Drying for a snack: observations on the occurrence of rare *Badister* spp. (Carabidae) in dry stream beds

Kieran J. Gething
School of Science and Technology, Nottingham Trent University; kieran.gething@ntu.ac.uk

Temporary streams, which transition between wet and dry phases, support both aquatic and terrestrial species (Bunting *et al*., 2021), some of which are of conservation interest (e.g. *Agabus brunneus* Fabricius (Dytiscidae)). During hand searches for terrestrial arthropods in the dry channels of Bourne Rivulet (SU396525, a tributary of the River Test) and the Candover Brook (SU566373, River Itchen), I observed high densities of aquatic snails (Fig. 1). The snails were mostly Lymnaeidae and Planorbidae which had been stranded by the recent loss of surface water. Subsequent identification of the terrestrial arthropods collected around the flowing channel by pitfall trapping in April, May, June and July 2021 and from the dry channel bed by hand searching and pitfall trapping during July 2022 revealed four species of *Badister* (Clairville) - which are noted for their asymmetrical mandibles that allow them feed on both aquatic and terrestrial snails (Hayashi & Sugiura, 2021). In total, 17, 60 and 50 individuals of *Badister bullatus* Schrank, *B. dilatatus* Chaudoir (Nationally Scarce) and *B. unipustulatus* Bonelli (Nationally Scarce) were captured. These species were captured both on the banks and in the channel by pitfall trapping and hand searching, and in both catchments during every sampling month. In contrast, *B. peltatus* (Nationally Rare) was only collected on the banks by pitfall trapping, with a single individual in April 2021 from the Candover Brook and another in May 2021 from the Bourne Rivulet.

Some aquatic invertebrates have been dubbed “temporary stream specialists” because of their frequent occurrence in temporary streams, despite being rare at a national level (e.g. the stonefly *Nemoura lacustris* Pictet). It is theorised that these specialists withstand the effects of drying to take advantage of the fewer aquatic competitors present in temporary streams (Aspin & House, 2022). Temporary streams are hypothesised to contain fewer terrestrial competitors during drying (Steward *et al*., 2022). There may thus be parallels between these rare aquatic specialists and the observed occurrence of *Badister* spp. Many *Badister* spp. are found in moist conditions around drying streams and lakes (LaBonte & Johnson, 1989). In combination, the relative lack of competitors, an affinity for moist or water-adjacent habitats and an abundance of their preferred food (i.e. stranded aquatic snails) may allow *Badister* spp., including a number of Nationally Rare and Scarce terrestrial species, to flourish in dry temporary streams.

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Fig. 1 The dry bed of a temporary stream with high densities of aquatic snails.

References

ASPIN, T. & HOUSE, A. 2022. Alpha and beta diversity and species co-occurrence patterns in headwaters supporting rare intermittent-stream specialists. *Freshwater Biology* **67**: 1188-1202. https://doi.org/10.1111/fwb.13910

BUNTING, G., ENGLAND, J., GETHING, K., SYKES, T., WEBB, J. & STUBBINGTON, R. 2021. Aquatic and terrestrial invertebrate community responses to drying in chalk streams. *Water and Environment Journal* **35**: 229-241. https://doi.org/10.1111/wej.12621

GETHING, K.J. 2024. *Dry me a river: characterising and monitoring how aquatic and terrestrial invertebrates respond to drying and anthropogenic pressures in temporary streams.* PhD Thesis. Nottingham: Nottingham Trent University. https://irep.ntu.ac.uk/id/eprint/51574/

HAYASHI, M. & SUGIURA, S. 2021. Shell-breaking predation on gastropods by *Badister pictus* (Coleoptera, Carabidae) with strikingly asymmetric mandibles. *ZooKeys* **1044**: 815-830. https://doi.org/10.3897/zookeys.1044.62293

LABONTE, J.R. & JOHNSON, P.J. 1989. Distribution, Ecological, and Behavioral Notes on *Blethisa* in Montana and Oregon (Coleoptera: Carabidae). *The Coleopterists Bulletin* **43**: 170-172. https://www.jstor.org/stable/4008630

STEWARD, A.L., DATRY, T. & LANGHANS, S.D. 2022. The terrestrial and semi-aquatic invertebrates of intermittent rivers and ephemeral streams. *Biological Reviews* **97**: 1408-1425. https://doi.org/10.1111/brv.12848