

Tiny crustaceans can provide insights into evolution, ecology and biodiversity. **Louise Maurice<sup>1</sup>, John Bloomfield<sup>1</sup>, Anne Robertson<sup>2</sup> and Debbie Allen<sup>1</sup>** investigate how their occurrence might be related to permeability, degree of fracturing, flow patterns in boreholes, and water table.

# Groundwater animals

Groundwater animals are adapted to live in environments with no light and limited nutrients. They can provide insights into fundamental questions of evolution, ecology and biodiversity. They also have an important role to play in informing the reconstruction of past changes in geomorphology and climate, and can be used for characterising aquifers. The BGS is undertaking a systematic survey of selected areas and lithologies in the UK where groundwater animals have not been investigated. This is important because little is known about groundwater ecosystems in the UK despite the unique contribution to biodiversity made by these animals. Groundwater organisms are also thought to provide ecosystem services by means of their role in nutrient cycling and natural remediation of pollutants in the subsurface. They may also be useful indicators of human impacts on groundwaters.

(BAP) species. In Ireland there are two other species of *Niphargus* which are endemic. There is a significant lack of data on groundwater ecology in the UK, particularly compared with other parts of Europe, and the full extent of groundwater biodiversity has not yet been described so other species may be present, including other endemics. Most records of stygobites in the UK are

Groundwater ecosystems comprise organisms that live in groundwater and generally do not exist above the ground surface (known as **stygobites**), organisms that can live both above and below ground (**stygophiles**), and organisms that occur accidentally in groundwater (**stygoxenes**). Stygobites generally have no eyes, elongated shapes, long appendages and lack pigmentation so are colourless or translucent. Many stygobite species are small crustaceans.

The UK and Ireland have 10 known species of stygobite and three of these are endemic. *Niphargus glenniei* is endemic to groundwater in Devon and Cornwall, and has recently been listed as a UK Biodiversity Action Plan



*The groundwater species Niphargus aquilex is found in UK groundwaters and is generally 4 to 15 mm long.*

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*Sampling for stygobites in a borehole in Berkshire.*

from cave systems in the Carboniferous Limestone and boreholes in the Chalk, but even in these lithologies there are areas of the UK which have not been investigated.

In collaboration with groundwater ecologists, the BGS is starting a UK-wide survey of groundwater animals which is focused on lithologies and areas that have not previously been well sampled (e.g. the Permian limestones, the Jurassic limestones, the Permo-Triassic sandstones). The aim is to provide information on the biodiversity of UK groundwaters, which would act as a baseline enabling recognition of future changes in groundwater ecosystems due to climate change or anthropogenic impacts. The survey aims to highlight the location of groundwater ecosystem resources in the UK, enabling future research to be targeted most effectively.

The BGS also has an important role to play by providing geological and hydrogeological input into studies of the controls on the distribution of groundwater animals and their role in nutrient cycling and attenuation

of pollutants. For example, we are currently collaborating with ecologists at Roehampton University to investigate the distribution of groundwater animals in Devon and Dorset. With

our colleagues at Roehampton, we are also carrying out a pilot study to sample groundwater animals in Chalk boreholes in Berkshire where the hydrogeology is well understood. Our aim is to investigate whether stygobite diversity and abundance in boreholes is related to factors such as permeability, degree of fracturing, flow patterns in boreholes, and depth to the water table.

We recently found stygobites in boreholes in the Yorkshire and Lincolnshire Chalk for the first time, and we might even discover a new species. In this exciting new area of groundwater science we are learning more about these enigmatic animals, and about how geology affects groundwater ecosystems, which in turn can help us to understand hydrogeology.

[www.bgs.ac.uk/research/groundwater/ecology.html](http://www.bgs.ac.uk/research/groundwater/ecology.html)  
[www.freshwaterlife.org/hcra](http://www.freshwaterlife.org/hcra)

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*Lowering an ecology sampling net down a borehole.*