Biological assessment

Version: February 2018

Background information on sampling bores for stygofauna

1 Purpose and scope

This document provides background information on sampling bores for stygofauna (subterranean aquatic fauna).

2 Associated documents

Biological assessment: Sampling bores for stygofauna

3 Introduction

Stygofauna, also known as subterranean aquatic fauna, are aquatic fauna that live part or all of their lives in groundwater systems such as aquifers or underground caves. Stygofauna are found in aquifers and caves, inhabiting the water filled pore spaces, voids, cracks and fissures of most rock types including sandstones, laterites, calcretes and basalts, in natural and modified springs and unconsolidated sediments (Humphreys 2006, Humphreys 2008).

The majority of stygofauna are crustaceans. Other stygofauna taxa include mites, worms, snails, insects and fish. These animals live in the dark where primary production is limited, and because of this, some stygofauna rely on organic matter introduced into their environment, predominantly from seepage of water from the surface. Other stygofauna are predators or use bacterial biofilms as a food source (EPA 2012 and references cited within). Some stygofauna species are adapted to living their entire life in total darkness. A group of stygofauna call stygobites live exclusively in groundwater and are characterised by the loss or severe reduction of eyes and pigment (Figure 1).

(a)

(b)

Figure 1: Examples of stygofauna (a) Acarina (mite) (photo credit A. Prior, DNRME) and (b) Syncarida (photo credit A. Steward, DES)

Stygofauna are a key part of Australia's biodiversity and tend to have a high degree of endemism (Humphreys 2006). They are potentially impacted by groundwater withdrawal and changes in groundwater quality (Nevill et al. 2010, Hartland et al. 2011). Stygofauna in Queensland have been described at depths of up to 60m below ground, at electrical conductivities above 50,000µS/cm and in both acidic (pH 3.5) and alkaline (pH 10.3) environments (Schultz et al. 2013, Glanville et al. 2016). The Queensland Government has provided a guideline for the environmental assessment process of stygofauna and contains information on the design of stygofauna sampling programs. This can be found at: https://publications.qld.gov.au/dataset/subterranean-aquatic-fauna.

4 Sampling stygofauna

There are two recommended sampling methods for stygofauna—netting and pumping *(*see *Sampling bores for stygofauna* document). Netting is a passive sampling method that collects animals residing within the bore casing (Figure 2). Pumping is an active sampling method that collects groundwater and fauna from within the bore casing and the surrounding aquifer substrate. As the pump actively draws water and fauna into the bore, it effectively samples a larger area outside the bore, but sampling time can be longer than netting.

The choice of groundwater sampling equipment, particularly the pump that is used, is important as to minimise damage to the animals being collected. Although most pumps can be used, impeller driven pumps such as electric submersible pumps are more likely to damage fauna during collection. The pump used should be able to deliver water to the surface at a rate >10L/min from a water table 40m below ground to ensure that animals are drawn in from the surrounding aquifer (EPA 2007).

Figure 2: Example of a net used to sample stygofauna, with collection vial attached to bottom of net

5 Stygofauna database

The Queensland Herbarium manages a Queensland Government Subterranean Aquatic Fauna Database that

contains a collection of stygofauna locations and species throughout Queensland. Upon completion of projects involving stygofauna sampling, results should be sent to the Queensland Herbarium to ensure the database is kept up to date (Queensland.Herbarium@qld.gov.au). Data provided must be in a suitable format as detailed in the DSITI *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI 2014).

This database is available upon request to the Queensland Herbarium (Queensland.Herbarium@qld.gov.au), and will be made publicly available in the future.

6 References and additional reading

DSITI 2014, *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna,* Department of Science, Information Technology and Innovation, Queensland Government, viewed 26 July 2016, https://publications.qld.gov.au/dataset/subterranean-aquatic-fauna.

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WetlandInfo 2013, *Aquifers and caves*, Department of Environment and Heritage Protection, Queensland Government, Queensland, viewed 26 July 2016, http://wetlandinfo.des.qld.gov.au/wetlands/ecology/aquatic-ecosystems-natural/aquifers-caves/.