



Jimblebar *Eremophila capricornica*  
Targeted Flora Survey

Biologic Environmental Survey

Report to BHP Western Australian Iron Ore

March 2021



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## EXECUTIVE SUMMARY

BHP Western Australia Iron Ore (BHP WAIO) commissioned Biologic Environmental Survey (Biologic) to undertake a targeted flora survey for *Eremophila capricornica* (Priority 1) in the areas surrounding Jimblebar and Caramulla. Recent flora and vegetation surveys have identified numerous populations of *Eremophila capricornica* (Priority 1) within, and adjacent, BHP WAIO tenure. The objective of the targeted flora survey was to fill knowledge gaps surrounding the occurrence, distribution, and habitat of the conservation significant flora taxon *Eremophila capricornica* within and around BHP WAIO tenure at Jimblebar and Caramulla.

The species is listed as Priority 1 by the Department of Biodiversity, Conservation and Attractions (DBCA), as it does not qualify for listing as threatened under the *Biodiversity Conservation Act 2016* (BC Act). It is noted to have a very restricted distribution; however, it is locally abundant at most known locations. The DBCA currently have five populations documented, while BHP WAIO have location information for additional occurrences in the Pilbara.

BHP WAIO requested that Biologic propose a Study Area based upon a species distribution assessment and modelling utilising broad land system mapping, soil mapping and bedrock mapping with the known occurrences of *Eremophila capricornica*. Following the development of the Study Area, a targeted flora survey was undertaken across seven days from the 9<sup>th</sup> to the 15<sup>th</sup> of July 2020, by two Biologic botanists. Targeted searching was undertaken for *Eremophila capricornica* within the Study Area in suitable habitat as identified prior to, and during, the field survey. Where habitat was deemed unsuitable for the target species, searching intensity was limited or ceased to maximise field survey efficiency in suitable habitat.

Specimens collected in the field as *Eremophila capricornica*, were identified based on morphological characters as either *Eremophila capricornica*, *Eremophila jucunda* subsp. *pulcherrima*, or *Eremophila* sp. (Sect. *Eriocalyx*). However, genomic analysis subsequently revealed all of these specimens form a single unique lineage and it is most likely that they represent the taxon *Eremophila capricornica*.

*Eremophila capricornica* was recorded from 1,047 point locations and 21 separate populations within the Study Area, with an estimated combined plant count of 28,898 individuals. The locations of *Eremophila capricornica* were recorded from a range of soil types and topography such as red sand, sandy loam, clay loams, on sandy/ stony plains and slopes, undulating low hills, drainage areas and floodplains. The vegetation consisted primarily of *Acacia*/ mulga shrubland and woodland and *Triodia* hummock grassland.

The targeted survey increased the known occurrences of *Eremophila capricornica* in the local region, extending its known distribution further to the east by approximately 11 km. Whilst *Eremophila capricornica* is still only known from a relatively restricted area along boundary of the Pilbara and Gascoyne bioregions, it has been found growing in varied habitats, including broad drainage areas, stony plains, undulating slopes and hillcrests. It is thought that with additional survey effort the distribution of *Eremophila capricornica* could be further expanded to the south and east of the current known distribution.

## 1 INTRODUCTION

### 1.1 Background

BHP Western Australia Iron Ore (BHP WAIO) commissioned Biologic Environmental Survey (Biologic) to undertake a targeted flora survey of *Eremophila capricornica* (Priority 1) in the local region surrounding BHP WAIO Jimblebar and Caramulla project areas, as well as targeting a more regional extent in potential habitat. The Jimblebar iron ore operation is located within the Jimblebar and Caramulla project areas and is located approximately 40 km east of Newman (Figure 1.1).

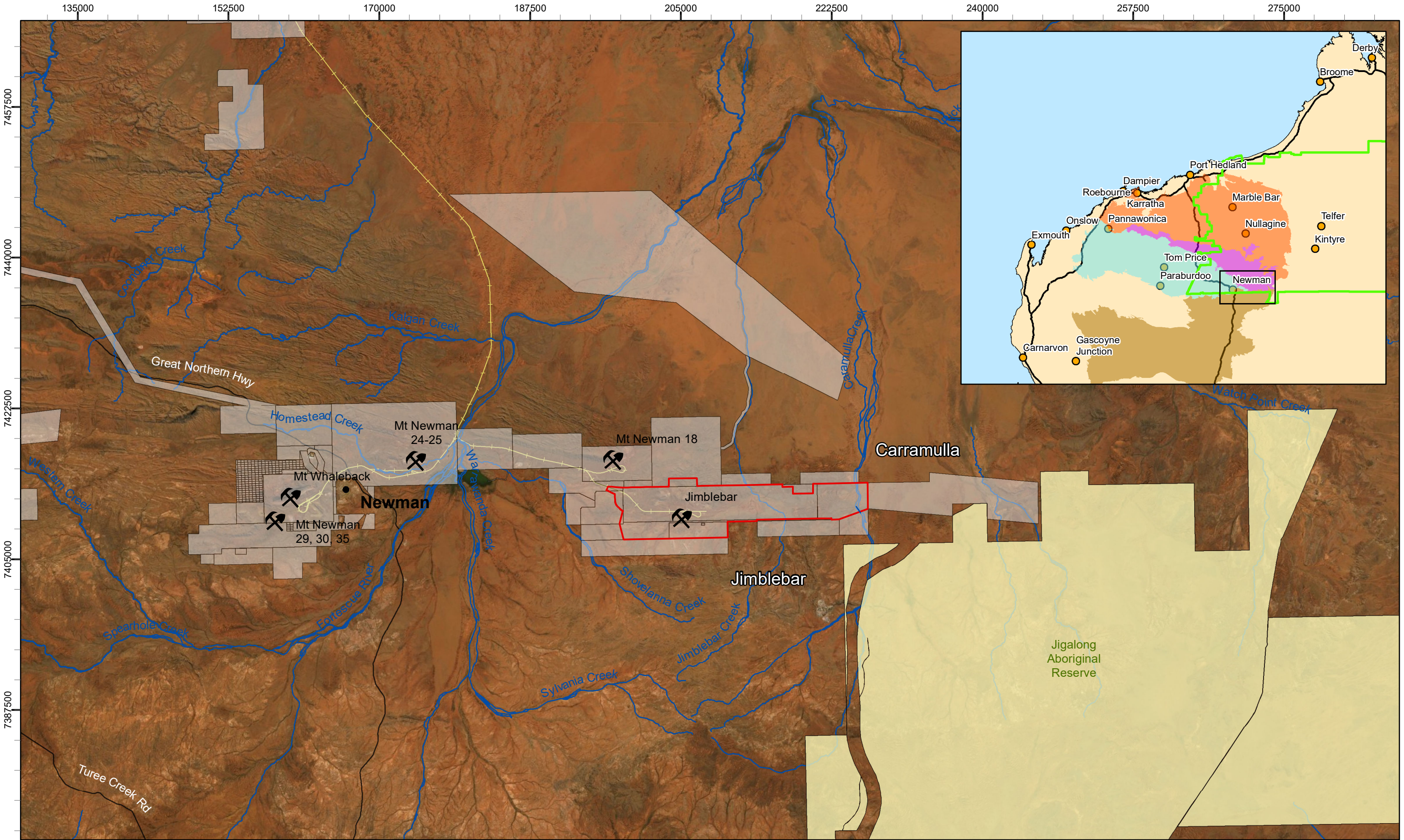
Following recent flora and vegetation surveys surrounding the Jimblebar iron ore operation, including surveys within North Jimblebar, East Jimblebar and Caramulla project areas, populations of *Eremophila capricornica* (Priority 1) have been recorded on BHP WAIO tenure. As there are potential impacts to this species from future proposed operations within the Jimblebar area (associated with the Jimblebar iron ore operation), additional targeted surveying of areas, including off tenure, surrounding Jimblebar and Caramulla was required to record further occurrences and map habitat outside of potential impact areas.

### 1.2 Survey objectives

The overarching objective of the targeted flora survey was to fill knowledge gaps surrounding the occurrence, distribution, and habitat of the conservation significant flora taxon *Eremophila capricornica* (Priority 1) within and around BHP WAIO tenure at Jimblebar and Caramulla, specifically to:

- Complete a comprehensive database and literature review for *Eremophila capricornica*;
- Determine and map suitable habitat prior to field survey (identifying the “Study Area”);
- Conduct targeted searches for *Eremophila capricornica* within the Study Area to determine its distribution and establish population sizes; and
- Use genomic methods to sequence the chloroplast genomes of *Eremophila capricornica* and other *Eremophila* species (that share similarities to *Eremophila capricornica*) from the Jimblebar and Caramulla project areas, in order to determine suitability and success of identifying individuals that are sterile (separate report included as Appendix A).





- Legend**
- BHP Minesite
  - BHP Tenements
  - Jimblebar Iron Ore Operations
  - Jigalong Aboriginal Reserve
  - Shire of East Pilbara
  - Hydrology
  - Rail
  - Major Road
  - IBRA Subregion**
  - Augustus
  - Chichester
  - Fortescue
  - Hamersley

**biologic**  
Environmental Survey

N  
1:400,000  
0 5 10 20 km

**BHP WAIO**  
*Eremophila capricornica* Targeted Flora Survey

**Figure 1.1: Study Area and regional location**

Coordinate System: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994

Size A3. Created 11/03/2021



### 1.3 Compliance

This targeted survey was conducted and delivered in line with relevant state and BHP WAIO guidelines. Where guidelines differ between BHP WAIO standards and state standards, the most stringent guidelines were applied. Specifically, the assessment was undertaken with consideration of the following guidelines:

- Environmental Protection Authority's (EPA) Statement of Environmental Principles, Factors and Objectives (EPA, 2020);
- EPA's Environmental Factor Guideline, Flora and Vegetation (EPA, 2016a);
- EPA's Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b);
- BHP WAIO's Biological Survey Spatial Data Requirements Procedure (SPR-IEN-EMS-015) (BHP, 2020b); and
- BHP WAIO's Vegetation and Flora Survey Procedure (0124627) (BHP, 2018).

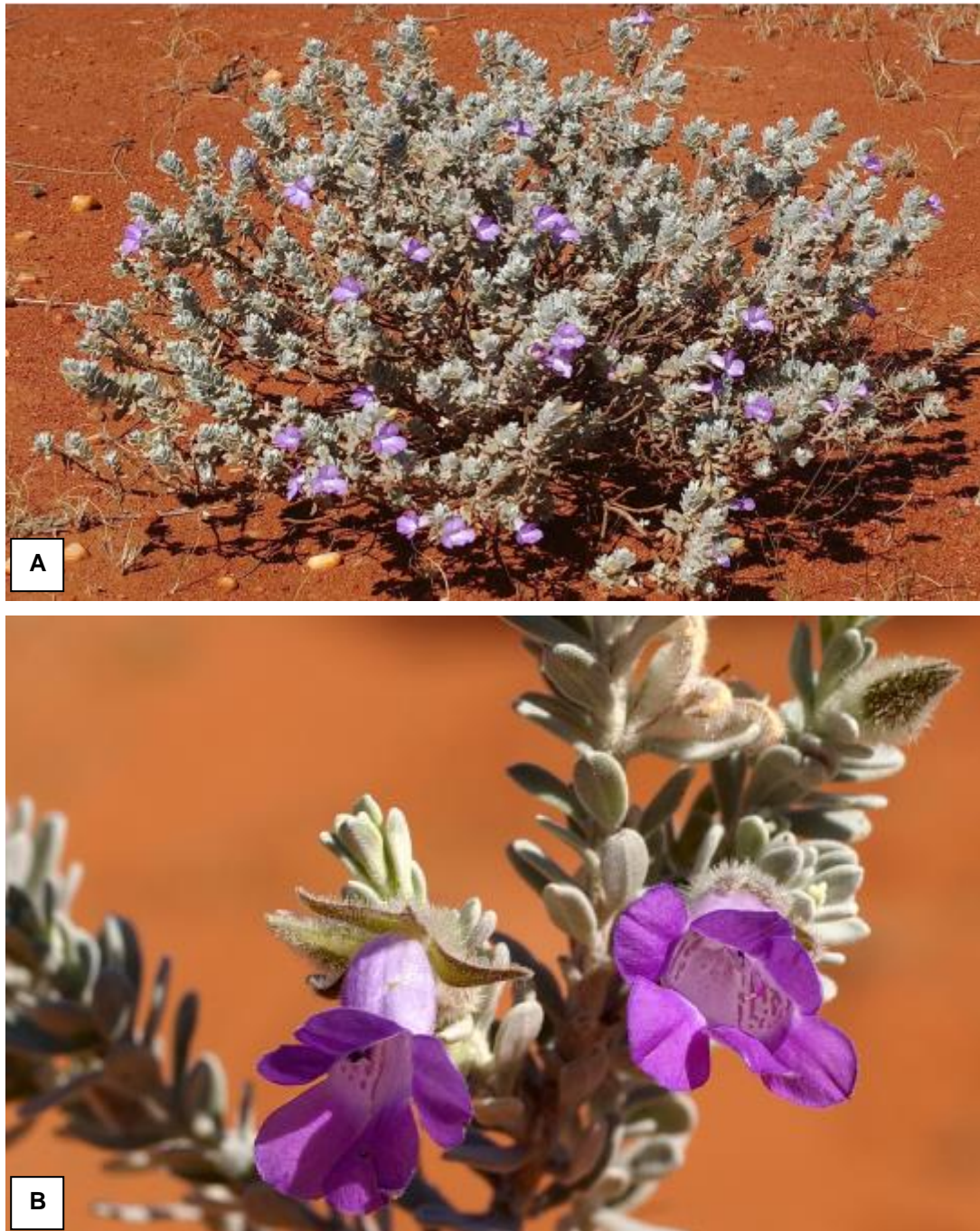
### 1.4 Background and taxonomy of *Eremophila capricornica*

*Eremophila capricornica* (Priority 1) was formally described in 2016 (Buirchell & Brown, 2016). Prior to the formal naming it was phrase named *Eremophila* sp. Jigalong (B. Buirchell BB 204) (Brown & Buirchell, 2011; WAH, 1998-). The species is endemic to the Western Australian Pilbara and Gascoyne biogeographic regions and is found from east of Newman across to the Aboriginal community of Jigalong. The species is listed as Priority 1 by the Department of Biodiversity, Conservation and Attractions (DBCA) (WAH, 1998-), as it does not qualify for listing as threatened under the *Biodiversity Conservation Act 2016* (BC Act). Priority 1 taxa are species that are known from one or a few locations (generally five or less) which are potentially at risk (Appendix B). It is noted to have a very restricted distribution; however, some populations have been noted as being locally abundant (WAH, 1998-). *Eremophila capricornica* has been found to grow in sandy clay loams and open stony areas in open mulga shrubland with an understorey of *Triodia* species and other grasses (Buirchell & Brown, 2016).

*Eremophila capricornica* is a small shrub to 75 centimetres (cm) in height with terete branches with dendritic hairs and old leaf scars. Leaves are alternate, sessile, oblanceolate, and grey, and are clustered towards the ends of branches. Leaves are covered with dendritic hairs on both upper and lower surfaces and are acute with a prominent ridge and entire margins. *Eremophila capricornica* produces one flower per leaf axil with five dark green to grey hairy sepals. The petals form in a tube shape 15-20 millimetres (mm) in length, coloured mauve to lilac with a glabrous outer surface and glandular hairs on the inside of the tube. Flowers predominantly appear between June to August, but may also flower at other times of the year in response to rainfall (paragraph adapted from Buirchell & Brown, 2016) (Figure 1.2).

*Eremophila capricornica* appears closely related to *Eremophila margarethae* and *Eremophila demissa*. *Eremophila demissa* is listed as a Priority 1 species and not known to occur in the Pilbara, occurring in the Gascoyne and Murchison regions (WAH, 1998-). It is separated from *Eremophila capricornica* by at least 170 km. A specimen identified as '*Eremophila demissa*' at the time of the survey was collected by

Onshore Environmental from the Jimblebar region in 2014 (Onshore, 2018b). Following the taxonomic review of *Eremophila* taxa, this specimen has since been determined to be *Eremophila capricornica*. *Eremophila margarethae* is known from the Pilbara and has been collected by Biologic within the Study Area (Biologic, 2019). *Eremophila margarethae* has obovate to elliptic leaves compared to the oblanceolate leaves of *Eremophila capricornica* as well as having longer leaves and pedicels (Buirchell & Brown, 2016) (Table 1.1). *Eremophila capricornica* can also superficially resemble *Eremophila jucunda*, *Eremophila forrestii* and *Eremophila pilosa* when sterile, however, leaf shape, size and hair presence can assist in separating sterile individuals (Table 1.1).



**Figure 1.2: *Eremophila capricornica*. A – plant *in situ*; B – flowers and leaves. Photographs by B. Buirchell (Buirchell & Brown, 2016).**

**Table 1.1: Characters that differentiate *Eremophila capricornica* from similar *Eremophila* species from Sect. Eriocalyx (adapted from Buirchell & Brown, 2016; Chinnock, 2007)**

Character	<i>E. capricornica</i>	<i>E. demissa</i>	<i>E. margarethae</i>	<i>E. jucunda</i>	<i>E. forrestii</i>	<i>E. pilosa</i>
<b>Height</b>	50 - 75 cm	25 - 90 cm	25 - 40 cm	25 - 100 (180) cm	50 - 200 cm	50 - 150 cm
<b>Leaf dimensions</b>	8 - 12 × 3 - 4 mm	12 - 42 × 2 - 5 mm	5.5 - 13 × 2 - 4 mm	(6.5) 8.5 - 20 (22.5) × (1.6) 2.5 - 5.5 (7) mm	(6) 11 - 30 (35) × (4.2) 6.5 - 16 (20) mm	(10) 14 - 25 (35) × (3.7) 4-9 (10.5) mm
<b>Leaf shape</b>	oblanceolate	linear to linear-oblanceolate	obovate-elliptic	obovate to oblanceolate	oblanceolate, ovate, obovate to orbicular	obovate to oblanceolate
<b>Pedicle length</b>	2 - 3 mm	3.5 - 7.5 mm	3 - 7 mm	3 - 9 (11) mm	(2) 4 - 24 mm	6 - 9 mm
<b>Sepal dimensions</b>	6 - 9 × 1.5 - 3 mm	7.5 - 13 × 0.5 - 1.7 mm	9 - 14 × 2 - 5 mm	(8) 9.5 - 17 (21.5) × 1 - 2.5 mm	(7.5) 9 - 19 (24) × 2 - 7.5 (9) mm	8 - 13.5 × 1.6 - 3.2 mm
<b>Sepal shape</b>	lanceolate	linear-triangular to lanceolate	lanceolate to elliptic	linear to lanceolate	lanceolate, oblanceolate to obovate	lanceolate
<b>Sepal hairs (on inner surface)</b>	scattered glandular	dense glandular	dense glandular	dense long dendritic in basal half, more scattered above	stellate or dendritic-tomentose	branched eglandular in basal half, glandular-pubescent in distal half
<b>Corolla hairs (on outer surface)</b>	absent or fine dendritic	substellate	glandular	absent or obscurely to prominently glandular/eglandular pubescent	glandular and/ or dendritic	absent or eglandular-pubescent
<b>Style hairs</b>	absent	absent or with scattered simple eglandular or branched hairs	simple eglandular in basal half	simple eglandular	absent or sparsely eglandular, simple or branched	absent

## 2 METHODOLOGY

### 2.1 Desktop assessment

#### 2.1.1 Literature review

A review of all available literature on *Eremophila capricornica* (Priority 1), including previous flora and vegetation surveys, was undertaken to document information on known localities, preferred habitat/landforms, similar species, flowering times, and soil types. Detailed taxonomic information on *Eremophila capricornica* was reviewed so that the field botanists were aware of the differences between similar species (Table 1.1) (Brown & Buirchell, 2011; Buirchell & Brown, 2016; Chinnock, 2007). The literature review consisted of numerous survey reports of relevance to the Study Area, with previous reviews completed by Biologic (Biologic, 2019) forming the basis of the review as this was the most relevant and recent work in the local region. The previous field surveys that were considered were provided by BHP WAIO and were located within a radius of 20 km from the Study Area. In addition to the taxonomic reports, four assessment reports reviewed included information on *Eremophila capricornica* (Table 2.1).

The Index of Biological Surveys for Assessments (IBSA) online portal was reviewed to identify additional projects that have been conducted in close proximity to the Study Area. No additional surveys were identified from the IBSA. However, it is plausible that further information is available that is currently not in the public domain or held by BHP WAIO.

**Table 2.1: Literature sources which identified the presence of *Eremophila capricornica***

Title	Location
Biologic (2019). BHP WAIO East Jimblebar & Caramulla Detailed Flora and Vegetation Assessment.	East Jimblebar and a portion of Caramulla Creek
Onshore (2019). Jimblebar North Reconnaissance Flora and Vegetation Survey.	Jimblebar North
Onshore (2018a). Reconnaissance Flora and Vegetation Survey Caramulla.	East Jimblebar and a portion of Caramulla Creek
Onshore (2018b). Vegetation Survey and Desktop Assessment Caramulla Creek.	Caramulla Creek and a portion of East Jimblebar
Buirchell and Brown (2016). New species of <i>Eremophila</i> (Scrophulariaceae): thirteen geographically restricted species from Western Australia	Alongside Jigalong Mission Road (~14 km southeast of Jimblebar)
Brown and Buirchell (2011). A field guide to the Eremophilas of Western Australia	East of Newman across to Jigalong (~14 km southeast of Jimblebar)

#### 2.1.2 Database searches

Four flora databases were searched (Table 2.2), two to obtain general information on *Eremophila capricornica* (NatureMap and Atlas of Living Australia) and two to identify locality information on *Eremophila capricornica* (DBCA Threatened Flora Database and Western Australian Herbarium Specimen Database). The BHP WAIO database was also consulted to capture additional records of *Eremophila capricornica* found by previous surveys but not yet databased by the Western Australian Herbarium (WAH) and DBCA (BHP, 2020a).



**Table 2.2: Details of database searches conducted**

Provider	Reference	Database	Parameters
Department of Biodiversity, Conservation and Attractions (DBCA)	DBCA (2020a)	NatureMap. Accessed throughout 2020	Species Search
Department of Biodiversity, Conservation and Attractions (DBCA)	(DBCA, 2020c)	Threatened and Priority Flora Database. Received 9 July 2020	Species Occurrence Search
		Western Australian Herbarium specimen database. Received 9 July 2020	
Atlas of Living Australia (ALA)	ALA (2020)	Species Occurrence Search. Accessed throughout 2020	Species Search
BHP WA Iron Ore	BHP (2020a)	BHP Internal Database. Accessed 2 July 2020	Custom Species Search

### 2.1.3 Study Area determination

BHP WAIO requested Biologic propose a Study Area based on existing locations of *Eremophila capricornica* and other known environmental information. Maximum entropy modelling (MaxENT) was used within the R Statistical Package to map species distribution (R Core Team, 2020) by Biologic's senior statistician Lisa King. MaxENT is a type of species distribution model which uses a set of environmental variables and species presence locations to express a probability distribution where each area or grid has a predicted suitability of conditions for the species in question (CBC, 2020). Species distribution models can be used to map suitable habitat, helping to make field searches more targeted and efficient. Species presence locations for *Eremophila capricornica* were provided by BHP WAIO from their internal database, and the environmental variables used were:

- Land system mapping (van Vreeswyk et al., 2004)
- 1:500,000 scale soil landscape mapping (CSIRO, 2013)
- 1:500,000 scale State interpreted bedrock geology mapping (GSWA, 2016).

Additional *Eremophila capricornica* locations were not utilised in the MaxENT modelling as it was determined that the data held by BHP WAIO was the most comprehensive, while the remaining locations for *Eremophila capricornica* (i.e., DBCA database locations) were limited and widespread. The addition of the DBCA records may have potentially created a "murkier study area" that would have required further aerial imagery review and in-field refinement.

The variables used in the MaxENT analysis was limited to a broader dataset to capture a wider area for searching. The use of more detailed datasets for variables was not considered as the extent for the MaxENT assessment would be restricted to the smallest dataset extent, thus reducing the ability to search further afield (for example, the analysis may not have incorporated locations from near Jigalong). The MaxENT modelling produced a Core Study Area that was used to guide survey effort and sampling

(Figure 2.1). The final Study Area consisted of a 20 km buffer of the Core Study Area, enabling a broader area to be surveyed (Figure 2.1). The 'Study Area' referred to in this report refers to the 20 km buffer area.

In addition to utilising MaxENT, the field botanists undertook a review of aerial imagery to determine additional areas of suitable habitat that was not captured within the MaxENT analysis. These additional areas concentrated on suitable habitat outside of Core Study Area (Figure 2.1) that was remote and difficult to access via vehicle. Suitable habitat was based upon site descriptions for WAH records and local knowledge held by Biologic botanists, and was considered to be open stony plains with scattered *Acacia*/ mulga shrubs and an understorey of *Triodia* and other grasses. Low slopes and undulating stony plains adjacent to larger ironstone (and other geologies) hills were thought to provide suitable habitat based on previous experience of Biologic botanists.

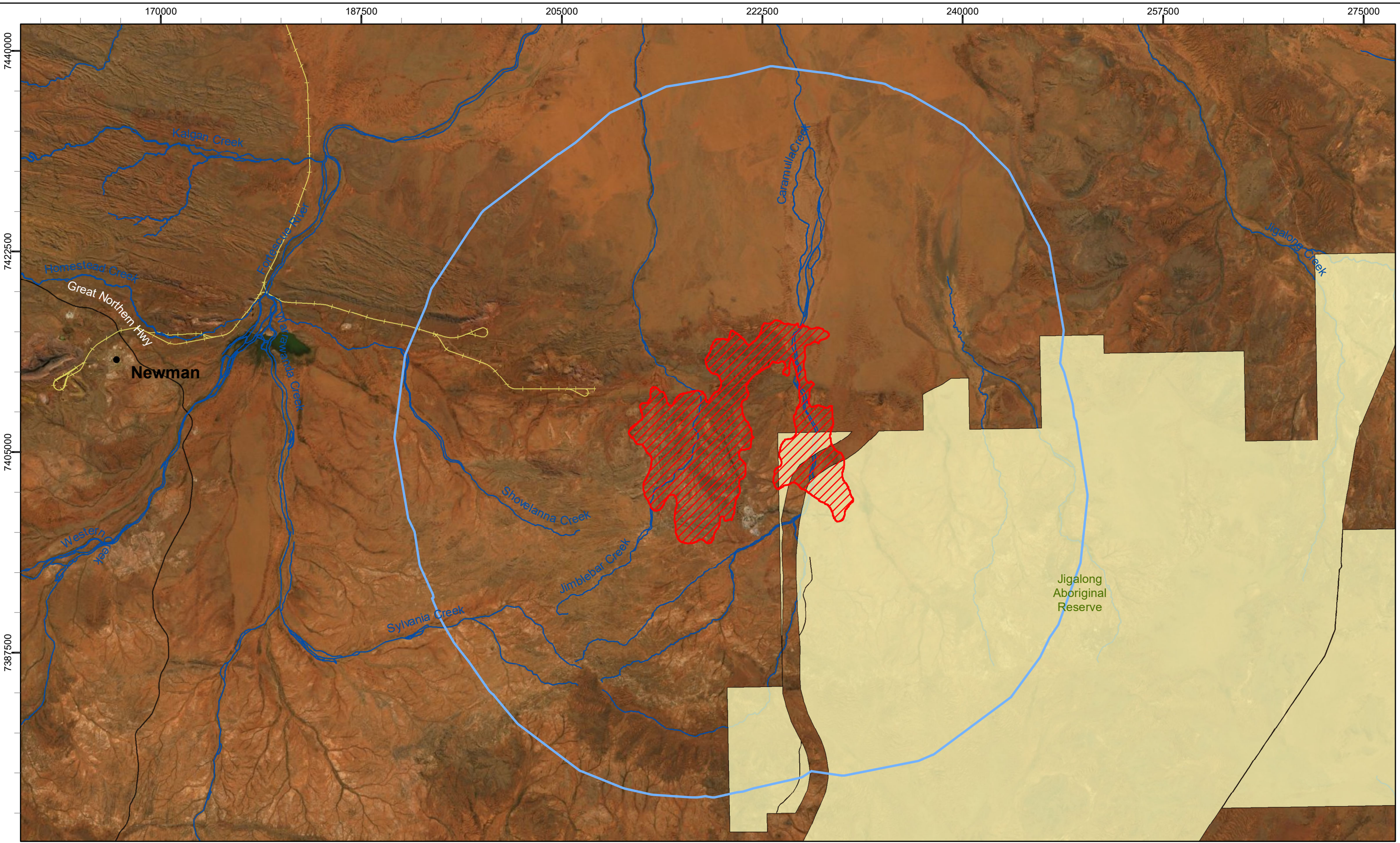
## 2.2 Survey type, timing and weather

A targeted flora survey was deemed the most appropriate survey method and was undertaken across seven days from the 9<sup>th</sup> to the 15<sup>th</sup> of July 2020, equivalent to approximately 120-person hours. The targeted survey was undertaken by Biologic's botanists Clinton van den Bergh and Samuel Coultas. Both Clinton and Samuel have previously located individuals of *Eremophila capricornica* from the East Jimblebar and Caramulla project areas in 2019 (Biologic, 2019). Collectively, Clinton and Samuel have over 20 years' experience, with direct and relevant experience in the region. Clinton and Samuel both meet the minimum 5 years' experience to lead a flora survey in the Pilbara bioregion as detailed by the EPA (2016b).

The field survey was undertaken following above average rainfall for January 2020; however, this was mostly due to a single rainfall event on the 9<sup>th</sup> of January recording a total of 142.8 mm (BoM, 2020). The months of February to June 2020 preceding the survey all received below average rainfall (88 mm compared to 167.5 mm; Figure 2.2), in particular March through to June which only received 26.2 mm of rain (BoM, 2020). Although rainfall preceding the survey was below average, *Eremophila capricornica* flowers through June to August, so the field survey was completed within the known flowering period.

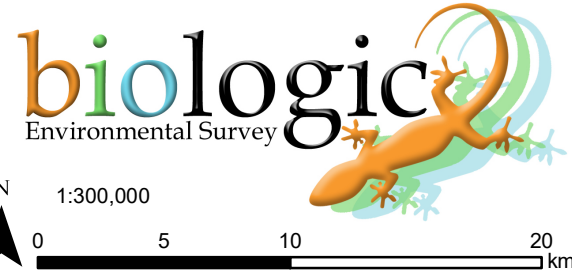
The weather conditions at the time of the survey were considered suitable to complete the targeted searches. The daytime temperatures were mild (ranging from 22°C to 28°C; BoM, 2020) with some cloud cover. The absence of rain preceding the survey meant access to tracks was unimpeded.





**Legend**

- Core Study Area
- 20km Core Study Area
- Jigalong Aboriginal Reserve
- Hydrology
- Rail
- Major Road


  
 biologic
   
 Environmental Survey

N  
 1:300,000  
 0 5 10 20 km

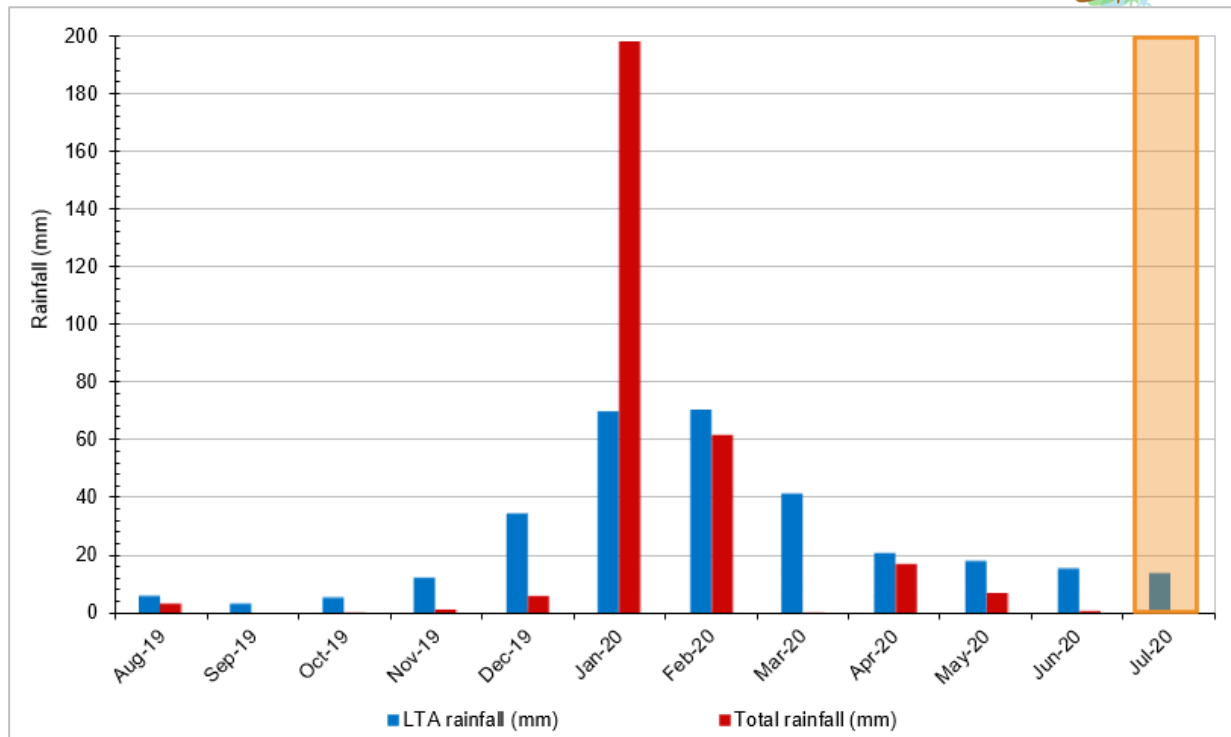
**BHP WAIO**  
*Eremophila capricornica* Targeted Flora Survey  
**Figure 2.1: Study Area produced from MaxENT modelling**

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Coordinate System: GDA 1994 MGA Zone 51  
 Projection: Transverse Mercator  
 Datum: GDA 1994

Size A3. Created 21/12/2020





**Figure 2.2: Monthly rainfall and long-term average (LTA) rainfall for Newman Airport (Station ID 007176) (BoM, 2020). Survey period indicated by orange bar.**

## 2.3 Sampling techniques

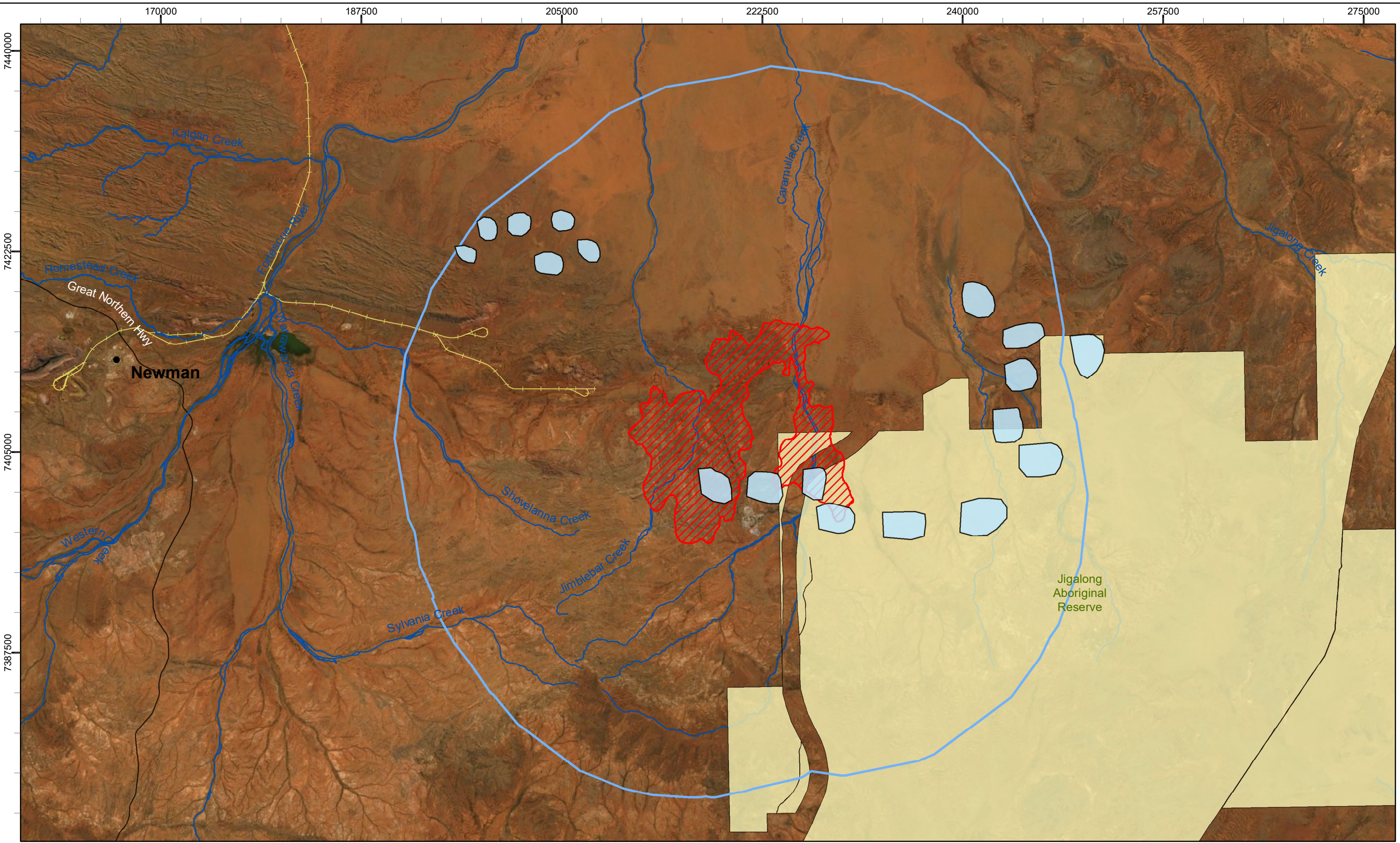
The targeted searching and sampling techniques were designed and implemented following the EPA's technical guidance (page 5; EPA, 2016b). A targeted survey was used to gather comprehensive information on *Eremophila capricornica*, with the aim to determine the size and extent of all populations in the Study Area and to place any potential future impacts into context (EPA, 2016b).

### 2.3.1 Targeted searching

Targeted searching was undertaken for *Eremophila capricornica* in suitable habitat within the Study Area as identified prior to, and during, the field survey (Figure 2.1). Most areas were traversed by road and tracks; however, a helicopter was used for the more remote and inaccessible areas of the Study Area. Eighteen helicopter landing sites were visited across three days (11<sup>th</sup> to the 13<sup>th</sup> of July 2020) and the surrounding suitable or potentially suitable habitat traversed by foot (Figure 2.3; Figure 2.4). Known DBCA occurrences were visited to determine persistence and extent of the populations.

Where habitat was deemed unsuitable for the target species, searching intensity was limited or ceased to maximise field survey efficiency in suitable habitat. Additional habitats in the Study Area that were not deemed suitable habitat included the higher elevations consisting of exposed bedrock (generally ironstone), steep slopes, quartz ridges and areas of lower elevation like claypans, and major riverine or creek systems. Representatives of these areas were visited; however, they were not as intensively targeted as areas within the Study Area that were deemed to be suitable habitat.





**Legend**

- Core Study Area
- 20km Core Study Area
- Helicopter Drop Points
- Jigalong Aboriginal Reserve
- Hydrology
- Rail
- Major Road

**biologic**  
Environmental Survey

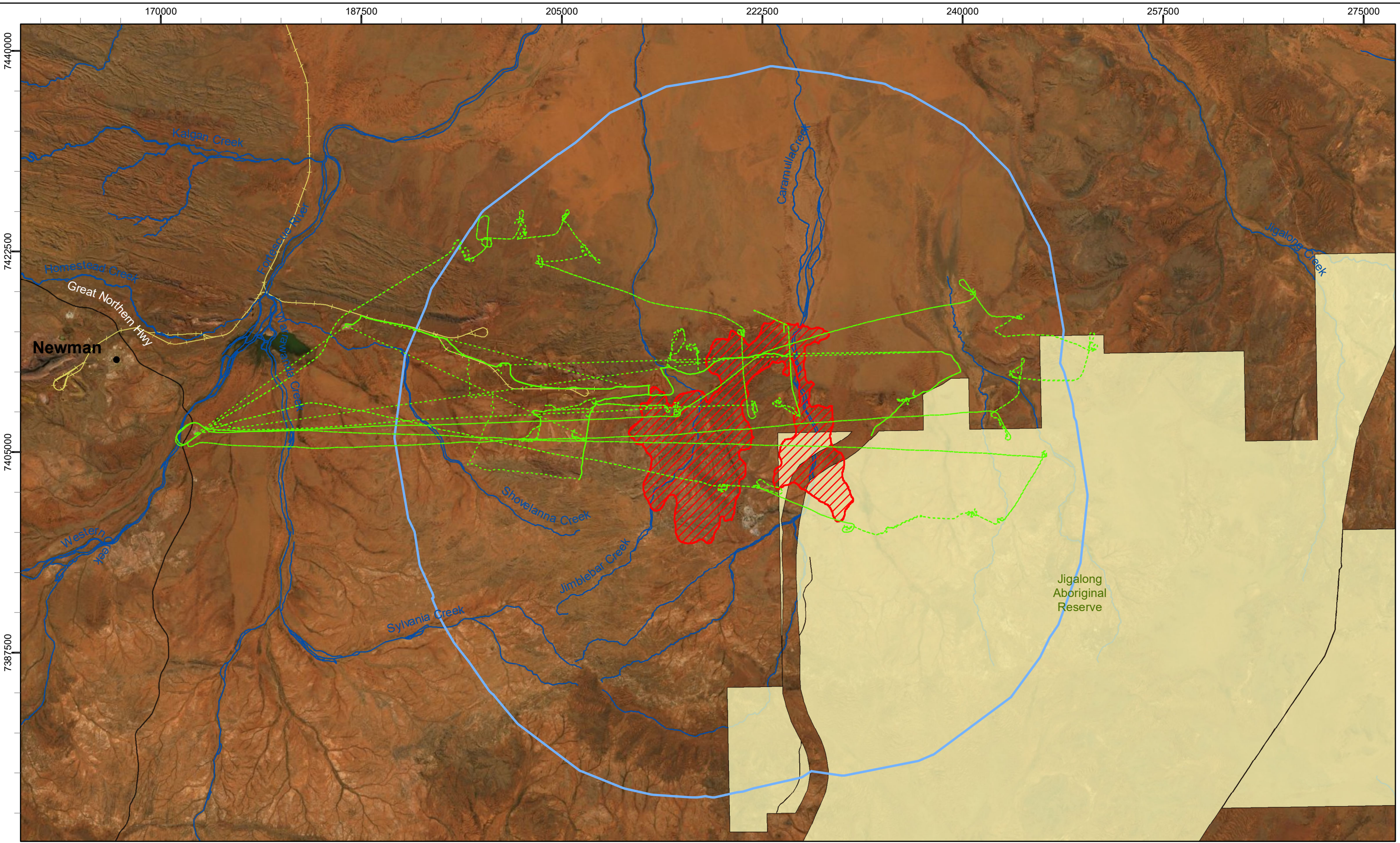
N  
1:300,000  
0 5 10 20 km

**BHP WAIO**  
***Eremophila capricornica* Targeted Flora Survey**  
**Figure 2.3: Sampling intensity – Helicopter drop points**

Coordinate System: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994


Size A3. Created 21/12/2020





**Legend**

- Core Target Area
- GPS Tracks (Vehicle and Foot Traverses)
- 20km Buffer Core Target Area
- Jigalong Aboriginal Reserve
- Hydrology
- Rail
- Major Road


  
 biologic
   
 Environmental Survey

N  
 1:300,000  
 0 5 10 20 km

**BHP WAIO**  
*Eremophila capricornica* Targeted Flora Survey  
**Figure 2.4: Sampling intensity – GPS track logs**

Coordinate System: GDA 1994 MGA Zone 51  
 Projection: Transverse Mercator  
 Datum: GDA 1994  
 Size A3. Created 17/11/2020



When an individual was identified, a GPS coordinate of the individual was taken, when occurring in isolation, or a central coordinate for a small population was taken (central coordinate with an approximate 20 m radius). Once an individual/ population was located, the surrounding area was searched to define the population extent.

Generalised information was collected for each occurrence or population identified in the Study Area. The generalised information collected included an estimate on the number of individuals present (within 20 m of a central coordinate), the reproductive status of the individual/ population (i.e., flowering and/ or fruiting), the condition and health of the individual/ population, landform, soil type, and a broad description and condition of the vegetation community.

Where possible, a specimen was collected from every potential population, however this was not always possible due to the presence of sterile individuals. Four known populations of *Eremophila capricornica* within BHP WAIO tenure were visited to collect additional flowering material and confirm previous tentative identifications.

As stated above, specimens were not collected from every population due to sterile individuals. No specimens were collected from six locations identified during the field survey, while one specimen each was collected from ten locations identified during the field survey. Multiple specimens were collected from six locations identified in the field.

During the field survey all records of *Eremophila capricornica* held by the DBCA were visited to ascertain persistence and extent of the population. This included the collection of a specimen from the vicinity of accession number 8527601 (the holotype used for description of the species). DBCA record with accession number 9151079 was submitted to the WAH by Biologic as part of their 2019 survey (Biologic, 2019). However, upon review of the data, it was discovered that the GPS coordinate held by the DBCA/ WAH is incorrect, and therefore the correct location was not visited. The correct GPS coordinate has been supplied to the WAH. The original (incorrect) location was revisited as part of the current targeted survey and a specimen taken from the population. It should be mentioned that every attempt was made to locate the original plant or plants in close proximity; however, locating the exact location of the record was not always possible due to GPS error and presence of flowering individuals.

### **2.3.2 Specimen identification and vouchering**

Plant specimens collected during the field survey were assigned a unique number for tracking purposes and pressed for subsequent identification. Identifications were initially carried out by Biologic's taxonomist, Dr Rachel Meissner, utilising the Western Australian Herbarium's reference collection, taxonomic keys, and reference material. Specimens of *Eremophila capricornica* were subsequently submitted to the WAH for further taxonomic identification and clarification.

Twenty specimens of *Eremophila capricornica* (and 11 specimens identified morphologically as *Eremophila jucunda* subsp. *pulcherrima*) collected from the Study Area were vouchered with the Western Australia Herbarium (accession numbers ACC/8536/E).



*Threatened and Priority Flora Report Forms* for a subset of the individuals recorded were submitted to Parks and Wildlife Service of DBCA, as required under the flora collecting permits. The remainder of the known locations was also provided as an accompaniment to the report forms.

#### **2.4 *Eremophila capricornica* targeted flora genomic analysis**

In conjunction with the targeted *Eremophila capricornica* flora survey, Biologic's molecular systematics team completed an analysis of *Eremophila* specimens collected during the targeted field survey. The aims and objectives of the molecular systematics analysis were to:

- Perform genome skimming of 24 *Eremophila* specimens collected from the Study Area;
- Reconstruct plastomes from genome skimming data using standard bioinformatic methods;
- Use phylogenomic analyses to investigate the relationships among sequences from the Study Area and to compare to existing sequence data (from GenBank and "Plastids of the Pilbara" (DBCA, 2020b));
- Compare phylogenomic results to morphological identifications to infer the species identification of the 24 *Eremophila* specimens;
- If required, reconstruct the nrDNA gene region using standard bioinformatic methods, undertake phylogenomic analyses, and compare nrDNA phylogenomic results to plastome and morphological identifications; and
- Explore whether phylogenomic analyses can be used to reliably distinguish *Eremophila* species and identify sterile specimens of *E. capricornica*.

Details on the molecular systematics methods and analysis is provided in Appendix A. The results of the genomic analysis are discussed in this document where relevant.

## 3 RESULTS

### 3.1 Desktop assessment

#### 3.1.1 Literature review

Since *Eremophila capricornica* (Priority 1) was formally described in 2016 it has been found by a number of flora and vegetation surveys in the Jimblebar and Caramulla project areas, as outlined in Table 2.1. These records are all included within the BHP WAIO database (BHP, 2020a) and are presented in Figure 3.1.

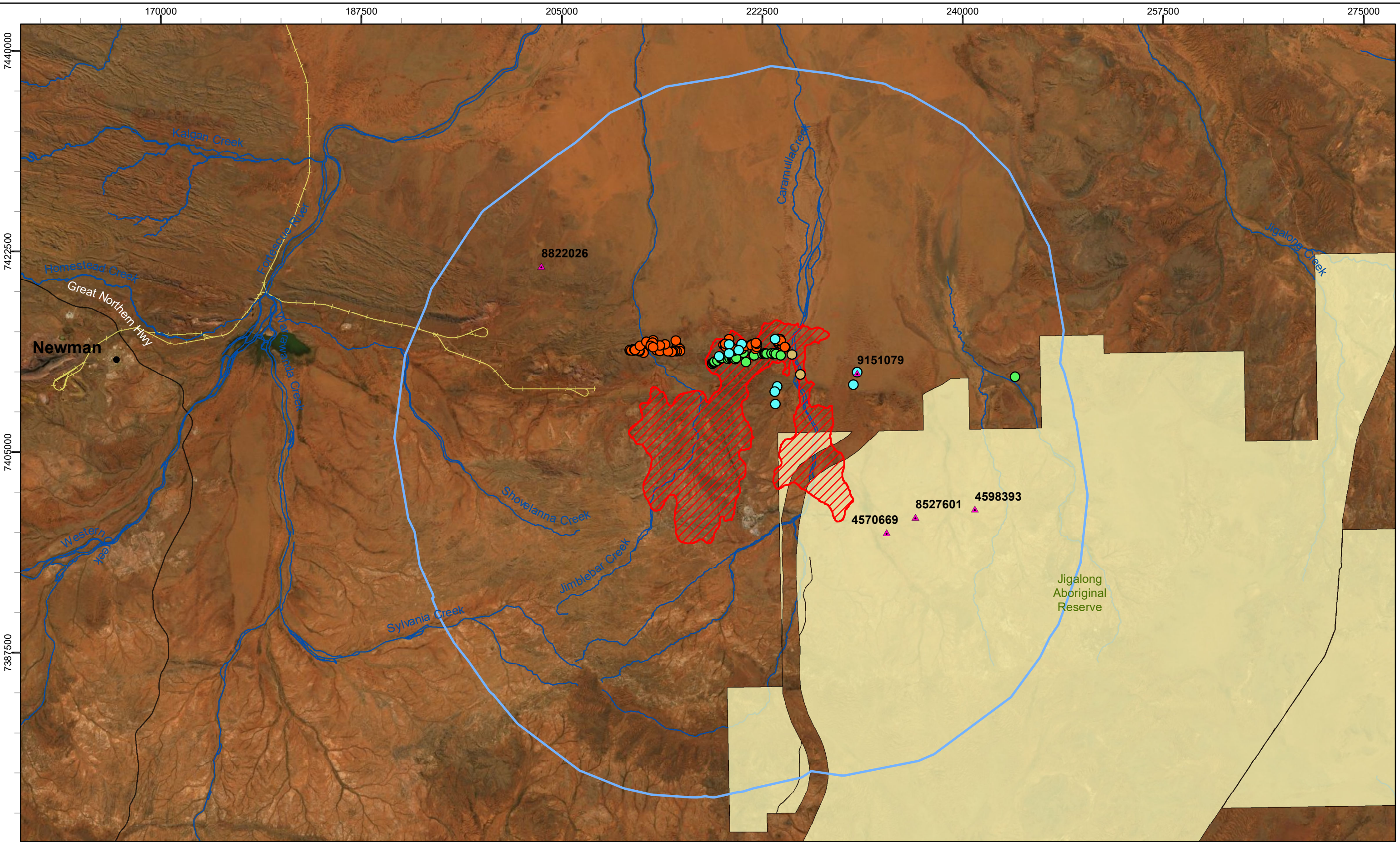
*Eremophila capricornica* was recorded from 38 locations within the eastern portion of the Caramulla exploration mining lease by Onshore Environmental in February 2018. Number of individuals ranged from one to 150 with a total of 1,384 individuals across the study area. It occurred on hill slopes, undulating low hills, stony plains, and hardpan plains where it provided up to five percent ground cover in certain populations. Vegetation descriptions recorded across the 38 locations were largely comprised of *Triodia* hummock grassland, *Acacia* low woodland, and *Acacia* low open woodland. Other genera within these associated vegetation units included *Senna*, *Sida*, *Dodonaea*, *Grevillea*, *Psydrax* as well as other *Eremophila* species (Onshore, 2018a).

A reconnaissance survey of Caramulla Creek conducted by Onshore Environmental in June 2018 located *Eremophila capricornica* in two locations. One location had a count of 10 individuals and the other location had an estimate of 200 plants. The plants were found within broad vegetation types of *Triodia* hummock grassland, very open tussock grassland, low open *Acacia* woodland, and high *Acacia* open shrubland (Onshore, 2018b).

Onshore Environmental conducted a survey of the Jimblebar North project area covering the Crowes Nest and Lasseter deposits in September 2018. This survey recorded *Eremophila capricornica* from 70 locations scattered throughout the study area from sandy/ stony plains and hill slopes. Records ranged from a few scattered individuals through to approximately 150 individuals, with a total of 3802 individuals. Plants were recorded from similar broad vegetation types of *Triodia* hummock grassland, *Acacia* high shrubland, and *Acacia* low open woodland (Onshore, 2019).

Additional populations of *Eremophila capricornica* were found within the East Jimblebar and Caramulla project areas during a recent detailed flora and vegetation survey by Biologic (Biologic, 2019). A total of 175 individuals were recorded from 11 locations. *Eremophila capricornica* was found in various vegetation units including low *Acacia* woodland, *Acacia* and *Corymbia hamersleyana* low open woodland, *Acacia* and *Hakea* high open shrubland, high *Acacia* shrubland, *Acacia* and *Senna* open shrubland, Open *Triodia* hummock grassland and *Triodia* hummock grassland. These locations were on a range of soil types and topography such as red or brown sand, sandy loams, silty/ clayey loams, on stony/ hardpan plains, hill slopes, hillcrests, drainage areas and floodplains (Biologic, 2019).





**Legend**

- Core Study Area
- 20km Core Study Area
- Jigalong Aboriginal Reserve
- Hydrology
- Rail
- Major Road

***Eremophila capricornica* Records**

- DBCA, showing accession number
- Biologic (2019)
- Onshore (2018a)
- Onshore (2018b)
- Onshore (2019)

**biologic**  
Environmental Survey

N  
1:300,000  
0 5 10 20 km

**BHP WAIO**  
***Eremophila capricornica* Targeted Flora Survey**  
**Figure 3.1: Known occurrences of *Eremophila capricornica***

Coordinate System: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994

Size A3. Created 11/03/2021



### 3.1.2 Database searches

The DBCA currently have five populations documented, all of which are located within the Study Area (DBCA, 2020c) (Figure 3.1). An additional specimen was collected by Bevan Buirchell and lodged with University of Melbourne, located 80 km east of Marble Bar and approximately 250 km north of the Study Area (ALA, 2020). The location for this record was not visited, so the validity of this record is not known. As discussed in Section 2.3.1, the original location held by WAH for Accession No. 9151079 is incorrect and has since been updated with WAH. The correct location for Accession no. 9151079 is shown on Figure 3.1.

**Table 3.1: Summary of known DBCA records for *Eremophila capricornica* (Priority 1) (DBCA, 2020c; WAH, 1998-)**

Specimen	No. of individuals / Frequency	Habitat
Accession no. 9151079	20 plants	Stony rise within mulga hardpan plain area. Low woodland of <i>Acacia pteraneura</i> over high open shrubland of <i>A. wanyu</i> and <i>A. synchronicia</i> over mid open shrubland of <i>Senna glutinosa</i> subsp. <i>x luerksenii</i> .
Accession no. 8527601	Over 50 plants	Plain in rangeland with brown/red loam soil. Grassland with spinifex and <i>Acacia</i> .
Accession no. 4570669	Infrequent	Shallow soiled hardpan plain. Open mulga woodland.
Accession no. 4598393	Abundant	Hardpan plain over granite. <i>Acacia aneura</i> and this species.
Accession no. 8822026	Not stated	Not stated.

## 3.2 Specimen identification results

### 3.2.1 Identification based on morphology

A total of 23 specimens were collected from the field and submitted to the WAH for paid taxonomic identification based on morphological characters. The specimens were submitted to the WAH to ensure there is a clear and transparent process of taxonomic identification associated with the genomic assessment. The specimens were originally reviewed by Michael Hislop, who then sought assistance from Andrew Brown and Dr Bevan Buirchell. *Eremophila capricornica* was formally described by Andrew and Bevan, so their opinions were valuable in determining accurate taxonomic identifications.

Specimen identifications from the WAH gave some unexpected results with over half of the submissions returning as *Eremophila jucunda* subsp. *pulcherrima*. Upon further review of the specimens collected, a clear geographical divide was present. The specimens collected from east of Caramulla Creek were identified as *Eremophila capricornica*, while the specimens collected from the west of Caramulla Creek were identified as *Eremophila jucunda* subsp. *pulcherrima*. As a result, it was decided to call all point

locations to the east of Caramulla Creek *Eremophila capricornica*, while all point locations west of Caramulla Creek were identified *Eremophila jucunda* subsp. *pulcherrima*.

A subset of *Eremophila capricornica* was identified as “*Eremophila capricornica* – narrow sepals”, having slightly narrower sepals than other confirmed specimens of *Eremophila capricornica*. Two other species from Sect. Eriocalyx were collected during this survey (*Eremophila forrestii* subsp. *forrestii* and *Eremophila latrobei* subsp. *glabra*), as well as four specimens which could not be identified down to species level; three of these belonged to Sect. Eriocalyx (*Eremophila* sp. (Sect. Eriocalyx)), of which includes *Eremophila capricornica*, *Eremophila jucunda* subsp. *pulcherrima* and other species with a sparse to dense pubescence or tomentum of stellate to dendritic glandular and/ or eglandular hairs (Chinnock, 2007). The remaining specimen belonged to a different section within the *Eremophila* genus (*Eremophila* sp. indet).

### 3.2.2 Identification using genetic tools

Genetic sequencing has subsequently confirmed that all specimens morphologically identified as *Eremophila capricornica*, *Eremophila capricornica* – narrow sepals, *Eremophila jucunda* subsp. *pulcherrima* and *Eremophila* sp. (Sect. Eriocalyx) form a single unique lineage (Appendix A). This unique lineage likely represents *Eremophila capricornica*, however this would need to be confirmed by genetic sequencing of the type specimen (WAH accession no. 8527601). Moreover, specimens morphologically identified as *Eremophila forrestii* subsp. *forrestii*, *Eremophila latrobei* subsp. *glabra* and *Eremophila* sp. indet, did not fall within the *Eremophila capricornica* clade.

For the purposes of this report, it has been assumed that all records morphologically identified as *Eremophila capricornica* (including the ‘narrow sepals’ form), *Eremophila jucunda* subsp. *pulcherrima*, and *Eremophila* sp. (Sect. Eriocalyx), as well as all records identified in the field as *Eremophila capricornica* (i.e., where no specimen was taken), represent the taxon *Eremophila capricornica*.

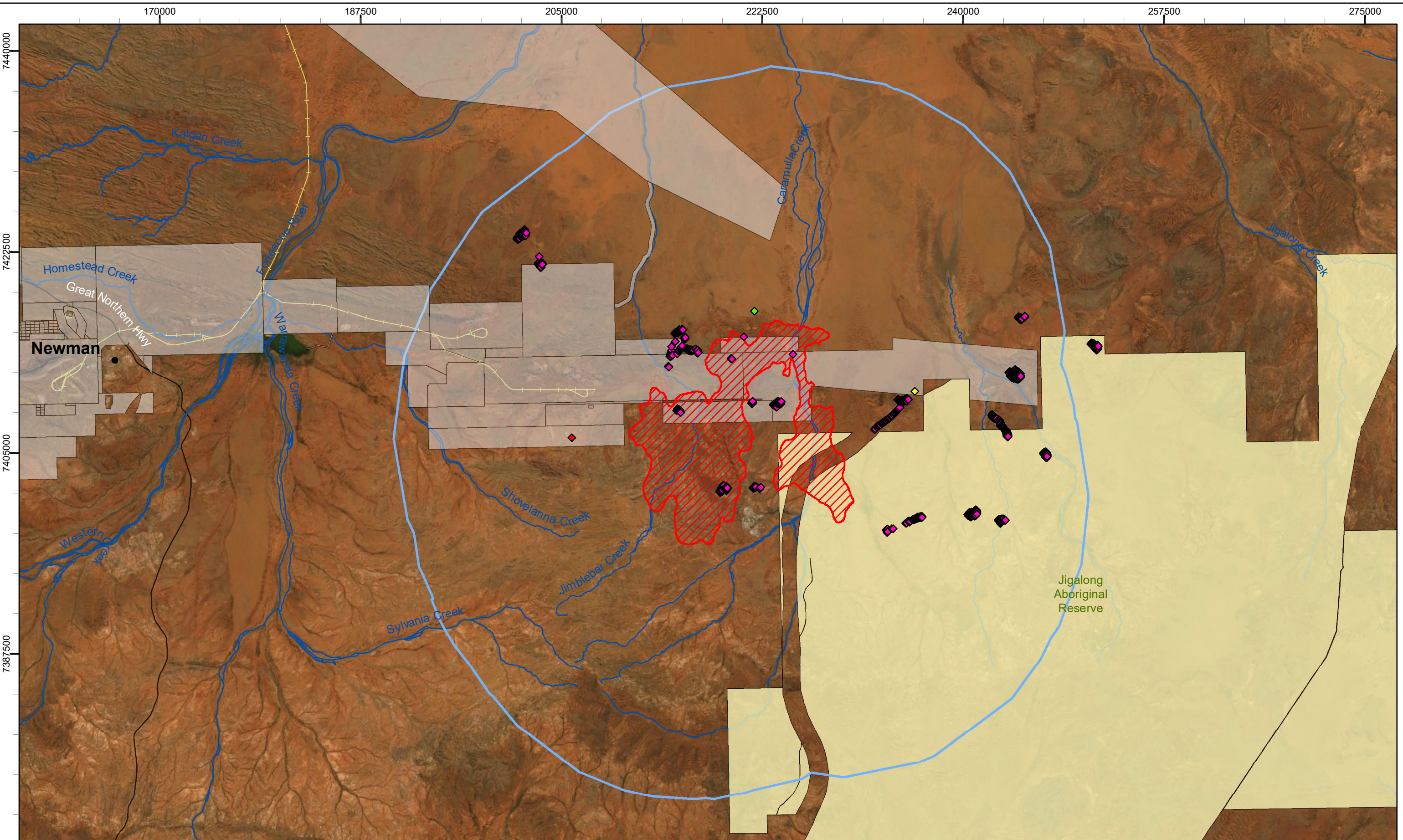
### 3.3 *Eremophila capricornica* field observations

*Eremophila capricornica* (Priority 1) was recorded from 1,047 locations within the Study Area, with an estimated combined plant count of 28,898 individuals (Figure 3.2 and Appendix C).

Where available, vegetation units where *Eremophila capricornica* was recorded are provided in Table 3.2. Vegetation units for Jimblebar East and Caramulla project areas were mapped by Biologic in 2019 (Biologic, 2019). Consolidated vegetation mapping has been conducted for BHP tenements by Onshore Environmental, including an area to the east of Caramulla Creek (Onshore, 2014). Vegetation for the remainder of the areas surveyed has not been determined beyond a broader regional scale.

Within unmapped areas of the Study Area, *Eremophila capricornica* (Priority 1) was noted to occur in low open *Acacia*/ mulga woodland, tall shrubland and tall open shrubland with a mixture of *Acacia*, mulga (*Acacia aneura* and close relatives), and *Hakea lorea*, over *Acacia* spp. and *Eremophila fraseri* open shrubland over *Triodia* hummock grassland or tussock grassland (Plate 3.1). *Eremophila capricornica* was primarily found on mid-low rocky slopes and plains in sand, sandy loams, and clay loams.





**Legend**

- Core Study Area
- BHP Tenements
- 20km Core Study Area
- Jigalong Aboriginal Reserve
- Hydrology
- Rail
- Major Road

***Eremophila* Sect. *Eriocalyx* Records**

- Eremophila capricornica*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila latrobei* var. *glabra*
- Eremophila* sp. *indet*

**biologic**  
Environmental Survey

N  
1:300,000  
0 5 10 20 km

**BHP WAIO**  
***Eremophila capricornica* Targeted Flora Survey**  
**Figure 3.2: *Eremophila capricornica* locations recorded by the Survey**

Coordinate System: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994

Size A3. Created 11/03/2021



**Table 3.2: Previously mapped vegetation units where *Eremophila capricornica* was located during the current targeted survey (adapted from Biologic, 2019; Onshore, 2014)**

Broad vegetation formation	Vegetation association
Acacia high open shrubland	High open shrubland of <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Acacia wanyu</i> and <i>Acacia aptaneura</i> over low open shrubland of <i>Senna glaucifolia</i> , <i>Senna artemisioides</i> subsp. <i>oligophylla</i> and <i>Senna artemisioides</i> subsp. <i>helmsii</i> over very open tussock grassland of <i>Eulalia aurea</i> , <i>Aristida inaequiglumis</i> and <i>Chrysopogon fallax</i> on brown loamy sands on sand plains, hardpan plains and drainage areas/ floodplains
	High open shrubland of <i>Acacia wanyu</i> over open shrubland of <i>Senna glutinosa</i> subsp. <i>luerssenii</i> and <i>Senna stricta</i> over low open shrubland of <i>Eremophila cuneifolia</i> , <i>Maireana triptera</i> and <i>Frankenia setosa</i> on brown silty loams on foot slopes and stony plains
Acacia high shrubland	High shrubland of <i>Acacia balsamea</i> , <i>Acacia wanyu</i> and <i>Eremophila fraseri</i> over open hummock grassland of <i>Triodia vanleeuwenii</i> with low scattered trees of <i>Acacia aptaneura</i> and <i>Acacia catenulata</i> subsp. <i>occidentalis</i> on red sandy loams on hill slopes and undulating low hills
Acacia low woodland	Low woodland of <i>Acacia aptaneura</i> , <i>Corymbia hamersleyana</i> and <i>Acacia pruinocarpa</i> over mid open shrubland of <i>Dodonaea petiolaris</i> , <i>Eremophila forrestii</i> and <i>Senna artemisioides</i> subsp. <i>helmsii</i> over very open tussock grassland of <i>Themeda triandra</i> , <i>Chrysopogon fallax</i> and <i>Aristida inaequiglumis</i> on red clayey loams on hardpan plains, drainage areas and floodplains
	Low woodland of <i>Acacia aptaneura</i> , <i>Acacia catenulata</i> subsp. <i>occidentalis</i> and <i>Acacia ayersiana</i> over high shrubland of <i>Acacia subcontorta</i> over open hummock grassland of <i>Triodia basedowii</i> on orange silty clay loam on stony plains
Corymbia low open woodland	Low open woodland of <i>Corymbia hamersleyana</i> , <i>Eucalyptus odontocarpa</i> and <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over open shrubland of <i>Acacia ancistrocarpa</i> , <i>Acacia pachyacra</i> and <i>Acacia adsurgens</i> over open hummock grassland of <i>Triodia basedowii</i> , <i>Triodia schinzii</i> and <i>Triodia vanleeuwenii</i> on red brown sandy loam on footslopes and stony plains
<i>Eremophila</i> low shrubland	Low shrubland of <i>Eremophila compacta</i> , <i>Eremophila cuneifolia</i> and <i>Lepidium platypetalum</i> with low open woodland of <i>Acacia aptaneura</i> and <i>Acacia paraneura</i> and high open shrubland of <i>Acacia wanyu</i> and <i>Senna glutinosa</i> subsp. x <i>luerssenii</i> on clay loam on low hills
<i>Eucalyptus</i> woodland	Woodland of <i>Eucalyptus victrix</i> , <i>Acacia citrinoviridis</i> and <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> over low open shrubland of <i>Tephrosia rosea</i> var. <i>clementii</i> , <i>Corchorus crozophorifolius</i> and <i>Acacia pyrifolia</i> var. <i>pyrifolia</i> over very open tussock grassland of * <i>Cenchrus ciliaris</i> , <i>Eulalia aurea</i> and <i>Themeda triandra</i> on brown loamy sand on channels of major drainage lines



Broad vegetation formation	Vegetation association
<i>Frankenia</i> low open shrubland	Low open shrubland of <i>Frankenia setosa</i> with scattered tussock grasses of * <i>Cenchrus ciliaris</i> on red brown clay loam on saline flats
<i>Triodia</i> hummock grassland	Hummock grassland of <i>Triodia basedowii</i> with low open woodland of <i>Acacia aptaneura</i> , <i>Acacia pruinocarpa</i> and <i>Acacia pteraneura</i> over low open shrubland of <i>Eremophila forrestii</i> on red sandy loam on floodplains and drainage areas
	Hummock grassland of <i>Triodia vanleeuwenii</i> with high open shrubland of <i>Acacia pruinocarpa</i> , <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> and <i>Hakea lorea</i> subsp. <i>lorea</i> over low open shrubland of <i>Acacia hilliana</i> , <i>Calytrix carinata</i> and <i>Eremophila exilifolia</i> on red sandy loam on hill slopes and undulating low hills
	Hummock grassland of <i>Triodia basedowii</i> with low open woodland of <i>Acacia aptaneura</i> and <i>Acacia pruinocarpa</i> over open shrubland of <i>Eremophila forrestii</i> subsp. <i>forrestii</i> on red sandy loam on floodplains
	Hummock grassland of <i>Triodia vanleeuwenii</i> on red brown sandy loam on hill slopes
	Hummock grassland of <i>Triodia vanleeuwenii</i> with high open shrubland of <i>Grevillea wickhamii</i> subsp. <i>hispidula</i> , <i>Acacia ancistrocarpa</i> and <i>Acacia marramamba</i> over open shrubland of <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Senna glutinosa</i> subsp. <i>luerssenii</i> and <i>Ptilotus rotundifolius</i> on red sandy loams on hill slopes and undulating low hills
<i>Triodia</i> open hummock grassland	Open hummock grassland of <i>Triodia basedowii</i> with high open shrubland of <i>Acacia aptaneura</i> and <i>Hakea lorea</i> subsp. <i>lorea</i> over open shrubland of <i>Eremophila fraseri</i> , <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) and <i>Eremophila ?capricornica</i> on red loamy sand on sandy/ stony plains
	Open hummock grassland of <i>Triodia vanleeuwenii</i> , <i>Triodia pungens</i> and <i>Triodia basedowii</i> with low open woodland of <i>Acacia aptaneura</i> , <i>Acacia pruinocarpa</i> and <i>Acacia wanyu</i> and open shrubland of <i>Acacia tetragonophylla</i> , <i>Eremophila exilifolia</i> and <i>Eremophila latrobei</i> subsp. <i>latrobei</i> on red sandy loam on hill slopes



**Plate 3.1: Examples of habitat across the Study Area with *Eremophila capricornica* individuals present as scattered shrubs to low open shrubland**

The individuals observed in the field ranged in condition from healthy flowering and fruiting individuals to sterile, dry looking individuals (Plate 3.2). Broadly, individuals to the west were generally in better condition than individuals to the east. This may be a result of reduced rainfall further to the east of Newman, which is difficult to determine due to a lack of reliable rainfall gauges east of Newman (BoM, 2020). The field observations, including observations of the vegetation broadly, noted that the landscape was notably drier further towards Jigalong, compared to the Jimblebar area. Flowering specimens were available from most populations located in the field, however, most of the individuals were sterile with only occasional flowering or fruiting specimens present.



The vegetation types supporting the populations of *Eremophila capricornica* were generally in very good condition with little to no disturbance. Most disturbances were noted from sporadic cattle activity, grazing, informal tracks and mining/ exploration activities. The presence of weeds was low across the populations, with most weed locations associated with exploration activities (i.e., weeds along tracks) or drainage/ wet areas. There was limited evidence of recent fire across the area, which was not observed to impact on any individuals identified.

*Eremophila capricornica* was locally abundant and widespread at most locations with approximately 55% of locations consisting of 20 or more individuals and 6% of locations having 100 or more individuals.



**Plate 3.2: Close up of *Eremophila capricornica* flowering and fruiting specimens identified from the Study Area. Biologic photos taken during the field survey**

### 3.4 Updated known occurrence of *Eremophila capricornica*

Following the review of available information for *Eremophila capricornica* (Priority 1) and the inclusion of information collected by Biologic during the current targeted survey, it is evident that *Eremophila capricornica* is more widespread and abundant than previously thought (Figure 3.2).

For the purposes of this report, it has been assumed that all coordinates are accurate, except for the ALA record from 250 km north of Jimblebar which has not been confirmed (ALA, 2020). The specimen from the original (incorrect) location of accession no. 9151079 was confirmed as *Eremophila capricornica* by WAH (DBCA, 2020c; WAH, 1998-). Some records of *Eremophila capricornica* held by the DBCA use

descriptive words like 'abundant' and 'infrequent' so it is difficult to determine an accurate total number of individuals for these locations (WAH, 1998-). The BHP WAIO internal database combines all previous survey data to give a combined population estimate of 5,571 individuals (BHP, 2020a). During the current targeted survey, it was observed that a number of the populations of *Eremophila capricornica* extended further than the area traversed (see section 3.5 for explanation of time constraints). For example, the individuals recorded along Jigalong Mission Road (south of the Caramulla project area; Figure 3.2) extended further from the road (to the north and south). Given that the current survey found 28,898 individuals throughout the Study Area, it can be concluded that the combined number of known individuals is at least 34,469, and likely in excess of 35,000 individuals.

Separate populations of *Eremophila capricornica* were defined as being more than 500 m apart, in line with guidelines in the DBCA's *Threatened and Priority Flora Report Form – Field Manual* (Stack, 2017). A review of the point-locations recorded during this survey has identified 21 separate populations in the Study Area. BHP database records indicate a further eight populations across the North Jimblebar, East Jimblebar and Caramulla project areas. When all location records are combined (including WAH and TPFL specimens) there is a total of 22 distinct populations. Given the abundance and frequency at which plants occurred, it is likely that several of the populations identified during current and previous surveys form part of a larger, broader contiguous population.

### 3.5 Survey constraints and limitations

There are a number of possible constraints and limitations that can impinge on the adequacy of targeted flora surveys (EPA, 2016b). The limitations of the current assessment are presented in accordance with the Technical Guidance (EPA, 2016b) (Table 3.3).

The survey was undertaken during the known flowering period for *Eremophila capricornica* (June to August) and therefore the survey timing was considered optimal for the target species, in line with EPA guidance for targeted surveys (EPA, 2016b).

Although there was significant rainfall in the preceding wet season, this was followed by several months of below average rainfall. A large proportion of *Eremophila capricornica* individuals did not bear flowers or fruit; this was particularly evident in the eastern part of the survey area where it was observed to be drier. Plants were still able to be identified relatively easily in the field as botanists were aware of key differences between *Eremophila capricornica* and similar species. Where plants could not be confidently identified in the field or flowering specimens were present and available, specimens were taken.

**Table 3.3: Botanical survey limitations and constraints**

Limitation	Constraint	Comment
Availability of contextual information at a regional and local scale	No	Sufficient contextual information was available for the Study Area, including broad information on land systems and vegetation associations. The Study Area surrounds BHP's Jimblebar iron ore operation. An extensive amount of biological survey work has occurred across the Jimblebar project area and surrounds; the data and reports of which were all available for this assessment.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	No	The survey was led by an experienced botanist with over 14 years' experience. The lead botanist met the minimum requirements to manage a flora and vegetation field survey in the Pilbara bioregion (EPA, 2016b). The lead botanist was assisted by a botanist with seven years' experience. Both botanists were involved in a recent flora and vegetation survey of the Jimblebar project area and were familiar with <i>Eremophila capricornica</i> and its potential habitat / landform requirements.
Proportion of targeted individuals recorded and/or collected, any identification issues	No	<p>The survey intensity (targeted) is designed to capture a specific flora taxon within the Study Area. Although the seasonal conditions prior to the survey was considered below optimal (i.e., following below average rainfall preceding the survey), there were still many individuals flowering at the time, and where confident identification was not possible, specimens were taken for further taxonomic identification.</p> <p>The survey team collected in excess of 20 specimens for further taxonomic review. Genetic material was also obtained from the specimens collected in the field. This genetic material was successfully used to determine similarities across the species present within Sect. Eriocalyx of the <i>Eremophila</i> genus.</p>
Was the appropriate area fully surveyed (effort and extent)	No	<p>As the survey intensity was set as a targeted survey, only areas deemed suitable were required to be surveyed. Species distribution mapping was used to determine a Study Area with potential habitat for <i>Eremophila capricornica</i>.</p> <p>The Study Area was traversed and surveyed on foot and by vehicle/ helicopter with all prospective habitats visited. A helicopter was used to access more remote areas.</p>

Limitation	Constraint	Comment
Access restrictions within the survey area	No	<p>The Study Area was accessed via mining, exploration, and pastoral tracks, while a helicopter was utilised to access the more remote and inaccessible areas.</p> <p>The track running north-south along Caramulla Creek (on the western side) was blocked by hydrologists working in the area, which restricted access to the southern parts of the study area. Furthermore, access was not granted to several third-party tenements.</p> <p>It should be noted that the field botanists attempted to record the extent of all populations located, however time and access constraints did not make this achievable. For example, the individuals of <i>Eremophila capricornica</i> recorded along Jigalong Mission Road (south of Caramulla project area) extended beyond the track verge. Due to time constraints, the population extent could not be fully determined.</p> <p>In consideration of the large, remote, and inaccessible Study Area, a substantial area was still able to be covered and additional populations identified, and therefore access is not considered a constraint.</p>
Survey timing, rainfall, season of survey	No	<p><i>Eremophila capricornica</i> flowers predominantly between June and August and therefore survey timing was considered optimal for this species. Rainfall in the months preceding the survey was lower than average. Vegetation was observed to be in a dry state, especially further to the east. As a result of the drier conditions, flowering and fruiting specimens were scattered throughout the populations, with most individuals considered to be sterile.</p> <p>Sterile material was collected from some populations to assist in the next generation sequencing and for “proof of concept” (i.e., accurately identify sterile plants during surveys completed out of season).</p> <p>Although flowering and fruiting individuals of <i>Eremophila capricornica</i> were limited in some locations, the timing and seasonality of the survey was not considered to be a limiting factor in survey.</p>
Disturbance that may have affected the results of survey such as fire, flood or clearing	No	Disturbances recorded during the survey included fire, grazing and weeds. These disturbances were minor and were not considered to be a constraint of this survey.



## 4 SUMMARY

A targeted flora survey for *Eremophila capricornica* (Priority 1) was completed over seven days across the Study Area, with the majority of the Study Area traversed on foot by both roads and helicopter drop points, with all suitable habitat visited and sampled. The targeted survey recorded:

- 28,898 individuals of *Eremophila capricornica* from 1,047 locations, and 21 separate populations;
- Individuals were generally observed to be in good condition with flowering and fruiting individuals present. A portion of the individuals observed were in a poorer condition due to perceived lower rainfall totals in the east of the Study Area;
- Individuals and populations were observed from a variety of habitats, ranging from low rocky slopes, plains and hardpans;
- Broad vegetation types included:
  - *Acacia*/ mulga shrubland and woodland;
  - *Triodia* hummock grassland
  - *Eremophila* low shrubland
  - *Eucalyptus*/ *Corymbia* woodland
  - *Frankenia* low open shrubland
- Vegetation types supporting *Eremophila capricornica* were generally in very good condition.

The MaxENT modelling of known occurrences of *Eremophila capricornica* against landform, soil and bedrock map layers produced a Core Study Area that was used to guide targeted survey effort. Many populations, however, were found outside of this Core Study Area, suggesting that *Eremophila capricornica* can grow under a wide range of habitats and environmental conditions. Whilst it is still only known from a relatively restricted area of the Pilbara/ Gascoyne bioregional border, it has been found growing in many different habitats, from broad drainage areas and stony plains to undulating slopes and hillcrests. Although *Eremophila capricornica* has been found growing in broad floodplains and drainage areas, it does not seem to grow in defined creek lines, riverbanks or areas inundated with water.

The current targeted survey has increased the known occurrences of *Eremophila capricornica* to at least 34,469 individuals and has extended its known distribution east by approximately 11 km. It is thought that with additional survey effort the distribution of *Eremophila capricornica* could be further expanded to the south and east.

This targeted flora survey and complementary genomic analysis has highlighted the complexity that can exist within groups of closely related plant species, particularly when morphological differences in sterile specimens are not conspicuous. Genomic analysis of *Eremophila capricornica* has shown that it is possible to confidently identify sterile individuals using nuclear ribosomal DNA (nrDNA), making out-of-season surveys a viable option for this taxon.



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**6 APPENDICES**

**Appendix A: *Eremophila capricornica* Genomic Sequencing Report**



Jimblebar *Eremophila capricornica*  
Targeted Flora Genomic Analysis

Biologic Environmental Survey

Report to BHP Western Australian Iron Ore

March 2021



DOCUMENT STATUS				
Version No.	Authors	Review / Approved for Issue	Approved for Issue to	
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3	Joel Huey, Nihara Gunawardene	Nihara Gunawardene	T. Carroll & B. Menezies	March 2020

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## GLOSSARY

18S	18S ribosomal RNA – a nrDNA gene commonly used in phylogenetics.
28S	28S ribosomal RNA – a nrDNA gene commonly used in phylogenetics.
5.8S	5.8S ribosomal RNA – a conserved gene nested within the nrDNA region.
Annotated genome	A genome that has all gene regions and genomic structures identified.
Bioinformatic	Analysis and management of large biological datasets, using novel computational solutions.
Bootstrap value	Value between 0 and 100 that indicates the robustness of the node in a phylogenetic tree.
bp	Base pairs – a measure of the number of nucleotides in a sequence
DNA barcoding	Identification of specimens by comparing DNA sequences of unknown specimens to known sequence libraries.
ETS	External Transcribed Spacer – a region adjacent to 18S which typically shows more genetic variation than 18S.
GenBank	Annotated open access sequence database of all publicly available nucleotide sequences and their protein translations.
Genome skimming	Genome skimming is a sequencing approach that uses shallow NGS sequencing of a genome to generate fragments of DNA. These fragments contain information about the high-copy fraction of the genome (e.g., plastome and nrDNA).
Genomic	Data derived from whole genomes, or large fragments of the whole genome.
ITS	Internal Transcribed Spacer – made up of subunits 1 and 2. These regions are nested within the nrDNA region, and show significantly more genetic variation than adjacent regions.
Mitochondrial DNA (mtDNA)	Mitochondrial DNA is the circular genome found in all animal cells. MtDNA is in high copy numbers and has certain evolutionary properties that make it useful for barcoding and phylogenetic studies.
NGS	Next Generation Sequencing – sequencing technologies that enable rapid genomic sequencing, producing large, powerful datasets. Also known as “massively parallel sequencing”.
nrDNA	The nuclear ribosomal DNA region, comprised of ETS, 18S, ITS, 5.8S and 28S. The nrDNA region is located in the nuDNA genome and is duplicated throughout that genome..
Nuclear DNA (nuDNA)	Nuclear DNA is the DNA found in the cell nucleus, where the bulk of eukaryote DNA is found.
Organelle DNA	DNA is found in two parts of cells; the nucleus, where most of the DNA is found, and the organelles (mitochondria and plastids). Organelle DNA is in high copy numbers and has certain evolutionary properties that make it useful for barcoding and phylogenetic studies.
Phylogenomic	Phylogenetics based on genomic data.
Plastid DNA	Plastid DNA is the circular genome (also called a plastome) found in all plant cells. Plastid DNA is in high copy numbers and has certain evolutionary properties that make it useful for barcoding and phylogenetic studies.
Plastome	See "plastid DNA".

## 1 INTRODUCTION

BHP Western Australia Iron Ore (BHP WAIO) commissioned Biologic Environmental Survey (Biologic) to undertake a targeted flora survey for *Eremophila capricornica* (Priority 1) in the areas surrounding the Jimblebar and Caramulla project areas (the Study Area). Accurate species identification of *Eremophila* specimens is difficult when specimens are not in flower (sterile). Molecular tools can supplement morphological identification to accurately identify more specimens, maximising the efficiency of targeted flora surveys.

DNA barcoding involves sequencing a short fragment of organelle DNA, which can be compared to a sequence library of known specimens (Hebert *et al.*, 2003). These organelle DNA sequences are from mitochondrial DNA in animals and plastid (chloroplast or other) DNA in plants. However, in closely related species there may be insufficient genetic information to reliably differentiate species (Hassel *et al.*, 2013). In addition, a positively identified specimen of the target species may have never been sequenced, making comparisons unreliable. For *E. capricornica*, both limitations apply. Comparison of available *Eremophila* plastid sequence data (not including *E. capricornica*) revealed low genetic variation between species (data not included), and there are no *E. capricornica* sequences available in public databases (e.g., GenBank).

Genome skimming is a powerful tool to overcome these limitations. Genome skimming uses high throughput, next generation sequencing technologies to sequence the entire genome at low coverage (nuclear and organelle), producing a genetic dataset to compare closely related species and providing molecular resources for previously un-sequenced taxa (Dodsworth, 2015). Reconstructing the entire genome (nuclear and organelle) from genome skimming is not the objective. Rather, high copy regions of the genome such as the entire plastid genome (“plastome”) and the nuclear ribosomal DNA (nrDNA) gene region can be sequenced and analysed. In *Eremophila* this equates to approximately 150,000 base pairs (bp) of plastome DNA sequence data and 7,500 bp of nrDNA sequence data. The nrDNA dataset includes genes commonly used in phylogenetics (18S ribosomal RNA [18S], the Internal Transcribed Spacer subunits 1 and 2 [ITS1 and ITS2], 5.8S ribosomal RNA [5.8S], and 26S ribosomal RNA [26S]).

Recently, the “Plastids of the Pilbara” project (DBCA, 2020) produced 672 plastomes from 585 Pilbara taxa, including 13 *Eremophila* species (Nevill *et al.*, 2020). Unfortunately, this dataset did not include *E. capricornica*, but the method and existing dataset provide a path to develop a plastid dataset to resolve targeted surveying of *E. capricornica* in and surrounding the Study Area. Since this project was proposed, two annotated *Eremophila* plastomes and 257 *Eremophila* nrDNA sequences have been published on GenBank (Fowler *et al.*, 2020; Fowler *et al.*, in review). While these datasets do not include *E. capricornica*, they are useful for comparative purposes, and can expedite the analysis process.

### 1.1 Aims and objectives

The aims and objectives of the molecular systematics analysis were to:

- Perform genome skimming of 24 *Eremophila* specimens collected from the Study Area;

- Reconstruct plastomes from genome skimming data using standard bioinformatic methods;
- Use phylogenomic analyses to investigate the relationships among sequences from the Study Area and to compare to existing sequence data (from GenBank and “Plastids of the Pilbara”);
- Compare phylogenomic results to morphological identifications to infer the species identification of the 24 *Eremophila* specimens;
- If required, reconstruct the nrDNA gene region using standard bioinformatic methods, undertake phylogenomic analyses, and compare nrDNA phylogenomic results to plastome and morphological identifications; and
- Explore whether phylogenomic analyses can be used to reliably distinguish *Eremophila* species and identify sterile specimens of *E. capricornica*.

This document reports the methods and results of the genomic analysis. All sequence data will be uploaded to GenBank™ (Benson *et al.*, 2013) as per Biologic’s Molecular Systematics Data Sharing Policy.



## 2 METHODS

### 2.1 Sub-sample preparation, DNA extraction and sequencing

A targeted flora survey was undertaken in the Study Area, across seven days from the 9th to the 15th of July 2020. This survey identified 28,000 individuals, which were later separated into *E. capricornica* (Priority 1), *E. jucunda* subsp. *pulcherrima* and *E. sp.* (Sect. *Eriocalyx*) based on WA Herbarium identifications of collected specimens. Twenty-six of these collected specimens were selected for DNA extraction, from which 24 specimens were selected for genome skimming (i.e. sequenced) (Table 2.1).

Plant leaves were collected in the field using sterile equipment, with storage of tissue in envelopes submerged in silica beads. This dehydrated the leaves, delaying DNA degradation before DNA extraction in Biologic's laboratory. More than 15 leaves were collected per plant to ensure sufficient tissue was available to fine tune the DNA extraction protocol. DNA extractions were undertaken using the Qiagen DNeasy Plant Mini Kit following the manufacturer's instructions. Some steps were modified to improve the protocol after checking the final quality and quantity of DNA to ensure each extraction had greater than 200 nanograms (ng) of high genomic weight DNA, at a concentration greater than 10 ng per microlitre (uL). Modifications included using a mortar and pestle to grind tissue after freezing and extending the homogenisation of tissue in the Qiagen TissueLyser II.

DNA extractions were sent to the Melbourne AGRF node for library preparation and sequencing. Library preparations consist of fragmenting target DNA into an ideal length for sequencing while adding short DNA adaptors to the target DNA. These adaptors allow the target DNA fragments to adhere to the sequencing flowcell and to identify specimens post-sequencing. Next generation sequencing entails pooling libraries from multiple individuals and simultaneously sequencing all fragments of DNA in the sample pool. These fragments (or reads) are then split back into their corresponding specimens and are analysed using bioinformatic tools. Each specimen will include millions of 100-150 bp DNA sequencing reads, which are then overlapped to reconstruct a gene region of interest.

Nextera Flex Library Preps were used on specimens, and after passing library preparation quality checks, libraries were sequenced on a single lane of an Illumina NovaSeq SP Lane, 300 cycle (150 bp paired end). This was expected to produce ~16 million reads per specimen, which is more than sufficient to reconstruct plastomes. Nevill *et al.* (2020) reconstructed plastomes using ~5 million reads per specimen.

**Table 2.1: Specimens that were selected for DNA sequencing**

BMR	Biologic ID	Registration Number	WA Herbarium or other further ID	Lat	Long	Sequenced
BMR01799	<i>Eremophila capricornica</i>	ECG.22	<i>Eremophila capricornica</i>	-23.4105	120.3989	Yes
BMR01800	<i>Eremophila capricornica</i>	ECG.20	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.2895	120.0964	Yes
BMR01804	<i>Eremophila capricornica</i>	ECG.18	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )	-23.2619	120.0853	Yes
BMR01805	<i>Eremophila capricornica</i>	ECG.08	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.4674	120.2779	Yes
BMR01806	<i>Eremophila margarethae</i>	EMG.01	<i>Eremophila latrobei</i> var. <i>glabra</i> *	-23.3951	120.4147	Yes
BMR01807	<i>Eremophila capricornica</i>	ECG.14	<i>Eremophila capricornica</i>	-23.3861	120.5012	Yes
BMR01808	<i>Eremophila capricornica</i>	ECG.15	<i>Eremophila capricornica</i>	-23.3867	120.5030	No
BMR01809	<i>Eremophila capricornica</i>	ECG.17	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.4058	120.2135	Yes
BMR01810	<i>Eremophila capricornica</i>	ECG.16	<i>Eremophila capricornica</i>	-23.3396	120.5072	Yes
BMR01811	<i>Eremophila capricornica</i>	ECG.21	<i>Eremophila capricornica</i>	-23.4015	120.4092	Yes
BMR01812	<i>Eremophila capricornica</i>	ECG.13	<i>Eremophila capricornica</i>	-23.4218	120.4874	Yes
BMR01813	<i>Eremophila capricornica</i>	ECG.19	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.2669	120.0861	Yes
BMR01814	<i>Eremophila capricornica</i>	ECG.03	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.3590	120.2239	Yes
BMR01815	<i>Eremophila capricornica</i>	ECG.10	<i>Eremophila capricornica</i>	-23.4952	120.4142	Yes
BMR01816	<i>Eremophila forrestii</i>	EFG.01	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> *	-23.3296	120.2795	Yes
BMR01817	<i>Eremophila capricornica</i>	ECG.12	<i>Eremophila capricornica</i>	-23.4474	120.5251	Yes
BMR01818	<i>Eremophila</i> sp. indet	EJG.01	<i>Eremophila</i> sp. indet*	-23.4264	120.1219	Yes
BMR01819	<i>Eremophila capricornica</i>	ECG.02	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.3441	120.2139	Yes
BMR01820	<i>Eremophila capricornica</i>	ECG.06	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )	-23.4699	120.2486	Yes
BMR01821	<i>Eremophila capricornica</i>	ECG.11	<i>Eremophila capricornica</i>	-23.4893	120.4646	Yes
BMR01822	<i>Eremophila capricornica</i>	ECG.09	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )	-23.5036	120.3885	Yes
BMR01823	<i>Eremophila capricornica</i>	ECG.01	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.3669	120.2596	Yes
BMR01824	<i>Eremophila capricornica</i>	ECG.07	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.4662	120.2499	Yes
BMR01825	<i>Eremohila ?jucunda</i>	EJC.01	<i>Eremophila</i> sp. indet*	-23.4264	120.1219	Yes
BMR01826	<i>Eremophila capricornica</i>	ECG.04	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.4051	120.2962	No
BMR01827	<i>Eremophila capricornica</i>	ECG.05	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>	-23.4033	120.2991	Yes

\*Specimens not identified by WA Herbarium

## 2.2 Plastome Analysis

### 2.2.1 Analysis of DNA sequence reads

All DNA read analysis and plastome construction occurred in Geneious Prime (2020.0.5). Paired DNA reads were imported into Geneious and trimmed using the Geneious BBDuk plugin, with the default settings, trimming adapters and low quality (Q20), and discarding short reads (minimum length 10 bp).

Assembly of next generation sequencing reads collapses millions of paired reads into a single consensus sequence of the plastome (~150,000 bp). The availability of two annotated *Eremophila* plastomes allowed us to use a reference mapping approach, expediting the assembly of the sequence read data. For each specimen, reads were mapped to *Eremophila oppositifolia* (GenBank Accession Number MN044645) using the Geneious Read Mapper, on medium-low sensitivity and iterating up to five times. Consensus sequences were extracted from the assemblies using the “Highest Quality (Adjusted)” setting.

### 2.2.2 Phylogenomics

Alignments of plastomes were carried out using the online MAFFT alignment server (Kato et al., 2019), which efficiently handles large datasets. Initially, all available *Eremophila* plastomes (including species not from Western Australia) were included, however datasets that included the *Eremophila youngii* subsp. *lepidota* (Priority 4) specimen from the “Plastids of the Pilbara” website (specimen code 22471) failed to align efficiently. This specimen had a shorter sequence length relative to other *Eremophila* sequences on the “Plastids of the Pilbara” website (129.8k vs >151k) suggests that it may be a low quality assembly from a smaller initial read dataset. As such, it was excluded from all downstream analyses. The specimens included in the analysis are detailed in Table 2.2.2.

A maximum likelihood phylogeny was built using the RAxML-HPC2 on XSEDE tool on the Cipres Science Gateway (Miller et al., 2010), with 1,000 bootstrap replicates and the GTR+GAMMA substitution model.

**Table 2.2.2: Specimens included in plastome alignments**

Voucher Number	Source	Species
BMR01799	This Study	<i>Eremophila capricornica</i>
BMR01800	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01804	This Study	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )
BMR01805	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01806	This Study	<i>Eremophila latrobei</i> var. <i>glabra</i>
BMR01807	This Study	<i>Eremophila capricornica</i>
BMR01809	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01810	This Study	<i>Eremophila capricornica</i>
BMR01811	This Study	<i>Eremophila capricornica</i>
BMR01812	This Study	<i>Eremophila capricornica</i>
BMR01813	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01814	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01815	This Study	<i>Eremophila capricornica</i>
BMR01816	This Study	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>



Voucher Number	Source	Species
BMR01817	This Study	<i>Eremophila capricornica</i>
BMR01818	This Study	<i>Eremophila</i> sp. indet
BMR01819	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01820	This Study	<i>Eremophila</i> sp. (Sect. Eriocalyx)
BMR01821	This Study	<i>Eremophila capricornica</i>
BMR01822	This Study	<i>Eremophila</i> sp. (Sect. Eriocalyx)
BMR01823	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01824	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01825	This Study	<i>Eremophila</i> sp. indet
BMR01827	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
22464	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila pilosa</i>
22468	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila longifolia</i>
22470	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila latrobei</i> subsp. <i>filiformis</i>
22472	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila pusilliflora</i>
22480	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>
22481	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila spongiocarpa</i>
22559	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila cuneifolia</i>
33450	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila magnifica</i> subsp. <i>velutina</i>
33453	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila magnifica</i> subsp. <i>magnifica</i>
33473	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila platycalyx</i> subsp. <i>pardalota</i>
33474	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila maculata</i> subsp. <i>brevifolia</i>
33540	Plastids of the Pilbara, Nevill <i>et al.</i> 2020	<i>Eremophila lanceolata</i>
MN044640, MELU	GenBank, Fowler <i>et al.</i> 2020	<i>Eremophila gibbifolia</i>
MN044645, MELUD118629a	GenBank, Fowler <i>et al.</i> 2020	<i>Eremophila oppositifolia</i>

## 2.3 Nuclear rDNA Analysis

### 2.3.1 Assembly of DNA sequence reads

The trimmed reads were assembled using the aforementioned “map to reference” method (Section 2.2.1) against *Eremophila jucunda* subsp. *pulcherrima* (isolate RMF75, GenBank Accession Number MN411414); a 7,474 bp sequence, which includes the 18S gene, internal transcribed spacer 1 (ITS1), 5.8S gene, internal transcribed spacer 2 (ITS2), and 26S gene. The fragment also includes some of the External Transcribed Spacer (ETS).

### 2.3.2 Phylogenomics

There are 257 nrDNA *Eremophila* sequences on GenBank (Fowler *et al.*, in review). These sequences provide a valuable comparative dataset, as they include vouchered specimens of species that may be in the target dataset. These included *Eremophila jucunda* subsp. *pulcherrima*, *Eremophila latrobei* var. *glabra*, *Eremophila forrestii*, and other species in the ‘sect. Eriocalyx’ part of the *Eremophila* radiation.

Alignments of nrDNA genes can be challenging due to the impact of insertions and deletions (indels) when aligning highly divergent sequences. As such, we initially aligned all available *Eremophila* nrDNA

sequences, and then selected a smaller dataset from the 'sect. Eriocalyx' part of the *Eremophila* radiation that included all sequences closely related to the target sequences, and those species that were believed to be in the target dataset based on morphological identifications. This dataset included species not found in Western Australia, but that were still phylogenetically related to the target specimens. This smaller dataset was aligned again. This improved the quality of the final alignment and provided a more easily interpreted final phylogeny.

See Table 2.3.2 for a list of sequences included in the final nrDNA alignments. Alignments of the nrDNA sequences were undertaken on the MAFFT online server, and maximum likelihood phylogenies were constructed following the same method detailed in Section 2.2.2.

**Table 2.3.2: Specimens included in nrDNA alignments**

Voucher Number	Source	Species
BMR01799	This Study	<i>Eremophila capricornica</i>
BMR01800	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01804	This Study	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )
BMR01805	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01806	This Study	<i>Eremophila latrobei</i> var. <i>glabra</i>
BMR01807	This Study	<i>Eremophila capricornica</i>
BMR01809	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01810	This Study	<i>Eremophila capricornica</i>
BMR01811	This Study	<i>Eremophila capricornica</i>
BMR01812	This Study	<i>Eremophila capricornica</i>
BMR01813	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01814	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01815	This Study	<i>Eremophila capricornica</i>
BMR01816	This Study	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>
BMR01817	This Study	<i>Eremophila capricornica</i>
BMR01818	This Study	<i>Eremophila</i> sp. <i>indet</i>
BMR01819	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01820	This Study	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )
BMR01821	This Study	<i>Eremophila capricornica</i>
BMR01822	This Study	<i>Eremophila</i> sp. (Sect. <i>Eriocalyx</i> )
BMR01823	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01824	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
BMR01825	This Study	<i>Eremophila</i> sp. <i>indet.</i>
BMR01827	This Study	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
MN380713	GenBank, Fowler <i>et al.</i> in review	<i>Eremophila bowmanii</i>
MN411326	GenBank, Fowler <i>et al</i> in review	<i>Eremophila eriocalyx</i>
MN411328	GenBank, Fowler <i>et al</i> in review	<i>Eremophila caespitosa</i>
MN411341	GenBank, Fowler <i>et al</i> in review	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>
MN411352	GenBank, Fowler <i>et al</i> in review	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>
MN411353	GenBank, Fowler <i>et al</i> in review	<i>Eremophila jucunda</i> subsp. <i>jucunda</i>
MN411355	GenBank, Fowler <i>et al</i> in review	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>
MN411377	GenBank, Fowler <i>et al</i> in review	<i>Eremophila obovata</i> subsp. <i>glabriuscula</i>
MN411378	GenBank, Fowler <i>et al</i> in review	<i>Eremophila obovata</i> subsp. <i>obovata</i>
MN411380	GenBank, Fowler <i>et al</i> in review	<i>Eremophila compacta</i> subsp. <i>fecunda</i>
MN411381	GenBank, Fowler <i>et al</i> in review	<i>Eremophila forrestii</i> subsp. <i>capensis</i>
MN411386	GenBank, Fowler <i>et al</i> in review	<i>Eremophila bowmanii</i> subsp. <i>nutans</i>
MN411392	GenBank, Fowler <i>et al</i> in review	<i>Eremophila compacta</i> subsp. <i>compacta</i>
MN411412	GenBank, Fowler <i>et al</i> in review	<i>Eremophila latrobei</i> subsp. <i>filiformis</i>
MN411414	GenBank, Fowler <i>et al</i> in review	<i>Eremophila jucunda</i> subsp. <i>pulcherrima</i>
MN411447	GenBank, Fowler <i>et al</i> in review	<i>Eremophila conferta</i>



Voucher Number	Source	Species
MN411448	GenBank, Fowler et al in review	<i>Eremophila muelleriana</i>
MN411459	GenBank, Fowler et al in review	<i>Eremophila occidens</i>
MN411471	GenBank, Fowler et al in review	<i>Eremophila punicea</i>
MN411485	GenBank, Fowler et al in review	<i>Eremophila margarethae</i>
MN411489	GenBank, Fowler et al in review	<i>Eremophila citrina</i>
MN411495	GenBank, Fowler et al in review	<i>Eremophila campanulata</i>
MN411498	GenBank, Fowler et al in review	<i>Eremophila glandulifera</i>
MN411519	GenBank, Fowler et al in review	<i>Eremophila congesta</i>
MN411523	GenBank, Fowler et al in review	<i>Eremophila rigens</i>
MN411525	GenBank, Fowler et al in review	<i>Eremophila physocalyx</i>
MN411532	GenBank, Fowler et al in review	<i>Eremophila tenella</i>
MN411591	GenBank, Fowler et al in review	<i>Eremophila demissa</i>
MN411596	GenBank, Fowler et al in review	<i>Eremophila humilis</i>
MN411598	GenBank, Fowler et al in review	<i>Eremophila buirchellii</i>
MN411599	GenBank, Fowler et al in review	<i>Eremophila conferta</i>
MN411600	GenBank, Fowler et al in review	<i>Eremophila yinnetharrensensis</i>
MN411601	GenBank, Fowler et al in review	<i>Eremophila rhegos</i>
MN411602	GenBank, Fowler et al in review	<i>Eremophila recurva</i>
MN411604	GenBank, Fowler et al in review	<i>Eremophila anomala</i>

## 2.4 Constraints and Limitations

The analysis was constrained by the breadth of data available to undertake comparisons and the accuracy of morphological identifications. The survey team collected in excess of 20 specimens believed to be *E. capricornica* for further taxonomic review, however over half of the specimens collected were identified as *E. jucunda* subsp. *pulcherrima* by specialist taxonomists at the WA Herbarium. This included specimens collected from previously known *E. capricornica* locations within the Study Area. The main survey report (Biologic, 2021) has highlighted the issue of morphological differentiation between these two species in the Study Area. More comprehensive datasets of *Eremophila* from the region would have assisted in analysis and interpretation.

The databases used for regional comparisons included GenBank and the “Plastids of the Pilbara” dataset. While these sequence databases, in combination, is a significant comparative dataset, it is acknowledged that taxon sampling was incomplete, and it is possible that identifications were incorrect. Furthermore, more intraspecific genetic data would have assisted in analysis and interpretation. GenBank is a dynamic database, and the addition of new sequences and altered taxonomic classifications could not be included into this report if they occurred after the 15<sup>th</sup> of November 2020.

All care was taken to ensure that the risks of laboratory contamination, data handling issues, and specimen management issues were minimised within Biologic’s laboratories throughout the subsampling, processing and genetic analysis.

### 3 RESULTS AND DISCUSSION

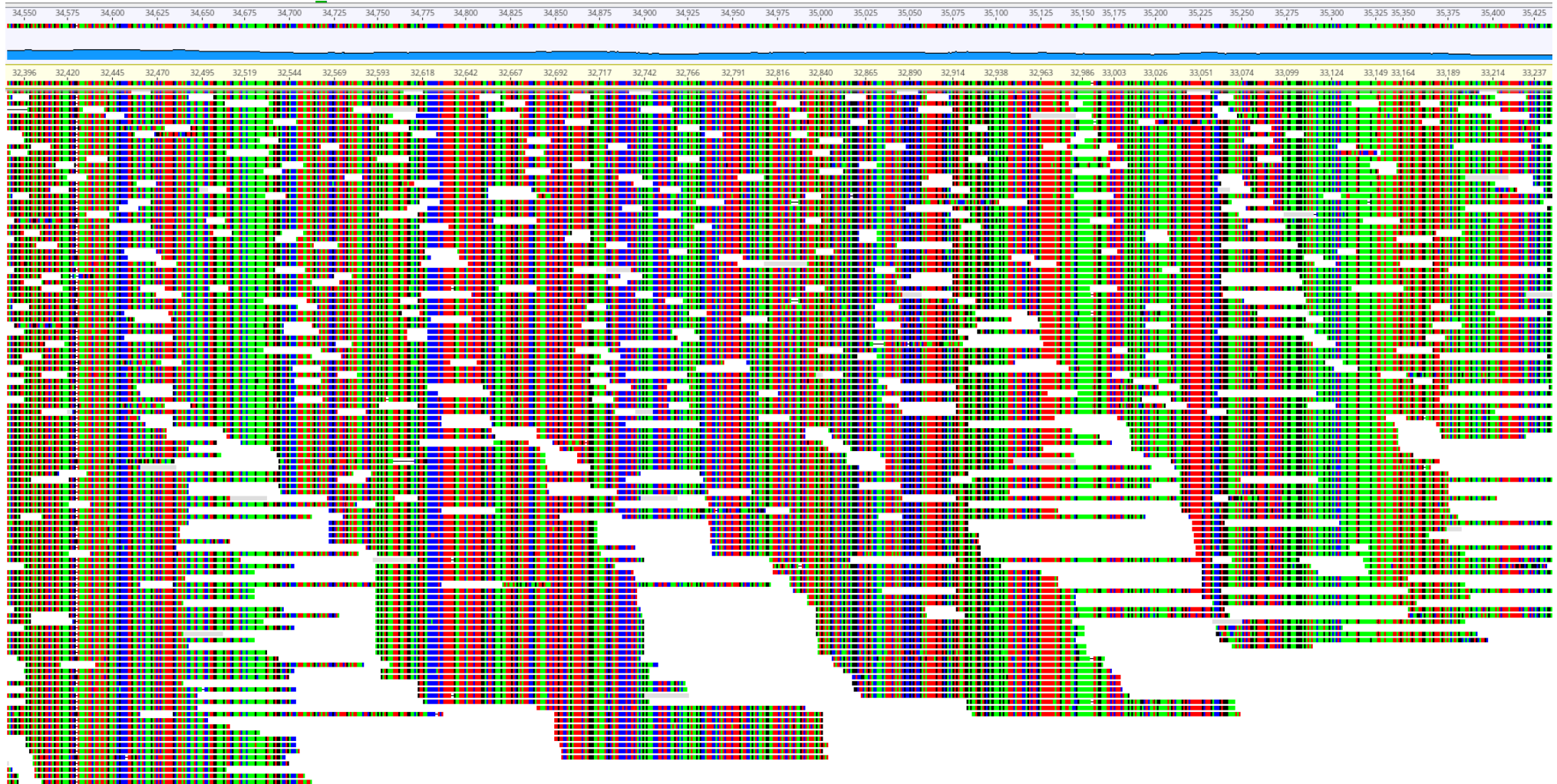
#### 3.1 Sequencing Effectiveness

All 24 selected specimens returned high quality data, within the expected yield (Table 3.1). After assembly of the plastomes and nrDNA genes, read coverage was high (Table 3.1), enabling the extraction of high-quality consensus sequences for all specimens, for both genomic regions. Figure 3.1 visually shows the assembly of reads to a reference plastome sequence.

**Table 3.1: Summary of Next Generation Sequencing and assembly read coverage.**

Specimen	Paired End Reads	Yield (Gb)	Plastome average coverage (reads)	Plastome sequence length (bp)	nrDNA average coverage (reads)	nrDNA sequence length (bp)
BMR01799	17,078,308	5.16 Gb	258.1	151,563	4,620.4	7,479
BMR01800	24,414,424	7.37 Gb	375.9	151,592	5,002.4	7,479
BMR01804	17,401,910	5.26 Gb	454.3	151,606	2,640.5	7,479
BMR01805	11,721,621	3.54 Gb	215.2	151,574	2,435.6	7,479
BMR01806	15,095,148	4.56 Gb	959.0	151,574	6,012.2	7,478
BMR01807	17,416,452	5.26 Gb	192.0	151,577	5,604.0	7,479
BMR01809	15,393,034	4.65 Gb	184.8	151,574	5,425.8	7,480
BMR01810	16,387,381	4.95 Gb	835.3	151,556	4,800.7	7,479
BMR01811	15,771,630	4.76 Gb	239.4	151,582	4,366.6	7,479
BMR01812	15,871,130	4.79 Gb	124.8	151,561	4,019.2	7,480
BMR01813	17,687,243	5.34 Gb	273.4	151,609	6,313.7	7,479
BMR01814	17,344,211	5.24 Gb	251.4	151,584	4,767.1	7,481
BMR01815	13,706,718	4.14 Gb	394.5	151,570	4,084.9	7,479
BMR01816	15,418,997	4.66 Gb	182.5	151,587	2,344.1	7,475
BMR01817	16,786,937	5.07 Gb	547.5	151,556	3,826.3	7,479
BMR01818	18,330,925	5.54 Gb	558.6	151,594	7,874.7	7,481
BMR01819	15,597,659	4.71 Gb	272.8	151,576	4,476.8	7,479
BMR01820	16,308,653	4.93 Gb	204.4	151,587	6,077.6	7,479
BMR01821	14,953,850	4.52 Gb	216.9	151,570	3,015.9	7,479
BMR01822	20,551,114	6.21 Gb	346.3	151,572	5,877.0	7,479
BMR01823	16,724,025	5.05 Gb	310.2	151,570	5,433.3	7,477
BMR01824	19,171,416	5.79 Gb	205.9	151,582	5,160.2	7,479
BMR01825	21,307,120	6.43 Gb	372.3	151,548	3,428.7	7,474
BMR01827	17,527,600	5.29 Gb	204.5	151,565	3,591.7	7,479
<b>Total</b>	<b>407,967,506</b>	<b>123.21 Gb</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

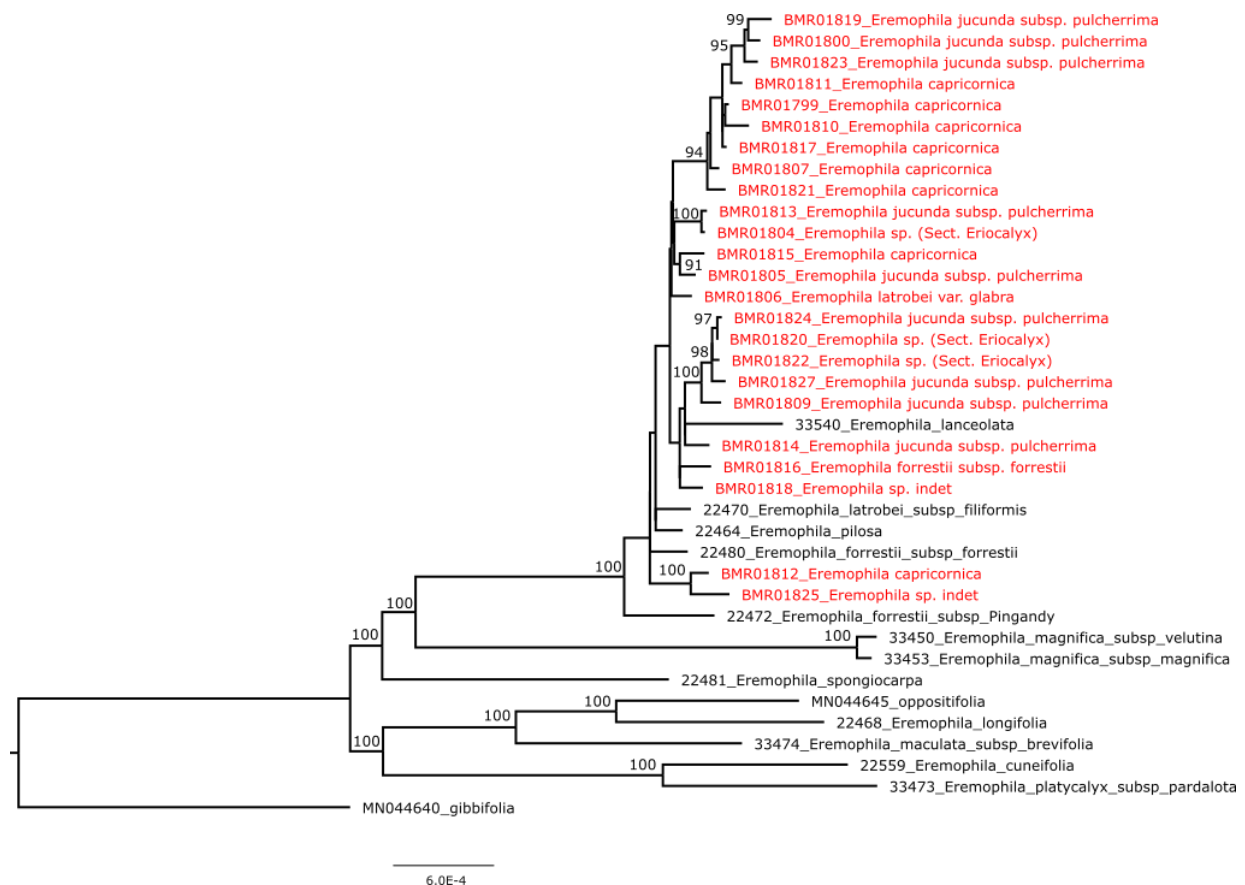
**Figure 3.1: Screenshot of plastome assembly (BMR01812). Colours represent different nucleotides (A, T, C, G), with read data assembled below the reference sequence. This represents approximately 900bp of the 150,000bp plastome (0.6%).**





### 3.2 Plastomes

The phylogeny of the plastome dataset failed to clearly resolve species that were included in the analysis (Figure 3.2). All of the target sequences of *E. capricornica* and *E. jucunda* subsp. *pulcherrima* (sequences labelled with BMR prefix) formed a single clade, which also included other species. However, other more distinctive species were phylogenetically resolved (e.g., *E. magnifica*). This result suggests that the plastome is not useful for distinguishing between closely related species but does seem to resolve more distinct species.



**Figure 3.2: ML Phylogeny of *Eremophila* plastome sequences. Values represent bootstrap support (%). Values below 80%, which represent moderate to low support have been removed. Sequences highlighted in red are from this study.**

### 3.3 Nuclear rDNA

The nrDNA phylogeny was more informative (Figure 3.3). All target specimens identified as *E. capricornica*, *E. jucunda* subsp. *pulcherrima*, and *Eremophila* sp. (Sect. Eriocalyx) formed a single lineage, with moderate-strong bootstrap support (red in Figure 3.2). *Eremophila jucunda* subsp. *pulcherrima* from GenBank was not closely related to these specimens (green in Figure 3.2). This GenBank specimen was originally collected in 2014, before the description of *E. capricornica*. However, the specimen was originally collected by B. Buirchell and R. Fowler, and B. Buirchell is one of the

describers of *E. capricornica*. The molecular work was undertaken by R. Fowler, in collaboration with B. Buirchell, and uploaded to GenBank in 2020. We have discussed these results with R. Fowler and B. Buirchell and they are confident that the GenBank specimen of *E. jucunda* subsp. *pulcherrima* is correctly identified and that the survey specimens are not *E. jucunda* subsp. *pulcherrima*.

This group was closely related to *E. demissa*, a species found to the south of the Pilbara and unlikely to be confused with *E. capricornica* as they are separated by ~170 km (Buirchell & Brown, 2016). However, a WA Herbarium specimen that is now identified as *E. capricornica* was initially identified as *E. demissa*, and Buirchell and Brown (2016) state that *E. capricornica* is most similar morphologically to *E. demissa* and *E. margarethae*.

Based on this result we conclude that the target specimens identified as *E. capricornica*, *E. jucunda* subsp. *pulcherrima*, and *Eremophila* sp. (Sect. *Eriocalyx*) are all conspecific and represent *E. capricornica*. The identification of survey specimens as *E. jucunda* subsp. *pulcherrima* were misidentifications. See Figure 3.3 for a graphical representation of this lineage. From this point forth, we refer to these specimens as *E. capricornica*.

A final confirmation of this result would require the sequencing of the type specimen of *E. capricornica*, currently held in the WA Herbarium. While the type location of *E. capricornica* was sampled for this study, the identical plant could not be confirmed (see survey report).

The remaining four target specimens were not identified as *E. capricornica* or *E. jucunda* subsp. *pulcherrima* and were not within the *E. capricornica* group. BMR01806 was morphologically identified as *E. latrobei* var. *glabra* (but without flowers) but was not closely related to the GenBank sequence of *E. latrobei* subsp. *latrobei* (MN411341). BMR01816 was identified as *E. forrestii* subsp. *forrestii* and was closely related to *E. forrestii* subsp. *forrestii* in the analysis. BMR01818 and BMR1825 was identified as *Eremophila* sp. indet. and did not group with tightly with any other GenBank *Eremophila* sequences.

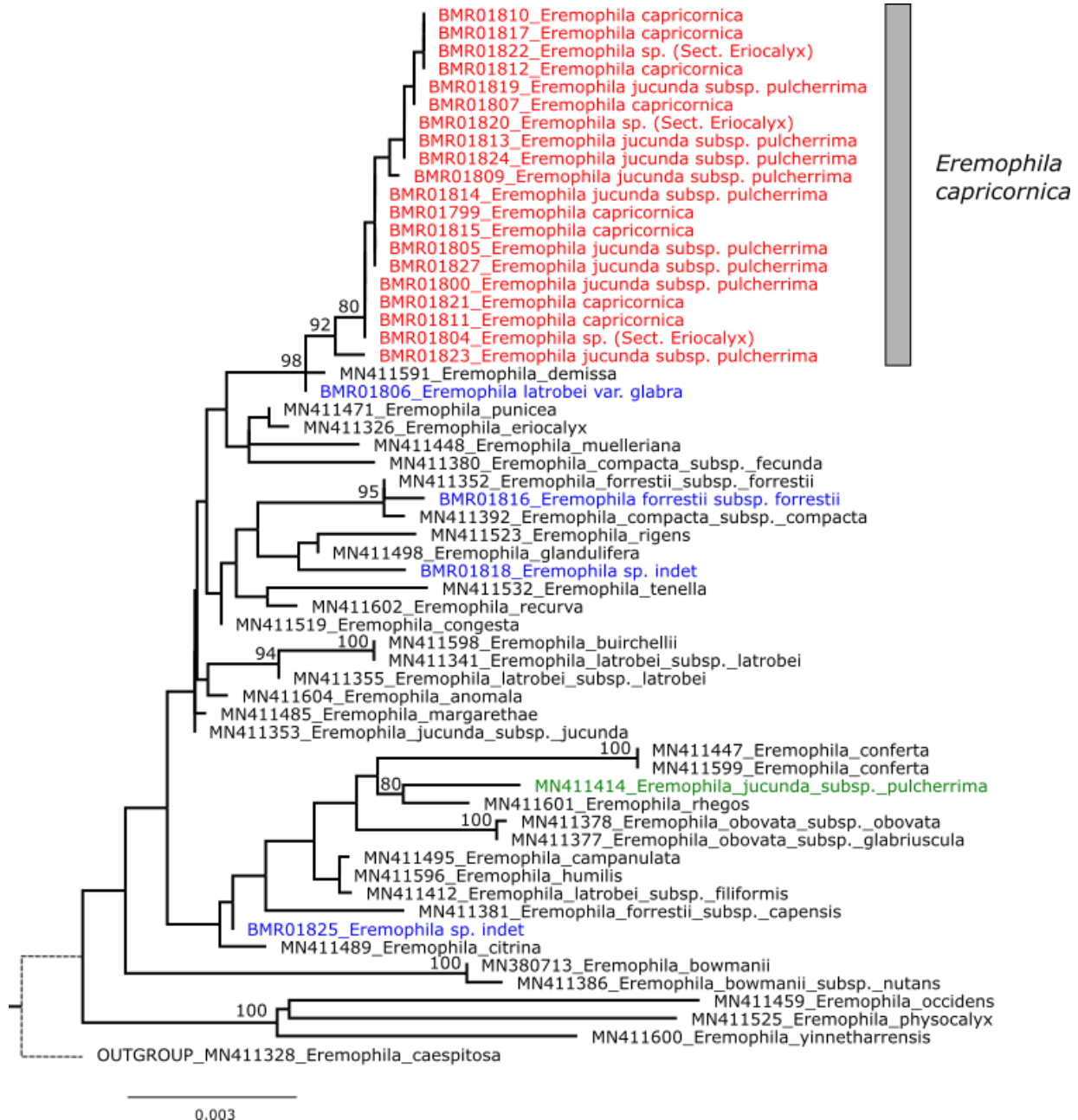


Figure 3.3: ML Phylogeny of *Eremophila* nrDNA sequences. The phylogeny tips state the original morphological identifications made by WA Herbarium or other further ID. The grey box indicates the specimens we are identifying as *E. capricornica* based on molecular evidence. Values represent bootstrap support (%). Values below 80%, which represent moderate to low support, have been removed.

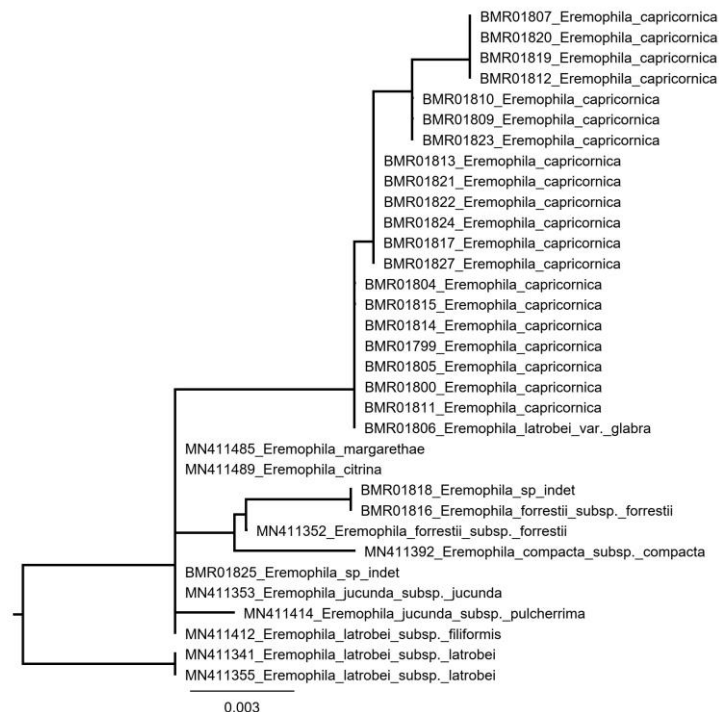


### 3.4 Barcoding

Generating whole plastome and nrDNA datasets may allow the identification of a shorter fragment of DNA that has fixed differences between the target taxon (*E. capricornica*) and all other sympatric species. Targeting then sequencing that fragment using a cheaper sequencing technology, or analysing using restriction enzymes, could provide a cheap and efficient method for identifying specimens without using the more expensive and time-consuming genome skimming approach.

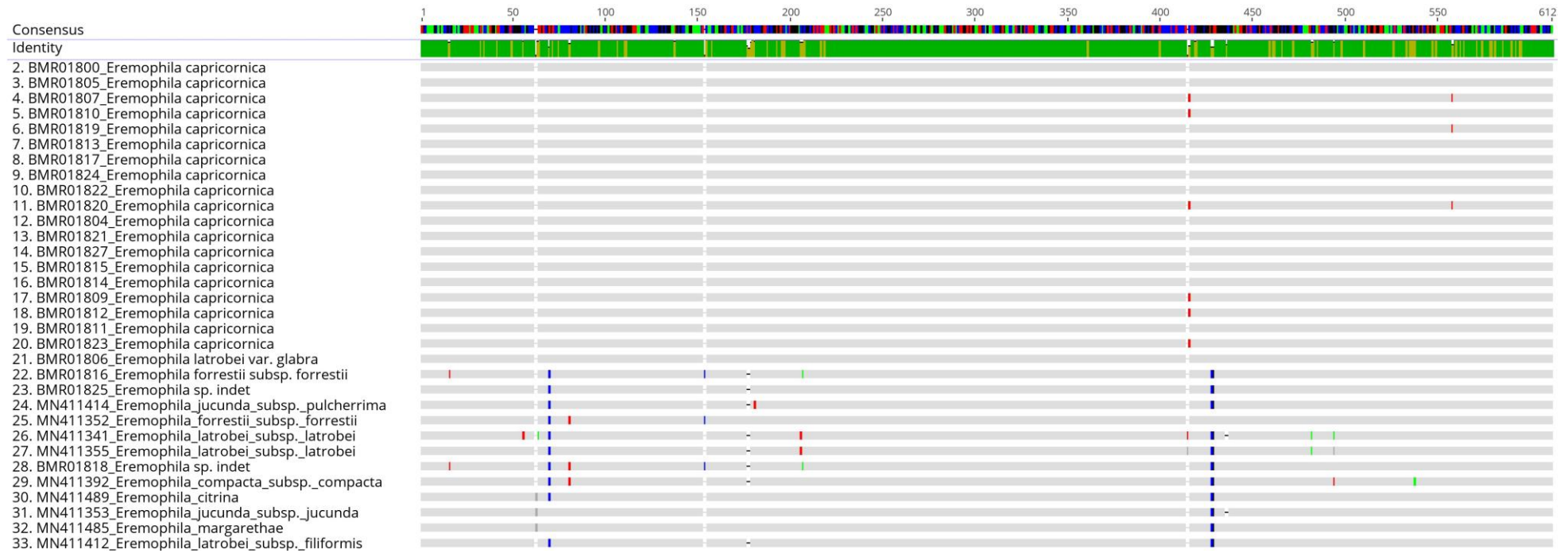
Biologic searched for these diagnostic fragments in the plastome dataset and nrDNA dataset, aiming to identify a fragment that would differentiate *E. capricornica* from all other species. The plastome dataset had no fixed diagnostic nucleotides, mirroring the lack of phylogenetic resolution. The ~600bp ITS1-5.8S-ITS2 fragment of the nrDNA dataset showed more resolution, and other than the specimen BMR01806 (which was initially identified as *Eremophila latrobei* var. *glabra* but phylogenetically distinct based on nrDNA, Figure 3.3), all species could be easily distinguished (Figure 3.4 and 3.5). This analysis excluded *E. demissa*, as it is not sympatric with *E. capricornica*.

This region can be easily amplified using Sanger sequencing, which is significantly cheaper than genome skimming, and could allow the barcoding of many specimens across a project area. For *E. capricornica*, this nrDNA fragment shows promise, however a more comprehensive sample of non-*E. capricornica* species would be advisable to confirm that diagnostic nucleotides are fixed. Sampling intraspecific variation will ensure that this technique is robust and reliable. Primer design and successful amplification and sequencing of this region has not yet been conducted on *Eremophila* specimens to-date.



**Figure 3.4:** RaxML tree of the ~600bp fragment of ITS1-5.8S-ITS2. Specimens with *Eremophila capricornica* on tips are those identified molecularly using nrDNA in Section 3.3.

**Figure 3.5: Alignment of the ~600bp fragment of ITS1-5.8S-ITS2. The coloured bars represent mutations that differentiate sequences from each other (variable sites). Specimens with *Eremophila capricornica* on tips are those identified molecularly using nrDNA in Section 3.3.**



## 4 SUMMARY

Genome skimming was used to successfully sequence the entire plastome and nrDNA region of 24 specimens of *Eremophila* from the Study Area. The plastome was not effective at distinguishing between *E. capricornica* specimens and other *Eremophila* species (specifically, *E. jucunda* subsp. *pulcherrima*, and *E. sp. indet.*). The nrDNA region showed more phylogenetic signal and confirmed that all specimens morphologically identified as *E. capricornica*, *E. jucunda* subsp. *pulcherrima*, and *Eremophila* sp. (Sect. *Eriocalyx*) formed a single unique lineage. This unique lineage likely represents *E. capricornica*, however sequencing of the type specimen would be required to confirm this.



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## Appendix B: State Flora Conservation Listings



**Biodiversity Conservation Act 2016**

Category	Definition
<b>Threatened Flora Species</b>	
<b>Critically Endangered (CR)</b>	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Published under schedule 1 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for critically endangered flora.
<b>Endangered (EN)</b>	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Published under schedule 2 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for endangered flora.
<b>Vulnerable (VU)</b>	Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”. Published under schedule 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for vulnerable flora.
<b>Extinct (EX)</b>	Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.
<b>Extinct in the Wild (EW)</b>	Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened flora species listed as extinct in the wild.

**Department of Biodiversity, Conservation and Attractions Priority Definitions**

Category	Definition
<b>Priority Flora Species</b>	
<b>Priority 1 (P1)</b>	<p><b>Poorly-known Species</b></p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>



Category	Definition
<p><b>Priority 2 (P2)</b></p>	<p><b>Poorly-known Species</b></p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>
<p><b>Priority 3 (P3)</b></p>	<p><b>Poorly-known Species</b></p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
<p><b>Priority 4 (P4)</b></p>	<p><b>Rare, Near Threatened and other species in need of monitoring</b></p> <p>(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>



**Appendix C: *Eremophila capricornica* location coordinates**

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-10	1	-23.3433387	120.2183371
<i>Eremophila capricornica</i>	2020-07-10	1	-23.3617807	120.2303792
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4694636	120.2810445
<i>Eremophila capricornica</i>	2020-07-12	1	-23.3402789	120.5067905
<i>Eremophila capricornica</i>	2020-07-13	1	-23.2886241	120.0998092
<i>Eremophila capricornica</i>	2020-07-13	1	-23.28874915	120.0998109
<i>Eremophila capricornica</i>	2020-07-12	1	-23.4066983	120.2115801
<i>Eremophila capricornica</i>	2020-07-12	1	-23.4051828	120.2123003
<i>Eremophila capricornica</i>	2020-07-12	1	-23.4065331	120.212067
<i>Eremophila capricornica</i>	2020-07-12	1	-23.4061629	120.2125519
<i>Eremophila capricornica</i>	2020-07-12	1	-23.40627314	120.2126891
<i>Eremophila capricornica</i>	2020-07-12	1	-23.40620377	120.2130126
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4913938	120.4622129
<i>Eremophila capricornica</i>	2020-07-12	1	-23.4242002	120.4885492
<i>Eremophila capricornica</i>	2020-07-12	1	-23.41726884	120.4831345
<i>Eremophila capricornica</i>	2020-07-12	1	-23.417478	120.4837489
<i>Eremophila capricornica</i>	2020-07-12	1	-23.42318152	120.488486
<i>Eremophila capricornica</i>	2020-07-13	1	-23.290349	120.0970541
<i>Eremophila capricornica</i>	2020-07-13	1	-23.2908106	120.0978534
<i>Eremophila capricornica</i>	2020-07-13	1	-23.2884876	120.0963285
<i>Eremophila capricornica</i>	2020-07-13	1	-23.2835414	120.0971831
<i>Eremophila capricornica</i>	2020-07-13	1	-23.40225782	120.276073
<i>Eremophila capricornica</i>	2020-07-13	1	-23.26969981	120.0794666
<i>Eremophila capricornica</i>	2020-07-13	1	-23.26765502	120.0826923
<i>Eremophila capricornica</i>	2020-07-12	1	-23.3619743	120.5716296
<i>Eremophila capricornica</i>	2020-07-12	1	-23.36404078	120.5714432
<i>Eremophila capricornica</i>	2020-07-14	1	-23.40072963	120.4080912
<i>Eremophila capricornica</i>	2020-07-14	1	-23.40088951	120.4084588
<i>Eremophila capricornica</i>	2020-07-14	1	-23.40141621	120.4091579
<i>Eremophila capricornica</i>	2020-07-14	1	-23.40275961	120.4078785
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4675535	120.2491652
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4676057	120.2534401
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4697517	120.2492281
<i>Eremophila capricornica</i>	2020-07-11	1	-23.47168319	120.2475094
<i>Eremophila capricornica</i>	2020-07-11	1	-23.47142732	120.2470387
<i>Eremophila capricornica</i>	2020-07-11	1	-23.46975801	120.2492961
<i>Eremophila capricornica</i>	2020-07-11	1	-23.46704395	120.253013
<i>Eremophila capricornica</i>	2020-07-10	1	-23.4055255	120.2968351
<i>Eremophila capricornica</i>	2020-07-10	1	-23.3559027	120.2173682
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40336927	120.2942781
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40517413	120.2967007
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40553351	120.2969972
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40078408	120.2978069
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40081527	120.2985198



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40234705	120.3002172
<i>Eremophila capricornica</i>	2020-07-10	1	-23.40251565	120.3002318
<i>Eremophila capricornica</i>	2020-07-10	1	-23.4014403	120.3004747
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4965708	120.4873286
<i>Eremophila capricornica</i>	2020-07-14	1	-23.4094491	120.3998448
<i>Eremophila capricornica</i>	2020-07-11	1	-23.49574064	120.4113981
<i>Eremophila capricornica</i>	2020-07-11	1	-23.49699392	120.4082328
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4971112	120.4077034
<i>Eremophila capricornica</i>	2020-07-11	1	-23.49711291	120.4076001
<i>Eremophila capricornica</i>	2020-07-11	1	-23.50271806	120.3930629
<i>Eremophila capricornica</i>	2020-07-11	1	-23.50387412	120.3880042
<i>Eremophila capricornica</i>	2020-07-11	1	-23.50362261	120.3885454
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4956748	120.4125651
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4958679	120.4119771
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4985408	120.4057172
<i>Eremophila capricornica</i>	2020-07-11	1	-23.4985606	120.4051764
<i>Eremophila capricornica</i>	2020-07-11	1	-23.5055256	120.3891216
<i>Eremophila capricornica</i>	2020-07-12	1	-23.38197111	120.5036882
<i>Eremophila capricornica</i>	2020-07-12	1	-23.38093555	120.5016883
<i>Eremophila capricornica</i>	2020-07-12	1	-23.3812598	120.4974993
<i>Eremophila capricornica</i>	2020-07-10	2	-23.34914901	120.2196721
<i>Eremophila capricornica</i>	2020-07-10	2	-23.34978005	120.2195134
<i>Eremophila capricornica</i>	2020-07-10	2	-23.35060857	120.2196145
<i>Eremophila capricornica</i>	2020-07-10	2	-23.3585838	120.2286001
<i>Eremophila capricornica</i>	2020-07-11	2	-23.46759323	120.2773272
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4692424	120.2813047
<i>Eremophila capricornica</i>	2020-07-13	2	-23.2889183	120.0995389
<i>Eremophila capricornica</i>	2020-07-12	2	-23.4061607	120.212572
<i>Eremophila capricornica</i>	2020-07-12	2	-23.4235557	120.4880859
<i>Eremophila capricornica</i>	2020-07-13	2	-23.290691	120.0978608
<i>Eremophila capricornica</i>	2020-07-13	2	-23.26564376	120.0853005
<i>Eremophila capricornica</i>	2020-07-13	2	-23.26970767	120.0791947
<i>Eremophila capricornica</i>	2020-07-14	2	-23.40287949	120.4030382
<i>Eremophila capricornica</i>	2020-07-14	2	-23.40190724	120.400764
<i>Eremophila capricornica</i>	2020-07-14	2	-23.40181524	120.4038321
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4664145	120.2508988
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4713775	120.2476546
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4665329	120.2496184
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4698015	120.2489836
<i>Eremophila capricornica</i>	2020-07-11	2	-23.47066613	120.2472236
<i>Eremophila capricornica</i>	2020-07-11	2	-23.47027608	120.2471562
<i>Eremophila capricornica</i>	2020-07-10	2	-23.4010876	120.3008509
<i>Eremophila capricornica</i>	2020-07-10	2	-23.4028352	120.3005486
<i>Eremophila capricornica</i>	2020-07-10	2	-23.4033597	120.2940664

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4965757	120.4869227
<i>Eremophila capricornica</i>	2020-07-14	2	-23.41540133	120.3931081
<i>Eremophila capricornica</i>	2020-07-14	2	-23.41616772	120.3923001
<i>Eremophila capricornica</i>	2020-07-11	2	-23.494645	120.4139449
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4959279	120.410865
<i>Eremophila capricornica</i>	2020-07-11	2	-23.49704434	120.4071659
<i>Eremophila capricornica</i>	2020-07-11	2	-23.50296983	120.3892199
<i>Eremophila capricornica</i>	2020-07-11	2	-23.496179	120.4110675
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4975283	120.4077123
<i>Eremophila capricornica</i>	2020-07-11	2	-23.4975	120.4075202
<i>Eremophila capricornica</i>	2020-07-11	2	-23.5028582	120.3943743
<i>Eremophila capricornica</i>	2020-07-11	2	-23.5036152	120.3887623
<i>Eremophila capricornica</i>	2020-07-11	2	-23.504781	120.3893431
<i>Eremophila capricornica</i>	2020-07-11	2	-23.5050176	120.3896306
<i>Eremophila capricornica</i>	2020-07-10	3	-23.3505251	120.2200827
<i>Eremophila capricornica</i>	2020-07-10	3	-23.3487677	120.2198702
<i>Eremophila capricornica</i>	2020-07-10	3	-23.346332	120.2112423
<i>Eremophila capricornica</i>	2020-07-09	3	-23.3666768	120.2594321
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4676822	120.2761432
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4676775	120.2764686
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4682708	120.2821938
<i>Eremophila capricornica</i>	2020-07-12	3	-23.4058464	120.2127079
<i>Eremophila capricornica</i>	2020-07-12	3	-23.4178307	120.4841917
<i>Eremophila capricornica</i>	2020-07-12	3	-23.4183791	120.4858199
<i>Eremophila capricornica</i>	2020-07-12	3	-23.4230772	120.4877539
<i>Eremophila capricornica</i>	2020-07-13	3	-23.2884486	120.0965448
<i>Eremophila capricornica</i>	2020-07-13	3	-23.3498254	120.2701067
<i>Eremophila capricornica</i>	2020-07-14	3	-23.4074581	120.4018974
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40262535	120.4055499
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40263812	120.4053383
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40208142	120.4011327
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40223133	120.4019642
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40317732	120.403546
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4699443	120.2485927
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4677615	120.2491873
<i>Eremophila capricornica</i>	2020-07-11	3	-23.469806	120.2486096
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4700349	120.2479853
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4706004	120.2477515
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4679964	120.2534568
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4683852	120.2484119
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4698207	120.2490927
<i>Eremophila capricornica</i>	2020-07-10	3	-23.4018187	120.3006181
<i>Eremophila capricornica</i>	2020-07-10	3	-23.3569664	120.2169305
<i>Eremophila capricornica</i>	2020-07-10	3	-23.40326779	120.3001882

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-10	3	-23.4018912	120.2965388
<i>Eremophila capricornica</i>	2020-07-14	3	-23.42458298	120.3797088
<i>Eremophila capricornica</i>	2020-07-14	3	-23.4167426	120.3909075
<i>Eremophila capricornica</i>	2020-07-14	3	-23.41021368	120.3989268
<i>Eremophila capricornica</i>	2020-07-14	3	-23.4159982	120.3926874
<i>Eremophila capricornica</i>	2020-07-14	3	-23.40914173	120.4001851
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4948617	120.4139183
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4954566	120.4133072
<i>Eremophila capricornica</i>	2020-07-11	3	-23.49773	120.4081523
<i>Eremophila capricornica</i>	2020-07-11	3	-23.4986253	120.4049746
<i>Eremophila capricornica</i>	2020-07-11	3	-23.5046406	120.3891679
<i>Eremophila capricornica</i>	2020-07-12	3	-23.3820315	120.4988513
<i>Eremophila capricornica</i>	2020-07-10	4	-23.34398875	120.2173225
<i>Eremophila capricornica</i>	2020-07-09	4	-23.3668818	120.2596319
<i>Eremophila capricornica</i>	2020-07-11	4	-23.4674999	120.2775983
<i>Eremophila capricornica</i>	2020-07-12	4	-23.3401543	120.5059577
<i>Eremophila capricornica</i>	2020-07-12	4	-23.3384094	120.5052733
<i>Eremophila capricornica</i>	2020-07-12	4	-23.4244637	120.4888571
<i>Eremophila capricornica</i>	2020-07-14	4	-23.40292627	120.4027577
<i>Eremophila capricornica</i>	2020-07-14	4	-23.40263055	120.4073902
<i>Eremophila capricornica</i>	2020-07-11	4	-23.4685201	120.2486052
<i>Eremophila capricornica</i>	2020-07-11	4	-23.4689606	120.2486542
<i>Eremophila capricornica</i>	2020-07-11	4	-23.4710149	120.2487421
<i>Eremophila capricornica</i>	2020-07-10	4	-23.4013932	120.296931
<i>Eremophila capricornica</i>	2020-07-10	4	-23.4020997	120.2969032
<i>Eremophila capricornica</i>	2020-07-10	4	-23.40500997	120.2966478
<i>Eremophila capricornica</i>	2020-07-11	4	-23.50282825	120.3892359
<i>Eremophila capricornica</i>	2020-07-11	4	-23.4977749	120.4079483
<i>Eremophila capricornica</i>	2020-07-11	4	-23.5043731	120.3891449
<i>Eremophila capricornica</i>	2020-07-12	4	-23.3812592	120.4982471
<i>Eremophila capricornica</i>	2020-07-12	4	-23.3811829	120.4981135
<i>Eremophila capricornica</i>	2020-07-10	5	-23.3454634	120.2122515
<i>Eremophila capricornica</i>	2020-07-10	5	-23.3461629	120.2110849
<i>Eremophila capricornica</i>	2020-07-10	5	-23.34324485	120.2177419
<i>Eremophila capricornica</i>	2020-07-10	5	-23.34333141	120.2180937
<i>Eremophila capricornica</i>	2020-07-09	5	-23.3669281	120.2587622
<i>Eremophila capricornica</i>	2020-07-13	5	-23.4010423	120.2765674
<i>Eremophila capricornica</i>	2020-07-13	5	-23.4012613	120.2763668
<i>Eremophila capricornica</i>	2020-07-13	5	-23.4011062	120.276202
<i>Eremophila capricornica</i>	2020-07-13	5	-23.40110198	120.2757631
<i>Eremophila capricornica</i>	2020-07-11	5	-23.46883263	120.2755161
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4680378	120.2779577
<i>Eremophila capricornica</i>	2020-07-10	5	-23.3595575	120.21481
<i>Eremophila capricornica</i>	2020-07-12	5	-23.33885883	120.506578



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2890714	120.0997881
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2893452	120.099836
<i>Eremophila capricornica</i>	2020-07-12	5	-23.40613971	120.2131054
<i>Eremophila capricornica</i>	2020-07-12	5	-23.40603151	120.2131154
<i>Eremophila capricornica</i>	2020-07-12	5	-23.40617417	120.214074
<i>Eremophila capricornica</i>	2020-07-12	5	-23.40676224	120.2146326
<i>Eremophila capricornica</i>	2020-07-11	5	-23.493449	120.4591164
<i>Eremophila capricornica</i>	2020-07-11	5	-23.49162252	120.4631259
<i>Eremophila capricornica</i>	2020-07-12	5	-23.4176196	120.4827163
<i>Eremophila capricornica</i>	2020-07-12	5	-23.4256178	120.4898033
<i>Eremophila capricornica</i>	2020-07-12	5	-23.4261971	120.4904471
<i>Eremophila capricornica</i>	2020-07-12	5	-23.41952608	120.4868552
<i>Eremophila capricornica</i>	2020-07-12	5	-23.42480684	120.4900835
<i>Eremophila capricornica</i>	2020-07-12	5	-23.42508211	120.4902743
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2908725	120.0980674
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2911703	120.0979091
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2900878	120.096612
<i>Eremophila capricornica</i>	2020-07-13	5	-23.289309	120.0961403
<i>Eremophila capricornica</i>	2020-07-13	5	-23.26520042	120.0854183
<i>Eremophila capricornica</i>	2020-07-13	5	-23.2658972	120.0850195
<i>Eremophila capricornica</i>	2020-07-13	5	-23.26646046	120.0849064
<i>Eremophila capricornica</i>	2020-07-13	5	-23.26941854	120.0802781
<i>Eremophila capricornica</i>	2020-07-12	5	-23.36126853	120.5695794
<i>Eremophila capricornica</i>	2020-07-12	5	-23.36239997	120.5715974
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40157885	120.4000036
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40236301	120.4035993
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40171071	120.406547
<i>Eremophila capricornica</i>	2020-07-14	5	-23.4012707	120.4072624
<i>Eremophila capricornica</i>	2020-07-14	5	-23.4010718	120.4083243
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40245969	120.4063879
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40278535	120.4058699
<i>Eremophila capricornica</i>	2020-07-14	5	-23.4009378	120.4004376
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40190802	120.4019994
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40073994	120.4075017
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40073067	120.4076536
<i>Eremophila capricornica</i>	2020-07-14	5	-23.40097535	120.4086613
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4686605	120.2486263
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4707533	120.2477632
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4715182	120.2477066
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4699341	120.2489523
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4678332	120.2487998
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4686005	120.2482947
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4712755	120.2486772
<i>Eremophila capricornica</i>	2020-07-11	5	-23.47118283	120.2470689

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	5	-23.47077193	120.2471623
<i>Eremophila capricornica</i>	2020-07-11	5	-23.46884214	120.2482896
<i>Eremophila capricornica</i>	2020-07-11	5	-23.47091573	120.2471135
<i>Eremophila capricornica</i>	2020-07-10	5	-23.3615286	120.2306712
<i>Eremophila capricornica</i>	2020-07-10	5	-23.3575908	120.2164461
<i>Eremophila capricornica</i>	2020-07-10	5	-23.40463664	120.2962301
<i>Eremophila capricornica</i>	2020-07-10	5	-23.40221518	120.2963172
<i>Eremophila capricornica</i>	2020-07-10	5	-23.40159298	120.2977956
<i>Eremophila capricornica</i>	2020-07-10	5	-23.40295811	120.3001615
<i>Eremophila capricornica</i>	2020-07-11	5	-23.49663024	120.4856457
<i>Eremophila capricornica</i>	2020-07-11	5	-23.49673708	120.4864988
<i>Eremophila capricornica</i>	2020-07-11	5	-23.49648952	120.4884954
<i>Eremophila capricornica</i>	2020-07-14	5	-23.42357821	120.3803643
<i>Eremophila capricornica</i>	2020-07-14	5	-23.41952983	120.3863305
<i>Eremophila capricornica</i>	2020-07-14	5	-23.41130593	120.3979713
<i>Eremophila capricornica</i>	2020-07-14	5	-23.4089331	120.4001166
<i>Eremophila capricornica</i>	2020-07-14	5	-23.42214641	120.3825349
<i>Eremophila capricornica</i>	2020-07-14	5	-23.42007253	120.3861176
<i>Eremophila capricornica</i>	2020-07-14	5	-23.41786755	120.3893222
<i>Eremophila capricornica</i>	2020-07-14	5	-23.41643231	120.3915853
<i>Eremophila capricornica</i>	2020-07-14	5	-23.41279291	120.3962825
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4947242	120.4148811
<i>Eremophila capricornica</i>	2020-07-11	5	-23.4953758	120.4135037
<i>Eremophila capricornica</i>	2020-07-12	5	-23.3866882	120.5012417
<i>Eremophila capricornica</i>	2020-07-12	5	-23.3866641	120.5012399
<i>Eremophila capricornica</i>	2020-07-12	5	-23.381377	120.5034483
<i>Eremophila capricornica</i>	2020-07-12	5	-23.382035	120.4990965
<i>Eremophila capricornica</i>	2020-07-10	6	-23.349329	120.2200099
<i>Eremophila capricornica</i>	2020-07-10	6	-23.34565737	120.2143667
<i>Eremophila capricornica</i>	2020-07-11	6	-23.467444	120.2779008
<i>Eremophila capricornica</i>	2020-07-12	6	-23.4169606	120.4808501
<i>Eremophila capricornica</i>	2020-07-14	6	-23.40251715	120.4010478
<i>Eremophila capricornica</i>	2020-07-14	6	-23.40125231	120.408828
<i>Eremophila capricornica</i>	2020-07-14	6	-23.40245779	120.407608
<i>Eremophila capricornica</i>	2020-07-11	6	-23.4702473	120.2477033
<i>Eremophila capricornica</i>	2020-07-11	6	-23.4708784	120.2475898
<i>Eremophila capricornica</i>	2020-07-11	6	-23.4700657	120.2488601
<i>Eremophila capricornica</i>	2020-07-11	6	-23.4670164	120.2527461
<i>Eremophila capricornica</i>	2020-07-11	6	-23.47083932	120.2487677
<i>Eremophila capricornica</i>	2020-07-10	6	-23.4052909	120.2965182
<i>Eremophila capricornica</i>	2020-07-10	6	-23.4015554	120.2970311
<i>Eremophila capricornica</i>	2020-07-10	6	-23.4054334	120.2967116
<i>Eremophila capricornica</i>	2020-07-14	6	-23.4094731	120.399737
<i>Eremophila capricornica</i>	2020-07-14	6	-23.4093163	120.3998665

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	6	-23.4973204	120.408903
<i>Eremophila capricornica</i>	2020-07-12	6	-23.381844	120.4999659
<i>Eremophila capricornica</i>	2020-07-10	6	-23.4039191	120.2948405
<i>Eremophila capricornica</i>	2020-07-10	7	-23.3431902	120.2173761
<i>Eremophila capricornica</i>	2020-07-12	7	-23.4063425	120.2128213
<i>Eremophila capricornica</i>	2020-07-12	7	-23.4210939	120.4868981
<i>Eremophila capricornica</i>	2020-07-11	7	-23.448533	120.5264349
<i>Eremophila capricornica</i>	2020-07-13	7	-23.2621478	120.0854424
<i>Eremophila capricornica</i>	2020-07-13	7	-23.26471398	120.0867782
<i>Eremophila capricornica</i>	2020-07-13	7	-23.26945812	120.0787687
<i>Eremophila capricornica</i>	2020-07-14	7	-23.40222895	120.4063644
<i>Eremophila capricornica</i>	2020-07-11	7	-23.4697708	120.2486998
<i>Eremophila capricornica</i>	2020-07-11	7	-23.471144	120.2475696
<i>Eremophila capricornica</i>	2020-07-11	7	-23.4699966	120.2492504
<i>Eremophila capricornica</i>	2020-07-11	7	-23.46901482	120.2483674
<i>Eremophila capricornica</i>	2020-07-10	7	-23.3613506	120.230618
<i>Eremophila capricornica</i>	2020-07-12	8	-23.3397537	120.5053228
<i>Eremophila capricornica</i>	2020-07-12	8	-23.33931	120.5053161
<i>Eremophila capricornica</i>	2020-07-13	8	-23.4020597	120.2754988
<i>Eremophila capricornica</i>	2020-07-13	8	-23.4023312	120.2759252
<i>Eremophila capricornica</i>	2020-07-12	8	-23.363536	120.5686402
<i>Eremophila capricornica</i>	2020-07-14	8	-23.4028633	120.4024711
<i>Eremophila capricornica</i>	2020-07-14	8	-23.40150566	120.4067951
<i>Eremophila capricornica</i>	2020-07-14	8	-23.40229301	120.406614
<i>Eremophila capricornica</i>	2020-07-14	8	-23.40320399	120.4016889
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4680474	120.2490149
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4692274	120.2487041
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4714082	120.2483188
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4709306	120.2484229
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4699223	120.2488706
<i>Eremophila capricornica</i>	2020-07-10	8	-23.4017985	120.297312
<i>Eremophila capricornica</i>	2020-07-10	8	-23.4040784	120.2950347
<i>Eremophila capricornica</i>	2020-07-10	8	-23.4018889	120.2978842
<i>Eremophila capricornica</i>	2020-07-10	8	-23.4050663	120.2961883
<i>Eremophila capricornica</i>	2020-07-14	8	-23.41623725	120.3914653
<i>Eremophila capricornica</i>	2020-07-11	8	-23.4985282	120.4053891
<i>Eremophila capricornica</i>	2020-07-10	10	-23.3432267	120.2169256
<i>Eremophila capricornica</i>	2020-07-10	10	-23.34929923	120.2196524
<i>Eremophila capricornica</i>	2020-07-13	10	-23.4014706	120.2760929
<i>Eremophila capricornica</i>	2020-07-14	10	-23.3641619	120.3115527
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4686637	120.2756075
<i>Eremophila capricornica</i>	2020-07-13	10	-23.2918437	120.0978053
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33858793	120.5048134
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33834258	120.5038445



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33785987	120.5044108
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33756157	120.5095784
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33775736	120.5095998
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33843955	120.5094184
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33896781	120.5067258
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33872153	120.5063547
<i>Eremophila capricornica</i>	2020-07-12	10	-23.33834535	120.5059604
<i>Eremophila capricornica</i>	2020-07-12	10	-23.3380712	120.5055146
<i>Eremophila capricornica</i>	2020-07-13	10	-23.2899805	120.09977
<i>Eremophila capricornica</i>	2020-07-13	10	-23.2899708	120.0995842
<i>Eremophila capricornica</i>	2020-07-13	10	-23.29176157	120.0989
<i>Eremophila capricornica</i>	2020-07-12	10	-23.4064837	120.2139866
<i>Eremophila capricornica</i>	2020-07-12	10	-23.40691348	120.2148855
<i>Eremophila capricornica</i>	2020-07-12	10	-23.40760875	120.2149861
<i>Eremophila capricornica</i>	2020-07-12	10	-23.40794745	120.2149758
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4903151	120.4639523
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4910698	120.4636942
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4914225	120.4634793
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4483716	120.52652
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4480575	120.5266481
<i>Eremophila capricornica</i>	2020-07-13	10	-23.29039887	120.0969497
<i>Eremophila capricornica</i>	2020-07-13	10	-23.2892936	120.0960014
<i>Eremophila capricornica</i>	2020-07-13	10	-23.40227413	120.2762476
<i>Eremophila capricornica</i>	2020-07-10	10	-23.35999622	120.2143155
<i>Eremophila capricornica</i>	2020-07-13	10	-23.26617244	120.0846565
<i>Eremophila capricornica</i>	2020-07-13	10	-23.26644134	120.0846927
<i>Eremophila capricornica</i>	2020-07-13	10	-23.26650103	120.084476
<i>Eremophila capricornica</i>	2020-07-13	10	-23.26677992	120.0851899
<i>Eremophila capricornica</i>	2020-07-13	10	-23.26915069	120.0785118
<i>Eremophila capricornica</i>	2020-07-12	10	-23.36221899	120.5689517
<i>Eremophila capricornica</i>	2020-07-12	10	-23.36184872	120.5691764
<i>Eremophila capricornica</i>	2020-07-12	10	-23.36117096	120.5704705
<i>Eremophila capricornica</i>	2020-07-12	10	-23.36168344	120.571462
<i>Eremophila capricornica</i>	2020-07-12	10	-23.3637839	120.5714274
<i>Eremophila capricornica</i>	2020-07-12	10	-23.3648569	120.5707994
<i>Eremophila capricornica</i>	2020-07-12	10	-23.36514541	120.5701953
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40182758	120.4072204
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40239464	120.4026231
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40336278	120.4026514
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40209935	120.4025609
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40186225	120.404754
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40153872	120.4060685
<i>Eremophila capricornica</i>	2020-07-14	10	-23.40142244	120.4062337
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4704276	120.2480394

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4681189	120.2483791
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4702964	120.2526794
<i>Eremophila capricornica</i>	2020-07-10	10	-23.3605007	120.2304879
<i>Eremophila capricornica</i>	2020-07-10	10	-23.40309506	120.294251
<i>Eremophila capricornica</i>	2020-07-10	10	-23.40356345	120.2947515
<i>Eremophila capricornica</i>	2020-07-10	10	-23.40478028	120.2964875
<i>Eremophila capricornica</i>	2020-07-10	10	-23.4015663	120.2973466
<i>Eremophila capricornica</i>	2020-07-10	10	-23.401731	120.2983786
<i>Eremophila capricornica</i>	2020-07-10	10	-23.40203375	120.2987538
<i>Eremophila capricornica</i>	2020-07-10	10	-23.40331408	120.2990614
<i>Eremophila capricornica</i>	2020-07-10	10	-23.36137913	120.2302617
<i>Eremophila capricornica</i>	2020-07-11	10	-23.498335	120.4843173
<i>Eremophila capricornica</i>	2020-07-14	10	-23.41895943	120.387398
<i>Eremophila capricornica</i>	2020-07-14	10	-23.41266985	120.3959328
<i>Eremophila capricornica</i>	2020-07-14	10	-23.41198066	120.3971723
<i>Eremophila capricornica</i>	2020-07-14	10	-23.41168529	120.3975626
<i>Eremophila capricornica</i>	2020-07-14	10	-23.42440916	120.3803958
<i>Eremophila capricornica</i>	2020-07-14	10	-23.42401875	120.3804944
<i>Eremophila capricornica</i>	2020-07-14	10	-23.4210081	120.385033
<i>Eremophila capricornica</i>	2020-07-14	10	-23.41628094	120.3920403
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4949675	120.4130429
<i>Eremophila capricornica</i>	2020-07-11	10	-23.4951288	120.413892
<i>Eremophila capricornica</i>	2020-07-12	10	-23.3831517	120.504017
<i>Eremophila capricornica</i>	2020-07-12	10	-23.38542794	120.5051598
<i>Eremophila capricornica</i>	2020-07-12	10	-23.38078229	120.496058
<i>Eremophila capricornica</i>	2020-07-12	10	-23.3821409	120.5033683
<i>Eremophila capricornica</i>	2020-07-10	12	-23.3431629	120.2156941
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4689232	120.2809685
<i>Eremophila capricornica</i>	2020-07-12	12	-23.3389121	120.506123
<i>Eremophila capricornica</i>	2020-07-12	12	-23.3395925	120.5072499
<i>Eremophila capricornica</i>	2020-07-12	12	-23.3386947	120.505297
<i>Eremophila capricornica</i>	2020-07-12	12	-23.4177218	120.4831555
<i>Eremophila capricornica</i>	2020-07-13	12	-23.2624977	120.0853684
<i>Eremophila capricornica</i>	2020-07-14	12	-23.40278987	120.4042031
<i>Eremophila capricornica</i>	2020-07-14	12	-23.40218338	120.4014645
<i>Eremophila capricornica</i>	2020-07-14	12	-23.40096679	120.4081449
<i>Eremophila capricornica</i>	2020-07-11	12	-23.467291	120.2493706
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4664322	120.249727
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4704612	120.2475663
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4691438	120.2526459
<i>Eremophila capricornica</i>	2020-07-11	12	-23.468818	120.2527625
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4681531	120.2533468
<i>Eremophila capricornica</i>	2020-07-10	12	-23.4037338	120.2944813
<i>Eremophila capricornica</i>	2020-07-10	12	-23.40231	120.298745

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-10	12	-23.4026871	120.2983551
<i>Eremophila capricornica</i>	2020-07-10	12	-23.3596537	120.2307319
<i>Eremophila capricornica</i>	2020-07-10	12	-23.3591791	120.2242525
<i>Eremophila capricornica</i>	2020-07-10	12	-23.4021284	120.2973285
<i>Eremophila capricornica</i>	2020-07-10	12	-23.4022555	120.2985196
<i>Eremophila capricornica</i>	2020-07-14	12	-23.4224233	120.3815743
<i>Eremophila capricornica</i>	2020-07-11	12	-23.4950058	120.4146212
<i>Eremophila capricornica</i>	2020-07-11	12	-23.49525	120.4137096
<i>Eremophila capricornica</i>	2020-07-12	12	-23.38192	120.4996239
<i>Eremophila capricornica</i>	2020-07-12	14	-23.3391075	120.50641
<i>Eremophila capricornica</i>	2020-07-11	14	-23.47035	120.2525022
<i>Eremophila capricornica</i>	2020-07-11	14	-23.4689702	120.2527396
<i>Eremophila capricornica</i>	2020-07-11	14	-23.4662201	120.249926
<i>Eremophila capricornica</i>	2020-07-10	15	-23.3453575	120.211946
<i>Eremophila capricornica</i>	2020-07-10	15	-23.3459713	120.2115232
<i>Eremophila capricornica</i>	2020-07-10	15	-23.3460771	120.2119499
<i>Eremophila capricornica</i>	2020-07-10	15	-23.35944119	120.2302617
<i>Eremophila capricornica</i>	2020-07-13	15	-23.2913813	120.097897
<i>Eremophila capricornica</i>	2020-07-12	15	-23.338579	120.5037955
<i>Eremophila capricornica</i>	2020-07-12	15	-23.33947698	120.5072988
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3394274	120.5066741
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3383055	120.5053059
<i>Eremophila capricornica</i>	2020-07-13	15	-23.2920663	120.0980559
<i>Eremophila capricornica</i>	2020-07-11	15	-23.44464793	120.5244661
<i>Eremophila capricornica</i>	2020-07-11	15	-23.44441249	120.5254715
<i>Eremophila capricornica</i>	2020-07-11	15	-23.4447722	120.5258703
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40595955	120.2132827
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40687934	120.2135872
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40610136	120.2136341
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40631487	120.2139485
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40601276	120.2139537
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40625611	120.2143106
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40822412	120.2149547
<i>Eremophila capricornica</i>	2020-07-12	15	-23.40847203	120.2150593
<i>Eremophila capricornica</i>	2020-07-12	15	-23.418959	120.4863018
<i>Eremophila capricornica</i>	2020-07-12	15	-23.420915	120.4867573
<i>Eremophila capricornica</i>	2020-07-12	15	-23.4322287	120.493368
<i>Eremophila capricornica</i>	2020-07-11	15	-23.4488211	120.5256646
<i>Eremophila capricornica</i>	2020-07-13	15	-23.40195074	120.27642
<i>Eremophila capricornica</i>	2020-07-13	15	-23.2623365	120.0853976
<i>Eremophila capricornica</i>	2020-07-13	15	-23.26402663	120.0842019
<i>Eremophila capricornica</i>	2020-07-13	15	-23.26489971	120.0858682
<i>Eremophila capricornica</i>	2020-07-13	15	-23.26659157	120.0839435
<i>Eremophila capricornica</i>	2020-07-13	15	-23.26699901	120.083297



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-13	15	-23.2687359	120.0789321
<i>Eremophila capricornica</i>	2020-07-12	15	-23.36329	120.5684759
<i>Eremophila capricornica</i>	2020-07-14	15	-23.4026352	120.4050439
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40235058	120.4022314
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40234498	120.4032243
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40230783	120.4038406
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40209455	120.4069413
<i>Eremophila capricornica</i>	2020-07-14	15	-23.4031854	120.4047941
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40338932	120.4035648
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40206148	120.4030337
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40169054	120.4050103
<i>Eremophila capricornica</i>	2020-07-14	15	-23.40157081	120.4059364
<i>Eremophila capricornica</i>	2020-07-11	15	-23.4663683	120.2498685
<i>Eremophila capricornica</i>	2020-07-11	15	-23.4686338	120.2534686
<i>Eremophila capricornica</i>	2020-07-11	15	-23.46826367	120.2535219
<i>Eremophila capricornica</i>	2020-07-11	15	-23.46811667	120.2535545
<i>Eremophila capricornica</i>	2020-07-10	15	-23.3595694	120.222762
<i>Eremophila capricornica</i>	2020-07-10	15	-23.35963907	120.22648
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41910557	120.3867479
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41763434	120.389177
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41947475	120.3869924
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41915725	120.3875992
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41691596	120.3909268
<i>Eremophila capricornica</i>	2020-07-14	15	-23.41475123	120.3943607
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3852581	120.5047182
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3843818	120.50453
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3862635	120.5012612
<i>Eremophila capricornica</i>	2020-07-12	15	-23.3863395	120.5015092
<i>Eremophila capricornica</i>	2020-07-12	15	-23.38621051	120.500778
<i>Eremophila capricornica</i>	2020-07-12	15	-23.386547	120.5015874
<i>Eremophila capricornica</i>	2020-07-13	16	-23.2627202	120.0852003
<i>Eremophila capricornica</i>	2020-07-12	16	-23.3630977	120.5684752
<i>Eremophila capricornica</i>	2020-07-14	16	-23.40093323	120.4078853
<i>Eremophila capricornica</i>	2020-07-11	16	-23.4704482	120.2484218
<i>Eremophila capricornica</i>	2020-07-11	16	-23.46849	120.2531809
<i>Eremophila capricornica</i>	2020-07-10	16	-23.4049619	120.2959719
<i>Eremophila capricornica</i>	2020-07-10	16	-23.402522	120.2981121
<i>Eremophila capricornica</i>	2020-07-10	16	-23.4051062	120.2963542
<i>Eremophila capricornica</i>	2020-07-11	18	-23.4707791	120.248585
<i>Eremophila capricornica</i>	2020-07-11	18	-23.4702995	120.2487011
<i>Eremophila capricornica</i>	2020-07-12	18	-23.3820656	120.5012026
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3495739	120.220174
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3458378	120.2117372
<i>Eremophila capricornica</i>	2020-07-10	20	-23.34374935	120.2153806

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-10	20	-23.34405327	120.2169266
<i>Eremophila capricornica</i>	2020-07-10	20	-23.34454706	120.2153262
<i>Eremophila capricornica</i>	2020-07-10	20	-23.34521331	120.2135726
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3522678	120.2117657
<i>Eremophila capricornica</i>	2020-07-13	20	-23.4006121	120.2765998
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3619905	120.2306622
<i>Eremophila capricornica</i>	2020-07-10	20	-23.36110034	120.229918
<i>Eremophila capricornica</i>	2020-07-10	20	-23.36160765	120.230226
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4690857	120.2756733
<i>Eremophila capricornica</i>	2020-07-13	20	-23.2912235	120.0981732
<i>Eremophila capricornica</i>	2020-07-13	20	-23.2915813	120.0978074
<i>Eremophila capricornica</i>	2020-07-12	20	-23.339486	120.5068684
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3395852	120.5070159
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3395783	120.5054376
<i>Eremophila capricornica</i>	2020-07-13	20	-23.2921561	120.0987207
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4453207	120.5264356
<i>Eremophila capricornica</i>	2020-07-11	20	-23.44619317	120.5264661
<i>Eremophila capricornica</i>	2020-07-11	20	-23.44643015	120.5266423
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4945775	120.4604882
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4935919	120.4594164
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4929024	120.4580505
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4913433	120.4590886
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4910861	120.4599984
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4911846	120.4603973
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4919666	120.4623287
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4924868	120.4621771
<i>Eremophila capricornica</i>	2020-07-12	20	-23.4158615	120.4801356
<i>Eremophila capricornica</i>	2020-07-12	20	-23.4162406	120.4802452
<i>Eremophila capricornica</i>	2020-07-12	20	-23.4205417	120.4866483
<i>Eremophila capricornica</i>	2020-07-12	20	-23.4250281	120.4891676
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4479725	120.5247794
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4488738	120.5264411
<i>Eremophila capricornica</i>	2020-07-13	20	-23.2897682	120.0964789
<i>Eremophila capricornica</i>	2020-07-13	20	-23.2645494	120.0856718
<i>Eremophila capricornica</i>	2020-07-13	20	-23.26693492	120.0861276
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3598029	120.567848
<i>Eremophila capricornica</i>	2020-07-14	20	-23.4084505	120.4007416
<i>Eremophila capricornica</i>	2020-07-14	20	-23.4011398	120.4074783
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40149733	120.4091647
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40164611	120.405765
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40142473	120.4064023
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40114633	120.4066492
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40107914	120.4068151
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40086811	120.406972

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40079934	120.4072873
<i>Eremophila capricornica</i>	2020-07-14	20	-23.40234521	120.407869
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4711393	120.2483936
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4695684	120.252632
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4686505	120.2528423
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4703122	120.2488824
<i>Eremophila capricornica</i>	2020-07-10	20	-23.4021274	120.2970423
<i>Eremophila capricornica</i>	2020-07-10	20	-23.4029477	120.2990829
<i>Eremophila capricornica</i>	2020-07-10	20	-23.4038412	120.2942075
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3593437	120.2234168
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3600423	120.2255204
<i>Eremophila capricornica</i>	2020-07-10	20	-23.3565343	120.2085053
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4996147	120.4858337
<i>Eremophila capricornica</i>	2020-07-14	20	-23.42191444	120.3824443
<i>Eremophila capricornica</i>	2020-07-14	20	-23.42073091	120.384738
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41571884	120.3925147
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41096872	120.39827
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41853548	120.3886295
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41830873	120.3888629
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41749159	120.3899297
<i>Eremophila capricornica</i>	2020-07-14	20	-23.41414143	120.3949424
<i>Eremophila capricornica</i>	2020-07-14	20	-23.4121468	120.3974164
<i>Eremophila capricornica</i>	2020-07-11	20	-23.49449842	120.4150691
<i>Eremophila capricornica</i>	2020-07-11	20	-23.4947601	120.4152006
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3859504	120.500899
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3859794	120.4989718
<i>Eremophila capricornica</i>	2020-07-12	20	-23.38174214	120.5035716
<i>Eremophila capricornica</i>	2020-07-12	20	-23.38109373	120.4987215
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3815576	120.502561
<i>Eremophila capricornica</i>	2020-07-12	20	-23.3809883	120.4956949
<i>Eremophila capricornica</i>	2020-07-12	22	-23.3399609	120.5051676
<i>Eremophila capricornica</i>	2020-07-11	22	-23.4702158	120.2484475
<i>Eremophila capricornica</i>	2020-07-10	22	-23.4020482	120.2981739
<i>Eremophila capricornica</i>	2020-07-10	22	-23.3610873	120.2305849
<i>Eremophila capricornica</i>	2020-07-11	24	-23.4682972	120.2532776
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3441804	120.2155737
<i>Eremophila capricornica</i>	2020-07-10	25	-23.372079	120.2054425
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3601462	120.2299785
<i>Eremophila capricornica</i>	2020-07-11	25	-23.4677643	120.2771976
<i>Eremophila capricornica</i>	2020-07-11	25	-23.4685418	120.2773222
<i>Eremophila capricornica</i>	2020-07-12	25	-23.33923594	120.5069156
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3389359	120.5053746
<i>Eremophila capricornica</i>	2020-07-13	25	-23.2921105	120.0982967
<i>Eremophila capricornica</i>	2020-07-11	25	-23.44484061	120.5241027



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-12	25	-23.40581624	120.2134998
<i>Eremophila capricornica</i>	2020-07-12	25	-23.40668656	120.2138512
<i>Eremophila capricornica</i>	2020-07-12	25	-23.4166523	120.4805075
<i>Eremophila capricornica</i>	2020-07-12	25	-23.4175754	120.482371
<i>Eremophila capricornica</i>	2020-07-12	25	-23.420254	120.4866663
<i>Eremophila capricornica</i>	2020-07-12	25	-23.4172624	120.4824782
<i>Eremophila capricornica</i>	2020-07-12	25	-23.4172961	120.4829126
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3623316	120.2130057
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26603967	120.0843041
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26628493	120.0842426
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26650855	120.0853553
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26662901	120.0855216
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26688829	120.0839439
<i>Eremophila capricornica</i>	2020-07-13	25	-23.2679852	120.0796758
<i>Eremophila capricornica</i>	2020-07-13	25	-23.26836189	120.0792242
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3603238	120.5652504
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3596729	120.5672356
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3606435	120.5682929
<i>Eremophila capricornica</i>	2020-07-12	25	-23.36275362	120.5692414
<i>Eremophila capricornica</i>	2020-07-12	25	-23.36120913	120.5709409
<i>Eremophila capricornica</i>	2020-07-14	25	-23.40241445	120.4059655
<i>Eremophila capricornica</i>	2020-07-14	25	-23.40274798	120.4045377
<i>Eremophila capricornica</i>	2020-07-14	25	-23.40233602	120.404207
<i>Eremophila capricornica</i>	2020-07-14	25	-23.40137182	120.4070286
<i>Eremophila capricornica</i>	2020-07-14	25	-23.40190951	120.4076365
<i>Eremophila capricornica</i>	2020-07-11	25	-23.4687585	120.2526951
<i>Eremophila capricornica</i>	2020-07-11	25	-23.468893	120.2533271
<i>Eremophila capricornica</i>	2020-07-10	25	-23.4022343	120.2976381
<i>Eremophila capricornica</i>	2020-07-10	25	-23.359244	120.2235569
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3592544	120.2246238
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3578848	120.2163685
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3595731	120.2229825
<i>Eremophila capricornica</i>	2020-07-10	25	-23.3599836	120.2260852
<i>Eremophila capricornica</i>	2020-07-10	25	-23.35677071	120.2166067
<i>Eremophila capricornica</i>	2020-07-10	25	-23.40385761	120.2951969
<i>Eremophila capricornica</i>	2020-07-10	25	-23.40247841	120.2965811
<i>Eremophila capricornica</i>	2020-07-10	25	-23.40258148	120.2970498
<i>Eremophila capricornica</i>	2020-07-10	25	-23.36120661	120.2301896
<i>Eremophila capricornica</i>	2020-07-14	25	-23.4136987	120.3951389
<i>Eremophila capricornica</i>	2020-07-14	25	-23.41332949	120.3951627
<i>Eremophila capricornica</i>	2020-07-14	25	-23.4097625	120.3995071
<i>Eremophila capricornica</i>	2020-07-14	25	-23.42150742	120.3843142
<i>Eremophila capricornica</i>	2020-07-11	25	-23.49502791	120.4144448
<i>Eremophila capricornica</i>	2020-07-11	25	-23.49437	120.4183163

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3833075	120.5041888
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3857082	120.5003478
<i>Eremophila capricornica</i>	2020-07-12	25	-23.38467183	120.5052322
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3842537	120.5050691
<i>Eremophila capricornica</i>	2020-07-12	25	-23.38511836	120.4970199
<i>Eremophila capricornica</i>	2020-07-12	25	-23.38116697	120.5033835
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3817071	120.5030362
<i>Eremophila capricornica</i>	2020-07-12	25	-23.3817746	120.500338
<i>Eremophila capricornica</i>	2020-07-11	26	-23.4685684	120.2530405
<i>Eremophila capricornica</i>	2020-07-10	26	-23.4043925	120.29533
<i>Eremophila capricornica</i>	2020-07-10	26	-23.4027058	120.298592
<i>Eremophila capricornica</i>	2020-07-11	26	-23.49518	120.4141676
<i>Eremophila capricornica</i>	2020-07-10	28	-23.3613724	120.2311014
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3430768	120.2181227
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3427723	120.2177517
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3431208	120.2154173
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3431592	120.2150702
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3459947	120.2115945
<i>Eremophila capricornica</i>	2020-07-10	30	-23.34359913	120.2173952
<i>Eremophila capricornica</i>	2020-07-10	30	-23.34428761	120.2164675
<i>Eremophila capricornica</i>	2020-07-10	30	-23.34481815	120.2133576
<i>Eremophila capricornica</i>	2020-07-10	30	-23.34519601	120.214357
<i>Eremophila capricornica</i>	2020-07-10	30	-23.34554649	120.2138203
<i>Eremophila capricornica</i>	2020-07-09	30	-23.3665898	120.2587575
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3598893	120.2147151
<i>Eremophila capricornica</i>	2020-07-13	30	-23.2897284	120.0998415
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4922844	120.458475
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4938371	120.4643919
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4936758	120.4647353
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4897046	120.4645091
<i>Eremophila capricornica</i>	2020-07-12	30	-23.4143345	120.4801564
<i>Eremophila capricornica</i>	2020-07-12	30	-23.4173746	120.4818508
<i>Eremophila capricornica</i>	2020-07-12	30	-23.4198045	120.4863824
<i>Eremophila capricornica</i>	2020-07-12	30	-23.4214753	120.4869935
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4473697	120.5250563
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4484573	120.5251101
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4489626	120.526152
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4477046	120.5261271
<i>Eremophila capricornica</i>	2020-07-13	30	-23.265027	120.0858372
<i>Eremophila capricornica</i>	2020-07-13	30	-23.2639153	120.0844689
<i>Eremophila capricornica</i>	2020-07-13	30	-23.2619339	120.0853168
<i>Eremophila capricornica</i>	2020-07-13	30	-23.26458292	120.0833694
<i>Eremophila capricornica</i>	2020-07-13	30	-23.26623542	120.081253
<i>Eremophila capricornica</i>	2020-07-13	30	-23.26675543	120.0835776

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-13	30	-23.26729399	120.0802777
<i>Eremophila capricornica</i>	2020-07-13	30	-23.2677693	120.0818532
<i>Eremophila capricornica</i>	2020-07-13	30	-23.26798265	120.0822
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3596308	120.5674374
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3609083	120.5685134
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3620958	120.5687894
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3623452	120.568568
<i>Eremophila capricornica</i>	2020-07-12	30	-23.365077	120.5704648
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40160277	120.407496
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40253341	120.4056791
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40271407	120.404809
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40191973	120.4059226
<i>Eremophila capricornica</i>	2020-07-14	30	-23.4011471	120.4085339
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40201249	120.4072162
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40194204	120.402303
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40189837	120.4031714
<i>Eremophila capricornica</i>	2020-07-14	30	-23.40188979	120.4041294
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4683361	120.2532987
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4695564	120.2531551
<i>Eremophila capricornica</i>	2020-07-11	30	-23.469031	120.2530642
<i>Eremophila capricornica</i>	2020-07-11	30	-23.46819601	120.2534069
<i>Eremophila capricornica</i>	2020-07-10	30	-23.4023184	120.2978147
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3626449	120.2071677
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3594385	120.2223897
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3596273	120.2230983
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3589873	120.223882
<i>Eremophila capricornica</i>	2020-07-10	30	-23.359179	120.2239168
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3583163	120.215726
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3594186	120.2225449
<i>Eremophila capricornica</i>	2020-07-10	30	-23.35937998	120.2266957
<i>Eremophila capricornica</i>	2020-07-10	30	-23.3600656	120.2243518
<i>Eremophila capricornica</i>	2020-07-10	30	-23.35700743	120.2165106
<i>Eremophila capricornica</i>	2020-07-10	30	-23.4028401	120.2988186
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4981498	120.4843093
<i>Eremophila capricornica</i>	2020-07-11	30	-23.5001912	120.4856062
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4977049	120.4897638
<i>Eremophila capricornica</i>	2020-07-14	30	-23.4241332	120.3800719
<i>Eremophila capricornica</i>	2020-07-14	30	-23.4213203	120.384127
<i>Eremophila capricornica</i>	2020-07-14	30	-23.41599727	120.39211
<i>Eremophila capricornica</i>	2020-07-14	30	-23.41450386	120.394187
<i>Eremophila capricornica</i>	2020-07-14	30	-23.4140753	120.394868
<i>Eremophila capricornica</i>	2020-07-14	30	-23.42179938	120.3834257
<i>Eremophila capricornica</i>	2020-07-14	30	-23.41032629	120.3991723
<i>Eremophila capricornica</i>	2020-07-14	30	-23.409842	120.3995588



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	30	-23.49352485	120.4182548
<i>Eremophila capricornica</i>	2020-07-11	30	-23.49402367	120.4155431
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4942903	120.4191558
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4944465	120.417805
<i>Eremophila capricornica</i>	2020-07-11	30	-23.4948381	120.4149032
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3860988	120.5011861
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3855968	120.5047314
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3831945	120.4972628
<i>Eremophila capricornica</i>	2020-07-12	30	-23.385448	120.4997499
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3866778	120.5029577
<i>Eremophila capricornica</i>	2020-07-12	30	-23.38710847	120.5021198
<i>Eremophila capricornica</i>	2020-07-12	30	-23.38697091	120.5026968
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3858523	120.4984911
<i>Eremophila capricornica</i>	2020-07-12	30	-23.38608834	120.4996394
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3828851	120.5046957
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3812284	120.4961347
<i>Eremophila capricornica</i>	2020-07-12	30	-23.3827284	120.4968528
<i>Eremophila capricornica</i>	2020-07-10	35	-23.3443417	120.2138479
<i>Eremophila capricornica</i>	2020-07-10	35	-23.34477312	120.213707
<i>Eremophila capricornica</i>	2020-07-10	35	-23.35274952	120.2111202
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4450355	120.5238454
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4943593	120.4600441
<i>Eremophila capricornica</i>	2020-07-12	35	-23.4172164	120.4813603
<i>Eremophila capricornica</i>	2020-07-10	35	-23.35968706	120.2145777
<i>Eremophila capricornica</i>	2020-07-13	35	-23.2646758	120.0862328
<i>Eremophila capricornica</i>	2020-07-13	35	-23.2650942	120.0855371
<i>Eremophila capricornica</i>	2020-07-13	35	-23.2634641	120.0855618
<i>Eremophila capricornica</i>	2020-07-13	35	-23.26447283	120.0852994
<i>Eremophila capricornica</i>	2020-07-12	35	-23.3599725	120.5654193
<i>Eremophila capricornica</i>	2020-07-12	35	-23.3611739	120.5688077
<i>Eremophila capricornica</i>	2020-07-14	35	-23.40228964	120.4045204
<i>Eremophila capricornica</i>	2020-07-14	35	-23.40198496	120.4045505
<i>Eremophila capricornica</i>	2020-07-14	35	-23.40178035	120.4054478
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4699085	120.2529445
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4684108	120.2535277
<i>Eremophila capricornica</i>	2020-07-10	35	-23.3592598	120.2254267
<i>Eremophila capricornica</i>	2020-07-10	35	-23.3602639	120.2303515
<i>Eremophila capricornica</i>	2020-07-10	35	-23.3583415	120.2209918
<i>Eremophila capricornica</i>	2020-07-10	35	-23.3583964	120.2212365
<i>Eremophila capricornica</i>	2020-07-10	35	-23.36015528	120.2249963
<i>Eremophila capricornica</i>	2020-07-10	35	-23.36019825	120.2252413
<i>Eremophila capricornica</i>	2020-07-10	35	-23.35898224	120.2219503
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4973703	120.484796
<i>Eremophila capricornica</i>	2020-07-14	35	-23.41148715	120.3981514

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-14	35	-23.41108502	120.3985969
<i>Eremophila capricornica</i>	2020-07-11	35	-23.49417944	120.4160339
<i>Eremophila capricornica</i>	2020-07-11	35	-23.4942642	120.4173176
<i>Eremophila capricornica</i>	2020-07-12	35	-23.3866097	120.5032189
<i>Eremophila capricornica</i>	2020-07-12	35	-23.3807996	120.4990423
<i>Eremophila capricornica</i>	2020-07-12	35	-23.38310021	120.4961506
<i>Eremophila capricornica</i>	2020-07-10	35	-23.4025959	120.2990656
<i>Eremophila capricornica</i>	2020-07-10	40	-23.343003	120.2175251
<i>Eremophila capricornica</i>	2020-07-10	40	-23.371838	120.2054609
<i>Eremophila capricornica</i>	2020-07-10	40	-23.3725107	120.205853
<i>Eremophila capricornica</i>	2020-07-11	40	-23.46826244	120.2756529
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4917525	120.4587792
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4909855	120.4594184
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4920626	120.4600595
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4917177	120.4601604
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4915227	120.4602691
<i>Eremophila capricornica</i>	2020-07-11	40	-23.49293395	120.4627715
<i>Eremophila capricornica</i>	2020-07-11	40	-23.48929974	120.464584
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4900328	120.4644916
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4193482	120.4862066
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4220139	120.4869764
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4223021	120.4869991
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4267193	120.4909744
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4273917	120.4913127
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4277	120.4913838
<i>Eremophila capricornica</i>	2020-07-12	40	-23.4318984	120.4930723
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4486595	120.5254479
<i>Eremophila capricornica</i>	2020-07-13	40	-23.2637175	120.0851311
<i>Eremophila capricornica</i>	2020-07-13	40	-23.26449796	120.0829656
<i>Eremophila capricornica</i>	2020-07-13	40	-23.26915145	120.0808849
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3603211	120.5681497
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3608958	120.5688862
<i>Eremophila capricornica</i>	2020-07-14	40	-23.40187475	120.4068616
<i>Eremophila capricornica</i>	2020-07-14	40	-23.40204291	120.4066223
<i>Eremophila capricornica</i>	2020-07-14	40	-23.4017491	120.4062877
<i>Eremophila capricornica</i>	2020-07-14	40	-23.40179318	120.4035558
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4700995	120.2525134
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4697393	120.2525511
<i>Eremophila capricornica</i>	2020-07-10	40	-23.3630649	120.2091109
<i>Eremophila capricornica</i>	2020-07-10	40	-23.3583731	120.221853
<i>Eremophila capricornica</i>	2020-07-10	40	-23.3592568	120.2218427
<i>Eremophila capricornica</i>	2020-07-10	40	-23.35737403	120.2162004
<i>Eremophila capricornica</i>	2020-07-10	40	-23.3594076	120.2083243
<i>Eremophila capricornica</i>	2020-07-11	40	-23.4946297	120.4154044

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3863672	120.504162
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3848286	120.4984151
<i>Eremophila capricornica</i>	2020-07-12	40	-23.38693491	120.5031575
<i>Eremophila capricornica</i>	2020-07-12	40	-23.38550549	120.4973371
<i>Eremophila capricornica</i>	2020-07-12	40	-23.38624713	120.4991372
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3816358	120.5018602
<i>Eremophila capricornica</i>	2020-07-12	40	-23.3819361	120.5007115
<i>Eremophila capricornica</i>	2020-07-13	45	-23.2893717	120.0995181
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3445944	120.2134084
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3455541	120.2125254
<i>Eremophila capricornica</i>	2020-07-10	50	-23.34410161	120.2147336
<i>Eremophila capricornica</i>	2020-07-10	50	-23.34432324	120.2143842
<i>Eremophila capricornica</i>	2020-07-10	50	-23.34458756	120.2142537
<i>Eremophila capricornica</i>	2020-07-10	50	-23.34500084	120.214053
<i>Eremophila capricornica</i>	2020-07-10	50	-23.34527855	120.213901
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4687107	120.2761569
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4682713	120.276912
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4684959	120.2770633
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4677932	120.2775522
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4679167	120.2777046
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2896663	120.0995609
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2919356	120.0985661
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4471533	120.5249447
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44656701	120.5239723
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44623001	120.5237531
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44590202	120.5234765
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44553572	120.5233016
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44515165	120.5234601
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44593715	120.5263479
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44701438	120.5266215
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44733386	120.5265403
<i>Eremophila capricornica</i>	2020-07-11	50	-23.44746971	120.5260391
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4941754	120.4598039
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4934702	120.4583616
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4934111	120.4583005
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4918837	120.4616772
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4928427	120.4617376
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4931015	120.4612503
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4929553	120.4600917
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4910149	120.461729
<i>Eremophila capricornica</i>	2020-07-11	50	-23.491109	120.4620622
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4940143	120.4638908
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49171751	120.4659387
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49086026	120.4659544



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49019413	120.4658215
<i>Eremophila capricornica</i>	2020-07-11	50	-23.48970316	120.4655628
<i>Eremophila capricornica</i>	2020-07-11	50	-23.48929499	120.4653102
<i>Eremophila capricornica</i>	2020-07-11	50	-23.48898005	120.4647728
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4906531	120.4637161
<i>Eremophila capricornica</i>	2020-07-12	50	-23.414681	120.4801294
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4152285	120.4801082
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4280967	120.491702
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4291291	120.4921813
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4294802	120.4921579
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4301727	120.4926601
<i>Eremophila capricornica</i>	2020-07-12	50	-23.431321	120.4924569
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4314794	120.4929368
<i>Eremophila capricornica</i>	2020-07-12	50	-23.43218	120.4931401
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4143462	120.4803052
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4151267	120.4805186
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4159789	120.4804817
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4163577	120.4805702
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4168184	120.4814262
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42053633	120.4871229
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42105229	120.4872765
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42146262	120.4874568
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42662581	120.4915798
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42696527	120.4918405
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42713773	120.492197
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4277105	120.4923993
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42822953	120.4925878
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42859602	120.4928432
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42898689	120.4930214
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42944625	120.4932216
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42988426	120.4932763
<i>Eremophila capricornica</i>	2020-07-12	50	-23.43035288	120.4931841
<i>Eremophila capricornica</i>	2020-07-12	50	-23.4307581	120.493501
<i>Eremophila capricornica</i>	2020-07-12	50	-23.43104015	120.4933741
<i>Eremophila capricornica</i>	2020-07-12	50	-23.43133127	120.4934438
<i>Eremophila capricornica</i>	2020-07-12	50	-23.43182595	120.4935465
<i>Eremophila capricornica</i>	2020-07-12	50	-23.42182834	120.487441
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4481815	120.5248733
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2895495	120.096352
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2654052	120.0843505
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2649922	120.0842778
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26420051	120.0848504
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26538266	120.084864
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26554592	120.0845363



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26591998	120.0814237
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26695505	120.0804902
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26727158	120.0833734
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26738786	120.0831617
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26758026	120.0800406
<i>Eremophila capricornica</i>	2020-07-13	50	-23.2678414	120.0826525
<i>Eremophila capricornica</i>	2020-07-13	50	-23.26798062	120.0792789
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3597043	120.5666289
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3619954	120.5691888
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3624403	120.5689753
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3620259	120.5690426
<i>Eremophila capricornica</i>	2020-07-12	50	-23.36144459	120.5712692
<i>Eremophila capricornica</i>	2020-07-14	50	-23.40224256	120.4048592
<i>Eremophila capricornica</i>	2020-07-14	50	-23.40229382	120.4052166
<i>Eremophila capricornica</i>	2020-07-14	50	-23.40209847	120.4056993
<i>Eremophila capricornica</i>	2020-07-14	50	-23.40110203	120.4077545
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4698232	120.2524378
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4694526	120.2527399
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4693333	120.2526658
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4701664	120.2527295
<i>Eremophila capricornica</i>	2020-07-11	50	-23.46939665	120.2532018
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3632763	120.2084402
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3630383	120.2093295
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3603516	120.2081958
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3615048	120.2076288
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3617237	120.2079668
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3592088	120.2220777
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3593916	120.2249536
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3593802	120.2253156
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3586482	120.2154468
<i>Eremophila capricornica</i>	2020-07-10	50	-23.3596859	120.2232676
<i>Eremophila capricornica</i>	2020-07-10	50	-23.36003801	120.2245488
<i>Eremophila capricornica</i>	2020-07-10	50	-23.35762494	120.2158875
<i>Eremophila capricornica</i>	2020-07-10	50	-23.35799522	120.2155277
<i>Eremophila capricornica</i>	2020-07-10	50	-23.35839737	120.2153031
<i>Eremophila capricornica</i>	2020-07-11	50	-23.497613	120.4849433
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4971632	120.4846826
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4971658	120.4844246
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4971332	120.4841405
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4972288	120.483893
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4991927	120.4863626
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4988931	120.486296
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49742617	120.4857268
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49700447	120.4853038

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49721909	120.4896504
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49761961	120.4900394
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49760494	120.4892356
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4976778	120.4884926
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49743347	120.4878367
<i>Eremophila capricornica</i>	2020-07-14	50	-23.41811368	120.3886868
<i>Eremophila capricornica</i>	2020-07-14	50	-23.41060012	120.3985329
<i>Eremophila capricornica</i>	2020-07-14	50	-23.41369285	120.3953967
<i>Eremophila capricornica</i>	2020-07-14	50	-23.4104724	120.3988901
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49363536	120.4189727
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49342113	120.4187004
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49360554	120.41765
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49391052	120.4165433
<i>Eremophila capricornica</i>	2020-07-11	50	-23.49398401	120.4150288
<i>Eremophila capricornica</i>	2020-07-11	50	-23.4945253	120.4160347
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3838981	120.497797
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3844471	120.4983089
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3854609	120.4999988
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38383694	120.5050525
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38369476	120.4961844
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38421115	120.4962525
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38454935	120.496684
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38572736	120.4976865
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38569351	120.4981924
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38102018	120.5027749
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38091308	120.5023602
<i>Eremophila capricornica</i>	2020-07-12	50	-23.380521	120.4993089
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38139009	120.4950539
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38189017	120.4952855
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3820885	120.4954584
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38210774	120.4957445
<i>Eremophila capricornica</i>	2020-07-12	50	-23.38228193	120.4958223
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3816035	120.5022158
<i>Eremophila capricornica</i>	2020-07-12	50	-23.3817124	120.5015514
<i>Eremophila capricornica</i>	2020-07-10	60	-23.3433127	120.2147918
<i>Eremophila capricornica</i>	2020-07-10	60	-23.3447806	120.2128992
<i>Eremophila capricornica</i>	2020-07-10	60	-23.3721407	120.2057411
<i>Eremophila capricornica</i>	2020-07-13	60	-23.2892075	120.0993844
<i>Eremophila capricornica</i>	2020-07-11	60	-23.4925941	120.4583196
<i>Eremophila capricornica</i>	2020-07-13	60	-23.26438556	120.0837108
<i>Eremophila capricornica</i>	2020-07-13	60	-23.26462697	120.0817787
<i>Eremophila capricornica</i>	2020-07-11	60	-23.4944417	120.4186748
<i>Eremophila capricornica</i>	2020-07-11	60	-23.494329	120.4169123
<i>Eremophila capricornica</i>	2020-07-12	60	-23.3864657	120.5036872



Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-13	70	-23.2919179	120.0983207
<i>Eremophila capricornica</i>	2020-07-11	70	-23.490785	120.4612103
<i>Eremophila capricornica</i>	2020-07-12	70	-23.4298556	120.4921906
<i>Eremophila capricornica</i>	2020-07-11	70	-23.4477702	120.5247764
<i>Eremophila capricornica</i>	2020-07-13	70	-23.2631897	120.0851069
<i>Eremophila capricornica</i>	2020-07-11	70	-23.4977561	120.485539
<i>Eremophila capricornica</i>	2020-07-14	70	-23.41832319	120.3883278
<i>Eremophila capricornica</i>	2020-07-11	70	-23.4946782	120.4157467
<i>Eremophila capricornica</i>	2020-07-10	75	-23.34410443	120.2139115
<i>Eremophila capricornica</i>	2020-07-10	75	-23.34459505	120.2159291
<i>Eremophila capricornica</i>	2020-07-10	75	-23.35982146	120.224165
<i>Eremophila capricornica</i>	2020-07-10	80	-23.3438772	120.2141453
<i>Eremophila capricornica</i>	2020-07-11	80	-23.4476263	120.5250848
<i>Eremophila capricornica</i>	2020-07-10	100	-23.3436038	120.2145058
<i>Eremophila capricornica</i>	2020-07-10	100	-23.3451798	120.212667
<i>Eremophila capricornica</i>	2020-07-13	100	-23.291538	120.0983074
<i>Eremophila capricornica</i>	2020-07-11	100	-23.44734642	120.5253513
<i>Eremophila capricornica</i>	2020-07-11	100	-23.44693071	120.5245428
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4937164	120.4617748
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4925265	120.457939
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4921877	120.4613347
<i>Eremophila capricornica</i>	2020-07-11	100	-23.493206	120.460452
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4924877	120.4599097
<i>Eremophila capricornica</i>	2020-07-11	100	-23.491004	120.4607528
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4917201	120.462321
<i>Eremophila capricornica</i>	2020-07-11	100	-23.49235634	120.4659631
<i>Eremophila capricornica</i>	2020-07-12	100	-23.4234106	120.4869928
<i>Eremophila capricornica</i>	2020-07-12	100	-23.4234044	120.4869687
<i>Eremophila capricornica</i>	2020-07-12	100	-23.4283543	120.4920397
<i>Eremophila capricornica</i>	2020-07-12	100	-23.4304639	120.4926554
<i>Eremophila capricornica</i>	2020-07-12	100	-23.4310314	120.4925198
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2652191	120.0852312
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2657964	120.0850376
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2655895	120.084543
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2646115	120.0843028
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2642017	120.0845179
<i>Eremophila capricornica</i>	2020-07-13	100	-23.2637507	120.0846595
<i>Eremophila capricornica</i>	2020-07-13	100	-23.26465599	120.0824251
<i>Eremophila capricornica</i>	2020-07-13	100	-23.26508313	120.0813742
<i>Eremophila capricornica</i>	2020-07-13	100	-23.26544128	120.0812966
<i>Eremophila capricornica</i>	2020-07-13	100	-23.26668763	120.0807782
<i>Eremophila capricornica</i>	2020-07-12	100	-23.359751	120.5656801
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3594786	120.5658807
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3595393	120.5662445

Taxon	Date	Abundance	Latitude	Longitude
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3619534	120.5690637
<i>Eremophila capricornica</i>	2020-07-10	100	-23.3641221	120.2075849
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4980613	120.4860304
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4978596	120.4857848
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4974543	120.4840112
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4978186	120.4841251
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4998975	120.4857283
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4985949	120.4864381
<i>Eremophila capricornica</i>	2020-07-11	100	-23.49749218	120.4872231
<i>Eremophila capricornica</i>	2020-07-11	100	-23.49767651	120.4866475
<i>Eremophila capricornica</i>	2020-07-14	100	-23.42136344	120.3832222
<i>Eremophila capricornica</i>	2020-07-14	100	-23.41184805	120.3978271
<i>Eremophila capricornica</i>	2020-07-11	100	-23.49382447	120.4169607
<i>Eremophila capricornica</i>	2020-07-11	100	-23.4945042	120.416537
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3853438	120.4991815
<i>Eremophila capricornica</i>	2020-07-12	100	-23.38260505	120.5048986
<i>Eremophila capricornica</i>	2020-07-12	100	-23.38253581	120.5045127
<i>Eremophila capricornica</i>	2020-07-12	100	-23.38252997	120.5041968
<i>Eremophila capricornica</i>	2020-07-12	100	-23.38030805	120.5007056
<i>Eremophila capricornica</i>	2020-07-12	100	-23.38008955	120.5005705
<i>Eremophila capricornica</i>	2020-07-12	100	-23.37930418	120.5004397
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3798255	120.5002624
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3798889	120.4999345
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3802148	120.4996552
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3824771	120.5036912
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3813347	120.4957078
<i>Eremophila capricornica</i>	2020-07-12	100	-23.3817549	120.496079
<i>Eremophila capricornica</i>	2020-07-10	100	-23.3609109	120.2078673
<i>Eremophila capricornica</i>	2020-07-11	150	-23.4942481	120.4614236
<i>Eremophila capricornica</i>	2020-07-11	150	-23.4944265	120.4609687
<i>Eremophila capricornica</i>	2020-07-11	150	-23.4983472	120.4865487
<i>Eremophila capricornica</i>	2020-07-11	150	-23.4980213	120.4864866
<i>Eremophila capricornica</i>	2020-07-12	150	-23.3836086	120.4974119
<i>Eremophila capricornica</i>	2020-07-12	150	-23.3827409	120.5038329
<i>Eremophila capricornica</i>	2020-07-10	200	-23.3639432	120.2067454



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