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ACT Environmental Offsets (AMTECH and Jerrabomberra East) – 2017 Striped Legless Lizard Monitoring

Capital Ecology project no. 2758.

Dear Ms McInnes,

This letter provides the report for the 2017 Striped Legless Lizard *Delma impar* monitoring season at the AMTECH and Jerrabomberra East Environmental Offsets (the 'offset sites').

Introduction

The offset sites are managed by ACT Parks and Conservation (PCS) for their conservation values. Specifically, each site is known to support *D. impar*, a species listed as vulnerable pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the ACT *Nature Conservation Act 2014* (NC Act).

The presence of *D. impar* at each offset site has been determined through previous surveys and habitat assessment, and the sites have now been designated as offsets for the clearance of *D. impar* habitat elsewhere.

The 2016 monitoring season at AMTECH and Jerrabomberra East formed the baseline data for these offsets. The 2016 monitoring methodology was consistent with the ACT Government *Monitoring Guidelines for Striped Legless Lizard* (Conservation Research 2015¹), with grids containing 30 well-spaced tiles.

¹ ACT Government (2015). *Monitoring Guidelines for Striped Legless Lizard*. Conservation Research, Environment and Sustainable Development. October 2015.

The methodology for the 2017 monitoring season employed a new methodology (described in the following sections). In short, this methodology employs more grids, but with fewer tiles per grid placed closer together. This method was developed to better relate *D. impar* presence/absence to habitat characteristics.

The main objective of the current project was to provide information regarding the distribution and relative abundance of *D. impar* at the monitoring sites, as required as part of the offset arrangements. A secondary objective was to trial the new *D. impar* monitoring methodology.

The results of this project will inform PCS’ ongoing management of the offset sites with the aim of ensuring the long-term suitability of the habitat for *D. impar* and stability of the populations.

The locations of the offset sites are shown on Figure 1.

Methodology

The monitoring methodology provided to Capital Ecology for the 2017 monitoring season was developed by ACT PCS Environmental Offsets. No modifications to the methodology were made, but an additional (seventh) check of all tile grids was performed at the end of the monitoring period. The work was completed under scientific licence number LT2016891, issued by the ACT Government, with ethics approval from the Animal Care and Ethics Committee of the Secretary of the NSW Department of Industry, Skills, and Regional Development (TRIM15/2046).

Specifically, the survey employed the following methodology and scope.

Tile grids were laid out by Capital Ecology staff, with grids containing 8 tiles arranged in a square. Tiles were spaced 5 m apart, and each grid was located within a 20 x 20 m vegetation monitoring plot. The vegetation within these plots was recorded and is presented as a separate report (Capital Ecology 2018²).

Following a two week 'settling in' period, each tile was checked seven times over the monitoring period. Checks were timed to occur during optimal conditions. Before the first check, all tiles were numbered (1 to 8) with paint directly on the tile, and each grid was labelled with permanent marker on a survey flag at the NW corner of the monitoring plot. Start/finish times and weather conditions were recorded for each grid. For each *D. impar* individual or sloughed skin observed, the location (grid and tile) was recorded. All other vertebrates were also recorded to tile. Tiles will be stacked in a central location within each offset site during suitable weather conditions in February 2018.

Table 1 lists the total numbers of grids/tiles monitored for each offset site, Table 2 lists the monitoring dates for each offset site, and Table 3 provides GPS coordinates of the northwest corner of each monitoring plot at each offset site. The locations of the grids are shown on Figure 2 and Figure 3.

Table 1. Total grids and tiles per offset site

	AMTECH	Jerrabomberra East
Grids	9	15
Total number of tiles	72	120

² Capital Ecology (2018). *ACT Environmental Offsets (AMTECH and Jerrabomberra East) – 2017 Grassland Monitoring*. Prepared for ACT Government Parks and Conservation Service.

Table 2. Monitoring dates

	AMTECH	Jerrabomberra East
Check 1	13/10/2017	13/10/2017
Check 2	20/10/2017	20/10/2017
Check 3	26/10/2017	26/10/2017
Check 4	03/11/2017	03/11/2017
Check 5	07/11/2017	07/11/2017
Check 6	20/11/2017	20/11/2017
Check 7	29/11/2017	29/11/2017

Table 3. Coordinates (easting and northing, GDA, Zone 55) of NW corner of each monitoring plot

Location data removed

Results

A total of four (4) *D. impar* were sighted under two (2) tiles across the two offset sites over the course of the seven monitoring checks. All *D. impar* sightings were from two (2) grids in AMTECH (i.e. no *D. impar* were recorded at Jerrabomberra East). No skin sloughs were found at either offset site.

A breakdown of results for each offset site is provided in the following sections.

AMTECH

Table 4 provides the *D. impar* records for the 2017 monitoring season at AMTECH. *Delma impar* were recorded at Grid 8 (1 individual) and Grid 1 (3 individuals). The *D. impar* recorded at Grid 1 were all found under the same tile (Tile 8). Based on our experience with the offset site, it has deteriorated noticeably in condition over the past several years (Capital Ecology 2018). Notwithstanding this, the low *D. impar* numbers recorded this season are consistent with the low-density population recorded during previous surveys within the site (discussed below).

Non-target fauna recorded under tiles were predominantly skinks, with species including Common Dwarf Skink *Menetia greyii* (65 records), Delicate Skink *Lampropholis delicata* (8 records), and Three-toed Skink *Hemiergis decresiensis* (1 record). One Perunga Grasshopper *Perunga ochracea* was recorded in Grid 9³, and one Eastern Brown Snake *Pseudonaja textilis* was recorded between Grids 7 and 8. The total numbers of reptiles recorded at each grid over the seven checks are shown in Table 5. In general, more reptiles were found in grids located in Natural Temperate Grassland (NTG) and Native Pasture, with fewer found in Exotic Pasture.

Table 4. 2017 *Delma impar* records at AMTECH

Number of <i>D. impar</i> detected	Grid.Tile	Date	Time	Temperature (°C)	Cloud Cover (%)
1	8.3 ⁴	26/10/2017	9:40 am	16.8	> 40
2	1.8 ⁵	03/11/2017	10:00 am	18.1	> 40
1	1.8	07/11/2017	8:43 am	10.8	None

Table 5. 2017 number of reptiles detected per grid at AMTECH

Grid	Number of reptiles	Plot vegetation
AM 01	9	Native Pasture
AM 02	9	Exotic
AM 03	4	Exotic
AM 04	18	Native Pasture
AM 05	7	NTG
AM 06	9	NTG
AM 07	7	Native Pasture
AM 08	2	Exotic
AM 09	13	NTG

Jerrabomberra East

No *D. impar* were recorded during the 2017 monitoring season at Jerrabomberra East. Previous findings have indicated that *D. impar* occur at comparatively low density within Jerrabomberra East. However, the lack of sightings may indicate that the 2017 monitoring methodology requires adjustment (discussed below).

³ Canberra Nature Map - [Perunga grasshopper](#)

⁴ Canberra Nature Map - [Delma impar 1](#)

⁵ Canberra Nature Map - [Delma impar 2](#)

In comparison to AMTECH, the number of non-target fauna recorded under tiles was also low. Non-target fauna were predominantly skinks, with species including Three-toed Skink *Hemiergis decresiensis* (8 records), Delicate Skink *Lampropholis delicata* (7 records), Common Dwarf Skink *Menetia greyii* (1 record), Eastern Brown Snake *Pseudonaja textilis* (1 record), and Unidentified Skink (2 records). One Eastern Blue-tongued Lizard *Tiliqua scincoides* was recorded close to Grid 11. The total numbers of reptiles recorded at each grid over the seven checks are shown in Table 6. In contrast to AMTECH, more reptiles were found in grids located in Exotic Pasture. No reptiles were found in grids located in Native Pasture, and only two (2) were found in grids located in NTG.

Table 6. 2017 number of reptiles detected per grid at Jerrabomberra East

Grid	Number of reptiles	Plot vegetation
JE 01	0	Native Pasture
JE 02	7	Exotic
JE 03	6	Exotic
JE 04	0	Native Pasture
JE 05	0	Native Pasture
JE 06	0	NTG
JE 07	0	Native Pasture
JE 08	3	Exotic
JE 09	1	Exotic
JE 10	0	Exotic
JE 11	0	NTG
JE 12	2	NTG
JE 13	0	Exotic
JE 14	0	Native Pasture
JE 15	0	NTG

Comparison with Previous Monitoring/Survey Capture Rates

Table 7 provides a summary of the results, as well as per-site calculations of ‘capture rate’ (animals per 1000 tiles, per 10 days) (as described in ACT Government 2015⁶). Although previous surveys employed different tile survey configurations, the 2017 capture rate at AMTECH is consistent with those in 2016 and indicates that this site continues to support a broadly distributed, yet low density, *D. impar* population.

With respect to Jerrabomberra East, no *D. impar* were detected in 2017. However, this may be due to the change in methodology. Using the results from Jerrabomberra East in 2016, the number of *D. impar* we could expect to detect in 2017 (given 120 tiles checked on seven occasions) is only two (2). This is calculated by:

- Individuals detected per tile per check in 2016 = (7 Individuals / 296 tiles) / 10 checks = 0.0024

⁶ ACT Government (2015). *Monitoring Guidelines for Striped Legless Lizard*. Conservation Research, Environment and Sustainable Development. October 2015.

- Individuals expected in 2017 = $(0.0024 * 120 \text{ tiles}) * 7 \text{ checks} = 2 \text{ Individuals}$

Given the very low number of *D. impar* we could expect to detect in 2017, it is perhaps not too surprising that none were detected.

Table 6. Summary of results and capture rate calculation*

Offset Site	Year	No. of grids	No. of tiles (T)	No. of checks (C)	No. of tiles with SLL detected (N)	'Captures' per 1000 tiles per 10 days (TC) TC = $(N/T * 1000) * (10/C)$
AMTECH	2016	3	90	10	3	33
AMTECH	2017	9	72	7	2	40
Jerrabomberra East	2016	8	296	10	7	24
Jerrabomberra East	2017	15	120	7	0	0

* The 'capture rate' formula uses the number of tiles under which a *D. impar* was found, not the number of *D. impar* sightings. Therefore, we are making the assumption that a *D. impar* sighted under the same tile in subsequent weeks is the same animal, and we make no allowance for tiles supporting multiple animals (as was the case for AMTECH Grid 1 Tile 8). The formula does however allow for a simple comparison of *D. impar* 'capture' rates between sites and years. Tiles under which two animals were recorded have not been added twice. These calculations can be re-run with this information (contained in Attachment B) if desired.

Discussion

The 2017 SLL monitoring season across the ACT reported lower than expected numbers of SLL (Brett Howland (PCS), pers. comm.). This could be due to the weather conditions in 2017 (a dry winter with cold nights⁷ and warmer than average spring days⁸). However, we believe it is more likely that the low numbers we detected were due to the monitoring methodology used in 2017.

Based on the 2016 results, and the number of tiles and checks in 2017, the expected number of *D. impar* captures at each offset site in 2017 was approximately two (2) (an example calculation for Jerrabomberra East is described above). Such a low number does not leave much room for variation between seasons, or guard against simple bad luck (e.g. missing a *D. impar* sighting by 10 minutes). At AMTECH, we did indeed detect the expected number of *D. impar*. However, at Jerrabomberra East we did not detect any *D. impar*, suggesting that other aspects of the 2017 methodology may also have had an effect.

One such aspect may be differences in the total 'draw' of the grids between years. Draw refers to the distance over which a tile will attract a *D. impar*. The draw concept was first developed in the ACT by Biosis Research (2012⁹) (author R. Speirs) to estimate the population size within several large sites in the Gungahlin Valley, Majura Valley, and Jerrabomberra Valley, based on the results of surveys involving 12

⁷ Commonwealth of Australia (2017). *Australian Capital Territory in winter 2017: dry season with warm days and cool nights*. Bureau of Meteorology Seasonal Climate Summary for Canberra.

⁸ Commonwealth of Australia (2017). *Australian Capital Territory in spring 2017: warmer than average days*. Bureau of Meteorology Seasonal Climate Summary for Canberra.

⁹ Biosis Research (2012). *Striped Legless Lizard (Delma impar) Survey and Vegetation Assessment Report*. Unpublished report to the ACT Government.

weekly checks of 500 tiles per site during spring 2011. In that study the draw was set at 20 m based on the assumption that all *D. impar* within 20 metres of the standard 50 tile arrays were captured, the draw being 0.34 hectares for each tile array. In the following year EcoLogical (2012¹⁰) applied the same draw to estimate the population size within the Gungaharra, Mulanggari, and Crace grassland nature reserves. Other recent studies (Umwelt 2016¹¹) have discussed the suitability of various draw distances for *D. impar* population size estimation and the matter has been the subject of much deliberation by both ACT Government ecologists and local consulting ecologists in recent years. Our understanding is that the general consensus reached is that 20 m is likely to overestimate the draw and that 10 m is a more suitable draw. We note that the ACT Government Monitoring Guidelines for Striped Legless Lizard (ACT Government 2016) (used for the 2016 monitoring at AMTECH and Jerrabomberra East) involves grids of 30 tiles, in five rows of six. Within rows, tiles are spaced 20 m apart, and each row is separated by 25 m. This tile spacing was used in order to permit the assumption that sightings under adjacent tiles are most likely different individuals (i.e. minimum of two draw distances between tiles).

With regard to the above, working with the concept that the total draw within an offset site is directly influenced by the number of grids and spacing between the tiles within grids, if we assume that each tile has a draw of 10 metres, we can approximately calculate the total draw of a grid by adding 10 m to the outside dimensions of the grid. In 2016, each grid therefore had an approximate draw of 1.45 ha (Table 8). In comparison, due to the 5 m spacing of tiles in grids, the draw of each grid in 2017 was roughly sixteen times lower (0.09 ha).

At AMTECH, this difference was partially offset as there were three times as many grids in 2017 as compared to 2016. This still resulted in a total draw that was approx. five (5) times lower in 2017. However, as Jerrabomberra East only had double the number of grids in 2017, the total draw of all grids was approx. nine (9) times lower. Given that we only expected to detect two *D. impar* in 2017 based on the number of tiles and checks, this large reduction in total draw, and therefore reduction in the total area surveyed, may well explain the lack of *D. impar* sightings.¹²

We must note that the 2017 survey methodology was more practicable and efficient in terms of initial setup, monitoring (i.e. locating tiles in the grass), time management (i.e. ensuring all checks are completed during good-optimal conditions), and end-of-season tile removal. We also appreciate that the smaller size of grids makes it easier to determine the relationship between *D. impar* presence/absence and habitat characteristics. Accurately establishing this relationship is vital for the long-term management of *D. impar* in the ACT. We therefore recommend that future survey methodology account for the problems we have identified above, while at the same time attempting to maintain the advantages of smaller grids. This could be achieved in a number of ways, such as increasing the total number of grids per offset site, increasing the total number of checks in a survey season, or by increasing the 'draw' of each grid (i.e. increasing tile separation to at least 10 m). The most attractive of these suggestions is increasing tile separation in grids to at least 10 m. Using the 2017 methodology of eight tiles per grid, this would almost double the draw of each grid (1,600 m² compared to 900 m²), while still maintaining a small overall grid size.

¹⁰ EcoLogical (2012). *Striped Legless Lizard Surveys 2012: Gungahlin Grassland Nature Reserves*. Prepared for ACT Government, Conservation Planning and Research, Canberra.

¹¹ Umwelt (2016). *Ecological Values of CSIRO Ginninderra Research Station*. Final – September 2016.

¹² Brett Howland (PCS) also carried out *Delma impar* monitoring at Jerrabomberra East in 2017. He employed 40 grids (8 tiles, 5 metres spacing). When combined with the results presented here, we would have expected to capture 7.4 individuals (seven checks of 440 tiles). Only one *D. impar* was detected (Melita Milner (PCS), pers. comm.). Despite the large number of tiles, the total draw of all grids in Jerrabomberra East was only 4.95 ha (2.4 times lower than in 2016). These additional findings also suggest that draw is having a significant effect.

Table 8. Total 'draw' of all grids. We have assumed a draw of 10 metres for each tile, and approximately calculated the total draw of a grid by adding 10 m to the outside dimensions.

Offset Site	Year	No. of grids	No of tiles per grid	Grid spacing (Row x Column)	Approx. draw per grid (ha)	Total draw (ha)
AMTECH	2016	3	30	20 x 25	1.45	4.35
AMTECH	2017	9	8	5 x 5	0.09	0.81
Jerrabomberra East*	2016	8	37	20 x 25	1.48	11.84
Jerrabomberra East	2017	15	8	5 x 5	0.09	1.35

*Grids had 7 additional tiles placed in the SE corner, arranged in a square with 5 m intervals

We trust that this letter-report provides the information and advice required. If, however, you should have any questions relating to this letter, please do not hesitate to contact us.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Robert Speirs".

Robert Speirs

Director / Principal Ecologist

A handwritten signature in black ink, appearing to read "Sam Reid".

Dr Sam Reid

Consultant Ecologist

Attachments:

Figure 1 – Locality Plan

Figures 2 – AMTECH Monitoring Grids

Figure 3 – Jerrabomberra East Monitoring Grids

Attachment A – Photo Plates

Attachment B – PCS Spreadsheet of Results (separate file)

Attachment C – GIS files (separate files)

Figure 1 – Offset Site Locations

Figure 2 – AMTECH Monitoring Grids

Figure removed to protect sensitive species location information

Figure 3 – Jerrabomberra East Monitoring Grids

Figure removed to protect sensitive species location information

Attachment A – Photo Plates

Plate 1. Distinctly marked Striped Legless Lizard *Delma impar* under tile at AMTECH.



Plate 2. Perunga Grasshopper *Perunga ochracea* under tile at AMTECH.





Plate 3. Juvenile Eastern Brown Snake *Pseudonaja textilis* under tile at Jerrabomberra East.

Attachment B – PCS Spreadsheet of Results (separate Microsoft Excel file)

Attachment C – GIS files (separate folder of GIS Shapefiles)