

Inland Fisheries Service

RECREATIONAL FISHERIES REPORT



Fisheries Performance Assessment

Technical Report

Bronte Lagoon – September 2018

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I. Introduction

Bronte Lagoon is a Hydro Electric water storage formed in 1953 by construction of a low rockfill dam at the edge of Woodward's Marsh. It is a shallow water situated at 666 m above sea level (full supply level is 665.98m) and is approximately 480 hectares. It is surrounded by sub-alpine woodland with open and grassy shorelines consisting of extensive snowgrass. The lagoon receives on average, 3 654 angler visits per annum and is a significant fishery of statewide importance, offering an angling experience for brown, rainbow and the occasional brook trout.

Bronte Lagoon is the first of four small storages that supply water to the Tungatinah power station. Water flows into Bronte Lagoon from Pine Tier Dam via Bronte Canal. The canal also collects water pumped from Serpentine Creek. Inflows are also received from Laughing Jack Lagoon and the Clarence River, via the Clarence Pipeline. The lagoon is a shallow storage and consequently changes in water level can expose or inundate large areas of the surrounding land and influence the performance of the fishery in both the long and short term.

Under the Tasmanian Inland Recreation Fishery Management Plan 2018-28, Bronte Lagoon is managed as a 'wild self-sustaining fishery' with a fishing season open from August to April in the following year. Fishing is restricted to the use of artificial lures only with a daily bag limit of 12 fish and minimum size limit of 300 mm length.

The lagoon is primarily a brown trout fishery however, there are a small number of rainbow trout and the infrequent brook trout captured each season. The lagoon also has populations of short finned eels, spotted and climbing galaxiids and the introduced tench.

2. FPA Survey Methodology

2.1. In-Lake Population Surveys

During 17 - 19 September 2018, 80 box traps were set each night over two nights (total of 160 box trap sets), with a wide area of the lagoon covered. In total, 292 trout were captured consisting of 281 brown trout, 10 rainbow trout and one brook trout, with all fish weighed and measured (fork length). All brown trout were judged as male, female or indeterminate, with fish released away from the trap site after processing.

2.2. Annual Postal Survey

Since 1986, the Service has conducted a postal survey seeking information about anglers' catches. The survey comprises a form sent to ten percent of all categories of anglers, asking set questions about their angling (catch of trout) for the past season. This information is entered into a database and information on catch per day, harvest and angling effort is extrapolated. This provides a long term overview of individual fishery performance in addition to characterising effort. In this report, only records post 2000 are analysed.

2.3. Stocking Database

The Service keeps electronic records of fish stocking within public waters dating back to 1980. These records set out information on location, date of stocking, species, age, origin, stock type and genotype, in addition to some length/weight data and comments e.g. denoting tagged fish. This information provides an historical record of supplementary recruitment into individual waters.

2.4. Analysis Methods

Condition factor for all fish was calculated using the basic formula of $K=10^5 \times \text{weight}/\text{length}^3$. This provides a basic generalised result that can be used to compare other fish and fisheries. Condition factor categories assigned to each level of condition i.e. poor, fair, good or excellent, are reflective of an individual fish or population at a particular time within the reproductive cycle and will therefore change during this cycle e.g. high during peak spawning condition. NB Categories are indicative and may not necessarily reflect the perception of anglers in general. A growth equation was generated using standardised log-linear data (ln) for weight against length.

3. Results

3.1. In-Lake Population Survey – Brown Trout

During 17 - 19 September 2018, the Service conducted an in-lake survey at Bronte Lagoon to examine:

- CPUE for brown trout and rainbow trout,
- to assess the population structure of brown trout and,
- the condition of all fish captured.

CPUE

In total, 281 brown trout were captured from 160 box trap sets. This equates to a CPUE of 1.76 fish per trap, with approximately 75% of trap sets catching one or more fish. Despite a previous survey being undertaken during 2003, no directly comparable catch effort data is available, as the previous survey used gill nets to collect fish.

Weight and Length Information

The catch consisted of 42% females, 29% males with 29% of indeterminate sex. All brown trout were weighed and measured for fork length. Table I shows the summary statistics for these fish separated by sex. There was difficulty in determining the sex of some trout and this resulted in a higher than normal percentage of indeterminately classed fish. On average, male fish were significantly heavier than female fish by around 208 grams.

The average weight for all fish, including immature fish was 573 grams. The average weight for fish over 300 mm was 653 grams, with 83% of the catch being greater than 300 mm length (see figure 1).

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Grouping	Measurement	Mean	Std Error	Minimum	Maximum
All brown trout (n=281)	Length (mm)	363	5.01	108	556
	Weight (g)	573	17.05	20	2 080
	Cond Factor (k)	1.10	0.01	0.68	1.77
Male (n=80)	Length (mm)	418	5.13	333	556
	Weight (g)	796	30.13	410	2 080
	Cond Factor (k)	1.06	0.01	0.79	1.61
Female (n=119)	Length (mm)	374	4.18	273	510
	Weight (g)	588	17.10	220	1,202
	Cond Factor (k)	1.09	0.01	0.88	1.46
Indeterminate (n=82)	Length (mm)	293	9.56	108	500
	Weight (g)	335	28.65	20	1,222
	Cond Factor (k)	1.14	0.02	0.68	1.77

Table I: Length, weight and condition factor for brown trout separated by sex or immature fish.

The growth of fish appears to be good with all fish showing a healthy weight for a given length, with no signs of larger fish being in poor condition. However, only two percent of brown trout were over 500 mm (see figure 1).

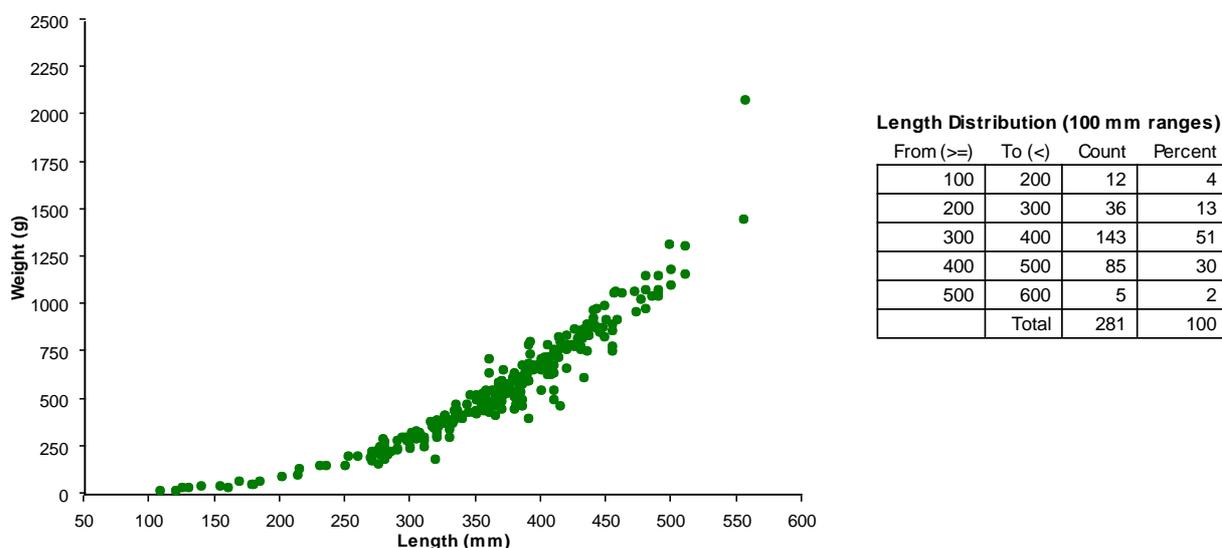


Figure 1: Length/weight regression for brown trout captured 2018 ($Y = -10.138 + 2.78 * X$; $R^2 = 0.973$)

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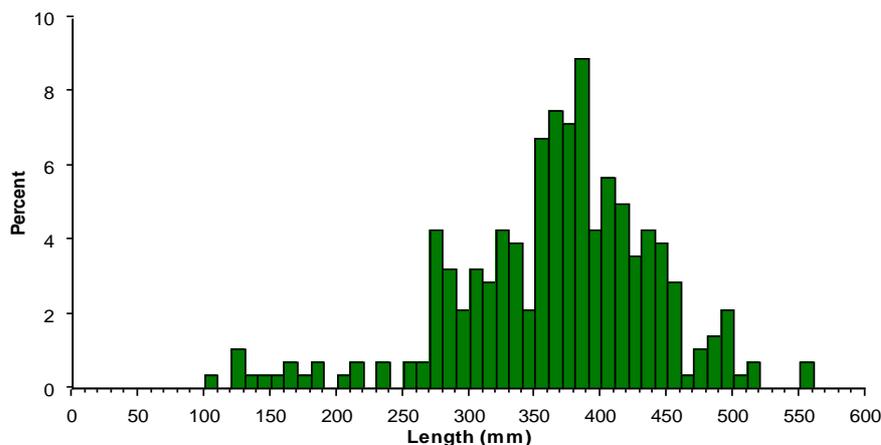


Figure 2: Length frequency for brown trout 2018.

There was good evidence to suggest the recruitment of brown trout has been solid across several years with all length classes present (see figure 2). This also included a strong signal from young of the year fish in the 100-200 mm range.

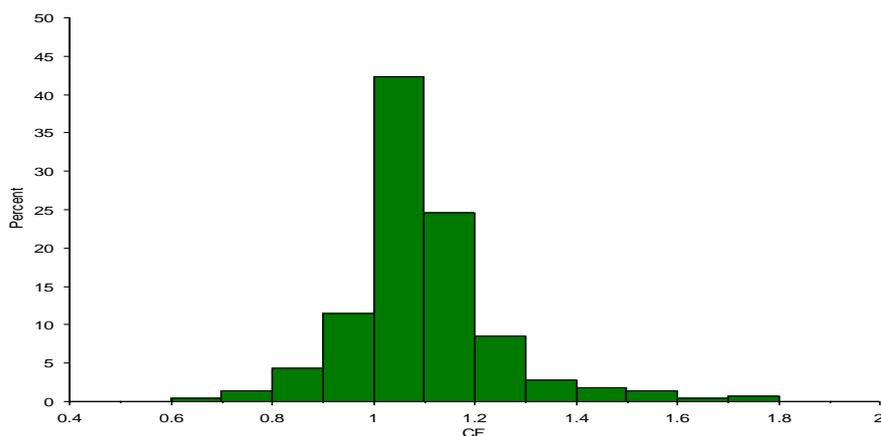


Figure 3: Condition factor (k-factor) for brown trout 2018.

In general, the overall condition of brown trout was good, with an average k-factor of 1.08. Approximately 16 percent showed some evidence of being in poorer condition, with 84 percent in the fair to excellent range (see figure 3). This is typical of most lake fisheries within the State.

3.2. In-Lake Population Survey – Rainbow Trout

Just 10 rainbow trout were captured, with all being caught on the first day of the survey. The CPUE for rainbow trout was therefore extremely low at 0.063 fish per trap or 3.5 percent of the total catch. All fish were between 250 – 300 mm length with an average weight of 274 g and average length 279 mm. All but one fish (a female) was recorded as indeterminate sex. All fish were in good to excellent condition with an average k-factor of 1.25.

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3.3. Angler Postal Survey

Average (mean) fishing effort in the period 2000 - 2018 was 9,793 angler days per season, with a low of 5,847 days during 2003-04 and a high of 13,575 days during 2017-18 (see figure 4). The increase in fishing effort during 2006 – 2010 is likely a consequence of drought conditions during 2006 – 2009 affecting other major fisheries, with an influx of anglers electing to fish waters such as Little Pine Lagoon and Bronte Lagoon. This drought broke in late 2009 and anglers began to fish at other waters in preference to Bronte Lagoon. The catch rate for brown trout during this period (2010 - 2016) was variable and a likely contributing factor in lower fishing effort (see figure 7). However, a large increase in fishing effort occurred in the 2017-18 season, the reasons for this are unclear although the daily catch rate during 2016-18 was above the long term average (see figure 7) and likely to encourage anglers to fish this water.

The average number of days fished by anglers within each season remained around the long term average of 5 days (see figure 5).

The estimated harvest of brown trout has fluctuated considerably through time and is not strongly linked to fishing effort (as normally occurs), but influenced more by the daily catch rate.

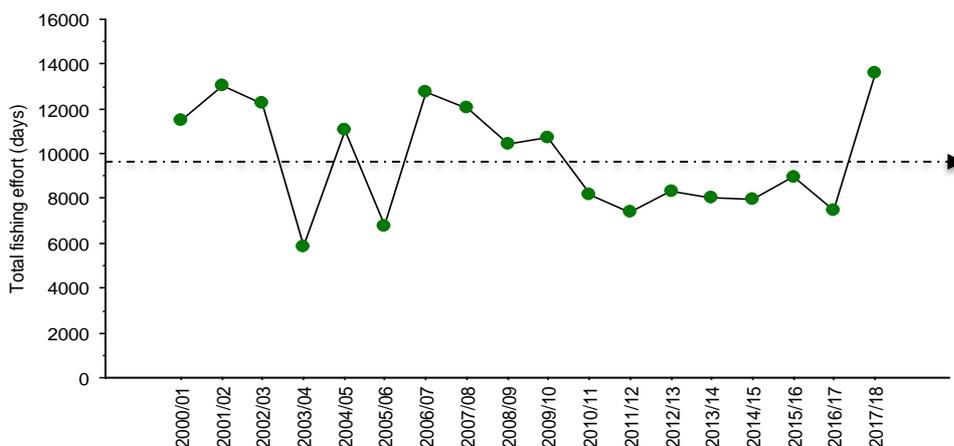


Figure 4: Total fishing effort 2000 – 2018 (dotted line indicates long-term average).

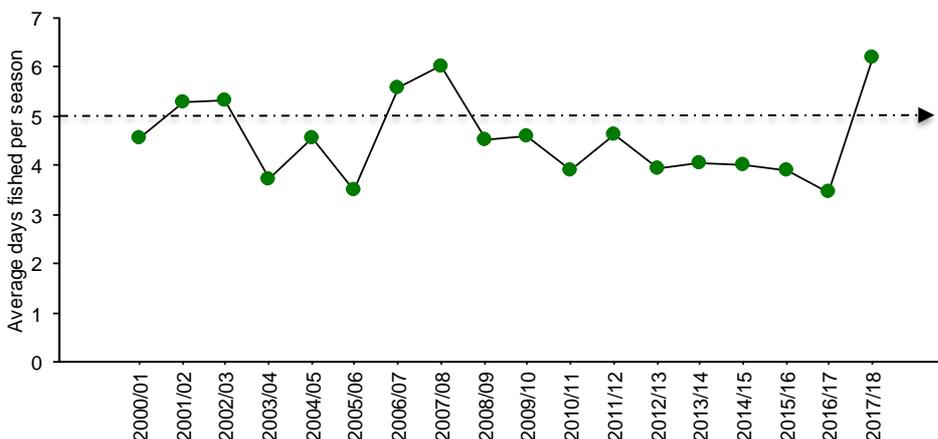


Figure 5: Number of days fished per angler for each season 2000 – 2018 (dotted line indicates long-term average).

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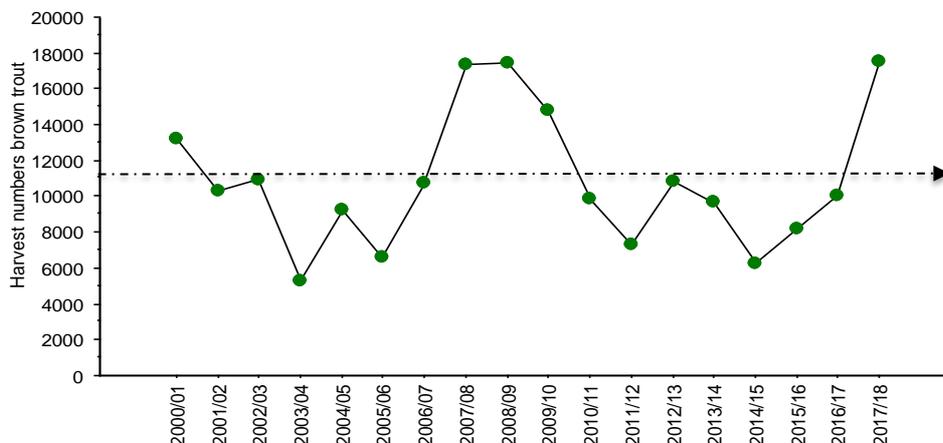


Figure 6: Estimated harvest of brown trout 2000 – 2018 (dotted line indicates long-term average).

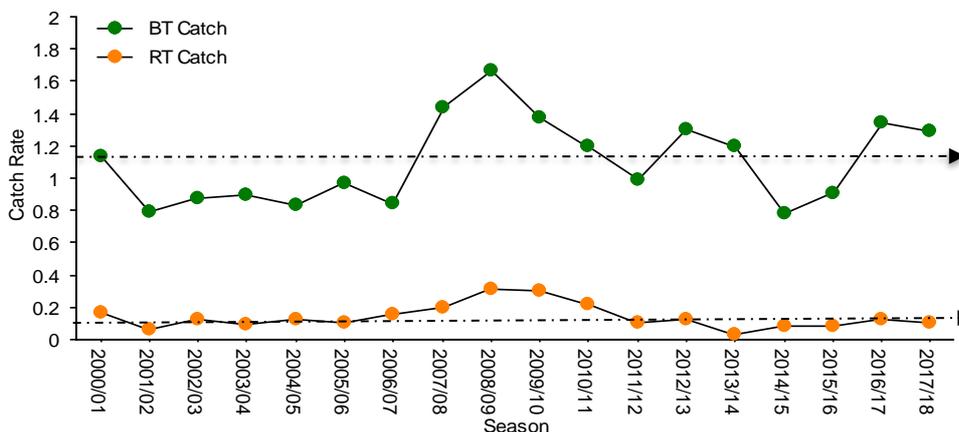


Figure 7: Daily catch rate for brown & rainbow trout 2000 – 2018 (dotted line indicates long-term average).

The average catch rate for rainbow trout has remained low at around 0.14 fish per day with an estimated annual harvest of 1 445 fish. The occasional brook trout is also captured at Bronte Lagoon during most seasons.

3.4. Stocking

Brown trout

The brown trout populations within Bronte Lagoon is entirely from natural recruitment from upstream sources.

Brook trout

It is assumed that downstream dispersal of brook trout from Clarence Lagoon has in the past contributed to some catches, although past catch rates suggest these instances are extremely rare (see appendix C). Brook trout were stocked into the lagoon during the period 2003-2009 (see appendix A). These stockings were mainly due to hatchery supplies being excessive. There is some correlation with the stocking of brook trout into the lagoon and an increase in catch rates, although

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these catch rates are very low. The stocking of yearling and adult fish appear to provide the best return.

Rainbow trout

Other than an increase in the daily catch rate for rainbow trout during 2008 – 2011, there is virtually no correlation between the stocking of rainbow trout and increased daily catch rate (see appendix B). Rainbow trout have been recorded in angler's catches prior to any stocking occurring, suggesting that immigration can sustain a base level population.

4. Discussion

The fishery at Bronte Lagoon at present appears to be performing well. The CPUE from the in-lake survey was slightly lower than expected and was below that for similar waters, e.g. Little Pine Lagoon (4.64 brown trout per trap) and Woods Lake (2.30 brown trout per trap). This suggests the abundance of brown trout is in the moderate range. There were a large number of size classes present and no signs of any poor recruitment over the past 5-6 years. The long term average daily catch rate for brown trout is good but there have been significant fluctuations over the long term. The reasons for these fluctuations are not clear but they are likely to reflect the total abundance of brown trout through time. Factors such as water level operations may be a contributing factor but they are not within the scope of this report.

The average weight of fish over 300 mm was lower than expected at 653 grams. This result is a reflection of the large number of smaller fish present within the population. Just over 50 percent of the catch was between 300-400 mm long, with 30 percent between 400 – 500 mm. While there were no signs of any growth limiting factors, only 2 percent of brown trout measured more than 500 mm. Very few fish were in poor condition.

There was no apparent link between angling effort and catch rate and there did not appear to be any significant evidence of angling effort influencing the annual harvest figure. This indicates the population is not being affected to any substantial degree by the seasonal take by anglers.

The daily catch rate for rainbow trout showed very little correlation to the relevant stocking events, except for the stocking of some yearlings and adult fish. Rainbow trout have been captured within Bronte Lagoon prior to any stocking events indicating there is some dispersal from other waters into the lagoon, which maintains a small population.

There is some evidence the stocking of brook trout can contribute to anglers' catches. However, the return to the daily creel is extremely low and on-going stocking is difficult to endorse, especially when brook trout supplies are traditionally very limited.

In summary, at present Bronte Lagoon has a moderate abundance of brown trout across a wide range of sizes. The vast majority of fish captured were good condition and the growth of fish appears to be acceptable. The annual harvest relative to fish abundance is low and present fishery

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management actions are serving the fishery adequately. The lagoon holds a very small self-sustaining population of rainbow trout that are likely from downstream dispersal from other waters. The brook trout population is negligible.

5. Recommendations

- The trout fishery at Bronte Lagoon continues to be managed by way of adjustment to bag and size limits. At present (2018-19 season), the minimum size limit is 300 mm with a daily bag limit of 12 fish that includes only two brook trout (and five Atlantic salmon). Given there is no substantial evidence that angling effort and consequently annual harvest is impacting the brown trout population, there are no recommendations to alter either bag or size limits.
- Monitoring of future angling effort and harvest is achieved by angler feedback and assessment via the annual postal survey.
- Monitoring of the trout population is undertaken on an as needs basis.
- The on-going stocking of rainbow trout is either increased to 50,000 fry (equivalent), or discontinued completely with an acceptance of a daily catch rate of around 0.15.
- Unless the availability of brook trout for stocking is high, no stocking is recommended.
- Recruitment of brown and rainbow trout is from downstream dispersal and is influenced by hydro water management and flood events. These factors are identified for potential future investigation.

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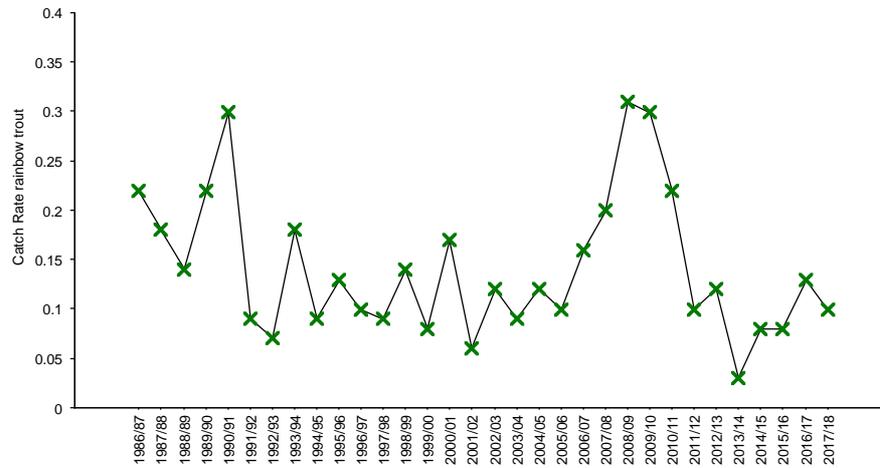
6. Appendix

Date	Species	Number	Age	Type
04-Dec-02	Brook trout	15 000	Fingerling	Diploid
09-Jan-03	Brook trout	5 000	Fingerling	Diploid
09-May-03	Brook trout	1 000	Yearling	Diploid
24-Nov-03	Brook trout	11 000	Adv Fry	Diploid
30-Apr-04	Brook trout	1 200	Yearling	Diploid
16-Dec-04	Brook trout	20 000	Adv Fry	Diploid
09-Nov-05	Brook trout	1 000	Yearling	Diploid
20-Dec-05	Brook trout	850	Adult	Diploid
21-Mar-06	Brook trout	715	Fingerling	Diploid
28-Dec-06	Brook trout	11 000	Fingerling	Diploid
11-Mar-09	Brook trout	8 500	Fingerling	Diploid
20-Nov-09	Brook trout	6 000	Fry	Diploid
04-Dec-03	Rainbow trout	40 000	Fry	Diploid
21-Mar-05	Rainbow trout	3 000	Fingerling	Triploid
23-Aug-05	Rainbow trout	3 000	Yearling	Triploid
12-Jul-07	Rainbow trout	15 000	Fingerling	Diploid
26-Apr-08	Rainbow trout	16 000	Fingerling	Diploid
03-Jun-09	Rainbow trout	10 000	Fingerling	Diploid
28-Jan-10	Rainbow trout	10 000	Fry	Diploid
25-Feb-11	Rainbow trout	10 000	Fingerling	Diploid
23-Mar-12	Rainbow trout	10 000	Fingerling	Diploid
14-Dec-12	Rainbow trout	10000	Fry	Diploid
14-Jan-14	Rainbow trout	10000	Fry	Diploid

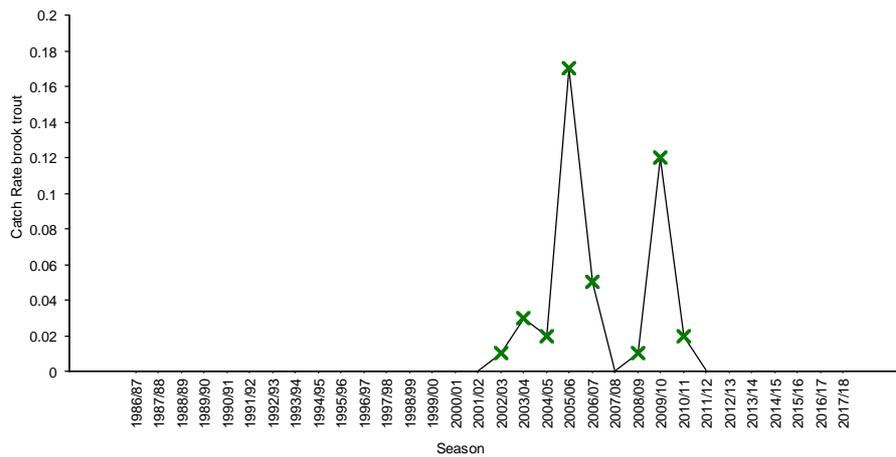
Appendix A: Stocking records for Bronte Lagoon – all species for all years (1986 – 2018)

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Appendix B: Daily catch rate for rainbow trout, Bronte Lagoon 1986 - 2018



Appendix C: Daily catch rate for brook trout, Bronte Lagoon 1986 - 2018