



ACT
Government

2024 Two-spined Blackfish (Wagar) Survey in relation to Environmental Flows

This project was undertaken by Office of Nature Conservation, Environment Planning and Sustainable Development Directorate, ACT Government for Icon Water on Ngunnawal country.

Executive Summary

The 2024 monitoring for Two-spined Blackfish in the Cotter River and Bendora Reservoir was undertaken between February and May 2024. Blackfish catch rate declined in both environmental flow reaches and remained very low in the unregulated Above Corin reach.

Bendora to Cotter Reach declined to below an average of 5 fish per transect as a result of low breeding success over the previous four years. Despite this the reach exceeded the indicator level of 60% of shots with two or more blackfish, one of the two indicators of environmental flow performance for Blackfish in the Icon Water Environmental Management Plan. The second indicator of at least 30% of the catch being juveniles, under 120 mm in length, was not met for the 4th year in a row. However, juveniles were detected at each site in this reach, and seven fish under 80mm were recorded, showing some successful breeding in 2023/24.

The other environmental flow reach, Corin to Bendora, only recorded one juvenile Blackfish at the only site in the reach. Bendora Reservoir did not record any Blackfish for the first time. As such, neither area should be considered to have successfully met the indicators.

The Above Corin reach recorded very low catch rates and breeding success which have continued due to the sedimentation caused by the 2020 bushfires. ACT Government has investigated the genetic diversity of the population to inform potential translocations and is undertaking the installation of artificial habitat structures at three of the sites in this reach. These will be monitored over the coming years.

The following recommendations are made for the sustainability of Blackfish in the Cotter River.

- Note the ongoing low recruitment of Blackfish and table for discussion at the 2024 Spawning Plan meeting.
- Undertake the 2026 environmental flow monitoring as planned.
- Icon Water and the ACT Government ensure minimal impact on Blackfish breeding in the Cotter Catchment by programming works, prescription burns and manageable flow impacts to outside October to December.
- Icon Water will collate available data on the Blackfish surveys of Bendora Reservoir and convene a workshop to determine any pathways and inform any discussion of the indicator for this water body.
- Icon Water to support the ACT Government in the recovery of Blackfish in the Above Corin reach with the continuation of surveys during the Eflows monitoring.

Introduction

Two-spined Blackfish (*Gadopsis bispinosa*), Wagar in the Ngunnawal language (hereafter Blackfish) are listed as Vulnerable in the ACT (*Nature Conservation Act 2014*). They grow to 30 cm in total length and occur in the upland regions of the southern Murray Darling Basin (Lintermans 2023). In the ACT they are restricted to the Cotter River and are managed by a species action plan (ACT Gov 2018). They require cool, clean clear cobble rivers to live and breed (Kohen 1990, Lintermans 1998, O'Connor & Zampatti 2006). The major threat to Blackfish in the region is sedimentation which fills the interstitial spaces within the cobbles that the Blackfish use for refuge, breeding, and foraging. Other threats include predation by trout, river regulation, inappropriate fire regimes, loss of habitat and riparian vegetation, degradation of water quality and climate change (ACT Gov 2018). Appropriate environmental flows have been shown to help sustain the species through dry periods and maintain habitat by clearing sediment from the cobbles.

Icon Water, as part of its licence (WU67), provides environmental flows (eflows) below Corin Dam and Bendora Dam. These flows are designed to support the aquatic ecosystem, including the vulnerable Two-spined Blackfish. These flows contain base flow and higher flow events for riffle and pool maintenance, as well as allowances for periods of water restrictions. For most of the time since the last survey standard environmental flow has been provided from Bendora Dam. However, a significant high-flow event, overtopping the dam, occurred from December 2023 to February 2024, immediately prior to the survey (Figure 1). This flow peaked at 1100 ML/day at Vanitiys Crossing and 800 ML/day at Gingera in the Above Corin reach. This flow level is double the 550 ML/day set as a flow that would maintain pool structure in this river (ACT Gov 2020). However, this flow is still much lower than the maximum flows seen between 2020-2022, where 10 flows over 2000ML/day (maximum of 18000ML/day) were recorded (Icon Water data presented in ACT Gov 2022).

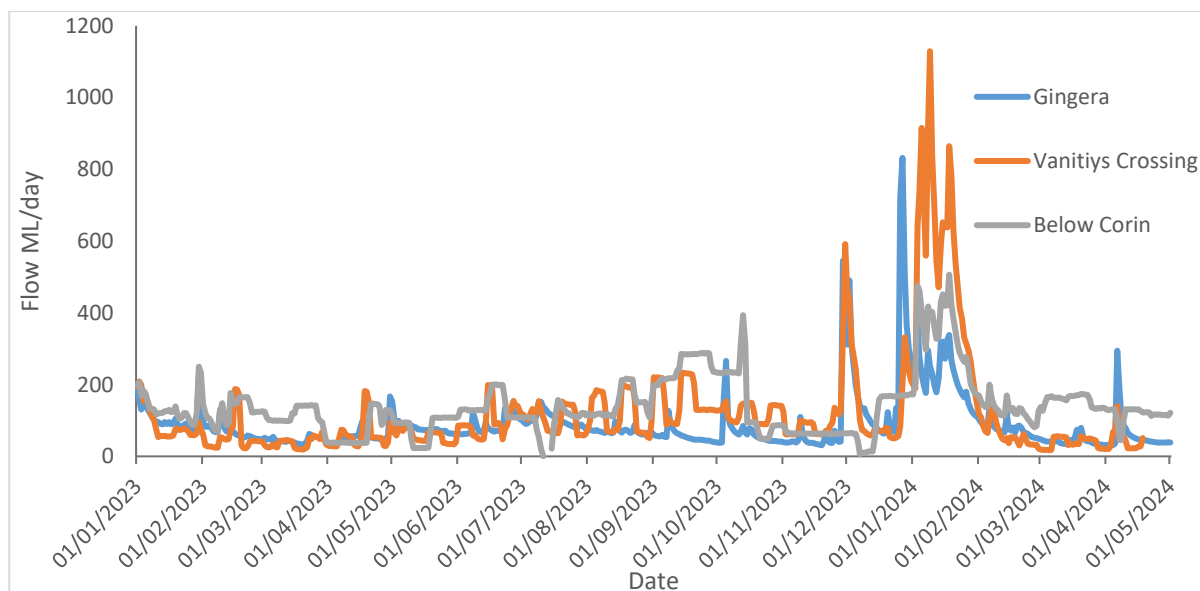


Figure 1. Flow in the Cotter River, January 2023 to May 2024. Gingera – Above Corin, Below Corin – Corin to Bendora and Vanitiys Crossing – Bendora to Cotter (Data from Icon Water gauges Gingera 410730; Vanitiys 410725 and Below Corin 410752)

Corin Dam also overtopped in this period, and while environmental flow is released from Corin Dam, it is usually dwarfed by the release of transfer flow to be extracted at Bendora for human consumption. High transfer flows are particularly evident in summer. For example, the natural flow in the upper catchment Above Corin in February 2023 averaged 70 ML/day with a maximum flow of 130 ML/day and a minimum

flow of 47 ML/day). In the same period, the reach between Bendora and Cotter, receiving only environmental flow, averaged 55 ML/day (Max 188 ML/day, Min 23 ML/day). At the same time, flow from Corin to Bendora averaged 128ML/day (Max 176 ML/day, Min 70 ML/day) a flow almost doubles the natural flow and 2.5 times the environmental flow requirement for the same period.

As was noted in previous surveys, there are still significant amounts of sand and sediment in the Cotter River above Corin Reservoir and between Corin and Bendora from the 2020 Bushfires (Beitzel et.al 2020, 2022). Sedimentation from erosion and fire are a threat to Blackfish (Lintermans 2023). Sediment smothers the spaces under the cobbles that Blackfish need for breeding, sheltering and feeding. Previous surveys have shown a dramatic reduction in Blackfish in the Above Corin reach since 2020 and very few signs of recovery. The ACT Government has undertaken a number of measures to help recover the population. These include investigating genetic diversity to inform translocation, planning for additional surveys of under-surveyed areas such as Corin Reservoir and the Corin to Bendora reach, and installation of habitat structures in the Cotter River Above Corin which is planned for late winter 2024.

Methods

In 2024 to monitor Blackfish in the Cotter River, 11 river sites were sampled, comprised of:

- 5 sites in the unregulated reach, Above Corin reach;
- 5 sites in the environmental flow reach, Bendora to Cotter reach; and
- 1 site in the environmental flow and transfer reach, Corin to Bendora reach.

At each river site, five 30 m transects (or electrofishing shot) were sampled with a backpack electrofisher to capture Blackfish using the standard monitoring method (from Beitzel et.al 2010).

Bendora Reservoir was also sampled. In Bendora Reservoir, 10 single wing fyke nets were set overnight and collected the next morning.

All fish captured were identified to species and measured (total length or caudal fork length dependent upon tail shape) and all native fish are returned to the water.

Indicators

Icon Water's Environmental Management Plan has the following indicators to maintain a sustainable Blackfish population in the environmental flows reaches based on the ACT Environmental Flow guidelines (ACT Gov 2019)

- More than 2 Blackfish per transect (or shots) are recorded in 60% or greater of the survey transects (shots), in at least one year, over the last two years.
- Blackfish under 120 mm total length (0 and 1+ year old fish) comprise 30% of the catch in a reach.

There is also an indicator for Bendora Reservoir of two or more Blackfish per net-night.

Results

In 2024, a total of 141 fish were recorded. Of these, 84 were Blackfish, comprising 22 in the Above Corin reach, one in the Corin to Bendora reach, and 61 in the Bendora to Cotter reach (Table 1 individual site

catch is found in the Appendix). No Blackfish were recorded from the fyke netting in Bendora Reservoir. The next most common species was Rainbow Trout, *Oncorhynchus mykiss* with 48 individuals recorded, the majority of which were in the Bendora to Cotter reach. Four Brown Trout, *Salmo trutta* and five endangered Macquarie Perch, *Macquaria australasica*, Gubay¹, were also recorded in this reach and four Trout Cod *Maccullochella macquariensis*, Gudu, were recorded in the fyke netting from Bendora Reservoir

Table 1. Fish caught in the 2024 Eflow survey in three reaches in the Cotter River and Bendora Reservoir.

	Above Corin	Corin to Bendora	Bendora to Cotter	Bendora	Total
Brown Trout	0	0	4	0	4
Macquarie Perch	0	0	5	0	5
Rainbow Trout	16	1	31	0	48
Trout Cod	0	0	0	4	4
Two-Spined Blackfish	22	1	61	0	84

Compared to previous years, the Above Corin reach continued to have a very low fish catch that it has been at since the 2020 fires (Figure 2). The Bendora to Cotter reach also had lower catch than previous years, falling below an average of 5 fish per shot.

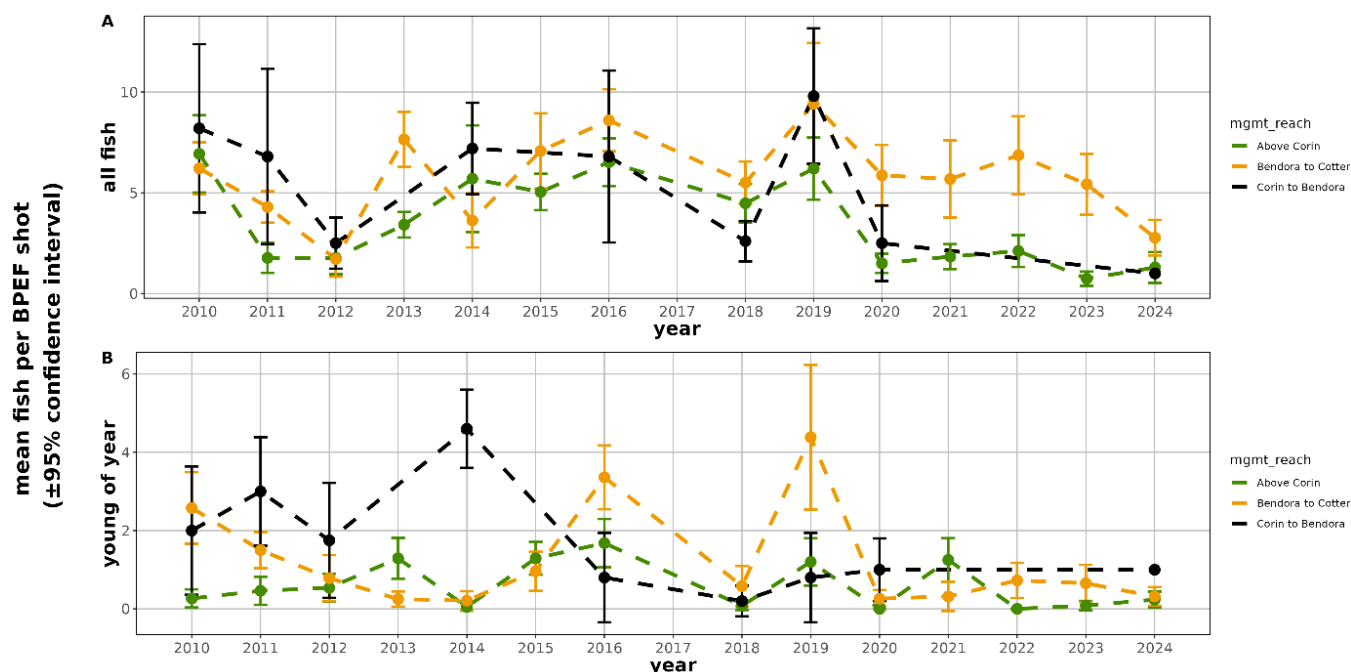


Figure 2. Mean Blackfish per shot for each reach, all Blackfish and only Young of year (<80mm) from 2010-2024.

In 2024, the indicator for catch was met in the Bendora to Cotter reach, with 64% of shots in the reach recording two or more Blackfish. However, 2024 was much lower than the average for this reach from 2010-2024. Two upper sites in this reach had few Blackfish reported (Figure 3).

¹ Ngannawal language and names in this report provided by the Winnagay Ngannawal Language Group

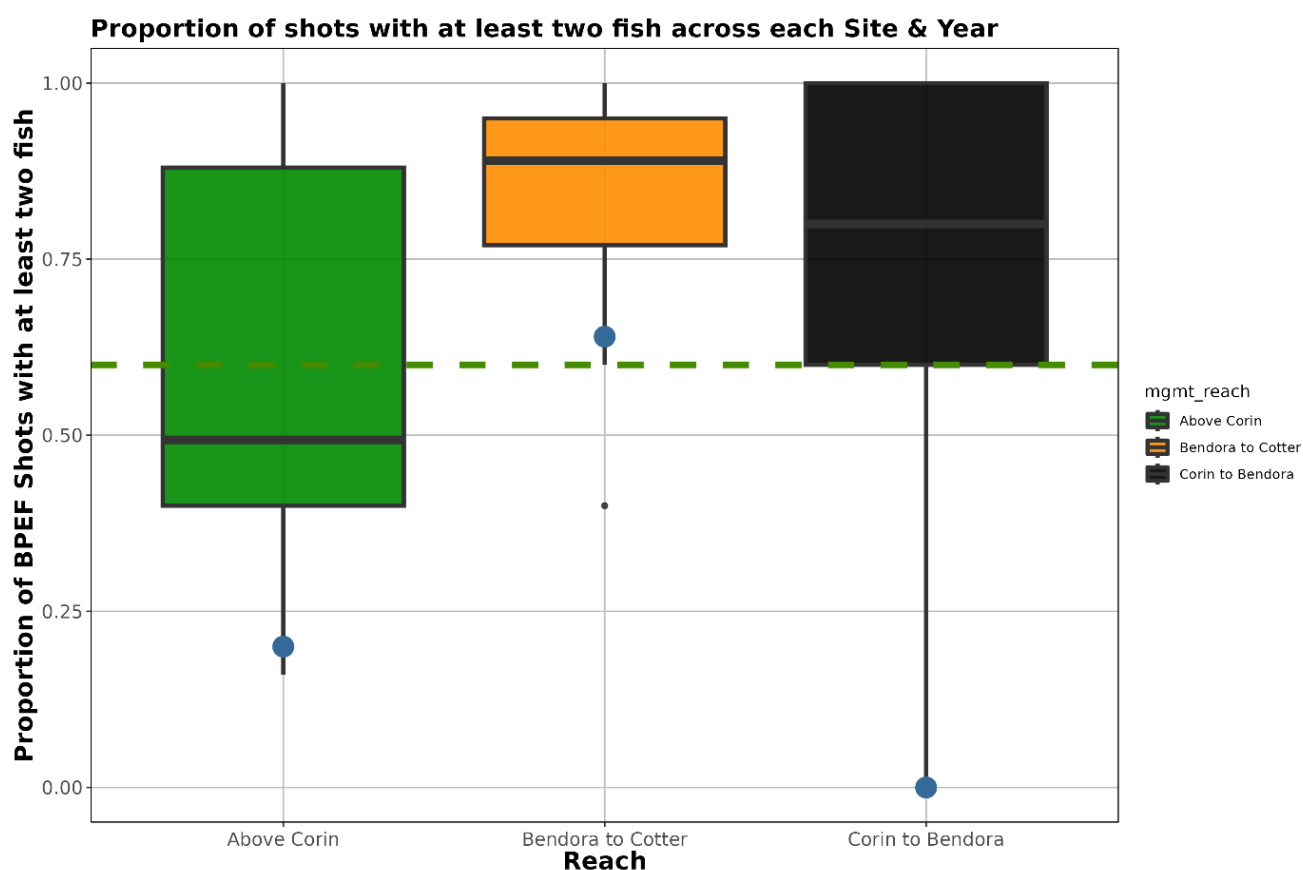


Figure 3 Boxplot of the proportion of transects/shots in a reach with at least 2 Blackfish. 2024 shown as a blue dot overlaying a boxplot of 2010-2024, for each reach. The black horizontal line indicates the mean of annual catch and the green dashed line indicates the 60% indicator threshold level.

The unregulated reach Above Corin was again well below the indicator level. This reach is struggling to recover from the 2020 bushfire impact and has been well below the indicator level in the last five seasons. 2024 is the first year that the long-term average (2010-2024) from this reach (thick black horizontal line in the green box of Figure 3) has dipped below 50%.

The Corin to Bendora reach did not attain the indicator level. There is no replication of sites in this reach due to the difficulty of access, so the average is based on only five transects. However, only one Blackfish was caught in the reach. Blackfish are expected to occur throughout this reach and recently during works on the Corin Dam stilling basin, six blackfish were rescued (Icon Water pers coms). Aerial observations of this reach in 2024 noted significant amounts of sediment still present following the 2020 fires (ACT Gov unpublished observation). Investigations on how to increase the number of sites in this reach are underway by the ACT Government.

Bendora Reservoir did not record any Blackfish in 2024 and has continued at its almost undetectable level that it has been at for several years. As such, it has failed to meet its indicator level of two Blackfish per net night.

Juvenile Catch

The Bendora to Cotter reach recorded 21.3% of the catch in the reach under 120mm size class (Figure 4). It did not achieve the indicator threshold of 30% or more of the catch under 120 mm. However, 13 juveniles (<120 mm) were recorded, with at least one at each site in this reach. Of the 13 juveniles, seven were

below 80 mm, indicating they were spawned in the spring of 2023 and that successful spawning did occur this season. The Above Corin reach was also below the indicator, at 22.7%, in the juvenile size class. Juveniles were only recorded in the lower two sites in this reach. The only Blackfish recorded in the Above Bendora site was within the juvenile size class. This gives the impression that this reach achieved the indicator. However, this is why assessing both indicators together is important for the ongoing conservation of the Blackfish population.

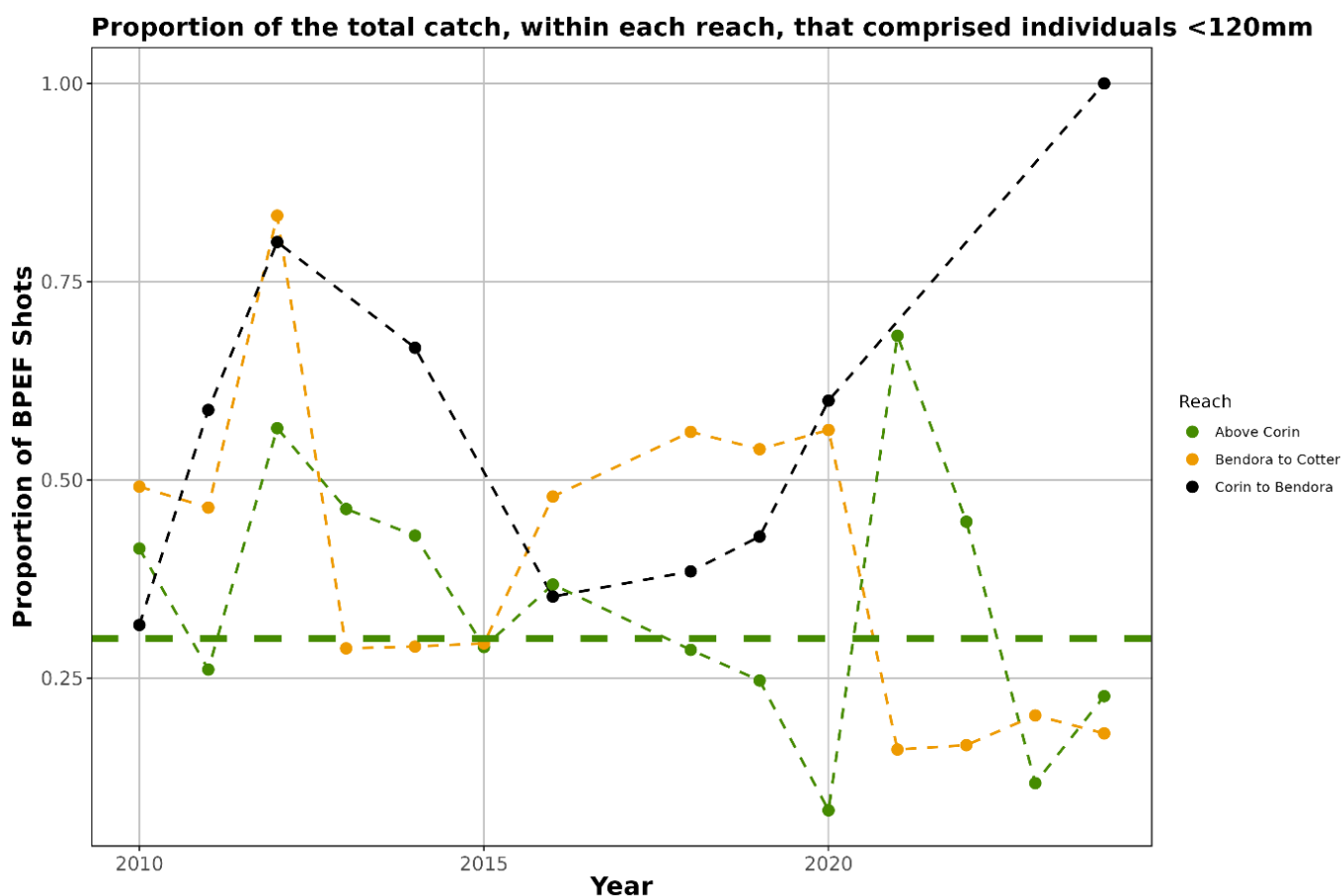


Figure 4. Proportion of the catch that is under 120 mm (Young of year and 1+ aged fish). 2010-2024. Green dashed line represents the threshold level.

The results in the Bendora to Cotter reach indicate, that while not absent, the recruitment of juvenile fish over the last two seasons in this reach is low. There has been much-reduced breeding success in this reach since 2020 (Figure 4). It is likely that this ongoing low recruitment will impact on the overall population over the next 3-5 years. This is likely being observed in this survey with the overall catch indicators, the proportion of shots with 2 or more Blackfish and mean catch per shot in this reach falling (Figure 2 and Figure 3).

In previous surveys, high-flow events during the breeding period have been identified as potentially responsible for low or absent juvenile production in a season. Although this season only had one high flow period, it occurred at the start of December, which is the end of the breeding season for Blackfish (figure 1). It may be that the high flow experienced in December could have been responsible for the low production of recruits in the Bendora to Cotter reach.

Bendora Reservoir

No Blackfish were recorded in Bendora Reservoir, which did not meet the indicator. This is in keeping with previous years, when Blackfish have become rare in the reservoir (Figure 5). It is not known why the Bendora population of Blackfish has declined to almost undetectable levels.

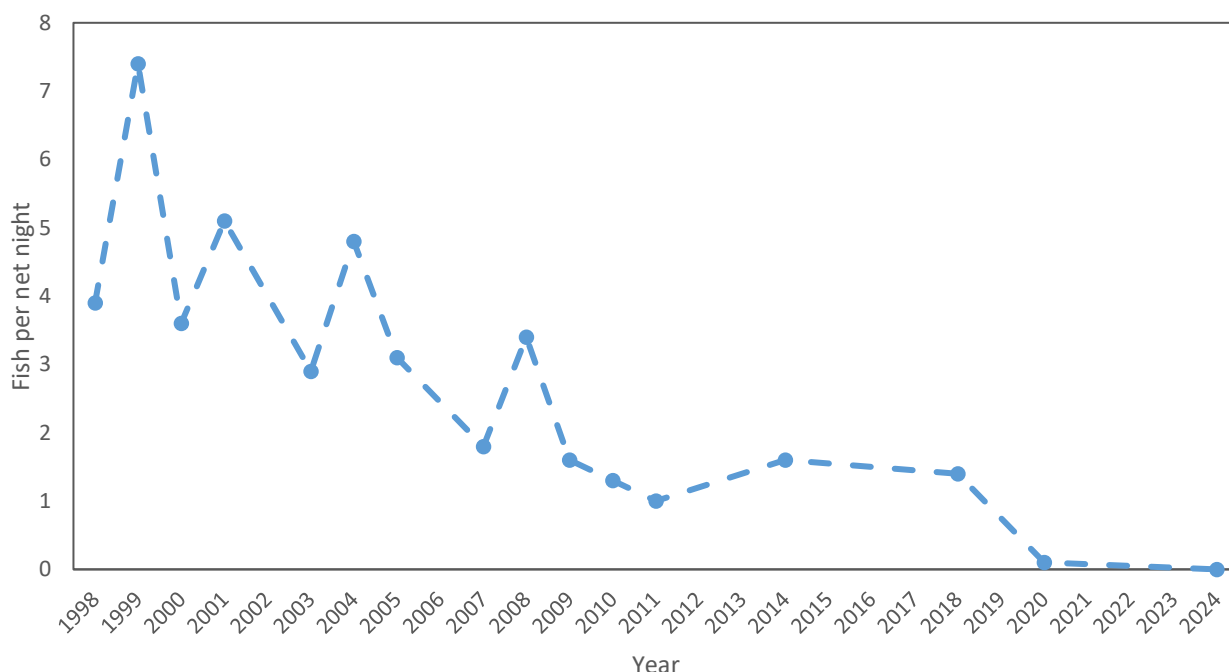


Figure 5. Average fyke net catch in Bendora Reservoir (fish/net night) from 1998-2024.

There has been some variation over the years in the timing of this survey and construction of the nets used. Investigations could be considered in these areas and the repeatability of the survey both spatially and temporally. It is suggested that a working group be set up to examine the data from the Enlarged Cotter Dam (ECD) and Eflow programs. The working group could determine if there is an overall impact on the conservation of Blackfish, advise as to potential options for recovery and whether surveying other reservoirs could be beneficial in determining status and trends. However, the results seen over time in Bendora may result of reservoir aging with consequent decreasing productivity and ongoing sedimentation of the reservoir. Cotter Reservoir, which is older and has a higher sediment load than the upstream dams, did not have a Blackfish population prior to the construction of the ECD. No Blackfish population has established since the ECD has filled, despite the new reservoir flooding areas that previously held Blackfish populations.

Conclusion and Recommendation

In 2024 the Blackfish population in the environmental flow Bendora to Cotter reach partially met the threshold values for a healthy population. The proportion of shots with two or more fish indicator was met, though it was lower than the long-term average. The low juvenile numbers continued since the 2020 season, resulting in the juvenile indicator not being met in the Bendora to Cotter reach.

The Corin to Bendora reach did not meet the proportion of shots indicator. While the juvenile indicator was met, there was only one Blackfish was caught in this reach, and this should not be considered a sufficient

catch to pass this indicator. Bendora Reservoir also did not meet the indicator, with no Blackfish recorded for the first time.

In the Above Corin reach, the sediment impact from the 2020 fires is still limiting any recovery of the population and this reach did not meet either indicator. The ACT Government has developed a recovery plan for Blackfish and intends to install artificial habitats into the reach in winter of 2024. Monitoring of these habitats will occur over the next 2-3 years.

The next scheduled environmental flow monitoring for Blackfish is in 2026. However, the low recruitment over the last 4 years in the environmental flow reaches and extremely low catch in the Corin to Bendora reach is worrying. The following recommended are made:

- Note the ongoing low recruitment of Blackfish: able this issue for discussion at the 2024 Spawning Plan meeting (IW).
- Conduct the 2026 Blackfish environmental flow monitoring: Ensure this monitoring is carried out as planned (IW)
- Minimise impact on Blackfish breeding: Icon Water and ACT Government will program works, prescription burns, and manageable flow impacts outside the October to December breeding season to ensure minimal impact on Blackfish in the Cotter Catchment.
- Compile and review Blackfish survey data: Compile available data on the Blackfish surveys of Bendora Reservoir. Convene a workshop to determine future monitoring pathways and inform discussions on the indicators for this water body (ACTG, with Icon Water)
- Support Blackfish recovery efforts: Icon Water will support the ACT Government in the recovery of Blackfish in the Above Corin reach by continuing surveys during the EFlows monitoring.

References

- ACT Government. 2018. ACT Aquatic and Riparian Conservation Strategy and Action Plans. Canberra, ACT Government
- ACT Government 2019 ACT Water Resources Environmental Flow Guidelines 2019 Canberra, ACT Government
- Beitzel M., Evans L. and Jekabsons M. 2010, 2010 Monitoring of Two-spined Blackfish (*Gadopsis bispinosus*) in relation to Environmental Flows *Report prepared for Icon Water*. Canberra, ACT
- Beitzel M., Evans L. and Jekabsons M. 2020, 2020 Monitoring of Two-spined Blackfish (*Gadopsis bispinosus*) in relation to Environmental Flows *Report prepared for Icon Water*. Canberra, ACT
- Beitzel M., Evans L. and Jekabsons M. 2022, 2022 Monitoring of Two-spined Blackfish (*Gadopsis bispinosus*) in relation to Environmental Flows *Storymap prepared for Icon Water*. Canberra, ACT
- Koehn, J. D. 1990 Distribution and conservation status of the Two-spined Blackfish *Gadopsis bispinosus* in Victoria. *Proceedings of the Royal Society of Victoria*, 102(2), 97-103.
- Lintermans, M. 1998. The ecology of the two-spined blackfish *Gadopsis bispinosus* (Pisces: Gadopsidae). (Masters Masters), Australian National University, Canberra.
- Lintermans M. 2023, Fishes of the Murray Darlin Basin. Australian River Restoration Centre. Canberra, ACT
- O'Connor, J., & Zampatti, B. 2006. Spawning season and site location of *Gadopsis bispinosus* Sanger (Pisces: Gadopsidae) in a montane stream of southeastern Australia. *Transactions of the Royal Society of South Australia*, 130(2), 227-232.

Appendix

Site	Brown Trout	Macquarie Perch	Rainbow Trout	Trout Cod	Two-Spined Blackfish
Cotter Flats			2		
Black Sallee Flat			2		
Lick Hole Track Crossing			2		2
Cribbs Creek			2		6
Gingera Gauge			8		14
Above Bendora			1		1
Bendora Dam				4	
Below Bushrangers	1		3		4
Burkes Crossing			19		9
Pipeline Crossing		3	4		8
Spur Hole	3		5		22
Vanitys Crossing		2			18