Supplementary Material

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| **Theme** | **Examples from interviews** |
| Market consolidation | “[Salmon Scotland is] a key player in all of this. They're a focal point, and all producing companies are members, large number of supply chain members are members, […] we are a member of that. […] it's a key focal point, that's a key place for us to come together as a sector to face into challenges, but it's also about facing outwards and making sure that we've got unified voices, clear messaging, which might conflict, engagement, political, local, council level, etc. Just so that everyone -- there is a clear and consistent message about the sector being portrayed. And equally Salmon Scotland will face into, rather than one company coming out into media or facing into inquiries on their own and voicing on behalf of the industry. Salmon Scotland can do that.” (E1)  “it’s a very consolidated industry […] there's only really three or four producers I would say in Scotland now. […] So everyone's critical, really from a producer side in such a consolidated industry. […] I think there will continue to be value chain consolidation. So I think more and more farmers will get into the value chain, adding value to the product, supplying direct to retailers, potentially direct to consumers at some point in the future. I think that's a trend that started and is inevitable in a way. (E2)  “[…] there's an issue in terms of UK salmon consumption and supply in that there are only two UK retailers that exclusively stocked Scottish salmon […]. Everybody else has a mixture. […] there are four producers in Scotland that have scale, that's it. No more than four. Used to be 10, used to be 20 and so the producers and the buyers and the retailers because the retailers set a whole host of requirements on producers and those are around volume, price, quality, adherence to a whole range of either in-house retailer standards or externally certified standards, RSPCA Freedom Foods, welfare, stocking densities, use of antibiotics, different forms of husbandry treatments. The retailers certainly had collectively -- have agreed buying policies for their growers on fish feed.” (E9) |
| Global commodity | “[…] there has been funding mechanisms that has been platforms created via likes of UKRI to support the sector […] more innovation funds, sourced funding bodies, like Innovate UK, or KTN, as it used to be, they put quite significant investments into collaborative projects. And that would then bring together the sector players, the relevant sector players who wanted to support it, as well as R&D bases so Sterling, Aberdeen, Edinburgh, Rosalind, etc, whomever, Cefas, Weymouth, the list goes on and on. Those are sort of mechanisms that help really push forward research and development. […] you get bigger jumps, when you've got collaborative projects […]And it was quite a few significant scale projects, looking at feeds, development of raw materials, you know, sea lice control mechanisms, vaccine development, etc. It was those sort of platforms that really moved things along” (E1)  “the technology has evolved, which has allowed […] bigger scale production. The industry's largely very well financed, and can invest to innovate and grow production technology and methodology and so on. I mean, […] If you contrast salmon farming or producers in Scotland with sheep farming […] there's a lot of them so any kind of evolution of the industry is kind of hampered by the scale of those farmers, their access to capital and innovation. So the industry is very, very innovative. And while we have challenges, no question there, what the industry has been really good at is finding solutions to the challenges that come up. And then and then investing in infrastructure to manage them. […] technology has allowed us to move into higher energy environments and investment. (E2)  “Another factor [in the rise of salmon] would be I'd say dramatic improvements in productivity and efficiency of production through state changes in two things. One, the genetics and the breeding of the animal so it grows faster and the way in which it's farmed takes less time. So that improves your profitability. That's been a very big change in increasing supply. […] So the second thing would be improvements in Disease Control. So we can now vaccinate fish against diseases that they used to die from. […] And it's difficult to vaccinate. You know, fish are different animals to us in terms of immune systems and so on and there's been big improvements in animal health, through medical and scientific technology developments. And then the third thing that would explain the dramatic increase in production is we've gotten better at farming at bigger and bigger scale and the equipment and the know-how and the technology of how you do that”(E9). |
| Labelling and certification | “there's a very strong association of it being a Scottish product, and certainly that works very strongly in its favour” (E6)  “Scotland has a fantastic reputation to build on. In terms of the imagery that is associated with Scotland. It's very positive and he's very clean and it‘s wild and it's majestic and […] you compare like Norwegian salmon with Scottish salmon, there's a clear premium to be associated with the Scottish one, because it's seen as better […] and you will evoke those sorts of relations in the market.” (E6)  “Scottish salmon is sold on a premium. It sold in a premium of Scottish environment pristine, great animal health and welfare.” (E8)  “But there has been a lot of discussion about certification and labelling schemes. And both I know, from the point of view of how do you guarantee those schemes work as they should actually work. […] And there's a problem that they're often paid by the industry to certify them as sustainable. And so […] that's open to criticism. And then the other side of it is […] the consumer take. We look at all these little marks […] it's fair, it's fair trade, it's red tractor, it's sustainable fishery. When you need quite a lot of the consumer has to be well informed and have the time to think about it.” (E3) |
| Retail power | “the reality is, [consumers] don't like things with heads, eyes, gills, the UK consumers like easily accessible, quick and easy to use protein. And salmon offers that […] Retailers stepping away from having counters. […] And so availability of that traditional sourcing of fish is getting harder and harder for UK consumers. But what they're used to is spending on pack, you know, going up to the counter and there's all these packs presented to you and it's quick and easy grab it, there's a great portion size, everything's dealt with you and salmon lends itself very well to that. So you know that drive is primarily due to boneless portions, fillet portions, in some cases go even further being skinless or descale all the rest of it. […]. I think accessible format is key. (E1)  “Salmon, without question is the biggest single product within the seafood category. […] And in many retailers was in the region of 30 to 40% of the total seafood category. So from a retailer's point of view, having appropriate salmon offering was critical to the whole of that category performance. So it was hugely important. […] salmon for consumers was possibly seen along cloak more akin to other proteins, terrestrial proteins in a way. So if they were going to buy fish, they will choose between cod, haddock, sea bass, prawns potentially, so that was almost a purchase decision among those seafoods whereas salmon would be a case of ‘okay, we're gonna have chicken, beef, lamb, or salmon tonight’. Not absolute situation, but certainly more towards that kind of purchase decision” (E2)  “30 to 40 different products. So it was a vast ingredients in other products. Now M&S is different retailer because of the kind of the breadth of the portfolio of added value products compared to other retailers but that's probably an evolution that's happened over time. And I think then also, you know, you go to the sandwich, the lunch section of the retailer now and you will see much more salmon now than you would have done. So maybe going back 10-15 years, you would have seen a smoked salmon sandwich, but you wouldn't have seen salmon bites or sushi or so on and so on and so on. So I think salmon has made that move into different eating and consumption occasions.” (E2)  “Well, I'm sure the retailers have a big part to play. You know, if they have their but a kind of, “Pick one of your proteins, one of your stir fry mixes one of your carbohydrates and a sauce and a sachet” (27:18). Then you can have noodles or rice, and you can have green vegetables or rainbow vegetables, and you can have a piece of chicken or a piece of salmon. So some of it will be literally physically that the salmon is in a fridge next to the chicken and the chicken and salmon fridge is not next to the beef and pork fridge. […]there's elements about “What’s eye level?”, “What’s on promotion?” […] They might not even tell you anyway, but you know the retailers will have strategies that optimize the profitability of their lines and so they will push or not push depending on, can they get the supply that they want and can they get the profit margin that they want […] smoked salmon or ready meals […] that's a huge part of the market as well because lots of people don't even cook a fillet at home. (E9) |
| Health benefits | “[there is ] a regular health message out there ‘make sure you omega 3 and make sure you eat an oily fish’ - Salmon delivers on that” (E1)  "When we asked consumers why they have chosen salmon, nine times out of 10, there's two real drivers on purchase decision. The first one is because they like eating salmon. That's it, they really enjoy the bite because they like to eat it. The second one is from a health aspect. So they enjoy it and they know it’s good for their health. […]ultimately, it's a good -- because it's a good product, because it's healthy so it's, I mean, how many foods do we eat, that a) we enjoy, and b) are good for us?” (E2)  “both Norway and Chile have much lower requirements on the fish feed ingredients, which means that the product quality that the Omega 3 in the fish that we eat is significantly less from those sources. Scottish salmon would have more Omega 3 than any of the well Pacific salmon that people think of as healthy […] it's at the pinnacle of nutritional value […] I think one of the drivers of people's consumption of [salmon, prawns] is they are perceived to be healthy, but they don't have a preparation hurdle associated with them.” (E9) |
| Convenience | “…because it's quite versatile, it's got a nice size fillet. And it's got a nice colour to it generally, it’s got a quite nice texture, I suppose it's easy to do different things with cooking different ways. It's perceived as being nutritious, omega three fatty acids. I still think that's why and it's a price which is affordable for most as not maybe as a staple every week for parents, but something that they can get on a reasonably regular basis.” (E4)  “But rushing into a supermarket after work to buy some tea, there's a nice packet of salmon with some instructions on how to cook it, you know, you can cook it in 15 minutes. And so that's why what you buy” (E3)  “[…] it's not like you just buy salmon fillets, and that's all there is, in the same way that you might only by sea bass fillets. […] But salmon, you can get as a smoked, as poached, […] little trimming scraps, as a product, as a moose, as a spread, as you know, it comes in a lot of different forms. So, there's a lot of different value-added opportunities for the industry as well.” (E5)  “there's all these packs presented to you and it's quick and easy grab it, there's a great portion size, everything's dealt with you and salmon lends itself very well to that.” (E1) |
| Consumer perception | “…the supermarket opened, and it was selling salmon, and […] salmon on the shelf. So, I think that farmed salmon had become a part of the diet. And I guess the producers become big enough to come to agreements with the supermarket chains to supply them in the quantity that they needed.” (E3)  “I think it's one of the most purchased fish products in supermarkets, for people to buy and cook at home. I think that it has become a staple because the industry and the retail sector have found it to be a product that can be sold to customers as ‘easy to cook’, ‘mild in flavour’, ‘easy to make into different recipes at home’ ‘doesn't require, you know, boning’ or can be produced in a ways that the consumers find it easy to consume.” (E5) |
| Fish welfare | “What I've noticed is personal now, […] the typical salmon supermarket […] it tastes flabby and oily. And I put that down to the changes in the stock that are being bred for fast growth, they're being fed a largely vegetable diet. They don't get the exercise […] I am still willing to eat animals, but I think they have to have a high welfare life before they're sorted.” (E3)  “I think the public perception is still that salmon and farmed salmon is a sustainable product. I think the industry has cultivated that perception very strongly. And that's the reason that it exists. I think there's maybe a greater awareness than there was, say, like, three or four years ago, that there are some problems with salmon farming. And if people probably, if you ask them would turn to issues like sea lice, or use of antibiotics or polluting local waters […] or maybe fish welfare” (E5) |
| Sustainability | “there was a feeling that UK consumers were starting to gravitate away from red meat with a sort of concern about impacts -- their impact of their basket on climate change, so on so forth, and it looked like there was a real opportunity there to try and capture elements of that consumer spend and it looked like it was gravitating towards fish, primarily salmon, as well as plant based products. […] if you're sourcing from responsibly sourced fisheries, ie certified sustainable fisheries, you could argue that is potentially the lowest impact source that we should be using. If you were to flex across to terrestrial proteins or oils, they bring a very significant carbon footprint with them. So if you want to go with a low carbon footprint feed, actually, high marine inclusions is the way to head (E1)  “[because a fishery lost its] MSC approval, we would no longer source fishmeal from those fisheries. So ‘No, it's not been independently certified as sustainable so we're out, we're not sourcing from there, we'll buy elsewhere’. And we will only be using a trimming, so a byproduct of those fish that were used for human consumption”. […] through work with SEPA and Marine Scotland, each farm will look at the expected and modelled impact on the seabed. So we will do the research that says if we have 1500 tonnes of salmon on this site at peak biomass, it will have this impact on the seabed. And that impact would be recoverable over […] so short number of years if that farm was removed, and then every year, that peak biomass and at the end of the crop, you go in, and you sample the seabed around the farm. […]So it's all about the carrying capacity of the environment with a constant feedback loop. […] [what] will influence how much salmon we produce will be what sites we’re producing fish on, are those sites sustainable – environmentally and economically and sustainable, when should we stock them for the best outcome, again economically and welfare, and then what does that then do in terms of our harvest profile.”(E2)  “the […] issue that is the most fundamental is the diet of farmed salmon. Some of the carnivores, initially, were fed on a diet made from fish, small fish, anchovies, fish like that often collected off the coast of Peru, for example, or these big upwelling fisheries. From fisheries in the North Sea, at one time, there were fish like herring and sprat, fish for human consumption, and now it turned into fish meal and some of it goes to salmon, some of it goes to chicken. It's a general problem.” (E3)  “Over the last couple of years, there has been more and more energy put into things like the ASC, developing sustainability standards and that's a sign that there's an industry that feels it might have a sustainability problem on its hands, and needs to hedge that bet, sooner rather than later.” (E5)  “we have funded projects about waste capture, resource efficiency […] We have conversations with the Sustainable Seafood Coalition […] I think the people that are driving improvements in sustainability or environmental footprint are directly the retailers and the feed companies. […] farming in the sea is intrinsically by a factor of about five, at least five more sustainable than farming on land. […] And so that there are many, many ways in which farmed salmon is a highly sustainable product for those biological reasons (E9)  “…looking globally, I would see that some of the perceptions are really shared. I think Tasmania, there's this phrase that's often used as that salmon farming has lost a social licence. Tasmania has sort of gone through that recently and they've published a new strategy, seeing salmon farming has lost its social licence. Norway, they've been through a difficult period. They've made really big changes to the way that they regulate sea lice and environmental. And I think that has helped to improve things and improve relationships.” (E8)  “So that's a really positive story, the space of water use […] lower carbon footprint, because I know it's got a sort of similar footprint to chicken, for example. But in a place where you need food, where the sector is already committed to like, Net Zero 2045. Those are all positive things.” (E8) |
| Future challenges | “…the total demand for fish feed for salmon could outstrip the world production of small fish. There's been a move to replace much of the fish protein with vegetable protein. [This] leaves the problem with the fish oils, the Omega-3 oils, which the salmon need, without which salmon doesn't taste like salmon. And also, it can't be sold on the health benefits. So, [there is] even more of a shortage of Omega-3 oils. I know that there's work being done to try and produce these either from algae or from genetically modified rapeseed crops, which has the problem of genetic modification” (E3)  “There's also a lot of research going into more exposed sites going further away, because having more robust cages which allows us to produce more on both sides, having the other one which allows you to expand the industry in terms of volume. Then there are the challenges that you have around disease, and particularly sea lice. That's the major one-- that's there to be solved and these management ones, solutions have been the best so far. There's cleaner fish, but there's challenges around cleaner fish is you've got the welfare issues of the cleaner fish and the production of clean fish and that whole new species for sharing so incorporate into your salmon cages. It's been partially successful, but it's largely challenges around maintaining the health of the cleaner fish, the interaction of the theme of fish with the salmon, and then what to do with the cleaner fish once we have salmon.” (E4)  “I think the industry is very aware that sustainability debates are going to be increasingly important, that they need to be absolutely on point in terms of any sort of environmental impact. […] You already see that things like antibiotics they handled years ago, right, massive replacement on how they operated. You know, already in the past, what five or six years have a massive shift on how they feed the salmon to go again, go, move away from unsustainable things because it was a risky move for them from a financial standpoint to keep what they were doing. But it was also a perception risk. […] So I think you'll just continue seeing the sort of move that you see now: open communication, try to address the issues, try to partner with retailers, with NGOs, kind of open doors as much as possible or create associations with other industries that could offset the impact of production.” (E6) |

**Table S1**. Thematic structure of interviews with supporting quotes.



**Figure S1**. Average weekly consumption (g per person) of major aquatic food groups by wealth decile. Data on household purchases from Family Food Datasets (Methods).

Supplementary Methods

**Interview Template**

***A: Interviewee Background***

**1. Can you describe your interest and experience with farmed salmon?**

* How long has been working with it?
* In what capacity (past and current job)?

***B: Narrative around salmon industry***

*Perspectives on salmon as sustainable, healthy seafood*

1. **What is the current perception of the salmon industry globally?**

* Is salmon considered a healthy seafood? Where + why?
* Is salmon a profitable market? Where + why?
* Is salmon a sustainable seafood? Where + why?

1. **What is the current perception of the salmon industry in the UK?**

* Is salmon considered a healthy seafood in the UK?
* Is salmon a profitable market in the UK?
* Is salmon a sustainable seafood in the UK?

1. **How has the perception of salmon changed over time?**

* How would your previous answers change 20 years ago?

1. **Why do you think salmon has become a popular seafood?**

* Wild Scottish salmon was a luxury, upper class food, and farmed salmon is now one of the top 5 seafood consumed in the UK. What do you think is the main reason for this change?

***C: Key salmon interventions / state of industry***

*Key players, policies + technologies underlying salmon growth*

1. **Who do you think are the key players in the salmon industry?**

*Key player = companies with market influence: producers, farmers, sales, marketing*

1. **What key interventions supported the rise of farmed salmon globally?**

* What technologies have supported industrial salmon farming?
* How have improvements in disease and feeds supported salmon growth?
* What policies supported industrial salmon farming?
* How do policies make salmon farming economically profitable?
* Have any marketing strategies been particularly important for the growth of farmed salmon? In which countries?

1. **What key interventions supported the rise of farmed salmon in the UK?**

* How has the farming process changed over time?
* How has regulation changed the industry?
* How do you promote the product/channels/target audience?
* What would you say is the goal of the business/industry?
* How would you say salmon figures in British diets?
* Why is salmon popular in the UK?

***D: Future salmon***

*Sustainability, food security, profit + growth*

1. **In your opinion, what is the future of Scottish farmed salmon?**

* Do consumers want to eat more salmon? Why?
* How will the salmon industry tackle environmental issues?

*(disease, crowding, coastline space, feed, animal welfare)*

* Will salmon industry continue to be incentivised by government? Why?

1. **How will farmed salmon need to change in the future, if at all?**

* Do you think farmed salmon will contribute to global food security? How?
* Do you think salmon industry growth will lead to any sort of conflict? Which and why? *(marine space: renewables, recreation, tourism, access)*
* Do you think that environmental concerns impact the profitability and growth of the farmed salmon industry?
* Should salmon impacts be penalised with legislation? How?