

11 July 2024

Claire McGuire
Environment Manager
Warriedar Mining Pty Ltd
Level 2, 18 Richardson Street
West Perth, WA 6005

Re: Arid Bronze Azure Butterfly survey - Eureka project

Dear Claire

Terrestrial Ecosystems is pleased to provide a scope of works and fee estimate to undertake a targeted Arid Bronze Azure Butterfly (ABAB) survey for the Eureka Project (i.e. project area).

Arid Bronze Azure Butterfly

The Arid Bronze Azure Butterfly (ABAB) is associated with colonies of the ant *Camponotus terebrans* in mallee vegetation on sandy soil, often near flood plains, and the ant typically digs its nest at the base of eucalypts (Threatened Species Scientific Committee 2014). Butterfly larvae hatching from eggs laid near an ant nest entrance (often near the bases of various mallee eucalypts) are carried, by the ants, into their nest. Details of *C. terebrans* biology and of any form of herbivory by the larvae are unknown; however, it is likely that the larvae are myrmecophagous. These butterflies fly close to the ground and have been observed flying over agricultural lands near presumed breeding colonies (Williams and Williams 2008). The goldfields population was originally known from Lake Douglas, about 12kms south-west of Kalgoorlie (Field 1999), however, this population is reported to have become extinct (Williams et al. 2008, Williams and Williams 2008, Williams et al. 2018). There is an extant population in the Barbalin Nature Reserve (~11km west of Mukinbudin) in the Avon Wheatbelt (Threatened Species Scientific Committee 2014) and a more recently discovered population 40–60km north of Kalgoorlie (M. Byrne, DBCA pers comm.). There is also an additional extant population 100km from Barbalin Nature Reserve, but the DBCA has not provided its location nor direction from Barbalin Nature Reserve. There are some more recently discovered populations ~50km north of Kalgoorlie and ~20km north of Kalgoorlie near the Gidji Roaster.

Camponotus terebrans is typically only found in areas with smooth bark Eucalypts including Gimlet (*Eucalyptus salubris*) and Lake Grace Gum (*Eucalyptus loxophleba* ssp. *gratae*), but also Wheatbelt Wandoo (*E. capillosa capillosa*) and Salmon Gum (*E. salmonophloia*). At Lake Douglas, the host tree was *Eucalyptus concinna* (Field 1999, Threatened Species Scientific Committee 2014).

Williams and Williams (2008; p.8) commented that ‘Over 30 surveys have been conducted in the region by DEC staff and experienced volunteers between 1992 and 2008’ and ‘include extensive surveys between Payne’s Find and Kalgoorlie, including most of the major conservation reserves. The surveys have covered extensive parts of the region in which *O. s. petrina* might occur, but have not detected any individuals or additional populations of the butterfly’ (Williams and Williams 2008; p.8). The fact that further populations have not been located, despite the species being conspicuous, demonstrates the rarity of this butterfly and the significance of the Barbalin site.’ (Williams and Williams 2008; p.9).

Methodology

There is a low possibility that this butterfly is in the project area, as it contains multiple smooth barked trees. A survey guideline for this species has been published by DBCA and Terrestrial Ecosystems has used these guidelines as a basis for developing the field methodology.

Due to the obligate association of the ABAB with the host ant, surveys to detect this species need to consider both species. The habitat critical for the ABAB is the optimal habitat for the host ant. If the ant does not occur in a survey area, then ABAB will be absent. However, ant’s presence does not guarantee the ABAB is present,

given that only the larger colonies will support a butterfly population. A large ant colony is a strong indicator of potential presence of the Arid Bronze Azure Butterfly.

Ant survey

Ant surveys can be conducted at any time of year, although lower ant activity is lower in winter and this may reduce levels of detection, which increases the risks of regulators not approving of the methods. The optimal time to conduct ant surveys is when the ABAB is flying from mid-September to late October, however the ABAB is still active in lower numbers between late October and late April. There are two methods recommended to survey for the ants:

1. nocturnal survey – this is the most effective method; or
2. diurnal survey – slightly less effective method.

The DBCA indicates that the host ant can be detected by one sampling method or a combination of them. Due to the timing of the proposed surveys and size of the survey area, we are planning on completing diurnal ant surveys in combination with surveys for the butterfly. Ant specimens would be collected and given to the Dr Brian Heterick (WA Museum) for identification or if sufficient quality photographs can be obtained these will be used for identification. All ants will be collected live and taken to the museum the day after the survey.

The diurnal survey method will comprise of the following technique:

- after selecting a sample tree, we will use a pick to disturb the soil/bark/detritus at the base of the tree to a depth of ~10cm; and
- observe for about 20-30 seconds to see if any host ants appear, as we would expect a short delay between the disturbance and the ants appearing.

The survey guidelines (Department of Biodiversity Conservation and Attractions 2020c, a, b) provide a detailed method for determining the number of trees and spacing of trees for sampling and this is determined based on available habitat (i.e. smoothed barked eucalypt trees). There is approximately 515ha of suitable habitat that needs assessment.

Using the formula provided in the survey guidelines (Department of Biodiversity Conservation and Attractions 2020c, a, b), Terrestrial Ecosystems has determined that we will need to sample approximately 227 trees with an approximate spacing of 151m between trees. The sampled trees will be spread evenly across site in the suitable habitat.

During the field investigations the following details will be recorded for each tree:

- tree species if known (otherwise “smooth-barked eucalypt/mallee” will suffice);
- GPS location;
- tree diameter at 1.5m height; and
- ant and leafhopper presence/absence.

Butterfly survey

Adult ABABs will always be found close to the breeding areas. Because of their dependence on the host ant, areas within and around places that have high densities of the ants are a priority for surveys. Male ABABs are territorial, and they often establish small territories in open areas or along tracks so any tracks near the ant occurrences should be included in the survey area.

Surveys to detect the ABABs follow the standard butterfly walk transect method. Once the route of the transects is determined, it is investigated at a steady pace by one or more observers. Any ABABs seen to each side and ahead of the observers are recorded.

ABABs are only active in fine, warm weather and prefer sunny days with temperatures >23°C and light winds. The optimal time of day to observe them is between 10am and 3pm. Before commencing each transect survey the following details will be recorded:

- site name,
- date of survey,
- number and identify of observers,
- weather conditions – air temperature, wind speed and direction, estimate of cloudiness (% cloud cover), and

- the start and end time of transect which can be used to quantify survey effort.

At the completion of the survey the temperature, wind speed and direction and cloud cover will be recorded again.

Using the formula provided in the survey guidelines (Department of Biodiversity Conservation and Attractions 2020c, a, b), Terrestrial Ecosystems has determined that it will need to survey approximately 15.9km of transects to determine the presence of the ABAB. Because the length of the ABAB flight season is variable and adults may be sparse and difficult to detect, several repeat surveys with no ABAB sightings are needed to confirm absence of the species at a site. During the main flight period, between mid-September and late October, three repeat surveys at (at least) 2-week intervals are sufficient; between November and late April, 5 repeat surveys are needed, also at (at least) 2-week intervals. If the ABAB is detected, specimens should be photographed (where possible) to confirm their identification, and then released. At this stage only one field survey is proposed for the ABAB, however, if *C. terebrans* ants are recorded, multiple additional visits will be required. These additional visits are not part of this proposal.

The speed up the field program the work will be completed by two zoologists.

Field work

To undertake this assessment, two Terrestrial Ecosystems staff will drive from Perth, towing our ATV on a trailer, spend three days on-site searching for ants and butterflies, and drive to Perth. It is envisaged that Terrestrial Ecosystems staff will stay overnight in Kalgoorlie.

Reporting

Terrestrial Ecosystems will provide a letter report including relevant figures for review. The draft document can be provided in MS Word if this is preferred. Electronic copies of the final report incorporating comments from Red Dirt Minerals will be provided. Terrestrial Ecosystems will provide the draft report within 4 weeks of the field work and incorporate any comments or suggested changes to the draft report within one week of receiving comments.

Fee estimate

The cost to complete a single survey in October 2022, which will include an ant and butterfly survey, is \$21,735 (ex GST). Should *C. terebrans* be found in the project area, then two additional field surveys will be required focussing on butterflies. These additional surveys have not been included in this proposal.

Items	Cost (\$)
Project management (inc drug and alcohol test)	1,075
Site visit (fieldwork and travel included)	19,450
Reporting, drafting and review	1,210
Total (ex GST)	21,735

Assumptions

Terrestrial Ecosystems has made the following assumptions when preparing this proposal. If these assumptions are incorrect, then Terrestrial Ecosystems reserves the right to modify our methodology and/or cost estimates. Terrestrial Ecosystems have assumed that:

- an instant drug and alcohol test is sufficient for site access;
- accommodation and meals can be sourced in Kalgoorlie;
- no additional inductions are required for site access;
- a National Police Certificate within 6 months is valid for site access;
- we can use our ATVs and 4WD to access the areas for the assessment;
- there are no new government imposed Covid-19 restrictions that would impact on the field work;
- there are no Company imposed Covid-19 restrictions that will restrict site access or increase the field time;
- there are no significant weather events (cyclones, floods) which prohibit site access;
- the DBCA doesn't significantly alter the proposed survey methodology; and

- this scope does not include the preparation of management plans for conservation significant species, the preparation of referrals to the Commonwealth under the *EPBC Act 1999* or any additional surveys that may be recommended as part of this assessment.

Please find attached a Client Acceptance Form. By signing and returning this form you have indicated an agreement to this proposal and for Terrestrial Ecosystems to complete the work outlined above. Please do not hesitate in contacting the undersigned (0407 385 239), if you require any further information regarding this proposal.

Yours sincerely



Dr Scott Thompson
Partner and Principal Zoologist

References

- Department of Biodiversity Conservation and Attractions. 2020a. Arid bronze azure butterfly (ABAB) survey in Western Australia additional information. Perth.
- Department of Biodiversity Conservation and Attractions. 2020b. Guideline for the survey of arid bronze azure butterfly (ABAB) in Western Australia. Perth.
- Department of Biodiversity Conservation and Attractions. 2020c. Information on the arid bronze azure butterfly and it associated host ant. Perth.
- Field, R. P. 1999. A new species of *Ogyris* Angus (Lepidoptera: Lycaenidae) from southern arid Australia. *Memoirs of Museum Victoria* **57**:251-251.
- Threatened Species Scientific Committee. 2014. Conservation Advice *Ogyris subterrestris petrina* Arid bronze azure (a butterfly). Canberra.
- Williams, A., T. Gamblin, J. Richardson, M. Williams, and P. Blechynden. 2008. The critically endangered Arid Bronze Azure butterfly (*Ogyris subterrestris petrina*): progress report and recommendations for future actions. Perth.
- Williams, A. A. E., M. Williams, and R. A. Coppen. 2018. Conservation of the Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) and host sugar ant (*Camponotus terebrans*). Survey results from *Camponotus terebrans* sites GIM 01, GIM 03, GIM 09, GIM 10, GIM 11, GIM 13, GIM 14, GIM 51, GIM 63, GIM 66, and GIM 68 south of Southern Cross (2014), and from *C. terebrans* site east of Merredin., Perth.
- Williams, M. R., and A. A. E. Williams. 2008. Threats to the critically endangered Arid Bronze Azure butterfly (*Ogyris subterrestris petrina*) by proposed vegetation clearing. Perth.