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Fisheries Research Services

# Scottish Fish Farms
# Annual Production Survey, 2006

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The Scottish Government


# SCOTTISH FISH FARMS

## Annual Production Survey 2006

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# Foreword

The annual production survey of fish farms in Scotland for 2006 was carried out by Fisheries Research Services (FRS), an agency of the Scottish Government. This survey collates annual production data from registered Scottish fish farm sites. Surveys conducted by other organisations are produced independently of FRS and may not be directly comparable. The production tonnage obtained is for the wet weight of fish at harvest.

Responses to questionnaires from Scottish fish farming companies covering the period 1 January - 31 December 2006 are summarised in this survey. The questionnaires are given in Appendix 1a-d. The survey is structured to allow readers to follow industry trends within the trout, salmon and other farmed species sectors. Where available, statistics are given for the 15-year period 1991-2006. Data from previous years have been reassessed and updated where necessary. To allow direct comparison to data provided in previous surveys, production information by region is presented in defined areas.

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

R J Smith

October 2007

## Table of Contents

## SUMMARY

The tables below summarise the results from the 2006 fish farms annual production survey.

### Rainbow Trout (*Oncorhyncus mykiss*)

| | | 2005 | 2006 |
|---|---|---|---|
| Total production | (tonnes) | 6,989 | 7,492 |
| Production for the table | (tonnes) | 6,170 | 6,628 |
| Production for restocking | (tonnes) | 819 | 864 |
| Number of staff employed | | 143 | 147 |
| Mean productivity | (tonnes/person) | 48.9 | 51.0 |
| Number of ova laid down to hatch | (millions) | 20.2 | 26.8 |
| Number of ova imported | (millions) | 19.9 | 25.1 |

In 2006, rainbow trout production increased by 503 tonnes. Employment increased by four staff members, and productivity per person increased to 51.0 tonnes. There was an increase of 6.6 million ova laid down to hatch, and the number of ova imported also increased.

### Other Species (including Arctic charr, *Salvelinus alpinus*; Brown trout, *Salmo trutta*; Cod, *Gadus morhua*; Halibut, *Hippoglossus hippoglossus*)

| | | 2005 | 2006 |
|---|---|---|---|
| Total production | (tonnes) | 467 | 1,047 |
| Number of staff employed | (full-time) | 73 | 92 |
| | (part-time) | 18 | 17 |
| Number of ova laid down to hatch | (millions) | 45[a] | 135[a] |
| Number of ova imported | (millions) | 0.015[b] | 0[b] |

[a] Excluding cod ova laid down to hatch from foreign sources.
[b] Excluding cod ova imported.

In 2006 the production of other species increased by 580 tonnes on the 2005 total. Overall, employment increased by eighteen, due to continued development of the other species sector. There were also increases in the number of ova laid down to hatch, but due to the small number of companies involved, it is not possible to summarise these data without potentially revealing the figures for individual companies.

### Number of Incidents of Escape from Fish Farms Notified to the Scottish Government

| Species | Number of escape notifications | Number of fish escaped |
|---|---|---|
| Rainbow trout | 5 | 36,853 |
| Atlantic salmon (freshwater stages) | 6 | 10,976 |
| Atlantic salmon (seawater stages) | 19 | 142,037 |
| Other species | 1 | 12,230 |

## Atlantic salmon (*Salmo salar*)

### Smolts

| | | 2005 | 2006 |
|---|---|---|---|
| Number of ova produced | (millions) | 73.2 | 60.9 |
| Number of ova laid down to hatch | (millions) | 75.7 | 64.1 |
| Number of ova exported | (millions) | 13.3 | 31.3 |
| Number of ova imported | (millions) | 16.8 | 30.2 |
| Number of smolts produced | (millions) | 36.3 | 40.8 |
| Number of smolts put to sea | (millions) | 37.2 | 41.1 |
| Number of staff employed | | 274 | 271 |
| Mean productivity (000s smolts/person) | | 132.6 | 150.6 |

The production of ova decreased by over twelve million in 2006, and the number of ova laid down to hatch decreased by over eleven million. Imports and exports of ova increased considerably, along with an increase of over four million in the production of smolts. The number of staff employed decreased by three, and mean productivity increased.

### Production fish

| | | 2005 | 2006 |
|---|---|---|---|
| Total production | (tonnes) | 129,588 | 131,847 |
| Production of 0-year fish | (tonnes) | - | 211 |
| Production of grilse | (tonnes) | 22,972 | 18,162 |
| Production of pre-salmon | (tonnes) | 44,766 | 45,937 |
| Production of salmon | (tonnes) | 61,850 | 67,537 |
| Mean fish weight 0-year | (Kg) | - | 1.8 |
| Mean fish weight grilse | (Kg) | 4.1 | 4.2 |
| Mean fish weight pre-salmon | (Kg) | 4.7 | 4.7 |
| Mean fish weight salmon | (Kg) | 4.4 | 4.7 |
| Number of staff employed | | 979 | 871 |
| Mean productivity | tonnes/person | 132.4 | 151.4 |

Production tonnage increased by 2% with an increase in harvest at later stages of production. Staff numbers decreased by 108. Mean productivity showed an increase.

### Smolt survival (percentage harvested)

| Survival (%) | Years 0+1 | Year 2 | Total |
|---|---|---|---|
| 2003 input year class | 45.7 | 32.3 | 78.0 |
| 2004 input year class | 39.0 | 36.5 | 75.5 |

Overall smolt survival decreased by 2.5% compared with the 2003 year class.

# 1. RAINBOW TROUT (*Oncorhynchus mykiss*)

Annual production survey questionnaires were sent to all 36 companies registered with the Scottish Government and engaged in the production of rainbow trout in Scotland during 2006. Returns were received from all 36 companies, covering the 66 sites currently in production.

## Production

**Table 1a:** Total production (tonnes) of rainbow trout during 1993-2006

| Year | Tonnes | Year | Tonnes |
|---|---|---|---|
| 1993 | 4,023 | 2000 | 5,154 |
| 1994 | 4,263 | 2001 | 5,466 |
| 1995 | 4,683 | 2002 | 6,659 |
| 1996 | 4,630 | 2003 | 7,085 |
| 1997 | 4,653 | 2004 | 6,352 |
| 1998 | 4,913 | 2005 | 6,989 |
| 1999 | 5,834 | 2006 | 7,492 |

Production increased in 2006 by 503 tonnes, an increase of 7.2%. This was mainly due to an increase in production from seawater cages for the table trade. Within the table trade, significant increases were observed in the large and medium sizes of fish, with a decrease in small sized fish. In the restocking trade, the production of large and small fish showed an increase, while medium sized fish production showed a decrease.

**Table 1b:** Production (tonnes) for the table trade during 1996-2006 according to weight category

| Year | ‹450 g | 450-900 g | ›900 g | Total |
|---|---|---|---|---|
| | ‹1 lb | 1-2 lbs | ›2 lbs | Tonnes |
| 1996 | 2,701 | 181 | 1,002 | 3,884 |
| 1997 | 2,646 | 104 | 1,098 | 3,848 |
| 1998 | 3,009 | 173 | 887 | 4,069 |
| 1999 | 3,151 | 144 | 1,562 | 4,857 |
| 2000 | 3,005 | 203 | 1,103 | 4,311 |
| 2001 | 3,053 | 404 | 1,217 | 4,674 |
| 2002 | 2,937 | 1,056 | 1,718 | 5,711 |
| 2003 | 2,531 | 1,181 | 2,477 | 6,189 |
| 2004 | 1,553 | 1,946 | 1,917 | 5,416 |
| 2005 | 2,856 | 1,203 | 2,111 | 6,170 |
| 2006 | 2,182 | 1,810 | 2,636 | 6,628 |

Production for the table in 2006 was 6,628 tonnes, an increase of 458 tonnes (7.4%) on the 2005 total, and accounted for 88.5% of the total rainbow trout production, a similar proportion to that produced in 2005. Supply was mainly of fish weighing up to 900 g, encompassing 60% of total production for the table.

**Table 1c:** Production (tonnes) for the restocking trade during 1996-2006 according to weight category

| Year | ‹450 g | 450-900 g | ›900 g | Total |
|---|---|---|---|---|
| | ‹1 lb | 1-2 lbs | ›2 lbs | Tonnes |
| 1996 | 188 | 484 | 74 | 746 |
| 1997 | 97 | 589 | 119 | 805 |
| 1998 | 69 | 538 | 237 | 844 |
| 1999 | 237 | 553 | 187 | 977 |
| 2000 | 41 | 609 | 193 | 843 |
| 2001 | 18 | 526 | 248 | 792 |
| 2002 | 28 | 484 | 436 | 948 |
| 2003 | 63 | 490 | 343 | 896 |
| 2004 | 64 | 509 | 363 | 936 |
| 2005 | 21 | 390 | 408 | 819 |
| 2006 | 36 | 357 | 471 | 864 |

Production for the restocking of angling waters increased in 2006 and accounted for 11.5% of total rainbow trout production in 2006. In 2006, production totalled 864 tonnes, an increase of 45 tonnes (5.5%) on the 2005 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.

## Escapes

There were five reported escapes from rainbow trout sites in 2006, involving the loss of 36,853 fish.

## Production by Site

**Table 2:** Numbers of sites grouped by tonnage produced during 1996-2006

| Year | Number of sites per production tonnage | | | | Total number of sites |
|---|---|---|---|---|---|
| | ‹1-25 | 26-100 | 101-200 | ›200 | |
| 1996 | 24 | 14 | 12 | 6 | 56 |
| 1997 | 19 | 22 | 12 | 4 | 57 |
| 1998 | 26 | 14 | 8 | 8 | 56 |
| 1999 | 18 | 14 | 8 | 9 | 49 |
| 2000 | 16 | 12 | 8 | 8 | 44 |
| 2001 | 17 | 12 | 6 | 10 | 45 |
| 2002 | 16 | 13 | 4 | 12 | 45 |
| 2003 | 17 | 9 | 6 | 11 | 43 |
| 2004 | 14 | 14 | 5 | 10 | 43 |
| 2005 | 18 | 12 | 6 | 11 | 47 |
| 2006 | 16 | 15 | 6 | 13 | 50 |

Production was reported from 50 sites. The number of producers in the size brackets 26-100 tonnes and ›200 tonnes increased in 2006, while those producers in the size bracket ‹1-25 tonnes decreased, and the number of producers in the size bracket 101-200 tonnes remained unchanged. These figures do not include those sites specialising in the production of ova or young fish for on-growing.

## Production by Method

**Table 3:** Grouping of rainbow trout sites by production tonnages, main method of production in 2006, and comparison with production in 2005

| Production method | Production grouping (tonnes) in 2006 | | | | | Total tonnage and (%) by method | | Number of sites | |
|---|---|---|---|---|---|---|---|---|---|
| | ‹10 | 10-25 | 26-50 | 51-100 | ›100 | 2005 | 2006 | 2005 | 2006 |
| FW cages | 2 | 1 | 0 | 0 | 5 | 3,771 (53.9) | 2,842 (37.9) | 10 | 8 |
| FW ponds and raceways | 5 | 5 | 6 | 6 | 7 | 1,972 (28.2) | 2,299 (30.7) | 29 | 29 |
| FW tanks and hatcheries | 3 | 0 | 0 | 0 | 0 | 4 (0.1) | 10 (0.1) | 3 | 3 |
| SW cages | 0 | 0 | 0 | 3 | 7 | 1,242 (17.8) | 2,341 (31.3) | 5 | 10 |
| SW tanks | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 10 | 6 | 6 | 9 | 19 | 6,989 | 7,492 | 47 | 50 |

Freshwater production accounted for 5,151 tonnes (68.7%) and seawater production for the remaining 2,341 tonnes (31.3%). The main rearing facilities were freshwater cages, ponds and raceways. There was a significant increase in production from seawater cages, but a decrease in production from freshwater cages.

## Company and Site Data

**Table 4:** Number of companies and sites in production during 1993-2006

| Year | No. of companies | No. of sites |
|---|---|---|
| 1993 | 52 | 74 |
| 1994 | 56 | 72 |
| 1995 | 54 | 69 |
| 1996 | 52 | 69 |
| 1997 | 51 | 69 |
| 1998 | 51 | 71 |
| 1999 | 54 | 68 |
| 2000 | 54 | 63 |
| 2001 | 50 | 57 |
| 2002 | 39 | 57 |
| 2003 | 37 | 56 |
| 2004 | 38 | 62 |
| 2005 | 42 | 70 |
| 2006 | 36 | 66 |

The number of companies registered with the Scottish Government as being actively engaged in rainbow trout production was 36 in 2006. The number of sites registered and in production during 2006 was 66.

## Staffing and Productivity

**Table 5:** Number of staff employed, and productivity per person during 1993-2006

| Year | Full-time | Part-time | Total | Productivity (tonnes/person) |
|---|---|---|---|---|
| 1993 | 134 | 73 | 207 | 19.4 |
| 1994 | 139 | 70 | 209 | 20.4 |
| 1995 | 132 | 64 | 196 | 23.9 |
| 1996 | 129 | 60 | 189 | 24.5 |
| 1997 | 130 | 52 | 182 | 25.6 |
| 1998 | 137 | 49 | 186 | 26.4 |
| 1999 | 126 | 51 | 177 | 33.0 |
| 2000 | 121 | 47 | 168 | 30.7 |
| 2001 | 118 | 41 | 159 | 34.4 |
| 2002 | 114 | 46 | 160 | 41.6 |
| 2003 | 107 | 41 | 148 | 47.9 |
| 2004 | 115 | 37 | 152 | 41.8 |
| 2005 | 108 | 35 | 143 | 48.9 |
| 2006 | 112 | 35 | 147 | 51.0 |

The overall number of staff employed in 2006 increased by four to 147. During 2006 the number of full-time staff increased by four and the number of part-time employees remained the same.

Productivity, measured as tonnes produced per person, increased by more than two tonnes per person in 2006. No distinction was made between full and part-time employees when calculating productivity.

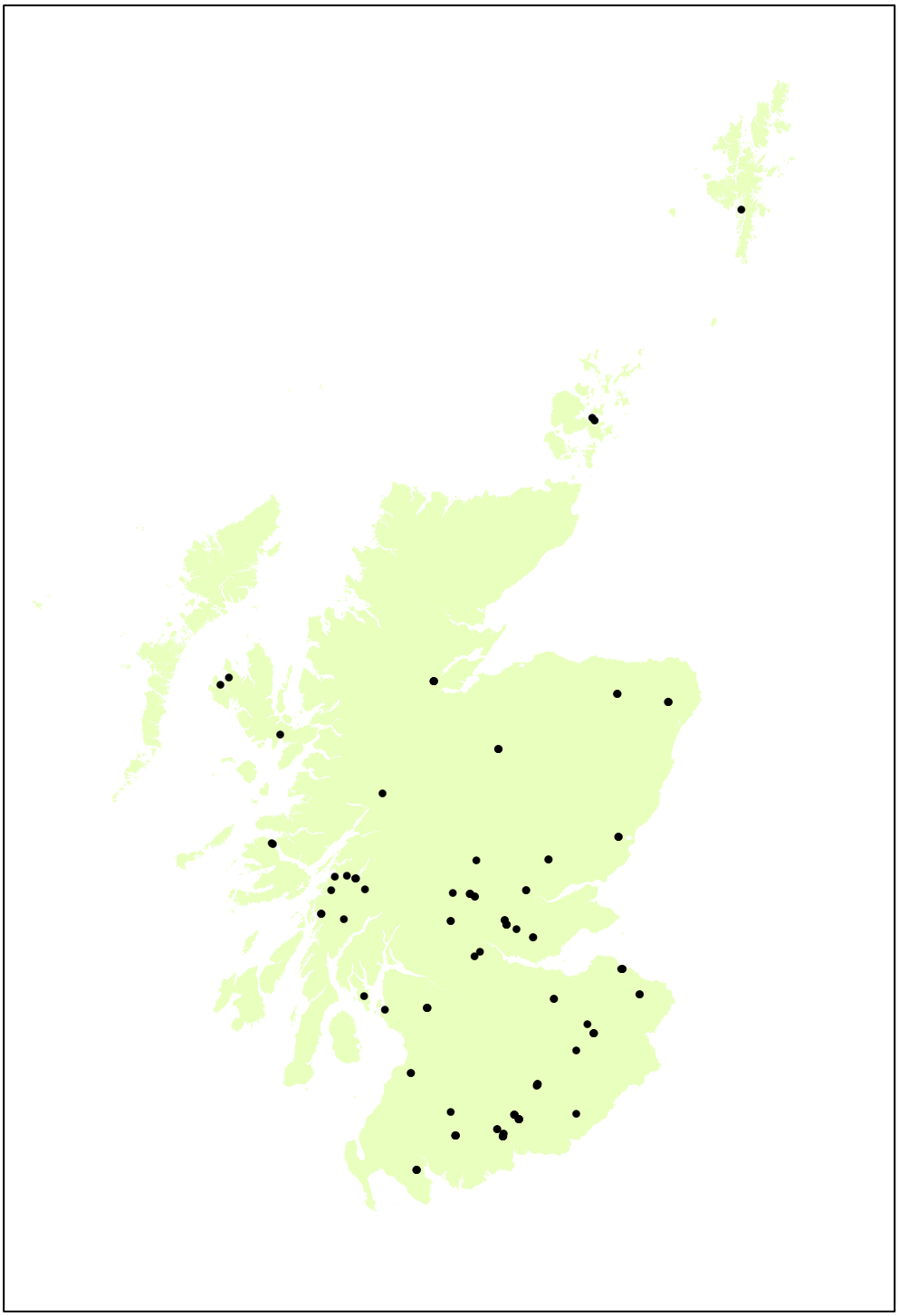
## Production by Area

**Table 6:** Production and staffing by area in 2006

| Area | No. sites | Table production (tonnes) | Restocking production (tonnes) | Mean tonnes per site | Staffing | | | Productivity tonnes/person |
|---|---|---|---|---|---|---|---|---|
| | | | | | F/T | P/T | Total | |
| North | 15 | 1,378 | 105 | 98.9 | 21 | 7 | 28 | 53.0 |
| East | 18 | 1,354 | 302 | 92.0 | 36 | 9 | 45 | 36.8 |
| West | 16 | 2,975 | 81 | 191.0 | 29 | 7 | 36 | 84.9 |
| South | 17 | 921 | 376 | 76.3 | 26 | 12 | 38 | 34.1 |
| All | 66 | 6,628 | 864 | 113.5 | 112 | 35 | 147 | 51.0 |

Productivity per site was greatest in the west, 191 tonnes per site, a reflection of some of the production being in freshwater and seawater cage sites in this area. Productivity per person was also greatest in the west, at 84.9 tonnes per person.

Figure 1: The distribution of active rainbow trout sites 2006



## Type of Ova Laid Down

**Table 7:** Number (000s) and proportions (%) of ova types laid down to hatch during 1995-2006

| Year | All female diploid no.(%) | Triploid no. (%) | Mixed sex diploid no. (%) | Total ova |
|---|---|---|---|---|
| 1995 | 19,546 (94) | 1,170 (6) | 119 (<1) | 20,835 |
| 1996 | 21,308 (94) | 935 (4) | 435 (2) | 22,678 |
| 1997 | 21,117 (90) | 1,386 (6) | 1,000 (4) | 23,503 |
| 1998 | 23,222 (92) | 1,515 (6) | 504 (2) | 25,241 |
| 1999 | 16,324 (88) | 1,853 (10) | 456 (2) | 18,633 |
| 2000 | 17,264 (82) | 1,202 (6) | 2,513 (12) | 20,979 |
| 2001 | 20,788 (90) | 2,107 (9) | 140 (1) | 23,035 |
| 2002 | 19,733 (89) | 1,822 (8) | 570 (3) | 22,125 |
| 2003 | 24,692 (94) | 1,586 (6) | 60 (<1) | 26,338 |
| 2004 | 29,272 (90) | 3,146 (10) | 138 (<1) | 32,556 |
| 2005 | 16,773 (83) | 1,729 (8) | 1,745 (9) | 20,247 |
| 2006 | 22,378 (84) | 2,804 (10) | 1,626 (6) | 26,808 |

## Source of Ova Laid Down

**Table 8:** Number (000s) and sources of ova laid down to hatch 1995-2006

| Year | Ova produced in Great Britain (GB) | | | Imported ova | | | Total |
|---|---|---|---|---|---|---|---|
| | Own stock | Other stock | Total | Northern hemisphere | Southern hemisphere | Total | |
| 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 | 23,503 |
| 1998 | 2,559 | 60 | 2,619 | 11,038 | 11,595 | 22,633 | 25,252 |
| 1999 | 878 | 392 | 1,270 | 11,415 | 5,946 | 17,361 | 18,631 |
| 2000 | 1,397 | 900 | 2,297 | 10,161 | 8,525 | 18,686 | 20,983 |
| 2001 | 918 | 525 | 1,443 | 13,515 | 8,075 | 21,590 | 23,033 |
| 2002 | 530 | 200 | 730 | 12,385 | 9,010 | 21,395 | 22,125 |
| 2003 | 430 | 280 | 710 | 25,578 | 50 | 25,628 | 26,338 |
| 2004 | 330 | 320 | 650 | 31,906 | 0 | 31,906 | 32,556 |
| 2005 | 281 | 105 | 386 | 16,977 | 2,884 | 19,861 | 20,247 |
| 2006 | 541 | 2,169 | 2,710 | 22,588 | 1,510 | 24,098 | 26,808 |

In 2006, the total number of eyed-ova laid down to hatch increased by over six million (32%) on the 2005 figure. The proportion of ova from GB broodstock increased to 10.1% of the total, and the rainbow trout industry remained reliant on imported ova. Data on importation of ova into Scotland are also available from the import licences, and are shown in Table 9a. Any discrepancy between the figures in Tables 8 and 9a is due to data being obtained from two independent sources.

## Imports of Ova from Official Import Licences

**Table 9a:** Number (000s) and sources of ova imported into Scotland during 1999-2006

| Source | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| N. Ireland | 3,335 | 1,085 | 710 | - | - | 405 | 1,710 | 2,830 |
| Isle of Man | 4,222 | 5,842 | 6,670 | 6,775 | 6,855 | 8,012 | 1,700 | 3,480 |
| Denmark | 4,546 | 4,225 | 6,135 | 5,000 | 5,270 | 6,370 | 9,225 | 14,525 |
| South Africa | 6,036 | 7,762 | 8,075 | 7,750 | 50 | - | - | - |
| USA | - | - | - | 1,700 | 11,035 | 17,335 | 4,440 | 2,310 |
| France | - | - | - | - | 875 | 800 | 200 | - |
| Australia | - | - | - | - | - | - | 2,600 | 1,500 |
| Norway | - | - | - | - | - | - | - | 500 |
| Totals | 18,139 | 18,914 | 21,590 | 21,225 | 24,085 | 32,922 | 19,875 | 25,145 |

**Table 9b:** Seasonal variation in numbers (000s) and sources of ova imported into Scotland during 2006

| Month | Norway | Australia | Isle of Man | Denmark | N. Ireland | USA |
|---|---|---|---|---|---|---|
| January | - | - | 75 | 1,980 | - | - |
| February | - | - | 1,025 | 500 | - | - |
| March | 500 | - | 1,050 | 1,300 | 400 | 250 |
| April | - | - | 980 | 1,345 | - | - |
| May | - | - | 50 | 3,950 | - | - |
| June | - | - | - | 1,050 | - | 300 |
| July | - | - | - | 800 | 100 | 760 |
| August | - | 1,500 | - | 250 | - | - |
| September | - | - | - | - | 300 | - |
| October | - | - | - | 500 | 1,900 | 400 |
| November | - | - | - | 2,350 | 130 | 600 |
| December | - | - | 300 | 500 | - | - |
| Totals | 500 | 1,500 | 3,480 | 14,525 | 2,830 | 2,310 |

Suppliers within the EU accounted for 83% of ova imported into Scotland during 2006, with the USA accounting for 9%, Australia 6% and Norway 2%. To maintain their ability to regulate production throughout the year and produce a constant supply of fish for their markets, producers have to rely upon supplies of out of season ova. Historically these have been obtained from sources in the southern hemisphere, but to meet demand, markets have now been established within the EU.

## Trade in Fry and Fingerlings

**Table 10:** Number (000s) of fry and fingerlings traded during 1995-2006

| Year | Fry and fingerlings bought | | | Total number bought | Total number sold |
|---|---|---|---|---|---|
| | All female diploid nos. (%) | Triploid nos. (%) | Mixed sex diploid nos. (%) | | |
| 1995 | 12,449 (95) | 683 (5) | 0 | 13,132 | 10,912 |
| 1996 | 12,174 (93) | 572 (5) | 283 (2) | 13,029 | 11,578 |
| 1997 | 15,028 (94) | 889 (5) | 98 (1) | 16,015 | 10,330 |
| 1998 | 13,035 (96) | 410 (3) | 80 (1) | 13,525 | 11,000 |
| 1999 | 11,264 (94) | 90 (1) | 616 (5) | 11,970 | 9,759 |
| 2000 | 13,410 (92) | 287 (2) | 892 (6) | 14,589 | 12,505 |
| 2001 | 16,065 (96) | 685 (4) | 0 | 16,750 | 13,961 |
| 2002 | 10,031 (88) | 670 (6) | 667 (6) | 11,368 | 10,101 |
| 2003 | 17,500 (94) | 1,007 (5) | 193 (1) | 18,700 | 17,451 |
| 2004 | 18,859 (91) | 1,536 (7) | 364 (2) | 20,759 | 19,166 |
| 2005 | 14,618 (83) | 1,532 (9) | 1,480 (8) | 17,630 | 16,919 |
| 2006 | 19,731 (89) | 790 (4) | 1,675 (7) | 22,196 | 20,460 |

The established trade between hatcheries and on-growing farms continued in 2006. Some companies specialised in the production of fry and fingerlings. The total number of fry and fingerlings purchased by producers increased by 26%, and the total number sold by producers also increased by 21%. The disparity between supply and demand is met by supplies being bought from England, Wales and Northern Ireland. The shortage in supply was greater than that noted in 2005.

## Use of Vaccines

**Table 11:** Number of sites rearing fish vaccinated against enteric redmouth disease (ERM) during 1995-2006

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of sites | 31 | 33 | 35 | 31 | 40 | 35 | 33 | 34 | 38 | 42 | 37 | 31 |

Vaccines continued to be widely used as a preventative treatment against ERM, a potentially serious bacterial disease, caused by the bacterium *Yersinia ruckeri*. A total of 36.4 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.

## 2. ATLANTIC SALMON (*Salmo salar*) - OVA AND SMOLTS

Annual production survey questionnaires were sent to all 39 companies registered with the Scottish Government as being actively engaged in the freshwater production of Atlantic salmon in Scotland during 2006. Returns were received from all companies, covering the 135 sites currently in production.

### Company and Site Data

**Table 12:** Number of companies and sites in production during 1998-2006[c]

| Year | No. of companies | No. of sites |
|---|---|---|
| 1998 | 64 | 177 |
| 1999 | 65 | 189 |
| 2000 | 60 | 184 |
| 2001 | 56 | 169 |
| 2002 | 55 | 173 |
| 2003 | 48 | 176 |
| 2004 | 48 | 172 |
| 2005 | 41 | 148 |
| 2006 | 39 | 135 |

In 2006 the number of companies registered with the Scottish Government as being actively engaged in the freshwater production of Atlantic salmon decreased to 39. A total of 270 freshwater sites were registered, and of these, 135 sites were inactive and 135 sites were actively engaged in commercial production.

### Production and Staffing

**Table 13:** Number (000s) of smolts produced, staff employed and smolt productivity during 1996-2006

| Year | | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number (000s) of smolts produced | | 33,619 | 38,187 | 44,853 | 39,763 | 45,583 | 47,546 | 47,161 | 44,414 | 39,999 | 36,326 | 40,827 |
| Staffing | Full-time | 308 | 344 | 318 | 300 | 341 | 317 | 312 | 291 | 259 | 200 | 209 |
| | Part-time | 133 | 166 | 96 | 124 | 103 | 111 | 93 | 82 | 60 | 74 | 62 |
| | Total | 441 | 510 | 414 | 424 | 444 | 428 | 405 | 373 | 319 | 274 | 271 |
| Productivity, 000s of smolts per person | | 76.2 | 74.9 | 108.3 | 93.8 | 102.7 | 111.1 | 116.4 | 119.1 | 125.4 | 132.6 | 150.6 |

Smolt production in 2006 increased by over 4.5 million, an increase of 12.4% compared to 2005. The number of staff employed decreased by three, and productivity increased by almost 14%, to a figure of 150,600 smolts produced per employee.

[c] Under the terms of the Registration of Fish Farming and Shellfish Farming Businesses Order 1985, as amended, all persons engaged in the practice of fish farming in Scotland are required to register the details of their business within two months of the commencement of commercial activity. Fisheries Research Services is the Scottish Government agency responsible for administering the fish farms business register and is the point of contact for farmers who wish to change registration details or register a new business. Although registration details of specific sites and businesses are confidential under Section 9 of the Diseases of Fish Act 1983, the company and site information is published here in summary form, in accordance with the terms of the Act.

## Escapes

There were six reported escapes from freshwater Atlantic salmon sites in 2006, involving the loss of 10,976 fish.

## Smolts by Age Group

**Table 14:** Number of smolts (000s) produced by type during 1995-2006

| Year | S½ | S1 | S1½ | S2 | Total |
|---|---|---|---|---|---|
| 1995 | 2,663 | 22,705 | 365 | 806 | 26,539 |
| 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 |
| 1999 | 10,770 | 28,345 | 586 | 62 | 39,763 |
| 2000 | 11,841 | 33,722 | 0 | 20 | 45,583 |
| 2001 | 14,684 | 32,732 | 110 | 20 | 47,546 |
| 2002 | 15,791 | 30,527 | 843 | 0 | 47,161 |
| 2003 | 14,907 | 28,836 | 671 | 0 | 44,414 |
| 2004 | 14,428 | 24,862 | 709 | 0 | 39,999 |
| 2005 | 12,639 | 22,197 | 1,489 | 1 | 36,326 |
| 2006 | 16,953 | 23,172 | 698 | 4 | 40,827 |

In 2006, production was dominated by S1 smolts, with numbers produced increasing by 4.4%. The production of S½ smolts also increased by 34%. There was a decrease in the production of S1½ smolts, but an increase in the production of S2 smolts.

## Production Systems

**Table 15:** Number and capacity of production systems during 2002-2006

| System | No. of sites with system | | | | | Total capacity, 000s cubic metres | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Cages | 81 | 80 | 76 | 61 | 58 | 409 | 391 | 365 | 378 | 365 |
| Tanks and Raceways | 92 | 96 | 96 | 87 | 77 | 41 | 40 | 43 | 38 | 36 |
| Total | 173 | 176 | 172 | 148 | 135 | 450 | 431 | 408 | 416 | 401 |

The principal types of facility used for the production of smolts in freshwater are cages or tanks and raceways. In 2006, the number of farms employing tanks and raceways decreased by 10, and the number of farms employing cages decreased by 3. In terms of volume, tank and raceway capacity decreased by 2,000 $m^3$, and cage volume decreased by 13,000 $m^3$. This resulted in a net decrease in volume of 15,000 $m^3$ available for the production of smolts in Scotland during 2006.

**Table 16:** Number (000s) of smolts produced and stocking densities by production system during 2002-2006

| | Number of smolts produced (000s) | | | | | Stocking densities (smolts /m$^3$) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Cages | 27,076 | 24,094 | 17,575 | 15,380 | 18,700 | 66 | 62 | 48 | 41 | 51 |
| All others | 20,085 | 20,320 | 22,424 | 20,946 | 22,127 | 490 | 508 | 521 | 551 | 615 |
| Total | 47,161 | 44,414 | 39,999 | 36,326 | 40,827 | - | - | - | - | - |

The average stocking densities of cages and tanks increased compared to 2005; in the case of cages from 41 to 51 fish per m³ and in the case of tanks, from 551 to 615 fish per m³.

## Ova Production

**Table 17:** Number (000s) of salmon ova produced during 1999-2006

| Year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|
| No. of ova | 122,649 | 124,619 | 99,921 | 107,996 | 115,569 | 128,866 | 73,211 | 60,941 |

Just under 61 million ova were stripped in 2006, a decrease of over 12 million (17%) on the 2005 season.

**Table 18:** Source, number (000s) and previous year's estimate of ova laid down to hatch during 1995-2007

| Year | In-house broodstock | Out-sourced GB broodstock | GB wild broodstock | Foreign ova | Total | Previous year's estimate |
|---|---|---|---|---|---|---|
| 1995 | 37,176 | 25,063 | 475 | 2,160 | 64,874 | 46,538 |
| 1996 | 46,545 | 23,784 | 65 | 8,045 | 78,439 | 71,635 |
| 1997 | 60,421 | 23,308 | 323 | 1,750 | 85,802 | 76,629 |
| 1998 | 49,207 | 19,085 | 0 | 1,010 | 69,302 | 69,632 |
| 1999 | 52,122 | 25,804 | 4,291 | 500 | 82,717 | 68,644 |
| 2000 | 38,674 | 33,592 | 1,605 | 4,660 | 78,531 | 69,220 |
| 2001 | 40,086 | 32,002 | 615 | 10,720 | 83,423 | 83,458 |
| 2002 | 40,732 | 30,664 | 120 | 15,184 | 86,700 | 80,679 |
| 2003 | 38,766 | 21,138 | 0 | 20,822 | 80,726 | 73,193 |
| 2004 | 31,390 | 20,024 | 27 | 19,138 | 70,579 | 74,464 |
| 2005 | 43,261 | 22,465 | 71 | 9,896 | 75,693 | 65,741 |
| 2006 | 19,063 | 17,768 | 63 | 27,157 | 64,051 | 58,385 |
| 2007 | - | - | - | - | - | 68,032 |

The number of ova laid down to hatch was 64.1 million, a decrease of over eleven million (15.4%) on the 2005 figure. The majority of the ova (57%) were derived from GB broodstock, the proportion being less than that noted in 2005. Supplies derived from sources outside Great Britain increased by over 17 million, almost a three-fold increase on the 2005 figure. Producers' estimates for the number of ova to be laid down in 2007 show a projected increase compared to the actual number of ova laid down in 2006. The ova derived from wild stocks are generally held and hatched for wild stock enhancement by the aquaculture industry in cooperation with wild fisheries managers.

## Smolts Produced and Put to Sea

**Table 19:** Actual and projected smolt production and smolts put to sea (millions) during 1997-2008

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actual smolts put to sea | 42.8 | 45.9 | 41.1 | 45.2 | 48.6 | 50.1 | 43.8 | 39.1 | 37.2 | 41.1 | | |
| Smolts produced | 38.2 | 44.8 | 39.8 | 45.6 | 47.5 | 47.2 | 44.4 | 40.0 | 36.3 | 40.8 | | |
| Estimated production | 41.6 | 45.3 | 49.6 | 42.1 | 50.2 | 49.3 | 44.2 | 40.0 | 36.2 | 33.2 | 41.2 | 45.7 |
| Ratio of ova laid down to smolts produced | 2.2 | 1.5 | 1.7 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 2.1 | 1.6 | | |

The figure for the number of smolts put to sea includes smolts produced in England and fish imported from elsewhere, whereas smolt production data relate only to those produced in Scotland. Any discrepancy may be due to smolts that were produced in Scotland, but were not put to sea in Scotland. Farmers estimate putting 41.2 million smolts to sea in 2007.

The ratio of ova laid down to hatch to smolts produced in 2006 was less than the ratio in 2005.

## Scale of Production

**Table 20:** Smolt-producing sites grouped by numbers (000s) of smolts produced during 1994-2006

| Year | Scale of production | | | | | | | | No. of sites in production | Total smolts produced |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1-10 | 11-25 | 26-50 | 51-100 | 101-250 | 251-500 | 501-1,000 | >1,000 | | |
| 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 |
| 1999 | 1 | 1 | 15 | 25 | 29 | 24 | 21 | 7 | 123 | 39,763 |
| 2000 | 1 | 2 | 10 | 17 | 36 | 24 | 24 | 9 | 123 | 45,583 |
| 2001 | 0 | 1 | 7 | 19 | 30 | 26 | 13 | 14 | 110 | 47,546 |
| 2002 | 1 | 1 | 11 | 17 | 29 | 34 | 17 | 10 | 120 | 47,161 |
| 2003 | 2 | 0 | 7 | 20 | 32 | 31 | 12 | 10 | 114 | 44,414 |
| 2004 | 3 | 3 | 9 | 14 | 31 | 22 | 18 | 7 | 107 | 39,999 |
| 2005 | 2 | 1 | 4 | 15 | 25 | 22 | 21 | 4 | 94 | 36,326 |
| 2006 | 1 | 4 | 2 | 9 | 19 | 21 | 18 | 10 | 84 | 40,827 |

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

There has been a decrease in the number of sites producing smolts since 2005. The number of sites producing less than 101,000 smolts has decreased by six, and there has been a decrease of four in the number of sites producing more than 100,000 smolts. The number of sites producing in excess of one million smolts per year increased by six, with a decrease in the number of sites producing between 501,000 and one million smolts per year.

## Production of Ova and Smolt by Production Area

**Table 21:** Staffing, and ova laid down to hatch 2005-2006, smolt production 2005-2006 and estimated production 2007-2008 by region

| Region | Number of staff employed in 2006 | | Ova laid down to hatch (000s) | | Smolt production (000s) | | Estimated smolt production (000s) | |
|---|---|---|---|---|---|---|---|---|
| | F/T | P/T | 2005 | 2006 | 2005 | 2006 | 2007 | 2008 |
| Northwest | 96 | 33 | 33,726 | 32,020 | 18,783 | 21,825 | 23,502 | 25,144 |
| Orkney | 1 | 1 | 100 | 110 | 185 | 95 | 161 | 202 |
| Shetland | 14 | 7 | 1,644 | 140 | 1,528 | 647 | 1,080 | 1,900 |
| West | 53 | 8 | 19,488 | 14,623 | 9,491 | 10,043 | 8,120 | 8,796 |
| Western Isles | 33 | 8 | 16,615 | 15,384 | 4,934 | 6,629 | 6,366 | 7,722 |
| East and South | 12 | 5 | 4,120 | 1,774 | 1,405 | 1,588 | 1,947 | 1,965 |
| All Scotland | 209 | 62 | 75,693 | 64,051 | 36,326 | 40,827 | 41,176 | 45,729 |

The north west, west and the Western Isles were the main ova and smolt producing areas in Scotland in 2006, and employed the greatest number of staff.

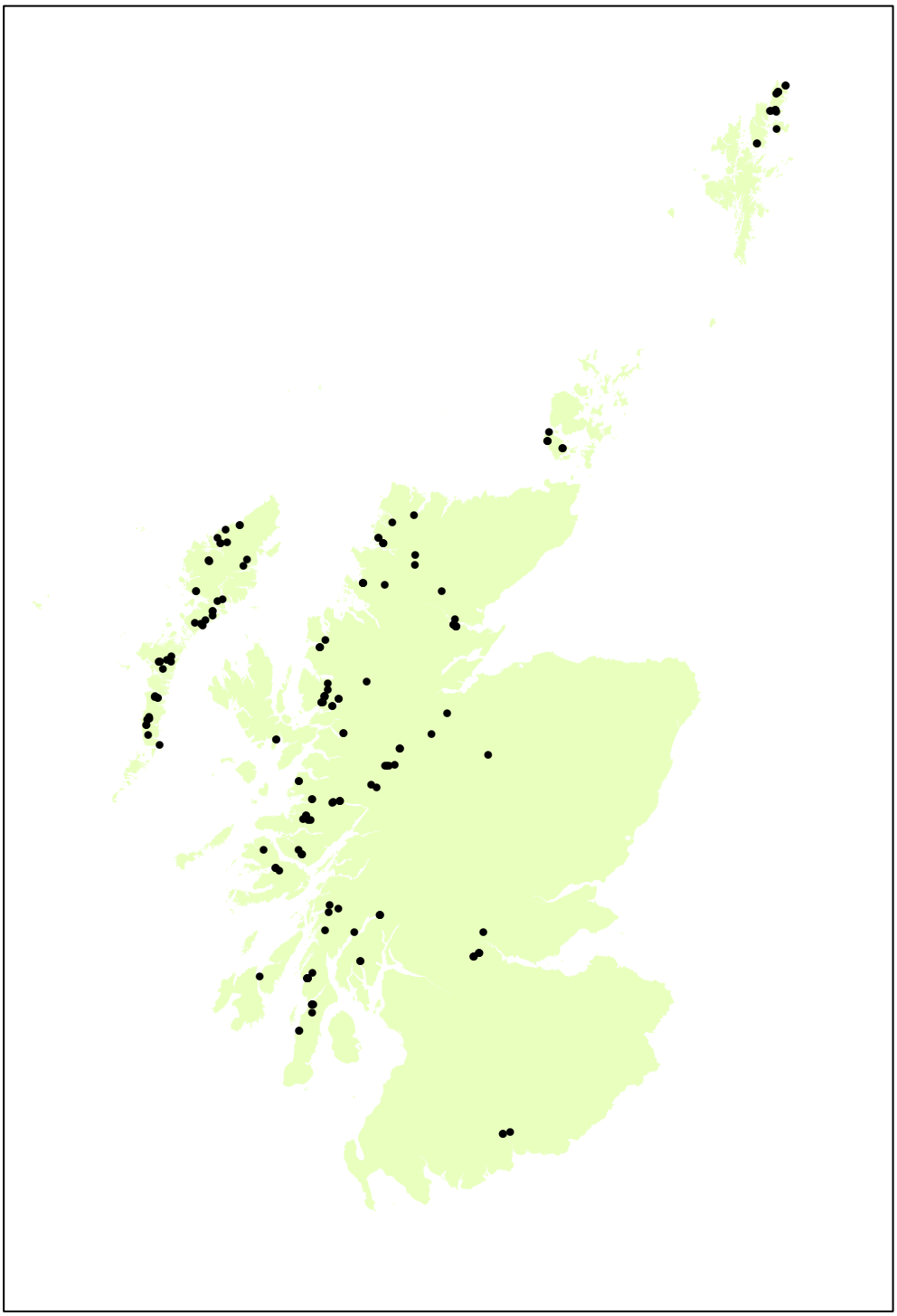
## International Trade in Ova

Since the introduction of the EU single market on 1 January 1993 and the associated Fish Health Regulations common to all EU member states, a trade in live salmon and ova has been established.

In addition, the European Economic Area (EEA) Agreement allows trade between the EU and the member states of the European Free Trade Association (EFTA). Until 2003, trade under the EEA Agreement was restricted to halibut alevins and salmonid eggs or gametes. With the cessation of these restrictions, trade became based on the same rules as are established within the EU regarding approval of farms and zones for listed diseases. Norway has an equivalent status to Great Britain with regard to List II diseases, but additional guarantees granted to Great Britain in respect of *Gyrodactylus salaris* have prevented trade in live fish. Changes to these protective measures in 2003 mean the importation of salmonid ova is permitted from Norway.

Trade with Third Countries has also been established, but only from sites that have met the same health standards as are established within the EU regarding the approval of farms and zones for listed diseases. Exports to countries outside the EU are subject to the health conditions placed by the importing country. FRS advises potential exporters to ascertain with the importing country any specific health testing requirements that may be a condition of import.

Figure 2: The distribution of active smolt sites 2006



## Imports and Exports

**Table 22a:** Source and number (000s) of ova, parr and smolts imported during 1995-2006 derived from import licences

| Import Year | Ova | | | | | | Parr and Smolts |
|---|---|---|---|---|---|---|---|
| | EU Member States | EFTA | | Third Countries | | Total | EU Member States |
| | | Iceland | Norway | Australia | USA | | |
| 1995 | 1,470 | - | - | 600 | - | 2,070 | 2,902 |
| 1996 | 6,690 | - | - | 1,355 | - | 8,045 | 2,849 |
| 1997 | 2,305 | - | - | 1,200 | - | 3,505 | 2,168 |
| 1998 | 260 | - | - | 750 | - | 1,010 | 2,140 |
| 1999 | 244 | - | - | 500 | - | 744 | 900 |
| 2000 | 0 | 4,610 | - | 500 | - | 5,110 | 3,436 |
| 2001 | 8,173 | 10,833 | - | 1,620 | - | 20,626 | 2,475 |
| 2002 | 8,650 | 11,623 | - | 1,800 | 500 | 22,573 | 2,879 |
| 2003 | 7,820 | 9,518 | 2,900 | 550 | 400 | 21,188 | 2,570 |
| 2004 | 4,450 | 3,475 | 6,750 | 1,860 | 450 | 16,985 | 824 |
| 2005 | 2,610 | 570 | 13,210 | - | 450 | 16,840 | 150 |
| 2006 | 11,575 | 300 | 15,940 | 2,400 | - | 30,215 | 375 |

The numbers of ova imported increased by 79%. The number of parr and smolts imported increased.

**Table 22b:** Destination and number (000s) of salmon ova exported during 1996-2006 derived from export certificates

| Export year | Farmed origin | | | | Total | Wild origin total |
|---|---|---|---|---|---|---|
| | Chile | EU | Faroes | Others | | |
| 1996 | 19,720 | 20,445 | 0 | 20 | 40,185 | 435 |
| 1997 | 44,810 | 12,525 | 0 | 0 | 57,335 | 270 |
| 1998 | 23,375 | 4,459 | 0 | 20 | 27,854 | 492 |
| 1999 | 16,880 | 13,054 | 0 | 0 | 29,934 | 52 |
| 2000 | 9,740 | 25,311 | 0 | 0 | 35,051 | 50 |
| 2001 | 2,675 | 8,542 | 0 | 0 | 11,217 | 0 |
| 2002 | 1,600 | 6,627 | 0 | 0 | 8,227 | 0 |
| 2003 | 0 | 2,171 | 0 | 0 | 2,171 | 0 |
| 2004 | 2,215 | 3,699 | 0 | 0 | 5,914 | 0 |
| 2005 | 8,560 | 3,130 | 1,566 | 0 | 13,256 | 0 |
| 2006 | 26,930 | 4,312 | 0 | 0 | 31,242 | 0 |

In 2006, a total of 31.2 million ova were exported. Exports of ova to other EU member states increased by 38% to 4.3 million in 2006. The trade with Chile increased by over 18 million ova. Overall, exports more than doubled compared with the 2005 figure.

## Vaccines

**Table 23:** Number of sites using vaccines and number (millions) of fish vaccinated during 1998-2006

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|
| No. of sites | 122 | 115 | 114 | 106 | 108 | 104 | 98 | 84 | 79 |
| No. of fish (millions) vaccinated | 43.7 | 43.9 | 45.8 | 51.3 | 47.5 | 41.7 | 39.4 | 33.8 | 43.5 |

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. Vaccination is normally carried out at the pre-smolt stage by intra-peritoneal injection. In addition, some sites vaccinated fish against enteric redmouth disease (ERM), infectious pancreatic necrosis (IPN) and *Vibrio*sis. A total of 43.5 million fish were vaccinated across 79 sites.

# 3. ATLANTIC SALMON - PRODUCTION

## Production

Production survey information was collected from all 44 companies actively involved in Atlantic salmon production, farming 252 active sites. This figure represents the entire industry operating in Scotland.

**Table 24:** Annual production of Atlantic salmon (tonnes) during 1986-2006 and projected production in 2007

| Year | Tonnes | Percentage difference | Year | Tonnes | Percentage difference |
|---|---|---|---|---|---|
| 1986 | 10,337 | - | 1997 | 99,197 | 19 |
| 1987 | 12,721 | 23 | 1998 | 110,784 | 12 |
| 1988 | 17,951 | 41 | 1999 | 126,686 | 14 |
| 1989 | 28,553 | 59 | 2000 | 128,959 | 2 |
| 1990 | 32,351 | 13 | 2001 | 138,519 | 7 |
| 1991 | 40,593 | 25 | 2002 | 144,589 | 4 |
| 1992 | 36,101 | -11 | 2003 | 169,736 | 17 |
| 1993 | 48,691 | 35 | 2004 | 158,099 | -7 |
| 1994 | 64,066 | 32 | 2005 | 129,588 | -18 |
| 1995 | 70,060 | 9 | 2006 | 131,847 | 2 |
| 1996 | 83,121 | 19 | 2007 | 142,556* | |

*farmers' estimate of projected tonnage based on stocks currently being on-grown

The total production of Atlantic salmon during 2006 was 131,847 tonnes, an increase of 2,259 tonnes (2%) on the 2005 production. The recent trend of decreasing production has been reversed following a period of consolidation and renewed optimism within the industry.

## Escapes

There were 19 reported escapes from seawater Atlantic salmon sites in 2006, involving the loss of 142,037 fish.

**Table 25:** Number (000s) and production (tonnes) of salmon harvested, and mean fish weight (Kg) per year class during 1996-2006

| | Year of smolt input | Year of harvest | Number (000s) | Production (tonnes) | Mean weight at harvest (Kg) |
|---|---|---|---|---|---|
| Harvest in year 0 (i.e. in year of input) | 1996 | 1996 | 315 | 638 | 2.0 |
| | 1997 | 1997 | 282 | 585 | 2.1 |
| | 1998 | 1998 | 696 | 2,048 | 2.9 |
| | 1999 | 1999 | 1,000 | 2,763 | 2.8 |
| | 2000 | 2000 | 765 | 2,673 | 3.5 |
| | 2001 | 2001 | 557 | 1,227 | 2.2 |
| | 2002 | 2002 | 272 | 824 | 3.0 |
| | 2003 | 2003 | 82 | 276 | 3.4 |
| | 2004 | 2004 | 168 | 319 | 1.9 |
| | 2005 | 2005 | 0 | 0 | 0 |
| | 2006 | 2006 | 115 | 211 | 1.8 |
| Harvest in year 1 | 1995 | 1996 | 17,132 | 57,998 | 3.4 |
| | 1996 | 1997 | 20,245 | 71,349 | 3.5 |
| | 1997 | 1998 | 29,014 | 86,783 | 3.0 |
| | 1998 | 1999 | 22,556 | 83,823 | 3.8 |
| | 1999 | 2000 | 23,077 | 89,963 | 3.9 |
| | 2000 | 2001 | 22,726 | 96,539 | 4.2 |
| | 2001 | 2002 | 23,528 | 90,230 | 3.8 |
| | 2002 | 2003 | 22,602 | 96,205 | 4.3 |
| | 2003 | 2004 | 19,596 | 85,792 | 4.4 |
| | 2004 | 2005 | 15,075 | 67,738 | 4.5 |
| | 2005 | 2006 | 14,036 | 64,099 | 4.6 |
| Harvest in year 2 | 1994 | 1996 | 5,408 | 24,485 | 4.5 |
| | 1995 | 1997 | 6,195 | 27,263 | 4.4 |
| | 1996 | 1998 | 5,148 | 21,953 | 4.3 |
| | 1997 | 1999 | 9,027 | 40,100 | 4.4 |
| | 1998 | 2000 | 8,450 | 36,323 | 4.3 |
| | 1999 | 2001 | 9,096 | 40,754 | 4.5 |
| | 2000 | 2002 | 11,354 | 53,535 | 4.7 |
| | 2001 | 2003 | 15,619 | 73,255 | 4.7 |
| | 2002 | 2004 | 15,555 | 71,988 | 4.6 |
| | 2003 | 2005 | 13,920 | 61,850 | 4.4 |
| | 2004 | 2006 | 14,237 | 67,537 | 4.7 |

**Table 26:** Number (000s) and production (tonnes) of grilse and pre-salmon harvested during 1996-2006

| Year | Grilse (January-August) | | | Pre-salmon (September-December) | | |
|---|---|---|---|---|---|---|
| | Number | Tonnes | Average weight (Kg) | Number | Tonnes | Average weight (Kg) |
| 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 |
| 1999 | 12,448 | 41,259 | 3.3 | 10,109 | 42,564 | 4.2 |
| 2000 | 12,561 | 45,229 | 3.6 | 10,516 | 44,734 | 4.2 |
| 2001 | 11,072 | 42,065 | 3.8 | 11,654 | 54,474 | 4.7 |
| 2002 | 9,872 | 33,609 | 3.4 | 13,656 | 56,621 | 4.1 |
| 2003 | 8,560 | 32,977 | 3.8 | 14,042 | 63,228 | 4.5 |
| 2004 | 6,824 | 27,710 | 4.1 | 12,772 | 58,082 | 4.5 |
| 2005 | 5,662 | 22,972 | 4.1 | 9,413 | 44,766 | 4.7 |
| 2006 | 4,357 | 18,162 | 4.2 | 9,679 | 45,937 | 4.7 |

**Table 27:** Percentage (by weight) of annual production by growth stage harvested during 1998-2006

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|
| Growth stage | - | - | - | - | - | - | - | - | - |
| Input year fish | 2 | 2 | 2 | ‹1 | ‹1 | ‹1 | ‹1 | 0 | ‹1 |
| Grilse | 35 | 32 | 35 | 30 | 23 | 19 | 17 | 18 | 13 |
| Pre-salmon | 43 | 34 | 35 | 39 | 39 | 37 | 37 | 34 | 35 |
| Salmon | 20 | 32 | 28 | 30 | 37 | 43 | 45 | 48 | 51 |

## Survival and Production in Smolt Year Classes

**Table 28:** Survival and production in smolt year classes during 1990-2006

| 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) | Yield per smolt (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Number (000s) | Weight (tonnes) | Mean weight (Kg) | % harvested | Number (000s) | Weight (tonnes) | Mean weight (Kg) | % harvest | Number (000s) | Weight (tonnes) | Mean weight (Kg) | % harvest | | | |
| 1990 | 21,408 | - | - | - | - | 8,877 | 21,026 | 2.4 | 41.5 | 4,315 | 14,728 | 3.4 | 20.1 | 61.6 | 35,754 | 1.67 |
| 1991 | 20,227 | - | - | - | - | 8,864 | 21,373 | 2.4 | 43.8 | 4,675 | 15,875 | 3.4 | 23.1 | 66.9 | 37,248 | 1.84 |
| 1992 | 20,527 | - | - | - | - | 11,102 | 32,738 | 3.0 | 54.1 | 5,096 | 21,812 | 4.3 | 24.8 | 78.9 | 54,550 | 2.65 |
| 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 | 3.10 |
| 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 | 3.31 |
| 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 | 3.19 |
| 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 | 2.85 |
| 1997 | 42,766 | 282 | 585 | 2.1 | 0.7 | 29,014 | 86,783 | 3.0 | 67.8 | 9,027 | 40,098 | 4.4 | 21.1 | 89.6 | 127,466 | 2.98 |
| 1998 | 45,870 | 696 | 2,048 | 2.9 | 1.5 | 22,556 | 83,823 | 3.7 | 49.2 | 8,450 | 36,323 | 4.3 | 18.4 | 69.1 | 122,194 | 2.66 |
| 1999 | 41,106 | 1,000 | 2,763 | 2.8 | 2.4 | 23,077 | 89,963 | 3.9 | 56.1 | 9,096 | 40,754 | 4.5 | 22.1 | 80.6 | 133,480 | 3.25 |
| 2000 | 45,185 | 765 | 2,673 | 3.5 | 1.7 | 22,726 | 96,539 | 4.2 | 50.3 | 11,354 | 53,535 | 4.7 | 25.1 | 77.1 | 152,747 | 3.38 |
| 2001 | 48,643 | 557 | 1,227 | 2.2 | 1.1 | 23,528 | 90,230 | 3.8 | 48.4 | 15,619 | 73,255 | 4.7 | 32.1 | 81.6 | 164,712 | 3.39 |
| 2002 | 50,086 | 272 | 824 | 3.0 | 0.5 | 22,602 | 96,205 | 4.3 | 45.1 | 15,555 | 71,988 | 4.6 | 31.1 | 76.7 | 169,017 | 3.37 |
| 2003 | 43,083 | 82 | 276 | 3.4 | 0.2 | 19,596 | 85,792 | 4.4 | 45.5 | 13,920 | 61,850 | 4.4 | 32.3 | 78.0 | 147,918 | 3.43 |
| 2004 | 39,041 | 168 | 319 | 1.9 | 0.4 | 15,075 | 67,738 | 4.5 | 38.6 | 14,237 | 67,537 | 4.7 | 36.5 | 75.5 | 135,594 | 3.47 |
| 2005 | 37,168 | - | - | - | - | 14,036 | 64,099 | 4.6 | 37.8 | | | | | | | |
| 2006 | 41,091 | 115 | 211 | 1.8 | 0.3 | | | | | | | | | | | |

In 2004, the last year for which survival can be calculated, the survival rate from smolt input to harvest was 75.5%. The 2004 year class displayed a lower survival rate than that noted in 2003, and was lower than the survival averaged over the last 15 year-classes.

Of the 2005 year class, 37.8% of the input has been harvested, approximately 1.2% lower than the average harvest of fish one year after input in the 2004 year class. The average weight increased by 0.1Kg to 4.6 Kg. This may indicate an increased harvest in 2007 of 2 sea winter (2SW) fish.

In 2006, the harvest of fish from the 2006 smolt input was 0.3%, an increase compared with the proportion of fish harvested from the same year class in 2005.

## Smolts to Sea

**Table 29:** Number (000s) and origin of smolts put to sea during 1994-2006

| Year | Smolts put to sea (000s) | | | | Total (000s) | Scottish Origin | English Origin | | Other Origin | |
|---|---|---|---|---|---|---|---|---|---|---|
| | S½ | S1 | S1½ | S2 | | % | (000s) | % | (000s) | % |
| 1994 | 1,865 | 19,701 | 113 | 274 | 21,953 | 93 | 1,451 | 7 | - | - |
| 1995 | 2,442 | 23,081 | 589 | 674 | 26,786 | 97 | 852 | 3 | - | - |
| 1996 | 5,527 | 26,157 | 180 | 974 | 32,838 | 90 | 1,166 | 4 | 1,936 | 6 |
| 1997 | 8,936 | 33,274 | 182 | 374 | 42,766 | 88 | 2,957 | 7 | 2,028 | 5 |
| 1998 | 12,796 | 32,649 | 190 | 235 | 45,870 | 92 | 2,714 | 6 | 1,080 | 2 |
| 1999 | 11,585 | 29,119 | 335 | 68 | 41,107 | 94 | 2,221 | 5 | 600 | 1 |
| 2000 | 9,517 | 35,176 | 399 | 93 | 45,185 | 92 | 3,396 | 8 | 0 | 0 |
| 2001 | 14,118 | 34,321 | 171 | 33 | 48,643 | 98 | 1,183 | 2 | 0 | 0 |
| 2002 | 15,850 | 32,761 | 1,475 | 0 | 50,086 | 94 | 1,564 | 3 | 1,676 | 3 |
| 2003 | 14,534 | 28,283 | 986 | 0 | 43,803 | 93 | 2,590 | 6 | 325 | >1 |
| 2004 | 14,044 | 23,776 | 1,221 | 0 | 39,041 | 97 | 634 | 2 | 541 | >1 |
| 2005 | 13,051 | 22,501 | 1,616 | 0 | 37,168 | 96 | 1,594 | 4 | 0 | 0 |
| 2006 | 15,578 | 23,733 | 1,779 | 0 | 41,090 | 96 | 1,257 | 3 | 272 | >1 |

The total number of smolts put to sea in 2006 was over 41 million. The smolt input comprised mainly S1 smolts (58%), and the proportion of photoperiod adjusted fish (S½ smolts and S1½ smolts) input increased to 42%. Approximately 4% of smolts input into Scottish salmon farms were sourced from outwith Scotland. This is similar to the proportion observed in 2005.

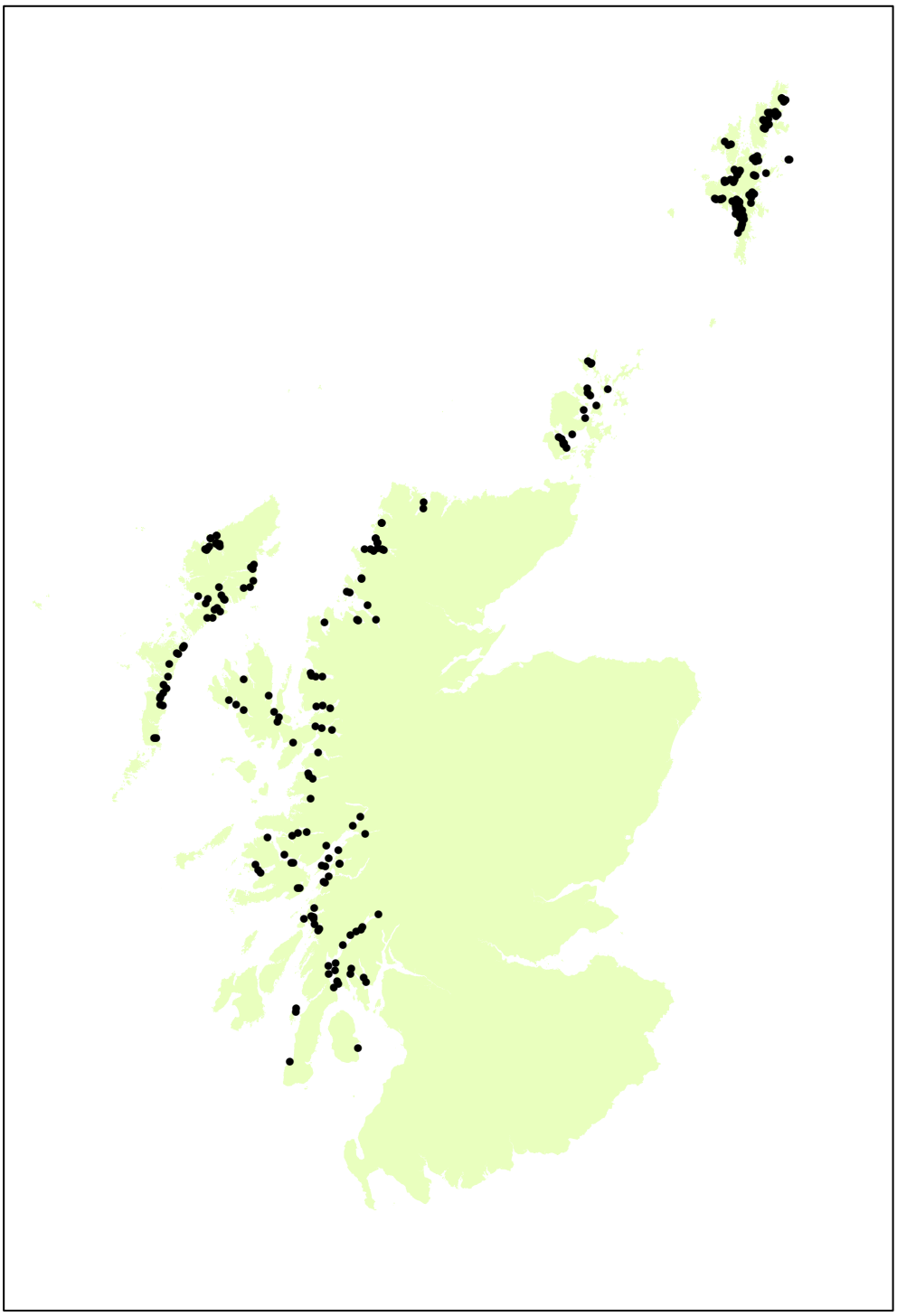
## Survival and Production in Smolt Year Classes by Production Area

**Table 30:** Number (000s) of smolts put to sea and year class survival by area during 1995-2006

| Region | Smolts put 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 | % |
| North West | 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 | 1999 | 2,183 | 19.4 | 9,548 | 85.0 |
| | 1998 | 17,808 | 1998 | 315 | 1.8 | 1999 | 9,075 | 50.9 | 2000 | 1,614 | 9.1 | 11,004 | 61.8 |
| | 1999 | 11,393 | 1999 | 288 | 2.5 | 2000 | 9,422 | 82.7 | 2001 | 1,198 | 10.5 | 10,908 | 95.7 |
| | 2000 | 11,308 | 2000 | 457 | 4.0 | 2001 | 6,754 | 59.7 | 2002 | 2,144 | 19.0 | 9,355 | 82.7 |
| | 2001 | 13,767 | 2001 | 93 | 0.7 | 2002 | 8,112 | 58.9 | 2003 | 2,455 | 17.8 | 10,660 | 77.4 |
| | 2002 | 12,634 | 2002 | 135 | 1.1 | 2003 | 7,007 | 55.5 | 2004 | 3,113 | 24.6 | 10,255 | 81.2 |
| | 2003 | 13,103 | 2003 | - | - | 2004 | 7,667 | 58.5 | 2005 | 2,847 | 21.7 | 10,514 | 80.2 |
| | 2004 | 9,642 | 2004 | 168 | 1.7 | 2005 | 4,516 | 46.8 | 2006 | 2,978 | 30.9 | 7,662 | 79.5 |
| | 2005 | 10,888 | 2005 | - | - | 2006 | 5,796 | 53.2 | | | | | |
| | 2006 | 10,403 | 2006 | 115 | 1.1 | | | | | | | | |
| Orkney | 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 | 1999 | 257 | 17.1 | 1,228 | 81.6 |
| | 1998 | 2,409 | 1998 | 75 | 3.1 | 1999 | 986 | 40.9 | 2000 | 259 | 10.8 | 1,320 | 54.8 |
| | 1999 | 3,235 | 1999 | 10 | 0.3 | 2000 | 1,614 | 49.9 | 2001 | 782 | 24.2 | 2,406 | 74.4 |
| | 2000 | 2,604 | 2000 | - | - | 2001 | 670 | 25.7 | 2002 | 597 | 22.9 | 1,267 | 48.6 |
| | 2001 | 2,932 | 2001 | - | - | 2002 | 1,369 | 46.7 | 2003 | 1,464 | 49.9 | 2,833 | 96.6 |
| | 2002 | 2,741 | 2002 | - | - | 2003 | 1,169 | 42.6 | 2004 | 742 | 27.1 | 1,911 | 69.7 |
| | 2003 | 2,964 | 2003 | - | - | 2004 | 1,141 | 38.5 | 2005 | 980 | 33.1 | 2,121 | 71.6 |
| | 2004 | 1,842 | 2004 | - | - | 2005 | 480 | 26.0 | 2006 | 416 | 22.6 | 896 | 48.6 |
| | 2005 | 2,192 | 2005 | - | - | 2006 | 598 | 27.3 | | | | | |
| | 2006 | 1,622 | 2006 | - | - | | | | | | | | |
| Shetland | 1995 | 5,811 | 1995 | 41 | 0.7 | 1996 | 3,021 | 52.0 | 1997 | 2,622 | 45.1 | 5,684 | 97.8 |
| | 1996 | 6,234 | 1996 | - | - | 1997 | 3,828 | 61.4 | 1998 | 1,141 | 18.3 | 4,969 | 79.7 |
| | 1997 | 13,276 | 1997 | - | - | 1998 | 7,265 | 54.7 | 1999 | 3,835 | 28.9 | 11,100 | 83.6 |
| | 1998 | 12,617 | 1998 | 78 | 0.6 | 1999 | 5,498 | 43.6 | 2000 | 4,783 | 37.9 | 10,359 | 82.1 |
| | 1999 | 12,663 | 1999 | 65 | 0.5 | 2000 | 5,576 | 44.0 | 2001 | 4,139 | 32.7 | 9,780 | 77.2 |
| | 2000 | 15,096 | 2000 | - | - | 2001 | 5,102 | 33.8 | 2002 | 4,578 | 30.3 | 9,680 | 64.1 |
| | 2001 | 17,398 | 2001 | 123 | 0.7 | 2002 | 6,465 | 37.2 | 2003 | 7,973 | 45.8 | 14,561 | 83.7 |
| | 2002 | 17,260 | 2002 | - | - | 2003 | 5,850 | 33.9 | 2004 | 5,675 | 32.9 | 11,525 | 66.8 |
| | 2003 | 14,446 | 2003 | - | - | 2004 | 6,031 | 41.7 | 2005 | 4,071 | 28.2 | 10,102 | 69.9 |
| | 2004 | 12,372 | 2004 | - | - | 2005 | 4,220 | 34.1 | 2006 | 4,040 | 32.7 | 8,260 | 66.8 |
| | 2005 | 10,824 | 2005 | - | - | 2006 | 4,162 | 38.5 | | | | | |
| | 2006 | 13,180 | 2006 | - | - | | | | | | | | |

| Region | Smolts put 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 | % |
| South West | 1995 | 6,437 | 1995 | 25 | 0.4 | 1996 | 3,268 | 50.8 | 1997 | 1,349 | 20.9 | 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 | 35.7 | 1999 | 2,305 | 20.0 | 6,431 | 55.7 |
| | 1998 | 6,505 | 1998 | 41 | 0.6 | 1999 | 2,543 | 39.1 | 2000 | 1,501 | 23.1 | 4,085 | 62.8 |
| | 1999 | 5,370 | 1999 | 226 | 4.2 | 2000 | 1,626 | 30.3 | 2001 | 2,131 | 39.7 | 3,983 | 74.2 |
| | 2000 | 7,851 | 2000 | 110 | 1.4 | 2001 | 4,554 | 58.0 | 2002 | 2,925 | 37.3 | 7,589 | 96.7 |
| | 2001 | 7,667 | 2001 | - | - | 2002 | 3,014 | 39.3 | 2003 | 3,022 | 39.4 | 6,036 | 78.7 |
| | 2002 | 7,403 | 2002 | - | - | 2003 | 3,761 | 50.8 | 2004 | 2,808 | 37.9 | 6,569 | 88.7 |
| | 2003 | 6,834 | 2003 | - | - | 2004 | 2,110 | 30.9 | 2005 | 3,646 | 53.3 | 5,756 | 84.2 |
| | 2004 | 6,786 | 2004 | - | - | 2005 | 3,281 | 48.4 | 2006 | 2,722 | 40.1 | 6,003 | 88.5 |
| | 2005 | 6,589 | 2005 | - | - | 2006 | 2,054 | 31.2 | | | | | |
| | 2006 | 7,032 | 2006 | - | - | | | | | | | | |
| Western Isles | 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 | 9.5 | 4,983 | 97.0 |
| | 1997 | 5,274 | 1997 | 170 | 3.2 | 1998 | 3,900 | 73.9 | 1999 | 447 | 8.5 | 4,517 | 85.6 |
| | 1998 | 6,559 | 1998 | 187 | 2.8 | 1999 | 4,455 | 67.9 | 2000 | 294 | 4.5 | 4,936 | 75.2 |
| | 1999 | 8,445 | 1999 | 411 | 4.9 | 2000 | 4,839 | 57.3 | 2001 | 847 | 10.0 | 6,097 | 72.2 |
| | 2000 | 8,325 | 2000 | 198 | 2.4 | 2001 | 5,646 | 67.8 | 2002 | 1,110 | 13.3 | 6,954 | 83.5 |
| | 2001 | 6,879 | 2001 | 341 | 5.0 | 2002 | 4,568 | 66.4 | 2003 | 705 | 10.2 | 5,614 | 81.6 |
| | 2002 | 10,048 | 2002 | 137 | 1.4 | 2003 | 4,815 | 47.9 | 2004 | 3,217 | 32.0 | 8,169 | 81.3 |
| | 2003 | 6,456 | 2003 | 82 | 1.3 | 2004 | 2,647 | 41.0 | 2005 | 2,377 | 36.8 | 5,106 | 79.1 |
| | 2004 | 8,399 | 2004 | - | - | 2005 | 2,578 | 30.7 | 2006 | 4,081 | 48.6 | 6,659 | 79.3 |
| | 2005 | 6,675 | 2005 | - | - | 2006 | 1,426 | 21.4 | | | | | |
| | 2006 | 8,853 | 2006 | - | - | | | | | | | | |

Figure 3: The distribution of active salmon production sites 2006



## Staffing

**Table 31:** Number of staff employed in salmon production during 1996-2006

| Year | | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Staff | F/T | 1,150 | 1,088 | 1,117 | 1,036 | 1,141 | 1,066 | 1,083 | 1,066 | 1,019 | 851 | 790 |
| | P/T | 241 | 207 | 192 | 268 | 256 | 191 | 223 | 151 | 142 | 128 | 81 |
| Total staff | | 1,391 | 1,295 | 1,309 | 1,304 | 1,397 | 1,257 | 1,306 | 1,217 | 1,161 | 979 | 871 |
| Productivity (tonnes/person) | | 59.8 | 76.6 | 84.6 | 97.2 | 92.3 | 110.2 | 110.7 | 139.5 | 136.2 | 132.4 | 151.4 |

The total number of staff employed in salmon production in 2006 was 871, a decrease of 108 compared with 2005. The staffing figures collected refer specifically to the production of salmon, and do not include figures for staff involved with processing or marketing activities. Productivity increased from 132.4 to 151.4 tonnes production per person.

## Production Methods

**Table 32:** Production methods, capacity, tonnage and average stocking densities (Kg/$m^3$) during 2004-2006

| Method | Number of sites | | | Total capacity (000s cubic metres) | | | Production (tonnes) | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 | 2004 | 2005 | 2006 |
| Seawater tanks | 1 | 1 | 1 | 5.8 | 5.8 | 5.8 | 0 | 0 | 0 |
| Seawater cages | 314 | 277 | 251 | 15,531 | 15,569 | 15,406 | 158,099 | 129,588 | 131,847 |
| For cage sites: ratio of production (Kg) to cage capacity ($m^3$) | | | | | | | 10.2 | 8.3 | 8.6 |

All of the fish were produced in seawater cages. The fact that there was no production from seawater tank sites in 2006 reflects the continued high installation and running costs incurred in operating seawater tank systems. Twelve active seawater tank sites were registered in Scotland, but none were actively producing salmon. Most seawater tank capacity has now been re-deployed for the production of other species or salmon broodstock.

Sea cage capacity decreased by 163,000 $m^3$ during 2006. This continues to reflect the decrease 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 0.3 Kg in 2006. In cage sites, the ratio of production, expressed in kilograms, to cage capacity, expressed in cubic metres, was 10.2, 8.3 and 8.6 in 2004, 2005 and 2006 respectively. This indicates that on average across all production stages in any year, the stocking density is just above 9 Kg per cubic metre.

## Scale of Production by Site

**Table 33:** Number of sites shown in relation to their production grouping and percentage share of production 1996-2006

| Production grouping (tonnes) | 0 | 1-50 | 51-100 | 101-200 | 201-500 | 501-1,000 | >1,000 | Total Sites* | Total Tonnes |
|---|---|---|---|---|---|---|---|---|---|
| 1996 | 125 | 20 | 28 | 49 | 66 | 25 | 21 | 334 | 83,121 |
| 1997 | 120 | 21 | 22 | 41 | 63 | 43 | 28 | 338 | 99,197 |
| 1998 | 130 | 32 | 16 | 31 | 66 | 39 | 29 | 343 | 110,784 |
| 1999 | 158 | 21 | 17 | 21 | 53 | 42 | 39 | 351 | 126,686 |
| 2000 | 183 | 8 | 20 | 15 | 40 | 40 | 40 | 346 | 128,959 |
| 2001 | 148 | 9 | 4 | 28 | 41 | 39 | 51 | 320 | 138,519 |
| 2002 | 131 | 10 | 10 | 25 | 50 | 51 | 51 | 328 | 144,589 |
| 2003 | 125 | 6 | 14 | 13 | 53 | 45 | 70 | 326 | 169,736 |
| 2004 | 122 | 10 | 7 | 25 | 41 | 55 | 55 | 315 | 158,099 |
| 2005 | 112 | 8 | 13 | 16 | 41 | 37 | 51 | 278 | 129,588 |
| 2006 | 95 | 10 | 10 | 16 | 29 | 30 | 62 | 252 | 131,847 |
| 1996 | 0 | 1 | 3 | 9 | 26 | 22 | 39 | - | - |
| 1997 | 0 | 1 | 2 | 6 | 20 | 28 | 43 | - | - |
| 1998 | 0 | 1 | 1 | 4 | 21 | 23 | 50 | - | - |
| 1999 | 0 | 1 | 1 | 2 | 13 | 24 | 59 | - | - |
| 2000 | 0 | 0.6 | 1.4 | 1.9 | 10.9 | 25.1 | 60.5 | - | - |
| 2001 | 0 | 0.2 | 0.2 | 2.9 | 10.0 | 20.8 | 65.9 | - | - |
| 2002 | 0 | 0.2 | 0.5 | 2.7 | 12.8 | 26.5 | 57.3 | - | - |
| 2003 | 0 | 0.1 | 0.6 | 1.2 | 10.4 | 19.7 | 68 | - | - |
| 2004 | 0 | 0.1 | 0.4 | 2.4 | 9.4 | 26.1 | 61.6 | - | - |
| 2005 | 0 | 0.2 | 0.7 | 1.9 | 10.8 | 20.5 | 65.9 | - | - |
| 2006 | 0 | 0.2 | 0.6 | 1.8 | 7.9 | 15.9 | 73.6 | - | - |

*Includes farms stocked but having no production.

In 2006, there was a decrease of 13 in the number of sites producing less than 500 tonnes, and an increase of four in those sites producing over 500 tonnes. This reflects the decrease in the overall number of sites in production and the concentration of production in larger sites.

## Company Productivity

**Table 34:** Number of companies grouped by production (tonnes), manpower and productivity (tonnes per person) during 2005-2006

| Total Tonnage | | 0-100 | 101-200 | 201-400 | 401-700 | 701-1,000 | 1,001-2,000 | >2,000 | Total |
|---|---|---|---|---|---|---|---|---|---|
| No. of Companies | 2005 | 13 | 3 | 6 | 2 | 6 | 6 | 14 | 50 |
| | 2006 | 15 | 5 | 3 | 2 | 4 | 4 | 11 | 44 |
| No. of tonnes | 2005 | 126 | 391 | 1,712 | 927 | 5,239 | 9,360 | 111,833 | 129,588 |
| | 2006 | 67 | 826 | 977 | 1,130 | 3,440 | 5,832 | 119,575 | 131,847 |
| Manpower (total) | 2005 | 38 | 11 | 28 | 8 | 66 | 100 | 728 | 979 |
| | 2006 | 39 | 15 | 15 | 22 | 51 | 63 | 666 | 871 |
| Productivity (tonnes/person) | 2005 | 3 | 35 | 61 | 116 | 79 | 94 | 154 | 132 |
| | 2006 | 2 | 55 | 65 | 51 | 67 | 93 | 179 | 151 |

Productivity may be used as a measure of efficiency, and was found to be related to the scale of production. The greatest productivity (179 tonnes per person) was achieved in those companies having a production of over two thousand tonnes, and the least (two tonnes per person) in the companies producing the smallest tonnages. In comparison with 2005, the average company productivity increased from 132 to 151 tonnes per person.

Overall production was dominated by 11 companies in 2006, which between them accounted for over 90% of the salmon production in Scotland.

## Manpower and Production by Production Area

**Table 35:** Manpower and production (tonnes) by area 1997-2006, and projected production in 2007

| Region | Year | Staff | | Annual Production | Productivity (t/person) | Year of input | | Grilse | | Pre salmon | | Salmon | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F/T | P/T | | | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) |
| North west | 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 | 403 | 72 | 39,635 | 83 | 670 | 2.3 | 18,618 | 3.1 | 12,538 | 4.0 | 7,809 | 3.6 |
| | 2000 | 365 | 62 | 45,486 | 106 | 1,795 | 3.9 | 20,360 | 3.5 | 16,374 | 4.4 | 6,957 | 4.3 |
| | 2001 | 373 | 38 | 34,120 | 83 | 130 | 1.4 | 14,062 | 3.5 | 13,334 | 4.8 | 6,594 | 5.5 |
| | 2002 | 366 | 77 | 40,156 | 91 | 437 | 3.2 | 11,819 | 3.2 | 17,772 | 4.0 | 10,128 | 4.7 |
| | 2003 | 259 | 32 | 40,425 | 139 | - | - | 12,250 | 3.7 | 15,971 | 4.3 | 12,204 | 5.0 |
| | 2004 | 321 | 38 | 48,609 | 135 | 319 | 1.9 | 10,912 | 4.0 | 22,586 | 4.6 | 14,792 | 4.7 |
| | 2005 | 267 | 31 | 32,439 | 109 | - | - | 8,816 | 3.9 | 10,608 | 4.7 | 13,015 | 4.6 |
| | 2006 | 203 | 23 | 40,219 | 178 | 211 | 1.8 | 8,742 | 4.2 | 16,995 | 4.6 | 14,271 | 4.8 |
| | 2007 | | | 32,987* | | | | | | | | | |
| Orkney | 1997 | 36 | 20 | 3,063 | 67 | - | - | 277 | 2.6 | 1,119 | 3.5 | 1,667 | 3.9 |
| | 1998 | 66 | 15 | 4,485 | 55 | 150 | 2.0 | 1,884 | 3.4 | 1,378 | 3.3 | 1,073 | 3.4 |
| | 1999 | 78 | 20 | 4,902 | 50 | 22 | 2.2 | 1,162 | 3.2 | 2,486 | 4.0 | 1,232 | 4.8 |
| | 2000 | 91 | 15 | 6,370 | 60 | - | - | 3,338 | 3.6 | 2,089 | 3.1 | 943 | 3.6 |
| | 2001 | 75 | 15 | 5,588 | 62 | - | - | 810 | 4.2 | 1,892 | 4.0 | 2,886 | 3.7 |
| | 2002 | 80 | 11 | 6,565 | 72 | - | - | 1,949 | 3.2 | 2,649 | 3.5 | 1,967 | 3.3 |
| | 2003 | 121 | 15 | 10,740 | 79 | - | - | 1,016 | 3.6 | 3,508 | 4.0 | 6,216 | 4.2 |
| | 2004 | 68 | 10 | 6,600 | 85 | - | - | 1,877 | 3.3 | 2,107 | 3.6 | 2,616 | 3.5 |
| | 2005 | 47 | 4 | 5,183 | 102 | - | - | 989 | 3.5 | 805 | 4.1 | 3,389 | 3.5 |
| | 2006 | 72 | 3 | 3,724 | 50 | - | - | 509 | 3.1 | 1,689 | 3.9 | 1,526 | 3.7 |
| | 2007 | | | 5,340* | | | | | | | | | |
| Shetland | 1997 | 224 | 83 | 24,630 | 84 | - | - | 3,207 | 2.9 | 10,002 | 3.7 | 11,421 | 4.4 |
| | 1998 | 218 | 93 | 33,404 | 107 | 222 | 2.8 | 11,162 | 1.5 | 16,690 | 4.2 | 5,330 | 4.7 |
| | 1999 | 227 | 100 | 36,228 | 111 | 221 | 3.4 | 4,449 | 2.7 | 15,111 | 4.0 | 16,447 | 4.3 |
| | 2000 | 258 | 77 | 43,133 | 129 | - | - | 7,189 | 3.7 | 16,360 | 4.5 | 19,584 | 4.1 |
| | 2001 | 227 | 52 | 39,745 | 142 | 130 | 1.1 | 4,905 | 3.7 | 16,441 | 4.3 | 18,269 | 4.4 |
| | 2002 | 238 | 46 | 49,341 | 174 | - | - | 7,107 | 3.6 | 19,646 | 4.4 | 22,588 | 4.9 |
| | 2003 | 222 | 48 | 61,685 | 228 | - | - | 3,898 | 3.9 | 21,698 | 4.5 | 36,089 | 4.5 |
| | 2004 | 185 | 27 | 53,101 | 250 | - | - | 6,732 | 4.2 | 20,543 | 4.6 | 25,826 | 4.5 |
| | 2005 | 162 | 33 | 38,946 | 200 | - | - | 3,424 | 4.4 | 16,296 | 4.7 | 19,226 | 4.7 |
| | 2006 | 190 | 18 | 39,278 | 189 | - | - | 3,765 | 4.3 | 16,134 | 4.9 | 19,379 | 4.8 |
| | 2007 | | | 44,458* | | | | | | | | | |

| Region | Year | Staff | | Annual Production | Productivity (t/person) | Year of input | | Grilse | | Pre salmon | | Salmon | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F/T | P/T | | | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) | Tonnes | Mean weight (Kg) |
| South West | 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 | 108 | 26 | 23,929 | 179 | 741 | 3.3 | 5,064 | 3.4 | 5,594 | 5.2 | 12,530 | 5.4 |
| | 2000 | 166 | 87 | 14,088 | 56 | 325 | 3.0 | 2,894 | 3.4 | 3,385 | 4.3 | 7,484 | 5.2 |
| | 2001 | 165 | 48 | 32,574 | 153 | - | - | 9,113 | 4.2 | 13,166 | 5.4 | 10,295 | 4.8 |
| | 2002 | 196 | 54 | 26,351 | 105 | - | - | 2,992 | 3.5 | 9,112 | 4.2 | 14,247 | 4.9 |
| | 2003 | 218 | 35 | 33,583 | 133 | - | - | 4,329 | 4.1 | 13,407 | 4.9 | 15,847 | 5.2 |
| | 2004 | 219 | 34 | 23,911 | 95 | - | - | 2,733 | 4.1 | 6,832 | 4.7 | 14,346 | 5.1 |
| | 2005 | 188 | 36 | 33,056 | 148 | - | - | 4,675 | 4.7 | 11,430 | 5.0 | 16,951 | 4.6 |
| | 2006 | 181 | 22 | 25,460 | 125 | - | - | 2,467 | 4.4 | 7,920 | 5.3 | 15,073 | 5.5 |
| | 2007 | | | 34,505* | | | | | | | | | |
| Western Isles | 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 | 220 | 50 | 21,992 | 81 | 1,109 | 2.7 | 11,966 | 4.1 | 6,835 | 4.5 | 2,082 | 4.7 |
| | 2000 | 261 | 15 | 19,882 | 72 | 553 | 2.8 | 11,448 | 3.7 | 6,526 | 3.8 | 1,355 | 4.6 |
| | 2001 | 226 | 38 | 26,493 | 100 | 967 | 2.8 | 13,176 | 3.8 | 9,640 | 4.4 | 2,710 | 3.2 |
| | 2002 | 203 | 35 | 22,176 | 93 | 387 | 2.8 | 9,742 | 3.6 | 7,442 | 4.0 | 4,605 | 4.2 |
| | 2003 | 246 | 21 | 23,303 | 87 | 276 | 3.4 | 11,484 | 3.9 | 8,644 | 4.6 | 2,899 | 4.1 |
| | 2004 | 226 | 33 | 25,878 | 100 | - | - | 5,456 | 4.1 | 6,014 | 4.5 | 14,408 | 4.5 |
| | 2005 | 187 | 24 | 19,964 | 95 | - | - | 5,068 | 3.8 | 5,627 | 4.5 | 9,269 | 3.9 |
| | 2006 | 144 | 15 | 23,166 | 146 | - | - | 2,679 | 4.0 | 3,199 | 4.3 | 17,288 | 4.2 |
| | 2007 | | | 25,266* | | | | | | | | | |
| All Scotland | 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 | 1,036 | 268 | 126,686 | 97 | 2,763 | 2.8 | 41,259 | 3.3 | 42,564 | 4.2 | 40,100 | 4.4 |
| | 2000 | 1,141 | 256 | 128,959 | 92 | 2,673 | 3.5 | 45,229 | 3.6 | 44,734 | 4.2 | 36,232 | 4.3 |
| | 2001 | 1,066 | 191 | 138,520 | 110 | 1,227 | 2.2 | 42,066 | 3.8 | 54,473 | 4.7 | 40,754 | 4.5 |
| | 2002 | 1,083 | 223 | 144,589 | 111 | 824 | 3.0 | 33,609 | 3.4 | 56,621 | 4.1 | 53,535 | 4.7 |
| | 2003 | 1,066 | 151 | 169,736 | 139 | 276 | 3.4 | 32,977 | 3.8 | 63,228 | 4.5 | 73,255 | 4.7 |
| | 2004 | 1,019 | 142 | 158,099 | 136 | 319 | 1.9 | 27,710 | 4.1 | 58,082 | 4.5 | 71,988 | 4.6 |
| | 2005 | 851 | 128 | 129,588 | 132 | - | - | 22,972 | 4.1 | 44,766 | 4.7 | 61,850 | 4.4 |
| | 2006 | 790 | 81 | 131,847 | 151 | 211 | 1.8 | 18,162 | 4.2 | 45,937 | 4.7 | 67,537 | 4.7 |
| | 2007 | | | 142,556* | | | | | | | | | |

*Estimated production in 2007

## Company and Site Data

**Table 36:** Number of companies and sites engaged in salmon production during 1996-2006

| Year | Number of companies | | | Number of sites | | |
|---|---|---|---|---|---|---|
| | Producing | Non-producing | Total | Producing | Non- producing | Total |
| 1996 | 106 | 1 | 107 | 278 | 56 | 334 |
| 1997 | 98 | 3 | 101 | 275 | 65 | 340 |
| 1998 | 95 | 11 | 106 | 289 | 54 | 343 |
| 1999 | 94 | 1 | 95 | 264 | 87 | 351 |
| 2000 | 68 | 22 | 90 | 163 | 183 | 346 |
| 2001 | 81 | 6 | 87 | 238 | 82 | 320 |
| 2002 | 73 | 11 | 84 | 197 | 131 | 328 |
| 2003 | 63 | 18 | 81 | 201 | 125 | 326 |
| 2004 | 57 | 12 | 69 | 193 | 122 | 315 |
| 2005 | 40 | 10 | 50 | 166 | 112 | 278 |
| 2006 | 32 | 12 | 44 | 157 | 95 | 252 |

The number of companies registered and actively producing salmon in 2006 was 32, a decrease of eight on the 2005 figure. Twelve companies remained active and registered, although not producing salmon for harvest in 2006. This continued the trend of salmon production being concentrated within fewer companies. These 44 companies have 252 registered active sites, although not all active sites may have produced fish for harvest in 2006.

## Fallowing

**Table 37:** Number of seawater sites employing a fallow period during 1997-2006

| Year | Fallow Period (weeks) | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | 0 | <4 | 4-8 | 9-26 | 27-51 | 52 | |
| 1997 | 122 | 6 | 54 | 77 | 11 | 65 | 335 |
| 1998 | 118 | 10 | 55 | 84 | 22 | 54 | 343 |
| 1999 | 94 | 12 | 49 | 90 | 33 | 73 | 351 |
| 2000 | 74 | 23 | 61 | 86 | 25 | 75 | 344 |
| 2001 | 80 | 10 | 76 | 94 | 15 | 45 | 320 |
| 2002 | 99 | 8 | 85 | 85 | 24 | 27 | 328 |
| 2003 | 95 | 14 | 68 | 80 | 40 | 29 | 326 |
| 2004 | 82 | 9 | 52 | 95 | 42 | 35 | 315 |
| 2005 | 75 | 11 | 36 | 86 | 37 | 33 | 278 |
| 2006 | 67 | 10 | 44 | 74 | 37 | 20 | 252 |

Of the 252 sites recorded as being active in 2006, 165 farms were fallow for a variable period, whilst a further 20 farms were fallow for the whole of 2006. The normal production cycle in sea water varies in length between 18 months and two years, and a fallow period at the end of production can break the cycle of disease or parasitic infections. There were 67 sites that had no fallow period in 2006. These may have been stocked late in 2005 with out of season smolts, or may not follow recommended practice of incorporating a fallow period in the production cycle.

## Broodstock Sites

**Table 38:** Number of sites holding broodstock during 1995-2006

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Broodstock sites | 18 | 28 | 37 | 25 | 20 | 18 | 15 | 19 | 20 | 15 | 15 | 17 |

In 2006, the number of freshwater and seawater sites holding broodstock increased to 17. 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 trend. Ten thousand, one hundred and twenty seven female fish were stripped, yielding just under 61 million ova, compared with over 73 million in 2005, which can be calculated to show an average ova yield per fish of 6,018.

# 4. OTHER SPECIES

There has been continued interest in the farming of other species. Brown trout (*Salmo trutta*) has been farmed for many years for the restocking market, but there is an increasing interest in farming marine species. These provide diversification from the production of rainbow trout and Atlantic salmon, allowing some of the smaller companies to remain within the aquaculture sector, and the larger companies to broaden their production base. As the marine species sector expands, and markets are established, the employment provided and the contribution to the total production of the Scottish aquaculture industry is expected to increase.

## Staffing

**Table 39:** Number of staff employed in farming other species during 1999-2006

| Year | Full-time | Part-time | Total |
|---|---|---|---|
| 1999 | 54 | 18 | 72 |
| 2000 | 73 | 25 | 98 |
| 2001 | 75 | 22 | 97 |
| 2002 | 69 | 30 | 99 |
| 2003 | 73 | 24 | 97 |
| 2004 | 61 | 18 | 79 |
| 2005 | 73 | 18 | 91 |
| 2006 | 92 | 17 | 109 |

## Company, Site and Production Data

**Table 40:** Number of companies and sites producing other species, and production of other species (tonnes) during 2003-2006, and estimated production in 2007

| Species | No. of companies | No. of sites | 2003 Production tonnage | 2004 Production tonnage | 2005 Production tonnage | 2006 Production tonnage | 2007 Production tonnage* |
|---|---|---|---|---|---|---|---|
| Arctic Charr | 3 | 5 | 3.1 | 3.25 | 3 | 3.5 | 6 |
| Brown trout/ Sea trout | 25 | 43 | 198.3 | 167 | 122 | 267 | 198 |
| Cod | 12 | 20 | 82.1 | 8 | 69.6 | 543 | 2,902 |
| Halibut | 7 | 13 | 231.8 | 186.8 | 272.4 | 233 | 151 |

*farmers' estimates based on stocks currently being on-grown

There were significant increases in the production of cod and brown trout or sea trout. Cod production increased by over 473 tonnes on the 2005 figure, and brown trout or sea trout production increased by 145 tonnes. Production of Arctic charr showed a slight increase, while there was a decrease in halibut production.

Not all of this production is for the table market. There is some production of Arctic charr (*Salvelinus alpinus*) and brown trout for the angling restocking market.

## Escapes

There was one reported escape from a site rearing other species in 2006, involving the loss of 12,230 fish.

## Ova Laid Down to Hatch

**Table 41:** Source of other species' ova laid down to hatch during 2006

| Species | Source of ova laid down to hatch (000s) | | |
|---|---|---|---|
| | Own broodstock | Other GB broodstock | Foreign ova |
| Arctic charr (*Salvelinus alpinus*) | 15 | 0 | 0 |
| Cod (*Gadus morhua*) | 119,900 | 2,779 | [d] |
| Brown trout/Sea trout (*Salmo trutta*) | 1,870 | 250 | 0 |
| Halibut (*Hippoglossus hippoglossus*) | 10,000 | 0 | 0 |

[d] There were companies which laid down cod ova from foreign sources, but due to the small number of companies involved, it is not possible to summarise these data without potentially revealing the figures for individual companies.

## Trade in Small Fish

**Table 42:** Trade in other species' small fish in 2006

| Species | Bought (000s) | Sold (000s) |
|---|---|---|
| Cod | 3,405 | 1,911 |
| Halibut | 166 | 131 |
| Brown trout / Sea trout | 1,049 | 922 |

There were also sites stocked with brook charr (*Salvelinus fontinalis*), carp (*Cyprinus carpio*), Dover sole (*Microstomus pacificus*), haddock (*Melanogrammus aeglefinus),* lemon sole (*Microstomus kitt*), pollack (*Pollachius pollachius*), sheepshead minnow (*Cyprinodon variegatus variegatus*), tench (*Tinca tinca*), turbot (*Scophthalmus maximus*) and whiting (*Merlangius merlangus*). There was production of brook charr, carp, Dover sole, lemon sole, haddock, sheepshead minnow and turbot, but due to the small number of companies in production, it is not possible to summarise these data without revealing the production of individual companies.

# 5. CONCLUSIONS

## Rainbow trout (*Oncorhynchus mykiss*)

The production of rainbow trout increased by 7.2% in 2006 to 7,492 tonnes and was directed at the table (88.5%) and restocking (11.5%) markets. The total numbers of staff employed by the sector increased by four to 147. Although there was an increase in employment, the additional production resulted in an overall increase in the productivity of the industry to 51.0 tonnes per person. One of the reasons for this was the increase in the production from seawater cage sites for the table market.

The number of ova laid down to hatch increased by over six million and was mainly all-female diploid stock (84%). The proportion of ova that were sourced within GB increased to 10.1%, resulting from an increase in the numbers of home-produced ova. There were no imports from South Africa during 2006. To meet the needs of out of season production, the industry continued the trade with Australia (6% of total ova imported) and established a trade with Norway (2% of total ova imported). There was also a continued decline in the number of ova imported from the USA. The trend reflecting the high dependence of the Scottish trout industry on imported ova was maintained.

There was a continued trade in fingerlings, with the majority still being sourced within Scotland.

A high percentage of stock was vaccinated against ERM, indicating producers' awareness of the risk of infectious diseases.

## Atlantic salmon (*Salmo salar*)

The survey shows an increase in the production of salmon, increased productivity per person and an increased yield from smolts. There was an increase in the production of smolts, and the yield from ova increased.

Smolt production increased by 12.4% to 40.8 million, with over half (56.8%) being S1 and the majority of the remainder being S½ smolts (41.5%). The number of staff directly employed on freshwater sites decreased by three. This resulted in an increase in productivity to over 150,600 fish per person. The number of ova laid down to hatch has decreased by 15.4%. The ratio of ova laid down to smolts produced has decreased to 1.6 in 2006. Projected estimates for 2007 suggest that more ova were laid down to hatch and that more smolts will be produced in 2007, followed by another increase in 2008.

The majority of ova for the production of Scottish salmon were derived from Scottish farmed stocks, with 42% being derived from non-Scottish stocks, an increase of 29% on reliance from foreign sources. The export of ova to other countries within the EU increased by 38%, and the trade with Chile also increased by over three-fold.

The production tonnage in seawater increased by 2% in 2006, this was due mainly to an increase in the yield per smolt put to sea. The number of staff directly employed on site decreased, with the loss of 108 jobs in the seawater industry. The estimated smolt placement in 2007 has increased to 41.2 million, and an increase in production is expected in 2007 given the decrease in the number of fish harvested one year after input from the 2005 year class. The estimated harvest forecast for 2007 is 142,566 tonnes, an increase of 8.1% on the 2006 total.

With the production tonnage increasing in 2006, the number of sites in production decreased from 278 to 252. The trend towards increasing the size of producing sites continued with 73.6% of production being concentrated in the sites producing over 1,000 tonnes per annum. This was an increase of 7.7% on the 2005 figure.

## Other Species

Interest in the diversification of aquaculture was maintained. Staff numbers increased mainly due to expansion within the cod sector. In 2006 there was a significant increase in the tonnages of cod and brown trout produced. There was also a decrease in the tonnage of halibut produced. Industry has predicted a significant increase in production for the cod sector in 2007.

# APPENDIX 1

Questionnaires sent to Fish Farmers

# ANNUAL RETURN of INFORMATION from SCOTTISH FISH FARMS for the PERIOD 1 JANUARY to 31 DECEMBER 2006

## RAINBOW TROUT - DATA

**Please complete and return by 31 JANUARY 2007 to R J Smith, FRS Marine Laboratory PO Box 101, Victoria Road, Aberdeen, AB11 9DB**

Reg No FB/

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

**1 How many staff were employed in RAINBOW 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 2006** | | | | |
| a from own broodstock | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b from other GB broodstock | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c from abroad (Northern Hemisphere **incl**, N Ireland and Isle of Man) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| d from abroad (Southern Hemisphere) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **3 How many of the above ova were** | | | | |
| a all female diploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b mixed sex diploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c all triploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **4 How many fry/fingerlings were** | | | | |
| a bought | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b sold | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **5 How many bought fry/fingerlings were** | | | | |
| a all female diploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b mixed sex diploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c all triploid | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **6 How many of these fish were vaccinated against ERM** | | | | |
| a vaccinated on site | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b bought vaccinated | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **7 What was your total production in TONNES for the TABLE TRADE** | | | | |
| a <450 g (<1 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b 450-900 g (1-2 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c >900 g (>2 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **8 What was your total production in TONNES for the RESTOCKING TRADE** | | | | |
| a <450 g (<1 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b 450-900 g (1-2 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c >900 g (>2 lb) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |

# SEERAD ANNUAL PRODUCTION SURVEY 2006

## GUIDANCE NOTES FOR QUESTIONNAIRE

## RAINBOW TROUT

### GENERAL NOTES

1. Please check that the pre-printed information on the sheet is correct.
2. If a site is inactive and **not part of a fallowing cycle**, please write "INACTIVE" after the site name.
3. When completing the boxes please start from the right, if NONE then enter a **zero** in right hand box eg

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 0 |

Hopefully all questions are self explanatory but you may wish to note that:

**Q1. How many staff**

a Please give the total number of full and part-time workers employed by the company in rainbow trout production

b Please ensure that the same staff are NOT included more than once if the company/business operates more than one site

c Staff employed solely in processing dead fish for marketing should NOT be included

**Q2. Ova laid down for hatching**

Give the TOTAL NUMBER of ova laid down, if the number exceeds six figures please indicate the total number clearly in margin beside the appropriate box - this also applies to questions 3-5

**Q7-8. Weight of fish sold for:**

Please record the weight of fish sold to the nearest **tonne** (not in kgs), for part tonnes please indicate strongly using a decimal point, eg **31.5**

**It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2007 to allow the Annual Survey Report for 2006 to be produced.**

# ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2006

## ATLANTIC SALMON - SMOLT DATA

**Please complete and return by 31 JANUARY 2007 to R J Smith, FRS Marine Laboratory PO Box 101, Victoria Road, Aberdeen, AB11 9DB**

Reg No FB/

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

**1 How many staff were employed in smolt production (company total)** — **Full time** ☐☐☐ **Part time** ☐☐☐

**2 How many ova were produced in the winter of 2005-2006 (company total)** ☐☐☐☐☐☐☐☐

| **3 How many eyed ova were laid down for hatching in winter of 2005-2006** | **Site 1** | **Site 2** | **Site 3** | **Site 4** |
|---|---|---|---|---|
| a From own farmed broodstock | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b From other GB farmed broodstock | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c From GB wild broodstock | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| d From foreign sources | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **4 How many eyed ova do you expect to hatch this winter (2006-2007)** | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **5 How many fry or parr were** | | | | |
| a Transferred into the site | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b Transferred out of the site | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **6 How many smolts were produced as** | | | | |
| a **S$^1/_2$s** (ie from 2006 hatch) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b **S1s** (ie from 2005 hatch) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c **S1$^1/_2$s** (ie from 2005 hatch) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| d **S2s** (ie from 2004 hatch) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **7 How many smolts were sold as** | | | | |
| a **S1s** (incl S$^1/_2$s) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b **S2s** (incl S1$^1/_2$s) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **8 How many smolts do you expect to produce for sea winter on-growing next spring (2007) as** | | | | |
| a **S1s** (incl S$^1/_2$s) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b **S2s** (incl S1$^1/_2$s) | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **9 How many smolts do you plan to produce in 2008** | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **10 What is the fish holding capacity of each site in cubic metres** | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **11 Duration of FALLOW PERIOD in WEEKS (cage sites only)** | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| **12 How many fish did you vaccinate** | | | | |
| a against furunculosis | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| b against ERM | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| c against IPN | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |
| d against *Vibrio* spp. | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ | ☐☐☐☐☐☐ |

# SEERAD ANNUAL PRODUCTION SURVEY 2006

## GUIDANCE NOTES FOR QUESTIONNAIRE
## ATLANTIC SALMON SMOLTS

### GENERAL NOTES

1. Please check that the pre-printed information on the sheet is correct.
2. If a site is inactive and **not part of a fallowing cycle**, please write "INACTIVE" after the site name.
3. When completing the boxes please start from the right, if NONE then enter a **zero** in right hand box eg

| | | | | | |
|---|---|---|---|---|---|
| | | | | | 0 |

4. If the numbers for any box exceeds 6 figures please indicate the total number clearly in margin beside the appropriate box

Hopefully all questions are self explanatory but you may wish to note that:

**Q1. How many staff**

Please enter the total number of full and part-time staff employed in smolt production, this includes maintenance staff and staff seasonally employed for specific purposes, eg vaccination - please indicate clearly if you have contracted out vaccinating work to avoid duplication in numbers

Please ensure that the same staff are NOT included more than once if your company operates more than one site, especially for companies which operate both smolt and salmon grower sites

Companies are asked to use their discretion as to what they class as full and part-time staff

**Q2. Number of ova produced**

Enter the total number of ova produced by the company only once, if more than one form is used please enter **zero** or score out on subsequent forms

**Q6. How many smolts produced as S2 or S1 etc**

The definitions used for the survey are:

$S^1/_2$ <12 months old, ie put to sea in year of hatch
S1 12-18 months old, ie put to sea in January-June in year post hatch
$S1^1/_2$ 19-24 months old, ie put to sea in July-December in year post hatch
S2 >24 months old when put to sea

**Q7.** } **For S1s** - combine numbers of $S^1/_2$s with S1s and
**Q8.** } **For S2s** - combine numbers of $S1^1/_2$s with S2s

**Q9. Enter here the total number of smolts (any stage) likely to be produced**

**Q11 Please enter the total cubic metre capacity for all tanks or cages combined**

**Q12. Fallow period - applies to cage sites only**

Please enter any weeks that the site was fallow in 2006 (maximum = 52)

**It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2007 to allow the Annual Survey Report for 2006 to be produced.**

# ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2006

## ATLANTIC SALMON - PRODUCTION DATA

**Please complete and return by 31 JANUARY 2007 to R J Smith, FRS Marine Laboratory PO Box 101, Victoria Road, Aberdeen, AB11 9DB**

Reg No FB/

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

| | | Site 1 | Site 2 | Site 3 | Site 4 |
|---|---|---|---|---|---|
| 1 | **How many staff were employed in salmon production (company total), excluding post-harvest processing staff** | **Full time** | | **Part time** | |
| 2 | **How many smolts were put into the site in 2006 as:** | | | | |
| a | **S$^1/_2$s** (ie from 2006 hatch) | | | | |
| b | **S1s** (ie from 2005 hatch) | | | | |
| c | **S1$^1/_2$s** (ie from 2005 hatch) | | | | |
| d | **S2s** (ie from 2004 hatch) | | | | |
| 3 | **How many of the above smolts came from England** | | | | |
| 4 | **Total smolt input proposed in 2007** | | | | |
| 5 | **HARVEST of 2006 SMOLT INPUT in 2006** | | | | |
| a | Number of tonnes (wet weight at harvest) | | | | |
| b | Number of fish | | | | |
| 6 | **HARVEST of 2005 SMOLT INPUT from 1 JANUARY to 31 AUGUST** | | | | |
| a | Number of tonnes (wet weight at harvest) | | | | |
| b | Number of fish | | | | |
| 7 | **HARVEST of 2005 SMOLT INPUT from 1 SEPTEMBER to 31 DECEMBER** | | | | |
| a | Number of tonnes (wet weight at harvest) | | | | |
| b | Number of fish | | | | |
| 8 | **HARVEST of 2004 SMOLT INPUT** | | | | |
| a | Number of tonnes (wet weight at harvest) | | | | |
| b | Number of fish | | | | |
| 9 | **How many tonnes of fish do you expect to harvest in 2007** | | | | |
| 10a | **Were brood fish produced in 2006** | **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; MAX = 52)** | | | | |
| 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** |

# SEERAD ANNUAL PRODUCTION SURVEY 2006

### GUIDANCE NOTES FOR QUESTIONNAIRE

## ATLANTIC SALMON

**GENERAL NOTES**

1. Please check that the pre-printed information on the sheet is correct.
2. If a site is inactive and **not part of a fallowing cycle**, please enter "INACTIVE" after the site name.
3. All harvest tonnages should be supplied for the wet weight of fish at harvest.
4. If a site was used **only to hold broodstock** for stripping please enter "BRD" after the site name.
5. When completing the boxes please start from the right eg for 250 tonnes enter as | | | | 2 | 5 | 0 | or if NONE then enter as | | | | | | 0 |

Hopefully all questions are self explanatory but you should note that:

**Q1. How many staff**

Please enter the total number of full and part-time workers employed in salmon production; this includes site staff, veterinary and maintenance staff, vaccination teams, administrative and harvesting staff but NOT processing or marketing staff

Please ensure that the same staff are NOT included more than once if the company operates more than one site, especially if your company operates both salmon grower and smolt sites

**Q2. How many smolts put to sea**

The definitions used for the survey are:

**S$^1/_2$** **<12 months old**, ie put to sea in year of hatch
**S1** **12-18 months old**, ie put to sea in January-June in the year post hatch
**S1$^1/_2$** **19-24 months old**, ie put to sea in July-December in the year post hatch
**S2** **>24 months old**, ie when put to sea

**Q10. Broodstock production**

Please circle **YES** if broodfish were produced on the site

**Q11. Fish holding capacity**

Please enter the total cubic metre capacity for all tanks and cages combined or, if not known, give the size of tanks or cages (area or circumference plus depth x nos tanks or cages)

**Q12. Fallow period**

**For cage sites only;** please enter any number of weeks a site was fallow in 2006; the total number of fallow weeks should not exceed 52

**It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2007 to allow the Annual Survey Report for 2006 to be produced.**

**ANNUAL RETURN of INFORMATION from SCOTTISH FISH FARMS**
**for the PERIOD 1 JANUARY to 31 DECEMBER 2006**

# OTHER SPECIES - DATA

**Please complete and return by 31 JANUARY 2007 to R J Smith, FRS Marine Laboratory, PO Box 101, Victoria Road, Aberdeen, AB11 9DB**

Business address: .....

Business number: .....

FB/0 .....

| | Name of site | Site no | Species code | Main method of production |
|---|---|---|---|---|
| 1 | ..... | FS ..... | ..... | ..... |
| 2 | ..... | FS ..... | ..... | ..... |
| 3 | ..... | FS ..... | ..... | ..... |
| 4 | ..... | FS ..... | ..... | ..... |

1. How many staff in total were employed in other species production (company total) Full time ☐ Part time ☐

| | Site ..... | Site ..... | Site ..... | Site ..... |
|---|---|---|---|---|
| Species code | ..... | ..... | ..... | ..... |
| 2. How many ova were laid down for hatching in 2006 | | | | |
| a) From own broodstock | ..... | ..... | ..... | ..... |
| b) From GB broodstock | ..... | ..... | ..... | ..... |
| c) From foreign sources | ..... | ..... | ..... | ..... |
| 3. How many fry/small fish were | | | | |
| a) Bought | ..... | ..... | ..... | ..... |
| b) Sold | ..... | ..... | ..... | ..... |
| 4. What was your total production for the market in TONNES | ..... | ..... | ..... | ..... |
| 5. What is your predicted production for the market in 2007 in TONNES | ..... | ..... | ..... | ..... |

# SEERAD ANNUAL PRODUCTION SURVEY 2006

## GUIDANCE NOTES FOR QUESTIONNAIRE

## OTHER SPECIES

### GENERAL NOTES

1. The results of this survey will be made available to the FAO and will be published in the Annual Production Survey of Scottish Fish Farms produced by SEERAD, in summary form only.
2. All information on the form has been hand written, please check that it is correct.
3. If a site is inactive, and not part of a fallowing cycle, or is no longer used to culture the species concerned, please score through the relevant site name or species code.

| Species Codes | | | |
|---|---|---|---|
| ACH | Arctic Charr | BCH | Brook Charr |
| CAR | Carp | COD | Cod |
| HAD | Haddock | HAL | Halibut |
| LSO | Lemon Sole | TIL | Tilapia |
| TRO | Brown/sea trout | TUR | Turbot |

### Q1. How many staff

Please include those staff that were involved only in other species production. Please do not include staff that are involved in the production of Atlantic salmon or rainbow trout.

### Q4 - 5. Weight of fish sold

Please record the wet weight of fish sold to the nearest **tonne** (not in kgs), for part tonnes please indicate strongly using a decimal point, e.g. **31.5**

**It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2007 to allow the annual survey report for 2006 to be produced.**

# APPENDIX 2

Glossary and Abbreviations

| | |
|---|---|
| **Active** | Fish farms in a production growing cycle which may contain stock or be fallow. |
| **Alevin** | Young fish, at stage from hatching to end of dependence on yolk sacs as primary source of nutrition. |
| **Approved Zone Status** | EU recognition of an area clear of listed disease(s). |
| **Broodstock** | Adult fish held until maturation for breeding purposes. |
| **Diploid** | Fish with the normal two sets of chromosomes. |
| **EEA** | European Economic Area. |
| **EFTA** | European Free Trade Association. |
| **EU** | European Union. |
| **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. |
| **Fallow** | Fish farm having no stock, but still part of a growing cycle. |
| **Fingerling** | A term commonly applied to young stages of salmonid fish. |
| **FRS** | Fisheries Research Services. |
| **Fry** | Young salmon at stage from independence of yolk sac as primary source of nutrition to dispersal from the redd. |
| **Gamete** | Reproductive cells. |
| **Grilse** | Salmon maturing after one winter at sea. |
| **Inactive** | Fish farms not in a production cycle and without stock. |
| **Intra-peritoneal** | Within the body cavity. |
| **Non-producing** | A site which is active, may be stocked with fish, but has produced no fish for harvest during the specified year. |
| **On-growing** | Farm producing fish for the table market. |
| **Ova** | Eggs. |
| **0-year fish** | Fish in their first year of life. |
| **Parr** | Young salmon at stage from dispersal from redd to migration as a smolt. |
| **Photoperiod** | Alteration of light regime. |
| **Pre-salmon** | Non-mature salmon usually after one winter at sea. |
| **Raceway** | Concrete or brick channels used for farming fish. |

| | |
|---|---|
| $S^1/_2$ | 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. |
| $S1^1/_2$ | Salmon or sea trout smolting at approximately 18 months from hatch. |
| S2 | Salmon or sea trout smolting at approximately two years from hatch. |
| SEERAD | Scottish Executive Environment and Rural Affairs Department. |
| Smolt | Fully silvered juvenile salmon ready to be transferred or to migrate to sea. |
| Third Country | Country outside the EU. |
| Triploid | Genetically modified fish that have three sets of chromosomes instead of two. |
| Year Class | Fish hatched or put to sea in a given year. |
| ERM | Enteric redmouth. |
| IHN | Infectious haemopoeitic necrosis. |
| IPN | Infectious pancreatic necrosis. |
| ISA | Infectious salmon anaemia. |
| VHS | Viral haemorrhagic septicaemia. |
| RTFS | Rainbow trout fry syndrome. |