

## Native fish benefits from the North-west flow event in 2020

### Why did we protect flows for fish?

Many waterways in the Murray-Darling Basin are dryland rivers that typically cease to flow during the warmer and drier seasons. After flows cease, water often persists in isolated pools. Native fish take refuge in the isolated pools when flows cease, then move out rapidly and may reproduce in large numbers when flows recommence.

Change to the natural flow regime has extended the duration of low flows, especially during drought. If remnant pools are isolated for extended periods, water quality may deteriorate, predation risks increase and the general health of populations begins to decline. It is critical for native fish to be able to rapidly disperse and breed when flows recommence. Fish larvae are carried downstream along with the front of water, growing in the water column and dispersing as far as the connecting flows can go (Plate 1). If the recommencing flows are extracted too quickly, connectivity may be disrupted and migrating adult fish, newborn larvae and juvenile fish may not be able to disperse and breed in the areas that support the native fish population as a whole.

The 2020 north-west flow event provided the opportunity to achieve two critically important outcomes for native fish:

1. Reducing the risk to native fish populations by protecting flows that could reconnect and refresh critical refuge pools.
2. Improving the resilience and distribution of native fish by protecting flows that support movement and breeding for adult fish, and dispersal of larvae and juveniles.

### How did we measure the outcomes?

The NSW Department of Primary Industries – Fisheries identified 37 river zones in the NSW Border Rivers, Gwydir, Namoi, Macquarie-Castlereagh and Barwon-Darling valleys that have high priority fish refuge pools. NSW Department of Planning, Industry and Environment - Water sought to provide connecting flows through as many of these river zones as possible.

Flow targets for small initial flows (or 'freshes') were selected from the [Long Term Water Plans](#) in each valley to provide a goal for delivering connecting flows. The 'small fresh' environmental water requirement was chosen because it provides sufficient flow to connect and replenish pools.



**Plate 1. Native fish larval dispersal or drift sample (top) containing golden perch larvae and juveniles which should enhance recruitment of sub-adults and adults. Sample was collected from the Barwon-Darling River at Walgett, 4 March 2020. (Photo: Top DPIF, mid and bottom: Gunther Schmida).**

NSW Department of Primary Industries – Fisheries also took larval drift samples and there is ongoing adult fish movement (acoustic tracking) and population monitoring for native fish in the northern Basin.

## What have we found so far?

### Meeting the flow targets for fish

The department found that the small fresh connecting flows refreshed most of the 37 identified refuge zones. This includes:

- all of the identified refugia zones in the Border Rivers, Namoi and Barwon-Darling valleys
- most in the Gwydir Valley with the exception of Gwydir River between Tyreel and Brageen Crossing, where some (but not all) refugia in this zone were refreshed
- all refugia zones in the Macquarie-Castlereagh Valley, with the exception of the Macquarie River from Oxley to the Barwon River.

### Supporting movement of adult fish and larvae

Researchers from the NSW Department of Primary Industries – Fisheries visited the Barwon-Darling, Warrego, Culgoa and Moonie rivers during March 2020 to monitor for fish spawning and larval drift (Plate 1). Preliminary results identified larvae and juveniles of golden perch (a large-bodied native fish known to migrate and breed during flow events) at several locations on the Barwon-Darling River between Mungindi and Bourke.

Sampling in the upper and lower reaches of the Barwon-Darling was approximately two weeks apart and suggests golden perch probably spawned on multiple occasions and that larvae drifted and matured into juveniles within the flows as it progressed south. The larval drift samples are still being processed, but it is anticipated that other species, such as Murray cod, also spawned and migrated.

A network of acoustic tracking stations is maintained by the NSW Department of Primary Industries – Fisheries to track the movement of golden perch on the Barwon-Darling River between Bourke and Goondiwindi, and in sections of the Gwydir and Mehi rivers. These stations log the movements of thousands of fish that have been tagged with tracking devices.

It is expected that golden perch adults would have moved extensively during the north-west flow event, thereby helping to expand the range and improve the long-term resilience of the species.

Data from the acoustic tracking stations has to be manually downloaded on-site. Unfortunately, download of this data has been delayed due to large flows in February and March and field work travel restrictions due to the Covid-19 pandemic response. It is anticipated that data will be collected, analysed and reported towards the end of 2020.

### Ongoing native fish monitoring

Annual monitoring of Murray-Darling Basin fish communities is undertaken by NSW Department of Primary Industries – Fisheries. Samples were collected between January and March from sites on the Barwon-Darling River including Bourke, Goondiwindi, the Gwydir River and the upper reaches of the Border Rivers, Gwydir, Namoi and Macquarie valleys. Sampling was interrupted by large flows and travel restrictions due to the Covid-19 pandemic, but it is anticipated that these results will also be available towards the end of 2020.

Fish monitoring data will provide information about the diversity and population structure of fish communities within the drought refugia zones that were a priority during the North-west flow event. Comparison with long-term data will help to establish whether populations have continued to persist through the drought and the connecting flow events.

More information on all monitoring, evaluation and reporting (MER) efforts in the northern Basin can be found in the surface water MER Plans for the [Gwydir](#), [Macquarie-Castlereagh](#), [Namoi](#), [NSW Border Rivers](#) and [Barwon-Darling](#).

### Summary of benefits

There were a range of positive outcomes for native fish based on the evidence collected and analysed by NSW Department of Primary Industries – Fisheries and NSW Department of Planning, Industry and Environment - Water. These include:

- The delivery of connecting and replenishing flows in every northern Basin valley, with every high priority drought refuge zone likely to have received connecting flows. This outcome will be of enormous benefit in maintaining the health and resilience of native fish populations.
- The suggestion (from drift sampling evidence) that golden perch were able to take advantage of the flow event and spawn effectively. Evidence also suggests that Golden perch larvae were carried downstream in the flows and are likely to have arrived in the Menindee Lakes, which is a critically important nursery for these juvenile fish.

Further data regarding adult fish movement will become available over time, as will longer-term monitoring of fish distribution and populations. Based on our understanding of previous flow events in the northern Basin, it is expected that the 2020 North-west flow event will have helped to improve the long-term resilience of native fish populations.