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# Trophic structure of benthic resources and consumers varies across a regulated floodplain wetland

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**Abstract.** Riverine food webs are often laterally disconnected (i.e. between watercourses) in regulated floodplain wetlands for prolonged periods. We compared the trophic structure of benthic resources and consumers (crustaceans and fish) of the three watercourses in a regulated floodplain wetland (the Gwydir Wetlands, Australia) that shared the same source water but were laterally disconnected. The crustaceans *Cherax destructor* (yabby), *Macrobrachium australiense* (freshwater prawn), the exotic fish *Cyprinus carpio* (European carp) and *Carassius auratus* (goldfish) showed significantly different $\delta^{13}C$ values among the watercourses, suggesting spatial differences in primary carbon sources. Trophic positions were estimated by using $\delta^{15}N$ values of benthic organic matter as the base of the food web in each watercourse. The estimated trophic positions and gut contents showed differences in trophic positions and feeding behaviours of consumers between watercourses, in particular for *Melanotaenia fluviatilis* (Murray–Darling rainbowfish) and *M. australiense*. Our findings suggest that the observed spatial variation in trophic structure appears to be largely related to the spatial differences in the extent and type of riparian vegetation (i.e. allochthonous carbon source) across the floodplain that most likely constituted part of the benthic resources.

**Additional keywords:** allochthonous carbon source, food webs, riparian vegetation, river regulation, spatial segregation, stable isotopes.

## Introduction

Floodplain wetlands provide habitats for many species of terrestrial and aquatic biota (Junk *et al.* 1989; Bayley 1991; Junk and Wantzen 2004). River regulation has increased the spatial and temporal extent of lateral disconnection between watercourses in the wetlands (Kingsford 2000; Frazier and Page 2006; Powell *et al.* 2008). Aquatic food webs in regulated floodplain wetlands are confined within watercourses for prolonged periods. Under such environmental conditions, the structure of aquatic food webs is most likely influenced by in-channel conditions (e.g. hydrology, habitat size and complexity) and surrounding geomorphic settings (e.g. riparian vegetation) specific to the watercourses (Tockner *et al.* 2000; Thorp *et al.* 2006; Zeug and Winemiller 2008). This may lead to spatial differences in trophic structure across a regulated floodplain wetland.

The major aquatic consumers of floodplain wetlands include native and exotic fish, reptiles, amphibians and invertebrates. Freshwater crustaceans break down leaf matter and in the case of omnivorous and carnivorous species regulate prey populations (Momot 1995; Usio 2000). *Cherax destructor* ('yabby') is the most abundant and widespread freshwater crayfish in Australia (Jones and Obst 2000). The natural diet of yabbies may include either plant material and detritus or small fish (Bunn and Boon 1993; Beatty 2006). The freshwater palaemonid prawn *Macrobrachium australiense* is another widespread freshwater crustacean in Australia (Murphy and Austin 2004). This species is an indiscriminate scavenger and browser, known to feed on bacteria and biofilm (Lee and Fielder 1982; Burns and Walker 2000). Fish often regulate prey populations including plants, herbivores and other predators (Hall *et al.* 1970; Thorp 1986; Power 1990). In Australia, the trophic ecology of freshwater fish has been studied in relation to the food sources sustaining populations (Medeiros 2004; Burford *et al.* 2008), dietary overlaps between native and exotic species (Pen and Potter 1991; Pen *et al.* 1993), flow conditions (Balcombe *et al.* 2005; Sternberg *et al.* 2008) and fish passage obstruction in regulated rivers (Baumgartner 2007).

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