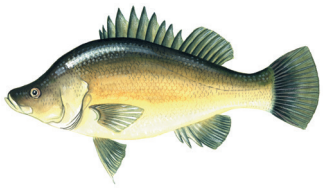
Native Fish Report Card
Lower Goulburn River 2023

Goulburn Broken Region

Fish found in the lower Goulburn River in our 2023 surveys

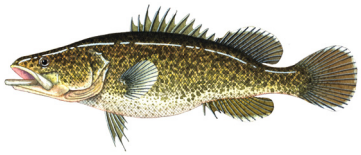
Target Species

✓ *recorded in 2023*



✓ **Golden Perch**

Macquaria ambigua



✓ **Murray Cod**

Maccullochella peelii

✓ **Silver Perch**

Bidyanus bidyanus

✓ **Trout Cod**

Maccullochella macquariensis

Non-target species

✓ *recorded since 2017**

Large-bodied native species

- ✓ Bony Bream
- ✓ River Blackfish

Small-bodied native species

- ✓ Australian Smelt
- ✓ Flatheaded Gudgeon
- ✓ Carp Gudgeon sp.
- ✓ Murray-Darling Rainbowfish
- ✓ Unspecked Hardyhead

Exotic species

- ✓ Common Carp
- ✓ Eastern Gambusia
- ✓ Goldfish
- ✓ Oriental Weatherloach
- ✓ Redfin

** These non-target species were incidentally captured during NFRC surveys since 2017 but not measured as for target species.*

Fish community

The NFRC Program began in 2017, with a focus on targeting the monitoring of population dynamics of key iconic fish species that have high recreational and/or conservation values, in large rivers across Victoria. In the Goulburn River, the target species are Murray Cod, Golden Perch, Silver Perch and Trout Cod. Surveys occur in April/May each year, at 11 sites from just downstream of Lake Nagambie (Goulburn Weir) to upstream of the junction with the Murray River (River Bend Caravan Park - Sun Valley). The timing of the surveys coincides with reduced flows immediately following the irrigation season, when the target species are most easily captured. The equipment and habitats surveyed are focused on these species, which are measured to determine population structures. Other fish species that are incidentally captured are recorded, but not measured to determine their population structures.

Summary of key health indicators for target species in 2023

Species	Key Health Indicators		
	Recent recruitment	Multiple size classes	Mature fish present
Golden Perch	No	Yes	Yes
Murray Cod	Yes	Yes	Yes
Silver Perch*	-	-	-
Trout Cod	No	Yes	Yes

Recent recruitment means young-of-year fish

** - cannot be determined due to low numbers*

Both Silver Perch and Trout Cod were historically abundant in the lower and mid Goulburn River, with Silver Perch historically abundant up to the Nagambie area and Trout Cod present upstream of the Lake Eildon confluence. These species have experienced dramatic declines across their range reflected in their classification as threatened species nationally under the Environment Protection and Biodiversity Conservation Act 1998. The status of both species has now improved, with Trout Cod now having a self-sustaining population downstream of Lake Nagambie and Silver Perch present, although in lower densities. Overall, the Goulburn River appears to be maintaining healthy populations of Golden Perch, Murray Cod and Trout Cod. The following pages have more detail about the population structures of each target species.

Non-target species

The non-target fish species that have been incidentally recorded in the Goulburn River during NFRC surveys since 2017 are:

Large-bodied native species

Other large-bodied native fish species recorded in fish surveys are Bony Bream and River Blackfish. Bony Bream are a lowland species only expected to be found in the lower Goulburn River. The species is recorded in lowland rivers across the Murray-Darling Basin and is intolerant of cold water. River Blackfish are a lowland species, generally found at altitudes below 200 metres. This species has suffered a decline in distribution and abundance across the State. It has low abundance in this section of the Goulburn River, but was captured in 2019, 2020 and 2022 during NFRC surveys.

Small-bodied native species

The small-bodied species Australian Smelt, Carp Gudgeon, Flat-headed Gudgeon and Unspecked Hardyhead are common and are expected to be widespread throughout the Goulburn River and more broadly within the Murray-Darling Basin. Murray-Darling Rainbowfish were historically present to 130 m altitude in the Goulburn River system. While once widespread in the Murray-Darling Basin, its range has become more restricted. The species now has a patchy distribution and is listed as threatened in Victoria.

Exotic fish species

Common Carp, Goldfish and Redfin are widely distributed across the Goulburn River, with Eastern Gambusia more common in the slower flowing waters. Weatherloach are increasing in distribution and abundance and are found in slower flowing areas, often in silt substrate. Weatherloach often disperse during floods.

Other native fish species known from the lower Goulburn River

Some fish species known to occur in the Goulburn system have never been recorded during NFRC surveys. For example, no Freshwater Catfish, Murray Galaxias, Obscure Galaxias or Southern Pygmy Perch have been detected in the surveys. The two galaxiid species are hard to detect using the NFRC sampling method. Murray Galaxias, Freshwater Catfish and Southern Pygmy Perch are common in offstream habitats within the Goulburn system. As the section surveyed is downstream of the cooler trout waters, it is not unexpected that trout have not been detected in the NFRC surveys.

Other notable species

Surveys have also recorded Murray Crayfish, Yabbies and turtle species.

Environmental and Management Context

Environment

Stream flow was marginally higher in 2018, 2020-22 compared to 2017, 2019 and 2023, due to water management (i.e. Inter Valley Transfers) and this may have decreased electrofishing efficiency in those years. During 2020 and 2021 surveys there was elevated turbidity following earlier flooding, which also further decreased electrofishing efficiency for all species.

River rehabilitation efforts in the Goulburn River

Many rehabilitation actions have occurred, and are underway, to improve the health of the Goulburn River and its fish community. These include revegetation, weed control and fencing of riparian areas, reintroduction of instream woody habitat, allocations of water for the environment, fish stockings and pest control. Regular monitoring of the fish community has occurred for over 10 years. Current research and monitoring programs include the Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) and Flow-MER (fish theme). Recent work has focused on the role of flows for spawning of Golden Perch and Silver Perch using drift net surveys, as well as links between flows and movements of these species using telemetry techniques. Organisations involved in rehabilitation and management of the Goulburn River and its fish community include the Goulburn-Broken Catchment Management Authority, DEECA, the Victorian Fisheries Authority and Yorta Yorta Nation Aboriginal Corporation support rehabilitation and management of the lower Goulburn River and its fish community.

See the ARI website for further information on the Native Fish Report Card program.

The NFRC program, and related monitoring initiatives, provide improved understanding of the structure of fish communities and how rivers can be best managed.

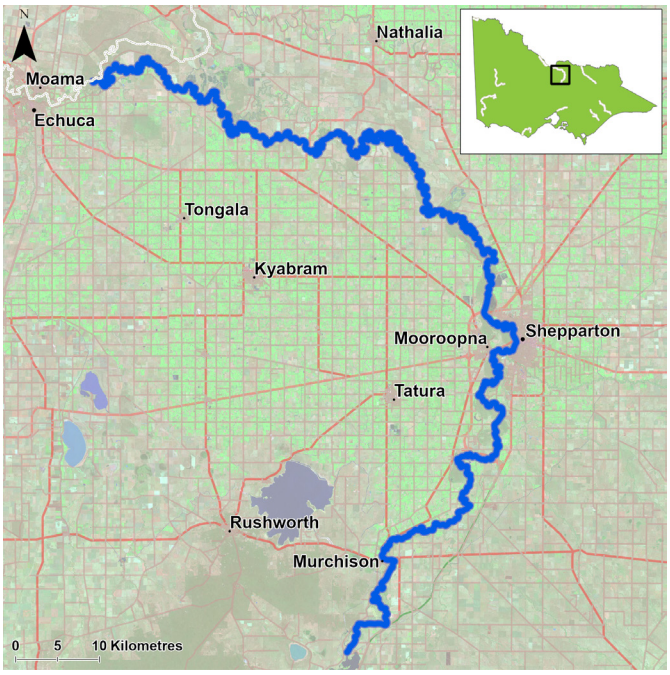


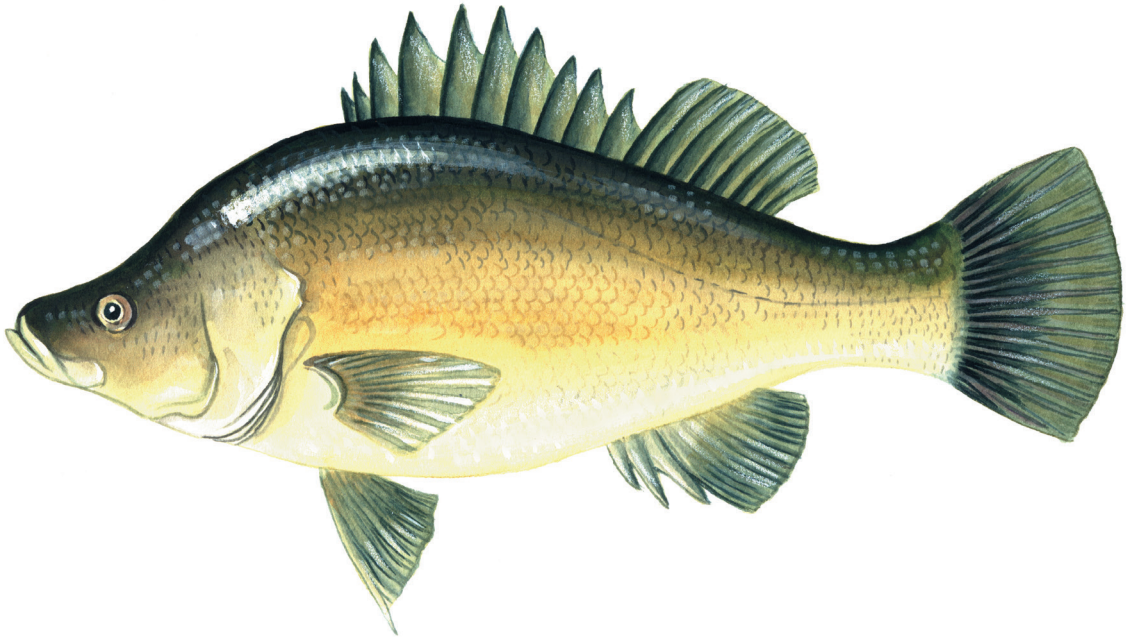
Figure 1. Map showing the section of Goulburn River where NFRC sampling occurs

Figure 2. A juvenile Silver Perch

Figure 3. A Trout Cod

Golden Perch

Macquaria ambigua



Key Health Indicators

- ✗ Recent recruitment
- ✓ Multiple size classes
- ✓ Mature fish present

Monitoring Results	
Total number of fish caught	84
Fish per 1km of waterway	6.54
Largest fish by length (cm)	55.5
Largest fish by weight (kg)	4.10
% of the catch that is legal size	89.3

Lower Goulburn **RECREATIONAL SPECIES**

The abundance of Golden Perch (*Macquaria ambigua*) was consistently relatively high from 2017-19 and 2023, but lower from 2020-22 (Figure 4). Low catches in 2020 through 2022 were likely caused, at least partly, by high flows and associated high turbidity reducing the likelihood of capturing fish. However, flows were high and turbid in 2023, with high abundances recorded. It is possible that the higher flows that resulted in flooding in 2016 and 2022 provided immigration events for Golden perch from the Murray River, resulting in the highest abundances detected in 2017 and 2023 (Figure 4), albeit 2019 also having higher abundances. Adult Golden Perch have been detected in all years of sampling and a large proportion of Golden Perch collected are adults (Figure 4), including 90% in 2023 (Figure 5). Juveniles have been recorded in six of the seven years of sampling (Figure 4). Recruits of this species are difficult to catch using the NFRC survey method and none have been detected in all seven years of sampling (Figure 4). It is worth noting that other surveys have shown that Golden Perch recruitment is low or often zero in the Goulburn River, with less than 20% spawned locally, over 60% were stocked and 20% were migrants into the system[1]. This indicates that natural immigration of adults as well as stocking is maintaining a large proportion of the Golden Perch population within the Goulburn River.

Stocking Fifty-thousand Golden Perch were stocked in 2016; 44,000 in 2017; 59,000 in 2018; 89,950 in 2019; 61,000 in 2020; 115,000 in 2021. No fish were stocked in 2022. These fish were released downstream of Lake Nagambie (where NFRC surveys occur).

Figure 4. The densities of recruits, juveniles and adult Golden Perch for NFRC surveys in the Goulburn River from 2017 to 2023

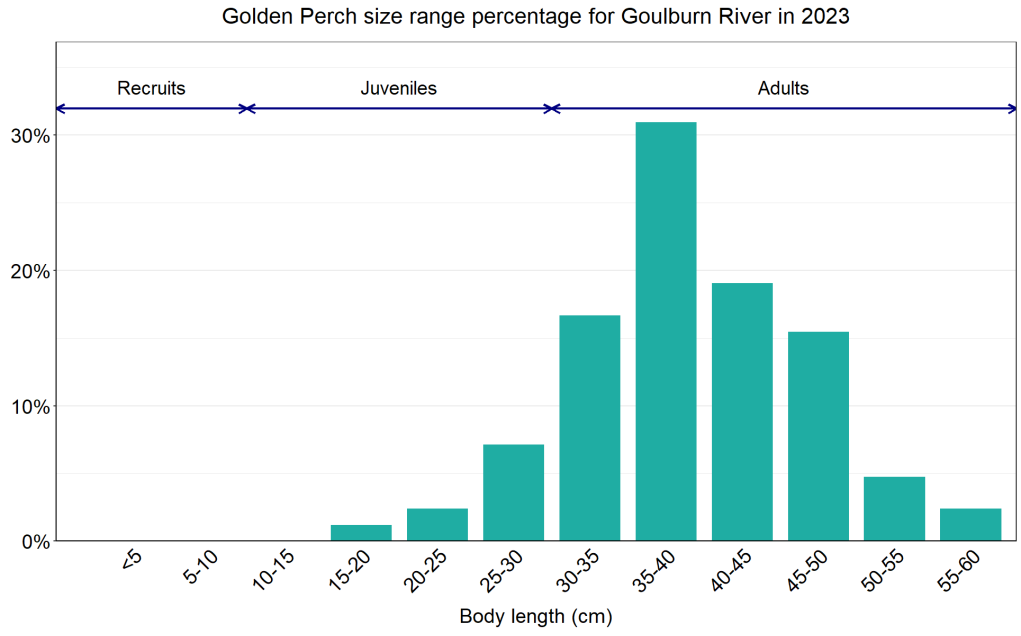
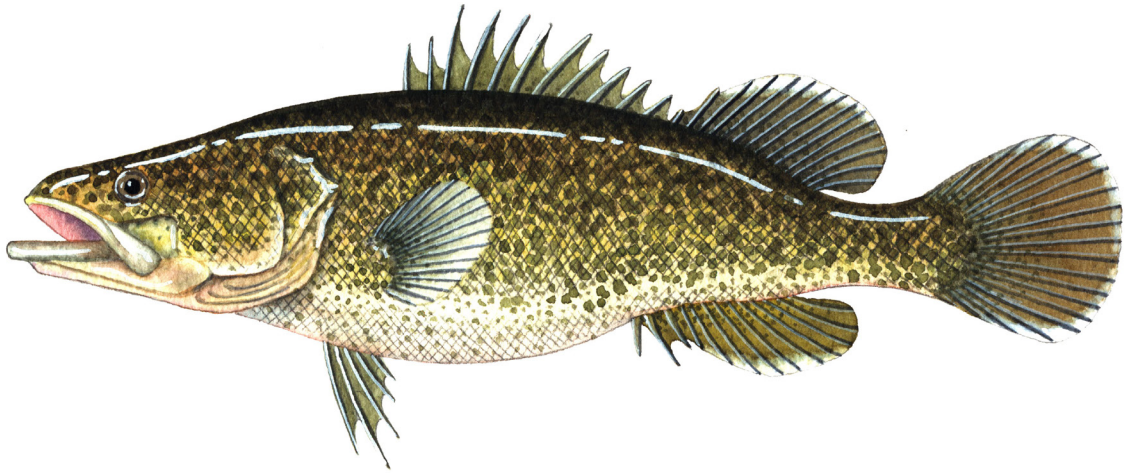


Figure 5. The size range percentage of Golden Perch measured from the Goulburn River during NFRC surveys in 2023

[1] *Tonkin, Z., Kitchingman, A., Ingram, B., Lieschke, J., Koster, W., Lyon, J., Lutz, M. and Pavlova, A. (2019). Smarter stocking: a synthesis of existing data to assess native fish stocking success in Victorian rivers. Unpublished Client Report for the Victorian Fisheries Authority. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.*

Murray Cod

Maccullochella peelii



Key Health Indicators

- Recent recruitment
- Multiple size classes
- Mature fish present

Monitoring Results	
Total number of fish caught	92
Fish per 1km of waterway	7.17
Largest fish by length (cm)	123
Largest fish by weight (kg)	36
% of the catch that is legal size	22.8

Lower Goulburn **RECREATIONAL SPECIES**

Moderate numbers of Murray Cod (*Maccullochella peelii*) were captured in 2023 (Figure 6). The lower abundances in 2020 and 2021 correlate with higher flows and associated high turbidity reducing the likelihood of capturing fish. Multiple size classes including adult, juvenile and young-of-year fish were caught in all seven years (Figure 6). A wide range of sizes was captured in 2023, however the highest proportion of adults were detected in 2023 (Figure 7). A large proportion of Murray Cod in the Goulburn River are from wild spawning. An otolith* study showed that all Murray Cod from the 2016/17 and 2017/18 year classes, and most fish (65%) from the 2018/19 year class were spawned in the river[2]. Similarly, Murray Cod collected from the Goulburn River for the Long-Term Intervention Monitoring (LTIM) project (otoliths collected in 2016 and 2017) showed most were wild fish. This indicates that stocked Murray Cod are making a very small contribution to the Murray Cod population in the Goulburn River.

Stocking

In 2016, 54,000 Murray Cod were stocked; 102,000 in early 2017; 50,000 in late 2017; 40,000 in 2018; 21,000 in 2019; 96,000 in 2020; 17,000 in 2021 and 50,000 in January 2022. No stockings occurred in the first half of 2023. These stockings occurred below Lake Nagambie (where NFRC surveys occur).

**Otoliths are fish earbones*

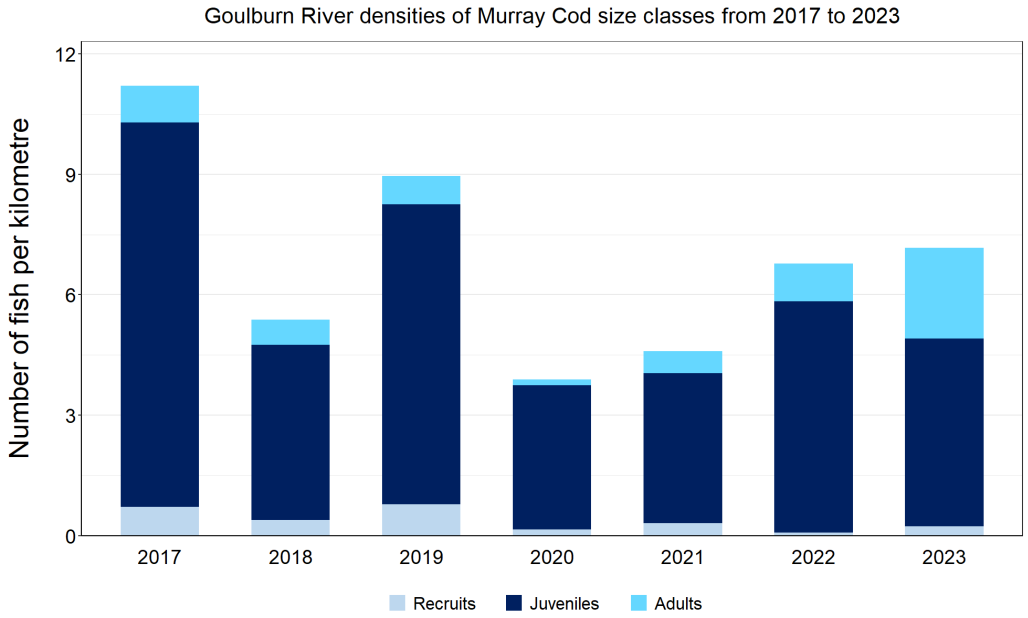


Figure 6. The densities of recruits, juveniles and adult Murray Cod for NFRC surveys in the Goulburn River from 2017 to 2023

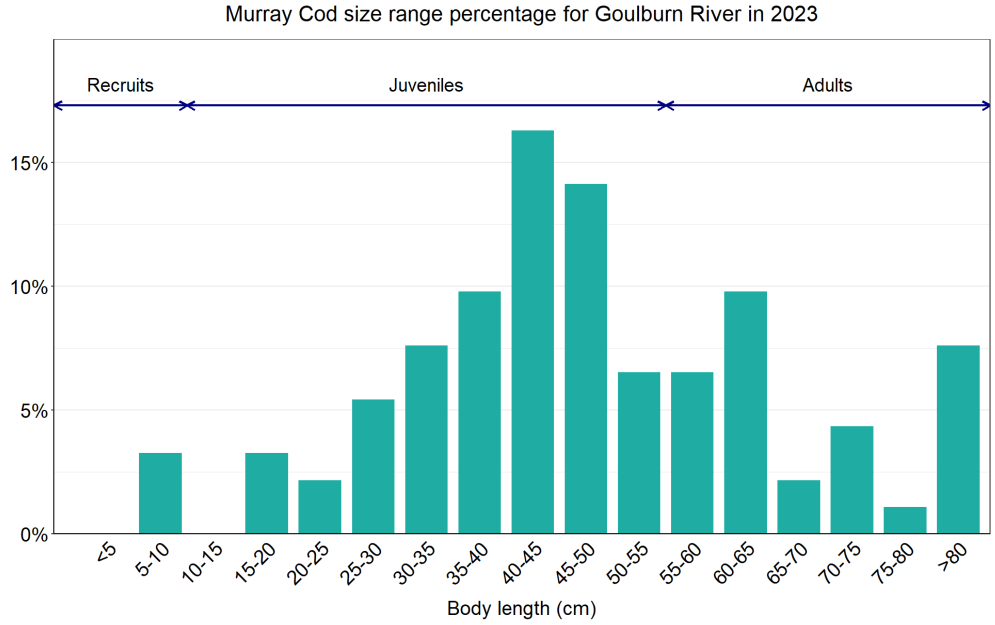


Figure 7. The size range percentage of Murray Cod measured from the Goulburn River during NFRC surveys in 2023

[2] *. Harris, A., Tonkin, Z., Moloney, P., and Woodhead, J. (2020). Using Otolith Microchemistry to Assign Natal Origin to Juvenile Murray Cod. Unpublished Client Report for Water and Catchments, Department of Environment, Land, Water and Planning. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria*

Silver Perch

Bidyanus bidyanus

Key Health Indicators

- Cannot be determined
- Cannot be determined
- Cannot be determined

Monitoring Results	
Total number of fish caught	9
Fish per 1km of waterway	0.70
Largest fish by length (cm)	45.4
Largest fish by weight (kg)	2.95
% of the catch that is legal size	NA

Lower Goulburn **THREATENED SPECIES**

The natural range of Silver Perch (*Bidyanus bidyanus)* includes most of the Murray-Darling Basin, excluding the cool, higher altitude upper reaches of streams. Within the Goulburn River, Silver Perch were historically abundant up to the Nagambie area. Cold water pollution, river regulation and barriers are all factors that have impacted Silver Perch populations, and all of these are relevant to the Goulburn River. The NFRC does not expect to capture enough Silver Perch to measure key health indictors. However, by collecting data for non-recreational species including threatened species such as Silver Perch, it will allow a greater understanding of the current status of the populations providing essential information to the management of these species. Low abundances of Silver Perch have been detected in all seven years with juveniles and adults captured in six of the seven years (Figure 8; Figure 9). Only adults were captured in 2021 (Figure 8). Recruits of this species are difficult to catch using the sampling method used by NFRC and none have been detected in all seven years of sampling. Silver Perch recruitment is low or often zero in the Goulburn River, with 90% of the population classified as migrants (unpublished report to GBCMA).

Stocking

No stocking has occurred.

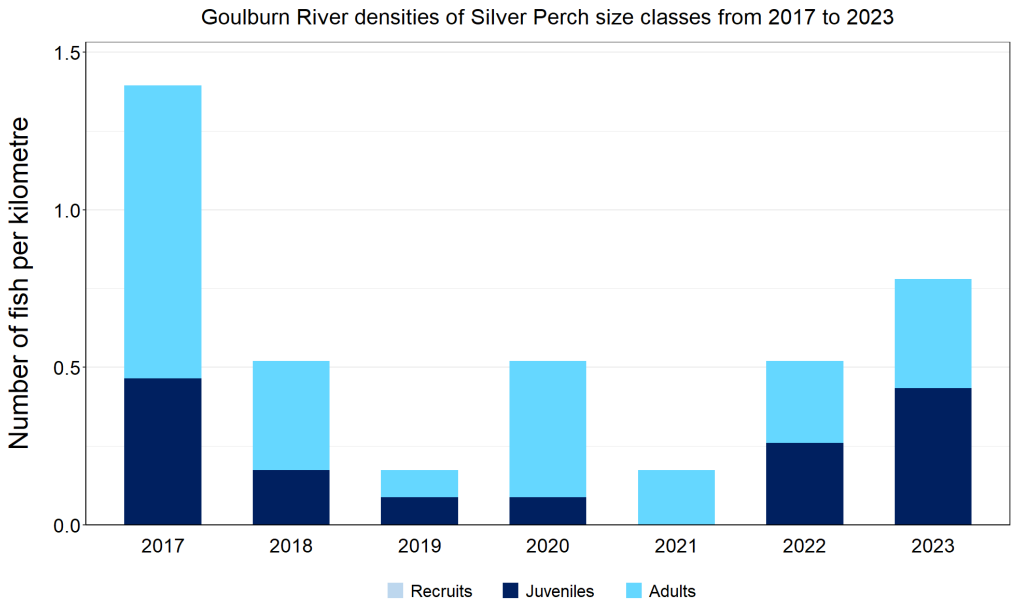


Figure 8. The densities of recruits, juveniles and adult Silver Perch for NFRC surveys in the Goulburn River from 2017 to 2023

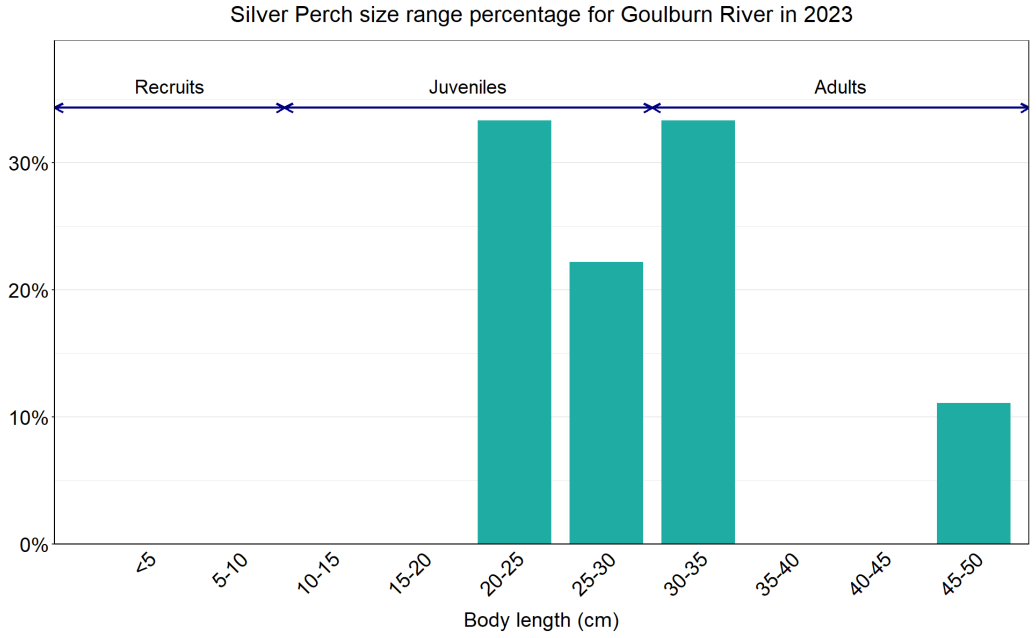


Figure 9. The size range percentage of Silver Perch measured from the Goulburn River during NFRC surveys in 2023

Trout Cod

Maccullochella macquariensis

Key Health Indicators

- ✗ Recent recruitment
- ✓ Multiple size classes
- ✓ Mature fish present

Monitoring Results	
Total number of fish caught	78
Fish per 1km of waterway	6.07
Largest fish by length (cm)	53.6
Largest fish by weight (kg)	1.81
% of the catch that is legal size	NA

Stocking

There has been no stocking below Lake Nagambie (where NFRC surveys occur) since 1997. Between 1993 and 1997, a total of 58,500 fish were stocked from Lake Nagambie to Seymour.

Lower Goulburn | **THREATENED SPECIES**

Trout Cod (*Maccullochella macquariensis*) were absent in surveys downstream of Lake Nagambie from 1982–1983[3], with low numbers detected in 2003-04[4] and low numbers persisting since then[5]. In 2023, Trout Cod abundances were twice as high as any other year of NFRC sampling (Figure 10), largely due to an increase in adults (Figure 10; Figure 11). Abundances in 2018, 2020 and 2021 were lower compared to 2017 and 2019. Recruits have only been detected in 2018 but juveniles and adults have been collected every year (Figure 10). No recruits have been detected in 2017 and from 2021-23. However, 1+ fish were detected in 2022 and 2023, indicating recruitment did occur in 2021 and 2022. Very few Trout Cod have been caught downstream of Shepparton, indicating a restricted distribution between Shepparton and Lake Nagambie. This is consistent with other research, including the Long-Term Intervention Monitoring program. Prior to 2022, both the Flow-MER and NFRC had caught relatively few Trout Cod downstream of Shepparton, indicating a restricted distribution between Shepparton and Lake Nagambie. However, both programs captured increased abundances and from a greater number of sites in 2022. The NFRC program again captured adults and a juvenile downstream of Shepparton in 2023, however the abundances were low and did not have a large impact on the overall increase of abundances observed in 2023. The whole of Murray River monitoring program (River Murray Channel Monitoring Plan[6]) also captured Trout Cod down to Swan Hill in 2022, indicating Trout Cod dispersing throughout 2021 and early 2022.

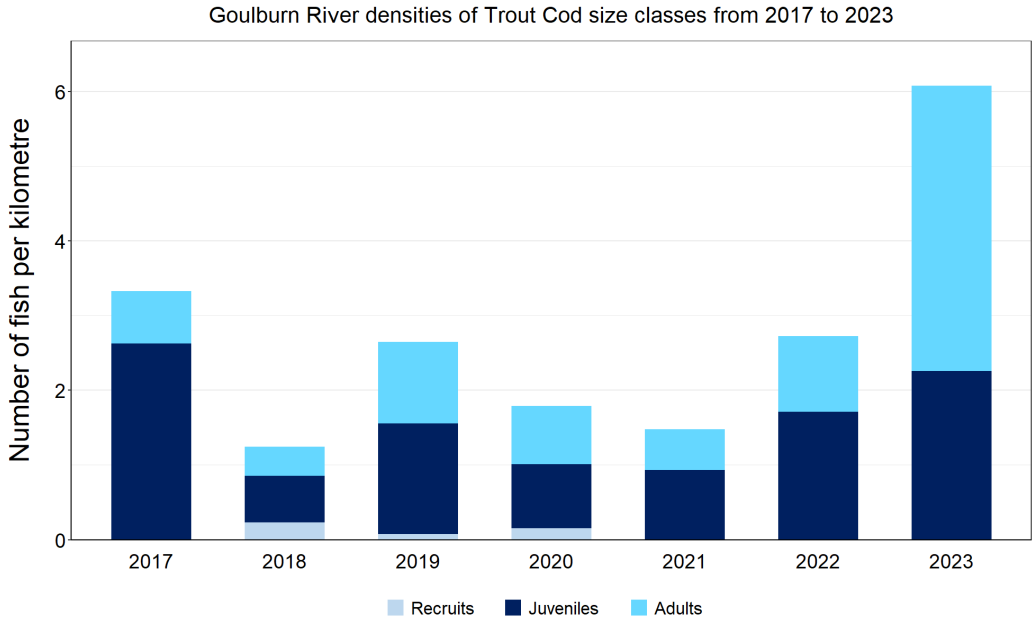


Figure 10. The densities of recruits, juveniles and adult Trout Cod for NFRC surveys in the Goulburn River from 2017 to 2023

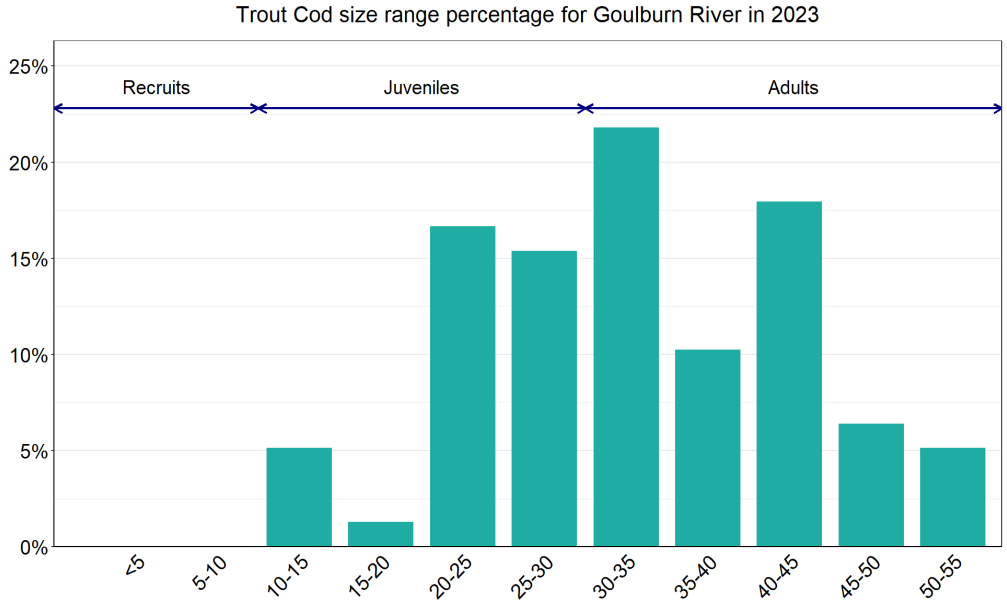


Figure 11. The size range percentage of Trout Cod measured from the Goulburn River during NFRC surveys in 2023

[3] *Brumley et al. (1987). Revision of the conservation status of several species of warmwater native fish after surveys of selected sites in northern Victoria. (1982–1984). Technical Report Series No. 33. Arthur Rylah Institute for Environmental Research, Department of Conservation, Forests and Lands, Shepparton, Victoria.*

[4] *Koster et al. (2012) Status of fish populations in the lower Goulburn River (2003-2012). Arthur Rylah Institute for Environmental Research Unpublished Client Report for Goulburn Broken Catchment Management Authority, Department of Sustainability and Environment, Heidelberg, Victoria.*

[5] *Webb et al. (2021). Commonwealth Environmental Water Office Long Term Intervention Monitoring Project Goulburn River Selected Area Scientific Report 2020-21.*

[6] *River Murray Channel Monitoring Plan. The Department of Agriculture, the Environment and Water, through its Commonwealth Environmental Water Office (CEWO), on behalf of River Murray jurisdictions (via the Southern Connected Basin Environment Watering Committee), has agreed to engage a consortium team, led by CSIRO, to implement the River Murray Channel Monitoring Plan*

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it.

We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

DEECA is committed to genuinely partnering with Victorian Traditional Owners and Victoria's Aboriginal community to progress their aspirations.

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