

Inland Fisheries Service Carp Management Program

Quarterly Report



October to December 2018



Australian Government

Inland Fisheries Service



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This quarterly report details the Carp Management Program activities from October to December 2018.

The objective of the program is: *To eradicate carp from Tasmanian waters and, in the meantime, to minimise the impact of carp on Tasmania from economic, recreational and ecological points of view.*

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Carp captures at a glance

Lake Sorell

October – December 2018 (Total)	Adult/Juvenile	Total 1995 to present
33	33 / 0	41,485

Lake Crescent

October – December 2018 (Total)	Adult/Juvenile	Total 1995 to present
0	0 / 0	7797

Overview

Lake Sorell

Fishing effort this quarter resulted in the removal of 33 carp from Lake Sorell. This is in comparison to 71 carp removed from the same quarter in 2017. Gill nets were set over a wide area of the lake, with structure and habitat continuing to be a priority. Most nets were set around the shallow regions of the lake in response to rising water temperatures and lake levels during this quarter. Nets were set at right angles to the shoreline to target fish moving around the margins of the lake. Some nets were also set in deeper water over the rocky reefs where carp have historically been known to favor. In addition to gillnets, a wide range of fishing methods were again used during this quarter (Table I, Figure I), which includes fyke nets stitched into barrier nets, the boat electro-shocker (25 hours), and backpack electro-shockers (14 hours). These techniques select for adult and any potential juvenile carp (which are not susceptible to gillnet capture).

Table 1. Catch data from all methods used in Lake Sorell throughout October-December 2018.

Gear Type	October	November	December	Total
Non-Targeted Gillnets	2	6	17	25
Inshore Set Gillnets*	0	0	1	1
Barrier Fyke Nets	2	0	2	4
Backpack Electro-shocker	0	0	0	0
Boat Electro-shocker	0	0	0	0
Gillnets Behind Marsh	0	0	3	3
Total	4	6	23	33

*Blocking gillnets which prevent access to particular bays.

5.5km gill nets were set behind the barrier nets to make sure carp could not access spawning habitat. Gillnets were also set across and within key drainage areas in the marshes behind the barrier nets, as additional safety. Trammel gillnets, which are good at capturing carp of varying sizes, were used to block off these areas. Three carp were caught in Silver Plains marsh in the four inch monofilament gill net behind the barrier net (Table 1). The three carp were mature but had not spawned. After catching these carp behind the barriers, intensive netting effort was undertaken behind the barrier net at Silver Plains, with an additional ten nets installed. Electrofishing was undertaken all throughout this area, including up the drains. These additional nets have been left to soak, to ensure that any other carp that may have breached the barrier net are captured.

Juvenile recruitment surveys commenced in December and will continue each month through until March. These monthly surveys are to see if there has been any recent spawning events. The recruitment survey undertaken in December was conducted over two days and returned no evidence of spawning. The surveys involved intensive backpack-electrofishing effort throughout the marsh regions; Kermodes, Silver Plains, and Robertsons. Using multiple backpack electro-shockers and fine-mesh dip nets, the areas were thoroughly surveyed from the marsh fringe through to the back of the lake edge. No juvenile carp were observed, however a healthy population of golden galaxias, shortfin eels, tadpoles, and aquatic invertebrates were present.



Picture 1. Two bigger than average female carp which were caught in trammel gill nets at the start of a warm weather event in December.

During this quarter 12% of carp were captured in fyke nets (Figure 1), despite ideal conditions of rising and high lake levels along with warm weather. Carp respond to these weather cues, pushing into shallow marshes to look for spawning sites. The low catch rates in the fyke nets are likely to be due to a combination of a low remaining population size as well as inhibited maturity levels in the remaining fish. No carp were caught this quarter by electrofishing (backpack and boat), which is also likely to be a result of the low remaining population size (Table 1 and Figure 1).

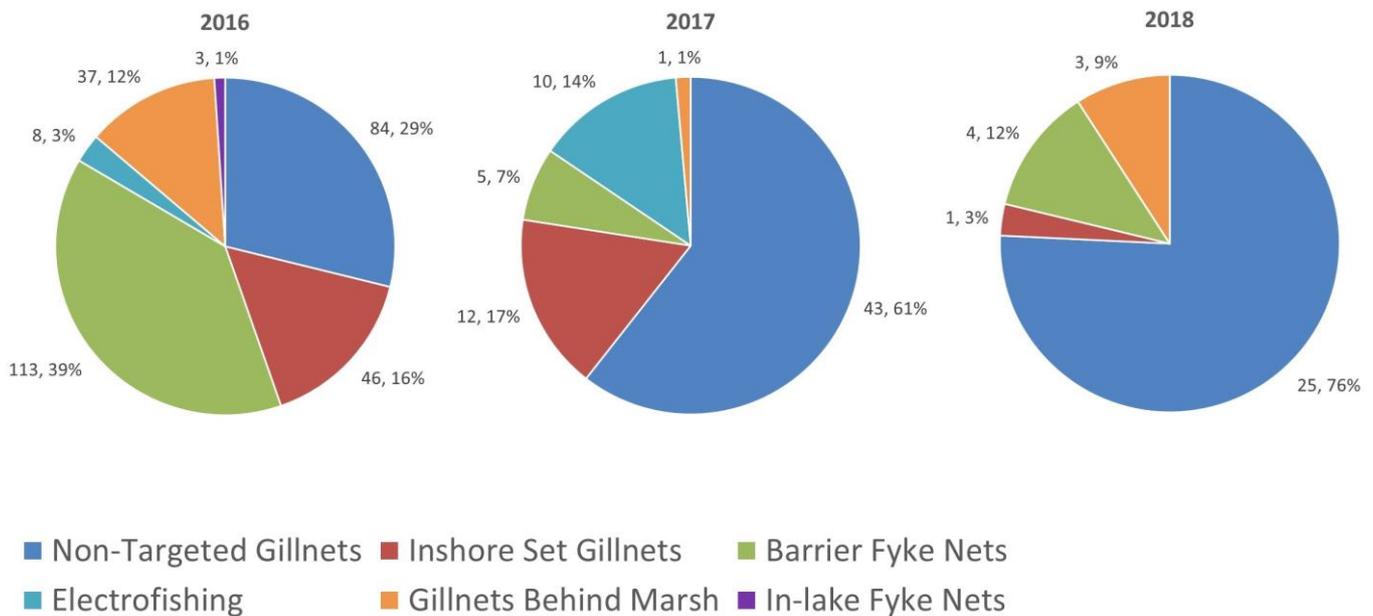


Figure 1. Actual numbers and percentages of total carp captures from all gear types used in Lake Sorell during the October-December quarter for 2016, 2017, and 2018.

Most carp (76%) were caught in non-targeted gillnets this quarter (Figure 1), which reflects the high level of gill netting effort around the lake (Table 2). Since 2016, the proportion of carp caught in non-targeted gill nets has continued to increase (Figure 1) however, the number of carp caught by this method continues to decrease (Table 2). This is despite a significant increase in non-targeted netting effort in 2018, compared to 2016 and 2017 (Table 2). These results reflect the decreasing population of carp in Lake Sorell, and the continually decreasing catch per unit effort (CPUE) of the non-targeted gill nets (Figure 2).

Table 2. Non-targeted carp captures and gillnet fishing effort in Lake Sorell during the October-December quarter for 2016, 2017, and 2018.

Month	Non-Targeted Carp Captures*			100m Net Hours		
	2016	2017	2018	2016	2017	2018
October	12	6	2	24010	21132	31403
November	39	26	6	27097	30314	41186
December	30	11	17	28412	26450	52509
Total	81	43	25	79519	77896	125098

*Note: Non-targeted carp captures refers to carp caught in fishing gill nets without the aid of transmitter fish, and not part of aggregations.

This continues the trend of dramatically declining catch rates as the 2009 cohort is further depleted (Figure 2). Catch from non-targeted gillnets is standardized to carp per 100 m net hour, to allow comparisons between different nets, months and years. With this information, adjustments in gear use are made to ensure and maintain a high level of fishing efficiency. The 4 inch trammel and monofilament gillnets were prioritised for use in the lake this quarter. 100m net hours of non-targeted gillnets peaked in December (Table 2), which was in response to ideal weather conditions, and increased movement in carp. The largest carp for the 2018/19 season was caught in late December in a non-targeted trammel gill net, which was a female measuring 437mm and 1.9kg in weight. This was much larger than the 700gm average weight for the quarter, and was an important fish to remove from the lake.

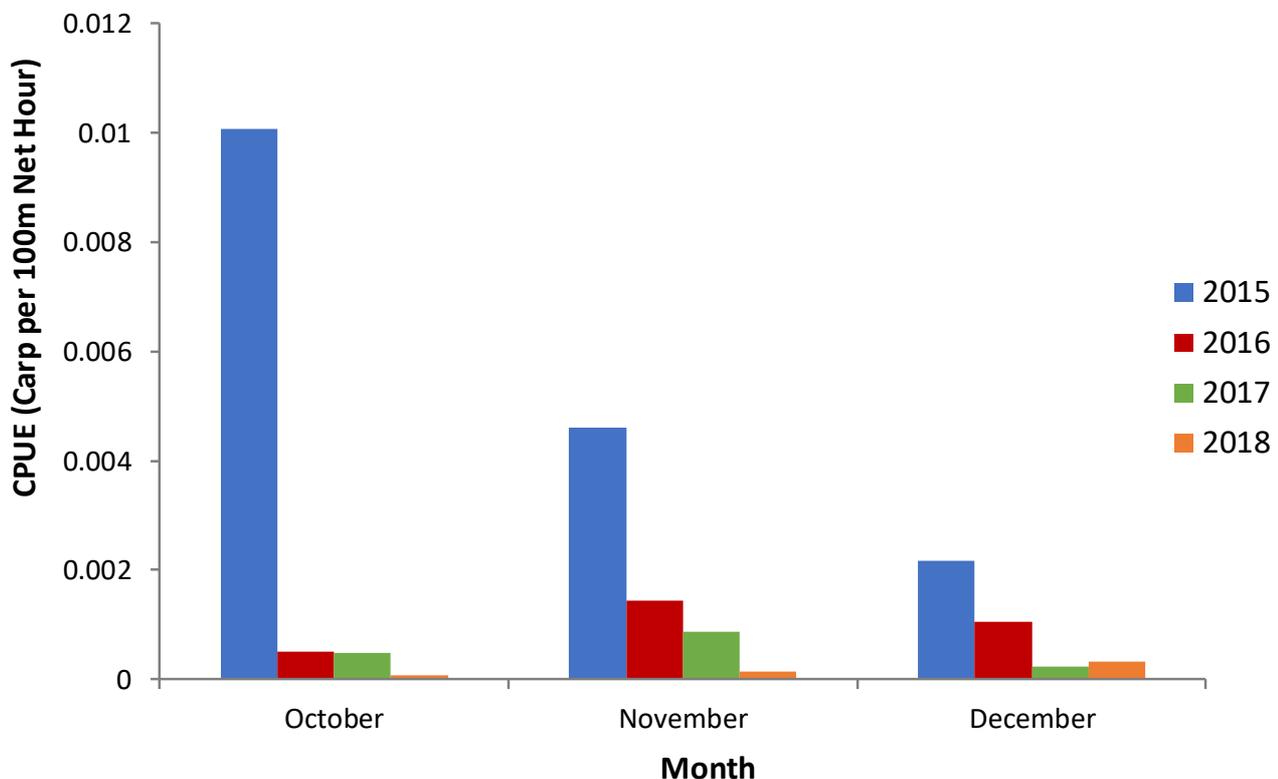


Figure 2. Catch per unit effort (CPUE) of non-targeted gillnet sets in Lake Sorell during the October-December quarter in 2015, 2016, 2017, and 2018.

The ratio of jelly gonad condition (JGC) carp to healthy males has been close to 1:1, which relates to 1 affected carp for 1 healthy male (Figure 3). The number of male carp affected by JGC is playing an important part in the final stages of the eradication.

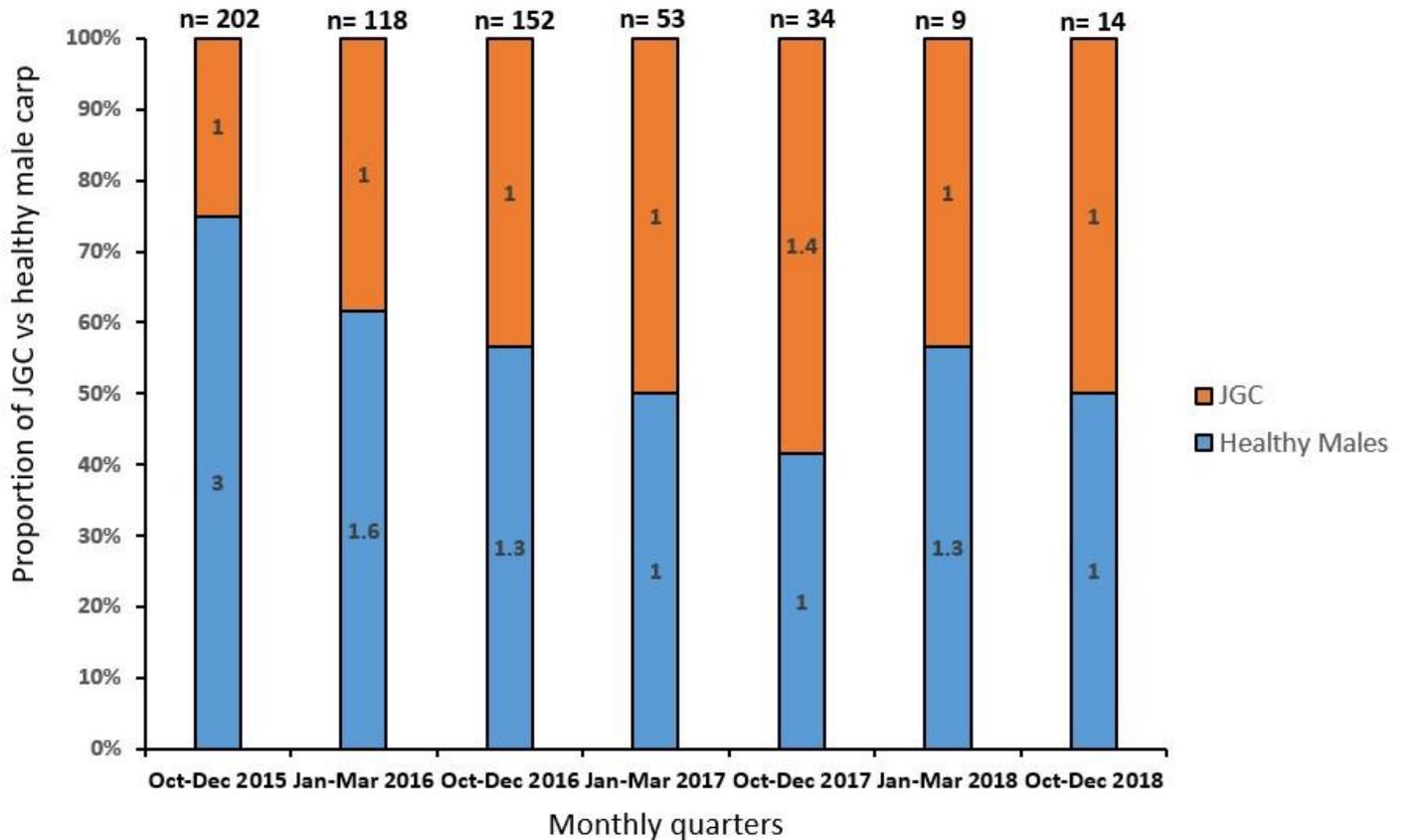


Figure 3. The ratio of jelly gonad condition carp to healthy males during the October-December and January-March quarters (2015-2018).

In summary, this quarter required hard work and motivation by all CMP team members, in order to target the small population of carp. CMP staff were faced with some of the lowest catch per unit effort (carp per 100m net hour) they had ever encountered, while increasing the amount of netting effort to a level in excess of previous seasons. A good lake level, a number of rain events and warm weather encouraged the carp to become active. Intensive gill net effort across the lake caught a large proportion of the remaining carp. As of the end of December, the spawning risk has dramatically decreased due to the loss of spawning habitat (de-watering of marshes) and falling lake levels. In January, it is expected that the carp will push back out to the deeper sections of the lake now. We will begin to shift the fishing gill nets from the shallow edges, out into these feeding areas.

Lake Crescent

Lake Crescent's water quality is continuing to show signs of improvement (Figure 4). Since the extremely low water levels in 2008, the average total turbidity of Lake Crescent has decreased considerably. This is the direct result of high water levels flushing the lake after large rainfall events. The capture of a lone female carp in an aggregation with a number of transmitter fish in December 2007 proved to be significant, with no other carp caught since this event. Despite extensive fishing effort and monitoring over the past eleven years there has been no evidence of recruitment or the presence of any carp. Timely rains over the winter period saw the lake fill up, allowing water into the marshes.



Picture 2. Annual electrofishing and fyke net effort in Lake Crescent did not detect any presence of carp.

Work experience

We receive regular requests from schools, universities, and interested graduates looking for work experience in freshwater fisheries. The CMP is especially sought after due to the overall diversity of work in the field. Jake Brumley who is currently undertaking a Bachelor of Science majoring in Fisheries Management, approached the IFS in order to fulfil the work placement component of the unit “Practicum in the Marine Environment”. He was required to undertake 20 days of work experience and chose the IFS, to gain a better understanding of how the CMP operates, gain practical experience in fisheries management, and learn more about the impacts of pest fish in Tasmania. As a keen recreational salt and freshwater fisher, he was also excited about getting the opportunity to use commercial techniques to sample for various fish species.

Jake was based at the Lake Crescent Field Station for the duration of the period, working with the CMP. The activities he was involved in ranged from general boating activities, checking and setting of gillnets/fyke nets, using the boat and backpack electro-shocker to survey the margins of the lake, to dissecting carp and staging the maturity of the gonads. He was also able to develop important skills in relation to boat operation and aquatic field work. Due to Jake’s great work ethic and hardworking qualities, he was offered casual employment over the peak carp season from November through till February. On completion of his studies, Jake hopes to either gain employment in a fisheries related department in Tasmania, or he will begin to look for work around Australia.

Table 3. Work experience (October – December 2018)

Name	Background	Timeline
Jacob Kelly	Triabunna District School	4 th – 5 th Oct
Jake Brumley	Australian Maritime College	5 th – 11 th Oct
Brendan Klok	Australian Maritime College	28 th – 29 th Oct



Picture 3. Jake Brumley with an ex-transmitter fish which expired in September 2016, and was caught this November out of a trammel gill net.

CMP leader presents work at the 2018 Australian Society for Fish Biology (ASFB) conference in Melbourne

Team leader, Jonah Yick, presented at the 2018 Australian Society for Fish Biology conference which was held from the 7th – 11th of October in Melbourne. Delegates from universities, environment, and fisheries bodies around Australia attended the conference. There were approximately 200 presentations during the conference and Jonah Yick presented in the “Carp control” special session, chaired by staff from the National Carp Control Program. Jonah talked about the current status of carp in Lake Sorell, and how close the CMP are to eradicating carp from Tasmania. His presentation was well received by other delegates, and highlighted the need to carefully manage invasive pest fish in Tasmania.



Picture 4. Presenting the carp situation in Lake Sorell at the ASFB conference.

Carp Management Program presents at Tasmanian Fly Tyers Club meeting

Team leader, Jonah Yick, recently presented at the Tasmanian Fly Tyers Club meeting, informing the group on how the management of carp in Lake Sorell is progressing. The Fly Tyers have been great supporters of the CMP since the early stages of the program, and were very excited at the possibility of a successful eradication. Jonah presented data on the plummeting catch rates of carp, the most effective gear types used, the jelly gonad condition present in a large proportion of the male carp, as well as the overall poor condition and small average size of the remaining carp in Lake Sorell. Many of the club members had fished Lake Sorell back in the pre-carp days, and are hopeful that they will be able to get back onto their favourite trout water soon.



Picture 5. Jonah Yick presenting at the Tasmanian Fly Tyers Club meeting.

Student projects

Raihan Mahmud has been investigating the Jelly-like gonad condition (JGC) of Lake Sorell carp for the last 4 years. This project was supervised by Associate Professor John Purser and Dr. Jawahar Patil from the Institute for Marine and Antarctic Studies (IMAS). The primary objectives of the project were to characterise the condition, detect any potential biological and abiotic cues that influences the condition, and assess it's practical application. The results of the research indicated that occurrence of this condition is unique but shares some feature with human carcinoma. Over 7,000 genes and more than 130 pathways were affected by the JGC condition, with subsequent sequential rationalisation deducing 40 candidate genes as possible drivers of the condition. Follow up research is underway to discern the function of those candidate genes. Overall, this research could be helpful to understand many aspects of biology including sterility, cell death and reproduction. A thesis detailing the research findings, background literatures, practical applications and future directions of JGC project has been submitted to University of Tasmania for the fulfilment of Raihan's PhD degree. This thesis is currently under examination.



Picture 6. Raihan Mahmud with a JGC male carp caught in a trammel net.

Employment and funding

Five casual workers were employed to assist with carp management activities during the period.

Table 4. Casual positions (October – December 2018)

Name	Background	Timeline
Kim Clark	Interlaken Shack Owner	3 rd Nov – 9 th Dec
Julian Butschek	University of Tasmania	1 st – 19 th Oct
Laurence Farr	Australian Maritime College	17 th Oct
Jake Brumley	Australian Maritime College	19 th Nov – 14 th Dec
Will Ertler	University of Canberra	14 th – 28 th Dec

Water Management

Table 5. Water Release data (October – December 2018)

Month	Lake Sorell release (ML)	Lake Crescent release (ML)
October	-	636.97
November	-	633.56
December	-	811.61
TOTAL	-	2082.14

* Note: There is no continuous flow monitoring on the Lake Sorell release, only spot checks are done.

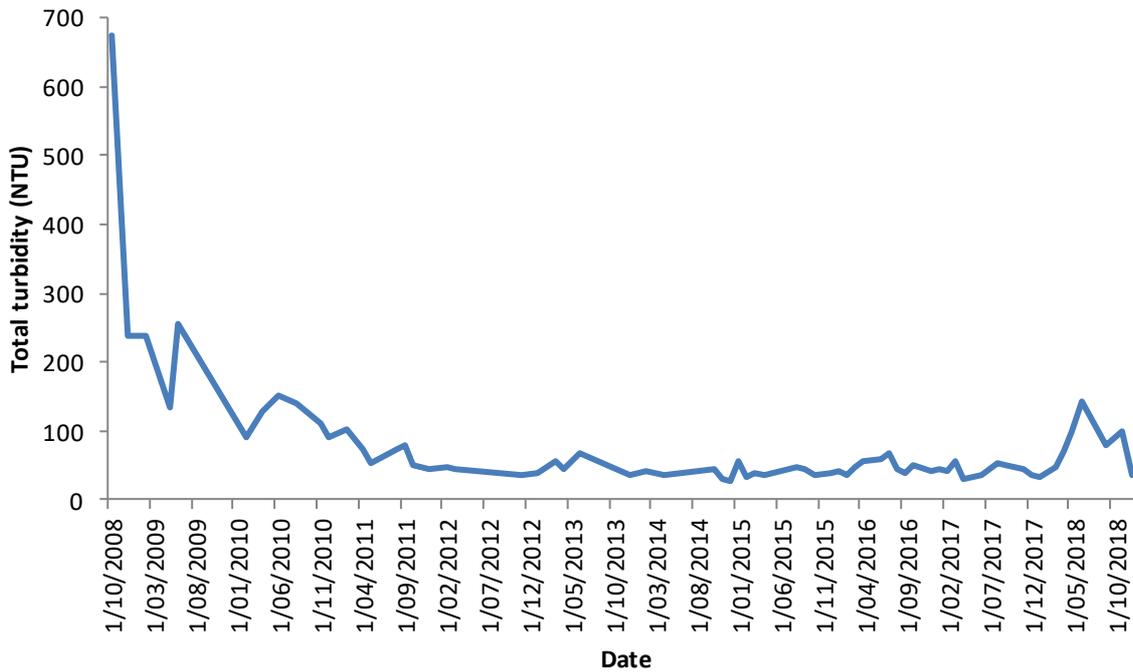


Figure 4. Turbidity levels in Lake Crescent from October 2008 to December 2018

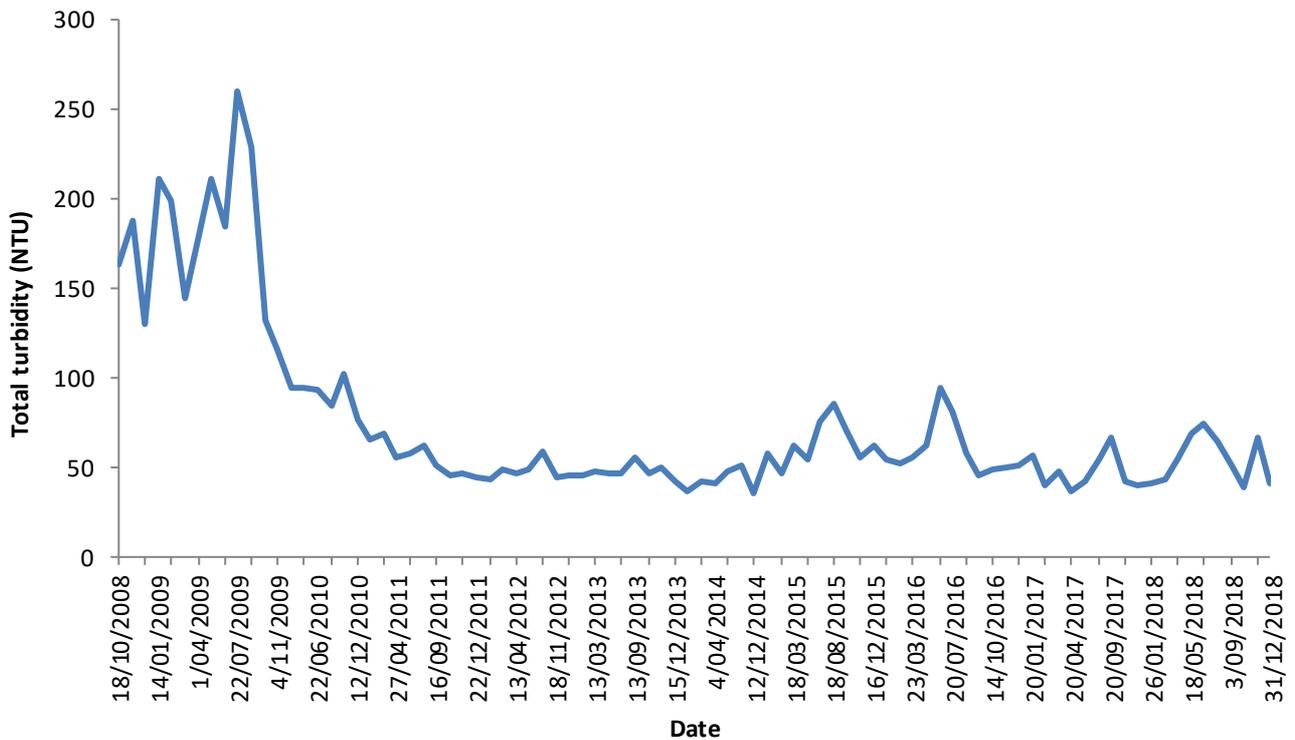
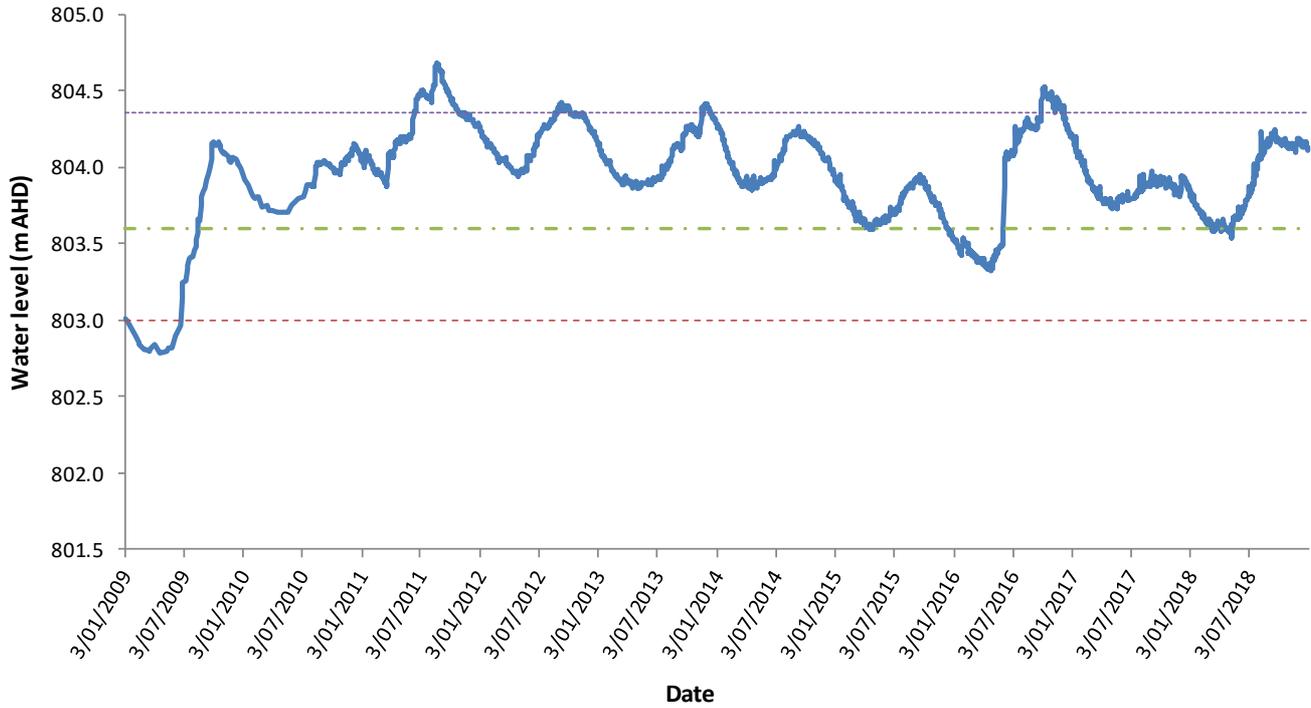


Figure 5. Turbidity levels in Lake Sorell from October 2008 to December 2018

Lake Sorell



Lake Crescent

