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University

Research Note:

Preliminary Results on Ageing Chinook Salmon from Bullen Merri and Purrumbete Lakes

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To be cited as:

Vu A.V., Doyle K., Baumgartner L.J. (2023). Preliminary Results on Ageing Chinook Salmon from Bullen Merri and Purrumbete Lakes. Unpublished Research Note. Gulbali Institute, Albury NSW Australia.

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1. Introduction

Fish stocking programs play an important role for local economics and society in Australia (Hunt et al., 2017). The crater lakes region of Victoria has long been regarded as one of the premier Salmonid fisheries in Australia (Gercovich, 2011). For example, Bullen-Merri lake was stocked 50,775 salmonid individuals (72% chinook salmon, 18% rainbow trout, and 10% brown trout) while the Purrumbete lake was stocked 58,571 salmonid individuals (78% chinook salmon, 18% rainbow trout, and 20% brown trout) in 2018 (VFA, 2018). Both lakes, Purrumbete and Bullen-Merri are deep with permanently assured water which provides cool refuge for trout and salmon in warmer months (Gercovich, 2011). Both lakes are known for trophy sized trout and salmon, with the rich and productive ecosystems enabling accelerated growth rates (Gercovich, 2011).

In recent times the lakes have been subjected to fish kills which were thought to have completely eradicated all salmonids in the system (Hunt et al., 2012). Recovery from the fish kills was facilitated through the implementation of a stocking program. The stocking program has included a trial of the introduction of fingerlings (several months old) and yearlings (at around one year of age) in an attempt to improve fishery quality (Ridgeway, 2022).

Following the most recent fish kill, Chinook salmon (*Oncorhynchus tshawytscha*) were stocked in Lake Bullen Merri to enhance and support recreational fisheries (Ridgeway, 2022). Chinooks were collected from Bullen Merri and Purrumbete lakes (Figure 1), they were then sent to the Gulbali Institute, Charles Sturt University to verify their ages. It was hypothesised that the Chinooks were the same age.

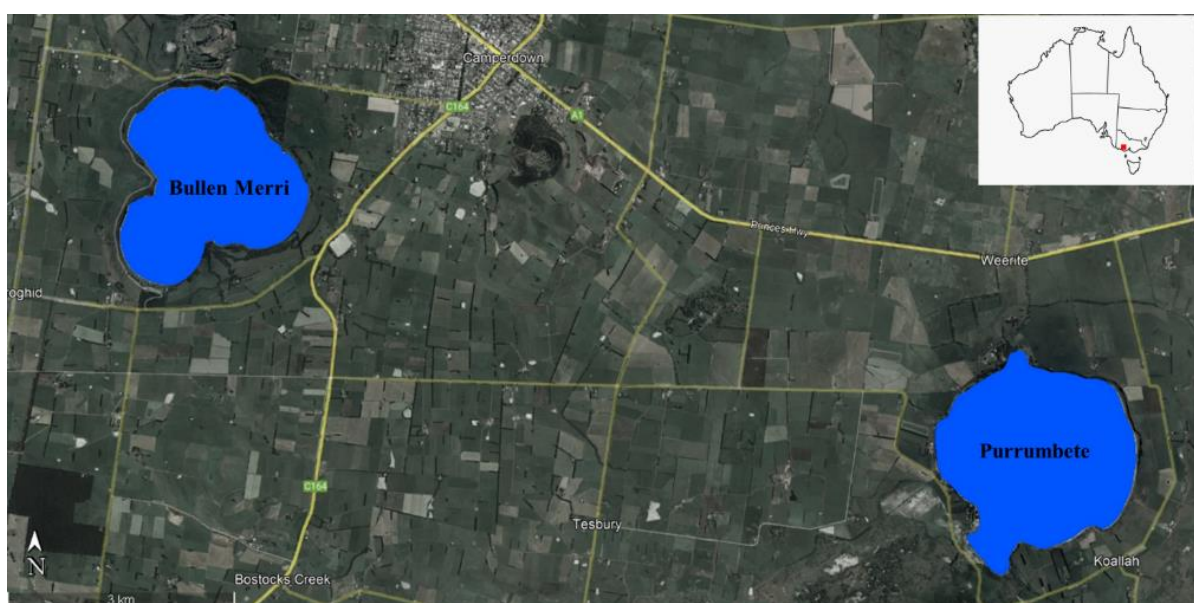


Figure 1: Location of Bullen Merri and Purrumbete lakes

2. Methods

One Chinook (Chinook #1) was collected from Lake Bullen Merri and two (Chinook #2 and Chinook #3) were deceased individuals from a yearling stocking into Lake Purrumbete (Figure 2). All fish originated from the Snobs Creek Hatchery and were hypothesised to have been from the same cohort; Chinook #1 stocked as a fingerling; Chinook #2 and Chinook #3 grown-out to a yearling and then stocked. To determine if these fish were the same age, their otoliths (also known as ear-bones, calcium carbonate structures) were removed. Otoliths are located next to the brain of most fish species. Otoliths are commonly used for ageing fish.

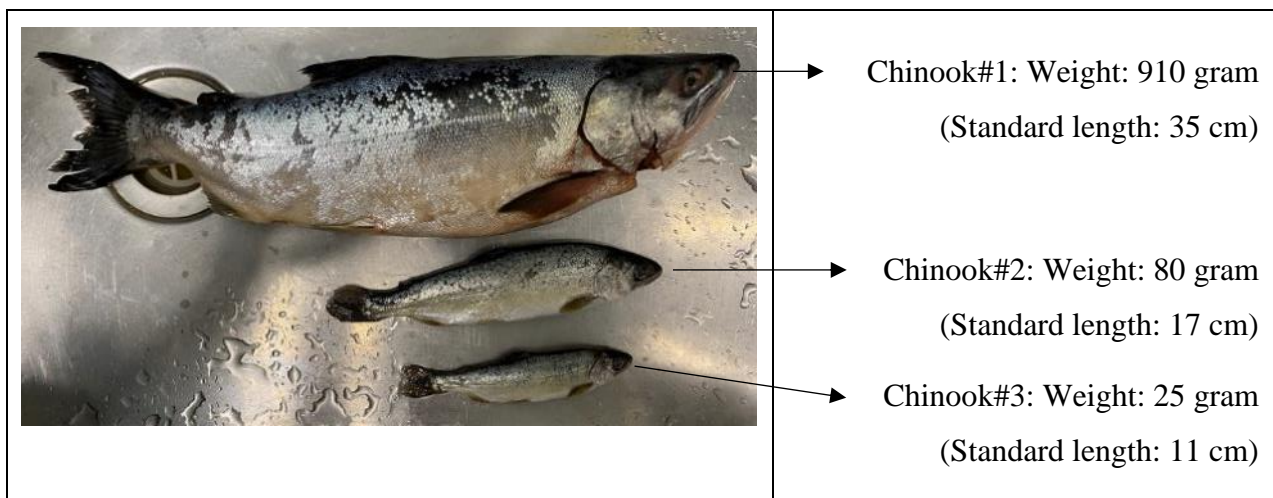


Figure 2: Three Chinooks collected for otolith removal

Otoliths were removed from each fish and washed prior to taking pictures and setting in resin. They were embedded in resin, dried for three days then sectioned at the core using a precision diamond blade saw. They then were polished until the otolith core (which equates to the date of birth) was exposed (Figure 3). Their age was determined by examining their growth zones (or bands or rings) in the otolith.

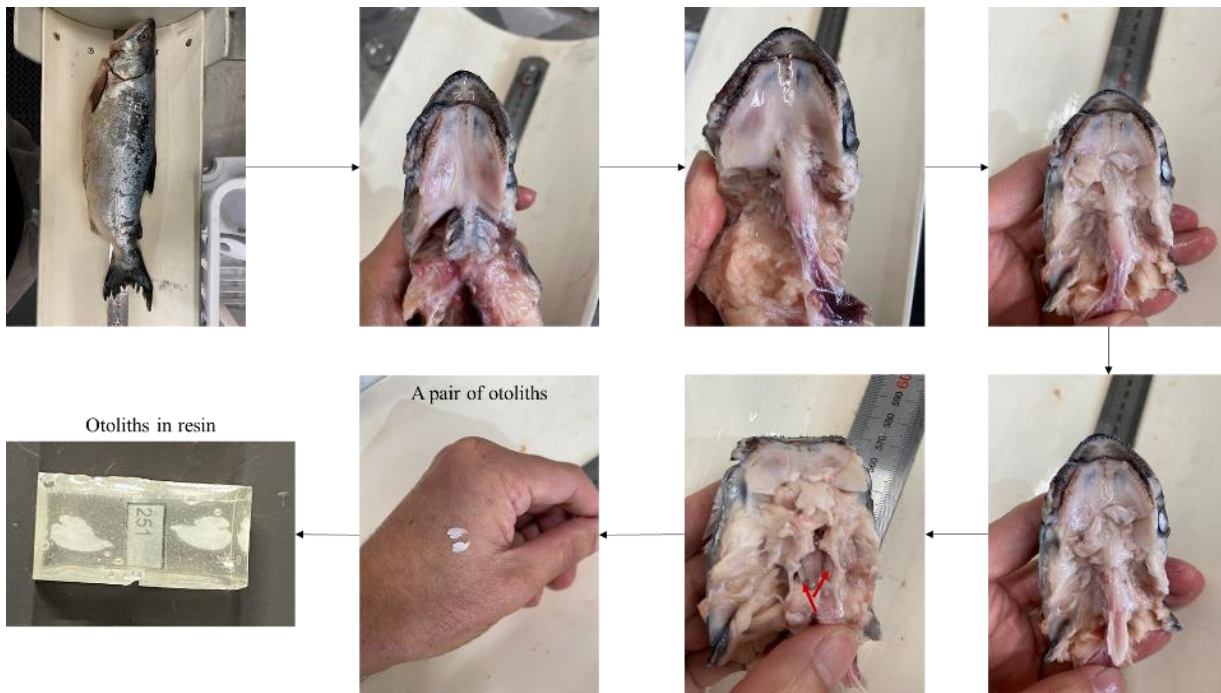


Figure 3: Otolith removal and setting otoliths in resin

3. Results

Otoliths of Chinooks are relatively difficult to age because their growth bands are not very clear (Figure 4). However, the growth patterns of the three fish are relatively similar, especially the two larger Chinooks (Chinook#1 and #2). Their first growth ring in both sectioned and whole otoliths is clear while the second ring is not clear (Figure 4). This indicates they are the same age, somewhere between 1-2 years of age.

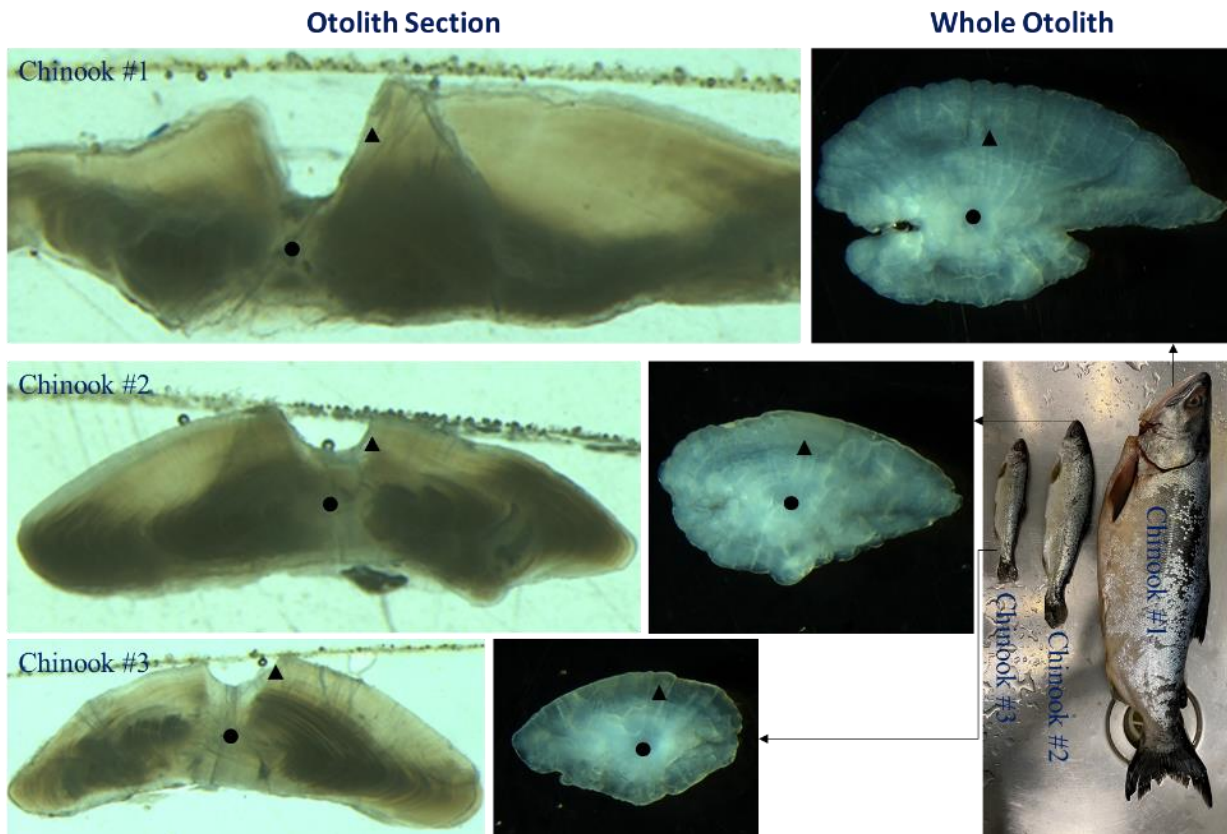


Figure 4: Growth bands in otolith sections and whole otoliths. Round dots are the otolith cores (birth) and triangles indicate annual growth bands

4. Discussion

Although the three Chinooks are very different in sizes (body weight: 910g, 80g and 25g; standard length: 35cm, 17cm and 11cm), they appear to be of similar age (estimated at 1 – 2 years old). We acknowledge, though, that the sample sizes assessed in this observation are relatively small. This preliminary observation supports the hypothesis that these fish are of similar age.

Catch rates of Chinooks are proportional to number of fish Chinooks stocked (Hunt et al., 2014). Stocking Chinooks at different fish sizes (fingerlings vs yearlings), would likely account for the changes in growth rates. In general, fish in natural water bodies tend to growth faster than in hatcheries due to the abundance of food and space (Vehanen et al., 2009). Availability of food and space is a key factor influencing fish growth rates. In this regard, food is often available and abundant in both Bullen Merri and Purrumbete lakes, hence salmonids can potentially grow much faster (Gercovich, 2011). Examining stomach contents of Chinook #1 showed that there were many small fish in their stomach (Figure 5). These fish individuals appear as galaxias. Common jollytail galaxias (*Galaxias maculatus*)

found many lakes in Victoria, including Bullen Merri and Purrumbete lakes (Laurenson et al., 2012). A previous study found common jollytail galaxias in the stomach of chinook salmon sampled in the Purrumbete lake (Cadwallader & Eden, 1981).



Figure 5: Stomach contents of Chinook #1 (dominance of galaxiids)

This report is based on only three Chinooks. More fish samples should be obtained to increase precision for a future study. This may include following a stocking trial for multiple seasons, comparing growth rates for specific cohorts in hatchery and wild fish and performing long term monitoring of the crater lakes fishery, through opportunities such as angler creel surveys, to ensure that fishery quality is maintained over time. Nevertheless, these findings should provide critical information to guide current and future discussions regarding stocking programs.

Acknowledgements

Samples were provided by recreational anglers who collected the fish within bag limits and under Victorian recreational fishing licences. Funding for this study and otolith processing was provided by the Next Generation Water Management Hub, Gulbali Institute, Charles Sturt University. Otolith processing was carried out by the Inland Fisheries Research Group, Gulbali Institute, Charles Sturt University.

References

- Cadwallader, P. L., & Eden, A. K. (1981). Food and growth of hatchery-produced chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), in landlocked Lake Purrumbete, Victoria, Australia. *Journal of Fish Biology*, 18(3), 321-330. <https://doi.org/10.1111/j.1095-8649.1981.tb03773.x>
- Gercovich, M. (2011). The trout twins. *Monthly Fishing*.
<http://fishingmonthly.com.au/Articles/Display/12276-The-trout-twins#:~:text=Bullen%20Merri%20and%20Purrumbete%20are%20two%20crater%20lakes, and%20captures%20of%20both%20brown%20and%20rainbow%20trout.>
- Hunt, T. L., Brown, P., & Giri, K. (2012). *Looking back to go forward: Recreating a world class Chinook salmon fishery in Victoria's western crater lakes*.
- Hunt, T. L., Giri, K., Brown, P., Ingram, B. A., Jones, P. L., Laurenson, L. J. B., & Wallis, A. M. (2014). Consequences of fish stocking density in a recreational fishery. *Canadian Journal of Fisheries and Aquatic Sciences*, 71(10), 1554-1560. <https://doi.org/10.1139/cjfas-2013-0517>
- Hunt, T. L., Scarborough, H., Giri, K., Douglas, J. W., & Jones, P. (2017). Assessing the cost-effectiveness of a fish stocking program in a culture-based recreational fishery. *Fisheries Research*, 186, 468-477. <https://doi.org/10.1016/j.fishres.2016.09.003>
- Laurenson, L. J. B., French, R. P., Jones, P., Ierodiaconou, D., Gray, S., Versace, V. L., Rattray, A., Brown, S., & Monk, J. (2012). Aspects of the biology of *Galaxias maculatus*. *Journal of Fish Biology*, 81(3), 1085-1100. <https://doi.org/10.1111/j.1095-8649.2012.03383.x>
- Ridgeway, G. (2022). *Report on 3-year fingerling trial in Lake Bullen Merri and Lake Purrumbete (2019 – 2022)*.
- Vehanen, T., Huusko, A., & Hokki, R. (2009). Competition between hatchery-raised and wild brown trout *Salmo trutta* in enclosures - do hatchery releases have negative effects on wild populations? *Ecology of Freshwater Fish*, 18(2), 261-268. <https://doi.org/10.1111/j.1600-0633.2008.00343.x>
- VFA. (2018). *Salmonid Fish Releases 2018*. Victorian Fisheries Authority.
<https://vfa.vic.gov.au/recreational-fishing/fish-stocking/fish-stocking-reporting/salmonid-fish-releases/salmonid-fish-releases-2018>



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