Scottish Government
Riaghaltas na h-Alba
gov.scot

Marine Scotland Science

Scottish Fish Farm Production Survey 2016

marinescotland
science

SCOTTISH FISH FARM PRODUCTION SURVEY 2016

This report was prepared by Marine Scotland Science

Written and compiled by : **L A Munro**
I S Wallace

This document is available from our website at **www.scotland.gov.uk.**

ISBN : 978-1-78851-227-5 (web only)
ISSN : 1363-5867

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

Artwork produced by Keith Mutch and Mhairi Sinclair, Marine Scotland Communications Team
Produced for the Scottish Government by APS Group Scotland
PPDAS294846 (09/17)

Published by the Scottish Government, September 2017

// FOREWORD

The annual production survey of fish farms in Scotland for 2016 was carried out by Marine Scotland Science (MSS). This survey collates annual production data from Scottish fin fish farm sites operated by authorised aquaculture production businesses. The production tonnage obtained is for the wet weight (i.e. weight of live fish) at harvest.

Responses to questionnaires from Scottish fish farming companies covering the period 1st January to 31st December 2016 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 rainbow trout, Atlantic salmon and other farmed species sectors. 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 Scottish fish farming industry in completing the questionnaires is gratefully acknowledged. The authors also acknowledge Alan Christie, Sonia Duguid, Helen McGregor, Keith Mutch, Sarah Payne, Mhairi Sinclair, Ronald Smith, Diane Spalding and Andrea Warwick for their contributions to the production of this report.

L A Munro
I S Wallace

September 2017

CONTENTS

// EXECUTIVE SUMMARY

The tables below summarise the results from the 2016 fish farms annual production survey.

Rainbow Trout (*Oncorhynchus mykiss*)

		2015	2016
Total production	(tonnes)	8,588	8,096
Production for the table	(tonnes)	8,033	7,437
Production for restocking	(tonnes)	555	659
Number of staff employed		126	121
Mean productivity	(tonnes/person)	68.2	66.9
Number of ova laid down to hatch	(millions)	12.1	9.9
Number of ova imported	(millions)	11.2	9.6

In 2016, the production of rainbow trout decreased by 492 tonnes. Employment decreased by five staff and mean productivity decreased to 66.9 tonnes per person. The number of ova laid down to hatch decreased by 2.2 million and the number of ova imported decreased by 1.6 million.

Atlantic salmon (*Salmo salar*)

Smolts

		2015	2016
Number of ova produced	(millions)	11.6	13.7
Number of ova laid down to hatch	(millions)	68.2	64.3
Number of ova exported	(millions)	0.1	0.4
Number of ova imported	(millions)	59.7	49.4
Number of smolts produced	(millions)	44.6	42.9
Number of smolts put to sea	(millions)	45.5	43.0
Number of staff employed		294	294
Mean productivity (000s smolts/person)		151.6	145.9

The production of ova increased by 2.1 million in 2016 and the number of ova laid down to hatch decreased by 3.9 million. A very small amount of ova were exported in 2016 (0.4 million) and the number of ova imported decreased by 10.3 million from the 2015 figure. The number of smolts produced decreased by 1.7 million. In 2016 the number of staff remained the same and mean productivity decreased by 5,700 smolts per person.

Production fish

		2015	2016
Total production	(tonnes)	171,722	162,817
Production of 0-year fish	(tonnes)	626	333
Production of grilse	(tonnes)	53,930	59,853
Production of pre-salmon	(tonnes)	60,182	51,310
Production of salmon	(tonnes)	56,984	51,321
Mean fish weight 0-year	(kg)	2.8	2.9
Mean fish weight grilse	(kg)	4.8	4.4
Mean fish weight pre-salmon	(kg)	4.7	4.6
Mean fish weight salmon	(kg)	5.2	4.7
Number of staff employed		1,363	1,486
Mean productivity	tonnes/person	126.0	109.6

Production tonnage decreased by 8,905 tonnes with an increase in the mean weight of 0-year fish but a decrease in the mean harvest weights of grilse, pre-salmon and salmon. Staff numbers increased by 123 and mean productivity decreased to 109.6 tonnes per person.

Smolt survival (percentage harvested)

Survival (%)	Years 0+1	Year 2	Total
2013 input year class	49.6	26.7	76.3
2014 input year class	50.6	22.7	73.3

The smolt survival rate for the 2014 input year class decreased to 73.3%.

Other Species

Including Arctic charr (*Salvelinus alpinus)*; brown/sea trout (*Salmo trutta)*; halibut (*Hippoglossus hippoglossus)*; lumpsucker (*Cyclopterus lumpus*) and several species of wrasse (Labridae)

		2015	2016
Total production	(tonnes)	107[a]	122
Number of staff employed	(full-time)	35	43
	(part-time)	15	20
Number of ova laid down to hatch	(millions)	14.8	16.9
Number of ova imported	(millions)	0.6	3.2

Some figures are excluded from this report as providing them would reveal production information from individual companies.

a Excluding Arctic charr production.

In 2016, the production of other species increased by 15 tonnes from the 2015 total. Overall, employment increased by 13 people in 2016. There was an increase in the number of ova laid down to hatch.

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

Species	Number of reported incidents which could have led to an escape of farmed fish	Number of reported incidents which did lead to an escape of farmed fish	Number of fish escaped
Rainbow trout	0	1	200
Atlantic salmon (freshwater stages)	0	0	0
Atlantic salmon (seawater stages)	3	5	311,496

// 1. RAINBOW TROUT *(ONCORHYNCHUS MYKISS)*

Production survey information was collected from all 24 companies actively involved in rainbow trout production, farming 44 active sites. This figure represents the entire industry operating in Scotland.

Production

Table 1a: Annual production (tonnes) of rainbow trout during 2002-2016 and projected production in 2017

Year	Tonnes	Year	Tonnes
2002	6,659	2010	5,139
2003	7,085	2011	4,619
2004	6,352	2012	5,670
2005	6,989	2013	5,611
2006	7,492	2014	5,882
2007	7,414	2015	8,588
2008	7,670	2016	8,096
2009	6,766	2017	7,208*

* Industry estimate based on stocks currently being on-grown.

Production decreased in 2016 by 492 tonnes, a decrease of 6%, to 8,096 tonnes. Production remained high as the 2016 total is the second highest level of rainbow trout production ever recorded in Scotland.

Table 1b: Production (tonnes) for the table trade during 2006-2016 according to weight category

Year	<450 g <1 lb	450-900 g 1-2 lbs	>900 g >2 lbs	Total Tonnes
2006	2,182	1,810	2,636	6,628
2007	2,499	1,663	2,407	6,569
2008	2,375	1,950	2,487	6,812
2009	2,232	1,143	2,620	5,995
2010	2,125	727	1,606	4,458
2011	1,421	1,004	1,433	3,858
2012	1,195	1,655	2,209	5,059
2013	1,908	825	2,268	5,001
2014	2,334	290	2,704	5,328
2015	2,299	258	5,476	8,033
2016	2,393	234	4,735	7,437

Production for the table in 2016 was 7,437 tonnes, a decrease of 596 tonnes (7%) on the 2015 total, and accounted for 92% of the total rainbow trout production, a decrease on the proportion to that produced in 2015. Also, an increase in the number of fish in the small size range and a decrease in the number of fish in the medium and large size ranges were highlighted.

Table 1c: Production (tonnes) for the restocking trade during 2006-2016 according to weight category

Year	<450 g <1 lb	450-900 g 1-2 lbs	>900 g >2 lbs	Total Tonnes
2006	36	357	471	864
2007	24	413	408	845
2008	27	351	480	858
2009	32	294	444	770
2010	19	201	461	681
2011	8	419	334	761
2012	22	266	323	611
2013	24	221	365	610
2014	28	256	270	554
2015	15	158	382	555
2016	35	183	441	659

In 2016, production for the restocking of angling waters increased to 659 tonnes representing an increase of 104 tonnes (19%) on the 2015 total. This accounted for 8% of total rainbow trout production in 2016. These figures represent the tonnage of fish supplied to angling waters for restocking purposes; they do not account for the catch taken by anglers. The production of small, medium and large sized fish all showed an increase.

Production by Site

Table 2: Numbers of sites grouped by tonnage produced during 2006-2016

Year	Number of sites per production tonnage				Total number of sites
	<1-25	26-100	101-200	>200	
2006	16	15	6	13	50
2007	14	15	3	16	48
2008	8	15	7	14	44
2009	10	11	7	11	39
2010	7	13	9	7	36
2011	9	10	6	8	33
2012	10	10	6	8	34
2013	6	11	5	8	30
2014	6	11	5	9	31
2015	4	10	5	11	30
2016	6	10	3	13	32

Production was reported from 32 of the 44 active sites. The number of producers in the size bracket 101-200 tonnes decreased while those in the <1-25 tonnes and >200 tonnes size brackets increased. The number of sites in the 26-100 tonnes bracket remained the same as in 2015. 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 methods of production in 2016 and comparison with production in 2015

Production method	Production grouping (tonnes) in 2016					Total tonnage and (%) by method		Number of sites	
	<10	10-25	26-50	51-100	>100	2015	2016	2015	2016
FW cages	1	0	0	0	5	2,433 (28.3%)	2,836 (35.0%)	6	6
FW ponds and raceways	1	1	6	2	5	1,405 (16.4%)	1,420 (17.6%)	14	15
FW tanks and hatcheries	3	0	0	1	0	72 (0.8%)	81 (1.0%)	4	4
SW cages	0	0	0	1	6	4,678 (54.5%)	3,759 (46.4%)	6	7
SW tanks	0	0	0	0	0	0	0	0	0
Total	5	1	6	4	16	8,588	8,096	30	32

Freshwater production accounted for 4,337 tonnes (53.6%) and seawater production for the remaining 3,759 tonnes (46.4%). Production from freshwater cages increased whilst there was a decrease in production from seawater cages.

Company and Site Data

Table 4: Number of companies and sites in production during 2003-2016

Year	No. of companies	No. of sites
2003	37	56
2004	38	62
2005	42	70
2006	36	66
2007	38	70
2008	31	66
2009	27	56
2010	25	51
2011	23	48
2012	25	48
2013	24	46
2014	24	46
2015	24	45
2016	24	44

In 2016 the number of companies authorised by the Scottish Government and actively engaged in rainbow trout production was 24. The number of sites registered and in production was 44.

Staffing and Productivity

Table 5: Number of staff employed and productivity per person during 2003-2016

Year	Full-time	Part-time	Total	Productivity (tonnes/person)
2003	107	41	148	47.9
2004	115	37	152	41.8
2005	108	35	143	48.9
2006	112	35	147	51.0
2007	111	32	143	51.8
2008	107	34	141	54.4
2009	111	27	138	49.0
2010	98	31	129	39.8
2011	95	23	118	39.1
2012	79	28	107	53.0
2013	89	21	110	51.0
2014	93	20	113	52.1
2015	110	16	126	68.2
2016	100	21	121	66.9

The overall number of staff employed in 2016 decreased by five to 121. The number of full-time staff decreased by 10 while the number of part-time staff increased by five.

Productivity, measured as tonnes produced per person, decreased by 1.9% in 2016 with no distinction between full and part-time employees being made for this calculation.

Production by Area

Table 6: Production and staffing by area in 2016

Area	No. of sites	Table production (tonnes)	Restocking production (tonnes)	Mean tonnes per site	Staffing			Productivity (tonnes/ person)
					F/T	P/T	Total	
North	3	3	30	11.0	2	1	3	11.0
East	13	1,131	332	112.5	38	6	44	33.3
West	15	5,331	40	358.1	43	5	48	111.9
South	13	972	257	94.5	17	9	26	47.3
All	44	7,437	659	184.0	100	21	121	66.9

Productivity was greatest in the West at 358.1 tonnes per site and 111.9 tonnes per person.

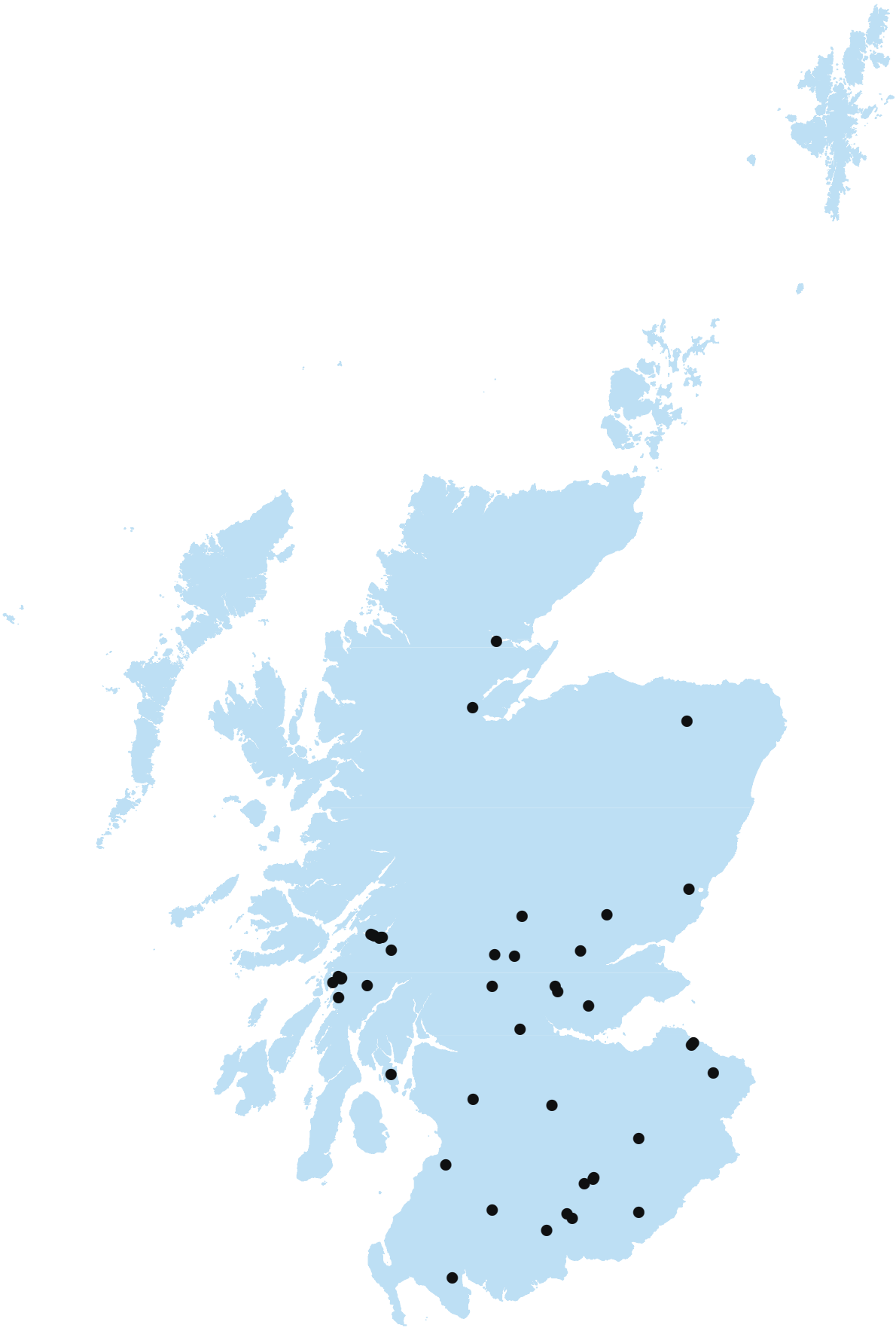


FIGURE 1: THE DISTRIBUTION OF ACTIVE RAINBOW TROUT SITES IN 2016

Type of Ova Laid Down

Table 7: Number (000s) and proportions (%) of eyed ova types laid down to hatch during 2005-2016

Year	All female diploid no.(%)	Triploid no. (%)	Mixed sex diploid no. (%)	Total ova
2005	16,773 (83)	1,729 (8)	1,745 (9)	20,247
2006	22,378 (84)	2,804 (10)	1,626 (6)	26,808
2007	23,630 (83)	2,531 (9)	2,140 (8)	28,301
2008	22,978 (88)	2,526 (9)	725 (3)	26,229
2009	15,469 (87)	2,341 (13)	35 (<1)	17,845
2010	13,352 (89)	1,052 (7)	675 (4)	15,079
2011	12,673 (84)	2,254 (15)	215 (1)	15,142
2012	10,967 (85)	2,005 (15)	7 (<1)	12,979
2013	7,857 (80)	1,955 (20)	77 (<1)	9,889
2014	8,321 (75)	2,710 (25)	9 (<1)	11,040
2015	10,245 (85)	1,800 (15)	76 (<1)	12,121
2016	7,986 (80)	1,943 (20)	5 (<1)	9,934

Source of Ova Laid Down

Table 8: Number (000s) and sources of eyed ova laid down to hatch in 2005-2016

Year	Ova produced in Great Britain (GB)			Imported ova			Total
	Own stock	Other stock	Total	Northern hemisphere	Southern hemisphere	Total	
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
2007	936	230	1,166	26,650	485	27,135	28,301
2008	582	487	1,069	25,160	0	25,160	26,229
2009	603	220	823	17,022	0	17,022	17,845
2010	415	50	465	14,614	0	14,614	15,079
2011	215	189	404	14,738	0	14,738	15,142
2012	14	230	244	12,735	0	12,735	12,979
2013	77	537	614	9,275	0	9,275	9,889
2014	9	655	664	10,376	0	10,376	11,040
2015	6	888	894	11,227	0	11,227	12,121
2016	35	349	384	9,550	0	9,550	9,934

In 2016, the total number of eyed ova laid down to hatch decreased by 2.2 million (18%) on the 2015 figure. The proportion of ova from GB broodstock decreased to 3.9% of the total and the rainbow trout industry remained reliant on imported ova. Data on the importation of ova into Scotland are also available from the health certificates 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 from Official Import Health Certificates

Table 9a: Number (000s) and sources of ova imported into Scotland from outwith GB during 2009-2016

Source	2009	2010	2011	2012	2013	2014	2015	2016
Denmark	4,070	1,715	5,250	1,950	1,315	2,500	2,330	5,535
Isle of Man	290	1,400	520	300	800	1,000	175	20
N. Ireland	10,090	9,247	7,320	8,332	5,125	4,780	6,535	3,040
Norway	750	200	130	300	175	710	670	500
USA	2,240	2,340	1,580	1,800	2,350	1,700	1,675	750
Totals	17,440	14,902	14,800	12,682	9,765	10,690	11,385	9,845

Table 9b: Seasonal variation in numbers (000's) and sources of ova imported into Scotland from outwith GB during 2016

Month	Denmark	Isle of Man	N. Ireland	Norway	USA
January	0	0	870	250	0
February	5	0	0	0	0
March	1,390	0	0	100	0
April	0	0	180	150	175
May	970	0	0	0	10
June	1,150	0	0	0	205
July	0	0	320	0	205
August	220	0	970	0	0
September	200	0	20	0	155
October	1,200	0	360	0	0
November	0	20	0	0	0
December	400	0	320	0	0
Totals	**5,535**	**20**	**3,040**	**500**	**750**

Table 9c: Number (000's) and sources of fish imported into Scotland from outwith GB during 2009-2016

Source	2009	2010	2011	2012	2013	2014	2015	2016
N. Ireland	0	<1	72	155	537	674	746	592
Republic of Ireland	0	2	0	0	0	0	0	0

Suppliers within the European Union (EU) accounted for 87.3% of ova imported into Scotland during 2016 with the USA and Norway accounting for 7.6% and 5.1% respectively. 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. In recent years there has been a trend for producers to import part grown rainbow trout into Scotland from outwith GB.

Trade in Fry and Fingerlings

Table 10: Number (000s) of fry and fingerlings traded during 2005-2016

Year	Fry and fingerlings bought			Total number bought	Total number sold
	All female diploid no. (%)	Triploid no. (%)	Mixed sex diploid no. (%)		
2005	14,618 (83)	1,532 (9)	1,480 (8)	17,630	16,919
2006	19,731 (89)	1,675 (7)	790 (4)	22,196	20,460
2007	14,830 (89)	1,140 (7)	675 (4)	16,645	23,631
2008	24,298 (95)	1,082 (4)	118 (0.5)	25,498	31,036
2009	21,113 (94)	1,358 (6)	0	22,471	20,597
2010	15,539 (95)	585 (4)	141 (1)	16,265	14,686
2011	16,288 (88.5)	1,970 (10.7)	138 (0.8)	18,396	16,612
2012	12,543 (91)	1,226 (9)	0	13,769	12,088
2013	6,734 (84)	1,239 (16)	0	7,973	6,749
2014	5,911 (81)	1,423 (19)	0	7,334	6,719
2015	6,104 (87)	598 (9)	290 (4)	6,992	6,971
2016	6,452 (85)	1,124 (15)	0	7,577	6,779

The established trade between hatcheries and on-growing farms continued in 2016. Some companies specialised in the production of fry and fingerlings. The total number of fry and fingerlings sold decreased by 2.8% while the number bought increased by 8.4%. The disparity between supply and demand is due to trade with England and Wales.

Use of Vaccines

Table 11: Number of sites rearing fish vaccinated against enteric redmouth disease (ERM) and number of fish vaccinated (millions) during 2005-2016

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. of sites	37	31	28	28	31	27	26	24	19	21	17	18
No. of fish	30.0	36.4	41.4	29.1	27.5	20.0	20.3	20.4	9.9	10.0	8.3	7.3

Vaccines continued to be used as a preventative treatment against enteric redmouth disease (ERM), a potentially serious bacterial infection, caused by *Yersinia ruckeri*. Vaccination is generally carried out as a bath treatment at the fingerling stage, although some vaccines are administered by intra-peritoneal injection. A total of 7.3 million fish were vaccinated on 18 sites.

Organic Production

Of the 44 sites recorded as being active in rainbow trout production in 2016, none were certified as organic.

Escapes

There was one incident involving the loss of 200 fish from a rainbow trout site in 2016.

// 2. ATLANTIC SALMON (*SALMO SALAR*) – OVA AND SMOLTS

Production survey information was collected from all 26 companies actively involved in the freshwater production of Atlantic salmon, farming 87 active sites. This figure represents the entire freshwater industry operating in Scotland.

Company and Site Data

Table 12: Number of companies and sites in production during 2007-2016

Year	No. of companies	No. of sites
2007	37	135
2008	38	130
2009	30	105
2010	31	104
2011	28	98
2012	28	100
2013	27	102
2014	26	96
2015	25	87
2016	26	87

In 2016 the number of companies authorised by the Scottish Government for freshwater production of Atlantic salmon increased by one to 26. A total of 87 sites were actively engaged in commercial production, which remained the same as the 2015 figure.

Production and Staffing

Table 13: Number (000s) of smolts produced, staff employed and smolt productivity during 2006-2016

Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number (000s) of smolts produced		40,827	38,125	36,450	36,868	36,872	43,626	44,324	40,457	45,004	44,571	42,894
Staffing	Full-time	209	217	209	216	233	225	235	237	244	239	252
	Part-time	62	62	54	54	56	68	93	48	65	55	42
	Total	271	279	263	270	289	293	328	285	309	294	294
Productivity, 000s of smolts per person		150.6	136.6	138.6	136.5	127.6	148.9	135.1	142.0	145.6	151.6	145.9

Smolt production in 2016 decreased by 4% compared to 2015. The number of staff employed in 2016 remained the same and productivity decreased by 3.8% to a figure of 145.9 smolts produced per person. Data for staffing and productivity in 2013 are shown, however, there are uncertainties with these data due to consolidation within the industry.

Smolts by Age Group

Table 14: Number of smolts (000s) produced by type during 2004-2016

Year	S½	S1	S1½	S2	Total
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
2007	15,431	22,694	0	0	38,125
2008	12,431	24,019	0	0	36,450
2009	13,837	23,031	0	0	36,868
2010	14,116	22,756	0	0	36,872
2011	17,233	26,393	0	0	43,626
2012	18,795	25,239	290	0	44,324
2013	19,024	21,279	154	0	40,457
2014	22,367	22,473	164	0	45,004
2015	23,850	20,711	10	0	44,571
2016	25,072	17,822	0	0	42,894

In 2016, there was an increase (5.1%) in the number of S½ smolts produced but a decrease (13.9%) in the number of S1 smolts produced. There was no production of S1½ and S2 smolts in 2016.

Production Systems

Table 15: Number and capacity of production systems during 2012-2016

System	No. of sites with system					Total capacity, 000s cubic metres				
Year	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Cages	43	44	41	38	38	349	372	351	355	400
Tanks and Raceways	57	58	55	49	49	51	64	65	47	46
Total	100	102	96	87	87	400	436	416	402	446

The principal types of facility used for the production of smolts in freshwater are cages or tanks and raceways. In 2016, the number of farms using cages and tanks and raceways remained the same as in 2015. In terms of volume, cage capacity increased by 45,000 m^3 and tank and raceway capacity decreased by 1,000 m^3. This resulted in a net increase in volume of 44,000 m^3 available for the production of smolts in Scotland during 2016.

Table 16: Number (000s) of smolts produced and stocking densities by production system during 2012-2016

	Number of smolts produced (000s)					Stocking densities (smolts/m³)				
Year	2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Cages	26,882	20,910	22,816	18,135	15,884	77	56	65	51	40
All others	17,442	19,547	22,188	26,436	27,010	342	305	341	562	587
Total	44,324	40,457	45,004	44,571	42,894	-	-	-	-	-

The average stocking densities of cages decreased from 51 to 40 fish per m^3 in 2016 compared to 2015 while densities in tanks and raceways increased from 562 to 587 fish per m^3.

Ova Production

Table 17: Number (000s) of salmon ova produced during 2009-2016

Year	2009	2010	2011	2012	2013	2014	2015	2016
No. of ova	91,964	91,655	78,208	57,489	56,904	33,450	11,605	13,689

In 2016, 13.7 million ova were stripped, an increase of 18% from the number of ova produced in 2015.

Table 18: Source, number (000s) and previous year's estimate of ova laid down to hatch during 2005-2017

Year	In-house broodstock	Out-sourced GB broodstock	GB wild broodstock	Foreign ova	Total	Previous year's estimate
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	18,837	14,366	78	42,022	75,303	68,032
2008	19,831	14,261	171	26,409	60,672	75,302
2009	17,148	20,158	65	30,200	67,571	64,693
2010	13,744	26,220	0	29,657	69,621	61,011
2011	15,664	14,630	0	34,322	64,616	54,526
2012	18,556	9,981	0	34,700	63,237	55,723
2013	16,996	8,263	0	41,315	66,573	49,249
2014	14,418	2,725	10	53,684	70,837	48,149
2015	6,479	223	10	61,463	68,175	65,284
2016	5,884	4	0	58,458	64,346	59,604
2017						60,673

The number of ova laid down to hatch was 64.3 million, a decrease of 3.9 million (5.6%) on the 2015 figure. The majority of the ova (90.8%) were derived from foreign sources, this being a decrease of 3.0 million (4.9%) on the 2015 figure. Supplies derived from GB broodstock decreased by 0.8 million, a 12.1% decrease on the 2015 figure. No ova from GB wild broodstock were laid down in 2016, however, in previous years the ova derived from wild stocks were 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 2007-2018

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Actual smolts put to sea	37.8	36.6	38.5	38.5	42.7	41.1	40.9	48.1	45.5	43.0		
Smolts produced	38.1	36.4	36.9	36.9	43.6	44.3	40.5	45.0	44.6	42.9		
Estimated production	41.2	34.9	32.6	28.7	35.9	31.3	28.1	39.9	43.4	36.6	39.3	43.3
Ratio of ova laid down to smolts produced	2.0	1.7	1.8	1.9	1.5	1.4	1.6	1.6	1.5	1.5		

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. Farmers estimate putting 39.3 million smolts to sea in 2017. The ratio of ova laid down to hatch to smolts produced in 2016 was same as the ratio in 2015.

Scale of Production

Table 20: Smolt-producing sites grouped by numbers (000s) of smolts produced during 2003-2016

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		
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
2007	2	2	4	7	21	21	14	11	82	38,125
2008	2	1	5	8	21	20	15	9	81	36,450
2009	0	0	3	7	14	18	10	12	64	36,868
2010	1	0	4	4	16	15	10	14	64	36,872
2011	1	0	4	5	11	14	9	17	61	43,626
2012	0	0	1	3	19	14	11	13	61	44,324
2013	1	0	1	7	14	14	7	14	58	40,457
2014	0	0	2	1	11	9	14	13	50	45,004
2015	1	1	2	4	9	11	16	11	55	44,571
2016	1	1	0	3	7	11	13	12	48	42,894

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

The number of sites producing smolts in 2016 was 48. The number of sites producing less than 101,000 smolts has decreased by three and there has also been a decrease of five in the number of sites producing between 101,000 and one million smolts. The number of sites producing in excess of one million smolts per year increased by one.

Production of Ova and Smolt by Production Area

Table 21: Staffing in 2016, ova laid down to hatch in 2015-2016, smolt production in 2015-2016 and estimated production in 2017-2018 by region

Region	Number of staff employed in 2016		Ova laid down to hatch (000s)		Smolt production (000s)		Estimated smolt production (000s)	
	F/T	P/T	2015	2016	2015	2016	2017	2018
North West	132	29	36,668	31,637	24,788	23,787	17,036	21,531
Orkney	1	3	55	0	142	150	150	150
Shetland	26	0	7,473	7,834	3,372	3,428	5,300	5,300
West	63	8	17,433	17,363	9,625	10,386	11,289	11,160
Western Isles	22	2	5,596	6,460	4,823	3,785	4,382	4,450
East and South	8	0	950	1,052	1,821	1,358	1,127	720
All Scotland	252	42	68,175	64,346	44,571	42,894	39,284	43,311

In 2016, the North West and the West were the main areas where ova were laid down to hatch. The North West, the West and the Western Isles were the main smolt producing areas. The greatest number of staff were employed in the North West region.

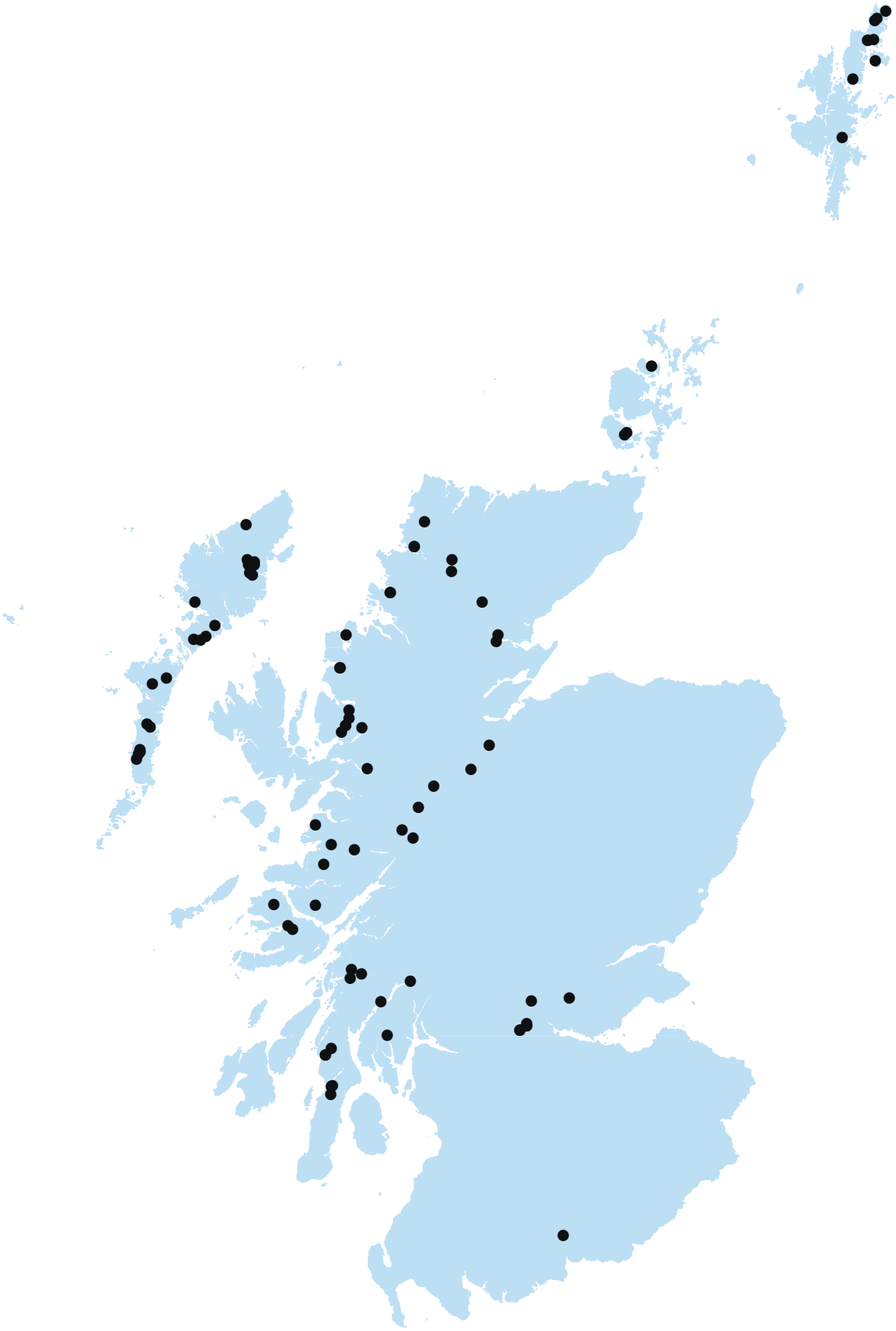


FIGURE 2: THE DISTRIBUTION OF ACTIVE ATLANTIC SALMON SMOLT SITES IN 2016

International Trade in Ova

Since the introduction of the EU single market on 1st 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). Trade is based on the same rules as are established within the EU regarding compartments and zones declared free from listed diseases.

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. Marine Scotland Science advises potential exporters to ascertain with the importing country any specific health testing requirements that may be a condition of import.

Imports and Exports

Table 22a: Source and number (000s) of ova, parr and smolts imported during 2004-2016 derived from health certificates

Import Year	Ova						Parr and Smolts	
	EU Member States	EFTA		Third Countries		Total	EU Member States	EFTA-Norway
		Iceland	Norway	Australia	USA			
2004	4,450	3,475	6,750	1,860	450	16,985	824	0
2005	2,610	570	13,210	0	450	16,840	150	0
2006	11,575	300	15,940	2,400	0	30,215	375	0
2007	10,511	0	33,555	0	0	44,066	420	0
2008	5,600	0	22,703	0	0	28,303	519	0
2009	5,460	0	29,938	0	0	35,398	328	0
2010	2,150	0	26,533	0	0	28,683	452	0
2011	3,400	0	35,851	0	0	39,251	800	0
2012	10,134	0	23,849	0	0	33,983	0	0
2013	10,700	2,719	35,044	0	0	48,463	55	0
2014	5,218	3,813	49,831	0	0	58,862	1,602	1,748
2015	4,815	8,978	45,926	0	0	59,719	2,118	365
2016	5,444	5,324	38,602	0	0	49,370	1,956	0

The numbers of ova imported decreased by 17.3%. The number of parr and smolts imported decreased from that observed in 2015, with only 1.9 million parr and smolts imported from EU member states.

Table 22b: Destination and number (000s) of salmon ova, parr and smolts exported during 2005-2016 derived from health certificates

Export year	Farmed origin ova				Total	Parr and Smolts
	Chile	EU	Norway	Others		
2005	8,560	3,130	0	1,566	13,256	1,362
2006	26,930	4,312	0	0	31,242	998
2007	32,150	164	0	0	32,314	2,169
2008	62,185	130	0	15	62,330	551
2009	7,181	317	0	0	7,498	89
2010	0	189	600	0	789	130
2011	0	0	0	820	820	183
2012	0	0	0	0	0	55
2013	0	650	0	0	650	404
2014	0	0	0	0	0	259
2015	0	93	0	2	95	8
2016	0	335	0	23	361	173

In 2016, 361,000 ova were exported. Parr and smolt exports increased by 165,000 fish on the 2015 figure.

Vaccines

Table 23: Number of sites using vaccines and number (millions) of fish vaccinated during 2008-2016

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
No. of sites	80	68	70	67	63	63	56	55	47
No. of fish (millions) vaccinated	36.7	39.6	42.6	49.2	48.1	47.5	44.7	48.0	42.6

Vaccines were used to provide protection against furunculosis, infectious pancreatic necrosis (IPN), ERM, vibriosis and salmonid alphavirus (SAV). The majority of fish were vaccinated against furunculosis and IPN, with smaller numbers of fish being vaccinated against ERM, vibriosis and SAV. A total of 42.6 million fish were vaccinated across 47 sites.

Escapes

In 2016, there were no reported escapes from sites rearing freshwater Atlantic salmon.

// 3.ATLANTIC SALMON – PRODUCTION

Production

Production survey information was collected from all 15 companies actively involved in Atlantic salmon production, farming 253 active sites. This figure represents the entire industry operating in Scotland.

Table 24: Annual production of salmon (tonnes) during 1996-2016 and projected production in 2017

Year	Tonnes	Percentage difference	Year	Tonnes	Percentage difference
1996	83,121	19	2007	129,930	-1.4
1997	99,197	19	2008	128,606	-1
1998	110,897	12	2009	144,247	12
1999	126,686	14	2010	154,164	6.9
2000	128,959	2	2011	158,018	2.5
2001	138,519	7	2012	162,223	2.7
2002	144,589	4	2013	163,234	0.6
2003	169,736	17	2014	179,022	9.7
2004	158,099	-7	2015	171,722	-4.1
2005	129,588	-18	2016	162,817	-5.2
2006	131,847	2	2017	177,202*	

*industry estimate of projected tonnage based on stocks currently being on-grown.

The total production of Atlantic salmon during 2016 was 162,817 tonnes, a decrease of 8,905 tonnes (5.2%) on the 2015 total.

Table 25: Number (000s), production (tonnes) of salmon harvested and mean fish weight (kg) per year class during 2006-2016

	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)	2006	2006	115	211	1.8
	2007	2007	23	40	1.7
	2008	2008	116	216	1.9
	2009	2009	81	178	2.2
	2010	2010	128	268	2.1
	2011	2011	109	307	2.8
	2012	2012	127	301	2.4
	2013	2013	0	0	-
	2014	2014	286	720	2.5
	2015	2015	223	626	2.8
	2016	2016	114	333	2.9
Harvest in year 1	2005	2006	14,036	64,099	4.6
	2006	2007	13,787	60,890	4.4
	2007	2008	13,011	54,759	4.2
	2008	2009	16,338	77,621	4.7
	2009	2010	18,266	85,826	4.7
	2010	2011	18,694	91,105	4.9
	2011	2012	21,502	97,744	4.5
	2012	2013	21,264	106,161	5.0
	2013	2014	20,316	101,997	5.0
	2014	2015	24,038	114,112	4.7
	2015	2016	24,633	111,163	4.5
Harvest in year 2	2004	2006	14,237	67,537	4.7
	2005	2007	14,999	69,000	4.6
	2006	2008	15,881	73,631	4.6
	2007	2009	14,132	66,448	4.7
	2008	2010	13,666	68,070	5.0
	2009	2011	13,772	66,606	4.8
	2010	2012	13,053	64,178	4.9
	2011	2013	11,283	57,073	5.1
	2012	2014	13,712	76,305	5.6
	2013	2015	10,910	56,984	5.2
	2014	2016	10,940	51,321	4.7

Table 26: Number (000s) and production (tonnes) of grilse and pre-salmon harvested during 2006-2016

Year	Grilse (January-August)			Pre-salmon (September-December)		
	Number	Tonnes	Average weight (kg)	Number	Tonnes	Average weight (kg)
2006	4,357	18,162	4.2	9,679	45,937	4.7
2007	3,823	15,811	4.1	9,964	45,079	4.5
2008	3,716	15,296	4.1	9,295	39,463	4.2
2009	5,631	23,857	4.2	10,707	53,764	5.0
2010	6,877	29,733	4.3	11,389	56,093	4.9
2011	7,604	35,146	4.6	11,090	55,959	5.0
2012	11,337	53,216	4.7	10,165	44,528	4.4
2013	9,618	47,496	4.9	11,646	58,665	5.0
2014	9,048	46,686	5.2	11,268	55,311	4.9
2015	11,243	53,930	4.8	12,795	60,182	4.7
2016	13,463	59,853	4.4	11,170	51,310	4.6

Table 27: Percentage (by weight) of annual production by growth stage harvested during 2008-2016

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Growth stage	-	-	-	-	-	-	-	-	-
Input year fish	<1	<1	<1	<1	<1	0	<1	<1	<1
Grilse	12	16	19	22	33	29	26	31	37
Pre-salmon	31	37	36	35	27	36	31	35	31
Year 2 salmon	57	46	44	42	39	35	42	33	31

Survival and Production in Smolt Year Classes

Table 28: Survival and production in smolt year classes during 1999-2016

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)	% harvest	Number (000s)	Weight (tonnes)	Mean weight (kg)	% harvest	Number (000s)	Weight (tonnes)	Mean weight (kg)	% harvest			
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	0	-	-	0	14,036	64,099	4.6	37.8	14,999	69,000	4.6	40.3	78.1	133,099	3.58
2006	41,091	115	211	1.8	0.3	13,787	60,890	4.4	33.5	15,881	73,631	4.6	38.6	72.5	134,732	3.28
2007	37,853	23	40	1.7	0.06	13,011	54,759	4.2	34.4	14,133	66,448	4.7	37.3	71.8	121,247	3.20
2008	36,662	116	216	1.9	0.3	16,338	77,621	4.7	44.6	13,666	68,070	5.0	37.3	82.2	145,907	3.98
2009	38,548	81	178	2.2	0.2	18,266	85,826	4.7	47.4	13,772	66,606	4.8	35.7	83.3	152,610	3.96
2010	38,490	128	268	2.1	0.3	18,694	91,105	4.9	48.6	13,053	64,178	4.9	33.9	82.8	155,551	4.04
2011	42,733	109	307	2.8	0.3	21,502	97,744	4.5	50.3	11,283	57,073	5.1	26.4	77.0	155,124	3.63
2012	41,094	127	301	2.4	0.3	21,264	106,161	5.0	51.7	13,712	76,305	5.6	33.4	85.4	182,767	4.45
2013	40,936	0	-	-	0	20,316	101,997	5.0	49.6	10,910	56,984	5.2	26.7	76.3	158,981	3.88
2014	48,112	286	720	2.5	0.6	24,038	114,112	4.7	50.0	10,940	51,321	4.7	22.7	73.3	166,153	3.45
2015	45,465	223	626	2.8	0.5	24,633	111,163	4.5	54.2							
2016	42,957	114	333	2.9	0.3											

In 2014, the last year for which survival can be calculated, the survival rate from smolt input to harvest decreased to 73.3%. Of the 2015 year class, 54.7% of the input has been harvested, 4.1% higher than the average harvest of fish one year after input in the 2014 year class. In 2016, the harvest of fish from the 2016 input was 0.3%, this was a decrease compared with the proportion of fish harvested from the same year class in 2015.

Smolts to Sea

Table 29: Number (000s) and origin of smolts put to sea during 2004-2016

Year	Smolts put to sea (000s)				Total (000s)	Scottish Origin	English Origin		Other Origin	
	S½	S1	S1½	S2		%	(000s)	%	(000s)	%
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
2007	14,665	23,188	0	0	37,853	94	1,747	5	420	1
2008	11,101	25,561	0	0	36,662	96	1,418	4	0	0
2009	14,967	23,581	0	0	38,548	95	1,700	4	105	<1
2010	14,069	24,421	0	0	38,490	95	1,541	4	120	<1
2011	17,721	25,012	0	0	42,733	96	1,765	4	0	0
2012	17,334	23,480	280	0	41,094	96	1,510	4	0	0
2013	19,262	21,534	140	0	40,936	97	1,169	3	0	0
2014	23,758	24,212	142	0	48,112	94	893	2	2,072	4
2015	22,886	22,569	10	0	45,465	96	938	2	1,082	2
2016	22,052	20,905	0	0	42,957	97	1,048	2	611	1

The total number of smolts put to sea in 2016 was 43.0 million. This smolt input comprised S1s (48.7%) and S½s (51.3%). There was no production of S1½s or S2s in 2016. Three percent of the smolts stocked to Scottish salmon farms were sourced from outwith Scotland, 1% of which came from sources outwith GB. This was a decrease of 1% compared with the proportion observed in 2015.

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 2005-2016

Region	Smolts put to sea (000s)		Harvest in year 0			Harvest in year 1			Harvest in year 2			Total Harvest	
	Year	No	Year	No	%	Year	No	%	Year	No	%	No	%
North West	2005	10,888	2005	0	0	2006	5,796	53.2	2007	2,914	26.8	8,710	80.0
	2006	10,403	2006	115	1.1	2007	4,300	41.3	2008	3,612	34.7	8,027	77.1
	2007	9,563	2007	23	0.2	2008	5,394	56.4	2009	1,850	19.3	7,267	75.9
	2008	9,099	2008	116	1.3	2009	4,897	53.8	2010	2,687	29.5	7,700	84.6
	2009	9,986	2009	42	0.4	2010	7,045	70.5	2011	2,003	20.1	9,090	91.0
	2010	9,924	2010	117	1.2	2011	6,324	63.7	2012	2,802	28.2	9,243	93.1
	2011	12,605	2011	53	0.4	2012	7,937	63.0	2013	1,744	13.8	9,734	77.2
	2012	11,588	2012	127	1.1	2013	7,179	62.0	2014	2,623	22.6	9,929	85.7
	2013	10,975	2013	0	0	2014	6,549	59.7	2015	1,695	15.4	8,244	75.1
	2014	17,543	2014	191	1.1	2015	9,649	55.0	2016	3,768	21.5	13,608	77.6
	2015	8,646	2015	223	2.6	2016	6,122	70.8					
	2016	14,534	2016	114	0.8								
Orkney	2005	2,192	2005	0	0	2006	598	27.3	2007	602	27.4	1,200	54.7
	2006	1,622	2006	0	0	2007	433	26.7	2008	586	36.1	1,019	62.8
	2007	1,408	2007	0	0	2008	594	42.2	2009	741	52.6	1,335	94.8
	2008	1,912	2008	0	0	2009	507	26.5	2010	1,120	58.6	1,627	85.1
	2009	1,154	2009	0	0	2010	741	64.2	2011	95	8.2	836	72.4
	2010	2,557	2010	0	0	2011	1,126	44.0	2012	936	36.6	2,062	80.6
	2011	2,718	2011	0	0	2012	1,203	44.3	2013	765	28.1	1,968	72.4
	2012	2,727	2012	0	0	2013	1,422	52.1	2014	1,167	42.8	2,589	94.9
	2013	2,104	2013	0	0	2014	1,023	48.6	2015	512	24.3	1,535	72.9
	2014	2,829	2014	0	0	2015	1,412	49.9	2016	1,244	44.0	2,656	93.9
	2015	3,266	2015	0	0	2016	1,580	48.4					
	2016	3,050	2016	0	0								
Shetland	2005	10,824	2005	0	0	2006	4,162	38.4	2007	4,175	38.6	8,337	77.0
	2006	13,180	2006	0	0	2007	4,578	34.7	2008	4,959	37.6	9,537	72.3
	2007	14,947	2007	0	0	2008	4,610	30.8	2009	4,930	33.0	9,540	63.8
	2008	13,929	2008	0	0	2009	4,992	35.8	2010	4,659	33.4	9,651	69.2
	2009	10,031	2009	29	0.3	2010	4,201	41.9	2011	3,234	32.2	7,464	74.4
	2010	11,573	2010	0	0	2011	4,134	35.7	2012	4,292	37.1	8,426	72.8
	2011	11,206	2011	49	0.4	2012	4,911	43.8	2013	2,709	24.2	7,669	68.4
	2012	11,389	2012	0	0	2013	4,995	43.9	2014	4,022	35.3	9,017	79.2
	2013	9,956	2013	0	0	2014	4,289	43.1	2015	3,034	30.5	7,323	73.6
	2014	11,309	2014	0	0	2015	5,042	44.6	2016	2,663	23.5	7,705	68.1
	2015	9,040	2015	0	0	2016	5,322	58.9					
	2016	10,640	2016	0	0								
South West	2005	6,589	2005	0	0	2006	2,054	31.2	2007	4,175	63.3	6,229	94.5
	2006	7,032	2006	0	0	2007	2,677	38.1	2008	3,065	43.6	5,742	81.7
	2007	6,135	2007	0	0	2008	980	16.0	2009	3,289	53.6	4,269	69.6
	2008	6,507	2008	0	0	2009	4,153	63.8	2010	2,969	45.6	7,122	109.4*
	2009	8,200	2009	10	0.1	2010	2,700	32.9	2011	4,697	57.3	7,407	90.3
	2010	6,565	2010	12	0.2	2011	3,000	45.7	2012	2,648	40.3	5,660	86.2
	2011	7,493	2011	0	0	2012	2,673	35.7	2013	3,706	49.4	6,379	85.1
	2012	7,363	2012	0	0	2013	2,841	38.6	2014	3,863	52.5	6,704	91.1
	2013	7,801	2013	0	0	2014	3,202	41.0	2015	3,564	45.7	6,766	86.7
	2014	6,981	2014	95	1.4	2015	3,771	54.0	2016	2,023	29.0	5,889	84.4
	2015	11,156	2015	0	0	2016	4,944	44.3					
	2016	8,093	2016	0	0								
Western Isles	2005	6,675	2005	0	0	2006	1,426	21.4	2007	3,133	46.9	4,559	68.3
	2006	8,853	2006	0	0	2007	1,799	20.3	2008	3,659	41.3	5,458	61.6
	2007	5,800	2007	0	0	2008	1,433	24.7	2009	3,320	57.2	4,753	81.9
	2008	5,214	2008	0	0	2009	1,789	34.3	2010	2,231	42.8	4,020	77.1
	2009	9,177	2009	0	0	2010	3,579	39.0	2011	3,743	40.8	7,322	79.8
	2010	7,870	2010	0	0	2011	4,110	52.2	2012	2,375	30.2	6,485	82.4
	2011	8,711	2011	7	0.1	2012	4,778	54.9	2013	2,358	27.1	7,143	82.0
	2012	8,027	2012	0	0	2013	4,827	60.1	2014	2,037	25.4	6,864	85.5
	2013	10,100	2013	0	0	2014	5,254	52.0	2015	2,105	20.8	7,359	72.8
	2014	9,451	2014	0	0	2015	4,164	44.1	2016	1,242	13.1	5,406	57.2
	2015	13,357	2015	0	0	2016	6,665	49.9					
	2016	6,640	2016	0	0								

* The survival of the 2008 smolt input in the South West is over 100% due to the practice of putting smolts to sea in one region and subsequently moving them to another sea water site in another region for harvest.

Staffing

Table 31: Number of staff employed in the production of salmon during 2006-2016

Year		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Staff	F/T	790	798	849	874	944	923	944	1,081	1,191	1,256	1,379
	P/T	81	118	100	89	120	90	115	99	134	107	107
Total staff		871	916	949	963	1,064	1,013	1,059	1,180	1,325	1,363	1,486
Productivity (tonnes/person)		151.4	141.8	135.5	149.8	144.9	156.0	153.2	138.3	135.1	126.0	109.6

In 2016, the total number of staff employed in salmon production was 1,486, an increase of 123 compared with 2015. The staffing figures collected refer specifically to the production of Atlantic salmon and do not include figures for staff involved with processing or marketing activities. Productivity decreased from 126.0 to 109.6 tonnes produced per person.

Production Methods

Table 32: Production methods, capacity, tonnage and average stocking densities (kg/m^3) during 2014-2016

Method	Number of sites			Total capacity (000s cubic metres)			Production (tonnes)		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
Seawater tanks	3	4	5	6.1	6.2	7.4	0	179	21
Seawater cages	257	250	248	19,481	20,338	20,067	179,022	171,543	162,796
For cage sites: ratio of production (kg) to cage capacity (m^3)							9.2	8.4	8.1

In 2016, the majority of fish were produced in seawater cages. There were 21 tonnes of production from seawater tank sites in 2016. This reflects the high installation and running costs incurred in operating seawater tank systems. Most seawater tank capacity has been re-deployed for the production of other species of marine fin fish or salmon broodstock.

Sea cage capacity decreased by 271,000 m^3 during 2016 and the number of sea cage sites in production decreased by two. Production efficiency in sea cages, measured as the ratio of fish weight in kilograms produced per cubic metre, decreased to 8.1 kg/m^3. In cage sites, the ratio of production (expressed in kilograms) to cage capacity (expressed in cubic metres) was 9.2, 8.4 and 8.1 in 2014, 2015 and 2016 respectively.

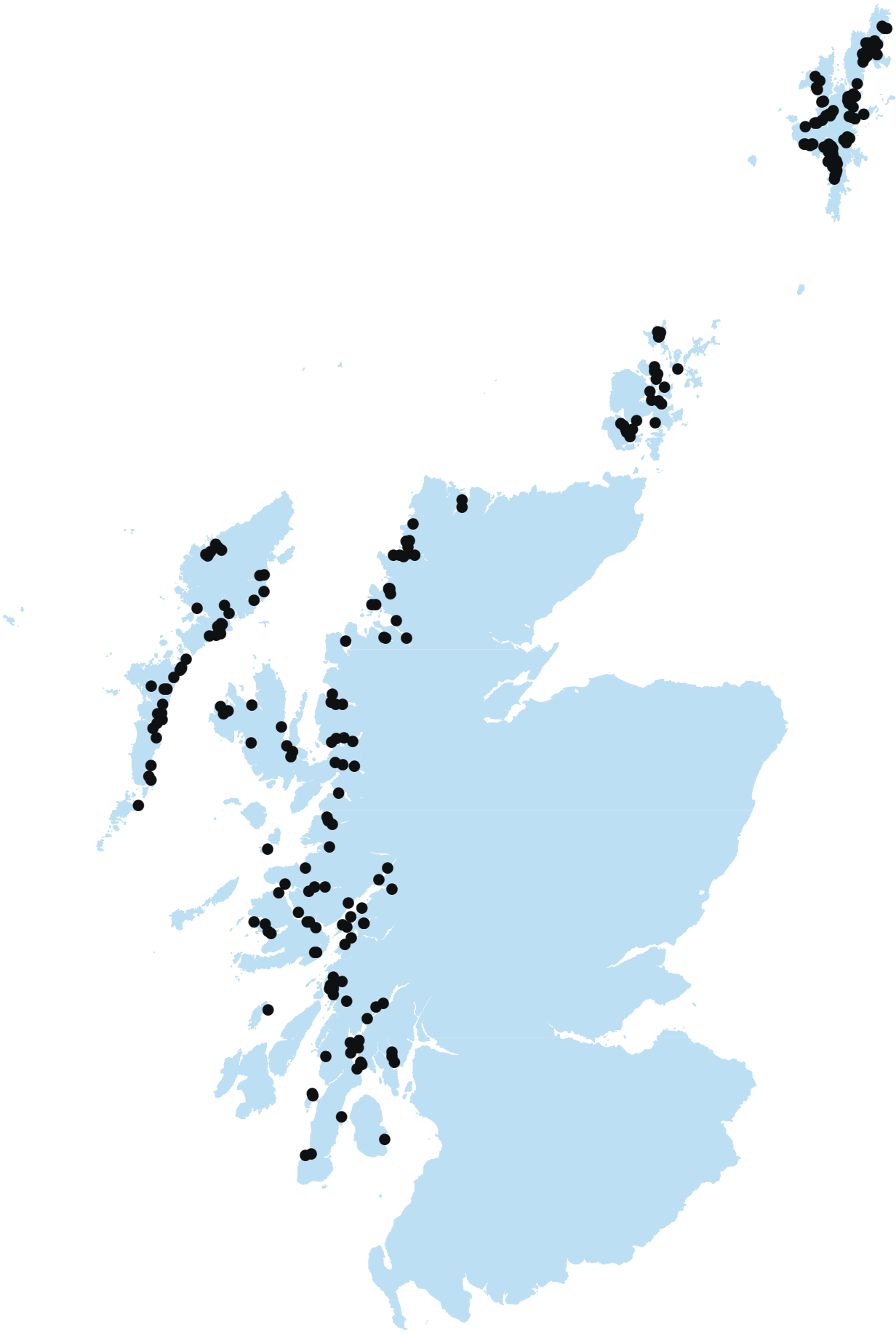


FIGURE 3: THE DISTRIBUTION OF ACTIVE ATLANTIC SALMON PRODUCTION SITES IN 2016

Scale of Production by Site

Table 33: Number of sites shown in relation to their production grouping and percentage share of production 2006-2016

Production grouping (tonnes)	0	1-50	51-100	101-200	201-500	501-1,000	>1,000	Total	
								Sites*	Tonnes
2006	95	10	10	16	29	30	62	252	131,847
2007	89	9	8	19	33	34	55	247	129,930
2008	118	7	9	15	22	29	57	257	128,606
2009	104	12	12	10	33	25	58	254	144,247
2010	109	5	6	10	33	22	64	249	154,164
2011	106	9	7	9	28	29	66	254	158,018
2012	115	3	5	9	25	33	67	257	162,223
2013	112	9	3	12	18	36	67	257	163,234
2014	117	8	1	9	26	29	70	260	179,022
2015	115	2	1	9	26	26	75	254	171,722
2016	117	3	3	9	22	26	73	253	162,817
2006	0	0.2	0.6	1.8	7.9	15.9	73.6	-	-
2007	0	0.2	0.4	2.3	8.3	19.0	69.8	-	-
2008	0	0.1	0.5	1.6	5.8	15.9	76	-	-
2009	0	0.2	0.6	1.0	7.7	13.0	77.5	-	-
2010	0	0.1	0.3	0.9	7.3	10.8	80.6	-	-
2011	0	0.2	0.3	0.8	6.4	13.4	78.9	-	-
2012	0	<0.1	0.2	0.9	5.0	15.0	78.8	-	-
2013	0	0.1	0.1	1.1	4.0	16.7	78.0	-	-
2014	0	0.1	<0.1	0.8	5.0	12.0	82.0	-	-
2015	0	<0.1	<0.1	0.9	5.0	11.6	82.4	-	-
2016	0	<0.1	0.1	0.8	4.6	11.7	82.8	-	-

*Includes farms stocked but having no production.

In 2016, the number of sites with no production increased by two whilst the number producing 1 to 500 tonnes decreased by one. Despite the number of sites producing over 500 tonnes decreasing by two, the trend towards production in larger sites continued with 82.8% of production being derived from sites producing over 1000 tonnes.

Company Productivity

Table 34: Number of companies grouped by production (tonnes), manpower and productivity (tonnes per person) during 2015-2016

Total Tonnage		0-100	101-200	201-400	401-700	701-1,000	1,001-2,000	>2,000	Total
No. of companies	2015	6	2	1	0	0	1	6	16
	2016	6	0	1	0	1	0	7	15
No. of tonnes	2015	0	369	203	0	0	1,504	169,646	171,722
	2016	21	0	211	0	808	0	161,777	162,817
Manpower (total)	2015	1	20	4	0	0	34	1,304	1,363
	2016	14	0	4	0	38	0	1,430	1,486
Productivity (tonnes/person)	2015	0	19	51	0	0	44	130	126
	2016	2	0	53	0	21	0	113	110

The greatest productivity of 113 tonnes per person was achieved in the companies producing over 2000 tonnes. The least productivity of 2 tonnes per person was from the companies producing between 0-100 tonnes. In comparison with 2015, the average company productivity decreased from 126 to 110 tonnes per person. Overall, production was dominated by seven companies in 2016 which between them accounted for 99% of Scotland's farmed Atlantic salmon production.

Manpower and Production by Production Area

Table 35: Manpower and production (tonnes) by area 2007-2016 and projected production in 2017

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	2007	277	44	33,541	104	40	1.7	6,674	4.1	13,212	4.9	13,615	4.7
	2008	280	34	40,718	130	216	1.9	7,817	4.2	15,997	4.5	16,688	4.6
	2009	256	32	35,295	122	75	1.8	9,777	4.7	15,860	5.6	9,583	5.2
	2010	294	44	47,353	140	239	2.0	15,895	4.4	17,837	5.1	13,382	5.0
	2011	303	38	41,656	122	174	3.2	13,152	4.3	16,879	5.1	11,451	5.7
	2012	300	40	50,987	150	301	2.4	31,121	4.7	5,842	4.7	13,723	4.9
	2013	350	48	43,320	109	0	-	17,937	4.9	16,417	4.7	8,966	5.1
	2014	348	46	50,873	129	511	2.7	26,440	5.3	8,731	5.5	15,191	5.8
	2015	382	66	54,741	122	626	2.8	18,046	4.8	26,897	4.6	9,172	5.4
	2016	538	30	46,917	83	333	2.9	21,576	4.7	7,515	5.0	17,493	4.6
	2017			53,834*									
Orkney	2007	41	7	4,432	92	0	-	196	3.9	1,657	4.3	2,579	4.3
	2008	60	5	5,716	88	0	-	811	4.2	1,747	4.3	3,158	5.4
	2009	47	2	6,220	127	0	-	754	4.6	1,793	5.2	3,673	4.9
	2010	58	2	9,388	156	0	-	1,221	4.1	2,279	5.1	5,888	5.3
	2011	69	0	6,369	92	0	-	3,508	5.1	2,355	5.4	506	5.3
	2012	65	6	11,694	165	0	-	3,532	5.3	2,720	5.1	5,442	5.8
	2013	86	3	11,479	129	0	-	3,191	5.1	4,491	5.7	3,797	5.0
	2014	90	6	13,029	136	0	-	980	5.5	5,045	6.0	7,004	6.0
	2015	93	1	11,074	118	0	-	1,386	5.0	6,129	5.4	3,559	6.9
	2016	102	8	14,752	134	0	-	3,491	4.6	4,668	5.7	6,593	5.3
	2017			14,288*									
Shetland	2007	182	25	40,795	197	0	-	2,663	4.5	17,838	4.5	20,294	4.9
	2008	202	26	41,374	182	0	-	4,091	4.1	14,287	4.0	22,996	4.6
	2009	188	22	43,785	208	65	2.3	4,873	3.3	16,183	4.6	22,664	4.6
	2010	178	23	45,439	226	0	-	3,624	4.9	17,179	5.0	24,636	5.3
	2011	189	22	35,493	168	118	2.4	4,611	4.7	16,071	5.1	14,693	4.5
	2012	188	16	43,010	211	0	-	6,083	4.3	15,784	4.5	21,143	4.9
	2013	210	14	36,694	164	0	-	5,822	4.5	18,121	4.9	12,751	4.7
	2014	224	24	46,369	187	0	-	6,196	5.7	17,604	5.5	22,569	5.6
	2015	228	19	42,786	173	0	-	11,134	5.4	14,939	5.0	16,713	5.5
	2016	200	23	37,464	168	0	-	11,844	4.4	12,906	4.9	12,714	4.8
	2017			38,612*									
South West	2007	162	36	31,353	158	0	-	4,309	4.1	7,069	4.3	19,975	4.8
	2008	173	21	19,229	99	0	-	1,212	4.0	3,108	4.6	14,909	4.9
	2009	199	23	35,726	161	38	3.5	4,615	4.6	15,988	5.1	15,085	4.6
	2010	231	39	27,751	103	29	2.5	6,032	4.2	7,118	5.7	14,572	4.9
	2011	212	17	37,157	162	0	-	3,618	4.8	10,899	4.8	22,640	4.8
	2012	221	24	26,850	110	0	-	9,315	5.4	4,508	4.8	13,027	4.9
	2013	251	19	34,924	129	0	-	5,847	4.8	9,111	5.6	19,966	5.4
	2014	279	29	34,976	114	209	2.2	4,278	5.1	10,476	4.4	20,013	5.2
	2015	302	12	35,911	114	0	-	10,356	4.7	6,686	4.3	18,869	5.3
	2016	305	26	31,022	94	0	-	12,349	4.3	9,246	4.4	9,427	4.7
	2017			37,981*									
Western Isles	2007	136	6	19,809	140	0	-	1,969	3.8	5,303	4.2	12,537	4.0
	2008	134	14	21,569	146	0	-	1,365	3.8	4,324	4.0	15,880	4.3
	2009	184	10	23,221	120	0	-	3,838	4.1	3,940	4.6	15,443	4.6
	2010	183	12	24,233	124	0	-	2,961	3.7	11,680	4.2	9,592	4.3
	2011	150	13	37,343	229	15	2.1	10,257	4.7	9,755	5.0	17,316	4.6
	2012	170	29	29,682	149	0	-	3,165	3.7	15,674	4.0	10,843	4.6
	2013	184	15	36,817	185	0	-	14,699	5.2	10,525	5.2	11,593	4.9
	2014	250	29	33,775	121	0	-	8,792	4.5	13,455	4.1	11,528	5.7
	2015	251	9	27,210	105	0	-	13,008	4.4	5,531	4.5	8,671	4.1
	2016	234	20	32,662	129	0	-	10,593	4.2	16,975	4.1	5,094	4.1
	2017			32,487*									
Scotland Total	2007	798	118	129,930	142	40	1.7	15,811	4.1	45,079	4.5	69,000	4.6
	2008	849	100	128,606	135	216	1.9	15,296	4.1	39,463	4.2	73,631	4.6
	2009	874	89	144,247	150	178	2.2	23,857	4.2	53,764	5.0	66,448	4.7
	2010	944	120	154,164	145	268	2.1	29,733	4.3	56,093	4.9	68,070	5.0
	2011	923	90	158,018	156	307	2.8	35,146	4.6	55,959	5.0	66,606	4.8
	2012	944	115	162,223	153	301	2.4	53,216	4.7	44,528	4.4	64,178	4.9
	2013	1,081	99	163,234	138	0	-	47,496	4.9	58,665	5.0	57,073	5.1
	2014	1,191	134	179,022	135	720	2.5	46,686	5.2	55,311	4.9	76,305	5.6
	2015	1,256	107	171,722	126	626	2.8	53,930	4.8	60,182	4.7	56,984	5.2
	2016	1,379	107	162,817	110	333	2.9	59,853	4.4	51,310	4.6	51,321	4.7
	2017			177,202*									

*Estimated production for 2017.

Company and Site Data

Table 36: Number of companies and sites engaged in the production of Atlantic salmon during 2006-2016

Year	Number of companies			Number of sites		
	Producing	Non-producing	Total	Producing	Non-producing	Total
2006	32	12	44	157	95	252
2007	28	10	38	158	89	247
2008	26	9	35	139	118	257
2009	25	6	31	150	104	254
2010	20	10	30	140	109	249
2011	21	6	27	148	106	254
2012	16	6	22	142	115	257
2013	15	6	21	145	112	257
2014	11	7	18	143	117	260
2015	10	6	16	139	115	254
2016	10	5	15	136	117	253

The number of companies authorised and actively producing Atlantic salmon in 2016 was 10, which remained the same as in 2015. Five companies remained active and authorised, although not producing salmon for harvest in 2016. This continued the trend of Atlantic salmon production becoming concentrated within fewer companies. These 15 companies had 253 registered active sites, although not all these sites produced fish for harvest in 2016.

Fallowing

Table 37: Number of seawater cage sites employing a fallow period during 2007-2016

Year	Fallow Period (weeks)						Total
	0	<4	4-8	9-26	27-51	52	
2007	67	16	41	61	38	24	247
2008	53	16	28	92	40	28	257
2009	51	3	30	86	46	37	253
2010	53	8	26	83	41	36	247
2011	60	10	31	85	27	39	252
2012	58	4	31	97	28	37	255
2013	51	4	31	92	35	43	253
2014	48	4	36	89	29	51	257
2015	45	6	41	84	27	47	250
2016	47	5	27	88	32	49	248

Of the 248 seawater cage sites recorded as being active in 2016, 49 sites were fallow for the entire year whilst 152 sites were fallow for a variable period. There were 47 sites that did not fallow in 2016. The normal production cycle in seawater 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.

Broodstock Sites

Table 38: Number of sites holding Atlantic salmon broodstock during 2005-2016

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Broodstock sites	15	17	20	20	11	10	11	7	8	8	4	3

In 2016, the number of freshwater and seawater sites holding broodstock decreased to three. The number of sites holding broodstock in any one year can be variable, as can be seen from the previous years' figures, which indicate no obvious trend. A total of 1,695 fish were stripped, yielding 13.7 million ova, giving an average yield of 8,083 ova per fish.

Organic Production

Table 39: Organic production of Atlantic salmon during 2011-2016

Year	Number of active cage sites	Number of cage sites certified as organic	Production (tonnes)
2011	252	10	3,104
2012	255	7	4,597
2013	253	8	5,207
2014	257	8	3,588
2015	250	5	2,382
2016	248	5	3,903

Of the 248 active Atlantic salmon seawater cage sites in 2016, five were certified as organic, producing 3,903 tonnes.

Escapes

There were five incidents involving the loss of 311,496 fish from seawater Atlantic salmon sites in 2016. There were three additional incidents reported where the companies confirmed there was no loss of fish.

// 4.OTHER SPECIES

The Scottish aquaculture industry has continued to farm other species of fish during 2016. The production of brown trout (*Salmo trutta*) showed a small decrease, with the majority of the production being for the angling restocking market. Production of halibut (*Hippoglossus hippoglossus*) increased while there was no Arctic charr (*Salvelinus alpinus*) or cod (*Gadus morhua*) production during 2016. Lumpsucker (*Cyclopterus lumpus*) and several species of wrasse (Labridae) were also produced in 2016. The production of lumpsucker and wrasse are targeted at the marine Atlantic salmon industry where they are used as a biological control for parasites.

Company, Site and Production Data

Table 40: Number of companies and sites producing other species in 2016, annual production of other species (tonnes) during 2013-2016 and estimated production in 2017

Species	No. of companies	No. of sites	2013 Production tonnage	2014 Production tonnage	2015 Production tonnage	2016 Production tonnage	2017 Production tonnage*
Arctic charr	0	0	0	0	†	0	0
Brown trout/ Sea trout	12	15	44	48	42	41	92
Cod	1	1	†	†	0	0	0
Halibut	2	3	56	66	56	67	80
Lumpsucker	4	7	0	5	6	10	46
Wrasse spp.	3	3	0.1	0.1	3	4	3

* Industry estimates based on stocks currently being on-grown.

† Production occurred but this cannot be shown without revealing the figure for an individual company.

Staffing

Table 41: Number of staff employed in farming other species during 2007-2016

Year	Full-time	Part-time	Total
2007	75	29	104
2008	80	44	124
2009	23	22	45
2010	19	24	43
2011	24	19	43
2012	25	21	46
2013	29	21	50
2014	29	20	49
2015	35	15	50
2016	43	20	63

In 2016, the overall number of staff employed in the production of other species increased by 13.

Production of Cleaner fish

Table 42: Number (000s) of cleaner fish produced during 2015-2016

Species	Number of fish produced 000's	
	2015	2016
Lumpsucker	235	262
Wrasse spp.	75	118

In recent years lumpsucker and wrasse spp. have been produced for use as a biological control for parasites in the marine Atlantic salmon industry. Data on the number of fish produced has only been collected since 2015. As data for future years is collected it will show trends in cleaner fish production.

Ova Laid Down to Hatch

Table 43: Source of ova from other species laid down to hatch during 2016

Species	Source of ova laid down to hatch (000s)		
	Own broodstock	Other GB broodstock	Foreign ova
Brown trout/sea trout	407	0	5
Halibut	8,000	0	0
Lumpsucker	100	0	3,200
Wrasse spp.	5,200	0	0

Trade in Small Fish

Table 44: Trade in small fish of other species in 2016

Species	Bought (000s)	Sold (000s)
Halibut	400	65
Brown trout/sea trout	49	17
Lumpsucker	1,752	452
Wrasse spp.	1,000	43

There was also a small amount of production of: brook charr (*Salvelinus fontinalis*); sheepshead minnow (*Cyprinodon variegatus variegatus*); tiger trout (*Salmo trutta* x *Salvelinus fontinalis*) and turbot (*Scophthalmus maximus*). However, due to the small number of companies in production, it is not possible to summarise these data without revealing the production of individual companies.

Organic Production

Of the 30 sites recorded as producing other species in 2016, no organic production was reported.

Escapes

There were no reported escapes from sites rearing other species during 2016.

// 5.SCOTTISH MARINE REGIONS

The Marine (Scotland) Act 2010 introduces integrated management of Scotland's seas. The creation of a National Marine Plan, as required by the Act, sets the wider context for planning within Scotland including what should be considered when creating regional marine plans. Eleven Scottish Marine Regions have been created under the Act (see Appendix 3 map) which cover sea areas extending out to 12 nautical miles.

To support the development of Regional Marine Plans by Regional Marine Planning Partnerships, tonnages and financial values of annual finfish production have been calculated for the regions defined under the Act. These regional data are presented in Appendix 3. In order to maintain commercial confidentiality salmon production figures for Argyll & Clyde and the North Coast & West Highlands have been merged. Other finfish species including brown/sea trout, rainbow trout, cod, halibut and cleaner fish were produced, however these figures cannot be attributed to Scottish Marine Regions due to commercial confidentiality.

// 6. SUMMARY

Rainbow trout

The production of rainbow trout decreased by 6% in 2016 to 8,096 tonnes and was directed at the table (92%) and restocking (8%) markets. Although a decrease in production this was still the second highest level of rainbow trout production recorded in Scotland. The total numbers of staff employed by the sector decreased by five to 121. There was an overall decrease in the productivity of the industry to 66.9 tonnes per person.

In 2016, the number of eyed ova laid down to hatch (9.9 million) decreased by 2.2 million and was mainly all-female diploid stock (80%). The proportion of ova from GB broodstock decreased to 3.9%. Denmark was the largest source of imported ova with 56.2% of the total, this was an increase proportionally from 2015. There were no imports of ova from the Southern hemisphere during 2016. The Scottish rainbow trout industry continues to be highly dependent on imported ova. Additionally, imports of part grown rainbow trout from Northern Ireland continued in 2016.

Atlantic salmon

In 2016, the total production of Atlantic salmon decreased by 8,905 tonnes to 162,817 tonnes, a 5.2% decrease on the 2015 production total. The survey shows increases in the production of grilse but a decrease in the production of pre-salmon and salmon. The number of staff directly employed on the farms increased by 123. Overall, there was a decrease in the productivity of tonnes produced per person from 126.0 to 109.6. The estimated harvest forecast for 2017 is 177,202 tonnes. The trend towards concentrating production in larger sites was maintained with 82.8% of production being concentrated in the sites producing over 1,000 tonnes per annum.

During 2016 there was an increase in the number of ova produced to 13.7 million. The number of ova laid down to hatch decreased by 5.6% to 64.3 million. This highlights the trend towards using foreign ova sources with 90.8% of the ova laid down to hatch being imported and only 9.2% derived from Great British sources. Smolt production decreased slightly to 42.9 million, with the majority being produced as S½ smolts (58.5%) and S1 smolts (41.5%). The number of staff directly employed on freshwater sites remained the same as in 2015 and productivity decreased to 145,900 fish per person. Projections suggest that fewer smolts will be produced in 2017, followed by an increase in 2018.

Other Species

There was a decrease in the production of brown/sea trout from 42 tonnes in 2015 to 41 tonnes in 2016. Halibut production increased by 11 tonnes and there was no reported production of Arctic charr or cod. Lumpsucker and wrasse were produced for use as biological controls for parasites in the marine Atlantic salmon farming industry. In 2016, the total number of staff employed in the production of other species increased by 13 to 63.

// APPENDIX 1

Questionnaires sent to Fish Farmers

ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2016
RAINBOW TROUT – DATA
Please complete and return by 31 January 2017 to L A Munro, Marine Scotland Science
375 Victoria Road, Aberdeen, AB11 9DB

Business No:

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

2 **Please detail any accreditation schemes this company is a member of;** _____

		Site No Site Name	Site No Site Name	Site No Site Name
3	**How many eyed ova were laid down for hatching in 2016**			
a	from own broodstock			
b	from other GB broodstock			
c	from abroad (Northern Hemisphere)			
d	from abroad (Southern Hemisphere)			
4	**How many of the above ova were**			
a	all female diploid			
b	mixed sex diploid			
c	all triploid			
5	**How many fry/fingerlings were**			
a	bought			
b	sold			
6	**How many bought fry/fingerlings were**			
a	all female diploid			
b	mixed sex diploid			
c	all triploid			
7	**How many of these fish were vaccinated against ERM**			
a	vaccinated on site			
b	bought vaccinated			
8	**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)			
9	**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)			
10	**From the total production what amount in TONNES was certified as organic**			
11	**What is your predicted production in 2017 in TONNES**			
12	**What is the fish holding capacity of the holding units for each site in cubic metres**			
a	Tanks			
b	Ponds			
c	Raceways			
d	Cages			

ANNUAL PRODUCTION SURVEY 2016

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. Accreditation Schemes

Please include membership to trade associations, quality schemes or organic certification schemes.

Q3. 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
Ova from abroad- Northern Hemisphere includes those from Northern Ireland and Isle of Man.

Q8-9. 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**

Q12. Fish Holding Capacity

Please enter the total cubic metre capacity for each type of production unit

It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2017 to allow the Annual Survey Report for 2016 to be produced.

ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2016
ATLANTIC SALMON - SMOLT DATA

Please complete and return by 31 January 2017 to L A Munro, Marine Scotland Science
375 Victoria Road, Aberdeen, AB11 9DB

Business No:

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

2 **Please detail any accreditation schemes this company is a member of;**

3 **How many ova were produced in the winter of 2015-2016 (company total)**

		Site No / Site Name	Site No / Site Name	Site No / Site Name
4	**How many eyed ova were laid down for hatching in winter of 2015-2016**			
a	From own farmed broodstock			
b	From other GB farmed broodstock			
c	From GB wild broodstock			
d	From foreign sources			
5	**How many eyed ova do you expect to hatch this winter (2016-2017)**			
6	**How many fry or parr were**			
a	Transferred into the site			
b	Transferred out of the site			
7	**How many smolts were produced as**			
a	**S$^{1}/_{2}$s** (ie from 2016 hatch)			
b	**S1s** (ie from 2015 hatch)			
c	**S1$^{1}/_{2}$s or S2s** (ie from 2015 or 2014 hatch)			
8	**How many smolts were sold as**			
a	**S1s** (incl S$^{1}/_{2}$s)			
b	**S2s** (incl S1$^{1}/_{2}$s)			
9	**How many smolts do you expect to produce for sea winter on-growing in 2017 as**			
a	**S1s** (incl S$^{1}/_{2}$s)			
b	**S2s** (incl S1$^{1}/_{2}$s)			
10	**How many smolts do you plan to produce in 2018**			
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	**How many fish did you vaccinate**			
a	against furunculosis			
b	against ERM			
c	against IPN			
d	against *Vibrio* spp.			
e	against SAV			

ANNUAL PRODUCTION SURVEY 2016

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. Accreditation Schemes

Please include membership to trade associations, quality schemes or organic certification schemes.

Q3. 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

Q7. How many smolts produced as S1/2 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

Q8. } **For S1s** - combine numbers of $S^1/_2$s with S1s and
Q9. } **For S2s** - combine numbers of $S1^1/_2$s with S2s

Q10. 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 2016 (maximum = 52)

It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2017 to allow the Annual Survey Report for 2016 to be produ

ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2016

ATLANTIC SALMON - PRODUCTION DATA

Please complete and return by 31 January 2017 to L A Munro, Marine Scotland Science
375 Victoria Road, Aberdeen, AB11 9DB

Business No:

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

2 **Please detail any accreditation schemes this company is a member of;** ____________________

		Site No Site Name	Site No Site Name	Site No Site Name
3	**How many smolts were put into the site in 2016 as:**			
a	**S$^{1}/_{2}$s** (ie from 2016 hatch)			
b	**S1s** (ie from 2015 hatch)			
c	**S1$^{1}/_{2}$s** or **S2s** (ie from 2015 or 2014 hatch)			
4	**How many of above came from England**			
5	**Total smolt input proposed in 2017**			
6	**HARVEST of 2016 SMOLT INPUT in 2016**			
a	Number of tonnes (wet weight at harvest)			
b	Number of fish			
7	**HARVEST of 2015 SMOLT INPUT from 1 JANUARY to 31 AUGUST**			
a	Number of tonnes (wet weight at harvest)			
b	Number of fish			
8	**HARVEST of 2015 SMOLT INPUT from 1 SEPTEMBER to 31 DECEMBER**			
a	Number of tonnes (wet weight at harvest)			
b	Number of fish			
9	**HARVEST of 2014 SMOLT INPUT**			
a	Number of tonnes (wet weight at harvest)			
b	Number of fish			
10	**From the total production what amount in TONNES was certified as organic**			
11	**How many tonnes of fish do you expect to harvest in 2017**			
12	**BROODSTOCK PRODUCTION**			
a	**Were brood fish produced in 2016**	**YES/NO**	**YES/NO**	**YES/NO**
b	**How many fish were stripped**			
13	**What is the current fish holding capacity of each site in cubic metres**			
14	**Duration of FALLOW PERIOD in WEEKS (cage sites; MAX = 52)**			

15 **Please enter the conversion factor used in Q6, Q7, Q8 and Q9 to convert gutted weight to wet weight at harvest**

ANNUAL PRODUCTION SURVEY 2016

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. Accreditation Schemes

Please include membership to trade associations, quality schemes or organic certification schemes.

Q3. 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

Q12. Broodstock production

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

Q13. 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)

Q14. Fallow period

For cage sites only; please enter any number of weeks a site was fallow in 2016; the total number of fallow weeks should not exceed 52

Q15. Conversion Factor
Please enter the value used to convert gutted weights to wet weight at harvest (i.e. weight of live fish)

It will be appreciated if the questionnaires are returned promptly and not later than 31 January 2017 to allow the Annual Survey Report for 2016 to be produced.

ANNUAL RETURN OF INFORMATION FROM SCOTTISH FISH FARMS
FOR THE PERIOD 1 JANUARY TO 31 DECEMBER 2016
OTHER SPECIES – DATA

Please complete and return by 31 January 2017 to L A Munro, Marine Scotland Science
375 Victoria Road, Aberdeen, AB11 9DB

Business No:

1 **How many staff were employed in other species production (company total)**

Full time male | **Full time female** | **Part time male** | **Part time female**

2 **Please detail any accreditation schemes this company is a member of:** _____

		Site No Site Name	Site No Site Name	Site No Site Name	Site No Site Name
3	**How many eyed ova were laid down for hatching in 2016**				
a	from own broodstock				
b	from other GB broodstock				
c	from foreign sources				
4	**How many fry/small fish were**				
a	bought				
b	sold				
5	**What was your total production for the market in TONNES**				
a	Number of tonnes				
b	Number of fish				
6	**From this production what amount in TONNES was certified as organic**				
7	**What is your predicted production for the market in 2017 in TONNES**				
a	Number of tonnes				
b	Number of fish				
8	**What is the holding capacity of the holding units for each site in cubic metres**				
a	Tanks				
b	Ponds				
c	Raceways				
d	Cages				

ANNUAL PRODUCTION SURVEY 2016

GUIDANCE NOTES FOR QUESTIONNAIRE

OTHER SPECIES

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**, or is no longer used to culture the species concerned, please score through the relevant site or species code.

3. When completing the boxes please start from the right, if NONE then enter a **zero** in right hand box eg

					0

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.

Q2. Accreditation Schemes

Please include membership to trade associations, quality schemes or organic certification schemes.

Q5 - 7. 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 2017 to allow the Annual Survey Report for 2016 to be produced.

// APPENDIX 2

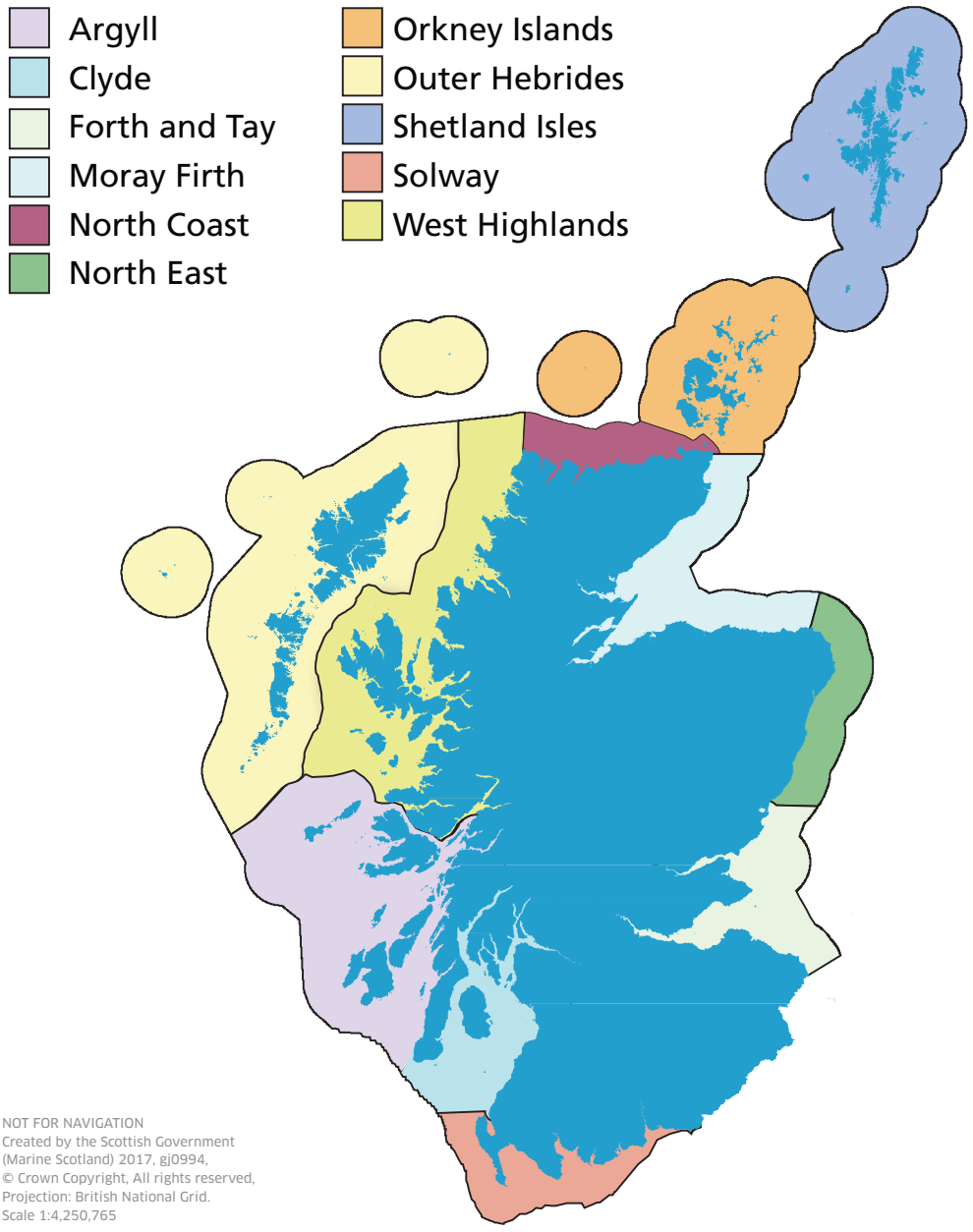
Glossary and Abbreviations

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 National Control Measures	Disease control measures in accordance with The Aquatic Animal Health **National Control** (Scotland) Regulations 2009.
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.
ERM	Enteric redmouth disease.
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.
Fry	The life stage of a young salmon from independence of the yolk sac as the primary source of nutrition to dispersal from the redd.
Gamete	Reproductive cells.
Grilse	Salmon harvested between 1st January and 31st August after one winter at sea.
Intra-peritoneal	Within the body cavity.
IPN	Infectious pancreatic necrosis.
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.
MSS	Marine Scotland Science.
Parr	Young salmon at stage from dispersal from redd to migration as a smolt.

Photoperiod	Alteration of the daylight regime.
Pre-salmon	Salmon harvested between 1st September and 31st December after one winter at sea.
Raceway	Concrete or brick channels used for farming fish.
SAV	Salmonid alphavirus.
S½	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.
S1½	Salmon or sea trout smolting at approximately 18 months from hatch.
S2	Salmon or sea trout smolting at approximately two years from hatch.
Smolt	Fully silvered juvenile salmon ready to be transferred or to migrate to sea.
Third Country	Country outside the EU.
Triploid	Triploid fish are sterile fish which have three sets of chromosomes, unlike a fertile fish that have two sets of chromosomes (diploid).
Year class	Fish hatched or put to sea in a given year.

// APPENDIX 3

Scottish Marine Regions

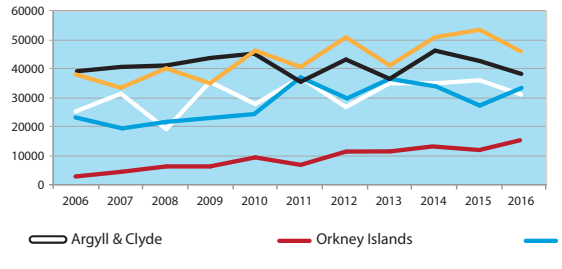


Salmon Production by Scottish Marine Region (Tonnage and Value)

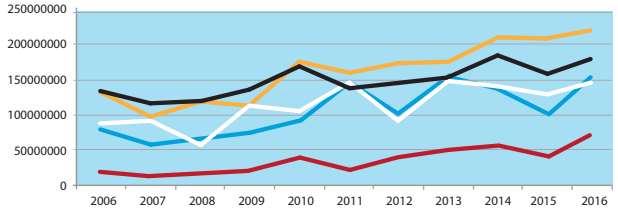
	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
Region	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)	Tonnage	Value (£)
Argyll & Clyde	25,460	89,822,880	31,353	92,334,585	19,229	57,687,000	35,726	115,110,139	27,751	106,120,436	37,157	147,921,619	26,850	93,599,100	34,924	149,684,264	34,976	142,212,416	35,911	134,702,161	31,022	145,803,400
Orkney Islands	3,724	13,138,272	4,432	13,052,240	5,716	17,148,000	6,220	20,040,840	9,388	35,899,712	6,369	25,354,989	11,694	40,765,284	11,479	49,198,994	13,029	52,975,914	11,074	41,538,574	14,752	69,334,400
Outer Hebrides	23,166	81,729,930	19,809	58,337,505	21,569	64,707,000	23,221	74,818,062	24,233	92,666,992	37,343	148,662,483	29,682	103,472,846	36,817	157,797,662	33,775	137,329,150	27,210	102,064,710	32,662	153,511,400
Shetland Isles	39,278	138,572,477	40,795	120,141,275	41,374	124,122,000	43,785	141,075,270	45,439	173,758,736	35,493	141,297,633	43,010	149,932,860	36,694	157,270,484	46,369	188,536,354	42,786	160,490,286	37,464	176,080,800
North Coast & West Highlands	40,219	141,892,632	33,541	98,778,245	40,718	122,154,000	35,295	113,720,490	47,353	181,077,872	41,656	165,832,536	50,987	177,740,682	43,320	185,669,520	50,873	206,849,618	54,741	205,333,491	46,917	220,509,900
All Scotland	**131,847**	**465,156,191**	**129,930**	**382,643,850**	**128,606**	**385,818,000**	**144,247**	**464,764,801**	**154,164**	**589,523,748**	**158,018**	**629,069,260**	**162,223**	**565,510,772**	**163,234**	**699,620,924**	**179,022**	**727,903,452**	**171,722**	**644,129,222**	**162,817**	**765,239,900**

Footnote - Figures for Argyl & Clyde and the North Coast & West Highlands have been merged due to commercial confidentiality. Other finfish species including brown/sea trout, rainbow trout, cod, halibut and cleaner fish were produced but can not be attributed to Scottish Marine Regions due to commercial confidentiality. Average prices (real) have been adjusted for inflation based on 2016 price estimates.

Salmon Tonnes



Value £ real price (inflation adjusted on 2016 Price estimates)



This publication is available at **www.gov.scot**

Any enquiries regarding this publication should be sent to us at
The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

ISBN: 978-1-78851-227-5
ISSN: 1363-5867

This document is also available on The Scottish Government website:
www.gov.scot

Produced for The Scottish Government by APS Group Scotland, 21 Tennant Street, Edinburgh EH6 5NA
PPDAS294846 (09/17)