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Montebello Renewal: *Western Shield* review—February 2003

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SUMMARY

Objectives

1. To rid the Montebello Islands Conservation Park of exotic black rats and feral cats.
2. To reintroduce locally extinct animals and, where justified, introduce mammals threatened on the mainland by predation by exotic carnivores.

Achievements (against targets)

1. Feral cats eradicated. Black rats possibly eradicated (requires at least another two years of monitoring).
2. Hermite Island targeted for reintroductions; eradication of black rats not yet confirmed. Reintroductions delayed.
3. Mala introduced successfully to Trimouille Island and djoongari introduced successfully to North West Island. Other introductions possible, eg, of critically endangered antina (Central rock-rat) to Alpha Island if black rat eradication confirmed.

Difficulties

1. Black rat eradication not achieved in planned timeframe or by using initial methodology (bait stations laid and serviced on foot). New eradication method (aerial baiting from helicopter-borne spreader bucket) trialed successfully.
2. Introductions were commenced before rat eradication achieved archipelago-wide (this was not known at the time). No evidence that rats have spread to either island used for introductions.

Potential economies

1. Aerial baiting is more cost-effective and much quicker than hand baiting with bait stations. This technology can potentially be used for introduced rats and mice on any island in WA where there are no non-target populations that may be affected by the bait type.

Potential improvements

1. No further improvements are considered necessary at this time.

Future Plans

1. Continue to monitor for rats; the islands should not be considered rat-free until rats have not been detected for at least three years.
2. Continue to monitor the mala and djoongari populations. In 2003, mala will have been established on Trimouille Island for five years and a review of the subspecies IUCN Red List status should be undertaken. Downgrading of the mala from 'Extinct in the Wild' to 'Endangered' may be warranted.
3. Once the Montebellos are considered rat- and cat-free, reintroduce spectacled hare-wallabies, golden bandicoots, rakali (water-rat) and spinifexbirds from Barrow Island and also establish the Barrow Island black-and-white fairy-wren.

INTRODUCTION

This review addresses the following terms of reference:

- Provide an overview of the project against original targets.
- Discuss feral animal eradication methods and results, with justification for any new methods introduced.
- Discuss translocations, and why they took place before eradication of introduced animals had been achieved within the whole archipelago.
- Present an overview of future plans.

The Montebello Islands are situated off the Pilbara coast, to the north of Barrow Island (Fig. 1). They comprise about 180 islands, islets and rocks with a total area of more than 2100 ha. The largest islands are Hermite (1020 ha), Trimouille (520 ha), North West (135 ha), Alpha (120 ha) and Bluebell (65 ha).

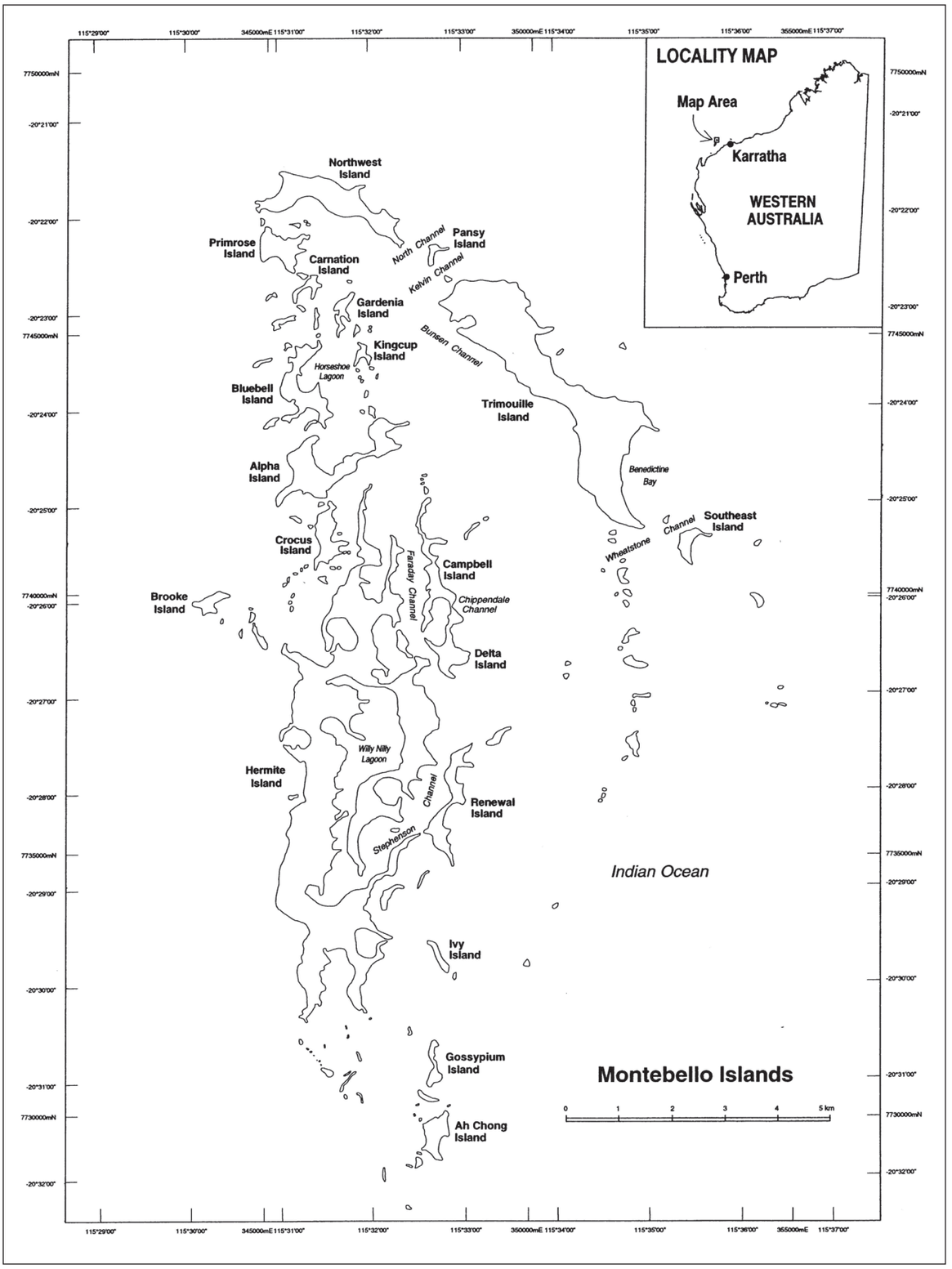

Figure 1. Montebello Islands.

In 1952 and 1956, three nuclear weapons tests were conducted in the Montebellos; one in a ship adjacent to Trimouille Island, one on a tower at the northern end of Trimouille and one on a tower on Alpha Island. In 1952, the islands and surrounding seas were placed under Commonwealth control and declared a prohibited area. In 1992, the Montebellos reverted to State control and were declared a Conservation Park. As part of an agreement between the Commonwealth and the State, Western Australia agreed to eradicate feral mammals from the archipelago and, to the extent possible, restore the native fauna. Some funds were provided by the Commonwealth to support this project and to contribute to infrastructure on the islands. At a later date, it was decided to use selected islands for 'marooning' species threatened with extinction by exotic predators (particularly the feral cat) on the mainland.

Montebello Renewal is a *Western Shield* project that aims to rid the Montebello Islands Conservation Park of exotic mammals and reintroduce and introduce native mammal species. *Montebello Renewal* has been a joint project between the Department of Conservation and Land Management's (CALM) Threatened Species and Communities Unit and Pilbara Region.

Prior to 1992, knowledge of the islands' fauna had revealed that two mammal species (spectacled hare-wallaby *Lagorchestes conspicillatus* and golden bandicoot *Isoodon auratus*) and two bird species (black-and-white fairy-wren *Malurus leucopterus edouardi* and spinifexbird *Eremiornis carteri*) were locally extinct and that black rats *Rattus rattus* and feral cats *Felis catus* were established (Burbidge 1971).

Current human usage of the islands is restricted to short visits by tourists. Several charter boats bring visitors to the islands, mainly for fishing. Montebello Islands Safaris maintains a houseboat in a bay at the southern end of Hermite Island. Morgan and Co own pearling leases covering many bays, the venture being known as Faraday Pearls, named after the channel in which their houseboats and main facilities are moored. This company continues to maintain equipment dumps on the conservation park, eg, on Hermite and Alpha Islands.

1995 *WESTERN SHIELD* PROPOSAL

The eradication of black rats and feral cats was an aim of the 1995 *Western Shield* proposal. The proposal stated that feral cats would be eradicated by 1996, a date that proved too ambitious. It seemed prudent to eradicate black rats first, as they probably provided a major food source for the cats, making bait uptake less likely.

WESTERN SHIELD STRATEGIC PLAN JULY 1999 TO JUNE 2004

Montebello Renewal is not mentioned in this Plan.

DESCRIPTION OF MONTEBELLO RENEWAL

The project can be best described under six headings:

1. Biogeographic survey of the islands' vertebrate fauna.
2. Rat eradication using rodenticide laid by hand in bait stations.
3. Rat eradication using aerial spreading of rodenticide.
4. Cat eradication using aerial baiting followed by trapping.
5. Introduction of threatened mammals.
6. Monitoring.

1. Biogeographic survey of the islands' vertebrate fauna

Surveys commenced in May-June 1994, after the construction of a base on Hermite Island (now known as Hurricane Hill Hut). The results have been published (Burbidge *et al.* 2000, Burbidge & Fuller 1999). This work confirmed that black rats were distributed on almost every island in the archipelago and that feral cats were restricted to Hermite Island (they had been recorded on Trimouille and Bluebell Islands in the past). It also revealed an additional mammal extinction, of rakali (or water-rat) *Hydromys chrysogaster*. Planning for the eradication of black rats commenced during the surveys.

2. Rat eradication using rodenticide in bait stations

The Montebello Islands have a tropical, arid climate with unpredictable, highly variable rainfall; most rain coming from summer tropical cyclones and thunderstorms and autumn and early winter middle level disturbances (Burbidge e*t al.* 2000).

Knowledge of black rat abundance at different times of the year and their annual breeding cycle would have been helpful in designing the eradication project. There was no survey data from the Montebellos that would enable estimates of rat numbers at different times of the year. Breeding data were also not available, but it was thought that breeding was more likely to be dependent on major rainfall events rather than being seasonal. It was considered more important and more feasible to carry out work during the cooler winter and early spring months, when cyclones were unlikely and temperatures and humidity would allow staff and volunteers to work without major discomfort, than to try to time baiting to population abundance or breeding cycles.

In August 1995 a trial eradication was conducted on Renewal Island (58 ha). The trial used bait stations (1 L plastic bottles with two 43 mm holes cut in the sides) with Talon G pellets as the rodenticide. Talon G is a pelletised, bran-based bait containing brodifacoum at 0.005% (0.05 g/kg), manufactured in and registered for

use in Australia. It includes the taste inhibitor Bitrex, designed to prevent ingestion by humans, especially children. Bait stations were pinned to sandy soils with two hooked wires or glued to rocks using Selleys 'All Clear'. The bait stations were initially filled with approximately 100 g of bait, and were rebaited/replaced as necessary three and six days later. An inspection of the island 12 weeks later revealed no sign of rats.

Bait stations were chosen as the preferred eradication method as there was concern that the rodenticide may affect two granivorous birds occurring in the archipelago – bar-shouldered dove *Geopelia humeralis* and brown quail *Coturnix australis*. Limited data on toxicity of brodifacoum suggests that it is toxic to birds (Eason and Spurr 1995) and could lead to bird deaths either through direct ingestion or through secondary poisoning, particularly in raptors. Limited data suggest that brodifacoum has little effect on reptiles and none on invertebrates.

In 1996, a major project was conducted, lasting from late May to early September, involving over 40 people, of whom at least eight were at the Montebellos at one time. Most personnel were volunteers and most were CALM staff, who gave some of their holiday time to assist with the project. Because of the remote location and size of the project, logistics were a major issue. Because the funds remaining from the grant provided by the Commonwealth Department of Primary Industry and Energy were insufficient to pay for the project, significant sponsorship was required and sought. Support was received from West Australian Petroleum (now incorporated into ChevronTexaco), Apache Energy, ACI Plastics Packaging, and the Selleys Chemical Company. The Australian Customs Service also provided some boat transport.

Some 11,000 bait stations (plastic bottles with holes cut in their sides) were laid on a 50 m grid over all larger islands, with smaller islands, islets and rocks being treated with plastic bags of bait laid from a helicopter and by boat. Over two tonnes of Talon G pellets rodenticide were laid, over all the 180 or so islands, islets and rocks in the archipelago. A helicopter was used during the first three weeks, during which time the more remote and difficult to access islands were baited and equipment dumps were established. After that, CALM's vessel *Pseudorca* provided transport within the archipelago. A more detailed description can be found in Burbidge (1997) and on the Montebello Islands Departmental file.

During 1996, no non-target or secondary poisoning was noted. A pair of white-bellied sea-eagles, (*Hieraaetus leucogaster*) nesting on Brooke Island, was observed to be consuming dying rats; however they ate only flesh, discarding the gut contents. Bungarras (*Varanus gouldii*) were also observed eating dead and dying rats to the extent that some droppings contained the green dye from the bait; however, no dead or moribund *Varanus* were observed.

In March 1997, a visit was made to search for rat sign. This revealed small numbers of rat tracks on two islands – Primrose and Crocus, and these were rebaited. In July 1997, a further visit searched for tracks and trapped on all larger islands. No rat sign was detected. During this visit as many bait stations as possible were examined as empty bait stations might reveal inadequate baiting during 1996; however, no empty bait stations were detected except on Primrose and Crocus, the islands rebaited earlier that year.

In 1997, we saw no evidence that native animals were eating the Talon laid in 1996. Of the two granivorous birds occurring in the Montebellos, bar-shouldered doves appeared to be considerably more common in 1997 than in 1994, 1995 or 1996. Brown quail had never been frequently observed previously, but were noted on several islands during July 1997. Raptors, including white-bellied sea-eagles, ospreys, Brahminy kites and kestrels, appeared to be as common as or more common than in past years. Reptiles were also common in July, noting that this is the coolest time of the year. Bungarra tracks were plentiful on all islands on which they occur.

In June 1998, several islands were searched for rat sign but none was detected. The owner of the Pearl Farm told us that his staff had reported rat droppings on one island. However, a search of this locality revealed nothing.

In May 1999, further searches were conducted. On this occasion we found moderate densities of rat tracks on Delta and Campbell Islands and low densities on Hermite Island. Campbell and Delta were baited immediately; however, Hermite was too large to be baited with the staff and other resources available. Rats were not detected on any other island.

3. Rat eradication using aerial spreading of rodenticide

After consultation with staff of the Department of Conservation in New Zealand, it was decided to bait Hermite Island using a spreader bucket slung beneath a helicopter. This technique had been developed in New Zealand and was by then being widely used (Cromarty *et al.* 2002). Observations on non-target and secondary poisoning since 1996 had convinced me that secondary poisoning was not an issue and bait stations were not necessary.

CALM purchased a second-hand spreader bucket as well as the bait for the bucket from New Zealand, as only one company there produced bait suitable for a spreader bucket. The bait used was Pestoff Rodent 20R (16 mm diameter bait) manufactured by Animal Control Products, Wanganui, New Zealand. It contains brodifacoum at 0.002% (0.02 g/kg). It does not contain Bitrex. The bait is not registered for use in Australia and special registration had to be obtained from the National Registration Authority. NZ DoC provided Simon Mowbray, who is very experienced in running aerial baiting operations, to supervise the spreading. An experienced New Zealand helicopter pilot was provided by the contracting company.

Hermite was aerially baited during October 1999. Bait was also applied to the nearby Renewal, Campbell, Delta, Alpha and Bluebell islands in case rats had swum to these islands.

A visit in August 2000 revealed low level tracks on Hermite Island. No tracks or other sign were located on any other island.

It was believed that logistical problems had prevented a fully comprehensive baiting in 1999 (see below) and it was decided to rebait in 2001. A visit in June 2001 revealed rat racks on Alpha and Bluebell Islands, which had been considered rat free since 1996, showing the ability of rats to readily swim between the islands. Tracks were still present on Hermite.

Aerial baiting was conducted in September 2001. On this occasion, a differential global positioning satellite (DGPS) navigation system was used to help the helicopter pilot fly accurately along planned flight lines. All islands from Ah Chong northward to Primrose were baited. Two baitings were conducted, ten days apart; the first at 8 kg/ha and the second at 4 kg/ha. The DGPS system 'painted' a 100 m wide swathe onto the navigation screen following the helicopter's actual track, enabling review immediately after a flight to check for any gaps in the swathes. Figure 2 shows a printout from the navigation system, without the 'painted' 100 m swathe.

Inspections covering all of the larger and many small islands in September 2002 and May 2003 did not reveal any rat activity on any island.

4. Cat eradication using aerial baiting followed by trapping

In 1997, a trial aerial baiting of cats on Hermite was carried out using kangaroo meat sausages with the toxin 1080 as developed at that time by Dr David Algar. Track counts suggested that bait uptake was low and that further development of the cat bait may be needed.

Feral cat eradication was carried out on Hermite Island in 1999. The techniques used and results are described in Algar, Burbidge and Angus (2002).

Feral cat eradication comprised two stages—aerial baiting and trapping. Briefly, aerial baiting utilised the recently developed kangaroo meat sausage baits with flavour enhancers and the toxin 1080. About 1100 baits were dropped by hand from a helicopter. Hermite Island has two main surface types—sand and skeletal limestone. Aerial baiting primarily targeted sandy soils. Four cats, all females, remained after baiting. These were trapped using innovative techniques involving Victor 'softcatch'© traps set either in association with phonic and odour lures or set in narrow runways. Eradication was achieved over a six-week period. Searches for evidence of cat activity in 2000 indicated that cats had been eradicated. Searches in 2001, 2002 and 2003 have confirmed eradication.

5. Introduction of threatened mammals

(i) Mala (Rufous hare-wallaby central Australian subspecies) *Lagorchestes hirsutus* undescribed subspecies

Thirty mala, a subspecies listed nationally and in Western Australia as 'Extinct in the Wild', were introduced to Trimouille Island in 1998. The animals were sourced from the 'Mala Paddock' in the Tanami Desert, NT. The techniques used and monitoring up to 2001 have been published (Langford and Burbidge 2001). Monitoring in September 2002 and May 2003 suggested that the mala are continuing to increase in numbers and range on the island.

(ii) Djoongari (Shark Bay mouse) *Pseudomys fieldi*

A total of 59 djoongari, a species listed as Vulnerable nationally and in Western Australia, were introduced to North West Island in 1999 and 2000 (30 in June 1999, 29 in August 2000). The animals were sourced from Bernier Island and bred in captivity at Perth Zoo. By 2001 they were abundant and widespread, tracks being present all over the island. In September 2002 and May 2003 inspections revealed a similar situation.

6. Monitoring

Monitoring for the presence of exotic mammals and monitoring the introduced mammal populations is a key component of *Montebello Renewal*. Monitoring has occurred at least annually since 1996 and needs to be maintained on at least an annual basis.

DISCUSSION

General issues

Working at the Montebellos is logistically difficult. The islands are remote and the CALM did not have a seagoing vessel licensed to travel from Dampier to the Montebellos in the Pilbara until 1999. It still does not have an employee in the Pilbara qualified to take the vessel to the Montebellos (volunteers from the Dampier Port Authority captain the boat during the ocean crossings). Summers are hot and humid and working at the islands can be debilitating. Winter weather is often very windy with strong wind warnings being frequent during June, July and August. CALM has depended on the oil industry in particular to assist with logistics. In 1996, West Australian Petroleum (WAPET, now incorporated into ChevronTexaco) provided barges to mobilise and demobilise the operation. Since then Apache Energy has provided helicopter and barge support. The islands are spread over a large distance and there are numerous reefs and sandbanks, making within-archipelago boat usage tricky. Pilbara Region staff visit the Conservation Park irregularly, perhaps only once per year.

Boat transport within the archipelago has been a major issue. Initially, Pilbara Region had a Zodiac located at the Hermite base; however, this frequently punctured on the often sharp rocky coastline. It was replaced by a 4.5 m aluminium dinghy, which was much more suitable. Use of this was limited to non-strong wind conditions. Now changes to Department of Planning and Infrastructure rules prevent its use at the Montebellos unless registered as a tender to a seagoing vessel. Boat use at the Montebellos is still an issue that CALM Regional staff are trying to sort out.

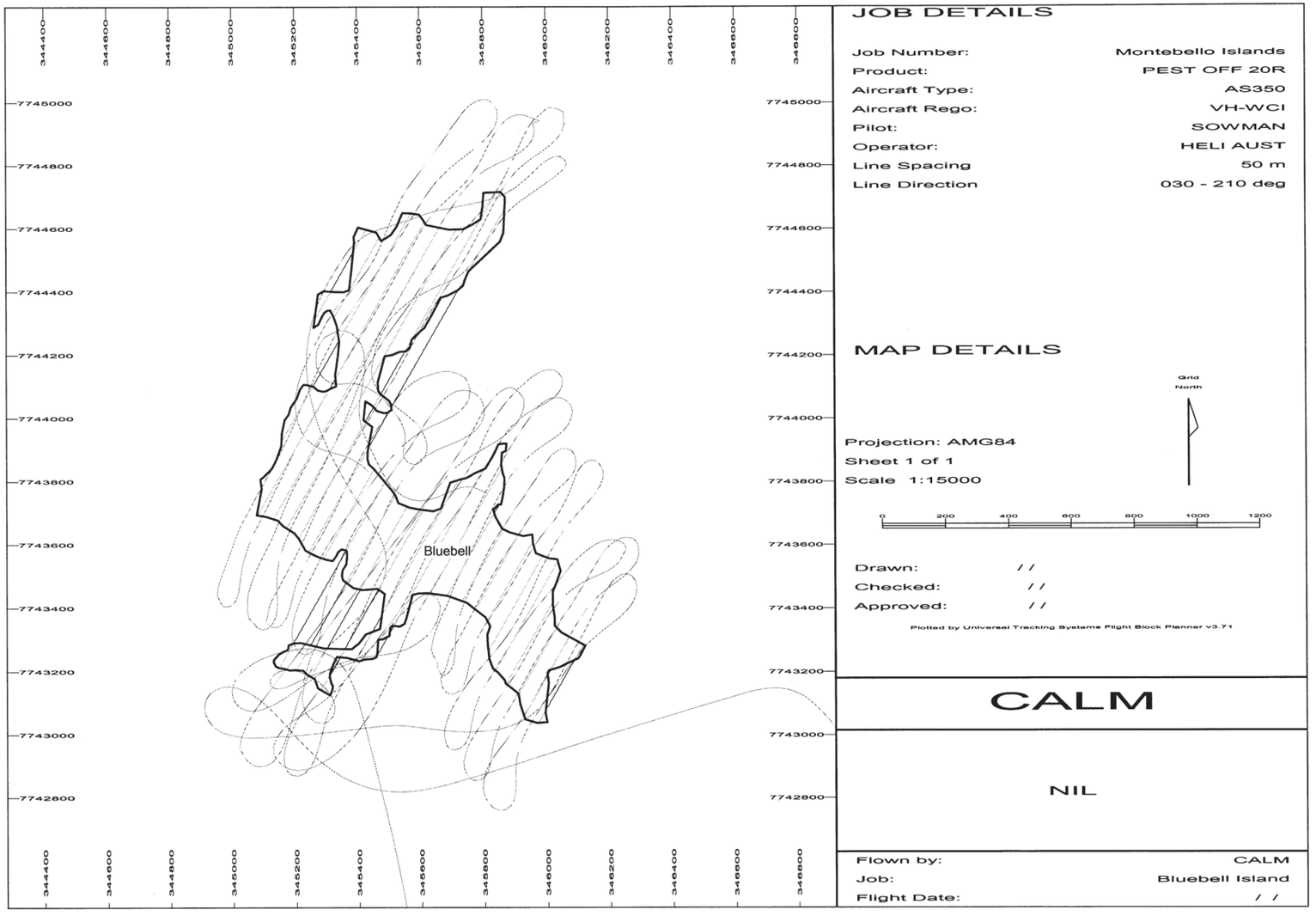

Figure 2. Differential GPS navigation system printout for Bluebell Island.
Initial baiting at 4 kg/ha at 50 m intervals. Bucket swathe 100 m, providing 8 kg/ha and minimising possibility of gaps.

Fresh water at Hurricane Hill Hut is derived from a single rainwater tank. As rainfall is infrequent, water can be a limiting factor when planning trips. We used a small reverse osmosis plant during 1996 and occasionally since, but the 240 v generator has not always been reliable and the reverse osmosis plant has broken down at critical times. Lack of fresh water almost prevented the last feral cat being killed during the trapping operation, as it would have run out within a few days.

Failure of 1996 bait station rodent baiting

Failure to eradicate exotic rodents on islands is usually due to:

(i) gaps between the bait stations being too large, or
(ii) bait not being replaced in bait stations after it has been consumed by dominant rats.

There are two possible reasons for the failure of the 1996 bait station work. The most likely is that the volunteers failed to refill all bait stations during rebaiting operations. This appeared to be the case with Primrose and Crocus Islands, which had to be rebaited in March 1997, and could have been the cause of rats not being eradicated on Hermite, Delta and Campbell Islands (although rats could have swum from Hermite to Delta and Campbell or vice versa as they are separated by only a narrow channel. The second possibility is that rats re-invaded via the pearl farm – the fact that rats were located in 1999 on the three islands closest to the pearl farm supports this hypothesis; however, it is just as likely that some rats remained after the 1996 baiting. Since 1998, CALM has assisted the pearl farm operators to upgrade their quarantine.

There is evidence that Bitrex (denatonium benzoate) reduces consumption of bait by rats (Kaukeinen and Buckle 1992, Veitch 2002) and this may have been a factor in the failure to eradicate black rats in 1996; however, why eradication should have been achieved on most islands and not on a minority of islands is not clear if Bitrex was involved. The Pestoff 20R bait used for helicopter baiting did not contain Bitrex.

The Montebellos is the largest area where rat eradication has been attempted in Australia. The existence of many (very irregularly-shaped) islands close to each other in an archipelago means that eradication has to be achieved on every island within a short time; otherwise any remaining rats will spread rapidly by swimming. In New Zealand, larger areas than the Montebellos have now been successfully rid of rats via aerial baiting; however, these have been single, regular-shaped islands.

Failure of the 1999 aerial baiting

There were significant logistical problems in 1999, largely due to our inexperience in the use of helicopter-borne spreading buckets and associated equipment. The major problems were the frequent failure of the motor that drives the spinner on the bucket while it was being flown under the helicopter (probably due to it being an old engine that got wet with seawater on the way to the island) and the failure to use a DGPS navigation system to ensure that there were no gaps in the bait laying. These problems were overcome in the 2001 aerial baiting, which proceeded without any major problems.

Introduction of native mammals before eradication had been achieved

Planning for the mala introduction proceeded during a period when it was thought that eradication had been achieved, and the rats were not discovered until after the introduction had taken place. In hindsight, we should have waited for at least three years of non-detection of rats before commencing introductions of native mammals. There was some pressure on CALM to proceed with the mala introduction as this species was extinct in the wild and attempts to reintroduce it to the Tanami Desert had failed due to cat predation. As long as rats have not swum to Trimouille or North West Islands, the introductions will have been justified; there is no evidence that this has happened.

FUTURE PLANS

Monitoring to check that rats have been eradicated at the Montebello Islands should continue. Monitoring on sandy islands can be readily carried out by searching for tracks. Monitoring on rock islands is more difficult. Rats are notoriously difficult to capture in Elliott traps and the use of break-back (kill) traps is contraindicated because it will lead to the death of numerous reptiles. Baited tunnels with ink pads (eg, 'black trakka', manufactured in New Zealand) should be used on rock islands in future.

Quarantine is important to prevent reintroduction of black rats or introduction of other invasive species. Quarantine arrangements have been agreed between CALM and Faraday Pearls and licensed charter boast working in the area. Private boats visiting the area, while having a low risk of transporting invasive animals, are an issue that requires addressing.

If no rat sign is detected, reintroductions of spectacled hare-wallaby, golden bandicoot, rakali and spinifexbirds should be planned for 2004 or 2005. There remains some doubt that black-and-white fairy-wrens ever occurred on the Montebellos (Burbidge *et al.* 2000); however, as this subspecies is restricted to Barrow Island, consideration should be given to translocating it to the Montebellos. Candidates for marooning include the antina (Central Rock-rat, *Zyzomys pedunculatus*) and, possibly, other species restricted to a single island or threatened by cat predation on the mainland.

Should black rats be detected at the Montebellos, an external review of the project should be commissioned before further baiting takes place. The New Zealand Department of Conservation should be asked to provide a reviewer. Action to achieve complete eradication must be carried out quickly after rat detection; otherwise the rats will quickly spread to other islands, including those with threatened mammals.

ACKNOWLEDGMENTS

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Many CALM staff, too numerous to list here, helped with the project; however, I would highlight the help of Pilbara staff Fran Stanley and Geoff Kregor, and Jill Pryde from the WA Threatened Species and Communities Unit.

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