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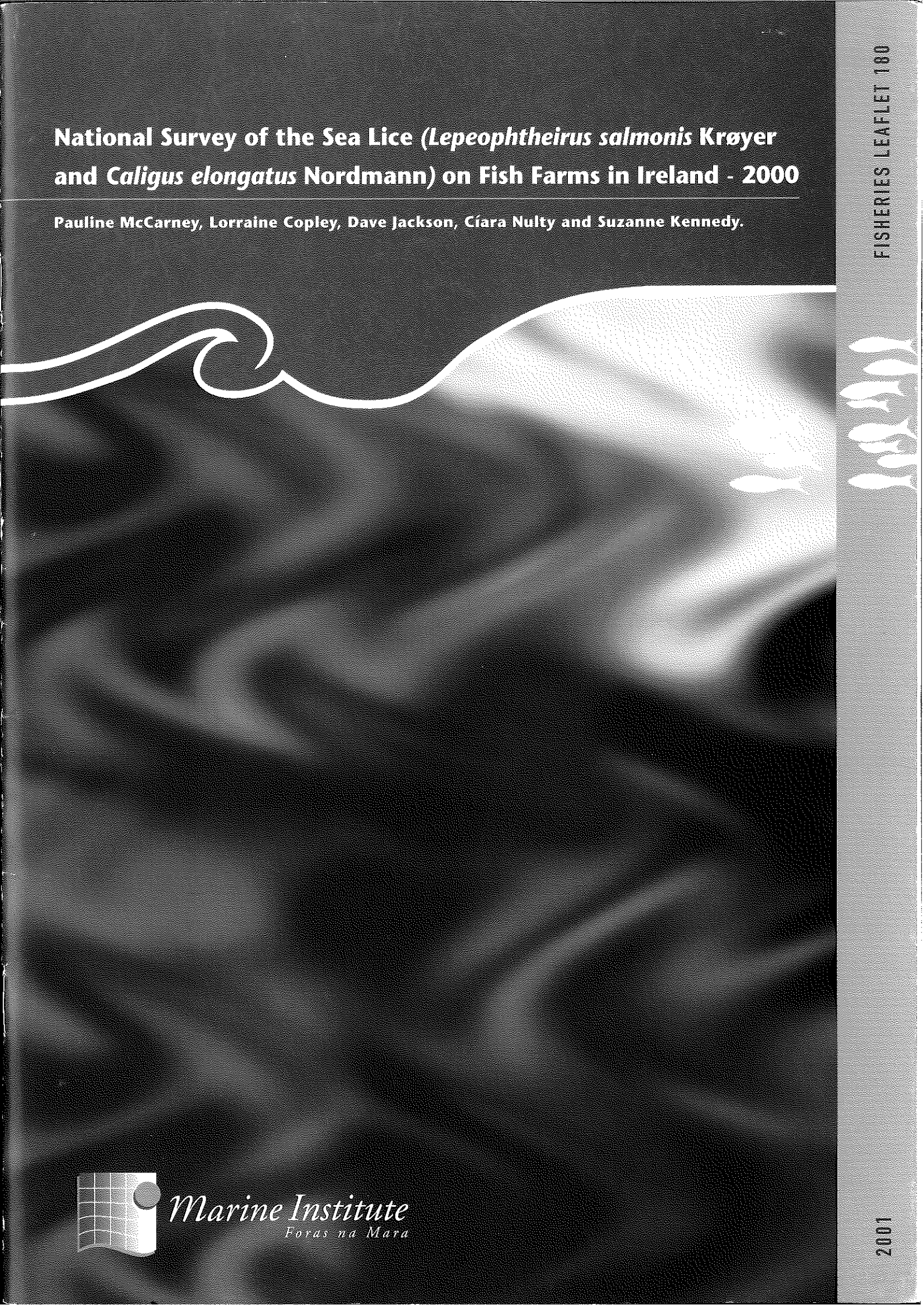

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NATIONAL SURVEY OF THE SEA LICE (*LEPEOPHTHEIRUS SALMONIS* KRØYER AND *CALIGUS ELONGATUS* NORDMANN) ON FISH FARMS IN IRELAND – 2000.

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INTRODUCTION

Farmed fish can be divided into three distinct groups, rainbow trout and two year classes (or generations) of salmon. In terms of husbandry and lice management, salmon which are at sea for a year or longer in April (growers/one-sea winter) are treated separately from younger salmon (smolts) and rainbow trout. Those salmon that were put to sea in winter 1999/spring 2000 are referred to as smolts, or 2000 year class fish. The farms were inspected twice a month in March, April and May and once a month thereafter, with one exception, December/January where sites were visited only once.

Two species of lice are commonly found on cultured salmonids, *Caligus elongatus* Nordmann, a species of parasite that infests over fifty different species of marine fish, and *Lepeophtheirus salmonis* Krøyer, which infests only salmon and closely related species such as rainbow trout. *Lepeophtheirus salmonis*, the Salmon Louse, is regarded as the more serious of the two species and occurs most frequently on Irish cultivated salmon (Jackson and Minchin, 1992). Results for both species are given for each sampling period (Appendix 1). These sea-lice inflict damage to their hosts through their feeding activity on the host's body (Jones *et al.*, 1990; Jonsdottir *et al.*, 1992; Kabata, 1974) and significant economic losses were attributed to these copepod ectoparasites by Roth *et al.* (1993).

Lepeophtheirus salmonis is a member of the Family Caligidae and has a direct life-cycle (i.e. a single host). This life-cycle comprises ten stages. Following hatching from paired egg strings, two free-living nauplius stages are dispersed into the plankton. These stages are followed by a copepodid stage where contact with 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).

METHODS AND MATERIALS

Sampling frequency has been determined with regard to lice development rates, critical periods and environmental conditions. During winter temperatures, (December – February) lice development occurs slowly and a low frequency of inspection will detect changes adequately. During the spring rise in temperatures, lice development accelerates therefore more frequent sampling is carried out.

RESULTS

Appendix 1 shows the results from the individual farms for the year 2000. Two cages were inspected at each visit, a standard and a random cage. The mean derived from these two cages is shown for each species of louse. The mean number of egg bearing (ovigerous) female lice per fish and the mean number of mobile lice per fish are presented, respectively. Mobile lice are of both sexes and all ages that have developed beyond the attached larval stages. The total mobile levels estimate successful infection. Ovigerous lice levels estimate the numbers of successfully breeding

females. Effective parasite control is characterised by a drop in lice levels at subsequent inspections.

Rainbow trout

There were two sites producing rainbow trout in the year 2000. Three inspections took place of 1999 generation trout at Eany Fish Products Ltd. in Inver Bay from December/January 2000 to May 2000. The lice levels of both species of lice were very low at each of these inspections. Slightly elevated *L. salmonis* mobile lice levels were seen at the initial visit but levels were reduced for the subsequent visits, before harvesting commenced in June. Rainbow trout of the 2000 generation were inspected at Seastream Ltd. in Clew Bay on eleven occasions in the year 2000, before being harvested in September 2000. Lice levels of both species were very low throughout the sampling period until the ultimate inspection before harvesting, when slightly elevated levels were recorded. *Caligus elongatus* levels were slightly elevated earlier in the year but had been reduced by the next inspection.

Atlantic salmon 2000

A total of 224 inspections took place of 2000 generation salmon in the year 2000. Lice levels of both species were quite low for all regions. One incidence of elevated ovigerous lice levels occurred in the western region during the summer/autumn period. Levels were subsequently reduced prior to the next inspection. High levels of mobile lice occurred infrequently on this generation and were always brought under control quickly. Levels of 0.1 or less *L. salmonis* were recorded in over 33% of smolts examined nationwide (27% in the west, 44% in the southwest and 40% in the northwest). Only one occurrence of more than one ovigerous *C. elongatus* was recorded overall, in the western region. Levels were very low otherwise for this species, being generally below a mean 0.5 ovigerous level for all regions.

Atlantic salmon 1999

A total of 218 lice inspections took place of 1999 generation salmon in the year 2000. Levels of 0.1 or less *L. salmonis* were recorded in 8.5% of fish examined in the west, 15.5% in the southwest and 5% in the northwest. Ovigerous *L. salmonis* levels of over two per fish were recorded at ten inspections after May 2000. Two of these were in the southwest and occurred at ultimate and penultimate inspections before harvest. There were three occurrences in the northwest. One of these was in relation to harvesting procedures and occurred in the penultimate inspection before harvest. Where levels were above two ovigerous lice on fish not for immediate harvest, lice levels were controlled before harvesting commenced. In the western region there were five occurrences where ovigerous lice levels of *L. salmonis* were greater than two per fish. Three of these were successive inspections to one site, with levels increasing at each inspection, before fish were harvested out. Lice levels were brought under control in this region for subsequent visits. High mobile levels occurred infrequently, generally being associated with harvest procedures. *Caligus elongatus* levels were generally very low on all farms for this generation of fish. In the northwest and western regions there were no elevated levels of ovigerous *C. elongatus* and mobile levels were also very low. In the southwest *C. elongatus* levels were higher with greater than five ovigerous lice per fish being recorded in February to April inclusive at Cuan Baoi in Bantry Bay. High mobiles were also recorded at these inspections

(greater than 10 per fish). Levels along the same magnitude were also recorded at Roancarraig in July but were reduced by the subsequent inspection.

COMMENTS

New treatment trigger levels were brought into effect in May 2000 concerning the numbers of *L. salmonis* that could be recorded on farmed salmonids (Monitoring Protocol No. 3 for Offshore Finfish Farms – Sea lice Monitoring and Control, DoMNR, May 2000). Levels over two ovigerous *L. salmonis* per fish necessitates treatment unless fish are for immediate harvest. During the critical spring period (March to May inclusive) ovigerous *L. salmonis* levels per fish must remain in the 0.3 to 0.5 range. Fish with levels exceeding these limits must be treated. This is in response to concerns that salmonid smolts going to sea for the first time were being negatively impacted on by high burdens of lice transferring from farmed salmonids. As can be seen in Appendix 1 *L. salmonis* levels were kept very low on all generations of fish throughout the year 2000, with very few exceptions. Of the 442 lice inspections undertaken there were only 11 occasions where ovigerous lice levels were over the mean level of two per fish following the implementation of the sea lice monitoring protocol. In nearly all of these instances fish were under harvest and these visits were the ultimate or penultimate inspections before that generation of fish were harvested out. Where fish were being kept longer at sea, levels were subsequently controlled. *Caligus elongatus* levels were very low overall with the highest being recorded in the southwest of the country. This parasite has a greater number of hosts than *L. salmonis* and can be associated with over fifty marine fish species. It is possible that this parasite is more geographically abundant in that region than in the other regions examined.

A fundamental change in the control of lice on farmed fish occurred early in the year 2000. Ivermectin, generally used as a smolt treatment, was withdrawn. In the absence of an alternative oral treatment, this resulted in an increased reliance on bath treatments, particularly early in the season. A new oral treatment became available, on a restricted basis late in the spring. Taken together these changes amount to a most fundamental change in lice treatment practices at a critical time of the year for lice control. These changes were driven by legislative processes and were entirely outside the control of the industry.

Individual farm results

The instances of elevated lice levels in the samples from the individual farms over the period December 1999 to November 2000 (Appendix 1) can be categorised into two distinct groups, those arising from treatment strategies and those arising from harvesting effects.

Treatment strategies

Spring is a critical period of the year in terms of lice control measures in order to ensure infestations are maintained at a low level. It is also the most sensitive period in terms of concerns over wild migratory fish. During the spring rise in temperatures, lice development accelerates. The control of lice populations in winter/spring by targeted treatments is the most effective way of managing lice infestations for the following reasons:-

- by elimination of production of infectious larvae,
- by ensuring maximum efficacy of the treatment,
- by ensuring a more cost effective result.

Bath treatments used in summertime pose serious health risks due to high summer water temperatures and low oxygen levels. It has been demonstrated that forward planning is the most successful strategy for the prevention of high lice infestations and that by early intervention with bath treatments in winter/early spring, which successfully lower the number of lice, the need for baths later in the growing season is avoided. It is therefore safer and more effective to treat early in the year when water temperatures have not begun to rise significantly, even though lice levels may not appear to warrant treatment. It has been noted that where this strategy has not been fully implemented or has only been partially effective, elevated lice levels occur.

The same is generally true of in feed treatments; it is more effective to treat early in the year, before the rise in water temperature triggers the acceleration in sea lice development. There are a number of benefits in the administration of oral treatments: if necessary synchronous bay treatments can be undertaken without difficulty, treatments are not weather dependent, fewer treatments are required and therefore less chemicals are used, and because they are easily administered they can be very cost effective.

Harvesting effects

Towards the end of the growing season, as harvesting proceeds at a site, fish not for immediate harvest represent a smaller proportion of the fish at the site. The lice sampled from these fish increase in number due to two factors. Firstly, the site effort changes by degrees from growing fish to emptying the site. Secondly, lice treatments become less effective as cages adjacent to fish being harvested get re-infected by lice dislodged from the fish being removed. Lice can swim short distances and re-attach to the nearest fish in adjoining cages.

It should be emphasised that the increase in lice levels in the ultimate samples before site clearance represents this concentration of lice on fewer available fish, and not an increase in the overall lice population at the site.

SUMMARY

Good control of lice was continuous throughout the year 2000 on one sea-winter salmon (growers). In most cases where there were occurrences of higher lice numbers, levels were reduced by the next inspection. The exception being at harvest time. Of the 27 sites that had growers in 2000, sustained elevated lice levels were associated with harvest events. This reflects an increase in numbers of lice per fish but not an increase in total populations of lice.

Lice levels on rainbow trout were maintained at low levels throughout the year.

Lepeophtheirus salmonis and *Caligus elongatus* numbers were generally kept at low levels on smolts for all regions throughout the year 2000. Incidences of slightly elevated lice numbers were successfully controlled.

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Glossary of terms used:

Ovigerous lice:	egg bearing female lice
Mobile lice:	all lice that are mobile on the fish (includes immature and adult lice)
Smolt (S1):	this is a stage in the life cycle of the salmon when it changes from a freshwater fish to a seawater fish during the process of smoltification, generally in the Spring approximately 15 months after hatching
S1/2:	this is a smolt which has had a faster development than an S1 smolt and is ready to go to sea the Winter before its siblings
Grower:	a fish which has been at sea for one year or more

APPENDIX 1. SEA-LICE MONITORING ON SALMONID FARMS 2000

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
GAELIC SEAFOODS					
Roancarraig					
Atlantic salmon, 1999	18/01/00	0.03	0.33	0.93	1.93
	22/02/00	0.00	0.31	2.93	7.69
	08/03/00	0.00	0.03	0.68	2.39
	28/03/00	0.00	0.10	0.48	1.10
	10/04/00	0.13	0.67	1.10	2.83
	09/05/00	0.03	0.33	0.80	1.60
	28/06/00	0.10	0.83	1.90	5.20
	17/07/00	0.38	1.06	5.00	10.50
	09/08/00	0.45	1.40	1.45	1.75
	05/09/00	2.03	5.73	1.23	2.30
Atlantic salmon, 2000 S1/2	18/01/00	0.00	0.00	0.67	1.67
	22/02/00	0.00	0.03	0.42	1.03
	08/03/00	0.00	0.00	0.00	0.00
	28/03/00	0.00	0.07	0.10	0.30
	10/04/00	0.02	0.09	0.19	0.63
	09/05/00	0.00	0.25	0.19	0.97
	29/05/00	0.00	0.00	0.00	0.03
	28/06/00	0.03	0.23	1.32	3.84
	17/07/00	0.06	0.97	0.39	0.81
	09/08/00	0.06	0.56	0.09	0.09
	05/09/00	0.45	1.62	0.38	0.55
	23/10/00	0.13	0.22	0.00	0.00
	14/11/00	0.04	0.38	0.15	0.23
Atlantic salmon, 2000	28/06/00	0.00	0.03	0.35	1.00
	17/07/00	0.00	0.00	0.06	0.17
	09/08/00	0.00	0.03	0.12	0.15
	05/09/00	0.03	0.06	0.00	0.00
	23/10/00	0.10	0.48	0.00	0.00
	14/11/00	0.13	0.56	0.24	0.75
LASINGERS					
Cuan Baoi					
Atlantic salmon, 1999	18/01/00	0.10	0.33	3.43	8.93
	22/02/00	0.00	0.11	10.32	17.58
	07/03/00	0.12	0.28	8.00	12.40
	28/03/00	0.00	0.37	8.00	13.53
	10/04/00	0.20	1.20	5.60	12.50
	09/05/00	0.09	0.09	0.09	0.27
	29/05/00	0.00	0.07	0.86	2.14
	28/06/00	0.00	0.82	1.70	6.27
	05/09/00	1.47	3.83	0.30	0.57
	17/10/00	1.20	3.73	0.20	0.33
	14/11/00	2.33	11.40	7.53	15.87

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2000	28/03/00	0.00	0.03	0.10	1.97
	10/04/00	0.00	0.13	0.38	3.25
	09/05/00	0.00	0.07	0.50	0.87
	29/05/00	0.00	0.06	1.23	2.03
	28/06/00	0.00	0.23	1.71	4.26
	17/07/00	0.00	0.35	1.32	2.10
	09/08/00	0.00	0.03	0.15	0.21
	05/09/00	0.28	1.00	0.34	0.53
	17/10/00	0.58	2.87	0.22	0.35
	14/11/00	0.55	2.38	1.17	2.97
KENMARE BAY					
GAELIC SEAFOODS					
Kealincha - Inishfarnard					
Atlantic salmon, 1999	19/01/00	0.05	0.19	0.05	0.18
	23/02/00	0.00	0.00	0.00	0.33
	29/03/00	0.15	0.59	0.40	1.29
	11/04/00	0.13	0.73	0.03	0.17
	10/05/00	0.22	1.70	1.65	3.17
	15/06/00	0.60	1.40	0.13	0.70
	29/06/00	0.63	1.63	0.74	1.15
Atlantic salmon, 2000	10/05/00	0.00	0.00	0.00	0.00
	15/06/00	0.00	0.08	0.00	0.05
	29/06/00	0.00	0.19	0.00	0.00
	18/07/00	0.00	0.21	0.00	0.04
	10/08/00	0.03	0.38	0.00	0.00
	06/09/00	0.03	0.23	0.00	0.00
	16/10/00	0.00	0.00	0.00	0.00
	15/11/00	0.00	0.22	0.00	0.00
Travara					
Atlantic salmon, 2000	29/06/00	0.00	0.06	0.03	0.03
	18/07/00	0.00	0.44	0.03	0.09
	10/08/00	0.06	0.76	0.03	0.03
	06/09/00	0.10	0.45	0.00	0.00
	16/10/00	0.06	0.18	0.00	0.03
	15/11/00	0.06	0.42	0.06	0.23
ST KILLIAN'S HARVEST					
Kilmacillogue					
Atlantic salmon, 1999	19/01/00	0.23	1.03	0.10	0.30
	23/02/00	0.27	0.67	0.13	0.40
	08/03/00	0.13	0.33	0.07	0.13
	29/03/00	0.00	0.00	0.13	0.31
	11/04/00	0.10	0.60	0.17	0.60
	26/04/00	0.00	0.03	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2000	08/03/00	0.00	0.00	0.00	0.00
	29/03/00	0.00	0.00	0.00	0.00
	11/04/00	0.00	0.00	0.00	0.04
	26/04/00	0.00	0.00	0.00	0.00
	10/05/00	0.00	0.00	0.00	0.00
	15/06/00	0.00	0.00	0.02	0.06
	29/06/00	0.00	0.17	0.00	0.07
	18/07/00	0.00	0.21	0.00	0.05
	10/08/00	0.07	1.40	0.25	0.30
	06/09/00	0.02	2.09	0.05	0.11
	16/10/00	0.77	5.93	0.06	0.15
	15/11/00	1.33	5.92	0.00	0.02
BEARA ATLANTIC SALMON					
Deenish					
Atlantic salmon, 1999	20/01/00	0.11	0.21	0.75	1.46
	24/02/00	0.00	0.12	2.12	3.60
	09/03/00	0.04	0.22	1.50	2.34
	30/03/00	0.02	0.13	0.37	0.99
	18/04/00	0.07	0.19	0.22	0.60
	27/04/00	0.09	0.32	0.44	1.30
	11/05/00	0.05	0.12	0.32	0.53
	16/06/00	0.13	0.58	0.88	1.33
	30/06/00	0.15	0.38	0.62	1.34
	19/07/00	0.36	1.66	0.64	1.09
	11/08/00	1.29	3.61	0.62	1.26
GREATMAN'S BAY					
CUIGEAL TEO					
Carraroe					
Atlantic salmon, 2000 S1/2	17/01/00	0.00	0.85	0.04	0.35
	25/02/00	0.00	0.92	0.25	1.10
	08/03/00	0.00	2.09	0.55	1.27
	23/03/00	0.00	0.03	0.00	0.02
	05/04/00	0.00	0.18	0.00	0.00
	25/04/00	0.00	0.50	0.00	0.05
	08/05/00	0.00	0.40	0.00	0.07
	31/05/00	0.02	1.17	0.04	0.12
	26/06/00	0.00	1.91	0.07	0.07
	20/07/00	0.23	3.01	0.00	0.12
	16/08/00	0.75	2.50	0.02	0.04
	21/09/00	2.85	15.00	0.05	0.17
	25/10/00	0.40	2.79	0.00	0.03
	22/11/00	0.17	0.49	0.00	0.00
GOLAM TEO					
Cuigeal					
Atlantic salmon, 2000	07/07/00	0.00	2.41	0.31	0.59
	17/08/00	0.09	2.48	0.09	0.39
	15/09/00	0.13	1.32	0.06	0.16
	October	Fish transferred to Golam site			

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
KILKIERAN BAY					
MUIR ACHMHAINNI TEO					
Daonish					
Atlantic salmon, 1999	13/01/00	2.17	6.79	0.19	0.32
	28/02/00	2.00	8.25	0.00	0.00
	15/03/00	0.25	1.32	0.00	0.03
	27/03/00	0.26	3.39	0.02	0.02
	10/04/00	0.15	10.10	0.04	0.21
	03/05/00	0.97	4.49	0.07	0.30
	16/05/00	2.09	7.25	0.38	0.51
	23/06/00	5.20	12.00	0.03	0.03
	13/07/00	4.67	37.33	0.67	1.33
Atlantic salmon, 2000	11/10/00	0.22	2.02	0.14	0.19
	21/11/00	0.39	1.71	0.03	0.03
Casheen					
Atlantic salmon, 1999	13/01/00	0.23	6.03	0.17	0.53
	21/02/00	0.60	1.09	0.00	0.04
	15/03/00	0.23	0.55	0.05	0.27
	27/03/00	0.09	8.20	0.02	0.12
	10/04/00	0.04	0.67	0.00	0.05
	03/05/00	0.07	1.52	0.02	0.05
	16/05/00	0.30	14.04	0.07	0.08
Red Flag					
Atlantic salmon, 2000	13/07/00	0.04	3.78	0.04	0.14
	01/08/00	0.51	8.08	0.02	0.02
	13/09/00	0.00	0.20	0.00	0.02
	October	Fish transferred to Daonish site			
MUIR GHEAL TEO					
Cnoc					
Atlantic salmon, 1999	18/01/00	0.10	0.45	0.00	0.06
	21/02/00	0.10	6.09	0.00	0.23
	16/03/00	0.02	0.03	0.00	0.00
	30/03/00	0.00	0.19	0.00	0.03
	13/04/00	0.00	6.43	0.00	0.06
	28/04/00	0.02	0.24	0.00	0.00
	11/05/00	0.04	0.16	0.00	0.02
	26/05/00	0.06	25.24	0.09	0.15
	12/06/00	0.03	1.23	0.09	0.20
Atlantic salmon, 2000 S1/2	18/10/00	1.96	10.75	0.13	0.21
	27/11/00	0.12	0.22	0.00	0.00
Lettercallow					
Atlantic salmon, 2000 S1/2	18/01/00	0.02	1.18	0.18	0.18
	17/02/00	0.05	1.21	0.08	0.13
	16/03/00	0.02	1.20	0.24	0.28
	30/03/00	0.04	1.69	0.12	0.17
	13/04/00	0.02	1.88	0.11	0.22
	25/04/00	0.03	1.39	0.24	0.52
	11/05/00	0.00	0.00	0.02	0.02

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Oilean Iarthach					
Atlantic salmon, 2000 S1/2	30/05/00	0.00	4.48	0.19	0.66
	30/06/00	0.19	2.39	0.14	0.66
	27/07/00	0.02	4.80	0.22	0.40
	18/08/00	0.26	1.06	0.00	0.03
	15/09/00	0.57	1.36	0.00	0.00
Atlantic salmon, 2000	18/08/00	0.00	0.03	0.00	0.00
	15/09/00	0.45	2.13	0.00	0.06
EISC UI FLARTHARTA TEO					
Ardmore					
Atlantic salmon, 1999	02/02/00	0.51	1.06	0.05	0.14
	23/02/00	0.25	4.33	0.15	0.48
	20/03/00	0.78	1.96	0.11	0.22
	31/03/00	0.44	3.74	0.15	0.29
	18/04/00	0.31	1.25	0.00	0.12
	27/04/00	0.35	0.82	0.10	0.33
	10/05/00	0.52	5.30	0.55	1.12
	06/07/00	1.00	11.47	0.13	0.37
Atlantic salmon, 2000	12/10/00	0.24	1.32	0.03	0.03
	23/11/00	0.29	3.79	0.04	1.34
Birbeag					
Atlantic Salmon, 2000	06/07/00	0.11	6.22	0.00	0.05
	03/08/00	0.00	3.27	0.00	0.02
	14/09/00	0.22	1.82	0.17	0.65
GOLAM TEO					
Golam					
Atlantic salmon, 1999	14/01/00	2.97	10.90	0.03	0.10
	21/02/00	0.53	1.03	0.00	0.00
	07/03/00	0.06	0.10	0.00	0.00
	20/03/00	0.03	1.93	0.00	0.10
	10/04/00	0.00	9.03	0.10	0.43
	03/05/00	4.27	18.83	0.73	1.60
	15/05/00	1.00	1.50	0.03	0.10
Atlantic salmon, 2000	25/10/00	0.11	0.31	0.00	0.00
	21/11/00	0.07	0.23	0.03	0.07
CUIGEAL TEO					
Annaghbhan					
Atlantic salmon, 1999	17/01/00	1.94	8.80	0.00	0.02
	25/02/00	2.82	8.14	0.02	0.03
	08/03/00	0.08	0.49	0.00	0.00
	23/03/00	0.04	0.20	0.00	0.00
	05/04/00	0.28	12.40	0.00	0.07
	25/04/00	0.27	1.52	0.00	0.00
	08/05/00	0.35	5.57	0.14	0.25

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
The Gurrig					
Atlantic salmon, 2000 S1/2	17/01/00	0.00	0.89	0.00	0.02
	25/02/00	0.00	0.18	0.00	0.00
	08/03/00	0.00	0.41	0.00	0.03
	23/03/00	0.02	2.41	0.00	0.00
	05/04/00	0.00	0.05	0.00	0.00
	25/04/00	0.00	0.46	0.00	0.03
	08/05/00	0.02	2.95	0.00	0.02
	31/05/00	0.07	0.81	0.00	0.02
	26/06/00	0.00	0.07	0.00	0.00
	20/07/00	0.10	2.35	0.00	0.00
	16/08/00	0.00	0.00	0.00	0.00
	22/09/00	0.07	2.43	0.00	0.00
	08/11/00	0.44	6.30	0.02	0.15
BERTRAGHBOY BAY					
GAELIC SEAFOODS LTD					
Salt Pt.					
Atlantic salmon, 1999	12/01/00	0.59	1.98	0.45	0.94
	28/02/00	0.57	10.00	0.00	1.43
	15/03/00	0.90	5.69	0.15	0.27
	31/03/00	0.15	0.90	0.02	0.02
	14/04/00	0.18	0.70	0.00	0.02
	27/04/00	0.08	0.26	0.00	0.00
	09/05/00	0.14	0.32	0.02	0.02
	31/05/00	0.00	0.09	0.03	0.03
	22/06/00	0.10	0.23	0.14	0.32
Atlantic salmon, 2000	26/10/00	0.00	0.02	0.02	0.04
	22/11/00	0.00	0.10	0.03	0.07
Sealax					
Atlantic salmon, 1999	12/01/00	1.21	4.15	0.04	0.09
	28/02/00	1.95	20.70	0.50	1.40
	15/03/00	0.24	1.46	0.00	0.06
Atlantic salmon, 2000	26/10/00	0.00	0.00	0.00	0.03
	22/11/00	0.00	0.07	0.00	0.02
OBB					
Atlantic salmon, 2000	27/07/00	0.00	0.00	0.02	0.02
	23/08/00	0.20	0.49	0.02	0.02
	14/09/00	0.00	0.04	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
MANNIN BAY					
MANNIN BAY SALMON CO. LTD					
Clifden Bay/Hawks Nest					
Atlantic salmon, 1999	19/01/00	0.83	4.35	0.00	0.02
	15/02/00	1.87	5.67	0.00	0.04
	03/03/00	1.52	10.07	0.00	0.05
	21/03/00	0.00	0.07	0.00	0.00
	04/04/00	0.03	0.10	0.00	0.02
	17/04/00	0.00	2.23	0.00	0.02
	02/05/00	0.02	1.52	0.00	0.10
	June/July	Fish transferred to Corhounagh site			
Atlantic salmon, 2000	25/07/00	0.00	0.04	0.00	0.00
	22/08/00	0.02	0.34	0.00	0.00
	21/09/00	0.00	0.22	0.00	0.03
	24/10/00	0.02	1.03	0.00	0.00
	21/11/00	0.09	0.82	0.00	0.00
Mannin Bay/Corhounagh					
Atlantic salmon, 1999	17/05/00	1.88	4.00	0.37	1.07
	21/06/00	0.13	2.60	0.09	0.27
	25/07/00	2.41	11.43	0.27	0.37
	22/08/00	0.62	2.90	0.00	0.00
	21/09/00	1.22	2.85	0.00	0.00
	24/10/00	1.03	13.87	0.07	0.30
KILLARY HARBOUR					
KILLARY SALMON LTD					
Rosroe					
Atlantic salmon, 1999	20/01/00	0.43	1.41	0.02	0.16
	15/02/00	0.27	2.77	0.10	0.28
	03/03/00	0.62	6.45	0.05	0.23
	21/03/00	0.34	3.57	0.07	0.28
	04/04/00	0.18	2.96	0.04	0.09
	17/04/00	0.22	3.40	0.00	0.12
	10/05/00	0.22	1.08	0.00	0.02
	09/06/00	0.08	0.23	0.00	0.00
	27/06/00	0.05	1.85	0.07	0.22
	27/07/00	0.61	0.72	0.00	0.02
	24/08/00	0.14	0.43	0.00	0.00
Atlantic salmon, 2000	17/11/00	0.05	0.42	0.00	0.02

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Inishdeighil					
Atlantic salmon, 2000	21/03/00	0.00	0.17	0.00	0.02
	04/04/00	0.00	0.71	0.04	0.13
	17/04/00	0.00	1.47	0.03	0.19
	10/05/00	0.03	0.86	0.03	0.08
	09/06/00	0.00	0.16	0.00	0.00
	27/06/00	0.00	0.07	0.00	0.00
	27/07/00	0.00	0.09	0.00	0.02
	24/08/00	0.00	0.70	0.00	0.00
	19/09/00	0.35	2.04	0.00	0.02
	October	Fish transferred to Rosroe			
BALLINAKILL BAY					
GAELIC SEAFOODS					
Ballinakill					
Atlantic salmon, 2000	13/04/00	0.00	0.00	0.00	0.00
	05/05/00	0.00	0.02	0.00	0.00
	25/05/00	0.00	0.05	0.13	0.17
	21/06/00	0.00	0.05	0.02	0.07
	28/07/00	0.00	0.04	0.00	0.00
	22/08/00	0.00	0.03	0.00	0.02
	20/09/00	0.07	0.92	0.16	0.36
	27/10/00	0.07	0.38	0.00	0.00
	24/11/00	0.10	0.48	0.00	0.00
Fraochoilean					
Atlantic salmon, 2000	20/04/00	0.00	0.00	0.00	0.00
	05/05/00	0.00	0.08	0.00	0.00
	25/05/00	0.00	0.02	0.02	0.03
	21/06/00	0.00	0.00	0.02	0.09
	28/07/00	0.00	0.03	0.00	0.02
	22/08/00	0.00	0.16	0.03	0.16
	20/09/00	0.20	0.67	0.26	0.46
	27/10/00	0.00	0.21	0.00	0.00
	24/11/00	0.16	0.35	0.00	0.04
CLEW BAY					
SEASTREAM LTD					
Rainbow trout, 2000	13/12/99	0.00	0.03	0.02	0.02
	17/02/00	0.00	0.65	2.58	4.92
	02/03/00	0.02	0.10	0.00	0.02
	23/03/00	0.00	0.00	0.00	0.00
	07/04/00	0.00	0.29	0.12	0.37
	19/04/00	0.07	0.94	0.60	1.07
	03/05/00	0.00	0.02	0.00	0.00
	24/05/00	0.00	0.30	0.08	0.19
	22/06/00	0.05	0.69	0.25	0.40
	26/07/00	0.18	0.93	0.15	0.30
	16/08/00	1.13	6.07	1.73	3.33

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
CLARE ISLAND SEAFARM					
Atlantic salmon, 1999	14/04/00	0.00	0.02	0.00	0.00
	28/04/00	0.00	2.59	0.02	0.30
	12/05/00	0.03	0.50	0.13	0.22
	25/05/00	0.14	0.43	0.02	0.04
Atlantic salmon, 2000	16/03/00	1.43	7.24	1.30	2.73
	31/07/00	0.03	0.47	0.84	1.30
	16/08/00	0.15	0.66	1.65	2.27
	28/11/00	0.17	2.06	0.14	0.64
BEALACRAGHER BAY					
CURRAUN FISHERIES LTD					
Atlantic salmon, 1999	13/12/99	0.00	0.00	0.00	0.00
	17/02/00	0.00	0.05	0.00	0.00
	10/03/00	0.03	0.13	0.00	0.00
	31/03/00	0.00	0.24	0.00	0.00
	22/06/00	0.15	0.43	0.07	0.07
	26/07/00	0.03	0.15	0.00	0.00
	16/08/00	0.00	0.20	0.00	0.00
Atlantic salmon, 2000 S1/2	13/12/99	0.00	0.00	0.00	0.00
	17/02/00	0.00	0.06	0.00	0.00
	10/03/00	0.00	0.02	0.00	0.02
	31/03/00	0.02	0.30	0.02	0.05
	14/04/00	0.02	0.17	0.00	0.00
	19/04/00	0.02	0.25	0.00	0.02
	03/05/00	0.02	0.30	0.02	0.02
	24/05/00	0.05	0.53	0.00	0.00
	22/09/00	0.00	0.05	0.00	0.00
	30/11/00	0.00	0.01	0.00	0.00
DONEGAL BAY					
OCEAN FARM LTD					
Inver Bay					
Atlantic salmon, 2000 S1/2	18/01/00	0.06	1.94	0.00	0.00
	29/02/00	0.02	0.38	0.00	0.03
	08/03/00	0.00	0.13	0.00	0.00
	31/03/00	0.00	0.00	0.00	0.01
	13/04/00	0.00	0.00	0.00	0.00
	25/04/00	0.00	0.00	0.00	0.00
	16/05/00	0.02	0.02	0.00	0.06
	30/05/00	0.00	0.03	0.02	0.03
	20/06/00	0.00	0.00	0.03	0.06
	19/07/00	0.00	0.02	0.00	0.00
	15/08/00	0.00	0.02	0.00	0.02
	21/09/00	0.14	0.44	0.00	0.00
	01/11/00	0.11	0.66	0.00	0.00
	28/11/00	0.09	1.14	0.04	0.17

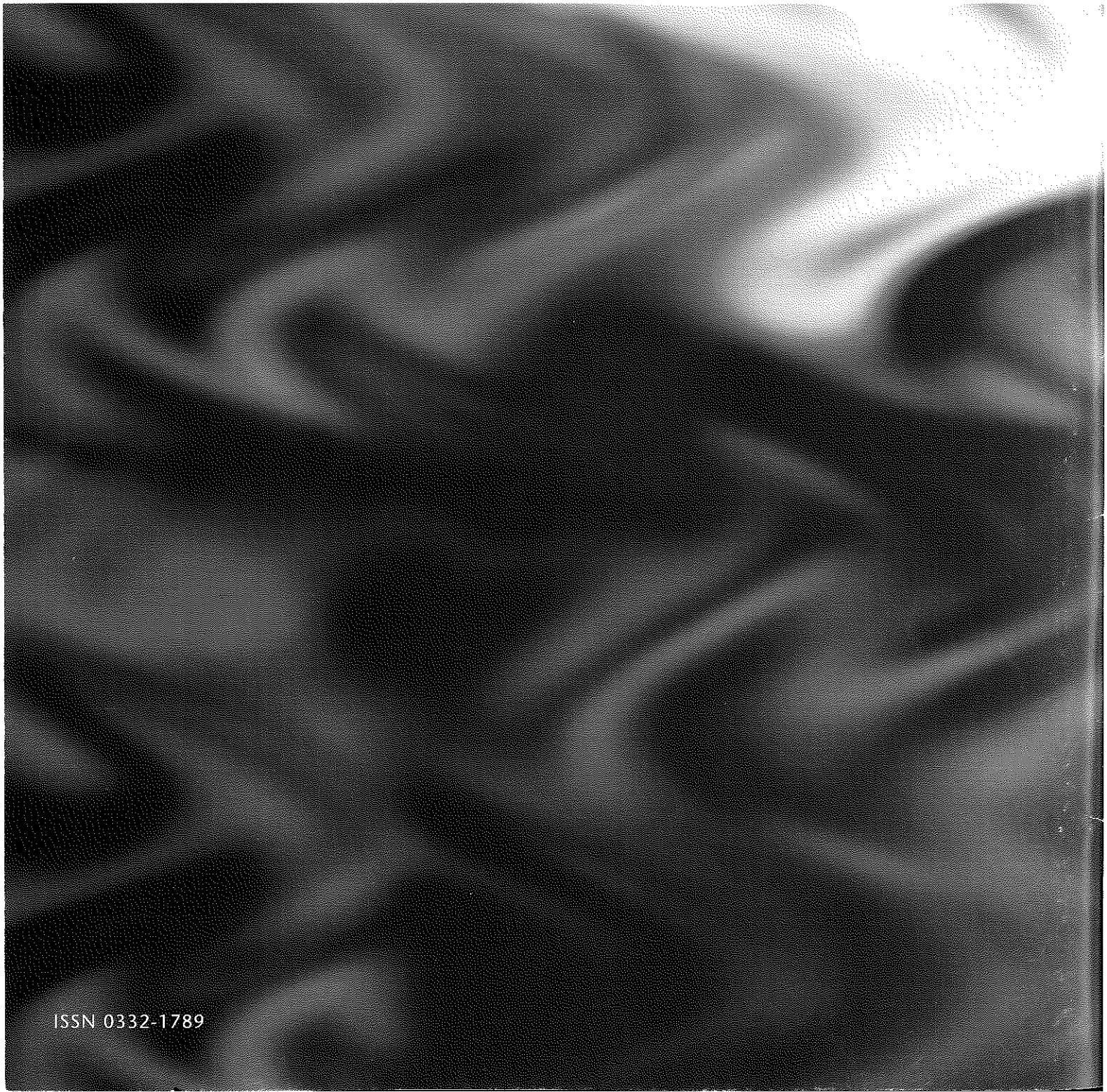
	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
McSwynes Bay					
Atlantic salmon, 1999	18/01/00	1.65	4.14	0.00	0.00
	08/03/00	3.38	8.00	0.09	0.41
	31/03/00	0.30	0.48	0.00	0.09
	13/04/00	0.16	0.88	0.02	0.07
	26/04/00	0.12	3.55	0.08	0.27
	23/05/00	4.11	10.32	0.29	0.31
	30/05/00	3.50	10.47	0.42	0.49
	09/06/00	2.63	3.71	0.09	0.13
	25/07/00	0.32	1.20	0.00	0.00
	15/08/00	1.79	7.75	0.00	0.00
	02/11/00	6.85	13.15	0.00	0.00
	28/11/00	0.77	1.94	0.00	0.04
Atlantic salmon, 2000	09/06/00	0.00	0.02	0.00	0.00
	15/08/00	0.00	0.66	0.00	0.00
	26/09/00	0.48	4.98	0.00	0.00
	02/11/00	0.11	1.19	0.00	0.00
	28/11/00	0.25	1.72	0.06	0.09
EANY FISH PRODUCTS LTD					
Inver Bay					
Rainbow trout, 1999	15/12/99	0.00	6.48	0.26	0.30
	16/03/00	0.00	1.24	0.04	0.04
	27/05/00	0.03	1.32	0.32	0.32
Atlantic salmon, 1999	15/12/99	0.00	0.76	0.06	0.06
	28/02/00	0.13	0.32	0.00	0.08
	07/04/00	0.25	4.56	0.32	0.26
	19/04/00	1.02	7.54	0.19	0.31
	16/05/00	0.73	4.78	0.25	0.35
	27/05/00	0.33	1.00	0.00	0.00
Atlantic salmon, 2000	16/05/00	0.00	0.00	0.02	0.04
	20/06/00	0.00	0.00	0.02	0.08
	20/07/00	0.00	0.01	0.01	0.11
	14/08/00	0.00	0.03	0.00	0.07
	21/09/00	0.39	3.15	0.01	0.08
	25/10/00	0.12	0.69	0.00	0.00
	29/11/00	0.17	0.61	0.00	0.08
CREEVIN					
Inver Bay					
Atlantic salmon, 1999	04/02/00	0.06	0.28	0.06	0.06
	15/03/00	0.09	1.06	0.00	0.02
	07/04/00	0.06	0.22	0.09	0.20
	18/04/00	0.02	0.65	0.02	0.14
	26/04/00	0.03	0.68	0.09	0.14
	23/05/00	0.14	0.57	0.05	0.09
	27/11/00	0.06	0.42	0.00	0.05

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Atlantic salmon, 2000 S1/2	04/02/00	0.00	0.00	0.00	0.00
	29/02/00	0.00	0.13	0.00	0.00
	07/04/00	0.00	0.00	0.00	0.00
	18/04/00	0.00	0.00	0.00	0.00
Atlantic salmon, 2000	21/06/00	0.00	0.05	0.04	0.07
	19/07/00	0.00	0.05	0.03	0.03
	15/08/00	0.03	0.07	0.00	0.00
	21/09/00	0.04	0.46	0.00	0.01
PORTSIDE					
Inver Bay					
Atlantic Salmon, 1999	29/02/00	3.80	10.00	0.50	0.50
	29/03/00	0.59	4.81	0.17	0.52
	06/04/00	0.66	2.54	0.17	0.51
	18/04/00	0.85	4.44	0.14	0.49
	22/05/00	0.47	2.14	0.13	0.47
	28/05/00	0.14	0.50	0.00	0.04
	08/06/00	0.10	0.30	0.00	0.13
MULROY BAY					
FANAD FISHERIES LTD					
Cranford					
Atlantic salmon, 1999 S1/2	20/01/00	0.57	1.03	0.00	0.00
	19/02/00	0.02	0.04	0.00	0.00
	10/03/00	0.07	0.58	0.00	0.00
	23/03/00	0.04	2.27	0.00	0.00
	06/04/00	0.05	2.57	0.05	0.14
	19/04/00	0.46	5.74	0.02	0.12
	04/05/00	0.75	6.82	0.02	0.11
	19/05/00	1.50	5.90	0.04	0.07
Atlantic salmon, 2000 S1/2	28/01/00	0.00	0.00	0.00	0.00
	19/02/00	0.00	0.00	0.00	0.00
	10/03/00	0.00	0.19	0.00	0.00
	23/03/00	0.00	0.24	0.00	0.00
	06/04/00	0.00	0.29	0.00	0.00
	19/04/00	0.02	0.85	0.00	0.00
	04/05/00	0.02	1.12	0.00	0.02
	19/05/00	0.00	0.48	0.00	0.03
	14/06/00	0.00	0.02	0.00	0.00
	19/07/00	0.27	1.78	0.00	0.02
	10/08/00	0.15	2.01	0.02	0.02
	26/09/00	0.14	1.31	0.00	0.00
	25/10/00	0.06	0.30	0.02	0.02
	14/11/00	0.10	0.68	0.00	0.02

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Moross					
Atlantic salmon, 1999 S1/2	21/01/00	0.00	0.00	0.00	0.00
	10/03/00	0.01	0.05	0.00	0.00
	24/03/00	0.00	1.30	0.00	0.02
	06/04/00	0.00	1.68	0.00	0.03
	19/04/00	0.19	6.84	0.02	0.02
	04/05/00	0.26	1.64	0.00	0.00
	17/05/00	0.52	1.88	0.00	0.00
	12/06/00	0.45	0.78	0.00	0.00
Atlantic salmon, 2000	19/07/00	0.06	0.58	0.00	0.00
	11/08/00	0.40	1.40	0.00	0.00
	28/09/00	1.40	7.60	0.00	0.00
	20/10/00	0.50	1.90	0.00	0.00
Atlantic salmon, 2001 S1/2	28/09/00	0.00	0.53	0.00	0.00
	20/10/00	0.00	0.00	0.00	0.00
	15/11/00	0.00	0.76	0.00	0.00
Millstone					
Atlantic salmon, 1999 S1/2	09/03/00	0.00	0.12	0.00	0.00
	24/03/00	0.11	0.27	0.00	0.00
	07/04/00	0.04	0.80	0.02	0.04
	19/04/00	0.13	3.84	0.00	0.05
Atlantic salmon, 1999	05/05/00	0.00	0.07	0.00	0.00
	19/05/00	0.00	0.81	0.00	0.00
	14/06/00	0.72	1.69	0.00	0.00
	17/07/00	0.44	0.83	0.00	0.00
	09/08/00	1.63	5.82	0.00	0.03
	25/09/00	0.51	0.93	0.00	0.00
	19/10/00	0.36	1.07	0.00	0.00
	24/11/00	0.92	1.87	0.00	0.00
Glinsk					
Atlantic salmon, 1999	20/01/00	0.50	1.29	0.00	0.00
	22/02/00	0.75	0.92	0.00	0.03
Atlantic salmon, 2000	17/07/00	0.00	0.29	0.00	0.00
	09/08/00	0.00	0.06	0.00	0.00
	25/09/00	0.73	1.32	0.00	0.00
	24/10/00	0.08	0.42	0.00	0.00
	24/11/00	0.12	1.14	0.04	0.07
Milford					
Atlantic salmon, 1999 S1/2	14/12/99	0.08	0.95	0.00	0.00
	22/02/00	0.20	0.25	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
LOUGH SWILLY					
FANAD FISHERIES LTD					
Atlantic salmon, 1998	19/01/00	8.80	21.63	0.73	1.19
	28/01/00	3.53	5.33	0.07	0.27
	19/02/00	3.06	10.81	0.13	1.13
	09/03/00	0.80	6.00	0.30	0.30
Atlantic salmon, 1999	19/01/00	0.93	4.21	0.18	0.33
	28/01/00	1.29	3.00	0.07	0.50
	19/02/00	0.27	10.87	0.27	0.67
	09/03/00	1.05	18.30	0.09	0.23
	29/03/00	0.78	11.93	0.03	0.18
	14/04/00	0.80	2.63	0.00	0.04
	21/04/00	1.19	3.72	0.08	0.11
	16/05/00	0.46	1.01	0.00	0.00
	29/05/00	0.31	0.92	0.02	0.04
	16/06/00	0.94	6.71	0.04	0.04
	24/07/00	1.08	2.04	0.00	0.03
	11/08/00	0.81	13.28	0.19	0.31
	28/09/00	0.58	4.03	0.00	0.00
	20/10/00	1.31	8.10	0.00	0.00
	15/11/00	4.80	55.95	0.45	1.65

The Marine Institute, 80 Harcourt Street, Dublin 2, Ireland.



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