

*Healthy Rivers, Healthy Communities*  
*Presenting current research in the Goulburn Broken Catchment*

*Habitat patches in the Broken River: fish, bugs and food webs*

*Robert Cook*

*Ben Gawne, John Hawking, Helen Gigney, Daryl Nielsen, Alison Mitchel and Garth Watson*

*The Murray Darling Freshwater Research Centre / [Robert.Cook@csiro.au](mailto:Robert.Cook@csiro.au)*

**Abstract:**

River systems are diverse, complex systems consisting of a diversity of habitat patches that are largely formed through hydrological and geomorphic processes. Flow is perhaps the overriding force structuring these patches. Over the past 3 years the Murray Darling Freshwater Research Centre has performed manipulative experiments where we have altered the nature of two major patch types in the Broken River; main channel flowing and slackwater. By directing flow into slackwater environments we created a flowing patch and by directing flow away from an edge environment we created a slackwater patch. We measured a range of biotic and abiotic variables including, zooplankton, macroinvertebrate, fish and shrimp abundance as well as sediment composition and primary productivity, in order to assess the functional role of these habitats in lowland river systems. In this presentation we highlight the results from previous years experiments and outline the study that is currently in progress.

Primary production was similar in the flowing and slackwater patches, however, distinct biotic communities existed in each patch type. Microinvertebrate, fish and shrimp abundance was greatest in the slackwater habitats, whereas macroinvertebrate abundance was greatest in the flowing patches. Thus, the hydraulic nature not primary productivity of a patch determined the biotic communities within a patch. These distinct biotic communities indicate that the food web structure in the two patch types is different and of varying complexity. We present a conceptual model of a flow-mediated food web for the Broken River. These results highlight the importance of maintaining the integrity of the all habitat patch types to maintain diversity and protect riverine ecosystem functions.

**Key Findings:**

- Primary production was similar in flowing and slackwater habitats
- Microinvertebrates, shrimp (adult and larvae), small fish (adult and larvae) were in greater abundance in slackwater habitats
- Macroinvertebrates were in greater abundance in the flowing habitats
- The hydraulic nature of the habitat patch is driving habitat use by invertebrates and fish

**Implications:**

- Successful breeding and recruitment of many fish and shrimp species depends on the availability of slackwater patches.
- The timing of the availability of the habitat patches is critical
- Loss of slackwater patches will alter the biotic communities of lowland rivers
- Summer irrigation releases potential to remove slackwater patches, reducing breeding success of many fish and shrimp species.

**Summary:**

- Flowing and slackwater habitats support different biotic communities.
- Flowing and slackwater habitats potentially have very different food web structure.
- Slackwaters are vital for the successful breeding and recruitment of many native fish and shrimp

- Finally, summer irrigation releases have the potential to remove slackwater habitats from lowland rivers and therefore reduce the breeding success of many native fish and shrimp.

**Further Reading:**

- Humphries, P., Serafini, L.G. and King, A.J. (2002) River regulation and fish larvae: changes in space and time. *Freshwater Biology*, 47, 1307-1330.
- Richardson, A.J, Gowns, J.E. and Cook, R.A. (2004). Distribution and life history of caridean shrimps in regulated rivers in southern Australia. *Marine and Freshwater Research* 55, 295-308

