Introduction

From a recreational fishing perspective, there are grave concerns for the future of the native fisheries of the Murray-Darling Basin in context of operational changes proposed by the SDL project proposals, and obvious lack of commitment to compliance so far, and the overall implementation of the Murray Darling Basin Plan in its entirety by the NSW state government, the MDBA, and Australian federal government.

There are approximately 430,000 recreational fishers residing in the Murray-Darling Basin (and many thousands more who live outside the Basin, but frequently fish the Basin rivers). The Murray-Darling Basin recreational fishing industry is worth $1.35 billion and employs around 11,000 people. Recreational fishing is a vital component of the Murray-Darling Basin tourism industry and vital for regional economies.

The native fisheries of the Murray-Darling Basin are under enormous and continual pressure. All Basin river systems (i.e. the Darling River (including the Macintyre River and other Border Rivers), the Murray (including the Edward-Wakool system), Murrumbidgee (including the Yanco-Colombo Billabong) and Lachlan have been identified as Endangered Ecological Communities by the NSW Fisheries Scientific Committee (FSC). Endangered ecological communities face a very high risk of extinction in the near future and is eligible for listing as endangered if it has undergone a very large reduction in ecological function, geographic distribution or genetic diversity, and is affected by a threatening process (source: http://www.dpi.nsw.gov.au/fishing/species-protection/conservation/whatcurrent#key).

The installation and operation of in stream structures and other mechanisms that alter natural flow regimes of rivers and streams details the processes that are causing the continual decline of native fish communities in the Murray-Darling Basin. Climate change, removal of large woody debris, introduction of non-indigenous fish and plants, and degradation of riparian vegetation are also key issues identified by the FSC. In addition to this, over half of the 46 native fish species that are endemic to the Murray-Darling Basin are listed as threatened species. This includes the iconic Murray cod, trout cod, silver perch and eel-tailed catfish.

Recreational fishers expect the native fisheries of the Murray-Darling Basin to be robust and sustainable. The expected outcomes for native fish are detailed in the Basin-wide environmental watering strategy (BWS). The BWS promotes a significant improvement of native fish populations when the Basin Plan is fully implemented. If the expected outcomes of the $13 billion Basin Plan are not achieved, then this will be regarded as a major failure of governments to the people who expect a marked improvement in the balance of the Murray-Darling Basin values. In reality there is a complete lack of equity and enforcement of law in the Murray-Darling Basin. The existing water policies strongly favour the economy, and the environmental, cultural and social values seem to be largely disregarded. Native fish are an integral part of the environment, and are as integrally valuable from a social, cultural and economic perspective too.

SDL adjustment projects – considerations and implications

Recreational fishers in the southern connected basin are extremely concerned about the probable negative implications to native fish populations from several of the so-called SDL adjustment projects. For instance, the Yanco-Colombo-Billabong creek system contains one of the most robust trout cod populations in the Murray-Darling Basin. The proposed Yanco Creek Offtake SDL adjustment project could decimate this highly valued fishery. Similarly, the Mullaroo Creek in Victoria is described by fish ecologists as the "mecca" for Murray cod in the Basin. The Mullaroo Creek is likely to be a major source population for the Lower Murray into South Australia. The proposed SDL adjustment project to construct a weir across the Lindsay River is likely to disrupt flows in the Mullaroo Creek and negatively affect Murray cod breeding, recruitment and dispersal.

It is widely accepted that the Menindee Lakes and Darling River provide high value native fish habitat for fish at the scale of the entire Murray-Darling Basin, especially for the key recreational fishing species (Murray cod and golden perch) and NSW threatened species (Murray cod and silver perch). Whilst this section describes the value of the Menindee Lakes and Darling River in great detail, the concerns previously raised about the other SDL adjustment projects proposed for the southern connected basin should not be understated. All sites are of equal value as far as recreational fishers are concerned.

Case study: the Menindee SDL adjustment project

Recent research based on otolith chemistry for natal origin has confirmed that in years when there is strong recruitment to golden perch and silver perch populations across the Murray-Darling Basin, these coincide with flow and flood pulses in the border river tributaries of the Barwon-Darling system such as the Macintyre, Condamine-Balonne, Weir Rivers, etc. After spawning, larval transition to early juveniles occurs in the main river channel of the Barwon-Darling. Rapid growth and strong survivorship occurs in the main river channel during the consequent 3-4-week, long-distance (> 1000 km) downstream movement. The rivers provide sufficient food resources for young fish. From spawning events in the Border Rivers, early juvenile fish, approximately 30-40 mm long, settle along the river corridor but many settle into the Menindee Lakes where these highly productive floodplains provide a perfect nursery for the next 4-12 months.

At approximately 12 months old, juvenile golden perch migrate from floodplain nursery habitats at Menindee Lakes back to river channel habitats when these systems are re-connected. They can then migrate upstream into the Darling River and upstream tributaries and downstream from the lakes to the Lower Darling/Great Darling Anabranch, and disperse into the Murray River, downstream to South Australia and upstream into NSW/Victorian tributaries. Recent data suggests that recruitment and emigration events of Darling River fish contribute to a sizable proportion of Murray and tributary rivers populations. The function of Menindee Lakes as a key nursery area (i.e. temporal patterns of inflow and releases) is now the major tenet in contemporary models of recruitment to lower Darling and Murray catchment golden perch populations. Thus, our present conceptual understanding is that when strong cohorts occur in the Murray River and tributaries these align with Darling River catchment origin.

In short;

- Spawning occurs in the Barwon-Darling system, well upstream of Menindee;
- Larvae and early juveniles are transported downstream along the Barwon-Darling and many settle into Menindee Lakes nursery areas, resulting in strong recruitment of 1+ year old fish;
- Subsequent inflows to Menindee Lakes facilitate upstream dispersal of age 1+ year old fish into the Darling River and potentially the Border Rivers region;

• Flows released to Lower Darling and Great Darling Anabranch provide downstream dispersal pathways for age ~1+ juveniles to the Lower Darling, Great Darling Anabranch, Murray River and ultimately to NSW/Victorian tributaries (e.g. Edward-Wakool, central Murray and Goulburn rivers). Population modelling funded by MDBA and undertaken by the Arthur Rylah Institute in 2017 shows that without the Menindee Lakes nursery habitats, golden perch recruitment potential at the Basin scale is dramatically reduced.

This conceptual understanding highlights the need for improved management and protection of flow events in the Northern Connected Basin that support migration and spawning, and also the transition to the sheltered nurseries of the Menindee Lakes.

Lake Cawndilla is particularly important because it is the terminal lake in the Menindee system (thus an end point for young fish moving downstream). Research in 2016 found that golden perch juveniles in Lake Cawndilla were substantially larger than the same cohort in Menindee Lake and the Darling River. This productive environment creates the capacity for juvenile perch to later disperse downstream when connecting flows are provided from Cawndilla Lake, thus providing a dispersal pathway to the Murray River via the Darling Anabranch.

To further emphasise the critical role of the Menindee Lakes to golden perch populations is to consider the findings of the Commonwealth Environmental Water Office funded long-term intervention monitoring in the Edward-Wakool, which has not detected golden perch spawning and recruitment over the duration of the program. Similarly, local golden perch recruitment is low in the Murray River between Torrumbarry to the Lower Lakes, and is severely limited in the Murrumbidgee River, despite spawning being regularly documented there. Lack of recruitment in these reaches is mainly due to the effects that weirs have, reducing the free-flowing nature of the streams, and disconnecting historic native floodplain nurseries (such as lakes, creeks and wetlands) from the rivers.

Contemporary research suggests southern basin populations of golden perch (the least restricted recreational fishing target species in the Murray-Darling Basin) are driven by, and hence dependant on, successful breeding events which start with spawning in the headwater tributaries of the Barwon Darling system and subsequently strong recruitment into and from the Menindee Lakes.

The Barwon-Darling and Lower Darling (including the Menindee Lakes) river systems are undoubtedly under enormous pressure in an environmental sense. There is real concern that the Menindee SDL project will compound this pressure.

The Menindee SDL project proposes to generate water savings by isolating Cawndilla Lake from the Darling River and the Menindee Lakes, and allow faster draw down from Lake Menindee. It also proposes to reduce the trigger level at which control of the Menindee Lakes releases transfers from NSW to the MDBA. This will impact significantly on the availability and functionality of important nursery habitat for native fish (particularly golden perch and the threatened silver perch), which will in turn have severe negative consequences on the golden and silver perch populations in the southern connected basin. It will also incur socio-economic consequences to regional communities (especially the recreational fishing and regional tourism industries). This contrasts with the aim of the SDL program – to deliver enhanced environmental outcomes with neutral or improved socio-economic impact.

Significant fluctuations in flow velocities and river heights in the Lower Darling River over the September-October-November Murray cod breeding season will have negative implications for the Lower Darling River Murray cod population. This cod population is recognised as one of the most robust and valuable in the Murray-Darling Basin, and its preservation is critical considering recent

black water events in the southern connected basin which decimated adjacent Murray cod populations (i.e. in the Murray and Murrumbidgee rivers).

Rapid increases in releases from the Menindee Lake Storage will increase the likelihood of extended low flow or cease to flow events in the Lower Darling River downstream of the Menindee Lakes. Water quality issues associated with thermal stratification in the Lower Darling River during low flows are well documented, with resulting impacts including (but not limited to) extensive and localised fish kills. In 2004 thousands of large Murray cod perished in a tragic and publicly documented event.

Response to the NSW Water Reform papers

The NSW Water Reform is a step in the right direction. However, it appears in order for the NSW Government to have embarked on a water reform process it has taken the Four Corners 'Pumped' Report, two ABC Lateline reports, the Matthews Report, the NSW Ombudsmen's report, numerous investigative reports by the media, the Australia Institute and NSW Environmental Defenders Office, constant pressuring from the South Australian Government (who initiated a Royal Commission), and also the NSW and Federal Labor Party and federal and state senators from the Greens, Australian Conservatives and Xenophon parties to have encouraged them to do so.

The 'Shooters, Fishers and Farmers Party' has been conspicuously silent on this issue. Their candidate in the NSW Murray Electorate and the National Party MP both live in the Murrumbidgee irrigation heartland and have strong ties to the irrigation industry. The National Party believe that funding native fish re-stocking and habitat programs and amenity blocks for regional fishing groups will appease recreational fishers. This is definitely not the case. The Murray-Darling Basin Plan and water reform in NSW (and Queensland) provide great opportunities to enhance native fish populations at a large scale. Large scale works programs will create employment and a boost to regional economies.

The NSW and Federal National parties were given the water portfolios during the largest water reform process ever undertaken in Australia and given responsibility of implementing the $13 billion Murray Darling Basin Plan. This has been a catastrophic failure. It seems the National Party, the National Irrigators Council and NSW Irrigators Council, and Cotton Australia has taken this opportunity to completely undermine this process.

In addition to the measures proposed for water reform by the NSW Government, recreational fishers want the following items implemented (note: these items are not listed in order of priority):

1. The Menindee and Yanco Creek Offtake SDL adjustment projects are not to proceed until they are fully scrutinised and endorsed by independent fish ecologists nominated by local recreational fishing groups. The Menindee SDL adjustment will be achieved by reducing the volume of water lost to evaporation the Menindee Lake Storage. The water storages constructed on the upstream cotton farms apparently work on a minimum 40 per cent loss to evaporation. Apparently the environmental and approval protocols were not obtained for some of these major works. The NSW Government and MDBA should investigate opportunities to achieve substantial water efficiency measures in the cotton growing areas before reducing the volume of water that is meant to be recovered for the environment, before another important fish nursery (Lake Cawndilla) is disconnected, and instead of continually decreasing the frequency of flows into the Menindee Lake to the Lower Darling River to the Murray River.
2. Complementary works identified by NSW Fisheries and the NSW Office of Environment and Heritage to improve fish passage, habitat and connectivity in the Murray-Darling Basin

must be prioritised over the SDL adjustment projects.

3. Additional works to improve fish passage identified by local recreational fishers and endorsed by independent fish ecologists must be included in the NSW Fisheries works program described above (see Item 2).
4. Alternative SDL adjustment projects supported by the independent fish ecologists and recreational fishers can replace the Menindee and Yanco Creek Offtake projects if required.

5. SDL adjustment projects must consider potential system-scale effects. For example, the Yanco Creek Offtake SDL adjustment project does not consider fish passage issues further downstream in the Yanco Creek, Colombo Creek, Billabong Creek or Forest Creek. This system is an important tributary of the Edward River, so negative effects upstream will certainly have implications downstream.
6. The recovery of the 450 GL 'up-water' must not be constrained to on-farm water efficiency measures. Additional SDL adjustment projects (supported by recreational fishers) must also be included.
7. Constraints management strategies and prerequisite policy measures in the Murray River and Murrumbidgee River must be fast-tracked and must prioritise impacts to riparian landholders over SDL adjustments. The Constraint Management Strategy for the Lower Darling River must be scrapped.
8. The toolkit measures specifically identified for native fish outcomes in the Northern Basin Review must be implemented with no reduction to water recovery for the environment. Works include improved fish passage and protection of low-flows to the Menindee Lakes, etc. The size of river pumps must be reduced to a size that does not allow the natural flow in a river or any natural watercourse to be reversed, and screening of river pumps must be mandatory.
9. The NSW government must purchase all A Class water licenses in the Barwon-Darling Unregulated River Source.
10. Mandatory extraction embargo's must be written into the Barwon-Darling Unregulated River Water Sharing Plan and/or associated water resource plan to ensure the frequency of flow into the Lower Darling River is increased. The protection of low-flows from the Barwon-Darling to the Menindee Lakes, protection of the Lower Darling River cod population, and continual access to Lower Darling River high security water allocations must be the highest priorities for Barwon-Darling and Lower Darling River connectivity.
11. Enforce the NSW Pools Policy, especially in the Northern Basin, to protect drought refuge for native fish. Penalties must be increased to discourage over-extraction of critical drought refuge for native fish. Recreational fishers who live along the Macintyre River describe large waterholes being pumped dry by cotton farmers. As a consequence, thousands of native fish have perished. The Border Rivers are described by researchers as containing source populations of golden and silver perch for the Murray-Darling Basin.
12. Ensure that connectivity with Lake Cawndilla and the Murray River via the Darling Anabranch is achieved whenever Lake Cawndilla is filled to allow migration of juvenile golden and silver perch into the southern basin. Ensure the conditions of the Darling Anabranch Pipeline Environmental Impact Statement are met. Remove impediments to fish passage along the Darling Anabranch, e.g. replace 183 Dam with a bridge.
13. The NSW Government and MDBA must fully fund ten-year contracts for an additional 20 NSW water compliance officers and 20 NSW Fisheries compliance officers for the Murray-Darling Basin. The estimated total cost over the ten-year contract period will be $80 million including salaries, on-costs, vehicles and boats (purchase and running costs), training, uniforms and equipment, etc. This will be instrumental in changing a culture of water theft, illegal water diversion and storage works and also illegal fishing in NSW inland rivers. Ensure penalties for water theft, illegal water diversion and storage works, and illegal fishing is appropriate and discourages repeat offences.

14. Funding for all of the above items is obviously not an issue, (or shouldn't be) considering the former Federal Water Minister approved the purchase of the Tandou water ($78 million) and the so-called Warrego River "goanna water" ($17 million), and an $80 million purchase in the Condamine-Balonne. In addition to this expenditure, $800 million is proposed to be spent on the SDL adjustment projects, and the cost of the Broken Hill Pipeline is almost $500 million.
15. Floodplain harvesting must be stopped in NSW, Victoria and Queensland, especially in the Northern Basin. This must be agreed to by COAG. Illegal water diversion and storage works must be de-constructed and sites rehabilitated and revegetated at full cost to the landowner/s.
16. In consideration of Item 14, all water purchases approved by the Australian Federal government (especially during Barnaby Joyce's tenure as Water Minister) must be made public and the NSW Government must support a Federal Royal Commission into the $13 billion Murray-Darling Basin Plan.
17. All proposed works and water purchases must be approved via a public consultation process. Recreational fishing representatives (nominated by their peers) must be included in final approval of proposed works or water purchases by state or federal governments.
18. Any changes made to water sharing plans, especially changes surreptitiously made by NSW Water Ministers after public exhibition, must be reversed. Water sharing plan rules must not be changed for supplementary access or translucency flows in the Murray-Darling Basin, and particularly for the Namoi River and Lachlan River.
19. A 'No More Dams or Weirs Policy' must also be agreed to by COAG for the Murray-Darling Basin. Storages in the Murray-Darling Basin have altered the natural flow regime of the river systems. This has had a significant negative effect on our native fisheries and is the primary reason why the major inland rivers in NSW have been determined endangered ecological communities by the NSW Fisheries Scientific Committee **(see installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams).**
20. Opportunities to reduce the effects of hypoxic black water to native fish populations and help with the recovery of native fish populations in the southern connected basin should be investigated and implemented if deemed practical and feasible.
21. Bag limits for Murray cod and golden perch are too excessive and puts too much pressure on these species. Therefore, in NSW "bag limits" must be abolished and possession limits only apply for Murray cod (two) and for golden perch (five). Fishers should not be permitted to take these species on a daily basis. A slot limit for golden perch should be investigated also, i.e. 33cm's to 47cm's.
22. Research is the key to informing and engaging the public. Therefore, Murray-Darling Basin Plan research and monitoring programs must be supported by recreational fishing representatives. The Murray-Darling Basin Recreational Anglers Advisory Group (formerly known as the NSW Engaged Fishers Advisory Group) should be looked upon as a great investment opportunity that can provide a forum for the exchange of information and ideas, which can then be distributed with the aid of group members through their wider community networks. This model of engagement has proven to be a highly effective vehicle for promoting angler and community group engagement on fish and flow issues, as well as helping government share information opportunities.