62.1	48.1
1980	57.1	37.4
1981	49.2	38.0
1982	56.2	66.2
1983	62.9	53.8

The siting of the morpholine drip on either the Mill Race of Salmon Leap has failed to produce conclusive results. The choice of the fish between the two routes of upstream migration is dependant not only on the presence/absence of a morpholine drip but on a number of other variables. These include water height and the timing of the run. The necessity of maintaining a steady-state concentration of morpholine despite widely variable volumes of water and the small numbers of returning adults from imprinted smolts posed problems in determining the effectiveness of this artificial imprinting.

3. WILD SEA TROUT

i) Upstream movements.

a) Timing and numbers.

The sea trout run of 966 fish was the lowest since full trapping facilities became available in 1970. The finnock (0+ sea years) proportion of the run was estimated at 29.2%. The highest number of sea trout moved upstream through the traps in September & almost equal proportions ascended the Mill Race and the Salmon Leap.

The totals of upstream-migrating sea trout, counted through the traps from 1970 onwards, were as follows:-

Table 36 . Annual runs of sea trout.

Year	Mill Race	Salmon Leap	Total	
1970	885	359	1244	
1971	989	518	1407	
1972	1799	426	2225	2130
1973	1596	1248	2844	
1974	1658	1261	2929	
1975	1651	1697	3348	
1976	894	2408	3302	
1977	731	1481	2212	2504
1978	427	1303	1730	
1979	443	1987	2430	
1980	399	1104	1503	
1981	390	886	1276	
1982	489	630	1119	1216
1983	505	461	966	

The timing of the sea trout run in 1983 and previous years, expressed as monthly percentages, is shown in Table 37 .

Table 37 . Timing of sea trout run.

	1970-79	1980	1981	1982	1983
May	-	-	0.8	0.1	0.2
June	13.1	41.5	17.5	32.4	15.2
July	54.4	40.2	60.3	24.1	35.2
August	15.8	6.8	10.1	33.8	-
September	7.6	7.2	6.8	4.2	42.6
October	6.4	2.7	2.4	3.9	4.7
November	2.4	1.5	1.6	1.5	1.9
December	0.3	0.1	0.5	-	0.2

A higher proportion than usual of the run migrated upstream in September because the fish had previously been held up in L. Furnace by low water conditions during July and August.

b) Net-marked fish.

Twenty four sea trout (2.5% of the total run) was noted as net-marked in 1983. A similar proportion were net-marked in 1982 (2.1%).

c) Spawning escapement.

Table 38 . Calculation of spawning escapement.

Live fish counted through the traps	:	966
Rod catch on L. Feeagh	:	41
Maximum escapement	:	925

The maximum spawning escapement to the rivers running into L. Feeagh continued to decline in 1983 as can be seen from the following table:-

Table 39 . Annual spawning escapement of sea trout in the last four years with the average for 1970-79.

Year	1970-79	1980	1981	1982	1983
Maximum escapement	2090	1345	1174	1014	925

(ii) Downstream movements.

a) Sea trout smolts.

Early smolts began to move downstream in January but only small numbers of fish migrated before March. The majority of the run occurred in May (72.4%), with a few smolts being recorded until July. Most sea trout smolts left L. Feeagh via the Salmon Leap trap (89.5%). The smolt run at 4852 showed an increase over the ten-year average from 1970-79 and also exceeded the number recorded in 1982:

Table 40 . Annual sea trout smolt numbers.

Year	1970-79	1980	1981	1982	1983
Sea trout smolt number	4176	2327	6710	3907	4852

Note that freshwater production of sea trout smolts has not declined in parallel with the adult run.

b) Autumn-migrating trout.

These are juvenile trout, which move down through the traps from September to December and cannot with certainty be identified as either freshwater or sea-going *Salmo trutta*. The autumn-migrating trout run at 1574 was the lowest since comdete trapping began in 1970.

Table 41 . Timing and numbers of autumn-migrating trout.

	Mill Race	Salmon Leap	Total
September	-	337	337
October	133	532	665
November	53	175	225
December	82	265	347
			1574

If it is assumed that all autumn-migrating trout contribute to the sea trout smolt run the following year, then a figure for total recruitment can be calculated (Table 42). However, it should be noted that 50% of the autumn-migrating trout in 1982 were shown by scale reading to be 0+ years old and it is doubtful if these young fish made any contribution to sea trout production in 1983 (*Ann. Rep. XXVII*, Section C3,ii). In addition, these 0+ trout are so small that a large proportion might be expected to escape through the grids of the traps and thus avoid capture.

Table 43 . Total migrant juvenile trout production.

Year	Smolt total	Autumn juveniles (preceding year)	Total recruitment	
1970	3228	N/A	3228+	
1971	2961	3128	6089	
1972	5465	3620	9085	6746
1973	6071	2124	8195	
1974	4527	2606	7133	
1975	3587	2703	6290	
1976	5270	4171	9378	
1977	3889	2947	6836	7487
1978	3167	3506	6673	
1979	5656	2603	8259	
1980	2537	2351	4688	
1981	6710	2631	9341	6684
1982	3907	1730	5637	
1983	4852	2218	7070	

c) Sea trout kelts.

The first kelts of the 1982/83 season were recorded in the downstream traps during November. The peak of the larger (over 30cm) kelt run occurred in March while the greatest number of smaller kelts (less than 30 cm) passed downstream in April (Table 44). A fork length of 30cm roughly delimits finnock from adult sea trout. In 1983, the proportion of sea trout kelts marked by fungus (2%) was greater than that recorded in 1982 (0.4%).

Table 44 . Timing and numbers of sea trout kelts.

Month	Large	Small	Total	% marked
November 1982	23	20	43	9.3
December	35	49	84	11.9

January 1983	29	12	41	7.3
February	10	10	20	5.0
March	203	131	334	0.3
April	151	174	325	0
May	26	62	88	0
Totals	477	458	935	2.0

The comparable survival rates from the maximum spawning escapement of 1982 to the kelts of 1982/83 are expressed as percentages in Table 45.

Table 45. Annual % survival rate to kelt.

Year	Large	Small
1976	79	66
1977	63	45
1978	50	66
1979	33	107
1980	50	82
1981	44	345
1982	53	211
1983	63	177

As in 1979, 1981 and 1982, the number of "small" sea trout kelts exceeded the number of finnock recorded in the upstream run. The reason for the observed discrepancy in numbers in mainly due to the fact that small finnock can pass through the bars at the front of the upstream traps. This problem of incomplete census of upstream-migrating finnock was discussed in detail in *Ann. Rep. XXVII*.

(iii) Tagging of autumn-migrating trout and sea trout smolts.

Each autumn and spring since September, 1979 (with the exception of autumn 1983), wild autumn-migrating trout and sea trout smolts have been tagged in the downstream traps. Recaptures in 1983 are detailed below and total percentage recaptures to December 31, 1983 are given in Table 46.

Autumn-migrating trout, 1979-1982.

No recaptures of any of the above groups of autumn-migrating trout were recorded in 1983.

Sea trout smolts 1980.

No recaptures of these fish were recorded in 1983.

Sea trout smolts 1981.

One tagged fish from this group was recorded as a sea trout kelt in March, 1983. This fish had previously been recorded as a finnock in July, 1981. From a fork length of 21.1 cm when tagged in April, 1981, it had grown to a length of 29.5 cm in July of that year and to 36.3 cm in March, 1983. Its whereabouts in 1982 remain unknown.

Sea trout smolts 1982.

Eight fish from this group were recaptured in 1983 as finnock kelts. Five of these fish were not recorded as maiden finnock migrating upstream in 1982. One fish, having been released as a finnock kelt during spring 1983 was recorded for a second time migrating upstream in September, 1983. This fish had grown from a length of 20.5 cm fork length when tagged as a smolt in 1982 to 32.5 cm at return in September, 1983.

Sea trout smolts 1983.

409 wild sea trout smolts were tagged in 1983. Eleven of these fish were recaptured in 1983, all as finnock. Mean length at recapture was 29.0 cm, slightly smaller than the average length for rod-caught finnock in 1983 (see Table 46).

Summary.

Table 46 . Details of first recaptures of tagged downstream-migrating trout up to December 31, 1983.

Year	Type	Number tagged	Percentage Recaptured
1979	Autumn trout	353	0.8
1980	Smolts	448	0.4

1980	Autumn trout	522	1.7
1981	Smolts	456	6.4
1981	Autumn trout	336	0.6
1982	Smolts	446	4.7
1982	Autumn trout	387	0
1983	Smolts	409	2.7*

* First returns of upstream migrating finnock only.

(iv) Scales.

a) Sea trout smolts, 1983.

96 sets of scales were collected from sea trout smolts in 1983. Only two and three-years old fish were found in the sample.

Table 46a compares the percentage age composition of samples from the smolt run of 1980-83.

Table 46a.

Age	1980	1981	1982	1983
1+	-	1	-	-
2+	64	68	72	48
3+	36	30	28	52
4+	-	1	-	-

There was a considerable increase in the proportion of 3 years-old smolts in 1983, when compared with previous years.

Lengths for both age classes were similar to those previously recorded. Weights and condition factors were not recorded in 1983. The trend for a higher proportion of B-type growth among 2+ than 3+ smolts was maintained in 1983.

Table 46b.

Age	Length (cm)	%A-type growth	% B-type growth
2+	19.3	34.8	65.2
3+	21.1	64.0	36.0

b) Rod caught sea trout

In 1983, 216 scale samples were collected from a total sea trout catch of 250 fish (86%). Of these, 9 (4.2%) were unreadable and 2 (0.9%) were found to be brown trout scales.

The age, number, year of hatching, mean lengths, weights and condition factors of the sample are given in Table 47 .

Table 47 . Details of the rod-caught sea trout sample.

Age	Number	Hatched	Length (cm)	Weight (g)	Condition Factor
2+	98	1981	28.6	222	0.94
2+SM+	8	1980	36.7	520	1.05
2.1+	27		36.4	519	1.08
3+	45		31.1	305	1.01
2+2SM+	1	1979	44.5	855	0.97
2.1+SM+	6		43.8	855	1.02
2.2+	5		44.6	866	0.98
3+SM+	2		43.5	570	0.70
3.1+	9		38.9	656	1.10
2.1+2SM+	2	1978	47.0	1211	1.17
3.2+	1		42.0	656	0.88
3.1+2SM+	1	1977	47.0	1055	1.02

A comparison of mean fork lengths at capture of the different age groups of sea trout (Table 48) shows an increase in the size of all groups.

Table 48. Fork lengths (cm) of sea trout smolts and of maiden fish with varying histories at sea.

	Smolts	+	1+	2+
1956-58	19.6*	27.9	36.1	40.9
1980	20.0	27.8	37.1	42.5
1981	19.8	27.0	36.3	43.2
1982	19.7	27.8	35.1	40.5
1983		29.4	37.0	44.2

* Back calculated length

The proportion of finnock, other maiden fish and previous spawners in the 1983 sample are compared with results for 1980, 1981 and 1982 in Table 49.

Table 49. The numbers of maiden and previously spawned fish (percentages are given in parentheses).

	Maiden Fish			Previous	
	0+	1+	2+	Spawners	Totals
1980	125(33.4)	135(36.4)	9(2.4)	92(24.8)	371
1981	197(53.1)	107(28.8)	10(2.7)	57(15.4)	371
1982	145(58.2)	73(29.3)	4(1.6)	27(10.9)	249
1983	143(69.8)	36(17.6)	6(2.9)	20(9.8)	205

The general trend in the rod-catch data towards an increased finnock proportion continued in 1983. There was also a further decrease in the proportion of 1 year old maiden fish and a low incidence of previous spawners.

In Table 50 the smolt ages of the various categories of sea trout are given as percentages. Mean values for 1980-83 are in parentheses.

Table 50. Analysis of smolt age.

Smolt Life (yrs)	Finnock	Maiden Sea Trout	Previous Spawners	Total Sample
1	- (0.2)	- (0.2)	- (0.4)	- (0.3)
2	68.5(53.6)	76.2(61.0)	85(70.6)	71.7(61.0)
3	31.5(43.9)	23.8(37.9)	15(28.7)	28.3(37.4)
4	- (2.3)	- (0.9)	- (0.4)	- (1.2)

In 1983, a higher proportion of all categories of sea trout were derived from 2 years old smolts when compared with previous years. As before, the finnock category had the highest proportion of 3 years old smolts. No fish were found to be derived from 1 or 4 years old smolts in 1983.

Table 51 . Age of previous spawners at first spawning (percentages are given in parentheses).

	+SM	1+SM	2+SM	3+SM
1950-58	39(16)	191(77)	18(7)	-
1980	43(47)	39(42)	10(11)	-
1981	25(44)	30(53)	1(2)	1(2)
1982	18(67)	5(18)	4(15)	-
1983	10(50)	9(45)	1(5)	-

The results obtained in 1983 are similar to those recorded previously.

Table 52 . Divided migration and return of the various year classes of sea trout expressed as percentages.

Returned in	Hatched:				
1983 as:	1977	1978	1979	1980	1981
Finnock	-	-	-	22.0	47.8
1+	-	-	4.4	13.2	-
2+	-	0.5	2.4	-	-
With SM's	0.5	1.0	4.4	3.9	-

Table reflects the trends outlined above. It shows that the high proportio of finnock in the rod-caught sample (69.8%) are derived mostly from the 1981 year class (47.8%). It also shows that few 1 year old maidens hatched in either 1979 or 1980 were present in this sample.

A much higher proportion of finnock were caught on L. Furnace than L. Feeagh in 1983 (see Table 53). As in 1982, drought conditions in July and August prevented upstream movement at what is usually the height of the finnock run making fewer finnock available to anglers on L. Feeagh.

Table . Proportions of sea trout of each type caught by rods L. Furnace and L. Feeagh in 1983.

	Maiden Fish			Previous	Number
	0+	1+	2+	Spawners	in sample
L. Furnace	76.9	12.4	3.0	7.7	169
L. Feeagh	36.1	41.7	2.8	19.4	36

4. REARED SEA TROUT.

(i) Recaptures of reared sea trout released in 1982.

In 1982, a total of 2844 reared 2+ sea trout smolts were released. These fish were derived from two stocks: 1090 Connemara and 1754 Burrishoole. Details of recapture rates in 1982 were discussed in *Ann. Rep. XXVII*, C4 (i).

In 1983, a further 7 tagged fish from this group were recaptured, 6 being recorded for the first time. In addition, 27 others which had lost their tags but were identifiable by adipose finclips and by scale reading, were also recorded. 18 fish were recaptured as finnock kelts, 12 as one-sea-winter maidens and 3 as fish which had not migrated to sea. One untagged fish could not be classified by scale reading.

The minimum recapture rate up to the end of 1983 was 6.6%. However, if it is assumed that all fish which bore tags at first recapture did not subsequently lose their tags, the recapture rate could be as high as 13%. These figures may be compared to the 4.7% recapture rate for wild sea trout, tagged by the same method in 1982. However, these comparisons may not be valid since, as discussed below, the behaviour of the reared sea trout in 1982 differed from that of wild sea trout.

It was only possible to work out the recapture rates of the Burrishoole and Connemara stocks independently from fish that had retained their tags. Thus data given in Table 54 represents minimum recapture rates.

Table 54. Recapture rates of reared sea trout released in 1982.

Stock	Number of smolts released	No. of recaptures to end of 1983	% Recapture
Burrishoole	1754	122	7.0
Connemara	1090	66	6.1
Total	2844	188	6.6

There was little difference in recapture rates between the two stocks.

(ii) Recaptures of reared sea trout released in 1983.

In 1983, a total of 1301 reared 1+ sea trout smolts was released. These fish were derived from two stocks: 1258 from Connemara and 42 from Burrishoole. All were externally tagged with modified Carlin-type tags.

Up to the end of 1983, 4 tagged fish were recaptured as finnock. This represented a recapture rate of 0.3%. This figure may be compared with the 2.7% recapture of wild smolts as finnock, tagged by the same method in 1983.

The survival of reared 1+ sea trout smolts to the finnock stage was substantially lower than for reared 2+ fish. One-year-old smolts rarely occur naturally in the Burrishoole system and reared yearlings may not have developed full migratory behaviour.

(iii) Behaviour of reared sea trout.

During 1983, the majority of returning reared sea trout were recorded only in the upstream traps and few moved downstream subsequently.

In contrast, the reared sea trout in 1982 were frequently recorded in both up- and downstream traps during October and November and a large proportion (38%) were found by scale reading not to have migrated to sea.

(iv) Tag loss.

71% of all reared sea trout recaptured in 1983 had shed their tags. Consideration of the data shows that tag loss is an ongoing process and that it should be taken into account in estimates of total sea trout survival or calculations of finnock/maiden sea trout proportions using external tags. These external tags are necessary for this work although it is appreciated that they affect survival rates.

(v) Growth of reared sea trout to the finnock stage.

Four reared sea trout which were recaptured as finnock had grown, on average, from 16.8 cm when released as 1+ smolts, to 24.3 cm. The fastest

growing individual grew from 20.2 cm as a smolt to 26.0 cm on recapture as a finnock. In Table 55 , the growth of various groups of finnock in 1983 is compared.

Table 55 . Growth of various groups of finnock in 1983.

	Mean smolt length	Mean finnock length	% growth	Sample No.
Reared-ranched 1+ smolts, 1983	16.8	24.3	45	4
Wild rod-caught	20.3	29.4	45	143
Wild-tagged	20.3	29.0	43	11

It can be seen that reared-ranched finnock (derived from reared 1+ smolts) had a similar growth increment to the tagged and rod-caught wild finnock

The presence of external tags on both reared-ranched and wild smolts in 1983 seems not to have affected growth.

(vi) Growth of reared sea trout to the one-sea-winter maiden stage.

Twelve reared one-sea-winter maiden sea trout were recaptured in 1983. In Table 56 , the growth of both reared and wild one-sea-winter maiden sea trout are compared.

Table 56 . Growth of reared and wild one-sea-winter maiden sea trout in 1983.

	Mean smolt length	Mean one-sea-winter maiden length	% growth	Sample no.
Reared-ranched	22.4 cm	37.4 cm	67	12
Wild-rod-caught	20.2 cm	37.0 cm	83	36

The growth increment from smolts of wild one-sea-winter maidens was greater than that of reared-ranched fish of the same age.

SECTION D: FISHERY DETAILS

1. CATCH DATA

(i) Numbers and average weights of rod catch

The rod catch for the 1983 season (including wild and reared salmon was as follows:-

	SALMON			SEA TROUT		
	No.	Total wt (lb)	Av. Wt (lb)	No.	Total wt (lb)	Av. Wt. (lb)
L. Feeagh	35	180.9	5.17	41	45.3	1.10
L. Furnace	95	490.6	5.16	199	155.2	0.78
	130	671.5	5.17	250	200.5	0.80

Table 57. Number and average weights of rod caught salmon and sea trout, 1970-83.

	SALMON		SEA TROUT	
	No.	Av. Wt. (lb)	No.	Av. Wt. (lb)
1970-74	237	4.6	957	0.94
1975-79	141	4.9	568	0.87
1980	59	5.0	455	1.08
1981	42	4.4	385	0.88
1982	105	4.5	371	0.76
1983	130	5.2	250	0.80

(ii) Salmon

130 salmon were caught in 1983 compared with 105 in 1982. As in 1982, there was little rain from late June until early August. This prevented fish from migrating upstream and the majority of the fish (95 salmon) were caught on L. Furnace. Of these, 48 (50.5%) were reared fish. In contrast to recent years, the average weight of rod caught salmon was higher in 1983.

(iii) Sea trout

Only 250 sea trout were caught in 1983, the lowest catch for 44 years. As in 1981 and 1982, this poor catch is a reflection of the very small stock of fish available. Again, the unfavourable weather conditions for angling (hot, dry and windless) recorded during July and most of August, contributed to this poor result. Only when storms and rain occurred in September were sea trout once again seen and caught.

2. EXPLOITATION RATES BY ROD FISHING

Only fly-fishing is permitted and records of the rate of exploitation for stocks of wild and reared salmon and sea trout now exist since 1970. Accurate assessments can be made for L. Feeagh but the complication of unknown numbers of sea trout spawning in the streams flowing directly into L. Furnace makes it impossible to attempt reliable estimates of the exploitation rate of sea trout in L. Furnace. 199 sea trout were caught in L. Furnace during 1983, most of which, it can be assumed, were destined to spawn in the L. Furnace tributaries (see Frontispiece for geography of the Burrishoole River system).

For salmon, the maximum rates are accurate, assuming no spawning in L. Furnace tributaries. To arrive at the minimum rates, a tentative correction of 10% has been applied. This is a slight, deliberate over-estimation, as only one stream is used to a minor extent by spawning salmon.

The 1983 rod fishing season for salmon ended on September 30, as in 1981 & It should be noted that the exploitation rates of 1970-78 are not directly comparable with those for 1979 & 1980 when the statutory closing date was earlier.

The 1983 exploitation rate of the total stock of wild salmon (11.4 - 12.5%) was in the range normally recorded, however the exploitation rate for L. Feeagh (4.6%) was lower than normal.

The stock of sea trout in L. Feeagh was the smallest yet recorded and the exploitation rate was also poor (4.5%). As noted in Section C.2(iii), the exploitation rates for reared grilse were the highest yet recorded, at an overall value of 30.1% for the stock of both lakes, including 7.4% of that on L. Feeagh.

Table 53. Exploitation rates for rod fishing.

	1970-74	1975-79	1980	1981	1982	1983
WILD SALMON						
Lough Feeagh						
"Available" fish by end of fishing season	989	644	610	356	407	520
Rod catch	86	51		15	30	24
Exploitation rate %	8.7	7.9	5.9	4.2	7.4	4.6
WILD SALMON						
Loughs Feeagh and Furnace						
Total stock of wild fish	1282	802	700	407	570	67
10% addition for L. Furnace residents	141	882	771	447	627	
Total catch of wild fish	200	113	50	32	71	
Minimum exploitation rate	14.0	12.8	6.5	7.2	11.4	1 ..
Maximum exploitation rate	16.1	14.1	7.1	7.9	12.5	1 ..
REARED SALMON						
Lough Feeagh						
"Available" fish by end of fishing season	154	122	77	159	115	143
Rod catch	4	7	5	4	3	11
Exploitation rate %	2.6	5.7	6.5	2.5	2.6	7.4
REARED SALMON						
Loughs Feeagh and Furnace						
Total stock	261	257	163	228	247	196
Total rod catch	32	23	9	10	30	59
Exploitation rate %	12.3	10.9	5.5	4.4	12.1	30.1
SEA TROUT						
Lough Feeagh						
"Available" fish by end of fishing season	1983	2513	1450	1218	1113	907
Rod catch	318	210	103	67	102	41
Exploitation rate %	16.0	8.3	7.1	5.5	9.2	4.5

567
624
71
11.4
12.5

3. FISHING EFFORT.

(i) Boat lettings.

Boat lettings increased by 15.5% in 1983 compared with 1982 and were 21.5% above the average recorded between 1979-83. Weekly lettings also increased by over 100%. The number of boats let with boatmen remained similar to 1982 and boats let without boatmen continued to provide the largest revenue to the fishery.

Table 59. Boat lettings (number of boat days).

	Let by week	Let by day	With boatman	Without boatman	Total boat days let
1979	96	74	172	Not applicable	172
1980	73	119	76	116	192
1981	57	103	46	114	160
1982	32	155	67	120	187
1983	72	144	65	151	216

(ii) Effort data.

Table 60. Effort data.

	L. Furnace:		L. Feeagh:			
	Rod hours	Boats /day	Rod hours	Boats /day	Overall boat utilisation rate	Total rod hours
1979	1928*	0.8*	1272*	1.1*	1.9*	3476*
1980	2543	1.7	1149	0.7	2.4	3691
1981	2042	1.5	836	0.6	2.1	2878
1982	2672	1.5	1240	0.7	2.1	3912
1983	3619	2.0	955	0.5	2.6	4555

*estimated

(f) Fishing success.

In Table 61, the catch data is incorporated with the fishing effort to give an estimate of fishing success: number of rod days to catch one fish.

Table 61. Catch per unit effort (rod days per fish).

	L. Furnace		L. Feeagh	
Year	Salmon	Sea trout	Salmon	Sea trout
1980	14.8	0.9	3.5	1.3
1981	11.1	0.8	5.5	1.6
1982	4.1	1.4	4.2	1.5
1983	4.8	2.3	3.4	2.9

The increased catch per unit effort (C.P.U.E.) of salmon recorded for L. Furnace was maintained in 1983. Drought conditions during late July and August held and concentrated grilse in L. Furnace and despite unsuitable angling conditions (lack of wind, high water temperatures and salinity, etc.), certain tidal conditions may have been responsible for good catches of grilse. Sea trout did not react in a similar manner and this is reflected in the very low C.P.U.E. recorded.

C.P.U.E. of salmon on L. Feeagh improved slightly in 1983 but the very low stock level of sea trout in this lough resulted in a very poor C.P.U.E. of sea trout.

4. EELS.

(i) Silver eels.

The catch of 1548 silver eels in 1983 was the second lowest recorded since full trapping began in 1971. The total was not a complete count since the fine mesh screens on the Mill Race fish fence had to be lifted during a high flood (October 10 - 13). However, the Salmon Leap trap was operational during this period and the low numbers trapped here indicated that few eels migrated downstream on this flood.

In contrast with 1982, over half (56.6%) of the catch was made at the Mill Race trap and, as in previous years, the bulk of the run (70.7%) migrated in October (see Table 62).

Table 62 . Timing of the silver eel run.

	Salmon Leap	Mill Race	Totals
September	88	-	88(5.7%)
October	336	759	1095(70.7%)
November	222	105	327(21.1%)
December	26	12	38(2.5%)

Two batches of silver eels were sample-weighed before sale, with the following results:-

Date	Number	Total weight	Av. weight
November 9	303	59.5 kg	196 g
December 5	220	59.8 kg	272 g

There was further evidence of larger eels migrating later in the season, during 1983. In addition, the average weight over the entire run was 228 g in 1983, the highest average weight on record.

Table 63 . Catches of silver eels and average weights.

1971-75	4465	84g
1976-80	4023	115g

1981	4702	131g
1982	4234	148g
1983	1548	228g

(ii) Elvers.

There was an unexplained cohort failure of elvers in 1983, as in 1981. The elver traps on the Mill Race were set working in mid-April but virtually no elvers were caught.

SECTION E: BIOCHEMICAL GENETICS

1. Introduction

In the branch of biochemical genetics discussed below, the technique called electrophoresis is used to separate the enzymes and other specific proteins extracted from tissues such as skeletal muscle, liver, heart, brain or eye. Comparison of the protein constituents of fish populations reflects the degree of relationship between them: closely related populations sharing similar protein constituents, while more distantly related fish show measurably different protein constituents. The differences between salmon populations demonstrated by this method are expressed as genetic distance which increases as the protein differences between populations become greater.

2. Atlantic salmon (Salmo salar)

(a) Genetic variation throughout the range of the salmon

This study is now complete and shows that, while small differences occur between the salmon populations of individual rivers, three major groups of populations exist. These are eastern North American, western European and eastern Scandinavian. The abstract of a paper currently being prepared is given below.

Five polymorphic enzymes have been investigated using starch gel electrophoresis in salmon samples from Ireland, Scotland, Norway, Iceland, Newfoundland and New Brunswick. Coupling these data with earlier results from Scandinavia, the genetic distances between samples, based on the genetic loci determining these enzymes, have been calculated. A major difference is evident between North American samples and European samples, including that from Iceland. Within the European area a discontinuity is evident between salmon from the Baltic and Eastern Atlantic while smaller but significant differences occur between riverine samples from within each area. These results are discussed in relation to an earlier genetic study using the transferrin locus, the geological history of the area, the distribution of other North Atlantic and Baltic forms and the implications for aquaculture of moving salmon between the major areas defined by this investigation.

(b) Electrophoretic analysis of salmon from the Faroes commercial catch

The methodology of this investigation was discussed in detail in Ann. Rep., XXVII, Section E, 2b. During early 1983, two samples of tissues, each from between 150 and 200 salmon caught in the Faroes oceanic fishery, were obtained. These samples were collected at the beginning and end of April to test whether the stock proportion in the fishery varies with time. The samples will be analysed electrophoretically in early 1984 and the results published.

3. Brown trout and sea trout (Salmo trutta)

Electrophoretic work on the anadromous and non-migratory forms of this species in the Burrishoole and neighbouring Newport systems was completed in 1983. This study demonstrated genetic differences between sea trout of the Burrishoole and Newport systems and between three populations of brown trout separated by impassable waterfalls in the Burrishoole system but not between sea trout and brown trout where they occur together on the Burrishoole system.

The provisional title and abstract of a paper to be presented at a workshop to be organised by the Atlantic Salmon Trust in October 1984 are as follows:-

An intensive electrophoretic survey of brown trout and sea trout (Salmo trutta L.) in western Ireland.

Starch gel electrophoresis coupled with enzyme staining was used to study trout, (Salmo trutta L.) from the Burrishoole and Newport systems entering Clew Bay in the west of Ireland. Migratory sea trout were sampled from the Burrishoole river and Newport river, which enter the sea 1Km from each other. Resident brown trout were taken from three locations on the Burrishoole system, one where intermixing with adult sea trout occurs and two from above impassable waterfalls. Significant genetic differences occurred between all samples except for the sea trout and brown trout which freely intermixed in the Burrishoole system. This suggests that, at least in this system, migratory habit is not associated with reproductive isolation.

Alevin	First free-swimming stage after hatching from the egg, having a yolk-sac which contains food supply for the first few weeks.
Coded-wire tag	Microscopic particle of binary-coded wire, injected into nasal cartilage of smolts. The particle is magnetised for later detection.
Condition factor	The relationship between length and weight of fish, giving a measure of fatness. Values above unity (1.00) reflect increased fatness.
Costia	Small, motile protozoan parasite of gills and skin surfaces.
Dip	Direct immersion of fish in buffered vaccine.
Eyed ova	Eggs with embryo inside egg shell, having visible eye-pigment.
Finnock	Sea trout which return to fresh water in the same year as they left as smolts.
Fry	Free-swimming stage after yolk-sac has been used up.
Furunculosis	Bacterial disease of salmonid fish.
Gene	Section of nucleic acid carrying heritable information.
Gene frequencies	The proportion of alternative genes at a locus.
Genetic distance	A measure of the difference between samples calculated from gene frequencies.
Glass eel	Unpigmented elver, before migration into fresh water.
Grilse	Salmon which spends only 1 winter in the sea before returning to fresh water
H.I. — Hyperosmotic Infiltration	Achieving the uptake of vaccine by immersing fish in an hypertonic salt solution before immersion in the buffered vaccine.
Imprinting	The process in which the distinctive odour of the natal river is learnt by the salmon smolt, enabling specific homing as an adult.
Locus	An area in which one maternal and one paternal gene occurs on a pair of chromosomes.
Ova	Eggs.
Panjet	Instrument which uses compressed air to inject substances subcutaneously.
Parr	Juvenile salmon before smolt transformation.
Salmonid	This term embraces all species of the genus *Salmo*, including salmon, sea trout, brown trout and rainbow trout.
Sea trout	Migratory trout, spending 2 or more months in the sea each year after migration.
2-sea-winter fish	Salmon, including spring and summer fish, but excluding grilse.
Smolt	Juvenile stage at which salmon and sea trout migrate to salt water.
UDN	Ulcerative Dermal Necrosis — skin condition of adult salmon, often leading to death.