

APAI Scholarship: Growth and recruitment of freshwater fish during environmental flows in the Lachlan and Macquarie Rivers, Murray-Darling Basin, Australian Rivers Institute, Griffith University, Brisbane.

Background briefing

Regulation and fragmentation of the world's large river systems has caused a range of hydrological and ecological impacts. In the Murray-Darling, restoration of degraded systems centres largely on the purchase of water and management of flows for the environment. These efforts are underpinned by the natural flow regime paradigm, but few attempts have assessed effectiveness of restorative flows in realising their positive ecological outcomes. Thus, deciding how to best translate general principles into specific flow delivery rules (e.g., quantity, timing and frequency) for individual river basins remains a challenge for water managers.

Freshwater fish are acknowledged as key indicators of river and wetland health because they rely substantially on natural flows to meet their ecological needs. However, our understanding of the fine-scale mechanics driving these relationships is limited and debate reigns concerning fundamental aspects of fish community structure and function in arid-zone rivers. To date, research in this particular field has produced conflicting and, as yet, unresolved hypotheses. The low-flow hypothesis suggests that native species in the lower Murray-Darling Basin are capable of recruiting in the absence of large-scale flooding. However, recent research on Cooper Creek, an unregulated river in the northern Basin, has confirmed the use of floodplain habitats by larvae and juveniles from a range of native species. What happens in regulated systems like the Lachlan and Macquarie Rivers is unclear – natural flows have been altered substantially by water extraction, main channel habitats are relatively shallow and floodplain lagoons are highly ephemeral.

To address this knowledge gap, the APAI will investigate the growth and recruitment of native and exotic species in different habitats under a range of flow conditions and develop recommendations for improving the delivery of environmental flows to meet the needs of native fishes. A suite of techniques may be employed in this project, including RNA:DNA analysis of larval fish condition, otolith microchemistry and *in situ* experiments. There is an opportunity to use environmental flows that are delivered to specific wetlands in the Lachlan and Macquarie Rivers as large-scale experiments. The APAI will benefit from the context provided by research being conducted by the university and industry partners in these rivers, including analysis of fish feeding, food web dynamics and movements.

This project will be co-supervised by Professors Angela Arthington (Griffith University) and Richard Kingsford (University of New South Wales, UNSW), with assistance from Dr Kim Jenkins and Dr Thomas Rayner (UNSW). The APAI will be enrolled at the Australian Rivers Institute, Griffith University, Brisbane, but based at the Waterbirds, Wetlands and Rivers Research Lab, School of Biological Earth and Environmental Science, UNSW. Further details of the team and their research are available at:

www.wetrivers.unsw.edu.au

www.griffith.edu.au/environment-planning/australian-rivers-institute/