Bennelongia Environmental Consultants

Yandi Operations Short-Range Endemic Fauna Survey Report

Prepared for:

BHP

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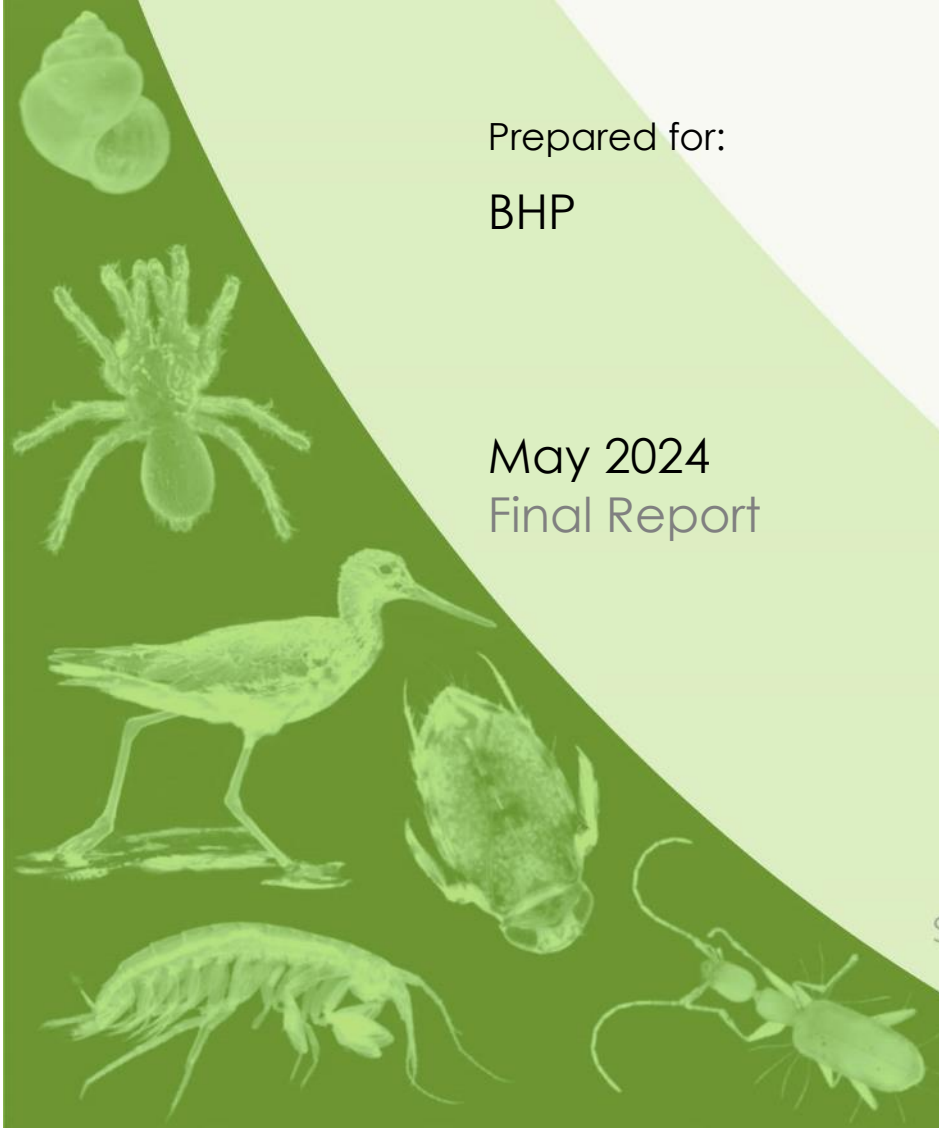
Final Report



Short-Range Endemics | Subterranean Fauna

Waterbirds | Wetlands

Yandi Operations Short-Range Endemic Fauna Survey Report

Bennelongia Pty Ltd
5 Bishop Street
Jolimont WA 6014

P: (08) 9285 8722
F: (08) 9285 8811
E: info@bennelongia.com.au

ABN: 55 124 110 167

Report Number: 609

Report Version	Prepared by	Reviewed by	Submitted to Client	
			Method	Date
Draft	Robin Hare	Huon Clark	Email	23 August 2023
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EXECUTIVE SUMMARY

BHP manages the iron ore mine known as Yandi Operations, which lies 100 km north-east of Newman in the Pilbara. BHP proposes to expand mining at Yandi Operations to include the Yandi E8 pit area (the Project) and other nearby developments. Recognising the potential for the Project and other developments to affect short-range endemic invertebrates (SREs), BHP commissioned Bennelongia Environmental Consultants to document SRE fauna values in a Survey Area comprising the Yandi Operations (tenement M270SA)

For the purpose of environmental impact assessment surveys, SRE species are defined as ground-dwelling invertebrates with a distribution of <10,000 km^2. The survey process is simplified by considering only those species belonging to SRE Groups. These are broad groups of ground-dwelling invertebrates likely to contain a high proportion of SRE species (e.g. scorpions, mygalomorph spiders). This report presents the results of both a desktop review of the records of SRE Group species in a 100 x 100 km Study Area around the Yandi Survey Area and then a subsequent field survey of SREs within the Survey Area.

The desktop review collated records of SRE Group species from the databases of the Western Australian Museum, Bennelongia and BHP. These databases contained 6,285 records from the Study Area, comprising 13,575 individuals identifiable to a maximum of circa 500 species belonging to SRE Groups. The actual number of species is almost certainly smaller than this, given the quantity of higher order identifications.

Eighteen species occurring in the Study Area have been recorded from the smaller Survey Area. Fourteen of these are considered to have Widespread distributions (i.e. they are not SREs), while the remaining four are potentially SRE species. Two of the Potential SRE species also occur outside the Survey Area (the selenopid spider *Karaops* `ARA001` and the pseudoscorpion *Xenolpium* `PSE033`). The other two Potential SREs are known only from the Survey Area: the pseudoscorpion *Xenolpium* `PSE120` was collected from a major drainage that extends beyond the Survey Area; and the centipede Geophilidae sp. B01 was collected from two habitat types in the northernmost section of the Survey Area (a south-facing slope on Hillcrest/ Hillslope and a gully from Gorge/ Gully), suggesting it can occupy various habitat types. No Confirmed SREs (well studied species with known distributions <10,000 km^2) have been recorded the Survey Area.

A two-season field survey for SREs was conducted in the Survey Area from 14-19 October 2022 (dry season) and from 30 March-4 April 2023 (wet season). A total of 44 sites were sampled. During the dry season survey, 26 of the 38 sites visited were sampled for SREs and assessed for habitat; the remainder were only assessed for habitat. During the wet season survey, 27 of the 38 sites visited were sampled for SREs and assessed for habitat; the remainder were assessed only for habitat. Substantial rain fell during the survey in 2023, including 85.6 mm on 30 March, 9.8 mm on 31 March, and 6.8 mm on 4 April.

The field survey collected 903 individuals attributable to at least 58 species belonging to SRE Groups. Of these, 25 were arachnids, including mygalomorph spiders, pseudoscorpions, and scorpions; 15 were centipedes, predominantly scolopendrids; seven were molluscs; seven were isopod crustaceans; and the remaining four species were millipedes. Two species were Confirmed SREs (the mygalomorph *Missulena faulderi* and the millipede *Antichiropus pendiculus*) and 15 species were categorised as Potential SREs. An additional two Potential SRE species were recorded from the desktop search. Both the Confirmed SRE species and four of the Potential SRE species are known from outside the Survey Area. The other 13 Potential SRE species are known only from the Survey Area. The 13 species are:

- One mygalomorph spider:
    - *Conothele* `BMYG220, collected from a dry trap on a south-facing slope.

- Seven pseudoscorpions:
    - *Oratemnus* `BPS502` comprising four specimens collected from two sites on major drainage lines. One specimen was collected from sieving *Acacia* leaf litter; the other three were collected from *Acacia* in *Eucalyptus* woodland, one from each of the following techniques: tree digging, litter raking, and bark peeling.
    - *Oratemnus* `BPBS503` collected from leaf litter (species unknown) on a single site on major drainage.
    - Cheliferidae `BPS504` collected from a single site on a major drainage line in *Corymbia* leaf litter.
    - *Synsphyronus* `BPS511` (lathrius?) collected from a single site on a minor drainage line from a bark peel of *Corymbia*.
    - *Austrohorus* `PBS509` collected from a single site in a gully from *Eucalyptus* leaf litter.
    - Olpiidae `BPS510`, collected from a single site in a drainage zone. Specimens were variously collected from a soil sieve; from *Acacia* leaf litter; and from *Eucalyptus* leaf litter.
    - *Xenolpium* 'PSE120' collected twice from one site in a drainage line the western part of the Survey Area.
- One scorpion:
    - *Lychas* `BSCO088` `pilbara1 group` collected from a dry trap at a single site in a drainage zone.
- One centipede:
    - Geophilidae sp. B01 collected from two sites in the northern part of the Survey Area.
- Three isopods:
    - *Acanthodillo* `BIS523` collected from a rock flip at a single site characterised by a waterhole.
    - *Acanthodillo* `BIS524` collected from a dry trap at a single site on stony plains.
    - *Buddelundia* `BIS521` collected from two sites, one on stony plains and the other a south-facing slope. On the south-facing slope the specimens were collected in a dry trap; on the stony plains the specimen was collected during an *Acacia* tree dig.

Eleven different habitat types were found in the Survey Area. In descending order of area, the habitat types were: Stony Plain; Drainage Lines (Major, Medium, and Minor) and Drainage Area/ Floodplain; Cleared/ Disturbed; Hillcrest/ Hillslope; Sand Plain; Hardpan Plain; Gorge/ Gully; and Waterhole. All but Cleared/ Disturbed are prospective for SREs. Different habitats contain at least partially different suites of species. For example, mygalomorphs burrow in the harder soil of Stony Plain and Hardpan Plain, whereas *Urodacus* scorpions dig burrows in the softer Sand Plain. SREs requiring high humidity, including millipedes and molluscs, are usually found in Drainage Lines, Drainage Area/ Floodplain, Waterhole and south-facing slopes among Hillcrest/ Hillslope and Gorge/ Gully habitat. Pseudoscorpions that live among vegetation also prefer moister habitats.

Overall, the field survey data indicate that the Survey Area contains suitable habitat for SREs. Of the 11 habitat types sampled, seven yielded Potential SREs known only from that habitat. The Potential SREs known only from one habitat type tended to be associated with drainage systems. Four of these species were collected from Major Drainage Line; two from Drainage Area/ Floodplain; and one each from Stony Plain, Hillcrest/ Hillslope, Sand Plain, and Waterhole. All of these habitat types extend beyond the Survey Area, presumably providing habitat for the 13 species outside the Survey Area. In order to make more certain assessments of the distributions of species, further survey and specimen collection would be required.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

BHP manages the iron ore mine known as Yandi Operations, which lies 100 km north-east of Newman in the Pilbara. BHP proposes to expand mining at Yandi Operations to include the Yandi E8 pit area (the Project) and other nearby developments. Recognising the potential for the Project and other developments to affect short-range endemic invertebrates (SREs), BHP commissioned Bennelongia Environmental Consultants to document SRE fauna values in a Survey Area comprising Yandi Operations (tenement M270SA).

For the purpose of environmental impact assessment surveys, SRE species are defined as ground-dwelling invertebrates with a distribution of <10,000 km^2. The survey process is simplified by considering only those species belonging to SRE Groups. These are broad groups of ground-dwelling invertebrates likely to contain a high proportion of SRE species (e.g. scorpions, mygalomorph spiders). This report presents the results of both a desktop review of the records of SRE Group species in a 100 x 100 km area Study Area around the Yandi Survey Area and then a subsequent field survey of SREs within the Survey Area itself.

In accordance with established guidelines (EPA 2016), the objectives of this report are:

- To collate records of SRE Group species from the desktop Study Area to determine the types of SRE species likely to be present in the Project Survey Area;
- To identify and map habitat types in the Survey Area and its surrounds;
- To identify and map all records of SRE animals collected during survey; and
- To determine the conservation status of the species recorded in the Survey Area and to report the known distribution of any conservation-significant species.

1.1. SRE Framework

As already stated, the term short-range endemic (SRE) species is applied here to terrestrial invertebrate species with a natural range of less than 10,000 km^2 (Harvey 2002). SREs are particularly susceptible to disturbances because they tend to live in discontinuous habitats, grow slowly, and often produce few offspring. The main sources of disturbances that threaten persistence of SRE species include habitat removal or modification, changes in fire regimens, the introduction of weeds and pathogens, and changes in local hydrology. SREs are recognised by the Environmental Protection Authority (EPA) for their relatively high susceptibility to disturbances (EPA 2016, 2018).

Surveys of SRE fauna focus on several taxonomic groups of terrestrial invertebrates (the SRE Groups) that have been identified as containing a high proportion of SRE species (EPA 2016). The SRE Groups change somewhat according to location and the groups dealt with in this report are mygalomorph and selenopid spiders, pseudoscorpions, scorpions, isopods (slaters), centipedes, millipedes and snails, although BHP (2022) excludes centipedes as an SRE group. Accordingly, although listed in tables, centipedes other than Geophilida, which are widely recognised as containing SREs (Harvey 2022), have received less taxonomic scrutiny than other than other species.

Not all species in the SRE Groups have highly restricted ranges and the SRE status of species in the Study and Survey Areas were determined from specimen records and scientific literature. For species with few records, likely ranges can be inferred to some extent by examining the habitats of existing records. In general, SREs tend to inhabit relictual, isolated, sheltered, and moist habitats (Durrant 2011), as well as specialist habitats including rock outcrops, alpine regions, south-facing slopes, gorges and gullies, drainage lines, vine thickets, and islands (EPA 2016; Harvey 2002).

The SRE status of species is assigned here to three categories (BHP 2022):

- **Confirmed SRE:** species is likely to have been surveyed across its range and its distribution is <10,000 km^2.
- **Potential SREs:** species for which there is some ecological evidence suggesting short-range endemism (e.g. closely related to Confirmed SREs, occurrence in limited habitat), including known range <10,000 km^2.
- **Uncertain:** species with known ranges <10,000 km^2 for which more evidence is required to assess SRE status or existing evidence suggests the species is unlikely to be an SRE. For example, in most cases a species collected only once, or a species collected multiple times from multiple different habitats, would be categorised as Uncertain.
- **Not SRE (Widespread):** species with known ranges >10,000 km^2.

While species are considered Confirmed SREs if their known range is <10,000 km^2, even Confirmed SREs may be locally widespread around a project area. Thus, categorising the SRE status of a species is just the first step in a filtering process used to determine which species may be threatened by a proposed development. Determining the actual level of threat requires consideration of the extent of the species' preferred habitat, both within and outside the relevant area of disturbance.

1.1.1. Conservation legislation

Native flora and fauna in Western Australia are protected at both State and Commonwealth levels. At the state level, the *Biodiversity Conservation Act 2016* (BC Act) provides a legal framework for protection of species, particularly for species listed by the Minister for the Environment as threatened. In addition to the formal list of threatened species under the BC Act, the Department of Biodiversity, Conservation and Attractions (DBCA) also maintains a list of priority fauna species that are of conservation importance but, for various reasons, do not meet the criteria for listing as threatened. At the national level, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important species of flora and fauna.

Both the EPBC and BC Acts provide frameworks for the protection of threatened ecological communities (TECs), where an ecological community is defined as a naturally occurring group of plants, animals, and other organisms interacting in unique habitat (with the unique habitat created by the combination of the species and their landscape setting; DEC 2013). Communities occupying a small or threatened habitat are classified as TECs under the BC Act and the EPBC Act. Within Western Australia, DBCA also informally recognises communities of potential conservation concern, but for which there is little information, as priority ecological communities (PECs). The list of TECs recognised under the BC Act is larger than the EPBC Act list and has much greater focus on subterranean communities.

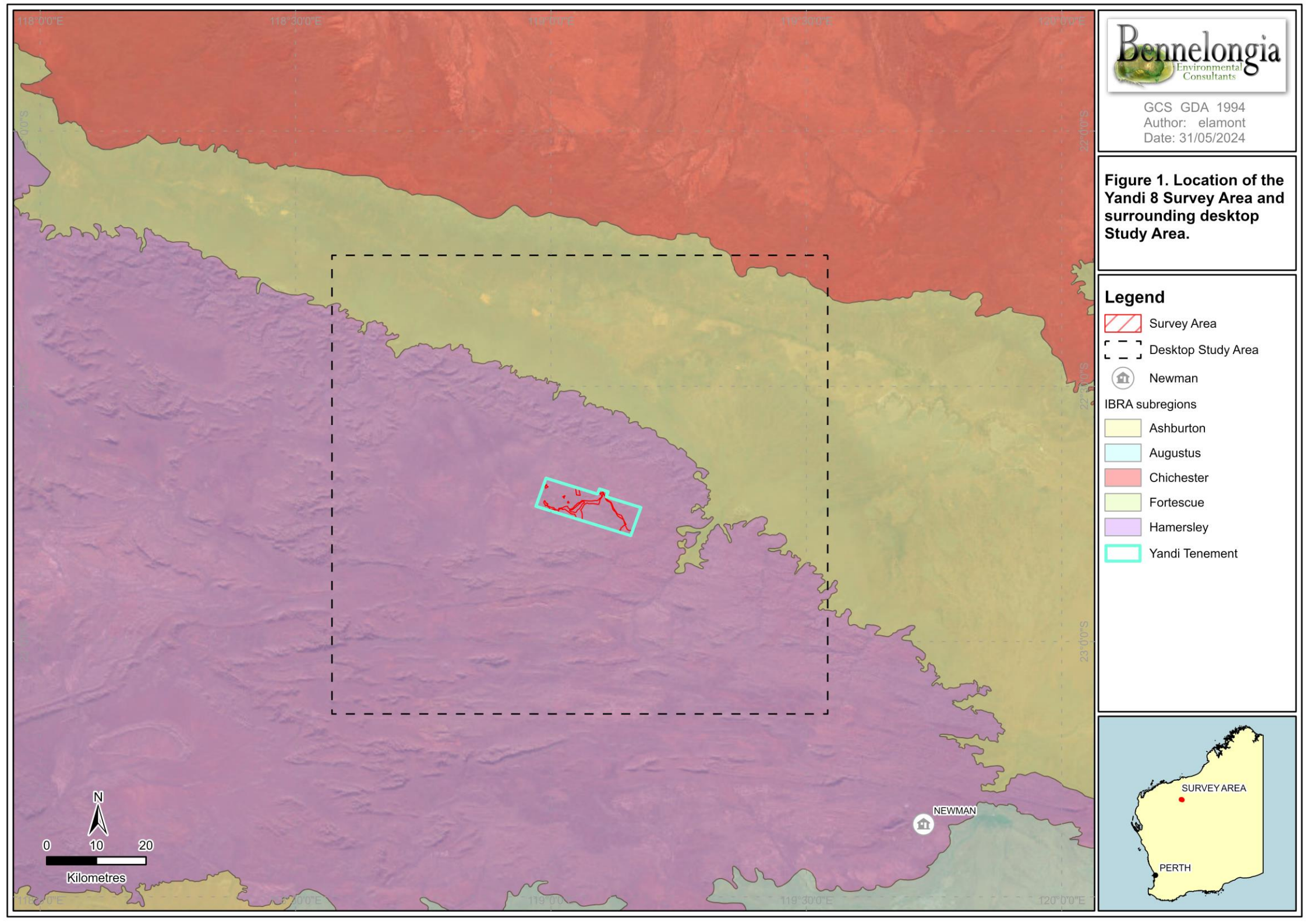
2. ENVIRONMENT

2.1. Overview

The Survey Area, which is in the Hamersley subregion of the Pilbara bioregion (Figure 1; DCCEEW 2021), lies within the Yandicoogina palaeovalley on the southern side of existing Yandi Operations mine pits. Topography is relatively subdued, comprising creekline, adjacent floodplain and low hills, with some small breakaways along the creekline.

2.2. Climate and Rainfall

The climate in the Central Pilbara is semi-arid to arid with a hot 'summer' from October-April and a mild 'winter' from May-September (Bureau of Meteorology 2023). Mean daily maxima and minima are highest in January (39.0°C and 25.3°C, respectively) and lowest in July (22.3°C and 8.1°C, respectively). Monthly rainfall peaks in February (80.1 mm) and is lowest in October (3.9 mm). Evaporation (3000 mm/yr) greatly exceeds rainfall (300 mm/yr) and results in arid conditions except along drainage systems


Bennelongia
Environmental Consultants
GCS GDA 1994
Author: elamont
Date: 31/05/2024
Figure 1. Location of the Yandi 8 Survey Area and surrounding desktop Study Area.
Legend
Survey Area
Desktop Study Area
Newman
IBRA subregions
Ashburton
Augustus
Chichester
Fortescue
Hamersley
Yandi Tenement
118°0'0"E
118°30'0"E
119°0'0"E
119°30'0"E
120°0'0"E
22°0'0"S
23°0'0"S
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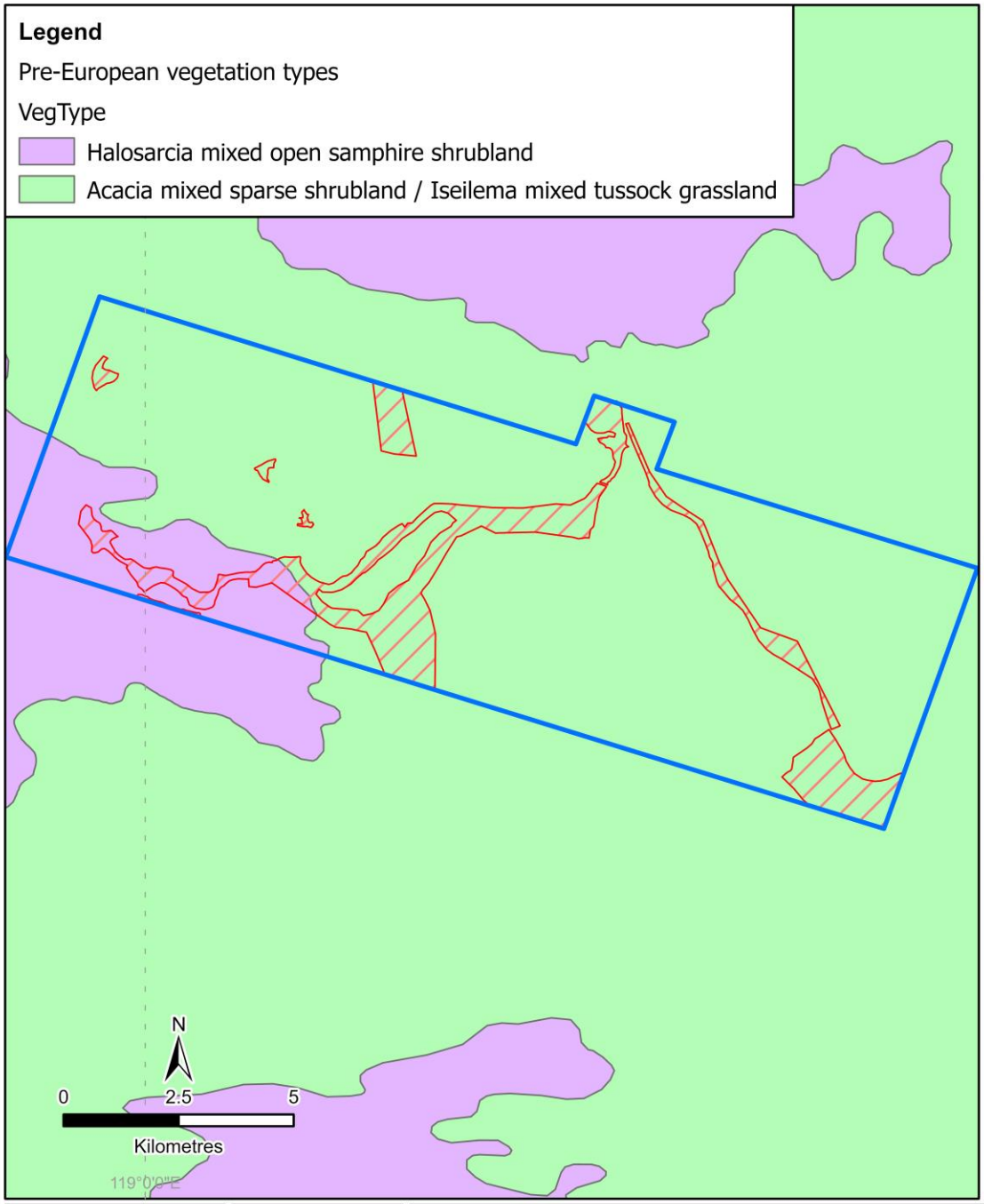
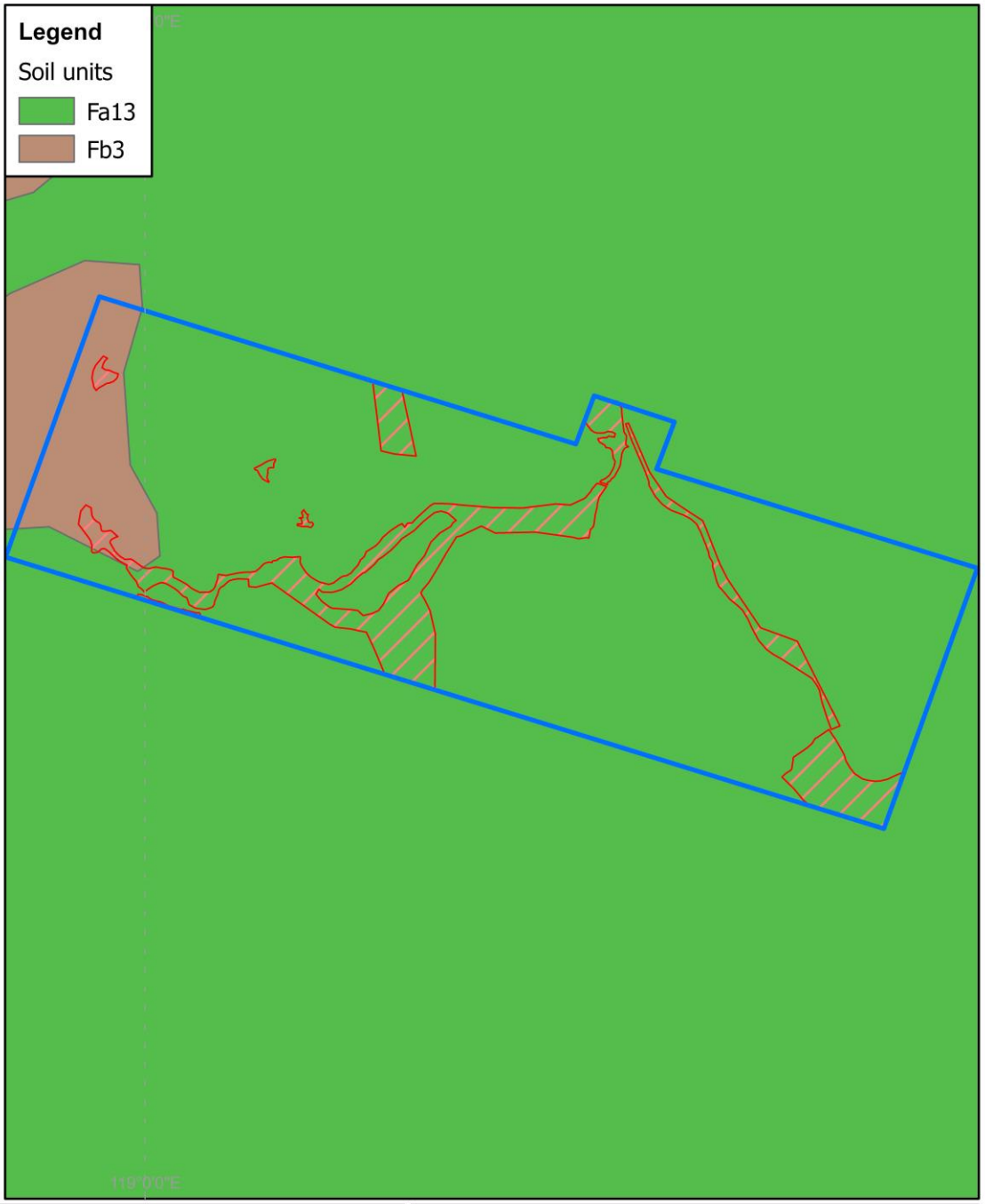
NEWMAN
SURVEY AREA
PERTH





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Legend

Survey Area

Yandi Tenement

Figure 2. Vegetation associations (left) and soil units (right) around the Survey Area. Soil units described in text.

and other areas intersected by groundwater, such as spring and river pool systems (Johnson and Wright 2001).

2.3. Geology, Soils, and Vegetation

In terms of deeper geology, the Survey Area lies entirely within the upper Hammersley Group (Johnson and Wright 2001). Surface geology is mostly alluvium along creeks, with some adjacent exposed rock. While hills and ranges occur to the north and south, terrain is relatively flat in the Survey Area itself: Surface elevation in the Survey Area varies from 550 mAHD in the southeast to 650 mAHD in the northwest, with most of the Survey Area lying between 550-600 mAHD.

Soil type can have a major impact on SRE distribution, as some SRE Groups dig burrows and have specific soil requirements. Most of the Survey Area consists of soil unit Fa13, which is typically stony and shallow, but extensive areas lack soil altogether. The westernmost portion of the Survey Area comprises soil unit Fb3, typically deep earthy loams (Figure 2).

Most of the Survey Area supports Beard's (1975) vegetation type 82 (*Acacia* mixed sparse shrubland / *Iseilema* mixed tussock grassland), with the remainder being type 18 (*Halosarcia* mixed open samphire shrubland) (Figure 2; Table 1).

Table 1. Beard's (1975) vegetation associations in the Survey Area.

Code	General description	Specific description
18	Succulent steppe; samphire	*Halosarcia* mixed open samphire shrubland
82	Mixed short grass and spinifex with scattered coolabah	*Acacia* mixed sparse shrubland / *Iseilema* mixed tussock grassland

3. METHODS

3.1. Desktop Assessment Methods

The SRE fauna of the subregion around the Survey Area was characterised through a database and literature review for a 100 x 100 km Study Area around the Survey Area. The coordinates defining the Study Area were vertices at -22.2434407, 118.5713024 and -23.1472305, 119.5418509. The desktop assessment combined four sources of information.

- Boundary information for the Survey Area and description of Project activity as supplied by BHP.
- Boundary information for TECs and PECs provided by DBCA and the Department of Mines, Industry Regulation, and Safety.
- Records of the occurrence of SRE Group species in the vicinity of the Project were obtained by searching the Western Australia Museum (WAM) and Bennelongia databases, with additional records supplied by BHP.
    - As much as possible, duplicate records (under the same or multiple names) from WAM, Bennelongia and BHP were combined.
    - For each species, the number of records (i.e. the number of times the taxon was found) and the number of individuals collected (i.e. how many were found in each record) were collated.
- Records of the occurrence of SRE Group species, and ecological information about them, were also obtained from the scientific literature and biological survey reports, including previous SRE survey reports from within 30 km of the Survey Area.

Species were assigned to SRE status categories using the framework described in section 1.1. Analysis and mapping were undertaken using ArcGIS Pro v2.9.

Table 2. Searches requisitioned from the database of the Western Australian Museum.

Database	Date of receipt
Hexapods (including insects)	19 August 2022
Chelicerates (including arachnids) and myriapods	27 January 2023
Crustaceans	19 August 2022
Molluscs	22 March 2023

3.2. Field Survey Methods

A two-season field survey targeting invertebrates belonging to SRE Groups was conducted in the Survey Area from 14-19 October 2022 (first round; dry season) and 30 March-4 April 2023 (second round; wet season). The aim of the survey was to collect species from recognised SRE Groups from representative habitat types in the Survey Area. Invertebrates of some SRE Groups are more active following rain, whereas others are active year-round, so collecting during both dry and wet seasons increases the likelihood of collecting all types of species present. No rain fell before or during sampling in October 2022 (Figure 3). In the three days before the March 2023 survey began, 19.4 mm of rain was recorded by Bom station 007176, Newman Aero (Figure 3). Substantial rain fell during the survey in 2023: 85.6 mm on 30 March, 9.8 mm on 31 March, and 6.8 mm on 4 April.

3.2.1. Site Selection

Prior to the survey, aerial imagery of the Survey Area was examined and prospective areas for SREs were identified. Prospective habitats for SREs in the Pilbara include south-facing slopes, gorges, gullies, drainage lines, and isolated habitats. Once sampling sites for each habitat type had been selected, additional sites from those habitat types for habitat assessment only were selected. Field-based observations were used to characterise the extent of habitat types during subsequent mapping (Section 2.2.3).

3.2.2. Sampling Techniques

Sampling techniques followed published guidelines (EPA 2016). One hour was spent at each site, with two team members using various sampling techniques depending on the site type, for two person-hours per site. Three general sampling techniques were used: hand foraging, litter collection and dry pitfall trapping.

Hand foraging consisted of actively searching for species belonging to SRE Groups in their preferred habitats. Hand foraging techniques included:

- Burrow excavation: digging up a burrowing mygalomorph spider or *Urodacus* scorpion. The burrow entrance was identified visually, often after leaf blowing. A loose zip tie was inserted into the burrow to mark the entrance. Soil around the burrow was removed using trowels, spoons, and kitchen knives until the end of the burrow was revealed, determined by the inability to insert the zip tie further. If the animal had not exited the burrow at this time, the burrow was gently lifted from beneath to stimulate movement. As the animal exited the burrow it was collected and immediately transferred to ethanol in a vial.
- Log flipping and litter raking: turning over and breaking apart logs and dead wood in search of isopods, myriapods, and pseudoscorpions. Raking litter uncovers isopods, snails, centipedes, millipedes and helps to uncover camouflaged mygalomorph spider burrows or to uncover buried land snails that may aestivate below the surface.

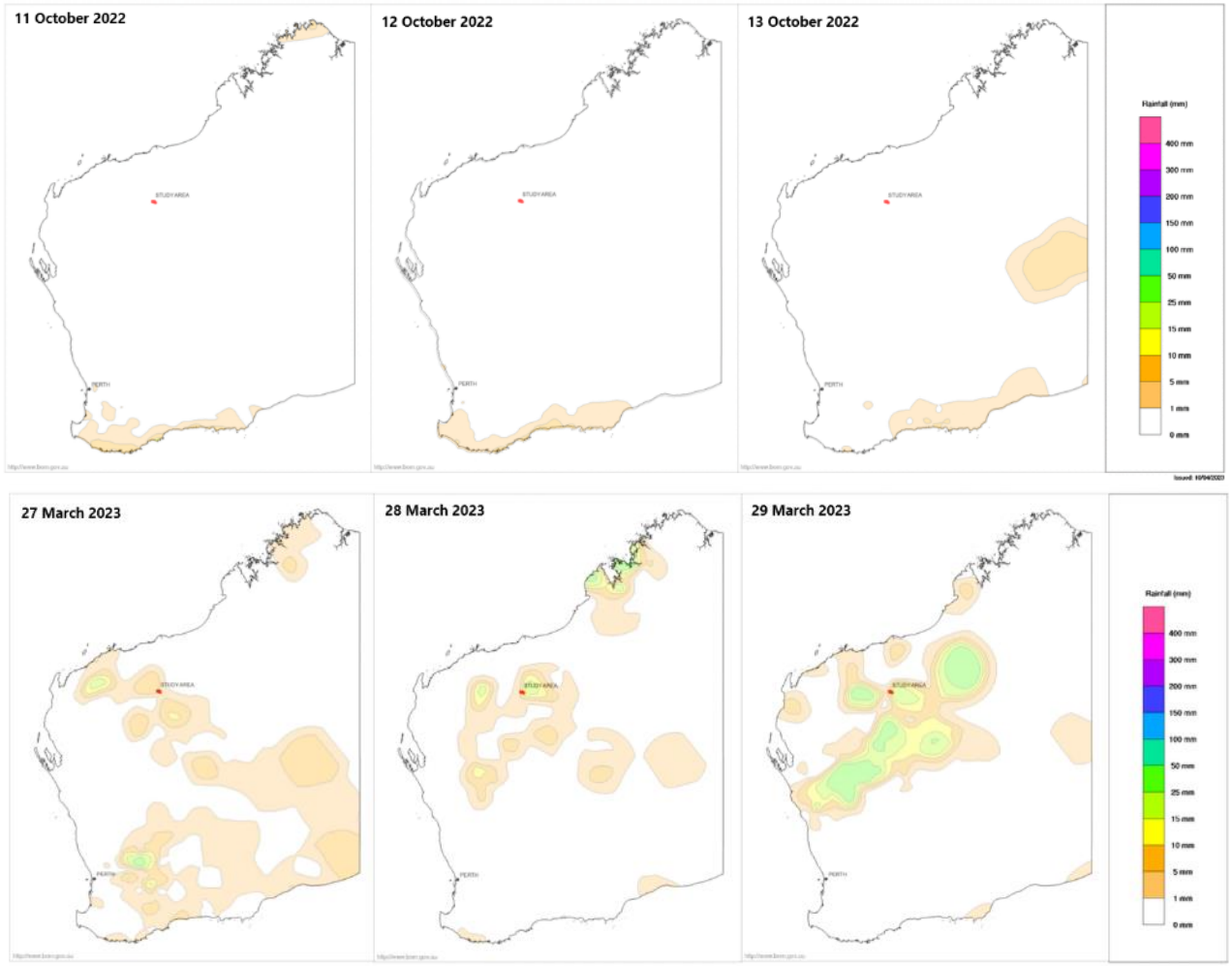


Figure 3. Rainfall in Western Australia in the days preceding the surveys (Bureau of Meteorology 2023).

- Rock flipping: turning over rocks and other debris in search of harvestmen, centipedes, and isopods. Rocks were returned to their natural position when possible.
- Leaf litter sieving: sieving leaf litter in the field to find soil- and litter-dwelling species. Leaf litter sieving also uncovers small-bodied SRE species (such as pseudoscorpions, millipedes, and land snails).
- Leaf blowing: hand-held leaf blowers were used to remove leaf litter and reveal mygalomorph spider burrows covered by litter or otherwise difficult to identify unaided. If found, burrows were examined; burrows likely to house a mygalomorph spider were then excavated.
- Bark peeling and tree digging: removing pieces of bark from trees with smooth and exfoliating bark for inspection, and removing dirt from the bases of trees to search for SRE taxa. These techniques were only applied at sites containing trees (i.e. not only shrubs or spinifex).
- Night searching: with the aid of ultraviolet torches, one site (YAN-15) was visited at night in round 2 in search of scorpions, which fluoresce under ultraviolet light and are thereby easily detected.

While foraging, two leaf litter samples per site were collected in cloth bags to send to the Bennelongia laboratory in Perth, where the litter was placed in Tullgren funnels to extract litter-dwelling invertebrates. Leaf litter typically comprised *Eucalyptus* and/or *Acacia* leaves but where available, litter of *Hakea* and other species was also collected.

Dry pitfall pit trapping was undertaken at 10 sites for five days in both rounds of survey. For each trap, a small hole was dug in the ground and a plastic cup (height: 12 cm; diameter: 9 cm) was inserted so that the mouth was level with the soil surface. The trap opening was covered by a slightly raised roof to exclude vertebrate predators and by-catch, and to shield the trap from direct sunlight, and rain (Richter and Freegard 2009), and 3 m of drift fence was used to funnel animals into the trap (BHP 2022). Traps were checked daily in the first hours of the morning and any invertebrates in it were removed using gloves and/or forceps and placed into a vial of ethanol.

3.2.3. Sampling Effort

Forty-four sites were sampled in the Survey Area (Table 3; Figures 4-5; Appendices 1-2; see Appendix 5 for photographs of field sites), and one opportunistic sample was collected from an administration building (site Opp 01; Table 3). Site number 39 was not used because the intended Site 39 was inaccessible. During the dry season survey, 12 of the 38 sites visited were assessed for habitat only; the remainder were sampled for SREs. During the wet season survey, 11 of the 38 sites visited were assessed for habitat only; the remainder were sampled for SREs.

3.2.4. Habitat Assessment and Mapping

During the survey, habitat details of each site, as specified by BHP (2022), were collected. Details documented were:

- Habitat type.
- Landform.
- Aspect.
- Slope.
- Shade.
- Whether moisture was evident.
- Soil type.
- Soil distribution.
- The type of rock outcrop, if present.
- Rock size.
- The amount of leaf litter.
- Whether any burrows were present.
- Time since last fire.
- Evidence of disturbance.

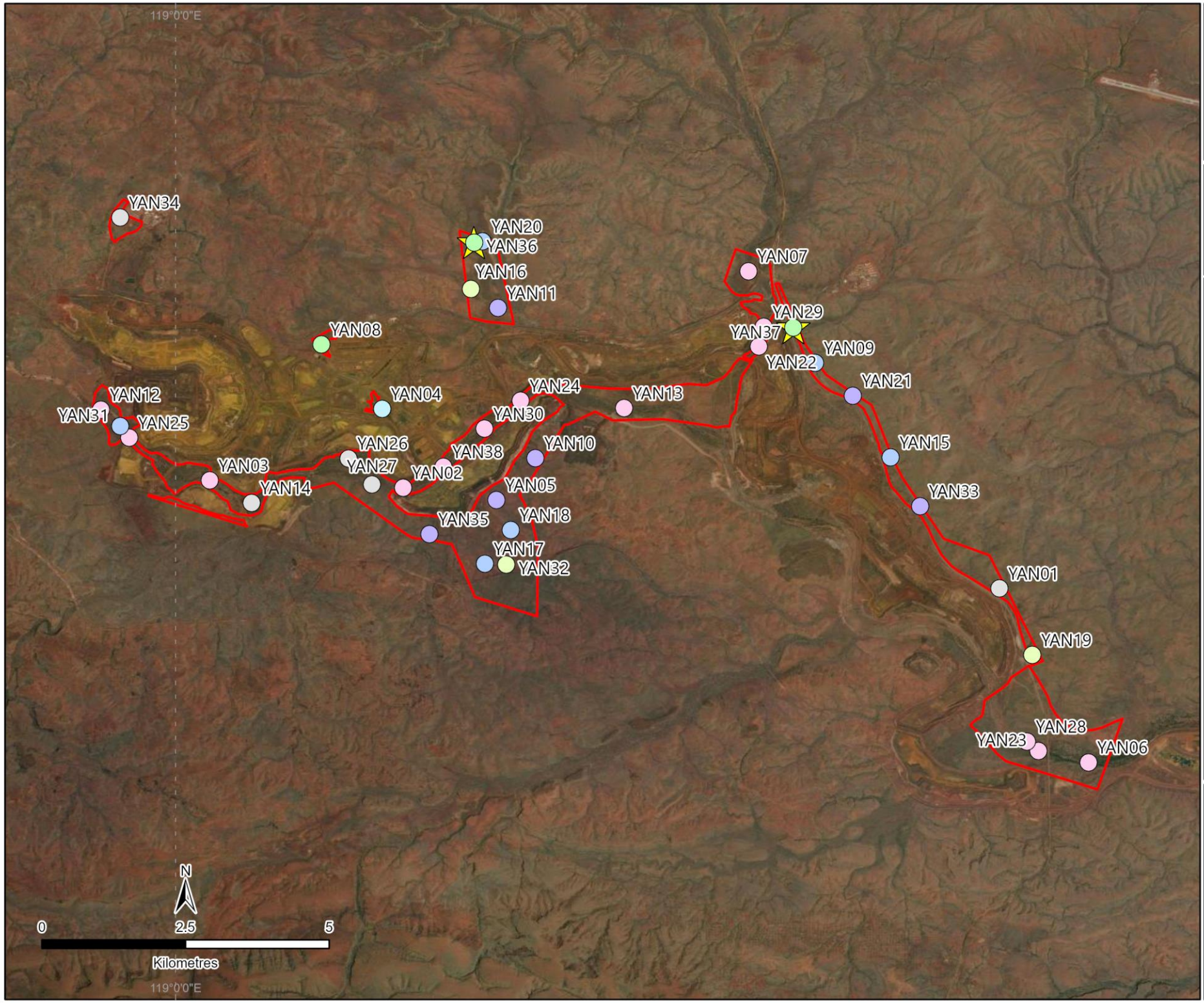
Following the survey, boundaries between habitat types were drawn over aerial imagery. Habitat continuous with a sample site was assigned the same category as that sample site; boundaries were

Table 3. Sites sampled for SREs during the field survey. Full details of sampling activity are recorded in Appendices 1 and 2, and photographs are presented in Appendix 5.

Number	Site Code	Latitude	Longitude	Date	Habitat	Comments
Opp1	BHP5353	-22.71272	119.03692	30-Mar-23	Cleared/ Disturbed	
YAN-01	BHP5012	-22.75844	119.13962	17-Oct-22	Drainage Area/ Floodplain	Habitat assessment only
				02-Apr-23		Habitat assessment only
YAN-02	BHP5013	-22.74136	119.03859	15-Oct-22	Major Drainage Line	
				01-Apr-23		Habitat assessment only
YAN-03	BHP5014	-22.74014	119.00578	14-Oct-22	Major Drainage Line	
				01-Apr-23		
YAN-04	BHP5015	-22.72802	119.03499	15-Oct-22	Waterhole	
				02-Apr-23		
YAN-05	BHP5016	-22.74343	119.05438	16-Oct-22	Minor Drainage Line	
YAN-06	BHP5017	-22.78788	119.15468	17-Oct-22	Major Drainage Line	
				02-Apr-23		
YAN-07	BHP5018	-22.70466	119.0971	18-Oct-22	Major Drainage Line	
				04-Apr-23		
YAN-08	BHP5019	-22.71711	119.02475	18-Oct-22	Hillcrest/ Hillslope	
				04-Apr-23		
YAN-09	BHP5020	-22.72021	119.108345	17-Oct-22	Gorge/ Gully	
				02-Apr-23		
YAN-10	BHP5021	-22.73635	119.06098	16-Oct-22	Minor Drainage Line	Habitat assessment only
YAN-11	BHP5022	-22.71091	119.05463	19-Oct-22	Minor Drainage Line	
				03-Apr-23		
YAN-12	BHP5023	-22.72813	118.987364	14-Oct-22	Major Drainage Line	Habitat assessment only
				01-Apr-23		Habitat assessment only
YAN-13	BHP5024	-22.72787	119.07597	16-Oct-22	Major Drainage Line	
				31-Mar-23		

YAN-14	BHP5025	-22.74394	119.01287	14-Oct-22	Drainage Area/ Floodplain	
				01-Apr-23		
YAN-15	BHP5026	-22.73622	119.12117	17-Oct-22	Gorge/ Gully	Habitat assessment only
				02-Apr-23		
YAN-16	BHP5027	-22.7077	119.05005	19-Oct-22	Gilgai Plain	
				03-Apr-23		
YAN-17	BHP5028	-22.75423	119.05242	16-Oct-22	Gorge/ Gully	Habitat assessment only
YAN-18	BHP5029	-22.74852	119.05679	16-Oct-22	Gorge/ Gully	Habitat assessment only
YAN-19	BHP5030	-22.7697	119.14518	17-Oct-22	Gilgai Plain	
				02-Apr-23		
YAN-20	BHP5031	-22.69964	119.05203	19-Oct-22	Gorge/ Gully	
				03-Apr-23		
YAN-21	BHP5032	-22.72576	119.11479	17-Oct-22	Minor Drainage Line	Habitat assessment only
				02-Apr-23		Habitat assessment only
YAN-22	BHP5033	-22.71744	119.09882	18-Oct-22	Major Drainage Line	Habitat assessment only
				04-Apr-23		Habitat assessment only
YAN-23	BHP5034	-22.78595	119.14621	17-Oct-22	Major Drainage Line	Habitat assessment only
				02-Apr-23		Habitat assessment only
YAN-24	BHP5035	-22.72662	119.0585	16-Oct-22	Major Drainage Line	Habitat assessment only
				31-Mar-23		Habitat assessment only
YAN-25	BHP5036	-22.7329	118.99218	14-Oct-22	Major Drainage Line	
				01-Apr-23		Habitat assessment only
YAN-26	BHP5037	-22.73639	119.02929	15-Oct-22	Drainage Area/ Floodplain	Habitat assessment only
				01-Apr-23		Habitat assessment only
YAN-27	BHP5038	-22.74082	119.03328	15-Oct-22	Drainage Area/ Floodplain	
				01-Apr-23		
YAN-28	BHP5039	-22.78437	119.14428	17-Oct-22	Major Drainage Line	
				02-Apr-23		

YAN-29	BHP5040	-22.7141	119.09964	18-Oct-22	Major Drainage Line	
				04-Apr-23		
YAN-30	BHP5041	-22.73137	119.05235	16-Oct-22	Major Drainage Line	
				31-Mar-23		
YAN-31	BHP5042	-22.73093	118.99064	14-Oct-22	Gorge/ Gully	
				01-Apr-23		
YAN-32	BHP5043	-22.75435	119.05604	16-Oct-22	Gilgai Plain	
YAN-33	BHP5044	-22.7445	119.12615	17-Oct-22	Minor Drainage Line	
				02-Apr-23		Habitat assessment only
YAN-34	BHP5045	-22.69559	118.99059	15-Oct-22	Drainage Area/ Floodplain	
				04-Apr-23		
YAN-35	BHP5046	-22.74923	119.04304	16-Oct-22	Minor Drainage Line	Habitat assessment only
YAN-36	BHP5047	-22.69982	119.05058	19-Oct-22	Hillcrest/ Hillslope	
				03-Apr-23		
YAN-37	BHP5048	-22.71424	119.10469	18-Oct-22	Hillcrest/ Hillslope	
				02-Apr-23		
YAN-38	BHP5049	-22.73782	119.04541	15-Oct-22	Major Drainage Line	
				01-Apr-23		
YAN-40	BHP5223	-22.73163	119.06093	31-Mar-23	Stony Plain	
YAN-41	BHP5224	-22.72107	119.09523	31-Mar-23	Minor Drainage Line	
YAN-42	BHP5225	-22.71119	119.05352	03-Apr-23	Hardpan Plain	
YAN-43	BHP5226	-22.72946	119.08841	31-Mar-23	Minor Drainage Line	
YAN-44	BHP5227	-22.73297	118.99082	03-Apr-23	Hardpan Plain	Habitat assessment only
YAN-45	BHP5228	-22.70742	119.05279	03-Apr-23	Hillcrest/ Hillslope	



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Date: 22/02/2024

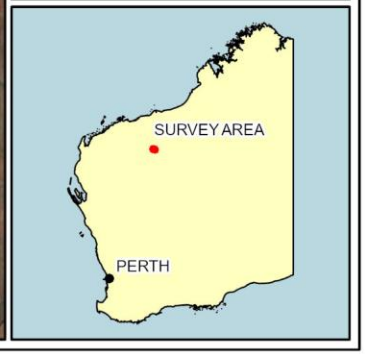
Figure 4. Sites sampled for SREs in October 2022.

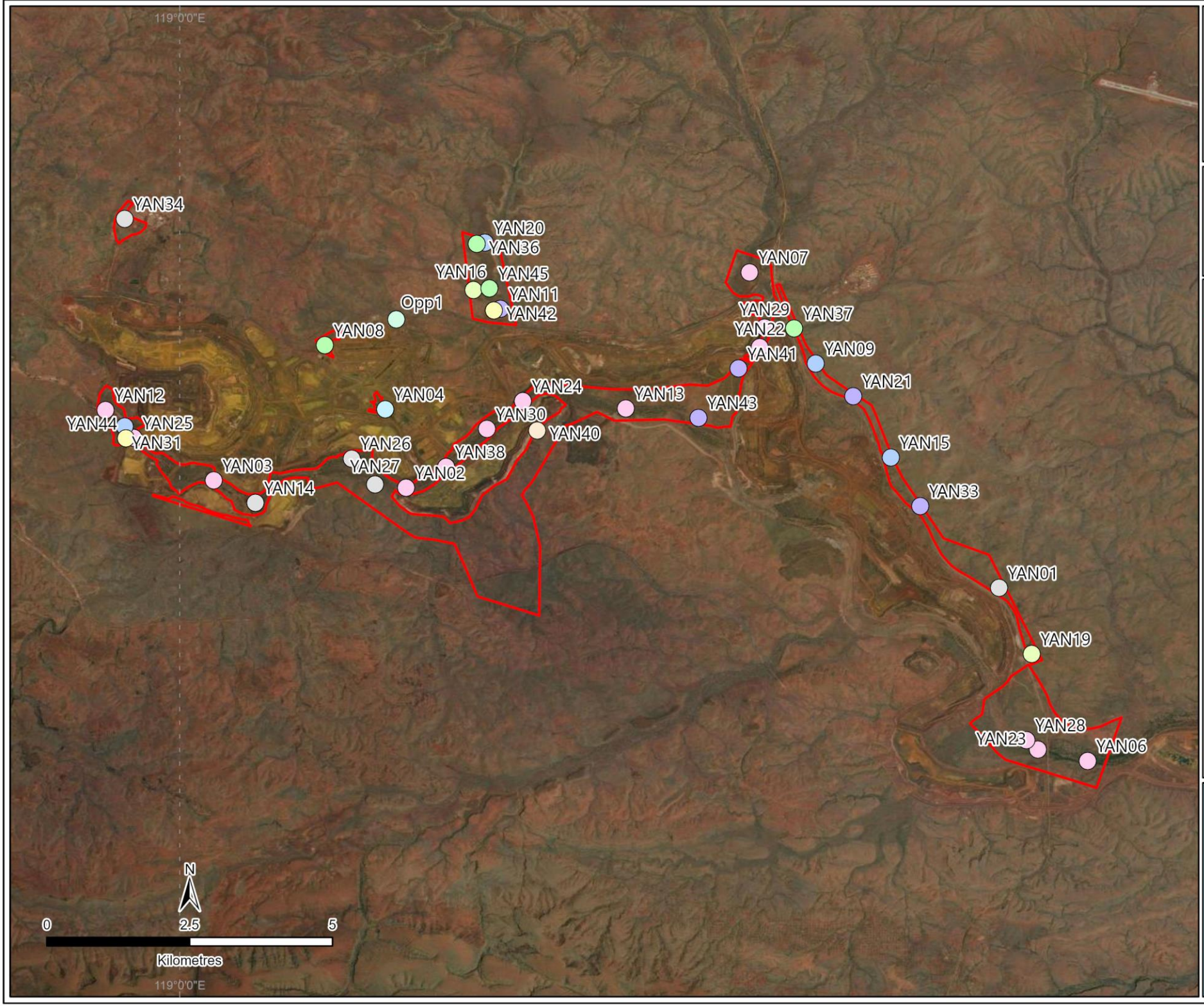
Legend

- Newman
- Survey Area

SRE sampling sites (October 2022)

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Stony Plain
- Waterhole
- Sand Plain
- South-facing slopes





Bennelongia Environmental Consultants

GCS GDA 1994
Author: abrowse
Date: 26/02/2024

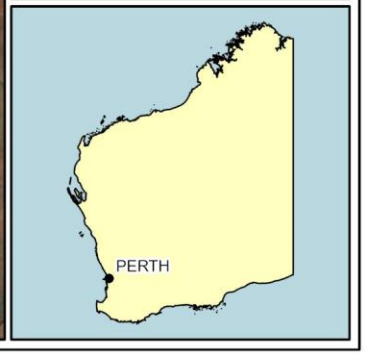
Figure 5. Sites sampled for SREs in March-April 2023.

Legend

- Survey Area

SRE sampling sites (March-April 2023)

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Stony Plain
- Waterhole
- Sand Plain
- South-facing slopes



recognised according to changes in vegetation, elevation and/or soil type identified in aerial imagery and were informed by ground truthing during the survey.

3.2.5. Laboratory Processing

In the laboratory, samples were first sorted under a dissecting microscope to separate animals belonging to SRE Groups from litter and invertebrate by-catch. The SRE Group specimens were identified to described species where possible using available keys and species descriptions. When necessary, they were dissected and examined under a differential interference contrast compound microscope.

For nearly all SRE Groups, most of the species collected were undescribed. Species that were not formally described were nevertheless recognised through morphology and/or genetically as belonging to discrete species and a placeholder code (e.g. `B01`) was assigned to enable the species to be traced in the reporting process. Some specimens that were damaged, juvenile or of the non-diagnostic sex could not be identified to species level and were assigned a higher level identification (usually genus or family). These specimens carry the miscellaneous designation 'sp.' Where possible, such specimens were analysed genetically to improve taxonomic resolution.

3.2.6. Molecular Methods

To improve taxonomic resolution, 24 specimens collected from the Survey Area and one animal from elsewhere were sequenced for the COI gene. For all samples, DNA was extracted using a Qiagen Dneasy Blood & Tissue kit (Qiagen 2006). For smaller animals such as pseudoscorpions, legs and other body parts (e.g. sections of the abdomen) were used for DNA extraction. For larger animals, and where possible, muscle tissue was collected from the legs. Elute volumes varied from 50 µL to 100 µL, and were dependent on the age, condition, and quantity of material available.

Primer combinations used for PCR amplifications were LCO1490:HCO2198, C1J1718:HCO2198, and LCO1490:HCOoutout, targeting the COI region of the mitochondrial genome; (Folmer *et al.* 1994). PCR products were sequenced using dual-direction Sanger sequencing carried out by the Australian Genome Research Facility (AGRF). The returned sequences were edited and aligned manually in Geneious (version 2022.2.2; Kearse *et al.* 2012). Sequences were then compared against Bennelongia's internal database and the open database GenBank. The results of molecular analysis are presented in Appendix 4.

3.2.7. Survey Limitations

Survey limitations were few. Timing was good, and sites were well distributed through the Survey Area. Some constraints on access during the wet season may have reduced the number of specimens collected from the southern part of the Survey Area (Table 4).

There is a general limitation to all SRE surveys in that many species are unstudied and undescribed. Unless the various taxonomic groups of animals have been studied in the wider region (and uniform names or code names applied) it is difficult to compare the results of surveys in different areas to get maximum information about species ranges.

Table 4. Limitations of the survey.

Limitation	Explanation	Mitigation
Survey access constraints	A windrow constructed in the southern part of the central Study Area between survey rounds prevented six sites from being re-visited in the second round.	New sites were added. Overall the target number of sites was achieved, but a substantial portion of the Study Area could not be sampled during the wet season, potentially limiting the diversity and abundance of specimens collected.

Limitation	Explanation	Mitigation
Unsuitable specimens for identification	In most SRE Groups, taxonomic keys rely on adult male characters to differentiate species. Specimens that were not adults of the right sex or are damaged can be difficult to identify unless expert in the group. Specimens that are small, damaged, or contaminated (e.g. by parasites) tend not to yield sufficient genetic material for molecular analysis.	Molecular sequencing was used for identification in 25 specimens that could not be identified morphologically. Other specimens were identified morphologically to the lowest level possible and treated accordingly in text.

3.2.8. Personnel

Personnel involved in the creation of this report are listed in Table 5.

Table 5. Bennelongia personnel involved in the generation of this report.
Fieldwork was undertaken under Regulation 27 licence BA27000108-5. Licence holder: Mike Scanlon.

Role	Name	Qualifications/Experience
Fieldwork	Huon Clark (both rounds)	B.Sc. (Hons), Ph.D. Five years' experience conducting SRE surveys in the Pilbara.
	Ella Carstens (both rounds)	B.Sc. One year's experience conducting SRE surveys in the Pilbara.
	Kevin Sagastume (second round)	B.Sc., M.Sc. One year's experience conducting SRE surveys in the Pilbara. Twelve years' experience in Central/South America
	Monique Moroney (second round)	B.Sc. (Hons). Two years' experience conducting SRE surveys in the Pilbara.
Sample sorting	Adam Barnard	B.Sc. (Hons)
	Ella Carstens	B.Sc.
	Georgia Rice	B.Sc.
	Heather McLetchie	B.Sc. (Hons)
	Megan Lewis	B.Sc., M.Sc.
Species identification	Jane McRae (pseudoscorpions)	Over 30 years of identification experience, author of 12 taxonomic papers and 9 papers on species inventory/ecology.
	Ella Carstens (centipedes)	B.Sc.
	Georgia Rice (millipedes)	B.Sc.
	Huon Clark (isopods)	B.Sc. (Hons), Ph.D.
	Kevin Sagastume (spiders)	B.Sc., M.Sc.
	Megan Lewis (millipedes)	B.Sc., M.Sc.
	Melanie McGellin (centipedes)	B.Sc. (Hons).
	Melita Pennifold (molluscs; myriapods)	B.Sc (Hons).
Molecular identification	Heather McLetchie (extraction)	B.Sc. (Hons).
	Daniel White (analysis)	B.Sc. (Hons), M.Sc., Ph.D.

Role	Name	Qualifications/Experience
Mapping	Robin Hare	B.Sc. (Hons), Ph.D.
	Huon Clark	B.Sc. (Hons), Ph.D.
Reporting	Robin Hare (drafting)	B.Sc. (Hons), Ph.D.
	Huon Clark (review)	B.Sc. (Hons), Ph.D.
	Stuart Halse (review)	B.Sc. (Hons), Ph.D.

4. RESULTS

4.1. Desktop Assessment Results

The desktop searches for the Study Area returned 6,284 records comprising 13,574 individuals identifiable to a maximum of c. 500 species (Figure 6; Appendix 3). The actual number of species is almost certainly smaller than this, given the quantity of higher order identifications.

The vast majority (86.5%) of records and individuals (80.0%) were arthropods. Among these, arachnids predominated (3,829 or 70.5% of arthropod records; 5,958 or 54.8% of individuals), with spiders (Araneae; 1,826 records of 2,083 individuals) and pseudoscorpions (1,468 records of 3,071 individuals) providing the bulk of these records. Smaller numbers of scorpions (522 records of 781 individuals) and opilionids (13 records of 23 individuals) were also recovered.

Myriapods comprised the group with the next highest number of records, with 1,085 records of 3,773 individuals (20.0% and 34.7%, respectively, of all arthropods). Myriapod records were split approximately evenly among centipedes (Chilopoda; 501 records) and millipedes (Diplopoda; 584 records), but the number of specimens differed markedly between each (584 for centipedes; 3,125 for millipedes). The remaining arthropod group, Crustacea, contributed 521 records of 1,134 individuals (9.6% and 10.4%, respectively, of all arthropods). All crustacean records were isopods.

All non-arthropod records were molluscs. In total, 849 records (13.5% of total) of 2,709 individuals (20.0%) were attributable to land snails. Among molluscs, stylommatophorans were most common (813 records of 2,596 individuals), particularly pupillids (462 records of 1,580 individuals).

The desktop search of the Study Area found 68 records of 109 specimens within the Survey Area. These belong to 18 species (Figure 7).

1. The selenopid spider *Karaops* `ARA001`, synonymous with *Karaops* `ARA001-DNA`. This species is known from a range of <1 km^2 and is considered a Potential SRE, but it is known from outside the Study Area so is not restricted to it.
2. The pseudoscorpion *Austrochthonius* `PSE135, pilbara`. This species has also been collected hundreds of kilometres south of the Study Area (Alacran Environmental Science 2022).
3. The pseudoscorpion *Tyrannochthonius aridus*, widespread in the Pilbara.
4. The pseudoscorpion *Xenolpium* `PSE033`, synonymous with *X.* PSE033. Has a linear range of ca. 25 km and is found outside the Study Area.
5. The pseudoscorpion *Xenolpium* `PSE120`. Collected from major drainage on Marillana Creek in a section that is now cleared. Considering it occupies an extensive habitat, it is probably not restricted to the Study Area.
6. The scorpion *Lychas* `pilbara1` (also listed as *Lychas* `pilbara 1`), widespread in the Pilbara.
7. The centipede Geophilidae sp. B01, collected from two habitat types (a south-facing slope on Hillcrest/ Hillslope and a gully from Gorge/ Gully). Its collection from multiple habitat types in the north of the Study Area suggests it is not restricted to a localised area in the Study Area.

8. The centipede *Cryptops australis*, a widespread species.
9. The centipede *Cormocephalus aurantiipes*, a widespread species.
10. The centipede *Cormocephalus westangelasensis*, a widespread species.
11. The centipede *Scolopendra laeta*, a widespread species.
12. The centipede *Scolopendra morsitans*, a widespread species.
13. The snail *Bullastra* cf. *lessoni*, tentatively assigned by the identifier to a widespread species.
14. The snail *Gastrocopta larapinta*, a widespread species.
15. The snail *Gastrocopta mussoni*, a widespread species.
16. The snail *Pupoides pacificus* s.l., tentatively assigned by the identifier to a widespread species.
17. The snail *Pupoides lepidulus*, widespread in the Pilbara.
18. The snail *Eremopeas interioris*, a widespread species.

No species from the SRE Groups is considered to occur only in a habitat restricted to the Study Area.

4.1.1. Threatened and Priority Ecological Communities

No TECs or PECs relevant to SREs were identified in the desktop search.

4.1.2. Previous Surveys

Reports of previous SRE surveys within 30 km of the Survey Area were reviewed (Table 6). Differences in target area, groups, and survey methods prevent straightforward comparison of richness among the surveys. In general, low (one) to moderate (>17) numbers of Potential SRE species have been found in previous surveys. Many of the species collected during these surveys appear in the desktop search data. The numbers of SRE species in Table 6 were generated by consulting the species lists in the reports (and adjusting for potential overlap) rather than using the numbers reported in text. For example, Biologic (2021) reported 19 Potential SREs, but two higher-order entries in the list (*Buddelundia* sp. indet. and Buddelundiinae sp. indet.) may overlap with each other and/or with other listed species (e.g. *Buddelundia* `sp. 10MA`, *B.* `sp. 48`, or *B.* `sp. 49`). There are at least 17 unique Potential SRE species in the list, and the higher-order entries may constitute discrete species, so the number of Potential SREs is reported as >17.

4.2. Survey Results

4.2.1. Sampling Results

The field survey in the Survey Area collected 903 individuals belonging to at least 58 species (Table 7; Figures 8-19). Of the 58 species collected, 25 were arachnids, including mygalomorph spiders, pseudoscorpions, and scorpions; 15 were centipedes, predominantly scolopendrids; seven were molluscs; seven were isopod crustaceans; and the remaining four were millipedes.

Nineteen of the 58 species collected in the survey were recorded in the desktop search, with nine of them known from the Survey Area. However, all nine species are widespread. Seventeen of the species were collected during the survey were recorded there for the first time. No Confirmed SREs were found in the survey.

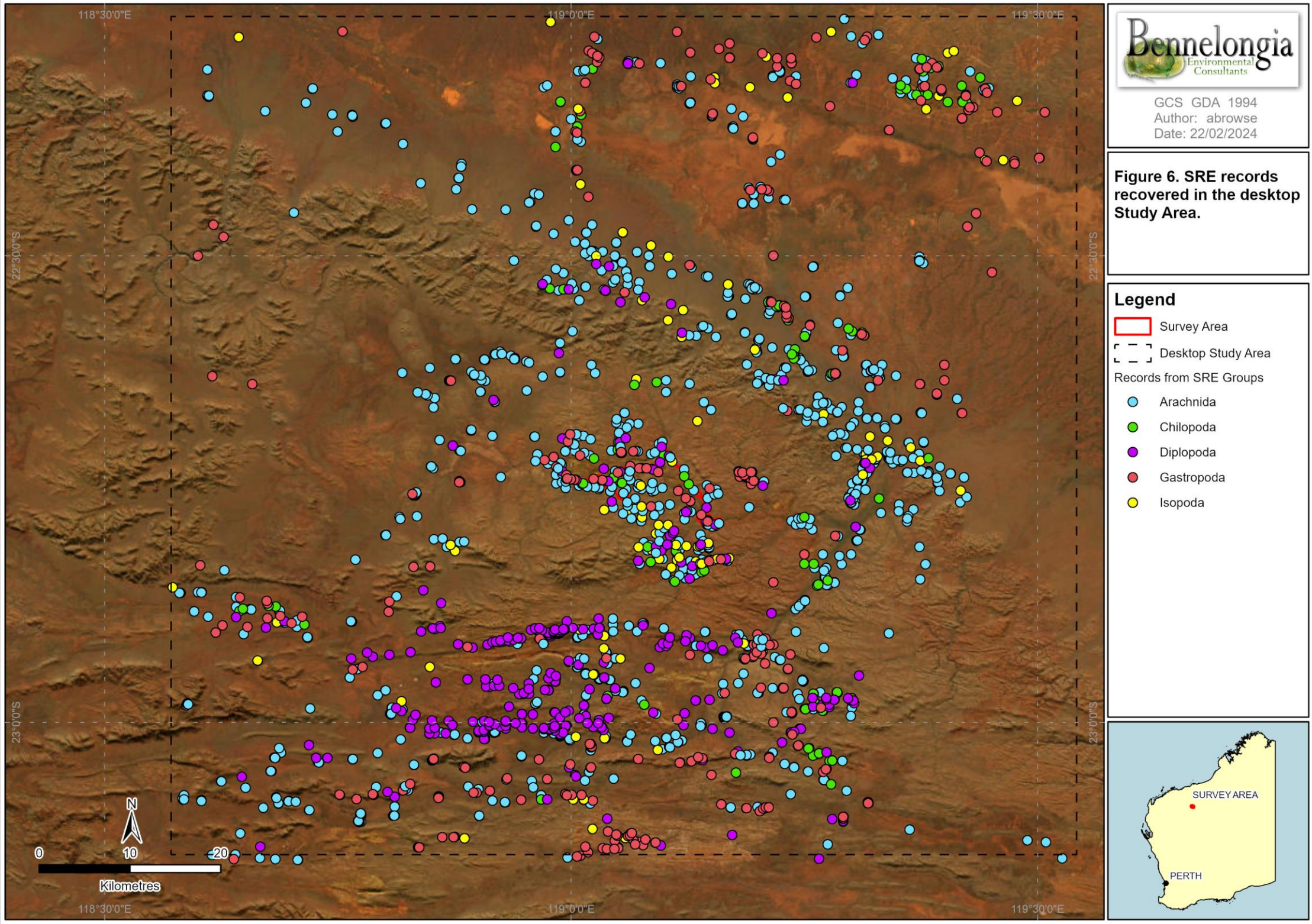
Of the 58 species collected from the Survey Area, two are Confirmed SREs: the mygalomorph spider *Missulena faulderi* and the millipede *Antichiropus pendiculus*. Both are described species with well-sampled distributions of <10,000km^2. A further 15 species are categorised as Potential SREs, 14 as Uncertain SREs, and the remaining 27 are Widespread (Not SRE).

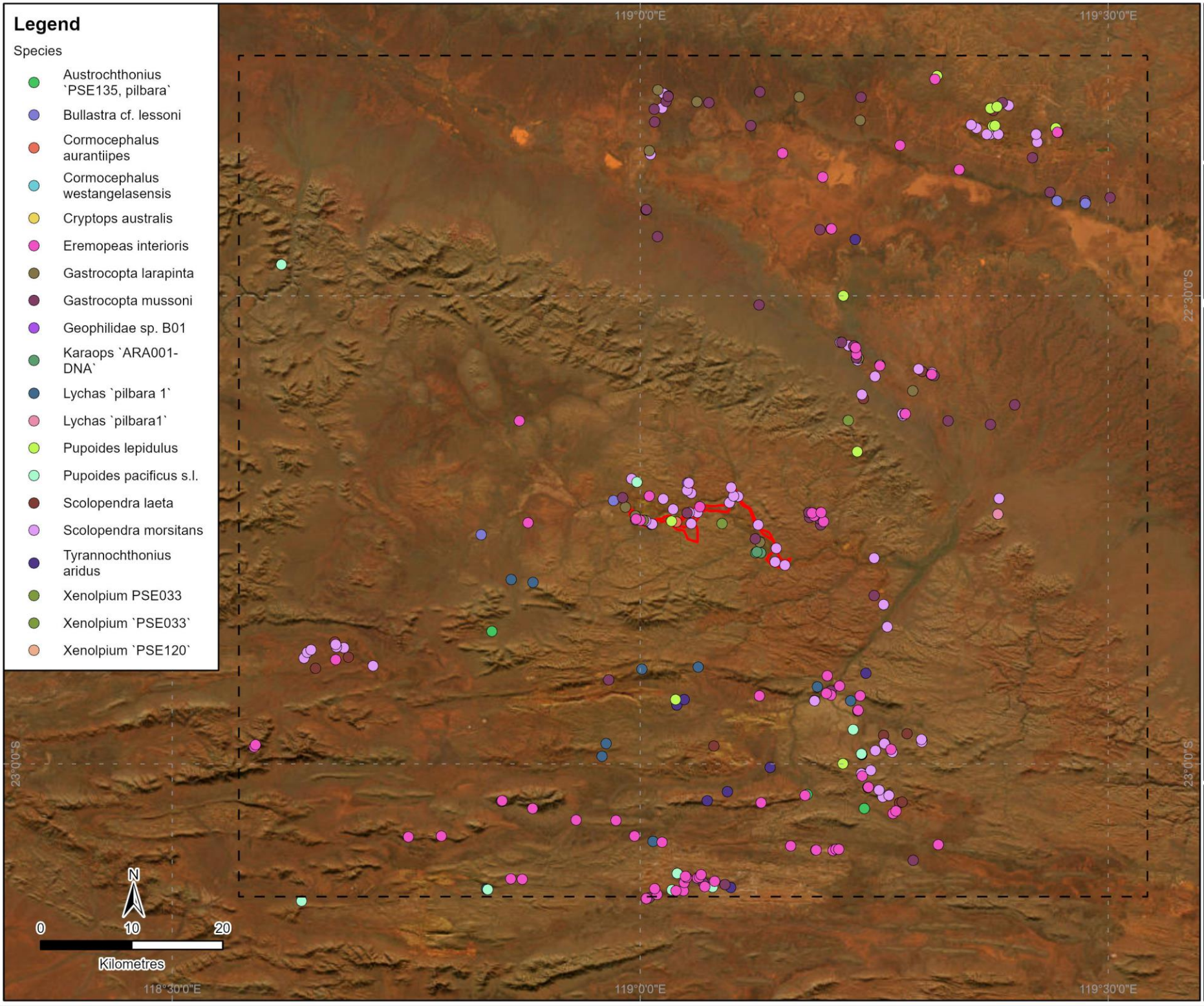
No centipedes (Arthropoda: Myriapoda: Chilopoda) were determined to be Potential SREs. Likewise, no Potential SREs were found among the gastropod molluscs collected.

Table 6. Previous SRE surveys within 30 km of the Survey Area.

Survey	Survey area	Distance to Study Area	Survey dates	Sites visited (all sampled unless otherwise stated)	SREs found
Biologic (2021)	Ministers North, Yandicoogina creek	<5 km	R1: 9-13 Sept 2019 R2: 3-10 April 2020	R1: 45 R2: 25 Total: 70 (32 sampled, remainder habitat only)	0 Confirmed >17 Potential
Biologic (2018a)	Marillana	1 km	R1: 3-10 April 2018	Total: 111 (24 sampled, remainder habitat only)	0 Confirmed 4 Potential
Biologic (2018b)	Ministers North, Yandi Corridor	5 km	R1: 9-13 Oct 2017 R2: 14-24 June 2018	R1: 20 R2: 18 Total: 38 (all but one assessed for habitat)	0 Confirmed 6 Potential
Biologic (2016)	Ministers North	5 km	R1: 31 Mar-3 April 2015 R2: 31 Aug-3 Sept 2015	R1: 58 (18 sampled, remainder habitat only) R2: 57 (25 sampled, remainder habitat only) Total: 109 (38 sampled, remainder habitat only)	0 Confirmed 8 Potential
Biologic (2015)	Yandi	0 km	R1: 3-10 April 2014 R2: 9-16 Sept 20114	R1: 88 (63 sampled, remainder habitat only) R2: 68 (all sampled, 31 new sites assessed for habitat) Total: 119 (94 sampled, remainder habitat only)	0 Confirmed 5 Potential
Biota (2014)	Area C	10 km	R1: 25 May-2 June 2011 R2: 7-15 Sept 2011 5-8 R3: 5-8 Feb 2012	R1: 13 R2: 3 R3: 7 (nocturnal searches only) Total: 22 (6 with nocturnal searches only)	0 Confirmed 9 Potential

Survey	Survey area	Distance to Study Area	Survey dates	Sites visited (all sampled unless otherwise stated)	SREs found
Biologic (2013)	Yandi	0 km	R1: 13-18 May 2013	Total: 55 (34 sampled, remainder habitat only)	0 Confirmed 10 Potential
Biota (2013a)	Jinidi	15 km	R1: 25 Jul-8 Aug 2011	Total: 33	0 Confirmed 9 Potential
Biota (2013b)	South Flank, Jinidi	15 km	R1: 11-20 April 2011 R2: 2-11 Nov 2011 R3: 30 Jan-8 Feb 2012	R1: 14 R2: 11 R3: 5	0 Confirmed 1 Potential
Biota (2013c)	Marillana	10 km	R1: 13-22 June 2011 R2: 7-8 Feb 2012	R1: 24 R2: 12	0 Confirmed 11 Potential
Biota (2011)	Area C, Southern Flank	>10 km	R1: 15-26 Feb 2010 R2: 23-30 June 2010	R1: 27 R2: 21 Total: 44	0 Confirmed >6 Potential
Outback Ecology (2008)	Area C	10 km	R1: 10-18 April 2008 R2: 9-18 June 2008	R1: 15 R2: 15 Total: 15	0 Confirmed ~3 Potential


118°30'0"E
119°0'0"E
119°30'0"E
22°30'0"S
23°0'0"S
N
0
10
20
Kilometres
Bennelongia
Environmental Consultants
GCS GDA 1994
Author: abrowse
Date: 22/02/2024
Figure 6. SRE records recovered in the desktop Study Area.
Legend
Survey Area
Desktop Study Area
Records from SRE Groups
Arachnida
Chilopoda
Diplopoda
Gastropoda
Isopoda
SURVEY AREA
PERTH



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Date: 22/02/2024

Figure 7. Species from SRE Groups previously collected from within the Survey Area (and Study Area).

Legend

Survey Area

Desktop Study Area

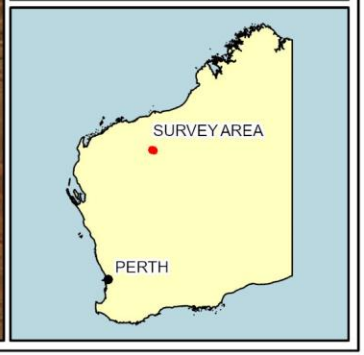

Table 7. SRE fauna recovered during the field survey of the Survey Area.
Bolded values under Lowest Identification indicate taxonomic ranks higher than genus. No. of individuals refers to the total number of individuals collected across all samples. SRE status may be C (**C**onfirmed), P (**P**otential), **N** (**N**ot SRE, =Widespread), or **U** (**U**ncertain, =Data Deficient). For most taxa, a genomic difference of >10% at the target gene is considered a species-level divergence. Orange highlighting indicates the animal is known only from the Survey Area. Grey highlighting indicates a higher order classification that may belong to a named species elsewhere in the list; these specimens are not counted as additional species. The comment "Poor taxonomic framework" indicates that the specimen belongs to a group for which taxonomic research is lacking, meaning that few if any species have been formally described and/or diagnostic characters or molecular divergence thresholds have not been clearly established. Specimens with this comment are identified to higher order only to reflect this taxonomic uncertainty.

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Arthropoda	**857**					
Chelicerata	**173**					
Arachnida	**173**					
Araneae	**32**					
Mygalomorphae	**32**					
Actinopodidae	**1**					
Missulena faulderi	1	42	Hardpan Plain	Y	Linear approx. 36 km.	C
Anamidae	**18**					
Aname `MYG336`	1	16	Sand Plain		Linear approx. 18 km.	P
Aname mellosa	17	Opp1, 08, 09, 16, 20, 27, 30-34, 36, 43	Cleared/ Disturbed, Hillcrest/ Hillslope, Gorge/ Gully, Drainage Area/ Floodplain, Major Drainage Line, Minor Drainage Line	Y	Widespread.	N
Barychelidae	**9**					
Aurecocrypta `MYG316`	9	08, 11, 34, 36, 45	Hillcrest/ Hillslope, Minor Drainage Line, Drainage Area/ Floodplain	Y	Also collected at Roy Hill. Linear range >100 km. Unlikely to be an SRE.	U

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Ctenizidae	**4**					
Conothele `BMYG220`	1	36	Hillcrest/ Hillslope		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Conothele `MYG279`	3	08, 20, 40	Hillcrest/ Hillslope, Gorge/ Gully, Stony Plain	Y	Linear approx. 350 km. Almost certainly not an SRE.	U
Pseudoscorpiones	**117**					
Chthoniidae	**16**					
Austrochthonius `BPS507`	10	11, 20, 36	Minor Drainage, Gorge/ Gully, Hillcrest/ Hillslope	N	New species; this is the only record known. Sampled from multiple sites, so the probability of being an SRE is relatively low, but its distribution remains unknown.	U
Austrochthonius sp.	4	08, 20, 29	Hillcrest/ Hillslope, Gorge/ Gully, Major Drainage Line		Juvenile specimens.	U
Tyrannochthonius aridus	2	03, 37	Major Drainage Line, Hillcrest/ Hillslope	Y	Widespread (Atlas of Living Australia 2023).	N
Panctenata	**88**					
Atemnidae	**7**					
Oratemnus `BPS502`	4	30, 38	Major Drainage Line		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Oratemnus `BPS503`	1	13	Major Drainage Line		New species; this is the only record known. Phylogeny and habitat suggest	P

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
					the possibility that this animal may be an SRE, but its distribution remains unknown.	
Oratemnus sp.	2	04, 13	Waterhole, Major Drainage Line		Juvenile specimens. Probably belongs to one of the species above.	U
Cheliferidae	**11**					
Cheliferidae `BPS504`	11	30	Major Drainage Line		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Garypidae	**23**					
Synsphyronus `BPS511`(lathrius?)	10	11	Minor Drainage Line		New species; this is the only record known. Collected from a drainage line that extends beyond the Study Area, but its distribution remains unknown.	P
Synsphyronus `paradoxus complex`	12	13, 30, 31	Major Drainage Line, Gorge/ Gully		New species; this is the only record known. Sampled from multiple sites, so the probability of being an SRE is relatively low, but its distribution remains unknown.	U
Synsphyronus sp.	1	02	Major Drainage Line		Juvenile specimens.	U
Olpiidae	**45**					
Austrohorus `BPS508`	12	07, 20, 36, 37	Major Drainage Line, Gorge/ Gully, Hillcrest/ Hillslope		New species; this is the only record known. Sampled from multiple sites, so the probability of being an SRE is relatively low, but its distribution remains unknown.	U
Austrohorus `BPS509`	1	31	Gorge/ Gully		New species; this is the only record known. Collected from a habitat that	P

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
					extends beyond the Study Area, but true distribution remains unknown.	
Beierolpium 8/2 `BPS521`	1	42	Hardpan Plain		New species; this is the only record known. Members of the genus tend not to be SREs.	U
Beierolpium 8/4 small `BPS505`	13	03, 06, 14, 29	Major Drainage Line, Drainage Area/ Floodplain		New species; this is the only record known. Sampled from multiple sites and members of the genus tend not to be SREs, so the probability of being an SRE is relatively low.	U
Beierolpium sp.	2	31	Gorge/ Gully			U
Indolpium sp.	8	03, 28, 37, 40, 43	Major Drainage Line, Hillcrest/ Hillslope, Stony Plain, Minor Drainage Line		Juvenile specimens.	U
Olpiidae gen. 7/4`BPS510`	5	34	Drainage Area/ Floodplain		New species; this is the only record known. Collected in a disturbed area, so probably occurs beyond the point of collection, but its distribution remains unknown.	P
Olpiidae sp.	16	11, 14, 15, 16, 29, 30, 34, 42	Minor Drainage Line, Drainage Area/ Floodplain, Gorge/ Gully, Major Drainage Line, Hardpan Plain		Juvenile specimens.	U
Sternophoridae	**2**					
Afrosternophorus `BPS506`	2	06, 13	Major Drainage Line		New species; this is the only record known. Sampled from multiple sites, so the probability of being an SRE is	U

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
					relatively low, but its distribution remains unknown.	
Scorpiones	**24**					
Buthidae	**21**					
Lychas `BSCO056`	14	07, 14, 15, 19, 28, 29	Major Drainage Line, Drainage Area/ Floodplain, Gorge/ Gully		Also collected at Western Ridge. Linear range approx. 97 km. Same species as *Lychas* sp. Biologic-SCO001. Unlikely to be an SRE.	U
Lychas `BSCO058`	1	19	Gorge/ Gully		Also collected at Coombanbunna. Linear range approx. 90 km. Same species as *Lychas* sp. Biologic-SCOR003. Unlikely to be an SRE.	U
Lychas `BSCO088` `pilbara1 group`	1	34	Drainage Area/ Floodplain		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Lychas `pilbara1`	5	28, 34	Major Drainage Line, Drainage Area/ Floodplain	Y	Widespread (Atlas of Living Australia 2023).	N
Urodacidae	**3**					
Urodacus `BSCO045`	3	27, 29, 34	Drainage Area/ Floodplain, Major Drainage Line	Y	Also collected at Western Ridge. Linear range approx. 103 km. Unlikely to be an SRE.	U
Crustacea	**296**					
Malacostraca	**296**					
Isopoda	**296**					
Armadillidae	**270**					

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Acanthodillo `BIS523`	2	04	Waterhole		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Acanthodillo `BIS524`	1	40	Stony Plain		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Buddelundia `BIS374`	68	03, 11, 15, 25, 31, 36, 37	Major Drainage Line, Gorge/ Gully, Hillcrest/ Hillslope		Linear range approx. 95 km. Less likely to be an SRE due to the linear distribution and variety of habitats.	U
Buddelundia `BIS520`	193	03, 06-09, 11, 13-16, 19, 20, 27-30, 33, 34, 37, 38, 40, 45	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Stony Plain		Linear range approx. 21 km.	P
Buddelundia `BIS521`	3	37, 40	Hillcrest/ Hillslope, Stony Plain		New species; this is the only record known. Phylogeny and habitat suggest the possibility that this animal may be an SRE, but its distribution remains unknown.	P
Buddelundia `BIS536`	2	08, 31	Hillcrest/ Hillslope, Gorge/ Gully	Y	Also collected at Ministers North. Linear range of approximately 17 km.	P

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Buddelundia sp.	1	09	Gorge/ Gully		Specimen damaged and dried out in vial leak.	U
Philosciidae	**26**					
Laevophiloscia `BIS522`	26	03, 04, 06, 13, 14, 28, 36, 37, 41	Drainage Area/ Floodplain, Hillcrest/ Hillslope, Major Drainage Line, Waterhole	Y	Also collected at Ministers North. Linear range approx. 16 km.	P
Myriapoda	**388**					
Chilopoda	**131**				Not considered an SRE Group (BHP 2022) but included for completeness.	
Geophilida	**23**					
Geophilida sp.	3	07, 41	Major Drainage Line, Minor Drainage Line		Poor taxonomic framework.	N
Chilenophilidae	**5**					
Chilenophilidae sp.	5	06, 14, 36	Drainage Area/ Floodplain, Hillcrest/ Hillslope, Major Drainage Line		Poor taxonomic framework.	N
Geophilidae	**2**					
Geophilidae sp.	2	20, 30	Gorge/ Gully, Major Drainage Line		Poor taxonomic framework.	N
Mecistocephalidae	**13**					
Mecistocephalidae sp.	13	03, 04, 06, 07, 28, 31, 34, 37, 41, 45	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Waterhole		Poor taxonomic framework.	N

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Scolopendrida	**97**					
Cryptopidae	**2**					
Cryptops sp.	2	13, 30	Major Drainage Line		Poor taxonomic framework.	N
Scolopendridae	**95**					
Arthrorhabdus paucispinus	1	29	Major Drainage Line	Y	Widespread (Koch 1984).	N
Cormocephalus aurantiipes	1	02	Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Cormocephalus michaelseni	3	04, 06, 14	Drainage Area/ Floodplain, Major Drainage Line, Waterhole		Widespread (Bennelongia database)	N
Cormocephalus similis	3	04, 28, 29	Waterhole, Major Drainage Line		Widespread (Bennelongia database)	N
Cormocephalus sp.	1	28	Major Drainage Line		Probably belongs to one of other species in genus	N
Cormocephalus westangelasensis	1	28	Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Notiasemus glauerti	2	06	Major Drainage Line		Widespread (Bennelongia database)	N
Scolopendra laeta	8	07-09, 19, 33, 34	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Minor Drainage Line	Y	Widespread (Vahtera *et al.* 2013).	N
Scolopendra morsitans	67	03-08, 11, 14-16, 19, 20, 28-31, 33,	Drainage Area/ Floodplain, Gorge/ Gully, Hardpan Plain, Hillcrest/ Hillslope, Major Drainage Line,	Y	Widespread (Atlas of Living Australia 2023).	N

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
		34, 37, 38, 40-43, 45	Minor Drainage Line, Stony Plain, Waterhole			
Scolopendra sp.	8	07, 08, 16, 19, 38, 41	Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Minor Drainage Line		Specimens not identifiable.	N
Scutigeromorpha	**11**					
	11					
	7					
Scutigeromorpha sp.	7	07, 08, 19, 37, 40, 45	Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line		Poor taxonomic framework.	N
Scutigeridae	**4**					
Scutigeridae sp.	4	15, 28, 34, 40	Drainage Area/ Floodplain, Gorge/ Gully, Major Drainage Line, Stony Plain		Poor taxonomic framework.	N
Diplopoda	**257**					
Polydesmida	**17**					
Paradoxosomatidae	**17**					
Antichiropus pendiculus	13	19, 34, 37, 42, 45	Drainage Area/ Floodplain, Gorge/ Gully, Hardpan Plain, Hillcrest/ Hillslope	Y	Very likely to be an SRE (Car *et al.* 2019); described species with range approx. 500 km^2.	C
Antichiropus sp.	4	19, 20, 37, 45	Gorge/ Gully, Hillcrest/ Hillslope		Likely to be *Antichiropus pendiculus*, but not sufficiently diagnostic to identify.	U
Polyxenida	**226**					
Polyxenidae	**203**				No SREs known from this family.	

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Unixenus sp.	203	03, 04, 07, 08, 13, 14, 16, 19, 27, 28, 30, 34, 37, 40, 43	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line, Stony Plain, Waterhole			N
Synxenidae	**23**					
Phryssonotus novaehollandiae	23	03, 06, 14, 19, 27, 31, 36, 37, 41	Drainage Area/ Floodplain, Gorge/ Gully, Hillcrest/ Hillslope, Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Spirobolida	**14**					
Trigoniulidae	**14**					
Austrostrophus sp.	9	07, 11, 31, 42, 45	Gorge/ Gully, Hardpan Plain, Hillcrest/ Hillslope, Major Drainage Line, Minor Drainage Line		Juveniles and/or nondiagnostic sex.	U
Austrostrophus stictopygus	5	07, 11, 31, 42, 45	Gorge/ Gully, Hardpan Plain, Hillcrest/ Hillslope, Major Drainage Line, Minor Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Mollusca	**46**					
Gastropoda	**46**					
Gastropoda sp.	2	31, 37	Gorge/ Gully, Hillcrest/ Hillslope		Too fragmentary to identify.	U
Stylommatophora	**44**					
Charopidae	**1**					

Lowest identification	No. of individuals	Site(s)	Habitat associations	Found in desktop search?	Comments	SRE status
Discocharopa aperta	1	14	Drainage Area/ Floodplain		Widespread (Atlas of Living Australia 2023).	N
Pupillidae	**37**					
cf. *Pupisoma* sp.	2	04, 34	Drainage Area/ Floodplain, Waterhole		Specimens too small for molecular analysis.	U
Gastrocopta mussoni	32	06, 14	Drainage Area/ Floodplain, Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Pupoides beltianus	1	42	Hardpan Plain	Y	Widespread (Atlas of Living Australia 2023).	N
Pupoides lepidulus	2	27	Drainage Area/ Floodplain	Y	Widespread (Atlas of Living Australia 2023).	N
Subulinidae	**3**					
Allopeas sp.	1	14	Drainage Area/ Floodplain		Juvenile.	U
Eremopeas interioris	2	06	Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023).	N
Succineidae	**3**					
Austrosuccinea australis	2	30, 31	Gorge/ Gully, Major Drainage Line	Y	Widespread (Atlas of Living Australia 2023)	N
Austrosuccinea sp.	1	30	Major Drainage Line		Specimen too damaged to identify.	U
Grand Total	**903**					

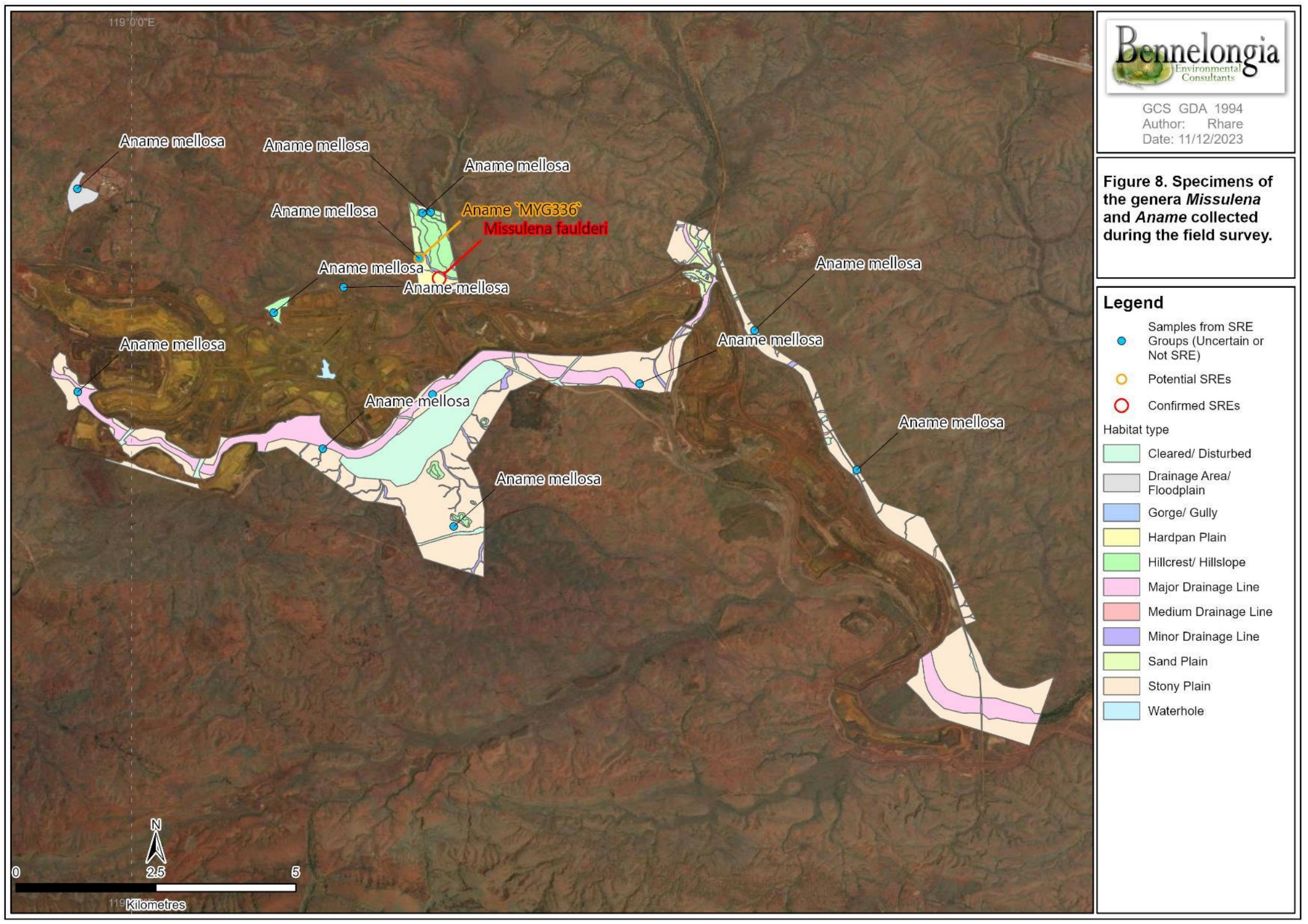

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Figure 8. Specimens of the genera *Missulena* and *Aname* collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs
- Confirmed SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

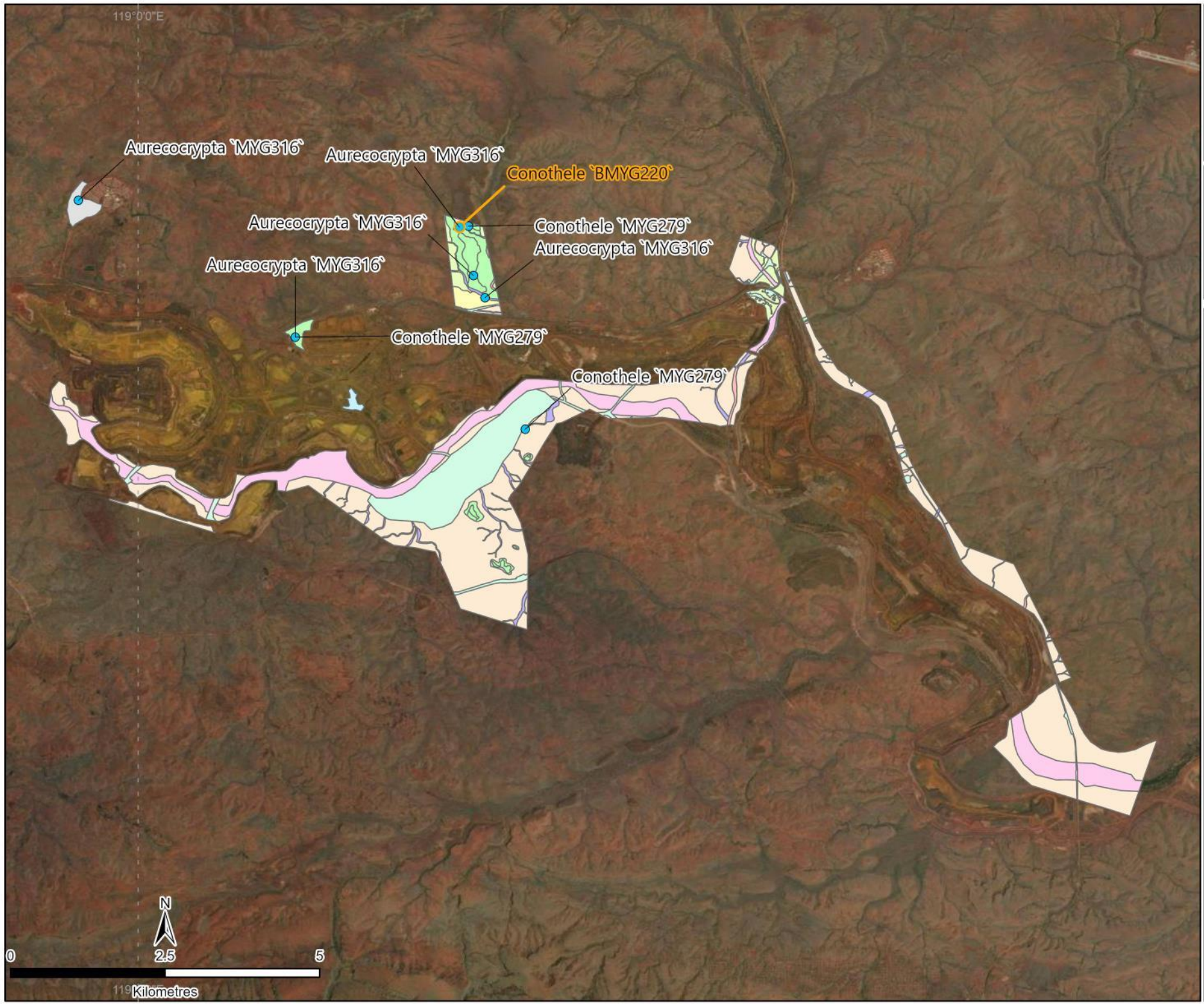

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Figure 9. Specimens of the genera *Aurecocrypta* and *Conothele* collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

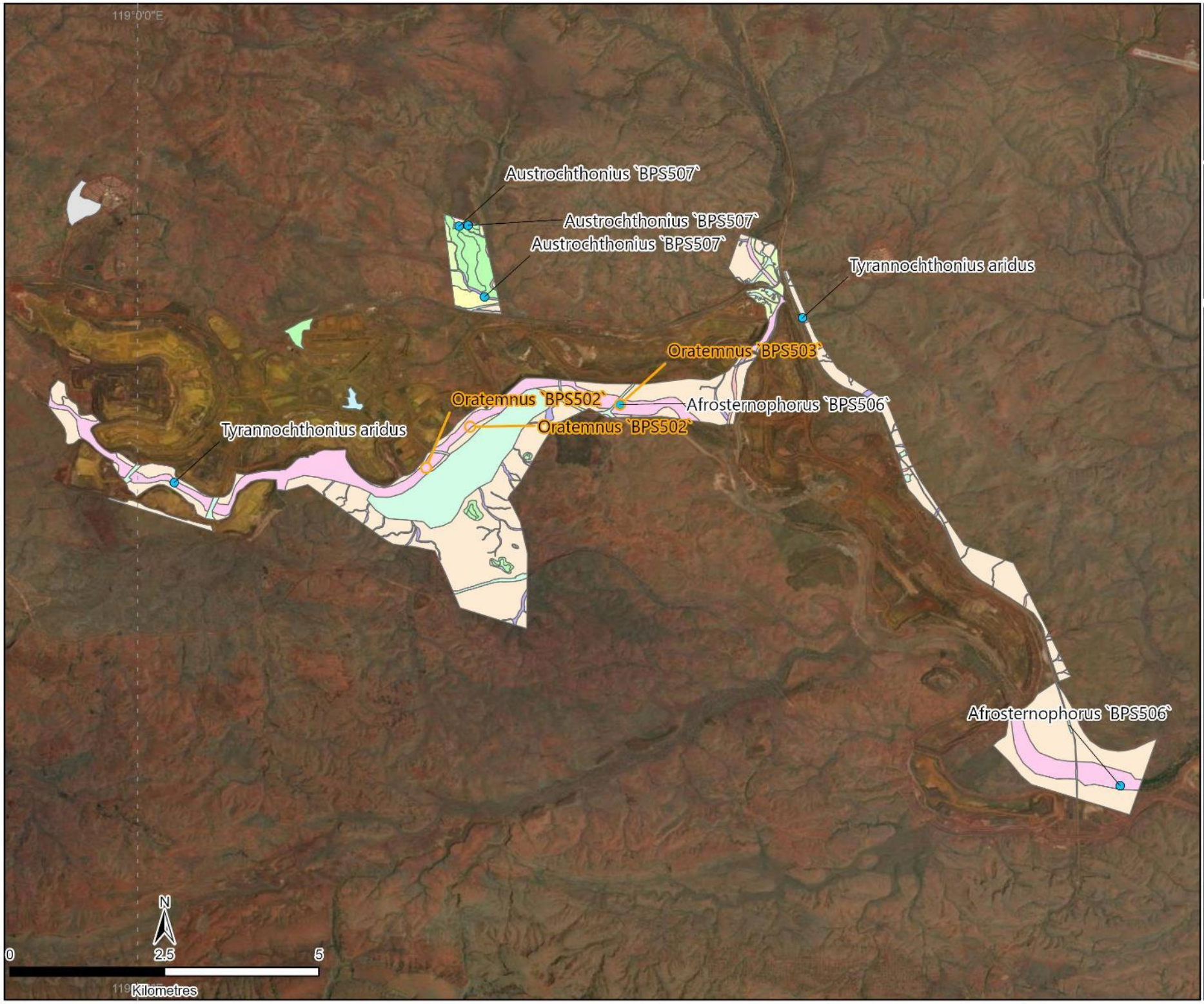

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Figure 10. Specimens of the families Chthoniidae, Atemnidae, and Sternophoridae collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

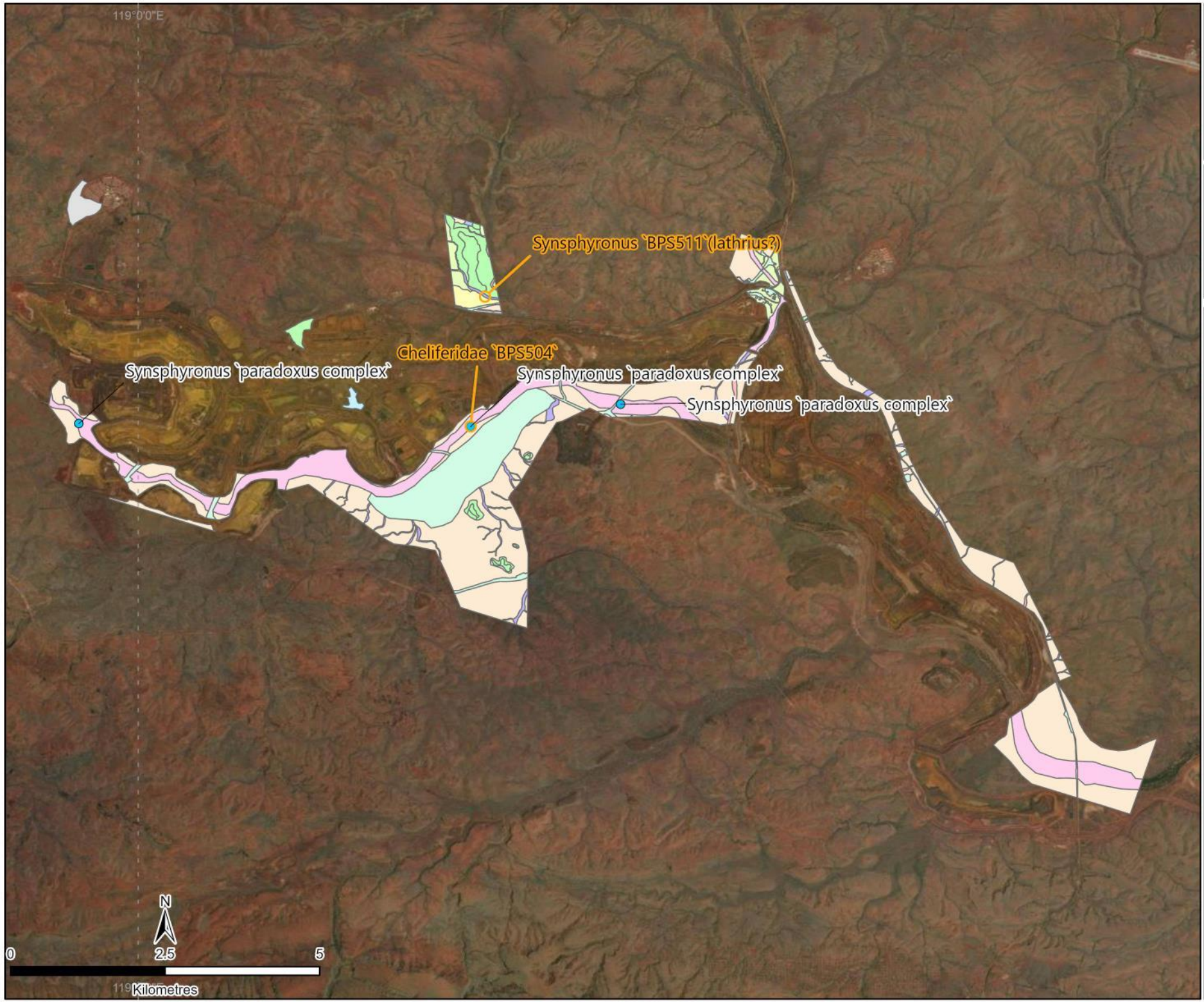

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Figure 11. Specimens of the families Cheliferidae and Garypidae collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

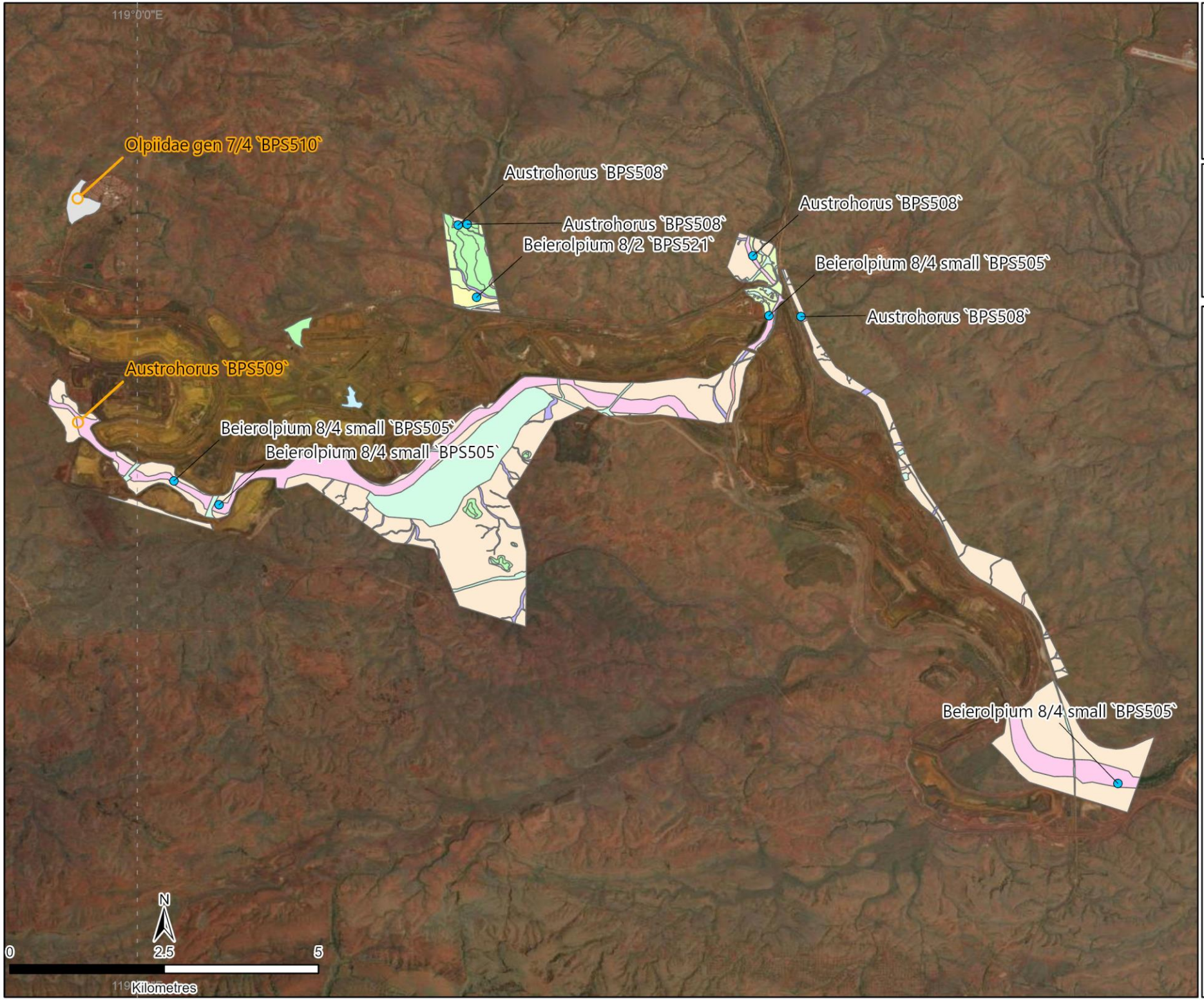

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Figure 12. Specimens of the family Olpiidae collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

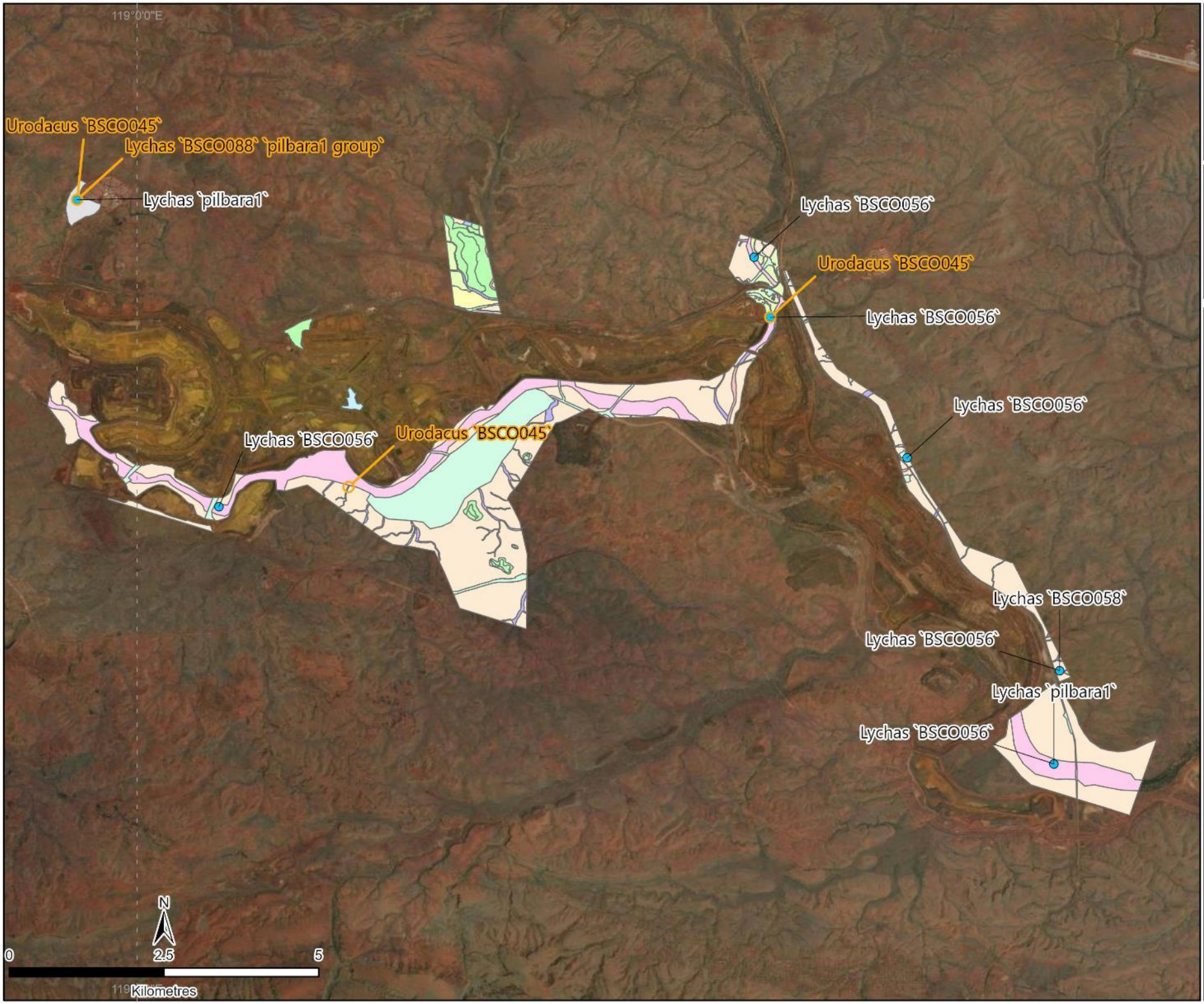

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Figure 13. Scorpions collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

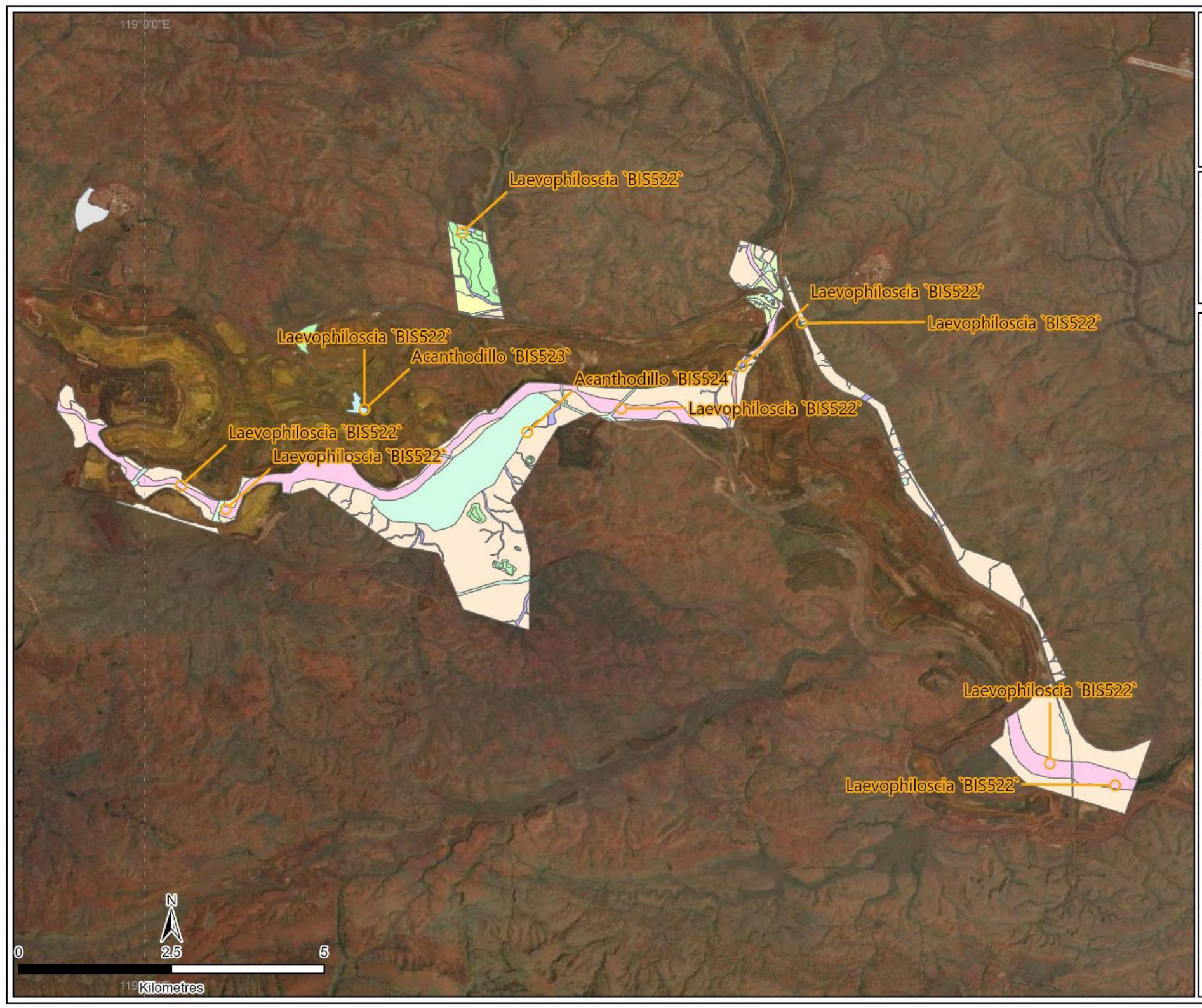

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Figure 14. Specimens of the genera *Acanthodillo* and *Laevophiloscia* collected during the field survey.

Legend

- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

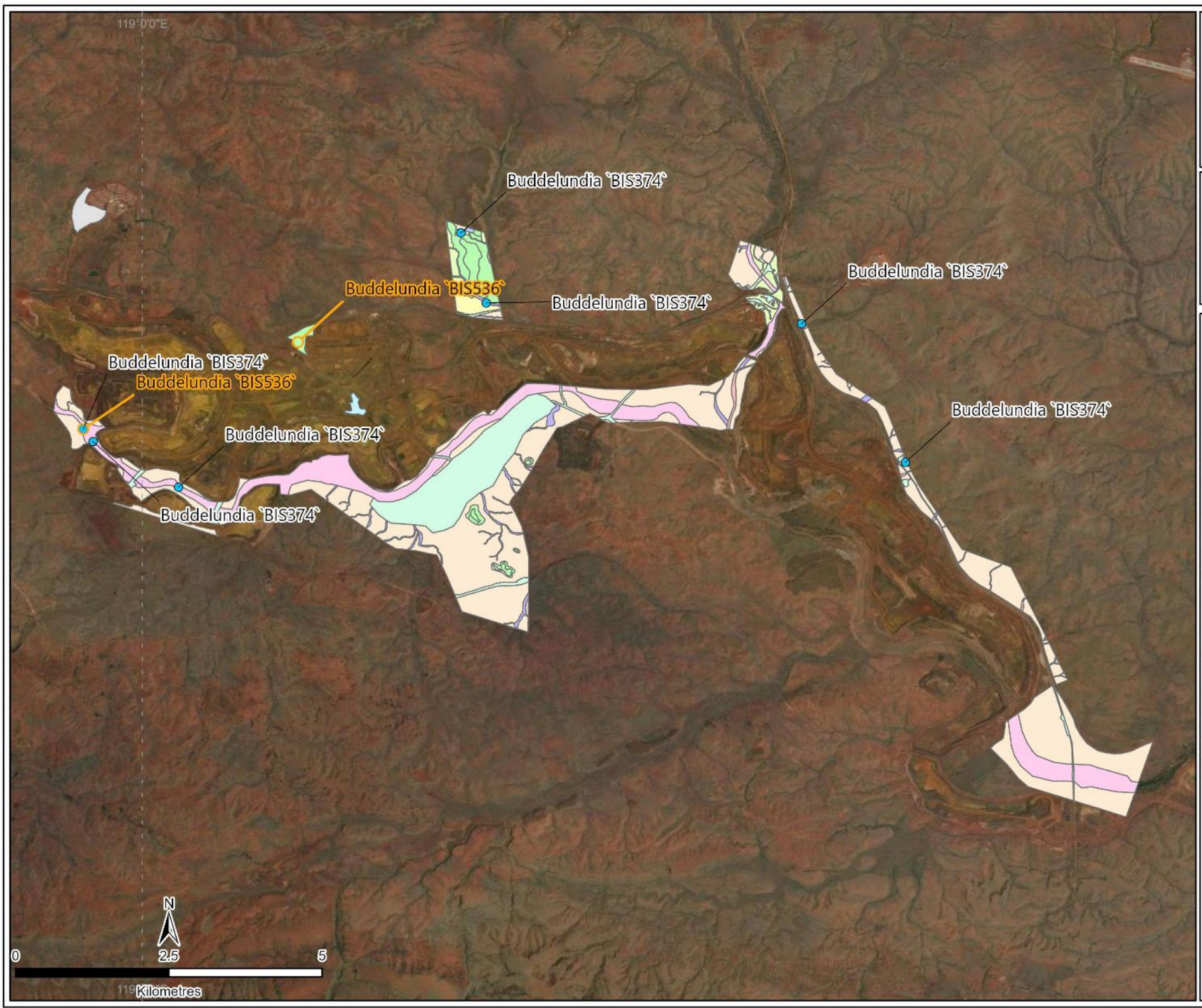

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Figure 15. Specimens of the species *Buddelundia* `BIS374` and *B.* `BIS536` collected during the field survey.

Legend

- Potential SREs
- Samples from SRE Groups (Uncertain or Not SRE)

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

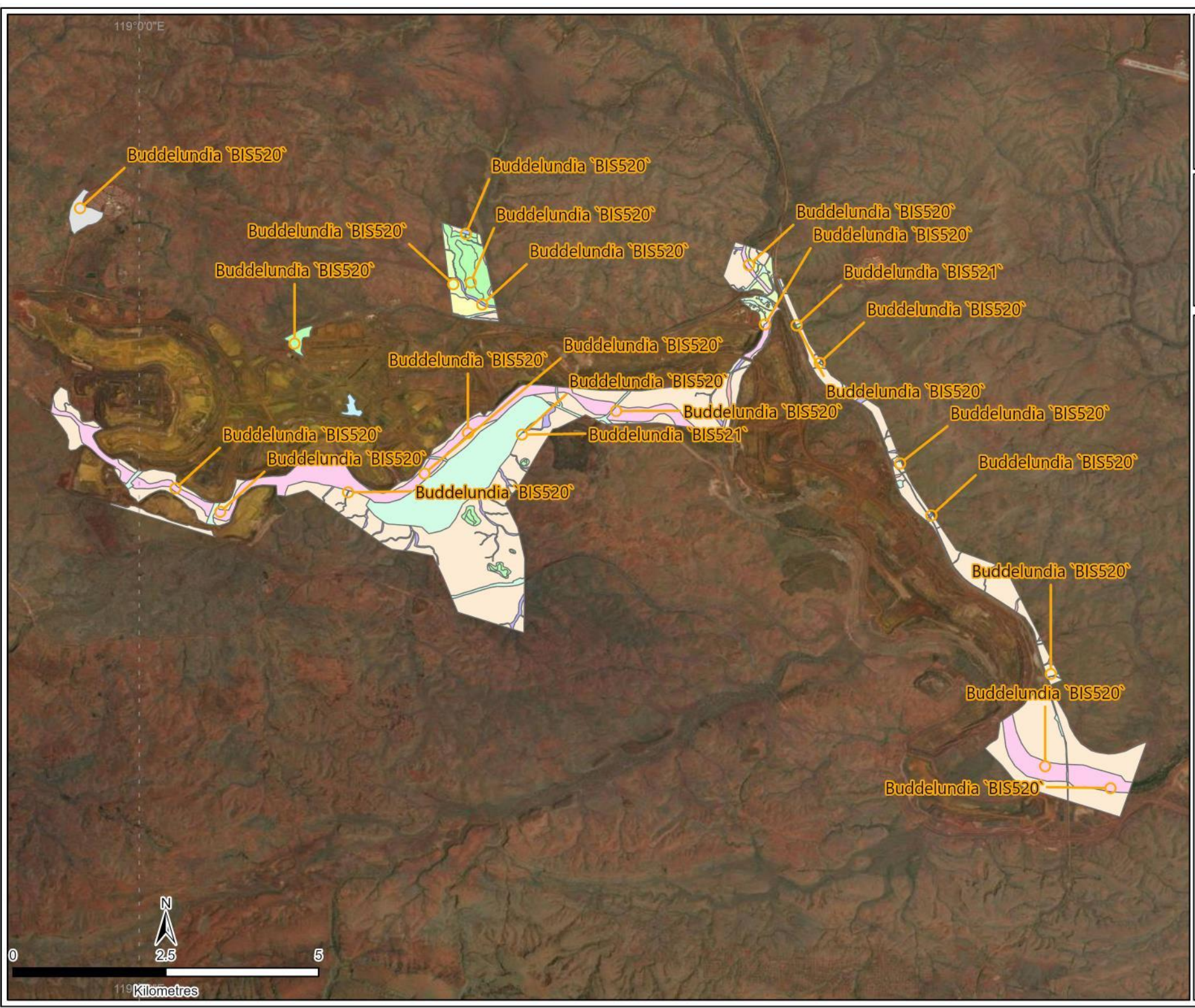

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Figure 16. Specimens of the species *Buddelundia* `BIS520` and *B.* `BIS521` collected during the field survey.

Legend

- Potential SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

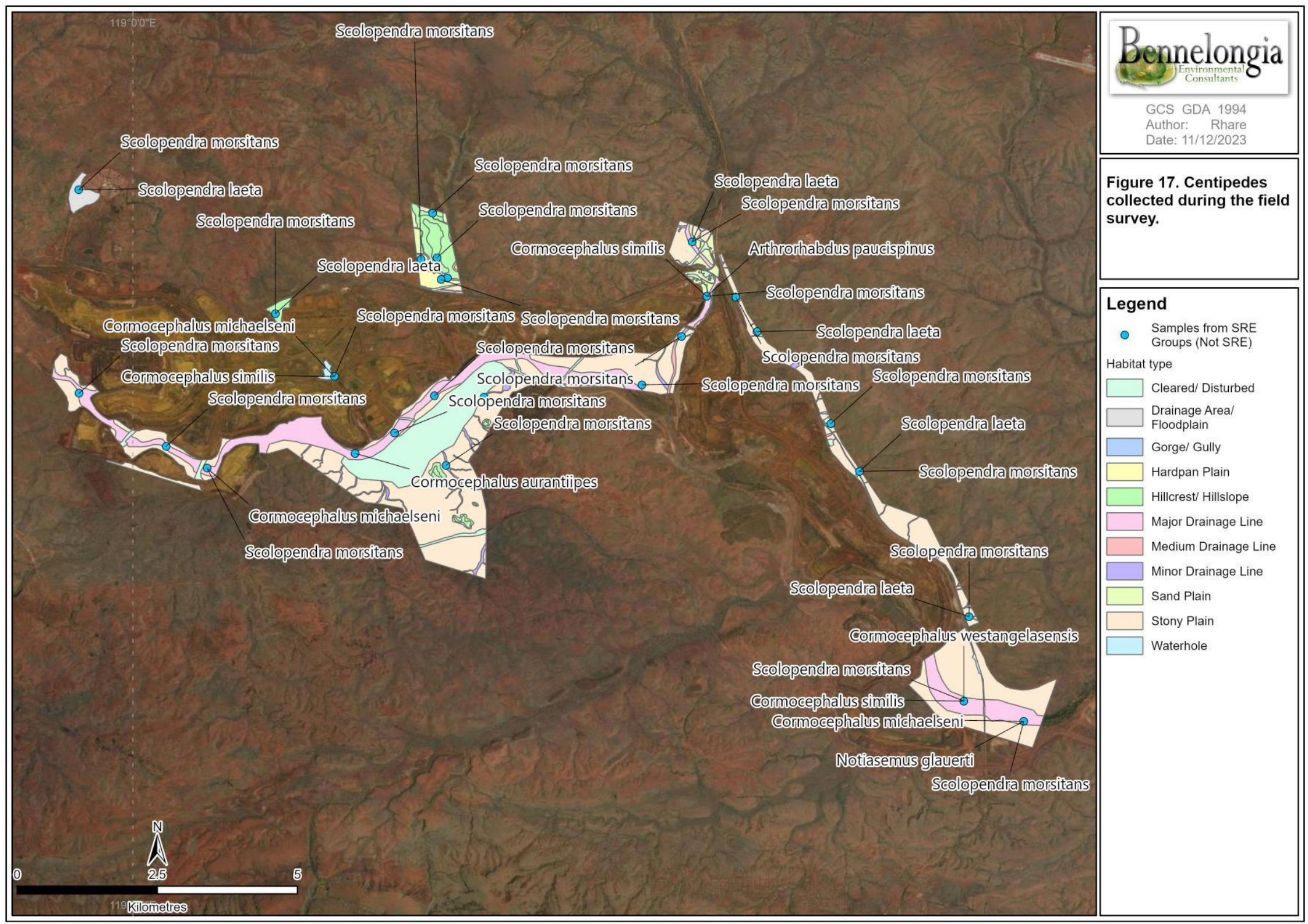

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Figure 17. Centipedes collected during the field survey.

Legend

- Samples from SRE Groups (Not SRE)

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

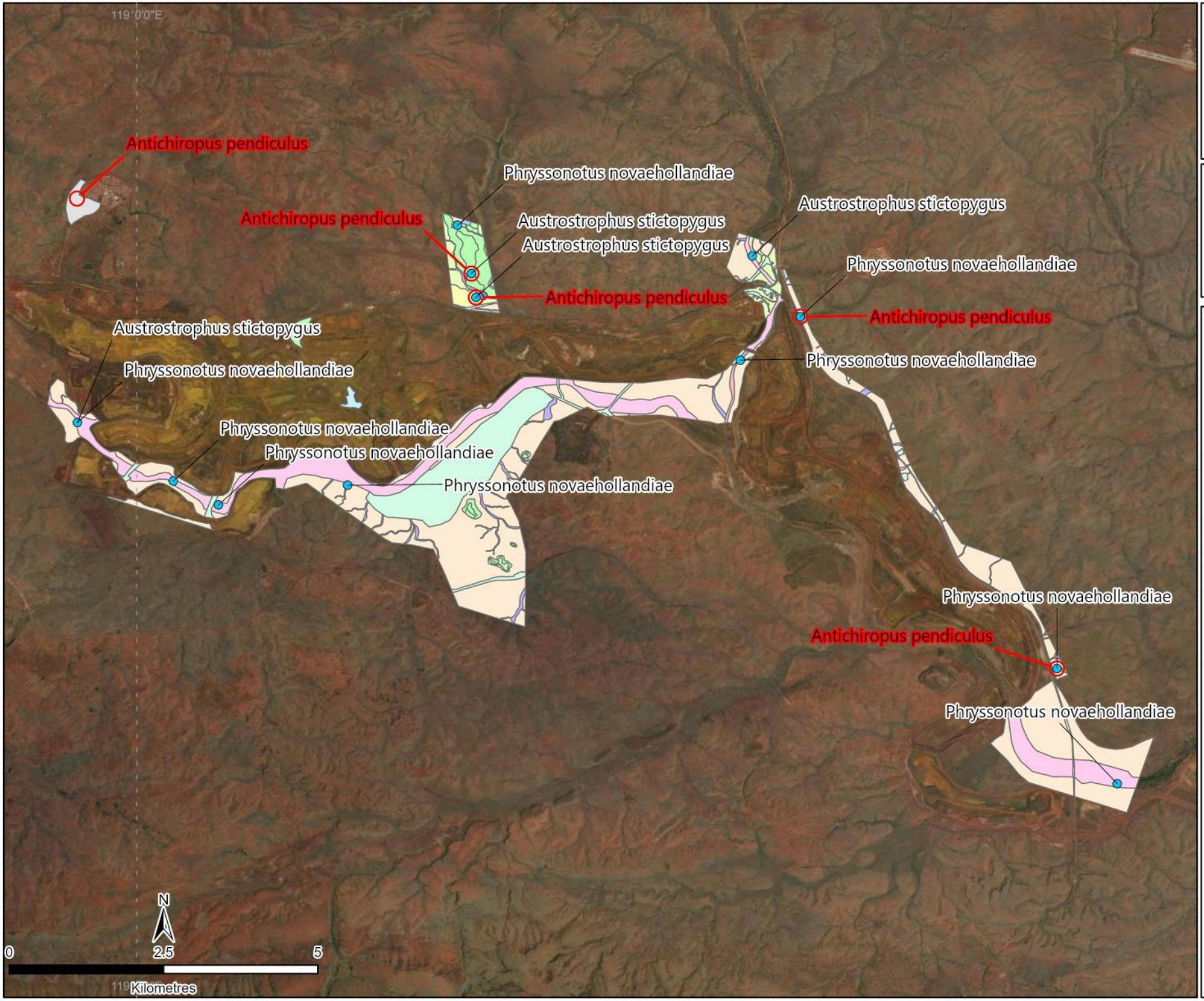

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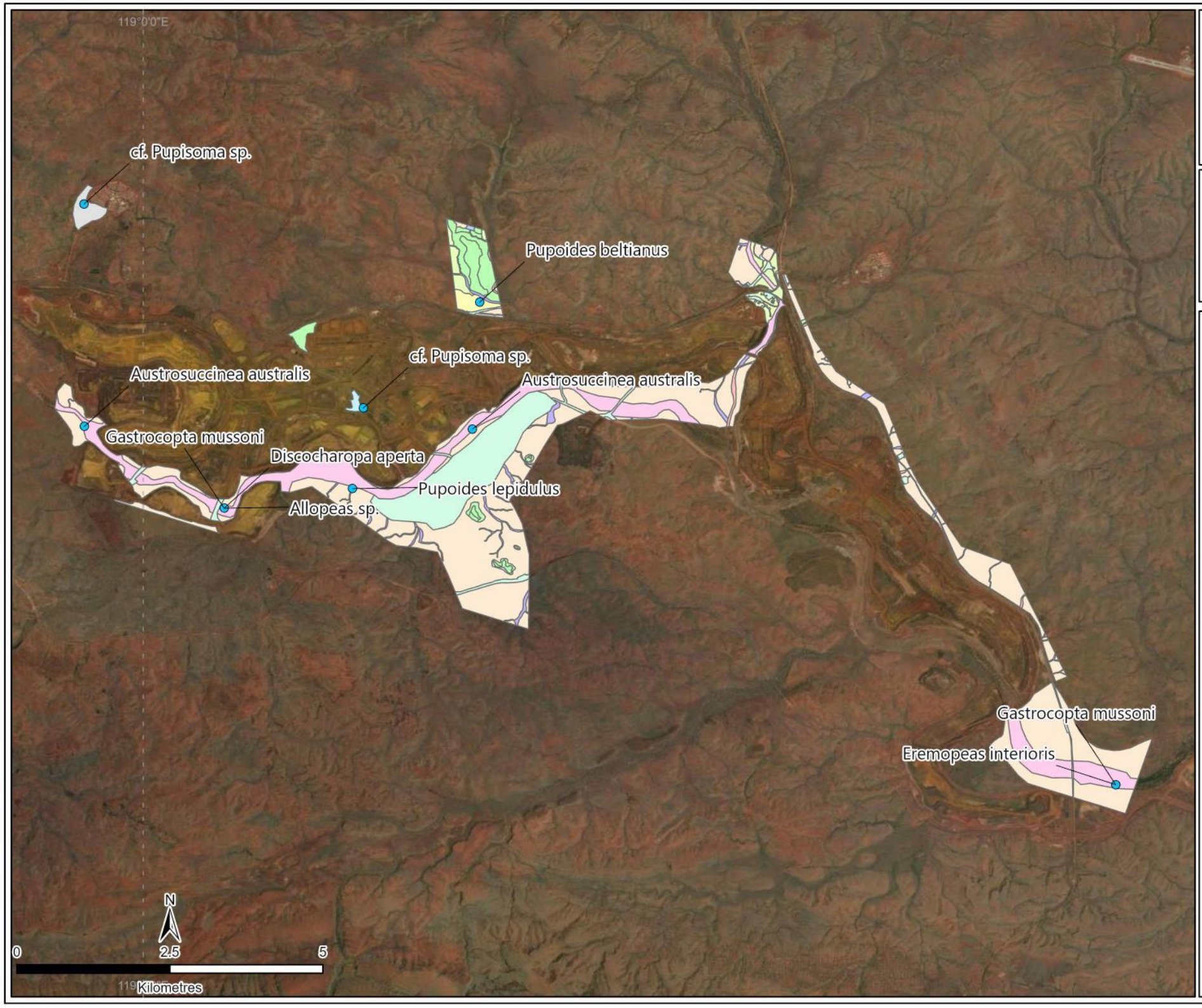
Figure 18. Millipedes collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)
- Confirmed SREs

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole



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Date: 11/12/2023

Figure 19. Land snails collected during the field survey.

Legend

- Samples from SRE Groups (Uncertain or Not SRE)

Habitat type

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

4.2.2. Habitat Mapping

Eleven different habitat types were found in the Survey Area (Table 8; Figure 20). Examples of the habitats can be seen in the photographs of all sites (Appendix 5). Habitat assessment and mapping in the Survey Area show habitat suitable for SREs is abundant. All habitat types discussed below, excluding Cleared/ Disturbed, are prospective for SREs.

Table 8. Habitat types found in the Study Area.

Habitat type	Area	%	Sites	Comments/Microhabitats
Stony Plain	1018.7	56.1	40	Habitat in continuous swathes extending beyond the Study Area. *Acacia* encountered during survey, providing microhabitat under bark and in leaf litter. Stony rocks on the plains also provided microhabitats for invertebrates.
Major Drainage Line	314.2	17.3	02, 03, 06, 07, 12, 13, 22, 23, 24, 25, 28, 29, 30, 38, 39	Marillana Creek and various tributaries extend through and beyond the Study Area. Sites often supported vegetation providing microhabitats under bark and/or in leaf litter for invertebrates, from the genera *Acacia*, *Eucalyptus*, *Melaleuca*, and *Hakea*. Sandy soils further away from the watercourse provided suitable habitat for burrowing invertebrates.
Cleared/ Disturbed	261.1	14.4	Opp1	Part of the Study Area has been cleared for mining. Clearing and disturbance are not expected outside the Study Area. Two specimens of *Aname mellosa* were collected opportunistically from an administration building.
Hillcrest/ Hillslope	83.7	4.6	08, 36, 37, 45	Hills occurring within the Study Area are likely relatively isolated from hills occurring outside the Study Area. All sites in this habitat but YAN-08 are south-facing. South-facing slopes in particular support vegetation, in this case *Hakea* and *Eucalyptus*, and have higher humidity than other aspects.
Sand Plain	43.3	2.4	16	Probably also occurs outside the Study Area, but not in the abundance or continuity of Stony Plain. No vegetation associations were recorded for this habitat type.
Minor Drainage Line	40.9	2.3	05, 10, 11, 21, 33, 35, 41, 43	As for Major Drainage Line. *Acacia*, *Eucalyptus*, *Hakea*, and *Corymbia* were encountered during survey.
Drainage Area/ Floodplain	23.0	1.3	14, 26, 27, 34	As for Major Drainage Line. *Acacia*, *Eucalyptus*, *Hakea*, and *Corymbia* were encountered during survey.
Hardpan Plain	16.4	0.9	42	Relatively uncommon and discontinuous habitat type in the Study Area. Leaf litter from *Acacia* and *Eucalyptus* provided suitable microhabitat for invertebrates at this site.
Gorge/ Gully	1.1	0.6	01, 09, 15, 16, 17, 18, 19, 20, 31, 32, 44	As with hills, gorges and gullies occurring within the Study Area probably do not provide continuous habitat with gorges and gullies

Habitat type	Area	%	Sites	Comments/Microhabitats
				outside the Study Area. Often rocky, but higher humidity at the base of declivities provides habitat for invertebrates. During survey, *Acacia*, *Hakea*, and *Eucalyptus* were encountered, providing bark and leaf litter microhabitats.
Medium Drainage Line	7.5	0.4	None	As for Major Drainage Line.
Waterhole	5.9	0.3	04	Isolated habitat type within the Study Area. *Acacia* provided bark and leaf litter at this site, and rocks provided sheltered microhabitat for invertebrates.

Stony Plain

Stony Plain is the most common mapped habitat type in the Survey Area. Stony Plain typically provides habitat for burrowing SREs requiring firmer soils (e.g. most mygalomorph spiders) but not for burrowing SREs requiring looser soils (e.g. some *Urodacus* scorpions). The presence of rocks and vegetation throughout Stony Plain provides suitable microhabitat for *Lychas* scorpions, centipedes, millipedes, and pseudoscorpions, which may occur beneath rocks, under bark, and/or in leaf litter; rocks and vegetation may also retain enough humidity to support isopods. The stony plains of the Survey Area were broad and presumably continuous with similar habitat in the surrounding Study Area. Thus, animals found in Stony Plain in the survey are not expected to be limited to the Survey Area. Mygalomorph spiders, pseudoscorpions, isopods, centipedes, and millipedes were collected from Stony Plain.

One Potential SRE was collected exclusively from Stony Plain in the survey: the isopod *Acanthodillo* `BIS524`.

Drainage Lines (Major, Medium, and Minor) and Drainage Area/ Floodplain

These four habitat types were common throughout the Survey Area. Residual seasonal moisture from drainage lines provides elevated humidity suitable for gastropods, isopods, and millipedes. Moisture from drainage lines also supports vegetation, the shade, bark, and leaves of which provide microhabitat for centipedes, millipedes, and pseudoscorpions. Further from the watercourse, soils suitable for mygalomorphs often occur. Gastropods, isopods, millipedes, centipedes, pseudoscorpions, and mygalomorphs were all collected from drainage lines during the survey. The continuity of drainage lines within and beyond the Survey Area renders it unlikely that any of the species collected in these habitat types are restricted to the Survey Area.

Four Potential SREs were collected exclusively from Major Drainage Line in the survey: the pseudoscorpions *Oratemnus* `BPS502`, *O.* `PBS503`, Cheliferidae `BPS504`, *Synsphyronus* `BPS511` (Iathrius?).

Two Potential SREs were collected exclusively from Drainage Area/ Floodplain in the survey: the pseudoscorpion Olpiidae `BPS510` and the scorpion *Lychas* `BSCO088` `pilbara1 group`,

No Potential SREs were collected exclusively from Medium or Minor Drainage Lines.

Cleared/ Disturbed

This habitat type is generally unsuitable for SREs.

Hillcrest/ Hillslope

South-facing hill slopes are at least partially sheltered from the sun, leading to cooler temperature and higher humidity than in surrounding habitat types. South-facing slopes are thus highly prospective for SREs, particularly as they are often isolated within broader landscapes. Millipedes, anamid mygalomorphs, and *Lychas* scorpions are all likely to occur in south-facing slopes. Hillcrest/ Hillslope

hosting *Acacia* species often provides bark and leaf litter for pseudoscorpions as well. Mygalomorphs, pseudoscorpions, isopods, centipedes, millipedes, and molluscs were collected from south-facing Hillslope during the survey.

One Potential SRE was collected exclusively from Hillcrest/ Hillslope: the mygalomorph spider *Conothele* `BMYG220`.

Sand Plain

Sand plains with loose soil are suitable for *Urodacus* scorpions and anamid mygalomorphs lacking a rastellum. Isopods may also be found in leaf litter. Sand Plain occurred in isolated patches in the Survey Area. Mygalomorph spiders, centipedes, millipedes, pseudoscorpions, and isopods were collected in this habitat during the survey. Sand Plain evidently provides suitable habitat for SREs in the Survey Area.

One Potential SRE was collected exclusively from Sand Plain in the survey: the mygalomorph spider *Aname* `MYG336`.

Hardpan Plain

Hardpan Plain is highly prospective for mygalomorphs in the genus *Conothele*, which often prefer to burrow in claypan. Centipedes, including the SRE-rich families Geophilidae and Cryptopidae, are also often more abundant in this habitat type. Centipedes, millipedes, mygalomorphs, molluscs, and pseudoscorpions were collected from Hardpan Plain during the survey.

One Confirmed SRE was collected exclusively from Hardpan Plain: the trapdoor spider *Missulena faulderi*. No Potential SREs were collected exclusively from Hardpan Plain.

Gorge/ Gully

Gorges and gullies tend to be rocky, but soil in and around the declivities may provide suitable habitat for invertebrates. Seasonal water in the base of the gorge/gully may provide sufficient humidity to support various plant species and humidity-dependent SRE Group species such as millipedes and isopods. Rocks and vegetation provide habitat for *Lychas* centipedes. Soils often provide habitat suitable for mygalomorphs. When vegetation is present, pseudoscorpions may also occur. Mygalomorphs, isopods, centipedes, millipedes, and occasional pseudoscorpions were collected from Gorge/ Gully during the survey. Gorges/ Gully tends to be an isolated habitat type.

No Potential SREs were collected exclusively from Gorge/ Gully in the survey.

Waterhole

Waterholes largely resemble drainage areas in terms of suitability for SREs. The major difference is that Waterhole, whether natural or artificial, tends to be isolated within the broader landscape; accordingly, moisture-dependent SREs may not have distribution corridors away from Waterhole. Isopods, molluscs, centipedes, and pseudoscorpions were collected from the waterhole sampled during survey.

One Potential SRE was collected exclusively from Waterhole: the isopod *Acanthodillo* `BIS523`.

4.2.3. Molecular Analysis

All of the 24 specimens from the Survey Area selected for sequencing returned sequences. Molecular analysis resulted in confirmed or updated identifications for 13 of the specimens (Appendix 4): these were five specimens identified morphologically to species and eight specimens identified morphologically to higher levels. For the remaining nine specimens, molecular analysis supported the original morphological identifications (Appendix 4).

Updates to species-level morphological identifications

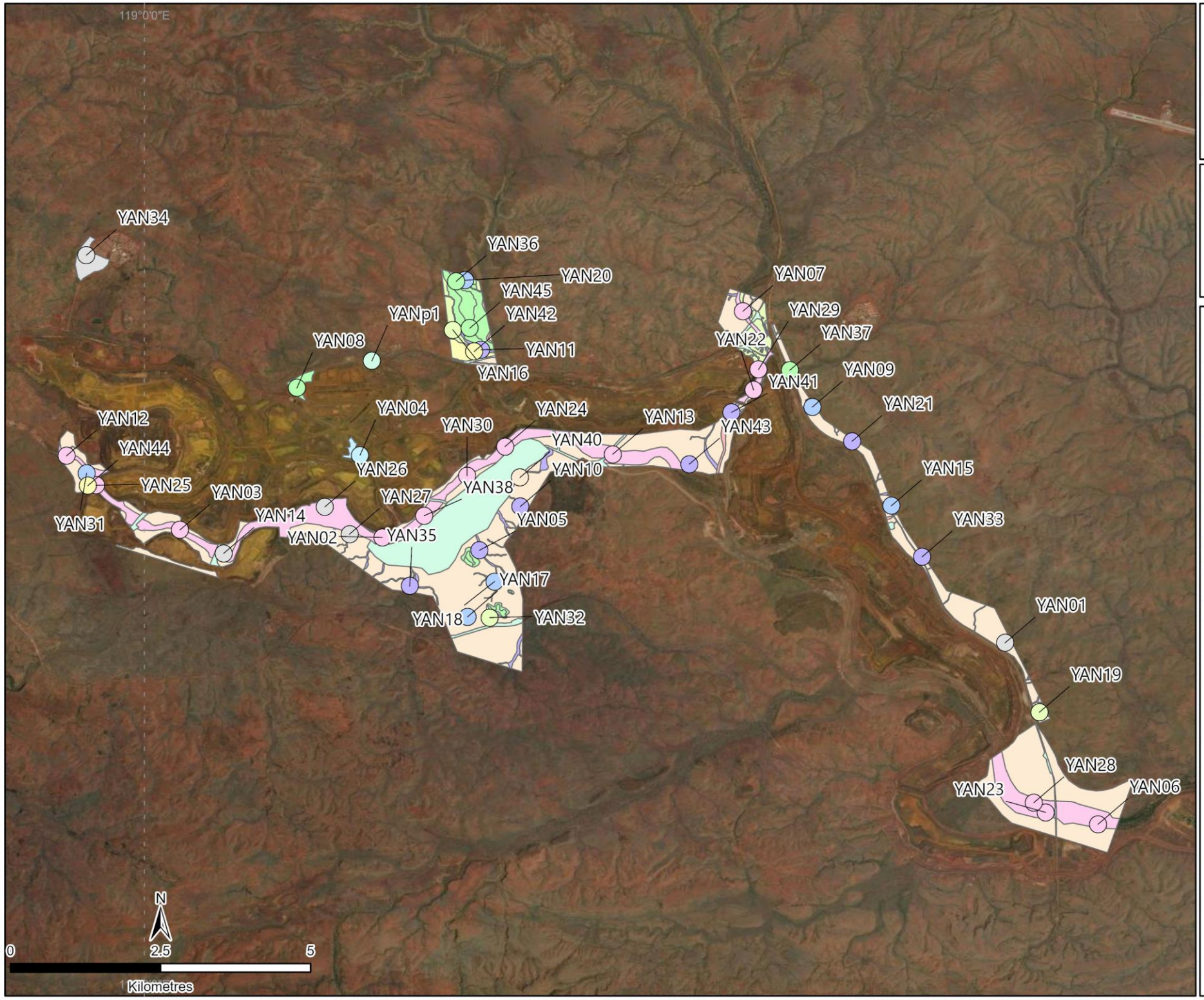
The species-level identifications that were confirmed or updated were:

1. A subadult mygalomorph spider identified morphologically as *Aname* `mellosa group` was updated to *Aname mellosa*.
2. A second subadult mygalmorph spider identified morphologically as *Aname* `mellosa group` was also updated to *Aname mellosa*.
3. An isopod identified morphologically as *Buddelundia* `BIS377` was genetically different from *B.* 'BIS377' animals elsewhere and named was changed to *Buddelundia* `BIS536`.
4. A scorpion identified morphologically as belonging to the *Lychas* `pilbara1` group was genetically divergent from other *Lychas* specimens in the database, so had its identification updated to the new code *L.* `BSCO088` `pilbara group`.
5. A pseudoscorpion identified morphologically as *Xenolpium* `BPS510` was suggested by molecular analysis to be closely related to a WAM specimen identified as Olpiidae gen. 7/4 sp. BMR00039. The name was updated to Olpiidae gen. 7/4 `BPS510`.

Updates to higher-order morphological identifications

The mygalomorph genera *Conothele*, *Idiommata*, and *Idiosoma* are known to be speciose but many of the species have not been formally described. There are, however, records of genetically recognised species.

In this survey, three specimens identified morphologically to *Conothele* sp. had their identifications updated through molecular analysis. Two of the specimens matched with the known manuscript species *Conothele* `MYG279`, while a third did not match any known species and was given a new code, *C.* `BMYG220`. Three specimens identified morphologically to *Idiosommata* sp. had their identifications updated to the known manuscript species *Aurecocrypta* `MYG316`. One specimen identified morphologically as *Idiosoma* sp. had its identification updated to *Aname* `MYG336`. Finally, a small pulmonate snail identified morphologically as possibly belonging to the genus *Pupisoma* had its identification updated to *Gastrocopta mussoni*.



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Author: abrowse
Date: 22/02/2024

Figure 20. Habitat types mapped during the survey.

Legend

- Cleared/ Disturbed
- Drainage Area/ Floodplain
- Gorge/ Gully
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Medium Drainage Line
- Minor Drainage Line
- Sand Plain
- Stony Plain
- Waterhole

5. DISCUSSION

5.1. Desktop Assessment

The desktop assessment indicates that animals from SRE Groups are abundant in the Study Area. While much of the search area comprises exposed rock, the colluvium and alluvium around rivers and gorges provide more suitable substrates for various SRE Group species. The presence of scattered trees in the predominant vegetation types provides leaf litter conducive to occurrence of other SRE Groups. Two of the 18 SRE Group species recorded in the Study Area (the pseudoscorpion *Xenolpium* 'PSE120' and centipede Geophilidae sp.) are known only from the smaller Survey Area. Specimens of Geophilidae sp. were also collected from the Survey Area during field survey but no further effort was put into identification following BHP (2022) guidance that centipedes are rarely SREs.

Among the SRE Groups detected in the desktop search, several are known to contain high proportions of Potential or even Confirmed SREs. This includes the spider genus *Karaops* (Crews and Harvey 2011; Crews 2023). Among mygalomorph spiders, the particularly speciose genus *Aname* contains some Confirmed SREs (Rix *et al.* 2021), while SRE status of the genera *Missulena* (Miglio *et al.* 2014) and *Kwonkan* have not been revised for some time and the number of Confirmed SRE species is unclear. Some scorpions in the genus *Urodacus* are known to be Confirmed SREs. The millipede genus *Antichiropus* is particularly rich in SREs (Car *et al.* 2019).

Outside these large flagship genera, it is difficult to generalise about likely SRE status. Among other mygalomorphs, for example, no barychelids are currently known to be Confirmed SREs (Raven 1994). The distributional information and taxonomic frameworks for mygalomorphs like *Conothele* (Huey et al. 2019) and Idiopidae (Rix *et al.* 2018; Rix *et al.* 2017), and for scorpions like *Lychas* (Koch 1977), remain poor in terms of the knowledge needed to support SRE status. High numbers of species from these genera and family appeared in the desktop search.

While it is clear from the desktop review that the Study Area hosts a high diversity and abundance of animals from SRE Groups, historical information suggests that by comparison with similar areas it hosts only low numbers of Confirmed SREs.

5.2. Survey

Fifty-eight species from SRE Groups were collected from the Survey Area during field survey. Of these, two are Confirmed SREs, 15 are Potential SREs, 14 are Uncertain, and 27 are Not SREs. Confirmed and Potential SREs will be discussed below.

5.2.1. Confirmed SREs

Records of the mygalomorph spider *Missulena faulderi* have a linear range of 36 km and the distribution of the species extends outside the Survey Area.

The millipede *Antichiropus pendiculus* has a known linear range of <40 km. As with *Missulena faulderi*, the distribution of *Antichiropus pendiculus* extends outside the Survey Area.

5.2.2. Potential SREs

Mygalomorphae

Two species of mygalomorph spiders were categorised as Potential SREs.

Conothele `BMYG220` is known only from the Survey Area. *Conothele* `BMYG220` was collected for the first time during field survey as a single individual on a south-facing slope at site YAN-36. It showed

sequence difference of >13% to other species, well over the threshold of 9.5% proposed by Castalanelli *et al.* (2014) to distinguish species in most mygalomorph genera. Further sampling would be needed to determine with certainty whether *Conothele* `BMYG220` occurs outside the Survey Area.

The second Potential SRE, *Aname* `MYG336`, has a linear range of 18 km that extends outside the Survey Area.

Pseudoscorpiones

Many pseudoscorpions disperse through phoresy and most are not SREs. Nevertheless, some SRE species of pseudoscorpion do occur (Harvey 1987, 2010) and six new species from the Survey Area were categorised as Potential SREs. The category of Potential SRE was assigned when new species were known from only one habitat type; species known from multiple types were assigned the category Uncertain.

The distributions of the six Potential SRE pseudoscorpions remain unknown, beyond their occurrence within the Survey Area. While the biology of related species suggests the six species have varying likelihoods of being true SREs all were collected from single habitats and are conservatively treated as Potential SREs. The six species are:

1. *Oratemnus* `PBS502`. Collected from two sites (YAN-30, YAN-38) on a major drainage line in the centre of the Survey Area. Major Drainage Line occurs beyond the Survey Area but the connectivity of habitat between the centre of the Survey Area and outside it is unclear.
2. *Oratemnus* `PBS503`. Known from a single site (YAN-13) on Major Drainage Line. As with *O.* `PBS503`, the site is in the centre of the Survey Area, so habitat connectivity is difficult to assess.
3. Cheliferidae `PBS504`. Collected from a single site (YAN-30). As with *Oratemnus* `PBS502`, the connectivity of suitable habitat is difficult to assess.
4. *Synsphyronus* `BPS511` (lathrius?). Collected from a single site (YAN-11) on Minor Drainage Line. The drainage line extends beyond the Survey Area and it is probable that the species' habitat extends beyond the Study Area as well.
5. *Austrohorus* `PBS509`. Known from a single site (YAN-31) on Major Drainage Line habitat. This habitat occurs beyond the Study Area.
6. Olpiidaegen. 7/4 `BPS510`. Known from a single site (YAN-34) on a Drainage Area/ Floodplain. This habitat is relatively well connected.

Scorpiones

One scorpion, *Lychas* `BSCO088` `pilbara1 group`, was assigned the category of Potential SRE. It was collected for the first time in this study and is known only from the Survey Area. Given that *Lychas* `BSCO088` `pilbara1 group` was collected from a site marked as Disturbed/ Cleared, its range almost certainly extends into surrounding habitat. Nevertheless, as with *Conothele* `BMYG220`, further sampling would be needed to determine its range.

Isopoda

Of six isopod species categorised as Potential SREs, three new species are known only from the Survey Area: *Acanthodillo* `BIS523`, *A.* `BIS524`, and *Buddelundia* `BIS521`. *Acanthodillo* `BIS523` was collected from a site near a waterhole (YAN-04) that was relatively disturbed. Presumably its distribution extends into surrounding habitat as well. Similarly, *A.* `BIS524` was found from a single location (YAN-40), on a stony plain near basalt outcrops. This habitat type appears relatively well connectes, presumably providing further habitat suitable for *A.* `BIS524`. *Buddelundia* `BIS521` was collected from the same site (YAN-40) as well as site YAN-37, a south-facing slope surrounded by cleared and/or exposed areas. The collection of *Buddelundia* `BIS521 from two sites suggests at least a modest distribution. However, further sampling would be needed to determine whether the three species occur outside the Survey Area.

The other three Potential SREs among isopod species have ranges extending outside the Survey Area and are also known from Ministers North. *Buddelundia* `BIS520` has a known range of approximately 21 km. *Buddelundia* `BIS536` has a known linear range of approximately 17 km and *Laevophiloscia* `BIS522` has a known linear range of 16 km.

5.3. Summary and Conclusion

The desktop assessment showed that species from SRE Groups occur in the Study Area around the Yandi 8 Survey Area. Field survey in 2022 and 2023 collected two Confirmed SRE species and 15 species categorised as Potential SREs from the Survey Area. In addition, two Potential SRE species were recorded from the desktop search. Both the Confirmed SRE species and four of the Potential SRE species are known from outside the Survey Area. The other 13 Potential SRE species are known only from the Survey Area. The 13 species are:

- One mygalomorph spider:
    - *Conothele* `BMYG220, collected from a dry trap on a south-facing slope.
- Six pseudoscorpions:
    - *Oratemnus* `BPS502` comprising four specimens collected from two sites on major drainage lines. One specimen was collected from sieving *Acacia* leaf litter; the other three were collected from *Acacia* in *Eucalyptus* woodland, one from each of the following techniques: tree digging, litter raking, and bark peeling.
    - *Oratemnus* `BPBS503` collected from leaf litter (species unknown) on a single site on major drainage.
    - Cheliferidae `BPS504` collected from a single site on a major drainage line in *Corymbia* leaf litter.
    - *Synsphyronus* `BPS511` (lathrius?) collected from a single site on a minor drainage line from a bark peel of *Corymbia*.
    - *Austrohorus* `PBS509` collected from a single site in a gully from *Eucalyptus* leaf litter.
    - Olpiidae `BPS510`, collected from a single site in a drainage zone. Specimens were variously collected from a soil sieve; from *Acacia* leaf litter; and from *Eucalyptus* leaf litter.
    - *Xenolpium* 'PSE120' collected twice from one site in a drainage line the western part of the Survey Area.
- One scorpion:
    - *Lychas* `BSCO088` `pilbara1 group` collected from a dry trap at a single site in a drainage zone.
- One centipede:
    - Geophilidae sp. B01 collected from two sites in the northern part of the Survey Area.
- Three isopods:
    - *Acanthodillo* `BIS523` collected from a rock flip at a single site characterised by a waterhole.
    - *Acanthodillo* `BIS524` collected from a dry trap at a single site on stony plains.
    - *Buddelundia* `BIS521` collected from two sites, one on stony plains and the other a south-facing slope. On the south-facing slope the specimens were collected in a dry trap; on the stony plains the specimen was collected during an *Acacia* tree dig.

Overall, the field survey data indicate that the Survey Area contains suitable habitat for SREs. Of the 11 habitat types sampled, seven yielded Potential SREs known only from that habitat. However, Potential SREs known only from one habitat type tended to be associated with drainage systems. Four of these species were collected from Major Drainage Line; two from Drainage Area/ Floodplain; and one each from Stony Plain, Hillcrest/ Hillslope, Sand Plain, and Waterhole. All of these habitat types extend beyond the Survey Area, presumably providing habitat for the 11 species to occur outside the Survey Area. In

order to make more certain assessments of the distributions of species, further survey and specimen collection would be required.

6. REFERENCES

Alacran Environmental Science (2022) Baseline short-range endemic survey for the Caravel Copper Project. Alacran Environmental Science, Canning Vale, 64 pp.

Atlas of Living Australia (2023) Search and analysis tool. https://bie.ala.org.au/, retrieved 2023.

Beard, J.S. (1975) Vegetation survey of Western Australia. Western Australia 1:1,000,000 vegetation series. Sheet 5, Pilbara. University Of Western Australia Press: Nedlands.

BHP (2022) Short-range endemic invertebrate fauna assessment methods: technical process instruction. Version 4.0, BHP WAIO: Perth, 10 pp.

Biologic (2013) Yandi Mine short-range endemic invertebrate survey and impact assessment. Biologic Environmental Survey, Perth, 148 pp.

Biologic (2015) Yandi tenement short-range endemic invertebrate survey. Biologic Environmental Survey, Perth, 120 pp.

Biologic (2016) Ministers North short-range endemic invertebrate survey. Biologic Environmental Survey, Perth, 50 pp.

Biologic (2018a) Marillana and Marillana Corridor SRE invertebrate fauna survey. Biologic Environmental Survey, Perth, 66 pp.

Biologic (2018b) Ministers North to Yandi Corridor SRE invertebrate fauna survey. Biologic Environmental Survey, Perth, 58 pp.

Biologic (2021) Ministers North and Yandicoogina Creek short-range endemic invertebrate fauna survey. Biologic Environmental Survey, Perth, 79 pp.

Biota (2011) Area C and surrounds short range endemic invertebrate fauna survey. Biota Environmental Sciences, Leederville, 213 pp.

Biota (2013a) A survey of short range endemic invertebrate fauna in the Jinidi to Mainline Corridor. Biota Environmental Sciences, Leederville, 68 pp.

Biota (2013b) A survey of the short range endemic invertebrate fauna of South Flank to Jinidi. Biota Environmental Sciences, Leederville, 125 pp.

Biota (2013c) Targeted survey for short range endemic fauna in the Marillana survey area. Biota Environmental Sciences, Leederville, 189 pp.

Biota (2014) A survey of the short range endemic invertebrate fauna of Area C West to Yandi. Biota Environmental Sciences, Leederville, 90 pp.

Bureau of Meteorology (2023) Bureau of Meteorology, Climate Statistics for Australian Locations. Commonwealth of Australia, retrieved 2023.

Car, C.A., Harvey, M.S., Hillyer, M.J., and Huey, J.A. (2019) The millipede genus *Antichiropus* (Diplopoda: Polydesmida: Paradoxosomatidae), part 3: species of the Pilbara bioregion of Western Australia. *Zootaxa* **4617**: 1-71.

Castalanelli, M.A., Teale, R., Rix, M.G., Kennington, W.J., and Harvey, M.S. (2014) Barcoding of mygalomorph spiders (Araneae : Mygalomorphae) in the Pilbara bioregion of Western Australia reveals a highly diverse biota. *Invertebrate Systematics* **28**: 375-385.

Crews, S., and Harvey, M.S. (2011) The spider family Selenopidae (Arachnida, Araneae) in Australia and Asia. *ZooKeys* **99**: 1-103.

Crews, S.C. (2023) But wait, there's more! Description of new species and undescribed sexes of flattie spiders (Araneae, Selenopidae, Karaops) from Australia. *ZooKeys* **1150**: 1-189.

DCCEEW (2021) Australia's bioregions (IBRA) Version 7 (Subregions). Department of Climate Change, Energy, the Environment and Water, Canberra

DEC (2013) Definitions, categories and criteria for threatened and priority ecological communities. Department of Environment and Conservation, Perth.

Durrant, B.J. (2011) Short-range endemism in the Central Pilbara. Department of Environment and Conservation, Woodvale, 33 pp.

EPA (2016) Technical Guidance - Sampling of short range endemic invertebrate fauna. Environmental Protection Authority, Perth, 35 pp.

EPA (2018) Statement of environmental principles, factors and objectives. Environmental Protection Authority, Perth, 6 pp.

Folmer, O., Black, M., Hoeh, W., Lutz, R., and Vrijenhoek, R. (1994) DNA primers for amplification of mitochondrial cytochrome c ocidase subunit I from diverse metazoan invertebrates. *Molecular Marine Biology and Biotechnology* **3**: 294-299.

Gardiner, S.J. (2003) Impacts of mining and mine closure on water quality and the nature of the shallow aquifer, Yandi Iron Ore Mine. MSc thesis, Curtin University of Technology, Perth.

Harms, D., and Framenau, V.W. (2013) New species of mouse spiders (Araneae: Mygalomorphae: Actinopodidae: Missulena) from the Pilbara region, Western Australia. *Zootaxa* **3637**: 521-540.

Harvey, M.S. (1987) A revision of the genus *Synsphyronus* Chamberlin (Garypidae : Pseudoscorpionida : Arachnida). *Australian Journal of Zoology* **Supplementary Series 126**: 1-99.

Harvey, M.S. (2002) Short-range endemism amongst the Australian fauna: some examples from non-marine environments. *Invertebrate Systematics* **16**: 555-570.

Harvey, M.S. (2010) Two new species of *Synsphyronus* (Pseudoscorpiones: Garypidae) from southern Western Australian granite landforms. *Records of the Western Australian Museum* **26**: 11-22.

Huey, J.A., Hillyer, M.J., and Harvey, M.S. (2019) Phylogenetic relationships and biogeographic history of the Australian trapdoor spider genus *Conothele* (Araneae: Mygalomorphae: Halonoproctidae): diversification into arid habitats in an otherwise tropical radiation. *Invertebrate Systematics* **33**: 628-643.

Javidkar, S.M. (2014) Molecular systematics and biogeographic history of oniscidean isopod troglofauna in groundwater calcretes of central Western Australia. Ph D Thesis, University of Adelaide, Adelaide.

Johnson, S.L., and Wright, A.H. (2001) Central Pilbara groundwater study. Hydrogeological Record Series. HG 8, Water and Rivers Commission, East Perth, 124 pp.

Kearse, M., Moir, R., Wilson, A.*, et al.* (2012) Geneious Basic: an integrated and extendable desktop software platform for the organization and analysis of sequence data. *Bioinformatics* **28**: 1647-1649.

Koch, L.E. (1977) The taxonomy, geographic distribution and evolutionary radiation of Australo-Papuan scorpions. *Records of the Western Australian Museum* **5**: 83-367.

Koch, L.E. (1984) Australian species of the centipede genus *Arthrorhabdus* Pocock (Chilopoda: Scolopendridae: Scolopendrinae). *Journal of Natural History* **18**: 363-368.

Miglio, L.T., Harms, D., Framenau, V.W., and Harvey, M.S. (2014) Four new mouse spider species (Araneae, Mygalomorphae, Actinopodidae, *Missulena*) from Western Australia. *ZooKeys* **410**: 121-148.

Outback Ecology (2008) Area C Mining Operation environmental management plan (revision 4) A, D, P1 and P3 deposits. Terrestrial invertebrate short-range endemic assessment. Outback Ecology, Jolimont, 90 pp.

Qiagen (2006) 'DNeasy blood & tissue handbook.' https://www.qiagen.com/au/resources/resourcedetail?id=6b09dfb8-6319-464d-996c-79e8c7045a50&lang=en

Raupach, M.J., Rulik, B., and Spelda, J. (2022) Surprisingly high genetic divergence of the mitochondrial DNA barcode fragment (COI) within Central European woodlice species (Crustacea, Isopoda, Oniscidea). *Zookeys* **1082**: 103-125.

Raven, R.J. (1994) Mygalomorph spiders of the Barychelidae in Australia and the Western Pacific. *Memoirs of the Queensland Museum* **35**: 291-706.

Richter, V., and Freegard, C. (2009) Dry pitfall trapping for vertebrates and invertebrates. Standard Operating Procedure No. 9.3. Department of Environment and Conservation, Perth

Rix, M.G., Huey, J.A., Cooper, S.J.B., Austin, A.D., and Harvey, M.S. (2018) Conservation systematics of the shield-backed trapdoor spiders of the *nigrum*-group (Mygalomorphae, Idiopidae, *Idiosoma*):

integrative taxonomy reveals a diverse and threatened fauna from south-western Australia. *ZooKeys* **756**: 1-121.

Rix, M.G., Raven, R.J., Main, B.Y., Harrison, S.E., Austin, A.D., Cooper, S.J.B., and Harvey, M.S. (2017) The Australasian spiny trapdoor spiders of the family Idiopidae (Mygalomorphae: Arbanitinae): a relimitation and revision at the generic level. *Invertebrate Systematics* **31**: 566-634.

Rix, M.G., Wilson, J.D., Huey, J.A., Hillyer, M.J., Gruber, K., and Harvey, M.S. (2021) Diversification of the mygalomorph spider genus *Aname* (Araneae: Anamidae) across the Australian arid zone: Tracing the evolution and biogeography of a continent-wide radiation. *Molecular Phylogenetics and Evolution* **160**: 107127.

Vahtera, V., Edgecombe, G.D., and Giribet, G. (2013) Phylogenetics of scolopendromorph centipedes: can denser taxon sampling improve an artificial classification? *Invertebrate Systematics* **27**: 578-602.

Appendix 1. Sites sampled for SREs during the field survey (2022).

Sites highlighted in orange were assessed for habitat only. Forage hours counted in person-hours, where two people attended every site visit.

Site	Forage hours	Litter bags	Bark peel	Tree dig	Rock flip	Log flip	Rake	Burrow dig	Sieves	Leaf blowing	Dry traps	Vegetation condition	Slope	Slope aspect	Fire
Site 01	0											Good	Low	N	NA
Site 02	2	2	X	X	X	X	X		3	X		Good	Flat	E	NA
Site 03	2	2	X	X	X	X	X		3	X		Good	Low	E	NA
Site 04	2	2	X	X	X	X	X		3	X		Degraded	Flat		NA
Site 05	2		X	X	X	X	X					Good	Flat		NA
Site 06	2	2	X	X	X	X	X			X		Good	Flat		NA
Site 07	2	2	X	X	X	X	X		2			Good	Flat		NA
Site 08	2	2			X	X		X	1			Degraded	Moderate	N	NA
Site 09	2	2	X	X	X	X	X	X	2			Good	Low	W	NA
Site 10	0											Good	Steep	S	NA
Site 11	2	2	X	X	X	X	X		2			Good	Flat		NA
Site 12	0											Good	Flat		NA
Site 13	2	2										Good	Flat		NA
Site 14	2	2	X	X	X		X		5	X		Good	Flat		NA
Site 15	0											Good	Low	S/W	NA
Site 16	2	2	X	X	X	X	X	X	3		10	Good	Flat		NA
Site 17	0											Good	Low	W	NA
Site 18	0											Good	Moderate	N	NA
Site 19	2	2	X	X	X	X	X			X		Good	Low	S/W	NA
Site 20	2	2	X	X	X	X	X	X	2			Good	Moderate	S	NA

Site	Forage hours	Litter bags	Bark peel	Tree dig	Rock flip	Log flip	Rake	Burrow dig	Sieves	Leaf blowing	Dry traps	Vegetation condition	Slope	Slope aspect	Fire
Site 21	0											Poor	Flat		NA
Site 22	0											Good	Flat		NA
Site 23	0											Good	Flat		NA
Site 24	0											Good	Flat		NA
Site 25	2	2	X	X	X	X	X			X		Good	Flat		NA
Site 26	0											Good	Flat		NA
Site 27	2	2	X	X	X	X	X		5	X		Good	Low	N	NA
Site 28	2	2	X	X	X	X	X		2	X	10	Good	Flat		NA
Site 29	2	2	X	X	X	X	X		4			Poor	Flat		NA
Site 30	2	2	X	X	X	X	X			X		Good	Low	N/E	NA
Site 31	2	2	X	X	X		X	X	3	X		Good	Flat		NA
Site 32	2		X	X	X	X	X			X		Good	Low	W	NA
Site 33	2	2	X	X	X	X	X			X	10	Degraded	Low	S/W	NA
Site 34	2	2	X	X	X	X	X		4	X	10	Good	Flat		NA
Site 35	0											Good	Low	N	NA
Site 36	2	2	X	X	X	X	X	X	2			Good	Moderate	S	NA
Site 37	2	2	X	X	X	X	X			X	10	Good	Steep	S	NA
Site 38	2		X	X	X	X	X			X		Good	Flat		NA

Appendix 2. Sites sampled for SREs during the field survey (2023).

Sites highlighted in orange were assessed for habitat only. Forage hours counted in person-hours, where two people attended every site visit.

Site	Forage hours	Litter bags	Bark peel	Tree dig	Rock flip	Log flip	Rake	Burrow dig	Sieves	Leaf blowing	Dry traps	Vegetation condition	Slope	Slope aspect	Fire
Site 01	0											Degraded	Low	S	NA
Site 02	0											Very Good	Flat		NA
Site 03	2	2	X	X	X	X	X		3	X		Excellent	Low	E	NA
Site 04	2	2	X	X	X	X	X		2	X		Degraded	Flat		NA
Site 06	2	2	X	X	X	X	X		3	X		Excellent	Flat		NA
Site 07	2	2	X	X	X	X	X		3	X	10	Good	Flat		NA
Site 08	2	2	X	X	X	X	X		3	X	10	Poor	Moderate	N	NA
Site 09	2	2	X	X	X	X	X		3	X		Poor	Low	W	NA
Site 11	2	2	X	X	X	X	X		3	X		Good	Flat		NA
Site 12	0											Good	Flat		NA
Site 13	2	2	X	X	X	X	X		2	X	10	Good	Flat		NA
Site 14	2	2	X	X	X	X	X		3	X	10	Poor	Flat		NA
Site 15	2	2	X	X	X	X	X		2	X	10	Good	Low	S/W	NA
Site 16	2	2	X	X	X	X	X	X	2	X	10	Good	Flat		NA
Site 19	2	2	X	X	X	X	X		3	X	10	Poor	Low	S/W	NA
Site 20	2	2	X	X	X	X	X		3	X		Poor	Low	S	NA
Site 21	0											Poor	Flat		NA
Site 22	0											Poor	Flat		NA
Site 23	0											Good	Flat		NA
Site 24	0											Good	Flat		NA

Site	Forage hours	Litter bags	Bark peel	Tree dig	Rock flip	Log flip	Rake	Burrow dig	Sieves	Leaf blowing	Dry traps	Vegetation condition	Slope	Slope aspect	Fire
Site 25	0											Very Good	Flat		NA
Site 26	0											Very Good	Flat		NA
Site 27	2	2	X	X	X	X	X		3	X		Good	Low	N	NA
Site 28	2	2	X	X	X	X	X		3	X	10	Good	Flat		NA
Site 29	2	2	X	X	X	X	X		3	X		Poor	Flat		NA
Site 30	2	2	X	X	X	X	X		3	X		Good	Low	N/E	NA
Site 31	2	2	X	X	X	X	X		2	X	10	Very Good	Flat		NA
Site 33	0											Degraded	Low	S/W	NA
Site 34	2	2	X	X	X	X	X	X	3	X	10	Good	Flat		NA
Site 36	2	2	X	X	X	X	X		3	X	10	Good	Moderate	S	NA
Site 37	2	2	X	X	X	X	X		3		10	Good	Steep	S	NA
Site 38	2	2	X	X	X	X	X		3	X	10	Poor	Flat		NA
Site 40	2	2	X	X	X		X	X	3	X	10	Good	Flat		NA
Site 41	2	2	X	X	X	X	X		3	X	10	Poor	Flat		NA
Site 42	2	2	X	X	X	X	X		3	X	10	Good	Flat		NA
Site 43	2	2	X	X	X	X	X	X	3	X		Poor	Moderate	S	NA
Site 44	0											Good	Flat		NA
Site 45	2	2	X	X	X	X	X		3	X		Poor	Low	S	NA

Appendix 3. Species from SRE Groups identified in the desktop search area.

No. records refers to the number of times the taxon was recorded. No. individuals refers to the number of individuals recorded across all records. Bolded values indicate higher taxonomic ranks. Purple highlighting indicates species collected within the Study Area.

Lowest identification	No. records	No. individuals
Arthropoda	**5435**	**10865**
Chelicerata	**3829**	**5958**
Arachnida	**3829**	**5958**
Araneae	**1826**	**2083**
Araneae sp.	4	4
Araneomorphae	**183**	**197**
Selenopidae	**182**	**196**
Karaops `ARA001`	12	12
Karaops `ARA001-DNA`	4	4
Karaops `ARA002`	1	1
Karaops `BAR126`	1	1
Karaops ARA001-DNA	1	1
Karaops banyjima	6	6
Karaops nyangumarta	4	4
Karaops sp.	117	129
Karaops? sp.	8	8
Selenopidae sp.	28	30
Mygalomorphae	**1640**	**1883**
Mygalomorphae sp.	31	32
Actinopodidae	**117**	**120**
Missulena `?MYG045`	3	3
Missulena `A3`	1	1
Missulena `marillana`	4	4
Missulena `MYG045`	60	60
Missulena `MYG253`	1	1
Missulena `MYG311-DNA`	1	1
Missulena davidi	16	16
Missulena faulderi	3	3
Missulena langlandsi	7	7
Missulena rutraspina	2	2
Missulena sp.	19	22
Anamidae	**917**	**949**
Aname `marillana grp`	5	9
Aname `mellosa group`	6	6
Aname `MYG001` group	1	1
Aname `MYG004`	31	31
Aname `MYG035`	1	1
Aname `MYG098` (or Kwonkan)	2	2
Aname `MYG104`	2	2

Lowest identification	No. records	No. individuals
Aname `MYG105`	1	1
Aname `MYG195`	1	1
Aname `MYG321-DNA`	2	2
Aname `MYG322`	10	10
Aname `MYG323`	7	7
Aname `MYG331`	28	30
Aname `MYG336`	3	3
Aname `MYG339`	7	7
Aname `MYG340`	1	1
Aname `MYG370`	1	1
Aname `MYG377`	2	2
Aname `MYG380`	1	1
Aname `MYG661`	5	6
Aname mellosa	301	310
Aname sp.	181	191
Aname whitei	42	42
Anamidae `sp. N140`	3	3
Anamidae `sp. N43`	5	5
Anamidae sp.	10	10
Anaminae sp.	9	11
Anatemnus sp.	1	1
Kwonkan `MYG006`	31	31
Kwonkan `MYG033`	7	7
Kwonkan `MYG088`	3	3
Kwonkan `MYG195`	39	39
Kwonkan `MYG197`	3	3
Kwonkan `MYG321`	1	1
Kwonkan `MYG323`	1	1
Kwonkan `MYG324`	4	4
Kwonkan `MYG325`	15	15
Kwonkan `MYG325-DNA`	8	8
Kwonkan `MYG337`	6	6
Kwonkan `MYG338`	6	6
Kwonkan `MYG338-DNA`	6	6
Kwonkan `MYG339`	13	13
Kwonkan `MYG340`	2	2
Kwonkan `MYG341`	3	3
Kwonkan `MYG378`	2	2
Kwonkan `MYG379`	9	9
Kwonkan `MYG379-DNA`	6	6
Kwonkan `MYG380`	1	1
Kwonkan `MYG484`	8	8
Kwonkan `MYG648`	2	2
Kwonkan `MYG653`	2	2
Kwonkan `MYG683`	1	1
Kwonkan sp.	57	60
Kwonkan? sp.	1	1
Swolnpes `MYG234`	3	3
Teyl `MYG027`	3	3

Lowest identification	No. records	No. individuals
Teyl heuretes	1	1
Teyl sp.	4	5
Barychelidae	**133**	**134**
?Aurecocrypta sp.	1	1
Aurecocrypta `chichester`	1	1
Aurecocrypta `HD1`	1	1
Aurecocrypta `MYG057`	1	2
Aurecocrypta `MYG246`	3	3
Aurecocrypta `MYG315`	6	6
Aurecocrypta `MYG316`	1	1
Aurecocrypta `MYG316-DNA`	2	2
Aurecocrypta `MYG317`	2	2
Aurecocrypta sp.	4	4
Barychelidae `B1`	1	1
Barychelidae sp.	10	10
Idiommata `MYG111`	4	4
Idiommata sp.	3	3
Synothele `MYG127`	22	22
Synothele `MYG309`	29	29
Synothele `MYG311`	10	10
Synothele `MYG334`	1	1
Synothele `Weld Range`	1	1
Synothele `xkarara`	11	11
Synothele karara	1	1
Synothele sp.	18	18
Ctenizidae	**163**	**336**
Conothele `MYG002`	27	51
Conothele `MYG279`	6	6
Conothele `MYG280`	38	38
Conothele `MYG281`	5	5
Conothele `MYG282`	53	125
Conothele `MYG333`	1	1
Conothele `MYG333-DNA`	1	1
Conothele `MYG525`	5	5
Conothele `MYG527`	5	77
Conothele `MYG528`	1	1
Conothele `MYG533`	1	1
Conothele `MYG534`	2	2
Conothele `MYG539`	2	2
Conothele `MYG608`	1	1
Conothele sp.	11	12
Conothele sp. B01	4	8
Euagridae	**1**	**1**
Cethegus `Cloudbreak sp. 1`	1	1
Halonoproctidae	**8**	**8**
Conothele `MYG279`	2	2
Conothele `MYG279-DNA`	1	1
Conothele `MYG528`	2	2
Conothele `MYG610`	1	1

Lowest identification	No. records	No. individuals
Conothele sp.	2	2
Idiopidae	**257**	**290**
Arbanitinae sp.	2	2
Bungulla bertmaini	2	2
Eucyrtops sp.	23	28
Eucyrtops sp. B01	1	1
Gaius tealei	27	27
Idiopidae sp.	8	8
Idiosoma ?occidentalis	1	1
Idiosoma `Cloudbreak sp. 1`	1	1
Idiosoma `MYG083`	17	19
Idiosoma `MYG085`	7	7
Idiosoma `MYG086`	5	5
Idiosoma `MYG126`	2	2
Idiosoma `MYG233`	3	3
Idiosoma `MYG286`	27	27
Idiosoma `MYG300`	4	4
Idiosoma `MYG300-DNA`	1	1
Idiosoma `MYG303`	5	5
Idiosoma `MYG305`	3	3
Idiosoma `MYG306`	3	3
Idiosoma `MYG384`	4	4
Idiosoma `MYG384-DNA`	9	9
Idiosoma `sp. nov. (Anidiops)`	1	1
Idiosoma sp.	94	120
Idiosoma? sp.	7	7
Nemesiidae	**8**	**8**
Nemesiidae sp.	8	8
Theraphosidae	**5**	**5**
Selenotholus `MYG381`	4	4
Theraphosidae sp.	1	1
Opiliones	**13**	**23**
Opiliones sp.	8	11
Opiliones sp. B04	2	3
Grassatores	**3**	**9**
Assamiidae	**3**	**9**
Assamiidae sp.	3	9
Pseudoscorpiones	**1468**	**3071**
Pseudoscorpiones sp.	96	174
Chthoniidae	**57**	**71**
Austrochthonius `pilbara`	1	1
Austrochthonius `PSE135, pilbara`	11	11
Austrochthonius sp.	5	6
Chthoniidae sp.	1	1
Tyrannochthonius ?aridus	1	1
Tyrannochthonius `HD1`	1	1
Tyrannochthonius aridus	33	39
Tyrannochthonius sp.	4	11
Hemictenata	**2**	**3**

Lowest identification	No. records	No. individuals
Gymnobisiidae	**1**	**1**
`PSEAAH` `PSE182`	1	1
Hyidae	**1**	**2**
Indohya `Mt. Meharry`	1	2
Panctenata	**1313**	**2823**
?Olpiidae	**2**	**2**
?Olpiidae sp.	2	2
Atemnidae	**72**	**125**
Oratemnus sp.	72	125
Cheiridiidae	**33**	**128**
`PSEAAA` sp.	32	127
Cheiridiinae sp.	1	1
Chernetidae	**48**	**206**
`PSEAAF` sp.	1	1
Austrochernes `PSE072`	5	5
Austrochernes sp.	1	1
Chernetidae sp.	3	8
Haplochernes sp.	9	13
Haplochernes sp. 1	10	105
Haplochernes sp. 2	4	57
Nesidiochernes sp.	12	13
Sundochernes `PSE090`	1	1
Sundochernes sp.	1	1
Troglochernes sp.	1	1
Garypidae	**74**	**135**
Synsphyronus `long hand 2`	1	1
Synsphyronus `PSE014 long hand 2`	2	2
Synsphyronus `PSE014`	5	5
Synsphyronus `PSE085`	5	7
Synsphyronus `PSE217`	1	1
Synsphyronus gracilis	8	19
Synsphyronus heptatrichus	9	18
Synsphyronus sp.	6	12
Synsphyronus xynus	37	70
Garypinidae	**10**	**20**
Amblyolpium `PSE100`	1	1
Solinus sp.	9	19
Olpiidae	**1050**	**2150**
`Genus 7/4` `PSE118`	1	2
`Genus 7/4` `PSE176`	10	11
`Genus 7/4` sp.	32	51
`PSEAAA` `HD4`	1	1
`PSEAAA` sp.	2	2
Austrohorus `BPS296`	1	1
Austrohorus `M1`	1	2
Austrohorus `M2`	1	1
Austrohorus `PSE119`	9	18
Austrohorus `PSE121`	7	10
Austrohorus `PSE122`	3	5

Lowest identification	No. records	No. individuals
Austrohorus `PSE126`	1	1
Austrohorus sp.	68	90
Austrohorus? sp.	1	1
Beierolpium `8/2`	2	2
Beierolpium `8/3`	1	1
Beierolpium `8/4`	29	61
Beierolpium `HD1`	1	1
Beierolpium `HD2`	1	1
Beierolpium `M1`	1	1
Beierolpium `sp. 8/2`	4	6
Beierolpium `sp. 8/3`	16	19
Beierolpium `sp. 8/4 (small)`	5	5
Beierolpium `sp. 8/4 lge`	4	7
Beierolpium `sp. 8/4 small`	1	1
Beierolpium `sp. 8/4`	32	67
Beierolpium 8/2 sp.	12	16
Beierolpium 8/3 sp.	24	39
Beierolpium 8/4 large sp.	2	5
Beierolpium 8/4 small sp.	6	10
Beierolpium sp.	63	117
Beierolpium sp. 1	3	34
Beierolpium? `sp. 8/4`	1	2
Beierolpium? sp.	1	1
Euryolpium sp.	46	64
Euryolpium sp. B01	25	40
Euryolpium? sp.	2	2
Indolpium `BPS298`	1	1
Indolpium `PSE118`	3	6
Indolpium `PSE123`	12	19
Indolpium `PSE124`	1	1
Indolpium `PSE125`	1	11
Indolpium sp.	397	1046
Linnaeolpium sp.	6	16
Olpiidae `Helix-PO009`	1	1
Olpiidae `Helix-PO016`	3	3
Olpiidae Genus 7/4 `PSE176`	1	1
Olpiidae Genus 7/4 sp.	12	15
Olpiidae sp.	101	167
Olpiidae sp. MA	2	2
Olpiidae sp. MC	1	1
Xenolpium `Biologic-PSEU028`	2	2
Xenolpium `PSE033`	1	1
Xenolpium `PSE120`	2	2
Xenolpium `sp. 1`	1	2
Xenolpium PSE033	3	3
Xenolpium sp.	74	110
Xenolpium sp. 1	4	41
Xenolpium sp. 2	1	1
Sternophoridae	**24**	**57**

Lowest identification	No. records	No. individuals
Afrosternophorus sp.	19	30
Afrosternophorus sp. 1	5	27
Scorpiones	**522**	**781**
Scorpiones sp.	5	9
Buthidae	**397**	**626**
Buthidae sp.	9	10
Isometroides `goldfields 1`	1	1
Isometroides `SCO025, pilbara 1`	10	11
Isometroides `SCO025`	1	1
Isometroides `sp. 1`	1	1
Isometroides sp.	16	16
Lychas ?annulatus	1	1
Lychas ?austroccidentalis	1	1
Lychas ?bituberculatus	16	16
Lychas `adonis`	10	14
Lychas `adonis` ms	2	4
Lychas `annulatus complex`	6	16
Lychas `Biologic-SCOR001`	2	2
Lychas `hairy tail complex`	8	17
Lychas `hairy tail group`	49	89
Lychas `hairy tail grp`	1	1
Lychas `hairy tail?`	3	3
Lychas `hairy tail`	8	17
Lychas `harveyi group, SCO038`	3	3
Lychas `harveyi group`	53	110
Lychas `harveyi`	1	1
Lychas `harveyi` ms	1	1
Lychas `Hope Downs`	1	1
Lychas `iron valley`	4	8
Lychas `mjobergi?`	1	1
Lychas `multipunctatus complex`	7	12
Lychas `multipunctatus group`	1	1
Lychas `multipunctatus?`	1	1
Lychas `multipunctatus`	8	8
Lychas `pilbara 1`	26	28
Lychas `pilbara 1``SCO041`	2	2
Lychas `pilbara1`	5	5
Lychas `racing stripe`	3	3
Lychas `sp. 1`	4	7
Lychas `sp. 2`	3	3
Lychas `sp. 3`	10	18
Lychas `sp. 4`	5	10
Lychas `sp. 5`	1	1
Lychas `sp. 6`	3	7
Lychas `spiny hairy tail`	6	6
Lychas `waldockae`	1	1
Lychas annulatus	8	13
Lychas annulatus? (tail only)	1	1
Lychas bituberculatus	13	13

Lowest identification	No. records	No. individuals
Lychas bituberculatus group	2	2
Lychas jonesae	2	2
Lychas sp.	75	134
Lychas sp. 3	1	2
Urodacidae	**120**	**146**
Urodacus `BSCO049`	2	2
Urodacus `butleri group`	1	1
Urodacus `cloudbreak`	16	16
Urodacus `firetail`	18	22
Urodacus `HD1`	1	1
Urodacus `megamastigus complex`	3	7
Urodacus `megamastigus grp`	1	1
Urodacus `megamastigus long`	1	1
Urodacus `megamastigus, short`	9	10
Urodacus `megamastigus?`	1	1
Urodacus `novaehollandiae?`	1	1
Urodacus `pearcei`	3	3
Urodacus `pilbara 12`	1	1
Urodacus `Pilbara 5`	1	1
Urodacus `pilbara 8`	2	2
Urodacus `SCO029`	2	2
Urodacus `SCO031`	1	1
Urodacus `sp. 1`	1	1
Urodacus `sp. 5`	1	1
Urodacus `sp. 9`	4	17
Urodacus butleri	1	1
Urodacus megamastigus	3	3
Urodacus megamastigus `long`	1	1
Urodacus megamastigus `short`	14	15
Urodacus sp.	29	32
Urodacus sp. B01	2	2
Crustacea	**521**	**1134**
Malacostraca	**521**	**1134**
Eumalacostraca	**521**	**1134**
Isopoda	**521**	**1134**
Isopoda sp.	107	225
Ligiamorpha	**414**	**909**
Armadillidae	**383**	**848**
?Hybodillo sp. B03	1	5
Acanthodillo `sp. 6`	1	1
Acanthodillo sp.	3	4
Armadillidae sp.	18	48
Barrowdillo `sp. 1`	1	1
Buddelundia `10ma`	5	9
Buddelundia `14`	2	4
Buddelundia `14cr`	2	2
Buddelundia `14fm`	3	4
Buddelundia `15`	1	1
Buddelundia `19`	8	28

Lowest identification	No. records	No. individuals
Buddelundia `48`	5	9
Buddelundia `49`	4	7
Buddelundia `BIS375`	10	14
Buddelundia `BIS391`	1	1
Buddelundia `sp. 10`	10	10
Buddelundia `sp. 10ma`	6	9
Buddelundia `sp. 13`	6	6
Buddelundia `sp. 14`	30	50
Buddelundia `sp. 15`	34	46
Buddelundia `sp. 16?`	4	4
Buddelundia `sp. 16`	35	66
Buddelundia `sp. 19`	14	18
Buddelundia `sp. 20`	1	1
Buddelundia `sp. 77`	6	10
Buddelundia `sp. B27` (SJ `13`)	2	35
Buddelundia `sp. B48`	5	13
Buddelundia `sp. B49`	4	24
Buddelundia sp.	115	260
Buddelundia sp. B02	8	35
Buddelundia sp. B05	1	1
Buddelundia sp. B07	4	26
Buddelundia sp. B08	2	5
Buddelundia sp. B09	1	1
Buddelundia sp. B22 (SJ `14`)	11	42
Buddelundia sp. B27 (SJ `13`)	8	33
Buddelundiinae sp.	1	1
cf. Spherillo `sp. 3`	1	1
Pseudodiploexochus sp.	2	3
Spherillo `sp. 3`	1	2
Troglarmadillo sp.	3	5
Buddelundia	3	3
Oniscidae	**1**	**1**
Oniscidae sp.	1	1
Philosciidae	**30**	**60**
Laevophiloscia `sp. Wonmunna A`	3	4
Laevophiloscia `sp. Wonmunna B`	1	1
Laevophiloscia sp.	2	2
Philosciidae sp.	24	53
Myriapoda	**1085**	**3773**
Chilopoda	**501**	**648**
Chilopoda sp.	14	20
Geophilida	**124**	**134**
Geophilida sp.	33	33
Chilenophilidae	**26**	**28**
Chilenophilidae sp.	5	6
Sepedonophilus `HD1`	6	6
Sepedonophilus `HD2`	1	1
Sepedonophilus sp.	14	15
Geophilidae	**19**	**19**

Lowest identification	No. records	No. individuals
Geophilidae sp.	17	17
Geophilidae sp. B01	2	2
Mecistocephalidae	**41**	**49**
Mecistocephalidae sp.	33	41
Mecistocephalus `HD1`	4	4
Mecistocephalus `HD2`	1	1
Mecistocephalus `HD3`	2	2
Mecistocephalus sp. B02	1	1
Oryidae	**4**	**4**
Orphnaeus `HD1`	1	1
Orphnaeus brevilabiatus	2	2
Oryidae sp.	1	1
Schendylidae	**1**	**1**
Australoschendyla capensis	1	1
Scolopendrida	**315**	**371**
Scolopendrida sp.	35	37
Cryptopidae	**26**	**26**
Cryptopidae sp.	10	10
Cryptops australis	1	1
Cryptops sp.	14	14
Cryptops sp. B17	1	1
Scolopendridae	**254**	**308**
Arthrorhabdus paucispinus	4	5
Arthrorhabdus sp. B02	3	3
Asanda sp. B01	1	1
Cormocephalus `long anal legs`	2	2
Cormocephalus aurantiipes	1	1
Cormocephalus sp. B02	2	2
Cormocephalus strigosus	8	8
Cormocephalus turneri	20	23
Cormocephalus westangelasensis	1	1
Ethmostigmus curtipes	15	15
Ethmostigmus muiri	1	1
Otostigmus sp. B01	2	3
Scolopendra laeta	58	68
Scolopendra morsitans	116	155
Scolopendra sp.	20	20
Scutigeromorpha	**48**	**123**
Scutigeromorpha sp.	13	15
Scutigeridae	**33**	**106**
Allothereua sp.	1	1
Pesvarus sp.	3	3
Pilbarascutigera incola	17	88
Pilbarascutigera sp.	4	6
Scutigeridae sp.	6	6
Thereuoneminae sp.	1	1
Thereuopodina sp.	2	2
Thereuopoda lesueurii	1	1
Diplopoda	**584**	**3125**

Lowest identification	No. records	No. individuals
Diplopoda sp.	2	2
Helminthomorpha	**319**	**478**
Polydesmida	**107**	**208**
Dalodesmidae	**2**	**6**
Dalodesmidae sp.	2	6
Paradoxosomatidae	**105**	**202**
?Antichiropus sp.	2	4
Antichiropus `cloudbreak`	1	1
Antichiropus `DIP006, Area C, species1`	5	6
Antichiropus `DIP007, Area C, species2`	3	3
Antichiropus `DIP163, wonmunna?`	2	3
Antichiropus `DIP163, wonmunna`	5	15
Antichiropus `DIP173, danberrin5`	2	2
Antichiropus cirratus	22	22
Antichiropus cloudbreak	3	3
Antichiropus gibbus	6	15
Antichiropus lucyae	2	13
Antichiropus nimbus	10	66
Antichiropus patriciae	1	1
Antichiropus pendiculus	18	18
Antichiropus sp.	23	30
Polyzoniida	**1**	**1**
Polyzoniida sp.	1	1
Spirobolida	**198**	**255**
Spirobolida sp.	2	2
`Trigoniulidae?`	**1**	**1**
`Trigoniulidae?` sp.	1	1
Trigoniulidae	**195**	**252**
?Austrostrophus sp.	5	5
Austrostrophus `clade A NGQ-2020`	3	3
Austrostrophus `clade A`	1	2
Austrostrophus `clade E`	4	7
Austrostrophus `DIP018`	4	4
Austrostrophus sp.	85	106
Austrostrophus stictopygus	84	109
Austrostrophus stictopygus complex	1	1
Trigoniulidae sp.	8	15
Spirostreptida	**13**	**14**
Spirostreptida sp.	13	14
Penicillata	**263**	**2645**
Polyxenida	**263**	**2645**
Polyxenida sp.	20	86
Polyxenida sp. S05	7	14
Lophoproctidae	**1**	**2**
Lophoproctidae sp.	1	2
Polyxenidae	**196**	**2336**
Polyxenidae sp.	176	2047
Unixenus `mjoebergi complex`	2	6
Unixenus attemsi	2	4

Lowest identification	No. records	No. individuals
Unixenus karijinensis	2	145
Unixenus sp.	14	134
Synxenidae	**39**	**207**
Phryssonotus novaehollandiae	13	46
Phryssonotus sp.	2	5
Synxenidae sp.	24	156
Mollusca	**849**	**2709**
Gastropoda	**849**	**2709**
Gastropoda sp.	24	65
Caenogastropoda	**1**	**1**
Bithyniidae	**1**	**1**
Gabbia aff. Smithii	1	1
Heterobranchia	**824**	**2643**
Planorbidae	**1**	**1**
Isidorella cf. newcombi	1	1
Hygrophila	**7**	**41**
Lymnaeidae	**7**	**41**
Austropeplea sp.	1	3
Bullastra cf. lessoni	6	20
Bullastra lessoni	2	21
Lymnaeidae sp.	1	2
Stylommatophora	**881311**	**2596**
Bothriembryontidae	**185**	**625**
Bothriembryon `Pilbara`	2	14
Bothriembryon `Pilbara` n.sp.	180	607
Bothriembryon nov.	1	1
Bothriembryon sp.	2	3
Camaenidae	**40**	**110**
Camaenidae `Mount Robinson` n.sp.	7	34
Camaenidae `Z` n.sp.	3	13
cf. Quistrachia sp.	9	34
gen. nov. nov.	1	1
Quistrachia nr turneri	1	1
Quistrachia sp.	1	1
Rhagada sp.	18	26
Helicodiscidae	**1**	**1**
Stenopylis coarctata	1	1
Punctidae	**1**	**1**
Paralaoma sp.	1	1
Pupillidae	**462**	**1580**
cf. Pupisoma sp.	1	1
Gastrocopta cf. hedleyi	12	46
Gastrocopta cf. larapinta	4	5
Gastrocopta cf. mussoni	4	16
Gastrocopta hedleyi	34	226
Gastrocopta larapinta	51	130
Gastrocopta mussoni	119	444
Gastrocopta sp.	11	47
Gastrocopta sp.	2	7

Lowest identification	No. records	No. individuals
Gastrocoptinae sp.	11	24
Pupillidae sp.	17	56
Pupoides beltianus	78	294
Pupoides beltianus s.l.	24	70
Pupoides cf. beltianus	9	12
Pupoides cf. eremicolus	1	1
Pupoides eremicolus	1	1
Pupoides eremicolus s.l.	2	14
Pupoides ischnus	1	1
Pupoides lepidulus	12	23
Pupoides pacificus	33	78
Pupoides pacificus s.l.	24	62
Pupoides sp.	11	22
Subulinidae	**120**	**270**
Allopeas sp. B02	1	1
Eremopeas interioris	111	242
Subulinidae sp.	8	27
Succineidae	**4**	**9**
Succinea sp.	3	7
Succinea sp. B01	1	2
Grand Total	**6284**	**13574**

Appendix 4. Results of molecular analysis

Orange highlighting indicates an identification that was changed using molecular evidence.

SRE Group	Site	Round	Lowest identification (morphological)	Updated identification (molecular)	Comments
Mygalomorphs	31	1	*Aname* `mellosa group`	*Aname mellosa*	>97% similarity with other specimens of *Aname mellosa*, and >99% similarity with voucher specimen #KJ44505 on GenBank (Castalanelli *et al.* 2014)
	33	1	*Aname* `mellosa group`	*Aname mellosa*	>97% similarity with other specimens of *Aname mellosa*, and >99% similarity with voucher specimen #KJ744669 on GenBank (Castalanelli *et al.* 2014)
	Opp01	2	*Aname mellosa*	*Aname mellosa*	Damaged specimen from administration building. >97% similarity with other specimens of *Aname mellosa*, and >99% similarity with voucher specimen #KJ744803 on GenBank (Castalanelli *et al.* 2014)
	Opp01	2	*Aname mellosa*	*Aname mellosa*	Damaged specimen from administration building. >97% similarity with other specimens of *Aname mellosa*, and >99% similarity with voucher specimen #KJ744669 on GenBank (Castalanelli *et al.* 2014)
	20	1	*Conothele* sp.	*Conothele* `MYG279`	>90% similarity to specimens in Bennelongia and 98.2% match with specimen #MK735602 on GenBank. Very large species complex
	40	2	*Conothele* sp.	*Conothele* `MYG279`	>99% similarity to voucher specimen for *Conothele* sp. MYG279 on GenBank (#KJ744763)
	36	2	*Conothele* sp.	*Conothele* `BMYG220`	New species code. Closest match 86.1% with *Conothele* `MYG280`.
	36	1	*Idiommata* sp.	*Aurecocrypta* `MYG316`	>94% similarity with voucher specimen #KJ745033 on GenBank

SRE Group	Site	Round	Lowest identification (morphological)	Updated identification (molecular)	Comments
	34	2	*Idiommata* sp.	*Aurecocrypta* `MYG316`	88.9% similarity with voucher specimen above; retained with this identity based on high morphological similarity with other specimens of *Aurecocrypta* `MYG316`
	45	2	*Idiommata* sp.	*Aurecocrypta* `MYG316`	>90% similarity with voucher specimen above. Juvenile specimen
	16	2	*Idiosoma* sp.	*Aname* `MYG336`	>98% similarity with voucher specimen #KJ745137 on GenBank (Rix *et al.* 2021)
	42	2	*Missulena faulderi*	*Missulena faulderi*	86% similarity with voucher specimen (#KJ745442 on GenBank). Identity retained because molecular sequencing allows for relatively low-resolution differentiation in this genus (Harms and Framenau 2013)
Millipedes	19	2	*Antichiropus pendiculus*	*Antichiropus pendiculus*	>91% similarity with other specimens of *Antichiropus pendiculus*. 92.2% match with voucher specimen #MK735849 on GenBank
	45	2	*Austrostrophus stictopygus*	*Austrostrophus stictopygus*	>96% similarity with other specimens in Bennelongia database. Also strong similarity (>97%) with GenBank specimens BMR00052, BMR00064, BMR00059, and BMR00065, attributed to *Austrostrophus* sp. clade A NGW-2020
Isopods	15	2	*Buddelundia* `BIS374`	*Buddelundia* `BIS374`	>86% similarity with other specimens in Bennelongia database. Among isopods this relatively low level of molecular similarity is expected for conspecifics (Javidkar 2014; Raupach *et al.* 2022). Best match on GenBank was with *Buddelundia* sp. Biologic-ISOP052 (83.9%; #ON923795)
	31	2	*Buddelundia* `BIS377`	*Buddelundia* `BIS536`	<80% similarity to other *Buddelundia* 'BIS377' sequences in Bennelongia database, so new species code established

SRE Group	Site	Round	Lowest identification (morphological)	Updated identification (molecular)	Comments
	NA	NA	*Buddelundia* `BIS391`	*Buddelundia* `BIS391`	<84%, Specimen from Bennelongia database sequenced to compare with `BIS377`. The match was not close enough to establish synonymy
Scorpions	7	2	*Lychas* `BSCO056`	*Lychas* `BSCO056`	>92% identity to specimens in Bennelongia database. 94.7% match with *Lychas* sp. Biologic-SCOR001 isolate 7631 (#ON929037) and *Lychas* sp. BMR00047 (#MN436720) on GenBank. The code `BSCO056` pre-dates the code Biologic-SCOR001 by two years, so is retained by seniority
	19	2	*Lychas* `BSCO058`	*Lychas* `BSCO058`	>98% identity to specimens in Bennelongia database. 98.4% match with *Lychas* sp. BMR00044 (#MN436717) and 94.7% match with *Lychas* sp. Biologic-SCOR003 isolate ESV18:0178 on GenBank. As above, the B-code here supersedes Biologic-SCOR003
	34	1	*Lychas* `pilbara1`	*Lychas* `BSCO088` `pilbara group`	<90% match with specimens in Bennelongia and GenBank databases. New species code assigned. Belongs to the `pilbara` species complex. Closest match on GenBank is *Lychas* sp. Biologic-SCOR008 isolate 9132 (#ON929012; 89.5%)
	27	2	*Urodacus* `BSCO045`	*Urodacus* `BSCO045`	>94% match with specimens in Bennelongia database. 93.9% match with GenBank specimen #ON923756, *Urodacus* sp. Biologic-SCOR005. Morphological identification and code retained because the code has seniority
Pseudoscorpions	20	2	*Austrohorus* `BPS508`	*Austrohorus* `BPS508`	Juveniles and nondiagnostic sex analysed to verify identity. >99% similarity with other specimens in Bennelongia database. Closest match on GenBank was with *Austrohorus* sp. WAM-PSE121 isolate 9780 (89.5%; #ON929040)

SRE Group	Site	Round	Lowest identification (morphological)	Updated identification (molecular)	Comments
	36	2	*Austrohorus* `BPS508`	*Austrohorus* `BPS508`	Juveniles and nondiagnostic sex analysed to verify identity. >99% similarity with other specimens in Bennelongia database. Closest match on GenBank was with *Austrohorus* sp. WAM-PSE121 isolate 9780 (89.5%; #ON929040)
	34	1	*Xenolpium* `BPS510`	Olpiidae gen. 7/4 `BPS510`	92.8% match on GenBank with Olpiidae gen. 7/4 sp. BMR00039 (#MN436735). The two species are probably synonymous, the genus was updated but the internal Bennelongia species code is retained conservatively
Pulmonate snails	34	2	cf. *Pupisoma* sp.	*Gastrocopta mussoni*	Very small animal. 100% match with *Gastrocopta mussoni* isolate muss cyl G15 59371A on GenBank (16S)

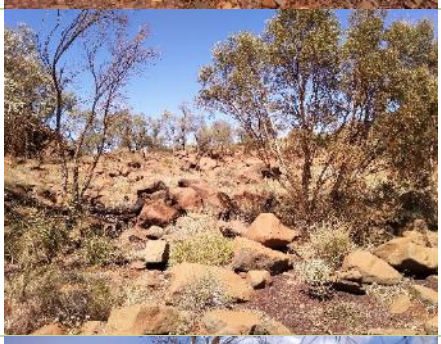
Appendix 5. Photo plates of survey sites

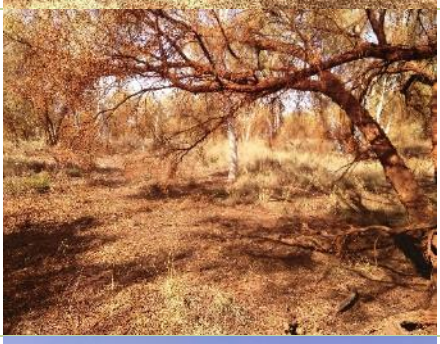
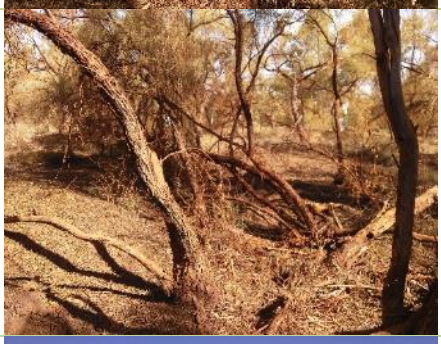
Site	Season	Photo 1	Photo 2
Site 1	Dry		
	Wet		
Site 2	Dry		
	Wet		
Site 3	Dry		

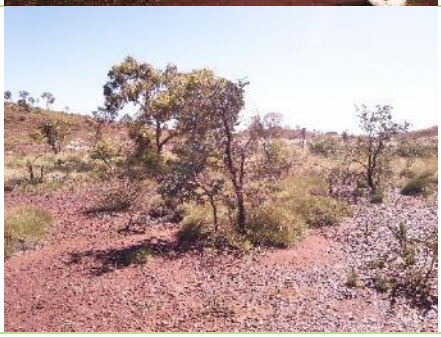
Site	Season	Photo 1	Photo 2
	Wet		
Site 4	Dry		
	Wet		
Site 5	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	

Site	Season	Photo 1	Photo 2
Site 6	Dry		
	Wet		
Site 7	Dry		
	Wet		
Site 8	Dry		

Site	Season	Photo 1	Photo 2
	Wet		
Site 9	Dry		
	Wet		
Site 10	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	
Site 11	Dry		

Site	Season	Photo 1	Photo 2
	Wet		
Site 12	Dry		
	Wet		
Site 13	Dry		
	Wet		

Site	Season	Photo 1	Photo 2
Site 14	Dry		
	Wet		
Site 15	Dry		
	Wet		
Site 16	Dry		

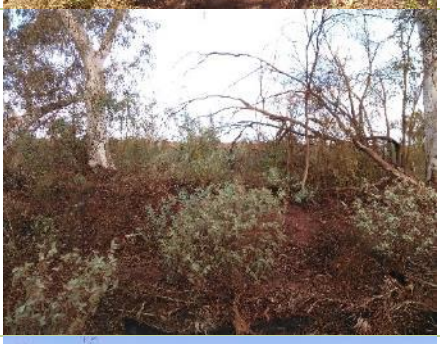
Site	Season	Photo 1	Photo 2
	Wet		
Site 17	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	
Site 18	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	
Site 19	Dry		
	Wet		

Site	Season	Photo 1	Photo 2
Site 20	Dry		
	Wet		
Site 21	Dry		
	Wet		
Site 22	Dry		

Site	Season	Photo 1	Photo 2
	Wet		
Site 23	Dry		
	Wet		
Site 24	Dry		
	Wet		

Site	Season	Photo 1	Photo 2
Site 25	Dry		
	Wet		
Site 26	Dry		
	Wet		
Site 27	Dry		

Site	Season	Photo 1	Photo 2
	Wet		
Site 28	Dry		
	Wet		
Site 29	Dry		
	Wet		

Site	Season	Photo 1	Photo 2
Site 30	Dry		
	Wet		
Site 31	Dry		
	Wet		
Site 32	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	

Site	Season	Photo 1	Photo 2
Site 33	Dry		
	Wet		
Site 34	Dry		
	Wet		
Site 35	Dry		
	Wet	Dry Season Only – Inaccessible due to windrow construction between sample rounds. Moved and renumbered	

Site	Season	Photo 1	Photo 2
Site 36	Dry		
	Wet		
Site 37	Dry		
	Wet		
Site 38	Dry		

Site	Season	Photo 1	Photo 2
	Wet		
Site 39	Dry	Wet Season Only	
	Wet	Inaccessible due to windrow construction between sample rounds. Moved and renumbered	
Site 40	Dry	Wet Season Only	
	Wet		
Site 41	Dry	Wet Season Only	
	Wet		
Site 42	Dry	Wet Season Only	
	Wet		
Site 43	Dry	Wet Season Only	

Site	Season	Photo 1	Photo 2
	Wet		
Site 44	Dry	Wet Season Only	
	Wet		
Site 45	Dry	Wet Season Only	
	Wet