March 2020

LONNAVALE HATCHERY

- When first purchased by Huon in 2006, the site (just flow-through) had operated as a privately owned salmon and trout grow-out system using a network of outdoor ponds.
- The development of the RAS system in 2008 allowed Huon to transfer all smolt production from the ponds, reduce the biomass remaining in the system by more than 90% and convert the grow-out ponds to only hold broodstock.
- Today, the broodstock in the flow-through are a minor but valuable component of the operations at Lonnavale, with the main production taking place within the RAS facility. Average daily feed (for the outside ponds) has reduced to 25kg per day; a reduction of 94% on the 2007 peak.
- The RAS facility includes incubation and fish rearing tanks. The eggs are fertilised by hand and held onsite in a series of cylindrical tanks. We grow the hatched salmon at Lonnavale until they are ready for transfer to sea.
- Our Lonnavale facility, environmentally, is our most closely scrutinised and monitored site due to its location at the edge of the Tasmanian wilderness area. We are proud of our environmental management at this location and the regular monitoring of the Russell River justifies our efforts.
- Monthly and annual reports are provided to the Environmental Protection Authority for a range of environmental and biodiversity indicators to ensure the hatchery's outputs are within the parameters outlined in the Environmental Licence.
- The operation is regulated by the EPA under Environmental Licence 7677/2, which prescribes production limits and water quality discharge limits for the flow-through operation.

MANAGING BIOMASS

When first purchased by Huon in 2006, the site (just flow-through) had operated as a privately owned salmon and trout grow-out system using a network of outdoor ponds. At that time, the site biomass was over 49,000 kg with the feed tally in excess of 50,000 kg per year peaking at an average of 475 kg per day.

The development of the RAS system in 2008 allowed Huon to transfer all smolt production from the ponds, reduce the biomass remaining in the system by more than 90% and convert the grow-out ponds to only hold broodstock. By having broodstock onsite biosecurity was improved as eggs were produced onsite and not transferred across other facilities.

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The RAS facility includes incubation and fish rearing tanks. The eggs are fertilised by hand and held onsite in a series of cylindrical tanks. Eggs are kept at a low temperature until they are ready for hatching, at which

time they are moved into trays and the water temperature is raised to encourage their lifecycle to start. We grow the hatched salmon at Lonnavale until they are ready for transfer to sea.

WATER USAGE

The flow-through facility is just that, the same volume of water extracted at the hatchery intake is returned to the river at the outfall. The outflow from the system passes through a series of settlement ponds, a drum filter and an extended riffle section (a shallow gravelly stream bed) before returning to the river. We also use floating feed so that any uneaten feed can easily be removed by the drum filter or from the screens on the ponds.

The RAS hatchery uses water from a borehole, not the river. The outflow from the recirculation hatchery passes through a filtration process where waste feed and faeces are removed so not to be discharged into the water course.

RAS wastewater at the site is irrigated on plantation forests. To ensure there is no irrigation run off during the wetter cooler months, the water is stored in dams. In the drier summer months, this water is used to drip-irrigate plantation forest on the surrounding property, Maiden Meadows. Irrigation is controlled by soil moisture sensors and irrigation is conducted according to the Environmental Protection Agency approved Wastewater Reuse Environmental Management Plan.

ENVIRONMENTAL MONITORING

Since 2014, an Environmental Protection Notice (EPN) has been in place requiring monthly sampling at seven Russell River sites upstream and downstream of the hatchery as well as sites below all irrigation operations. The sampling sites are:

- 2km upstream of the inlet;
- At the site Inlet (in triplicate);
- At the site outlet;
- 50 metres downstream from outfall;
- 200 metres downstream from outfall;
- Lorkins Bridge (below all operations); and
- Lorkins Bridge (3km from outfall).

This sampling report includes daily feed, flows, sampling and lab analysis of nutrient levels, river flows and percentage of water diverted and returned. Each week, eight hours of staff time is spent collecting samples. Sampling in this data set is conducted by Huon staff, external consultants and Analytical Services Tasmania staff.

In addition, Huon conducts field samples for pH, DO and temperature, groundwater and soil sampling of the irrigation area twice daily. Huon also conducts an irrigation re-use plan every five years, as well as undertakes macroinvertebrate sampling twice annually (as per AusRivas standards). In addition, over the past few years river assessments requested by the State Government (outside of the current Environmental Licence conditions) have also been required.

Annual Environmental Reviews for the Lonnavale hatchery are publicly available on Huon's website.

Solid waste is disposed of off-site in accordance with the *Tasmanian Biosolids Reuse Guidelines 1999,* as well as disposal of controlled waste (in accordance with EMPCA).

Macroinvertebrates
Macroinvertebrate sampling is conducted by an independent consultant, Kanunnah Natural Resources Tasmania, in accordance with AusRivas standard.

Samples are taken from areas known as riffles where possible. A riffle is a shallow section of a stream or river with a rapid current, and a surface broken by gravel, cobble or boulders. A riffle sample is generally preferred, as it produces a larger sample due to the higher amount of available habitat.

AUSRIVAS is a rapid procedure to quantify any impact on the in-stream biota. At present, this is achieved by predicting the occurrence of families of macro invertebrates at test sites from environmental variables and a large database of high-quality reference sites. The raw output from this procedure is a list of the families of invertebrates expected in a standard sample from the site, the probability of occurrence of each family in that sample, and a tally of which of those families did occur in an actual sample.

The most recent independent biomonitoring report (released in March 2020) has, once again, indicated the Russell River, downstream from the hatchery, remains in good condition with characteristics of a "relatively clean-water environment" (summary, page 2). The two downstream assessment sites (at 50m and 200m) received an A rating (against the AUSRIVAS assessment protocol). The report went on to state that "there was minimal evidence for impacts (of the hatchery) on the health of the macro-invertebrate fauna and algae growth downstream". https://www.huonaqua.com.au/the-healthy-russell-river-downstream-of-our-lonnavale-hatchery/

Water quality
In 2019, Huon commissioned a review into the water quality between Lonnavale and Lorkins Bridge. The report was conducted by Freshwater Biomonitoring and provided to the EPA.

Results of this report found that the water downstream from the hatchery is in good condition and the river is well on its way to recovery after the 2018 extreme flood event.

The following points summarise the report:

- The Russell River catchment undergoes substantial change between the upper river and the reach between Lonnavale and Lorkins Bridge. The elevation is reduced, the slope of the river decreases, and flood plains have developed in areas underlain by limestone in the lower catchment. These changes affect the physical environment by reducing water velocities, increasing water temperatures, and providing a greater inflow of groundwater through the alluvial fans and floodplains.
- Flow in the Russell River is variable, with generally higher flows in winter, but episodic high flow events occur year-round. A relatively stable volume of water is extracted from the river for use in the hatchery, equivalent to 30 per cent or less of the Russell River flow for 90 per cent of the time.
- Water quality in the Russell upstream of the hatchery is characterised by very low nutrient concentrations, low EC and high DO, with most nutrient parameters below the reliable limit of detection.
- The water quality discharged from hatchery has a higher concentration of nutrients as compared to the upstream river, however, these are extremely low values just above the limit of detection. The nutrient concentrations are consistently below the discharge limits in the EL, and below the draft Tasmanian WQOs and the ANZECC (2000) guidelines. The evidence based ANZECC (2000) guidelines apply to ambient waters, rather than point source discharges. After mixing in the Russell River, the resulting concentrations are very low compared to these guidelines and likely to pose a low risk to the environment.
- Nutrient concentrations at the water quality monitoring site 50 metres downstream of the outlet (site five) are higher as compared to the upstream sites, but within an additional 200 metres downstream (site six), concentrations are generally equivalent to the sites upstream of the outlet. Concentrations of nitrate + nitrite in the Russell River are lower than found in similar 'clean' headwater streams in Tasmania.

- DRP concentrations show seasonal patterns, with higher concentrations during the summer months when groundwater inputs are relatively high, and a larger proportion of the flow (generally) is directed to the flow-through.
- Nutrient balances between the sites upstream of the Lonnavale Hatchery (sites one and three), the outlet and site five show good agreement, indicating that the nutrient load at site five can be accounted for by the upstream catchment inputs and the hatchery outflow. This strongly suggests there are no substantial fugitive emissions being discharged from the site to the Russell River.
- Nutrient fluxes show that the 80th percentile load from the hatchery is contributing 0.3kg day^{-1} of ammonia, <0.25kg day^{-1} of nitrate + nitrite, about 0.1kg day $^{-1}$ DRP, and 2.5kg day^{-1} of TKN. TKN is composed predominantly of organic nitrogen and is not available for direct uptake by the biota.
- Although very low, the nutrient output from the hatchery, combined with the physical attributes of the river downstream of the hatchery result in an increase in benthic algae at site five relative to the upstream sites. Algal scores of 2.5 or greater, indicative of 50 per cent of the river bed having algal cover, were recorded on five occasions in 2016–2018 at the site. Downstream at site seven, algal scores of 2.5 or greater were recorded on 12 occasions but did not correspond to the patterns at site five. Nutrient concentrations at site seven are lower than those at site five, and generally equivalent to the sites upstream of the hatchery, suggesting that factors other than nutrients are promoting algal growth.
- Benthic chlorophyll-a concentrations exceeded 100mg m^{-2} on one occasion each at sites five and seven, but during different years. The results show weak seasonal trends, but there is no correlation between the sites. The data set is biased to low flows, as only two samples have been collected when rainfall exceeded 10mm in the previous five days. Within this low flow data set, the results ranged from zero, to ~140mg m^{-2}, indicating that factors other than flow contribute to algal growth patterns (e.g. not all low flows result in elevated algae).
- The difference in river substrate between sites five and seven may be responsible for some of the differences between algal growth patterns at the sites. Following very high flow events, benthic algae is greatly reduced or removed at both sites but recovers more rapidly at site seven. This may be due to the widespread occurrence of bedrock at site seven, which is more stable during floods as compared to the predominantly cobble and gravel substrate at site five that gets disturbed during the high flow events. Other factors may include a difference in aspect in the monitoring sites leading to more light penetration at site seven, or the inflow of surface runoff and groundwater from the cleared floodplains contributing micronutrients, such as calcium, iron, magnesium or zinc that promote additional algal growth;
- Benthic algae growth within the Russell River may be aided by the presence of trout, which have been found to increase benthic algal growth relative to streams supporting only galaxiids due to the impact of the different predation patterns on grazers.
- Overall, the water quality and algal results suggest that the discharge from the Lonnavale Hatchery is a contributor to small increases in nutrient concentrations and algal growth at site five, with nutrient concentrations remaining within levels considered to pose low risks with respect to nuisance algae. At site seven, where benthic algal growth is higher, water quality is similar to sites upstream of the hatchery, indicating that factors other than water quality are contributing to the increased growth of algae at the downstream site.

  Russell River Water Quality Review – Lonnavale hatchery to Lorkins Bridge. L Koehnken P/L 2019. Report Prepared for Huon Aquaculture Company and presented to EPA. 45pp.

  The full report can be found on Huon's website: https://www.huonaqua.com.au/russell-river-report/.