



Report from the Global Salmon Conference, Hobart 2017

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CHRIS G. CARTER
CATRIONA MACLEOD
JEFF ROSS
CALEB GARDNER
MAREE FUDGE
JANA BANNISTER



FRDC





Institute for Marine and Antarctic Studies, University of Tasmania,
Private Bag 49, Hobart TAS 7001

Enquiries should be directed to:
Professor Chris Carter
Institute for Marine and Antarctic Studies
University of Tasmania
Private Bag 49, Hobart, Tasmania 7001, Australia
Chris.Carter@utas.edu.au

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FRONT AND BACK COVER PHOTOS:
PETUNA AQUACULTURE, HUON AQUACULTURE,
TASSAL AND IMAS

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FOREWORD

The Tasmanian salmon industry is seeking to grow production safely and sustainably in the next two decades, further increasing the tangible benefits to the Tasmanian community. Our aim, through the Tasmanian Global Salmon Symposium partnership, is to deliver this by being the most environmentally sustainable salmon industry in the world – creating an industry of which all Tasmanians can be proud.

The Tasmanian Global Salmon Symposium initiative began in 2017 following discussion between Professor Brigid Heywood, the Deputy Vice-Chancellor Research at the University of Tasmania, and Frances Bender, Executive Director of Huon Aquaculture Group Ltd. The Tasmanian Global Salmon Symposium partnership brought together the Tasmanian Salmonid Growers Association and the three Tasmanian salmon farming companies, Huon Aquaculture Group Ltd., Petuna Aquaculture Pty Ltd and Tassal Group Ltd; the State Government, through the Environment Protection Authority, Department of Primary Industry, Parks, Water and Environment and Biosecurity Tasmania; and the University of Tasmania. The Fisheries Research and Development Corporation worked with the initial partners and later joined as a formal Symposium partner. Contributions were

provided by the three Tasmanian salmon farming companies (Huon Aquaculture, Tassal and Petuna Aquaculture) and the Australian Government through the FRDC; the State Government; the Environmental Protection Authority; and the University of Tasmania.

Three themes emerged from partner discussions: *Future Farming*, *Biosecurity* and *Environment*.

Planning for a Blue Future brings together the information gathered and the thinking developed on the three themes during the *Planning for a Blue Future* Global Salmon Conference held in Hobart, Tasmania, in December 2017. It provides discussion from the three conference themes and identifies important aspects for the future of research and the salmon industry. An important feature of this *Planning for a Blue Future* report are impact statements from key partners, which capture some of the major outcomes from this event.

PROFESSOR BRIGID HEYWOOD

Chair Steering Committee

PROFESSOR CHRIS CARTER

Chair Science Committee

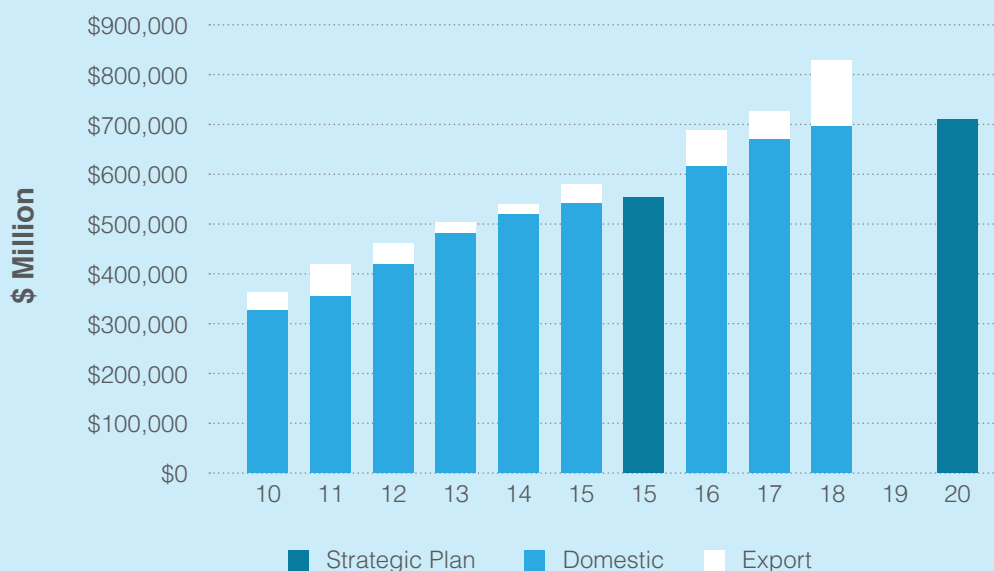
BACKGROUND

PHOTO: TASSAL



TASMANIAN SALMONID SALES

Fiscal years

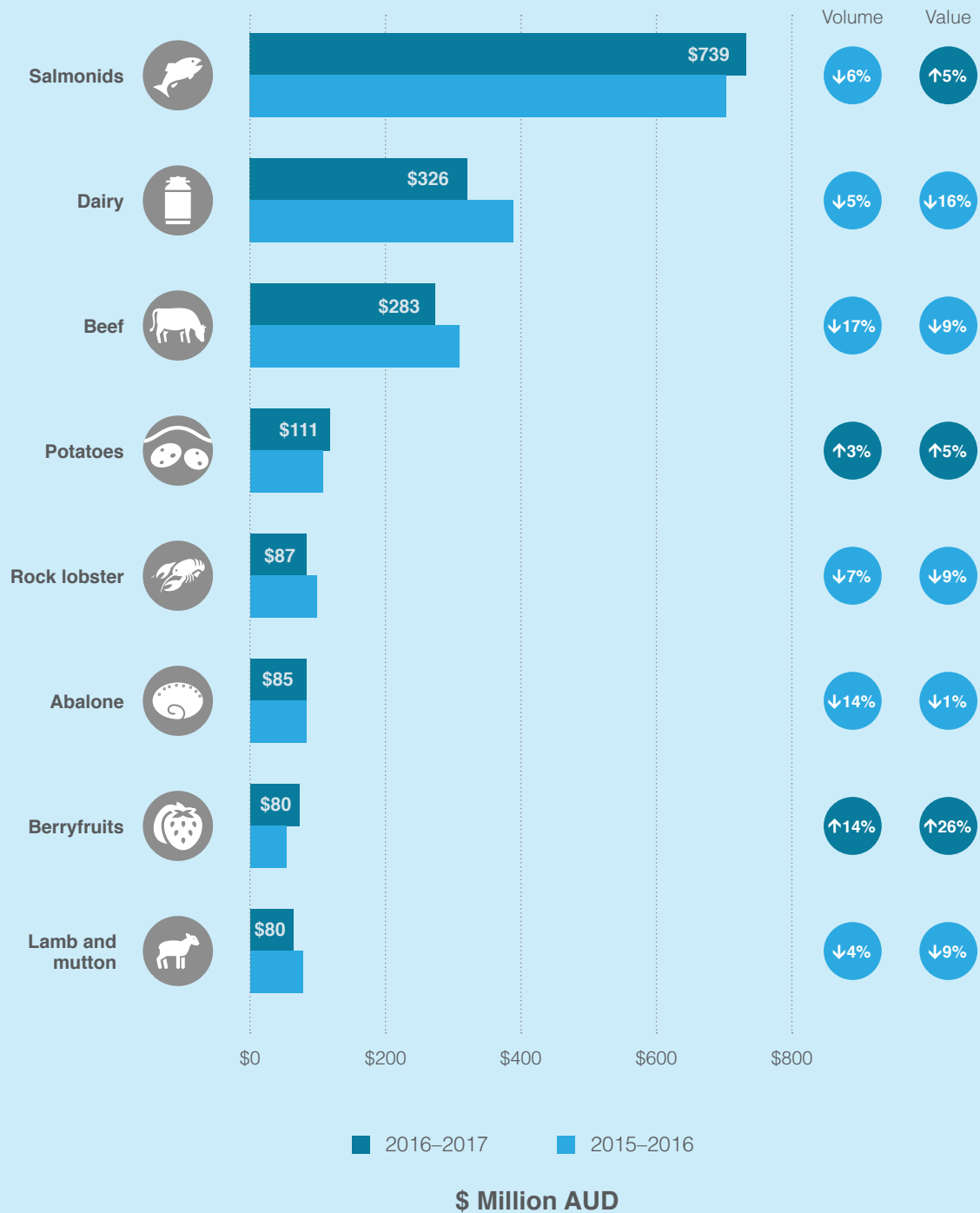


Tasmanian Salmonid Industry Facts

Information from TSGA (received on 29 Nov 2018) and Mobsby D, 2018, Australian fisheries and aquaculture statistics 2017, Fisheries Research and Development Corporation project 2018-134, ABARES, Canberra.

- From an initial 56 tonne harvest in 1986-87, in 2018, the Tasmanian salmonid farming industry harvested in excess of 60,000 tonnes.
- From this small beginning, the Tasmanian industry has become the most important farming activity in Tasmania with significant employment benefits in most regional areas of the State. All Head Offices are based in Tasmania.
- 2017/18 industry value of \$830M, including exports of \$135M.
- Largest aquaculture industry in Australasia.
- Largest seafood industry in Australia.
- Tasmanian seafood production is dominated by salmonid aquaculture, which accounts for over three quarters of the value of production.
- Strong domestic prices contributed to gross value of salmonids increasing by 4.9% in 2017/18
- Direct and indirect employment impact is estimated at 5,000 FTEs.
- Largest farming industry in Tasmania. The following information is from the *Tasmanian Agri-Food ScoreCard 2016-17*.

KEY CONTRIBUTORS TO GROSS FOOD VALUE IN TASMANIA



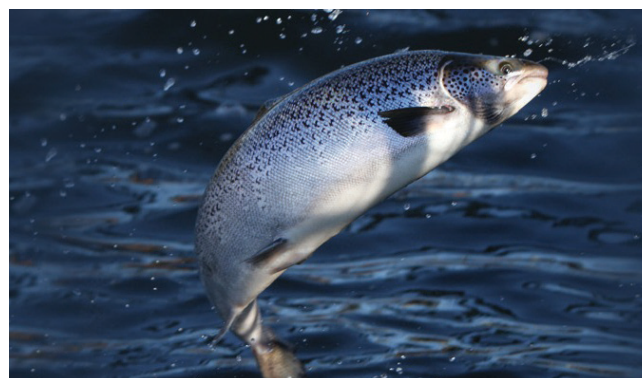
This report comes from the Tasmanian Global Salmon Symposium partnership and reflects the international conference, *Planning for a Blue Future*, that was held in Hobart in December 2017. It contains information about the conference, provides a record of the knowledge shared at workshops and provides a summary discussion on each of the three themes of the conference: Future Farming, Biosecurity, and Environment.

The conference program can be found in Appendix 1.

PHOTO: IMAS



PHOTO: PETUNA AQUACULTURE



The three themes of the conference, *Planning for a Blue Future*:

- 1 **Future farming**
 - Offshore aquaculture
 - Land-based / Recirculating aquaculture systems (RAS)
 - Integrated multi-trophic aquaculture (IMTA)
- 2 **Biosecurity**
 - Biosecurity status and future risk
 - Biosecurity planning
 - Production management
- 3 **Environment**
 - Global issues, the Tasmanian context and public perception
 - Environmental requirements for planning and regulation
 - Information management and transparency
 - Common themes

A BOLD VISION FOR THE TASMANIAN SALMON INDUSTRY

The Tasmanian salmon industry is seeking to grow production safely and sustainably in the next two decades, further increasing the tangible benefits to the Tasmanian community. The overarching aim of the Tasmanian Global Salmon Symposium partnership is to deliver this by supporting the industry to be a world leader in environmental, fish health and biosecurity sustainability – creating an industry of which all Tasmanians can be proud.

Both the salmon aquaculture industry members and the Tasmanian Government recognise that to achieve this bold vision for a world class salmon industry in Tasmania, a clear focus is required on development of both sea and land-based farming operations, the utilisation of the best available technologies, and collaboration with researchers and aquaculture innovators. This includes consideration of farming systems that promote sustainable growth and innovative developments such as off-shore (high energy) technology.

The Tasmanian Government, the independent industry regulators and salmon aquaculture industry members will also be confirming that the highest standard of both environmental and biosecurity regulatory controls are in place to ensure the industry's environmental and fish health credentials stand amongst the best in the world as the industry grows. This is in line with the Tasmanian Government's vision for the salmon aquaculture industry detailed in its Sustainable Industry Growth Plan for the salmon industry.

PHOTO: PETUNA AQUACULTURE



The Tasmanian Government's vision for the salmon aquaculture industry, as detailed in its *Sustainable Industry Growth Plan for the Salmon Industry*, includes the core objectives of:

- Maintaining public confidence in the salmon industry;
- Improving the efficiency, effectiveness and transparency of the industry's environmental and biosecurity systems; and
- Supporting industry growth.

PLANNING FOR THE FUTURE — SUMMARY FROM THE CONFERENCE

The University of Tasmania's Institute for Marine and Antarctic Studies (IMAS) hosted the international conference, *Planning for a Blue Future*, from 6-8 December 2017, for key salmon aquaculture industry stakeholders and invited international and local research and industry experts in the three identified theme areas: future farming, biosecurity and environment. The conference was initially designed to provide participants with the opportunity to create an agenda for a planned Tasmanian Global Salmon Symposium, which was proposed to be held in 2018. Conference participants included salmon industry and government representatives from Tasmania, Norway, Denmark (including Faroe Islands), Scotland and Canada, representatives from the research community (Tasmania, Norway, New Zealand) and a number of local (Tasmanian) environmental interest groups.

On the first day of the conference, invited international speakers partnered with local experts to provide their insights into the future of salmon aquaculture, through a series of presentations and panel sessions covering the three theme areas: future farming, biosecurity and environment.

On days two and three of the conference, representatives from the industry, science, policy, regulators and non-government organisations came together in a series of workshops. The objective of the workshops was to identify and develop the key issues, concerns, challenges, ideas and opportunities of particular significance to the sustainable development of salmon aquaculture in Tasmania and worldwide across the three theme areas: future farming, biosecurity and environment. The workshop discussions were interesting, wide-ranging and thought provoking, and major progress was made in mapping the challenges within each of the key themes.

Due to the success of the conference in detailing the issues facing the industry and a broad range of actions that could be taken in response, the Symposium partners agreed that the follow-up event proposed for 2018 was no longer required.

Two overarching themes emerged from plenary discussions that participants felt warranted further consideration and action:

- **Social acceptability and community engagement**

It was felt that there was a need to restore and improve community confidence and address negative perceptions of the industry, and that this would require:

- a clear understanding of community concerns and information needs,
- better mechanisms to provide information in a timely and open fashion (transparency).
- a consolidated industry approach, providing data across industry, and
- a consolidated government approach, providing data across different government departments.

- **Trusted multiple use planning and management**

- It was felt that more robust planning processes were needed that take into account multiple resource users (public and private, community and industry), with
- clear planning, monitoring and regulation to address biosecurity issues and the potential for environmental impacts and adverse interactions between users.

Whilst these issues are relevant to existing farming operations, it was noted that current adverse perceptions and concerns within the community may also have been exacerbated by the release of strategic growth plans for the industry into new environments.

PHOTO: IMAS



In the Future Farming session we explored the underlying drivers for adoption of each new technology, what practical issues or concerns we might need to consider, and how the global understanding of these technologies might help with adoption in Tasmania. The discussions were centred on three future farming technologies:

- Offshore Aquaculture;
- Land Based/ Recirculating Aquaculture Systems (RAS); and,
- Integrated Multi-Trophic Aquaculture (IMTA).

PHOTO: TASSAL

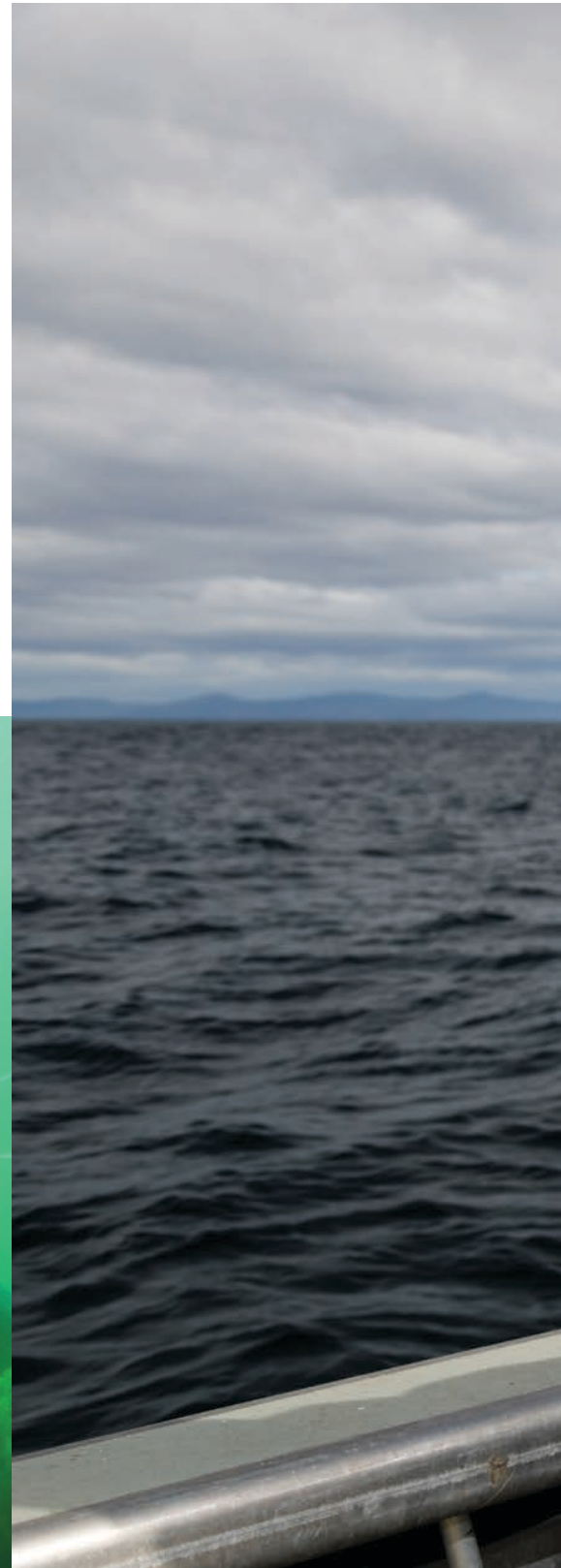


PHOTO: IMAS



FUTURE FARMING



OFFSHORE AQUACULTURE

The definition of “offshore” varies and needs to be clearly articulated when discussing “offshore aquaculture”.

Workshop participants agreed there were two key drivers behind most decisions to move to offshore farming globally and that these were equally relevant to Tasmania. Firstly, offshore development could provide significant capacity for growth. Underpinning the growth priority for Tasmania was an acknowledgement by participants that the salmon industry’s ability to access new water in inshore coastal areas was limited both by the physical/ environmental suitability of sites for farming and by reduced social acceptability for farming in inshore areas (i.e. where the potential for adverse interactions or conflicts with other resource users is greater than for offshore). Secondly, offshore development offers potential to improve management of certain biosecurity risks. Biosecurity was discussed in greater detail in the separate themed session.

Key drivers for offshore aquaculture:

- 1 Increase capacity for growth, and
- 2 Improve management of biosecurity risks.

Notwithstanding the potential benefits, participants identified a number of important practical considerations that needed to be addressed to support offshore aquaculture development into the longer term. Key amongst these was access to suitable technology for farming in remote and hydrodynamically challenging offshore environments. Participants agreed this was not just a case of whether the technologies are affordable, more that offshore technology is a research and development issue worldwide, and the technology is still evolving. Whilst moving offshore may have benefits (environmentally and socially), to be viable long-term, participants suggested that it must be cost-effective and it was noted that “cost-effectiveness” needs to be considered in a whole of business context. For example, offshore aquaculture needs to ensure good production outcomes (welfare, growth, feeding, energy availability, harvesting, marketing, staffing, biosecurity) as well as good environmental outcomes. As such, moving offshore is not just about having appropriate cage technology at a good price.

Key practical considerations:

- 1 Suitable technology, and
- 2 Cost-effectiveness in a whole of business context.

The international participants provided some useful insights and considerations from their experience that they suggested would be useful in discussions regarding offshore development in Tasmania:

- **Definition:** It is important to clearly articulate what we mean when referring to “offshore” development. There were many different definitions of “offshore” amongst the workshop participants, and it was noted that these differences in definition could have a major influence on how such systems aligned with existing planning and management regulations and policy. Differences in perceptions of what is meant by “offshore” could also affect how the industry communicates with the broader community, and the community’s understanding of the industry.
- **Investment:** Large-scale offshore development may require significant capital and practical commitment and investment from both the industry members and the relevant government. In many other countries, this has been achieved with targeted financial investment and subsidies. International partners suggested that it would be wise to explore the potential for this from the outset as it could significantly enhance the rate and nature of any developments.
- **Be ‘Fast Followers’.** If offshore development is a key future farming strategy, then Tasmania should not expect to do all of the research and development to support this by itself. It was acknowledged that although Tasmania was a very progressive industry, it could not hope to compete with the European countries and Canada in developing new farming technologies. The advice to the Tasmanian industry was to look to the rest of the world to ensure that the industry takes up technology from elsewhere as quickly as possible, that is, become ‘fast followers’.

PHOTO: TASSAL



LAND-BASED / RECIRCULATING AQUACULTURE SYSTEMS (RAS)

A recirculating aquaculture system (RAS) is a production unit where the same water is re-used in a closed circuit after passing through a treatment system.

Key drivers for land-based / recirculating aquaculture system:

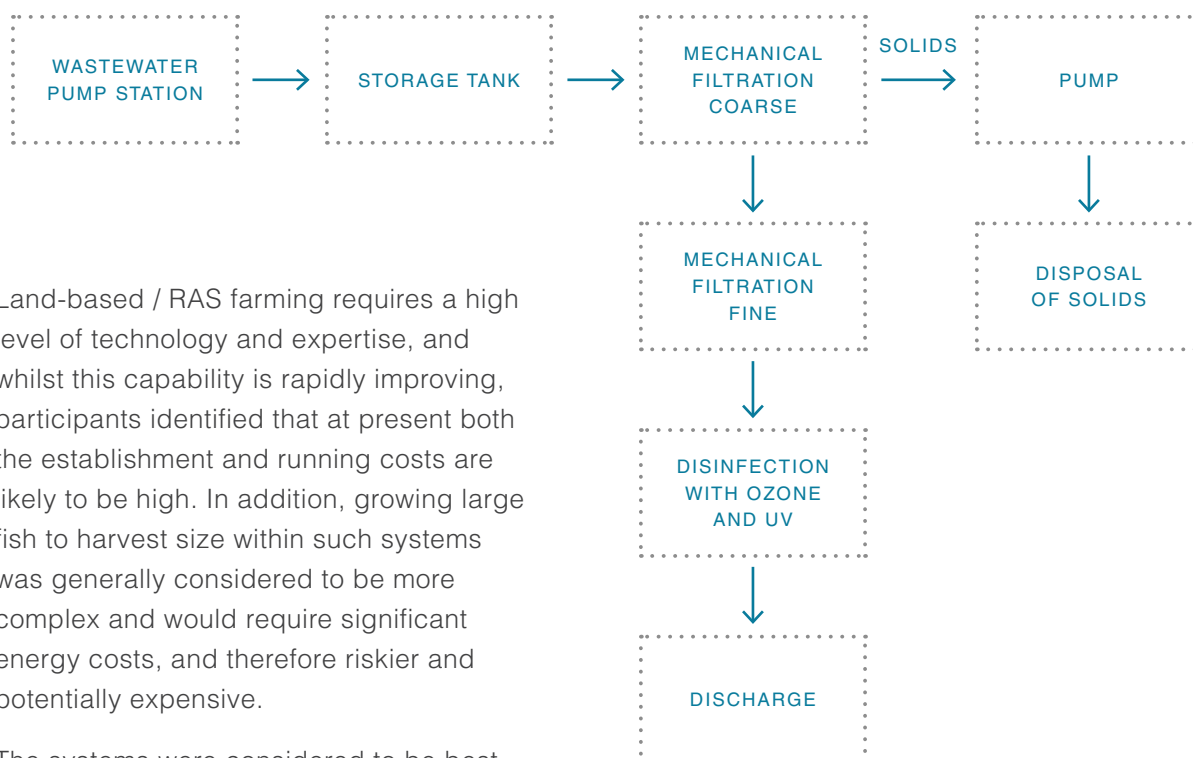
- 1 Increase capacity for growth, and
- 2 Improve social acceptability.

The participants felt that the main drivers for land-based / recirculating aquaculture systems (RAS), as with offshore farming, were growth potential and, to a lesser extent, an acknowledgement that social acceptability of salmon farming may be improved.

With respect to social acceptability, however, it was also suggested that RAS might be perceived to be either less or more sustainable depending on regional differences in environmental or social concerns. For example, where genetic pollution of wild stocks is a key concern then land-based/ RAS farming might be considered a more sustainable farming practice, whereas under other circumstances land-based/ RAS farming might be perceived as “unnatural”.

Potential benefits of land-based / RAS were identified. RAS give farmers more control over growing conditions and timing production stages. An ability to control incoming water quality means farmers can better manage and eliminate many farming risks and fine-tune production parameters. Industry participants acknowledged that the technology currently available would be most effective in supporting more efficient use of existing seawater sites rather than as an alternative to open water farming. For example, to better support the seawater production cycle by using larger smolts or to enable longer fallow periods. It was also noted that land based / RAS farming is a particularly attractive strategy from a biosecurity perspective. Biosecure populations could act as reserve in the event of a major disease event. This was particularly relevant in the Tasmanian context where the grow-out locations for all companies are closely located.

SEAWATER RAS WASTEWATER TREATMENT, BASED ON THE EXPERIMENTAL AQUACULTURE FACILITY AT IMAS TAROONA



Land-based / RAS farming requires a high level of technology and expertise, and whilst this capability is rapidly improving, participants identified that at present both the establishment and running costs are likely to be high. In addition, growing large fish to harvest size within such systems was generally considered to be more complex and would require significant energy costs, and therefore riskier and potentially expensive.

The systems were considered to be best suited to supporting the growth of larger smolts rather than completing the full production cycle. Waste management was also acknowledged as a significant issue with current land-based / RAS farming and the disposal of solid waste materials represented a particular issue as waste from seawater systems can be highly saline.

The collective conclusion was that, as a result of current technology limitations and practical husbandry considerations, land-based / RAS farming could at present only represent a partial solution to seawater farming constraints, and that it was unlikely to support a full cycle grow-out for some time. Notwithstanding the current limitations, it was acknowledged that the technology is improving, particularly in terms of energy efficiency and so the situation could change quite quickly.

It was suggested that some additional investigations might be needed in this area, as perhaps the most recent RAS advances might be more “cost-effective” than generally thought.

Participants supported the need for further work to improve land-based / RAS grow-out strategies and fine-tune operations, and research to support mechanisms to reduce energy costs, identify new waste disposal and utilisation strategies and explore the potential for renewables. Finally, it was once again acknowledged that this was an area where the local industry needs to be more prepared and should definitely take the approach of ‘fast follower’.

INTEGRATED MULTI-TROPHIC AQUACULTURE (IMTA)

Integrated multi-trophic aquaculture (IMTA)

uses commercially viable and environmentally sustainable marine species, based on the concept that the wastes consisting of uneaten feed, faeces and metabolic excretion of one species are recaptured for growth of another

species, thereby potentially mitigating the environmental impact of nutrient enhancement. The scale of IMTA (farm scale or system scale) could affect both the viability of operations and management, and there is a need to develop viable business models.

FLOW OF NUTRIENTS IN IMTA SYSTEMS EXAMPLE OF AN IMTA SYSTEM

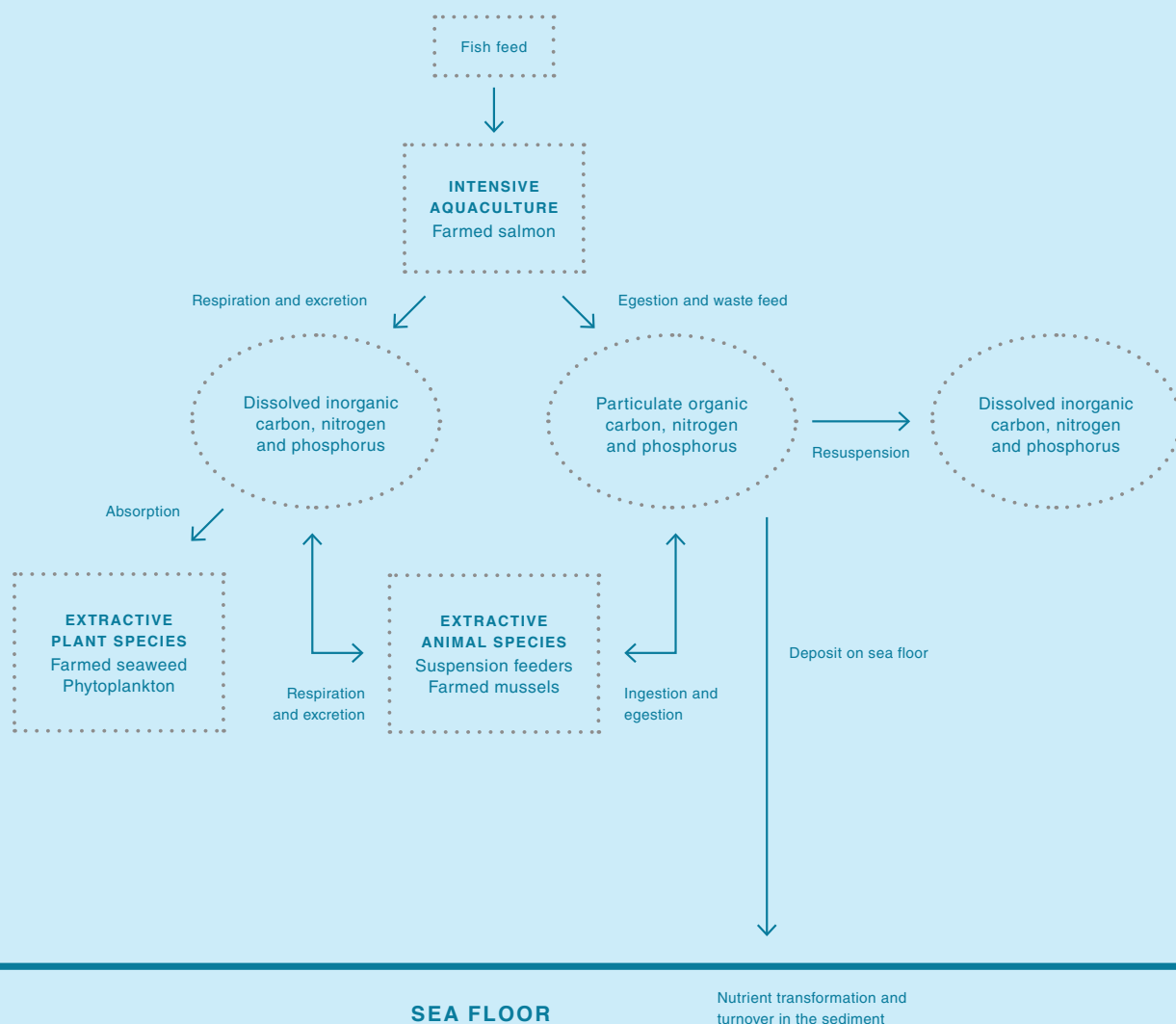
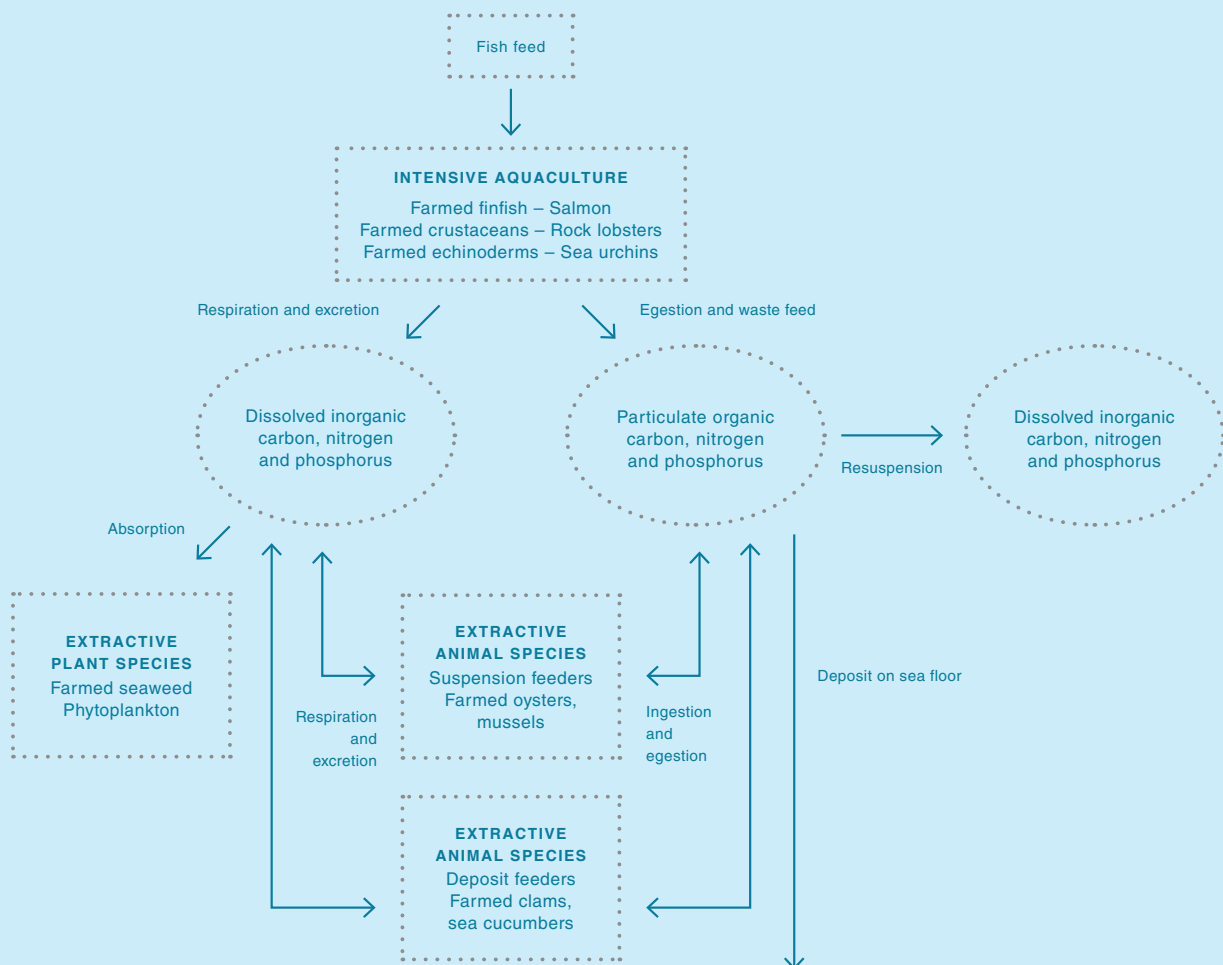




PHOTO: HUON AQUACULTURE

FLOW OF NUTRIENTS IN IMTA SYSTEMS GENERALISED VERSION OF IMTA SYSTEMS



SEA FLOOR

Nutrient transformation and
turnover in the sediment

Participants identified that whilst the fundamental premise of IMTA was that it provided a means to manage and potentially mitigate the environmental impact of finfish-derived nutrient enhancement, a key motivation was often also an increase in societal acceptability in coastal areas (“social licence”). Participants suggested that IMTA can be a more environmentally sustainable approach to farming, given that the co-culture of the selected species is designed to mitigate acknowledged environmental impacts, and in coastal areas it can provide a mechanism to integrate a broader range of aquaculture businesses and activities within a regional community.

It was clear from all participants, however, that unless the value proposition stacked up economically, IMTA was unlikely to be viable. In responding to this concern, participants discussed a range of potential benefits including:

- Product diversification across an enterprise returning benefits in terms of nutrient offsets and the ability to better control environmental impacts;
- Potential to alleviate some business and market risks (depending on the products generated);
- Realistic strategy to do something profitable with salmon aquaculture wastes, and accordingly would provide an opportunity to potentially close the loop around waste management.

This latter in particular has the potential to improve the overall eco-balance / life cycle analysis via co-production models. Participants also considered the potential for new incentives such as nutrient or carbon credits would also contribute to a more appealing business model.

There was discussion around the scale at which IMTA should be undertaken, that is, whether around farms or as an ecosystem wide management strategy. It was agreed that scale could affect both the viability of IMTA operations and the ways in which it is managed. IMTA at a farm scale, where the various species and culture systems are grown in close proximity, can clearly deliver benefits in terms of waste management for the aquaculture operations, with each culture species taking advantage of the other. This is the traditional model of IMTA and there were a number of practical issues noted with this approach that would need to be investigated. These included determining which species, products and markets and how to manage therapeutics, fallowing, food security and biosecurity. It was suggested that it would be relatively easy to characterise a management and regulation model around this co-production strategy.

In contrast, it was identified that IMTA at a system scale presents a more complex suite of management issues. IMTA at this scale is where the various component products are grown within a connected system but are not necessarily cultured adjacent to one another. In this scenario, it was suggested that the planning and regulation requirements would be more difficult, and work may be needed to clarify these.

Participants felt there was a need for the development of viable business models for the two different culture scenarios outlined above. Others pointed out that some overseas studies indicated that even where there was a strong commitment from partners, many IMTA operations have fallen over as a result of poorly structured business plans. Success requires an understanding of how to manage collective expectations and ensure sustainable co-production. A key issue appeared to be clarity about whether the IMTA reflected diversification of a single farming enterprise or a collaborative business among a number of entities.

It was clearly recognised by all participants that IMTA could present a real opportunity for aquaculture development, and that whoever gets the implementation right would have major advantages worldwide.

General comments from the plenary session

Participants in the Future Farming session also identified a number of overarching issues which, whilst relevant to the development and implementation of new technologies, are also important to the salmon farming industry more broadly. These were:

- **Perception:** Participants broadly agreed that the salmon industry as a whole needs to address how it is perceived in the community and to identify ways to address negative perceptions. It was argued that the industry members need to provide open and transparent information about their business models, farming practices and any potential risks (including what we do and do not know or understand).
- **Risk:** As discussed above, the industry as a whole needs to clearly identify the risks with current and new farming practices and quantify these, so that effort and resources can be directed towards understanding and improving management in those areas with the greatest risks, impacts, needs or benefits.
- **Regulation:** It was acknowledged that regulation is needed to support sustainable development, but it needs to be well conceived and risk appropriate. Good regulation will provide the necessary reassurance where adverse impacts are a possibility but will also provide the surety business needs and the mechanisms to support the development of new technologies and alternate production

Suggestions for international salmon symposia from Future Farming

Participants in the Future Farming Session proposed a number of potential topic areas for future international salmon conferences including a set of overarching or common themes as listed below.

FUTURE FARMING

- Clever Farming – new technologies, new species
- Offshore: practical and technological improvements
- Offshore: developing maritime connections
- Offshore biosecurity (tactical and strategic management)
- RAS: Waste optimisation/ management
- RAS: Decreasing production costs for RAS
- IMTA: which species?
- Renewables/ Energy production
- Economics of Future Farming Approaches (Risks and Opportunities)

ENVIRONMENT

- Environmental Management: Freshwater
- Environmental Management: Spatial scale (farm vs. bay vs. region)

BIOSECURITY

- Offshore biosecurity (tactical and strategic management)

- **Collaboration:** Importantly, the Future Farming session identified the need for collaboration – both between government and industry and within the industry. It should not be one approach or technology versus another. Collaboration with the broader community was also identified as an essential pre-requisite to a sustainable industry. This highlighted the need to regain community trust and willingness to support a salmon industry as a key development opportunity for Tasmania. This will require considerable efforts and much better engagement strategies from all parties.

OVER-ARCHING THEMES

- **MANAGEMENT:** Optimising the regulatory environment (trust and flexibility)
- **MANAGEMENT:** Prediction and Risk Assessment – where does modelling fit?
- **ENGAGEMENT:** Social Licence (what is it and how can you obtain it?)
- **ENGAGEMENT:** Strategies for communication (what and who)?
- **FOOD SECURITY:** Where does salmon aquaculture fit in?
- **FOOD SECURITY:** Fish Welfare
- **FOOD SECURITY:** New technologies/ farming systems
- **TASMANIA:** What is the Tasmanian advantage?
- **TASMANIA:** In what way is Tasmania “open for business”?

BIOSECURITY

PHOTO: HUON AQUACULTURE

In this session, we considered the science and practices required by the changing biosecurity profile of a growth industry including into new areas, and utilising new technologies for production. The discussions were centred on three areas:

- Biosecurity status and future risk;
- Biosecurity planning; and
- Production management.

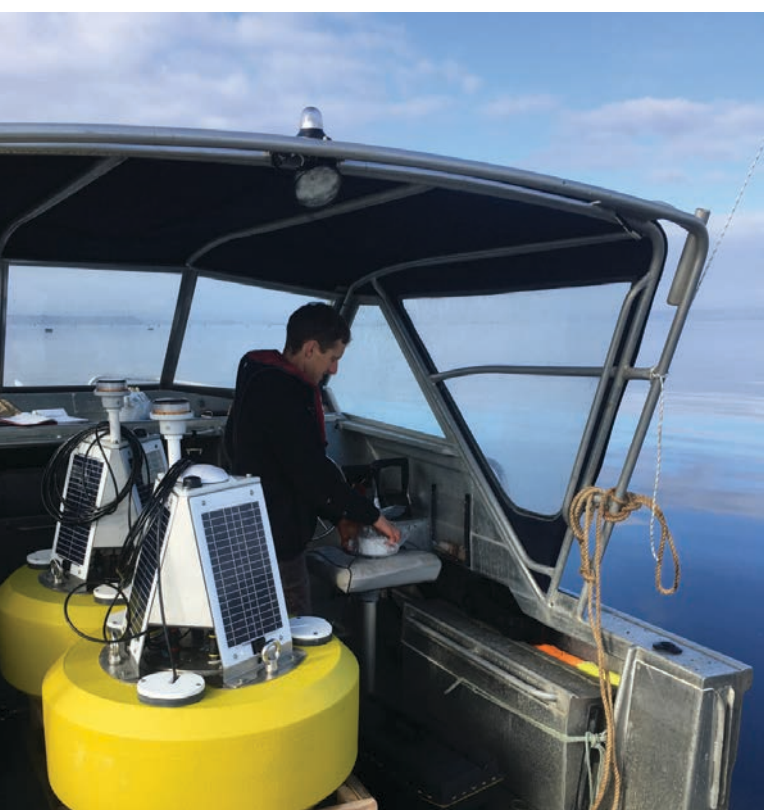


BIOSECURITY STATUS AND FUTURE RISK

It was clear that all salmon farming regions globally have a history of encountering and managing new diseases. In Tasmania, it was reported that although relatively minor in relation to global issues there have been historical challenges with infectious bacterial diseases. It was noted that these are largely resolved today, but concerns remain for new biosecurity problems. In particular, there is currently much concern around pilchard orthomyxovirus (POMV) in Tasmania.

In Tasmania, there is currently much concern around pilchard orthomyxovirus (POMV) as a new biosecurity problem.

PHOTO: IMAS



Presentations from farming regions outside Australia drew attention to the outbreak of infectious salmon anaemia (ISA), and it was identified that this disease was almost catastrophic for some industries. These experiences shared from different countries had common themes:

- New salmon diseases tend to emerge, which means that industries need to be prepared.
- Biosecurity planning allowed industries to cope better when new diseases occurred. Included within planning is ongoing monitoring for detection of pathogens.
- Biosecurity management needs to be part of normal farm operations. Routine production issues are relevant because disease outbreaks are more prevalent when fish are stressed.
- Responses to diseases included both veterinary (e.g. vaccines) and husbandry actions and strategies (e.g. farm spacing).
- Some aspects of biosecurity management require regulation while others are managed through codes of practice. The latter requires industry cooperation especially within connected growing regions.

BIOSECURITY PLANNING

Biosecurity plans have been valuable for reducing and managing biosecurity threats. It was also noted that biosecurity plans require flexibility for regular review and updating.

Extensive discussions were held around planning and the following points were made to help guide future development of biosecurity planning:

- Development is most appropriately led by government, but it also requires producer input.
- Plans in other countries sometimes benefited from categorising planning into different spatial scales, for example national with regional sub-plans. The regional level plans were thought to be needed in some cases because the pattern of farming may differ between regions for example, for single vs. multiple companies, or different types of risks.
- Biosecurity plans required defined but broad scope (exports, domestic or farm) and to consider all production stages.

Participants also suggested the following elements are important to consider for a biosecurity plan:

- Monitoring and reporting procedures;
- Response to outbreaks including triggers and processes for destocking;
- Handling protocols for moribund and dead fish;
- Farm siting (e.g. spacing);
- Farm management procedures (e.g. cohort management);
- Movement controls on fish, vessels and people between sites/farms;
- Consideration of other vectors (e.g. feed);
- Hatchery controls;
- Distribution of smolt;
- Broodstock isolation;
- Specific / unique risks to the system (e.g. any risks from pilchard biology in the case of POMV);
- Capability gaps (e.g. diagnostic or vaccine needs); and
- Strong communication networks.

Participants suggested that biosecurity plans ideally identify target and/or aspirational settings for biosecurity where targets cannot be implemented immediately. It was indicated that this would help apply pressure for change acknowledging that change elsewhere had at times been difficult without the trigger of a disease crisis. Setting aspirational targets was also felt to enable progressive improvement through the life of a biosecurity plan. It was noted that an Australian national biosecurity model in development for terrestrial animals and plants could be used to assist salmon.

It was acknowledged that many elements of biosecurity within a plan need to be enforceable and appropriately legislated. An approach that was discussed for Tasmania was to consolidate regulatory processes, disclose all monitoring data to the public, include a voluntary code of practice (which is monitored by the regulators), and ensure periodic reviews to identify failures and successes. Finally, it was noted that risk matrix approaches are widely used and help ensure biosecurity plans and actions under plans are focused.

PHOTO: IMAS



Tasmanian Biosecurity: Snapshot of Current Status (2018)

Biosecurity in particular emerged as the priority issue of the conference. Biosecurity is an unseeable threat with the potential to decimate existing production levels, as well as preventing industry growth. In 2018, the industry accepted that current biosecurity practices needed to be revised, refreshed and renewed. Work began in January 2018 on developing a new Biosecurity Blueprint. This commitment to “Develop an industry-wide Biosecurity Program” is a shared priority of the Tasmanian Government and is an identified priority in the *Sustainable Industry Growth Plan for the Salmon Industry (2017)*.

The Biosecurity Blueprint will replace the *TSGA Biosecurity Program 2014* and it will also contain a strategic plan and communication plan for implementation.

The development of a new TSGA Biosecurity Blueprint has progressed during the course of 2018 and it has involved and will be adopted by all of industry in conjunction with other key stakeholders (i.e. Tasmanian government, MAST, DAWR, TSIC). The Government is strongly committed to continuing to underpin Tasmanian biosecurity. As a priority, the Government will work with the industry to develop the new Biosecurity Blueprint that ensures the industry works to the highest biosecurity standards. It will include assurances of protection for the inland salmonid populations from any risk of fish disease arising from the land-based facilities of the marine farmers. This approach will be consistent with the Government’s complete overhaul of the State’s biosecurity legislation and the intention is to have the new program approved under the proposed new Biosecurity Act. If legislative change is required in order to implement elements of the new Biosecurity Program, it will be prioritised.

To be effective, the Blueprint must be consistent with and complement other industry codes of practice or agreements and the principles outlined within the Tasmanian Biosecurity Blueprint. This will no doubt also require review of these other documents. Similar biosecurity blueprints are being developed for other aquatic industries in Tasmania, and the aim is to have a consistent format across all.

The objectives of the Biosecurity Blueprint are to:

- Establish a common understanding of industry compliance and regulatory obligations for finfish license conditions and plan area management controls, as per Tasmanian and federal legislation;
- Gain industry and government agreement on the minimum biosecurity practices undertaken within the Tasmanian salmonid industry;
- Document the biosecurity practices in a manner which clearly outlines responsibilities of all parties participating in the Tasmanian salmonid industry;
- Identify biosecurity strategies that have been implemented to provide domestic and overseas markets with confidence in the high aquatic animal health standards of Tasmanian salmonids;
- Establish a state-wide Biosecurity Blueprint that is effective in managing the threats of disease to industry; and
- Demonstrate transparent and consistent biosecurity decision-making and management practices consistent with state and national obligations.

The industry feel that they are at a high risk to disease introduction through the importation of fish that require processing from high risk regions that have very potent diseases such as ISA. As such, enhanced Industry biosecurity measures are considered critical to the growth of salmonid farming in Australia.

PRODUCTION MANAGEMENT

It was noted that Tasmania's biosecurity is influenced by the extremes of temperature and dissolved oxygen seen in some areas in recent years, especially when stocking densities were high. This has been despite holding fish at densities lower than most other farming regions in the world (~12 kg/m³ in winter, ~8 kg/m³ in summer). Participants agreed that the entire suite of farm management procedures are relevant to biosecurity in the context of managing the resilience of fish in Tasmania. The potential for net fouling and cleaning to be a risk in Tasmania was also identified.

Participant discussions covered many specific approaches to farm management relevant to biosecurity. It was acknowledged that many aspects of biosecurity involve a trade-off between efficiency and risk and that this is often considered in an ad-hoc way. It was also noted that insights and improvements are generally made using economic analysis for example, considering what is the optimal procedure for pathogen testing given the trade-off between cost of testing vs. frequency, and assessing the false-positive risk versus lost production from destocking.

Other production approaches considered important for further consideration were:

- Single cohort stocking and fallowing periods between cohorts;
- Fallowing protocols for the pens, sites and regions and including regulation of protocols;
- Spacing of farms with guidelines drawn from international experience, for example 5 km minimum;
- Single owners within region (i.e. company separation) or ensuring stocking is coordinated between different companies in shared region;
- Mortality removal and disposal protocols;
- Biosecurity training, including regular refreshers and updates, for all staff;
- Tracking and management of any movement between pens or sites including fish, vessels, equipment, people; and
- Management of ecological interactions with such possible vectors in seals and wild fish.

PHOTO: PETUNA AQUACULTURE



PHOTO: IMAS



Suggestions for international salmon symposia from Biosecurity

Participants in the Biosecurity Session proposed a number of potential topic areas for future international salmon conferences, and these are listed below grouped according to three overarching topic areas.

NEW DEVELOPMENTS

- Overview of global examples of solutions to managing diseases.
- Best available practice regulation for biosecurity – who is doing what and where?
- Auditing, compliance and accountability.

SITE PLANNING

- The science behind the 5km separation between sites.
- Fallowing: what is needed and for how long?
- Expert site placement in terms of biosecurity from a global perspective.
- Summary of production during the past 5 years.

BIOSECURITY FOR HIGH-ENERGY SITES

- Ecological interactions
- Stress-biosecurity interactions.

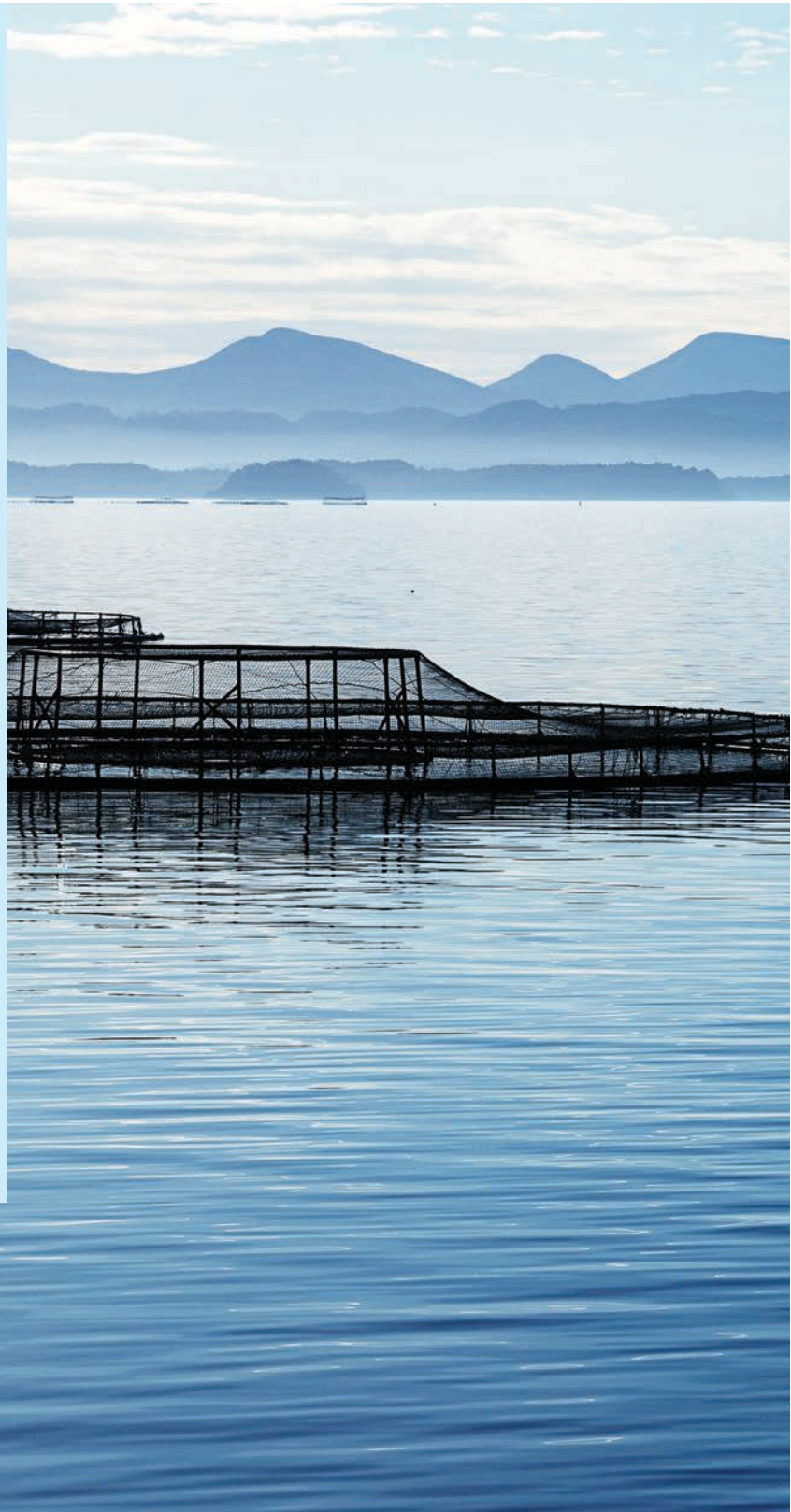
ENVIRONMENT

PHOTO: PETUNA AQUACULTURE

The focus of the environment theme workshop was to begin the process of identifying world's best practice in environmental management and regulation. This will underpin industry and governments aspiration for salmon farming in Tasmania to become the most environmentally sustainable in the world. The discussions in the 3 progressive sessions were centred on:

- Key environmental issues facing aquaculture globally and the Tasmanian industry in particular;
- Environmental requirements for planning, monitoring and regulation both in Tasmania and elsewhere; and
- Information management and transparency.

Each session workshop finished with a summary of the key issues and any questions or topics for further investigation. A summary of those discussions is provided here.



NEEDS IDENTIFIED DURING THE ENVIRONMENT THEME WORKSHOP

Global and Tasmanian environmental issues	Environmental requirement for planning, monitoring and regulation	Information management and transparency
<ul style="list-style-type: none"> • Develop a framework for “world’s best practice” • Demonstrate that industry is meeting or exceeding “world’s best practice” 	<ul style="list-style-type: none"> • Greater emphasis on a multi-sectoral spatial approach to planning • Review KPIs for site selection and baseline requirements • Review planning processes • Modify methods for monitoring benthic compliance and adapt to different farming environments and practices • Increase community engagement to help improve understanding about the industry and increase social acceptance and support 	<ul style="list-style-type: none"> • Create a better structure and platform for environmental data and information • Engage with the community to better understand who wants information, what they want or need and why • Identify how best to make this data available to the community

GLOBAL ISSUES, THE TASMANIAN CONTEXT AND PUBLIC PERCEPTION

All salmon producing nations are looking to expand into more dispersive sites in more exposed locations, although farming salmon in inshore coastal environments will continue to be a key production strategy globally. Workshop participants identified that as the industry looks to expand, the requirement for sites which are suitable for contemporary farming practices presents a range of common challenges worldwide. Although there are regional differences in the environmental issues facing an expanding salmon industry (e.g. the northern hemisphere face issues with sea lice and the potential for adverse interactions with wild salmon stocks which are not relevant to the Tasmanian context), it was very clear from the discussions that many of the challenges are shared.

Firstly, an identified priority is the potential for increased interactions with other sectors and resource users in newly accessed waters (i.e. with wild fisheries, shipping, tourism and recreational pursuits). A number of key interactions were singled out by participants for further discussion, including the possibility and implications of disease transfer, both from and to wild fish stocks. The capacity for increased interactions with large predators and marine mammals as the industry moves further offshore was also a key concern, and participants suggested this is currently an important knowledge gap.

Secondly, participants identified that with the industry expansion into more offshore and dispersed sites, cumulative effects might be less obvious than for inshore areas. While it was acknowledged that the accumulation of particulate and dissolved wastes from farming is likely to be diluted in these environments, the potential for subtle effects as a result of waste nutrient accumulation over greater distances and longer periods is less well understood. The capacity to monitor and detect these types of cumulative effects was acknowledged as a challenge for framing both research and regulation. Participants saw a clear need for a multi-sectoral approach to spatial planning, and this was a recurrent theme throughout all of the sessions.

The difficulty in defining 'an acceptable level of impact', whether for cumulative effects from fish farms or as a result of other users of the waterway was the subject of much discussion. Participants highlighted the need to understand community concerns, expectations and values as crucial from both a planning context and with respect to industry obtaining a "social licence" to expand. There was broad agreement that maintaining a "social licence" is contingent upon a number of factors, but that critical amongst them is the establishment of clear and transparent environmental performance measures and benchmarks.

The importance of communication and transparency was strongly emphasised, with open disclosure of the environmental performance of the industry seen as paramount in improving and maintaining “social licence”. To this end, there was a strong view that increasing public understanding and support for the salmon industry in Tasmania will require a consolidated industry approach.

Lessons shared from international participants highlighted that industry members need to take a leading role in the pursuit of world’s best practice in environmental management. It was suggested that it is no longer an option to simply rely on government regulatory frameworks as the most effective and accepted standard for environmental management. ‘World’s best practice’ these days may well be beyond regulatory requirements, and it was noted that in many cases external accreditation systems have expectations beyond that of regulatory requirements.

To gain community support for expansion of the industry in Tasmania, both the industry and government need to be able to clearly demonstrate that they are meeting or exceeding ‘world’s best practice’ in environmental management. Participants also noted that at present there is no consensus or existing documentation on what ‘world’s best practice’ for environmental management actually entails. As such, it was suggested that a major objective for future salmon conferences could be to develop a framework for ‘world’s best practice’, and that the Tasmanian industry has an opportunity to lead the world on this. There was a strong commitment from the international participants to collaborate on the development of such a framework.

PHOTO: HUON AQUACULTURE



ENVIRONMENTAL REQUIREMENTS FOR PLANNING, MONITORING AND REGULATION

At the forefront of discussions on planning was the growing need to consider other sectors as the industry expands into new areas. There was a strong view that whilst the current planning process may have met the needs and expectations of the community in the existing more sheltered coastal areas, there was now need for a greater emphasis on a multi-sectoral spatial approach to planning.

There was a lot of discussion about baseline information requirements for new sites and participants agreed that the timely collection and delivery of this information to both government and the broader community is paramount. In addition, it was suggested that the KPIs (key performance indicators) for site selection and baseline requirements have remained unchanged for many years and that these need to be reviewed given the evolution of farming methods and the expansion into new environments.

There was a view expressed by a number of the participants that industry development and expansion is running ahead of the planning process, and that a more structured, transparent and strategic planning process is required to instil community confidence. Participants suggested that a review of planning processes might allow for some new technologies to better inform the process and provide better community engagement and communication tools as there have been major advancements in mapping and spatial

analysis technology that could be utilised e.g. multibeam sonar for habitat mapping, GIS improvements and the availability of real time data/sensors and autonomous underwater vehicles.

It was clear that participants identified that the environmental monitoring programs in Tasmania are amongst the 'world's best practices'. They were assessed as comprehensive as anywhere else in the world and often more detailed and inclusive than most other jurisdictions. It was noted that monitoring benthic condition under cages or within leases to ensure farming does not exceed the assimilative capacity of the local sediment or lead to unacceptable impacts beyond the lease boundary is a compliance and regulatory approach used throughout the world and that this inevitably depends on some combination of predictive capacity and observational data collection. In most countries depositional modelling, visual inspections with remotely operated video and benthic sampling are the key monitoring / management approaches currently employed. It was explained that in Tasmania it is increasingly being recognised and acknowledged that the methods for monitoring benthic compliance need to be modified and adapted to different farming environments and changing farming practices including the use of larger cages (this is currently a focus of research in Tasmania).

Similarly, it was identified that concerns in Tasmania with respect to potential interactions with rocky reef ecosystems and the fisheries that depend on them (e.g. abalone and rock lobster) have led to an expansion of monitoring requirements in certain areas. It was noted that Tasmania and New Zealand appear to be leading the way and few other countries monitor the effects of finfish farming on rocky reefs. Participants also identified that Tasmania is leading the way with respect to monitoring water column effects with few other countries regularly monitoring for water quality effects either within or outside of farm leases, and the broad scale monitoring programs (BEMPS) required under licence conditions in Tasmania are unique. It was acknowledged that the extent of monitoring in Tasmania is not well communicated to the public, and that presents an opportunity for greater dissemination of information to the community to help improve understanding about the industry and increase social acceptance and support.

Whilst it was acknowledged that in many aspects Tasmania leads the world with respect to environmental monitoring, a number of improvements were suggested by international participants. It was clear that there was still significant uncertainty regarding how this information is used to assess environmental performance and how it aligns with regulation. It was felt, for example, that performance

measures and regulatory controls for seabed impacts are well understood, but the need for adaption to new growing environments (as outlined earlier) was also recognised. Participants noted the concerns with respect to the broader impacts and interactions of fish farming, and also noted that the capacity to detect and attribute change to farming in highly mixed and connected water bodies is a major challenge. Similarly, it was noted that attribution of cause of change or impact in reef ecosystems that are inherently variable and patchy in distribution is difficult. Understanding how other jurisdictions deal with these challenges will be important, particularly as the Tasmanian industry moves into more dispersive locations. It was suggested by some that the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines that aim to protect aquatic ecosystems from pollutants such as nutrient inputs can provide a useful framework for developing water column standards.

It was quite clear from the participant discussions that monitoring in Tasmania often exceeds that undertaken elsewhere, whilst the development and justification of this monitoring may present challenges for our scientists and regulators, it also an opportunity for Tasmania to be a world leader in setting environmental standards.

INFORMATION MANAGEMENT AND TRANSPARENCY

The workshop participants all agreed that there is a need to create a better structure and platform for environmental data and information that engenders community trust. The core principles discussed across the tables were: transparency and access to data or information; the independence of results and interpretation; the timeliness of delivery and relevance to users. Participants suggested that ensuring each of these is essential for developing community trust that the information is reliable and accurate. It was noted by a number of the participants that there is already considerable environmental information relevant to salmon farming and salmon farming interactions already in the public domain through specific industry, government and research agency websites and dashboards. There was agreement among participants, however, that this information is not necessarily easy to find, nor is it in a form that is easy to understand. As such, it was acknowledged that there is a need to provide this information in a more digestible and easy to access format. Further, it was identified that there is a very clear need to engage with the community to better understand who wants information, what they want or need and why, in order to ensure communication is effective.

It was identified that recent advances in sensor technology and information systems mean that rates of real-time data provision and use are increasing dramatically across the industry internationally, including across all research, industry and government sectors. This includes the availability of near real time modelling products. Discussions indicated that the Tasmanian industry is at the forefront of this innovation, for example, real time networks using state of the art acoustic sensors and associated dashboards have been developed to monitor dissolved oxygen in Macquarie Harbour, and the technology has been extended to understand and monitor the environment experienced by sentinel animals, such as the Maugean Stake. This technology has now been adopted in other growing regions around the world. It was noted that real-time data aggregation allows the industry, the community and regulators to see “what’s happening now,” but the process is not without challenges. Participants identified that a number of challenges that come with these advancements in real time data: despite the inevitable ‘reality’ of real-time data, data accumulated real-time is only useful if the knowledge gathered can be applied in a timely manner; having enough analytical capacity; ensuring data integrity; and, the availability of ancillary information and context for interpretation.

Participants felt these challenges are paramount, and in particular when considering public access to real-time data. It was noted that requests for access to raw data are increasing, but in most cases raw data is not likely to be useful given the sheer volume and its complexity. It was agreed that there is a real challenge ahead in identifying how best to make this complex data available to the community in a way that addresses their information needs, is understandable and is trusted.

It was clearly identified that it is incumbent on both industry and government to educate the community on the distinction between data and information (and that the availability or unavailability of raw data is not a means to hide things) and to rebuild trust.

PHOTO: PETUNA AQUACULTURE



COMMON THEMES

A number of recurrent themes emerged across the day, many of which, on reflection, were shared with the Future Farming and Biosecurity sessions. Key amongst these was the need to build community confidence in the industry and how it is managed and regulated. As noted above, building community confidence requires improved communication and greater transparency on environmental performance. Defining environmental performance benchmarks, determining what is an acceptable impact, and a better understanding of community expectations are necessary precursors to this. The need for a consolidated industry approach to expansion into new areas was seen as paramount to gaining a social licence. Similarly, a multi-sectoral and bioregional approach to planning will be required to gain the support of other sectors. Ultimately, the plan for the future must rest on co-operation, trust and collaboration.

PHOTO: IMAS



Suggestions for international salmon symposia from Environment

Participants in the Environment Session proposed a number of potential topic areas for future international salmon conferences, and these are listed below grouped according to the overarching topic areas.

SOCIAL ACCEPTABILITY AND COMMUNITY ENGAGEMENT

- Community concerns and information needs
- Mechanisms of engagement

MULTIPLE USE PLANNING AND MANAGEMENT

- Defining and managing risk
- Spatial mapping
- Governance

ASSESSING ENVIRONMENTAL PERFORMANCE

- Role of certification
- New monitoring technologies
- Managing large data sets
- Defining benchmarks/expectations

WASTE MANAGEMENT

- By-products
- Waste capture and processing/re-use

PARTNER IMPACT STATEMENTS

PHOTO: PETUNA AQUACULTURE

Partners were invited to contribute statements to document the impact of the conference to their organisation that might include: the value of the conference to their organisation; how their understanding might have changed (or been reinforced) with respect to the focus areas; and any actions that may have arisen as a result of the meeting.



TASMANIAN SALMONID GROWERS ASSOCIATION

As the Tasmanian salmon industry seeks to grow to meet increasing demand for healthy produce, it is imperative all farmers are prudent to international best practice and adopt responsible policies and processes to support a sustainable future.

The TSGA and its members all agree, the Planning for *Blue Future Global Salmon Conference* – hosted by IMAS and the University of Tasmania – provided a timely reminder to all participants of what is required to responsibly grow Tasmania's salmon aquaculture industry to meet the State Government's *Sustainable Industry Growth Plan for the Salmon Industry* ('Growth Plan') production target by 2030.

Like all farmers, we are challenged to produce food in a sustainable way and in an ever-changing environment. Continuous improvement, supported through leading research and science, is therefore paramount. At the conference we were pleased to hear from international experts from Norway, Denmark, Scotland and Canada, who provided valuable insights into strategic imperatives relative to their farming regions.

It is a compliment to our industry that such a group of world leaders in their various fields from our vibrant international industry were prepared to travel across the globe to attend at such short notice.

There is a strong synergy between the key highlights of the conference and the priorities of the Tasmanian Government's Growth Plan:

- Biosecurity framework (the development of specific farming bioregions and consistent practices to mitigate risk of mortality);
- Technological advancements: adoption of innovations which support further environmental footprint reduction;
- Future investment into high energy zone farming and further off-shore farming, as technology, infrastructure and safety allows; and
- Future investment in land-based farming in a responsible way which does not negate environmental footprint and is commercially sustainable.

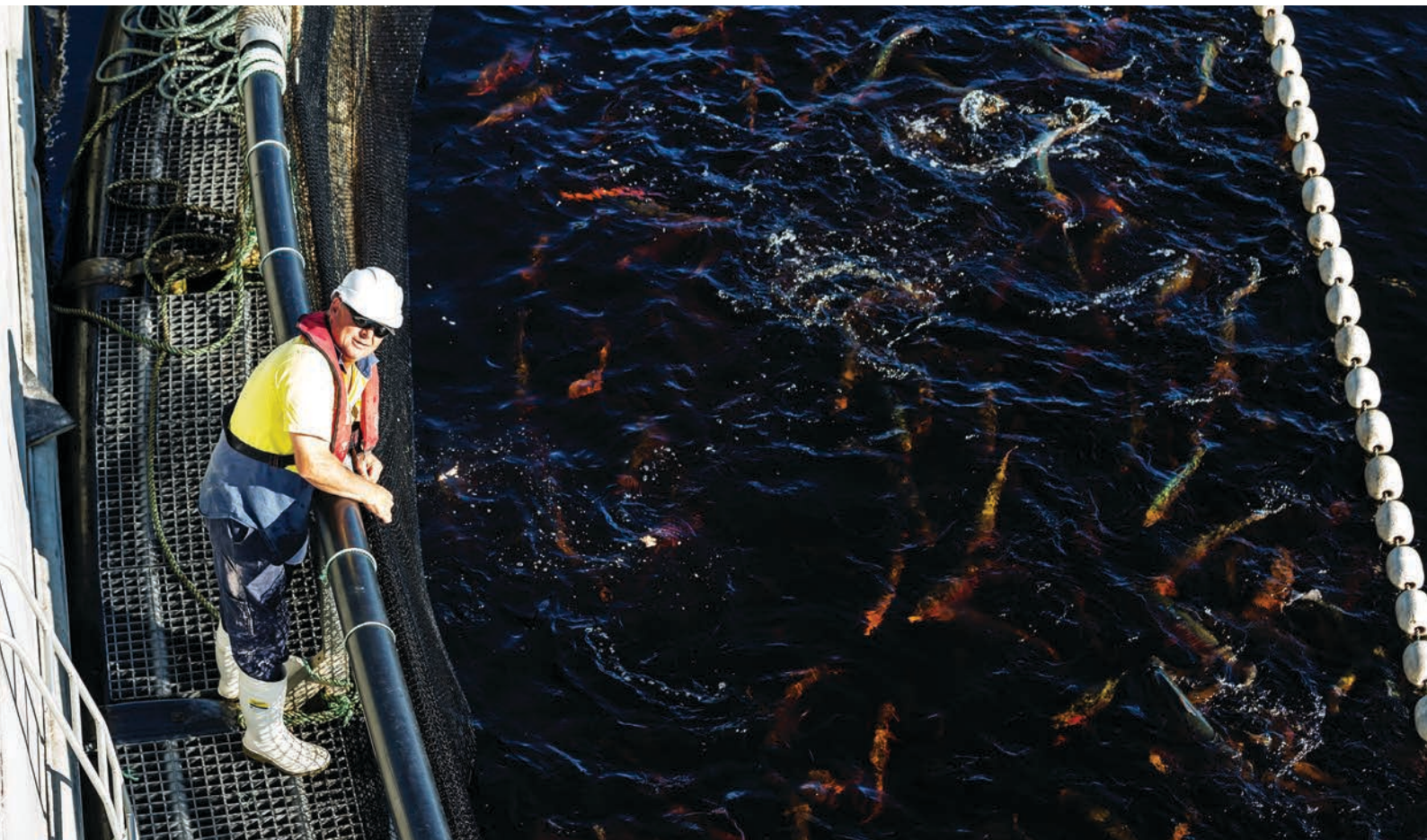
Biosecurity in particular emerged as the priority issue of the conference. Biosecurity is an unseeable threat with the potential to decimate existing production levels, as well as preventing industry growth. We are a smart, innovative industry and we can continue to grow, but we must accept that current biosecurity practices need to be revised, refreshed and renewed.

I am pleased to say our state's salmon growers have taken decisive and positive steps towards improving biosecurity practices across Tasmania and are currently in the process of engaging the Tasmanian Government and key stakeholders in this plan.

Salmonid farming in Australia is a leader in policy, innovation and production. That is a very special place that comes with responsibility. The Tasmanian salmon industry is committed to remaining at the forefront of global innovation and sustainable practices, which support a long-term future.

We (industry) know that the core group of participants that came together for this conference felt a long overdue sense of comradery and positive resolve and that we had missed this 'coming together' feeling. We all recognised that safeguarding our industry from risks is imperative and the core advantage to global symposiums is learning from the challenges and threats which international peers have overcome, and to implement mitigating solutions proactively to protect and sustain our operations.

PHOTO: PETUNA AQUACULTURE



HUON AQUACULTURE

“When I initially discussed the concept of the December 2017 Global Salmon Conference with Professor Brigid Heywood I was excited about the potential role that such an event could play in underpinning the future success of a prosperous and sustainable salmon farming industry in Tasmania.

The outcomes of the Conference have met, and indeed exceeded my expectations, with the event bringing together a wide range of stakeholders from Industry, Government, Research and Community to share in, and learn from the wealth of experience so graciously provided by an array of overseas experts.

It was no mean feat to convince so many highly regarded and busy international experts in their field to come to Tasmania at short notice. On behalf of Huon Aquaculture Group Ltd, I would like to express my gratitude to all those who were involved in pulling together such a successful event.

It is a credit to the outstanding determination, cooperation and expertise of all involved. I am hopeful that we can build on the outcomes of the Conference to ensure that our industry continues as a dynamic global leader into the future which Tasmanian's can be proud of.”

*Frances Bender, Executive Director
of Huon Aquaculture Group Ltd.*

PETUNA AQUACULTURE

The *Planning for a Blue Future* pre-symposium provided an opportunity for the Tasmanian aquaculture industry to come together with experts from around the world to share their ideas and experiences.

It also provided a timely forum for the industry to collectively explore some of the critical issues it will need to address to ensure sustainable growth into the future.

The symposium's narrow focus allowed a comprehensive investigation into the onshore/offshore farming debate, environmental science and regulation as well as biosecurity risk management.

The event was a positive stepping stone towards improved industry unity and provided a platform for open communication between the industry, scientists, government regulators and community stakeholder groups.

From the initial dialogue and with reference to global sources, the industry has taken positive action to develop a biosecurity blueprint.

TASSAL GROUP

From Tassal's perspective it reinforced the importance of a statewide biosecurity plan, as part of the growth program, yet also demonstrated the technology, innovation and regulation which exists in Tasmania is among the best in the industry. It was of comfort to know our focus in responsibly identifying high energy transitional operating areas, and land-based technologies is as advanced as other commercial operators in the world, yet reinforced a need to retain a lens of continuous improvement in this space and invest in research programs to remain at the forefront of advancing innovations.

A priority action from the meeting was to work with the other salmon farmers in Tasmanian to achieve a biosecurity framework, which has progressed well.

BIOSECURITY TASMANIA

Biosecurity Tasmania found the conference to be of real value. The highlighting of the biosecurity risks to the Salmon Industry was timely and well described by participants. The technical discussions regarding solutions were practical and informative. Although many of the possible solutions were well understood prior to the conference, reinforcement of the need to implement change to manage the biosecurity risk to the Salmon Industry was an important outcome of the discussions.

As a result of the conference, the Salmon Industry is developing, in consultation with Government, a Tasmanian Salmon Industry Biosecurity Plan to guide the changes in how the industry will operate in order to minimise the biosecurity risks to the industry. Biosecurity Tasmania is close to delivering a new Biosecurity Act for Tasmania which will provide modern tools for underpinning industry led programs such as the Biosecurity Plan.

EPA TASMANIA

From EPA perspective there were two reasons to hold the Conference: (1) to provide a forum for EPA, other government agencies and industry to learn from the world about management of environmental and biosecurity issues and opportunities and risks in terms of future farming; and (2) to show the community where Tasmania aquaculture stands in comparison with international industries.

Information gained at the conference will assist in effective environmental regulation, particularly in terms of development of new environmental licence conditions. It highlighted the importance of transparency of data in increasing community confidence, the importance of evidence-based/science-based decision making in the regulatory framework and the need to support ongoing research in the salmon sector.

EPA Tasmania has embarked on a 12-month project to develop an Environmental Standard following review of international performance-based monitoring approaches for Salmon farming.

DPIPWE

This conference was a catalyst for bringing together a wide range of stakeholders and highly regarded local and international experts to discuss important issues that are of direct relevance to the sustainable future growth of the industry.

The *Future Farming* theme stimulated much useful discussion with some very informative and relevant input from overseas experts on the challenges of offshore farming, the current status of land based Recirculating Aquaculture Systems (RAS) elsewhere and the concepts and potential benefits of Integrated Multi-Trophic Aquaculture (IMTA). It was clear that while offshore development presents definite social and environmental benefits there will be considerable demand for high technology infrastructure, a need for support of innovation in the research and development of new technology and more generally a need to carefully manage future development in exposed offshore sites.

The outputs of these *Future Farming* discussions are being used to inform policy, management, communication and engagement strategies.

UNIVERSITY OF TASMANIA

IMAS and the University of Tasmania were privileged to host the conference, bringing together experts from around the world with our stakeholders from industry, government, research and the community.

The most pleasing and profound outcome was to see the very positive step forward towards rebuilding amongst partners that improved industry unity and cooperation, and the platform it provided for open communication between the industry, researchers, government regulators and community stakeholder groups.

The conference demonstrated that the Tasmanian industry is among the best in the world with respect to innovation, environmental monitoring and regulation and supported by internationally recognised scientific research and development.

The conference also provided the opportunity to learn from the world about management of environmental and biosecurity issues and opportunities and risks in terms of future farming.

To hear of the challenges and threats which international peers have overcome was compelling; paramount was the importance of managing biosecurity.

However, the global challenge of producing food in a sustainable way in the face of environmental change remains, and the Tasmanian sector must maintain a clear focus on innovation and the pursuit of continuous improvement in all areas.

There were several overarching themes that emerged from discussions particularly pertinent to the success of achieving the State Government's Sustainable Industry Growth Plan for the Salmon Industry: social acceptability and community engagement, and trusted multiple use planning and engagement.

Conferences like these are incredibly beneficial in benchmarking our industry, its management and regulation and the research and development that support it against world's best practice. IMAS and the University looks forward to its continued involvement in supporting the sectors through its RD&E and facilitating events like these in the future.

PHOTO: TASSAL



APPENDIX 1

CONFERENCE PROGRAM

DAY ONE EXPERT PANEL SESSIONS

Moderator: Chris Carter, Centre Head (Fisheries and Aquaculture),
Institute for Marine and Antarctic Studies, University of Tasmania

Session	Panel members
Welcome 12:30pm – 12:40pm	Jeremy Rockliff Deputy Premier and Minister for Primary Industries and Water
Introduction 12:40pm – 12:50pm	Brigid Heywood Deputy Vice Chancellor (Research), University of Tasmania
Future Farming 12:50pm – 2:45pm	Joachim Buarø Product Certification, Aquastructures, Norway <ul style="list-style-type: none"> Offshore Aquaculture Patrick Tigges Managing Director, Billund Aqua Australia <ul style="list-style-type: none"> Marine Recirculation Aquaculture Systems (RAS) Thierry Chopin Professor of Marine Biology, University of New Brunswick, Canada <ul style="list-style-type: none"> Integrated Multi-Trophic Aquaculture (IMTA): bringing some Canadian experience to plan for a turquoise future in Australia Regin Jacobsen Chief Executive Officer, Bakkafrost, Faroe Islands <ul style="list-style-type: none"> Sustainable Salmon Aquaculture in the Faroe Islands ADDITIONAL PANEL MEMBERS Michael Sylvester Chief Executive Officer, PFG Group Adam Main Chief Executive Officer, Tasmanian Salmonid Growers Association (TSGA)

Session	Panel members
Afternoon Tea 2:45pm – 3:15pm	
Environment and Biosecurity 3:15pm – 4:55pm	<p>Stuart Baird Area Manager, Scottish Environment Protection Agency, Scotland</p> <ul style="list-style-type: none"> • Salmon Farming in Scotland: A Regulator's view <p>Henrik Hareide (Former) Head of Section, Directorate of Fisheries, Norway</p> <ul style="list-style-type: none"> • Environmental Regulation of Norwegian Salmon Farming <p>Larry Hammell Professor and Dean (Interim), UPEI School of Graduate Studies and Associate Dean, AVC Graduate Studies and Research, University of Prince Edward Island, Canada</p> <ul style="list-style-type: none"> • Fish Farm Biosecurity Challenges in Aquatic Environments <p>ADDITIONAL PANEL MEMBERS</p> <p>Atli Gregersen Managing Director, Hiddenfjord, Faroe Islands</p> <p>Wes Ford Director, Environment Protection Authority (EPA) Tasmania</p> <p>Lloyd Klumpp General Manager, Biosecurity Tasmania, Department of Primary Industries, Parks, Water and Environment</p>
Close 4:55pm – 5:00pm	<p>Brigid Heywood Deputy Vice Chancellor (Research), University of Tasmania</p>
Refreshments 5:00pm – 6:00pm	

DAY TWO THEME PROGRAM

FUTURE FARMING — LECTURE THEATRE

Convenor: Catriona Macleod (Institute for Marine and Antarctic Studies)

Facilitator: Chris Rees (Impact Solutions International)

Session	
Session 1F 9.00am – 11.00am	What are the drivers? Regin Jacobsen Farming in the Faroes—inshore and offshore, what is the difference? Thierry Chopin IMTA: who's doing it successfully and why?
	Tables Hosts: 1. Offshore: Colin Buxton and Regin Jacobsen 2. Land-based/recirculation: Harry King and Patrick Tigges 3. IMTA: Thierry Chopin and Patrick Hone
Session 2F 11:30am – 1:30pm	Practical considerations Michael Sylvester Cage designs and farming support requirements Irene Penesis Energy solutions and the role of renewables
	Tables Hosts: 1. Offshore: Irene Penesis and Michael Sylvester 2. Land-based/recirculation: Pheroze Jungalwalla and Louise Adams 3. IMTA: Catriona Hurd and Emily Ogier
Session 3F 2:30pm – 4:30pm	Think global, act local: challenges, opportunities and gaps for Tasmania Adam Main The Tasmanian industry: challenges and opportunities Stuart Baird Future of new approaches to finfish farming in Scotland/Europe
	Tables Hosts: 1. Offshore: Erik Raudzens and Stuart Baird 2. Land-based/recirculation: Adam Main and Chris Carter 3. IMTA: Sam Ibbott and Mick Hortle

BIOSECURITY – WET LAB

Convenor: Caleb Gardner (Institute for Marine and Antarctic Studies)

Facilitator: Tom Lewis (RDS Partners)

Session	
Session 1B 9.00am – 11.00am	Tasmania's biosecurity status and what are the risks on the horizon? Hamish Rodger Salmon disease and biosecurity: what are the trends in disease, what's spreading/emerging
	Tables Hosts: 1. Infectious diseases, vaccinations and treatments: Hamish Rodger and James Wynne 2. Disease reporting: Chris Carter and Mick Hortle 3. Hatchery biosecurity: Lloyd Klumpp and Andrew Bridle
Session 2B 11:30am – 1:30pm	Synergies and stressors: environmental effects on disease and biosecurity Debes Christiansen The effect of growing conditions on disease
	Tables Hosts: 1. Environmental stressors (water quality, climate change, bethos): Debes Christiansen and Adam Main 2. Stocking rates and management: Henrik Hareide and Harry King 3. IMTA: Jane Symonds and Jayson Semmens
Session 3B 2:30pm – 4:30pm	Keeping control: training, regulation and other steps to reduce biosecurity risk in the Tasmanian salmon industry Atli Gregersen Lessons from the Faroe Islands
	Tables Hosts: 1. Movements of fish and morts: Larry Hammell and Barbara Nowak 2. Planning for a response: Lloyd Klumpp and Rod Andrewartha 3. Education and training (workplace training, professional capability): Andrew Bridle and Emily Ogier

ENVIRONMENT — FLEX SPACE

Convenor: Jeff Ross (Institute for Marine and Antarctic Studies)

Facilitator: Maree Fudge (RDS Partners)

Session	
Session 1E 9.00am – 11.00am	Environmental issues for salmon aquaculture globally Nigel Keeley Global environmental issues — experiences from Norway and New Zealand
	Tables Hosts: 1. Global issues, the Tasmanian context and public perception: Adam Main and Laura Kelly 2. Interactions with commercial and recreational fisheries: Tim Dempster and Emma Woodcock 3. How will “Future Farming” address environmental concerns? (positive/negative outcomes): Mark Nikolai and Henrik Hareide
Session 2E 11:30am – 1:30pm	Environmental requirements in planning and regulation David Taylor Environmental requirements in planning and regulation in New Zealand Sean Riley Broad scale monitoring programs in Tasmania
	Tables Hosts: 1. Information requirements for new site/new farming practices: David Taylor and Graham Woods 2. Environmental (water quality and benthic condition) monitoring programs: Nigel Keeley and Sean Riley 3. Assessing environmental performance (licence conditions, trigger levels, accreditation): Stuart Baird and Kate Hoyle
Session 3E 2:30pm – 4:30pm	Information management and transparency Wes Ford Managing environmental data into the future
	Tables Hosts: 1. Environmental data and transparency: Steve Gallagher and Jayson Semmens 2. Real time data and information tools: David Horner and David Taylor 3. Key outputs and objectives for Global Salmon Symposium 2018: Wes Ford and Josh Fielding

DAY TWO WORKSHOPS

Session	
Registration 8:30am – 8:45am	<i>Help yourself to tea or coffee and take a seat in the Aurora Lecture Theatre</i>
Welcome 8:45am – 9:00am	Chris Carter Institute for Marine and Antarctic Studies
Workshop Session 1 9:00am – 11:00am	1F: Future Farming – Lecture Theatre 1B: Biosecurity – Wet Lab 1E: Environment – Flex Space
Morning Tea 11:00am – 11:30am	
Workshop Session 2 11:30am – 1:30pm	2F: Future Farming – Lecture Theatre 2B: Biosecurity – Wet Lab 2E: Environment – Flex Space
Lunch 1:30pm – 2:30pm	
Workshop Session 3 2:30pm – 4:30pm	3F: Future Farming – Lecture Theatre 3B: Biosecurity – Wet Lab 3E: Environment – Flex Space
Conference Dinner 6:30pm – 9:30pm	Henry Jones Art Hotel 25 Hunter Street, Hobart <i>Dress: Smart Casual</i>

DAY THREE WORKSHOP REVIEW

Session	
Registration 8:30am – 8:45am	<i>Help yourself to tea or coffee and take a seat in the Aurora Lecture Theatre</i>
Workshop Feedback 8:45am – 10:15am	<p>Moderator: Chris Carter, Institute for Marine and Antarctic Studies</p> <p>Future Farming Lead: Catriona Macleod, Institute for Marine and Antarctic Studies</p> <p>Biosecurity Lead: Caleb Gardner, Institute for Marine and Antarctic Studies</p> <p>Environment Lead: Jeff Ross, Institute for Marine and Antarctic Studies</p>
Morning Tea 10:15am – 10:45am	
Workshop Feedback 10:45am – 11:45am	<p>Moderator: Chris Carter, Institute for Marine and Antarctic Studies</p> <p>Government Lead: Wes Ford, Environment Protection Authority Tasmania</p> <p>Salmon Industry Lead: Adam Main, Tasmanian Salmonid Growers Association</p>
Close 11:45am – 12:00pm	<p>Patrick Hone Executive Director, Fisheries Research and Development Corporation</p> <p>John Whittington Secretary, Department of Primary Industries, Parks, Water and Environment</p>

APPENDIX 2

COMMITTEES

2018 The Steering and Science Committees met together in all their meetings in 2018.

Organisation	Steering Committee	Science Committee
University of Tasmania	Chris Carter (Chair) Brigid Heywood	Chris Carter Caleb Gardner Catriona Macleod Jeff Ross Gail Eagle
Tasmanian Salmonid Growers Association	Adam Main Owen Carington Smith	Adam Main Mick Hortle
Huon Aquaculture	Jane Gallichan (to July)	Steve Percival
Tassal Group	Barbara McGregor	Bradley Evans
Petuna Aquaculture	Dianne Maynard Jacqui Ray David Wood	Dianne Maynard
DPIPWE	Fionna Bourne	Graham Woods
EPA Tasmania	Wes Ford	Stephen Gallagher
Biosecurity Tasmania	Lloyd Klumpp	Lloyd Klumpp
Observers		Joshua Fielding Maree Fudge Jana Bannister

2017

Organisation	Steering Committee	Science Committee
University of Tasmania	Brigid Heywood (Chair) Richard Coleman Mandy Richardson	Chris Carter (Chair) Caleb Gardner Catriona Macleod Jeff Ross Gail Eagle
Tasmanian Salmonid Growers Association	Adam Main Owen Carington Smith	Adam Main Mick Hortle
Huon Aquaculture	Jane Gallichan	Steve Percival
Tassal Group	Barbara McGregor Linda Sams	Bradley Evans
Petuna Aquaculture	Dianne Maynard	Dianne Maynard David Wood
DPIPWE	John Whittington Deidre Wilson	Graham Woods
EPA Tasmania	Wes Ford	Stephen Gallagher
Biosecurity Tasmania	Lloyd Klumpp	Rod Andrewartha
FRDC		Josh Fielding
Observers	Chris Carter	Maree Fudge Chris Rees Tom Lewis

