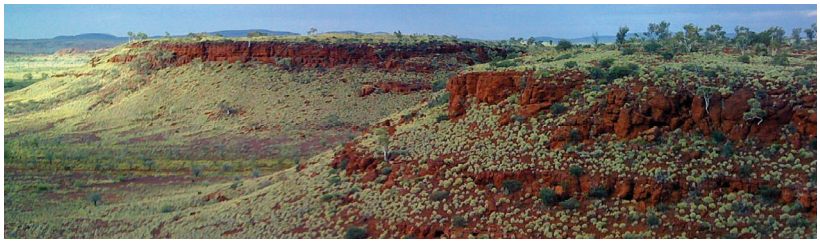
Biota Environmental Sciences

West Pilbara Iron Ore Project Troglobitic Fauna Assessment



Prepared for API Management

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West Pilbara Iron Ore Project Troglofauna Assessment

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1.0 Introduction

1.1 Project Background

API Management (API) proposes to develop the West Pilbara Iron Ore Project (WPIOP). The spatial scope of the project area encompasses several mine deposits located primarily in the vicinity of Red Hill in the western Pilbara, with a rail corridor to Anketell Point (Figure 1.1). Additional infrastructure associated with the project includes haul roads, stockpiles, waste dumps, airfield options, plant and camp areas in the area of the project deposits.

API referred the WPIOP proposal to the Western Australian Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986*. The EPA determined that the proposal would be formally assessed at the level of Public Environmental Review (PER). The project was also referred to the Federal Department of the Environment, Water, Heritage and the Arts (DEWHA) under the *Environment Protection and Biodiversity (EPBC) Conservation Act 1999*. DEWHA determined that the project would also be treated as a Controlled Action for the purposes of this latter act. Biota Environmental Sciences (Biota) was commissioned to complete subterranean fauna surveys of areas to be impacted by the mining components of the proposed WPIOP development.

Eight ore bodies are proposed for mining as part of the project, all of which occur on mesa landforms at the western margins of the Hamersley Range. The ore bodies comprise:

- Cochrane and Jewel: approximately 9 km to the northeast of Red Hill Station;
- Kens Bore: 15 km southeast of Red Hill Station;
- Cardo Bore North: 25 km southeast of Red Hill Station;
- Cardo Bore East: also approximately 30 km southeast of Red Hill Station;
- Upper Cane: about 30 km southeast of Red Hill Station;
- Trinity Bore: approximately 50 km southeast of Red Hill Station; and
- Catho Well: 52 km south-southeast of Red Hill Station (Figure 1.1).

All of these ore bodies contain Robe pisolite formations, which are known from previous studies to provide habitat for troglobitic fauna (Biota 2006a; Harvey et al. 2008; Biota 2008). Troglobites are obligate subterranean animals living in caves or air-filled void spaces in subterranean strata above the water table. This fauna is known to display extreme short-range endemism (Harvey 2002), meaning that there are potential conservation issues associated with developments affecting their habitat. Troglobitic fauna (troglofauna) therefore represents a relevant factor for the formal environmental assessment of the West Pilbara Iron Ore Project.

1.2 Scope and Objectives of this Study

The survey documented in this report was planned and implemented in accordance with:

- EPA Guidance Statement No. 54 "Sampling of Subterranean Fauna in Groundwater and Caves" (EPA 2003); and
- EPA Guidance Statement No. 54a "Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia" (EPA 2007).

The scope and objectives of this study were to:

- document the troglobitic fauna assemblage within the habitats of the project mine areas using established sampling techniques;

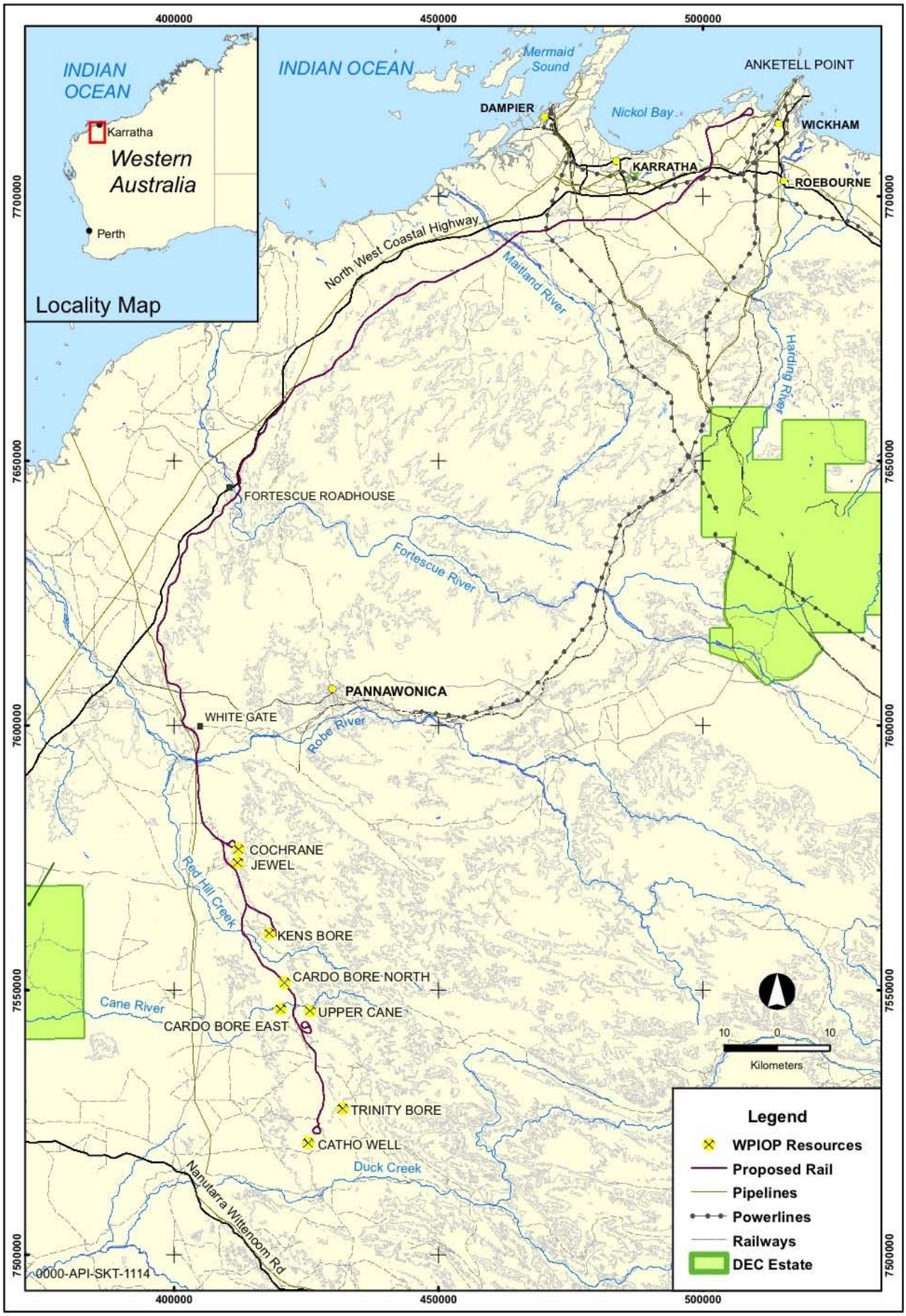

Figure 1.1: Locality map for the West Pilbara Iron Ore Project.

- identify the collected fauna to species level wherever possible and assess their distributions; and
- provide a generic assessment of the potential impacts of the proposed development on the fauna habitats and assemblages occurring in the project mine areas.

This report describes the methodology employed for the subterranean fauna survey of the proposed WPIOP mine project area. It documents the results of the field surveys, describes the collected troglobitic fauna assemblage, and discusses the generic impacts of the project on troglofauna communities and assemblages. Its intended use is as a supporting document for the formal environmental assessment of the WPIOP project. Both the field sampling and this report are subject to the limitations discussed in Section 2.7.

1.3 Terminology

For the purposes of this report, the following terms are used as defined below:

Project area – the overall spatial extent of the WPIOP mine areas, from Cochrane in the north to Catho Well in the south.

Study area – an individual mine area sampling locality (e.g. Trinity Bore).

Sample site – a specific drill hole from which specimens were collected.

Troglobite - obligate subterranean fauna living in air-filled cavities.

Edaphobite - soil and leaf litter dwelling fauna.

Other terms are detailed in the glossary provided in Section 6.0.

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2.0 Approach and Methodology

2.1 Study Team

This study was designed and coordinated by Garth Humphreys of Biota, with input from Dan Kamien and Jason Alexander (Biota), and API staff. Eight phases of subterranean fauna sampling have been completed for the project at the time of preparing this report (Section 2.3). These field surveys were completed by a team of zoologists comprising Garth Humphreys, Dan Kamien, Jason Alexander, Tim Sachse, Myles Menz, Michael Greenham, Jessica Cairnes and David Keirle (all of Biota). Field assistance was also provided by Caroline Lever (API).

Sorting of litter traps was completed by Jason Alexander, Dan Kamien, Tim Sachse, Jess Cairnes, Myles Menz, David Keirle and Penny Brooshooft (all of Biota). Preliminary identification of troglofauna specimens to order level was conducted at the sorting stage by the sorting team. Family, genus and species level identifications were primarily completed by Dr Volker Framenau and Dr Mark Harvey of the Western Australian Museum, and other specialist zoologists as detailed in Section 2.5.

Molecular (DNA) analysis of schizomid and troglobitic cockroach specimens was completed by Zoë Hamilton (Biota), Kate Loynes and Yvette Hitchen (Helix Molecular Solutions), respectively. Dr Terrie Finston (Helix) provided further analysis and interpretation of these molecular data.

Geographical Information System (GIS) mapping and analysis for this report was carried out by Paul Sawers (Biota).

2.2 Sampling Methods

Troglofauna were sampled by means of custom-built litter traps suspended within boreholes in each of the various study areas. Drill logs were reviewed, where suitable information was available, to identify areas where fracture zones or cavities occurred in the profile. Traps were suspended within each hole sampled to generally align with these more prospective zones.

Traps were constructed from 40 mm internal diameter reticulation pipe cut to a length of 150 mm. The external diameter of the completed trap was such that it sat closely against the interior of the sampled bore once installed, facilitating fauna entry into the trap. Both ends were sealed with screw caps after the tubing was filled with wet leaf litter.

Leaf litter material was gathered locally from the ground surface within the study area, particularly from the bases of *Acacia* shrubs. The collected litter was soaked in water and irradiated in a microwave oven on maximum power setting (to kill any surface invertebrates present and assist in litter decay). Litter was added to the traps wet and both kept in sealed containers until immediately prior to insertion into the drill holes. After the installation of each trap, the opening of the boreholes were sealed to maintain humidity and to minimise the input of surface fauna into the traps. Traps were left in the ground to allow sufficient time for troglofauna colonisation, and subsequently recovered and stored in labelled zip lock bags for return to Perth for laboratory sorting (Section 2.4).

2.3 Survey Design and Effort

The troglobitic fauna sampling programme was designed by reference to similar subterranean fauna programmes undertaken elsewhere (e.g. Biota 2004; 2006a and b) and to the requirements of EPA (2003 and 2007). Sample sites were selected within each of the individual deposit study areas such that sampled drill holes provided:

- sampling effort on each of the seven study areas consistent with, or exceeding, the requirements of EPA (2007);

- spatial coverage of the extent of the mesa landform and Channel Iron Deposit (CID) (the core habitat for troglofauna) within each study area; and
- sampling effort both inside and outside of planned mine pit shells at each study area (where these were known at the time of the sampling phase field work).

An overview of the distribution of the drill holes sampled for troglofauna across the WPIOP project area is shown in Figure 2.1. Enlargements showing detailed distribution of individual sample sites within each study area follow in Figure 2.2 to Figure 2.8.

Sampling for troglofauna was conducted over eight phases spanning a two-year period during the course of this study. Troglofauna litter traps were left installed for a period of approximately six weeks after installation during each phase at each study area. Details of survey timing specific to each of the seven study areas are provided in Table 2.1.

Table 2.1: Timing of survey phases and installed and recovery of traps in the WPIOP study areas.

	Study Area						
Date	**Cochrane and Jewel**	**Kens Bore**	**Cardo Bore North**	**Cardo Bore East**	**Upper Cane**	**Trinity Bore**	**Catho Well**
Phase 1							
Installed	04-08/09/2007	04-08/09/2007	-	04-08/09/2007	04-08/09/2007	-	04-08/09/2007
Recovered	23-24/10/2007	23/10/2007	-	23/10/2007	24/10/2007	-	22, 24/10/2007
Phase 2							
Installed	22-24/10/2007	22-24/10/2007	-	22-24/10/2007	22-24/10/2007	-	22-24/10/2007
Recovered	16-17/01/2008	17/01/2008	-	17/01/2008	17/01/2008	-	17/01/2008
Phase 3							
Installed	26-28/6/08	26-28/6/08	26-28/6/08	26-28/6/08	26-28/6/08	26-28/6/08	26-28/6/08
Recovered	19/08/2008	18/08/2008	17-18/08/2008	17-18/08/2008	18/08/2008	16/08/2008	17/08/2008
Phase 4							
Installed	15-21/08/2008	15-21/08/2008	15-21/08/2008	15-21/08/2008	15-21/08/2008	15-21/08/2008	15-21/08/2008
Recovered	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008
Phase 5							
Installed	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008	13-16/10/2008
Recovered	25-28/11/2008	25-28/11/2008	25-28/11/2008	25-28/11/2008	25-28/11/2008	25-28/11/2008	25-28/11/2008
Phase 6							
Installed	11-13/2/2009	11-13/2/2009	11-13/2/2009	11-13/2/2009	11-13/2/2009	11-13/2/2009	11-13/2/2009
Recovered	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009
Phase 7							
Installed	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009	24-26/3/2009
Recovered	13-15/5/2009	13-15/5/2009	13-15/5/2009	13-15/5/2009	13-15/5/2009	13-15/5/2009	13-15/5/2009
Phase 8							
Installed	12-14/5/2009	12-14/5/2009	12-14/5/2009	12-14/5/2009	25-27/5/2009	12-14/5/2009	12-14/5/2009
Recovered	7-10/7/2009	7-10/7/2009	7-10/7/2009	7-10/7/2009	7-10/7/2009	7-10/7/2009	7-10/7/2009

The number of sample sites within each study area during each phase varied due to availability of drill holes and when study areas were added to the programme. Most sample points were sampled multiple times at each study area with an overall total of 840 drill hole sampling events (Table 2.2).

Table 2.2: Summary of troglofauna sampling effort in the WPIOP study areas (number of drill holes).

	Phase								
Study Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Cochrane and Jewel	28	27	17	16	17	16	7	5	**133**
Kens Bore	13	13	6	6	6	14	13	12	**83**
Cardo Bore North	-	-	10	10	10	10	7	7	**54**
Cardo Bore East	19	19	10	10	9	12	11	9	**99**
Upper Cane	17	17	17	16	17	7	9	24	**124**
Catho Well	28	28	15	15	15	13	14	14	**142**
Trinity Bore	-	-	33	33	33	37	35	34	**205**
Total:	**105**	**104**	**108**	**106**	**107**	**109**	**96**	**105**	**840**

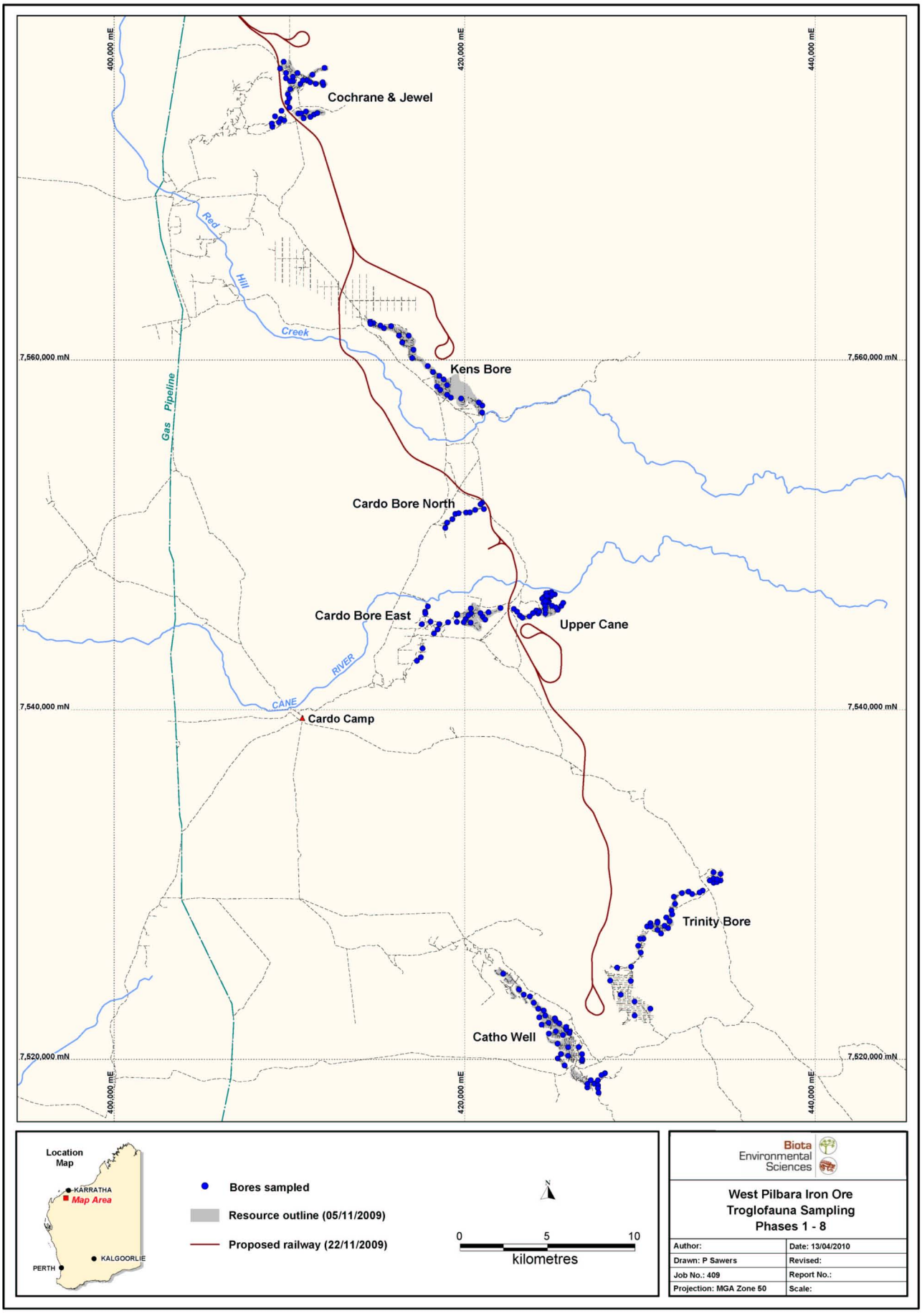

Figure 2.1: Overview of sample sites within study areas across the extent of the WPIOP project area.

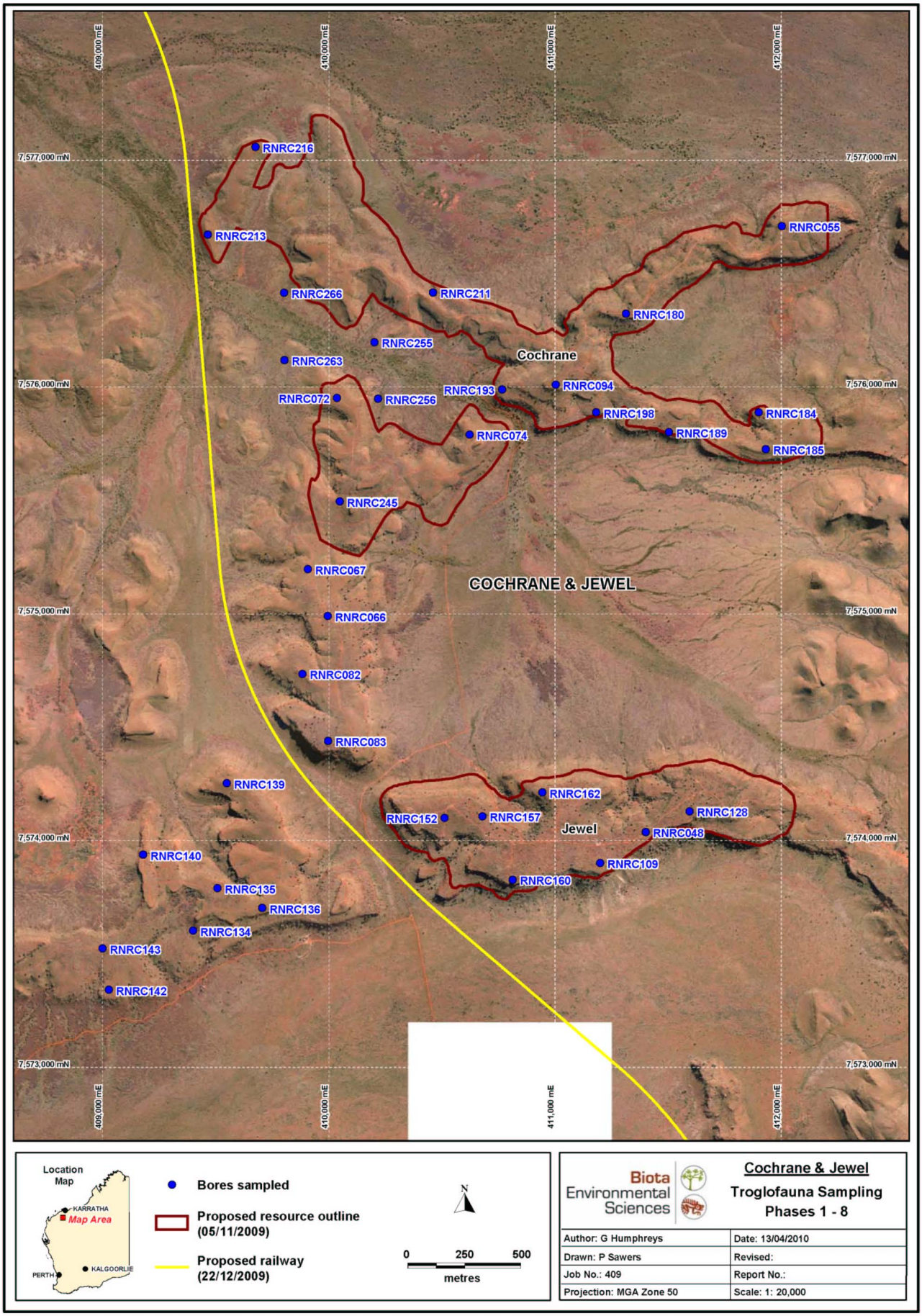

Figure 2.2: Sample sites at the Cochrane and Jewel deposits study area.

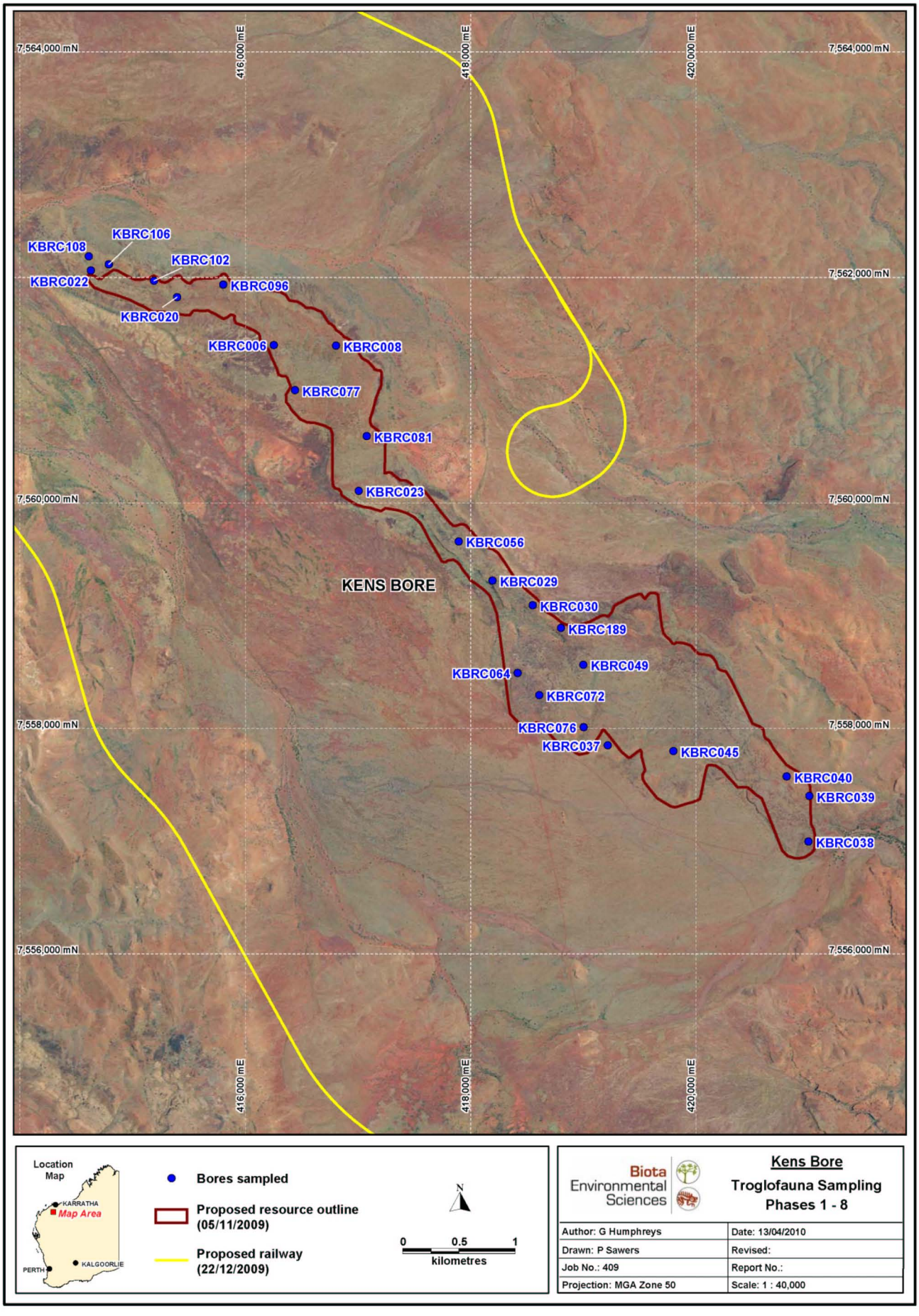

Figure 2.3: Sample sites at the Kens Bore deposit study area.

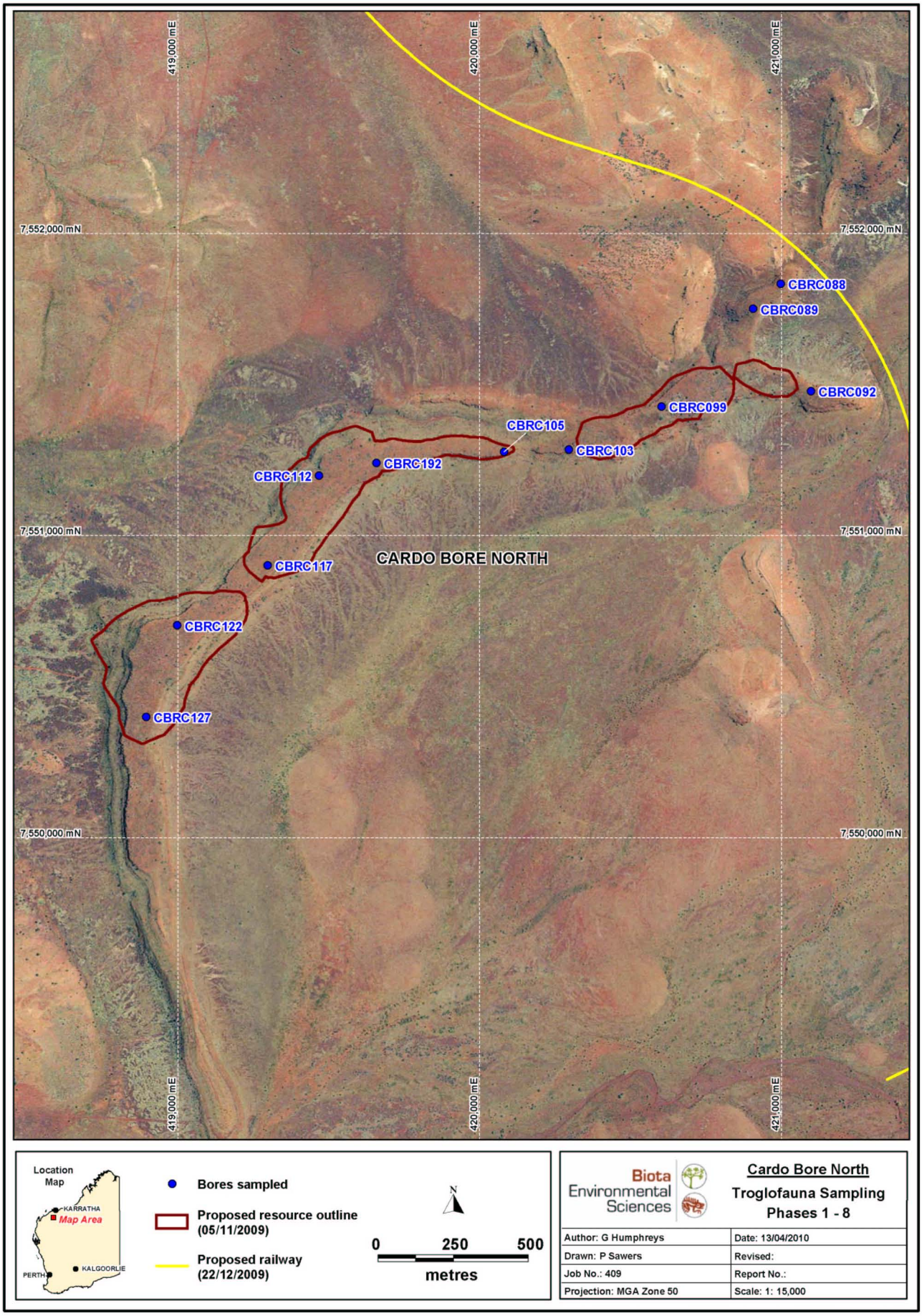

Figure 2.4: Sample sites at the Cardo North deposit study area.

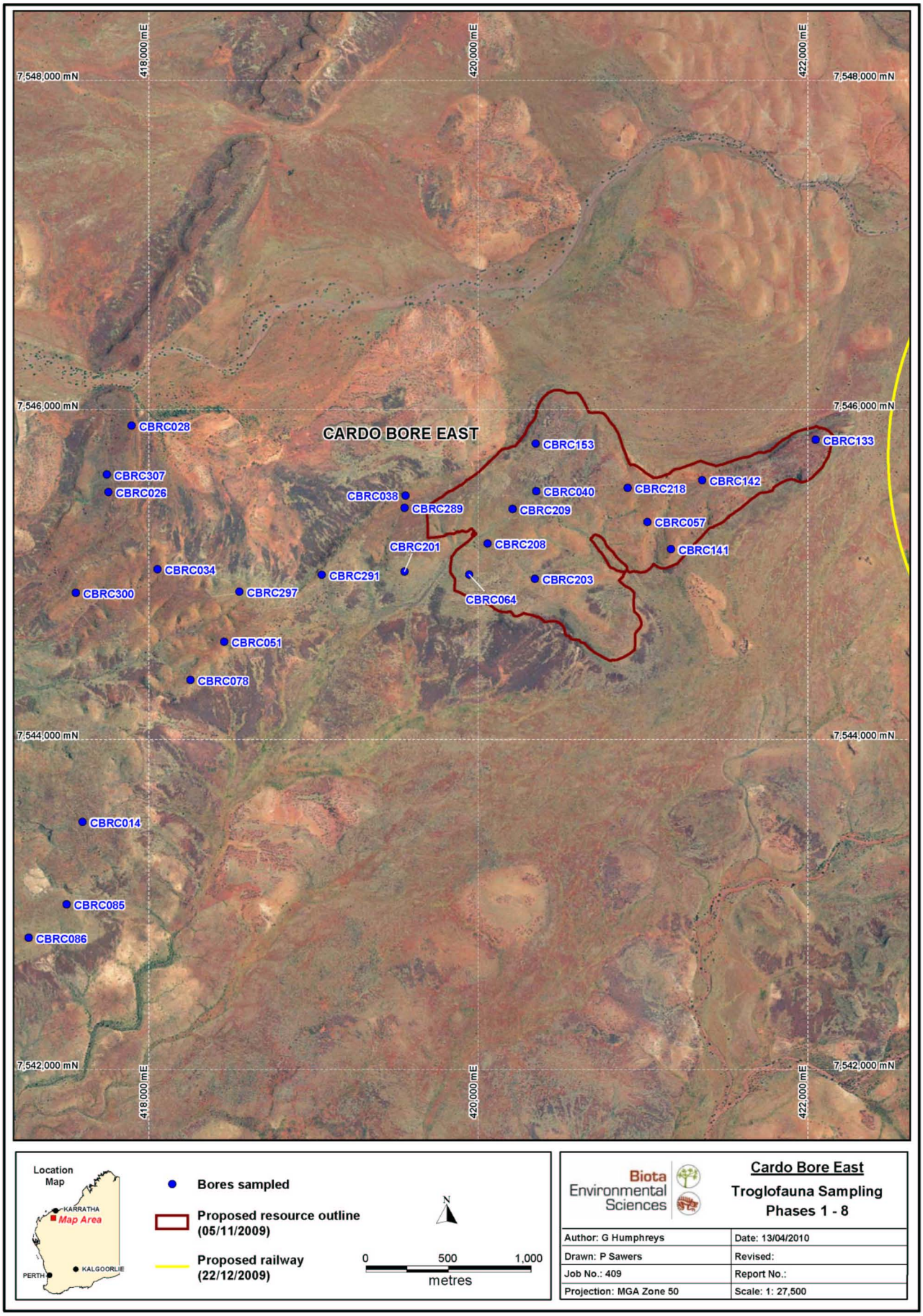

Figure 2.5: Sample sites at the Cardo East deposit study area.

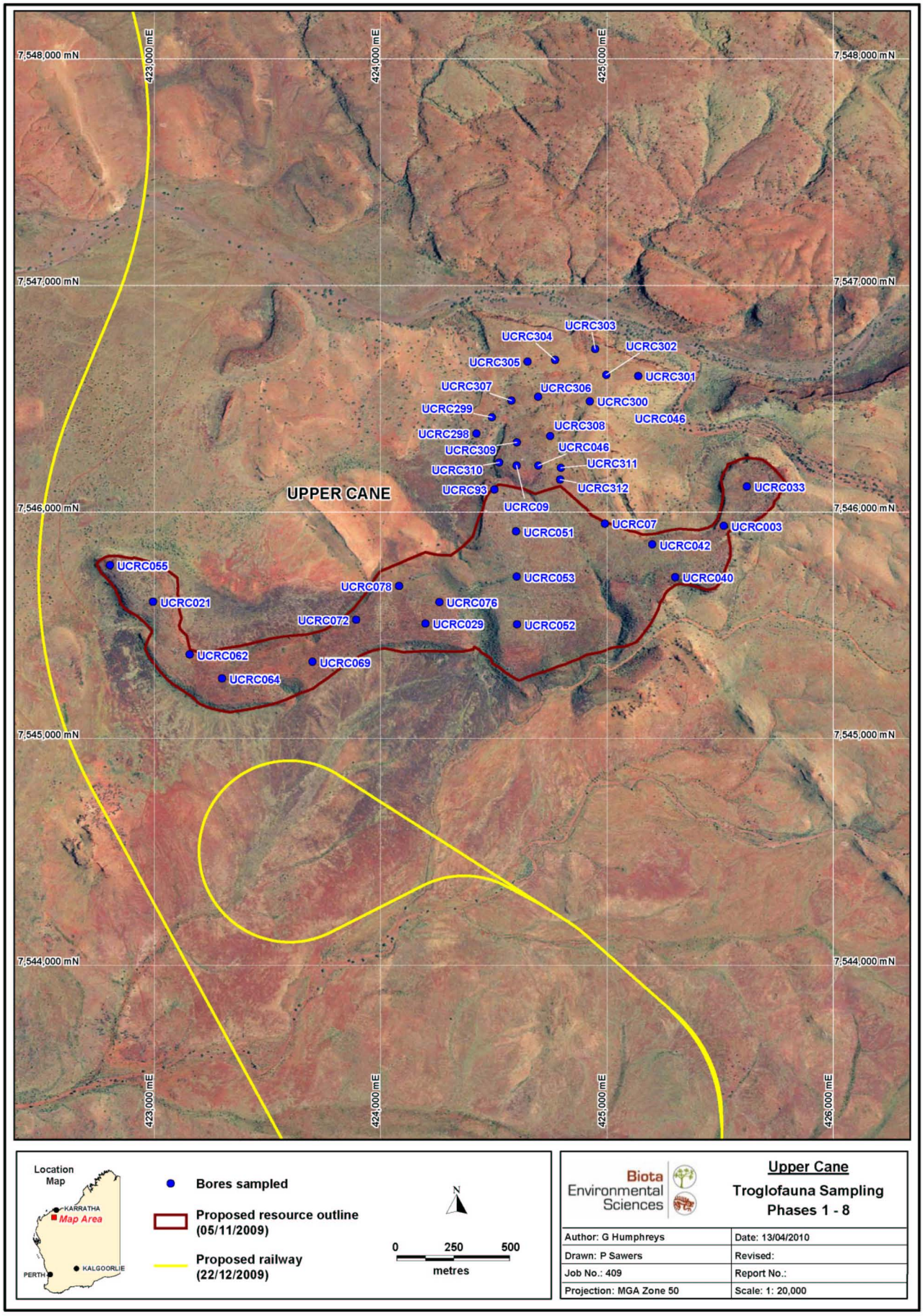

Figure 2.6: Sample sites at the Upper Cane deposit study area.

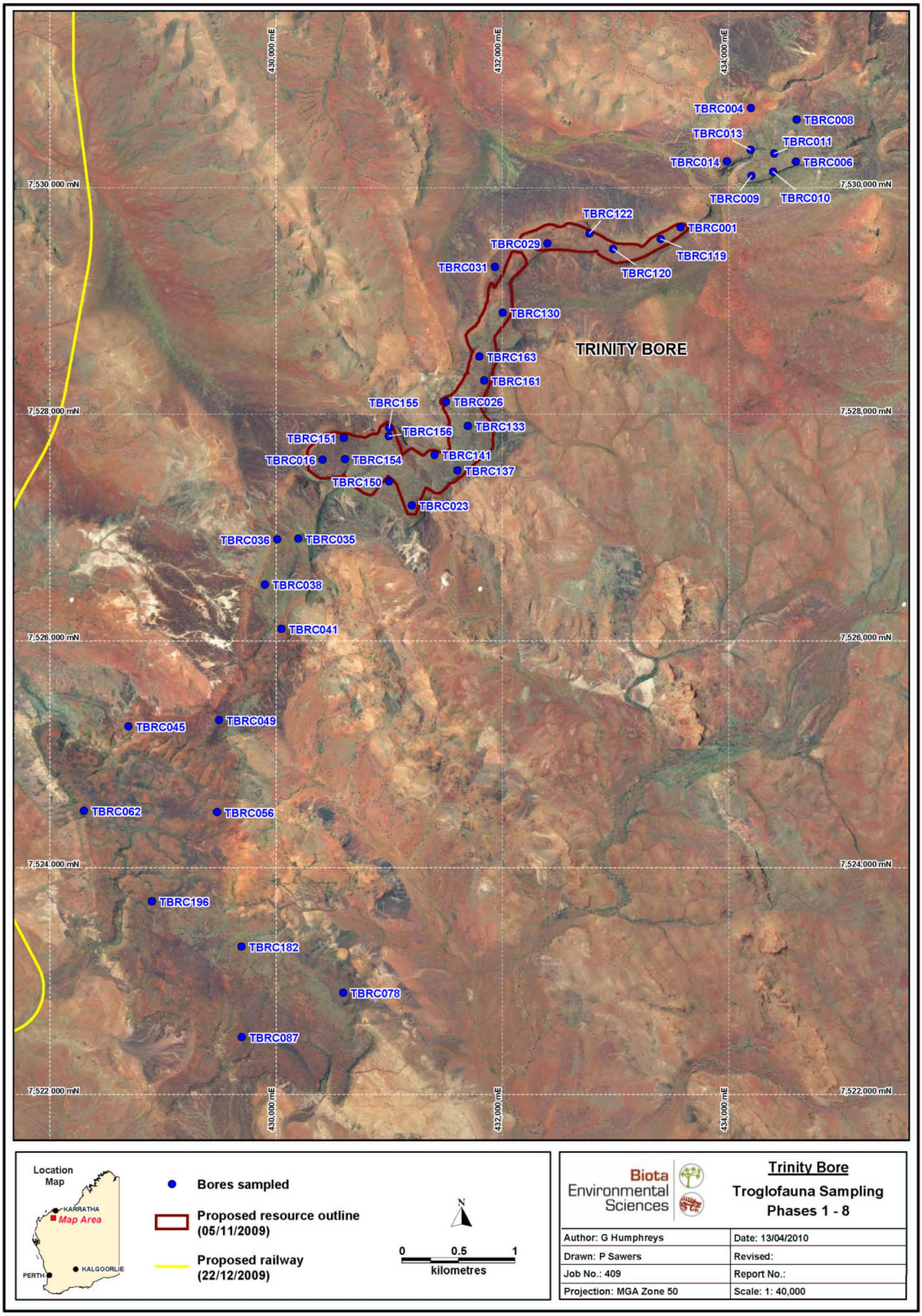

Figure 2.7: Sample sites at the Trinity Bore deposit study area.

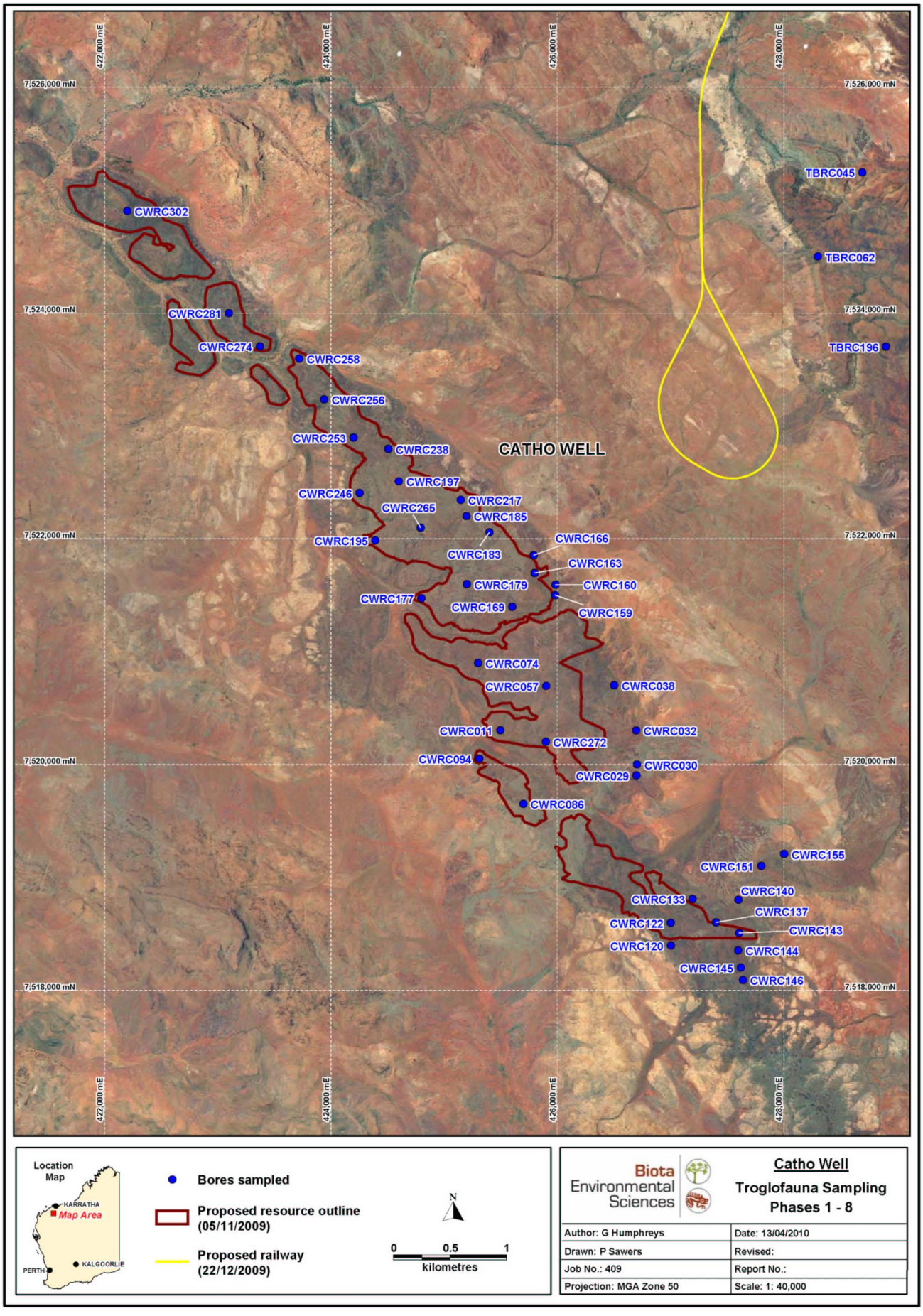

Figure 2.8: Sample sites at the Catho Well deposit study area.

Removing overlaps between phases, an overall total of 214 individual drill holes were sampled for troglofauna during the eight-phase survey, comprising:

- Cochrane and Jewel – 36 sample sites;
- Kens Bore – 23 sample sites;
- Cardo Bore North – 13 sample sites;
- Cardo Bore East – 25 sample sites;
- Upper Cane – 35 sample sites;
- Trinity Bore – 40 sample sites; and
- Catho Well – 42 sample sites.

The 214 sample sites were sampled with a total of 2,109 leaf litter habitat traps over the eight phases. The apportionment of these traps amongst the study areas is summarised in Table 2.3. Further details on sampled drillholes are provided in Appendix 1.

Table 2.3: Summary of troglofauna sampling effort in the WPIOP study areas (number of traps).

	Phase								
Study Area	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Cochrane and Jewel	77	68	44	44	38	47	16	15	**349**
Kens Bore	38	37	18	18	18	33	25	22	**209**
Cardo Bore North	49	46	27	27	19	29	20	20	**237**
Cardo Bore East	-	-	24	24	17	29	23	22	**139**
Upper Cane	50	50	46	46	45	20	22	56	**335**
Catho Well	63	59	35	35	35	36	34	31	**328**
Trinity Bore	-	-	84	84	72	99	89	84	**512**
Total:	**277**	**260**	**278**	**278**	**244**	**293**	**229**	**250**	**2,109**

Differences in proportional sampling effort reflected the spatial extent of the deposits at each study area, availability of drill holes and field access constraints.

2.4 Specimen Sorting, Curation and Data Management

Troglofauna litter traps were sorted in a laboratory in Perth, with the leaf litter samples initially put through banks of tullgren funnels. The heat gradient created by this device causes invertebrates to move downward to a catch bottle containing 100% ethanol to produce a bulked sample. After a 24-hour period in the funnels, the dried leaf litter was removed and checked for any residual invertebrates. The bulked invertebrate sample was then sorted under a dissecting microscope (Olympus SZ40), with specimens classified to order level and divided into labelled subsamples accordingly. Recovered specimens were curated in 100% ethanol, with any specific preservation requirements for the various taxonomic groups confirmed in liaison with the WA Museum.

All specimens collected during the study were tracked with a specifically designed data management procedure, involving field data forms (for sampling collection details) and specimen curation forms (to track collection location, date, sample number and specimen numbers throughout the duration of the study). All collected specimens have been lodged with the WA Museum as part of the State's collection and allocated registration numbers where deemed appropriate by WA Museum staff.

All spatial data in this study use the GDA94 datum.

2.5 Specimen Identifications

Family, genus and species level morphological identification of the collected specimens were conducted by several zoologists in different institutions, comprising:

- Dr Volker Framenau (Western Australian Museum);

- Dr Mark Harvey (Western Australian Museum);
- Mr Garth Humphreys (Biota Environmental Sciences);
- Dr Markus Koch (University of Bonn);
- Mr Graeme Smith (private consultant); and
- Dr Fred Stone (University of Hawaii).

Specimens were identified on the basis of morphological characters, by:

- examination under dissecting and high-powered stage microscopes;
- dissection and slide-mounting of key diagnostics features relevant to each group;
- comparisons to reference specimen collections; and
- use of published and unpublished taxonomic keys for each faunal group as appropriate.

Details of the specific taxa identified by each person are provided in Appendix 2. Identification status is also detailed in Appendix 2, and elsewhere in this report, using the following terminology:

- Complete (morphology): the specimen was fully identified to a described species or equivalent morphotype based on morphology.
- Indeterminate ('Indet'): the specimen could not be identified to species level due to immaturity, damage or lack of taxonomic framework.
- Completed (molecular): the specimen was assigned to a molecular species based on DNA sequence data
- Complete (both): the specimen was identified based on morphology and DNA sequence data.

The taxonomic hierarchy and nomenclature used in this report follows Harvey and Yen (1997), or as otherwise advised by the Western Australian Museum. Reviews and identification of troglobitic groups have been completed as part of previous studies in the locality (Biota 2006a, 2006b and Biota 2007). This work was completed jointly with the Western Australian Museum and distinguished groups that may be troglobitic (and therefore potentially restricted) from deep-soil (edaphobitic) and surface (epigean) fauna. This framework was used here as the basis for specific examination of the WPIOP fauna.

2.6 Molecular Analysis

DNA analysis was only carried out for selected groups where there were existing phylogenetic frameworks and/or sufficient individuals were collected to enable a meaningful analysis to be completed. In the case of this study, this consisted of the Schizomida, Polyxenida and the Blattodea specimens.

2.6.1 DNA Extraction

DNA was extracted from specimens using a simple Qiagen Dneasy kit following the prescribed protocol, with the exception of the final elution of extracted DNA in 60 μL volume. DNA was extracted from multiple legs or whole specimens depending upon size of specimen.

2.6.2 Polymerase Chain Reaction (PCR)

Polymerase Chain Reaction (PCR) was used to amplify the mitochondrial cytochrome oxidase 1 (CO1) gene. This gene was chosen as the primary gene for the Schizomida and Polyxenida because of the known useful levels of variability of this region in many other phylogenetic investigations, and the reliability of this gene for inferring phylogenetic information (Biota 2006a, 2006c; Hart and Podolsky 2005; Bond 2004; Hebert et al. 2004; Paquin and Hedin 2004; Steinke et al. 2004; Bond and Sierwald 2003; Hebert et al. 2003; Holland and Hadfield 2002; Stothard et al.

2002; Farrell 2001; and Kojima et al. 1995). The gene has also been found to be reliable for 'DNA barcoding' (Hebert et al. 2003).

For the schizomid specimens, the nuclear rDNA marker 'internal transcribed spacer' (ITS1) was also sequenced in addition to CO1. For the troglobitic Blattodea, the mitochondrial12S gene was sequenced as trials indicated this could more reliably be amplified than CO1.

PCR amplification of double-stranded product was performed using a PTC-200 Peltier Thermal Cycler. Successful reactions for the target genes involved an initial denaturation at 94°C for 2 minutes. The reaction was then cycled through denaturation at 94°C for 30 seconds, followed by annealing at 48°C for 20 seconds and then elongation at 74°C for 15 seconds, and these steps were repeated for 35 cycles, followed by a final elongation at 72°C for 2 minutes.

For each PCR reaction, positive and negative controls were used. The positive control (the standard) consisted of the same PCR mix with extracted Schizomida, Polyxenida or Blattodea DNA that was previously shown to work with the primers. This control was used to test that PCR conditions were correct. If the positive control did not produce a band of the desired size, then a problem with the PCR conditions was apparent. Alternatively, if the positive control did produce a band of the correct size, and no band was produced for the desired taxon, then there was a problem with the DNA template. The negative control (the blank) consisted of the same mixture of chemicals, except that dH2O replaced the DNA template. This control was used to ensure that there was no contamination in the dH2O used in the reactions.

PCR products were run on a 1% agarose gel in 0.5 x TBE buffer using a constant voltage of 100V (400mA) for 20 minutes. The gels were then stained with SybrSafe for approximately 40 minutes. After staining, the gel was exposed to UV light and photographed in order to visualise the PCR products. Photographs were viewed using AlphaDigiDoc. PCR products were verified against an appropriately sized marker, a GeneRulerTM 100bp DNA ladder Plus. The blank and the standard were also run out on the gel to check for contaminants, and to verify that PCR conditions were stable. PCR products were then purified using an "Ultra Clean PCR Clean-Up DNA Purification kit" (MO BIO Laboratories Inc) following manufacturers instructions. PCR products were sequenced using the ABI BigDye chemistry by the Macrogen Inc facility.

2.6.3 Sequence Editing and Analysis

Sequences were checked and edited and chromatograms were visualised using Sequencher software (GENECODES). Sequences were aligned using ClustalW, and gaps were adjusted by eye.

Phylogenetic and molecular evolutionary analyses were conducted using MEGA version 3.1 (Kumar et al. 2004). Kimura's 2-parameter model of genetic distance was used to generate a distance matrix in MEGA version 3.1 (Kumar et al. 2004). Kimura's model of genetic distance (Kimura 1980) accounts for the difference in the ratio of transitions to transversions. A transition is the substitution of a purine for another purine or the substitution of a pyrimidine for another pyrimidine. Transversions are all other types of nucleotide substitutions. In most DNA segments, transitional nucleotide substitutions are known to occur more frequently than transversions (Forstner et al. 1995; Nei and Kumar 2000).

A neighbour joining tree was constructed using all individuals in MEGA version 3.1 (Kumar et al. 2004). A bootstrap routine with 100 pseudoreplicates was performed to determine the internal support for the individual nodes. Separate trees were constructed using CO1 and ITS for Schizomida, CO1 for the Polyxenida and for 12S with the Blattodea. Where possible, samples sequenced in this study were analysed together with previously sequenced specimens of the same taxa from the Pilbara (e.g. Biota 2006a and Berry 2005), thus providing context for the observed levels of sequence divergence of the WPIOP specimens.

2.7 Limitations

Several limitations should be recognised by the reader of this report. Many are common functions of working on subterranean fauna, rather than functions of this specific study. These limitations include:

- For several of the faunal groups there is a lack of adequate taxonomic framework and specialist expertise within Australia and internationally. This limited the conclusiveness of some of the findings on some taxa in regards to both taxonomic placement and ecological status.
- As is commonly the case, there was a high frequency of juvenile specimens compared to adults amongst the collected specimens. For most taxa, only adults can be determined to species level based on morphology, so this limited the level to which many specimens could be identified.
- There was somewhat differential sampling effort across study areas due to changes in project design and study focus, and the availability of sample points. While effort was made here to standardise for this, this has probably affected the adequacy with which the fauna has been documented between different study areas.

3.0 Subterranean Habitats

3.1 Geomorphology and Physical Setting

The geomorphology and geohistory were documented by DC Blandford & Associates (2009). That study identified the WPIOP deposits to be the remnants of palaeo channel deposits, generally forming highly variable mesa-like landforms. The adjacent or surrounding landforms have been removed by historical erosion process to expose the country rock as the basal unit of the younger mesa landscape (DC Blandford 2009). Robe Pisolite, which forms the erosion-resistant upper surface and structural benches of the mesas, has been assigned an age of Late Eocene (Hocking et al. 1987).

The Hamersley Range and plateaux, immediately north and east of the survey area, forms the major regional physiographic unit, with the pisolite capped palaeo channel deposits extending away from the flanks of the range towards the west and north-west (DC Blandford 2009). In most of the study areas, the debris slopes of the mesa landforms grade to a well-formed pediment and/or directly into the alluvial/colluvial deposits of contemporary drainage systems (DC Blandford 2009).

3.2 Study Areas

DC Blandford (2009) also classified the landforms present at each of the study areas considered in this troglofauna survey. This work placed the seven study areas into a paleo channel context and linked those deemed to form part of the same paleodrainage system into five groups. These study area groupings are summarised in the following sections, with aerial photography and representative landform photos of each area supplied in Plate 3.1 to Plate 3.14.

3.2.1 Cochrane and Jewel

Although distinct deposits, these two sites have been grouped in this report as a single study area. This is consistent with the landscape-scale assessment of DC Blandford (2009), which treated these as the 'Jewel-Cochrane System'. Jewel is a single, large, elongated mesa with a thick structural bench, distinct from Cochrane (Plate 3.1). The mesas have a generally broken surface which grades from rolling to undulating (DC Blandford 2009), but the free faces are strongly eroded locally and incised by contemporary drainage lines (Plate 3.2).

3.2.2 Kens Bore

Kens Bore ranges in width from a broad, 1 km wide plateau at the south-east end to a narrow remnant approximately 300 m wide at its north-western end (DC Blandord 2009; Plate 3.3). The Kens Bore landforms show highly variable weathering with an undulating upper surface resulting from drainage line incision (Plate 3.4).

3.2.3 Cardo Bore East, Cardo Bore North and Upper Cane

Upper Cane is the main mesa in this part of the system and is approximately 3.5 km long, with maximum width of 1 km (Plate 3.5). CID exposure on the free face varies in thickness and in some areas, weathering has reduced the free face to a step-like structure (Plate 3.6). The mesa has a flat to undulating surface, which shows local strongly incised drainage (DC Blandford 2009).

Cardo Bore East consists of a central plateau with a narrow mesa landform neck extending toward Upper Cane to the east (Plate 3.7). To the west, the plateau narrows before opening out into a further plateau. Further west, Cardo Bore East extends into the 'Cardo Bore' area of DC Blandford (2009), and has been highly weathered into a series of low hills (Plate 3.7).

Plate 3.1: Aerial view of Cochrane and Jewel.

Plate 3.2: Cochrane mesa landform.

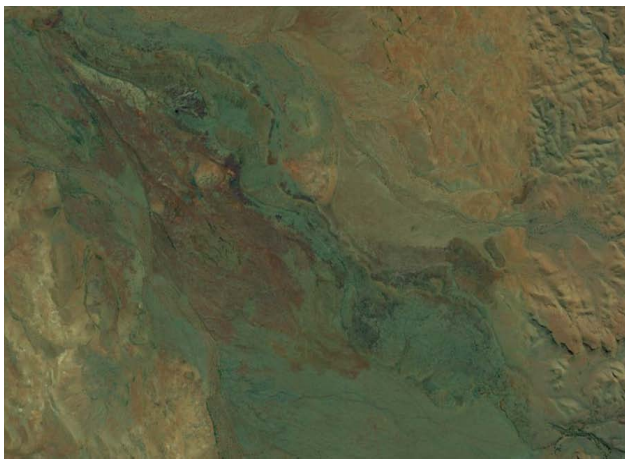

Plate 3.3: Aerial view of Kens Bore.

Plate 3.4: Kens bore undulating plateau landform.

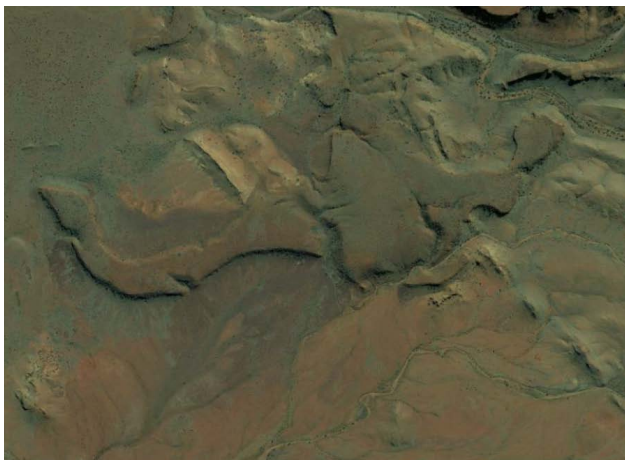

Plate 3.5: Aerial view of Upper Cane.

Plate 3.6: Upper Cane mesa landform.

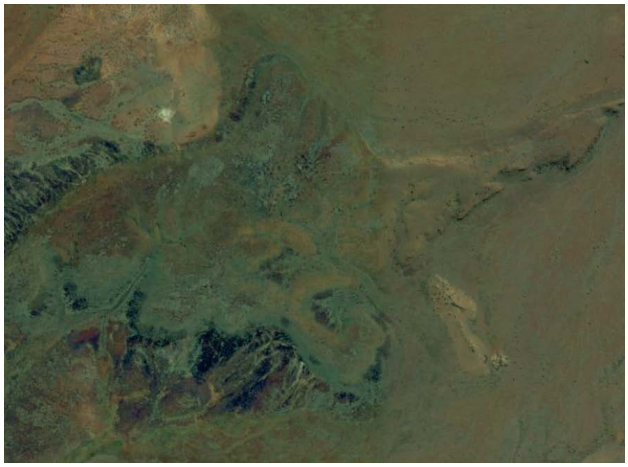

Plate 3.7: Aerial view of Cardo East.

Plate 3.8: Cardo East mesa landform at eastern neck.

Cardo Bore North is an elongated mesa-form structure that extends over a length of approximately 4km (DC Blandford 2009; Plate 3.9). The surface of the main structure is generally flat to gently undulating with a defined free face (Plate 3.10).

3.2.4 Trinity Bore

Trinity Bore has a length of approximately 30 km, which comprises a major south-west trending mesa-form structure (DC Blandford 2009; Plate 3.11; Plate 3.12). DC Blandford (2009) considered this system to be linked to the Catho Well system by a structure known as the Northeast Tongue of Catho Well. 'Trinity North' is a small portion of the north-eastern landform, separated from the main structure by a contemporary drainage system.

3.2.5 Catho Well

Catho Well System is a large, elongated, low-lying central plateau, that extends for approximately 9 km (DC Blandford 2009). The surface of this central plateau complex, which is undulating to rolling, has been dissected by contemporary drainage systems (Plate 3.13; Plate 3.14). Weathering patterns within the structure are complex, reflecting the distance from the sediment source area in the Hamersley Range and competency of the CID (DC Blandford 2009).

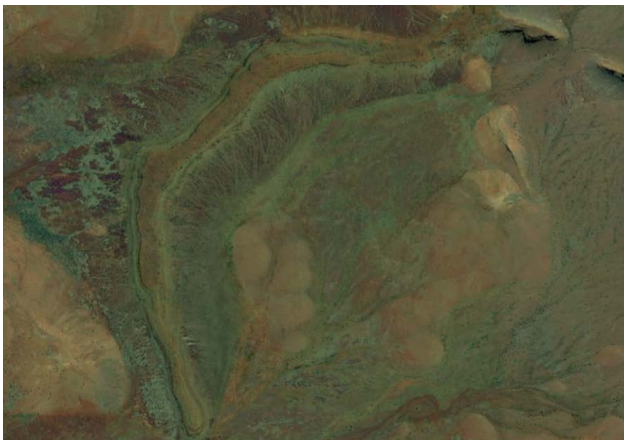

Plate 3.9: Aerial view of Cardo North.

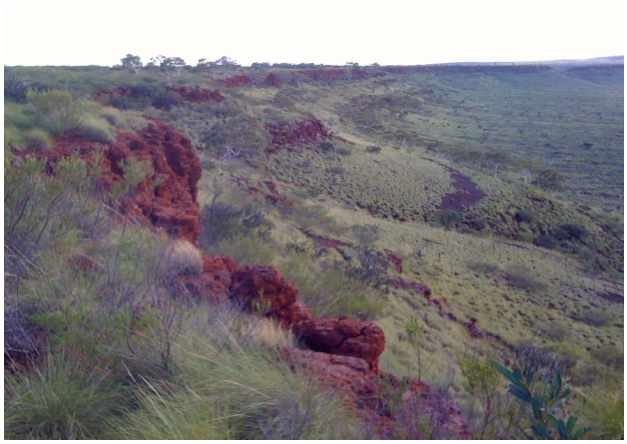

Plate 3.10: Cardo North mesa landform.

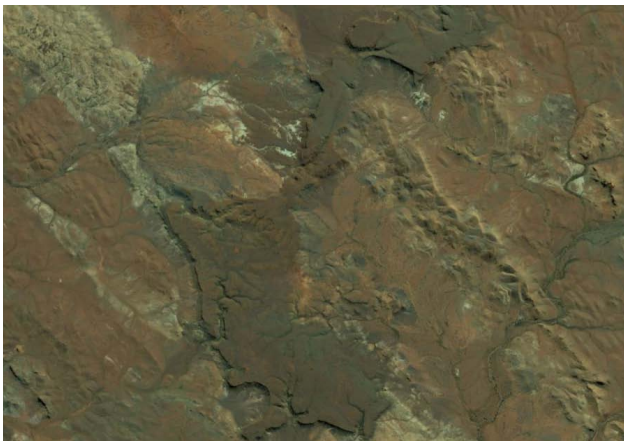

Plate 3.11: Aerial view of Trinity Bore.

Plate 3.12: Trinity Bore mesa landform.

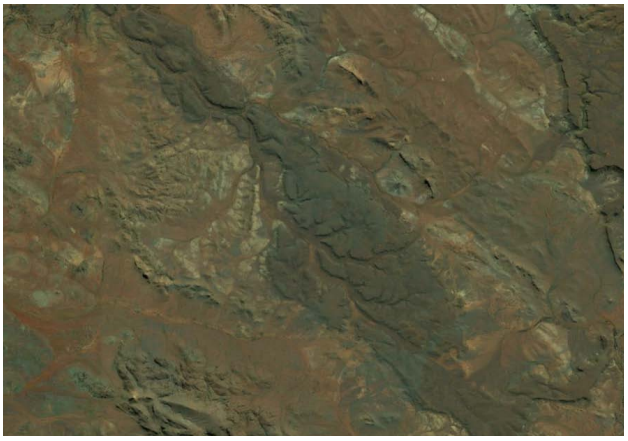

Plate 3.13: Aerial view of Catho Well.

Plate 3.14: Catho Well undulating plateau landform.

3.3 Hydrology

Water within the mesa landforms of the various study areas is most likely associated with spatially discrete clay zones of reduced permeability within the lithology of the mesa. Groundwater recharge within the mesa is dominated by rainfall events where the highly fractured and jointed cap provides a zone of enhanced infiltration to the underlying strata.

Once water accumulates on the surface and infiltrates towards the lower strata, the depth of penetration and flow-paths will be dependent on a range of sub-surface conditions and processes. Well-developed joint sets and fracture zones will provide primary pathways for water movement. Detention and storage will occur at depth when the water is allowed to seep into vugs and small cavities below the depth of evaporation influence.

The presence of zones of decreased permeability, resulting from clay layers and lenses in the structures, will affect sub-surface hydrology. These zones will act as zones of storage and maintain a humid microclimate within the strata. More substantive clay layers may also prevent or reduce further vertical water movement into underlying strata (creating localised 'perching' of infiltrated water). Functionally, this is likely to be an important process in respect of the primary troglobitic fauna habitat within the mesas of the study area (the humidified pisolitic strata (CID)).

4.0 Results

4.1 Overview

The eight-phase survey yielded a total of 961 troglomorphic invertebrate specimens, representing 15 orders. A taxonomic summary of specimens collected within each order, and the number of sample site locations from which they were recorded, is provided in Table 4.1.

Table 4.1: Overview of the confirmed and potential troglofauna collected during the eight phases (orders containing confirmed troglobites shown in bold).

Taxon				
Subphylum	**Class**	**Order (and Common Name)**	**Total Individuals**	**No. of sample sites**
Crustacea	Malacostraca	Isopoda (slaters)	109	21
Myriapoda	Pauropoda	Pauropoda (pauropods)	1	1
	Symphyla	Symphyla (symphylans)	3	3
	Chilopoda	**Scolopendrida (centipedes)**	**10**	**8**
	Diplopoda	**Polydesmida (millipedes)**	**1**	**1**
		Polyxenida (pincushion millipedes)	**233**	**46**
Chelicerata	Arachnida	**Schizomida (schizomids)**	**190**	**60**
		Pseudoscorpiones (pseudoscorpions)	**23**	**22**
		Opiliones (harvestmen)	7	5
		Aranae (spiders)	41	24
		Palpigradi (palpigrades)	1	1
Hexapoda	Diplura	**Diplura (diplurans)**	**21**	**15**
	Insecta	**Thysanura (silverfish)**	**17**	**11**
		Blattodea (cockroaches)	**255**	**45**
		Hemiptera (true bugs)	49	16
		Total individuals:	**961**	

Some of the taxonomic groups contained specimens where the extent to which they were truly troglobitic was unclear. Many edaphobites also display similar troglomorphic features (e.g. lack of pigmentation and reduced or absent eyes). In the interests of a precautionary assessment, these were referred to the WA Museum for further diagnosis. These groups are discussed in Section 4.2.

Eight of the orders were confirmed as including troglobitic animals (highlighted in bold in Table 4.1). The troglofauna was numerically dominated by three of these orders; Polyxenida, Blattodea and Schizomida, which together accounted for over 90% of the collected specimens (Figure 4.1).

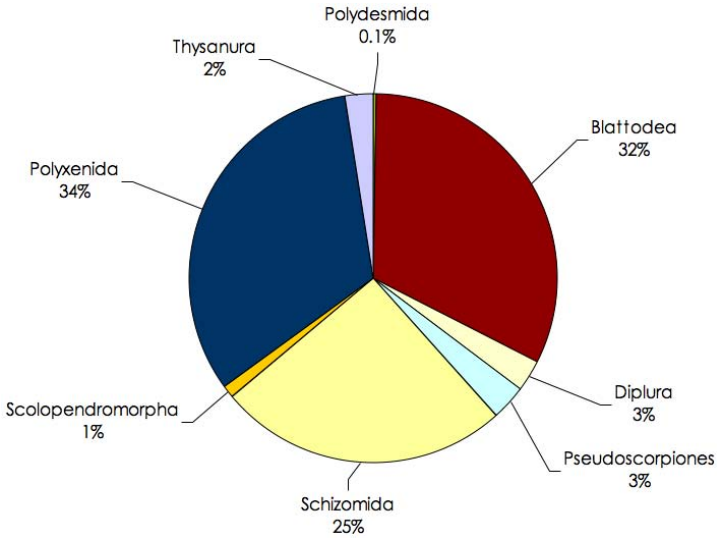

Figure 4.1: Proportional representation of orders amongst the confirmed troglobites collected in this study.

Troglofauna were collected from every study area sampled during this survey, with an overview of the distribution of the confirmed troglobite records from the project area shown in Figure 4.2.

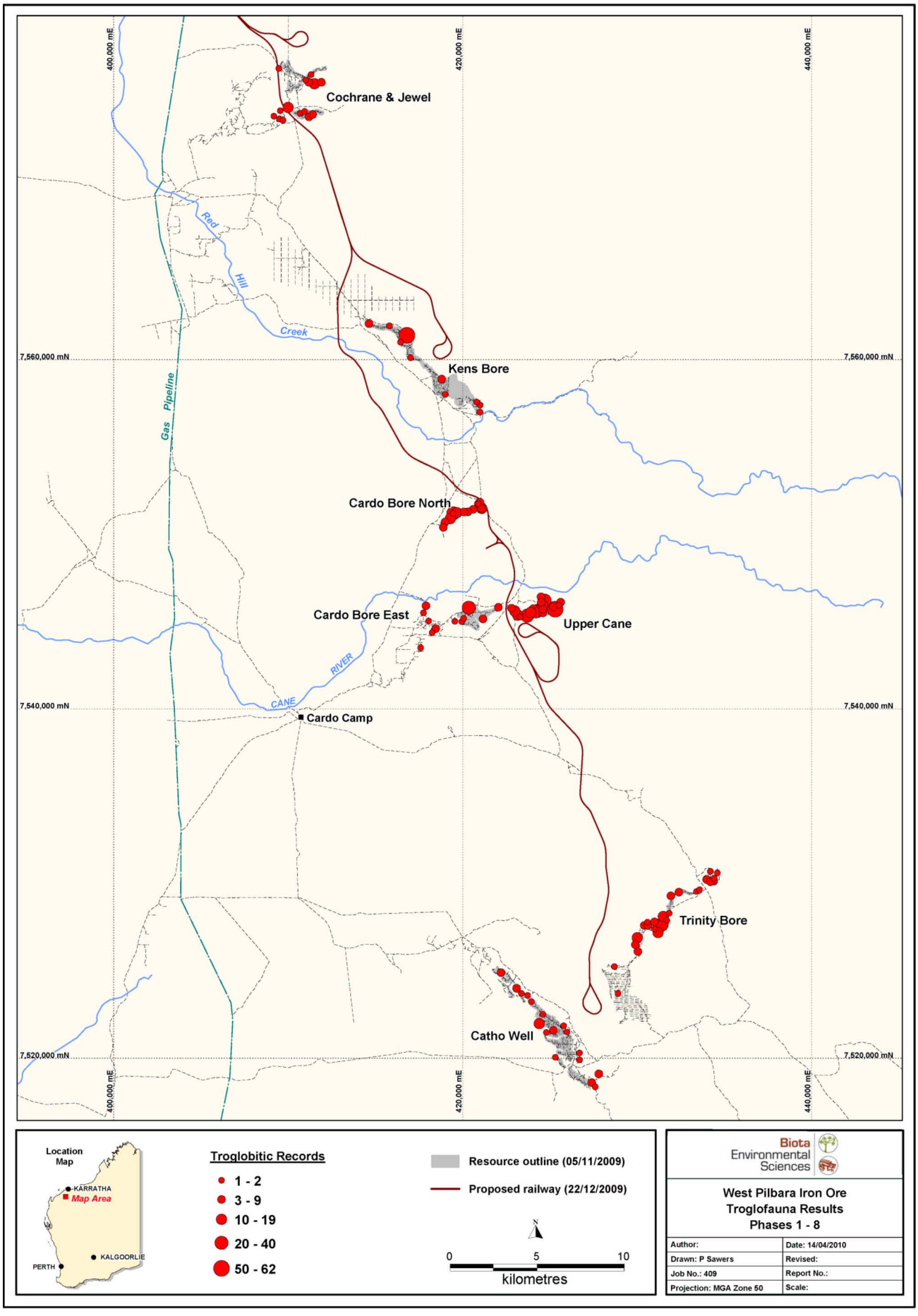

Figure 4.2: Overview of troglofauna records from the WPIOP project area.

4.2 Edaphobitic Fauna

On detailed examination, seven of the 15 orders represented amongst the specimens showing troglomorphic features were not confirmed as troglobites (Table 4.1). In many cases, the taxonomy of the groups involved is very poorly known within Australia, and specimens are infrequently collected. The WA Museum determinations of these seven orders follow.

- **Order Opiliones (harvestmen)**
  All seven Opiliones specimens showed some form of troglomorphism (reduced pigmentation) but also had fully developed eyes. Two of the mature specimens were tentatively placed in the family Phalangodidae (Shear 1991).
- **Order Araneae (spiders)**
  Though troglobitic spiders have been collected from similar habitats in the locality (Biota 2006a), none of the spiders collected during this study were troglobitic. All specimens collected had eyes, including a female *Opopaea* sp. (Oonopidae) specimens from Catho Well and two mature ground spiders (family Gnaphosidae: ?*Gnaphosa* sp.).
- **Order Palpigradi (palpigrades)**
  A single palpigrade specimen was collected from site CBRC133 at the eastern most end of Cardo Bore East. Only three species of palpigrades are currently known from Australia, but only one of these, the Yilgarn region species *Eukoenenia guzikae*, is considered native (Harvey et al. 2006, Barranco and Harvey 2008). Palpigrades are rarely collected in Australia and a species identification of the single specimen collected at Cardo Bore is not possible (Framenau 2009). The specimen has been sent to P. Barranco (University of Almeria, Spain) for future taxonomic evaluation.
- **Order Pauropoda (pauropods)**
  The pauropoda are small myriapods generally collected in soil habitats (Scheller 2008). Although the Pauropoda appears to be a homogenous group, virtually nothing is known about affinities between the genera (Scheller 2008; Framenau 2009). A single pauropod specimen was collected from Cochrane and Jewel and has been forwarded to a pauropod specialist for future taxonomic evaluation (Ulf Scheller, Sweden).
- **Order Symphylas (symphylans)**
  Three single symphylan specimens were collected from Cochrane (TBRC013), Cardo Bore North (CBRC112) and Trinity Bore (RNRC152). The Australian symphylan fauna currently comprises two families, Scolopendrellidae (with two genera and five species) and Scutigerellidae (four genera and 21 species). The Western Australian fauna were last studied by Scheller (1991), who recognized several species. They are common in the high rainfall forests of southwestern Australia where they occur in leaf litter and under the bark of trees. They have been taken from several different subterranean systems in the Pilbara region but the status of each population is uncertain (Framenau 2009). A full taxonomic treatment of the entire collection of Western Australian specimens would be necessary before their status as a troglobitic or short-range endemic species can be further assessed.
- **Order Hemiptera (bugs)**
  Forty-nine hemipteran specimens were collected during the survey, with records from almost all study areas. The majority of these were collected from Trinity Bore (32 specimens from eight samples sites across the study area). Some of these possessed troglomorphic features such lack of eyes and pigmentation. The WA Museum was not able to provide any more detailed identifications for this group due to the lack of a suitable hemipteran specialist (Framenau 2009).
- **Order Isopoda (slaters)**
  A total of 109 isopod specimens were collected from across the project area, with records from every study area. While some troglomorphies were evident (reduced pigment and eyes), they could not be confirmed as troglobites. The material has been sent to isopod taxonomist Stefano Taiti in Italy for future taxonomic determination.

4.3 Account of the Troglobitic Fauna

A summary of the troglofauna identifications completed as part of this study is provided for higher order taxonomic groups in the following annotated list. As noted in Section 4.1, only taxonomic groups that contained confirmed troglobitic specimens have been considered in this section and in the balance of this report.

4.3.1 Order Scolopendrida (Centipedes)

Ten troglobitic centipedes were collected during the field survey. The Cryptopidae (Plate 4.1) are generally smaller than other scolopendromorphs (15–150 mm in length) and live in soil, rock crevices, under bark or leaf litter and in caves. The family, which comprises 150 species in 15 genera worldwide, is recorded predominantly from tropical regions, although some species do live in temperate areas (Framenau 2009). The majority (n=7) of the specimens from this study came from Trinity Bore and all were confirmed as belonging to the family Cryptopidae (Table 4.2). Single specimens were also recorded from Kens Bore, Upper Cane and Catho Well.

Table 4.2: **Troglobitic Cryptopidae recorded from the WPIOP study areas during this study** (n=number of individuals).

Study Area	Taxa	Sample Sites	n
Kens Bore	Cryptopidae sp.	KBRC096	1
Upper Cane	Cryptopidae sp.	UCR055	1
Trinity Bore	Cryptopidae sp.	TBRC023, TBRC029, TBRC036, TBRC038, TBRC141	7
Catho Well	Cryptopidae sp.	CWRC179	1
		Total:	**10**

Plate 4.1: **Cryptopid centipede Cryptopidae sp. from site TBRC029 (Trinity Bore).**

The taxonomy of the Australian cryptopid fauna is poorly known and as a result, the specimens in this study cannot be determined below the level shown in Table 4.2. Cryptopids are frequently found in subterranean samples (e.g. Biota 2002 and 2006a), but it is not clear if these specimens are true troglobites, as the epigean representatives found in litter also show troglomorphism (Framenau 2009).

4.3.2 Order Polyxenida (Pincushion Millipedes)

Polyxenid millipedes were the seond most abundant of the troglobitic groups collected during this study with 233 specimens (Figure 4.1). Polyxenids were also widespread, being collected from 46 sites representing every study area, with the greatest numbers coming from Kens Bore and Cardo Bore North (Table 4.3).

Table 4.3: Troglobitic Polyxenida recorded from the WPIOP study areas during this survey (n=number of individuals).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel	Polyxenidae sp. A	RNRC048, RNRC083, RNRC135, RNRC136, RNRC139, RNRC157, RNRC184, RNRC189	13
Kens Bore	Polyxenidae sp. A	KBRC008, KBRC022	47
Cardo Bore North	Polyxenidae sp. A	CBRC091, CBRC099, CBRC105, CBRC112, CBRC117, CBRC127, CBRC192	59
Cardo Bore East	Polyxenidae sp. A	CBRC014, CBRC026, CBRC051, CBRC064, CBRC141, CBRC153	35
Upper Cane	Polyxenidae sp. A	UCRC033, UCRC069, UCRC299	23
Trinity Bore	Polyxenidae sp. A	TBRC001, TBRC009, TBRC011, TBRC026 TBRC031, TBRC041, TBRC119, TBRC133 TBRC150, TBRC154, TBRC161	25
Catho Well	Polyxenidae sp. A	CWRC032, CWRC137, CWRC144, CWRC151, CWRC159, CWRC179, CWRC195, CWRC197, CWRC258	31
		Total:	**233**

The taxonomy of the Australian polyxenid fauna is very poorly known with only four described species (Framenau 2009). Two surface species occur in Western Australia, *Unixemus attemsi* and *U. mjoebergi* (Duy-Jacquemin and Condé 1967; Koch 1985). The latter species appears periodically in irruptive populations throughout the northern parts of the state (Koch 1985). Due to the poorly resolved taxonomy in this group, the polyxenids collected from the study areas cannot be distinguished at species level based on morphology.

The ecological status of the samples from the WPIOP project areas is also uncertain, with most showing evidence of troglomorphism (particularly loss of pigment; Framenau 2009). To assist in determining the number of taxa present and the risk of short-range endemism, molecular analysis was conducted (Figure 4.3; Helix Molecular Solutions 2010).

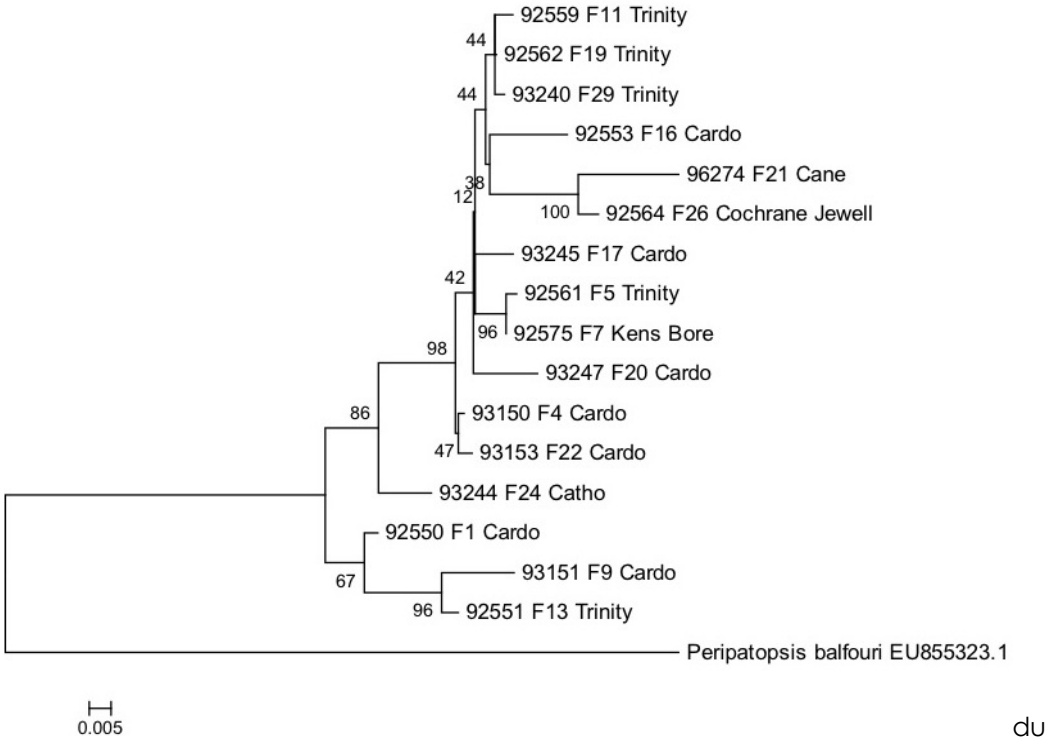

Figure 4.3: CO1 neighbour joining tree of uncorrected p-distances among haplotypes of troglobitic polyxenid millipedes from study area (Source: Helix Molecular Solutions 2010; Bootstrap support shown on branches).

These data show minimal genetic divergence amongst the sequenced individuals (less than 2% overall; Helix Molecular Solutions 2010), with some haplotypes represented on multiple mesas and specimens from individual mesas represented on multiple clades (Figure 4.3; note small divergence represented by scale bar). These results indicate that Polyxenidae sp. A represents the same species distributed across all mesas, albeit with some low level genetic variation.

4.3.3 Order Polydesmida (Polydesmid Millipedes)

Only a single polydesmid millipede specimen was collected during the survey. The specimen was collected at Upper Cane from drill hole UCRC040 during Phase III. Due to the juvenile condition of the specimen, its taxonomic and troglobitic status cannot be confirmed. Troglobitic specimens of this order have, however, previously been recorded from the nearby Robe Valley (Biota 2006a).

4.3.4 Order Schizomida (Schizomids)

Schizomids are fast moving, predatory arachnids that mostly live in tropical climates (Harvey and Yen 1997). They superficially resemble spiders but have a tail-like structure at the end of the abdomen (the flagellum) and long, sensory front legs (Harvey and Yen 1997) (Plate 4.2).

Plate 4.2: ***Paradraculoides* sp. 'Cardo' collected from site CBRC192 (Cardo Bore North).**

There are currently 48 species of schizomids formally described from Australia, all of which belong to a single family; the Hubbardiidae (Harvey 1992, 2001). The Western Australian fauna contains 14 described species, all of which occur in subterranean habitats in the north west of the State (Cape Range, Barrow Island and the Kimberley; Harvey 1988, 1992, 2001; Harvey et al. 2008). The fauna collected during this study represents a further seven, previously undescribed species belonging to the genus *Paradraculoides* (family Hubbardiidae).

A total of 190 schizomid specimens were collected from 57 different sampling sites over the eight sampling phases (Table 4.4). Schizomids were collected from all seven study areas within the WPIOP project area. The highest number of specimens was collected from Upper Cane, where 101 schizomid specimens were collected from 17 of the 35 drillholes sampled (Table 4.4).

Table 4.4: **Summary of troglobitic Schizomida recorded from the WPIOP study sites during this study** (n=number of individuals; "sp." specimens not able to be determined to species level).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel (n=31)	*Paradraculoides* sp. 'cochrana'	RNRC048, RNRC083, RNRC094, RNRC109, RNRC140, RNRC162, RNRC184, RNRC189, RNRC198, RNRC213	29
	Paradraculoides sp. 'cardo'	RNRC189	1
	Paradraculoides sp. 'gemma'	RNRC162 (Jewel)	1
Kens Bore (n=4)	*Paradraculoides* sp. 'kens'	KBRC023, KBRC039, KBRC096	3
	Paradraculoides sp. 'gemma'	KBRC040	1
Cardo Bore North (=18)	*Paradraculoides* sp. 'cardo'	CBRC089, CBRC092, CBRC099, CBRC103, CBRC112, CBRC192	17
	Paradraculoides sp.	CBRC192	1
Cardo Bore East (n=4)	*Paradraculoides* sp. 'cardo'	CBRC034, CBRC153, CBRC133, CBRC208	4

Table 4.4: Summary of troglobitic Schizomida recorded from the WPIOP study sites during this study (n=number of individuals; "sp." specimens not able to be determined to species level).

Study Area	Taxa	Sample Sites	n
Upper Cane (n=101)	*Paradraculoides* sp. 'cardo'	UCRC003, UCRC021, UCRC029, UCRC033, UCRC040, UCRC042, UCRC051, UCRC053, UCRC055, UCRC062, UCRC064, UCRC069, UCRC072, UCRC076, UCRC078, UCRC93, UCRC299	96
	Paradraculoides sp.	UCRC040, UCRC076, UCRC93, UCRC299	5
Trinity Bore (n=20)	*Paradraculoides* sp. 'trinity'	TBRC023, TBRC026, TBRC036, TBRC038, TBRC154, TBRC156, TBRC161	16
	Paradraculoides sp. 'confusus'	TBRC014	2
	Paradraculoides sp. 'cochrana'	TBRC008	1
	Paradraculoides sp.	TBRC156	1
Catho Well (n=12)	*Paradraculoides* sp. 'catho'	CWRC179, CWRC281, CWRC302, CWRC166	10
	Paradraculoides sp.	CWRC177	2
		Total:	**190**

The determination of these new species was completed as joint exercise between the WA Museum, Biota Environmental Sciences and Helix Molecular Solutions (Section 2.1). This was based on consideration of molecular data (both mitochondrial and nuclear genes), morphological characters, and the spatial distribution and inferred phylogeography of the putative species. The distributions of the seven new species are shown in Figure 4.4. In summary, they occur as follows:

- *Paradraculoides* sp. 'cochrana' – recorded primarily from Cochrane and Jewel (n=29), but with a single record from the Trinity North part of Trinity Bore;
- *Paradraculoides* sp. 'gemma' – single records of this species from Jewel and from the southeast end of Kens Bore (Table 4.4);
- *Paradraculoides* sp. 'kens' – recorded only at Kens Bore;
- *Paradraculoides* sp. 'cardo' – the most widespread species: recorded at Cardo Bore North, Cardo Bore East and Upper Cane (with these three sites accounting for 117 of the specimens of this species), and a single confirmed record from Cochrane and Jewell (Figure 4.4);
- *Paradraculoides* sp. 'confusus' – recorded only at 'Trinity North', an isolated portion of the Trinity system to the northwest of the main Trinity Bore study area (Figure 4.4);
- *Paradraculoides* sp. 'trinity' – recorded only at Trinity Bore (Figure 4.4 and Table 4.4); and
- *Paradraculoides* sp. 'catho – recorded only at Catho Well.

Mitochondrial DNA analysis of schizomid specimens was completed by Biota and Helix Molecular Solutions personnel (Section 2.1). This work identified six phylogenetic clades (A-F), which were largely associated with the mesa landforms and corresponded to the species listed above (Figure 4.5). The identified clades were well supported and separated by between 8 and 17% sequence divergence (Table 4.5). With few exceptions, there were geographical patterns evident in the phylogenetic tree, and clades corresponded to single mesas or groups of closely located mesas (Helix Molecular Solutions 2009; Section 5.1). In almost all cases where adults were sequenced the morphological identifications matched the geographical collection location and phylogenetic clade. For three individuals, these did not match however and the CO1 data assigned the specimens to a different clade from the collection location and the morphological identification. In these cases however, the adult taxonomic identification was given priority particularly when ITS (nuclear) sequence data assigned the individuals to the species matching the collection locality.

The lowest CO1 sequence divergence amongst previously described schizomid species averages 5.5% (Berry 2005), with values as high as 30% documented among the most divergent taxa (Harvey et al. 2008). The levels of divergence observed here are therefore consistent with clades A-F equating to distinct species (Table 4.5).

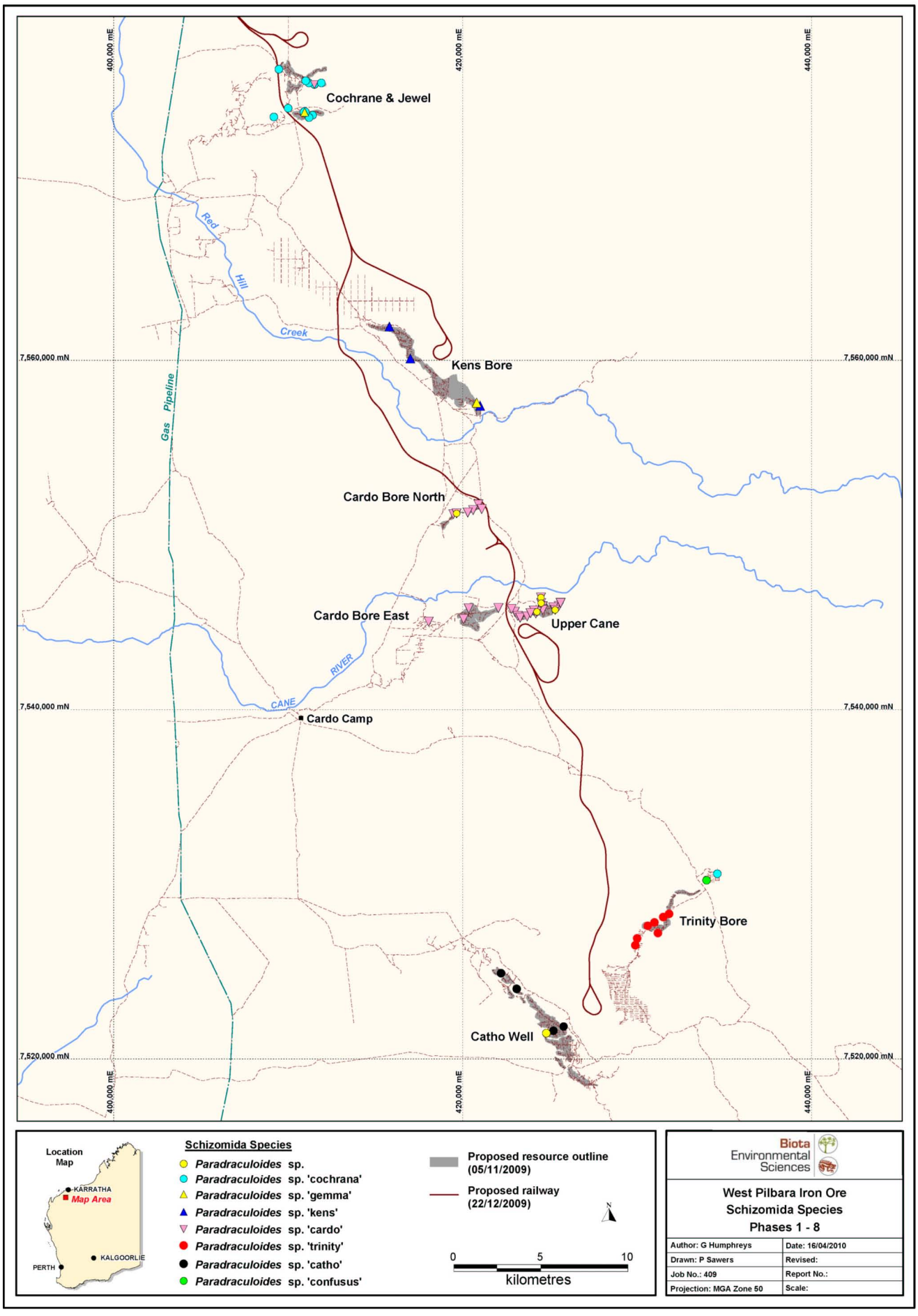

Figure 4.4: **Distribution of troglobitic schizomid species records from the WPIOP project area (shows confirmed species only).**

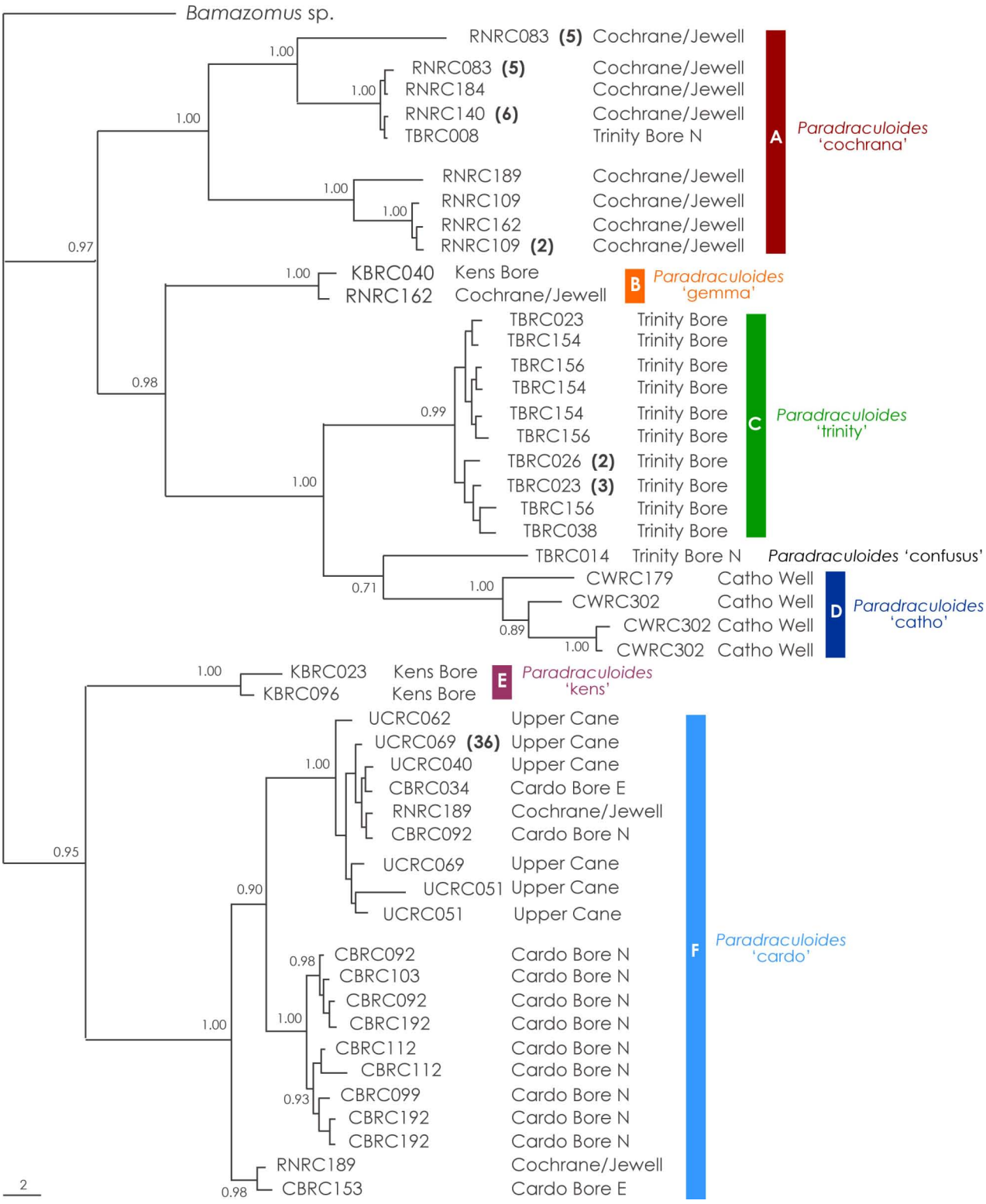

Figure 4.5: **Bayesian analysis of 595 bp fragment of CO1 for haplotypes of troglobitic schizomids from the project area** (Source: Helix Molecular Solutions 2009; Bold numbers in brackets indicate number of additional specimens with the same haplotype not shown on the tree; Posterior probability support shown on branches; Coloured bars to the right correspond to the six identified clades).

Table 4.5: **Table of genetic distance (uncorrected p-distances) comparisons between schizomid CO1 clades** (Source: Helix Molecular Solutions 2009).

	A	B	C	D	E	F
A	-					
B	8.1 – 9.4	-				
C	10.4 – 11.2	11.9 – 13.2	-			
D	12.7 – 15.6	11.4 – 14.5	10.4 – 13.0	-		
E	13.2 – 14.3	13.2 – 14.8	11.2 – 12.2	11.2 – 14.5	-	
F	14.0 – 15.8	13.8 – 17.1	11.2 – 14.0	11.4 – 15.8	8.8 – 11.2	-

The determination of species recognised here was also informed by the morphological analysis completed by the WA Museum (Framenau 2009). This work assessed key taxonomic characters for the order, including flagellum structure in mature males and spermathecae in mature females. In some instances where genetic divergence was intermediate, these data influenced decisions to split specimens into separate taxa or to collapse them into a single species.

A case in point was *Paradraculoides* 'confusus' at Trinity Bore North. Sequence data separated *P.* 'confusus' from *P.* 'trinity' by 9.1 – 9.4% and from *P.* 'catho' by 7.5 – 8.6% (Figure 4.5; Helix Molecular Solutions 2009). These levels make determination of a separate species based on genetic distance alone somewhat uncertain. However, the male holotype specimens of *P.* 'confusus' (Figure 4.6) showed very clear morphological differences in flagellum structure when compared with *P.* 'trinity' specimens from the remainder of the Trinity Bore study area (Figure 4.7).

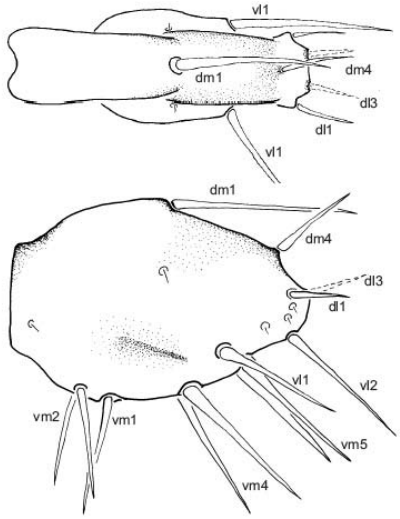

Figure 4.6: **Dorsal and lateral view of flagellum structure of male *Paradraculoides* 'confusus'** (source: Framenau 2009).

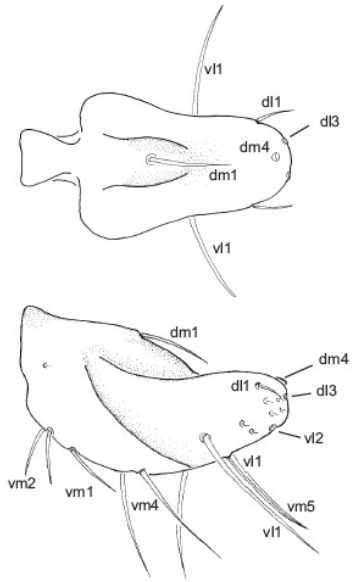

Figure 4.7: **Dorsal and lateral view of flagellum structure of male *Paradraculoides* 'trinity'** (source: Framenau 2009).

This morphological distinctness, combined with the still relatively high divergence and its occurrence on a separate landform, warranted the delineation of *P.* 'confusus' as a separate species.

In contrast, while there was considerable genetic variation evident within clade F, this was identified as corresponding to a single species: *Paradraculoides* 'cardo' (Figure 4.5). There was evidence of geographical structuring within this species, particularly in the association of the central clade with Cardo Bore North (Figure 4.5). However, divergences were lower between the three clades within *P.* 'cardo' (3-4%), and no notable morphological differences could be detected between specimens from the different study areas (V. Framenau, WA Museum, pers. comm.), leading to the three clades being treated here as a single species: *P.* 'cardo'.

4.3.5 Order Pseudoscorpiones (Pseudoscorpions)

Pseudoscorpions are small arachnids that superficially resemble scorpions, but lack the stinging tail (Plate 4.3 and Plate 4.4). Twenty-three troglobitic pseudoscorpion specimens were collected during this survey. Pseudoscorpions were collected from all study areas, with the exception of Cardo Bore East. In almost all cases, only single specimens of each species were collected from each of 19 drilholes (Table 4.6).

Table 4.6: Troglobitic Pseudoscorpiones recorded from the WPIOP study sites during this study (n=number of individuals; "sp." specimens not able to be determined to species level).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel	*Tyrannochthonius* sp.	RNRC180, RNRC189	2
Kens Bore	*Lagynochthonius* sp.	KBRC076	1
Cardo Bore North	*Tyrannochthonius* sp. B	CBRC099, CBRC112, CBRC122	3
	Tyrannochthonius sp.	CBRC092, CBRC103, CBRC192	3
Upper Cane	*Tyrannochthonius* sp. F	UCRC040	1
	Lagynochthonius sp. E	UCRC033	1
	Lagynochthonius sp. A	UCRC040	1
	Ideoblothrus sp.	UCRC029	1
Trinity Bore	*Tyrannochthonius aridus*	TBRC141, TBRC156, TBRC196, TBRC151	3
	Tyrannochthonius sp. D	TBRC141	2
	Tyrannochthonius sp.	TBRC023, TBRC141	3
Catho Well	*Tyrannochthonius aridus*	CWRC159	1
	Tyrannochthonius sp.	CWRC274	1
		Total:	**23**

Two families were represented amongst the pseudoscorpions, the Chthonidae and the Syarinadae. Six previously undescribed troglobitic species were confirmed from amongst the 23 specimens (Table 4.6). The distribution of these species across the WPIOP project area is shown on Figure 4.8, with their occurrence summarised as follows:

- *Tyrannochthonius* sp. B - recorded from three locations across Cardo Bore North; and
- *Lagynochthonius* sp. A - Plate 4.4; only recorded from Upper Cane (Figure 4.8);
- *Lagynochthonius* sp. E - Plate 4.3; only recorded from Upper Cane (Figure 4.8);
- *Tyrannochthonius* sp. F - only recorded from a single site at Upper Cane (Figure 4.8);
- *Ideblothrus* sp. - also only recorded from a single site at Upper Cane (Figure 4.8);
- *Tyrannochthonius* sp. D - only recorded from a single site on Trinity Bore (Table 4.6; Figure 4.8);
- *Tyrannochthonius aridus* - recorded from four locations across Trinity Bore and once at Catho Well (a species that has also been recorded relatively widely from epigean environments; Harvey and Edward 2008);

Plate 4.3: *Lagynochthonius* sp. E from site UCRC033 at the Upper Cane study area.

Plate 4.4: *Lagynochthonius* sp. A from site UCR040 at the Upper Cane study area.

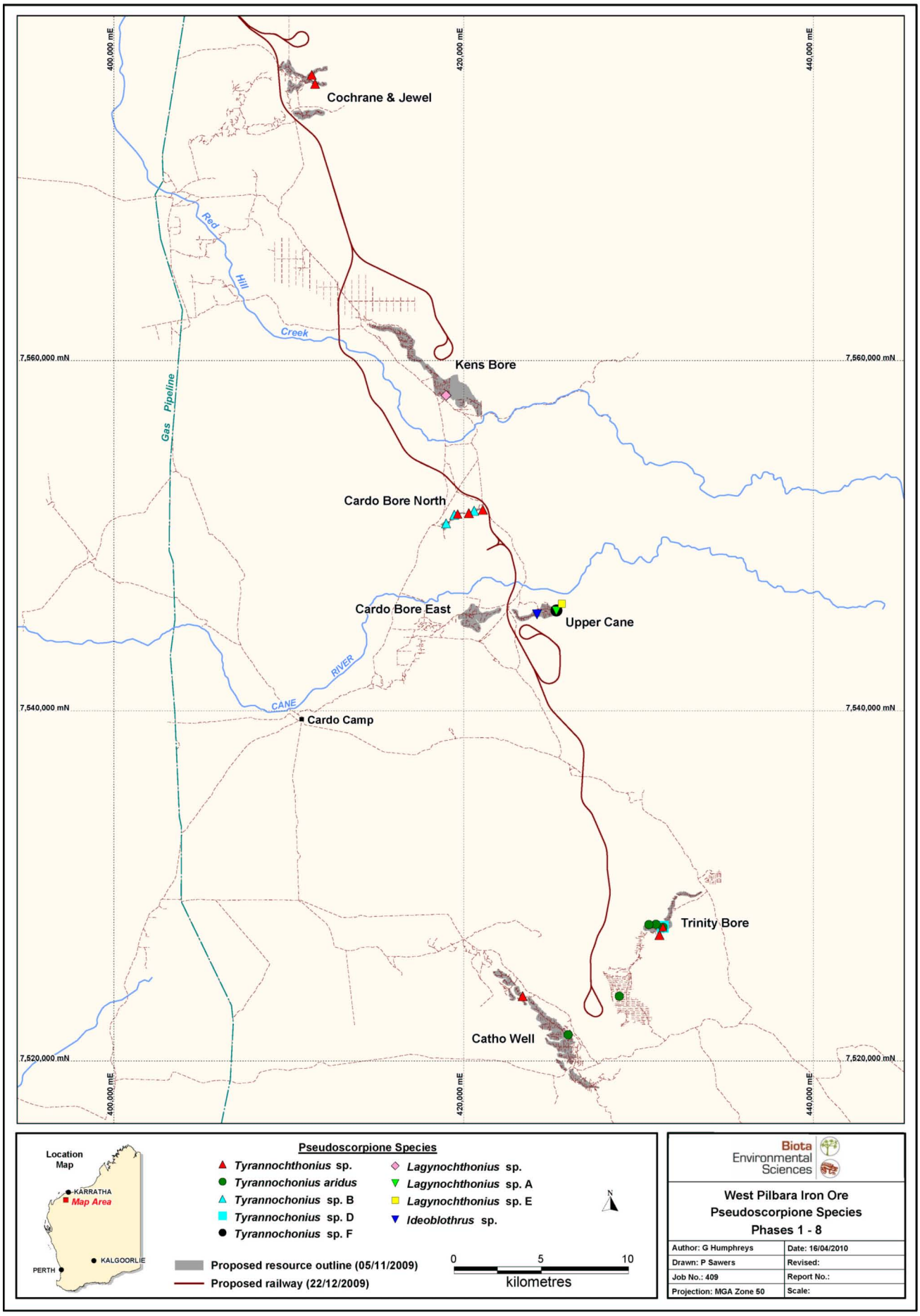

Figure 4.8: Distribution of troglobitic pseudoscorpion species records from the WPIOP project area.

4.3.6 Order Diplura (Diplurans)

A total of 21 diplurans were collected from all study areas except Upper Cane. The highest number of specimens was collected from Trinity Bore (n = 11) (Table 4.7). All individuals belonged to the family Japygidae and the genus *Indjapyx* (Plate 4.5).

Table 4.7: Troglobitic Diplura recorded from the WPIOP study areas during this study (n=number of individuals).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel	*Indjapyx* sp. A	RNRC180	1
Kens Bore	*Indjapyx* sp. A	KBRC038, KBRC077	2
Cardo Bore North	*Indjapyx* sp. A	CBRC089, CBRC117	2
Cardo Bore East	*Indjapyx* sp. A	CBRC078, CBRC201	2
Trinity Bore	*Indjapyx* sp. A	TBRC001, TBRC004, TBRC029, TBRC036, TBRC045, TBRC141	11
Catho Well	*Indjapyx* sp. A	CWRC094, CWRC274	3
		Total:	**21**

Plate 4.5: *Indjapyx* sp. A collected from site CBRC089 (Cardo Bore North).

A specialist dipluran taxonomist visiting the WA Museum conducted a preliminary examination of the WPIOP specimens. His initial assessment of key taxonomic features indicated that all of the diplurans collected represented the same species (Dr Markus Koch, University of Bonn, pers. comm. 2009). More detailed examination of the specimens will be completed as part of a future taxonomic description, but these have all been treated as *Indjapyx* sp. A for the purposes of this report. Given that this species occurs on six of the study areas, and covers the spatial extent of the project area, it also calls into question if it is truly an obligate subterranean taxon or is actually more edaphobitic in nature (see Section 4.1 for a related discussion). Other members of the Diplura are soil dwellers (M. Koch, pers. comm. 2009) and it appears possible that this is also the case for *Indjapyx* sp. A. However, in the interests of a precautionary assessment, the group has been retained as part of the troglofauna in this document.

4.3.7 Order Thysanura (Silverfish)

A total of 17 specimens of troglobitic thysanurans were collected during the survey. These occurred in small numbers (n<4) at all study areas except Cardo Bore North and Ken's Bore (Table 4.8). Five undescribed species were represented amongst the material based on morphological examination completed by Graeme Smith (a specialist on the Thysanura; Section 2.1).

Table 4.8: Troglobitic Thysanura recorded from the WPIOP study sites during this study (n=number of individuals; "sp." specimens not able to be determined to species level).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel	*Trinemura* sp. C	RNRC198	1
	Trinemura sp.	RNRC139	1
Cardo Bore East	*Trinemura* sp.	CBRC153	2
Upper Cane	*Trinemura* sp.	UCRC040	1
Trinity Bore	*Pseudogastrotheus* sp. A	TBRC156	1
	Trinemura sp E	TBRC036	1
	Trinemura sp. F	TBRC036	2
	Trinemura sp.	TBRC036, TBRC141	3
Catho Well	*Trinemura* sp. F	CWRC151	1
	Trinemura sp.	CWRC029, CWRC137 CWRC151, CWRC197	4
		Total:	**17**

Sixteen of the thysanuran specimens were identified as belonging to the genus *Trinemura* (family Nicoletiidae) and a single specimen was identified as belonging to the genus *Pseudogastrotheus* (family Ateluriidae) (Table 4.8). Most species were only recorded from a single study area, with the exception of *Trinemura* sp. F, which occurred on both Trinity Bore and Catho Well.

4.3.8 Order Blattodea (Cockroaches)

The majority of the 255 troglobitic cockroach specimens collected during the survey, were collected from Upper Cane (n=148; 58%). Troglobitic cockroaches were also collected from all other study areas in smaller numbers (Table 4.9). All of the collected specimens belonged to the family Nocticolidae and to the troglobitic genus *Nocticola* (Plate 4.6).

Table 4.9: Troglobitic Blattodea recorded from the WPIOP study sites during this study (n=number of individuals).

Study Area	Taxa	Sample Sites	n
Cochrane and Jewel	*Nocticola* sp. A	RNRC083, RNRC184, RNRC198	8
Kens Bore	*Nocticola* sp. A	KBRC008, KBRC189	14
Cardo Bore North	*Nocticola* sp. A	CBRC088, CBRC092, CBRC103, CBRC105, CBRC112, CBRC112, CBRC122, CBRC127	24
Cardo Bore East	*Nocticola* sp. A	CBRC028, CBRC133	8
Upper Cane	*Nocticola* sp. A	UCRC021, UCRC029, UCRC040, UCRC042 UCRC046, UCRC051, UCRC052, UCRC053 UCRC055, UCRC062, UCRC064, UCRC069 UCRC072, UCRC076, UCRC078, UCRC93, UCR299	149
Trinity Bore	*Nocticola* sp. A	TBRC010, TBRC014, TBRC016, TBRC023, TBRC026, TBRC029, TBRC031, TBRC137, TBRC038, TBRC141, TBRC156, TBRC161	50
Catho Well	*Nocticola* sp. B	CWRC256	2
		Total:	**255**

Plate 4.6: *Nocticola* sp. A collected from site UCRC040 (Upper Cane).

Mitochondrial DNA analysis of representative nocticolid specimens from the project study areas was completed by Helix Molecular Solutions (Section 2.1). This work determined that there were 13 haplotypes present amongst the sequenced specimens. Where multiple specimens were collected from a study area, these haplotypes formed six well-supported clades (A-F), each of which was strongly associated with a mesa landform (Figure 4.9).

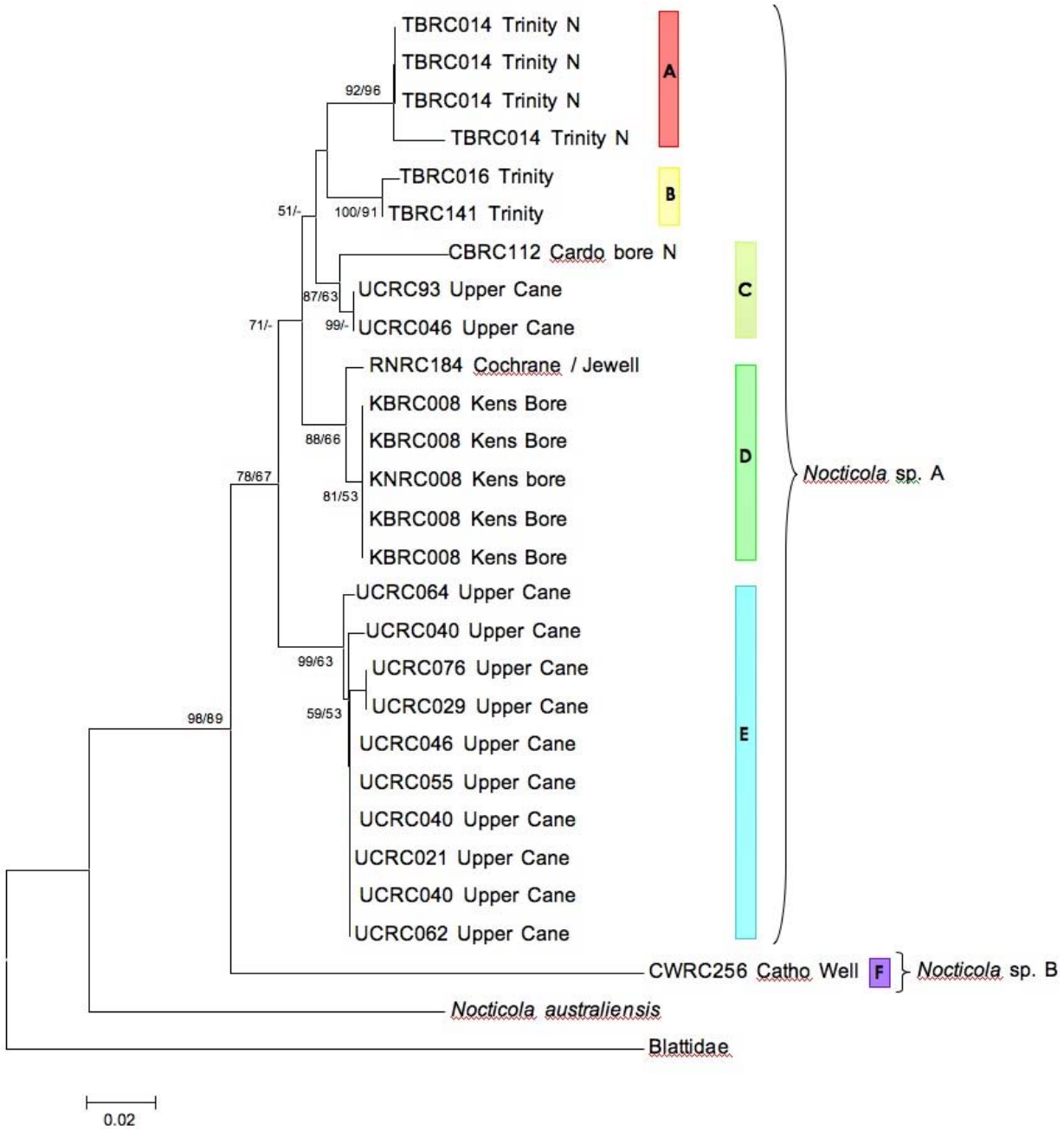

Figure 4.9: **12S neighbour joining tree of uncorrected p-distances among haplotypes of troglobitic nocticolids from study area** (Source: Helix Molecular Solutions 2009; Bootstrap support shown on branches; Coloured bars to the right of the tree correspond to the six identified clades).

Variation among haplotypes within each study area was low, ranging from 0 to 2.5% sequence divergence. This suggests that relatively recent or current gene flow is occurring within these landforms. Variation between mesas was substantially higher, ranging from 3 to 19% (Table 4.10).

Table 4.10: **Table of genetic distance (uncorrected p-distances) comparisons between nocticolid 12S clades.**

	A	B	C	D	E	F
A	-					
B	3.5 - 5.5	-				
C	3.5 - 7.5	3.0 - 6.0	-			
D	3.5 - 6.0	4.5 - 5.0	3.5 - 6.0	-		
E	5.0 - 7.0	5.0 - 6.0	4.0 - 7.5	4.5 - 5.0	-	
F	17.6	16.6 - 17.1	16.1 - 19.1	16.1	15.1 - 15.6	-

In most cases (A-E), the clades were separated by between 3 and 7% sequence divergence (Table 4.10). This moderate level of sequence divergence at 12S falls into a 'grey area': greater sequence divergence than is usually seen between members of the same species, but somewhat less than usually seen between species (Helix Molecular Solutions 2009). It is therefore unclear if these less differentiated clades correspond to distinct species based on genetic distance alone. Morphological analysis was limited by the lack of adults in the collected material, but it appeared that there was variation in key features between the northern and southern-most specimens, possibly indicating of at least two species (F. Stone, pers. comm.).

The intermediate genetic divergence levels, combined with the lack of clear morphological distinctness, suggest that while gene flow has ceased between the geographically separated mesas, most populations have not differentiated to the point where they represent separate species. Interestingly, there was evidence of genetic isolation between Trinity North and Trinity (Clades A and B on Figure 4.9, respectively) (see Plate 5.3). This is consistent with the findings of the Schizomida molecular and morphological investigations (Section 4.3.4).

The Catho Well clade however, diverged from the other *Nocticola* clades by up to 19% (Table 4.10; Figure 4.9) and, with the morphological differences in the adult material from this southern site (F. Stone pers. comm.), their separation as a distinct species appears warranted.

At present then, the data suggest two species of nocticolid: one of which is widespread but occurs in genetically isolated populations (*Nocticola* sp. A.), and a second that is only known from Catho Well (*Nocticola* sp. B; Figure 4.9; Table 4.9).

5.0 Discussion

5.1 Phylogeography

Previous work on troglobitic communities in the locality has shown highly restricted species distributions with no evidence of recent gene flow (Biota 2006a; Harvey et al. 2008). In the Robe River valley, this was attributed to the isolated nature of the CID mesa landforms inhabited by the fauna and their separation due to historical erosion (Biota 2006a; Berry 2005).

The geomorphic history of the landscape can therefore play a potentially important role in determining the current distribution of extant subterranean taxa. DC Blandford (2009) documented the CID palaeodrainages of the WPIOP project area and categorised these into five systems (Figure 5.1):

- Jewell-Cochrane;
- Kens Bore;
- Upper Cane-Cardo Bore (including Cardo Bore East and Cardo Bore North);
- Trinity; and
- Catho Well.

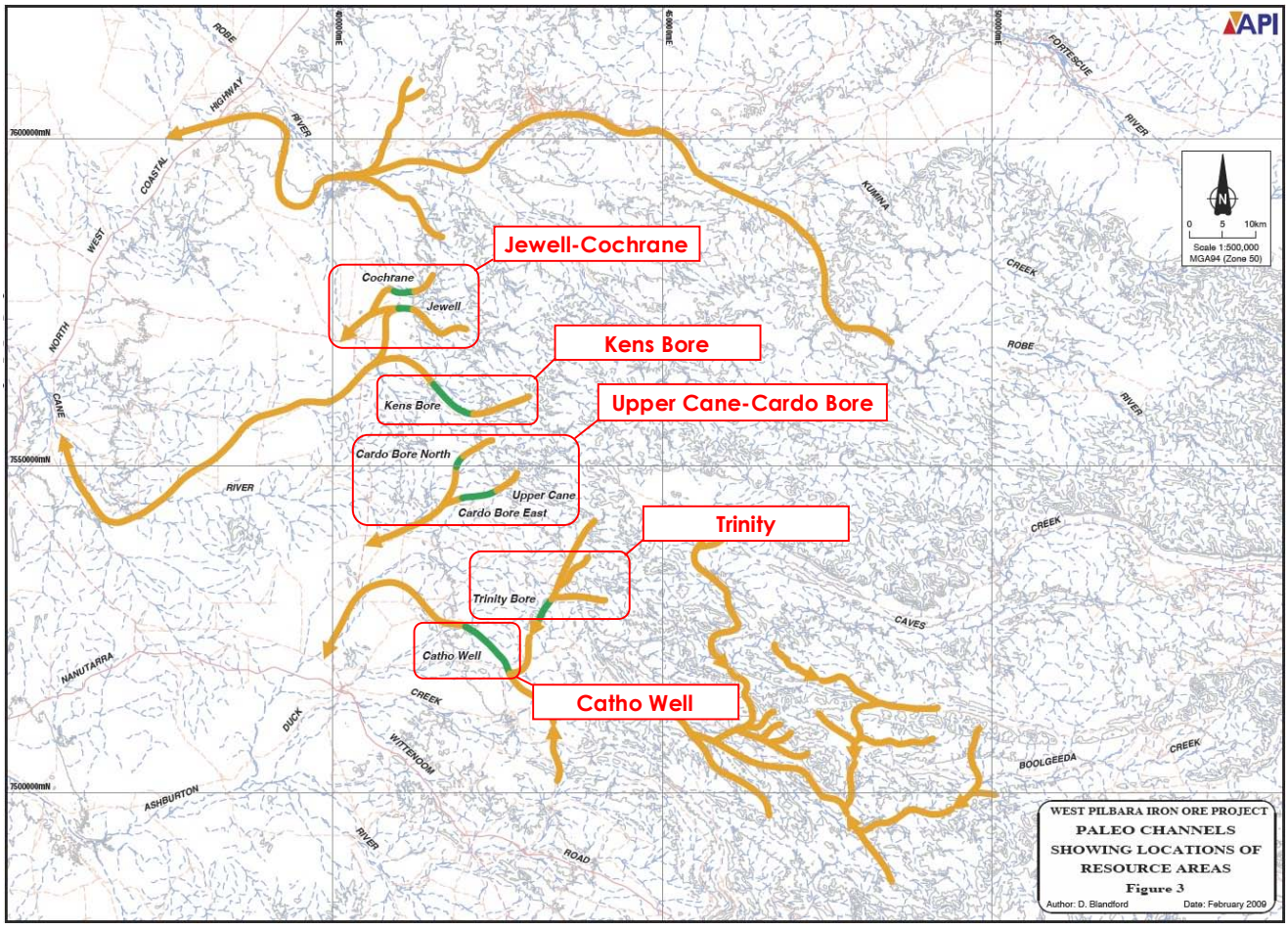

Figure 5.1: Palaeodrainage systems of the WPIOP project area as identified by DC Blandford (2009).

There was evidence that the distributional patterns of the troglobitic taxa identified in this study have been influenced by these palaeo channel systems. As summarised in Table 5.1, a range of fauna data reflected both palaeo channel isolation and historical habitat connections between adjoining systems.

Table 5.1: Relationship of troglobitic taxa distributions and the study areas of this survey to the palaeodrainage systems identified by DC Blandford (2009).

Palaeodrainage System *(Study Areas)*	**Relevant Fauna Distributions**
Jewel-Cochrane *(Cochrane and Jewel)*	• *Trinemura* sp. C only recorded from Cochrane and Jewel • *Paradraculoides* 'cochrana' recorded from all individual mesa landforms within Cochrane and Jewell, spanning approximately 30 km^2 • *Paradraculoides* 'gemma' only recorded from Cochrane and Jewel, and the immediately adjacent system at Kens Bore • Closely related *Nocticola* sp. A haplotypes recorded from Cochrane and Jewell and at Kens Bore on clade 'D' (Figure 4.9) but not recorded elsewhere
Kens Bore *(Kens Bore)*	• *Paradraculoides* 'kens' only recorded from Kens Bore, but confirmed from over a minimum range extending 2.5 km along the landform • *Paradraculoides* 'gemma' only recorded from Kens Bore, and Cochrane and Jewell • Closely related *Nocticola* sp. A haplotypes from Kens Bore, and Cochrane and Jewel Group on clade 'D' but not elsewhere
Upper Cane - Cardo Bore *(Cardo Bore North, Cardo Bore East, Upper Cane)*	• *Paradraculoides* 'cardo' recorded from all of Upper Cane, Cardo Bore East and Cardo Bore North (117 records spanning the full extent of the three study areas demonstrating inter-connected habitat and no barriers to gene flow) • Closely related *Nocticola* sp. A haplotypes from Upper Cane and Cardo Bore North on clade 'C' (Figure 4.9) that were not recorded elsewhere • *Indjapyx* sp. A confirmed from both Cardo Bore North and Cardo Bore East • Polyxenidae sp. A confirmed from Upper Cane, Cardo Bore East and Cardo Bore North
Trinity *(Trinity Bore)*	• *Paradraculoides* 'confusus' only recorded from Trinity Bore North • Clade 'A' of *Nocticola* sp. A (Figure 4.9) only recorded from Trinity Bore North • *Paradraculoides* 'trinity' only recorded from Trinity Bore, but occurs along at least 5 km of the landform • *Tyrannochthonius* sp. D only recorded from Trinity Bore • *Pseudogastrotheus* sp. A only recorded from Trinity Bore • *Trinemura* sp. E only recorded from Trinity Bore • *Trinemura* sp. F recorded from Trinity Bore and Catho Well • Almost all Cryptopidae sp. records from Trinity Bore and Catho Well • Molecular data indicate *Paradraculoides* 'trinity' and 'catho' are sister clades
Catho Well *(Catho Well)*	• *Paradraculoides* sp. 'catho' only recorded from Catho Well • No other *Paradraculoides* species recorded from Catho Well • *Nocticola* sp. B only recorded from Catho Well • No other *Nocticola* species recorded from Catho Well • Molecular data indicate *Paradraculoides* 'Catho' and 'Trinity' closely related

While there were a small number of geographical exceptions, these results were generally supportive of a connected habitat model equating to the five palaeodrainage systems independently identified by DC Blandford (2009) (Figure 5.1; Table 5.1). The general biogeographic parameters of these habitat units are:

- spatial restriction of one or more species to that palaeodrainage unit;
- distribution of individual species across large or entire extents of each unit, including across small-scale and local changes in landform; and
- evidence of more closely related or identical taxa occurring on adjacent units, particularly where linked by palaeo channels.

Table 5.2 shows the distribution of the troglobitic taxa within the five palaeodrainage units, excluding the four widespread taxa which are not informative in examining similarities between the communities (Polyxenidae sp. A, *Indjapyx* sp. A, Cryptopidae sp. and *Nocticola* sp. A; Section 4.3). A pattern of relatively distinct community species composition is evident from one palaeodrainage to the next (Table 5.2). Even where species were in common between adjacent palaeodrainages, the relative abundance was strongly skewed toward only one of the units. *Paradraculoides* 'cardo' for example, was common across Upper Cane, Cardo North and Cardo East (the 'Upper Cane – Cardo Bore' unit): the species was also recorded at Cochrane and Jewel, but 99% of the individuals came from Upper Cane – Cardo Bore (Table 5.2). The situation was similar for *P.* 'cochrana', where although a single record came from another other unit, the great majority came from Cochrane-Jewel (Table 5.2).

Table 5.2: Distribution and abundance of troglobitic taxa amongst palaeodrainage units identified by DC Blandford (2009) (excluding the four widespread taxa).

	Palaeodrainage Unit				
Taxa	**Upper Cane - Cardo Bore**	**Cochrane-Jewel**	**Ken Bore**	**Trinity**	**Catho Well**
Ideoblothrus sp.	1				
Lagynochthonius sp. A	1				
Lagynochthonius sp. E	1				
Polydesmidae sp.	1				
Tyrannochthonius sp. B	3				
Tyrannochthonius sp. F	1				
Paradraculoides sp. 'cardo'	117	2			
Paradraculoides sp. 'cochrana'		28		1	
Trinemura sp. C		1			
Paradraculoides sp. 'gemma'		1	1		
Paradraculoides sp. 'kens'			3		
Paradraculoides sp. 'confusus'				2	
Paradraculoides sp. 'trinity'				17	
Pseudogastrotheus sp. A				1	
Trinemura sp. E				1	
Tyrannochthonius sp. D				2	
Trinemura sp. F				1	1
Tyrannochthonius aridus				3	1
Nocticola sp. B					2
Paradraculoides sp. 'catho'					10
No. of taxa:	**8**	**4**	**2**	**8**	**4**
% of taxa only recorded from this unit:	**88%**	**50%**	**50%**	**63%**	**50%**
No. of taxa shared only with adjacent unit:	**0**	**1**	**1**	**2**	**2**

Proportion of total abundance: 100-70% | 70-30% | 30-5% | 5-1%

Unlike the findings from the more isolated mesa landforms of the Robe valley (Biota 2006a), a number of discrete contemporary landform units sampled in this study yielded the same species. Several species recorded in this study also occurred on multiple mesas – again in contrast to the Biota (2006a) study. This appears to be a function of the nature of the CID landforms in the WPIOP project area, where a series of spatially close landforms occur that have probably become separated more recently than those in the Robe valley. At that site by contrast, the sampled mesas were spatially separated by many kilometres and populations therein had probably not been connected for in excess of five million years (Biota 2006a).

The results from Upper Cane, Cardo Bore North and Cardo Bore East are illustrative of this. Both morphological and molecular analysis indicated that the same species of schizomid, *Paradraculoides* 'cardo', occurred on all three separate study areas, despite the specimens being collected from three separate contemporary landforms (Plate 5.1). This result was not recorded once from any of the seven similar mesas sampled along the Robe valley by Biota (2006a): in that study each mesa supported its own clearly delineated schizomid species.

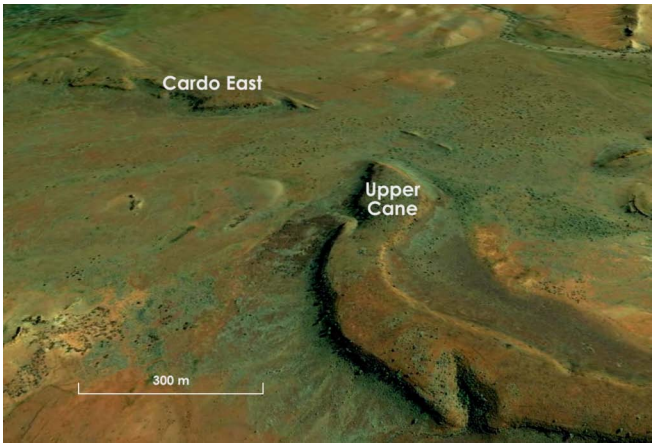

Plate 5.1: Oblique westward view from Upper Cane to Cardo East (image source: GoogleEarth)

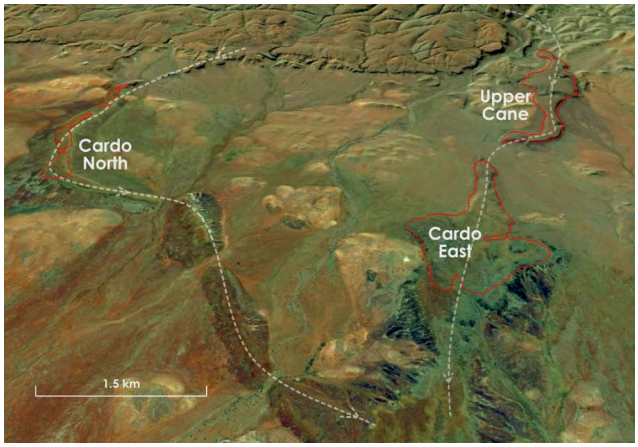

Plate 5.2: Oblique eastward view of the thee study areas in the Upper Cane – Cardo Bore paleo channel system (source: GoogleEarth)

Amongst other possibilities, this finding may be indicative of:

- relatively recent habitat separation, meaning that insufficient time has elapsed for the isolated populations to diverge into different species; or
- that there are existing contemporary habitat connections between the mesa landforms below the level of the surrounding plain (i.e. that erosional processes have not yet removed all habitat connections between the populations within each landform).

Comment from API geologists suggests that the latter option is possible in some locations and that the mesas may still have contemporary connections below the plain but above watertable (M. Carey, API, pers. comm.). Whichever model explains the current distribution, it is clear that *Paradraculoides* sp. 'cardo' is not restricted to, for example, the Upper Cane study area (the initial hypothesis based on the findings from the Robe valley (Biota 2006a)). This is illustrated by Figure 5.2, which shows the confirmed occurrence of both the CO1 haplotypes and the morphologically confirmed adult specimens of P. 'cardo' on Upper Cane, Cardo Bore North and Cardo Bore East. This distribution of the fauna is supportive of, and consistent with, the Upper Cane – Cardo Bore palaeo channel system identified by DC Blandford (2009) (Plate 5.2). While more limited, the molecular data for *Nocticola* sp. A also appear to reflect this, with the specimens from the north of Upper Cane grouping on the same clade as the Cardo North specimens (Figure 4.9). The result is similar for the individual landforms of Cochrane and Jewel (Figure 5.3), where *P*. 'cochrana' is confirmed from each component of this palaeochannel unit.

There are also indications of connections between Cochrane and Jewell, and Kens Bore (with the shared occurrence of *Paradraculoides* 'gemma' (Table 5.2) and clade D of *Nocticola* sp. A (Figure 4.9)), and between Trinity and Catho Well (common occurrence of *Trinemura* sp. F at both sites (Table 5.2) and that *Paradraculoides* 'trinity' and 'catho' are sister clades (Figure 4.5)). These findings are consistent with the geographic distribution of the palaeo channel connections independently derived by DC Blandford (2009) as shown on Figure 5.1.

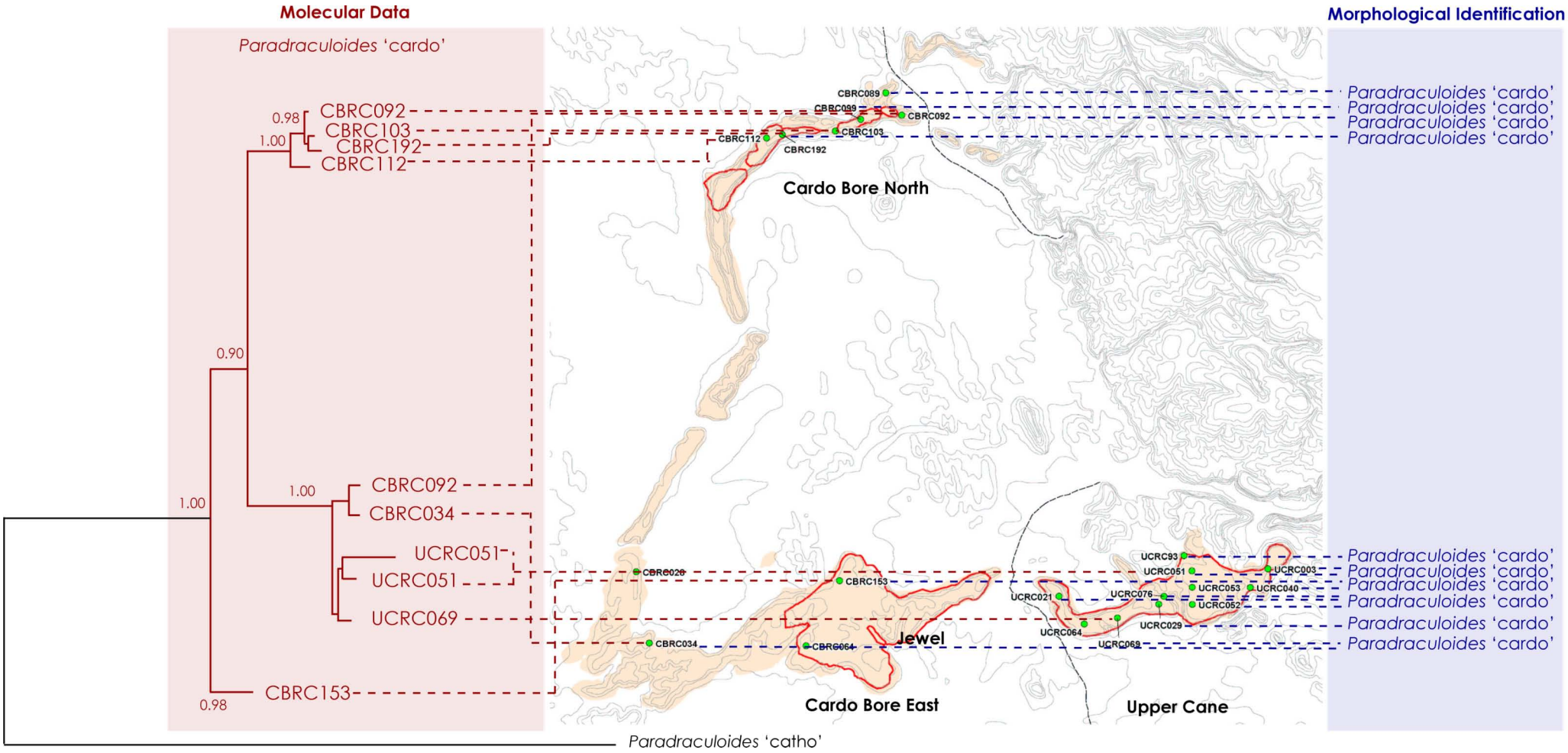

Figure 5.2: **Distribution of CO1 haplotypes *Paradraculoides* 'cardo and morphologically confirmed adult specimens of *Paradraculoides* 'cardo' on the components of the Upper Cane – Cardo Bore palaeochannel unit (not all individuals shown; phylogenetic tree modified from Helix (2009) with genetic distance to *P.* 'catho' shown for context).**

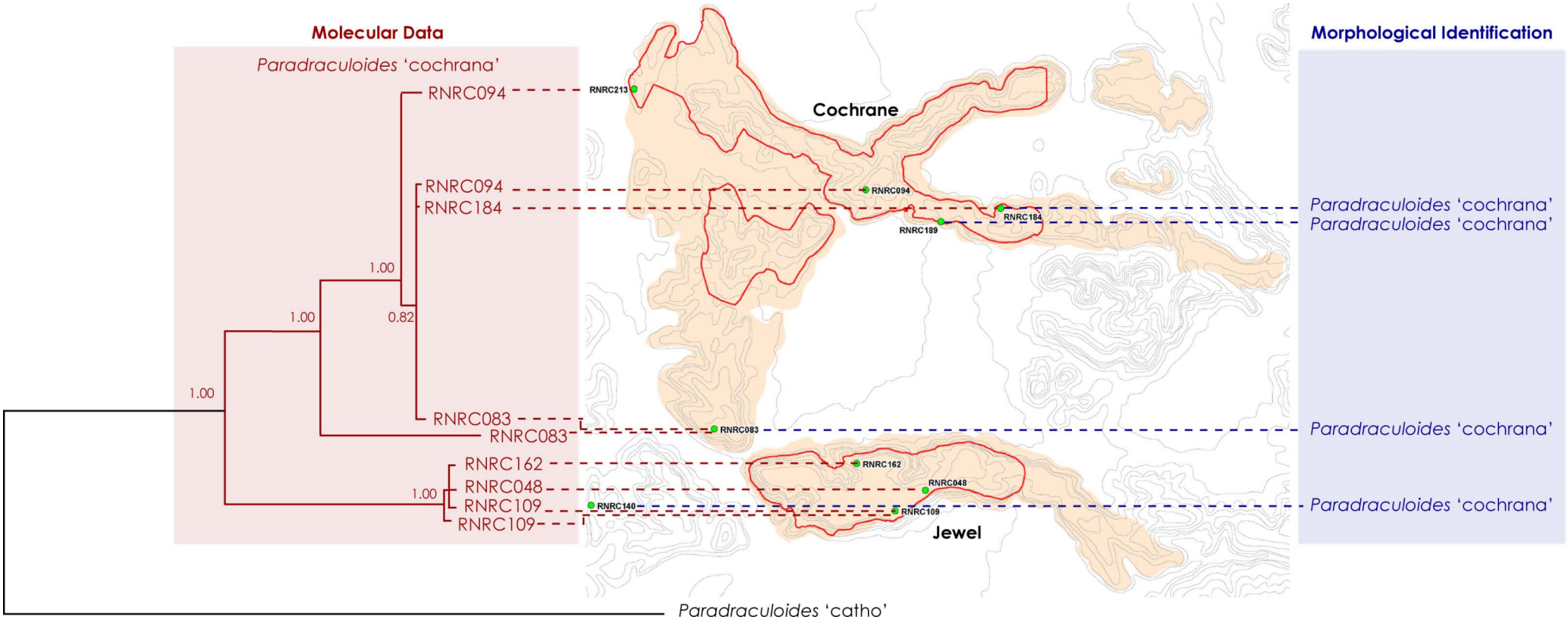

Figure 5.3: **Distribution of CO1 haplotypes *Paradraculoides* 'cochrana' and morphologically confirmed adult specimens of *Paradraculoides* 'cochrana' on the components of the Cochrane and Jewel palaeochannel unit (not all individuals shown); phylogenetic tree modified from Helix (2009) with genetic distance to *P.* 'catho' shown for context).**

The results do suggest however, that some of the landform separations have been important in shaping species distributions. Both molecular and morphological data indicate a clear separation into those from Trinity North and those from Trinity Bore. *Paradraculoides* 'confusus' was only recorded from Trinity North, with a different species, *P*. 'trinity', only occurring on the remainder of Trinity Bore (Section 4.3.4). The main part of Trinity Bore is separated from this northern portion by an incised drainage divide that has apparently resulted in long-term separation of these habitats (Plate 5.3).

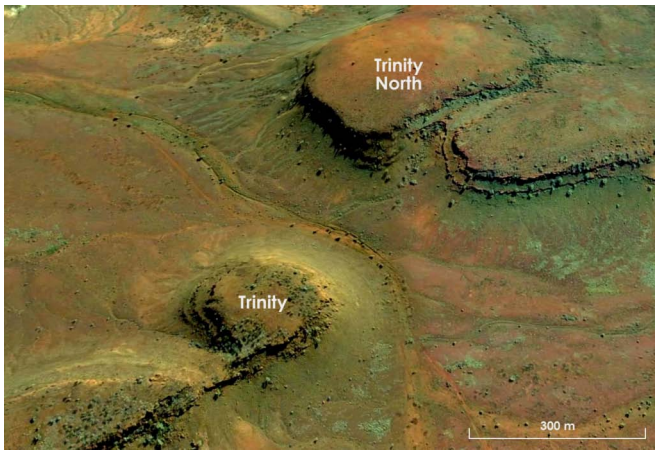

Plate 5.3: Oblique north-westward view from Trinity to Trinity North (image source: GoogleEarth).

This pattern was also repeated in the nocticolid cockroaches, with clade A of *Nocticola* sp. A only occurring on Trinity North, and a separate clade (B) on the remainder of Trinity Bore (Figure 4.9).

At firsthand field inspection, the level of landform separation between Card Bore East and Upper Cane (Plate 5.1) would appear similar, if somewhat less incised, to that between the Trinity Bore and Trinity North mesas (Plate 5.3). This highlights the importance of detailed molecular and morphological analysis of the fauna in identifying these patterns.

5.2 Distribution of Troglobitic Taxa Relative to Proposed Mining Areas

One impact assessment question for this study, and for the PER or the proposal (Section 1.1), is how the distribution of the recorded troglofauna taxa compares to the potential mine pit impact areas?

A total of 24 troglobitic taxa were documented from this survey, with varying distributions (Section 4.3). Table 5.3 summarises the status of 11 of these species confirmed to occur outside of proposed mining areas. Figure 5.5 to Figure 5.11 show the spatial distribution of sample sites with troglofauna records at each study site relative to potential pit outlines for reference.

Table 5.3: Troglobitic taxa confirmed as occurring outside of the proposed mining impact areas.

Taxa	Comments
Schizomida	
Paradraculoides sp. 'cochrana'	Occurs primarily on Cochrane and Jewel (99% of specimens), including at sites outside of proposed mine pit shells (e.g. RNRC140; Figure 5.5), with a single record from Trinity Bore.
Paradraculoides sp. 'cardo'	An apparently widespread species in the locality: occurs primarily at Cardo Bore North, Cardo Bore East and Upper, with multiple records outside of mining areas (e.g. CBRC034; Figure 5.9), with a single record from Cochrane and Jewel.
Paradraculoides sp. 'confusus'	Recorded only from Trinity North, which is currently outside of proposed mining areas (Figure 5.10)
Paradraculoides sp. 'trinity'	Only recorded from Trinity Bore, but with records from habitat in the south of the mesa outside of the proposed mine pits (TBRC038; Figure 5.10)
Pseudoscorpiones	
Tyrannochthonius aridus	Occurs across Trinity Bore, with records outside of proposed mining areas (TBRC196; Figure 5.10). Also known from the wider region (Harvey and Edward 2008)
Scolopendrida	
Cryptopidae sp.	Occurs at Kens Bore, Trinity and Catho Well, including at site outside of the proposed mine pits (TBRC036; Figure 5.10)
Polyxenida	

Table 5.3: Troglobitic taxa confirmed as occurring outside of the proposed mining impact areas.

Taxa	Comments
Polyxenidae sp. A	Occurs on every study area, with multiple records from outside of the mine impact areas (e.g. TBRC041; Figure 5.10)
Diplura	
Indjapyx sp. A	Occurs on almost every study area, with multiple records from outside of mine impact areas (e.g. CBRC078 and CBR201; Figure 5.9)
Thysanura	
Trinemura sp. E	Only recorded from Trinity Bore, but from TBRC036 which is outside of proposed mining areas (Figure 5.10)
Trinemura sp. F	Only recorded from Trinity Bore, but from TBRC036 which is outside of proposed mining areas (Figure 5.10)
Blattodea	
Nocticola sp. A	Occurs on six of the seven study areas, with records from habitat outside of mining areas (e.g. RNRC083; Figure 5.5)

The remaining 13 species have currently only been recorded from proposed mining impact areas. The occurrence of these troglobitic taxa is summarised in Table 5.4. It is relevant to note that the majority (eight) of these 13 taxa were singletons (recorded only as single individuals) and most of the remainder were doubletons (only two individuals representing that taxon).

Table 5.4: Summary of troglobitic taxa currently only recorded from within proposed mining impact areas (n=number of individuals).

Taxa	n	Impact Area Sites	Comments
Schizomida			
Paradraculoides sp. 'gemma'	2	KBRC040 RNRC162	A low frequency species but occurs on two palaeodrainge systems and therefore likely to be more widely distributed
Paradraculoides sp. 'kens'	3	KBRC023, KBRC039, KBRC096	Only recorded from Kens Bore, but from across the extent of the study area (8 km; Figure 5.6).
Paradraculoides sp. 'catho'	10	CWRC177 CWRC179 CWRC302	Data indicate this species occurs across the extent of Catho Well (even where local drainage divides occur; Figure 5.11)
Pseudoscorpiones			
Lagynochthonius sp. A	1	UCRC040	Only a single record from the same Upper Cane sample site as *Tyrannochthonius* sp. F and Polydesmidae sp.
Lagynochthonius sp. E	1	UCRC033	Single specimen from the eastern end of Upper Cane
Tyrannochthonius sp. B	3	CBRC099, CBRC112, CBRC122	Only recorded from Cardo Bore North but from across the extent of the study area (Figure 5.7)
Tyrannochthonius sp. D	1	TBRC141	Single specimen from the central portion of Trinity Bore
Tyrannochthonius sp. F	1	UCRC040	Only a single record from the same sample site as *Lagynochthonius* sp. A and Polydesmidae sp
Ideoblothrus sp.	1	UCRC029	Single specimen from the central portion of Upper Cane
Polydesmida			
Polydesmidae sp.	1	UCRC040	Only a single record from the same sample site as *Lagynochthonius* sp. A and *Tyrannochthonius* sp. F
Thysanura			
Pseudogastrotheus sp. A	1	TBRC156	Single specimen from the central portion of Trinity Bore
Trinemura sp. C	1	RNRC198	Single specimen from the central portion of Cochrane
Blattodea			
Nocticola sp. B	2	CWRC256	Only recorded from a single site on Catho Well, but very likely to be more widely distributed in this study area given the range of other *Nocticola* in the locality.

Many of the species recorded during this survey were at low frequency or singletons, with few taxa commonly recorded (Figure 5.4). This is a typical pattern in ecological sampling data sets (Lindenmayer and Burgman 2005) and previously documented as frequently encountered in troglobitic communities (Biota 2006a, 2006b and 2007). While a common outcome, this does have ramifications when attempting to assess the true distribution of the infrequently recorded species.

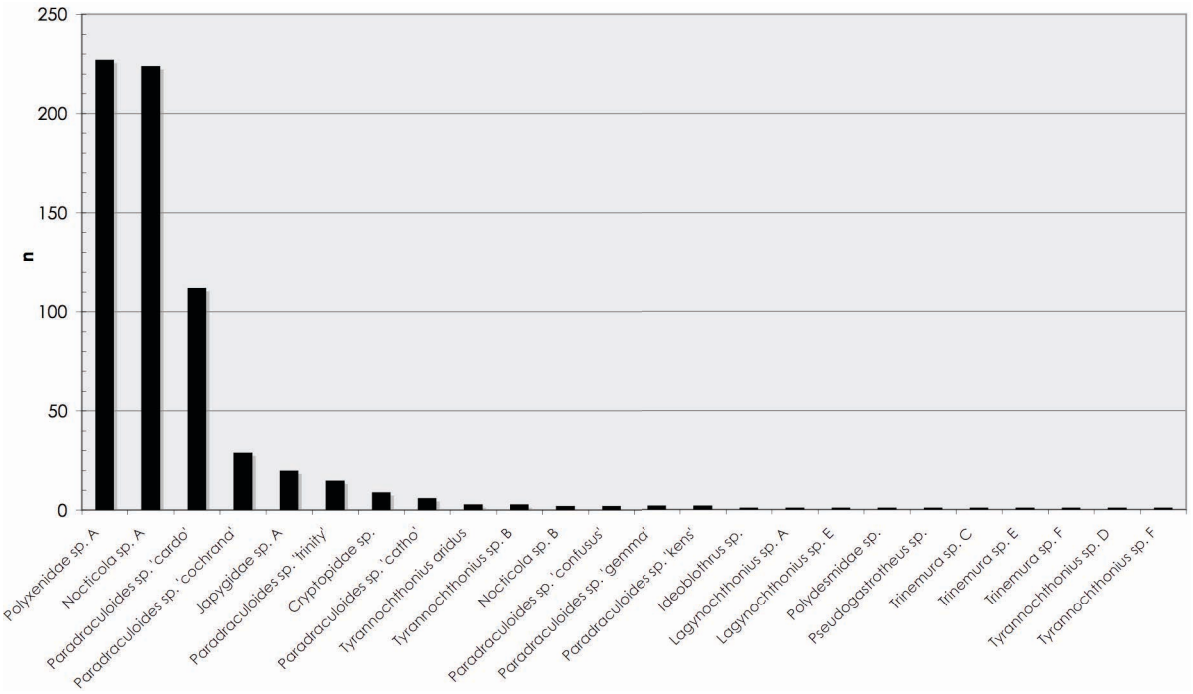

Figure 5.4: Total abundance of the 24 troglobitic taxa recorded during this study.

The assessment of impacts on subterranean fauna requires the risk that these low frequency species are spatially restricted to be assessed. Singleton records are clearly not representative of the true distribution of the taxa involved, as no species will have a distribution the size of a single drillhole. Ten of the 24 species in this study were represented by single specimen records only (Figure 5.4). The evidence from this study suggests that these taxa are likely to in fact occur more widely within each palaeodrainage unit and that their singleton status reflects ecological sampling effects. Support for this model includes that:

- molecular data for the best sampled troglobite group, the Schizomida, indicate that in general there is gene flow and interbreeding throughout each individual mesa landform (Section 4.3.4);
- parallel molecular results were recorded from troglobitic Nocticolidae (Section 4.3.8); and
- other members of the same genus as some of the singleton taxa occur more widely.

The results from Upper Cane, where the best numbers of animals were collected, are illustrative. There were 96 specimens of *Paradraculoides* 'cardo' collected from this study area, with records from all portions of the mesa sampled (Figure 5.7). *Nocticola* sp. A was also collected from across the extent of Upper Cane (Figure 5.7) and DNA sequencing showed that specimens from across the mesa share the same haplotype (Figure 4.9). These findings indicate habitat connectivity and no barriers to gene flow within the CID. This same study area however, also yielded four singleton taxa, three of which were collected from UCRC040 (Table 5.4). Both *Nocticola* sp. A and *Paradraculoides* 'cardo' were also recorded from UCRC040 and demonstrated to occur across the mesa. It therefore appears likely that the four singleton taxa are in reality similarly distributed within at least the extent of Upper Cane and not restricted just to site UCRC040. *Paradraculoides* 'cardo' has also been confirmed as occurring further afield within the Upper Cane – Cardo Bore palaeodrainage unit (Section 5.1). The Schizomida were previously used as the primary guide as to the likelihood of overall troglobitic community restriction within the Robe Valley (Biota 2006a). In the case of this study, species of the same genus are distributed at the scale of the palaeodrainage units identified here, rather than local mesas: this may also then suggest a reduced risk for the singleton species from the same sample sites and that these may in reality also be distributed at the level of the local palaeodrainage systems.

While these comparisons and the use of ecological surrogates can have limitations, in overview the data indicate the risk of very small-scale spatial restrictions (i.e. intra-mesa) for any of these taxa is low. The most practical way forward would therefore appear to be a habitat-based impact assessment. Direct mining impacts can then be more readily quantified on the basis of proportional removal of CID habitat within each palaeodrainage unit (Section 5.4.1).

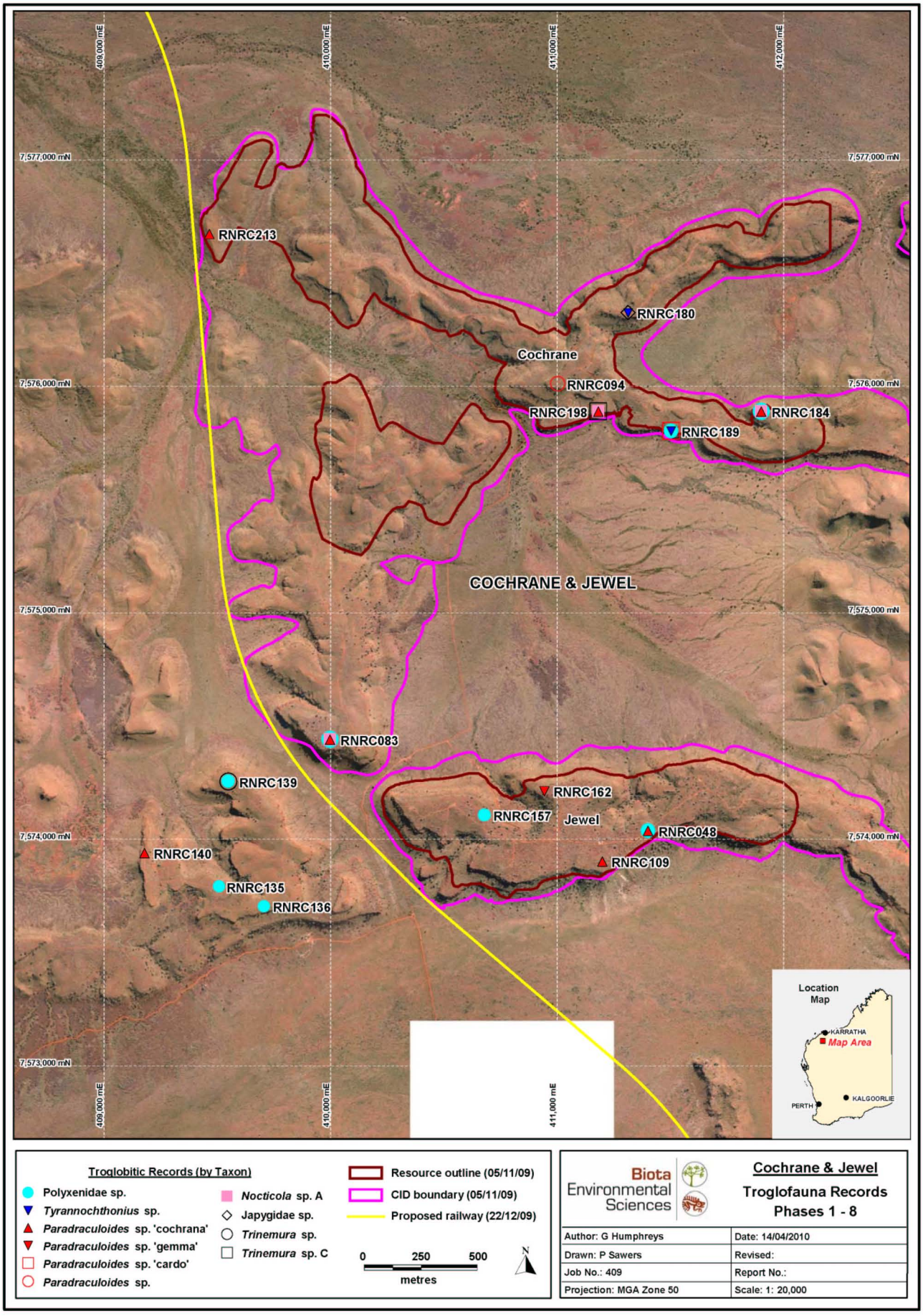

Figure 5.5: Distribution and abundance of troglofauna records from Cochrane and Jewel.

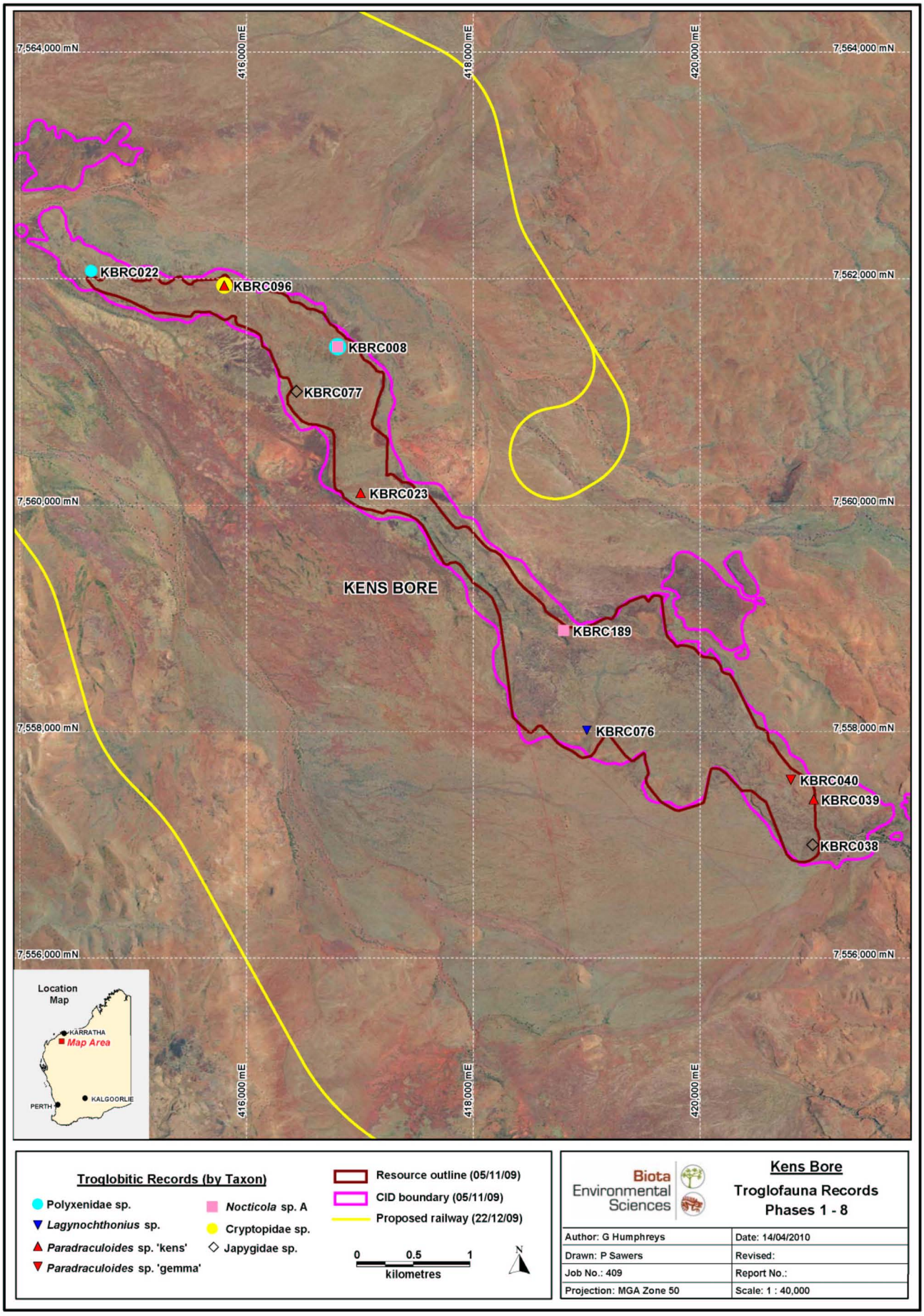

Figure 5.6: Distribution and abundance of troglofauna records from Kens Bore.

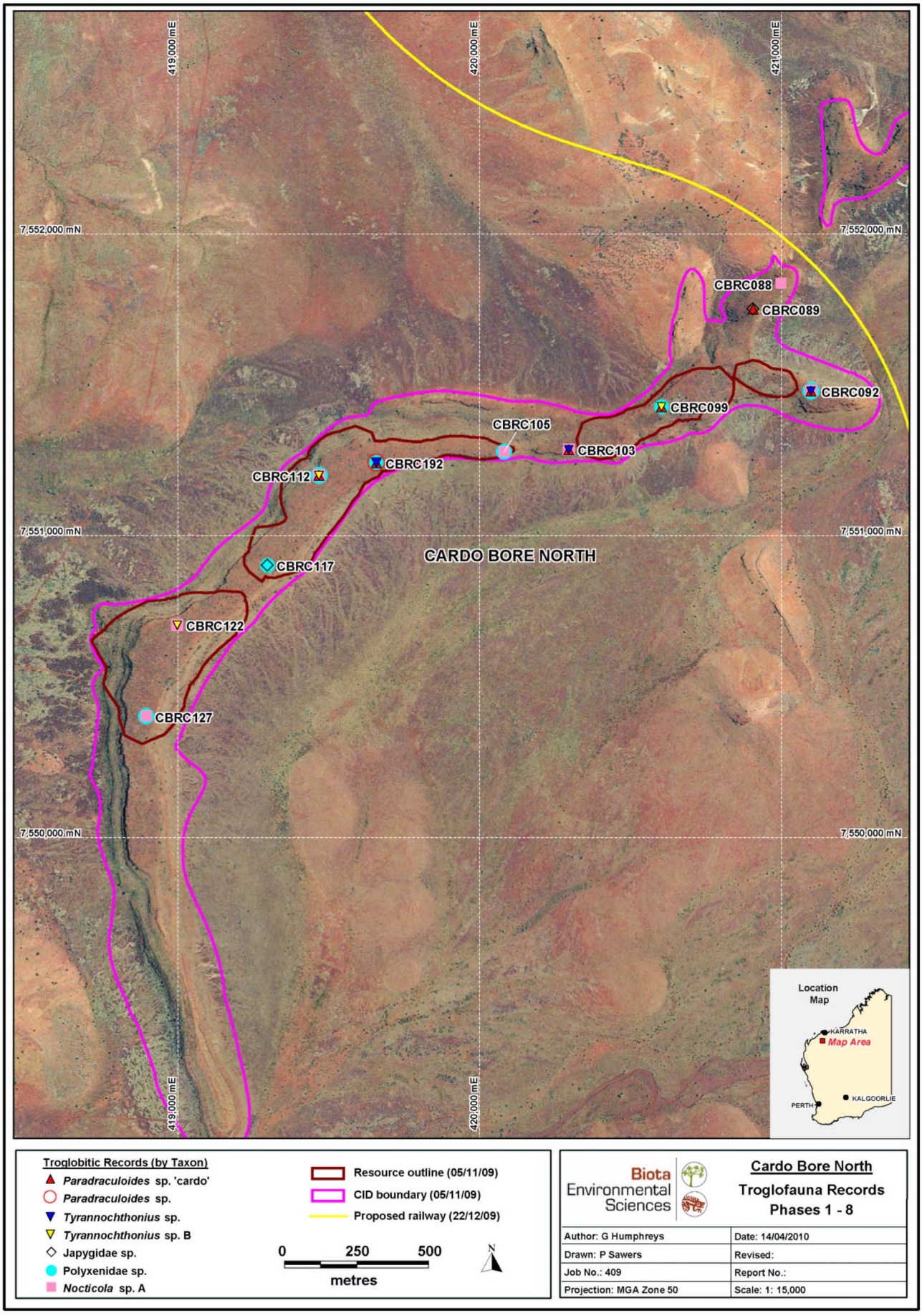

Figure 5.7: Distribution and abundance of troglofauna records from Cardo Bore North.

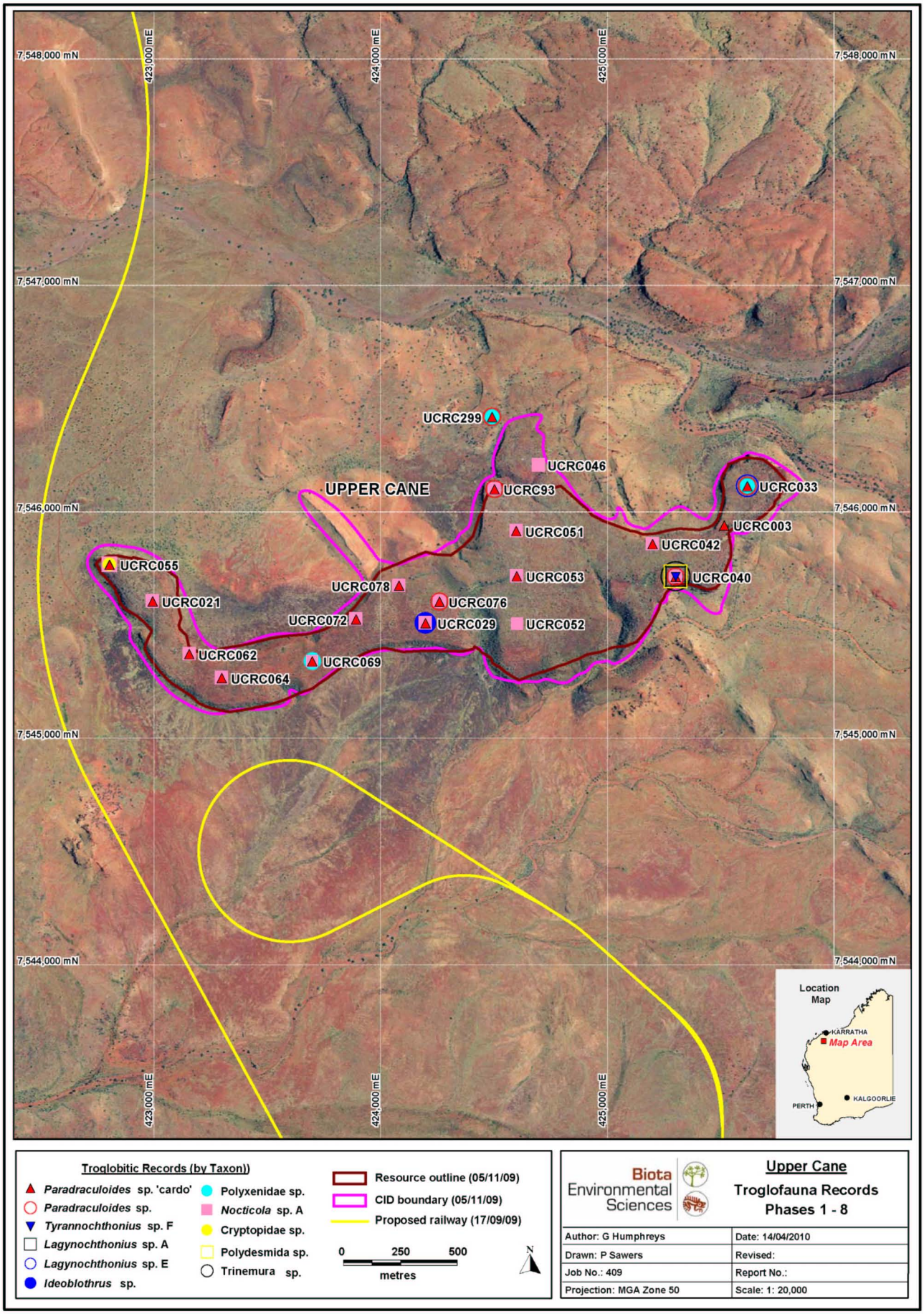

Figure 5.8: Distribution and abundance of troglofauna records to date from Upper Cane.

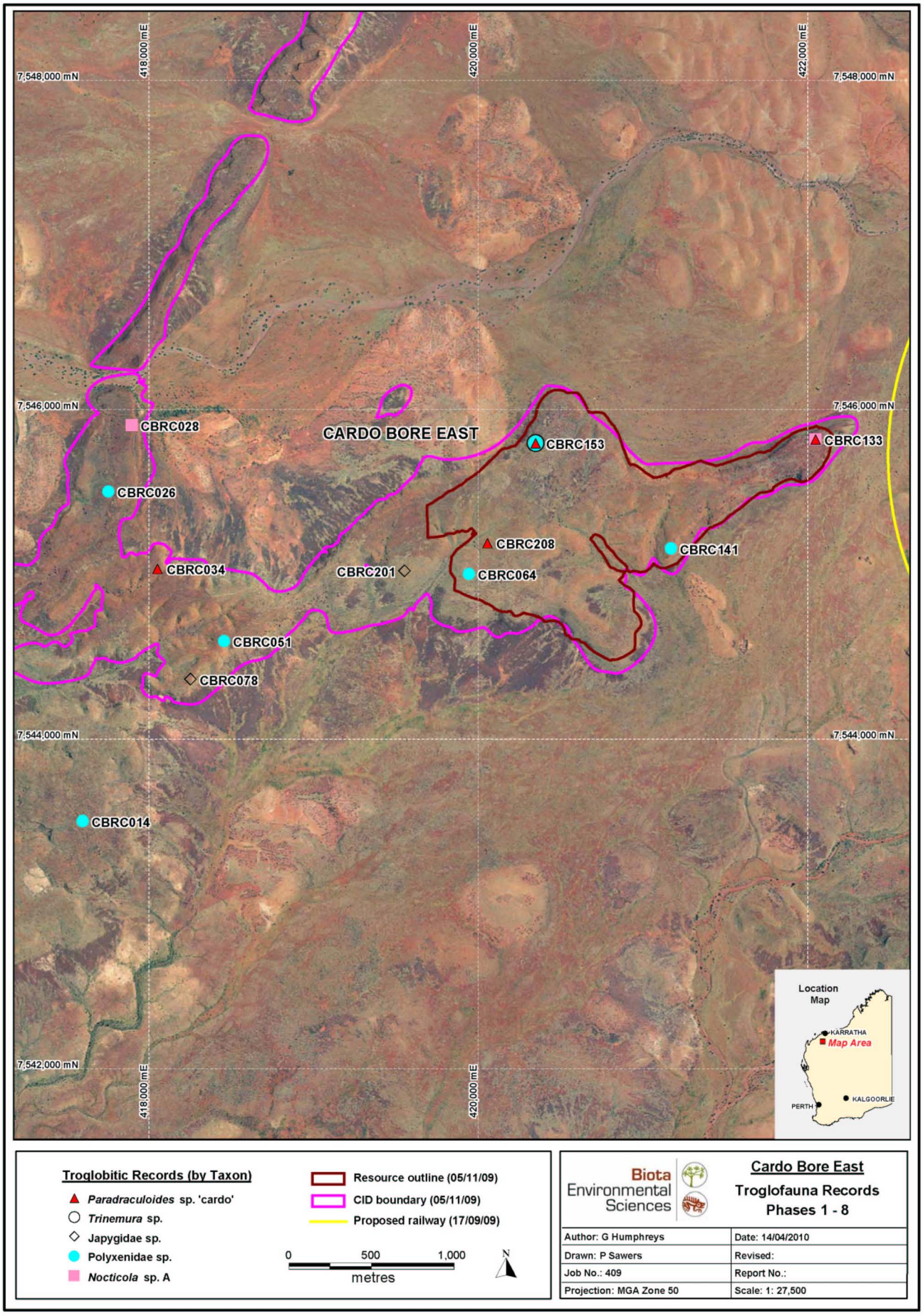

Figure 5.9: Distribution and abundance of troglofauna records to date from Cardo Bore East.

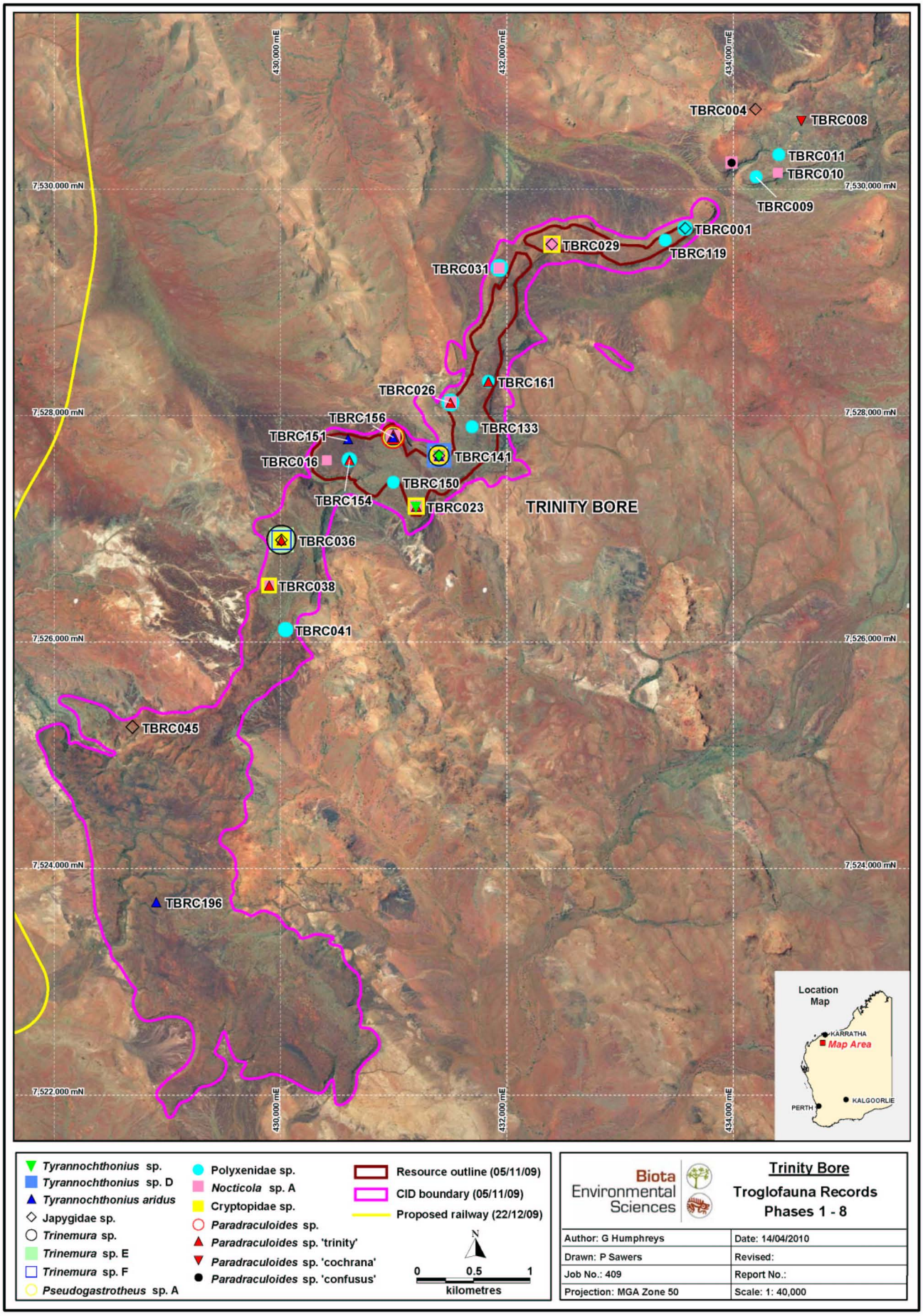

Figure 5.10: Distribution and abundance of troglofauna records from Trinity Bore.

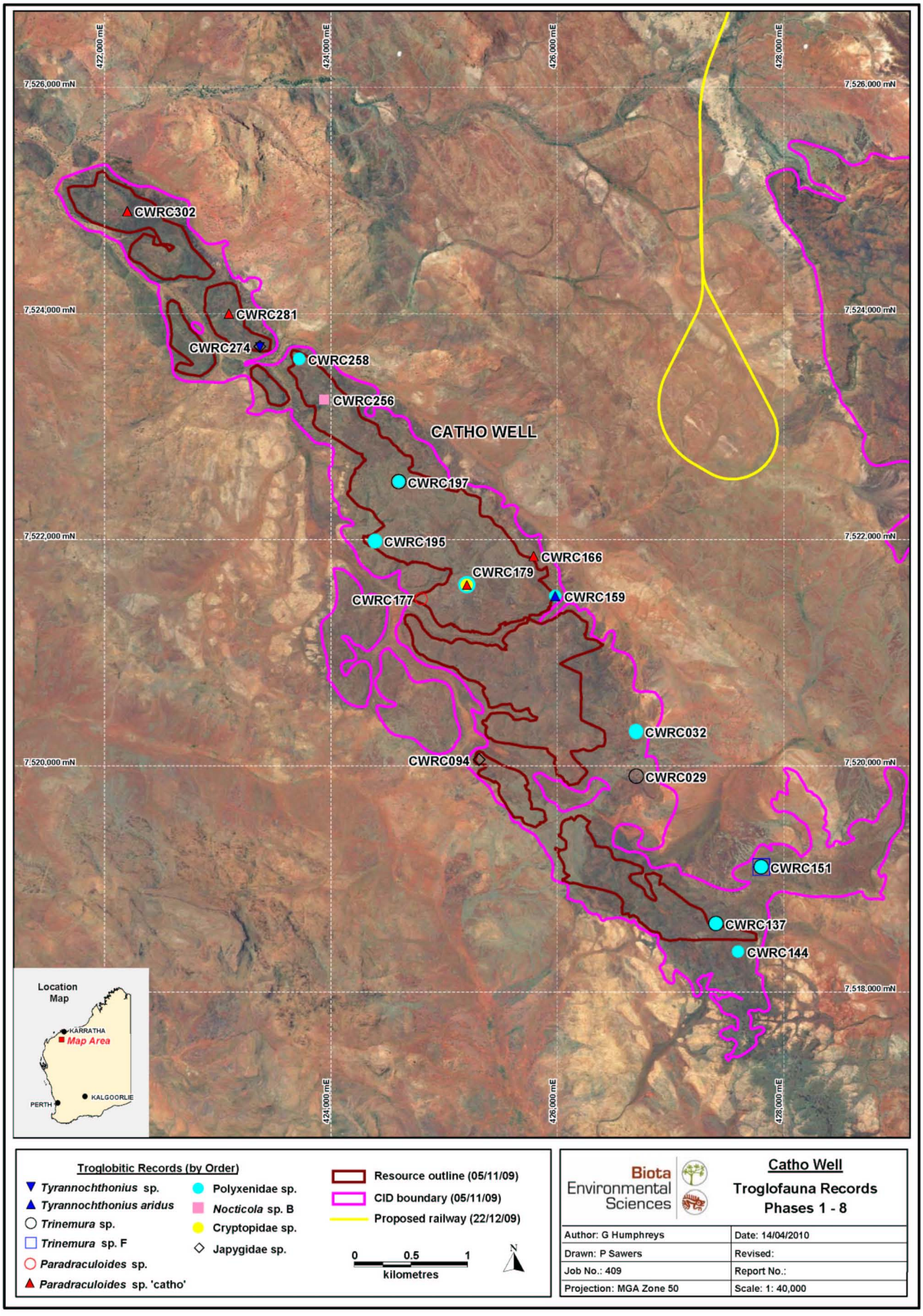

Figure 5.11: Distribution and abundance of troglofauna records from Catho Well.

5.3 Conservation Significance

The troglobitic fauna documented in this study includes 24 previously undescribed species. Similar subterranean fauna communities occur on Cape Range and Barrow Island within the conservation estate. The conservation significance of these species and communities has previously been formally recognised as follows:

- thirteen of the species are listed as Threatened Fauna under the State *Wildlife Conservation Act 1950-1979*;
- two of the species are listed under the Federal *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*; and
- the Camerons Cave troglobitic community on Cape Range is listed as a State Threatened Ecological Community (TEC).

Most of these species have been listed on the basis that they have restricted spatial distributions and only occur in particular habitat types.

The troglobitic species recently described from the nearby Robe valley pisolitic mesas have also now been formally listed as Threatened Fauna (Harvey et al. 2008). While some of the troglobitic taxa documented by this study from the WPIOP project would probably be considered 'data deficient', it is likely that the schizomid taxa documented would also meet similar conservation category criteria,

The troglobitic fauna of the WPIOP project areas has the following attributes of relevance to assessing its conservation significance:

- species with very short range distributions based on available data; each species currently appears to be restricted to either a local palaeochannel system or an individual mesa;
- relictual fauna representative of very old lineages; the lineages from which the contemporary troglofauna arose was present in subterranean habitats since the late Miocene (at least the last 10 million years);
- similar distributions to species now listed as Schedule 1 under State legislation in similar habitats in the bioregion;
- it is probable that other, currently uncollected species occur in the mesas which also have restricted distributions.

With these attributes, it is likely that the troglobitic species occurring in the WPIOP mesas would be assigned a similar conservation status to the other, previously described troglobitic species endemic to Cape Range and the Robe River valley.

5.4 Impact Mechanisms

Assessing the impacts of the proposed WPIOP development on troglobitic fauna requires consideration of:

- the distribution data on the troglobitic taxa recorded in this study;
- the current understanding of the ecosystem processes in troglobitic communities;
- key biophysical parameters central to maintaining the suitability of subterranean habitat for troglofauna; and
- the aspects of the WPIOP project that may affect mesa landforms and trogobitic fauna habitat.

Within this context, the predicted impacts on troglofauna associated with the proposed WPIOP development may be divided into two components:

1. direct impacts on troglofauna occurring in the proposed mine disturbance areas (Section 5.3.1); and
2. indirect impacts on troglofauna occurring in retained mesa areas, adjoining the mine areas (Section 5.3.2).

5.4.1 Direct Impacts in Mine Pit Areas

Habitat removal is the most direct impact on the troglofauna occurring within the WPIOP mesas. The CID proposed to be mined at each of the mesas of the study areas is also the core habitat for troglobites. Given that most of the subterranean species in question are slow-moving and occur in microhabitats that have been relatively stable for an extended period, the assumption is that any populations present in the proposed pit shells will be lost as a result of habitat removal or direct mortality.

A key question that arises from this impact is the viability of the remaining populations of the troglobitic fauna species endemic to each palaeodrainage system. This is likely to be a function of the extent, configuration and intactness of the portions of the landforms left undisturbed by proposed mining activities.

Guidance can also be obtained in this from:

- the size of other, smaller mesas known to contain similar troglobitic assemblages (such as Mesa B in the Robe Valley; Biota (2006a));
- the size and configuration of habitat remnants in other areas subject to historical mining disturbance that still support troglofauna (Mesa K and Middle Robe); and
- data from other sites where mining activity has encroached into troglobitic fauna habitat (e.g. the Exmouth Limestone mine at Cape Range; Biota (2004)).

Mesa B, which contained a similar abundance and diversity of troglofauna to the mesas sampled in this study, is 173 ha in size. This smaller extent of habitat has clearly been large enough to sustain troglofauna in the long term, with at least five taxa representing four troglobitic orders extant in the mesa today (Biota 2006a).

The distribution and extent of remnant mesa habitat in the disturbed areas of Mesa K and Middle Robe may also be informative (Biota 2006a). Mining ceased at Mesa K in 1996, after a project life of eight years, leaving some 44% (137 ha) of the original mesa formation intact. Sampling conducted there by Biota (2007) demonstrated that a similar community to that of the then intact Mesa A was still present more than 10 years later. Middle Robe (lease 2402E) provides a similar analogue, but was originally smaller in size (89 ha). Lease 2402E at Middle Robe was mined for a period of 12 years, ending in 1983 (Biota 2006a). Approximately 24 ha of Middle Robe was left un-mined, representing 27% of the original extent of this mesa, with troglofauna still present in remnant habitat areas 22 years later (Biota 2006a).

Mining at the Exmouth Limestone mine on Cape Range also provides some guidance as to the sensitivity of troglofauna to mining in nearby areas. Sampling at this project's bore RC29 (less than 50 m from the pit wall; Figure 5.2) showed the continued presence of troglofauna over nine years after the commencement of mining (Biota 2002; Biota unpublished data). These observations suggest that any influence of mining on adjoining troglofauna habitats is not immediate, the effects may be relatively superficial (i.e. less than the 50 m distance from the pit wall in that case) or that fauna have some tolerance (at least in the short term) to any microclimate changes that do occur.

The available information from other sites indicates that mining can approach relatively close to undisturbed troglofauna habitat without necessarily resulting in local population extinctions, at least in the decade timeframe. The long-term effect of the overall population reductions that will occur in the mesas will be more difficult to predict. The schizomids and other fauna occurring within the landforms will be effectively forced through a genetic and demographic bottleneck. The ability of the troglofauna to establish a new population equilibrium that would be stable and

viable in the long-term, or their ability to recolonise any mined out areas, is difficult to assess on the basis of current knowledge. Persistence of these populations in the longer term is likely to be determined primarily by the extent and configuration of the portion of habitats that are left intact within each palaeochannel system after mining.

5.4.2 Indirect Impacts in Areas Adjacent to Mine Pit Areas

In addition to the primary impact of habitat removal for mining pits, other indirect impacts could also affect troglofauna habitat retained at each deposit area. As detailed in Biota (2006a), the CID habitats in which troglofauna occur in the locality are typically characterised by:

- a subterranean network of mesocaverns, fracture zones and cavities;
- darkness or near-darkness;
- stable, cool-moderate temperatures (Humphreys 2001; Paquin and Hedin 2004);
- high relative humidity (Humphreys 2001);
- relatively high carbon dioxide levels (Culver and Sket 2000); and
- relatively low energy levels with autotrophic organic carbon entering the system from surface sources, particularly during flood events (Culver 1985, Humphreys 1991).

The ongoing suitability of habitat to support troglofauna in areas adjacent to mining operations is therefore linked to the maintenance of these core biophysical conditions and processes. Potential impacts can arise from a range of sources that could alter these subterranean conditions, including:

1. Changes to Surface Hydrology

Humidity levels within the mesas are ultimately sustained by periodic surface water input and recharge during rainfall events. Alteration to surface hydrology, particularly in regards to sealing of recharge areas, could therefore affect underlying subterranean habitats. Increases in surface erosion could also lead to sedimentation of interstices and the filling (and thereby degradation or loss) of microhabitat space utilised by troglofauna within the mesa landforms (James 1993).

2. Changes to Subterranean Microclimate

Reduction in the key microclimate parameters, particularly humidity levels, could lead to changes in troglofauna use of the retained habitat. Troglobitic fauna have been shown to be far more sensitive to water loss than their surface analogues. Hadley et al. (1981) found that troglobitic lycosid spiders lost significantly more water than their surface congeners (up to 10 times the water loss rate at 0% relative humidity; mainly due to wax content differences in the cuticle). Humphreys (1991) also demonstrated that troglobitic fauna communities tend to contract in distribution into deeper habitats as humidity levels fall in more superficial areas. These physiological and ecological responses signal sensitivities in this fauna to drying of strata and reductions in subterranean relative humidity levels.

A potential impact mechanism relating to this is presented by the exposure of openings in the mine pit wall leading to deeper fractured strata in adjoining mesa habitat. The likelihood of this causing humidity reductions or other microclimate change in subterranean habitat in the remnant areas of the mesas will reduce with increasing distance from the pit wall. This would suggest that very small or narrow mesa remnants could become less suitable for troglofauna use. Equally, larger areas of retained mesa habitat are likely to continue to provide microclimate conditions suitable for troglobitic communities, at least in the short to medium term. There is some support for this with the collection of troglobites from remnant mesa areas at Middle Robe and Mesa K, both of which were historically mined (Biota 2006a and 2007).

3. Surface and Ground Water Contamination

The potential exists for the subterranean environment to be degraded by spills of hydrocarbons or wastewater (e.g. Hubbard and Balfour 1993). Diesel and other hydrocarbons will be used on a routine basis during mining, presenting both operational (e.g. refuelling) and storage risks.

4. Reduction in Organic Inputs

All organic carbon inputs to troglobitic ecosystems ultimately stem from surface sources. Clearing of vegetation beyond the mine pit shells therefore has the potential to reduce nutrient influx to the underlying mesa remnants.

5. Vibration

Blasting activities during mining have the potential to cause collapses of strata and other features such as mesocaverns in the remnant mesa formation.

The majority of these indirect impact process would be subject to environmental management controls and monitoring protocols as part of project implementation. This will be addressed in the development of a dedicated subterranean fauna management plan to be prepared as part of the formal assessment of the WPIOP project.

6.0 Glossary

Allopatry	Occurring in geographically separate areas; see also sympatry and parapatry.
Autotroph	An organism that produces organic compounds from carbon dioxide as a carbon source, using either light or reactions of inorganic chemical compounds, as a source of energy. An autotroph is known as a producer in a food chain.
Base	The DNA is a chain of nucleotide units; each unit consists of a backbone made of a sugar and a phosphate group, with a nitrogenous base attached. The base unit is one of adenine (A), guanine (G), cytosine (C), or thymine (T). In RNA, uracil (U) is used instead of thymine. A and G belong to the chemical class called purines; C, T, and U are pyrimidines.
Clade	A monophyletic faunal group arising from of a common ancestor.
Coalescence	The evolutionary process viewed backward through time, so that allelic diversity is traced back through mutations to ancestral alleles.
Cryptic	Tending to conceal or camouflage.
Edaphobite	Deep soil inhabitant (Wilkens et al 2000).
Endemic	Native to or confined to a certain region.
Epigean	The surface environment as opposed to the subsurface (subterranean, hypogean) Environment (Wilkens et al 2000).
Haplotype	A group of alleles of different genes on a single chromosome that are closely enough linked to be inherited, usually as a unit.
Karst	Soluble-rock landscape; terrain with distinctive hydrology and landforms arising from a combination of high rock solubility and well-developed secondary porosity (Wilkens et al 2000).
Lineage	Direct descent from a particular ancestor; ancestry. The descendants of a common ancestor considered to be the founder of the line.
Mesocaverns	Underground voids in the size range 0.1 – 20cm, especially in karst and volcanic Substrates (Wilkens et al 2000).
Nonparametric Bootstrapping	A statistical method based on repeated random sampling with replacement from an original sample to provide a collection of new pseudoreplicate samples, from which sampling variance can be estimated.
Nucleotide	Unit building block of DNA and RNA; a nucleotide consists of a sugar and phosphate backbone with a base attached.
Oligonucleotide	A short chain of nucleotides, often produced in the laboratory.
Parametric Bootstrapping	A method for producing independent pseudoreplicates of a data set by estimating parameters from the observed data, using the estimates to produce a model, and using the model to simulate replicate data sets.
Parapatry	Adjacent but non-overlapping distributions; see also sympatry and allopatry.
Phylogenetic	Relating to or based on evolutionary development or history.
Phylogeny	The historical relationships among lineages of organisms or their parts (eg. genes).
Pisolite	Rock composed of pisoliths.
Pisolith	A small rounded accretionary mass, usually of calcium carbonate.
Primers	Oligonucleotides used to initiate synthesis of DNA by a DNA polymerase or reverse transcriptase. A primer anneals to a complementary sequence in a single-stranded DNA or RNA template, and the polymerase then extends the complementary sequence from the primer.
Purine	A kind of base; in the DNA, adenine (A) and guanine (G) are purines.
Putative	Thought, assumed, or alleged to be such or to exist.
Pyrimidine	A kind of base; in the DNA, cytosine (C) and thymine (T), and in RNA, cytosine (C) and uracil (U) are pyrimidines.
Reproductive Isolation	Two populations, or individuals of opposite sex, are reproductively isolated from one another if they cannot together produce fertile offspring.

Short Range Endemic (SRE)	A species that has a naturally small distribution and is often characterised by having poor dispersal capabilities, confinement to disjunct habitats and low fecundity.
Stop Codon	Any of three codons (UAA, UAG, or UGA) that signal the termination of the synthesis of a protein. Also called "chain termination codon".
Stygofauna	Fauna inhabiting the various types of groundwater (Wilkens et al 2000).
Sympatry	The occurrence of organisms in overlapping geographical areas, but without interbreeding; see also allopatry and parapatry.
Systematics	A near synonym of taxonomy.
Taxonomy	Theory and practice of biological classification.
Transition	The substitution of a purine for another purine, or the substitution of a pyrimidine for another pyrimidine.
Transversion	The substitution of all types of nucleotide substitutions other than transitions.
Troglobite	Species which do not exist outside caves. They may, however, occur in the superficial underground compartment or in the upper hypogean zone (Wilkens et al 2000).
Troglophile	Species able to live a reproduce underground as well as in the epigean environment (Wilkens et al 2000).
Variance	A measure of the variability within a set of numbers. The more variable the numbers, the higher the variance.
Vug	A small cavity in a rock or vein, often with a mineral lining of different composition from that of the surrounding rock.

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Appendix 2

Details of Sampled Drillholes

Study Area and drillhole	Site status	Depth of hole	Easting	Northing	Zone	Trap depths
Cardo Bore						
CBRC014	Reference	14	417597	7543501	50	5, 10
CBRC026	Reference	36	417754	7545502	50	10, 20
CBRC028	Reference	27	417896	7545905	50	10, 20
CBRC034	Reference	17	418052	7545034	50	5, 10
CBRC038	Reference	21	419558	7545480	50	10, 20
CBRC040	Impact	33	420352	7545507	50	10, 20, 30
CBRC051	Reference	33	418458	7544594	50	10, 20, 30
CBRC057	Impact	46	421026	7545320	50	10, 20, 30
CBRC064	Impact	52	419944	7545001	50	10, 20, 30
CBRC078	Reference	40	418252	7544362	50	5, 10, 15
CBRC085	Reference	28	417501	7543001	50	10, 20
CBRC086	Reference	46	417271	7542798	50	10, 20, 30
CBRC088	Reference	0	420998	7551834	50	10, 20, 30
CBRC089	Reference	40	420906	7551750	50	10, 20, 30
CBRC092	Reference	46	421098	7551479	50	15, 30, 45
CBRC099	Impact	48	420603	7551427	50	15, 30, 45
CBRC103	Reference	50	420296	7551285	50	15, 30, 45
CBRC105	Impact	52	420080	7551277	50	15
CBRC112	Impact	58	419467	7551199	50	15, 30, 45
CBRC117	Impact	68	419297	7550901	50	15, 30, 45
CBRC122	Impact	62	418998	7550703	50	15, 30, 45
CBRC127	Impact	58	418895	7550400	50	15, 30, 40
CBRC133	Impact	40	422048	7545818	50	10, 20, 30
CBRC141	Impact	40	421169	7545156	50	10, 20, 30
CBRC142	Impact	40	421359	7545573	50	10, 20, 30
CBRC153	Impact	40	420348	7545795	50	10, 20, 30
CBRC192	Impact	40	419657	7551241	50	15, 30
CBRC201	Reference	52	419552	7545019	50	5, 20
CBRC203	Impact	34	420343	7544975	50	10, 20, 30
CBRC208	Impact	46	420056	7545189	50	5, 15
CBRC209	Impact	46	420208	7545399	50	10, 20
CBRC218	Impact	50	420907	7545527	50	10, 20, 30
CBRC289	Reference	0	419552	7545406	50	10, 20, 30
CBRC291	Reference	0	419050	7545000	50	10, 20, 30
CBRC297	Reference	0	418549	7544897	50	10, 20, 30
CBRC300	Reference	0	417557	7544890	50	10, 20, 30
CBRC307	Reference	0	417745	7545608	50	10, 20
Catho Well						
CWRC011	Impact	22	425497	7520304	50	10, 20
CWRC029	Reference	21	426699	7519905	50	5, 15
CWRC030	Reference	18	426703	7520002	50	5
CWRC032	Reference	19	426696	7520303	50	5, 10
CWRC038	Reference	21	426503	7520705	50	5, 10, 15
CWRC057	Impact	19	425902	7520697	50	5, 15
CWRC074	Impact	21	425301	7520900	50	10, 20
CWRC086	Impact	11	425700	7519653	50	5, 10
CWRC094	Impact	21	425310	7520053	50	10, 20
CWRC120	Reference	15	427003	7518396	50	5, 10
CWRC122	Impact	14	427001	7518598	50	5, 10
CWRC133	Reference	30	427195	7518810	50	10, 20
CWRC137	Reference	25	427402	7518602	50	10, 15
CWRC140	Reference	21	427599	7518804	50	5, 10, 15
CWRC143	Impact	18	427606	7518509	50	5, 10
CWRC144	Reference	21	427597	7518354	50	5, 10, 15
CWRC145	Reference	21	427621	7518208	50	10
CWRC146	Reference	17	427640	7518093	50	5, 15
CWRC151	Reference	21	427802	7519103	50	10, 15
CWRC155	Reference	15	428003	7519210	50	5, 15
CWRC159	Reference	25	425982	7521502	50	10, 20
CWRC160	Reference	20	425984	7521595	50	5, 10, 15
CWRC163	Impact	27	425800	7521698	50	5, 10, 15
CWRC166	Reference	23	425791	7521856	50	5, 10, 15
CWRC169	Impact	26	425602	7521399	50	10, 20
CWRC177	Impact	21	424799	7521474	50	5, 15
CWRC179	Impact	33	425200	7521599	50	10, 20, 30
CWRC183	Impact	46	425400	7522058	50	10, 20, 30

Study Area and drillhole	Site status	Depth of hole	Easting	Northing	Zone	Trap depths
CWRC185	Impact	38	425198	7522202	50	10, 20, 30
CWRC195	Impact	23	424391	7521987	50	10, 20
CWRC197	Impact	40	424599	7522510	50	10, 20, 30
CWRC217	Impact	44	425147	7522346	50	10, 20, 30
CWRC238	Impact	40	424507	7522797	50	10, 20, 30
CWRC246	Impact	22	424252	7522406	50	10, 20
CWRC253	Impact	34	424200	7522897	50	10, 20, 30
CWRC256	Impact	30	423940	7523236	50	10, 20, 30
CWRC258	Impact	22	423719	7523597	50	10, 20
CWRC265	Impact	24	424793	7522099	50	10, 20
CWRC272	Impact	18	425898	7520203	50	5, 15
CWRC274	Impact	34	423373	7523704	50	10, 20, 30
CWRC281	Impact	28	423098	7523999	50	10, 20, 25
CWRC302	Impact	40	422201	7524905	50	10, 20, 30
Kens Bore						
KBRC006	Impact	28	416253	7561400	50	10, 20
KBRC008	Impact	46	416805	7561396	50	10, 20, 30
KBRC020	Impact	52	415395	7561825	50	10, 20, 30
KBRC022	Reference	40	414630	7562063	50	10, 20, 30
KBRC023	Impact	58	417007	7560107	50	15, 30, 45
KBRC029	Impact	58	418193	7559312	50	5, 15, 25
KBRC030	Impact	38	418550	7559093	50	10, 20, 30
KBRC037	Reference	46	419216	7557851	50	10
KBRC038	Impact	54	420996	7556998	50	10, 20, 30
KBRC039	Impact	56	421004	7557401	50	15, 30, 45
KBRC040	Impact	58	420803	7557574	50	15, 30, 45
KBRC045	Impact	46	419798	7557800	50	10, 20, 30
KBRC049	Impact	56	418999	7558566	50	10, 20, 30
KBRC056	Impact	54	417894	7559659	50	10, 20, 30
KBRC064	Impact	50	418416	7558491	50	5, 10, 25
KBRC072	Impact	42	418607	7558295	50	10, 20, 30
KBRC076	Impact	56	419002	7558012	50	5, 10, 25
KBRC077	Impact	48	416441	7561001	50	5, 10
KBRC081	Impact	9	417077	7560593	50	5, 9
KBRC096	Impact	44	415803	7561938	50	10, 20
KBRC102	Impact	34	415190	7561971	50	10, 20
KBRC106	Reference	16	414789	7562117	50	10
KBRC108	Reference	22	414611	7562187	50	10, 20
KBRC189	Impact	52	418801	7558892	50	10
Cochrane & Jewell						
RNRC048	Impact	48	411401	7574037	50	15, 30, 45
RNRC055	Impact	44	412003	7576709	50	15, 30, 45
RNRC066	Reference	64	409996	7574991	50	15, 30, 45
RNRC067	Reference	56	409907	7575197	50	15, 30, 45
RNRC072	Impact	72	410036	7575952	50	10, 20
RNRC074	Impact	60	410622	7575790	50	15, 30, 45
RNRC082	Reference	100	409883	7574735	50	15, 30, 30
RNRC083	Reference	64	409997	7574440	50	15, 30, 45
RNRC094	Impact	70	411003	7576010	50	15, 30, 45
RNRC109	Impact	46	411199	7573902	50	15, 30, 45
RNRC128	Impact	82	411594	7574129	50	15, 30, 45
RNRC134	Reference	40	409401	7573603	50	10, 20, 30
RNRC135	Reference	58	409508	7573791	50	15, 30, 45
RNRC136	Reference	46	409706	7573703	50	15, 30, 45
RNRC139	Reference	40	409549	7574254	50	15, 30, 40
RNRC140	Reference	58	409179	7573939	50	15, 30, 45
RNRC142	Reference	34	409028	7573343	50	10, 20, 30
RNRC143	Reference	34	409000	7573525	50	10, 20, 30
RNRC152	Impact	68	410511	7574100	50	15, 30, 45
RNRC157	Impact	70	410679	7574107	50	15, 30, 45
RNRC160	Impact	58	410813	7573827	50	15, 30, 45
RNRC162	Impact	70	410944	7574213	50	15, 30, 45
RNRC180	Impact	58	411314	7576324	50	15, 30, 45
RNRC184	Impact	34	411901	7575888	50	10, 20, 30
RNRC185	Impact	40	411932	7575726	50	10, 20, 30
RNRC189	Impact	28	411503	7575802	50	10, 20
RNRC193	Impact	28	410766	7575989	50	10, 20, 30

Study Area and drillhole	Site status	Depth of hole	Easting	Northing	Zone	Trap depths
RNRC198	Impact	22	411182	7575888	50	10, 20
RNRC211	Impact	34	410460	7576417	50	10, 20, 30
RNRC213	Impact	28	409465	7576672	50	10, 20
RNRC216	Impact	28	409676	7577059	50	10, 20
RNRC245	Impact	52	410049	7575496	50	15, 30, 45
RNRC255	Reference	30	410201	7576198	50	10, 20
RNRC256	Reference	26	410218	7575948	50	10, 20
RNRC263	Reference	46	409804	7576118	50	15
RNRC266	Reference	28	409802	7576415	50	10, 20
Trinity Bore						
TBRC001	Impact	36	433576	7529651	50	10 20 30
TBRC004	Reference	26	434197	7530703	50	10, 25
TBRC006	Reference	58	434594	7530230	50	15 30 45
TBRC008	Reference	34	434601	7530601	50	15, 20
TBRC009	Reference	46	434202	7530106	50	10 20 30
TBRC010	Reference	40	434393	7530140	50	10 20 30
TBRC011	Reference	58	434403	7530301	50	15, 30, 45
TBRC013	Reference	46	434192	7530335	50	10 20 30
TBRC014	Reference	46	433984	7530231	50	10, 25
TBRC016	Impact	46	430410	7527600	50	15, 30
TBRC023	Impact	46	431199	7527197	50	15, 30, 45
TBRC026	Impact	40	431501	7528114	50	10 20 30
TBRC029	Impact	52	432397	7529509	50	15 30 45
TBRC031	Reference	40	431933	7529301	50	10 20 30
TBRC035	Reference	40	430197	7526904	50	10
TBRC036	Reference	40	430009	7526897	50	10 20 30
TBRC038	Reference	40	429900	7526498	50	10
TBRC041	Reference	46	430046	7526108	50	10 20 30
TBRC045	Reference	22	428694	7525248	50	10 20
TBRC049	Reference	40	429495	7525302	50	10 20 35
TBRC056	Reference	28	429477	7524490	50	10 25
TBRC062	Reference	28	428302	7524502	50	10 25
TBRC078	Reference	22	430593	7522899	50	10 20
TBRC087	Reference	46	429696	7522506	50	15 30 45
TBRC119	Impact	38	433400	7529547	50	10 20 30
TBRC120	Impact	40	432978	7529460	50	10 20 35
TBRC122	Impact	36	432770	7529596	50	10 20 30
TBRC130	Impact	34	432003	7528896	50	10 20 30
TBRC133	Impact	42	431694	7527898	50	10 20 30
TBRC137	Impact	34	431603	7527505	50	10 25
TBRC141	Impact	40	431400	7527643	50	10 20 35
TBRC150	Reference	34	430997	7527408	50	10 20 30
TBRC151	Impact	34	430597	7527793	50	10 20 30
TBRC154	Impact	38	430610	7527605	50	10 20 30
TBRC155	Impact	26	430999	7527881	50	10 20
TBRC156	Impact	28	430995	7527808	50	10 25
TBRC161	Impact	34	431838	7528299	50	10 20 30
TBRC163	Impact	34	431796	7528511	50	10 20 30
TBRC182	Reference	32	429694	7523305	50	10 20 30
TBRC196	Reference	22	428902	7523703	50	10 20
Upper Cane						
UCRC003	Impact	34	425515	7545940	50	10, 20, 30
UCRC021	Impact	58	422995	7545605	50	10, 25, 40
UCRC029	Impact	48	424198	7545508	50	15, 30, 45
UCRC033	Impact	50	425618	7546113	50	15, 30, 45
UCRC040	Impact	32	425301	7545713	50	10, 20, 30
UCRC042	Impact	34	425200	7545857	50	10, 20, 30
UCRC046	Reference	16	424696	7546205	50	5, 15
UCRC051	Impact	42	424598	7545915	50	10, 20, 30
UCRC052	Impact	56	424602	7545505	50	15, 30, 45
UCRC053	Impact	46	424601	7545715	50	15, 30, 45
UCRC055	Impact	42	422804	7545766	50	10, 20, 30
UCRC062	Impact	38	423156	7545372	50	10, 20, 30
UCRC064	Impact	50	423299	7545266	50	5, 15, 25
UCRC069	Impact	46	423699	7545340	50	15, 30, 45
UCRC07	Impact	0	424991	7545949	50	5,10
UCRC072	Impact	40	423891	7545525	50	10, 20, 30

Study Area and drillhole	Site status	Depth of hole	Easting	Northing	Zone	Trap depths
UCRC076	Impact	44	424260	7545603	50	10, 20, 30
UCRC078	Impact	52	424082	7545674	50	15, 30, 45
UCRC09	Reference	0	424601	7546205	50	5,10,15
UCRC93	Impact	0	424503	7546100	50	5,10
UCRC308	Reference	20	424749	7546336	50	10, 20
UCRC300	Reference	14	424924	7546489	50	4, 14
UCRC301	Reference	20	425138	7546601	50	10, 20
UCRC303	Reference	70	424948	7546720	50	15, 30, 45
UCRC299	Reference	30	424492	7546419	50	10, 20, 30
UCRC311	Reference	20	424796	7546195	50	10, 20
UCRC312	Reference	20	424793	7546144	50	10, 20
UCRC309	Reference	24	424602	7546308	50	10, 20
UCRC307	Reference	20	424578	7546492	50	10, 20
UCRC305	Reference	40	424649	7546664	50	10, 25, 40
UCRC304	Reference	20	424771	7546672	50	10, 20
UCRC306	Reference	20	424696	7546509	50	10, 20
UCRC302	Reference	20	424997	7546606	50	10, 20
UCRC310	Reference	30	424524	7546219	50	10, 20, 30
UCRC298	Reference	24	424423	7546347	50	10, 20

Appendix 2

Details of Troglobitic Specimens

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
1	23/10/07	Cardo Bore E	CBRC014	417597	7543501	CBRC014T1-2		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
1	23/10/07	Cardo Bore E	CBRC201	419552	7545019	CBRC201T1-2		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
1	22/10/07	Catho Well	CWRC029	426699	7519905	CWRC029T2-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
1	24/10/07	Catho Well	CWRC094	425310	7520053	CWRC094T1-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
1	24/10/07	Catho Well	CWRC137	427402	7518602	CWRC137T2-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
1	24/10/07	Catho Well	CWRC151	427802	7519103	CWRC151T2-1	92569	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
1	24/10/07	Catho Well	CWRC179	425200	7521599	CWRC179T1-1	54126	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	T. Finston
1	24/10/07	Catho Well	CWRC197	424599	7522510	CWRC197T3-3	92570	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
1	22/10/07	Catho Well	CWRC256	423940	7523236	CWRC256T3-1	14707	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. B	2	Complete	F. Stone, T. Finston
1	24/10/07	Cochrane / Jewell	RNRC048	411401	7574037	RNRC048T3-2	54129	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (molecular)	Z. Hamilton
1	23/10/07	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083T2-2	92564	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
1	23/10/07	Cochrane / Jewell	RNRC094	411003	7576010	RNRC094T3-3	54134	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
1	23/10/07	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189T2-1	54123	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
1	23/10/07	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189T2-3	92567	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
1	24/10/07	Cochrane / Jewell	RNRC213	409465	7576672	RNRC213T2-1	54128	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
1	23/10/07	Kens Bore	KBRC008	416805	7561396	KBRC008P2T3-1	92577	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	5	Complete (molecular)	T. Finston
1	23/10/07	Kens Bore	KBRC008	416805	7561396	KBRC008T2-1	92578	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	7	Complete (molecular)	T. Finston
1	23/10/07	Kens Bore	KBRC008	416805	7561396	KBRC008T3-1	92579	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
1	23/10/07	Kens Bore	KBRC076	419002	7558012	KBRC076T1-2	92581	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Lagynochthonius* sp.	1	Juvenile	M. Harvey
1	24/10/07	Upper Cane	UCRC021	422995	7545605	UCRC021T3-1	54131	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC021	422995	7545605	UCRC021T3-2	14706	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
1	24/10/07	Upper Cane	UCRC029	424198	7545508	UCRC029T3-1	54130	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC064	423299	7545266	UCRC064T2-2	54125	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC069	423699	7545340	UCRC069T2-1	54127	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC069	423699	7545340	UCRC069T3-1	54139	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	7	Complete (both)	V. Framenau
1	24/10/07	Upper Cane	UCRC072	423891	7545525	UCRC072T3-1	54124	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	4	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC072	423891	7545525	UCRC072T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
1	24/10/07	Upper Cane	UCRC076	424260	7545603	UCRC076T1-1	54122	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
1	24/10/07	Upper Cane	UCRC076	424260	7545603	UCRC076T2-1	54138	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Cardo Bore E	CBRC208	420056	7545189	CBRC208P2T1-1	54144	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Catho Well	CWRC137	427402	7518602	CWRC137P2T2-2	92571	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
2	17/01/08	Catho Well	CWRC151	427802	7519103	CWRC151P2T2-1	92573	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	5	Complete (molecular)	T. Finston
2	17/01/08	Catho Well	CWRC179	425200	7521599	CWRC179P2T3-1	93282	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
2	17/01/08	Cochrane / Jewell	RNRC048	411401	7574037	RNRC048P2T3-2	92563	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	5	Complete (molecular)	T. Finston
2	17/01/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P2T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Cochrane / Jewell	RNRC157	410679	7574107	RNRC157P2T2-1	92565	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
2	17/01/08	Cochrane / Jewell	RNRC162	410944	7574213	RNRC162P2T2-1	54136	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'gemma'	1	Complete (both)	V. Framenau
2	17/01/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P2T3-1	92566	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
2	16/01/08	Cochrane / Jewell	RNRC198	411182	7575888	RNRC198P2T1-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp. C	1	Complete (morphology)	G. Smith
2	17/01/08	Kens Bore	KBRC008	416805	7561396	KBRC008P2T2-2	92575	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	29	Complete (molecular)	T. Finston
2	17/01/08	Kens Bore	KBRC022	414630	7562063	KBRC022P2T1-3	92577	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	4	Complete (molecular)	T. Finston
2	17/01/08	Kens Bore	KBRC023	417007	7560107	KBRC023P2T2-1	54175	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'kens'	1	Complete (molecular)	T. Finston
2	17/01/08	Kens Bore	KBRC038	420996	7556998	KBRC038P2T3-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
2	17/01/08	Upper Cane	UCRC003	425515	7545940	UCRC003P2T2-1	54141	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
2	17/01/08	Upper Cane	UCRC003	425515	7545940	UCRC003P2T1-1	54142	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
2	17/01/08	Upper Cane	UCRC029	424198	7545508	UCRC029P2T1-1	54133	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
2	17/01/08	Upper Cane	UCRC040	425301	7545713	UCRC040P2T1-1	54135	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC040	425301	7545713	UCRC040P2T3-1	14710	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC040	425301	7545713	UCRC040P2T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC042	425200	7545857	UCRC042P2T3-1	54145	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
2	17/01/08	Upper Cane	UCRC046	424696	7546205	UCRC046P2T1-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC046	424696	7546205	UCRC046P2T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC051	424598	7545915	UCRC051P2T3-1	54143	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC051	424598	7545915	UCRC051P2T2-1	54146	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC051	424598	7545915	UCRC051P2T3-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC052	424602	7545505	UCRC052P2T1-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC053	424601	7545715	UCRC053P2T2-1	54137	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC053	424601	7545715	UCRC053P2T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC053	424601	7545715	UCRC053P2T3-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC062	423156	7545372	UCRC062P2T3-1	54147	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC069	423699	7545340	UCRC069P2T3-1	54132	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	T. Finston
2	17/01/08	Upper Cane	UCRC069	423699	7545340	UCRC069P2T3-2	92574	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
2	17/01/08	Upper Cane	UCRC072	423891	7545525	UCRC072P2T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC076	424260	7545603	UCRC076P2T2-2	54140	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
2	17/01/08	Upper Cane	UCRC076	424260	7545603	UCRC076P2T3-1	14144	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC076	424260	7545603	UCRC076P2T1-1	15142	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
2	17/01/08	Upper Cane	UCRC076	424260	7545603	UCRC076P2T2-1	15143	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	17/08/08	Cardo Bore E	CBRC026	417754	7545502	CBRC026P3T2-4	92552	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Cardo Bore E	CBRC051	418458	7544594	CBRC051P3T3-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	6	Complete (molecular)	T. Finston
3	17/08/08	Cardo Bore E	CBRC051	418458	7544594	CBRC051P3T2-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
3	17/08/08	Cardo Bore E	CBRC051	418458	7544594	CBRC051P3T1-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Cardo Bore E	CBRC133	422048	7545818	CBRC133P3T3-1	14678	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	17/08/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P3T1-1	92553	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
3	17/08/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P3T3-4	92554	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
3	17/08/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P3T3-6		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	2	Indet	G. Smith
3	18/08/08	Cardo Bore N	CBRC089	420906	7551750	CBRC089P3T2-1	92533	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (both)	V. Framenau
3	18/08/08	Cardo Bore N	CBRC092	421098	7551479	CBRC091P3T1-3	93151	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	10	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC092	421098	7551479	CBRC091P3T3-1	14907	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Cardo Bore N	CBRC092	421098	7551479	CBRC091P3T1-2	93141	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Cardo Bore N	CBRC099	420603	7551427	CBRC099P3T1-4		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC105	420080	7551277	CBRC105P3T2-5		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Cardo Bore N	CBRC105	420080	7551277	CBRC105P3T2-2	92548	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC105	420080	7551277	CBRC105P3T3-5	92549	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	5	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC105	420080	7551277	CBRC105P3T1-5	92551	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T1-5	14905	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T3-6	14906	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T1-2	93153	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	18	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T3-4	93154	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	4	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T2-2	93155	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC112	419467	7551199	CBRC111P3T2-1	93144	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC117	419297	7550901	CBRC117P3T1-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
3	18/08/08	Cardo Bore N	CBRC117	419297	7550901	CBRC117P3T2-2	92550	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	12	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC127	418895	7550400	CBRC127P3T2-4		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC127	418895	7550400	CBRC127P3T1-4		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Cardo Bore N	CBRC192	419657	7551241	CBRC192P3T2-4	93150	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	3	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC094	425310	7520053	CWRC094P3T2-3		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
3	17/08/08	Catho Well	CWRC137	427402	7518602	CWRC137P3T1-1	93149	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC151	427802	7519103	CWRC151P3T1-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
3	17/08/08	Catho Well	CWRC151	427802	7519103	CWRC151P3T2-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp. F	1	Complete (morphology)	G. Smith
3	17/08/08	Catho Well	CWRC159	425982	7521502	CWRC159P3T1-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC177	424799	7521474	CWRC177P3T2-1	92509	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	2	Indet	V. Framenau
3	17/08/08	Catho Well	CWRC195	424391	7521987	CWRC195P3T2-1	92557	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	3	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC195	424391	7521987	CWRC195P3T3-1	93148	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC258	423719	7523597	CWRC258P3T1-3	93152	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	17/08/08	Catho Well	CWRC274	423373	7523704	CWRC274P3T1-2	92546	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
3	17/08/08	Catho Well	CWRC281	423098	7523999	CWRC281P3T3-2	92506	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	Z. Hamilton
3	17/08/08	Catho Well	CWRC281	423098	7523999	CWRC281P3T1-2	92508	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	Z. Hamilton
3	17/08/08	Catho Well	CWRC302	422201	7524905	CWRC302P3T3-3	92507	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	T. Finston
3	19/08/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P3T2-4	92538	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (molecular)	Z. Hamilton
3	19/08/08	Cochrane / Jewell	RNRC109	411199	7573902	RNRC109P3T2-2	92534	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	T. Finston
3	19/08/08	Cochrane / Jewell	RNRC139	409549	7574254	RNRC139P3T2-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
3	19/08/08	Cochrane / Jewell	RNRC140	**409179**	**7573939**	RNRC140P3T1-4	92536	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (both)	V. Framenau
3	19/08/08	Cochrane / Jewell	RNRC162	410944	7574213	RNRC162P3T3-1	92539	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	T. Finston
3	19/08/08	Cochrane / Jewell	RNRC180	411314	7576324	RNRC180P3T1-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
3	19/08/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P3T3-5	92535	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
3	19/08/08	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189P3T2-4	92537	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (molecular)	T. Finston
3	19/08/08	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189P3T1-1	92541	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (both)	V. Framenau
3	19/08/08	Cochrane / Jewell	RNRC198	411182	7575888	RNRC198P3T3-4	92540	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Kens Bore	KBRC008	416805	7561396	KBRC008P3T3-3	14703	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC001	433576	7529651	TBRC001P3T1-2		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
3	18/08/08	Trinity Bore	TBRC011	434403	7530301	TBRC011P3T1-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC014	433984	7530231	TBRC014P3T1-1	14903	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC014	433984	7530231	TBRC014P3T2-2	14904	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC014	433984	7530231	TBRC014P3T2-1	93142	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'confusus'	1	Complete (morphology)	V. Framenau
3	18/08/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P3T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P3T1-2	92542	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
3	18/08/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P3T3-2	92542	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
3	18/08/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P3T3-1	92511	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	3	Complete (both)	V. Framenau
3	18/08/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P3T1-1	92515	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (both)	V. Framenau
3	18/08/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P3T1-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P3T2-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P3T2-1	92560	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	3	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P3T2-2	92514	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T1-1	93285	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T2-1	93286	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T3-1	93287	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T3-2		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp. E	1	Complete (morphology)	G. Smith
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T1-5		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp. F	1	Complete (morphology)	G. Smith
3	18/08/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P3T3-4	92510	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (both)	V. Framenau
3	18/08/08	Trinity Bore	TBRC038	429900	7526498	TBRC038P3T1-1	93283	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
3	18/08/08	Trinity Bore	TBRC038	429900	7526498	TBRC038P3T1-5	92517	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC119	433400	7529547	TBRC119P3T3-1	92559	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC133	431694	7527898	TBRC133P3T1-2	92562	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P3T2-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	2	Complete	M. Koch
3	18/08/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P3T3-5	92543	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
3	18/08/08	Trinity Bore	TBRC154	430610	7527605	TBRC154P3T1-3	92561	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC154	430610	7527605	TBRC154P3T3-6	92513	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC154	430610	7527605	TBRC154P3T2-3	92516	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	2	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC156	430995	7527808	TBRC156P3T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Trinity Bore	TBRC156	430995	7527808	TBRC156P3T2-1	92512	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	2	Complete (molecular)	T. Finston
3	18/08/08	Trinity Bore	TBRC161	431838	7528299	TBRC161P3T2-3	92558	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Upper Cane	UCRC021	422995	7545605	UCRC021P3T1-3	92521	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC021	422995	7545605	UCRC021P3T1-4		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC021	422995	7545605	UCRC021P3T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC021	422995	7545605	UCRC021P3T3-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC029	424198	7545508	UCRC029P3T3-1	92527	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	Z. Hamilton
3	18/08/08	Upper Cane	UCRC029	424198	7545508	UCRC029P3T2-2	92531	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Upper Cane	UCRC029	424198	7545508	UCRC029P3T2-1	92545	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Syarinidae	*Ideoblothrus* sp.	1	Juvenile	M. Harvey
3	18/08/08	Upper Cane	UCRC033	425618	7546113	UCRC033P3T1-1	92555	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Upper Cane	UCRC033	425618	7546113	UCRC033P3T3-2	92556	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
3	18/08/08	Upper Cane	UCRC033	425618	7546113	UCRC033P3T2-2	92544	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Lagynochthonius* sp. E	1	Complete (morphology)	M. Harvey
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T1-1	92518	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T3-1	92522	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	5	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T2-1	92526	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T2-2	14694	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T1-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T3-7		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
3	18/8/08	Upper Cane	UCRC040	425301	7545713	UCRC040P3T2-1		Arthropoda	Myriapoda	Diplopoda	Polydesmida	Indet	Polydesmida sp.	1	Indet	V. Framenau
3	18/08/08	Upper Cane	UCRC042	425200	7545857	UCRC042P3T2-1	92525	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC042	425200	7545857	UCRC042P3T1-1	92528	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	5	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC042	425200	7545857	UCRC042P3T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC046	424696	7546205	UCRC046P3T2-1	14682	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC046	424696	7546205	UCRC046P3T1-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC051	424598	7545915	UCRC051P3T2-2	92520	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC051	424598	7545915	UCRC051P3T1-3	92523	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC051	424598	7545915	UCRC051P3T3-4	92532	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Upper Cane	UCRC051	424598	7545915	UCRC051P3T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	5	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC053	424601	7545715	UCRC053P3T1-4		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC055	422804	7545766	UCRC055P3T3-4	14677	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC062	423156	7545372	UCRC062P3T3-1	92529	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC062	423156	7545372	UCRC062P3T1-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC062	423156	7545372	UCRC062P3T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC069	423699	7545340	UCRC069P3T1-1	92524	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC069	423699	7545340	UCRC069P3T2-1	93143	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC072	423891	7545525	UCRC072P3T2-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC072	423891	7545525	UCRC072P3T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC078	424082	7545674	UCRC078P3T3-1	92519	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
3	18/08/08	Upper Cane	UCRC078	424082	7545674	UCRC078P3T2-2	92530	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
3	18/08/08	Upper Cane	UCRC078	424082	7545674	UCRC078P3T1-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	6	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC078	424082	7545674	UCRC078P3T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
3	18/08/08	Upper Cane	UCRC078	424082	7545674	UCRC078P3T3-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Cardo Bore E	CBRC133	422048	7545818	CBRC133P4T3-3	15159	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Cardo Bore E	CBRC133	422048	7545818	CBRC133P4T1-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
4	16/10/08	Cardo Bore E	CBRC133	422048	7545818	CBRC133P4T3-1	293199	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
4	16/10/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P4T2-3	93185	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	13	Complete (molecular)	T. Finston
4	16/10/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P4T3-3	93190	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
4	16/10/08	Cardo Bore N	CBRC127	418895	7550400	CBRC127P4T3-2	15169	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Catho Well	CWRC179	425200	7521599	CWRC179P4T2-3	93187	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
4	16/10/08	Catho Well	CWRC195	424391	7521987	CWRC195P4T2-2	93189	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	9	Complete (molecular)	T. Finston
4	16/10/08	Catho Well	CWRC274	423373	7523704	CWRC274P4T1-4		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
4	16/10/08	Catho Well	CWRC281	423098	7523999	CWRC281P4T2-1	93192	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	2	Complete (both)	V. Framenau
4	16/10/08	Catho Well	CWRC302	422201	7524905	CWRC302P4T2-2	93200	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	T. Finston
4	16/10/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P4T2-3	15171	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
4	16/10/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P4T2-4	93193	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
4	16/10/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P4T1-3	93197	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (both)	V. Framenau
4	16/10/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P4T3-3	93198	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
4	16/10/08	Cochrane / Jewell	RNRC109	411199	7573902	RNRC109P4T2-3	93207	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
4	16/10/08	Cochrane / Jewell	RNRC180	411314	7576324	RNRC180P4T2-4	93157	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
4	16/10/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P4T1-3	15170	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P4T2-3	93191	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (molecular)	Z. Hamilton

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
4	16/10/08	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189P4T2-5	93158	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
4	16/10/08	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189P4T1-1	93194	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
4	16/10/08	Kens Bore	KBRC008	416805	7561396	KBRC008P4T1-3	15180	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
4	16/10/08	Kens Bore	KBRC008	416805	7561396	KBRC008P4T2-3	15181	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
4	16/10/08	Kens Bore	KBRC008	416805	7561396	KBRC008P4T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Trinity Bore	TBRC001	433576	7529651	TBRC001P4T3-4	93186	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
4	16/10/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P4T2-4	15183	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P4T3-4	93195	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	T. Finston
4	16/10/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P4T2-4		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
4	16/10/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P4T3-3		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
4	16/10/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P4T1-3		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
4	16/10/08	Trinity Bore	TBRC150	430997	7527408	TBRC150P4T1-3	93188	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
4	16/10/08	Trinity Bore	TBRC156	430995	7527808	TBRC156P4T2-3	-	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
4	16/10/08	Trinity Bore	TBRC156	430995	7527808	TBRC156P4T1-3	93196	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	T. Finston
4	16/10/08	Trinity Bore	TBRC196	428902	7523703	TBRC196P4T1-3	93156	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius aridus*	1	Complete (morphology)	M. Harvey
4	16/10/08	Upper Cane	UCRC021	422995	7545605	UCRC021P4T2-1	93202	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (both)	V. Framenau
4	16/10/08	Upper Cane	UCRC021	422995	7545605	UCRC021P4T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC033	425618	7546113	UCRC033P4T2-4	93201	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
4	16/10/08	Upper Cane	UCRC040	425301	7545713	UCRC040P4T1-1	15173	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC040	425301	7545713	UCRC040P4T3-1	15174	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC051	424598	7545915	UCRC051P4T2-1	15176	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC053	424601	7545715	UCRC053P4T1-2	15172	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC062	423156	7545372	UCRC062P4T3-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC064	423299	7545266	UCRC064P4T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC069	423699	7545340	UCRC069P4T1-1	15154	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC069	423699	7545340	UCRC069P4T3-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	15	Complete (molecular)	T. Finston
4	16/10/08	Upper Cane	UCRC069	423699	7545340	UCRC069P4T2-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
4	16/10/08	Upper Cane	UCRC072	423891	7545525	UCRC072P4T1-1	15163	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC072	423891	7545525	UCRC072P4T3-3	15164	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
4	16/10/08	Upper Cane	UCRC076	424260	7545603	UCRC076P4T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	6	Complete	F. Stone, T. Finston
5	28/11/08	Cardo Bore E	CBRC034	418052	7545034	CBRC034P5T1-1	93225	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Cardo Bore E	CBRC064	419944	7545001	CBRC064P5T2-2	93247	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Cardo Bore E	CBRC141	421169	7545156	CBRC141P5T1-3	93245	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Cardo Bore E	CBRC141	421169	7545156	CBRC141P5T2-3	93246	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	4	Complete (molecular)	T. Finston
5	28/11/08	Cardo Bore E	CBRC153	420348	7545795	CBRC153P5T1-1	93224	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Cardo Bore N	CBRC089	420906	7551750	CBRC089P5T2-1		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
5	28/11/08	Cardo Bore N	CBRC092	421098	7551479	CBRC092P5T2-1	15182	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Cardo Bore N	CBRC092	421098	7551479	CBRC092P5T3-1	93238	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
5	28/11/08	Cardo Bore N	CBRC092	421098	7551479	CBRC092P5T1-1	93227	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Cardo Bore N	CBRC099	420603	7551427	CBRC099P5T1-3	93223	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Cardo Bore N	CBRC103	420296	7551285	CBRC103P5T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
5	28/11/08	Cardo Bore N	CBRC103	420296	7551285	CBRC103P5T1-3	93237	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
5	28/11/08	Cardo Bore N	CBRC127	418895	7550400	CBRC127P5T3-3	15161	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Cardo Bore N	CBRC127	418895	7550400	CBRC127P5T2-3	15162	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
5	28/11/08	Cardo Bore N	CBRC192	419657	7551241	CBRC192P5T2-1	93222	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
5	28/11/08	Catho Well	CWRC032	426696	7520303	CWRC032P5T2-1	93243	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Catho Well	CWRC032	426696	7520303	CWRC032P5T1-2	93244	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Catho Well	CWRC151	427802	7519103	CWRC151P5T1-1	93242	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Catho Well	CWRC197	424599	7522510	CWRC197P5T2-2		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
5	28/11/08	Catho Well	CWRC302	422201	7524905	CWRC302P5T3-3	93226	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	2	Complete (molecular)	Z. Hamilton
5	28/11/08	Cochrane / Jewell	RNRC083	409997	7574440	RNRC083P5T1-3	93229	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (both)	V. Framenau
5	28/11/08	Cochrane / Jewell	RNRC109	411199	7573902	RNRC109P5T2-2	93228	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	T. Finston
5	28/11/08	Cochrane / Jewell	RNRC136	409706	7573703	RNRC136P5T3-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Cochrane / Jewell	RNRC139	409549	7574254	RNRC139P5T3-3		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
5	28/11/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P5T1-1	93230	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (both)	V. Framenau
5	28/11/08	Cochrane / Jewell	RNRC184	411901	7575888	RNRC184P5T3-1	93232	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (both)	V. Framenau
5	28/11/08	Cochrane / Jewell	RNRC189	411503	7575802	RNRC189P5T1-1	93231	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	2	Complete (both)	V. Framenau
5	28/11/08	Cochrane / Jewell	RNRC198	411182	7575888	RNRC198P5T3-1	15153	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
5	28/11/08	Cochrane / Jewell	RNRC198	411182	7575888	RNRC198P5T3-6	93233	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	Z. Hamilton
5	28/11/08	Kens Bore	KBRC008	416805	7561396	KBRC008P5T3-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC008	434601	7530601	TBRC008P5T2-3	93208	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cochrana'	1	Complete (molecular)	T. Finston
5	28/11/08	Trinity Bore	TBRC014	433984	7530231	TBRC014P5T2-2	15168	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC014	433984	7530231	TBRC014P5T1-2	93209	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'confusus'	1	Complete (molecular)	T. Finston
5	28/11/08	Trinity Bore	TBRC016	430410	7527600	TBRC016P5T1-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC016	430410	7527600	TBRC016P5T2-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC023	431199	7527197	TBRC023P5T2-3	93234	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
5	28/11/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P5T2-1	15156	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P5T3-1	15158	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC026	431501	7528114	TBRC026P5T1-1	15160	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC031	431933	7529301	TBRC031P5T3-4	93240	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
5	28/11/08	Trinity Bore	TBRC036	430009	7526897	TBRC036P5T3-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
5	28/11/08	Trinity Bore	TBRC041	430046	7526108	TBRC041P5T1-2	93241	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	2	Complete (molecular)	T. Finston
5	28/11/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P5T3-1	15155	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P5T1-2		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
5	28/11/08	Trinity Bore	TBRC141	431400	7527643	TBRC141P5T3-6	93236	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp. D	1	Complete (morphology)	M. Harvey
5	28/11/08	Trinity Bore	TBRC156	430995	7527808	TBRC156P5T2-3	93210	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	Z. Hamilton
5	28/11/08	Upper Cane	UCRC021	422995	7545605	UCRC021P5T1-4	15186	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC029	424198	7545508	UCRC029P5T3-2	93216	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (both)	V. Framenau
5	28/11/08	Upper Cane	UCRC029	424198	7545508	UCRC029P5T2-3	15175	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC029	424198	7545508	UCRC029P5T1-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC040	425301	7545713	UCRC040P5T2-3	93211	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Upper Cane	UCRC040	425301	7545713	UCRC040P5T3-3	93212	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (both)	V. Framenau
5	28/11/08	Upper Cane	UCRC040	425301	7545713	UCRC040P5T1-4	93214	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (both)	V. Framenau
5	28/11/08	Upper Cane	UCRC040	425301	7545713	UCRC040P5T1-3	15145	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC042	425200	7545857	UCRC042P5T2-1	93220	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
5	28/11/08	Upper Cane	UCRC046	424696	7546205	UCRC046P5T1-1	15177	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC046	424696	7546205	UCRC046P5T2-1	15178	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC051	424598	7545915	UCRC051P5T1-1	93219	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	Z. Hamilton
5	28/11/08	Upper Cane	UCRC051	424598	7545915	UCRC051P5T2-2	15146	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC051	424598	7545915	UCRC051P5T3-1	15147	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC052	424602	7545505	UCRC052P5T3-1	15179	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC053	424601	7545715	UCRC053P5T3-2	93221	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
5	28/11/08	Upper Cane	UCRC062	423156	7545372	UCRC062P5T3-3	15184	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC069	423699	7545340	UCRC069P5T3-5	93213	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
5	28/11/08	Upper Cane	UCRC069	423699	7545340	UCRC069P5T2-3	93218	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	Z. Hamilton
5	28/11/08	Upper Cane	UCRC069	423699	7545340	UCRC069P5T2-5	15165	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC069	423699	7545340	UCRC069P5T3-3	15166	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC069	423699	7545340	UCRC069P5T1-4	15167	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC072	423891	7545525	UCRC072P5T1-4	93217	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
5	28/11/08	Upper Cane	UCRC072	423891	7545525	UCRC072P5T3-3	15184	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
5	28/11/08	Upper Cane	UCRC076	424260	7545603	UCRC076P5T3-3	93215	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (both)	V. Framenau
6	26/3/09	Cardo Bore E	CBRC028	417896	7545905	CBRC028P6T1-2	15121	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
6	26/3/09	Cardo Bore E	CBRC078	418252	7544362	CBRC078P6T1-3		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
6	26/3/09	Kens Bore	KBRC077	416441	7561000	KBRC077P6T1-4		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
6	26/3/09	Kens Bore	KBRC096	415803	7561938	KBRC096P6T2-3	93780	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
6	26/3/09	Kens Bore	KBRC189	418801	7558892	KBRC189P6T1-3	15122	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC004	434197	7530703	TBRC004P6T2-4		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
6	26/3/09	Trinity Bore	TBRC010	434393	7530140	TBRC010P6T2-3	15116	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC010	434393	7530140	TBRC010P6T3-3	15117	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC026	431501	7528114	TBRC026P6T1-3	15126	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC026	431501	7528114	TBRC026P6T2-3	15127	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC026	431501	7528114	TBRC026P6T3-3	15128	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC029	432397	7529509	TBRC029P6T1-3	15115	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC029	432397	7529509	TBRC029P6T3-3	93779	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
6	26/3/09	Trinity Bore	TBRC031	431933	7529301	TBRC031P6T3-2	15120	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P6T1-3	15129	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P6T2-5	15130	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
6	26/3/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P6T1-6	93771	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius aridus*	1	Complete (morphology)	M. Harvey
6	26/3/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P6T3-5	93778	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
6	26/3/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P6T2-4		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
6	26/3/09	Trinity Bore	TBRC156	430995	7527808	TBRC156P6T1-4	93770	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius aridus*	1	Complete (morphology)	M. Harvey
6	26/3/09	Upper Cane	UCRC040	425301	7545713	UCRC040P6T1-3		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
6	26/3/09	Upper Cane	UCRC040	425301	7545713	UCRC040P6T3-4	12124	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
6	26/3/09	Upper Cane	UCRC040	425301	7545713	UCRC040P6T2-3	15123	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
6	26/3/09	Upper Cane	UCRC046	424696	7546205	UCRC046P6T1-3	15134	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	8	Complete	F. Stone, T. Finston
6	26/3/09	Upper Cane	UCRC055	422804	7545766	UCRC055P6T1-3	15135	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
6	26/3/09	Upper Cane	UCRC076	424260	7545603	UCRC076P6T1-4		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
6	26/3/09	Upper Cane	UCRC076	424260	7545603	UCRC076P6T1-3	15132	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Cardo Bore N	CBRC088	420998	7551834	CBRC088P7T1-3	15136	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
7	15/5/09	Cardo Bore N	CBRC092	421098	7551479	CBRC092P7T1-4		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	T. Finston
7	15/5/09	Cardo Bore N	CBRC099	420603	7551427	CBRC099P7T1-2	93768	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp. B	1	Complete (morphology)	M. Harvey
7	15/5/09	Cardo Bore N	CBRC103	420296	7551285	CBRC103P7T1-2	15133	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Cardo Bore N	CBRC103	420296	7551285	CBRC103P7T1-1		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	T. Finston
7	15/5/09	Cardo Bore N	CBRC112	419467	7551199	CBRC112P7T2-1	93769	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp. B	1	Complete (morphology)	M. Harvey
7	15/5/09	Cardo Bore N	CBRC122	418998	7550703	CBRC122P7T1-1	15131	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Cardo Bore N	CBRC122	418998	7550703	CBRC122P7T1-5	93766	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp. B	1	Complete (morphology)	M. Harvey
7	15/5/09	Cardo Bore N	CBRC192	419657	7551241	CBRC192P7T1-1	98321	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (both)	V. Framenau
7	15/5/09	Cardo Bore N	CBRC192	419657	7551241	CBRC192P7T2-5		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (molecular)	T. Finston
7	15/5/09	Catho Well	CWRC144	427597	7518354	CWRC144P7T2-2	98323	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
7	15/5/09	Kens Bore	KBRC040	420803	7557574	KBRC040P7T3-2		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'gemma'	1	Complete (molecular)	T. Finston

Phase	Date	Study Area	Site	Easting	Northing	Biota Specimen No.	WAM No.	Phylum	Subphylum	Class	Order	Family	Taxon	n	ID status	Det
7	15/5/09	Kens Bore	KBRC096	415803	7561938	KBRC096P7T2-1	98320	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'kens'	1	Complete (both)	V. Framenau
7	15/5/09	Trinity Bore	TBRC009	434202	7530106	TBRC009P7T2-3	98325	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	6	Complete (molecular)	T. Finston
7	15/5/09	Trinity Bore	TBRC023	431199	7527197	TBRC023P7T3-4	15118	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
7	15/5/09	Trinity Bore	TBRC026	431501	7528114	TBRC026P7T3-3	15125	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
7	15/5/09	Trinity Bore	TBRC029	432397	7529509	TBRC029P7T3-3		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	2	Complete	M. Koch
7	15/5/09	Trinity Bore	TBRC031	431933	7529301	TBRC031P7T2-3	98322	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
7	15/5/09	Trinity Bore	TBRC036	430009	7526897	TBRC036P7T1-3		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
7	15/5/09	Trinity Bore	TBRC036	430009	7526897	TBRC036P7T3-1		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
7	15/5/09	Trinity Bore	TBRC041	430046	7526108	TBRC041P7T2-1	98324	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
7	15/5/09	Trinity Bore	TBRC045	428694	7525248	TBRC045P7T1-4		Arthropoda	Hexapoda	Diplura	Diplura	Japygidae	Japygidae sp.	1	Complete	M. Koch
7	15/5/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P7T1-4	15119	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	4	Complete	F. Stone, T. Finston
7	15/5/09	Trinity Bore	TBRC156	430995	7527808	TBRC156P7T2-3		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Pseudogastrotheus* sp. A	1	Complete (morphology)	G. Smith
7	15/5/09	Upper Cane	UCRC029	424198	7545508	UCRC029P7T1-2	98312	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T2-1	98313	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T1-1	98315	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	3	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T3-1	98316	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T1-1	98317	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T1-2	15139	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T2-2	15140	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T3-2	15141	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	6	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T3-3	93764	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Lagynochthonius* sp. A	1	Complete (morphology)	M. Harvey
7	15/5/09	Upper Cane	UCRC040	425301	7545713	UCRC040P7T2-4	93767	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp. F	1	Complete (morphology)	M. Harvey
7	15/5/09	Upper Cane	UCRC046	424696	7546205	UCRC046P7T2-1	15142	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	6	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC055	422804	7545766	UCRC055P7T3-1	98314	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC076	424260	7545603	UCRC076P7T3-5	98311	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC076	424260	7545603	UCRC076P7T1-1	98318	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC076	424260	7545603	UCRC076P7T2-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC076	424260	7545603	UCRC076P7T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC93	424503	7546100	UCRC93P7T1-2		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
7	15/5/09	Upper Cane	UCRC93	424503	7546100	UCRC93P7T2-1	98319	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	2	Complete (morphology)	V. Framenau
7	15/5/09	Upper Cane	UCRC93	424503	7546100	UCRC93P7T1-1	15137	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
7	15/5/09	Upper Cane	UCRC93	424503	7546100	UCRC93P7T2-2	15138	Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Cardo Bore N	CBRC088	420998	7551834	CBRC088P8T2-4		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	5	Complete	F. Stone, T. Finston
8	7/8/09	Cardo Bore N	CBRC122	418998	7550703	CBRC122P8T1-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
8	7/8/09	Cardo Bore N	CBRC192	419657	7551241	CBRC192P8T1-1		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
8	10/7/09	Cardo Bore N	CBRC192	419657	7551241	UCRC040P8T1-4		Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius* sp.	1	Juvenile	M. Harvey
8	10/07/09	Catho Well	CWRC159	425982	7521502	CWRC274P3T1-2	92546	Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius aridus*	1	Complete (morphology)	M. Harvey
8	7/8/09	Catho Well	CWRC166	425791	7521856	CWRC166P8T2-1	98700	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'catho'	1	Complete (molecular)	T. Finston
8	7/8/09	Cochrane / Jewell	RNRC135	409508	7573791	RNRC135P8T2-5		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
8	7/8/09	Kens Bore	KBRC039	421004	7557401	KBRC039P8T2-5	98698	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'kens'	1	Complete (molecular)	T. Finston
8	7/8/09	Trinity Bore	TBRC010	434393	7530140	TBRC010P8T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
8	7/8/09	Trinity Bore	TBRC010	434393	7530140	TBRC010P8T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	3	Complete	F. Stone, T. Finston
8	7/8/09	Trinity Bore	TBRC031	431933	7529301	TBRC031P8T2-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Trinity Bore	TBRC038	429900	7526498	TBRC038P8T3-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Trinity Bore	TBRC041	430046	7526108	TBRC041P8T2-2		Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	1	Complete (molecular)	T. Finston
8	7/8/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P8T1-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Trinity Bore	TBRC141	431400	7527643	TBRC141P8T3-3		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	10/7/09	Trinity Bore	TBRC151	430597	7527793	TBRC151P8T3-4		Arthropoda	Chelicerata	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius aridus*	1	Complete (morphology)	M. Harvey
8	7/8/09	Trinity Bore	TBRC161	431838	7528299	TBRC161P8T2-4	98704	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'trinity'	1	Complete (molecular)	T. Finston
8	10/7/09	Upper Cane	UCR299	424492	7546419	PH16P8T2-4	98712	Arthropoda	Myriapoda	Diplopoda	Polyxenida	Polyxenidae	Polyxenidae sp.	4	Complete (molecular)	T. Finston
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T2-4		Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T3-5	98702	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T1-5		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T2-5		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T3-4		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	1	Complete	F. Stone, T. Finston
8	7/8/09	Upper Cane	UCRC040	425301	7545713	UCRC040P8T3-6		Arthropoda	Hexapoda	Insecta	Thysanura	Nicoletiidae	*Trinemura* sp.	1	Indet	G. Smith
8	10/07/09	Upper Cane	UCRC055	422804	7545766	UCRC055P8T2-1	98714	Arthropoda	Myriapoda	Chilopoda	Scolopendrida	Cryptopidae	Cryptopidae sp.	1	Indet	V. Framenau
8	7/8/09	Upper Cane	UCRC076	424260	7545603	UCRC076P8T1-2		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	6	Complete	F. Stone, T. Finston
8	7/8/09	Upper Cane	UCRC076	424260	7545603	UCRC076P8T3-1		Arthropoda	Hexapoda	Insecta	Blattodea	Nocticolidae	*Nocticola* sp. A	2	Complete	F. Stone, T. Finston
8	7/8/09	Upper Cane	UCRC299	424492	7546419	PH16P8T3-3	98699	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp.	1	Indet	V. Framenau
8	7/8/09	Upper Cane	UCRC299	424492	7546419	PH16P8T1-1	98701	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston
8	7/8/09	Upper Cane	UCRC299	424492	7546419	PH16P8T2-1	98705	Arthropoda	Chelicerata	Arachnida	Schizomida	Hubbardiidae	*Paradraculoides* sp. 'cardo'	1	Complete (molecular)	T. Finston