Effectiveness of aerial and ground baiting on introduced predators on Matuwa (Lorna Glen), winter 2017

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August 2017

Summary

The annual aerial baiting of Matuwa using Eradicat was carried out in July 2017 to control feral cats and wild dogs. In conjunction with this operation, a ground baiting trial was conducted on Martuwa east. Camera traps were used to assess the effectiveness of baiting and to monitor introduced predator activity on nearby Karrara Karrara, an unbaited reference area. The pre-bait level of cat activity (a surrogate for cat density) on Matuwa was the highest it has been since baiting operations began in 2003, and was 87% of the level commonly found in the absence of baiting. In 2016, aerial baiting reduced cat activity by 38%. This year, the combination of aerial baiting on Matuwa and additional ground baiting of Matuwa east, reduced the overall feral cat camera activity index (CAI) from 9.8 to 7.3, an overall reduction of 25.5%, leaving a relatively high residual population. This year, aerial baiting alone (Matuwa west) was virtually ineffective against feral cats, achieving a 10.7% knockdown. The combination of aerial baiting and ground baiting (Matuwa east) increased the knockdown to 39.4%. Of concern is a) the trend of an increasing population of introduced predators in the last 4-5 years, and b) the high residual cat population, which is currently at about double the target level. The residual wild dog population on Matuwa is also at a high level. Overall, aerial and ground baiting reduced the dog population by 41.7%, but, because of their high mobility, the reliability of the camera trap method for assessing dog populations is uncertain.

The poor baiting results are attributed to low bait uptake in response to increased prey availability due to good seasons (above average rainfall). It is also possible that the introduced predators are becoming more wary of the baits. Despite annual aerial baiting, there is a trend of an increase in the feral cat population on Matuwa since 2012/13.

The interaction between the recent large bushfires and introduced predators appears to have adversely impacted small native mammal populations on Kararra Karrara; no mulgara were captured and only a few hopping mice.

We make recommendations about how management could respond to this trend of increasing introduced predator density on Matuwa, including further ground baiting trials, setting a trigger point for deciding whether it is worthwhile aerial baiting, and implementing other control strategies that engage Martu including strategic trapping and hunting. Importantly, there is an urgent need for research into biological control measures including infectious diseases and engineered gene drive technology. Until alternative control strategies are developed, as a backup to the successful Matuwa predator-proof compound, we suggest establishing a second predator-proof compound for rare mammals at another suitable location in the arid zone.

Pre and post bait sampling

Each year, Western Shield aerial baiting of Matuwa, including a 5 km buffer around the property boundary, covers an area of ~3,600 km^2 and costs ~$100,000. Given this level of expenditure, and the level of toxic (Eradicat) baits introduced into the environment (~180,000 baits each 4.5 mg 1080) it is imperative that the efficacy of baiting on introduced predators and on nature conservation values is properly evaluated and reported. Historically feral cat and wild dog baiting effectiveness has been variable at Matuwa (and other locations) for a variety of reasons so we cannot assume a level of knockdown following a baiting event. While it is important to know the level of knockdown, it is vital to know the density of the residual (surviving) population – i.e., what's left? This determines predation pressure on conservation values, so through time, is the real measure of the effectiveness of control programs, not the level of knockdown *per se*. Historically, we set a target of a residual feral cat density equivalent to a track activity index (TAI) of <10, which equates to a camera activity index (CAI) < 3.4. To obtain these data it is necessary to annually monitor and report on baiting effectiveness (level of knockdown and the residual population), which is the purpose of this report.

As with last year (2016), trail cameras (Reconyx 900) were used to assess the effectiveness of aerial baiting at Matuwa (M) (Lorna Glen). Fifty track-side cameras were placed at 2 km intervals and 45-50 cm above ground angled slightly down the track; 25 cameras on 50 km of track in the east (Matuwa east – ME) and 25 cameras on 50 km of track in the west (Matuwa west – MW). Cameras were set on 19/20 June 2017 and closed on 18/19 August. A camera in the east malfunctioned and a spinifex stalk caught in the grate of a camera in the west, filling the card with photos of the waving stalk. This left 24 functioning cameras at each site. At the time of setting the cameras, aerial baiting was scheduled for the 13-15 July 2017, but at short notice was brought forward one week to 6-8 July. This meant that instead of the cameras being set 23 days prior to baiting, the pre-bait camera trap sample time was reduced to 16 days. While it is recognised that there may be operational needs to change the baiting dates at short notice, this should be avoided where possible.

While cameras were left armed in the field for the entire duration (19/20 June – 18/19 August), a ten day period was allowed to elapse following aerial baiting to allow bait uptake, after which time animals 'captured' on cameras were considered to be 'baiting survivors' and the data considered 'post-bait'. Previous radio tracking during an aerial baiting operation on Matuwa showed that all collared cats that were killed by the baits, died within 10 days of baiting, with 80% dying in the first 4 days (see Burrows *et al*. 2014 report).

On 13 July, a further 20 track-side cameras were set 2 km apart on tracks at Karrara Karrara (Earaheedy) west and north of Jenny's Bore, in a predominantly spinifex-dominated sand plain system, acting as an unbaited 'control' or reference area. These cameras were retrieved on 23 August. Camera trap sample intensity is summarised in Table 1.

Sample area (treatment)	Pre-bait camera nights	Post-bait camera nights
Matuwa east (ME) (aerial and ground baiting)	16 nights x 24 cameras = 384	31 nights x 24 cameras = 744
Matuwa west (MW) (aerial baiting only)	16 nights x 24 cameras = 384	31 nights x 24 cameras = 744
Karrara Karrara (KK) (unbaited)	40 nights x 20 cameras = 800	

Table 1: Camera trap sample effort by baiting treatments

Camera trap data were analysed for the pre- and post-bait periods by recording the number of individual cats and dogs (and other fauna) 'trapped' by each camera each night/day. Distinguishing features (markings), time of capture and the travel direction of the animal were also noted. Where the same cat (or dog) was trapped at the same camera more than once on the same night/day, it was scored as one capture. On occasions when the same cat or dog was captured on one or more cameras (2 km apart) on the same night/day, it was scored as multiple captures, consistent with the rule-set for track counting. In many cases, individual cats could be identified, but not always, due to poor imagery (blurred, under/overexposed) or because of an incomplete picture of the animal (e.g., tail, hind quarters, etc.). For similar reasons, and often because of lack of distinguishing features, it was not always possible to identify individual dogs. Because of the different pre-and post-bait sample time periods, data were standardized to the number of captures per camera per night and for ease of using the numbers, this was converted to a camera activity index (CAI) of captures per 100 camera trap nights. For example, at Karrara Karrara (KK), there were 57 cat captures by 20 cameras over 40 nights (i.e., 800 camera nights), so the CAI = 62/800 x 100 = 7.75 (captures per 100 camera nights). Previous calibration (see Burrows *et al*. 2015 report) showed that one unit of CAI is equivalent to ~2.94 units of the previously used Track Activity Index (TAI), so the cat TAI at KK (unbaited) was 22.8. Earlier research established that the TAI was a meaningful measure of cat density and it is assumed that the CAI is likewise –i.e., the more cats captured on the cameras per unit of sampling effort, the greater the density of cats. However, because of the greater mobility of dogs, this technique is unproven and likely far less reliable for assessing dog density.

Ground baiting trial

A trial was undertaken to assess the effectiveness of ground baiting on tracks on Matuwa east using a mechanical ground baiting machine designed and built by DBCA volunteer Errol Thoomes. A ground baiting trial was programmed to occur concurrently with the aerial baiting but because of the late change of dates for aerial baiting the ground baiting commenced 11 July, several days after the completion of aerial baiting. The rationale underpinning the ground baiting was as follows:

- We know from cat tracks (footprints) and extensive radio tracking data (e.g., Wysong 2016) that cats (and wild dogs) extensively utilise the tracks on Matuwa, spending considerable amount of their 'patrol' time on tracks.
- Being an ex-pastoral lease, there is a relatively high density of tracks, with the area-to-track length ratio being ~355 ha to 1 km of track. The mean centroid distance (distance from the geometric centre of a 'cell' and the nearest track) is estimated at about 3 km and the maximum is estimated at about 5 km – these dimensions are well within the home range and activity patterns of feral cats and wild dogs.
- Unlike canids, cats are poor at locating baits, which is largely the reason for high density aerial baiting (50 baits km^{-2}). Current aerial baiting does not result in an even distribution of baits

across the landscape. Rather, baits are clumped – about 50 baits are dropped in an approximately 1.0-1.5 ha footprint, every 1 km along each flight line. Placing the baits along the roads/tracks significantly increases the likelihood of a cat encountering a bait.

If ground baiting proves to be safe and efficacious (effective knockdown), then it has the following advantages over aerial baiting:

- Significantly cheaper – the ~700 km of tracks on Lorna Glen could be ground baited for ~$6,500 total cost of one operation (one pass) with a bait every ~200 m.
- Flexible, targeted – ground baiting can be carried out whenever weather conditions are optimal for baiting. It can also target areas of high conservation value (such as bilby populations) or land systems known for higher cat densities and avoid areas not frequented by cats.
- Repeatable –multiple operations can occur over the cold winter months, significantly increasing the exposure of cats to fresh baits. We know from radio tracking on Matuwa that all collared cats that died from baiting, did so within the first 10 days of baiting, with most (80%) dying in the first 4 days (see Burrows *et al.* 2014 report) when baits were relatively fresh.
- Reduced risks to non-target animals and significantly less toxin in the environment. In an aerial baiting operation on Matuwa (including the 5 km buffer), ~185,000 baits (832,500 mg 1080) are dropped across the landscape in clumps. Ground baiting all of the ~700 km of tracks at 200 m intervals requires 3,500 (15,750 mg 1080) baits per operation (i.e., ~1.9% of the baits used in an aerial operation).
- Baiting tracks should increase the exposure efficiency of baits to cats, and of cats to baits (i.e. increases the likelihood of a cat encountering a fresh bait). Aerial baiting is a one-off 'shotgun' approach - of the 185,000 baits dropped from the air, at least 30% will be hung up in spinifex or other vegetation, likely making them inaccessible. Baits will also fall on areas not visited, or infrequently visited by cats including claypans, salt lakes and other sparsely vegetated, open 'hard', stony land systems, which make up a significant proportion of Matuwa. If cats largely rely on sight to detect baits, then in spinifex land systems, the average line of sight for a cat is about 1.5-2 m, the average distance between clumps.
- A negative aspect of ground/track baiting is that baits are more exposed to people / public who may use the tracks, increasing the risk of bait tampering. However, the likelihood of a person, even a child, ingesting a lethal quantity of baits is extremely low; Human 1080 LD50 is estimated at 2.0 mg/kg, so a 40 kg child and 80 kg adult would need to ingest 18 and 36 baits respectively, which is extremely unlikely; bait tampering and removal is a risk.

Ground baiting was implemented on ~250 km of internal tracks in the eastern part of Matuwa (see Figure 1), which was also aerial baited several days earlier. The trailer-mounted proto-type ground bait machine, which has a capacity to hold 60 Eradicat baits in a 'carousel' (see Plate 1), mechanically dispenses a single bait on the track at ~190 m intervals regardless of travel speed, which is essentially limited by track condition. While two people participated in this trial, it is a one-person operation. Including bait reload, lunch, morning and afternoon tea, pit stops etc., an average of 15 km of track was baited per hour, or about 150 km per day. Two circuits of ground baiting were undertaken with a break between circuits. In addition to increasing the number of baits laid, it also increased the length of time that 'fresh' baits were available to introduced predators. In all, ~2,500 ground baits were dispensed. A bait was also placed opposite each of the 25 cameras to record bait uptake.

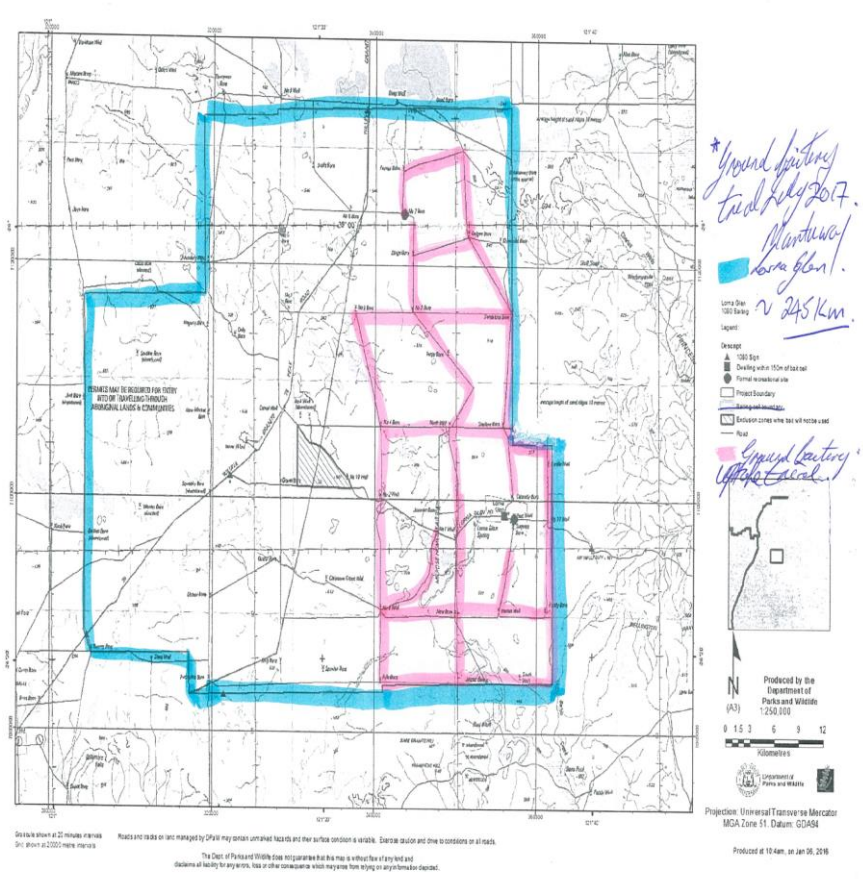


Figure 1: Ground baiting trial (pink) on Matuwa East (ME) in association with aerial baiting.

Plate 1: DBCA volunteer Errol Thoomes with the trailer mounted ground baiting machine he designed and built.

Weather

As can be seen from Fig. 2 below, it was an exceptionally wet 12 month period from July 2016 to July 2017 due to very high rainfall in summer 2017. Rainfall over this 12 month period was 415 mm, almost 60% above average. The last significant rainfall prior to aerial baiting in July 2017, was 19.6 mm on 25 June. No rain fell during or within 3 weeks of baiting.

Minimum and maximum daily temperatures during and one week after aerial baiting commenced are shown in Fig. 3. During baiting, overnight minima were sufficiently cold to reduce prey activity (reptiles and small mammals – although hopping mice were detected on cameras when temps were as low as 3°C) and maxima were <19°C, which is ideal. However, while nights remained cold, daytime maxima increased soon after baiting to the mid-20s, which is not ideal (too warm), resulting in increased reptile activity during the day. The extent to which daytime temps may have affected prey availability is unknown but colder conditions are preferred for at least one week post-baiting.

Figure 2: Well above average rainfall Martuwa July 2016-July 2017

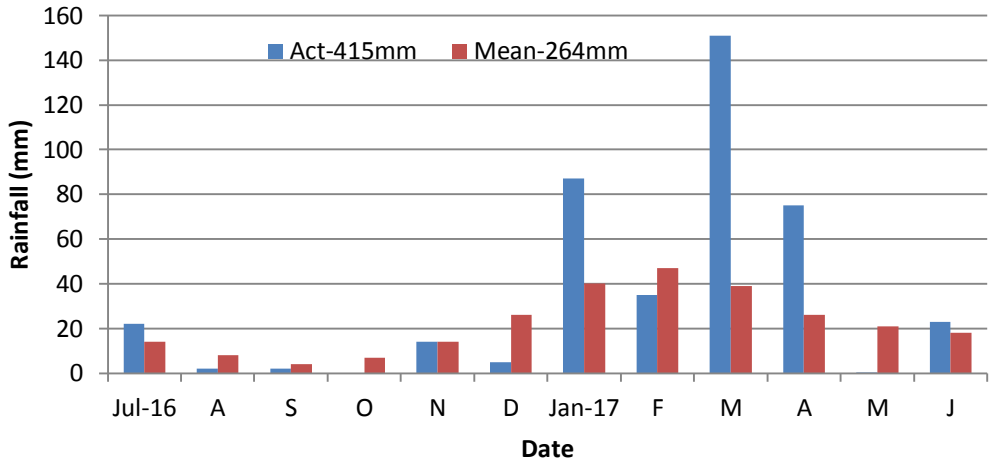
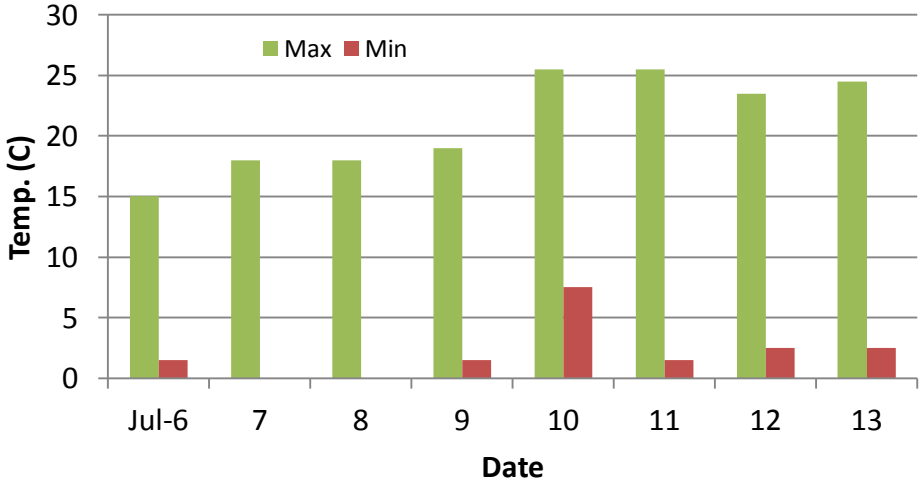


Figure 3: Daily min and max temps Matuwa July 6-13 2017



2017 Results

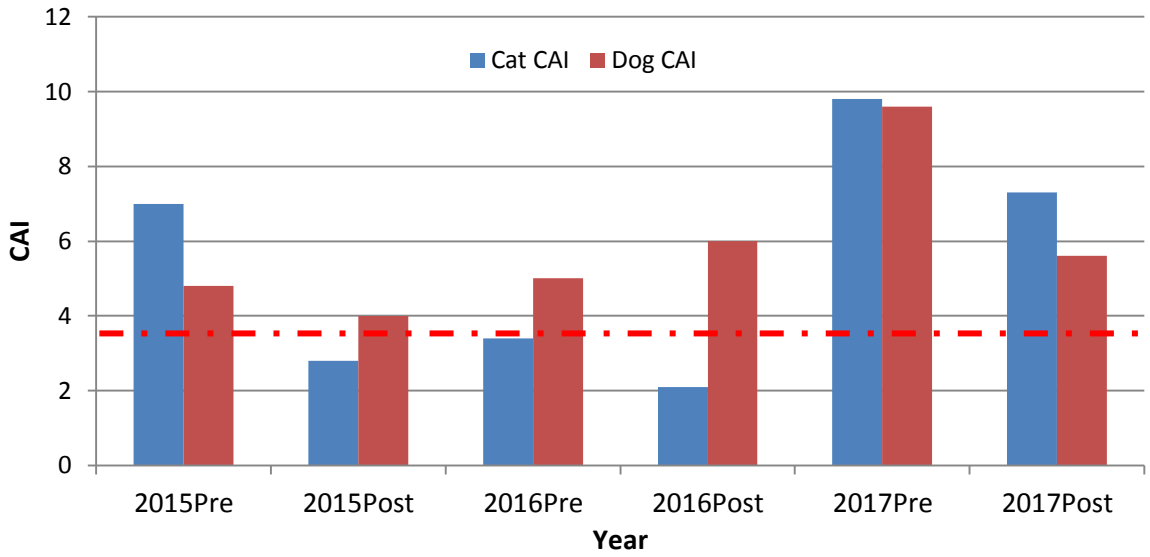
The pre- and post-bait CAIs for feral cats and wild dogs by treatments are summarised in Table 1. Of concern is the high level of both cat and dog activity on M, which is considerably higher than KK, even though KK has never been cat baited. However, apart from kangaroos, few native mammals were detected on cameras at KK compared with M. There were no detections of mulgara and only a few detections of hopping mice on KK. The lower prey and cat activity on KK is probably due to the interaction between recent large bushfires and predators, reducing prey availability to cats (see Burrows *et al*. 2015 report). Also, significant sections of the tracks on KK are overgrown, so may be less trafficked by predators. At 9.8 (TAI = 28.8), the pre-bait level of cat activity on M overall is the highest since the initial aerial baiting operation in winter 2003, and is similar to the level observed in unbaited areas of the arid zone.

Overall, the combination of aerial baiting on Matuwa and additional ground baiting of the eastern portion (ME) (Fig. 1), reduced the overall feral cat camera activity index (CAI) from 9.8 to 7.3, an overall reduction of 25.5%. The wild dog CAI was reduced from 9.6 to 5.6, an overall reduction of 41.7% (Table 1; Fig. 4). However, there were differences between the feral cat CAIs across the three baiting treatments shown in Table 1. The best knockdown was achieved at ME by a combination of aerial and ground baiting, which increased knockdown by a further 28.7% compared with aerial baiting alone (MW). Aerial baiting alone (MW) only achieved a 10.7% reduction in cat CAI but a 46.5% reduction in dog CAI, whereas the combination of ground baiting and aerial baiting achieved a cat reduction of 39.4% and a dog reduction of 25.5%. The higher knockdown of dogs in the MW aerial baiting zone may be due to the much higher pre-bait dog density in this zone compared with the ME. As has been the case since we began monitoring predators on M in 2003, there is no indication of an inverse relationship between wild dog and feral cat density – they co-exist at relatively high densities with some degree of diet and habitat partitioning as described by Wysong (2016). However, given the high mobility of dogs, it is uncertain whether this method (camera traps at 2 km intervals) of monitoring dog activity/density is reliable.

Treatment	**Pre-bait camera detections**		**Post-bait camera detections**		**Pre-bait CAI**		**Post-bait (R) CAI**		**Reduction attributable to baiting (%)**	
	Cats	Dogs	Cats	Dogs	Cats	Dogs	Cats	Dogs	**Cats**	**Dogs**
Matuwa east (ME) (aerial and ground baiting)	40	18	47	26	10.4	4.7	6.3	3.5	**39.4%**	**25.5%**
Matuwa west (MW) (aerial baiting only)	36	56	62	58	9.3	14.6	8.3	7.8	**10.7%**	**46.5%**
Matuwa overall	76	74	109	84	9.8	9.6	7.3	5.6	**25.5%**	**41.7%**
Karrara Karrara (unbaited)	62 cats 39 dogs				Cat CAI = 7.7 Dog CAI = 4.8					

Table 1: Summary of pre- and post-bait camera captures and Camera Activity Indices (CAI). (R) = residual.

Figure 4: Cat and dog camera activity index (CAI) pre and post bait, for 2015, 2016 and 2017. A CAI of 3.4 equates to the 'old' TAI of 10 (dashed line), our target for cat residuals.



Since the 2016 survey, there has been a significant increase in feral animal activity, except rabbits, which have slightly decreased (Fig. 5). It's possible that the high wild dog and feral cat populations are keeping the rabbit population in check, despite the good seasons (Fig. 6). There has been a three-fold increase in camel detections. Notably, in response to the 'good season' (above average rainfall) and despite high introduced predator densities, there has been a significant increase in small mammals (prey species) such as hopping mice (Fig. 8).

Figure 5: Total camera activity index (CAI - pre-and post bait) of feral animals on Matuwa winters 2016 and 2017

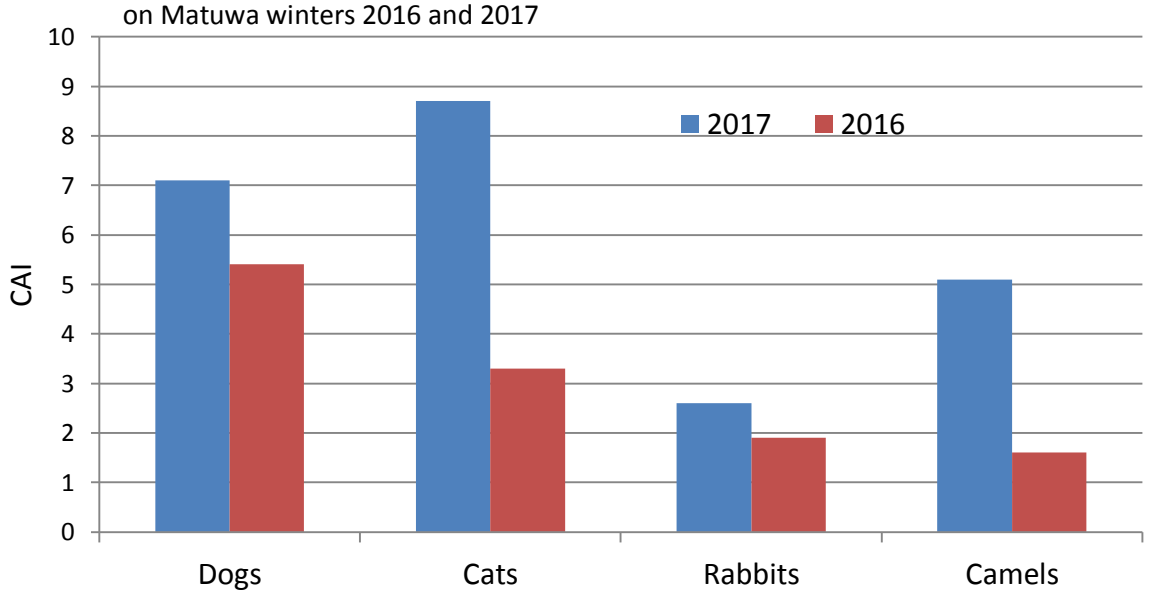
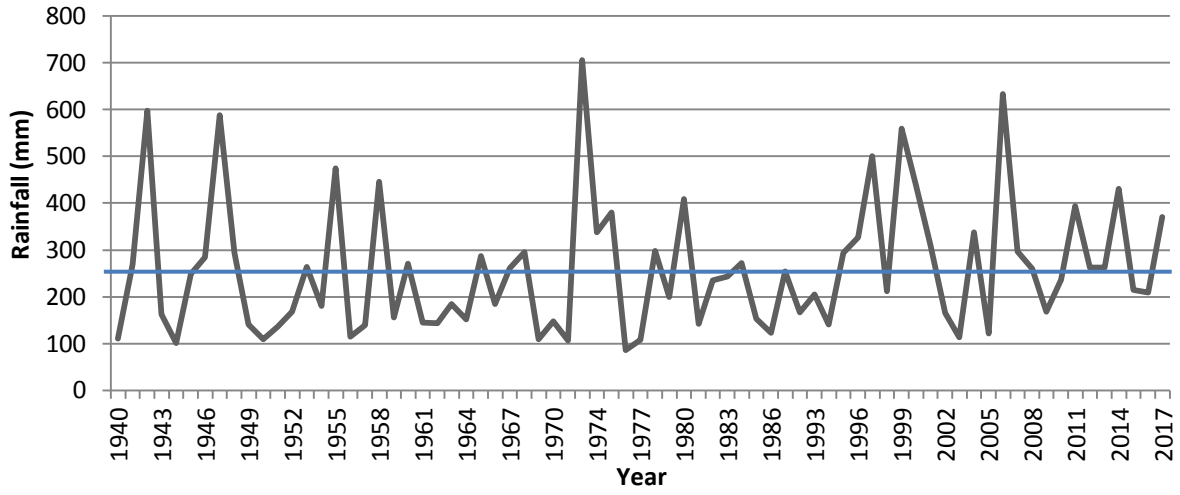


Figure 6: Annual rainfall for Matuwa 1940 to July 2017. Blue line is long term average (260 mm). Rainfall from winter 2016 to winter 2017 was 60% higher than average.



To maintain continuity with the former index generated by track counting (the Track Activity Index – TAI) since 2003, the CAIs since 2015 were converted to TAIs based on results obtained when both indices were run synchronously (see 2015 report); TAI = 2.94xCAI. Figure 7 shows that the feral cat activity index, an estimate of feral cat density, is steadily increasing and has been doing so since about 2012/13 despite annual baiting. Currently, it is at 87% of the value prior to commencement of baiting; historically, baiting has maintained the cat density at about 40-45% of the unbaited value.

Reasons for this could be:

- There has not been a prolonged 'drought' period in the rainfall record since 2005, with there being only one year (2009) that rainfall was <200 mm (Fig. 6). While exceptionally wet years drive productivity in the arid zone, prolonged drought years equally drive famine and contraction.
- Since the 1990s the decadal mean annual rainfall has been over 300 mm; prior to this it was mostly 200-250 mm, so the trend is one of increasing rainfall, no doubt leading to increasing prey species and increasing fecundity of feral cats and wild dogs.
- Based on relatively high numbers of native fauna, Fig. 8 below also indicates a 'good season', hence a) relatively high prey availability and b) high fecundity for feral cats.
- Increasing incidence of bait shyness as a result of sub-lethal dose?
- A more disconcerting possibility is that 'natural selection' is operating. We have long known that a proportion of cats (around 25-30%) in a bait naïve population, are 'bait wary' and will not pick up baits. It is possible that this innate wariness (risk aversion) of some individuals could be a genetic disposition and that some 13 years of annual baiting has selected for a higher proportion of 'bait wary' individuals in population? This suggestion needs further investigation because it has serious ramifications for long term baiting effectiveness.

As mentioned above, a single bait was also placed opposite each of the 25 cameras in the MW ground baiting trial. Consistent with the poor baiting result, all cats and dogs that passed in front of the camera, thereby passing the bait, ignored the bait. In all, there were 31 occasions (13-15 individuals) when a cat walked past the camera bait, and 18 occasions when dogs walked past the bait; on no occasion did either dogs or cats pick up the baits in front of the cameras. This is perhaps

not surprising because it is well known that there is a proportion of the dog and cat population that either will not pick up baits, or will walk past several (or more) baits before picking one up. In all, the 25 baits set in front or the cameras represent only 1% of the ground baits, so the likelihood of these baits being picked was low. However, it helps explain the poor knockdown from this year's baiting operation – low bait uptake most likely due to high prey availability, or perhaps due to an increasing proportion of animals that are 'bait shy', or both.

The cameras detected a bait being consumed by an emu; several other emus ignored the baits. A bustard also consumed a bait – another bustard ignored the baits. Similarly, a mulgara removed a bait and a kangaroo 'played' with but did not consume a bait.

Figure 8: Trends in feral cat track activity index (TAI) on Matuwa from 2003 to post-baiting in winter 2017. The 2017 baiting reduced the TAI from 28.8 to 21.4, a 25.5% reduction overall. Red line is the maximum residuals target. (Note: Monitoring method

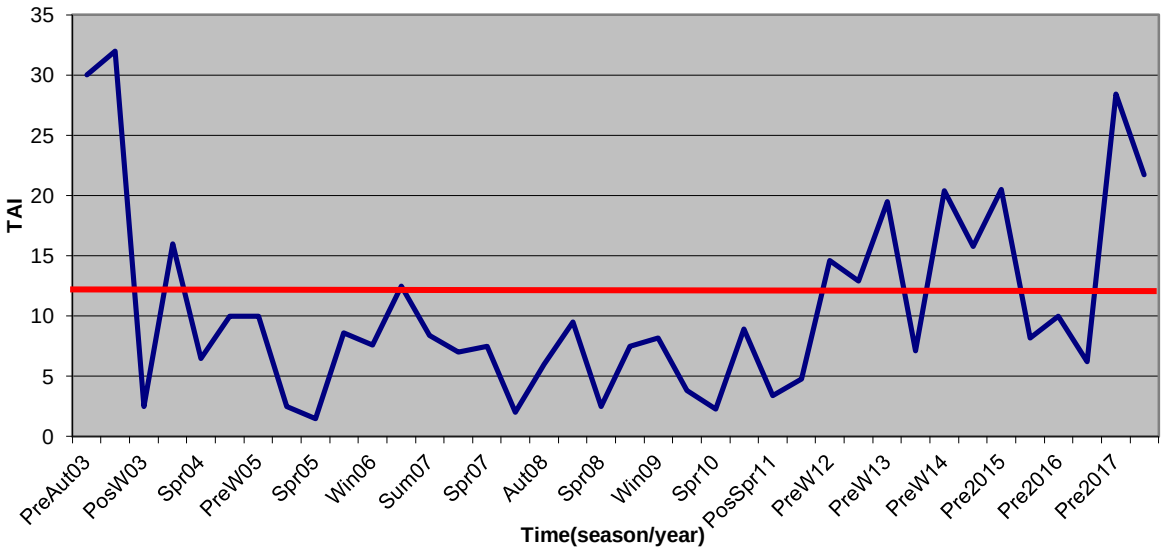
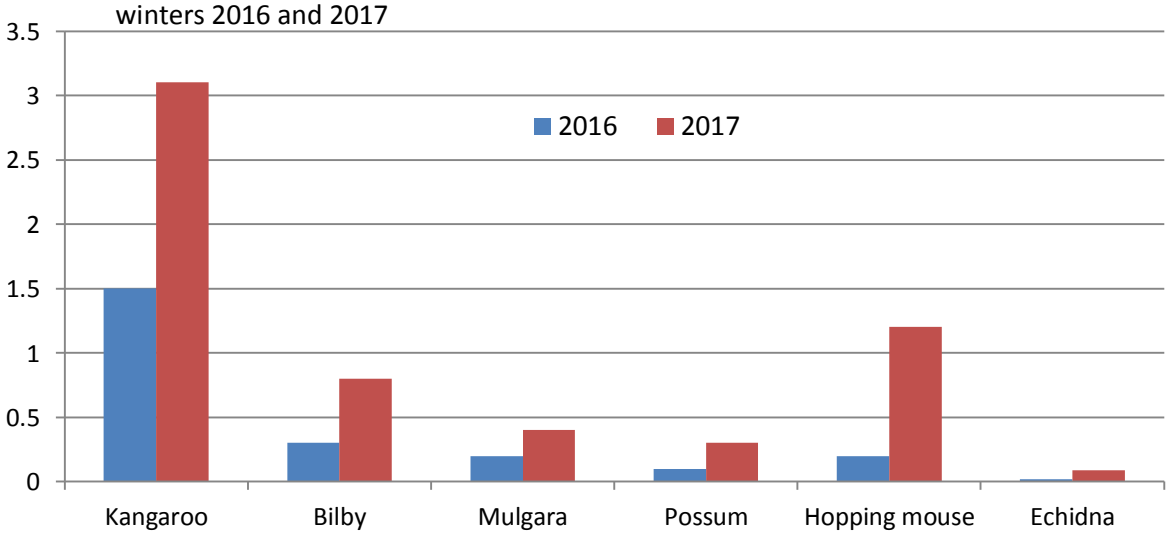


Figure 8: Total camera capture activity (CAI) of some native fauna on Matuwa winters 2016 and 2017



Other camera captures of interest

- Despite high introduced predators, the bilby population on M appears to be increasing and dispersing, with the cameras detecting more animals this year than previous years. It will be interesting to monitor the longer term (to winter 2018) effect of high predator numbers on the bilby population. Bilbies detected on cameras MA088A; MA093A; MA096A; MA084A; MA094A; MA078A; MA063B; MA071A.
- Bilbies have dispersed as far north as at least west of Jenny's Bore on KK. Bilby on KK were detected on cameras MA105A and MA106A.
- BT possums on M (camera MA066), a few mulgaras and a significant increase in hopping mice detections.
- Detection of native mammals on KK was very poor compared with M. Other than kangaroos, the bilby, and a few hopping mice, there was nothing else. No Mulgaras were detected on KK, which is disappointing, but Burrows *et al.* (2015 report), noted that;

"The mulgara population on KK has declined significantly to very low levels since the 2014 survey, most likely due to the combined effects of the recent extensive bushfires in spinifex country (no cover) and the relatively high cat density (predation pressure). There was a noticeable sparsity of small mammal footprints generally (including rabbit) on the KK survey lines".

- two pregnant cats
- A radio-collared dog (ex Mike Wysong study 2014)
- Bustards
- Curlew
- Echidna
- Emus with chicks
- Australian shell duck with ducklings
- No mallee fowl captured this year

Conclusions and recommendations

Overall, aerial and ground baiting on Matuwa achieved a 25.5% knockdown of feral cats. However, aerial baiting alone (MW) was virtually ineffective, achieving just a 10.7% knockdown of cats. This compares with 38% in 2016. In the area that experienced combined aerial / ground baiting (ME) the cat knockdown was 39.4%; although not startling, it suggests further investigation of ground/track baiting is warranted. Of great concern is the high residual population; at a CAI of 7.3 (TAI = 21.5), it is about double the targeted residual. Overall, the wild dog knockdown was 41.7%, but there is uncertainty about the reliability of the camera trap method for estimating wild dog populations because dogs are highly mobile. The poor cat baiting result is most likely due to low bait uptake because of high live prey availability following good seasons. It is also possible that introduced predators are becoming more increasingly wary of the baits.

Despite annual aerial baiting, there is a trend of increasing cat population on Matuwa since about 2012/13. Below we make recommendations about how management could respond to this.

<u>Recommendation 1: Proposed ground baiting trial winter 2018</u>

A limitation of the 2017 ground baiting was that, out of necessity, it was carried out in conjunction with the aerial baiting, casting some doubt over the interpretation of the results, even though there was a non-ground baited, aerial baited only, reference area (MW). To better evaluate, compare and contrast the two operations, it is proposed to excise part of Matuwa from aerial baiting in 2018 and use this excision for a ground baiting only trial. The proposal is as follows.

A 45,000 ha cell of Matuwa between the track that links Hegarty's Bore and Porcupine Bore, and the western boundary (see attached map), be excluded from aerial baiting and instead be ground baited only using the bait machine to deliver a single bait every ~200 m intervals, repeated after 3-4 days. This area is chosen because it has a high residual population of cats and is least likely to be traversed or accessed by others (Martu, scientists, managers, public) over the duration of the trial. Within the proposed trial area there is ~160 km of internal access tracks including the boundary tracks, giving an area-to-track distance ratio of 280 ha per km of track. This compares with a ratio of ~230 for the trial conducted this year, a 20% lower track density. The proposal is to run a double baiting of the access tracks with 3-4 days between each operation; a total of 1,600 baits will be used. As well as increasing the density of baits, this will also increase the time of exposure of 'fresh' baits to predators.

Given the discovery of bilbies on Karrara Karrara, and that the KK cat and dog populations are bait naïve, it would be worthwhile to also run a ground baiting trial on a section of KK in the vicinity of the bilbies, similar to that outlined above for M. Irrespective of ground baiting, the survey tracks on KK need cleaning up – in sections they are overgrown and badly washed out – go-arounds are needed. Suggest this be done with a truck and a heavy drag – no graders, loaders.

Carrying out these trials, subject to approval by the owners (MKK / TMPAC), and relevant baiting permits endorsed by Goldfields Region, including a risk assessment, will require track access to be closed for at least 2 weeks to minimise the risk of 'bait tampering' by people. By 2 weeks, the remaining baits will have deteriorated sufficiently to be highly unlikely to be tampered with.

Recommendation 2: Aerial baiting trigger points

If not carried out under the right environmental conditions, aerial baiting can be a significant waste of money. Well designed bait uptake trials (using non-toxic baits) in the week(s) before aerial baiting, should be undertaken first. If uptake by introduced predators is <30%, then baiting should be post-poned and a combination of ground baiting, trapping and hunting considered instead. None of these options will be as expensive as aerial baiting, but could be more effective when bait uptake is low. A portion of the Western Shield funds earmarked for aerial baiting could fund these operations.

Recommendation 3: Mop-up trapping, hunting

Should aerial and / or ground baiting be unsuccessful (i.e., cannot reduce / maintain CAI ≤ 3.4 (TAI 5≤10)) then a well designed, strategic program of trapping / hunting should be considered.

Recommendation 4: Innovative feral cat control research

After early baiting success, there are now strong signals in the monitoring data that since 2012/13, the feral cat population on Matuwa is steadily trending up as baiting, for whatever reason, becomes less effective, or is more variable from year-to-year in terms of knockdown. From the outset, baiting was always considered a 'holding action' while better control strategies were developed; at the moment, there is nothing on the horizon. Further research is urgently needed to explore:

- Biological control including infectious diseases and engineered gene drive technology ('daughterless scats').
- Whether there is a genetic pre-disposition to 'bait aversion' as discussed above.
- Novel baits?

Recommendation 5: Expansion or replication of the predator proof compound

While we work at innovative feral cat control solutions, there is an urgent need to expand or replicate predator proof compounds (inland islands) to protect threatened arid zone native mammals (and possibly birds). As an 'insurance policy' and back-up to the highly successful compound on Matuwa, serious consideration should be given to establishing a second 'inland island' for threatened arid zone mammals in the Goldfields Region.

Acknowledgements

We thank Rob Brazell and the Western Shield Team, and Matuwa caretakers, Dave and Corrie, for invaluable assistance with this project. No thanks to feral cats and wild dogs, who were most unco-operative. Congratulations to bilbies, who, despite the cats and dogs, have made it to Karrara Karrara.

Attachment 1

Map of proposed ground baiting trial July 2018 (red hatching)

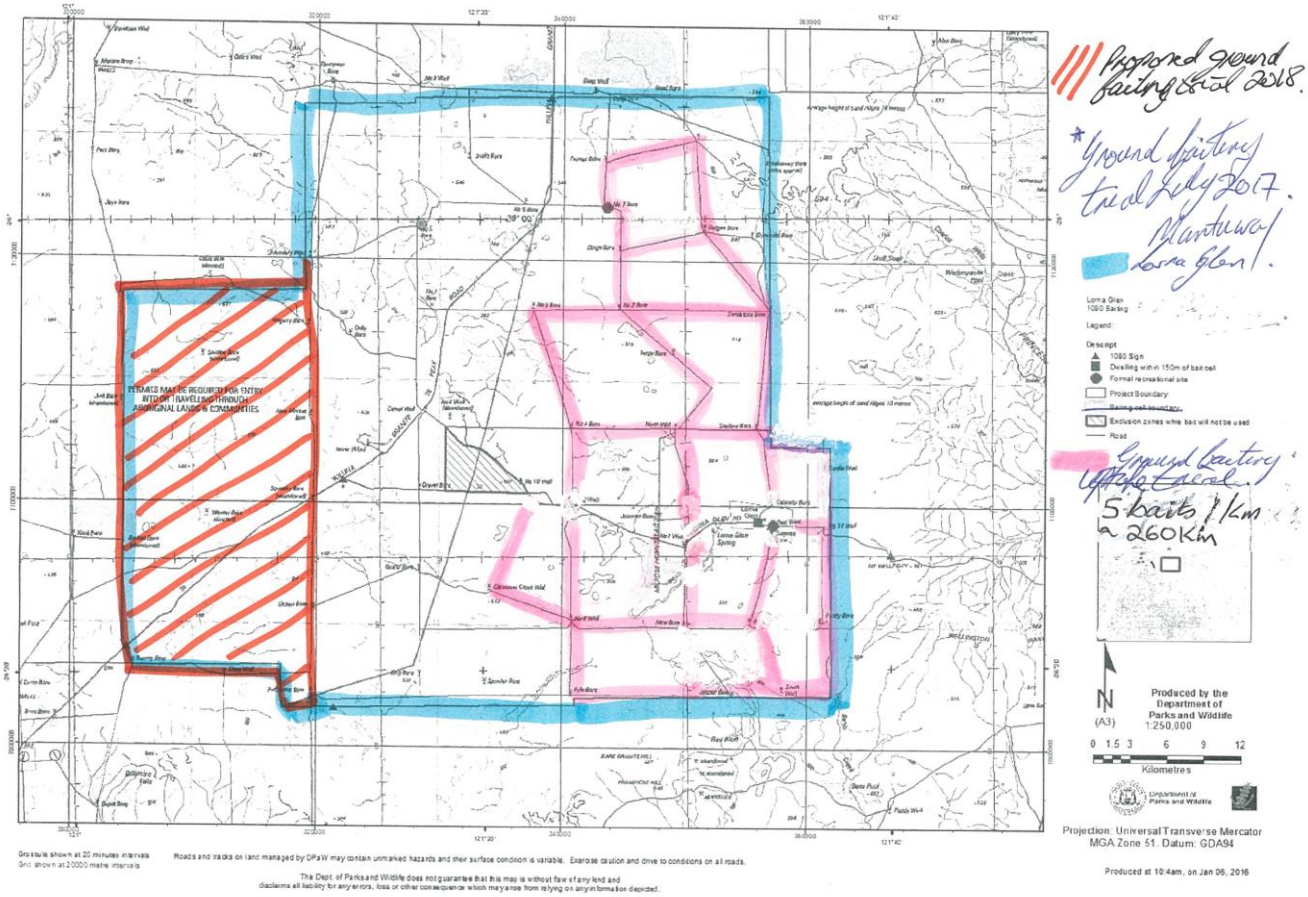


Photo Gallery


2017-08-17 17:27:27 M 1/3 22°C
095
RECONYX


2017-07-26 08:41:07 M 3/3 19°C
054
RECONYX


2017-08-09 09:55:59 M 3/3 21°C
067
RECONYX


2017-08-06 22:50:35 M 1/3 4°C
082
RECONYX


2017-08-06 17:43:09 M 3/3 22°C
066
RECONYX


2017-08-06 07:55:24 M 2/3 3°C
082
RECONYX


2017-07-01 09:31:13 M 3/3 13°C
059
RECONYX


2017-07-27 06:59:57 M 3/3 2°C
085
RECONYX


2017-07-19 05:59:10 M 1/3 3°C
062
RECONYX


2017-07-19 01:08:08 M 1/3 9°C
067
RECONYX


2017-07-09 12:10:47 M 1/3 23°C
091
RECONYX


2017-07-01 23:55:55 M 2/3 9°C
093
RECONYX


2017-08-11 20:14:51 M 3/3 7°C
069
RECONYX


2017-06-23 21:13:43 M 1/3 10°C
072
RECONYX


2017-07-05 04:04:00 M 1/3 -3°C
060
RECONYX


2017-07-19 04:16:06 M 3/3 8°C
059
RECONYX


2017-07-16 16:58:20 M 1/3 20°C
060
RECONYX


2017-06-26 07:19:19 M 3/3 11°C
067
RECONYX


2017-06-29 10:20:53 M 3/3 15°C
051
RECONYX


2017-06-20 11:46:41 M 2/3 30°C
072
RECONYX