biologic

Mt Gibson Ranges Targeted *Idiosoma nigrum* Survey

Mt Gibson Mining Limited

June 2014

DOCUMENT STATUS				
Version No.	Author	Review / Approved for Issue	Approved for Issue to	
			Name	Date
1	Brad Durrant	Shae Callan	Stuart Hawkins	10/02/14
Final	Brad Durrant	Morgan O'Connell	Stuart Hawkins	04/03/14
Update	Brad Durrant	Morgan O'Connell	Stuart Hawkins	27/06/14

IMPORTANT NOTE

We have prepared this report for the sole purposes of the Client for the specific purpose only for which it is supplied. This report is strictly limited to the Purpose and the facts and matters stated in it and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

This report is presented without the assumption of a duty of care to any other person (other than the Client) ("Third Party"). The report may not contain sufficient information for the purposes of a Third Party or for other uses. Without the prior written consent of Biologic:

a) this report may not be relied on by a Third Party; and

b) Biologic will not be liable to a Third Party for any loss, damage, liability or claim arising out of or incidental to a Third Party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

If a Third Party uses or relies on the facts, content, opinions or subject matter contained in this report with or without the consent of Biologic, Biologic disclaims all risk and the Third Party assumes all risk and releases and indemnifies and agrees to keep indemnified Biologic from any loss, damage, claim or liability arising directly or indirectly from the use of or reliance on this report.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

Executive Summary

Biologic Environmental Survey (Biologic) was commissioned by Mt Gibson Mining Limited (MGX) to conduct a targeted survey for the Shield-backed Trapdoor Spider *Idiosoma nigrum* within specified areas at the Mt Gibson Ranges, hereafter referred to as the "Study Area". The Mt Gibson Ranges are located approximately 350 kilometres (km) north east of Perth, approximately 80 km north from the town of Wubin and 70 km south of the town of Payne's Find.

Idiosoma nigrum is listed as a Threatened Species of fauna under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and as Specially Protected Fauna (Schedule 1) under the *Wildlife Conservation Act 1950*. *Idiosoma nigrum* has been assessed as meeting the category of "Vulnerable" using the criteria of the International Union for the Conservation of Nature.

Two field surveys were undertaken; December 2013 and June 2014.

Previous fauna surveys at the Mt Gibson Ranges has not recorded *I. nigrum*; however, regional records indicate that this taxa may potentially occur at the Mt Gibson Ranges.

The objective of the survey was to undertake a systematic targeted field survey for *I. nigrum* within the Study Area to provide an improved understanding of the presence and distribution of *I. nigrum* across the Mt Gibson ranges, in context with the results of previous surveys at the Mt Gibson Ranges and the broader region.

A total of 86 active and three inactive (abandoned) burrows of *I. nigrum* were recorded in the Study Area. Most of the active burrows (79%) were found in three loose clusters, with the remaining burrows scattered adjacent to, and in between, clusters.

Whilst *I. nigrum* was recorded within the Study Area, there was a distinct lower density of burrows, with respect to both the clusters and overall population, compared to populations at Weld Range and Jack Hills (in the

more arid Murchison region) and Blue Hills, 60km north east of the Study Area. This may indicate the Study Area is not a key habitat for this taxa.

The *I. nigrum* records coincided with five vegetation units mapped by Bennett (2000); four of which are thickets, dominated by *Acacia* and *Allocasuarina* species, and the fifth an open shrub mallee community over *Acacia* thicket.

On the ground, *I. nigrum* burrows were recorded within *Acacia* thickets, sometimes bordering *Allocasuarina* thickets or open mallee areas. There appeared to be a strong preference for *Acacia ramulosa*, however burrows were also found to be associated with *A. assimilis* and *Allocasuarina acutivalvis*, although less commonly and often still very close to *A. ramulosa*.

All *I. nigrum* burrows were recorded on the gentler lower slopes and the adjacent plains, with no *I. nigrum* burrows recorded in the middle or upper slopes of the ranges. Additionally, *Idiosoma nigrum* burrows were recorded only in areas associated with loamy soils, both with and without surface pebbles.

It appears highly likely that the local *I. nigrum* population is widespread through the greater area, but fragmented, due to vegetation and soil preferences. A*cacia* thickets, and *A. ramulosa*, appear to be common through the greater area, and appear to be associated with the loamy/ clay-loam soils and lower slopes that *I. nigrum* inhabit.

The widespread and fragmented nature of the records also indicates that there are few hindrances to movement on the surface, important for both the dispersal of juveniles and mature males looking for females in burrows.

The absence of burrows on the middle and upper slopes is likely due to a combination of factors, most notably the lack of preferred soil (which likely influences the presence of *A. ramulosa*), the lower surface stability, lower coverage of leaf litter and the more favourable climate in the area, compared to the Murchison.

The prospective habitat for *I. nigrum* in, and adjacent to, the Study Area can be regarded as primarily *Acacia* thickets on lower slopes and plains with loamy soils. Whilst the vegetation mapping in the area is too coarse to allow

accurate mapping specifically of *Acacia* thickets, the slope mapping gives a good indication of habitat prospective for *I. nigrum*.

Two active burrows of the Tree-stem Trapdoor Spider *Aganippe castellum* (Priority 4) were also recorded within the Study Area. The low number of records for this taxa, compared to other fauna studies in the broader region, may also indicate that the Mt Gibson Ranges is not a key habitat for this taxa.

1 INTRODUCTION

1.1 Background

1.1.1 Project

Biologic Environmental Survey (Biologic) was commissioned by Mt Gibson Mining Limited (MGX) to conduct a targeted survey for the Shield-backed Trapdoor Spider *Idiosoma nigrum* within specified areas at the Mt Gibson Ranges, hereafter referred to as the "Study Area". The Study Area was surveyed over two separate trips, one in December 2013 and the other in June 2014.

The Mt Gibson Ranges are located approximately 350 kilometres (km) north east of Perth, approximately 80 km north from the town of Wubin and 70 km south of the town of Payne's Find, as identified by Figure 1.1. The Study Area is identified by Figure 1.2.

Idiosoma nigrum is listed as a listed Threatened Species of fauna under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) and as Specially Protected Fauna (Schedule 1) under the *Wildlife Conservation Act 1950*. *Idiosoma nigrum* has been assessed as meeting the category of "Vulnerable" using the criteria of the International Union for the Conservation of Nature.

1.1.2 Scope

Previous fauna surveys at the Mt Gibson Ranges has not recorded *I. nigrum*; however, regional records indicate that this taxa may potentially occur at the Mt Gibson Ranges.

The objective of the survey was to undertake a systematic targeted field survey for *I. nigrum* within the Study Area to provide an improved understanding of the presence and distribution of *I. nigrum* across the Mt Gibson ranges, in context with the results of previous surveys at the Mt Gibson Ranges and the broader region.

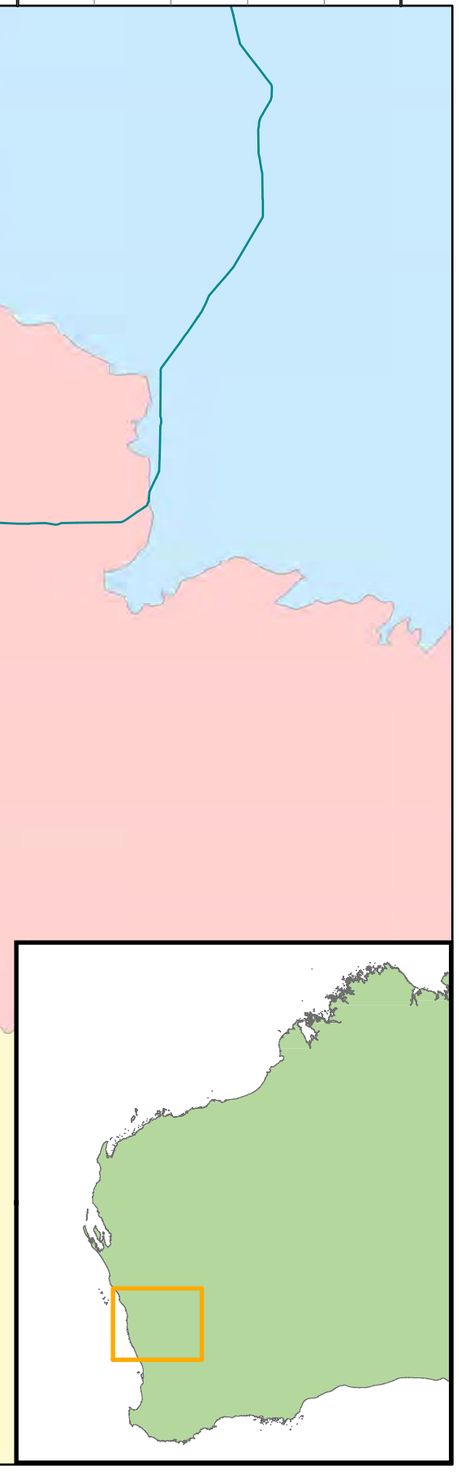
Previous surveys of the Mt Gibson Ranges include:

- ATA Environmental (ATA) – *Fauna assessment Mount Gibson*: Report to Mount Gibson Mining Limited (2005);
- The University of Western Australia (UWA) – *The Mygalomorph spiders from the Mt Gibson region, Western Australia, including species apparently endemic to the area*: Report to ATA Environmental (2005);
- ATA Environmental (ATA) – *Mt Gibson magnetite project supplementary vegetation and flora surveys*: Report to Mount Gibson Mining Limited (2006a);
- ATA Environmental (ATA) – Mt Gibson iron ore mine and infrastructure project, Public Environmental Review: Report to EPA (2006b);
- Coffey Environments (Coffey) – Extension Hill *Idiosoma nigrum* survey letter to MGM (2008); and
- Coffey Environments (Coffey) – Extension Hill *Idiosoma nigrum* survey letter to EPA (2008).

300000 350000 400000 450000 500000 550000 600000

6800000 6750000 6700000 6650000

Mingenew
Morawa
Dongara
Perenjori
Three Springs
Study Area
Eneabba
Coorow
Dalwallinu
Jurien



Legend

- Local_towns
- Local_Highway
- Study Area

IBRA_sub-region

- Dandaragan Plateau
- Eastern Murchison
- Geraldton Hills
- Katanning
- Lesueur Sandplain
- Merredin
- Perth
- Southern Cross
- Tallering

1:800,000

0 5 10 20 30 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 1.1. Regional location and IBRA sub-regions

Created: 07-02-2014

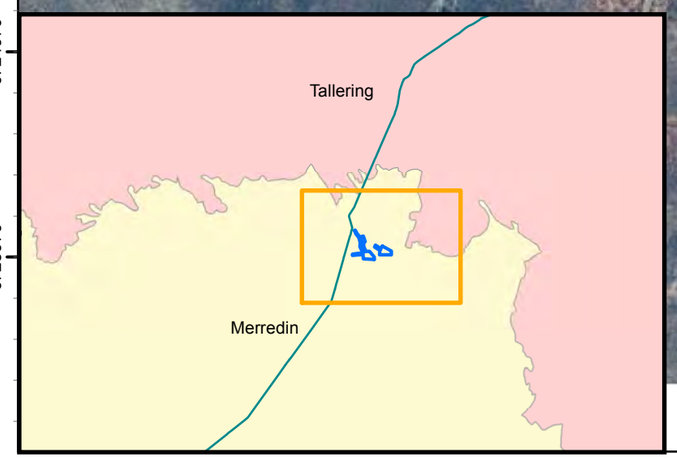
Coordinate System: GDA 1994 MGA Zone 50

Projection: Transverse Mercator

Datum: GDA 1994

512000 513000 514000 515000 516000 517000 518000 519000 520000 521000

6729970 6728970 6727970 6726970 6725970 6724970 6723970



Legend

Study Area

1:30,000

0 0.225 0.45 0.9 1.35 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 1.2. Study Area and aerial photography

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

1.1.3 *Idiosoma nigrum*

Idiosoma nigrum was first identified by Barbara York Main in 1952. Current records indicate *I. nigrum* has a linear distribution of greater than 700km, extending from south of Perth to north of Geraldton (DPaW 2014).

Idiosoma nigrum is regarded as one of the most arid-adapted mygalomorph spiders in Australia (Main 1982). This adaptability has allowed the species to survive the aridification of Western Australia (Main 1982), particularly in the arid Murchison IBRA Region where its distribution is restricted to ironstone ranges and breakaways. In particular, the highly sclerotized "shield" (Plate 1) of *I. nigrum* reduces water loss through evaporation and provides protection by allowing the individual to "plug" the inside of the burrow (also known as phragmosing) to stop predators entering. This is facilitated by the species' creating a narrow "neck" within the burrow (Plate 2), allowing the entrance to be completely blocked, and a "goblet" shaped entrance to allow the individual to turn around without leaving the burrow. These features are important diagnostic characteristics for *I. nigrum*. Other characteristics that have increased the species' ability to survive in arid environments include building deep burrows (up to approximately 30cm depth (DoE 2014)), which allow greater control over the internal temperature and humidity, "twig-lining" burrows (Plate 3) to increase foraging capacity (DOE 2014), and development of large eyes and long legs which give a greater ability to capture prey.

Despite these adaptations, this species has biological characteristics that impinge on its ability to reproduce and disperse, including:

- Mortality and maturity: high mortality of emergent and juveniles (>40%), with typically five to six years for both males and females to reach reproductive maturity (Main 2003) (Table 1.1);
- low dispersal capabilities: emergent spiderlings generally establish a burrow within several centimetres of the matriarch female (forming distinct clusters of burrows) with the low dispersal potentially restricting gene flow (Main 1982, 2003; B. Main 2010 pers. comm);

Plate 1: *Idiosoma nigrum* (Biologic)

Plate 2: *Idiosoma nigrum* burrow showing "neck" constriction

Plate 3: *Idiosoma nigrum* burrow showing twig lines

- low genetic flow: gene flow is facilitated by the dispersal of males when sexual maturity is reached but appears to only occur over small distances (B. Main 2010 pers. comm.); and
- limited fecundity: it is likely that mature females only reproduce every second year, and then only until they are around 20 years of age (Main 2003).

Much of the ecological and biological information for *I. nigrum* was collected as part of a study at East Yorkrakine Nature Reserve over several years (Main 2003). This also included establishing the size classes for emergent spiderlings, juveniles and adults using measurements of the trapdoor and lumen (internal diameter of a burrow) (Table 1.2).

Table 1.1: Size classes for each life stage and annual mortality rate; after Main (2003).

	Emergents	Juveniles	Adults
Door (mm)	≤ 14	15 – 20	≥ 21
Lumen (mm)	≤ 10	11 – 14	≥ 15
Age (years)	< 1	1 – 5 or 6	> 5 or 6
Mortality (annual average)	56%	43%	29%

Idiosoma nigrum is currently known from the central and northern Wheatbelt, and the coastal and interior Midwest, extending into the north-eastern Goldfields. Within the Wheatbelt, the species is in decline, largely due to land fragmentation and degradation (Main 1987, 1991; Yen 1995) primarily through cropping, grazing and salinisation. In the Midwest and Goldfields, populations appear to be associated with sparsely distributed ranges and breakaways, resulting in each population being relatively isolated and restricting gene flow.

1.2 Existing environment

1.2.1 Climate

The Study Area is within a semi-desert Mediterranean climate, characterised by 9-11 months of dry weather, including hot, dry summers, and mild to cool, wet winters (Payne *et al.* 1998). The closest Bureau of Meteorology weather station is at Payne's Find, 80 km north west of the Study Area. Given the proximity of this weather station, this climatic data is expected to be generally reflective of the climate experienced in the area of the Mt Gibson Ranges. Monthly average maximum temperatures range from approximately 18 °C in July to 37 °C in January, and average minimum temperatures from approximately 5 °C in July to 21 °C in February. The average annual rainfall is approximately 280 mm, ranging from an average of approximately 42 mm in June to 11 mm in November. Rainfall is infrequent throughout the year, with an average of only 22 days with greater than 1 mm (BOM 2014).

1.2.2 Biogeography

The Study Area lies within the Avon Wheatbelt Bioregion (AW1 – Ancient Drainage subregion), as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995). The Avon Wheatbelt Bioregion is an area of active drainage and a gently undulating landscape of low relief, with the subregion an ancient peneplain of disconnected drainage and remnant ancient drainage in the form of salt lake chains that function only during high rainfall years.

1.2.3 Land systems

Five land system units defined by Payne *et al*. (1998) coincide with the Mt Gibson Ranges, as identified by Table 1.2.

Table 1.2: Land systems occurring at the Mt Gibson Ranges.

Land System	Description
Illaara	Gently undulating plains and occasional low rises with mantles of ironstone gravels supporting Acacia/ Casuarina shrublands
Joseph	Undulating yellow sandplain supporting very dense and diverse shrublands with some mallees, sedges and Spinifex
Moriarty	Gently undulating stony plains, low rises with limonite and alluvial plains supporting Salmon Gum, Gimlet and Goldfields Blackbutt woodlands with halophytic and Acacia shrublands
Pindar	Level plains with Eucalypt woodlands, surrounded by sandplain supporting Acacia shrublands
Tallering	Prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks with mixed shrublands

1.2.4 Vegetation associations

Eleven vegetation units as mapped by Bennett (2000) coincide with the Study Area, including thicket, mallee, woodland and heath. The vegetation units are described in Table 1.3 and mapped in Figure 3.3..

Table 1.3: Vegetation associations within the Study Area (Bennett 2000).

Vegetation Association	Description
Thicket Communities	
T1	Dense Thicket of mixed species dominated by *Acacia* species, *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calcopeplus paucifolius* and *Melaleuca nematophylla* over Low Shrubland in jaspilite rocks with pockets of loam.
T2	Dense Thicket dominated by *Acacia assimilis*, *A. stereophylla* var. *stereophylla*, *A. ramulosa* and *Allocasuarina acutivalvis* var. *prinsepiana* over Low Shrubland of *Acacia acuaria*, *Hemigenia* sp. Paynes Find and *Baeckea* affin. *cryptandroides* in loam with scattered rocks on the surface.
T3	Dense Thicket of *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. prinsepiana and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.
T4	Dense Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus oldfieldii* over an Open Scrub of *Acacia* species over Open Shrubland of *Hemigenia* sp. Paynes Find or Open Herbs of *Xanthosia bungei* .
T5	Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Grevillea obliquistigma* with emergent *Callitris glaucophylla* over Low Shrubland dominated by *Darwinia masonii*, *Hibbertia crassifolia*, *Melaleuca radula* and *Philotheca brucei* subsp. *brucei* over Open Herbs of *Xanthosia bungei* in loam pockets in dense jaspilite rocks.
T6	Thicket of *Acacia aneura* and *Acacia stowardii* over Low Shrubland of mixed species with large numbers of *Darwinia masonii* in loam with abundant rocks on the surface.
T9	Dense Thicket of *Acacia* species, *Hakea* species, *Eucalyptus brachycorys* and *E. oldfieldii* with emergent *Callitris glaucophylla* , over Open Low Shrubland of mixed species on sand.
Mallee Communities	
M1	Open Tree Mallee of *Eucalyptus brachycorys* , *E. hypochlamydea* subsp. *hypochlamydea* , *E. loxophleba* subsp. *supralaevis* and *Callitris glaucophylla* over Thicket of *Acacia* species over Low Shrubland and Herbs on loam.
M3	Open Shrub Mallee of *Eucalyptus brachycorys* and *E. synandra* over Thicket of *Acacia anthochaera* and *A. ramulosa* over Low Shrubland of *Baeckea* affin. *cryptandroides* and *Ptilotus obovatus* over Herbs of *Amphipogon caricinus* subsp. *caricinus*, *Chamaexeros macrantha* , *Gilbertia tenuifolia* , *Waitzia acuminata* and *Velleia rosea* .
M4	Very Open Shrub Mallee of *Eucalyptus leptopoda* with emergent *Eucalyptus loxophleba* subsp. *supralaevis* over Thicket of *Acacia ramulosa* over Herbland of Asteraceae species in loam.
Woodlands	

Vegetation Association	Description
W2	Dense to Open Woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with occasional *Callitris glaucophylla* over a Thicket of *Acacia* species dominated by *A. assimilis* over Herbs dominated at the time of survey by *Velleia rosea* on silty sand.
W4	Very Open Woodland of *Callitris glaucophylla* and *Eucalyptus loxophleba* subsp. *supralaevis* over an Open Thicket of *Acacia acuminata* over a Herbland in sandy loam.
Heath Communities	
HS1	Low Heath of *Ptilotus obovatus* with emergent shrubs of *Acacia stowardii* and *Calcopeplus paucifolius* over Herbs in loamy clay amongst large boulders.

2 METHODS

2.1 Compliance

The database review and field survey was carried out in a manner consistent with the requirements for the environmental surveying and reporting of fauna outlined by the Western Australian (WA) Environmental Protection Authority (EPA), WA Department of Parks and Wildlife (DPaW), including the following documents:

- Environmental Protection Authority (2002) EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection. March 2002.
- Environmental Protection Authority (2004) EPA Guidance Statement 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. June 2004.
- Environmental Protection Authority (2009) EPA Guidance Statement 20: Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia. May 2009.

2.2 Previous data

A search of the Department of Parks and Wildlife's (DPaW) *Naturemap* was conducted for records of *I. nigrum* in the vicinity of the Mt Gibson Ranges (DPaW 2014a; Appendix B). A radius of 40km was searched, with the Study Area used as the centroid.

A similar search was conducted of the Western Australian Museum's (WAM) database (WAM 2014; Appendix C).

Previous reports on relevant fauna surveys at the Mt Gibson Ranges reviewed include:.

- ATA Environmental (ATA) – *Fauna assessment Mount Gibson*: Report to Mount Gibson Mining Limited (2005);
- The University of Western Australia (UWA) – *The Mygalomorph spiders from the Mt Gibson region, Western Australia, including*

species apparently endemic to the area: Report to ATA Environmental (2005);

- ATA Environmental (ATA) – *Mt Gibson magnetite project supplementary vegetation and flora surveys*: Report to Mount Gibson Mining Limited (2006);
- Coffey Environments (Coffey) – Extension Hill *Idiosoma nigrum* survey letter to MGM (2008);
- Coffey Environments (Coffey) – Extension Hill *Idiosoma nigrum* survey letter to EPA (2008); and

2.3 Current survey methods

Targeted searches for *I. nigrum* were conducted in the Study Area from the 3rd to the 11th of December 2013 and the 9th to the 12th June 2014 (Figure 2.1). Transects were walked, ranging from 15 to 30m in between, dependant on vegetation thickness (with denser vegetation having the more closely spaced transects). When a burrow was found, and confirmed to be *I. nigrum*, a 5m perimeter was searched for other burrows, which is consistent with the limited dispersal of emergent *I. nigrum* from the host female burrow. Each burrow had coordinates, topographical position, vegetation characteristics and a photo taken.

2.4 Limitations

Consistent with EPA Guidance Statement 56 (EPA 2004), limitations of the survey are described below.

Table 2.1: Survey limitations, consistent with EPA Guidance Statement 56 (EPA 2004).

EPA (2004)	Biologic Comment
Competency/experience of the consultant carrying out the survey.	All personnel have previous experience with *Idiosoma nigrum* surveys.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions, e.g. pitfall trapping in waterlogged soils or inability to use pitfall traps because of rocky terrain or impenetrable subsoil)	There were no constraints on fulfilling the scope.

EPA (2004)	Biologic Comment
Proportion of fauna identified, recorded and/or collected.	It is likely that some *Idiosoma nigrum* burrows were not recorded, due to their cryptic nature, but this would not have impacted on the conclusions of the survey.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	All previous survey data was made available.
The proportion of the task achieved and further work which might be needed.	100% of the scope was achieved.
Timing/weather/season/cycle;	Timing and weather did not impact on the survey work.
Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey	No disturbances impacted on the survey work.
Intensity (in retrospect, was the intensity adequate)	The survey intensity was adequate (see below).
Completeness (e.g. was relevant area fully surveyed)	Approximately 120km of transects were walked within the Study Area at a 15m to 30m spacing. Based on a search distance of 2m either side of each survey personnel, this equates to approximately 47ha of the total 399ha Study Area being physically inspected. Noting the objective of the survey was to identify the presence and distribution of *I. nigrum*, rather than to record every burrow or individual, the survey of the Study Area is considered to be complete.
Resources (e.g. degree of expertise available in animal identification to taxon level)	There were no resource constraints.
Remoteness and/or access problems	There were no issues with access.
Availability of contextual (e.g. biogeographic) information on the region	The vegetation mapping for the Study Area was of a coarser scale than the vegetation mapping to the west of the Study Area. This difference in the vegetation mapping has made it difficult to comment on the potential distribution of *I. nigrum* related to the vegetation units.

514189 515549 516909 518269 519629

6727928 6727120 6726312 6725504 6724695

Legend

- Study Area Dec 2013
- Study Area Jun 2014
- Search transects

1:17,000

0 0.125 0.25 0.5 0.75 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 2.1. Search Transects within the Study Area

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

3 RESULTS AND DISCUSSION

3.1 Previous Data

3.1.1 Naturemap and WAM records

Fifteen records of *I. nigrum* were returned by the NatureMap and WAM records within a radius of 40km of the Study Area (Figure 3.1). Of these, five records were from 1955, and the remaining records from between 2000 and 2014.

The closest records (both from 1955) are within 700m of the northern most part of the Study Area, however the validity of these records may be questionable given the coordinates used for these records were prior to modern geographic positioning systems.

Beyond the 1955 records, the closest of the most recent records are located directly south of the Study Area, starting at approximately 4km from the most southern part of the Study Area. Only two records north of the Study Area were returned for the search area.

3.1.2 Previous survey work

Three previous surveys targeting invertebrate fauna have been undertaken within the vicinity of the Mt Gibson Ranges. All three surveys utilised either dry or wet pit trapping, with some foraging.

ATA (2005) utilised 11 trapping (dry pit traps) and 29 foraging sites across the Mt Gibson Ranges. Three trapping sites and two foraging sites coincide with the Study Area.

ATA (2006) identified a targeted short-range endemic (SRE) fauna survey utilising 20 wet pit traps, of which 6 trapping sites coincided with the Study Area.

Coffey (2008) undertook opportunistic survey work (vertebrate fauna dry pit traps) at the Mt Gibson Ranges adjacent to the northern part of the Study Area.

None of these previous surveys recorded *Idiosoma nigrum* specimens or burrows adjacent to, or within, the current Study Area. The absence of records of *I. nigrum* from these survey areas may not be a true reflection of the presence or distribution of this taxa, noting that pitfall trapping is not a preferred methodology for *I. nigrum* as it would necessitate traps to be placed within close proximity to burrows and rely on the movement of emergent individuals or dispersing males.

480099 500099 520099 540099

6750739 6738854 6726969 6715084 6703199

Tallering

Merredin

Legend

- Previous records I. nigrum
- State Highway
- Study Area

IBRA_sub-region

- Merredin
- Tallering

1:250,000

0 1.75 3.5 7 10.5 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 3.1. Records of Idiosoma nigrum returned from database searches

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

3.2 Biologic Survey Results and Discussion

3.2.1 Burrow Numbers and Occurrence

A total of 86 active and three inactive (abandoned) burrows of *I. nigrum* were recorded in the Study Area (Figure 3.2; Appendix A). Most of the active burrows (79%) were found in three loose clusters, with the remaining burrows scattered adjacent to, and in between, clusters.

The first cluster (34 burrows) and second cluster (16 burrows, including three inactive) were both recorded within the western Study Area, with the third cluster (18 burrows) recorded within the eastern Study Area.

The clustering in this Study Area is less concentrated, compared to Murchison populations. At Weld Range and Jack Hills, the two largest Murchison populations of *I. nigrum*, clustering occurs over a one to two meter radius, and is directly associated with individual trees. Within this Study Area, the clustering is occurring over a wider area, up to a 10–20 meter radius. This likely indicates an environment that is less hostile to the movement of breeding males and dispersing juveniles. Clustering in populations in the more arid Murchison IBRA region, is an adaptation that reduces an individual's time on the surface, improving the chances of survival in a harsh environment. The lower density of clustering of the *I. nigrum* burrows may also indicate preferred habitats are widespread and easily traversed, which would place less constraint on *I. nigrum*'s local distribution.

The *I. nigrum* population in the Study Area also appears to be at a lower population density compared to the Weld Range population and the nearby Blue Hills population, 60 km north east of the Study Area. Ecologia (2009), Bamford (2009) and Biologic (2012) all conducted targeted transects for *I. nigrum* at Weld Range, with Ecologia covering the majority of the range and Bamford and Biologic covering the same, smaller project area on the edge of the range. These reports found densities between 11 burrows per hectare and 27 burrows per hectare (Table 3.1). The population density at Blue Hills (Ecologia 2012) appears lower than Weld Range, but is still higher than in the Study Area.

Table 3.1: Population densities of I. nigrum at Weld Range, Blue Hills and the Study Area.

	Weld Range			Blue Hills	Mt Gibson
Report	*Ecologia (2009)*	*Bamford (2009)*	*Biologic (2012)*	*Ecologia (2012)*	*Biologic (2014)*
Area searched	30ha	4.9ha	4.6ha	6.7ha	47ha
Burrow no.s	1708	135	105	53	89
Density (burrows/ha)	11/ha	27/ha	23/ha	8/ha	2/ha

Two active burrows of the Tree-stem Trapdoor Spider *Aganippe castellum* (Priority 4) were also found within the Study Area. Both burrows were found associated with *Allocasuarina*, but were also close to *I. nigrum* burrows.

3.2.2 Vegetation Units

Based on the vegetation units described by Bennett (2000), the *I. nigrum* records coincide with five vegetation units (Table 3.1), of which four vegetation units are thickets dominated by *Acacia* and *Allocasuarina* species. The fifth vegetation unit is an open shrub mallee community over *Acacia* thicket. The largest numbers of burrows were found within Thicket community 3 (T3), largely due to the presence of Cluster 1 (36 burrows).

515100 516100 517100 518100 519100 520100

6727960 6726960 6725960 6724960

Cluster 1

Cluster 2

Cluster 3

Legend

- Aganippe castellum
- Idiosoma nigrum
- Study Area

1:17,000

0 0.125 0.25 0.5 0.75 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 3.2. Records of Idiosoma nigrum and Aganippe castellum within the Study Area

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

515000 516000 517000 518000 519000 520000

6727970 6726970 6725970 6724970

Cluster 1

Cluster 2

Cluster 3

12 T2 T1 M2 M2 32 9 L3 NINGH

VCL T2 5 T11 L398/616 NINGHL 04282 M2

VCL 10 W5 W2 T3 L398/616 NINGHL 03572

T9 M2 T10 T6

L398/616 NINGHL 04282 T5 T3 M1 HS1 T3 M3

T4 W4 T3 M4

LGE 1288242

Legend

- Study Area
- Idiosoma nigrum records

1:17,000

0 0.125 0.25 0.5 0.75 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 3.3. Records of I. nigrum and vegetation units

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

On the ground, all burrows were recorded within *Acacia* thickets, sometimes bordering *Allocasuarina* thickets or open mallee areas. There appeared to be a preference for *Acacia ramulosa*, however burrows were also found to be associated with *A. assimilis* and *Allocasuarina acutivalvis*, although less commonly and often still very close to *A. ramulosa*. These three flora species appeared to also provide the most common "twigs" for the twig-lining of *I. nigrum* burrows.

Ecologia (2012) found a similar association between *I. nigrum* burrows and Acacia shrubs at Blue Hills, particularly *Acacia ramulosa* var. *ramulosa* and *A. caesanura*.

Acacia ramulosa appears to be fairly common through the lower slopes and plains, and is directly mentioned in a number of vegetation communities mapped as part of previous vegetation survey work (Bennett 2000 and ATA 2005). *Acacia ramulosa* is not identified by Bennett (2000) or ATA (2005) as occurring in any of the vegetation units associated with the middle or upper slopes.

Table 3.2. Vegetation units at *I. nigrum* burrow locations

Vegetation Association	Description	*Idiosoma nigrum* burrows
Thicket Communities		
T2	Dense Thicket dominated by *Acacia assimilis* , *A. stereophylla* var. *stereophylla*, *A. ramulosa* and *Allocasuarina acutivalvis* var. *prinsepiana* over Low Shrubland of *Acacia acuaria*, *Hemigenia* sp. Paynes Find and *Baeckea* affin. *cryptandroides* in loam with scattered rocks on the surface.	4 burrows
T3	Dense Thicket of *Acacia assimilis*, *Allocasuarina acutivalvis* subsp. *prinsepiana* and *Melaleuca nematophylla* over Low Shrubland of *Hemigenia* sp. Paynes Find and *Hibbertia crassifolia* in loam pockets in jaspilite rocks.	Cluster 1 (34 burrows) + 4 individual burrows
T4	Dense Thicket of *Allocasuarina acutivalvis* subsp. *prinsepiana* with occasional *Eucalyptus oldfieldii* over an Open Scrub of *Acacia* species over Open Shrubland of *Hemigenia* sp. Payne's Find or Open Herbs of *Xanthosia bungei* .	Cluster 3 (18 burrows)
T9	Dense Thicket of *Acacia* species, *Hakea* species, *Eucalyptus brachycorys* and *E. oldfieldii* with emergent *Callitris glaucophylla* , over Open Low Shrubland of mixed species on sand.	Cluster 2 (16 burrows, inc. three inactive) + 4 individual burrows

Vegetation Association	Description	*Idiosoma nigrum* burrows
Mallee Communities		
M4	Very Open Shrub Mallee of *Eucalyptus leptopoda* with emergent *Eucalyptus loxophleba* subsp. *supralaevis* over Thicket of *Acacia ramulosa* over Herbland of Asteraceae species in loam.	9 individual burrows

3.2.3 Topography, soils and surface texture

The Study Area ranges in elevation from approximately 315m to 450m, with around half of the Study and Context Areas dominated by middle and upper slopes (Figure 3.4) and the remainder of the area comprising of gentler lower slopes and adjacent plains.

The Study Area varies from sandy soils through to extensive loam and clay-loam (with and without pebbled surfaces), into pockets of loam within jaspilite rocks on the upper slopes. The surface texture appears to vary with slope, with the lower slopes and plains often lacking surface pebbles, while gravel and pebbly surfaces increase in the middle slopes and heavy rocks and boulders appear on the upper slopes. *I. nigrum* burrows were recorded only on the gentler, lower slopes and the adjacent plains associated with loamy soils. No *I. nigrum* burrows were recorded in the middle or upper slopes.

Soil structure plays an important role in the construction and maintenance of trapdoor spider burrows; the soil generally needs to be reasonably compact to provide a stable substrate, and to be able to remain cool below the surface and retain moisture following rainfall. The reliance on such characteristics varies between species, but particularly in arid regions, these are regarded as reasonably consistent habitat requirements.

The lack of burrows on the middle and upper slopes may be a factor of soil availability, with the presence of surface and subsurface rocks and pebbles increasing upslope, potentially decreasing the availability of loamy soils for burrowing, which could also explain the absence of *Acacia ramulosa*.

3.2.4 Factors influencing presence

The potential factors influencing the suitability of habitats for *I. nigrum* are variable, but they may include:

Thermal protection: Canopy cover and leaf litter associated with *Acacia* thickets would provide thermal protective properties during the hotter times of the year and provide heat retention during the colder minimum temperatures.

The climate in the area is less hostile than the upper Midwest/ Murchison region, where the need for greater protection from solar exposure has influenced the position of *I. nigrum* populations to form matriarchal clusters on the middle slopes of the southern side of some ironstone ranges, despite the lower availability of soil, vegetation cover and leaf litter often associated with such landscapes.

Moisture retention: Soil type and protection from solar radiation (as outlined above) would allow moisture to be retained in the soil for longer periods following rainfall, which would aid with temperature regulation during the hotter times of year. Deeper loam to clay-loam soils have better moisture retention properties than sandy soils or skeletal soils, which were respectively found throughout the lower plain areas, and on the higher slopes.

Prey availability and capture: *Idiosoma nigrum* feeds on ground-dwelling invertebrate fauna, primarily ants. As such, the structural complexity of the habitat with respect to vegetation and leaf litter is required for the availability of prey.

Idiosoma nigrum is also entirely reliant on the effectiveness of the twig-lining burrow door for prey capture. This is influenced by the availability of material ("twigs" or phyllodes), often with a requirement for thin to medium width phyllodes, such as those provided by *Acacia* species.

Surface stability: The stability of the habitat (including vegetation, surface and soil) is considered to be important, given the maturation time for *I. nigrum* (5-6 years), long potential lifespan (up to 25 years for females), and inability to rebuild a new burrow if the original burrow is destroyed. Sheltered leaf litter beds under *Acacia* thickets can provide such stability, and gentler slopes will

generally be subjected to less disturbance from land slippage. However, these comparatively open habitats may be subject to other disturbances such as fire and grazing.

Dispersal: The flatter plains and lower slopes would provide easier terrain to traverse during dispersal.

515000 516000 517000 518000 519000 520000

6727970 6726970 6725970 6724970

Cluster 1

Cluster 2

Cluster 3

Legend

- Idiosoma nigrum records
- Study Area
- Mid and upper slopes

1:17,000

0 0.125 0.25 0.5 0.75 km

N

biologic

Mt Gibson Mining Ltd

Extension Hill Targeted Survey

Fig. 3.4. Idiosoma nigrum records (Biologic) and slope

Created: 26/06/2014
Coordinate System: GCS WGS 1984
Datum: WGS 1984

4 CONCLUSIONS

The local *I. nigrum* population within the Study Area is primarily associated with *Acacia* thickets (particularly with *Acacia ramulosa*) in areas of loam to clay-loam soils on the gentler lower slopes and adjacent plains. No *I. nigrum* burrows found on the middle and upper slopes. The association of *I. nigrum* with this habitat is likely to be influenced by a number of factors linked to survivability of individuals both in the burrows and on the surface while dispersing. The slope mapping provides a good indication of habitat that is prospective for *I. nigrum*.

It appears highly likely that the local population of *I. nigrum* is widespread through the greater area, although possibly fragmented due to vegetation and soil preferences. A*cacia* thickets, particularly *A. ramulosa*, appear to be common through the greater area of the Mt Gibson Ranges and its surrounds, and occur in association with the loam to clay-loam soils and lower slopes where *I. nigrum* burrows were primarily found.

The widespread and fragmented nature of the *I. nigrum* burrows within the Study Area indicates that there are few hindrances to movement on the surface, important for both the dispersal of juveniles and mature males looking for females.

Whilst *I. nigrum* was recorded within the Study Area, the low number of *I. nigrum* burrows recorded in comparison to the density of *I. nigrum* burrows recorded from other fauna surveys in the broader region indicates that the area of the Mt Gibson Ranges is not a key habitat for this taxa.

5 REFERENCES

ATA Environmental (2005) *Fauna assessment Mount Gibson*. Unpublished report to Mount Gibson Mining Limited.

ATA Environmental (2006a) *Mt Gibson magnetite project supplementary vegetation and flora surveys*. Unpublished report to Mount Gibson Mining Limited.

ATA Environmental (2006b) *Mt Gibson iron ore mine and infrastructure project, Public Environmental Review*. Report to EPA.

Bamford Consulting Ecologists (2009) Weld Range Direct Shipping Ore Project. Targeted Shield-backed Trapdoor Spider, SRE Invertebrate and Vertebrate Fauna Survey: September 2009. Report to Atlas Iron Limited.

Bennett Environmental Consulting (2000) *Flora and vegetation of Mt Gibson*. Unpublished report to Mount Gibson Mining Limited.

Bureau of Meteorology (BOM) (2014) Climate data online. Available from http://www.bom.gov.au/climate/data Accessed Fri 31 Jan 2014 09:21:33.

Coffey Environments (2008a) *Extension Hill Idiosoma nigrum survey*. Unpublished letter to Mount Gibson Mining Limited.

Coffey Environments (2008b) *Extension Hill Idiosoma nigrum survey*. Unpublished letter to EPA.

Department of the Environment (DoE) (2014). *Idiosoma nigrum* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed Fri, 31 Jan 2014 11:10:29.

Department of Parks and Wildlife (DPaW) (2014a) *NatureMap*. Available from http://naturemap.dec.wa.gov.au/default.aspx Accessed Fri, 17 Jan 2014 15:22:57.

Department of Parks and Wildlife (DPaW) (2014b) *NatureMap: Idiosoma nigrum*. Available from http://naturemap.dec.wa.gov.au/default.aspx on 10 January 2014.

Ecologia Environment (2009) Weld Range Iron Ore Project. The Shield-back Spider *Idiosoma nigrum* Targeted Survey: October 2009. Report to Sinosteel Midwest Corporation Ltd (SMC).

Ecologia Environment (2012) Blue Hills. *Idiosoma nigrum* Targeted Survey: December 2012. Report to Sinosteel Midwest Corporation Ltd (SMC).

EPA (2004) Guidance for the Assessment of Environmental Factors No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Environmental Protection Authority, Perth.

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

Main, B. Y. (1982) Adaptations to arid habitats by mygalomorph spiders. Pp. 273-283. In W. R. Baker and P. J. Greenslade, eds. *Evolution of the Flora and Fauna of Arid Australia*. Peacock Publications, Frewville, South Australia.

Main, B. Y. (1987) Persistence of invertebrates in small areas. Pp. 29-39. In D.A. Saunders, G.W. Arnold, A.A. Burbidge and A.J.M. Hopkins eds. *Nature Conservation: The Role of Remnants of Native Vegetation*. Surrey Beatty & Sons Pty Ltd, Chipping North, NSW

Main, B.Y. (1991) *Trapdoor spiders in remnant vegetation of the Western Australian Wheatbelt*. WEB (National Bulletin) 2: 8-9. Threatened Species Network.

Main, B.Y. (2003) *Demography of the Shield-back trapdoor spider Idiosoma nigrum in remnant vegetation of the Western Australian Wheatbelt.* Records of the South Australian Museum Monograph series 7:179-185.

Payne A.L., Van Vreeswyk, A.M.E, Pringle, H.J.R, Leighton K.A and Henning P. (1998) *An Inventory and vegetation Condition Survey of the*

Sandstone-Yalgoo-Paynes Find Area. Western Australia. Technical Bulletin No 90 Agriculture Western Australia, South Perth.

Thackway R and Cresswell I.D (1995). *An Interim Biogeographic Regionalisation for Australia: A framework for establishing the national system of reserves, Version 4.0.* Australian Nature Conservation Agency, Canberra.

University of Western Australia (UWA) (2005) *The Mygalomorph spiders from the Mt Gibson region, Western Australia, including species apparently endemic to the area*. Unpublished report to ATA Environmental.

WA Museum (WAM) (2013) Database search for *Idiosoma nigrum* records in Western Australia. Conducted by Mark Castalanelli, December 2013.

Yen, A.L. (1995) *Australian spiders: An opportunity for conservation*. Records of the Western Australian Museum. Supplement 52: 39-49.

Appendix A: *Idiosoma nigrum* and *Aganippe castellum* burrow data from the Study Area (Biologic)

Species	Lat	Long	Status	Position	Vegetation type	Closest vegetation
Idiosoma nigrum	-29.60339	117.19675	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60339	117.19712	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60339	117.19712	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60339	117.19712	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60304	117.16752	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60294	117.16769	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60275	117.19417	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60273	117.19912	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60272	117.19912	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60268	117.19906	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60268	117.19907	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60267	117.19397	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.6026	117.16735	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.6025	117.16776	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.6025	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60249	117.16843	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60249	117.16843	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60248	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60248	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60248	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60248	117.16842	Inactive	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60246	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60246	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60246	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60246	117.16842	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60243	117.20044	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60243	117.20044	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60243	117.20045	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60243	117.20045	Active	Flat	Acacia thicket	*Acacia ramulosa*

Species	Lat	Long	Status	Position	Vegetation type	Closest vegetation
Idiosoma nigrum	-29.60243	117.20046	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60243	117.20046	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60224	117.20047	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60224	117.20048	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60224	117.20048	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60224	117.20049	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.20049	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60223	117.2005	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60221	117.16807	Inactive	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60216	117.16242	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60214	117.16242	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60213	117.16823	Inactive	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.60178	117.19365	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60178	117.19365	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.60178	117.19365	Active	Flat	Acacia thicket/ open Mallee	*Acacia ramulosa*
Idiosoma nigrum	-29.59465	117.16588	Active	Lower slope	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.59166	117.16445	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58729	117.16308	Active	Flat	Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58608	117.16455	Active	Lower slope	Mixed Acacia thicket	*Allocasuarina acutivalvis*
Idiosoma nigrum	-29.58548	117.16416	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58517	117.16434	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16427	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.5851	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*

Species	Lat	Long	Status	Position	Vegetation type	Closest vegetation
Idiosoma nigrum	-29.5851	117.16429	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Allocasuarina acutivalvis*
Idiosoma nigrum	-29.58509	117.16424	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.1643	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.1643	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.1643	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58509	117.1643	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58508	117.1643	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58505	117.16428	Active	Lower slope	Mixed Acacia thicket	*Acacia assimilis*
Idiosoma nigrum	-29.58504	117.16425	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58504	117.16425	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58504	117.16426	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58504	117.16427	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58504	117.16427	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58504	117.16427	Active	Lower slope	Mixed Acacia thicket	*Acacia assimilis*
Idiosoma nigrum	-29.58504	117.16429	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58503	117.16422	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58503	117.16422	Active	Lower slope	Mixed Acacia thicket	*Acacia assimilis*
Idiosoma nigrum	-29.58503	117.16423	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58503	117.16423	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58502	117.16427	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58499	117.16423	Active	Lower slope	Mixed Acacia thicket	*Acacia ramulosa*
Idiosoma nigrum	-29.58426	117.16307	Active	Flat	Acacia thicket	*Acacia ramulosa*
Aganippe castellum	-29.60227	117.20044	Active	Flat	Mixed Acacia	*Allocasuarina*
Aganippe castellum	-29.59511	117.16646	Active	Lower slope	Mixed Acacia thicket	*Allocasuarina acutivalvis*

Appendix B: *Idiosoma nigrum* records from Naturemap (40km radius)

NAME	SOURCE_ID	FAMILY	VERNACULAR	LONG.	LAT.	DATUM	SITE_NAME	COLLECTOR	COLDATEY
Idiosoma nigrum	8998	Idiopidae	Shield-backed Trapdoor Spider	117.124	-29.660	WGS84	17 miles (27.2km) NE (of) Rabbit Proof Fence No. 2 (on) Great Northern Hwy. 32 miles NE of Wubin.	Barbara York-Main	1955
Idiosoma nigrum	8999	Idiopidae	Shield-backed Trapdoor Spider	117.124	-29.660	WGS84	17 miles (27.2km) NE (of) Rabbit Proof Fence No. 2 (on) Great Northern Hwy. 32 miles NE of Wubin.	Barbara York-Main	1955
Idiosoma nigrum	9000	Idiopidae	Shield-backed Trapdoor Spider	117.151	-29.572	WGS84	5 miles (8km) N of Mt Gibson turnoff (on) Great Northern Hwy.	Barbara York-Main	1955
Idiosoma nigrum	9009	Idiopidae	Shield-backed Trapdoor Spider	117.311	-29.347	WGS84	24 miles (38.4km) SW of Paynes Find on Great Northern Hwy.	Barbara York-Main	1955
Idiosoma nigrum	12190	Idiopidae	Shield-backed Trapdoor Spider	117.151	-29.572	WGS84	5 miles (8km) N of Mt Gibson turnoff (on) Great Northern Hwy.	Barbara York-Main	1955

Appendix C: *Idiosoma nigrum* records from the WA Museum database (40km radius).

REGNO	GENUS	SPECIES	SITE	MALE	FEMALE	JUVENILE	SPECNUM	DTFR	LATDEC	LONGDEC	HABIT
108519	*Idiosoma*	*nigrum*	Charles Darwin Nature Reserve	0	1	0	1	14/01/10	-29.662	117.121	
125765	*Idiosoma*	*nigrum*	Mummaloo_ ca. 76 km NE.Wubin	0	1	0	1	4/07/12	-29.638	117.231	Eucalyptus & acacia leaf litter
126451	*Idiosoma*	*nigrum*	Mummaloo_ ca. 72 km NE Wubin	0	0	1	1	7/08/12	-29.638	117.151	Eucalyptus woodland
126452	*Idiosoma*	*nigrum*	Mummaloo_ ca. 72 km NE Wubin	0	0	1	1	8/08/12	-29.646	117.171	Eucalyptus woodland
126453	*Idiosoma*	*nigrum*	Mummaloo_ ca. 76 km NE Wubin	0	1	0	1	10/08/12	-29.672	117.241	Eucalyptus woodland
126454	*Idiosoma*	*nigrum*	Mummaloo_ ca. 76 km NE Wubin	0	1	0	1	9/08/12	-29.685	117.268	Eucalyptus woodland
126455	*Idiosoma*	*nigrum*	Mummaloo_ ca. 72 km NE Wubin	0	1	0	1	13/08/12	-29.672	117.183	Eucalyptus woodland
126456	*Idiosoma*	*nigrum*	Mummaloo_ ca. 58 km NE Wubin	0	0	1	1	16/08/12	-29.805	117.123	Eucalyptus woodland
126457	*Idiosoma*	*nigrum*	Mummaloo_ ca. 58 km NE Wubin	0	0	1	1	16/08/12	-29.768	117.077	Eucalyptus woodland
126458	*Idiosoma*	*nigrum*	Mummaloo_ ca. 65 km NE Wubin	0	0	1	1	16/08/12	-29.684	117.103	Eucalyptus woodland