
Tasmanian Abalone Council Ltd

Submission to the Senate Inquiry into regulation of the Fin Fish aquaculture industry in Tasmania

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CONTENTS

Introduction	3
<i>Aim</i>	3
<i>Abalone Industry Overview</i>	3
Issues	4
<i>Salmonid farming inputs and subsequent waste</i>	4
<i>The views of abalone divers</i>	6
<i>Worlds Best Practice</i>	7
<i>Transparent regulation</i>	8
<i>Salmonid industry driven research</i>	9
<i>The need for further research</i>	9
<i>The problems with Salmonid industry driven accreditation and monitoring</i>	11
<i>The Global Salmon Initiative</i>	11
<i>The Aquaculture Stewardship Council (ASC)</i>	11
<i>The Global G.A.P</i>	13
Recommendations	14
Practical Solutions	15

Introduction

Aim

The Tasmanian Abalone Council Ltd (TACL) believes there are risks to the Tasmanian wild abalone fishery posed by both the current operations and the planned expansion of the Tasmanian Salmonid sector.

The TACL acknowledges the current and further potential value of the Salmonid industry to the Tasmanian and Australian economy, including, as publicly stated, the Salmonid industry's current plans to double production by 2030 and expand into oceanic waters.

The TACL's aim is that both industries flourish within a sustainable framework. To enable this, we are making key recommendations around the independence and transparency of the regulation of the Salmonid industry, the expansion of the evidence base upon which this regulation is based, and particularly, we are advocating for a greater focus on the impacts of pollutants and contaminants generated by the Salmonid Industry within marine ecosystems.

These recommendations are informed by recent research, world's best practice and include practical solutions or additions/improvements to current farming practices. The TACL believes that current salmonid farming practices pose unnecessary risk to surrounding marine ecosystems and therefore are a risk to the wild abalone fishery and the industry that it supports.

Abalone Industry Overview

The Tasmanian Abalone Industry makes a significant contribution to the Tasmanian Economy. The industry harvests, processes and exports the world's largest abalone resource supplying over 25% of total annual global production of wild caught abalone product. It is Tasmania's most valuable wild harvested marine resource and one of the states largest export earners.

Eighteen hundred and fifty tonnes of live weight abalone are harvested annually and over 95% is exported - principally to the Asian markets of China, Hong Kong, Singapore, Japan and Taiwan.

The current level of export revenue generated by the abalone industry is around \$100 million per annum. This in turn generates some \$200 million of associated economic activity (via economic multipliers) into the state's economy. In addition, the industry provides over \$30 million of wage income per annum via the harvesting (divers and deck hands), processing (factory workers, truck drivers and administrators), marketing and exporting (managers and consultants) and service industries (mechanics, technicians, welders and boilermakers).

Opportunities for increased production in the wild fishery are limited by an annual quota of total wild catch tonnage. Harvest limits are established to ensure sustainable management of the fishery for the long term. There are however opportunities for increased growth in associated and complimentary industries such as food tourism, particularly targeting Asian Markets. There is also

opportunity to significantly increase industry returns via investment in a strategic market development program such as *Australian Wild Abalone*TM (www.australianwildabalone.com.au).

Given the abalone industry's long history of driving associated investment in various areas of the Tasmanian economy from viticulture and agriculture to property development, any risks to the longer term viability of the Abalone industry should include the potential flow-on impacts of reduced government revenue and a decrease in investment in businesses external to the industry itself.

Issues

Salmonid farming inputs and subsequent waste

The wild Tasmanian Abalone Industry has few inputs which impact on the environment, other than those driven through the use of boats to harvest the catch. It is reliant on optimum environmental conditions for the growth of abalone in the wild. The abalone harvest is based on an annual quota system, which is monitored and regulated in a transparent way through the Tasmanian Department of Primary Industries Parks, Water and Environment (DPIPWE). The quota is adjusted annually based on scientific research and in broad and intensive consultation with the industry.

The abalone fishery is highly vulnerable to changes in the surrounding marine ecosystem.

In contrast, the Salmonid Industry has many inputs to the marine ecosystem, including organic inputs such as fish faeces, feed, dead fish, escaped fish and organic matter resulting from the cleaning of infrastructure such as nets and cages. There are also non-organic inputs such as antifoulants, fuel or oil spills.

The Salmonid Industry acknowledge that for every 1000 tonnes of feed input, in total, approximately 20% of that input enters the ecosystem as waste product in the form of uneaten food, faeces or soluble emissions (see Figure 1 below). **There are however, currently no requirements, or attempts by any Salmonid farming companies to contain or actively manage that waste.** There is an underpinning premise that the surrounding ecosystems can assimilate and break down the waste. However, as Tassal has demonstrated in their response to abalone industry concerns on this issue, the shift in Tasmanian salmon farming from easily accessible but poorly “flushed” bays and inlets to deeper oceanic sites will decrease the environmental impact of farms significantly¹. This statement suggests farms rely on the dispersal of waste beyond the local environment. This in turn raises the questions – Where does that waste go? What impacts does it have on the ecosystems in which it may settle?

¹ Information provided by Tassal in their report on issues raised by TACL in June 2014

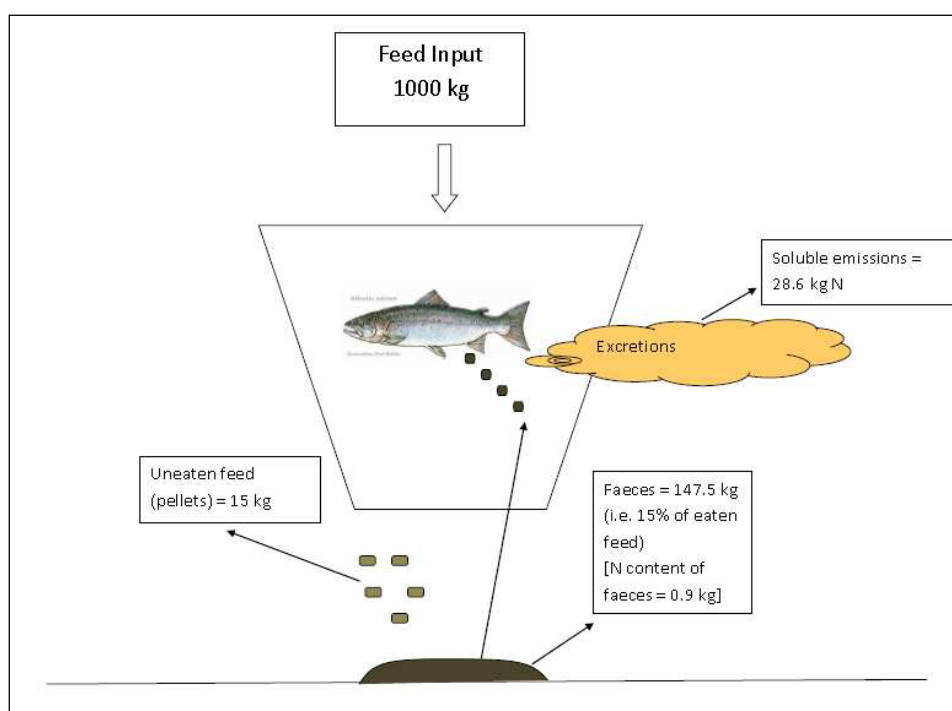


Figure 1: A typical feed to faeces example based on 1000KG of feed. Supplied to TACL by Tassal in their report on issues raised by the TACL in June 2014

In addition, in-situ net cleaners are now in use across the salmon industry. This method manually removes fouling organisms and associated net or cage coatings from the nets or other farming infrastructure such as cages or barges using hydraulic suction or blasting (using infrastructure called the Marine Inspector Cleaner or MIC). There is no requirement that the waste (bio-foul or equipment coatings) generated through this process is captured or removed from the marine environment.

It could be argued that Salmonid farms have been more environmentally responsible for the waste created through the cleaning of farming infrastructure in the past. Historically, nets were removed and washed onshore in semi-closed systems catching the waste in a sump. Likewise, pens were also historically removed from the water and cleaned and all barges were slipped in accordance to Marine and Safety Tasmania (M.A.S.T) regulations. The use of the MIC now results in waste being deposited directly into the marine environment and thereby removing the farms responsibility to capture and process its bio-foul by-products.

The *Environmental Practice Guideline for Cleaning of Salmon Cages using Marine Inspector Best Management in situ Net Cleaner* (<http://dipwe.tas.gov.au/Documents/Appendix%20%20-%20Environmental%20Best%20Management%20Practice%20guidelines%20for%20In%20situ%20Net%20Cleaning.pdf>) has been developed by industry, in consultation with scientists. However there remains no stipulation that the waste blasted or sucked from the nets is captured or removed. As

with the issues raised regarding excess feed and faeces, there is an underlying premise that the surrounding ecosystem can assimilate and break down this waste.

Salmonid industry representatives argue they use the MIC to clean nets while they are still relatively clean and therefore minimise waste. However this premise is also flawed, as previously the method of removing nets for washing deposited very little waste at the lease site, so any in-water cleaning methods increase the overall input into the environment.

In addition, interpretation of the Code of Practice is at the discretion of the farm manager. There is also no regulatory requirement to measure the impact of MIC technology in terms of environmental loadings. The Code of Practice seems to be primarily concerned with minimising any potential impacts on Salmonid stocks in the direct vicinity of the MIC, rather than on adjacent benthic conditions. It clearly emphasises that MIC discharges are to be kept away from salmon stock and deposited on the seabed.

Given the MIC is also used to clean sea cages in-situ, using the same Code of Practice described above, there are additional potential risks. The bio-foul associated with heavy farm equipment like sea cages includes shellfish and other invertebrates as well as algae. This could be considered a more potent form of pollution as it decomposes in the benthic zone.

When considering all of these factors, one needs to keep in mind the sheer scale of salmon farming operations in Tasmania and the massive volume of associated waste. Alarming, bio-foul wastage does not appear to be measured and incorporated into the total input assessment limits used by Government to regulate the impact of the industry. For further comment on bio-fouling, please refer to Dr Julie Mondon's paper which has been included as document #2 in the TACL Senate Inquiry Submission.

It is the view of the TACL that the current premise that the marine ecosystem can assimilate and break down all waste generated through Salmonid farming is not proven and should not underpin any further expansion of the industry.

The views of abalone divers

Since the late 1980's when the Salmonid industry first established in Tasmania, abalone divers have witnessed and subsequently reported that some sections of the inshore benthic community in the lower D'Entrecasteaux Channel have changed in a way which is less supportive to habitation by abalone and other benthic reef dwellers which were once abundant in this area. Over the last 30 years, abalone divers have witnessed significant changes in the health, composition and biodiversity of marine ecosystems in the lower D'Entrecasteaux Channel. In addition, the presence of a

prominent layer of milky sediment suggests that some sections of the Channel may be struggling to assimilate Salmonid farming waste.

There has also been a significant reduction in the productivity of the commercial abalone fishery in the same areas cited above over the past three decades, despite regular fishery closures.

These factors are naturally of great concern to our industry which relies on the health of the marine ecosystem for sustainable production.

It is of great concern to the TACL that our concerns have been dismissed by the salmonid industry as non-scientific and therefore less valid than those of the salmon industry itself. It appears however that when the scientific basis for the views of the salmon industry is explored in greater depth, there are significant gaps in the “science” that underpins their in-water production processes and a comprehensive lack of rigour in regulating these processes.

Worlds Best Practice

It appears that current practices for environmental monitoring and regulation of marine farming activities in Tasmania lack rigour in comparison to other jurisdictions around the world. For example, *Seafood Watch*, an international not-for-profit organisation which assists consumers and businesses to make choices about farmed seafood and which promotes sustainability, considers the following as guiding principals for industry best practice seafood production²:

- *Support aquaculture producers or industries that make information and data on production practices and their impacts available to relevant stakeholders.*
- *Promote aquaculture production that minimizes or avoids the discharge of wastes at the farm level in combination with an effective management or regulatory system to control the location, scale and cumulative impacts of the industry’s waste discharges within and beyond the immediate vicinity of the farm.*
- *Promote aquaculture production at locations, scales and intensities that cumulatively maintain the functionality of ecologically valuable habitats.*
- *Promote aquaculture production that by design, management or regulation avoids the use and discharge of chemicals toxic to aquatic life, and/or effectively controls the frequency, risk of environmental impact and risk to human health of their use.*
- *Within the typically limited data availability, use understandable quantitative and relative indicators to recognize the global impacts of feed production and the efficiency of conversion of feed ingredients to farmed seafood.*
- *Promote aquaculture operations that pose no substantial risk of deleterious effects to wild fish or shellfish populations through competition, habitat damage, genetic introgression, hybridization, spawning disruption, changes in trophic structure or other impacts associated with the escape of farmed fish or other unintentionally introduced species.*

² www.seafoodwatch.org

- *Promote aquaculture operations that pose no substantial risk of deleterious effects to wild populations through the amplification and retransmission of pathogens or parasites.*

The TACL remains concerned that despite claims to the contrary, there is little evidence to suggest that global best practice standards such as those outlined above are being achieved within the Tasmanian Salmonid industry. The TACL therefore suggests the Government require the Salmonid Industry to adopt a single standard world leading code of practice, prior to progressing any further approvals that support expansion.

The closest evidence we can find which indicates an attempt to meet these standards is through Salmonid companies attaining accreditation through the Aquaculture Stewardship Council (ASC). The ASC is an independent not-for-profit organisation founded in 2009 by the *World Wildlife Fund* and *The Sustainable Trade Initiative* to manage the global Standards for responsible aquaculture. The ASC's Standards were first developed by the Aquaculture Dialogues, a series of roundtables initiated and coordinated by the World Wildlife Fund³.

Currently, only Tassal are accredited through the ASC, and as discussed later in this paper, when put under close comparison against the requirements for environmental monitoring around the world, even the Tassal accreditation may not meet *worlds' best practice*.

Transparent regulation

In 2012, the Environmental Defenders Office of Tasmania commissioned an article into the current practices for regulation and monitoring of Tasmanian Marine Farms including drawing comparisons with other countries such as New Zealand, Canada and Scotland. This article provides excellent insight into areas for improvement in monitoring and regulation and the TACL believes it would be a useful input into this enquiry in its entirety (please refer to Document number five (5)).

Specifically, the article states that current monitoring of environmental impacts relies largely on evidence supplied from Salmonid farming companies themselves, often in the form of visual evidence collected through remotely operated vehicles.

It is the view of TACL, that visual assessment of individual leases alone is insufficient to determine the real impact of Salmonid farming waste on surrounding marine ecosystems. Tasmanian Salmonid farmers should be required to conduct at least the same forms of measurement that is expected in the rest of the world through the ASC and the Government should support this as a minimum requirement and improve on it to create real industry best practice.

³ <http://www.asc-aqua.org/>

Salmonid industry driven research

The TACL acknowledges the efforts of the Salmonid industry to participate in research related to environmental impacts very close to farming operations, particularly in the Huon and D'Entrecasteaux Channel areas.

For example, the *Broadscale Environmental Monitoring Program (BEMP)* is an assessment of the ecological condition in the D'Entrecasteaux Channel and Huon Estuary. The program commenced in March 2009, and includes participation by all marine finfish farm licence holders in the D'Entrecasteaux Channel and Huon River/Port Esperance Marine Farm Development Plan (MFDP) areas. Sampling conducted from 2009 to 2012 has been interpreted in a report, published by the Institute for Marine and Antarctic Studies at the University of Tasmania.

The research in this report, now over two years old, indicates that a number of ecosystem changes appear consistent with anticipated responses to increased inputs of organic matter and nutrients and that at the time, fish farms in the Huon and Channel areas contributed over 1800 tonnes per annum of dissolved Nitrogen⁴ into the marine ecosystem.

For the key environmental performance indicators such as Oxygen and Ammonia the research suggests a negative impact to the environment due to increased Ammonium concentrations and decreased Oxygen saturations in the water column close to the seabed. It found one of the likely causes was partly due to a combination of increased organic loading to the sediments and subsequent remineralisation and increased inputs to the seabed via excretion from farmed fish associated with the industry expansion⁵.

These findings are of concern to the TACL. The study represents the most comprehensive work undertaken in relation to the impacts of the industry, however it struggled to make conclusions in several areas due to a lack of historical environmental data sets. The study did however, demonstrate that the industry may be having an impact in some areas, and that waste may not be being assimilated or broken down by the ecosystem.

The need for further research

It is very pleasing to note the recent announcement of further FRDC funded research into the impacts of Salmonid farming through the University of Tasmania's *Institute for Marine and Antarctic Studies (IMAS)*: particularly as it relates to impacts of salmonid farming practises on oceanic reef systems. However, it remains unclear as to how BEMP research or the recently announced IMAS research into the broader ecosystem will inform improved Government regulation of the salmonid sector.

⁴ J. Ross and C. Macleod; *Evaluation of Broad Scale Environmental Monitoring Program (BEMP) data from 2009-2012*; University of Tasmania, Institute for Marine and Antarctic Studies, 2013

⁵ J. Ross and C. Macleod; *Evaluation of Broad Scale Environmental Monitoring Program (BEMP) data from 2009-2012*; University of Tasmania, Institute for Marine and Antarctic Studies, 2013

The TACL would like to see research such as the BEMP mandated by Government as a requirement of all Salmonid farms across all regions in which salmon farming occurs – i.e. in addition to the Huon River and Lower D’Entrecasteaux Channel, the BEMP should be expanded to include the salmon farming operations at Nubeena, Storm Bay and Macquarie Harbour. This should include a full spectrum of tests and samples taken in addition to increased video (ROV) surveillance under and around sea cages and the adjacent (broader) marine environment. This would provide a comprehensive data set on which further expansion of the industry could be based. It would also establish a world’s best practice approach to government regulation of the salmonid industry in Tasmania.

It also the strong view of TACL that research required for regulation should be conducted independently of salmonid industry and industry stakeholders.

It is worth noting that the BEMP was undertaken whilst *in-situ* net and equipment cleaning technology was in use. However, since the study commenced in 2009, its use is now much more frequent and widespread. *In-situ* equipment blasts or vacuums bio-foul off pens and nets sending it to the sea bed via a hose. In turn this increases organic loading and mineralisation on the seafloor. To our knowledge, no formal type of regular measurement or environmental analysis has been assigned to its impacts. There is therefore no mention of the accumulated affects of this technology in the study and no addition to the total permissible dissolved nitrogen output (TPDNO) calculation which is used as the key feed input “capping indicator” by DPIPWE.

Despite the recent announcement to conduct further research, the TACL are particularly concerned that there appears to be little or no historical Tasmanian based research that focuses on the risks of marine farming waste to inshore oceanic reef systems. Research to date has tended to focus on impacts directly beneath cages, or close to marine farming sites.

It is the view of TACL that a moratorium be placed on any further expansion until this research is conducted.

As new marine farming techniques/practises are progressively developed, the need for further research on the impact on surrounding marine ecosystems must be prioritised. For example, there have been some suggestions that with the introduction of new “Well Boat” technology by Huon Aquaculture, there may be a resurgence in trials of **Chloramine – T**, a chemical and mild disinfectant used to control Gill Amoeba Disease in Salmonid species. This raises questions such as: How would the chemical be disposed after its use? Is there any research on the impacts of the chemical if discharged into the marine environment on surrounding ecosystems, including wild fish stocks? How will it be regulated? These types of questions must be considered pro-actively in a transparent regulatory system. For further comment on the risks of Chloramine -T on the marine

ecosystem, please refer to Dr Julie Mondon's paper which has been included as document number 2 in the TACL Senate Inquiry Submission.

The problems with Salmonid industry driven accreditation and monitoring

TACL acknowledges that Salmonid farming companies use various international accreditation bodies to assist in their environmental management, marketing and communications. Industry representatives cite a variety of industry driven monitoring and regulation regimes, which they claim, ensure environmental accountability. Several of these are described below, along with what we see as their limitations in achieving robust, transparent and independent environmental monitoring:

The Global Salmon Initiative

Recently, industry representatives have cited the Global Salmon Initiative (GSI) as evidence of the environmental rigour of the Industry. For example, Mark Porter, CEO of Petuna Seafood recently said on ABC radio: "There's a global salmon initiative (GSI) that we all adhere to, all salmon farmers are measured by and out of all the salmon farms in the world the Tasmanian companies come within the top 12."

The GSI is a leadership initiative established by Salmonid producers. It is self-managed with no accountability or penalty for breaching guidelines. It has only 14 members globally – about 50% of global salmon producers (based on tonnage production). Interestingly, Petuna Seafood is not listed as a member on their website⁶.

The TACL are concerned that initiatives such as these are being "wheeled out" by the Tasmanian salmon farmers to demonstrate the environmental rigour of the industry when they are clearly industry driven and therefore potentially "self-serving". If Tasmania is indeed in the top 12 in the world, how can this be determined against only 14 members and 50% of global producers? Real environmental rigour should instead be demonstrated through robust research and associated independent regulation.

The Aquaculture Stewardship Council (ASC)

The ASC's aquaculture certification programme and logo recognise and reward responsible aquaculture. The ASC is a global organisation working internationally with aquaculture producers, seafood processors, retail and foodservice companies, scientists, conservation groups, non-

⁶ <http://www.globalsalmoninitiative.org/>

government organisations and the public to promote the best environmental and social choice practices in aquaculture.

As mentioned previously, Tassal is the only salmonid company in Australia to be a member of the ASC and so in our view, has been placed under the most scrutiny regarding environmental monitoring and transparent operations. However, there remain gaps in Tassal's conformity with the ASC standards. Variances have been granted to environmental sampling techniques, due to the lack of regulatory requirements by the Tasmanian Government, which suggest the rigour of environmental sampling is less than it should be to meet world's best practice⁷.

Tassal's assessment by the ASC was handed down on the 4th of September 2014. There were 13 non-conformities identified during the full assessment of the Dover farming region⁸, which equated to 93% compliance against the 152 compliance criteria. Some of these criteria are in the not applicable category (17%) partially due to the lack of environmental monitoring required by the Tasmanian Government as compared with other countries⁹.

For example, one of the non-conformities relates to the fact that the State Government only currently requires that biodiversity reports are undertaken when marine farming leases are amended. To their credit, Tassal has committed to taking this matter up with consultants to ensure biodiversity impact assessments are completed for all leases. The TACL view this as a positive step, although, again it demonstrates action by an individual company, rather than a transparent requirement of Government or an independent regulator.

There are also non-conformities relating to meaningful stakeholder consultations and specific consultations about the use of antibiotics.

Five non-conformities relate to the conservation of natural habitat, local biodiversity and ecosystem function. One specifically relates to the frequency of environmental impact sampling at the farm. Our research indicates that DPIPW has mandated in Schedule 3V of the Marine Farming Licence, that all salmonid farms are assessed visually by video monitoring of the seabed in place of chemical proxies such as Redox potential and Sulphide levels.

Interestingly, despite the non-conformities relating to environmental monitoring, the ASC categorised all non-conformities as minor allowing Tassal to achieve its accreditation.

⁷ Report for Tassal Operations Pty Ltd: Full assessment against ASC Salmon Standard V1.0, 2014 – page 22 assessment results

⁸ The Dover farming region comprises the southern areas of the D'entrecasteaux channel, which are in close proximity to significant abalone harvest areas in South Eastern Tasmania

⁹ Report for Tassal Operations Pty Ltd: Full assessment against ASC Salmon Standard V1.0, 2014 – page 9, Environmental Monitoring

It is the view of the TACL that the ASC is a form of assessment that is positive for Tasmania and aligns with the TACL aim of both industries flourishing as it brings together all areas of compliance with a final certification that seeks to drive accountable improvements in environmental and social responsibility.

We remain concerned, however, that the DPIPWE requirements for environmental monitoring are less than those required by the ASC, and even more concerning is that with Government support, variances to sampling techniques have been applied and accreditation granted.

The Global G.A.P

Huon Aquaculture is accredited through Global G.A.P. This is an Integrated Farm Assurance Standard that accredits many different primary producers around the world. The Aquaculture accreditation, 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. Unlike the ASC, it seems that accreditation reports are not publicly available. However, our research indicates there are environmental monitoring requirements including waste management processes and benthic sampling requirements to meet the standards¹⁰.

Evidence required to meet these standards could be based on the licensing requirements of the Tasmanian State Government for marine farming (as is the case with Tassal's approach to accreditation under the ASC). Similar issues then emerge about the current state government requirements around bio-foul and fish waste management and ROV sampling techniques.

All of the above represents an approach to environmental monitoring which is based on current State Government licensing requirements as the minimum standard for environmental monitoring. It seems that when international accrediting bodies require a different, possibly more robust type of monitoring, Tasmanian based companies can refer to what is required of the State Government (which are less rigorous) and can then seek variations to the standard.

It is the TACL's opinion that a full spectrum of sediment, chemical and visual samples of the specific locations under and around sea cages should be obtained and assessed to provide quality data sets to DPIPWE, other industries and the public for decision making and future reference. This should be in addition to further research on the broader environmental impacts beyond specific marine farming zones. It should be a regulatory requirement, governed through an independent regulator and framed within a world's best code of practice for Tasmanian Salmonid growers.

¹⁰ <http://www.globalgap.org>

Recommendations

To address the issues raised in this submission, the TACL proposes the following key recommendations for consideration:

1. An independent regulatory and monitoring system is established to ensure that regulation and associated environmental monitoring and research are conducted through an independent body, outside of the Marine Farming Branch of DPIPWE and fully funded through increases to Salmonid related licensing fees/levies/royalties.
2. That the independent regulator instigates a world's best code of practice for Tasmanian Salmonid Aquaculture. This should include improved environmental monitoring procedures by applying a broader range of measurement techniques such as those applied in the BEMP to all farms and that sampling is increased to encompass every sea cage site. This could be further strengthened through Governments endorsement of the ASC as the preferred accreditation framework for Salmonid farming in Australia.
3. That the independent regulator also commission research into the impacts of Salmonid farming waste flow-on effects in surrounding ecosystems, particularly inshore oceanic reef systems. This research should be conducted over a realistic timeframe, aligned with Salmonid farming cycles and in close consultation with TACL. This research should be a direct input into the regulation regime of the industry.
4. That a moratorium on any further expansion of the Salmonid industry in the South East of Tasmania be put in place until at least recommendations 2 and 3 have been completed.
5. That industry wide best-practice capture of excess feed and fish excretions is researched, developed and implemented including capture techniques beneath individual salmon cages (See practical solution two (2) detailed later in this document).
6. That industry ceases to clean equipment in-situ until capture of waste is built into the best practice net and cage cleaning techniques and becomes a regulated requirement. (See practical solution one (1) detailed later in this document)
7. That the State Government review current regulatory requirements and legislation to create closer alignment between the Tasmanian Marine Farming Act and the Environmental Management and Pollution Control Act, including initiating a monitoring and enforcement policy to be implemented through the independent regulator and which includes identification of waste, bio-foul and effluent spills with associated escalating penalties based on the severity and scale of a breach.

Practical Solutions

1. Effluent capture

Currently, in contrast to environmental expectations in other industries or parts of the community, Tasmanian Salmonid farms are permitted to discharge all of their untreated effluent (excess feed and fish faeces, net bio-foul) directly into the natural marine environment. Given the industry's existence within a marine environment, there are risks associated with effluent, including impacts on surrounding marine ecosystems and other wild fisheries. These risks are yet to be fully assessed and therefore mitigated, however effluent capture should be considered a practical solution for the industry and would bring with it world's best practice environmental benefits, which in turn would promote industry expansion.

Other primary production industries are already realising the significant financial gains associated with the capture of effluent by-products. For example in the Chicken Farming Industry, the effluent by-product, in some cases, is a higher value product than the chicken. It stands to reason that exploration of the concept of effluent capture in the Salmonid Industry could lead to a broad spectrum of positive outcomes including those impacting on stock, the environment, job creation and the economy. In addition, it may also result in substantial improvements to Salmonid farming practice, accountability and sustainability, associated with a world's best code of practice for aquaculture in Tasmania.

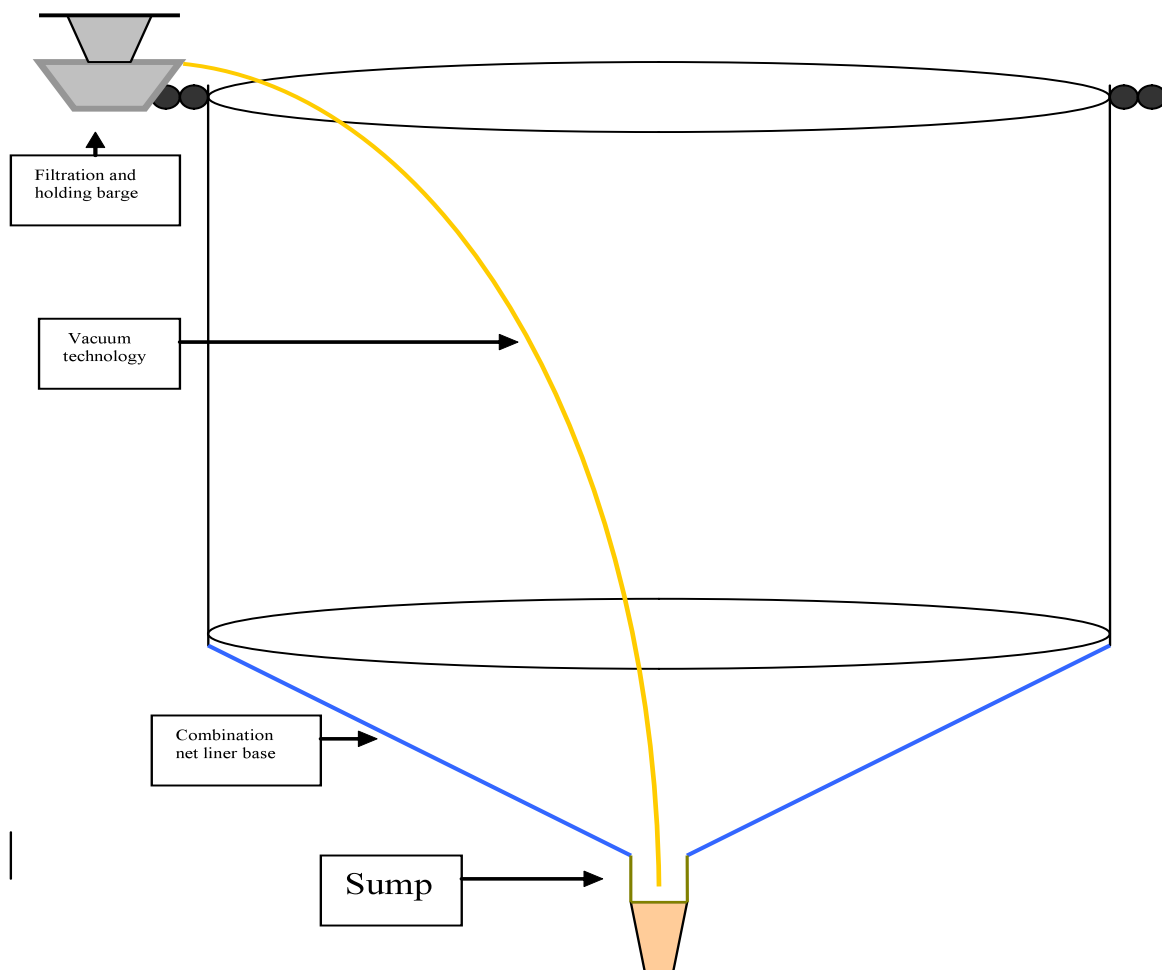
Significant funds have been allocated to monitoring the environmental impact of Salmonid farming in immediate farming zones. However, little focus has been given to the reduction of Salmonid farming waste other than through feed delivery of which the driving issue is always about minimising the cost of feed.

Tasmania has the opportunity now to develop technology that truly boasts world's best practice. Considering the challenges farms already tackle relatively successfully, including predation, bathing regimes and fish handling techniques; it stands to reason that Salmonid farms could develop and incorporate effluent capture technology into their operations, and potentially realise a financial return on the investment. For example, there may be a market for the technology internationally as well as for the effluent by-product.

In Tassal's case, given their construction of a waste plant in Triabunna, consideration could be given to increasing the scope of the plant to receive effluent by-product (salmon excreta and uneaten fish food pellets). This may result in further job creation and economic stimulus and may therefore represent a concept through which the industry could partner with Government to pursue.

This concept is premised on the development of technology to successfully capture effluent (salmon excreta and uneaten fish food pellets). The existing in situ net vacuum technology (MIC) could be used as the basis for this, with the addition of a vacuum and filtration system allowing effluent to be filtered, captured and ideally processed to a viable product. A concept drawing describing this technology is below.

Effluent removal concept drawing



Benefits:

While the environmental benefits are relatively obvious, and the potential financial benefits have already been proposed, this type of technology may evoke other operational benefits. From a lease management/operational perspective, implementing the above concept could result in substantial logistical savings. These would include minimising pen relocation for fallowing and enabling entire year classes to be kept separate.

Data collection would also be increased, each cage could be accurately assessed for excess feed and faeces could be analysed. Also, mortalities could be captured and assessed in a timely manner before decomposition made cause of death unknown.

Predation through seal attack would also no longer be associated with the net base and savings could be realised in predator net systems. There may also be cost benefits associated with growing stock under lights. For example, specific colours could be used in the effluent capture base to reflect and increase lux (light) levels reducing power costs and increasing efficiency.

With overall environmental monitoring and waste capture regimes improved, the implementation of effluent capture technology could also result in improving long term lease conditions. This would be of benefit to the ongoing debate over the environmental impacts of the current industry, and its future expansion.

2. Bio-foul and equipment coatings capture

In-situ net cleaners are now in use across the industry. This method manually removes fouling organisms and associated net or cage coatings from the nets or other farming infrastructure such as cages or barges using hydraulic suction or blasting (using infrastructure called the Marine Inspector Cleaner or MIC). There is currently no requirement that the waste (bio-foul or equipment coatings) created through this process is captured or removed from the marine environment.

It could be argued that Salmonid farms have been more environmentally responsible for the waste created through the cleaning of farming infrastructure in the past. Historically, nets were removed and washed onshore in semi-closed systems catching the waste in a sump. Likewise, pens were also historically removed from the water and cleaned and all barges were slipped in accordance to Marine and Safety Tasmania (M.A.S.T) regulations. ***The use of the MIC now results in waste being deposited directly into the marine environment and thereby removing the farms responsibility to capture and process its bio-foul by-products.***

The *Environmental Practice Guideline for Cleaning of Salmon Cages using Marine Inspector Best Management in situ Net Cleaner* (refer to <http://dpiwwe.tas.gov.au/Documents/Appendix%204%20-%20Environmental%20Best%20Management%20Practice%20guidelines%20for%20In%20situ%20Net%20Cleaning.pdf>) has been developed by industry, in consultation with scientists to guide these operations. However there remains no stipulation that the waste blasted or sucked from the nets is captured or removed. As with the issues raised regarding excess feed and faeces, there is an underlying premise that the surrounding ecosystem can assimilate and break down this waste.

Salmonid industry representatives argue they use the MIC to clean nets while they are still relatively clean and therefore minimise waste. However this premise is also flawed, as previously the method of removing nets for washing deposited very little waste at the lease site, so any in water cleaning methods increase the overall input into the environment.

In addition, interpretation of the Code of Practice is at the discretion of the farm manager. There is also no regulatory requirement to measure the impact of MIC technology in terms of

environmental loadings. The Code of Practice seems to be primarily concerned with minimising any potential impacts on Salmonid stocks in the direct vicinity of the MIC, rather than on benthic conditions. It clearly emphasises that MIC discharges are to be kept away from stock and deposited on the seabed.

Given the MIC is also used to clean sea cages in-situ, using the same Code of Practice described above, there are additional potential risks. The bio-foul associated with heavy farm equipment like sea cages includes shellfish and other invertebrates as well as algae. This could be considered a more potent form of pollution as it decomposes in the benthic zone.

When considering all of these factors, one needs to keep in mind the sheer scale of farming operations in Tasmania and the volume of associated waste. Alarmingly, bio-foul wastage does not appear to be measured and incorporated into the total input assessment limits used by Government to regulate the impact of the industry.

As has also been suggested in the effluent capture concept, the capture and processing of bio-foul and associated equipment coatings could be a primary objective of responsible farming and worlds best practice.

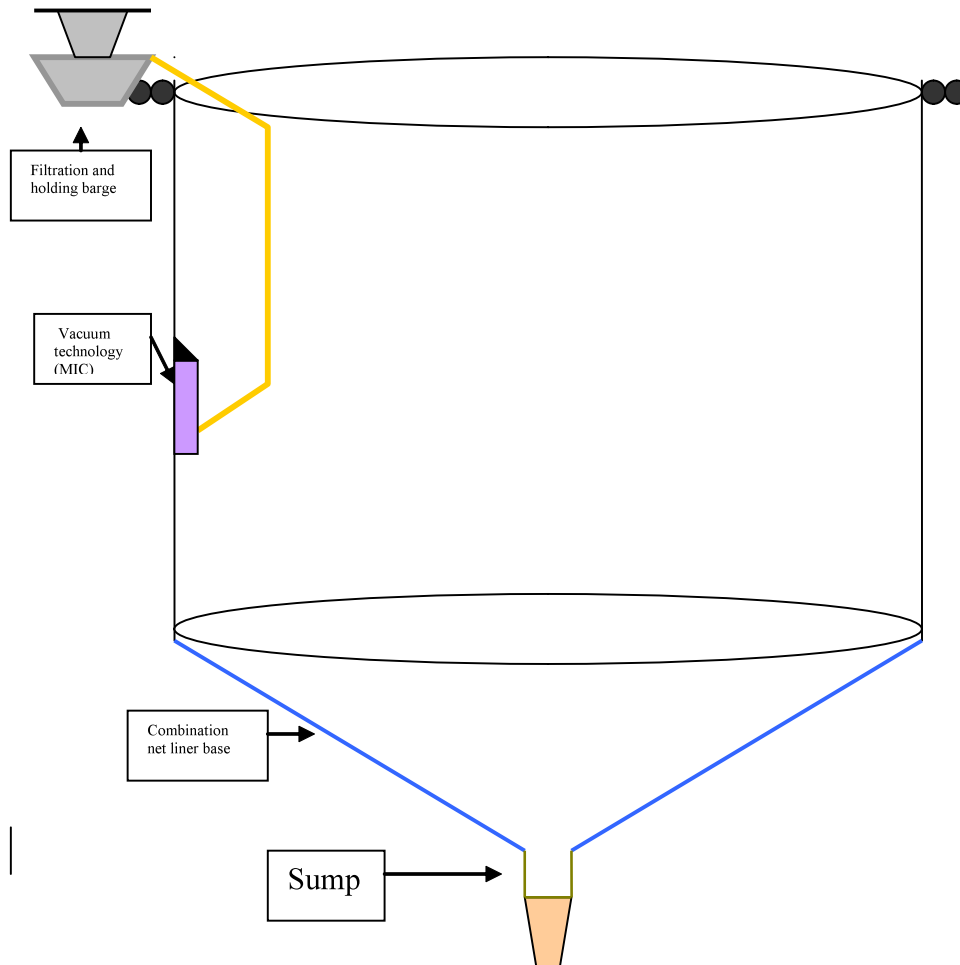
The MIC represents the technology required to capture bio-foul and associated coatings, however it should be used in conjunction with a filtration and holding facility (barge or vessel) and returned to shore for processing and appropriate disposal.

Given the infrastructure developed by the industry to overcome other challenges such as bathing regimes, it stands to reason that the MIC system could be improved to combine capture of discharge. Also given MIC's are already cleaning the infrastructure additional costs would be limited to the capture of the bio-foul technology only. This technology is readily available¹¹.

A concept diagram describing the improvements required and the additional technology is below:

¹¹ Further information regarding drum filter technology can be found at: <http://www.faivre.fr/index.php/en/products/drum-filters/19-en-produits/182-en-filter-rotoclean> . Video <http://www.youtube.com/embed/-NiPykqXpb8?wmode=transparent&rel=0&theme=light>

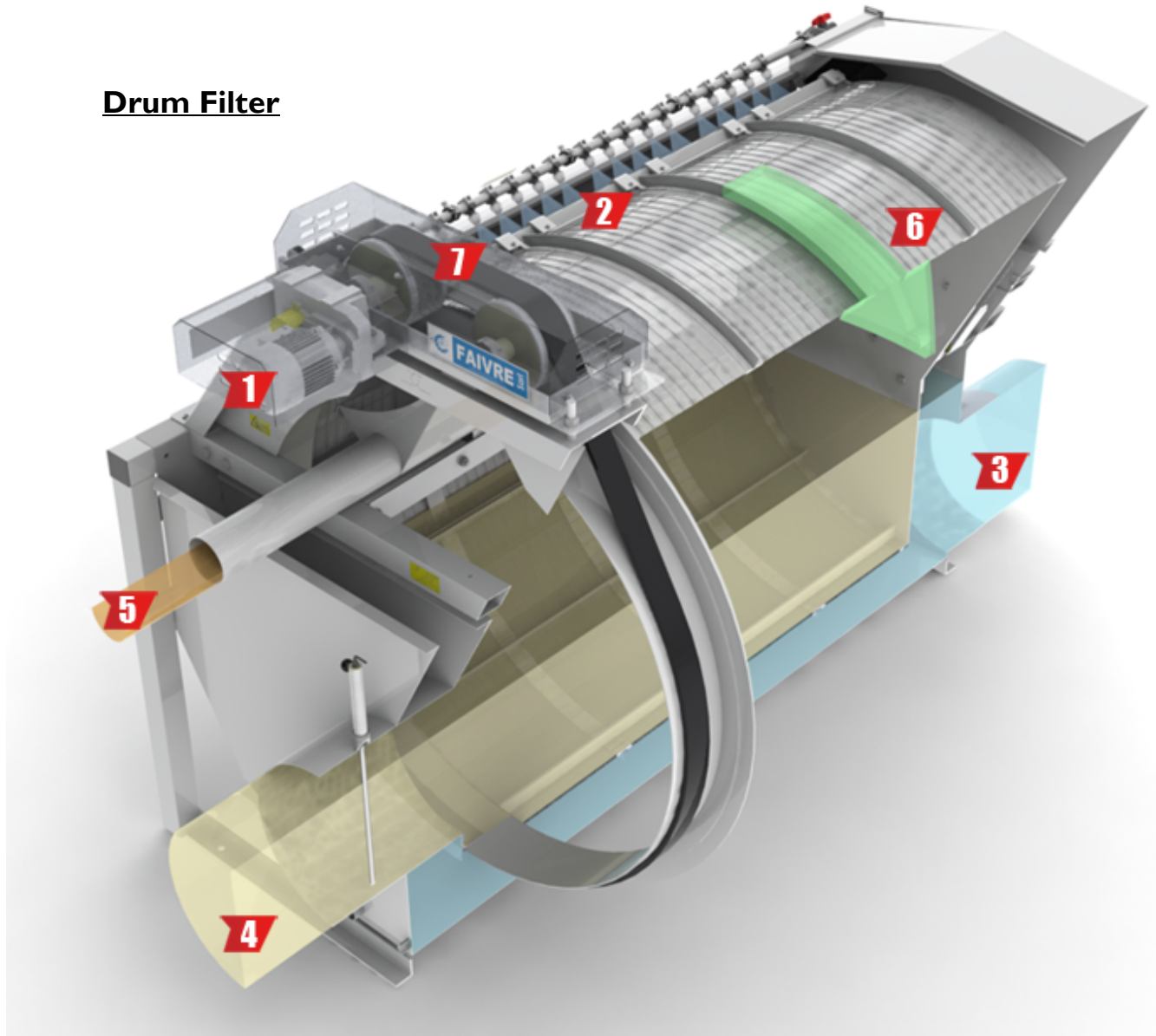
Biofoul and associated coatings capture concept drawing



The filtration and holding barge could house a drum filter. Drum filters are widely used to remove by products from aquaculture operations around the globe. The filtration system comes in a wide range of capacities; a diagram describing this technology is below¹².

¹² Further information regarding drum filter technology can be found at: <http://www.faivre.fr/index.php/en/products/drum-filters/19-en-produits/182-en-filter-rotoclean> . Or via Video at <http://www.youtube.com/embed/-NiPykqXpb8?wmode=transparent&rel=0&theme=light>

Drum Filter



- 1 : Drum motor - 2 : Rinsing manifold - 3 : Filtered water outlet
4 : Inlet for water to be filtered - 5 : Sludge outlet - 6 : Drum with filtration sheet
7 : Drum suspended on belts (BDS System)