

**NATIONAL SURVEY OF SEA LICE (*LEPEOPHTHEIRUS*
SALMONIS KRØYER AND *CALIGUS ELONGATUS* NORDMANN)
ON FISH FARMS IN IRELAND – 2008**

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INTRODUCTION

Farming of salmonids in Irish seas in 2007 produced approximately 9,923 tonnes and was worth over €51.2 million (Browne *et al.*, 2008). One of the greatest challenges facing Irish fish farming is sea lice. Sea lice are ectoparasites which occur on many fish worldwide. The main species of concern in Ireland are *Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann. Of the two species of sea lice found on cultured salmonids in Ireland, *C. elongatus* parasitises over 80 different types of marine fish, while *L. salmonis* infests only salmon and other salmonids. *L. salmonis* is regarded as the more serious parasite of the two species and has been found to occur most frequently on farmed Atlantic salmon (Jackson and Minchin, 1992; Jackson *et al.*, 2005). Sea lice have damaging effects in a variety of ways, namely: reduction in growth; reduction of marketability; and loss of scales - which leaves the fish open to secondary infections (Wooten *et al.*, 1982).

Most of the damage caused by these parasites is thought to be mechanical, carried out during the course of attachment and feeding (Kabata, 1974; Brandal *et al.*, 1976; Jones *et al.*, 1990). Inflammation and hyperplasia have been recorded in Atlantic salmon in response to infections with *L. salmonis* (Jones *et al.*, 1990; Jonsdottir *et al.*, 1992; Nolan *et al.*, 2000). Increases in stress hormones caused by sea lice infestations are thought to increase the susceptibility of fish to infectious diseases (MacKinnon, 1998). Severe erosion around the head caused by heavy infestations of *L. salmonis* has been recorded previously (Pike, 1989; Berland, 1993). Heavy infestations occur here because of the rich supply of mucus secreted by mucous-cell lined ducts in that region (Nolan *et al.*, 1999). In experimental and field investigations carried out in Norway, heavy infestation was found to cause fish mortalities (Finstad *et al.*, 2000).

L. salmonis has a direct life-cycle (i.e. a single host) that comprises of ten stages (Figure 1). Following hatching from paired egg-strings, two free-living nauplii stages are dispersed into the plankton. These stages are followed by a copepodid stage where attachment to the host takes place. The copepodid then moults through four attached chalimus stages before becoming a mobile pre-adult male or female. There are two pre-adult stages and this is followed by the fully mature adult phase. The adult female can produce a number of batches of paired egg-strings which in turn hatch into the water column to give rise to the next generation (Kabata, 1979; Schram, 1993).

Figure 1. Life cycle of *Lepeophtheirus salmonis* (after Schram, 1993)

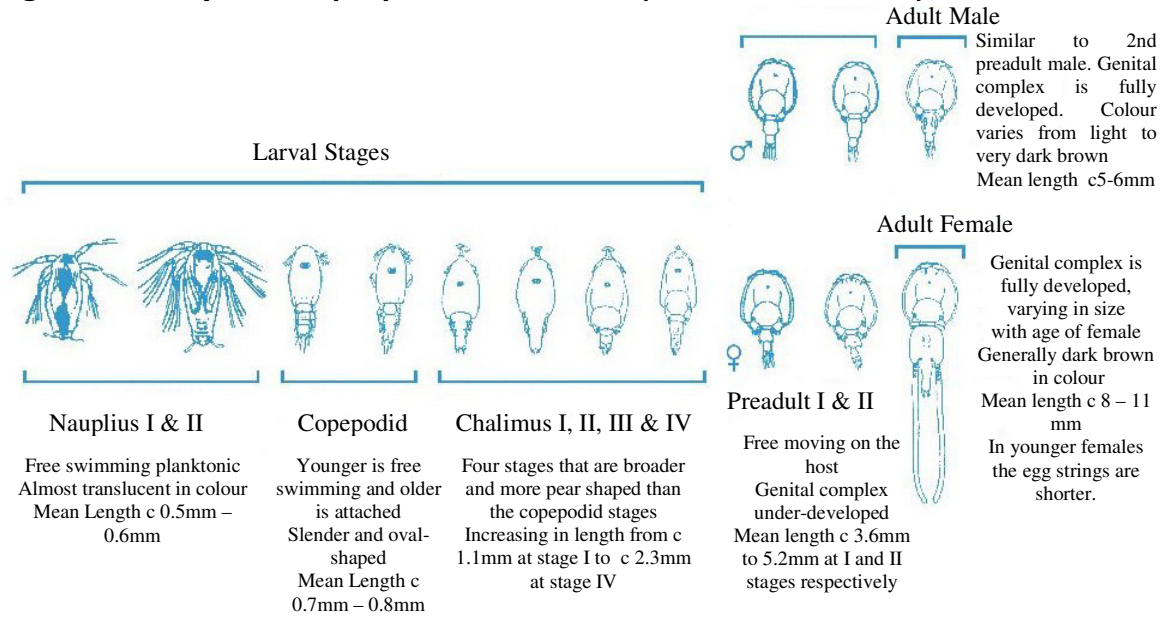
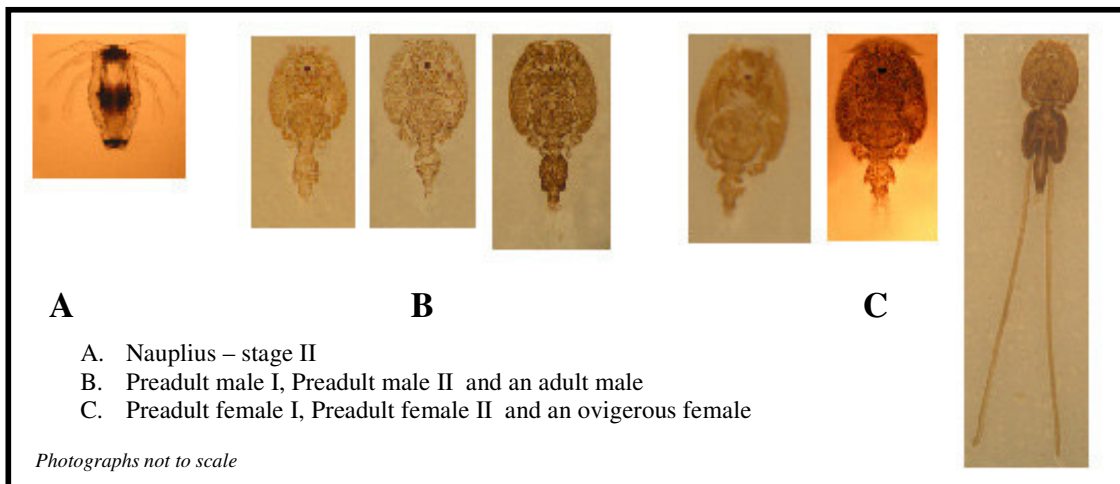


Diagram not to scale

Examples of nauplius, preadult and adult male & ovigerous female *L. salmonis* are shown in Figure 2. The mean length for an adult female is 8mm-11mm and an adult male is 5mm-6mm (Schram, 1993).

Figure 2. Photographs of stages of *L. salmonis*.



Photographs not to scale

C. elongatus is not as host specific as *L. salmonis* and parasitises a range of marine fish (Kabata, 1979). This, combined with the migrating patterns of their hosts, is thought to account for the highly variable levels on farmed salmonids at different times of the year. *C. elongatus* is smaller in size than *L. salmonis* and averages approximately 6-8mm in length (Hogans & Trudeau, 1989).

In 1991, the then Department of the Marine instigated a Sea Lice Monitoring Programme for finfish farms in Ireland, in 1993 it became a nationwide programme. In May 2000 the protocol for sea lice monitoring was formally published (Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control).

The purpose of the national sea lice monitoring programme is:

- ♦ To provide an objective measurement of infestation levels on farms.
- ♦ To investigate the nature of the infestations.
- ♦ To provide management information to drive the implementation of control and management strategies.
- ♦ To facilitate further development and refinement of this strategy.

The sea lice control and management strategy has five principal components:

- ♦ Separation of generations.
- ♦ Annual fallowing of sites.
- ♦ Early harvest of two-sea-winter fish.
- ♦ Targeted treatment regimes, including synchronous treatments.
- ♦ Agreed husbandry practices.

Together, these components work to reduce the development of sea lice infestations and to ensure the most effective treatment of sea lice challenges. They minimise sea lice levels whilst lessening reliance on, and reducing the use of, veterinary medicines. The separation of generations and annual fallowing prevent the vertical transmission of infestations from one generation to the next, thus retarding their development. The early harvest of two-sea-winter fish removes a potential reservoir of sea lice, the agreed practices and targeted treatments enhance the efficacy of treatment regimes. One important aspect of targeted treatments is the carrying out of synchronized autumn / winter treatments to reduce sea lice burdens to as close to zero as practicable on all fish which are to be over-wintered. This is fundamental to achieving near zero egg-bearing sea lice in spring. The agreed husbandry practises cover a range of related fish health, quality and environmental issues in addition to those specifically related to sea lice control. The Single Bay Management programme (SBM) serves to facilitate this and provides a forum for exchange of information and relevant management practices between farmers.

The setting of appropriate treatment trigger levels is an integral part of implementing a targeted treatment regime. Treatment triggers during the spring period are set close to zero in the range of 0.3 to 0.5 egg bearing female *L. salmonis* per fish and are also informed

by the numbers of mobile sea lice present on the fish. Where numbers of mobile sea lice are high, treatments are triggered even in the absence of egg bearing females. Outside of the spring period, a level of 2.0 ovigerous female *L. salmonis* per fish acts as a trigger for treatments. Over the period since the initiation of Single Bay Management, treatment triggers have been progressively reduced from a starting point of 2.0 ovigerous female *L. salmonis* per fish during the spring period to the current levels.

In late winter and early spring the sea water temperatures are at a minimum and the development rates of sea lice are reduced. These temperatures tend to synchronise the development of sea lice larvae. A strategic treatment at this time can break the cycle of infection. Ovigerous female sea lice are those which produce the infective larvae and treatments are timed to remove adult females before they can release larvae. Setting the treatment trigger at 0.5 ovigerous sea lice per fish in spring ensures that treatments are carried out when a maximum of half of the fish examined have any ovigerous sea lice. This is an optimum time to interrupt sea lice development. Later in the year, the development of new generations are not as synchronized and automatic intervention at a sea lice level of 0.5 ovigerous by way of treatment is not justified. A level of 2.0 ovigerous sea lice per fish has been shown to be a pragmatic level at which intervention by way of treatment is advisable. Levels of mobile sea lice or juvenile sea lice are important in advising fish health professionals in developing a sea lice control strategy. However, they are not of themselves appropriate measures upon which to trigger mandatory treatments.

Results of the monitoring programme are sent to the relevant farm within 5-10 days of the inspection. A monthly report of results is circulated to interested parties and the data is published annually (O'Donohoe *et al.*, 2008; O'Donohoe *et al.*, 2007; O'Donohoe *et al.*, 2006; O'Donohoe *et al.*, 2005; O'Donohoe *et al.*, 2004; O'Donohoe *et al.*, 2003; McCarney *et al.*, 2002; Copley *et al.*, 2001).

Table I shows a list of the animal medicines and other remedies available to assist in the control of sea lice.

Table 1. List of options available to assist in the control of sea lice.

Compound	Trade Name	Licensing status	Delivery Method	Group	Mode of action	Stages targeted	Withdrawal period
Animal medicines							
Azamethiphos	Salmosan®	AR-16	Bath	Organo-phosphate	Interferes with nerve transmission by blocking acetylcholinesterase at synapse	Adults, Preadults	24 hours
Cypermethrin	Excis®	Full MA	Bath	Pyrethroid	Interferes with nerve transmission by blocking sodium channels in nerve cells	Adults, Preadults, Chalimus III-IV	24 hours
Deltamethrin	Alphamax®	AR-16	Bath	Pyrethroid	Interferes with nerve transmission by blocking sodium channels in nerve cells	Adults, Preadults, Chalimus unknown	3 days (2 days for pen within 100m of treatment)
Emamectin benzoate	Slice®	Full MA	In-feed	Avermectin	Interferes with neurotransmission disrupting nerve cells causing paralysis and death. Effective at 3- 15°C. Protects fish for up to 11 weeks post treatment.	All stages	Zero
Teflubenzuron	Ektobann®	AR-16	In-feed	Insect Growth Regulator	Inhibits chitin synthesis preventing moulting and growth. Limited efficacy beyond medication period. Not authorized for use below 9°C	Moulting stages - Chalimus, Preadults only	7 days
Disinfectants							
Hydrogen peroxide			Bath	Oxidizer	Formation of gas bubbles on and within the sea lice.	Adults, Preadults	
Immuno-stimulants							
	Ergosan®		In-feed	Seaweed extract	Immuno-stimulant		
	Ecoboost®		In-feed	Blend of aromatic herbs	Immuno-stimulant		
Others							
Bioemitters			In cage		Electromagnetic signal		
	Bio-mos®		In-feed	Extract from yeast wall	Increases mucus production		
Wrasse			In cage		Cleaner fish. Issues with wrasse availability and efficacy	Adults, Preadults	

MA - marketing authorisation.

All AR16 licenses are temporary and specific for named sites and quantities.

METHODOLOGY

All stocks of salmonids on all farms in Ireland are visited on 14 occasions throughout the year when present. Sea lice are monitored for species, life stage and quantity. Follow-up inspections may be carried out where required. Sea lice inspections take place monthly, with two inspections taking place each month during March, April and May; referred to as the spring period. One inspection is carried out for the December-January period. At each inspection two samples are taken for each generation of fish on site, a sample from a standard cage, which is sampled at each subsequent inspection, and a sample from a random cage, which is selected on the day of the inspection. Thirty fish are examined for each sample by anaesthetising them in a container of sea water. The sea water is sieved for any lice at the end of each sample. Each fish is examined individually for all mobile lice. Lice are removed and placed in a bottle containing 70% alcohol, one bottle per fish. In the laboratory the species, quantity and life stage of the sea lice are determined and recorded. The mean number of sea lice per fish is calculated by adding the number of sea lice taken from each fish with the number from the sieved sea water, then dividing by the number of fish examined.

Results presented are mean ovigerous sea lice levels and mean mobile sea lice levels for *L. salmonis* and *C. elongatus*. Total mobile levels estimate successful infestation levels. Ovigerous sea lice levels estimate breeding female populations. The information gathered aims to evaluate the levels of sea lice on the fish and to inform the farmer on a control strategy, by advising treatment if necessary. Effective parasite control is characterised by a drop in lice levels on the subsequent inspection.

In the year 2008, salmonid farms had 5 different stocks of fish. These were: 2007 rainbow trout, *Oncorhynchus mykiss* (Walbaum) (rainbow trout first inspected in 2007); 2008 rainbow trout (rainbow trout first inspected in 2008); 2006 Atlantic salmon, *Salmo salar* L. (two-sea-winter salmon); 2007 Atlantic salmon (one-sea-winter salmon) and 2008 Atlantic salmon (smolts).

There are three distinct regions in Ireland where salmonid farming is carried out; the West (Counties Mayo and Galway), the Northwest (Co. Donegal) and the Southwest (Counties Cork and Kerry). These regions are geographically separate from each other with distances between regions of c.160 km from Northwest to West and c.200 km from West to Southwest. In the year 2008 a total number of 32 sites were inspected around Ireland, see figures 3-5.

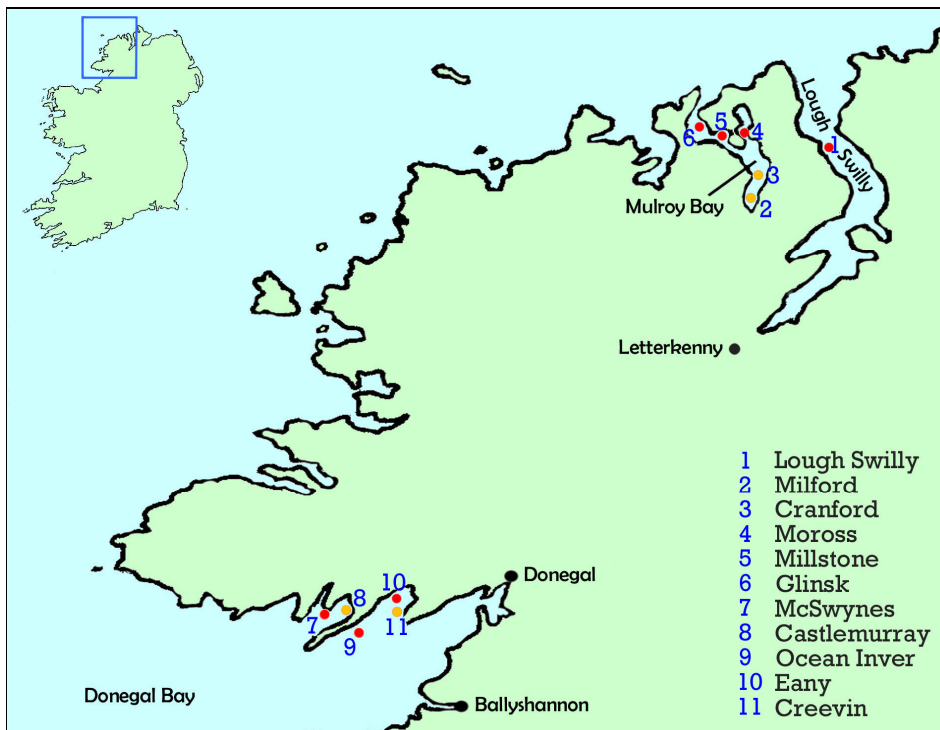


Figure 3. Locations of fish farm sites in Northwest region.

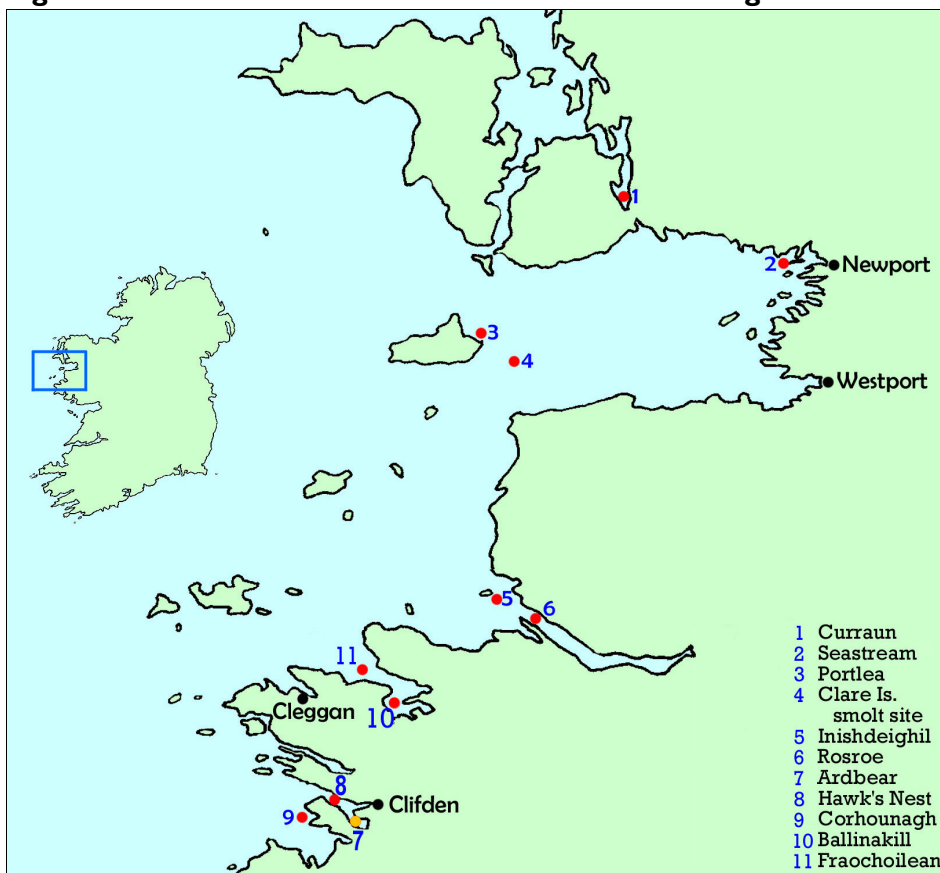


Figure 4a. Locations of fish farm sites in the West region (Mayo & N. Connemara).

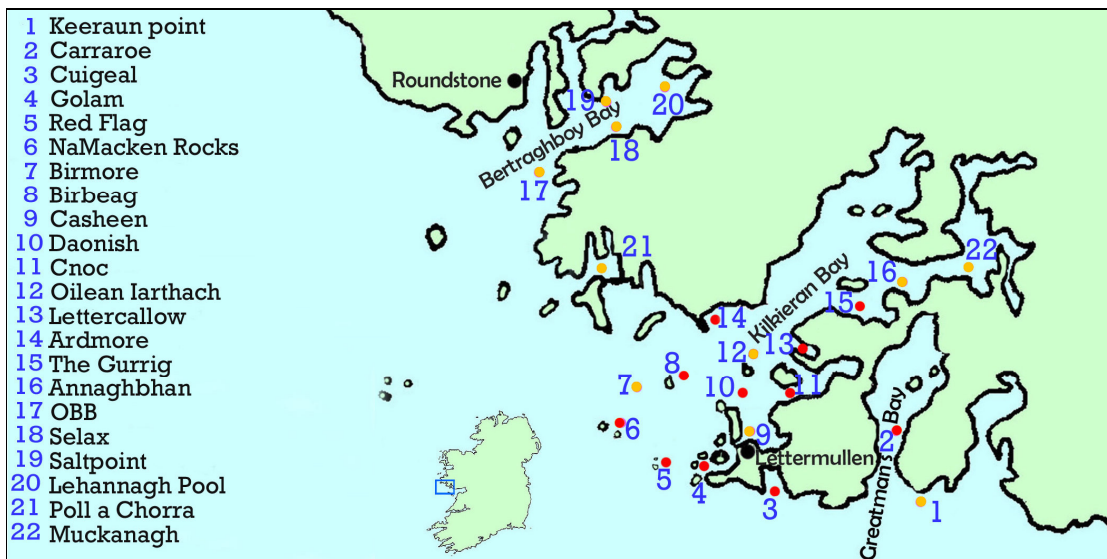


Figure 4b. Locations of fish farm sites in the West region (S. Connemara).

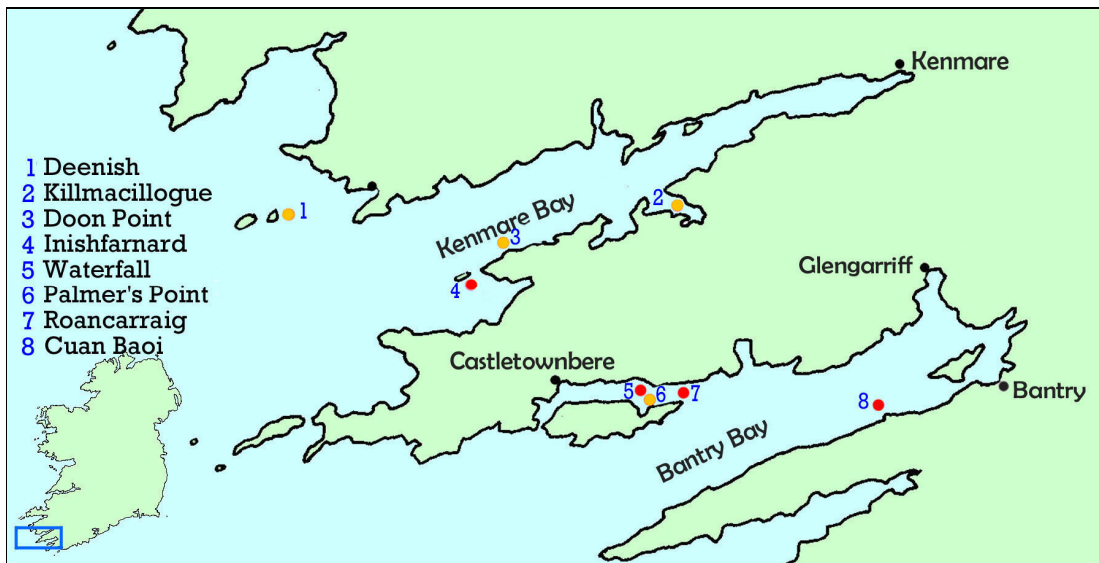


Figure 5. Locations of fish farm sites in the Southwest region.

- Sites stocked in 2008
- Sites fallow in 2008

RESULTS

Atlantic salmon 2006 (two-sea-winter salmon)

At the beginning of 2008, two-sea-winter salmon were stocked on 4 sites: Ballinakill (Bifand Ltd.), Ballinakill Harbour; Seastream Inner (Clare Island Seafarms Ltd.), Clew Bay; Millstone, Mulroy Bay, and Lough Swilly (Marine Harvest). Table 2 contains the number of inspections per site and total number of inspections exceeding the treatment trigger levels.

Table 2. National breakdown of inspections for 2006 fish on fish farm sites in 2008.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Bifand Ltd	Ballinakill	4	3	2	1	6	4	75%	50%	67%
Clare Island Seafarms Ltd.	Seastream Inner	5	3	2	0	7	3	60%	0%	43%
West	Totals	9	6	4	1	13	7	67%	25%	54%
Marine Harvest	Millstone	0	0	1	0	1	0	0%	0%	0%
	Lough Swilly	0	0	1	0	1	0	0%	0%	0%
Northwest	Totals	0	0	2	0	2	0	0%	0%	0%
National Totals		9	6	6	1	15	7	67%	17%	47%

A total of 15 visits were undertaken to these sites before harvesting was completed, with 47% of inspections exceeding treatment trigger levels.

Atlantic salmon 2007 (one-sea-winter salmon)

One-sea-winter salmon were stocked in a total of 13 sites in 9 bays in 2008. One hundred and fourteen visits were undertaken to this generation of fish. Three sites, in 3 bays, continued to stock one-sea-winter salmon in November 2008.

Ovigerous *L. salmonis* levels greater than the treatment trigger level were recorded in a total of 49 inspections (43%) on one-sea-winter fish (see Table 3). Within the critical spring period, sea lice levels were in excess of 0.5 ovigerous females per fish on 29 inspections (48%) and outside of the spring period 20 inspections (38%) were in excess of 2.0 ovigerous female sea lice per fish.

Table 3. National breakdown of inspections for 2007 fish on all fish farm sites in 2008.

	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
National Totals	61	29	53	20	114	49	48%	38%	43%

C. elongatus levels were consistently recorded at a low level throughout the year.

Southwest Region

There were no 2007 Atlantic salmon fish stocked in the Southwest region in 2008.

West Region

In the West region, sea lice infestation levels greater than the treatment trigger were recorded on 20 out of 37 inspections (54%) in the spring period and on 15 out of 29 inspections (52%) outside the spring period (see Table 4).

Table 4. Breakdown of inspections for 2007 fish on West sites in 2008.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Muirachmhainni Teo	Daonish	6	3	4	3	10	6	50%	75%	60%
Muir Gheal Teo	Cnoc	4	2	2	0	6	2	50%	0%	33%
Eisc Ui Flathartha Teo	Ardmore	6	3	4	2	10	5	50%	50%	50%
Mannin Bay Salmon Co Ltd	Corhounagh	6	6	2	2	8	8	100%	100%	100%
	Hawk's nest	0	0	2	2	2	2	0%	100%	100%
Bifand Ltd	Fraochoilean	4	4	2	1	6	5	100%	50%	83%
Celtic Atlantic Salmon (Killary) Co ltd	Rosroe	5	1	5	3	10	4	20%	60%	40%
Clare Island Seafarms Ltd	Seastream Inner	0	0	2	1	2	1	0%	50%	50%
	Portlea	6	1	6	1	12	2	17%	17%	17%
West	Totals	37	20	29	15	66	35	54%	52%	53%

At Corhounagh (Mannin Bay Salmon Co. Ltd.), Mannin Bay, sea lice exceeded treatment trigger levels for all 6 inspections in the spring and for both of the 2 inspections outside the spring. Both inspections at Hawk's Nest in January and February were in excess of treatment trigger levels.

Fraochoilean (Bifand Ltd.), Ballinakill Bay, exceeded treatment trigger levels for all 4 spring inspections and 1 of the 2 inspections outside the spring period.

Levels at Daonish (Muirachmhainni Teo), Kilkieran Bay, were in excess of treatment trigger levels for 3 out of 6 inspections in the spring period and 3 of the 4 inspections outside the spring period.

Ardmore, (Eisc Ui Flathartha Teo), Kilkieran Bay, was above treatment trigger levels for 3 of the 6 spring inspections and 2 of the 4 inspections outside the spring period.

Sea lice levels at Rosroe (Celtic Atlantic Salmon (Killary) Ltd.), Killary Harbour, were in excess of treatment trigger levels for 1 of the 5 inspections in spring and 3 of the 5 inspections outside the spring period.

Cnoc (Muir Gheal Teo.), Kilkieran Bay, were above treatment trigger levels for 2 of the 4 spring inspections and none of the 2 inspections outside spring.

Northwest Region

The treatment trigger levels were exceeded on 9 out of 24 inspections (38%) in the Northwest region during the spring period and on 5 out of 24 inspections (21%) outside that period (see Table 5).

Table 5. Breakdown of inspections for 2007 fish on Northwest sites in 2008.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Marine Harvest	McSwyne's Bay	6	3	8	0	14	3	50%	0%	21%
	Moross I	6	3	2	0	8	3	50%	0%	38%
	Millstone	6	1	8	3	14	4	17%	38%	29%
	Lough Swilly	6	2	6	2	12	4	33%	33%	33%
Northwest	Totals	24	9	24	5	48	14	38%	21%	29%

McSwyne's Bay (Marine Harvest), Donegal Bay, had sea lice levels in excess of treatment trigger levels for the second inspection in March and both April inspections before achieving control.

Moross I (Marine Harvest), Mulroy Bay, had elevated sea lice levels for the second April inspection and both May inspections before transfer to Millstone, Mulroy Bay, where levels were elevated in June and again in September and October.

Atlantic salmon 2008 (Smolts)

A total of 150 visits were undertaken at 21 sites stocking S1 and S½ smolts during the year 2008. *L. salmonis* levels were maintained below the treatment trigger level of 0.5 ovigerous female lice per fish for all but 1 of the 58 inspections in the spring period. Outside of this period, levels exceeded 2.0 ovigerous female lice per fish on 13 of the 92 inspections (see Table 6).

Table 6. National breakdown of inspections for 2008 fish on fish farm sites in 2008.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Fastnet Mussels Ltd	Cuan Baoi	6	0	8	0	14	0	0%	0%	0%
Silver King Seafoods Ltd	Roanacarraig	6	0	8	0	14	0	0%	0%	0%
	Inishfarnard	2	0	6	0	8	0	0%	0%	0%
Southwest	Totals	14	0	22	0	36	0	0%	0%	0%
Muirachmhainni Teo	Carraroe	2	0	5	1	7	1	0%	20%	14%
	Cuigeal	3	0	4	0	7	0	0%	0%	0%
	Daonish	0	0	3	2	3	2	0%	67%	67%
	Golam	5	0	2	0	7	0	0%	0%	0%
	Red Flag	1	0	3	1	4	1	0%	33%	25%
Muir Gheal Teo	Cnoc	0	0	2	2	2	2	0%	100%	100%
	Lettercallow	5	0	2	0	7	0	0%	0%	0%
	The Gurrig	4	0	2	0	6	0	0%	0%	0%
	Birbeag	2	1	3	0	5	1	50%	0%	20%
	Carraig na Meacha	1	0	3	2	4	2	0%	67%	50%
	Ardmore	0	0	2	2	2	2	0%	100%	100%
Mannin Bay Salmon Co Ltd	Hawk's nest	2	0	6	0	8	0	0%	0%	0%
Bifand Ltd	Fraochoilean	6	0	8	2	14	2	0%	25%	14%
Celtic Atlantic Salmon (Killary) Co Ltd	Inishdeighil	2	0	5	0	7	0	0%	0%	0%
Clare Island Seafarms Ltd.	C.I. smolt site	2	0	5	0	7	0	0%	0%	0%
	Portlea	0	0	1	0	1	0	0%	0%	0%
West	Totals	35	1	56	12	91	13	3%	21%	14%
Marine Harvest	OceanInver	6	0	8	0	14	0	0%	0%	0%
	Glinsk	3	0	6	1	9	1	0%	17%	11%
Northwest	Totals	9	0	14	1	23	1	0%	7%	4%
National Totals		58	1	92	13	150	14	2%	14%	9%

C. elongatus levels remained low throughout the year on 2008 smolts.

Rainbow trout

In 2008 there were 2007 rainbow trout and 2008 rainbow trout stocked between 3 sites, in 3 regions. There were a total of 38 inspections carried out on the 2007 rainbow trout. Sea lice levels reached treatment trigger levels on 2 inspections.

Sixteen inspections were carried out on the 2008 rainbow trout, stocked in Bealacragher Bay and Donegal Bay. Four of these inspections were above treatment trigger levels.

C. elongatus levels remained low throughout the year on rainbow trout.

Sampling record

Seven inspections were missed due to weather or technical difficulties in 2008. Four in April for technical reasons, two in August due to scheduling and weather problems and one in October. All the mean values for each farm visit can be seen in Appendix I.

One-sea-winter salmon monthly trend

Mean ovigerous and mean mobile *L. salmonis* and *C. elongatus* levels for each bay are shown in Table 7 for one-sea-winter salmon throughout the year. Monthly ovigerous *L. salmonis* levels were greater than the treatment trigger level of 0.5 ovigerous sea lice per fish on 12 of the 23 occasions during the spring period on a bay basis. These occurred in Mannin Bay (3), Kilkieran Bay (2), Ballinakill Harbour (2), Killary Harbour (1), Mulroy Bay (1), Donegal Bay (1), Lough Swilly (1) and Clew Bay (1). On 17 out of 45 inspections, outside of the spring period, mean ovigerous levels of 2.0 ovigerous females per fish or greater were recorded. These occurred in Mulroy Bay (3), Killary Harbour (3), Mannin Bay (2), Lough Swilly (2), Kilkieran Bay (2), Clew Bay (2), Clifden Bay (2) and Ballinakill Harbour (1).

Mean mobile levels in excess of 10 *L. salmonis* per fish were recorded on 24 occasions and 13 of these had means of greater than 20 mobile lice per fish. Three of these were over 40 mobile sea lice per fish with 1 exceeding 100 mobile sea lice per fish, in Killary Harbour in August. This is the highest level recorded in 2008, at 118.11 mobile sea lice per fish, which compares to a maximum level of 142.50 mobile sea lice per fish in 2007.

Table 7. Mean ovigerous and mean mobile *Lepeophtheirus salmonis* and *Caligus elongatus* per month, for one- sea-winter salmon for each bay inspected in the year 2008.

Mean ovigerous *L. salmonis*

	<i>Dec/Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>
Ballinakill Harbour	0.92	2.93	2.94	3.28	HO						
Clew Bay	0.04	0.38	1.40	0.18	0.23	1.00	0.97	1.04	2.23	0.03	5.00
Clifden Bay	6.29	3.00	TO								
Donegal Bay	0.19	0.03	0.40	1.66	0.01	1.71	0.14	0.74	0.90	0.00	0.02
Kilkieran Bay	1.21	0.88	0.88	0.62	0.49	4.54	8.40	HO			
Killary Harbour	0.12	0.29	0.26	0.17	0.77	3.61	3.18	7.84	HO		
Lough Swilly	0.20	0.00	0.67	0.49	0.00	1.38	1.03	5.22	3.50	HO	
Mannin Bay			0.83	10.46	2.21	5.69	7.42	HO			
Mulroy Bay	0.83	0.44	0.11	0.48	0.96	2.15	0.38	1.91	5.12	4.59	1.10

Mean mobile *L. salmonis*

	<i>Dec/Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>
Ballinakill Harbour	6.64	6.83	9.18	43.78	HO						
Clew Bay	4.87	6.44	4.03	3.38	2.12	1.65	3.09	3.11	11.23	0.05	12.62
Clifden Bay	28.35	31.65	TO								
Donegal Bay	0.45	0.13	2.91	3.63	0.27	2.62	0.25	1.52	2.36	0.19	1.33
Kilkieran Bay	9.31	10.95	11.47	5.65	10.08	10.88	23.72	HO			
Killary Harbour	0.92	5.37	1.38	35.36	36.22	5.47	25.43	118.11	HO		
Lough Swilly	1.88	1.78	12.11	1.46	0.85	2.34	3.95	11.92	20.73	HO	
Mannin Bay			29.00	25.25	7.45	17.88	17.55	HO			
Mulroy Bay	11.96	3.66	5.08	4.42	6.10	7.22	3.17	6.44	21.95	50.44	6.87

Mean ovigerous *C. elongatus*

	<i>Dec/Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>
Ballinakill Harbour	0.04	0.33	0.20	0.19	HO						
Clew Bay	0.02	0.09	0.12	0.02	0.11	0.14	0.02	0.05	0.37	0.00	0.37
Clifden Bay	0.05	0.00	TO								
Donegal Bay	0.61	0.16	1.13	1.84	0.26	0.36	0.00	0.00	0.00	0.00	0.00
Kilkieran Bay	0.02	0.00	0.01	0.04	0.08	0.00	0.00	HO			
Killary Harbour	0.00	0.02	0.02	0.04	0.06	0.00	0.09	0.05	HO		
Lough Swilly	0.00	0.00	0.62	0.21	0.03	0.24	0.02	0.02	0.00	HO	
Mannin Bay			0.05	0.07	0.00	0.00	0.00	HO			
Mulroy Bay	0.02	0.00	0.01	0.04	0.17	0.22	0.00	0.02	0.02	0.02	0.03

Mean mobile *C. elongatus*

	<i>Dec/Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>
Ballinakill Harbour	0.16	0.43	0.35	0.29	HO						
Clew Bay	0.02	0.18	0.19	0.12	0.23	0.25	0.07	0.13	0.73	0.00	0.44
Clifden Bay	0.07	0.00	TO								
Donegal Bay	0.88	0.31	2.28	3.52	0.57	0.44	0.00	0.00	0.00	0.00	0.00
Kilkieran Bay	0.04	0.01	0.06	0.05	0.17	0.03	0.00	HO			
Killary Harbour	0.00	0.02	0.02	0.17	0.11	0.00	0.29	0.05	HO		
Lough Swilly	0.00	0.00	2.07	0.29	0.11	0.34	0.02	0.07	0.00	HO	
Mannin Bay			0.19	0.24	0.00	0.03	0.00	HO			
Mulroy Bay	0.11	0.02	0.03	0.08	0.34	0.24	0.00	0.04	0.04	0.22	0.17

HO = Harvested out
TO = Transferred out

Regional monthly means for one-sea-winter salmon

L. salmonis monthly mean figures for one-sea-winter salmon are shown in Figures 6 and 7 for the regions. There were no one-sea-winter salmon stocked in the Southwest in 2008. Regional monthly mean *L. salmonis* levels were in excess of treatment trigger levels for all 3 spring months in 2008 in the West region and for the month of April in the Northwest. In the West monthly mean ovigerous levels were in excess of treatment trigger levels outside of the spring period in June, July, August, September and November. In the Northwest monthly mean ovigerous levels exceeded the treatment trigger levels in April, August, September and October before reducing in November.

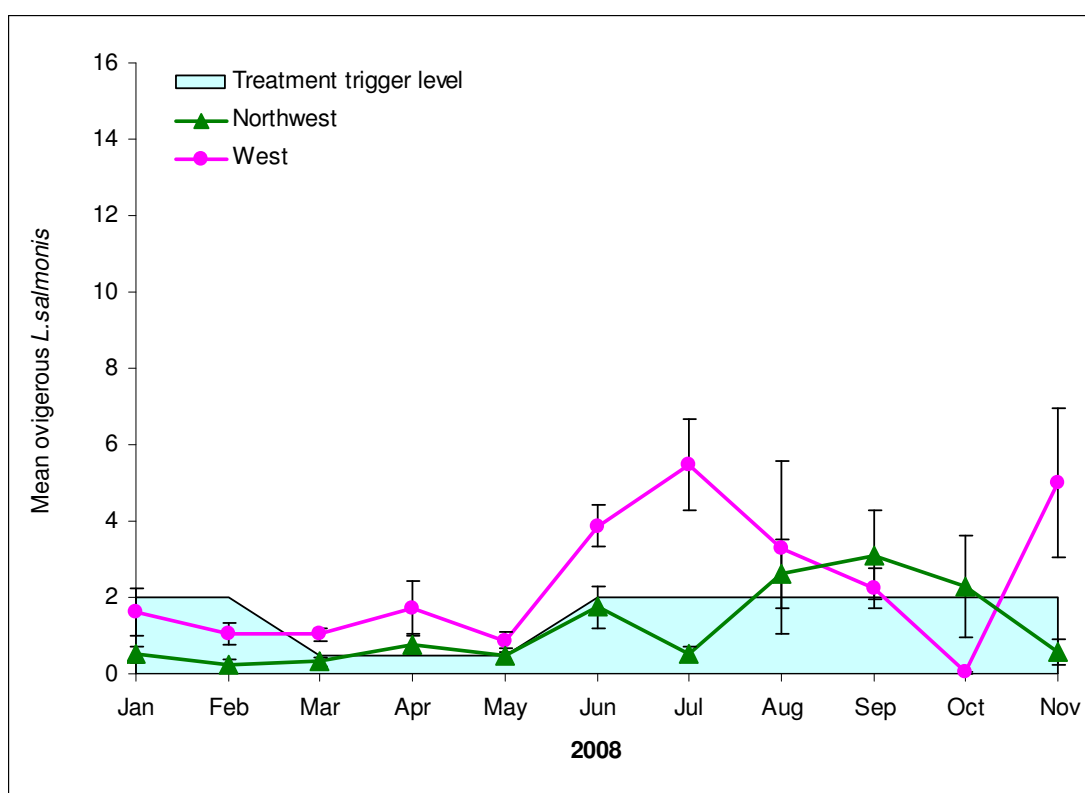


Figure 6. Mean (SE) ovigerous *L. salmonis* per month per region in 2008 on one-sea-winter fish.

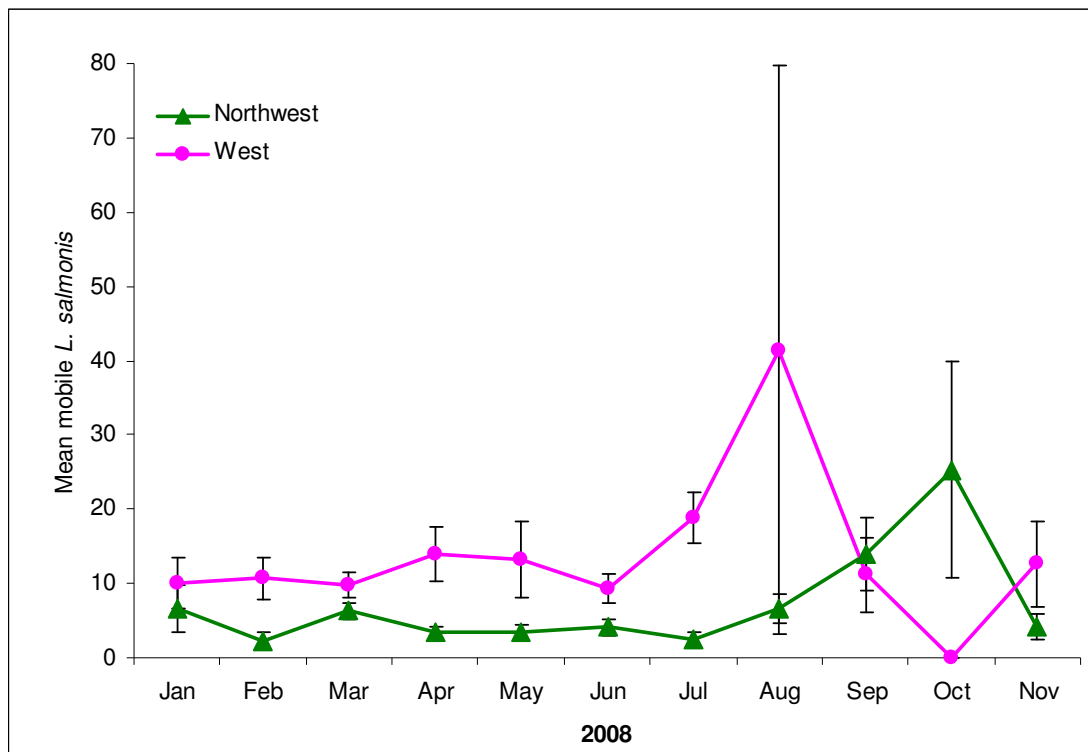


Figure 7. Mean (SE) mobile *L. salmonis* per month per region in 2008 on one-sea-winter fish.

Total mobile sea lice levels exceeded 10 sea lice per fish in January, February, April, May, July, August, September and November in the West region. In the Northwest total mobile levels exceeded 10 per fish in September and October.

Annual trends

The annual trend of *L. salmonis* ovigerous and mobile sea lice levels are compared in Figures 8 and 9 for one-sea-winter salmon in the month of May from 1991 to 2008. The mean number of ovigerous and mobile sea lice per fish are presented.

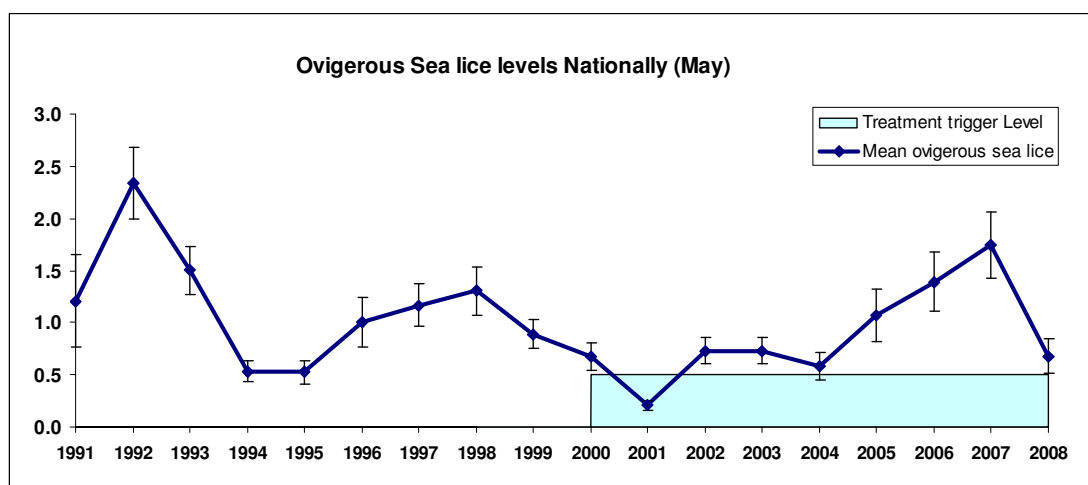


Figure 8. Annual trend (May mean) (SE) ovigerous *L. salmonis* on one-sea-winter salmon.

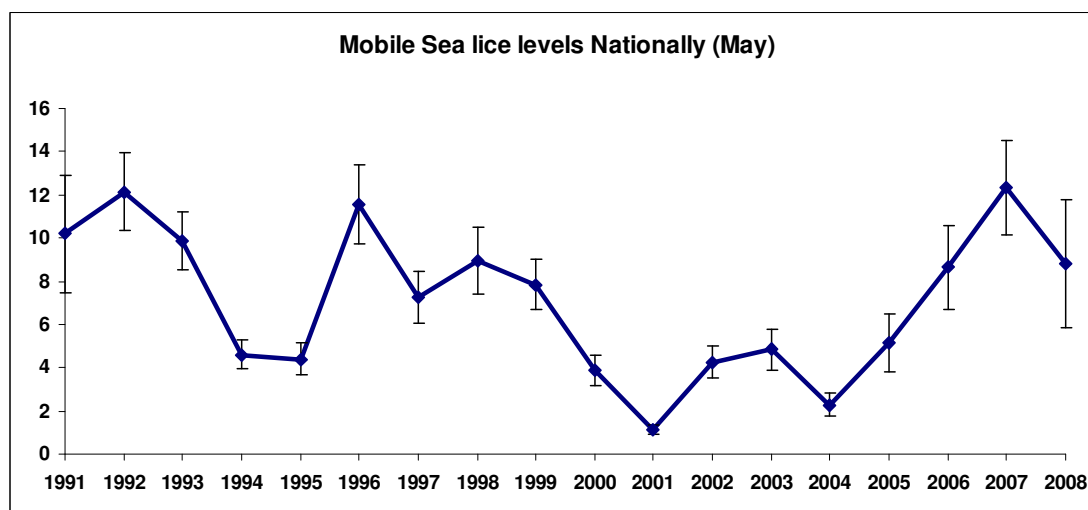


Figure 9. Annual trend (May mean) (SE) mobile *L. salmonis* on one-sea-winter salmon.

Sea lice levels were at their lowest on record in 2001 for both ovigerous and total mobile lice. Mean ovigerous *L. salmonis* levels have increased steadily since 2004 but showed a significant drop in the 2008 figure, to 0.68 ovigerous *L. salmonis* per fish.

Mean mobile levels show a similar pattern with the lowest levels recorded in 2001. There has been an increase in mobile sea lice levels from 2004 to 2007 and again a significant drop in the 2008 figure.

DISCUSSION

In 2008, of the 333 sea lice inspections carried out on salmonids, 74.9% of Atlantic salmon samples and 96.3% of rainbow trout samples were below the treatment trigger levels outlined in the Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control, Department of Marine and Natural Resources (2000).

In the smolt stock, 90.7% of inspections were below the treatment trigger levels, as were 78.4% of inspections on one-sea-winter salmon and 53.3% of inspections on two-sea-winter salmon.

On one-sea-winter salmon sea lice levels exceeded treatment trigger levels for 53% of inspections in the West and for 29.1% of inspections in the Northwest. During the spring period 54.1% and 37.5% of inspections exceeded the lower treatment trigger of 0.5 ovigerous sea lice per fish in the West and Northwest respectively. There were no one-sea-winter fish stocked in the Southwest in 2008. The monthly trend of sea lice levels on one-sea-winter salmon show that regional mean sea lice levels in the West, on one-sea-winter salmon, were elevated for the spring period, and again in June, July, August, September and also in November. In the Northwest, sea lice levels were elevated once in spring, with control being achieved over the summer months. Sea Lice levels increased from August to October with numbers in November dropping below treatment trigger levels. Total mobile sea lice levels held steady for most of the year but reached regional peaks of 41.44 total mobile *L. salmonis* per fish in August in the West and 25.31 total mobile *L. salmonis* per fish in October the Northwest.

Of the 15 inspections carried out on two-sea-winter fish, between Dec/Jan 08 and the last inspection in May, prior to completion of harvest, a maximum of 71.5 mobile sea lice per fish was recorded in the West and a maximum of 11.44 mobile sea lice per fish in the Northwest. This represented a reduction on maximum infestation levels recorded in 2007. The maximum level recorded for an individual site was 118.11 mobile *L. salmonis* per fish in 2008, compared to 142.5 in 2007.

The May mean annual trend *L. salmonis* graphs of one-sea-winter fish (figures 8 & 9) show that there was a decrease in both the May mean ovigerous levels and May mean mobile levels nationally compared to 2007. This difference in sea lice numbers may perhaps be a reflection of the increased effort in sea lice control.

Sea lice levels nationally in 2008 have shown an overall improvement when compared to 2007 levels, particularly in the Northwest region. This reflects, in part, at least, an increase in both effort and focus of effort. Sea lice numbers above the treatment trigger levels in the West were similar to 2007, however overall sea lice levels are lower in 2008 and show less variability. Sites where fallowing has taken place and where sea lice management has been prioritised have benefited with lower sea lice levels.

The presence of pancreas disease and challenges from water borne irritants, such as jellyfish and certain species of phytoplankton e.g. *Karenia mikimotoi* can have a detrimental effect on fish health leading to increased difficulties in the control of sea lice, especially in the summer months.

Sea temperatures are always a factor in the management of sea lice. Increases in water temperature leads to an acceleration in the life cycle of the sea louse and also an increase in reproductive output (Hogans and Trudeau, 1989). In the last number of years mean monthly sea temperatures have been relatively high with the average sea temperature in 2007 being 0.54°C higher than the 30 year mean (worked from source data from Met Éireann - www.met.ie).

In May 2008 the Department of Agriculture, Fisheries and Food published “A strategy for the improved pest control on Irish salmon farms”. This strategy outlines a range of measures to facilitate sea lice control. These measures will draw on the ongoing Single Bay Management process and will, through a comprehensive action plan and list of recommendations, seek to advance the suite of tools necessary for improved sea lice control on farms.

GLOSSARY

<i>Grower:</i>	A fish which has been at sea for one complete year or longer.
<i>Hyperplasia</i>	Enlargement caused by an abnormal increase in the number of cells in an organ or tissue.
<i>Mobile lice:</i>	All lice that are mobile – male and female (pre-adult and adult stages) sea lice that have developed beyond the attached larval stages.
<i>Ovigerous lice:</i>	An egg bearing adult female sea lice.
<i>Random (Ran.) Cage:</i>	A cage which is selected by the inspector on the day of inspection.
<i>Standard (Std.) Cage:</i>	The selected cage which is sampled at each inspection.
<i>S1 Smolt:</i>	This pertains to a stage in the life cycle of the salmon when it changes from being a freshwater fish to a seawater fish, a process known as smoltification. These fish are transported to the saltwater environment in the spring, which is approximately 15 months after they were hatched.
<i>S1/2 Smolt:</i>	These fish are exposed to manipulated photoperiods to hasten the onset of smoltification. Hence an S1/2 smolt is ready to go to sea during the Autumn/Winter, approximately 11 months after hatching. Also known as S0 (S zero) smolts.
<i>SE:</i>	Standard error (error bars in the graphs) is the standard error of the mean of a sample from a population with a normal distribution, which is equal to the standard deviation of the normal distribution divided by the square root of the sample size.

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APPENDIX I. Mean sea lice levels on salmonid farms in 2008.

	Date	<i>L.salmonis</i>		<i>C.elongatus</i>	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
<i>JOHN POWER LTD.</i>					
Waterfall					
Rainbow Trout, 2007 (1)	15/01/2008	0.95	3.95	2.57	3.81
	06/02/2008	0.33	1.54	0.77	0.92
	04/03/2008	0.00	0.00	0.00	0.00
	19/03/2008	0.00	0.03	0.00	0.03
	02/04/2008	0.00	0.10	0.00	0.00
	15/04/2008	0.03	0.10	0.10	0.17
	08/05/2008	0.04	0.09	0.02	0.02
	22/05/2008	0.00	0.13	0.15	0.25
	13/06/2008	0.03	0.12	0.02	0.10
	18/07/2008	0.03	0.21	0.06	0.11
	20/08/2008	0.07	0.22	0.07	0.14
			Harvested out		
<i>MURPHYS IRISH SEAFOOD</i>					
Cuan Baoi					
Atlantic Salmon, 2008 S1/2	16/01/2008	0.00	0.12	1.20	2.80
	06/02/2008	0.00	0.07	0.96	1.22
	04/03/2008	0.00	0.07	1.28	4.07
	18/03/2008	0.03	0.13	2.37	5.13
	02/04/2008	0.00	0.35	2.19	3.46
	15/04/2008	0.00	0.15	0.76	2.18
	08/05/2008	0.06	0.29	0.77	2.35
	21/05/2008	0.03	0.16	0.84	2.55
	12/06/2008	0.00	0.00	0.45	1.00
	17/07/2008	0.03	0.10	0.13	0.33
	20/08/2008	0.00	0.08	0.15	0.23
	08/09/2008	0.07	0.07	0.00	0.00
	14/10/2008	0.20	0.20	0.48	0.76
	04/11/2008	0.07	0.21	0.62	1.00

SILVER KING SEAFOODS LTD.**Roanarraig**

Atlantic Salmon, 2007	16/01/2008	Harvested out			
Atlantic Salmon, 2008 S1/2	16/01/2008	0.00	0.31	0.06	0.28
	06/02/2008	0.02	0.27	0.44	1.23
	04/03/2008	0.00	0.04	0.00	0.00
	19/03/2008	0.00	0.00	0.00	0.00
	02/04/2008	0.00	0.00	0.00	0.00
	15/04/2008	0.00	0.02	0.00	0.00
	08/05/2008	0.00	0.02	0.04	0.10
	22/05/2008	0.00	0.00	0.23	0.65
	13/06/2008	0.00	0.00	0.10	0.16
	18/07/2008	0.03	0.16	0.38	0.70
	20/08/2008	0.09	0.64	0.91	1.36
	08/09/2008	0.08	0.42	0.93	1.72
	14/10/2008	0.25	0.61	0.28	0.79
	05/11/2008	0.17	0.40	0.20	0.40

KENMARE BAY**SILVER KING SEAFOODS LTD.****Inishfarnard**

Atlantic Salmon, 2008	08/05/2008	0.00	0.00	0.00	0.00
	22/05/2008	0.00	0.00	0.00	0.00
	13/06/2008	0.00	0.00	0.00	0.00
	18/07/2008	0.00	0.00	0.05	0.19
	20/08/2008	0.00	0.02	0.03	0.03
	08/09/2008	0.00	0.03	0.00	0.00
	14/10/2008	0.00	0.00	0.09	0.14
	05/11/2008	0.02	0.02	0.04	0.05

GREATMAN'S BAY

MUIR GHAEIL TEO.**Carraroe**

Atlantic Salmon, 2008	30/04/2008	Missed due to technical difficulties			
	07/05/2008	0.00	0.57	0.14	0.35
	20/05/2008	0.00	0.59	0.29	0.71
	10/06/2008	0.00	0.04	0.27	0.53
	08/07/2008	0.14	0.88	1.03	1.14
	19/08/2008	0.27	1.73	0.03	0.05
	17/09/2008	1.82	14.24	0.23	0.39
	31/10/2008	2.59	5.82	0.00	0.00
		Transferred to Cnoc			

MUIRACHMHAINNI TEO.**Cuigeal**

Atlantic Salmon, 2008 S1/2	15/04/2008	0.00	0.28	0.00	0.00
	01/05/2008	0.00	1.29	0.13	0.26
	15/05/2008	0.02	0.64	0.15	0.25
	17/06/2008	0.74	3.05	0.85	1.50
	17/07/2008	0.12	2.10	0.13	0.17
	07/08/2008	0.85	6.00	0.22	0.30
	03/09/2008	0.29	2.84	0.00	0.00
		Transferred to Daonish			

KILKIERAN BAY

EISC UI FLATHARTHA TEO.**Ardmore**

Atlantic Salmon, 2007 S1/2	16/01/2008	0.79	4.84	0.03	0.03
	27/02/2008	0.45	2.64	0.00	0.00
	13/03/2008	1.00	10.64	0.02	0.02
	27/03/2008	0.91	13.00	0.00	0.23
	10/04/2008	0.18	1.15	0.03	0.03
	22/04/2008	0.19	3.18	0.02	0.02
	13/05/2008	0.22	2.90	0.00	0.00
	28/05/2008	1.39	15.28	0.19	0.35
	19/06/2008	4.15	9.90	0.00	0.02
	22/07/2008	9.36	19.68	0.00	0.00

Harvested Out

Atlantic Salmon, 2008 S1/2	03/10/2008	4.90	23.39	0.03	0.06
	12/11/2008	7.41	21.50	0.02	0.04

MUIR GHAEL TEO.**Birbeag**

Atlantic Salmon, 2008 S1/2	13/05/2008	0.40	8.66	0.05	0.40
	27/05/2008	1.61	7.28	0.16	0.23
	27/06/2008	0.27	7.41	0.02	0.17
	16/07/2008	0.83	8.44	0.08	0.10
	31/08/2008	Missed due to technical difficulties and weather			
	01/09/2008	0.49	16.91	0.00	0.00

Transferred to Ardmore

Cnoc

Atlantic Salmon, 2007 S1/2	08/01/2008	0.78	2.02	0.00	0.03
	27/02/2008	1.06	7.21	0.00	0.00
	13/03/2008	1.49	8.09	0.00	0.02
	27/03/2008	0.94	23.33	0.00	0.00
	09/04/2008	0.17	2.17	0.00	0.00
	25/04/2008	0.15	11.63	0.07	0.07

Transferred to Daonish

Atlantic Salmon, 2008 S1/2	31/10/2008	8.13	23.10	0.00	0.27
	20/11/2008	2.03	21.01	0.00	0.00

Lettercallow

Atlantic Salmon, 2008 S1/2	08/01/2008	0.02	0.70	0.00	0.02
	27/02/2008	0.00	0.25	0.00	0.00
	13/03/2008	0.02	0.12	0.00	0.00
	27/03/2008	0.00	0.55	0.00	0.00
	09/04/2008	0.00	0.19	0.00	0.00
	25/04/2008	0.02	1.48	0.00	0.00
	13/05/2008	0.14	2.97	0.00	0.02

Transferred to Carraig na Meachain

The Gurrig

Atlantic Salmon, 2008 S1/2	21/01/2008	0.22	3.23	0.00	0.00
	05/02/2008	0.31	7.51	0.00	0.00
	05/03/2008	0.20	2.83	0.00	0.00
	20/03/2008	0.25	3.30	0.00	0.00
	03/04/2008	0.21	7.11	0.00	0.00
	18/04/2008	0.07	2.96	0.00	0.02

Transferred to Birbeag

Carraig na Meachain

Atlantic Salmon, 2008 S1/2	27/05/2008	0.05	2.01	0.04	0.16
	30/06/2008	1.79	13.09	0.78	1.70
	16/07/2008	3.94	14.67	0.05	0.19
	31/08/2008	Missed due to technical difficulties and weather			
	01/09/2008	7.98	30.02	0.10	0.15

Transferred to Cnoc

MUIRACHMHAINNI TEO.**Daonish**

Atlantic Salmon, 2007 S1/2	12/12/2007	2.05	21.06	0.04	0.07
	12/02/2008	1.13	23.00	0.00	0.02
	06/03/2008	0.35	3.67	0.00	0.00
	19/03/2008	0.63	10.08	0.02	0.12
	02/04/2008	0.54	9.47	0.03	0.08
	15/04/2008	2.02	7.55	0.07	0.10
	08/05/2008	0.18	5.82	0.03	0.13
	22/05/2008	0.17	16.35	0.10	0.22
	24/06/2008	4.93	11.87	0.00	0.04
	23/07/2008	7.44	27.77	0.00	0.00

Harvested out

Atlantic Salmon, 2008 S1/2	23/09/2008	0.87	2.55	0.00	0.00
	22/10/2008	2.97	13.54	0.00	0.02
	20/11/2008	3.16	17.02	0.00	0.21

Golam

Atlantic Salmon, 2008 S1/2	12/12/2007	0.19	2.87	0.00	0.02
	12/02/2008	0.14	2.66	0.05	0.06
	05/03/2008	0.14	1.76	0.04	0.04
	20/03/2008	0.12	1.67	0.02	0.02
	03/04/2008	0.04	1.22	0.02	0.02
	15/04/2008	0.00	0.53	0.00	0.00
	01/05/2008	0.00	1.20	0.07	0.20

Transferred to Red Flag

Red Flag

Atlantic Salmon, 2008 S1/2	15/05/2008	0.05	1.36	0.17	0.24
	20/06/2008	0.36	6.70	1.20	2.44
	17/07/2008	0.88	4.62	0.38	0.60
	07/08/2008	5.11	35.43	0.11	0.18

Transferred to Daonish

MANNIN BAY

MANNIN BAY SALMON COMPANY LTD.**Corhounagh**

Atlantic Salmon, 2006	15/01/2008	Transferred to Ballinakill			
Atlantic Salmon, 2007	18/03/2008	0.82	28.09	0.00	0.00
	27/03/2008	0.84	29.90	0.10	0.10
	15/04/2008	9.63	26.57	0.03	0.10
	29/04/2008	11.28	23.93	0.10	0.38
	15/05/2008	1.39	4.74	0.00	0.00
	30/05/2008	3.03	10.16	0.00	0.00
	18/06/2008	5.69	17.88	0.00	0.03
	28/07/2008	7.42	17.55	0.00	0.00
Harvested Out					

CLIFDEN BAY

MANNIN BAY SALMON COMPANY LTD.**Hawks Nest**

Atlantic Salmon, 2007	15/01/2008	6.29	28.35	0.05	0.07
	15/02/2008	3.00	31.65	0.00	0.00
Transferred to Corhounagh					
Atlantic Salmon, 2008	30/04/2008	Missed due to technical difficulties			
	15/05/2008	0.00	0.15	0.00	0.00
	30/05/2008	0.00	0.04	0.00	0.00
	18/06/2008	0.00	0.92	0.00	0.00
	01/07/2008	0.02	0.65	0.00	0.02
	22/08/2008	0.87	5.05	0.00	0.02
	17/09/2008	1.90	13.23	0.00	0.00
	08/10/2008	0.02	2.10	0.00	0.02
	04/11/2008	0.14	1.11	0.02	0.02

BALLINAKILL HARBOUR***BIFAND LTD.*****Fraochoilean**

Atlantic Salmon, 2007 S1/2	22/01/2008	0.92	6.64	0.04	0.16
	21/02/2008	2.93	6.83	0.33	0.43
	04/03/2008	3.40	8.73	0.13	0.17
	25/03/2008	2.48	9.63	0.26	0.52
	10/04/2008	2.22	28.22	0.31	0.50
	24/04/2008	4.33	59.33	0.07	0.07

Transferred to Corhounagh

Atlantic Salmon, 2008 S1/2	22/01/2008	0.00	0.47	0.00	0.00
	21/02/2008	0.00	0.43	0.00	0.02
	04/03/2008	0.00	0.35	0.00	0.00
	25/03/2008	0.00	0.68	0.00	0.02
	10/04/2008	0.05	4.89	0.00	0.03
	24/04/2008	0.23	18.05	0.00	0.00
	16/05/2008	0.15	6.25	0.00	0.00
	30/05/2008	0.06	0.69	0.00	0.00
	20/06/2008	0.04	3.06	0.20	0.34
	10/07/2008	0.36	1.52	0.00	0.00
	13/08/2008	0.56	1.87	0.00	0.00
	17/09/2008	1.26	7.34	0.00	0.00
	08/10/2008	2.25	7.24	0.02	0.02
	04/11/2008	4.52	45.97	0.02	0.10

Ballinakill

Atlantic Salmon, 2006	22/01/2008	0.86	7.87	0.00	0.00
	21/02/2008	6.59	18.09	0.00	0.00
	04/03/2008	4.78	11.89	0.11	0.11
	25/03/2008	7.88	40.38	0.19	0.25
	10/04/2008	12.50	71.50	0.00	0.10
	30/04/2008	0.10	0.70	0.00	0.00

Harvested out

KILLARY HARBOUR

CELTIC ATLANTIC SALMON (KILLARY) LTD.**Inishdeighil**

Atlantic Salmon, 2007	22/01/2008	Transferred to Rosroe			
Atlantic Salmon, 2008	30/04/2008	Missed due to technical difficulties			
	01/05/2008	0.00	5.01	0.00	0.00
	20/05/2008	0.02	2.22	0.00	0.00
	19/06/2008	0.00	0.45	0.00	0.00
	10/07/2008	0.00	4.92	0.00	0.03
	22/08/2008	1.75	10.09	0.00	0.00
	18/09/2008	0.74	6.05	0.04	0.06
	31/10/2008	Missed due to technical reasons			
	13/11/2008	0.90	8.53	0.07	0.08

Rosroe

Atlantic Salmon, 2007	22/01/2008	0.12	0.92	0.00	0.00
	12/02/2008	0.29	5.37	0.02	0.02
	14/03/2008	0.39	1.75	0.00	0.00
	28/03/2008	0.14	1.00	0.04	0.04
	11/04/2008	0.17	35.36	0.04	0.17
	30/04/2008	Missed due to technical difficulties			
	01/05/2008	0.11	5.09	0.06	0.06
	20/05/2008	1.44	67.36	0.07	0.16
	19/06/2008	3.61	5.47	0.00	0.00
	10/07/2008	3.18	25.43	0.09	0.29
	22/08/2008	7.84	118.11	0.05	0.05
		Harvested out			

CLEW BAY

CLARE ISLAND SEAFARMS LTD.**Clare Island Smolt Site**

Atlantic Salmon, 2008	13/05/2008	0.00	0.70	0.02	0.02
	27/05/2008	0.00	0.13	0.00	0.00
	19/06/2008	0.00	0.09	0.00	0.12
	25/07/2008	0.07	0.21	0.18	0.28
	19/08/2008	0.20	0.73	0.15	0.23
	12/09/2008	0.24	1.14	0.10	0.20
	15/10/2008	0.45	3.53	0.04	0.09

Transferred to Portlea

Portlea

Atlantic Salmon, 2007	16/01/2008	0.04	4.87	0.02	0.02
	06/02/2008	0.38	6.44	0.09	0.18
	06/03/2008	2.31	6.57	0.23	0.37
	25/03/2008	0.49	1.50	0.02	0.02
	04/04/2008	0.20	0.49	0.02	0.02
	21/04/2008	0.17	6.27	0.02	0.22
	13/05/2008	0.08	1.34	0.02	0.15
	27/05/2008	0.39	2.90	0.21	0.31
	19/06/2008	1.00	1.65	0.14	0.25
	25/07/2008	0.97	3.09	0.02	0.07
	19/08/2008	1.04	3.11	0.05	0.13
	12/09/2008	2.23	11.23	0.37	0.73

Transferred to Seastream Inner

Atlantic Salmon, 2008	19/11/2008	0.28	1.00	0.04	0.04
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Seastream Inner

Atlantic Salmon, 2006	16/01/2008	1.02	1.64	0.04	0.05
	06/02/2008	0.04	0.10	0.00	0.00
	06/03/2008	0.23	2.22	0.06	0.06
	20/03/2008	0.35	3.04	0.08	0.11
	04/04/2008	0.90	1.97	0.17	0.27
	17/04/2008	0.97	5.93	0.10	0.14
	13/05/2008	1.54	12.42	0.13	0.13

Harvested out

Atlantic Salmon, 2007	15/10/2008	0.03	0.05	0.00	0.00
	19/11/2008	5.00	12.62	0.37	0.44

BEALACRAGHER BAY

CURRAN FISHERIES LTD.**Curraun**

Rainbow Trout, 2007 (2)	15/01/2008	0.77	5.35	0.00	0.03
	06/02/2008	0.13	1.47	0.00	0.00
	06/03/2008	0.06	0.35	0.00	0.00
	20/03/2008	0.04	0.36	0.00	0.00
	03/04/2008	0.00	0.10	0.00	0.00
	17/04/2008	0.00	0.52	0.00	0.00
	13/05/2008	Harvested out			
Rainbow Trout, 2007 (3)	15/01/2008	0.17	4.00	0.00	0.00
	06/02/2008	0.15	0.59	0.00	0.00
	06/03/2008	0.04	0.41	0.00	0.00
	20/03/2008	0.00	0.07	0.00	0.00
	03/04/2008	0.00	0.06	0.00	0.00
	17/04/2008	0.03	0.27	0.00	0.00
	13/05/2008	0.06	0.84	0.00	0.00
	27/05/2008	0.10	0.70	0.00	0.00
	19/06/2008	1.60	3.50	0.00	0.00
	25/07/2008	0.57	3.13	0.00	0.00
	25/08/2008	9.00	29.11	0.00	0.00
	25/09/2008	21.63	62.31	0.00	0.00
	15/10/2008	1.28	3.86	0.00	0.00
		Harvested out			
Rainbow Trout, 2008 (1)	13/05/2008	0.00	0.20	0.00	0.00
	27/05/2008	0.00	0.33	0.00	0.03
	19/06/2008	0.00	0.57	0.00	0.00
	25/07/2008	0.47	8.50	0.00	0.00
	25/08/2008	0.81	18.97	0.00	0.00
	25/09/2008	1.80	30.13	0.00	0.00
	15/10/2008	0.38	2.34	0.00	0.00
	20/11/2008	0.77	8.08	0.00	0.00
Rainbow Trout, 2008 (2)	20/11/2008	0.00	4.46	0.00	0.00

DONEGAL BAY

EANY FISH PRODUCTS LTD.**Inver Bay**

Rainbow Trout, 2007 (1)	18/12/2007		Harvested out		
Rainbow Trout, 2007 (2)	18/12/2007	0.29	1.29	0.03	0.05
	06/02/2008	0.04	0.58	0.00	0.00
	14/03/2008	0.00	0.13	0.00	0.00
	27/03/2008	0.00	0.21	0.00	0.04
	09/04/2008	0.00	0.13	0.03	0.03
	23/04/2008	0.00	0.13	0.00	0.00
	08/05/2008	0.00	0.13	0.03	0.03
	20/05/2008	0.00	0.37	0.00	0.00
	18/06/2008	0.05	0.38	0.29	0.52
			Harvested out		
Rainbow Trout, 2007 (3)	18/12/2007	0.05	0.44	0.00	0.06
	06/02/2008	0.07	3.07	0.00	0.00
	14/03/2008	0.00	0.16	0.00	0.00
	27/03/2008	0.05	0.80	0.00	0.10
	09/04/2008	0.00	0.28	0.04	0.04
	23/04/2008	0.03	0.24	0.13	0.15
	08/05/2008	0.02	0.25	0.13	0.13
	20/05/2008	0.00	0.65	0.05	0.05
	18/06/2008	0.04	0.27	0.44	0.72
	08/07/2008	0.00	0.13	0.14	0.14
	12/08/2008	0.02	0.20	0.02	0.04
	09/09/2008	0.06	0.44	0.03	0.03
	08/10/2008	1.03	5.93	0.13	0.13
	13/11/2008	1.27	9.21	0.02	0.13
Rainbow Trout, 2008 (1)	08/05/2008	0.00	0.04	0.00	0.00
	20/05/2008	0.00	0.04	0.00	0.00
	18/06/2008	0.00	0.02	0.68	1.17
	08/07/2008	0.00	0.00	0.61	0.75
	12/08/2008	0.02	0.20	0.10	0.19
	09/09/2008	0.00	0.56	0.06	0.06
	08/10/2008	0.07	1.41	0.06	0.09
	13/11/2008	0.40	4.38	0.03	0.06

MARINE HARVEST**Mc Swynes**

Atlantic Salmon, 2007	18/12/2007	0.19	0.45	0.61	0.88
	06/02/2008	0.03	0.13	0.16	0.31
	14/03/2008	0.05	2.77	1.22	2.21
	27/03/2008	0.75	3.06	1.04	2.35
	10/04/2008	1.26	3.04	1.75	3.07
	24/04/2008	2.06	4.22	1.94	3.97
	08/05/2008	0.02	0.10	0.49	0.99
	20/05/2008	0.00	0.45	0.04	0.16
	18/06/2008	1.71	2.62	0.36	0.44
	08/07/2008	0.14	0.25	0.00	0.00
	12/08/2008	0.74	1.52	0.00	0.00
	09/09/2008	0.90	2.36	0.00	0.00
	08/10/2008	0.00	0.19	0.00	0.00
	13/11/2008	0.02	1.33	0.00	0.00

Ocean Inver

Atlantic Salmon, 2008 S1/2	18/12/2007	0.00	0.75	0.00	0.02
	06/02/2008	0.11	1.51	0.05	0.13
	14/03/2008	0.00	0.04	0.00	0.00
	27/03/2008	0.00	0.03	0.00	0.00
	10/04/2008	0.00	0.03	0.00	0.00
	24/04/2008	0.00	0.00	0.00	0.00
	08/05/2008	0.00	0.04	0.00	0.02
	20/05/2008	0.00	0.07	0.00	0.00
	18/06/2008	0.00	0.04	0.05	0.07
	08/07/2008	0.00	0.04	0.00	0.00
	12/08/2008	0.00	0.03	0.11	0.22
	09/09/2008	0.00	0.07	0.02	0.03
	08/10/2008	0.07	0.25	0.02	0.02
	13/11/2008	0.33	1.16	0.02	0.03

MULROY BAY

MARINE HARVEST**Glinsk**

Atlantic Salmon, 2008	16/04/2008	0.00	0.00	0.00	0.00
	08/05/2008	0.02	0.37	0.00	0.00
	20/05/2008	0.00	0.75	0.03	0.06
	10/06/2008	0.00	0.00	0.00	0.00
	15/07/2008	0.17	1.11	0.18	0.22
	06/08/2008	0.03	1.97	0.22	0.26
	11/09/2008	1.71	15.51	0.20	0.24
	07/10/2008	3.86	15.83	0.32	0.48
	13/11/2008	0.07	8.15	0.17	0.27

Millstone

Atlantic Salmon, 2006	08/01/2008	0.33	2.40	0.00	0.00
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Harvested out

Atlantic Salmon, 2007	10/06/2008	2.15	7.22	0.22	0.24
	15/07/2008	0.38	3.17	0.00	0.00
	06/08/2008	1.91	6.44	0.02	0.04
	11/09/2008	5.12	21.95	0.02	0.04
	07/10/2008	4.59	50.44	0.02	0.22
	13/11/2008	1.10	6.87	0.03	0.17

Atlantic Salmon, 2007 S1/2	08/01/2008	0.25	2.55	0.00	0.00
	05/02/2008	0.00	0.73	0.00	0.04
	04/03/2008	0.00	4.48	0.04	0.04
	19/03/2008	0.05	3.09	0.02	0.07
	02/04/2008	0.14	3.60	0.07	0.15
	16/04/2008	0.07	1.92	0.05	0.05
	08/05/2008	0.15	4.40	0.17	0.40
	20/05/2008	1.34	11.78	0.48	0.92

Harvested out

Moross 1

Atlantic Salmon, 2007	08/01/2008	1.40	21.38	0.04	0.22
	05/02/2008	0.88	6.60	0.00	0.00
	04/03/2008	0.14	5.05	0.00	0.02
	19/03/2008	0.25	7.70	0.00	0.02
	02/04/2008	0.42	7.45	0.03	0.05
	16/04/2008	1.31	4.71	0.02	0.07
	08/05/2008	1.35	4.52	0.04	0.05
	21/05/2008	0.99	3.72	0.00	0.00

Transferred to Millstone

LOUGH SWILLY

MARINE HARVEST

Lough Swilly

Atlantic Salmon, 2006	08/01/2008	0.98	11.44	0.00	0.07
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Harvested out

Atlantic Salmon, 2007 S1/2	08/01/2008	0.20	1.88	0.00	0.00
	06/02/2008	0.00	1.78	0.00	0.00
	04/03/2008	0.25	10.77	0.37	1.54
	19/03/2008	1.09	13.45	0.88	2.60
	02/04/2008	0.57	1.72	0.28	0.37
	16/04/2008	0.42	1.20	0.14	0.20
	08/05/2008	0.00	0.07	0.00	0.00
	20/05/2008	0.00	1.63	0.05	0.22
	10/06/2008	1.38	2.34	0.24	0.34
	15/07/2008	1.03	3.95	0.02	0.02
	06/08/2008	5.22	11.92	0.02	0.07
	11/09/2008	3.50	20.73	0.00	0.00

Harvested out