18 January 2020

Open letter to Huon Aquaculture and other interested parties

Salmon Farming and Heavy Metal Pollution: More Facts

I read with interest a fact sheet that has recently been posted on Huon Aquaculture's website entitled '*Salmon Farming and Heavy Metal Pollution: The Facts'*.

As a professional with considerable experience in the management of heavy metal contaminated waterways, I would like to provide a more comprehensive view about the risk of heavy metal pollution associated with nutrient and organic pollution, with a particular focus on the Derwent estuary and Macquarie Harbour.

I am not suggesting that Tasmanian farmed salmon are likely to contain significant levels of heavy metals - presuming their feed is free of contaminants. However, the nutrient and organic pollution discharged by net pens in marine waters, as well as that discharged by hatcheries in freshwater, can have substantial flow-on impacts on metal contaminated systems. Furthermore, there has been extensive use of copper-based antifoulants on net pens in the past, which may still be present in sediments of the Channel and Huon.

As the former Director of the Derwent Estuary Program I spent over 20 years working on heavy metal contamination issues and was the lead author of the Derwent Estuary Program's *Water Quality Improvement Plan for Heavy Metals and Nutrients*. This major investigation was carried out over a period of nearly five years, in collaboration with scientists from IMAS and CSIRO, and included detailed monitoring, modelling and process studies[1]. Derwent estuary sediments have some of the highest known concentrations of zinc, mercury, lead, cadmium and arsenic in the world[2], and as such require careful management. A key aspect of the WQIP project focussed on contaminated sediments, and included lab experiments to evaluate the impact of reduced oxygen levels on metal mobility. These experiments showed that reduced oxygen led to rapid desorption of zinc and other metals[3], highlighting the importance of maintaining oxygen levels in the estuary as a key management tool. Mercury toxicity (via methylation) is also known to be significantly influenced by the combination of organic enrichment and hypoxic conditions, further emphasising the need for careful management of oxygen levels. Biogeochemical modelling by CSIRO indicated that nutrient inputs were a key driver for oxygen levels in the Derwent [4, 5], and nutrient management targets were set accordingly.

The WQIP project findings were incorporated into the DEP's management plan, which recommended a reduction in both heavy metal and nutrient loads. Since 2010, over $100 million has subsequently been spent on remediation projects at the Risdon zinc works, sewage treatment plant upgrades, effluent reuse schemes and various stormwater management projects to achieve this.

For **the Derwent**, the concern with respect to expansion of salmon farms is that the additional nutrients from the Yellow Bluff and Trumpeter Bay leases in Storm Bay – as well as additional nutrients from the Meadowbank smolt production facility on the Derwent River – could cancel or reverse the progress made over the past decade on nutrient reductions. For example, if just 5% of the dissolved nitrogen load from the planned 15 to 20,000 tpa of salmon production off North Bruny enters the Derwent [6,7], this would more than cancel out the nutrient load reductions from the recently completed Blackmans Bay sewage treatment plant upgrade. So, will the $50+ million dollars invested to upgrade this plant be wasted? Similarly, the large-smolt hatchery constructed at Meadowbank in 2015 is essentially a flow-through system with partial removal of pollutants[8]. This has added a significant additional nutrient load to river just upstream of

Hobart's main drinking water supply, and to the upper estuary – in an area that is already seasonally hypoxic and a risky area for mercury methylation.

So, rather than asserting that there is no evidence that salmon-derived nutrients will enter the Derwent at high enough levels to cause hypoxia, please provide the evidence that this will not contribute to environmental harm. Specifically, by how much will nutrient loads to the Derwent increase as a result of the recent and planned expansion? Will this prejudice the nutrient targets that have been set to manage heavy metal contamination in the Derwent? If you feel the nutrient targets previously set by the DEP and associated research scientists are inaccurate, please provide what you consider to be more appropriate targets, together with the evidence to back these up.

Furthermore, I would recommend that HAC either modify the Meadowbank hatchery to a full Recirculating Aquaculture System (RAS), or clearly demonstrate that the effluent is not detrimental to Hobart's water supply (including taste and odour issues), or to the environmental condition of the upper estuary.

Macquarie Harbour also has a severe metal contamination problem, particularly with respect to copper[9], which is a known marine biocide (hence its common use in biofouling paints). While this metal may not accumulate in farmed salmon in the Harbour, severe hypoxic events could potentially increase copper toxicity/bioavailability to benthic organisms in the harbour, and those native species that feed on these. Rather than dismissing this as a concern, can you please advise what research has been done to monitor and investigate copper mobility, toxicity and bioaccumulation in Macquarie Harbour? Is copper being monitored as part of the Macquarie Harbour BEMP? How have the multiple hypoxic events resulting from fish farm expansion influenced copper mobility and toxicity?

Another relevant topic regarding fish farms and heavy metals was the extensive use of **copper antifoulants on nets in the Huon and Channel** up until about 2014[10]. While I understand that antifoulants are no longer used on nets, can you please advise over what period this occurred, how much of this toxic paint was used, in what areas, and how much residual contamination of sediments remains? Also, has any research been done on the impacts this contamination is this having both on native marine species, and on the length of time needed for effective fallowing beneath pens?

I hope the points I raise above provide a more comprehensive overview of the potential interactions between fish farms and the risks of heavy metal contamination. Many of the documents supporting these points are publicly available on the DEP website, the Australian Government website (MLRRDP), and in the wider scientific literature. I have listed a number of these references below, but please let me know if you have any trouble finding the relevant documents, or if you have any follow-up questions.

Sincerely,

Christine Coughanowr
Water quality scientist

References:

(1) Derwent Estuary Program (2010). Water Quality Improvement Plan Stage 2: Synthesis Report and Recommendations - Management of heavy metals and nutrients

(2) Coughanowr C, Whitehead S, Whitehead J, Einoder L, Taylor U and Weeding B, 2015. State of the Derwent Estuary 2015. (see Chapters 7, 8 and 10 in particular)

(3) Banks, J and Ross, J (2009). From sink to source: how changing oxygen conditions can remobilise heavy metals from contaminated sediments. Report prepared by TAFI for Derwent Estuary Program (Water Quality Improvement Plan).

(4) Wild-Allen K, Skerratt J, Parslow J, and Rizwi F, (2009). Derwent Estuary Biogeochemical Model: Technical Report. Report prepared for the Derwent Estuary Program with support from the Australian Government coastal catchments initiative

(5) Wild-Allen K, Skerratt J, Parslow J, and Rizwi F (2009). Derwent Estuary Biogeochemical Model: Scenario Report. Report prepared for the Derwent Estuary Program with support from the Australian Government Coastal Catchments Initiative

(6) Huon Aquaculture Group (2017). Environmental impact statement to accompany the Draft Amendment No 3 (Storm Bay off Trumpeter Bay North Bruny Island)

(7) Derwent Estuary Program (2018). DEP submission on marine farming development plans/environmental impact statements; as submitted to Marine Farming Development Review Panel.

(8) Huon Aquaculture Group (2019). Annual Environmental Review 2018 (Meadowbank hatchery). Public report to EPA.

(9) Teasedale P, Apte S, Batley G and Ford P (1996). The behaviour of copper in sediment and waters of Macquarie Harbour, western Tasmania. Supervising Scientist Report 111, Australian Government.

(10) Parsons, 2012. State of the D'Entrecasteaux Channel and the Lower Huon Estuary 2012. Report prepared for the D'Entrecasteaux Channel Project