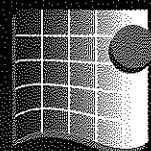


# National Survey of Sea Lice (*Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann) on Fish Farms in Ireland - 2003

Pauline O'Donohoe, Suzanne Kennedy, Frank Kane,  
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*Marine Institute*  
Foras na Mara

**NATIONAL SURVEY OF SEA LICE (*LEPEOPHTHEIRUS SALMONIS*  
KRØYER AND *CALIGUS ELONGATUS* NORDMANN) ON FISH FARMS IN  
IRELAND – 2003**

**February 2004**

**Pauline O'Donohoe, Suzanne Kennedy,  
Frank Kane, Oisín Naughton, David Tierney, Lorraine Copley  
and Dave Jackson.**

Aquaculture Section,

Aquaculture and Catchment Management Services, Marine Institute,

Galway Technology Park, Parkmore, Galway.

## INTRODUCTION

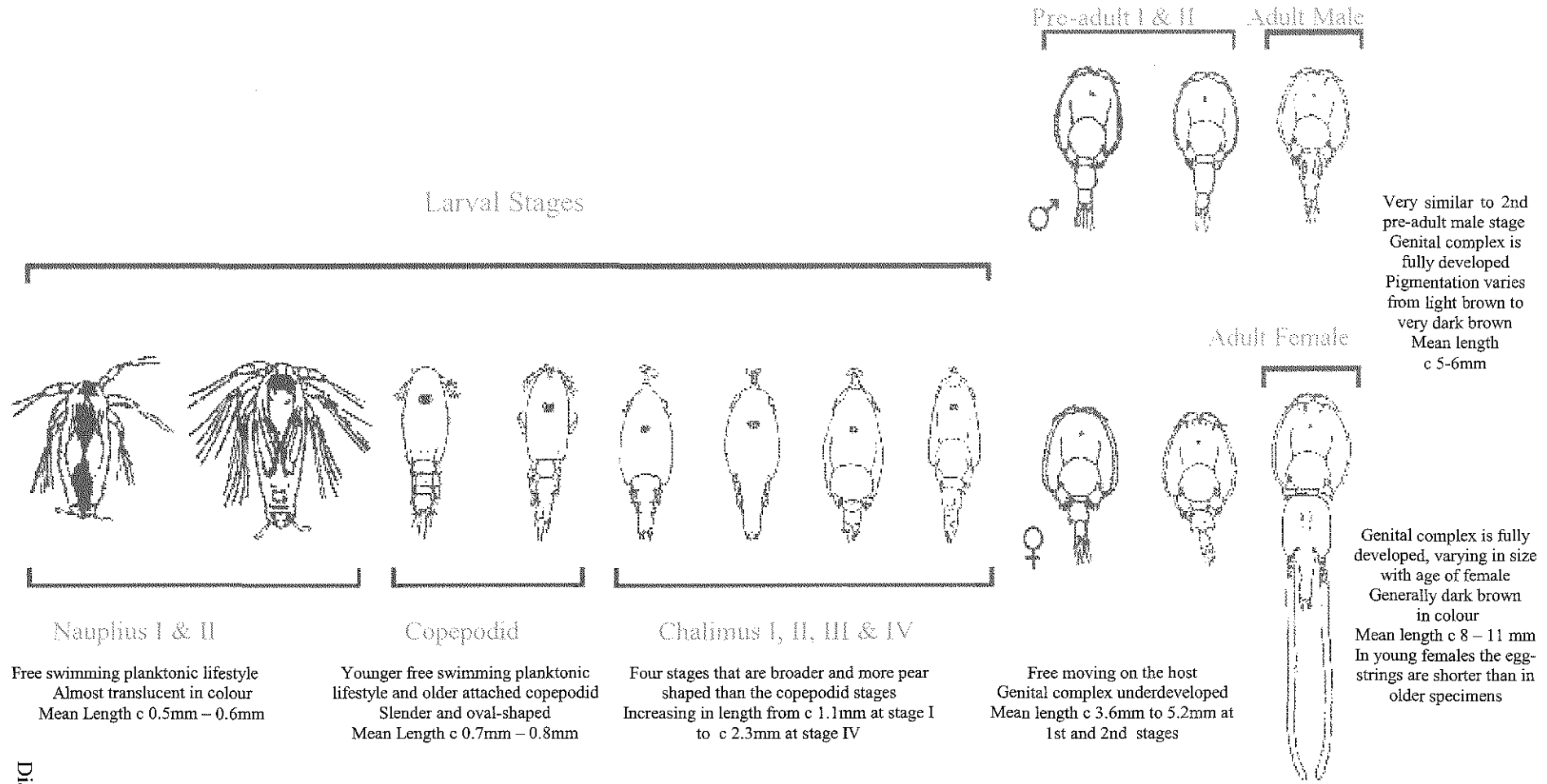
Sea lice are regarded as having the most commercially damaging effect on cultured salmon in the world with major economic losses to the fish farming community resulting per annum (Bristow and Berland, 1991; Jackson and Costello, 1991). They affect salmon in a variety of ways; by reducing fish growth; by causing loss of scales, which leaves the fish open to secondary infections (Wootten *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). 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 have been suggested 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). This is thought to occur 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).

Both *L. salmonis* and *C. elongatus* have a direct life cycle. There are ten stages in the life cycle of *L. salmonis*, each separated by a moult (Kabata, 1979; Schram, 1993; see Figure 1). Moulting involves the shedding of the outer shell or cuticle, this exposes a new cuticle underneath. The adult female extrudes a pair of egg-strings, which release eggs, which in turn hatch into planktonic nauplii. This is then followed by a second nauplius stage which eventually moults into a copepodid, which can survive in the plankton for a number of days. This copepodid must locate a salmonid host before the parasite can develop further. Copepodids make initial contact with the host by grasping the surface of the host with their

mouthparts and driving the clawed second antennae into the epidermis. Following settlement the copepodid moults into the chalimus phase which comprises four stages, characterised by permanent attachment to the host by a frontal filament (Johannessen, 1978). This frontal filament is lost when the chalimus IV stage develops into the mobile pre-adult male or female. A moult then separates two pre-adult stages after which the fully mature adult develops. The adult female is capable of producing a number of batches of paired egg-strings during her life span, which in turn hatch into the water column giving rise to the next generation. The number of egg-strings that can be produced by an adult female of *L. salmonis* can vary. Ritchie (1993) showed that six pairs of egg-strings were extruded over a period of 50 days at 14°C after one mating. However, Heuch *et al.* (2000) showed that some females, kept at a lower water temperature of 7.2°C, could produce as many as eleven egg-strings, and speculated that in the wild this value could be even higher. Various survival times have also been recorded for this species. Earlier studies have given survival times of 75 days at 14°C (Ritchie, 1993) and 191 days at 7°C (Nordhagen, 1997). However, a later study (Nordhagen *et al.*, 2000) indicated that the life span of *L. salmonis* could be up to one year at lower water temperatures.

*C. elongatus* is not as host specific as *L. salmonis* and parasitises a wide 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. The developmental stages of *C. elongatus* described by Hogans and Trudeau (1989) included nine stages, each separated by a moult as in *L. salmonis*. These stages included two free-living nauplii, a copepodid, four attached chalimi, a pre-adult and adult. However, studies by Piasecki (1996) contradict these earlier findings and states that there are only eight stages in the life cycle of *C. elongatus*. Piasecki (1996) maintains that previous studies labeled young adult individuals of *C. elongatus* as pre-adult stages. The adult life span for *C. elongatus* has been estimated at 260 days for an adult female in typical winter water temperature ranges of 2.2-12°C. Two sets of egg-strings are believed to be produced following a single mating (Piasecki and MacKinnon, 1995).



Diagrams not to scale.

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

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 four purposes of the National Sea Lice Monitoring Plan are:

- 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 the control and management strategy.
- 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 infestations and to ensure the most effective treatment of developing infestations. They minimise lice levels whilst controlling reliance on, and reducing 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 the development of infestations. 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 zero / near zero egg bearing lice in spring. The agreed husbandry practices 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. 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 treatment levels of 0.3 – 0.5 ovigerous female lice per 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.

Treatments are administered to farmed fish either as in-feed treatments or as topical / bath treatments. Currently, there are three licensed sea lice treatments in Ireland. Two of these, CALICIDE<sup>®</sup> and SLICE<sup>®</sup>, are in-feed and the third, EXCIS<sup>®</sup>, is a topical treatment. CALICIDE<sup>®</sup> contains teflubenzuron which acts as a chiton synthesis inhibitor that interferes with the cuticle formation of the louse. It is only effective against the moulting stages of the life cycle and it has a 7 day withdrawal period. SLICE<sup>®</sup> contains emamectin benzoate, which interferes with the peripheral nervous system of the louse causing paralysis or death. It is effective against all stage of the life cycle and has no withdrawal period. The topical treatment EXCIS<sup>®</sup> 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.

## METHODOLOGY

The frequency of sampling sites have been determined with regard to sea lice development rates, critical periods and environmental conditions. Essentially, during the winter months when the sea temperature is low (December - February) sea lice development is slowed, thus a low frequency of inspection is adequate to detect changes in sea lice abundance. However during the spring rise in sea temperatures (March - May), the corresponding increase in the development rates of sea lice necessitates an increase in the sampling frequency to track the changes in sea lice levels.

The frequency of sampling is fourteen inspections per year, plus any follow-up inspections required where advice to reduce lice levels has been issued. One lice inspection takes place each month at each site where fish are present, with two inspections taking place each month during the spring period March to May. Only one inspection occurs for December-January. At each inspection two samples are taken for each generation of fish on-site. One from a standard cage (which is sampled at each inspection) and one from a random cage (which is selected on the day of the inspection). Thirty fish are examined for each sample. These are anaesthetised in a bin, which at the end of the sample is sieved for any detached lice. Each fish is examined individually for all mobile lice. Lice are removed using forceps and placed in 30ml screw top plastic bottles containing 70% alcohol, one bottle per fish. The results presented in this report refer to mean lice numbers per fish. This was obtained by adding the number of lice taken per fish with the number from the bin, and dividing by the number of fish examined.

Salmonids farmed in Ireland in 2003 are categorized into one year class of rainbow trout and three year classes of Atlantic salmon. The year classes of salmon include, smolts (2003 generation), one sea-winter salmon (2002 generation) and two sea-winter salmon (2001 generation). S $\frac{1}{2}$  fish are transferred to sea in Autumn / Winter of the same year that they are hatched. Their S1 siblings smoltify and are put to sea in early spring, some three to four months later. Grower salmon or one sea-winter salmon which are at sea for a year or longer in April are treated separately from younger salmon (smolts) and rainbow trout. Those salmon that were put to sea in winter 2002 / spring 2003 are referred to as smolts, or 2003 year class fish. All generations of farmed fish were examined during the year 2003.

Salmon farming is carried out along the west coast of Ireland. There are three distinct regions where salmon farming is carried out, the West (Counties Mayo and Galway), the Northwest (Co. Donegal) and the Southwest (Counties Cork and Kerry). These 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 2003 a total number of 42 sites were inspected around Ireland. See Figures 2-5.

Results presented are mean ovigerous sea lice levels (egg bearing adult female lice) and mean mobile sea lice levels (lice that have developed beyond the attached chalimus stages) for *Lepeophtheirus salmonis* and *Caligus elongatus*. Total mobile levels estimate successful infection, with ovigerous lice levels estimating successful breeding females. The regularity of the monitoring protocol outlined above aims to evaluate the levels of lice on growing fish and to bring them under control if necessary by advising treatment. Effective parasite control is characterised by a drop in lice levels in the subsequent inspection.



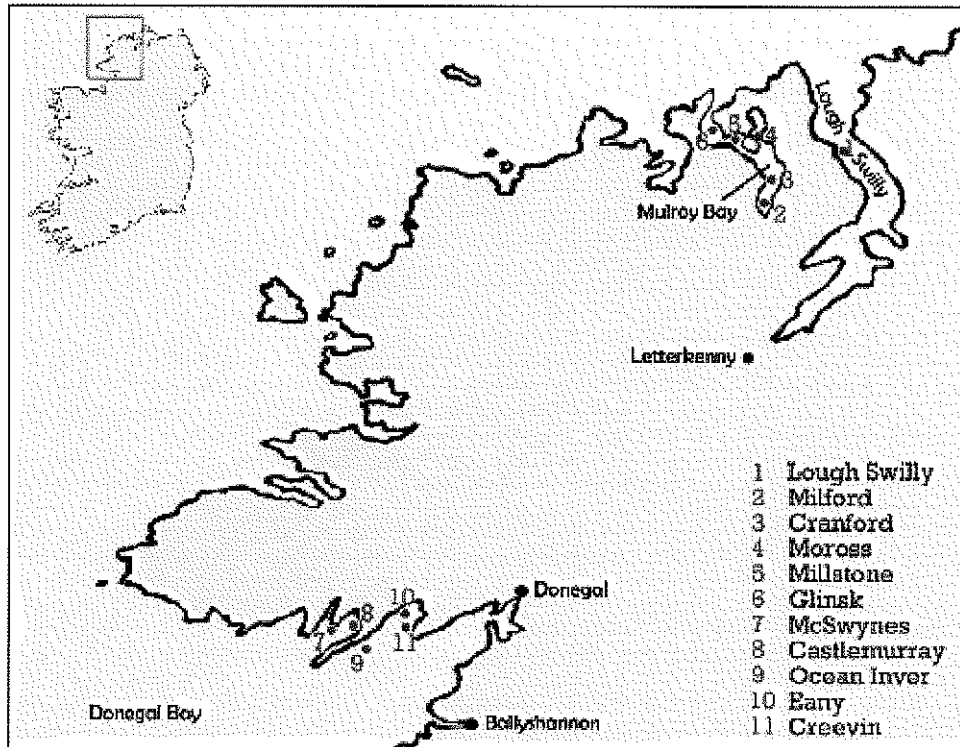


Figure 2. Location of fish farms in Northwest region.

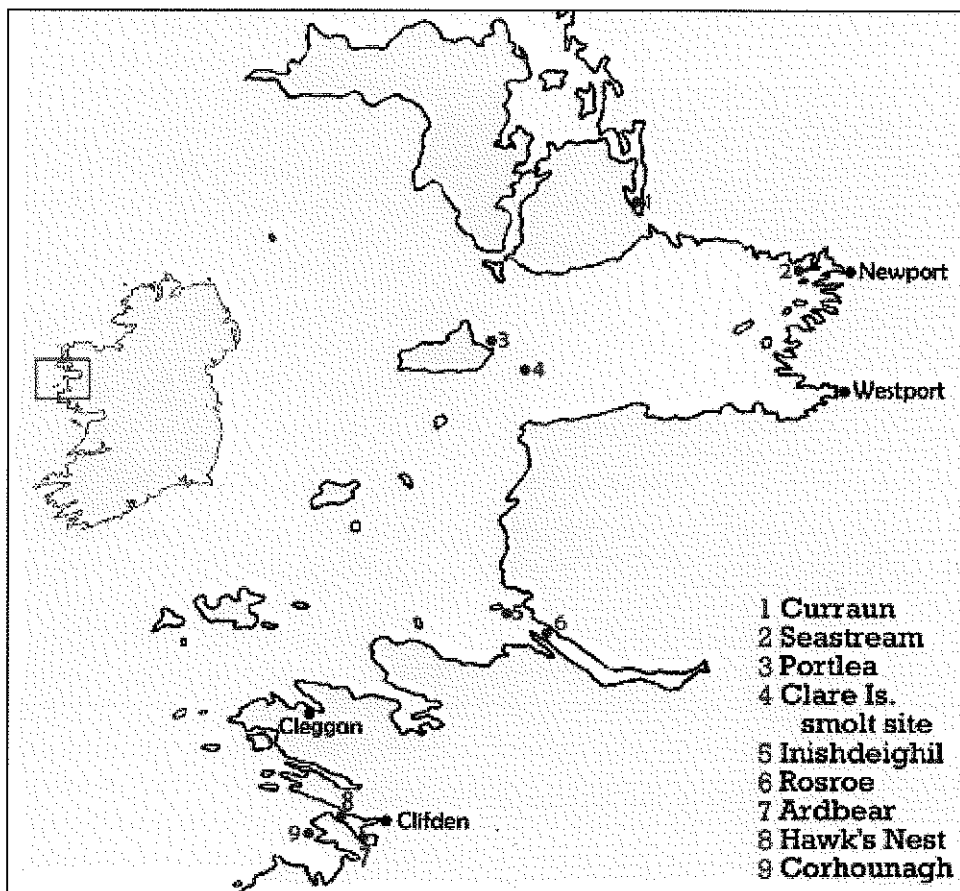


Figure 3. Location of fish farms in the Western region (Clew Bay / Connemara).

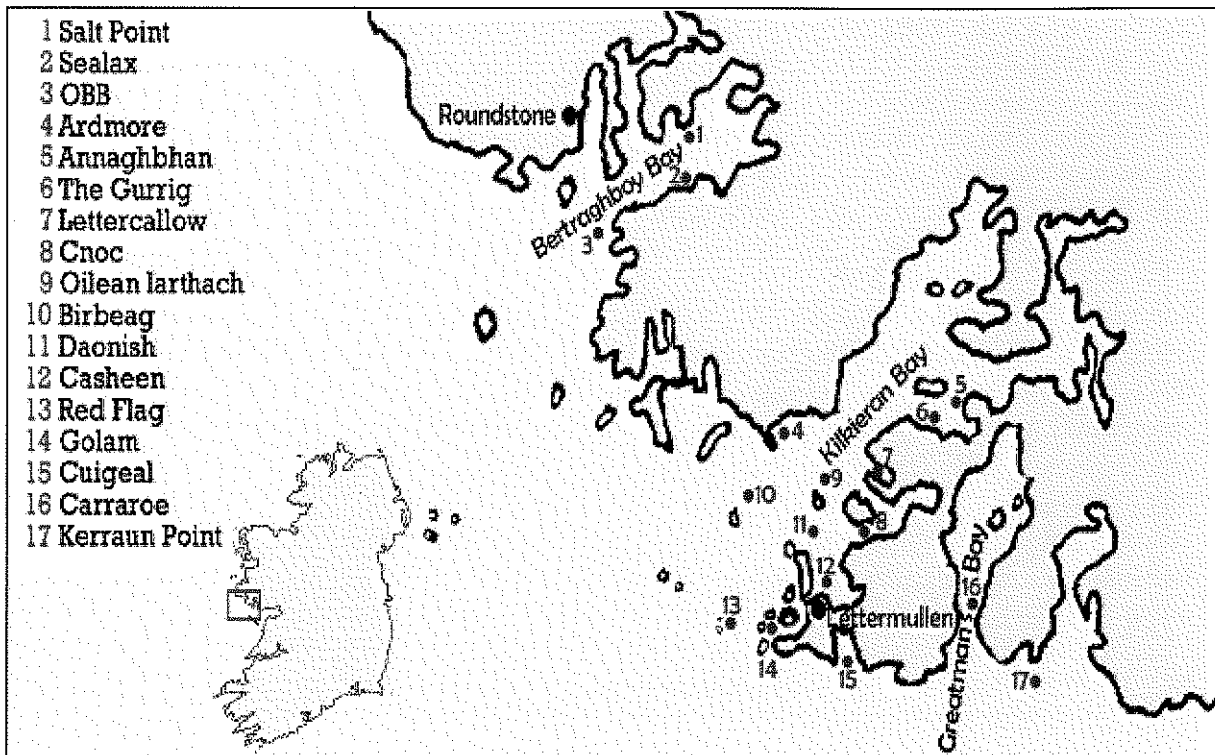


Figure 4. Location of fish farms in the Western region (Connemara).

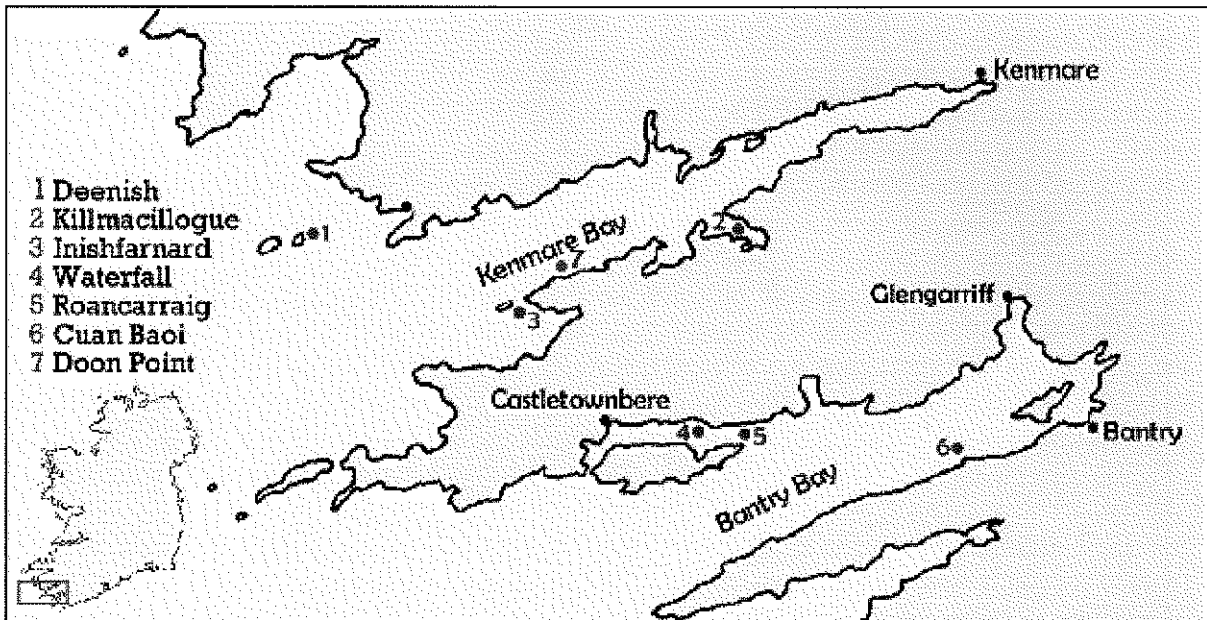


Figure 5. Location of fish farms in the Southwest region.

## RESULTS

### *Atlantic salmon 2003 (Smolts)*

A total of 159 visits were undertaken at 29 sites stocking S1 and S½ smolts during the year 2003. *Lepeophtheirus salmonis* levels were maintained below the treatment trigger level of 0.5 ovigerous female lice per fish throughout the critical spring period. Outside of this period levels exceeded 2.0 ovigerous female lice per fish on two occasions.

*Caligus elongatus* levels remained low throughout the year on 2003 smolts.

### *Atlantic salmon 2002 (one sea-winter salmon)*

One sea-winter salmon were stocked in a total of 26 sites in 10 bays in 2003. Two hundred and twenty eight visits were undertaken to this generation of fish. A total of six bays continued to stock one sea-winter salmon in November 2003.

Ovigerous *L. salmonis* levels greater than the treatment trigger levels were recorded in a total of 76 inspections on one sea-winter fish. Within the critical spring period lice levels were in excess of 0.5 ovigerous females per fish on 49 occasions. Twenty seven inspections were outside the critical spring period when ovigerous lice treatment trigger levels are set at a mean of 2.0 ovigerous female lice per fish.

In the Southwest region, Cuan Baoí (Cuan Baoí Seafarms Ltd.), Bantry Bay, had values above treatment trigger levels on two consecutive inspections in March, twice in May and once in November.

In the Western region, levels greater than the treatment trigger levels were recorded on 15 inspections in the spring period (March – May) and 10 inspections outside the spring period. Levels at Carraroe (Tairgeoiri Biamara Atlantach Teo.), Greatman's Bay, were in excess of treatment trigger levels in January and on both occasions in March prior to harvesting. Sea lice levels at The Gurrig (TBA Teo.), Kilkieran Bay, were in excess of treatment trigger levels on both inspections in March and both inspections in May, also for the July and August inspections. These fish were harvested in August. Lice levels at Ardmore (Éisc Ui Flathartha Teo.), Kilkieran Bay, exceeded the treatment trigger levels on three consecutive visits in February and March, twice in May and again in July prior to harvest.

Lice levels at Portlea (Clare Island Seafarms Ltd.), Clew Bay, were in excess of treatment trigger levels in October and November.

The treatment trigger levels were exceeded on 28 occasions in the Northwest region during critical spring period and on 14 occasions outside that period. McSwynes (Ocean Farm Ltd.), Donegal Bay, were above the treatment trigger levels in February, twice in March, twice in May, June, September, October and November (not sampled in August on veterinary advice). Lice levels exceeded treatment trigger levels at Inver Bay (Ocean farm Ltd.), Donegal Bay, on five inspections during the critical spring period and again in September. Lice levels at Creevin (Creevin Salmon Farm Ltd.), Donegal Bay, were in excess of treatment trigger levels on all six occasions in the spring period and again in June, July and August. Eany Fish Products Ltd. in Donegal Bay had elevated lice levels on five visits; twice in March, once in April, once in May and again in June.

Cranford A (Marine Harvest), Mulroy Bay, had lice levels in excess of treatment trigger levels from December - January until the first visit in April inclusive. Elevated lice levels were recorded at Moross (Marine Harvest), Mulroy Bay, on both inspections in March and lice levels were subsequently reduced. Glinsk (Marine Harvest), Mulroy Bay, had elevated lice levels on three occasions during the critical spring period. Lough Swilly (Marine Harvest) showed lice levels above the treatment trigger levels on one occasion in the spring period and again in September and November.

*C. elongatus* levels were consistently recorded at a low level throughout the year, with the exceptions being Cuan Baoi (Cuan Baoi Seafarm Ltd.), Bantry Bay, in January where relatively high numbers of *C. elongatus* were recorded and in April at Kealincha-Inishfanard (Beara Atlantic Salmon Ltd.), Kenmare Bay.

### ***Atlantic salmon 2001 (two sea-winter salmon)***

At the beginning of 2002, two sea-winter salmon were still being stocked on four sites, McSwynes (Ocean farm Ltd., Donegal Bay), Millstone (Marine Harvest, Mulroy Bay), Lough Swilly (Marine Harvest) and Portlea (Clare Island Seafarm Ltd., Clew Bay). A total of four visits were undertaken to these sites before harvesting was completed. *L. salmonis* levels on these fish were above the treatment trigger in Portlea (Clare Island Seafarm Ltd.) in December-January and in Lough Swilly (Marine Harvest) during the same period.

### ***Rainbow trout***

Lice levels on rainbow trout were generally low throughout the year. There were four sites stocking rainbow trout in the year 2003. A total of 33 farm visits were undertaken during the year. Lice levels in excess of treatment trigger levels were only recorded on two separate inspections during the year.

### ***Sampling record***

In 2003 one site visit was missed due to adverse weather conditions, three visits due to veterinary advice or fish health issues and one visit due to technical difficulties. Two consecutive visits were missed for one site before it became apparent that the fish were not completely harvested and sampling was resumed.

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. Mean ovigerous *L. salmonis* levels were greater than the treatment trigger level of 0.5 ovigerous lice per fish on 11 occasions during the critical spring period, for mean bay data. These occurred in Bantry Bay, Greatman's Bay, Kilkieran Bay, Mannin Bay, Donegal Bay and Mulroy Bay. On 16 occasions, outside of the critical spring period, mean ovigerous levels of at least 2.0 per fish were recorded. These occurred in Bantry Bay, Kenmare Bay, Greatman's Bay, Kilkieran Bay, Mannin Bay, Clew Bay, Donegal Bay and Lough Swilly.

### Regional Monthly Means

*L. salmonis* monthly mean figures for one sea-winter salmon are shown in Figures 6 and 7 for each of the three regions inspected. Regional monthly mean *L. salmonis* levels in the Southwest were above the treatment trigger levels in May, September and November. In the Western region monthly mean ovigerous levels were in excess of treatment trigger levels in March, May and November. In the Northwest region monthly mean ovigerous levels exceeded the treatment trigger levels throughout spring and again in June, September and November.

### Annual trends

*L. salmonis* ovigerous and mobile lice level trends are compared in Figures 8 and 9 for one sea-winter salmon in the month of May from 1991 to 2003. 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. However in recent years (i.e. 2002 and 2003) increases in both mean ovigerous and mean mobile values have been noted.

Table 1 Mean ovigerous and mean mobile *Lepeophtheirus salmonis* and *Caligus elongatus* per month, for one sea-winter salmon for each bay inspected in the year 2003.

Mean ovigerous *Lepeophtheirus salmonis*

	Bantry Bay	Kenmare Bay	Greatman's Bay	Kilkieran Bay	Manin Bay	Killary Harbour	Clew Bay	Donegal Bay	Mulroy Bay	Lough Swilly
January	0.50	0.04	2.55	1.53	0.04	0.24	0.47	0.69	1.16	
February	0.43	0.02	1.66	0.91	0.20	0.40	*	1.31	1.27	0.41
March	0.63	0.05	1.59	0.58	0.51	0.40	0.24	1.53	1.46	0.46
April	0.10	0.15		0.17	0.17	0.20	0.31	1.03	0.68	0.25
May	1.32	0.24		0.46	1.68	0.25	0.15	1.57	0.23	0.12
June	0.48	0.97		1.01	0.49	0.18	0.44	4.16	0.50	0.12
July	0.42	**		3.43	2.04	0.21	0.15	1.28	0.39	0.49
August	1.23	2.84		3.67	0.08	0.70	1.27	2.27	1.06	1.57
September	2.50	1.80		HO	1.82		1.37	9.24	0.72	3.93
October	1.90	HO			0.36		2.26	2.95	1.43	1.13
November	4.97				0.64		8.41	9.58	1.37	3.91

Mean mobile *Lepeophtheirus salmonis*

	Bantry Bay	Kenmare Bay	Greatman's Bay	Kilkieran Bay	Manin Bay	Killary Harbour	Clew Bay	Donegal Bay	Mulroy Bay	Lough Swilly
January	6.81	1.25	6.42	4.43	0.42	0.66	2.96	3.87	6.22	
February	1.19	0.16	4.45	1.93	2.61	18.02	*	13.22	6.66	4.43
March	1.44	1.36	5.85	1.89	3.81	6.04	1.01	6.26	8.84	5.65
April	0.51	1.47		2.56	0.39	1.22	0.98	3.82	2.84	1.05
May	4.00	2.82		2.30	7.37	1.00	1.30	14.50	0.87	0.50
June	1.49	2.32		17.49	17.83	0.78	0.97	10.88	1.26	0.62
July	1.39	**		14.98	21.30	0.55	0.62	3.54	2.87	1.09
August	4.08	6.11		12.78	2.48	2.09	2.55	5.40	6.44	6.05
September	5.29	3.40		HO	13.13		7.15	26.28	6.49	14.01
October	6.33	HO			0.69		8.85	11.25	5.88	24.52
November	8.90				8.36		11.67	54.46	3.30	18.49

Mean ovigerous *Caligus elongatus*

	Bantry Bay	Kenmare Bay	Greatman's Bay	Kilkieran Bay	Manin Bay	Killary Harbour	Clew Bay	Donegal Bay	Mulroy Bay	Lough Swilly
January	5.30	0.47	0.09	0.02	0.03	0.30	0.45	0.03	0.00	
February	0.15	0.84	0.06	0.01	0.03	2.20	*	0.19	0.06	0.65
March	0.33	1.40	0.14	0.02	0.14	0.02	0.03	0.06	0.09	0.56
April	0.25	2.26		0.02	0.00	0.00	0.16	0.03	0.03	0.02
May	2.32	1.51		0.02	0.18	0.04	0.43	0.27	0.01	0.01
June	0.97	0.84		0.16	0.25	0.00	0.40	0.20	0.01	0.04
July	1.24	**		0.15	0.05	0.09	3.11	0.07	0.05	0.07
August	0.20	0.09		0.00	0.02	0.07	1.22	0.07	0.00	0.17
September	0.35	0.03		HO	0.15		0.45	0.04	0.00	0.00
October	0.00	HO			0.02		0.21	0.00	0.00	0.02
November	0.13				1.00		0.13	0.00	0.00	0.00

Mean mobile *Caligus elongatus*

	Bantry Bay	Kenmare Bay	Greatman's Bay	Kilkieran Bay	Manin Bay	Killary Harbour	Clew Bay	Donegal Bay	Mulroy Bay	Lough Swilly
January	9.59	1.01	0.22	0.07	0.08	0.88	1.27	0.13	0.03	
February	0.25	1.44	0.20	0.03	0.20	3.90	*	0.46	0.15	1.16
March	0.84	2.97	0.31	0.07	0.23	0.05	0.08	0.14	0.15	0.99
April	1.25	4.55		0.26	0.00	0.02	0.38	0.14	0.05	0.05
May	4.69	3.57		0.04	0.35	0.07	0.81	0.48	0.02	0.04
June	2.72	1.90		0.50	0.62	0.00	1.47	0.38	0.04	0.05
July	2.72	**		0.40	0.42	0.10	6.86	0.24	0.11	0.16
August	0.58	0.25		0.00	0.05	0.11	3.58	0.07	0.00	0.20
September	0.47	0.07		HO	0.33		1.18	0.04	0.00	0.02
October	0.03	HO			0.05		0.66	0.00	0.03	0.07
November	0.33				2.00		0.25	0.02	0.00	0.06

HO = Harvested out \* Missed due to adverse weather conditions \*\*Missed due to technical difficulties

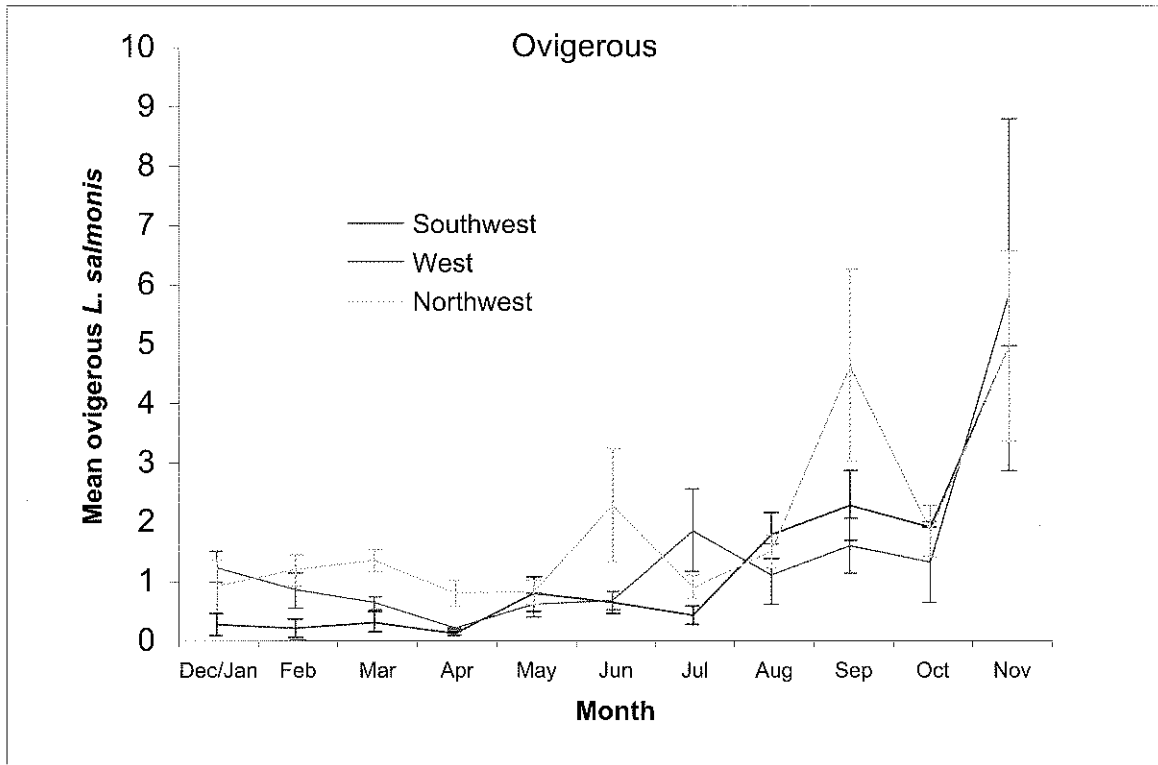


Figure 6. Mean ovigerous *L. salmonis* per month per region in 2003.

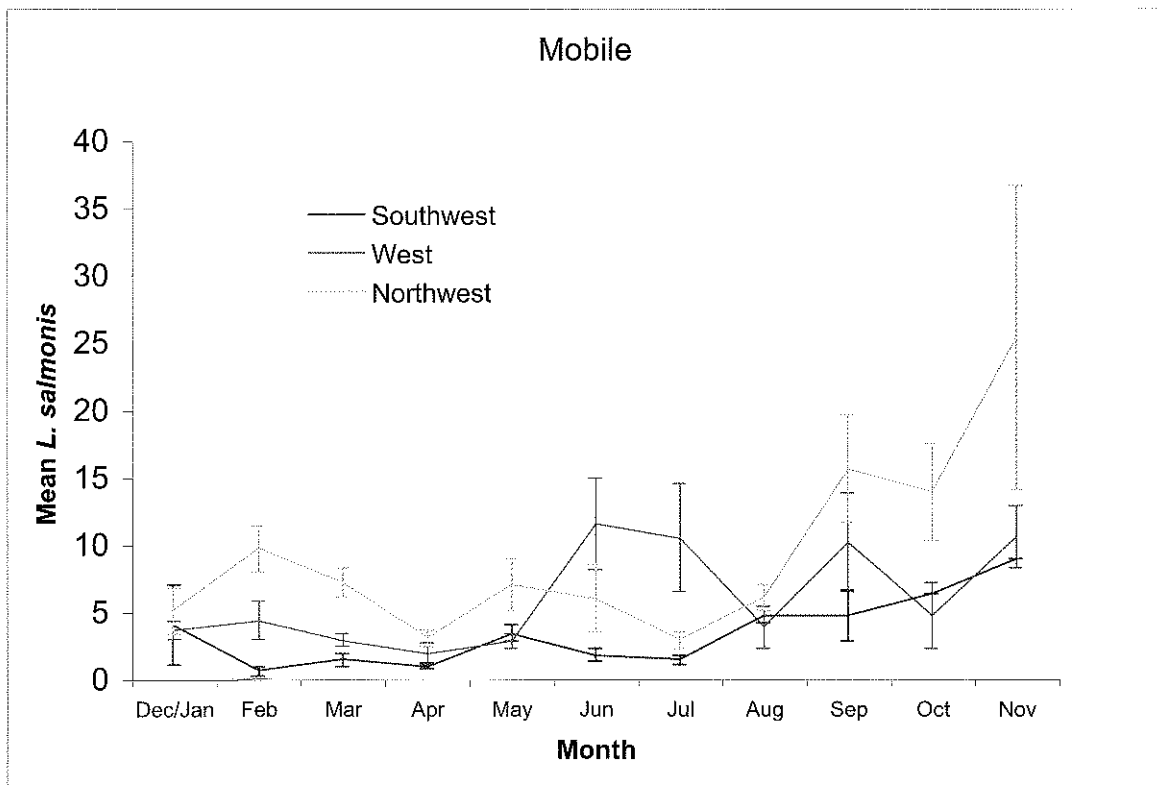


Figure 7. Mean mobile *L. salmonis* per month per region in 2003.

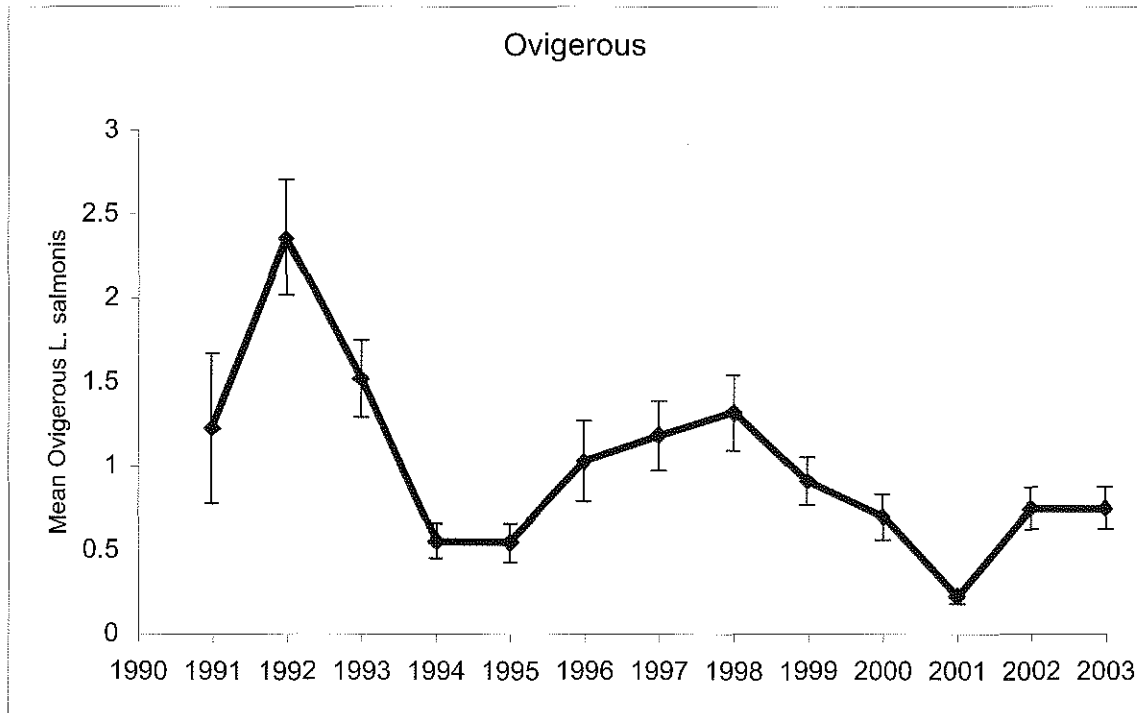


Figure 8. May mean (SE) ovigerous *L. salmonis* on one sea-winter salmon.

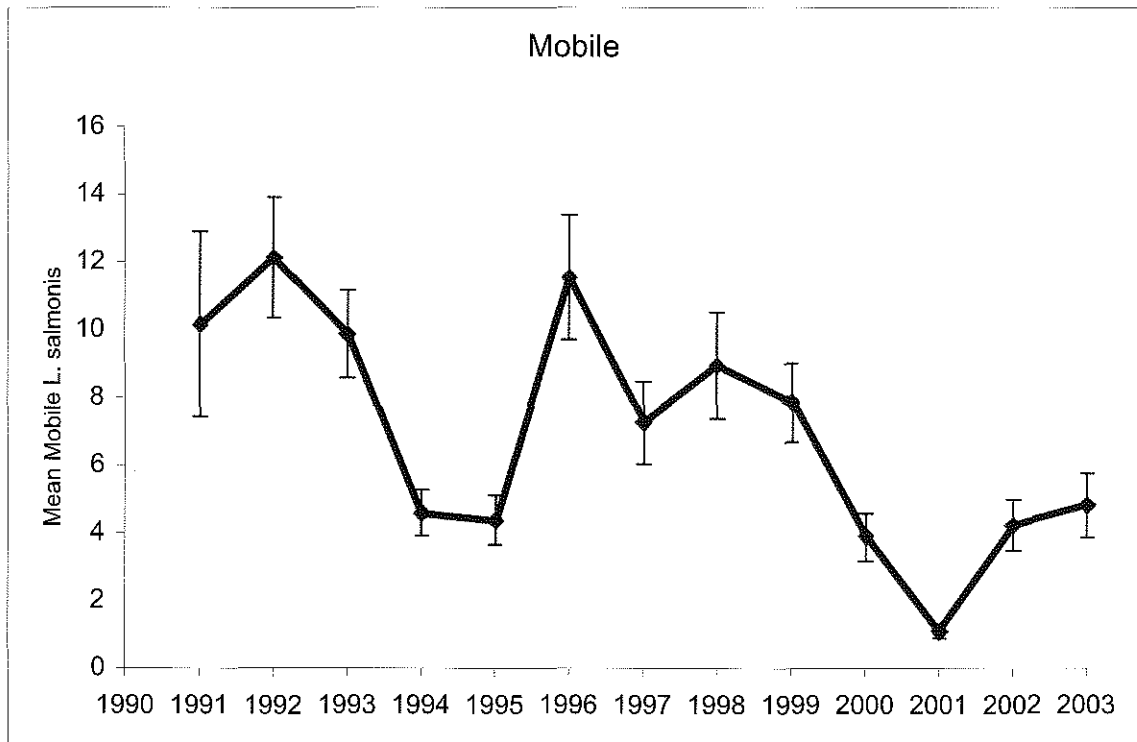


Figure 9. May mean (SE) mobile *L. salmonis* on one sea-winter salmon.



## DISCUSSION

In 2003, of the 424 sea lice inspections that were carried out on salmonids, 80.7% were below treatment trigger levels as outlined in DCMNR protocols, 94% of rainbow trout were below treatment trigger levels. In the smolt stock 98.7% of inspections did not exceed the treatment trigger levels and 67% of inspections of one sea-winter fish and 50% of the two sea-winter fish were within the limits treatment trigger levels.

In the Northwest region levels were in excess of treatment trigger levels on 45.7% of inspections of one sea-winter salmon. In the West and Southwest levels were exceeded on 27.5% and 20% of inspections, respectively.

During the critical spring period (March – May) 58.3% of inspections exceeded the treatment trigger in the Northwest. In the West the figure was 30.6% and 25% in the Southwest.

The monthly trend of lice levels in one sea-winter salmon shows that levels in the Northwest are generally higher than other regions for the year as a whole. In all three regions mean ovigerous levels were elevated for the month of November. This contrasts, both in timing and lice levels, with the 2002 results where the harvesting was essentially completed in October.

It can be seen from the May mean *L. salmonis* plots that there was no appreciable difference in mean levels of ovigerous females recorded for 2003 and 2002. However a small increase in the May mean mobile value is apparent. Looking at the whole year, a trend of increasing lice levels (both ovigerous and total mobile) from the end of the spring period onwards, is evident with peaks in September and November.

Factors that may have contributed to the overall sea lice levels for 2003 include both sea temperature and fish health problems. On average, mean monthly sea temperatures were 0.23°C higher than 2002 and 1.05°C higher than the 30 year mean (worked from source data from Met Éireann). The life cycle of the sea louse is accelerated by an increase in sea temperatures (Hogans and Trudeau, 1989). During the year fish health has been an issue on many farms. Symptoms of pancreas disease (PD) were reported in all three regions in late summer / autumn. Weakened fish are more susceptible to a greater parasitic burden and are more difficult to treat.

Glossary of terms used:

<i>Ovigerous lice:</i>	An egg bearing adult female sea lice
<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>Standard (Std.) Cage:</i>	The selected cage which is sampled at each inspection
<i>Random (Ran.) Cage:</i>	A cage which is selected by the inspector on the day of 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
<i>Grower:</i>	A fish which has been at sea for one complete year or longer

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**APPENDIX 1. SEA LICE MONITORING ON SALMONID FARMS 2003**

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>BANTRY BAY</b>					
<b>BEARA ATLANTIC SALMON LTD</b>					
<b>Roanarraig</b>					
Atlantic salmon, 2002	22/01/2003	0.31	1.48	0.00	0.17
S1/2	19/02/2003	0.03	0.30	0.00	0.03
	05/03/2003	0.20	0.30	0.03	0.13
	19/03/2003	0.27	0.47	0.17	0.33
	02/04/2003	0.03	0.10	0.00	0.00
	15/04/2003	0.00	0.62	1.17	4.66
	07/05/2003	0.06	2.11	0.89	2.17
	21/05/2003	1.30	3.80	0.73	1.20
Atlantic salmon, 2002	22/01/2003	0.03	0.06	0.00	0.03
	19/02/2003	.13	0.73	0.07	0.07
	05/03/2003	0.10	0.17	0.00	0.00
	19/03/2003	0.00	0.17	0.03	0.10
	02/04/2003	0.03	0.30	0.10	0.40
	15/04/2003	0.19	0.77	0.29	0.81
	07/05/2003	0.17	2.37	0.97	1.80
	21/05/2003	0.53	1.43	0.40	0.87
	18/06/2003	0.22	0.67	0.89	2.70
	09/07/2003	0.48	1.23	1.27	2.75
	13/08/2003	1.37	3.05	0.15	0.79
	17/09/2003	3.43	8.40	0.7	0.93
<b>LASINGERS</b>					
<b>CUAN BAOI SEAFARMS LTD</b>					
Atlantic salmon, 2002	22/01/2003	1.16	18.90	15.90	28.58
	19/02/2003	1.13	2.55	0.39	0.65
	05/03/2003	0.97	1.35	0.26	0.39
	19/03/2003	2.26	6.16	1.48	4.10
	02/04/2003	0.08	0.30	0.00	0.19
	15/04/2003	0.21	0.95	0.34	2.39
	07/05/2003	0.65	4.37	4.07	7.15
	23/05/2003	3.03	5.95	3.05	7.15
	18/06/2003	0.73	2.30	1.05	2.74
	09/07/2003	0.30	1.73	1.20	2.67
	13/08/2003	1.09	5.11	0.24	0.37
	17/09/2003	1.57	2.17	0.00	0.00
	16/10/2003	1.90	6.33	0.00	0.03
	20/11/2003	4.97	8.90	0.13	0.33

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>		
		F + eggs	Total	F + eggs	Total	
Atlantic salmon, 2003	09/07/2003	0.00	0.08	0.18	0.23	
	13/08/2003	0.03	0.68	0.03	0.06	
	17/09/2003	0.00	0.06	0.00	0.00	
	16/10/2003	0.06	0.79	0.06	0.09	
	20/11/2003	0.38	1.22	0.19	0.41	
<b>JOHN POWER LTD</b>						
<b>Waterfall</b>						
Rainbow trout, 2003	22/01/2003	0.00	6.65	0.59	0.85	
	19/02/2003	0.00	1.55	1.03	1.55	
	05/03/2003	0.13	1.37	0.82	1.62	
	19/03/2003	0.05	1.12	0.49	1.15	
	02/04/2003	0.17	2.93	0.45	0.65	
	15/04/2003	0.02	0.68	0.00	0.11	
	07/05/2003	0.05	2.29	0.87	1.65	
	22/05/2003	0.07	0.27	0.00	0.04	
	18/06/2003	0.02	0.25	0.07	0.37	
	09/07/2003	0.04	0.12	0.17	0.54	
	<b>KENMARE BAY</b>					
<b>BEARA ATLANTIC SALMON LTD</b>						
<b>Kealincha- Inishfarnard</b>						
Atlantic salmon, 2002	23/01/2003	0.00	0.13	0.63	1.40	
	20/02/2003	0.02	0.18	1.60	2.67	
	06/03/2003	0.03	0.32	1.77	2.67	
	20/03/2003	0.03	0.43	3.59	8.47	
	03/04/2003	0.16	0.63	6.09	11.85	
	16/04/2003	0.07	0.25	2.81	6.07	
	08/05/2003	0.17	1.14	2.79	6.20	
	21/05/2003	0.52	2.91	1.72	4.42	
	17/06/2003	0.97	2.32	0.84	1.90	
			Missed due to technical difficulties			
	14/08/2003	2.84	6.11	0.09	0.25	
	16/09/2003	1.80	3.40	0.03	0.07	
	<b>Deenish</b>					
Atlantic salmon, 2003	17/06/2003	0.00	0.01	0.13	0.52	
	08/07/2003	0.00	0.07	0.69	1.50	
	12/08/2003	0.00	0.05	0.17	0.44	
	16/09/2003	0.05	0.17	0.11	0.13	
	15/10/2003	0.00	0.07	0.13	0.27	
	19/11/2003	0.05	0.13	0.64	1.65	

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>LASINGERS</b>					
<b>ST KILLIAN'S HARVEST</b>					
<b>Kilmacillogue</b>					
Atlantic salmon, 2002	23/01/2003	0.07	1.82	0.39	0.82
	20/02/2003	0.02	0.15	0.08	0.22
	06/03/2003	0.15	2.45	0.05	0.19
	20/03/2003	0.00	2.25	0.18	0.55
	03/04/2003	0.18	1.69	0.04	0.10
	16/04/2003	0.19	3.30	0.10	0.20
	08/05/2003	0.03	0.23	0.00	0.03
	22/05/2003	0.03	8.58	0.06	0.16
Atlantic salmon, 2003	20/02/2003	0.00	2.30	0.07	0.71
S 1/2	06/03/2003	0.02	5.13	0.32	0.72
	20/03/2003	0.30	5.81	0.53	1.75
	03/04/2003	0.04	0.59	0.02	0.05
	16/04/2003	0.00	0.56	0.02	0.10
	08/05/2003	0.04	2.20	0.09	0.13
	22/05/2003	0.06	4.72	0.05	0.05
	17/06/2003	0.07	0.93	0.02	0.04
	08/07/2003	0.12	6.77	0.10	0.13
	14/08/2003	0.20	1.77	0.00	0.04
	17/09/2003	0.22	3.91	0.18	0.83
	15/10/2003	0.04	3.00	0.07	0.16
	19/11/2003	0.15	2.33	0.20	0.40
<b>Doon Point</b>					
Atlantic salmon, 2003	09/07/2003	0.00	0.06	0.18	0.44
	12/08/2003	0.00	0.07	0.10	0.13
	16/09/2003	0.00	0.03	0.00	0.00
	15/10/2003	0.00	0.04	0.00	0.00
	19/11/2003	0.00	0.00	0.07	0.07
<b>GREATMAN'S BAY</b>					
<b>TAIRGEOIRI BIAMARA ATLANTACH TEO</b>					
<b>Carraroe</b>					
Atlantic salmon, 2002	10/01/2003	2.55	6.42	0.09	0.22
S1/2	27/02/2003	1.66	4.45	0.06	0.20
	14/03/2003	1.59	6.29	0.12	0.27
	27/03/2003	1.59	5.42	0.17	0.36
Atlantic salmon, 2003	27/11/2003	0.00	0.08	0.06	0.25

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>Kerraun Point</b>					
Atlantic salmon, 2003	20/06/2003	0.00	0.06	0.06	0.18
	17/07/2003	0.02	0.24	0.43	0.96
	27/08/2003	0.00	0.17	0.00	0.00
	23/09/2003	0.16	0.67	0.07	0.16
	23/10/2003	0.12	0.14	0.02	0.02
Fish transferred to Carraroe					
<b>MUIRACHMHAINNI TEO</b>					
<b>Cuigeal</b>					
Atlantic salmon, 2003	30/04/2003	0.00	0.10	0.00	0.04
S1/2	14/05/2003	0.00	0.22	0.02	0.12
	29/05/2003	0.00	0.07	0.12	0.25
	11/06/2003	0.00	0.10	0.07	0.19
	16/07/2003	0.38	2.12	0.12	0.45
	21/08/2003	0.07	0.27	0.00	0.00
	23/09/2003	0.09	0.53	0.00	0.00
Fish transferred to Daonish and Casheen					
<b>KILKIERAN BAY</b>					
<b>MUIRACHMHAINNI TEO</b>					
<b>Casheen</b>					
Atlantic salmon, 2002	06/12/2002	1.70	3.77	0.00	0.10
S1/2	26/02/2003	0.18	0.55	0.00	0.00
	12/03/2003	0.71	1.00	0.00	0.00
	25/03/2003	0.17	0.77	0.00	0.00
	11/04/2003	0.04	0.93	0.00	0.11
Atlantic salmon, 2003	21/10/2003	0.03	0.73	0.10	2.37
S1/2	26/11/2003	0.31	2.00	0.15	0.19
<b>Daonish</b>					
Atlantic salmon, 2002	06/12/2002	1.59	2.83	0.02	0.03
S1/2	26/02/2003	0.40	1.19	0.00	0.00
	12/03/2003	0.29	0.71	0.06	0.06
	25/03/2003	0.13	0.35	0.00	0.02
	11/04/2003	0.20	1.11	0.02	0.02
	30/04/2003	0.27	1.33	0.03	0.10
Atlantic salmon, 2003	21/10/2003	0.14	1.15	0.10	1.70
S1/2	26/11/2003	0.20	0.95	0.10	0.15



	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>Golam</b>					
Atlantic salmon, 2003	26/02/2003	0.02	0.84	0.03	0.05
S1/2	12/03/2003	0.02	1.95	0.05	0.13
	25/03/2003	0.05	1.95	0.12	0.37
	11/04/2003	0.00	0.45	0.00	0.00
Fish transferred to Cuigeal and Red Flag					
<b>Red Flag</b>					
Atlantic salmon, 2003	30/04/2003	0.00	0.20	0.00	0.08
S1/2	14/05/2003	0.00	0.07	0.07	0.17
	29/05/2003	0.00	0.11	0.66	1.39
	11/06/2003	0.02	0.26	0.36	0.79
	16/07/2003	1.22	4.92	0.08	0.33
	21/08/2003	0.43	1.14	0.00	0.05
	23/09/2003	0.91	1.61	0.05	0.23
Fish transferred to Daonish and Casheen					
<b>MUIR GHEAL TEO</b>					
<b>Cnoc</b>					
Atlantic salmon, 2002	23/01/2003	3.05	7.72	0.00	0.02
S1/2	28/02/2003	0.24	0.38	0.00	0.00
	14/03/2003	0.12	0.42	0.00	0.00
	28/03/2003	0.02	0.41	0.00	0.00
	08/04/2004	0.15	6.40	0.00	0.05
	29/04/2003	0.07	0.69	0.00	0.00
	13/05/2003	0.02	0.23	0.00	0.02
	28/05/2003	0.04	0.91	0.07	0.09
	18/06/2003	0.68	10.25	0.00	0.04
<b>TAIRGEOIRI BIAMARA ATLANTACH TEO</b>					
<b>Annaghbhan</b>					
Atlantic salmon, 2002					
S1/2	17/12/2002	2.28	7.47	0.00	0.00
	27/02/2003	0.28	0.43	0.00	0.00
	14/03/2003	0.70	1.32	0.00	0.06
	31/03/2003	0.21	2.60	0.00	0.00
	14/04/2003	0.19	0.64	0.00	0.00
	28/04/2003	0.22	1.35	0.00	0.05
On starve for harvest					
	21/07/2003	1.27	33.57	0.00	0.37
<b>The Gurrig</b>					
Atlantic salmon, 2002	17/12/2002	0.02	1.75	0.00	0.00
	27/02/2003	0.93	3.71	0.00	0.00
	14/03/2003	0.55	2.25	0.00	0.04
	31/03/2003	0.54	1.55	0.02	0.02

Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
	F + eggs	Total	F + eggs	Total
14/04/2003	0.24	0.55	0.00	0.00
28/04/2003	0.10	0.32	0.00	0.00
19/05/2003	0.62	5.07	0.00	0.09
30/05/2003	0.86	3.62	0.02	0.02
16/06/2003	1.52	17.92	0.02	0.33
15/07/2003	2.73	4.28	0.00	0.00
29/08/2003	3.67	12.78	0.00	0.00

### EISC UI FLATHARTHA TEO

#### Ardmore

Atlantic salmon, 2002	22/01/2003	0.65	2.72	0.08	0.27
	27/02/2003	3.07	5.53	0.04	0.17
	18/03/2003	1.26	2.96	0.02	0.21
	28/03/2003	2.20	7.37	0.13	0.34
	10/04/2003	0.35	0.58	0.00	0.00
	29/04/2003	0.00	21.07	0.33	4.22
	14/05/2003	0.83	2.00	0.00	0.00
	22/05/2003	0.70	1.30	0.00	0.00
	19/06/2003	0.67	31.13	0.79	1.79
	17/07/03	7.00	17.78	0.61	1.22

### BERTRAGHBOY BAY

#### COMHLAUGHT BRADAIN CONNAMARRA TEO

#### Salt Point

Atlantic salmon, 2003	26/02/2003	0.00	0.00	0.00	0.02
S1/2	13/03/2003	0.00	0.02	0.02	0.13
	28/03/2003	0.08	3.32	0.37	0.74
	10/04/2003	0.03	1.66	0.28	0.55
	25/04/2003	0.00	0.35	0.00	0.00
	09/05/2003	0.00	0.03	0.00	0.00
	22/05/2003	0.00	0.21	0.02	0.07
	11/06/2003	0.00	0.09	0.00	0.02
	16/07/2003	0.07	0.14	0.02	0.07
	22/08/2003	0.02	0.08	0.00	0.02
	29/09/2003	0.02	0.46	0.03	0.10
	22/10/2003	0.14	1.19	0.14	0.44
	28/11/2003	0.28	2.19	0.04	0.05
Atlantic salmon, 2003	29/09/2003	0.10	0.67	0.52	0.96
	22/10/2003	0.19	1.80	0.46	2.38
	28/11/2003	0.14	1.51	0.30	0.43

#### OBB

Atlantic salmon, 2003	11/06/2003	0.00	0.03	0.52	0.75
	18/07/2003	0.00	0.08	0.75	1.56
	22/08/2003	0.00	0.05	0.07	0.22

Fish transferred to Saltpoint

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>MANNIN BAY</b>					
<b>MANNIN BAY SALMON CO LTD</b>					
<b>Hawk's Nest</b>					
Atlantic salmon, 2002	17/01/2003	0.04	0.42	0.03	0.08
	26/02/2003	0.20	2.61	0.03	0.20
	14/03/2003	0.59	3.65	0.17	0.20
	25/03/2003	0.44	3.97	0.12	0.27
	10/04/2003	0.25	0.52	0.00	0.00
	24/04/2003	0.08	0.27	0.00	0.00
Fish transferred to Corhounagh					
Atlantic salmon, 2003	12/08/2003	0.17	2.51	0.03	0.10
	10/09/2003	0.54	1.40	0.00	0.00
	30/10/2003	0.70	3.63	0.12	0.64
	26/11/2003	0.55	2.58	0.05	0.08
<b>Corhounagh</b>					
Atlantic salmon, 2002	14/05/2003	0.45	7.08	0.05	0.15
	29/05/2003	2.92	7.65	0.30	0.55
	25/06/2003	0.49	17.83	0.25	0.62
	17/07/2003	2.04	21.30	0.05	0.42
	12/08/2003	0.08	2.48	0.02	0.05
	10/09/2003	1.82	13.13	0.15	0.33
	30/10/2003	0.36	0.69	0.02	0.05
26/11/2003	0.64	8.36	1.00	2.00	
<b>Ardbear</b>					
Atlantic salmon, 2003	05/06/2003	0.00	0.00	0.00	0.00
	02/07/2003	0.00	0.05	0.00	0.00
Fish transferred to Corhounagh					
<b>KILLARY HARBOUR</b>					
<b>KILLARY SALMON CO LTD</b>					
<b>Rosroe</b>					
Atlantic salmon, 2002	17/01/2003	0.24	0.66	0.30	0.88
	28/02/2003	0.40	18.02	2.20	3.90
	21/03/2003	0.30	6.46	0.02	0.05
	28/03/2003	0.50	5.62	0.02	0.05
	09/04/2003	0.21	1.41	0.00	0.03
	23/04/2003	0.19	1.03	0.00	0.00
	06/05/2003	0.12	0.53	0.00	0.02
	23/05/2003	0.39	1.47	0.08	0.13
	06/06/2003	0.18	0.78	0.00	0.00
	03/07/2003	0.21	0.55	0.09	0.10
	06/08/2003	0.70	2.09	0.07	0.11
	Atlantic salmon, 2003	27/11/2003	0.11	1.42	1.60

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>Inishdeighil</b>					
Atlantic salmon, 2003	06/06/2003	0.02	1.01	0.05	0.15
	03/07/2003	0.00	0.38	0.00	0.03
	06/08/2003	0.14	0.84	0.23	0.50
	04/09/2003	0.06	0.49	0.09	0.13
	21/10/2003	0.09	0.51	0.08	0.24
Fish transferred to Rosroe					
<b>CLEW BAY</b>					
<b>CLARE ISLAND SEAFARMS LTD</b>					
<b>Portlea</b>					
Atlantic salmon, 2001	06/12/2002	5.00	8.50	0.00	0.00
Atlantic salmon, 2002	06/12/2002	0.42	3.61	0.55	1.51
	Feb	Missed due to adverse weather conditions			
	07/03/2003	0.34	1.11	0.02	0.07
	25/03/2003	0.15	0.92	0.05	0.10
	04/04/2003	0.23	1.02	0.13	0.36
	28/04/2003	0.40	0.94	0.20	0.40
	14/05/2003	0.02	0.49	0.28	0.51
	27/05/2003	0.29	2.12	0.59	1.12
	11/06/2003	0.44	0.97	0.40	1.47
	03/07/2003	0.15	0.62	3.11	6.86
	14/08/2003	1.27	2.55	1.22	3.58
	15/09/2003	1.37	7.15	0.45	1.18
	21/10/2003	2.26	8.85	0.21	0.66
	26/11/2003	8.41	11.67	0.13	0.25
	<b>Smolt Site</b>				
Atlantic salmon, 2002	06/12/2002	0.52	2.31	0.34	1.03
Fish transferred to Portlea					
Atlantic salmon, 2003	11/06/2003	0.00	0.10	0.64	1.56
	03/07/2003	0.00	0.11	1.51	2.51
	14/08/2003	0.32	0.92	2.15	4.65
	15/09/2003	0.17	3.06	0.23	0.38
	21/10/2003	0.15	0.58	0.08	0.10
	26/11/2003	0.23	6.90	0.83	2.48
<b>SEASTREAM LTD</b>					
Rainbow Trout, 2003	03/07/2003	0.03	0.23	0.90	1.67
	27/08/2003	0.19	1.00	1.52	4.22
	15/09/2003	0.12	0.72	0.87	1.97
	21/10/2003	0.27	0.46	0.07	0.08
	26/11/2003	0.20	1.23	0.30	0.52

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>BEALACRAGHER BAY</b>					
<b>CURRAUN FISHERIES LTD</b>					
Rainbow trout, 2002	23/01/2002	0.00	0.10	0.07	0.10
	27/02/2003	0.00	0.13	0.07	0.07
	07/03/2003	0.00	0.17	0.10	0.10
	25/03/2003	0.02	0.59	0.07	0.11
	04/04/2003	0.20	2.13	0.13	0.32
	29/04/2003	2.37	11.99	0.49	1.12
	16/05/2003	0.14	1.17	0.02	0.03
	27/05/2003	0.09	6.70	0.12	0.57
<b>DONEGAL BAY</b>					
<b>OCEAN FARM LTD</b>					
<b>Inver Bay</b>					
Atlantic salmon, 2002	12/12/2002	1.64	5.78	0.03	0.16
	19/02/2003	0.59	1.90	0.00	0.02
	04/03/2003	0.95	2.07	0.00	0.03
	21/03/2003	0.87	1.63	0.00	0.00
	02/04/2003	0.54	1.38	0.00	0.05
	16/04/2003	0.24	0.72	0.02	0.03
	15/05/2003	0.99	10.52	0.06	0.15
	27/05/2003	1.10	5.69	0.04	0.11
	25/06/2003	1.31	3.45	0.02	0.09
	09/07/2003	0.77	1.45	0.04	0.21
		Not sampled due to fish health problems			
	26/09/2003	10.80	22.67	0.07	0.07
Atlantic salmon, 2003	25/06/2003	0.00	0.12	0.08	0.15
	09/07/2003	0.00	0.09	0.01	0.04
		Not sampled due to fish health problems			
	26/09/2003	1.83	9.14	0.00	0.00
<b>McSwynes</b>					
Atlantic salmon, 2001	11/12/2002	1.92	11.79	0.04	0.15
Atlantic salmon, 2002	20/02/2003	2.93	15.10	0.09	0.14
	06/03/2003	3.58	12.54	0.02	0.05
	21/03/2003	1.11	1.79	0.00	0.00
	03/04/2003	0.48	1.15	0.00	0.00
	15/04/2003	0.30	1.17	0.00	0.00
	15/05/2003	1.06	8.18	0.06	0.27
	28/05/2003	2.69	11.42	0.24	0.32

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
	18/06/2003	2.83	5.87	0.05	0.14
	10/07/2003	1.63	3.37	0.02	0.05
		Not sampled due to fish health problems			
	26/09/2003	7.68	29.88	0.00	0.00
	17/10/2003	2.95	11.25	0.00	0.00
	19/11/2003	9.58	54.46	0.00	0.02
Atlantic salmon, 2003	10/07/2003	0.17	1.33	0.02	0.04
		Not sampled due to fish health problems			
	26/09/2003	1.59	5.83	0.00	0.02
	17/10/2003	0.21	1.02	0.00	0.00
	19/11/2003	0.05	0.34	0.00	0.00
<b>Castlemurray</b>					
Atlantic salmon, 2002	11/12/2002	0.57	7.15	0.03	0.15
		Fish transferred to McSwyne's Bay			
<b>CREEVIN SALMON FARM LTD</b>					
<b>Inver Bay</b>					
Atlantic salmon, 2002	12/12/2002	0.17	0.97	0.03	0.14
SI/2	19/02/2003	0.84	12.74	0.19	0.52
	04/03/2003	2.27	22.87	0.47	1.00
	20/03/2003	0.79	1.90	0.00	0.00
	02/04/2003	6.81	10.81	0.04	0.11
	08/05/2003	1.40	8.20	0.40	0.80
	27/05/2003	1.84	31.19	0.39	0.74
	17/06/2003	13.52	33.59	1.10	1.90
	10/07/2003	2.27	4.07	0.00	0.00
Atlantic salmon, 2002	12/12/2002	0.27	1.27	0.03	0.15
	19/02/2003	1.50	22.37	0.73	1.53
	04/03/2003	2.53	21.70	0.33	0.83
	20/03/2003	1.63	3.70	0.00	0.07
	02/04/2003	1.00	2.16	0.03	0.13
	15/04/2003	1.60	12.77	0.10	0.44
	08/05/2003	0.90	15.43	0.37	0.47
	27/05/2003	5.21	40.68	0.71	0.93
	17/06/2003	5.27	20.80	0.13	0.23
	20/08/2003	2.27	5.40	0.07	0.07
Atlantic salmon, 2003	10/07/2003	0.00	0.03	0.00	0.01
	20/08/2003	0.54	3.73	0.00	0.00
	25/09/2003	0.16	0.81	0.00	0.00
	16/10/2003	0.21	0.55	0.00	0.00
	19/11/2003	0.03	0.16	0.00	0.00

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>EANY FISH PRODUCTS LTD</b>					
<b>Inver Bay</b>					
Atlantic salmon, 2002	12/12/2002	0.33	1.43	0.02	0.06
	19/02/2003	0.54	18.32	0.23	0.67
	04/03/2003	0.67	2.03	0.00	0.04
	20/03/2003	1.43	3.57	0.00	0.00
	02/04/2003	0.41	2.97	0.05	0.35
	16/04/2003	0.53	2.37	0.00	0.10
	08/05/2003	0.33	1.80	0.03	0.13
	27/05/2003	0.62	34.14	1.03	1.90
	17/06/2003	2.07	3.16	0.03	0.10
	10/07/2003	0.61	7.52	0.29	0.90
		Not sampled due to fish health problems			
Atlantic salmon, 2003	17/06/2003	0.00	0.68	0.05	0.09
	10/07/2003	0.02	0.30	0.00	0.00
	20/08/2003	0.18	4.72	0.00	0.00
	25/09/2003	0.10	0.43	0.00	0.00
	16/10/2003	0.12	0.18	0.00	0.00
	19/11/2003	0.00	0.30	0.00	0.00
Rainbow trout, 2003	19/02/2003	0.00	5.33	0.22	0.56
	04/03/2003	0.03	0.10	0.03	0.17
	20/03/2003	0.13	0.87	0.10	0.10
	02/04/2003	0.10	1.17	0.00	0.03
	16/04/2003	0.00	1.40	0.00	0.03
	08/05/2003	0.03	4.50	0.33	0.50
	27/05/2003	0.13	10.87	0.17	0.47
	17/06/2003	0.10	0.77	0.03	0.13
	10/07/2003	0.52	4.00	0.16	0.42
	20/08/2003	4.00	13.60	0.30	0.43
<b>MULROY BAY</b>					
<b>MARINE HARVEST</b>					
<b>Cranford A</b>					
Atlantic salmon, 2002 S1/2	10/12/2002	3.87	17.18	0.00	0.05
	20/02/2003	2.81	10.58	0.10	0.22
	05/03/2003	3.07	10.60	0.10	0.10
	19/03/2003	2.67	12.81	0.21	0.23
	02/04/2003	1.17	4.38	0.02	0.05
	16/04/2003	0.27	1.10	0.00	0.00
	08/05/2003	0.22	0.74	0.00	0.01
	21/05/2003	0.30	0.67	0.04	0.04
	09/06/2003	0.43	0.86	0.00	0.00

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2003	08/05/2003	0.00	0.00	0.00	0.00
S1/2	21/05/2003	0.00	0.09	0.00	0.00
	09/06/2003	0.00	0.16	0.00	0.00
	03/07/2003	0.27	2.26	0.03	0.07
	13/08/2003	3.28	24.06	0.03	0.20
	10/09/2003	1.39	3.66	0.00	0.00
	16/10/2003	3.70	15.60	0.00	0.00
	20/11/2003	1.92	13.15	0.00	0.07
<b>Cranford C</b>					
Atlantic salmon, 2003	19/02/2003	0.00	1.33	0.02	0.08
S1/2	05/03/2003	0.00	1.77	0.02	0.07
	19/03/2003	0.03	2.84	0.00	0.07
	02/04/2003	0.00	0.19	0.00	0.00
	16/04/2003	0.00	0.02	0.00	0.00
Fish transferred to Cranford A					
<b>Moross</b>					
Atlantic salmon, 2002	10/12/2002	0.23	2.65	0.00	0.00
S1/2	20/02/2003	0.63	7.04	0.04	0.14
	05/03/2003	1.27	10.50	0.02	0.07
	19/03/2003	0.67	12.87	0.03	0.15
	02/04/2003	0.42	2.93	0.00	0.02
	15/04/2003	0.32	1.37	0.00	0.02
	07/05/2003	0.35	1.64	0.00	0.00
	21/05/2003	0.19	0.73	0.00	0.00
	09/06/2003	0.95	2.35	0.00	0.04
	03/07/2003	0.27	1.77	0.00	0.00
Atlantic salmon, 2003	09/06/2003	0.00	1.41	0.00	0.02
S1/2	03/07/2003	0.39	2.28	0.00	0.02
	13/08/2003	3.60	22.27	0.00	0.05
	09/09/2003	1.87	11.57	0.00	0.00
	16/10/2003	0.48	6.70	0.00	0.05
	20/11/2003	1.05	11.30	0.00	0.09
<b>Moross 1</b>					
Atlantic salmon, 2003	19/02/2003	0.02	1.17	0.00	0.02
S1/2	05/03/2003	0.02	1.10	0.00	0.00
	19/03/2003	0.00	2.85	0.03	0.05
	02/04/2003	0.00	0.07	0.00	0.00
	15/04/2003	0.00	0.06	0.00	0.00
	07/05/2003	0.00	0.09	0.00	0.00
	21/05/2003	0.00	0.07	0.00	0.00
Fish transferred to Moross					



	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
<b>Glinsk</b>					
Atlantic salmon 2002	11/12/2002	0.44	2.52	0.00	0.07
	19/02/2003	0.38	2.37	0.05	0.09
	06/03/2003	0.70	3.30	0.15	0.27
	19/03/2003	0.40	2.95	0.07	0.12
	02/04/2003	0.73	1.87	0.03	0.06
	15/04/2003	1.20	5.39	0.14	0.17
	07/05/2003	0.07	0.59	0.02	0.04
	21/05/2003	0.14	0.63	0.00	0.05
	10/06/2003	0.09	0.37	0.02	0.06
	02/07/2003	0.46	3.42	0.08	0.17
	14/08/2003	1.06	6.44	0.00	0.00
	09/09/2003	0.72	6.49	0.00	0.00
	15/10/2003	1.43	5.88	0.00	0.03
	19/11/2003	1.37	3.30	0.00	0.00
<b>Millstone</b>					
Atlantic salmon, 2001	11/12/2002	0.23	2.56	0.02	0.05
Atlantic salmon, 2003	10/06/2003	0.00	0.20	0.02	0.02
	02/07/2003	0.00	0.26	0.06	0.11
	14/08/2003	0.23	7.15	0.00	0.02
	09/09/2003	1.43	7.26	0.00	0.00
	15/10/2003	0.33	1.58	0.00	0.00
	19/11/2003	0.25	4.00	0.00	0.05
<b>Milford</b>					
Atlantic salmon, 2002	11/12/2002	0.09	2.52	0.00	0.00
Fish transferred to Lough Swilly					
Atlantic salmon, 2003	10/06/2003	0.00	0.00	0.00	0.00
	03/07/2003	0.00	0.00	0.00	0.00
	14/08/2003	0.02	0.11	0.00	0.00
	09/09/2003	0.23	1.36	0.00	0.00
	15/10/2003	0.30	1.33	0.00	0.00
	20/11/2003	0.11	1.27	0.00	0.00
<b>LOUGH SWILLY</b>					
<b>MARINE HARVEST</b>					
Atlantic salmon, 2001	10/12/2002	2.40	7.45	0.08	0.30
Atlantic salmon, 2002	19/02/2003	0.41	4.43	0.65	1.16
	06/03/2003	0.34	6.80	0.71	1.23
	20/03/2003	0.66	3.93	0.34	0.62

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
	03/04/2003	0.23	1.56	0.02	0.05
	16/04/2003	0.27	0.55	0.02	0.05
	07/05/2003	0.09	0.40	0.00	0.02
	22/05/2003	0.15	0.60	0.02	0.07
	09/06/2003	0.12	0.62	0.04	0.05
	02/07/2003	0.49	1.09	0.07	0.16
	13/08/2003	1.57	6.05	0.17	0.20
	10/09/2003	3.93	14.01	0.00	0.02
	15/10/2003	1.13	24.52	0.02	0.07
	19/11/2003	3.91	18.49	0.00	0.06
Atlantic salmon, 2003	06/03/2003	0.00	0.12	0.02	0.03
S1/2	20/03/2003	0.00	0.13	0.00	0.02
	03/04/2003	0.00	0.02	0.00	0.00
	16/04/2003	0.00	0.02	0.00	0.00
	07/05/2003	0.00	0.02	0.00	0.02
	22/05/2003	0.00	0.00	0.00	0.00
	09/06/2003	0.00	0.12	0.00	0.00
	02/07/2003	0.02	0.06	0.00	0.00
	13/08/2003	1.95	6.32	0.20	0.40
	10/09/2003	1.86	10.09	0.02	0.02
	15/10/2003	1.66	19.71	0.00	0.02
	19/11/2003	1.74	23.70	0.04	0.22

The Marine Institute, Galway Technology Park, Parkmore, Galway, Ireland.

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