Submission to the Senate Standing Committee on Environment and Communications with respect to the regulation of the fin-fish aquaculture industry in Tasmania

on behalf of the

Tasmanian Salmonid Growers Association ('TSGA')
and its members comprising:

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Executive Summary

The Tasmanian salmonid farming industry is committed to investing in and supporting the best available science and globally proven best management practices to guide the operation and growth of our industry.

From an initial 56 tonne harvest in 1986-87, in 2013-14, the Tasmanian salmonid farming industry produced in excess of 43,000 tonnes of Atlantic salmonid and Ocean trout, with a Gross Value of Production (GVP) of approximately $625.9M. The Tasmanian salmonid industry is now:

- the largest single "fishery" sector in Australia by GVP;
- the largest primary production sector in Tasmania;
- larger than all other aquaculture and fishery sectors in Tasmania combined; and
- a significant contributor to the Tasmanian "food bowl" concept.

TSGA members aim to sustainably grow the industry to meet increasing demand for products both domestically and internationally. During the past 30 years, salmonid farmers have learned the critical importance of protecting the waters on which we depend, to safeguard and develop our vital workforce and to develop markets to ensure that this rural Tasmanian industry can continue to enjoy long term success.

The salmon farming industry is one of many waterway users and we all share the benefits and risks associated with operating within the waterways of coastal Tasmania. The industry requires similar values from the waterways that many other users expect, and as a major user we have a role as custodians to ensure those values are maintained. We are on the water every day across a broad geographic region and are well placed to observe and respond to changes.

The health of all Tasmanian waterways reflects historic and current marine and terrestrial influences from both natural and anthropogenic sources, not the least of which is a changing climate. The industry acknowledges that salmonid aquaculture, in line with all types of farming and human activity, can have impacts in the waterways where we farm.

The Tasmanian salmonid farming industry collects a range of data relating to waterway health. For example, the Broadscale Environmental Monitoring Program has collected over 75,000 individual data points from more than 110 full days of sampling over the past six years. The current Macquarie Harbour Environmental Monitoring Program involves monthly sampling from 17 sites and 60 depths covering 30 parameters.

The data collected goes well beyond meeting basic compliance needs and provides a transparent environment from which regulators, scientists, environmental groups and the general public can assess the industry's actions. These data sets are robust, often publicly available, independently sourced, longitudinal, peer reviewed and audited. Our work in this area has been internationally recognised.

Our growing knowledge of the marine environment along with innovation and advanced

technology plays a considerable part in the continual evolution of farm management practices to ensure our farms operate at the highest standards. Tasmanian salmonid farming in 2015 is a much more sophisticated, responsive and environmentally aware industry compared to that of the past.

Tasmanian salmonid farmers are dedicated to building a sustainable and responsible industry, a path that will continue as the sector further evolves to meet the growing need for healthy and sustainable protein sources.

The salmon farming sector helps drive rural economic diversification by directly and indirectly creating jobs, further supporting small businesses and stimulating ongoing, transferable research and development innovation. Salmon farming may well represent the most promising approach to help revitalise our regional communities and reverse the trend of young people leaving rural areas to work and live in larger urban centres.

The Tasmanian salmonid industry in Tasmania currently employs 1,571 people and supports a further 3,769 FTE jobs in both Tasmania and the rest of Australia. The majority of aquaculture jobs are full-time, on-going positions in regional and remote locations around Tasmania.

The industry continually engages with key stakeholders to ensure the constant improvement of regulations and environmentally and socially responsible practices. The industry has developed and initiated an adaptive stakeholder engagement approach to ensure that there are ample opportunities for communities, interest groups and other stakeholders to engage in a range of consultative processes and discussions in relation to marine farming management and ongoing industry development.

Our farmers have developed a modern and responsible industry that meets international and national regulations and industry codes of practice. Through significant investment in research and development, the Tasmanian salmonid industry is at the forefront of technological advances, and is transforming aquaculture industry practices.

An efficient, predictable and accountable regulatory process is required to operate successfully and to provide the investor confidence necessary to grow a sustainable aquaculture sector in Tasmania. It is also the basis for public confidence that the aquaculture industry in Tasmania is responsible and accountable. The Tasmanian salmonid industry is currently regulated by over 70 Commonwealth and state acts and more than 670 separate legislative requirements.

The TSGA is committed to:

- minimising the environmental impact of Tasmanian operations;
- sourcing sustainable feed from responsible feed producers and suppliers;
- continuing to improve the positive social impact of our operations;
- ensuring that the industry supports economic growth and prosperity in Tasmania; and
- producing a healthy and nutritious product farmed in a sustainable way.

Response to Terms of Reference (TOR)

TOR (a) The adequacy and availability of data on waterway health

The Tasmanian salmonid farming industry collects a range of data relating to waterway health. The data collected goes well beyond meeting basic compliance needs and provides a transparent environment from which regulators, scientists, environmental groups and the general public can assess the industry's actions. These data sets are robust, often publicly available, independently sourced, longitudinal, peer reviewed and audited. Our work in this area has been internationally recognised.

What waterway data is collected?

Our approach to assessing water way health and potential impacts of salmonid farming is consistent with the *EU Water Framework Directive for Marine and Coast* [1] (acknowledged as world's Best Practice guidelines in this field). In terms of data collected and the level of independent scrutiny of the data sets, it is comparable to what is collected in all other marine finfish jurisdictions internationally.

Within an Adaptive Management framework, an appropriate monitoring program should modify farm management to address significant risk and persistent impacts to the water way health. Monitoring and research to quantify downstream, far-field and long-term effects of fish farms beyond the immediate pen perimeter will continue to be important.

An extensive body of research supports the basis for selecting the parameters that are currently monitored in the Tasmanian context. The Aquafin CRC initiative that helped establish the current suite of water quality parameters was a partnership between industry, government, the Institute for Marine and Antarctic Studies (IMAS) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). This series of projects has evolved from system wide research work that first commenced in 1996. It guided the appropriate measurements for the Tasmanian context and led to the implementation of the Broadscale Environmental Monitoring Program (BEMP) which is a regulatory requirement that commenced in 2009. More information about the Aquafin CRC and the BEMP is provided in Appendix 1.

The Tasmanian salmonid industry has recently completed its sixth consecutive year of supporting this independent monitoring of the health of the marine environment in the D'Entrecasteaux Channel and Huon Estuary. From the outset, there was a clear understanding that this approach would be trialled, tested and reviewed on a regular basis and the last review was conducted by IMAS in 2013.[2]

[1] http://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF

[2] Ross, J. and Macleod, C. (2013). *Evaluation of Broadscale Environmental Monitoring Program (BEMP) data from 2009-2012*. Institute for Marine and Antarctic Studies (IMAS). Technical report. Tasmania.

Sampling occurs from North West Bay to Recherche Bay in the south. The program has collected over 75,000 individual data points (see Appendix 1). It is aimed at assessing water quality and sediment health at 15 sites in the region occupied by salmonid farms in the D'Entrecasteaux Channel and Huon Estuary.

This monitoring program not only benefits the salmonid industry, but also serves to assist coastal managers and regulatory bodies to better understand the marine environment in the Channel and Huon regions. It is considered a world's best practice program in terms of broadscale assessment of the impacts of aquaculture on an ecosystem.

The monitoring program has a water quality component and a sediment component. It will assist the salmonid industry to better predict environmental changes in the region and optimise their operations to minimise any impact on the surrounding marine environment. Table 1 summarises the parameters measured.

Table 1 – Parameters measured during BEMP monthly sampling

Matrix	Component	Analyte/Parameter
Sediment	Biota	Biodiversity
	Chemistry	Visual assessment, REDOX potential, total organic carbon (LOI), stable isotopes (carbon and nitrogen, incorporating C:N ratio), particle size analysis, sulphide concentration
Water	Nutrients	Ammonium, nitrate, phosphate, silica, total nitrogen, total phosphorous
	Dissolved Oxygen (DO)	DO (ppm, percentage saturation), temperature, salinity
	Phytoplankton	Pigments by way of HPLC, cell counts, chlorophyll *a,* abundance

The review of BEMP monitoring data by IMAS researchers[3] has shown that the ecosystem has the capacity to assimilate the inputs from salmonid farming activities as well as other human produced sources.

This independent monitoring approach has since been replicated in the Macquarie Harbour Environmental Monitoring Plan (MHEMP), and it has again been tailored to the specific environmental conditions, hydrodynamics and unique ecosystem attributes encountered in the harbour. The program commenced formally in April 2013, although collection of the dataset began in September 2011. Additional independent monitoring was undertaken prior to 2011 informing the development of the hydrodynamic/geochemical model and the development of the Macquarie Harbour Environmental Impact Statement. The water quality monitoring and sampling program in this region will be reviewed in September 2015. The current MHEMP monitoring program involves monthly sampling from 17 sites, 60 depths and the measurement of 30 water quality parameters.

[3] Ross, J. and Macleod, C. (2013). *Evaluation of Broadscale Environmental Monitoring Program (BEMP) data from 2009-2012*. Institute for Marine and Antarctic Studies (IMAS). Technical report. Tasmania.

A similar BEMP style program is under development for the Tasman and Storm Bay Marine Farming Plan Areas.

Data Quality and Quality Control

The integrity of data sets is ensured through the use of prescriptive quality control and quality assurance measures. Compliance monitoring, where these activities form part of a company's licence requirements, involves meeting the environmental survey standards of the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE). These standards are specified in schedules attached to marine farming licences. Examples include Schedules 3V (Annual Remotely Operated Vehicle (ROV) Compliance Video Surveys) and Schedule 3BEMP (Broadscale Environmental Monitoring Program). For each of these schedules, a range of procedures are described to ensure that the survey components meet the minimum standards required by the DPIPWE.

For instance, when reporting the results of underwater video surveys of the marine farm leases to the DPIPWE, companies must:

- show evidence of surface footage showing pen bays and compass bearings on stocked pen sites;
- supply a time and date stamped Differential GPS file (DGPS) showing logged positions for ROV spot dives;
- supply video footage with clear time and date stamp; and
- supply a DGPS file showing the logged positions of a Standard Permanent Mark (SPM) as a quality control measure.

The submitted report, DGPS file and video footage are then reviewed and validated by DPIPWE staff.

With the BEMP and MHEMP, a range of quality assurance and quality control measures are prescribed by the DPIPWE to ensure that sampling activities produce environmental data that can be interpreted with a high degree of confidence, and that appropriate methodologies, procedures and processes are carried out at all of the critical control points – from sampling in the field, to laboratory analysis and finally to data interpretation.

During monthly or annual sampling events, the BEMP samples a range of biological and physical parameters. Some of the measures undertaken to maintain data quality and integrity during BEMP sampling include:

- Adherence to detailed sampling procedures and methodologies to minimise the potential for sample contamination:
  (i.e. All methods and equipment used in water quality sampling must meet the relevant Australian and/or ISO Standard (AS/NZS 1998: Australian/New Zealand AS/NZS 5667.1:1998 *Water Quality – Sampling – Guidance on the design of sampling Programs, Sampling Techniques and the Preservation and Handling of samples*).
- The selection of qualified personnel to undertake field sampling and laboratory analysis:
  (i.e. accredited by the EPA, or under AS/NZ 9001:2008, or NATA).

- The collection of randomly chosen duplicate samples (for each analyte at every sampling event) to provide an estimate of analytical and sampling variance, and the collection of triplicate samples for sediment cores and infaunal grabs.
- Adherence to formal documented chain of custody procedures to confirm sample collection details.
- Third party contractors must be diligent in identifying and evaluating threats to independence and applying appropriate safeguards.

In recent years, IMAS and CSIRO have become important contributors to validating and evaluating the credibility of a range of data sets collected as part of industry's environmental monitoring activities throughout Tasmania. Their ability to provide an independent, sound interpretation of environmental data sets, as well as recommendations for further action, is valued by industry as an important component of the adaptive management framework.

The industry acknowledges there are sensitivities with making raw data sets publicly available due to both the size and complex nature of such data sets and the ease with which data can be misinterpreted. However, the industry considers that ongoing evaluation and assessment of environmental data by recognised research organisations such as IMAS or CSIRO demonstrate the high standards and practices used by industry to monitor impacts on the environment.

Data use

1. Industry

Data supports the development and expansion of the industry and underpins the preparation of significant documents like the environmental impact statements that are now required to address the concerns of regulators and the public. The salmonid industry has long had a culture of data collection and information generation that goes well beyond meeting its basic compliance needs.

A significant part of the data set collected by industry relates to the environment in which the fish are grown and is used to better understand the interactions between farming operations, the performance of fish and the waterways on which the industry rely. A high quality and comprehensive data set informs good management decision making and planning for the future.

The industry continuously investigates new ways to collect and use data, as well as to make it more accessible, with the clear aim of providing additional assurances to regulators and the public about the environmental health of the areas the industry operates in. A good example of that is the industry's success in gaining Sense-T funding to develop real time data collection from sentinel fish in pens, a world first in this field. Based on upload of data from live fish, the project will enable industry to develop a real time decision support system to manage fish feeding in response to a changing environment.

2. Regulation

While industry understands that regulatory obligations require detailed reporting and also recognises that public demand for information is increasing, we consider that aquaculture is

already held to a higher standard than other food producers. The industry has no difficulty with this.

The industry provides extensive datasets to DPIPWE as part of satisfying reporting requirements cited under a range of management controls that form part of marine licence conditions. The data enables the regulator to assess the impact of industry on waterway health. It should be noted that some of the data is provided in commercial confidentiality because it is company specific, possibly share price sensitive information that would breach Australian Stock Exchange (ASX) rules on data disclosure.

3. Science

The industry regularly collects data on behalf of other organisations and actively provides datasets to external scientific research agencies to aid studies on many aspects of the waterways in which it operates. For example data on interactions with marine predators is provided to University of Tasmania (UTAS) scientists working on marine mammals.

The industry also funds the collection of, or provides from its own data storage systems, extensive data sets to enable external organisations to model the potential impacts of its activities. Examples of this are the Ecolab modelling for the Macquarie Harbour wide system; INFORMD stage 2 that is developing innovative tools to integrate key marine values with environmental understanding via computer modelling; and DEPOMOD which models the impact of fish farms on the benthic environment under the pens.

Organisations that have benefitted from data sets provided by industry or the use of industry resources to aid in the collection of data include CSIRO, IMAS/UTAS, private research providers and state and Commonwealth government departments. Such data sets have value for applications other than understanding the environmental impacts of salmonid farming. Long term water temperature data sets have been used by oceanographers and climate scientists to better understand the changing impact of the East Australian Current on Tasmania's marine ecosystems.

The industry now has long term (in some cases 25-30 years), independently sourced and externally peer reviewed data sets (such as the 2013 IMAS review of BEMP) that has significant commercial and scientific value. This is a unique situation and is the envy of other salmon farming regions globally.

4. Certification

Much of the certification process that the Tasmanian salmonid industry has voluntarily embarked upon relies on the collection and analysis of data sets to support and verify claims made by the companies. Data collected is reviewed against proscribed standards as part of the annual audit process to continue certification. (see TOR (c) for further detail).

It takes a significant commitment to meet the full range of requirements that the certifying bodies demand. It requires a high level of transparency, regular monitoring of key indicators, a willingness to make some performance data publicly available and the ability to provide other performance data as requested by the auditors.

5. Global industry context

We are a small part of a much bigger international salmonid farming industry and to gain the benefits of being part of that community we regularly supply data:

- To the International Salmonid Farmers Association.
- To shared and twinning projects with international research agencies into challenges facing the global salmonid industry, such as the recent initiatives and international collaborations investigating amoebic gill disease (AGD).
- For peer review by an independent international aquaculture information service as an assessment of sustainability. Three Tasmanian salmonid companies have performed strongly in a 2014 benchmarking report that assesses the transparency of corporate, social and environmental reporting amongst the top 35 salmonid farming companies world-wide. All Tasmanian companies were ranked within the top 12 (Tassal 1, Huon Aquaculture 8 and Petuna 12). The report is published annually to help key stakeholders assess the level of transparency and communication displayed by salmonid farmers worldwide as they relate to corporate, social and environmental sustainability. Further information can be found at: http://www.seafoodintell.com/

6. Stakeholders (non-science)

The industry regularly provides access to information and data upon request to a wide range of users - community forums, conservation groups, university students, schools and the media. This covers many aspects of industry operation that often go beyond our impact on waterway health such as bird and mammal sightings, marine debris, and weather recordings.

Each company employs community engagement officers who are able to facilitate access to data and information where readily available and appropriate (see TOR (f) for further detail).

Availability of information

The industry recognises that there is a high level of public interest in fish farming generally and specifically as it relates to environmental performance and waterway health. The regulator, the industry, the scientific community and certification bodies provide information publicly as it relates to waterway health and other aspects of environmental performance.

The links below provide access to information made available by industry participants as it relates to waterway health.

- Tassal sustainability report (Tassal sustainability)
- Huon website dashboard (http://dashboard.huonaqua.com.au/)
- Petuna sustainability report (Petuna sustainability)
- TSGA website (http://www.tsga.com.au/)
- FRDC website (http://frdc.com.au/Pages/home.aspx)
- Seafood CRC website (http://www.seafoodcrc.com/)
- Aquaculture Stewardship Council (http://www.asc-aqua.org/)
- Global G.A.P. (http://www.globalgap.org/uk_en/for-producers/aquaculture/)
- Best Aquaculture Practices (http://bap.gaalliance.org/)
- Global Salmonid Initiative (http://www.globalsalmoninitiative.org/)

- Marine Farm Planning Development Plans (Tasmanian marine farming)
- National Aquaculture Council (http://www.aquaculture.org.au/introduction.htm)
- International Salmonid Farming Association (http://www.salmonfarming.org/)
- IMAS (http://www.imas.utas.edu.au/research/fisheries-and-aquaculture)
- CSIRO (marine and atmospheric research (http://www.cmar.csiro.au/)
- The D'Entrecasteaux and Huon Collaboration (http://www.ourwaterway.com.au/)

Conclusion

The industry maintains that there is currently adequate and available data on waterway health in terms of quality and quantity to provide sufficient confidence for:

- industry participants to make appropriate management decisions;
- regulators to be able to monitor industry and apply regulation;
- the scientific community to analyse and report on data;
- other parties such as certification bodies; and
- interested parties in the community as well as consumers.

Readily available access to credible, scientifically sound and reliable data is essential to regulatory decision making and therefore sustainable development. In the Tasmanian salmonid farming context, scientific information forms the basis for decisions regarding strategic planning, assessment of proposals, monitoring programs and enforcement activities.

However, the industry also recognises that due to evolving technology and knowledge, there will be opportunities to review and improve data collection, management, security and sharing.

Further, the industry considers that information sharing with stakeholders and the public provides a welcome opportunity to demonstrate our environmental credentials at both a company and industry level in both local and broadscale effects.

The TSGA asks that the Committee note:

- that the Tasmanian salmonid industry relies on credible, scientifically sound and reliable data about its impact on Tasmanian waterways to make management decisions;
- that in working with regulators, the Tasmanian salmonid industry has developed an extensive and thorough monitoring framework that facilitates comprehensive data collection;
- that much of this data is already shared with the research community and contributes to the broader understanding of the marine environment;
- that the industry is committed to continuously improving its data collection and management and contributing to public knowledge of Tasmania's waterways; and
- the industry has commenced the development of:
    a) an industry data management strategy to streamline data collection and ensure the standardisation of data collection and therefore ease of comparability; and
    b) an industry information strategy to guide the way we collect and analyse data to ensure it is responsive to the needs of management, researchers and the broader community.

TOR (b) The Impact on waterway health, including to threatened and endangered species.

The salmon farming industry is one of many waterway users and we all share the benefits and risks associated with operating within the waterways of coastal Tasmania. The industry requires similar values from the waterways that many other users expect, and as a major user we have a role as custodians to ensure those values are maintained. We are on the water every day across a broad geographic region and are well placed to observe and respond to changes.

The impact of salmonid aquaculture on waterway health is dependent on the nature and intensity of farming and the capacity of the receiving environment to assimilate the impacts. There is a continuum of interconnectedness between the farm and the surrounding environment which varies with season, weather and the time in the production cycle.

Research has established that industry impacts on waterway health are wholly reversible[4][5]. In practice this means if a farm is moved or removed the bottom beneath the leases would recover to background levels.

What is our impact on waterway health?

Impacts can be divided into two broad categories - seafloor or benthic impacts (solids) and water quality (dissolved) impacts both near field and broadscale.

1. Benthic impacts

Near field

Salmonid aquaculture in Tasmania is permitted by farm licence conditions to have a permitted zone of impact, monitored over a number of compliance points 35m from the lease boundary. Impacts to the benthos are largely predictable and reversible.

The deposition to the seafloor of excess feed and solid fish excreta is very well understood[6] and marine farming licence conditions to this end are therefore based on solid peer reviewed science. Fauna living on and within the sediments of the seafloor of an active finfish lease comprise different species to those of the surrounding area. Lease benthic communities are comprised of small animals and bacteria adapted to living in high nutrient areas. These specialist communities consume excess nutrients greatly aiding the Assimilative capacity of the environment. If nutrient levels become too high, then one species will tend to dominate over the others and this will be visually obvious. The use of visual indicators is a

[4] Cromey CJ, Nickell TD, Black KD. 2002. DEPOMOD – modelling the deposition and biological effects of waste solids from marine cage farms. Aquaculture 214:211-239.

[5] Macleod, C.K., Eriksen, R.S., Davey, A., Kelly, B., and Ross, D.J. (2013). *Long-term Recovery - Review of sediment condition at Marine Farm lease No. 76 (Gun Powder Jetty, North West Bay.* Institute for Marine and Antarctic Studies

[6] Op cit Cromey et al., 2002.

scientifically robust method of sustainably managing the seafloor within a marine farming lease.[7]

Marine farming licence conditions state that there must be no significant visual, physicochemical or biological impacts at or extending beyond 35 metres from the boundary of the lease area. This is monitored using company operated ROV surveys at specific times in the production cycle when the impact is likely to be greatest and at specific points within and beyond the lease as directed by the regulator.

Survey footage, date stamped GPS data files and a comprehensive report is supplied to the regulator who may require operational changes and follow up surveys if nutrient enrichment is visible. Companies also voluntarily use ROV technology to pro-actively optimise fallowing strategies.

Mitigation strategies include:

- continued improvement in feed management, feeding regimes and formulation;
- designated Marine Farm Plan Areas, optimal positioning of leases, comprehensive environmental impact statements and baseline surveys;
- pro-active fallowing (resting) of leases; and
- ongoing research into near field and far field impacts.

Further detail on the scientific evidence that impacts to the seafloor beneath finfish leases are **permitted** and **reversible,** is provided below.

Broadscale

Evidence from the BEMP in the Huon Estuary and D'Entrecasteaux Channel show no evidence for broadscale effects on the condition of the seafloor and faunal communities as a result of salmon farming.

The MHEMP is now in its second year and work is ongoing to determine the most suitable parameters for assessment of impacts given the unique nature of the Macquarie Harbour waterway. The benthic indicators are under review pending analysis and outcomes from current research projects.

Please note that there is an extensive monitoring program in place (see TOR (a)) to provide the information needed for a review similar to the BEMP 2013 process.

Rocky Reefs

Marine farming regulations prohibit the siting of a finfish zone over a rocky reef, however the potential broadscale impact of salmonid farming on rocky reefs has been recently identified as a gap in our knowledge. To fill this gap, the industry has spearheaded the development of an IMAS led Fisheries Research and Development Corporation (FRDC) project (2015-024) 'Managing ecosystem interactions across differing environments: building

[7] Sim-Smith, C.& Forsythe, A, (2013). Comparison of the international regulations and best management practices for marine finfish farming. MPI Technical Paper No: 2013/47. National Institute of Water & Atmospheric Research Ltd

flexibility and risk assurance into environmental management strategies'. The aim of this project is to understand potential broadscale interactions with reef systems and validation of local scale sediment condition indicators in new salmonid farming regions. Industry is also supporting an additional FRDC project (2014-042 A1 Atlantic Salmon Aquaculture IPA) 'Understanding broadscale impacts of salmonid farming on rocky reef communities' that is updating a coastal reef study undertaken ten years ago.

2. Water quality impacts

Soluble wastes associated with finfish culture include ammonia, phosphates and dissolved organic carbon emissions. Impacts associated with these nutrient emissions are minimised where flushing rates are sufficient enough to dilute nutrient loads, hence the importance of well sited farms.[8]

Water quality impacts from salmonid aquaculture nutrients must be considered within the context of other nutrient inputs into the system:

- land based anthropogenic (terrestrial farming, forestry, refuse disposal sites, and septic and sewage inputs);
- natural catchment inputs; and
- oceanic inputs.

While attribution of the source of nutrient input is complex, especially in a changing natural system, it is achievable. The industry remains committed to ongoing research that provides a more complete analysis.

Near field

The effect of feed input and fish excreta at any salmonid farm is expected to result in localised environmental impacts to water quality within and around the lease boundary. The most relevant indicators are water quality and sediment parameters such as DO levels and de-gassing from the substrate for example. These parameters have been identified as early warning signs on which companies base management actions.

Broadscale

A local peer reviewed study[9] has shown that, in general, salmonid farm derived nutrient inputs **were not** anticipated to result in significant or broadscale effects to the water quality characteristics or ecosystem. This research is currently being reviewed and replicated to identify if there have been any significant changes in the past 10 years.

The Broadscale Environmental Monitoring Program (BEMP) and Macquarie Harbour Environmental Monitoring Program (MHEMP) described in TOR (a) and detailed in Appendix

[8] Sim-Smith, C.& Forsythe, A, (2013). Comparison of the international regulations and best management practices for marine finfish farming. MPI Technical Paper No: 2013/47. National Institute of Water & Atmospheric Research Ltd

[9] Crawford, C., Thompson, P., Jordan, A., Foster, S., Mitchell, I., Bonham, P. and Willcox, S. (2006). *Development of broadscale environmental monitoring and baseline surveys in relation to sustainable salmon aquaculture in the D'Entrecasteaux Channel region. Aquafin CRC Project 4.4., Aquafin Cooperative Research Centre, Fisheries Research and Development Corporation, CommonwealthScientific and Industrial Research Organisation*. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

1, provide comprehensive assessments of ecological condition in the state's south east (D'Entrecasteaux Channel & Huon Estuary) and Macquarie Harbour respectively.

Multiple sites within each Marine Farm Development Plan (MFDP) area are monitored throughout the year to assess spatial and temporal patterns of water and sediment quality. This includes a broad suite of parameters capturing the physical, chemical and biological characteristics of the system. This dataset provides a significant body of information that can be used by regulators, industry and other stakeholders to assess ecological condition and to support adaptive management strategies.

In situ net cleaning

The development of in situ net cleaning enabled the salmonid industry to exit from the use of antifoulant paint on sea cage nets which was identified as potentially posing a long term environmental threat to local ecology. Net cleaning involves using high pressure blasting or vacuuming to remove biofouling from the net surface of the sea pen before it reaches mature stages or heavy growth. Particulate organic matter is released to the environment through this process.

Following a three year study, in 2013 the industry established and published a Best Management Practice (BMP) guideline for this operation which details net washing practices to reduce the impact.

Ongoing research and monitoring is being conducted to further refine best practice in relation to:

- general mass balance calculations around net cleaning emission volumes and overall assimilation capacity;
- updating the marine biosecurity and biofouling management plan for the industry;
- continual improvement of onsite surveillance and monitoring programs and strengthening this in relation to natural seasonality; and
- linkages to international work being undertaken around emission capture and beneficial reuse.

Marine debris

Each company has implemented a waste mitigation strategy in order to reduce the incidence of farming infrastructure leaving leases and entering the marine environment. Rope and feed pipe are a particular focus of the current mitigation strategies. Industry has a 'rapid response' philosophy when it is notified of debris irrespective of its origin.

Broadly, strategic objectives are to:

- develop clear, rapid response plans when marine debris is reported in the vicinity of fish farms;
- achieve zero material waste entering the environment;
- establish procedures and operating mechanisms that focus on managing the loss of farm materials into the marine environment;
- establish chains of responsibility at the farm level;
- establish monitoring procedures;
- conduct regular marine debris cleanup efforts in the vicinity of fish farms; and

- identify equipment to drive accountability.

The industry does not discriminate when collecting marine debris from shorelines: in FY2013 and FY2014 the industry collected approximately 15m^3 of debris each year that could not be attributed to fish farming operations (Table 2).

Table 2 – Consolidated salmonid industry marine debris cleanup figures.

	Volume of Rubbish Collected (m^3)	**% attributable to Salmonid Farms**	**Labour Hours**
FY2013	50.4	67	479
FY2014	60.5	72	626

What do we do to understand our impact on waterway health?

Monitoring

The industry's responsiveness to environmental change is supported by robust monitoring programs. These include, but are not limited to, the following:

- Baseline monitoring at new sites or for site amendments of:
  - water quality;
  - sediments;
  - general environmental characteristics; and
  - threatened species.
- daily routine farm level monitoring of salinity, oxygen and water temperature;
- ROV monitoring to achieve and exceed compliance requirements;
- broadscale monitoring of water quality and sediment health in all farming areas;
- emerging issues; and
- implementation of novel real time environmental monitoring such the Sense-T initiative in TOR (a).

Please see Appendix 1 for additional background information on the above issues. The industry also provides detailed Environmental Impact Statement (EIS) whenever a new farm site is considered and more detail on this process is provided in TOR (c).

The current annual industry commitment to environmental monitoring for both compliance and an improved understanding of the environment of the waterways is more than $1.9 million. In addition, annual certification costs for independent assessments of the practices and environmental credibility of the industry are in excess of $0.5 million.

Modelling

In recent years the industry has put significantly greater effort and resources into understanding impacts across the wider ecosystem, rather than just at the farm site scale. This has required a modelling approach backed up by long time-series measurements for validation and calibration, and this approach is ongoing in both the south east and Macquarie Harbour. This modelling is supported by well developed hydrodynamic models overlayed with geochemical and depositional modelling. Please see Appendix 1 for further details.

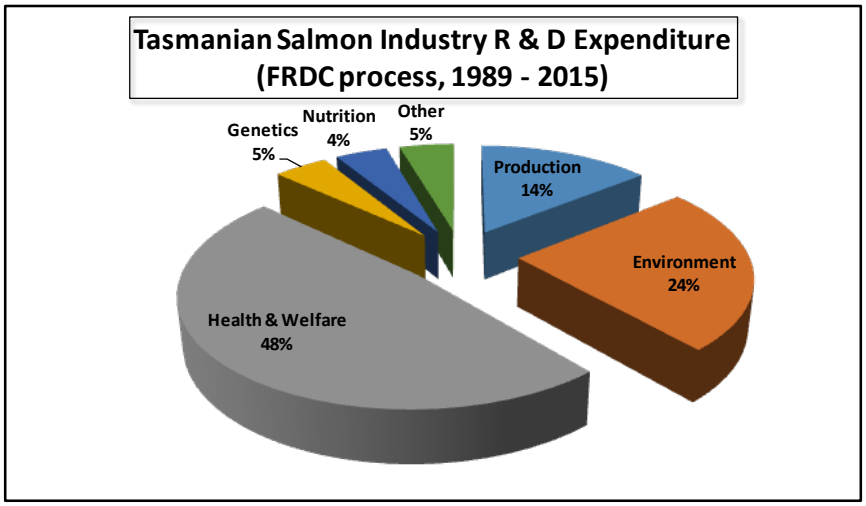
Support and funding for research to understand our impact

The salmonid industry has a long standing commitment to research and development. The *Saltwater Salmonid Culture Act 1985* guaranteed that at least 25 per cent of annual smolt cost would be invested in research and development to support the emerging industry, and this was in place until 1995. The industry has contributed in excess of $200 million in Australian Taxation Office (ATO) recognised research expenditure to a broad range of topics over the last 30 years. Further contributions from the Fisheries Research Development Corporation (FRDC), supportive research bodies and organisations and businesses associated with the industry add an additional $75 million.

This equates to a total industry research and development spend in excess of **$275 million.**

The total spend through the FRDC funding mechanism (1989 – 2015) is estimated at $48 million (including in-kind contributions from research organisations and industry). This has been in a number of key program areas including health and welfare, environment, production, nutrition and genetics. The environment portfolio of projects (19 in total) accounts for 24 per cent of expenditure (see Figure 1).

Figure 1. Tasmanian salmonid industry R & D expenditure by tactical program.



How do we manage and respond to our impact on waterway health?

Much of the impact of salmonid farming on waterway health is managed by an extensive set of management controls attached to annual farm licence conditions, and the monitoring and reporting requirements attached to these. For example, there are more than 70 prescribed management controls attached to licence conditions for farming in Macquarie Harbour. Such management controls are often linked to the adaptive management framework detailed in Appendix 1.

In addition to this, all companies have extensive data collection programs covering all facets of the business and housed in commercially developed databases. Analysis of relevant data helps understand some of the industry's impacts. Data sets can be extracted, supplied to specialist consultancy firms and fed in to more complex modelling software to give further insights.

There has been considerable research effort undertaken in Tasmania aimed at establishing best practice farm management across the whole salmonid farming industry. The adaptive management framework adopted for the ongoing management of the industry underpins the drive for continuous improvement of the industry in Tasmania.

How do we minimise/mitigate our impacts on the waterways?

The industry employs a number of strategies to minimise the impact on waterways. These strategies include, but are not limited to, the following:

- Initiate, participate in and support applied research and collaboration with scientific research institutions such as IMAS, CSIRO and UTAS to better understand the industry's interaction with the environment.
- Maintain contact with leading international research scientists and organisations so that emerging current knowledge can be implemented in our farm management practices.
- Adopt the latest farming infrastructure and monitoring technology if it leads to environmental improvements.
- Continuously review practices and procedures, and change where appropriate, to further reduce impacts on the environment.
- Seek third party independent endorsement/certification that represents international best practice. Third party audit and scrutiny is voluntarily undertaken by industry participants to aid continuous improvement and provide evidence to a range of stakeholders that the industry is acting responsibly and sustainably.
- Maintain a compliance focus to ensure industry meets regulatory requirements, and where possible operates at and provides information above and beyond the minimum standards required.
- Adopt management practices that will ensure the long term viability of farm sites, such as the development of effective fallowing regimes. Fallowing is the practice of relocating or not re-stocking marine fish cages to allow the sediment below to undergo natural recovery, both geochemically and ecologically, from the impacts of nutrient loading.

Does the environment recover?

An independent IMAS study was conducted in 2002 and replicated in 2012 to assess the long-term recovery of vacated marine farm lease No. 76 in North-West Bay. This was undertaken to determine whether the benthic, visual and physical-chemical conditions were consistent with control site conditions and to what extent the system had recovered. Comparisons were made between data collected one week, 24 months and 13 years after removal of cages from the site. This was one of the earliest farms in the industry and at the time complied with the guidelines for a well sited salmonid farm. The site had been intensively farmed for a period of 10 years during the 1990s and it is now acknowledged within industry that the depth and water movement at this site was not conducive to long term sustainable fish farming. Application of the adaptive management process and research findings saw the cessation of farming in this location in 2000.

The key findings of the study suggested that sediments were subjected to organic enrichment from active farming at the time of removal and that the extent of impact diminished both with time and distance from the sea cage positions. All parameters, except for the benthic community structure, had returned to conditions equivalent to those at the

reference site after two years.[10] In 2012, the sediments had recovered and there was no evidence to indicate that farming activity had any permanent impact on the benthic environment.[11] This study supports the view that the impact of salmonid farming on waterway health is **spatial, temporal** and **reversible**.

Involvement in collaborative community projects looking at waterway health

The industry has long been committed to supporting and participating in co-operative studies and projects that provide more information and a better understanding of the marine environment that we operate in. This first commenced with the Huon Healthy Rivers program, initiated in 1996, and is today represented by projects such as INFORMD, Your Marine Values, and D'Entrecasteaux and the Huon collaboration. These projects have produced reports such as '*State of the D'Entrecasteaux Channel and the lower Huon Estuary 2012*" and "*D'Entrecasteaux Channel and the Lower Huon Estuary inventory of scientific information 2012*' which draw on 86 scientific data sets accumulated for the region since 1999. Collaborations and data sets like this provide the basis for the implementation of adaptive management and are of value to all users of the waterway.

Threatened and endangered species

Many of the animals and plants in our marine environment symbolise the iconic nature of Tasmanian waterways. Industry recognises these species as natural assets and acknowledges its responsibility to deliver farm-based actions that support effective and robust management of interactions with these species. The industry's actions are underpinned by good science and potential impacts on threatened and endangered species are a key focus in daily activities. The industry has commissioned reports and developed mitigation strategies in relation to a number of species. These include, but are not limited to the following:

- *Whales/dolphins* – as whale populations recover, there is an increasing likelihood of interaction between migrating whales and other users of the waterways. The industry has developed Wildlife Interaction Plans and mitigation strategies as part of standard operating procedures to minimise the potential for adverse impacts. In addition, companies adhere to DPIPWE whale and dolphin viewing guidelines and company resources are made available for whale rescue efforts. Furthermore, one company is in discussion with IMAS and the Australian Antarctic Division in relation to joint research opportunities and assistance with cetacean monitoring in Tasmanian waters (For more detailed discussion refer to Supplementary Information in Relation to Draft Amendment No. 6 to D'Entrecasteaux Channel MFDP, May 2015[12]).

- *Maugean skate* – one of the conditions of expansion of farming in Macquarie Harbour was an industry supported study into the Maugean skate. Draft findings have provided

[10] MacLeod, C. K., Mitchell, I. M., Crawford, C. M. and Connell, R. (2002). *Evaluation of sediment recovery after removal of finfish cages from marine farm lease no. 76 (Gunpowder Jetty), North West Bay*. TAFI. Hobart.

[11] MacLeod, C.K., Eriksen, R.S., Davey, A., Kelly, B., and Ross, D.J. (2013). *Long-term Recovery - Review of sediment condition at Marine Farm lease No. 76 (Gun Powder Jetty, North West Bay.* Institute for Marine and Antarctic Studies

[12] http://dpipwe.tas.gov.au/sea-fishing-aquaculture/marine-farming-aquaculture/marine-farming-development-plans/draft-amendments-to-marine-farming-development-plans/draft-amendment-no-6-to-the-dentrecasteaux-channel-marine-farming-development-plan-february-2002

significant data on ecology, movement, behaviour, diet and population. Early indications are that the skate population in the harbour is significantly larger than has been suggested in the past. Skate also spent the vast majority of their time in the 6-15 metre depth range although some individuals did move into very shallow water (<1metre). Detections in depths greater than about 25 metres, which is the depth on the harbour in which the majority of the farms are located, were rare (Dr Jeremy Lyle, IMAS, *pers comm.* 2015).

- *Australian and New Zealand fur seals* – industry interaction with seals commenced the day the first salmonids were put to sea and since then significant time and expense has been devoted to better understanding their behaviour and designing and installing netting systems that minimise interactions and impact on both seals and fish. The industry manages interactions with seals according to DPIPWE seal management protocols.

  One company has commissioned UTAS to provide a report in to the population status and trends of Australian and New Zealand fur seals in and around local waters.[13] [14] The initial report found that populations of these seals were recovering from past exploitation, at a similar rate to other species elsewhere in the world. The second report included a risk assessment of fur seal interactions with aquaculture in Tasmania. It was concluded that the current level of seal mortality from the activities of the Tasmanian salmonid aquaculture industry is not adversely affecting the population trajectory of either species.

- *Handfish* – this group of endemic Tasmanian fish is represented by three species (Spotted, Ziebells and Red). They are known to prefer inshore demersal habitats within a depth range of approximately 5 to 15 metres, and they have a limited and often fragmented range linked to habitat preference. Recently the handfish, was found within one fish farm lease in the lower D'Entrecasteaux Channel, a region in which the handfish was no longer thought to exist. There is no current evidence that the industry either positively or negatively impacts on the handfish. Through annual monitoring programs the industry is well placed to provide further data on this important group of fish.[15]

  Birds – Tasmania supports a diverse range of bird species including waders, waterfowls, seabirds, woodland/forest birds, and raptors, many of which are listed as endangered or threatened. Estuarine and coastal habitats are of particular importance especially for breeding and migratory shorebirds that utilise exposed near shore landforms (such as beaches, dunes and rocky outcrops) and littoral zones (such as mudflats and estuaries) for feeding and roosting.[16] [17] Common silver gulls and New Zealand Kelp gulls commonly

[13] Hindell, M & Lea, M. (2012) Status and trends of Australian (*Arctocephalus pusillusdoriferus*) and New Zealand fur seals (*A. forsteri*) in Australia and New Zealand. UTAS/IMAS Unpublished Report.

[14] Hindell, M, Lea, M & Auman, H. (2013) A risk assessment of fur seal interactions with aquaculture in Tasmania. UTAS/IMAS Unpublished Report.

[15] http://www.environment.gov.au/system/files/resources/49f4f5ea-2687-4693-b5fa-309f2f0ebced/files/4-handfish-issues-paper.pdf

[16] Bryant, S. (2002). *Conservation assessment of beach nesting and migratory shorebirds in Tasmania*. Nature Conservation Branch, Department of Primary Industries, Water and Environment, Tasmania.

roost on farm infrastructure and may opportunistically consume salmon feed. It is unusual for other species to interact with farms.

- *Macroalgal communities* – early work on macroalgal communities[18] found that '*Changes in the abundances of algae species were recorded in the reserves and at external control sites. No consistent patterns over time were apparent. Each species varied over time in different ways, depending on location and site*'. There were no trends in macroalgae communities that could be attributed to fish farming in the area. However, as a means of addressing the concerns of the Tasmanian Abalone Council and Environment Tasmania about the broadscale impacts on rocky reef communities the industry has funded a two year study aimed at characterising the status and health of macroalgal communities in south east Tasmanian waters. In addition the industry is supporting two further FRDC funded projects over the next three years that will provide a comprehensive assessment of reef health and re-survey local marine protected area and reef life survey sites from previous studies.

  There are two industry-funded PhD studies currently underway to clarify the relationship between salmonid farm nutrient loads and changes in macroalgal community structure and distribution. The first project is investigating the effects of increased nutrient availability on macroalgal communities in the D'Entrecasteaux Channel and Lower Huon areas by introducing a nutrient source to three reef systems. The second project has modelled the feasibility of growing algae in and around salmonid farms in the D'Entrecasteaux Channel and Huon Estuary for integrated multi-trophic aquaculture (IMTA).

- *Ecosystem biodiversity* – industry has commissioned independent biodiversity reports for farming regions. These reports will catalogue areas that represent important natural values and recognised ecosystems adjacent to marine farming developments and active farming regions. Furthermore, an IMAS led FRDC Project (2015-024) 'Managing ecosystem interactions across differing environments: building flexibility and risk assurance into environmental management strategies' will look at understanding potential broadscale interactions with reef systems and validation of local scale sediment condition indicators in new salmonid farming regions.

Ecosystem shift

Perceived changes in the environment are often identified by comparing current observations to unique past events that serve as a baseline for future reference. Often referred to as sliding or shifting baselines, they can change between individuals and generations depending on differing experiences. What is believed to be 'natural' is subconsciously viewed as the state of the environment from one's earliest memory. Therefore, the expectation of what the environment should look like depends on the

[17] Parsons, K. E. (2012). *State of the D'Entrecasteaux Channel and the lower Huon Estuary 2012.* Report for the D'Entrecasteaux Channel Project, prepared by Ecomarine Consulting. 222 pp.

[18] Crawford, C., Thompson, P., Jordan, A., Foster, S., Mitchell, I., Bonham, P. and Willcox, S. (2006). *Development of broadscale environmental monitoring and baseline surveys in relation to sustainable salmon aquaculture in the D'Entrecasteaux Channel region. Aquafin CRC Project 4.4., Aquafin Cooperative Research Centre, Fisheries Research and Development Corporation, Commonwealth Scientific and Industrial Research Organisation*. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

remembered observations within one's lifetime, changing with each generation.[19] When reconstructing historical circumstances, often the most significant or outstanding events triumph the non-memorable occasions.[20] Therefore, sliding baselines can provide an inadequate measurement for long term, system wide change. This is particularly evident in the marine environment which the vast majority of people only view from above or through a limited exposure. This places unduly increased weighting on marine cues visible from the surface, such as the decline in giant kelp forests.

Giant kelp (*Macrocystis pyrifera*) was once a commonly visible aspect of Tasmanian coastal ecology, in quantities sufficient to support a commercial harvest. Reliant on cold nutrient rich waters, the giant kelp has been in a long term decline on the east and south coasts of Tasmania aligning with the increased influence of the East Australian Current over the past 30 years. This change has been increasingly evident on the east coast and has moved further south as the East Australian Current has influenced further south and persisted in southern regions. While the decline in giant kelp has therefore been observed in parallel with increased fish farming activity over the past 30 years, there has been no scientific evidence that salmonid farming is the cause of the decline in giant kelp and considerable evidence that it is the result of changes in the East Australian Current.

Conclusion

There is a framework in place to manage environmental performance through; management controls, robust monitoring, and mitigation strategies. In addition, by continuously improving our modelling and investing in research and development, we are confident that we can continue to improve environmental performance, while contributing to improved understanding of the ocean environment.

The TSGA ask that the Committee note:

- that the Tasmanian salmonid industry acknowledges it has an impact on the environment and is committed to appropriate management controls and mitigation strategies to minimise this impact;
- that the industry makes a meaningful contribution to ocean management through initiatives such as collection of marine debris and information collection regarding threatened and endangered species; and
- the science has established that our impact on waterway health is spatial, temporal and reversible.

[19] Hobday, A.J 2011, *Sliding baselines and shuffling species: implications of climate change for marine conservation*, Marine Ecology, vol. 32, No. 3, pp. 392-403

[20] Bulleri, F, Underwood, A.J, Benedetti-Cecchi, L 2007, *The assessment and interpretation of ecological impacts in human-dominated environments,* Environmental Conservation, Vol. 34, No. 3, pp. 181-182

TOR (c) The adequacy of current environmental planning and regulatory mechanisms

An important issue for the industry is the planning and regulatory environment. The legislation and regulations that the industry must comply with are wide and varied, and includes Commonwealth, state and local government components. Industry has operated successfully within this framework for 30 years and has driven innovation in and the evolution of a contemporary planning and regulatory environment.

Statutory compliance
The Tasmanian salmonid industry is currently governed by almost 70 Commonwealth and State Acts. These acts and their subordinate regulations serve to regulate and support the responsible development and growth of the industry. Please see the Statutory Compliance List in Appendix 2 for further detail.

Voluntary commitments
In addition to these statutory obligations the industry participates in or is directed by a number of state and Commonwealth policies and voluntary programs. Please see Additional Programs in Appendix 3 for further detail.

A prime example of an industry led voluntary program that is internationally recognised and considered progressive by global industry peers is the Tasmanian Salmonid Health Surveillance Program (TSHSP). This is a joint venture between the DPIPWE and the Tasmanian salmonid industry. The program has been in operation for over 20 years and is acknowledged by industry and the Tasmanian and Australian governments as an important means of providing health services to a key sector of primary industry. The program underpins Tasmania's access to markets domestically and internationally.

Initially, the program was comprised of active surveillance and general ('passive') surveillance. However, in recent years the focus of the program has been on general surveillance due to the development of a system capable of the detection and prompt reporting of disease. For the Tasmanian salmonid industry, this is achieved through industry veterinarians and trained fish health technicians who are supported by a laboratory network that provides competent and authoritative findings.

For many years the TSHSP was a standalone activity, largely for the purpose of general surveillance. However, a need to reposition the TSHSP has emerged with the intensification and expansion of salmonid production. A fish health area management agreement for Macquarie Harbour has been developed and a formal state-wide integrated Biosecurity Program for the Tasmanian salmonid industry has been developed and ratified (2014). The Biosecurity Program establishes the guiding principles for biosecurity standards, strategies and requirements for salmonid production across Tasmania. The TSHSP has become a defined component of the Biosecurity Program. To help implement this program the industry has supported a multi-million dollar investment in a new state run bio-secure fish facility.

Planning Mechanisms

The *Marine Farming Planning Act 1995* and associated regulations provide the mechanisms to guide, manage and amend marine finfish farming plans. More detail on the planning process and mechanisms can be found in our response to TOR (d).

For example, industry is required to provide a detailed Environmental Impact Statement (EIS) whenever a new farm site is considered or significant modifications are planned for an existing farm site. Much of the information and discussion in these documents centres on potential impacts on waterway health. They therefore provide an extensive data and reference set to the issues raised under these terms of reference. Examples can be seen at the following web site addresses – Trumpeter Bay, Trumpeter Bay EIS ; Lippies Point, Lippies EIS).

Regulatory mechanisms

Tasmania has one of the most comprehensive environmental regulatory and planning frameworks in the world, a global best practice planning process and unmatched levels of broadscale monitoring[21]. The industry has invested heavily in developing and maintaining comprehensive broadscale water quality monitoring programs which means Tasmania has environmental baselines that can be used to alert regulators and industry to cumulative or far field environmental changes. Some of the important features of the Tasmanian regulatory framework are as follows:

- broadscale water quality monitoring based on hydrodynamic and geochemical modelling that tracks water quality changes over time and provides an early warning of any system wide changes;
- annual benthic compliance surveys based on local conditions and local, current research which ensure that industry do not have irreversible impacts outside their lease areas;
- fish health surveillance programs that detect any emerging or exotic diseases;
- biosecurity frameworks that protect both the health of Tasmanian farmed salmonids and wild marine species;
- extensive siting criteria, a well-developed environmental impact statement (EIS) framework and dedicated aquaculture plan areas that ensure salmonid farms are located in appropriate marine areas with a minimum of environmental and social impact and a maximum economic value to the state; and
- a seal management framework that ensures the humane and ethical treatment of seals interacting with salmonid farms.

In addition, the industry works closely with WorkSafe Tasmania which is the division of the Department of Justice responsible for administering and enforcing laws that regulate work health and safety and worker rehabilitation and compensation. This ensures compliance with the overarching legislation, the *Work Health and Safety Act 2012.*

The salmonid industry also consults with Marine and Safety Tasmania (MAST) to ensure safe operation of vessels and equipment and to ensure that lease siting will not disrupt

[21] FAO (2009). Environmental impact assessment and monitoring in aquaculture. *FAO Fisheries and Aquaculture Technical Paper 527*. Food and Agriculture Organisation of the United Nations, Rome.

recreational or commercial boating traffic. MAST is a statutory authority established in 1997 to ensure the safe operation of recreational and commercial vessels, provide and manage marine facilities and manage environmental issues relating to vessels. MAST has four primary functions which are conferred by the *Marine and Safety Authority Act 1997*:

- to ensure the safe operation of vessels;
- to perform the functions delegated to it by the national regulator for commercial vessels, the Australian Maritime Safety Authority;
- to provide and manage marine facilities; and
- to manage environmental issues relating to vessels.

The current system has been proven to be effective: infringement notices have been issued and responded to. For example, marine farming licence conditions state that there must be no significant visual, physicochemical or biological impacts at or extending beyond 35 metre from the boundary of the lease area. If there is a significant impact at the 35 metre compliance point, the company is advised and asked to implement an appropriate management response. This is called a required management action. The frequency of surveillance is increased to monitor the impact of the response.

Standards, certification and accreditation

In addition to compliance requirements, the industry invests significant resources annually in third party sustainability certifications. The aim of these standards

> *'is to credibly offer measurable, performance-based requirements that minimize or eliminate the key negative environmental and social impacts of salmonid farming, while permitting the industry to remain economically viable'*[22].

Producers seeking relevant certification are required to comply with numerous standards that cover environmental impacts, fish health and disease management, sustainability of feed ingredients, wildlife management, employee safety and working conditions, transgenic animals, escapes, energy efficiency and biosecurity, as well as the mandatory regulations required by the government. These voluntary standards typically have higher requirements than legislated regulations, but the extra compliance costs involved may be offset by increased production through the reduction of mortality from disease and stress, and increased growth under better environmental conditions [23]. Certified products also have greater market access and can obtain a higher market price.

The industry has been involved in the evolution of aquaculture accreditation programs since their genesis and continues to support their development provided the certification criteria are rigorous and transparent. Criteria must consider environmental outcomes, not just processes –the industry is of the view that merely having an environmental management plan should not be sufficient to satisfy the requirements. Industry participants must

[22] ASC salmon standard. ver. 1.0. Aquaculture Stewardship Council, The Netherlands. 103 pp. Available from http://www.asc-aqua.org/upload/ASC%20Salmon%20Standard_v1.0.pdf (Accessed May, 2015).

[23] Sim-Smith, C.& Forsythe, A, (2013). Comparison of the international regulations and best management practices for marine finfish farming. MPI Technical Paper No: 2013/47. National Institute of Water & Atmospheric Research Ltd

demonstrate that the plan has been successfully implemented, is responsive, and is achieving sustainability outcomes.

Tasmanian salmon industry participation in certification schemes

1. **Best Aquaculture Practices (BAP) – Van Diemen Aquaculture, Tassal and Petuna**
   http://bap.gaalliance.org/

Best Aquaculture Practices (BAP) is an international, third-party certification system that verifies the environmentally and socially responsible processes under which finfish are produced.

BAP certification standards contain the key elements of responsible aquaculture, such as environmental responsibility, social responsibility, food safety, animal health and welfare, and traceability.

2. **Global G.A.P. – Huon Aquaculture**
   http://www.globalgap.org/

The Global G.A.P. Integrated Farm Assurance Standard – Aquaculture Version 4 – is a pre-farm gate standard that covers the whole production process of the certified product from the hatchery until the point of harvest and packing.

The Global G.A.P. Aquaculture Standard sets criteria for legal compliance, for food safety, worker occupational health and safety, animal welfare, and environmental and ecological care. The Global G.A.P. Aquaculture Standard applies to a diversity of fish, crustaceans and molluscs and extends to all hatchery-based farmed species, as well as the passive collection of seedlings in the planktonic phase. It covers the entire production chain, from broodstock, seedlings and feed suppliers to farming, harvesting and processing. Aquaculture producers covered by the standard are also required to source the compound feed used at the aquatic farming and hatchery levels from Global G.A.P. accredited suppliers.

3. **Global Salmonid Initiative (GSI) – Huon Aquaculture**
   http://www.globalsalmoninitiative.org/

The Global Salmonid Initiative (GSI) is a global leadership initiative founded and lead by salmonid producers dedicated to determining the best measures by which our sector can grow sustainably. Salmonid aquaculture is the world's fastest growing food production system.

The GSI has four main objectives:

- Bring together global farmed salmonid producers and other industry stakeholders to strive towards significantly improving the sustainability of salmonid farming.
- Cooperation to continue to outperform other sources of animal protein in terms of contribution to human health, environmental responsibility, and efficient feed conversion rate, and to be widely recognized for this accomplishment.
- Achieve the highest standards of corporate citizenship in the regions where members operate.

- Translate environmental and social sustainability into greater economic sustainability through enhanced social license and market acceptance.

4. Aquaculture Stewardship Council (ASC) – Tassal
http://www.asc-aqua.org/

The ASC program promotes industry best practice to minimise the environmental and social footprint of commercial aquaculture. Through its consumer label, the ASC promotes certified responsibly farmed products in the marketplace.

The ASC program is:
- credible – ASC standards are developed and implemented according to ISEAL guidelines (ISEAL Alliance is the global membership association for sustainability standards) - which are multi-stakeholder, transparent, and incorporating science-based performance metrics;
- meaningful – including science-based performance metrics, the requirements in the standards are realistic, measurable and auditable; and
- effective – a globally recognised, market-oriented program that aims to promote meaningful improvements in aquaculture production in a credible and cost efficient way that adds real value to producers and buyers of certified products.

5. Global Reporting Initiative (GRI) – Tassal
https://www.globalreporting.org/

GRI promotes the use of sustainability reporting as a way for organizations to become more sustainable and contribute to sustainable development. GRI's Sustainability Reporting Framework is a reporting system that enables all companies and organizations to measure, understand and communicate this information. GRI's mission is to make sustainability reporting standard practice; one which helps to promote and manage change towards a sustainable global economy.

Please see Appendix 4 for further detail regarding the certification schemes listed above.

The industry is also compliant with a myriad of quality and safety certification schemes (Table 3), including, but not limited to, the following:

Table 3. Quality and safety certification schemes that the Tasmanian salmonid industry participates in.

	Auditing Body	Main purpose	Audit Frequency
DAFF (formerly AQIS)	DA Biosecurity	Export compliance	Dependent on site rating and previous audit results – between six and nine months All facilities currently have an A rating
ISO 9001:2008	Societe Generale de Surveillance (SGS)	International standard	Annual surveillance/ three year recertification

HACCP	SGS	International Standard	Annual recertification/ six monthly surveillance (processing sites only)
SQF Code (Safe Quality Food) Level 3	SGS	International Standard/ Customer requirement	Annual recertification
WQA	SGS	Customer requirement	Six monthly
HALAL	Halal Australia	Sell product with Halal approval	Annual desk audit
KOSHER	Kosher Australia	Sell product with Kosher approval	Annual audit
AS 4801	TQCS	Australian Standard	Annual audit rotation basis/ three yearly recertification
OHS AS 18001:2007	TQCS	International standard	Annual audit rotation basis/ three yearly recertification
Woolworths Quality Assurance Program (WQA)	Woolworths Quality Assurance Program (WQA)	Compliance with WQA Version 8 – Manufactured Foods.	Annual audit

Additional information on all the industry sustainability and safety certification schemes, and compliance with, can be found at the following locations:

Huon Aquaculture

Website – http://www.huonaqua.com.au/

Dashboard – http://dashboard.huonaqua.com.au/

Petuna

Website – http://www.petuna.com.au/aquaculture/

Reports – http://www.petuna.com.au/wp/wp-content/themes/petuna/img/Petuna-Sustainable-Living-Book-SML.pdf

Tassal

Website – http://www.tassal.com.au/

Dashboard – http://www.tassal.com.au/sustainability/asc-dashboard/

Reports – http://www.tassal.com.au/sustainability/our-sustainability-reports/

Regulatory costs

Tasmanian salmonid farming companies pay some of the highest environmental compliance costs in the world both from a statutory and voluntary perspective. Industry calculations put the cost of compliance at **$0.04/kg or $1,720,000 per annum** and increasing.

Industry estimates that costs have increased 100 per cent in the past five years due to increased monitoring, additional staff, independent certification and operational changes to meet certification requirements.

The industry accepts that this is the cost of 'doing business'.

Conclusion

As clean, well oxygenated seawater is essential for the production of healthy, high quality seafood, our farmers are resolutely committed to protecting the environment. A secondary driver for achieving ongoing improvements in environmental performance stems from requirements within third-party certification programs. Certification programs by third party organisations support industry growth, public confidence and help develop and maintain markets. Certifications help consumers make informed decisions.

Minimising the environmental impacts of marine aquaculture is a common goal for regulatory authorities and producers because environmental quality, growth and health of fish and farm profits are inextricably linked. Internationally, many countries and independent global organisations have developed aquaculture best management practices to improve the environmental and financial performance of aquaculture operations.

The TSGA ask that the Committee note:

- that Tasmania has one of the most comprehensive environmental regulatory and planning frameworks in the world;
- the industry's high level of participation in meaningful international certification schemes;
- the industry's high level of compliance with the conditions attached to marine farming licences; and
- that the industry accepts that increased regulatory costs are a part of doing business.

TOR (d) The interaction of state and federal laws and regulation

The salmonid industry is regulated by over 70 Commonwealth and state acts and more than 670 separate regulatory or subordinate obligations.

The Secretary of the Department of Primary Industries, Parks, Water and Environment is responsible for assessing and regulating marine farming activities.

All marine farming occurs in state waters; there is no farming in Commonwealth waters.

In Tasmania there is a three tiered approach to aquaculture management involving:

- resource assessment, planning and zoning of certain areas for marine aquaculture;
- allocation of marine aquaculture leases that provide long term tenure and the right to occupy and use a specific site within an aquaculture zone; and
- administration of various approvals (including licences) that set out operating conditions.[24]

[24] Productivity Commission, 2004, Assessing Environmental Regulatory Requirements for Aquaculture, Canberra.

In 1995 specific legislation was established to manage this activity in state waters. The *Marine Farming Planning Act 1995* and associated regulations provide for:
• preparation of marine farming development plans (MFDPs);
• amendments to plans; and
• reviews of plans.

Plans establish zones where marine farming leases may be located (Figure 2). Plans and zones specify:
• the maximum lease area that can be granted in a zone;
• the species that may be farmed within a zone; and
• operational constraints on marine farming through the use of management controls.

Figure 2 - Marine farm lease and zone boundaries are clearly defined in marine farming development plans (MFDPs).

The objectives of the *Marine Farming Planning Act 1995* are to:
• integrate marine farming activities with other marine users;
• minimise any adverse impacts;
• take account of land uses; and
• take account of the community's right to have an interest in those activities.

The Act establishes the Marine Farming Planning Review Panel, an expertise and ability based panel which considers draft plans and draft amendments to plans and makes recommendations to the Minister.

In addition to management controls, every marine farming lease can have specific management and reporting criteria allocated through both specifications on the MFDPs and individual lease/licence conditions.

In the event that a significant visual impact is detected at any point 35 metres or more from the lease boundary, the licence holder may be required to undertake a triggered environmental survey or other remedial activity determined by the Secretary.

Water quality is also managed through the *Living Marine Resources Management Act 1995*. This legislation provides for licensing of marine farming activities in coastal waters, and as part of the marine farm licencing process enables provisions to be included in lease/licence conditions to protect the environment.

These two significant pieces of legislation are part of a suite of legislation that has the common goal of managing industry toward environmental sustainability.

In addition, approval from the Commonwealth government may be required under the *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC) for aquaculture activities that are likely to have a significant impact on a matter of national environmental significance. Potential impacts are deemed to be significant if they are likely to impinge on World Heritage Areas, National Heritage places or listed threatened species and communities.

As the proponent for the expansion of salmonid farming in Macquarie Harbour, the salmonid industry addressed a matter of national environmental significance under the EPBC Act in 2012/13 in the preparation of the environmental impact statement. The proximity of farms to the World Heritage Area and the potential interaction with the threatened Maugean Skate prompted a referral.

Conclusion

An efficient, predictable and accountable regulatory process is required to operate successfully and to provide the investor confidence necessary to grow a sustainable aquaculture sector in Tasmania. It is also the basis for public confidence that the aquaculture industry in Tasmania is responsible and accountable. The industry considers the current regulatory framework is sufficient to ensure these goals are met.

The industry recognises that government agencies need to adopt rigorous compliance guidelines and develop a culture of consistent, incremental enforcement activity in response to breaches of licence conditions.

The TSGA ask that the Committee note:

- that the Tasmanian salmonid industry is currently regulated by over 70 Commonwealth and state acts and more than 670 separate legislative requirements; and
- that the industry considers the current regulatory framework to be sufficiently evidence-based, efficient, predictable and accountable.

TOR (e) The economic impacts and employment profile of the industry

Economic value of the salmonid industry in Tasmania

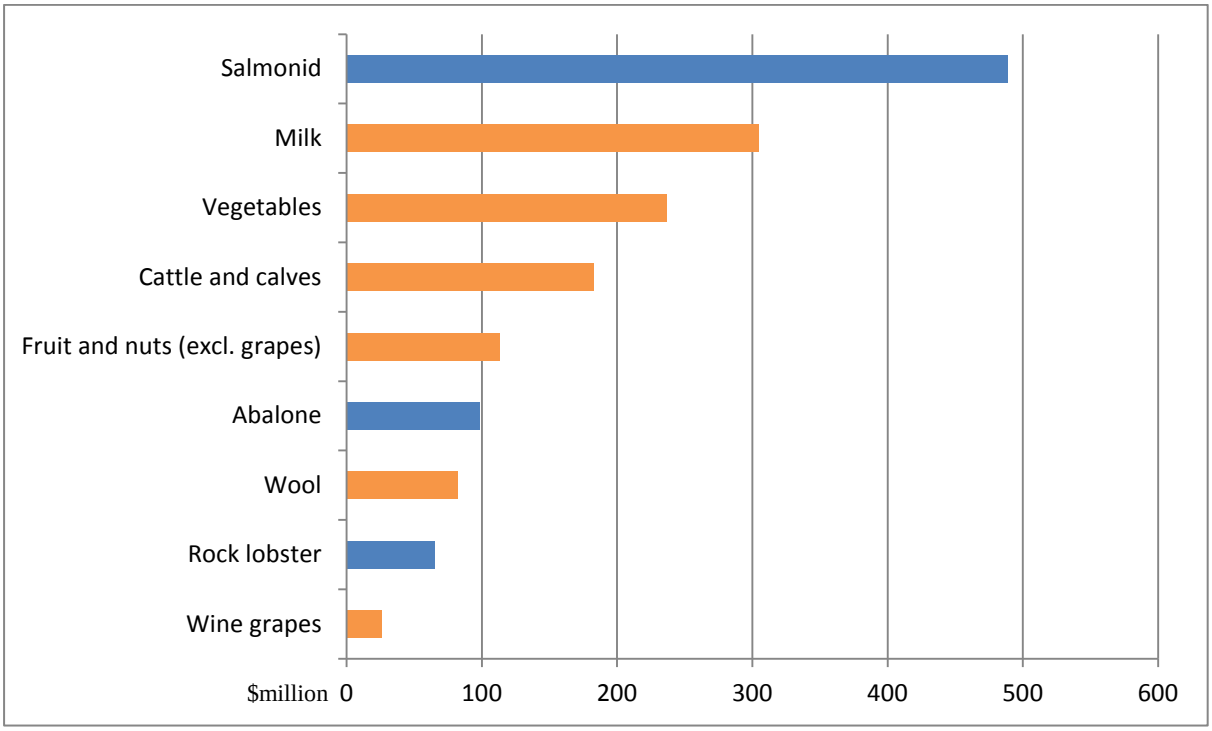
Tasmania is the largest aquaculture producer in Australia and salmonid aquaculture made up 94% of the total value of Tasmanian aquaculture in 2012-13.[25]

Tasmania's salmonid industry has a turnover of $1.12 billion and represents 2.3 per cent of the state's Gross State Product (GSP).[26]

[25] ABARES 2015, Agriculture, Fisheries and Forestry in Tasmania, 2015, About my region 15.50, Canberra, April.
[26] KPMG 2015, Economic Impact Assessment; Tasmanian Aquaculture Industry May 2015, Hobart.

The salmonid industry is Tasmania's largest primary industry (food) production sector by value as shown in Figure 3. The sector has also experienced strong growth over the past decade with the real value of aquaculture production tripling[27] and now represents about 75 per cent of the state's total fisheries production.[28]

Figure 3 Comparison of Tasmanian primary industry sectors by Gross Value Product 2012-13



Source: Australian Bureau of Statistics, cat.no. 7503.0, Value of agricultural commodities produced, Tasmania 2012-2013

The salmon aquaculture industry in Tasmania is of high economic value because almost all of its expenditure is exogenous, that is, would not be used for alternative purposes. It has broad links with the rest of the economy (especially the service and transport industries), which generates a high (multiplied) output or turnover effect and so expands the capacity and depth of an economy and has significant export potential.[29]

Economic value of the salmonid industry to the rest of Australia

Although the economic benefits of the salmonid industry are largely experienced within Tasmania, the industry also economically contributes to the rest of Australia with an annual turnover of over $180 million, contributing over $115 million to other mainland economies and providing support for a further 417 FTE jobs.

Employment profile of the industry

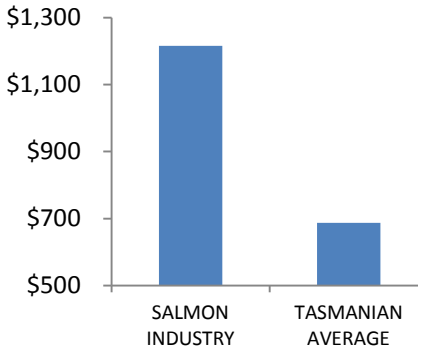
The Tasmanian salmonid industry in Tasmania currently:

- employs **1,571 people**; and
- supports a further **3,769 FTE** jobs in both Tasmania and the rest of Australia.

[27] Op cit ABARES 2015 pp13
[28] Op cit ABARES 2015 pp13
[29] KPMG 2015, Economic Impact Assessment; Tasmanian Aquaculture Industry May 2015, Hobart.

The average weekly wage for salmonid industry employees is almost double the Tasmanian average (Figure 4). This is particularly significant in the context of the largely regional and rural nature of employment in the industry.

Figure 4. Average weekly wage for salmon industry employees



Source: DEDTA Economic Development Plan- salmon sector profile, 2014

The industry makes up over 10 per cent of the Tasmanian agriculture, forestry and fishing sector which employs 13,500 FTE's.[30]

More broadly, the industry contributes substantially to private sector and specifically traded sector (defined as producing goods and services used outside the region) employment inTasmania. The excerpt below from West (2012)[31]provides background on the primary sources of employment and income.

> *'Tasmania's traded sector is small and vulnerable. With 36 per cent of Tasmanian households deriving their sole or primary income from a Commonwealth Government payment, and roughly 30 per cent of the total economy made up of public services and government business enterprises, including 26 per cent of jobs, along with 15 per cent in private wholesale and retail trade, and construction at eight per cent, Tasmania's traded sector could account for the incomes of as little as 10 per cent of households.'*

Australian Bureau of Statistics (ABS) most recent Labour Force Survey[32] indicates that around 239,000 people were employed in Tasmania in April 2015 and salmonid aquaculture accounts for **1 out of every 100 persons employed**.

Importantly, the Tasmanian salmonid industry provides employment in regional and remote areas. Notably, the industry provides employment to many local government areas that have experienced significant employment loss over the last five years as a result of the forestry

[30] ABARES 2015, *Agriculture, Fisheries and Forestry in Tasmania, 2015, About my region 15.50*, Canberra, April.
[31] West, J et al. (2012). Diversifying Tasmania's Economy: Analysis and Options- final report. Australian Innovation Research Centre, Dept of Infrastructure and Regional Development.
[32] Australian Bureau of Statistics, cat.no. 6202.0, Labour Force, Tasmania April 2015

industry downturn. The industry directly employs people in 26 of Tasmania's 29 local government areas.

Table 4 Salmonid industry employment (direct and indirect) by local government area.

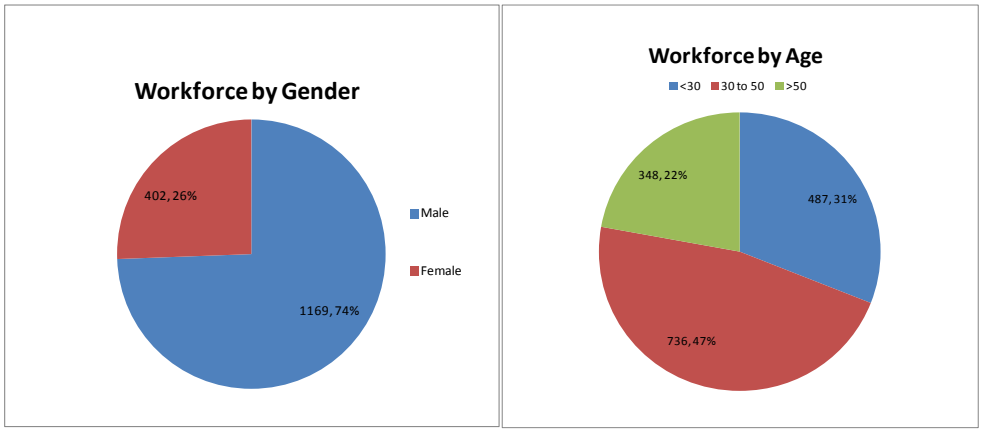
Local Government Area	Salmonid industry direct employment	Salmonid industry direct and indirect employment*
Break O'Day	4	10
Brighton	2	5
Burnie	5	12
Central Coast	4	10
Central Highlands	1	2
Circular Head	1	2
Clarence	71	170
Derwent Valley	23	55
Devonport	137	329
Dorset	18	43
Glamorgan SB	3	7
Glenorchy	37	89
Hobart	103	247
Huon Valley	600	1440
Kentish	3	7
Kingborough	303	727
Latrobe	46	110
Launceston	13	31
Meander Valley	8	19
Northern Midlands	40	96
Sorell	22	53
Southern Midlands	6	14
Tasman	22	53
Waratah/Wynyard	4	10
West Coast	92	221
West Tamar	3	7
Total	**1571**	**3769**

As can be seen from the table above, there are several local government areas that the industry has large numbers of employees. For example, salmonid aquaculture is responsible for 31% of private sector employment in the Huon Valley Council Area and, almost 10% in the Tasman Council Area, and 14% of the West Coast Council Area. The Huon and Tasman government areas have been significantly affected by the downturn in the forestry industry, and the West Coast has been affected by recent mining closures.

Gender and age profile

Approximately three quarters of direct salmonid employees are male and one quarter female. The largest proportion of the workforce at 47 per cent is the 30-50 year. Interestingly, the over 50 age bracket makes up more than 30 per cent of the industry's workforce (Figure 5).

Figure 5. Gender and age profile for salmonid industry employees.

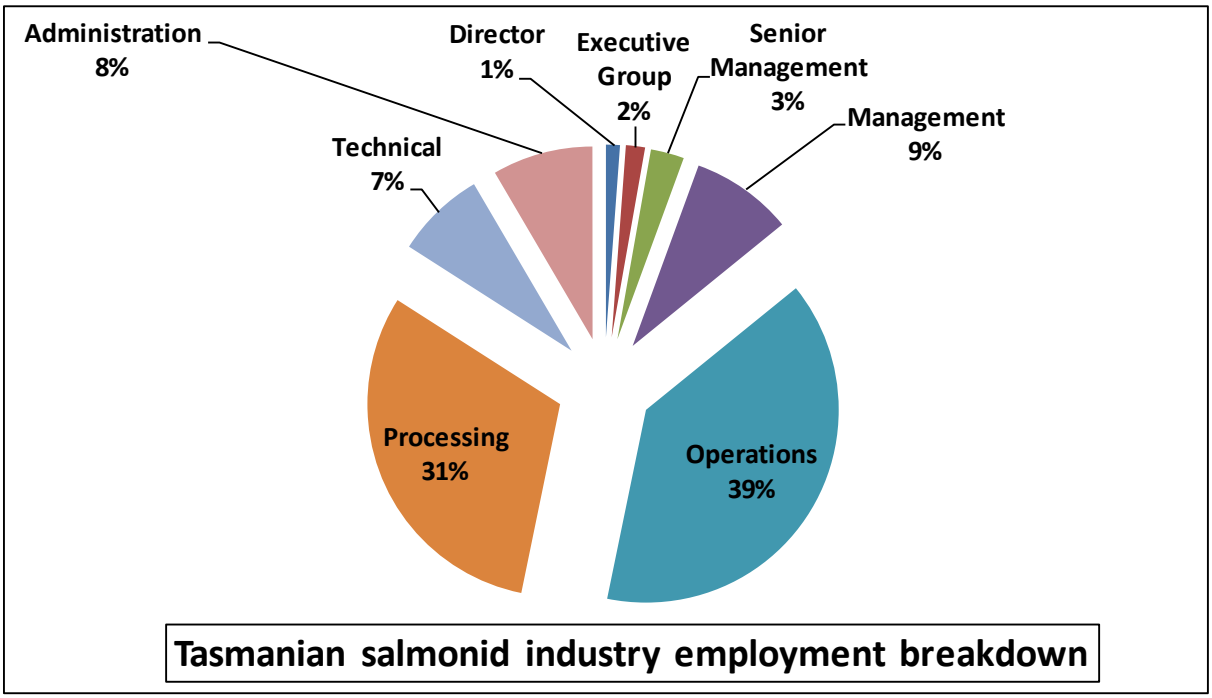


Source: International Salmonid Farmers Association, April 2015

Employment category

Figure 5 below shows industry participants by employment category.

Figure 5. Industry employment categories



Future employment profile

West (2012) estimated that new farms could create a further 800 FTE jobs in the industry over the coming few years and as many as a further 1,100 (1,000 farming, 100 processing) beyond the intermediate term with support for a further 1,233 FTE jobs.

West (2012, pp2-3) also noted that '*It is vital that Tasmania strengthen and grow its private sector. Only the private sector can generate the income that ultimately finances the public sector, and only the private sector is likely to sustain long-term employment in the regions most affected by forestry-sector shrinkage.'* and '*Expanding Tasmania's traded private sector is the key to long-term diversification and economic security for Tasmanians.'*

Future potential economic value of the industry

Tasmanian Atlantic salmon is a high value/premium quality product in which Tasmania has a distinct advantage when it comes to growing, processing and selling salmon to domestic and export markets. Perhaps more importantly, the industry and its likely expansion is providing a valuable addition to a sluggish Tasmanian economy.

The industry continues to experience strong sales momentum despite the current challenging economic environment. Sales are proving resilient with sales approaching $550 million at wholesale levels. Ongoing investment plans are likely to lead to increasing production and employment opportunities to meet the local and international demand.

The Global Context

The International Salmonid Farmers Association marked its 25th anniversary by releasing the first-ever socio-economic report on global salmonid farming industry in March 2015. The report, entitled *Salmonid Farming: Sustaining Communities and Feeding the World*[33], found that global salmonid farmers produce 14.8 billion meals every year from only 0.00008 per cent of the world's oceans. The report also found the global salmonid farming industry produces $10 billion (USD) worth of salmonid each year, creates 121,000 direct and indirect jobs around the world and stimulates thousands more spin-off jobs and economic growth in a wide variety of other sectors.

Conclusion

The salmon farming sector helps drive rural economic diversification by directly and indirectly creating jobs, further supporting small businesses and stimulating ongoing, transferable research and development innovation. Salmon farming may well represent the most promising approach to help revitalise our regional communities and reverse the trend of young people leaving rural areas to work and live in larger urban centres. The majority of aquaculture jobs are full-time.

The TSGA ask that the Committee note:

- the significant economic and employment contribution the salmon industry makes to Tasmania and in particular to regional and rural communities; and
- the future potential economic and employment growth the industry may provide

[33] http://www.salmonfarming.org/events/14-8-billion-meals-and-121000-jobs/

TOR (f) Any other relevant matters

Stakeholder Engagement

The industry is committed to genuine, open and ongoing consultation with communities and stakeholders.

The salmon industry has significantly expanded its ongoing commitment to stakeholder engagement over the last five years with each company now employing at least one dedicated employee to community engagement.

Regular engagement activities include, but are not limited to, the following:

- open Days and information sessions;
- community and stakeholder meetings;
- stakeholder presentations;
- Huon and Channel Collaboration participation;
- west Coast Community forum;
- presentation at Environmental Defenders Office (EDO) conference;
- sustainability Reporting;
- community attitude research to inform engagement planning and issue identification;
- additional web-based information;
- social media via Facebook and Twitter;
- TSGA Meetings with EDO, Tasmanian Aquaculture Reform Alliance (TARA) and Environment Tasmania (ET);
- direct complaint resolution;
- sponsorship and donations to community groups;
- grant programs;
- public sessions on collaborative research with industry;
- presentations and engagement with a wide-range of community and interest groups including Probus, Rotary, Southern Coastcare Association for example; and
- engagement with local aboriginal communities.

The industry is responsive to stakeholder feedback as illustrated below (this list is not exhaustive and provides an example of the types of issues and engagement undertaken to address community and stakeholder concern).

Topic	**Community concerns with service providers**
Category (Environmental, Social, Economic)	Social
Stakeholder Group	Strahan Streets Working Group (SSWG), wider community, transport service providers
How we engaged	Meetings with Industry, transport companies and SSWG Relayed process to Community Forum
What stakeholders told us	To improve truck behaviour on Strahan streets

Our response	Industry drafted a Truck Behaviour Code of Conduct in conjunction with the Transport companies and SSWG
Outcomes	Improvement of truck driver behaviour on the streets of Strahan

Topic	**Wildlife Interactions**
Category (Environmental, Social, Economic)	Environmental
Stakeholder Group	ENGOs, community
How we engaged	Sustainability Report Advisory Committee/Sustainability dashboard Industry Partnerships with wildlife organisations Listened and acknowledged media EDO conference Community feedback Seal Management Forums with DPIPWE – Wildlife Operations, Wildlife Management Branch
What stakeholders told us	Interactions with protected wildlife is not acceptable
Our response	Employ dedicated wildlife management team Develop protocols Educate Staff Invest in infrastructure Invest in staff training Continued adherence to government regulations - Seal Management Framework
Outcomes	Significant reduction in entrapped birds and bird mortality Significant reduction in seal mortality Significant reduction of interactions with all wildlife

Topic	**Reduction in noise from farms**
Category (Environmental, Social, Economic)	Social, environmental
Stakeholder Group	Neighbours to operations
How we engaged	One on one liaison, respond to complaints
What stakeholders told us	Some farms disturb rural peace and quiet
Our response	Introduce noise reduction protocols Work with regulators Engage acoustic specialists Invest in sound mitigation Educate staff New policies
Outcomes	Significant noise reductions Reduction in complaints Improved neighbour relationships

Topic	**Corporate, Environmental and Social (CSE) certification standards**
Category (Environmental, Social, Economic)	Environmental/social
Stakeholder Group	ENGO's/Community groups
How we engaged	Sustainability Report Advisory Committee Work with Environmental NGOs Listened and consumed media Community feedback

	Certification holders IMAS/UTAS
What stakeholders told us	Third party certification would give some level of assurance that environmental impacts of salmon farming are being minimised
Our response	Certification to world-leading standards (e.g. ASC, Global GAP and BAP) Aligned internal reporting systems All companies Improved practices across all certification parameter's All companies improved transparency
Outcomes	All three companies are accredited under 3rd party certification schemes

Conclusion

The industry has developed and initiated an adaptive stakeholder engagement approach to ensure that there are ample opportunities for communities, interest groups and other stakeholders to engage in a range of consultative processes and discussions in relation to marine farming management and ongoing industry development.

That the committee note;

- that the industry directly invests in stakeholder and community engagement on an ongoing basis; and
- that the industry actively participates and proactively engages with stakeholders and communities across a wide range of topics and utilises a range of activities and methods to do this.

Appendix 1: Development of waterway health monitoring programs

Supporting research

A number of environmental research and monitoring programs have underpinned and contributed to management of salmonid farming in Tasmania. In particular, a brief summary (in chronological order) of important developments in this area includes the following:

- 1996 – Huon Estuary Study (HES) – three year project undertaken by the CSIRO to improve knowledge of impacts of salmonid farming on a range of environmental parameters (i.e. dissolved oxygen, turbidity, nutrients, chlorophyll a and microalgal assemblages).
- 2002 – Aquafin CRC Project 4.2(2)"A whole of ecosystem assessment of environmental issues for salmonid aquaculture" and "Monitoring the Huon Estuary and D'Entrecasteaux Channel for the Environmental Effects of Finfish Aquaculture" – system-wide investigations of the Huon Estuary and D'Entrecasteaux Channel to improve understanding and assimilative capacity of these waterways to sustainably support finfish farming across a range of production levels, and a risk-based assessment of the monitoring techniques required to validate these assumptions. The determination of individual TPDNOs by the Secretary (DPIPWE) for the Huon Estuary and D'Entrecasteaux Channel was a management initiative that was implemented in response to these studies.
- 2004 – Aquafin CRC Project 4.1 (Extension) "Guide to the assessment of sediment condition at marine finfish farms in Tasmania" – an assessment of the rate of recovery associated with fallowing practices and the development of acceptable methodologies for farm based monitoring of environmental impacts in Tasmanian waterways.
- 2009 – Initiation of the BEMP - consistent with the recommendations provided by Aquafin CRC Project 4.2(2)) - to provide a comprehensive assessment of the ecological condition in the Huon Estuary and D'Entrecasteaux Channel.
- 2013 – Evaluation of the BEMP data from 2009-2012 – a review undertaken by IMAS to evaluate the BEMP data in the context of the major anthropogenic and environmental drivers and key ecosystem processes with the Huon Estuary and D'Entrecasteaux Channel.
- 2014 – IMAS Proposed FRDC Project (2015-024) "Managing ecosystem interactions across differing environments: building flexibility and risk assurance into environmental management strategies" – three year project aimed at understanding potential broadscale interactions with reef systems and validation of local scale sediment condition indicators in new salmonid farming regions.

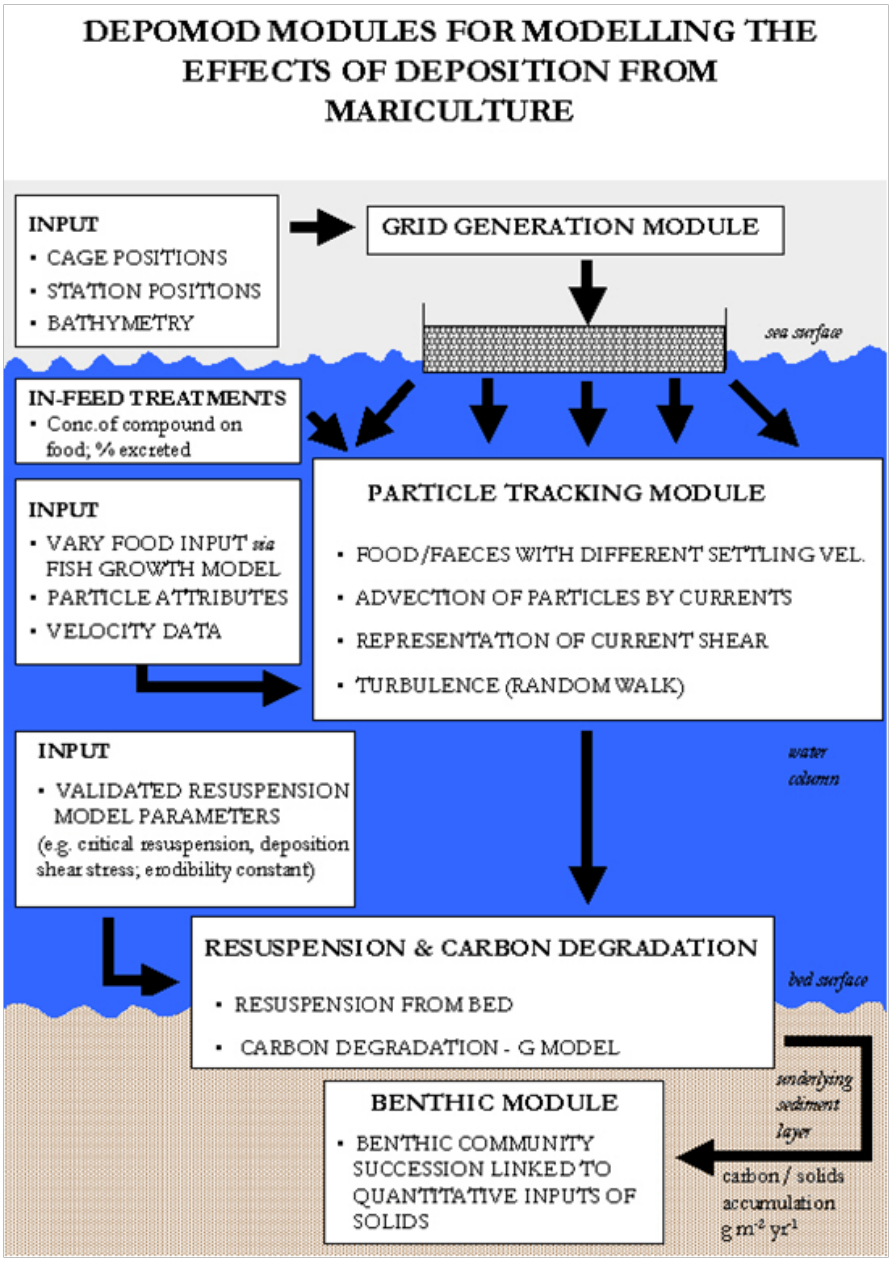
Management tool example

DEPOMOD is just one example of an industry funded waterway health management tool that assists industry manage its impact on waterway health.

The DEPOMOD model is used for planning and monitoring of sea cage fish farms and was specifically developed for Atlantic salmon farms. With site-specific information on the current velocity and direction, depth and husbandry characteristics such as feed input and

cage layouts, predictions of waste, faecal and feed deposition and associated benthic impact near the farms can be obtained. This can assist with predicting the environmental performance of the farm, regulation of the farms and provide guidance to the industry on selection of sites with good husbandry characteristics. Several peer reviewed academic papers have been published describing this work, and review and update of the program is ongoing. Industry participants now use DEPOMOD to run simulated production cycles on several of their leases, in an attempt to better understand the likely environmental footprint at a specific site given a set of production parameters (see Figure 6).

Figure 6. Schematic of DEPOMOD process.



Monitoring in practice

- Across the 48 marine farm leases (35-40 operational at any one time) in the industry, 65-70 annual lease surveys are completed that will include almost 2,000 remotely operated vehicle (ROV) dives to video the sea floor under cages (at positions directed by the Secretary of DPIPWE) and at compliance points and reference sites outside the lease. Sites for monitoring are selected by the regulatory authority according to highest levels of organic enrichment from feed input and in-situ net cleaning over the previous 12 month period. In addition, each company conducts numerous daily, weekly and monthly monitoring programs measuring and recording a range of water quality parameters to aid in stock and lease management.

Appendix 2: Tasmanian Salmonid Industry – Statutory Compliance List (2015)

Commonwealth Legislation

Aboriginal and Torres Strait Islander Heritage Protection Act, 1984
Aboriginal Lands Act, 1995
Australian Heritage Council Act, 2003
Coastal Waters (State Powers) Act, 1980
Competition and Consumer Act, 2010
Environmental Protection and Biodiversity Conservation Act, 1999
Environmental Protection (Sea Dumping) Act 1981
Export Control Act, 1982
Export Control (Fish and Fish Products) Orders, 2005
Greenhouse Gas Emissions Act, 2005
Heritage Commission Act, 1975
Maritime Safety Authority Act, 1990
National Environment Protection Council Act, 1994
Navigation Act, 2012
Quarantine Act, 1908
Resource Assessment Commission Act, 1989
Sea Installations Act, 1987
Seas and Submerged Lands Act, 1973

Tasmanian Legislation

Aboriginal Relics Act, 1975
Agricultural and Veterinary Chemicals (Tasmania), 1994
Agricultural and Veterinary Chemicals (Control of Use), 1995
Animal Health Act, 1995
Animal Welfare Act, 1993
Crown Lands Act, 1976
Dangerous Goods Act, 1998
Energy Coordination and Planning Act, 1995
Environmental Management and Pollution Control Act, 1994
Farm Water Development Act, 1985
Fire Service Act, 1979
Food Act, 1998
Forest Practices Act, 1985
Gene Technology Act, 2001
Genetically Modified Organisms Control Act, 2004
Groundwater Act, 1985
Historical Cultural Heritage Act, 1995
Hobart Regional Water (Arrangements) Act, 1996
Hydro-Electric Corporation Act, 1995
Inland Fisheries Act, 1995
Land Titles Act, 1980
Land Use Planning and Approvals Act, 1993
Litter Act, 2007
Living Marine Resources Management Act, 1995
Local Government Act, 1993
Marine Farming Planning Act, 1995
Marine and Safety Authority Act, 1997
Mineral Resources Development Act, 1995
National Parks and Reserves Management Act, 2002
Natural Resource Management Act, 2002
Nature Conservation Act, 2002
Poisons Act, 1971
Pollution of Waters by Oil and Noxious Substances Act, 1987
Primary Produce Safety Act, 2011
Public Health Act, 1997
Rivers and Water Supply Commission Act, 1999
Roads and Jetties Act, 1935
Sewer and Drains Act, 1954
State Coastal Policy Validation Act, 2003
State Policies and Projects Act, 1993
Tasmanian Building Act, 2002
Tasmanian Planning Commission Act, 1997
Threatened Species Protection Act, 1995
Water Management Act, 1999
Water Quality Act, 1999
Whales Protection Act, 1988
Wildlife Regulations, 1999
Work Health and Safety Act, 2012
Weed Management Act, 1999

Other Guidelines – policies, codes of practice, strategies, management plans

Aquatic Animal Welfare Guidelines, National Aquaculture Council, 2004
Broadscale Environmental Monitoring Program (BEMP)
Convention Concerning the Protection of World Cultural and Heritage Areas
Global Reporting Initiative (GRI) Sustainability Reporting
Marine Farming Development Plans and Licences
Marine and Safety (Mooring) By-laws, 1998
Seal and Fishery Interaction Management Strategy, 2002
State Coastal Policy, 1996
State Policy on Water Quality Management, 1997
Statewide Baseline Water Quality Monitoring Program
Tasmanian Marine Protected Areas Strategy, 2001
Tasmanian Salmonid Farming Industry Code of Practice, 2004
Environmental Guidelines for the Use of Recycled Water in Tasmania, December 2002
Tasmanian Biosolids Reuse Guidelines, August 1999

Appendix 3: Industry Committee, Working Group and Forum Representation

Forum	Position	Frequency
TSGA Technical Committee	Chair, Secretary	Minimum 6 times per year
National Aquaculture Council (NAC)	Director	Minimum 4 times per year
Tasmanian Aquaculture Council (TAC)	Director	Minimum 4 times per year
Tasmanian Fisheries Research Advisory Board (TasFRAB)	Director	Minimum 4 times per year
Environmental Resource Allocation Group (RAG)	Member	Annually
Area Management Agreement Management Group	Chair	As required
Finfish Resource Allocation Group (RAG)	Member	Annually
International Salmonid Farmers Association (ISFA)	Member	Annually
Macquarie Harbour Technical Working Group	Member	As required
Macquarie Harbour Communications Group	Member	As required
Macquarie Harbour Area Management Agreement (AMA) Working Group	Member, Secretary	As required
Seal Management Framework Working Group	Member	As required
Marine Predators Working Group	Chair, Secretary	As required
Salmonid Health Working Group (SHWG)	Chair, Secretary	Minimum 4 times per year
Tasmanian Salmonid Health Surveillance Program Review Working Group	Industry Representative	Annually
Primary Industry Biosecurity Action Alliance (PIBAA)	Member	Minimum 4 times per year
Seafood Training Tasmania (STT)	Director (pending)	Minimum 4 times per year
Amoebic Gill Disease Working Group	Chair	Minimum 4 times per year
Food Industry Advisory Committee	Member	As required
Selective Breeding Technical Committee	Member	Minimum 3 times per year
Seafood CRC	Director	Annually
Fisheries Research and Development Council (FRDC)	Member	As required
INFORMD Stage 2 Writing Group	Industry Representative	Minimum 4 times per year
Tasmanian Chamber of Commerce & Industry (TCCI)- Infrastructure Working Group	Member	Minimum 2 times per year
Australian Maritime Safety Authority (AMSA) Tasmanian State Stakeholder Advisory Group (SSAG)	Industry Representative	As required
Australian Maritime Safety Authority (AMSA) Fishing Industry Advisory Committee	Industry Representative	Minimum 2 times per year
Broadscale Environmental Monitoring Program (BEMP) Working Group	Member	As required
Primary Industry Skills Working Group	Industry Representative	As required
Biosecurity Working Group	Member	As required
Tasmanian Firearms Consultative Committee	Member	Minimum 4 times per year
Marine Pest Sectoral Committee	Industry Member	Minimum 4 times per year
AquaPlan Steering Committee	Industry Representative	As required
National Aquaculture Strategy Working Group	Industry Representative	As required
West Coast Community Forum	Chair	Minimum 3 times per year
Macquarie Harbour DO Working Group	Chair	Weekly until further notice
AgriGrowth Advisory Group	Industry Representative	Minimum 2 times per year
Communication Advisory Group (CAG)	Chair, Secretary	Monthly
Biosecure Fish Facility Management Committee	Member	Minimum 4 times per year

Appendix 4: Industry Third party Accreditation and Standard Scheme

Requirement of Standard	Aquaculture Stewardship Council (ASC)	Best Aquaculture Practices (BAP)	Global GAP
Third party certification body	✓	✓	✓
Audit reports made publically available	✓	-	-
Local and national legal requirements and regulations			
Compliance with local and national legal requirements and regulations	✓	✓	✓
Local biodiversity and ecosystem function			
Benthic Biodiversity and benthic effects	✓	✓	✓
Water quality	✓	✓	✓
Nutrient release from production	✓	✓	✓
Critical or sensitive habitats and species	✓	✓	✓
Interactions with wildlife	✓	✓	✓
Biosecurity			
Biosecurity Management	✓	✓	✓
Area Management Agreement	✓	✓	✓
Escapes Management	✓	✓	✓
Resource Use			
Third party certification of feed suppliers	In development	-	✓
Raw materials in feed	✓	✓	✓
Non-biological waste from production	✓	✓	✓
Non-therapeutic chemical inputs	✓	✓	✓
Energy consumption and GHG emission accounting	✓	-	✓
Fish Health			
Animal welfare	✓	✓	✓
Fish Health Management Plan	✓	✓	✓
Dedicated Fish Health professionals	✓	✓	✓
Stocking densities	-	✓	✓
Responsible disposal of mortalities	✓	✓	✓
Controls on chemical, therapeutant and antibiotic use	✓	✓	✓
Maximum level of viral disease-related mortality	✓	-	-
Maximum unexplained mortality rate	✓	-	-
Harvest, transport and handling criteria	✓	✓	✓
Social Responsibility			
Workplace Health and Safety criteria	✓	✓	✓
Human Resources criteria (discrimination, access to union, wages, conflict resolution)	✓	✓	✓
Contractor management criteria	✓	✓	✓
Education and training criteria	✓	✓	✓
Stakeholder Engagement			
Community Engagement criteria	✓	✓	✓

Indigenous Engagement criteria	✓	✓	-
Assessment of company's impact on access to resources	✓	✓	✓
Freshwater			
Smolt Production	✓	-	✓
Third party certification of smolt suppliers	-	-	✓
Food Safety			
Food safety criteria	✓	✓	✓
Transparency of farm-level performance data			
Requirement for transparency of farm-level performance data	✓	-	o
Publicly available information			
Lethal Wildlife Interactions	✓	-	o
Unidentifiable transmissible agents	✓	-	-
OIE-notifiable disease detected on farm	✓	-	-
Estimated Unexplained Loss (EUL) by production cycle	✓	-	-
Therapeutic Treatments	✓	-	o

o Represents information made publically available which is not a requirement of the certification.