

Edward/Kolety-Wakool system Environmental Flows Newsletter

Issue Number 4 | 1 April – 30 June 2020

Edward/Kolety-Wakool Monitoring, Evaluation and Research Program



What's in issue #4

Update on monitoring and research

- Hydrology
- Water quality
- Ecosystem metabolism
- Fish monitoring and research
- Environmental DNA research
- Physical habitat research
- Turtle research

Focus on fish population monitoring

Focus on fish movement research

What have we been doing during the COVID-19 restrictions?

Welcome to the issue 4 of the Edward/Kolety-Wakool Environmental Flows Newsletter - a quarterly newsletter that will provide updates on our progress as we monitor and undertake research on the ecosystem outcomes of Commonwealth environmental watering actions in the Edward/Kolety-Wakool system.

The Edward/Kolety-Wakool MER Program is a collaboration between universities, state government agencies, consultants and local community organisations.

More information on the program can be found at:

<https://flow-mer.org.au/selected-area-edward-kolety-wakool/>
<https://www.csu.edu.au/research/ilws/research/environmental-water>

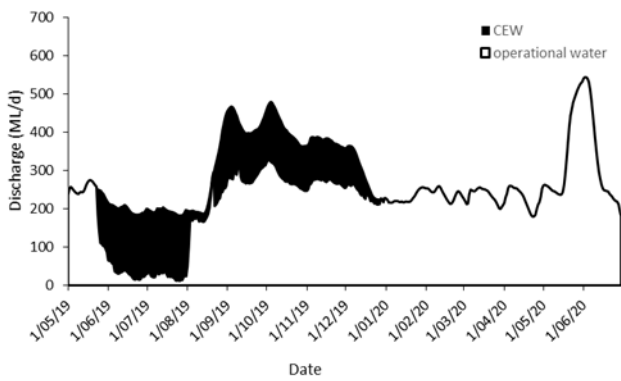


Update on monitoring and research

Hydrology

We use data from flow gauges and information from water accounts to determine the contribution of environmental water to changes in flow and water level in the Edward/Koety-Wakool river system.

In the last newsletter we described a period of low operational flows from January to April 2020. In contrast, between mid-May and early June 2020 there was an unregulated flow event in the system due to significant rainfall in the upper catchments. Inflows to the Murray system reached levels not observed for several years. This caused a flow pulse that was evident throughout the Wakool-Yallakool, Colligen-Niemur and Edward/Koety rivers. The release from Yarrowonga Weir peaked at around 24,000 ML/day on 6 May, and as this pulse moved downstream the flows through the Wakool River, Yallakool Creek and Colligen Creek offtake regulators peaked at 85 ML/day, 440 ML/day and 465 ML/day respectively. The flow in the Edward/Koety River downstream of Stevens Weir peaked at 3,135 ML/day during this event. There were no Commonwealth environmental watering actions between January and June 2020.



Discharge (ML/day) in the Wakool River at Wakool-Barham Rd (gauge 409045) from 1 May 2019 to 30 June 2020 showing Commonwealth environmental watering actions in 2019 and the unregulated flow pulse in May/June 2020.

Water quality and ecosystem metabolism

We monitor water quality once per month at 18 sites throughout the river system to inform us about water quality under different flows. We measure algae (measured as the concentration of chlorophyll in water), nutrients, and the concentration of dissolved organic carbon in the water and compare the water quality during environmental watering actions with results from operational flows. By continuously monitoring dissolved oxygen with loggers that are installed at 10 sites we calculate daily production of oxygen (photosynthesis) by plants and algae, and consumption of oxygen (respiration) by bacteria and other organisms.

Xiaoying (Shasha) Liu and John Trethewie continued to maintain and download loggers and monitor water quality throughout the COVID-19 pandemic by following strict travel restrictions (see story later in this newsletter on what we have been doing during the COVID restrictions).



John Trethewie monitoring water quality and maintaining loggers (Photos Shasha Liu)

Fish monitoring and research

We monitor fish spawning, fish recruitment and adult fish populations in the Edward/Kolety-Wakool system.

- Fish spawning is monitored using light traps and drift nets once a fortnight during spring and summer.
- Recruitment of Murray cod, silver perch and golden perch is monitored in February each year to assess the survival of larvae hatched that year (young-of-year) or in the previous year (1+ individuals).
- An annual fish population survey is undertaken in the Wakool River (**see focus story in this issue**). The 2020 surveys of the mid-Wakool River showed that native species numbers were stable while alien species declined.
- We will survey fish populations at 20 sites throughout the system in year three (2022) of this project. This survey has been undertaken seven times since 2009 and the results will contribute to the long-term dataset.
- A research project on fish spawning in the Edward/Kolety River is being undertaken in collaboration with the Edward-Wakool Angling Association. These results will be integrated with other research on river productivity, turtles, vegetation and riverbank condition in the Edward/Kolety River.

Environmental DNA (eDNA) research

Meaghan Duncan (DPI Fisheries) is leading a research project using an environmental DNA technique to determine the presence and spatial distribution of threatened, uncommon and iconic aquatic species including Murray cod, trout cod, silver perch, freshwater catfish, dwarf flathead gudgeon, Murray crayfish and platypus in the Edward/Kolety-Wakool system.

Monitoring aquatic species using traditional netting or electrofishing methods can often miss rare or cryptic species. Environmental DNA (eDNA) provides an indirect approach to detect the presence or absence of a species. eDNA is continuously shed into the water by aquatic organisms when they defecate and shed cells. This eDNA can be captured by filtering the water, extracting the DNA and using targeted DNA methods to identify if the species is present or absent. In addition to providing information about the distribution of the focus species in the Edward/Kolety-Wakool system, we will evaluate the effectiveness of the eDNA methods to complement the broader fish surveys.

Physical habitat research

Neil Sutton and Geoff Vietz from Streamology are undertaking a research project to examine the effectiveness of drone-based survey methods to detect changes in the river banks. The research is being undertaken in three reaches that have different hydrology and geomorphology:

- the upper Edward/Kolety River in the Murray Valley National Park – Millewa
- the Edward/Kolety River downstream of Stevens Weir in Werai Forest
- Colligen Creek

Imagery collected by the drone are able to measure even very small changes in riverbank physical condition over time. Changes in riverbank condition due to the environmental watering actions in 2019 will be evaluated by comparing results before and after the flow actions. Changes in riverbank condition due to the unregulated flow event in May 2020 will be evaluated by comparing the data collected before and after the event. The research on physical habitat was a feature story in newsletter 3 in March 2020.

Turtle research

Research on turtle populations in the Edward/Kolety-Wakool River system is a collaboration between La Trobe University, Yarkuwa Indigenous Knowledge Centre, Charles Sturt University and NSW Department of Primary Industries (Fisheries). We are examining how river flows and connectivity of wetlands affects the movement and condition of turtles.

Over the past few months we recorded several turtles moving downstream from Moonacullah Lagoon to a site past Mutton Gut Lagoon, one taking 19 days to travel this distance. Other turtles from a billabong that started to dry down between December and February were recorded moving across the river to Dahwilly Lagoon. **The turtle research project was featured in newsletter 2 in December 2019 and will be featured again in newsletter 5 in September 2020.**

Focus on fish population monitoring

The native fish communities in the Murray-Darling Basin have suffered dramatic declines due to numerous human-induced impacts. Environmental flows, used in conjunction with a range of other complementary actions, help to maintain and enhance native fish populations.

Over the past 10 year we've been monitoring the fish communities of the Edward/Kooley-Wakool system through a series of research programs including 'Fish and Flows', LTIM and now the Flow-MER program. We undertake standardised surveys using electrofishing and netting in autumn and early winter which provide us with an indication of the size of the adult population and the presence of 'new recruits' – larvae that have survived to become juveniles and will form the future generations.

The MER project team comprises staff from DPI Fisheries and CSU and is undertaken annually at 10 sites in the Wakool River. An electrofishing boat is used during the day - it sends electrical pulses into the water for a few seconds at a time to stun fish so they are easily netted. Fyke nets are set overnight and these are funnel-shaped traps with wings at the opening to guide fish in. Together they give us an indication of the abundance of the different fish species in the system, as well as the relative proportions of juveniles and adults.

Over the past decade we've seen unregulated flood-induced hypoxic blackwater and drought take a toll on native fish in the Edward/Kooley-Wakool system. Thankfully our native fish are resilient and we're seeing evidence of spawning and the survival of juveniles through to adulthood, suggesting the populations are recovering. Environmental flows play an important role to maintain base flows to ensure connectivity of habitats, maintain suitable water quality, provide habitat and food resources for native fish, and provide cues for spawning and facilitating movement within this system as well as with the nearby Murray River.

In June 2020 the field team completed the annual fyke net sampling. We caught most of the smaller native fish species normally captured by this method: Australian smelt, bony herring, carp gudgeon, Murray-Darling rainbowfish and unspotted hardyhead. The boat electrofishing sampling is planned for July.



Clockwise from top left: a set fyke net; boat electrofishing; a typical net catch of small-bodied native species; Murray cod ready for release. (Photos DPI Fisheries).

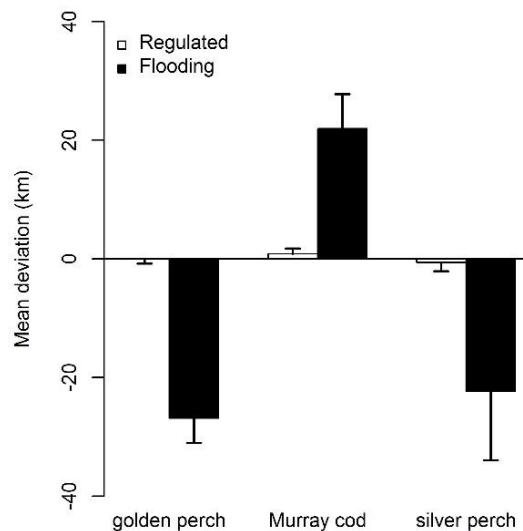
Focus on fish movement research

Elevated river flows, including unregulated floods and in-channel flow pulses, provide opportunities for fish to disperse and colonise new habitats, access food resources and utilise suitable spawning habitats, which ultimately benefit the whole fish population.

DPI Fisheries, in collaboration with CSU and Murray LLS, has spent the last few years investigating where, when and why large river fish such as Murray cod, golden perch and silver perch move throughout the Edward/Koety-Wakool river system. We have answered these questions by surgically implanting electronic tags inside fish to track their movements. Receiver stations were set up throughout the river system to record the pings from tagged fish as they swam past.

Generally golden perch and Murray cod stayed close to home, although all three species moved larger distances during the unregulated floods in late 2016. Golden perch and silver perch generally moved downstream on the rising floodwaters, and those fast enough to escape the hypoxic blackwater moved into the Murray via the Wakool River. One golden perch was subsequently detected on a receiver station near Mildura (590 km away) and one silver perch was detected in the lower Darling River (over 700 river km away). Murray cod were more likely to move upstream on the rising floodwaters and several fish moved upstream through Yallakool Creek and the Wakool River into the Edward River and subsequently into the Murray River.

The information collected by this study improved our understanding of the movement pathways for fish throughout the Edward/Koety-Wakool system and highlights the importance of river flows in connecting the system with the nearby Murray River. Small water level rises (including those created by rainfall events, irrigation releases and environmental flows) are important to enable the redistribution of fish through the system to complete important daily or seasonal needs. However, it was the larger flows that prompted fish to move long distances to escape from poor water quality while at the same time providing opportunities for new fish to enter the system and replenish the diminished stocks.



Clockwise from left: A fish 'listening station' and electronic tag; a receiver station being downloaded by field staff; DPI staff surgically implanting a tag inside a silver perch.

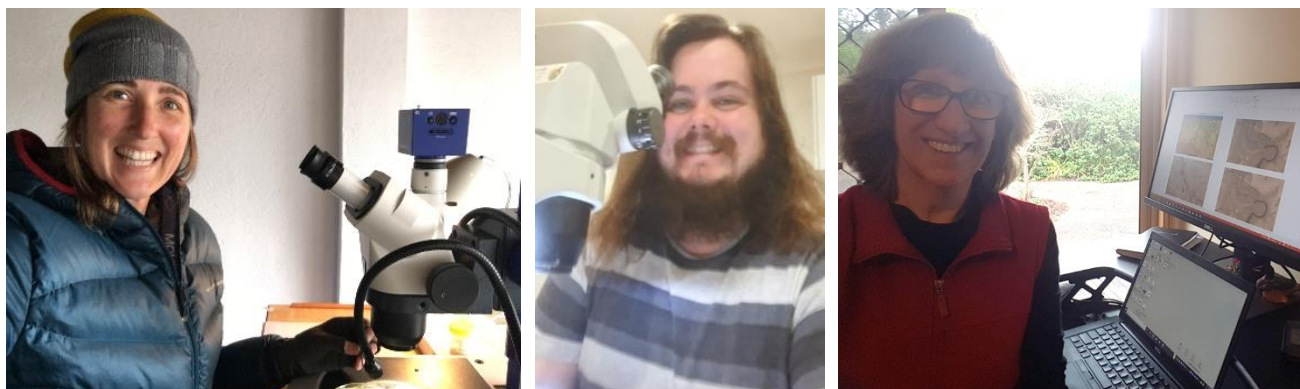
Right: The graph illustrates average distances and direction of movement of three native fish species away from a home site during normal operational flow conditions (regulated) and the 2016 unregulated flood (flooding). Positive values indicate upstream movement and negative values indicate downstream movement. All species moved small distances during regulated flows (white bars) and much larger distances during unregulated flooding flows (black bars). Golden perch and silver perch moved downstream, and Murray cod moved upstream during the unregulated flooding flows.

What have we been doing during the COVID-19 restrictions?

The past few months have been unusual to say the least! However the social distancing rules and travel restrictions due to the COVID-19 pandemic have not slowed us down. Due to closure of offices and laboratories on the Charles Sturt University campus and other workplaces we all had to switch to working from home. Nicole McCasker, John Trethewie and Dale Campbell were able to process fish samples at their 'home laboratories' after completing safety assessment for working at home. Team meetings have been done using zoom videoconferencing, with family pets sometimes attending meetings.

After much paperwork we received permission to continue essential field activities to ensure that the water quality loggers and acoustic receivers monitoring turtle movement could be maintained and downloaded. Fieldwork during the period of travel restrictions has been undertaken under strict guidelines. All field trips involved two staff (for field safety) but staff had to travel in a separate vehicles to maintain social distancing. All fieldwork was scheduled as day trips so staff could return to their homes at the end of each day. In addition, staff were required to take their own food and drink from home so they would not need to visit shops in the region, with sanitiser on hand for when staff were required to fill up with fuel.

Unfortunately the COVID pandemic resulted in the postponement of some community workshops that were being planned in collaboration with Western Murray Land Improvement Group. We will organise some community workshops when we get to the other side of this pandemic. In the meantime we will continue to keep you updated through these newsletters and the CEWO Flow-MER website (<https://flow-mer.org.au/selected-area-edward-kolety-wakool/>) and the CSU Institute for Land, Water and Society website (<https://www.csu.edu.au/research/ilws/research/environmental-water/edwardkolety-wakool-mer>).



Some of the team working from home during COVID-19 restrictions: From left, Nicole McCasker, Dale Campbell and Robyn Watts

More information

To join the newsletter mailing list please contact Professor Robyn Watts, Institute for Land, Water and Society, Charles Sturt University, Albury NSW. rwatts@csu.edu.au or ilws@csu.edu.au

We respectfully acknowledge the Wamba Wamba or Wemba Wemba, and Perrepa Perrepa or Barapa Barapa peoples, traditional owners of the land on which the Edward/Kolety-Wakool program is focussed. We recognise their unique ability to care for Country and their deep spiritual connection to it. We honour Elders past, present and emerging whose knowledge and wisdom has ensured the continuation of culture and traditional practices. The Edward/Kolety-Wakool team would also like to acknowledge the local landholders with whom we work and thank them for their contribution to the monitoring and research.

Watts, R.J., Thiem J., Wright D., Duncan M., Van Dyke J. (2020) Edward/Kolety-Wakool System Environmental Flows Newsletter, Issue 4. Charles Sturt University.