

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

Campaspe Flow Manipulation Project

Paul Humphries¹

Rob Cook, Adam Richardson, Luciano Serafini

CRC for Freshwater Ecology, Murray-Darling Freshwater Research Centre and Department of Biological Sciences, Monash University.

*¹Present address: The Johnstone Centre, School of Environmental and Information Sciences, Charles Sturt University /
phumphries@csu.edu.au*

Abstract:

The principle objective of the Campaspe Flow Manipulation Project was to assess the current status of the Campaspe River and then conduct a ‘before/after’ environmental flow experiment to test the response of components of the biota to a ‘translucent dam’ approach to providing environmental flows. Because of an extended drought, the experiment was never realized, however, we were able to assess the effects of flow regulation by making comparisons among sections of Campaspe River with different hydrologies and between the Campaspe and the less regulated Broken River. As part of our study, we have identified two major stressors on the Campaspe River biota, many of which are relevant to regulated rivers generally: the imposition of enhanced flows between late spring and early autumn and the loss of flushing flows in winter/spring. The first stressor has: altered the macroinvertebrate fauna to resemble that of an upland stream; and imposed poor conditions for the recruitment of some native fish and shrimp species. The second stressor has resulted in: a loss of cues for fish movement, both upstream and downstream; a loss of scouring flows, which has resulted in a build-up or an inorganic-rich/organic-poor biofilm on snags and, as a consequence, reduced macroinvertebrate diversity. We have come up with recommendations for the operation of storage releases from lowland rivers in ways that we think can alleviate these two stressors.

Key Findings:

- Summer irrigation flows have substantially altered the macroinvertebrate community in the most regulated sections of the Campaspe, from one characteristic of a lowland river to one which more resembles that of an upland stream.
- Only two native fish species persist as self-sustaining populations in this region of the river. Alien species and stocked native species predominate. By contrast, the Broken River fish fauna is relatively good shape.
- Comparisons with the Broken River suggest that this is not because of lack of spawning. Fish in the Broken River spawn every year. It is likely that river regulation has created unfavourable conditions for the recruitment of some species of fish (and of shrimp), through reducing the frequency and extent of inchannel slackwater habitats.
- Barriers to fish movement and the infrequent high winter/spring flows have probably eliminated many species and prevented recolonisation.
- Extended low flow periods in the lower section of the Campaspe River (regulation and drought), have degraded macroinvertebrate communities, through sedimentation of snags.
- The inorganic-rich/organic-poor biofilms which typically develop on snags in the lower section of the Campaspe are dominated by collector/gatherer macroinvertebrate taxa. We suggest that scouring of snags by spates regenerates high quality habitat, which allows colonization of a more diverse range of species and a greater density of individuals.
- The shrimp, *Caridina mccullochi*, seems to have promise as an indicator of those rivers which are regulated by summer releases. The commonly used AUSRIVAS assessment method was not useful in detecting the effect of flow change.

Implications:

- The effects of the release of enhanced flows over summer need to be addressed either through restoration of more natural flow regimes or by the construction of flow-refuge structures
- Flushing flows, designed to scour sediment from snags and provide cues for fish movement, should be part of management plans for rivers

Summary:

- The Campaspe macroinvertebrate and fish faunas are highly degraded, due to the effects of river regulation, whereas those of the Broken River are much less so.
- Altered flows in the 'summer-release' section have produced an upland river macroinvertebrate fauna and provided unfavourable conditions for the recruitment of some species of fish and shrimp.
- Altered flows and drought in the 'low-flow' section have resulted in the build-up of poor quality sediment, reducing the diversity of macroinvertebrates.
- Finally, management of the Campaspe River and similar systems must address the two main flow stressors on the system: enhanced summer flows and lack of winter/spring flushes.

Further Reading:

- Humphries, P. and Cook, R.A. (2004). Campaspe Flow Manipulation Final Report, Dept. of Environment and Heritage, Canberra.
- Richardson, A.J, Grown, 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.
- 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.
- Humphries, P. and Lake, P.S. (2000). Fish larvae and the management of regulated rivers. *Regulated Rivers: Research and Management*. 16, 421-432.
- Cook R.A., Humphries, P. and Richardson, A.J. Persistence of macroinvertebrate communities in lowland rivers. In preparation.
- Cook, R.A, Hawking, J, Humphries, P and Richardson, A.J. Snag macroinvertebrate communities in lowland rivers: possible impacts of discharge regime. In preparation.
- Humphries, P., Brown, B., Douglas, J., Pickworth, A., Strongman, R., Hall, K. and Serafini, L.G. The fish fauna of a regulated lowland river.

