11ASM Full Paper

Sharpe, Zampatti, Tonkin, Bice, Whiterod – Visualising a better future for native fish across the Southern Murray-Darling Basin

Visualising a better future for native fish across the Southern Murray-Darling Basin

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Abstract

*   To effectively manage waterways and ecological processes that operate across multiple catchments we need to be able to visualise what is happening at landscape scales.
*   Fish populations in the Southern Murray Darling Basin (SMDB) operate over a range of spatial scales. Information about these scales and the ecological patterns and processes that support them can be found in scientific literature, agency reports and with individual researchers, but there are few tools that synthesise that knowledge in a format that is readily accessible to others.
*   An initial workshop with fish ecologists, waterway managers and First Nations representatives to consider how to share and integrate fish knowledge across the SMDB identified maps as a useful way of making information about fish populations accessible.
*   We held several workshops to develop maps that summarise the western science understanding of how Murray Cod, Golden Perch, Congoli (Tupong) and Southern Pygmy Perch use the SMDB and the key factors affecting their distribution and abundance.
*   The process of developing the maps stimulated conversations among workshop participants about the key factors limiting population outcomes for these species, and what we may do to improve the populations.
*   It is expected that the maps will be used and built on by researchers, managers, Traditional Owners and the broader community to have collective discussions about the current distribution and abundance of native fish populations, how we would like to change those patterns over time, and the key areas and actions needed across the SMDB to realise those changes.

Keywords

Murray Darling Basin, native fish, maps, landscape-scale planning management and communication.

Introduction

Improving outcomes for native fish populations is a key waterway management objective in the Murray Darling Basin (MDB). To achieve meaningful environmental outcomes, waterway management programs are increasingly recognising the need to plan and implement actions at scales relevant to the life history process and population dynamics of specific biota. However, effective implementation, at appropriate scales, has been hampered by uncertainty about how to do it, what successful outcomes look like, and a lack of information that describes ecological patterns at relevant spatial and temporal scales.

In short, if you don't know the current status of populations or the scales at which populations operate, then it is difficult to agree on the actions required to deliver effective environmental outcomes. We suggest that maps may be a useful tool to facilitate discussions to break down some of the barriers to effective waterway management at larger landscape scales.

Fish ecologists across the MDB individually know much about fish life histories and population processes (sometimes limited to particular locations), and have shared their knowledge through the published

literature, client reports, seminars and other means. Collectively that knowledge can tell a story about the status of fish population and the processes that drive them, but there are few tools that synthesise this knowledge in formats that are readily accessible to others. We set about consolidating contemporary knowledge of fish ecology and population dynamics onto maps of the Southern Connected Murray Darling Basin (SMDB) to facilitate waterway management planning discussions.

Why maps?

The genesis of this work came from an initial workshop with fish scientists, waterway managers and First Nation representatives to explore how to share and integrate knowledge about fish populations in the SMDB and the factors that influence the size and distribution of those populations. Those who attended the initial workshop agreed that capturing knowledge and creating a narrative was a good idea and supported a goal of ultimately integrating western science and Traditional Ecological Knowledge. Attendees also agreed that translating current western knowledge into maps would be a food first step.

Maps are particularly good for defining scales of interest and visualising patterns at those scales. Written environmental objectives are often open to interpretation by the reader, but showing a current or desired ecological pattern on a map leaves little room for ambiguity. The maps being developed for this project are intended to be physical maps that can be used in meetings and on-site gatherings and also produced in digital form to be readily shared and modified.

What we did

The authors of this paper held a series of on-line and face to face workshops to develop maps summarising the current western science understanding of native fish distribution patterns, abundance and population processes across the Southern Connected Murray Darling Basin and the key physical and biological factors influencing those patterns. Separate maps were developed for species representing four different life-history and habitat requirements:

- Golden Perch – long-lived mobile species with a widespread population
- Murray Cod – long-lived species that has high fidelity to individual river reaches
- Southern Pygmy Perch – small-bodied floodplain specialist
- Congolli (Tupong) – Diadromous species that moves between marine and freshwater environments.

The number and format of maps varied for each species based on the information to be conveyed. All maps are still in development and only select examples are presented in this paper to show readers how some of the different types of information will be displayed. The Murray Cod information was presented in a single map to illustrate the relative strength of populations in different river reaches (see Figure 1). The Golden Perch and Congoli information were presented in a series of maps to show how the relative abundance and age structure of fish in reaches varies between wet and dry years, and to highlight the importance of movement between reaches in maintaining the overall populations (see Golden Perch example for wet condition in Figure 2). The Southern Pygmy Perch map (not shown) highlighted significant contraction of populations since the Millennium Drought and the conceptual arrangement of sites needed to support viable self-sustaining meta-populations in the future.
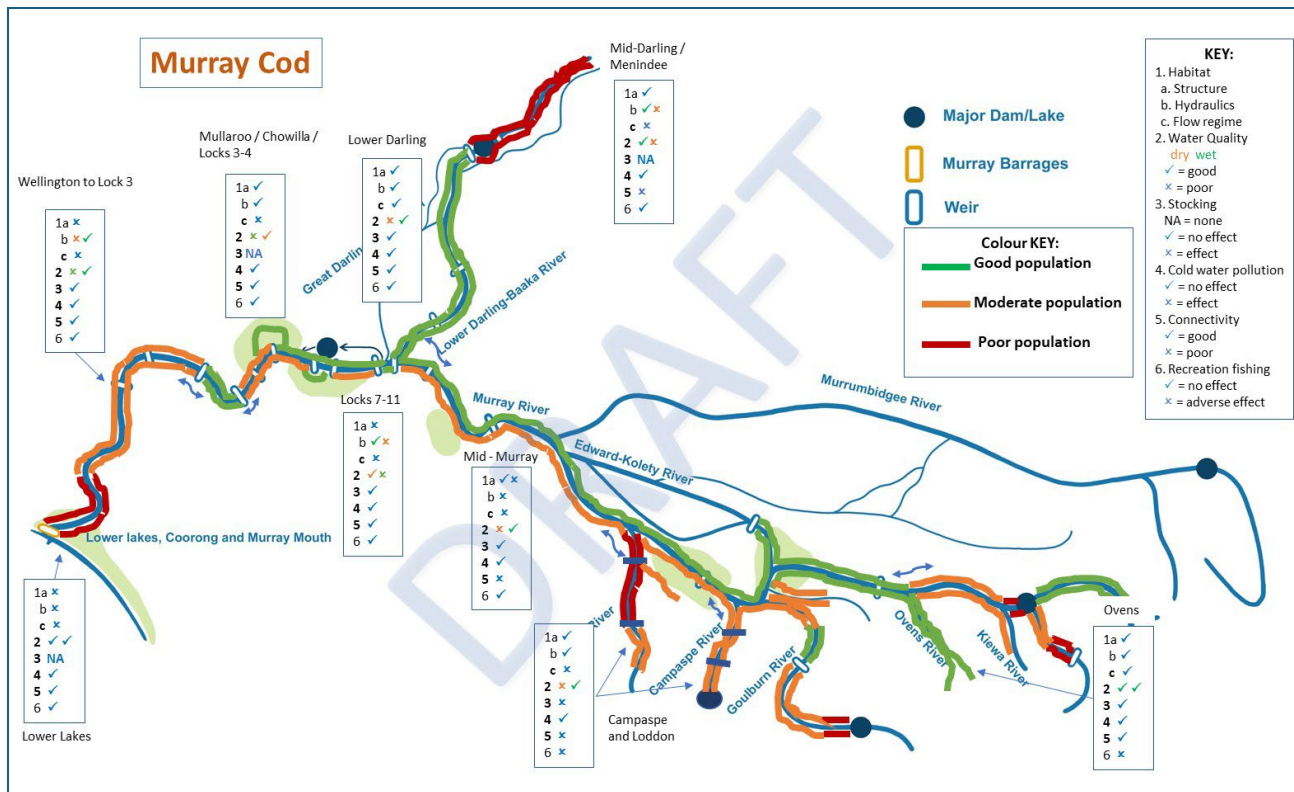
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Figure 1: Draft map showing current western science understanding of the relative condition of Murray Cod populations throughout the Southern Connected Murray Darling Basin and the factors influencing those distribution patterns.
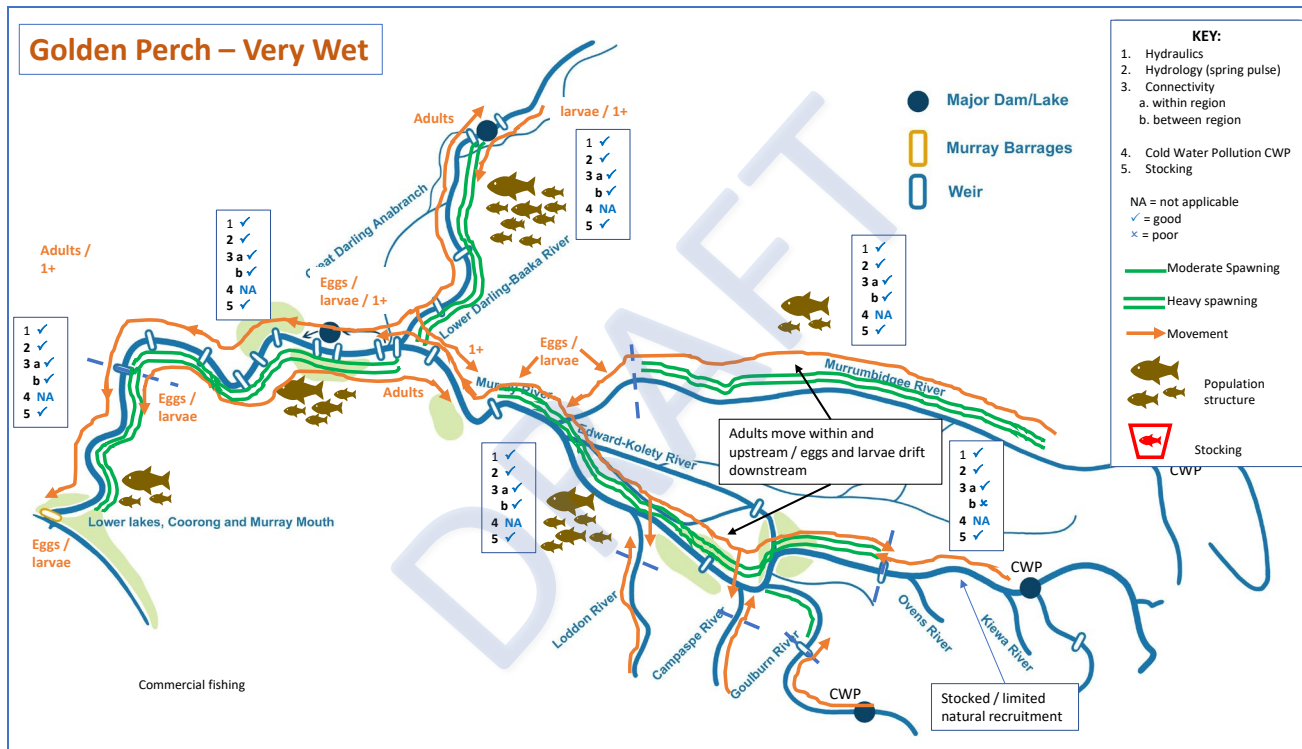

Figure 2: Draft map showing current western science understanding of the relative distribution and movement of Golden Perch throughout the Southern Connected Murray Darling Basin in very wet conditions and the factors influencing those distribution patterns.

How we anticipate the maps will be used.

We suggest the maps will be a useful resource to focus discussions among and between researchers, waterway managers, First Nations and the broader community. The maps may be laid on tables to facilitate discussions in meeting rooms or laid on the ground or a car bonnet to facilitate discussions in the field.

Researchers can use the maps to consider the information presented and to highlight priority knowledge gaps to address through further studies. The latter point will be particularly important in helping future monitoring and research projects to focus on answering questions that will improve the adoption and effectiveness of landscape scale planning for native fish outcomes.

Waterway managers can use the maps to develop a shared understanding of the current status and condition of native fish populations throughout the Southern Connected Basin, to decide what they would like the populations to look like in future (i.e. set unambiguous management objectives) and prioritise intervention activities (what, where and when) to achieve the desired outcomes for native fish.

Traditional Owners may choose to use the maps to understand the western knowledge about current fish distribution patterns and reflect on how those patterns compare to their understanding of past fish distributions. They may also elect to adapt the maps to incorporate Traditional Ecological Knowledge and to highlight themes of particular interest.

Researchers, waterway managers and Traditional Owners may use the maps to support conversations about current environmental problems, describe medium and long-term objectives and identify the monitoring and management activities that need to be implemented at specific locations to achieve those objectives. The maps will be particularly useful in helping community members understand the ecological role their local patch plays in the broader landscape, how management actions proposed in their patch will contribute to the bigger picture, and how actions proposed at other locations may influence fish outcomes in their local patch.

Where to from here?

The maps in their current form reflect knowledge derived from western science and our hope is that they will be updated and modified in future to incorporate new western knowledge and relevant traditional ecological knowledge where First Nations representatives see value.

The maps are currently in draft form and we are in the process of producing professionally designed versions to support further discussion and refinement. The final home for the maps is still to be determined, but our intention is that the maps will become a shared resource that anyone can use and build upon.