Prepared on 03/01/2018 by Alexis Heeren, with Findings and Recommendations copied from Rachel Irvine's summary report for SRS.

Living Lab project summary – Alleviating ecological impacts of Scottish salmon production

Description of the paper

This paper describes the results of dissertation research into the capacity of various certification schemes to mitigate the negative ecological effects of Scottish salmon production.

Research question

What farmed salmon certifications have the best sustainability outcomes, and what actions can the University take to improve sourcing of farmed salmon?

Objectives

1. Summarise the key environmental impacts associated with salmon aquaculture
2. Review the most commonly available ecolabels and certification schemes for their sustainability performance and ability to mitigate negative environmental impacts of salmon production (ASC, Organic, RSPCA Assured etc.)
3. Make recommendations to the University for how it should procure and use farmed salmon to ensure sustainability

Findings and recommendations

The Atlantic salmon (*Salmo salar)* aquaculture industry contributes significantly to the national economy of Scotland. However, poor husbandry and management practices on farms are resulting in major ecological changes, which in turn are threatening the sustainable development of the industry. A literature review of contemporary scientific research highlighted many ecological, environmental and social impacts of Atlantic salmon production that are threatening the longevity of both the species and the industry. An in depth consideration of six of these noted that without sufficient alterations to methods of production, irreversible ecological changes to the environments surrounding farms are likely. There is therefore a necessity for more sustainable practices within the sector. As a result, aquaculture certification schemes have been created in an attempt to decrease impacts of production.

This research aimed to compare and rank the performance of such schemes in addressing six ecological impacts of Atlantic salmon farming: escapees, disease, chemical and medicinal use, antibiotic resistance, sustainability of fish feed and nutrient release. A breadth and depth analysis assessing the comprehensiveness of five certification schemes in mitigating, preventing and managing these impacts was conducted.

The results indicated that as the number of factors addressed by a scheme increased, so did the relative rigour of that scheme. However, no scheme attained the top score of seven for any of the impacts analysed. Therefore the compliance criteria could be enhanced in all five of the schemes, to better address these impacts. Overall, the Aquaculture Stewardship Council (ASC) certification provided the most extensive and ambitious compliance criteria regarding the six impacts addressed (figure 1). The scheme attained a depth score of 76.1%, in turn providing the best level of ecological sustainability assurances. GLOBAL Good Agricultural Practice (GLOBALG.A.P) and RSPCA attained equivalent total depth scores of 40.4% when all impacts were considered. This represented the lowest score and therefore these two schemes were the equal poorest performers. GLOBALG.A.P did not attain a score of higher than three on any of the six impacts analysed. However, variations occurred between the results of individual impacts. For example, the Soil Association standard addressed the use of chemicals and medicines the most thoroughly of all schemes, but failed to address antibiotic resistance at all and the criteria for nutrient release on certified farms was the least stringent of all analysed standards. The poorest addressed impact for all schemes was that of antibiotic resistance, whilst escapees and sustainability of feed represented areas where the majority of schemes performed comparatively well. An Independent-Samples Kruskal-Wallis test was conducted to evaluate whether the results of the analysis were statistically significant. The results indicated that there were no statistically significant differences between the distributions of any of the six impacts across the five schemes (χ^2 = 4.000, df = 4, p = 0.406). Although the results were not statistically significant, some clear differences occurred when the comprehensiveness of certification schemes was considered against individual impacts.

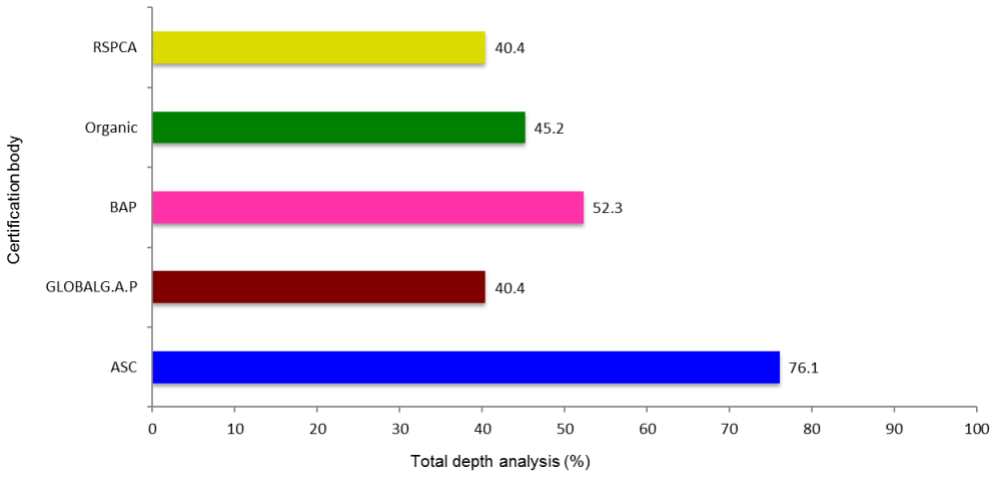

Figure 1. Total depth analysis percentage achieved for each of the five certification bodies. ASC gained the highest overall percentage, followed by BAP and Organic. The RSPCA and GLOBALG.A.P achieved the joint lowest overall percentage.

The majority of schemes demonstrated a positive correlation between breadth and depth (figure 2). This indicated that as the quantity of different impacts addressed by a standard increased, the assessment became more rigorous. However, this was not the case for GLOBALG.A.P and the Soil Association organic standards. Moreover, upon statistical analysis, no statistically significant differences were found between the distributions of either total depth score, or breadth score, across the five certification schemes. Therefore, from the results of this analysis it can be concluded that as the breadth score of a scheme increases, there is a consequent increase in the potential for that scheme to more comprehensively address

factors. Conversely, the potential for an extensive set of guidelines within a standard is automatically decreased if there is a reduced number of factors addressed within it.

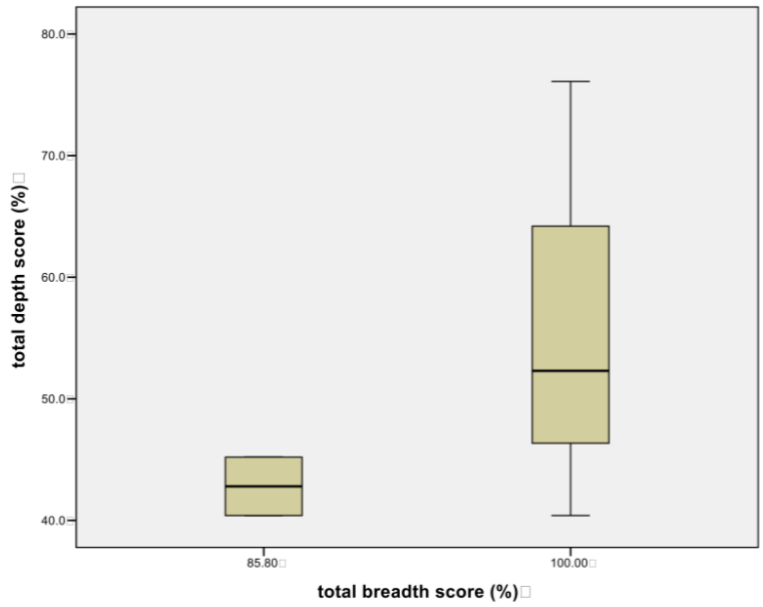

Figure 2. A comparison of the breadth and depth analysis results, demonstrating that as the number of factors addressed by a scheme increases, so does the potential of that scheme to offer more comprehensive guidelines and criteria within its standard.

This research aimed to utilise the findings of the breadth and depth analysis in order to provide recommendations to increase the sustainability of farmed Atlantic salmon procured by the University of Edinburgh. Upon review of the University's Sustainable Fish and Seafood sourcing policy, it is clear that there is a necessity to better reflect the requirement for more responsible management practices in the salmon farming sector specifically. The review indicated a number of areas where improvements could be made within the policy, including through the addition of more detailed, specific and measurable objectives. There is a necessity for the University to better reflect the requirement for more responsible management practices on farms within their sourcing policy. As a large-scale buyer there is a need to better exercise their power within the supply chain, to demand and thus ensure enhanced sustainability of Atlantic salmon procured. Based on findings from this dissertation, three main recommendations of pathways to achieve this are suggested:

1. To shift the sourcing of farmed Atlantic salmon to producers possessing Aquaculture Stewardship Council (ASC) certification.

2. Secondly, where ASC certified salmon is unavailable, sourcing should follow the order of comprehensiveness of standards from best to worst, as demonstrated in this research. I.e. Best Aquaculture Practices (BAP) certified salmon second choice to ASC, followed by Soil Association organic certified salmon, GLOBAL Good Agricultural Practice (GLOBALG.A.P), and RSPCA assured salmon only sourced where none of the above certifications are available.

3. Finally, to update the University of Edinburgh Fish and Seafood Sourcing policy to better proportionally

reflect farmed Atlantic salmon. Incorporating findings of contemporary research and the best available scientific evidence to create objectives that more accurately, and in more detail, reflect effective methods of mitigating key impacts of salmon farming.

The creation of a more robust and detailed farmed fish sourcing policy aimed more explicitly at salmon, will provide an effective decision making tool to ensure sustainable procurement. Responsible procurement favouring sustainable production methods in this way will help safeguard this iconic species of national importance, whilst enabling the sustainable development of one of the great Scottish success stories.