

## REPORT OF THE DAFS ANNUAL SURVEY OF FISH FARM FOR 1989

Responses to a Departmental questionnaire from Scottish rainbow trout and salmon farming companies are summarised in the following paragraphs and attached Tables 1-14. The cooperation of the fish farming industry in completing these questionnaires is gratefully acknowledged.

### RAINBOW TROUT

A total of 69 (100%) returns were received including 10 from companies which had no trout production in 1989. Returns received from the remaining 59 companies (57 in 1988) operating 82 farm sites (83 sites in 1987) showed that trout production was 3,512 tonnes (3,556 tonnes in 1988) a decrease of 44 tonnes (1.2%) on the previous year. Some 1,123 tonnes (1,231 tonnes in 1988) of production were fish greater in weight than 1 lb and 475 tonnes (298 in 1988) were used for restocking angling waters.

Comparison by system of production showed that ponds and raceways produced 1,166 tonnes (1,062 tonnes in 1988); fresh water tanks produced 382 tonnes (335 in 1988); fresh water cages produced 1,482 tonnes (1,450 in 1988); and sea cages produced 482 tonnes (709 in 1988).

Purchases of fry and fingerlings totalled 9.32 million (8.54 in 1988). Of the purchased fish 6.77 million (5.80 in 1988) were all female and 94,000 (0.20 million in 1988) were mixed sex triploids. A nil return was recorded for use of female triploids. A total of 29.62 million ova were laid down for hatching (26.9 million in 1988) comprising 5.5 million from own broodstock, 11.70 million from other UK farms and the rest imported under licence from foreign sources. Of these ova 16.40 million (12.80 in 1988 and 9.9 million in 1987) were all female. The manpower employed was 151 full time and 83 part time (146 and 83 respectively in 1988).

Analyses of production by region shows that Strathclyde has most trout production with Dumfries and Galloway and Tayside some way behind respectively.

The results indicate that the industry has reached a mature state of development and production.

The most notable feature was the increasing use of all female stock.

#### ATLANTIC SALMON - SMOLTS AND OVA

A total of 90 returns (92 possible) were received showing 188 sites of which 168 were in operation (176 in 1988) comprising 70 cage sites and 98 tank sites (72 and 104 respectively in 1988). Production of smolts was 25.825 million (22.499 in 1988) of which 23.970 million were S1's and 1.855 million were S2's (19.76 and 2.74 respectively in 1988). Some 9.405 million (36.4% compared to 36.3% in 1988) were sold. Anticipated production in 1990 is 26.242 million compared to estimates of 33.621 million last year. Estimates for 1991 are 28.011 million. Movements of fry and parr into and out of farms were 34.016 and 37.738 respectively.

Numbers of ova hatching were 75.3 million (80.39 in 1988) of which 3.67 million were of Scottish wild stock (3.2 million in 1988) the rest were from farmed stock. It is estimated 90.0 million ova will hatch in 1990. The number of sites vaccinating fish was 65 (29 in 1988 and 8 in 1987).

Comparing smolt production by region shows Highland (15.3 million) well ahead of the nearest rivals Strathclyde (5.2 million) and the Western Isles (3.4 million) followed by England and Shetland (0.771 and 0.672 million respectively). Numbers of staff employed were 330 full time and 87 part time (344 and 119 respectively in 1988).

## ATLANTIC SALMON PRODUCTION

A total of 176 companies contributed (159 in 1988) of which 10 indicated no production. Some 292 sites were in operation and 39 not in use. Production was 28,553 tonnes (17,951 in 1988). The return showed that 18,240 tonnes comprising 7.890 million fish, average weight 2.31 kg, were from the 1988 smolt intake and 10,312 tonnes comprising 3.267 million fish average weight 3.16 kg were from the 1987 smolt intake.

Table 12 illustrates the performance data of the 1984-88 smolt intakes and gives estimates for in the years 1990-92. The reasons for the lowest ever recorded mean weight for salmon are probably disease and not management marketing decisions. The drop in survival from smolt to harvest seen in last year's results also shows clearly in the latest figures. Only two out of three survive to harvest and the trend is still downwards. Taken together these figures show the industry is losing at least 10% more tonnage than might be expected from previous years survival records.

A collective management decision seems to have been taken in 1988 to limit growth of production by limiting numbers of ova. Table 5 illustrates ova and smolt production records and previous estimates made by the industry of both. These figures indicate that Scottish salmon production cannot rise much beyond current estimates for 1990-92 until greater numbers of ova are laid down. Production therefore will be relatively static between 1991-94.

Cages produced 27,975 tonnes and pumped sea water systems 578 tonnes. Brood fish were produced on 44 sites (31 in 1988).

Some 23,839 million smolts (20.921 in 1988) were placed in sea water of which 0.567 million (0.649 in 1988) came from England. S1 smolt numbers were 22.289 million and S2 smolts 1.551 million (S2% was 6.5% and 12.2% in 1988). Salmon production was greatest in Highland Region

(11,529 tonnes) with Shetland second (7,336 tonnes). Large Regional differences in grilse and salmon numbers harvested are recorded in Table 14. Numbers of staff employed were 1,102 full time (991 in 1988) and 316 part time (329 in 1988).

Table 11 shows that numbers of cage sites with fallow periods, useful as a break in disease transmission, was low (55.7%) for fresh water and especially low (7.4%) for sea water.

Salmon farming looks set to reach a plateau in production by 1991 through management decisions probably determined by market forces. However, even holding current levels of ova and smolt production greater yields than the estimates made here should be achievable if sea water survival can be improved.

TABLE 1

Rainbow trout production - 1989 data

No of companies	No of sites registered	Staff		
		Full time	Part time	Total
69	102	151	83	234

Egg sources and numbers ('000s)

Own broodstock	Other UK farms	Foreign	Total	All female	All female triploids	Mixed sex triploid
4,585.30	11,699.00	13,339.00	29,623.30	16,395.50	0.00	90.00

Fry and fingerlings ('000s)

Bought	All female	All female triploid	Mixed sex triploid	Sold
9,316.40	6,773.40	0.00	94.00	9,740.90

Production (tonnes)

Table	Restocking	Total	Fish >1 lb
3,037.83	474.60	3,512.43	1,123.13

Use of vaccines
21 sites

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	9	2	550	935		935	263.0	10.5	8.0	1
Central, Fife, Shetland	8	8					26.5	51.5	35.5	
Dumfries & Galloway	32	14	2,427	3,160	5,939	5,665	690.4	125.1	52.1	4
Grampian	5	9		169		69	28.0	12.5	9.3	1
Highland	7	10					153.9	10.0	33.2	2
Lothian	7	5	412	415	350	477	35.0	31.5	35.0	
Strathclyde	49	25	1,196	1,070	1,000	1,670	1,249.8	48.3	773.0	7
Tayside	29	9		5,870	6,050	7,520	589.2	174.3	164.1	6
Western Isles	5	1		80		60	2.0	11.0	13.0	
All Scotland	151	83	4,585	11,699	13,339	16,396	3,037.8	474.6	1,123.1	21

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	2	4	3	1	1	1	4	1,482.28	426.63	16	42.20
FW ponds and raceways	8	6	5	3	2	5	1	1,165.70	139.55	30	33.19
FW tanks	24	9	8	1	1	1	0	382.05	82.25	44	10.88
SW cages	5	3	2	0	1	0	1	482.40	474.70	12	13.73
All methods	39	22	18	5	5	7	6	3,512.43	1,123.13	102	100.00

\* includes sites not in production

**TABLE 4**

**Atlantic salmon smolts - 1989 data**

No of companies	No of sites	Staff		
		Full time	Part time	Total
90	168	330	87	417

**Method of production**

	No	Total capacity (cubic metres)	Production (‘000s)
Tanks	98	58,623	12,328
Cages	70	225,685	13,498

**Egg sources and numbers (‘000s)**

Own broodstock	Other UK farms	UK wild	Foreign	Total	Estimate 1989-90
51,523.00	19,734.00	3,670.00	400.00	75,327.00	90,839.50

**Movements of fry and parr (‘000s)**

In	Out
34,016.70	37,738.50

**Use of vaccines**

65 Sites
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**Smolt production (‘000s)**

Produced as			Sold as		
S1	S2	Total	S1	S2	Total
23,970.03	1,855.19	25,825.22	11,174.63	1,163.89	12,338.52

**Estimated production (‘000s) - 1990**

S1	S2	Total
24,038.10	2,204.00	26,242.10

**- 1991**

Total
28,011.10

TABLE 5

Atlantic salmon - ova and smolt production records and estimates

	1985	1986	1987	1988	1989	1990	1991
<b>Hatching ova ('000)</b>							
Actual	16,151	38,652	60,107	80,386	75,327	-	-
1 year previous estimate	None	None	58,573	67,475	85,077	90,839	-
<b>Smolts ('000)</b>							
Growers data	5,585	6,595	12,858	20,921	24,099	-	-
Producers current data	6,177	7,030	13,294	22,499	25,825	-	-
Producers previous (1 year old) data	None	7,566	15,119	23,094	28,740	26,242	-
Producers previous (2 year old) data	None	None	None	22,352	28,213	33,621	28,011

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 1989	57	7	18	20	16	37	20	10	3	188	25,825.2
Same sites estimates for 1990	55	4	10	29	23	35	18	13	1	188	26,242.1
Some sites estimates for 1991	60	3	7	23	24	39	18	12	2	188	28,011.1

TABLE 7

Atlantic salmon - ova and smolt production by region

Region code	Staff		Eggs ('000s) 1990				Female triploid ova ('000s)	Total eyed eggs ('000s) 1991	1989 smolts ('000s)				1990 smolts ('000s)		1991 smolts ('000s) estimate
	F/T	P/T	Own farmed	Farmed UK	Wild UK	Foreign source			Produced as		Sold as		Estimates		
*Combined regions	18	9		2,810	1,090	400	397	4,697	1,006	50	996	50	1,040	45	1,490
Highland	152	28	41,936	7,906	1,410		331	64,630	14,335	997	5,326	781	14,580	823	15,322
Orkney	7	3	110	505	100			800	135	36	85	18	285	11	410
Shetland	13	15		903	175			1,800	636	37	573	31	655	43	1,275
Strathclyde	64	20	5,340	4,550	670		950	12,035	5,112	63	2,934	9	4,612	63	5,112
Western Isles	76	14	4,137	3,060	225		780	8,320	2,748	672	1,261	275	2,866	919	4,402
All Scotland	330	87	51,523	19,734	3,670	400	2,458	90,840	23,970	1,855	11,175	1,164	24,038	2,204	28,011
England	19	16	-	5,200	-	-	-	5,200	746	25	640+	25+	1,200	38	1,300

\* Combined regions consist of Central, Dumfries and Galloway, Grampian and Tayside  
+ sold to Scotland

**TABLE 8**

Salmon and grilse production - 1989 data

No of Companies	No of sites registered	Staff		
		Full time	Part time	Total
176	331	1,102	316	1,418

Method of production

	No	Total capacity (cubic metres)	Production (tonnes)
Sea water tanks	12	71,793	578.10
Sea water cages	282	6,224,105	27,974.57

Smolts to sea ('000s)

S1	S2	Total	From England	No of broodstock sites
22,288.56	1,550.49	23,839.05	567.05	44

Production - from the 1988 smolt intake harvested in 1989

Jan-Aug			Sep-Dec			Jan-Dec		
Nos ('000s)	Tonnes	Average weight	Nos ('000s)	Tonnes	Average weight	Nos ('000s)	Tonnes	Average weight
2,923.26	5,952.28	2.04	4,966.86	12,288.04	2.47	7,890.12	18,240.32	2.31

Production - from the 1987 smolt intake harvested in 1989

Jan-Dec		
Nos ('000s)	Tonnes	Average weight
3,267	10,312	3.16

Total production in 1989

Tonnes
28,553

TABLE 9

Production and manpower of sea sites by region

Region	Staff		Smolts ('000s) to sea	Grilse		Pre-salmon		Salmon		Total (tonnes)
	F/T	P/T		Tonnes	('000s)	Tonnes	('000s)	Tonnes	('000s)	
Highland	519	66	10,831	2,199.5	1,218	4,613.5	2,076	4,715.9	1,640	11,528.1
Orkney	28	29	518	89.9	38	286.3	106	264.0	80	640.2
Shetland	184	124	4,315	1,059.0	424	3,423.6	1,120	3,299.9	807	7,336.5
Strathclyde	206	33	4,969	1,887.3	856	2,706.0	1,072	1,588.9	551	6,182.2
Western Isles	165	64	3,467	734.7	395	1,504.6	675	625.7	218	2,865
All Scotland	1,102	316	24,100	5,970.3	2,931	12,534.0	5,049	10,494.3	3,297	28,552.8

**TABLE 10**

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

Production (Nos '000s)	0	<10	10-25	26-50	51-100	101-200	201-300	301-400	401-500	>500	Totals	
											Sites	Tonnes
No of sites in 1989	112	19	34	47	30	52	11	13	7	8	333	28,998.7
% share of production	0.00	0.34	1.99	6.06	8.09	26.01	8.73	16.15	10.83	21.81		

**TABLE 11**

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	233	5	15	25	5	0
No of fresh water sites	31	0	9	23	7	0

TABLE 12

Atlantic salmon - production record and estimates of future production

Year	No of smolts harvested	Year	Mos of grilise and pre salmon ('000)	Weight (tonnes)	Mean fish wt (kg)	% of fish recovered	Year	No of salmon ('000)	Weight (tonnes)	Mean fish wt (kg)	% of fish recovered	% total recovery	Total harvested (tonnes)	Annual production (tonnes)	Grilise Mos ('000)	% grilise	
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	85	6,921	1,084	34.5
1985	5,586	1986	2,409	5,988	2.486	43.1	1987	1,522	5,521	3.627	27.3	70.4	11,508	86	10,333	1,090	27.7
1986	6,595	1987	3,285	7,200	2.143	49.8	1988	1,750	6,086	3.480	25.8	75.6	13,286	87	12,721	1,526	30.3
1987	12,858	1988	5,167	11,866	2.300	40.2	1989	3,267	10,312	3.156	25.3	65.5	22,178	88	17,951	2,247	26.6
1988	20,921	1989	7,890	18,240	2.312	37.7	1990	5,293	16,408	3.100	25.3	63.0	34,648	89	28,553	2,923	22.0
1989	23,839	1990	8,987	20,671	2.300	37.7	1991	6,031	18,697	3.100	25.3	63.0	39,368	90	37,079		
1990	24,000	1991	9,048	20,810	2.300	37.7	1992	6,072	18,823	3.100	25.3	63.0	39,633	91	39,507		
1991	24,000	1992	9,048	20,810	2.300	37.7	1993	6,072	18,823	3.100	25.3	63.0	39,633	92	39,633		

Figures in this box are based on estimates

TABLE 13

Account of the difference between the 1988 estimate of production and 1989 outturn of production

	Tonnes
Estimated tonnage for 1989	31,015
Actual tonnage for 1989	28,553
Difference	2,462

Lost production is accounted as follows

	Tonnes
1. Salmon production estimate was 3,408,000 fish at 3.50 kg Salmon production outturn was 3,266,730 fish at 3.16 kg	11,928 10,323
Difference	1,605
2. Grilse and pre-salmon estimate was 8,368,000 fish at 2.28 kg Grilse and pre-salmon outturn was 7,890,120 fish at 2.31 kg	19,087 18,226
Difference	861
Sum 1 and 2	2,466

TABLE 14

Grilse, pre-salmon and salmon production by number and region for the 1987 smolt intake

Harvested in Region	1988				1989	
	Grilse		Pre-salmon		Salmon	
	Nos ('000)	%	Nos ('000)	%	Nos ('000)	%
Western Isles	473	43.6	394	36.3	218	20.1
Orkney	84	35.4	73	30.8	80	33.8
Highland	1,074	26.3	1,365	33.5	1,640	40.2
Strathclyde	283	22.8	409	32.9	551	44.3
Shetland	332	18.6	678	37.9	777	43.5