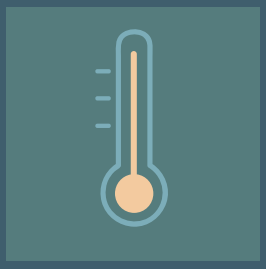
SALMON
FEELS THE HEAT

CAPITAL AT RISK FROM INVESTOR CONCENTRATION IN THE SALMON AQUACULTURE INDUSTRY

BRIEFING PAPER

DECEMBER 2019





Planet Tracker

ABOUT PLANET TRACKER

Planet Tracker is a non-profit financial think tank aligning capital markets with planetary limits. It was launched in 2018 by the Investor Watch Group whose founders, Mark Campanale and Nick Robins, created the Carbon Tracker Initiative.

Planet Tracker was created to investigate market failure related to ecological limits. This investigation is for the investor community where other ecological limits, in contrast to climate change, are poorly understood and even more poorly communicated and not aligned with investor capital.

SEAFOOD TRACKER

Seafood Tracker investigates the impact that financial institutions have in funding publicly listed wild catch and aquaculture companies.

Our aim is to align capital markets with the sustainable management of ocean resources.

This briefing paper focuses on financial risks to aquaculture expansion - in particular, salmon farming. As the aquaculture sector is forecast to experience double digit growth through to 2050, capital markets should be thinking about key sustainability issues in their investments.

Seafood Tracker is a part of the wider Planet Tracker Group of Initiatives.

ACKNOWLEDGEMENTS

Authored by: Archie Cage, Matthew McLuckie, Gabriel Thoumi CFA FRM

Research Team: Christopher Baldock, Nitin Sukh

Planet Tracker gratefully acknowledges the support of the following funders who helped to make the publication of this report possible:

THE FINANCE HUB

GORDON AND BETTY MOORE FOUNDATION

OAK FOUNDATION

This report is funded in part by the Gordon and Betty Moore Foundation through the Finance Hub, which was created to advance sustainable finance.

INVESTORS BACK AQUACULTURE TO SUPPLY GLOBAL PROTEIN DEMAND

A step change in global food systems is required to ensure healthy and sustainable food for a global population forecast to approach 10 billion by 2050. On one hand, global wild-catch seafood production has plateaued over the last 15 years at approximately 90 million tonnes (Mt) per year and 60% of world fish stocks are already fully fished and a further 30% overfished.[1]

On the other hand, aquaculture production is projected, by some, to more than double from 60 million tonnes in 2010 to 140 million tonnes by 2050, thus helping to satisfy what is expected to be a continually growing demand for seafood-sourced protein.[2]

The seafood industry, scientists and governments are all taking action now to enable aquaculture to plug the seafood protein production gap and investors are following suit. In 2018 and 2019, over $14 billion changed hands in merger and acquisition activity and stock exchange listing transactions for the global aquaculture sector[3]. This was in large part because, between 2001 and 2016, the global aquaculture sector has been the fastest-growing segment of food production by volume, with a compound annual growth rate (CAGR) of 5.8%.[4] In 2016, the Food and Agriculture Organisation (FAO) reported that the value of the global aquaculture sector was $244 billion[5], showing an 11.9% increase between 2006 and 2016.[6]

CLOUDS ON THE HORIZON

But aquaculture's upward trajectory faces some important complications. The FAO and the Organisation for Economic Co-operation and Development (OECD) have, for example, recently forecast a slowdown in global aquaculture production growth to 2.2% CAGR from 2016 to 2028, when production is estimated to reach 102 Mt – see Figure 1. This is in part due to a slowdown in the construction of new aquaculture production facilities in China, which was responsible for 61.5% of all aquaculture production globally in 2016[7] and also to fewer environmentally suitable coastal production sites available around the world.[8]

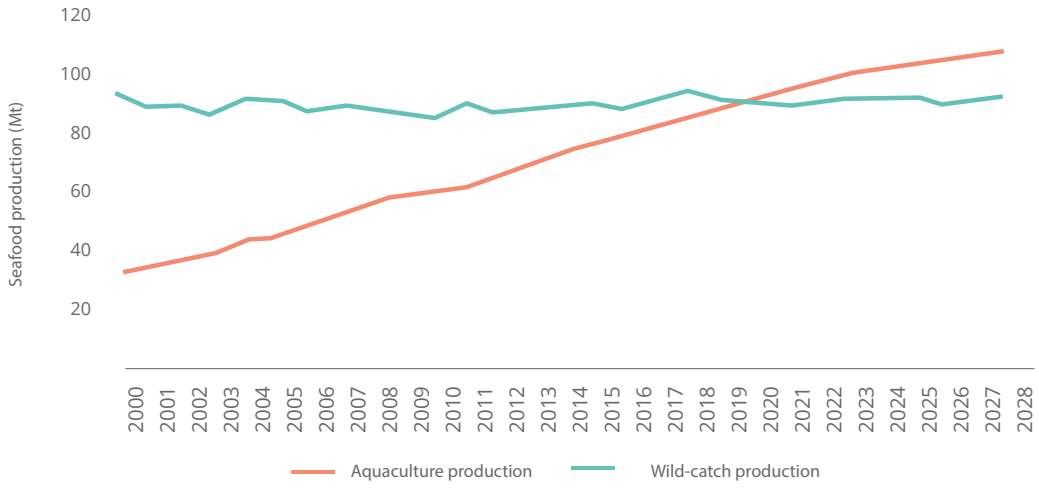


Figure 1: *Global Aquaculture and Wild-catch Production, 2000–28*[9]

A slowdown in new aquaculture production sites does not necessarily mean industry production yields cannot grow. Adopting sustainable intensification and more efficient practices at current sites is preferable to further expansion into new areas. Higher yields and productivity gains can be achieved on current sites especially if, through better sustainable management, these sites can become more resilient to environmental constraints.

A growing body of research now also points towards additional constraints to those early growth forecasts. Earlier this year, for example, both the FAIRR Initiative[10] and a consortium led by The Nature Conservancy and Encourage Capital[11] published research highlighting environmental constraints not yet consistently recognised and priced by financial markets in their aquaculture investments and growth forecasts. These constraints include, but are not limited to, disease, available freshwater systems and competition for feed resources.[12]

Investors should, therefore, recognise that many of aquaculture sector's biggest environmental shocks are yet to be experienced.

FOCUS ON SALMON

Within the global aquaculture market, Atlantic salmon (Salmo salar) is the second most financially valuable farmed fish species in the world,[13] with over 2.4 Mt of farmed salmon products produced in 2018 representing a market value of $18 billion, based on NASDAQ Salmon Index prices.[14]

According to FAO data, in 2016, Norway, Chile, the United Kingdom and Canada accounted for 95% of global farmed Atlantic salmon production. Norway once dominated the Atlantic salmon trade, with an 86% market share in 2008, but since 2009, Chile's share of the global Atlantic salmon export market has increased from less than 1% to 19% in 2018.[15] Investors should note that Chile regularly switches production between different salmon species. Data for certain years may indicate a decline in Atlantic salmon production, but this may not represent a decline in total salmon production. Since 2000, global production of Atlantic salmon has increased by 155%[16] - see Figure 2.

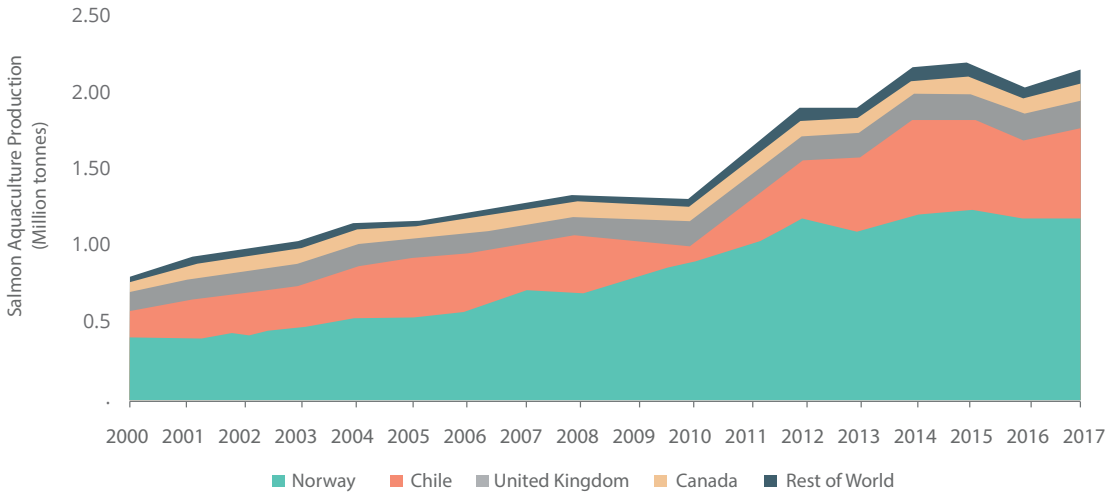


Figure 2: *Global Atlantic Salmon Production – Top 4 Nations and Rest of the World, 2000–17.*[17]

ENVIRONMENTAL FACTORS CAUSING PRODUCTION VOLATILITY

The salmon aquaculture industry in Chile, Norway, the United Kingdom and Canada is experiencing annual production shocks resulting from environmental constraints, including:

ALGAL BLOOMS

Nitrate and phosphate runoff from agriculture negatively impact the health of farmed salmon.[18] Increases in phosphate levels in runoff lead to algal blooms, which cause hypoxia. In 2019, algal blooms in Norway led to the elimination of 11,600 tonnes of salmon by the end of Q2. Total annual losses are expected to rise to 40,000 tonnes by the end of the season – representing lost revenues of up to $223 million.[19] Similarly, in 2016 algal blooms decreased Chilean salmon industry revenue by $800 million.[20,21]

DISEASE

Infectious salmon anaemia (ISA) and other diseases are estimated to cause over $6 billion in industry losses annually.[22] In Norway, 43% of ISA outbreaks from 2004 to 2009 resulted from close farm proximity, which created a build-up of faecal matter and uneaten food, rendering the aquaculture farms and surrounding area toxic,[23] negatively impacting profitability. Disease prevalence and intensity are directly correlated to the environmental quality of the aquaculture pens, stocking rates and feed volumes. Because of confirmed ISA, the share price of one company, Norway Royal Salmon, fell 29% from NOK170 ($21.54) to NOK125 ($15.38) in Q4 2017.[24]

PARASITES

Sea lice infestations are one of the costliest challenges to the industry and have been calculated to cause yearly losses of up to $1 billion.[25] In 2018, high seawater temperatures accompanied reports that 8% of all Norwegian farms contained sea lice levels above the regulatory limit, decreasing the total harvestable weight for the year.[26] Separately, in 2018, 1.35 million salmon died within six months at sites in Macquarie Harbour, Tasmania, due to an outbreak of pilchard orthomyxovirus exacerbated by warmer waters and low water oxygen content in the bay.[27]

WATER TEMPERATURE

The optimal temperature range for Atlantic salmon aquaculture is 8ºC to 14ºC. The Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway 6.0 report forecasts an average coastal seawater temperature increase of approximately 1.6ºC between 2000 and 2050 for Norway and Scotland, and 1.1ºC for Chile across the same period.

Water temperature is highly relevant for investors. Norway, for example, saw maximum coastal seawater temperatures breach 14ºC in all months from June to September 2018 – see Figure 3.[28]

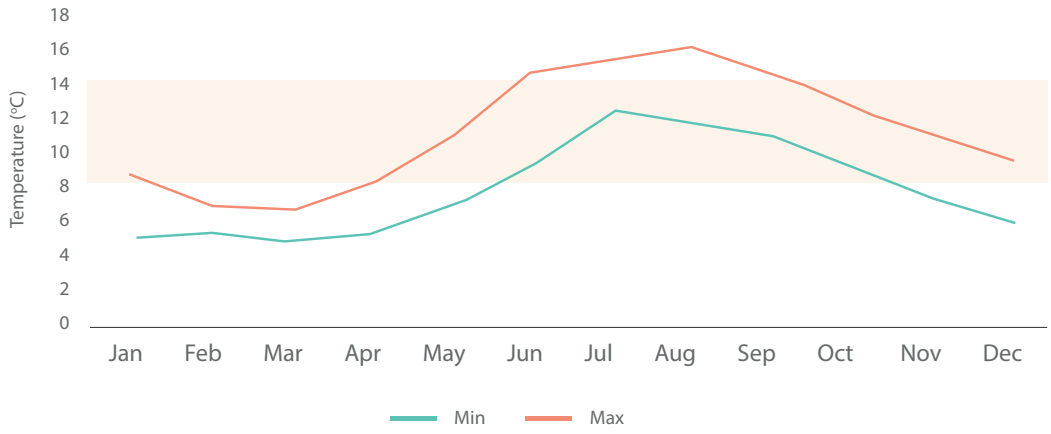


Figure 3: *Norwegian Sea Temperatures 2018.*[29]
**Yellow-coloured box indicates the optimum temperature range for salmon growth*

If salmon farms experience prolonged periods of higher water temperatures these might not only increase the frequency and intensity of environmental shocks such as algal blooms, disease and parasites, but also impact salmon health and mortality.[30] As a result, coastal salmon aquaculture assets, such as pens, processing, storage and refrigeration equipment could become commercially unviable for longer periods of the year under high temperature change scenarios, or due to increased costs to move the pens to cooler waters. Less well-regulated markets may be even more exposed to such environmental impacts.

For this reason, Planet Tracker estimates that growth forecasts to 2025 for coastal farmed salmon may be overestimated by 6% to 8%.

This estimate is based on reported fish losses resulting from recurring environmental shocks impacting annualised production forecasts for the 10 largest publicly listed salmon producers in Norway, Chile and the UK between 2010 and 2019 YTD. The compounded average annualised production losses relative to forecast salmon production across these companies were 5% for the period 2010 to 2018 YTD.

If these same losses are carried forward on an annual basis and applied to forecast global farmed salmon production between 2020 and 2025, the estimated total loss to salmon production is approximately 580,000 Gutted Weight (GWT) tonnes. Financially, this equates to a cost of $4.1 billion for the industry, companies and their shareholders.

As a result, earnings per share of these companies may be revised downwards in response to greater production volatility.

As demand for farmed salmon grows, production volumes and intensity are expected to increase and - as seen in parts of the agriculture sector with the application of fertilisers, pesticides and intensification at all costs - environmental issues such as aquaculture feed supply (wild-catch fish and soybean protein concentrate are both environmentally problematic), eutrophication, disease and waste leakage are forecast to grow in parallel.

As an illustration, in 2018, Northern Harvest Sea Farms, a division of Mowi, lost 5,000 tonnes (2.6 million fish) of Atlantic salmon, citing water temperature increases at their Newfoundland and Labrador Fortune Bay aquaculture farms.[31] Mowi's share price fell 5% on the day following the news announcement.

CONSTRAINTS CAUSE PRODUCTION AND EARNINGS LOSSES

Publicly traded salmon aquaculture companies in Norway, Chile, the United Kingdom and Canada have cited these natural constraints as direct causes of earnings and production losses.

Investors are, as a result, failing to realise potential returns from certain farmed salmon holdings. Planet Tracker has analysed shareholder positions for the top ten global listed aquaculture producers by salmon-specific revenue - see Figure 4.

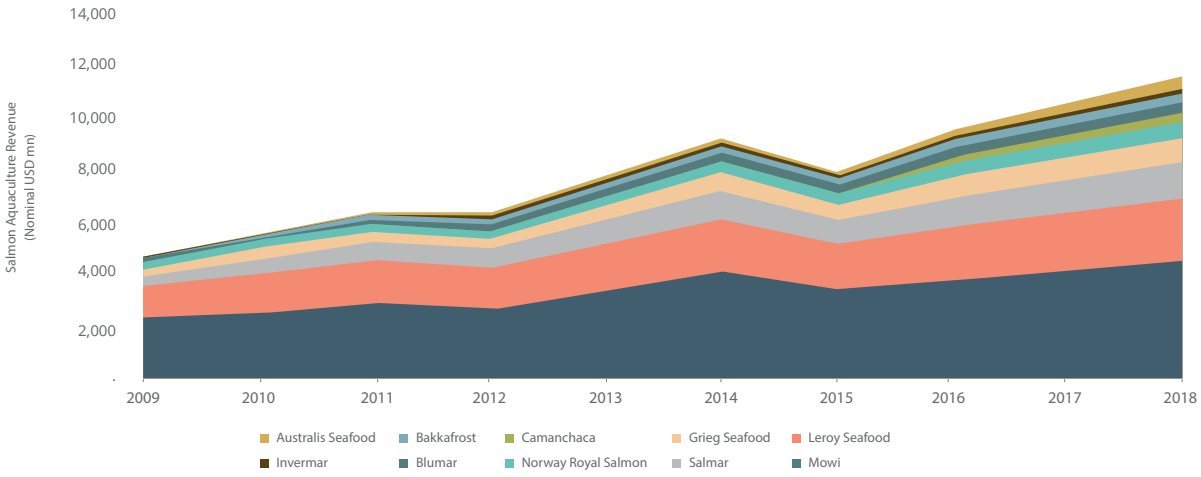


Figure 4: *Salmon-specific Revenue for Ten Major Listed Salmon Producers, 2010–18.*[32]

These ten aquaculture listed equities account for nearly 50% of salmon production in Norway, Chile, the United Kingdom and Canada with a combined market capitalisation value of $30 billion.[33] These companies experienced aggregated production and earnings losses as a result of environmental constraints between 2010 and 2019 of 206,000 tonnes with a market value of $1.2 billion - see Figure 5.

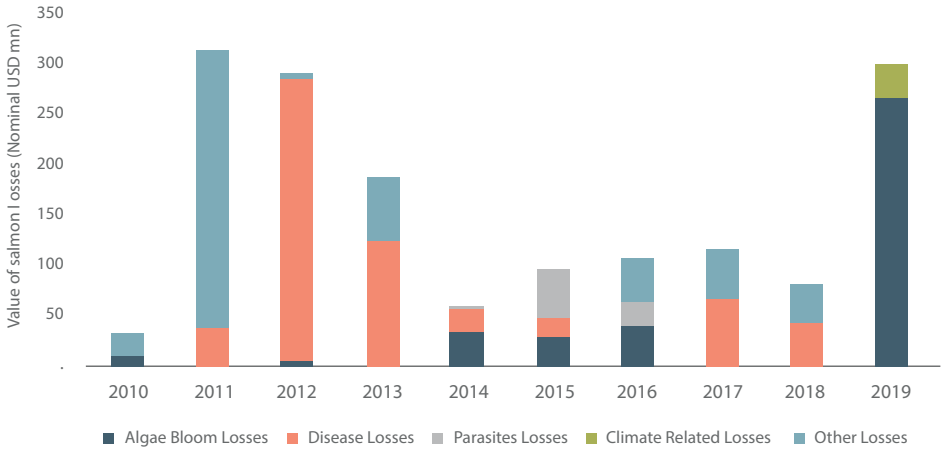


Figure 5: *Aquaculture Publicly Traded Equities' Earnings Losses Resulting from Environmental Constraints 2010–18.*[34]

At the time of writing, effects of the 2019 El Niño had not yet been publicly reported by these listed companies.

Five of the ten firms analysed are pure-play salmon production companies and, overall, 92% of revenue generated by the ten companies is from salmon aquaculture.

Limited product diversification at the corporate level means that environmental shocks to salmon aquaculture systems will adversely affect company revenue and stakeholder returns – see Table 1.

Table 1: *Salmon Revenue Percentage of Total Revenue, 2009–18.*[35]

Company	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mowi	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.5%	99.4%	99.6%
Leroy Seafood	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	95.3%	95.4%	97.0%
SalMar	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Grieg Seafood	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Norway Royal Salmon	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Salmones Camanchaca	n/a	n/a	n/a	n/a	n/a	n/a	100.0%	100.0%	100.0%
Blumar	n/a	n/a	45.2%	53.5%	57.4%	54.3%	62.5%	57.9%	62.7%
Bakkafrost	100.0%	87.1%	83.1%	81.8%	86.6%	87.7%	89.1%	83.6%	81.6%
Invermar	100.0%	100.0%	96.4%	97.1%	95.5%	91.8%	94.4%	96.1%	94.1%
Australis Seafoods	n/a	100.0%	100.0%	100.0%	100.0%	98.6%	98..4%	98.6%	97.0%

These ten companies display high investor concentration risk as they are majority owned by a small number of private individuals and companies. Approximately 45% of share ownership across these companies is held by private individuals or private equity, with only 28% controlled by institutional asset managers – see Figure 6.

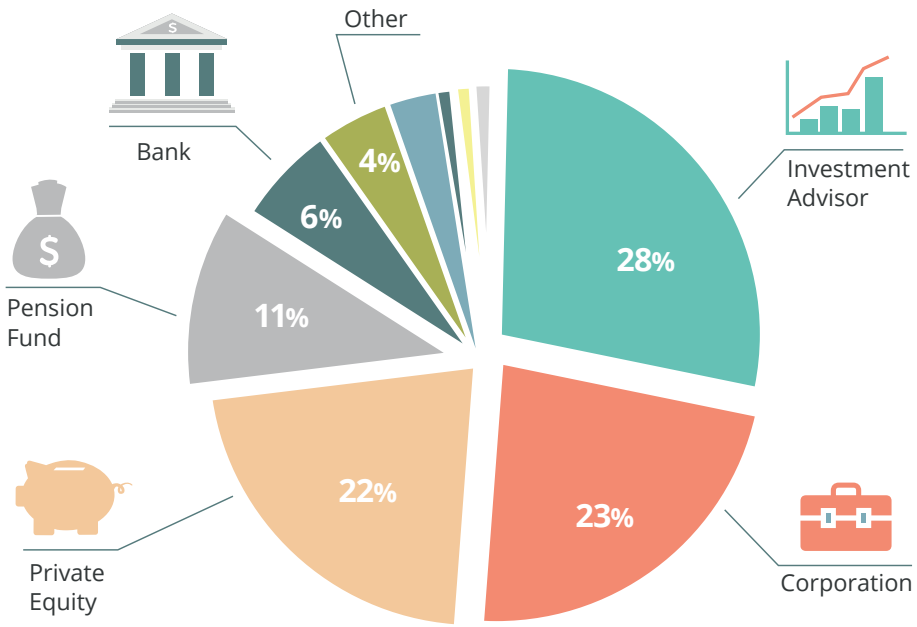


Figure 6: *Breakdown of Investor Type Across Seafood Equities Surveyed.*[36]

Four of these ten companies are majority-owned by only five institutions - see Table 2.

Table 2: *$8 Billion Concentration Risk in Four of the Top Ten Publicly Traded Salmon Aquaculture Equities,*[37]

Company	Major Investor	% Concentration Ownership	Total $ (millions)
Salmar	Witzoe Gustav	52.46	$ 2,640
Lerøy Seafood	Austevoll Seafood Asa	52.70	$ 1,946
Mowi	Fredriksen John	14.42	$ 1,712
Mowi	Folketrygdfondet	9.26	$ 1,651
Grieg Seafood	Legend Holdings Corp	95.00	$ 848
			$ 8,797

Private investors have a high concentration of capital in salmon aquaculture. This means that they are directly exposed to salmon aquaculture production shocks and price volatility.

While institutional investors such as Jupiter Asset Management, Henderson Global Investors and the Vanguard Group have less concentrated exposure, they still are exposed and should call on these companies to fulfil their fiduciary duty and mitigate their supply side environmental risks.

CONSEQUENCES FOR INVESTORS

Markets are forecasting year on year growth in the farmed salmon sector, albeit at a slower rate than in the last ten years. An example of market growth is Bakkafrost's September 2019 purchase of 69% of Scottish Salmon's equity for $440 million valued at 7.2x EBITDA.[1] This valuation was partially based on Scottish Salmon's ownership of the genetic rights to native Hebridean Salmon, a stronger and leaner salmon strain. Yet this purchase also further consolidates the market, increasing concentration risk in the industry.

Planet Tracker's upcoming Farmed Salmon Tracker report, "Loch-ed Profits", will illustrate the disparity between supply and demand due to environmental constraints in the short to mid-term.

If environmental shocks continue to hit coastal salmon aquaculture farms, as highlighted by this paper, the production rates achieved at existing sites may in fact fall relative to forecasts, negating the effect of new production capacity coming on stream, which in itself is limited by the availability of suitable sites around the world.

In response, firms such as Salmar are expanding beyond their coastal operations to install more offshore-farming capacity.

Investors should therefore weigh up the higher operating costs of offshore farming with the risk mitigation benefits that new offshore technology can bring in reducing production losses. Evidence to date demonstrates to investors that fast growth at all costs is not sustainable. Investing now in making the industry more sustainable will enable sustainable growth to continue whilst mitigating environmental risks.

1 Earnings before Interest, Tax, Depreciation and Amortisation

Medium-term commercial viability of both coastal and offshore sites will largely depend on buoyant market prices. Environmental degradation impacts companies such as Mowi, putting downward pressure on EBIT, whilst in tandem higher production costs associated with offshore facilities and production shock write-offs will reduce profit margins. Salmon stock write-offs as a result of environmental constraints can, for example, inflate insurance premiums.

With an industry whose ownership is increasingly concentrated amongst a few key investors, it is imperative that institutional and other investors demand long-term sustainable industry growth through the implementation of effective environmental and financial risk management policies within a sustainable business model. As part of their decision-making investors should be addressing disease resilience, genetics, site selection, technology type and operational resilience to climate change.

Companies and investors failing to implement effective sustainability strategies, which will require short term capital commitments, face medium term production and profit margin pressure. Without an overall sustainability policy in place that integrates environmental with financial concerns, each category of investor will face declining profit margins and increasing environmental risks driven by growing market demand.

Over time, this may negatively impact investment returns in the salmon aquaculture sector, whose industry 12-month forward P/E trades at about 12x versus its international food and beverage peers, whose industry 12-month forward P/E trades at about 19x.

Simply put, high demand twinned with ownership concentration and consistent environmental risks may cause the salmon aquaculture industry to underperform financially compared to other food and beverage sectors. Hence, these two risks – investment concentration and environmental shocks – when mitigated, may enable equity growth, closing the gap between the salmon sector and its international food and beverage peers and improving returns for both majority and minority investors.

As part of our future aquaculture research programme, Planet Tracker will quantify these environmental and financial risks in more detail across different markets and species within the aquaculture sector.

Our research will provide data and tools for investors to work with companies to instil good environmental practice throughout the value chain, minimising governance risk and ensuring consistent harvests at a quality which satisfies market demand. Failure to incorporate best practice has already been shown to result in production shocks.

If companies fail to achieve this, investors should consider two key investment consequences:

1. Sustainable coastal salmon aquaculture production may plateau and stagnate due to environmental and related biological factors.

2. As global fish demand increases, producers will be pressured to increase production yields, exacerbating environmental constraints and resulting in large scale single event production shocks.

However, investors may positively impact the industry by championing the development of sustainable management regimes and also supporting technical innovations that work to mitigate environmental constraints such as recirculating aquaculture systems (RAS) or offshore farm systems.

See our next Seafood Tracker Report on farmed salmon, "Loch-ed Profits", being released early next year.

DISCLAIMER

Investor Watch's reports are impersonal and do not provide individualised advice or recommendations for any specific reader or portfolio. Investor Watch is not an investment adviser and makes no recommendations regarding the advisability of investing in any particular company, investment fund or other vehicle. The information contained in this research report does not constitute an offer to sell securities or the solicitation of an offer to buy, or recommendation for investment in, any securities within any jurisdiction. The information is not intended as financial advice.

The information used to compile this report has been collected from a number of sources in the public domain and from Investor Watch licensors. While Investor Watch and its partners have obtained information believed to be reliable, none of them shall be liable for any claims or losses of any nature in connection with information contained in this document, including but not limited to, lost profits or punitive or consequential damages. This research report provides general information only. The information and opinions constitute a judgment as at the date indicated and are subject to change without notice. The information may therefore not be accurate or current. The information and opinions contained in this report have been compiled or arrived at from sources believed to be reliable and in good faith, but no representation or warranty, express or implied, is made by Investor Watch as to their accuracy, completeness or correctness and Investor Watch does also not warrant that the information is up-to-date.

REFERENCES

1 FAO (2018). The State of World Fisheries and Aquaculture.

2 Willet et al, (2019). The Lancet: Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems.

3 Factset (2019), UnderCurrentNews (2019).

4 FAO (2018). The State of World Fisheries and Aquaculture.

5 FAO (2018). The State of World Fisheries and Aquaculture.

6 TNC, Encourage Capital Issue guidance on sustainable aquaculture investment.

7 FAO (2018). The state of world fisheries and aquaculture.

8 Planet Tracker, (2019). "Loch-ed Profits"

9 Martini, R. and J. Innes (2018). "Relative Effects of Fisheries Support Policies", OECD Food, Agriculture and Fisheries Papers, No. 115.

10 FAIRR Initiative (2019). Shallow Returns? ESG Risks and Opportunities in Aquaculture.

11 The Nature Conservancy and Encourage Capital (2019). "Toward a Blue Revolution: Catalyzing Private. Investment in Sustainable Aquaculture Systems,"

12 WWF (2019). "Risk and opportunity in the seafood sector: The business case for sustainability"

13 Cai et al., (2017). Top 10 species groups in global aquaculture 2017.

14 Planet Tracker, FAO (2019).

15 Planet Tracker, COMTRADE (2019).

16 Planet Tracker, FishStat (2019).

17 FAO (2018) The State of World Fisheries and Aquaculture.

18 Environment Agency (2016). Water management: key actions for farmers.

19 Drønen (2019). Algae may halve Norway salmon production growth.

20 Reuters (2016). Chile's salmon farms lose $800m as algal bloom kills millions of fish.

21 Nikolik (2016). Are We at the End of the Chilean Salmon-Farming Roller Coaster?

22 Stentiford (2017). Solving the $6 billion per year global aquaculture disease problem.

23 M. Aldrin, T. M. Lyngstad, A. B. Kristoffersen, B. Storvik, Ø. Borgan and P. A. Jansen (2011). Modelling the spread of infectious salmon anaemia among salmon farms based on seaway distances between farms and genetic relationships between infectious salmon anaemia virus isolates.

24 Fish Farming Expert (2018). ISA costs hurt Norway Royal Salmon's bottom line.

25 IntraFish (2019). Business intelligence: The salmon farming industry's biggest problem.

26 FAO (2019). Chile leads growth as Norway and Scotland grapple with fish health issues.

27 https://aquaculturedirectory.co.uk/macquarie-harbour-salmon-1-35-million-fish-deaths-prompt-call-to-empty-waterway-of-farms/

28 Environment Agency (2008). The thermal biology of brown trout and Atlantic salmon.

29 Seatemperature.com (2019) Norway.

30 Grubbins (2014). Impacts of climate change on aquaculture.

31 Fish Farming Expert (2019). Mowi farm licences suspended after 2.6m salmon die in Canada.

32 Planet Tracker, Bloomberg. L.P. (2019).

33 FactSet (2019).

34 Planet Tracker (2019).

35 M. Aldrin, T. M. Lyngstad, A. B. Kristoffersen, B. Storvik, Ø. Borgan and P. A. Jansen (2011). Modelling the spread of infectious salmon anaemia among salmon farms based on seaway distances between farms and genetic relationships between infectious salmon anaemia virus isolates.

36 Bloomberg L.P. (2019). FactSet (2019).

37 Planet Tracker, FactSet (2019)

www.planet-tracker.org

FUNDERS

THE FINANCE HUB

GORDON AND BETTY MOORE FOUNDATION

OAK FOUNDATION