NATIONAL SURVEY OF SEA LICE (*LEPEOPHTHEIRUS SALMONIS* KRØYER AND *CALIGUS ELONGATUS* NORDMANN) ON FISH FARMS IN IRELAND – 2005

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INTRODUCTION

Sea lice are an ectoparasite which occur on many fish worldwide and are regarded as having the most commercially damaging effect on cultured salmon in the world, with major economic losses to the fish farming community resulting each year (Bristow and Berland, 1991; Jackson and Costello, 1991). Sea lice affect salmon in a variety of ways, namely; by reducing fish growth; by causing loss of scales, which leaves the fish open to secondary infections (Wooten *et al.*, 1982); and by damaging the fish, which reduces its marketability. The two species of sea lice found on cultured salmonids in Ireland are *Caligus elongatus* Nordmann, a species of parasite that infests over 80 different types of marine fish, and *Lepeophtheirus salmonis* Krøyer, which 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 salmon (Jackson and Minchin, 1992; Jackson, D. *et al*, 2005). 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 (enlargement caused by an abnormal increase in the number of cells in an organ or tissue) 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. 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 chalimus stages before becoming a pre-adult male or female. This pre-adult phase comprises two stages and 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). Examples of adult ovigerous female *L. salmonis* and adult

male *L. salmonis* are shown in Figure 1. The mean length for an adult female is 8mm-11mm and an adult male is 5mm-6mm (Schram, 1993).

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. An example of an adult ovigerous female *C. elongatus* and an adult male *C. elongatus* are shown in Figure 2. *C. elongatus* averages approximately 6-8mm in length (Hogans & Trudeau, 1989).

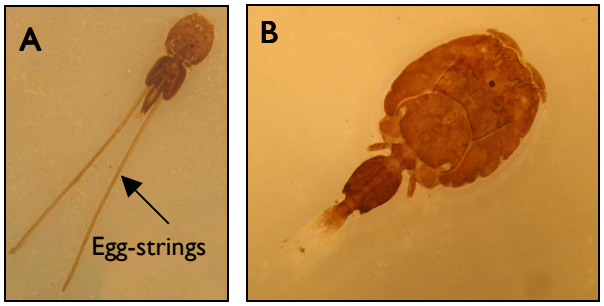

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Figure 1. (A) Adult ovigerous female *L. salmonis*. (B) Adult male *L. salmonis*.

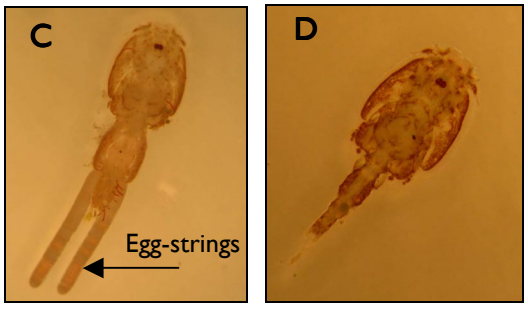

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Figure 2. (C) Adult ovigerous female *C. elongatus*. (D) Adult male *C. elongatus*.

In 1991, the then Department of the Marine instigated a sea lice monitoring programme for finfish farms in Ireland and 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 controlling 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 lice infestation and the agreed practices and targeted treatments enhance the efficacy of treatment regimes. One important aspect of targeted treatments is the carrying out of autumn / winter treatments to reduce 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 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 lice control.

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 0.3 to 0.5 egg bearing females per fish and are also informed by the mobile lice on the fish. Where numbers of mobile lice are high, treatments are triggered even in the absence of egg bearing females. Outside of the critical spring period, a level of 2.0 ovigerous female lice per fish acts as a trigger for treatments. Over the period since the initiation of Single Bay Management (SBM), treatment triggers have been progressively reduced from a starting point of 2.0 ovigerous female lice per fish during the spring period to the current levels which are the optimal sustainable at present. Triggered treatments are underpinned by follow up inspections and, where necessary, by sanctions. Sanctions employed include; peer review under the SBM process; conditional fish movement orders; and accelerated harvests.

In late winter and early spring the sea water temperatures are at a minimum and development rates of lice are reduced. This has the effect of tending to synchronise the

development of lice larvae. A strategic treatment at this time can break the cycle of infection.

Ovigerous female lice are those which produce the infective larvae and treatments are timed to removed adult females before they can release larvae. Setting the treatment trigger at 0.5 ovigerous lice per fish ensures that treatments are carried out when a maximum of half of the fish examined have any ovigerous lice. This is the optimum time to interrupt lice development. Later in the year generations are not as synchronized and intervention at a lice level of 0.5 ovigerous by way of treatment is generally not justified. A level of 2.0 ovigerous lice per fish has been shown to be a pragmatic level at which intervention by way of treatment is advisable. Levels of mobile lice or juvenile lice are important in advising fish health professionals in developing a 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*, 2005; O'Dohohoe *et al*, 2004; O'Donohoe *et al*, 2003; McCarney *et al*, 2002; Copley *et al*, 2001)

Treatments are administered to farmed fish either as in-feed treatments or as topical / bath treatments. Currently, there are four licensed sea lice treatments in Ireland. Two of these, CALICIDE® and SLICE®, are in-feed and the remaining two, EXCIS® and ALPHAMAX® are topical treatments. CALICIDE® contains teflubenzuron which acts as a chiton synthesis inhibitor that interferes with the cuticle formation of the louse. It is effective against the moulting stages of the life cycle and it has a 7 day withdrawal period. SLICE® contains emamectin benzoate, which interferes with the peripheral nervous system of the louse causing paralysis or death. It is effective against all stages of the life cycle and has no withdrawal period. The topical treatment EXCIS® contains cypermethrin, which also affects the nervous system of the louse. It is effective against all stages of the life cycle and has a 24 hour withdrawal period. ALPHAMAX® contains deltamethrin and again is effective against the nervous system of the louse. It affects adults and pre-adults (it's efficacy against the chalimus stages is unknown) and has a 3 day withdrawal period.

METHODOLOGY

All stocks of salmonids on all farms in Ireland are visited on 14 occasions throughout the year and sea lice numbers are recorded. Follow-up inspections may be carried out where required. Sea lice inspections take place monthly where fish are present, with two inspections taking place each month during March, April and May; referred to as the critical spring period. Only 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 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 in a container of sea-water, which at the end of the sample is sieved for any lice. Each fish is examined individually for all mobile lice. Lice are removed and placed in a plastic bottle containing 70% alcohol, one bottle per fish. The mean is calculated by adding the number of 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 *Lepeophtheirus salmonis* and *Caligus elongatus*. Total mobile levels estimate successful infestation levels. Ovigerous lice levels estimate successful breeding female populations. The information gathered aims to evaluate the levels of lice on growing fish and to inform the fish farmer on his 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 2005, salmonid farms stocked 5 different generations of fish. These were; 2004 rainbow trout (rainbow trout first inspected in 2004); 2005 rainbow trout (rainbow trout first inspected in 2005); 2003 Atlantic salmon (two-sea-winter salmon); 2004 Atlantic salmon (one-sea-winter salmon) and 2005 Atlantic salmon (smolts). All generations of farmed fish were examined during the year 2005.

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 2005 a total number of 32 sites were inspected around Ireland. See Figures 3-6.

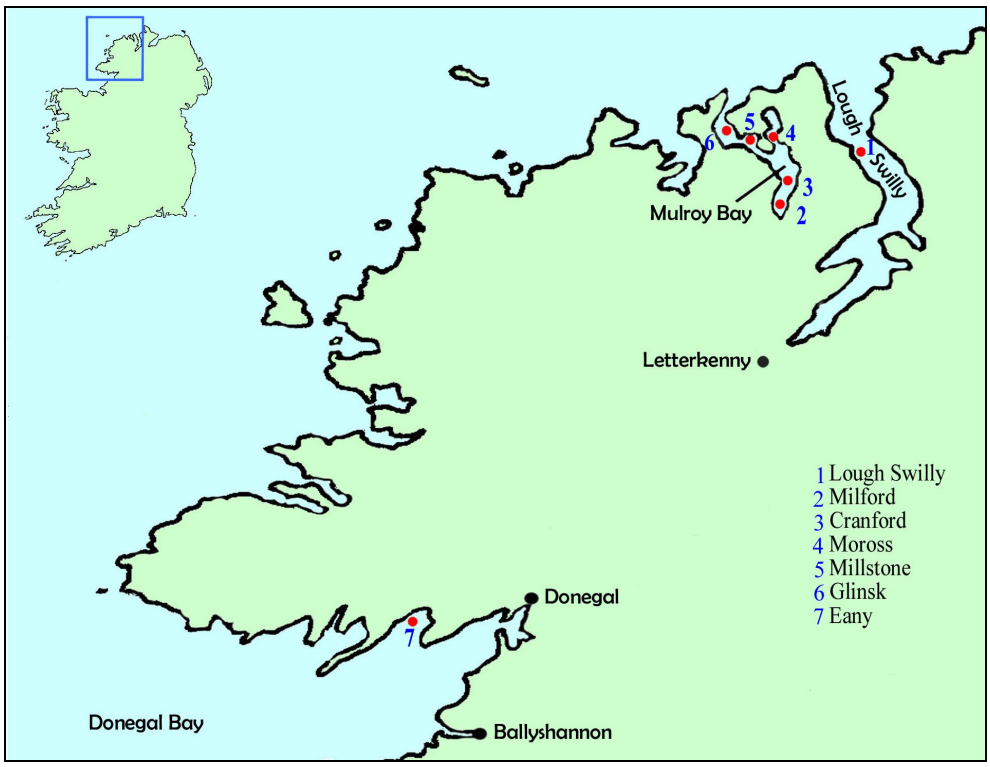

Figure 3. Locations of fish farm sites in Northwest region.

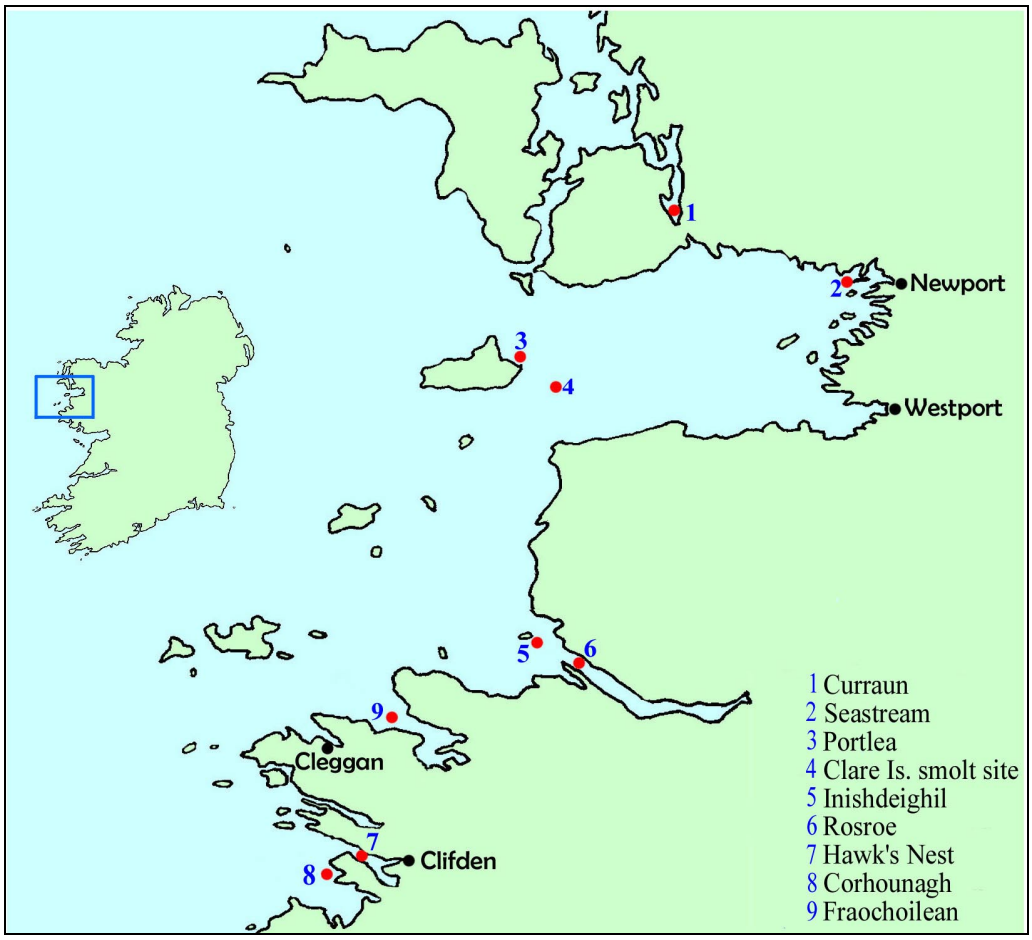

Figure 4. Locations of fish farm sites in the West region (Clew Bay / Connemara).

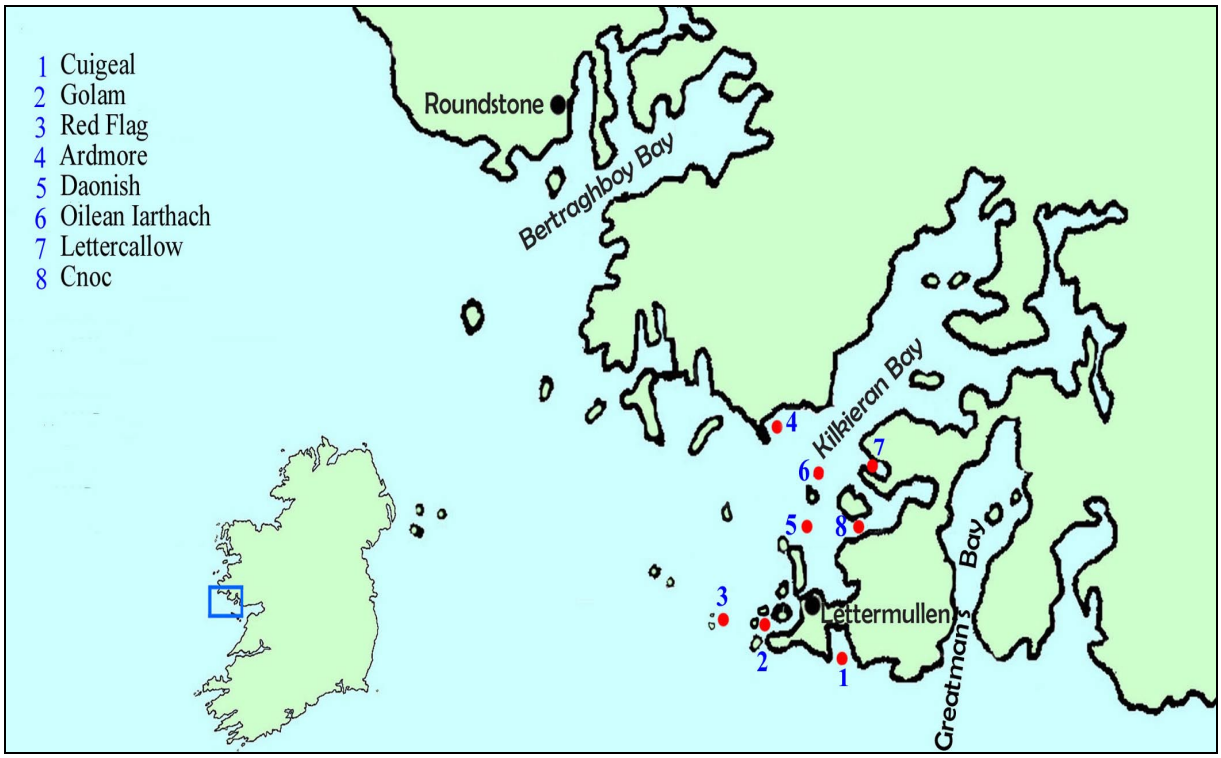

Figure 5. Locations of fish farm sites in the West region (Connemara).

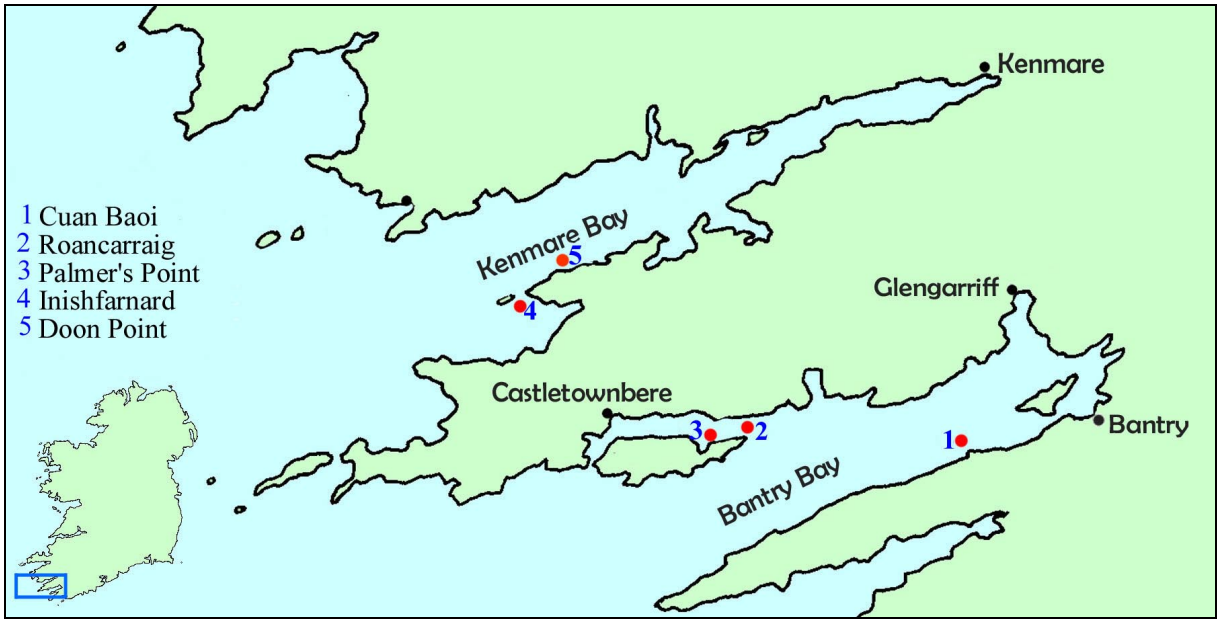

Figure 6. Locations of fish farm sites in the Southwest region.

RESULTS

Atlantic salmon 2005 (Smolts)

A total of 132 visits were undertaken at 22 sites stocking S1 and S½ smolts during the year 2005. *Lepeophtheirus salmonis* levels were maintained below the treatment trigger level of 0.5 ovigerous female lice per fish for all of the 36 inspections in the critical spring period. Outside of this period levels exceeded 2.0 ovigerous female lice per fish on 8 of the 96 inspections.

Caligus elongatus levels remained low throughout the year on 2005 smolts, except during the summer months where numbers exceeded 10 mobile lice per fish for one visit in the Southwest, but dropped back on subsequent inspections.

Atlantic salmon 2004 (one-sea-winter salmon)

One-sea-winter salmon were stocked in a total of 17 sites in 10 bays in 2005. One hundred and forty-eight visits were undertaken to this generation of fish. Four sites, in three bays, continued to stock one-sea-winter salmon in November 2005.

Ovigerous *L. salmonis* levels greater than the treatment trigger level were recorded in a total of 75 inspections (51%) on one-sea-winter fish. Within the critical spring period, lice levels were in excess of 0.5 ovigerous females per fish on 43 occasions (57%) and outside of the spring period 32 inspections (44%) were in excess of 2.0 ovigerous female lice per fish.

In the Southwest region none of the 25 inspections were in excess of treatment trigger levels.

In the West region, levels greater than the treatment trigger were recorded on 27 out of 34 inspections (79%) in the spring period (March – May) and on 13 out of 29 inspections (45%) outside the spring period.

Levels at Daonish (Muirachmhainni Teo), Kilkieran Bay, were in excess of treatment trigger levels for all inspections, 6 in the spring period and 2 outside the spring period.

At Hawk's Nest (Mannin Bay Salmon Co. Ltd.), Mannin Bay, levels exceeded treatment trigger levels at the start of the spring and remained so for the whole spring period even as the fish were moved to Corhounagh in April. These fish dropped below treatment trigger levels for August and September but rose again for the last inspection prior to harvest in October.

At Fraochoilean (Bifand Ltd), Ballinakill Bay, levels exceeded treatment trigger levels for all six inspections in spring and again on the final inspection before harvest in July.

Treatment trigger levels were exceeded in Cnoc (Muir Gheal Teo), Kilkieran Bay, on 3 occasions in the spring and again in June on the last inspection before harvest.

Lice levels were in excess of treatment trigger levels at Rosroe (Celtic Atlantic Salmon (Killary) Ltd.) for both inspections in March before achieving control and again on the final inspection in August prior to harvest.

Lice levels at Portlea (Clare Island Seafarms Ltd), Clew Bay, were in excess of treatment trigger levels for 4 of the 5 inspections in spring and again in June, August, September, October and November.

The treatment trigger levels were exceeded on 16 out of 30 inspections (53%) in the Northwest region during the critical spring period and on 19 out of 30 inspections (63%) outside that period.

Lough Swilly (Marine Harvest) 2004 fish had lice levels at or above the treatment trigger levels for 12 of the 14 inspections. They achieved control at the end of the spring period for the months of June and July before reaching levels of 108.76 mobile *L. salmonis* per fish in November. Millstone (Marine Harvest), Mulroy Bay, had elevated lice levels for January, February, March, April and again in the period from August to November inclusive. Cranford A (Marine Harvest), Mulroy Bay, had lice levels in excess of treatment trigger levels in January, February, March, April and again from August to November inclusive (the October visit was missed due to technical difficulties).

Sea lice levels in Donegal Bay, in the Northwest region, did not exceed treatment trigger levels in 2005.

C. elongatus levels were consistently recorded at a low level throughout the year, with the exception in the Southwest in July where total numbers reached 11.29 mobile *C. elongatus* per fish.

Atlantic salmon 2003 (two-sea-winter salmon)

At the beginning of 2005, two-sea-winter salmon were still being stocked on five sites; Cuan Baoi (Cuan Baoi Seafarms Ltd.)[1 inspection]; Doon Point (Lasingers- St. Killian's Harvest Ltd)[1 inspection]; Seastream Inner (Clare Island Seafarm Ltd., Clew Bay)[7 inspections]; Millstone (Marine Harvest)[1 inspection] and Lough Swilly (Marine Harvest)[2

inspections]. A total of 12 visits were undertaken to these sites before harvesting was completed, with 91.67% of inspections exceeding treatment trigger levels. *L. salmonis* levels on these fish were above the treatment trigger levels on all inspections at all sites except for the February visit to Doon Point (the December/January inspection to this site was missed due to technical problems).

Rainbow trout

In 2005 there were 2004 rainbow trout and 2005 rainbow trout stocked between 4 sites. Eany (Eany Fish Products Ltd), Inver Bay and Ardmore (Eisc Ui Flathartha Teo), Kilkieran Bay, stocked 2004 rainbow trout. There were a total of 18 inspections carried out on this stock in 2005. Of the 12 inspections in the spring, 4 were over treatment trigger levels, all at Ardmore (Eisc Ui Flathartha Teo) on four non-consecutive visits.

Seventeen inspections were carried out on the 2005 rainbow trout, stocked at Palmer's Point (John Power Ltd), Bantry Bay, and Curraun (Curraun Fisheries Ltd) Bealacragher Bay, and all 17 inspections were below treatment trigger levels.

Sampling record

In 2005 three site inspections in April were missed due to adverse weather conditions and two other inspections were missed due to technical difficulties throughout the year.

All the mean values for each farm visit can be seen in Appendix 1.

Monthly Trends: *Lepeophtheirus salmonis* and *Caligus elongatus*

Mean ovigerous and mean mobile *L. salmonis* and *C. elongatus* levels for each bay are shown in Table 1 for one-sea-winter salmon throughout the year. Monthly ovigerous *L. salmonis* levels were greater than the treatment trigger level of 0.5 ovigerous lice per fish on 17 occasions during the critical spring period for mean bay data. These occurred in Kilkieran Bay (3), Mannin Bay (3), Ballinakill Bay (3), Killary Harbour (1), Clew Bay (2), Mulroy Bay (2) and Lough Swilly (3). On 23 occasions outside of the critical spring period, mean ovigerous levels of 2.0 ovigerous females per fish or greater were recorded. These occurred in Kilkieran Bay (2), Mannin Bay (3), Ballinakill Bay (1), Killary Harbour (1), Clew Bay (5), Mulroy Bay (5) and Lough Swilly (6).

Mean mobile levels in excess of 10 mobile *L. salmonis* per fish were recorded on 28 occasions and 13 of these showed means of greater than 20 mobile lice per fish. Two inspections showed means greater than 100 mobile lice per fish.

Regional Monthly Means

L. salmonis monthly mean figures for one-sea-winter salmon are shown in Figures 7 and 8 for each of the three regions where lice inspections were carried out. Regional monthly mean *L. salmonis* levels in the Southwest did not reach the treatment trigger levels in 2005. In the West region monthly mean ovigerous levels were in excess of treatment trigger levels throughout the spring period, in March, April and May, and also for the whole period June to November inclusive. In the Northwest region monthly mean ovigerous levels exceeded the treatment trigger levels in January, February, for the spring period March to May and again in August until the last visit November 2005.

Total mobile lice levels exceeded 10 sea lice per fish in July, October and November in the West region. In the Northwest total mobile levels exceeded 10 per fish in January, August, September, October and November, with October and November exceeding 60 mobile lice per fish.

Annual trends

L. salmonis ovigerous and mobile lice level trends are compared in Figures 9 and 10 for one-sea-winter salmon in the month of May from 1991 to 2005. The mean number of ovigerous lice per fish, and the mean number of mobile lice per fish are presented. From 1998 to 2001 the levels decreased steadily for both ovigerous and total mobile lice. Mean ovigerous *L. salmonis* levels increased in 2002, remained steady in 2003 and show a slight decrease again in 2004. In 2005 levels increased and are the highest since 1998. Mean mobile levels increased from 2001 to 2002 and again from 2002 to 2003 but show a reduction in the 2004 figure. Again the 2005 figure increased to a level not seen since 1999.

Table 1. Mean ovigerous and mean mobile *Lepeophtheirus salmonis* and *Caligus elongatus* per months, for one-sea-winter salmon for each bay inspected in the year 2005.

Mean ovigerous *L. salmonis*

	Dec/Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*
Bantry Bay	1.33	1.14	0.35	0.14	0.10	0.00	0.03	0.00	1.13	HO	
Kenmare Bay	0.63	0.90	0.07	0.11	0.03	0.00	0.00	1.00	0.71	0.93	HO
Kilkieran Bay	4.43	1.78	1.30	1.11	2.15	3.65	HO				
Mannin Bay	1.22	1.17	1.18	1.82	2.56	3.57	3.60	0.37	1.83	6.71	HO
Ballinakill Bay	0.91	1.49	1.36	1.65	2.36	0.83	11.66	HO			
Killary Harbour	0.27	0.74	0.61	0.36	0.08	0.05	1.92	9.61	HO		
Clew Bay	0.28	0.40	0.42	1.00	1.78	2.53	1.04	2.14	3.42	4.18	4.78
Donegal Bay	0.36	0.82	0.35	0.17	0.07	HO					
Mulroy bay	3.29	1.88	1.25	0.90	0.37	0.10	0.63	2.80	8.02	6.98	8.75
Lough Swilly	4.80	4.25	4.81	2.07	0.94	0.42	0.82	2.91	13.85	15.25	16.34

Mean mobile *L. salmonis*

	Dec/Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*
Bantry Bay	4.10	4.52	2.92	0.52	0.22	0.00	0.50	2.00	2.00	HO	
Kenmare Bay	6.28	4.71	0.42	0.32	0.20	0.04	0.04	3.00	1.77	1.67	HO
Kilkieran Bay	12.66	2.91	9.00	4.65	14.06	21.87	HO				
Mannin Bay	5.07	4.97	13.83	7.64	12.76	7.97	24.03	0.40	5.17	20.25	HO
Ballinakill Bay	5.45	10.67	3.95	27.30	5.30	11.67	24.07	HO			
Killary Harbour	6.48	2.45	1.56	1.51	0.72	0.15	13.39	25.45	HO		
Clew Bay	0.93	1.59	3.59	3.61	10.34	6.41	2.28	5.04	5.06	16.24	11.74
Donegal Bay	1.41	2.33	1.03	0.39	0.31	HO					
Mulroy bay	10.61	4.87	3.61	2.62	1.36	0.44	2.02	22.15	34.28	23.00	44.86
Lough Swilly	28.62	13.22	12.49	3.39	1.66	0.90	8.78	12.23	34.58	107.55	108.76

Mean ovigerous *C. elongatus*

	Dec/Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*
Bantry Bay	5.30	3.59	1.11	0.14	0.20	0.90	6.30	1.00	0.44	HO	
Kenmare Bay	4.91	1.92	0.02	0.00	0.08	0.19	0.61	0.50	0.06	0.07	HO
Kilkieran Bay	0.07	0.00	0.02	0.08	0.19	0.30	HO				
Mannin Bay	0.00	0.00	0.02	0.02	0.19	0.00	0.06	0.00	0.00	0.29	HO
Ballinakill Bay	0.19	0.07	0.04	0.07	0.03	0.00	0.34	HO			
Killary Harbour	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.00	HO		
Clew Bay	0.08	0.05	0.11	0.26	0.56	0.19	0.05	0.09	0.04	0.57	0.22
Donegal Bay	0.19	0.50	0.16	0.00	0.02	HO					
Mulroy bay	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lough Swilly	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Mean mobile *C. elongatus*

	Dec/Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*
Bantry Bay	12.27	10.10	3.35	0.28	0.65	6.07	12.27	3.00	0.81	HO	
Kenmare Bay	10.24	4.43	0.02	0.01	0.12	0.30	0.87	0.67	0.13	0.07	HO
Kilkieran Bay	0.08	0.00	0.08	0.13	0.47	0.60	HO				
Mannin Bay	0.00	0.00	0.07	0.14	0.33	0.00	0.47	0.00	0.00	0.32	HO
Ballinakill Bay	0.30	0.13	0.07	0.19	0.13	0.13	1.10	HO			
Killary Harbour	0.02	0.00	0.00	0.02	0.00	0.03	0.07	0.00	HO		
Clew Bay	0.20	0.05	0.31	0.52	1.00	0.83	0.16	0.13	0.17	1.04	0.61
Donegal Bay	0.37	3.47	0.60	0.05	0.02	HO					
Mulroy bay	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.03	0.00
Lough Swilly	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00

HO = Harvested out

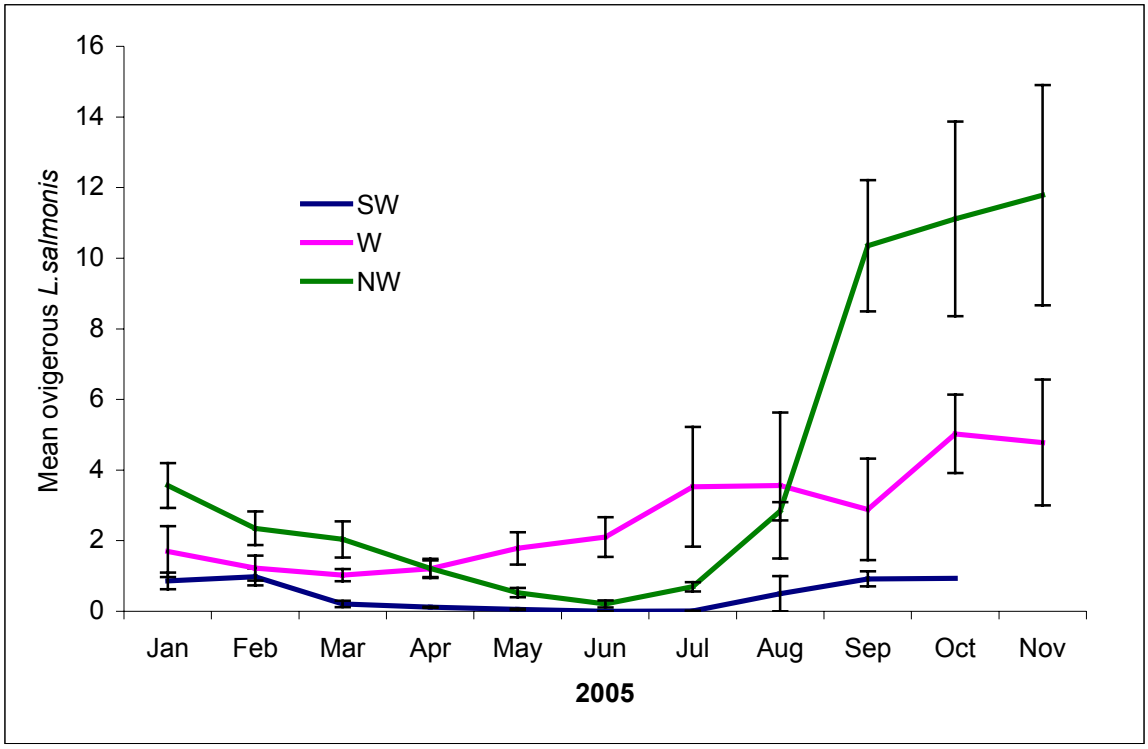

Figure 7. Mean (SE) ovigerous *L. salmonis* per month per region in 2005.

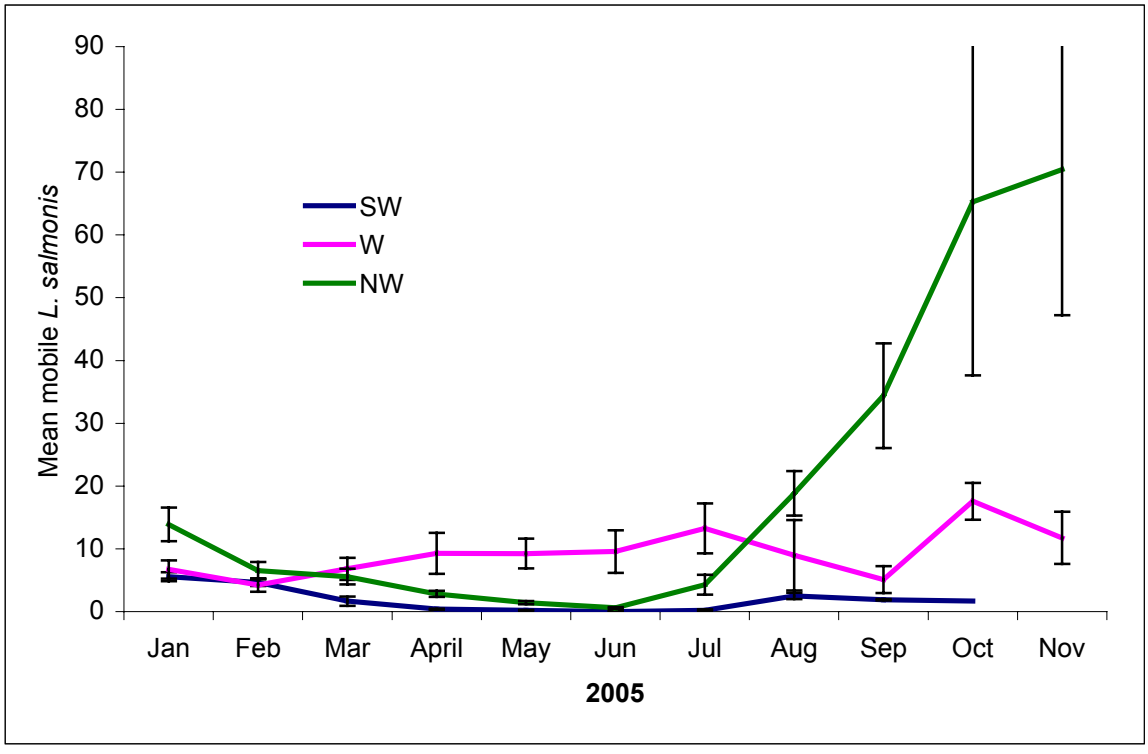

Figure 8. Mean (SE) mobile *L. salmonis* per month per region in 2005.

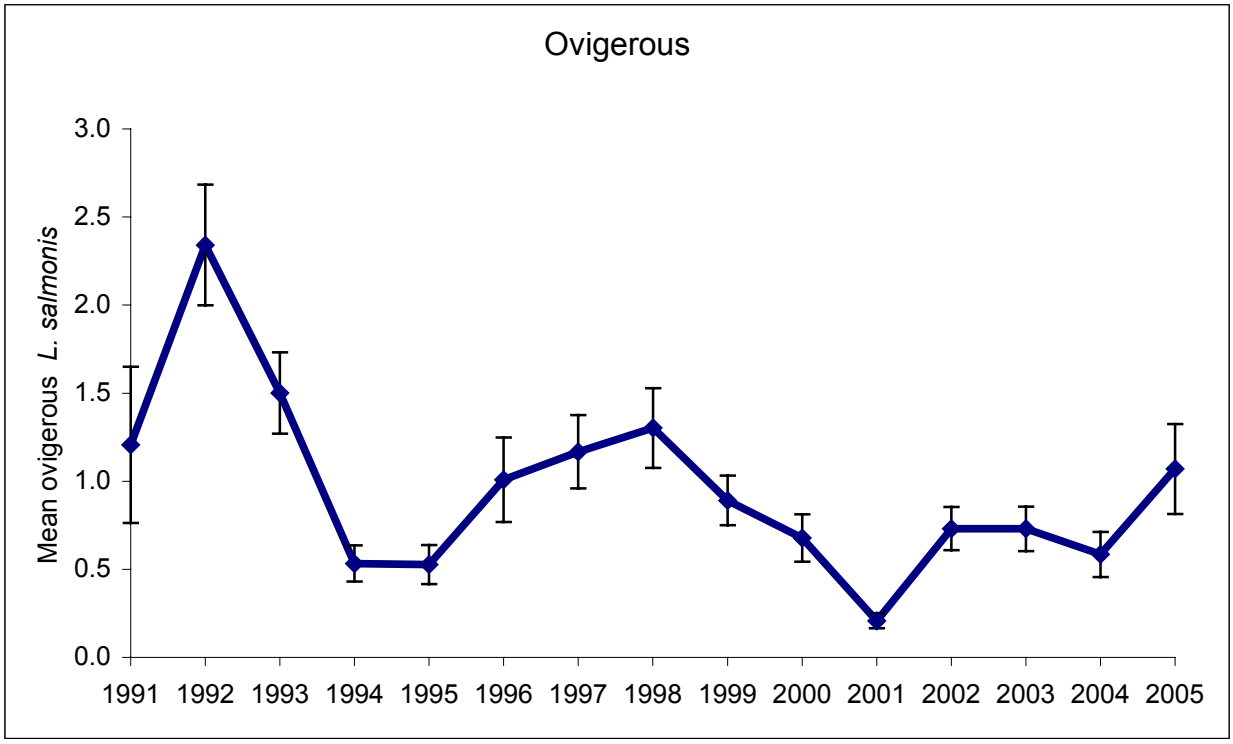

Figure 9. Annual trend (May mean) (SE) ovigerous *L. salmonis* on one-sea-winter salmon.

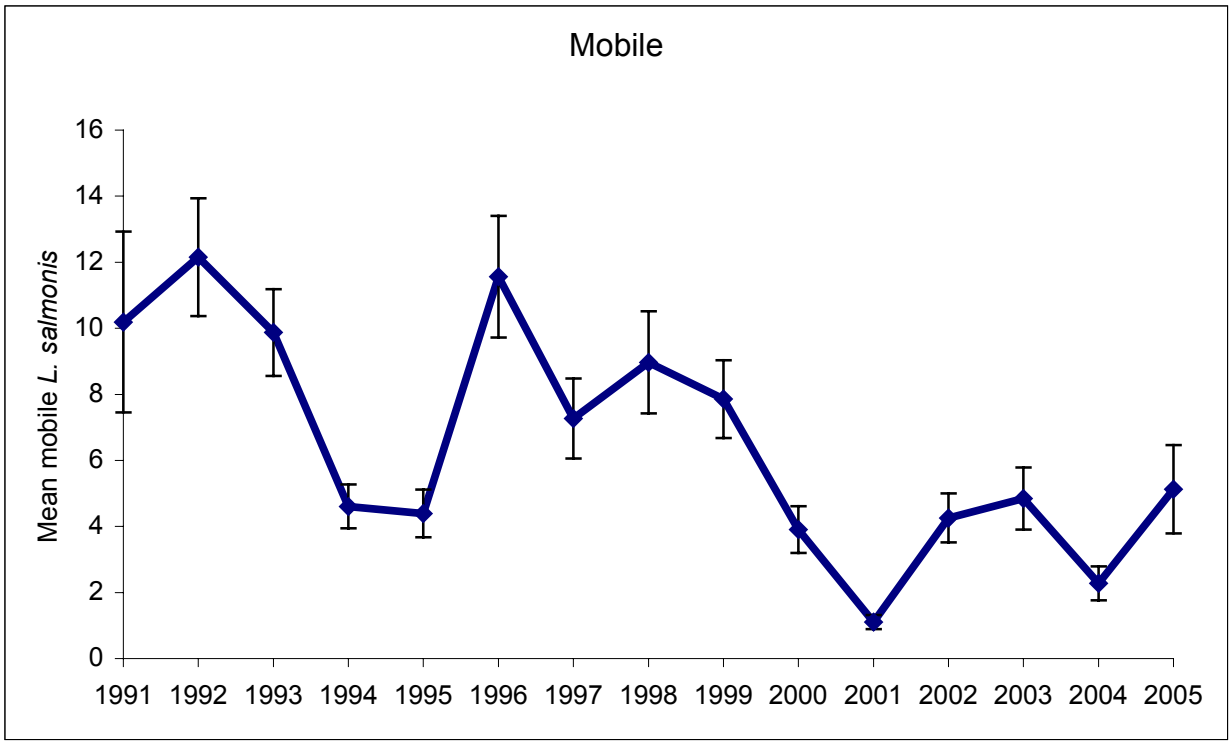

Figure 10. Annual trend (May mean) (SE) mobile *L. salmonis* on one-sea-winter salmon.

DISCUSSION

In 2005, of the 327 sea lice inspections carried out on salmonids, 67.8% of Atlantic salmon samples were below the treatment trigger levels outlined in DCMNR protocols and 88.6% of rainbow trout samples were below the levels. In the smolt stock 93.9% of inspections did not exceed the treatment trigger levels. One-sea-winter salmon had 49.3% of inspections below the treatment trigger levels and two-sea-winter salmon had 8.3% of inspections below treatment trigger levels.

In the Southwest region lice levels did not reach treatment trigger levels for any inspections of one-sea-winter salmon. In the Northwest and West treatment trigger levels were exceeded on 58.3% and 63.5% of inspections, respectively.

During the critical spring period 79.4% of inspections exceeded the treatment trigger in the West. In the Northwest 53.3% of inspections were above the level and no inspections exceeded treatment trigger levels in the Southwest.

The monthly trend of lice levels in one-sea-winter salmon show that the Southwest region achieved lice control throughout the year. Mean lice levels in the West region were elevated for most of the year, starting in the spring period and continuing through to November. At the start of the year in the Northwest region, lice levels were elevated and continued through the spring period before achieving control in June. Levels rose again in August and persisted into November.

Taking the year as a whole, lice numbers increased significantly in the latter few months of the year, particularly in the Northwest region. Here, *L. salmonis* levels started to increase from June growing steadily to reach a maximum mean of 70.42 *L. salmonis* per fish in November. Numbers in the West remained elevated from the beginning of the spring period and reached a maximum of 17.57 *L. salmonis* per fish in October.

Nationally for all stocks, total lice numbers greater than a mean of 10 *L. salmonis* per fish were recorded on 52 inspections in 2005 compared with 19 in 2004. Means greater than 20 *L. salmonis* per fish were recorded on 21 of these inspections - up from 7 in 2004 (O'Donohoe et al., 2005). Lice are known to cause damage to fish at these levels (Wooten et al., 1982). For 7 of these inspections, mobile *L. salmonis* numbers exceeded 40 per fish in 2005 and exceeded 100 lice per fish on 3 inspections, all in the Northwest.

It can be seen from the Annual trend (May mean) *L. salmonis* graphs that there was an increase in both the May mean ovigerous levels and May mean mobile levels nationally. Both are at the highest levels recorded in at least 5 years.

Sea temperature may have been a complicating factor in the management of sea lice in 2005. In the last number of years mean monthly sea temperatures have been relatively high with mean monthly sea temperatures being 0.23°C higher than 2004, 0.29°C higher than 2003 and 1.36°C higher than the 30 year mean. Temperatures for January and February were 0.7 °C higher and 0.2°C, respectively, than the same months in 2004. February 2005 was 2.1°C above the 30 year mean (worked from source data from Met Éireann). An increase in water temperatures leads to an acceleration in the life cycle of the sea louse and also an increase in reproductive output (Hogans and Trudeau, 1989).

There were a number of treatments carried out on some farms in 2005 which proved less effective than expected and did not achieve complete clearance of the sea lice present. The residual lice contributed to a more rapid increase in the total population present.

Pancreas disease (PD) was present in 2005 in most sites in the West and Northwest, but was not reported from the Southwest. Fish with PD display reduced appetite, which makes treating for sea lice more difficult.

Finally, a review of Single Bay Management fallow plans at the end of 2005 indicated that a sufficient fallow period (of at least 1 month) was not undertaken in a number of sites, particularly in some sites in the Northwest and West regions. Fallowing at a site helps break the sea lice life cycle and thus is important in the overall management of sea lice at a site and within a bay (Jackson *et al*, 1997; Jackson *et al*, 2002).

Glossary of terms used

Ovigerous lice:	An egg bearing adult female sea lice
Mobile lice:	All lice that are mobile – male and female (pre-adult and adult stages) sea lice that have developed beyond the attached larval stages
Standard (Std.) Cage:	The selected cage which is sampled at each inspection
Random (Ran.) Cage:	A cage which is selected by the inspector on the day of inspection
S1 Smolt:	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
S1/2 Smolt:	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
Grower:	A fish which has been at sea for one complete year or longer
SE:	Standard error (error bars in the graphs): the standard error of the mean of a sample from a population with a normal distribution that is equal to the standard deviation of the normal distribution divided by the square root of the sample size

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APPENDIX 1. Mean sea lice levels per inspection on salmonid farms in 2005

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
LASINGERS					
Cuan Baoi Seafarms Ltd					
Atlantic salmon, 2003	24/01/2005	2.40	5.70	0.50	1.40
	09/02/2005		On starve for harvest		
Atlantic salmon, 2004	24/01/2005	1.33	4.10	5.30	12.27
	09/02/2005	1.14	4.52	3.59	10.10
	02/03/2005	0.25	3.25	0.25	2.00
	31/03/2005	0.45	2.59	1.97	4.69
	12/04/2005	0.10	0.63	0.07	0.13
	27/04/2005	0.17	0.40	0.20	0.43
	11/05/2005	0.06	0.13	0.13	0.23
	26/05/2005	0.13	0.30	0.26	1.07
	15/06/2005	0.00	0.00	0.90	6.07
	13/07/2005	0.03	0.50	6.30	12.27
	10/08/2005	0.00	2.00	1.00	3.00
	06/09/2005	1.13	2.00	0.44	0.81
Atlantic salmon, 2005	15/06/2005	0.00	0.03	0.03	1.88
	13/07/2005	0.00	0.03	2.27	3.13
	10/08/2005	0.00	0.00	0.20	0.27
	06/09/2005	0.07	0.17	0.07	0.07
	05/10/2005	0.10	0.19	0.10	0.10
	09/11/2005	0.06	0.06	0.13	0.26
SILVER KING SEAFOODS LTD					
Roancarraig					
Atlantic salmon, 2005 S1/2	01/03/2005	0.00	0.14	0.00	0.02
	30/03/2005	0.00	0.05	0.19	0.55
	12/04/2005	0.00	0.00	0.00	0.07
	26/04/2005	0.00	0.02	0.00	0.09
	10/05/2005	0.00	0.02	0.10	0.28
	25/05/2005	0.00	0.03	0.16	0.39
	14/06/2005	0.00	0.00	1.27	6.87
	13/07/2005	0.06	0.26	4.84	11.29
	10/08/2005	0.00	0.93	0.96	2.32
	06/09/2005	0.65	1.29	0.19	0.26
	05/10/2005	0.54	1.32	0.04	0.07
	09/11/2005	0.73	3.17	0.57	0.83

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2005	14/06/2005	0.00	0.00	0.09	0.47
	13/07/2005	0.00	0.03	1.23	3.90
	10/08/2005	0.00	0.03	0.94	2.39
	06/09/2005	0.13	0.27	0.30	0.53
	05/10/2005	0.07	0.10	0.00	0.00
	09/11/2005	0.12	1.12	0.42	0.79
JOHN POWER LTD					
Palmer's Point					
Rainbow trout 2005	24/01/2005	0.05	0.19	1.15	2.01
	09/02/2005	0.02	0.14	0.81	1.71
	01/03/2005	0.00	0.05	0.05	0.11
	30/03/2005	0.00	0.05	0.02	0.05
	12/04/2005	0.00	0.00	0.00	0.03
	26/04/2005	0.00	0.02	0.07	0.20
	10/05/2005	0.00	0.04	0.09	0.15
	26/05/2005	0.02	0.09	0.27	0.52
	14/06/2005	0.05	0.20	0.93	3.00
	14/07/2005	0.05	0.21	0.63	1.03
	10/08/2005	0.30	2.37	0.96	2.04

KENMARE BAY

SILVER KING SEAFOODS LTD					
Inishfarnard					
Atlantic salmon, 2004	25/01/2005	0.63	6.28	4.91	10.24
	10/02/2005	0.90	4.71	1.92	4.43
	01/03/2005	0.03	0.50	0.03	0.03
	31/03/2005	0.10	0.33	0.00	0.00
	13/04/2005	0.10	0.34	0.00	0.02
	26/04/2005	0.12	0.30	0.00	0.00
	10/05/2005	0.06	0.26	0.04	0.07
	26/05/2005	0.00	0.14	0.12	0.18
	14/06/2005	0.00	0.04	0.19	0.30
	13/07/2005	0.00	0.04	0.61	0.87
	11/08/2005	1.00	3.00	0.50	0.67
	06/09/2005	0.71	1.77	0.06	0.13
	05/10/2005	0.93	1.67	0.07	0.07
			Harvested out		
LASINGERS - ST KILLIAN'S HARVEST LTD					
Doon Point					
Atlantic salmon, 2003	Jan		Missed due to technical difficulties		
	28/02/2005	0.14	1.43	0.14	0.29
			Harvested out		

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
GREATMAN'S BAY					
MUIRACHMHAINNI TEO					
Cuigeal					
Atlantic salmon, 2005 S 1/2	23/06/2005	0.02	0.75	0.42	0.75
	13/07/2005	0.02	0.02	0.02	0.02
	10/08/2005	0.47	1.45	0.02	0.08
	06/09/2005	0.62	2.83	0.05	0.11
			Transferred to Daonish		
KILKIERAN BAY					
MUIRACHMHAINNI TEO					
Golam					
Atlantic salmon, 2005 S 1/2	13/01/2005	0.00	0.16	0.00	0.00
	10/02/2005	0.00	0.50	0.00	0.00
	11/03/2005	0.02	0.36	0.00	0.00
	24/03/2005	0.00	0.02	0.00	0.00
	15/04/2005	0.00	0.69	0.00	0.00
	29/04/2005	0.00	0.13	0.00	0.05
	10/05/2005	0.00	1.04	0.02	0.02
	30/05/2005	0.04	0.90	0.04	0.07
Red Flag					
Atlantic salmon, 2005 S 1/2	23/06/2005	0.12	3.64	0.95	3.42
	13/07/2005	0.06	5.96	0.75	2.14
	10/08/2005	0.02	1.53	0.00	0.03
	06/09/2005	0.12	3.34	0.08	0.19
			Transferred to Daonish		
Daonish					
Atlantic salmon, 2004 S 1/2	28/01/2005	6.17	12.64	0.10	0.12
	17/02/2005	2.51	3.62	0.00	0.00
	11/03/2005	2.08	2.67	0.00	0.00
	24/03/2005	2.22	3.55	0.07	0.20
	15/04/2005	2.68	9.53	0.06	0.09
	29/04/2005	1.02	6.53	0.33	0.51
	13/05/2005	0.64	2.79	0.06	0.10
	30/05/2005	1.36	7.70	0.04	0.23
Atlantic salmon, 2005 S 1/2	25/10/2005	0.91	2.42	0.00	0.00
	17/11/2005	1.52	22.83	0.02	0.17

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
MUIR GHEAL TEO					
Cnoc					
Atlantic salmon, 2004 S 1/2	13/01/2005	0.96	12.70	0.00	0.00
	25/02/2005	1.05	2.20	0.00	0.00
	15/03/2005	0.39	0.80	0.00	0.00
	31/03/2005	0.50	28.97	0.00	0.12
	22/04/2005	0.67	2.73	0.00	0.00
	29/04/2005	0.29	0.75	0.00	0.00
	13/05/2005	0.10	9.64	0.08	0.13
	31/05/2005	6.52	36.12	0.59	1.44
	28/06/2005	3.65	21.87	0.30	0.60
Atlantic salmon, 2005 S 1/2	23/06/2005	2.31	5.28	0.00	0.05
	21/07/2005	1.04	1.49	0.00	0.04
	31/08/2005	2.06	5.26	0.04	0.09
	21/09/2005	0.98	1.47	0.02	0.05
	27/10/2005	0.28	0.34	0.00	0.00
	15/11/2005	0.43	13.74	0.00	0.00
Atlantic salmon, 2005	21/07/2005	0.00	0.64	0.00	0.00
	31/08/2005	0.00	0.00	0.00	0.00
Lettercallow					
Atlantic salmon, 2005 S 1/2	25/02/2005	0.00	2.63	0.00	0.00
	15/03/2005	0.02	3.33	0.00	0.00
	31/03/2005	0.06	1.52	0.00	0.00
	15/04/2005	0.00	0.49	0.00	0.00
	29/04/2005	0.00	1.07	0.00	0.00
	10/05/2005	0.02	1.45	0.00	0.00
	31/05/2005	0.14	3.27	0.00	0.00
	23/06/2005	0.25	6.40	0.00	0.02
Oilean Iarthach					
Atlantic salmon, 2005 S 1/2	21/07/2005	0.99	3.32	0.00	0.00
	30/08/2005	1.65	7.68	0.00	0.10

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
EISC UI FLATHARTHA TEO					
Ardmore					
Rainbow trout, 2004	15/12/2004	1.23	8.93	0.67	1.20
	17/02/2005	0.97	6.74	0.00	0.00
	09/03/2005	0.68	23.16	0.00	0.23
	23/03/2005	0.14	8.64	0.05	0.23
	07/04/2005	2.00	7.41	0.00	0.00
	20/04/2005	2.03	7.80	0.00	0.10
	05/05/2005	0.16	0.37	0.00	0.00
	18/05/2005	0.55	0.97	0.00	0.00
	22/06/2005	0.13	8.45	0.61	1.77
			Harvested out		

MANNIN BAY

MANNIN BAY SALMON CO LTD

Corhounagh

Atlantic salmon, 2003			On Starve for Harvest		
Atlantic salmon, 2004	05/04/2005	1.53	6.17	0.00	0.17
	21/04/2005	2.10	9.10	0.03	0.10
	05/05/2005	2.50	17.83	0.37	0.63
	26/05/2005	2.62	7.69	0.00	0.03
	10/06/2005	3.57	7.97	0.00	0.00
	07/07/2005	3.60	24.03	0.47	3.60
	25/08/2005	0.37	0.40	0.00	0.00
	13/09/2005	1.83	5.17	0.00	0.00
	05/10/2005	6.71	20.25	0.29	0.32
Hawk's nest					
Atlantic salmon, 2004	21/01/2005	1.22	5.07	0.00	0.00
	10/02/2005	1.17	4.97	0.00	0.00
	10/03/2005	1.05	11.83	0.02	0.06
	21/03/2005	1.32	15.83	0.02	0.09
Atlantic salmon, 2005 S 1/2	10/03/2005	0.00	0.00	0.00	0.00
	21/03/2005	0.00	0.10	0.00	0.00
	05/04/2005	0.00	0.65	0.00	0.00
	21/04/2005	0.00	1.60	0.00	0.00
	05/05/2005	0.02	0.80	0.02	0.03
	26/05/2005	0.00	0.13	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2005	10/06/2005	0.00	0.05	0.00	0.00
	07/07/2005	0.00	0.40	0.04	0.14
	25/08/2005	0.02	0.22	0.00	0.00
	13/09/2005	0.02	0.45	0.00	0.00
	05/10/2005	0.07	0.44	0.02	0.12
	10/11/2005	0.07	3.86	0.10	0.74

BALLINAKILL BAY

BIFAND LTD

Fraochoilean

Atlantic salmon, 2004 S 1/2	21/01/2005	0.91	5.45	0.19	0.30
	10/02/2005	1.49	10.67	0.07	0.13
	10/03/2005	0.61	1.79	0.00	0.02
	22/03/2005	2.12	6.10	0.08	0.12
	05/04/2005	2.00	43.98	0.13	0.38
	21/04/2005	1.30	10.62	0.00	0.00
	05/05/2005	3.64	8.76	0.04	0.14
	26/05/2005	1.09	1.83	0.02	0.13
	10/06/2005	0.83	11.67	0.00	0.13
	07/07/2005	11.66	24.07	0.34	1.10
			Harvested Out		
Atlantic salmon, 2005 S 1/2	10/06/2005	0.00	1.51	0.02	0.02
	07/07/2005	2.99	7.23	0.62	1.07
	25/08/2005	2.05	6.38	0.02	0.02
	13/09/2005	0.02	13.24	0.00	0.00
	05/10/2005	0.42	0.57	0.00	0.00
	10/11/2005	0.12	0.18	0.00	0.00

KILLARY HARBOUR

CELTIC ATLANTIC SALMON (KILLARY) LTD

Rosroe

Atlantic salmon, 2004	31/01/2005	0.27	6.48	0.00	0.02
	23/02/2005	0.74	2.45	0.00	0.00
	22/03/2005	0.50	1.19	0.00	0.00
	31/03/2005	0.71	1.94	0.00	0.00
	14/04/2005	0.36	1.51	0.00	0.02
	April(2)		Missed due to weather		
	19/05/2005	0.13	0.20	0.00	0.00
	27/05/2005	0.02	1.25	0.00	0.00
	10/06/2005	0.05	0.15	0.02	0.03
	27/07/2005	1.92	13.39	0.04	0.07
	30/08/2005	9.61	25.45	0.00	0.00
			Harvested out		
Atlantic salmon, 2005	30/11/2005	0.13	0.54	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Inishdeighil					
Atlantic salmon, 2005	10/06/2005	0.00	0.15	0.00	0.00
	27/07/2005	0.00	1.70	0.00	0.02
	30/08/2005	0.05	0.22	0.00	0.00
	29/09/2005	0.57	12.17	0.02	0.02
	28/10/2005	1.49	11.63	0.00	0.00
			Transferred to Rosroe		

CLEW BAY

CLARE ISLAND SEAFARMS LTD

Portlea

Atlantic salmon, 2004	25/01/2005	0.28	0.93	0.08	0.20
	17/02/2005	0.40	1.59	0.05	0.05
	02/03/2005	0.33	1.99	0.08	0.12
	15/03/2005	0.51	5.19	0.14	0.50
	12/04/2005	1.00	3.61	0.26	0.52
	April(2)		Missed due to weather		
	12/05/2005	1.49	10.29	0.45	0.73
	24/05/2005	2.08	10.38	0.68	1.26
	27/06/2005	2.53	6.41	0.19	0.83
	14/07/2005	1.04	2.28	0.05	0.16
	18/08/2005	2.14	5.04	0.09	0.13
	08/09/2005	3.42	5.06	0.04	0.17
	13/10/2005	4.18	16.24	0.57	1.04
	04/11/2005	4.78	11.74	0.22	0.61
Atlantic salmon, 2005	04/11/2005	0.67	7.74	0.81	3.21

Clare Island smolt site

Atlantic salmon, 2005	14/07/2005	0.10	2.70	1.11	1.39
	18/08/2005	0.97	3.75	0.03	0.05
	08/09/2005	1.42	3.95	0.00	0.00
	13/10/2005	0.50	4.36	0.00	0.12

Seastream Inner

Atlantic salmon, 2003	25/01/2005	8.03	35.42	0.11	0.28
	17/02/2005	3.67	6.73	0.00	0.02
	02/03/2005	4.10	7.22	0.04	0.27
	15/03/2005	5.07	30.67	0.67	1.27
	12/04/2005	2.25	11.71	0.21	0.42
			Missed due to weather		
	11/05/2005	2.00	4.34	0.00	0.00
	25/05/2005	3.24	18.03	0.00	0.00
			Harvested out		

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Seastream Outer					
Atlantic salmon, 2005	09/06/2005	0.00	0.00	0.00	0.00
	26/07/2005	0.03	0.61	0.67	1.00
	18/08/2005	0.07	1.57	1.00	1.61
	08/09/2005	0.10	0.40	0.00	0.00
	13/10/2005	0.00	0.37	0.07	0.17
	04/11/2005	0.32	1.26	0.10	0.13

BEALACRAGHER BAY

CURRAUN FISHERIES LTD

Curraun

Rainbow trout 2005	27/06/2005	0.00	0.04	0.02	0.02
	14/07/2005	0.00	0.03	0.00	0.00
	22/08/2005	0.00	0.02	0.00	0.00
	28/09/2005	0.15	1.12	0.02	0.02
	27/10/2005	0.10	0.29	0.00	0.04
	29/11/2005	0.10	2.24	0.00	0.00

DONEGAL BAY

EANY FISH PRODUCTS LTD

Inver Bay

Atlantic salmon, 2004	27/01/2005	0.36	1.41	0.19	0.37
	23/02/2005	0.82	2.33	0.50	3.47
	09/03/2005	0.30	1.10	0.30	1.15
	23/03/2005	0.41	0.95	0.02	0.05
	05/04/2005	0.10	0.37	0.00	0.10
	21/04/2005	0.23	0.40	0.00	0.00
	05/05/2005	0.00	0.29	0.00	0.00
	18/05/2005	0.13	0.33	0.03	0.03
			Harvested out		
Rainbow trout 2004	27/01/2005	0.07	0.74	0.15	0.22
	23/02/2005	0.04	0.34	0.10	0.53
	09/03/2005	0.00	0.45	0.37	0.95
	23/03/2005	0.02	2.26	0.44	2.14
	05/04/2005	0.02	1.40	0.85	1.84
	21/04/2005	0.03	0.33	0.47	0.63
	05/05/2005	0.07	0.27	0.27	0.30
	18/05/2005	0.00	0.05	0.06	0.08
	29/06/2005	0.00	0.10	0.10	0.17
			Harvested out		

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2005	29/06/2005	0.00	0.00	0.01	0.03
	13/07/2005	0.00	0.22	0.02	0.05
	18/08/2005	0.02	0.11	0.00	0.00
	29/09/2005	0.00	0.00	0.00	0.00
	28/10/2005	0.00	0.43	0.03	0.07
	16/11/2005	0.20	0.60	0.00	0.02

MULROY BAY

MARINE HARVEST

Millford

Atlantic salmon, 2004	26/01/2005	1.46	9.02	0.00	0.00
	22/02/2005	0.91	3.79	0.00	0.00
Atlantic salmon, 2005	14/06/2005	0.00	0.00	0.00	0.00
	05/07/2005	0.00	0.00	0.00	0.00
	10/08/2005	0.00	0.06	0.00	0.00
	07/09/2005	0.00	0.09	0.00	0.00
	11/10/2005	0.10	4.59	0.00	0.00
	01/11/2005	0.83	4.45	0.00	0.12

Cranford A

Atlantic salmon, 2004 S 1/2	25/01/2004	4.08	7.81	0.00	0.00
	22/02/2005	3.10	5.42	0.00	0.00
	09/03/2005	0.91	3.07	0.00	0.00
	22/03/2005	0.30	1.13	0.00	0.00
	06/04/2005	0.60	1.75	0.00	0.00
	19/04/2005	0.23	0.53	0.00	0.00
Atlantic salmon, 2004	09/03/2005	1.55	3.42	0.00	0.00
	22/03/2005	1.10	2.93	0.03	0.03
	06/04/2005	0.61	2.90	0.00	0.03
	19/04/2005	1.55	3.59	0.00	0.00
	11/05/2005	0.44	2.03	0.00	0.00
	24/05/2005	0.24	1.12	0.00	0.00
	14/06/2005	0.16	0.36	0.00	0.00
	05/07/2005	0.53	1.82	0.00	0.00
	09/08/2005	2.47	15.74	0.00	0.00
	06/09/2005	3.70	64.40	0.00	0.00
	October		On starve for harvest		
	01/11/2005	17.88	106.88	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2005 S 1/2	11/05/2005	0.02	0.03	0.00	0.00
	24/05/2005	0.00	0.18	0.00	0.00
	14/06/2005	0.00	0.18	0.00	0.00
	05/07/2005	0.13	0.69	0.00	0.00
	09/08/2005	0.32	3.07	0.00	0.00
	06/09/2005	3.36	9.97	0.00	0.00
	11/10/2005	1.15	18.74	0.00	0.00
	01/11/2005	1.93	6.10	0.00	0.02
Cranford C					
Atlantic salmon, 2005 S 1/2	22/02/2005	0.05	3.72	0.00	0.00
	09/03/2005	0.04	1.19	0.00	0.00
	22/03/2005	0.02	1.02	0.00	0.00
	06/04/2005	0.11	0.60	0.00	0.00
	19/04/2005	0.03	0.04	0.00	0.00
Moross					
Atlantic salmon, 2004 S 1/2	25/01/2005	2.79	7.47	0.00	0.00
	22/02/2005	0.96	1.72	0.00	0.00
	09/03/2005	0.43	1.03	0.00	0.00
	22/03/2005	0.71	1.03	0.00	0.00
	05/04/2005	0.36	1.45	0.00	0.00
	19/04/2005	0.37	0.60	0.00	0.00
Moross 1					
Atlantic salmon, 2004 S 1/2	10/05/2005	0.11	1.04	0.00	0.00
	24/05/2005	0.67	3.20	0.00	0.00
	June		On starve for harvest		
Atlantic salmon, 2005 S 1/2	22/02/2005	0.00	0.00	0.00	0.00
	09/03/2005	0.00	0.00	0.00	0.00
	22/03/2005	0.00	0.02	0.00	0.00
	05/04/2005	0.00	0.04	0.00	0.00
	19/04/2005	0.00	0.00	0.00	0.00
	10/05/2005	0.00	0.02	0.00	0.00
	24/05/2005	0.00	0.00	0.00	0.02
	14/06/2005	0.00	0.05	0.00	0.00
	05/07/2005	0.28	0.68	0.00	0.00
	09/08/2005	0.79	6.91	0.00	0.00
	06/09/2005	5.05	16.81	0.00	0.00
	11/10/2005	2.49	7.68	0.00	0.02
	02/11/2005	0.62	12.54	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Millstone					
Atlantic salmon, 2003	25/01/2005	5.28	19.76	0.00	0.00
Atlantic salmon, 2004	25/01/2005	4.04	16.05	0.00	0.05
	22/02/2005	2.54	8.54	0.00	0.00
	09/03/2005	2.38	7.79	0.00	0.00
	22/03/2005	2.07	6.90	0.00	0.00
	05/04/2005	1.64	4.87	0.00	0.00
	19/04/2005	1.18	3.28	0.00	0.00
	10/05/2005	0.40	0.94	0.00	0.00
	24/05/2005	0.36	0.59	0.00	0.00
	14/06/2005	0.05	0.52	0.00	0.00
	06/07/2005	0.74	2.22	0.00	0.00
	09/08/2005	3.12	28.56	0.00	0.00
	07/09/2005	10.18	19.23	0.00	0.10
	12/10/2005	6.98	23.00	0.00	0.03
	02/11/2005	4.19	13.85	0.00	0.00
Glinsk					
Atlantic salmon, 2004	25/01/2005	4.93	14.80	0.00	0.00
Atlantic salmon, 2005	14/06/2005	0.00	0.02	0.00	0.00
	06/07/2005	0.00	0.32	0.00	0.02
	09/08/2005	0.03	0.85	0.00	0.00
	06/09/2005	1.89	8.78	0.00	0.02
	11/10/2005	2.14	11.26	0.00	0.05
	02/11/2005	0.41	1.40	0.00	0.01

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
LOUGH SWILLY					
MARINE HARVEST					
Atlantic salmon, 2003	26/01/2005	3.10	21.85	0.00	0.00
	23/02/2005	6.00	13.67	0.00	0.00
			Harvested out		
Atlantic salmon, 2004	26/01/2005	4.80	28.62	0.05	0.12
	23/02/2005	4.25	13.22	0.00	0.00
	10/03/2005	6.29	16.41	0.00	0.00
	23/03/2005	3.33	8.56	0.00	0.00
	05/04/2005	3.39	5.58	0.00	0.00
	20/04/2005	0.75	1.21	0.00	0.00
	10/05/2005	1.38	2.65	0.00	0.00
	25/05/2005	0.50	0.68	0.00	0.00
	15/06/2005	0.42	0.90	0.00	0.00
	05/07/2005	0.82	8.78	0.00	0.00
	10/08/2005	2.39	8.68	0.00	0.00
	07/09/2005	13.85	34.58	0.00	0.06
	12/10/2005	15.25	107.55	0.00	0.00
	03/11/2005	16.34	108.76	0.00	0.00