Fish spawning in the Edward-Wakool System

Nicole McCasker, Robyn Watts, Keller Kopf, James Abell
Institute for Land, Water and Society, Charles Sturt University. For further information nmccasker@csu.edu.au
This information sheet is a summary of a presentation given by Nicole McCasker at the Native Fish Forum in Deniliquin, NSW on 28 November 2013. In this handout, we focus on the spawning ecology of the fish community in the Edward-Wakool system. This is one component of a larger monitoring program funded by the Commonwealth Environmental Water Office. For further information on monitoring and evaluation of environmental water in the Edward-Wakool system http://www.environment.gov.au/topics/water/commonwealth-environmental-water-office/publications-and-resources

Introduction

There are a range of factors that are important to sustain fish populations in river ecosystems. These include appropriate spawning cues and habitat, nursery grounds for young fish, sufficient food, shelter, mates, and other factors such as water quality and a healthy, productive ecosystem to reside in.

Most fish are highly fecund and can produce between 100's to millions of eggs. The chances of an individual surviving from hatching through to the adult stage is extremely low, because up to 99.9% of eggs and larvae will die before they reach juvenile and adult stages (Figure 1). Thus, it is the survivorship of these early life stages that determine the size of adult populations.

Through this project we are seeking to understand how different aspects of the flow regime (such as the magnitude, timing, duration and frequency of flow events) influence spawning, survival and recruitment of fish into the adult population. This information is important for understanding how environmental water can best be used in the Edward-Wakool system to maintain and enhance native fish populations.

Larval fish monitoring in Edward-Wakool system

Ecological monitoring of the Edward-Wakool River system has been undertaken since 2011, and encompasses a whole-of-ecosystem approach in order to understand these systems, their productivity, and the biota residing in them, including zooplankton, frogs, shrimp and crayfish, and fish.

Fish larvae have been sampled in the Wakool River, Yallakool Creek, Colligen Creek, Little Merran Creek and in the Edward River (main source of environmental water). Sampling has been undertaken fortnightly from August to April each year since 2011. Numbers of fish larvae are compared among rivers receiving environmental water and rivers not receiving environmental water.

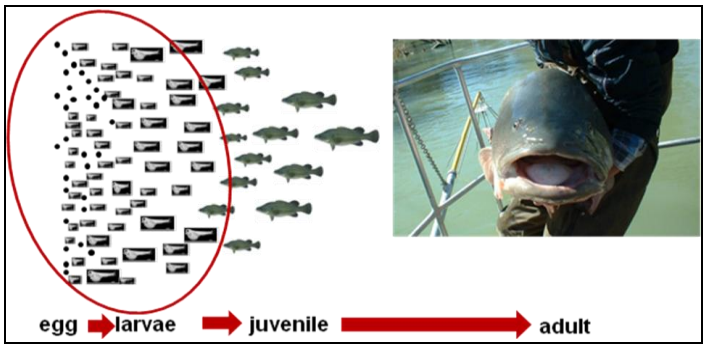

Figure 1. In the fish world it takes a lucky individual to reach adulthood

Three groups of native fishes classified according to their reproductive strategies (after Humphries 1999)

Group 1: Low-flow specialist spawners
(Australian smelt, carp gudgeon, flathead gudgeon, unspecked hardyhead, Murray River rainbowfish)

- Small increases in flow appear to trigger carp gudgeon spawning, though timing of watering is important
- Aquatic vegetation is a key spawning substrate for some species in this group. Environmental water can help to increase aquatic vegetation and nursery areas to promote spawning of these species.

Group 2: Flow-dependent opportunistic spawners
(golden perch, silver perch)

- No golden perch and only 2 silver perch larvae were collected between 2011 and 2013. Lack of spawning appears to be limiting population growth in this group.
- The monitoring is helping to determine the timing, duration, magnitude, rate of rise, rate of fall that is needed to trigger spawning of these species.

Group 3: flow-independent spawners
(Murray cod, river blackfish)

- From 2011 to 2013 Murray cod spawning occurred in all rivers independently of flow conditions, with timing of spawning being very predictable
- Spawning habitat, recruitment and the size of the adult population maybe be the limiting population growth. Environmental watering can be used to increase spawning habitat and food availability to increase recruitment of these species.

Key findings from the 2012-13 fish spawning season

- Of the 15 fish species known to occur in the Edward-Wakool area, 13 were collected as larvae or young juveniles during 2012-2013. Although the majority of fish species in this system spawned successfully, some species were collected in very low numbers.
- Native fish species collected as larvae include: Murray cod, river blackfish, silver perch, Australian smelt, carp gudgeon, flathead gudgeon, Murray River rainbowfish, unspecked hardyhead (Figure 2). Alien fish species collected as larvae included common carp, goldfish, gambusia, redfin and oriental weatherloach.
- Differences in the timing and duration of spawning were evident across the fish community (Figure 3). This highlights the importance of the timing of environmental watering to initiate spawning, increase nursery grounds, or stimulate production of food resources for young fish.

Summary

- Spawning and recruitment success are key factors that influence the size of fish populations.
- The majority of fish species in this system are spawning, but some species occur in low numbers.
- Environmental water can be delivered in a number of ways to improve fish recruitment. It can help increase aquatic vegetation and nursery areas to promote spawning of some species. For species where food is a limiting factor, environmental water could help create conditions that improve food availability. Other species require specific flow conditions to trigger spawning and environmental water can help create the appropriate timing, duration, magnitude, rate of rise, and rate of fall of in-channel flow pulses to trigger spawning of these species.
- Information regarding fish spawning under different flow conditions can assist management decisions about how environmental water be delivered to maximize outcomes. Learning from monitoring and evaluation is a key part of the adaptive management of environmental water in the the Edward-Wakool River system.

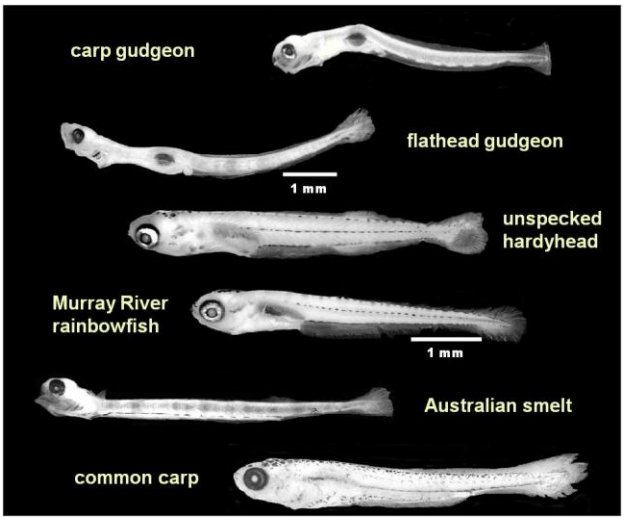

Figure 2. Photos of larval fish species found in the Edward-Wakool River system (Source:Serafini and Humphries 2004).

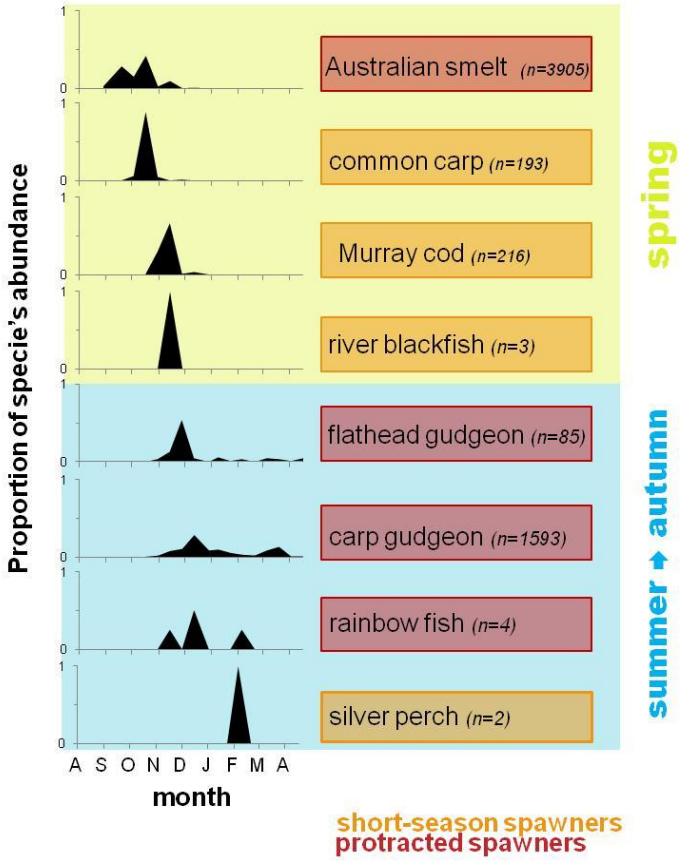

Figure 3. Seasonal timing of appearance of fish larvae collected in the Edward-Wakool River system throughout the 2012-2013 spawning season, all rivers combined.
n= total number of larvae sampled.

Acknowledgements

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References

- Serafini L, and Humphries P (2004) Guide to the Identification of Larvae of Fish from the Murray-Darling Basin. CRC for Freshwater Ecology, Canberra.
- Humphries P, *et al.* (1999) Fish, flows and floodplains: links between freshwater fishes and their environment in the Murray-Darling River system, Australia. *Env. Biol. Fishes* 56, 129-151.