

SUBMISSION NO. 10

Inquiry into the Role of Science for Fisheries and Aquaculture

House of Representatives Committees

Submission for the Inquiry into the Role of Science for Fisheries and Aquaculture

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Background

Over the past decade the Huon Estuary and southern D'Entrecasteaux Channel have taken on the appearance of an industrial area on the water, with the black circles - fish pens - extending 10 or 15 metres below the surface.

The wonderful wildness that was a great attraction of the D'Entrecasteaux Channel and Huon Estuary in the late 1980s and early 90s is now an industrial seascape. I am concerned about the damage to the natural environment and the visual amenity of our waterways and the impacts on residents of these coastal areas.

Support for sustainable aquaculture

I am not opposed to farming salmon in Tasmania's waterways. If sufficient scientific background information is prepared and the precautionary principle is employed, sustainable aquaculture may provide a source of fish that will allow Australia to rely less on its diminishing stocks of wild fish. The source of fishfeed needs thorough scientific assessment to ensure that wild fish stocks are not being depleted to feed farmed fish, and that all feed is analysed to ensure it is disease-free. The carbon footprint of farmed salmon should be quantified through correlation of wild fisheries research and assessment of other sources of feed.

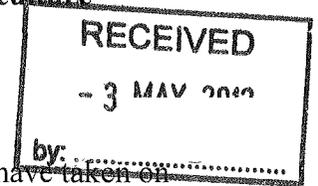
Salmon farming has become a major employer in the Huon Valley, and I would not like to see the industry collapse because it becomes unsustainable due to water temperature rises, disease and so on, as has happened to aquaculture industries around the world.

In March 2012 the Environmental Defender's Office organised a one-day conference in Hobart "Managing Marine Farming: have we achieved best practice". This highlighted some of the issues confronting aquaculture in Tasmania.

Tasmania's potential

The salmon farming industry in Tasmania should be developed as one that is appropriate to the scale and capacity of the waterways.

- High-value, low-impact marine farming could and should be a wonderful industry for Tasmania, and could be sustainable far into the future.
- It could also be the basis of high-value salmon-tourism – but only if it expands slowly, is done on a smaller scale and with sustainability as its primary goal, not as an afterthought.
- Tasmania's brand, or promise, is all-important.
- This was highlighted by Gerard Castles at the EDO conference when he talked about "the wild amazing place that is Tasmania" and emphasised that the product, in this case Atlantic salmon, "must be what it says it is."



- Tasmania bases its marketing on a clean, green image. If the image is not the reality, over time consumers will come realise that the product is not what it claims to be, and it will become unacceptable.

The following points were ones that I raised specifically in relation to the proposed expansion of aquaculture in Macquarie Harbour. Not all are relevant to aquaculture elsewhere, but the principle of the need for scientific assessment of aquaculture sites is universal.

Visual impacts and effect on the brand – or promise - of wilderness at Macquarie Harbour

- The greatest tourism drawcard of the town of Strahan is the wilderness atmosphere provided by the vast expanse of Macquarie Harbour.
- It is the base for the cruises to Sarah Island and the Gordon River with its primeval forests that entrance visitors from all over the world.
- Do these visitors anticipate that the route through Macquarie Harbour to Tasmania's last wild river will be lined with industrial scale fish farms?

Expansion

I have been concerned because the expansion of aquaculture has been so fast in the Huon/D'Entrecasteaux and there is a need to proceed on the basis of scientific understanding of the environment in which aquaculture is operating.

- It has been difficult to get information about the environmental impacts of the industry, and it has taken over 25 years to get the first sustainability report from Tassal. Such reports have not been made public by the other two proponents of the Macquarie Harbour expansion.
- Transparency has not been a feature of an industry, so there is a lot of catching-up to do to develop open and sustainable practices.
- In Macquarie Harbour, unlike the southern D'Entrecasteaux Channel, there will be constant surveillance of the farming. Fish escapes, mortality of fish in the pens and any other events will be visible to visitors and locals. The science must be understood to ensure that irreparable damage is not done in this fragile environment.
- Informed residents may know better what to look for, because the environmental changes that have taken place in Port Esperance over the past decade – increased algal growth, changed water flows etc, will provide a guide for them to know what to look out for.
- The environmental credentials of any expansion must be internationally recognised as world class if the brand or promise is to be the reality for aquaculture in Macquarie Harbour especially, but also in other Tasmanian waterways.

Bathurst Harbour and Macquarie Harbour – low nutrient estuaries

A couple of years ago I was lucky enough to visit Bathurst Harbour and experience the unique qualities of the South West Wilderness World Heritage Area and the Bathurst Harbour and Port Davey waterways in particular.

Information provided by Parks and Wildlife Service (PWS) added enormously to the experience by highlighting the underwater wonders and the unique values of the harbour.

It was the experience of Bathurst Harbour that prompted me to make the submission on the expansion of marine farming in Macquarie Harbour.

Like Bathurst Harbour, Macquarie Harbour is a stratified water system, and thus a very fragile environment.

Surely the two sites must be similar in their qualities and environmental values?

In Bathurst Harbour the PWS booklet tells us of the *“unusual water features – dark, layered water”*

“When freshwater meets saltwater, layering occurs because freshwater is lighter than dense saltwater. Within the marine reserve, this causes the dark band of tannin-rich freshwater to sit on top of the clear saltwater. The phenomenon is known as stratification. In Bathurst Harbour and Bathurst Channel the freshwater layer is at its deepest – about 4m – in winter when rainfall is highest. The narrow zone where freshwater meets saltwater is called the halocline, or salt gradient. Mixing of the halocline disturbs marine life as some species have adapted to live in either fresh or saltwater.

Reducing boat speed helps avoid mixing the fresh and saltwater layers.”

Effects of increased boat movements in Macquarie Harbour

- Boat speed and the consequent noise have been major issues in the Huon River where aquaculture vessels often travel at high speeds.
- In the Huon D’Entrecasteaux region, pens are towed around by fairly substantial boats with large engines that churn up the water and could well disturb the stratification of water in Macquarie Harbour.
- In such waterways restrictions are needed to minimise impacts on the stratification of the waters by boats with powerful engines, and to prevent coastal erosion due to wakes of fast motor boats, such as people movers, used in aquaculture.

Disturbance of stratification by pens

- The bottoms of the 15 metres deep pens will penetrate well into the saltwater layer. Fallowing requires pens to be moved around, thus further disturbing the stratification of the waterway.
- If pens that are 10-15 metres deep are moved around in Macquarie Harbour it could significantly disturb the stratification.
- Even the continuous movement of fish within the deep pens may set up local currents that affect the layering of the water. Scientific research on this needs to be done before expansion into stratified waterways.

- The proximity of the furthest south lease closest to the WHA must mean that there is a risk of change to the waters across that imaginary line.

A report from Lenfest Ocean Program (www.lenfestocean.org) in April 2011 “Dilution cannot be assumed the Solution for Aquaculture Pollution” on a scientific study in the journal *Environmental Fluid Mechanics* was the first detailed look at how real-world factors influence the flow of wastewater from fish farms. It provides a basis for understanding the impact of aquaculture on coastal water quality.

Low nutrients

In their response to my submission the Planning Authority (PA) stated that one of my concerns was *“increased nutrient levels resulting from salmonid farming into what is considered by the representer to be low nutrient waters”*.

This response from the PA implies that there is no evidence that the waters of Macquarie Harbour have low nutrient levels.

In the EIS here are two references to low nutrient levels in Macquarie Harbour. Based on these references and the Bathurst Harbour booklet I believe that there is justification for my “considering” that the waters are low in nutrients.

In the Executive Summary p xxi

“The fish community in Macquarie Harbour is very similar to that found in Bathurst Harbour. There is low diversity, possibly reflecting the low nutrient waters of the West Coast.”

On p.59 under the heading **Fish**

The fish community in Macquarie Harbour is very similar to that found in Bathurst Harbour. There is a low diversity, possibly reflecting the low nutrient waters of the West Coast, resulting in drainage from poor soils and inert metamorphosed Precambrian rock types (Edgar et al. 1998).

The beautiful booklet prepared by the Parks and Wildlife Service for visitors to Bathurst Harbour states that *“it is highly unusual for an estuary to have low nutrient levels as the waters that drain into them usually contain sediments rich in nutrients. In the south west, however, the waters have drained through the nutrient-poor shallow soils of eroded quartzites.*

The low nutrient levels affect the entire food chain, with less plankton, less fish and less filter-feeding invertebrates, other than at locations with rapidly flowing currents. The marine invertebrates in Bathurst Channel and Bathurst Harbour exist in – and rely on – this low nutrient environment. Any increase in nutrients can poison the animals and encourage invasive species.

Discharging boat sewage and sullage increases nutrient levels. Boat owners are encouraged to discharge outside the marine reserve.”

- Bathurst Harbour is a highly protected waterway - a national treasure - and is treated with the greatest respect by the limited number of visitors who are lucky enough to be able to travel to this remote location.
- Even the relatively minor amount of effluent that might be discharged from marine toilets is tightly regulated and policed.
- In contrast, the equally special and wild Macquarie Harbour has already been adversely affected by human activities, especially mining and residential, but also by some aquaculture.

Any expansion of aquaculture into the more southerly area of Macquarie Harbour (only 400m from the boundary with the World Heritage area) has the potential to irreversibly damage this iconic waterway through the effluent from fish farms changing the fragile natural balance of the waterway.

Increasing nutrients are likely to spread over wider areas over time, simply by diffusion and wind.

The report from Lenfest “Dilution cannot be assumed the solution for aquaculture pollution” in 2011 on a research paper in the journal *Environmental Fluid Mechanics*, states

“Marine aquaculture or fish farming is viewed as a means to supplement declined wild fisheries and to help meet the rising global demand for seafood; however, it can cause environmental degradation. For example water quality can be significantly impacted because farmed fish excrete much of the nutrients contained in their feed, including nitrogen and phosphorus. In excess these nutrients can trigger eutrophication and depleted oxygen levels.

Nutrients discharges are a particular concern when fish are grown in open net pens because nutrient-laden faeces, undigested feed and other fish wastes flow freely into the surrounding environment, some settling to the bottom and other wastes dissolving into the water column.

The concentrations of dissolved waste from net pens are often assumed to decline continuously in all directions as the discharge moves further from the pens, diluting the environmental impacts as the distance from the pens increases.

The scientists created a modelling tool that predicts a site’s ability to meet water quality standards, taking into account local factors such as tidal flows, river outflows, wind-induced currents, shape of embayments, the earth’s rotation and other properties of the locality influence the concentration and spread of dissolved wastewater plumes.”

This study is consistent with a 2005 paper from the Aquafin CRC on the D’Entrecasteaux Channel in which tracers were used and it was found that *“a continuous release of tracer from the cage results in a plume emanating from the cage in the form of a long narrow ribbon. The position and concentration of the plume is dependent on the in situ flow conditions and possesses large variability in space and time. It is possible for a plume having concentration of 10% (ie 10:1 dilution) of the source concentration to exist up to 0.5km from the cage on occasion”.*

Note that Zone 9 in Macquarie Harbour is only 400m from the boundary of the World Heritage Area.

The CRC report on the D'Entrecasteaux Channel goes on to say that *"for settling rates typical of feed pellets or faecal material eg of the order of 10cm/sec, the footprint is restricted to the cage site. However, settling rates an order of magnitude less than this result in footprints in the form of an elongated plume with typical length 0.5km and width 200m emanating from the cage site. The direction of this plume is controlled by subsurface currents, and may be in the opposite direction to surface currents."*

The data in the EIS for the Macquarie Harbour expansion give the impression that there will be no pollution outside the lease areas.

These data from the two papers referred to suggest that pollution is very likely to spread at least from Zone 9 into the waters of the World Heritage Area and its coastline – and possibly from other zones.

In the EIS (p.252- 3) the conclusion is that *"aside from localised effects, there will most likely be a small elevation of nutrients within the central harbour area. It is possible that such an increase could create indirect impacts like macro-algal growth in more remote and shallow locations. While it is thought unlikely due to dilution of the nutrients with distance from the farms in the central harbour region and light limitation similarly affecting plankton development."*

This suggests that greater effects may be in shallow waters, where the threatened Maugean Skate has been found.

Total Permissible Dissolved Nitrogen Output (TPDNO)

The issue of the TPDNO was raised in relation to the proposed expansion of the lease at Soldier's Point in the D'Entrecasteaux Channel.

The Panel's report stated that: *"Both the EIS and the section 40 report suggest that because the total feed input to the Channel is within the Total Permissible Dissolved Nitrogen Output (TPDNO), there is a low risk of dissolved nutrients having a deleterious environmental impact on the regional environment."*

I have searched the EIS for the TPDNO for Macquarie Harbour and have not been able to find any reference to it.

It is essential that scientific research defines the TPDNO for Macquarie Harbour before any expansion of aquaculture is permitted, and that it is consistent with the low nutrient conditions present in Macquarie Harbour in its natural state.

Disease - Chile's experience

In Chile the salmon industry developed in the 1980s collapsed between 2007 and 2009 because of a viral infection causing severe anaemia in Atlantic salmon. Before 2009 the salmon industry had 550 farms and employed 50,000 people with profits in 2006 of \$2.5bn. In 2008-2009 15,000 workers lost their jobs. Disease is a threat to all salmon farming and the bigger the venture the more disastrous is the impact.

Antibiotic Use

- The use of antibiotics is of concern. If a bacterial disease occurs, aquaculture companies have no choice but to use antibiotics, so there is no guarantee that antibiotics will not be used if and when diseases occur.
- The use of large quantities of antibiotics in the inshore marine environment has potential to increase antibiotic resistance among bacteria affecting human health.
- According to Dr John Volpe who spoke at the EDO conference in Hobart in March, there has never been an instance where disease was not a significant problem for finfish aquaculture.
- His view was that it is not whether antibiotics will be used by the aquaculture industry but when and how much.

Climate Change

The effects of climate change and in particular rising CO₂ levels that are lowering the pH of waterways are likely to impact aquaculture.

Climate change is a long term issue that will need to be dealt with under adaptive management strategies by the industry. Detailed scientific analysis of water temperature and acidity will be needed to understand the impacts.

Water temperature

In the Huon D'Entrecasteaux region, the rising water temperatures that were predicted as part of the effects of climate change have been considerably greater than expected, and have had serious effects on the aquaculture industry.

- Fish pens now need to be venturated and flushed with fresh water in order to minimise disease. The Federal Government recently allocated almost \$5 million to provide fresh water flushing of pens for existing aquaculture.
- It is not clear whether potential sea temperature rises were taken into consideration in previous marine farming plans, but should be considered in detail whenever expansion is considered.
- If the water temperature in Macquarie Harbour, for example, were to rise significantly so that venturation was needed, this could significantly disturb the stratification of the water in the harbour.

pH changes

In the TAFI paper "Scoping Study into adaptation of the Tasmanian Salmonid Aquaculture Industry to Potential Impacts of Climate Change" the authors refer to pH changes as a threat.

“The oceans are becoming more acidic due to absorption of increasing atmospheric carbon dioxide. Surface ocean pH decreased by 0.1 pH unit since 1750, and is expected to decline by an additional 0.2 to 0.3 units by 2100 (Hobday et al 2007). While this change may not have direct effect on salmon health it is possible that it can contribute to disease outbreaks”.

- The greater scientific understanding that climate change is happening now – in particular rising water temperatures and falling pH – means that it must be taken into account.
- It should be a substantial part of the modelling for any long term development – and needs to be done before any expansion of aquaculture in Macquarie Harbour is approved.

Rate of development

The proposed expansion of marine farming in Macquarie Harbour is going to take place over the next five years, with expenditure of something like \$88 million.

The Planning Authority claims that this is “gradual development”.

- I regard this as rapid expansion and question whether it will allow for the adaptive management processes that are part of this proposal.
- How can the cumulative effects of salmon farms on areas at a distance from the leases be determined within one or two years of the pens being put on the lease?
- Water monitoring so far has been once or twice a year. More frequent monitoring is needed as farms are established and the process of growing the fish proceeds.
- Scientific assessment of the cumulative impacts of leases is essential and this information must be available to the public in an accessible form.

The expansion of aquaculture in the Huon D’Entrecasteaux Channel over the past 10 years has been dramatic.

Anecdotally, the decrease in wild fish numbers in Port Esperance have been quite significant. The changes are noticed by members of Coastcare groups, people who walk on the beach and especially those who visit shacks regularly, but at longer intervals. The increases in algal growth, especially sea lettuce in the inter-tidal zone has been very noticeable.

Accreditation for environmental credibility

If aquaculture is to continue, it must have consumer acceptance – and consumers are becoming more discerning.

- Tasmanian Atlantic salmon is marketed as a clean green product grown in pristine waters without environmental damage.
- This marketing image must also be the reality.
- The “promise” of the World Heritage Area must be protected.

International Accreditation

In 2010 an international accreditation system was introduced for the first time.

The Global Aquaculture Performance Index - GAPI – is internationally recognised (www.seafoodsource.com October 2010, and www.lenfestocean.org)

GAPI has two functions - it evaluates and compares the environmental impacts, and simplifies the results for key marine finfish species such as Atlantic salmon.

- Firstly, it provides a measure of the intensity of environmental impacts per unit of production.
- Secondly it provides a *“cumulative score which encapsulates the overall impact of aquaculture production across a region or within a country, allowing policy makers to assess proper scale and carrying capacity for a given area”*.
- Dr John Volpe, who was involved in developing the accreditation system, said: *“Even within species we found dramatic difference from country to country across the board.*

Scale matters. Efficiency on a farm-by-farm basis is good but one must keep an eye on the cumulative effect. GAPI is the first initiative to take a global snapshot of aggregate impacts”.

If the Tasmanian farmed salmon industry is to be recognised as environmentally responsible it needs to embrace the standards set out in the Global Aquaculture Performance Index. The 2010 media release says that GAPI should also be used by governments *“to inform policies and regulations to minimise the environmental footprint of fish farming. Farmers can it to improve production practices. And buyers can use it to compare and select better, more environmentally friendly seafood options”*.

The tools are available

If Australia is to achieve the best possible production methods and minimise environmental impacts, as well as improving market acceptance – or at least not losing market acceptance – then it is critical that GAPI is used to assess any expansion of aquaculture in Macquarie Harbour or elsewhere before any expansion takes place, not afterwards, when it may be too late to make the necessary adjustments.

Conclusion

Open and transparent reporting processes based on rigorous scientific data on existing aquaculture operations are essential if aquaculture is to be sustainable. The sources of feed must also be made public and the operations must be assessed under the same planning processes as land-based activities.

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