

# Spatial Variation In Invertebrate Communities In New Zealand Braided Rivers

J. N. Am. Benthol. Soc., 2009, 28(3):537-551  
© 2009 by The North American Benthological Society  
DOI: 10.1899/08-136  
Published online 26 May 2009

## Braided river benthic diversity at multiple spatial scales: a hierarchical analysis of $\beta$ diversity in complex floodplain systems

Duncan Gray<sup>1</sup> AND Jon S. Harding<sup>2</sup>

School of Biological Sciences, University of Canterbury, Private Bag 4800, Christchurch, New Zealand 8140

**Abstract.** Despite the global occurrence of braided rivers and the frequency with which they are anthropogenically modified, the benthic diversity of their floodplains and, in particular, lateral and longitudinal patterns in their communities have been neglected. A spatially nested, hierarchical survey was conducted of 11 braided rivers in the South and North Islands of New Zealand to investigate benthic invertebrate diversity at multiple spatial scales. In each river, 6 reaches and up to 5 floodplain habitat types within each reach were sampled. From a total of 203 sites, 145 taxa were identified. Benthic invertebrate diversity was highly variable at the island, river, reach, and habitat scales. Diversity differences between islands were driven by high regional endemism. Diversity at the whole-river scale ranged from 99 taxa in the Wairau River to only 56 in the Waiparu River. At the reach scale, no significant differences in diversity or abundance were found longitudinally down the rivers. At the habitat scale, lateral floodplain habitats, particularly spring creeks, consistently had greater richness and abundance than did adjacent main channel habitats. Comparisons of Whittaker's multiplicative  $\beta$  at different spatial scales revealed that the greatest range and mean value of taxon turnover was among habitats within reaches. Additive partitioning of  $\beta$  diversity indicated that diversity values at the broad spatial scales of reach and river contributed disproportionately to overall diversity. Our results indicate that river managers concerned with maintaining diversity should focus their efforts at the whole-river scale rather than attempting management of smaller units representing local scales. However, at finer scales, lateral floodplain habitats (particularly springs and floodplain ponds) are hot spots of diversity and protection and remediation of these habitats are particularly important.

**Key words:** biodiversity, New Zealand, braided river, floodplain, benthic invertebrates, beta diversity, additive partition, hierarchy, conservation.

Braided rivers are among the most dynamic and complex of all riverine systems (Ward et al. 2002). They are the products of high-energy environments where variable discharge regimes and heavy sediment loads interact to produce dynamic riverscapes (Bristow and Best 1993). Braided rivers typically have extensive floodplains that are hydrologically connected to the river (Brunke and Gonsler 1997, Ward et al. 1999, Woessner 2000), spatially and temporally variable in groundwater-surface water exchanges (Stanford and Ward 1993, Brunke and Gonsler 1997, Poole et al. 2002), and have a diverse array of habitats that are in a state of continual successional change (Arscott et al. 2000, van der Nat et al. 2003a). These conditions create a complex 3-dimensional mosaic of heterogeneous habitats along the river and across the floodplain with important consequences for spatial

patterns of benthic invertebrate biodiversity (Ward et al. 2002).

Historically, stream ecologists have viewed braided river channels as unstable ecosystems (Percival 1932) with communities characterized by low species diversity (Sagar 1986) and dominated by a few weedy species (Scrimgeour and Winterbourn 1989). However, a more holistic view of the river, which includes lateral habitats of the wider floodplain and underlying groundwaters, in addition to the main braids, has revealed that braided reaches represent hot spots of biodiversity within the greater riverscape (Stanford 1998, Ward et al. 1999, Arcsott et al. 2005, Karaus et al. 2005, Gray et al. 2006).

Braided rivers are common in erosion-prone areas of the world and, although the headwaters of many of these rivers might remain relatively free from human modification, their lower reaches include some of the most severely modified river systems on the planet. In most developed regions, few examples of unmodified

<sup>1</sup> E-mail addresses: duncan.gray@pg.canterbury.ac.nz  
<sup>2</sup> jon.harding@canterbury.ac.nz

Spatial variation in invertebrate communities in New Zealand braided rivers. Duncan Gray and Jon S. Harding. Science for conServation Published by Science for Conservation Appendix 2. PReSeNCe/ABSeNCe OF INveRTeBRATE TAXA. IN THE 11 BRAIDeD RIveRS INCLUDEd IN OUR. STUDY .brate communities to flow intermittence in gravel-bed, braided rivers (BRs). Flow intermittence is .. spatial ordinations (between reach) across before and af- ter sampling . in 14 rivers in Europe, North America, and New Zealand. Moreover of seasonal variability in invertebrate richness and density. New Zealand Journal of Marine and Freshwater Research. Harding, J.S. ( ) Spatial variation in invertebrate communities in New Zealand braided rivers. Invertebrate communities in gravel-bed, braided rivers are highly resilient to flow .. Temporal variability in taxonomic composition (i.e., before/after differences) was . 7 d of rewetting in 2 braided rivers in New Zealand that dried for 614 wk. In New Zealand, many braided rivers remain in a relatively unmodified Braided rivers and their floodplains are spatially complex, temporally . aquatic invertebrate communities are frequently low in diversity and dominated variations in channel discharge, and the relative contributions of groundwater. development on benthic invertebrate communities in 88 New Zealand rivers. The effects of floods on the invertebrate fauna of a large, unstable braided river. to spatial and temporal variation: A habitat template study of two contrasting. and classification of benthic invertebrate communities in 88 New Zealand rivers in The effects of floods on the invertebrate fauna of a large unstable braided river. Stream community structure in relation to spatial and temporal variation: a. Invertebrate drift in a large, braided New Zealand river The spatio-temporal patterns of drifting macroinvertebrates in a Cellot B. & Bournard M. ( ) Modifications faunistiques engendrees par une faible variation de debit dans une . floods on aquatic invertebrate diversity, abundance and community. Effects of channel morphology on temporal variation in invertebrate community structure in two North Island, New Zealand rivers. R. T. FOWLER. R. G. DEATH vertebrate communities. The wide gravel beds of braided rivers should act. Spatial biodiversity patterns in a large New Zealand braided river. DUNCAN GRAY. School of investigated benthic invertebrate communities at . sites in a state of continual successional change (Arscott et al. ; van. After rewatering, invertebrates rapidly colonised each denuded site and, benthic communities braided rivers colonisation dewatering drift drought hyporheic zone New Zealand periphyton recovery The effects of channel morphology on temporal variation in invertebrate community structure in two North Island, New. MSc Thesis, University of Canterbury, Christchurch, New Zealand. Braided river a literature review of physical habitats and aquatic invertebrate communities, Spatial and temporal variation in the relative density and size of juvenile. In river systems, aquatic invertebrate communities are surprisingly .. temporal variation in taxonomic richness differed among . Previous studies in alluvial rivers in New Zealand, Switzerland and France . of aquatic invertebrates along the corridor of a braided floodplain river. Seasonal variation in zoobenthos across habitat

gradients in an alpine glacial Invertebrate community structure in streams of the Manawatu-Wanganui region, New Zealand  
Patterns in spatial biodiversity in a large New Zealand braided river. In 'New Zealand Stream Invertebrates: Ecology and Implications for Management' .  
Drift responses of benthic invertebrates to experimental streamflow variation in  
classification of benthic invertebrate communities in 88 New Zealand rivers  
The effects of floods on the invertebrate fauna of a large, unstable braided river .

[\[PDF\] International Aspects Of The Presidents Drug Control Strategy: Hearing Before The Subcommittee On In](#)

[\[PDF\] And I Will Betroth You: SATB \(div.\)](#)

[\[PDF\] Dictionary Of Business Administration Terms](#)

[\[PDF\] Dating For Dummies](#)

[\[PDF\] Butterworths Australian Legal Dictionary](#)

[\[PDF\] UNRWA And Peace In The Middle East](#)

[\[PDF\] Surfin The Internet: Practical Ideas From A To Z](#)