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River Flows for Our Fish

Linking fish, environmental water and recreational fishers in the Murray–Darling Basin

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'River Flows for Our Fish – Linking fish, environmental water and recreational fishers in the Murray–Darling Basin'

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Cover image: A great catch – a Murray Cod prior to release (NSW DPI)

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Executive Summary

NSW Department of Primary Industries (DPI) Fisheries has identified the need to actively engage NSW recreational fishers in the Murray Darling Basin on how environmental flows may improve outcomes for native fish. A survey titled 'River Flows for our Fish' was used to assess the knowledge and capacity of fishers to participate in, and contribute to, discussions about environmental water delivery for fish. The survey identified where people fish within the Murray-Darling Basin (MDB) and gauged their level of understanding of the benefits to fish from planned water releases in these areas, and how that water affects their fishery. It also identified widespread concern among fishers regarding potential impacts of environmental water on increasing carp populations and poor water quality.

The survey enabled the identification of the communication needs of fishers to better understand environmental flows and their potential benefits to the environment, the community and fishing. The recommendations derived from the survey data aim to improve communications between DPI Fisheries staff and fishers when engaging about environmental flows. The results will also assist in developing a broader community engagement strategy, one that provides a clear path on how to develop messages and methods that will listen to fishers' concerns, respond in a timely fashion and effectively engage recreational fishers in working together to deliver outcomes for fish from environmental water.

The clear message from the survey and associated focus group was that recreational fishers are interested in environmental water and understand that it has the potential to deliver better outcomes for fish. Importantly there was a clear desire by recreational fishers to be more involved in the decision-making process for water events that may impact "my river" and a willingness to share information with others to improve fish outcomes. To achieve this, feedback mechanisms either at face-to-face events or via prompt email or web based live-chat sessions would enable information to be exchanged and concerns aired and addressed.

Recommendations

1. Adopt an environmental water engagement strategy specifically for the recreational fishing community.
2. Work with the NSW and Commonwealth Environmental Water Holders to develop a web portal based on an interactive map to provide current information about environmental water plans, delivery, monitoring and research.
3. Compile catchment specific email databases to enable targeted emails about pending environmental water events to recreational fishers.

Introduction

Recreational fishers are primary stakeholders in the water debates in the MDB. Recreational fishing within the MDB is worth $912 million annually (Deloitte Access Economics 2012) and 10,950 jobs (Ernst and Young 2011) a year and forms an important contribution to social well-being, communities and regional economies. Fishers come from all sectors within the MDB community and represent a diverse range of socio-economic, education, employment and age demographics. They share a passion for fishing, even though the majority are not fishing every day or even every week. They also share a deep and abiding interest in the focus of their sport – the fish themselves.

In much of the environmental water discussions and public debates, fish have been a largely missing part of the picture. Waterbirds, Ramsar wetlands and redgums are highly visible and are part of the environmental water rationale, however fish are of a more personal point of interest for the 20 percent of the Australian population who enjoy fishing. An event that provides benefits for fish is something that, by association, fishers have a stake in.

DPI Fisheries are responsible in NSW for providing advice to the NSW and Federal Government on how Long Term Environmental Water Plans, Water Resource Plans and Water Quality Plans can be developed to best

deliver outcomes for fish in the MDB. In addition DPI Fisheries provides advice annually on the design of the Annual Environmental Water Plans. To realise these outcomes the support and advice of recreational fishers is important. To this end DPI Fisheries has commenced a program to engage recreational fishers in the delivery of environmental flows. The objectives of this program are to:

- establish what level of understanding fishers currently have towards environmental water events and their intended outcomes for native fish, the environment and communities within the MDB
- gain an insight into how, and on what basis, any existing negative attitudes have been formed
- develop an understanding of fishers' needs for improved communication between themselves, DPI Fisheries and other related water management agencies
- support ongoing engagement with fishers promoting a renewed level of trust and communication with DPI Fisheries and those agencies that help decide the timing and location of water releases.

The 'River Flows for Our Fish' survey ('the survey') which formed part of this program was conducted by an independent consultant to address the above objectives.

Fish in the Murray–Darling Basin

The MDB has 46 species of native fish, of which around 10 are larger species that have now or in the past been target fish for anglers. There are also at least ten non-native invasive species[i], which influence native species through competition, predation and habitat alteration.

Since European settlement, development and use of freshwater resources has contributed to a substantial decline in native fish numbers throughout the MDB[ii] with some areas affected more so than others. Twenty-six native fish species are currently listed as threatened either at Federal or state and territory levels[iii].

The poor condition of MDB fish communities are generally attributed to a range of threats and stressors, including[iv]:

- Flow regulation: reduced flow and hydraulic complexity, seasonal flow reversal, loss of small to medium floods, permanent inundation of formerly ephemeral habitats (wetlands that are not permanently wet) and altered connectivity.
- Habitat degradation: including damage to riparian zones, removal of in-stream structural habitat such as large woody habitat (snags) and macrophytes, and sedimentation.
- Lowered water quality: including impacts on nutrient concentrations, turbidity, sedimentation, salinity, dissolved oxygen (e.g. black water events), artificial changes in water temperature (especially cold water release from storages), pesticides and other contaminants.
- Barriers which impede fish passage: including dams, weirs, levees, culverts and non-physical barriers such as high velocities leading to loss of population connectivity.

Fish and flow management

Fish play a critical role in the whole river system by cycling nutrients, providing food for other parts of the food web (e.g. waterbirds) and sustaining a billion dollar a year recreational fishing industry. Looking after fish, therefore, provides a range of environmental, social and economic benefits.

For fish, survival is related to the quality of the water itself, the availability of food, and the suitability of habitat and connectivity within the fish's broader ecological niche. Each species responds differently to various flow scenarios, and this means that assuming any water will have positive outcomes for all fish is simplistic. Historically, diversity and variability in flowing conditions was a natural feature of the MDB, to which fish and other aquatic biota adapted over millennia. Human influences and the exploitation of freshwater resources have significantly altered MDB flow regimes in a relatively short time period (less than 200 years). As a result, native fish populations in the MDB remain in a poor state[v].

In flow-altered systems, such as the MDB, restoring a more natural flow regime is targeted at ecosystem recovery to encourage recruitment, dispersal and growth processes[vi]. Restoring flow regimes with environmental water allocations has become a key aspect of ecosystem management in the MDB[vii]. The management of 'environmental flows' for river restoration aims to mimic components of the river's natural flow variability, including the magnitude, frequency, timing, duration, and rate of change of flow events[viii].

As well as having specific environmental targets, environmental flows also provide opportunities to engage with local and regional communities about the broader-reaching and longer-term aims of the Murray-Darling Basin Plan.

The Murray–Darling Basin Plan

The Commonwealth *Water Act 2007* established the Murray–Darling Basin Authority (MDBA) and tasked it with the preparation of a Murray–Darling Basin Plan ("Basin Plan") to provide for the integrated management of the MDB's water resources[ix]. Within the Basin Plan, an Environmental Watering Plan (EWP) will ensure that the size, timing and nature of river flows will maximise benefits to the environment. The intent is for the EWP to protect, enhance and nourish the rivers, wetlands, and floodplains of the MDB, together with their plants and animals, including native fish.

Managing riverine flows for consumptive use while considering flow restoration for environmental purposes can be challenging[x]. Water managers are currently unable to return large volumes of water to mimic natural flooding cycles due to water availability and physical and operational constraints. Managed flows may also have negative outcomes, such as increased recruitment of non-native fishes[xi], localised hypoxic black water events[xii], or high levels of sedimentation[xiii]. Competing demands in the MDB has also led to conflict over water buybacks and environmental water management[xiv].

Recovery of native fish populations in the MDB will not be achieved without continued concerted management efforts and the incorporation of new knowledge. The potential for achieving long-term ecological outcomes through environmental water management is likely to be increased by undertaking parallel complementary actions, such as habitat restoration, and engaging more effectively with all stakeholders, including recreational fishers.

'River Flows for Our Fish' survey

Recreational fishers are primary stakeholders in the health of the MDB. DPI Fisheries would be better able to engage fishers, if knowledge of their understanding and concerns for environmental flows were better known. This document provides insights into both the attitudes and understanding recreational fishers have about environmental flows, and how to communicate more effectively with them. This work builds upon other research with recreational fishers that enables improved engagement with this community, better and more trusted relationships to be developed, and enhanced fisher capacity to be actively involved.

This survey is part of a broader engagement strategy. DPI Fisheries formed an *Engaged Fishers Flows Advisory Group* (see Appendix 1) to provide advice on improved communication and engagement with recreational fishers. A preliminary investigation into understanding and attitudes of recreational fishers to environmental water was undertaken in late 2015 through this group. Key findings indicated that there were significant misunderstandings about environmental water and its purpose, how it could benefit fish and the ability to accurately recall environmental watering events versus natural floods (e.g. natural 2010 events which caused black water, hypoxia and fish kills were strongly recalled as environmental watering actions, or at the least were linked to earlier environmental water). This underestimation of the complexity of water management for competing demands and multiple outcomes/clients (towns, irrigated agriculture, stock and domestic, floodplain environments and rivers) is common with people or groups with a focus on a specific issue (D. Jacobs pers. comm.). Importantly, however there was a clear desire by recreational fishers to be more involved in the decision-making process for water events that may impact "my river" and a willingness to share information with managers about fish and fisher needs.

As a consequence of these results, this survey was proposed to test these initial findings and to assist in developing a broader engagement strategy, one that provides a clear path on how to develop messages and

methods that will effectively engage recreational fishers. This survey, 'River Flows for Our Fish' was made available to all NSW licensed recreational fishers via the regular electronic newsletter (*Newscast*). Key questions within the survey included:

- Where and when people go fishing and how often?
- If a decline in native fish numbers have been observed and their thoughts on the reasons why?
- Do fishers want more communications about the timing of environmental flows and would that information directly impact on where and when they decide to go fishing?
- Where fishers go for fishing and non-fishing related information?

River Flows for Our Fish – survey results

The results of the survey are summarised in this section. The survey was returned by 183 fishers. Where relevant, data from other surveys of recreational fishers are also mentioned to provide a broader context for these results.

Fishing

A very small percentage of survey respondents fish nearly every day (less than 1%), although 20% fish once or twice a week. The majority (56%) go fishing once or twice a month. This is consistent with other surveys which show that the majority are occasional, even if regular, fishers[xv].

Club membership

Club membership was 77%, which is significantly higher than the national average of about 10%[xvi]. This indicates the potential strong role of fishing clubs in inland NSW with already existing interest and concerns in regard to environmental matters.

Perception of fish numbers

Forty three percent of respondents considered that there are more native fish around now, than there were when they started fishing. Thirty one percent thought there were less, while 18% thought the numbers were about the same. Those that felt that they had observed a decline in native fish numbers thought that this decline had occurred more than 10 years ago (52%). Only 16% felt that the decline had occurred within the last three to five years. The fishers who perceived an improvement in fish numbers thought that this had occurred within the last three to five years (53%).

Knowledge about fish

The majority of respondents (87%) rated their knowledge about the life cycle of the fish they catch as either fair / reasonable or very good; only 12% felt that their knowledge was poor. In addition, the majority (77%) felt they understood how river flows affect the life cycle of the fish they catch. Sixteen percent were unsure.

Threats to fish stocks

Fishers were asked what they thought were the biggest threats to native fish stocks in their region. They were asked to identify the threats in priority order. The threat that more fishers put first was 'Carp and other introduced species' (27%); followed by 'Changes to natural water flow' (22%). When the results for first, second and third priority were grouped, the threats fishers identified as the biggest were:

- Changes to natural water flow (60.3%)
- Carp and other introduced species (59.9%)
- Poor water quality (51.6%) and Habitat destruction / alteration (51%).

Environmental water

The majority of respondents were aware that the government has, in recent years, delivered water flows to directly benefit native fish. However, 19% were unaware of this fact. Sixty one percent of respondents indicated that they had concerns about the impact of environmental water delivery on native fish. These concerns were predominantly about the timing of these events. Specific comments referred to too much water at inappropriate times of the year, or at times that do not coincide with fish migration and breeding; or that the timing caused or exacerbated black water events and fish kills. Cold water pollution was also noted and it appears that these fishers understand what cold water pollution is and the impacts it has on fish. The two other concerns most commonly noted were (1) that the environmental water deliveries were insufficient and (2) that Carp were seen to benefit more than native fish.

Over 60% of respondents were prepared to offer suggestions about how environmental water could be better managed to benefit native fish. Their suggestions mirrored their concerns:

- Timing
    - in general
    - to support native fish breeding
    - that more closely mimicked natural cycles of seasonal flow
    - seasonally relevant to minimise potential for black water events / fish kills.
- Reduction of cold water pollution.

In addition, there were suggestions about the amount of water. Generally, more water was wanted. More frequent low to medium flows were also suggested. The need for better management of irrigation was also a frequent suggestion, along with either minimising rice and cotton or growing alternate crops that need less water. Several respondents suggested that the needs of the river and fish need to come before the needs of irrigators. The need to have complementary measures, such as fish passage, habitat restoration and bank erosion control, to maximise the benefits of environmental flows, was also suggested.

The majority (78%) indicated that they would like to be informed when an environmental flow is planned for an area where they fish, and indicated that this information would impact on their decisions about when and where to go fishing.

The majority (73%) would also prefer to be informed about impending environmental flows by email, while much smaller percentage preferred using Facebook (11.5%) or SMS (9%). Other suggestions included local media and an online real-time map that enabled anyone to look at where e-flows are, how much, when and why.

Sources of information

Fishers get their non-specific fishing-related information from a variety of sources, the most used being:

- Family or friends (58%)
- Local bait / tackle shop (38%)
- On-line government sites (33%) and books (31%).

Contacting a government office, either in person or by telephone, was not a usual source of information and was noted by only 8.5% of respondents.

When asked what sources of information they trust the most, 60% of fishers indicated ‘other fishers I know’ as a trusted source. Articles in magazines and government were each among the three most trusted sources by 45% of respondents although the previous response regarding source of information used should be again noted here.

These results are consistent with a wide range of surveys of recreational fishers which show that by far the most used and most trusted source of information is other fishers, family and friends[xvii].

Discussion

Support and concern for environmental water

There is a clear indication that recreational fishers understand that there is a link between fish populations, river health and water flows with almost 80% of the survey respondents demonstrated a good understanding of how river flows affect the life cycle of fish. The results of this survey of recreational fishers reflect a 15 year effort to increase engagement of recreational fishers in key habitat issues for native fish particularly through the MDB Native Fish Strategy. Unfortunately the high level of concern is not extensive with 19% of fishers not aware of environmental flow delivery for native fish and those that were aware had concerns for the possible negative impacts of such flows. The lack of detailed understanding by some was also reflected in the results from the Regional Wellbeing Survey[xviii] where; NSW residents (70%) feel it is important to improve the environmental condition of rivers and wetlands; however, they have little awareness or knowledge of environmental water with just under 30% aware that environmental water deliveries had occurred in their region, and only 34% having views about the associated benefits and costs.

This Regional Wellbeing Survey also found that NSW residents are much more supportive of environmental water when considering specific outcomes rather than environmental water in general. Notably, 62% supported environmental water events aiming to achieve outcomes for native fish populations. This is a higher level of support for fish than bird breeding or growth of riverine woodlands.[xix] Many people in the broader NSW population had doubts or questions about how environmental water was being managed and its outcomes.[xx]

How to meet the engagement and communication needs of recreational fishers

Recreational fishers also want to be better informed about both the science behind environmental water and specific deliveries. Specifically, recreational fishers want information about:

- What environmental flows, termed ‘e-flows’ are?
- Where information about environmental water can be found?
- Which agency or water management body is responsible for which flow and what is the difference is between each flow and their outcome?
- The science, its currency and relevance to each system and potential negative outcomes
- How to be more involved and offer advice on what is happening in “my river”?

> *“Developing an understanding within the fishing community that the best and brightest scientists are informing this process, along with the opportunities for fisherfolk to participate, will hopefully increase the public’s acceptance and appreciation for e-flows and their delivery*.” Danswell Starrs, Angler and scientific officer with Waterwatch.

As noted above, recreational fishers want to be better informed about environmental water, both in general and in relation to specific deliveries, and would prefer to be informed by email. This could reflect the higher percentage of survey respondents who belong to a club and are therefore more likely to regularly receive information via email from their clubs. A much smaller percentage preferred using Facebook, SMS, local media or a specific website. This is different to the broader NSW population, whose preference in order, was for: websites and local newspapers, followed by to a much less extent by letters or flyers, email NRM groups, Facebook, and local shopfront notices[xxi]. These preferences varied by group and by region, highlighting the need for a communication strategy that is tailored to the recreational fishing community.

Fishers have identified ways in which water and fisheries management agencies could communicate more effectively with them. The general 'let me know by email about a local environmental water delivery' has been teased out through focus group discussions to provide a range of communication options related to different topics.

Broader research with recreational fishers has shown that fishers get involved in activities that benefit fish, such as habitat rehabilitation, when they feel they are part of a community of people who are doing so. They see it as the right thing to be doing, as 'putting something back' into their sport[xxii]. Engaging effectively with recreational fishers about environmental water can contribute to a sense of being part of a community who are doing things to bring the fish back, and if this sense of community is achieved, there are likely to be broader benefits for local communities and NSW.

Fisher to Fisher Information

Research has also consistently shown that fishers prefer to get their information from other fishers and that other fishers are a more trusted source of information than other sources.[xxiii] The success of the NSW Fisheries initiated 'Fisher for Fish Habitat Forums' have provided ongoing evidence of the value and leverage this form of engagement has. This approach is now being used across Australia. It should be noted that in areas, such as the Namoi, where there has been a recent Fishers for Fish Habitat Forum, 'fishing forums or groups' was the most preferred of all particular modes of communication about environmental water by residents in general, not just fishers[xxiv].To enhance these actions the existing Engaged Fishers Flows Advisory Group should continue to provide a forum for concerns to be aired and addressed; exchange ideas and share information on how to communicate to recreational fishers the role of environmental water in improving fish outcomes. It is proposed that this group be offered a Water and Fish Literacy Program to develop their 'water literacy,' meet water managers and scientists and provide basic media training so that they can communicate with fellow recreational fishers across the MDB. To assist this activity the group would work with DPI Fisheries to identify and prepare communication material (print, digital and videos) for group members to share on social media, and with fishing clubs, tackles stores and interested community groups.

Emails

As noted above, this is the preferred means of receiving information about pending local environmental water delivery. It could take the form of a notification with a link to a dedicated website – however, such a link would have to be to specific information, not the generic homepage. Technology exists and is already used by NSW DPI to send emails to target groups (i.e. grouped by catchment) that is secure and consistent with State and Commonwealth Privacy legislation.

Water release information

Fishers suggest that a website, a mobile phone App or a dedicated Facebook page is an option for providing water release information. It needs to be dedicated to this topic, providing a single location for fishers and the community to access information about environmental water releases. Up-to-date information about planned releases and those which occur with short notice could be featured on an interactive map.

The information fishers would like about each environmental water release includes: date and time; amount of water; type of release; style of the release (staggered or quick); and, the expected water heights of all major water stations downstream of release location.

There is an opportunity for a new website or Facebook page to build a strong following and profile from outside and inside the fishing community. Articles from DPI Fisheries and other water management agencies would be featured to help fishers better understand the process. The site or page should also include infographics, short clips and regular input from fishers.

A website or Facebook page is the ideal platform for users to take themselves on their own educational journey about fish and environmental water. There was a clear desire by respondents to the River Flows for Our Fish survey, backed by the Advisory Group for more information about the "science of water management". A website provides a platform and limitless opportunities to help its users become better

informed although this needs to be considered in regard to work already carried by the Murray Darling Baisn Authority (mdba.gov.au).

Other research indicates that fishers like to access information online and like to hear from other fishers about their perspective[xxv]. They like to 'put a face' to information so short videos showing researchers engaged in, for example, monitoring activities and explaining their findings, are likely to be more effective than providing links to technical documents. Even more powerful would be short interviews with people who had concerns about environmental water and how they saw those concerns addressed (for example, through changes to the timing of delivery).

Re-brand e-flows

During all stages of the engagement process, it has become clear that negative associations or connotations of the term 'environmental water' are not limited to one target group. It is now a "label" that captures the wider community and media's attention for all the wrong reasons and perhaps why some of the productive and exciting work happening within the Basin Plan is not being reported on. Re-badging e-flows needs to be considered. An option to explore is the use of 'themed' flows that convey environmental water delivery/management objectives: such as using 'fish flows' where the flow objective is fish. The specific branding of an environmental water event that is aimed at providing benefits for fish as a 'fish flow' is more likely to attract the attention and interest of recreational fishers and, potentially, the general public.

Education through media engagement

It is essential to begin showcasing and promoting e-flows and fish habitat issues, including the role of science behind it, in mainstream media outlets and targeted fishing publications with good news stories on the issue. The focus groups recommended more articles and publications presenting e-flows in a more factual light, while addressing the following questions:

- What are e-flows/translucent flows, irrigation flows – what is the difference?
- Why are they important to fish breeding cycles?
- What is the effect of dams/weirs and how can anglers help?
- How does the management system work?

The focal point of these articles should be the fish. Abstract concepts will not be as useful as an article that describes how a specific and targeted fish, such as Murray Cod, responds to water flows and the ways in which individuals and populations will benefit from more natural water flow regimes.

Recreational fishers' engagement strategy

A strategy for engagement with recreational fishers about e-water is outlined below:

- An *Engaged Fishers Flows Advisory Group* to provide a forum for the exchange of ideas on engaging recreational fishers on flow delivery for fish.
- Face-to-face interaction between fishers, water managers and fisheries scientists at specifically designed forums and workshops.
- The development of well informed 'leaders' in the recreational fishing community through an engagement program targeted at water literacy. A possible outcome of such an objective is the future involvement of recreational fishers in existing Environmental Water Advisory Groups.
- Feedback mechanisms, either at the face-to-face events or via prompt email or web-based live-chat sessions that enable information to be exchanged and concerns to be both aired and addressed.

- A dedicated and directed email alert service. This needs to be targeted so that fishers only receive information relevant to their area. It cannot be a general broadcast that recipients then have to interrogate to see if it's relevant to their area. Privacy issues are also important to address.
- A dedicated and interactive map-based web portal. This will enable fishers to find information that is relevant to them but in their own time. It is suggested that such a web portal be designed preferably as a stand-alone or via recreational fishing groups, rather than government branded.
- Links to resources, including engaging communication products designed to simplify the complex messages around fish and flows and water management. Short videos with fishers explaining key aspects and outcomes of e-water should also be included.
- Media messages that specifically highlight the expected benefits of e-water for fish, both directly through supporting breeding events, and indirectly through improved water quality and seasonal flow. It is important to make fish part of the 'sell'. It is also preferable that the information be specific to particular species that both the general public and recreational fishers will know, such as Murray Cod or Golden Perch. A focus on threatened fish species has a more limited receptivity with the fishing community as they are unable to recreationally interact with these species.

The bigger picture

It is important to note that the delivery of water is only one step in the process of achieving environmental outcomes for native fish. The achievement of meaningful outcomes for fish will often require complementary actions, including things like re-snagging, mitigating cold water pollution, improvements to fish passage, conservation stocking, screening of irrigation pump offtakes to minimise fish entrainment, pest fish control, riparian restoration and coordinated watering strategies (between States, jurisdictions and sites).

Recreational fishers are interested in improving the health of fish populations in the MDB through habitat rehabilitation and this includes environmental water. They do, however, have concerns about environmental water and its delivery. Most of these concerns relate to the appropriateness – or otherwise – of the timing and size of the environmental water delivery. Recreational fishers are a valuable source of local, in-depth knowledge about the waterways in which they fish and the fish populations they fish. As such, improving communication with fishers is likely to mean that issues keep being raised. However as one fisher said "Something needs to happen"[xxvi] and fishers are putting their hand up to help make it happen in ways that provide better outcomes for fish and for recreational fishing.

Recommendations

1. Develop and implement an environmental water engagement strategy specifically for the recreational fishing community with the support of State and Federal partners.
2. Work with the NSW and Commonwealth Environmental Water Holders to develop a web portal based on an interactive map to provide current information about environmental water plans, delivery, monitoring and research, and review options to provide a stand-alone portal.
3. Compile catchment specific email databases to enable target emails about pending environmental water events to be emailed to recreational fishers.

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Appendix 1: Endnotes

[i] Lintermans 2007

[ii] MDBC 2004; Koehn and Lintermans 2012

[iii] Lintermans 2007

[iv] adapted from Koehn and Lintermans 2012

[v] Koehn et. al. 2014a

[vi] Poff et. al. 1997

[vii] Arthington 2012; Koehn et. al. 2014b

[viii] Arthington et. al. 2006; Mallen-Cooper and Zampatti 2015

[ix] Commonwealth of Australia 2007; 2012

[x] Arthington 2012; Koehn et. al. 2014b

[xi] Stuart & Jones 2006; Beesley et. al. 2011

[xii] King et. al. 2012; Beesley et. al. 2012; Leigh & Zampatti 2012

[xiii] Lyon & O'Connor 2008

[xiv] Koehn et. al. 2014b

[xv] see Copeland et al 2017; Sutton 2006; Orsmby 2004, Henry and Lyle 2001

[xvi] Henry and Lyle 2001

[xvii] see Copeland et al 2017; NSW DPI 2010; Sutton 2006

[xviii] UoC 2016

[xix] UoC 2016

[xx] UoC 2016

[xxi] UoC 2016

[xxii] Copeland et al 2017

[xxiii] Copeland et al 2017; NSW DPI 2010

[xxiv] UoC 2016

[xxv] Copeland et al 2017

[xxvi] Rhys Creed, Ambassador for Engaged Fishers within the MDB

Appendix 2: Engaged Fishers Flow Advisory Group

David Oates, Boomi, NSW	Landholder, treasurer with Boomi Fishing Club
Richie Hardman, Moree, NSW	Owner of Hardman Outdoor/Tackle
Kristy Tong, Hillston, NSW	Secretary of Hook, Line and Sinker fishing festival
Graeme May, Hillston, NSW	Former President of Hook, Line and Sinker fishing festival, local business owner
Mat Bodinnar, Balranald,NSW	President of the Balranald District Ex-Servicemen's Anglers Club, local business owner
Luke Pianca, Leeton, NSW	Angler
Phil Beasley, Albury, NSW	Administrator Murray Monsters webpage
Rhys Creed, Tumut, NSW	Creator of socialfishing.com.au
Rod Mackenzie, Manangatang, Vic	Fishing journalist, creator of Codmac.com
Troy Bright, Edward Wakool, NSW	Public Relations Officer, Edward-Wakool Angling Association
Dr Danswell Starrs, Dickson, ACT	Angler and Scientific Officer with Waterwatch