Inland Fisheries Service

Arthurs Lake Electrofishing Surveys 2022 to 2025 – Report



Inland Fisheries Service

Tasmanian Government

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Arthurs Lake Electrofishing Surveys 2022 to 2025

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Executive Summary

This report presents the findings of four years of electrofishing surveys (2022–2025) undertaken to assess the population dynamics, and to help inform management of, the Arthurs Lake brown trout fishery. Annual electrofishing monitoring was initiated following several years of favourable wet conditions associated with the 2020–2023 La Niña period. These conditions enhanced spawning and recruitment, however this was countered by elevated predation pressure from increased cormorant abundance observed from 2023 to 2025.

Brown trout were sampled annually using electrofishing, with biological data collected to determine catch-per-unit-effort (CPUE) and population metrics. These data sets were integrated with fishery-dependent information from angler postal surveys and independent spawning run monitoring. This data helps provide a comprehensive assessment of population structure over the study period.

Results indicate that the interplay between favourable environmental conditions and variable predation pressure led to pronounced fluctuations in recruitment, trout size-class structure and overall abundance. Strong natural recruitment was evident following the La Niña period, particularly in 2023, with a dominance of smaller cohorts reflecting successful spawning and juvenile survival.

In contrast, 2024 was characterised by a marked decline in the abundance of younger fish (<1+) and a notable absence of larger adult cohorts. This shift is consistent with increased predation pressure, coinciding with a widespread rise in cormorant numbers across the fishery.

Encouragingly, data from 2025 indicate signs of ongoing recruitment recovery, with the re-emergence of smaller cohorts despite removal of trout for stocking into assisted fisheries.

Overall, the fishery appears to be in a recovery phase following a period of heightened predation (2023–2025). Continued monitoring will be critical to determine the persistence of this recovery and to guide adaptive management in the context of ongoing environmental variability and predator pressure.

Introduction

Arthurs Lake has been a key Central Highlands trout fishery for over 80 years. Initially stocked with both rainbow and brown trout, it has been a brown trout only fishery since 1960. It is known for high catch rates, often rivalling Yingina / Great Lake in angler visitation. It also functions as a Hydro Tasmania water storage and irrigation supply via Woods Lake.

After drought in the 2000s, heavy rainfall from late 2009 rapidly refilled the lake, with prolonged high levels during consecutive La Niña events through 2012. This led to poor water quality and loss of critical weed beds and reducing catch rates despite strong juvenile recruitment. The lake's productivity has not returned to the levels observed throughout the 2000s.

Spawning traps installed between 2014 and 2016 enable management of brown trout and support transfer of adults to other fisheries. Transfers were reduced as part of a rebuilding strategy, but fishery performance remained below pre-2009 levels.

This report presents the findings of four years of annual electrofishing surveys, conducted since 2022 to monitor population dynamics and inform management. These surveys were initiated in response to renewed wet conditions associated with the 2020–2023 triple La Niña, and more recently, to assess the impacts of increased predation following a sharp rise in cormorant numbers in 2024.

Method

Surveys were conducted using the Inland Fisheries Service (IFS) Smith-Root electrofishing boat launched from Pumphouse Bay in the first week of December for each survey year. Sampling took place at fixed sites following a predefined route shown in Figure 1. Along this route, the generator was activated intermittently to pulse electrical current and optimise fish capture. The start and end time, shock time (on a counter) and the number of fish captured were recorded for each electrofishing run. At the end of each run, trout were weighed, measured and sexed before being released back into the lake (except for the fish euthanised for further analysis in 2022).

To obtain a sample of young of the year in 2022 a backpack electrofishing unit was used proximal to Hydro Creek. This sample is not included with the boat electrofishing catch.

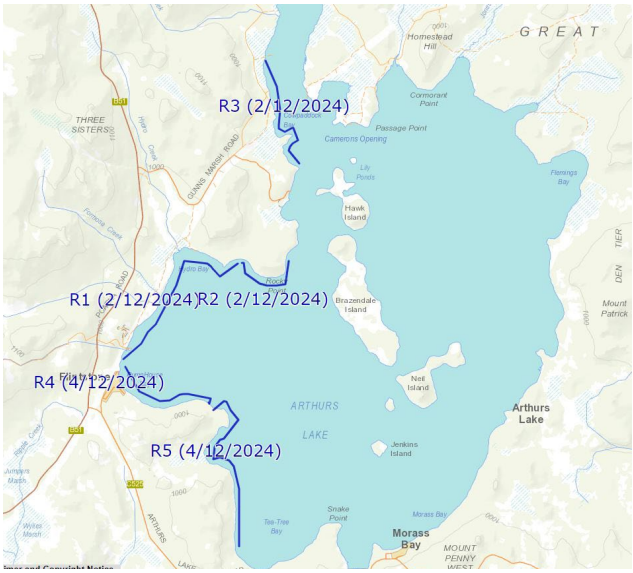


Figure 1: Map showing route of the electrofishing surveys in 2024 – similar routes are used for each survey year.

Results

Fish captured during the first survey (2022) were euthanised so their otoliths could be removed for aging. In subsequent surveys trout were released back into the lake after they were weighed, measured and their sex determined.

In 2022, 199 brown trout were caught, measured, weighed, and had their otoliths removed. The results of this can be found here. The age at length key found in that report is difficult to use with accuracy as there is significant overlap of lengths for each age.

A summary of the total number of fish captured in each survey year can be found in Table 1. Note that some fish were discarded from the data analysis, hence the discrepancy between fish caught and analysis.

Effort

The electrofishing surveys between 2022 and 2025 followed approximately the same routes. Despite this, the distances covered were 10.6 to 24.8 km. This is due to changes in lake level and prevailing weather conditions The actual routes are chosen by the skipper of the vessel in response to those variables.

The catch per unit effort (CPUE) is the number of fish caught over the shock time (expressed as fish/hr). As the counter used to indicate shock time was not working for the 2025 survey, shock duration was estimated using a generalised linear model of the previous year's data.

The 2022, 2024 and 2025 surveys all had CPUE values between 31.5 and 32.2 fish per hour. The 2023 survey had nearly twice the CPUE of any other survey year.

Table 1: CPUE of each survey 2022 to 2025

Year of survey	digital time (hours)	counter (seconds)	distance (km)	total fish caught	CPUE (fish/hr)
2022	12.68	22,273	24.8	199	32.2
2023	5.02	11,794	10.6	209	63.9
2024	7.70	19,462	14.4	170	31.5
2025	9.08	18,619	17.0	165	31.9

Biological data

The number of brown trout caught, their average weight, length and Condition Factor (k) are summarised in Table 2. A detailed breakdown of length, weigh and k for each survey year can be found in Appendix 1 a) to d).

Table 2. Summary of each year captures including average weights, lengths, Condition Factor and average k-factor category.

Year of survey	Number caught	Average length (mm)	Average weight (g)	Average Condition Factor (k)	Average Condition Factor category
2022	199	279	353	1.17	Fair
2023	207	335	408	1.03	Fair
2024	170	290	286	1.11	Fair
2025	164	324	436	1.16	Fair

The average condition of captured fish has not varied greatly over the four surveys. Overall, the average k for captures in each survey fit into the “fair” category, meaning a k value between 0.90 and 1.20. In each survey, more than 50 per cent of all fish caught fit into this category. The frequency of the k categories in each sample/survey are shown in the Figure 2.

Whilst the average k for the population has not changed much between 2022 to 2025, the k category distribution has changed. The proportion of the fish in the “fair” category varies each year, from 54 per cent in 2023 to 80 per cent in 2024 (61 per cent in 2022 and 76 per cent in 2025). In 2022, 2023 and 2024 there were fish in the “poor” category. By 2025, fish are absent from that category and 25 per cent fit into the “good” and “excellent’ category.

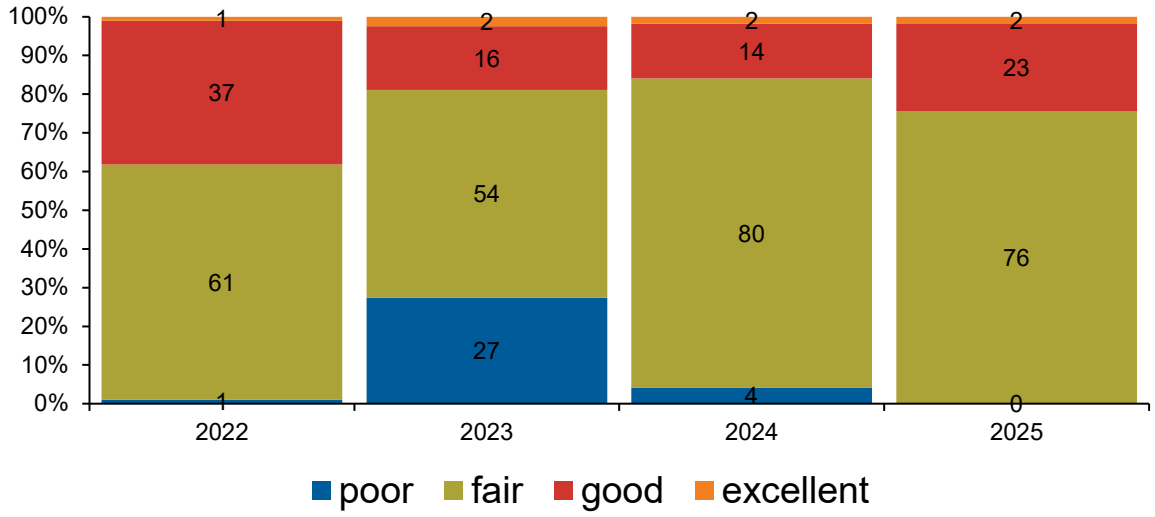


Figure 2. the distribution of k factor categories for each year’s catch. The distribution of Condition Factor (k) categories; “poor” <0.9, “fair” 0.9≥<1.2, “good” ≥1.2<1.6 and “Excellent ≥1.6

The scatter plots of length verses k in Figure 3 show that some smaller fish, i.e. the indeterminate fish, show better condition compared to the adults. This is not uniform though, with a k range of 0.50 to 2.10 for fish that are 100 to 200 mm.

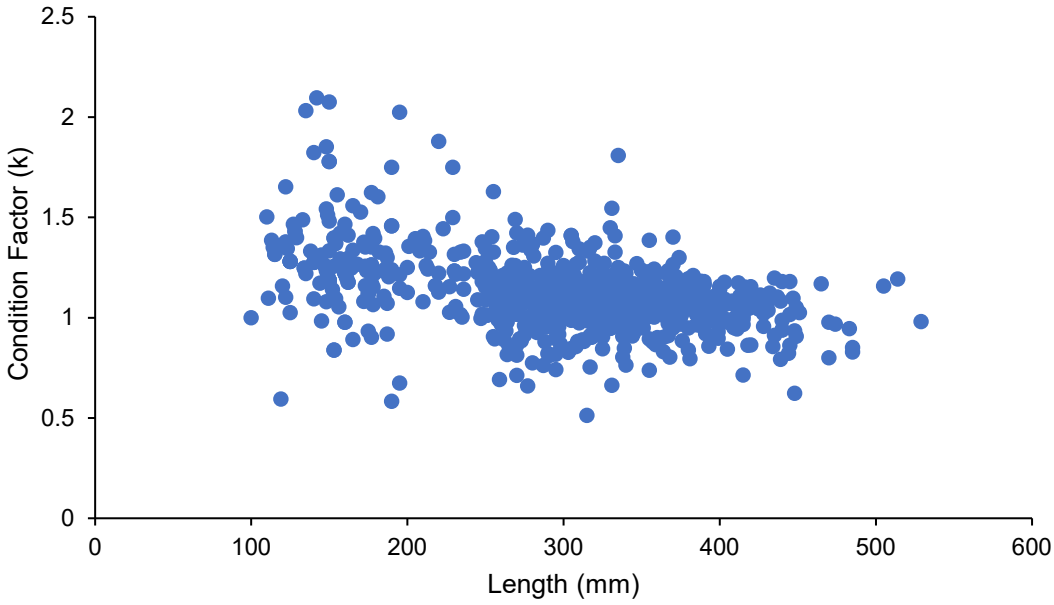


Figure 3. Length versus Condition Factor (k) of all fish n=730 caught during the four surveys.

Length frequency distributions for each year are shown in the Appendix 2 a) to d). The general trend is that the bulk of the population are between 250 mm and 450 mm. In all surveys there was a grouping of cohorts that represent 1+ and some 2+ fish between 100 mm and 220 mm.

In the 2022 sample the range of lengths (excluding the 0+ cohort) was 120 mm through to 520 mm. In addition, a targeted sample of young of the year (YOY) (0+) was -collected that year and they were between 30 mm to 70 mm. This YOY data was excluded from CPUE calculations and from estimates of mean weight, length or k for 2022. These samples were used to assist in validation of otolith section reading.

Angler Postal Survey

The Angler Postal Survey (APS), which has been conducted since 1985–86, provides long-term data on catch rates, harvest, and angler visitation for Arthurs Lake (Appendix 3 a) to c)). Between the 2022–23 and 2025–26 seasons, the harvest of brown trout dropped by around 55 per cent from approximately 25,000 to 11,000 fish per year. Over the same period, estimated angler visitation declined substantially, dropping from around 4,500 to 3,700 anglers. The 2025-26 season recorded the lowest harvest and angler visitation for Arthurs Lake since the start of the APS in 1985-86.

The most notable variation occurred in catch rates where 1.29 fish per angler day were recorded in 2022–23, the rate increased to 1.36 in 2023–24 before falling by roughly 50 per cent to 0.67 during the 2024–25 season. For the 2025-26 season the catch rate rose slightly to 0.75.

Trap management

The IFS uses fish traps installed on key spawning creeks across Tasmania to support the monitoring and management of trout populations. These traps also provide a reliable source of spawning fish for transfer to Assisted Fisheries, where natural recruitment is limited, and regular stocking is required. Fish that are not transferred are released from the trap and allowed to continue migrating upstream to spawn naturally in the creek.

Three traps have been constructed on three of the four main spawning creeks feeding Arthurs Lake. Two of these, located on Tumbledown Creek and Scotch Bobs Creek, were commissioned in 2014. The third trap, at Hydro Creek, was a refurbished existing structure brought into operation in 2015. Fewer than 400 trout were transferred from Arthurs Lake in 2021, while more than 14,500 fish were released upstream to access spawning habitat (Figure 4). The following year, 2022 produced a spawning run of similar size, with fewer than 2,000 trout transferred and around 14,000 released.

In contrast, the 2023 and 2024 spawning runs (which can be impacted by a range of factors including timing, trap activation and rainfall events) were less than half the size of the two preceding years at 7,400 and 5,800 fish, respectively. Approximately 2,000 trout were transferred to Assisted Fisheries in 2023, increasing to around 4,500 in 2024. In 2025 approximately half of the 7,500 fish that were captured were transferred, and the other half were released above the trap to spawn.

The number of trout removed from the system in 2021, 2022 and 2023 was low, at 2.5 per cent, 12 per cent and 35 per cent of total fish trapped. In 2024 78 per cent of total trapped fish were removed. The removal rate in 2025 was reduced to 50 per cent of the total captured.

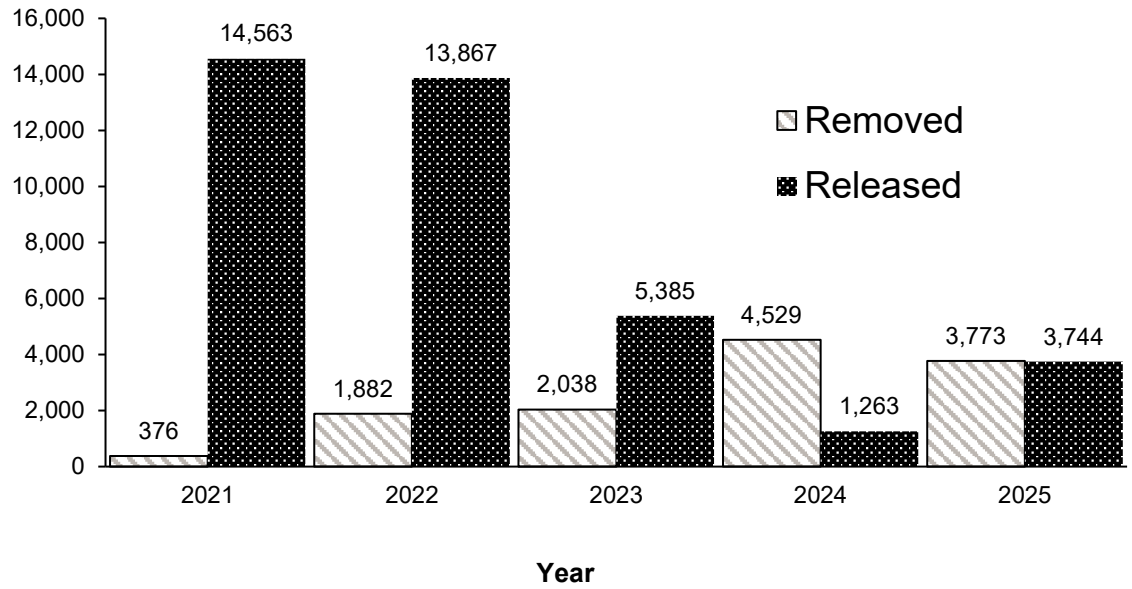


Figure 4.
The number of trout released back into Arthurs Lake versus trout that are transferred to other waters for the four years of the survey, 2021 to 2025.

Spawning monitoring over time

The spawning run at Arthurs Lake has been monitored annually since 1977. Each year 200 trout have been weighed and measured in the Hydro Creek spawning run. Since 2014 the trout in the Tumbledown and Scotch Bobs creeks have also been monitored to provide greater representation of the lake population. A summary of the average length and weight for years 1977-2025 in shown in Figure 5.

In 2025, the average brown trout measured 338 mm and weighed 426 g. This represents the third consecutive year of declining averages. These results are only slightly above the lowest values recorded since monitoring began, an average length of 327 mm in 2014 and an average weight of 374 g in 2013.

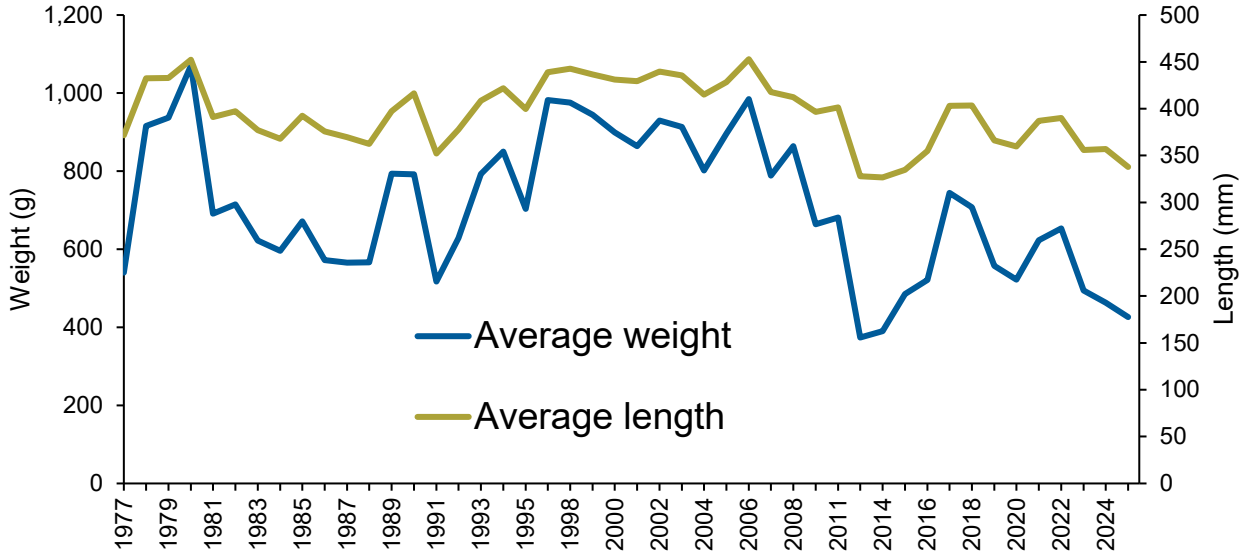


Figure 5. Average weight and length of fish in the Arthurs Lake spawning run 1977 to 2025

Discussion

This report presents the key findings from four years of electrofishing surveys (2022–2025) at Arthurs Lake. The surveys were undertaken during a period of highly variable environmental conditions influenced by the preceding La Niña years (2020–2023) and a notable spike in cormorant abundance from 2024. These combined factors contributed to marked fluctuations in trout size-class structure and recruitment and align with widespread anecdotal reports of cormorant impacts on trout populations across Tasmania.

In addition to strong juvenile representation, the 2022 trout population also displayed a broad spread of size classes, including several fish >450 mm and individuals up to 520 mm. The presence of multiple cohorts across the 230–450 mm range, along with larger adult fish, reflects a more typical and well-structured population for Arthurs Lake during this period.

The 2023 length-frequency distribution was broadly like that recorded in 2022, however, the 100–200 mm (1+) length classes were noticeably absent, indicating lower recruitment in 2023. The bulk of the 2023 catch data remained between 230 and 450 mm, representing the growth of the dominant 1+ cohort from 2022. Fish up to 530 mm were also present in the catch. The 2024 length-frequency data indicate a substantial decline of both small (<250 mm) and large (>350 mm) trout from the Arthurs Lake population. Only 12 fish under 240 mm were recorded, despite 113 fish being classified as indeterminate juveniles. This suggests that many smaller fish were removed from the system before sampling, likely through predation. Similar pressures appear to affect larger adult trout, which were also largely absent from the 2024 sample.

Field observations in 2024 recorded a high prevalence of fish scarring consistent with cormorant attacks, aligning with reports of unusually high cormorant numbers across the state. The 1+ cohort appears particularly vulnerable. These young fish are typically displaced from preferred habitat by older fish, forcing them into open water where predation risk is elevated. Larger trout (>350 mm), similarly displaced by density-driven habitat competition, are also exposed to predation due to increased overlap with foraging cormorants.

The 2024 length-frequency distribution is characterised by few 1+ fish and an absence of larger adults. This strongly reflects selective predation on both the smallest and largest size classes. This pattern coincided with a noticeable decline in angler catch rates at Arthurs Lake, consistent with angler reports from other Tasmanian fisheries during the same period. This supports the conclusion that elevated cormorant predation significantly impacted the population structure in 2024.

The 2025 length-frequency distribution indicates clearer signs of recruitment recovery, with a strong 140–230 mm cohort consistent with the 1+ year-class absent in 2024. The remaining fish (250–440 mm) represent multiple older cohorts, suggesting a more balanced population structure than observed in 2024.

Between 2022 to 2024 trout transferred from the Arthurs Lake spawning traps was minimal but even with the higher removal level in 2025 the overall impact on population structure appears limited. Despite clear evidence of strong cormorant predation in 2024, resulting in the loss of both small (<250 mm) and large (>350 mm) cohorts, the population in 2025 continued to reflect a recovery in recruitment to the population.

Recommendations

- The electrofishing survey should be continued on an annual basis to monitor changes in CPUE and population structure following recovery from the cormorant predation. In addition, these surveys will also continue to provide insight into the dynamics of the brown trout population with changing lake levels and climatic conditions over time.
- Consideration should be given to assessing age structure and the collection of otoliths in a future survey. By 2032, trout originating from the strong 2022 recruitment event will have reached approximately 10 years of age, which is currently the maximum age observed in the Arthurs Lake population. Consequently, only a small number of these fish are likely to remain, and the population age structure is expected to have shifted substantially from that observed today.

Appendices

Appendix 1. Catch statistics

a) Catch statistics for the 2022 survey

Grouping	Measurement	Mean	Minimum	Maximum
All brown trout (n=199)	**Length (mm)**	**279**	**111**	**514**
	Weight (g)	**353**	**15**	**1,620**
	Condition Factor (k)	**1.17**	**0.83**	**1.65**
Female (n=59)	Length (mm)	348	265	483
	Weight (g)	499	215	1,175
	Condition Factor (k)	1.12	0.94	1.38
Male (n=38)	Length (mm)	414	295	514
	Weight (g)	786	285	1,620
	Condition Factor (k)	1.08	0.83	1.45
Indeterminate (n=102)	Length (mm)	189	111	375
	Weight (g)	108	15	565
	Condition Factor (k)	1.24	0.90	1.65
Young of the year (n=8)	Length (mm)	37.5	29	45
	Weight (g)	0.51	0.18	0.88
	Condition Factor (k)	0.86	0.67	1.10

b) Catch statistics for the 2023 survey

Grouping	Measurement	Mean	Minimum	Maximum
All brown trout (n=207)	**Length (mm)**	**335**	**195**	**529**
	Weight (g)	**408**	**150**	**1,450**
	Condition Factor (k)	**1.03**	**0.51**	**2.02**
Female (n=114)	Length (mm)	334	248	448
	Weight (g)	395	150	770
	Condition Factor (k)	1.02	0.51	1.81
Male (n=34)	Length (mm)	379	225	529
	Weight (g)	559	240	1,450
	Condition Factor (k)	0.99	0.71	1.63
Indeterminate (n=59)	Length (mm)	252	195	275
	Weight (g)	182	150	275
	Condition Factor (k)	1.17	0.81	2.02

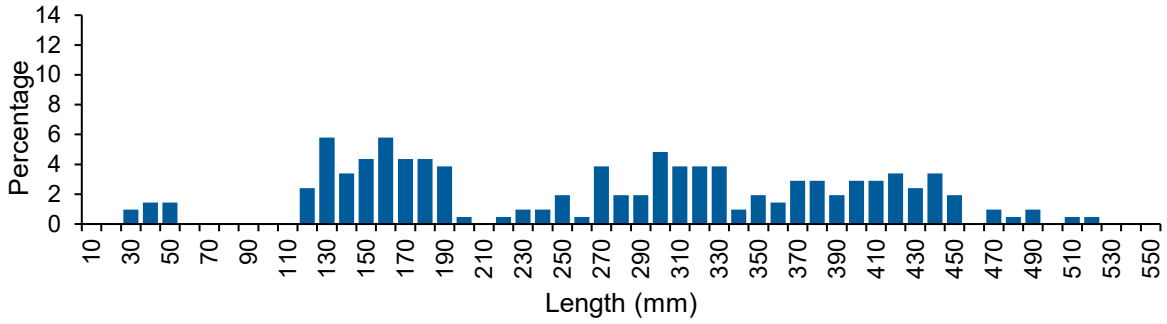
c) Catch statistics for the 2024 survey

Grouping	Measurement	Mean	Minimum	Maximum
All brown trout (n=170)	**Length (mm)**	**290**	**120**	**440**
	Weight (g)	**286**	**20**	**850**
	Condition Factor (k)	**1.11**	**0.86**	**2.07**
Female (n=37)	Length (mm)	326	254	440
	Weight (g)	399	210	850
	Condition Factor (k)	1.11	0.89	1.41
Male (n=20)	Length (mm)	328	274	405
	Weight (g)	391	220	650
	Condition Factor (k)	1.08	0.90	1.36
Indeterminate (n=113)	Length (mm)	271	120	340
	Weight (g)	230	20	450
	Condition Factor (k)	1.12	0.86	2.07

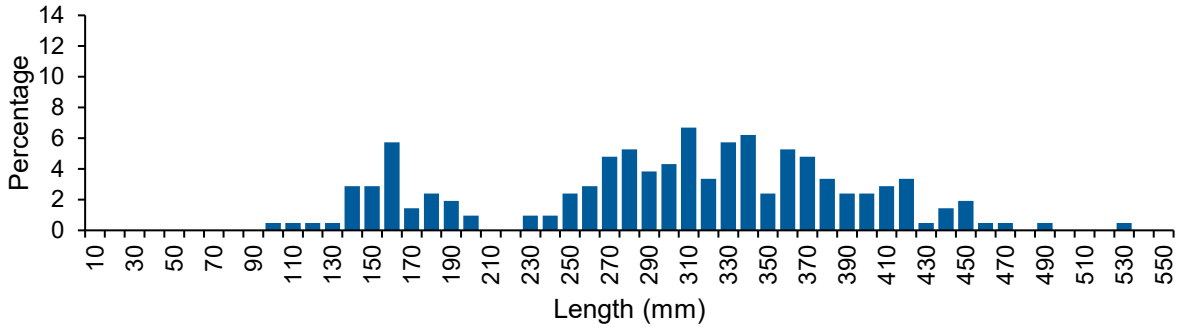
d) Catch statistics for the 2025 survey

Grouping	Measurement	Mean	Minimum	Maximum
All brown trout (n=164)	**Length (mm)**	**324**	**148**	**448**
	Weight (g)	**436**	**50**	**920**
	Condition Factor (k)	**1.16**	**0.92**	**1.85**
Female (n=63)	Length (mm)	357	300	448
	Weight (g)	503	210	850
	Condition Factor (k)	1.10	0.89	1.41
Male (n=60)	Length (mm)	365	213	477
	Weight (g)	550	120	920
	Condition Factor (k)	1.11	0.52	1.28
Indeterminate (n=41)	Length (mm)	218	148	318
	Weight (g)	141	50	340
	Condition Factor (k)	1.27	0.92	1.85

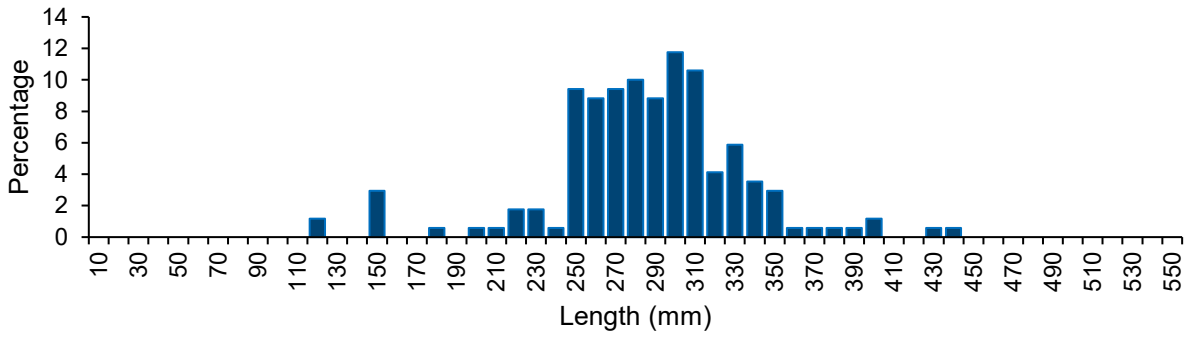
Appendix 2. Length frequency distribution



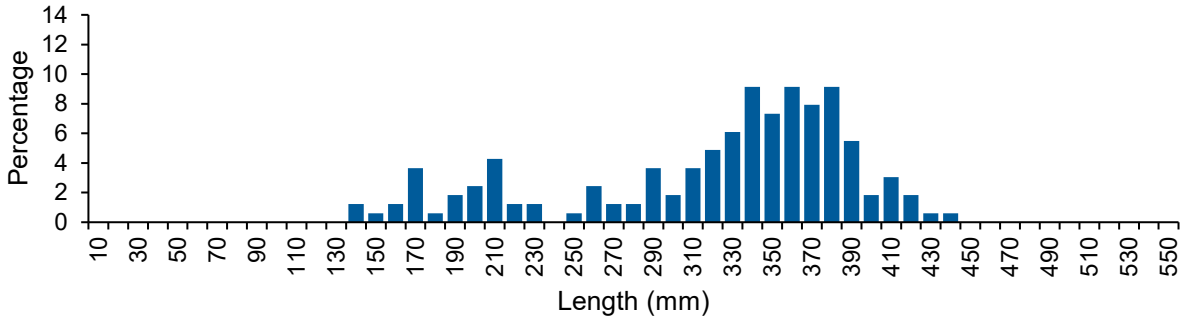
a) Length frequency distribution for the catches from the 2022 survey.



b) Length frequency distribution for the catches from the 2023 survey.

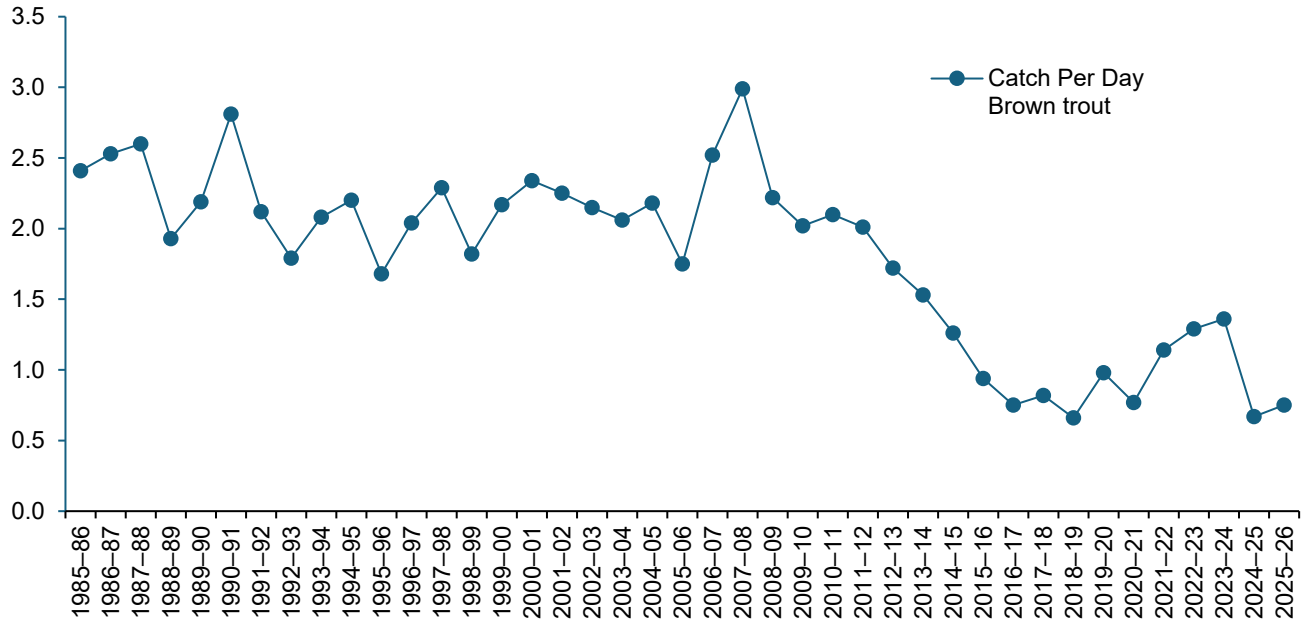


c) Length frequency distribution for the catches from the 2024 survey.

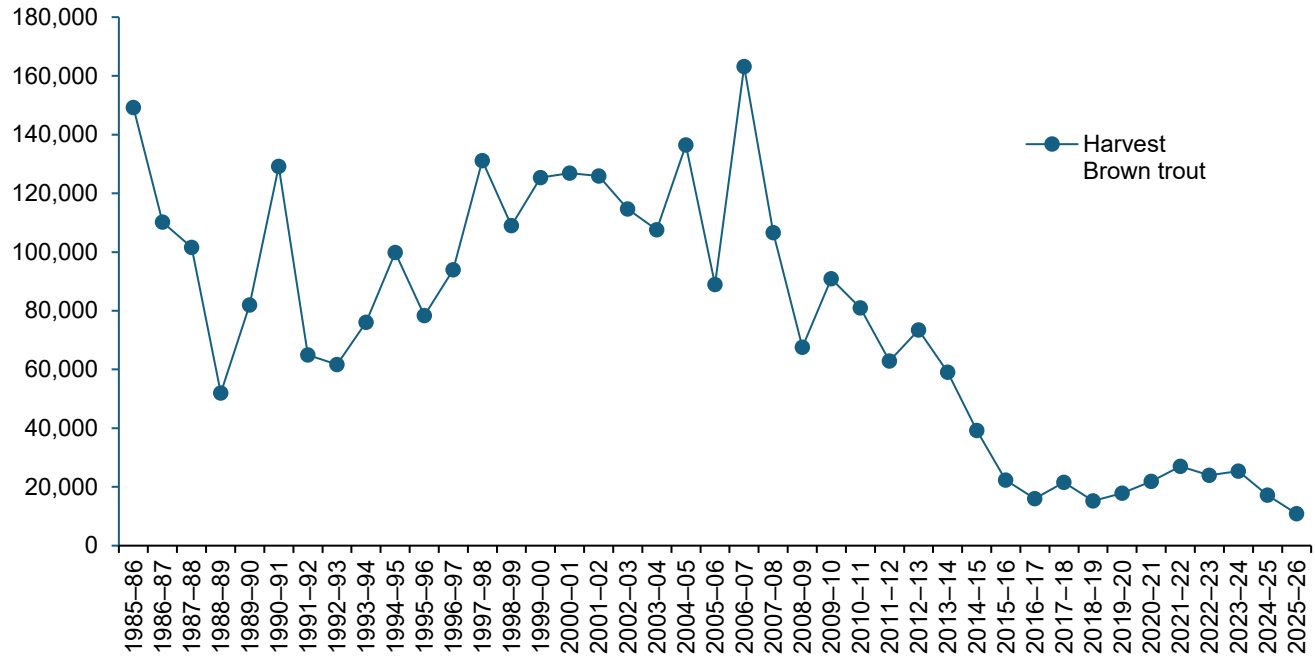


d) Length frequency distribution for the catches from the 2025 survey.

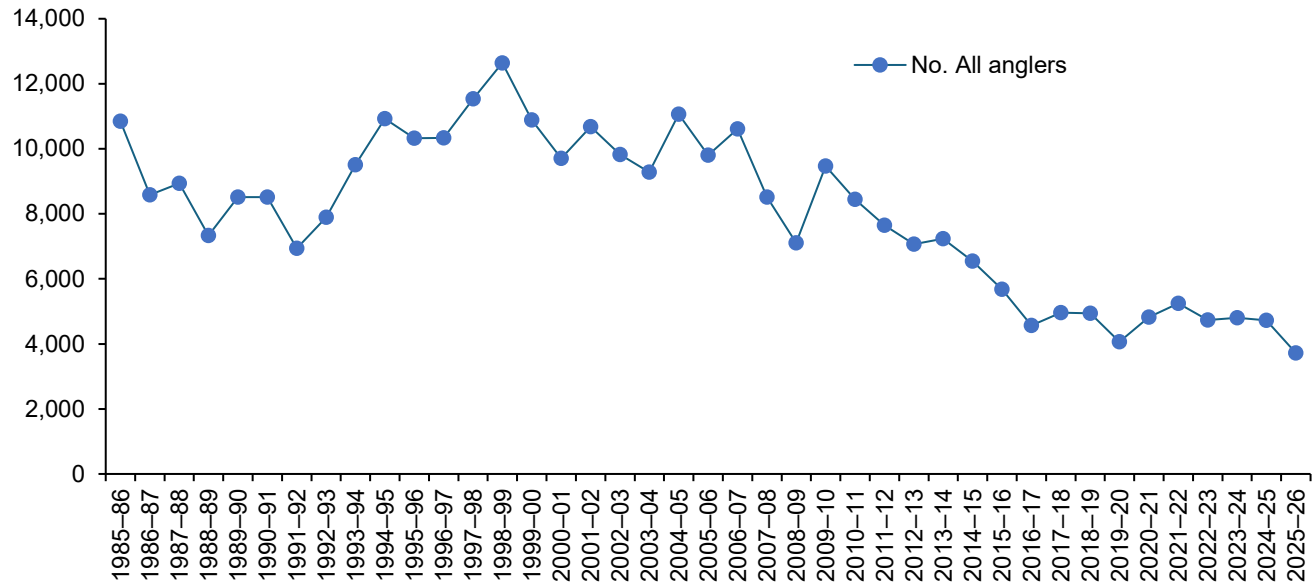
Appendix 3. Angler Postal Survey (APS) results for Arthurs Lake to the 2025-26 season



a) Catch rate derived from the APS (1986/87 – 2025/26)



b) Harvest derived from the APS (1986-87 to 2025-26).



c) Number of anglers visiting Arthurs Lake derived from the APS (1986-87 to 2025-26).

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