

Subterranean fauna capability statement

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Subterranean Fauna



Phoenix offers complete subterranean survey solutions that are well-planned and employ cutting edge, best practice field and laboratory methods that follow rigorous HSE standards. We deliver high quality reports and practical, scientifically-sound advice to manage subterranean fauna issues.

Dr Erich Volschenk is Australia's leading scorpion expert and Manager of subterranean projects at Phoenix. He has studied subterranean fauna since 1996 and has extensive experience surveying and researching subterranean fauna. Erich is Australia's only scorpion taxonomist and has described all of Australia's troglobitic scorpions.

ABOUT SUBTERRANEAN FAUNA

Subterranean fauna are animals (usually invertebrates) that live beneath the surface of the ground. They are usually classified into air breathing species (troglofauna) and aquatic species (stygofauna).

Troglofauna inhabit cavernous networks within rock and alluvial sediments, and stygofauna are usually associated with aquifers and the hyporheic zones (water logged sediments) of rivers and lakes.

Some subterranean species (troglobites and stygobites) are so specialised to life underground that they cannot survive anywhere else. They typically have no pigmentation, reduced or absent eyes and wings, elongated bodies and appendages, no circadian rhythms (regular day / night behaviours like sleeping) and greater sensory dependence on vibration.

that they are incapable of dispersal and can be classified as extreme short-range endemics (SREs). Their usual small distributions also make these species vulnerable to modification of their habitat, through mining and water abstraction for example.

The EPA's objective for subterranean fauna are to ensure that important habitats are adequately protected and no species is threatened with extinction. In environmental impact assessment (EIA), proponents must demonstrate that they will meet these objectives according to *EPA's Guidance Statement 54, 'Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia'*.

In Western Australia, the Pilbara and Yilgarn regions (including the WA Goldfields) have become known for their rich diversity of subterranean fauna. Limestone systems in southern WA also support significant subterranean fauna.

INDUSTRY ISSUES

Sampling subterranean fauna habitats is challenging because there is limited access to the target fauna. Confusion arises from the fact that the extent of



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Phoenix Environmental Sciences offers a broad range of complementary biological and environmental management services. Our team strikes the right balance of scientific credibility, practical application and business sense.



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frequent instances where bores intersect more than one potential habitat. These factors can hamper interpretations of both troglofauna and stygofauna distributions.

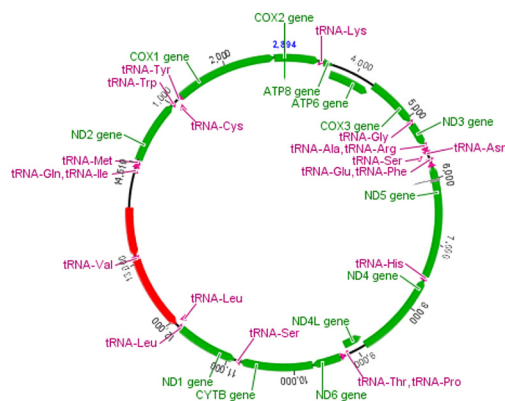
Subterranean fauna surveys often require long lead times, for example, to allow bores to adequately colonise after drilling, or to collect supplementary information to support impact assessments, e.g. geological or hydrogeological data. Early survey planning and implementation is critical to avoid impeding broader project timelines.

Some troglofauna communities are quite rarefied, requiring specific survey techniques. Surveys that use standard methods can result in incomplete datasets and inaccurate determinations of 'impact area' species. Also, subterranean fauna often appear extremely similar to one another and have lost key features that would normally enable definitive identification. They are frequently represented by groups for which there is no established local taxonomic knowledge, which frustrates standard identification efforts.

OUR SOLUTION

Phoenix undertakes detailed site-specific survey scoping and planning for each subterranean fauna survey. Our survey strategies identify and target the most suitable bores for subterranean fauna, then build a complete picture of the subterranean ecosystem with detailed records of bore characteristics to define the habitats being sampled.

We can meet tight timelines by tailoring survey methods to reduce the time required to complete surveys, while



Mitochondrial genome

maintaining EPA expectations and best practice standards. By supplementing standard methods with more recent and effective techniques, we are able to gain more data, increase survey success and meet stringent requirements of the EIA process.

We reduce the chances of wrongly classifying 'widespread' species as 'restricted' species by using robust statistics and confirmation of in-house identifications with genomic analyses, including barcoding methods.

Our team delivers high quality, cost-effective subterranean surveys through:

- transparent science – complete datasets presented in technical reports, supplemented by spatial data
- industry-leading parataxonomy, enabling identification of nearly all types of subterranean invertebrates
- efficient and accurate data management systems
- expert knowledge of subterranean habitats across Australia
- extensive experience in project-specific and targeted survey design
- opportunity to revise project conditions, status and limitations from a more strategic point of view

SERVICES

- Subterranean fauna survey scoping and design
- Risk assessments and baseline surveys for EIA
- Compliance monitoring for subterranean fauna and habitats
- Development of management plans and survey strategies
- Strategic advice
- Review of subterranean proposals

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