

Fisheries
Research
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SCOTTISH FISH FARMS Annual Production Survey 1998

This report was conducted for the Scottish Executive
by the Marine Laboratory Aberdeen.

The Marine Laboratory Aberdeen is a division of
Fisheries Research Services, an agency of the Scottish
Executive.

FOREWORD

The annual production survey of fish farms in Scotland for 1998 was carried out on behalf of the Rural Affairs Department of the Scottish Executive (SERAD) formerly The Scottish Office Agriculture Environment and Fisheries Department (SOAEFD) by the Marine Laboratory Aberdeen (MLA). The Marine Laboratory Aberdeen is the official reference source for data in this report.

Responses from Scottish rainbow trout (*Oncorhynchus mykiss*) and Atlantic salmon (*Salmo salar* L.) farming companies covering the period January-December 1998 are summarised in this report. Copies of the questionnaires are included in Appendix 1 (a-c). The report is structured to allow readers to follow trends within the trout and salmon industries, in addition to providing information on production in 1998. Where available, statistics are given for the ten year period 1989-1998. Data from previous years have been reassessed and updated where necessary. To allow direct comparison to data provided in previous reports, production information by region is presented in SERAD defined areas.

Under the terms of the Registration of Fish Farming and Shellfish Farming Business Order 1985, all persons engaged in the practice of fish farming in Scotland are required to register with SERAD within two months of the commencement of business. The Marine Laboratory Aberdeen maintains this register on behalf of SERAD. Under the terms of the Diseases of Fish Act 1937, (as amended), the contents of these registers cannot be made public except under specific circumstances. However, company and site information can be published in summary form and these are displayed in the appropriate tables.

This survey is concentrated upon the production of Atlantic salmon and rainbow trout in both freshwater and seawater. Other fish species are cultured in Scotland. These include thirty two sites farming brown trout and sea trout (*Salmo trutta*), eleven sites farming halibut (*Hippoglossus hippoglossus*), six sites farming turbot (*Scophthalmus maximus*), nine sites farming Arctic char (*Salvelinus alpinus*) and two sites farming common carp (*Cyprinus carpio*). These species have been excluded from the 1998 survey, but will be included in the future. There is also an increasing number of sites developing the culture of other marine species, including cod, haddock and lemon sole.

The cooperation of the fish farming industry in completing the questionnaires is gratefully acknowledged.

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SUMMARY

The contents of the annual production survey are summarised below. For detailed information on this year's and previous year's production, please refer to the specific sections within this report.

RAINBOW TROUT (*Oncorhynchus mykiss*)

		1997	1998
Total production	(tonnes)	4,653	4,913
Production for the table	(tonnes)	3,848	4,069
Production for restocking	(tonnes)	805	844
Number of staff employed		182	188
Mean productivity	(tonnes/person)	25.6	26.4
No. ova laid down to hatch	(million)	23.1	25.2
Number of ova imported	(million)	21.4	22.6

In 1998, rainbow trout production increased by 260 tonnes. Employment increased by four staff, and productivity per person increased to 26.4 tonnes per person. There was an increase of 2.1 million ova laid down to hatch and a slight increase in the number of ova imported.

ATLANTIC SALMON

(*Salmo salar*)

SMOLTS

		1997	1998
No. ova produced	(million)	186.5	151.8
No. ova laid down to hatch	(million)	85.8	69.3
No. ova exported	(million)	41.5	47.9
No. ova imported	(million)	3.5	1.3
No. smolts produced	(million)	38.2	44.9
No. smolts put to sea	(million)	42.8	45.9
Number of staff employed		510	414
Mean productivity (000s smolts/person)		74.9	108.5

The production of ova decreased by almost 20%, as did the number of ova laid down to hatch. Imports of ova also fell significantly, whilst exports rose. Smolt production increased by 17%. The number of staff decreased by 96, and productivity increased as a consequence.

PRODUCTION FISH

Total production	(tonnes)	99,199	110,784
Production of 0-year fish	(tonnes)	585	2048
Production of grilse	(tonnes)	34,227	38,963
Production of pre-salmon	(tonnes)	37,122	47,820
Production of salmon	(tonnes)	27,263	21,953
Mean fish weight 0-year	(kg)	2.1	2.9
Mean fish weight grilse	(kg)	3.3	2.3
Mean fish weight pre-salmon	(kg)	3.8	3.9
Mean fish weight salmon	(kg)	4.4	4.3
Number of staff employed		1,295	1,309
Mean productivity	(tonnes/person)	77	85

Production tonnage increased by almost 12% with an increased harvest at each stage of production. Staff numbers increased by 14. Average productivity improved by over 10%.

SMOLT SURVIVAL (% harvested)

	years 0+1	Survival year 2	Total survival(%)
1995 input year class	64.7	23.1	87.8
1996 input year class	62.5	15.6	78.1

Overall smolt survival decreased by 9.7%. This was indicated at each stage of production.

I. RAINBOW TROUT

(Oncorhynchus mykiss)

Annual production surveys were sent to 56 companies registered with The Scottish Office as being engaged in the production of rainbow trout in Scotland during 1998. Returns were received from all 56 companies, covering 71 sites currently in production.

Production

TABLE 1
a) Total production (tonnes) of rainbow trout in 1989-1998

Year	Tonnes	Year	Tonnes
1989	3,512	1994	4,263
1990	3,183	1995	4,683
1991	3,334	1996	4,630
1992	3,953	1997	4,653
1993	4,023	1998	4,913

b) Production (tonnes) for the table trade in 1994-1998 according to weight category

Year	<450 <1 lb	450-900g 1-2 lbs	> 900g >2 lbs	Total tonnes
1994	2,376	288	1,038	3,702
1995	2,736	199	1,149	4,084
1996	2,701	181	1,002	3,884
1997	2,646	104	1,098	3,848
1998	3,009	173	887	4,069

c) Production (tonnes) for the restocking trade in 1994-1998 according to weight category

Year	<450 <1 lb	450-900g 1-2 lbs	>900g >2lbs	Total tonnes
1994	125	337	99	561
1995	107	411	81	599
1996	188	484	74	746
1997	97	589	119	805
1998	69	538	237	844

The production of rainbow trout was directed solely at the table and restocking markets. Production rose in 1998 by 260 tonnes, an increase of almost 6%. Within the table trade, increases in production were accounted for in the smaller-sized fish. In the restocking trade the production of 900g+ fish almost doubled.

Production for the table was 4,069 tonnes, an increase of 221 tonnes (6%) over the 1997 total and accounted for 83% of the total production. This is the same percentage share as seen in 1997. Supply was mainly of the smaller fish weighing up to 450g and over 900g. These made up 74% and 22% of total production respectively.

Production for the restocking of angling waters has increased annually, and accounted for 21% of total rainbow trout production in 1998, an increase of 4% on 1997. In 1998, production totalled 844 tonnes, an increase of 39 tonnes (5%) on the 1997 total. These figures represent the tonnage of fish supplied to angling waters for restocking purposes, they do not account for the catch taken by anglers.

Production by Site

TABLE 2
Numbers of sites grouped by tonnage produced 1993-1998

Year	Number of sites per production tonnage				Total number of sites
	<1-25	26-100	100-200	>200	
1993	28	13	11	5	57
1994	25	15	12	4	56
1995	26	15	13	5	59
1996	24	14	12	6	56
1997	19	22	12	4	57
1998	26	14	8	8	56

Production was reported from 56 sites. The number of small producers (production less than 25 tonnes) and the number of large producers (production more than two hundred tonnes) increased in 1998. There was a decrease in the number of mid-sized producers.

Production by Method

TABLE 3
Grouping of rainbow trout sites by production tonnages, main method of production in 1998, and comparison with production in 1997

Production method	Production grouping (tonnes) in 1998					Total tonnage & (%) by method		No.* of sites	
	<10	10-25	26-50	51-100	>100	1997	1998	1997	1998
FW cages	1	4	0	2	5	1,729 (39)	1,902 (39)	11	12
FW ponds and raceways	4	7	4	5	9	1,683 (34)	2,323 (47)	20	28
FW tanks and hatcheries	7	2	0	2	0	657 (14)	184 (4)	19	12
SW cages	1	0	0	1	2	584 (13)	504 (10)	7	4
Total	13	13	4	10	16	4,653	4,913	57	56

* Excludes sites which specialised in the production of ova, fry and/or fingerlings for ongrowing

Freshwater production accounted for 4,409 tonnes (90%) and seawater production for the remaining 504 tonnes (10%). The main rearing facilities were cages, tanks, ponds and raceways.

The number of sites having different facilities* in use in 1998 are as follows —

Hatchery units	27	sites
Ponds and raceways	38	"
Tanks	40	"
Fresh water cages	15	"
Sea water cages/raceways	8	"

*Not all of the these facilities were in use.

Company and Site Data

TABLE 4
Number of companies and sites in production 1991-1998

Year	No. of companies	No. of sites
1991	56	69
1992	53	72
1993	52	74
1994	56	72
1995	54	69
1996	52	69
1997	51	69
1998	51	71

The number of companies registered with the Scottish Executive as being actively engaged in rainbow trout production was 51. The number of sites registered and in production was 71, an increase of two from 1997. Three of the registered active sites were recorded as being fallow.

Staffing and Productivity

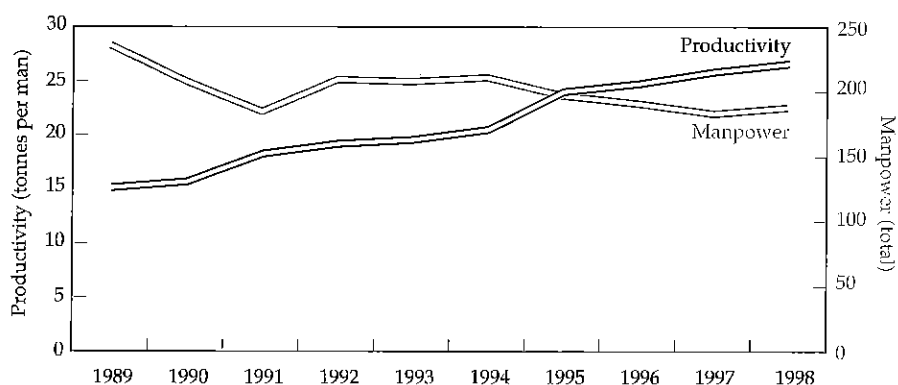
TABLE 5
Number of staff employed and productivity per person 1991-1998

Year	Full-time	Part-time	Total	Productivity (tonnes/person)
1991	133	51	184	18.12
1992	135	73	208	19.00
1993	134	73	207	19.43
1994	139	70	209	20.40
1995	132	64	196	23.89
1996	129	60	189	24.50
1997	130	52	182	25.56
1998	137	49	186	26.41

The overall number of staff employed in 1998 increased by four to 186 in 1998. The number of part-time staff decreased by three, whilst the number of full-time employees increased by seven.

Productivity, measured as tonnes produced per person, increased by 0.85 tonnes (3%) in 1998. No distinction was made between full and part-time employees when calculating productivity.

Figure 1. Manpower and productivity in rainbow trout production 1989-1998



Production by Area

TABLE 6
Production and staffing by area 1998

Area	No. sites	Production (tonnes)		Tonnes per Site	Staffing			Productivity tonnes/person
		Table	Restocking		F/T	P/T	Total	
North	10	411	121	53.2	17	12	29	18.3
East	21	1,069	310	65.6	39	11	50	27.6
West	20	1,503	142	82.2	45	14	59	27.9
South	20	1,086	271	67.8	36	12	48	28.3
All	71	4,069	844	69.2	137	49	186	26.4

Historically, rainbow trout production has been situated close to the major markets, and population centres. Relatively few sites were located in the far north. This situation has not changed recently, even with improved transportation systems.

Productivity per site was greatest in the west, at 82.2 tonnes per site. Productivity per person was greatest in the south, at 28.3 tonnes.

Figure 2. Distribution of active rainbow trout sites in Scotland 1998



Type of Ova Laid Down

TABLE 7
Number (000s) and proportions (%) of ova types laid down to hatch 1993-1998

Year	Total ova	All female diploid No.s (%)	Triploid No.s (%)	Mixed sex diploid No.s (%)
1993	19,744	17,261 (87)	1,396 (7)	1,087 (6)
1994	19,604	18,105 (92)	1,134 (6)	365 (2)
1995	20,835	19,546 (94)	1,170 (6)	119 (+)
1996	22,678	21,308 (94)	935 (4)	435 (2)
1997	23,503	21,117 (90)	1,386 (6)	1,000 (4)
1998	25,242	23,222 (92)	1,515 (6)	504 (2)

All female diploid stock was the predominant stock laid down to hatch in 1998 (92%). A small number of triploid stock was produced mainly for the restocking trade. They have the advantage of not maturing, which allows greater growth potential.

Source of Ova Laid Down

TABLE 8
Number (000s) and sources of ova laid down to hatch 1993-1998

Year	GB ova			Imported ova			Total
	Own stock	Other GB stock	Total GB	Northern hemisphere	Southern hemisphere	Total foreign	
1993	1,830	405	2,235	12,815	4,694	17,509	19,744
1994	479	625	1,104	13,055	5,445	18,500	19,604
1995	165	360	525	12,485	7,825	20,310	20,835
1996	420	988	1,408	13,247	8,023	21,270	22,678
1997	1,232	837	2,069	11,594	9,840	21,434	23,053
1998	2,559	60	2,619	11,038	11,585	22,623	25,242

In 1998, the total number of eyed-ova laid down to hatch increased by almost 2.2 million (9.5%) on the 1997 figure. This continued the trend evident since 1994. The proportion of ova from UK broodstock increased to 10% of the total, but the rainbow trout industry once again relied heavily on imported ova.

Imports of Ova

TABLE 9
a) Number (000s) and sources of ova imported into Scotland 1995-1998

Source	1995	1996	1997	1998
Northern Ireland	6,285	4,095	2,425	2,065
Isle of Man	3,550	4,182	4,205	3,273
Denmark	2,650	5,075	5,354	5,700
South Africa	7,825	8,023	9,450	11,585
Others (EU)	-	220	-	-
Totals	20,310	21,595	21,434	22,623

b) Seasonal variation in number (000s) and sources of imports during 1998

Month	Northern Ireland	Isle of Man	Denmark	South Africa
January	400 (1)	820 (4)	600 (3)	-
February	-	500 (2)	300 (1)	-
March	-	-	2,600 (7)	-
April	600 (2)	-	1,700 (2)	-
May	350 (3)	-	500 (2)	-
June	-	200 (1)	-	600 (2)
July	-	-	-	10,985 (12)
August	440 (3)	-	-	-
September	190 (1)	-	-	-
October	25 (1)	50 (1)	-	-
November	-	803 (2)	-	-
December	60 (1)	901 (1)	-	-
Totals	2,065 (12)	3,273 (11)	5,700 (15)	11,585 (14)

The ova import figures for 1998 included a quantity of milt and fingerlings imported from Northern Ireland, Denmark, the Isle of Man and Northern Ireland. This accounted for 49% of ova imported into Scotland during 1998 (56% during 1997), the remainder being sourced in South Africa. By using a mixture of ova from the northern and southern hemisphere, producers are able to regularise production throughout the year and produce a constant supply of fish for the markets. The quantity of out of season ova imported from South Africa has increased annually since 1994. In contrast, imports of northern hemisphere eggs have decreased by approximately one million, a difference of 8%.

Trade in Fry and Fingerlings

TABLE 10
Number (000s) of fry and fingerlings* traded 1993-1998

Year	Fry and fingerlings bought (000s)			Total number bought	Total number sold
	All female diploids Nos. (%)	Triploid Nos. (%)	Mixed sex diploids Nos. (%)		
1993	8,395 (73)	917 (8)	2,239 (19)	11,551	9,823
1994	9,854 (90)	1,017 (9)	47 (+)	10,918	10,379
1995	12,449 (95)	683 (5)	0 (0)	13,132	10,912
1996	12,174 (93)	572 (4)	283 (2)	13,029	11,578
1997	15,028 (93)	889 (5)	98 (1)	16,215	10,330
1998	13,035 (96)	410 (3)	80 (1)	13,525	11,000

*Includes trade in small fish up to about 80g.

The established trade between hatcheries and on-growing farms continued in 1998. Some companies specialise in the production of fry and fingerlings. The total number of fry and fingerlings purchased by producers decreased by 17%, whilst the total numbers sold by producers increased by 6%. The disparity between supply and demand is met by supplies being bought in from England, Wales and Northern Ireland, although the shortage in supply was less than in previous years.

Regulations covering importation of live fish and gametes

Since 1993, movements of live fish, ova and gametes have been controlled by EC directive 91/67/EEC. Northern Ireland, the Isle of Man, the Republic of Ireland and parts of Denmark have achieved similar health status to the United Kingdom with regard to freedom from the List II diseases VHS and IHN. A limited number of farms in mainland Europe have also been granted approved health status. Additional health protection was granted to the UK in 1998 through safeguard measures for list III diseases. Under Decision 98/24/EEC whereby imports of live salmonids, including ova, is further controlled from areas in which the parasite *Gyrodactylus salaris* is present.

Companies wishing to import ova or live fish from approved areas MUST GIVE PRIOR NOTICE of any shipment into Scotland to the Marine Laboratory Aberdeen. No imports are permitted from EU member states or farms not having approved health status. Imports from other countries outwith the EU, such as South Africa and North America, are only permitted under licence, following stipulated tests by the official authorities in the country of origin. For more information refer to the pamphlet *A Guide to Importing Fish — an explanation of the controls governing the movement of live and dead fish, fish eggs and gametes into and from Great Britain* /MAFF, WOAD, SOAEFD, 1995.

Use of Vaccines

TABLE 11
Number of sites rearing fish vaccinated against enteric redmouth disease (ERM) 1989-1998

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
No. of sites	21	27	30	33	28	35	31	33	35	31

Vaccines continue to be widely used as a preventative treatment against ERM, a potentially serious bacterial disease, caused by the bacterium *Yersinia ruckeri*. A total of 21.5 million fish were vaccinated. Vaccination is generally carried out as a bath treatment at the fingerling stage although some vaccines were administered by intra peritoneal injection.

CONCLUSIONS RAINBOW TROUT (*Oncorhynchus mykiss*)

Production of rainbow trout in 1998 increased by 6%. Portion sized fish for the table trade accounts for the bulk of production, although demand for fish for restocking angling waters increased. Production continued to be focused in freshwater. Staff numbers increased slightly, although productivity per person increased again, indicating a more efficient use of the work force.

Increases in the numbers of ova imported and in the numbers of ova laid down to hatch were recorded in 1998. Approximately 10% of these ova were sourced within the UK; the remainder was imported from other northern and southern hemisphere countries.

The stock of choice within the industry continued to be all female diploid, with a small minority of ova being either mixed sex diploid or triploid. There was a continuing trade in fingerlings, although an increasing proportion was being sourced within Scotland.

A high percentage of total stocks were vaccinated against ERM, indicating producers' awareness of the risk of infectious diseases.

II. ATLANTIC SALMON (*Salmo salar*)

The report on Atlantic salmon is subdivided into two sections— ova and smolt production in the fresh water phase of the life cycle, and table and broodstock production in the sea water phase.

I. Ova and Smolts

Annual production surveys were sent to 64 companies registered with the Scottish Executive as being actively engaged in the fresh water production of Atlantic salmon in Scotland during 1998. Returns were received from all 64 companies.

Company and Site Data

TABLE 12
Number of companies and sites in production 1993-1998

Year	No. of companies	No. of sites
1993	73	138
1994	68	147
1995	69	162
1996	67	166
1997	65	171
1998	64	177

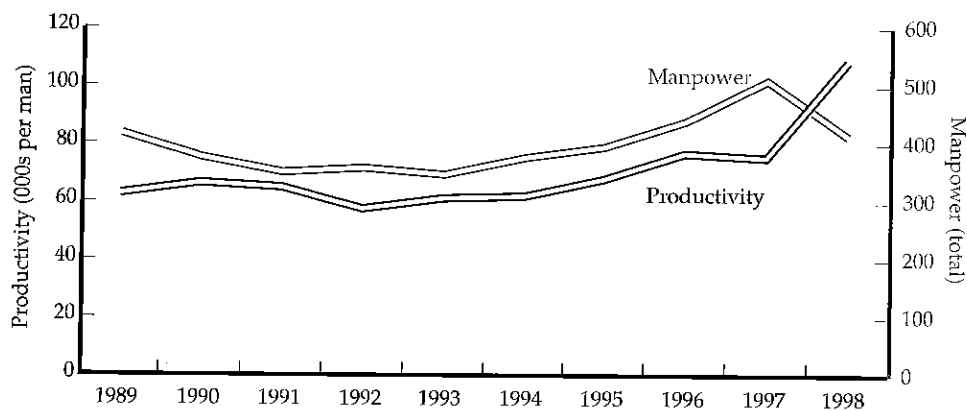
A total of 258 freshwater sites were registered with the Scottish Executive in 1998. Of these, 50 sites were inactive and 208 active. Of the active sites 177 were in commercial smolt production and the remainder are involved in producing fry and parr, prior to ongrowing elsewhere. A number of different rearing facilities* may be present on a site, depending on the company's mode of operation.

The number of sites having different facilities* in use in 1998 are as follows —

Hatchery	92
Tanks	123
Ponds and raceways	6
Cages	128

*Not all of these facilities were in use.

Figure 3. Manpower and productivity in smolt production 1989-1998



Production and Staffing

TABLE 13
Number (000s) of smolts produced, staff employed and smolt productivity during 1989-1998

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Number (000s) of smolts produced	25,825	24,875	22,404	20,827	21,043	23,117	26,540	33,619	38,187	44,853
Staffing:										
full-time	330	285	271	266	233	245	279	308	344	318
part-time	87	93	79	93	115	133	117	133	166	96
Total staff	417	378	350	359	348	378	396	441	510	414
Mean number (000s) of smolts produced per person	61.9	65.8	64.0	57.2	60.5	61.2	67.0	76.2	74.9	108.3

Smolt production in 1998 increased by 6.7 million, an increase of 17% over the number produced in 1997. It is anticipated that this increase in smolt production will lead to an increased harvest production in seawater in 1999 and 2000.

The number of staff decreased sharply by 96. This decrease reflects the change in vaccinating procedure, where many companies employed a contract vaccination service instead of employing temporary staff to carry out vaccination in-house. This change in practice led to a large increase in productivity, measured as the number of smolts produced per employee. Average productivity increased by 45%, to a figure of 108,000 smolts produced per employee.

Smolts by Age Group

TABLE 14
Number of smolts (000s) produced by type 1993-1998

Year	S ^{1/2}	S1	S1 ^{1/2}	S2	Total
1993	686	19,698	202	457	21,043
1994	1,672	20,712	511	222	23,117
1995	2,663	22,705	365	806	26,540
1996	6,298	26,334	523	464	33,619
1997	9,333	27,679	692	483	38,187
1998	8,478	35,383	686	306	44,853

Production of smolts in 1998 was dominated, as expected, by the production of S1 smolts. The proportion of S1s produced increased by 4%. The production of all other year classes was down, the greatest decline being in the production of S2s.

Production Systems

TABLE 15
Number and capacity of production systems 1995-1998

System	No. of sites with systems				Total capacity (000s) cubic metres			
	1995	1996	1997	1998	1995	1996	1997	1998
Hatcheries, tanks, ponds and raceways	95	93	101	97	49	48	45	40
Cages	67	73	70	80	266	308	326	343
Total	162	166	171	177	329	356	371	383

There are two principal types of facility used for the production of smolts in fresh water — tanks and cages. In 1998, the number of sites using tanks, ponds and raceways decreased by 4, and the number of sites using cages increased by 10. In terms of volume, tank capacity dropped by 5,000m³ whilst cage volume increased by 17,000m³. This resulted in a net increase in volume of 12,000m³ available for the production of smolts in Scotland during 1998.

TABLE 16
Number (000s) of smolts produced and stocking densities by production system 1995-1998

Year	Number of smolts produced (000s)				Stocking densities (smolts/m ³)			
	1995	1996	1997	1998	1995	1996	1997	1998
Cages	15,060	18,335	19,942	25,049	54	59	61	73
Tanks	11,480	15,284	18,245	19,804	234	318	405	495
Total	26,540	33,619	38,187	44,853	-	-	-	-

The number of smolts produced in cages and tanks increased by 5.1 and 1.6 million fish respectively. The stocking densities of both cages and tanks also increased; in the case of cages from 61 to 73 fish per m³ and in the case of tanks, from 405 to 495 fish per m³. Where in the past a single cycle of fish has been raised in a year, it is now the case that more than one cycle of fish is produced which increases the efficiency of the production unit. This could account for the increase in stocking densities observed in tank based farms where the majority of photoperiod fish are produced.

Ova Production

TABLE 17
Number (000s) of salmon ova produced during 1992/93 -1997/98 spawning periods

Year	1992/1993	1993/1994	1994/1995	1995/1996	1996/97	1997/98
No. of ova	93,517	98,900	89,556	122,665	186,470	151,841

The stripping of broodstock takes place between October and January. As a result the data presented here relate to the 1997/98 stripping season. 151.8 million ova were stripped, a decrease of 34.7 million (18.6%) on the 1996/97 season.

TABLE 18
Source and number (000s) of ova laid down to hatch 1992/93-1997/98

Year	In-house broodstock	Out-sourced UK broodstock	UK wild broodstock	Foreign ova	Total	Previous year's estimate
1992/93	44,524	19,281	514	4,381	68,699	54,415
1993/94	25,883	14,991	450	5,347	46,672	49,064
1994/95	37,176	25,063	475	2,160	64,873	46,538
1995/96	46,545	23,784	65	8,045	78,439	71,635
1996/97	60,421	23,308	323	1,750	85,802	76,629
1997/98	49,207	19,085	0	1,010	69,302	69,632
1998/99	-	-	-	-	-	68,644

The total number of ova laid down to hatch was 69.3 million, a decrease of 16.5 million (19%) on the 1996/97 figure. However, it was almost exactly the figure predicted by the producers at the end of 1997. This decreased production was seen across the board occurring in both in-house production and out-sourced stock. The majority (71%) of ova were derived from producers own broodstock with a very small proportion (1.4%) derived from outside the UK. Producers estimates for 1998/9 show another projected decrease in production.

International Trade in Ova

Since the introduction of the EU single market on 1 January 1993 and the associated Fish Health Regulations common to all member states, a trade in live salmon and ova has been established. Trade with third countries has also been established, but imports are permitted only under licence, from sources who have met rigorous health testing requirements. Exports to countries outside the EU are subject to the health conditions placed by the importing country. The Marine Laboratory Aberdeen advises potential exporters to ascertain with the importing country any specific health testing requirements that may be a condition of import.

Ova and Smolt Production

TABLE 19
Ova laid down to hatch (millions) actual and projected smolt production (millions) 1989-2000

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ova (million) laid down to hatch												
Number laid down ¹	75.3	64.6	50.7	56.9	68.7	46.7	64.9	78.4	85.8	69.3	-	-
Estimated number	85.1	90.8	50.4	60.4	54.4	49.1	46.5	71.6	76.6	69.6	68.6	
Smolt production												
Smolts put to sea	23.8	21.4	20.3	20.5	20.5	22.0	26.8	30.8	42.8	45.9 ¹	-	-
Smolts produced	25.8	24.9	22.4	20.8	21.0	23.1	26.5	33.6	38.2	44.8	-	-
Estimated smolts produced	28.7	26.2	24.1	21.5	21.8	22.1	25.2	31.8	41.6	45.3	49.6	47.0
Ratio of ova laid down to smolts produced	2.9	2.6	2.3	2.7	3.3	2.0	2.4	2.3	2.2	1.5	-	-

¹ Includes imported smolts

The figure for the number of smolts put to sea includes 1.08 million smolts imported from the Republic of Ireland.

The ratio of ova laid down to hatch/to smolts produced decreased again in 1998, reflecting an increasingly efficient use of ova and fry. Mortality occurs annually during the hatching and first feeding stages. This is mainly due to the culling which follows inadequate growth in the first summer. The rate of culling in 1998 has been reduced, all greater proportion of fish are now taken through the first winter. A combination of improved technology and the requirement to become more efficient are the major factors responsible for this reduction.

Scale of Production

TABLE 20
Smolt producing sites grouped by number (000s) of smolts produced 1989-1998

Year	1-10	10-25	26-50	51-100	101-250	251-500	501-1,000	>1,000	No. of sites in production	Total smolts produced
1990	3	15	19	20	29	19	9	4	118	24,874
1991	2	11	17	22	26	26	5	2	111	22,404
1992	3	8	14	17	41	23	4	0	110	20,828
1993	1	9	15	17	32	21	9	0	104	21,043
1994	4	5	13	24	37	17	13	0	113	23,117
1995	1	6	15	29	30	26	14	1	122	26,540
1996	1	7	13	29	33	26	17	3	129	33,619
1997	0	3	13	22	39	24	18	6	125	38,187
1998	1	3	12	24	33	29	20	8	130	44,853

Note: These data refer only to sites producing smolts, sites holding only ova, fry and/or parr are excluded.

There has been a significant increase in the number of production units producing more than 250,000 smolts in 1998. This is due in part to an increase in the number of facilities producing more than one population of photoperiod fish in 1998. This trend is likely to increase as more efficient use is made of production facilities

Production of Ova and Smolt by Production Area

TABLE 21

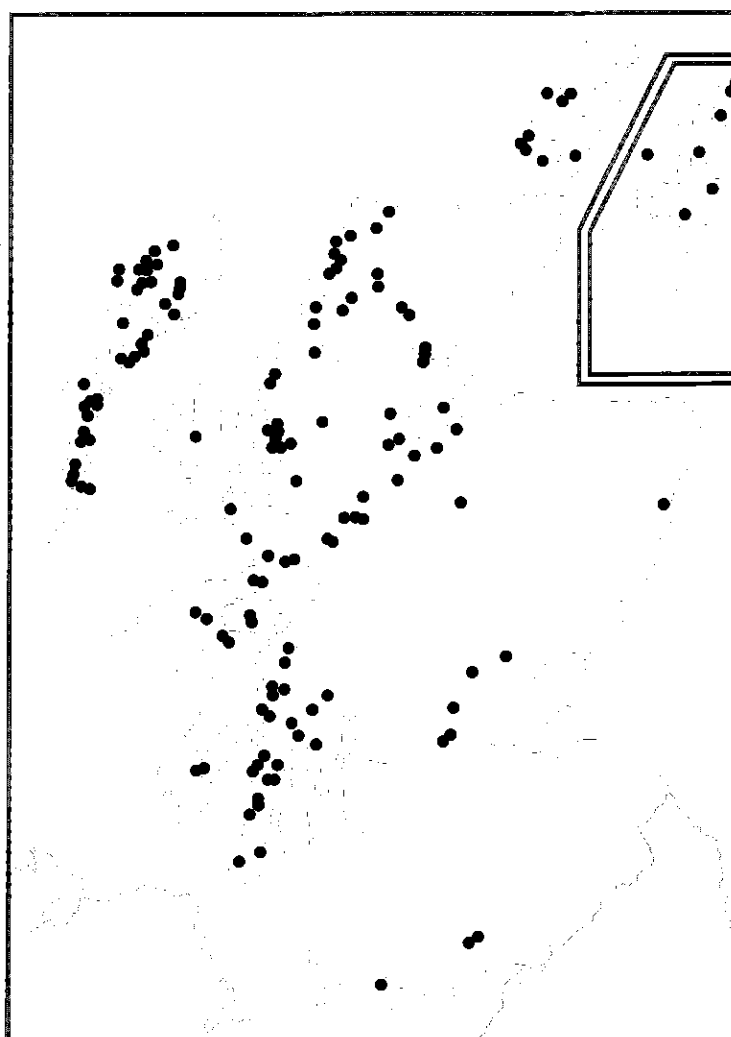
Staffing, and ova laid down to hatch, 1997 and 1998, smolt production and projected production 1999 and 2000 by region

REGION	Number of staff employed in 1998		Ova laid down to hatch (000s)		Smolt production (000s)		Estimated smolt production (000s)	
	F/T	P/T	1997	1998	1997	1998	1999	2000
Northwest	135	42	38,201	28,771	21,464	24,291	26,845	23,113
Orkney	7	8	852	784	387	657	815	808
Shetland	23	14	6,054	5,306	1,385	2,531	4,422	4,720
Southwest	62	18	24,869	16,781	202	9,159	6,996	8,989
Western Isles	78	9	11,707	14,981	5,064	6,975	8,14	7,700
East and South	13	5	4,120	2,678	1,686	1,338	2,390	1,756
All Scotland	318	96	85,803	69,301	38,187	44,851	49,611	47,086

The north west, south west and the Western Isles were the main ova and smolt producing areas in 1998, and employed the greatest number of staff. This distribution pattern reflects the abundance of accessible clean freshwater.

All areas, apart from the east and south increased their smolt production in 1998, and all other areas anticipate an increase in production in 1999. However, only the south west and the Shetland Islands anticipate an increase in production in the year 2000. This anticipated decrease reflects the reported reduction in demand for smolts in 2000, estimated at 35.3 million from the survey results.

Figure 4. Distribution of active smolt sites in Scotland 1998



Trade in Ova

TABLE 22
a) Source and number (000s) of ova imported 1993-1998

Import year	EU Member States	Ova Australia	Total	Parr and Smolt EU Member States
1993	4,439	470	4,909	-
1994	5,823	240	6,063	72
1995	1,470	600	2,070	2,662
1996	6,690	1,355	8,045	2,553
1997	2,305	1,200	3,505	2,168
1998	260	750	1,010	2,140

b) Destination and number (000s) of salmon ova exported 1994-1999 from broodstock spawned in the previous year

Export year	Farmed origin			Total	Wild origin
	Chile	EU	Others		Total
1994	9,467	7,540	40	17,047	50
1995	22,691	7,242	40	31,833	50
1996	17,542	7,937	20	25,499	60
1997	28,585	13,729	-	42,314	60
1998	34,165	7,289	20	41,474	50
1999	34,885	13,024	-	47,909	492

The import of ova decreased by almost 71% to 1,010,000, probably due to the availability of home produced ova. The number of ova and the number of parr and smolts imported, were both lower than in previous years.

In 1999, a total of 25.9 million ova stripped during the 1998/99 season were exported. Exports to other EU member states increased by 79% to just over 13 million. Exports to Chile increased by 3.5% to just under 35 million. Overall, exports increased by 15% of the 1998 figure. The export of wild ova also increased in 1999.

Vaccines

TABLE 23
Number of sites using vaccines and fish vaccinated 1988-1998

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
No. of sites	29	65	59	61	71	73	85	102	112	118	122
No. of fish vaccinated (million)	-	-	-	-	-	-	19.4	25.3	31.8	37.9	43.7

Vaccines were used to provide protection against furunculosis, a disease caused by the bacterium *Aeromonas salmonicida*, which was the cause of serious losses within the fish farming industry in the late 1980s and early 1990s. Ninety five percent of all smolts put to sea had been vaccinated against furunculosis in 1998. Vaccination is normally carried out at the pre-smolt stage by intra-peritoneal injection. In addition, 16 sites vaccinated 8.7 million parr against enteric redmouth disease (ERM). Vaccination against ERM is normally achieved by a bath immersion.

Production Fish (Atlantic Salmon)

Production

Production survey information was collected from 95 companies actively involved in Atlantic salmon production, farming 343 active sites. This figure represents the entire industry operating in Scotland.

TABLE 24
Annual production of salmon (tonnes) 1986-1998 and projected production 1999

Year	Tonnes	Year	Tonnes
1986	10,337	1993	48,691
1987	12,721	1994	64,066
1988	17,951	1995	70,060
1989	28,553	1996	83,121
1990	32,351	1997	99,197
1991	40,593	1998	110,784
1992	36,101	1999	111,918*

*farmers' estimate based on perceived harvest of current stock

The total production of Atlantic salmon during 1998 was 110,784 tonnes, an increase of 11,587 tonnes (11.7%) on 1997 production. This is the seventh consecutive annual increase in production.

TABLE 25
Number (000s) and production (tonnes) of salmon harvested and mean fish weight (kg) per year class in 1994-1998

	Year of smolt input	Year of harvest	Number (000s)	Production (tonnes)	Mean weight (kg) at harvest
Harvest in year 0 (i.e. in year of input)	1994	1994	261	388	1.5
	1995	1995	207	369	1.8
	1996	1996	315	638	2.0
	1997	1997	282	585	2.1
	1998	1998	696	2,048	2.9
Harvest in year 1	1993	1994	13,446	41,865	3.1
	1994	1995	14,420	47,775	3.3
	1995	1996	17,132	57,998	3.4
	1996	1997	20,245	71,349	3.5
	1997	1998	29,014	86,783	3.0
Harvest in year 2	1992	1994	5,096	21,812	4.3
	1993	1995	5,137	21,916	4.3
	1994	1996	5,408	24,485	4.5
	1995	1997	6,195	27,263	4.4
	1996	1998	5,148	21,953	4.3

The number and average weight of fish harvested in the year of input increased in 1998. The use of photoperiod and 'early' smolts, combined with the rapid rates of growth achieved using high energy feeds and modern husbandry methods resulted in the highest average harvest weight of zero sea winter fish ever attained. This is only 0.1kg less than that attained for one sea winter fish. The increased number and tonnage of one sea winter fish includes fish harvested early under compulsory slaughter programmes for the control of infectious salmon anaemia (ISA). The number and tonnage of two sea winter fish decreased, although the average weight was similar to that achieved in previous years.

TABLE 26
Number (000s) and production (tonnes) of grilse and pre-salmon harvested 1994-1998

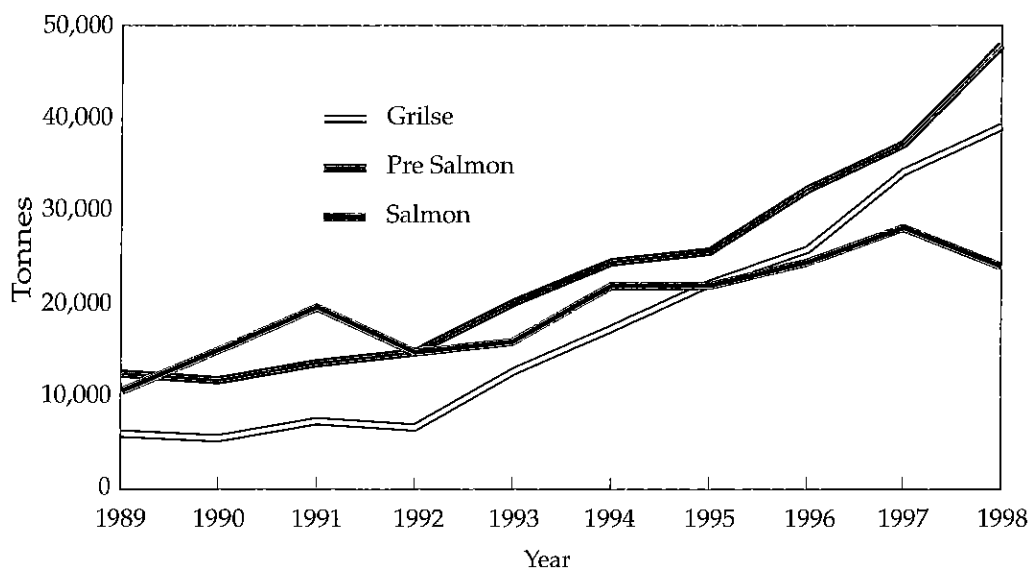
Year	Grilse (Jan - Aug)			Pre-salmon (Sep - Dec)		
	Number (000s)	Tonnes	Mean weight (kg)	Number (000s)	Tonnes	Mean weight (kg)
1994	6,435	17,386	2.7	7,011	24,479	3.5
1995	7,610	22,235	2.9	6,809	25,540	3.8
1996	8,669	25,776	3.0	8,462	32,222	3.8
1997	10,489	34,227	3.3	9,756	37,122	3.8
1998	16,740	38,963	2.3	12,275	47,820	3.9

TABLE 27
Percentage (by weight) of annual production by growth stage harvested 1994-1998

Year	1994	1995	1996	1997	1998
Growth stage					
Input year fish	<1	<1	<1	<1	2
Grilse	27	32	31	35	35
Pre-salmon	38	37	39	37	43
Salmon	34	31	29	27	20

The tonnage and number of grilse and pre-salmon produced in 1998 increased on the 1997 figures, although the average weight of the grilse harvested decreased significantly. This was partly due to the early ungraded harvesting of fish under compulsory slaughter programmes for the control of ISA. The harvest of pre-salmon increased by 6%, with a corresponding decrease in the harvest of salmon, reflecting the shorter production cycle required to achieve the desired harvest weight. The target weight for most producers was 3-4kg.

Figure 5. Production (tonnes) of salmon harvested by growth stage in 1989-1998



Survival and Production in Smolt Year Classes

TABLE 28
Survival and production in smolt year classes 1989-1998

Year of smolt input	Smolt input (000s)	HARVEST YEAR 0				HARVEST YEAR 1				HARVEST YEAR 2				Total % of year class harvested	Year class weight (tonnes)
		Number (000s)	Weight (tonnes)	Mean weight (kg)	% Harvested	Number (000s)	Weight (tonnes)	Mean weight (kg)	% Harvested	Number (000s)	Weight (tonnes)	Mean weight (kg)	% Harvested		
1989	23,839	-	-	-	-	7,683	17,459	2.3	32.2	6,123	19,567	3.2	25.7	57.9	37,026
1990	21,408	-	-	-	-	8,877	21,026	2.4	41.5	4,315	14,728	3.4	20.1	61.6	35,754
1991	20,227	-	-	-	-	8,864	21,373	2.4	43.8	4,675	15,875	3.4	23.1	66.9	37,248
1992	20,527	-	-	-	-	11,102	32,738	3.0	54.1	5,096	21,812	4.3	24.8	78.9	54,550
1993	20,541	46	78	1.7	0.2	13,446	41,865	3.1	65.5	5,135	21,916	4.2	25.0	90.7	63,859
1994	21,953	260	388	1.5	1.2	14,420	47,775	3.3	65.7	5,408	24,485	4.5	24.6	91.5	72,629
1995	26,786	206	269	1.8	0.8	17,132	57,998	3.4	64.0	6,195	27,263	4.4	23.1	87.8	85,530
1996	32,906	315	638	2.0	1.9	20,245	71,349	3.5	61.5	5,148	21,953	4.3	15.6	78.1	93,940
1997	42,766	282	585	2.1	0.7	29,014	86,783	3.0	67.8						
1998	45,870	696	2,048	2.9	1.5										

In 1996, the last year for which survival can be calculated, the survival rate from smolt input to harvest was 78.1%. This was a decrease of 9.7% compared to the 1995 year class, and can be attributed to a variety of causes, such as disease, environmental factors, escapes, predation, poor husbandry and weather related incidents.

Of the 1997 year class, 68.5% of the input has been harvested, an increase of 5.1% in number compared with the 1996 input, although the average weight decreased by 0.5kg to 3.0kg. This may indicate a reduced harvest in 1999 of two sea winter fish, or an increase in the survival rate of the 1997 year class as a whole.

In 1998, the harvest of fish from the 1998 smolt input was 1.5%, more than twice the proportion of fish harvested from the same year class in 1997.

Smolts to Sea

TABLE 29
Number (000s) and origin of smolts put to sea 1993-1998

Year	Smolts to sea (000s)				Total (000s)	England origin (000s)		Other origin (000s)	
	S ¹ / ₂	S1	S ¹ / ₂ s	S2		(000s)	%	(000s)	%
1993	-	19,843	-	698	20,541	827	4	-	-
1994	1,865	19,701	113	274	21,953	1,451	7	-	-
1995	2,442	23,081	589	674	26,786	852	3	-	-
1996	5,527	26,157	180	974	32,906	1,166	4	2,138	6
1997	8,936	33,274	182	374	42,766	2,957	7	2,028	5
1998	12,796	32,649	190	235	45,870	2,714	6	1,080	2

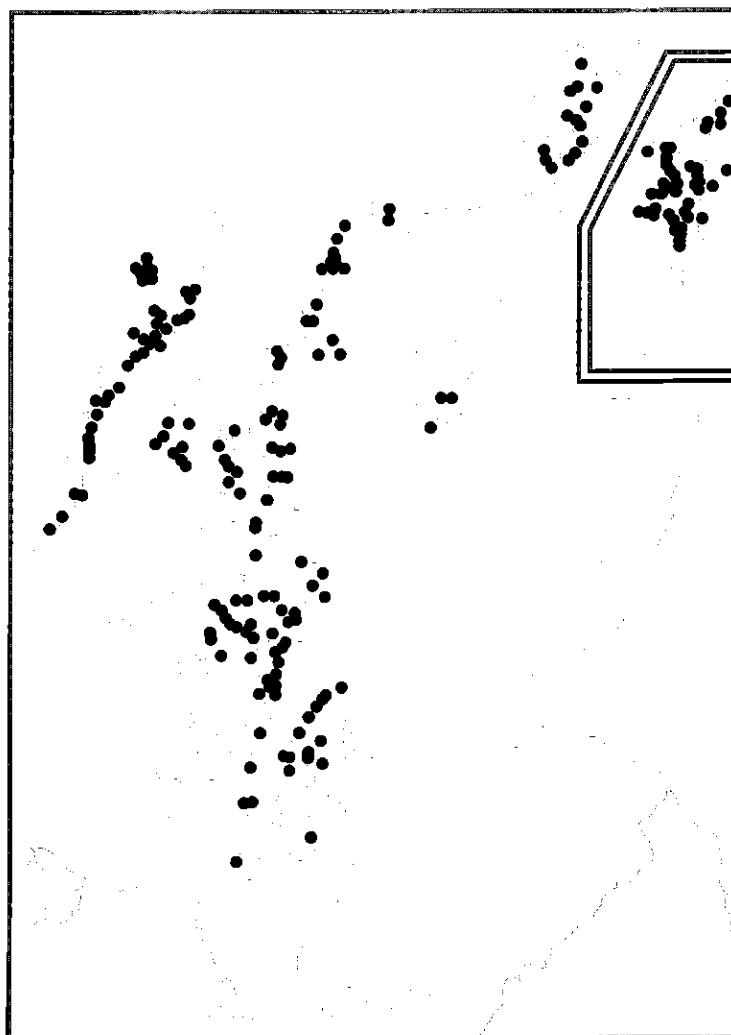
The total number of smolts put to sea in 1998 was 45.9 million, an increase of 3.1 million (7.2%) on 1997. The smolt input comprised mainly S1s (71%), although the proportion of photoperiod adjusted fish (S¹/₂s and S¹/₂s) input increased by 7% to 28.3% (21.3% in 1997). This demonstrates the increased demand for early smolts, which when stocked in conjunction with S1 smolts on the same or other sites within a company, and allows for the production of market sized fish all year round. Approximately 8% of smolts input into Scottish salmon farms were sourced from outwith Scotland. This is a decrease compared with the proportion observed in recent years.

Survival and Production in Smolt Year Classes by Production Area

TABLE 30
Number (000s) of smolts put to sea and year class survival by area 1992-1998

Region	Smolts to sea (000s)		Harvest in Year 0			Harvest in Year 1			Harvest in Year 2			Total harvest (= survival)	
	Year	No.	Year	No.	%	Year	No.	%	Year	No.	%	No.	%
Northwest	1992	7,650	1992	-	-	1993	5,160	67.5	1994	1,647	21.5	6,807	89.0
	1993	7,684	1993	47	0.6	1994	5,405	70.3	1995	1,927	25.1	7,379	96.2
	1994	7,914	1994	108	1.4	1995	4,721	59.7	1996	1,438	18.2	6,267	79.2
	1995	9,428	1995	60	0.6	1996	7,500	79.6	1997	1,153	12.2	8,713	92.4
	1996	12,438	1996	99	0.8	1997	8,335	67.0	1998	1,818	14.6	10,252	82.4
	1997	11,228	1997	112	1.0	1998	7,253	64.6					
	1998	17,808	1998	315	1.7								
Orkney	1992	681	1992	-	-	1993	236	34.7	1994	217	31.9	453	66.6
	1993	726	1993	-	-	1994	478	65.8	1995	176	24.2	654	90.0
	1994	754	1994	-	-	1995	399	52.9	1996	222	29.4	621	82.3
	1995	1,127	1995	-	-	1996	508	45.1	1997	430	38.1	938	83.2
	1996	1,175	1996	-	-	1997	428	36.4	1998	291	24.8	719	61.2
	1997	1,506	1997	-	-	1998	971	64.5					
	1998	2,409	1998	75	3.1								
Shetland	1992	5,014	1992	-	-	1993	2,342	46.7	1994	1,248	24.9	3,590	71.6
	1993	4,591	1993	-	-	1994	3,354	73.1	1995	993	21.6	4,347	94.7
	1994	5,012	1994	24	0.5	1995	3,055	61.0	1996	1,846	36.8	4,925	98.3
	1995	5,811	1995	41	0.7	1996	3,021	52.0	1997	2,622	44.4	5,643	95.5
	1996	6,234	1996	-	-	1997	3,825	61.4	1998	1,141	18.3	4,966	79.7
	1997	13,276	1997	-	-	1998	11,765	88.6					
	1998	12,617	1998	78	0.6								
Southwest	1992	3,989	1992	-	-	1993	1,667	41.8	1994	1,182	29.6	2,849	71.4
	1993	5,131	1993	-	-	1994	2,300	44.8	1995	1,215	23.6	3,515	68.5
	1994	4,614	1994	-	-	1995	2,994	64.9	1996	1,460	31.6	4,454	96.5
	1995	6,437	1995	25	0.4	1996	3,268	50.8	1997	1,349	21.0	4,642	72.1
	1996	9,924	1996	64	0.6	1997	3,317	33.4	1998	1,408	14.2	4,789	48.2
	1997	11,540	1997	-	-	1998	4,126	35.8					
	1998	6,505	1998	41	0.6								
Western Isles	1992	3,195	1992	-	-	1993	1,742	54.5	1994	802	25.1	2,544	79.6
	1993	2,805	1993	-	-	1994	1,909	68.1	1995	825	29.4	2,734	97.5
	1994	4,002	1994	125	3.1	1995	3,252	81.3	1996	442	11.0	3,819	95.4
	1995	3,983	1995	80	2.0	1996	2,836	71.2	1997	641	16.1	3,557	89.3
	1996	5,137	1996	152	3.0	1997	4,340	84.5	1998	491	9.6	4,983	97.1
	1997	5,274	1997	170	3.2	1998	3,900	73.9					
	1998	6,559	1998	187	2.8								

Figure 6. Distribution of active salmon sites in Scotland 1998



Staffing

TABLE 31
Number of staff employed in salmon production 1989-1998

Year		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Staff:	full-time	1,102	1,165	1,014	985	976	1,003	1,104	1,150	1,088	1,117
	part-time	316	326	272	275	248	242	251	241	207	192
Total staff		1,418	1,491	1,286	1,260	1,224	1,245	1,355	1,391	1,295	1,309
Mean productivity (tonnes/person)		20.1	21.7	31.6	28.7	39.8	51.4	51.7	59.8	76.6	84.6

The total number of staff employed in salmon production in 1998 was 1,309, an increase of 14. In addition, the proportion of full-time to part-time positions increased when compared to 1997. The staff figures collected refer specifically to the production of salmon and do not include processing or marketing activities. Productivity reached a high of 84.6 tonnes production per person, an increasing trend since 1992.

Production Methods

TABLE 32
Production methods, capacity, tonnage and final stocking density (kg/m³) 1996-1998

Method	Number of sites			Total capacity (000s cubic metres)			Production (tonnes)		
	1996	1997	1998	1996	1997	1998	1996	1997	1998
Sea water tanks	5	5	4	23	23	27	490	515	317
Sea water cages	272	271	320	8,433	10,587	11,636	82,631	98,682	110,467
For cage sites: ratio of production (kgs) to cage capacity (m ³)							9.8	9.3	9.5

Almost all of the production, 110,467 tonnes (99.7%) was produced in seawater cages, with a further reduction in the proportion from seawater tanks, 0.3% in 1998. This figure reflects the high installation and running costs incurred in operating seawater tank systems. Forty active seawater tank sites are registered in Scotland. Only four are actively producing salmon. Most seawater tank capacity has now been re-deployed to the production of alternative species such as halibut and turbot.

Sea cage capacity increased by over a million cubic metres in 1998, reflecting the rise in the number of sites in production. Production efficiency in cages, measured as the ratio of fish weight in kilograms produced per cubic metre, increased by 0.2kg in 1998.

Company Productivity

TABLE 33
Number of companies grouped production (tonnes) and productivity (tonnes/person) 1997 and 1998

Total tonnage		0-100	101-200	201-400	401-700	701-1000	1001-2000	>2,000	Total
No. companies	1997	15	20	17	21	6	12	7	98
	1998	25	9	14	20	4	13	10	95
No. tonnes	1997	561	3,080	5,186	11,230	6,987	16,974	58,079	99,197
	1998	612	1,432	4,120	10,543	3,665	15,643	74,769	110,784
Manpower (total)	1997	62	99	87	171	99	195	582	1,295
	1998	90	31	70	166	53	182	717	1,309
Productivity (tonnes/person)	1997	9	31	60	66	71	87	100	77
	1998	7	46	59	64	69	86	104	85

Productivity can be used as a measure of efficiency, and was found to be directly related to the scale of production. The greatest productivity (104 tonnes per person) was achieved in those companies having the greatest production and the least (7 tonnes per person) in the companies producing the smallest tonnages. In comparison with 1997, the average company productivity increased from 77 to 85 tonnes per person, although productivity fell in all company sizes, except those producing between 101 and 200 tonnes and those producing in excess of 2,000 tonnes.

Production was dominated by seven companies in 1998, which between them accounted for 60% of the overall salmon produced in Scotland.

Manpower and Production by Production Area

TABLE 34
Manpower and production (tonnes) by area 1993-1998 and projected production in 1999

Region	Year	Staff		Annual production*	Prod-activity (t/pers.)	Year of Input		Tonnes		Salmon		Tonnes	
		F/T	P/T			Tonnes	Mean wt (kg)	Tonnes	Mean wt (kg)	Tonnes	Mean wt (kg)	Tonnes	Mean wt (kg)
Northwest	1993	372	52	20,279	48	78	1.7	7,177	2.5	7,225	3.2	5,800	3.4
	1994	407	59	25,003	54	170	1.6	7,392	2.7	9,991	3.7	7,450	4.5
	1995	401	54	22,509	49	99	1.6	7,291	2.7	7,433	3.6	7,686	4.0
	1996	405	45	32,282	72	200	2.0	14,824	3.1	10,789	3.9	6,469	4.5
	1997	392	40	35,218	82	221	2.0	14,879	3.2	14,669	3.9	5,449	4.7
	1998	396	43	32,213	73	1,139	3.6	12,847	3.0	10,973	3.8	7,254	4.0
	1999			29,527*									
Orkney	1993	38	16	1,245	23	-	-	212	2.3	428	3.0	605	2.9
	1994	48	19	2,107	31	-	-	371	2.5	957	3.0	780	3.6
	1995	58	11	1,903	28	-	-	392	2.7	849	3.4	662	3.8
	1996	55	13	2,444	36	-	-	511	2.5	1,023	3.3	910	4.1
	1997	36	20	3,073	67	-	-	277	2.6	1,119	3.5	1,677	3.9
	1998	66	15	4,485	55	150	2.0	1,884	3.4	1,378	3.3	1,073	3.4
	1999			6,859*									
Shetland	1993	191	116	11,659	38	-	-	1,246	2.6	6,013	3.2	4,400	3.9
	1994	193	106	14,278	48	23	1.0	3,371	2.6	5,967	2.9	4,918	3.9
	1995	201	109	15,523	50	59	1.4	4,204	3.2	6,908	3.9	4,352	4.4
	1996	209	114	19,710	61	-	-	2,042	2.8	8,814	3.9	8,854	4.8
	1997	224	83	24,630	84	-	-	3,207	2.9	10,002	3.7	11,421	4.4
	1998	218	93	33,304	107	222	2.8	11,162	1.4	16,690	4.2	5,330	4.7
	1999			31,603*									
Southwest	1993	199	32	8,675	38	-	-	2,107	2.8	3,366	3.7	3,202	3.3
	1994	173	35	13,184	63	5	1.0	3,277	2.8	4,249	3.8	5,653	4.8
	1995	247	51	15,777	53	47	1.9	4,641	3.0	5,505	3.8	5,584	4.6
	1996	273	44	17,223	54	68	1.1	3,889	2.8	6,895	3.7	6,371	4.4
	1997	197	19	17,194	80	-	-	6,186	3.2	4,705	3.4	6,303	4.7
	1998	223	14	23,722	100	88	2.1	8,783	3.2	8,936	3.8	5,915	4.2
	1999			22,198*									
Western Isles	1993	176	32	6834	33	-	-	1,998	2.5	2,968	3.1	1,868	3.0
	1994	182	23	9,493	46	191	1.5	2,976	2.7	3,316	4.2	3,011	3.8
	1995	197	26	14,348	64	164	2.0	5,707	2.9	4,845	3.8	3,632	4.4
	1996	208	25	11,462	49	370	2.4	4,510	2.8	4,701	3.8	1,881	4.3
	1997	239	45	19,082	67	364	2.1	9,678	3.5	6,627	4.2	2,413	3.8
	1998	214	27	17,073	71	449	2.4	4,287	3.2	9,843	3.8	2,494	5.1
	1999			22,591*									
All Scotland	1993	976	248	48,691	40	78	1.7	12,740	2.7	20,077	3.2	15,875	3.4
	1994	1,003	242	64,066	51	389	1.5	17,386	2.7	24,479	3.5	21,812	4.3
	1995	1,104	251	70,060	52	368	1.8	22,235	2.3	25,540	3.8	21,916	4.3
	1996	1,150	241	83,121	60	638	2.0	25,776	3.0	32,222	3.8	24,485	4.5
	1997	1,088	207	99,197	77	585	2.0	34,227	3.3	37,122	3.8	27,263	4.4
	1998	1,117	192	110,784	85	2,048	2.9	38,963	2.3	47,820	3.9	21,953	4.3
	1999			111,918*									

* Estimated production in 1999

The west coast of Scotland, the Western Isles, the Orkney and Shetland Islands, remain the principal locations for the Scottish salmon industry. This is due to the requirement for relatively clean, sheltered areas in which to locate marine fish farms. The salmon industry continued to be a major provider of local employment in these areas.

Production increased in all areas other than the Western Isles and the northwest in 1998, with increased productivity (tonnes per person) in all other areas than the Orkney Islands and the northwest.

Company and Site Data

Table 35
Number of companies and sites engaged in salmon production 1993-1998

Year	Number of companies			Number of sites		
	Producing	Non-producing	Total	Producing	Non-producing	Total
1993	132	12	144	283	86	369
1994	119	12	131	262	101	363
1995	108	12	120	268	91	359
1996	106	1	107	278	56	334
1997	98	3	101	275	65	340
1998	95	11	106	289	54	343

The number of producing companies registered with SERAD in 1998 was 95, a decrease of 3 since 1997. This continues the trend of salmon production being concentrated within fewer companies. Eleven companies were still registered as active, although they produced no fish for harvest in 1998. These 106 companies have 343 registered active sites, although not all active sites may have produced fish for harvest in 1998.

Fallowing

TABLE 36
Number of sea cage sites employing a fallow period in 1994-1998

Year	0	Fallow period (weeks)					Total
		<4	4-8	8-26	26-51	≥52	
1994	118	13	48	64	12	103	358
1995	110	14	60	73	6	91	354
1996	112	12	71	70	13	56	334
1997	122	6	54	77	11	65	335
1998	118	10	55	84	22	54	343

Of the 343 sites recorded as being active in 1998, 171 farms were fallow for a variable period, whilst 54 farms were fallow for the whole year 1998. The accepted normal production cycle in seawater varies in length between eighteen months and two years, and a fallow period at the end of production can break the cycle of disease or parasitic infections. There were 118 sites that had no fallow period in 1998. These may have been stocked late in 1997 with out of season smolts, or may not have used a fallow period.

Mandatory fallow periods have been established in the high risk zones defined around ISA suspect and infected sites in 1998. Confirmed and suspect sites will have to be fallowed for a minimum period of six months. Sites that fall within the fallowing areas, but are neither confirmed nor suspect are required to fallow for a minimum period of three months. These fallow periods have to be simultaneous, ie all sites must be fallowed at the same time. Sites that are within the high risk area but are outwith a fallowing area are required to fallow for a minimum period of six weeks.

Elsewhere, it is recommended that a minimum fallow period of six weeks is used between on- growing cycles.

Scale of Production by Site

TABLE 37
Number of sites shown in relation to their production grouping and percentage share of production 1993-1998

Production grouping (tonnes)		0	1-50	51-100	101-200	201-500	501-1000	>1000	Total	
									Sites	Tonnes
No of sites	1993	144	53	44	50	61	10	7	369	48,691
	1994	154	29	31	49	64	27	9	363	64,066
	1995	162	24	23	37	68	32	13	359	70,060
	1996	125	20	28	49	66	25	21	334	83,121
	1997	120	21	22	41	63	43	28	340	99,197
	1998	130	32	16	31	66	39	29	343	110,784
	% share of production	1993	0	3	7	14	38	19	18	-
	1994	0	1	4	12	33	31	19	-	-
	1995	0	1	2	8	31	32	26	-	-
	1996	0	1	3	9	27	22	39	-	-
	1997	0	1	2	6	20	28	43	-	-
	1998	0	>1	1	4	21	23	50	-	-

*Includes sites stocked in 1998 but having no production.

In 1998, there was an increase in the number of sites producing less than 50 tonnes, although the proportion of production from these sites was less than 1%. There was a significant decrease (-4) in those sites producing between 501 and 1,000 tonnes, and an increase in those sites producing in excess of 1,000 tonnes. The concentration of production into larger farms is economically efficient. It should be noted that all of the sites confirmed as infected with ISA were stocked at a level that would have placed them in the category of producing in excess of 1,000 tonnes.

Broodstock Sites

TABLE 38
Number of sites holding broodstock 1989-1998

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Broodstock sites	44	35	27	15	21	24	18	28	37	25

In 1998, the number of sites holding broodstock, including freshwater and seawater farms was 25, a decrease on the 1997 figure. The number of sites holding broodstock in any one year is variable, as can be seen from the previous years' figures, which indicate no obvious long term trend. Twenty four thousand, two hundred and forty female fish were stripped, yielding 152 million ova, compared with 186 million in 1997, which can be calculated to show an average ova yield per fish of 6,264.

CONCLUSIONS

ATLANTIC SALMON

(Salmo salar)

The year-on-year increases in production in all areas of the salmon farming industry continued in 1998. The production of smolts increased by 17%, almost completely satisfying the demand for fish. In seawater, production increased by 12%. Increases in productivity were also seen in both sectors. Salmon farming continues to be of great importance in terms of employment to the communities of the west coast, Western Isles, Orkney and Shetland Islands.

Smolt production increased, with the continued dominance of the production of S1 smolts, and a decrease in the percentage of Ss produced. The number of staff directly employed on site decreased, with the loss of 96 jobs. This is mainly as a result of vaccination being contracted out.

The combination of the loss of these jobs and an increase in production has increased the productivity per person involved in freshwater production to over 100,000 fish.

Almost all ova for the production of Scottish salmon was derived from Scottish farmed stocks, only 1.5% was derived from non-Scottish stocks. No ova was sourced from the wild. The export of ova to other countries increased by 15%.

Projected estimates for 1998/99 suggest that there were fewer ova laid down to hatch, and that fewer smolts will be produced in 1999 and 2000.

The production tonnage in seawater increased by 12% in 1998, due mainly to a increased smolt placement in 1996 and 1997, rather than an increase in the size of individual fish produced. The estimated smolt placement in 1999 was 35.3 million, which would indicate a reduced harvest in 2000 and 2001. The estimated harvest forecast for 1999 is 111,918 tonnes, an increase of 1% on the 1998 total.

Some companies have indicated that they may not be producing salmon in the year 2000 as a result of uncertainty in the industry, with regard both to market conditions and the outbreak of infectious salmon anaemia (ISA).

R Stagg
C E T Allan
August 1999

**ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 1998**

RAINBOW TROUT - DATA

Please complete and return by 10 January 1999 to C E T Allan, FRS Marine Laboratory
PO Box 101, Victoria Road, Aberdeen, AB11 9DB

Reg No SF/

Name of site Please correct site name here Please correct main method of production on each site (if
(if necessary) (if necessary), ie fresh water cages or tanks

1 How many staff were employed in trout production (company total) Full time Part time

	Site 1	Site 2	Site 3	Site 4
2 How many eyed ova were laid down for hatching in 1998				
a from own broodstock	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b from GB broodstock	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
c from abroad (<u>Northern Hemisphere</u> including N Ireland and Isle of Man)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
d from abroad (<u>Southern Hemisphere</u>)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
3 How many of the above ova were				
a all female diploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b mixed sex diploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
c all triploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
4 How many fry/fingerlings were				
a bought	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
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5 How many bought fry/fingerlings were				
a all female diploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b mixed sex diploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
c all triploid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
6 How many of these fish were vaccinated against ERM				
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b bought vaccinated	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
7 What was your total production in TONNES for the TABLE TRADE				
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b 450-900 g (1-2 lb)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
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8 What was your total production in TONNES for the RESTOCKING TRADE				
a <450 g (<1 lb)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b 450-900 g (1-2 lb)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
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**ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 1998**

ATLANTIC SALMON - PRODUCTION DATA

Please complete and return by 10 January 1999 to C E T Allan, FRS Marine Laboratory
PO Box 101, Victoria Road, Aberdeen, AB11 9DB

Reg No SF/

Name of site Please correct site name here Please correct main method of production on each site (if
(if necessary) (if necessary), ie sea water cages or tanks

1 How many staff were employed in salmon production (company total), excluding post-harvest processing staff Full time Part time

	Site 1	Site 2	Site 3	Site 4
2 How many smolts were put into the site in 1998 as:				
a S ¹ / ₂ s	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
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c S1 ¹ / ₂ s	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
d S2s	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

3 How many smolts came from England

4 Total smolt input proposed in 1999

5 HARVEST of 1997 SMOLT INPUT in 1998

a Number of tonnes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b Number of fish	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

6 HARVEST of 1996 SMOLT INPUT from 1 JANUARY to 31 AUGUST

a Number of tonnes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b Number of fish	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

7 HARVEST of 1997 SMOLT INPUT from 1 SEPTEMBER to 31 DECEMBER

a Number of tonnes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b Number of fish	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

8 HARVEST of 1996 SMOLT INPUT

a Number of tonnes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
b Number of fish	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

9 How many tonnes of fish do you expect to produce in 1999

10a Were brood fish produced in 1998 YES/NO YES/NO YES/NO YES/NO

b How many fish were stripped

11 What is the current fish holding capacity of each site in cubic metres

12 Duration of FALLOW PERIOD in WEEKS (cage sites only)

13 Does a management agreement in respect of fish health operate with other producers in your area YES/NO YES/NO YES/NO YES/NO

Appendix 2

Glossary and abbreviations

Ova	Eggs
Alevin	Young salmon, at stage from hatching to end of dependence on yolk sacs as primary source of nutrition.
Fry	Young salmon at stage from independence of yolk sac as primary source of nutrition to dispersal from the redd.
Parr	Young salmon at stage from dispersal from redd to migration as a smolt.
Smolt	Fully silvered juvenile salmon ready to be transferred or to migrate to sea.
Fingerling	A term commonly applied to young stages of salmonid fish.
Eyed-ova/eggs	Fish egg(s) at the stage of development when the heavily pigmented eyes of the embryo are sufficiently developed to be clearly visible.
Cohort	A group of fish spawned at a given period.
Pre-salmon	Non-mature salmon usually after one winter at sea.
Milt	Sperm.
Grilse	Salmon maturing after one winter at sea.
Grilsing period	Period during first year at sea when gonads are maturing (salmon).
Non-maturing	Gonads not maturing.
Fecundity	Fertility of an organism.
S¹/₂	Salmon or sea trout smolting at approximately six months from hatch (usually by photoperiod and/or temperature manipulation)
S1	Salmon or sea trout smolting at approximately one year from hatch.
S1¹/₂	Salmon or sea trout smolting at approximately 18 months from hatch.
S2	Salmon or sea trout smolting at approximately two years from hatch.
Diploid	Fish with the normal two sets of chromosomes.
Triploid	Genetically modified fish which have three sets of chromosomes instead of two.
Active	Fish farms in a production growing cycle which may contain stock or be fallow.
Inactive	Fish farms not in a production cycle and without stock.
Fallow	Fish farm having no stock, but still part of a growing cycle.
Ongrowing	Farm producing fish for the table market.
GB approved	EU recognised zone clear of List II diseases. health zone
Redd	Spawning depression in the stream bed created by salmon or trout.
Raceway	Concrete or brick channels used for farming fish.

Approved Zone Status	EU recognition of an area clear of listed disease(s).
Photoperiod	Alteration of light regime.
Biomass	Weight of organisms in an area.
Monovalent	Vaccine to produce a protective immune response against a single pathogen.
Polyvalent	Vaccine to produce a protective immune response against several pathogens.
0-year fish	Fish in their first year of life.
Third Country	Country outside the EU.
IHN	Infectious haemopoietic necrosis.
VHS	Viral haemorrhagic septicaemia.
ERM	Enteric redmouth.
RTFS	Rainbow trout fry syndrome.
Recreational Fisheries	Angling fishery.
First feeder	Refers to the youngest feeding fish on a farm.
Year Class	Fish hatched or put to sea in a given year.
MAFF	Ministry of Agriculture, Fisheries and Food.
WOAD	Welsh Office Agriculture Department.
SOAFD	Scottish Office Agriculture and Fisheries Department (became Scottish Office Agriculture, Environment and Fisheries Department in October 1995).