



**Aquaculture Licence Appeals Board
Kilminchy Court
Dublin Road
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Co. Laoise
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16 January 2019

To whom it may concern,

RE: AP2/1-14/2015: Response to Supplementary EIS from Marine Harvest Ireland in relation to the foreshore licence application at Shot Head, Bantry Bay, Co.Cork.

Further to your email regarding the supplementary EIS submitted by Marine Harvest Ireland in relation to the foreshore licence application at Shot Head in Bantry Bay Co. Cork, we should like to register the submission and observations.

Issue 1. The risk (i.e. posed by the proposed salmon farm installation) of sea-lice infestation of wild salmonids migrating from/to the Dromogowlane and Trafrask rivers and any implications for local freshwater pearl mussel (FPM) populations.

The supplementary EIS states, based on their modelling and desk research, “*wild salmonid stocks of Bantry Bay will suffer no additional impacts....*”.

This conclusion states the exact opposite to the international research consensus which states sea lice emanating from salmon farms cause local wild salmon populations to be reduced by 29% to 50%, with the proximity of the salmon farm to the salmon river being critical - see Appendix 1. Given the Dromogowlane and Trafrask rivers are a mere 2.5km from the Shot Head site, this raises the question of how the modelling produced results which directly contradict scientific understanding.

This could be explained by a number of factors not being taken into account within the model:

- Historical data for sea lice numbers on salmon farms in Bantry Bay is used. This fails to take consider ever increasing treatment resistance being witnessed within salmon farming today.¹⁻⁶
- Increasing prevalence of other salmon disease (amoebic gill disease, pancreatic disease,) has affected fish appetite in recent years resulting in decreased ingestion of in-feed medication to control sea lice which results in sea lice prevention methods being less effective.⁷

- Greater cross contamination of sea lice between salmon farms as farm density increases within Bantry Bay (though while not accounting for this in the model, the report does note a risk and that “*this should be avoided*”).⁶
- Increasing water temperatures which encourages sea lice reproduction.^{8,9}

Research globally has noted sea lice are becoming an increasing problem due to these particular issues.

The supplementary EIS goes on to show maximum plumes of dispersing copepodid density from both the currently operational Marine Harvest salmon farm at Roancarrig, and the proposed one at Shot Head. What is interesting is the distances of copepodid dispersion suggested by the RPS model in the supplementary EIS are considerably smaller than those found in a similar but more detailed study by the Marine Institute and Martin Ryan Institute (copy attached).¹⁰ Here sea lice from the Roancarrig salmon farm are mapped as disseminating distances many many times greater than the distances suggested by the RPS model.¹⁰ This study states “*In most cases around the Irish coast, using the combined circulation features of the model over a 1 year period meant a larger than previously defined epidemiological unit around any given site. An example of this is given in figure 4 where particles originating at Roancarrig are picked up in high numbers within the 5km and 10km radius zones but there is also extensive movement of particles eastward into Bantry Bay, south-westward into Dunmanus Bay and along the northern shore of Bantry Bay. When two sites in adjacent bays are considered the epidemiological units are extensive. Figure 5 shows that Roancarrig has the potential to infect almost all of Bantry Bay while the zone of potential influence from Deenish (Kenmare Bay) extends southwest of Bantry and northward to the Blasket Islands*’.

This offers clear evidence of sea lice dispersing far more widely than the supplementary EIS states, and raises serious questions of the validity of the RPS model.

The supplementary EIS goes on to note that highest risk of Copepodids from the salmon farm attaching to Salmonids were if they were to pass close to the site, and make the assumption this is will not occur when it’s concluded there will be zero impact. This fails to acknowledge Salmonids are attracted to the ready food source salmon farms provide, and provides significant risk of cross contamination from sea lice.

What is more, no data has been gathered on local wild salmonids migration patterns. Local expertise (see evidence from Ger O’Sullivan, former NPWS, ALAB Oral Hearing) state wild salmon population in the Trafrask Harbour are known to leave the river and circulate in the harbour regularly during the ‘riverine’ phase, which would increase the risk of sea lice contamination further. Once cross contamination has occurred, and wild salmon return to their rivers, they will infect further wild salmon and sea trout. These knock on effects are not considered within the conclusions either.

Interestingly, the supplementary EIS acknowledges they have little information on salmonids in the Trafrask / Dromogoulane River stating “*little is known about stock status of these, including Trafrask...*”.

It goes on to also acknowledge limited understanding of salmon population in the Adrigole River, another river in close proximity to the Shot Head site, but also close to Marine Harvest’s current salmon farm at Roancarrig. Salmon migrating from the Adrigole River must pass the Roancarrig farm. The EIS notes this river is not recovering from the drift net ban as well as others in Bantry Bay, and suggests “*riverine habitat conditions may be impacting on juvenile fish recruitment*” with no evidence to back this claim. The only conclusions that can be drawn is wild salmon populations in the Adrigole River are not currently clear, and why this particular salmon river in Bantry Bay is failing to recover is not

known. While water quality may or may not be an issue, there is plenty of research evidence on the impact of salmon farms on wild salmon (see Appendix 1); the Marine Institute and Martin Ryan Institute suggest high concentrations of sea lice in the vicinity; and the EIS itself shows plumes of sea lice in the path out to sea which salmon would follow when migrating to and from the Adrigole river.

The fact is, the EIS confirms limited understanding of the salmon population in the Adrigole River, salmon are not recovering as well as in other rivers in Bantry Bay, and Marine Harvest's other salmon farm is in close proximity, suggests an opportunity for understanding has been missed. While correlation and causation shouldn't be confused, neither should empirical data be ignored.

It is concluded in the supplementary EIS that *"...there is effectively no lice risk projected from the proposed Shot Head site, to wild salmonids at any location."* This extraordinary claim is based on a hydro-dynamic model which uses historical sea lice data only, fails to take account of current sea lice trends on salmon farms, overlooks other research models on sea lice dispersal in the area, and ignores the vast cohort of international research on the impacts of sea lice emanating from salmon farms.

Nor has local understanding or recent data on salmonids population and behavioural patterns in the Trafrask or Adrigole Rivers been gathered and considered, instead old and incomplete data has been relied upon.

Thus the model is inadequate and incomplete, and thereby fails to offer a true projection of potential outcomes for wild salmonids.

The impact of a salmon farm at Shot Head on Freshwater Pearl Mussels (FPM) will be affected by the impact on wild salmonids. The supplementary EIS states *"It is further submitted that there is zero risk that anadromous salmonids will be reduced in numbers in their freshwater phase, as a result lice larva dispersal from the proposed Shot Head site, to impact on the availability of vector hosts for FPM Glochidia larval development and dispersal"*. This cannot be claimed with a number of missing elements in the model offered, as noted above.

Any monitoring of future impacts if the farm goes ahead will also be impossible, as little baseline data on FPM populations is available. The supplementary EIS notes *"monitoring has been sparse or non-existent and their precise stock status has not been ascertained"*. The only data available is 10 years old, part of a survey completed by Ross in 2008. It concluded the populations of FPM in the Trafrask and Adrigole rivers were two of the four most significant populations identified out of 14 rivers in Cork and Kerry; and may be of national significance. Yet no further surveys have been completed to determine whether or not this is the case, and to establish what current status of the FPM in the Trafrask / Dromogoulane Rivers.

The supplementary EIS goes on to state current FPM populations in the Trafrask River are *"under huge risk of extinction"* stating this is largely due to neglect of their freshwater habitat, which is categorised as having 'high' water quality. It is also acknowledged there's a lack of understanding of these FPM populations *"even to an extent overlooking legal requirements"*. This suggests there may have been legal failings to designate the area as an SAC under the Habitats Directive, which had this been the case may well have prevented a salmon farm license at Shot Head ever being granted.

Next, it's concluded recovery of a local FPM population *"may be a forlorn hope"* and *"this is the true background against which the risk exposure of FPM in the Trafrask River, must be judged"*. This suggests a gun-ho attitude of 'they're extinct anyway and it's not our fault' - hardly an approach which should be taken towards protected species, where it's been

acknowledged legal obligations may have been missed. The Precautionary Principle must prevail, and if it continues to be unclear whether or not this protected species is at risk, a salmon farm at Shot Head should not go ahead.

Indeed, it clearly remains beyond reasonable scientific doubt a salmon farm at Shot Head will impact on this protected species nearby. The sea lice model is inadequate and incomplete as it doesn't address a number of sea lice concerns being witnessed today. Resulting implications for wild salmonids populations, and in turn for FPM populations, are therefore not fully understood, and it cannot be claimed neither species will be affected.

Issue 2. The impact of salmon farm waste on water quality in Bantry Bay, having regard to the maintenance of 'good water status' as required under the Water Framework Directive.

Both the EIS and supplementary EIS offer a model of dispersion from the proposed salmon farm at Shot Head. Based on the model, it is concluded '*benthic infaunal composition is only impacted within the Acceptable Zones of Effects established for salmon farming operation. Beyond these limits, benthic infaunal composition is projected to be normal throughout the Outer Bantry Bay Water Body, if the Shot Head site is licenced for full operation*'.

The Shot Head site lies near the boundary of Inner Bantry Bay, where water quality impacts have not been considered. This is a clear omission.

Further difficulty lies in the modelling approach taken. Empirical data suggests such simplistic modelling approaches cannot fully represent the reality of the situation. Following the oil tanker Betelgeuse explosion on 8 January 1979 pollutants may dispersed far more widely than the model in the supplementary EIS suggests would be possible.¹¹

This is further supported by the research completed by the Marine Institute and Martin Ryan Institute, which examines dispersion of sea lice and harmful algal blooms in Bantry Bay which show far greater dispersal of pollutants in Bantry Bay than the model in the EIS claims.¹¹

Yours sincerely,

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References:

1. Jones, M. W., Sommerville, C. & Wootten, R. 1992 Reduced sensitivity of the salmon louse, *Lepeophtheirus salmonis*, to the organophosphate dichlorvos. J. Fish Dis. 15, 197–202. (doi:10.1111/j.1365-2761.1992.tb00654.x)
2. Treasurer, J. W., Wadsworth, S. & Grant, A. 2000 Resistance of sea lice, *Lepeophtheirus salmonis* (Krøyer), to hydrogen peroxide on farmed Atlantic salmon, *Salmo salar* L. Aquaculture Res. 31, 855–860. (doi:10.1046/j.1365-2109.2000.00517.x)

3. Tully, O. & McFadden, Y. 2000 Variation in sensitivity of sea lice [*Lepeophtheirus salmonis* (Krøyer)] to dichlorvos on Irish salmon farms in 1991–92. *Aquaculture Res.* 31, 849–854. (doi:10.1046/j.1365-2109.2000.00518.x)
4. Sevatdal, S. & Horsberg, T. E. 2003 Determination of reduced sensitivity in sea lice (*Lepeophtheirus salmonis* Krøyer) against the pyrethroid deltamethrin using bioassays and probit modelling. *Aquaculture* 218, 21–31. (doi:10.1016/S0044-8486(02)00339-3)
5. Fallang, A., Ramsay, J. M., Sevatdal, S., Burka, J. F., Jewess, P., Hammell, K. L. & Horsberg, T. E. 2004 Evidence for occurrence of an organophosphate-resistant type of acetylcholinesterase in strains of sea lice (*Lepeophtheirus salmonis* Krøyer). *Pest. Manag. Sci.* 60, 1163–1170. (doi:10.1002/ps.932)
6. Jansen, P. A. et al. Sea lice as a density-dependent constraint to salmonid farming, *Proc. R. Soc B* (2012), 279, 2330–2338.
7. New Study highlights 34% loss in wild salmon numbers from Sea Lice, Statement by Inland Fisheries Ireland, 16 August 2013. <http://www.fisheriesireland.ie/Press-releases/new-study-highlights-34-loss-in-wild-salmon-numbers-from-sea-lice.html>
8. Costello, M.J.; Ecology of sea lice parasitic on farmed and wild fish, *Trends in Parasitology*, Volume 22, Issue 10, October 2006, Pages 475–483;
9. Stien, A., Bjørn, P. A., Heuch, P. A. & Elston, D. A. 2005 Population dynamics of salmon lice *Lepeophtheirus salmonis* on Atlantic salmon and sea trout. *Mar. Ecol. Prog. Ser.* 290, 263–275. (10.3354/meps290263)
10. Nolan G, Lyons K, Ruane N, Jackson D, Silke J and Raine R; Oceanographic modelling products as a decision support to the Irish aquaculture sector (copy attached)
11. Cross, T.F. Southgate, T and Myers, A.A. 1979; The Initial Pollution of Shores in Bantry Bay, Ireland, by Oil from the Tanker Betelgeuse. *Marine Pollution Bulletin*, Vol. 10, pp. 104–107

APPENDIX 1: IMPACT OF SEA LICE EMANATING FROM SALMON FARMS ON WILD SALMONIDS

Threat from sea lice

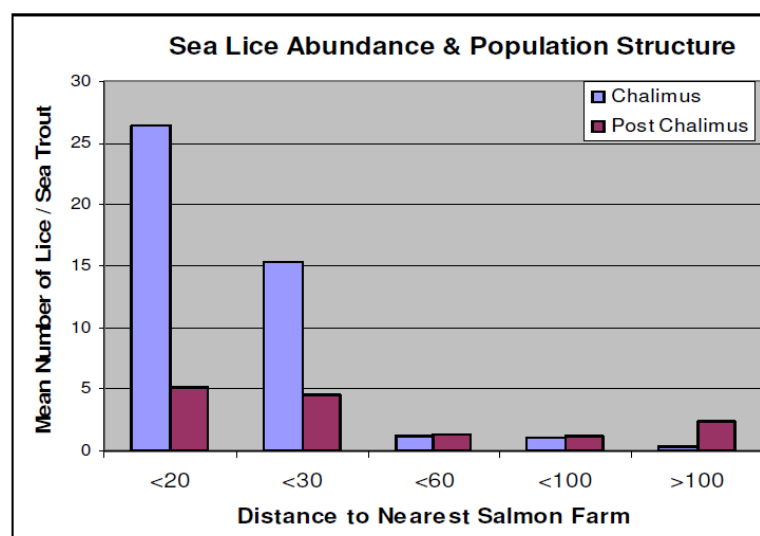
In the wild, salmon are perfectly adapted to cope with sea lice concentrations found in natural open ocean environments. However, in salmon farms sea lice build up to such an extent that the fish have to be treated with pesticides to stop them suffering such severe damage that they develop infections and die. In the west of Ireland, where salmon farms are near ubiquitous, young wild salmon (smolts) must migrate unprotected through dense clouds of sea lice and sea lice larvae. It is universally accepted that these lice are having a negative impact on wild salmon and sea trout populations.

Various scientific studies have examined the scale of this impact. What is clear is the sea lice emanating from salmon farms are significantly increasing mortality rates in juvenile salmon migrating out to sea. The young salmon, smolts, are most vulnerable because of their size. Indeed, it only takes a couple of sea lice significantly impacting their potential survival. In turn, the numbers of adult salmon returning to spawn has dropped so drastically they're increasingly limited in their ability to sustain future generations.

Three recent scientific papers, including three meta-analysis, show that sea lice emanating from salmon farms cause anything from a 39%, 44% or even 50% reduction in wild salmon populations.^{1,2,3,4} The most recent Irish study in 2017, focussing on the Erriff River showed a reduction of more than 50%;⁵ whilst a 2018 comprehensive review of research put the population-level effects of salmon lice in Ireland and Norway showed that lice-induced mortality in farm-intensive areas can lead to an average of 29% fewer adult salmon.⁶

So, it can be seen it is only the size of the negative impact that is in dispute today.

Research conducted in Ireland revealed the highest level of sea lice were recorded at sites less than 20km from salmon farms, with total lice infestation lower at sites less than 30km from farms.^{7,8}



This research highlights the need to separate salmon farms from wild salmon rivers to ensure wild salmon populations are not at risk of collapsing. It is for these reasons, that in 1994 a Report

commissioned by the Minister of the Marine from the Sea Trout Working Group stated that until the precise nature of the relationship between sea lice and sea trout is understood ‘a *precautionary approach dictates that it would be prudent to avoid siting new fish farms or increased salmon farm production...within 20km of a sea trout river mouth*’.⁹ Meanwhile, in Scotland the ‘rule of thumb’ is salmon farms should be located at least 18km from salmon river mouths.¹⁰

More recently, as part of the Strategic Environmental Assessment [SEA] of the Irish Seafood National Program 2007 – 2013 published under the National Development Plan in July 2010 it was determined that ‘*The targets for increased productive capacity for salmon will now have to be deferred until after 2013 at the earliest as a result of the amendments made to this Programme... during the SEA process*’.⁹ The concerns again related to the negative impact of sea lice, and were submitted by the former Central and Regional Fisheries Boards and supported by the Department of Communication, Energy and Natural Resources (DCENR).¹¹

Today, the situation is far from resolved. Salmon farms continue to be located much too close to wild salmon rivers with the result that local salmon and sea trout populations have been devastated.

While some progress has been made in the control of sea lice on some farms, these are often thwarted. Increasing disease incidence, recently seen with the widespread outbreaks of amoebic gill disease, has affected fish appetite resulting in decreased ingestion of in-feed medication to control sea lice. Furthermore, increased resistance to treatment and warming seas are also favouring lice breeding. The result is persistent breaches of the Treatment Trigger Level (TTL), the accepted level of lice per fish, beyond which immediate treatment is required. The number of salmon farms exceeding the TTL in 2010, 2011, and 2012 show that the sea lice levels have not been controlled and in some cases are worse than at the time of the publication of the “Irish Seafood National Program 2007 – 2013” in July 2010.^{12, 13, 14} One winter salmon farm exceeded the limit in 25% of salmon farms over the last three years. The number of sites with lice levels above the TTL in two-winter salmon farms has risen continually over the last three years from 24% to 40% to 50% in 2011.

Recently published large scale Norwegian research study noted that ‘*increased intervention efforts have been unsuccessful in controlling elevated infection levels*’.¹⁵ In particular the paper notes that where there is an increased number of farmed salmon, either through a greater number of farms or greater farm size in an area, sea lice control becomes more difficult. It is suggested this is due to sea lice gaining resistance to available treatments.

It is this experience that has led government bodies in other countries to take action to protect their valuable wild salmon populations. The recent Cohen Report published in Canada has recommended banned all expansion of salmon farming, with a view to possibly closing existing salmon farms should the issue not be resolved.¹⁶ Meanwhile, in Norway 29 fjords and 52 rivers have been designated as salmon protection areas in which the development of salmon farming is banned.

A note on Dr Jackson’s (Marine Institute’s) sea lice research claims provided as evidence in the supplementary EIS:

Despite the bulk of research determining a negative impact of sea lice from salmon farms on wild salmon, there remain some ‘doubters’. Just as there have been in the smoking causes cancer or climate change debates. Ironically, in Ireland the key ‘doubter’ is the Marine Institute. The

government agency responsible for monitoring lice on salmon farms and charged with advising Ministers on salmon farm licence applications.

To date, the most conclusive research studies examining the impact of sea lice emanating from salmon farms on wild salmon populations have been based on the same model. A research team will release pesticide treated smolts, alongside ordinary smolts, and monitor differing return rates.

A team from the Marine Institute, led by Dr Jackson, undertook such a research study. They published three papers using their data which concluded '*that infestation of outwardly migrating salmon smolts with the salmon louse was a minor component of the overall marine mortality in the stocks studied*'.^{17,18,19}

The Marine Institute's conclusion was quickly picked up and quoted by Simon Coveney, Minister for Agriculture, Food and the Marine; Bord Iascaigh Mhara; and the Irish Farmers Association and government bodies when promoting the current salmon farming agenda.^{20,21,22} They claimed the study was definitive and unequivocal.

Meanwhile, there was outcry amongst the international research community. One key player, Prof Costello, wrote directly to Minister Simon Coveney, to inform him he was being misled.²³ Inland Fisheries Ireland wrote a public statement, as did the internationally renowned Prof Ken Wheelan on behalf of the Association of Salmon Fishery Boards in Scotland.^{24,25}

Not long after, in August 2013, a devastating critique of the Marine Institutes work was published in The Journal of Fish Diseases. The international team of experts from Scotland, Norway and Canada re-analysed the Marine Institute's data. It noted that the Marine Institute's team '*incorrectly lead the reader to a conclusion that sea lice play a minor, perhaps even negligible, role in salmon survival*' and that '*such conclusions can be supported only if one is prepared to accept at least three methodological errors*'.²⁶

Having re-analysed the data using the standard statistical methods the international team highlight that rather than sea lice emanating from salmon farms causing a 1% mortality of salmon smolts, as David Jackson of the Marine Institute concluded, they in fact cause a one third reduction in adult salmon returns. The research team concluded that this '*has implications for management and conservation of wild salmon stocks*'.

The results of the reanalysis concur with other international studies, as well as Irish studies^{1,2,3,26} which indicate that sea lice emanating from salmon farms have a devastating impact on wild Atlantic salmon populations. Inland Fisheries Ireland, national and international angling and environment groups, as well as international research teams have all welcomed the clarification. Inland Fisheries Ireland stated '*In this context, the location of salmon farms in relation to salmon rivers and the control of sea lice prior to and during juvenile salmon migration to their high seas feeding ground is critical if wild salmon stocks are not to be impacted. The development of resistance to chemical treatment of sea lice and other fish husbandry problems, such as pancreas disease and amoebic gill disease, are likely to make effective sea lice control even more difficult in future years.*'²⁷

More recently in September 2014, a definitive review of over 300 scientific publications, was published by a team of international scientists from Norway, Scotland and Ireland. It concluded sea lice have negatively impacted wild salmon and sea trout stocks in salmon farming areas in Ireland, Scotland and Norway.⁴

REFERECES:

1. P.G.Gargan et. al. Evidence for sea lice-induced marine mortality of Atlantic salmon (*Salmo salr*) in western Ireland from experimental releases of ranched smolts treated with emamectin benzoate, *Can. J. Fish Aquat Sci.* 69: 343-353, 2012
2. Krkosek. M et al. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean, *Proc R Soc B Journal*, 2012,
<http://rspb.royalsocietypublishing.org/content/early/2012/11/01/rspb.2012.2359>
3. Ford, J.S. and Myers, R.A. 2008, A global assessment of salmon aquaculture impacts on wild salmonids. *PloSBiol*6 (2): doi:10.1371/journal.pbio.0060033
4. P.G.Gargan et.al. The Relationship between sea lice infestation, sea lice production and sea trout survival in Ireland 1992-2001. In: *Salmon on the Edge* (ed. D.Mills), Blackwell Science, Oxford.
5. Shephard, S, Gargan, P 2017. Quantifying the contribution of sea lice from aquaculture to declining annual returns in a wild Atlantic salmon population. *Aquacult Environ Interact*: Vol. 9: 181–192, 2017
6. Thorstad, E.B. & Finstad, B. 2018. Impacts of salmon lice emanating from salmon farms on wild Atlantic salmon and sea trout. *NINA Report* 1449: 1-22.
7. Thorstad EB et al 2014 Effects of salmon lice on sea trout a literature review , *NINA REPORT* 1044, Sept 2014.
8. Costello MJ 2009 *Proc. R. Soc. B* (2009) 276, 3385–3394
9. Fisheries Research Centre, Abbotstown (1995) Report to the Minister of the Marine, Sea Trout Working Group 1994. Published by The Stationary Office, Dublin.
10. SARF, 2005, SARF005 - Site Optimisation for Aquaculture Operations,<http://www.sarf.org.uk/Project%20Final%20Reports/SARF005%20-%20Final%20Report.pdf>).
11. The Irish Seafood National Programme 2007-2013; Published by 2007-2013 National Development Plan, 2010.
12. Marine Institute (2011) National Survey of Sea Lice (*Lepeophtherirus salmonis* Kroyer and *Caligus elongatus* Nordmann) on fish farms in Ireland 2010
13. Marine Institute (2012) National Survey of Sea Lice (*Lepeophtherirus salmonis* Kroyer and *Caligus elongatus* Nordmann) on fish farms in Ireland 2011
14. Marine Institute (2012) Monthly Sea Lice Report – January to November 2012.
15. Jansen.P.A et al. Sea lice as a density-dependent constraint to salmonid farming, *Proc. R. Soc B* (2012), 279, 2330-2338
16. Commission of Inquiry into the decline of the Sockeye Salmon in the Frazer River, The uncertain future of the Frazer River Sockeye, October 2012.
<http://www.cohencommission.ca/en/FinalReport/>
17. Jackson D., Cotter D., ÓMaoiléidigh N., O'Donohoe P., White J., Kane F., Kelly S., McDermott T., McEvoy S., Drumm A., Cullen A. & Rogan, G. (2011a) An evaluation of the impact of early infestation with the salmon louse *Lepeophtherirus salmonis* on the subsequent survival of outwardly migrating Atlantic salmon, *Salmo salar* L., smolts. *Aquaculture* 320, 159-163.
18. Jackson D., Cotter D., ÓMaoiléidigh N., O'Donohoe P., White J., Kane F., Kelly S., McDermott T., McEvoy, S., Drumm, A. & Cullen A. (2011b) Impact of early infestation with the salmon louse *Lepeophtherirus salmonis* on the subsequent survival of outwardly migrating Atlantic salmon smolts from a number of rivers on Ireland's south and west coasts. *Aquaculture* 319, 37-40.
19. Jackson D., Cotter D., Newell J., McEvoy S., O'Donohoe P., Kane F., McDermott T., Kelly S., & Drumm, A. (2013) Impact of *Lepeophtherirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality. *Journal of Fish Diseases* doi:10.1111/jfd.12054.
20. Written answers, Thursday, 26 April 2012, Department of Agriculture, Marine and Food, Aquaculture Development. <http://www.kildarestreet.com/wrans/?id=2012-04-26.1432.0&s=sea+lice#g1434.0.r>
21. House of the Oireachtas. Our Ocean Wealth: Discussion with Bord Iascaigh Mhara, Joint Committee on Communications, Natural Resources and Agriculture Debate, Thursday, 26 April 2012. <http://debates.oireachtas.ie/AGJ/2012/04/26/00003.asp>

22. Don't blame fish farms for wild salmon decline, Fish News EU, 18 May 2012. Don't blame fish farms for wild salmon decline, Fish News EU, 18 May 2012
23. Letter from Mark Costello to Minister Coveney, 10 May 2013
<http://bantryblog.wordpress.com/2013/05/13/fie-press-release-13-may-2013-world-expert-warns-minster-on-sea-lice-cites-recent-incorrect-information-in-the-media/>.
24. Wild Salmon Survival in the Balance – 1% may be the Crucial Tipping Point, Statement by Inland Fisheries Ireland, 2 Feb 2013, <http://www.fisheriesireland.ie/Press-releases/wild-salmon-survival-in-the-balance-1-may-be-the-crucial-tipping-point.html>
25. Association of Salmon Fishery Boards, Statement on Sea Lice, 3 Feb 2013,
<http://www.asfb.org.uk/asfb-statement-on-sea-lice/>
26. M Krkosek, C W Revie, B Finstad and CD Todd; (2013) Comment on Jackson *et al.* 'Impact of *Lepeophtheirus salmonis* infestations on migrating Atlantic salmon, *Salmo salar* L., at eight locations in Ireland with an analysis of lice-induced marine mortality', Published in Journal of Fish Disease, doi: 10.1111/jfd.12157.
27. New Study highlights 34% loss in wild salmon numbers from Sea Lice, Statement by Inland Fisheries Ireland, 16 August 2013. <http://www.fisheriesireland.ie/Press-releases/new-study-highlights-34-loss-in-wild-salmon-numbers-from-sea-lice.html>