NSW GOVERNMENT | Chief Scientist & Engineer

EXECUTIVE SUMMARY

INDEPENDENT REVIEW INTO THE 2023 MASS FISH DEATHS IN THE DARLING-BAAKA RIVER AT MENINDEE

Findings and Recommendations

31 August 2023

NSW GOVERNMENT | Chief Scientist & Engineer

The Hon Penny Sharpe MLC
Minister for the Environment

The Hon Rose Jackson MLC
Minister for Water

52 Martin Place
SYDNEY NSW 2000

31 August 2023

Independent Review into the February-March 2023 fish deaths in the Darling-Baaka River, Menindee

Dear Ministers

In April 2023 you asked that I undertake an independent review into the February-March 2023 mass fish deaths in the Darling-Baaka River at Menindee.

Enclosed is the Executive Summary from the Review report, in accordance with the Terms of Reference. Our report addresses environmental conditions in the lead-up to the fish deaths, causal factors and the response. We make recommendations, including immediate actions in recognition of short as well as longer term risk. The final report will be released pending availability of independent data and analysis, and final checks for accuracy. We expect to release this in approximately two weeks.

Our findings and recommendations reflect an understanding of the 2023 event as symptomatic of broader degradation of ecosystem health and consequential long-term pressure on the Darling-Baaka river system. This observation is not new, having been the subject of numerous expert reviews and reports. Data and expert advice provided to this review make clear that without substantive change to our regulatory approach, paired with investment in people, data and infrastructure, there will be further environmental degradation and recurrence of such events. Difficult decisions will need to be made. These are essentially social and not scientific in nature. However, it is hoped that the advice contained in our report will make a positive contribution to the discussions to follow.

I would like to acknowledge the time taken by the local community to share their deep knowledge and experience of the river, lakes and surrounds. Their love and concern for the health of the Darling-Baaka River, and implications for community, are palpable. I am particularly thankful for the generosity and patience of the Barkandji People in sharing their knowledge and insights with the Review team, and acknowledge their enduring connection to, and care of, the Darling-Baaka River and all its species. That community knowledge informed - and is reflected throughout - this review.

I acknowledge also inititiatives made by agencies in recent years to address many of the issues subject of our review. Individuals and agencies made valuable submissions and were generous in sharing their expertise and deep knowledge with the Review team.

Finally, I thank the Expert Panel members for their expertise and insights: Professor Robert Vertessy, Professor Lucy Marshall, Professor Lee Baumgartner, Associate Professor Bradley Moggridge, Doctor Sarah Mika, Associate Professor Michael Reid, and expert advisor (emergency management) Mr David Owens.

H. Durrant-Whyte.

Professor Hugh Durrant-Whyte
NSW Chief Scientist & Engineer

Executive summary

In mid-March 2023 an estimated 20-30 million fish died in the Darling-Baaka River near the town of Menindee, NSW. This event – following prolonged flood, extended drought and previous mass fish deaths – has had a profound impact on both the environment and the local community.

The Office of the Chief Scientist & Engineer (OCSE) has reviewed the causes and contributing factors, environmental conditions, water management and emergency response to this event. Our findings and recommendations reflect an understanding of this event as symptomatic of broader degradation to ecosystem health and consequential long-term risks to the Darling-Baaka river system.

Findings

1. Hypoxia – resulting from low dissolved oxygen in the water column - was the most likely proximate cause of fish death.
2. Low dissolved oxygen in the water column was driven by a confluence of factors, including high biomass (particularly carp and algae), poor water quality, reduced inflows and high temperature. The area around the Menindee Lakes is particularly susceptible to fish deaths events.
3. Mass fish deaths are symptomatic of degradation of the broader river ecosystem over many years. Changes to flow regime and fish passage from water infrastructure and altered water use in the Northern Basin are likely key factors in decreasing water quality and the decline of native species.
4. The health and wellbeing of the local community is inherently linked to the health of the river. Consecutive mass fish deaths have had a profound, ongoing community impact: social, cultural, mental health, and economic.
5. Explicit environmental protections in existing water management legislation are neither enforced nor reflected in current policy and operations. Water policy and operations focus largely on water volume, not water quality. This failure in policy implementation is the root cause of the decline in the river ecosystem and the consequent fish deaths.
6. Data limitations (e.g. resolution, water quality, and biomass) have hindered timely decision making.
7. While limited, observations and monitoring data indicated compromised water quality and potential for fish deaths prior to the March 2023 event. However, the scale of any potential event was underestimated.
8. An initial lack of understanding of emergency management arrangements by key stakeholders hampered a swift response. Lack of clarity around agency responsibilities and funding streams further hindered response and recovery.
9. There is a clear disconnect between agencies involved in ongoing river operations and those responsible for emergency management. Triggers for response are not clearly defined.
10. Communication of ongoing river operations and during the emergency are/were inconsistent, not timely and did not always consider local/regional accessibility. Trusted voices within specific communities and Aboriginal groups, were not engaged. Local and Traditional knowledge and experience was rarely used by agencies to inform management actions.
11. The local community feel that their knowledge, insights and experience of the river, lakes and broader environment are not given appropriate consideration in water policy, operations, environmental protection, and emergency management.
12. Mitigation of fish deaths currently relies on releasing limited environmental water holdings. This is unsustainable, inconsistent with their purpose, expensive, and carries a significant opportunity cost.
13. Further mass fish deaths are likely. Decomposition of dead fish and other biota from March 2023 likely continue to deplete oxygen and release nutrients (i.e. a feed-forward loop). Reduced flows with a drying climate trend, and high spring/summer temperatures exacerbate this risk.
14. Many of the issues identified in this review have been well documented in previous reports. However, many of the recommendations made in those reports have not been implemented. This lack of action represents a clear contributing factor to ongoing system decline and fish deaths.

Recommendations

A lead agency should be clearly tasked with responsibility and oversight for implementation and reporting progress against the following recommendations.

Recommendation 1: Regulatory environmental protections must be enforced

The regulatory framework must be upgraded to include legally enforceable obligations and powers to give effect to environmental protections and whole of catchment ecosystem health, as expressed in the objects of water, environmental and biodiversity legislation. Changes should:

a. draw on scientific, cultural and local community insights and be developed in partnership with these knowledge communities
b. address risks to the Lower Darling-Baaka and its water-dependent ecosystems
c. be informed by an independent review of existing water rights, water accounting systems, exercise of rules and operational parameters, and their impact on riverine catchment health. This includes provisions in Water Sharing Plans to improve water flow across the system
d. be based on much improved real-time data and monitoring of the whole river system

Recommendation 2: Better decisions require better data

An integrated, open, whole-of-system approach to data collection, analysis and management needs to be established. This is essential to enable timely and transparent decision making and build trust in the community. This water data regime should be based on the following principles:

a. the data must cover the whole of the river system as all parts are connected. The monitoring network needs to be expanded to address key gaps (e.g. sites, resolution, and indicators)
b. the data must minimally cover water flow rates and water quality (including dissolved oxygen), fish and algal biomass, and monitoring cause and effect variables to provide early warning of deteriorating conditions and ecosystem response
c. the data must be open and accessible to all (Findable, Accessible, Interoperable, and Reusable - FAIR https://ardc.edu.au/resource/fair-data/).
d. investment in new sensors and technology platforms (including telemetry), and their maintenance, to provide adequate coverage and warning
e. development and use of probabilistic models and baseline steps towards a catchment digital twin, drawing on real time data, machine learning algorithms and insights
f. recognition and integration of community observations and Aboriginal Traditional Knowledge as important sources of evidence

Recommendation 3: Effective emergency management

A local, detailed and effective emergency management framework is required. The current system is dysfunctional and not well understood at the local level.

a. a NSW Mass Fish Death Sub Plan, under the Emergency Management Plan NSW (EMPLAN) should be developed and implemented as a matter of urgency (including a specific Menindee appendix)
b. a simultaneous assessment of emergency management resources should be undertaken. This includes a review of membership and training; assessment of current prevention and response resourcing, capability and volunteer capacity
c. resources should include development of a communications plan and an educational resource package

Recommendation 4: Interventions to mitigate against future mass fish deaths

An integrated suite of strategies should be designed and implemented to reduce the risk of further mass fish deaths and restore the health of the broader river ecosystem. These strategies should include improved monitoring, data collection and sharing, and be integrated with other recommendations in this report. The strategies should ensure risks are identified and managed, impacts quantified and adaptive learning implemented. These interventions should at least include:

4.1 Immediate term measures (0-12 months) to manage water quality should focus on maintaining dissolved oxygen in the Menindee weir pool. Potential interventions include:

a. modifying the nature of environmental and other water releases (such as pulsing releases) to maximise desired benefits
b. pumping/recirculation infrastructure to enable water release from Pamamaroo outlet without exhausting environmental water holdings
c. investigating the feasibility of oxygenation infrastructure to maintain refugia in designated areas
d. reducing oxygen demand in the Menindee weir pool by reducing biomass - including fish removal (especially carp) and suppression of algal growth
e. applying short-term technical fish passage solutions to create temporary opportunities for fish to progress upstream

4.2 Mid-term strategies (1-5 years) include:

a. construction of fishways identified in the NSW Fish Passage Strategy. Priority and resourcing should be given to the construction of effective fishways to maximise fish mobility above the Menindee weir pool
b. an integrated national invasive fish species management strategy be finalised and resourced. Implementation of the strategy should be accompanied by an information, communication and education plan, informed by local and Aboriginal knowledge, and subject to monitoring and annual reporting of actions, impacts and adaptive management responses

4.3 Long-term strategies (ongoing) include:

a. restoration of flow regimes and connectivity across the catchment
b. water quality – accounting and management of nutrient inflows across the catchment
c. coordinated and systemic ecosystem regeneration strategies, inclusion of Aboriginal people's knowledge, including R&D and scale up of refugia for fish, invertebrate and other species
d. in addition to other performance and impact metrics, the strategy should include monitoring of iconic long-lived animal, plant and invertebrate species recognised for their contribution to river health, including species identified as culturally significant to Indigenous communities