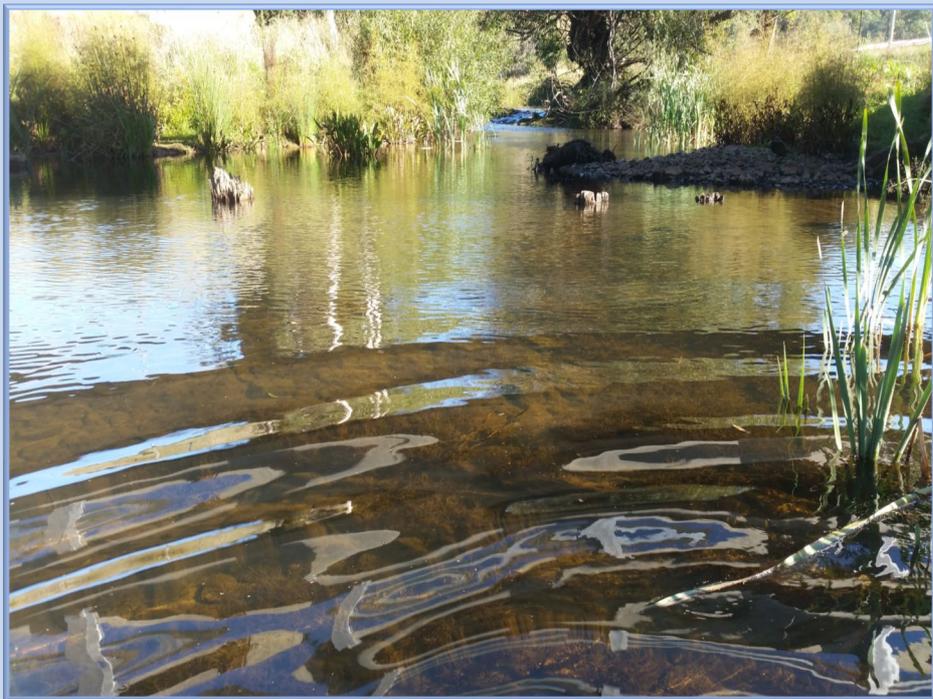


Inland Fisheries Service

RECREATIONAL FISHERIES REPORT



Fisheries Performance Assessment Technical Report North West Rivers – March 2021

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I. INTRODUCTION

In recent years anglers have expressed concern regarding widespread declines in their catch rate of brown trout from several streams of the North West coast, Tasmania. The rivers of greatest concern tended to be those further west, between Burnie and Smithton. An initial analysis was done to examine the extent of these declines and potential reasons. Review of the annual postal survey results confirmed declining catch rates.

It was decided to assess key rivers that represented a cross section of fisheries across the region. An initial desktop assessment was done to select the most suitable rivers with three reaches evaluated on each stream, representing lower, mid and upper reaches. In addition, sites were chosen that had long term data sets relating to the Monitoring of River Health program, as conducted by the Water Resource Section of DPIPWE. From this process, the Blythe, Inglis, Emu and Gawler rivers were selected as candidate waters. In addition, a single site on each of the Pet River above the Pet Reservoir and the Mersey River at Merseylea were surveyed for trout.

Under the *Tasmanian Inland Recreation Fishery Management Plan 2018-28*, these rivers are managed as wild river fisheries with a bag limit of five fish per day and a minimum size limit of 220 mm length, with natural recruitment sustaining the fishery.

2. FPA SURVEY METHODOLOGY

2.1. RIVER ELECTROFISHING SURVEYS

Rivers were selected for surveying using a range of criteria such as, popularity of the fishery, representative location, limited impacts from farming and forestry, comparable climatic attributes, suitability to survey using backpack electrofishing and where possible included sites that have long term data sets under the Monitoring River Health Program (MRH). (*Reporting against the MRH sites will be done later once up to date results are available*). The survey sites are shown on Figure 1 and further details are listed in appendix A. Within each river, three sites were selected, one in the lower, mid and upper reaches.

At each reach, the river was electrofished for 1,200 seconds on-time. All trout captured were measured for length (mm) with larger fish weighed to the nearest 10 grams. Many of the smaller trout were not weighed due to the precision of the scales. Other freshwater fish and freshwater crayfish observed were noted and abundance estimated. No formal habitat notes were collected although general field notes were recorded for most sites but are not reported here.

In addition to the four main rivers surveyed, two separate sites, one on the Pet River above the Pet Reservoir and one on the Mersey River at Merseylea were electrofished to examine recruitment and the abundance of brown trout. These two sites are reported in summary in section 3.6.

River flows at the time of survey were moderately low and conducive to efficient backpack electrofishing. Flow data was available for the Blythe River (64 MI/d upstream South Riana Dam) and the Mersey River (330 MI/d at Shale Road).

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Figure 1: Location of each river surveyed, with lower, mid and upper reaches shown, along with the secondary survey sites of the Pet River and Mersey River.

2.2. ANNUAL POSTAL SURVEY

Since 1986, the Inland Fisheries Service has conducted a postal survey seeking information about anglers' catches. The survey comprises a form sent to around 4,000 freshwater anglers, asking set questions about their angling (catch of trout) for the past season. Information on catch per day, harvest and angling effort is collated and analysed. This provides a long-term overview of individual fishery performance in addition to characterising fishing effort. In this report, only records from 1990 to 2020 are analysed and reported.

2.3. ANALYSIS METHODS

Condition factor was calculated using the basic formula of $K=10^5 \times \text{weight}/\text{length}^3$. This provides a 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. The shortcomings of condition factor are acknowledged but are used for relative comparisons only. Categories are indicative and may not necessarily reflect the perception of anglers in general.

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3. RESULTS

3.1. SUMMARY ALL RIVERS

Across all four rivers, a total of 226 brown trout were captured and measured for length. Of these, 135 (60%) were weighed. The smallest fish weighed was 10 grams and the largest 2.15kg. No rainbow trout were captured from any river.

There was substantial variation in the average length (and average weight) of fish from the Gawler River compared to the other three rivers (see Figure 2). The average length of brown trout from the Gawler River was 251 mm, while the Emu River was 129 mm, Blythe River 154 mm and Inglis 156 mm. The average number of fish captured per standardised unit effort (CPUE) (i.e. fish per 1,200 seconds on-time) was similar across all rivers, except for the Emu River (see Figure 3). Between 25-26 fish were capture per 1,200 seconds of electrofishing on-time for the Inglis and Gawler rivers and 15 fish for 650 seconds on-time for the Blythe. However, the Emu River returned a result of just eight fish per 1,200 seconds electrofishing.

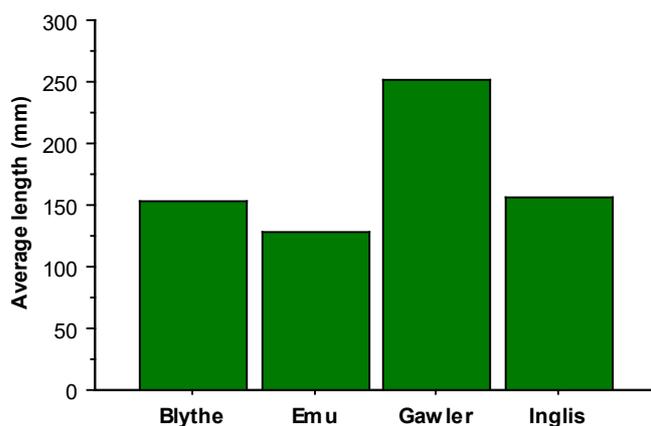


Figure 2: Average (mean) length of brown trout combined for each river.

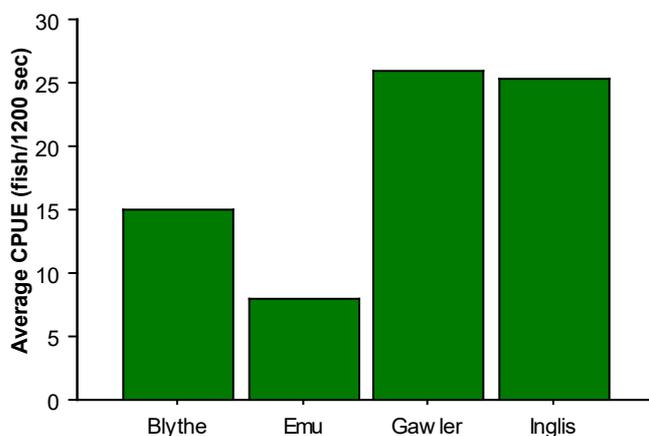


Figure 3: Average CPUE for brown trout for each river, combining all three reaches. **note electrofishing effort for the mid Blythe River reach was limited to 650 seconds due to equipment issues, therefore the CPUE was reduced (extrapolated result likely to be an average of approximately 21-23 fish for the Blythe River, discussed in section 5.1).*

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Examination of the length against weight data (see Figure 4) did not show any substantial difference in the weight of fish for a given length between rivers. Indicating the growth of fish was similar across all rivers. It is notable the Inglis and Gawler rivers had several larger trout over 400 mm length.

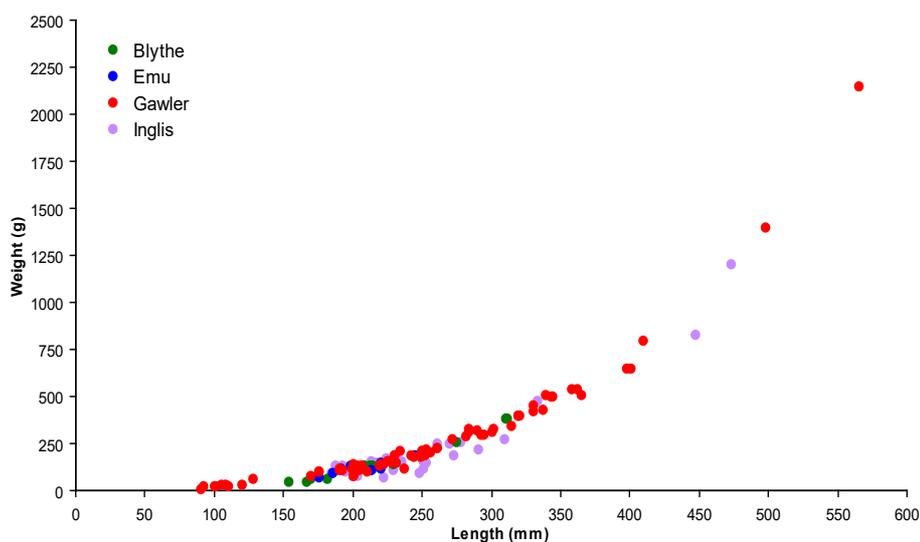


Figure 4: Length frequency results, brown trout, all rivers combined.

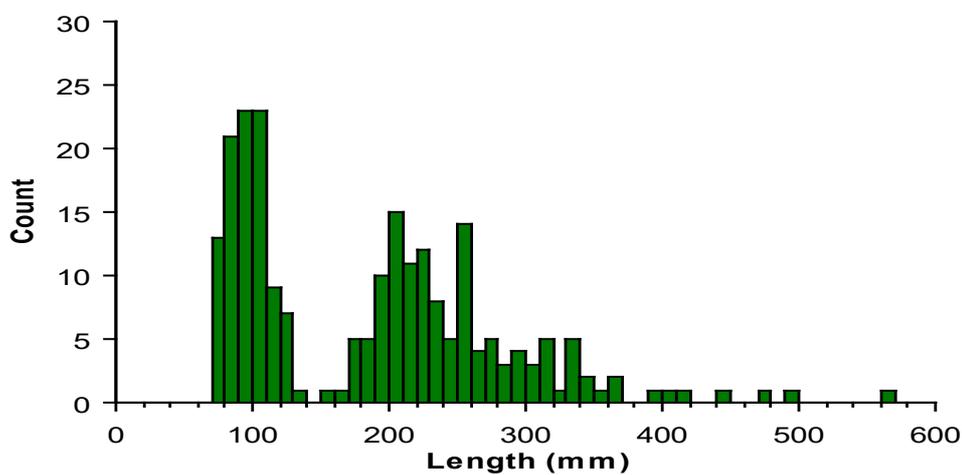


Figure 5: Length frequency results, brown trout, all rivers combined.

The length frequency data for brown trout for all rivers combined (see Figure 5), shows there are multiple cohorts with a strong YOY component and a significant number of fish in the 150 – 300 mm range. This result suggests there has been consistent recruitment over several years (4 years). Consequently, there is unlikely to be any one factor (i.e. climate) impacting the regional fishery causing poor recruitment and the loss of any year classes of fish.

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The combined result for length frequency plots separated into lower, mid and upper reaches (see Figure 7 a - c), indicates the lower reaches held fewer fish, but these fish tended to be larger i.e. over 400 mm length. There were also low numbers of YOY fish present. In general, mid reaches held the highest abundance of fish (see Figure 6), except for the Gawler River, which is discussed in section 3.5. Mid reaches also held significant numbers of YOY 60 - 140 mm length (see Figure 7b), suggesting these areas are important for recruitment, although this pattern was not apparent for the Gawler River.

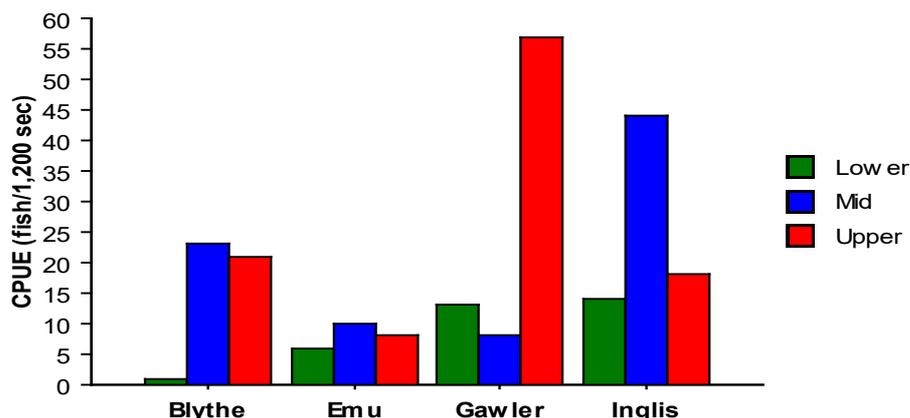


Figure 6: CPUE (fish per 1,200 seconds electrofishing) for each river; separated for lower, mid and upper river reach. (note electrofishing effort for the mid Blythe River reach was limited to 650 seconds due to equipment issue).

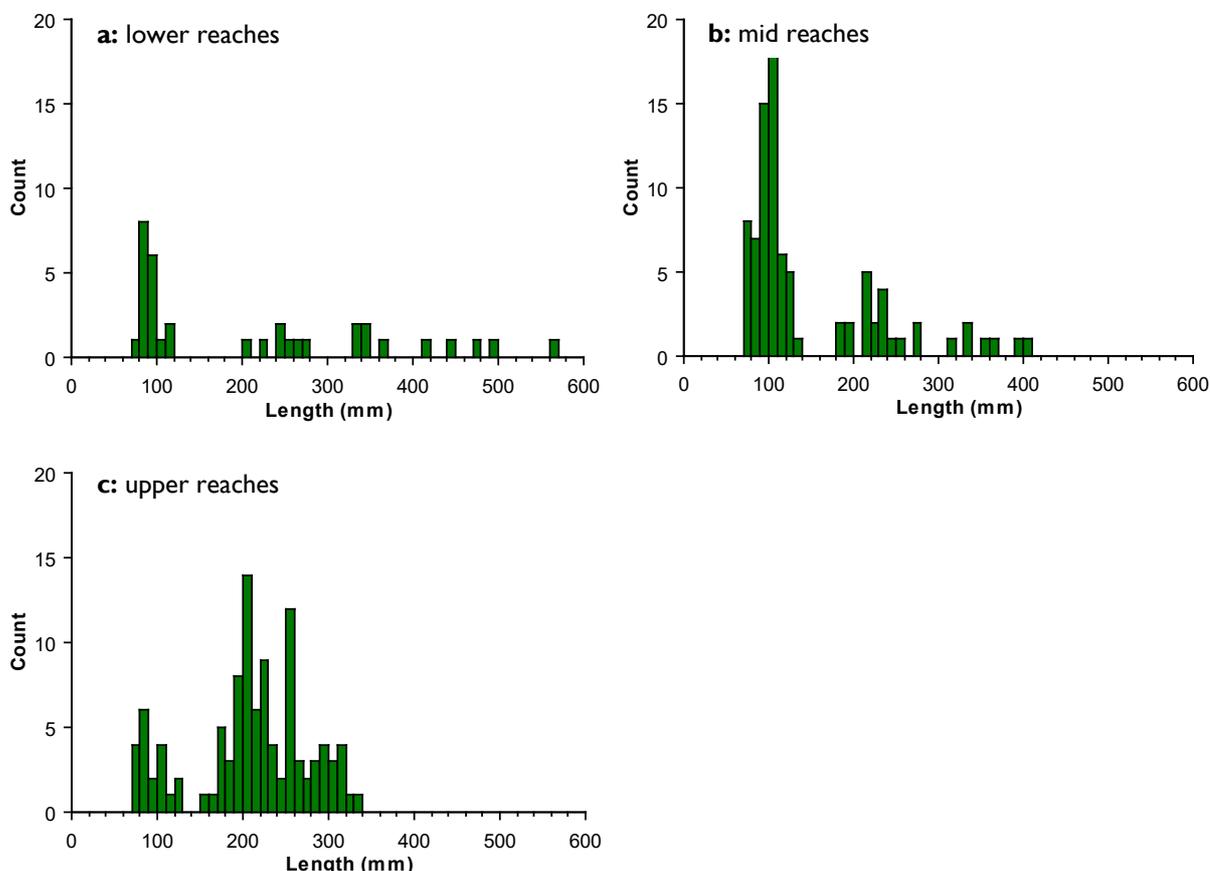


Figure 7: Length frequency plots for all rivers combined, separated into; (a) lower, (b) mid and (c) upper reaches.

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3.2. BLYTHE RIVER

All Blythe River Sites Combined

A total of 45 brown trout were captured from the Blythe River of which 19 were weighed. The average length of fish was 153 mm and the average weight of those fish weighed was 141 grams (see Table 1). Across all sites combined, there was evidence of good recruitment, but the number of larger fish was low (see Figure 9a). The highest abundance of trout was from the mid and upper reaches (see Figure 8).

Lower Reach (Iron Mine Road)

The lower reach at Iron Mine Road resulted in just one fish captured. This was a male of 262 mm length (see Figure 9b). This reach was broad and flat and even though the habitat was generally good, it was almost devoid of fish. Some trout were observed but not captured.

Mid Reach (Camena Road)

The mid reach at Camena Road resulted in the capture of 23 fish with only three fish weighed. This site held mostly (87%), YOY in the 90 – 120 mm length range indicating strong recruitment (see Figure 9c). It should be noted the electrofishing effort at this site was limited to only 650 seconds on-time, due to an issue with the electrofishing unit. Consequently, the total catch would have been significantly higher and is discussed in section 5.1.

Upper Reach (Back Creek Road)

The upper reach at Black Creek Road resulted in the capture of 21 fish with 16 weighed. This site held fish mostly in the 150 – 240 mm length range with five YOY present (see Figure 9d).

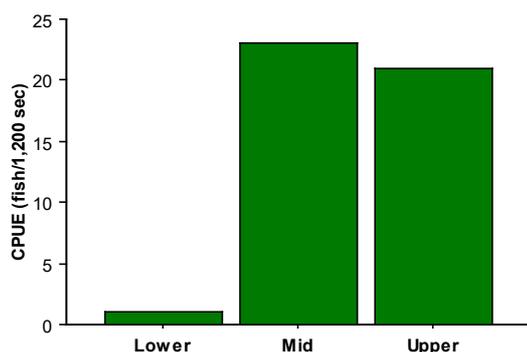


Figure 8: CPUE for each river reach, Blythe River.
*The mid reach was for 650 seconds on-time only.

Table 1: Summary statistics Blythe River for combined and each river reach

	Mean (mm)	Count	Min (mm)	Max (mm)
Length combined	153	45	74	311
Length lower	262	1	262	262
Length mid	127	23	83	310
Length upper	177	21	74	311
Weight combined	141	19	50	380
Weight lower		0		
Weight mid	253	3	120	380
Weight upper	120	16	50	380

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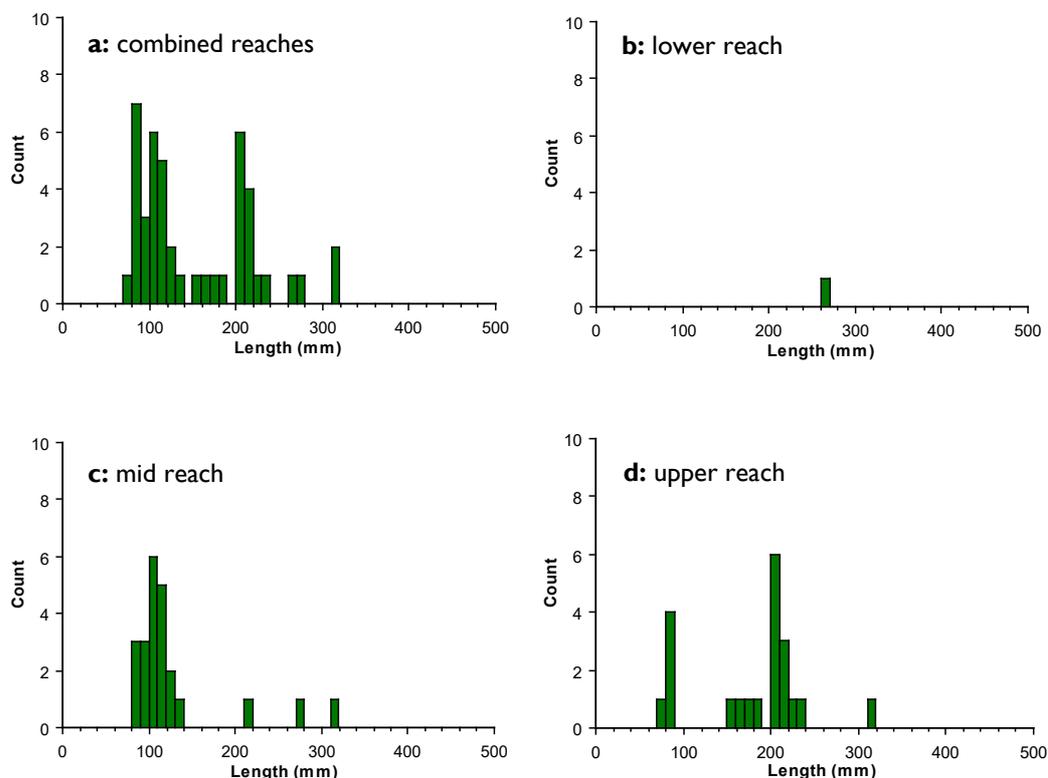


Figure 9: Length frequency plots Blythe River; (a) combined river reaches, and separate reaches; (b) lower, (c) mid, (d) upper reach.

3.3. EMU RIVER

All Emu River Sites Combined

A total of 24 brown trout were captured from the Emu River of which eight were weighed. The average length of fish was 129 mm. The average weight of those fish weighed was 123 grams (see Table 2). Across all sites combined, there was poor recruitment with low numbers of fish evident in the 90 -110 mm range, along with low numbers of larger fish (see Figure 11a). The highest abundance was from the mid reach at Stowport (see Figure 10).

Lower Reach (Fern Glade)

The lower reach at Fern Glade resulted in the capture of six fish. All fish were YOY between 80 – 100 mm length (see Figure 11b), no fish weighed. The river reach at this site is broad and the habitat was generally good for trout, however it was difficult to electrofish efficiently. Some fish of a larger size were observed but not captured.

Mid Reach (Upper Stowport)

The mid reach at Upper Stowport resulted in the capture of 10 fish with three weighed. The reach held low numbers of YOY in the 80 – 110 mm length range (7 fish), with just three fish measuring over 190 mm (see Figure 11c). There was good quality trout habitat present and the efficiency of electrofishing was good, despite this only low numbers were captured or observed.

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Upper Reach (Upper Natone Road)

The upper reach at upper Natone Road resulted in the capture of eight fish with five weighed. This site held low numbers of fish across all lengths (see Figure 11d). The site was conducive to electrofishing with good quality trout habitat present throughout.

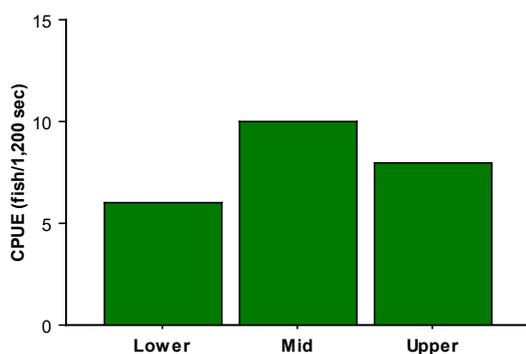


Figure 10: CPUE for each river reach, Emu River.

Table 2: Summary statistics Emu River for combined and each river reach

	Mean (mm)	Count	Min (mm)	Max (mm)
Length combined	129	24	77	245
Length lower	87	6	80	97
Length mid	134	10	86	245
Length upper	153	8	77	220
Weight combined	123	8	70	190
Weight lower		0		
Weight mid	157	3	130	190
Weight upper	102	5	70	120

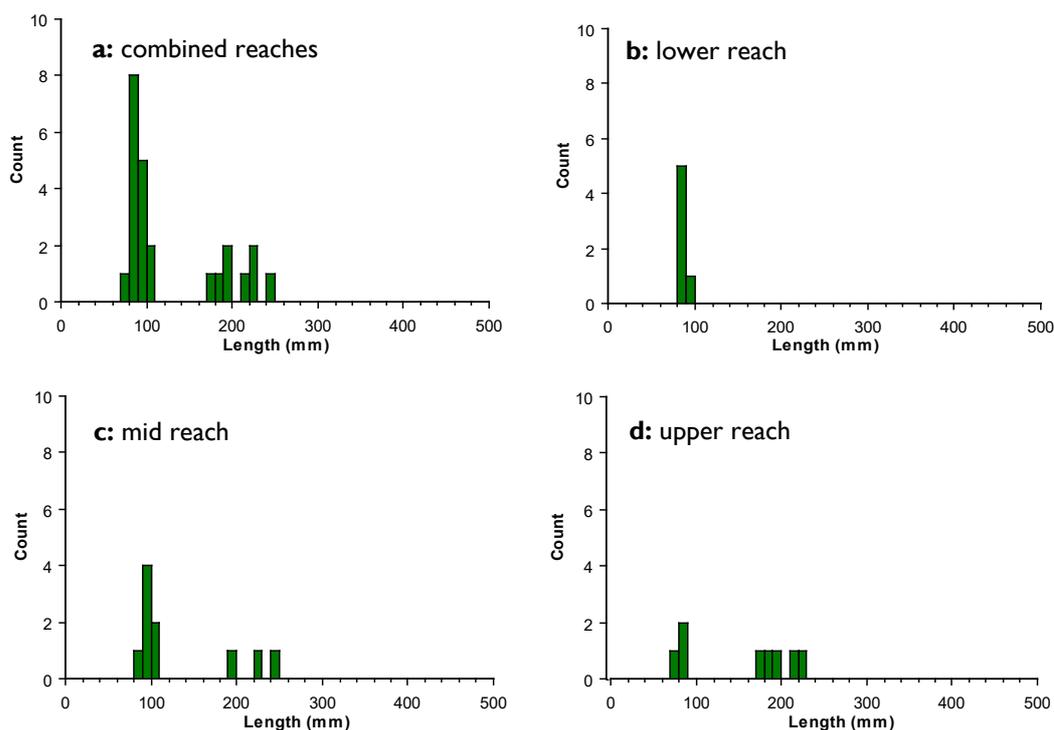


Figure 11: Length frequency plots Emu River; (a) combined river reaches, and separate reaches; (b) lower, (c) mid, (d) upper reach.

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3.4. INGLIS RIVER

All Inglis River Sites Combined

A total of 78 brown trout were captured from the Inglis River of which 31 were weighed. The average length was 156 mm. The average weight from those fish weighed was 217 grams (see Table 3). Across all sites combined, there was strong evidence of high recruitment with high numbers of YOY in the 70 – 120 mm range (see Figure 13a). Additionally, there were significant numbers of fish greater than 200 mm, with four fish captured measuring over 300 mm. The mid reach held by far the highest abundance of fish (see Figure 12).

Lower Reach (Pages Road)

The lower reach at Pages Road resulted in 15 fish captured with four weighed. There were signs of recruitment with eleven YOY in the 70 – 120 mm range (see Figure 13b). This site also held two larger fish over 400 mm with the largest weighing 1.2 kg.

Mid Reach (Jeffersons Road)

The mid reach at Jeffersons Road resulted in the capture of 45 fish with 12 weighed. A total of 11 YOY in the 70 – 130 mm length range were present (see Figure 13c), indicating significant recruitment. Eleven fish in the 180 – 280 mm range were also captured along with one larger fish over 300 mm. Electrofishing efficiency was high with a series of runs and riffles occurring, favouring juvenile fish.

Upper Reach (Chromys Road- Takone)

The upper reach at Chromys Road resulted in the capture of 18 fish with 15 fish weighed. This site held 15 fish in 180 – 320 mm length range, with just three YOY captured (see Figure 13d). This section was characterised by slower flowing runs segregated by a large pool, with a significant overstorey of willows. Electrofishing efficiency was good, although a large pool at the confluence of the Inglis and Rattler rivers could not be accessed.

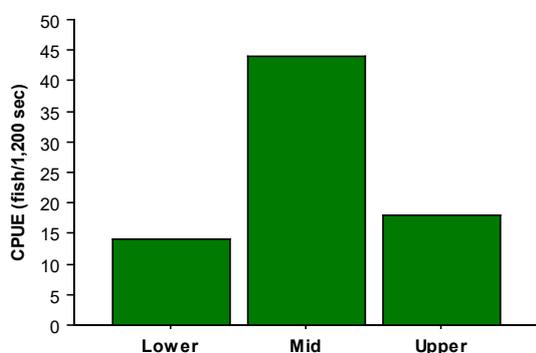


Figure 12: CPUE for each river reach, Inglis River.

Table 3: Summary statistics Inglis River for combined and each river reach

	Mean (mm)	Count	Min (mm)	Max (mm)
Length combined	156	78	71	473
Length lower	161	15	79	473
Length mid	130	45	71	333
Length upper	215	18	76	309
Weight combined	217	31	70	1200
Weight lower	565	4	80	1200
Weight mid	176	12	90	480
Weight upper	158	15	70	270

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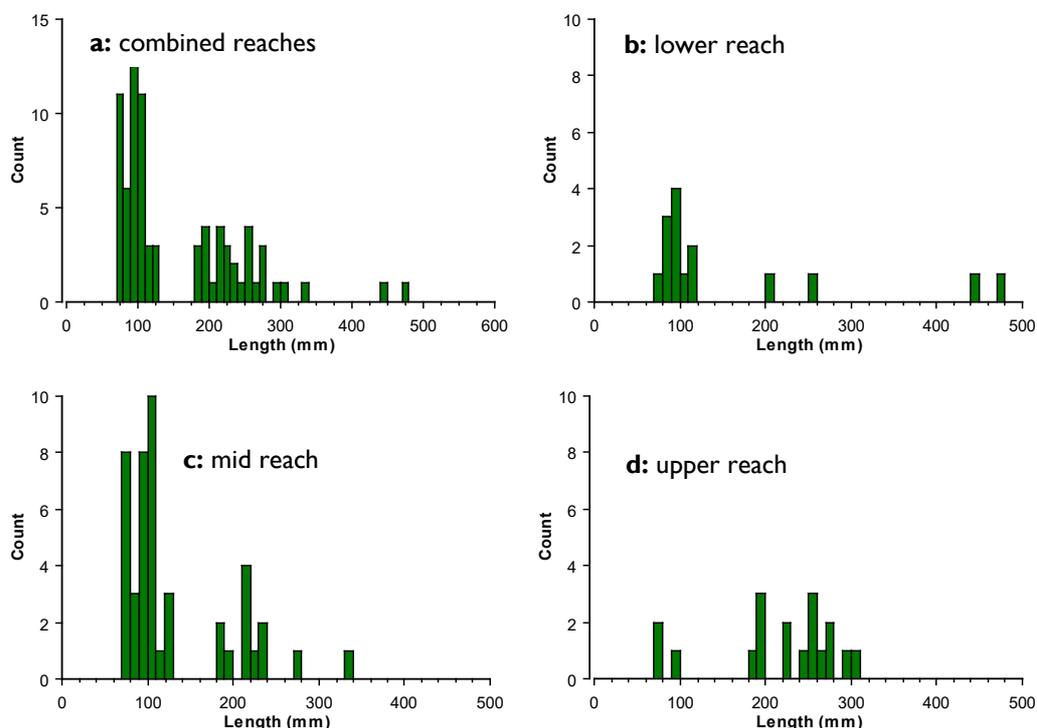


Figure 13: Length frequency plots Inglis River; (a) combined river reaches, and separate reaches; (b) lower, (c) mid, (d) upper reach.

3.5. GAWLER RIVER

All Gawler River Sites Combined

A total of 79 brown trout were captured from the Gawler River with all fish weighed and measured. The average length of fish was 251 mm and average weight was 270 grams (see Table 4). There were 20 fish measuring over 300 mm (25%) (see Figure 15a), with the largest fish captured measuring 565 mm and weighing 2.15 kg. YOY in the 70 – 130 mm range were less abundant with only eight captured, indicating low recruitment during 2020. The upper reach held the highest abundance of fish (see Figure 14). The efficiency of electrofishing was very good as the stream is mostly narrow with good trout habitat present, although trout within the mid-reach were less abundant compared to the lower and particularly the upper reach.

Lower Reach (Preston Road)

The lower reach at Preston Road resulted in 13 fish captured. All fish were weighed. Just one YOY was captured. There were nine fish in the 200 – 400 mm length range and three fish over 400 mm (see Figure 15b), including two fish weighing 1.40 and 2.15 kg, the largest fish captured across all rivers. Electrofishing efficiency was high with a series of well contained runs and significant overstorey of willows.

Mid Reach (Isandula Road)

The mid reach at Isandula Road resulted in the capture of eight brown trout with all fish weighed and measured. By comparison to the lower and upper sites this reach held relatively low numbers (see Figure 14). There were no YOY fish captured. This site held five fish in the 300 – 420 mm length range (see Figure

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15c). Electrofishing efficiency was good with the stream being well confined and significant trout habitat present. Several large blackfish (*Gadopsis marmoratus*) were also captured (refer Appendix D).

Upper Reach (Central Castra Road)

The upper reach at Central Castra Road resulted in the capture of 58 fish. All fish were weighed and measured. This reach held the highest abundance of fish and the highest abundance of all river reaches surveyed (see Figure 6). Of the 58 fish captured, eight were YOY (14%) measuring 90 – 130 mm length (see Figure 15d). Sixty eight percent (37 fish) measured between 200 – 300 mm with a further six measuring greater than 300 mm. Electrofishing efficiency was good with the stream holding a series of shallow runs and small pools with the stream being 2 – 3 metres wide.

Table 4: Summary statistics Gawler River for combined and each river reach

	Mean (mm)	Count	Min (mm)	Max (mm)
Length combined	251	79	90	565
Length lower	328	13	90	565
Length mid	324	8	234	401
Length upper	224	58	92	330
Weight combined	270	79	10	2150
Weight lower	581	13	10	2150
Weight mid	424	8	120	650
Weight upper	179	58	20	420

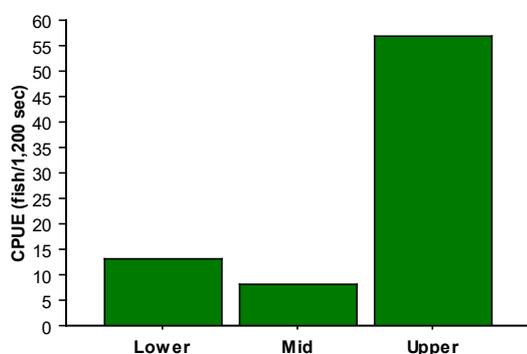


Figure 14: CPUE for each river reach, Gawler River.

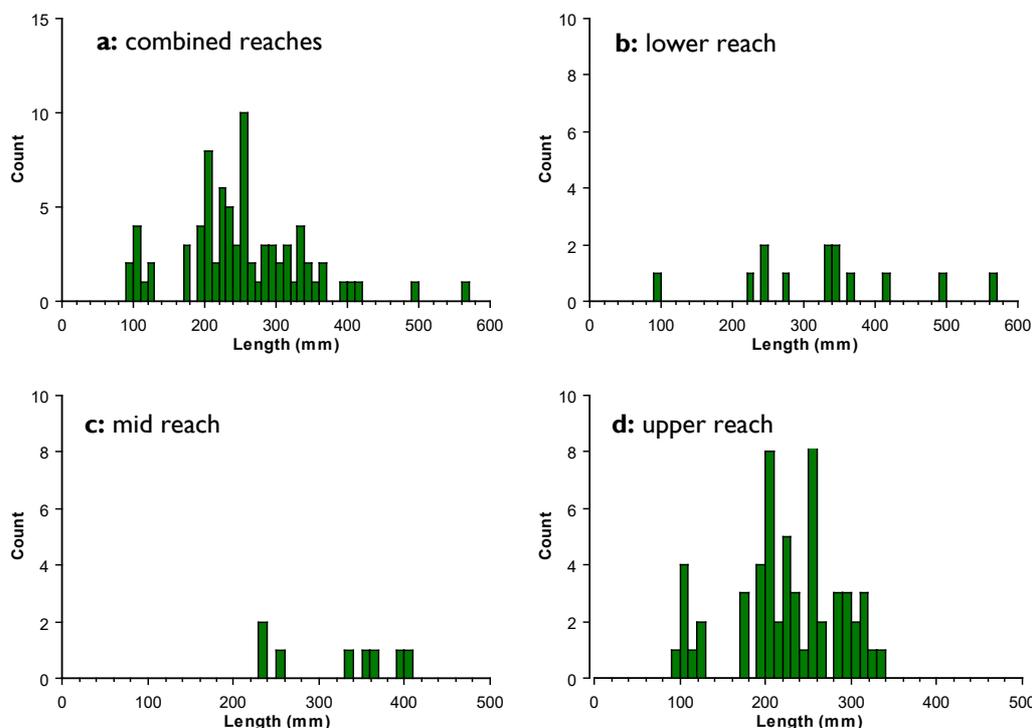


Figure 15: Length frequency plots Gawler River; (a) combined river reaches, and separate reaches; (b) lower, (c) mid, (d) upper reach.

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3.6. PET AND MERSEY RIVERS

A single site on each of the Pet and Mersey rivers were surveyed. The Pet River was surveyed specifically for potential recruitment to the Pet Reservoir, while the Mersey River at Merseylea was examined for recovery following the 2016 flood.

Pet River

The site on the Pet River is located above the Pet Reservoir at Highclere Road. This section was surveyed to examine recruitment and for the potential for brown trout to drop downstream and take up residence in the Pet Reservoir.

A total of 34 brown trout were electrofished from 600 seconds of electrofishing, of which 10 were measured. During electrofishing many additional fish were observed but were unable to be captured, as the abundance of fish was very high. Survey staff also reported large numbers of brown trout present throughout the stream, with multiple length classes observed.

Mersey River

The site on the Mersey River is located 150 m downstream of the Merseylea Bridge. This is a long term monitoring site that was part of the Mersey River environmental flows study, as published by DPIPWE (*Water Assessment Aquatic Ecology Report Series, Report No. WA 09/09*). This site was subject to the impacts of a one in a hundred year flood event during June 2016, with significant riverbed and riparian zone damage occurring.

Just one brown trout (260 mm) was captured within this section of stream for 1,200 seconds of electrofishing.

3.7. NATIVE SPECIES OBSERVATIONS

Throughout the survey a range of native freshwater fish and the giant freshwater crayfish (*Astacopsis gouldi*) were observed. A table of these species with estimated numbers is listed in Appendix D. The common galaxias (*G. maculatus*) and sandy (*P. urvillii*) were present within most lower and mid reaches, and the upper reach of the Inglis River. Short finned eels (*Anguilla australis*) were common within most river reaches. Blackfish (*Gadopsis marmoratus*) were found at a high abundance within the lower reach of the Emu River. The spotted galaxias (*Galaxias truttaceus*) was found only in the lower Blythe River. Several larval forms of lamprey (unidentified species) were observed throughout the Emu River and at the lower Gawler River. The common galaxias, sandies, short finned eels and a single Pygmy perch (*Nannoperca australis*) were observed at Merseylea. Only one eel was recorded at the Pet River site.

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4. ANGLER POSTAL SURVEY

Records from the APS during 1990 to 2021 were extracted and analysed for daily catch rate of brown trout and fishing effort. However, the reply rate to the questionnaire for each river was low in most years, with the exception for the Inglis River with an average of 15 replies over the 30 year period (see appendix B). In some years for Blythe, Emu and Gawler rivers, reply rates ranged between 1 – 6 replies. Consequently, the quality of the results were highly variable and this should be considered when interpreting this information.

4.1. BLYTHE RIVER

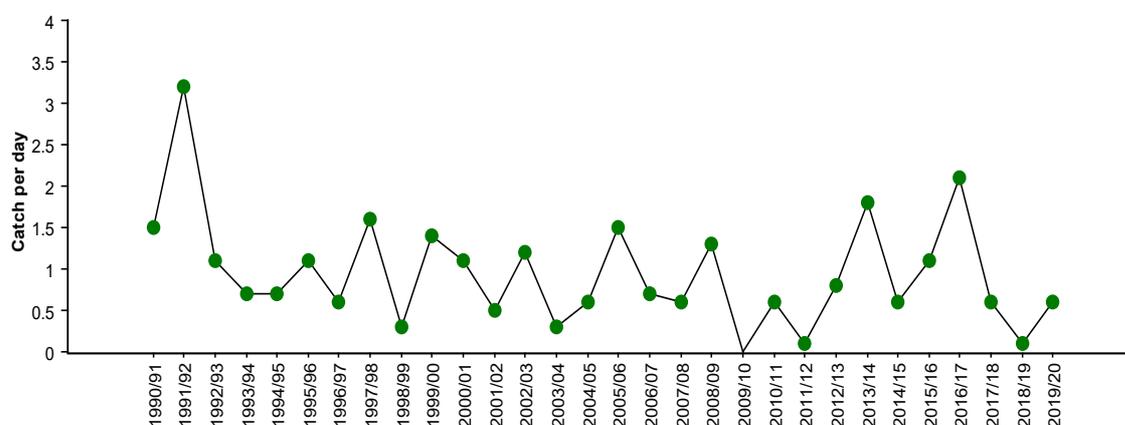


Figure 16: Daily catch rate for brown trout, Blythe River 1990 – 2020.

The Blythe River APS results are generated from an average of seven replies per season. This resulted in a 30 year average catch rate for brown trout of 0.9 fish per day (see Figure 16). The maximum catch rate was 3.2 for the 1991-92 season. This was generated from only two anglers and not generally reflective of the long term catch. Similarly, the 2009-10 result for no fish captured was from just two respondents.

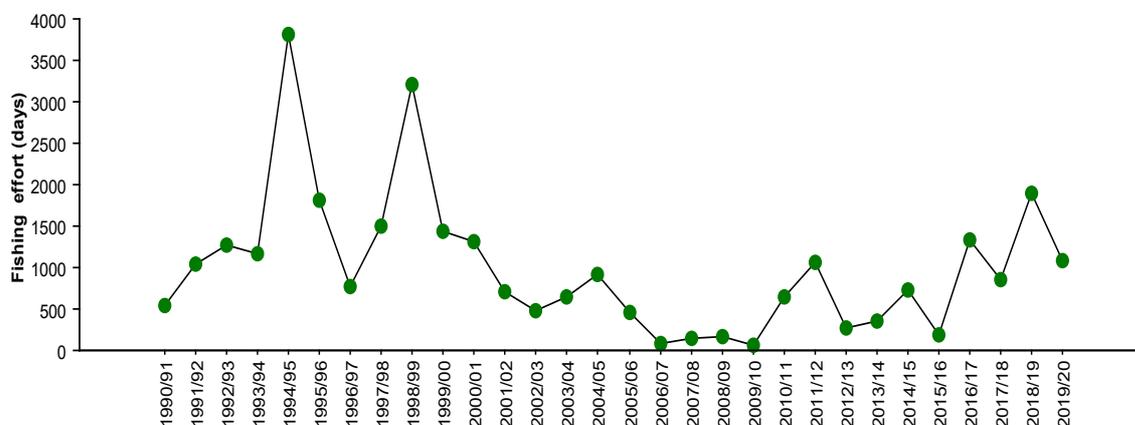


Figure 17: Total fishing effort for the Blythe River for each angling season, 1990 – 2020.

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On average, anglers spent a total of 998 days per season fishing the river (see Figure 17). The results through time are variable with major peaks during 1994-95 and 1998-99. The period 2006-2009 shows consistently low fishing effort during a time of very low river flows resulting from drought condition. A steady increase in effort to around the long term average occurred during 2016-20.

4.2. EMU RIVER

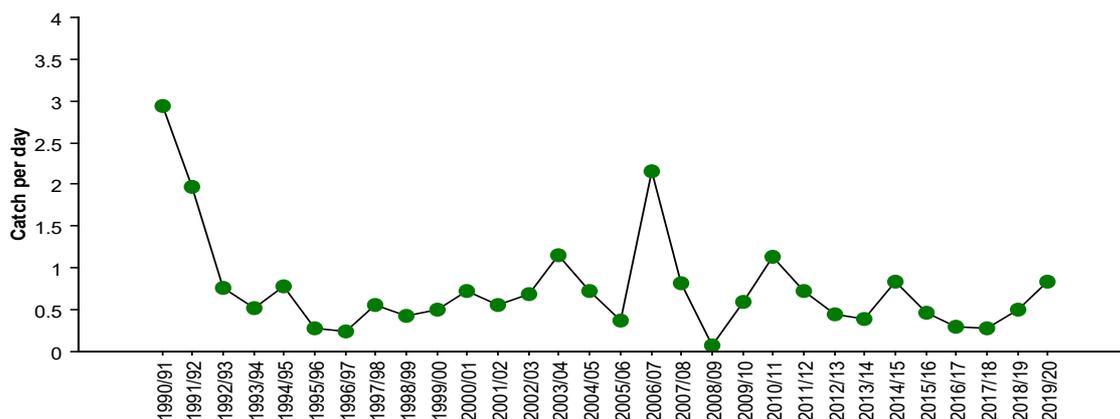


Figure 18: Daily catch rate for brown trout, Emu River 1990 – 2020.

The Emu River APS results are generated from an average of eight replies per season. This resulted in a 30 year average catch rate for brown trout of 0.8 fish per day (see Figure 18). The maximum catch rate occurred during 1990-91 season at 2.9 fish per day with a peak also during 2006-07. Since 2009 the catch rate has been at or just below the long term average.

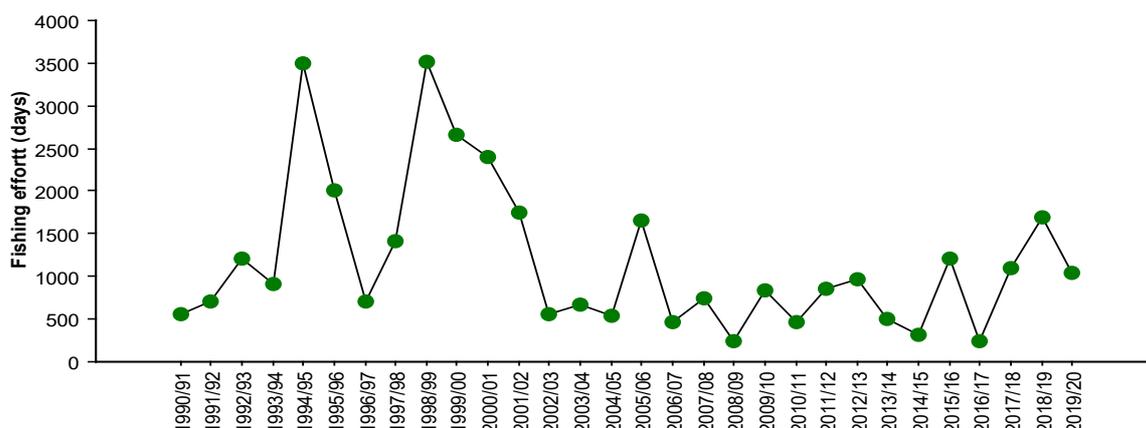


Figure 19: Total fishing effort for the Emu River for each angling season, 1990 – 2020.

On average, anglers spent a total of 1,182 days per season fishing the river (see Figure 19). Like the Blythe River, the results are variable, with major peaks during 1994-95 and 1998-99. The period 2006-2009 shows consistently low fishing effort with a steady increase in effort to around the long term average during 2017-20.

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4.3. INGLIS RIVER

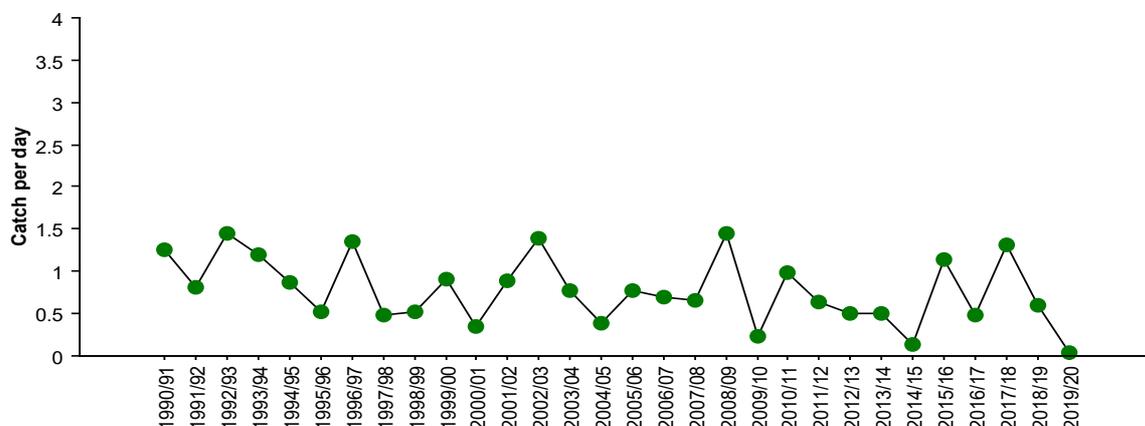


Figure 20: Daily catch rate for brown trout, Inglis River 1990 – 2020.

The Inglis River APS results are generated from an average of 15 replies per season. This resulted in a 30 year average catch rate for brown trout of 0.8 fish per day (see Figure 20). Generally, the catch rate has varied around the long term average with a decline during the period 2010 – 2015 and very low catch rates for the 2014-15 and 2019-20 seasons. These low catch rates correlate with low fishing effort for these seasons.

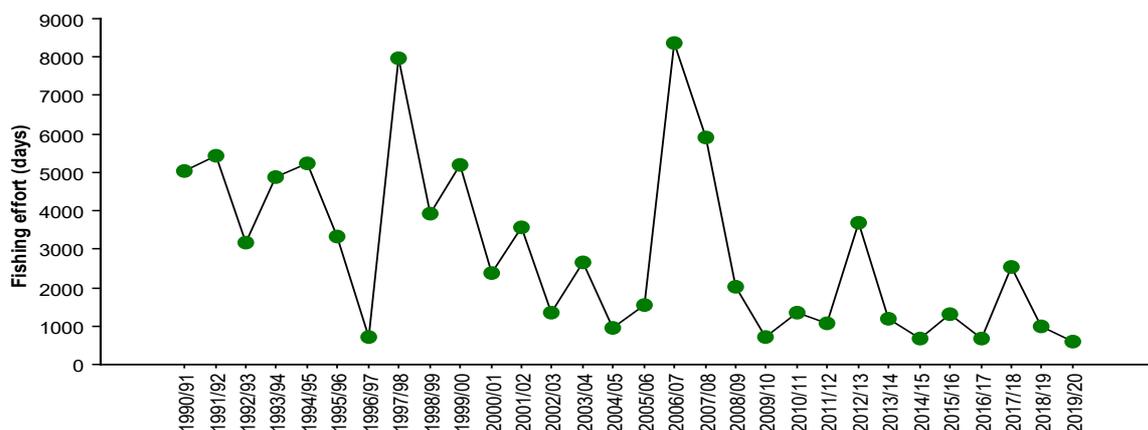


Figure 21: Total fishing effort for the Inglis River for each angling season, 1990 – 2020.

On average, anglers spent a total of 2,947 days per season fishing the river (see Figure 21). Marked peaks in daily catch occurred during the 1997-98 season and 2006-2008. However, since 1999-00, fishing effort has generally declined and remained at low levels from 2009 until 2020.

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4.4. GAWLER RIVER

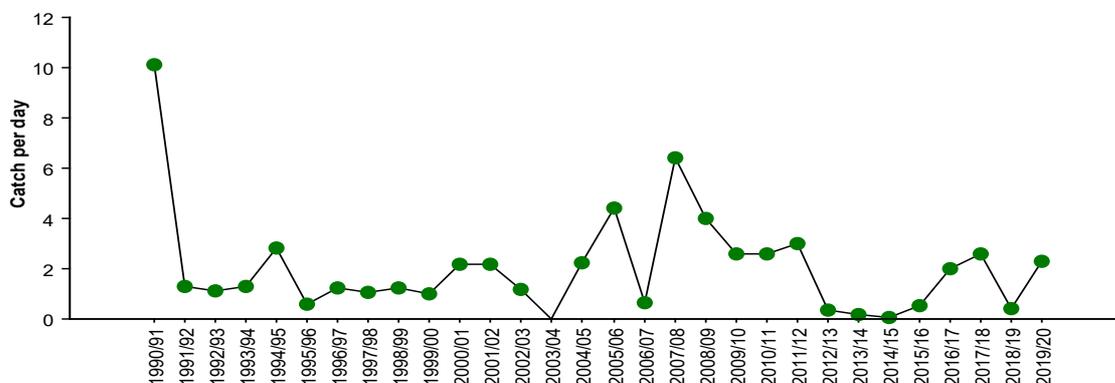


Figure 22: Daily catch rate for brown trout, Gawler River 1990 – 2020.

The Gawler River APS results are generated from an average of five replies per season. This resulted in a 30 year average catch rate for brown trout of 2.1 fish per day (see Figure 22). Compared to the other rivers analysed, the Gawler River has in general a much higher catch rate, although the small number of respondents in specific years has influenced these results. Of note, for the 2003-04 season there were no respondents, resulting in an allocated zero catch. By comparison, the 1990-91 result was generated from a single response that reported fishing on eight separate occasions for a total catch of eighty fish, therefore solely influencing the catch rate for that year.

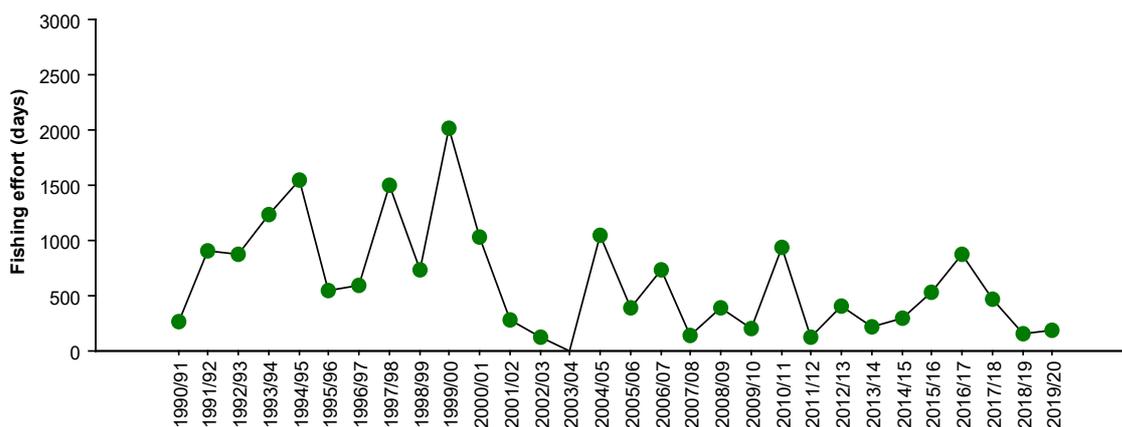


Figure 23: Total fishing effort for the Gawler River for each angling season, 1990 – 2020.

On average, anglers spent a total of 626 days per season fishing the river (see Figure 23). This was the lowest long term angling effort for all rivers analysed. Angling effort was consistently higher during the period 1992 – 2001. After this time, fishing effort was at or below the long term average at 426 fishing days, although the daily catch rate remained high at 1.9 fish per day.

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5. DISCUSSION

With the exception of the Gawler River, the lower reaches of all rivers surveyed contained fewer trout compared to mid and upper reaches. The mid reaches were found to be the most productive in terms of total numbers. Mid reaches also held the highest proportion of juvenile fish, indicating they are important nursery areas for developing fingerling and yearling trout.

Evidence from length/weight data suggest the growth of fish was similar across all rivers and typical of most riverine fish from similar streams within Tasmania.

Comparison of combined catches between each river suggest the Emu River had a lower abundance of trout. This was evident across all reaches of the Emu River, although the relative pattern of catches between lower, mid and upper reaches was similar to the catches for the Blythe and Inglis rivers. Total CPUE for the Inglis and Gawler rivers were similar, with the Blythe River CPUE being slightly less. However, the lower number of trout captured from the Blythe River was largely due to reduced electrofishing effort because of equipment failure, with only 650 seconds recorded for the mid reach at Camena Road. Given this issue it's likely all three rivers would have returned a similar catch effort.

From the analysis of the length frequency data for all rivers combined, there does not appear to be any systemic conditions i.e. drought or flood, affecting recruitment across the North West region. Furthermore, there are a range of length classes present across all streams, indicating a robust regional population structure.

5.1. BLYTHE RIVER

From the limited information analysed from the APS, the Blythe River is subject to low seasonal fishing effort. The daily catch rate for brown trout is low, and consequently the annual harvest is low. While the low response rate to the APS is likely to influence this result, the consistent reporting of generally low catches is likely to be representative of this fishery. Fishing pressure is therefore not an issue affecting this fishery.

During the survey, the catch of brown trout from the lower reach at Iron Mine Road was very low, with only one trout captured. This was despite this reach containing suitable trout habitat. There were some issues associated with the efficiency of electrofishing at this site, as the river in this area is wide and flat. However, given the overall result, this reach appeared to contain a low abundance of trout.

Compared to the upper and lower reaches, the mid reach held the highest abundance of fish. This is despite electrofishing effort being limited to 650 seconds. The CPUE was reduced by around 43 percent for this reach. Had a full electrofishing run been achieved, the average CPUE for the Blythe River would have been approximately 21-23 fish, which is comparable to Inglis and Gawler rivers. The majority of fish from this reach were YOY indicating this is a significant nursery area. The upper reach held low numbers of YOY but a moderate abundance smaller adult fish in the 200 – 240 mm range. Habitat was more favourable for young adult fish in this section with larger pools and slow runs present.

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The Blythe River held a moderate abundance of brown trout that were confined to the mid and upper reaches. Recruitment was strong in the mid reach. The lower reach held significantly fewer fish than any other section of all the rivers surveyed.

5.2. EMU RIVER

Similar to the Blythe River the response rate to the APS for the Emu River was low. Nonetheless, indications are seasonal fishing effort is generally low. The daily catch rate is also low and consequently the annual harvest of trout is minimal. Fishing pressure is therefore not a factor influencing this fishery.

The CPUE figures for the Emu River indicate this fishery contains a relatively low abundance of trout compared to the other rivers surveyed. The reasons for this are unclear however, the underlying geology may have an influence, as the Emu River predominately has a different geological description relative to the other rivers surveyed. This factor may need to be examined further.

The lower Fern Glade reach was not conducive to efficient electrofishing as the river is flat and wide throughout this reach. Access within this area is also limited with steep sided hills. An alternate survey site would have been preferable for efficient sampling.

Of all the rivers the Emu River held the lowest abundance of trout. The daily catch rate and fishing effort were similar to the Blythe and Inglis river.

5.3. INGLIS RIVER

The response rate for the Inglis River from the APS relative to other rivers was much higher, making the results more reliable and reflective of the fishery. Compared to the other waters pre 2008, fishing effort for the Inglis River was high. Since 2008 fishing effort has declined to around 1,000 angler days. This is now comparable to the Blythe and Emu rivers. The reasons for this decline are unclear as the daily catch has remained around the long term and there is good evidence suggesting a moderate abundance of trout. This indicates there is significant latent catch effort available at this fishery that is not readily exploited by anglers.

By comparison to the upper and mid reaches, the lower reach held a slightly lower abundance of fish, although there were several larger fish over 400 mm. This section of stream contains good trout habitat.

The mid reach at Jeffersons Road held a high abundance of fish, especially YOY, indicating this area is important habitat for development of juvenile trout. There were also good numbers of slightly larger fish 180 – 280 mm range.

The upper section held low numbers of YOY but good numbers of fish in the 180 to 320 mm range, with most measuring over the legal size limit.

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The Inglis River despite holding a moderate abundance of trout appears to be under exploited by anglers. Good numbers of fish were present throughout the river with some larger fish present in the lower reaches. The mid reach is important habitat for recruitment and development of juvenile trout.

5.4. GAWLER RIVER

Of all the rivers analysed, the Gawler River had the lowest result in terms of fishing effort, especially post 2001, with around 400 angler days spent at this water. However, the river consistently returned the highest catch rate of all rivers analysed, with 2.1 brown trout captured per day. While this figure has declined marginally over the last ten years, in comparison to the other rivers it remains high. Like the Blythe and Emu rivers, the results from the APS were generated from a low number of responses. Nonetheless, the results are generally consistent over time and are likely to be broadly reflective of this fishery.

The lower section of the Gawler River held good numbers of fish and was comparable to the lower Inglis River, with several larger fish present.

The catch of trout from the mid reach in comparison to the upper and lower reaches; and by comparison to the mid reaches of other rivers, was poor. Past electrofishing surveys 2013 - 2017, indicate similar results, however the average size of fish has increased during this period (see Appendix C). The reasons for these results are unknown and are a stark contrast to the high abundance of fish found in the upper reach.

The upper section of the Gawler River was the standout of all rivers, with a high abundance of trout, mainly in the 200 - 300 mm size range, with several YOY present. This section of stream is highly productive and likely to provide significant downstream recruitment of fish, although the mid reach had a low abundance.

In total, the Gawler River held a comparable abundance of trout to the Inglis and Blythe rivers. The upper reach held a very high abundance of fish. Fishing effort is low although the catch rate is relatively high.

5.5. PET AND MERSEY RIVERS

Pet River

The Pet River results while limited, clearly provided strong evidence of a high abundance of brown trout upstream of the Pet Reservoir. The site held numerous fish with multiple length classes present, demonstrating consistent high recruitment. This implies there should be a significant number of brown trout dispersing into the Pet Reservoir and contributing to that fishery. Given this result and the low catch rate of brown trout from the Pet Reservoir, it may be necessary to survey the reservoir to examine the trout population further. Recruitment from the Pet River should be adequate to sustain the lake fishery.

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Mersey River

The Mersey River at Merseylea was a long term monitoring site under the Mersey River environmental flows study between 1999 - 2009. The site has also been monitored periodically since this time. The Mersey River was subject to a very large flood early June 2016 that exceeded several existing records within the catchment. The area through Merseylea took the brunt of the flood flows and resulted in significant riverbed and riparian damage. As a result, trout habitat was greatly diminished. Subsequent riparian and flood mitigation works have also impacted this site. Consequently, the abundance of trout within the Merseylea to Kimberly area is significantly reduced. Substantial fish habitat works would be required to return the trout population to post flood abundance.

6. RECOMMENDATIONS

- Survey results are indicative of a health fishery and no additional surveys are required, unless a significant adverse event occurs.
- Further assessment is achieved by analysing catch returns via the APS and on-ground creel data.
- If future monitoring is to occur on the Emu or Blythe rivers, then alternate representative lower reach sites should be selected.
- There are no changes to fishery management actions recommended for these rivers.
- There is scope to undertake river improvement works on the mid reach of the Gawler River, such as instream habitat improvement and fish passage on the existing weir. At present, this is a low priority but there may be an opportunity to enter discussions with DPIPW about fish passage at this site.
- The Mersey River between Merseylea and Kimberley be considered under a specific grants program for fish habitat improvement, if a program becomes available.

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7. APPENDIX

Appendix A: Co-ordinates for river survey reaches.

River	Site	Co-ordinates (GDA 94)
Blythe River	Iron Mine Road	411821E, 5445572N
Blythe River	Camena Road	412455E, 5441633
Blythe River	Black Creek Road	403720E, 5425933N
Emu River	Fern Glade Reserve	409476E, 5451293N
Emu River	Upper Stowport (Elphinstone property)	405809E, 5443032N
Emu River	Upper Natone Road	398999E, 5430624N
Inglis River	Pages Road	384876E, 5460243N
River	Site	Co-ordinates (GDA 94)
Inglis River	Jeffersons Road Camping area	382494E, 5451269N
Inglis River	Chromys Road	385373E, 5442401N
Gawler River	Preston Road	428113E, 5439914N
Gawler River	Isandula Road	428132E, 5437628N
East Gawler River	Central Castra Road	427068E, 5430357N
Pet River	Highclere Road	401082E, 5440254N
Mersey River	Merseylea d/s of bridge	455952E, 5421414N

Appendix B: Number of respondents to the APS for each year, 1990 – 2020.

Blythe River

	Mean
No. Resp this water, Total	7
No. Resp this water, 1990/91	6
No. Resp this water, 1991/92	16
No. Resp this water, 1992/93	15
No. Resp this water, 1993/94	5
No. Resp this water, 1994/95	10
No. Resp this water, 1995/96	10
No. Resp this water, 1996/97	7
No. Resp this water, 1997/98	14
No. Resp this water, 1998/99	16
No. Resp this water, 1999/00	9
No. Resp this water, 2000/01	11
No. Resp this water, 2001/02	7
No. Resp this water, 2002/03	6
No. Resp this water, 2003/04	6
No. Resp this water, 2004/05	7
No. Resp this water, 2005/06	7
No. Resp this water, 2006/07	3
No. Resp this water, 2007/08	3
No. Resp this water, 2008/09	4
No. Resp this water, 2009/10	2
No. Resp this water, 2010/11	6
No. Resp this water, 2011/12	5
No. Resp this water, 2012/13	3
No. Resp this water, 2013/14	5
No. Resp this water, 2014/15	7
No. Resp this water, 2015/16	3
No. Resp this water, 2016/17	6
No. Resp this water, 2017/18	7
No. Resp this water, 2018/19	5
No. Resp this water, 2019/20	8

Emu River

	Mean
No. Resp this water, Total	8
No. Resp this water, 1990/91	5
No. Resp this water, 1991/92	12
No. Resp this water, 1992/93	18
No. Resp this water, 1993/94	8
No. Resp this water, 1994/95	11
No. Resp this water, 1995/96	11
No. Resp this water, 1996/97	6
No. Resp this water, 1997/98	17
No. Resp this water, 1998/99	18
No. Resp this water, 1999/00	10
No. Resp this water, 2000/01	19
No. Resp this water, 2001/02	9
No. Resp this water, 2002/03	11
No. Resp this water, 2003/04	5
No. Resp this water, 2004/05	7
No. Resp this water, 2005/06	5
No. Resp this water, 2006/07	7
No. Resp this water, 2007/08	4
No. Resp this water, 2008/09	4
No. Resp this water, 2009/10	8
No. Resp this water, 2010/11	7
No. Resp this water, 2011/12	6
No. Resp this water, 2012/13	5
No. Resp this water, 2013/14	3
No. Resp this water, 2014/15	5
No. Resp this water, 2015/16	7
No. Resp this water, 2016/17	4
No. Resp this water, 2017/18	7
No. Resp this water, 2018/19	9
No. Resp this water, 2019/20	6

Inglis River

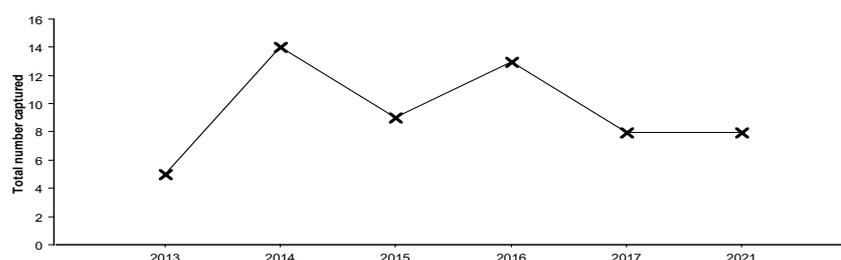
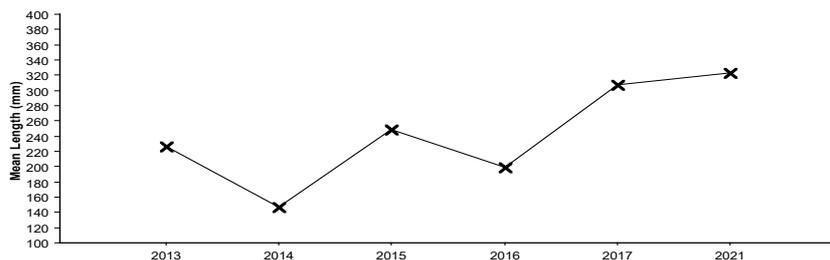
	Mean
No. Resp this water, Total	15
No. Resp this water, 1990/91	20
No. Resp this water, 1991/92	28
No. Resp this water, 1992/93	32
No. Resp this water, 1993/94	13
No. Resp this water, 1994/95	13
No. Resp this water, 1995/96	15
No. Resp this water, 1996/97	7
No. Resp this water, 1997/98	33
No. Resp this water, 1998/99	22
No. Resp this water, 1999/00	28
No. Resp this water, 2000/01	27
No. Resp this water, 2001/02	15
No. Resp this water, 2002/03	17
No. Resp this water, 2003/04	12
No. Resp this water, 2004/05	4
No. Resp this water, 2005/06	11
No. Resp this water, 2006/07	17
No. Resp this water, 2007/08	13
No. Resp this water, 2008/09	16
No. Resp this water, 2009/10	7
No. Resp this water, 2010/11	12
No. Resp this water, 2011/12	8
No. Resp this water, 2012/13	18
No. Resp this water, 2013/14	12
No. Resp this water, 2014/15	3
No. Resp this water, 2015/16	12
No. Resp this water, 2016/17	9
No. Resp this water, 2017/18	7
No. Resp this water, 2018/19	13
No. Resp this water, 2019/20	6

Gawler River

	Mean
No. Resp this water, Total	5
No. Resp this water, 1990/91	1
No. Resp this water, 1991/92	12
No. Resp this water, 1992/93	6
No. Resp this water, 1993/94	3
No. Resp this water, 1994/95	5
No. Resp this water, 1995/96	6
No. Resp this water, 1996/97	3
No. Resp this water, 1997/98	9
No. Resp this water, 1998/99	8
No. Resp this water, 1999/00	9
No. Resp this water, 2000/01	6
No. Resp this water, 2001/02	2
No. Resp this water, 2002/03	3
No. Resp this water, 2003/04	0
No. Resp this water, 2004/05	9
No. Resp this water, 2005/06	5
No. Resp this water, 2006/07	6
No. Resp this water, 2007/08	2
No. Resp this water, 2008/09	4
No. Resp this water, 2009/10	2
No. Resp this water, 2010/11	9
No. Resp this water, 2011/12	1
No. Resp this water, 2012/13	4
No. Resp this water, 2013/14	3
No. Resp this water, 2014/15	5
No. Resp this water, 2015/16	6
No. Resp this water, 2016/17	4
No. Resp this water, 2017/18	4
No. Resp this water, 2018/19	2
No. Resp this water, 2019/20	3

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Appendix C: Surveys data Gawler River mid reach, 2013 – 2021. (Top) average length of fish and (bottom) total catch of fish from electrofishing. Years 2013 – 2017 using repeat runs electrofishing with removal of fish from 3 runs of 600 seconds on-time, and 2021 a continuous 1,200 second run.

Appendix D: Estimated number of native freshwater fish observed during electrofishing with each river reach. **all larval.*

Species	G. maculatus	G. truttaceus	P. uvillii	A. australis	G. marmoratus	A. gouldi	N. australis	Lamprey*
River Reach								
Blythe lower	300	4	50	8				
Blythe mid				3				
Blythe upper								
Emu lower	100			6	25			4
Emu mid			20	4				1
Emu upper					2			1
Inglis lower	300		100	15				
Inglis mid	20		60	6		5		
Inglis upper			20	12	1	3		
Gawler lower	500		150	24				1
Gawler mid	250		60		7			
Gawler upper				10				
Pet River				1				
Mersey River	100		50	30			1	