Technical Appendix C5

Subterranean Fauna

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

SUBTERRANEAN FAUNA

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1 Introduction

ChevronTexaco Australia and its joint venturers propose to develop a gas processing facility at Town Point on Barrow Island and to construct a pipeline across the island from North White's Beach to the gas facility. Potential impacts to the underlying karst habitats and the rich diversity of subterranean fauna that it supports, require assessment under the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Biota Environmental Sciences were engaged to collate existing literature on the subterranean fauna of Barrow Island and to instigate field studies to redress the lack of knowledge on diversity and distribution of the fauna.

This report describes the current understanding of the subterranean fauna of the proposed Development area and its likely conservation significance. It also documents progress on the genetic investigations and investigative sampling work conducted in the vicinity of the proposed Gorgon Development. Field studies and identifications are ongoing and the completed studies will be reported separately. Recent draft field reports are attached to this Technical Appendix to illustrate the status of the surveys..

1.1 Overview of Subterranean Fauna

Subterranean fauna has been known from Western Australia since the 1940s, with the blind gudgeon *Milyeringa veritas*, amongst other fauna, being documented from groundwater beneath the coastal plain at Cape Range (Humphreys 2001). However, little work was carried out in relation to subterranean communities until the early 1990s. The increase in knowledge and general profile of subterranean communities in Western Australia has been due largely to work conducted by the Western Australian Museum, which focussed initially on Cape Range (Humphreys 1993), and has also included substantial work on Barrow Island (see Section 1.2).

Two broad categories of fauna are generally considered to comprise true subterranean fauna:

- stygofauna — groundwater-dwelling, aquatic fauna (including stygobites; obligate groundwater dwellers)
- troglobites — obligate cave or karst-dwelling, terrestrial subterranean fauna occurring above the watertable.

A broad overview of typical ecological characteristics of subterranean fauna and their environment is provided in Table 1-1.

Table 1-1 - Characteristics of Subterranean Ecosystems and their Components (adapted from Gibert et al. 1994)

Environment	Constant darkness
	Physical inertia which increases with depth
	Predictability: hydrologic and chemical variation usually not very evident in interstitial environments
	Restricted variety of habitats: lack of vegetation, reduction of space
	Habitat heterogeneity results from arrangement of grains, void size, physical and chemical characteristics of aquifers within the pore space
Organisms	Obligate groundwater dwellers
	Morphological, physiological and behavioural specialisations to subterranean environment: • general lack of pigmentation • ocular regression • appendages long and numerous • highly developed chemical and mechanical receptors • convergence of vermiform body shape for different taxa
Biocenosis	Dominance of one species
	Richness, diversity and density low and variable
	A-type strategy of Greenslade (1983): • slower metabolic rates and growth, reduced motor output • lengthening of each stage of the lifecycle, late maturity, increase in longevity • less frequent reproduction, lower fecundity • unique behaviours such as stereotropism, thigmotropism and thigmotactism
Functional Characteristics	Heterotrophy and allotrophy
	Short, simple food webs with few trophic links
	Detritus feeders dominant
	System with low productivity
	Invertebrate diets not specialised, polyphagous

Groundwater food webs are typically almost entirely heterotrophic, with bioproduction primarily dependent on the transport of resources (biomass, detritus) from the surface (allotrophy; Gibert et al. 1994). There are few primary producers (chemolithotrophic bacteria; Danielopol et al. 1994). Groundwater microbes (i.e. bacteria, fungi and protozoans) are the primary consumers, with general short direct trophic links to most meiofauna in the system. It is worth noting that Barrow Island appears to potentially represent an exception to this rule (see Section 1.3; Humphreys in press).

The distribution of subterranean fauna species appears to be generally more restricted than that of surface fauna analogues. High levels of endemicity are also typically characteristic of subterranean taxa, often at high taxonomic levels. Endemic species tend to be concentrated in regions that support relatively diverse communities, rather than being distributed randomly (see review in Strayer 1994; also Humphreys 2000).

Stygofauna in Western Australia, and in particular Barrow Island and Cape Range, are regarded as geological relicts, descendants from ancient pre-Gondwanan lineages, with species characterised by restricted distributions and a low tolerance to disturbance. The stygofauna of Barrow Island represent relict lineages closely related to fauna of Gondwana, the Tethys Sea and epigean ancestors that occurred prior to the break-up of Pangaea (see review in Humphreys 2001).

1.2 Previous Work on Barrow Island

Work on Barrow Island's subterranean ecosystems has been carried out for a number of years by the Western Australian Museum. This has included seven sampling visits to the Island over the past decade and Humphreys (in press) has recently assembled a summary account of the findings of this work on stygofauna and troglofauna. This included documentation of the known subterranean fauna, its distribution and conservation status. Stable isotope analysis data were also presented indicating that some of the groundwater ecosystems on the Island may be chemoautotrophic — that is that their energy production is derived via bacterial systems from petroleum rather than surface inputs, as with most subterranean systems (Humphreys in press).

Other key studies that have been completed on the subterranean fauna of Barrow Island include:

- *Haptolana pholeta* sp. nov., the first subterranean flabelliferan isopoda crustacean (Cirolanidae) from Australia (Bruce and Humphreys 1993).
- *Speleostrophus nesiotes*, the first known troglobitic spiroboloid millipede, from Barrow Island, Western Australia (Hoffman 1994).
- Freshwater amphipods from Barrow Island, Western Australia (Bradbury and Williams 1996).
- Two new species of anchialine amphipods from Barrow Island, Western Australia (Bradbury and Williams 1996a).
- The hypogean fauna of Cape Range Peninsula and Barrow Island, north -Western Australia (Humphreys 2000).

1.3 Legislative Framework

In addition to the more general requirements of the *Environmental Protection Act 1986* (EP Act), there are two acts relevant to subterranean fauna.

1.3.1 Wildlife Conservation Act 1950

In Western Australia, all native fauna species are protected under the *Wildlife Conservation Act 1950* (Wildlife Conservation Act). The Act is administered by the Department of Conservation and Land Management (CALM). Fauna species that are considered rare, threatened with extinction or have high conservation value are specially protected under the Act. Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice* recognises four distinct schedules of taxa, with Schedule One taxa being those 'which are rare or likely to become extinct'. In addition to this statutory classification, CALM also classifies other fauna under four different Priority codes, recognising other species which are of poorly known conservation status or which could become threatened if conditions change.

1.3.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, an 'action' consists of 'a project, development, undertaking, activity or series of activities'. Actions are required to be referred under the EPBC Act if they take place on Commonwealth land or are an action by the Commonwealth, or are likely to significantly impact a matter of National Environmental Significance (NES). There are currently seven NES factors identified in the Act. One of these, relating to threatened flora and fauna species and threatened ecological communities, is relevant to the conservation of subterranean biota. Certain threatened species, including some subterranean fauna, are formally listed under the EPBC Act and actions which impact on these require referral to the Federal Minister for the Environment to determine if the action will be a 'controlled action' for the purposes of the Act and be subject to Federal formal environmental assessment.

2 Approach and Methodology

2.1 General Approach

The approach to this study has consisted of:

- liaison and consultation with the Western Australian Museum (Drs. Bill Humphreys and Mark Harvey), CALM Woodvale (Dr. Stuart Halse, Adrian Pinder and Jane McRae), CALM Karratha (Dr. Peter Kendrick) and the University of WA School of Animal Sciences (Dr. Terrie Finston);
- a search of the specimen records database of the Western Australian Museum for stygofauna and troglobite records from Barrow Island
- background literature searches (via on-line databases, biological abstracts and other sources), sourcing and review
- Three phases of field survey and subterranean fauna sampling within the proposed development area, with additional reference sampling across the rest of the Island.

More detail on the methodology for specific components of the work completed to date is provided in the Sections 2.2 and 2.3. Phase three work that is still in progress is outlined in Section 2.4, Attachment 2 (November/December 2004 field survey) and Attachment 3 (February/March 2005 field survey).

2.2 Field Sampling Methodology

2.2.1 Stygofauna Sampling – Phase One (August 2002)

Stygofauna were sampled from 34 bores, drillholes and wells by means of modified plankton haul nets between 9/8/02 and 13/8/02. The nets were constructed from 200 μm mesh, with apertures of various sizes attached to a weighted catch jar. Each hole was dragged at least three times. If fauna were observed in the sample, further samples were taken. Once the net reached the bottom, it was agitated gently to bring the benthos and any fauna above the net before dragging the column. On the surface, the net was flushed thoroughly with water bailed from the same hole and the resultant sample placed in a labelled plastic bag within a shaded esky. A hygiene protocol was followed at the completion of each hole whereby nets and catch bottles were washed clean to avoid any sample contamination between boreholes.

Samples were not fixed prior to sorting as live stygofauna are more easily observed and recovered. Samples were sorted under a dissecting microscope (magnification up to 40 x). Stygofauna specimens were tracked and preserved in 100 per cent ethanol (suitable for both morphological and DNA analyses). A subsample of live amphipods collected was frozen in liquid nitrogen for use in ongoing genetic (allozyme) analysis work being conducted at the University of Western Australia (see Section 2.3).

Sampling for stygofauna was conducted at 18 boreholes closest to the proposed gas processing facility, most of which were located in the immediate vicinity of the Terminal Tank farm (see Table 2-1). Of these, four were substantially affected by hydrocarbons and could not be adequately sampled. A further 20 boreholes were sampled on other parts of Barrow Island to provide additional reference data and material for genetic and morphological analysis (see Section 2.3; Table 2-1).

Table 2-1 - Boreholes Sampled on Barrow Island During the August 2002 Survey (Coordinates in UTMs, AGD84 datum)

Borehole	Area	Easting	Northing	Comments
MW3	Terminal tanks area	-	-	
MW4	Terminal tanks area	-	-	Oil affected – not sampled
MW7	Terminal tanks area	340159.00	7701530.00	
MW7nr1	Terminal tanks area	340158.00	7701532.00	Trog fauna trap installed
MW8	Terminal tanks area	-	-	
MW9	Terminal tanks area	-	-	
MW13	Terminal tanks area	340228.00	7701084.00	
MW14	Terminal tanks area	-	-	
MW15	Terminal tanks area	-	-	Oil affected –sampled
MW16	Terminal tanks area	340001.00	7701183.00	
MW16nr1	Terminal tanks area	340068.00	7701219.00	Trog fauna trap installed
MW16nr2	Terminal tanks area	340246.00	7701370.00	Oily – trog trap installed
MW17	Terminal tanks area	340343.00	7701456.00	
MW18	Terminal tanks area	340421.00	7701304.00	
MW21	Terminal tanks area	-	-	Oil affected –sampled
MW22	Terminal tanks area	-	-	Oil affected – not sampled
Terminal tanks water bore	Terminal tanks area	-	-	Clean
Abandoned seismic hole	Terminal tanks area	-	-	Dry – trog trap installed
AMW10	Reference	334192.00	7691344.00	Airport monitoring well
AMW11	Reference	334188.00	7691340.00	Airport monitoring well
AMW15	Reference	334191.00	7691330.00	Airport monitoring well
AMW18	Reference	334206.00	7691339.00	Airport monitoring well

Borehole	Area	Easting	Northing	Comments
AMW19	Reference	334196.00	7691301.00	Airport monitoring well
AMW20	Reference	334206.00	7691327.00	Airport monitoring well
B14 South	Reference	328637.00	7692399.00	
C62	Reference	332790.00	7690453.00	
C62NR1	Reference	332797.00	7690466.00	
C65	Reference	331896.00	7689829.00	
F41A North	Reference	330400.00	7694380.00	
L18A	Reference	333183.00	7699032.00	
L32j	Reference	331038.00	7697999.00	
L4N1	Reference	332213.00	7698310.00	
J16j	Reference	331488.18	7697437.23	
L8	Reference	332663.63	7697030.81	> 30 m water column
Tip MW 1	Reference	328195.00	7699302.00	Very turbid
Tip MW 2	Reference	328195.00	7699302.00	Very turbid – not sampled
Washdown pond MW1	Reference	-	-	Very turbid
Washdown pond MW2	Reference	-	-	Very turbid

2.2.2 Stygofauna Sampling – Phase Two (November 2003)

The second phase of stygofauna sampling followed essentially the same methodology as earlier sampling work on the proposed development area. Stygofauna were sampled from bores, drillholes and wells by means of modified plankton haul nets between 25/11/03 and 28/11/03. The sampling, curation and data management procedures were completed as outlined for the August 2002 sampling phase (see Section 2.2.1).

Stygofauna were sampled from 19 bores during this second phase of sampling; seven in the Terminal Tanks area (north of the proposed gas processing facility site) and a further 12 boreholes on other parts of Barrow Island (Table 2-1). This was largely a targeted exercise, focussing on holes that previously yielded fauna. Boreholes that proved to be contaminated with hydrocarbons, blocked or excessively turbid during the phase one sampling (Section 2.2.1; Biota Environmental Sciences 2002) were not revisited as part of the November 2003 sampling.

Table 2-2 - Boreholes Sampled on Barrow Island During the November 2003 Survey (Coordinates in UTMs, AGD84 datum)

Borehole	Location	Easting	Northing	Comments
MW3	Terminal tanks area	340102	7701401	
MW7	Terminal tanks area	340159	7701530	
MW7nr1	Terminal tanks area	340158	7701532	Trog fauna trap installed
MW9	Terminal tanks area	-	-	
MW13	Terminal tanks area	340228	7701084	
MW14	Terminal tanks area	-	-	
MW16nr1	Terminal tanks area	340068	7701219	Troglofauna trap installed
MW16nr2	Terminal tanks area	340246	7701370	Troglofauna trap installed
MW17	Terminal tanks area	340343	7701456	
MW18	Terminal tanks area	340421	7701304	
AMW10	Remainder of Barrow I	334192.00	7691344.00	Airport monitoring well
AMW11	Remainder of Barrow I	334188.00	7691340.00	Airport monitoring well
AMW15	Remainder of Barrow I	334191.00	7691330.00	Airport monitoring well
AMW18	Remainder of Barrow I	334206.00	7691339.00	Airport monitoring well
AMW19	Remainder of Barrow I	334196.00	7691301.00	Airport monitoring well
C62	Remainder of Barrow I	332790.00	7690453.00	
C65j	Remainder of Barrow I	331896	7689829	
C77j	Remainder of Barrow I	-	-	
L32j	Remainder of Barrow I	331038	7697999	
L4N1	Remainder of Barrow I	332213	7698310	
L8	Remainder of Barrow I	332663	7697030	> 30 m water column
X62M	Remainder of Barrow I	-	-	

2.2.3 Stygofauna Sampling – Phase Three

Phase three represents the initiation of the Subterranean Fauna Sampling Programme designed in consultation with the EPA and CALM. Phase three sampling takes advantage of recently drilled geotechnical/subterranean fauna bores within the proposed Development area.

Stygofauna was sampled from a range of bores both within and outside the proposed Development area from 30 November 2004 to 3 December 2004 (Attachment 3) and 28 February 2005 and 4 March 2005 (Attachment 4). Additional sampling in April 2005 will be reported separately.

2.2.4 Troglobitic Fauna Sampling

There are no known caves located within the proposed development area or any other obvious surface expressions of substantial karst development. Foot traverses of the area were carried out by members of the Gorgon terrestrial study team and no significant formations were noted. As a result, troglobitic fauna sampling was limited to installation of litter traps in four abandoned drill holes within the proposed development area (Table 2-1). Traps were again installed in these locations during the second phase of sampling (Table 2-2). Troglobitic fauna sampling was also undertaken as part of the latter two sampling surveys. Results from the November/December 2004 survey and February/March 2005 survey can be found in Attachment 3 and Attachment 4, respectively.

Traps were constructed from 60 mm internal diameter PVC stormwater pipe cut to a length of 120 mm. Both ends were blocked with aviary mesh after the tubing was filled with wet leaf litter. Leaf litter material was gathered from the ground surface on the Island, particularly from the bases of *Melaleuca* and *Ficus* shrubs. The litter was soaked in water and irradiated in a microwave oven on the maximum power setting (to kill any invertebrates present and assist in break-down). Wet litter was added to the traps and kept in sealed containers until immediately prior to insertion into the boreholes. After the installation of each trap, the opening of each borehole was sealed to maintain humidity and to minimise the input of surface fauna into the traps.

2.3 Identifications and Genetic Analyses

Specimens were sorted live and, as far as possible, identified in an on-site laboratory prior to curation. In some cases it was possible to identify material to species level at this stage, but for most of the recovered fauna, this represented order or family level taxonomic resolution.

More detailed identification of the Phase One material was carried out by Jane McRae at CALM Woodvale, utilising existing taxonomic descriptions and keys published by various taxonomic authorities. Adrian Pinder of CALM Woodvale carried out further identification of worm taxa collected. With the exception of amphipods consumed in genetic investigations, the collected specimens have been lodged with the Western Australian Museum and are currently contributing to ongoing taxonomic work.

Frozen material, primarily amphipods, was also subject to electrophoretic analysis by Dr. Terrie Finston at the University of Western Australia, School of Animal Sciences. This work is also ongoing and has more recently been extended to include mitochondrial DNA analyses.

2.4 Limitations of this Report

Several limitations should be recognised in the interpretation of this report:

The installation of purpose-built bores for sampling subterranean fauna within the proposed gas processing facility was not completed during phases 1 or 2. Consequently, sampling reported in this document has been limited to the opportunistic use of existing boreholes, resulting in poor spatial coverage of the proposed gas processing facility. The closest bores to the proposed development were those in the vicinity of the Terminal Tanks, located approximately 500 m to the north of the proposed development. These

bores had only a few metres of penetration into the aquifer, and therefore limited saturated thickness present to sample. No sampling for stygofauna or troglobitic fauna has been possible in the proposed development area during phases 1 or 2. Sampling during November/December 2004 (Attachment 3) and February/March 2005 (Attachment 4) was undertaken within the proposed development area. The results of these two sampling surveys can be found in those respective attachments.

As most bores in the study area are cased for their entire length, troglobitic fauna sampling has been limited to a small number of relatively shallow, opportunistic sites.

As outlined in Section 2.3 the work completed to date represents work in progress in respect of species level consideration of fauna distribution.

3 Results

3.1 Stygofauna

3.1.1 Summary

Stygofauna were recovered from 13 of the 38 bores visited during the phase one sampling (34 per cent of sites; 345 specimens). Five of these locations were within the Terminal Tanks area to the north of the proposed gas facility site (see Figure 3-1). Stygofauna were recovered from ten of the 19 bores visited during the second field survey (53 per cent of sites). This relatively high rate was due to targeting of prospective sites (see Section 2.2.2). Two hundred and four specimens were collected, of which 25 were recorded from three bores in the Terminal Tanks area (MW13, MW17 and MW18).

A combined summary of the relative abundances of the various stygal taxa collected during both rounds of sampling for the proposed development is presented in Table 1-1. The collected specimens represented five classes, nine orders and 12 families, with a total of 23 taxa (including ten described species). Thirteen of these taxa were recorded from the Terminal Tanks area, the closest location sampled to the proposed gas processing facility. Nine of the 23 taxa were recorded from both this area and other parts of the Island (see Table 1-1).

Further sampling for stygofauna, including within the proposed development area, was undertaken in November/December 2004 and February/March 2005. The results of these surveys can be found in Attachment 3 and Attachment 4 for the 2004 and 2005 surveys, respectively.

Table 3-1 - Stygofauna Abundance Recorded from the Terminal Tanks Area and Other Reference Sites Sampled Across the Island (August 2002 and November 2003 data sets combined)

Taxon	Terminal	Reference	Total
Isopoda: Cirolanidae (*Haptolana pholeta)*	-	27	27
Isopoda: Oniscideae sp. nov. 1	1	-	1
Amphipoda: Melitidae (*Nedsia sculptilis/ macrosculptilis*)	-	2	2
Amphipoda: Melitidae (*Nedsia* nr. *hulberti)*	-	1	1
Amphipoda: Melitidae (*Nedsia* spp.)	27	125	152
Amphipoda: Bogidiellidae (*Bogidella* sp.)	1	3	4
Copepoda: Cyclopoida (*Diacyclops* aff. *humphreysi)*	4	4	8
Copepoda: Cyclopoida (*Diacyclops* sp.)	2	-	2
Copepoda: Cyclopoida (*Halicyclops rochai)*	-	15	15
Copepoda: Cyclopoida (*Halicyclops* sp.)	1	2	3
Copepoda: Cyclopoida	-	28	28
Copepoda: Harpacticoida (*Sarsameira* sp.)	17	3	20
Copepoda: Harpacticoida (*Phyllopodopsyllus wellsi)*	1	-	1
Copepoda: Harpacticoida (*Phyllopodopsyllus* aff. *thiebaudi)*	1	3	4
Copepoda: Harpacticoida (*Phyllopodopsyllus* sp. 1)	1	-	1
Copepoda: Calinoida: sp. nov. 1	1	81	82
Decapoda: Atyidae (*Stygiocaris stylifera*)	-	148	148
Thermosbenacea (*Halosbaena tulki)*	13	48	61
Vertebrata: Perciformes (*Milyeringa veritas)*	-	2	2
Ostracoda: sp.	-	4	4
Nematoda: sp. 1	-	4	4
Oligochaeta: Phreadrilidae: sp. 1	2	4	6
Polychaeta: sp. 1	-	3	3
	72	507	579

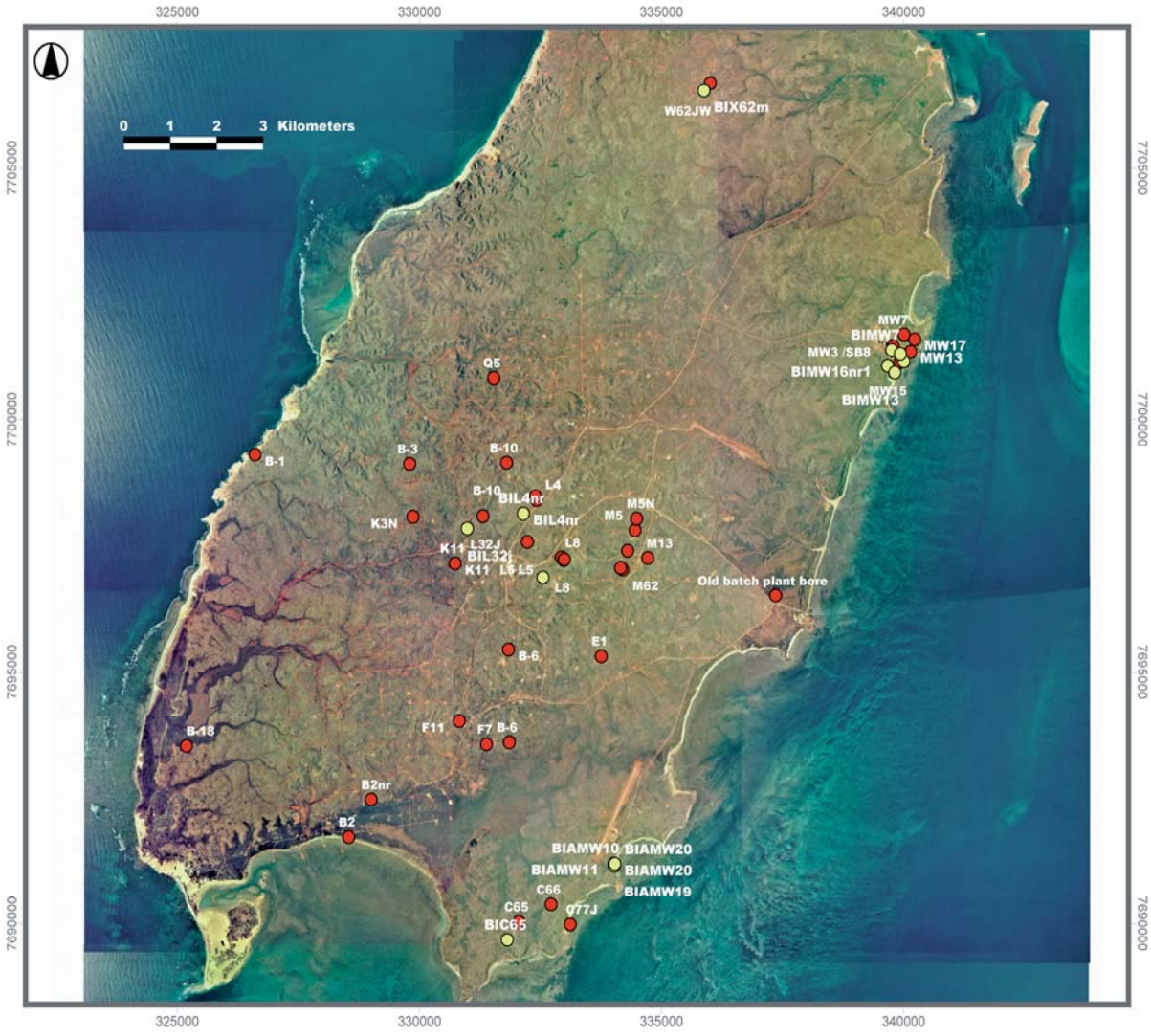

Figure 3-1 - Borehole Sampling Locations on Barrow Island which Yielded Stygofauna

(Red = historical sampling, yellow = current study).

Copepods were the most abundant and taxonomically diverse component of the recorded fauna, accounting for 28 per cent of the 507 specimens collected and nine of the 22 taxa currently documented (41 per cent of the species richness) (see Table 1-1). The amphipods were the next most common and species-rich group, with 159 individuals (31 per cent) representing at least four species. The numerical and species level dominance of these two orders is a common feature of stygal communities (Biota Environmental Sciences unpublished data). The identification of amphipods belonging to the genus *Nedsia* was limited by the lack of mature and intact animals amongst the collected specimens. The aytid decapod *Stygiocaris stylifera* was the next most abundant group and species recorded during the sampling programme (148 individuals; Table 1-1).

With the exception of the polychaete worm collections, the second phase of sampling did not collect any new taxa beyond those of the first sampling phase for the proposed development (Biota Environmental Sciences 2003). The stygal polychaete collections are of considerable interest, however, being the first records of stygal polychaetes from

Barrow Island (Humphreys, W.F. 2003. Personal communication). The resolution of morphological identification and taxonomic work on this material is limited at present. This is being advanced as part of ongoing work (see Section 1). Additional taxa may be resolved from the collected material as part of this.

3.1.2 Annotated List

Phylum Nematoda

Four nematodes were collected during the survey but the specimens were extremely small and have curated poorly. They could not be located for more detailed examination. The animals were not recorded from the sample sites near the proposed gas processing facility and, given the state of stygal nematode taxonomy, it is unlikely that they could have been identified beyond the family level (Pinder, A. 2002. Personal communication).

Class Oligochaeta

Four oligochaete specimens were collected from well L8 (outside the proposed development area) during the phase one sampling, and two from the Terminal Tanks area during phase 2. These specimens belonged to the family Phreadrilidae and represent the first record of this family from Barrow Island (Pinder, A. 2002. Personal communication; Attachment 2). The specimens are therefore likely to represent an undescribed species, but the material collected was not mature enough to allow for a formal description.

Class Ostracoda

Four ostracods were collected during the survey, all from areas away from the site of the proposed gas facility (Table 3-1). These await examination by an ostracod specialist, but it is possible that they represent a previously unknown species, given that the recent review of the Island's fauna by Humphreys (in press) lists no ostracods for Barrow Island and the Western Australian Museum's records contain only two other ostracod records (see Attachment 1).

Order Copepoda

The copepods were the most diverse group amongst the stygofauna, with nine taxa representing three families (see Table 1-1). The presence of the calinoid copepods was significant in that there are no calinoid copepod species currently described for Barrow Island (McRae, J. 2002. Personal communication), although material has previously been collected by the Western Australian Museum (Attachment 1).

Most other species were either confirmed or tentatively identified as previously described species (Table 3-1). Three of the copepod taxa, *Diacyclops* sp., *Phyllopodopsyllus wellsi* and *Phyllopodopsyllus* sp. 1, were recorded from the Terminal Tanks area (Figure 3-2). *Phyllopodopsyllus wellsi* has been previously described and is known to occur on Cape Range (McRae, J. 2004. Personal communication). The other two taxa appear to represent currently undescribed species.

Figure 3-2 - Copepod Records

(Red = Calinoida, light blue = Harpacticoida, dark blue = Cyclopoida).

Order Thermosbaenacea

A single species of thermosbaenacean was collected during the survey, *Halosbaena tulki*, which has previously been documented as relatively widespread and common across the Island (Humphreys in press). The species was present in reasonable abundance within the Terminal Tanks area (near the proposed gas processing facility; n=13) and elsewhere on the Island (n=48) (Table 1-1).

Order Isopoda

Two families were represented amongst the isopods, the Cirolanidae and the Oniscideae (Table 3-1). The most commonly recorded species was the cirolanid *Haptolana pholeta* (27 records from four locations, all away from the proposed gas processing facility) (Plate 3-1; Figure 3-3). This species was described from Barrow Island in 1993 (Bruce and Humphreys 1993) and occurs at least four other sites on the Island (Humphreys in press; Appendix 1).

Plate 3-1 - Isopoda: *Haptolana pholeta*

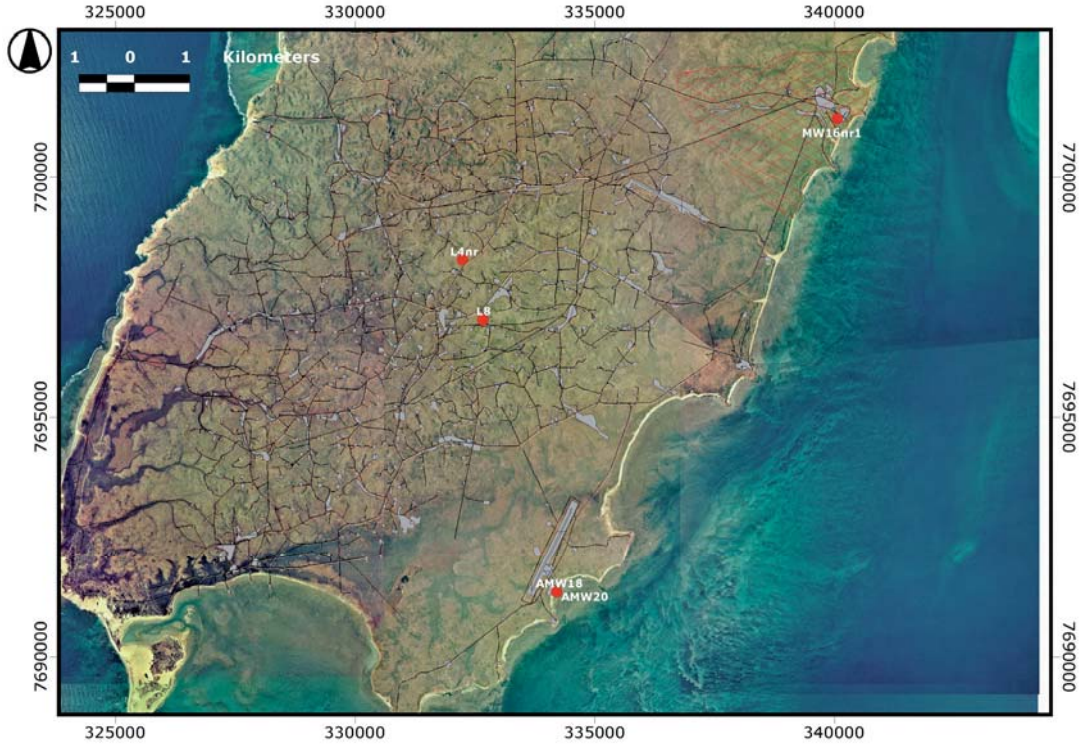

Figure 3-3 - Isopod records

The other family of isopods represented was the Oniscideae, with a single animal recorded from an old bore adjacent to Terminal Tanks monitoring well MW16 (MW16nr1) (Figure 3-3). This is a significant specimen as it is the first record of an aquatic oniscoid isopod from Barrow Island and probably represents a previously undescribed species (see Section 4).

Order Amphipoda

Two families were represented amongst the collected material (

Figure 3-4). The majority of the amphipods collected (156 of 160 individuals) were melitid amphipods of the genus *Nedsia* (Table 3-1). This is a difficult group to identify with confidence and this material needs to be dissected and slide-mounted to be identified. Two animals recorded from areas away from the gas processing facility have been identified as *Nedsia sculptilis/ macrosculptilis* (bores AMW18 and L4nr) and one as *Nedsia* nr. *hulberti* (bore L32j) (Bradbury and Williams 1993; Humphrey in press). Many of the remaining amphipod specimens were juvenile, damaged or incomplete, lacking many of the diagnostic characters required by Bradbury and Williams (1993) and Bradbury (2001). It may not be possible to take this material to species-level identification based on morphology but the material has been lodged with the Western Australian Museum and is currently being examined by John Bradbury of the University of Adelaide. Allozyme electrophoretic data have provided some insight into species level distributions in this genus (Section 3.1.3, and DNA analyses may provide further clarification on species distributions).

Plate 3-2 - Amphipoda: *Nedsia sculptilis*

(Photo: J. McRae, CALM)

Figure 3-4 – Amphipoda Records

(Pl blue = Melitidae, Dk blue = Bogidiellidae)

The remaining amphipods were all from areas other than the Terminal Tank farm (AMW18 at the airport and L8 near the base), and belong to the family Bogidiellidae. These four specimens are of considerable significance, as the only previously described member of this family from Barrow Island is *Bogidomma australis*. This monospecific genus was erected specifically as Bogidomma was the only stygal amphipod with eyes — a feature absent from the bogidiellids collected during the current study. It is most likely that these new specimens belong to the genus *Bogidiella* (McRae, J. 2002. Personal communication) and probably represent an undescribed species.

Order Decapoda

One decapod crustacean was collected during the current study, the atyid *Stygiocaris stylifera* (Plate 3-3). It was relatively abundant where present (n=148 from three locations, all outside the proposed development area). This species is known to be fairly widespread on the Island, having been recorded from 16 locations during previous Western Australian Museum surveys (Humphreys in press).

Plate 3-3 - Decapoda*: Stygiocaris stylifera*

Plate 3-4 - Vertebrata*: Milyeringa veritas*

Class Vertebrata

One stygal vertebrate was recorded during the study, the blind gudgeon *Milyeringa veritas* (Plate 3-4). This species is listed as Schedule One under the Wildlife Conservation Act and as Vulnerable under the EPBC Act. It is one of only two-known stygal vertebrate species in Australia, with Cape Range the only known locality outside Barrow Island (Humphreys 2001). Two individuals were collected (one during each sampling phase), both from bore L8 away from the proposed gas processing facility. The recovered specimens were preserved in liquid nitrogen to provide for any future electrophoretic work that may be undertaken.

3.1.3 Results of Genetics Investigations to Date

Genetic analyses of stygal specimens from Barrow Island have recently been advanced by Dr Terrie Finston of the School of Animal Sciences, University of Western Australia. Electrophoretic investigations completed to date have focussed on the amphipod fauna. This order is the most diverse and widespread stygal group on the Island, making it a key group for such study. Analysis to date has resulted in the identification of five genetic

groups approximately equating to species 'types' in terms of genetic difference (see Attachment 2).

Amphipods from Barrow Island were analysed for 20 allozyme loci following standard methods for protein electrophoresis (see Attachment 2). For comparative purposes, known specimens of amphipods from the families Bogidiellidae and Melitidae (genus *Nedsia*), were included in these analyses.

Of the seven bores from which material was analysed, five contained a single genetic type, while two of the bores (L32j and AMW18) contained two genetic types (Attachment 1). A cluster analysis using Nei's genetic distances among samples and the neighbour-joining clustering algorithm suggested the presence of five genetic types or 'species' level groups (Attachment 2). These were differentiated by the presence of two or more fixed differences among the 20 loci. Six of the groups showed affinities with the Melitids from other regions of the Pilbara. Two (MW14nr1 and MW17-4) represent unique types.

Table 3-2 - Species Level Group Results from Electrophoretic Analyses of Amphipoda to Date

Bore	Number of genetic types	Genetic type group ('species')	Comments
L32j	2	Group 2 Group 5	1 common type (n = 13), similar to Paraburdoo Melitids 1 rare type (n = 1), similar to Mt. Brockman Melitids
L8	1	Group 2	(n = 2) similar to Mt. Brockman Melitids
MW14nr1	1	Group 1	(n = 1) unique genetic type
MW7	1	Group 5	(n = 1) similar to Paraburdoo Melitids
AMW19	1	Group 5	(n = 1) similar to Paraburdoo Melitids
AMW18	2	Group 3	(n = 2) similar to Mt. Brockman Melitids (n = 3) similar to Paraburdoo Melitids but unable to score many loci
MW17	1	Group 4	(n = 1) unique genetic type

Two of the species level groups therefore appear to be relatively widespread on the Island (Table 3-2). Species Group Two is represented at both L32j and L8 (~2.5 km apart), whilst Group Five was recorded from both AMW19 (at the airport) and MW7 (~12 km away at the Terminal Tanks area). Three of the species groups suggested by the electrophoretic data are currently only known from single bore locations, two of which are not near the proposed gas processing facility (Table 3-2).

The findings available to date indicate several species level groups within the genus *Nedsia* on Barrow Island. This is broadly consistent with the morphological analysis of Bradbury and Williams (1996) and Bradbury (2002), in the sense that several, patchily-distributed species were recognised. However, specific paired comparisons between genetic and morhphological analyses have not yet been carried out. These results should therefore be interpreted with caution, as a limited number of loci could be scored for some individuals, and sample sizes were relatively low (Attachment 2). Ongoing work

may help resolve the situation, including the use of mitochondrial DNA markers to better address specific questions regarding species level distributions (see Section 4).

3.2 Troglobitic Fauna

As limited field sampling has been possible to date (see Section 2.2), an initial assessment was completed based on the habitat of the area and known records from previous work on the Island (Biota Environmental Sciences 2002; Section 3.2.1). The results of surveys carried out in November/December 2004 and February/March 2005 can be found in Attachment 3 and Attachment 4, respectively.

3.2.1 Desktop Review

The Western Australian Museum's database includes 324 records of terrestrial invertebrate taxa collected from caves or other subterranean environments on Barrow Island. The distribution of these records on the Island is shown in Figure 3-4. A detailed listing of these records is provided in Attachment 1.

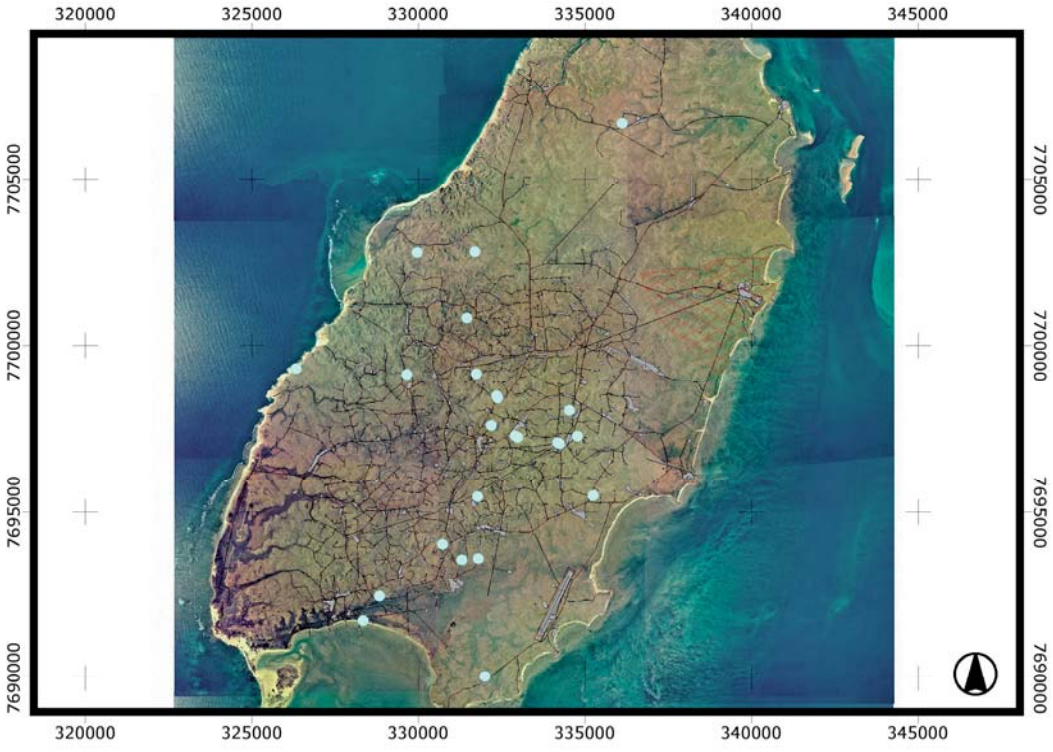

Figure 3-5 - Troglobitic Fauna Records from Barrow Island (Source: Western Australian Museum)

The majority of the known troglofauna records are associated with caves, although some are from fauna recorded during borehole sampling (see Appendix 1). There are no previous records of troglobitic fauna from the proposed development area. This is probably a function of sampling access availability to the karst underlying the site as well as the apparent lack of caves with suitable microclimates. There is considerable evidence of subsurface cavities on the Island that do not open to the surface (Humphreys in press), but current seismic and geotechnical data do not indicate any significant voids at the proposed development area. It is likely that the limestone strata below the proposed

development area provide suitable habitat for troglobitic fauna, but this is likely to be limited by the extent of caverns and fracturing.

It is expected that most of the area traversed by the proposed feed gas pipeline is similar in nature in this respect, with the exception of the area on the western side of the Island approaching the Flacourt Bay option. In this locality the karstic development becomes more massive and developed with the formation of gorges and incised drainages reminiscent of the geomorphological features of Cape Range (Biota Environmental Sciences 2002).

A proportion of this fauna contains terrestrial invertebrate taxa that are not strongly troglobitic and are probably accidentals or troglophiles rather than a true component of the troglofauna. This includes ants (Hymenoptera: Formicidae), several beetle taxa (Coleoptera), springtails *(Collembola),* and ticks (Acarina: Ixodidae) (see Attachment 2).

Humphreys (in press), provides an account of the true troglobitic species currently described from Barrow Island and this is summarised in Table 3-3.

Table 3-3 - Troglobitic Fauna Species Known from Barrow Island

Species	Records	Conservation Status
Draculoides bramstokeri (Schizomida: Hubbardiidae)	7	Schedule 1 (Wildlife Conservation Act)
Speleostrophus nesiotes (Diplopoda: Trigoniulinae)	1	Schedule 1; (Wildlife Conservation Act)
Nocticola sp. nov. (Blattodea: Nocticolidae)	1	Undescribed species
Isopoda: Oniscidea: sp. indet.	5	Undescribed species
Arachnida: Scorpiones: sp. nov. (family uncertain)	1	Undescribed genus

The majority of these troglofauna records have come from cave 6B1 (Ledge Cave), which is a highly significant site for this fauna. It is situated in the south-west of the Island, well removed from the proposed gas processing facility. Of the troglobitic species documented from the Island, the schizomid *Draculoides bramstokeri* is known to be widespread, having been recorded from several sites on Barrow Island and also occurring across Cape Range (Biota Environmental Sciences 2002; Humphreys in press).

Other potentially troglobitic species have also been collected from Barrow Island (see Attachment 1) but the taxonomy of some of these groups has not been advanced. One potentially troglobitic species stands out in particular: the blind snake *Ramphotyphlops longissimus*. This species is known from only a single specimen recovered during removal of a well casing on the Island (Aplin 1988; Humphreys in press). The species is depigmented, has very reduced eyes and an extremely vermiform morphology. It is possibly troglobitic, which would make *R. longissimus* the only known reptile troglobite in the world (Humphreys in press).

3.2.2 Sampling Results

Litter traps recovered during Phase one and Phase two of the sampling program have collected largely epigean and edaphobitic (deep soil) fauna. This has included isopods (slaters), ants (epigean taxa) and collembolans (springtails). The only troglobitic species

recorded during sampling for the proposed development to date is a single schizomid from MW16nr in the Terminal Tanks area. Liaison with Dr Mark Harvey of the Western Australian Museum determined that the specimen was a *Draculoides* and probably *D. bramstokeri* (Schedule 1). This species has been recorded from several other locations on Barrow Island and on Cape Range (Biota Environmental Services 2003). Unfortunately, the traps installed during November 2003 could not be recovered due to sediment burial arising from run-off during a cyclonic event during early 2004.

Preliminary data from Phase three sampling is included in Attachments 3 and 4.

4 Summary

4.1 Conservation Significance

Barrow Island is well recognised as being of high conservation significance for subterranean fauna communities at the state, national and international levels of consideration. The subterranean fauna of the Island demonstrates a high level of endemicity and species diversity, with over twenty species known only from Barrow Island. The fauna of the Island includes one of only two stygal vertebrate species occurring in Australia and, potentially, the only troglobitic reptile known globally. There is also evidence to suggest that the subterranean ecosystems of Barrow Island may be at least locally driven by chemautotrophic energy sources, rather than traditional allotrophic (surface energy) inputs.

Twelve of the species known from the Island are listed as Schedule fauna under the Wildlife Conservation Act and one is listed as 'vulnerable' under the EPBC Act. This tally includes three Schedule One species recorded during the current study, *Milyeringa veritas, Nedsia hulbertii* and *N. macrosculptilis,* none of which were recorded from the proposed development area (see Section 3.1). Five other *Nedsia* species are also Schedule listed and it is possible that some of these are represented amongst the specimens collected from the Terminal Tanks area. This includes *Nedsia hulbertii* which has previously been recorded from the area by the Western Australian Museum (MW17; Humphreys in press).

In addition to the currently described and Schedule listed fauna, a significant component of the Island's troglofauna and stygofauna comprises poorly sampled or undescribed taxa. This is illustrated by the results of the current survey which yielded several specimens that are either currently undescribed or are entirely new records for the Island (see Section 3.1). Of these taxa, four were recorded outside and four within the proposed development area. Of the undescribed taxa within the area of investigation, two are copepods and may correspond to material contained within the 'Copepoda: indet.' group listed in Humphreys (in press). The oniscid Isopod specimen appears to be the first representative of this family known from the Island and was recovered from MW16nr1. Further work is being undertaken on this material. The status and conservation significance of these undescribed taxa is unknown, but it is likely that they are endemic to Barrow Island, given the biogeographic patterns generally evident amongst the described fauna (Humphreys, 2000). It is worth noting that these specimens are not only new species, but representatives of new genera and family level records for the Island in some instances, highlighting the levels of biodiversity involved.

All of Barrow Island has high conservation value. On the basis of the available information , the specific conservation values represented in the vicinity of the proposed

development area would be ascribed high conservation value in a regional context because it:

- has records of Schedule One fauna (the stygobite *Nedsia hulbertii* and the troglobite *Draculoides bramstokeri*)
- is the only known location for *Nedsia chevronia* (well MW15; Bradbury, 2002)
- has records of undescribed stygofauna taxa not known from elsewhere on the Island.

4.1.1 Ongoing Work

Investigations into troglobitic and stygobitic subterranean fauna of Barrow Island are ongoing. Additional sampling in Phase three of the study will provide quantitative data with which to better assess the significance of the subterranean assemblages in the potential impact areas of Barrow Island.

Additional sampling is in progress in the proposed development area to address the key limitations that exist with respect to the sampling completed to date and the resulting data. The results of the first two of these surveys (November/December 2004 and February/March 2005) can be found in Attachment 3 and Attachment 4. The data from these surveys will be presented separately when identifications are complete.

4.1.2 Lack of Data on Subterranean Fauna in the Proposed Development Area

Project definition and other investigations (including geotechnical, hydrology and hydrogeology studies), have now allowed for the more accurate delineation of the actual impact on the proposed development area. This impact area is, however, outside the sampling work completed during either the first or second phases of sampling that is reported here. The lack of data within 'impact' sites is being redressed in Phase three sampling. A subterranean fauna sampling program has been developed and agreed with environmental agencies. The program is tied-in with the geotechnical investigation of the karst structure of the proposed development area, that was completed in August-September 2004.

The preliminary results are included in Attachments 3 and 4. Further data will be provided by the April 2005 sampling and reported subsequently. All of the data collected to date will be reviewed once the agreed sampling plan has been completed.

4.1.3 Limitations on Existing Electrophoretic Data

Dr Terrie Finston at the University of Western Australia is currently continuing her analysis of material collected from Barrow Island. This will include additional electrophoresis, and has expanded to analysis of DNA markers. It is hoped that this work, particularly the latter technique (which allows for increased samples sizes), will clarify the situation with respect to species level relationships amongst amphipod populations on Barrow Island, and between populations on the Island and the mainland. These relationships are important in assessing the conservation significance of the Barrow Island subterranean taxa and the potential impacts of the proposed development.

4.1.4 Level of Morphological Identification and Taxonomic Resolution

Whilst genetic analysis is a valuable and powerful tool, there is also a requirement to advance alpha (morphology-based) taxonomy in relation to this fauna. A proportion of the material collected to date could be identified to species level, but some groups

(particularly the Amphipoda) are more problematic. Additional efforts are ongoing to engage specialist taxonomists to resolve morphology-based identifications as far as possible. This may be limited in some cases by the nature of the material, in respect of size, intactness and maturity. Lodgement of the collected fauna with the Western Australian Museum is the first step in this process and has been completed. Ongoing collections will significantly increase the representation of Barrow Island subterranean fauna in the Western Australian Museum collection.

Preliminary contact has been made with key taxonomists in some groups who have agreed to examine the material collected for the proposed development (specifically Mr John Bradbury of the University of Adelaide (Amphipoda) and Dr Mark Harvey of the Western Australian Museum (Schizomida and other troglobitic taxa). This work will pursue the identification of collected specimens against existing keys where possible, and the advancement of new taxonomic descriptions for previously undocumented taxa (notably the polychaete worms and the oniscid isopods previously uncollected from Barrow Island).

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6 Glossary

Allotrophy	External inputs of organic matter to the ecosystem.
Allozyme	Alternative forms of the same protein coded for by different genes at the same locus.
Aytid	Decapod crustacean belonging to the family Aytidae.
Chemautotrophs	Organisms deriving nourishment from chemical reactions and inorganic substances.
Chemolithotroph	An organism which obtains its energy from the oxidation of inorganic compounds.
Detritus	The mixture of organic and inorganic material on surfaces that forms the food of some animals.
DNA	Deoxyribonucleic Acid – the fundamental genetic material of all cells.
Electrophoresis	A lab technique for separating proteins based on their different mobility through an electric field.
Epigean habitat	Terrestrial, dwelling in habitats on the ground surface.
Heterogeneity	The provision of a variety of habitats through increased habitat complexity; provides for a greater number of niches.
Heterotrophy	the process where existing organic molecules are used by an organism for its energy needs. All organic constituents in the organism are derived from preformed organic molecules.
Locus	The place at which a particular gene resides on the DNA or genetic map.
Meiofauna	Fauna that will pass through a 500 μm sieve but not a 40 μm sieve.
Melitid	Amphipod crustacean belonging to the family Melitidae
Oniscid	Isopod crustacean belonging to the family Oniscideae
Protozoan	Single celled organisms in the Kingdom Protista.
Stereotropism	See Thigmotropism.
Stygobites	Obligate groundwater-dwelling fauna.
Stygofauna	A general term to describe groundwater-dwelling fauna.
Thigmotactism	The tendency of many small organisms to seek maximum surface area contact.
Thigmotropism	Directional growth in response to the stimulus of direct contact.
Vermiform	Worm-type body organisation.

Attachment 1 - Western Australian Museum Stygofauna and Troglofauna Records from Barrow Island

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Arachnida	Araneae	Ctenidae (JW)		
B-1	-20.79806	115.33139	Arachnida	Acarina	Ixodidae	*Amblyomma*	*triguttatum*
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*hurlberti* Bradbury & Williams, HOLOTYPE
B-1	-20.79806	115.33139	Malacostraca	Amphipoda	Hadziidae	*Liagoceradocus subthalassicus Bradbury & Williams*	
B-1	-20.79806	115.33139	Arachnida	Araneae	Oecobiidae	*Oecobius*	sp.
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Ctenidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Stiphidiidae	*Janusia*	
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria			
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139		Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Maxillopoda: Copepoda	Calanoida			
B-1	-20.79806	115.33139	Maxillopoda: Copepoda	Calanoida			

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-1	-20.79806	115.33139	Insecta	Coleoptera	Carabidae		
B-1	-20.79806	115.33139	Insecta	Collembola			
B-1	-20.79806	115.33139	Insecta	Collembola			
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera			
B-1	-20.79806	115.33139	Insecta	Hemiptera	Cixiidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139		Hymenoptera	Formicidae		
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda			
B-1	-20.79806	115.33139		Isopoda: Oniscidea	Philosciidae	*?Laevophiloscia Wahrberg, 1922 sp. nov.*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Insecta	Psocoptera			
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Scorpionida	Ischnuridae	*Liocheles*	sp.
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-1	-20.79806	115.33139			Japygidae		
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae	*Icona*	sp.
B-2	-20.71667	115.38333	Arachnida	Acarina			
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae		
B-2	-20.71667	115.38333	Arachnida	Araneae			
B-2	-20.71667	115.38333	Arachnida	Araneae	Pholcidae		
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae		
B-2	-20.71667	115.38333	Insecta	Coleoptera			
B-2	-20.71667	115.38333	Insecta	Collembola			
B-2	-20.71667	115.38333	Insecta	Hemiptera	Cixiidae?		
B-2	-20.71667	115.38333	Insecta	Hymenoptera	Formicidae		
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-2	-20.71667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Psocoptera			
B-2	-20.71667	115.38333	Insecta	Psocoptera			
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-3	-20.80000	115.36331	Arachnida	Acarina			
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-3	-20.80000	115.36331	Insecta	Coleoptera	Dermestidae	*Dermestes*	*frischi* Kugelann
B-3	-20.80000	115.36331	Insecta	Collembola			
B-3	-20.80000	115.36331	Insecta	Collembola			

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-3	-20.80000	115.36331	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-3	-20.80000	115.36331	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	sp.
B-3	-20.80000	115.36331	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp
B-3	-20.80000	115.36331	Arachnida	Araneae	Pholcidae		
B-3	-20.80000	115.36331	Arachnida	Araneae	Ctenidae		
B-3	-20.80000	115.36331	Arachnida	Araneae	Pholcidae	*Trichocyclus*	
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae		
B-3	-20.80000	115.36331	Insecta	Collembola			
B-3	-20.80000	115.36331	Insecta	Diptera			
B-3	-20.80000	115.36331	Insecta	Hemiptera			
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Philosciidae		*Laevophiloscia yalgoonensis* Wahrberg 1922
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea	Philosciidae		
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea	"Porcellenid"		
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331		Pscocidae			
B-3	-20.80000	115.36331	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-3	-20.80000	115.36331	Diplopoda				epigean species

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-3	-20.80000	115.36331		Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp.
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Insecta	Coleoptera	Tenebrionidae	*Brises*	sp.
B-4	-20.76667	115.38333	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-4	-20.76667	115.38333	Arachnida	Araneae	? Gnaphosidae (JW)		
B-4	-20.76667	115.38333	Arachnida	Araneae	? Cyclotenidae (JW)		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda (JW)*	
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Cyclotenidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Gnaphosidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	
B-4	-20.76667	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-4	-20.76667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-4	-20.76667	115.38333	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-4	-20.76667	115.38333	Insecta	Psocoptera			
B-4	-20.76667	115.38333	Diplopoda				epigean species
B-5	-20.76667	115.36667	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-5	-20.76667	115.36667	Arachnida	Araneae	Pholcidae		
B-5	-20.71667	115.38333	Arachnida	Araneae	Pholcidae		
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Arachnida	Pseudoscorpionida	Atemnidae	*Oratemnus*	sp. nov.
B-5	-20.76667	115.36667	Arachnida	Araneae	Heteropodidae (JW)	*Heteropoda*	
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Malacostraca	Isopoda: Oniscidea		*Buddelundia*	
B-5	-20.76667	115.36667	Malacostraca	Isopoda: Oniscidea	Pholoscidae		

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-5	-20.76667	115.36667	Arachnida	Pseudoscorpionida	Atemnidae	*Oratemnus*	sp. nov.
B-5	-20.76667	115.36667	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Arachnida	Acarina			
B-6	-20.83333	115.38333	Arachnida	Acarina			
B-6	-20.85000	115.38333	Arachnida	Araneae	Araneidae	*Argiope*	*protensa*
B-6	-20.83333	115.38333	Arachnida	Araneae	Oonopidae	*?Opopaea*	sp.
B-6	-20.83333	115.38333	Arachnida	Araneae	Theridiidae	*Euryopis*	sp.
B-6	-20.85000	115.38333	Arachnida	Araneae			
B-6	-20.85000	115.38333	Arachnida	Araneae	Desidae	*Badumna*	
B-6	-20.83333	115.38333	Arachnida	Araneae	Oonopidae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Gnaphosidae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Zoridae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Amaurobidae		
B-6	-20.85000	115.38333	Arachnida	Araneae	Pholcidae		
B-6	-20.83333	115.38333	Insecta	Blattodea			
B-6	-20.83333	115.38333	Insecta	Blattodea			
B-6	-20.83333	115.38333	Insecta	Coleoptera	Carabidae: Pterostichini	*Prosopogmus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Entiminae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Cryptorhynchinae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Ectychini	*Ectyche*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Crypticini	*Microcrypticus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Opatrini	*Mesomorphus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Carabidae: Pterostichini	*Prosopogmus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Entiminae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Ectychini	*Ectyche*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Opatrini	*Mesomorphus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae:		

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
					Crytptorhynchinae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Lathridiidae: Lathridiinae	*genus?*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Ptiliidae		
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.85000	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Mollusca	Gastropoda			
B-6	-20.83333	115.38333	Mollusca	Gastropoda			
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae	*Centrogonus*	sp. 1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera			
B-6	-20.85000	115.38333	Insecta	Hemiptera			
B-6	-20.83333	115.38333	Insecta	Hemiptera			
B-6	-20.83333	115.38333	Insecta	Hemiptera			
B-6	-20.85000	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.83333	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.83333	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.85000	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Insecta	Isoptera			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-6	-20.83333	115.38333	Insecta	Orthoptera			
B-6	-20.85000	115.38333	Insecta	Orthoptera			
B-6	-20.83333	115.38333	Diplopoda	Polyxenida	Polyxenidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Olpiidae	*Xenolpium*	sp.
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Cheiridiidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Olpiidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Cheiridiidae		
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.85000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Acrotelsella*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Acrotelsella*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae		
B-6	-20.83333	115.38333	Insecta				
B-6	-20.85000	115.38333	Gastropoda				
B-8	-20.83333	115.41667	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-10	-20.80000	115.38333	Insecta	Coleoptera	Pselaphidae		
B-10	-20.80000	115.38333	Insecta	Diptera			
B-10	-20.80000	115.38333	Insecta	Hemiptera			
B-10	-20.80000	115.38333	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-10	-20.80000	115.38333	Insecta	Psocoptera			
B-10	-20.80000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-10	-20.80000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-18	-20.85000	115.31667	Ostracoda	Ostracoda	Candonidae: Paracypridinae	*Phlyctenophora mesembria Wouters*	
B-18	-20.85000	115.31667	Copepoda				
B -1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B -1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
Q5	-20.78472	115.38083		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
"F Cave"			Arachnida	Araneae	Pholcidae	*Trichocyclus*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*fragilis* Bradbury & Williams, HOLOTYPE
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Insecta	Coleoptera	Curculionidae: Cryptorhynchinae		
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Insecta	Hymenoptera	Formicidae		
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2			Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda: Oniscidea	Armadillidae		
B2	-20.86667	115.35000	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B2	-20.86000	115.35472	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B2	-20.86667	115.35000	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae,	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae,	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B2	-20.86000	115.35472		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B7			Malacostraca: Pancarida	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
C38	-20.86917	115.40111		Araneae	Pholcidae		
C38	-20.86917	115.40111		Collembola			
C65	-20.88222	115.38500	Arachnida	Acarina			
C65	-20.88222	115.38500	Arachnida	Araneae			
C65	-20.88222	115.38500	Maxillopoda: Copepoda	Calanoida			
C65	-20.88222	115.38500		Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
C65	-20.88222	115.38500	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500		Isopoda: Oniscidea			
C65	-20.88222	115.38500		Collembola			
C65	-20.88222	115.38500		Araneae			
C65N	-20.87833	115.39250	Ostracoda				
C66	-20.87917	115.39167	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*macrosculptilis* Bradbury & Williams, HOLOTYPE
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C66	-20.87917	115.39167	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C66	-20.87917	115.39167	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
C66	-20.87917	115.39167	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
C77J	-20.88278	115.39556	Maxillopoda: Copepoda	Calanoida			
C77J	-20.88278	115.39556	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
E1	-20.83472	115.40250	Maxillopoda: Copepoda	Calanoida			
E1	-20.83472	115.40250		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
F11	-20.84606	115.37309	Arachnida	Araneae			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
F11	-20.84606	115.37309	Arachnida	Araneae	Trochanteriidae		
F11	-20.84611	115.37306	Maxillopoda: Copepoda	Calanoida			
F11	-20.84606	115.37309	Maxillopoda: Copepoda	Calanoida			
F11	-20.84611	115.37306	Insecta	Coleoptera			
F11	-20.84611	115.37306	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
F11	-20.84611	115.37306		Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
F11	-20.84611	115.37306		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
F41A			Maxillopoda: Copepoda	Calanoida			
F41A			Maxillopoda: Copepoda	Calanoida			
F41A				Hemiptera	Meenoplidae		
F53S	-20.84361	115.38083		Collembola			
F7	-20.85028	115.37861	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
G19			Maxillopoda: Copepoda	Calanoida			
G19			Maxillopoda: Copepoda	Calinoida			
G19			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
G19			Arachnida	Scorpionida	Buthidae	*Lychas*	*marmoreus*?
G19			Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
K11	-20.81778	115.37250	Malacostraca	Amphipoda	Melitidae	*Nedsia*	?*urifimbriata* Bradbury & Williams ALLOTYPE?
K11	-20.81778	115.37250	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*urifimbriata* Bradbury & Williams, HOLOTYPE
K11			Arachnida	Araneae			
K11			Insecta	Hymenoptera			
K3N	-20.80944	115.36389	Copepoda	Cyclopoida	Cyclopidae	*Halicyclops*	*longifurcatus*
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Cyclopoida	Cyclopidae	*Halicyclops*	*longifurcatus*
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; HOLOTYPE & PARATYPES
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; HOLOTYPE & PARATYPES
K3N	-20.80944	115.36389	Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; PARATYPES
L 16			Malacostraca	Amphipoda	Melitidae	*Nedsia*	straskaba Bradbury & Williams, HOLOTYPE
L 16			Malacostraca	Amphipoda	Melitidae	*Nedsia*	*straskraba* Bradbury & Williams, 1996
L 16			Maxillopoda: Copepoda	Calanoida			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L 16			Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L 16			Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L17			Maxillopoda: Copepoda	Calanoida			
L17			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L17			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L2	-20.80917	115.36417		Collembola			
L32J	-20.80944	115.37833		Amphipoda			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Calanoida			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Calanoida			
L32J	-20.80944	115.37833		Collembola			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
L32J	-20.80944	115.37833	Amphipoda				
L32J	-20.80944	115.37833		Araneae	Pholcidae		
L4	-20.80667	115.38944	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*humphreysi* Bradbury & Williams, HOLOTYPE
L4	-20.80667	115.38944	Malacostraca	Amphipoda		*Nedsia*	sp. nov.? (cf *sculptilis*)
L4	-20.80667	115.38944	Malacostraca	Amphipoda			
L4	-20.80611	115.38917	Maxillopoda: Copepoda	Calanoida			
L4	-20.80667	115.38944	Maxillopoda: Copepoda	Calanoida			
L4	-20.80667	115.38944	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80611	115.38917		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80611	115.38917		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80608	115.38922	Copepoda	Harpacticoida			
L4	-20.80611	115.38917	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
L4	-20.80667	115.38944	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
L4	-20.80667	115.38944	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80611	115.38917		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80667	115.38944		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80667	115.38944	Amphipoda				
L4N	-20.80608	115.38922	Malacostraca	Amphipoda			
L4N	-20.81728	115.39506	Malacostraca	Amphipoda			
L4N	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L4N	-20.81728	115.39506	Insecta	Coleoptera			
L5	-20.81409	115.38747	Maxillopoda: Copepoda	Calanoida			
L5	-20.81409	115.38747	Maxillopoda: Copepoda	Calanoida			
L5	-20.81409	115.38747	Insecta	Hymenoptera	Formicidae		
L8	-20.81739	115.39497	Arachnida	Acarina			
L8	-20.81728	115.39506	Arachnida	Acarina			
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Bogidiellidae	*Bogadomma*	*australis* Bradbury & Williams
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Bogidiellidae	*Bogidomma*	*australis* Bradbury & Williams, HOLOTYPE
L8	-20.81694	115.39444	Malacostraca	Amphipoda		*Nedsia*	*sculptilis*
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*sculptilis* Bradbury & Williams, HOLOTYPE
L8	-20.81728	115.39506	Malacostraca	Amphipoda			
L8	-20.81694	115.39444	Arachnida	Araneae			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81739	115.39497	Maxillopoda: Copepoda	Calanoida			
L8	-20.81739	115.39497	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Insecta	Coleoptera			
L8	-20.81728	115.39506	Insecta	Collembola			
L8	-20.81728	115.39506	Insecta	Collembola			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81739	115.39497		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81739	115.39497		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81728	115.39506		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis, 1960
L8	-20.81694	115.39444	Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; PARATYPE
L8	-20.81728	115.39506	Insecta	Hymenoptera	Formicidae		
L8	-20.81694	115.39444	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81728	115.39506	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444	Insecta	Psocoptera			
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Malacostraca	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81728	115.39506		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81889	115.40667	Amphipoda				
L8	-20.81739	115.39497	Amphipoda				

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L8	-20.81739	115.39497		Collembola			
L8	-20.81739	115.39497	Amphipoda				
L8	-20.81728	115.39506	Pisces		Eleotridae	*Milyeringa*	*veritas*
L8	-20.81728	115.39506	Amphipoda			*Nedsia*	
M13	-20.81719	115.41233	Malacostraca	Amphipoda			
M13	-20.81719	115.41233	Arachnida	Araneae	Desidae		
M13	-20.81719	115.41233	Insecta	Diptera			
M13	-20.81719	115.41233	Insecta				
M5	-20.81222	115.40972		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
M5	-20.81222	115.40972	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
M52	-20.81586	115.40814	Maxillopoda: Copepoda	Calanoida			
M52	-20.81586	115.40814	Maxillopoda: Copepoda	Calanoida			
M52	-20.81586	115.40814		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M5N	-20.81017	115.41006	Arachnida	Araneae	Pholcidae		
M5N	-20.81017	115.41006	Arachnida	Araneae	Pholcidae		
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Calanoida			
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Calanoida			
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* De Laurentiis et al 1999
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
M5N	-20.81017	115.41006	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
M5N	-20.81017	115.41006	Insecta	Hemiptera: Fulgoroidea?			
M5N	-20.81017	115.41006		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M62	-20.81889	115.40667	Arachnida	Acarina			
M62	-20.81919	115.40706	Arachnida	Acarina			
M62	-20.81919	115.40706	Malacostraca	Amphipoda			
M62	-20.81919	115.40706	Malacostraca	Amphipoda			
M62	-20.81889	115.40667	Maxillopoda: Copepoda	Calanoida			
M62	-20.81919	115.40706	Maxillopoda: Copepoda	Calanoida			
M62	-20.81919	115.40706	Maxillopoda: Copepoda	Calanoida			
M62	-20.81889	115.40667	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
M62	-20.81889	115.40667		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M62	-20.81889	115.40667	Amphipoda				

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
M62	-20.81919	115.40706	Foramenifera				
M62			Maxillopoda: Copepoda	Calanoida			
M62			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
Malouet Cave			Arachnida	Araneae	Ctenidae	*Janusia*	sp.3
Malouet Cave			Arachnida	Araneae	Pholcidae		
MW13	-20.78083	115.46694		Harpacticioda		*Inermipes*	*humphreysi* Lee & Huys
MW13 / SB31	-20.78083	115.46694		Harpacticioda		*Inermipes*	*humphreysi* Lee & Huys
MW15	-20.78278	115.46472	Amphipoda				
MW15	-20.78278	115.46472	Amphipoda				
MW15	-20.78278	115.46472	Amphipoda				
MW17	-20.77861	115.46778	Amphipoda				
MW3 /SB8	-20.77972	115.46333	Malacostraca	Syncarida Bathynellacea			
MW3 /SB8	-20.77972	115.46333	Syncaridae	Bathynellacea			
MW7	-20.77775	115.46561		Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
N62			Arachnida	Acarina			
N62			Arachnida	Araneae	Pholcidae	*Trichocyclus*	
N62			Arachnida	Araneae			
N62			Insecta	Collembola			
N62			Insecta	Diptera			
N62			Insecta	Hemiptera	Reduviidae: Emesinae		
N62			Malacostraca	Isopoda: Oniscidea			
N62			Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
N62			Insecta	Orthoptera			
Old batch plant bore	-20.82417	115.43861		Cyclopoida		*Allocyclops*	"*barrowi* n.sp. Karanovic"
Old batch plant bore	-20.82417	115.43861		Collembola			
Old batch plant bore	-20.82417	115.43861		Acarina			
Q5	-20.78472	115.38083	Maxillopoda: Copepoda	Calanoida			
Q5	-20.78472	115.38083	Maxillopoda: Copepoda	Calanoida			
Q5	-20.78472	115.38083	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
Q5	-20.78472	115.38083	Insecta	Hymenoptera			

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
Q5	-20.78472	115.38083	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
S87	-20.76667	115.38333	Arachnida	Araneae	Salticidae	*Zenodorus*	?*orbiculatus*
S87	-20.76667	115.38333	Arachnida	Araneae	Zodariidae	*Habronestes*	sp
W62JW	-20.73222	115.42611	Malacostraca	Amphipoda		*Nedsia*	*hurlberti*
W62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
X62JW	-20.73222	115.42611	Malacostraca	Amphipoda			
X62JW	-20.73222	115.42611	Arachnida	Araneae	Theridiidae	*Latrodectus*	*hasseltii*
X62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
X62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
X62JW	-20.73222	115.42611		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.

Attachment 2 - Interim Advice on Electrophoretic Investigations by University of Western Australia Zoology

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Genetic Diversity in samples of stygobitic amphipods from Barrow Island

4 June 2004

Frozen specimens of amphipods from seven bores from Barrow Island were analysed for 20 allozyme loci following standard methods for protein electrophoresis. For comparative purposes, specimens of amphipods from the families Bogidiellidae and Melitidae (genus *Nedsia*), were included in the analyses from other sites where they are known (Cape Preston, Mount Brockman, and Paraburdoo)

In the following discussion, the word "group" may be loosely interpreted to mean "species" however, as will be explained in the concluding remarks, we must be cautious with the interpretation of species boundaries based on allozyme data alone.

Of the seven bores, five contained a single genetic group, while two of the bores (L32j and AMW18) contained two genetic groups (Table 1). In order to test for similarities among groups from different bores, a cluster analysis (using multi-dimensional scaling of Nei's genetic distances among samples) was used to group genetically similar samples. This analysis indicated the presence of six distinct genetic groups in the Barrow Island material, which were differentiated by the presence of two or more fixed differences among the 20 loci (Figure 1). Three of the groups (2, 3, and 5), accounting for six bores, showed affinities with melitids from other regions of the Pilbara. The other three (1, 4, and 6) represent groups that have not yet been detected in other bores.

Table 1. Number of genetic groups in each sample and brief description of their affinities. Where two distinct groups were found in a bore, they are labelled species a and b.

Bore	**Number of genetic groups**	**Comments**
L32j	2	species a (n = 13), similar to Paraburdoo melitids species b (n = 1), similar to Mt. Brockman melitids
L8	1	(n = 2) similar to Mt. Brockman melitids
14nr1	1	(n = 1) unique genetic type
MW7	1	(n = 1) similar to Paraburdoo melitids
AMW19	1	(n = 1) similar to Paraburdoo melitids
AMW18	2	species a (n = 2) similar to Mt. Cape Preston melitids species b (n = 3) unique genetic group but unable to score many loci
M17-4	1	(n = 1) unique genetic type

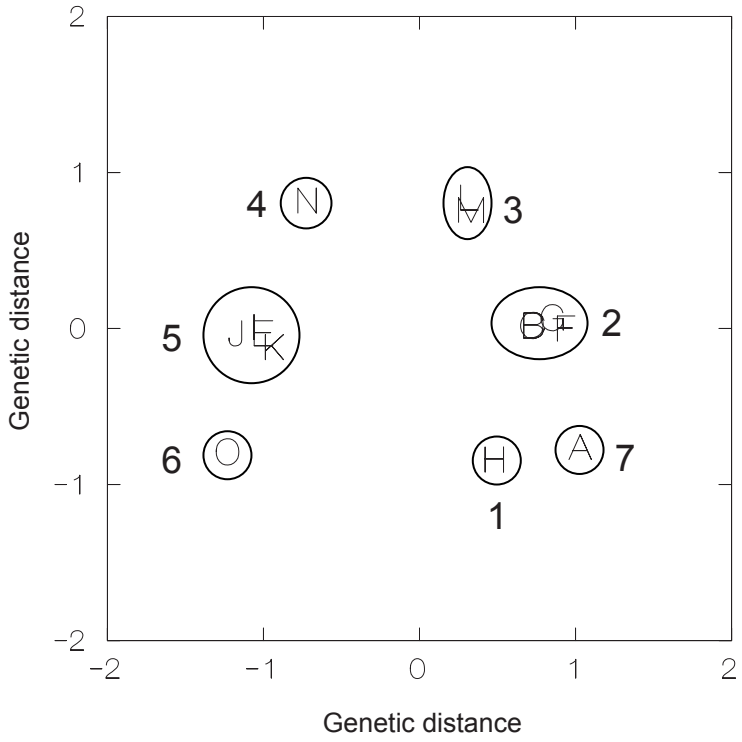

Figure 1. Multidimensional scaling of genetic distances for distinct bore x species groups.

Group 1:
H Barrow 14nr1

Group 2:
B Homestead meltid
C Homestead meltid
D Homestead meltid
F Barrow L32J-species b
G Barrow L8

Group 3:
L Cape Preston melitid
M Barrow AMW18-species a

Group 4:
N Barrow AMW18-species b

Group 5:
E Barrow L32J-species a
I Barrow MW7
J Barrow AMW19
K Paraburdoo melitid

Group 6:
O: Barrow M17-4

Group 7:
A Paraburdoo bogidiellid

In 1996, Bradbury and Williams described seven new species of the genus *Nedsia* (family Melitidae) plus a single species in the family Bogidiellidae from samples from Barrow Island. These descriptions were based on exhaustive documentation of morphological differences among specimens. The allozyme data showed the presence of six distinct genetic groups some of which may correspond to species already described by Bradbury and Williams.

In this study, distinct genetic groups were identified by fixed differences at two or more loci between populations. Fixed differences may arise when movement of individuals or gene flow between two populations ceases. If the populations remain isolated for a long period of time, differentiation may arise to the point that the two populations are no longer able to interbreed. Speciation occurs as a result of this process. Fixed differences may also arise between groups that are isolated for shorter periods of time, but may still retain the ability to interbreed if they were to come into contact again. Given the small sample sizes at each bore, differences may also arise from sampling error. That is, what appears to be a fixed difference may in fact be due to sampling an individual from a population that carries a rare allele, while other individuals not sampled carry that allele in heterozygous form along with other more common alleles found in other populations. If sample sizes were increased, we may find that populations that differ at only one or two loci actually converge. Finally, differences may arise due to localised selection acting on isolated populations.

In this study, there is a large split between groups 1, 2, 3 and 7, and groups 4, 5, and 6 (Figure 1). This is due to differences at 6-8 loci between the two groups. However, differences between populations within groups differ by only 1-3 loci. At this level of differentiation, it is sometimes difficult to determine if the differences represent real species differences, or are due to stochastic events such as sampling error described above. Breeding experiments are sometimes used as a test of reproductive incompatibility, however, given the protracted life cycles of stygobitic fauna, this sort of test is impractical. For this reason, it is important to combine both morphological and genetic data to come to a final conclusion on the number of species present. If the genetic groups correspond well to morphological groups, then differences detected at only a few loci in this study indeed represent species differences. However, if the genetic groups do not correspond to morphological species, then other factors such as small sample sizes may be playing a part. Finally, the use of other molecular markers, such as sequence divergence at mitochondrial genes, may help clarify species boundaries.

Attachment 3 - Barrow Island – Interim Subterranean Fauna Sampling Results – November/December 2004

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Biota Environmental Sciences

Barrow Island – Interim Subterranean Fauna Sampling Results – November/December 2004

We provide here a summary of the recent work completed on Barrow Island in commencing implementation of the Gorgon development Subterranean Fauna Sampling Programme.

Sampling for stygofauna was undertaken over five days from 30th November 2004 to 3rd December 2004. A total of 43 boreholes were sampled for stygofauna during this period (Table 1.1). These included recently installed boreholes situated inside and outside of the plant footprint. Boreholes were also sampled in two locations outside of the plant area, at the island Base and processing facility areas. The methodology for this work was consistent with both the Subterranean Fauna Sampling Programme and previous work undertaken by Biota on Barrow Island.

Ten boreholes were also profiled for water physico-chemical parameters (Table 1.2). These boreholes were selected due to their target geology (halocline). The halocline depth bores were installed specifically in order to investigate the potential for marine lineage stygofauna below the halocline, which would indicate a deeper, marine origin fauna. Readings were taken every five metres below ground level, to the total drilled depth (typically ~50 m). Various parameters were recorded, including dissolved oxygen, conductivity, depth and temperature. The data from this exercise will be combined within the full report, pending 2005.

Troglofauna traps were installed within 43 boreholes (see Table 1.3), in accordance with the Subterranean Fauna Sampling Programme. The sorting and curation of specimens to preliminary identification level was undertaken in the camp laboratory, with further analysis and identification undertaken in the office laboratory in Perth. More detailed taxonomic identification (i.e. to species level) is planned to be undertaken by the submission of the curated specimens to staff at the University of Western Australia and Western Australian Museum and other specialist taxonomists. Stygofauna were collected from 10 bores, including one borehole within the project impact area and nine outside of the project area (see Table 1.4). Some troglobitic taxa were also collected during the field visit, opportunistically recovered from bores sampled for stygofauna.

The installed troglofauna traps are scheduled for retrieval in January 2005, and sorting of samples to be undertaken on return to Perth, in the Biota office laboratory.

Table 1.1: Details of boreholes visited inside and outside of the proposed Gorgon Gas project area, indicating which boreholes were sampled and the Stygofauna collected (WGS84 datum Zone 51).

Boreholes	Easting	Northing	Comments	Dates Sampled
A4	335329	7702611	3 hauls	29/11/04 - 01/12/04
B1	340113	7700371	3 hauls	29/11/04 - 01/12/04
B3	339690	7700465	3 hauls	29/11/04 - 01/12/04
B4	339459	7700690	3 hauls	29/11/04 - 01/12/04
B5	339304	7700415	3 hauls	29/11/04 - 01/12/04
6A	338869	7700186	3 hauls	29/11/04 - 01/12/04

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B7	339265	7700282	3 hauls	29/11/04 - 01/12/04
B8	339183	7700106	3 hauls	29/11/04 - 01/12/04
B9	339064	7700221	3 hauls	29/11/04 - 01/12/04
B10	338966	7700305	3 hauls	29/11/04 - 01/12/04
B11	338790	7700469	3 hauls	29/11/04 - 01/12/04
B12	338578	7700655	3 hauls	29/11/04 - 01/12/04
B13	338968	7700106	3 hauls	29/11/04 - 01/12/04
B14	339096	7699852	3 hauls	29/11/04 - 01/12/04
B15	338862	7700009	3 hauls	29/11/04 - 01/12/04
B16	338762	7700078	3 hauls	29/11/04 - 01/12/04
B17	338648	7700195	3 hauls	29/11/04 - 01/12/04
B18	338582	7700270	3 hauls	29/11/04 - 01/12/04
B19	338491	7700337	3 hauls	29/11/04 - 01/12/04
B20	338335	7700480	3 hauls	29/11/04 - 01/12/04
B21	338125	7700679	3 hauls	29/11/04 - 01/12/04
B22	338388	7700222	3 hauls	29/11/04 - 01/12/04
B23	338393	7699997	3 hauls	29/11/04 - 01/12/04
B24	338291	7700118	3 hauls	29/11/04 - 01/12/04
B26	338681	7699356	3 hauls	29/11/04 - 01/12/04
B27	338462	7699556	3 hauls	29/11/04 - 01/12/04
CHW1	331945	7697424	3 hauls	29/11/04 - 01/12/04
CHW2	332913	7700890	3 hauls	29/11/04 - 01/12/04
CHW3	332870	7700851	3 hauls	29/11/04 - 01/12/04
BMW1	332847	7700930	3 hauls	29/11/04 - 01/12/04
BMW4	332820	7700883	3 hauls	29/11/04 - 01/12/04
BMW5	331999	7697055	3 hauls	29/11/04 - 01/12/04
BMW6	331870	7697078	3 hauls	29/11/04 - 01/12/04
BMW7	331864	7697228	3 hauls	29/11/04 - 01/12/04
S1	337433	7701733	3 hauls	29/11/04 - 01/12/04
S2	338465	7701878	3 hauls	29/11/04 - 01/12/04
S3	339423	7701776	3 hauls	29/11/04 - 01/12/04
S4	336298	7699910	3 hauls	29/11/04 - 01/12/04
S5	337101	7699396	3 hauls	29/11/04 - 01/12/04
S6	338220	7699071	3 hauls	29/11/04 - 01/12/04
S7	335167	7698272	3 hauls	29/11/04 - 01/12/04
S8	336189	7697735	3 hauls	29/11/04 - 01/12/04
S9	337097	7696971	3 hauls	29/11/04 - 01/12/04

Table 1.2: Details of halocline boreholes profiled for physico-chemical parameters.

Boreholes	Date logged	Comments
A4	29/11/04	Logged
B5	29/11/04	Logged
B8	29/11/04	Logged
B12	29/11/04	Possible collapse or pinched pipe at ~10 m
B18	29/11/04	Logged
B24	29/11/04	Logged
B26	29/11/04	Logged
S3	29/11/04	Logged
S5	29/11/04	Logged
S9	29/11/04	Logged

Table 1.3: Details of boreholes where Troglofauna traps were installed, including trap and interval depths in Metres. BGL = Below Ground Level

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
A4	335329	7702611	3 traps	5, 10, 15
A6	337811	7700967	1 trap	6-10
B1	340113	7700371	1 trap	5
B3	339690	7700465	1 trap	6
B4	339459	7700690	1 trap	5
B5	339304	7700415	1 trap	6
6A	338869	7700186	2 traps	6, 11
B8	339183	7700106	2 traps	5, 10
B9	339064	7700221	2 traps	6, 11
B10	338966	7700305	1 trap	6-10
B11	338790	7700469	1 trap	6-10
B12	338578	7700655	2 traps	5, 10
B13	338968	7700106	1 trap	6-10
B15	338862	7700009	2 traps	5, 10
B16	338762	7700078	1 trap	6-10
B17	338648	7700195	1 trap	6-10
B18	338582	7700270	2 traps	5, 10
B19	338491	7700337	1 trap	6-10
B20	338335	7700480	2 traps	5, 10
B21	338125	7700679	1 trap	6-10
B22	338388	7700222	1 trap	6-10
B23	338393	7699997	1 trap	6-10
B24	338291	7700118	3 traps	5, 10, 15
B26	338681	7699356	3 traps	5, 10, 15
B27	338462	7699556	3 traps	5, 10, 15
CHW1	331945	7697424	4 traps	5, 12, 25, 46
CHW2	332913	7700890	4 traps	5, 12, 21, 36
CHW3	332870	7700851	4 traps	7, 16, 30, 44
BMW1	332870	7700851	4 traps	6, 15, 24, 37
BMW4	332847	7700930	4 traps	5, 18, 26, 39

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
BMW5	332820	7700883	4 traps	5, 11, 21, 37
BMW6	331999	7697055	3 traps	5, 15, 33
BMW7	331870	7697078	1 trap	5, 9, 16, 26
S1	331864	7697228	Blocked past 7m, 1 trap	7
S2	338465	7701878	3 traps	7, 14, 22
S3	339423	7701776	2 traps	5, 11
S4	336298	7699910	2 traps	6, 12
S5	337101	7699396	1 trap	6
S6	338220	7699071	1 trap	6
S7	335167	7698272	3 traps	7, 13, 19
S8	336189	7697735	2 traps	7, 13
S9	337097	7696971	1 trap	5
Tony's Hole	338113	7700633	2+ traps	5, 10

Stygofauna Sampling Results

One of the bores where stygofauna were collected was within the impact area of the development footprint (B18), with nine bores outside (B18, BMW1, BMW4, BMW5, BMW6, BMW7, S4, S5, S6 and S9) (Table 4.1). Four stygofauna taxa and two species of troglofauna were collected. The stygofauna collected represented three higher taxonomic groups as follows; Class Malacostraca (Order Amphipoda), Class Copepoda, Class Ostracoda and Class Decapoda (*Stygiocaris stylifera*). Troglofauna taxa collected represented two higher groups; Class Arachnida (Schizomid; *Draculoides bramstokerii*) and Class Collembola. The preliminary results from the stygofauna sampling are listed in Table 1.4.

Table 1.4: Preliminary results of stygofauna sampling (Am = Amphipod, Col = Collembola, Co = Copepod, Os = Ostracod, Sh = Schizomid, St = *Stygiocaris stylifera* (Decapoda)).

Boreholes	Easting	Northing	Taxa
B18	338582	7700270	Am (1) Co (1)
BMW1	332847	7700930	Col (1) Sc (2)
BMW4	332820	7700883	Co (4)
BMW5	331999	7697055	Col (1)
BMW6	331870	7697078	Sc (1)
BMW7	331864	7697228	Am (1) Co (1) Sc (1)
S4	336298	7699910	Co (2)
S5	337101	7699396	Am (1) Co (3)
S6	338220	7699071	Am (5) Co (4) St (3)
S9	337097	7696971	Os (1) St (9)

Other Comments

A small percentage of the boreholes were inaccessible beyond a certain depth due to possible PVC piping constrictions or possible hole collapse. This affected the both the data logging of one bore (B12), depth of stygofauna sampling and the installation of the anticipated number of troglofauna traps in a number of other bores.

Attachment 4 - Barrow Island – Interim Subterranean Fauna Sampling Results – February/March 2005

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Barrow Island – Interim Subterranean Fauna Sampling Results – March 2005

We provide here a summary of the recent work completed on Barrow Island in the ongoing implementation of the Gorgon development Subterranean Fauna Sampling Programme.

Sampling for stygofauna and troglofauna trap insertion was undertaken over five days from 28 February 2005 to 4 March 2005. A total of 33 boreholes were visited for stygofauna sampling, of which 31 were sampled (Table 1.1). These included recently installed boreholes situated inside and outside of the plant footprint. Boreholes were also sampled in two locations outside of the plant area, at the island base and the central processing facility areas. The methodology for this work was consistent with both the Subterranean Fauna Sampling Programme and previous work undertaken by Biota on Barrow Island.

Following the stygofauna sampling exercise, troglofauna traps were installed within 43 boreholes (Table 1.2), in accordance with the Subterranean Fauna Sampling Programme. The sorting and curation of specimens to preliminary identification level was undertaken in the camp laboratory, with further analysis and identification undertaken in the office laboratory in Perth. More detailed taxonomic identification (i.e. to species level) and genetic analyses are scheduled to be undertaken after the submission of the specimens to staff at the University of Western Australia, the Western Australian Museum and other specialist taxonomists. Stygofauna were collected from 13 bores, including five boreholes within the project impact area and eight outside of the project area (Table 1.3). Some troglobitic taxa were also collected during the field visit, opportunistically recovered from bores sampled for stygofauna.

The troglofauna traps installed in December 2004 were retrieved on 24 January 2005, and sorting of trap contents was undertaken on return to Perth, in the Biota office laboratory. The results of the troglofauna survey are given in Table 1.4. Troglofauna were recorded from 35 of the 42 boreholes sampled, and are further discussed in the Troglofauna Sampling Results section.

Table 1.1: Details of boreholes visited inside and outside of the proposed Gorgon Gas project area, indicating which boreholes were sampled for stygofauna (WGS84 datum Zone 50).

Boreholes	Easting	Northing	Comments	Dates Sampled
A4	335329	7702611	3 hauls	28/02/05 - 03/02/05
B1	340113	7700371	3 hauls	28/02/05 - 03/02/05
B3	339690	7700465	3 hauls	28/02/05 - 03/02/05
B4	339459	7700690	3 hauls	28/02/05 - 03/02/05
B5	339304	7700415	3 hauls	28/02/05 - 03/02/05
6A	338869	7700186	3 hauls	28/02/05 - 03/02/05
B8	339183	7700106	3 hauls	28/02/05 - 03/02/05
B9	339064	7700221	3 hauls	28/02/05 - 03/02/05
B12	338578	7700655	Heavily silted, sample aborted	28/02/05 - 03/02/05
B15	338862	7700009	3 hauls	28/02/05 - 03/02/05

B18	338582	7700270	3 hauls	28/02/05 - 03/02/05
B20	338335	7700480	Possible blockage at 30m	28/02/05 - 03/02/05
B21	338125	7700679	3 hauls	28/02/05 - 03/02/05
B24	338291	7700118	3 hauls	28/02/05 - 03/02/05
B26	338681	7699356	3 hauls	28/02/05 - 03/02/05
B27	338462	7699556	3 hauls	28/02/05 - 03/02/05
CHW1	331945	7697424	3 hauls	28/02/05 - 03/02/05
CHW2	332913	7700890	3 hauls	28/02/05 - 03/02/05
CHW3	332870	7700851	3 hauls	28/02/05 - 03/02/05
BMW1	332847	7700930	3 hauls	28/02/05 - 03/02/05
BMW4	332847	7700930	3 hauls	28/02/05 - 03/02/05
BMW5	331999	7697055	3 hauls	28/02/05 - 03/02/05
BMW6	331870	7697078	3 hauls	28/02/05 - 03/02/05
BMW7	331864	7697228	3 hauls	28/02/05 - 03/02/05
S1	337433	7701733	3 hauls	28/02/05 - 03/02/05
S2	338465	7701878	3 hauls	28/02/05 - 03/02/05
S3	339423	7701776	3 hauls	28/02/05 - 03/02/05
S4	336298	7699910	3 hauls	28/02/05 - 03/02/05
S5	337101	7699396	3 hauls	28/02/05 - 03/02/05
S6	338220	7699071	3 hauls	28/02/05 - 03/02/05
S7	335167	7698272	3 hauls	28/02/05 - 03/02/05
S8	336189	7697735	3 hauls	28/02/05 - 03/02/05
S9	337097	7696971	3 hauls	28/02/05 - 03/02/05

Table 1.2: Details of boreholes where troglofauna traps were installed, including trap and interval depths in metres. BGL = Below Ground Level

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
A4	335329	7702611	3 traps	5, 10, 15
A6	337811	7700967	1 trap	8
B1	340113	7700371	1 trap	5
B3	339690	7700465	1 trap	6
B4	339459	7700690	1 trap	5
B5	339304	7700415	1 trap	6
6A	338869	7700186	2 traps	6, 11
B8	339183	7700106	2 traps	5, 10
B9	339064	7700221	2 traps	6, 11
B10	338966	7700305	1 trap	6-10
B11	338790	7700469	1 trap	6-10
B12	338578	7700655	2 traps	5, 10
B13	338968	7700106	1 trap	6-10
B15	338862	7700009	2 traps	5, 10
B16	338762	7700078	1 trap	6-10
B17	338648	7700195	1 trap	6-10
B18	338582	7700270	2 traps	5, 10
B19	338491	7700337	1 trap	6-10
B20	338335	7700480	2 traps	5, 10
B21	338125	7700679	1 trap	6-10
B22	338388	7700222	1 trap	7
B23	338393	7699997	1 trap	6-10
B24	338291	7700118	3 traps	5, 10, 15
B26	338681	7699356	3 traps	5, 10, 15
B27	338462	7699556	3 traps	5, 10, 15
CHW1	331945	7697424	4 traps	5, 12, 25, 46
CHW2	332913	7700890	4 traps	5, 12, 21, 36
CHW3	332870	7700851	4 traps	7, 16, 30, 44
BMW1	332870	7700851	4 traps	6, 15, 24, 37
BMW4	332847	7700930	4 traps	5, 18, 26, 39
BMW5	332820	7700883	4 traps	5, 11, 21, 37
BMW6	331999	7697055	3 traps	5, 15, 33
BMW7	331870	7697078	4 traps	5, 9, 16, 26
S1	331864	7697228	Blocked past 7m, 1 trap	7
S2	338465	7701878	3 traps	7, 14, 22
S3	339423	7701776	2 traps	5, 11
S4	336298	7699910	2 traps	6, 12
S5	337101	7699396	1 trap	6
S6	338220	7699071	1 trap	6
S7	335167	7698272	3 traps	7, 13, 19
S8	336189	7697735	2 traps	7, 13
S9	337097	7696971	1 trap	5
Non-referenced	338113	7700633	1 trap	8

Stygofauna Sampling Results

Four of the bores where stygofauna were collected are located within the proposed development footprint (impact area); B4, B18, B21 and B24. Stygofauna were recorded from five bores outside of the proposed development footprint (A4, BMW7, S5, S6 and S9) (Table 1.3). Five stygofauna taxa and three species of troglofauna were represented amongst the collected specimens. The stygofauna represented amongst collected represent four higher taxonomic groups as follows; Class Malacostraca (Order Amphipoda and Order Bathynellacea), Class Copepoda, Class Ostracoda and Order Decapoda (*Stygiocaris stylifera*). The troglofauna species represent three higher groups; Class Arachnida (Schizomid; *Draculoides bramstokerii*), Class Collembola and Class Malocastraca (Order Isopoda). The preliminary results from the stygofauna sampling are listed in Table 1.3.

Table 1.3: Preliminary results of stygofauna sampling (including troglofauna records in bold) Am = Amphipod, Ba = Bathynellid Col = Collembola, Co = Copepod, Is = Isopod, Os = Ostracod, Sc = Schizomid, St = *Stygiocaris stylifera* (Decapoda). Boreholes where stygofauna have previously been recorded are indicated with *****.

Boreholes	Easting	Northing	Taxa
A4	335329	7702611	Am (1) + remains, **Is (remains)**
B4	339459	7700690	Am (5)
B18 *	338582	7700270	Am (4)
B21	338125	7700679	Ba (4)
B24	338291	7700118	Am (1)
B27	338462	7699556	**Is (1)**, **Sc (1)**
BMW1	332847	7700930	**Is (1)**, **Sc (2)**
BMW5	331999	7697055	**Is (1)**, **Sc (2)**
BMW6	331870	7697078	**Sc (2)**
BMW7 *	331864	7697228	Am (1), Co (1)
S5 *	337101	7699396	Am (1), St (4)
S6 *	338220	7699071	Co (10), Is (1), St (4)
S9 *	337097	7696971	Am (1), **Col (1)**, St (7)

Troglofauna Sampling Results

Troglofauna taxa were collected form bores located both inside and outside of the proposed development footprint. A total of 10 species were collected, representing four higher taxonomic groups, Class Arachnida, Class Collembola, Class Insecta and Class Oligochaeta. These groups comprise seven orders, Acarina, Haplotaxida, Hemiptera Hymenoptera Isoptera, Psuedoscorpionida and Schizomida. The preliminary results from the troglofauna sampling are listed in Table 1.4.

Table 1.4: Preliminary results of troglofauna sampling. (n=number of specimens)

Borehole	Trap No	Taxa	N	Depth m
A4	1	Isoptera	5	5
	2	Collembola	1	10
	2	Isoptera	1	10
A6	1	Acarina	2	6
B4	1	Isoptera	2	5
B5	1	Acarina	2	6
6A	1	Oligochaete	6	6
	2	Collembola	1	11
	2	Oligochaete	4	11
B8	1	Isoptera	3	5

Borehole	Trap No	Taxa	N	Depth m
B9	1	Collembola	1	6
	2	Collembola	1	11
B10	1	Archaeognath	1	6-10
B11	1	Collembola	7	6-10
	1	Schizomid	1	6-10
B12	1	Isoptera	2	5
	2	Oligochaete	11	10
B13	1	Collembola	2	6-10
	1	Oligochaete	5	6-10
B15	2	Acarina	2	10
	2	Collembola	2	10
B18	1	Collembola	3	5
	1	Hemiptera	1	5
	1	Schizomid	1	5
	2	Collembola	3	10
	2	Schizomid	3	10
B20	1	Acarina	2	5
	1	Collembola	2	5
B23	1	Collembola	1	6
	1	Oligochaete	8	6
B24	1	Isoptera	1	5
	1	Undetermined taxon	1	5
	1	Thysanura	1	5
B26	1	Acarina	2	5
	3	Collembola	8	15
	3	Oligochaete	1	15
B27	1	Oligochaete	30+	5
	2	Collembola	12	10
	3	Collembola	1	15
CHW1	1	Isoptera	4	5
	3	Isoptera	30	12
	4	Collembola	1	46
	4	Acarina	1	46
CHW2	1	Acarina	6	5
	2	Collembola	6	12
	3	Collembola	30	21
CHW3	2	Isoptera	3	16
	3	Isoptera	1	30
	4	Isoptera	3	44
BMW1	1	Isoptera	7	6
BMW5	1	Isoptera	25	5
	2	Diptera	16	11
	3	Diptera	3	21
	3	Hymenoptera	1	21
	4	Collembola	1	37
BMW6	1	Collembola	6	5
	2	Collembola	3	15
	2	Oligochaete	5	15
	3	Isopod	1	33

Borehole	Trap No	Taxa	N	Depth m
	3	Oligochaete	5	33
	3	Schizomid	1	33
BMW7	1	Isoptera	30	5
	1	Pseudoscorpion	1	5
	3	Collembola	1	16
	3	Oligochaete	11	16
S1	1	Isoptera	1	7
S2	2	Collembola	3	14
	2	Schizomid	1	14
S3	1	Collembola	2	5
S4	2	Schizomid	1	6
S5	1	Oligochaete	10	6
S6	1	Collembola	4	6
S7	1	Isopod	2	7
	2	Isopod	4	13
	2	Schizomid	1	13
	3	Schizomid	1	19
S8	1	Acarina	2	7
S9	1	Collembola	5	5
Non- referenced	1	Acarina	1	5
	1	Isopod	1	5
	1	Schizomid	1	5

Other Comments

Some of the species recorded still require further taxonomic and genetic work to confirm their status as troglobitic invertebrates, and not troglophilic specimens sharing similar morphological characteristics.

A small percentage of the boreholes were inaccessible beyond a certain depth due to possible PVC piping constrictions or possible hole collapse. This affected the sampling and the installation of the planned number of troglofauna traps in a number of other bores. One bore (B12) was not sampleable for stygofauna due to the heavy silts content and difficulty retrieving the nets.

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