



Commonwealth Environmental Water Holder submission to the NSW Chief Scientist and Engineer’s Independent Review into the February-March 2023 fish deaths in the Darling-Baaka River, Menindee.

The Commonwealth Environmental Water Holder (CEWH) welcomes the review of the February-March 2023 fish deaths at Menindee. This most recent event is the second serious event that has occurred in the Lower Darling since 2018. Following the fish deaths associated with the cease-to-flow conditions of 2018 and 2019 (see Ellis *et. al.* 2021, for details on impacts on local community and First Nations people), seeing a subsequent and significant fish death event associated with flooding conditions less than 5 years later has been devastating for the native fish population, local community, and First Nations people.

Role of Commonwealth Environmental Water Holder

The CEWH is responsible for the management of the Commonwealth environmental water holdings to protect or restore the environmental assets of Murray-Darling Basin. This function is governed by the Commonwealth *Water Act 2007* (Water Act), the *Basin Plan 2012* (the Basin Plan) and the Basin-wide environmental watering strategy.

The CEWH manages the Commonwealth’s water portfolio to ensure its effective, efficient and ethical use, consistent with the statutory obligations within the Water Act and the *Public Governance, Performance and Accountability Act 2013*.

The Commonwealth environmental water holdings currently consist of entitlement with 2,001 gigalitres long-term average annual yield which has a current value of approximately \$3.8 billion (based on purchase price). The CEWH makes decisions on whether to use, carryover or trade environmental water throughout the Basin.

The CEWH has a strong interest in the recommendations and findings of the Chief Scientist’s review given the likelihood that similar situations will arise in the future without action being taken.

Environmental flows and conditions in the lead up to the 2023 fish death

The CEWH works in partnership with state government agencies, First Nations people, local communities, industry and scientists in planning, delivery and monitoring the use of water for the environment. In the lower Darling/Baaka, the CEWH partners directly with NSW Department of Planning and Environment – Biodiversity, Conservation and Science Directorate (DPE BCS) in the delivery of Commonwealth environmental water.

Since the fish deaths in the drought of 2018 and 2019, the CEWH has invested significantly in supporting the recovery of native fish populations in the lower Darling/Baaka. Once flows in the lower Darling/ Baaka ‘restarted’, 47 gigalitres of Commonwealth environmental water (along with around 21 gigalitres of other environmental water) was delivered during 2019-20 and 2020-21, primarily for native fish outcomes (including supporting native fish spawning, recruitment and movement).

To complement environmental water delivery, the CEWH funded \$1.9 million in monitoring the response of native fish populations to flow since 2018-19, complementing contributions from DPE BCS and NSW Department of Primary Industries (DPI) Fisheries. This monitoring has been invaluable for guiding real-time management of environmental flow releases, informing planning for future water use and demonstrating outcomes to the community and broader public.

Key results identified by fish monitoring include the following:

- Supported by environmental flows, Murray cod spawned in spring 2016, 2017, 2020 and 2021. These fish formed significant new cohorts in the lower Darling/Baaka Murray cod population.
- Spawning responses from both golden and silver perch were recorded in response to environmental flows in the lower Darling/Baaka in 2016, and again by golden perch in 2021.
- Golden perch larvae that spawned in the northern Murray-Darling Basin in recent years have drifted over many hundreds of kilometres before settling into the productive nursery grounds of the Menindee Lakes. Downstream dispersal of young golden perch from the Menindee Lakes has then been facilitated by releasing environmental water into the lower Darling/Baaka (and in 2017 and 2021-2023, the Great Darling Anabranch), providing vital dispersal pathways for golden perch recruitment into the lower Darling/Baaka and Murray River populations.

Reports are published on the CEWH website as they are finalised (see references).

Response to the 2023 fish deaths – Commonwealth environmental water use

In response to the recent fish death emergency, the CEWH made a significant volume of environmental water available to support native fish affected by the poor water quality. As at 30 June 2023, 88 gegalitres of Commonwealth environmental water has been used (additional to the 30 gegalitres of Environmental Water Allowance made available under the New South Wales Murray Lower Darling Water Sharing Plan, approximately 83 gegalitres of environmental water made available by The Living Murray Program and 2 gegalitres of NSW environmental water).

The CEWH made this water available to support native fish populations in the lower Darling/Baaka. This decision recognised that the NSW Lower Darling EWA (which is a 30 gegalitre allowance made available under the Water Sharing Plan for the management of water quality, including dissolved oxygen levels) had been exhausted early in the emergency, leaving NSW with no other immediate options to slow the ongoing deterioration of water quality or to even consider trying to improve water quality for native fish, the local town and users. There is broad recognition that the system is an area of environmental, social and cultural significance, providing recreational, tourism and economic opportunities for the town and surrounding region.

Decisions on the timing, location and rate of releases of environmental water from the Menindee Lakes have been made collaboratively via the hypoxic blackwater response group, chaired by NSW DPE Water, which included environmental water managers, river operators and water quality monitoring staff along with fish and water quality experts. Ultimately decisions on which lakes to draw water down was the responsibility of WaterNSW consistent with the operating arrangements for the Menindee Lakes system. There was a high degree of cooperation between NSW and Commonwealth agencies, who were genuinely trying to work out ways to reduce the risks and improve water quality for the community and genuine local environment, while at the same time conscious of impacts on future water security.

An ongoing water quality challenge – the risk remains

The situation at Menindee has abated for now with cooler winter temperatures, but the challenge is not over. Water (currently being sourced in 2023-24 from the Lower Darling EWA) continues to be released to support dissolved oxygen levels near Menindee.

Once temperatures increase in spring and summer, which reduces the amount of dissolved oxygen that water can hold, the large biomass of fish trapped in this reach of river may be under pressure

again. There is the possibility that further fish deaths cannot be avoided in the reach in the coming season without large releases continuing from the 'upper lakes' (lakes Pamamaroo and Wetherell). Such a release regime may not be sustainable from the perspective of environmental water portfolios. There is a risk that the EWA will again be exhausted, leaving NSW with no apparent options to manage water quality in the lower Darling/Baaka.

Further, river operators typically look to maximise the volume of water stored in the upper lakes for drought reserve purposes, and preferentially draw on Lake Menindee to meet demands downstream of Weir 32. By continuing to make releases from the 'upper lakes', it is coming at the expense of future drought reserves, which are important for the town and region.

Given the ongoing risks in the system and a possibility that the EWA could be exhausted early in the 2023-24 water year, planning and local intervention options in the short-term need to be identified in advance to provide NSW agencies the capacity to respond to further water quality issues that might arise through summer. Failure to do so may result in environmental water holders being called upon again, and there is no guarantee that the same level of intervention will be possible from environmental water portfolios in the future.

We recommend that a plan is developed for the next twelve months that considers the various sources of water available and considers forecast inflows to the Menindee Lakes. Continuation of the intensive water quality monitoring and ensuring community involvement in consideration of options will be imperative throughout the coming year.

Feedback on the Review

The role of environmental water versus other water sources in managing water quality

The volume of environmental water used to address the water quality emergency at Menindee was significant (more water was delivered in a small number of months than the combined total of Commonwealth allocations delivered to the river in the several years prior). This delivery of water comes at a cost in terms of availability of water allocations to meet future environmental demands, both within the catchment (such as Murray cod breeding in spring 2023) and in the broader southern Basin. It also comes at the cost of water being available in water storages for future needs (including drought reserves), which given the large volumes of environmental water released to date, may see a deterioration in community support for any additional environmental flows in coming months.

The use of Commonwealth environmental water was justified based on it being used to support the native fish population. However, it is noted that the emergency was driven by a water quality problem, which has been shown to be of environmental, social and cultural significance. Water quality is a shared responsibility for all water users in the system – it is not solely an environmental issue to resolve. The Basin Plan identifies that *'an agency of a Basin State must have regards to the targets [of relevance here: to maintain dissolved oxygen at a target value of at least 50% saturation] when performing functions relating to the management of water flows'* (Basin Plan Section 9.14(3)). This event has shown that current water management arrangements are not adequate to meet Basin Plan targets and longer term changes and interventions are needed.

The operation of the NSW Murray and Lower Darling Surface Water Resource Plan (Water Resource Plan) and WSP to manage resource risks to both the environment and communities should contain effective risk management strategies and procedures that do not rely upon held environmental water to underpin the operation of the WSP.

In the case of Menindee Lakes, consideration also needs to be given to the Murray-Darling Basin Agreement, noting that Menindee Lakes was a shared resource at the time of the fish deaths. Under

the Agreement, the support of Victoria and South Australia is required if any changes to the operations at Menindee Lakes, to support water quality, would have a material impact on water availability to the Murray system.

The focus of water managers and river operators to maximise water security over other outcomes was evident in the initial response to the declining water quality at Menindee. In addition to the release of held environmental water, environmental water holders were also asked to cover the potential losses associated with a change in operational releases in response to declining oxygen levels, where these operations were deemed outside of normal practice. While the volume of water to cover these losses was likely to be small and ultimately not required, it highlights the limited flexibility for river operators under current rules to respond to poor water quality (and the reliance on held environmental water).

The Review should consider the need for alternative sources of water to be available for water quality emergencies (i.e. a source that is borne by all water users, given that water quality is not just an environmental issue, but one that also affects town water supply, use for irrigation and stock and cultural outcomes).

An open question remains: in the absence of large volumes of environmental water allocations, what would river operators have done in response to the water quality and fish death emergency of autumn 2023? What will river operators do if water quality declines and the risk of fish deaths escalates in spring/summer 2023? Answers to these questions could usefully inform recommendations of this review.

Connectivity and storage management

Flow connectivity across the northern Basin is critical to the health of native fish in the lower Darling/Baaka, and influences water quality and flow management, including in relation to the operation of the Menindee Lakes.

Structural changes to address the protection of environmental water and connectivity more generally in the northern Basin offer the best chance of reducing the frequency, magnitude and impact of fish death events (Mallen-Cooper and Zampatti 2020). This will require a coordinated and flexible approach: a toolkit of policy measures that can be tailored to specific systems and needs rather than a 'silver bullet' solution.

The CEWH considers the following as high priority actions (CEWH 2022):

- Completion of active management rules, to protect held environmental water as it moves through unregulated water sources.
- Resumption of flow rules extended to northern tributaries, to allow ecosystems in the northern Basin and through to Menindee Lakes to recover after cease-to-flow periods.
- Water shepherding arrangements to enhance flow connection from the northern to southern Basin, through Menindee Lakes.
- Fish flow targets to support fish passage and all aspects of native fish breeding cycles, supporting a more resilient, distributed native fish population.

Improving connectivity and protection of flows will also provide greater flexibility in the management of the Menindee Lakes storages. As noted above, one of the challenges in responding to the fish deaths at Menindee was the need to release water from the 'upper lakes' (Lakes Pamamaroo and Wetherell) and balancing this against the risk to future drought reserves. Improving

flow connectivity across the northern Basin and into the Menindee Lakes and having greater protection of future inflows reduces the significance of this trade off decision.

Removing barriers to fish movement

In addition to the above policy reforms, there are several infrastructure and other measures that will allow for a more resilient native fish population in the lower Darling/Baaka River (potentially reducing or avoiding future fish deaths). These include:

- Enhanced fish movement – in the 2023 fish deaths event, extremely large numbers of fish congregated in the reach of the Darling River between Lake Wetherell main weir and Menindee town (unable to move upstream past the Menindee Main Weir). This reach is where the major fish death event occurred and is the same reach where most fish deaths occurred in 2018-19 in opposite (cease to flow) conditions. Enabling fish to move freely is critical for reducing the risk of future fish deaths. While some progress (with Commonwealth funding) has been made towards initial investigations for refurbishing existing fishways at some locations in the region, implementation of improved fish passage solutions in the area is critical.
- Fish passage at Menindee Main Weir – this is a critical step in enabling fish to move out of the Menindee reach of the lower/Darling River into Lake Wetherell. The challenges in autumn 2023, following the floods, in maintaining adequate dissolved oxygen in the Menindee reach of the river are understood to be strongly driven by the high biomass of fish in the reach – a ‘bottleneck’ zone as the fish cannot move further upstream.
- Implementation of the ‘reconnecting the northern Basin’ project - this project is important for improving outcomes for fish through environmental works projects to promote fish movement and habitat, including fishway construction.

Other fish passage problems in the lower Darling/Baaka (i.e., those identified in Vertessy et. al. 2019) also need to be addressed as a matter of urgency, to support a resilient native fish population that can better cope with future pressures.

Ongoing native fish monitoring

Regular monitoring of native fish populations is required to assess their recovery. A continuation of the annual survey by NSW DPI Fisheries that has run for the past three years following the 2018-19 fish deaths would be valuable to inform management actions to improve the health of the native fish population. This survey complements the CEWH funded fish monitoring described above.

Increased water quality monitoring

A small number of telemetered water quality stations are available in the Menindee Lakes and lower Darling/Baaka River. Following the fish death event, there was a significant increase in water quality monitoring. The improved data has enabled informed and responsive management of water releases to manage the water quality situation. Reflecting on the value of this increased water quality monitoring, having additional monitoring data in the lead-up to the event would have been useful to identify the emerging risk promptly and inform decisions on the volumes and locations of water releases. Should additional resources be available for monitoring activities, agencies such as DPI Fisheries, DPE EHG, DPE Water and MDBA would be well placed to provide advice on priority locations for ongoing monitoring, including additional telemetered stations.

Local advice

The response relied on on-ground advice from local and regionally based staff from both state and Commonwealth agencies. There was a significant load on these staff during the emergency. Noting the importance of their advice and networks within the local community, options to further support

these staff, including through additional local staff, could be considered. This could include opportunities to engage the Barkandji River Rangers to help support river health management and monitoring.

To complement this, improved consultative processes to both share information and obtain advice from the local community to inform management of the Menindee Lakes would be beneficial. There is currently no formal process for obtaining input from the local community on operations at Menindee Lakes. The local community are a valuable source of 'eyes on the ground' information, which can supplement gauging and other information that informs operational decisions. Further, local communities are an important stakeholder in decisions, with the potential to provide informed ideas, critique proposals and to provide a local perspective on important trade-offs.

Flood management

The floods in the lower Darling/Baaka in summer 2022 were likely to be a contributing factor to the fish deaths at Menindee. The CEWH is aware that the lower Darling/Baaka community have raised significant concerns with the management of the floods and have requested an independent review into the event. The CEWH also recognises the inherent challenges in managing floods, with response agencies often making decisions with imperfect information.

Noting the significance of the event and community concerns, options to build community confidence in water management agencies, share information and identify any lessons to inform future management in response to the flood should be considered.

Constraint relaxation

One of the limitations in managing releases from Menindee Lakes is the restrictions on flows to avoid third party impacts. For example, during the recent flood operations, the State Emergency Service advised WaterNSW to limit flows to 18,000 megalitres per day in response to the risk of third-party impacts around the Menindee township.

NSW DPE Water has undertaken flood mapping surveys to identify flood inundation risks for properties around the Menindee township associated with flows in the lower Darling/Baaka up to 25,000 megalitres per day. To complement this work, the CEWH partnered with the NSW DPE Water to model the environmental benefits to the floodplains of flows in increments from 18,000-30,000 megalitres per day. These two studies should inform a program of works for mitigating the identified third-party impacts, in order to enable higher flows to be released to benefit the lower Darling/Baaka floodplain in the future.

In addition to providing greater operational flexibility for WaterNSW to manage releases in response to flood conditions, relaxing this flow constraint could allow for more frequent inundation of the floodplain. This in turn would help to manage carbon building up on the floodplain, thereby reducing the risk of future hypoxic events that result from large volumes of decaying material returning to the river from the floodplain. The area of floodplain inundated (to the benefit of native vegetation, while also flushing carbon) was modelled as inundating triple the area of native vegetation at 25,000 megalitres per day compared to 18,000 megalitres per day, and quadruple the area at 30,000 megalitres per day.

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