Murray Darling Basin – water quality and dissolved oxygen results

Multiple agencies are undertaking water quality monitoring to review dissolved oxygen conditions across NSW, identify potential risks to ecological communities, implement mitigating measures and responding to a mass fish death event in the Darling River. This update provides a summary of information collected up to 23 March 2023.

On 17 March there were mass fish deaths in the reach of the Darling River between Lake Wetherell main weir and Menindee town. The dead native fish species were predominantly Bony Herring, with large-bodied natives including Murray Cod and Golden Perch, also observed in this event.

After successive years of high flows and successful fish breeding events, a large biomass of fish has accumulated in this reach of the Darling River. To maintain an oxygenated flow in the Darling River through Menindee township to sustain this large fish population and reduce the risk of fish deaths, releases of good quality water from the Lake Pamamaroo outlet had been continued. Simultaneously, releases from Lake Menindee had been reduced to assist in the flow of water from Lake Pamamarooo, past Menindee town and through to the lower Darling River. Despite these operational measures, fish deaths have occurred.

The maximum air temperature at Menindee increased to 37°C on Thursday 16 March, which is 6.2 degrees above average, and 42.6°C on Saturday 18 March which is 11.8 degrees above average. As air temperature increases, so does the water temperature. The amount of dissolved oxygen water can hold decreases with increasing water temperature. This may have increased the stress on fish that were already struggling to get enough oxygen.

Further downstream, dissolved oxygen levels in the Darling River between Weir 32 and Pooncarie are also remaining below the safe levels for fish health as low oxygen water continues to make its way downstream.

To report any further incidents of dead fish, fish struggling or starting to gasp at the water surface, or crayfish exiting the water, please call the NSW Department of Primary Industries Fisheries' Fishers Watch Phoneline 1800 043 536 or fill in a fish kill protocol and report form at: https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Dissolved oxygen levels – Darling River at Menindee

Planet satellite imagery taken on 17 March (Figure 1) shows dead fish accumulating along the banks of the Darling River through Menindee town. Imagery from 19 March (Figure 2) shows there is not the same extent of dead fish along the banks but there is an accumulation of dead fish upstream of the

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junction of the Darling River and Menindee Creek. The imagery from 22 March (Figure 3) shows that the accumulation of dead fish that was at the junction of the Darling River and Menindee Creek has been dispersed.

Figure 1: Planet satellite image from 17 March 2023 showing dead fish accumulating along the banks of the Darling River at Menindee

Figure 2: Planet satellite image from 19 March 2023 showing an accumulation of dead fish at the junction of the Darling River and Menindee Creek

Figure 3: Planet satellite image from 21 March 2023 showing the accumulation of dead fish that was at the junction of the Darling River and Menindee Creek has been dispersed

Figure 4 is a Planet satellite image showing the Darling River and Menindee Lakes at Menindee on 21 March. Dissolved oxygen monitoring results collected by WaterNSW on 22 March are shown on Figure 4.

Dissolved oxygen levels in the water being released from lakes Pamamaroo and Menindee is above the safe threshold for fish health. The bulk of the water being released is from Lake Menindee with a smaller flow from Lake Pamamaroo. As a general guide, native fish and other large aquatic organisms require at least 2 milligrams per litre (mg/L) of dissolved oxygen to survive but may begin to suffer if levels are below 4 to 5 mg/L for prolonged periods.

The lowest readings are in the Darling River from Menindee down to the junction of the Darling River and Menindee Creek (1.70 mg/L). These low dissolved oxygen results indicate that there is still a risk of further fish deaths in this area and downstream. The reading of 4.40 mg/L collected in the Darling River at the railway bridge was taken near the water surface, indicating there is some oxygen replenishment from the atmosphere. However, readings taken deeper in the water column show oxygen levels quickly drop below 2 mg/L at around 60 cm.

The image also highlights the green coloured low oxygen flood water from the upper Barwon-Darling River is being captured in Lake Wetherell. As a temporary measure to prevent the poorer quality water from Lake Wetherell being drawn through the Pamamaroo outlet and discharged into the Darling River, the inlet regulator between lakes Wetherell and Pamamaroo was closed in late February. The inlet regulator has been opened again this week to allow the water levels between lakes Wetherell and Pamamaroo to even out to retain infrastructure integrity. The green coloured water can be seen pushing out into the turbid water of Lake Pamamaroo. Ongoing monitoring will identify if this low oxygen water is once again being drawn into the Pamamaroo outlet.

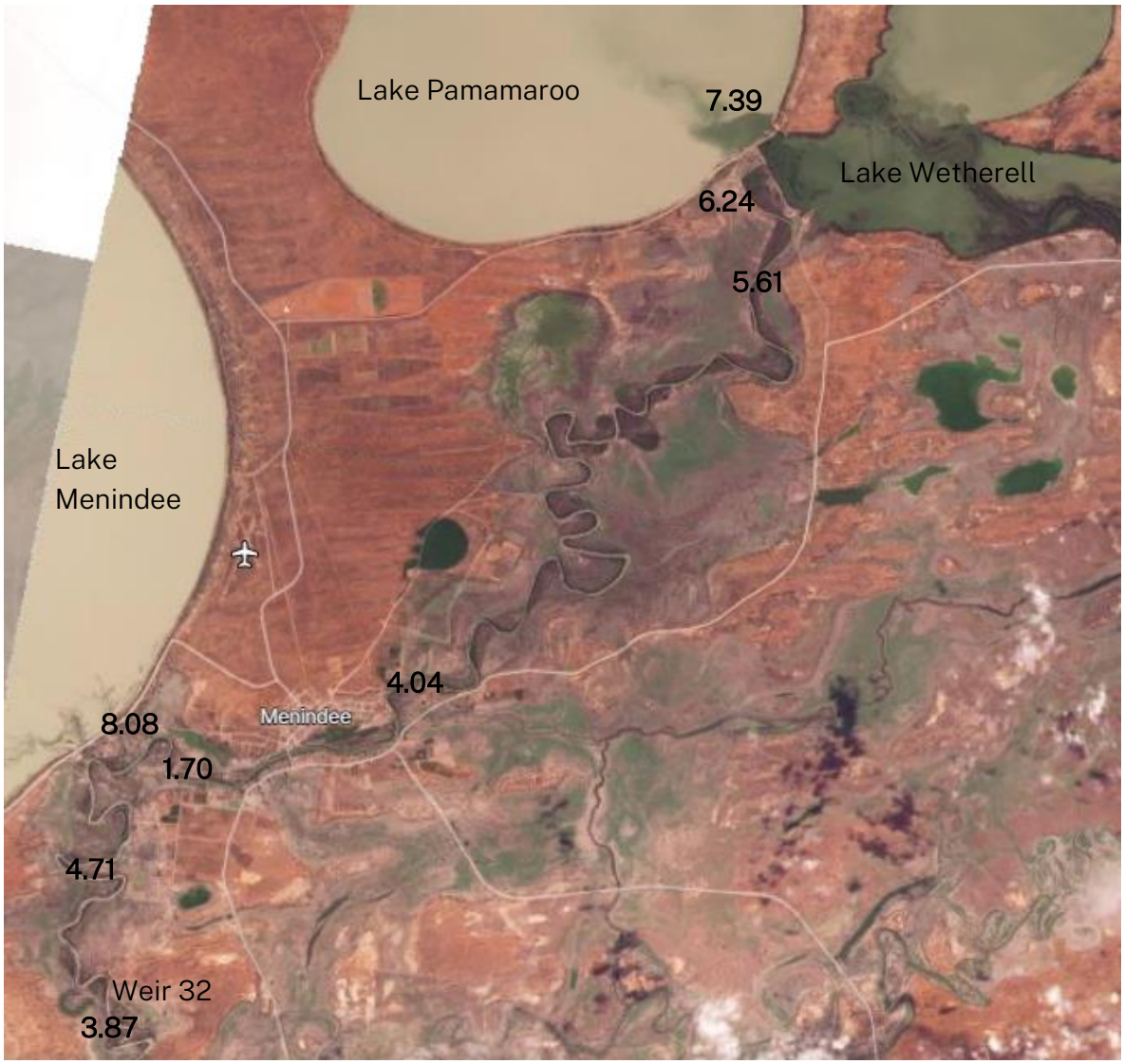

Figure 4: Planet satellite image – Image 21 March. Dissolved oxygen data collected 22 March (mg/L)

Dissolved oxygen in the Darling River downstream of Menindee at Weir 32 had been above the safe level for fish health but decreased rapidly on 17 March, coinciding with the fish deaths at Menindee upstream. Oxygenated water is being released from Lake Menindee to dilute the poor quality water coming down the Darling River. Monitoring on 22 March shows that dilution of the low oxygen water is occurring and that turbulence from the high flow velocity is mixing oxygen through the whole water column. The dissolved oxygen result from near the water surface at Weir 32 are higher than the readings from the continuous sensor at the gauging station (Figure 5). The sensor at Weir 32 is set at a fixed depth lower in the water column of the weir pool. Oxygen levels can be higher near the water surface than on the bottom of pools.

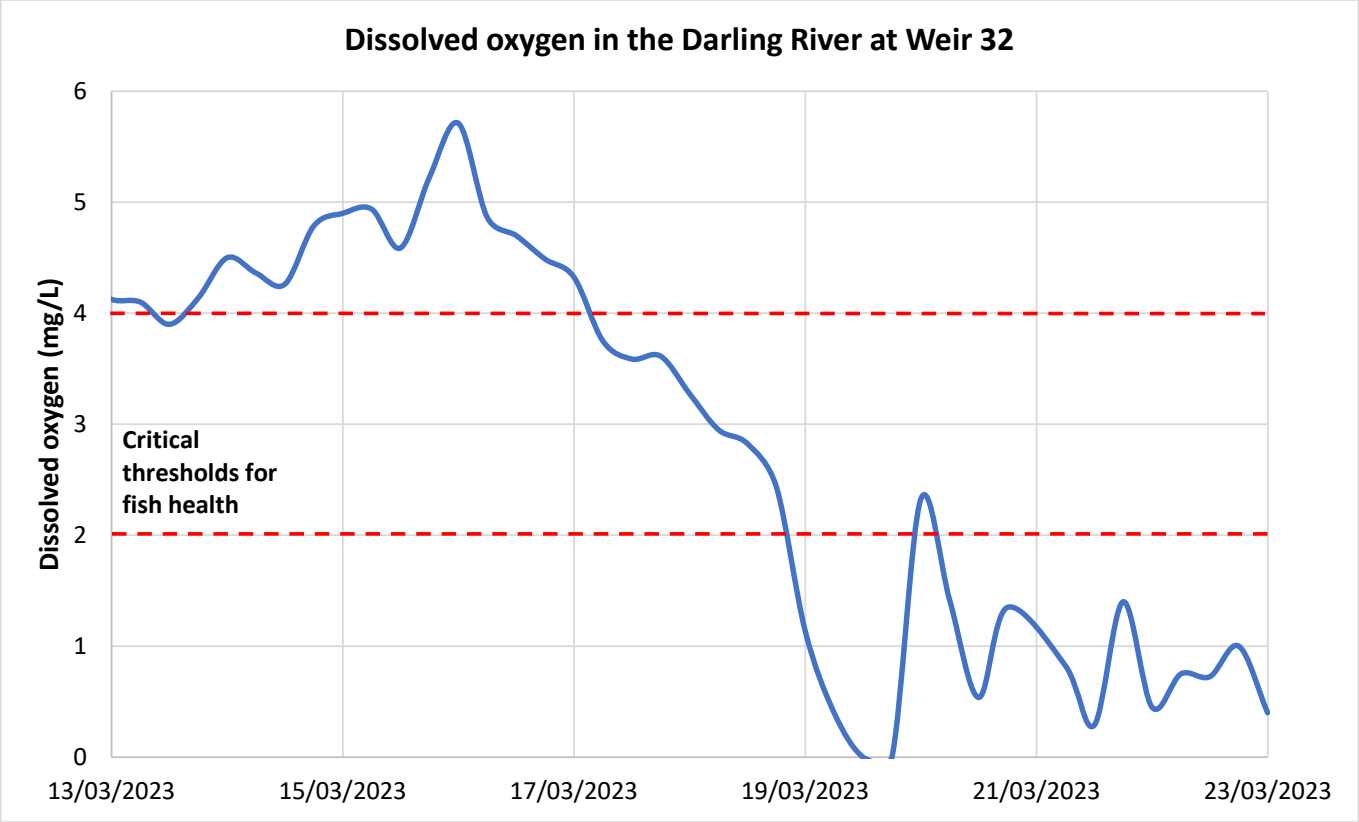

Figure 5: Dissolved oxygen (mg/L) in the Darling River at Weir 32 – 13 to 23 March 2023

NSW and Commonwealth agencies will continue to work together and monitor dissolved oxygen levels in this area and advise operational measures to mitigate risks to aquatic life where possible. This can involve adjusting the timing, volume and location of releases from the Lakes into the lower Darling River to maintain the quality of the water in the river.

Dissolved oxygen levels – lower Darling River

In the lower Darling River, the majority of the floodwater has returned to the channel with some water remaining in larger billabongs and depressions. As the river level drops, the last of the floodwaters around Burtundy are draining off the floodplain and back into the main river channel. As flows recede, fish can become stranded in disconnected waterbodies and billabongs on the floodplain where they may suffer from declining water depth, dissolved oxygen depletion (particularly overnight when photosynthetic production of oxygen ceases), higher air and water temperatures and exposure to predators as these waterbodies dry out.

As the low oxygen floodwaters continue downstream, dissolved oxygen levels are being monitored in the Darling River arm of the Wentworth weir pool (Lock 10). Results show that dissolved oxygen levels through the weir pool are between 2 and 4 mg/L as the flood water continues down the Darling River arm of the Wentworth weir pool and merges into the Murray River.

Hypoxic blackwater fish death summary

In recent months NSW DPI Fisheries has received reports of fish deaths, fish struggling and crustaceans leaving the water across a broad area in the Murray-Darling Basin, including in the

Murray, Kolety/Edward, Wakool, Murrumbidgee, Lachlan, Gwydir, Darling, Barwon, Namoi and Macquarie rivers and Yanco-Billabong Creek system. High air temperatures increase the risk of further reductions in dissolved oxygen in some areas and the potential for further fish death events.

On 17 March there were mass fish deaths in the reach of the Darling River between Lake Wetherell main weir and Menindee town. Hot temperatures coupled with high biomass of fish and organic matter in the water exacerbated the existing low oxygen conditions in this area. The dead species were predominantly Bony Herring, with large-bodied natives (Murray Cod and Golden Perch) also observed in this event.

There has been a report on 17 March of fish deaths in the Lachlan River near Hillston. Up to 100 Murray Cod were observed along with high levels of algae and very warm temperatures. High levels of algae may have resulted in wide daily fluctuations in dissolved oxygen, caused when algae stop producing oxygen overnight when photo synthesis stops. Earlier reports of some of the fish struggling in this area indicated they had high rates of infection by the parasitic crustacean Lernea and this may have made some fish more susceptible to low dissolved oxygen levels.

NSW agencies are working together to investigate and determine if any other native fish have been affected. There may be other fish death incidents that have not yet been reported directly to NSW Department of Primary Industries Fisheries.

Programs to benefit native fish such as improving fish passage and habitat restoration to provide conditions conducive to fish breeding and population growth are ongoing. These works are vital to provide an environment where fish populations can bounce back from low oxygen events.

What is being done?

Water for the environment is being delivered to reduce the risk of further fish deaths by maintaining oxygenated releases from the Menindee Lakes and providing water between Main Weir and Weir 32. To maintain an oxygenated flow in the Darling River through Menindee township and reduce the risk of further fish deaths, releases from the Lake Pamamaroo outlet will continue. Releases from Lake Menindee will also continue, to dilute the low oxygen water coming past Menindee town. The discharge will attempt to maintain flow velocity that research has shown provides conditions that are less favourable for harmful algal bloom formation. Ongoing monitoring will identify if the operations achieve the desired results and be used to inform future operational decisions. Additional water testing is being done to see if there are toxins in the water that could be exacerbating the problem.

There are no operational measures available to reduce the current risk of further fish deaths in the lower Darling River downstream of the Menindee Lakes. Oxygenated water is being released from Lake Menindee, but this will take some weeks to pass along the system. The volume of water being released will not be sufficient to reconnect billabongs on the floodplain to allow any remaining stranded fish to return to the main river channel.

Weather outlook

The Bureau of Meteorology has forecast median maximum air temperatures will remain higher than the median for April with a very high chance of exceeding the median maximum temperature for

April to June across most of NSW. The forecast is that rainfall figures for April through to June will be lower than historic averages for the majority of NSW. Refer to the Bureau of Meteorology website for the latest forecasts.

Additional information

To notify the NSW Department of Planning and Environment – Water of potential blackwater events email: waterqualitydata@dpie.nsw.gov.au

To report dead fish, fish struggling or gasping at the water surface, or crayfish leaving the water please call the NSW DPI Fisheries Phoneline 1800 043 536 or fill in a fish kill protocol and report form at: https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills-2019-2020/info-sheet

Information on recent fish deaths is available at: Fish kills in NSW. When reporting, please include the name of the river/waterbody, location and date of your observation. If possible, please also record what species are affected and an estimate of number of each species observed.

Further information on blackwater events can be found at the DPE Water website at: https://www.industry.nsw.gov.au/water/allocations-availability/droughts-floods/drought-update/managing-drought-recovery/blackwater

Additional information is also available on the Murray-Darling Basin Authority website at: https://www.mdba.gov.au/publications/mdba-reports/water-management-101-factsheets

Operational updates are available at: WaterInsights - WaterNSW

Flood updates can be found on the Environment Protection Authority web page at: https://www.epa.nsw.gov.au/news/news/2022/nsw-storm-and-flood-updates-2022

To report suspected algal blooms see the WaterNSW website.