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# **Assesment of Feral Cat Status on Garden Island: a Report to the Department of Defence (HMAS Stirling).**

**January 2003**

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M.L. Onus<sup>1</sup>, D. Algar<sup>1</sup>, R.I. Brazell<sup>2</sup>, G.B. Withnell<sup>2</sup> and N. Hamilton<sup>1</sup>

<sup>1</sup> Department of Conservation and Land Management, Science Division.  
P.O. Box 51, Wanneroo W.A. 6946.

<sup>2</sup> Department of Conservation and Land Management, Wellington District.  
P.O. Box 809, Collie W.A. 6225.

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*Conserving the nature of WA*

## Background

The importance of islands to the conservation of Australian mammal species has been well documented (Burbidge and McKenzie 1989; Abbott and Burbidge 1995). One of the key factors in the historic importance of islands has been that most have remained free of introduced predators. Burbidge (1999) highlighted the current and future importance of islands to nature conservation and stated that 'Australian nature conservation agencies need to pay more attention to the eradication of exotic animals from islands'. Control of feral cats is recognized as one of the most important conservation issues in Australia today and as a result, a national 'Threat Abatement Plan for Predation by Feral Cats' has been developed (Anon. 1999). Under the Threat Abatement objectives and actions, the first two key objectives in the TAP, were listed as: -

- *Eradicate feral cats from islands where they are a threat to endangered or vulnerable native animals.*
- *Prevent feral cats occupying new islands in Australia where they may threaten species or ecological communities with extinction.*

Feral cats have been present on Garden Island for some time. The founding population may have arrived on the island prior to European settlement. From 1648 when the island was sighted by the skipper of the 'Walkende Boey' a procession of explorers including Vlaming 1697, Peron 1801 and Stirling 1827 recorded the Island (Anon. 1979), although Stirling is the first known to have landed. Often these vessels carried cats as a means of controlling rodents and it is possible that cats may have escaped and established on the island. However, it is more likely that cats colonised the island during European settlement, which commenced in 1829. From this time, Garden Island has been occupied for various purposes including ship careening and refurbishment, quarantine hospitalisation, and in WWII as a naval base with Army coastal defence emplacements (Anon. 1979). The island also has a long history of recreational use, through holiday cottages along all of the eastern coast and by day-trippers (Op cit.). Development of the current naval base, HMAS STIRLING commenced in 1972 and a causeway connecting the island to the mainland was completed in 1973. Before the island was connected to the mainland, cats could only have been introduced either accidentally or deliberately from boats. HMAS STIRLING was commissioned in 1978 with the naval facilities occupying approximately one third of the island. The Department of Defence is responsible for environmental management and the public has restricted access by private boat to areas outside naval facilities.

Since development of the naval base on the island, feral cats have been observed and recorded on a number of occasions. In 1973-4, the island supported a small population of feral cats. There was a total of 12 cat sightings (including multiple sightings on some nights and sightings of kittens as evidence of breeding) on 6 of 12 nights of spot-light surveying between 7 Nov. 1973-14 Feb. 1974 (Anon. 1974). Persistent cat control efforts, by seconded Department of Conservation and Land Management (DCLM) Rangers, since that time are considered to have eradicated all cats from the island whenever incursions have occurred (Wykes *et al.* 1999). Management strategies include reducing potential incursion across the causeway by upgrading of vermin-proof fencing and daily removal of bird kills on the causeway. Means of preventing cats establishing on the island include daily collection of Tammar (*Macropus eugenii*) road kills on the island, rigorous refuse hygiene measures including disposal of all food wastes off the island, and baiting, shooting and trapping campaigns when an animal is confirmed in an area.

There was only one cat sighting (Denham Road) during the 1991-2 CSIRO survey, which included 14 vehicle spot-light surveys for Tammar (Brooker *et al.* 1995). However, a greater number of cats have been observed at times during more recent years. A 1080 baiting program was conducted for an estimated six cats detected on the island during 1995-6

(GIEAC 1996). No cats were sighted during monthly spotlight surveys for Tammars in 1996-7 along the same 18.1 km route used in the CSIRO surveys. However; an estimated five different cats were reported around the Base during the year (GIEAC 1997). An eradication campaign from August-October 1997, involving the shooting of one cat and intensive baiting, resulted in no cat sightings from October to June 1998 (GIEAC 1997; Wykes *et al.* 1999). The first known record of a fox (*Vulpes vulpes*) on Garden Island was documented in July 1996; this animal was baited (GIEAC 1997; Wykes *et al.* 1999). One cat, sighted during 1997-8, was shot by the ranger (GIEAC 1998). In 1998-9, feral predators were reported gaining access to Garden Island (GIEAC 1999). Foxes were regularly reported scavenging for seagulls on the causeway and several cats were also present. A baiting program was conducted and the Ranger was confident that the animals had not survived (GIEAC 1999). Foxes were again sighted at the mainland end of the causeway during 1999 and 2000 and scats (1999) and fox tracks at Beagle Rd. Beach (2000) were found on the island (Trevor Smith pers. comm.; Ranger-in-Charge, Garden Island). In both years fox baits were laid resulting in the removal of these animals. In 2000, two cats were observed on the island, one of which was run over by a vehicle later that year (T. Smith pers. comm.). Seven individual cats were sighted between January and June 2002 (T. Smith pers. comm.).

The continued presence of feral cats on Garden Island has been of concern because of the predation threat to the survival of the Tammar population (Anon. 1979; Anon. 1981; Anon. 1983). The System 6 Study (Anon. 1981; Anon. 1983) even went so far as to say that Tammars are "*threatened with possible extinction by feral cats*" and it was recommended that feral cats be eliminated from Garden Island and control measures implemented to prevent their future introduction. Feral cats are also a problem because they are vectors of disease that affect the well-being of both native fauna and humans.

DCLM 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. Recently, successful feral cat eradication programs have been conducted on a number of islands: - Serrurier Island (Moro 1996); Hermite Island in the Montebellos (Algar and Burbidge 1999; Algar *et al.* 2002); Faure Island (Algar *et al.* 2001) and recently on Rottneest Island (Algar *et al.* in prep.). A cat control program has also been established on the Cocos (Keeling) Islands (Algar *et al.* in press).

DCLM was approached by Dr Boyd Wykes (Senior Environmental Advisor WA, Department of Defence) to assess cat numbers and control options on Garden Island. Documented in this report are their findings and recommendations for feral cat control.

## Methodology

### Site

Garden Island is situated at 32°12' S and 115°40' E. It is 9.5 km long and 1.5-2 km wide at its widest point. The southern tip of the island is 2 km off Point Peron on the mainland. The area of the island is approximately 1200 ha.

### Trapping Program

Department researchers have developed a highly successful technique to trap feral cats. 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 (Algar *et al.* 1999).

The trapping technique utilises padded 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.

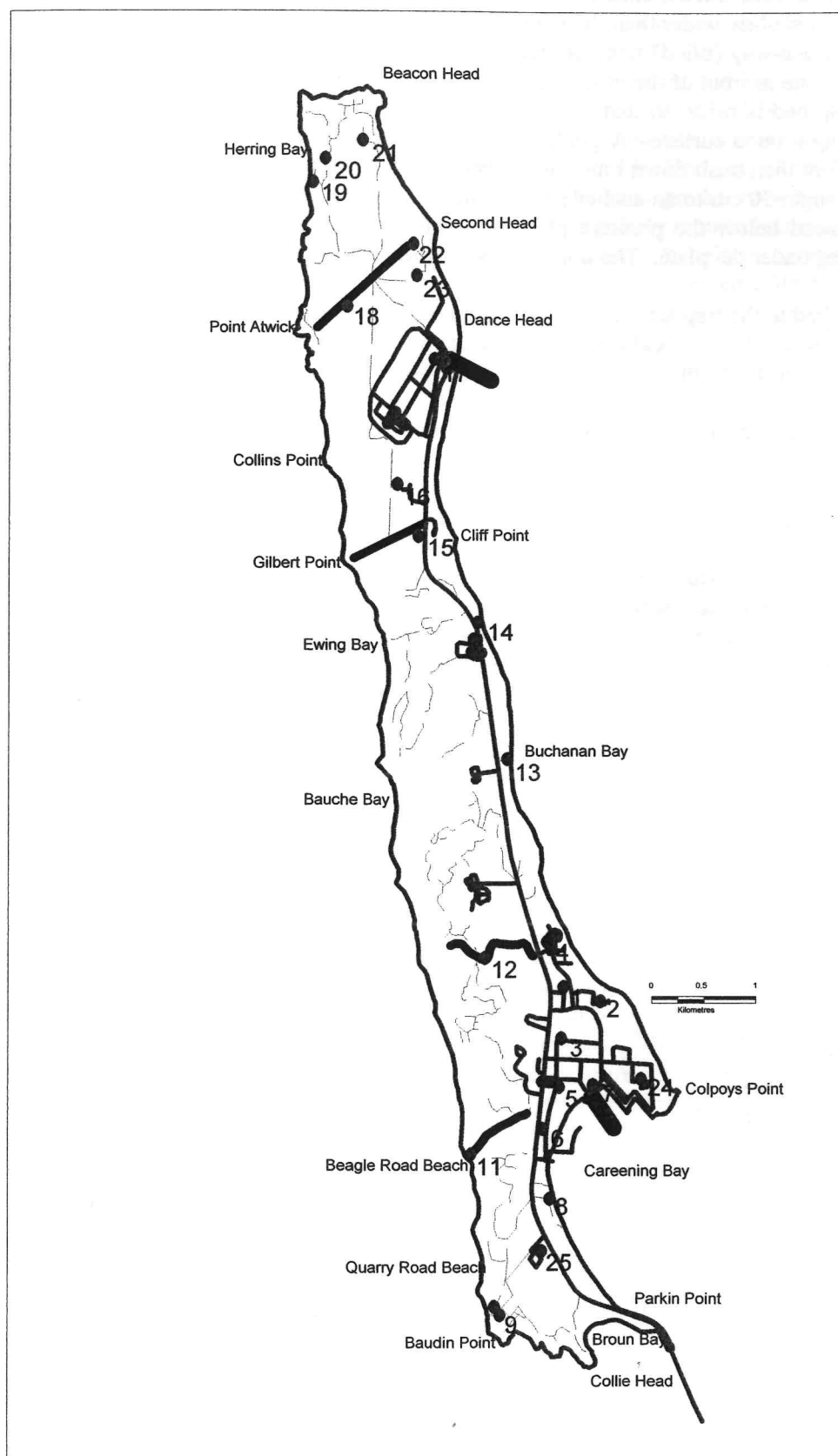
Cats are lured to the trap set initially by the audio signal of the FAP that is located at the back of the trap set, either concealed under leaf litter or hidden within the bush. As cats approach the trap set they are further enticed into the traps by the smell of 'pongo'.

To prevent the potential risk of capturing Tammar Wallabies and causing them injury, the leg-hold traps were located in areas from which tammar wallabies were excluded. This technique has been used successfully to trap cats and avoid harm to quokkas (*Setonix brachyurus*) on nearby Rottnest Island (Algar and Angus 2002). Where available, existing fenced vegetation rehabilitation exclosures were used (see Plate 1). Where existing exclosures were not available, small exclosures, measuring 2 x 3 m were erected on-site (see Plate 2). A total of 25 trap sites were located strategically around the island; their locations were recorded using a Garmin II Plus GPS receiver and are described in Table 1 and shown in Figure 2. All traps were left in position for a minimum of ten days (2-12 July), providing a total of 250 trap nights. The traps were routinely checked at first light each day.

**Table 1. Trap site description and location, \*trap sites placed within old vegetation plots**

Trap No	Location	Latitude	Longitude
1	Senior sailors	32° 13.113'	115° 41.300'
2	Junior sailors	32° 13.273'	115° 41.531'
3	Parkes	32° 13.332'	115° 41.153'
4	Endracht Rise	32° 12.983'	115° 41.119'
5	Standpipe	32° 13.641'	115° 41.194'
6 *	Gardener's Nursery	32° 13.813'	115° 41.077'
7	Quarterdeck	32° 13.638'	115° 41.390'
8	Camp Markham	32° 14.108'	115° 41.134'
9 *	Helicopter quarry area	32° 14.518'	115° 40.886'
10	Beach	32° 14.473'	115° 40.752'
11	Beagle Rd	32° 13.930'	115° 40.709'
12 *	Denham Rd	32° 13.117'	115° 40.760'
13	Sand beach	32° 12.278'	115° 40.846'
14	Buchanan Bay	32° 11.626'	115° 40.652'
15 *	Cliff Head	32° 11.331'	115° 40.442'
16	Torpedo	32° 11.118'	115° 40.160'
17	Armaments wharf	32° 10.494'	115° 40.505'
18 *	Point Atwick West	32° 10.347'	115° 39.849'
19	Herring Bay	32° 09.840'	115° 39.781'
20	Solar panel	32° 09.638'	115° 39.781'
21 *	Well	32° 09.584'	115° 39.944'
22 *	Flagpole	32° 09.979'	115° 40.328'
23 *	Explosive area	32° 10.118'	115° 40.308'
24	Contractors area	32° 13.597'	115° 41.699'
25	Helicopter support	32° 14.358'	115° 41.117'

**Figure 1. Map of Garden Island with numbered trap locations**







**Plate 1. Trap site placed within old vegetation enclosure at Cliff Head (Trap No. 15)**



**Plate 2. Trap site located within small enclosure made on-site (Trap No. 13)**

#### *Cat Activity Monitoring Program*

Two methods of observation, surveys for cat tracks and spotlight surveys, were used to monitor cat activity on the island. Areas of sandy soil along the trapping route were examined for evidence of cat activity, these areas were assessed daily from a 4WD vehicle, driven at a speed of less than 10 km/h. Over the period of the trapping program (1-10 July), on-foot systematic surveys for evidence of cat activity were conducted along all beaches and picnic areas. A second survey was conducted over the period 13 –14 August.

The spotlight surveys for cats were restricted to only one night (13 August) because of inclement weather (continual rain) during the assessment period. The spotlight survey was conducted along all available tracks and roads on the island from 20:00-24:00 h.

## Results

### *Trapping Program*

No cats were caught or recorded in the vicinity of any of the trap sets during the trapping program.

### *Cat Activity Monitoring Program*

No evidence of cat activity was observed during the cat track monitoring programs or the spotlight survey.

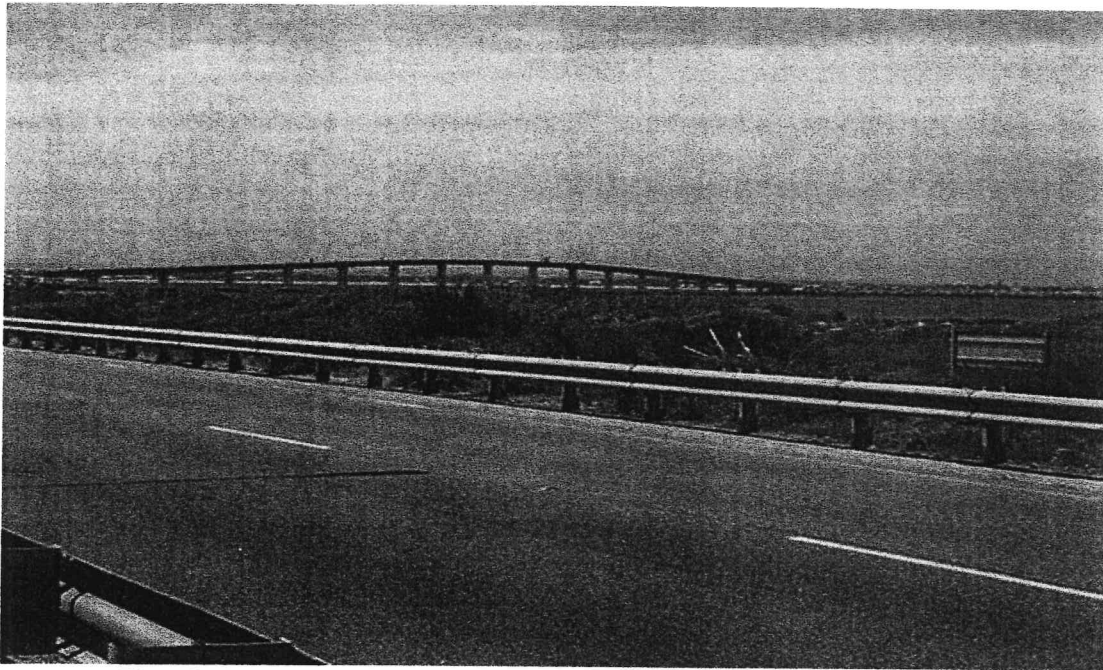
## Discussion and Recommendations

No cats were trapped and no evidence of cat activity was observed during this control program, which suggests that cats were absent on Garden Island. The inclement weather during the program would have limited possible cat movement and reduced the effectiveness of the cat activity monitoring programs however; it is highly unlikely that if cats were present they would not have been detected. Despite the absence of cats during this program, cats have certainly been there in the past. The records indicate that most of the cats sighted were generally only observed once or twice. This and other factors such as coat colour, suggests that most incursions onto the island are probably by domestic cats. These animals would have poor survival particularly in an environment where food refuse was unavailable. All seven individual cats sighted in 20002 were all observed only once. No further cats have been sighted since the control program, although possible cat tracks were observed on Denham Rd. (T. Smith pers. comm.)

Despite the lack of evidence of cats being present on Garden Island at the time of this program it is still important to prevent cats from gaining access to and becoming established on the island. A number of potential sources for reinvasion have been postulated, suggestions include that cats may be released from pleasure craft moored around the island or from vehicles, released by sailors prior to a sea posting, or released and supported by sailors living 'on-board' (Wykes *et al.* 1999).

Despite the shyness of feral cats and foxes to traffic, exposed areas and elevated, open bridge crossings, it would appear that construction of the 3 km causeway (see Plate 3) has also provided an avenue for cats to cross from the mainland. This was evidenced by the frequent sightings of cats reported on the Causeway at night in 1974 (on 3 of 11 visits) (Anon. 1974). Anon. (1974) stated that "the cat can never resist a fish dinner and it is possible that they are being attracted onto the causeway by the current spate of prohibited amateur line fishing taking place from the two bridges". Today there is no fishing activity on the causeway but these introduced predators may still be enticed to the causeway by bird road-kills and seagull nesting sites.

It was believed that invasion via the causeway seemed a low risk once the gatehouse was established with round-the-clock staffing (GIEAC 1997) but in the light of the fox incursions, this assessment was later thought incorrect (Wykes *et al.* 1999). In 1998 a vermin barrier was installed on the causeway before the Gatehouse (GIEAC 1999). The loose rock skirting was consolidated beneath an existing personnel barrier with the barrier extended a metre over the water and closely spaced steel upright bars added, sufficient to block cats and foxes. Movement-triggered lights and dog-bark devices were also fitted to deter animals from walking along the road on reaching the barrier. Sand-filled pits, into which 1080 loaded egg baits could be placed, were also dug close to the barrier on both sides.



**Plate 3. Causeway and bridges linking Garden Island to the mainland**

There are only three avenues available for cats to migrate onto Garden Island: human assisted by boat, human assisted by vehicle and walking across the causeway. These provide a focus to assess and restrict the number of incursions. The existing public education and awareness program and liaison with the general public who visit the island by boat should minimize cat entry onto the island by this route. This can be emphasized during the Ranger's talks to visitors by highlighting the detrimental impacts of feral cats should they colonise the island. The threat from feral cats is also emphasised during inductions by the Ranger of Defence staff and contractors working on the island to reinforce the Defence regulation that pets including cats are not permitted 'on-board'.

It is apparent that the vermin barrier erected in 1998 is not totally preventing introduced predators onto the causeway. The point of entry to the causeway is the Gatehouse, which is manned by security staff around the clock. These staff are tasked with logging and reporting any movement of cats and foxes onto the causeway. This requirement needs to be encouraged. Daily monitoring of the presence or absence of track activity on sand pads on the edges at the beginning and end of the causeway should also be used to determine whether incursions have occurred. All personnel travelling to and from the island and 'on-board' should be requested to record and inform their supervisor of any cat and fox sightings (and their location), to be passed onto the Ranger as soon as possible.

Another mode of access is cats 'hitching' a ride in vehicles. Cats are known to be transported after seeking shelter in the undercarriage of parked vehicles and given the high number of vehicle movements to Garden Island, this low frequency occurrence would in fact be almost inevitable (see incident reported, GIEAC 2002). There is little that can be done to prevent such incidences.

The existing fence around the naval base would not provide a barrier to the movement of either cats or foxes from the developed area to the natural scrub and forest without costly structural modifications. As a control option this would not be fool-proof and the cost is unlikely to be warranted.

Sightings of cats and foxes reported to the Ranger, should be verified by examining the sighting location for the presence of track activity. A protocol should be established so that



any report is acted upon as swiftly as possible. Two methods, trapping and baiting, detailed below, are available to provide effective and cost-efficient control of cats once they arrive and/or are detected on the island. A third control option of spotlighting and shooting could be used however; it is likely to be labour intensive and ineffective and is only warranted if the animal is routinely seen at a site where it can be shot.

The trapping program implemented during this exercise has been used successfully to eradicate cats following baiting programs (Algar and Burbidge 1999, Algar *et al.* 2002), monitoring successful baiting programs (Algar *et al.* 2001) and as the sole tool in eradication (Algar and Angus 2002 and Algar *et al.* in prep.). Strategic placement of traps should commence once a cat has been verified present on the island. The network of exclosures present provides a comprehensive coverage for trap placement across the island.

In addition to these sites, it is recommended that an additional exclosure be established, in the vicinity of the end of the causeway (see Plate 4). Traps should be set in this exclosure and maintained permanently in commission and examined daily. Any cat that crosses the causeway will more than likely visit the site and therefore can be removed before establishing itself on the island.



**Plate 4. Area at the end of causeway where cat trap and fox bait stations should be established**

Fox baits are not readily consumed by feral cats (Burrows *et al.* in press; Algar unpub. data). It is highly unlikely therefore that fox baits used previously on Garden Island were successful in controlling feral cats. Department researchers have recently completed design and development of an innovative cat bait that is proving highly effective in experimental and operational baiting programs in arid and semi-arid regions of WA. For example, the most recent large scale aerial baiting trial implemented under dry winter conditions in the Gibson Desert resulted in about a 95% reduction in the relative abundance of feral cats (Liddelow *et al.* 2002). The feral cat bait has been used successfully in the eradication of feral cats from three islands off the Western Australian coast (Moro 1996; Algar and Burbidge 1999; Algar *et al.* 2001; Algar *et al.* 2002). The bait is composed of 70% kangaroo meat mince, 20% chicken fat and 10% digest and flavour enhancers (Patent No. AU13682/01). All baits are treated with an ant deterrent compound (CoopeX<sup>®</sup>) to prevent bait degradation by ant attack and the physical presence of ants on and around the bait medium.

An experimental permit (Permit No. PER5356) has been obtained from the National Registration Authority (NRA) to allow toxic baiting campaigns to be conducted at a number of sites including Garden Island. Toxic baits contain the poison sodium monofluoroacetate

(1080) at a dose rate of 4.5 mg per bait. Toxic baiting is only permitted to proceed at any site following approval being granted under the 'Risk Assessment' guidelines of the State and Federal statutory regulations for the "Code of Practice on the Use and Management of 1080". Should cats gain access to the island, a baiting program in strategic areas should be conducted in conjunction with the implementation of the trapping program. Long duration bait stations at possible points of entry onto the island (eg. end of causeway) are inappropriate for cats as cats prefer relatively fresh baits.

The above recommendations provide a strategy for reducing the likelihood of feral cats migrating onto the island and for eradicating them should they establish.

### Acknowledgements

The authors would like to acknowledge the Department of Defence for providing the funds for this work. We are also grateful to Boyd Wykes (Senior Environmental Advisor WA, Department of Defence) for his support and securing the funding. We would like to thank Trevor Smith (Ranger-in-Charge, Garden Island) for his invaluable assistance and to the staff of HMAS Stirling for their hospitality while we were 'on-board'.

The techniques used in this program have been approved by DCLM's Animal Ethics Committee, which includes independent members from animal welfare organisations.

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