**Lindsay River/Mullaroo Creek (Lindsay River system) 2023**

***Mallee region***

**This report card summarises the 2023 Native Fish Report Card (NFRC) survey in the Lindsay River system**

**Sites 11, MCMA, Electrofishing**

**Fish found in Lindsay River system for NFRC**

**Target species**

Golden Perch

Murray Cod

Silver Perch

**Non-target species captured since 2017\***

**Large-bodied native species**

Bony Bream

Freshwater Catfish

**Small-bodied native species**

Australian Smelt

Carp Gudgeon

Flatheaded Gudgeon

Murray-Darling Rainbowfish

Unspecked Hardyhead

**Exotic species**

Common Carp

Eastern Gambusia

Goldfish

Redfin

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

LOGOS – ARI, DEECA

**Lindsay River system 2023**

**Fish Community**

**NFRC target species**

**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 Lindsay River system, the target species are Golden Perch, Murray Cod and Silver Perch. Surveys occur in March each year, at 10-13 sites from both the Mullaroo (6-8 sites) and Lindsay (4-5 sites) offtakes with the Murray River upstream of weir seven to the junction of the Lindsay and Murray rivers. The number of sites differs due to the level of collaboration with the Living Murray Project. 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, except Freshwater Catfish which are also captured, measured and weighed.**

**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 | - | - | - |

*Recent recruitment means young-of-year fish*

*\*- cannot be determined due to low abundances*

Silver Perch were historically abundant throughout the Lindsay River system but have experienced dramatic declines across their range. Silver Perch are present in low densities. Overall, the Lindsay River system appears to be maintaining healthy populations of Golden Perch with the Murray Cod population recovering following the 2016 blackwater event.

**Non-target species**

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

**Large-bodied native species**

Other large-bodied species recorded in surveys are Bony Bream and Freshwater Catfish. Bony Bream which are cold water intolerant are common in the lower Murray-Darling Basin, including the Lindsay River system. The species is often in higher abundances in slower flowing habitats. Freshwater Catfish are a lowland species, generally found at altitudes below 200 metres. This species has suffered a decline in distribution and abundance across Victoria. Low abundances of Freshwater Catfish have been recorded from 2018 onwards. In 2021, young-of-year were collected for the first time during NFRC surveys.

**Small-bodied native species**

The small-bodied species Australian Smelt, Carp Gudgeon, Flatheaded Gudgeon and Unspecked Hardyhead are common and are expected to be widespread throughout the Lindsay River system and more broadly within the Murray-Darling Basin. Murray-Darling Rainbowfish are common throughout the Lindsay River system. This species was once widespread in the Murray-Darling Basin, and now has a patchy distribution and a restricted range and is considered threatened in Victoria.

**Exotic fish species**

Common Carp and Goldfish are widely distributed across sampling sites. Eastern Gambusia are not as widely distributed and are more likely to be collected in the slower flowing waters. Redfin are also distributed throughout, but in low abundances.

**Other native species known from the Lindsay River system**

There is a range of other species historically known from this system, although they have not been detected for many decades.

**Other notable species**

Surveys have also recorded Yabbies and Turtle species.

LOGOS – ARI, DEECA, NFRC

**Lindsay River system 2023**

**Environmental and Management Context**



Figure 1. Map showing the section of Lindsay River and Mullaroo Creek where NFRC sampling occurs

**Environment**

A blackwater event impacted the fish population in late 2016. Generally, stream flows were similar during the autumn sampling periods in 2017 to 2022 but were higher in 2023. Prior to 2022 surveys, the Murray River has had varying levels of connectivity with the upper Lindsay River since the 2016 flood. As such, the upstream reaches of the Lindsay River (above the Mullaroo Creek junction) have generally experienced lower flows and water levels since 2017. Working collaboratively with The Living Murray (TLM) Project, the number of sites fished and used in the analysis has varied with 12 sites fished in 2017, 13 in 2018- 2020, ten sites in 2021-22 and 11 sites in 2023. Sites were surveyed by an electrofishing boat in March 2017-22 but were delayed until April 2023 due to flooding. The water turbidity levels were much higher in 2022 and 2023, which likely reduced the efficiency of the electrofishing surveys.

**River rehabilitation efforts in the Lindsay River**

A range of rehabilitation actions to improve the health of the Lindsey River system and its fish community, have been identified within the [Mallee Waterway Strategy 2014-2022](https://urldefense.proofpoint.com/v2/url?u=https-3A__us-2Deast-2D2.protection.sophos.com-3Fd-3Dproofpoint.com-26u--3D-26i-3DNWQ5NmRhNTk1OTdlZTcwZTM1YTg3ZmJj-26t-3DV3d2NHBPMk1YQ2t6SDFTVUpwS2Z0VlVGYVhKUFhITlIwb0JpRWVwQnRHQT0-3D-26h-3D3173ab62a6b14763a2f974543740d8dd&d=DwMFAg&c=JnBkUqWXzx2bz-3a05d47Q&r=4LJQkWQ2ymhi2a_WqRps8-yM9TOpwW2fejjnOU1zMlg&m=2apaXs42fmhjP4tP8we2CsiQDR8P_ezlOXn4c2pwlJk&s=AThP8j). The core current focus involves allocation of water for the environment and improving fish passage. Since 2006, fish monitoring has occurred for the Lindsay, Mulcra, Wallpolla Islands, as part of [The Living Murray](https://urldefense.proofpoint.com/v2/url?u=https-3A__us-2Deast-2D2.protection.sophos.com-3Fd-3Dmdba.gov.au-26u-3DaHR0cHM6Ly93d3cubWRiYS5nb3YuYXUvaXNzdWVzLW11cnJheS1kYXJsaW5nLWJhc2luL3dhdGVyLWZvci1lbnZpcm9ubWVudC9saW5kc2F5LW11bGNyYS13YWxscG9sbGEtaXNsYW5kcy1yZXBvcnQtY2FyZA-3D-3D-26i-3DNWQ5NmRhNTk1OTdlZTcwZTM1YTg3ZmJj-26t-3DRzJNbnBmZEJ2QXlmSzRnK2R2dDZTQlJWcDBOV0wzUDJLTElGYnZVclBuQT0-3D-26h-3D3173ab62a6b14763a2f974543740d8dd&d=DwMFAg&c=JnBkUqWXzx2bz-3a05d47Q&r=4LJQkWQ2ymhi2a_WqRps8-yM9TOpwW2fejjnOU1zMlg&m=2apaXs42fmhjP4tP8we2CsiQDR8P_ezlOXn4c2pwlJk&s=rKOeZFgPDdcuR_Vtb4iVZCc-gGvaFu-W2amn6rmMyVU&e=) Program. The [Mallee Catchment Management Authority](https://urldefense.proofpoint.com/v2/url?u=https-3A__us-2Deast-2D2.protection.sophos.com-3Fd-3Dproofpoint.com-26u--3D-3D-26i-3DNWQ5NmRhNTk1OTdlZTcwZTM1YTg3ZmJj-26t-3DVkxrNS94OWU4UW5GSlIraWtXMW9jS0EzMk14d2o1WTN4ck80bkFEMmxYVT0-3D-26h-3D3173ab62a6b14763a2f974543740d8dd&d=DwMFAg&c=JnBkUqWXzx2bz-3a05d47Q&r=4LJQkWQ2ymhi2a_WqRps8-yM9TOpwW2fejjnOU1zMlg&m=2apaXs42fmhjP4tP8we2CsiQDR8P_ezlOXn4c2pwlJk&s=bs0-nFrKud_lTuF_Gc97AQyKcUVsdEMQX53AHgmEnoE&e=), DEECA and VFA support rehabilitation and management of the Lindsay River and its fish community.

PHOTOS

LOGOS – ARI, DEECA, NFRC

**Golden Perch**

**Lindsay River system, Mallee region**

**Key Health Indicators**

Recent recruitment No

Multiple size classes Yes

Mature fish present Yes

**Monitoring Results**

Total number of fish caught 45

Fish per 1km of waterway 3.24

Largest fish by length (cm) 50.8

Largest fish by weight (kg) 2.74

% of the catch that is legal size 57.8

**The abundance of Golden Perch (*Macquaria ambigua*) appears to have declined after the higher abundances in 2017 and 2018 and were consistent aside from the relatively low catch rates in 2022 (Figure 2). An increase in juvenile abundances in 2023 contributed to the higher catch rates in 2023 compared to 2022. It is likely that the 2016 and 2022 floods attracted juvenile Golden Perch into the system, with abundances of juveniles in the upper Lindsay system (above the Mullaroo Creek junction) being highest in 2017 and 2023 when flows were high. Recruits were detected in 2017 and 2022. In 2022 the small Golden Perch which were present throughout the study areas were spawned in the Darling River (confirmed using otolith chemistry) but had dispersed into and were growing in Victorian Mallee floodplains. The movements of these Golden Perch have also been tracked using acoustic telemetry and the results indicate that while some fish have moved out of the area, most fish have remained within Lindsay Island despite the 2022-23 flooding. A large proportion of Golden Perch collected have been adults, however, a higher proportion of juveniles (42%) was observed in 2023 (Figure 2; Figure 3). The 58% legal (adult) Golden Perch is the lowest percentage across the five northern rivers that monitor them. Other fish surveys in the area, supported by the Mallee CMA found Golden Perch recruits in the Lindsay River and in wetlands in the Lindsay River system in 2022 and 2023 (unpublished data). Golden Perch are consistently captured in the Lindsay-Mullaroo system.**

**Stocking**

No stocking has occurred.

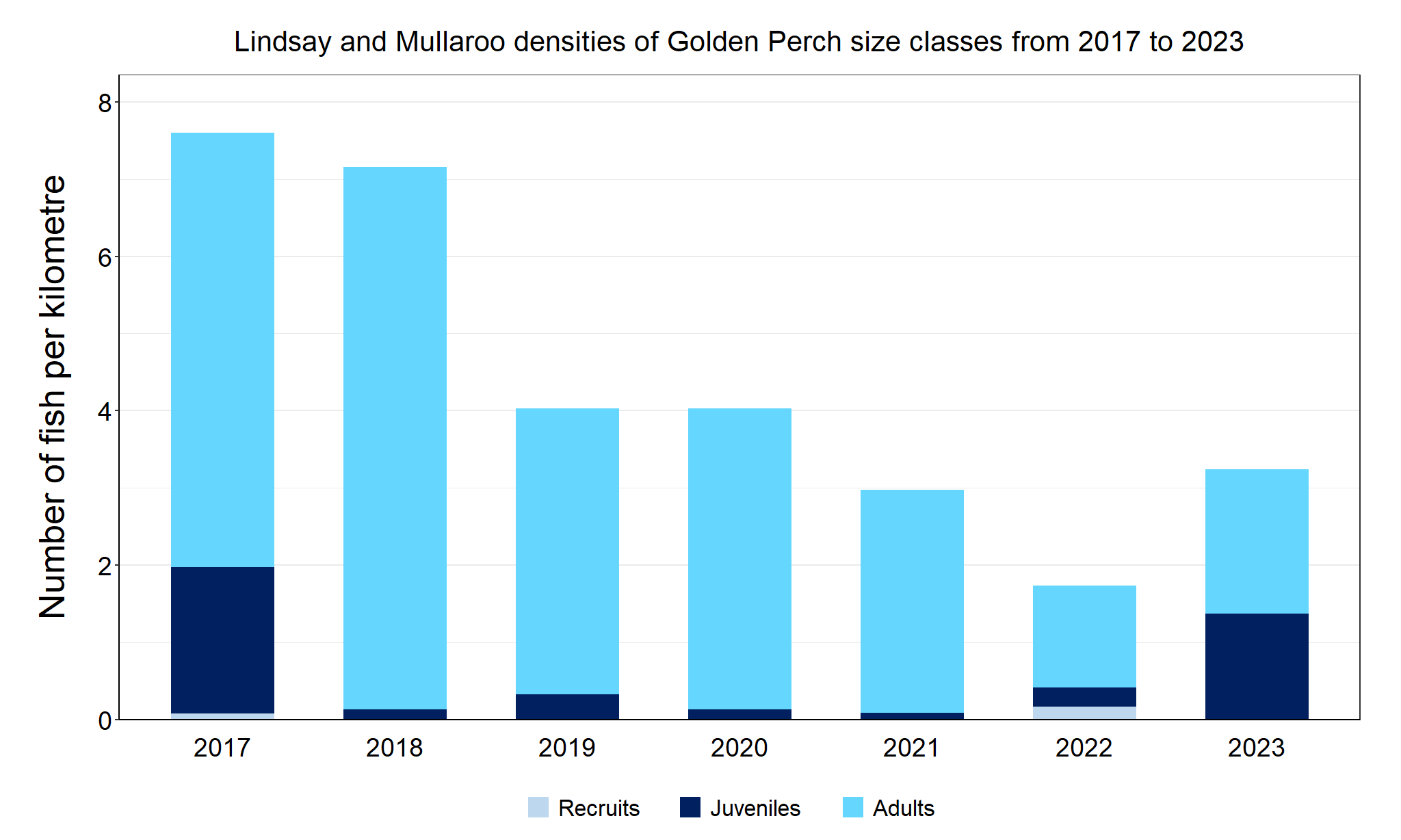


Figure 2. The densities of recruits, juveniles and adult Golden Perch in the Lindsay River system from 2017 to 2023

A graph of a number of people

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Figure 3. The size range percentage of Golden Perch in the Lindsay River system in 2023

**Murray Cod**

**Lindsay River system, Mallee region**

**Key Health Indicators**

Recent recruitment Yes

Multiple size classes Yes

Mature fish present Yes

**Monitoring Results**

Total number of fish caught 20

Fish per 1km of waterway 1.44

Largest fish by length (cm) 114

Largest fish by weight (kg) 25.9

% of the catch that is legal size 35.0

**The abundance of Murray Cod (*Maccullochella peelii*) in the Lindsay River system declined dramatically following the 2016 blackwater event either through emigration or mortality**2**. Only one Murray Cod was captured in 2017, with abundances increasing from 2018 to 2020 before declining in 2021, 2022 and 2023 (Figure 4). The decreases in abundances in 2021 and 2022 are largely due to lower abundances of juvenile fish (10­55 cm). In 2020, some Murray Cod were aged, and the 2017 spawning made up approximately 50% of Murray Cod in the system3. Murray Cod can reach maturity in 4­5 years. The highest abundances of adults collected were in 2021 and 2022, indicative of fish surviving and reaching maturity following the 2017 spawning event. From 2018­23 multiple size classes including mature and young-of-year fish have been recorded, except for 2022 where no recruits were recorded (Figure 4). The NFRC has set maximum size thresholds for recruits for Murray Cod across all priority rivers as 10 cm (based on previous research). In the Lindsay River system in 2018 approximately 71% of fish captured were 9­15 cm TL, representative of young-of-year fish spawned in spring 2017 (a subsample was aged by otoliths\*), indicating a faster growth rate following the 2016 blackwater event**2**. As a result, the abundance of recruits is most likely under-represented in Figures 4 and 5 and despite not catching a Murray Cod classified as a recruit in 2022, they were likely present. The 2022 floods also caused a minor blackwater event with Murray Cod and Common Carp found dead in the system (ARI unpublished data). There is a distinct gap in 20­50 cm fish in 2023 (Figure 5), which corresponds with the gap between 15­35 cm detected in 2022. The first Murray Cod detected during the program from the Lindsay River was recorded in 2022, with three Murray Cod detected in 2023 (a recruit, a juvenile and an adult). This suggests that increased flows in 2021 and 2022 have increased Murray Cod dispersal within the system.**

**Stocking**

Twenty-seven thousand Murray Cod were stocked into the Lindsay River in March 2021. Note this stocking occurred after the 2021 surveys.

*\*Otoliths are fish earbones*

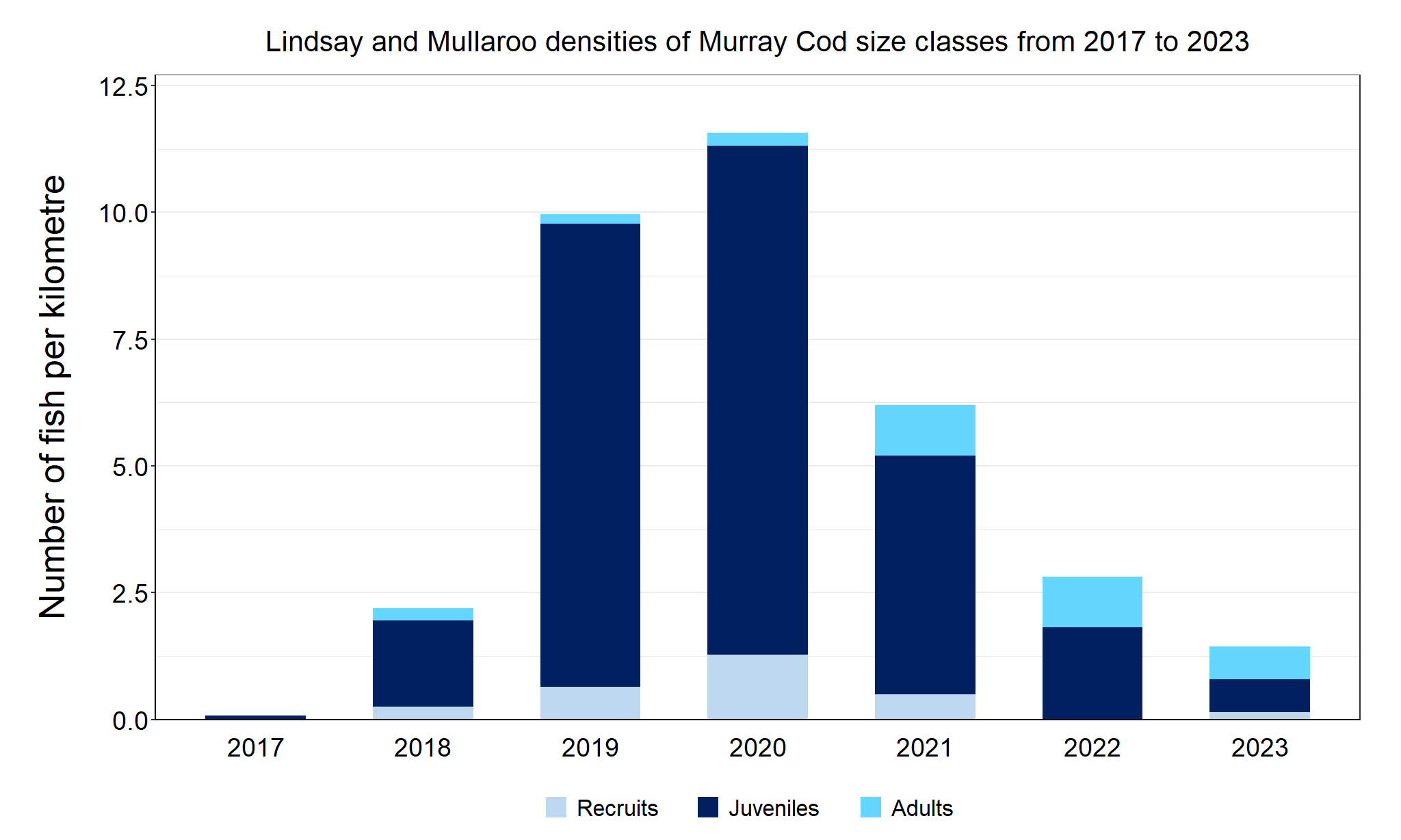


Figure 4. The densities of recruits, juveniles and adult Murray Cod in the Lindsay River system from 2017 to 2023

A graph with numbers and a bar

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Figure 5. The size range percentage of Murray Cod in the Lindsay River system in 2023

2. Tonkin, Z., O’Mahony, J., McMaster, D., Raymond, S., Moloney, P. and Lyon, J. (2017). Fish movement in the Lindsay and Mulcra Island anabranch systems: 2017 Progress report. Unpublished Client Report for the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research. Department of Environment, Energy, Environment and Climate Change Group, Heidelberg, Victoria.

3. Tonkin, Z., O’Mahony, J., Kitchingman, A., Moloney, P., Raymond, S., Hackett, G., and J. Lyon (2020). Murray cod movement and population structure in the Lindsay Island anabranch system: 2020 Report. Unpublished Client Report for the Mallee Catchment Management Authority. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

**Silver Perch**

**Lindsay River system, Mallee region**

**Key Health Indicators**

Recent recruitment Cannot be determined

Multiple size classes Cannot be determined

Mature fish present Cannot be determined

**Monitoring Results**

Total number of fish caught 0

Fish per 1km of waterway 0

Largest fish by length (cm) NA

Largest fish by weight (kg) NA

% of the catch that is legal size NA

**The natural range of Silver Perch (*Bidyanus bidyanus*) includes most of the Murray-Darling Basin, excluding the cool, higher altitude upper reaches of streams. River regulation and barriers have been listed as factors negatively impacting Silver Perch populations, with these relevant to the Lindsay River system. While the NFRC only expects to capture low numbers of this species, the monitoring can provide a greater understanding of the current status of the populations which is essential to inform management of the species. Due to the low abundances of Silver Perch collected during NFRC the key health indicators cannot be measured. No Silver Perch were detected in 2023, though low abundances have been detected in all six years previous (Figure 6). The Silver Perch detected are a mixture of recruits (2020), juveniles (2017, 2019, 2021 and 2022) and adults (2018–19 and 2021–22 (Figure 6). Recruits of this species are difficult to catch using this sampling methodology. Recruits were only detected in 2020 suggesting spawning success in 2019. As Silver Perch are only detected in low abundances, it cannot be determined whether the 2022 blackwater (hypoxia) event impacted the population. Silver Perch are a highly mobile species with previous studies demonstrating positive impacts of high flows and flooding on their survival, growth and condition3,4. Whilst Silver Perch have been shown to benefit from flow events, even if those flow events are associated with hypoxia, in systems or circumstances where they cannot move, they are susceptible to hypoxia5.**

**Stocking**

No stocking has occurred.

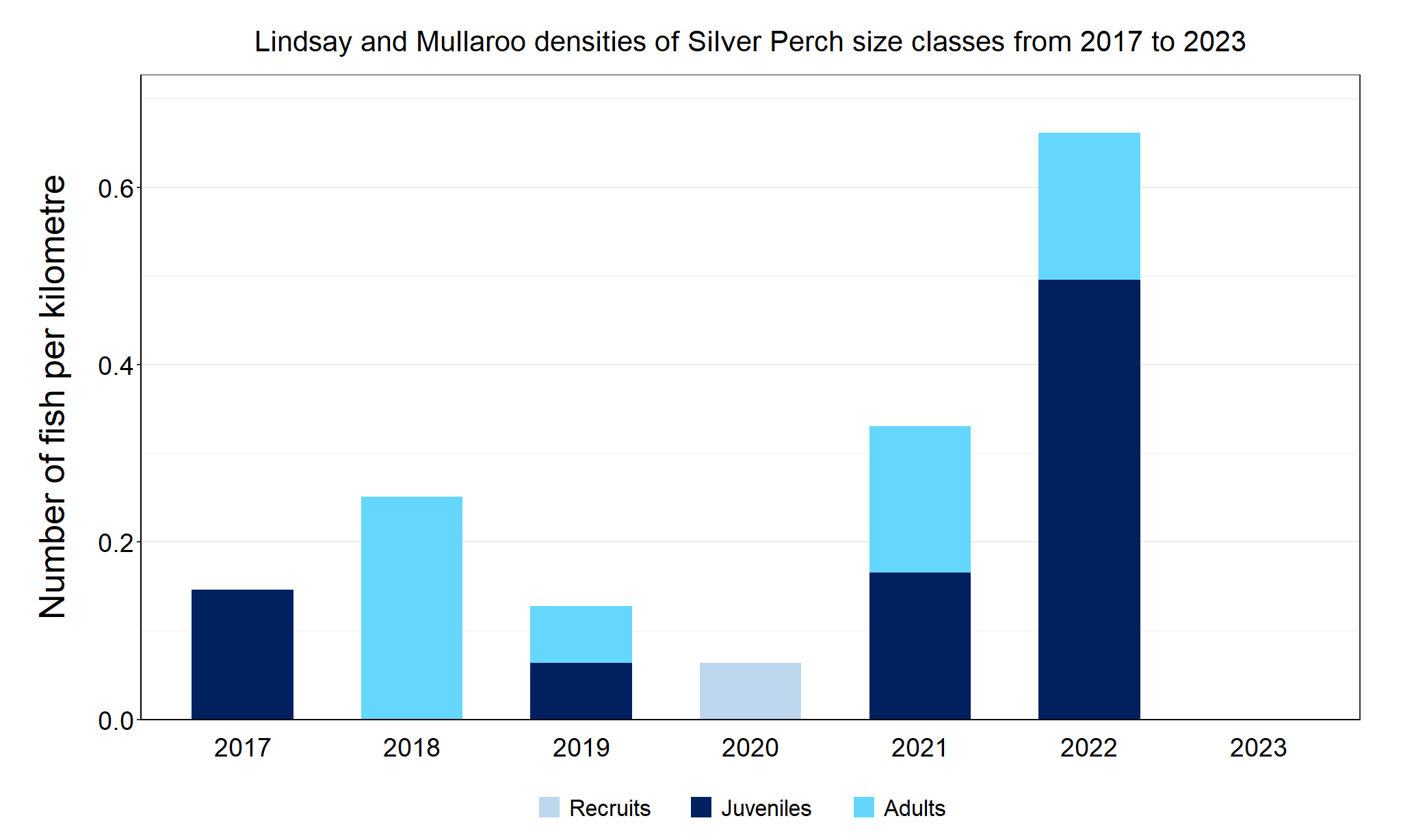


Figure 6. The densities of recruits, juveniles and adult Silver Perch in the Lindsay River system from 2017 to 2023

4. Tonkin, Z., Stuart, I., Kitchingman, A., Jones, M., Thiem, J., Zampatti, B., Hackett, G., Koster, W. and Koehn, J. (2017). The effects of flow on silver perch population dynamics in the Murray River. Arthur Rylah Institute for Environmental Research. Technical Report Series No. 282. Department of Environment, Land, Water and Planning, Heidelberg, Victoria

5. Tonkin, Z., Stuart, A. Kitchingman, J. D. Thiem, B. Zampatti, G. Hackett, W. Koster, J. Koehn, J. Morrongiello, M. Mallen-cooper and J. Lyon (2019). Hydrology and water temperature influence recruitment dynamics of the threatened silver perch *Bidyanus bidyanus* in a regulated lowland river. *Marine and Freshwater Research,* **70**: 1333-1344.

6. Thiem, J. D., L. J. Baumgartner, B. Fanson, A. Sadekov, Z. Tonkin and B. P. Zampatti (2022). Contrasting natal origin and movement history informs recovery pathways for three lowland river species following a mass fish kill. *Marine and Freshwater Research*, **73**: 237-246

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.

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