Optimising field surveys and exploring habitat associations of the carpentarian false antechinus, *Pseudantechinus mimulus* in the Selwyn Range, north-western Queensland.

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Cover Image: A *P. mimulus* individual captured on trail camera within the Mt Elliot study area. Daytime activity was frequently recorded on the trail cameras during Winter, but was not observed after July.

Contents

Executive Summary

- Camera trap surveys were undertaken at 218 sites, consisting of 362 camera survey points. *P. mimulus* were detected at 44 of these. Excluding the 39 non-rocky sites (which results below suggest aren't habitat for *P. mimulus*), the detection histories pooled for each site result in an overall occupancy estimate of 0.3761, S.E= 0.0554, and 95%CI = 0.2751 - 0.4890, or greater than a third of all sites were occupied by the species.
- This study suggests that *P. mimulus* is confined to rocky habitats in the study area. No *P. mimulus* were detected in 39 non-rocky habitats.
- *P. mimulus* presence at a site is predicted by the occurrence of massive rock features including boulders, outcrops, rubble, and scarps, and vegetation type.
- Factors that don't predict the species presence are lithology, landform (i.e. different types of massive rock formation), aspect, or % ground cover of rock, gravel, soil, grass or leaf litter.
- Variants of the universal bait mixture (peanut butter, rolled oats) incorporating sardine and honey do not increase the probability of detecting *P. mimulus* over standard peanut butter and rolled oats mix.
- The detectability of *P. mimulus* changed significantly over the six months that we surveyed the area, from late Autumn to Spring. Detectability was high in May and June, and dropped to very low levels in August and September.
- During a period of low detectability and site occupancy (September 2013), Elliott and camera trapping at the same sites, using the same baits and deployment lengths did not produce significantly different detection or occupancy estimates.
- There is evidence that *P. mimulus* is tolerant of fire but insufficient site controls are in place to explore this statistically.
- The discovery of *P. mimulus* in a waste rock dump during preliminary survey was not replicated despite searching that area with trail cameras and Elliot traps during this current study, and therefore the suitability of this 'habitat' type to support resident populations of *P. mimulus* cannot be assessed.

Recommendations for optimum survey of *P. mimulus* include;

- Surveys aimed at detecting *P. mimulus* should ideally be conducted during May-July and not be conducted during August –October as detection probability is very low at this time. If it is necessary to undertake August-October surveys, an increased survey effort (number of cameras per site and number of nights deployed) will be required. Occupancy modelling suggests that using two camera traps deployed as per this study, surveys to detect *P. mimulus* presence/absence during August-October with 80% confidence will need to be undertaken over 154 nights at a site. This is clearly impractical and nonsensical, given the fact that detection rates likely change over periods shorter than this. Unfortunately, we don't have detection data for greater that two cameras per site during August-October, and so we cannot model the minimum survey effort required to confidently attribute absence from a site during these months.

- We have insufficient data to provide estimates of the search effort required to confidently attribute absence during August-October, using greater than two cameras per site.
- We cannot make specific recommendations regarding the suitability of November – April for *P. mimulus* surveys, as we didn't undertake surveys during this time.
- Any of the three peanut butter bait mixes used here can be used in conjunction with trail cameras to detect *P. mimulus*. However, we recommend the sweet mixture, which we feel provides more supplementary energy for foraging *P. mimulus*.
- Use trail cameras in preference to Elliot traps to detect *P. mimulus*. At worst, an array of two trail cameras spaced 60-m-apart, are as effective as a transect of 10 Elliot traps spaced 10-m-apart, but require much lower effort to set and maintain.
- There is no difference in effectiveness of a single trail camera compared to two trail cameras per site. Data from one month (May) suggests that using more than two trail cameras generates much higher detection probabilities and much higher confidence in survey results for a shorter period of survey.
- Using one or two trail cameras over seven nights during May-July will deliver very high confidence (95% or higher), in attributed absences of *P. mimulus* from a site.
- Targeted research which would assist interpretation of *P. mimulus* survey data includes;
    - Repeated sampling of sites throughout the year to better determine seasonal changes in detectability of *P.mimulus*;
    - Repeated sampling using trail cameras and Elliot traps to compare the relative effectiveness of each method, at different times of the year;
    - Studies of spatial ecology (radio-tracking or RFID systems) would enable better interpretation of the presence/absence and habitat utilisation data obtained during *P. mimulus* surveys.

Recommendations for habitat management

- Our modelling suggests that *P. mimulus* occurs within all massive rock types in the study area, however those sites supporting low woodland to open forest of *Acacia shirleyi* (Lancewood) (RE1.11.2x2a) are significantly more likely to be occupied by *P. mimulus*.
- The above does not mean that other vegetation types on rock are not also important habitats for *P. mimulus*.
- These habitat associations suggest those activities which permanently remove outcropping rock or vegetation (especially RE 1.11.2x2a *Acacia shirleyi* low open woodland) will impact on habitat suitability for *P. mimulus*.
- There is some evidence that *P. mimulus* populations can tolerate burning of their habitat, but this requires targeted investigation prior to implementation of burn plans.
- We are unable to comment on the suitability of rock waste dumps as habitat for resident *P. mimulus*, however it is recommended where possible to include suitable rock habitat development targeted at *P. mimulus* in mine rehabilitation programs and to monitor the use if these by *P. mimulus*.
- Targeted research to help identify and manage *P. mimulus* habitat includes
    - Research listed above to refine deployment and interpretation of survey results;
    - Further surveys throughout the potential range of *P. mimulus* in north western Queensland;

- Targeted surveys and/or manipulative experiments to investigate responses of *P. mimulus* populations to fire;
- Targeted surveys and/or manipulative experiments to investigate the utilisation artificial habitats by *P. mimulus*.

Introduction

The Vulnerable (EPBC Act 1999) carpentarian false antechinus, *Pseudantechinus mimulus* is one of Australia's rarest mammals. Until 2012, only 10 individuals had ever been captured (Lloyd *et al.* 2013). These limited data suggest that the species distribution is centred on the Mt Isa/Cloncurry area however the distribution and occurrence of the species within this distribution range is purely speculative. All captures prior to this study have been made in rocky habitats (Lloyd *et al.* 2013) using Elliot live traps, suggesting that this is the preferred habitat of *P. mimulus.* However a strict association with rock is not certain, due to the very small number of observations made. Further, the paucity of records precludes the identification of particular microhabitat conditions such as geology, landform or vegetation parameters that may influence *P. mimulus* habitat within these rocky habitats.

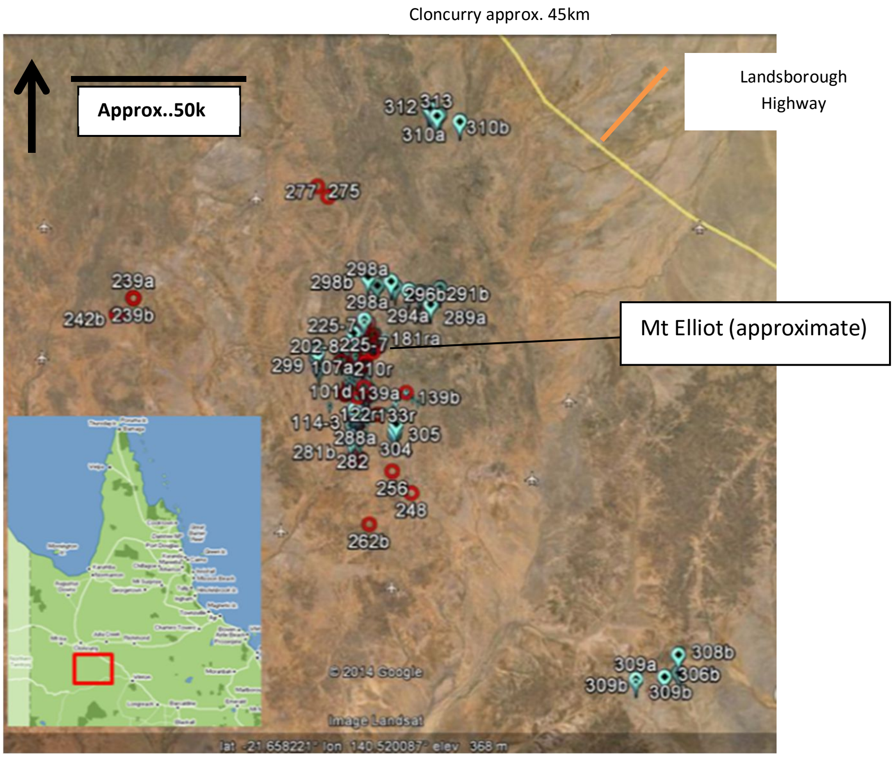
Continuing and new mining activity in the Cloncurry area, and legislative requirements to understand the impacts of this activity on the distribution and habitat of *P. mimulus* require that knew knowledge is gathered. In order to better gather this information, especially in light of the apparently low detectability of the species, it is necessary to explore how to optimise presence surveys for *P. mimulus*.

In this study we therefore use an occupancy modelling approach to explore which features of survey design increase the probability of detecting *P. mimulus* when it occurs at a site (i.e. detection probability). We test different baits, 'trap' types and trap deployments and develop a list of recommendations for optimal detection of *P. mimulus*. We also use the presence/absence data collected, and measured site habitat factors explore the habitat preferences of *P. mimulus*.

Study Area and Methods

Study area

This study was conducted in the Mt Elliott area of the Selwyn Range, approximately 100km south of Cloncurry, in north-western Queensland. Survey activity was conducted at 238 sites (Map A). A site consisted of a 90-m-long transect on which either 10 Elliot traps, spaced 10-m-apart, or a variable number of trail cameras (between 1 and 4) were deployed.



Map A. Mt Elliot study area, approximately 100km south of Cloncurry. Red donuts indicate sites where *P. mimulus* was detected, blue pins represent sites where no *P. mimulus* were detected. Site numbers correspond to site numbers in Appendix A.

Camera trapping

Camera trapping was the primary method used to collect the site occupancy data for *P. mimulus* required to conduct the comparisons listed below.

We collected these data using a pool of 38, Reconnyx HG550V trail cameras which we set at 218 sites (and 362 unique camera survey points or subsites) (Appendix A) from 09/05/2013 - 25/10/2013. Each camera was set to rapid-fire mode (5 pictures taken in rapid succession for each movement detected), on their highest sensitivity setting. At each subsite, a single camera was mounted on a tripod approximately 1 m from the bait, of which approximately 100g was smeared onto rock faces within the camera capture zone.

Cameras were set at each site for between five and 12 consecutive days/nights (Appendix A). All captured images were visually checked for *P. mimulus* which were identified by the combination of pointed snout, large ears, rock hugging posture, incrassated tail, small size (e.g. cover picture).

Other animals identified from the camera trap photos were also noted for each site.

Elliot trapping

Elliot trapping was only used when we were specifically investigating the relative performance of Elliot and trail cameras to detect *P. mimulus* at a site (see below Optimising detection of *P. mimulus*).

At each site where Elliott traps were used, we used an approximately contour-hugging transect of 10 Elliot traps, spaced 10-m-apart. All traps were baited with a mixture of oats, peanut butter and honey which was refreshed daily by the addition of a small amount of new bait. The traps were operated for 4 consecutive nights at each site; checked each morning within 2 hours of sunrise, closed during the day and re-set in the late afternoon prior to sunset.

The habitat associations of *P. mimulus*

Rocky vs non-rock habitats

At commencement of this project, we undertook trail camera sampling in both rocky and non-rocky habitats in order to validate the assumption (e.g. Johnson *et al.* 2008), that *P. mimulus* is only found in rocky habitats. This was achieved by simultaneously camera trapping in 39 rocky sites and 39 non-rocky sites. Non-rocky sites were typically *Triodia* flats located in the valleys (e.g. Fig 1a), while rocky sites were any type of habitat exhibiting massive rock outcropping (e.g. Fig.1b). We used the occupancy and detection probability output from program Presence (Hines 2006, http://www.mbr-pwrc.usgs.gov/software/doc/presence/presence_doc.html); to identify the point at which sufficient non-rocky sites had been surveyed to be 80% certain that *P. mimulus* really wasn't present at those sites using the formula;

$$\text{Power} = 1 - \{1 - P[1 - (1 - p)^m]\}^n = 1 - \{1 - Pp'\}^n \text{ (Stauffer } et\ al. \text{ 2002)}$$

Where P is the occupancy estimate, p is the probability of detection (the likelihood of observing the species in a site when it does occur there), m is the number of samples in each site (i.e. number of nights of survey), and n is the number of sites sampled.

Fig. 1a. Example of a non-rocky site (Site 115). These were defined by distance greater than 300m to nearest massive rock outcropping and included sites with stony or pebbly substrate.

Fig. 1b. Example of a rocky site (Site 152). These sites were characterised by massive rock outcrops, boulders, rubble or scarp lines.

Site parameterisation

In order to explore relationships between *P. mimulus* presence/absence and features of each site, we parameterised the biotic and abiotic environment at seventy-five sites using the following categorical variables:

1. Landform type:
   i. Boulder outcrop/pile
   ii. Ridge
   iii. Scarp
   iv. Rubble
   v. Artificial
2. Lithology of rock unit:
   vi. Sedimentary
   vii. Metamorphic
   viii. Igneous
3. Aspect (N, NE, E, SE, S, SW, W, NW)
4. Rock cavity index (0-5)
5. Ground cover % (Grass, Rock, Gravel, Soil, Leaf litter)
6. Regional Ecosystem (RE) classification

Lithology was grouped into three broad categories as above. This represents a simplification of the 47 different rock units observed at each of the survey sites (Appendix B).

Site aspect was divided into 8 categories (N, NE, E, SE, S, SW, W, NW). Sites at which multiple aspects were represented within 25 m of a site's camera trap, e.g. for sites close to a ridgeline, were represented by a combination of two or more of the above terms.

A rock cavity index rating between 0 and 5 was attributed to each site. A rating of 1 represents no rock cavities present (for example a colluvial slope consisting of pebbles only), and a rating of 5 representing maximum saturation of rock cavities (e.g. Deep loose rock piles at the base of cliffs with numerous crevices).

Ground cover percentages for each site were derived by averaging survey values from 5 quadrats, each measuring 1.7 x 2.2 m (3.74 m2). A central quadrat was chosen as close as possible to camera trap location and the remaining four quadrats positioned 25 m out from the centre in the four cardinal compass directions (as measured with a hand-held GPS). Percentage cover estimates of (i) grass, (ii) rock, (iii) gravel, (iv) soil and (v) litter were calculated for each quadrat from photographs taken of each quadrat during or immediately after the camera trapping session.

At each subsite, all **flora species** within a 50 m radius of camera trap location were identified. This species list, combined with site geology, was then used to attribute a Regional Ecosystem (RE) category based on the Queensland Herbarium Regional Ecosystem Description Database (REDD) Version 7.1 (2013) downloaded from the Department of Environment and Heritage Protection website (http://www.ehp.qld.gov.au/ecosystems/biodiversity/regional-ecosystems/how_to_download_redd.html).

Optimising detection of *P. mimulus*

In seeking to optimise the detection of *P. mimulus*, we tested the comparative performance (in terms of the detection probability of *P. mimulus*) of;

i. three bait types
ii. two detection methods- elliot trapping and camera trapping;
iii. various numbers (1, 2 and >2 (i.e.3-5)) of trail cameras per site

Comparing baits

We compared the detection probability of *P. mimulus* when trail cameras were baited with one of three bait types;

a. a peanut butter, rolled oats, honey and anchovies mix at 55 sites;
b. a peanut butter, rolled oats, honey mix at 37 sites;
c. standard peanut butter and rolled oats mix at 56 sites.

As our goal to improve the survey methods used during this study, we only conducted this trial during the initial stages of our survey, from 9/5 – 19/6/13.

Comparing performance of trail cameras and Elliot traps

In order to compare the effectiveness of camera trapping versus Elliott trapping in detecting *P. mimulus*, 20 comparison sites were selected across the core study area where camera trapping surveys had previously detected the species. At each of these sites, Elliot traps were deployed between 10/09/2013 and 19/09/2013, as above.

All captured animals were marked prior to release by clipping their toe-nail and/or clipping their forehead fur. In addition, captured *P. mimulus* were weighed, head-body, tail length, ear and pes measurements recorded, and females were checked for any pouch young.

Camera trapping at the 20 comparison sites was undertaken following Elliot trapping between 19/09/2013 and 25/10/2013. At each site, two camera traps placed at 15m and 75m along the 90-m-long transect, and using the same bait used in the Elliot traps, were set for 12 consecutive nights. This second round of camera trapping occurred between 5 and 20 days following the completion of Elliott trapping at each site.

Statistical analyses

Habitat associations

We searched for significant relationships between environmental factors and presence and absence of *P. mimulus* using occupancy modelling and generalised linear modelling.

Occupancy modelling was conducted using single group, constant detection models in program Presence (Hines 2006) to calculate and compare occupancy of *P. mimulus* within a 39 non-rocky and the first 39 rocky sites sampled during May and June 2013 (Appendix A). At each site, daily *P. mimulus* presence and absence data were pooled across all cameras to create a single capture history for each site.

Generalised linear and generalised linear mixed models were used to identify measured environmental features which have a significant effect on predicting the presence/absence of *P. mimulus*. Data for each camera location were used in these analyses.

Generalised linear modelling was undertaken in a three step process;

Step 1. Test broad factors – (Factors 1-6 under *Site parameterisation* above), for influence on *P. mimulus* presence/absence. These tests for habitat associations of *P. mimulus* were conducted using the packages *lme4*, *nlme* and *MASS* within the R statistical environment v3.0.2 (R core team 2013). To identify general environmental variables associated with *P. mimulus* occurrence (e.g. site lithology), generalized linear models (GLM) were fit to the data, where presence/absence was treated as a binary response variable and each environmental variable as a single factor;

Step 2. Apply GLMM and a model simplification process to identify significant factors within the broad groups (identified from Step 1). GLMMs include a linear mixed model (to consider random effects) and a generalized linear model, which accounts for non-normal data distributions and binary response variables (i.e. presence/absence) (Bolker *et al.* 2009).

Month of detection was treated as a random effect when fitting each GLMM, as it was shown to be a significant factor during step 1. Model simplification analysis was conducted on the GLMMs using the R function *drop1*, which incorporated a *chi-square* test argument type. The *drop1* package identifies factors, that if removed, will significantly affect model fit and consequently, insignificant factors were removed manually from the GLMM, producing the minimum adequate model for environmental variables. Environmental variables identified by the minimum adequate model were standardized (standardized by mean) to prevent scaling issues when fitting the GLMM to further investigate habitat relationships (Step 3 below).

Correlation coefficients between environmental variables were produced when fitting GLMMs and none resulted in $r > 0.5$. Therefore, the factors were not deemed auto-correlated (e.g. Dormann *et al*. 2013), and all were included in initial model iterations.

Step 3. Search for the source of significance within each significant factor (identified in Step 2) by applying an individual GLM to each. In order to identify specific habitat types utilized by *P. mimulus* within significant broad environmental variables, individual GLMs were fit to data where *P. mimulus* presence/absence was treated as a binomial response variable, and specific habitat types (e.g. sedimentary or igneous substrate within lithology) were factors.

Optimising survey method

The program PRESENCE version 6.1 (Hines, 2006) was used for occupancy modelling of the Elliott and camera data for *P. mimulus*. Occupancy modelling takes presence/absence data from surveys and calculates both the estimated site occupancy and detection probability. We used these, (especially detection probability, which is the modelled chance of detecting a *P. mimulus* when it is present at a site), to compare the effectiveness of various sampling styles and to generate statistics about the power of the sample style. We used single-season, constant detection rate p(.). models in all tests.

Optimum survey methods were identified as those which returned the highest detectability of *P. mimulus*.

Because GLM (below) and Occupancy modelling showed a significant effect of month of year on detection probability (see Results), all tests for optimisation of search effort were conducted on a month by month basis.

To summarise the results of the comparison of different survey methods (Elliot and trail camera) the power of the design to detect each species when present was determined using the formula of Stauffer *et al*. (2002);

$$\text{power}_{\text{region}} = 1 - \{1 - P[1 - (1 - p)^m]\}^n = 1 - \{1 - Pp'\}^n.$$

Where P is the occupancy estimate (proportion of sites in the RE where the species occurs), p is the probability of detection (the likelihood of observing the species in a site when it does occur there), m is the number of samples in each site (number of trap nights), and n is the number of sites in the RE.

We also tested for the minimum number of nights required to achieve 80%,90% and 95% confidence in the validity of sampled absence of P. mimulus using the formula of Kery (2002);

$$N = \frac{\text{Log}_{10}\left(1 - \frac{a}{100}\right)}{\text{Log}_{10}(1 - p)},$$

Where N= number of survey nights required to attribute absence of *P. mimulus* from a site, a = the desired level of confidence (80%, 90%, or 95% in this case) and p = the detection probability.

Results

General results

Two-hundred and eighteen sites, consisting of 362 camera survey points were surveyed during this study, resulting in 247 detections of *P. mimulus* at 44 of these sites. Excluding the 39 non-rocky sites (which results below suggest aren't habitat for *P. mimulus*), and pooling the detection histories for each site resulted in an overall occupancy estimate of 0.3761, S.E= 0.0554, and 95%CI = 0.2751 - 0.4890. In other words, based in imperfect detection it is estimated that *P. mimulus* occupied 37.61% of sites surveyed.

Environment relationships of *P. mimulus*

Rocky vs non-rocky sites

This study suggests that *P. mimulus* is confined to rocky habitats in the study area. No *P. mimulus* were detected in 39 non-rocky habitats. At the same time the estimated occupancy at 39 rocky sites was 0.2583 (S.E =0.0704). Interestingly, despite this dependence on rock habitat, the presence/absence of *P. mimulus* at a site is not predicted by any of the rock variables; lithology (metamorphic, sedimentary or igneous; p=0.756), landform (boulder, scarp, ridge etc.; p=0.556), % rock ground cover (p=0.782), or an index of cavity size and number (p=0.099).

Other relationships between environment and presence/absence of *P. mimulus*

Pseudantechinus mimulus were detected in 15 Regional Ecosystem (RE) types during this survey (Appendix C). All of these REs are associated with rocky or range landforms.

GLM indicates that month is a predictor of *P. mimulus* occurrence (p=0.0148) and therefore month was treated as a random factor in subsequent mixed effects models (GLMM). These indicate that the presence of *P. mimulus* has a weak significant link with regional ecosystem (RE) type (p= 0.0282). Within RE type, independent GLMs detected a weak significant link between vegetation type RE1.11.2 x 2a (p=0.0165) and *P. mimulus* presence. No other RE types demonstrated a significant effect on *P. mimulus* presence.

There is no support for a significant influence of aspect (p=0.767), or % ground cover of soil (p=0.8694), gravel (p=0.984), grass (p=0.448) or leaf litter cover (p=0.9443).

P. mimulus and disturbance

This study was not designed to explicitly explore the impacts of disturbance on *P. mimulus* presence, however some observations on the presence of the species at 18 burnt sites, and two waste rock dumps can be made.

Fire

Eighteen sites were located in country that had burnt within the past 2 years. Nine sites had burnt within the past 6 months (e.g. Site Fig. 2a), and *P. mimulus* was detected in four (44%) of these. A further nine sites were located in country that had burnt approximately two years previously (Fig 2b). Three (33%) of these sites were occupied by *P. mimulus* during this study.

Fig. 2a. Site 199 burnt approximately 6 months prior to our surveys there in June/July 2013. This site was occupied by *P. mimulus*.

Fig 2b. Site 225 burnt approximately two years prior to our surveys. A succession of below average wet seasons has resulted in very little regrowth during that time. *P. mimulus* occupied this site during our surveys there in June/July 2013.

Artificial habitats

Two waste rock dump sites were surveyed by Chinova staff in early 2013. A *P. mimulus* was found at one of these sites (Site 35, Fig. 3), at that time. One of these sites (Site 35) was resurveyed by us in September 2013, using a two camera deployment and a transect of 10 Elliot traps. No *P. mimulus* were detected.

Fig. 3. The waste rock dump, Site 35, where a *P. mimulus* was detected on trail camera by Chinova staff in early 2013. No *P. mimulus* were found here during follow-up survey in September 2013.

Optimising detectability of *P. mimulus*

Month and detectability of *P. mimulus*

At the site level, camera trap data reveal that the probability of detecting *P. mimulus* at sites where it was present was approximately 50% during May and June (Table 1). This dropped (although there is insufficient evidence to suggest whether this is statistically significant), to approximately 33% in July, and was significantly lower in August (4%) and September and October (no *P. mimulus* detected) (Table 1).

Month of year	Detection probability estimate	S.E	95%CI	AIC	No Parameters	N
May	0.5032	0.0347	0.4356 - 0.5706	363.5659	2	45
June	0.5064	0.046	0.4161 - 0.5963	219.0382	2	49
July	0.3306	0.0524	0.2370 - 0.4400	149.3814	2	44
August	0.0416	0.0391	0.0063 - 0.2290	55.6695	2	30
September	n/a	n/a	n/a	n/a	2	11
October	n/a	n/a	n/a	n/a	2	9

Table 1. Summary of detection probability (p) estimates produced by occupancy modelling using program Presence, in each of the six months during which trail camera-based surveys were carried out during this study. No *P. mimulus* were detected at the small number of sites surveyed during September and October, hence detection probabilities couldn't be estimated. S.E is standard error around each estimate; 95%CI is the 95% confidence interval around each estimate; AIC is Akaike's Information Criterion; N is the number of camera sites sampled.

Resampled sites provide further evidence for seasonal change in detectability of *P. mimulus*

Further evidence for a decrease in detectability of *P. mimulus* from Autumn-early Winter to Spring is evident in 20 sites which were sampled twice during 2013; once during Winter and again during Spring. The detection probability values produced for the Spring sample are less than half those of the Winter sample, and each estimate is bounded by non-overlapping 95% confidence intervals indicating significant difference (Table 2).

Sample occasion	Detection probability estimate	S.E	95%CI	AIC	No Parameters	N
T1 (Winter)	0.4864	0.0366	0.4154 - 0.5580	270.9265	2	20
T2 (Spring)	0.206	0.053700	0.1200 - 0.3304	99.5041	2	20

Table 2. Summary of detection probability (p) estimates produced by occupancy modelling using program Presence, during initial and repeated surveys at 20 sampling sites in the Mt Elliot area. S.E is standard error around each estimate; 95%CI is the 95% confidence interval around each estimate; AIC is Akaike's Information Criterion; N is the number of camera sites sampled, and power is the power of each method to accurate detect the absence of *P. mimulus*.

Bait type and detectability

Detection probabilities are similar irrespective of bait used. Standard error ranges indicate that there is no significant difference in the performance of sweet and standard bait, or between sweet and fish bait. There is insufficient evidence to indicate whether fish-added bait performs better than standard bait (Table 3). The overlapping 95% confidence intervals around each estimate do not provide any evidence either way (Table 3).

Method	Detection probability estimate	S.E.	95%CI	AIC	N
Peanut butter rolled oats, fish and honey	0.3282	0.0335	0.2661 - 0.3969	345.2849	55
Peanut butter rolled oats	0.4458	0.0425	0.3647 - 0.5299	261.2777	56
Peanut butter rolled oats, honey	0.355	0.1436	0.1387 - 0.6531	44.2174	37

Table 3. Summary of detection probability (p) estimates produced by occupancy modelling using program Presence, for each of the three baits used during this study, and two model parameters Psi and p. S.E is standard error around each estimate; 95%CI is the 95% confidence interval around each estimate; AIC is Akaike's Information Criterion; N is the number of camera sites sampled.

Trap type and detectability

There was no significant difference in detection probability of *P. mimulus* at any of the sites at which multiple methods were used during September (Table 4). Extending camera trapping to 12 consecutive nights didn't improve detection probabilities. The power of all methods was very high, that is to say, if over 20 sites you found no *P. mimulus* using any of these methods at this time of year, you could be almost certain that the species didn't occur there.

Method	Occupancy estimate	S.E.	95%CI	Detection probability estimate	S.E.	95%CI	AIC	N	power
camera trap 12 consecutive days	0.3201	0.1107	0.1480-0.5606	0.206	0.0537	0.1200-0.3304	99.5041	20	0.912
camera trap 4 consecutive days	0.3953	0.2141	0.1015-0.7910	0.2213	0.1268	0.0630 - 0.5458	49.5283	20	0.999
Elliot trap 4 consecutive days	0.5278	0.2856	0.1058-0.9135	0.1895	0.112	0.0530 - 0.4939	54.9941	20	0.999

Table 4. Summary of detection probability (p) estimates produced by occupancy modelling using program Presence, for each of the three baits used during this study, and two model parameters Psi and p. S.E is standard error around each estimate; 95%CI is the 95% confidence interval around each estimate; AIC is Akaike's Information Criterion; N is the number of camera sites sampled, and power is the power of each method to accurate detect the absence of *P. mimulus*.

How many nights of survey are required to be confident that *P. mimulus* is absent from a site?

Due to the confounding influence of month on detection of *P. mimulus* (Tables 1 and 2), the relative performance of different numbers of cameras deployed at a site are compared on a month by month basis below (Table 5). The detection probabilities returned by having one or two trail cameras deployed per site are similar, and the overlapping standard errors in all pairwise comparison per month reveal that these are not significantly different in any case. The one month in which several deployments of greater than two trail cameras was undertaken (May), reveals a much greater probability of detecting *P. mimulus*.

The number of nights of survey required for each level of confidence (80, 90, 95%) that *P. mimulus* is truly absent from that site is similar irrespective of whether 1 or 2 trail cameras are set, and for May – July surveys, indicate that our level of sampling was sufficient for greater than 90% confidence in our occupancy-based results throughout this study (Table 5). Irrespective of whether one or two cameras are deployed, a very high confidence (>95%) can be achieved with a deployment of between 4 and 7 days. Note the very large number of days required to sample sites in August in order to achieve even modest confidence of 80%.

The deployment of greater than 2 cameras (in this case anywhere between 3 and 5 cameras) per site greatly decreases the number of nights over which sampling is required to obtain the minimum acceptable confidence (i.e. 80%)(Table 5).

							No. nights for level of confidence		
Month	**No. cameras /site**	**p**	**SE**	**95%CI**	**AIC**	**N**	**80%**	**90%**	**95%**
May	1	0.3792	0.0456	0.2948-0.4717	227.6134	67	3	4	6
May	2	0.3555	0.2494	0.0613-0.8232	13.3094	2	4	4	7
May	>2	0.6986	0.0537	0.5844-0.7926	102.8897	9	1	2	2
June	1	0.5184	0.0481	0.4246-0.611	192.8675	35	2	3	4
June	2	0.3602	0.1742	0.1134-0.7125	29.6718	18	4	4	7
July	1	0.3306	0.08	0.1956-0.5009	67.5932	23	4	5	7
July	2	0.3306	0.0693	0.2109-0.4772	85.4923	21	4	5	7
Aug	1	0.0083	0.0083	0.0012-0.0567	15.5666	10	193	228	359
Aug	2	0.0104	0.0073	0.0026-0.0407	26.2365	16	154	181	287

Table 5. Detection probability estimates, their standard errors (S.E.) and 95% confidence intervals (95%CI) and Akaike's Information Criterion value (AIC), for surveys undertaken with different numbers of cameras during each month. N is the numbers of sites that were surveyed in each month using each number of trail cameras. No. nights for level of confidence lists the number of nights required to sample in that month, for each number of trail cameras per site, to be 80%, 90% or 90% confident that lack of *P. mimulus* captures reflects true absence from that site.

Discussion

This project provides important new information on the distribution and habitats of the carpentarian false antechinus, *Pseudantechinus mimulus*. We have approximately quadrupled the number of sites from which the species is known and revealed new information regarding its preferred habitats. We have also been able to retrospectively analyse our survey data to make suggestions about how to optimise future surveys for the species.

It must be born in mind that given the strong influence of month of year described above, and the fact that our study only occurred during the six months from May – October, caution should be applied to extrapolating these results to other times of the year. Similarly, this study occurred during a single year (and following two below-average wet seasons), and so the conditions at the time might be considered atypical, especially with regards to the significant decline in detectability of *P. mimulus* into Spring. This decline could reflect a true change in the population, perhaps reflecting an annual pattern of die-off of adults, a population decline caused by some resource collapse caused by the long drought during which this project was undertaken, or a behavioural change in individuals in relation to the reproductive or some other annual cycle, which renders individuals less detectable due to changes in activity or increases in timidity.

This study provides a glimpse into the ability of *P. mimulus* to tolerate disturbance of its habitat. The occupation of 7/18 burnt sites by the species, all of which had been virtually denuded of vegetation for greater than 6 months (and half of the sites greater than 2 years) suggests that the species may be able to tolerate low vegetative cover over an extended period. It is possible that the physical structure of the rocks in which *P. mimulus* live buffers the effects of exposure to the elements and predators that vegetation would normally provide to small mammals and importantly their invertebrate prey. The incrassated tail of *P. mimulus* no doubt provides some buffering against a shortage of prey, but this alone could not explain the apparent persistence of the species in sites that have been denuded for 2 years or more. Alternatively, *P. mimulus* may be a highly mobile animal with individuals roaming from rock outcrop to outcrop, and their presence at any site may not indicate the presence of a permanent population there. There is no information on the spatial ecology of the species to test this idea.

Possible high mobility and therefore transient nature of individual *P. mimulus* may also explain the presence of the species in a rock waste dump by Chinova staff prior to this study. With only two such sites sampled during the current study, and no *P. mimulus* detected, it is impossible to draw any conclusions as to the regularity or significance of this finding.

Recommendations for optimum survey of *P. mimulus* include;

- Surveys aimed at detecting *P. mimulus* should ideally be conducted during May-July and not be conducted during August –October as detection probability is very low at this time. If it is necessary to undertake August-October surveys, an increased survey effort (number of cameras per site and number of nights deployed) will be required. Occupancy modelling suggests that using two camera traps deployed as per this study, surveys to detect *P. mimulus* presence/absence during August-October with 80% confidence will need to be undertaken over 154 nights at a site. This is clearly impractical and nonsensical, given the fact that detection rates likely change over periods shorter than this. Unfortunately, we don't have detection data for greater that two cameras per site during August-October, and so we cannot model the minimum survey effort required to confidently attribute absence from a site during these months.

- We have insufficient data to provide estimates of the search effort required to confidently attribute absence during August-October, using greater than two cameras per site.
- We cannot make specific recommendations regarding the suitability of November – April for *P. mimulus* surveys, as we didn't undertake surveys during this time.
- Any of the three peanut butter bait mixes used here can be used in conjunction with trail cameras to detect *P. mimulus*. However, we recommend the sweet mixture, which we feel provides more supplementary energy for foraging *P. mimulus*.
- Use trail cameras in preference to Elliot traps to detect *P. mimulus*. At worst, an array of two trail cameras spaced 60-m-apart, are as effective as a transect of 10 Elliot traps spaced 10-m-apart, but require much lower effort to set and maintain.
- There is no difference in effectiveness of a single trail camera compared to two trail cameras per site. Data from one month (May) suggests that using more than two trail cameras generates much higher detection probabilities and much higher confidence in survey results for a shorter period of survey.
- Using one or two trail cameras over seven nights during May-July will deliver very high confidence (95% or higher), in attributed absences of *P. mimulus* from a site.
- Targeted research which would assist interpretation of *P. mimulus* survey data includes;
    - Repeated sampling of sites throughout the year to better determine seasonal changes in detectability of *P.mimulus*;
    - Repeated sampling using trail cameras and Elliot traps to compare the relative effectiveness of each method, at different times of the year;
    - Studies of spatial ecology (radio-tracking or RFID systems) would enable better interpretation of the presence/absence and habitat utilisation data obtained during *P. mimulus* surveys.

Recommendations for habitat management

- Our modelling suggests that *P. mimulus* occurs within all massive rock types in the study area, however those sites supporting low woodland to open forest of *Acacia shirleyi* (Lancewood) (RE1.11.2x2a) are significantly more likely to be occupied by *P. mimulus*.
- The above does not mean that other vegetation types on rock are not also important habitats for *P. mimulus*.
- These habitat associations suggest those activities which permanently remove outcropping rock or vegetation (especially RE 1.11.2x2a *Acacia shirleyi* low open woodland) will impact on habitat suitability for *P. mimulus*.
- There is some evidence that *P. mimulus* populations can tolerate burning of their habitat, but this requires targeted investigation prior to implementation of burn plans.
- We are unable to comment on the suitability of rock waste dumps as habitat for resident *P. mimulus*, however it is recommended where possible to include suitable rock habitat development targeted at *P. mimulus* in mine rehabilitation programs and to monitor the use if these by *P. mimulus*.

- Targeted research to help identify and manage *P. mimulus* habitat includes
    - Research listed above to refine deployment and interpretation of survey results;
    - Further surveys throughout the potential range of *P. mimulus* in north western Queensland;
    - Targeted surveys and/or manipulative experiments to investigate responses of *P. mimulus* populations to fire;
    - Targeted surveys and/or manipulative experiments to investigate the utilisation artificial habitats by *P. mimulus*.

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Appendices

Appendix A. Details of survey activity and results from each site and subsite surveyed during this project. The columns Detected Night 1, Night 2 etc refer to the consecutive night since cameras were deployed, and whether *P. mimulus* was detected (1), not detected (0) or if the camera was not deployed or operational that night (-). Subsites labelled with the suffix x, are non-rocky sites, all other sites are rocky sites.

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
110	110x	-21.702671	140.487625	WGS84	Honey fish	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
111	111x	-21.694140	140.479142	WGS84	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
115	115x	-21.670150	140.471606	WGS84	Honey fish	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
117	117x	-21.685796	140.466285	WGS84	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
120	120x	-21.657718	140.452396	WGS84	Honey fish	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
121	121x	-21.641136	140.452258	WG	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				S84																
123	123x	-21.651464	140.480294	WGS84	Honey fish	23/05/2013	29/05/2013	0	0	0	0	0	0	0	-	-	-	-	-	-
124	124x	-21.637326	140.476837	WGS84	Standard	23/05/2013	29/05/2013	0	0	0	0	0	0	0	-	-	-	-	-	-
125	125x	-21.628971	140.468299	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
126	126x	-21.626416	140.462276	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
128	128x	-21.637845	140.449692	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
129	129x	-21.624898	140.447261	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
131	131x	-21.693767	140.540966	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
135	135x	-21.650859	140.584429	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
136	136x	-21.658450	140.595199	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
142	142x	-21.779390	140.479909	WGS84	Honey fish	25/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
145	145x	-21.759276	140.488606	WGS84	Standard	25/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
146	146x	-21.743917	140.495294	WGS84	Honey fish	25/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
149	149x	-21.663279	140.486457	WGS84	Honey fish	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
151	151x	-21.663619	140.518411	WGS84	Standard	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
153	153x	-21.660852	140.500423	WGS84	Honey fish	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
156	156x	-21.697012	140.499249	WGS84	Standard	28/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
157	157x	-21.702214	140.506210	WGS84	Honey fish	28/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
158	158x	-21.721451	140.498151	WGS84	Standard	28/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
159	159x	-21.642628	140.493400	WGS	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
161	161x	-21.645504	140.484913	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
164	164x	-21.624862	140.492502	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
167	167x	-21.599752	140.486578	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
168	168x	-21.604448	140.478522	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	-	-	-
169	169x	-21.595797	140.470946	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
171	171x	-21.537688	140.480503	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
173	173x	-21.531954	140.534648	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
176	176x	-21.552368	140.527059	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
178	178x	-21.541145	140.512268	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
179	179xa	-21.630729	140.483837	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
179	179xb	-21.630878	140.483326	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
180	180xa	-21.611397	140.466420	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
180	180xb	-21.611355	140.465878	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
187	187xa	-21.697175	140.459130	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
187	187xa	-21.697175	140.459130	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
187	187xb	-21.697519	140.459007	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
190	190xa	-21.683661	140.408778	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
190	190xb	-21.683274	140.409020	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	-	-	-	-	-	-	-	-	-	-
195	195xa	-21.558868	140.453526	WGS	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
195	195xb	-21.559295	140.453525	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
197	197xa	-21.589480	140.451291	WGS84	Sweet	14/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
197	197xb	-21.589833	140.450923	WGS84	Sweet	14/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
101	101a	-21.637256	140.490838	WGS84	Honey fish	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
101	101a	-21.637256	140.490838	WGS84	Honey fish	13/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	-	-	-	-
101	101b	-21.636963	140.490944	WGS84	Standard	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	-	-	-
101	101c	-21.636419	140.490897	WGS84	Honey fish	9/05/2013	13/05/2013	0	0	0	0	0	-	-	-	-	-	-	-	-
101	101c	-21.636419	140.490897	WGS84	Honey fish	13/05/2013	21/05/2013	1	1	1	1	1	1	1	1	1	-	-	-	-
101	101d	-21.636046	140.491173	WGS84	Standard	9/05/2013	13/05/2013	0	0	0	0	0	-	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
101	101d	-21.636046	140.491173	WGS84	Standard	13/05/2013	21/05/2013	1	0	0	1	1	0	0	0	0	-	-	-	-
102	102a	-21.619978	140.490275	WGS84	Honey fish	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
102	102b	-21.620339	140.490342	WGS84	Standard	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
102	102c	-21.620455	140.489785	WGS84	Honey fish	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
102	102d	-21.619984	140.489694	WGS84	Standard	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
103	103a	-21.671132	140.490905	WGS84	Honey fish	9/05/2013	23/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
103	103b	-21.671476	140.490667	WGS84	Standard	9/05/2013	23/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
103	103c	-21.671945	140.490416	WGS84	Honey fish	9/05/2013	23/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
103	103d	-21.672391	140.490359	WGS84	Standard	9/05/2013	23/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
104	104a	-21.540630	140.502862	WGS	Honey fish	9/05/2013	21/05/2013	1	0	0	0	0	0	0	1	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
104	104b	-21.540368	140.502516	WGS84	Standard	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
104	104c	-21.540622	140.502108	WGS84	Honey fish	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
104	104d	-21.540939	140.501847	WGS84	Standard	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
105	105a	-21.542807	140.504606	WGS84	Honey fish	9/05/2013	21/05/2013	1	0	0	0	0	0	1	0	0	0	1	0	0
105	105b	-21.542479	140.504784	WGS84	Standard	9/05/2013	21/05/2013	1	0	0	1	1	1	1	1	1	1	1	1	1
105	105c	-21.542396	140.505148	WGS84	Honey fish	9/05/2013	21/05/2013	1	0	0	0	1	0	0	0	0	0	0	1	0
105	105d	-21.542827	140.505345	WGS84	Standard	9/05/2013	21/05/2013	1	0	1	0	0	0	0	0	0	0	0	0	0
106	106a	-21.571951	140.471492	WGS84	Honey fish	9/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
106	106b	-21.572402	140.471381	WGS84	Standard	9/05/2013	21/05/2013	1	0	0	0	0	0	1	1	1	1	1	1	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
106	106c	-21.572768	140.471306	WGS84	Honey fish	9/05/2013	21/05/2013	1	0	0	0	0	0	1	0	1	1	1	0	0
106	106d	-21.573328	140.471168	WGS84	Standard	9/05/2013	21/05/2013	1	0	0	0	0	1	1	1	1	0	0	0	1
107	107a	-21.581966	140.493809	WGS84	Honey fish	10/05/2013	21/05/2013	1	0	0	0	0	0	0	0	0	1	0	0	-
107	107b	-21.582352	140.493674	WGS84	Standard	10/05/2013	21/05/2013	1	1	1	0	1	0	0	0	1	1	1	0	-
	107c	-21.582748	140.493422	WGS84	Honey fish	10/05/2013	21/05/2013	1	0	1	0	1	1	1	1	1	1	0	0	-
107	107d	-21.583151	140.493186	WGS84	Standard	10/05/2013	21/05/2013	1	0	0	1	0	0	1	1	1	0	1	0	-
108	108a	-21.589682	140.485772	WGS84	Honey fish	10/05/2013	21/05/2013	1	0	0	0	1	1	1	1	1	1	1	1	-
108	108b	-21.590077	140.486048	WGS84	Standard	10/05/2013	21/05/2013	0	0	0	0	0	0	0	0	0	0	0	0	-
108	108c	-21.590412	140.486368	WGS84	Honey fish	10/05/2013	21/05/2013	1	0	0	0	0	0	0	0	0	0	1	1	-
108	108d	-21.590793	140.486544	WGS	Standard	10/05/2013	21/05/2013	1	0	1	0	0	0	0	1	0	1	0	0	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
109	109a	-21.698689	140.486419	WGS84	Honey fish	10/05/2013	22/05/2013	1	1	1	1	1	1	0	0	0	0	0	0	0
109	109b	-21.699027	140.486738	WGS84	Standard	10/05/2013	22/05/2013	1	0	0	0	1	1	1	1	0	-	-	-	-
109	109c	-21.699339	140.487053	WGS84	Standard	10/05/2013	22/05/2013	1	1	0	0	1	1	0	1	-	-	-	-	-
109	109d	-21.699394	140.487668	WGS84	Honey fish	10/05/2013	22/05/2013	1	0	0	0	0	1	0	0	0	0	0	0	0
109	109e	-21.699749	140.487901	WGS84	Standard	10/05/2013	22/05/2013	-	-	-	-	-	-	-	-	-	-	-	-	-
112	112r	-21.702741	140.476059	WGS84	Honey fish	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
113	113r	-21.707134	140.474932	WGS84	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
114	114r	-21.699167	140.468920	WGS84	Honey fish	22/05/2013	27/05/2013	1	0	0	0	0	1	-	-	-	-	-	-	-
116	116r	-21.691251	140.464218	WGS84	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
118	118r	-21.680403	140.468364	WGS84	Honey fish	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
119	119r	-21.658749	140.461642	WGS84	Standard	22/05/2013	27/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
122	122r	-21.660603	140.477075	WGS84	Honey fish	23/05/2013	29/05/2013	1	0	0	0	0	1	1	-	-	-	-	-	-
127	127r	-21.631217	140.455694	WGS84	Standard	23/05/2013	28/05/2013	1	0	1	0	0	0	-	-	-	-	-	-	-
130	130a	-21.621533	140.455595	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
130	130b	-21.621066	140.456048	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
132	132r	-21.687300	140.560594	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
133	133r	-21.675196	140.567792	WGS84	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
134	134r	-21.666852	140.572442	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
137	137r	-21.666938	140.607215	WGS	Honey fish	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
138	138r	-21.675010	140.619854	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
139	139a	-21.650128	140.592346	WGS84	Standard	23/05/2013	28/05/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
139	139b	-21.649671	140.592094	WGS84	Honey fish	23/05/2013	28/05/2013	1	0	0	0	1	1	-	-	-	-	-	-	-
140	140r	-21.804462	140.479132	WGS84	Honey fish	25/05/2013	11/06/2013	1	0	1	1	0	0	1	0	0	0	0	0	0
141	141r	-21.795765	140.483677	WGS84	Standard	25/05/2013	11/06/2013	1	0	0	1	0	0	0	0	0	1		0	0
143	143r	-21.789882	140.468853	WGS84	Honey fish	25/05/2013	11/06/2013	1	1	0	1	0	0	0	0	0	1	0	0	0
144	144r	-21.773526	140.477356	WGS84	Standard	25/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
147	147r	-21.672529	140.485854	WGS84	Standard	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
148	148r	-21.679963	140.485399	WGS84	Honey fish	27/05/2013	11/06/2013	1	0	0	0	0	0	0	0	0	1	1	1	1

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
150	150r	-21.663255	140.510717	WGS84	Standard	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
152	152r	-21.659089	140.503971	WGS84	Honey fish	27/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
154	154r	-21.648105	140.492157	WGS84	Standard	27/05/2013	11/06/2013	1	0	0	1	1	0	1	1	1	1	1	1	1
155	155r	-21.704282	140.496654	WGS84	Standard	28/05/2013	11/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
160	160r	-21.649755	140.498472	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
162	162r	-21.644812	140.489656	WGS84	Honey fish	29/05/2013	12/06/2013	1	1	1	1	0	1	1	1	1	0	1	0	0
163	163r	-21.631170	140.493660	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
165	165r	-21.611007	140.492204	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
166	166r	-21.603292	140.495132	WGS84	Honey fish	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
170	170r	-21.584315	140.467781	WGS	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
172	172r	-21.534931	140.515264	WGS84	Honey fish	29/05/2013	12/06/2013	1	0	0	0	0	0	0	0	1	0	0	0	0
174	174r	-21.533663	140.531288	WGS84	Standard	29/05/2013	12/06/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
175	175r	-21.536117	140.524077	WGS84	Honey fish	29/05/2013	12/06/2013	1	0	0	0	1	1	1	1	1	1	0	1	0
177	177r	-21.541487	140.518446	WGS84	Standard	29/05/2013	12/06/2013	1	0	1	1	1	1	0	1	1	0	0	0	0
181	181ra	-21.529191	140.542101	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
181	181rb	-21.529748	140.542376	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
182	182ra	-21.535904	140.542639	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
182	182rb	-21.535939	140.542087	WGS84	Sweet	12/06/2013	17/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
183	183ra	-21.554110	140.509815	WGS84	Sweet	12/06/2013	5/07/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
183	183rb	-21.554643	140.509872	WGS84	Sweet	12/06/2013	17/06/2013	-	-	-	-	-	-	-	-	-	-	-	-	-
184	184ra	-21.682463	140.490411	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
184	184rb	-21.681825	140.490926	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
185	185ra	-21.690444	140.485378	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
185	185rb	-21.690295	140.485017	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
186	186ra	-21.693942	140.471289	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
186	186rb	-21.693521	140.471692	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
188	188ra	-21.694122	140.444453	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
188	188rb	-21.694455	140.444144	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
189	189ra	-21.690178	140.435371	WGS	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
189	189rb	-21.689769	140.435424	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
191	191ra	-21.672821	140.423392	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
191	191rb	-21.672936	140.423892	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
192	192ra	-21.659661	140.436198	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
192	192rb	-21.659312	140.436173	WGS84	Sweet	13/06/2013	18/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
193	193ra	-21.653434	140.446708	WGS84	Sweet	13/06/2013	18/06/2013	1	0	0	1	0	1	-	-	-	-	-	-	-
193	193rb	-21.653628	140.446344	WGS84	Sweet	13/06/2013	19/06/2013	1	0	0	1	1	1		-	-	-	-	-	-
194	194ra	-21.578529	140.444745	WGS84	Sweet	13/06/2013	19/06/2013	0	0	0	0	0	0	0	-	-	-	-	-	-
194	194rb	-21.578105	140.444970	WGS84	Sweet	13/06/2013	19/06/2013	0	0	0	0	0	0	0	-	-	-	-	-	-

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
196	196ra	-21.579252	140.436994	WGS84	Sweet	14/06/2013	19/06/2013	0	0	0	0	0	0	-	-	-	-	-	-	-
196	196rb	-21.578574	140.436916	WGS84	Sweet	14/06/2013	19/06/2013	1	0	0	0	0	1	-	-	-	-	-	-	-
198	198r	-21.546146	140.521465	WGS84	Sweet	17/06/2013	5/07/2013	1	1	0	0	0	0	0	0	0	1	1	0	1
199	199r	-21.545912	140.527317	WGS84	Sweet	17/06/2013	5/07/2013	1	1	1	1	1	1	1	1	1	1	1	0	0
200	200r	-21.547318	140.511500	WGS84	Sweet	17/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
201	201r	-21.563167	140.496047	WGS84	Sweet	17/06/2013	5/07/2013	1	1	1	0	1	1	1	1	1	1	1	1	1
202	202r	-21.529257	140.466205	WGS84	Sweet	17/06/2013	2/07/2013	1	1	1	1	1	1	1	1	1	1	1	1	1
203	203r	-21.501333	140.452542	WGS84	Sweet	17/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
204	204r	-21.506334	140.454634	WGS84	Sweet	17/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
205	205r	-21.546239	140.475170	WGS	Sweet	17/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
206	206r	-21.558827	140.486161	WGS84	Sweet	18/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
207	207r	-21.552891	140.488251	WGS84	Sweet	18/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
208	208r	-21.543906	140.483839	WGS84	Sweet	18/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
209	209r	-21.562556	140.509956	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
210	210r	-21.559285	140.513451	WGS84	Sweet	19/06/2013	5/07/2013	1	0	1	1	1	0	0	0	0	0	0	0	0
211	211r	-21.558631	140.503238	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
212	212r	-21.534695	140.498917	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
213	213r	-21.509766	140.514464	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
214	214r	-21.516244	140.513316	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
215	215r	-21.523114	140.511630	WGS84	Sweet	19/06/2013	5/07/2013	1	1	1	1	1	1	1	1	1	0	0	0	0
216	216r	-21.531826	140.510474	WGS84	Sweet	19/06/2013	5/07/2013	0												
217	217r	-21.526295	140.506597	WGS84	Sweet	19/06/2013	5/07/2013	-	-	-	-	-	-	-	-	-	-	-	-	-
218	218r	-21.511950	140.499030	WGS84	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
219	219r	-21.520168	140.491658	WGS84	Sweet	19/06/2013	2/07/2013	1	0	0	0	0	0	0	0	0	0	1	1	0
220	220r	-21.513551	140.488634	WGS84	Sweet	19/06/2013	2/07/2013	1	0	0	0	0	1	0	0	0	1	1	1	1
221	221r	-21.506363	140.477543	WGS84	Sweet	19/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
222	222r	-21.495143	140.471796	WGS84	Sweet	19/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
223	223r	-21.489823	140.468420	WGS84	Sweet	19/06/2013	2/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
224	224r	-21.487900	140.489763	WGS	Sweet	19/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
225	225r	-21.499167	140.491616	WGS84	Sweet	19/06/2013	5/07/2013	1	0	0	0	0	0	0	0	0	0	0	1	0
226	226r	-21.662944	140.491349	WGS84	Sweet	19/06/2013	6/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
227	227r	-21.676809	140.507984	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
228	228r	-21.686519	140.524311	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
229	229r	-21.703786	140.553481	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
230	230r	-21.731025	140.556113	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
231	231r	-21.766108	140.560317	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
232	232r	-21.756461	140.526011	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
233	233r	-21.764704	140.534472	WGS84	Sweet	20/06/2013	5/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
234	234a	-22.333667	141.187405	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
234	234b	-22.334076	141.187476	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
235	235a	-22.324744	141.190638	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
235	235b	-22.323981	141.190692	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
236	236a	-22.320209	141.184773	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
236	236b	-22.319981	141.184402	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
237	237a	-22.322344	141.181598	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
237	237b	-22.322672	141.181186	WGS84	Sweet	7/07/2013	24/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
238	238a	-21.439623	139.945133	WGS84	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
238	238b	-21.439199	139.945256	WGS	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
239	239a	-21.437942	139.938922	WGS84	Sweet	8/07/2013	31/07/2013	1	1	0	1	1	0	1	1	1	1	1	1	1
239	239b	-21.437468	139.938920	WGS84	Sweet	8/07/2013	31/07/2013	1	0	0	0	0	0	0	0	0	0	0	0	0
240	240a	-21.486137	139.895977	WGS84	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
240	240b	-21.486539	139.895513	WGS84	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
241	241a	-21.476513	139.898363	WGS84	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
241	241b	-21.475057	139.899421	WGS84	Sweet	8/07/2013	31/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
242	242a	-21.473712	139.898994	WGS84	Sweet	8/07/2013	31/07/2013	1	1	0	0	0	0	0	0	0	0	0	0	0
242	242b	-21.473183	139.899021	WGS84	Sweet	8/07/2013	31/07/2013	1	0	0	0	0	0	0	0	1	0	0	0	0
243	243	-22.040459	140.416337	WGS84	Sweet	8/07/2013	28/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
244	244a	-21.944514	140.676105	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
244	244b	-21.944063	140.675799	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
245	245a	-21.931432	140.661318	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
245	245b	-21.931037	140.661197	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
246	246	-21.923392	140.657916	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
247	247	-21.918786	140.626871	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
248	248	-21.872401	140.604992	WGS84	Sweet	9/07/2013	25/07/2013	1	0	0	0	0	1	0	0	0	0	0	0	0
249	249	-21.848163	140.579790	WGS84	Sweet	9/07/2013	25/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
250	250	-21.824656	140.584402	WGS84	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
251	251a	-21.833335	140.591254	WGS	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
251	251b	-21.833323	140.590782	WGS84	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
252	252a	-21.810387	140.597621	WGS84	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
252	252b	-21.809888	140.597787	WGS84	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
253	253	-21.798851	140.555223	WGS84	Sweet	9/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
254	254	-21.808375	140.556495	WGS84	Sweet	10/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
255	255a	-21.816444	140.551384	WGS84	Sweet	10/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
255	255b	-21.816878	140.551347	WGS84	Sweet	10/07/2013	26/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
256	256	-21.824144	140.558739	WGS84	Sweet	10/07/2013	26/07/2013	1	0	0	0	0	0	0	0	0	0	0	0	0
257	257a	-21.851638	140.526141	WGS84	Sweet	10/07/2013	28/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
257	257b	-21.851809	140.525720	WGS84	Sweet	10/07/2013	28/07/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
258	258a	-21.776769	140.529977	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
258	258b	-21.776317	140.529989	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
259	259	-21.798329	140.534355	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
260	260	-21.803605	140.531504	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
261	261	-21.865364	140.511812	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
262	262a	-21.941298	140.503592	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
262	262b	-21.941401	140.503371	WGS84	Sweet	28/07/2013	15/08/2013	1	1	1	0	0	0	0	0	0	0	0	0	0
263	263	-21.869967	140.504961	WGS84	Sweet	28/07/2013	15/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
264	264	-21.509725	140.348474	WGS	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
265	265	-21.502814	140.353484	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
266	266	-21.502326	140.357964	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
267	267	-21.481432	140.354027	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
268	268a	-21.473612	140.356574	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
268	268b	-21.473039	140.356910	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
269	269	-21.462645	140.357575	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
270	270	-21.455233	140.363918	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
271	271a	-21.614708	140.354580	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
271	271b	-21.615246	140.354428	WGS84	Sweet	29/07/2013	18/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
272	272	-21.693736	140.514655	WGS84	Sweet	30/07/2013	14/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
273	273a	-21.698266	140.524090	WGS84	Sweet	30/07/2013	14/08/2013	1	1	1	0	0	0	0	0	0	0	0	0	0
273	273b	-21.698937	140.524081	WGS84	Sweet	30/07/2013	14/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
274	274	-21.733174	140.499892	WGS84	Sweet	30/07/2013	14/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
275	275	-21.191513	140.380759	WGS84	Sweet	30/07/2013	16/08/2013	1	0	0	1	1	0	0	1	0	0	0	0	1
276	276a	-21.215508	140.399829	WGS84	Sweet	30/07/2013	16/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
276	276b	-21.215029	140.399686	WGS84	Sweet	30/07/2013	16/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
277	277	-21.215316	140.406498	WGS84	Sweet	30/07/2013	16/08/2013	1	0	1	1	1	1	0	0	0	1	0	1	1
278	278a	-21.654433	140.500770	WGS84	Sweet	1/08/2013	19/08/2013	1		1										
278	278b	-21.654210	140.500028	WGS	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
279	279a	-21.659341	140.509241	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
279	279b	-21.659379	140.509672	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
280	280a	-21.782200	140.463063	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
280	280b	-21.782973	140.462895	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
281	281a	-21.764923	140.457868	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
281	281b	-21.764599	140.458235	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
282	282	-21.758560	140.463504	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
283	283a	-21.733741	140.460626	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
283	283b	-21.733206	140.460921	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
284	284a	-21.711770	140.464234	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
284	284b	-21.711133	140.464294	WGS84	Sweet	1/08/2013	19/08/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
285	285a	-21.583073	140.375687	WGS84	Sweet	18/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
285	285b	-21.582219	140.376066	WGS84	Sweet	18/08/2013	4/09/2013	0												
285	285c			WGS84	Sweet	18/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
286	286a	-21.716459	140.476505	WGS84	Sweet	19/08/2013	3/09/2013	1	0	0	0	0	0	1	0	0	0	0	0	0
286	286b	-21.717085	140.476597	WGS84	Sweet	19/08/2013	3/09/2013	1	0	0	0	0	0	1	0	0	0	0	0	0
287	287a	-21.711462	140.474232	WGS84	Sweet	19/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
287	287b	-21.712073	140.474065	WGS84	Sweet	19/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
287	287z	-21.710983	140.47442	WGS	Sweet	19/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
288	288a	-21.70596	140.470721	WGS84	Sweet	19/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
288	288b	-21.706335	140.47029	WGS84	Sweet	19/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
289	289a	-21.466042	140.650626	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
289	289b	-21.466561	140.650542	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
290	290a	-21.450029	140.641831	WGS84	Sweet	20/08/2013	21/09/2013	1	0	0	0	0	0	1	0	0	0	0	0	0
290	290b	-21.449639	140.642562	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
291	291a	-21.431233	140.673665	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
291	291b	-21.430925	140.673240	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
292	292	-21.440920	140.642981	WGS84	Sweet	20/08/2013	21/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
293	293a	-21.439666	140.624757	WGS84	Sweet	20/08/2013	13/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
293	293b	-21.439894	140.625136	WGS84	Sweet	20/08/2013	13/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
294	294a	-21.435009	140.598237	WGS84	Sweet	20/08/2013	13/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
294	294b	-21.435808	140.598241	WGS84	Sweet	20/08/2013	13/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
295	295	-21.426379	140.565873	WGS84	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
296	296a	-21.415212	140.555548	WGS84	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
296	296b	-21.414952	140.555950	WGS84	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
297	297a	-21.424401	140.523121	WGS84	Sweet	20/08/2013	4/09/2013	0	-	-	-	-	-	-	-	-	-	-	-	-
297	297b	-21.424014	140.522926	WGS84	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
298	298a	-21.404658	140.500598	WGS	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
298	298b	-21.405023	140.500950	WGS84	Sweet	20/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
299	299	-21.571197	140.380219	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
300	300a	-21.556771	140.37924	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
300	300b	-21.556553	140.378959	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
301	301a	-21.561640	140.379681	WGS84	Sweet	21/08/2013	4/09/2013	1	0	0	0	1	0	0	0	1				
301	301b	-21.561155	140.379883	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
301	301c	-21.560730	140.380279	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
302	302	-21.605362	140.382993	WGS84	Sweet	21/08/2013	4/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
303	303a	-21.753240	140.564217	WGS84	Sweet	21/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
303	303b	-21.752951	140.563542	WGS84	Sweet	21/08/2013	3/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
304	304	-21.731388	140.567641	WGS84	Sweet	21/08/2013	5/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
305	305	-21.742841	140.564907	WGS84	Sweet	21/08/2013	5/09/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
306	306a	-22.293109	141.215542	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
306	306b	-22.292524	141.215732	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
307	307a	-22.283611	141.251143	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
307	307b	-22.283352	141.250714	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
307	307c	-22.283218	141.250262	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
308	308a	-22.243238	141.250003	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
308	308b	-22.243242	141.249204	WGS	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
309	309a	-22.297416	141.146745	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
309	309b	-22.297374	141.146495	WGS84	Sweet	22/09/2013	13/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
310	310a	-21.060571	140.721233	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
310	310b	-21.059795	140.721285	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
311	311b	-21.029956	140.646579	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
311	311a	-21.029524	140.646574	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
312	312	-21.033176	140.652019	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
313	313	-21.047851	140.666522	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
314	314a	-21.044514	140.673557	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
314	314b	-21.044655	140.672999	WGS84	Sweet	23/09/2013	12/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2-3	-21.519416	140.491216	WGS84	Sweet	9/10/2013	25/10/2013	-	0	-	-	-	-	-	-	-	-	-	-	-
2	2-8	-21.519007	140.491035	WGS84	Sweet	9/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
22	22-3	-21.660171	140.496524	WGS84	Sweet	19/09/2013	8/10/2013	1	0	1	0	1	0	0	0	0	0	0	0	0
22	22-8	-21.660050	140.496106	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	-	-	-	-	-	-	-	-
35	35-3	-21.711830	140.467797	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
35	35-8	-21.712211	140.467510	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
101	101-3	-21.636082	140.491170	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
101	101-8	-21.636349	140.490670	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
105	105-4	-21.542667	140.504572	WGS	Sweet	10/10/2013	25/10/2013	1	1	0	0	0	0	1	0	0	1	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
105	105-8	-21.542370	140.504807	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
106	106b	-21.572402	140.471381	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
106	106c	-21.572768	140.471306	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
108	108-3	-21.589900	140.485930	WGS84	Sweet	10/10/2013	25/10/2013	1	0	0	0	1	0	0	0	0	0	0	0	0
108	108-8	-21.590260	140.486160	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
109	109-3	-21.699148	140.486864	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
109	109-8	-21.699212	140.487624	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
114	114-3	-21.698870	140.468799	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
114	114-8	-21.699350	140.468845	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
122	122-8	-21.660409	140.477189	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
122	122-3	-21.660954	140.477021	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
148	148-3	-21.679914	140.485422	WGS84	Sweet	20/09/2013	9/10/2013	-	0	-	-	-	-	-	-	-	-	-	-	-
148	148-8	-21.679438	140.485778	WGS84	Sweet	20/09/2013	9/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
154	154-3	-21.648210	140.492252	WGS84	Sweet	19/09/2013	8/10/2013	1	0	0	0	1	1	1	1	1	-	-	-	-
154	154-8	-21.647933	140.491903	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
172	172-4	-21.535032	140.515204	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
172	172-7	-21.534773	140.515209	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
177	177-2	-21.541463	140.518401	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
177	177-7	-21.541066	140.518098	WGS	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
				84																
196	196-3	-21.578821	140.436943	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
196	196ra	-21.579252	140.436994	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
201	201-4	-21.563045	140.496045	WGS84	Sweet	10/10/2013	25/10/2013	1	0	0	0	0	0	0	0	0	1	0	0	0
201	201-10	-21.563583	140.496207	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
202	202-3	-21.529006	140.466267	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
202	202-8	-21.529470	140.466297	WGS84	Sweet	10/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
225	225-3	-21.499266	140.491596	WGS84	Sweet	9/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
225	225-7	-21.498910	140.491787	WGS84	Sweet	9/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
278	278-3	-21.654536	140.500877	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	Sub Site	Lat	Long	Datum	Bait	Set_Date	End_Date	Pmimulus_detected?	Detected Night1	Detected Night2	Detected Night3	Detected Night4	Detected Night5	Detected Night6	Detected Night7	Detected Night8	Detected Night9	Detected Night10	Detected Night11	Detected Night12
278	278-8	-21.654266	140.500558	WGS84	Sweet	19/09/2013	8/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
286	286-3	-21.716566	140.476481	WGS84	Sweet	20/09/2013	9/10/2013	1	1	0	0	0	0	0	0	0	0	0	1	0
286	286-8	-21.717144	140.476587	WGS84	Sweet	20/09/2013	9/10/2013	1	0	0	1	0	0	0	0	0	0	0	0	0
148	148-2	-21.68	140.485383	WGS84	Sweet	13/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0
148	148-9	-21.679341	140.485861	WGS84	Sweet	13/10/2013	25/10/2013	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B. Recoding of 46 lithic types into three broad categories.

Lithology	Classification
FineGrainedIgneousIntrusive	Igneous
FineGrainedIgneousIntrusiveMetaSiltstone	Igneous
Granite	Igneous
GraniteIgneousIntrusive	Igneous
GranitePegmatite	Igneous
Amphibolite	Metamorphic
Chalcedony	Metamorphic
Chert	Metamorphic
Duricrust	Metamorphic
IronstoneMetaSedimentary	Metamorphic
MetaBasalt	Metamorphic
MetaSandstone	Metamorphic
MetaSandstonePhylliteIronstoneHematite	Metamorphic
MetaSedimentary	Metamorphic
MetaSedimentaryIronstone	Metamorphic
MetaSedimentaryMetaIgneousIntrusiveAmphybolite	Metamorphic
MetaSedimentarySiltstone	Metamorphic
MetaSedimentQuartzIntrusionsGrowth	Metamorphic
MetaSiltstone	Metamorphic
Phyllite	Metamorphic
PhylliteIronstone	Metamorphic
PhylliteMetasiltstone	Metamorphic
Quartz	Metamorphic
QuartzHematiteSchist	Metamorphic
Quartzite	Metamorphic
Quartzitefinegrained	Metamorphic
QuartzMetasiltstone	Metamorphic
QuartzMicaSchist	Metamorphic
QuartzVeinShaleQuartzite	Metamorphic
SandstoneSchist	Metamorphic
Schist	Metamorphic
ShaleQuartzite	Metamorphic
Slate	Metamorphic
SlateSchist	Metamorphic
BrecciaQuartzAmethystIntrusions	Sedimentary
BrecciawithQuartzamethystintrusions	Sedimentary
Conglomerate	Sedimentary
DuricrustConglomerate	Sedimentary
Ironstone	Sedimentary
IronstoneHematite	Sedimentary
MetaSandstonePhylliteConglomerate	Sedimentary
MetaSedimentaryBreccia	Sedimentary
Mudstone	Sedimentary

Sandstone	Sedimentary
Shale	Sedimentary
SiltstoneSandstone	Sedimentary

Appendix C. The Regional Ecosystems (REs) from which *P. mimulus* were detected during this study. RE descriptions from http://environment.ehp.qld.gov.au/regional-ecosystems/ accessed 19 October 2014.

RE	Description
1.11.2	Eucalyptus leucophloia low open woodland or low woodland, sometimes with E. leucophylla usually with a Acacia spp. dominated shrub layer and Triodia spp. and/or tussock grass understorey. Treeless areas common. Occurs on hills and ranges on strongly folded metamorphic pre-Cambrian rocks; soils skeletal, some red earths. (BVG1M: 19a)
1.11.2a	Low open woodland of Eucalyptus leucophloia often with Corymbia spp., Terminalia aridicola and E. leucophylla with shrub layer of Acacia spp. and ground layer of Triodia spp. Occurs on steep hills and strike ridges. (BVG1M: 19a)
1.11.2e	Low open woodland of Eucalyptus leucophylla and E. leucophloia often with Acacia cambagei and Corymbia terminalis with a sparse ground layer of Triodia pungens and/or Triodia longiceps. Occurs on footslopes and lower slopes, broken by creeks and drainages. (BVG1M: 19b)
1.11.2a/disturbed	as above but disturbed by human actvities
1.11.2x2a	1.11.2x2a: Low woodland to open forest of Acacia shirleyi. Occurs on metamorphic hills. (BVG1M: 24a
1.11.2x3	Low open woodland of Corymbia aspera, often with Terminalia aridicola subsp. aridicola, Eucalyptus leucophloia and C. capricornia with a Triodia spp. understorey. Occurs on rock outcrops on hills and ranges on strongly folded siliceous sedimentary and metamorphic pre-Cambrian rocks; skeletal soils. (BVG1M: 19a)
1.12.1	Low open woodland of Eucalyptus leucophloia, sometimes with E. leucophylla, Corymbia terminalis or C. aparrerinja with an Acacia spp. dominated shrub layer and Triodia spp. dominated ground layer. Includes areas of treeless Triodia spp. grasslands and Acacia spp. shrublands. Occurs on ranges and stony hills and rises on igneous rocks; skeletal soils and some shallow red earths. (BVG1M: 19a
1.12.1x1	Low open woodland of Eucalyptus leucophylla often with Corymbia terminalis or C. aparrerinja, shrub layer of Acacia chisholmii with hummock grass ground layer of Triodia spp. Includes areas of treeless Triodia spp. grasslands and Acacia spp. shrublands. Occurs on ranges and stony hills and rises on igneous rocks; skeletal soils and some shallow red earths. (BVG1M: 19b)
1.10.4	Eucalyptus leucophloia and/or Acacia spp. low open woodland on stony sandstone plateaus
1.10.5	Acacia shirleyi open forest on skeletal soils and earths on sandstone plateaus
1.10.4/1.10.5	Eucalyptus leucophloia and/or Acacia spp. low open woodland on stony sandstone plateaus/Acacia shirleyi open forest on skeletal soils and earths on sandstone plateaus
1.7.1g	Low open forest of Acacia shirleyi. Occurs on the edge of eroding tertiary surfaces. (BVG1M: 24a)
1.7.1f	Low open woodland to low woodland of Eucalyptus leucophloia, scattered shrub layer of Acacia spp. and a sparse ground layer of Triodia pungens and/or tussock grasses +/- treeless areas. Occurs on small patches of deeper soils on the edge of eroding tertiary surfaces. (BVG1M: 19a)
1.9.6	Eucalyptus leucophloia and Corymbia terminalis low open woodland on limestone hills
4.7.8/4.7.4	Eucalyptus leucophloia low open woodland with a ground layer dominated by Triodia spp. Occurs on tablelands with shallow, gravelly loamy lithosol soils and frequent rock outcrops. (BVG1M: 19a)/Acacia cambagei tall open shrubland with Triodia spp. +/- Senna spp. near eroding edges of Tertiary plateaus