

**BEFORE THE COMMISSIONERS ON BEHALF OF
THE OTAGO REGIONAL COUNCIL**

Consent No. RM16.093.01
Consent No. RM18.345

BETWEEN

CRIFFEL WATER LIMITED

Applicant

AND

**LUGGATE IRRIGATION
COMPANY LIMITED / LAKE
MCKAY STATION LIMITED**

Applicant

AND

OTAGO REGIONAL COUNCIL

Consent Authority

REBUTTAL EVIDENCE OF RICHARD MARK ALLIBONE

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REBUTTAL EVIDENCE OF RICHARD MARK ALLIBONE

Introduction

1. My name is Richard Mark Allibone.
2. I am the Director and Principal Ecologist of Water Ways Consulting Limited. My qualifications, experience and acceptance of the Code of Conduct for Expert Witnesses are set out in my primary evidence.
3. In addition to those qualification and experience I have been conducting physical habitat analysis for more than ten years for Regional and District Councils and have frequently worked with Mr Jowett on the analysis and assessment of minimum flows using the habitat analyses.
4. The evidence filed for Aukaha (Dr Clucas and Ms Bartlett) advocate for a minimum flow of 300 L/s for Luggate Creek at the ORC minimum flow site. This suggested minimum flow relates to the provision of habitat for tuna (longfin eel). Dr Clucas notes that the physical habitat model (SEFA model) provided by Mr Jowett indicates that 90-95% of the tuna habitat available at the 7dMALF would be retained at 300 L/s and that this is an appropriate flow to provide for tuna in Luggate Creek rather than 180 L/s. However, aside from restating Mr Jowett's analysis no justification has been given for the 300 L/s minimum flow.
5. With respect to habitat modelling several issues should be acknowledged. The models predict the availability of physical habitat for a species and/or life history stage. This indicates the amount of habitat present, but is not a direct predictor of abundance or biomass of the species of interest. Other factors, aside from habitat availability can limit a population. An example of this is given in various people's evidence at this hearing with respect to tuna. At present, tuna are limited by a lack of recruitment and the impacts of commercial fishing that has removed the adult tuna. Therefore, at this time habitat is not limiting tuna and while the physical habitat model shows habitat is

present it is unoccupied. Another common limitation on populations is food, and fish populations especially trout can be food limited¹.

6. Therefore, with respect to Luggate Creek I believe all experts are in agreement that habitat is present but due to the present recruitment limitation and impact of fishing that habitat is not occupied. From a tuna management perspective under the proposed flow regime this means that until tuna are stocked to a level where they occupy all the available habitat at 180 L/s, which is 85% of the available habitat at the 7dMALF, the flow regime is not the limiting factor. The minimum flow only becomes important if there is a need to increase stocks over this 85% level.
7. It is notable that if the desire is to provide 90% or even 100% of the habitat available at 7dMALF, this can be achieved with other methods. Mr Jowett on pages 35 and 36 of his report² provides the habitat preference curves for tuna. For large tuna if more water depth greater than 30 cm with low water velocities is created, i.e. pool habitat, you will have more tuna habitat. This can be done by increasing the flow in the stream, but this has the counter acting effect of increasing water velocity. This is the reason the habitat available stops increasing as flow increases and then decreases once flow is over 500 L/s.
8. The effect of increasing flow can also be considered when looking at the median (990 L/s) and mean (1.170 L/s) flows for Luggate Creek. Flows occur for 50% of the time over 990 L/s and the habitat availability at 990 L/s and higher flows is decreasing. The modelling indicates that 180 L/s provides only slightly less habitat than 1000 L/s. When we consider the year-round flow regime the habitat available at 300 L/s is only available for a portion of the year and it is lost at both higher and lower flows. While raising the minimum flow to 300 L/s would reduce the low flow related habitat limit it will not change the high flow habitat limit.

¹ Huryn, A. D. (1996). "An appraisal of the Allen paradox in a New Zealand trout stream." Limnology and Oceanography **41**(2): 243-252.

² Jowett Consulting Ltd (2019) Fish habitat in Luggate Creek. Client report IJ1902

9. There are alternatives to simply increasing the flow to manage the instream habitat for tuna. For instance, small boulder weirs can be placed at the tail of pools and runs that will raise the water level in the upstream reach. This will occur while maintaining low water velocities improving habitat for large tuna and the raised riffles can be constructed using substrates that small tuna (elvers) use as habitat providing a benefit to the small tuna.
10. An additional management action that can be undertaken is the provision of cover. Tuna use logjams, undercut banks and boulder piles as day time cover and this can be a limiting factor. At Waituna Creek in Southland I am involved in just such a project where local iwi, the district and regional council and DOC are attempting to restore tuna and kokopu populations in a heavily modified reach of Waituna Creek. We cannot change the stream flow, but are managing to improve fish habitat by increasing the fish cover and habitat diversity in the stream (Figure 1). The project is also revegetating the river bank to provide overhanging vegetation as fish cover at the stream edge. This is expected to provide an additional food resource for the fish as terrestrial insects fall into the stream.
11. Dr Clucas notes in paragraph 24 of her evidence that there maybe a need to stock feeder tuna of 1-2 kg into Luggate Creek to restore ecological balance. I would agree with this, in the sense that abundant trout population present in Luggate Creek represents a significant limiting factor on tuna and any other fish. The larger trout are a predatory concern and will certainly eat small tuna. However, the large biomass of small trout will also be competitors for food and space for the small tuna. While it is possible to reduce the trout biomass by predation by larger tuna, it is highly uncertain that the trout numbers can be reduced to a level where competition for food and space is not a limiting factor. Therefore it is unlikely that tuna (and other species) will reach the population sizes that would be possible if trout were not present and in this case habitat will not be the limiting factor.
12. Another management alternative to increasing tuna in Luggate Creek is to prevent trout spawning runs from the Clutha River Mata-au

entering Luggate Creek. I accept this might not be desirable from a Fish & Game perspective, but it would be effective if increasing tuna is the primary objective. It might also be possible to remove the rainbow trout from the section upstream of the Criffel Water take downstream to the either the intake weir or the downstream waterfall barrier. This would then create a trout free reach where competition for food and space would be absent.

13. It is not clear from the Auhaka evidence how many tuna they intend stocking in Luggate Creek and the rate at which they might be placed in the stream. However, if just elvers are stocked, the low growth rate means large eels will not be present in Luggate Creek for decades and a limitation on habitat for then will therefore not occur for at least 20-30 years.
14. In conclusion, while the 300 L/s flow requested by Auhaka can provide more tuna habitat this habitat will not be available year round because habitat is more limited at both higher and lower flows. Furthermore, there are other stream management actions that can be taken to improve the tuna carrying capacity that are not flow related and provide year-round habitat improvements. I expect the trout population in lower Luggate Creek will be a significant limiting factor on tuna abundance as they compete for food and space. Finally, if the tuna stocking is conducted mainly with elvers then large tuna will not become present for 20-30 years and not abundant until sometime after those 20-30 years.

Date: 22 October 2019



Richard Allibone



Figure 1: Waituna Creek with replanted stream banks and log cover in the stream channel