Lower Murray Newsletter

Issue 1

These quarterly newsletters will bring updates of the work we are doing to monitor the outcomes of Commonwealth environmental water delivery in the Lower Murray system.

In this issue

Program introduction

The Water Act 2007 and the Basin Plan (2012) contain some provisions of water management to protect and restore the environmental assets of the Murray-Darling Basin (MDB). Monitoring and evaluation are key to measuring success and supporting efficient use of water for the environment.

In 2014, the Commonwealth Environmental Water Office (CEWO) commenced monitoring and evaluation projects at seven Selected Areas and at Basin-scale (Long-term Intervention Monitoring: LTIM) and Environmental Water Knowledge and Research (EWKR). Currently, CEWO's Monitoring, Evaluation and Research (MER) is extending both previous project activities (until 2022).

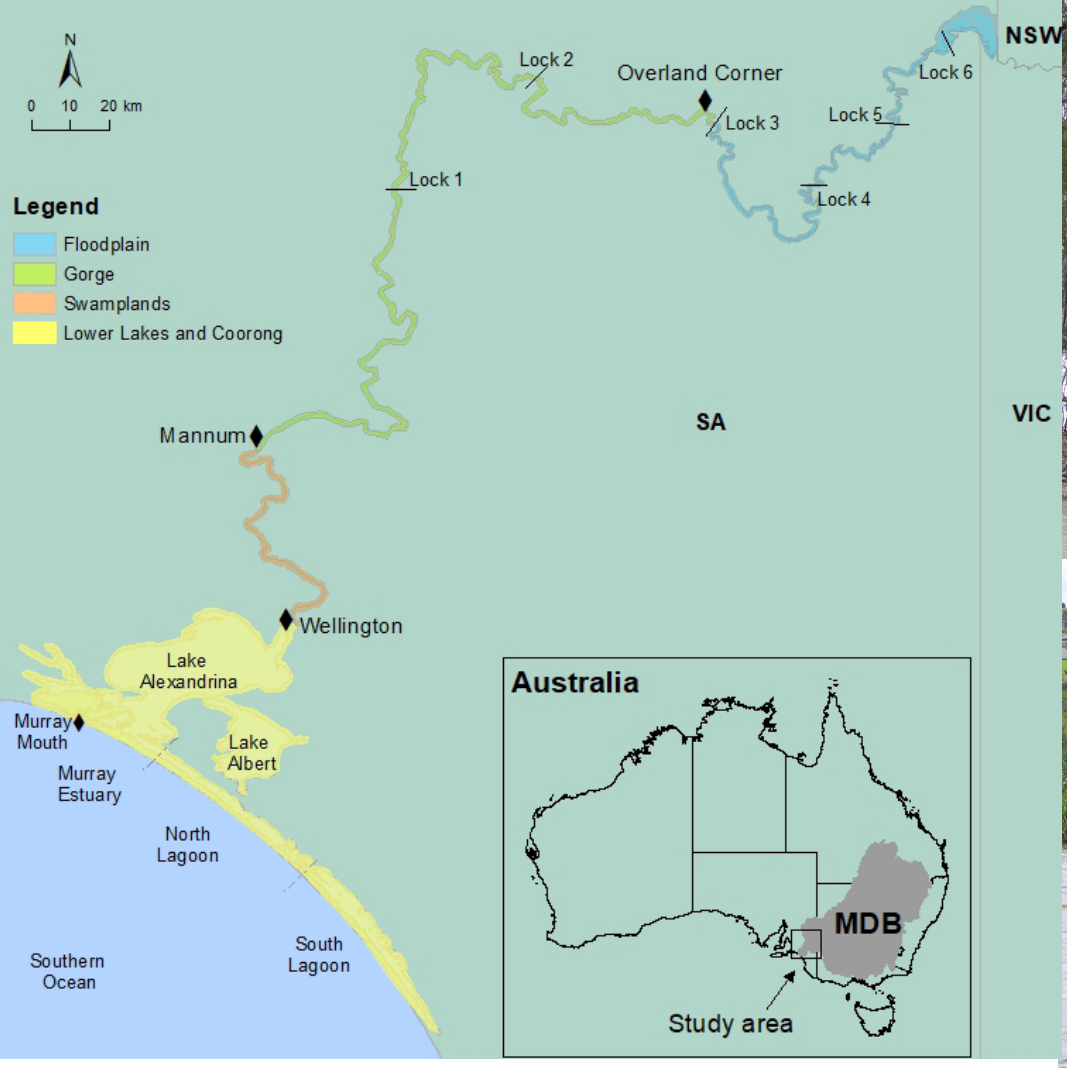
The overall aim of CEWO's MER project is to address the following question:

What did Commonwealth environmental water contribute to water quality, ecosystem function, biodiversity and population resilience?

Our team

Our South Australian Research and Development Institute (SARDI) leads the Lower Murray Selected Area team, which involves research partners from the University of Adelaide, the University of Western Australia, In Fusion Consulting and Wetland Research and Management. We conduct field sampling and measurements to collect on ground data/information and interpret biological responses to flow and environmental water deliveries. Modelling is also conducted to evaluate specific outcomes.

Our quarterly newsletters will bring updates for the Lower Murray Selected Area. Information about the whole Basin and seven Selected Areas can be found on the Department of the Environment and Energy website.



Photos (left to right, then down): 1. Map of Lower Murray showing the different geomorphical zones. 2. Floodplain region (near Lock 6). 3. Swampland zone. 4. Limestone cliffs in the gorge zone (photo: SARDI). 5. Flows over the barrages from the Lower Lakes into the Coorong. (All photos: SARDI)

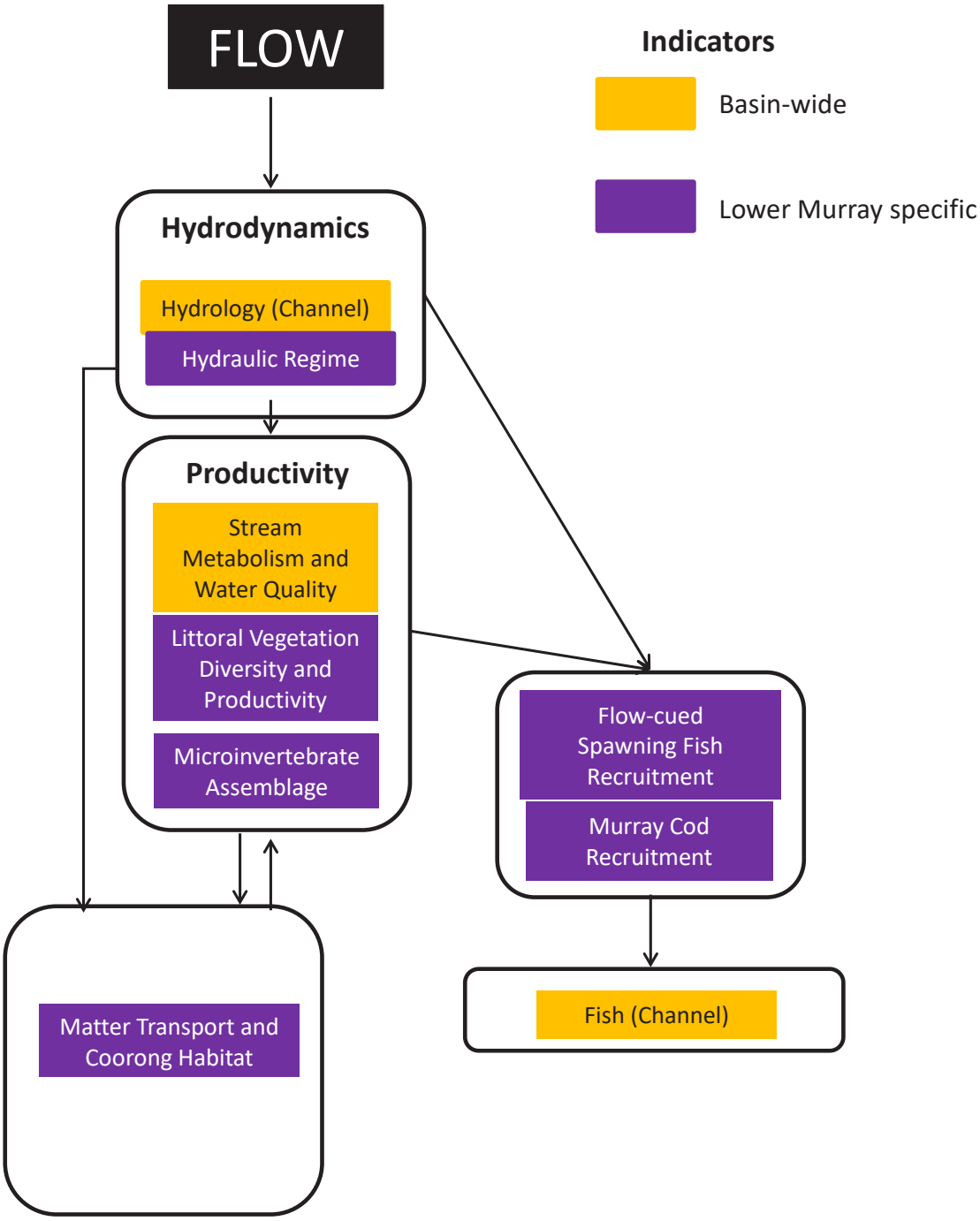
Where are we monitoring?

Our monitoring focuses on the main channel of the Lower Murray River between the South Australian border and Wellington, with one modelling component extending to the Lower Lakes and Coorong. The study area covers three different zones (floodplain, gorge and swamplands) and the Lower Lakes and Coorong (Wellington to Murray Mouth) (see map).

This part of the river is complex and includes the main river channel, anabranches, floodplain/wetlands, billabongs and stream tributaries. These diverse habitats support important water dependent plants and animals, including species requiring protection under state and federal legislations (e.g. Murray cod, Murray hardyhead, southern bell frog and various migratory waterbirds species).

What do we monitor?

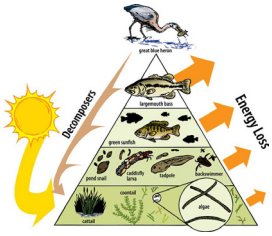
Our team measures how environmental water delivery influences flow regime and ecological responses. We look into how flow, including environmental water, improves riverine hydrodynamic conditions which in turn affect physical/chemical processes, including the transport of salt, nutrients and phytoplankton through the system and how they are exported to the Southern Ocean. In addition, we monitor how flow influences river productivity (stream metabolism and water quality), littoral vegetation abundance and diversity and microinvertebrate assemblage, which are important to support aquatic food webs in the Lower Murray. We also investigate how river flow regime and productivity influence fish spawning and recruitment, focusing on Murray cod and golden perch.



What have we seen 2014 - 2018

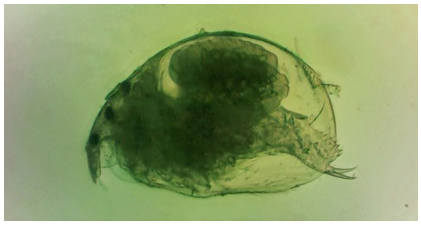
Increase in “flowing water” habitat and more variable water levels. More flowing water benefits native plants and animals that are adapted to a riverine environment. Variable water levels generally improve bank vegetation health and increase the diversity of biofilms, which is a key component of riverine food webs.

Maintenance of oxygen in the water above the required levels for aquatic animals (>5 mg/L during dry years), particular during the main reproductive season of many species (spring-summer).



Increased primary production/consumption and transport of nutrients and phytoplankton in the river channel. Greater primary production provides more food to aquatic food webs (e.g. for shrimps and fish). Downstream transport of food resources also benefit food webs in the Lower Lakes and the Coorong.

Maintenance of flows over the barrages to the Coorong, keeping a connection between the river and the Coorong estuary to support a functioning river system. Barrage releases also reduced salinity in the Coorong, providing improved habitats for estuary species, and removed excess salt from the Basin. In low flow years, environmental flow delivery had contributed significantly to salt export (64-87%).



The transport of microinvertebrates (zooplankton) from upstream sources to the Lower Murray, contributing to increased species diversity and potentially providing a more diverse food source for fish.

Spawning of golden perch in the Lower Murray River, however with no evidence of successful recruitment (survival to juvenile stage).

Small Murray cod in the Lower Murray River were detected in four consecutive years (2015–2018). While the reasons for improved recruitment are unclear, this is a promising sign of improving population health of Murray cod in this region.

Highlights of the past three months

Over the last three months, most of our team members have been gearing up for the start of the 2019-20 field season. We say most of our team because some researchers have already rolled up their sleeves and started. Fish researchers have been trapping lampreys on the Murray barrages and detected great movement of this migratory fish species facilitated by the winter-spring flows, supported by return flows from Goulburn environmental watering (see complete story below). In September 2019, the stream metabolism/water quality team went out to deploy water quality loggers which are already collecting data. During this period, our team is also working on planning detailed engagement and communication activities for 2019-20. This aims to better engage the interested communities, Aboriginal and recreational fishing groups in the work we do, improve knowledge exchange and support environmental water management to achieve best outcomes.

Lamprey migration in the Murray River

Pouched and short-headed lamprey are the only two anadromous fish species in the Murray-Darling Basin. Much of the lifecycle is spent at sea, however, young adults migrate upstream to freshwater, usually mid-winter/spring, to breed. To stimulate migrations (e.g. olfactory cues), river flow and connectivity are essential. In recent years, the delivery of environmental water during the upstream migration season and fishway construction have potentially contributed to increased movement of lamprey, expansion of distribution and improved recruitment.

During winter-spring 2019, we assessed the abundance of upstream migrating lamprey at the Murray Barrages as part of the MER project. The monitoring is also supported by the Murray-Darling Basin Authority (MDBA) and South Australia Department of Environment and Water (SA DEW). So far, across ~20 nights of monitoring of eight different fishways on the Murray Barrages, 44 pouched lamprey and 8 short-headed lamprey have been captured and implanted with PIT (passive integrated transponder) tags. The majority have been captured from fishways on Goolwa Barrage (40), with smaller numbers from Mundoo (10) and Tauwitchere barrages (2), whilst an individual pouched lamprey was observed passing a fishway on Boundary Creek Barrage. The implanted PIT tags assist in monitoring subsequent movement through upstream fishways on the River Murray. To-date, 13 pouched lamprey have migrated at least as far as Lock 1 (278 km upstream), and two of these have recently passed through Lock 5 (562 Km upstream). Further movements are expected to be detected on the Murray fishways as lamprey migration extends into early summer.

Pouched lamprey in a fishway trap at Goolwa Barrage in August 2019.

Engagement and communications planning

Our team are planning the extension of the engagement and communication services in the Lower Murray River. The activities planned for 2019-20 aim to ensure that the broader community are effectively informed about project activities and outcomes from environmental watering, and to promote information exchange between parties involved in environmental watering and monitoring/ research.

The current newsletter is one of the products that we use to improve communication of project activities and research findings with water managers and the general public. Additional activities such as development of the Lower Murray Selected Area web portal and use of social media (e.g. Twitter) have been discussed and guided by the Basin-wide MER engagement and communication team.

In addition, the Lower Murray team aims to engage Aboriginal and recreational fishing groups guided by their needs/wants. Lastly, a community forum is being planned, which is likely to occur at a regional town to disseminate the monitoring outcomes from LTIM/MER. The proposed activities will be submitted to CEWO for approval in October 2019.

What's next?

Our intensive field sampling will occur between October and January to collect data and biological samples (e.g. microinvertebrates). Littoral vegetation sampling will be conducted in November.

To assess Murray cod recruitment, larval fish sampling will start in November 2019 which coincides with peak spawning activity of the species. Sampling for early juveniles and young-of-year (age 0+) will occur between January and March 2020.

Meet the researchers

A/Professor Qifeng Ye (Project Leader)

Qifeng is a Principal Scientist in fish ecology with 25 years' research experience on the biology, population dynamics, habitat and environmental water requirements of native fish and the potential ecological impacts of river regulation. She has led a number of significant flow related ecology projects.

Dr Matt Gibbs (Hydro-Task Leader)

Matt is a principal hydrologist with 15 years' experience in the fields of water resources, modelling and optimisation techniques. Matt has detailed knowledge of hydrological/hydraulic models, river restoration, uncertainty analysis, forecasting and salinity modelling.

A/Professor Rod Oliver (Stream Metabolism-Task Leader)

Rod is an expert limnologist with 30 years' experience in aquatic ecology of reservoirs, lakes, rivers and wetlands. His research focus is on the population dynamics and community composition of phytoplankton, and how these interactions influence water quality, aquatic food webs, and ecosystem function.

Professor Justin Brookes (Matter Transport-Task Leader)

Justin is an expert limnologist with a broad interest in the biogeochemistry, primary productivity, phytoplankton and aquatic ecology, and the ecological functioning of stream, lake and estuarine ecosystems. He has considerable experience in developing tools to assist determination of flow requirements in MDB.

Dr Jason Nicol (Vegetation-Task Leader)

Jason is an experienced aquatic and riparian plant ecologist. He has worked extensively throughout south-eastern Australia over the past 21 years. He has excellent knowledge of the aquatic and riparian vegetation, particularly for the lower Murray and Darling Rivers and the Lakes and Coorong.

Dr Deborah Furst (Microinvertebrate-Task Leader)

Deb completed her PhD in Freshwater Biology with the University of Adelaide in 2014. Since then, Deborah has been a research fellow and involved in range projects investigating the impact of environmental water delivery on the dynamics of zooplankton community and the ecology of the Murray River system.

Chris Bice (Fish and Integrated Research-Task Leader)

Chris is a fish ecologist with 15 years' research experience on freshwater and estuarine fish in the MDB, particularly the Lower Murray. His expertise includes fish movement, fish passage, threatened species ecology and the response of fishes to changing flow regimes.

George Giatas (MER Project Officer)

George Giatas is a fish ecologist with seven years' research experience on freshwater and estuarine fish, particularly in the Murray River and Lakes and Coorong. His studies include ecological indicators of environmental flows, trophic dynamics and food webs.

Luciana Bucater (MER Engagement and Communication Officer)

Luciana Bucater is a fish ecologist with 16 years' research experience on freshwater and estuarine fish. She has been involved in numerous projects, some of which interested communities were engaged and citizen science was an important component. She has special interest in communicating research findings and in the exchange knowledge with local communities.

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