The use of baited stygofauna traps as a complimentary sampling method for sampling groundwater bores in the Pilbara, Western Australia

Syngeon Rodman[‡], Juliana Pille Arnold[‡], Michael Curran[‡], Dean Main[§]

‡ Biologic Environmental Survey, East Perth 6004, Australia
§ Rio Tinto Pty Ltd, Perth 6000, Australia

Corresponding author: Syngeon Rodman (syngeon@biologicenv.com.au)

Abstract

Stygofauna sampling predominantly comprises active sampling methods, such as net hauling or hand netting, which although highly effective at collecting specimens, can cause significant specimen damage and is unlikely to collect vagrant species. Studies assessing the efficacy of using stygofauna traps (both baited and unbaited) have been conducted with varying levels of success. Thus, the development of a robust and effective stygofauna trap design may be advantageous. Between 2021 and 2022, in conjunction with Rio Tinto, Biologic began developing and trialling a stygofauna trap designed to sample groundwater bores or drill holes intersecting groundwater, with the aim of evaluating the following hypotheses:

1. The stygofauna trap design and method used would successfully collect stygofauna in groundwater bores and drill holes intersecting groundwater.
2. Some taxa collected in stygofauna traps may differ from those collected in net haul samples, due to differences in ecological habit of fauna (crawling taxa colonising traps) or vagrant stygofauna (fauna travelling between suitable habitats).
3. Specimens collected in traps will be in better condition than those collected in net haul samples. This has positive implications for taxonomic and molecular identification, as well as the collection of voucher specimens.

Based on a fish funnel or box trap, the stygofauna traps consist of a 90mm cylindrical PVC frame, with a 150µm mesh inner lining. Both ends of the trap are capped with a removable funnel, allowing fauna to enter. In September 2021, a preliminary trial was conducted on sites intersecting the Robe and Bungaroo aquifers, in the coastal Pilbara region of Western Australia. These shallow aquifers are characterised by a highly abundant and rich stygofauna assemblage, typically dominated by crustaceans. Stygofauna traps (one trap per site) were deployed in seven groundwater bores or drill holes intersecting groundwater.

The traps, baited with algae pellets, were set at the bottom of the bore, and collected between 12 and 24 hours of deployment. For comparison, net haul sampling was conducted at each site immediately prior to trap deployment. Results from the initial trial were promising, prompting a two season (wet and dry) study. This study commenced in March 2022, where traps were deployed in 11 sites across both aquifers. Two baited traps per site were deployed, one within 1m of the groundwater level and one at the end of the hole, for 72 hours, to determine if a longer deployment and an additional trap would yield better results. The final phase of sampling is planned for August 2022.

Results from both the preliminary trial and first (wet) season of the 2022 study were very promising, with stygobitic taxa collected in four (of the seven) and nine (of eleven) trap sites respectively. The traps recorded a rich assemblage of stygofauna comprising Amphipoda, Copepoda, Gastropoda, Isopoda, Ostracoda and Thermosbaenacea. Compared to the respective net haul samples, the stygofauna traps yielded lower abundances and taxa richness. However, specimens collected in traps were in excellent morphological condition. At the conclusion of this study, taxonomic composition and abundance of stygofauna from the traps and net hauls will be analysed to provide further contextualisation of results.

Presenting author

Syngeon Rodman

Presented at

The 25th Conference on Subterranean Biology

Conflicts of interest