Low flow controls on riverine and hyporheic macroinvertebrates.

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Despite the hypothesised importance of the hyporheic zone as a refuge for riverine
invertebrate communities, little data exists to test its validity within largely perennial
lotic ecosystems. An extreme drought provided the opportunity to investigate riverine
and hyporheic invertebrate community response to declining river flow and associ-
ated changes in habitat characteristics. Changes to the riverine community included a
gradual reduction of aquatic insect taxa associated with the emergence of adults, the
expansion of a non-native (invasive/alien) taxon and the colonisation of sites by taxa
usually associated with lentic waters (ponds and lakes). The hyporheic community
was characterized by greater stability overall but displayed a marked step change in
community structure coinciding with the highest air and water temperatures. A sig-
nificant increase in the relative abundance of benthic taxa within the hyporheic zone
coincided with the most severe drought conditions demonstrating that some taxa in
this chalk stream sought refuge within the hyporheic zone. We present a conceptual
model of the processes influencing riverine and hyporheic invertebrates under severe
low flow conditions, based on data and literature from across the globe. This model
demonstrates the potential importance of surface water and hyporheic zone interac-
tions for some riverine invertebrate communities during severe low flow conditions,
and highlights the importance of managing rivers holistically to include groundwaters
and surface waters concurrently.