Assessment of Feral Cat Abundance and Control Strategies on Rottnest Island: A Report to the Rottnest Island Authority.

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Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT

Conserving the nature of WA

Introduction

Domestic cats (*Felis catus*) have been introduced to Rottnest Island at various times since European settlement (King 1985). It is likely that they were introduced both as pets and as predators of commensal pest animals such as rats (*Rattus rattus*) and mice (*Mus musculus*).

Historically, the Rottnest Island Board (now the Rottnest Island Authority) has attempted to rid the island of all cats. It was proposed by the Board in 1965, that all cats, including domestic pets, be removed from the island by October. All wild cats would be exterminated by shooting and trapping (West Australian Newspaper 1965). Fifteen years later in July 1980, in an effort to protect the island's bird populations, all domestic cats were removed from Rottnest. Approximately 20 residents had domestic pet cats at this time and the Board was still working on a solution to destroy all wild cats (West Australian Newspaper 1979 and 1980).

By 1985, a small population of feral cats was present on the island but its size was unknown (King 1985). There were no data to suggest that cats were implicated in the decline of any fauna on Rottnest Island however, there was the possibility that cats were influencing the abundance of native fauna (*op. cit.*). If the cat population was left uncontrolled, it was likely to increase and could result in considerable damage to ground nesting birds and heavy predation pressure on quokkas (*Setonix brachyurus*) and reptile species (King 1985).

Control measures available for feral cats at this time had not proved particularly effective or economical. Management options for the control of the cat population were to: - continue the prohibition of importation and/or the keeping of domestic cats on the island, maintain the occasional cage-trapping program, exclude cats from rubbish bins and the tip to reduce the source of supplementary food and the possibility of localised baiting programs. The implementation of this on-going management strategy, excluding baiting, was reported to have greatly reduced the feral cat population by 1997 and only a small number (possibly two or three) of cats remained (Pontre 1997). As part of the Rottnest Island Management Plan (1997-2002) control programs for feral cats were to continue to enable eradication of cats from the island (Pontre 1997).

The Department of Conservation and Land Management has been developing control strategies for feral cats under the umbrella program 'Western Shield'. This research has led to the successful design and development of an effective trapping technique and a bait that is readily consumed by cats and can be used over broad-scale areas for their control. The Department was approached by Claire Wright of the Rottnest Island Authority to assess feral cat numbers and control options on the island. Researchers visited the site from the 14-27

November 2001 to conduct a feral cat trapping program. Documented in this report are their findings and recommendations for feral cat control.

Methodology

Site Description
Rottnest Island is an 'A' Class reserve (Reserve A 16713), vested in the Rottnest Island Authority, gazetted for the purpose of public recreation. The island is located on the southern west coast of Western Australia at $32^{0}00'S$ and $115^{0}30'E$. The island, an area of approximately 19 km^2, lies in an approximate east-west orientation and is 11 km long and less than 5 km wide at its widest point.

Undulating old dunes, now limestone and overlain by sand, cover the greater part of the island. A chain of lakes dominate the north-eastern area. Many small swamps and soaks, located in the interdunal depressions, are scattered around the eastern half of the island. The serrated coastline consists of a succession of exposed headlands and sandy bays. There are also a number of sand blowouts that support little or no vegetation (Anon. 1978; Anon 1983). The vegetation on the island is described in the above references and Rippey and Rowland (1995).

Assessment of Cat Abundance and Control Options

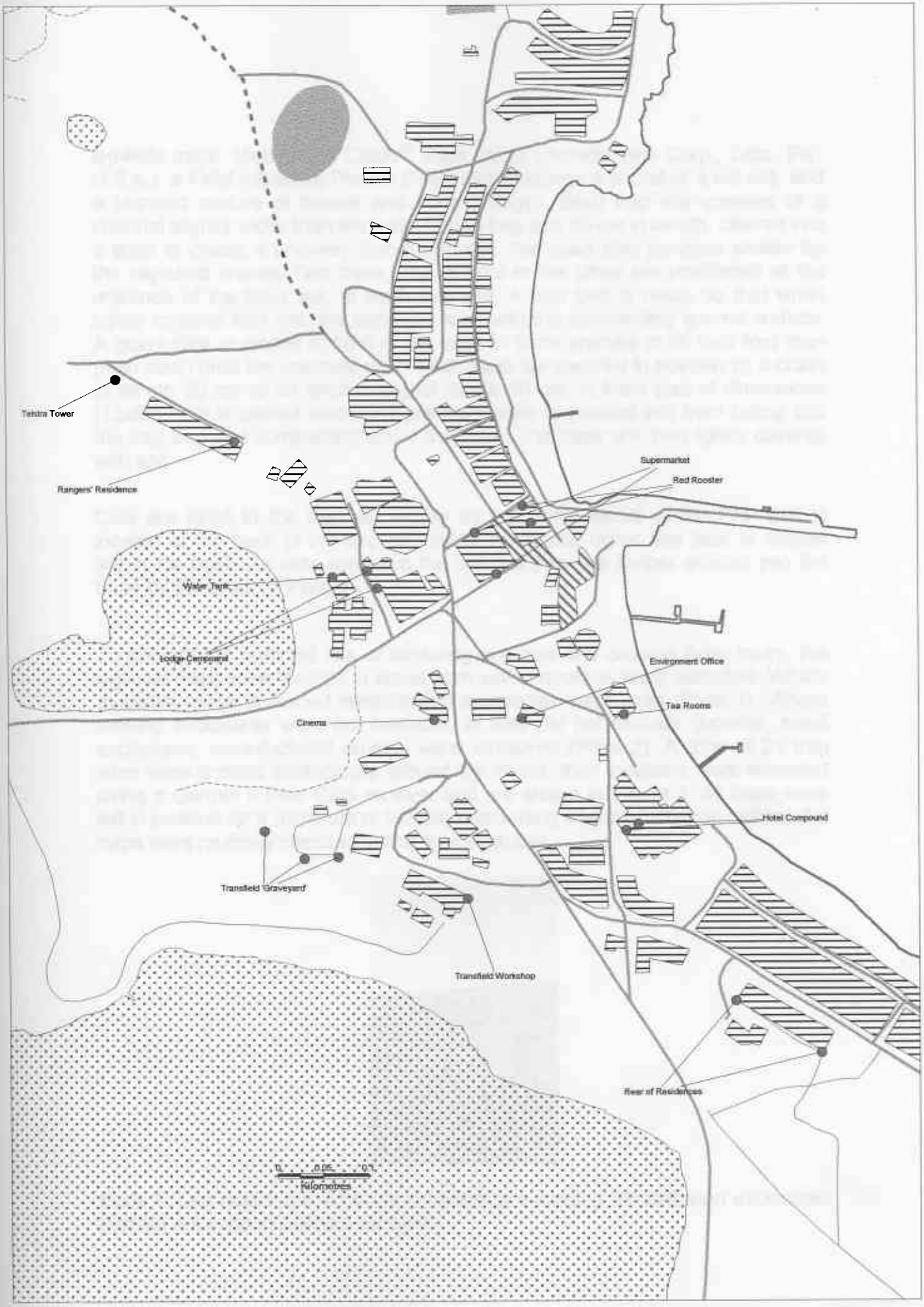
Records of cat sightings by Rottnest Island Authority staff, maintenance personnel and residents have been documented since April 2001. These records suggest that perhaps up to five feral cats were present on the island at the time the program described below was implemented.

A combination of trap success and monitoring of track activity, employing the techniques described below, was used to estimate cat abundance and identify any foci of activity.

The Trapping Program
A total of 30 wire cage traps (60x20x20 cm) with treadle plates were placed in areas of human habitation and where non-target species were likely to be captured. Locations within the settlement area are indicated by Figure 1. Further to these, cages were also placed at the nursery (1), university house – Wadgemup Hill (2), ranger's house – Wadgemup Hill (2), Kingstown Barracks (3) and immediately outside the refuse site (2). The majority of these traps were left in position over a five-day period, providing 145 trap nights. The traps were baited with fresh pilchards daily and sprayed with an ant deterrent compound (Coopex®) at a concentration of 12.5 g L^{-1} Coopex, as per the manufacturer's instructions.

Cage traps can be ineffective for trapping feral cats (Friend and Algar 1993; Lee 1994; Anon. 1999). A more effective technique to trap feral cats utilises padded

Figure 1: Locations of Cage Traps Within the Settlement Area.



● Cage trap location.

Buildings

Paved Mall.

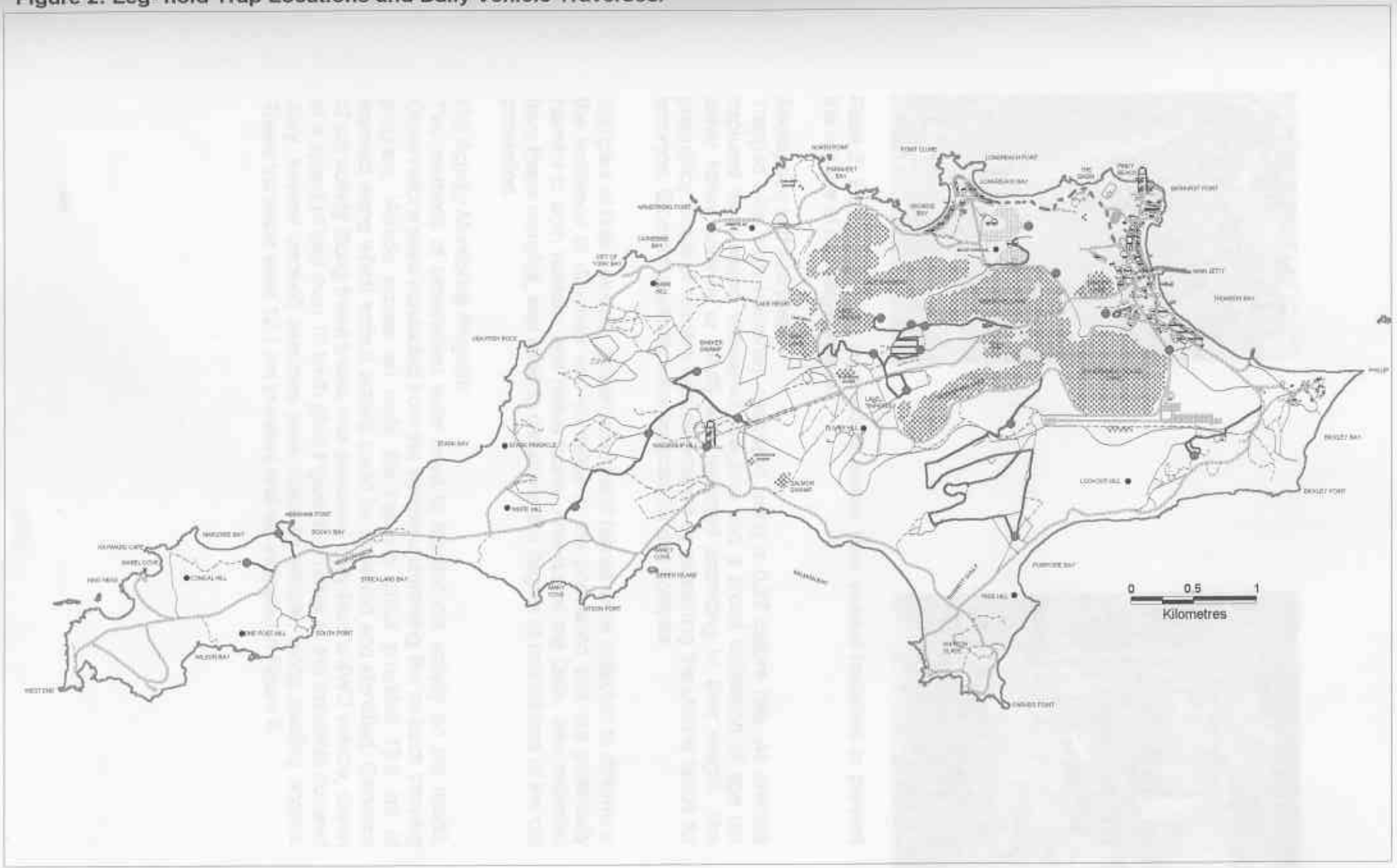
leg-hold traps, Victor 'Soft Catch'® traps No. 3 (Woodstream Corp., Lititz, Pa.; U.S.A.), a Felid Attracting Phonic (FAP) that produces a sound of a cat call, and a blended mixture of faeces and urine (Pongo). Each trap site consists of a channel slightly wider than the width of one trap and 80 cm in length, cleared into a bush to create a one-way (blind) trap set. The bush also provides shelter for the captured animal. Two traps, one in front of the other are positioned at the entrance of the blind set, at each trap site. A trap bed is made so that when lightly covered with soil, the traps are level with the surrounding ground surface. A guide stick is placed in front of the traps to force animals to lift their foot then push down onto the pressure plate. Both traps are secured in position by a chain of length 30 cm to an anchor peg of length 30 cm. A foam pad of dimensions (12x8x2 cm) is placed below the pressure plate to prevent soil from falling into the trap bed and compacting under the plate. The traps are then lightly covered with soil.

Cats are lured to the trap set initially by the audio signal of the FAP that is located at the back of the trap set, either concealed under leaf litter or hidden within the bush. As cats approach the trap set they are further enticed into the traps by the smell of 'Pongo'.

To prevent the potential risk of capturing quokkas and causing them injury, the leg-hold traps were located in areas from which quokkas were excluded. Where available, existing fenced rehabilitation exclosures were used (Plate 1). Where existing exclosures were not available, or they did not exclude quokkas, small exclosures, manufactured on-site, were employed (Plate 2). A total of 21 trap sites were located strategically around the island; their locations were recorded using a Garmin II Plus GPS receiver and are shown in Figure 2. All traps were left in position for a minimum of five days, providing a total of 162 trap nights. The traps were routinely checked at first light each day.

Plate 1: Leg-hold traps were placed within pre-existing rehabilitation exclosures that did not support resident quokkas.

Figure 2: Leg- hold Trap Locations and Daily Vehicle Traverses.



● Leg-hold Trap

——— Vehicle Traverse

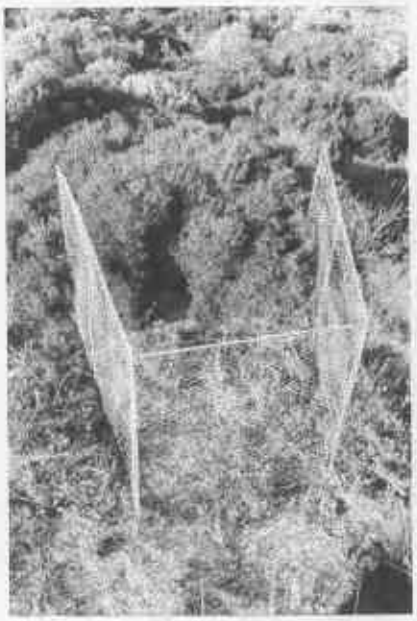


Plate 2: Exclosures were constructed on-site from various materials to prevent the capture of non-target species.

Necropsies and Analyses

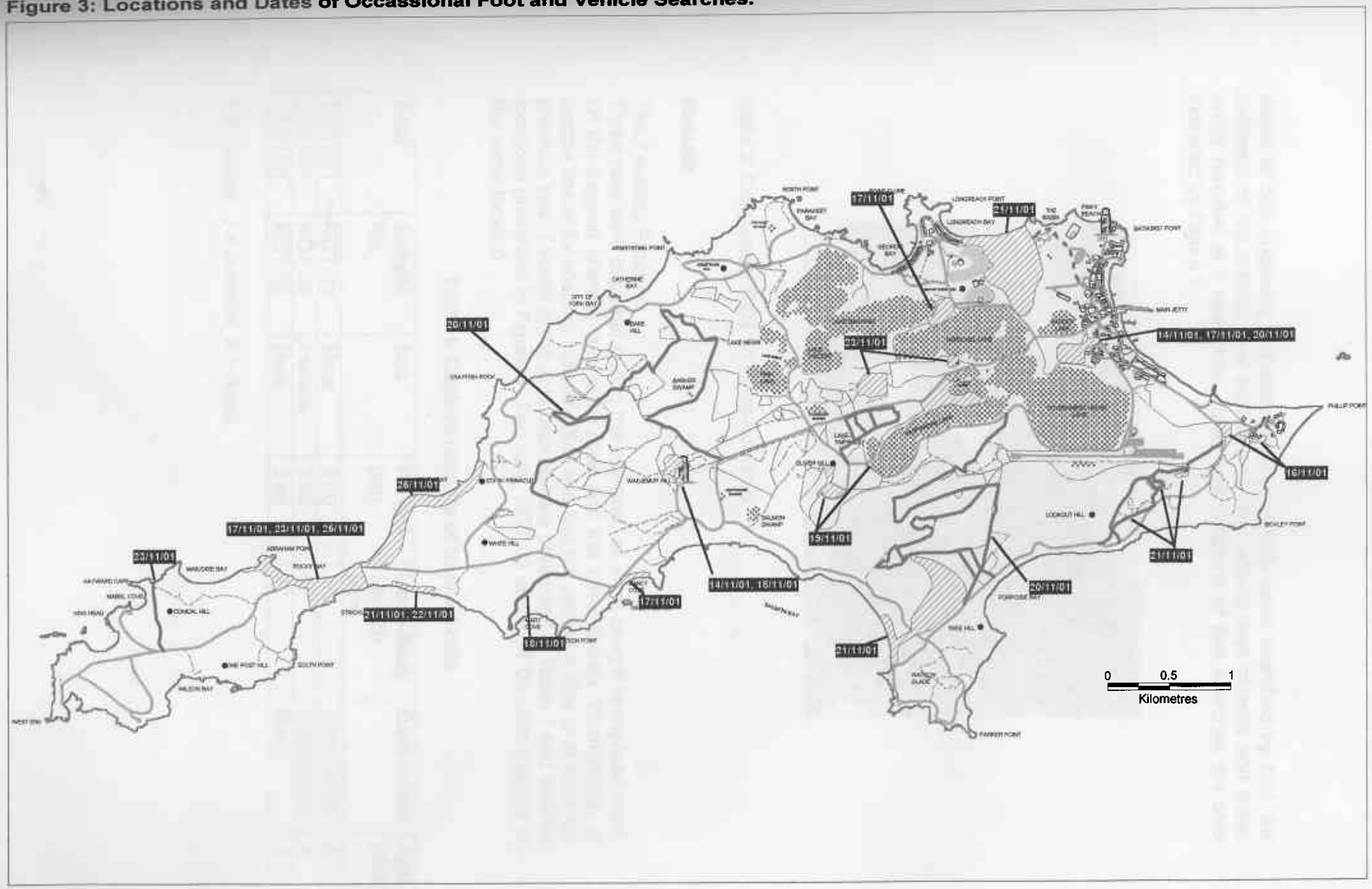
Trapped cats were humanely destroyed using a 0.22 calibre rifle. All animals captured were sexed, measured, weighed and a broad estimation of age (as either kitten, juvenile or adult) was recorded according to their weight. The pregnancy status of females was determined by examining the uterine tissue for embryos. Stomach contents were collected for diet analysis.

Samples of brain, muscle, spleen, blood and faeces were collected to determine the incidence of diseases and parasites in the population that are potentially harmful to both humans and native fauna. Analysis of the DNA, also collected from these samples, was used to determine the degree of relatedness of the cat population.

Cat Activity Monitoring Program

Two methods of observation were used to monitor cat activity on the island. Observations were conducted from the vehicle undertaking the on-track trapping program. Vehicle access en route the trapping circuit provided 13.6 km of transect along which animal activity could be observed and identified. Evidence of cat activity along these tracks was assessed daily from a 4WD vehicle, driven at a speed of less than 10 km/h (See Figure 2). Further to the transects covered daily, several once-off searches were made by vehicle, along existing access. These transects were 12.1 km in extent and are indicated in Figure 3.

Figure 3: Locations and Dates of Occassional Foot and Vehicle Searches.



Vehicle Traverse

Foot Traverse

Areas of soft substrate, not accessible by vehicle were searched by foot, for evidence of cat activity. Any evidence of past activity was cleared and these areas revisited at a later date. Dates and locations of foot searches are also indicated by Figure 3.

Plate 3: Cat number ROT 01 in leg-hold trap.

Results

The Trapping Program

Three cats were captured during the exercise; all were caught in leg-hold traps. Of the trapped animals, two were male and the other female. Examination of uterine tissue for scarring indicated that she had not carried a litter in at least the previous year. Details of the cats captured are presented in Table 1 and capture locations presented in Figure 4. Two cats, ROT 02 and ROT 03 were trapped at the same location.

Table 1. Capture records of trapped cats

Date	Sample No.	Sex	Weight (kg)	Head-Body Length (cm)	Coat colour	Age (K/J/A)*
20/11/01	ROT 01	Male	3.50	n/a	Black/white	A
22/11/01	ROT 02	Female	2.65	47	Black/white	A
23/11/01	ROT 03	Male	3.85	47	Black	A

* K = Kitten, J = Juvenile, A = Adult.

Of the three cats trapped, two had dietary items in their stomachs. The stomach volume and contents of captured cats are described in Table 2.

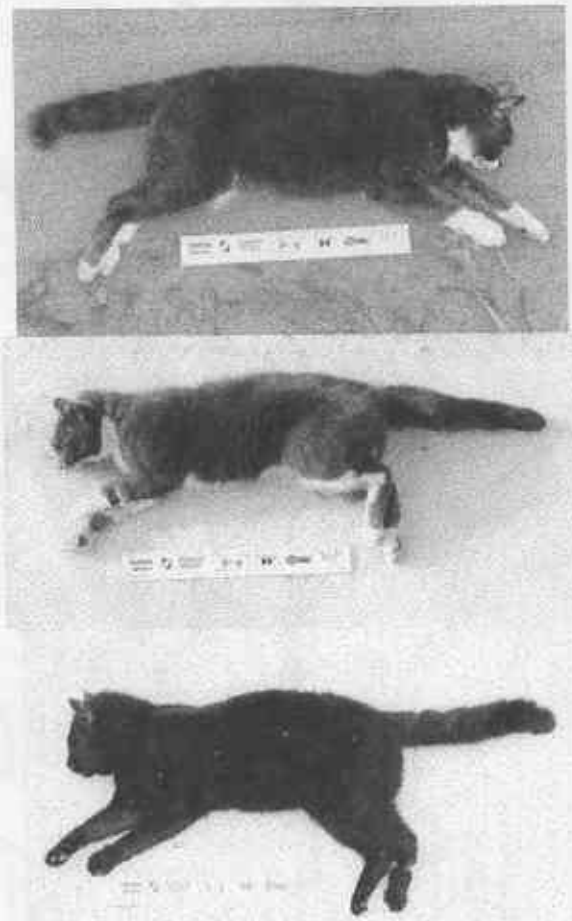


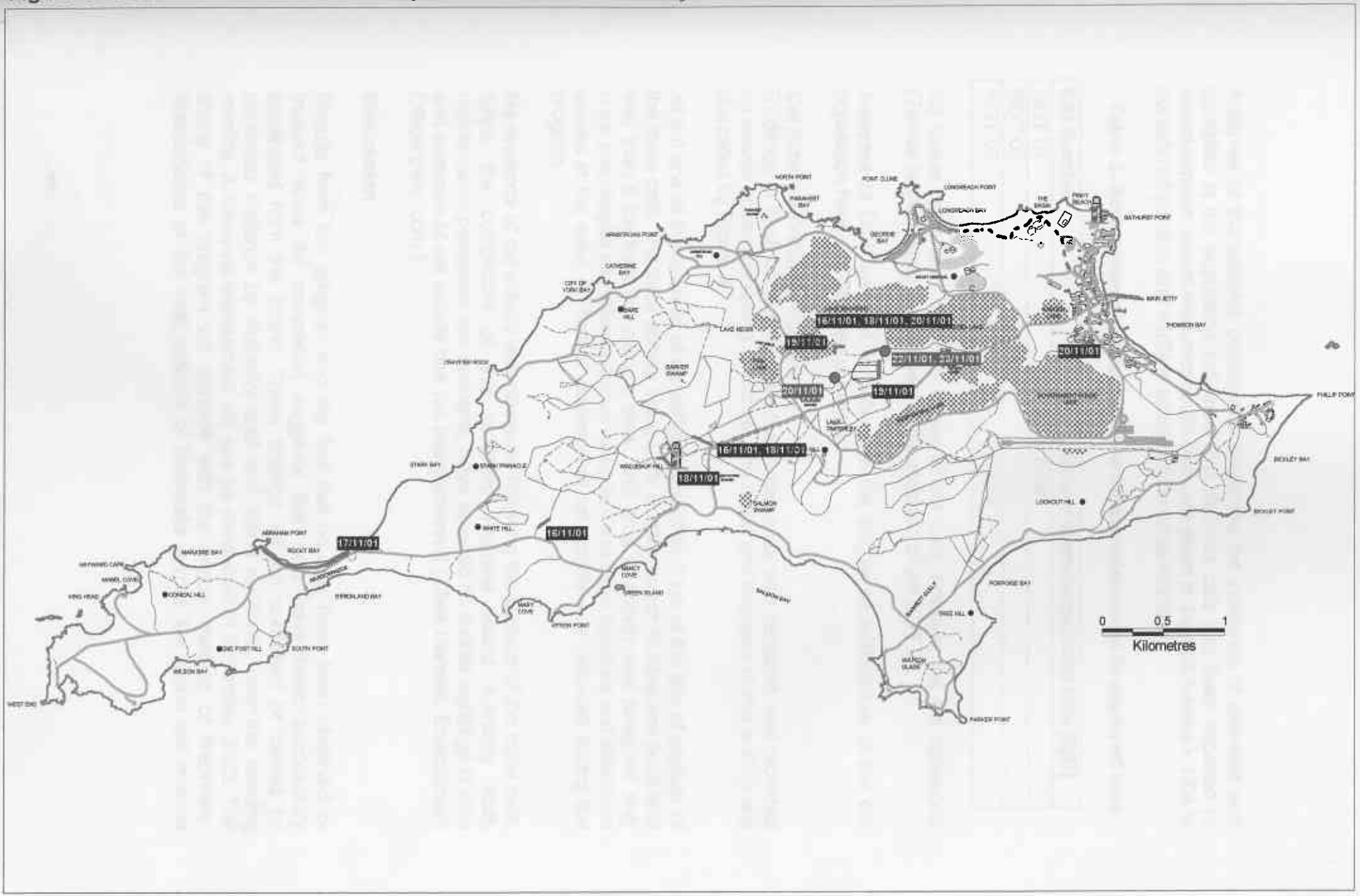
Plate 4: The three captured cats after dispatch and removal from leg-hold traps. From top to bottom – ROT 01-03.

Table 2. Stomach volume and contents of trapped cats

Sample No.	Approximate stomach volume (%)	Stomach content
ROT 01	10	1x *Egernia kingii*, cardboard
ROT 03	60	2x *Mus musculus*, 2x *Phasianus colchicus* runners, paper, plastic, Moreton Bay fig fruit

The trapping program also resulted in the capture of two non-target species. Almost all non-target captures (37 quokkas and 2 king skinks) occurred in cage traps. One quokka was captured in a leg-hold trap, within the rehabilitation exclosure immediately north of the refuse site. The animal was released with a slight oedema to the limb held and the trap set decommissioned.

Figure 4: Locations and Dates of Cat Captures and Areas of Activity.



- Location of cat capture.
- Location of cat activity.
- Date of cat activity
- Date of cat capture

Analyses of the samples collected to determine the incidence of diseases and parasites in the population indicated that all three cats had been exposed to toxoplasmosis; serum immunoglobulin titres are given in Table 3 (where > 1/64 is considered positive and <1/24 is considered a cross-reaction).

Table 3. Serum immunoglobulin titres for toxoplasmosis in captured cats

Cat Number	Serum immunoglobulin titre (IgD)
ROT 01	1/256
ROT 02	1/128
ROT 03	1/128

No tissue cysts were detected in any of the cats, however the cat tapeworm (*Taenia taeniaformis*) was present in the stomach of cat ROT 02.

Analyses of DNA samples to determine the degree of relatedness of the cat population have not yet been completed.

Cat Activity Monitoring Program
Evidence of fresh cat activity other than when a cat was captured, was recorded on eleven occasions during searches. The dates and locations of this activity are illustrated by Figure 4.

All but one of these areas of cat activity was within 2 km of the site of capture of the three cats. The track activity along Lady Edeline beach to Abraham point was less than 5 km from the capture sites. This area of activity was observed only once and despite intensive searches along this and other beaches and interdunal swales in the area, no further evidence of cat activity was recorded during the program.

No evidence of cat activity was observed following the capture of the three cats. Since the completion of this program, Rottnest Island Authority staff, maintenance personnel and residents, have reported no further sightings of cats and evidence of cat activity has not been observed (Chas Hansen, Environment Officer pers. com.).

Discussion

Results from this program and the fact that no cats have been observed or trapped since its completion suggests that cats have been successfully eradicated from the island. These findings will be confirmed or denied by continued vigilance by Authority staff and Island residents, over the ensuing months. A follow-up assessment will also be conducted in November 2002. The timing of this program will coincide with the annual clearing of firebreaks. Maintenance of the vast network of firebreaks across the island will remove

vegetation regrowth and disturb any compacted soil, improving the reliability with which cat presence can be detected.

The three cats captured all had stumpy tails, which suggests a high degree of relatedness. The cat trapped by Authority staff, earlier in 2001 also had a stumpy tail (Brad Daw pers. com.). Inbreeding often brings about an increased frequency of homozygosity and causes a reduction in survival and reproduction (Ishida *et al.* 2000) which could explain the absence of kittens and sub-adult cats on the island. The low density of cats on Rottnest in November 2001 and the apparent close relatedness of these animals suggests that previous control efforts by the Authority were successful in diminishing the viability of the feral population. The lack of genetic input from a domestic population and the dramatic reduction of the feral population left it inbred and invigorous. Very few individuals have been captured in the past decade and apparently as few as three cats were present on the island in November 2001. Given the capacity of cats to produce up to 8 kittens in a litter and conceive twice in a year, the removal of so few individuals would not have kept pace with recruitment by a viable population.

Records of cats captured during previous trapping programs are summarised in Table 4. A total of 63 cats was captured during these various exercises and of these animals, 81% were trapped in the general vicinity of the rubbish tip. All three cats trapped during this current program were also captured in the general vicinity of the rubbish tip which indicates that this area is a focus of cat activity on the island.

Table 4. Location of cat captures on Rottnest Island. Of the total number of trapped cats those captured at the rubbish tip are indicated in parentheses

Year	No. cats captured
1986	39 (31)
1987	2 (2)
1988	3 (2)
1989	4 (3)
1992	2 (2)
1993	4 (3)
1994	5 (5)
1995	2 (2)
1996	1 (0)
2001	1 (1)

It is always possible that individual cats will re-establish on the island. The most likely route of reinvasion is from domestic cats straying from pleasure craft moored around the island. Evidence suggests that if any cats do stray onto the island they will eventually be resident at the rubbish tip or the settlement where they will be able to scavenge food. There are two principal options available for the control of cats; baiting and/or trapping.

King (1985) suggested that baiting might provide a suitable method to control cats on Rottnest Island although there appeared to be considerable difficulty in getting feral cats to accept baits and this had not been a successful option so far. Department researchers have recently completed development of a cat bait that is readily accepted by feral cats. The baits have been employed to successfully eradicate cats from Hermite Island in the Montebellos (Algar and Burbidge 2000; Algar *et al.* in press) and on Faure Island in the eastern gulf of Shark Bay (Algar *et al.* in prep). The potential risk of toxic baiting campaigns to non-target species on these islands was considered to be minimal. On Rottnest, the feeding behaviour of quokkas would suggest that they are more than likely to consume multiple baits. Quokkas are listed as highly tolerant to the toxin 1080 and have a high, yet variable LD_{50} of between 10-40 mg/kg (King 1990). The current 1080 dose rate for cat baits is 4.5 mg 1080/bait and therefore, an individual quokka would only need to consume 2-3 baits for there to be a significant risk. Placement of baits above the ground, out of the reach of quokkas, would not overcome the problem because of the potential displacement of baits by the numerous gulls and corvids on the island.

A less hazardous and more effective cat control option for the island should cats stray onto the island would be to conduct a trapping program. Cats that do stray onto the island will be readily observed at the tip and/or settlement, invariably solitary and therefore easily removed. Removal of these animals should employ the trapping methodology adopted in this program. Cats are very inquisitive about other individuals in their area and this is likely to be more so if they are recent strays onto the island. Cat's communication instincts are principally reliant on audio and olfactory stimuli and the trapping technique uses lures based on these traits. As shown by this exercise, placement of traps in exclosures prevented the capture of non-target species but did not hinder access by cats. The employment of exclosures where capture of non-target species is an issue may also provide an invaluable tool in cat control strategies elsewhere. As no captures were made within the smaller exclosures, constructed on-site, more work is required to determine whether or not such devices diminish trap success for feral cats. If it can be established that the exclosures do not exclude feral cats, these devices could be used to help remove cats from areas that support extant populations of medium sized native animals.

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