

**REPORT OF THE SOAFD ANNUAL SURVEY OF
FISH FARMS FOR 1991**

Responses to a Departmental questionnaire from Scottish rainbow trout and salmon farming companies are summarised in the following paragraphs and attached Tables 1-15. The cooperation of the fish farming industry in completing these questionnaires is gratefully acknowledged.

RAINBOW TROUT

A total of 56 returns were received including four from companies which had no trout production in 1991. Returns received from the remaining 52 companies (54 in 1990) operating 69 farm sites (71 sites in 1991) showed that trout production was 3,334 tonnes (3,182 tonnes in 1990) an increase of 152 tonnes (4.8%) on the previous year. Some 1,074 tonnes (1,015 tonnes in 1990) of production were fish greater in weight than 1 lb and 425 tonnes (431 in 1990) were used for restocking angling waters.

Comparison by system of production showed that ponds and raceways produced 1,125 tonnes (1,090 tonnes in 1990); fresh water tanks produced 776 tonnes (366 in 1990); fresh water cages produced 1,254 tonnes (1,188 in 1990); and sea cages produced 178 tonnes (537 in 1990).

Purchases of fry and fingerlings totalled 8.5 million (13.3 in 1990). Of the purchased fish 7.6 million (10.6 in 1990) were all female and 0.5 million (0.45 million in 1990) were triploids. A total of 25.70 million ova were laid down for hatching (28.68 million in 1990), comprising 2.5 million from own broodstock, 8.3 million from other UK farms and the rest imported under licence from foreign sources. Of these ova 17.75 million (21.42 in 1990 and 16.40 million in 1989) were all female. The manpower employed was 133 full time and 51 part time (138 and 68 respectively in 1990).

Analyses of production by region shows that Dumfries and Galloway has most trout production followed by Strathclyde.

The trout production in Scotland seems to have levelled out over the last two years at two or three hundred tonnes below the peak production in the late 1980s. A fall in the numbers of fingerlings purchased last year may suggest a drop in production next year.

ATLANTIC SALMON - SMOLTS AND OVA

A total of 80 returns were received showing 172 sites (176 in 1990) of which 143 were in operation comprising 57 cage sites and 86 tank sites (66 and 86 respectively in 1990). Production of smolts was down 11% at 22.404 million (24.875 in 1990) of which 21.748 million were S1's and 0.656 million were S2's (23.06 and 1.80 respectively in 1990). Some 11.15 million (49.77% compared to 41.11 in 1990) were sold. Anticipated production

in 1992 is 21.503 million (compared to estimates of 26.363 million last year). Estimates for 1993 are 22.290 million indicating a plateau in production. Movements of fry and parr into and out of farms were 29.546 and 32.395 respectively.

Numbers of ova laid down for hatching were 50.720 million (64.5 in 1990) of which 0.5 million were of Scottish wild stock (0.6 million in 1990) the rest were from farmed stock. It is estimated 60.442 million ova will hatch in 1992. Numbers of ova stripped were estimated at 129,713 million (29.2% up on last year's corrected figure of 100 million). The vast majority of these are rejected but a small proportion are exported. The number of sites vaccinating fish was 61 (59 in 1990 and 65 in 1989).

Comparing smolt production by region shows Highland (11.4 million) well ahead of the nearest rivals Strathclyde (4.9 million) and the Western Isles (3.6 million) followed by England and Shetland (1.3 and 0.8 million respectively). Numbers of staff employed were 271 full time and 79 part time (285 and 93 respectively in 1990).

ATLANTIC SALMON PRODUCTION

A total of 163 companies contributed (171 in 1990) of which nine indicated no production. Some 365 sites were in operation and 67 not in use. Production was 40,593 tonnes (32,350 in 1990). The return showed that 21,026 tonnes comprising 8,877 million fish, average weight 2.37 kg, were from the 1990 smolt intake and 19,567 tonnes comprising 6,123 million fish average weight 3.19 kg were from the 1989 smolt intake.

The mean weight of salmon harvested in 1991 was 3.19 kg, a 19% increase on the 1990 figure of 2.76 kg possibly reflecting greater confidence in both the ability to achieve survival and the market price of larger fish.

Grilse and pre-salmon weights were marginally greater than last year. Survival of salmon was similar to last year, but grilse and pre-salmon survivals have improved from 32.2% to 41.4%. The overall survival for the 1989 year class of smolts was 57.91% compared to 63.4% for the 1988 year class, and it is estimated that survival in the 1991 year class will be approximately 67%. The combination of the bacterial disease furunculosis and lice infestation are the major causes of losses. Grilse percentages for the 1989 smolt class were 21.1%, the lowest on record, but are predicted to rise to 26% for 1990 year class. The estimated production for 1992 is 37,698 tonnes. Loss of confidence in the market for salmon and fears about the inability to control disease are believed to be major factors for the projected plateau in production.

Production by region shows that Highland is the biggest producer with 37.0% followed by Shetland at 26.1%. Shetland produces the biggest fish in all categories, grilse, pre-salmon and salmon suggesting that more northern waters favour salmon growth. Production by tonnage per site shows that sites producing >500 tonnes (18) produced the greatest proportion at 30.7%, with sites producing 200-300 tonnes second producing 20.3%. Although fallowing of sites to allow year class separation is strongly recommended for disease control purposes, only 84 of 286 (29%) sea cage sites recorded such an action. In

fresh water cage culture of 57 responses, 54 (97%) used fallowing periods. Some 27 sites produced broodstock (35 in 1990). Staff employed were 1,014 full time and 272 part time (1,165 and 326 respectively in 1990).

Some 20.2 million smolts were placed in sea water (21.4 million in 1990) of which 0.8 million came from England (27.9% decrease from 1990). Smolt numbers were for S1's 19.3 million (95%) and for S2's 0.8 million (4%).

Compared with the 1989 smolt intake of nearly 24 million, the 1990 and 1991 smolt intakes of 21.4 and 20.2 million respectively show that Scottish farmed salmon production is set to decrease by approximately 7% or at best plateau if trends in the 1991 numbers of fish surviving to harvest continue to improve. Factors leading to the conclusion that improved survival may feature significantly in future years are the following: the 41.4% of grilse and pre-salmon recovered from the 1990 year class (32% in the 1989 year class); the increasing number of farms applying for more sea cage space without increased production (ie reducing stocking densities); and the creation of strategic health management agreements involving fallowing and subsequent stocking with smolts of tested health status. However, the number of sea cage sites involved in fallowing (29% compared to 22% in 1990) is still unacceptably low when compared to the 97% of fresh water cage sites using fallowing. The full effect of strategic health management agreements which involve the collective fallowing of shared waters must await some years for evaluation. Preliminary reports of their operation, however, do suggest beneficial results both in reducing infestations of lice and outbreaks of furunculosis, as well as a decline in resistance patterns of lice to dichlorvos and of the furunculosis bacterium to antimicrobial medicines.

Market factors continue to dominate long-term production trends as can be seen by the forecasts for smolt production, namely 21.5 and 22.3 millions for 1992 and 1993 respectively implying that Scottish salmon production will be static around the 40,000 tonnes level until at least 1994.

TABLE 1

Rainbow trout production - 1991 data

No of companies	No of sites*	Staff		
		Full time	Part time	Total
56	81	133	51	184

* 12 sites not in production

Egg sources and numbers ('000s)

Own broodstock	Other UK farms	Foreign	Total	All female	Triploids
2,512	8,310	14,881	25,703	17,750	559

Fry and fingerlings ('000s)

Bought	All female	Triploids	Sold
8,535	7,609	501	7,979.9

Production (tonnes)

Table	Restocking	Total	Fish >1 lb
2,908.8	425.31	3,334.11	1,074.49

Use of vaccines
30

TABLE 2

Rainbow trout production by region

Region code	Staff		Eyed eggs ('000s)			Ova all female	Total production (tonnes)		Fish >1 lb (tonnes)	Vaccines used
	F/T	P/T	Own	UK	Foreign		Table	Restocking		
Borders	7	4	700	280	-	220	294.0	6.0	3.0	2
Central & Fife	22	13	-	100	-	100	551.6	96.0	84.6	3
Dumfries & Galloway	30	11	1,022	1,925	6,660	6,900	784.6	146.5	55.9	6
Grampian	6	9	55	10	-	-	11.4	14.0	10.3	5
Highland	13	2	-	151	1,001	-	379.9	20.8	450.0	3
Lothian	8	1	220	260	300	530	32.0	56.0	73.0	-
Strathclyde	34	7	500	1,400	1,200	2,400	654.5	63.0	371.0	7
Tayside	13	4	15	4,184	5,720	7,600	200.9	23.0	26.8	5
All Scotland	133	51	2,512	8,310	14,881	17,750	2,908.9	425.3	1,074.5	30

TABLE 3

Analysis of rainbow trout farms by system and scale of production

System	Production (tonnes)							Totals			
	0*	<10	10-25	26-50	51-100	101-200	>200	Tonnes	>1 lb	Number of sites*	% contribution
FW cages	4	4	1	0	0	2	4	1,254.94	570.55	15	37.64
FW ponds and raceways	2	1	3	2	6	4	0	1,125.08	186.26	18	33.74
FW tanks	18	11	8	0	2	3	0	776.08	116.18	42	23.28
SW cages	1	3	0	1	0	1	0	178.00	201.50	6	5.34
All methods	25	19	12	3	8	10	4	3,334.10	1,074.49	81	100.00

* includes sites not in production

TABLE 4

Atlantic salmon ova and smolts - 1991 data

No of companies	No of sites*	Staff		
		Full time	Part time	Total
80	172	271	79	350

* 29 sites not in operation

Method of production

	No	Total capacity (cubic metres)	Production ('000s)
Hatcheries and tanks	86	52,568	11,881
Cages	57	210,791	10,524

Eggs produced ('000)

129,713

Egg sources and numbers ('000s) laid down for hatching

Own broodstock	Other UK farms	UK wild	Foreign	Total	Estimate 1991-92
25,322	24,916	482	-	50,720	60,442

Movements of fry and parr ('000s)

In	Out
29,546	32,395

Use of vaccines

61

Smolt production ('000s)

Produced as			Sold as		
S1	S2	Total	S1	S2	Total
21,748	656	22,404	10,824	326	11,151

Estimated production ('000s) - 1992

S1	S2	Total
20,894	609	21,503

- 1993

Total
22,290

TABLE 5

Atlantic salmon - ova and smolt production records and estimates

	1985	1986	1987	1988	1989	1990	1991
Hatching ova ('000)							
Actual	16,151	38,652	60,107	80,386	75,327	64,559	50,720
Producers estimate for following year	None	58,573	67,475	85,077	90,839	50,406	60,442
Smolts ('000)							
Growers data	5,585	6,595	12,858	20,921	23,839	21,408	20,227
Producers current data	6,177	7,030	13,294	22,499	25,825	24,874	22,404
Producers estimate for following year	None	15,119	23,094	28,740	26,242	24,058	21,503
Producers estimate for two years ahead	None	21,697	28,213	33,621	28,011	26,363	22,290

TABLE 6

Grouping of smolt sites by the scale of their production

Production (Nos '000s)	0	<10	10-25	26-50	51-100	101-250	251-500	501-1000	>1,000	No of sites*	Annual No of smolts
No of sites in 1991	61	2	11	17	22	26	26	5	2	172	22,404
Same sites estimates for 1992	55	1	3	20	26	40	24	2	1	172	21,503
Some sites estimates for 1993	64	1	4	13	28	34	22	5	1	172	22,290

* 29 sites not in operation

TABLE 7

Atlantic salmon - ova and smolt production by region

Region code	Staff		Eggs ('000s)				Female triploid ova ('000s)	Total eyed eggs ('000s) 1992	1991 smolts ('000s)			1992 smolts ('000s)		1993 smolts ('000s) estimate		
	P/T	P/T	Own farmed	Farmed UK	Wild UK	Foreign source			Produced as			Sold as			Estimates	
									S1	S2	S1	S2	S1		S2	
*Combined regions	12	12	-	3,100	230	-	767	3,300	1,082	86	1,057	86	1,132	50	1,430	
Highland	124	23	15,937	10,161	124	-	760	34,832	11,308	141	4,432	38	10,490	100	11,484	
Orkney	7	5	250	450	-	-	-	700	320	21	247	6	412	24	485	
Shetland	14	7	-	3,325	-	-	80	3,620	848	13	813	8	1,410	14	1,700	
Strathclyde	55	18	5,375	4,020	18	-	30	6,740	4,953	2	3,020	-	3,952	10	3,937	
Western Isles	59	14	3,760	3,860	110	-	220	11,250	3,238	394	1,256	189	3,498	411	3,254	
All Scotland	271	79	25,322	24,916	482	-	1,857	60,442	21,748	656	10,824	327	20,894	609	22,290	
England	-	-	-	-	-	-	-	-	1,300	-	-	-	-	-	-	

* Combined regions consist of Central, Dumfries and Galloway and Taysid

TABLE 8

Salmon and grilse production - 1991 data

No of Companies	No of sites*	Staff		
		Full time	Part time	Total
163	365	1,014	272	1,286

* 67 not in use

Method of production

	No	Total capacity (cubic metres)	Production (tonnes)
Sea water tanks	12	78,582	828.29
Sea water cages	286	6,153,216	39,765.11

Smolts to sea ('000s)

S1	S2	Total	From England
19,368	858	20,227	870

No of broodstock sites
27

Production - from the 1990 smolt intake harvested in 1991

January-August			September-December			January-December		
Nos ('000s)	Tonnes	Average weight	Nos ('000s)	Tonnes	Average weight	Nos ('000s)	Tonnes	Average weight
3,604	7,449	2.07	5,272	13,577	2.57	8,877	21,026	2.37

Production - from the 1989 smolt intake harvested in 1991

January-December		
Nos ('000s)	Tonnes	Average weight
6,123	19,567	3.19

Total production in 1991

Tonnes
40,593

TABLE 9

Atlantic salmon - production record and estimates of future production

Year	No of smolts ('000)	Year harvested	Nos of grilse and pre salmon ('000)	Weight (tonnes)	Mean fish wt. (kg)	% of fish recovered	Year harvested	No of salmon ('000)	Weight (tonnes)	Mean fish wt (kg)	% of fish recovered	% total recovery	Year class weight (tonnes)	Grilse Nos ('000)	% grilse	Annual production (tonnes)
1984	3,628	1985	1,970	4,262	2.163	54.3	1986	1,168	4,350	3.723	32.2	86.5	8,612	1,084	34.5	6,921
1985	5,586	1986	2,403	5,988	2.466	43.1	1987	1,522	5,521	3.627	27.3	70.4	11,508	1,090	27.7	10,333
1986	6,595	1987	3,285	7,200	2.143	49.6	1988	1,750	6,086	3.480	26.5	76.3	13,286	1,526	30.3	12,721
1987	12,858	1988	5,167	11,866	2.300	40.2	1989	3,257	10,312	3.156	25.3	65.5	22,178	2,247	26.6	17,951
1988	20,921	1989	7,890	18,240	2.312	37.7	1990	5,382	14,891	2.770	25.7	63.4	33,131	2,923	22.0	28,553
1989	23,839	1990	7,683	17,459	2.272	32.2	1991	6,123	18,567	3.196	25.7	57.9	37,026	2,913	21.1	32,350
1990	31,402	1991	8,877	21,026	2.368	41.4	1992	5,500	17,501	3.200	25.7	67.1	38,627	3,604	26.55	40,593
1991	20,227	1992	8,373	20,097	2.400	41.4	1993	5,198	16,634	3.200	25.7	67.1	36,731			92 37,698
1992	20,232	1993	8,376	20,102	2.400	41.4	1994	5,199	16,538	3.200	25.7	67.1	36,740			

Figures in this box are based on estimates

TABLE 10

Account of the difference between the 1990 estimate of production and 1991 out turn of production

	Tonnes
Estimated tonnage for 1991	33,007
Actual tonnage for 1991	40,593
Difference	7,586

Lost production is accounted as follows

	Tonnes
1. Salmon production estimate was 6,126,000 fish at 2.80 kg	17,154
Salmon production outturn was 6,123,000 fish at 3.2 kg	19,567
Difference	2,439
2. Grilse and pre-salmon estimate was 6,893,000 fish at 2.3 kg	15,853
Grilse and pre-salmon outturn was 8,877,000 fish at 2.37 kg	21,038
Difference	5,173
Sum 1 and 2	7,586

TABLE 11

Production and manpower of sea sites by region

Region	Staff		Annual production (tonnes)	Tonnes produced/man	Grilse		Pre-salmon		Salmon				
	F/T	P/T			Tonnes ('000s)	Mean wt (kg)	Tonnes	Mean wt (kg)	Tonnes	Mean wt (kg)	Tonnes ('000s)	Mean wt (kg)	
Highland	367	68	15,022.7	34	4,007.7	1,986	2.01	4,000.0	1,724	2.30	7,015.0	2,305	3.04
Orkney	38	22	1,329.1	22	118.1	61	1.93	407.1	159	2.56	803.9	263	3.05
Shetland	202	102	10,614.0	35	826.2	289	2.85	4,321.8	1,398	3.09	5,466.0	1,388	3.93
Strathclyde	220	37	8,004.8	31	1,549.6	751	2.06	2,447.3	836	2.92	4,007.9	1,338	2.99
Western Isles	187	43	5,622.4	24	947.6	517	1.83	2,400.8	1,156	2.07	2,274.0	830	2.73
All Scotland	1,014	272	40,593.0	-	7,449.2	3,605	-	13,577.1	5,273	-	19,567.1	6,123	-

TABLE 12

Recovery of 1989 and 1990 smolt year classes by region ('000)

Region	Smolts to sea		Grilse and pre salmon		Salmon		Total recovered	% recovery		
				%		%				
Western Isles	(89)	3,467	(90)	1,136	57.8	(91)	830	42.2	1,966	56.7
	(90)	3,504	(91)	1,673						
Orkney	(89)	518	(90)	153	36.8	(91)	263	63.2	416	80.3
	(90)	747	(91)	220						
Highland	(89)	10,831	(90)	3,958	63.2	(91)	2,305	36.8	6,263	57.8
	(90)	8,302	(91)	3,710						
Strathclyde	(89)	4,969	(90)	1,044	43.8	(91)	1,338	56.2	2,382	47.9
	(90)	4,213	(91)	1,587						
Shetland	(89)	4,055	(90)	1,393	50.1	(91)	1,388	49.9	2,781	68.5
	(90)	4,643	(91)	1,687						

TABLE 13

Grilse, pre-salmon and salmon production by number and region for the 1989 smolt intake

Harvested in Region	1990				1991	
	Grilse		Pre-salmon		Salmon	
	Nos ('000)	%	Nos ('000)	%	Nos ('000)	%
Western Isles	402	20.4	734	37.3	830	42.20
Orkney	50	12.0	103	24.7	263	63.20
Highland	1,717	27.4	2,241	35.8	2,305	36.80
Strathclyde	390	16.4	654	27.45	1,338	56.25
Shetland	354	12.7	1,039	37.4	1,388	49.90

TABLE 14

Grouping of Atlantic salmon sea farm sites by the scale of production

Production	0	<10	10-25	26-50	51-100	101-200	201-300	301-400	401-500	>500	Totals	
											Sites	Tonnes
No of sites in 1991	132	7	26	35	51	36	34	16	8	18	365	40,593.4
% share of production	0.0	0.1	1.0	3.4	8.8	13.3	20.3	13.5	8.9	30.7		

TABLE 15

Record of numbers of cage sites employing fallow periods and the length of the period

Period (weeks)	0	<4	4-8	8-26	26-51	>=52
No of sea water sites	202	2	24	49	7	2
No of fresh water sites	14	7	11	13	9	3