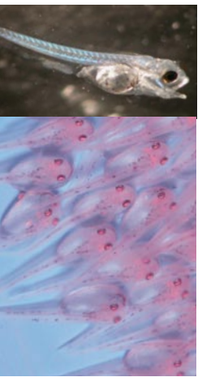
Current research

NSW DPI recently conducted some small-scale experiments using golden perch and Murray cod larvae to determine the any effects caused by a low-level weir (1m high).



The study returned surprising results. Up to 95% of Golden perch larvae and 52% of Murray cod larvae died whilst passing through undershot weirs. In contrast, mortality arising from passage through overshot weirs was less than 1.5% for both species.

These experiments clearly show that undershot weirs could have adverse impacts on native fish. This initial study was limited in that it only focused on two species and at a very small structure.To obtain results that could be applied across the Murray-Darling Basin as a whole, studies need to be conducted on more species and at higher weirs.

NSW DPI and the Murray Darling Basin Commission have subsequently commenced a major research project to try and answer these questions. The project, being undertaken at the Narrandera Fisheries Centre, aims to assess downstream movements of native fish through both types of weir during a wider range of flows and river conditions.

Scientists will work with species such as Australian smelt, bony herring, flyspecked hardyhead, Murray cod, golden perch and gudgeon to firstly determine the effects of dams and weirs and secondly, to try and develop methods to minimise the risk of injury.

Top: golden perch larvae, Murray cod larvae, NSW DPI staff undertaking field experiments. Bottom: NSW DPI staff processing fish, experimental fishlock.

Who is involved?

The Murray-Darling Basin Commission, NSW Department of Primary Industries and State Water are the partners involved in this three year project. Funding is being sourced from the Native Fish Strategy, which aims to rehabilitate numbers of fish to at least 60% of their pre-European levels by 2050. This project will provide important information to improve the management of human impacts on native fish throughout the Murray-Darling Basin.

Further information

Further information can be obtained through the Narrandera Fisheries Centre on 02 6959 9032 or by contacting the Murray-Darling Basin Commission on 02 6279 0155.

The following reports offer some detailed information on downstream migration:

Baumgartner, L.J., Reynoldson, N. and Gilligan, D.M., 2006. Mortality of larval Murray cod (Maccullochella peelii peelii) and golden perch (Macquaria ambigua) associated with passage through two types of low-head weirs. Marine & Freshwater Research, 57: 187–191.

J.P. O'Connor, O'Mahony, D.J., O'Mahony, J.M. and Glenane, T.J., 2006. Some impacts of low and medium head weirs on downstream fish movement in the Murray-Darling Basin in southeastern Australia. Ecology of Freshwater Fish 15 (4): 419–427.

Gilligan, D. and Schiller, C., 2003. Downstream transport of the eggs, larvae and juvenile fish in the Murray River: Impacts of river regulation on downstream dispersal. Paper presented at the 'Downstream Migration Workshop', 3 – 4 June 2003, Canberra, ACT, Australia.

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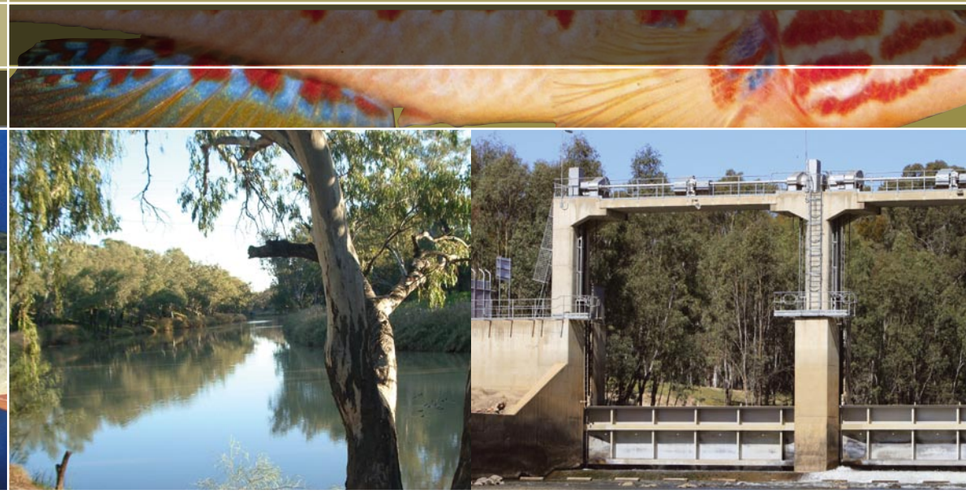
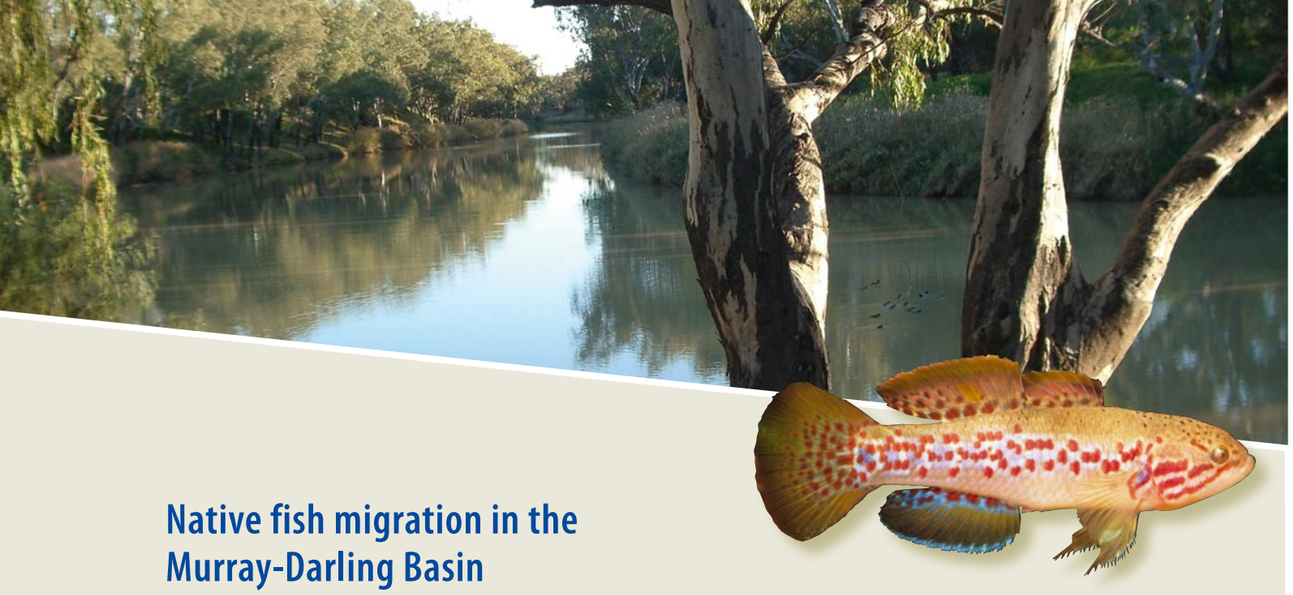
NSW DPI

THE Downstream Mortality of Native Fish PROJECT



NSW DEPARTMENT OF PRIMARY INDUSTRIES

MURRAY-DARLING BASIN COMMISSION



Native fish migration in the Murray-Darling Basin

The Murray-Darling Basin is home to 55 freshwater fish species, eight of which are not found anywhere else. Most fish in the Murray-Darling Basin are migratory. Until recently these migrations were thought to be in an upstream direction and directly related to spawning.

More recently, however, scientists have determined that native fish also make substantial downstream migrations, which are either 'active'—when adult fish move by actively swimming, or 'passive'—when fish just happen to get carried along by the flowing water. These migrations are important for colonising new habitats and for dispersal from nest sites.

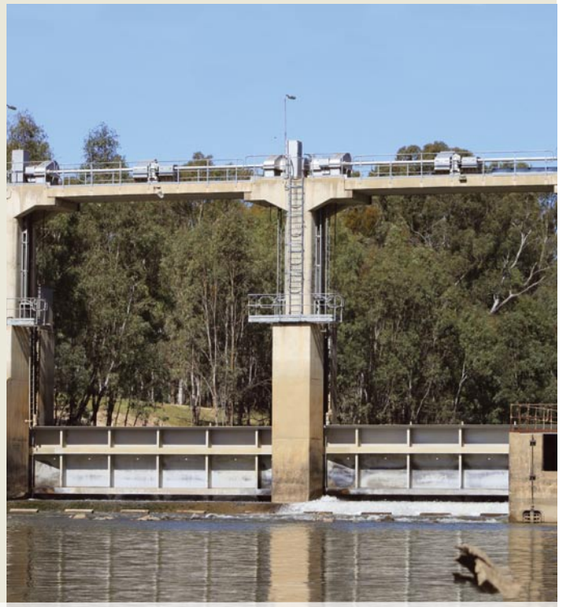
Barriers to downstream migration

Flows within rivers of the Murray-Darling Basin are heavily regulated to meet agricultural and domestic demands. To help deliver water to a growing population with increasing demand for agricultural production, over 4,000 dams and weirs were constructed between 1850 and 1970.

Historically, weirs were of overshot design, where water spills over a crest. Undershot weirs, where water flows through or beneath a gate, are increasingly being used to replace overshot designs. In recent years many fish species have dramatically declined in number due to several factors.

The construction of dams and weirs is thought to be one factor that has greatly reduced opportunities for native fish to complete important migrations and has contributed to declines in many areas.

Both types of weir act as barriers and could adversely affect fish that attempt downstream migrations.



Front cover: Murray cod is captured and tagged before release, Murray-Darling River habitat, undershot weir.
Left page: purple spotted gudgeon, undershot weir.
Right page: Top-overshot dam, overshot weir, adult golden perch.
Bottom-fish injured during passage in overshot weir.

Overshot weirs

Overshot weirs discharge water over a crest (top of the weir) which then either falls vertically or down a sloping spillway creating a plunging flow effect. Overshot weirs typically comprise concrete bays with wooden (or concrete) drop-logs which control water levels within the weir pool. Drop-logs can be added or removed to raise or lower the weir pool depth as required.

Fish choosing to pass through overshot weirs must swim over the crest and then fall downstream via gravity to continue their migrations. This may result in injuries or death, particularly for small fish and especially at particularly high structures.

Undershot weirs

Many older overshot weirs are now being converted to undershot designs to comply with new Occupational Health and Safety requirements and to minimise maintenance costs.

Undershot weirs typically release water beneath a series of steel gates that can be adjusted to alter flow rates. The change in water pressure from upstream to downstream creates strong turbulence and high water velocities.

Fish that pass through undershot weirs are often injured by either physically striking the structure or via stress associated with the turbulent conditions.