**Rhidorroch Estate**
**Ullapool**
**Wester Ross**
**IV26 2UB**
**Scotland**

Wester Ross Area Salmon Fishery Board
c/o Wester Ross Fisheries Trust Office
Harbour Centre
Gairloch
Ross-shire
IV21 2BQ

27th April 2013

Dear WRASFB members and river owners in Wester Ross,

**Why the 'Managing Interactions Aquaculture Project' must be opposed**

Further to my letter dated 14 January 2013 detailing "Reasons for WRASFB to withdraw support for MIAP", please find enclosed below further information in support of my proposal that that WRASFB withdraw immediately from the Managing Interactions Aquaculture Project (MIAP). Please consider the following a resolution to vote on during the WRASFB meeting on Tuesday (30 April):

**Resolved: That the WRASFB withdraw support from MIAP and write to RAFTS explaining the reasons for withdrawal**

In summary, WRASFB should withdraw support from MIAP for the following reasons:

**1) Sea lice infestation is already killing wild fish in Wester Ross**

**2) MIAP ignores scientific research on sea lice impacts**

**3) MIAP is NOT supported by Scottish Natural Heritage, Lochaber Fisheries Trust or Lochaber District Salmon Fishery Board**

**4) Genetic pollution is already pushing wild salmon to the brink of extinction**

**5) ALL rivers in Wester Ross (and across Scotland) deserve protection**

**6) Lack of consultation and transparency**

**7) Sea lice resistance to chemicals and chemical pollution**

Based upon all the scientific evidence and sea lice data, the only logical policy is to advocate for a blanket ban on salmon farms across the West coast of Scotland. Rather than supporting MIAP (whose partners including RAFTS and ASFB "recognises the permanence and economic importance of the aquaculture industry to Scotland and the West Coast of Scotland in particular"), WRASFB should adopt a zero tolerance approach to open net cage salmon farming in Wester Ross.

Faced with increasing sea lice burdens on wild fish stocks, surely the WRASFB should be opposing ALL new salmon farms and campaigning for the removal of ALL existing salmon farms?

A new salmon in Wester Ross was given the go-ahead by the Scottish Government in Loch Kishorn just this month – as reported on 9 April by the Press & Journal – despite complaints that "an increase in fish farms in the loch could pose a risk to wild fish" and after being originally turned down by Highland Council:

# Wester Ross fish farm has go-ahead

PJ 9.4.13

A Wester Ross fish farm turned down by Highland Council got the go-ahead from the Scottish Government yesterday.

Scottish Sea Farms (SSF) appealed to the government planning department after the council rejected plans for an Atlantic salmon fish farm covering 81 acres on the north shore of Loch Kishorn.

Government reporter Janet McNair upheld the firm's objection and passed the £2million development, comprising 16 cages, 82ft in diameter. They will be moored in two lines at the bay of Airigh-Drishaig, three miles from Plockton.

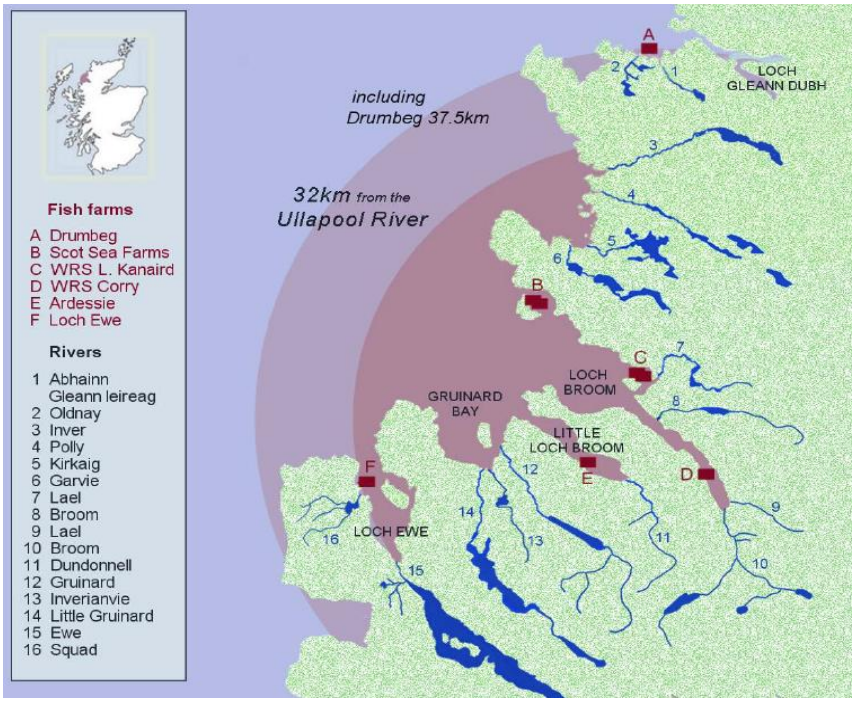
She said: "I accept the proposal would reduce the quality of recreational experience of the shore at Airigh-Drishaig, and deter some users. However ... I consider that the proposal's overall benefits would outweigh its localised adverse effects."

She said any detrimental impacts were not significant enough to conflict with the development plan policies.

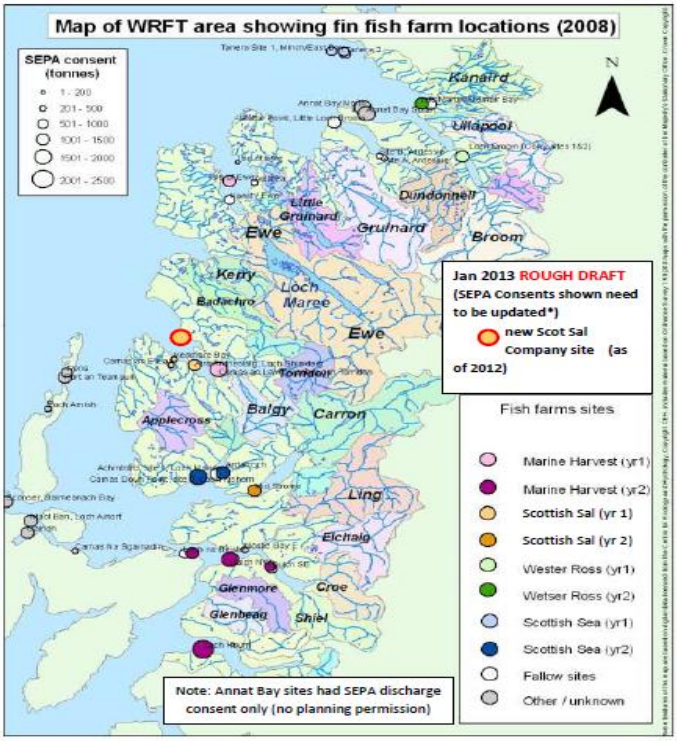
Objections to the application included that noise and lights from the development could deter boats from anchoring in the area and the local fisheries trust claiming an increase in fish farms in the loch could pose a risk to wild fish.

How can the WRASFB honestly say there is a 'safe' place to farm salmon in inshore waters? Even the Scottish Government admitted in a paper published in February 2013 that sea trout are impacted by sea lice up to 149km away from salmon farms with a distance of 31km considered a 'critical level'. In the case of the Ullapool

River, there are already five salmon farms within 32km with a sixth farm located within 37.5km:




If the WRASFB performed a similar mapping exercise on other rivers in Wester Ross, most rivers would have at least half a dozen salmon farms located within 32km. If the zone of impact was taken as 149km there would be dozens of salmon farms impacting the wild smolts leaving the Ullapool River as well as other rivers in Wester Ross. Wild fish in Wester Ross are already strangled by a hangman's noose of salmon farms!



Rather than supporting MIAP the WRASFB should surely be conducting further research on sea lice infestation rates near salmon farms, chemical resistance as well as demanding the immediate closure of salmon farms within 31km of rivers. The scientific evidence and current state of sea lice infestation on salmon farms in Wester Ross demands it. Please see more information in the Appendix.

In conclusion, I concur with Jon Gibb (Clerk of the Lochaber District Salmon Fishery Board) who wrote in April 2012:

"I really think that as many owners as possible should be made aware of this, especially smaller rivers for obvious reasons. I have let all 68 of the Lochaber proprietors know – there was utter disbelief at the Board meeting a fortnight ago when I raised it. However, in Lochaber we are heartened that the Lochaber Trust have refused to be part of it. Other Trusts should do the same if they have any conscience whatsoever. That would make it dead in the water. Andrew [Wallace] and Callum Sinclair are of course trying to maintain that this river ranking is just one aspect of the locational guidance but, as Diane [Baum] at Lochaber Trust says privately to me, although the list may be embedded in wider data about locations it will be seen as the most important part and once you have identified some 'expendable' rivers there is no going back."

It is becoming abundantly clear that MIAP has been designed by the Scottish Government as a Trojan Horse to attack wild salmon and force the expansion of salmon farming on the West coast of Scotland. Please send the signal that WRASFB will not stand idly by as the Scottish Government manipulates MIAP to further Alex Salmond's own agenda of increasing salmon farming production by 50% by 2020.

For further background and unanswered questions on MIAP please read a letter sent to RAFTS in February 2013 (read online here).

At the last WRASFB meeting in January 2013, a vote on MIAP was deferred. Please therefore re-consider my proposal to withdraw from MIAP immediately. Another deferral is tantamount to continued support for MIAP and signing a death warrant for wild salmon and sea trout in Wester Ross. The only sensible course of action is to pull out of MIAP now.

As I stated in my letter of January 2013: "Please note that if WRASFB do not immediately withdraw support for MIAP I will be seeking advice from my solicitor with a view to legal action. I have a duty to protect the River Ullapool and I would hope that other WRASFB board members are willing to do the same. I will not sit idly by as the River Ullapool along with ALL the other rivers in Wester Ross is simply not expendable."

In the spirit of transparency, please forward this letter to all board members and river owners in the Wester Ross area. As the statutory body responsible for salmon

and sea trout fisheries in the area extending from the River Kanaird in the north to the River Applecross in the south, the WRASFB has a duty to consult with all fishery interests (all the more so in the case of MIAP which is a publicly-funded project).

I've also copied this letter to WRFT trustees and hope that WTFT also pulls out MIAP. In Lochaber region, the LDSFB never supported MIAP and LFT withdrew their support from MIAP in January 2013. The WRASFB must now follow the lead of Lochaber Fisheries Trust and write to RAFTS withdrawing support for MIAP.

Yours faithfully,

Jenny Scobie, Rhidorroch Estate, Ullapool

**Appendix: Reasons for WRASFB to withdraw support for MIAP**

**1) Sea lice infestation is already killing wild fish in Wester Ross**

Earlier this month, the WRASFB wrote to Marine Scotland following reports of high sea lice counts on salmon farm sites operated by Wester Ross Salmon. Marine Scotland is scheduled to visit Wester Ross Salmon farms soon as part of their routine inspections. Previous inspections in 2009 and 2011 showed breaches of sea lice limits at Ardmair, Corry and Ardessie. The following information was compiled by Guy Linley-Adams based upon FOI data obtained from Marine Scotland:

## Loch Broom and Little Loch Broom

### *Summary of inspections by fish health inspectorate*

**Ardmair**

The Fish Health Inspectorate inspected Wester Ross Fisheries' Ardmair farm on 10th November 2009 and recorded that adult female sea lice counts were above the suggested threshold in the Code of Good Practice (CoGP).

Subsequent inspection of Ardmair, on 15th June 2011, also recorded that sea lice levels were above CoGP thresholds, with the site manager reporting that Alphamax treatments were not as effective as in the past.

A further inspection on 2nd August 2011 recorded that before an Alphamax treatment on 28th July, adult female lice levels were at 8.4 per fish, reducing to 6.7 the day after the treatment, but still way over the CoGP thresholds.

During 2011, the farm had also treated with Slice in May and July, which does not therefore appear to have controlled lice levels.

**Corry**

The Fish Health Inspectorate inspected the Corry farm on 21st March 2011 and reported "high lice loads observed in stocks especially the 2009 stocks (2 to 3 adult lice per fish), lice records showed lice numbers rising since February 2011".

The site representative at Corry reported that, this time, Salmosan treatments were becoming less effective than in the past, suggesting resistance.

A subsequent inspection of the same farm on 6th June 2011 showed that sea-lice counts conducted on 3rd June 2011 were still above the suggested threshold of the CoGP.

**Ardessie**

On 7th June 2011, the Ardessie farm was inspected and the inspectors recorded that lice levels on the fish recently delivered from Corry still appeared to be above the suggested threshold in the CoGP during the period for which records were inspected.

Repeat inspection on 2nd August 2011 showed that the farm had reported that Slice appeared to have reduced efficacy and that the "sea lice record indicates that whilst treatments have reduced lice loads, recorded numbers are still above suggested threshold".

Read the report in full online here and read all the FOI data obtained by the Salmon & Trout Association via "Sea-lice parasite numbers above industry's own 'threshold' level at over 30% of Scottish salmon farms inspected in second half of 2011".

Marine Harvest's 2012 Annual Report (published on 26 April 2013) reveals that Marine Harvest Scotland is breaching the sea lice trigger levels at 15.1% of their sites (i.e. one in seven) – up from 9.8% in 2010 and 11.7% in 2011.

2012 marineharvest ANNUAL REPORT

AVERAGE MONTHLY % OF SITES ABOVE NATIONAL TRIGGER LEVELS PER BU PER YEAR

| BU/YEAR | 2010 | 2011 | 2012 |
|---|---|---|---|
| Norway | 15.2 | 7.5 | 8.3 |
| Scotland | 9.8 | 11.7 | 15.1 |
| Ireland | 6.2 | 13 | 19.9 |
| Faroes | 6.2 | 15.8 | 7.6 |
| Canada | 5.5 | 1.5 | 5.5 |
| Chile | 4.8 | 14.1 | 23.7 |
| MHG average | 8.2 | 11.9 | 12.2 |

Marine Harvest also reports that the use of chemicals to control sea lice is increasing to alarming levels (indicating problems with chemical resistance and so-called 'super-lice'):

2012 marineharvest ANNUAL REPORT

ACTIVE SUBSTANCE GRAMS PER TONNE
BIOMASS PRODUCED 2008 - 2012 LICE TREATMENT

| | ORAL (g/T) | TOPICAL (g/T) | PEROXIDE (LTR/T) |
|---|---|---|---|
| 2008 | 0.83 | 0.26 | 0.91 |
| 2009 | 4.09 | 1.42 | 0.76 |
| 2010 | 1.10 | 2.06 | 5.13 |
| 2011 | 3.52 | 2.01 | 2.83 |
| 2012 | 0.75 | 4.79 | 10.85 |

The latest regional sea lice data published by the Scottish Salmon Producers' Organisation details significant breaches of lice thresholds across Scotland – including a 263% breach in North Mainland region which includes 41 active salmon farms (including all Wester Ross sites).

## North Mainland

### September to December 2012

The North Mainland region encompasses the coastline (and associated islands) from Loch Eriboll in the north to Rubh' Arisaig, near Loch nan Ceall on the west coast.

The region accounts for approximately 18% of all Scottish farmed salmon production[1] and contains 41 active farming sites[2]. During the present reporting period 36 of these active sites were stocked with fish, with the remaining sites being left fallow as part of an established and pre-determined production plan.


**Sea Lice & Area Management**

The SSPO manage a dedicated system that has been specifically designed to assist the industry, through the generation and exchange of information on fish health management across Scotland. Information gathered through the application of the system indicates that, during the present reporting period lice numbers across the North Mainland region were, on average, 263% above the suggested lice treatment threshold set out in the NTS and CoGP (*i.e.* 1.0 adult female lice per fish). Similar to all areas of Scotland, various lice management practices are adopted throughout the North Mainland region, some examples of which are given below:

During 2011, high sea lice levels were reported at salmon farms across Scotland: with North Mainland region breaching the thresholds by 149% in July 2011.

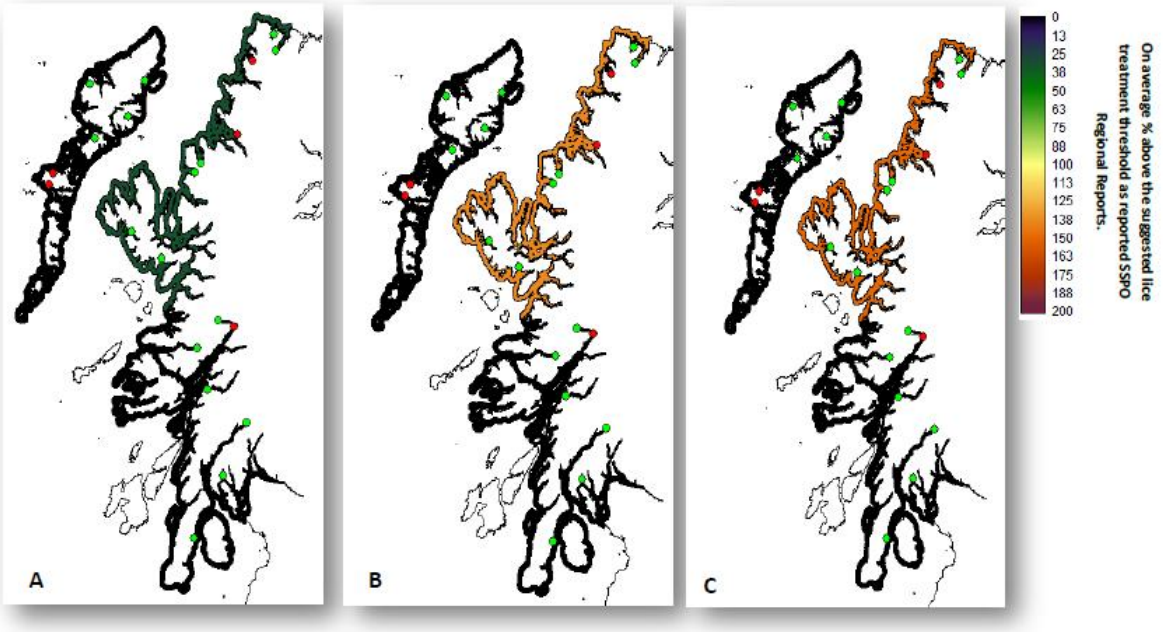



Figure 24: Map layers representing the reported farm sea lice levels in relation to the CoGP and NTS threshold levels. 0 indicates for that period on average the region is below the threshold level. The green dots indicate wild monitoring sites which did not exceed one of predetermined explored determinant threshold levels. In comparison the red dots indicate wild monitoring sites that did exceed one or more of the predetermined explored determinant threshold levels.

During 2012, sea lice levels on Scottish salmon farms continued to be a problem. RAFTS reported in January 2013:

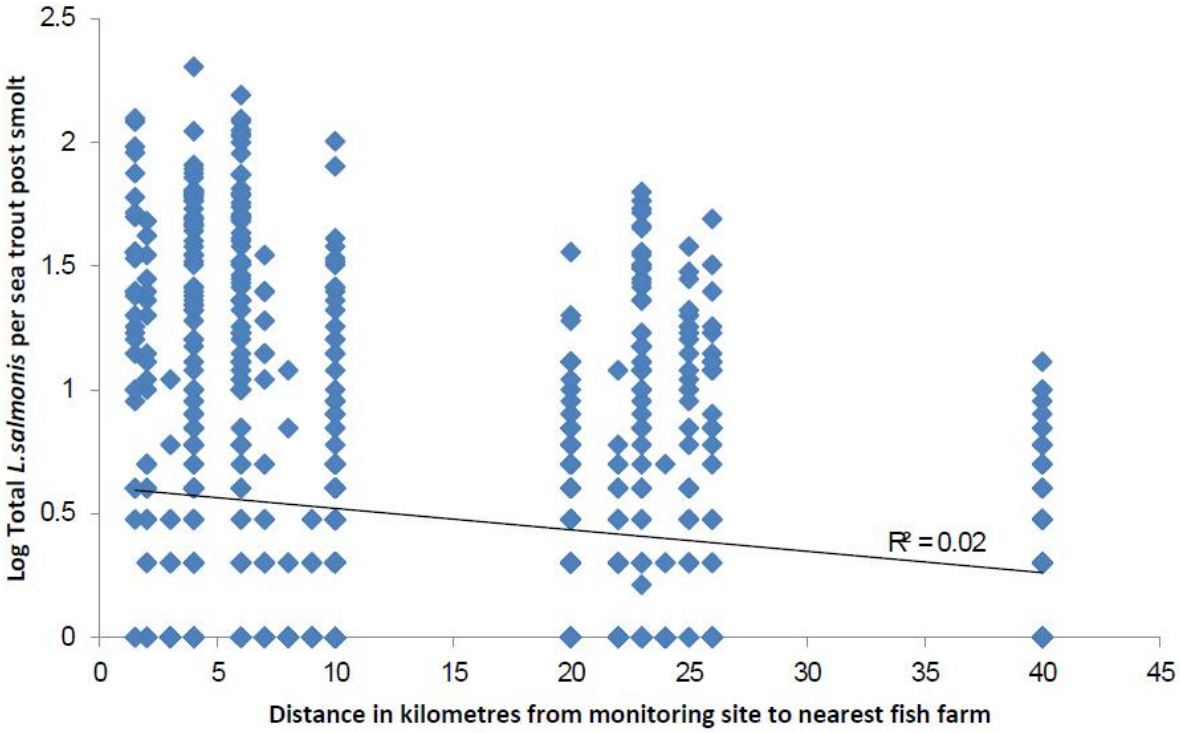
The SSPO reports indicate that in the period of May 2012 the Western Isles had lice numbers across these the region, on average, remained below the suggested lice treatment threshold set out in the National Treatment Strategy for the Control of Sea Lice on Scottish Salmon Farms (NTS) and the Code of Good Practice (CoGP). However, the North Mainland and South Mainland, lice numbers across this region were, on average, 152% and 70% respectively above the suggested treatment threshold set out in the NTS and CoGP (Figure 21A). In June 2012 the SSPO reports indicate that again the Western Isles, lice numbers across this region, on average, remained below the suggested lice treatment threshold set out in the NTS and CoGP. Whilst in the North Mainland and South Mainland regions the lice numbers across this region, on average, which were 458% and 22% respectively above the suggested lice treatment threshold set out in the NTS and CoGP (Figure 21B). Finally in July 2012 the SSPO reports indicated that the Western Isles and the South Mainland, lice numbers across these two regions, on average, remained below the suggested lice treatment threshold set out in the NTS and CoGP. Whilst the North Mainland during July, lice numbers were, on average, 233% above the suggested lice treatment threshold set out in the NTS and CoGP (Figure 21C).


Figure 21: Map layers representing the reported farm sea lice levels in relation to the CoGP and NTS threshold levels in 2012. 0 indicates for that period on average the region is below the threshold level. The green dots indicate wild monitoring sites which did not exceed one of predetermined explored determinant threshold levels in 2012. In comparison the red dots indicate wild monitoring sites that did exceed one or more of the explored threshold levels in 2012.

Sea lice data obtained in February 2013 via FOI also details infestation of wild salmon and sea trout across Scotland: infestation levels of up to 145 sea lice per fish were recorded in Shieldaig in Wester Ross in 2012 and a staggering 1001 sea lice on a salmon sampled in Kanaird in Wester Ross in 2008. Out of over 11,000 wild salmon and sea trout sampled since 1997 there were 2,750 fish with 10 or more sea lice; 913 fish with 50 or more sea lice and 367 fish with 100 or more sea lice. By far the worst area was Dundonnell in Wester Ross which reported 40 out of the top 50 infestation rates (read the sea lice data in full online here).

A RAFTS report published in January 2013 detailed increased sea lice infestation levels on wild sea trout during 2012 compared to 2011. The report referred to an "increasing infestation pattern" and "detrimental lice loads above critical thresholds" with five monitoring sites experiencing extensive heavy sea lice infestations (epizootics).

Another RAFTS report - Managing Interactions Aquaculture Project: Sea Trout Post Smolt Monitoring Project Regional Report 2011 – published in April 2012 showed high levels of sea lice infestation of sea trout sampled in the vicinity of salmon farms. Infestation levels of up to 130 sea lice per sea trout were recorded at Camas na Gaul; up to 126 sea lice per sea trout at Laxford and up to 120 sea lice per sea trout at Kanaird. Sea lice infestation was reported over 40 km away from the nearest salmon farm:




Scottish Government research published in February 2013 revealed that sea lice from salmon farms impact wild sea trout up to 149km away with 31km away considered a 'critical level'.

Fisheries Management and Ecology

*Fisheries Management and Ecology*, 2013, 20, 68–74

# Relationship between sea lice levels on sea trout and fish farm activity in western Scotland

S. J. MIDDLEMAS

*Marine Scotland Science Freshwater Fisheries Laboratory, Pitlochry, UK*

R. J. FRYER & D. TULETT

*Marine Scotland Science Marine Laboratory, Aberdeen, UK*

J. D. ARMSTRONG

*Marine Scotland Science Freshwater Fisheries Laboratory, Pitlochry, UK*

**Abstract** The relationship between aquaculture and infestations of sea lice on sea trout, *Salmo trutta* L., is controversial. Here, the association between sea lice infestations on wild sea trout and characteristics of local Atlantic salmon, *Salmo salar* L., farms were investigated using data collected on the Scottish west coast. The proportion of sea trout with louse burdens above a critical level was positively related to the fork length of the sea trout and the mean weight of salmon on the nearest fish farm, and negatively related to the distance to that farm. The distance to the nearest fish farm did not influence the probability of infestations above the critical level beyond 31 km although there was considerable uncertainty around this cut-off distance (95% limits: 13–149 km). The results support a link between Atlantic salmon farms and sea lice burdens on sea trout in the west of Scotland and provide the type of information required for marine spatial planning.

The scientific paper further stated:

> The maximum range of effect of lice from farms predicted by the critical threshold model is about 31 km (range 13–149 km), and the intensity of infection falls progressively within this range (Fig. 3). The estimate is similar to that reported by Gargan *et al.* (2003) with reference to bays in Ireland and matches the distribution presented graphically by Butler and Watt (2003). The distance over which any effect can be detected will be due to a combination of both dispersal of lice from the farms and movement of trout. Available data suggest that many sea trout remain close to their source river (within 6 km) during their first weeks at sea, although some individuals disperse more rapidly (Pemberton 1976; Thorstad *et al.* 2007; Middlemas *et al.* 2009).

Furthermore, the paper stated:

> While the pattern of decreasing probability of sea trout having lice levels over the critical threshold with distance to farm is highly significant, there is considerable uncertainty around the fitted values. This uncertainty is due to a number of factors, including the effect of averaging across sites, which does not take account of local differences in salinity and currents; it has been shown from Norway that incorporation of currents gives a much better description of risk of Pancreas Disease than does distance (Viljugrein *et al.* 2009). However, the main cause of the uncertainty in fitted values is the uncertainty in the estimate of $\delta$, which is itself due to the low number of sites sampled at larger distances. The data analysed in this study were originally collected to support discrete local investigations into sea lice infestation of sea trout rather than as a larger-scale strategic investigation of the problem, which here relies on *post hoc* best-fit to available information rather than use of a well-structured experimental design. To overcome this issue, a range of sites at increased distances from farms would need to be sampled. In the Scottish context, this would involve sampling on the Ayrshire coast, the north coast or on some of the remoter parts on the west coast.

Until such research has been conducted, the precautionary principle dictates that 149km is the zone of effect or 'end point'.

Even the Scottish Government's own scientific advisers – Marine Scotland Science – concede the scale of the problem in a review report (obtained via FOI in March 2013).

*Marine Scotland Science 20/02/2013*

**Summary of information relating to impacts of sea lice from fish farms on Scottish sea trout and salmon.**

Sea lice infest both farmed and wild salmonids to the potential detriment of aquaculture and angling interests. Several reviews have recently considered information concerning interactions between salmon farms and wild salmonids (e.g. Revie *et al.* 2009; Costello 2009; Whelan, 2010). Here, the evidence available to assess the likelihood and scale of impact of sea lice from salmon farms on Scottish wild salmonids is summarised. The aim is not to repeat extensive review but to focus on key issues relevant to locating fish farms in the Scottish coastal zone.

**Are salmon farms a significant source of lice?**
Yes, salmon farms have been shown to be a more important contributor than wild fish to the total lice in the environment (Penston & Davies, 2009; Revie et al., 2009).

**Is there an association between levels of lice on salmon farms and in the surrounding environment?**
Yes, there is a strong correlation between levels of lice on fish farms and in the local environment (Penston et al., 2008).

**Is there an association between levels of lice on salmon farms and on sea trout?**
Yes, stage of farm cycle relates to level of lice infestation on sea trout with higher levels of infestation during the second year of production (Butler 2002; Hatton-Ellis *et al.* 2006; Middlemas *et al.* 2010), when lice numbers are known to be greater on farms (Revie *et al.* 2002; Lees *et al.* 2008). Examination of data collected throughout the West Coast during 2003-2009 showed that the proportion of individual sea trout with louse burdens above a level known to cause major physiological stress increased with the mean weight of salmon on the nearest fish farm (a measure of where they are in their production cycle), and decreased with distance from that farm (Middlemas *et al.* in press).

**Is there an effect of sea lice on wild trout at the individual level?**
Yes, individual wild trout sampled on the west coast of Scotland have been shown to have infestations above a level known to cause major physiological stress (Well *et al.* 2006; Middlemas *et al.* 2010, in press).

The Marine Scotland Science report – dated February 2013 – concluded:

**SUMMARY**

Scientific evidence from Norway and Ireland indicates a detrimental effect of sea lice on sea trout and salmon populations. There is increasing scientific evidence that this is also the case for sea trout in Scotland although scientific studies investigating the case for Scottish salmon are lacking. Salmon aquaculture results in elevated numbers of sea lice in open water and hence is likely to have an adverse effect on populations of wild salmonids in some circumstances. The magnitude of any such impact in relation to overall mortality levels is not known. However, concerns that there may be a significant impact of aquaculture have been raised due to declines in catches of both salmon and sea trout on the Scottish west coast.

The report cited the following scientific references:



**References**


Amundrud, T.L. & Murray, A.G. 2009 Modelling sea lice dispersion under varying environmental forcing in a Scottish sea loch. *Journal of Fish Diseases* **32**, 27-44.

Butler, J.R.A. 2002 Wild salmonids and sea louse infestations on the west coast of Scotland: sources of infection and implications for the management of marine salmon farms. *Pest Management Science* 58, 595-608.

Butler JRA & Watt J. 2003. Assessing and managing the impacts of marine salmon farms on wild Atlantic salmon in western Scotland: identifying priority rivers for conservation. Pp. 93-118 in: Mills D (ed.). *Salmon at the Edge*. Blackwell Science, Oxford.

Costello, M.J. 2009 How sea lice from salmon farms may cause wild salmonid declines in Europe and North America and be a threat to fishes elsewhere. *Proc. R. Soc. B* **276**, 3385–3394 .

Ford, J. S., & Myers, R. A. 2008. A global assessment of salmon aquaculture impacts on wild salmonids. PLoS biology, 6(2), e33..

Gillibrand P.A. & Willis K.J. 2007 Dispersal of sea louse larvae from salmon farms: modelling the influence of environmental conditions and larval behaviour. *Aquatic Biology* **1**, 63–85, doi: 10.3354/ab00006.

Hatton-Ellis, M., Hay, D., Walker, A.F. & Northcott, S.J. 2006 Sea lice *Lepeophtheirus salmonis* infestations of post-smolt sea trout in Loch Shieldaig, Wester Ross, 1999–2003. In: *Sea Trout: Biology, Conservation and Management* (ed. by G.S. Harris & N.J. Milner), pp. 372–376. Blackwell Publishing, Oxford.

Krkosek, M., C. Revie, P. Gargan, O. Skilbrei, B. Finstad, & C. Todd. In press. Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean. Proceedings of the Royal Society B.

Lees F., Gettinby, G. & Revie, C.W. 2008 Changes in epidemiological patterns of sea lice infestation on farmed Atlantic salmon (*Salmo salar* L) in Scotland between 1996 and 2006. *Journal of Fish Diseases* **31**, 251-262

Middlemas, S. J., RaffelL, J.A., Hay, D.W., Hatton-Ellis, M. and Armstrong, J.D. 2010 Temporal and spatial patterns of sea lice levels on sea trout in western Scotland in relation to fish farm production cycles. *Biology Letters* **6**, 548–551

Middlemas, S.J., Fryer, R.J., Tulett, D. & Armstrong, J.D. in press Relationship between sea lice levels on sea trout and fish farm activity in western Scotland. *Fisheries Management & Ecology*.

Penston, M.J. and Davies, I.M. 2009 An assessment of salmon farms and wild salmonids as sources of *Lepeophtheirus salmonis* (Krøyer) copepodids in the water column in Loch Torridon, Scotland. *Journal of Fish Diseases* **32**, 75-88.

Penston, M.J., Millar, C.P., Zuur, A. & Davies, I.M. (2008) Spatial and temporal distribution of *Lepeophtheirus salmonis* (Krøyer) larvae in a sea loch containing Atlantic salmon, *Salmo salar* L., farms on the north-west coast of Scotland. *J. Fish Dis.* **31**, 361-371.

Revie C.W., Gettinby G., Treasurer J.W., Rae G.H. & Clark N. (2002) Temporal, environmental and management factors influencing the epidemiological patterns of sea lice (*Lepeophtheirus salmonis*) infestations on farmed Atlantic salmon (*Salmo salar* L.) in Scotland. *Pest Management Science* **58**, 576–584.

Revie, C., Dill, L., Finstad, B., and C.D. Todd. 2009 "Salmon Aquaculture Dialogue Working Group Report on Sea Lice" commissioned by the Salmon Aquaculture Dialogue available at http://wwf.worldwildlife.org/site/PageNavigator/SalmonSOIForm.

Whelan, K. 2010 *A Review of the Impacts of the Salmon Louse*, Lepeophtheirus salmonis *(Krøyer, 1837) on Wild Salmonids*. Atlantic Salmon Trust, Perth.

Vøllestad, L. A. *et al.* 2009 Divergent trends in anadromous salmonid populations in Norwegian and Scottish rivers. *Proc. Roy. Soc. B* **276**, 1021-1027.


One of the scientific papers cited by Marine Scotland Science was published online in November 2012 by the Royal Society. The paper - "Impact of parasites on salmon recruitment in the Northeast Atlantic Ocean" – showed that "between 18% and 55% of adult salmon in the Northeast Atlantic Ocean are lost to parasites each year". The authors (including Professor Christopher Todd from the University of St. Andrews) concluded:

It is rare to identify and quantify the factors that affect population dynamics of marine fishes [15] as well as the role of infectious disease in conservation [59]. Our results indicate that parasite-associated mortality may cause the closure of some fisheries when conservation targets of return adult abundances are not being met. However, the implications of our results may be most acute for small populations in small river systems. Due largely to the fidelity to their natal rivers, populations of Atlantic salmon typically show substantial genetic structuring and variability that is considered adaptive [60]. Small river systems that support salmon populations of low effective population size [61] will be especially vulnerable. The concern therefore is not only for a 39 per cent loss in salmon abundance, but also the loss of genetic variability and its associated potential for adaptation to other environmental changes. More broadly, and in contrast to the conclusions from two of the original studies [40,46], our results supply manipulative field experimental evidence at a large spatial scale that parasitism may be a significant limiting factor for marine fishes, fisheries and conservation.

Professor Chris Todd stated in a press release from St. Andrews University (7 November 2012):

"This high per cent mortality attributable to sea lice was unexpected. The salmon aquaculture industry has long placed a high priority on controlling sea lice on their captive salmon – but these results do emphasise the need for the industry to not only maintain the health of their own stocks, but also to minimise the risk of cross-infection of wild fish."

**2) MIAP ignores scientific research on sea lice impacts**

Despite the weight of evidence and in particular the scientific research published in February 2013 - undertaken in large part by the Rivers & Trusts of Scotland (RAFTS) – MIAP arbitrarily and wrongly assumes "no risk" beyond 25km. As one of the MIAP reports dated June 2012 (obtained by the Rhidorroch Estate via FOI) states:

To match distance of farm from rivers risk is proposed to vary on the bands below:

- 0-5km = High risk
- 5-15km = Medium Risk
- 15 -25km = Low Risk

For farms >25km from the nearest river it is assumed there is no risk. This end point is required as without it all farms will present a risk to all rivers. However, smolt migration routes (where these are known or can be assumed) will be required in addition to identify situations where a farm distant from a river mouth may still have an influence due to proximity during smolt migration.

When RAFTS (sponsors of MIAP along with the Scottish Government) state that "this end point is required as without it all farms will present a risk to all rivers" what they mean is that if they took 149km as the zone of impact the whole of the Scottish coast would be off-limits to salmon farms. Hence, the 25km end point advocated by RAFTS and by MIAP is based upon political expediency not scientific integrity.

Reading further in the MIAP paper #4 'Proposed Approach to Consider Distance in Locational Tool: Developing an Approach to Include Distance in Sensitivity/Risk Matrix', RAFTS explain how to "generate a risk assessment for each farm which considers both the distance of any farm to any river and also the production of fish from at that site".

To consider the production of the site and relate this to distance the following tonnage bands are proposed for consideration:

- <1000 tonnes = Low Risk
- 1000 – 2000 tonnes = Medium Risk
- >2000 tonnes = High Risk

These bandings would combine in **Table 1** below to generate a risk assessment for each farm which considers both the distance of any farm to any river and also the production of fish from at that site.

**Table 1: Combined Aquaculture Risk Matrix Considering Distance from River and Farm Production**

| Distance (km) and Production (tonnes) | <1000 | 1000 - 2000 | >2000 |
|---|---|---|---|
| 0-5 | High x Low = Medium | High x Medium = High | High x High = High |
| 5-15 | Medium x Low = Low | Medium x Medium = Medium | Medium x High = High |
| 15-25 | Low x Low = Low | Low x Medium = Low | Low x High = Medium |

To give balance to the combined assessment any risk derived from a low risk factor multiplied by medium risk is scored low risk. Any risk from a high risk multiplied by medium is scored high. If either a uniformly conservative or uniformly precautionary approach is adopted the table would change to those below (**Tables 1A** (conservative) and **Table 1B** (precautionary). The approach here should be discussed as either option has consequences for the output derived.

**Table 1A: Combined Aquaculture Risk Matrix Considering Distance from River and Farm Production (Conservative)**

| Distance (km) and Production (tonnes) | <1000 | 1000 - 2000 | >2000 |
|---|---|---|---|
| 0-5 | High x Low = Medium | High x Medium = Medium | High x High = High |
| 5-15 | Medium x Low = Low | Medium x Medium = Medium | Medium x High = Medium |
| 15-25 | Low x Low = Low | Low x Medium = Low | Low x High = Medium |

Read the MIAP document in full online here

Another MIAP paper – "Coastal/Transitional Water Bodies Prioritisation" – obtained by the Rhidorroch Estate via FOI outlines 'acceptable' lice loadings which will be used by RAFTS to "aid with location guidance of fish farm developments":

**2.2.4Criterion:Monitoring Data**

As identified in the RAFTS Regional monitoring report there is currently no guidance on the acceptable proportion of fish exceeding a detrimentalthreshold.There has been a recommendation from the EU project "Sustainable Management of Interactions between Aquaculture and Wild Salmonid":

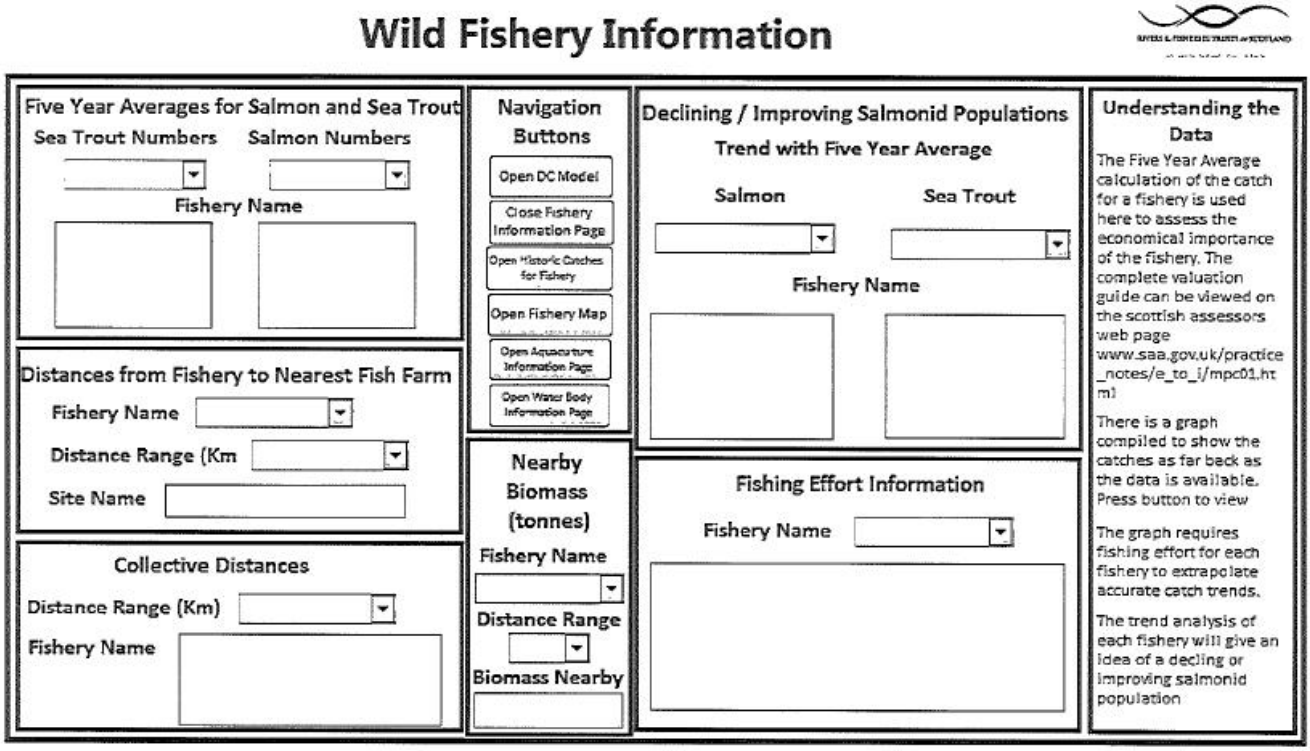
*"that a level of 10% or fewer of wild sea trout in any given population in Ireland bearing total infestations of ≥13 lice • fish-1 should be adopted as indicative of a satisfactory or acceptable lice loading. Within any given sea trout stock, frequencies of heavily-infested juvenile sea trout (i.e. those ≥13 lice • fish-1) >10% should perhaps be considered a cause for concern."* Hazon *et al* (2006)

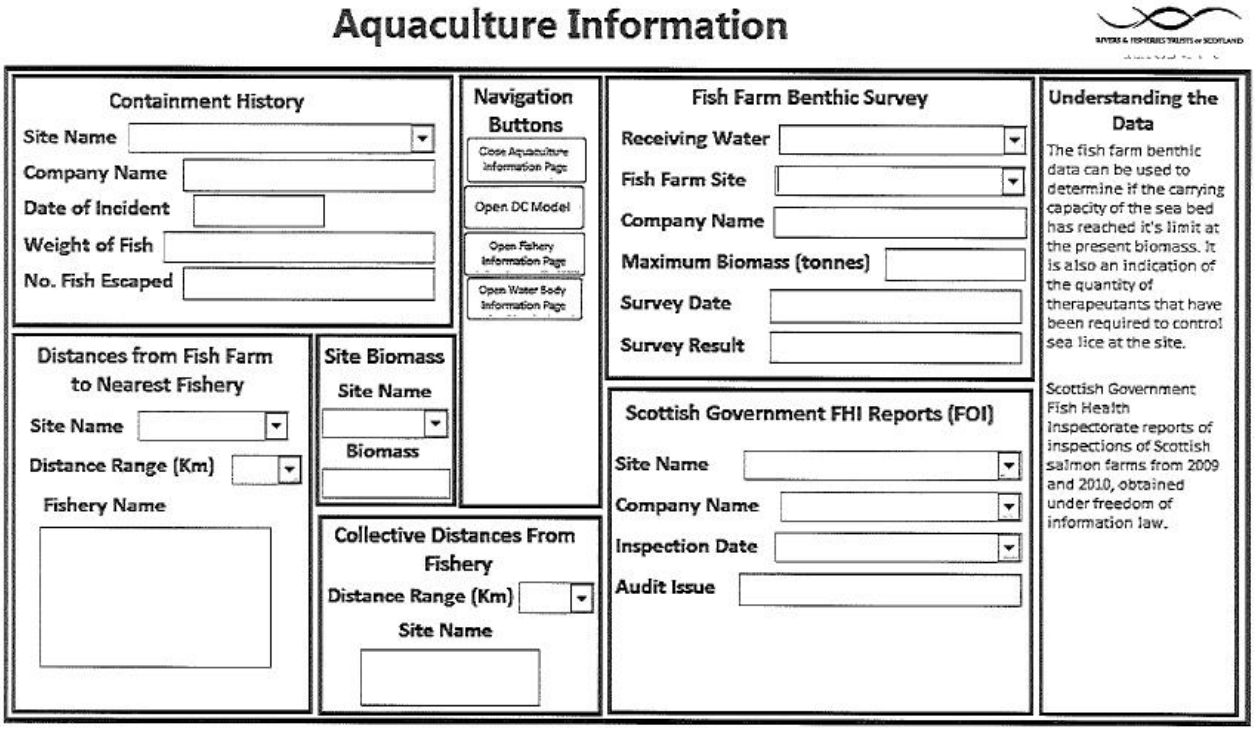
Being able to adopt such an acceptable or unacceptable proportion of lice loadings in Scotland would aid the local management strategies and aid with location guidance of fish farm developments. As such it is proposed to implement the regional monitoring data analysis which determines detrimental sea lice loadings implementing Wells *et al*(2006) thresholds. It is proposed thatthis criterion would be assessed by the scores and weightings in Table 4.

Table 4: Monitoring Data criterion attribute and weighting details.

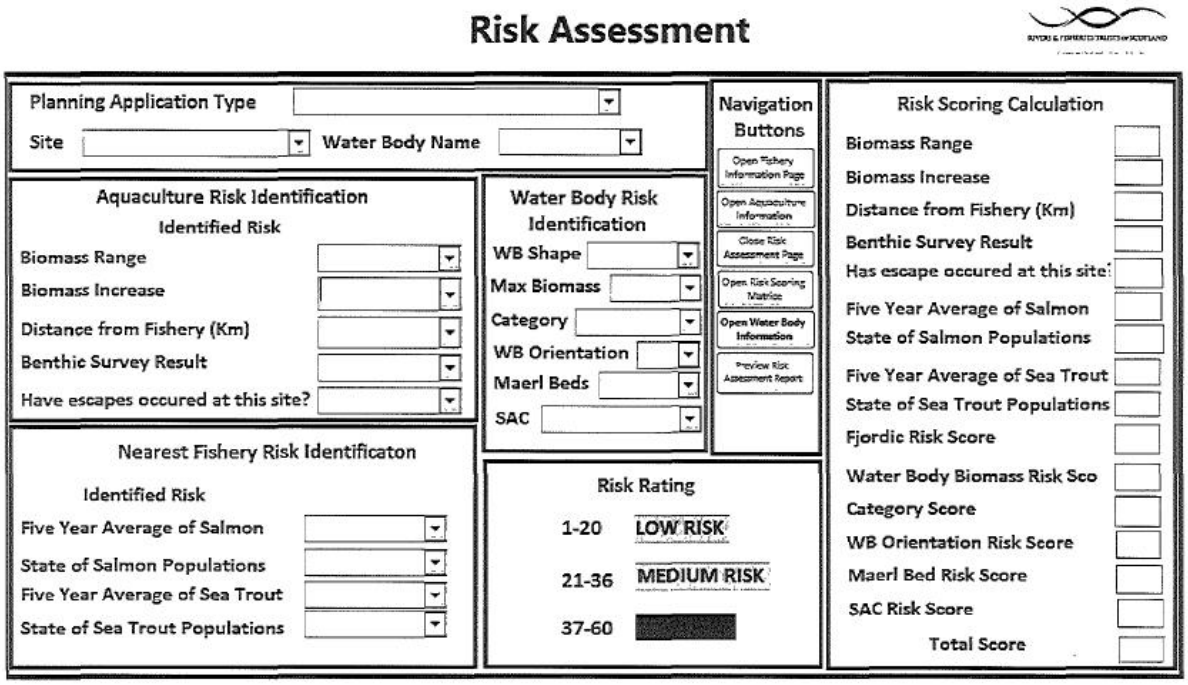
| Water Bodies (Transitional & Coastal) Criterion | Criterion Attributes | Criterion Attributes Score | Criterion Priority Weighting |
|---|---|---|---|
| Monitoring Data Sites | >10% in the past two years | High | To be confirmed |
| | <10% in the past two years | Medium | |
| | ≥0% or No Survey Data | Low | |

Another MIAP document – '[Locational Guidance Briefing Paper]' - circulated by RAFTS (obtained from Scottish Natural Heritage – who has expressed concern at MIAP) details how data on wild fisheries and aquaculture will be presented:



The information will then be used to assess the suitability for new or expanding salmon farms in a 'risk assessment'.

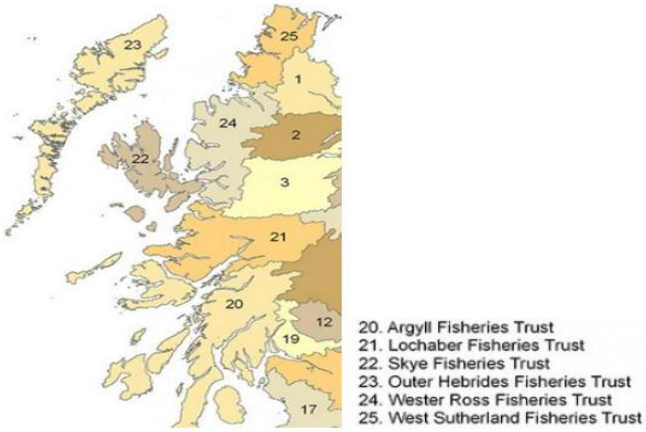



Read in full [online here]

If the WRASFB supports MIAP then you are effectively ignoring peer-reviewed scientific research in order to accommodate the expansion of salmon farming in Wester Ross (a region which is under even more pressure following the decision of both Lochaber Fisheries Trust and Lochaber District Salmon Board NOT to support MIAP – see below for more details). Using the available scientific evidence, Lochaber is not prepared to shoulder any risk at all – so why should WRASFB putits river owners in Wester Ross at risk?

**3) MIAP is NOT supported by Scottish Natural Heritage, Lochaber Fisheries Trust or Lochaber District Salmon Fishery Board**

Now that both Lochaber Fisheries Trust and Lochaber District Salmon Fishery Board do not support MIAP how can the project proceed without information relating to rivers in Lochaber?



Lochaber is one of only six regions on the West coast of Scotland and MIAP will therefore have difficulty functioning without the support of both the Trust and the Fishery Board.

"The Lochaber Fisheries Trust (LFT), which covers one of the most dense fish farming regions in Scotland, said it had refused to co-operate with RAFTS amid fears its research is flawed," reported The Sunday Times (13 January 2013). "Others have accused RAFTS of 'selling-out' to the Scottish government, which wants to increase farmed salmon production after striking a trade deal with the Chinese government. They claim the map will effectively rank Scotland's salmon rivers in order of commercial importance and lead to smaller rivers being sacrificed for aquaculture expansion.....Diane Baum, the LFT's senior biologist, said the trust initially backed the idea of locational guidance to 'help steer fish farms away from the most sensitive areas' but became concerned that the research is not sufficiently robust, in particular because the migration routes of young salmon and the dispersal of sea-lice from farms will not be considered."

Campaigners say the conservation trust, which opposes fish farms, such as this one in Loch Ewe, is leading a government project to help their spread

## Anti-aquaculture body 'aiding fish farm growth'

Mark Macaskill

A CONSERVATION body that opposes aquaculture has been criticised for leading a government-funded project that, critics argue, will aid the expansion of fish farms along the west coast of Scotland.

The Rivers and Fisheries Trusts of Scotland (Rafts) believes fish farms pose a deadly threat to wild salmon and has been handed public money to identify the salmon rivers most at risk from aquaculture. The one-year project is due to finish in March when a "locational guidance" map is due to be handed to ministers.

On Friday, however, the Lochaber Fisheries Trust (LFT), which covers one of the most dense fish farming regions in Scotland, said it had refused to co-operate with Rafts amid fears its research is flawed.

Others have accused Rafts of "selling out" to the Scottish government, which wants to increase farmed salmon production after striking a trade deal with the Chinese government.

They claim the map will effectively rank Scotland's salmon rivers in order of commercial importance and lead to smaller rivers being sacrificed for aquaculture expansion.

Concerns were raised last year when Rafts asked its 25 members to provide data for the project, such as the number of juvenile fish, the fateable values of rivers and fisheries and habitat quality.

Diane Baum, the LFT's senior biologist, said the trust initially backed the idea of locational guidance to "help steer fish farms away from the most sensitive areas" but became concerned that the research is not sufficiently robust, in particular because the migration routes of young salmon and the dispersal of sea-lice from farms will not be considered.

"We agree some areas are more sensitive to fish farming than others and are resigned to the expansion of aquaculture along the west coast," said Baum. "However, wild fish interests are coming under pressure from the Scottish government to assess the risk of fish farms without proper data. In our view, bad data are worse than no data. We have made a decision not to be part of it."

Last week, senior members of Rafts were contacted by The Sunday Times but refused to answer questions about the locational guidance, part of its publicly funded managing interactions aquaculture project (MIAP).

However, in a letter to be published in Trout and Salmon magazine, the body will state: "The assertion that the project is intended to support aquaculture development is offensive and wrong . . . Political support for aquaculture expansion in Scotland is significant. The best option for wild fisheries is to prevent development in important and sensitive locations . . . The locational guidance part of MIAP will help with this."

A document published by Rafts in July 2011 says a big "aspect of [MIAP] is a sensitivity analysis which will result in the production of locational guidance for planning marine aquaculture developments".

However, Jon Gibb, a member of the Lochaber District Salmon Fishery Board, said: "This will effectively rank rivers in order of importance. What on earth are we doing?

"Rafts is, perhaps inadvertantly, supporting the unsustainable expansion of aquaculture in onshore waters and ministers are buying endorsement from the wild fish community — what greater prise is there?"

Don Staniford, an anti-fish-farm campaigner, said: "Instead of being a guard dog for wild salmon, Rafts is rolling over on to its back and having its tummy tickled."

Salmon is Scotland's largest food export, with a global retail value of £1bn. In January 2011, the Scottish and Chinese governments signed a deal to export Scottish salmon to China.

"Wild fish interests are coming increasing pressure from the Scottish Government to assess the risk of fish farms without proper data," said Diane Baum, Lochaber Fisheries Trust's senior biologist, in an interview with The Sunday Times (13 January 2013). "In our view, bad data are worse than no data. We have made a decision not to be part of it."

Following a briefing meeting on MIAP, the clerk of Lochaber District Salmon Fishery Board (Jon Gibb) wrote in an email (16 December 2012) to the board:

"There is a certain amount of irony that a paper has just been published by Marine Scotland Science that has collated all of the Fishery Trusts sea lice monitoring data over the last 10 years. It has concluded that fish farms have an impact of up to 32km

from the farm (this should perhaps also be read in conjunction with peer-reviewed Norwegian/Irish research that also appeared last month that concluded that 39% of salmon smolts are being killed by sea lice in fish farm zones). But concentrating on the first paper which, after all, uses the Trust's own Scottish data, there is a clear evidence-based indication that fish farms should not be located within 32km of any migratory fish system. Very simple. However, when we raised this with RAFTS at the meeting they said that Scottish Government would not accept this as it would block off the whole of the inland of the West Coast (yes, we agreed, which is why the science says they should only farm offshore or on land). Nevertheless, in spite of our protestations Callum Sinclair confirmed that RAFTS intend to carry on with the Locational Model and it will not take into account this figure of 32kms."

In reply, an email dated 18 December 2012 from Callum Sinclair, Director of RAFTS, responded:

"RAFTS is supportive of the movement of aquaculture production offshore and/or to land and/or closed containment. What was observed and discussed at the meeting was that the application of the 32km distance to the west coast of Scotland would effectively, and based upon the indicative map shown using a 25km distance, exclude aquaculture development from all of the west coast. Whilst we may share this objective we pointed out that in our view such an outcome is unrealistic given the current site distribution on the west coast, the farm applications currently being submitted for consideration due to the economic imperatives to increase production due to expanding Chinese markets and than any change or move to offshore, land based or closed containment may take some time."

In the March 2013 issue of Scottish Field magazine, Jon Gibb wrote:

"When Scottish Natural Heritage were asked what would be required to identify suitable locations on the west coast for future fish farms they said that the two main elements needed would be information on wild smolt migration routes out from rivers and sea lice dispersal models from fish farms. SNH were right. With this information it might then perhaps be possible to identify places where the placing of a fish farm might present the least risk to the environment.

But the problem was that this research would have taken at least 5 years to assemble and Alex Salmond's expansion plans couldn't wait that long. So RAFTS came up with an alternative locational model, even though their own Aquaculture Policy Paper (written before they became embroiled in this) stated that 'without a far better understanding of the coastal migration routes and habitats of wild salmonids it is impossible to plan aquaculture developments in a fully informed manner'.

Over the last year (with the support of the Association of DSFB's, the Salmon and Trout Association and the Atlantic Salmon Trust, who all have in the past expressed their complete opposition to further inshore fish farm expansion) RAFTS has been putting together a map that will show areas of the inland west coast that might be

more suitable for future fish farms. Far from basing this map on relevant science, they have engaged in a process of 'ranking' rivers in order of economic and sporting 'importance' using measures such as catch records and rateable values. This information is then matched with some token geographic information on individual sea lochs. The result is a map showing areas of red, amber and green for possible future aquaculture development.

What the Scottish Government has managed to achieve therefore is a rubber stamp of approval from wild fish organisations for the location of more fish farms in the inshore sea lochs of the west coast, in spite of all of their policies to the contrary. At the time of writing a single fishery Trust (Lochaber LFT) were demonstrating their integrity by refusing to release data to the project on the grounds of its flawed scientific approach, but otherwise RAFTS and all of their member Trusts plan to apply for another 3 years of funding to 'fine tune' their map."

Writing in the March 2013 issue of Trout & Salmon magazine, Jon Gibb explained further:

"The great and the good of the national Scottish fisheries organisations (RAFTS, ASFB, S&TA, AST and FishLegal) defended their Locational Guidance model for fish farms against its many critics in your Letters page last month. This project, which aims to assess the risk to the environment of future fish farm locations, has perhaps attracted more heat than light in recent weeks. As someone who is at the sharp end of dealing with new fish farm applications here in Lochaber on a very regular basis, let me try and illuminate a little.

Firstly, it should probably be noted in passing that none of these individuals who so robustly defend this fish farm model live or work in fisheries management on the west coast of Scotland. Increasingly I see east coast eyes glaze over in national meetings when I appeal to them of our continuing plight here on the west – (I can only presume that as most of the big east coast rivers have such healthy stocks of salmon that they cannot imagine things are as bad as I make out).

Secondly, there is barely a qualified scientist amongst them. It is somewhat surprising that RAFTS in particular have not heeded the actions of two of their very qualified fisheries biologists on the ground in the Lochaber Fishery Trust who assessed the data being used in the model and concluded that 'no data is better than poor data' and withdrew from the project last month.

If you want to assess the risk to the environment from fish farms (and I for one would welcome such a tool) SNH confirmed at the outset of this project that the basis of that analysis must include the tracking of sea trout and salmon smolt migration routes and the detailed modelling of sea-lice dispersal from fish farms within estuaries. But the problem was that neither the money nor the time (5 years minimum) was available to complete this research in order to satisfy the political will to expand the industry to satisfy new Chinese demand. Instead of recognising

and addressing these shortfalls, RAFTS management ploughed on regardless and took a six figure sum of taxpayers' money from the Scottish Government to deliver a sub-standard version.

The result has been the design of a map-based model, which will suggest red/amber/green zones for aquaculture development over the whole west coast. The map relies heavily on assessing rivers in order of commercial and sporting 'importance' and meshing this with topographical data about estuaries. Both rateable values and rod catches will form part of the assessment, which effectively means that a small lightly fished sea trout burn will score far lower than a large commercial salmon river.

But hang on a minute. Have we not been told repeatedly over the last few years by these same organisations that it is these small vulnerable and genetically distinct populations of salmonids in the smallest of systems that need extra protection (the entire wild fish argument about the closure of mixed stocks nets is based on this very argument for instance)? RAFTS cannot have it both ways."

In April 2013, SNH explained (in reply to a FOI request) how they had not even been consulted on the MIAP map/guidance:

"SNH has not provided any input into the development of any operating rules, manual or guidance and we have not received copies of any documents that may have been prepared. Should RAFTS consult SNH on the MIAP tool/guidance in the future then we will respond at that time."

**4) Genetic pollution is already pushing wild salmon to the brink of extinction**

The scientific evidence detailing detrimental impacts of escaped farmed salmon on wild salmon is even more conclusive than for sea lice. A complaint filed by Guy Linley-Adams on behalf of the Rhidorroch Estate to the European Commission in 2011, included:

**The impacts of salmon farming on wild salmonids**

That aquaculture, more specifically the growing of farmed Atlantic salmon in floating cage farms in coastal waters on the west coast of Scotland, has had a negative impact on stocks of wild salmonid fisheries (wild Atlantic salmon and sea trout) is no longer contested, even by the Scottish Government, which concedes that "it is likely that impacts of aquaculture, and most probably the effects of sea lice and escapes of farmed fish, have contributed to the decline in stocks and may have slowed recovery of stocks in some rivers"[50].

[50] Scottish Government Marine Directorate (2008) Ad Hoc Review Group Implementation Plan for Meeting the Objectives of North Atlantic Salmon Conservation Organisation (NASCO) Resolutions and Agreements

A scientific paper published in 2003 by the Royal Society of London – "Fitness reduction and potential extinction of wild populations of Atlantic salmon, Salmo salar, as a result of interactions with escaped farm salmon" - detailed the "extinction vortex" precipitated by escapees.

THE ROYAL SOCIETY

*Received* 15 May 2003
*Accepted* 9 July 2003
*Published online* 15 October 2003

# Fitness reduction and potential extinction of wild populations of Atlantic salmon, *Salmo salar*, as a result of interactions with escaped farm salmon

**Philip McGinnity[1], Paulo Prodöhl[2], Andy Ferguson[2*], Rosaleen Hynes[2], Niall Ó Maoiléidigh[1], Natalie Baker[2], Deirdre Cotter[1], Brendan O'Hea[1], Declan Cooke[1], Ger Rogan[1], John Taggart[3] and Tom Cross[4]**

[1]*Aquaculture and Catchment Management Services, Marine Institute, Newport, Co Mayo, Ireland*
[2]*School of Biology and Biochemistry, Queen's University, Belfast BT7 1NN, Northern Ireland*
[3]*Department of Biological and Molecular Sciences, University of Stirling, Stirling FK9 4LA, UK*
[4]*Department of Zoology and Animal Ecology, National University of Ireland, Cork, Ireland*

The high level of escapes from Atlantic salmon farms, up to two million fishes per year in the North Atlantic, has raised concern about the potential impact on wild populations. We report on a two-generation experiment examining the estimated lifetime successes, relative to wild natives, of farm, $F_1$ and $F_2$ hybrids and $BC_1$ backcrosses to wild and farm salmon. Offspring of farm and 'hybrids' (i.e. all $F_1$, $F_2$ and $BC_1$ groups) showed reduced survival compared with wild salmon but grew faster as juveniles and displaced wild parr, which as a group were significantly smaller. Where suitable habitat for these emigrant parr is absent, this competition would result in reduced wild smolt production. In the experimental conditions, where emigrants survived downstream, the relative estimated lifetime success ranged from 2% (farm) to 89% ($BC_1$ wild) of that of wild salmon, indicating additive genetic variation for survival. Wild salmon primarily returned to fresh water after one sea winter (1SW) but farm and 'hybrids' produced proportionately more 2SW salmon. However, lower overall survival means that this would result in reduced recruitment despite increased 2SW fecundity. We thus demonstrate that interaction of farm with wild salmon results in lowered fitness, with repeated escapes causing cumulative fitness depression and potentially an extinction vortex in vulnerable populations.

A decade later in 2013, a report from RAFTS detailed how farmed salmon genes from Norway had polluted a quarter of Scotland's wild Atlantic salmon – in rivers across Argyll, Lochaber, Outer Hebrides, Skye, Wester Ross and West Sutherland.

**Table 2.** Sample sites with the number of individuals classified as Scottish, farmed ('Norwegian') or admixed. For admixed individuals, values in parentheses indicate if the level of admixture is significantly higher than expected by the estimated error rate.

| Trust | River | Site | Scottish | Norwegian | admixed |
|---|---|---|---|---|---|
| Argyll | Aros River | Loch Frisa (farm escapes) | 0 | 32 | 0 (N/A) |
| | River Awe | Lower Awe | 28 | 0 | 4 (Y) |
| | | Upper Orchy | 22 | 0 | 10 (Y) |
| | River Fyne | various locations | 63 | 0 | 37 (Y) |
| Lochaber | Achateny Water | Achateny Burn | 12 | 0 | 3 (Y) |
| | River Ailort | mainstem | 11 | 0 | 19 (Y) |
| | Carnoch River | various locations | 25 | 0 | 7 (Y) |
| | River Lochy | Lower Lochy | 23 | 0 | 6 (Y) |
| | | Lundy | 26 | 0 | 3 (N) |
| | | Pean | 13 | 0 | 7 (Y) |
| | | Roy | 34 | 0 | 9 (Y) |
| | | Upper Lochy | 30 | 0 | 3 (N) |
| | | Loch Lochy (farm escapes) | 0 | 34 | 0 (N/A) |
| | River Moidart | mainstem | 29 | 0 | 3 (N) |
| | River Morar | Loch an Nostarie | 18 | 0 | 1 (Y) |
| | River Shiel | River Callop | 21 | 0 | 9 (Y) |
| | | River Finnan 2008 | 8 | 0 | 3 (Y) |
| | | River Finnan 2010 | 17 | 0 | 4 (Y) |
| | | River Shlatach 2005 | 21 | 6 | 20 (Y) |
| | | River Shlatach 2008 | 0 | 5 | 19 (Y) |
| | | River Shlatach 2010 | 6 | 1 | 1 (N) |
| | Strontian River | 2008 | 23 | 0 | 0 (N) |
| | | 2010 | 4 | 0 | 2 (Y) |
| Outer Hebrides | Kintaravay | mainstem | 28 | 0 | 5 (Y) |
| | Ghriomarstaidh | Langadale River | 14 | 0 | 8 (Y) |
| | | Langavat – Grimersta | 21 | 0 | 0 (N) |
| | | Langavat – March Burn | 18 | 0 | 3 (Y) |
| | Laxadale | mainstem | 30 | 0 | 4 (Y) |
| | Loch Leosaid | River Leosaid | 30 | 0 | 3 (N) |
| Skye | River Drynoch | mainstem | 26 | 0 | 7 (Y) |
| | River Hinnisdal | mainstem | 23 | 0 | 8 (Y) |
| | River Sligachan | 2010 | 13 | 0 | 5 (Y) |
| | | 2011 | 29 | 0 | 6 (Y) |
| | River Snizort | Lower Snizort | 27 | 0 | 12 (Y) |
| | | Upper Snizort | 29 | 0 | 3 (N) |
| | Varagill River | mid river | 16 | 0 | 4 (Y) |
| Wester Ross | Balgy River | 2006 | 15 | 3 | 39 (Y) |
| | | 2007 | 8 | 7 | 6 (Y) |
| | River Carron | River Lair | 21 | 0 | 11 (Y) |
| | Loch Carron | Tullich burn | 0 | 6 | 1 (N/A) |
| | Gruinard River | Lower river | 19 | 0 | 2 (N) |
| | | Mid river | 17 | 0 | 3 (Y) |
| | | Upper river | 19 | 0 | 2 (N) |
| | River Kerry | Mid river | 24 | 0 | 9 (Y) |
| | River Kishorn | Lower river | 19 | 0 | 8 (Y) |
| | River Torridon | Mainstem | 31 | 0 | 11 (Y) |
| West Sutherland | River Dionard | Mainstem | 15 | 0 | 4 (Y) |
| | | Rhigolter Burn | 17 | 0 | 2 (N) |
| | River Laxford | Allt Horn | 27 | 0 | 5 (Y) |
| | | Bad na Baighe | 16 | 0 | 17 (Y) |
| | Allt a Mhuilinn | Bhadaidh Daraich | 34 | 0 | 0 (N) |
| | River Polla | Allt Coire an Uinnseinn | 19 | 3 | 13 (Y) |

Note: due to quality control, numbers of samples per site here may be lower than in Table 1.

As can be seen from the table above most sites had a signature of hybridization that was significantly higher than expected by chance. Across all sites, 369 out of 1472 (25.1%) individuals were identified as hybrids, which is significantly higher than that seen for the east coast 'wild' baseline. Furthermore, the three cases of putative escapees that were sampled (Loch Frisa, Loch Lochy & Tullich Burn), all but one individual were identified as pure Norwegian fish. Otherwise, very few pure Norwegian fish were identified. The 2006 samples from the Balgy showed most individuals (39 out of 57) to be admixed. However, for some of these fish, they were confirmed in the field as being farmed fish (e.g. presence of injection marks). However, it is known that some wild fish used in the hatchery broodstock were subsequently determined to be of farm origin and therefore it is possible that these escapees could have a mixed ancestry. A similar genetic signature has been found for these samples using microsatellites (Cauwelier et al., in prep, Marine Scotland Science).

WRFT reported (4 March 2013):

"For samples collected in the West of Scotland, the presence of Norwegian genetic signatures was identified from most sites. Several cases of putative direct aquaculture escapees were genetically consistent with field-based identification, including samples from the River Balgy (2006 and 2007) and the Tullich burn near Lochcarron (2011). It was also possible to distinguish individuals of mixed ancestry versus those of either pure Scottish or Norwegian origin. For rivers sampled in Wester Ross, juvenile salmon of mixed ancestry represented the following % of the samples from respective rivers (where n = number of fish in the sample): Gruinard 2005, 15% (n=20); Kerry 2011, 27% (n=33); Torridon 2007, 26% (n=44); Kishorn 2011, 30% (n=27); and Carron [River Lair] 2011, 34% (n=32).

Concerns about the genetic impacts of escaped and deliberately released farm salmon spawning in the wild in Scotland date from the 1980s. Following a large escape of farmed salmon in Loch Eriboll in Sutherland in 1989, Webb et al 1991 demonstrated spawning by escaped farmed female salmon in the nearby River Polla by identifying the artificial pigment canthaxanthin (used in salmon feed) in salmon eggs taken from redds located in the river. Subsequently canthaxanthin was found in salmon fry in many rivers in the west of Scotland in 1991 (Webb et al 1993). Within the WRFT area, canthaxanthin was found in samples of salmon fry taken from respective rivers, as follows: Gruinard, in 9.6% of sample (n=180); Kerry, 17.8% (n=45); Torridon, 11% (n=144); Elchaig, 1.9% (n=160). This study demonstrated that female farmed salmon had spawned successfully in 1990 (and noted that any contribution to spawning by escaped males would not have been detected). Between 1990 and 1995, the proportion of 'reared' salmon recorded in samples of salmon taken in nets at Red Point near Loch Gairloch varied from 14.5% to 37.5% (Youngson et al 1992). Rod catches of salmon in many Wester Ross rivers fell to their lowest levels at the end of the 1990s by which time recorded escaped farm salmon

were in some years 30% more of the rod catch of salmon. For example, of just 13 salmon that were caught in the River Carron in 1999, 8 were recorded as 'escaped farm fish'".

"As many as one in four wild Atlantic salmon from Scotland has been genetically "tainted" by Norwegian fish, a study suggests," reported The Sunday Times (3 March 2013). "Analysis of almost 1,500 wild salmon from the west coast found 369 possessed genetic markers unique to the Scandinavian fish."

# Invasion of the Viking salmon

## Scotland's wild stocks 'tainted' by Norwegian strains used in fish farms, writes **Mark Macaskill**

3.3.13

A salmon farm on Loch Linnhe; inset, a wild Atlantic salmon

AS MANY as one in four wild Atlantic salmon from Scotland has been genetically "tainted" by Norwegian fish, a study suggests. Analysis of almost 1,500 wild salmon from the west coast found 369 possessed genetic markers unique to the Scandinavian fish.

The findings have provoked a fresh row between environmentalists and Scotland's aquaculture industry.

Opponents argue fish farmers, who depend heavily on imported eggs from Norway to build up stocks, are primarily to blame — millions of escapees over the past decade are thought to have "polluted" the gene pool by cross-breeding with their wild cousins.

Last night, however, the Scottish Salmon Producers' Organisation (SSPO) said there was no evidence fish farming was responsible.

It is known, for example, that Norwegian fish have been used to boost salmon stocks in east coast rivers such as the Spey and the Shin. It is possible, said SSPO, that these fish have migrated and bred with west coast populations.

For the study, carried out by Rivers and Fisheries Trusts of Scotland (Rafts), 1,472 Atlantic salmon across more than 50 locations, including rivers such as the Awe, Lochy and Laxford, were sampled between 2005 and 2011.

A particular set of genetic markers unique to Norwegian fish enabled scientists to identify hybrids but it was not possible to determine if a Scottish salmon had bred with a wild fish from Norway or a farmed one. Nevertheless, it found much higher levels of hybridisation than expected in wild salmon on the west coast, home to more than 400 fish farms. Since 2002, according to Scottish government figures, about 2.4m farmed Atlantic salmon have escaped into the sea.

"Most sites had a signature of hybridisation that was significantly higher than expected by chance," states the study. "Across all sites, 369 out of 1, 472 (25.1%) individuals were identified as hybrids, which is significantly higher than that seen for the east coast 'wild' baseline."

Callum Sinclair, from Rafts, added: "The main focus of the report is the detection of introgression between Norwegian aquaculture strains and Scottish fish. [It] indicates significant levels of hybridisation of wild Scottish salmon in the West Highlands and Islands with genetic strains commonly in use in the Norwegian-owned salmon aquaculture industry."

Salmon are known to travel vast distances. A study that tracked the movements of fish released from a Scottish fish farm in 2007 found them as far afield as Norway and Sweden.

It is conceivable that farmed and wild fish from Norway have made the same trip to Scottish waters and bred successfully with native Atlantic salmon. However, Tony Andrews, chairman of the Atlantic Salmon Trust, said there was a "prima facie case" for salmon farming's role in creating hybrid fish.

A spokesman for SSPO said: "It is disappointing that so much public money has been spent on this non-peer-reviewed project that revealed no real differences between wild and farmed fish."

The Scotsman also reported (4 March 2013):


Read more via "Invasion of the Viking Salmon Hits Scotland!"

Scientific references cited in the RAFTS report are available online here

A 2005 scientific study authored by Dr. James Butler (a former biologist with the WRFT) detailed how escapees constituted at least 27 percent of potential spawning salmon in the River Ewe in Scotland. Another scientific paper published in 2011 – "Temporal change in genetic integrity suggests loss of local adaptation in a wild Atlantic salmon (Salmo salar) population following introgression by farmed escapees" – detailed how escapees in Eastern Canada resulted "in significant alteration of the genetic integrity of the native population, including possible loss of adaptation to wild conditions".

As the WRFT showed in a 2009 report there is a genetic difference between Norwegian-origin farmed salmon and native Scottish salmon:

**Escaped farm salmon and wild salmon at Dundonnell hatchery, October 2009**

1. This photograph of the two anaesthetised cock salmon shows typical differences between farm salmon and wild salmon in the autumn. Note how the farm salmon (top) has rounded margins to its caudal fin (tail) and other fins are slightly less perfect than the wild fish (below). Note that there are also more black spots on the escaped farm fish particularly around the head and base of the tail, which may be related to genetic differences between native wild Wester Ross salmon and farm salmon. Most salmon grown on farms around Scotland are descended from Norwegian strains of fish.

Lest we forget that escapes from salmon farms are ongoing in the Wester Ross and West Sutherland area with "Around 24,000" escapees at Marine Harvest's Loch Ewe site in 2007.

Loch Duart has had at least eight escapes in little more than a decade:

**Escapes** are also an ongoing problem at Loch Duart with at least 8 escapes since 2000 involving over 50,000 farmed salmon - including the following officially reported incidents:

April 2011: "Up to 100 fish" from Loch Duart's Loch Carnan site (later officially reported as 40)

December 2008: 6,500 from Loch Duart's Oldany site (more details online here)

November 2007: 10,400 from Loch Duart's Loch Laxford site

October 2005: 3,000 from Loch Duart's Badcall Bay site (according to the Scottish Government, the escapees had also been treated with EXCIS - Cypermethrin)

May 2004: 200 from Loch Duart's Torgawn site

August 2003: 18,416 from Loch Duart's Calva Bay (Calbha Beag) site (according to the Scottish Government, the escapees also came from a site affected by "Clinical Infectious Pancreatic Necrosis")

June 2002: 8,147 from Loch Duart's Badcall Bay site (according to the Scottish Government, the escapees had also been treated with SLICE - Emamectin benzoate)

In 2000, Loch Duart also reported an escape of 9,108 salmon from a site in Loch na Thuille

Read more via "Loch Duart's 'Sustainable Salmon' Scam Exposed"

A 2007 report also detailed how escapees were contaminated with chemicals such as Emamectin benzoate (SLICE) – including the following in Wester Ross and West Sutherland:

**Loch Duart's** Badcall Bay site (14th to 17th October 2005) - farmed salmon treated with Excis (Cypermethrin): 3,000 escaped (Zero escapees recovered)

**Scottish Sea Farm's** Kishorn B (North) site (11th to 13th January 2005) - Emamectin used on site: 43,453 escaped (600 escapees recovered)

**Marine Harvest's** Loch Ewe site (27th April 2003) - farmed salmon treated with Slice (Emamectin benzoate): 16,000 escaped (Zero escapees recovered)

**Loch Duart's Badcall** Bay site (End May to June 2002) - farmed salmon treated with Slice (Emamectin benzoate): 8,147 escaped (Zero escapees recovered)

Read more details via WRFT's 'Escaped Farmed Salmon'

**5) ALL rivers in Wester Ross (and across Scotland) deserve protection**

The importance of even the smallest of rivers and streams in Wester Ross as 'gene banks' for the preservation of Scottish salmon cannot be overemphasised. Following a briefing meeting on MIAP, the clerk of Lochaber District Salmon Fishery Board (Jon Gibb) wrote in an email (16 December 2012) to the board:

"The proposal by RAFTS essentially ignores the importance of vulnerable smaller rivers and burns, which we are told by fisheries scientists in other contexts are very important and need special protection due to the likelihood that they are remnants of genetically distinct populations of salmon or sea trout. The categories being used to put the locational map together for this project imply that these smaller rivers are less important than larger and more abundant river – more 'expendable' perhaps."

As owner of a smaller river I am obviously concerned at the Ullapool River being sacrificed to accommodate salmon farming expansion. Indeed, I understand that similar concerns from the 68 river owners in Lochaber led to the Lochaber Fishery Trust withdrawing their support for MIAP. It is surely a dangerous precedent to rank some rivers and particular salmon stocks as more equal than others?

When the MIAP map is finally published (I understand that RAFTS will be presenting the map at the WRSAFB meeting on 30 April) it will be interesting to see which particular rivers RAFTS are prepared to sanction as expendable.

How can the Rivers Ewe, Little Gruinard and Gruinard be ranked as higher importance than, for example, the Rivers Kaniard, Ullapool, Broom, Dundonnell, Kerry, Badachro, Torridon, Balgy, Applecross, Carron, Ling, Eichaig, Croe, Glenmore, Shiel, Glenbeag and Arnisdale? And when a West coast of Scotland-wide ranking is performed, where will the River Ewe and River Gruinard, for example, rank compared to rivers in the Outer Hebrides, Skye, Argyll and West Sutherland?

As a river owner who pays an annual levy, I was under the impression that RAFTS, WRASFB and WRFT are duty-bound to protect ALL rivers rather than engage in an Orwellian form of salmon-trading straight out of the pages of Animal Farm.

**6) Lack of consultation and transparency**

Based upon my own experience in Wester Ross, it seems clear that there was a woeful lack of consultation regarding the original support for MIAP. For example, the support of Wester Ross Area Salmon Fishery Board has never been minuted nor properly explained. When Wester Ross Fisheries Trust originally agreeing to support MIAP, presumably in 2011, there were no minutes, no consultation, no scientific information circulated and no debate on MIAP. The original support in Wester Ross for MIAP by both the Board and Trust appears to have been agreed on a whim by a few influential river owners without proper consultation.

In fact, when the issue of support for MIAP was raised last month it resulted in WRASFB asking RAFTS to remove their name from the list of "partners". The RAFTS web-page for MIAP now reads:

> A number of RAFTS members and related District Salmon Fisheries Boards support this programme. In the main, work will be undertaken by the participating fisheries trusts.
>
> Project partners: participating fishery trusts and boards are:
>
> - Argyll Fisheries Trust
> - Argyll District Salmon Fishery Board
> - Wester Ross Fisheries Trust
> - Skye Fisheries Trust
> - Skye District Salmon Fisheries Board
> - West Sutherland Fisheries Trust
> - Outer Hebrides Fisheries Trust
> - Western Isles Salmon Fisheries Board

Although original partners in the project in 2012/13, the Lochaber Fisheries Trust withdrew their participation in the locational guidance part of the MIAP on 09/01/13 having taken part fully in this and other areas of the project to that point and in the previous 2011/12 project. It is disappointing that they have withdrawn from the project at this time and in advance of a version 1 of the locational guidance map being prepared for review and consideration.

The Wester Ross DSFB, following the election of a new Board, have verbally indicated that they would prefer not to be listed as a project partner until after a meeting on 24/01/13 when the work will be presented to them by RAFTS and a Board position taken. RAFTS is advised that this is not a withdrawal of support at this time and the DSFB were listed in the project partners in the approved and funded grant application for 2012/13.

How are river owners in Wester Ross expected to endorse MIAP when the map prioritizing rivers is only presented in the WRASFB meeting on 30 April and is not even available publicly? If the WRASFB vote on 30 April in support of MIAP then it would be doing so without proper consultation with river owners and wild fish interests in Wester Ross.

**7) Sea lice resistance to chemicals and chemical pollution**

In the absence of published sea lice data on particular salmon farms in Wester Ross, the next best indicator is data recording the use of chemicals to kill sea lice. All the available evidence obtained from FOI from the Scottish Environment Protection Agency and Marine Scotland indicates a growing sea lice problem. So-called 'super-lice' – sea lice resistant to chemicals – are plaguing the salmon farming industry in Scotland as well as Norway and Ireland.

Read more via "Plague of 'super-lice' threatens wild salmon" and "Chemicals to control salmon parasites"

Between 2005 and 2012 there was an estimated 12-fold increase in the use of sea lice chemicals. The alarming rise in chemical use from 2008 to 2011 is five times more than the percentage increase in salmon farming production: whilst Scottish farmed salmon production steadily increased by 22% between 2008 and 2011 (up from 128,606 tonnes to 157,385 tonnes) the use of toxic chemicals increased by a shocking 110% - more than doubling from 188076g to 394631g). Using data back to 2005 the increase in the use of chemicals is a staggering 1094% - a twelve fold increase up from 33060g in 2005 to 394631g in 2011. That's over fifty times the percentage increase in Scottish farmed salmon production (which rose 21%)!

Read more via "Scottish Salmon's Toxic Toilets Named & Shamed! Twelve Fold Increase in Chemical Use Since 2005" and "Chemical Culture in Scotland"

Chemical use data obtained by SEPA for Wester Ross Salmon sites reveals an increase in the use of Azamethiphos, Teflubenzuron and Hydrogen Peroxide:

**2011:**

| Site Name | Site ID | SEPA Team Area | Excis (litres) | Cypermethrin (kgs) Threshold = 0.005kg | Salmosan (grams) | Azamethiphos (kgs) Threshold = 0.001kg | Calicide (grams) | Teflubenzuron (kgs) Threshold = 0.001kg | Slice (grams) | Emamectin salts and derivatives (kg) Threshold = 0.001kg |
|---|---|---|---|---|---|---|---|---|---|---|
| Isle Martin, Ardmair Bay | KAN2 | DING | 0 | 0 | 9960 | 4.98 | 14000 | 14 | 140996 | 0.281992 |
| River Kanaird, Ardmair Bay | KAN1 | DING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loch Broom (Corry1&2) | BRO1 | DING | 0 | 0 | 5040 | 2.52 | 0 | 0 | 44432 | 0.088864 |
| Ardessie Site A | LIT1 | DING | 0 | 0 | 240 | 0.12 | 0 | 0 | 21382 | 0.042764 |
| Ardessie Site B | LIT2 | DING | 0 | 0 | 2040 | 1.02 | 0 | 0 | 45086 | 0.090172 |

Over and above the chemicals listed above there's 26235 litres use of Hydrogen Peroxide

**2010:**

| Site Name | Site ID | SEPA Team Area | Excis (litres) | Cypermethrin (kgs) Threshold = 0.005kg | Salmosan (grams) | Azamethiphos (kgs) Threshold = 0.001kg | Calicide (grams) | Teflubenzuron (kgs) Threshold = 0.001kg | Slice (grams) | Emamectin salts and derivatives (kg) Threshold = 0.001kg |
|---|---|---|---|---|---|---|---|---|---|---|
| Isle Martin, Ardmair Bay | KAN2 | DING | 0 | 0 | 3180 | 1.59 | 0 | 0 | 0 | 0 |
| River Kanaird, Ardmair Bay | KAN1 | DING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loch Broom (Corry1&2) | BRO1 | DING | 0 | 0 | 4500 | 2.25 | 0 | 0 | 175392 | 0.350784 |
| Ardessie Site A | LIT1 | DING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ardessie Site B | LIT2 | DING | 0 | 0 | 600 | 0.3 | 0 | 0 | 83815 | 0.16763 |

**2009:**

| Site Name | Site ID | SEPA Team Area | Excis (litres) | Cypermethrin (kgs) Threshold = 0.05kg | Salmosan (grams) | Azamethiphos (kgs) Threshold = 0.001kg | Calicide (grams) | Teflubenzuron (kgs) Threshold = 0.001kg | Slice (grams) | Emamectin salts and derivatives (kg) Threshold = 0.001kg |
|---|---|---|---|---|---|---|---|---|---|---|
| Isle Martin, Ardmair Bay | KAN2 | DING | 0 | 0 | 8920 | 4.46 | 0 | 0 | 0 | 0 |
| River Kanaird, Ardmair Bay | KAN1 | DING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Loch Broom (Corry1&2) | BRO1 | DING | 0 | 0 | 900 | 0.45 | 0 | 0 | 0 | 0 |
| Ardessie Site A | LIT1 | DING | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ardessie Site B | LIT2 | DING | 0 | 0 | 1080 | 0.54 | 0 | 0 | 0 | 0 |

The toxic chemicals used to kill sea lice not only have a direct impact on wild salmon and sea trout in terms of spreading chemical resistance but there are also wider ecosystem impacts. Scientific research published in Aquatic Toxicology has shown that Cypermethrin, a chemical used on Scottish salmon farms, "may have a significant effect on Atlantic salmon populations through disruption of reproductive functions". Another study published in Ecotoxicology & Environmental Safety showed that Cypermethrin "immediately reduced zooplankton density and biodiversity not only directly, by killing copepods, but also indirectly, by increasing the numbers of rotifers". More recent research in Norway has shown how Teflubenzuron, used at sites across Scotland, is lethal to lobsters and other shellfish.

For a scientific review of the environmental impacts of the sea lice chemicals used on salmon farms read "Silent Spring of the Sea"

The increasing use of toxic chemicals represents a potential breach of the EU Habitats Directive by Scotland which is permitting salmon farming companies to discharge toxic chemicals into Special Areas of Conservation. Read more details via

a letter to the European Commissioner for the Environment in September 2012 – online here

Chemical pollution has also been reported under salmon farms. For more information from SEPA read the following survey reports: "The Occurrence of Chemicals used in Sea Lice Treatments In Sediments Adjacent to Marine Fish Farms"

Results of Screening Surveys During 2009 (459k)
Results of Screening Surveys During 2008 (557k)
Results of Screening Surveys During 2006 (260k)
Results of Screening Surveys During 2005 (597k)
Results of Screening Surveys During 2004 (124k)
Results of Screening Surveys During 2003 (191k)

Available online via SEPA's web-site

Based on the information above, the Sunday Herald detailed "The Lochs Contaminated by Pesticides" in 2011 – including two salmon farms (Summer Isles and Loch Kanaird) close to the Ullapool River:

Loch Linnhe, Fort William: teflubenzuron and emamectin
Loch Ewe, Poolewe: diflubenzuron and emamectin
Loch Nevis, near Mallaig: diflubenzuron and emamectin
Loch Kanaird, near Ullapool: teflubenzuron, diflubenzuron and emamectin
Summer Isles, Achiltibuie: teflubenzuron, diflubenzuron and emamectin
Loch Fyne. Lochgilphead: emamectin
Portree Bay, Skye: teflubenzuron and emamectin
Loch Slapin, Skye: teflubenzuron and emamectin
Loch na Keal, Mull: teflubenzuron and emamectin

Read more details via "Revealed: the toxic pesticides that pollute our lochs" and "Beauty-spot Lochs Contaminated by Toxic Chemicals"

Further information obtained from SEPA by the Salmon & Trout Association in 2012 via Freedom of Information revealed:

• The failure of fish-farmers to report to SEPA self-monitored data concerning sea-lice chemical residues in the sea-bed of Scottish sea lochs: SEPA recorded approximately 16% of fish-farms as failing to supply Slice residue data between 2005 and 2010 in accordance with regulations
• Sea-lice chemical residues in excess of Environmental Quality Standards: Approximately 13% of fish-farms reported self-monitored samples to SEPA of sea-bed residues in excess of EQS between 2005 and 2010
• A reduction in audit or 'check' monitoring of sea-bed residues of sea-lice chemicals by SEPA, despite its role as Scotland's environmental regulator

Hughie Campbell Adamson, Chairman of S&TA Scotland, told BBC News: "The information from SEPA raises serious concerns over the impact of in-feed sea lice treatments. While the control of sea lice on fish-farms is essential, it would not be environmentally responsible to threaten marine shellfish populations as a consequence."

Read more via "Salmon & Trout Association exposes sea-bed pollution of Scottish sea-lochs"

Find out which companies failed to provide chemical data and details on illegal chemical use via the "Reported sea lice treatment chemical residues in Scottish sea lochs"

Further data on chemical use on Scottish salmon farms has recently been accessed via the Scottish Environment Protection Agency and Marine Scotland. A preliminary analysis of the information shows a huge increase in chemical use which is indicative of sea lice resistance.

Documents on chemical contamination of sediments were also obtained from SEPA this week including damning data on Wester Ross Salmon. For example, the Ardessie salmon farm in Little Loch Broom was deemed "Unsatisfactory" with SEPA noting that: "It is of concern that the area of enrichment has developed after only six months of use."

SEPA

MARINE FISH FARM MONITORING REPORT

REPORT FROM: MARINE SCIENCE DINGWALL
REPORT TO: OPERATIONS STAFF

SITE DETAILS

| | |
|---|---|
| COMPANY: | Wester Ross Fisheries Ltd |
| LOCATION: | Ardessie A |
| RECEIVING WATER | Little Loch Broom |
| CAGE GROUP: | |
| CONSENT NUMBER: | CAR/L/1003012 |
| NGR: | NH 0466 9021 |
| TEAM: | North Highland |
| SITE ID: | LIT1 |

SURVEY DETAILS

| | | | |
|---|---|---|---|
| MONITORING METHOD: | Benthic | | |
| SURVEY TYPE: | Self Monitoring | | |
| SURVEY DATE: | 16/09/2011 | | |
| DATE RECEIVED: | 31/12/2011 | | |
| REPORT DATE: | 06/02/2012 | | |
| EVALUATED BY: | MW/AP | BIOMASS: | 90 (t) |
| SUBMISSION NO: | N 3466 | MAX BIOMASS | 262 (t) |

CLASSIFICATION: Unsatisfactory

Read the SEPA report in full online here

Another Wester Ross Salmon site at Corry in Loch Broom was also classified as "Unsatisfactory" – with SEPA reporting that the site was "degraded" with "poor species richness":

# MARINE FISH FARM MONITORING REPORT

SITE ID BRO1 SUBMISSION NO: N 3364

## SUMMARY

*Evaluated against quality criteria stated in SEPA's Fish Farm Manual Annex F according to NWM/MAR/010*

The sediment at the cage edge was described as Black smelly mud with shell. No waste or fungus was noted.
The sediment at the AZE & Ref stations consisted of brown mud with shell & stones.

Biology:
There was an obvious enrichment effect at the cage edge & 51m (AZE-10) stations, which showed little similarity to the other AZE & Ref stations. These stations had poor species richness & were dominated by the enrichment polychaetes, Capitella & Malacoceros. The resulting ITI scores indicated degraded communities. The cage edge station meets SEPA's criteria within the AZE, but the 51m station fails all of SEPA's criteria outwith the AZE.

The 61m (AZE) & 71m (AZE+10m) stations had quite good species richness & diversity values. However, these too were dominated by Capitella (along with Lumbrineris), & while their ITI scores were higher than at the 51m station, they still indicated degraded communities. These stations met 2 & failed 2 of SEPA's criteria outwith the AZE.

Due to the presence of enrichment at the AZE stations, this survey is classed as unsatisfactory based on the faunal data.

Read the SEPA report in full online here

Further FOI documents on salmon farms in the Wester Ross area will be made available over the coming months.