

Sampling bores for stygofauna

1 Purpose and scope

This document describes the procedure for sampling stygofauna from groundwater monitoring bores using both netting and pumping methods. This method is an adaptation of a sampling protocol developed by ALS Water Resources Group (Hancock & Bennison 2011).

2 Associated documents

Sampling design and preparation:

- *Permits and approvals*
- *Record keeping including taking of field photographs and videos*

Physical and chemical assessment: Guidance on the sampling of groundwaters

Biological assessment: Background information on sampling bores for stygofauna

3 Health and safety

Before following the methods contained in this document, a detailed risk management process (identification, assessment, control and review of the hazards and risks) must be undertaken. All work carried out must comply with the Queensland Work Health and Safety legislative obligations.

4 Permits and approvals

Permits and approvals may be required to conduct activities involving animals, plants and/or in protected areas (for example National Park/Regional Park, State Forest or State Marine Park). See *Permits and approvals* for more information on requirements.

5 Skills, training and experience

Skills, training and/or experience required to understand and/or undertake this method include training and experience in groundwater sampling.

6 Equipment

See Appendix 1 for example equipment checklist.

7 Procedure

7.1 Preparation for sampling

- Ensure the correct sampling method (netting and/or pumping) has been chosen to meet the objectives of the study.
- Check that the stygofauna nets are free of holes.
- Ensure that pump for groundwater sampling is in good working condition.
- Download DNRME bore cards for the groundwater monitoring bores you will be sampling. Bore cards can be located using the Google Earth™ and Queensland Globe (<https://data.qld.gov.au/maps-geospatial/qld-globe>). Load the Inland waters globe to find details of groundwater monitoring bores. Click on the bore of interest to download the bore card from Google Earth™.

7.2 Sampling

1. Record the bore number, bore diameter, bore depth, height of collar, whether casing extends for the entire length of bore, and whether the bore is screened. This information should be provided on DNRME bore cards. If a bore card is not available, measure as a minimum the depth of the bore and the water depth.
2. Take and record a GPS reading for the bore.
3. Take photos of bore and surroundings as a record of local vegetation and the immediate landscape.
4. Measure and record depth to water table and depth to bottom of the bore using water level meter.
5. If ground water quality samples are to be collected these should be collected after the stygofauna have been sampled (See *Groundwaters* document).

7.2.1 Netting

1. Attach the collection vial to bottom of the net (Figure 1a), and the net to a fishing reel.
2. Lower the net to the bottom of the bore (Figure 1b) using a fishing reel.
3. Once the net has reached the bottom of the bore, raise the net up and down to dislodge any fauna attached to the bottom of the bore. The net should be drawn up and down a distance of approximately 30cm and a total of four times.
4. Reel the net up in a smooth and steady motion (~10-20cm/sec) to avoid a bow wave and losing any fauna captured.
5. Place a 50µm sieve into the bottom of a plastic bucket. Once the net is clear of the bore, remove the collecting vial and pour the contents into the 50µm mesh sieve in the bucket. Ensure the net does not touch the ground.
6. Hold the net over the sieve and wash using water from a wash bottle (Figure 1c).
7. Repeat steps 1 to 5 six times in total.
8. When reeling in the line the final time at a bore, wipe the line with a cloth as it is reeled in to wipe off any fauna that may be stuck to it.
9. Rinse the net, vial and sinkers over the sieve.
10. Tilt the sieve and wash the contents of the sieve into a sample jar (Figure 1d). Preserve the sample with 100% ethanol and stain with a small quantity of Rose Bengal stain.

Note: For genetic studies, Rose Bengal should be avoided as it binds to genetic material.

11. Record bore number, water level depth, collection date, sample number and sample type (i.e. net or pump) on a label and add label to jar.
12. Wash the stygofauna net, collection vial and weights in Decon90 solution and then rinse thoroughly in tap water. Nets should be allowed to dry between sites.
13. Ensure bore cover is replaced and locked as found.



(a)



(b)



(c)



(d)

Figure 1: Sampling stygofauna using a net and reel

7.2.2 Pumping

1. Set up the groundwater sampling equipment as per manufacturer's instructions.

Note: Although most pumps can be used, impeller driven pumps such as electric submersible pumps are more likely to damage fauna during collection and this should be avoided if possible.

2. Feed the sampling hose into the bore until it reaches the bottom of the bore casing. Then lift hose so that it sits approximately 2m above the bottom of the bore.
3. Set out three rows of ten x 10L buckets, each row equivalent to a 100L sample (Figure 2a). Buckets with spouts are recommended, and it is helpful to have three different coloured buckets—

one colour for each row. If the area surrounding the bore is vegetated, clear the vegetation to provide flat surface. A weed trimmer/brush cutter maybe required for thick vegetation.

4. Start the pump and hold the end of the hose close to the bottom of the first bucket ensuring that it is below water level as the water flows in. This will reduce aeration for physico-chemical measurements.
5. Fill buckets sequentially and try to minimise splashing and overflows.
6. Use multi-probe to measure physico-chemical parameters from first bucket and then every 50L i.e. every five buckets.
7. Once the water quality parameters measurements have been recorded, sieve the contents of each bucket through a 50µm mesh sieve (Figure 2b). Gently swirl the contents of the bucket so that organic matter and fauna are suspended, then carefully pour through the sieve. Capture the sieved water in another bucket and then transfer back to original bucket. Elutriate and sieve twice more.
8. After sieving the first 10 buckets (i.e. 100L), transfer the sieve contents into a sample jar and preserve with 100% ethanol.
9. The sample jar should be labelled with a permanent marker label and a pencil label on waterproof paper should be placed in jar.
10. Repeat steps 8 and 9 for second and third 100L, so that there are three x 100L samples per bore site.
11. Record bore number, water level depth, collection date, sample number and sample type (i.e. net or pump), and sub-sample details (i.e. sub-sample 0-100L, 100-200L, 200-300L) on a label and add label to jar. Record these details in a notebook or equivalent.
12. Add a small amount of Rose Bengal to each sample jar.

Note: for genetic studies, Rose Bengal should be avoided as it binds to genetic material impacting on genetic analysis.

13. Water quality samples (e.g. Nutrients, Dissolved Organic Carbon, pesticides etc.) should be collected straight from the hose once stygofauna sampling has finished (i.e. after 300L has been collected in sample buckets).
14. Sample bottles must be labelled and the sample name, site, data and time and sampler name must be recorded in a notebook or equivalent.
15. After sampling is completed, remove hose from the bore and pump and empty it of water. Pump a solution of Decon90 through the hose to decontaminate it, then pump thoroughly with tap water.
16. Wash the outside of the hose and wipe dry with a towel to prevent grass and dirt sticking to the hose and contaminating the next bore.
17. Rinse and dry sieve.
18. Ensure bore cover is replaced and locked as found.
19. Chain of Custody (CoC) documentation should be filled out.



(a)



(b)

Figure 2: Sampling stygofauna using a pump and buckets

8 References and additional reading

EPA (Environmental Protection Authority) 2007, *Guidance for the Assessment of Environmental Factors: Sampling methods and survey considerations for subterranean fauna in Western Australia, Guidance Statement 54a, draft*, Available from: http://www.epa.wa.gov.au/EPADocLib/2543_GS54a30708.pdf.

EPA (Environmental Protection Authority) 2013, *Environmental assessment guideline for Consideration of subterranean fauna in environmental impact assessment in Western Australia, EAG 12*. Available from: <http://edit.epa.wa.gov.au/EPADocLib/EAG12%20Subterranean%20fauna.pdf>.

Hancock, P, Bennison, G 2011, *Collecting groundwater invertebrate samples from bores*, ALS Water Resources Group, Yeerongpilly, Brisbane, Queensland, Australia.

Hancock, P, and Steward, A 2004, *Pioneer Groundwater Biota Pilot Study. Review of Sampling Methods for Groundwater Fauna and Bacteria, Aquatic Ecosystems Technical Report No. 49*, Queensland Department of Natural Resources and Mines, Indooroopilly, Brisbane, Queensland.

Appendix 1

Table 1 Equipment checklist

Equipment	✓
Inertial pump	
30m hose	
Stygofauna sampling net (50µm mesh) with fishing rod and reel	
Groundwater level monitoring tape	
Vials and sinkers to attach to net	
50µm mesh sieve	
Squeeze bottle for water and ethanol	
Sample bottles and jars	
Waterproof markers and pencils	
Thirty 10L buckets	
Water quality meters	
5L containers for Decon90	
Notebook or field sheets	
Safety equipment	