



Spatial and temporal variability in fish community structure in Mediterranean climate temporary streams

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With 4 figures and 4 tables

Abstract: Temporary streams naturally experience flow intermittence and hydrologic discontinuity that act to shape fish community structure. Yet, alteration of the flow regime of temporary rivers may lessen the resilience of fish communities to tolerate hydrologic change imposed by droughts. This long-term study (2001–2013) predicted spatial structuring (across catchments and amongst reaches) in fish community composition and abundance across a hydrologically-altered Mediterranean-type region dominated by temporary streams. Shifts from freshwater specialist and diadromous species to more generalist and tolerant species (i.e. freshwater generalist, aliens and estuarine species) were anticipated as the region experienced low flows (2001–2006) and critical water shortage (2007–2010) associated with a most severe drought. It was anticipated that changes in composition and abundance would be revealed during flood (2011) and post-flood (2012–2013) periods after the drought. Contrary to these predictions, fish community structure was broadly consistent across catchments, despite varying climatic and hydrologic (mainly, flow intermittence) regimes. As expected, significant spatial variability was revealed at the reach scale, with significant differences between upper reaches and terminal wetlands, and with a clear transition in fish community structure between these reach types. Significant temporal variability was also revealed with the reduced abundance of diadromous species (although *Pseudaphritis urvillii* did increase) and increases in the abundance of aliens and surprisingly freshwater specialists over the period of critical water shortage relative to antecedent low flows. This was followed by mixed reach-dependent responses of fish during the flood and post-flood periods. The differential responses of fish communities across reaches and temporal periods must be considered as part of the management of threatened species in hydrologically-altered regions dominated by temporary streams.

Key words: functional fish groups; threatened species; flow alteration; millennium drought; Murray-Darling Basin.

Introduction

Freshwater fish communities are highly dynamic, with their distribution, composition, abundance, recruitment and resilience changing markedly across space and time (Matthews 1998). This spatial and temporal variability is regulated by a myriad of interrelated factors operating at multiple scales (Schlosser 1987; Poff et al. 1997; Bunn & Arthington 2002), but with flow

regime considered the overarching influence (Poff et al. 1997). For this reason, alteration of flow regimes (e.g. through river regulation and water abstraction) can detrimentally impact aquatic ecosystems through changes to resource and habitat availability, hydrologic connectivity and its influence on the dispersal of organisms, exchange of energy and materials and magnitude of disturbance (Petts 1984; Poff et al. 1997; Bunn & Arthington 2002; Sponseller et al. 2013). This

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