

# ON THE HOOK

Certification's failure to protect wild  
fish populations from the appetite  
of the Scottish salmon industry

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# KEY TERMS

**Aquaculture:** the farming of aquatic organisms, including fish, molluscs, crustaceans and plants.

**Fed and unfed aquaculture:** 'fed' aquaculture farms species, such as finfish, which require external feed inputs, as opposed to some 'unfed' aquaculture species, such as molluscs, which rely on available nutrients in their environment.

**Feed conversion ratio:** the weight of feed administered over the lifetime of an animal divided by the weight gained by the animal.

**Food-feed competition over land and marine resources:** arises when arable land suitable for producing human-edible crops is used for feed crop production, and when food-grade fish is used for livestock and aquaculture feed production.

**Forage fish:** also called prey fish, these ocean fish are the food of higher trophic-level species such as large fish, marine mammals and seabirds<sup>1</sup>. The Lenfest Forage Fish Taskforce defines forage fish 'in terms of their functional role in providing a critically important route for energy transfer from plankton to higher trophic levels in marine ecosystems'<sup>2</sup>. Also sometimes referred to as 'pelagic fish', for their typical habitat in pelagic ocean zones (i.e. away from the edge of the coast and the sea floor).

**Forage Fish Dependency Ratio (FFDR):** weight of the wild fish used in feed in relation to the weight of farmed fish produced.

**Maximum sustainable yield:** the maximum level at which fish stocks can be routinely exploited without long-term depletion.

**Omega 3:** omega 3 long-chain fatty acids – notably eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) – occur in the ocean food chain after they are synthesised by microalgae and cyanobacteria, then bioaccumulated through the trophic chain from smaller aquatic organisms to larger fish<sup>3</sup>.

**Reduction fishery:** a fishery that uses or 'reduces' its catch to produce fishmeal and fish oil (FMFO).

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# EXECUTIVE SUMMARY

Food from the sea provides key nutrients for communities all over the world. However, a reckless approach to safeguarding ocean health means that many fish populations, and the wider ocean food webs which depend on them, are now under grave threat. Future fishery collapses will be a tragedy for ecological diversity and for a well-functioning and healthy ocean.

Aquaculture, or fish farming, is often presented as a solution to address this dual challenge: a way to reduce pressure on fisheries while maintaining or increasing food security. However, key parts of the global aquaculture industry face an Achilles heel. 'Fed aquaculture', which requires some form of feed input to grow farmed fish, is the form of aquaculture most familiar in the global North: the farming of salmon, warm-water prawns, trout and sea bass all rely on external feed inputs. A key ingredient in all the feed used for these forms of aquaculture is wild fish and crustaceans, in the form of fishmeal and fish oil (FMFO): every year around 15 million tonnes of wild seafood is used to create FMFO for a variety of industries.

In other words, instead of escaping our ties to the ocean's ecosystems, these forms of aquaculture tighten the bonds. Among 'fed' farmed fish production, salmon farming stands out as one of the highest value global aquaculture sectors. To explore the implications of this industry's reliance on wild fish for global aquaculture, we have taken as a case study the Scottish salmon farming industry. Though a small proportion of global production, the Scottish farmed salmon industry plays an important role in the global aquaculture industry, setting quality standards and playing a key role in the branding and marketing of salmon products. One aspect of this market positioning has been an emphasis on nutritional quality. In general, salmon farming in Scotland uses a higher level of fish oil in its feed, the key ingredient that contributes to the omega 3 content in the final salmon product. In our previous report, we calculated that the Scottish farmed salmon industry currently uses at least 460,000 tonnes of wild fish per year to produce the fish oil necessary to feed its salmon<sup>1</sup> – roughly equivalent to the quantity of fish purchased by the entire UK adult population in a year. If the industry were to achieve the growth projections targeted by the industry body, the Scottish Salmon Producers Organisation, we calculated that companies would need to increase their use of wild fish by 310,000 tonnes, to a total of 770,000 tonnes, in 2030<sup>2</sup>.

With the approach of natural limits to the growth of FMFO production, the Scottish salmon industry – and the wider aquaculture industry – is acutely aware it faces a trade-off between increasing production and maintaining high levels of omega 3 micronutrients in its products, through the use of fish oil in feed. To manage this tension and demonstrate its commitment to sustainability while continuing to use FMFO, the sector's approach has largely been to rely on private sector-led certification schemes<sup>3</sup>.

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1 From these wild fish, a volume of fishmeal can also be produced to be used in other feeds for prawns or pigs for example, but producing this fishmeal is inevitable if we are to produce the necessary volumes of fish oil.

2 See Feedback 'Fishy Business: the Scottish salmon industry's hidden appetite for wild fish and land' (2019) for full calculations. Available at: <https://feedbackglobal.org/wp-content/uploads/2019/06/Fishy-business-the-Scottish-salmon-industrys-hidden-appetite-for-wild-fish-and-land.pdf>.

3 See Changing Markets Foundation and Feedback 'Caught Out: How UK retailers are tackling the use of wild fish in their aquaculture supply chains' (2020). Available at: <https://feedbackglobal.org/wp-content/>.



This report demonstrates that with regard to wild fish caught, certification is not the solution to overfishing. Our key concern about certification as used by the FMFO industry is that its primary driver is market demand: as the aquaculture industry grows, so does demand for certified forage fish for feed, and it is this demand which drives the certification of new fisheries. However, a 'market solves' mentality is not applicable to the ocean as an ecosystem.

Beyond the challenges of certifying fisheries for FMFO production – or 'reduction fisheries' as they are known – there looms a larger question. Should we be catching fish to produce feed for aquaculture, animal agriculture and pet food at all? Building on the findings of this report, and those of a sister report 'Off the menu: the Scottish salmon industry's failure to deliver sustainable nutrition' (2020), Feedback argues that reduction fisheries should not play a role in a healthy and ecologically sustainable future food system. Aquaculture and other industries which use FMFO compete for nutrients with the human food chain. To make best use of the nutrients available to us and ensure that people are nourished fairly, all food taken from the ocean should be intended for human consumption. This does not prevent the uptake of forms of aquaculture which do not rely on feed inputs – for example, mussels and other forms of bivalve farming.

Where certification may play a role is where fish is caught for direct human consumption: in this case, a fishery should demonstrate its sustainability status before being certified and this should be continuously reviewed in accordance with the latest scientific data. Certification should not be granted on the basis of a projected status of a fish stock that is expected as an outcome of a fisheries management programme, because there are too many uncertainties, particularly in the context of the climate emergency and its unpredictable impacts on the health of our seas.

A further, critical issue remains: equitable access to good nutrition. With limited nutritional resources from sustainable sources available to the global population, the question of who eats what is a vital one. Certification schemes are not designed to address the question of access to marine foods: rather, with a finite quantity of truly sustainably fished seafood, certification schemes ensure that these sources are monopolised by markets serving the Global North. Put in simple terms, we take fish from places where they could be sold on local markets, supporting local livelihoods and good nutrition, to feed them to farmed fish in faraway countries, for a product for a wealthier consumer, already with ready access to protein sources. Adopting a global food security lens, we need to ensure that there is equitable access to nutrition provided from marine resources.

To protect our ocean and find routes to truly sustainable aquaculture, we need bigger solutions and proper fisheries governance. We need to go beyond current approaches to producing farmed seafood, including salmon, which put our ocean at risk and intensify global food security issues. The Scottish salmon industry has a key role to play in stepping up to this challenge and setting an example for a rapid shift towards an aquaculture industry that leaves space for our ocean to heal: if it fails to do this, the prognosis is bleak.

# INTRODUCTION

## GLOBAL FISH POPULATIONS ARE UNDER THREAT

Stress on fish populations due to overfishing is one of the main threats to the health of the ocean. According to the FAO<sup>4</sup>, the proportion of global overfished marine stocks peaked in 2016 (representing 33% of global fish stocks); this was mirrored by the lowest level of underfished stocks (7%). The remaining 60% were fished at sustainable levels but with no room for any expansion.

The situation may be even worse than first appears: academic modelling of catch reconstructions<sup>4</sup> has revealed that global fisheries catches are likely to be higher than reported, which would mean that fish populations are in a much stronger decline than previously believed. Overall, reconstructed catches, which many scientists believe to be a more accurate representation compared to reported catches, were 53% higher than the reported data<sup>5</sup>. Furthermore, as underreporting was particularly strong in the peak years, a large underestimation of how much was caught then has led to a similar underestimation in the decline in catches. Since the year of peak catches in 1996, the reconstructed catch data show the decline to be over three times that of the reported FAO data: this decline in reconstructed total catches is not due to some countries reducing catch quotas so that stocks can rebuild – instead, it implies that the availability of fish in our seas is falling.

## ENTER THE BLUE REVOLUTION: AQUACULTURE'S RISE IN THE GLOBAL FOOD CHAIN

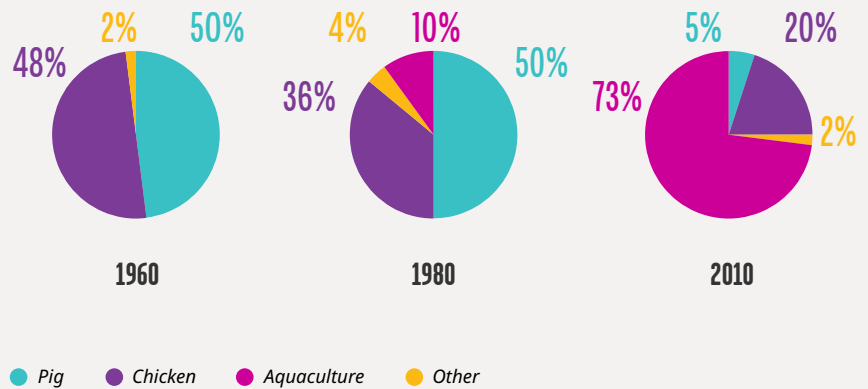
From a nutrition perspective, marine ingredients play an important role in the human diet through supplying key micronutrients, such as omega 3. Aquaculture is promoted as a sustainable solution to our ever-increasing pressure on the natural availability of wild seafood, decreasing pressure on overfished species while providing the public with a healthy source of protein and other key nutrients. More than half of the seafood we eat globally is farmed. As the world's fastest growing food-production sector, farmed seafood will account for 60% of global fish consumption within the next 10 years<sup>4</sup>.

However, fed aquaculture is reliant on wild-caught fish, usually small pelagic or 'forage fish', which are processed into two ingredients, fish meal and fish oil. Every year, around 15 million tonnes of wild fish from across the globe are used to produce FMFO<sup>4</sup>. Aquaculture accounts for 70% of FMFO consumption<sup>6</sup>. While the average global proportion of salmon feed made from wild fish has declined from 69% in the 1990s to 31% in 2015<sup>7</sup>, the industry's expansion has contributed to the substantial demands already being made by global animal agriculture and fed aquaculture on wild fish populations.

FMFO is a product of the global reduction fisheries industry. As well as aquaculture, this industry supplies both the animal feed industry – with fishmeal in particularly being used as an ingredient in chicken and pig feed – and the pet food industry, alongside being used directly for human consumption in the form of fish oil supplements (Figure 1).

<sup>4</sup> Catch reconstruction is a scientific methodology for estimating fishery catches in cases where there is no official data. Instead of entering 'no data' into a database, scientists create a best estimate based on related indicators – for example, number and size of fishing vessels operating in a certain area. This approach addresses in inherent negative bias in national and global catch data. For more information see Pauly and Zeller (2016)<sup>5</sup>.

Figure 1: IFFO estimates of FMFO use in 1960, 1980 and 2010



## WHY ARE FORAGE FISH IMPORTANT?



Two thirds of the FMFO used in fish feed globally are produced from wild-caught fish, largely small forage fish such as anchoveta, mackerel, blue whiting and sardines, which are the prey of larger ocean fish, birds and mammals<sup>8</sup>. There is expert agreement that heavy fishing of forage fish can have an impact not only on stocks of that fish, but also on the wider ocean ecosystem<sup>2</sup>. A Scottish Association for Marine Sciences report to the Scottish Parliament in January 2018 stated that **'the global harvest of forage fish is already at its limit'** and that further demand may increase pressure for unsustainable harvesting of fish<sup>9</sup>. As a result of this situation, a high-level panel of fishery and marine scientists has recommended that management should be more precautionary, and catch target levels should be significantly reduced in order to leave more of these fish populations in the ocean and safeguard the health of the ecosystem<sup>2</sup>. This panel also points to the pitfalls of using single species quotas in managing fish stocks, given the susceptibility of forage fish species to population collapse when the effects of fishing and unfavourable environmental conditions act together. The major knock-on impacts on animals that rely on forage fish as a food source also need to be considered.

Moreover, from a food security perspective, commodifying wild fish in the form of FMFO risks removing them from the human food chain, in parts of the world where they are widely eaten, such as West Africa. In some areas, these fish provide vital nutrition to the local community. This report adopts a global food security perspective and highlights that a key issue of certification schemes for fishery management is that they do not address access issues – who gets to eat what.



## THE SCOTTISH SALMON INDUSTRY'S APPETITE FOR WILD-CAUGHT FISH

Salmon aquaculture is a global industry that positions itself as being in the business of creating healthy and environmentally efficient protein. In Scotland, the salmon industry has boomed from a relatively small player in the early 1980s, to a major part of the portfolio of several global salmon farming brands, as well as a small number of businesses which operate only in Scotland. The industry promotes itself as a cornerstone of the Scottish economy, particularly in terms of the employment it brings to the remote areas where salmon farms are located, even if the true impact of the industry is disputed. A recent report estimates that the industry's 'Gross Value Added' is potentially exaggerated by 124%, while employment could be overestimated by an incredible 251%<sup>10</sup>.

Regardless of its contributions to the Scottish economy, the salmon industry has built a market niche off the back of its location, with marketing and branding that often plays off associations with Scotland's culture and scenery, as well as messages about healthy eating and sustainability.

In our first report, 'Fishy business: the Scottish salmon industry's appetite for wild fish and land'<sup>11</sup>, we questioned whether the reality of the industry's practice on feed lived up to the image its branding portrays. We highlighted the industry's appetite for wild fish: it currently uses at least 460,000 tonnes of wild fish per year to produce the fish oil necessary to feed its salmon<sup>5</sup> – roughly equivalent to the quantity of fish purchased by the entire UK adult population in a year. We argued that if the industry wishes to justify its place within a sustainable food system, it must provide sufficient transparency to demonstrate that the marine resources it uses in its feed are sustainable.

In this report we assess the results of this call for transparency, and what the data on wild fish use by the Scottish salmon industry tell us about the long-term role of the industry in a sustainable food system. We explore in detail the role of certification in assuring the sustainability of fish used in Scottish salmon feed, and conclude that alternative approaches to fisheries management are necessary if we are to truly safeguard the health of our ocean and marine life for future generations.



Photo: Tartan Salmon, The Scottish Salmon Company's brand in Japan. [www.tartansalmon.com](http://www.tartansalmon.com)

<sup>5</sup> While a volume of fishmeal can also be produced from these wild fish to be used in other feeds – for prawns or pigs, for example – its production is still inevitable, driven by the requirement for the necessary volumes of fish oil for farmed salmon feed.

# FEEDING THE SCOTTISH FARMED SALMON INDUSTRY

**The central challenge at the heart of feeding the Scottish, and wider, farmed salmon industry, is the need to maintain a certain level of key micronutrients in farmed salmon's diets, and thus in salmon products for the end consumer.**

This tension is particularly acute with regard to omega 3 fatty acids. As a carnivorous fish, wild salmon contains high levels of omega 3, and this nutritional feature has been important for establishing the popularity of farmed salmon in modern diets, as well as being a key marketing feature. While novel feed ingredients that could also deliver omega 3, such as algal oil, are being actively explored by the industry, the only current commercially viable mechanism of delivering the necessary level of omega 3 is through the use of a certain level of fish oil in salmon feed<sup>6</sup>. Fish oil is thus the limiting factor in reducing the level of wild fish in farmed salmon diets, and sourcing sufficient quantities of fish oil which meet quality criteria, and fit with individual companies' sustainable sourcing policies, is a key industry preoccupation.

While the focus of this report is wild fish, Feedback is highly conscious of the risk associated with other ingredients commonly used in salmon feed. Soya has received much attention recently, with great controversy over whether 'sustainable soya' is possible<sup>11</sup>. It is paramount that the fed aquaculture industry, in its drive to reduce its dependency on wild-caught fish in feed, does not simply substitute marine ingredients for potentially unsustainable land-based ingredients, such as soya or rapeseed oil.



## THE RISE OF SCOTTISH FARMED SALMON

Once a relatively small industry, farmed salmon has grown to become the UK's biggest food export<sup>12</sup> by value, with the industry increasing in production volume by 90% between 1997 and 2017<sup>13</sup>. After several years of consolidation, the Scottish industry is currently represented by six companies:

- » Cooke Aquaculture Scotland
- » Grieg Seafood
- » MOWI
- » Loch Duart
- » Scottish Sea Farms
- » The Scottish Salmon Company

Except for Loch Duart, all these companies supply retailers in the UK and the EU, as well as markets further afield, such as China and the USA.

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<sup>6</sup> See Feedback 'Off the menu: The Scottish salmon industry's failure to deliver sustainable nutrition' (2020), which explores the Scottish salmon industry's role in delivering protein and micronutrients to human diets.



Alongside their current operations, Scottish salmon companies have plans for expansion. In 2016, the Scottish Salmon Producer's Organisation, the industry body, proposed an expansion target of 100–160% by 2030<sup>14</sup>. While individual companies have since disclaimed this specific target in their communications with Feedback, planning applications for new sea-cage sites continue at pace, as well as plans for new 'super farms' positioned further out to sea<sup>15</sup>.

The Scottish salmon industry is supplied by a dedicated aquaculture feed (or 'aquafeed') industry, largely distinct from the wider animal feed industry. In Scotland, the main players in the feed supply chain are BioMar and EWOS Cargill (see Table 1). However, a trend towards vertical integration in the supply chain means that these companies' market share will be threatened by both a dedicated MOWI feed factory, which in addition to supplying the company's own farms will compete for wider business, and plans underway for Cooke Aquaculture to also establish its own factory. These very large investments in dedicated feed plants by salmon companies are an indication of the high costs of feed (salmon feed for Scottish production can account around 50% of production costs<sup>16</sup>), and the growth mindset that many companies are adopting towards their Scottish production.

Table 1: Aquafeed producers in Scotland

## AQUAFEED PRODUCERS

## KEY INFORMATION



*In 2015, Cargill acquired EWOS, a leading supplier of aquaculture feed globally. EWOS operates in all four major salmon farming regions: Norway, Chile, Canada and Scotland<sup>17</sup>. Cargill is a privately owned global corporation based in the USA. Cargill Animal Nutrition supplies feed globally to the beef, dairy, poultry and aquaculture industries.*



*BioMar is a global feed manufacturer for aquaculture, supplying feed to approximately 80 countries<sup>18</sup>. Established in 1962 by a group of Danish fish farmers<sup>19</sup>, today one out of five farmed fish produced in Europe and Chile are fed with BioMar feed<sup>20</sup>. BioMar is owned by Danish firm Schouw & Co, which is listed on the Copenhagen Stock Exchange<sup>20</sup>.*



*MOWI is the largest producer of farmed Atlantic salmon in the world<sup>21</sup>. MOWI is listed on the Oslo Stock Exchange and its shares also trade on the US OTC market<sup>22</sup>. In addition to its feed factory in Scotland, it also manufactures feed in Norway.*



## HOW IS THE SCOTTISH FARMED SALMON INDUSTRY MANAGING ITS RELIANCE ON WILD-CAUGHT FISH?

To assess the capacity and willingness of the industry to honestly and openly engage with the risks their feed-sourcing practices pose to the ocean's ecosystems, we wrote to the six largest salmon companies operating in Scotland. We asked each company to tell us:

1. The **specific fisheries** from which they source the wild fish used to produce FMFO for their feed, including the location, sourcing company and the certification status of these fisheries (e.g. MSC, MarinTrust/IFFO RS; see Box 2).
2. The **species and quantities** of fish used in their FMFO.
3. The **proportion of salmon feed marine ingredients sourced from by-products**, including trimmings and off-cuts, and the source of these ingredients.
4. The **Forage Fish Dependency Ratio** (FFDR) for Scottish operations, and how the companies reflect and take account of feed waste due to pre-harvest mortalities on their farms (Box 1).

Table 2 provides a summary of the responses from the six companies. Overall, there was considerable divergence between how different companies engaged with our research, with some willing to constructively acknowledge and discuss the feed sustainability challenges they faced, and others unwilling to engage at all.

## BOX 1: FEED USE AND SALMON MORTALITIES

*Mortalities of farmed salmon on Scottish farms continue to be a controversial issue, with much media coverage of incidents suggesting high mortality rates. The Scottish Government collects data on farmed salmon mortality incidents (where mortalities are higher than a designated threshold), which provide a fairly comprehensive outlook on variation between farms and over time. An analysis of the data from 2016 to 2019 (the latest years with full data available) showed a significant increase in mortalities in these years, rising from just under one million in 2016, to 5.8 million in 2019. Part of this increase is likely to reflect improvements in reporting over this period, but it is still a startling high percentage<sup>7</sup>. In one event in 2018/19, 50% of a farm's salmon died, over 1.5 million fish. One salmon company, MOWI, have stated: 'While our fish currently average better than 80 per cent survival, we expect 90 per cent to be commonplace.'<sup>23</sup> It is alarming that a 10% mortality rate is deemed to be an acceptable target, and an indication of how wasteful salmon farming is in its current form. For context, to achieve the UK's 'Red Tractor' standard, a chicken producer must be below 5% mortality per flock<sup>24</sup>. This means that even if MOWI was operating at what they consider an acceptable mortality rate, 10%, this is double what is deemed acceptable by the farmed chicken industry. Salmon companies reflect mortalities in their feed efficiency calculations by using a 'biological Feed Conversion Ratio' and an 'economic Feed Conversion Ratio' – the later includes a calculation factor to reflect the proportion of fish reaching full maturity and harvest.*

<sup>7</sup> Full calculations shown in Annex 1.





Table 2: Scottish salmon companies' public statements and disclosed sourcing practices

This table summarises the key responses provided by the companies that engaged with Feedback's request for transparency on feed sourcing.

(N.B. As these responses were given before the IFFO RS/MarinTrust rebrand, the former is referred to in this table.)

COMPANY	
<b>RESPONSE TO FEEDBACK</b>	<i>No response.</i>
<b>PUBLIC STATEMENT REGARDING FEED SOURCING</b>	<i>'We also use Third-Party Certification Programs to challenge us to go above and beyond our regulatory requirements in key areas like environmental and social responsibility, food safety, animal welfare and traceability. ... The 4-Star BAP (Best Aquaculture Practices) Certification mark, attests that our farmed salmon meets the BAP standards on four separate links in the chain of production: sea sites, processing plants, feed mills and freshwater hatcheries.'</i> <sup>25</sup>
COMPANY	
<b>RESPONSE TO FEEDBACK</b>	<ul style="list-style-type: none"> <li>» <i>The economic Feed Conversion Ratio (eFCR) across their global operations in 2019 was between 1.17 and 1.46. Grieg Seafood also makes their eFCR publicly available. In 2019 for their Shetland operation the eFCR was 1.47</i><sup>26</sup>.</li> <li>» <i>Provided detailed sourcing information for the 70% of their feed which is bought from BioMar. This showed that around 40% of their total wild fish usage for fish oil came from trimmings or off-cuts. For fishmeal this is 9%</i><sup>27</sup>.</li> <li>» <i>100% of wild marine ingredients sourced were IFFO RS certified and 81% were compliant with the Aquaculture Stewardship Council standards.</i></li> <li>» <i>The largest major source of wild fish for marine ingredients in 2018 was Peruvian Anchoveta, with significant quantities of trimmings from Atlantic fisheries, Menhaden from the Gulf of Mexico and South African anchovy.</i></li> <li>» <i>For the 30% of Grieg Seafood feed used in Scotland that was sourced from EWOS Cargill, only more general information was provided, which covered the whole of EWOS Cargill's Scottish production.</i></li> </ul>
<b>PUBLIC STATEMENT REGARDING FEED SOURCING</b>	<p><i>"Grieg Seafood works actively to achieve the ASC (Aquaculture Stewardship Council) standard. ASC certified fish is produced according to a set of strict rules."</i><sup>28</sup></p> <p><i>'It is important for both our local communities and customers to know that our farming practices are sustainable. To reassure them, our farms are certified by independent bodies.'</i><sup>26</sup></p>

## COMPANY



### RESPONSE TO FEEDBACK

- » Did not provide their feed conversion ratio or forage fish dependency ratio.
- » Loch Duart use a bespoke feed with a high marine content of 60%, with a 'dedicated focus' on using by-products from fish catch intended for human consumption.
- » Sources of fishmeal include MSC certified capelin carcasses, as well as further unspecified sources of fishmeal certified by IFFO RS.
- » Sources of fish oil were not given, but Loch Duart stated that sources of fish oil were IFFO RS certified, with a 'significant' level of trimmings used.

### PUBLIC STATEMENT REGARDING FEED SOURCING

*'We feed our salmon a diet which is as close as possible to what wild salmon eat. In the wild, salmon eat small fish as well as krill, squid and shrimp. With sustainability at the heart of our business, our challenge is to reproduce this diet without putting extra pressure on the sea's resources.'*

*Through a partnership with an Icelandic fishing company, we have sourced a by-product of their capelin fishery for our salmon feed. This ingredient is certified to the International Fishmeal and Fish Oil Organisation Responsible Supply Standard and in April 2017 was Marine Stewardship Council (MSC) certified as well.<sup>29</sup>*

## COMPANY



### RESPONSE TO FEEDBACK

- » MOWI makes its biological FCR (i.e. not accounting for mortalities) publicly available – in 2019 this was 1.14<sup>30</sup>.
- » Since June 2014, the average proportion of trimmings and off-cuts used to make MOWI feed at their Norwegian factory was 10.2% for fishmeal and 4.9% for fish oil. This is considerably lower than the figure provided by BioMar for Grieg Seafood – MOWI stated that they aim to use whole fish which deliver a high concentration of omega 3s, such as menhaden from the Gulf of Mexico and anchovy from the Black Sea. This is intended to minimise their overall use of fish oil. For fishmeal a high proportion is from blue whiting from the North-East Atlantic.
- » MOWI did not provide specific quantities of FMFO sourced from different fisheries; however, types of fish and countries of origin included gulf menhaden (USA), Peruvian anchovy (Peru), European anchovy (Turkey), blue whiting, capelin, Atlantic herring, pout and sandeel (Faroe Islands, Iceland, Norway, Denmark). MOWI confirmed in a meeting with Feedback that all FMFO used in Scottish operations is at least IFFO RS certified, with the aim to source MSC certified where possible.

### PUBLIC STATEMENT REGARDING FEED SOURCING

*'As a business, MOWI has globally committed to achieving 100 per cent ASC certification for all our farms. This is a long-term objective and I'm proud to say that in Scotland we have a plan in place for 2020 to expedite certification at a number of our sites and play our part in achieving this vision.'* Rory Campbell, Technical Manager<sup>31</sup>

## COMPANY



### RESPONSE TO FEEDBACK

» No specific information provided other than that FMFO from wild fish is IFFO RS certified. Informed that information would be made available via a dedicated website, this was not publicly available at the time of this report's publication.

### PUBLIC STATEMENT REGARDING FEED SOURCING

» No information available in public materials.

## COMPANY



The Scottish  
Salmon Company

### RESPONSE TO FEEDBACK

» No response

### PUBLIC STATEMENT REGARDING FEED SOURCING

*'We hold national and international accreditations and certifications across the value chain, including GLOBALG.A.P., the worldwide standard for Good Aquaculture Practice'<sup>32</sup>*

## LACK OF DATA TO VERIFY INDUSTRY'S SUSTAINABILITY CLAIMS

The wide variance in the responses we received from companies demonstrates that, overall, **there is insufficient data and information to verify the industry's claims that they are providing a sustainable source of protein, avoiding placing an excessive burden on wild fish populations.** While certain companies have provided adequate information, as a whole, the salmon farming industry is over-reliant on general statements as a means of demonstrating sustainability. In the absence of comprehensive, transparent, industry-wide data, we should be highly sceptical of the Scottish salmon industry's sustainable-sourcing claims. Where companies fail to provide specific information concerning the provenance of their feed ingredients, they fall back on their commitment to certification of feed ingredients as a blanket justification of sustainability. However, it is clear from specific examples – for example MOWI's goal to reach 100%<sup>66</sup> certification of feed, which was achieved in 2017 but slipped to 83% in 2018 – that where there are shortages of certified ingredients, companies will turn to non-certified sources: standards are flexible to demand.

**Amid this wider picture, we regard the lack of engagement by The Scottish Salmon Company, Cooke Aquaculture and, to some extent, Scottish Sea Farms, to indicate that these companies do not take the sustainability of their product seriously.** Overall, the collective response confirmed our concerns that the industry does not hold the information it needs to assess the sustainability of its operations, and that this information is not independently verifiable.



# IS CERTIFICATION A RED HERRING?

As can be seen from the information disclosed by certain companies, certification of wild-caught marine ingredients, and of the fisheries from which they are taken, is the primary means by which the salmon industry and feed companies seek to establish and maintain their sustainability credentials. Where demand outstrips market supply of certified marine ingredients, they are sometimes sourced from suppliers involved in 'Fisheries Improvement Projects'. To better understand whether this confidence in certification is justified, we look more deeply at whether certification provides sufficient protection to fish populations and wider ocean health.

This chapter sets out the relevant certification schemes, explores criticism related to these schemes and draws conclusions on what the Scottish salmon industry's reliance on certification means for its overall claims to sustainable sourcing. We focus mostly on supply chain information related to MOWI, Grieg Seafood, BioMar and EWOS Cargill, the companies that either provide publicly available information on their supply chain, or responded directly to our request for transparency (Loch Duart is excluded from this list because of the relatively small scale of their operations in comparison with other companies). We assume that these companies' best practice in terms of transparency translates into best practice in terms of sourcing policy.

## THE FISHERIES CERTIFICATION SEASCAPE

The certification landscape is complex. Several different schemes operate, some of which rely on each other's indicators and benchmarks, which can make it difficult to interpret the standards that different companies are adopting. The two main schemes we consider in this report are the Marine Stewardship Council and MarinTrust (formerly the IFFO Responsible Standard), and each of their Fisheries Improvement Projects (FIPs) – for further details on each scheme, as well as two other schemes commonly used by the industry, see Box 2.



## BOX 2: CERTIFICATION SCHEMES AND FMFO

*A variety of certification schemes cover FMFO used in aquaculture. The schemes most commonly used or referenced by companies are set out below.*

**MarinTrust** – Formerly known as the IFFO Responsible Standard and rebranded in April 2020<sup>33</sup>, MarinTrust certification was created by IFFO, the international trade organisation that represents and promotes the marine ingredients industry. However, the two organisations are separate entities. The MarinTrust certification process relies on factory audits and fisheries assessments, which are intended to ensure that whole fish used in the production of FMFO are sourced from ‘responsibly managed fisheries’.

**Marine Stewardship Council** – The MSC is an international non-profit organisation whose mission is to use their ecolabel and fishery certification programme to contribute to the health of the world's ocean. The MSC develops a global standard by which ‘the sustainability of a fishery can be assessed regardless of its size, geography or the fishing method used’<sup>34</sup>.

**Fisheries Improvement Projects (FIPs)** – While not directly relevant to the information we have seen regarding FMFO used in the Scottish market, FIPs are relevant for the wider practice of the companies involved in this market. FIPs allow fisheries that cannot currently be certified to receive advice and support from a certifying body such as MSC or MarinTrust, with the idea that this incentivises improvement in sustainable fisheries management and will eventually lead to a certified status.

**Aquaculture Stewardship Council** – The ASC is developing a global aquaculture feed standard that aims to address a wide range of issues throughout the feed supply chain for both marine and terrestrial ingredients, such as habitat loss, over-harvesting, biodiversity impacts, pollution, poor labour conditions, human rights abuses and lack of community consultation, among others<sup>35</sup>.

**GLOBALG.A.P.** – This is a trademark and a set of standards for good agricultural practices (G.A.P.). According to GLOBALG.A.P. their aquaculture standard ‘covers the entire production chain from feed to fork’<sup>36</sup>.

Globally, 15% of fisheries are MSC certified<sup>37</sup> and over 45% of marine ingredient production is MarinTrust/IFFO RS compliant<sup>38</sup>. There is disparity between different regions and the matrix of certified feed used, for example Cargill states that it uses ‘43% MSC certified marine ingredients globally and 65% MSC certified marine ingredients in Norway and Scotland’<sup>39</sup>. For those companies which do not provide transparency on their feed sourcing, there is no guarantee that their feed meets the standards we have found elsewhere in the industry.

## CRITIQUES OF CERTIFICATION SCHEMES

Voluntary certification schemes – the preeminent industry-led response to consumer demand for sustainably sourcing global commodities, from cotton to palm oil – face multiple challenges. These are explored in some detail in Changing Market's report 'The false promise of certification', an authoritative overview of the limits of certification in ensuring sustainability<sup>40</sup>. Aside from overall challenges, certification is particularly complicated with regard to a finite resource such as fish where the mechanism of certification as such cannot expand the actual availability of fish stocks.

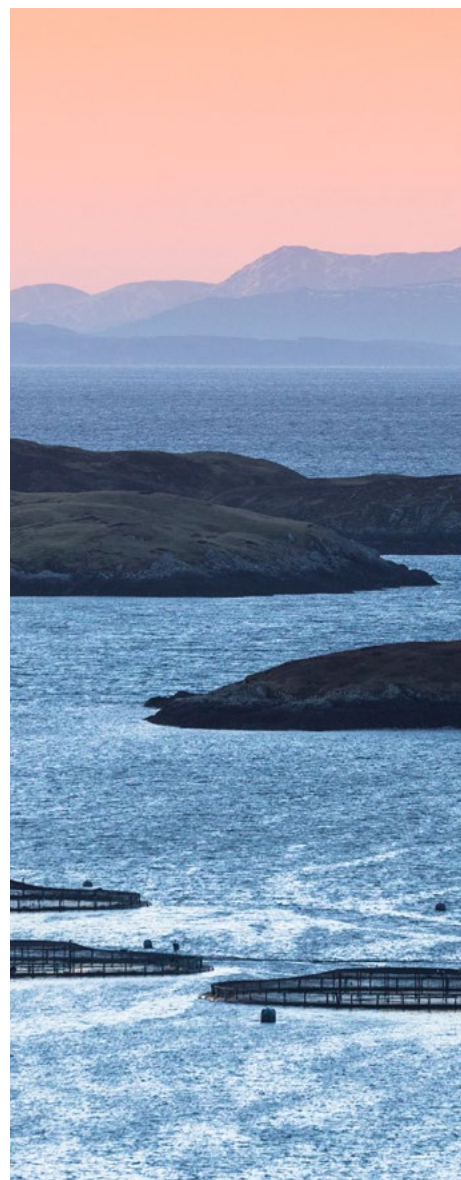
Fisheries certification schemes have generated significant controversy. We review some of the key, evidence-based challenges with the two schemes we have focused on with regard to FMFO used in global aquaculture.

### MSC CERTIFICATION

The MSC standard has been the subject of considerable controversy among fisheries experts and other NGOs concerned with protecting marine life<sup>41</sup>. An academic study led by the MSC<sup>42</sup> found that 18% of MSC certified fisheries had an exploitation rate that would not allow fish stocks to be either maintained or rebuild to a biomass supporting maximum sustainable yield – in other words nearly a fifth of certified fisheries are actually overexploiting the resource according the MSC itself. In contrast, an independent study looking at the same stocks but using more a cautious definition of overexploited stock found that 31% of MSC certified fisheries had overfished stock sizes and were subject to ongoing overfishing<sup>43</sup>.

This partly relates to the overly optimistic future outlook of MSC assessments, with fisheries allowed to receive a conditional pass if they achieve an overall score of 60% against the MSC principles, with conditions to be met within 5 years<sup>44</sup>. This is expressed in the MSC principle that 'for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery'<sup>45</sup>. The question is whether it is possible and realistic to have a fisheries management demonstrably leading to recovery within current market demand, coupled with the uncertainty resulting from climate change impacts on our ocean (Box 3).

More broadly, despite high costs and difficult procedures, conservation organisations and other groups have filed and paid for 19 formal objections to MSC fisheries certifications. An analysis of these objections, 'indicates that the MSC's principles for sustainable fishing are too lenient and discretionary, and allow for overly generous interpretation by third-party certifiers and adjudicators, which means that the MSC label may be misleading both consumers and conservation funders'<sup>46</sup>. A further challenge is that the MSC remains inaccessible to much of the world's developing country fisheries due to the expenses as associated with the programme and the high data requirements for assessment<sup>47</sup>.





MSC projects an image of sustainability: new research shows that small-scale, low-impact fisheries represented only 7% of MSC certified volumes but 47% of the illustrations used in MSC publicity materials<sup>48</sup>. The report authors note ‘the MSC label thus created its alternative reality, “guilt-free”, to fit to that desired by citizens who are increasingly concerned about their purchases’ environmental impact.<sup>49</sup>

### BOX 3: ADDING CLIMATE CHANGE INTO THE MIX

*Climate change is making the health of our ocean and the ecosystems it contains more unpredictable. A recent IPCC Oceans report found that<sup>50</sup>:*

- » *Since about 1950 many marine species have undergone shifts in geographical range in response to ocean warming, sea ice change and biogeochemical changes to their habitats, such as oxygen loss.*
- » *In some marine ecosystems, species are impacted by both the effects of fishing and climate changes.*
- » *Fisheries catches and their composition in many regions are already impacted by the effects of warming and changing primary production on growth, reproduction and survival of fish stocks.*
- » *Warming-induced changes in spatial distribution and abundance of fish stocks have already challenged the management of some important fisheries and their economic benefits.*

*Climate change may lead to a drastic reduction in fish stocks in areas where local diets are heavily dependent on fish catches; many African coastal regions are vulnerable to climate change impacts<sup>51</sup>.*

### MARINTRUST (PREVIOUSLY IFFO RESPONSIBLE SUPPLY STANDARD – IFFO RS)

Our conversations with Scottish salmon companies confirm that the MarinTrust standard is seen as the ‘minimum’ compared to MSC certification. According to a Seas At Risk report<sup>44</sup>, the IFFO RS (MarinTrust) is ‘limited to the fishmeal / fish oil factory as the unit of certification and as such does not carry out audits at fishery level nor allow fisheries to make any claim of responsibility’. MarinTrust states that whole fish used must come from fisheries that have been independently scientifically assessed and meet the key principles of the FAO’s Code of Conduct for Responsible Fisheries<sup>38</sup>. However, in an assessment of sardinella in Morocco from 2018 examined by Feedback, the assessor found that the fishery failed the minimum stock status requirements, saying that ‘sardinellas are considered overfished throughout the entire West African region’<sup>52</sup>. Nonetheless, the fishery was then passed on a ‘risk assessment approach’, based on the ‘high productivity’ of the fish population – in other words, on the assumption that the fishery is productive enough to withstand high demand. This is clearly not a precautionary approach.

A key concern with this scheme is the conflict of interest between IFFO the trade body and MarinTrust the certification body. While these two groups are legally separate bodies, there is a large degree of interplay between the two, and it is naïve to imagine that IFFO's policy goals as an industry representative do not affect the way in which certification standards are developed. IFFO have continued to stress the need for continued use of marine ingredients in feed from a nutrition perspective<sup>53</sup>. Eduardo Goycoolea, previous President of IFFO, who now sits on the MarinTrust Governing Body<sup>54</sup> has stated:

*'Salmon feed is still dependent on fishmeal and fish oil, because no substitute has been found with the nutritional quality of these marine ingredients.'*<sup>53</sup>

Currently there is a high demand for certified marine ingredients. This leads to market demand driving certification as opposed to a measured improvement in fisheries management. Fishmeal is big business – worth approximately €5.3 billion (£4.6 billion) in 2017, it is projected to reach €8.8 billion (£7.6 billion) by 2027<sup>7</sup>. IFFO itself has highlighted that demand for marine ingredients is outstripping supply, even suggesting the exploitation of mesopelagic or deep-sea fish to satisfy growing demand<sup>55</sup>. IFFO also supports the use of krill in FMFO, stating 'krill is an important raw material for marine ingredient production, both protein and oil'<sup>56</sup>. Feedback does not support the certification of Antarctic krill and we are opposed to commercial fishing of this cornerstone species in the unique Antarctic ecosystem<sup>57</sup>.

The April 2020 rebrand of IFFO RS as 'MarinTrust' has not been reflected in an updated view on how certification should operate. The goal remains growth. This is particularly concerning when investigations from the Changing Markets Foundation have highlighted that FMFO and aquafeed plants with proven links to highly unsustainable fishing practices are certified by, or are members of, IFFO<sup>55</sup>.

The key concern with certification as a 'guarantee' of sustainability is that its primary driver is market demand. This is exemplified in IFFO's 'market solves' approach to certification: the logic that if there is an increased demand for certified marine ingredients the solution is to certify more marine ingredients.

“

*Our ambition by 2025 is to get 75% of marine ingredients worldwide either certified, in assessment or in one of our 'improver programmes'.*

”

Libby Woodhatch, executive chairwoman of MarinTrust<sup>58</sup>

## FISHERIES IMPROVEMENT PROJECTS

The effectiveness of FIPs have been mixed and uneven with reports showing a large number of FIPs in the early phases of improvement (i.e. work plan design), without moving on to the implementation phase<sup>59</sup>. Looking at the state of global fisheries<sup>4</sup> and overall declines shown by reconstructed catch data<sup>5</sup>, it is not surprising that certain fisheries in FIPs are struggling to move on to certification stage, especially if they are located in fisheries under severe pressure overall. However, there is a risk that by being perceived to be engaged in a sustainability process, some fisheries, which would not otherwise be regarded as sustainable are brought into international supply chains. We explore this challenge further in the next section.

#### BOX 4: CERTIFICATION OF ORGANIC FARMED SALMON

Organic farmed salmon is on the Marine Conservation Society 'fish-to-eat' list, receiving a rating of 2 (with 1 being best and 5 being most unsustainable). The Marine Conservation Society<sup>60</sup> states that **feed used to farm organic salmon must be 'produced from off-cuts and by-products of human consumption fisheries and organic certified plant raw materials' (no GMO) and stringent regulations and third party on site auditing.'**

However, the full 'Feed Processing Guidelines' of the Soil Association<sup>61</sup>, the organic certification body, list five sources of permissible feed, with the last permissible choice being:

» feed products derived from whole fish caught in fisheries certified as sustainable under a scheme recognised by the competent authority in line with the principles laid down in Regulation (EU) No 1380/2013 of the European Parliament and of the Council.

The schemes recognised by the 'competent authority' in the UK (the Department of Environment, Food and Rural Affairs), include Marine Stewardship Council and the IFFO RS/MarinTrust. However, farmed organic salmon that is recommended by the Marine Conservation Society as a 'fish to eat' may have been fed on fish not caught in Marine Stewardship Council certified fisheries – and even if it were, there are, as we have seen, limits to the reliability of MSC schemes as an indication of fish stock sustainability. The challenges described in this report and Feedback's report 'Off the menu: the Scottish salmon industry's failure to deliver sustainable nutrition' suggest that even organically farmed salmon should not appear as 'best choice' in the Marine Conservation Society's Good Fish Guide unless the feed used is made entirely from by-products of fish caught for direct human consumption (see 'The case against certifying reduction fisheries' below). We also recommend that the Soil Association's organic standard is amended to exclude feed products derived from whole fish, however they are caught.





## WHY CERTIFICATION IS NOT THE SOLUTION TO OVERFISHING

Some would argue that certification, while undoubtedly imperfect, is better than nothing. Certainly, critical, independent research finds that for direct human consumption 'it is still reasonable to buy certified seafood, because the percentage of moderately exploited, healthy stocks is 3–4 times higher in certified than in non-certified seafood'<sup>43</sup>. However, we argue that, in the context of **growth of the salmon industry and overall fish stock depletion, reliance on certification of reduction fisheries to produce FMFO for salmon farming is not justified**.

The overarching logic of certification programmes is that establishing a credible standard will provide a commercial incentive for producers – in this case fishing industries and FMFO manufacturers – to raise their standards in order to open new markets for their product. Companies involved in the supply chain of Scottish salmon feed share these assumptions: where fisheries which supply the FMFO market are fragile or at risk, the argument of salmon feed producers is that market demand for certified marine ingredients will drive a move towards sustainability.

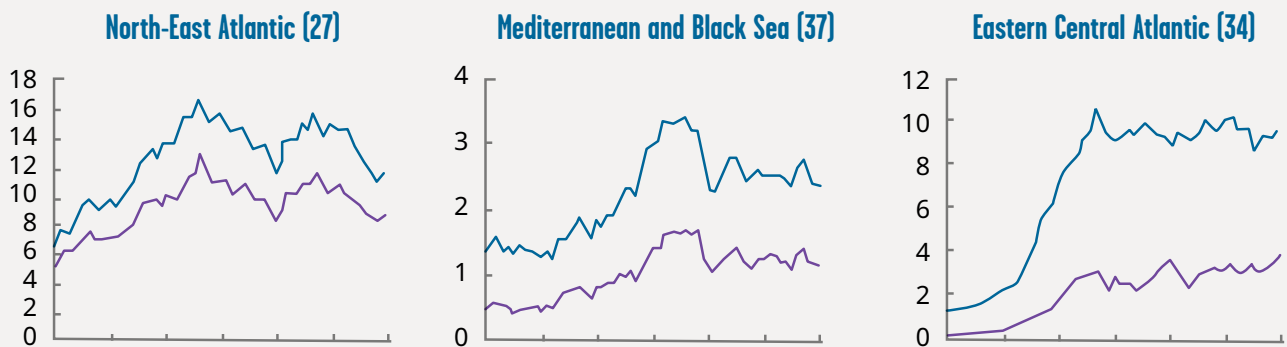
Yet this logic contains some significant failures. Uncertified fisheries in West Africa and Turkey provide a good example of this approach. The round sardinella (*Sardinella aurita*) from north-west Africa is a common dish in countries including Senegal and the Gambia, where fishing and fish form an important part of coastal communities' livelihoods and diets. A migratory pelagic fish, sardinella shoals are widely fished by both traditional artisanal fisheries and industrial trawlers from south of Senegal up to northern Morocco. In several countries, notably Morocco and Mauritania, they are also the primary source of wild fish for reduction fisheries, and this rising demand is causing challenges. Mauritanian and Moroccan waters are both situated within the FAO fishing area Eastern Central Atlantic, which has seen its overall capture fisheries grow by 17.3% between 2005 and 2014: it is the third fastest growing fishery globally and the fourth most unsustainably fished area worldwide, with 40% of fisheries biologically unsustainable<sup>62</sup>. The round sardinella in this area is listed as overexploited<sup>62</sup>. There is also local evidence that Mauritanian FMFO plants are operating significantly under capacity due to low catches. As the climate changes, fisheries like the West African sardinella will come under increasing pressure from changing sea temperatures and other ecosystem factors. Overall, tropical nations are expected to experience the greatest losses of a projected 40% decrease in fish catch potential as a result of climate change<sup>63</sup>.

Fishing by fleets from the European Union, Russia and South-East Asia – and high fish exports to the EU as well as China – have led to local fish scarcity and price increases that have made fish increasingly inaccessible to local people<sup>64</sup>. A confidential source active in the FMFO industry in Mauritania told Feedback that only four of the nine plants supplying fish oil to an intermediary company called Olvea – that supplies fish oil to BioMar and MOWI – are in the MarinTrust FIP. Another confidential source witnessed Senegalese canoes supplying sardinella to Mauritanian processing plants, which is highly problematic given reports of conflicts between Senegalese fish markets for human consumption and the FMFO sector.



The Turkish European anchovy (*Engraulis encrasicolus*) is also uncertified by either MSC or MarinTrust: the Mediterranean and Black Sea is the most overexploited fishery globally, with over 60% of fish stocks rated as biologically unsustainable<sup>4</sup>. According to the Marine Conservation Society, 'the stock status for anchovy in the Black Sea is unknown and fishing mortality is too high. Turkey's anchovy catch has fallen sharply since 1989 due to several factors including overfishing'<sup>65</sup>. European anchovy is, moreover, a common dish across Europe, both fresh and preserved in oil or salt. Figure 2 shows that the differences between reported catches and reconstructed catches (see Introduction) are particularly stark in the Mediterranean and Black Sea, and Eastern Central Atlantic areas, in contrast to the North-East Atlantic, as a comparator.

Figure 2: Reconstructed (blue/top line) and reported (purple/bottom line) catches by FAO areas. Source: Pauly and Zeller, 2016.



Yet within this wider picture of unsustainable and overexploited fisheries, three leading companies producing farmed salmon feed justify their purchases from sources in Turkey, Morocco and Mauritania by arguing that their demand, and the stipulations they place on suppliers to work towards certification, will have the overall effect of driving up standards towards sustainability. For example, EWOS Cargill told Feedback:

“

*We have purchased small amounts of fish oil from Olvea in Mauritania for our other European businesses, representing less than 2% of our total purchases, as an incentive for Olvea to engage and initiate a Fishery Improvement Project ... As Olvea successfully initiates and concludes its Fisheries Improvement Project, including obtaining the appropriate certification, we anticipate increasing our purchases with them for some of our businesses.*

”

Personal communication with EWOS Cargill

Similarly, MOWI states that it is 'encouraging suppliers who do not yet comply with our sourcing policy (Mauritania and Turkey) to acquire the relevant sustainability credentials'<sup>66</sup>. BioMar also has approved suppliers which it audits on-site in Mauritania and Morocco<sup>27</sup>, two countries which do not possess any MSC certified fisheries.

The wider evidence suggests that these fisheries are precarious. With these levels of insecurity and wider unsustainable practice, a small number of suppliers either certified or participating in a FIP cannot make a whole fishery sustainable when it is already under significant threat. Looking closely at these examples, it is difficult to have confidence in these companies' theories of incremental improvement: driving up demand for certified marine ingredients cannot support sustainable management across the board when there is significant shortage of supply in the first place.

#### **BOX 5: THE POLITICS OF CERTIFICATION – EUROPEAN MACKEREL**

*European mackerel gives a good case study on the difficulties of predicting the recovery potential of a certain fishery management approach, in the context of climate change and heavily contested fishing rights. Mackerel has bounced in and out of the MSC certification scheme since the first certificate in 2007. In 2019, British mackerel was again stripped of its MSC certification because stock in the North-East Atlantic dropped below a precautionary threshold, while catches remained far higher than advised by scientists<sup>67</sup>. Rising sea temperatures have caused mackerel to migrate north, leading Iceland and the Faroe Islands to unilaterally increase their quotas. This has led to the so-called 'Mackerel War' which has flared on various occasions since 2010 – Britain and Norway, backed by the EU, on the one hand, and Iceland and the Faroe Islands on the other, have not been able to agree a joint approach to catch sizes and quotas. As a result, total quotas between all mackerel fisheries were set far above scientific advice. This intersection between climate change and international fisheries politics demonstrates why certification schemes for fish intended for direct human consumption must be extremely cautious in their approach to approving fisheries. Feedback understands that the MSC is using the learnings from the mackerel case, particularly in terms of fisheries governance and 'yo yo fisheries' (or fluctuating fisheries), to help improve the MSC standard<sup>67</sup>. However, while mackerel had its certification suspended it is still on the Marine Conservation Society 'fish-to-eat' list.*



## CERTIFICATION AND EQUITY: THE PROBLEM OF 'SUPPLY CHAIN PRIVILEGE'

Why do companies that are highly aware of their sourcing policies and practices, such as BioMar and MOWI, continue to buy FMFO, and fish oil in particular, from contested locations such as Morocco and Mauritania? One reason is quality: fish oil made from West African sardinella is particularly appreciated for its high quality omega 3 content, which has the advantage of reducing the overall volume of fish oil needed in a feed formulation<sup>68</sup>. Against this advantage, the West African sardinella fishery is not MSC certified, and only some West African producers of FMFO are MarinTrust certified, solely in Morocco.

While EWOS Cargill, BioMar and MOWI all source fish oil from West African countries for their global operations, they have confirmed that this fish oil is not used in their Scottish operations. In their dialogue with us, they confirmed that they use different feed formulations for different production sites (for example, in Scotland versus in Norway). These decisions are a result of a variety of factors including but not limited to market demand on marine ingredients, sourcing and reputational issues, and omega 3 content. The fact that uncertified but high-quality sources of fish oil, such as West Africa, are excluded from feed formulations for the Scottish market indicates the higher value given to sustainability credentials for salmon products from Scottish farms.

This is essentially a decision to prioritise some raw materials with stronger sustainability credentials for some markets – and maximising on the marketing opportunities these credentials present – while still making use of more questionable sources within wider operations. But the overall context is clear: whichever market companies choose to prioritise, natural limits to fisheries are finite. In other words, while the Scottish salmon industry can choose to prioritise higher standards for marine ingredients, to support a market positioning as a higher quality option compared to other farmed salmon, **the industry remains a driver in creating increased overall demand for marine ingredients regardless of whether these come from certified sources. We term this dynamic 'Supply Chain Privilege'**. We therefore prioritise understanding the whole feed-ingredient supply chain of salmon companies operating in Scotland, regardless of where different sources of marine ingredients are then used downstream in feeding operations.



## THE CASE AGAINST CERTIFYING REDUCTION FISHERIES

This section has explored the inherent challenges of certifying a finite and commodified fish population which is subject to ever-rising demand. Forage fish populations are not only a food resource for people – in some cases one of the few plentiful sources of high quality protein and micronutrients<sup>69</sup> – they are also a cornerstone of ocean ecosystems and the means of survival for other species further up the food chain<sup>70</sup>. It is right that any use humans make of wild species like forage fish is fully justified within a sustainable food system.

We have argued that the available evidence on certification schemes does not support their use to justify the sustainability claims made by Scottish salmon companies regarding the feed they use. Looking in depth at the supply chains and decision-making of companies operating in Scotland, we have found that while the Scottish industry may set high sourcing standards in comparison with other global production sites, these standards still do not offset the risks posed to forage fish populations, both from expanding salmon aquaculture and other sources of demand (such as animal feed and pet food). For the salmon aquaculture industry to continue to grow, while meeting their public sustainability commitments, demand for certified forage fish for feed also grows: this leads to a drive to expand certification schemes. However, a ‘market solves’ mentality is not applicable to the ocean as an ecosystem. Instead of making assumptions about the future sustainability of fish stocks, we need to adopt the precautionary principle when dealing with the health of our ocean.

**As a result, Feedback does not support certification of any fish or fish populations intended for use as feed for either aquaculture or animal agriculture under any circumstances – this includes pet food. Schemes such as the MSC, to be credible, should not certify reduction fisheries – fish caught specifically to make FMFO.**

**Certification for direct human consumption ‘should not be granted until a fishery is shown to be actually sustainable’<sup>47</sup> and then very frequently reviewed, based on the latest scientific advice.** In severely overfished areas, legally binding and well-enforced policy measures are needed to bring significantly threatened fisheries within sustainable boundaries, before certification can play a role. In fishery areas with *strong legally enforced fishery management programmes*, voluntary certification schemes for fisheries for direct human consumption can play a role in supporting retailers and chefs to offer a wide range of wild fish to customers. This range should continuously adapt to the actual status of fish stocks, not projected status.

A salient question, beyond certification, is whether reduction fisheries should play any role at all within a sustainable food system. While to companies involved in the global aquaculture industry some fisheries are highly suitable to commodification in the form of FMFO, to many communities these fisheries are a source of nutrition and livelihood. **Certification of reduction fisheries is being used as tool to justify the reclassification of fish away from human food and**



**towards animal or fish feed.** The industry is currently catching fish which could be eaten by people, in West Africa, Turkey or elsewhere, in order to feed this catch to fish intended for a global export market. This approach essentially transfers nutrients around the globe, in the process removing them from more local supply chains and redirecting them towards international supply chains where they can deliver greater financial value. At the global scale, regions with nutrient deficiencies are net exporters of seafood to regions without nutrient deficiencies. In principle, developing countries could consume more seafood simply by exporting less of it. But prevailing conditions in the global seafood market make it advantageous for many countries to be seafood exporters<sup>71</sup>. But this ignores the question of how we make best use of nutritional value.



In the context of finite natural limits, pressure on ecosystems and growing human demand for nutrients, all available nutrients in fish should be consumed in the form that makes the most efficient use of them. In our report 'Off the menu: the failure of the Scottish salmon industry to deliver sustainable nutrition' we model whether it is possible to access the same or similar levels of micronutrients (in particular omega 3) to that currently provided by the Scottish salmon industry, by directly consuming some of the fish currently used to produce FMFO. Our research shows that by directly consuming a wide variety of small, oily wild-caught fish, alongside increasing our consumption of farmed mussels (which do not require feed and provide high levels of some micronutrients) as well as a smaller quantity of farmed seafood (salmon and prawns), we could access the same level of micronutrients as through the current level of farmed salmon production, **while avoiding the capture of 77% of fish currently used in Scottish salmon feed.** This report does not explore the geographical distribution of nutrients in this model, but we assume that such an approach would involve a more 'local' form of fish and seafood consumption, which is more likely to promote equity.

The principle that it is better to eat wild fish directly than redirect the nutrients they contain through farmed seafood appears to hold true for other common fed aquaculture species as well (unfed aquaculture, due to the fact it does not rely on external feed ingredients, should be assessed separately). Salmon is one of the most efficient farmed fish at converting protein in feed into biomass (see Box 6). But farmed salmon need more protein in their diets than humans do, leaving us in the strange position of sourcing additional wild marine protein to feed farmed salmon, to then feed people. With 90% of reduction fisheries catch being 'food grade'<sup>1</sup> (in other words, edible by people), it makes far more sense to simply remove the step of feeding wild fish to farmed salmon, and eat it directly. As a result, on the basis of current evidence, **Feedback advocates that the reduction fisheries industry should not form part of a sustainable salmon farming system, and that no wild fish should be sourced to feed salmon aquaculture.**



## BOX 6: RESEARCHING THE FOOD-FEED COMPETITION ISSUE FOR OTHER TOP FED AQUACULTURE SPECIES

*Feed for common fed aquaculture species (carp, tilapia, prawns and catfish/pangasius) are much lower in marine ingredients compared to feed produced for farmed salmon. In fact, tilapia is an herbivore and could be grown without any marine ingredients at all. However, the diets of these farmed fish are very high in cereal crops such as wheat, maize and rice, and plant protein, especially soya. This means that they are affected by the issue of 'food-feed' competition – the conflict between land and ocean resources used for human food and those used for animal feed. Food-feed competition is of particular concern in fed aquaculture, where on average 81% of protein and 90% of calories originally available in feed are lost during production and processing, and never make it to our plates in the form of edible portions<sup>72</sup>. Moreover, the species mentioned above have low omega 3 content compared to the oily fish species used to make FMFO, so do not make a significant contribution in terms of keeping micronutrients from wild fish in the food system. Therefore, Feedback **recommends that our modelling of the micronutrients available in farmed salmon, compared to in the wild fish used in FMFO (available in our report 'Off the menu'), is applied to these top aquaculture species. Alongside similar research approaches for land-based livestock which currently uses fishmeal in feed, this information will help to determine whether the reduction fishery sector can justify its existence at all. Finally, in facing these burning questions regarding the use of marine nutrients in our food system, it is difficult to justify the use of marine ingredients in pet food.***

The latest estimates from the FAO, from 2016, found that landings from reduction fisheries amounted to around 15 million tonnes<sup>4</sup>. Ceasing to catch wild fish for non-food uses would mean that some of this fish could enter the human food supply, while some could be left in the ocean, relieving pressure on the 33% of world fisheries that are currently overfished, and the wider ecosystems which rely on them. Using our case study of the Scottish salmon industry, which uses around 461,000 tonnes of wild fish per year for the fish oil it needs for feed, we calculated that 77% of this wild fish – or around 354,000 tonnes – could be left in the sea, while still supplying vital marine micronutrients into the human diet. See 'Off the menu' for more details of this research and implications for the salmon farming industry, policymakers and the public.

# WHAT'S THE ALTERNATIVE?

## A POLICY-BASED APPROACH TO PROTECTING THE WORLD'S FISHERIES

The previous chapter has explored the serious and worrying challenges to claims that certification can protect our ocean from overfishing while allowing companies to expand their operations as they choose. While there may be a limited role for very careful certification to support and maintain future sustainability in fisheries – specifically, when fisheries already have healthy stocks and the fish is for direct human consumption – certification is not the only approach to protecting the health of our ocean.

In this chapter, we briefly highlight more important and effective measures for sustainable fisheries management, put forward by some of the world's most important marine scientists. This is not intended to be a comprehensive review of fisheries policy options, rather a starting point for a discussion of active governance that could deliver a healthier ocean than relying on certification alone. First, it is worth noting that despite the challenges to some fish stocks and to the ocean's health, we do not have to stop fishing altogether. In the words of renowned marine biologist Daniel Pauly:

“

*When you have a non-fished stock that doesn't grow, the fish are old, they suffer from competition, so the growth of the population is nil, because they are at the maximum density that the environment can support. If you catch some of them, there will be more food available for each, more space, less competition, so the stock will be more productive, it will increase. The optimal condition is somewhere between a stock that is not fished at all and a stock that is totally fished out. At roughly half the original population size the stock is most productive. But we have a situation now where the stock doesn't produce enough.*<sup>73</sup>

”

Policymakers often perceive that rebuilding fisheries to healthy levels is too expensive in the short-term and therefore avoid taking the necessary action to sustainably manage fish stocks. But the benefits of rebuilding fish stock outweigh the costs (Table 3) and can be successfully achieved, and support fishing, as demonstrated by several Australian and US fisheries<sup>5</sup>. This is consistent with a recent review from the High Level Panel for a Sustainable Ocean Economy, which found that ‘judicious conservation of exploited wild fisheries result[s] in more biomass in the ocean, higher profits for fishers and an increase in food provision’<sup>63</sup>.

Table 3: Cost-benefit summary of strong policy interventions to rebuild global fishery stocks based on Sumaila et al.<sup>74</sup>

<b>CURRENT COSTS</b>	<ul style="list-style-type: none"> <li>» Global fisheries are not living up to their revenue potential.</li> <li>» The total cost of fishing is too high.</li> <li>» Governments provide harmful subsidies of an estimated US\$19 billion per year to the sector.</li> </ul>
<b>COST OF REFORM TO ALLOW FISH STOCKS TO REBUILD</b>	<p>Rebuilding costs:</p> <ul style="list-style-type: none"> <li>» The fishing industry will lose profits and wages during rebuilding.</li> <li>» To implement a rebuilding reform, governments may need to temporarily invest extra resources to support people currently employed in the fishing industry.</li> </ul> <p>Capacity reduction:</p> <ul style="list-style-type: none"> <li>» The world's current fishing capacity is estimated to be up to 2.5 times more than what is needed to land the Maximum Sustainable Yield (MSY).</li> <li>» Therefore, this capacity needs to be reduced by between 40 and 60%, or up to 2.6 million boats.</li> </ul>
<b>NET GAIN FROM REBUILDING FISH STOCKS</b>	<ul style="list-style-type: none"> <li>» The cost of harmful and ambiguous subsidies is higher than the cost of rebuilding fisheries.</li> <li>» This implies that society as a whole will make money by engaging in rebuilding.</li> <li>» After fishing costs and subsidies are deducted from revenues, rebuilding would result in a gain of US\$66 billion per year.</li> <li>» It would likely take just 12 years after rebuilding efforts begin for the gains to exceed the costs of adjustment.</li> </ul>



## FISHERIES MANAGEMENT POLICY

### ELIMINATING CAPACITY-ENHANCING SUBSIDIES

Capacity-enhancing subsidies in the fishing sector are direct and indirect financial transfers, usually from the government, that reduce fishing costs, increase catch or raise fishing revenues. Unless subsidised fisheries are tightly regulated, these subsidies provide a financial incentive for fishers to fish longer, harder and farther from port, which can compromise fish stock productivity and food provision. Estimates of total annual global fishery subsidies (capacity-enhancing and other forms of subsidies) range from US\$14 billion to \$54 billion, representing around 35% of all global fishing costs<sup>63</sup>. A recent study found that without subsidies, over half of the fishing grounds located in the high seas (all areas outside the 200-mile offshore limits of countries' exclusive fishing zones) appear to be unprofitable at current fishing levels<sup>75</sup>.

### MARINE PROTECTED AREAS

Although this may seem contradictory to the idea of food provision from the sea, appropriately sized fully protected Marine Protected Areas (MPAs) could reduce overfishing, and, if designed well, could increase local food production for some species<sup>76</sup> and achieve other objectives such as ecosystem protection. Large MPAs have already entered policymakers toolkits: In 2018, 10 nations signed the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (CAO), which prohibits unregulated fishing in the high seas areas of the central Arctic Ocean for 16 years.

As we write this report, a new agreement is being negotiated under the 1982 United Nations Convention on the Law of the Sea (UNCLOS) to provide legally binding mechanisms to protect the marine environment and to conserve and ensure the sustainable use of marine biodiversity on the high seas. One of the suggested objectives in the current draft text is to 'apply an approach that builds ecosystem resilience to the adverse effects of climate change' through area-based management tools, including MPAs. We now have the communications and satellite technologies that allow for the remote tracking of fish stocks and fishing boats<sup>77</sup>. Dynamic area-based management could become a vital conservation tool for the high seas if legal, political and scientific obstacles can be addressed through the UNCLOS implementing agreement for marine biodiversity.

### A GLOBAL BAN ON FISHING THE HIGH SEAS

The world's ocean is governed as a system of over 150 sovereign exclusive economic zones (EEZs) within 200 miles of the coast of maritime countries, making up 42% of the ocean, and one large high seas commons making up 58% of ocean 'owned' by all citizens of the world. About 12% of global catches comes from the high seas. The 10 leading high-seas fishing nations (Japan, South Korea, Taiwan, Spain, USA, Chile, China, Philippines, France and Indonesia) capture 71% of the landed values<sup>78</sup>. There is evidence that a complete closure of the high seas still returns larger fishery and conservation outcomes than does a high seas open to fishing<sup>79</sup>. Furthermore, closing the high seas could be catch-neutral while inequality in the distribution of fisheries benefits among the world's maritime countries could be reduced by 50%<sup>78</sup>.

# CONCLUSION AND RECOMMENDATIONS

## BOX: WHAT NEXT FOR THE SCOTTISH SALMON INDUSTRY?

*If certification is not a sufficient guarantee that the Scottish salmon industry is sourcing sustainable raw ingredients for its salmon feed, and in the current absence of robust policy-based approaches to fisheries' management, it is timely to consider what alternatives are open to the industry if it is serious about achieving sustainability.*

*The first option is to find alternative feed ingredients that replace the need for FMFO altogether. In our report 'Off the menu' we explore current alternative feed ingredients to FMFO, such as algal oil and waste-fed insects; however, there is not yet sufficient evidence that the use of these alternatives at scale will not pose additional environmental burdens, such as greenhouse gas emissions intensity<sup>80,81</sup>, which outweigh their benefits. The second option is to avoid all FMFO made from wild fish caught for this purpose, and only use FMFO made from by-products and trimmings of fish caught for direct human consumption. It is estimated that the Scottish salmon industry already uses fish oil from by-products and trimmings for roughly one third of its fish oil needs. To completely transition away from the use of FMFO from wild fish under current availability of by-products, therefore, the industry would need to shrink to roughly one third of its current size, a far cry from the industry's current growth-oriented mindset<sup>11</sup>. Salmon farming can play a role in retaining key micronutrients within the food system, without exacting a toll on wild fish populations, but only if it solely uses truly unavoidable by-products from capture fisheries, rather than whole wild fish caught specifically for feed. This approach would allow salmon farming to enter into a more circular and sustainable food system, as well as relieving pressure on wild fish stocks, alongside a worldwide end to reduction fisheries for non-food purposes.*

This report has explored the state of global fisheries and current industry approaches to ocean management, including the industry's framing of aquaculture as a solution to fishery collapse. Focusing on the Scottish salmon industry, this report has highlighted that fed aquaculture's reliance on wild-caught fish for feed, alongside an unrelenting desire for growth, as well as wider demand for wild fish for non-food uses, is incompatible with ocean health and with a sustainable food system.

The current dominant model of Scottish aquaculture – a focus on scaling up production of a single species, highly reliant on feed ingredients made from thousands of tonnes of wild fish which could be eaten by people – is not a sustainable, long-term answer to the question of how to balance ocean health and sustainable food systems. Box 7 explores some of the alternative approaches to feed available to the Scottish, and wider, farmed salmon industry. In its attempt to address its reliance on wild-caught fish for feed, the Scottish industry, and the aquaculture industry in general, has turned to private certification schemes. This report has outlined that certification schemes are not the solution to overfishing and moreover tend to privilege the capture and use of wild fish for global commodity markets rather than local consumption.



Regenerating the ocean requires going beyond certification schemes led by the market demand for certified fish as opposed to evidence of sustainability. It requires the adoption of strong governance structures, including a shift away from reduction fisheries aimed at supplying non-food markets. In order to deliver the vision set out in this report, Feedback makes the following recommendations:

## SCOTTISH SALMON FARMING COMPANIES

Feedback recommends that Scottish salmon companies transition rapidly away from the use of any wild-caught fish in their feed and that they limit salmon production to that which is possible using FMFO made from unavoidable fishery by-products alone. Any human-edible fish should be destined for direct human consumption, not salmon feed. This is likely to entail a reduction in the size of the reduction fisheries industry and a shift in supply chains towards sustainable use of by-products.

## GOVERNMENTS AND INTER-GOVERNMENTAL FISHERIES AUTHORITIES

Feedback recommends that **governments and inter-governmental fisheries authorities** focus on global, legally enforceable fish population rebuilding programmes, including:

- » The abolishment of all fishery capacity-enhancing subsidies (i.e. any subsidy that facilitates overfishing of fragile fish stocks).
- » An expanded use and enforcement of marine protected areas (MPAs), including a global ban on fishing in the high seas.
- » A halving of fishery capacity alongside a fair transition for those currently dependent on fisheries for their livelihood, there is evidence that this will result in fish stock increases and overall economic gains across the board.
- » In keeping with the principle that reduction fisheries should not be certified as 'sustainable', suspending recognition of the IFFO RS/MarinTrust certification as a certification scheme by the UK's Department of Environment, Food and Rural Affairs in the case of farmed Scottish salmon because reduction fisheries are inherently unsustainable. For other fed aquaculture species, a suspension would apply until such time as there is clear and independent evidence that fed aquaculture delivers more protein and essential micronutrients in the edible portions than is inputted as aquafeed (from both plant and animal sources).
- » Developing policy and regulation that restrict the disposal of by-products to drive industry innovation in maximising the use of fishery by-products in human consumption.

## CERTIFICATION BODIES

We do not support certification of any fish or fish populations intended for use as feed for either aquaculture or animal agriculture **under any circumstances** – this includes pet food. Schemes primarily targeted at human consumption, such as the MSC, should not certify reduction fisheries – fish caught specifically to make FMFO.

For fisheries intended for human consumption, we recommend that MSC and other certification schemes urgently review their criteria to adopt a precautionary approach, whereby fisheries are only certified once they are within sustainable limits, not before. Additionally, Feedback does not support the certification of Antarctic krill as it is opposed to commercial fishing of this cornerstone species in the unique Antarctic ecosystem, even for krill destined for direct human consumption in the form of krill oil.

- » In severely overfished areas, legally binding and well-enforced policy measures are needed to bring significantly threatened fisheries for direct human consumption within sustainable boundaries, *before* certification can play a role. An overall ecosystems approach needs to be taken instead of certifying individual fisheries.
- » *In fishery areas with strong legally enforced fishery management programmes*, voluntary certification schemes for fisheries for direct human consumption can play a role in supporting retailers and chefs to offer a wide range of wild fish to customers. This range should continuously adapt to the *actual* status of fish stocks, not *projected* status.
- » We need certifying bodies to bring a much wider range of small oily fish within their certification system for areas with an overall good ecosystem health.

We recommend that the **Soil Association** changes its organic standard for farmed salmon to require that organic farmed salmon is not fed using any ingredients made from whole, wild-caught fish. Organic salmon should solely be fed on FMFO produced from genuine by-products of fish caught for human consumption.

## RETAILERS

- » Adopt a target to eliminate FMFO made from wild fish and crustaceans from all aquaculture supply chains, no later than 2025<sup>82</sup>.
- » Stop selling farmed salmon until the marine feed inputs are comprised of true by-products only.
- » Commit to offering a wide range of seafood, including a greater diversity of sustainably caught wild fish, and aquaculture products produced without the use of FMFO. Promote the consumption of these products through shelf placement, recipes and marketing.
- » Actively support national and international government measures as described above, for example through a cross-retailer manifesto and through procurement policies. This could fall under the UN Sustainable Development Goal 14: ‘*Conserve and sustainably use the oceans, seas and marine resources for sustainable development*’<sup>83</sup>.



## CHEFS AND CITIZENS

- » We encourage chefs and citizens to stop selling and eating farmed salmon until the marine feed inputs are comprised of true by-products only.
- » Concerning certification for fish for direct human consumption, this report has highlighted many severe limitations with certification schemes, but we acknowledge that in the absence of a more comprehensive and effective fisheries governance policy, currently these schemes **can be a useful way for** the public to assess the relative sustainability of the fish they buy. We therefore suggest that **chefs and citizens** continue to use certification to guide their purchasing decisions, ensuring that they consume no more than two portions of seafood a week, including one portion of oily fish.
- » Replace portions of oily fish with farmed shellfish such as mussels, to maximise seafood health benefits at minimum environmental cost.
- » Variety is key: promotion and consumption of a few select species needs to be avoided; the consumption of small whole fish needs to be encouraged, as per NHS Eatwell guidance which states that *'to ensure there are enough fish and shellfish to eat, choose from as wide a range of these foods as possible. If we eat only a few kinds of fish, then numbers of these fish can fall very low due to overfishing of these stocks'*<sup>84</sup>.



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## ANNEX I

Table 4: Farmed salmon reported mortality rates in Scotland

### 2016:

Total number of produced fish	35,680,674
Number of fish mortalities	986,032
Total number of attempted produced	36,666,706
<b>% MORTALITIES OF TOTAL</b>	<b>3%</b>

### 2017:

Total number of produced fish	36,716,695
Number of fish mortalities	4,842,501
Total number of attempted produced	41,559,196
<b>% MORTALITIES OF TOTAL</b>	<b>12%</b>

### 2018:

Total number of produced fish	28,636,991
Number of fish mortalities	3,500,390
Total number of attempted produced	32,137,381
<b>% MORTALITIES OF TOTAL</b>	<b>11%</b>

### 2019:

Total number of produced fish	34,964,385
Number of fish mortalities	5,846,848
Total number of attempted produced	40,811,233
<b>% MORTALITIES OF TOTAL</b>	<b>14%</b>

Calculated on the basis of data available on: <https://www.gov.scot/publications/fish-health-inspectorate-mortality-information/>



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