



Hyporheic invertebrate community response to flow permanence in a chalk stream

Photo: Katie Muchan

Katie Muchan NERC Centre for Ecology and Hydrology, Wallingford

Acknowledgements:

Dr Francois Edwards NERC Centre for Ecology and Hydrology, Wallingford

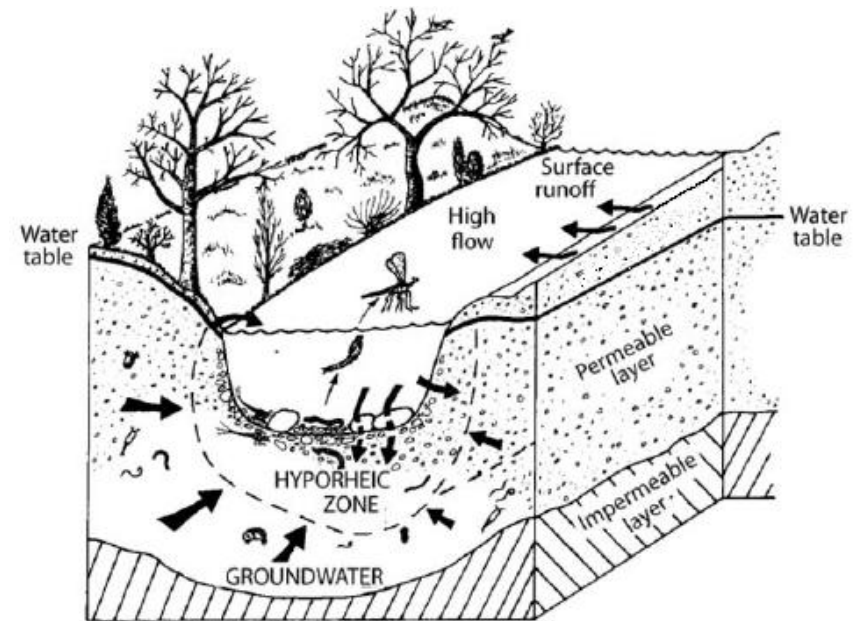
Tim Johns Environment Agency, Wallingford

Presentation Outline

- Introduction to the hyporheic zone
- Study background and aims
- Methods of field sampling
- Study results
 - Flow permanence
 - Hyporheic Zone depth
- Discussion
- Conclusion

The Hyporheic Zone

- ‘The saturated interstitial areas beneath the stream bed and into the stream banks that contain some proportion of channel water’ (White, 1993)
- Research began around 1960, but there has been a surge in interest over the last 20 years
 - Still large areas of debate
- Contrasts between groundwater and surface water characteristics



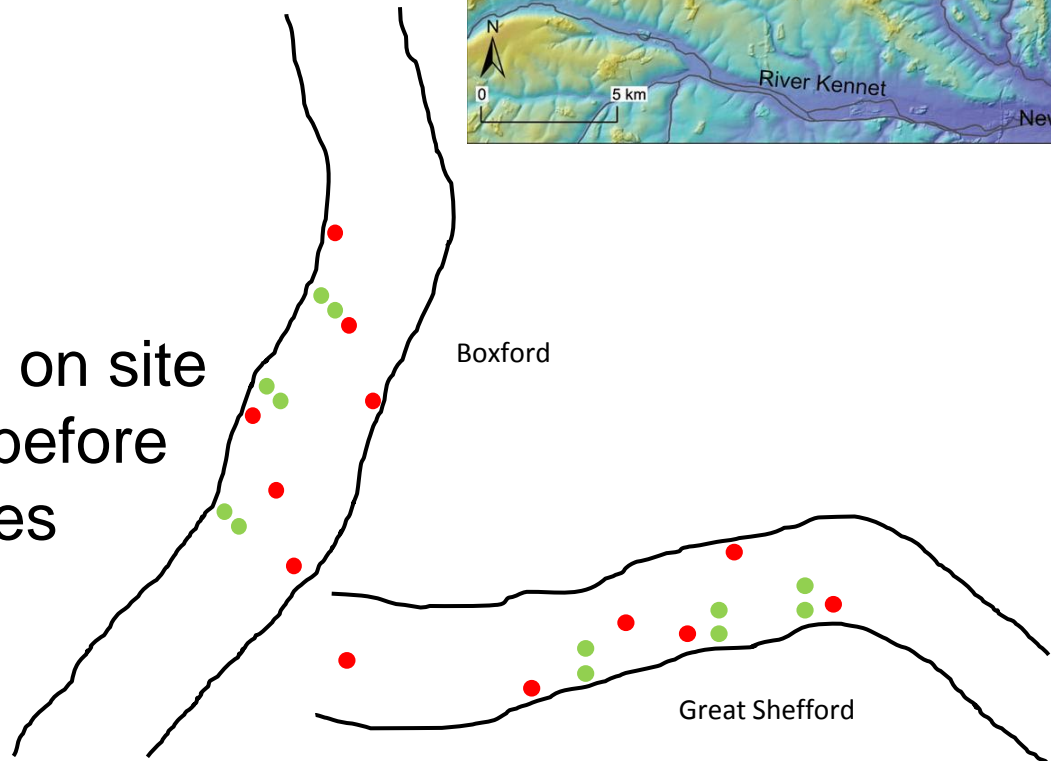
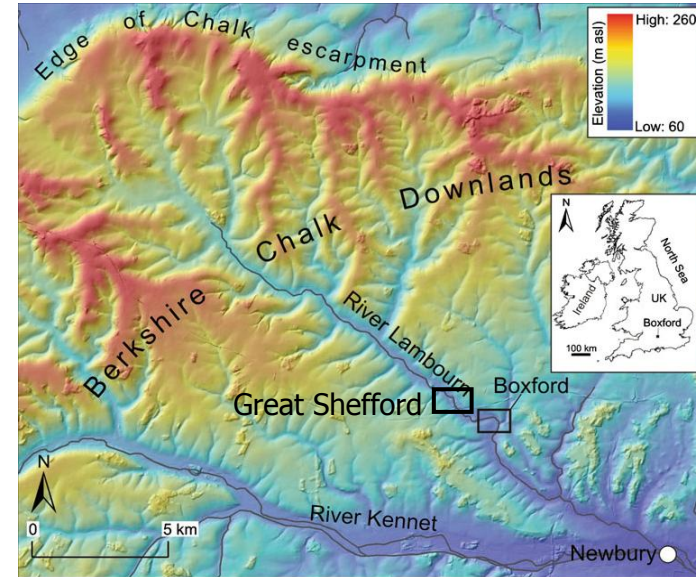
*Orghidan (1959); Schwoerbel (1961); White (1993);
Brunke and Gosner (1997); Williams et al. (2010); Wood et al. (2010)*

Study Background

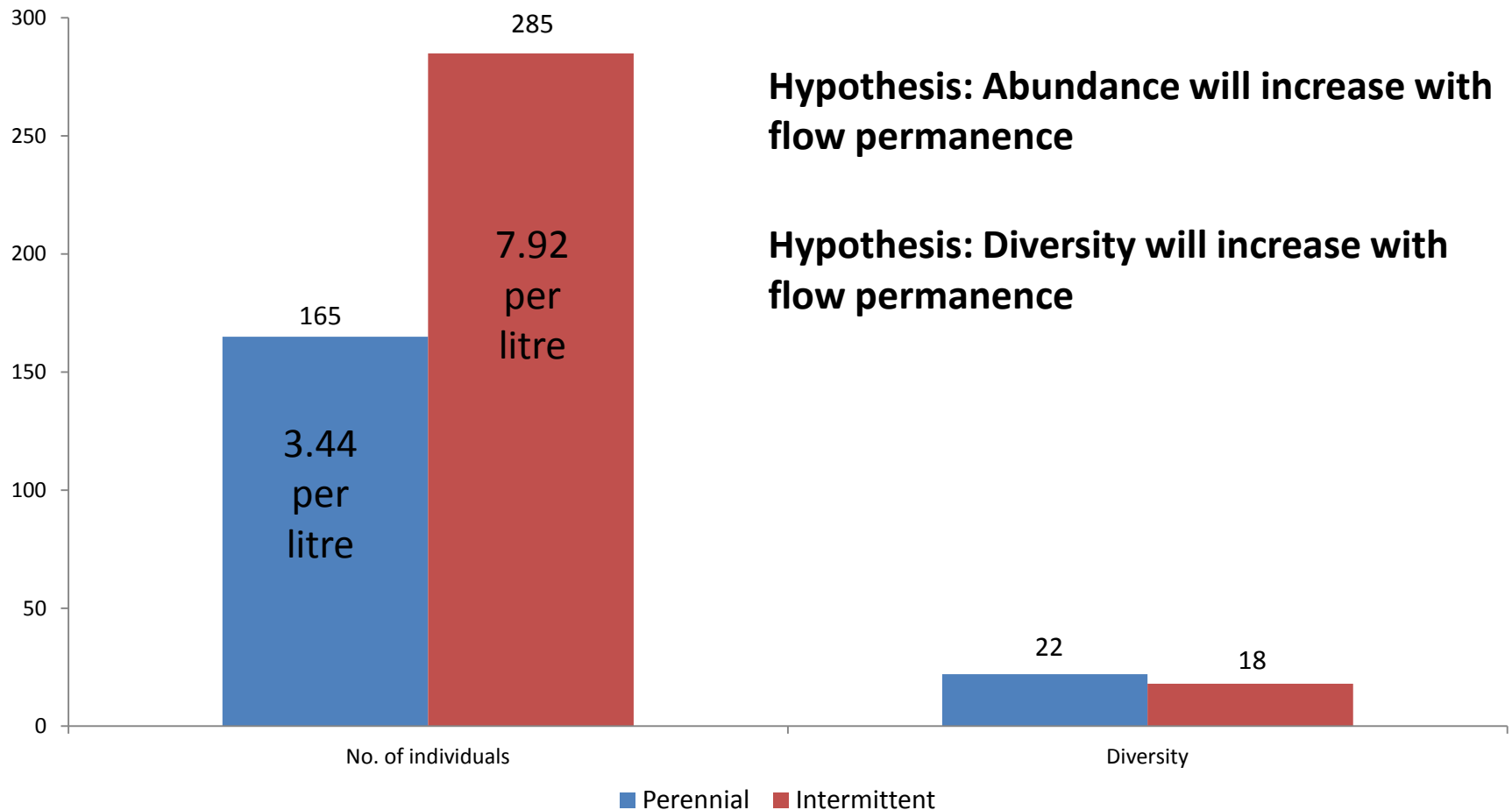
- Groundwater-surface water exchange in permeable catchments
- Future threats to the hyporheic zone
- Investigated three main drivers of hyporheic community
 - Flow permanence
 - Hyporheic zone depth
 - Sediment organic matter content
- Also looked at sampling methods as a separate question
 - Spot vs. 'permanent' sampling

Methods

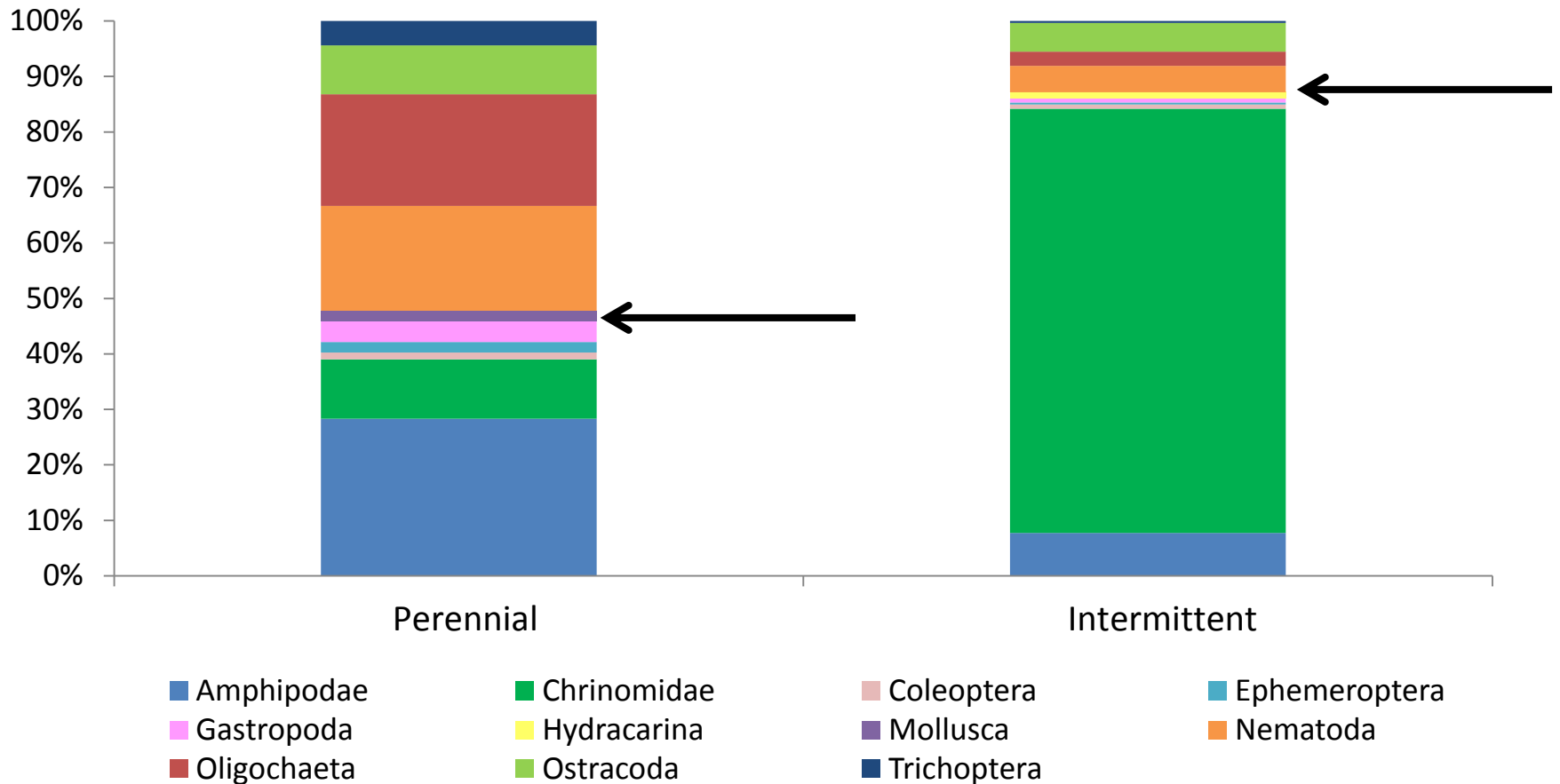
- River Lambourn, Berkshire
- Groundwater-dominated chalk stream
- Perennial and intermittent sites chosen
- Spot and permanent standpipes
- Samples were filtered on site and in the laboratory before sorting for invertebrates



Results – Flow Permanence

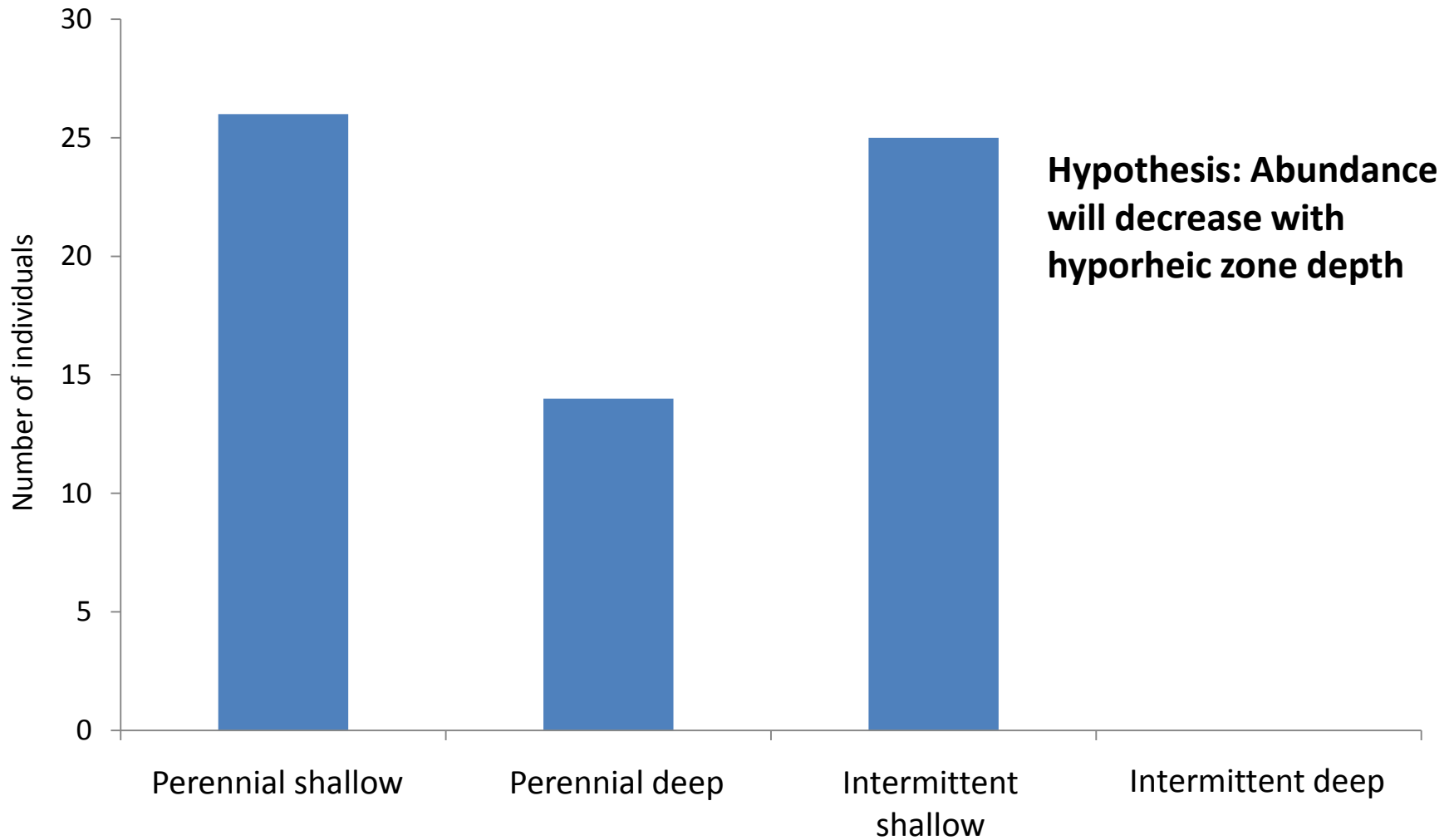


Results – Flow Permanence

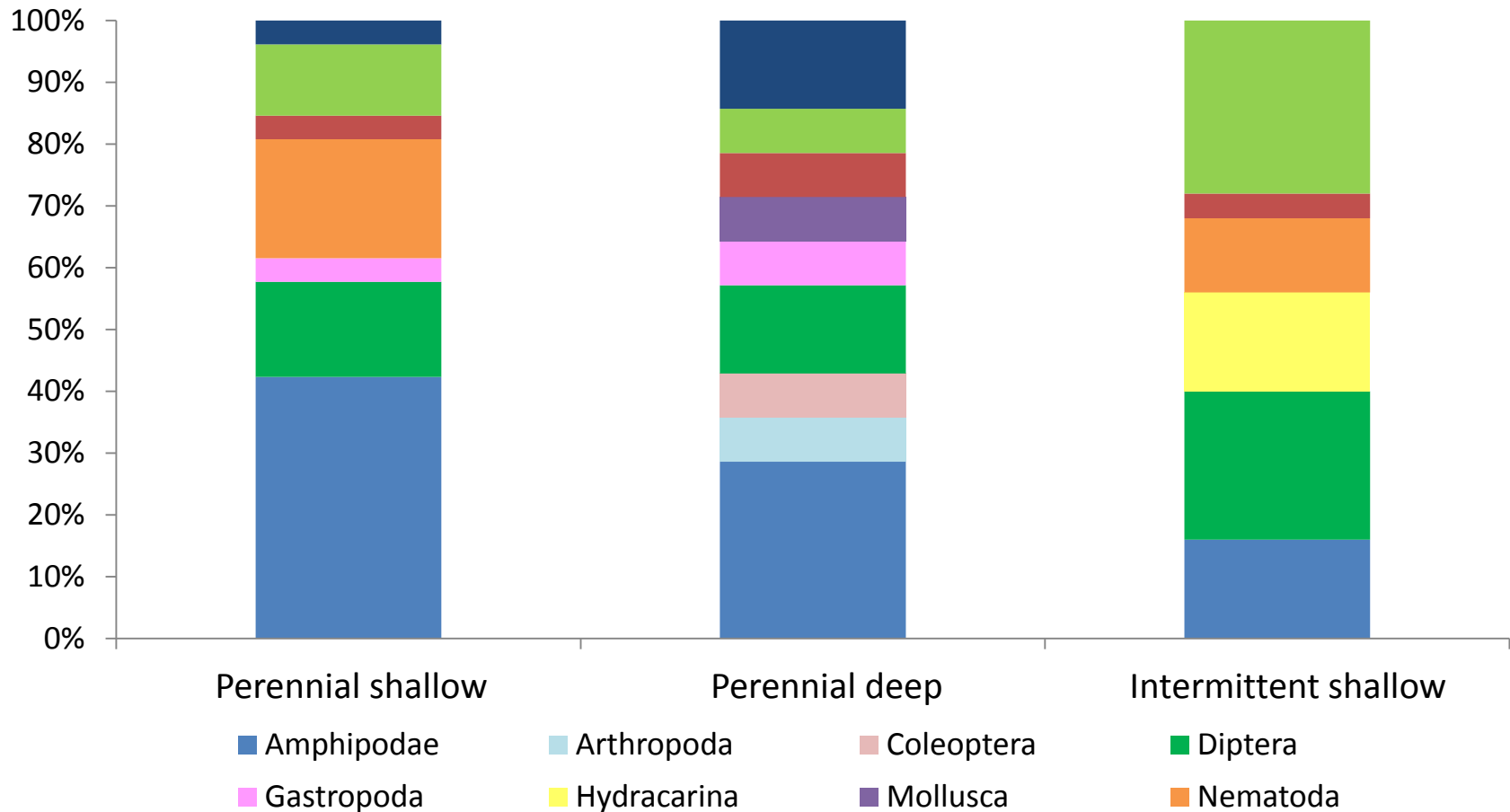


Hypothesis: Community composition will shift in response to flow permanence

Results – Hyporheic Zone Depth



Results – Hyporheic Zone Depth



Hypothesis: Community composition will shift in response to hyporheic zone depth

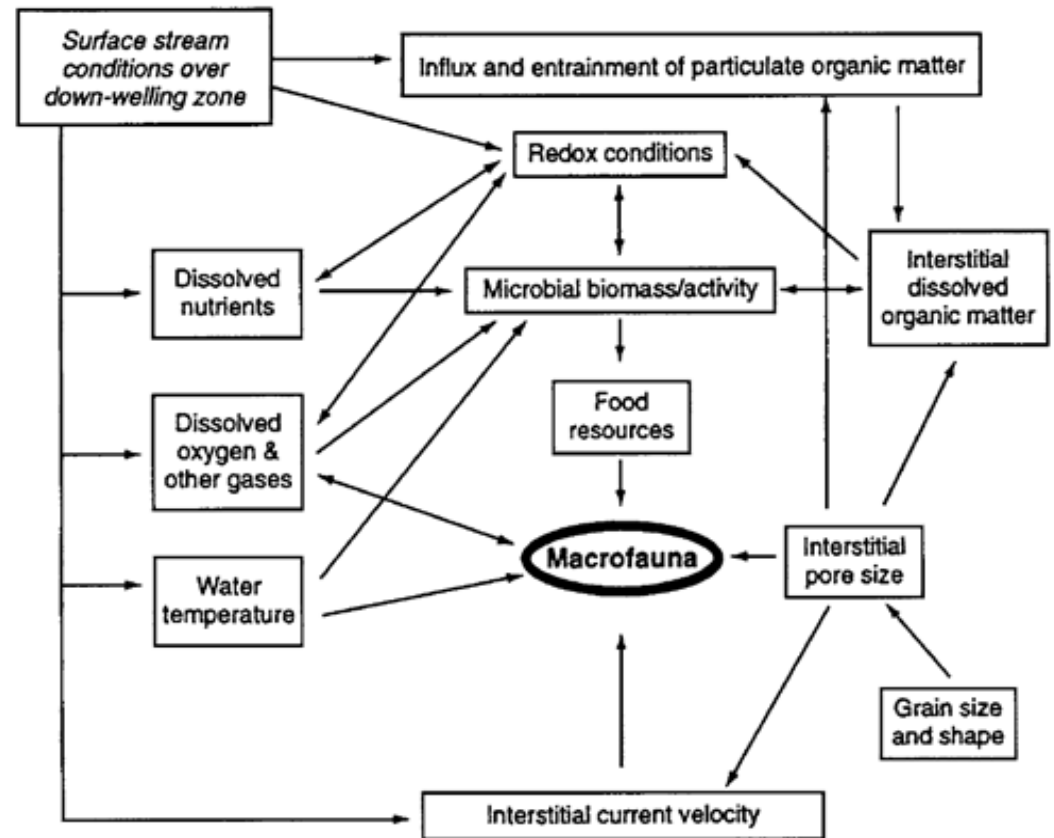
Discussion

- Both drivers influenced community composition, but with large variation
- Flow permanence
 - Important driver in a global context
 - Four taxa lost between the perennial and intermittent site
 - Overlap in community composition with some unique taxa
- Hyporheic zone depth
 - ‘Strongest predictor of invertebrate distribution’
 - More invertebrates found in the shallow samples
 - Presence of epigeal and hypogean taxa at both depths

*Adkins and Winterbourn (1999); Storey and Williams (2004);
Datry et al. (2007; 2010); Stubbington et al. (2009)*

Discussion

- Study limitations
 - Inefficiencies in sampling method
 - Number of samples
 - Only three drivers considered
- Still large scope for future research
 - Threats to the hyporheic zone
 - Hydrological extremes
 - Resilience and refugia



Variables influencing the distribution of hyporheic macrofauna

Brunke and Gosner (1997); Boulton (2000); Pretty et al. (2006)

Conclusion

- Large increase in research interest in the hyporheic zone in recent years
- Study investigated drivers of community composition
- Changes in the community were evident in response to flow permanence and depth
- There is still a lot to be learnt about the hyporheic zone in the future

Thank You

Any Questions?