Inland Fisheries Service Report

Recreational Fisheries Report

Fisheries Performance Assessment
Technical Report
Pet Reservoir - July 2018

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1 Introduction

Pet Reservoir (402024E 5443382N GDA94), is a domestic drinking water supply dam managed by TasWater. The 67 hectare (4,230 ML at FSL) reservoir is filled by inflows from the Pet River. The river itself contains a healthy population of brown trout and trout from the reservoir move upstream into the river to spawn. A significant population of the native blackfish occurs within the river and the reservoir. The freshwater lobster *Astacopsis gouldi* also occurs in this area. The Pet Reservoir is a popular fishery servicing the area around Burnie and beyond. As the water provides domestic drinking water, no boating is permitted.

2 Fishery Performance Methods

2.1 In-lake Surveys

In readiness for a capture-mark-recapture population estimate, 600 adult brown trout sourced from the Liawenee Canal spawning trap were adipose fin clipped and transferred to Pet Reservoir (14 June 2018). These fish weighed an average of 850 grams and measured 417 mm (fork length).

During 23-25 July 2018, the Service undertook an intensive trapping survey within Pet Reservoir. The purpose of the survey was to gain information on:

- catch per unit effort,
- the length structure of the brown trout population,
- the condition of fish,
- natural recruitment and stocking success, and
- establish an estimate of the brown trout population size.

A total of 46 box traps (see figure 1) were set over two nights, with all traps deployed around the perimeter of the lake.

From the 46 box trap sets, 29 brown trout and 5 rainbow trout were captured. All trout were weighed and measured for length. Brown trout were examined for the presence of an adipose fin clip. Traps were checked and cleared after the first night and then cleared and retrieved after the second night.

Figure 1: Typical box trap set showing three co-joined traps (Penstock Lagoon).

2.2 Stocking History

The Service keeps electronic records of public water stockings dating back to 1980. These records set out information on location, date of stocking, species, age, origin, stock (wild or domestic strain) and genotype, in addition to some length/weight data and comments of stocked fish, e.g. denoting tagged fish. This information provides an historical record of supplementary recruitment into individual waters; stocking records are shown in appendix (a).

2.3 Annual Postal Survey

Since 1986, the Service has conducted a postal survey seeking information about anglers' catches. The survey comprises of 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. For the Pet Reservoir, only records from 1999/2000 to 2017/18 seasons with ten or more respondents that indicated they fished this water were used.

3 Fishery Performance Results

3.1 In-Lake Survey

Length weight data

From 46 box trap sets, 29 brown trout and 5 rainbow trout were captured with all fish weighed and measured.

As only three fin clipped fish were captured, all the data was combined to produce an average length and weight (i.e. unclipped and clipped fish) (see table 1). Three native blackfish (*Gadopsis marmoratus*) were also captured.

Grouping	Measurement	Mean	Std Error	Minimum	Maximum
All brown trout (n=29 includes 4 immature fish)	Length (mm)	418	9.92	290	490
	Weight (g)	758	52.93	220	1,700
	Cond Factor (k)	1.00	0.02	0.72	1.44
Female (n=17)	Length (mm)	428	6.29	387	470
	Weight (g)	768	31.66	570	1,010
	Cond Factor (k)	0.97	0.03	0.72	1.14
Male (n=8)	Length (mm)	450	11.47	407	490
	Weight (g)	966	119.15	620	1,700
	Cond Factor (k)	1.03	0.07	0.90	1.44

Table 1: Descriptive statistics for brown trout for combined sample (with immature fish included), female and male fish.

The catch of 29 brown trout consisted of 17 females, 8 males and 4 immature fish. Males weighed an average of 996 g with an average length of 450 mm. This compared to females at 768 grams and 428 mm (see table 1 and figure 2). The mean condtion factor for both male and female fish was not significantly different (see figure 5). The average condition factor of 1.0 k is by comparison to most lake fisheries slightly lower than typical, although the majority of brown trout sampled were in post spawning condition.

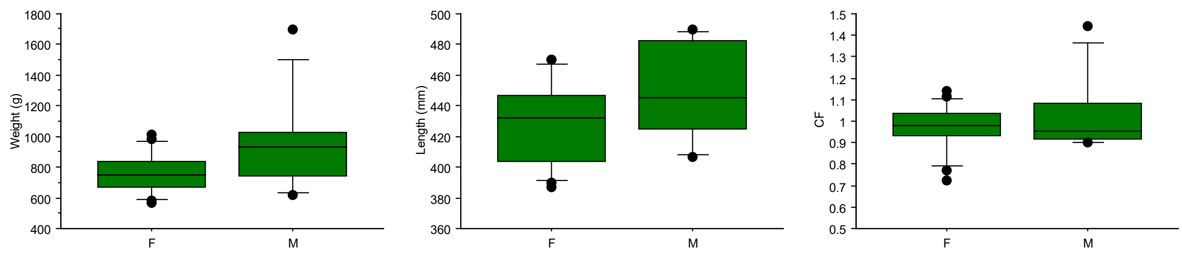

Figure 2: Box plots for brown trout - length, weight & condition factor separated by sex (F=female & M=male).

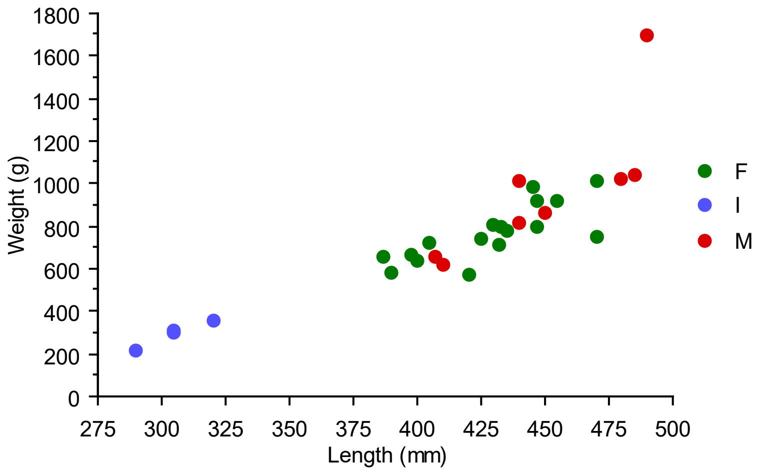

Figure 3: Length/weight comparison for brown trout separated by sex (F=female, M=male, I=immature).

A comparison of length against weight (see figure 3) indicates the growth of fish is typical of lower productive lake fisheries within Tasmanian, although a larger sample size is needed to make an objective assessment.

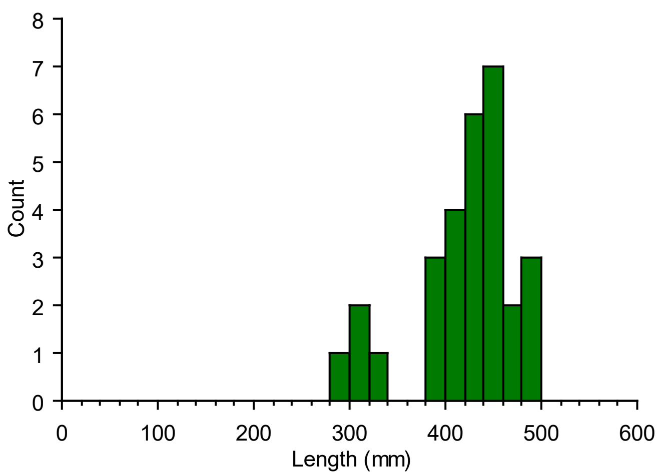

Figure 4: Length frequency plot for all brown trout captured.

A plot of length frequencies clearly shows two groups of brown trout. The first of these 280 – 340 mm are representative of typical three year old fish. The second group 380 – 500 mm possibly contains a range of fish from a combination of adult brown transfers from 2015 and 2017, natural recruitment pre 2015 and a stocking of 10,000 fry in 2013. It is not possible to differentiate any of these sources. It is however, evident that natural recruitment is low.

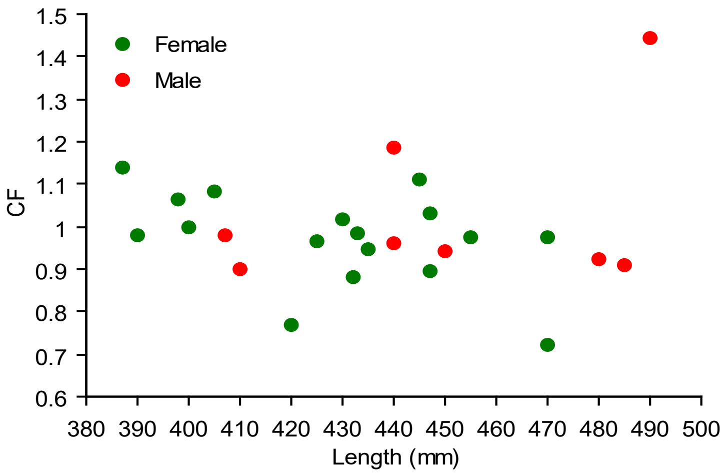

Figure 5: Condition factor for all brown trout captured separated by sex.

The condition of fish (see figure 5) on average was slightly below that normally expected of a typical lake based fishery, with a mean condition factor of 1.0 k.

3.2 CPUE Information

Generally, the capture of brown trout in box traps was extremely low with 29 brown trout capture from 46 box traps set over two nights (27 box trap sets each night). This equates to a mean CPUE of 0.63 brown trout per trap. This is indicative of a low abundance of brown trout. CPUE for rainbow trout was negligible with just three fish captured at 0.07 fish per trap.

3.3 Population Estimate

On 14 June 2018, 600 adult brown trout that had been adipose fin clipped were transferred from Great Lake to Pet Reservoir to allow a population estimate to be conducted. A six-week settling in period during the closed season, was allowed before a recapture survey was undertaken. A total of 29 brown trout were captured in box traps over two nights. Of these fish, just three were adipose fin clipped (10.3%). Table 2 shows the parameters of the Petersen estimate, with 5,800 brown trout estimated to be within the lake. The associated estimate of bias was very low i.e. 0.75 and implies a low degree of confidence in the estimate that is reflected in the broad and negative 95% confidence limits. As the number of total captures and fin clipped fish were low, the value of the estimate is limited. The estimate is indicative only but is reported here for reference.

Parameter	Result
Total tagged fish released (M)	600
Total recaptures (C)	29
Total marked recaptures (R)	3
Population estimate: MC/R = N	5,800
Standard error	3,163
Lower and Upper 95% CI limits	- 400 – +12.000
Estimate bias level: MC/4N =	0.75 (>4 acceptable bias)

Table 2: Petersen population estimate for brown trout Pet Reservoir.

4 Stocking History

The Pet Reservoir has been stocked with a range of trout and salmon species over a considerable period (see appendix a). This has mostly involved the use of fry or fingerlings of both rainbow and brown trout. Other stockings of tiger trout or Atlantic salmon have been undertaken on an opportunistic basis. These have fundamentally contributed little by way of return to anglers and are generally not fit for purpose for this water.

There is little correlation between the stocking of fish (see appendix a) and increases in catch rate or annual harvest (see figures 6 & 7), except where yearling rainbow trout have been stocked in large numbers. There is a seventeen year period between 1991 and 2008 where no stocking of brown trout was undertaken. There were no signs of a decrease in catch rate or harvest resulting from this cessation. It is also evident the transfer of adult brown trout has contributed little to increase the daily catch rate. The only consequence from these transfers was an increase in angling effort during 2014/15 (see figure 8) that drove up the total harvest without any real increase in catch rate.

5 Angler Postal Survey

Analysis of the Angler Postal Survey for the Pet Reservoir was limited to 2000-2018, for those years where ten or more respondents indicated they fished that water. Generally, the daily catch rate for brown and rainbow trout was low, with the long term average for brown trout at 0.41 fish per day and rainbow trout at 0.15 per day (see figure 6). The only notable increase in catch rate was for rainbow trout during 2005-2007. This increase was driven by a stocking of 7,000 yearling and fingerling rainbow trout that would normally not be available on a consistent basis. The spike in catch rate for rainbow trout during 2011/12 was driven by highly inflated catch returns from two individual anglers and therefore likely not to be indicative of the total angling population. This is reflected in the low harvest for this season. There was a notable increase in the harvest of brown trout for the 2014/15 season, which is driven by an increase in fishing effort, but not catch rate (see figures 6 & 8). This is a likely response to the stocking of adult brown trout for the first time at this fishery.

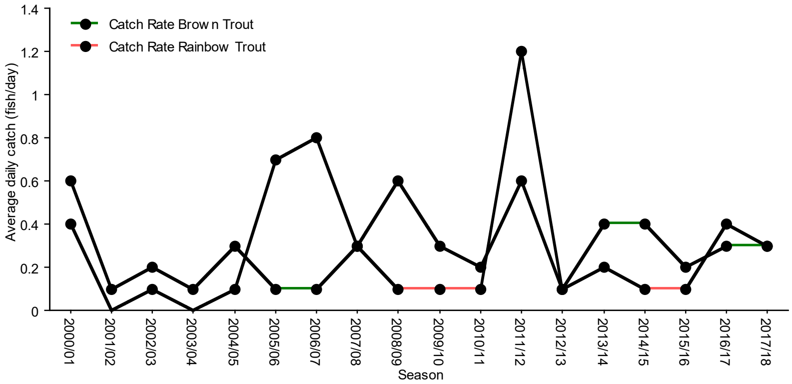

Figure 6: Average daily catch for brown and rainbow trout 2000-18.

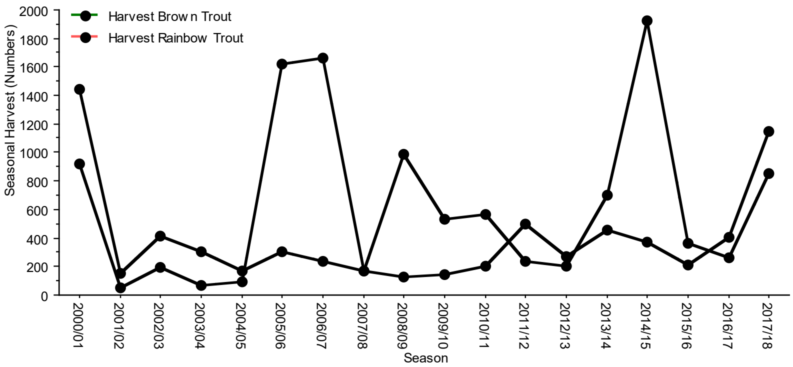

Figure 7: Estimated annual harvest for brown and rainbow trout 2000-18.

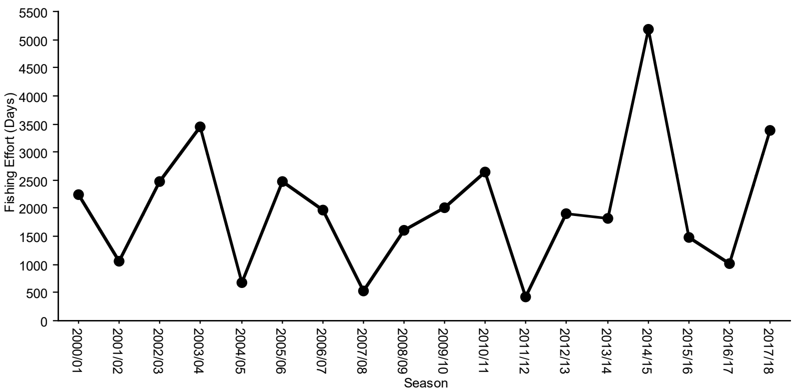

Figure 8: Estimated fishing effort 2000-18.

6 Discussion

The results of the 2018 survey indicate the Pet Reservoir has a relatively small brown trout population. The capture – mark – recapture population survey was inaccurate, due to the low number of fin clipped fish released, but primarily the low number of total captures. Given the low number of total captures, it is estimated that approximately 1,000 fish would have needed to be marked (fin clipped) to provide a meaningful estimate. Alternately, a total capture of at least 700 fish was needed with 400 marked fish (Robson and Regier 1964; Bernard and Hansen 1992). Nonetheless, the low CPUE of 0.63 brown trout per trap indicates a low population size.

The growth of fish is typical of lower productive lake fisheries within Tasmanian, although a larger sample size is needed to make an objective assessment.

Analysis of length frequencies showed two length cohorts. It is difficult to determine the origins of these fish but they are likely to be a mix of adult transfers, fry stocking and/or natural recruitment. Limited evidence from the survey suggests natural recruitment is low. The reasons for this are unclear, but the reservoir does appear to have a sizable blackfish population which may be influencing recruitment. There does not appear to be any demonstrated link between angler catch rates and stocking events, except for one larger stocking of yearling rainbow trout in 2005/06. The long-term catch rates for both brown and rainbow trout are low and below what might be considered acceptable for this type of fishery. The transfer of adult brown trout in the period 2014-2017 does not appear to have contributed to any meaningful improvement in catch rates. It may be necessary to increase the number of adult brown trout transferred to meet acceptable catch rates, however this would need to be balanced against the resulting increase in fishing effort.

There were just 5 rainbow trout captured for the whole survey (see appendix b), indicating very low abundance.

While the sample size from the Pet Reservoir survey was small, some broad conclusions can be made about the fishery. The population of brown trout is very small. Natural recruitment and stocking with fry/fingerlings is contributing little to the fishery, with very low daily catch rates. Stocking with small rainbow trout is ineffective, with only larger stockings of yearling rainbow trout returning measurable catches. The effectiveness of recent adult brown trout transfers is unclear and higher numbers may be needed to achieve an acceptable result. The growth of those fish examined was unremarkable and typical of a lower productive fishery.

7 Recommendations

- Pet Reservoir receives a minimum of 2,000 adult brown trout on an annual basis for three years, with an assessment undertaken to examine the effectiveness of this strategy.
- Any future survey is undertaken outside of the later spawning season for this water. Preferably the population during September, once all fish have returned from spawning and before anglers have removed excess fish.
- All stockings of rainbow trout should consist of yearling or adult fish.
- The regulations as outlined in the Tasmanian Inland Recreational Fishery Management Plan 20118-28 are implemented i.e. minimum size limit of 300 mm with a five fish bag limit consisting of only two fish greater than 500 mm (IFS 2018).

8 References

IFS 2018, Inland Fisheries Report, Tasmanian Inland Recreational Fishery Management Plan 2018-28. Inland Fisheries Service, Tasmania.

Robson, D.S. & Regier H.A. 1964, Sample Size in Petersen Mark-Recapture Experiments, *Transaction of the American Fisheries Society* Vol 93: Number 3.

Bernard, D.R. & Hansen, P.H. 1992, Mark-Recapture Experiments to Estimate the Abundance of Fish, Special publication No. 92-4, Department of Fish and Game, Alaska.

9 Appendix

Appendix a): Stocking list for Pet Reservoir 2015 – 2018.

SPECIES	DATE	NUMBER	ORIGIN	TYPE	WEIGHT (g)	AGE
Atlantic salmon	09/08/2001	85	Saltas	Diploid	5000	Adult
Atlantic salmon	21/07/2003	50	Saltas	Diploid	4500	Adult
Brown trout	01/08/1980	10000	Salmon Ponds	Diploid		Fry
Brown trout	01/08/1981	10000	Salmon Ponds	Diploid		Fry
Brown trout	01/08/1982	5000	Salmon Ponds	Diploid		Fry
Brown trout	01/08/1984	15000	Salmon Ponds	Diploid		Fry
Brown trout	01/08/1985	4000	Ulverstone RU	Diploid		Fry
Brown trout	01/12/1985	8640	Ulverstone RU	Diploid		Fry
Brown trout	01/08/1986	10000	Ulverstone RU	Diploid		Fingerling
Brown trout	01/12/1986	4000	Ulverstone RU	Diploid		Fry
Brown trout	01/08/1987	15000	Ulverstone RU	Diploid		Fingerling
Brown trout	01/12/1987	10000	Ulverstone RU	Diploid		Fry
Brown trout	01/08/1988	7940	Ulverstone RU	Diploid		Fingerling
Brown trout	01/12/1988	15000	Ulverstone RU	Diploid		Fry
Brown trout	01/12/1989	7940	Ulverstone RU	Diploid		Fry
Brown trout	01/12/1990	20000	Ulverstone RU	Diploid		Fry
Brown trout	01/08/1991	16000	Ulverstone RU	Diploid		Fry
Brown trout	04/09/2008	1486	New Norfolk	Diploid	63.3	Fingerling
Brown trout	14/11/2013	10000	IFS New Norfolk	Diploid	2.5	Fry
Brown trout	24/06/2014	400	Tumbledown Creek	Diploid	600	Adult
Brown trout	25/06/2015	700	Tumbledown Creek	Diploid	500	Adult
Brown trout	27/07/2017	150	Tumbledown Creek	Diploid	745	Adult
Brown trout	14/06/2018	600	Liawenee Canal	diploid	850	Adult
Rainbow trout	05/03/1997	4000	Cressy	Diploid	33	Fingerling
Rainbow trout	23/12/1998	2000	Salmon Ponds	Diploid	2.7	Fingerling
Rainbow trout	23/12/1999	2000	Salmon Ponds	Diploid	3	Fingerling
Rainbow trout	20/12/2000	2000	Salmon Ponds	Triploid	10	Fingerling
Rainbow trout	04/01/2002	2000	Salmon Ponds	Triploid	6	Fingerling
Rainbow trout	08/11/2004	10000	Springfield	Diploid		Fingerling
Rainbow trout	25/08/2005	2500	Tassal Russell Falls	Triploid	200	Yearling
Rainbow trout	08/02/2006	4500	Tassal Russell Falls	Triploid	60	Fingerling
Rainbow trout	18/12/2007	9000	Uni Tas	Diploid	5	Fingerling
Rainbow trout	14/08/2008	2100	New Norfolk	Diploid	39	Fingerling
Rainbow trout	18/06/2009	2500	New Norfolk	Triploid	21	Fingerling
Rainbow trout	06/08/2010	5000	New Norfolk	Diploid	13	Fingerling
Rainbow trout	09/02/2011	5000	Springfield	Triploid	20	Fingerling
Rainbow trout	10/04/2013	2500	Springfield Fisheries	Diploid	60	Fingerling
Rainbow trout	08/05/2014	1000	Springfield Fisheries	Triploid	150	Fingerling
Rainbow trout	05/11/2015	3000	Springfield Fisheries	Triploid	10	Fingerling
Rainbow trout	14/11/2015	6000	Springfield Fisheries	Triploid	7	Fingerling
Rainbow trout	06/01/2017	2500	HAC - Bridport	Triploid	40	Fingerling
Rainbow trout	04/04/2017	2200	Mountain Stream Fisheries	Triploid	220	Fingerling
Rainbow trout	14/06/2017	2500	HAC - Millibrook	Triploid	310	Yearling
Rainbow trout	16/07/2018	500	HAC - Millibrook	Triploid	385	Adult
Tiger	16/07/1991	700	Salmon Ponds	Triploid		Fingerling
Tiger	19/10/1992	1100	Salmon Ponds	Triploid	60	Fingerling
Tiger	17/12/1993	400	Salmon Ponds	Triploid		Yearling

Sex	Length	Weight (g)	Condition Factor
I	325	380	1.11
I	345	450	1.10
F	360	440	0.94
I	352	540	1.24
F	328	400	1.13
I	325	380	1.11

Appendix b): Length, weight and condition factor for rainbow trout (sex is **I**= immature, F=female**).**