



# **Swimming Against the Tide: Climate-Related Risks and Disclosure Gaps in Tasmania's Salmon Farming Industry**

Prepared for Australian Marine Conservation Society

**Institute for Sustainable Futures**

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### Research Team

Hollie Cheung  
Laure-Elise Ruoso  
David Booth  
Alison Atherton

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### About the authors

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### Institute for Sustainable Futures

Level 10, UTS Building 10  
235 Jones Street, Ultimo  
Sydney, NSW 2007, Australia  
[uts.edu.au/isf](https://uts.edu.au/isf)

### Acknowledgment of Country

UTS acknowledges the Gadigal People, the Boorooberongal People, the Bidiagal People and the Gamaygal People upon whose ancestral lands our university stands. We would also like to pay respect to the Elders past and present, acknowledging them as the traditional custodians of knowledge for these lands.

# Executive Summary

Tasmanian salmon farming is Australia's most valuable aquaculture industry (over \$1.36 billion for FY2022-23 (ABARES,2025)). As a 'global ocean hotspot' where marine waters are warming nearly four times faster than the global average, the salmon industry in Tasmania, is increasingly exposed to climate change. This includes climate-related physical and transition risks, which increasingly affect business performance, asset values and long-term viability. This policy brief examines the extent to which Tasmania's major salmon producers, their parent companies and reporting entities disclose these risks and their implications for business strategy, adaptation and future operations.

Climate-related risks are already affecting the industry. In the warmer months of the year, water temperatures can reach or exceed Atlantic salmon's ceiling thermal stress tolerance. Marine heatwaves are increasing in duration and becoming more frequent and intense. Rising water temperatures are contributing to lower dissolved oxygen levels, increased disease outbreaks, storm intensity and frequency, all of which are compounding in nature, and can result in salmon mortality events. These impacts have contributed to declining production, rising operational costs and increased uncertainty regarding the future suitability of some inshore farming locations.

Tassal, Huon Aquaculture (Huon) and Petuna, along with their parent companies Cooke, JBS and Sealord, are the three main salmon farming companies in Tasmania. The mandatory climate-related financial disclosure (CRFD) regime commenced in January 2025. Entities meeting the reporting thresholds need to disclose against the Australian Accounting Standards Board (AASB) S2 climate-related financial disclosures and reporting will be phased in based on entity size.

As of September 2026, Tassal (through its reporting entity Aquaculture Australia Holdco Pty Ltd) has submitted its CRFD. Although Huon meets the thresholds for reporting in the first group of entities, no disclosures were found. Petuna is smaller and likely to fall in later reporting years.

Beyond Tassal's CRFD report, key sustainability documents for all three companies were examined. Each generally acknowledges climate-related risks. However, core disclosures provide limited detail on the financial implications of these risks, the resilience of current business models, or the adaptation pathways required to maintain production. Climate-related transition risks, particularly evolving regulatory, legal, environmental and reputational pressures, are also not disclosed in sufficient detail despite their potential to constrain future operations and influence investor perceptions.

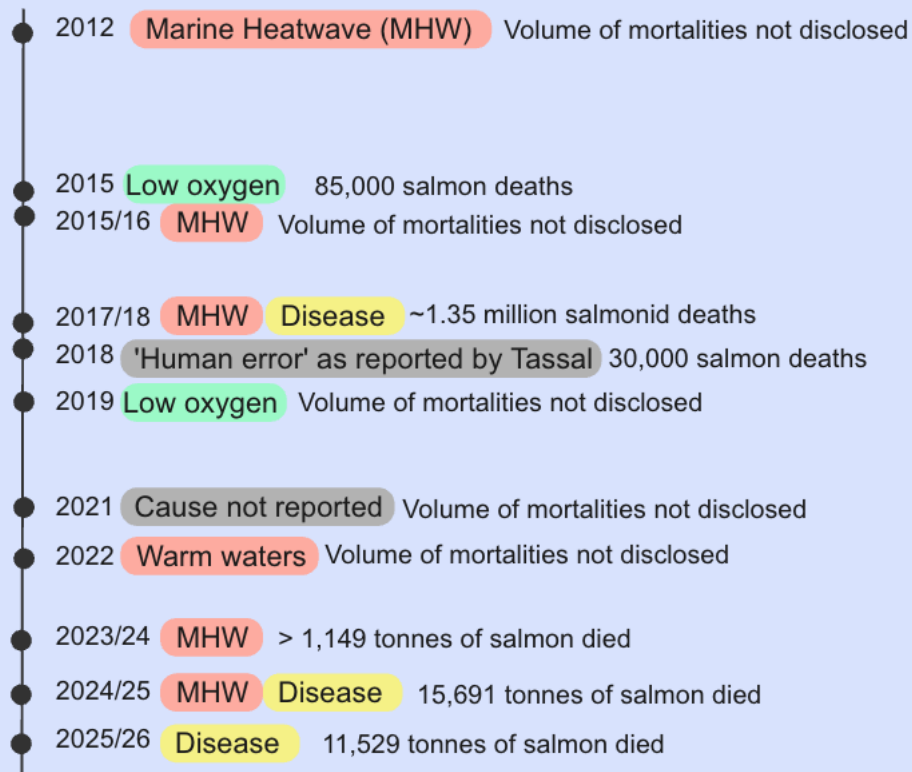
**Four key gaps were identified in Tassal, Huon and Petuna's disclosures and climate-related risks now and in the future:**

- 1. Companies fail to clearly translate the impacts of climate-related physical risks on their business models and strategies**
- 2. Continued inshore salmon farming in Tasmania is misaligned with reduced production in the last five years and growing physical and transition risks**
- 3. Climate adaptation will be necessary and interventions will be costly, however this detail and impact on future business strategy is not disclosed**
- 4. Climate-related transition risk is considerable, though the risks and their impacts are not disclosed in detail**

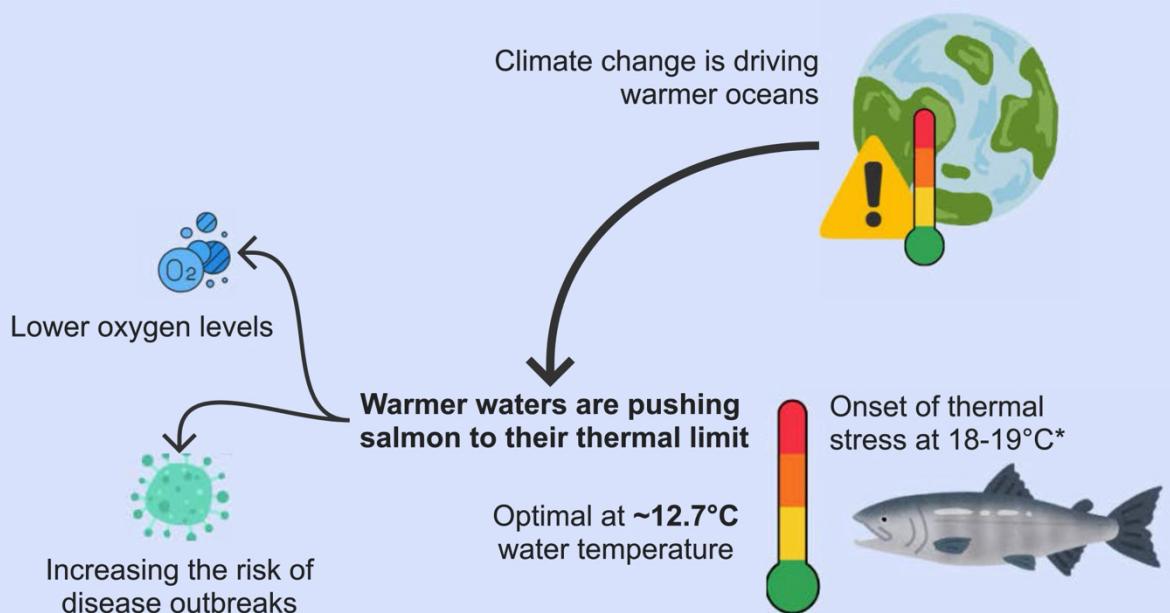
This brief has three sections: 1) a literature review, 2) an overview of CRFD and 3) gap analysis examining salmon company disclosures in the context of the literature review.

For investors, more robust disclosure is needed regarding financial implications, climate scenario analysis, adaptation costs, strategic responses and transition planning. Greater transparency would support more informed assessment of climate resilience, capital allocation decisions and long-term investment risk.

## Brief timeline of salmon mortality events in Tasmania



## Climate change is pushing salmon to their thermal limits



\*Well before temperatures reach lethal levels, welfare declines, growth rates slow and profitability declines. When thermal stress continues to increase, immune function breaks down increasing the risk of disease and mass mortality events.

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## 1. Salmon aquaculture in the context of climate change

### Salmon farming in Tasmania

In 2023-24, salmonid farming represented 37% of Australia's aquaculture and fisheries production value and approximately 62% of the aquaculture sector production value, making it the most valuable industry within the sector (Curtotti et al, 2024). Tasmania is a major producer of Atlantic salmon and, to a lesser degree, of rainbow trout. More than 90% of Atlantic salmon produced in Australia is farmed in the state's waters (DNRET, 2025a).

Salmonid farming in Tasmania almost entirely relies on freshwater hatcheries and sea-cage farming operations (DNRET, 2025a) located across the state's waters, including Macquarie Harbour on the western side, Tamar Estuary in the north and Great Oyster Bay Mercury Passage, Tasman Peninsula, Norfolk Bay, Storm Bay, D'Entrecasteaux channel and Huon River on the eastern side (DNRET, n.d.a). It is managed by three companies: Tassal, Huon and Petuna (Amoroso, 2026).

As Atlantic salmon represents most of the salmonid farming in Tasmania, the remainder of the report will specifically focus on salmon farming, rather than on salmonid farming (which also includes rainbow trouts).

### Climate change and warming oceans present a serious threat to aquaculture

Wild fisheries and aquaculture, including the salmon farming industry, are increasingly faced with the consequences of warming waters caused by climate change. Oceans act as a carbon sink and have absorbed over 90% of the excess heat generated by human-induced climate change since the 1970s (IPCC, 2013). This is not without consequences. The IPCC (2019) report shows that the absorption of excess heat by oceans has led to an acceleration of ocean warming (i.e. ocean warming has doubled in rate since the 1990s), along with more frequent and intense marine heatwaves. Marine heatwaves (MHW) refer to periods when sea surface temperatures (SST) are among the hottest 10% historically recorded for a specific location and time of year and last for five consecutive days or more (Hobday et al, 2016).

Australia's first National Climate Risk Assessment (ACS, 2025) outlines Australia's current and potential future climate risks. Seven key systems are examined, including primary industries and food. The assessment identifies ocean warming and acidification as a key climate hazard for the sector, with fisheries and aquaculture exposed and expected to experience declining productivity due to climate-driven ocean warming, ocean acidification, and longer and more intense MHWs. The current climate risk to the primary industry and food system overall is rated moderate-high, increasing to high-very high in 2050.

### Tasmania as a global warming hotspot

Tasmanian waters are often described as a 'global warming hotspot' or a 'global ocean hotspot' (Kajtar and Holbrook, 2021; Ridgway and Ling, 2023). Marine waters off eastern Tasmania are warming nearly four times faster than the global average (Meng et al, 2022; Ridgway, 2007). Between 1944 and 2002, the southwestern Tasman Sea warming trend was 2.28°C per century – approximately 0.24°C per decade – compared to an average of 0.6°C per century for global oceans (Ridgway, 2007). This trend has accelerated with a warming of 0.4°C per decade in the nearshore waters of Tasmania between 1992 and 2020, with a maximum of 0.55°C in the Macquarie Harbour area (Ridgway and Ling, 2023). While the rapid warming of Tasmanian waters is multi-factorial, the influence of the Eastern Australian Current (EAC) is substantial. The EAC forms from the South Equatorial Current in the Coral Sea and travels southward along the eastern coast of Australia. At 30-32 S latitude, the EAC diverts eastward into the Tasman Sea, while its extension – the East Australian Current Extension (EACx) – continues to flow southward, bringing warm waters to Tasmania. The increasing influence of warm EACx waters explains the warming trend on the eastern waters of Tasmania. Less well understood factors may play a role in the west (Ridgway and Ling, 2023). While models of SST trajectory do differ (GWL1.5 and GWL 3.0: Brodie et al, 2025), their predictions conform strongly through to at least 2035 (Kajtar, 2021).

## **Atlantic salmon have a low thermal threshold which is at its limits in Tasmania**

Atlantic salmon physiological responses are optimal at around 12.7°C and they start experiencing thermal stress when temperatures move beyond 18°C, leading to reduced feeding and growth rate (Calado et al, 2021; Korus, Filgueira and Grant, 2024; Tang et al, 2022). Pathogens like *Piscirickettsia salmonis* (*P. salmonis*), which were attributed to the 2024/25 and 2025/26 mortality events and often occur in waters between 12°C and 18°C (ABC News, 2026; DNRET, 2025b DNRET, 2025c). This suggests that regardless of specific temperature thresholds, being chronically exposed to the upper temperature limit means salmon spend a longer time under stress, which may increase their susceptibility to lethal disease. This has welfare and ethical ramifications as well, considering fish are sentient beings capable of consciousness and suffering (Barreto et al, 2022).

## **Warmer waters have decreased levels of oxygen, which can lead to mortalities**

Other factors affect the well-being and performance of Atlantic salmon, notably level of dissolved oxygen (Berntsson et al, 2025; Kajtar and Holbrook, 2021; Kajtar, Holbrook and Lyth, 2021). Dissolved oxygen refers to the oxygen present in water which is used by aquatic animals to breathe (NECMA, n.d.). Levels of dissolved oxygen present in the water are influenced by multiple factors, including temperature, organic materials, salinity and nutrients.

Cold water holds higher levels of oxygen than warm waters. As such, increases in water temperature under a changing climate reduces dissolved oxygen levels. To exacerbate this effect, fish metabolism (related to oxygen consumption) increases with temperature. When there is a high presence of organic materials or nutrients in the water, the number of bacteria metabolising them increases. In turn, bacteria consume oxygen that is no longer available for other aquatic animals (NECMA, n.d.).

In Macquarie Harbour, hypoxic levels of dissolved oxygen are a source of concern, primarily influenced by microbial breakdown of organic materials generated by Atlantic salmon farming (i.e. fish-feed and fish-waste). Increased water temperatures due to human-induced climate change and altered river flows due to hydroelectric infrastructures are additional compounding factors (DCCEEW, 2026). The Limiting Oxygen Saturation (LOS) – is the level under which fish welfare is in jeopardy – is 55% for salmon (Dempster, Wright and Oppedal, 2016).

## **Across Tasmanian salmon sites, Macquarie Harbour stands out for its low levels of dissolved oxygen and deep-water renewal events disturbing water columns**

The combination of warm water temperatures and low levels of dissolved oxygen can lead to salmon mortality (Meng et al, 2022). Macquarie Harbour, home to 11 salmon farming licenses/leases, is especially vulnerable to oxygen depletion. The harbour is a fjord-like system consisting of deep basins, with freshwater inflows from two river systems (Gordon and King) and a single, narrow and shallow entrance to the ocean through 'Hells Gates'. Due to limited tidal movement and deep basins within the harbour, denser ocean waters sit at the bottom of the basins progressively losing their oxygen, while oxygenated freshwater sits at the top creating 'layered water columns' (Aquaculture Environment Team, 2026; Hartstein et al, 2019). Water renewal events are rare and occur in autumn/winter, when the atmospheric pressure diminishes and north westerly winds pick up, enabling more ocean water to enter the harbour and mixing with freshwater (Hartstein et al, 2019).

When high SSTs combine with low oxygenation of the bottom water, salmon can be 'squeezed' within the water column. In a study conducted in Macquarie Harbour for three days during the 2015/16 MHW (12-14 of February 2016), the distribution of farmed salmon in cages was monitored using a cage-based echo-integration system (Dempster, Wright and Oppedal, 2016). Three-quarters of salmon were located at 4-6 meters depth, likely in response to warmer surface waters. However, the oxygen saturation levels during this period were 32-52% at 4 meters and 26-41% at 5 meters, well below Atlantic salmon's LOS threshold meaning basic welfare conditions were not met and salmon were at risk of hypoxia.

Deep-water renewal events – i.e. when denser oceanic water enters the harbour due to low atmospheric pressure and high wind – can also affect salmon farming, by uplifting hypoxic bottom waters up through the water column (Hartstein et al, 2019; Wallis, 2024). These uplifts can lead to salmon mortalities due to low

dissolved oxygen levels, as observed during deep-water renewal events in 2015 and 2019 (Harstein et al, 2019; Wallis, 2024).

## **Higher water temperature and algal blooms can increase the risk of disease outbreak among salmon**

Higher water temperature can increase salmon's susceptibility to disease and mortality (Brodie et al, 2025) including *P. salmonis*, amoebic gill disease caused by *Neoparamoeba perurans* and *Pilchard orthomyxovirus* (ABC News, 2018a; Brodie et al, 2025; DNRET, 2025b; Rigos et al, 2025). Ocean warming can trigger disease outbreaks due to increased stress on animals, especially those that are farmed (Harvell et al, 1999; Lafferty and Holt, 2003) and at their thermal tolerance threshold (Oldham et al, 2016).

In early 2025, a mass mortality event occurred in the D'Entrecasteaux Channel involving a combination of factors including *P. salmonis* and other pathogens, warmer waters, and the presence of algae and jellyfish (DNRET, 2025b). During the 2025/26 summer, five tonnes of antibiotics (florfenicol) were released to control another *P. salmonis* outbreak, which nonetheless killed 9,000 tonnes of salmon (ABC News, 2026a; Pulse Tasmania, 2026). Prior to that, 1.5 million fish died in 2018 in a *Pilchard orthomyxovirus* outbreak (ABC News, 2018a).

Rising SSTs also accelerate the growth rates of algal blooms (DNRET, n.d.d), which pose a compounding threat to the salmon industry and can contribute to diseases spreading (Asche et al, 1999). Greater outbreaks of disease increase the production cost of salmon, with additional antibiotics and vaccines required (Asche et al, 1999; Torrisen et al, 2013) and also undermine fish welfare. The use of antibiotics in aquaculture systems is raising concerns regarding impacts on aquatic ecosystems and species. It can also pose a risk to human health, notably adverse drug reactions and antibiotic resistance, through fish consumption and exposure of aquaculture workers to antibiotics in the form of dust aerosols (Cherian et al, 2023). In November 2025, the Public Health Services in the Department of Health issued precautionary advice recommending recreational fishers consider not eating wild fish caught within 3kms of salmon pens treated with florfenicol (Department of Health Tasmania, 2025). Two sections of the rock lobster fishery located within 3km of salmon pens were also temporarily closed to ensure continued access to international markets, notably China, which requires no traces of antibiotics be present in imported rock lobster (ABC News, 2025d).

## **Historical marine heatwaves (MHW) had devastating impacts on Tasmanian aquaculture, including farmed salmon**

In the context of this warming trend, Tasmania has experienced intense MHWs in recent years. Including 2012, September 2015 to May 2016, November 2017 to January 2018, December 2023 to July 2024 and November 2024 to March 2025 (Fishing Tasmania, n.d.; Kajtar et al, 2022; Hobday et al, 2026). Extreme ocean temperature events in 1988, 2000/2001, 2010 and 2012 caused significant impacts on the back of bull kelp, abalone (and salmon (Oliver et al, 2018).

In 2015/16, 251 days of MHW were recorded (from September 2015 to May 2016) (Oliver et al, 2017). The 2015/16 MHW is the longest and most intense recorded since measurements started in 2004. SSTs were at least 1°C warmer than expected at that time of year during the whole duration of the MHW, and 1.5-3°C warmer between November and February. Event attribution analysis found that human-induced climate change made the duration of the heatwave 330 times more likely and its intensity 6.8 times more likely (Oliver et al, 2017).

Atlantic salmon experienced reduced growth during the 2015/16 MHW period (Kajtar, Holbrook and Lyth, 2021; Oliver et al, 2017), which may have contributed to a 3,535 tonnes reduction in the volume of salmon production between the financial year 2015/16 and 2016/2017 (ABARES, n.d.; Meng et al, 2022). No further information on the amount of salmon mortalities during 2015/16 was found.

## Climate projections show MHW increasing in intensity and duration

The Primary Industries Technical Report for the National Climate Risk Assessment, notes that “existing aquaculture leases may not be able to maintain production in their current location into the future” due to rising sea temperatures and associated impacts on farmed species (Brodie et al, 2025, p.218).

Climate projections using moderate and high-emissions scenarios show an increase in the intensity and duration of MHW, with some areas being in a near-constant state of MHW by the end of this century (Oliver et al, 2019). Using a SST of 19°C as a threshold temperature for salmon, Kajtar and Holbrook (2021) found that under a low-emissions scenario (SSP1-2.6), the number of days above 19°C will be similar to those experienced across the Tasmanian region during the 2015/16 MHW (i.e. a few days). Under a high-emissions scenario (SSP5-8.5)<sup>1</sup> the number of days above 19°C will be closer to 20 days per year. However, this varies regionally. Tasmania’s north-east experienced more than 80 days above 19°C in 2015/16 and already has an average of 20 days above 19°C each year. In contrast, the south-west is unlikely to experience days above 19°C by 2050. In the south-east, where most salmon farming is concentrated, there were more than 20 days above 19°C in 2015/16 and it is projected to become an annual occurrence by 2045 under a high-emission scenario (Kajtar and Holbrook, 2021). These variations can be explained by a range of factors including the influence of the EACx (Kajtar et al, 2024) as well as local oceanographic conditions – e.g. sheltered areas tend to have higher temperatures than open ocean areas (Meng et al.,2022).

## Broader ecosystem impacts of salmon farming in Tasmania

In addition to the impacts of warming waters on the salmon farming industry, the industry itself has been found to impact local ecosystems, notably affecting the Maugean Skate (*Zearaja maugeana*). The Maugean Skate is an “endangered micro-endemic species” which is exclusively found in Macquarie Harbour (Woolley et al, 2026). The species recruitment is characterised by a pulse-recruitment pattern, which makes it sensitive to environmental conditions (Woolley et al, 2026). While factors explaining the presence and distribution of Maugean skate are site-dependent, water quality and more specifically low levels of dissolved oxygen were identified by DCCEEW (2026) as the primary threat. As mentioned earlier, salmon farming in Macquarie Harbour and its associated release of organic material in the form of fish-feed and waste contribute to reduced levels of dissolved oxygens which, in turn, negatively affect the Maugean Skate. Other threatening factors compounding the influence of low dissolved oxygen on the Maugean Skate include warming waters, extreme weather events and river flow alteration (DCCEEW, 2026).

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<sup>1</sup> Noting that RCP8.5 and SSP5-8-5 (worst case IPCC scenarios aligned with 4.3-4.8°C of warming by 2100) have been excluded from the most recent climate scenario framework as climate action efforts (although slow) have made that scenario less likely (King, 2026).

## 2. Climate-related financial disclosures and their importance for the salmon aquaculture industry

Due to its dependence on its surrounding environment, the salmon aquaculture industry is significantly exposed to climate-related risks (Zitti and Guttormsen, 2023). To mitigate and adapt to these increasing climate-related risks, significant capital expenditure will be required. The ability of companies to raise new debt or refinance, is crucial to maintaining investor trust, but may also be impacted by climate related risks (such as reduced revenue from fish mortalities, or increased insurance premiums from damaged infrastructure) (Zitti and Guttormsen, 2023). Investors and other stakeholders are increasingly demanding greater information and transparency from the salmon farming industry, including climate-related financial disclosures, which are mandatory in a growing number of countries.

### Brief overview of non-financial disclosures

Following environmental disasters including the Exxon Valdez oil spill in the 1990s, a range of voluntary frameworks were developed for companies to report their environmental, social and governance risks and impacts. To improve global consistency and comparability, the International Financial Reporting Standards (IFRS) Foundation released standards for disclosure in 2023: IFRS S1 (sustainability) and IFRS S2 (climate). IFRS S2 builds on the previous Taskforce on Climate-related Financial Disclosures (TCFD).

### Brief overview of salmon farming companies in Tasmania

The largest salmon farming companies in Tasmania – Tassal, Huon and Petuna – all established aquaculture operations in the late 1980s. Operations in Macquarie harbour began with Petuna in 1991, Tassal in 2003, and Huon in 2008 (ABC News, 2017). In 2020 and 2021 all three companies were sold to international seafood and agricultural producers. Key details on the three companies are included in Table 1.

Table 1 Tassal, Huon and Petuna high-level company information

|                                                                    | Tassal                                                                                                                                                         | Huon Aquaculture                                                                                                           | Petuna                                                                     |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Established</b>                                                 | 1986                                                                                                                                                           | 1986                                                                                                                       | 1949 (aquaculture 1990 onwards)                                            |
| <b>Date sold</b>                                                   | 2022 acquired by Canadian seafood company, Cooke Inc. Equity value of AU\$1.1 billion and enterprise value of \$1.7 billion (Tassal, 2022). Previously listed. | 2021 sold to Brazilian food producer, JBS. Equity value of \$425 million and enterprise value of \$549 million (AFR, 2021) | 2020 sold to New Zealand seafood company Sealord for an undisclosed amount |
| <b>Employment data</b><br>(Permanent staff in TAS) Q4 2025         | 858                                                                                                                                                            | 807                                                                                                                        | 175                                                                        |
| <b>Leases / leases operated by company (total)</b>                 | 35<br>(incl. 3 in Macquarie Harbour)                                                                                                                           | 17<br>(incl. 3 in Macquarie Harbour)                                                                                       | 7<br>(incl. 5 in Macquarie Harbour)                                        |
| <b>Estimated 2023-24 revenue from Tasmanian salmon<sup>2</sup></b> | \$612,008,446                                                                                                                                                  | \$512,225,193                                                                                                              | \$156,394,948                                                              |

Sources: Employment and lease data from DNRET Salmon Farming Data Portal (n.d.a).

<sup>2</sup> Calculation based on 2023-24 production value (\$) and production amount (tonnes) industry wide (ABARES, 2025), divided by company specific production (tonnes) (DNRET, n.d.a).

## Disclosure requirements for Australian reporting entities

In Australia, mandatory climate-related financial disclosures based on IFRS S2 commenced from 1 January 2025 and are being phased in for large entities, emissions intensive entities and financial institutions through the Corporations Act and AASB S2 Climate-related Disclosures. Reporting will be phased in according to the thresholds outlined in Table 2.

Table 2 Phased climate-related financial reporting for Australian entities

| Reporting entities                                                                  | Group 1<br>First annual reporting periods starting on or after 1 Jan 2025                                                         | Group 2<br>First annual reporting periods starting on or after 1 Jul 2026                                                                                                  | Group 3<br>First annual reporting periods starting on or after 1 Jul 2027                                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Large entities and their controlled entities meeting at least two of three criteria | Consolidated revenue: \$500 million or more<br>EOFY consolidated gross assets: \$1 billion or more<br>EOFY employees: 500 or more | Consolidated revenue: \$200 million or more<br>EOFY consolidated gross assets: \$500 million or more<br>EOFY employees: 250 or more                                        | Consolidated revenue: \$50 million or more<br>EOFY consolidated gross assets: \$25 million or more<br>EOFY employees: 100 or more |
| Others                                                                              | Entities above NGER publication threshold in s 13(1)(a) of the NGER Act 2007                                                      | All other NGER reporters. Registered schemes, Superannuation entities and retail Corporate Collective Investment Vehicles with \$5 billion assets under management or more |                                                                                                                                   |

As standalone companies Tassal and Huon are Group 1 entities (required to disclose based on information in Table 1), and Petuna is a possible Group 2 or 3 entity (not yet required to disclose). However, as the companies are now part of larger multinationals, whether parent companies disclose under AASB S2 depends on their Australian financial reporting obligations. Climate-related financial disclosures need to provide material information about the parent and its subsidiaries, to help users of reports to understand the effects of climate-related risks and opportunities on cash flows, access to finance and cost of capital over the short, medium and long term (AASB, 2024).

We conducted a search for lodgement of sustainability reports for Tassal, Huon and Petuna on the ASIC Connect Portal (between 7 September – 22 September 2026). Reports should be lodged with ASIC through a Form 398 ‘Copy of sustainability report and auditor’s report’. A Sustainability Report aligning with AASB S2 was found for a reporting entity representing Tassal, but not detected for Huon or Petuna. Petuna’s lack of disclosure is expected as it is not a Group 1 entity, however a Sustainability Report would be expected for Huon based on thresholds met in Table 1.

Table 3 Evidence of climate-related disclosures for salmon companies

|                                                          | Tassal                                                       | Huon                                                                                           | Petuna                                                                          |
|----------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>Reporting group</b><br>(information in Table 1 and 2) | Group 1                                                      | Group 1                                                                                        | Likely Group 2 or 3 entity                                                      |
| <b>Reporting entity</b>                                  | Aquaculture Australia Holdco Pty Ltd (Aquaculture Australia) | Flora Green Pty Ltd <sup>3</sup>                                                               | Petuna Pty Ltd                                                                  |
| <b>Form 398 disclosed</b>                                | Yes. Financial and Sustainability Reports lodged 30/04/2026. | Not detected. Significant Global Entity General Purpose Financial Statement lodged 18/09/2026. | Not detected (aligned with reporting group). Financial Report lodged 25/01/2026 |

<sup>3</sup> To the best of our knowledge, Flora Green Pty Ltd is the reporting entity for Huon. As outlined in its 2025 Annual Report it is “primarily involved in holding investments in JBS Holdco Australia Pty Ltd and JBS Southern Holdco Pty Ltd and JBS Smallgoods Holdco Pty Ltd”. A spokesperson for JBS stated “Flora Green was the “legal head entity” of the “JBS tax group in Australia” and included revenue from subsidiaries like Huon Aquaculture” (AFR, 2025).

**What is financial materiality?** Materiality is a concept that applies to the preparation and presentation of financial statements. Information is material if omitting, misstating or obscuring could reasonably be expected to influence stakeholders' decisions, including investors. IFRS S2 and AASB S2 require disclosure of information based on financial materiality – how climate change affects their finances.

Other jurisdictions such as the European Union, require double materiality climate reporting – how climate change affects their finances and how their business impacts people and the planet.

Under AASB S2, entities are required to disclose against four pillars (AASB, 2024):

- Governance – including processes, controls and procedures to monitor, manage and oversee climate-related risks and opportunities.
- Strategy – for managing climate-related risks and opportunities, including mandatory scenario analysis to assess climate resilience, and voluntary disclosure of climate-related transition plans.
  - Scenario analysis included in Aquaculture Australia's (Tassal) 2026 Sustainability Report, Sealord (Petuna) is for the broad seafood sector in Aotearoa New Zealand only. Not detected for Huon.
  - Tassal has a transition plan (Responsible Business Roadmap 2030), Sealord has a seafood sector adaptation toolkit for Aotearoa New Zealand. Not detected for Huon.
- Risk management – processes to identify, assess, prioritise and monitor climate-related risks and opportunities, including in overall risk management processes.
  - Aquaculture Australia's (Tassal) CRFD includes risk management (and all other pillars) and JBS (Huon) has conducted a climate risk and opportunity assessment (not public).
- Metrics and targets – understand an entity's performance in relation to its climate-related risks and opportunities, including any targets it has set and progress on these.

## Climate and nature-related risks are different, but interconnected

Climate-related risks can be categorised as physical or transition risks. Physical risks may be acute (climate change driven events such as heatwaves) or chronic (long-term changes such as rising ocean temperatures). Transition risks arise from the shift to a net zero economy and may include policy and legal risks from stricter regulations, reputational risks from perceived inaction, technology risks associated with replacing or upgrading equipment, and market risks driven by changing consumer and investor expectations. Key physical and transition risks for salmon aquaculture are summarised in Table 4.

Climate and nature are interconnected. This brief focuses on climate-related risks, while acknowledging nature-related risks are substantial for salmon farming in Tasmania. There are direct climate-related risks which impact salmon's respiration, mortality and growth (e.g. chronic risk of rising sea temperatures), alongside indirect impacts (e.g. policy-related risk from changes to soy exports (used as salmon feed)).

Table 4 Summary of climate-related risks and financial impacts for salmon aquaculture (Zitti and Guttormsen, 2023)

|                        | Climate-related risks                                                                                                                                                                                                                                                                                              | Potential financial impacts                                                                                                                                                                                                                                                                                                 |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Physical risk</b>   | <b>Acute risk</b> (e.g. storms, marine heat waves) <b>and associated impacts</b> (e.g. increased outbreaks of disease, algal blooms, decreased oxygen)                                                                                                                                                             | <ul style="list-style-type: none"> <li>Reduced revenue from decreased production capacity and lower sales/output (e.g. infrastructure damage, fish escaping, high mortality rate, diseases)</li> </ul>                                                                                                                      |
|                        | <b>Chronic risk</b> (e.g. rising mean water temperature, rising sea levels)                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>Write-offs and early retirement of existing assets (e.g. destroy installations and plants)</li> <li>Potential unviability of farming in some sites</li> </ul>                                                                                                                        |
|                        | <b>Acute and chronic risk</b>                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>Increased insurance premiums and costs</li> <li>Increased capital costs (e.g. from damage)</li> </ul>                                                                                                                                                                                |
| <b>Transition risk</b> | <b>Policy and legal</b> <ul style="list-style-type: none"> <li>Trade regulations (e.g. soybean imports)</li> <li>Higher air freight carbon taxes</li> <li>Production growth restrictions</li> <li>Fish welfare regulations related to rising sea temperatures</li> <li>Ecosystem protection regulations</li> </ul> | <ul style="list-style-type: none"> <li>Increased operating costs (e.g. higher transport costs)</li> <li>Increased costs and/or reduced demand for products and services</li> <li>Increased cost of compliance, for legal representation</li> </ul>                                                                          |
|                        | <b>Technology</b> <ul style="list-style-type: none"> <li>Disease outbreak imposes research and innovation developments</li> <li>Substituting soy with more sustainable options</li> <li>Shifting production toward offshore farms or land-based farms</li> </ul>                                                   | <ul style="list-style-type: none"> <li>Reduced demand for products and services (e.g. disease outbreak impacts demand)</li> <li>Research and development (R&amp;D) expenditures in technology and medicine</li> <li>Capital investments in technology</li> <li>Costs to adopt/deploy new practices and processes</li> </ul> |
|                        | <b>Market</b> <ul style="list-style-type: none"> <li>Changing customer behaviour</li> <li>Uncertainty in market signals</li> <li>Increase in soy costs</li> </ul>                                                                                                                                                  | <ul style="list-style-type: none"> <li>Reduced demand for goods and services due to a shift in consumer preferences</li> <li>Reduced revenues and profits</li> </ul>                                                                                                                                                        |
|                        | <b>Reputation</b> – Stigmatisation of sector (e.g. media scrutiny regarding animal welfare and sustainability goals)                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>Reduced revenue from decreased demand</li> <li>Reduced revenue from decreased production capacity (e.g. supply chain interruptions)</li> <li>Reduction in capital availability</li> </ul>                                                                                            |

## Brief overview of Aquaculture Australia's 2026 climate-related financial disclosures (CRFD)<sup>4</sup>

- Limited assurance undertaken by PwC covering governance, identification of climate-related risks and opportunities, strategy (risks and opportunities) and Scope 1 and Scope 2 emissions.
- Time horizons are based on when climate-related risks and opportunities could reasonably be expected to occur. The following time horizons were identified, aligning with the timelines used for strategic decision making:
  - Short term: 0-3 years
  - Medium term: 3-10 years
  - Long term: 10+ years
- Principal climate-related risks identified include:
  - Physical risks:
    - Extreme weather disruptions and acute physical risks (short to medium term) including periods of elevated water temperature and more intense storms and rainfall influencing fish health, site accessibility and operational planning.
    - Marine ecosystem stressors and chronic physical stressors (short to long term) including variations in water temperature and oxygen levels and ecosystem dynamics influencing growth performance, feed efficiency and broader biological outcomes.
  - Transition risks: market and consumer preference shifts for sustainable packaging, responsible sourcing, and enhanced climate and biodiversity performance
  - Key initiatives to manage physical risks include: selective breeding and biological innovation, enhanced environmental monitoring and early-warning systems, operational adaptation measures, infrastructure and equipment investment, and vaccine development and applications.
- Principal climate-related opportunities include: climate resilience and biological innovation, operational efficiency and decarbonisation, and data and predictive intelligence.
- Explicit financial impacts disclosed include: an estimated cumulative EBITDA impact of up to \$2.5 million over a five-year period for short-term weather-related variability, a rise in average sea temperature and extension in use of higher cost summer feed could increase feed cost by up to \$0.8 million per year, and an expected ~\$4.5 million in packaging compliance costs over the next five years. There are no dollar figures for mitigation and adaptation investment.
- The company estimates that a 1°C increase in sea temperature could reduce fish survival rates from around 85% to 81.5%. No baseline year is provided and financial implications of increased mortalities is not disclosed.
- Scenario analysis was conducted for 2030 and 2050 based on NFGS scenarios and CSIRO marine and coastal climate projects for Australia: net zero 2050/RCP2.6 (orderly transition) and current policies/RCP8.5 (disorderly, higher physical risk). Scenarios illustrate climate-resilience farming systems and data driven optimisation in one scenario and offshore systems, climate-resilient species and improved management in another scenario by 2050.

Overall Aquaculture Australia's 2026 CRFD provides significantly more detail than Tassal's 2025 Sustainability Report, highlighting the importance of a mandatory disclosure regime in enhancing consistency, comparability and quality of CRFD. Despite this, many of the gaps between an established scientific evidence base and industry practices are still present in these disclosures, as discussed in Section 3.

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<sup>4</sup> Climate-related financial disclosures aligned with AASB S2 when lodged with ASIC is called a "Sustainability Report". However as Tassal also has a 2025 Sustainability Report (not lodged with ASIC), for clarity Aquaculture Australia's 2026 Sustainability Report lodged with ASIC will be referred to as Aquaculture Australia's 2026 CRFD hereafter.

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### 3. Gap analysis

Key documents from Tassal, Huon and Petuna were examined to understand the climate-related risks and opportunities disclosed and compare to findings of the literature review. Analysis focused on relevant webpages, non-financial/climate/sustainability reports, transition plans and climate-related financial disclosures where available. Disclosures from both the companies themselves (Tassal, Huon, Petuna) were examined, alongside key disclosures from parent companies (Cooke, JBS and Sealord, respectively) and reporting entities where relevant (Aquaculture Australia, Flora Green Pty Ltd and Petuna Pty Ltd).

Tassal is the only company with a standalone 2025 Sustainability Report and 2026 CRFD lodged with ASIC by its reporting entity (Aquaculture Australia). Analysis focuses primarily on the risk management and strategy pillars. While important, other pillars are out of scope.

#### 3.1 Companies fail to clearly translate the impacts of climate-related physical risks on their business models and strategies

Tassal, Huon and Petuna acknowledge climate change as a “material risk” and recognise some of the acute and chronic physical risks, however there is limited detail from Huon and Petuna on business strategy and business model implications. Tassal stands out for its translation of climate-related risks to its business model and strategy. It states, “If not effectively managed, these risks have the potential to affect operational continuity, infrastructure, supply chains and long-term access to marine environments and markets” (Tassal, 2025, p.48) – absent from Huon and Petuna even though they are exposed to similar risks.

Climate change poses a significant risk:

- SeaLord (parent of Petuna) (n.d.) “Climate change is affecting all businesses and Sealord is committed to playing its part.” (Climate Change and our carbon footprint webpage)
- JBS (parent of Huon) “JBS recognizes its responsibility to take actions addressing one of the most pressing challenges of our time: climate change.” (Non-Financial Disclosure Report 2025, p.14)
- Tassal (2025) “Climate change is a material risk for our operations and the broader aquaculture sector.” (Sustainability Report 2025, p. 46)

All companies acknowledge the impact of climate-related physical risks on their business. Tassal and JBS have also conducted climate risk assessments:

- SeaLord (n.d.) “Our climate change response [includes] adaptation – understanding and responding to climate risk by developing plans to adapt to extreme weather and rising sea temperatures.” (webpage)
- Tassal (2025) “Our climate risk is primarily associated with: physical risks, including marine heatwaves, changes in ocean temperature, extreme weather events and longer-term shifts in environmental conditions that may affect fish health, productivity and site suitability ... If not effectively managed, these risks have the potential to affect operational continuity, infrastructure, supply chains and long-term access to marine environments and markets.” (p.48)
- JBS (Huon) (2025) notes two potential physical risks: extreme weather events (likely, high impact), and failure to adapt to physical effects of climate change (likely, high impact) (p.15)

Aquaculture Australia’s 2026 (reporting entity including Tassal) CRFD provides greater detail on climate-related physical risks in comparison to Tassal’s 2025 Sustainability Report. Briefly this includes:

- Acute physical risk (short term (3 years) to medium term (3-10 years)) – extreme weather disruptions and acute physical risks: “including periods of elevated water temperatures, more intense storm activity and rainfall events, may influence fish health, site accessibility and operational planning – primarily impacts own operations.” (p.16)
- Chronic physical risk (short term (3 years) to long term (10+ years)) – marine ecosystem stressors and chronic physical stressors: “including variations in water temperature, oxygen levels and ecosystem dynamics, may influence growth performance, feed efficiency and broader biological outcomes ... impacts own operations in marine farming with the greatest effects anticipated to salmon aquaculture.” (pp.16-17)
- Physical risks are considered more relevant over the medium to long term, reflecting the importance of marine environmental conditions to aquaculture operations. Factors assessed and prioritised based on potential financial implications, likelihood and the expected impacts timing across planning horizons. [paraphrased] (p.17)
- For impacts on business model and value chain: “Operations: Marine farms in southeast Australia are exposed to rising baseline sea temperatures, marine heatwaves and storm activity. Current effects include increased environmental variability affecting fish health, growth rates and operational planning. Anticipated effects include

heightened risk of mortality events, reduced feed conversion efficiency and potential changes to site suitability over time” (p. 18)

- For financial effects: “Extreme weather events - Scenario analysis indicates that, under a range of assumptions, short-term weather-related variability could result in an estimated cumulative EBITDA impact of up to \$2.5m over a five-year period. (p.21).
- Biological and operational resilience metrics – 84% of business activities (primarily related to salmon farming operations) are vulnerable to marine ecosystem stressors.” (p.29)
- For financial effects: “Marine Ecosystem Stressors - A rise in average sea temperature has the potential to materially affect biological performance and operating costs. A 1°C increase in sea temperature is estimated to reduce fish survival rates from approximately 85% to 81.5%, indicating higher mortality levels. While no specific financial impact has been quantified for mortalities, increased losses could give rise to additional operational expenditure, including the replacement cost of fish stock, higher husbandry and biosecurity costs, and the potential for reduced harvest volumes and lost sales. Additionally, this change could increase the feed cost by up to \$0.8m per year. [Assuming] there would be five more weeks in the year above 15°C, which is the threshold between summer and winter feed, summer feed being more expensive.” (p.22)

The salmon farming industry is highly vulnerable to climate-related physical risk and transition risk (see section 2). Many of these impacts are already being realised and increasing. However, Huon and Petuna are disclosing risks and impact at a high level only. While Tassal goes further, acknowledging the potential of climate-related risks to affect its business model and strategy, limited detail is provided on financial impacts.

Climate-related risks are already occurring, with record salmon mass mortality events in recent years, reduced production of salmon, and increased costs associated with antibiotics and vaccines, waste disposal – all of which are impacting the companies’ financial position, performance and cashflows in the short term and are expected to continue in the medium and long term if business as usual continues.

#### **Key climate-related physical risks and impacts:**

- Atlantic salmon have low thermal threshold (optimal physiological responses occur in waters at around 12.7°C), which is already at its limits in Tasmania
- Warmer waters affect salmon welfare, growth and can lead to mortality
- Tasmanian waters are well-understood as a “global warming hotspot” with waters off eastern Tasmania warming nearly four times faster than the global average
- Storms can influence dissolved oxygen supply in the water column and have caused mortality in ‘uplifting’ events in Macquarie Harbour.
- MHWs are increasing in intensity, duration and frequency
- MHWs place salmon under significant stress and often coincide with mass mortality events and trigger disease outbreaks

See further detail and references in the literature review.

#### **Growing number and financial cost of disease outbreaks and mass mortality events**

Disease outbreaks can be extremely costly – to purchase and administer antibiotics and efficiently manage waste. Abolofia et al. (2017) found that lice parasitism alone produced US\$436million in damages to the Norwegian industry in 2011. During recent Tasmanian salmon disease outbreaks, salmon are fed antibiotics such as Oxytetracycline and Florfenicol, which are blended directly into feed pellets. This medicated feed is significantly more expensive than normal feed, although there is little information available on wholesale costs. During the 2024/25 outbreak of *P. salmonis*, oxytetracycline was used but deemed “largely ineffective” by Huon (ABC, 2026a). In November 2025, the salmon aquaculture industry was granted an emergency permit to use florfenicol, approved for the first time in Australian waters. In 2025/26, 5,400 kilograms of florfenicol was used to treat the outbreak of *P. salmonis*. By March 2026 the permit was revoked after reports the antibiotic had been found in wild fish 10-14km away from the initial site (ABC, 2026a).

The EPA found that the scale of deaths exceeded Tasmania's mortality retrieval capabilities for the 2024/25 outbreak event (DNRET, 2025b). Louise Cherry, a former member of the Marine Farming Review Panel noted that due to the history of mortality events in the Tasmanian salmon industry, a plan for their management should have been devised, which was not the case (Cherry, 2026). This lack of planning was reflected in all parts of waste management – insufficient transport vehicles to take waste to secondary sites, high demand on rendering (thermal treatment to produce alternative products from waste), high demand on ensilage (waste is ground and liquified for fertiliser), and landfills at capacity. Huon's waste from the mortality event (16,200 tonnes) for example, was more than double its average waste (7,200 tonnes) (ABC, 2026b). Tassal sought approval for shallow burial grounds due to the overwhelming amount of salmon mortalities as existing landfills already at capacity (ABC, 2026b). Huon is now spending \$2.1million to improve its ensilage capacity (ABC, 2026b).

### **Companies provide minimal information on mortality events and can underplay their nature and cost**

Mortality events have occurred every year since 2021 (see Figure 1, next page), with the early 2025 (February to May) mass mortality event described as "large and unprecedented" (DNRET, 2025b) and the late 2025/ early 2026 mortality event requiring an emergency approval of florfenicol antibiotics which had never been used in Australia (ABC News, 2026a). There is aggregated mortality data for both these 2025 events due to policy changes requiring public disclosure of salmon mortality data, however information is not linked to sites or companies and prior to 2025, data is incredibly patchy.

This lack of transparency is reflected in Aquaculture Australia's (2026) CRFD. While both the early (February to May) and later 2025/26 (November 2025 to March 2026) mortality events fall outside of the reporting period (ending 31 December 2025), they do occur prior to authorisation of the document (April 2026). Transactions, other events or conditions that have occurred after the end of the reporting period and before the date of authorisation of issue should be disclosed in the CRFD report. Beyond Huon's \$2.1 million ensilage capacity investment, no further information on costs of mortality events was found from the three companies.

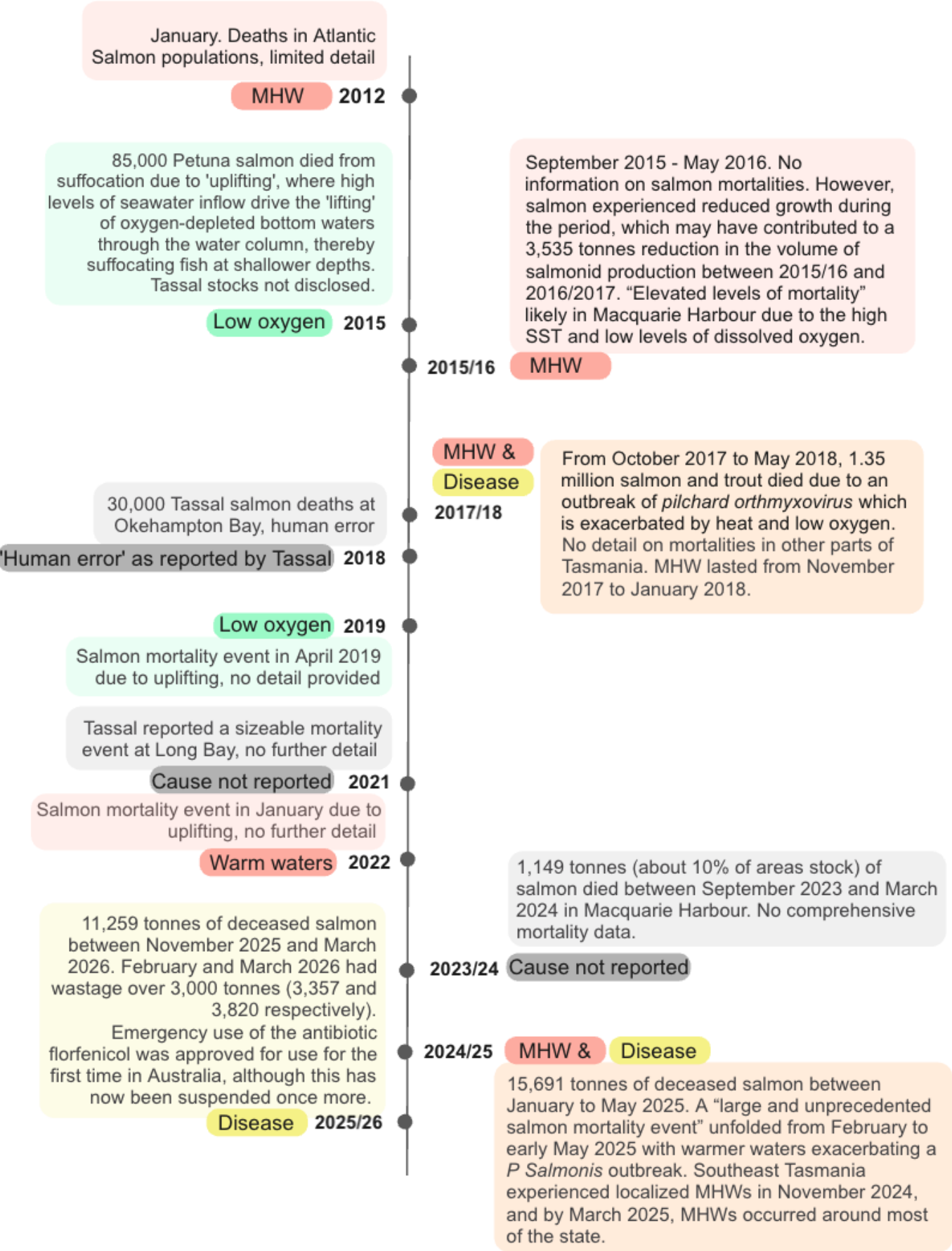
Aquaculture Australia's (2026) CRFD section on financial implications estimates a "1°C increase in sea temperature is estimated to reduce fish survival rates from approximately 85% to 81.5%" (p.22) with five more weeks in the year above 15°C. The warmer waters could increase feed costs by up to \$0.8 million a year (Aquaculture Australia, 2026). It is unclear when their baseline year is and no further rationale is provided for the use of a 15°C threshold, given that thermal stress and higher mortality rates are experienced beyond 18°C (Calado et al, 2021; Korus, Filgueira and Grant, 2024; Tang et al, 2022). No estimated costs are provided for the 3.5% reduction in survival rates for five more weeks annually above 15°C. Based on the contribution of Tasmanian salmon to Tassal's 2025 revenue (\$676million) a 3.5% reduction would equate to \$23.7million.<sup>5</sup> This is a substantial cost, roughly 30 times the feed figure published and arguably much more material. Costs would increase substantially at higher temperature thresholds.

Understating and/or failing to disclose significant financial implications associated with risks, opportunities and adaptation measures is reflected across the three companies and in Aquaculture Australia's (2026) CRFD, which provides no costs for increasing (mass) mortality events and no explicit commitment of investment funds for adaptation measures. The costs of climate-related physical risks to date are significant and will only increase in the future for inshore farming sites, as our oceans continue to warm and increase associated factors such as lower oxygen levels and risk of disease outbreaks.

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<sup>5</sup> Tassal's total 2025 was revenue \$834,680,000 (Aquaculture Australia, 2026). 81% of Tassal's revenue comes from salmon farming in Tasmania (\$676,090,800) and 3.5% of this is \$23,663,178.

Figure 1: Timeline of salmon mortality events 2012-2026



Source data: 2012 (Oliver et al, 2018), 2015 (ABC News,2015; Wallis,2024), 2015/16 (Kajtar, Holbrook and Lyth,2021; Oliver et al, 2017;Dempster et al,2016), 2017/18 (Tasmanian EPA in ABC News,2018), 2018 (ABC,2018b), 2019, 2021 and 2022 (Tasmanian Times, 2022; Wallis,2024), 2023/24 (DNRET in ABC News, 2024;Hobday et al, 2024;Fishing Tasmania, n.d.), 2024/25 (EPA TAS, n.d.a; EPA Tasmania,2025), 2025/26 (EPA TAS, 2026).

### 3.2 Continued inshore salmon farming in Tasmania is misaligned with reduced production in the last five years and growing physical and transition risks

Of all the companies, Petuna's website provides the most information on proposed inshore expansion in Tasmania. However, this fails to consider climate impacts to date and in the future, alongside reduced production in the last five years and various transition-related risks. Disclosures related to planned inshore expansion for Tassal and Huon were not detected.

- Petuna (n.d.a and n.d.b) Future exploration and growth and Sustainable growth webpages –expansion plans for proposed North-West Tasmania and Storm Bay sites. Includes key considerations (e.g. environmental certifications, minimising environmental impact etc), however no consideration of climate change.
- Petuna (n.d.c and n.d.d) South-East Tasmania webpage and North-West Tasmania webpage – no consideration of climate-related risks in site selection or expansion plans  
“Petuna's own research supports that the exposed waters in Storm Bay provide optimum farming conditions to enable maximum fish health and welfare in a best-practice farming environment”.
- Huon (2026b) Whale Point Nursery Expansion webpage – “Huon will invest \$100 million in regional Tasmania to expand its existing Atlantic salmon nursery facility”

Continued inshore salmon farming operations in Macquarie Harbour and other regions in Tasmania face a highly uncertain future. Given the mounting physical and transition risks that inshore farming presents to companies' business models and strategies – salmon companies should create clear transition plans outlining mitigation and adaptation measures to 2030 and beyond, and set exit dates for inshore farming.

#### **No plans to cease inshore farming and no clear plans for alternatives**

None of the companies have explicit plans to reduce inshore salmon farming in Tasmania. Of the three companies, only Petuna has inshore expansion plans for Tasmania's North-West and South-East included in key disclosures. None of these disclosures consider climate-related physical risk and impacts, despite extensive planning, mapping and testing (see also Important information about Petuna's Storm Bay Marine Farm (Petuna, n.d.e). Huon discloses plans for a land-based Whale Point Nursery.

#### **The salmon farming industry in Tasmania can be lucrative, although previous year on year data (2022-23 to 2023-24) showed an \$85.6 million dollar loss**

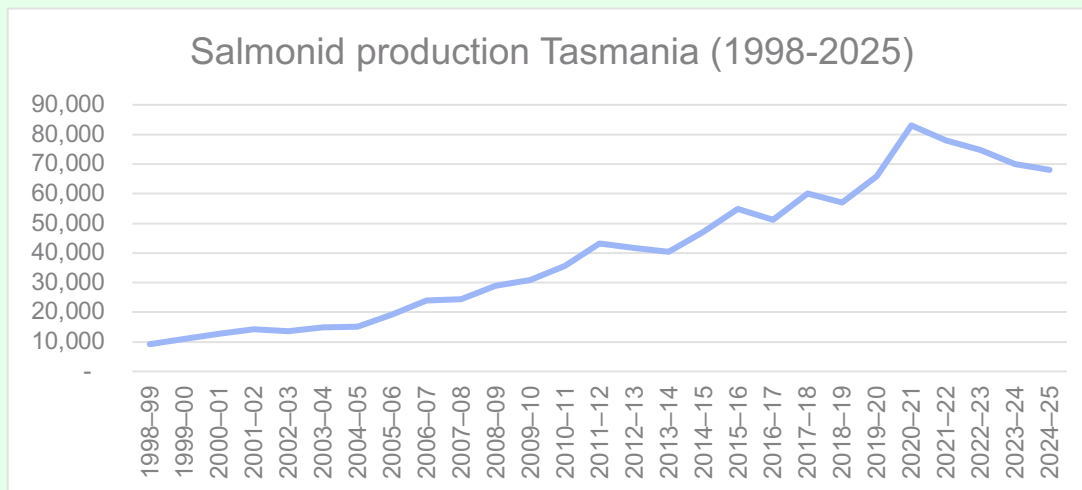
Aquaculture salmon production value in 2022-23 was \$1,366,182,000 for 75,655 tonnes of salmon in Tasmania.

This dropped by \$85,560,000 in 2023-24 to \$1,280,622,000 for 69,979 tonnes (ABARES, 2025). Broken down by company, for 2023-24:

- Tassal made \$612,008,446 in 2023-24 (33,442.92 tonnes)
- Huon \$512,225,193 (27,990.31 tonnes)
- Petuna \$156,394,948 (8,546.13 tonnes) (DNRET, n.d.a).

In the last five years the industry has steadily declined by almost a fifth (see Figure 2). From peak production in 2020-21 to 2024-25 there has been an 18% reduction in salmonid produced in Tasmania (from 83,056 tonnes produced in FY2020/21 to 69,979 tonnes in FY2024/25) (ABARES, 2025; DNRET, n.d.a). Financial losses from the most recent years for data: 2022/23 to 2023/24 may foreshadow future losses. This reflects a global trend, where conventional sea-based Atlantic salmon farming faces growth constraints, with supply growth expected to be limited to 2-3% per annum compound annual growth rate between 2024-2030 (Martinsen et al, 2024).

Figure 2 Salmonid production in Tasmania (1998-2025)



Source: ABARES (2025) for 1998/99 to 2023/24, DNRET (n.d.a) for 2024/25 data.

Contributing factors to reduced salmonid production include: direct climate-related physical risks, such as MHW and storms, and indirect climate impacts such as warmer waters increasing risk of disease outbreaks and reducing levels of oxygen in the water. Other factors, such as policy and legal changes have placed caps on the amount of salmon farming to limit environmental damage and also directly contributed to decreased production.

**Industry targets have been retracted and inshore farming has been highlighted as an area of “changing social and environmental suitability”.** A 2022 inquiry from the Tasmanian parliament recommended the development of a plan to stop salmon farming in ‘sensitive, sheltered and biodiverse areas’ (Legislative Council Select Committee, 2022, p. 27).

Since inception, the industry has continually sought to expand – with a 2009 target to double to a \$1 billion a year industry by 2030 (DPIPWE, 2017). In 2017 this was doubled, aiming for a \$2billion a year industry by 2030 (DNRET, 2023a). The latest 2023 Tasmanian Salmon Industry Plan did not include any targets for 2030 (DNRET, 2023b) which suggests a lack of certainty about the industry’s billion-dollar future. The plan notes “there is significant public interest in inshore farming areas and there is an ongoing need to consider changing social and environmental suitability in land and marine use planning” (DNRET, 2023b, p.10). It then points to new farms’ requirements under statutory planning process and that “the Government will support planning proposals in areas that are further away from land” (p.10). While useful, the information is very high-level and more detail and planning is required for the certainty of all stakeholders, including investors in Tassal, Huon and Petuna through their parent companies.

Salmonid production data for Tasmania shows declines in dollar value (between the most recent years of data 2022-23 to 2023-24), while production in tonnes has steadily declined since 2020-21 in the context of growing climate-related physical risks and transition risks. Targets for industry growth have been walked back, and there is uncertainty about continuing farming in its current primary form of inshore farming.

### 3.3 Climate adaptation will be necessary and interventions will be costly, however this detail and impact on future business strategy is not disclosed

JBS (parent of Huon) and Sealord (parent of Petuna) disclose that climate adaptation and resilience is needed, however there is little detail on what this involves for salmon farming operations in Tasmania. Aquaculture Australia (reporting entity for Tassal) includes climate-related opportunities and key initiatives to manage physical risks, providing greater detail compared to its peers. JBS invests in climate resilience initiatives across their supply chain, however none of these directly relate to the salmon farming industry in Tasmania. Sealord's *Integrated scenario analysis* and *Seafood Adaptation toolkits* are useful but focused on Aotearoa New Zealand.

On climate resilience and adaptation generally:

- Aquaculture Australia (Tassal) (2026) outlines three categories of climate-related opportunities: climate resilience and biological innovation, operational efficiency & decarbonisation, data and predictive intelligence (pp.17-18). Aquaculture Australia (2026) undertakes scenario analysis for scenarios across 2030 and 2050: net zero 2050/ RCP 2.6 (orderly transition), current policies / RCP8.5 (disorderly, higher physical risk).
- Aquaculture Australia (2026) identifies climate resilience and biological innovation as a principal climate-related opportunity – to “directly target reductions in mortality driven by marine heatwaves, disease vulnerability, and other climate-exacerbated stressors, with improved survival rates anticipated to increase harvest volumes and stabilise production cycles ... represent[ing] high-priority opportunities to materially enhance the Group’s financial trajectory while strengthening long-term adaptation capacity” (p.22).
- Aquaculture Australia (2026) “The Group’s strategic response to climate-related risks and opportunities is focused on managing exposure to material physical climate risks. Key initiatives include: selective breeding and biological innovation, enhanced environmental monitoring and early-warning systems, operational adaptation measures, infrastructure and equipment investment, vaccine development and applications” (p.20).
- JBS (Huon) (2025) “Building climate resiliency is essential for the long term sustainability of our operations, supply chains, and the communities we serve ... true resilience requires addressing broader climate-related risks such as droughts, floods, extreme weather events, and ecosystem shifts ... To address these risks, we invest in initiatives that promote sustainable practices across our supply chain.” (p.14)
- Sealord (Petuna) (n.d.) “Our climate change response [for] adaptation [involves] understanding and responding to climate risk by developing plans to adapt to extreme weather and rising sea temperatures.” (Climate change and our carbon footprint webpage). Sealord also has a Seafood Sector Adaptation Strategy and Seafood Sector Integrated Scenarios, both for New Zealand.

#### Scenario analysis

- Sealord has a Seafood Sector Adaptation Strategy and Seafood Sector Integrated Scenarios, both for New Zealand. The three scenarios include:
  - Tāmure (high temperature RCP7.0, responsive SSP3) where aquaculture transforms from inshore operations to capital intensive offshore ventures to completely land-based with recirculating aquaculture systems.
  - Pātiki (low temperature RCP4.5, divergent SSP4) where aquaculture progresses from fragmented adaptation and early resilience breeding to strategic species selection toward climate-resilient species.
  - Īnanga (low temperature RCP2.6, delayed transition SSP1) aquaculture transforms from vulnerable coastal operations to climate-resilient systems through hatchery production, breeding programs and offshore expansion.
- Aquaculture Australia’s (2026, pp.24-26) CRFD scenario analysis includes two climate-related scenarios for 2030 and 2050 based on NFGS scenarios and CSIRO marine and coastal climate projects for Australia: net zero 2050 and current policies.
  - Net zero 2050/RCP 2.6 (orderly transition). In 2030 “moderate and manageable physical climate impacts, including a gradual increase in marine heatwaves and weather variability ... operations demonstrate strong resilience, supported by proactive investment in climate data analytics, SmartFarming technologies and environmental monitoring”. In 2050 “global warming is limited to approximately 1.5°C, resulting in materially lower physical climate impacts ... early and sustained investment in decarbonisation, climate-resilient farming systems and data-driven optimisation supports long-term resilience.”
  - Current policies/RCP8.5 (disorderly, higher physical risk). In 2030 “physical risks become more apparent – increased marine heatwaves, extreme weather disruption and supply chain volatility, place upward pressure on feed costs, biosecurity expenditure and operational planning. Existing mitigation measures underpin resilience: predictive climate risk tools, improved oxygen and temperature management, selective breeding

for resilience, and the ability to relocate stock using well boats.” In 2050 “substantial physical climate risks, including more frequent and marine heatwaves, sea-level rise and more intense extreme weather events – risks materially affect fish health, infrastructure integrity, supply chains and insurance costs, increasing volatility in production and financial performance. Existing resilience measures (e.g. offshore systems, climate-resilient species, predictive analytics, water and oxygen management and flexible logistics) continue to mitigate impacts, the scale and cost of adaptation required is significantly higher.”

### **Adaptation approach by the salmon industry**

Key adaptation measures for the Tasmanian salmon farming industry include: moving operations further offshore and moving operations onto land. More transformative measures involve the industry shifting to more climate-resilient species. All these emerging options have material impacts on companies’ business models and will require significant capital expenditure and planning, both in time and research and development. No disclosures on these options and impact on their business model and strategy were detected for Huon or Petuna. Tassal, through Aquaculture Australia’s (2026) CRFD, provides more information on climate-related opportunities and key initiatives for managing exposure to material physical climate risks, however there is still limited information on offshore or land-based farming, or planning to transform business models.

### **Industry plans acknowledge the need for adaptation but are light on detail**

In the Sustainable Industry Growth Plan for the Salmon Industry 2017 (DPIPWE, 2017), innovation was a core principle, noting that “future growth lies in land-based and offshore salmon farming”. Similarly, for the 2023 Salmon Industry Plan (DNRET, 2023b) priority outcome one is a sustainable industry and highlights lease re-configurations for inshore farming areas and government support for offshore farming. However, the plan notes that “in the short term, sites further offshore may not be available and/or viable for industry”,

*“Government will look at policy settings to incentivise the relocation of existing inshore operational and dormant finfish leases to areas further offshore, particularly leases that may be constrained for social, economic or environmental reasons.” (p.10)*

### **Scenario analysis undertaken by salmon companies**

While focused on New Zealand, the findings of Sealord’s integrated scenario analysis can provide insight into salmon farming in Tasmania (The Aotearoa Circle and KPMG, n.d.). The scenario analysis examines three scenarios Tāmure (high temperature RCP7.0, responsive SSP3), Pātiki (low temperature RCP4.5, divergent SSP4) and Īnanga (low temperature RCP2.6, delayed transition SSP1) (more detail above). Scenarios illustrate a transition to completely land-based operations, switching to more climate-resilient species and offshore expansion by 2100.

Aquaculture Australia’s (2026, pp.24-26) CRFD scenario analysis includes two climate-related scenarios for 2030 and 2050 based on NFGS scenarios and CSIRO marine and coastal climate projects for Australia: net zero 2050/RCP2.6 (orderly transition) and current policies/RCP8.5 (disorderly, higher physical risk) (more detail above). Scenarios illustrate climate-resilience farming systems and data driven optimisation in one scenario and offshore systems, climate-resilient species and improvement management in another scenario by 2050.

Comparing the two sets of scenario analyses, Aquaculture Australia’s analysis is less detailed and appears to align more closely with current business as usual practices. Although noting that Sealord’s scenarios was undertaken at a sector level with greater resources and a longer timeframe (to 2100).

### **Disclosed magnitude of climate impacts seems conservative in light of recent events**

Projections in Aquaculture Australia’s (2026) scenario analysis appear to understate the impacts of physical risks compared to other peer-reviewed literature and impacts already being experienced. In the net zero 2050/RCP2.6 scenario with ~1.5°C of projected warming by 2050, the disclosure notes “under an

orderly transition, Tassal experiences moderate and manageable physical climate impacts, including a gradual increase in marine heatwaves and weather variability” (Aquaculture Australia, 2026, p.24). The financial impacts section for current and/or anticipated effects states “scenario analysis indicates that, under a range of assumptions, short-term weather-related variability could result in an estimated cumulative EBITDA impact of up to \$2.5m over a five-year period.” (Aquaculture Australia, 2026, p.21). This is not insignificant and also suggests further financial impacts were modelled as part of the scenario analysis, but were not disclosed.

Recent impacts arguably already go beyond “moderate and manageable”, with numerous (mass) mortality events in the last 14 years (Figure 1) including the recent 2024/25 event which DNRET (2025b) said exceeded Tasmania’s mortality retrieval capabilities. Transition risks are also materially impacting production, with an 18% decrease from peak production in 2020-21 to 2024-25 (ABARES, 2025; DNRET, n.d.a) mainly driven by changing policy and regulation. Latest year on year data for the salmon industry showed an \$85.6 million dollar loss from 2022-23 to 2023-24 (ABARES, 2025).

### **Future context of increasing MHW possibilities for the industry**

Climate projections using moderate and high-emissions scenarios show that the intensity, duration and frequency of MHWs is going to increase. For example, Kajtar and Holbrook (2021) forecast that by 2050, under a low-emissions scenario (SSP1-2.6), the number of days above 19°C will be similar to the number experienced across the Tasmanian region during the 2015/16 MHW (i.e. a few days), while it will reach close to 20 days per year under a high-emissions scenario (SSP5-8.5). These are the two RCPs used by Aquaculture Australia. By 2080-2100 some areas of Tasmania a forecast to be in a near constant state of MHW by (Oliver et al, 2019).

Use of Tasmania specific data for Aquaculture Australia’s climate-related scenarios rather than national CSIRO data, would be more valuable (as adopted by Katjar and Holbrook (2021)). Particularly given that 81% of Tassal’s revenue is from salmon farmed in Tasmania (Aquaculture Australia, 2026) and Tasmanian waters are a ‘global warming hotspot’ (Kajtar and Holbrook, 2021; Ridgway and Ling, 2023).

## **Feasibility of proposed alternatives and current adaptation actions**

### **Offshore farming in exposed sites**

Moving salmon sea cages to more exposed sites, presents an opportunity to reduce the climate-related physical risks and nature-related risks for inshore salmon farm sites. Offshore farming is characterised by rough weather conditions, strong water currents and powerful waves (Hvas et al, 2021). It is highlighted in the latest Salmon Industry Plan (DNRET, 2023b) as a pathway forward for the industry.

However, it can pose considerable challenges to fish welfare and personnel safety (Bjelland et al, 2015). There personnel challenges associated with outdoor working conditions, with exposure to wind, waves and currents and higher injury rates (Bjelland et al, 2025). For fish welfare the main concerns are their ability to cope in stronger water currents and higher waves (Bjelland et al, 2025). Although salmon are athletic fish with high sustained swimming abilities (Hvas et al, 2021), strong water currents that exceed salmon’s swimming abilities can reduce growth and compromise welfare (Solstorm et al, 2015; Johansson et al, 2014). In field studies in the Faroe Islands, one site had currents strong enough to disrupt normal swimming behaviour, while another site that was plagued with stormy weather, caused mass mortalities and the remaining stock needed to be terminated prematurely (Intrafish, 2017).

In Tasmania, the Blue Economy Cooperative Research Centre established a Blue Economy Zone offshore finfish aquaculture research trial in 2025. It sits 12km offshore from Burnie, Tasmania. The trial includes 15,000 Atlantic salmon and 15,000 yellowtail kingfish (Blue economy CRC, n.d.). This faces community opposition and concerns over environmental damage to the Bass Strait (ABC, 2025a).

In its current policies/RCP8.5 scenario Aquaculture Australia (2026) mentions “relocating stock using well boats” in 2030 and using “Tassal’s existing resilience measures such as offshore systems” in 2050 (p.25). No further detail is provided on the required investment and planning for either measure, which is a significant gap given previous salmon industry plans have highlighted offshore farming as the future

priority (DPIPWE, 2017; DNRET, 2023b). Further, with any further salmon farm expansion paused it is unclear where stock would be moved to in well boats.

### **Land-based farming**

Some degree of land-based salmon farming is already underway in Tasmania. Salmon spend their first two years on land – hatched as eggs and grown into juveniles (smolt); then transferred to inshore ocean pens for final grow-out. Extending land-based farming for salmon’s full lifecycle can better control challenges from inshore farming such as water temperature, disease spread, salmon escapes and waste management). Despite strong interest and investment over the last 5-10 years, immature technology and delays in government permits have posed barriers to land-based production at scale (Martinsen et al, 2024). The Boston Consulting Group (BCG) notes the industry is at an “inflection point” with these barriers being reduced. BCG forecasts land-based salmon production to reach 190,000 tonnes whole fish equivalent by 2030, with established players accounting for 70-80% of supply (Martinsen et al, 2024). Overall, this will still only make up 5-6% of global volumes in 2030.

### **Adaptation in the salmon industry is uneven, limited and lacking transparency on cost**

As the Primary Industries input to the National Climate Risk Assessment (Brodie et al, 2025) notes, “adaptive capacity to climate change across operators [in the finfish industry] is uneven, with limited examples of effective adaptation strategies. Cross-jurisdictional coordination and market diversification are essential for future climate adaptation but changing fishing grounds and/or target species will also be necessary as ecosystems shift under climate change.”

Aquaculture Australia provides the most detail on key initiatives to manage risks associated with physical risks (detailed below) and notes that resources are allocated through existing capital expenditures and operational budgeting processes (2026, p.20). The extent to which the identified climate-related opportunity for “climate resilience and biological innovation” will be effective for salmon which has a limited thermal threshold at its limits during summer months in Tasmania, is in question. Investment in resilience and adaptation measures is likely the most significant investment cost Tassal, Huon and Petuna face into the future. Despite this, there is no commitment of investment in Aquaculture Australia’s (2026) CRFD or disclosures from Huon and Petuna.

### **Adaption progress to date (in Australia)**

Adaptation measures in Tasmanian salmon farming are still emerging and very much in their nascent stage, particularly related to offshore farming. Observed existing measures by all three companies and key initiatives outlined by Aquaculture Australia’s (2026) CRFD largely focus on more smaller scale mitigation for the current business model (inshore farms), rather than the more transformative business model changes that are arguably required.

- Antibiotics and vaccines – antibiotics have been used to combat disease outbreaks typically occurring during summer months with warmer water or MHWs (noted by Aquaculture Australia (2026)). Antibiotics are added directly into inshore farming pens, including florfenicol to treat *P. Salmonis* and oxytetracycline to treat bacterial pathogens (EPA Tasmania, n.d.b). Vaccines are also administered, often when salmon are still in hatcheries.
- Selective breeding and biological innovation – Huon Aquaculture and Tassal have selectively bred salmon to be more resistant to warmer waters and *P Salmonis* (ABC, 2025b).
- Enhanced environmental monitoring and early-warning systems for timely operational responses during periods of elevated temperature and low dissolved oxygen (Aquaculture Australia, 2026)
- Operational adaptation measures – adjustments to stocking strategies, husbandry practices and site-level management during high-risk periods. Investment in infrastructure to protect against invasive species (Aquaculture Australia, 2026)
- Infrastructure and equipment investment – improve resilience to extreme weather events and support effective oxygen management and animal health outcomes. Including an industry collaboration to invest in infrastructure for the generation and dissolution of oxygen in Macquarie Harbour (Aquaculture Australia, 2026)

All three companies, directly, through their parent company or through their reporting entity, acknowledge the need for adaptation measures to mitigate climate-related physical risks. For Huon and Petuna, no disclosures on these options and impact on their business model and strategy was detected. Tassal, through Aquaculture Australia's 2026 CRFD, provides more detail on key initiatives to manage physical climate risks, however these largely focus on improvements to existing inshore farming operations. Current alternatives are still emerging technologies and practices, which are yet to scale globally. Any shift towards these alternate modes of production or change in business model will require careful planning and significant capital investment in initial infrastructure and capability building.

### 3.4 Climate-related transition risk is considerable, though the risks and their impacts are not disclosed in detail

Disclosures for Tasmanian salmon farming were not detected for Huon or Petuna. Although JBS (parent of Huon) discloses energy-related transition risks, these are less relevant for the salmon farming industry. Tassal notes that policy, legal, technology, market and reputational risks exist. In Aquaculture Australia's (2026) CRFD "market and consumer preference shifts" are identified as a principal climate risk, limited detail is provided on policy and legal risks.

- JBS (Huon) (2025) – "Potential transition risks: Risk of increased regulation on energy (Increased regulatory requirements, global inflation and energy scarcity driving up the cost and taxes on energy and fuel may increase transportation and operational costs)." Long term time period, global geographic concentration, likely and high impact. (p.16)
- Tassal (2025) "Our climate risk is primarily associated with: [physical risk and] transition risk, including evolving regulatory requirements, energy market changes and shifting stakeholder expectations ... If not effectively managed, these risks have the potential to affect operational continuity, infrastructure, supply chains and long-term access to marine environments and markets." (p.48)

Aquaculture Australia's (reporting entity for Tassal) CRFD (2026) provides greater detail on climate-related transition risks in comparison to Tassal's 2025 Sustainability Report. Briefly this includes:

- "The measurement of anticipated financial effects due to shifts in market expectations is subject to significant measurement uncertainty. With limited data ... there is a wide range of potential outcomes for the anticipated financial effects of this risk over the medium to long term" (p.10)
- Transition risks (short to long term) – Market & Consumer Preference Shifts: "Evolving market expectations for packaging, sourcing, certification, quality and traceability. Transition risks may arise across short, medium and longterm horizons depending on the pace of regulatory developments and market shifts. This risk primarily arises in the downstream value chain (customers) and may drive operational and capital responses within seafood processing and upstream supplier arrangements." (p.17)
- Impact on business model and value chain - Downstream: "evolving market expectations primarily arises in the downstream value chain. Retailers and consumers increasingly demand verified, lower-impact seafood products, influencing product mix, certification priorities and ESG disclosure expectations. Current effects include evolving certification and traceability requirements, while anticipated effects may include market access implications and pricing differentiation linked to emissions performance and sustainability credentials." (p.19)
- Financial effects (current and anticipated) – Market & Consumer Preference Shifts: "Evolving market expectations for sustainable packaging, responsible sourcing, and enhanced climate and biodiversity performance are creating increasing transition pressures for the Group ... Assessed as a high-priority, short-term transition risk... Australian Packaging Covenant Organisation (APCO) compliance obligations were used to gauge the financial impact of this risk. Tassal are expected to incur ~\$4.5m in additional costs across the next 5 years inclusive of annual certification costs, packaging costs and equipment expenditure." (p.22)

There are five main categories of transition risks: policy, legal, technology, reputation and market that can impact salmon farming in Tasmania. A summary of these at a global level is included in Table 4, page 13. This section will focus on transition risks specific to Tasmanian salmon farming vulnerable to climate change, where policy and legal transition risks dominate, followed by market and reputational risks. Technology risks are largely related to adaptation. The transition risks identified are primarily nature-related risks, as salmon farming has adverse impacts on the surrounding ecosystem, however, these also

intersect with climate-related risks due to climate impacts compounding ecosystem impacts (e.g. warmer waters reducing oxygen levels, increased disease requiring antibiotics that impact the area).

### **Policy and legal-related transition risk**

Salmon farming in Tasmania faces several climate and nature-related policy and legal risks. It is beyond the scope of this paper to provide an exhaustive list of policy and legal risks. This section will focus on key risks:

**1. Upgraded World Heritage Area ranking for the Tasmanian Wilderness** – the Tasmanian Wilderness has a current risk rating of “good with some concern”. In June 2026, civil society groups urged the United Nations Educational, Scientific and Cultural Organization (UNESCO) to upgrade the risk warning to “significant concern”, which if implemented, would increase scrutiny and pressure to ensure all levels of government address threats to the World Heritage Area.

**2. The Tasmanian Regulatory Framework for Finfish Aquaculture** – covers various aspects of management and regulation including: marine farm planning and assessment, EPA assessment process, licenses, managing threatened and protected species, biosecurity, welfare, compliance and monitoring and food production (DNRET, n.d.c).

**3. State government policy which limits production of salmon** – previously there were caps on biomass limits for salmon in Macquarie Harbour, peaking at 21,500 tonnes in 2016 before more than halving to 9,500 tonnes from 2020 onwards (ABC News, 2017; EPA Tasmania, n.d.c). From 2022 its limits are now set based on the Total Permissible Dissolved Nitrogen Output (TPDNO) of Macquarie Harbour – at 500.1 tonnes for any 12-month period (EPA Tasmania, n.d.c).

**4. Policy which requires transparent, regular data:** As part of the Biosecurity Act 2019, from February 2026, salmon companies need to disclose the number and cause of fish deaths in marine pens each week. Monthly data on tonnes of salmon waste is released publicly and facing significant scrutiny. However, they are presented in an aggregated form and do not allow mortality to be linked to specific leases, sites or companies (EPA Tasmania, n.d.a).

**5. The Environment Protection and Biodiversity Conservation (EPBC) Act 1999** – is a Federal Act that applies to any person undertaking marine or freshwater farming activities (DNRET, n.d.c). Very briefly, a 2012 Federal decision allowed environmental assessments to be undertaken by the State government rather than undergo a Federal assessment. In 2023 a request to review this decision was made. The Federal government amended the Environment Protection and Biodiversity Conservation Act (EPBC Act) to essentially uphold the 2012 decision, despite contrary advice from the Federal Department of Climate Change, Energy, Environment and Water (DCCEEW, 2023). Had the Federal government formally reconsidered it, all operations in Macquarie Harbour would need to cease while the area was assessed. For a brief summary of the proceedings, see Appendix I.

Aquaculture Australia (2026) does not list any of the five policy or regulatory changes summaries above as material or “principal” risks, despite the ability to severely limit or completely cease operations. The 2030 scenario analysis notes, “transition pressures begin to emerge” (net zero 2050/RCP2.5) and “transition risk remain muted in the short term” (current policies/RCP8.5). While in 2050, “transition risks are fully realised ... but Tassal’s early investment supports long-term resilience” (net zero 2050/RCP2.5) and “delayed global transition also heightens long-term “catch-up” transition risk” (current policies/RCP8.5). While many of the policies and regulations above reflect both nature and climate and may not be wholly relevant for CRFD, nonetheless they all present high risk to salmon farming companies.

### **Reputation and market-related transition risk**

All three companies face significant reputational and market-related transition risks. Salmon farming’s social license to operate, that is the level of acceptance or approval an industry earns from the community, its stakeholders and the broader public (Moffat and Zhang, 2014) is highly contested (Condie and Condie, 2026; Condie and Condie, 2025; Condie et al, 2024). Further, consumers may shift consumption patterns due to negative sentiment around salmon farming in Tasmania and associated mass mortality events and nature-related risk (UCommunications, 2025).

Considering the industry's social license to operate:

- Salmon farming is the only marine industry in Tasmania that is contested – based on a 2025 CSIRO survey of 931 Tasmanians' views on key marine industries. During 1986-2015 the industry had an “enviable social license to operate” but this has been increasingly contested from 2015 onwards (Condie and Condie, 2026).

*“Salmon aquaculture stands out as the only local industry posing both a significant threat (top 5) and a major concern (top 3). The industry attracts the most negative attitudes and the highest degree of certainty in those views across most stakeholder groups.” (Condie and Condie, 2026, p.28).*

- Ocean warming is the highest ranked threat, with salmon aquaculture coming in third – the highest-ranked threat is ocean warming (ranked highest by 34% of respondents and in the top 3 by 62%), followed by marine plastic pollution (21% and 50%), and salmon aquaculture (21% and 43%) (Condie and Condie, 2026).

On shifting consumer behaviour:

- In September 2017, 14% of respondents said concerns over environmental impacts stopped them from purchasing Tasmanian salmon in the past six months (Minshull and Browne, 2017), based on poll of 1,421 Australians by Research Now for The Australia Institute.
- In March 2025, 61% support stopping salmon farming in areas where it is putting the endangered Maugean skate at risk of extinction, more than twice those who oppose (24%) (TAI, 2025; UCommunications, 2025) – based on a poll of 860 people in the Federal Sydney Electorate.
- 63% have heard about the mass fish deaths currently happening in the salmon industry in Tasmania ((TAI, 2025; UCommunications, 2025).
- Restaurants and butchers are choosing to buy alternatives such as King Salmon from New Zealand citing welfare issues associated with Tasmanian Atlantic Salmon (Cannings, n.d.; The Guardian, 2021).

Aquaculture Australia's (2026) CRFD similarly identifies market and consumer preference shifts as a “principal” or material risk. However, their disclosure focuses largely on “packaging, sourcing, certification, quality and traceability ... primarily aris[ing] in the downstream value chain (customers) and may drive operational and capital responses within seafood processing and upstream supplier arrangements.” (p.17) Compliance with Australian Packaging Covenant Organisation (APCO) obligations is highlighted as a high priority, short-term transition risk expected to incur ~\$4.5 million in additional costs over the next five years (Aquaculture Australia, 2026). Beyond this there is only one mention of “social licence” in the document, in the context Tassal's strategy benefitting from an enhanced social licence under net zero 2050/RCP2.6. Arguably, the market and consumer preference shifts related to other climate and nature risks have a similar or greater impact as packaging compliance obligations.

Climate-related transition risks, particularly policy and legal-related risks can have material financial impact on salmon companies. Already, policies implemented reduce the production and associated revenue of inshore fish farms in Tasmania. If utilised, Federal government powers can be extensive and result in the complete halt of operations. In recent years, the salmon industry's social license to operate off Tasmania's coast has been increasingly contested, and there is some evidence that climate and nature-related risks associated with salmon farming have resulted in consumer boycotts. Tassal, Huon and Petuna should more clearly disclose the limitations of various policy and legal risks and financial implications, as well as measures to improve their reputation and social licence in Tasmania and broader Australia.

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## 4. Conclusion

The salmon farming industry is highly vulnerable to climate change, which poses an existential threat to the viability of Tasmanian salmon farming.

Tasmanian salmon farming faces a complex and growing combination of climate-related physical and transition risks. Physical risks include rising ocean temperatures and relatively acute marine heatwaves, which exacerbate reduced levels of dissolved oxygen and increased disease outbreaks. These impacts are already affecting production, with grave consequences for salmon welfare that are only expected to intensify over coming decades. At the same time, for transition risks, changing regulation and policy, ecosystem impacts and contested social licence present significant challenges to the industry's future development.

Although Tassal, Huon and Petuna recognise climate change as a material issue and disclose high-level climate-related financial disclosures, current core sustainability disclosures fail to convey the seriousness of the risks and provide sufficient detail. Huon and Petuna fail to adequately disclose how climate-related risks may affect future business models, operational locations, capital requirements or long-term profitability. Tassal has greater disclosure, but similar to its peers, companies do not provide sufficient detail on adaptation pathways, transition planning or questionable viability of maintaining existing inshore farming sites.

At a national and state level, the salmon aquaculture industry is highly lucrative, generating over \$1.36 billion for FY2022-23. For Tasmania in particular, the industry supports the local economy and provides jobs to the community. Clear disclosures are urgently needed so that all stakeholders – the companies, their investors, the local communities – can build resilience into the future.

As climate-related financial disclosure requirements are implemented in Australia and globally and investor expectations continue to evolve, greater transparency will be essential. We urge Tassal, Huon and Petuna and their parent companies Cooke, JBS and Sealord to be fully transparent about the likelihood, severity and impact of the climate-related risks associated with their business models and strategies. Aquaculture Australia's 2026 climate-related financial disclosures report is a start, and civil-society will expect that subsequent disclosures continue to strengthen in detail and greater transparency, particularly in financial implications for mortality events and adaptation investment.

Transition plans, which consider the scope of physical and transition risks, alongside detailed mitigation and adaptation measures with near term horizons will help provide greater certainty. Tassal, with its Responsible Business Roadmap to 2030 remains the only company with an Australian-specific transition plan, although greater detail particularly on adaptation and measures to manage physical risks with clear investments and timelines is needed. Decision-useful information on climate resilience, adaptation investments and strategic planning is urgently needed for an industry so exposed to climate change.

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## Appendix I – A brief summary of the proceedings

- 2012 Federal Government determined that the expansion of salmon farming in Macquarie Harbour was not a “controlled” action under the Environment Protection and Biodiversity Conservation Act (EPBC Act) and therefore did not need a federal assessment. State and Federal governments later approve the salmon farming lease expansion in Macquarie Harbour, contingent on protecting World Heritage Area and the endangered Maugean Skate.
- 2023 the Australia Institute, Bob Brown Foundation and the Environmental Defenders Office on behalf of the Australian Marine Conservation Society and Humane World for Animals (formerly known as Humane Society International - Australia), formally requested a review of the 2012 decision. Consequently, a federal consultation on salmon farming in Macquarie Harbour was undertaken between December 2023 and February 2024. In November, Tasmanian EPA renewed all environmental licenses for leases in Macquarie Harbour for 2 years.
- Advice from Federal Department of Climate Change, Energy, Environment and Water (DCCEEW) considered it likely the reconsideration requirements for the 2012 decision were met and was prepared to commence the process. It notes this would require a full assessment, and all operations would need to cease during this time (DCCEEW, 2023). It also reveals that 20 people in Strahan are employed in Offshore Caged Aquaculture (DCCEEW, 2023) representing 5.6% of the labour force (ABS, 2021).
- 2025 Freedom of Information Act request released DCCEEW 2023 advice publicly.
- Coming into effect on 28 March 2025, an amendment to the EPBC Act removed the Minister for Environment’s power to reconsider past decisions if operations have run over 5 years. This passed through the Lower and Upper Houses of Parliament on the final days of the Albanese’s first term of government in 2024.

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## Key annotated references

1. **Dempster, T., Wright, D., Oppedal, F. Fisheries Research and Development Corporation (2016). Identifying the nature, extent and duration of critical production periods for Atlantic salmon in Macquarie Harbour, Tasmania, during summer. University of Melbourne, August, CC BY 3.0.**
  - Long-term data of temperatures across all cage depths (0-15 m) indicated temperatures were broadly suitable for salmon production for most of the year (6 - 17°C), with the exception of the surface 3 -4 m layer in late summer where temperatures exceeded 18°C. Salmon actively avoid water warmer than 17 - 18 °C (Johansson et al., 2006, 2009).
  - Summer months have been identified by Huon Aquaculture as a critical production period given the combination of high temperatures and low dissolved oxygen (DO) at production depths within the cages.
  - Only 4 months of the year have suitable DO levels at 10 - 15 m (July to October) and only 6 months of the year have suitable DO levels at 5 - 10 m (July to December).
  - Over 75% of the salmon biomass in cages crowded into a narrow depth range between approximately 4 and 6 m depth.
  - Based on known limiting oxygen saturation (LOS) levels for salmon (Remen et al. 2013), the swimming depths of salmon in the 4 - 6 m depth range in the period from 12 - 14 Feb, and the environmental DO and temperatures, they conclude that LOS was consistently breached throughout this period and that welfare conditions were unacceptable. 32 - 52 % saturation at 4 m and 26 - 41 % saturation at 5 m over the course of Feb 7 - 14, 2016, at temperatures of 17 - 19°C were consistently below the known LOS threshold for diploid salmon at 18°C (55%). This is the level at which salmon are no longer able to metabolically regulate to cope with hypoxia. The effects of environmental hypoxia on production in MH will include reduced feeding and appetite, poor growth with the possibility of negative growth rates, elevated levels of ram ventilation to increase water flow across the gills, and elevated levels of mortality.
2. **Kajtar, J. B., & Holbrook, N. J. (2021). Future projections of marine heatwave hazards to aquaculture and fisheries in Tasmania. University of Tasmania, Institute for Marine and Antarctic Studies, University of Tasmania, Australia. 36pp**
  - The 2015/16 marine heatwave in particular impacted salmon farming, with lower output and reduced profitability the preferred temperature range for Atlantic salmon in sea cages in Tasmania is 16-18°C (Battaglione et al., 2008). Signs of stress have been shown to occur above 18°C, with the upper critical temperature range considered to be 20-34°C. 2008).
  - These thermal tolerances seem to be higher for salmon in Tasmania, as opposed to those farmed in cooler waters in the Northern Hemisphere, but it has been postulated that there has been some adaptation by Atlantic salmon in Tasmania. 2008).
  - Another study that actively monitored the movements of salmon narrowed the preferred temperature range to 16.5-17.5°C, with temperatures above 20°C being avoided (Stehfest et al., 2017). years.
  - The mean SST over the whole domain has only exceeded 19°C in two summers: 2015/16 and 2017/18, and only for a few days in each case NOTE Fig 4a temp thresholds exceeded in future!
  - If 19°C is in reality close to the critical temperature for impacts in all regions around Tasmania, then this marine heatwave hazard index is likely informative. It indicates that the southwest of Tasmania will continue to have very low levels of marine heatwave hazard for many years to come, regardless of the future scenario. This threshold is more likely to be exceeded in the warmer northeast of the state, whereas in the southwest, temperatures have not reached 19°C, nor are they likely to do so in future.
3. **Kajtar, J. B., Holbrook, N. J., Lyth, A., Hobday, A. J., Mundy, C. N., & Ugalde, S. C. (2024). A stakeholder-guided marine heatwave hazard index for fisheries and aquaculture. Climatic Change, 177(26), <https://doi.org/10.1007/s10584-024-03684-8>**

- Marine heatwaves pose an increasing threat to fisheries and aquaculture around the world under climate change. However, the threat has not been estimated for the coming decades in a form that meets the needs of these industries.
  - Tasmanian fisheries and aquaculture in southeast Australia have been severely impacted by marine heatwaves in recent years, especially the oyster, abalone, and salmon industries.
  - In a series of semi-structured interviews with key Tasmanian fishery and aquaculture stakeholders, information was gathered about the following: (i) the impacts they have experienced to date from marine heatwaves, (ii) their planning for future marine heatwaves, and (iii) the information that would be most useful to aid planning.
  - Using CMIP6 historical and future simulations of SSTs around Tasmania, we developed a marine heatwave hazard index guided by these stakeholder conversations. The region experienced a severe marine heatwave during the austral summer of 2015/16, which has been used here as a reference point to define the index. Our marine heatwave hazard index shows that conditions like those experienced in 2015/16 are projected to occur approximately 1-in-5 years by the 2050s under a low emissions scenario (SSP1-2.6) or 1-in-2 years under a high emissions scenario (SSP5-8.5). Increased frequency of marine heatwaves will likely reduce productivity by both direct (mortality) and in-direct (ecosystem change, greater incidence of disease) impacts on target species. The illustrative hazard index is one step towards a marine heatwave risk index, which would also need to consider aspects of exposure and vulnerability to be of greater utility to stakeholders
- 4. Meng, H., Hayashida, H., Norazmi-Lokman, N. H., & Strutton, P. G. (2022). Benefits and detrimental effects of ocean warming for Tasmanian salmon aquaculture. *Continental Shelf Research*, 246, Article 104829. <https://doi.org/10.1016/j.csr.2022.104829>**
- Atlantic salmon (*Salmo salar*) is the main aquaculture species in Tasmania, Australia. This species is known to be sensitive to ocean temperature and has its own optimal temperature range for exceptional growth.
  - As a hotspot of ocean warming, adaptation planning may be necessary for Tasmanian salmon aquaculture industries in coming years. In this study, we used high-resolution SST satellite observations to investigate ocean temperature variability and trends in the southeastern Tasmania over the past 28 years, and their impacts on growth suitability for sea-farmed Atlantic salmon using a metric called optimal days.
  - Long-term ocean warming in the region was evident but showed both positive and negative effects on optimal days. Winter warming would make salmon farms more suitable for salmon growth, while summer warming would make it too warm to grow optimally, which could lead to increased fish disease and even death. This seasonal difference also explained the year-to-year variability in the number of optimal days. Furthermore, spatial distributions of optimal day anomalies indicated that some farm regions were affected more than the others. Northern regions are becoming unsuitable for salmon aquaculture, while southern regions are still optimal for salmon growth in the next few decades. These findings demonstrate the complexity of consequences of global warming for salmon aquaculture industries, and can help stakeholders to develop a blueprint for strategizing future farm development and climate change adaptation plans.
  - The optimal temperature for Atlantic salmon growth ranges from 12 to 18°C (Elliott and Elliott, 2010), and the most suitable range is 13–14°C (Handeland et al., 2003, 2008). Above 18°C, previous studies report several negative impacts including reduced appetite, slow growth and early maturity, all of which can result in a significant decline in meat quality. When the temperature exceeds to 22 °C combined with hypoxia, (likely not Macquarie Harbourn) mainly SE Tas mortalities start and increase continuously as the temperature gets higher (Gamperl et al., 2020; Hvas et al., 2017). Therefore, periods of warm ocean temperature extremes such as marine heatwaves can lead to disease that can decrease the salmon growth rate.
- 5. Oliver, E. C. J., Benthuisen, J. A., Bindoff, N. L., Hobday, A. J., Holbrook, N. J., Mundy, C. N., Perkins-Kirkpatrick, S. E., & Sen Gupta, A. (2017). The unprecedented 2015/16 Tasman Sea marine heatwave. *Nature Communications*, 8, Article 16101. <https://doi.org/10.1038/ncomms16101>**

- 2015/16 Marine Heat wave in Tasmania: Global climate models indicate it is very likely to be that the occurrence of an extreme warming event of this duration or intensity in this region is respectively Z330 times and Z6.8 times as likely to be due to the influence of anthropogenic climate change. Climate projections indicate that event likelihoods will increase in the future, due to increasing anthropogenic influences.
6. **Oliver, E.C.J., Burrows, M.T., Donat, M.G., Sen Gupta, A., Alexander, L.V., Perkins-Kirkpatrick, S.E., Benthuyssen, J.A., Hobday, A.J., Holbrook, N.J., Moore, P.J., Thomsen, M.S., Wernberg, T. and Smale, D.A. (2019) 'Projected Marine Heatwaves in the 21st Century and the Potential for Ecological Impact', *Frontiers in Marine Science*, 6, Article 734. <https://doi.org/10.3389/fmars.2019.00734>.**
- Both the intensity of MHWs and the annual count of MHW days are projected to increase significantly over the 21st century.
  - The emission scenario strongly affects the projected intensity of events, with MHW increases following the high-emission scenario (RCP8.5) nearly double (by 2100, compared to the 1982–2005 baseline period) those projected under the lower emission scenario (RCP4.5).
  - The difference between emission scenarios is smaller when considering the total annual MHW days, since both saturate to near-permanent MHW states by 2100
7. **Ridgway, K. R., & Ling, S. D. (2023). Three decades of variability and warming of nearshore waters around Tasmania. *Progress in Oceanography*, 215, Article 103046. <https://doi.org/10.1016/j.pocean.2023.103046>**
- The ocean region around Tasmania forms an interface between major ocean basins and represents a significant global ocean hotspot due to a rate of warming higher than the global average.
  - Nearshore Tasmanian waters are of central importance for shallow-water ecosystems and a range of human activities, including recreation, aquaculture and fisheries which have become increasingly impacted by warming in recent decades.
  - However, the fine-scale spatial and temporal variability of SST in these waters is not well understood, limiting opportunities for effective local-scale mitigation and adaptation measures in the face of ongoing warming.
  - The authors used a high-resolution satellite to explore variability over seasonal, interannual, decadal and multi-decadal timescales at spatial scales from the nearshore up to the entire study domain. The SST estimate so gathered was used as a proxy for seasonal circulation by removal of the broad-scale radiative forcing (estimated by a region-wide latitudinal gradient of SST).
  - New results include the seasonality of three summer upwelling systems, the first direct evidence of EACx inflow into eastern Bass Strait, a time series of the endpoint of the ZC/EACx intersection, and a full year description of the ZC, from warm winter inflow transitioning into a summer cooler than ambient intrusion.
  - They found trends in the eastern shelf arise from intrusions of EACx waters, with local processes driving trends on the western shelf. Both east and west nearshore SST trends are around + 0.4°C decade<sup>-1</sup> with the highest value of + 0.55°C decade<sup>-1</sup> on the central west coast, possibly associated with outflow from Macquarie Harbour.

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## AI use statement

Microsoft Copilot, accessed via the University of Technology Sydney's secure Microsoft 365 environment, was used to identify a small number of references, check and format citations, clarify notions, concepts and terminology, explore apparent contradictions in the literature, verify interpretations against source materials, and provide light proofreading support. All source materials were independently reviewed, and all interpretations and writing were conducted by the authors.

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