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National Survey of Sea Lice (*Lepeophtheirus salmonis* Krøyer and *Caligus elongatus* Nordmann) on Fish Farms in Ireland - 2020

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INTRODUCTION

Sea lice are a naturally occurring parasite found on marine fish, including salmonids. They are small ecto-parasitic copepod crustaceans and there are approximately 559 species, made up of 37 genera (Ahyong *et al*., 2011), including 268 *Caligus* species (Boxshall, 2011) and 162 *Lepeophtheirus* species (Chad & Goeff, 2011). The two main species found in Ireland are *Caligus elongatus* and *Lepeophtheirus salmonis*. *C. elongatus* is known to parasitise over 80 different species of marine fish while *L. salmonis* infests only salmonids. *L. salmonis* is endemic at a high prevalence (>90%) within wild populations (Jackson *et al.,* 2013), and occurs frequently on farmed salmonids (Jackson & Minchin, 1992; Jackson *et al.,* 2005). There is one species of salmonid farmed at sea in Ireland on a commercial basis, namely, Atlantic salmon *Salmo salar* (Linnaeus, 1758).

L. salmonis is an obligate parasite with a direct lifecycle, and has 8 stages, comprising of nauplius 1 and 2, copepodid, chalimus 1 and 2, preadult 1 and 2, and the adult stage. The nauplius 1 stage hatches from paired egg-strings and is dispersed in the plankton. It moults to nauplius 2, also planktonic, which is followed by a copepodid, the infective stage where attachment to the host takes place. The copepodid then moults through the attached chalimus stages before becoming a mobile pre-adult. There are two pre-adult stages before maturing to the adult phase (Figure 1). The rate of this development through the different stages is dependent upon sea water temperature (Figure 2; Hamre *et al*., 2019; Samsing *et al*., 2016). The adult female can produce batches of paired egg-strings, which in turn hatch into the water column to give rise to the next generation (Hamre *et al*., 2013; Kabata, 1979; Schram, 1993). The mean length for an adult female is 8mm-11mm and an adult male is 5mm-6mm (Schram, 1993). Under experimental conditions female *L. salmonis* survived up to 210 days, producing as many as 11 pairs of egg strings (Boxaspen, 2006). Jackson and Minchin (1992), in Ireland, found fecundity (mean eggs per pair of egg strings) on wild salmon to be 965 ±30, which was higher than for farmed salmon at 758 ±39. This contrasts to a lower fecundity recorded for wild and farmed salmon in Norway where mean egg numbers have been recorded as 304 ±32 with a range from 246 to 366 at 7.2°C (Heuch *et al*. 2000).

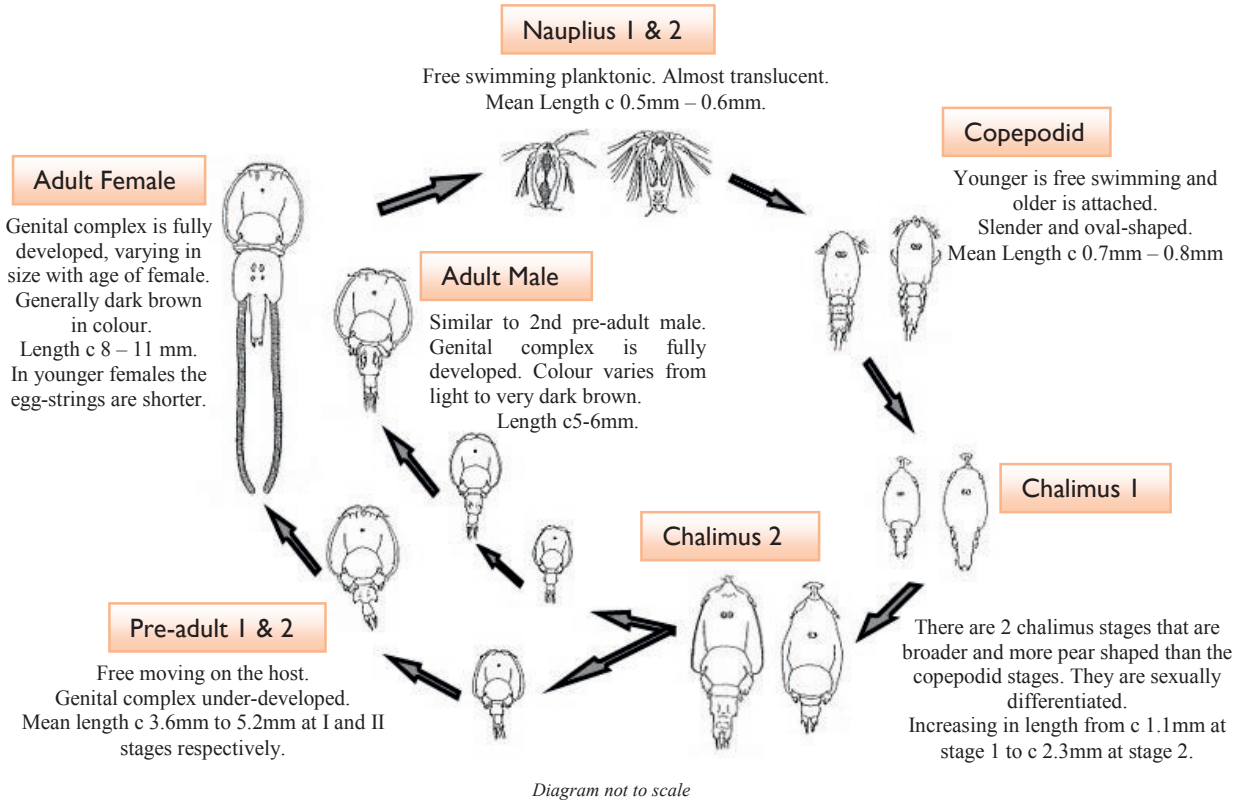

Figure 1 *Life cycle of Lepeophtheirus salmonis (after Schram, 1993 & Hamre et al., 2013).*

C. elongatus is smaller in size than *L. salmonis* averaging approximately 6-8mm in length and has a slightly different life cycle to *L. salmonis*, with four chalimus stages and no pre-adult stage (Hogans & Trudeau, 1989). The fact that *C. elongatus* is not as host specific as *L. salmonis* (Kabata, 1979) and that the hosts migrate widely is thought to be a factor in the highly variable levels on farmed salmonids at different times of the year (Hemmingsen *et al.*, 2020).

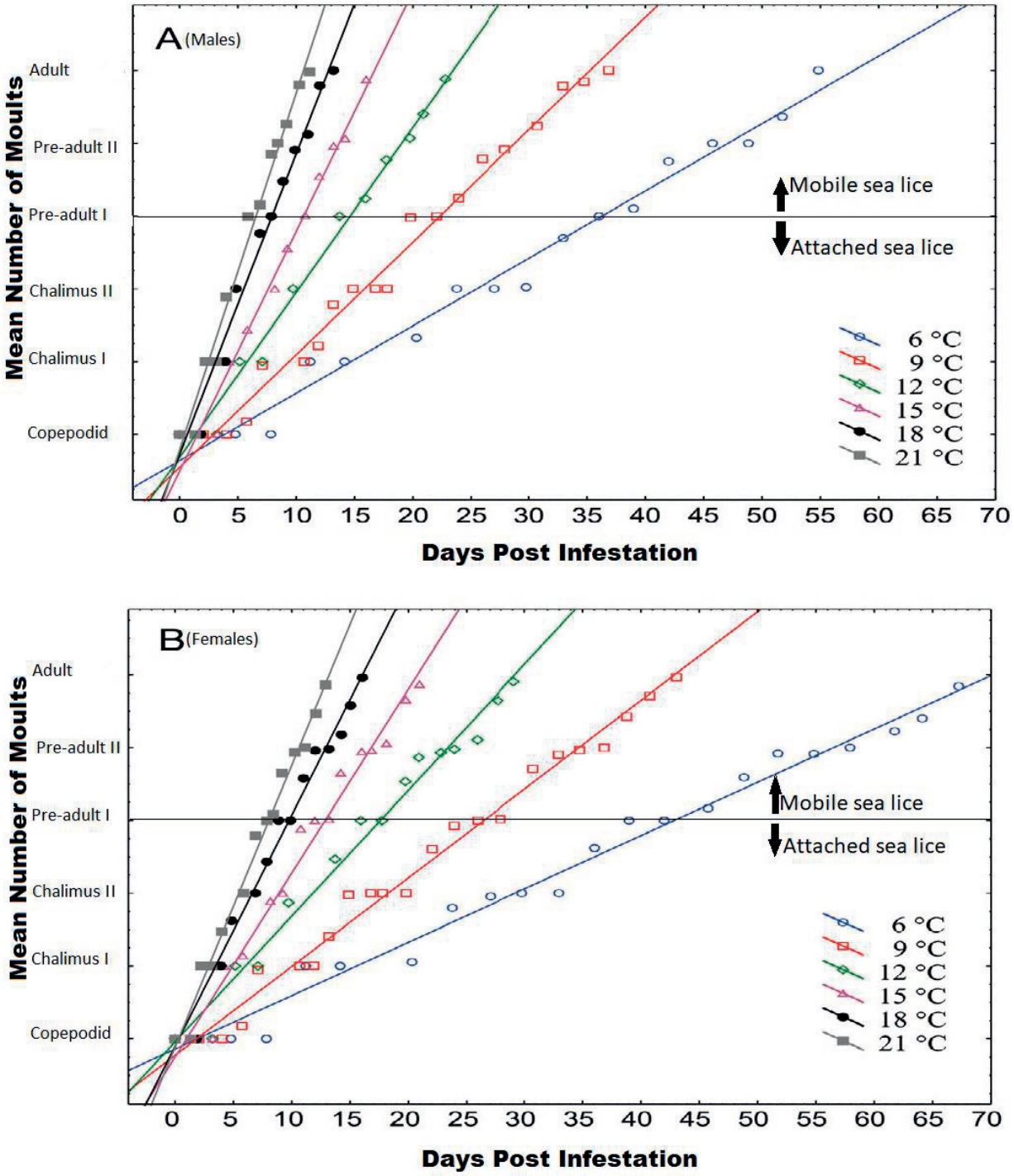

Figure 2 Mean number of moults vs. days post infestation for *L. salmonis* (A) males and (B) females.

Adapted from Hamre, *et al.*, 2019.

History of Sea Lice Monitoring in Ireland

In 1991, the Department of the Marine instigated a Sea Lice Monitoring Programme for Finfish Farms in Ireland (Jackson & Minchin, 1993) and in 1993 monitoring was expanded nationwide (Jackson *et al.*, 2002; Jackson *et al.*, 2005). 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*) by the Department of Marine and Natural Resources.

In 2008, the Department of Agriculture, Fisheries and Food (DAFF) published "*A strategy for the improved pest control on Irish salmon farms*". The strategy outlines a comprehensive range of measures to provide for enhanced sea lice control and was developed by a joint DAFF, Marine Institute and Bord Iascaigh Mhara workgroup in response to difficulties experienced by farms in achieving the low levels of infestation required by the national monitoring programme. These measures draw on the on-going Single Bay Management (SBM) process and, through a comprehensive action plan and list of recommendations, seek to advance the suite of tools necessary for improved sea lice control on farms.

The objectives of the National Sea Lice Monitoring Programme are:

- To provide an objective measurement of infestation levels on farms.
- To investigate the nature of infestations.
- Provide management with 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.

These components combine to reduce the development of sea lice infestations and to ensure the most effective treatment of sea lice. They seek to minimise sea lice levels whilst decreasing reliance on, and reducing the use of, veterinary medicines. Separation of generations and annual fallowing prevent the transmission of infestations from one generation to the next. One important aspect of targeted treatments is carrying out of synchronised autumn/winter treatments to reduce sea lice burdens to as close to zero as practicable, on all fish which are to be over-wintered. This is fundamental to achieving near zero egg-bearing sea lice in the spring. The agreed husbandry practises cover a range of related fish health, quality and environmental issues in addition to those specifically related

to sea lice control. The Single Bay Management Programme serves to facilitate this and provides a forum for exchange of information between farmers.

In late winter and early spring, seawater temperatures are at a minimum and the development rate of sea lice is slower (Figure 2). Rising water temperatures in spring tend to synchronise the development of sea lice larvae. A strategic treatment at this time can break the cycle of infestation. Ovigerous female sea lice are those which produce the infective larvae and treatments are timed to remove adult females before they can release larvae. Setting the treatment trigger at 0.5 ovigerous *L. salmonis* per fish in spring ensures that treatments are carried out when a maximum of half of the fish examined have one ovigerous sea louse. This is a practical time to interrupt sea lice development. Later in the year, the development of new generations is not as synchronised and automatic intervention at a sea lice level of 0.5 ovigerous by way of treatment is not justified. A level of 2.0 ovigerous sea lice per fish has been shown to be a pragmatic level at which intervention by way of treatment is advisable. Levels of mobile and juvenile sea lice are important in advising fish health professionals in developing a sea lice control strategy. However, they are not, of themselves, appropriate measures upon which to trigger mandatory treatments.

Results of the monitoring programme are sent to the relevant farm within 5-10 days of each inspection. A monthly report of results is circulated to relevant parties and the data is published annually (www.marine.ie; Sea Lice | Marine Institute).

Sea Lice Management

The sea lice management strategy includes the use of husbandry, management practises, veterinary medicines and non-medicinal measures to control sea lice infestation on farms. Table 1 shows a list of the veterinary medicines authorised to assist in the control of sea lice in Ireland. These are either administered topically or incorporated into the diet. Topical treatments are administered by bathing the fish in specified concentrations of the medicine. Bath treatments can be conducted using well-boats or tarpaulins/skirts to enclose the salmon net-pens. Medicines incorporated into the diet are a very efficient way to get the required dose to the fish. An over-reliance on any one technique can result in reduced efficacy in the short term and lead to development of resistance over time. For this and other reasons, current management practices are migrating away from veterinary medicines and moving toward non-medicinal removal of sea lice. A multi-pronged approach to sea lice control is considered more effective in the long-term and may combine biological, mechanical, thermal and freshwater/hyposaline measures.

Cleaner fish as a control method of sea lice continue to be used in Ireland. Farms typically stock the five species of wrasse most common in Irish waters, namely, Ballan wrasse *Labrus bergylta* (Ascanius, 1767); Goldsinny wrasse *Ctenolabrus rupestris* (L., 1758); Rock cook wrasse *Centrolabrus exoletus* (L., 1758); Corkwing wrasse *Crenilabrus melops* (L., 1758); Cuckoo wrasse *Labrus mixtus* (L., 1758). Lumpfish *Cyclopterus lumpus* (L., 1758) are a more suitable cold-water option for biological delousing of Atlantic salmon (Imsland *et al.*, 2014) and continue to be deployed with positive effects on farms in Ireland as part of a sea lice management plan.

The use of filtration methods at harvest sites has also proven to be a very successful method for removing all stages of sea lice, including egg-strings, preventing sea lice from re-entering the water column and potentially re-infesting stocks adjacent to the harvest area (O'Donohoe & McDermott, 2014).

In addition to mechanical de-lousing methods, thermal de-lousing is now used on several farms in Ireland, with high levels of clearance being reported. Additionally, the use of hyposaline water to control both *Neoparamoeba perurans*, the aetiological agent of amoebic gill disease and sea lice numbers on salmon farms in the West of Ireland, particularly during the warmer summer months is proving successful (McDermott, *et al.* 2021).

Table 1 *Veterinary medicines authorised for use in the control of sea lice on salmonids in Ireland (www.hpra.ie).*

Compound	*Group*	*Licensing status*	*Delivery Method*	*Mode of action*	*Stages targeted*	*Withdrawal period*
Animal medicines						
Deltamethrin	Pyrethroid	Full MA	Bath	Interferes with nerve transmission by blocking sodium channels in nerve cells	Adults, Preadults. Chalimus unknown	5 degree-days
Emamectin benzoate	Avermectin	Full MA	In-feed	Interferes with neurotranmission disrupting nerve cells causing paralysis and death	All stages	Zero
Teflubenzuron	Insect Growth Regulator	Full MA	In-feed	Inhibits chitin synthesis preventing moulting and growth. Limited efficacy beyond medication period. Not authorised for use use in water temperatures below 9°C	Moulting stages - Chalimus, Preadults only	45 degree-days
Hydrogen peroxide	Oxidizer	Full MA	Bath	Gas embolism	Adults, Preadults	Zero

METHODOLOGY

Farmed stocks of Atlantic salmon in Ireland are inspected on 14 occasions throughout the year to monitor sea lice levels as part of the national programme. Additional follow-up inspections may be carried out when it is deemed appropriate. Sea lice inspections take place twice per month in March, April and May (the spring period) and then monthly for the remainder of the year. December and January are combined and only one inspection is carried out.

At each inspection two samples are taken for each generation of fish on site, a sample from a standard cage, which is sampled at each subsequent inspection, and a sample from a random cage, which is chosen on the day of the inspection. Thirty fish are examined for each sample after anaesthetising using tricaine methane sulfonate in seawater. The seawater is sieved for any detached sea lice at the end of each sample. Each fish is examined individually for all mobile sea lice. Sea lice are removed and preserved in 70% ethanol. In the laboratory the species, quantity and life-stage of the sea lice are determined and recorded. The mean number of sea lice per fish is calculated (including the number of detached sea lice from the sieved seawater). Results presented are mean ovigerous sea lice levels and mean total mobile sea lice levels for *L. salmonis* and *C. elongatus* per fish.

Ovigerous sea lice levels are a measure of the breeding female population and total mobile levels provide an indication of current infestation levels. The information gathered aims to evaluate the level of sea lice on the fish and to inform the farmer on a sea lice management strategy. Effective parasite control is characterised by a reduction in sea lice levels on the subsequent inspection.

There are three distinct regions in Ireland where salmonid farming is carried out: the Southwest (Counties Cork and Kerry), the West (Counties Mayo and Galway) and the Northwest (Co. Donegal). 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 (Figure 3).

Covid-19: Temporary alteration to the Sea Lice Monitoring Programme

Following Covid-19 public health measures introduced by the Government, the sea lice monitoring programme was temporarily suspended from 24th March until 29th June 2020. During this period all active farms in the country submitted self-reported sea lice level data from their sites to the Marine Institute on a fortnightly basis from 24th March 2020 to 31st

May 2020 and monthly for June 2020. The Marine Institute resumed sea lice inspections from 1st July and continued to inspect all active sites for the remainder of 2020. For detailed information on the source of sea lice data see Appendix I. For the purposes of this report, both the Marine Institute sea lice inspection data and the self-reported data, shall heretofore be referred to as sea lice reports.

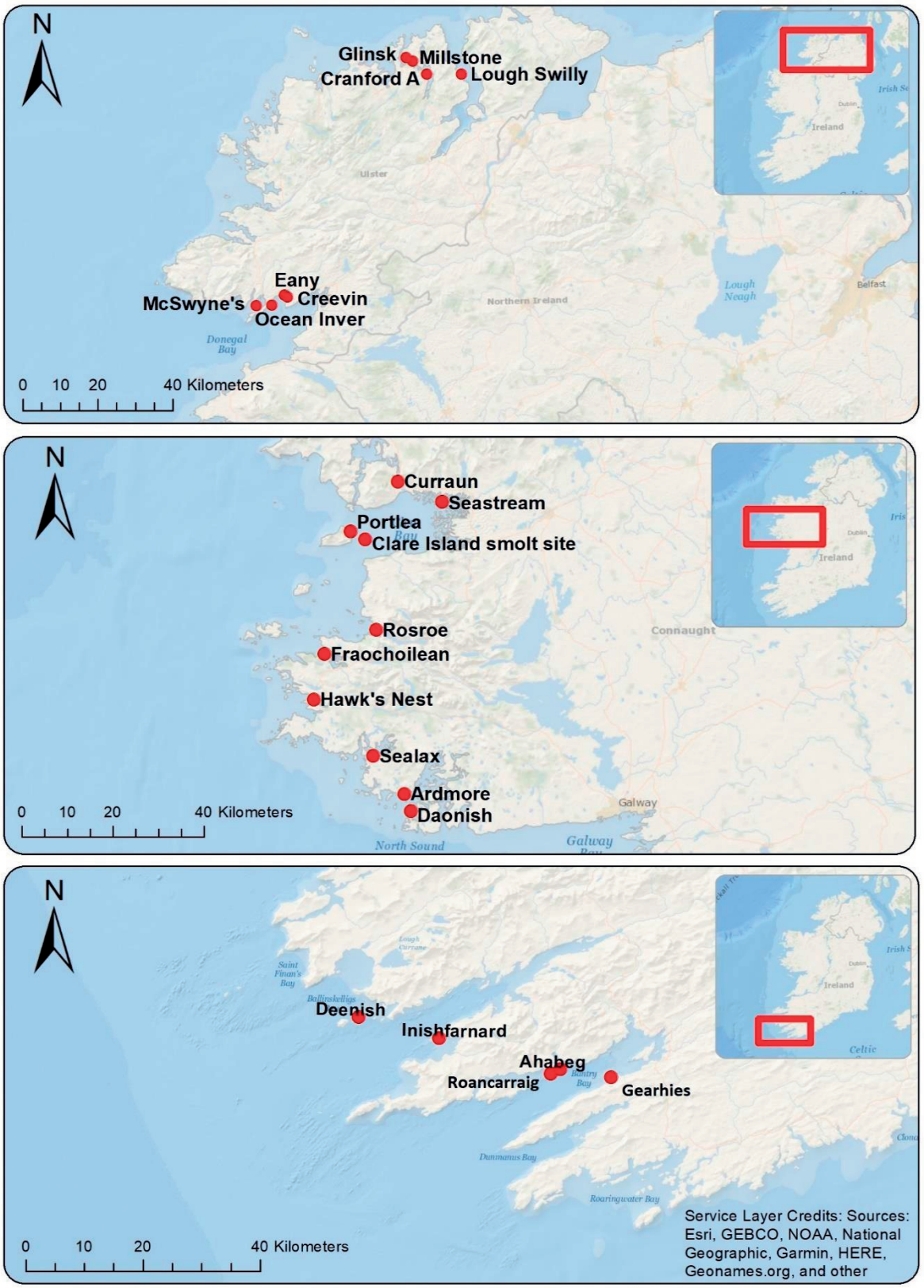

Figure 3 *Locations of fish farm sites active in 2020*

RESULTS

During 2020, a total of 209 sea lice reports (consisting of 108 MI reports and 101 farm reports) were received from 22 active farm sites. One inspection was not undertaken by the Marine Institute on fish health grounds. Over 98% of Atlantic salmon reports were below the Treatment Trigger Levels (TTL) as outlined in the *Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control,* Department of Marine and Natural Resources (2000). Of the 125 reports from salmon smolt sites, 99% were below the TTL and 97% of the 84 reports from one-sea-winter salmon sites were below the TTL.

Results of monthly sea lice reports of all active salmonid sites for 2020 are presented in Appendix 1. A summary of sea lice reports above the TTL by self-reported sea lice data & Marine Institute sea lice reports for one-sea-winter salmon & smolts in 2020 can be found in Appendix II.

During the period of self-reporting from 24th March to the end of June,100% of farms submitted self-reported data for sea lice levels for each requisite period.

Atlantic salmon 2019 (one-sea-winter salmon)

One-sea-winter salmon were present in a total of 12 sites in 9 bays in 2020. Eighty-four reports were received for this generation of fish.

Ovigerous *L. salmonis* levels greater than the TTL were recorded for a total of 2 reports (2.4%) on one-sea-winter fish (Table 2). Within the critical spring period sea lice levels were greater than 0.5 ovigerous females per fish on two reports (3.9%).

C. elongatus levels greater than 10 individuals per fish were recorded on 3 occasions during the year.

Table 2 *Summary of sea lice reports on one-sea-winter salmon nationally in 2020.*

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
National Totals		51	2	33	0	84	2	3.9%	0%	2.4%

Southwest Region

In the Southwest there were no instances of *L. salmonis* infestation levels greater than the TTL (Table 3).

Table 3 *Summary of sea lice reports on one-sea-winter salmon in the Southwest in 2020.*

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl	**Roancarraig**	6	0	2	0	8	0	0%	0%	0%
	Ahabeg	6	0	2	0	8	0	0%	0%	0%
	Deenish	6	0	6	0	12	0	0%	0%	0%
Southwest	**Totals**	18	0	10	0	28	0	0%	0%	0%

West Region

In the West, there were no instances of *L. salmonis* infestation levels greater than the TTL (Table 4).

Table 4 *Summary of sea lice reports on one-sea-winter salmon in the West in 2020.*

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Bradan Beo Teo.	**Daonish**	1	0	2	0	3	0	0%	0%	0%
Bifand Ltd	**Fraochoilean**	2	0	2	0	4	0	0%	0%	0%
Clare Island Seafarms Ltd	**Clare Island Smolt Site**	3	0	5	0	8	0	0%	0%	0%
	Seastream	3	0	2	0	5	0	0%	0%	0%
Curraun Blue Ltd	**Curruan**	1	0	2	0	3	0	0%	0%	0%
West	**Totals**	10	0	13	0	23	0	0%	0%	0%

Northwest Region

The TTL was exceeded on 2 out of 23 reports (9%) in the spring period (Table 5).

Table 5 *Summary of sea lice reports on one-sea-winter salmon in the Northwest in 2020.*

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Ocean Farm Ltd.	**Mc Swynes**	6	0	2	0	8	0	0%	0%	0%
Mowi Irl	**Cranford A**	5	0	0		5	0	0%		0%
	Millstone	6	2	4	0	10	2	33%	0%	20%
	L. Swilly	6	0	4	0	10	0	0%	0%	0%
Northwest	**Totals**	23	2	10	0	33	2	9%	0%	6%

Mean levels in excess of 10 mobile *L. salmonis* per fish were recorded on 6 occasions, 2 of these instances had a mean of greater than 20 mobile sea lice per fish. The maximum mean level recorded was 29.7 mobile sea lice per fish, in McSwynes Bay in January.

The maximum mobile *C. elongatus* level recorded was 21.18 per fish in the Southwest in August.

Atlantic salmon 2020 (smolts)

A total of 125 reports were undertaken at 10 sites stocking Atlantic salmon 2020 S1 and S½ smolts during the year 2020. *L. salmonis* levels were below the TTL of 0.5 ovigerous female sea lice per fish for all of 55 reports (100%) during the spring period. One out of 70 (99%) reports outside the spring period were above the TTL of 2 ovigerous female sea lice per fish (Table 6). There was one occasion where the mean total mobile *L. salmonis* was greater than 10. This occurred outside the spring period in the West region.

Table 6 *Summary of sea lice reports on salmon smolts nationally in 2020.*

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl.	**Inishfarnard**	5	0	6	0	11	0	0%	0%	0%
Southwest	**Totals**	5	0	6	0	11	0	0%	0%	0%
Bradan Beo Teo.	**Ardmore**	6	0	8	0	14	0	0%	0%	0%
Bifand Ltd / Mowi Irl.	**Sealax**	6	0	8	0	14	0	0%	0%	0%
Mannin Bay Salmon Company Ltd.	**Hawk's Nest**	6	0	8	0	14	0	0%	0%	0%
Rosroe Salmon Ltd.	**Rosroe**	6	0	8	0	14	0	0%	0%	0%
Clare Island Seafarms Ltd.	**Portlea**	3	0	6	0	9	0	0%	0%	0%
West	**Totals**	27	0	38	0	65	0	0%	0%	0%
Ocean Farm Ltd.	**Ocean Inver**	6	0	8	0	14	0	0%	0%	0%
Mowi Irl.	**Creevin**	6	0	7	1	13	1	0%	14%	8%
	Eany	6	0	5	0	11	0	0%	0%	0%
	Glinsk	5	0	6	0	11	0	0%	0%	0%
Northwest	**Totals**	23	0	26	1	49	1	0%	4%	2%
National Totals		55	0	70	1	125	1	0%	1%	1%

One-sea-winter salmon monthly trend by bay

Mean ovigerous and mean mobile *L. salmonis,* and *C. elongatus* levels for each bay are shown in Table 7 for one-sea-winter salmon throughout the year. Monthly ovigerous *L. salmonis* levels greater than the spring TTL of 0.5 ovigerous sea lice per fish were recorded on one out of 21 occasions due to elevated levels in Mulroy Bay.

All 31 bay means outside of the spring period were below the TTL of 2.0 ovigerous females per fish.

Table 7 *Mean ovigerous and mean mobile Lepeophtheirus salmonis and Caligus elongatus levels per month, for one-sea-winter salmon, for each bay inspected in the year 2020.*

Mean ovigerous *L. salmonis*

Bay	Dec/Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Bantry Bay	0.19	0.08	0.09	0.09	0.03	HO					
Kenmare Bay	0.08	0.31	0.13	0.01	0.03	0.00	0.00	0.46	0.35	HO	
Kilkieran Bay	1.21	0.14	0.38	HO							
Ballinakill Harbour	0.55	0.47	0.10	HO							
Clew Bay	0.02	0.15	0.01	0.00	0.04	0.10	0.12	0.00	0.00	0.04	HO
Bealacragher Bay	0.04	0.12	0.25	HO							
Donegal Bay	0.16	0.78	0.44	0.30	0.31	HO					
Mulroy Bay	1.04	0.47	0.35	0.25	0.63	0.28	1.17	HO			
Lough Swilly	0.40	0.00	0.14	0.00	0.19	0.30	1.69	HO			

Mean mobile *L. salmonis*

Bay	Dec/Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Bantry Bay	0.73	8.99	4.00	0.18	0.26	HO					
Kenmare Bay	0.34	0.85	0.31	0.44	0.14	0.03	0.30	0.82	0.89	HO	
Kilkieran Bay	22.29	4.00	3.64	HO							
Ballinakill Harbour	1.40	2.48	1.49	HO							
Clew Bay	0.17	0.31	0.21	0.21	0.14	0.28	1.10	0.46	0.31	0.54	HO
Bealacragher Bay	0.59	1.71	1.59	HO							
Donegal Bay	29.70	7.62	4.94	3.63	2.55	HO					
Mulroy Bay	5.09	7.55	1.74	0.86	1.31	0.18	8.27	HO			
Lough Swilly	2.70	6.47	2.58	0.53	0.70	0.08	10.42	HO			

Mean ovigerous *C. elongatus*

Bay	Dec/Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Bantry Bay	0.00	0.65	0.92	NR	NR	HO					
Kenmare Bay	0.74	0.82	0.44	NR	NR	NR	3.93	10.66	2.00	HO	
Kilkieran Bay	0.12	0.00	0.03	HO							
Ballinakill Harbour	0.00	0.00	0.00	HO							
Clew Bay	0.38	1.89	0.16	NR	NR	NR	0.22	0.95	0.13	0.29	HO
Bealacragher Bay	0.00	0.05	0.00	HO							
Donegal Bay	1.92	0.00	0.00	NR	NR	HO					
Mulroy Bay	0.07	0.38	0.00	NR	NR	NR	0.00	HO			
Lough Swilly	3.42	3.52	0.49	NR	NR	NR	0.55	HO			

Mean mobile *C. elongatus*

Bay	Dec/Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Bantry Bay	0.05	2.33	0.98	0.26	0.02	HO					
Kenmare Bay	1.77	1.28	0.32	0.03	0.05	9.43	10.56	21.18	6.96	HO	
Kilkieran Bay	0.23	0.00	0.03	HO							
Ballinakill Harbour	0.02	0.00	0.00	HO							
Clew Bay	3.38	3.12	1.01	0.56	0.03	0.03	0.27	1.64	0.22	0.79	HO
Bealacragher Bay	0.02	0.09	0.00	HO							
Donegal Bay	3.98	0.04	3.23	0.61	0.62	HO					
Mulroy Bay	0.30	0.58	0.00	0.00	0.00	0.00	0.07	HO			
Lough Swilly	13.65	7.62	0.52	0.00	0.14	0.00	1.32	HO			

HO = Harvested out

NR = Not required for self-reported data

Regional monthly means for one-sea-winter salmon

L. salmonis ovigerous and monthly mean mobile levels per fish for one-sea-winter salmon regionally are shown in Figures 4 & 5. In the spring period of 2020, the mean regional ovigerous sea lice levels per fish did not exceed the TTL on any occasion.

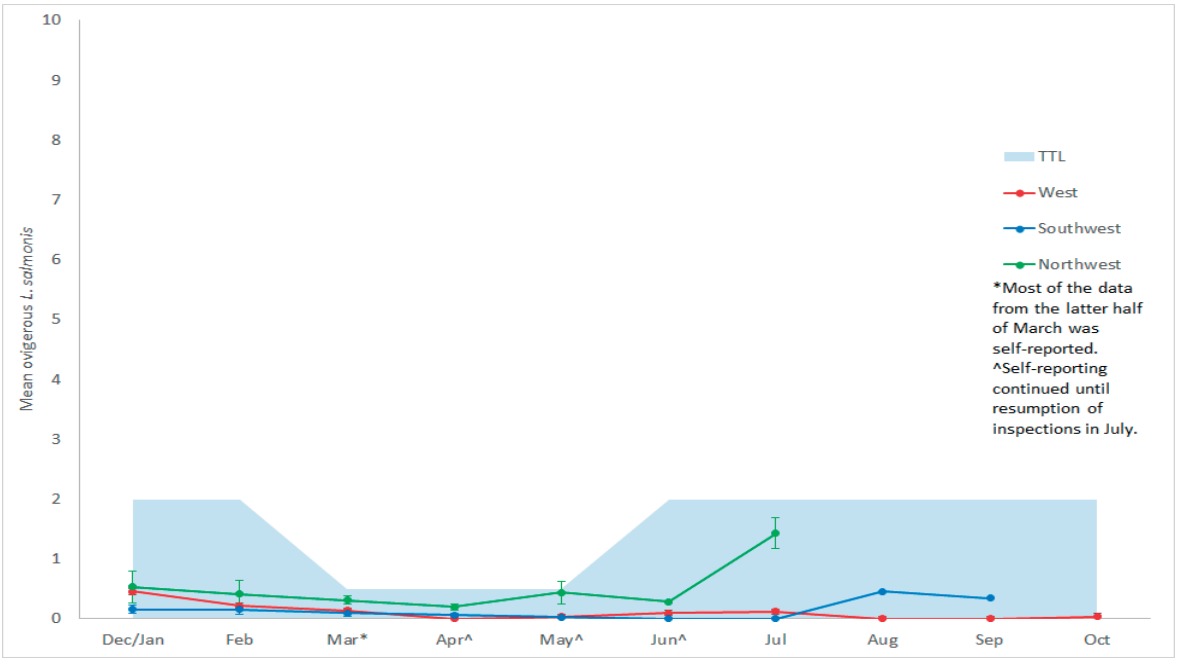

Figure 4 *Mean (±SE) monthly ovigerous L. salmonis per fish per region in 2020 on one-sea-winter salmon.*

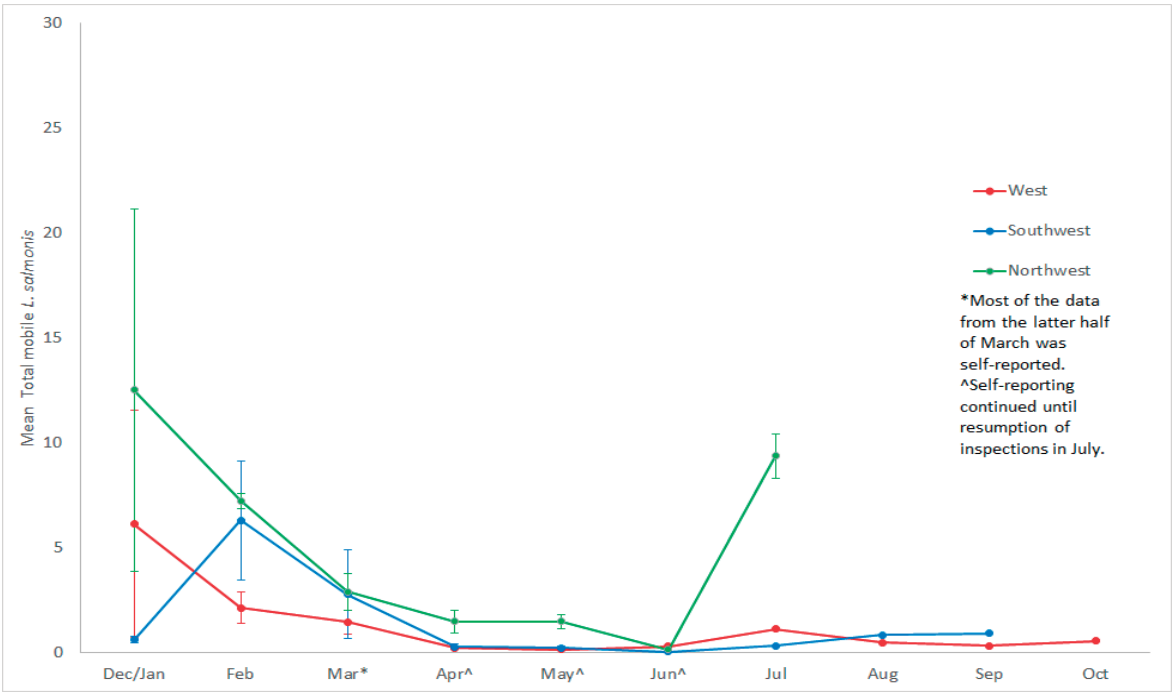

Figure 5 *Mean (±SE) monthly mobile L. salmonis per fish for each region in 2020 on one-sea-winter salmon.*

Total regional mean mobile *L. salmonis* levels peaked at 12.5 mobile sea lice per fish in the Northwest region in Dec/Jan, 6.3 in the Southwest in Feb and 6.1 in the West in Dec/Jan.

Annual trends

The annual trends of *L. salmonis* ovigerous and mobile sea lice levels are compared in Figures 6 & 7 for one-sea-winter salmon for the month of May from 1991 to 2020.

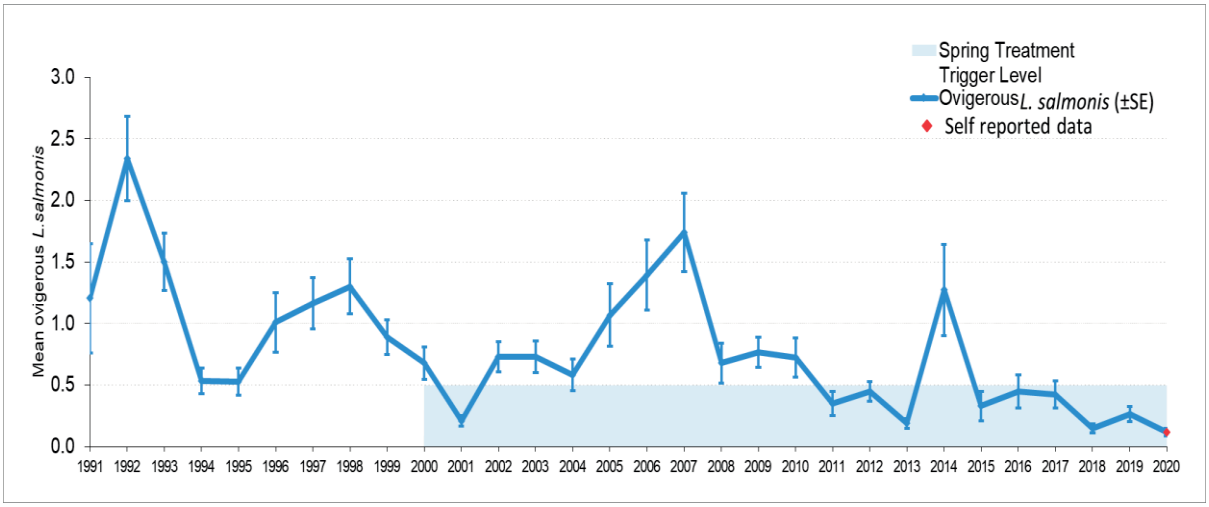

Figure 6 *Annual trend (May mean ±SE) ovigerous L. salmonis on one-sea-winter salmon.*

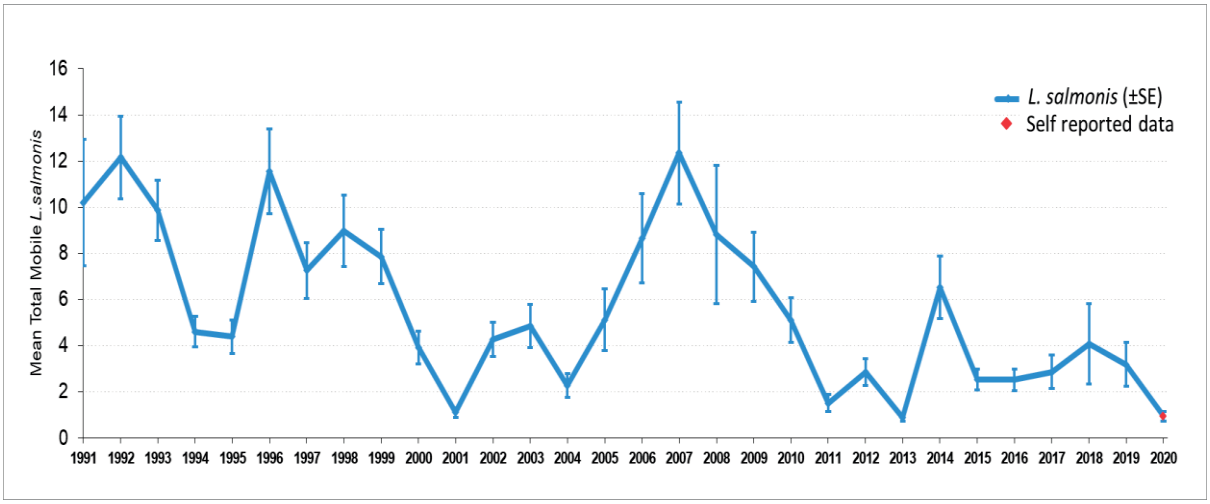

Figure 7 *Annual trend (May mean ±SE) mobile L. salmonis on one-sea-winter salmon.*

Mean ovigerous *L. salmonis* levels in May decreased to 0.12 sea lice per fish in 2020, compared to 0.27 per fish in 2019, and remained below 0.5. Total mobile *L. salmonis* levels decreased to 0.94 per fish compared to 3.19 per fish in May 2019.

DISCUSSION

Overall, in 2020, 98% of all sea lice reports were below the TTL corresponding to 99% of salmon smolt reports and 97% of reports on one-sea-winter salmon. These results indicate an improvement compared to the results from 2019 and are consistent with continued efforts to reduce sea lice infestation levels on marine Atlantic salmon farms in Ireland. In the case of one-sea-winter salmon, the two occasions when levels were elevated above TTL, subsequent reports indicated levels below the TTL, thus avoiding the requirement for a Management Cell. The national mean ovigerous *L. salmonis* levels for one-sea-winter salmon in May decreased to the lowest recorded levels, 0.12 per fish in 2020 compared to 0.27 per fish in 2019. Similarly, the national total mobile *L. salmonis* levels for May decreased in 2020 to 0.94. Overall, the mean ovigerous sea lice levels in May of each year have remained below 0.5 per fish for the past six years.

Regionally, reports on all stocks of salmon in the Southwest and the West were below the TTL in 2020. In the Northwest, during the spring period, 91% of reports on one-sea-winter-salmon were below the TTL and all sea lice reports of one-sea-winter salmon undertaken outside of the spring period were below the TTL. The mean regional ovigerous *L. salmonis* levels for one-sea-winter salmon demonstrates the continued improvement in maintaining levels below the TTL for the spring period.

2020 was the first year since the introduction of the pest management strategy that sea lice data was self-reported. In an evaluation of data, one-sea-winter salmon regional means for ovigerous and total *L. salmonis* revealed that the self-reported data from mid-March to the end of June was consistent with the data collected by the Marine Institute prior to and subsequent to that self-reporting period. Data from the Northwest showed a moderate increase from June to July, although levels did not exceed the TTL.

Following pilot trials run by BIM in previous years[1], the use of hyposaline water bathing for control of sea lice levels became established on a number of farms in 2020. This delousing technique was shown to be an effective tool in the control of sea lice (Mc Dermott, *et al.*, 2021). Thermal and mechanical delousing methods continue to be used and are successful at removing the mobile sea lice stages, although they are known to be less successful at removing the attached sea lice stages (Grøntvedt, *et al.*, 2015; Overton, *et al.*, 2018).

[1] https://www.bim.ie/aquaculture/industry-projects/desalination-solutions-for-the-salmon-industry

Overall, in 2020, sea lice levels were at their lowest for several years and the May-mean sea lice levels were the lowest recorded since the strategy was introduced. The regional mean ovigerous *L. salmonis* were consistently below the TTL throughout 2020. Of the three occasions when ovigerous *L. salmonis* levels rose above the TTL, all subsequent follow-up reports showed subsequent levels below the TTL. This pattern in reduced sea lice levels following advice to take action to control elevated sea lice levels, demonstrates a high level of adherence to the pest management strategy. The reasons for these consistently low sea lice levels are the continued adherence to the pest management strategy and proactive sea lice management. This includes the use of non-medicinal delousing systems such as cleaner fish, hyposaline water bathing, thermal and mechanical delousing methods as well as good husbandry, timely use of authorised veterinary medicines and implementation of Single Bay Management practices.

GLOSSARY

Grower:	A fish which has been at sea for one complete year or longer.
Mobile lice:	All sea lice that are mobile – male and female (pre-adult and adult stages) sea lice that have developed beyond the attached larval stages.
n<10:	Ten fish or fewer were inspected in one or both pens sampled.
Ovigerous lice:	An egg bearing adult female sea lice.
Random (Ran.) Pen:	A pen which is selected by the Inspector on the day of inspection.
Salmonids:	A fish of the family Salmonidae. It includes salmon, trout and charr.
Standard (Std.) Pen:	The selected pen which is sampled at each 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.
S½ Smolt (also known as S0):	These fish are put under lights to hasten the onset of smoltification. An S½ smolt is ready to go to sea during the autumn/winter, approximately 11 months after hatching. They are sometimes referred to as S0 (S zero) smolts.
SE:	Standard error (error bars in the graphs) is the standard error of the mean of a sample from a population with a normal distribution, which is equal to the standard deviation of the normal distribution divided by the square root of the sample size.
TTL:	Treatment Trigger Levels
Sea lice reports	Marine Institute sea lice inspection data and On farm self-reported data

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APPENDIX 1.

Mean sea lice levels on salmonid farms in 2020. (self-reported data: bold print)

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
MOWI IRL.					
Ahabeg					
Atlantic Salmon, 2019 S1/2	24/01/2020	0.29	0.79	0.00	0.03
	28/02/2020	0.09	7.43	0.53	2.10
	04/03/2020	0.29	13.04	1.73	3.50
	19/03/2020	**0.00**	**0.03**		**0.00**
	02/04/2020	**0.15**	**0.03**		**1.05**
	24/04/2020	**0.05**	**0.00**		**0.00**
	01/05/2020	**0.03**	**0.55**		**0.08**
	16/05/2020	**0.00**	**0.00**		**0.00**
		Harvested Out			
Roancarraig					
Atlantic Salmon, 2019 S1/2	24/01/2020	0.09	0.67	0.00	0.06
	28/02/2020	0.07	10.55	0.77	2.55
	04/03/2020	0.06	2.87	0.10	0.40
	16/03/2020	**0.00**	**0.05**		**0.00**
	02/04/2020	**0.13**	**0.65**		**0.00**
	21/04/2020	**0.03**	**0.03**		**0.00**
	01/05/2020	**0.08**	**0.48**		**0.00**
	16/05/2020	**0.00**	**0.00**		**0.00**
		Harvested Out			
MURPHY'S IRISH SEAFOOD LTD.					
Gearhies					
Atlantic Salmon, 2019		Transferred to Mc Swynes			

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*		
		F + eggs	Total	F + eggs	Total	
KENMARE BAY						
MOWI IRL.						
Deenish						
Atlantic Salmon, 2019	23/01/2020	0.08	0.34	0.74	1.77	
	27/02/2020	0.31	0.85	0.82	1.28	
	03/03/2020	0.25	0.57	0.44	0.63	
	23/03/2020	**0.00**	**0.05**		**0.00**	
	08/04/2020	**0.03**	**0.53**		**0.00**	
	30/04/2020	**0.00**	**0.35**		**0.05**	
	07/05/2020	**0.05**	**0.23**		**0.10**	
	19/05/2020	**0.00**	**0.05**		**0.00**	
	25/06/2020	**0.00**	**0.03**		**9.43**	
	23/07/2020	0.00	0.30	3.93	10.56	
	18/08/2020	0.46	0.82	10.66	21.18	n<10
	18/09/2020	0.35	0.89	2.00	6.96	
		Harvested Out				
Inishfarnard						
Atlantic Salmon, 2020	**31/03/2020**	**0.00**	**0.00**		**0.00**	
	07/04/2020	**0.00**	**0.00**		**0.00**	
	24/04/2020	**0.00**	**0.00**		**0.00**	
	12/05/2020	**0.00**	**0.05**		**0.00**	
	19/05/2020	**0.00**	**0.00**		**0.05**	
	24/06/2020	**0.00**	**0.00**		**20.08**	
	22/07/2020	0.00	0.02	0.14	2.50	
	17/08/2020	0.00	0.02	0.05	0.10	
	17/09/2020	0.00	0.11	1.97	4.08	
	14/10/2020	0.00	0.04	0.00	0.02	
	05/11/2020	0.02	0.10	2.84	7.00	

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
KILKIERAN BAY					
BRADAN BEO TEO.					
Ardmore					
Atlantic Salmon, 2020 S1/2	22/01/2020	0.10	4.98	0.00	0.07
	27/02/2020	0.10	4.86	0.02	0.02
	04/03/2020	0.07	4.51	0.00	0.00
	25/03/2020	**0.34**	**3.23**		**0.00**
	07/04/2020	**0.25**	**2.57**		**0.00**
	30/04/2020	**0.02**	**1.95**		**0.14**
	13/05/2020	**0.10**	**1.29**		**0.02**
	28/05/2020	**0.22**	**2.47**		**0.15**
	16/06/2020	**0.62**	**0.79**		**0.00**
	08/07/2020	0.12	0.92	0.02	0.02
	05/08/2020	0.03	0.23	0.00	0.00
	09/09/2020	0.03	0.18	0.02	0.02
	22/10/2020	0.32	1.23	0.14	0.20
	04/11/2020	0.44	3.49	0.03	0.32
Daonish					
Atlantic Salmon, 2019 S1/2	10/01/2020	1.21	22.29	0.12	0.23
	28/02/2020	0.14	4.00	0.00	0.00
	16/03/2020	0.38	3.64	0.03	0.03
		Harvested Out			

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BERTRAGHBOY BAY					
BIFAND LTD. / MOWI IRL.					
Sealax					
Atlantic Salmon, 2020 S1/2	21/01/2020	0.12	0.67	1.03	1.26
	13/02/2020	0.05	0.53	0.47	0.61
	05/03/2020	0.06	0.80	0.61	0.79
	26/03/2020	**0.03**	**0.90**		**0.00**
	09/04/2020	**0.03**	**0.35**		**0.00**
	21/04/2020	**0.05**	**0.58**		**0.03**
	05/05/2020	**0.05**	**0.83**		**0.08**
	21/05/2020	**0.20**	**2.43**		**0.00**
	24/06/2020	**0.28**	**0.45**		**0.10**
	07/07/2020	0.27	2.14	0.12	0.17
	26/08/2020	0.00	0.14	0.23	0.47
	01/09/2020	0.00	0.03	0.07	0.15
	15/10/2020	0.02	0.03	0.44	1.06
	05/11/2020	0.04	0.17	1.04	2.04
CLIFDEN BAY					
MANNIN BAY SALMON COMPANY LTD.					
Hawks Nest					
Atlantic Salmon, 2020 S1/2	08/01/2020	0.06	0.26	0.00	0.01
	12/02/2020	0.00	0.09	0.00	0.00
	03/03/2020	0.02	0.08	0.00	0.00
	23/03/2020	0.00	0.21	0.00	0.00
	15/04/2020	**0.00**	**0.20**		**0.00**
	29/04/2020	**0.00**	**0.15**		**0.00**
	07/05/2020	**0.00**	**0.10**		**0.00**
	27/05/2020	**0.00**	**0.20**		**0.00**
	11/06/2020	**0.10**	**0.40**		**0.00**
	13/07/2020	0.34	2.63	0.02	0.02
	06/08/2020	0.05	0.77	0.00	0.00
	11/09/2020	0.68	14.31	0.00	0.00
	07/10/2020	0.02	0.16	0.00	0.04
	04/11/2020	1.07	3.54	0.07	0.07

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BALLINAKILL HARBOUR					
BIFAND LTD.					
Fraochoilean					
Atlantic Salmon, 2019 S1/2	24/01/2020	0.55	1.40	0.00	0.02
	26/02/2020	0.47	2.48	0.00	0.00
	13/03/2020	0.00	0.60	0.00	0.00
	18/03/2020	0.20	2.37	0.00	0.00
		Harvested Out			
KILLARY HARBOUR					
ROSROE SALMON LTD.					
Rosroe					
Atlantic Salmon, 2020 S1/2	09/01/2020	0.00	0.10	0.00	0.01
	07/02/2020	0.03	0.33	0.00	0.02
	13/03/2020	0.07	0.47	0.00	0.00
	31/03/2020	**0.08**	**0.50**		**0.00**
	14/04/2020	**0.06**	**0.55**		**0.00**
	29/04/2020	**0.05**	**0.80**		**0.00**
	15/05/2020	**0.15**	**1.25**		**0.20**
	29/05/2020	**0.10**	**1.20**		**0.45**
	26/06/2020	**0.15**	**3.45**		**0.10**
	14/07/2020	0.00	1.12	0.00	0.02
	06/08/2020	0.00	7.07	0.14	0.22
	02/09/2020	0.00	0.00	0.02	0.02
	13/10/2020	0.00	0.02	0.02	0.05
	05/11/2020	0.00	0.11	0.02	0.09

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
CLEW BAY					
CLARE ISLAND SEAFARMS LTD.					
Clare Island Smolt Site					
Atlantic Salmon, 2019	**23/04/2020**	**0.00**	**0.18**		**0.00**
	12/05/2020	**0.00**	**0.10**		**0.00**
	27/05/2020	**0.08**	**0.18**		**0.05**
	10/06/2020	**0.10**	**0.28**		**0.03**
	20/07/2020	0.12	1.10	0.22	0.27
	28/08/2020	0.00	0.46	0.95	1.64
	15/09/2020	0.00	0.31	0.13	0.22
	08/10/2020	0.04	0.54	0.29	0.79
		Harvested Out			
Portlea					
Atlantic Salmon, 2018		Harvested Out			
Atlantic Salmon, 2020	**22/04/2020**	**0.00**	**0.00**		**0.05**
	12/05/2020	**0.00**	**0.03**		**0.00**
	28/05/2020	**0.00**	**0.03**		**0.05**
	12/06/2020	**0.00**	**0.00**		**0.05**
	20/07/2020	0.00	0.15	0.04	0.07
	28/08/2020	0.03	0.18	0.24	0.32
	15/09/2020	0.00	0.00	0.00	0.01
	08/10/2020	0.00	0.02	0.02	0.02
	06/11/2020	0.00	0.08	0.05	0.11
Seastream					
Atlantic Salmon, 2019	04/12/2019	0.02	0.17	0.38	3.38
	19/02/2020	0.15	0.31	1.89	3.12
	06/03/2020	0.02	0.10	0.16	0.49
	23/03/2020	**0.00**	**0.33**		**1.53**
	08/04/2020	**0.00**	**0.25**		**1.13**
		Transferred to Clare Island Smolt Site			

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BEALACRAGHER BAY					
CURRAUN BLUE LTD.					
Curraun					
Atlantic Salmon, 2019 S1/2	04/12/2019	0.04	0.59	0.00	0.02
	19/02/2020	0.12	1.71	0.05	0.09
	13/03/2020	0.25	1.59	0.00	0.00
		Harvested Out			
DONEGAL BAY					
MOWI IRL.					
Creevin					
Atlantic Salmon, 2020 S1/2	23/01/2020	0.02	0.06	0.71	1.15
	19/02/2020	0.02	0.25	1.00	1.69
	04/03/2020	0.04	0.33	0.54	1.10
	26/03/2020	**0.03**	**0.28**		**0.28**
	09/04/2020	**0.05**	**0.38**		**0.00**
	24/04/2020	**0.00**	**0.45**		**0.05**
	08/05/2020	**0.08**	**0.45**		**0.00**
	28/05/2020	**0.43**	**1.63**		**0.00**
	08/06/2020	**1.25**	**2.68**		**0.00**
	24/07/2020	1.31	6.10	0.02	0.02
	27/08/2020	0.00	3.17	0.00	0.00
	28/09/2020	Not sampled due to fish health reasons			
	14/10/2020	0.00	1.25	0.00	0.00
	30/11/2020	3.39	5.11	0.00	0.00
Eany					
Atlantic Salmon, 2020 S1/2	23/01/2020	0.04	0.21	1.35	2.49
	19/02/2020	0.02	0.43	1.61	2.17
	04/03/2020	0.02	0.75	0.60	1.38
	26/03/2020	**0.00**	**0.40**		**0.00**
	09/04/2020	**0.03**	**0.40**		**0.00**
	24/04/2020	**0.03**	**0.83**		**0.28**
	08/05/2020	**0.10**	**0.35**		**0.00**
	28/05/2020	**0.38**	**1.23**		**0.00**
	24/06/2020	**1.40**	**2.10**		**0.00**
	24/07/2020	0.21	4.12	0.00	0.00
	27/08/2020	0.00	9.39	0.10	0.11
		Harvested Out			

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
OCEAN FARM LTD.					
Mc Swynes					
Atlantic Salmon, 2019 S1/2	22/01/2020	0.16	29.70	1.92	3.98
	27/02/2020	0.78	7.62	0.00	0.04
	05/03/2020	0.40	3.43	0.00	0.13
	30/03/2020	**0.49**	**6.45**		**6.32**
	14/04/2020	**0.30**	**4.27**		**0.00**
	29/04/2020	**0.30**	**2.99**		**1.22**
	12/05/2020	**0.19**	**1.98**		**0.00**
	28/05/2020	**0.44**	**3.12**		**1.24**
		Harvested Out			
Ocean Inver					
Atlantic Salmon, 2020 S1/2	22/01/2020	0.00	0.31	0.76	1.43
	27/02/2020	0.03	0.97	0.90	1.88
	04/03/2020	0.08	0.83	1.11	2.27
	30/03/2020	**0.15**	**1.44**		**1.64**
	14/04/2020	**0.20**	**1.02**		**0.05**
	29/04/2020	**0.10**	**1.00**		**0.17**
	11/05/2020	**0.09**	**1.20**		**0.45**
	28/05/2020	**0.37**	**2.95**		**0.70**
	09/06/2020	**0.53**	**2.34**		**0.20**
	24/07/2020	1.80	6.15	0.06	0.11
	28/08/2020	0.62	1.76	0.00	0.00
	10/09/2020	0.14	1.97	0.02	0.02
	14/10/2020	0.47	1.97	0.00	0.00
	05/11/2020	0.17	2.18	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
MULROY BAY					
MOWI IRL.					
Cranford A					
Atlantic Salmon, 2019	**23/03/2020**	**0.18**	**0.98**		**0.00**
	02/04/2020	**0.33**	**0.60**		**0.00**
	27/04/2020	**0.28**	**1.98**		**0.00**
	13/05/2020	**0.33**	**1.38**		**0.00**
	19/05/2020	**0.45**	**1.65**		**0.00**
		Harvested Out			
Glinsk					
Atlantic Salmon, 2019		Transferred to Lough Swilly			
Atlantic Salmon, 2020	**24/03/2020**	**0.00**	**0.28**		**0.00**
	06/04/2020	**0.00**	**0.38**		**0.00**
	20/04/2020	**0.00**	**0.05**		**0.00**
	14/05/2020	**0.03**	**0.53**		**0.00**
	25/05/2020	**0.05**	**0.55**		**0.00**
	16/06/2020	**0.03**	**0.83**		**0.00**
	15/07/2020	0.00	0.59	0.04	0.04
	26/08/2020	0.00	1.30	0.00	0.00
	09/09/2020	0.00	2.36	0.00	0.04
	15/10/2020	0.00	0.12	0.00	0.00
	06/11/2020	0.00	1.15	0.04	0.04

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Millstone					
Atlantic Salmon, 2019	21/01/2020	1.04	5.09	0.07	0.30
	13/02/2020	0.47	7.55	0.38	0.58
	03/03/2020	0.59	3.08	0.00	0.00
	27/03/2020	**0.28**	**1.15**		**0.00**
	07/04/2020	**0.35**	**0.63**		**0.00**
	23/04/2020	**0.05**	**0.23**		**0.00**
	01/05/2020	**0.00**	**0.15**		**0.00**
	26/05/2020	**1.73**	**2.05**		**0.00**
	12/06/2020	**0.28**	**0.18**		**0.00**
	14/07/2020	1.17	8.27	0.00	0.07
		Harvested Out			
LOUGH SWILLY					
Lough Swilly					
Atlantic Salmon, 2019	21/01/2020	0.40	2.70	3.42	13.65
	13/02/2020	0.00	6.47	3.52	7.62
	03/03/2020	0.28	5.09	0.49	1.03
	29/03/2020	**0.00**	**0.08**		**0.00**
	09/04/2020	**0.00**	**1.05**		**0.00**
	29/04/2020	**0.00**	**0.00**		**0.00**
	12/05/2020	**0.08**	**0.88**		**0.28**
	20/05/2020	**0.30**	**0.53**		**0.00**
	14/06/2020	**0.30**	**0.08**		**0.00**
	14/07/2020	1.69	10.42	0.55	1.32
		Harvested Out			

APPENDIX 2

A summary of Marine Institute sea lice inspections & self-reported sea lice data for one-sea-winter salmon & smolts in 2020

Appendix 2.1. Summary of Marine Institute sea lice inspections on one-sea-winter salmon in 2020

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl.	**Roancarraig**	1	0	2	0	3	0	0%	0%	0%
	Ahabeg	1	0	2	0	3	0	0%	0%	0%
	Deenish	1	0	5	0	6	0	0%	0%	0%
Southwest	**Totals**	3	0	9	0	12	0	0%	0%	0%
Bradan Beo Teo.	**Daonish**	1	0	2	0	3	0	0%	0%	0%
Bifand Ltd.	**Fraochoilean**	2	0	2	0	4	0	0%	0%	0%
Clare Island Seafarms Ltd.	**Clare Island smolt site**	0	0	4	0	4	0		0%	0%
	Seastream	1	0	2	0	3	0	0%	0%	0%
Curraun Blue Ltd.	**Curruan**	1	0	2	0	3	0	0%	0%	0%
West	**Totals**	5	0	12	0	17	0	0%	0%	0%
Ocean Farm Ltd.	**Mc Swynes**	1	0	2	0	3	0	0%	0%	0%
Mowi Irl.	**Millstone**	1	1	3	0	4	1	100%	0%	25%
	L.Swilly	1	0	3	0	4	0	0%	0%	0%
Northwest	**Totals**	3	1	8	0	11	1	33%	0%	9%
National Totals		11	1	29	0	40	1	9%	0%	3%

Appendix 2.2 Summary of self-reported sea lice reports on one-sea-winter salmon in 2020.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl.	**Roancarraig**	5	0	0		5	0	0%		0%
	Ahabeg	5	0	0		5	0	0%		0%
	Deenish	5	0	1	0	6	0	0%	0%	0%
Southwest	**Totals**	15	0	1	0	16	0	0%	0%	0%
Clare Island Seafarms Ltd.	**Clare Island smolt site**	3	0	1	0	4	0	0%	0%	0%
	Seastream	2	0	0		2	0	0%		0%
West	**Totals**	5	0	1	0	6	0	0%	0%	0%
Ocean Farm Ltd.	**Mc Swynes**	5	0	0		5	0	0%		0%
Mowi Irl.	**Cranford A**	5	0	0		5	0	0%		0%
	Millstone	5	1	1	0	6	1	20%	0%	17%
	L.Swilly	5	0	1	0	6	0	0%	0%	0%
Northwest	**Totals**	20	1	2	0	22	1	5%	0%	5%
National Totals		40	1	4	0	44	1	3%	0%	2%

Appendix 2.3 Summary of Marine Institute sea lice inspections on smolts in 2020

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl.	**Inishfarnard**	0		5	0	5	0		0%	0%
Southwest	**Totals**	0		5	0	5	0		0%	0%
Bradan Beo Teo.	**Ardmore**	1	0	7	0	8	0	0%	0%	0%
Bifand Ltd / Mowi Irl.	**Sealax**	1	0	7	0	8	0	0%	0%	0%
Mannin Bay Salmon Company Ltd.	**Hawk's Nest**	2	0	7	0	9	0	0%	0%	0%
Rosroe Salmon Ltd.	**Rosroe**	1	0	7	0	8	0	0%	0%	0%
Clare Island Seafarms Ltd.	**Portlea**	0		5	0	5	0		0%	0%
West	**Totals**	5	0	33	0	38	0	0%	0%	0%
Ocean Farm Ltd.	**Ocean Inver**	1	0	7	0	8	0	0%	0%	0%
Mowi Irl.	**Creevin**	1	0	6	1	7	1	0%	17%	14%
	Eany	1	0	4	0	5	0	0%	0%	0%
	Glinsk	0		5	0	5	0		0%	0%
Northwest	**Totals**	3	0	22	1	25	1	0%	5%	4%
National Totals		8	0	60	1	68	1	0%	2%	1%

Appendix 2.4 Summary of self-reported sea lice reports on smolts in 2020.

Company	Site	Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Mowi Irl.	**Inishfarnard**	5	0	1	0	6	0	0%	0%	0%
Southwest	**Totals**	5	0	1	0	6	0	0%	0%	0%
Bradan Beo Teo.	**Ardmore**	5	0	1	0	6	0	0%	0%	0%
Bifand Ltd / Mowi Irl.	**Sealax**	5	0	1	0	6	0	0%	0%	0%
Mannin Bay Salmon Company Ltd.	**Hawk's Nest**	4	0	1	0	5	0	0%	0%	0%
Rosroe Salmon Ltd.	**Rosroe**	5	0	1	0	6	0	0%	0%	0%
Clare Island Seafarms Ltd.	**Portlea**	3	0	1	0	4	0	0%	0%	0%
West	**Totals**	22	0	5	0	27	0	0%	0%	0%
Ocean Farm Ltd.	**Ocean Inver**	5	0	1	0	6	0	0%	0%	0%
Mowi Irl.	**Creevin**	5	0	1	0	6	0	0%	0%	0%
	Eany	5	0	1	0	6	0	0%	0%	0%
	Glinsk	5	0	1	0	6	0	0%	0%	0%
Northwest	**Totals**	20	0	4	0	24	0	0%	0%	0%
National Totals		47	0	10	0	57	0	0%	0%	0%

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