



Department of
**Agriculture,
Fisheries and Food**

An Roinn
**Talmhaíochta,
Iascaigh agus Bia**

National Implementation Group Report on

A strategy for improved pest control on Irish salmon farms

November 2010

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1 Introduction

A policy document entitled “A Strategy for Improved Pest Control on Irish Salmon Farms” was developed by the Department of Agriculture, Fisheries and Food in consultation with the Marine Institute and an Bord Iascaigh Mhara in May 2008. The Strategy involved a number of recommendations to provide for enhanced sea lice control. Recommendation No. 7 recommended the establishment of a National Implementation Group to oversee the implementation of the strategy and its recommendations. The full text of the recommendation establishing the group is as follows:

7. A national implementation group to be established comprising appropriate representation from:

The Coastal Zone Management, Veterinary and Seafood Policy Divisions of the Department of Agriculture, Fisheries and Food;

An Bord Iascaigh Mhara;

Marine Institute; and

Industry representatives.

The group is to provide the Minister, within six months of it's establishment, with a full update of the actual situation on the ground, the progress made to reduce sea lice levels and the further steps required, if any, to redress the situation.

A national Implementation Group was established in December 2008. This report sets out the findings of the group and in addition gives an update of the situation on the ground, including progress made up to June 2010. The Group set out a number of recommendations to consolidate the gains in pest control achieved in 2008, 2009 and 2010 and identifies areas where further improvements can be achieved.

2 Membership of National Implementation Group

The membership of the Group was as follows:

Brendan Linehan, Chair, DAFF

John Corcoran, DAFF

Geraldine O'Donovan, Secretary

Donal Maguire, BIM

David Jackson, Marine Institute

Damien O'Ceallachain, RIP, ISGA

Catherine McManus, Marine Harvest

Richie Flynn, IFA Aquaculture

The Group met on 5 occasions, on 11th December 2008, 22nd January 2009, 26th February 2009, 22nd April 2009, and on 9th June 2009.

Damien O'Ceallachain RIP

It was with deep regret and shock that the Group learned of the sudden death of Damien O'Ceallachain in March 2009. Damien was a valued member of the Group and gave freely of his time and his contributions drew on his long experience as a pioneer of the salmon farming industry. He was widely admired in the industry on a professional basis and as a warm and kindly person.

Ar dheis De go raibh a anam dhillis.

3 Executive Summary

National Implementation Group Report on A strategy for improved pest control on Irish salmon farms

The National Implementation Group was set up in December 2008 to oversee and evaluate progress on the implementation of the National Pest Management Strategy for the control of sea lice on offshore salmon farms. The group met on five occasions between December 2008 and June 2009 and recommended that progress on further implementation of the strategy be overseen up to and including the spring period 2010.

The remit of the group was to assess the situation on the ground, report to the Minister on progress made to reduce sea lice levels on farmed salmon and recommend further steps required.

The Group found that since the introduction of the new Pest Management strategy there has been a sustained reduction in the level of ovigerous lice on farms in spring (Fig. 1).

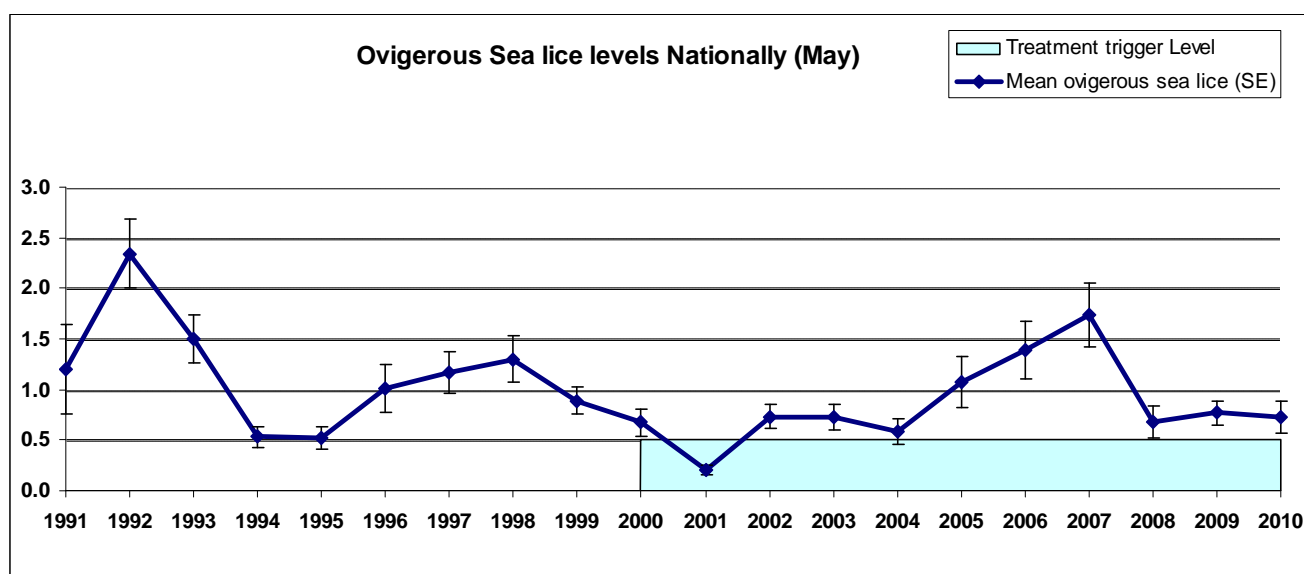


Fig 1. Mean (SE) ovigerous *L. salmonis* on one-sea-winter salmon.

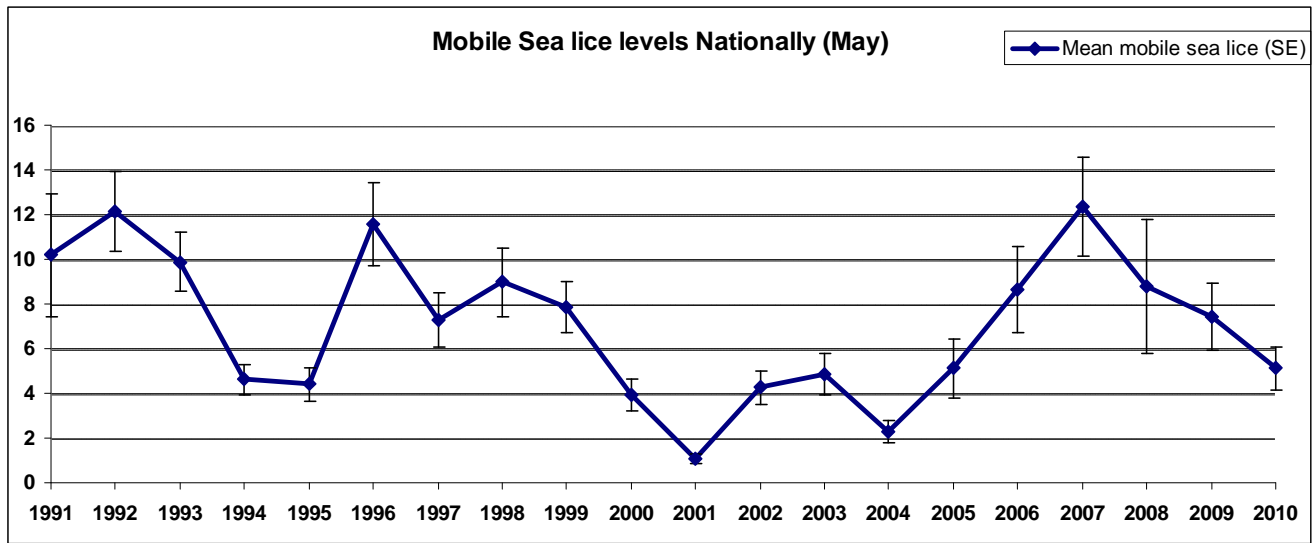


Fig 2. Mean (SE) mobile *L. salmonis* on one-sea-winter salmon.

There has also been a sustained incremental improvement in overall levels of lice infestation on farms (Fig. 2) during the spring period. The review of lice infestation data showed that this progress has been made particularly during the critical spring period and at a range of sites in all salmon farming areas. It also demonstrated that these improvements were not achieved by an increased level of treatment but rather by a combination of consistent application of appropriate husbandry techniques, combined with bay management approaches and carefully chosen application of appropriate treatments using best practice.

Recommendations:

The group made a series of thirteen recommendations to underpin the progress made to date and to ensure that obstacles to further progress are removed or mitigated in so far as possible.

1. The Marine Institute & the relevant Veterinary practitioners engage with DAFF to review the scope for increasing the availability of appropriate medicines.

2. That the industry with the regulatory authorities support the development of protocols to optimise the use of Hydrogen Peroxide and other bath treatments, strategic treatments and product rotation.
3. Where formal veterinary advice has been given to the effect that on balance and taking into account the welfare of the stock, the principles of integrated pest management and the potential for cross infection of other stocks, both wild and farmed, it is not advisable to treat stocks of large fish and/or fish due for imminent harvest that the requirement to carry out mandatory treatments would be waived. This would be done on a case by case basis and after examination by the Management Cell.
4. That industry through better coordination and with support from the Marine Institute encourage access to well boats, disinfection and training.
5. That the industry in cooperation with the Marine Institute monitor the use of the new Pancreas Disease vaccine.
6. That adherence to an agreed SBM Plan should be a condition of future licences.
7. That SBM principles and the provisions of Monitoring Protocol No 3 on Sea Lice Monitoring and Control be applied at all sites including provisions relating to separation of generations and fallowing.
8. That all Salmon Farms should submit a Business Management Plan (in accordance with SBM requirements).
9. That DAFF facilitate bay wide fallowing by prioritising where possible relevant licence applications.
10. That the Management Cell approach be extended to all regions.

11. That the Monitoring Regime and Pest Control Strategy be further developed to accommodate the growing trend towards organic farming.

12. That a Regional Management Plan for Connemara be drafted by industry with the assistance of the Marine Institute. The Plan should provide for the separation of generations and fallowing on a regional basis.

13. That the National Implementation Group chaired by the DAFF and representing BIM, Marine Institute, Veterinary and Industry interests continue to monitor the implementation of the Pest Control Strategy.

4 Meetings and workings of the Implementation Group

At the inaugural meeting of the group in December 2008 the recommendations of the document “A Strategy for the Improved Pest Control on Irish Salmon Farms” was reviewed by the group and a programme of work was agreed.

The industry representatives made a number of points in relation to the recommendations and highlighted the need to aid farmers in improving their pest control strategies while indicating that this would require a new approach to the use of licensed sites including exploring the possibility of using redundant sites and amending existing licenses to optimise fallowing and separation of generations. They also underlined the need for more research into optimising treatments, both the best deployment of existing treatments and the development of new treatments. They underlined the high cost of treatments and sea lice management to the industry and expressed the wish that there would be an international dimension to the further development of the management and treatment strategies. The industry also suggested that funding be sought for a programme of intensive focussed applied research on new treatment methods and treatment and control strategies perhaps with an international component to maximise synergies across the other Atlantic salmon farming countries which are also grappling with optimising sea lice control.

It was agreed that a series of working groups would be set up to progress matters on a range of issues between meetings and to prepare reports for consideration by the group.

A working Group was established to report back to the next meeting on a programme of work and plans for setting up real time SBM pilot programmes to implement the Management Cell approach outlined in the DAFF Pest Management Strategy on a trial basis.

The Working Group reported back to the group in January and an intensive round of consultations with industry and representative organisations was commenced (addressing Recommendations 4 &5 of the National Pest control Strategy 2008) to review potential areas of improvement in pest management from a farm perspective.

The full terms of reference for these consultations are given in Appendix I. The Working Group also set up two pilot areas to trial the Management Cell approach to dealing with high lice levels detected during the course of the Marine Institute run National sea lice monitoring programme, an integral component of the DAFF Pest Management Strategy. A flow chat setting out the steps in the Management Cell approach is given in Appendix II.

The Management Cell Approach was invoked during the spring period 2009 and the results of its actions were reported to the group at meetings in February and April. Initial results were very promising and the groups reviewed the performance of the trialling of this approach during the critical March – May period at its meeting in June 2009. The results of the intensive round of consultations with industry were also presented to the group at the June meeting together with an interim report on progress to date on implementing the National Pest Management Strategy (Appendix III). It was agreed that there was a need to extend the timeframe of the work currently being carried out by the group, of overseeing and evaluating progress in implementing the National Pest Management strategy beyond the current terms of reference of the group. It was further agreed that a review of lice control during 2009 be included as part of the groups final report as soon as the data was available. A review of lice monitoring results for 2009 is included at Appendix IV.

5. Findings and Recommendations of the Implementation Group

The overall picture in terms of lice control as reported to the group was that in both the Southwest (Cork/Kerry) and Northwest (Donegal) control during the critical spring period was excellent and continued to be good throughout the year. In the West (Galway/Mayo) control during the critical period (March – May) was good. In general problems with lice control were either isolated increases in infestation dealt with by way of appropriate treatment or were associated with protracted harvesting.

The Group were of the view that Single Bay Management with separation of generations was fundamental to the successful management of sea lice infestation. It was clear (see reports below on Review of Operation of Management Cell and Consultations with Industry and Representative Organisations) that problems arose in

those areas where for a variety of reasons Single Bay Management was not operating as intended. The Group were also of the view that the increased availability of the larger more effective type of well boat was of real importance in the management of sea lice. During the year, a large well boat was made available by Marine Harvest to other users. However problems arose with this boat and a different arrangement was entered into by Marine Harvest with the well boat provider. Limited availability of the boat was provided to other salmon farmers. While the well boat situation has improved, further progress is required so that the full benefit of effective well boat treatments is available generally and in a timely way to the industry.

The Group supported the view expressed by many that the wide use of Hydrogen Peroxide could be optimised through the development of appropriate protocols governing issues such as dosage, times to apply etc. Research into Treatment Alternatives is becoming more and more important taking into account the restrictions on treatment arising from organic salmon farming. Farmers expressed the desire to see products currently only available on special license being given full Marketing Authorisations as this simplifies the conditions for their use. They also highlighted the need for more products to be made available via special license. These views were endorsed by the group.

Ensuring continued sea lice sensitivity to treatments was identified as a key objective in any integrated pest management strategy. In particular farms expressed a desire to eliminate all “unnecessary treatments” especially those on large fish and fish due for harvest to limit the number of times lice are exposed to a particular treatment in a production cycle and to reduce the opportunities for the development of reduced sensitivity or even resistance. In practical terms this would require a more pragmatic and flexible approach to the application of the treatment triggers outside of the critical spring period.

5.1 Review of sea lice control during the spring – summer period 2008 - 2010

The Marine Institute carried out a review of lice control at all sites during the spring – summer period covering 2009 and 2010. The review comprised of an evaluation of the sea lice infestation data on a site by site basis, reviewing the SBM plans and their implementation on a bay by bay basis, one to one interviews with relevant personnel on each of the farms and a review of lice control activities at each site.

Since the introduction of the new Pest Management strategy there has been a sustained reduction in the level of ovigerous lice on farms in spring (Fig. 1a).

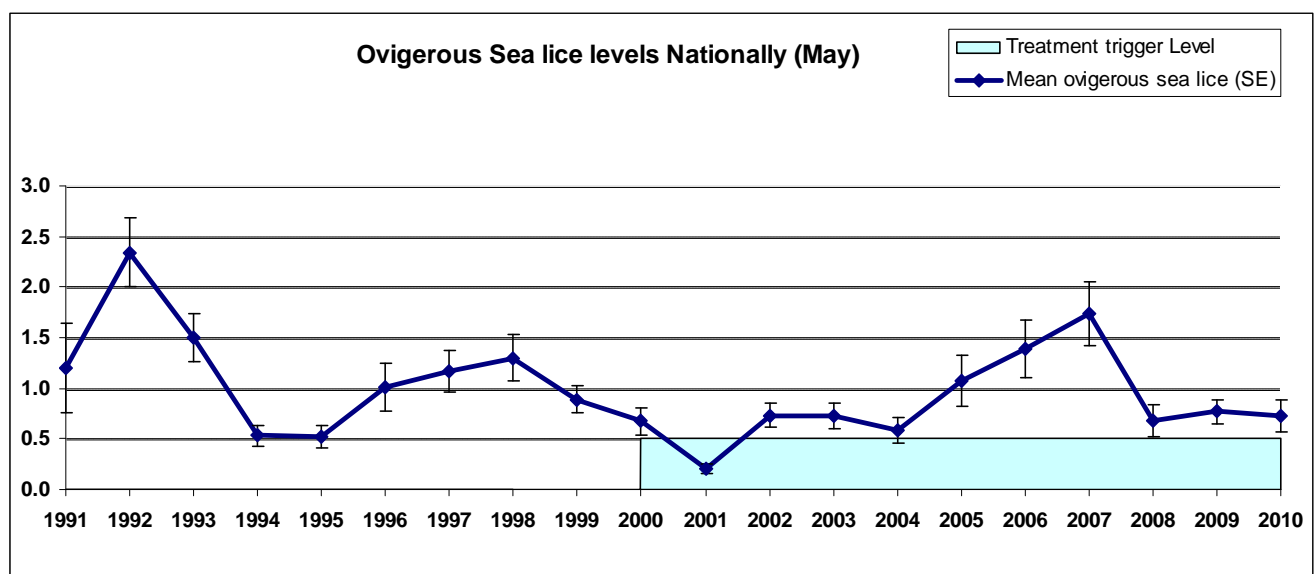


Fig 1 a. Mean (SE) ovigerous *L. salmonis* on one-sea-winter salmon.

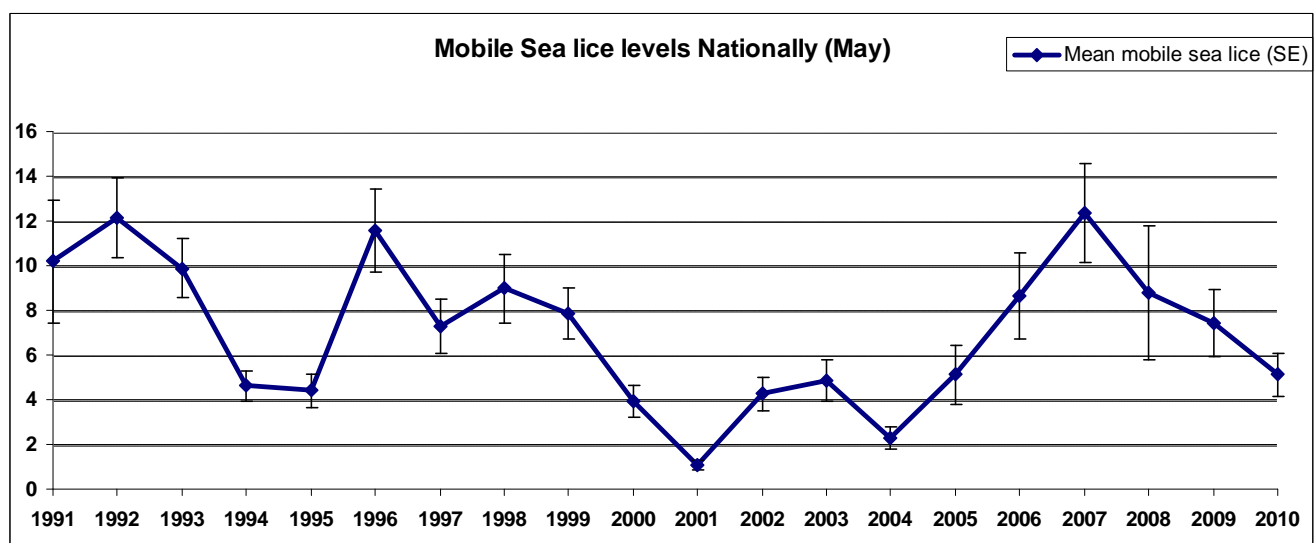


Fig 2b. Mean (SE) mobile *L. salmonis* on one-sea-winter salmon.

There has also been a sustained incremental improvement in overall levels of lice infestation on farms (Fig. 1b) during the spring period. The review of lice infestation data showed that this progress has been made particularly during the critical spring period and at a range of sites in all salmon farming areas. It also demonstrated that these improvements were not achieved by an increased level of treatment but rather by a combination of consistent application of appropriate husbandry techniques, combined with bay management approaches and carefully chosen application of appropriate treatments using best practice.

Wild sea trout smolts migrate outwards from the rivers to coastal bays during the period from mid March through to May each year. The outward migration of salmon smolts occurs over roughly the same period. When sea lice control treatment trigger levels were set for offshore salmon farms the trigger levels were set at the lowest practical level during the spring period for two reasons. Firstly to maximise effective control over lice infestation by targeting the ovigerous females during the spring period before they could contribute to further infestation and secondly as a precaution to minimise any potential for sea lice from farmed stock to act as a source of infestation for outwardly migrating wild smolts. The critical period was defined as 1st of March to the 31st May to encompass the period of smolt migration. When lice levels on farms exceed the treatment triggers a notice to treat is issued. The number of notices to treat issued during the spring period in 2009 was 25 in total. The corresponding figure for 2010 was 16. The vast majority of sites maintained lice levels below treatment trigger levels and in all instances when notices to treat were issued effective treatment plans were put into practice.

The effect of targeting control efforts towards optimising lice control during the critical spring period can be clearly seen by examining detailed data from all farm sites for 2009 as shown in Figure 2 (a-d). Of the 34 sites stocked with fish during the spring period in 2009 the vast majority maintained lice levels well below treatment trigger levels throughout the period and at those sites where trigger levels were exceeded control methods were deployed to reduce infestation levels.

A number of key factors have emerged which need to be considered in order to optimise lice control, particularly in the second year of the production cycle.

Figure 2 a: 2009 sea lice levels in Cork and Kerry.

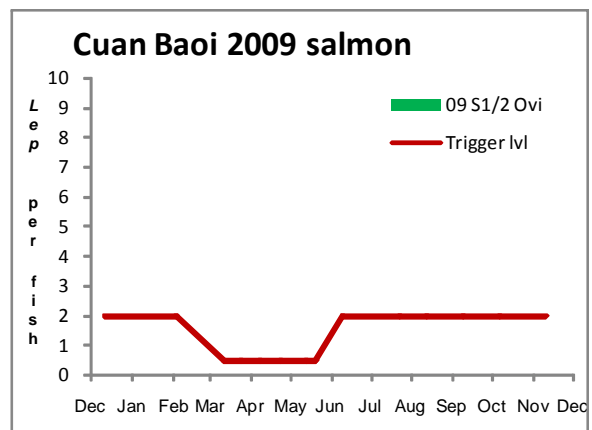
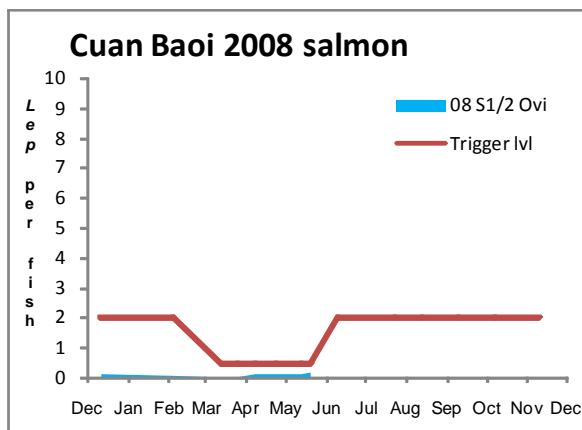
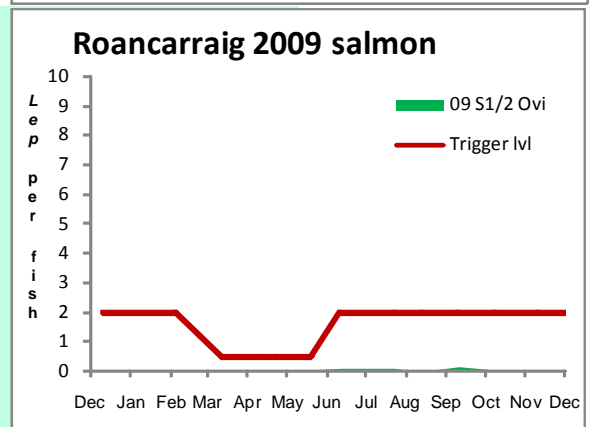
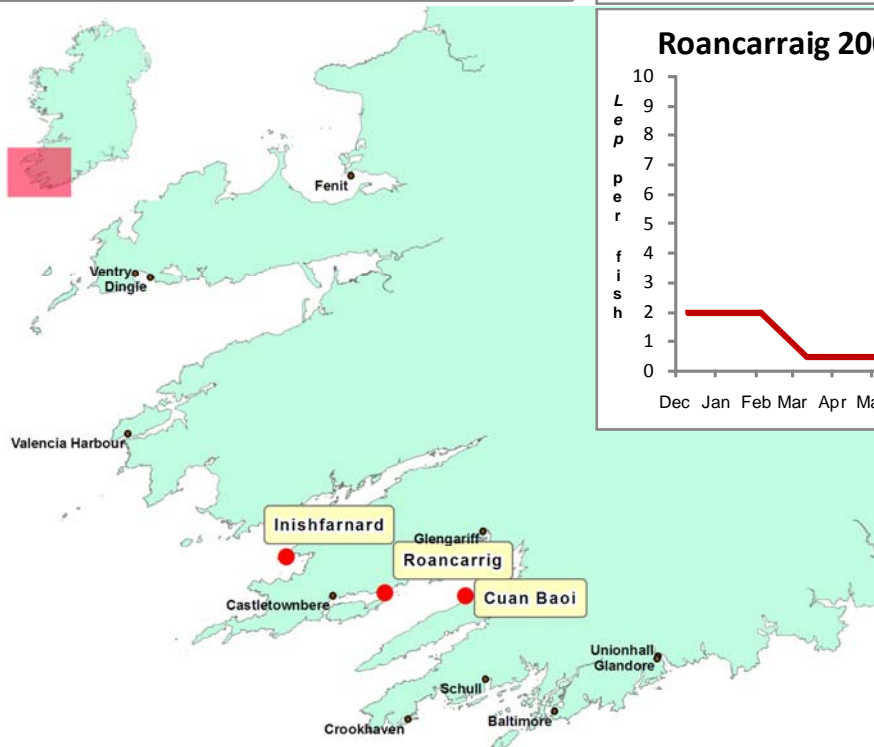
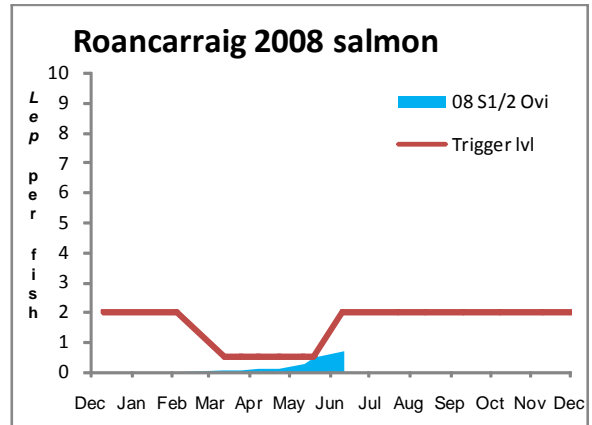
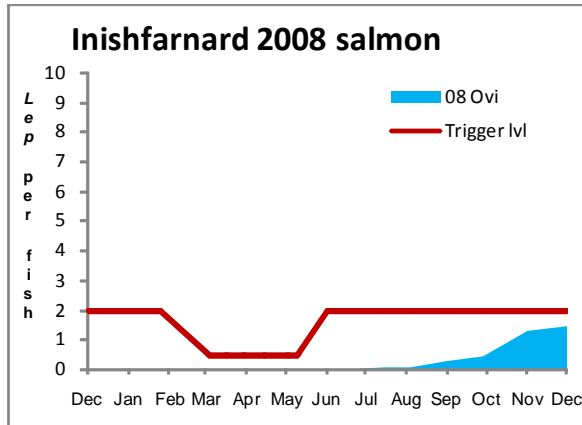


Figure 2 b: 2009 sea lice levels in south Connemara.

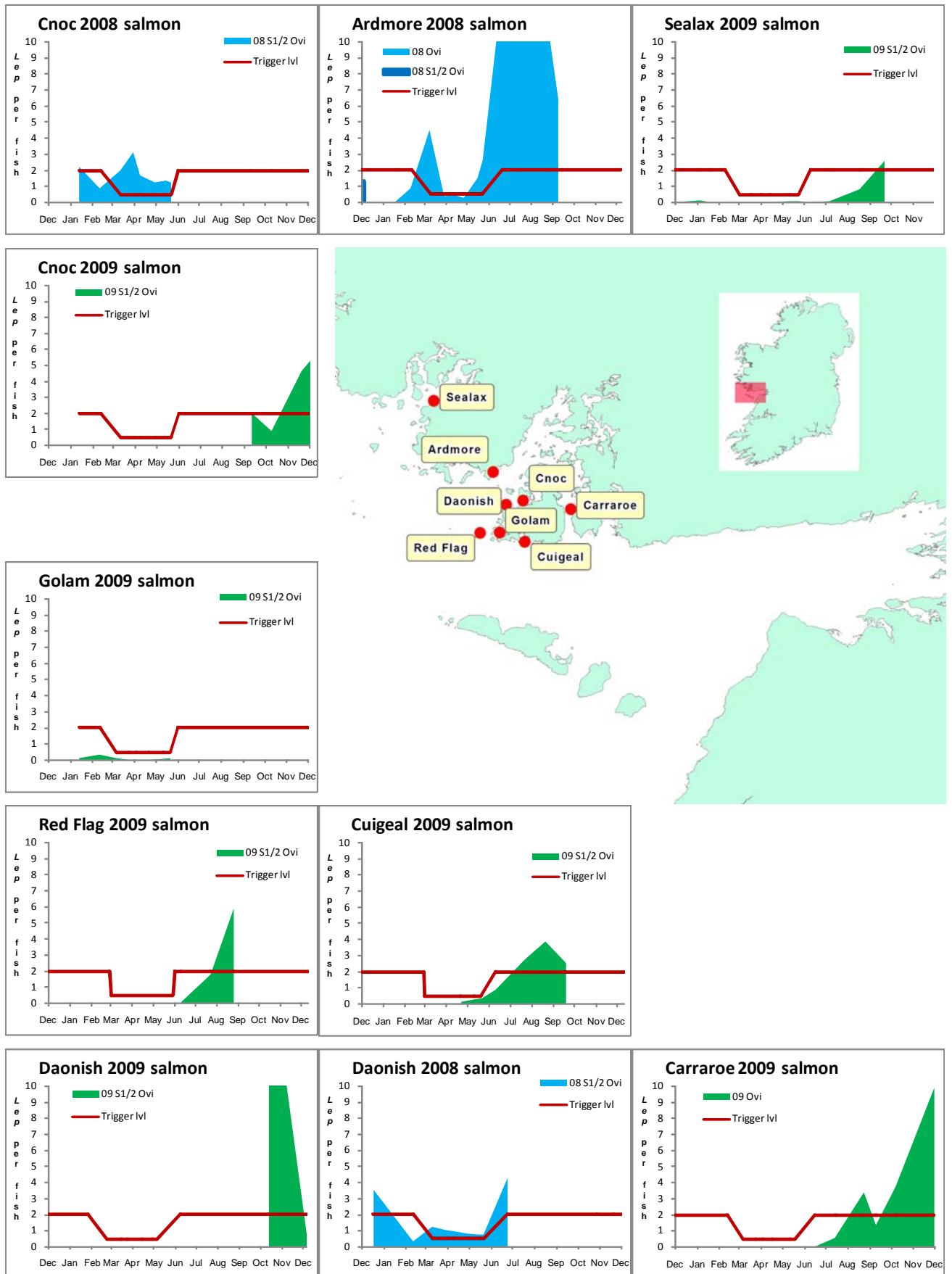


Figure 2 c: 2009 sea lice levels in north Connemara and Clew bay.

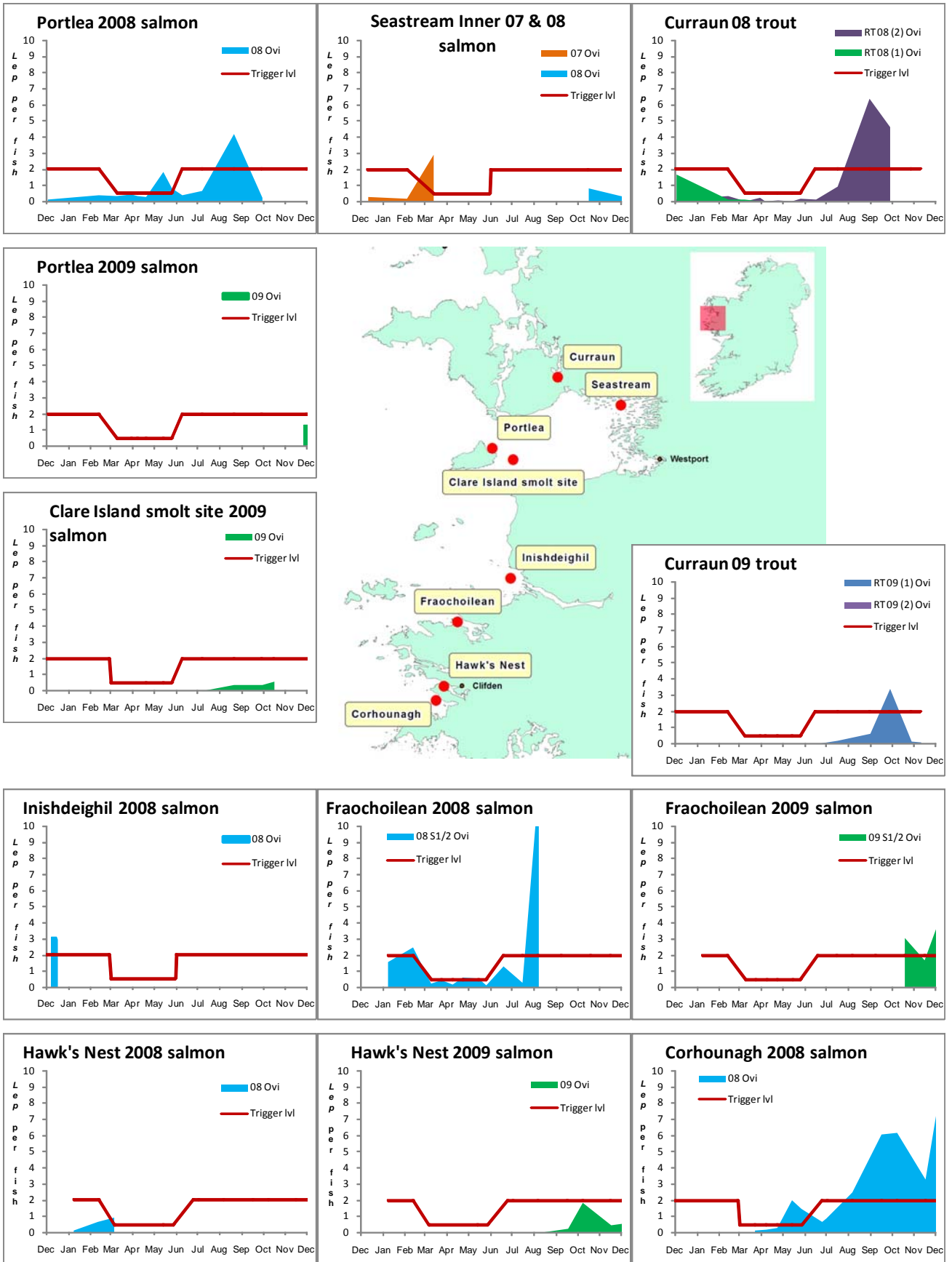
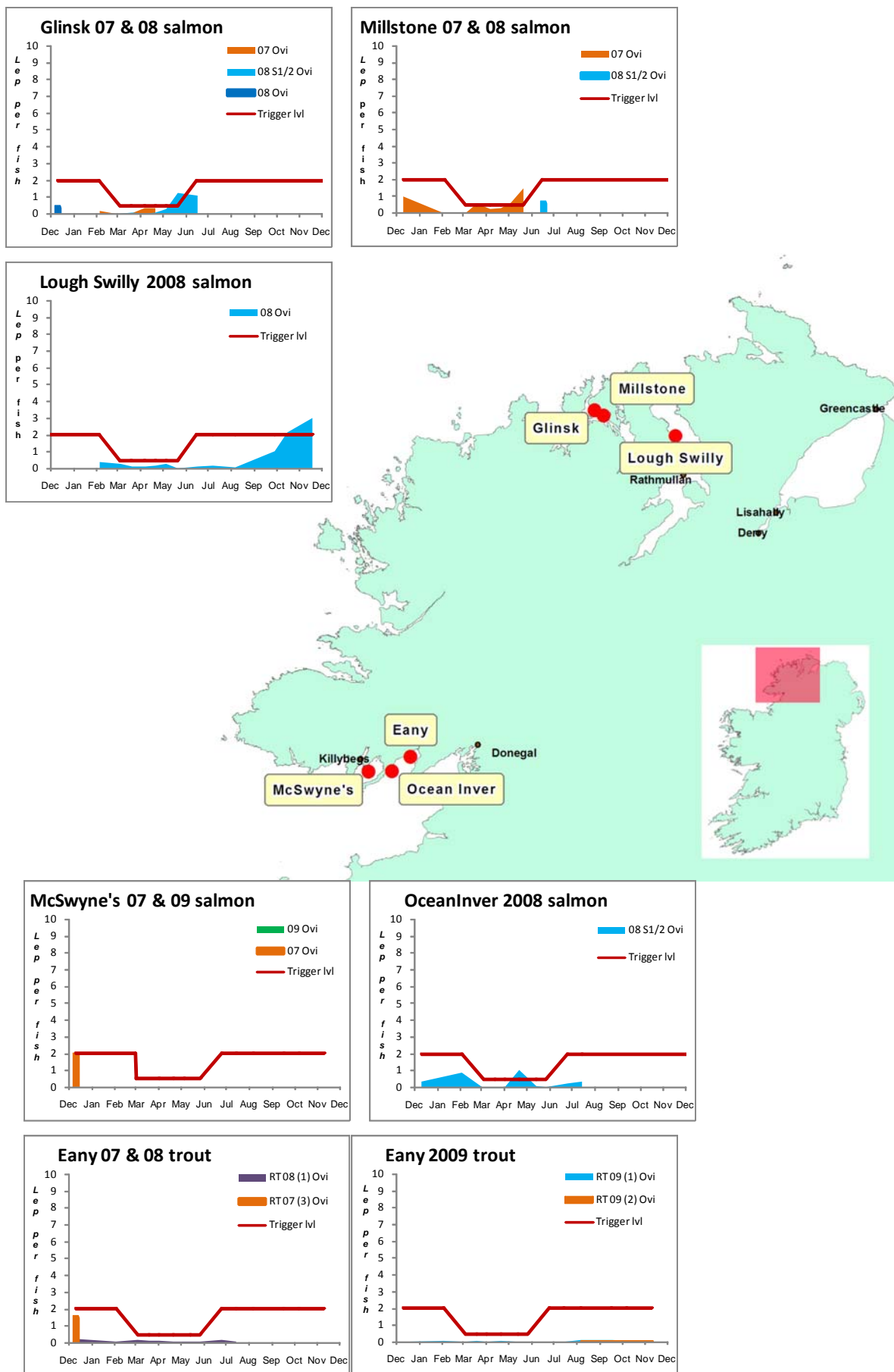


Figure 2 d: 2009 sea lice levels in Donegal.



Factors which underpinned good lice control

There were a number of factors which were associated with good control of infestations and a consistently good performance in this regard. The factors basically related to good planning, appropriate husbandry and effective follow-through.

Having a detailed proactive management plan in place was a key factor. The most effective management plans included schedules of planned regular appropriate treatments, logistical planning for carrying out these treatments and the availability of appropriately trained staff and suitable equipment for carrying out treatments.

Weekly lice counts to assess and follow the development of infestation to aid in the fine tuning of treatment plans was a feature of those sites with best control. Where in-feed treatments are planned the need to calculate cage specific dose rates to ensure appropriate amounts of treatment are delivered to different size grades of fish within the population was highlighted as a significant issue at some locations.

There were a number of husbandry factors which also underpinned good control. These were complete separation of generations (often in separate bays) with a minimum fallow period (1 month) prior to restocking and the removal of harvest fish from grower sites to separate harvest locations to facilitate best practice in the management of both grower fish and harvest fish.

These key factors can be summarised as follows:

- Detailed management plan in place
- Planned regular appropriate treatments
- Carefully pre-planned logistics for each treatment operation
- Avoidance of partial or incomplete treatments of a site
- Weekly lice counts to fine tune the treatment regime
- Complete separation of generations
- 1 month fallow between stockings
- Harvesting carried out remote from the grower sites.

Factors which militated against effective lice control

Poor logistics and planning for the execution of complicated bath treatments were identified as contributory factors in certain instances of sub-optimal lice control. A component of this issue is a training deficit for the staff involved. Lack of training in specific aspects of administering bath treatments was definitely identified as a factor in a number of cases. This matter has been actively addressed both at a farm level and an industry level over the past two years by way of targeted training courses and seminars.

Two husbandry related issues which militated against effective control at a number of locations were the practice of carrying out protracted or partial harvests on production sites and the absence of effective separation of generations and fallowing. Where a lack of fallowing or separation of generations occurred at the same time as protracted harvesting this further exacerbates difficulties in maintaining effective control of lice infestations.

5.2 Consultations with Industry and Representative Organisations

A series of countrywide consultation meetings were held by the Marine Institute with individuals and organisations over the period from February to April 2009 inclusive. Consultations were guided by an agreed framework document which was tabled and approved at the implementation group meeting on the 22nd of January 2009.

Consultations were held with the ISGA (Richie Flynn & Damien O’Ceallachain) and with representatives of all companies engaged in farming salmon and rainbow trout in the sea. Consultations were done face to face, either at prearranged meetings for that purpose or on site as an addition to other business.

Among those consulted were: Joseph Gibbons & Paul Gallagher (Marine Harvest, Kindrum, County Donegal); Willie Ward (Eany Fish Products, Inver County Donegal); Paul McCrudden (Marine Harvest, Killybegs, County Donegal); Tom

Doherty (Curraun Fisheries, Bealacragher, County Mayo; Sinead Doherty & Liam Doherty (Clare Island Seafarms, Achill, County Mayo); Eugene Casey & Gerry O'Donoghue (Mannin Bay Salmon & Bifand Ltd, Clifden, County Galway); Joe Lee & Noel Lee (Muirachmhainni teo, Comhluct Bradan Conamara teo & Muir Gheal teo, Tir an Fhia, County Galway); John Power (Silver King Seafoods, Castletownbere, County Cork) and Julie Maguire & David O'Neill (Murphy's Irish Seafood, Ghearies, Bantry, County Cork).

There was a lot of common ground regarding the key issues and main areas where changes and or improvements in approach would benefit sea lice control and management. A number of areas where more work on improving knowledge or developing protocols is needed were identified.

Lice management at the farm level

The role of the vet was generally identified as being focussed on regular health inspections, advising on health (including sea lice) management and prescribing treatments. The application of treatments and routine sea lice management is generally done by farm based personnel.

The Marine Institute data from the sea lice monitoring programme was the main source of accurate information on sea lice infestation parameters at a farm level. Particularly with regard to strategic treatments and this data was viewed as crucial and the main management tool. While the two visits/inspections per month were seen as good and adequate for the remainder of the summer period (June – September) the frequency of information available from the Marine Institute was lower than that required by the farm.

Sea lice monitoring carried out *on farm* was in general more qualitative than quantitative and carried out in association with batch weights or farm health checks.

Several farms expressed a desire for more detailed information on sea lice infestation parameters from the existing inspections and additional monitoring. Similar views were expressed by farm representatives at the Implementation Group meetings.

Treatments

The cost of treatments was cited as a major factor in farm cash flow.

Long lead times for in-feed treatments were problematic from time to time. This was particularly identified as an issue for Organic certified farms.

Sea lice sensitivity to treatments was identified as a huge issue. In particular farms expressed a desire to eliminate all “unnecessary treatments” especially those on large fish and fish due for harvest to limit the number of times lice are exposed to a particular treatment in a production cycle and to reduce the opportunities for the development of reduced sensitivity or even resistance.

Farmers expressed the desire to see products currently only available on special license being given full Marketing Authorisations as this simplifies the conditions for their use. They also highlighted the need for more products to be made available via special license.

The further development of strategic treatments and planned product rotation were seen as desirable and necessary to protect and extend the efficacy of existing treatments.

The use of Hydrogen Peroxide (a disinfectant) as an aid to sea lice control was highlighted. There is an urgent need to optimise its use and to develop appropriate protocols to aid in this.

Fish Health Issues

Pancreas Disease (PD) has been and remains an issue affecting sea lice control. PD compromised fish are much more difficult to treat effectively. The new PD vaccine is seen as a major positive development in this regard. Unvaccinated fish have proven more problematic in terms of effective lice control.

High temperatures and or water borne insults (phytoplankton and zooplankton) in summer stress fish and limit ability to carry out sea lice treatments. This applies in

particular to bath treatments but where appetite is affected it can have a negative impact on in-feed treatments also.

The management of well boat disinfection and bio-security is a major concern for the industry. Codes of conduct and protocols are being developed to address this but there is scope for further development here.

Well Boats

Access to well boats is improving but remains a major issue, particularly in regard to timing of access for optimum treatment timing.

Operating protocols for well boats are also an issue as there are considerable differences between the operating systems and layouts from boat to boat and what works on one will not necessarily work on another.

Limitations to the use of well boats based on size, draft, weather/tides and availability remain as key issues to be resolved.

There is considerable scope for additional work and improvement in relation to the use of well boats.

Single Bay Management and Strategic Treatments

Single Bay Management is seen as very beneficial both in terms of communication and the organisation of strategic lice management plans.

The use of strategic treatments is seen as a major factor in good sea lice control.

There is a perceived need for access to adequate sites with good separation to facilitate fallowing.

The industry is moving towards looking more at bay wide fallowing, particularly at the end of a production cycle.

Licensing Issues

Restrictions on licensing is a major issue and was universally raised as such. There are particular concerns regarding both licensing conditions and the renewal of existing licenses.

There is a major perception that there are not enough suitable fallowing sites available and that this needs to be addressed by fast tracking fallowing licenses.

5.3 Pilot operation of the Management Cell approach as part of the DAFF Pest Management Strategy for Sea Lice on Farmed Salmon

As part of the 2008 DAFF pest Management Strategy for sea lice control on farmed salmon a novel “Management Cell” approach was outlined for use where two consecutive inspections of a site had resulted in the issuing of a notice to treat, or NTT, by the Marine Institute due to ovigerous (egg bearing female) lice levels being in excess of the protocol treatment trigger levels. The basic premise of this management cell approach was to bring together expertise and advice from the relevant state agencies (BIM and the MI), fish health professionals (the relevant vet) and industry (the ISGA and local farmers representing the Single Bay Management group for the bay or region) together with farm management to assist in suggesting the best course of action to control lice on the site in question. A flow diagram of the operation of the management cell is included in Appendix III.

The process was trialled for sites in Connemara during 2009, the first full year of operation of the new pest management strategy. The management cell approach was invoked four times in all in 2009. Initially the group was convened in person at a meeting. This process worked well and resulted in early successes. Major advantages identified were the availability of extra knowledge and information to aid in the decision making process and a more strategic approach to deciding on control options. In terms of the latter the main advantages were the ability to take a more bay wide view and to look at the medium term prospects for achieving good control rather than merely improving figures for the next inspection. In order to streamline the process, ensure that the process was completed as quickly as possible and to reduce travel commitments for individuals later Management Cell deliberations were conducted by e-mail and phone.

The process was first invoked in February, just before the start of the critical spring period, for a site in north Connemara where there had been two consecutive NTT's issued. Following on from a meeting of the group a further treatment was undertaken

which resulted in successful reduction of lice infestation levels and for the remainder of the critical period good control was maintained at the site.

The management cell was invoked on two further occasions for sites in Kilkieran Bay. In the first case involving two sites following consultations between farm management and the Management Cell an accelerated harvest was agreed on as the best method of controlling lice at the two sites in question. Partial harvest operations had been ongoing at both sites which was making the effective implementation of a strategic treatment difficult. The accelerated harvests were implemented as agreed.

During the month of June a management cell was convened to recommend action on a further site in Kilkieran Bay. Accelerated harvest with treatment of fish not for immediate harvest was recommended. Treatments were carried out but progress on the harvesting out of the site was slow. At the beginning of October when it came to light that the site had not been fallowed, on advice from the Marine Institute, DAFF issued a notice to the farm to remove all remaining fish on the site within 21 days. This notice was complied with.

5.4 Recommendations:

- The Marine Institute & the relevant Veterinary practitioners engage with DAFF to review the scope for increasing the availability of appropriate medicines.
- That the industry with the regulatory authorities support the development of protocols to optimise the use of Hydrogen Peroxide and other bath treatments, strategic treatments and product rotation.
- Where formal veterinary advice has been given to the effect that on balance and taking into account the welfare of the stock, the principles of integrated pest management and the potential for cross infection of other stocks, both wild and farmed, it is not advisable to treat stocks of large fish and/or fish due for imminent harvest that the requirement to carry out mandatory treatments would be waived. This would be done on a case by case basis and after examination by the Management Cell.
- That industry through better coordination and with support from the Marine Institute encourage access to well boats, disinfection and training.
- That the industry in cooperation with the Marine Institute monitor the use of the new Pancreas Disease vaccine.
- That adherence to an agreed SBM Plan should be a condition of future licences.
- That SBM principles and the provisions of Monitoring Protocol No 3 on Sea Lice Monitoring and Control be applied at all sites including provisions relating to separation of generations and fallowing.
- That all Salmon Farms should submit a Business Management Plan (in accordance with SBM requirements).

- That DAFF facilitate bay wide fallowing by prioritising where possible relevant licence applications.
- That the Management Cell approach be extended to all regions.
- That the Monitoring Regime and Pest Control Strategy be further developed to accommodate the growing trend towards organic farming.
- That a Regional Management Plan for Connemara be drafted by industry with the assistance of the Marine Institute. The Plan should provide for the separation of generations and fallowing on a regional basis.
- That the National Implementation Group chaired by the DAFF and representing BIM, Marine Institute, Veterinary and Industry interests continue to monitor the implementation of the Pest Control Strategy.

Appendices

1. Terms of Reference for Industry Consultations.
2. Management Cell Flow Diagram.
3. Review of Lice Control Spring 2009.
4. Lice Monitoring Report 2009.
5. Sea Lice Monitoring Results 2009.
6. Sea Lice Monitoring Results to June 2010.

Appendix I

Draft Terms of Reference for Intensive Round of Consultations with Industry and Representative Organisations

(Addressing Recommendations 4 & 5 of the National Pest Control Strategy 2008)

1. Discuss individual farm based management structures for sea lice control & identify strengths and weaknesses.
 - a. Responsible personnel
 - b. Veterinary practitioner
 - c. Records
 - d. Management Plan

2. Identify main challenges as identified by local farm management & responsible personnel.
 - a. Bath/in-feed treatment mix
 - b. Logistical challenges
 - c. Experience with new treatments and methods (Hydrogen peroxide, well-boats etc)
 - d. Influence of other factors such as PD
 - e. Regulatory difficulties
 - f. Licensing limitations

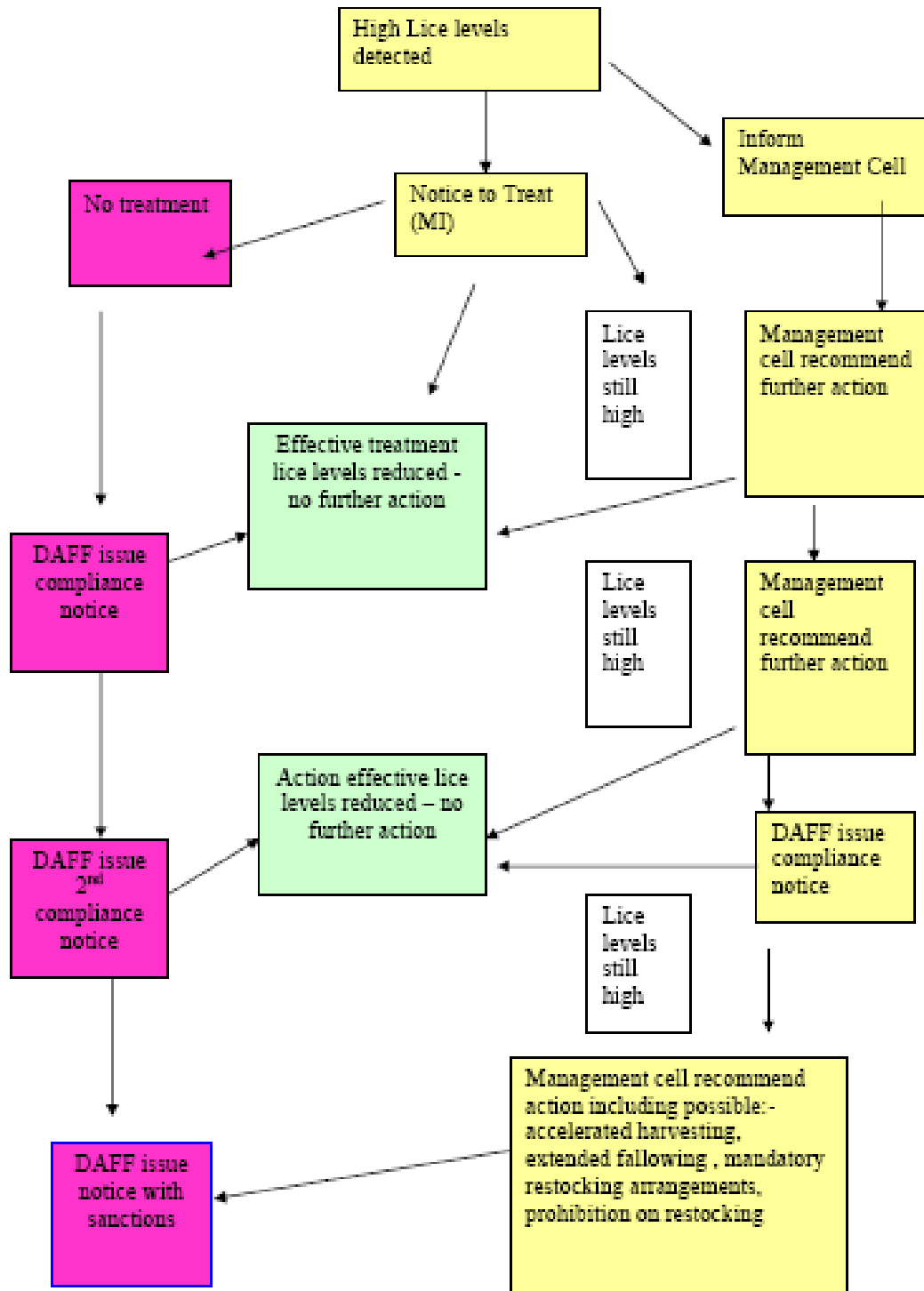
3. Examine the current practices in relation to product rotation and the factors governing decision making in this regard.
 - a. Use of MI data for management purposes
 - b. Own monitoring of lice levels and treatment efficacy
 - c. Analysis of results and use of data for management purposes
 - d. Availability of product

4. Look at the impacts of fish health management issues on lice control strategies.
 - a. Medium and long term objectives
 - b. PD and gill challenges

5. Review implications for lice control of various production strategies including multiple stocking with out of season smolts and organic production methods.
 - a. SBM efficacy
 - b. Restrictions imposed by licence conditions on sites
 - c. Availability of fallowing sites and requirement for new sites

Appendix II

Management Cell Flow diagram



Appendix III

Review of sea lice control during the spring – summer period 2009

(evaluation of performance under new DAFF Management Strategy)

As part of our ongoing assessment of the progress in improving sea lice control on Irish salmon farms the Marine Institute carried out a review of lice control at all sites during the spring – summer period of 2009. The review comprised of an evaluation of the sea lice infestation data on a site by site basis, reviewing the SBM plans and their implementation on a bay by bay basis, one to one interviews with relevant personnel on each of the farms and a review of lice control activities at each site.

The review of lice infestation data showed that considerable progress has been made on improving control, particularly during the critical spring period at a range of sites in all salmon farming areas. It also demonstrated that these improvements were not achieved by an increased level of treatment but rather by a combination of consistent application of appropriate husbandry techniques, combined with bay management approaches and carefully chosen application of appropriate treatments using best practice.

A number of key factors emerged which need to be considered in order to optimise lice control, particularly in the second year of the production cycle.

Factors which militated against effective lice control

In those bays where there was not a detailed medium term plan in place for sea lice management or where that plan was not implemented, for whatever reason, lice numbers were more likely to breach protocol limits. This was especially true of bays where there was more than one operator.

A related but distinct factor was the use of inappropriate treatments. By this we mean where treatments were used under inappropriate conditions (e.g. high summer water temperatures, reduced appetite due to disease), where the life history stage of the lice was unlikely to be sufficiently susceptible to the treatment or where reduced sensitivity was suspected.

Poor logistics and planning for the execution of complicated bath treatments were also identified as key factors in certain instances. A component of this issue is a training deficit for the staff involved. Lack of training in specific aspects of administering bath treatments was definitely identified as a factor in a number of cases.

Two husbandry related issues which had a major impact at a number of locations, including sites which managed to maintain reasonably good control were the practice of carrying out protracted or partial harvests on production sites and the absence of

effective separation of generations and fallowing. Where a lack of fallowing or separation of generations occurred at the same time as protracted harvesting this led to particularly severe difficulties in maintaining control of lice infestations.

Factors which underpinned good lice control

There were a number of factors which were associated with good control of infestations and a consistently good performance in this regard. The factors basically related to good planning, appropriate husbandry and effective follow-through.

Having a detailed proactive management plan in place was a key factor. The most effective management plans included schedules of planned regular appropriate treatments, logistical planning for carrying out these treatments and the availability of appropriately trained staff and suitable equipment for carrying out treatments.

Weekly lice counts to assess and follow the development of infestation to aid in the fine tuning of treatment plans was a feature of the those sites with best control. Where in-feed treatments are planned the need to calculate cage specific dose rates to ensure appropriate amounts of treatment are delivered to different size grades of fish within the population was highlighted as a significant issue at some locations.

There were a number of husbandry factors which also underpinned good control. These were complete separation of generations (often in separate bays) with a minimum fallow period (1 month) prior to restocking and the removal of harvest fish from grower sites to separate harvest locations to facilitate best practice in the management of both grower fish and harvest fish.

These key factors can be summarised as follows:

- Detailed management plan in place
- Planned regular appropriate treatments
- Carefully pre-planned logistics for each treatment operation
- Avoidance of partial or incomplete treatments of a site
- Weekly lice counts to fine tune the treatment regime
- Complete separation of generations
- 1 month fallow between stockings
- Harvesting carried out remote from the grower sites.

Appendix IV

Sea-Lice Monitoring in 2009

Atlantic salmon 2008 (one-sea-winter salmon) lice infestation levels in 2009

One-sea-winter salmon were stocked in a total of 16 sites in 11 bays in 2009. One hundred and thirty-three inspections were undertaken in respect of this generation of fish. Four sites, in 4 bays, continued to stock one-sea-winter salmon in November 2009.

Ovigerous salmon louse (*L. salmonis*) levels greater than the treatment trigger level were recorded in a total of 41 inspections (31%) on one-sea-winter fish (see Table 1). Within the critical spring period, sea lice levels were in excess of 0.5 ovigerous females per fish on 24 inspections (33%) and outside of the spring period 17 inspections (28%) were in excess of 2.0 ovigerous female sea lice per fish.

Table 1. National breakdown of inspections for 2008 salmon on all fish farm sites in 2009.

	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	72	24	61	17	133	41	33%	28%	31%

C. elongatus levels were recorded at numbers greater than 10 per fish on both inspections to Cuan Baoi in March and remained very low on all other sites stocking 2008 salmon.

Southwest Region

In the Southwest region, there were no sea lice levels greater than the treatment trigger levels were recorded (see Table 2).

Table 2. Breakdown of inspections for 2008 salmon on Southwest sites in 2009.

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
Murphy's Irish Seafood Ltd	Cuan Baoi	6	0	2	0	8	0	0%	0%	0%
Silver King Seafoods Ltd	Roanarraig	6	0	3	0	9	0	0%	0%	0%
	Inishfarnard	6	0	8	0	14	0	0%	0%	0%
Southwest	Totals	18	0	13	0	31	0	0%	0%	0%

West Region

In the West region, sea lice infestation levels greater than the treatment trigger were recorded on 22 out of 36 inspections (61%) in the spring period and on 15 out of 34 inspections (44%) outside the spring period (see Table 3).

Table 3. Breakdown of inspections for 2007 salmon on West sites in 2008.

Company		Samples in Spring	Over in Spring	Samples outside Spring	Over outside Spring	Total Samples	Total Over	% over in Spring	% over outside Spring	% over total
Muirachmhainni Teo	Daonish	6	6	3	2	9	8	100%	67%	89%
Muir Gheal Teo	Cnoc	6	6	2	1	8	7	100%	50%	88%
	Ardmore	0	0	1	0	1	0	0%	0%	0%
Eisc Ui Flathartha Teo	Ardmore	6	3	6	4	12	7	50%	67%	58%
Mannin Bay Salmon Co Ltd	Corhounagh	5	2	6	4	11	6	40%	67%	55%
	Hawk's nest	1	1	2	0	3	1	100%	0%	33%
Bifand Ltd	Fraochoilean	6	2	5	2	11	4	33%	40%	36%
Celtic Atlantic (Killary) ltd	Inishdeighil	0	0	1	1	1	1	0%	100%	100%
Clare Island Seafarms Ltd.	Portlea	6	2	6	1	12	3	33%	17%	25%
	Seastream Inner	0	0	2	0	2	0	0%	0%	0%
West	Totals	36	22	34	15	70	37	61%	44%	53%

Northwest Region

The treatment trigger levels were exceeded on 2 out of 18 inspections (11%) in the Northwest region during the spring period and on 2 out of 14 inspections (14%) outside that period (see Table 4).

Table 4. Breakdown of inspections for 2008 salmon on Northwest sites in 2009.

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.	Ocean Inver	6	1	4	0	10	1	17%	0%	10%
Marine Harvest	Glinsk	6	1	2	0	8	1	17%	0%	13%
	Millstone	0	0	1	0	1	0	0%	0%	0%
	Lough Swilly	6	0	7	2	13	2	0%	29%	15%
Northwest	Totals	18	2	14	2	32	4	11%	14%	13%

Trends and underlying factors in lice control in 2009

Sea lice levels on one-sea-winter salmon during the spring period (March to May inclusive) were below treatment trigger for 39% of inspections in the West, 89% in the Northwest and 100% in the Southwest. This compares with 45.9% in the West in 2008 and 62.5% in the Northwest in 2008. There was no one-sea-winter fish stocked in the Southwest in 2008.

The figures for outside of the spring period show that 66% of inspections are below TTLs in the West, 86% in the Northwest and 0% in the Southwest. These compare to 48% below in the West and 79% below in the Northwest in 2008 for one-sea-winter

salmon. Levels in excess of 10 *L. salmonis* per fish on one-sea-winter fish were recorded on 19 occasions and 6 of these had means of greater than 20 mobile lice per fish. On one-sea-winter fish the highest mean sea lice level recorded was 38.37 *L. salmonis* per fish, this compares to 118.11 mobile sea lice per fish in 2008 and 142.50 mobile sea lice per fish in 2007.

Sea lice levels on two-sea-winter salmon decreased nationally in 2009 with the total number of inspections exceeding the treatment trigger levels decreasing from 47% in 2008 to 24% in 2008.

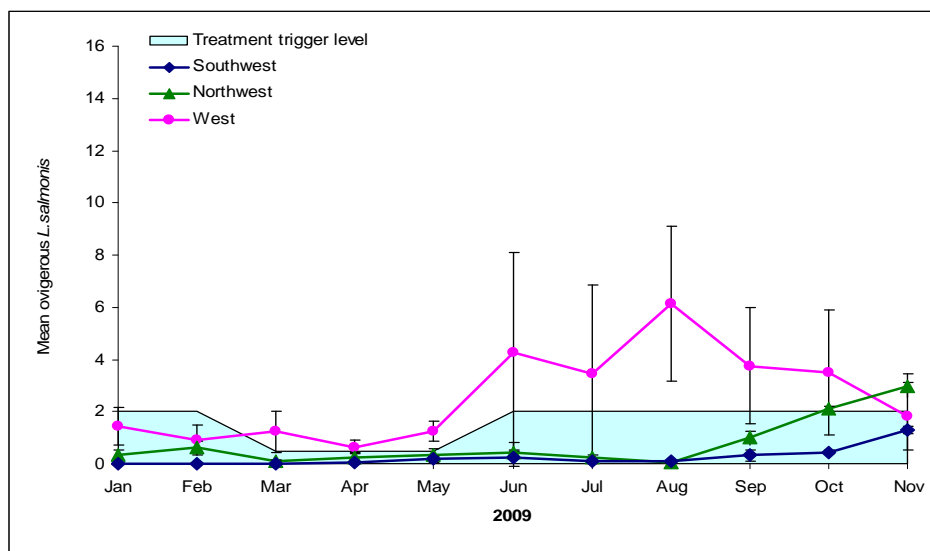


Figure 1. Mean (SE) ovigerous *L. salmonis* per month per region in 2009 on one-sea-winter fish.

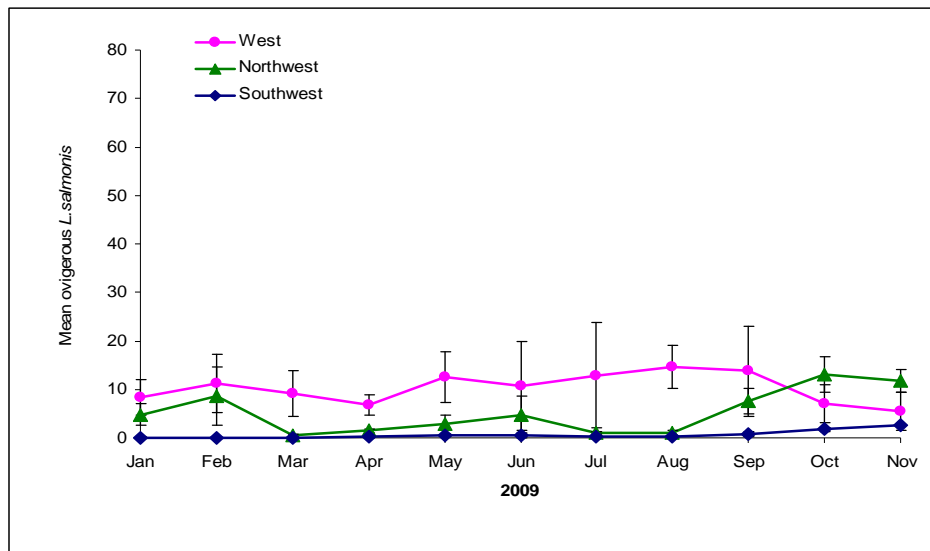


Figure 2. Mean (SE) mobile *L. salmonis* per month per region in 2009 on one-sea-winter fish.

The regional ovigerous *L. salmonis* mean monthly trends on one-sea-winter salmon (figure 1) show an improvement on 2008 levels with the Southwest being below TTLs for the whole period. The Northwest also maintained levels below TTLs for most of the year with mean levels exceeding TTLs in October and November. Ovigerous levels in the West were over TTLs for most of the year, barring January, February and November. Regional mean total *L. salmonis* levels are lower than 2008, mean numbers did not exceed 15 *L. salmonis* per fish compared to a peak of 41 *L. salmonis* per fish in 2008.

Sea Lice Levels during the Critical Period

Wild sea trout smolts migrate outwards from the rivers to coastal bays during the period from mid March through to May each year. The outward migration of salmon smolts occurs over roughly the same period. When sea lice control treatment trigger levels were set for offshore salmon farms the trigger levels were set at the lowest practical level during the spring period for two reasons. Firstly to maximise effective control over lice infestation by targeting the ovigerous females during the spring period before they could contribute to further infestation and secondly as a precaution to minimise and potential for sea lice from farmed stock to act as a source of

infestation for outwardly migrating wild smolts. The critical period was defined as 1st of March to the 31st May to encompass the period of smolt migration.

During the critical period March – May 2009 a total of twenty five fish farm sites were stocked with salmonids. The majority of these were stocked with salmon. Two sites were stocked with Rainbow trout. Twelve of the sites maintained lice levels below treatment trigger levels throughout the critical period. Three more had only one inspection where the treatment trigger was exceeded and a notice to treat was issued.

Three sites, all in Kilkieran Bay had difficulty in controlling their lice levels during the critical period. These sites, Cnoc, Daonish and Ardmore had repeated notices to treat issued. Treatments were carried out and in a number of instances, notably at Ardmore in mid March and through April, resulted in reductions of lice levels. However, the failure of treatments to bring lice infestation levels down below the treatment trigger levels at these sites resulted in the invocation of the Management Cell Approach to recommend further action at all three sites. The Management Cell operation is dealt with elsewhere in this report.

The sites stocked with rainbow trout have overlapping generations of fish as a norm. there are multiple stockings at these sites with in the region of three inputs of stock each year. The larger/older fish are harvested resulting in production of fish for market over most of the year. This method of production differs markedly from the production of salmon where in general sites are stocked with a single generation and fallowed before being restocked with a new cohort of fish. The two rainbow trout sites are Eany in Donegal by and Curraun in Bealacragher Bay. Both trout farms maintained their lice level well below treatment thresholds throughout the critical period.

Appendix V**Mean sea lice levels on salmonid farms in 2009.**

	Date	<i>Lepeophtheirus salmonis</i>		<i>Caligus elongatus</i>	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
MURPHYS IRISH SEAFOOD LTD					
Cuan Baoi					
Atlantic salmon, 2008 S 1/2	11/12/08	0.11	0.26	0.26	1.00
	04/02/09	0.05	0.11	0.47	7.05
	12/03/09	0.00	0.13	4.67	12.00
	25/03/09	0.00	0.00	3.31	10.23
	08/04/09	0.07	0.30	1.33	2.19
	24/04/09	0.07	0.31	0.93	2.00
	13/05/09	0.13	0.38	0.75	1.19
	20/05/09	0.19	0.56	3.44	9.93
	Harvested Out				
Atlantic salmon, 2009 S 1/2	11/12/08	0.00	0.00	0.06	0.17
	04/02/09	0.00	0.07	0.00	0.07
	12/03/09	0.00	0.00	0.04	0.07
	25/03/09	0.00	0.00	0.00	0.07
	08/04/09	0.00	0.00	0.03	0.10
	24/04/09	0.00	0.00	0.00	0.00
	13/05/09	0.00	0.00	0.10	0.20
	20/05/09	0.00	0.00	0.97	1.93
	10/06/09	0.00	0.13	0.43	1.37
	23/07/09	0.00	0.05	0.04	0.19
	12/08/09	0.02	0.02	0.07	0.15
	09/09/09	0.05	0.05	0.10	0.24
	07/10/09	0.00	0.05	0.29	0.45
	10/11/09	0.05	0.35	1.19	2.80
SILVER KING SEAFOODS LTD					
Roanarraig					
Atlantic salmon, 2008 S 1/2	11/12/08	0.00	0.00	0.09	0.34
	03/02/09	0.00	0.08	0.04	0.28
	12/03/09	0.05	0.12	1.12	4.08
	26/03/09	0.03	0.11	1.39	3.16
	08/04/09	0.07	0.34	1.52	3.25
	23/04/09	0.08	0.49	1.07	2.28
	12/05/09	0.27	1.01	0.70	1.66
	20/05/09	0.46	1.13	1.19	2.99
	11/06/09	0.71	1.12	1.21	4.18
	Harvested out				

Atlantic salmon, 2009 S 1/2	11/12/08	0.00	0.09	1.62	3.95
	03/02/09	0.00	0.02	0.06	0.24
	12/03/09	0.00	0.00	0.05	0.49
	26/03/09	0.00	0.04	0.11	0.56
	08/04/09	0.00	0.02	0.96	2.71
	23/04/09	0.00	0.22	2.04	3.80
	12/05/09	0.00	0.11	1.32	2.35
	20/05/09	0.02	0.11	2.34	4.00
	11/06/09	0.06	0.13	0.80	2.48
	23/07/09	0.06	0.18	1.06	2.23
	13/08/09	0.00	0.00	0.08	0.18
	10/09/09	0.12	0.18	0.33	0.62
	08/10/09	0.02	0.06	0.16	0.24
	10/11/09	0.04	0.35	0.10	0.29

KENMARE BAY

SILVER KING SEAFOODS LTD

Inishfarnard

Atlantic salmon, 2008	10/12/08	0.00	0.09	2.52	7.18
	03/02/09	0.02	0.02	0.00	0.00
	12/03/09	0.02	0.02	0.07	0.14
	26/03/09	0.00	0.00	0.12	0.27
	08/04/09	0.00	0.02	0.02	0.07
	23/04/09	0.00	0.00	0.00	0.04
	12/05/09	0.00	0.00	0.23	0.33
	19/05/09	0.00	0.05	0.95	1.71
	11/06/09	0.00	0.05	0.28	0.55
	23/07/09	0.10	0.27	0.90	2.71
	13/08/09	0.08	0.27	0.34	0.54
	10/09/09	0.32	0.77	0.35	0.58
	08/10/09	0.45	1.76	0.33	0.58
	10/11/09	1.29	2.62	0.11	0.27

GREATMAN'S BAY

MUIR GHEAL TEO

Carraroe

Atlantic salmon, 2009	12/02/09	0.00	0.00	0.00	0.00
	06/03/09	0.00	1.29	0.00	0.00
	24/03/09	0.00	0.88	0.03	0.07
	03/04/09	0.00	2.27	0.10	0.22
	16/04/09	0.02	1.95	0.16	0.27
	12/05/09	0.00	0.27	0.02	0.05
	19/05/09	0.00	0.20	0.00	0.00
	16/06/09	0.03	0.25	0.02	0.02
	14/07/09	0.56	1.92	0.27	0.41
	24/08/09	3.39	16.77	0.00	0.02
	09/09/09	1.39	8.50	0.00	0.00
	07/10/09	3.78	14.43	0.02	0.02
	30/11/09	9.93	21.23	0.00	0.07

MUIRACHMHAINNI TEO

Cuigeal

Atlantic salmon, 2009 S 1/2	21/04/09	0.16	4.62	0.21	0.31
	11/05/09	0.32	3.59	0.55	1.63
	21/05/09	0.34	7.00	1.50	2.60
	10/06/09	0.88	4.83	1.70	3.08
	22/07/09	2.73	12.23	0.00	0.04
	20/08/09	3.87	11.21	0.00	0.02
	18/09/09	2.54	5.13	0.00	0.00

Transferred to Daonish

KILKIERAN BAY

MUIRACHMHAINNI TEO

Golam

Atlantic salmon, 2009 S 1/2	13/01/09	0.08	3.28	0.02	0.02
	11/02/09	0.36	2.88	0.05	0.06
	06/03/09	0.07	1.77	0.09	0.10
	24/03/09	0.00	1.87	0.02	0.04
	03/04/09	0.00	1.34	0.12	0.15
	21/04/09	0.00	2.31	0.00	0.13
	11/05/09	0.03	1.70	0.08	0.10
	21/05/09	0.10	5.86	0.32	0.50

Transferred to Red Flag & Cuigeal

Red Flag

Atlantic salmon, 2009 S 1/2	10/06/09	0.10	2.08	0.02	0.02
	23/07/09	1.78	17.51	0.00	0.14
	25/08/09	5.95	27.98	0.07	0.25

Transferred to Cnoc

Daonish

Atlantic salmon, 2008 S 1/2	17/12/08	3.49	11.36	0.00	0.09
	11/02/09	0.29	13.34	0.02	0.09
	10/03/09	1.21	21.98	0.10	0.17
	31/03/09	0.99	7.58	0.05	0.13
	09/04/09	0.96	5.91	0.06	0.10
	30/04/09	0.78	13.82	0.00	0.00
	15/05/09	0.71	20.19	0.52	1.09
	22/05/09	0.70	19.28	0.49	0.97
	24/06/09	4.27	7.80	0.00	0.00

Harvested out

Atlantic salmon, 2009 S 1/2	28/10/09	15.43	67.00	0.64	0.79
	20/11/09	11.06	50.34	0.00	0.08

MUIR GHEAL TEO

Cnoc

Atlantic salmon, 2008 S 1/2	13/01/09	2.19	10.28	0.00	0.00
	12/02/09	0.87	17.78	0.00	0.05
	12/03/09	2.01	29.51	0.00	0.00
	31/03/09	3.13	16.56	0.04	0.06
	09/04/09	1.65	6.44	0.00	0.00
	30/04/09	1.26	5.48	0.00	0.00
	15/05/09	1.34	24.11	0.14	0.28
	22/05/09	1.24	17.07	0.11	0.14

Harvested out

Atlantic salmon, 2009 S 1/2	11/09/09	1.98	4.84	0.00	0.00
	09/10/09	0.87	10.79	0.00	0.00
	20/11/09	4.60	27.91	0.00	0.00

Ardmore

Atlantic salmon, 2008 S 1/2	03/12/08	1.22	3.52	0.00	0.05
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Harvested Out

EISC UI FLATHARTHA TEO**Ardmore**

Atlantic salmon, 2008	21/01/09	0.03	4.35	0.00	0.00
	12/02/09	0.84	24.78	0.13	0.40
	11/03/09	4.50	16.45	0.36	0.56
	31/03/09	0.37	1.58	0.10	0.11
	17/04/09	0.40	8.44	0.04	0.17
	29/04/09	0.24	5.44	0.00	0.22
	19/05/09	1.49	23.40	0.96	1.84
	26/05/09	2.60	20.63	0.16	0.55
	23/06/09	13.34	35.05	0.77	1.45
	17/07/09	10.47	38.37	0.02	0.06
	28/08/09	10.97	19.06	0.00	0.00
	11/09/09	6.39	11.96	0.00	0.00

Harvested out

BERTRAGHBOY BAY**COMHLUCHT BRADAIN CHONAMARA TEO****Sealax**

Atlantic salmon, 2009 S 1/2	03/12/08	0.00	3.02	0.00	0.06
	07/01/09	0.11	0.41	0.02	0.03
	21/01/09	0.00	0.03	0.00	0.04
	11/02/09	0.00	0.14	0.02	0.02
	03/03/09	0.00	0.27	0.04	0.05
	20/03/09	0.00	0.33	0.07	0.12
	03/04/09	0.00	0.19	0.15	0.15
	16/04/09	0.00	0.48	0.10	0.13
	12/05/09	0.02	0.83	0.22	0.40
	26/05/09	0.02	0.17	0.08	0.17
	12/06/09	0.00	0.10	0.00	0.03
	08/07/09	0.03	0.38	0.16	0.17
	19/08/09	0.79	4.36	0.00	0.02
	23/09/09	2.60	5.78	0.00	0.02

Transferred to Fraochoilean

MANNIN BAY

MANNIN BAY SALMON CO LTD

Corhounagh

Atlantic salmon, 2008	23/03/09	0.11	0.69	0.13	0.13
	08/04/09	0.17	8.55	0.04	0.05
	24/04/09	0.28	7.80	0.00	0.09
	14/05/09	2.01	6.85	0.24	0.66
	28/05/09	1.46	6.78	0.06	0.30
	25/06/09	0.67	1.42	0.07	0.23
	02/07/09	0.87	1.52	0.05	0.15
	07/08/09	2.46	10.36	0.25	0.32
	17/09/09	6.04	27.66	0.00	0.00
	08/10/09	6.17	11.39	0.00	0.02
	17/11/09	3.30	10.23	0.00	0.02

CLIFDEN BAY

MANNIN BAY SALMON CO LTD

Hawk's Nest

Atlantic salmon, 2008	08/01/09	0.07	1.89	0.05	0.07
	12/02/09	0.65	1.75	0.10	0.10
	06/03/09	0.92	3.33	0.21	0.37

Transferred to Corhounagh

Atlantic salmon, 2009	14/05/09	0.00	0.24	0.00	0.02
	28/05/09	0.00	0.01	0.00	0.01
	25/06/09	0.00	0.04	0.00	0.04
	02/07/09	0.00	0.06	0.00	0.03
	06/08/09	0.00	0.15	0.05	0.06
	17/09/09	0.22	0.59	0.00	0.00
	08/10/09	1.84	16.51	0.00	0.00
	16/11/09	0.45	1.82	0.00	0.00

BALLINAKILL HARBOUR

BIFAND LTD

Fraochoilean

Atlantic salmon, 2008 S 1/2	08/01/09	1.60	22.28	0.07	0.10
	12/02/09	2.49	7.47	0.10	0.16
	10/03/09	0.25	0.55	0.00	0.00
	24/03/09	0.46	5.08	0.02	0.09
	09/04/09	0.17	6.86	0.00	0.00
	23/04/09	0.64	3.91	0.00	0.00
	15/05/09	0.58	2.85	0.06	0.17
	26/05/09	0.12	1.49	0.10	0.13
	19/06/09	1.30	2.57	0.07	0.23
	16/07/09	0.32	7.65	0.16	0.55
	07/08/09	12.53	25.97	1.03	1.77

Harvested out

Atlantic salmon, 2009 S 1/2	19/10/09	3.09	8.98	0.00	0.00
	16/11/09	1.69	22.35	0.06	0.07

KILLARY HARBOUR

CELTIC ATLANTIC SALMON (KILLARY) LTD

Inishdeighil

Atlantic salmon, 2008	11/12/08	2.96	12.87	0.20	0.24
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Transferred to Ardmore

CLEW BAY

CLARE ISLAND SEAFARMS LTD

Clare Island Smolt Site

Atlantic salmon, 2009	20/04/09	0.00	1.57	0.02	0.06
	14/05/09	0.00	1.06	0.00	0.04
	26/05/09	0.00	0.66	0.02	0.06
	10/06/09	0.00	0.26	0.00	0.02
	07/07/09	0.00	0.18	0.11	0.16
	21/08/09	0.37	1.47	0.84	1.45
	29/09/09	0.35	3.76	0.44	0.75
	16/10/09	0.59	3.53	0.14	0.27

Transferred to Portlea

Portlea

Atlantic salmon, 2008	03/12/08	0.08	0.44	0.00	0.04
	13/02/09	0.33	2.35	0.19	0.28
	10/03/09	0.32	1.71	0.22	0.27
	30/03/09	0.42	5.52	0.59	0.87
	08/04/09	0.31	6.36	1.08	1.43
	20/04/09	0.25	4.69	0.60	0.75
	14/05/09	1.81	6.00	0.00	0.00
	26/05/09	0.79	2.27	0.09	0.30
	10/06/09	0.35	1.47	0.42	0.82
	07/07/09	0.61	1.47	1.41	3.20
	21/08/09	4.17	11.36	0.00	0.07
	29/09/09	0.17	0.70	0.00	0.00

Transferred to Seastream Inner

Atlantic salmon, 2009	30/11/09	1.18	4.35	0.00	0.02
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Seastream Inner

Atlantic salmon, 2007	11/12/08	0.32	0.75	0.00	0.02
	04/02/09	0.19	16.52	0.03	0.03
	13/03/09	2.93	4.52	0.11	0.11

Harvested out

Atlantic salmon, 2008	16/10/09	0.82	2.82	0.09	0.12
	30/11/09	0.34	0.83	0.00	0.03

BEALACRAGHER BAY

CURRAUN FISHERIES LTD

Curraun

Rainbow trout 2007 (3)					
			Harvested out		
Rainbow trout 2008 (1)	02/12/08	1.67	10.89	0.00	0.04
	13/02/09	0.10	3.03	0.00	0.00
	09/03/09	0.07	3.33	0.00	0.00
	30/03/09	0.00	3.13	0.00	0.00
			Harvested out		
Rainbow trout 2008 (2)	02/12/08	0.06	5.94	0.00	0.06
	04/02/09	0.32	1.42	0.00	0.00
	09/03/09	0.00	2.21	0.00	0.00
	30/03/09	0.17	2.33	0.00	0.00
	06/04/09	0.00	0.61	0.00	0.00
	24/04/09	0.04	1.04	0.00	0.02
	14/05/09	0.00	0.98	0.00	0.00
	26/05/09	0.15	3.88	0.00	0.00
	16/06/09	0.08	0.30	0.00	0.00
	17/07/09	0.90	2.60	0.00	0.00
	31/08/09	6.37	20.10	0.00	0.00
	28/09/09	4.57	10.37	0.00	0.00
			Harvested out		
Rainbow trout 2009 (1)	24/04/09	0.00	0.65	0.00	0.00
	14/05/09	0.00	0.57	0.00	0.00
	26/05/09	0.00	0.40	0.00	0.00
	16/06/09	0.00	0.13	0.00	0.00
	17/07/09	0.17	0.97	0.00	0.00
	31/08/09	0.60	4.07	0.00	0.00
	28/09/09	3.43	18.53	0.00	0.00
	28/10/09	0.13	1.13	0.00	0.00
	10/11/09	0.06	10.74	0.00	0.00
Rainbow trout 2009 (2)	28/10/09	0.00	0.63	0.00	0.00

10/11/09	0.00	4.87	0.00	0.00
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DONEGAL BAY

EANY FISH PRODUCTS LTD

Inver Bay

Rainbow trout 2007 (3)	10/12/08	1.46	15.14	0.11	0.14
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Harvested out

Rainbow trout 2008 (1)	10/12/08	0.22	5.11	0.07	0.12
	03/02/09	0.03	2.12	0.00	0.00
	04/03/09	0.12	1.00	0.02	0.02
	19/03/09	0.10	1.28	0.00	0.00
	02/04/09	0.09	0.62	0.02	0.09
	21/04/09	0.04	0.24	0.00	0.06
	14/05/09	0.05	0.32	0.02	0.02
	27/05/09	0.03	1.25	0.04	0.10
	25/06/09	0.13	0.33	0.03	0.07
	14/07/09	0.04	0.78	0.17	0.17

Harvested out

Rainbow trout 2009 (1)	10/12/08	0.00	0.82	0.00	0.00
	03/02/09	0.02	0.27	0.00	0.00
	04/03/09	0.00	0.22	0.00	0.00
	19/03/09	0.03	0.35	0.00	0.03
	02/04/09	0.00	0.04	0.00	0.00
	21/04/09	0.04	0.09	0.00	0.00
	14/05/09	0.00	0.02	0.00	0.00
	27/05/09	0.00	0.49	0.00	0.02
	25/06/09	0.00	0.04	0.04	0.07
	14/07/09	0.00	0.24	0.02	0.03
	06/08/09	0.13	0.44	0.00	0.00
	17/09/09	0.10	0.49	0.00	0.00
	07/10/09	0.04	0.12	0.00	0.00
	10/11/09	0.02	0.07	0.00	0.00

Rainbow trout 2009 (2)	06/08/09	0.00	0.03	0.04	0.04
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17/09/09	0.02	0.17	0.00	0.00
07/10/09	0.02	0.36	0.00	0.00
10/11/09	0.00	0.13	0.00	0.00

OCEAN FARM LTD

McSwyne's Bay

Atlantic salmon, 2007	10/12/08	1.88	3.43	0.00	0.00
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Transferred to Glinsk and Millstone

Atlantic salmon, 2009	02/04/09	0.00	0.00	0.00	0.00
	21/04/09	0.00	0.08	0.00	0.00
	05/05/09	0.00	0.05	0.00	0.00
	27/05/09	0.00	0.22	0.00	0.00
	25/06/09	0.00	0.00	0.02	0.09
	14/07/09	0.00	0.00	0.13	0.13
	06/08/09	0.00	0.00	0.04	0.04
	17/09/09	0.00	0.00	0.02	0.02
	07/10/09	0.02	0.02	0.00	0.00
	10/11/09	0.02	0.06	0.00	0.00

Ocean Inver

Atlantic salmon, 2008 S1/2	10/12/08	0.35	2.20	0.02	0.04
	03/02/09	0.88	15.69	0.04	0.10
	04/03/09	0.00	0.04	0.02	0.04
	19/03/09	0.03	1.02	0.03	0.19
	02/04/09	0.05	1.78	0.14	0.29
	21/04/09	1.04	2.70	0.14	0.24
	14/05/09	0.07	0.11	0.02	0.02
	27/05/09	0.02	0.10	0.02	0.05
	25/06/09	0.22	0.25	0.00	0.00
	14/07/09	0.35	1.26	0.04	0.04

Harvested out

MULROY BAY

MARINE HARVEST

Glinsk

Atlantic salmon, 2008	10/12/08	0.34	7.47	0.22	0.79
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Transferred to Lough Swilly

Atlantic salmon, 2008 SI/2	04/03/09	0.04	0.04	0.00	0.00
	20/03/09	0.09	0.32	0.00	0.00
	07/04/09	0.02	0.61	0.04	0.12
	21/04/09	0.09	1.32	0.02	0.14
	05/05/09	0.32	9.21	0.14	0.42
	21/05/09	1.29	3.26	0.18	0.27
	16/06/09	1.09	11.68	1.00	1.41

Transferred to Millstone

Atlantic salmon, 2007	04/02/09	0.16	2.47	0.02	0.02
	04/03/09	0.00	0.12	0.00	0.04
	20/03/09	0.02	0.62	0.00	0.00
	07/04/09	0.35	2.03	0.14	0.32
	21/04/09	0.36	4.00	0.15	0.38

Transferred to Millstone

Millstone

Atlantic salmon, 2007	10/12/08	0.96	24.25	0.21	0.61
	04/02/09	0.00	0.12	0.00	0.00
	04/03/09	0.00	0.36	0.02	0.02
	20/03/09	0.58	1.97	0.07	0.15
	07/04/09	0.24	0.59	0.05	0.05
	21/04/09	0.30	2.85	0.10	0.35
	05/05/09	0.59	8.64	0.33	0.70
	21/05/09	1.47	5.41	0.18	0.21

Harvested out

Atlantic salmon, 2008 SI/2	16/06/09	0.59	7.78	0.16	0.45
On starve for harvest (Harvesting site)					

LOUGH SWILLY

MARINE HARVEST

Lough Swilly

Atlantic salmon, 2008	04/02/09	0.33	1.68	0.05	0.05
	04/03/09	0.23	1.01	0.07	0.09
	20/03/09	0.07	0.24	0.06	0.06
	07/04/09	0.10	1.22	0.10	0.20
	21/04/09	0.12	1.36	0.16	0.26
	05/05/09	0.25	4.30	0.12	0.28
	21/05/09	0.00	0.04	0.00	0.00
	16/06/09	0.07	0.55	0.02	0.09
	07/07/09	0.16	0.78	0.72	1.59
	06/08/09	0.05	0.99	0.00	0.00
	29/09/09	0.99	7.60	0.00	0.00
	16/10/09	2.10	12.99	0.02	0.03
	18/11/09	2.99	11.71	0.00	0.00

APPENDIX VI**Mean Sea Lice Numbers 2010.**

	Date	<i>L. salmonis</i>		<i>C. elongatus</i>	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
MURPHYS IRISH SEAFOOD					
Cuan Baoi					
Atlantic Salmon, 2009 S1/2	09/12/09	0.11	0.21	2.21	5.54
	02/02/10	0.17	0.33	2.50	9.17
	02/03/10	0.04	0.08	6.16	13.12
	24/03/10	0.03	0.24	2.62	7.41
	08/04/10	0.00	0.40	1.73	8.13
	22/04/10	0.00	0.75	2.75	9.50
	04/05/10	0.25	0.88	1.71	4.08
	26/05/10	0.36	1.40	6.68	12.84
	15/06/10	0.20	0.70	4.30	8.30
Atlantic Salmon, 2010 S1/2	09/12/09	0.00	0.00	0.16	1.00
	02/02/10	0.00	0.07	0.48	1.48
	02/03/10	0.00	0.00	0.00	0.03
	24/03/10	0.00	0.00	0.03	0.06
	08/04/10	0.00	0.03	0.03	0.17
	22/04/10	0.00	0.12	0.09	0.68
	04/05/10	0.00	0.06	0.18	0.94
	26/05/10	0.00	0.00	0.47	1.69
	15/06/10	0.07	0.13	1.63	2.83
SILVER KING SEAFOODS LTD.					
Roancharraig					
Atlantic Salmon, 2009 S1/2	10/12/09	0.02	0.26	0.79	1.30
	02/02/10	0.13	0.49	0.72	4.12
	02/03/10	0.14	0.62	1.27	2.34
	23/03/10	0.33	1.52	1.59	5.56
	08/04/10	0.39	1.69	1.21	5.51
	22/04/10	0.00	0.00	0.00	0.02
	04/05/10	0.03	0.55	0.11	0.37
	27/05/10	0.15	0.94	0.49	0.83
	16/06/10	0.04	0.18	1.20	3.25
KENMARE BAY					
SILVER KING SEAFOODS LTD.					
Deenish					
Atlantic Salmon, 2010	23/04/10	0.00	0.00	0.30	1.99
	04/05/10	0.00	0.02	0.70	1.74
	27/05/10	0.00	0.03	0.41	0.80
	17/06/10	0.00	0.00	0.08	0.11
Inishfarnard					
Atlantic Salmon, 2008	10/12/09	1.49	4.24	0.77	1.45
		Harvested out			

Atlantic Salmon, 2010	27/05/10	0.00	0.00	0.03	0.09
	16/06/10	0.00	0.00	0.04	0.05

GREATMAN'S BAY

MUIRACHMHAINNI TEO.

Carraroe

Atlantic Salmon, 2009	30/11/09	9.93	21.23	0.00	0.07
		Transferred to Daonish			

Atlantic Salmon, 2010	28/04/10	0.00	0.00	0.00	0.68
	05/05/10	0.00	0.00	0.18	0.61
	18/05/10	0.00	0.57	0.06	0.41
	03/06/10	0.00	0.10	0.15	0.62

Cuigeal

Atlantic Salmon, 2010 S1/2	03/06/10	0.16	1.07	0.33	1.30
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KILKIERAN BAY

MUIR GHAEL TEO.

Cnoc

Atlantic Salmon, 2009 S1/2	22/12/09	6.34	28.27	0.00	0.00
		Harvested out			

MUIRACHMHAINNI TEO.

Daonish

Atlantic Salmon, 2009 S1/2	22/12/09	0.74	5.49	0.00	0.02
	01/02/10	0.23	13.26	0.02	0.04
	12/03/10	0.32	14.52	0.08	0.48
	24/03/10	0.76	4.99	0.02	0.10
	16/04/10	0.51	2.08	0.00	0.26
	30/04/10	0.18	1.49	0.11	0.20
	10/05/10	0.88	6.35	0.53	0.81
	26/05/10	1.08	4.62	0.13	0.26
	11/06/10	0.46	1.38	0.29	0.50

Golam

Atlantic Salmon, 2010 S1/2	14/01/10	0.08	8.28	0.17	0.51
	01/02/10	0.15	11.56	0.25	0.55
	09/03/10	0.04	4.52	0.02	0.10
	25/03/10	0.09	2.26	0.05	0.42
	14/04/10	0.04	0.82	0.15	0.30
	21/04/10	0.00	0.89	0.18	0.55
	10/05/10	0.02	0.98	0.13	0.41
	18/05/10	0.02	1.38	0.47	0.70

Transferred to
Cuigeal

BERTRAGHBOY BAY

MANNIN BAY SALMON COMPANY LTD.

Sealax

Atlantic Salmon, 2010	23/04/10	0.00	0.00	0.00	0.02
	06/05/10	0.00	0.09	0.07	0.42
	20/05/10	0.00	0.08	0.09	0.15
	16/06/10	0.00	0.04	0.68	1.69

MANNIN BAY

MANNIN BAY SALMON COMPANY LTD.

Corhounagh

Atlantic Salmon, 2008	14/12/09	10.70	64.07	0.44	0.93
		Harvested out			
Atlantic Salmon, 2009	02/03/10	0.07	1.98	0.00	0.00
	16/03/10	0.03	3.56	0.00	0.00
	09/04/10	0.43	4.17	0.05	0.15
	22/04/10	1.21	4.46	0.14	0.17
	07/05/10	1.08	2.85	0.19	0.35
	25/05/10	0.32	12.01	0.02	0.02
	17/06/10	5.64	43.57	1.34	2.50

CLIFDEN BAY

MANNIN BAY SALMON COMPANY LTD.

Ardbear

Atlantic Salmon, 2010 S1/2	03/12/09	0.00	1.65	0.00	0.00
	11/02/10	0.04	1.92	0.00	0.00
	02/03/10	0.06	1.12	0.00	0.00
	16/03/10	0.02	1.61	0.00	0.00
	09/04/10	0.02	6.58	0.00	0.00
	22/04/10	0.03	0.52	0.00	0.00
	07/05/10	0.00	0.49	0.00	0.00
	20/05/10	0.00	1.37	0.02	0.05

Transferred to Hawk's Nest

Hawks Nest

Atlantic Salmon, 2009	03/12/09	0.55	14.16	0.02	0.07
	11/02/10	2.53	16.70	0.00	0.16

Transferred to Corhounagh

Atlantic Salmon, 2010 S1/2	22/06/10	0.05	4.99	0.59	1.47
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BALLINAKILL HARBOUR

BIFAND LTD.

Fraochoilean

Atlantic Salmon, 2009 S1/2	22/12/09	6.07	22.13	0.13	0.22
	19/02/10	4.63	24.70	0.00	0.05
	05/03/10	3.09	34.74	0.00	0.06
	22/03/10	0.16	6.33	0.00	0.00
	13/04/10	0.80	34.14	0.00	0.02
	23/04/10	1.32	23.12	0.02	0.02
	11/05/10	2.22	12.28	0.00	0.00
	25/05/10	2.15	14.58	0.00	0.02
	25/06/10	12.30	36.27	0.12	0.26

KILLARY HARBOUR

MARINE HARVEST

Inishdeighil

Atlantic Salmon, 2010	13/05/10	0.00	0.02	0.00	0.05
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27/05/10	0.00	0.02	0.03	0.15
10/06/10	0.00	0.00	0.09	0.20

CLEW BAY

CLARE ISLAND SEAFARMS LTD.

Portlea

Atlantic Salmon, 2009	11/12/09	1.31	6.86	0.00	0.07
	11/02/10	2.82	28.70	0.30	1.38
	11/03/10	0.32	2.71	0.05	0.31
	24/03/10	0.52	3.95	0.04	0.49
	13/04/10	0.10	4.00	0.17	0.45
	23/04/10	0.05	4.27	0.07	0.19
	14/05/10	0.33	5.33	0.61	1.74
	26/05/10	0.90	5.77	1.28	3.29
	25/06/10	0.37	2.45	0.60	5.39

Seastream Inner

Atlantic Salmon, 2008	09/12/09	0.31	1.19	0.02	0.03
	11/02/10	1.13	7.13	0.73	1.26
	11/03/10	0.64	3.09	0.75	0.98
	24/03/10	0.69	8.00	0.48	0.89
	09/04/10	0.27	3.18	0.32	0.40
	23/04/10	0.54	7.02	0.54	0.76

Harvested out

BEALACRAGHER BAY

CURRAN FISHERIES LTD.

Curraun

Rainbow Trout, 2009 (1)	27/01/10	0.00	0.73	0.00	0.00
	12/02/10	0.00	0.00	0.00	0.00
	09/03/10	0.00	0.00	0.00	0.00
	30/03/10	0.00	0.10	0.00	0.00
	21/04/10	0.04	0.83	0.00	0.00

Harvested out

Rainbow Trout, 2009 (2)	27/01/10	0.43	1.63	0.00	0.00
	12/02/10	0.03	0.13	0.00	0.00
	09/03/10	0.00	0.00	0.00	0.00
	30/03/10	0.00	0.07	0.00	0.00
	21/04/10	0.00	0.13	0.00	0.00
	30/04/10	0.00	0.09	0.00	0.00
	13/05/10	0.00	0.17	0.00	0.00
	28/05/10	0.00	0.00	0.00	0.00
	24/06/10	0.00	0.03	0.00	0.00

Rainbow Trout, 2010 (1)	28/05/10	0.00	0.10	0.00	0.00
	24/06/10	0.00	0.00	0.00	0.03

DONEGAL BAY

EANY FISH PRODUCTS LTD.

Eany

Rainbow Trout, 2009 (1)	15/12/09	0.08	0.25	0.00	0.08
	03/02/10	0.00	0.07	0.00	0.00
		Harvested out			
Rainbow Trout, 2009 (2)	15/12/09	0.10	0.59	0.00	0.00
	03/02/10	0.02	0.09	0.00	0.00
	04/03/10	0.04	0.18	0.00	0.00
	16/03/10	0.00	0.00	0.00	0.07
		Harvested out			
Rainbow Trout, 2009 (3)	15/12/09	0.00	0.00	0.00	0.00
	03/02/10	0.00	0.02	0.00	0.00
	04/03/10	0.00	0.02	0.02	0.13
	16/03/10	0.00	0.04	0.04	0.04
	15/04/10	0.02	0.06	0.03	0.14
	27/04/10	0.00	0.00	0.00	0.13
	05/05/10	0.00	0.02	0.02	0.02
	25/05/10	0.00	0.00	0.00	0.00
	10/06/10	0.00	0.02	0.06	0.06
Rainbow Trout, 2010 (1)	15/04/10	0.00	0.00	0.00	0.05
	27/04/10	Missed due to technical difficulties			
	05/05/10	0.00	0.00	0.00	0.00
	25/05/10	0.00	0.02	0.07	0.07
	10/06/10	0.00	0.00	0.00	0.00

OCEAN FARM LTD.

Mc Swynes

Atlantic Salmon, 2009	15/12/09	0.03	0.54	0.04	0.13
	03/02/10	0.17	1.60	0.14	0.21
	04/03/10	0.00	0.04	0.03	0.03
	16/03/10	0.00	0.25	0.00	0.06
	20/04/10	0.00	0.19	0.00	0.02
	27/04/10	0.00	0.02	0.00	0.00
	05/05/10	0.00	0.00	0.00	0.00
	25/05/10	0.00	0.07	0.31	0.87
10/06/10	0.00	0.06	0.06	0.11	

Ocean Inver

Atlantic Salmon, 2010	20/04/10	0.00	0.04	0.04	0.40
	27/04/10	0.00	0.05	0.00	0.18
	05/05/10	0.00	0.00	0.00	0.11
	25/05/10	0.00	0.00	0.05	0.08
	10/06/10	0.00	0.00	0.00	0.03

MULROY BAY

MARINE HARVEST

Glinsk

Atlantic Salmon, 2010 S1/2	14/01/10	0.03	0.56	0.00	0.00
	17/02/10	0.00	0.05	0.00	0.00
	03/03/10	0.00	0.27	0.00	0.00
	23/03/10	0.00	0.05	0.00	0.02
	16/04/10	0.00	0.08	0.00	0.00
	28/04/10	0.00	0.03	0.00	0.17
	06/05/10	0.00	0.14	0.02	0.05

Transferred to Lough swilly

LOUGH SWILLY

Lough Swilly

Atlantic Salmon, 2008	14/01/10	0.73	6.28	0.05	0.10
	17/02/10	0.59	4.81	1.41	2.30

Harvested out

Atlantic Salmon, 2010 S1/2	26/05/10	0.00	0.22	0.29	0.36
	22/06/10	0.02	0.02	0.09	0.10