



Lower Murray River

Quarterly newsletter






Issue 17: July to September 2023

Welcome to issue 17 of the Lower Murray newsletter, where we provide updates on our work monitoring ecological responses to Commonwealth environmental water delivery in the Lower Murray.

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Project updates

-  Otolith-based age determination indicated the samples of small golden perch collected during autumn 2023 were made up of 0+ and 1+ year old fish. Murray cod ageing confirmed all fish collected were young-of-the-year (YOY, 0+). Interestingly, the sizes of YOY Murray cod were larger this season (up to 168 millimetres total length), presumably due to higher productivity promoted by high flows.
-  The Lower Murray team had a strong presence in Canberra for the Flow-MER Annual Forum, held on 15 and 16 August during National Science Week. Seven members of the team participated in group discussions and George Giatas presented the research outcomes on the ontogenetic diet shifts by Murray cod in the Lower Murray River.
-  Luciana Bucater, the Lower Murray Community Engagement and Communications coordinator, won the Delivering Better Outcomes for Aboriginal Communities category at the 2023 PIRSA Staff Excellence Awards. This award was granted based on the Indigenous Ecology in Action (IEA) workshops co-run by the South Australian Research and Development (SARDI) team and Calperum Station and funded under the Commonwealth Environmental Water Holder's (CEWH) Flow-MER program.
-  During the Riverland Field Days in September, we received many enquires about an isolated mass fish kill of juvenile carp, which occurred in shallow areas of Lake Bonney at Barmera. Our team didn't hesitate in providing service to the community. While in the region, we took water quality measurements and assured the locals that the fish kill was not related to poor water quality.
-  The Lower Murray team (SARDI consortium) has won the tender for the services to CEWH Flow-MER2.0 in the Lower Murray and Coorong, Lower Lakes and Murray Mouth Area. We are looking forward to working with the Knowledge Exchange, Basin-scale and other area-scale teams to shape out the Flow-MER2.0 plans in 2023-24. The program will be implemented from 2024-25 to 2028-29, with reporting to be completed in 2029-30.



George Giatas presenting at the Flow-MER Annual Forum.



Luciana Bucater with her PIRSA Staff Excellence Award.

Diet of Murray cod and basal carbon sources

Murray cod is one of several native fish species impacted by river fragmentation, altered flows and a lack of fast flowing habitat in the Lower Murray. Despite the population's decline, Murray cod spawning occurs annually between October and December in this part of the River.

Although the spawning occurs irrespective of river flow, recruitment appears to be positively related to flows. For this reason, one of the objectives of delivering water for the environment is to support the recruitment of Murray cod.

While we know flow is important, there is little knowledge about the best way to deliver flows to support the survival and growth of Murray cod larvae and juveniles.

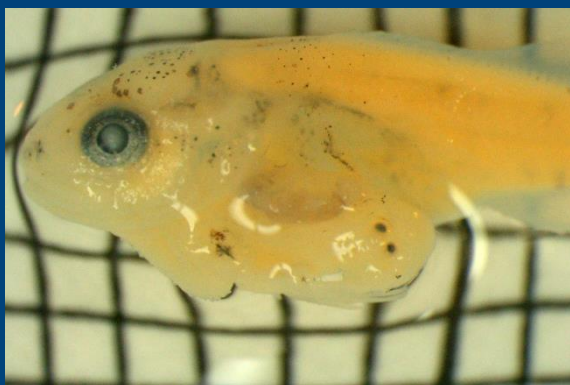
For six years from 2014/15 to 2020/21, the Lower Murray team investigated the diet of early life stage Murray cod, aiming to identify and understand diet and food sources which support Murray cod survivorship past sensitive life stages into population recruitment.

The study was designed to answer the following questions:

- What is the diet of larval and juvenile (≤ 1.5 years) Murray cod?
- What basal components of the food web support the growth of juvenile Murray cod? Is it internal (autochthonous) basal sources like phytoplankton or external (allochthonous) basal sources like floodplain trees that support Murray cod growth?
- How do diet and these basal components vary with flow?

To find out, we used a combination of techniques, including:

- traditional microscopy and DNA metabarcoding of Murray cod gut contents to assess diet and prey selectivity/preference
- a carbon isotope approach involving amino acids to trace carbon flow in food webs
- a modelling approach that uses data collected through this research project and others to test flow and trophic hypotheses linking to Murray cod recruitment.



Murray cod larvae being dissected for gut-content. The two eyes of a shrimp can be seen in the stomach of this fish.



Copepods extracted from the gut of a Murray cod larvae.

Key findings

Murray cod larvae (approximately < 20 days old) relied on a variety of food sources over the sampling period.

Larvae diet largely consisted of micro crustaceans (e.g. copepods) and rotifers but varied among years. This indicates their diet is flexible and can adjust to the food sources available under different flow conditions.

The diet of juvenile Murray cod (between 60 days and 18 months old) was predominately made up of decapod crustaceans:

- Australian glass shrimp (*Paratya australiensis*), which grows to about 3 centimetres
- Long armed freshwater shrimp (*Macrobrachium australiense*), which grows to about 5 cm
- Yabby (*Cherax destructor*), which commonly grows to 10-20 cm.

As the juveniles aged, their diet shifted from the smaller decapods to the larger decapods.

The diet of ~150-day-old juvenile Murray cod remained consistent over from 2015 to 2021, indicating that decapods are an important primary food source under all flow conditions.

During relatively low flow years (2019–21), the carbon that supported the growth of juvenile Murray cod came from multiple sources. Most of the carbon came from within the river, including periphyton (a mix of material that grows on submerged surfaces) and diatoms (micro-algae). There were also considerable carbon inputs from outside of the water from river red gum leaves, reeds, sedges and rushes.

This project has improved our understanding of the Lower Murray food web as it relates to Murray cod. This includes identification of dominant prey items for different early life stages.

Managing water for the environment to support these food sources may be important to support survival of Murray cod larvae and juveniles. The flow-ecology relationships for many of these species, however, are not well known yet.



Small juvenile Murray cod collected for analysis.



Long armed shrimp, *Macrobrachium australiense*.

Engagement and communications updates

- For the second consecutive year, the Inland Waters and Catchment Ecology team, joined the Department of Primary Industries and Regions' (PIRSA) stall during the 64th Riverland Field Days (RFD) and displayed Frank, our largest electrofishing boat. The boat caught many people's eyes and was displayed next to the Marine Safety Boat, the Fisheries Can-Am vehicle and various fishing traps, such as examples of permitted and prohibited yabby traps. Fishcare volunteers were also there educating the public and helping us promoting the Flow-MER monitoring program activities. Associate Professor Qifeng Ye did a radio interview with ABC Riverland to talk about boat electrofishing and how it has been applied to support research, for example, under Flow-MER to inform the delivery of water for the environment in the Lower Murray. A total of 450 people walked through PIRSA's stall - many spoke to us and learned about SARDI's research.
- We also took the opportunity to promote the next Electrofishing Field Demonstration Day which is planned for late February-early March. Expressions of interest were collected during the RFD.



Qifeng Ye being interviewed by Riverland ABC radio.



David Short showing Frank, SARDI's electrofishing boat and, explaining how it works.

What's next

- Reporting on the results of the 2023-24 season is on the cards for the Lower Murray team. It is also time to calibrate our instruments and prepare our gear for next season's field work, most of which starts in early October. Stream metabolism has already started.
- The field team will be heading out in late October to continue the stream metabolism data collection and zooplankton sampling and will be starting the larval fish sampling. If the flows over the South Australia border remain over 20 GL/day, we may expect to collect native perch eggs and hopefully larvae in our samples.

For more information about the work we do, visit our [webpage](#) and follow us on [Facebook](#) or [Twitter](#).

