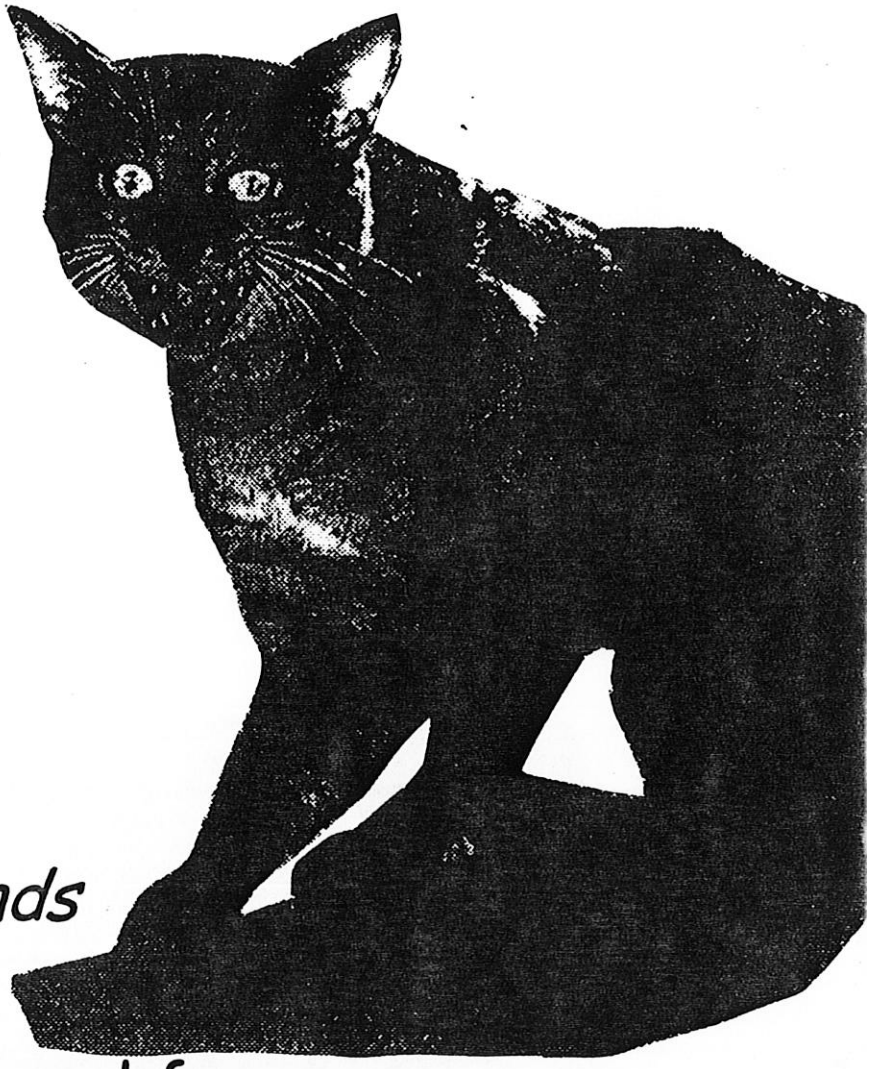
Feral cats



Argyle Diamonds

A report prepared for Argyle Diamond Mines Pty Ltd 1998

By J.A.Sinagra and D.Algar
Department of Conservation and Land Management
PO BOX 51 Wanneroo WA 6065

Introduction

Feral cats are widely recognised as a serious threat to populations of small to medium sized native vertebrates in Australia. Predation by cats has resulted in the local extinction of a number of species on islands and mainland Australia (Dickman 1996; Smith and Quin 1996) and may affect the continued survival of many others persisting at low population levels. A number of reintroduction programs have also suffered because cat predation has significantly reduced the survival of the reintroduced species (Gibson *et al.* 1994; Christensen and Burrows 1995). Control of feral cats is widely recognised as one of the most important conservation issues in Australia today.

Until recently, limited research has been conducted on control strategies for feral cats. The Department of Conservation and Land Management (CALM) has now developed a research program to provide an effective and cost efficient strategy to control feral cats as part of the umbrella program 'Western Shield'. Broadscale baiting offers the best option to control feral cats in strategic areas. CALM has recently developed a cat bait, that has proven highly acceptable to feral cats in a series of small-scale field trials. In conjunction with the bait, a series of techniques that enable assessment of baiting efficiency have also been developed.

We were invited to visit Argyle Diamonds to assess the feral cat problem on-site and examine the potential of the new bait type as a control strategy for the area. Results from this visit (11-24th August 1998) and recommendations are detailed in this document.

Methodology

Study Site

The study area selected, was slightly larger than that used during the previous visit (Algar and Sinagra 1998) in order to provide a greater sample size (see Fig. 1). Also the valley along Smoke Creek (Old Haul Way) was not trapped on this occasion because of mining traffic. The study site selected provided information on cat abundance in the range of habitat types on the lease. The area consisted of: -

- rocky ranges carrying open savannas and low tree steppe along Bent Way
- the Tailings Dam No. 3/Catchment Area around the Alluvial Plant and Tailings Dam No. 5 consisting of reed banks fringing the catchment area
- the drainage channels to the catchment area
- the alluvial plains, consisting of riverine fringing woodland along the creek banks with savannas of bunch-grass grasslands or spinifex along the main roads

The area is located in the Hall Botanical District of the Northern Botanical Province and general habitat descriptions have been taken from Beard (1979) and Dames and Moore (1981). In addition to the Hall Botanical District, the

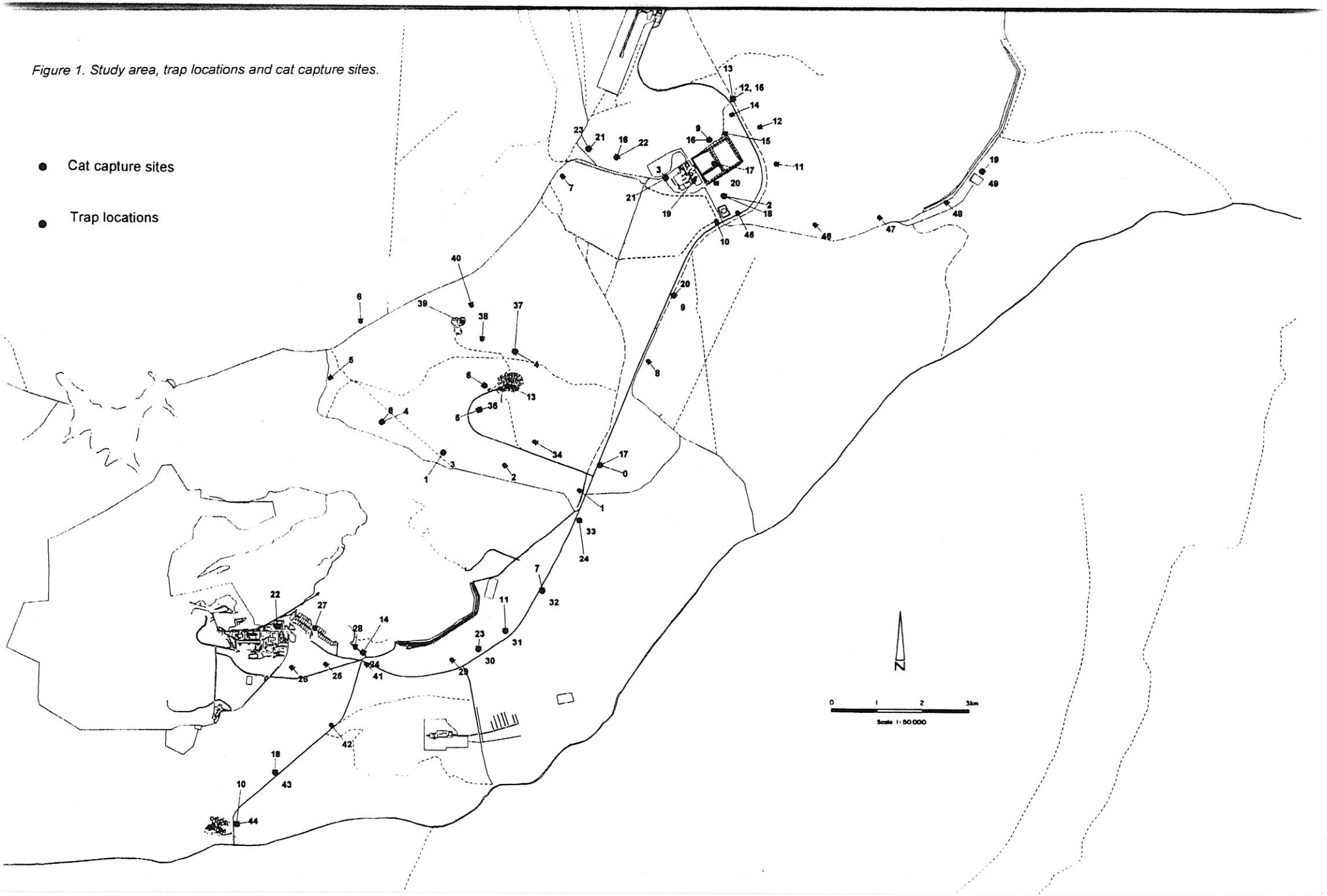


Figure 1. Study area, trap locations and cat capture sites.

vegetation also has elements representative of the Gardner and Fitzgerald Botanical Districts (Dames and Moore 1981).

Records of faunal species in the area are given in Kitchener (1978) and Dames and Moore (1981).

Baits and Baiting Regime
The bait developed consists of a small kangaroo meat sausage, approximately 30 g wet-weight, dried to approximately 20 –25 g. The dimensions of this chipolata style bait are 7 cm (length) and 2 cm (diameter) (see Plate 1). A number of flavour enhancers are added to the kangaroo meat (10%w/w) which significantly improve the acceptance of the bait.

The non-toxic sausage baits were injected with Rhodamine B (30 mg/bait), a systemic biomarker that is incorporated into the growing zone of hair. Rhodamine B has proven a very successful label in cats (Fisher *et al.* in press).

The dried non-toxic sausage baits were transported to Argyle and baiting was conducted from a vehicle, 10 days prior to our site visit. The baits were laid at 100 m intervals along the road and track verges described below. A total of 61.9 km was baited, giving an approximate baiting density of 10 baits/km^2.

Bait placement details were listed as follows:
1. Around administration building following the main road to Alluvials and then to the (airport and Lake Argyle)* (18.8 km)
2. Turnoff to alluvial, (Gap Dam, and around Gap Dam)* (9.3 km)
3. Gap Dam (via Bent Way) Main road (5.0 km)
4. From Main road, Wandarrie and around the village (4.3 km)
5. (From Main road, Limestone Creek mining Area)* (1.9 km)
6. From main road, Argyle village, around, sewerage ponds and oval (6.5 km)
7. (Inside processing plant, mess and waste disposal areas)* (7.0 km)
8. (Around oily waste plant, petrol station, fire control training yard and Environment block)* (3.0 km)
9. From main road to alluvial tailing dam (6.1 km)

( )* denotes areas not trapped.

Trapping methodology
CALM has developed a highly successful technique to trap feral cats. The technique, described below, also provides a simple and effective method to assess cat abundance.

Each trap site consists of a channel cleared into a bush to create a one-way (blind) trap set. Two Victor Soft-catch (No. 3) traps are positioned at the entrance of the blind set, at each trap site. Cats are lured into the traps by placing 'pongo' (a blended mixture of cat faeces and urine) and 'FAP's' (Felid Attracting Phonics) at the back of each blind set (see Plates 2 and 3). Trap sites were located at approximately 1 km intervals adjacent to the roads listed above. Certain areas that were baited could not be trapped because of mining

Plate 1. Rhodamine B labelled cat bait

Plate 2. Trap set configuration

Plate 3. Completed trap set

traffic, limited and/or restricted access. The trapping circuit was not continuous and 50 traps were located over approximately 32 km of track. Trap locations were recorded using a Garmin GPS 12XL and are shown in Figure 1.

In addition to the trapping program, described above, wire cage traps with treadle snares were used to trap cats around Argyle Village, Wandarrie and inside the mine-site. Five traps, baited with a variety of food lures, were placed opportunistically around these areas during the study period.

Trapped cats were humanely destroyed using a 0.22 calibre rifle. All animals captured were sexed, weighed and aged (as either kitten, juvenile or adult) according to their weight. Whisker samples were removed from each individual cats to determine the presence/absence of the biomarker (see Plates 4 and 5). Stomach contents were removed for diet analysis. Brain, liver, blood and faecal samples were collected for analysis of parasite presence and also for future DNA studies.

Laboratory examination of the whisker samples was conducted at (10 x) magnification using an epifluorescence condenser microscope (Jenamed2-Carl Zeiss) using a Green filter combination block. The whiskers were also examined using a hand held ultraviolet lamp (365nm) in a darkroom. Marked whiskers were distinguished by brilliant orange fluorescence located on or just above the base of the whisker.

The mammals collected in the cat stomach contents were identified according to cross-sectional hair structure as described in Brunner and Coman (1974). Identification of the bird and insect remains was not conducted.

Results

A maximum total of 50 trap sets were located in the study area. The daily trap numbers set and captures are given in Table 1.

Table 1. Daily trap numbers and cat captures

Date	Trap No's	Captures
14/8/98	24	3
15/8/98	40	6
16/8/98	45	3
17/8/98	45	4
18/8/98	45	1
19/8/98	50	2
20/8/98	48	1
21/8/98	48	2
22/8/98	45	1
23/8/98	26	1

A total of 24 cats (14 males, 10 females) were captured during the study period. The individual cat capture records are presented Table 2 and the capture locations are shown in Figure 1.

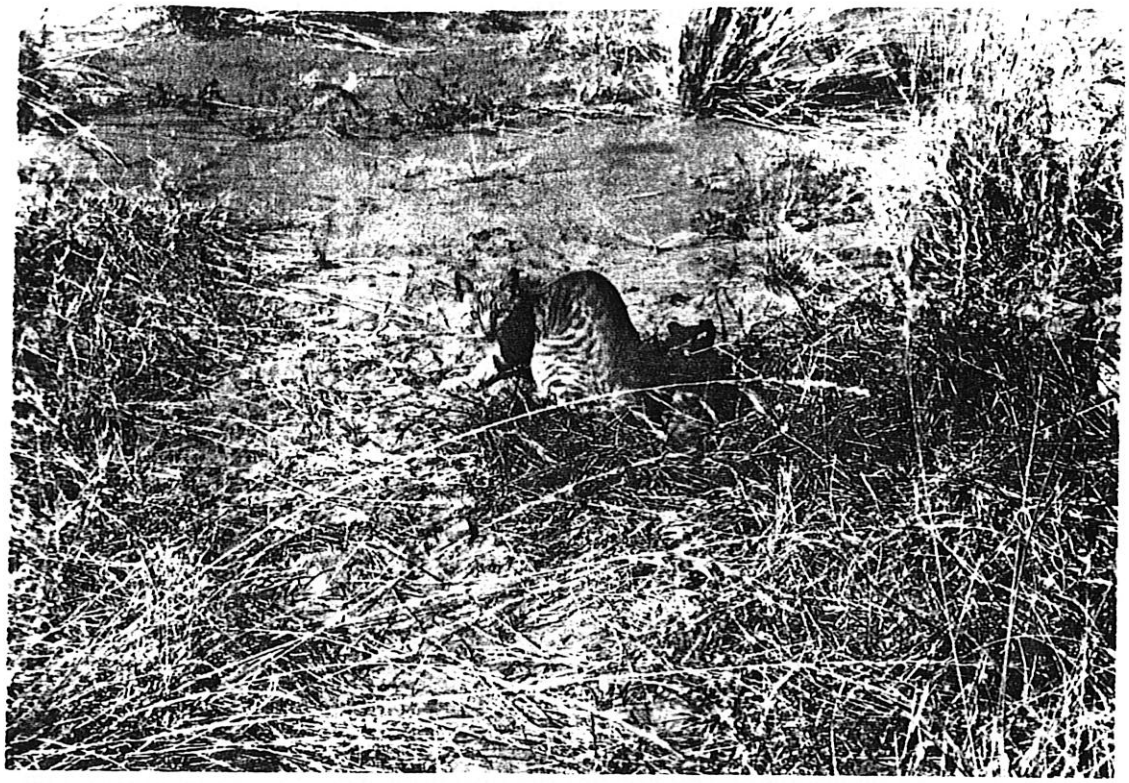


Plate 4. Trapped cat

Plate 5. Removal of cat whiskers for analysis of biomarker presence/absence

Table 2. Individual cat capture records. The age of the cats was recorded as A=Adult, J=Juvenile and K=Kitten

Date	Cat No.	Trap No.	Sex (M/F)	Coat colour	Weight (kg)	Age (A,J,K)
14/8/98	1	3	F	Tabby	3.0	A
	2	18	F	Tabby	2.2	J
	3	21	M	Orange	3.0	A
15/8/98	4	37	M	Black	4.0	A
	5	35	F	Orange	3.0	A
	6	36	M	Tabby	4.5	A
	7	32	F	Tabby	1.7	J
	8	4	M	Black	4.0	A
	9	16	F	Tabby	2.7	A
16/8/98	10	44	F	Tabby	3.3	A
	11	31	M	Orange	4.1	A
	12	13	F	Black	2.1	J
17/8/98	13	Cage	F	Tabby	2.6	A
	14	24	M	Tabby	4.3	A
	15	13	F	Black	2.2	J
	16	22	F	Tabby	2.3	J
18/8/98	17	0	M	Orange	4.5	A
19/8/98	18	43	M	Tabby	4.4	A
	19	49	M	Tabby	3.0	A
20/8/98	20	9	M	Tabby	4.1	A
21/8/98	21	23	M	Orange	3.0	A
	22	Cage	M	Tabby	3.6	A
22/8/98	23	30	M	Orange	4.1	A
23/8/98	24	33	M	Orange	2.9	A

A total of 9 cats contained stomach contents when captured. The contents of these stomachs are presented in Table 3.

Table 3. Stomach contents of captured cats

Cat No.	Stomach contents
1	*Mus musculus*
2	Bird
3	*Mus musculus*
4	*Mus musculus*
8	Bird
9	Insect
17	Insect
18	Bird and insect
22	Insect

Analysis of the presence/absence of Rhodamine B in the trapped population is presented in Table 4.

Table 4. Rhodamine B results for the trapped population

Cat No.	Rhodamine B Presence (+/-)
1	+
2	+
3*	-
4	+
5	+
6	-
7	+
8	-
9*	-
10	+
11	-
12*	-
13	+**
14	+
15*	-
16*	-
17	-
18	+**
19	+
20	+**
21	+**
22	+**
23	+
24	+

*denotes cats captured outside baited area,
**denotes cats with labelled whiskers and remnant baited material in stomach.

A total of 19 cats were captured in the baited area, of these animals15 individuals were marked with the Rhodamine B biomarker. A further 5 cats (Cat No.s 3, 9,12,15,and 16) were captured outside the baited area and were not labelled with the biomarker. These individuals were captured within the alluvial dam areas and were unlikely to have been exposed to a bait. Exclusion of these cats from the data set indicates that approximately 80% of the cat population had consumed at least one bait and would have died if a toxic bait delivery had occurred. Five of the trapped cats whose whiskers were marked also contained remnant bait material and the biomarker in their stomach or intestinal tract indicating that they had recently consumed a bait and had consumed multiple baits over time.

Discussion

In the previous study (Algar and Sinagra 1998) 16 feral cats were captured along a circuit of approximately 20 km (0.80 cats/km). In this study, 24 cats were trapped along 32 km of road (0.75 cats/km). These results indicate that cat density in the area is extremely high. In fact, these are the highest densities of cats we have recorded and such an abundance of cats would undoubtedly be having a serious impact on extant native species. The other important factor that these results show is that the removal of cats last year created a vacuum that was rapidly filled by cats dispersing in from outside the area. The results also indicate that cats are generally abundant across the various land systems trapped.

Baiting programs offer the most effective and cost efficient broad-scale control strategy for feral cats. Trapping as a control technique, as distinct from a research tool, is labour intensive and is only justified over small-scale areas (eg. islands) if eradication is warranted. The experimental baiting program used in this study resulted in 80% of the cat population consuming at least one bait. Also, a number of cats consumed multiple baits over a period of time, some of these baits were eaten long after they had been laid, despite environmental extremes affecting bait quality. It is likely that the proportion of the cat population killed, had the baits been toxic, would have been greater than the proportion that ingested the non-toxic baits. This is because consumption of multiple non-toxic baits over a number of days would reduce bait availability to other cats. In contrast, cats consuming toxic baits are unlikely to survive more than one day.

Since completion of the baiting program at Argyle additional research on bait refinement has been completed that has further enhanced the acceptability of the bait. It is anticipated that the new bait will significantly improve bait consumption in the field and result in an even greater baiting efficiency.

As suggested while on-site, it was recommended that there was a need to implement feral cat control in the area. Provision of cat control measures would reduce the potential health risk to staff and also reduce the significant predation pressure on extant wildlife. A series of recommendations to provide effective and cost efficient feral cat control, based on results from this study and recent advances in bait development, are detailed below for consideration.

- Baiting programs can be conducted either by aerial deployment or laying the baits from a vehicle. Aerial baiting programs conducted along standard width transects, are likely to provide a more effective control strategy because of uniform coverage of the area however, aerial baiting imposes a significant cost to the control program. Results of this study indicated that baits delivered from a vehicle would provide an effective control measure.

- The optimum baiting intensity for cost effective control has yet to be determined. The benchmark baiting regime of 10 baits/km^2 (one bait/100 m) would have resulted in an 80% reduction of the cat population. Baiting effectiveness would be expected to increase with the use of the newly

developed toxic baits. It is suggested that this baiting regime is appropriate for the site with baits being laid along all tracks and access areas within the lease.

- Although we have no data on appropriate baiting frequencies for the site it is suggested that two baiting programs be conducted during the dry season, each year. Staff at Argyle indicated that a large number of cats were observed following the wet season. It is suggested therefore that these two baiting programs be conducted in April and August each year. This baiting frequency should maintain effective control across the year by removing recruits during the main dispersal phases.

Acknowledgements

We gratefully appreciate the invitation to visit Argyle Diamonds extended to us by Mr Jeff Waddington, Shelley Innes and Dr Sam Samaraweera. We would also like to acknowledge the hospitality shown by all the staff of Argyle Diamonds.

References

Algar, D. and Sinagra, J.A. (1998). *Feral Cats: Argyle Diamonds.* Report prepared for Argyle Diamond Mines Pty. Ltd.

Beard, J.S. (1979). *Vegetation survey of Western Australia. Kimberley 1:1,000,000 Vegetation Series Explanatory Notes to Sheet 1.* University of Western Australia Press, Nedlands, Western Australia.

Brunner, H. and Coman, B.J. (1974). *The Identification of Mammalian Hair.* (Inkata Press: Melbourne).

Christensen, P. and Burrows, N. (1995). Project desert dreaming: experimental reintroduction of mammals to the Gibson Desert, Western Australia. In '*Reintroduction Biology of Australian and New Zealand Fauna*' (Ed. M. Serena). pp. 199-207. Surrey Beatty & Sons, Sydney.

Dames and Moore (1981). *Environmental Review and Management Program.* Argyle Diamond Project.

Dickman, C.R. (1996). Overview of the Impact of Feral Cats on Australian Native Fauna. Report to Australian Nature Conservation Agency.

Fisher, P., Algar, D. and Sinagra, J.A. (in prep.). Use of Rhodamine B as a systemic marker for feral cats (*Felis catus*). Submitted to *Wildlife Research.*

Gibson, D.F., Lundie-Jenkins, G., Langford, D.G., Cole, J.R. Clarke, D.E. and Johnson, K.A. (1994). Predation by feral cats, *Felis catus*, on the rufous hare-wallaby, *Lagorchestes hirsutus*, in the Tanami Desert. *Australian Mammalogy* **17**, 103-7.

Kitchener, D.J. (1978). Mammals of the Ord River area, Kimberley, Western Australia. *Records of the Western Australian Museum* **6**, 189-219.

Smith, A.P. and Quin, D.G. (1996). Patterns and causes of extinction and decline in Australian conilurine rodents. *Biological Conservation* **77**, 243-67.