

Review and assessment of the Inland Fisheries Service Carp Management Program eradication efforts in Lake Sorell

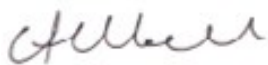
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Inland Fisheries Service
17 Back River Road,
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To whom it may concern,

Please find my review and assessment of the carp management program eradication efforts in Lake Sorell attached. Please do not hesitate to contact me if you have any questions or require any further information.

Kind regards,



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The Carp Management Program (CMP) was established within the Inland Fisheries Service (IFS) in 1995, in response to *Cyprinus carpio* (carp) found in Lake Crescent, at Interlaken, in central Tasmania. To prevent a serious threat to a range of environmental, economic, and recreational values across Tasmania, the CMP team successfully contained carp to Lake Crescent and the interconnected, upstream Lake Sorell. Integrated pest management strategies resulted in the successful eradication of carp from Lake Crescent in 2007, and have been ongoing in Lake Sorell [1]. Here, I review and assess the recent CMP eradication efforts in Lake Sorell.

Eradication of carp in Lake Sorell has been more complicated than in Lake Crescent due to its larger size (53km²) and diverse habitats (e.g., rocky shores, deep reefs, marshes). The CMP team have used intensive and integrated pest management strategies (physical carp removal using an integrated fishing down approach) in Lake Sorell since a large carp recruitment event in 2009. To prevent spawning and catch as many carp as possible each year, the CMP team have used a combination of techniques including electrofishing (backpack and boat), net fishing (gill and seine nets), traps (steel and fyke nets), physical barriers, and tracked transmitter-tagged carp (fish surgically implanted with radio transmitters) [1].

Over the 2021/22 sampling season, only four female carp were caught, bringing the total number of carp removed from Lake Sorell to 41,503 since their discovery in 1995. There now appears to be no fertile males left in the lake, and more than half of the male carp caught since 2017 have been affected by advanced stages of a never-before documented jelly gonad condition (JGC), where watery blisters form on the gonads, and make the fish sterile. This degenerative condition appears to be progressive, and the lack of any evidence

of fertile, healthy males since late 2018 indicates that the risk of any further spawning and recruitment events is extremely low. While the catch of four females in 2021-22 initially appears high, relative to the reduced number of netting hours and last season's catch, this was to be expected due to the favourable environmental conditions (high water level and long periods of warm, sunny weather) over spring. This increased carp activity therefore resulted in effective targeted gill net fishing. The ideal carp environmental conditions and relatively low catch rates still indicates a critically low remaining population, of most likely only females.

Consistent and high levels of gill netting effort have reduced the risk of spawning, and made it increasingly difficult to locate and catch carp, and despite increasing the targeted fishing pressure over the last few seasons, the total carp catch and catch per unit effort (CPUE) has continued to decline. In addition, extensive juvenile carp surveys have not found any evidence of recruitment, and all released water from Lake Sorell is still screened as a precautionary measure. Therefore, the CMP estimates that there are few, if any, carp remaining from the 2009 population. Additionally, the remaining Lake Sorell carp also have a stunted average size, poor general condition, and most males caught now are sterile from the JGC, which all adds to the evidence that strongly suggests that carp have been successfully eradicated from Lake Sorell. Therefore, the IFS reopened Lake Sorell for public recreational use in February 2020, and the lake and has remained open since.

The IFS CMP appears to have satisfied the three Bomford Model criteria, considered as essential for achieving eradication or control for vertebrate pests, which are: (i) rate of removal exceeds rate of increase at all population densities, (ii) immigration is zero, and (iii) all reproductive animals must be at risk [2]. In addition, the following evidence suggests that carp are effectively eradicated from Lake Sorell:

- Despite targeted fishing effort kept at a high level, only four female carp were caught this season (2021-22), and only one of those females appeared to have the

potential to be reproductively capable.

- There were no signs of carp recruitment detected in 2015/16 and 2021/22 despite ideal spawning conditions.
- The last population tagged carp was caught on the 30th of November 2017.
- The last ex-transmitter carp was caught on the 11th of December 2018, and there were very few wild/untagged carp caught in 2018 during the transmitter carp targeting events.
- The dominant carp cohort (2009 recruits) in Lake Sorell is approaching 13 years old, so most of the population left is likely close to natural mortality given their overall poor general condition [3, 4].
- The sex ratio of the population is strongly biased towards females, and if any male carp are remaining, there is a high probability they will have the Jelly Gonad Condition (JGC).
- The non-targeted gillnet catch per unit effort (CPUE) has continued to decline each year.
- The Allee Effect is likely to have a strong effect on the remaining population [5], and evidence of this is carp being caught in poor condition, and with tumour growths recorded internally on three out of four females caught in 2021-22.
- The last significant spawning event was in 2009, with the last small numbers (< 11) of recruits recorded in the 2013-14 season. No spawning or small carp were found in Lake Sorell over the 2021-22 season or the preceding seven seasons.

Therefore, the plan going forward is to allow Lake Sorell to remain open for public recreational use, while continuing to block carp spawning areas with barrier nets, and setting targeted gillnets during ideal environmental cues over the 2022-23 spring period. In addition, monthly recruitment and juvenile surveys (electrofishing and fyke net effort) and monitoring will also continue, to ensure that there are still no carp spawning and recruitment occurring. This is especially important as one healthy and mature female carp was found over the 2021-22 monitoring season. In the extremely unlikely event that there are any healthy, fertile male carp left then these two fish could have spawned, with potentially disastrous results. It is still too soon to completely scale back the program and remove all preventative measures and barriers and I recommend that in addition to targeted gillnets sets and juvenile/recruitment monitoring, that all water released from Lake Sorell continue to be screened as a precautionary measure. Future decision-making will need to be adaptable and based on the upcoming results from surveys over the 2022-23 spring season, and involve assessing the relative costs of the different strategies and cost effectiveness of each approach, to inform and optimise future strategies and direction. The likely eradication of carp is an outstanding achievement and a great result for the conservation of Lakes Sorell and Crescent, which are Ramsar listed wetlands of national and international significance.

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