MAMMAL MONITORING,

BARROW ISLAND NATURE RESERVE

OCTOBER 2002

Keith Morris[1], Andrew A Burbidge[2], Michelle Drew[3] and Geoff Kregor[4]

[1] Science Division, Department of Conservation and Land Management,
WA Wildlife Research Centre, PO Box 51, Wanneroo WA 6946

[2] Research Fellow, Science Division, Department of Conservation and Land Management
WA Wildlife Research Centre, PO Box 51, Wanneroo WA 6946

[3] IRC Environment, Ground Floor, 26 Colin St, West Perth, WA 6005

[4] Department of Conservation and Land Management, Pilbara Region, PO Box 835 Karratha, WA 6714

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

CHEVRON TEXACO

EXECUTIVE SUMMARY

Monitoring of the abundance and condition of native mammals on Barrow Island was conducted at the five trapping locations and along the two spotlighting transects as described in Burbidge *et al.* 1998. In addition, monitoring of Black-flanked Rock-wallabies continued for the second year via trapping and spotlighting. Trapping for the presence of introduced mammals (particularly rodents) was conducted in dunes at Narrow Neck. After reports of rat tracks on North Double Island, North and South Double Islands in addition to Boomerang Island were surveyed.

Captures of the smaller dasyurids and rodents were generally lower in 2002. Tan False Antechinus were not trapped on any grid this year. Brushtail Possum captures were also lower when compared with the previous two years. Lower capture rates may have been associated with modified foraging activity of larger proportion of lactating females, or another below average rainfall year. However, Golden Bandicoots were significantly higher in abundance compared to other years. Fourteen species of terrestrial reptile were also recorded.

More detailed analysis of the spotlighting data was undertaken and estimates of mammal density derived for the north and south transects in 1998, 2000, 2001 and 2002. Where there were significant differences in density, mammal densities on the north transect were always higher than on the south transect.

Trapping and track searches for introduced rodents revealed no evidence of these species on Barrow Island, Boomerang or North and South Double Islands.

Mammal road kills appear to have declined with a reduction in nocturnal drilling activity on the island. The "Euro" mats appear to have reduced the incidence of deaths related to Lufkin pump operations, however animals still shelter beside the pumps and further modifications to the mats may be required. It is recommended that gates be installed on the entrances to the camp swimming pool to eliminate the potential for animals drowning.

1. INTRODUCTION

Barrow Island, as well as being of considerable nature conservation significance for other reasons, is one of Australia's most important mammal conservation areas. It supports 14 terrestrial mammal species, of which five are listed as threatened pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and another is listed under the Western Australian *Wildlife Conservation Act 1950* (Table 1). The introduced House Mouse *Mus domesticus* and Black Rat *Rattus rattus* have also been reported on Barrow Island, but eradicated (Morris 2002). Barrow Island has been a producing oil field since 1964, until 1999 the operator was West Australian Petroleum Pty Ltd (WAPET); the operator is now ChevronTexaco Pty Ltd.

Table 1. Terrestrial mammals of Barrow Island

Species	**Conservation status** (*EPBC Act 1999, WCA 1950*)
Planigale, *Planigale* 'species 1' (Blacket *et al.* 2000)	not threatened
Pseudantechinus, *Pseudantechinus* sp.(probably Tan False Antechinus *P. roryi*)	not threatened
Barrow Island Golden Bandicoot, *Isoodon auratus barrowensis*	Vulnerable
Northern Brushtail Possum, *Trichosurus vulpecula arnhemensis*	not threatened
Barrow Island Boodie, *Bettongia lesueur* (Barrow Island subspecies)	Vulnerable
Barrow Island Spectacled Hare-wallaby, *Lagorchestes c. conspicillatus*	Vulnerable
Black-flanked Rock-wallaby, *Petrogale lateralis lateralis*	Vulnerable
Barrow Island Euro, *Macropus robustus isabellinus*	Vulnerable
White-striped Mastiff-bat, *Tadarida australis*	not threatened
Common Sheath-tail Bat, *Taphozous georgianus*	not threatened
Finlayson's Cave-bat, *Vespadelus finlaysoni*	not threatened
Rakali (Water-rat), *Hydromys chrysogaster*	not threatened
Djoorri (Common Rock-rat), *Zyzomys argurus*	not threatened
Barrow Island Mouse, *Pseudomys nanus ferculinus*	Vulnerable

The Black Flying Fox *Pteropus alecto* has been reported on Barrow, but these records apparently represent vagrants.

The Interim Management Guidelines (IMG) for Barrow Island Nature Reserve (CALM 1999) recommended that a formal mammal monitoring program be established. The former National Parks and Nature Conservation Authority, in reporting on a visit in September 1997, also recommended additional mammal monitoring. In the IMG, Section 6.4 – Management Actions states:

- "Establish protocols for terrestrial fauna monitoring on Barrow Island. These need to include:
  a) monitoring of mammal populations inside and outside the oilfield with a combination of spotlight transects and trapping;
  b) monitoring fauna recovery where rat eradication was undertaken (south end); and
  c) monitoring to ensure that feral animals, especially rodents and cats, do not establish.

- Establish protocols for determining the impact, if any, of road kills on mammal populations.
- Monitor the reintroduced population of Boodie *Bettongia lesueur* on Boodie Island.
- Continue monitoring the marine turtle rookeries on the west and east coasts of Barrow Island."

The mammal monitoring program was commenced in 1998 to address the first three of these dot points, although the full trapping program did not commence until 2000. The marine turtle rookeries are being monitored under a separate program. Unpublished reports (Burbidge *et al.* 1998, 2000, and Morris *et al.* 1999, 2001) provide the results of previous mammal monitoring surveys. While the reintroduced boodie population on Boodie Island has been monitored as part of this program in the past, it is likely that future

monitoring will be undertaken by *Landscope* Expeditions. This report covers the fifth mammal monitoring visit undertaken between 22-31 October 2002.

2. OBJECTIVES

The objectives for this survey were:

1. To monitor abundance and condition of native mammals (excluding bats). Euros, Spectacled Hare-wallabies, Brushtail Possums and Boodies were monitored via spotlight runs, while Boodies, Golden Bandicoots, Brushtail Possums, native rodents and small dasyurid marsupials were monitored via trapping. Monitoring of rock-wallabies (the least abundant mammal on Barrow Island) continued this year via both spotlighting transects and targeted trapping. Rock-wallaby scat collections continued at Q21.
2. To trap the Narrow Neck area for black rats.
3. To inspect the North and South Double Island and Boomerang Island for black rat tracks.
4. To record the reptiles trapped or seen, and to collect a specimen of the skink *Ctenotus pantherinus acripes* for the WA Museum so that the validity of this taxon can be confirmed.
5. To collect six male Golden Bandicoots *Isoodon auratus* for University of Western Australia researchers.
6. To make recommendations to the oilfield operators on practices which may detrimentally impact mammal abundances.

3. METHODS

3.1 Trapping

Five trapping grids, each covering one hectare, were established in November 1998 (completed in October 1999, but all grids were not fully operational until 2000) and a brief description of each is included in Burbidge *et al.* 1998. In 2000, the four corner points of each grid were located with GPS (using the AUS 84 datum) for long-term future reference and placing on ChevronTexaco operational maps, so that disturbance is avoided. After correction for the WGS 84 datum, grids have now been located on Barrow Island operational maps.

Sheffield cage traps, medium Elliott traps and pitfall traps were set on all grids in a 5 x 5 pattern (20m trap spacings) for four nights. In addition, 10 Elliott and 10 cage traps were set at Narrow Neck for four nights to detect any introduced rats and mice. Bromilow traps were set near the west coast at Q21, Flacourt Bay, YS88 and Y23 to monitor rock-wallabies. A cage trap was set at each Bromilow in an attempt to keep "non-target" species (mainly possums) out of the Bromilow traps. A summary of the trapping effort is shown in Table 2.

For the first time, most mammals trapped on grids were marked by a PIT (passive implanted transponder) tag injected superficially beneath the skin between the animal's shoulder blades (back of the neck). The smaller Rock Rats, Barrow Island Mouse and *Planigale* continued to be marked with ear notches, this year in the # 10 position (lower portion, front edge of left ear). In 1998, animals were marked with # 1, in 1999 they were marked with # 2, in 2000 with # 4 and in 2001 with # 7. All rock-wallabies were marked with a PIT implant, those trapped at Q21 and YS 88 also had an ear tag placed on the right ear.

The use of ear notches to mark animals had previously only provided information on which animals had been captured previously. This provided some information on the population dynamics each year and an approximate estimation on the age of some individuals. However, with the use of the PIT tags information on an individual's growth, sexual maturation and movements will be available. This detailed knowledge will enable more detailed analysis of collected information and potentially provide details of basic life history of several of the species on the island.

Table 2. Summary of trapping effort – October 2002

DATE	Wed 23/10	Thurs 24/10	Fri 25/10	Sat 26/10	Sun 27/10	Mon 28/10	Tues 29/10	Wed 30/10	Thurs 31/10	Total
Bandicoot Bay	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P						**100 C** **100 E** **100 P**
John Wayne	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P						**100 C** **100 E** **100 P**
M21		25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P					**100 C** **100 E** **100 P**
Landing					25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P		**100 C** **100 E** **100 P**
S62					25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P	25 C 25 E 25 P		**100 C** **100 E** **100 P**
Narrow Neck	10 C 10 E	10 C 10 E	10 C 10 E	10 C 10 E						**40 C** **40 E**
Q21 RW	10 B 10 C	10 B 10 C	10 B 10 C	10 B 10 C						**40 B** **40 C**
Flacourt Bay RW						8 B 8 C	8 B 8 C	8 B 8 C	8 B 8 C	**32 B** **32 C**
YS 88 RW						8 B 8 C	8 B 8 C	8 B 8 C	8 B 8 C	**32 B** **32 C**
Y23 RW					9 B 9 C	9 B 9 C	9 B 9 C	9 B 9 C		**36 B** **36 C**

Trapping effort:		
	C = Cage	680
	E = Medium Elliotts	540
	P = PVC pits	500
	B = Bromilow	140
	TOTAL	**1860 trap nights**

Trap success rates for Boodies and Brushtail Possums were calculated on cage trap numbers only, those for Golden Bandicoots on cage and Elliott trap numbers, those for the Tan False Antechinus, Barrow Island Mouse and Common Rock Rat on Elliott and pit trap numbers, and those for the Planigale on pit trap numbers only. Spectacled Hare-wallabies were caught only in cage traps. Rock-wallabies were caught in both Bromilow and cage traps and therefore in contrast to 2001, the number of cage trap nights were included in the trapping effort for this species.

Reptiles trapped on the grids were also recorded during this trip (Table 4). One *Ctenotus pantherinus acripes* was collected for the WA Museum.

3.1.1 Rock Wallaby Scats

Rock-wallaby scats were again collected from the colony near Q21 for David Pearson's study on estimating rock-wallaby abundance from scat accumulations.

3.2 Spotlighting

The standard spotlighting transects (one in the largely undisturbed northern end of the island and one within the oilfield towards the southern end of the island) were run on six nights (23/10, 24/10, 26/10, 27/10, 29/10 and 30/10). Each transect was about 30 km long. A 4WD tray-top vehicle was driven at 12 -15 km/h with one spotlighter observing animals. Estmated distance from the centre-line of the transect was recorded for each sighting to enable density calculations. To eliminate observer bias, each spotlighting team recorded on both runs on consecutive nights and the data from the two nights were combined.

Because the standard spotlighting transect does not adequately monitor the least abundant mammal, the Black-flanked Rock-wallaby, in 2001 an additional transect was established running for 11.9 km in the Flacourt Bay / YS88 / Y23 area. A descriptive log of this transect is provide in Morris *et al.* (2001). Spotlighting runs in a single vehicle were undertaken along this transect on 25 and 28 October and took approximately 65 minutes to complete.

A more detailed analysis of the spotlighting data collected since 1972 was undertaken and is reported on below.

3.3 Introduced Black Rat searches

In addition to the grid trapping, and that undertaken at Narrow neck (see above), North and South Double Island and Boomerang Islands were searched for black rat tracks by three trained staff. North and South Double Islands were searched for approximately 45 minutes by each person totalling 2 hours and 15 minutes search time on each island. Boomerang was searched for a total of one hour. Visual searches for rat tracks were also made at Narrow Neck while traps were being checked.

3.4 Rainfall

Rainfall for Barrow Island (airport) to November 2002 was 127.2 mm, 106 mm of which fell in July. This follows the driest year on record of 108.4 mm in 2001.

4. RESULTS AND DISCUSSION

Seven species of native mammal were trapped on the grids and six species identified during spotlight transects. The Black-flanked Rock-wallaby was not trapped on grids, but at selected sites along the west coast of Barrow Island. No introduced mammal species were recorded. Fourteen species of terrestrial reptile and the Green Turtle *Chelonia mydas* were recorded during this visit.

4.1 TRAPPING

The mean trap success rates for mammals trapped on the five grids since 1998 are shown in Table 3. Trap success rates for each of the grids is shown in Figures 1 – 5, and species trap success rates are shown in Figures 6 – 13. A summary of the grid trapping results showing individuals trapped is shown in Appendix 1, and trapping results for rock-wallabies in Appendix 2.

Numbers of species trapped on the grids was lower in 2002 compared to previous years. All eight possible species are usually trapped at Bandicoot Bay, however this year only five species were trapped. Neither the Common Rock-rat, Tan False Antechinus or *Planigale* were trapped at this site in 2002. Five species were also trapped at the John Wayne and Landing grids. Only three species were captured on M21 and S62. The *Planigale* was only captured at the Landing, the Rock-rat was only captured at the John Wayne grids and both Bandicoot Bay and John Wayne grids captured the Barrow Island Mouse.

Mean trap success rates for most species were lower, or the same this year compared to 2001. The Golden Bandicoot had over twice the trap success of 2001, however this was mostly attributable to retraps rather than an increase in the number of individuals captured. Many of the species captured were actively breeding, with a large cohort of captured females either carrying pouch young or with elongated teats, indicating that they may have had young at heal. It is possible that this high level of breeding activity may have altered species movements and foraging activity to different zones of the island potentially reducing capture rates on the grids in comparison to years with lower breeding activity. Trap success rates of the

smaller mammals have been less than 3.0 % for the duration of this study, making interpretation of fluctuations in trap success difficult. No doubt the continued low rainfall has had an impact on mammal population numbers on Barrow Island.

Table 3. The mean trap success rates (± SE) for mammals on Barrow Island since 1998. Data from grids and rock-wallaby traplines only

	1998	1999	2000	2001	2002
Golden Bandicoot	25.9 ± 4.6 %	34.7 ± 5.4 %	30.9 ± 4.8 %	27.6 ± 3.0 %	61.2 ± 15.2 %
Brushtail Possum	6.3 ± 1.9 %	15.4 ± 7.0 %	20.0 ± 6.2 %	24.8 ± 5.0 %	15.6 ± 7.4 %
Boodie	5.1 ± 2.9 %	9.2 ± 3.5 %	8.2 ± 3.5 %	7.6 ± 2.2 %	7.8 ± 3.1 %
Spectacled Hare-wallaby	Not processed	Not processed	3.0 ± 2.2 %	3.6 ± 2.2 %	2.4 ± 1.4 %
Black-footed Rock-wallaby	Not trapped	Not trapped	Not trapped	9.5 ± 4.4 % (4.8%**)	1.8 ± 0.7 %**
Pilbara Planigale	0.4 ± 0.1 %	1.2 ± 0.1 %	1.8 ± 0.7 %	2.8 ± 1.2 %	0.4 ± 0.4 %
Tan False Antechinus	0	1.0 ± 0.2 %	0.4 ± 0.4 %	0.4 ± 0.4 %	0
Barrow Island Mouse	1.9 ± 0.7 %	1.6 + 0.4 %	2.1 ± 1.0 %	1.7 ± 0.8 %	1.2 ± 1.1 %
Common Rock Rat	0.1 ± 0.1 %	0.1 ± 0.1 %	0.7 ± 0.2 %	0.6 ± 0.4 %	0.6 ± 0.7 %

** denotes trap success rate using the number of Bromilow and cage trap nights, instead of only number of Bromilow trapnights.

4.1.1 Golden Bandicoot *Isoodon auratus barrowensis* (Figure 6)

The Golden Bandicoot was again the most commonly trapped species, with mean trap success rates doubling from that recorded in 2001 (27.6% to 61.2%), although a large proportion of this increase is attributable to retrapped animals, captured individuals increased from 123 in 2001 to 138 in 2002. An average of 27.6 individuals was caught on each grid, ranging between 54 individuals on the John Wayne grid to 12 on the Bandicoot Bay grid. Of the 138 individuals trapped on all the grids, 55 (40%) were male and 83 (60%) were female. The majority of females were breeding (60%); 36 of which had pouch young and 14 had elongated teats and were probably suckling young at heel. This is in contrast to 2001 when only about 12% of adult females were lactating.

4.1.2 Northern Brushtail Possum *Trichosurus vulpecula arnhemensis* (Figure 7)

The Brushtail Possum was trapped on all grids, except M21. Capture rates were low at all grid sites compared to 2001 capture success and overall capture success rate was equivalent to that recorded in 1999. As mentioned above, there was considerable disturbance of Elliott traps at S62 by possums and this may have contributed to the lack of small mammals trapped at this site. Overall, trap success rates were higher than 2000 on all grids except for John Wayne. Of the 35 individuals trapped, 21 (60%) were male and 14 (40%) female. Twelve females (86%) were lactating, compared with last year, when only one female (4.5%) carried a pouch young and in 1999 when one third of the adult females were carrying pouch young.

4.1.3 Boodie *Bettongia lesueur* (Figure 8)

Boodies were trapped on all grids, including John Wayne, which had not recorded an individual since 1998. However despite numbers captured in John Wayne increasing from 0 in 2001 to five in 2002, significant decreases in trap success rates at Bandicoot Bay (11% to 4%, 2001 and 2002 respectively), overall trap

success rates were similar to that recorded in 2001. The highest trap success rate was again at the Landing, which probably reflects this grid's proximity to a nearby warren. Of the 24 individuals trapped, 17 (71 %) were males and 7 (29 %) were females. Four of the females had large, unfurred pouch young and two had elongated teats.

4.1.4 Spectacled Hare-wallaby (Figure 13)

Spectacled Hare-wallabies were trapped on Bandicoot Bay, Landing and M21 and were not captured at John Wayne or S62. Mean capture success rates were lower than in 2001 but not significantly so, however only eight individuals were captured in 2002 compared to 13 in 2001. Five males and two females were trapped (one individual was not sexed before release). One of the females had an unfurred pouch young with a 60.5mm pes length.

4.1.5 Black-flanked Rock-wallaby (Appendix 2)

Five Black-flanked Rock-wallabies (four males, 1 female) were trapped at Q21, YS 88 and Flacourt Bay. None were trapped at Y23, where trap success rates had been the highest in 2001. The female had an elongated teat, so possibly had a young at heel. Two individuals were trapped at YS 88 in cage traps baited with apple. Consequently trap success calculations were based on the number of Bromilow and cage trap nights.

4.1.6 Pilbara Planigale *Planigale* sp. (Figure 9)

Planigales were only trapped at the landing grid, contrasting with 2001 when they were captured at four of the five trapping grids. Trap success at the Landing grid was significantly lower this year than in 2001 (2% compared to 7.0 % respectively). A total of two individuals were trapped compared to nine last year. Of the two captured, one was a male and the other a female with several pouch young approximately 12mm crown-rump length.

4.1.7 Tan False Antechinus *Pseudantechinus roryi* (Figure 10)

Tan False Antechinus were not trapped at any site in 2002. Previously they have been recorded in low numbers on the Bandicoot Bay, M21 and S62 grids.

4.1.8 Barrow Island Mouse *Pseudomys nanus ferculinus* (Figure 11)

The Barrow Island Mouse was captured in low numbers at Bandicoot Bay and John Wayne grids. This species appears to favour the white sands at Bandicoot Bay and the red sands at John Wayne than the brown loams and gravels at M21, S62 and the Landing. This species is probably more abundant than indicated by these trap success rates as disturbance of Elliott traps by bandicoots and possums probably reduces their capture rate. Overall trap success was lower in 2002 compared to previous years, however there appeared to be more breeding activity this year. Of the 5 individuals trapped, three (60%) were males and two (40%) were females, one of which carried pouch young, while the other was pregnant (100% lactating). Comparatively lactating females have averaged only 23 $\pm$ 7.26% of those individuals captured. Low capture rates in 2002 may therefore be a result of altered foraging activity associated with breeding individuals.

4.1.9 Common Rock Rat *Zyzomys argurus* (Figure 12)

The Common Rock Rat was trapped in low numbers only on the John Wayne grid. Of the three individuals captured, one was a male and two non-breeding females. Since this study started, trap success rates have always been low (0.5 % – 1.5 %) and this is one of the less common species on Barrow Island.

4.1.10 Trapping at Narrow Neck

No Black Rats were trapped at Narrow Neck, nor were any rat tracks seen in the vicinity. Only tracks of Golden Bandicoots, Brushtail Possum and Spectacled Hare-wallaby were seen. Golden Bandicoots (30% trap success), Brushtail Possum (2.5%) and the Barrow Island Mouse (22.5 %) were trapped. This area was intensively baited to eradicate the Black Rat in 1990-91 (Morris 2002). In the process, local populations of

the Golden Bandicoot and Barrow Island Mouse were significantly reduced to trap success rates of 8.7 % and 0.7 % respectively. Prior to this visit, this area was last trapped in November 1998 and trap success rates of 44 % and 13 % respectively were recorded. It is clear that both species have now recovered from the rat baiting program.

4.1.11 Reptiles (Table 4)

Ten species of reptile were trapped on the trapping grids. Another three were seen at night during the spotlighting transects, and the Perentie *Varanus giganteus* was commonly seen around the camp and along roads during the day. Specimens of *Ctenotus pantherinus acripes*, *Ctenotus helenae* and *Diplodactylus jeanae* were collected for the WA Museum.

Grid / Location	Species
Bandicoot Bay	*Pogona minor* *Ctenophorus caudicinctus* *Heteronotia binoei* *Ctenotus saxatilis*
John Wayne	*Ctenotus grandis titan* *Ctenotus helenae* (WAM) *Ctenotus saxatilis* *Cyclodomorphus melanops* *Glaphyromorphus isolepis* *Diplodactylus jeanae* (WAM)
S62	*Ctenotus saxatilis* *Heteronotia binoei*
M21	*Ctenotus grandis titan* *Ctenotus saxatilis* *Heteronotia binoei*
Landing	*Ctenotus pantherinus acripes* (WAM R112820) *Ctenotus grandis* *Ctenotus saxatilis*
Free ranging	*Varanus giganteus*
Spotlighting	*Morelia stimsoni* *Pseudechis australis* *Lialis burtonis*

Table 4. Terrestrial reptiles recorded on Barrow Island – October 2002.

4.2 INSPECTION OF NORTH AND SOUTH DOUBLE, AND BOOMERANG ISLANDS

Mike Bamford, who had visited Barrow Island recently consulting for the Gorgon project, had advised Keith Morris that Chris Sermon, a seabird specialist from Murdoch University, had recently reported seeing rat tracks on North Double Island. The annual mammal monitoring trip in October 2002 provided an opportunity to check the veracity of the report. A brief (approx 10 minute) visit was also made to Boomerang Island.

Black Rats (*Rattus rattus*) were first reported on Double Island in 1918 by ornithologist F Lawson Whitlock (Whitlock 1918). They had probably been introduced from pearling vessels active in the area from the 1860s—rats found their way onto several Pilbara and south Kimberley Islands from this source at about the same time.

In 1983, a rat eradication project was conducted on the two Double Islands by the former Department of Fisheries and Wildlife and WAPET. Checks after this work showed that the rats had been eliminated (Burbidge and Morris 2002, Morris 2002). During the 2000 mammal monitoring work, a visit was made to both North and South Double, and Boomerang Islands, mainly to check for rats. No rat sign was located (Burbidge, Morris and Drew 2000).

Geoff Kregor (Department of Conservation and Land Management (DCLM), Karratha), Michelle Drew (IRC Environment), Andrew Burbidge (DCLM Research Fellow) travelled to North and South Double, and Boomerang Islands by dinghy on 28 October 2002.

North Double Island has skeletal soils, making tracks difficult to locate. However, there were several indications that there were no rats present. These were the lack of rat droppings, the lack of disturbance of seabird carcases (two wedge-tailed shearwaters, one smaller shearwater), no sign of ripe fig (*Ficus platypoda*) fruits being consumed and the presence of many seeds on the ground's surface. South Double has significant areas of white and brown sands. These were searched for tracks; none being located. The two islands are effectively joined at low tide and are well within rat swimming capability (black rats can swim between islands > 1 km apart).

We conclude that it is very unlikely that rats are present on either of the Double Islands. On Boomerang Island, Brushtail Possum (*Trichosurus vulpecula*) and Golden Bandicoot (*Isoodon auratus*) tracks were seen. Both species were noted during trapping on the island in October 2000. No rat tracks were seen.

4.2.1 Notes on fauna sighted on Double Islands

North Double

Kestrel (1), Bar-shouldered Dove (*ca* 5), Eastern Reef Egret (*ca* 10), Pied Cormorant (*ca* 40), recently used Osprey nest.

Two dead Wedge-tailed Shearwaters found; approx 25-50 nesting burrows under limestone cap-rock. A smaller dead shearwater was not identified to species.

South Double

Zebra Finch (*ca* 30), Spinifexbird (1), Yellow Silvereye (1), Singing Honeyeater (1), Brown Quail (2), Sooty Oystercatcher (2), Pied Oystercatcher (2).

Wedge-tailed Shearwater nesting burrows: *ca* 250 on west side behind main beach, *ca* 15 behind east beach, *ca* 20 on flat sandy area in middle of island adjacent to east beach, *ca* 20 under cap-rock. Total: *ca* 300.

4.3 ANALYSIS OF DATA FROM SPOTLIGHTING TRANSECTS 1972 TO 2002

4.3.1 Background

Five of Barrow Island's mammal species (including four of the threatened species) are readily detected by spotlighting along the many hundreds of kilometres of gravel roads on the island. In 1972, two spotlight transects were established, each of about 30 km, one within the oilfield in the southern part of the island and one in the relatively undisturbed northern part of the island. Mammal numbers along these transects have been counted whenever possible; until recently counts were opportunistic and usually associated with inspections of the island by nature conservation statutory authorities (WA Wildlife Authority, National Parks and Nature Conservation Authority) and Department of Conservation and Land Management (and its predecessors) staff. Usually only two nights' counting was possible.

In 1998, this mammal monitoring project commenced, conducted jointly by the Department of Conservation and Land Management and ChevronTexaco. Since then, counting has been conducted over six nights with additional data recorded, ie, the perpendicular distance of each animal sighted from the centre of the road.

4.3.2 Methods

The same two teams carry out counts over two consecutive nights. Two four-wheel drive tray-top vehicles are used, each equipped with one 100 W spotlight. On the first night one team counts the north transect and the other the south one; on the second night the same teams count the other transect, in the reverse

direction. Vehicles are driven at about 14-15 km/h and the spotlighter stands on the tray behind the cab. The same spotlighter, or combination of spotlighters, work on consecutive nights. Work commenced soon after 1900 hrs. All animals seen are recorded whether in spotlight or in vehicle headlights. From 1972 to 1977, the odometer reading for each animal observed was recorded. Since 1998, for each animal, the odometer distance from the start of the transect was recorded plus the estimated perpendicular distance of each animal from the centre of the transect (ie, the centre of the road). The time the observation was made was also recorded, as a check against the recording of the correct odometer reading. Wind speed and moon condition were recorded, but have not been used in the analyses. At the end of each transect the total odometer distance and the total time taken to complete the transect were recorded. Data were stored in a MS Excel file.

Data from 1998, 2000, 2001 and 2002 were analysed using the software program DISTANCE 3.5 (© 1998-1999 Research Unit for Wildlife Population Assessment, University of St. Andrews). Data from the six nights of spotlighting was combined and the Half Normal + Cosine model was used with no truncation of data. The uniform + cosine model was chosen after testing several models on a selection of data, based on the Akaike information criterion, as being the best model overall (Buckland *et al.* 2001). Data for 1999 were not anlaysed: a spotlight failed during one transect, making data from that pair of transects unusable, and on another night the vehicle allocated for our work was taken on a fishing trip by company employees or contractors, making data from a second pair of transects unusable.

Because rock-wallabies are not recorded at all on the South transect, and only occasionally recorded on the North transect, a rock-wallaby spotlighting transect was established in 2001. The transect is 11.5 km long and utilises available tracks on the west coast in and near rock-wallaby habitat. It was traversed twice in 2001 and twice in 2002.

4.3.3 Results

Species recorded were: Barrow Island Golden Bandicoot (*Isoodon auratus barrowensis*), Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*), Barrow Island Boodie (*Bettongia lesueur* undescribed subspecies), Barrow Island Spectacled Hare-wallaby (*Lagorchestes conspicillatus conspicillatus*) and Barrow Island Euro (*Macropus robustus isabellinus*). Rodents (Barrow Island Mouse *Pseudomys nanus ferculinus* and Common Rock-rat *Zyzomys argurus*) were also recorded as 'rodent'. A few 'rodent' records are of the Tan False Antechinus *Pseudantechinus roryi.* The Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*) is occasionally sighted on one section of the North transect.

The length of the transects, recorded on a GPS receiver were: North transect 29.8 km and South transect 29.6 km. Odometers on the vehicles used varied somewhat with distances recorded from 1998 to 2002 varying from 29.0 to 30.2 (North) and 27.5 to 30.0 (South). No corrections have been made for odometer error in the analyses.

Data from 1972 to 1997 are presented in Table 5 and data from the more commonly-sighted species are presented graphically in Figure 14.

Data from 1998 to 2002 (excluding 1999) are presented in Table 6 and Figure 15. Table 7 provides outputs from DISTANCE 3.5 analyses. Distance analyses suggest that in some years, there are significant differences ($p<0.05$) between the number of animals observed between the North and South transects; in all cases animals were more abundant in the North.

A total of 13 rock-wallaby observations were made in four rock-wallaby transect traverses, two each in 2001 and 2002 (Table 11).

4.3.4 Discussion of spotlighting analysis

The spotlighting data are not robust. While we attempted to control as many variables as possible (eg, North and South transects being counted on consecutive nights by the same teams, the same spotlighter operating for the same amount of time each night, repeated counts of the transects during the same trip), other

variables could not be controlled. In particular, while the transects were chosen to represent areas outside and within the oilfield, the terrain and habitat is not the same and visibility varies between transects. Between 1972 and 1997 only two nights' counting was possible on most occasions. Night to night variability when counting was spread over six nights between 1998 and 2002 (Table 6, see below) suggests that these data should be viewed with considerable caution. It would be even more courageous to compare data between years, as personnel and equipment have varied, as has visibility, which was better in the south soon after the end of oilfield development in 1972 and subsequent years compared to later years when revegetation of many disturbed areas was more extensive.

Visibility variability between North and South was corrected since 1998 by the DISTANCE software, which revealed consistently larger Effective Strip Widths (ESW) in the South than the North (Table 8).

There may be considerable variability between nights in the number of mammals seen for no obvious reason. Table 9 shows the number of hare-wallabies, an easily detected species, on six nights in October 2000. Clearly, the more nights of spotlighting per trip, the better.

The spotlight transects were established to permit a quick and easy method of detecting gross differences between animal density within and outside the oilfield, as well as detecting any significant reductions in animal numbers. Introduced mammals, if present, may also be detected. From 1972 to 1997, the data suggested that, while total numbers vary from year to year (probably due primarily to rainfall variation, but also to observer ability and changing visibility), there were no gross differences between the two transects, nor were any feral mammals detected. Inspection of Table 6 suggests significant differences between North and South for some species in some years; however, no reliability should be placed on these results as the data are uncorrected for visibility.

The DISTANCE analyses suggest significant differences between North and South, with North having a higher density of some mammal species in some years—Spectacled Hare-wallaby in 1998 and 2001, Golden Bandicoot in 2000, Brushtail Possum in 2000 and 2002 and Boodie in 1998 and 2001. Visibility is better in the oilfield, where there are numerous side roads, cleared oil well 'leases' and regenerating 'borrow' pits as well as other infrastructure, meaning that animals can be more readily detected in a spotlight further from the centre line of the transect. The significantly lower numbers on the South transect of some species in some years since 1998 (if real) are probably due to habitat destruction in the South; although differences in terrain and habitat can not be ruled out.

Overall, with all data from all species combined for 1998 and 2000-2002 (Table 10), the density of mammals in the North is significantly higher than in the South ($p<0.05$) and the Effective Strip Width is higher in the South.

Rock-wallaby spotlighting data are limited. They do show that rock-wallabies are present in the transect area, but there are too few records for meaningful analysis. DISTANCE analysis of the four transects combined gives a density of 0.065 – 0.304 animals/ha, but this is of little value, as they are detected when moving to feed or feeding, often some considerable distance from their shelter in caves on and near the west coast of Barrow Island.

4.3.5 Conclusions

Spotlighting is a quick and easy method of comparing the density (abundance) of the readily sighted mammals on Barrow Island Nature Reserve—Golden Bandicoot, Brushtail Possum, Boodie and Spectacled Hare-wallaby. The spotlighting data can be improved by repeated counting of the same transects and by estimating the perpendicular distance of the mammal when first sighted from the centre line of the transect. DISTANCE software allows improved comparisons between transects with differing visibility.

We believe that it is worthwhile continuing conducting regular spotlight traverses on Barrow Island, but only if they are run over several consecutive nights with two competent teams at the same time and with perpendicular distances from the transect centre-line being recorded.

		Mean number observed						
Date / Transect	**No. of nights**	**Golden Bandicoot**	**Possum**	**Boodie**	**Hare -wallaby**	**Euro**	**Rodent**	**Total[1]**
Dec 72 N	2[2]	7.5	7.5	23.0	51.5	10.0	6.0	105.5
Dec 72 S	2[2]	11.0	15.0	10.5	61.5	5.5	4.5	108.0
Jan 75 N	4	8.5	4.5	7.5	14.3	5.5	10.3	50.5
Jan 75 S	4	7.8	6.3	5.0	11.3	2.0	2.3	34.5
Feb 77 N	2	12.0	6.5	3.0	16.5	2.0	3.0	80.5
Feb 77 S	2	7.5	7.5	8.5	17.0	2.5	1.5	72.0
Feb 79 N	2	6.5	11.0	4.0	17.0	4.0	0.5	43.0
Feb 79 S	2	6.5	20.0	6.5	45.0	1.5	3.0	82.5
Feb 81 N	2	17.0	9.5	7.0	37.5	5.5	3.0	79.5
Feb 81 S	2	15.5	16.0	6.0	82.5	8.0	6.0	134.0
Mar 83 N	2	21.5	6.0	4.5	30.5	3.5	5.5	71.5
Mar 83 S	2	36.5	20.0	8.0	55.0	5.5	5.5	130.5
Feb 85 N	2	13.5	4.5	8.5	43.0	1.5	1.5	72.5
Feb 85 S	2	13.5	10.5	5.5	46.5	1.5	3.5	81.0
Nov 85 N	2	10.0	6.5	12.0	24.0	3.0	3.5	59.0
Nov 85 S	2	8.5	9.0	7.5	19.5	4.5	3.0	52.0
May 87 N	2	9.5	11.5	6.5	32.0	5.5	2.0	67.0
May 87 S	2	7.0	6.5	4.0	34.0	5.5	2.0	59.0
Mar 89 N	2	11.0	12.0	5.0	24.5	3.0	1.5	57.0
Mar 89 S	2	9.5	8.5	5.5	23.5	2.0	1.0	50.0
Jun 91 N	2	5.0	9.0	2.0	32.0	10.0	4.0	62.0
Jun 91 S	2	7.5	8.0	3.0	37.0	3.5	2.5	61.5
Oct 95 N	2	8.0	7.0	13.0	31.5	4.0	2.0	65.5
Oct 95 S	2	9.5	6.0	9.5	17.0	1.5	3.0	46.5
Sep 97 N	2	3.5	8.0	1.5	9.0	8.5	5.0	35.5
Sep 97 S	2	4.5	2.0	4.0	13.5	3.5	3.0	30.5

[1] Rock-wallaby observations excluded; species seen only on North transect
[2] One team over four consecutive nights.

Table 5. Spotlighting data from 1972 to 1997.

	Golden Bandicoot	Northern Brushtail Possum	Boodie	Spectacled Hare-wallaby	Barrow Island Euro	Rodents, etc.	Total[2]
1998							
North 3/4 Oct	7±2	6.5±0.5	4±2	30.5±12.5	7.5±0.5	1±0	56.5±16.5
South 3/4 Oct	10±5	5±0	7±1	23.5±2.5	1.5±0.5	2.5±0.5	49.5±3.5
North 5/6 Oct	17±4	8.5±1.5	3.5±3.5	23.5±0.5	4.5±1.5	4.5±1.5	61.5±8.5
South 5/6 Oct	17.5±3.5	9.5±2.5	3±0	32±7	1.5±0.5	6±1	69.5±12.5
North 9/10 Oct	26±5	8±2	11±0	27±4	4±1	0.5±0.5	76.5±6.5
South 9/10 Oct	30±5.5	7±2	7.5±4.5	28.5±1.5	0.5±0.5	2.5±1.5	76.5±10.5
Mean North	**16.7±3.9**	**7.7±0.8**	**6.2±1.9**	**27.0±3.6**	**5.3±0.8**	**2.0±0.8**	**64.8±4.3**
Mean South	**19.3±4.3**	**7.2±1.2**	**5.8±1.5**	**28.0±2.5**	**1.2±0.3**	**3.7±0.9**	**65.2±6.7**
1999							
North 14/15 Oct [3]	21.5±6.5	10±2	8±2	14.5±1.5	4±0	2.5±0.5	60.5±4.5
South14/15 Oct [3]	13.5±1.5	3±1	2.5±1.5	12.5±1.5	2±0	1±1	34.5±2.5
2000							
North 10/11 Oct	16±4	8.5±1.5	8.5±5.5	15.5±1.5	6±0	0	54.5±2.5
South10/11 Oct	15±5	6±2	3±0	23.5±5.5	3±3	2±2	52.5±3.5
North 12/14 Oct	21.5±3.5	11.5±6.5	10±0	21±4	4±2	5.5±5.5	73.5±17.5
South12/14 Oct	23.5±6.5	9.5±4.5	2±0	27.5±2.5	2.5±1.5	4.5±3.5	69.5±13.5
North 15/16 Oct	30±5	14±1	9±5	14.5±6.5	2±2	7±5	76.5±24.5
South15/16 Oct	21±4	10.5±0.5	3.5±0.5	21±2	1.5±0.5	6±6	63.5±11.5
Mean North	**22.5±3.2**	**11.3±2.0**	**9.2±1.9**	**17.0±2.4**	**4.0±1.0**	**4.2±2.3**	**68.2±8.9**
Mean South	**19.8±2.8**	**8.7±1.5**	**2.8±0.3**	**24.0±2.0**	**2.3±0.9**	**4.2±2.0**	**61.8±5.6**
2001							
North 16/17 Oct	13±1	8±2	4.5±2.5	24.5±2.5	0	2±0	52±8
South16/17 Oct	14.5±0.5	9.5±3.5	8±0	27±5	3±2	2±1	64±8
North 19/20 Oct	11±5	8.5±0.5	5±1	7.5±1.5	2.5±0.5	1.5±1.5	36±6
South19/20 Oct	11.5±3.5	7.5±1.5	3±0	19.5±2.5	2±1	5±3	48.5±4.5
North 22/23 Oct	9±0	9.5±4.5	7±4	20±5	2.5±0.5	1.5±0.5	58.5±0.5
South22/23 Oct	17±1	9±5	7.5±0.5	32.5±5.5	1±1	0.5±0.5	67.5±2.5
Mean North	**11.0±1.5**	**8.7±0.6**	**5.5±1.3**	**20.3±4.4**	**1.6±0.6**	**1.7±0.4**	**48.8±5.0**
Mean South	**14.3±1.4**	**8.7±1.7**	**6.2±1.0**	**26.3±3.1**	**2.0±0.7**	**2.5±1.2**	**60.0±4.4**
2002							
North 23/24 Oct	15.5±7.5	12±0	11.5±6.5	22.5±4.5	3±2	1±0	65.5±7.5
South23/24 Oct	18.5±5.5	3.5±0.5	2±1	17±0	3±1	0.5±0.5	44.5±2.5
North 26/27 Oct	14.5±0.5	4.5±1.5	7.5±3.5	19±0	0	1.5±0.5	47±6
South26/27 Oct	16±4	6±1	3.5±1.5	23.5±4.5	6±2	2.5±0.5	57.5±5.5
North 29/30 Oct	13.5±3.5	7±0	9.5±4.5	33.5±0.5	1.5±0.5	1.5±0.5	66.5±0.5
South29/30 Oct	11±5	5.5±1.5	6±4	22.5±2.5	2.5±0.5	1.5±1.5	52±1
Mean North	**14.5±2.2**	**7.8±1.4**	**0.5±2.3**	**25.0±3.0**	**1.5±0.8**	**1.3±0.2**	**59.7±4.7**
Mean South	**15.2±2.6**	**5.0±0.7**	**3.8±1.4**	**22.0±2.1**	**3.8±0.9**	**1.5±0.6**	**51.3±2.9**

Notes: 1. Figures are mean ± standard error. 2. Rock-wallaby data excluded as species seen only on North transect. 3. Only one completed pair of transects in 1999 due to equipment failure on one night and failure of company to provide suitable vehicle on one night.

Table 6. Barrow Island Nature Reserve, spotlighting data 1998-2002

Spectacled Hare-wallaby

	ESW	D	D LCL	D UCL	D CV	Diff?	?>?
North 1998	11.5	0.656	0.540	0.797	0.099	} *	N>S
South 1998	30.9	0.193	0.170	0.219	0.063		
North 2000	10.0	0.682	0.563	0.825	0.097	} NS	
South 2000	12.6	0.519	0.439	0.612	0.084		
North 2001	14.7	0.457	0.383	0.545	0.090	} *	N>S
South 2001	28.5	0.234	0.201	0.272	0.077		
North 2002	30.5	0.220	0.167	0.289	0.139	} NS	
South 2002	35.0	0.203	0.165	0.249	0.105		

Golden Bandicoot

	ESW	D	D LCL	D UCL	D CV	Diff?	?>?
North 1998	6.7	0.917	0.756	1.112	0.098	} NS	
South 1998	7.4	0.963	0.709	1.052	0.100		
North 2000	4.8	1.339	1.179	1.521	0.065	} *	N>S
South 2000	6.7	0.896	0.712	1.127	0.117		
North 2001	10.1	0.573	0.482	0.681	0.087	} NS	
South 2001	13.6	0.434	0.292	0.646	0.202		
North 2002	15.5	0.396	0.333	0.472	0.089	} NS	
South 2002	12.6	0.462	0.345	0.618	0.148		

Brushtail Possum

	ESW	D	D LCL	D UCL	D CV	Diff?	?>?
North 1998	12.5	0.429	0.302	0.611	0.177	} NS	
South 1998	21.3	0.266	0.185	0.383	0.183		
North 2000	7.6	0.718	0.598	0.863	0.093	} *	N>S
South 2000	11.7	0.437	0.359	0.532	0.099		
North 2001	17.4	0.332	0.251	0.440	0.141	} NS	
South 2001	14.2	0.366	0.235	0.568	0.223		
North 2002	16.5	0.348	0.259	0.468	0.149	} *	N>S
South 2002	41.4	0.117	0.090	0.152	0.130		

Boodie

	ESW	D	D LCL	D UCL	D CV	Diff?	?>?
North 1998	7.9	0.734	0.571	0.943	0.126	} NS	
South 1998	8.1	0.740	0.391	1.402	0.323		
North 2000	6.3	0.964	0.743	1.250	0.131	} *	N>S
South 2000	17.3	0.288	0.227	0.366	0.117		
North 2001	8.5	0.643	0.454	0.911	0.174	} NS	
South 2001	11.0	0.493	0.355	0.686	0.166		
North 2002	9.6	0.662	0.552	0.794	0.092	} *	N>S
South 2002	25.3	0.216	0.147	0.318	0.192		

Key:

ESW Effective Strip Width or Effective Detection Radius
D Density of individuals (animals/ha – note data are total of 6 transects)
D LCL Density of individuals (lower analytical confidence limit)
D UCL Density of individuals (upper analytical confidence limit)
D CV Density of individuals analytical coefficient of variance
* Significant difference between North and South transects, $p<0.05$

Table 7. Barrow Island spotlighting 1998 – 2002: outputs from DISTANCE 3.5

Species	North transect	South transect
Spectacled Hare-wallaby	16.6	26.8
Golden Bandicoot	9.3	10.1
Brushtail Possum	13.5	22.2
Boodie	8.1	15.4

Table 8. Mean Effective Strip Widths 1998, 2000, 2001, 2002. (Distance in metres)

Date	16th	17th	19th	20th	22nd	23rd
North	22	27	9	6	34	24
South	32	22	17	22	27	38

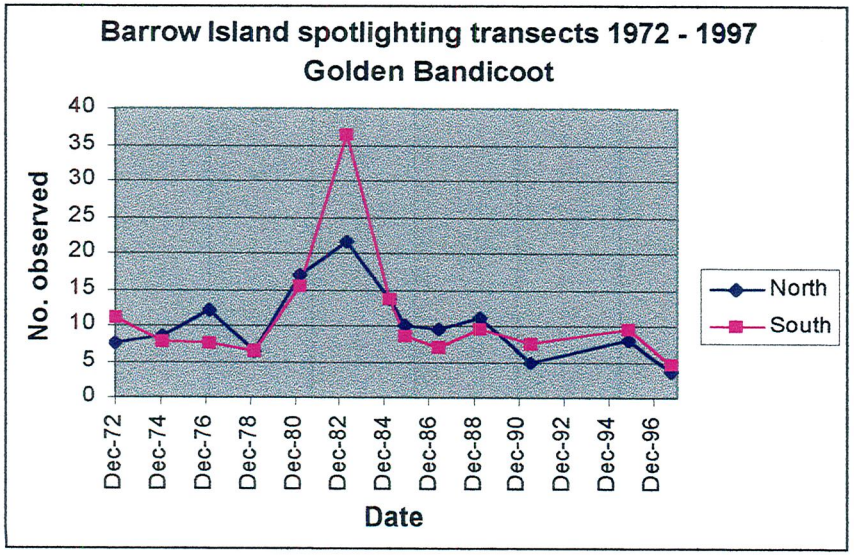
Table 9. Number of hare-wallabies observed in October 2001

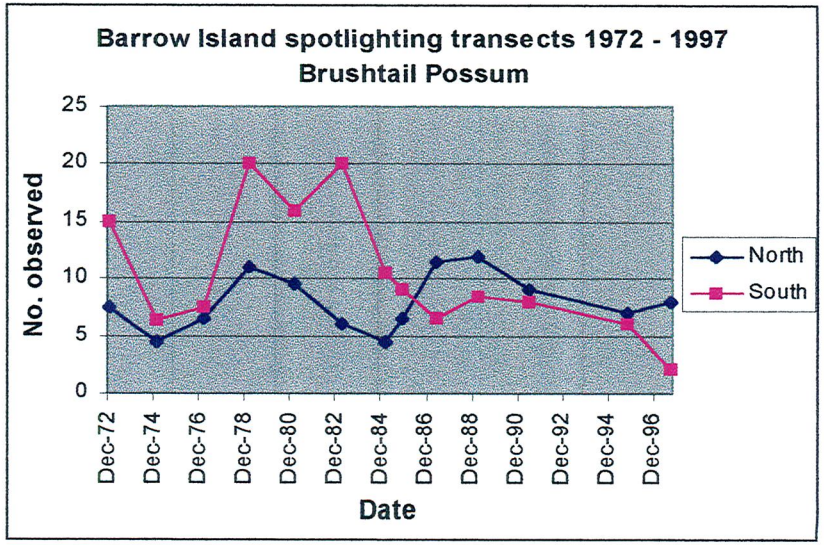
	ESW	D	D LCL	D HCL	D CV
All North	11.8	2.097	1.949	2.257	0.037
All South	15.1	1.701	1.579	1.833	0.038

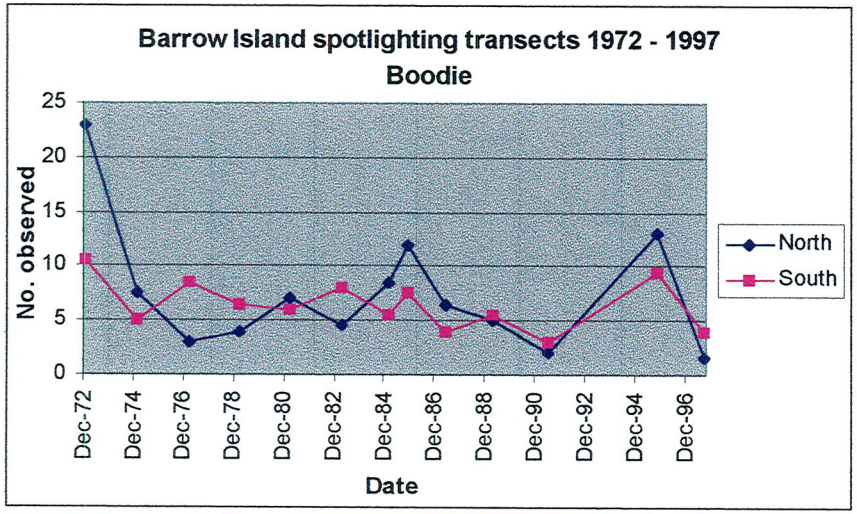
Table 10. DISTANCE outputs for all mammals for 1998 and 2000-2002. (Abbreviations as in Table 6.)

Date	Transect km	Perpendicular distance
19/10/2001	1.8	0
	5.2	6
	6.8	20
	11.2	6
21/10/2001	5.4	10
25/10/2002	1.1	12
	1.5	40
	6.8	80
	6.8	80
28/10/2002	0.8	50
	1.2	60
	3.6	10
	9.1	10

Table 11. Black-flanked Rock-wallaby spotlight records, 2001 and 2002







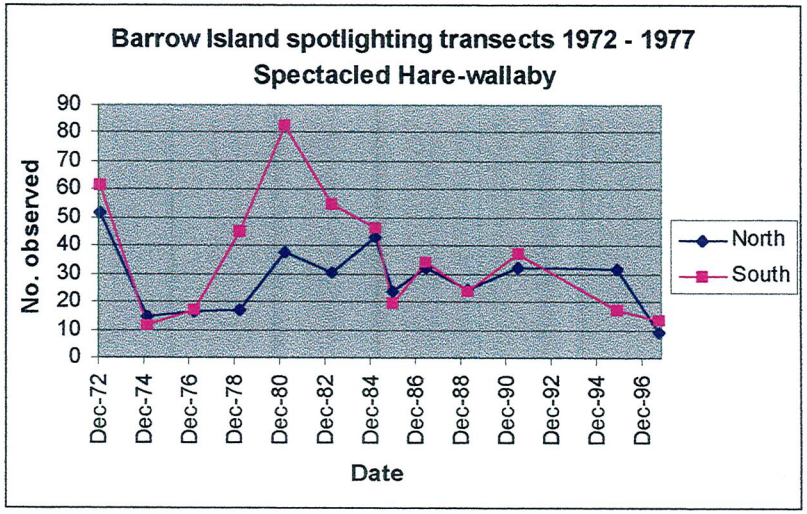
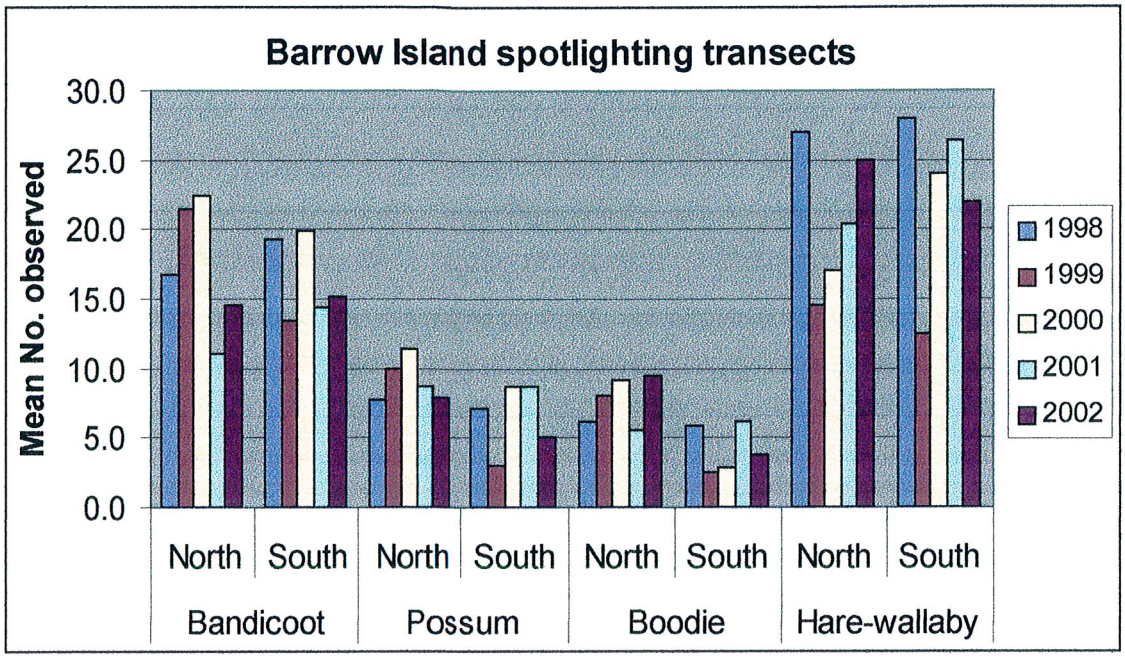
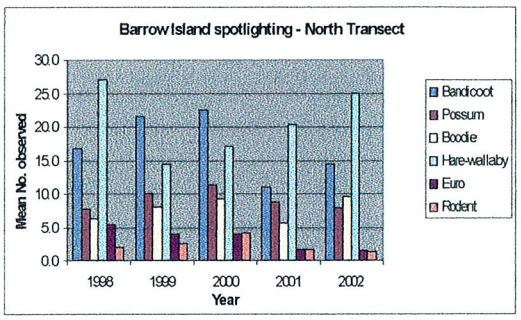
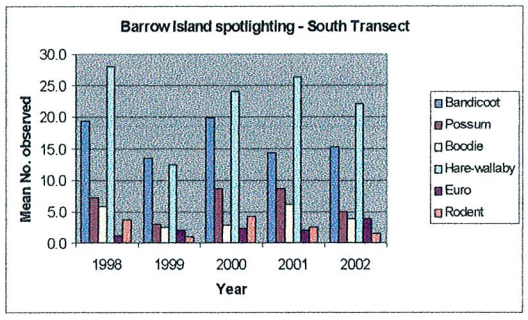
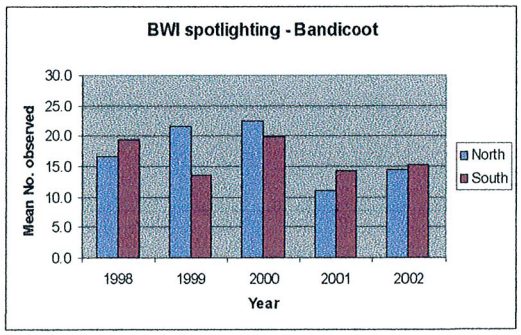


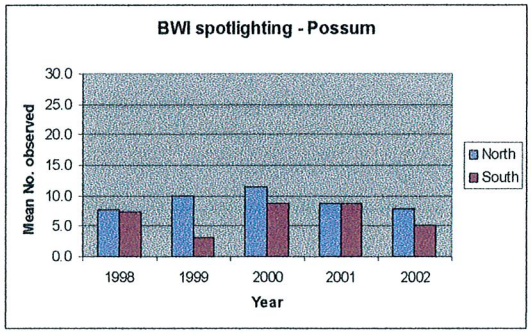
Figure 14. Barrow Island spotlighting transects 1972 – 1997. Data for commonly observed species

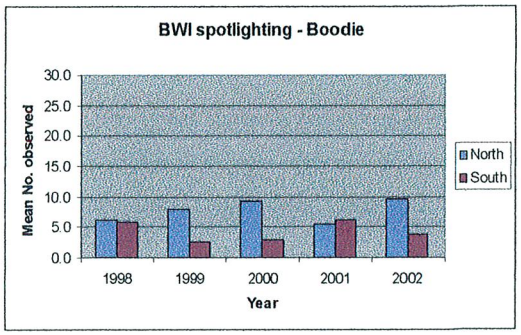












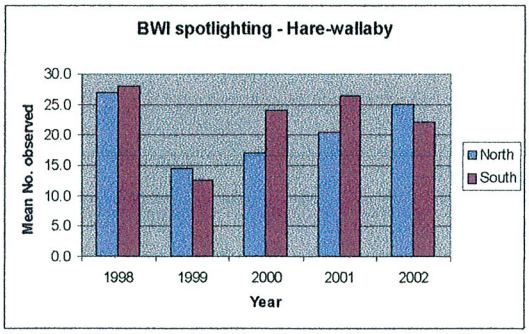


Figure 15. Barrow Island spotlighting transects 1998-2002. Data for commonly observed species.

5. MAMMAL CASUALTIES

ChevronTexaco have in place procedures for dealing with the death or injury of mammals on Barrow Island and these are included in the workforce induction process. The death or injury of any animal is supposed to be reported to the line manager, via a HazOb form, who in turn reports it to the Environmental Coordinator.

In 2000, 83 animals were reported killed, and in 2001, 44 casualties were reported. The majority of these were mammals. In 2002, nine animal deaths were reported via the Chevron Texaco reporting system. Five of these were mammals (one Bandicoot, two Euros, and two Hare-wallabies). The other deaths were two snakes, one perentie and one bird. Six of all deaths were related to road kills and three to Lufkin pump related incidents. These figures suggest a significant reduction in the numbers of animals killed on the roads and in Lufkin related incidents. There was no nocturnal drilling activity on the island and night time traffic was reduced compared to 2001. However, given that we saw one dead (road kill) bandicoot and one dead hare-wallaby during out 10 day visit may also indicate a reluctance by the work force to report animal deaths. If the Gorgon project proceeds, the potential for a significant increase in road kills needs to be managed appropriately.

It was noted that the Euro mats were still installed on many of the Lufkin pumps to prevent euros resting in the shade of the Lufkin and being killed by the counterweights when the automatic pumps start up with no warning. Lufkin related deaths have reduced from eight in 2001 to three in 2002. However, as in 2001, we again saw evidence that Euros were still able to rest on these and risk being killed when the pump starts up. As recommended in 2001, we believe the cones need to be more numerous, randomly scattered and sharper to prevent the Euros being able to rest their hind feet between the cones.

The swimming pool at Camp is surrounded by a fence; however there are no gates on the two entrances. Euros regularly pass through and drink at the pool. In the past, other animals have fallen into the pool and drowned. It is recommended that gates be installed on the entrances to prevent animals having access to the pool area. This recommendation was made in 2001 however no action has been taken.

6. FUTURE WORK

Annual mammal monitoring should be continued to at least 2004, as this will provide five complete years of baseline data for subsequent comparisons. This will allow better information to be gained on abundance, longevity and movement between grids. This data should then be analysed in greater detail and published. The mammal monitoring program may have to be modified / upgraded if the Gorgon proposal proceeds. The next visit should occur in mid-October 2003.

The South End of Barrow Island has not been trapped since 1991 and this area should be checked for Black Rats with both Elliott and cage trapping in 2003.

Improved monitoring of rock-wallabies will continue and become a regular undertaking of the mammal monitoring visits.

ACKNOWLEDGMENTS

ChevronTexaco arranged our visit and paid all travel, freight, vehicle and accommodation costs. We received assistance from many ChevronTexaco and contract staff. We would like to thank Stephan Fritz, Luke Ulstrup and Les McClements for arranging logistics for the visit. We also thank those who filled the positions of vehicle drivers during spotlighting transects: Stephan Fritz, Troy Crawford, Luke Usltrup, Charlie Ferraloro, Dave Keogh, Mike MacArthur, Lionel Murphy, Les McClements and Steve Dorrington. Luke Ulstrup arranged the dingy for the visit to the Double and Boomerang Islands.

REFERENCES

Blacket, M.J., Adams, M., Krajewski, C., and Westerman, M. (2000). Genetic variation within the dasyurid marsupial genus *Planigale*. *Australian Journal of Zoology* 48: 443-460.

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L. and Thomas, L. (2001). *Introduction to distance sampling. Estimating abundance of biological populations.* Oxford University Press, Oxford.

Burbidge, A.A., Morris, K.D., and Boggs, W. (1998). Mammal monitoring Barrow Island Nature Reserve, November 1998. Unpublished Report, Department of Conservation and Land Management, Perth.

Burbidge, A.A., Morris, K. and Drew, M. (2000). Mammal monitoring, Barrow Island Nature Reserve, October 2000. Unpublished Report, Department of Conservation and Land Management, Perth.

Burbidge, A.A. and Morris, K.D. (2002). Introduced mammal eradications for nature conservation on Western Australian islands: a review. In Pp 64-70: In Veitch, C.R. and Clout, M.N (eds) *Turning the tide: the eradication of invasive species.* IUCN SSC Invasive Species Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

CALM (1999). Barrow Island Nature Reserve Interim Management Guidelines. Department of Conservation and Land Management, Perth.

Hall, G. Onus, M, and Kinnear, J. (1993). A survey of Barrow Island for the black-flanked rock-wallaby (*Petrogale lateralis lateralis*). Unpublished Report, Department of Conservation and Land Management, Perth.

Morris, K.D. (2002) The eradication of the black rat (*Rattus rattus*) on Barrow and adjacent islands off the north-west coast of Western Australia. Pp 219-225: In Veitch, C.R. and Clout, M.N (eds) *Turning the tide: the eradication of invasive species.* IUCN SSC Invasive Species Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Morris, K. D., Burbidge, A. A. and Stanley, F. (1999). Mammal monitoring Barrow Island Nature Reserve, October 1999. Unpublished Report, Department of Conservation and Land Management, Perth.

Morris, K. D., Burbidge, Drew, M and Kregor, G. (2001). Mammal monitoring - Barrow Island Nature Reserve, October 2001. Unpublished Report, Department of Conservation and Land Management, Perth.

Pope, L., Storch, D., Adams, M., Moritz, C. and Gordon, G. (2001). A phylogeny for the genus *Isoodon* and a range extension for *I. obesulus peninsulae* based on mtDNA control region and morphology. *Australian Journal of Zoology* **49**: 411-434.

Whitlock, F.L. (1918). Notes on North-western birds. *Emu* 17: 166-179.

Figures 1 – 15

Appendices 1 and 2

Figure 1. Mammal trap success rates on the Bandicoot Bay grid, Barrow Island

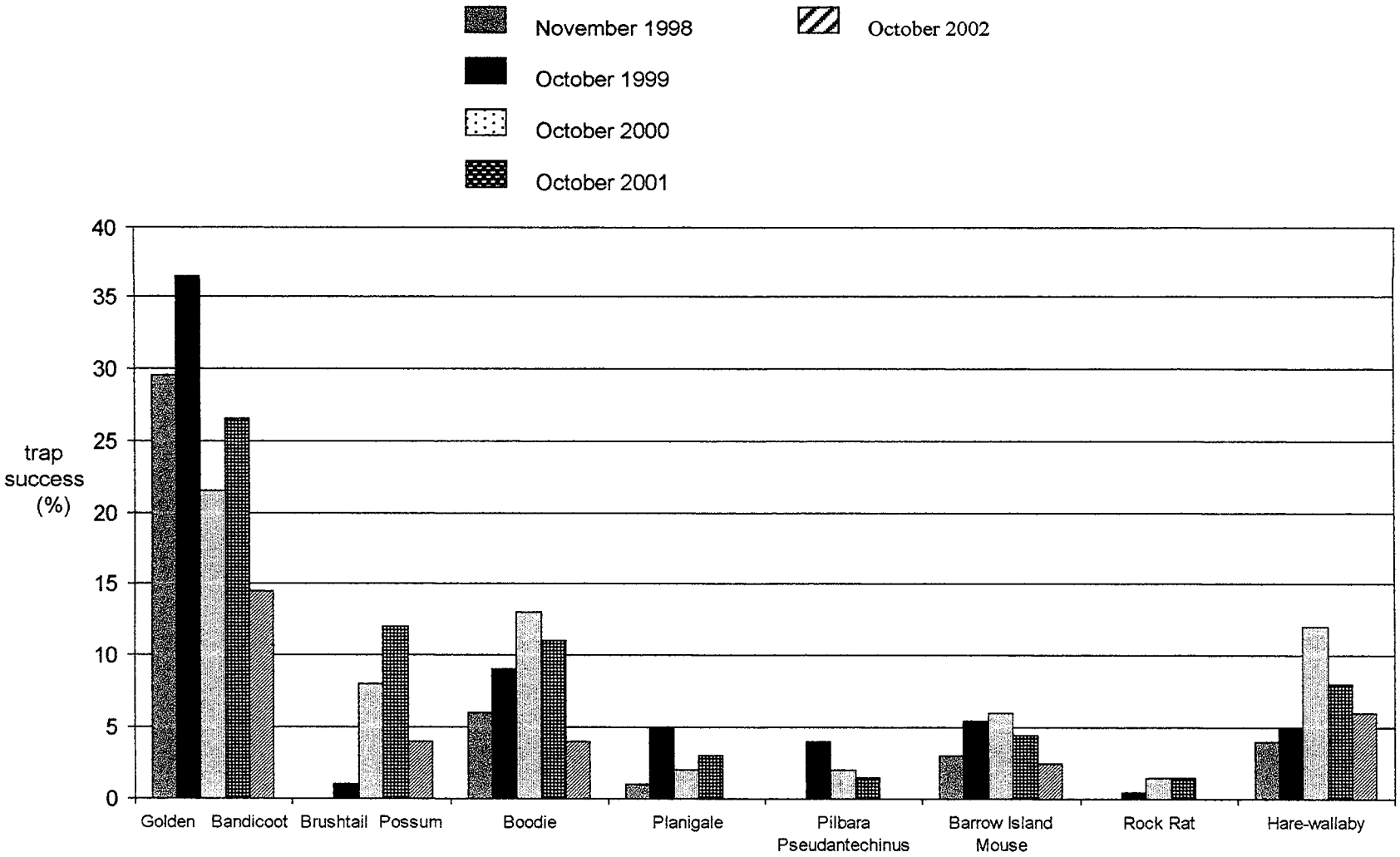


Figure 2. Mammal trap success rates on the John Wayne grid, Barrow Island

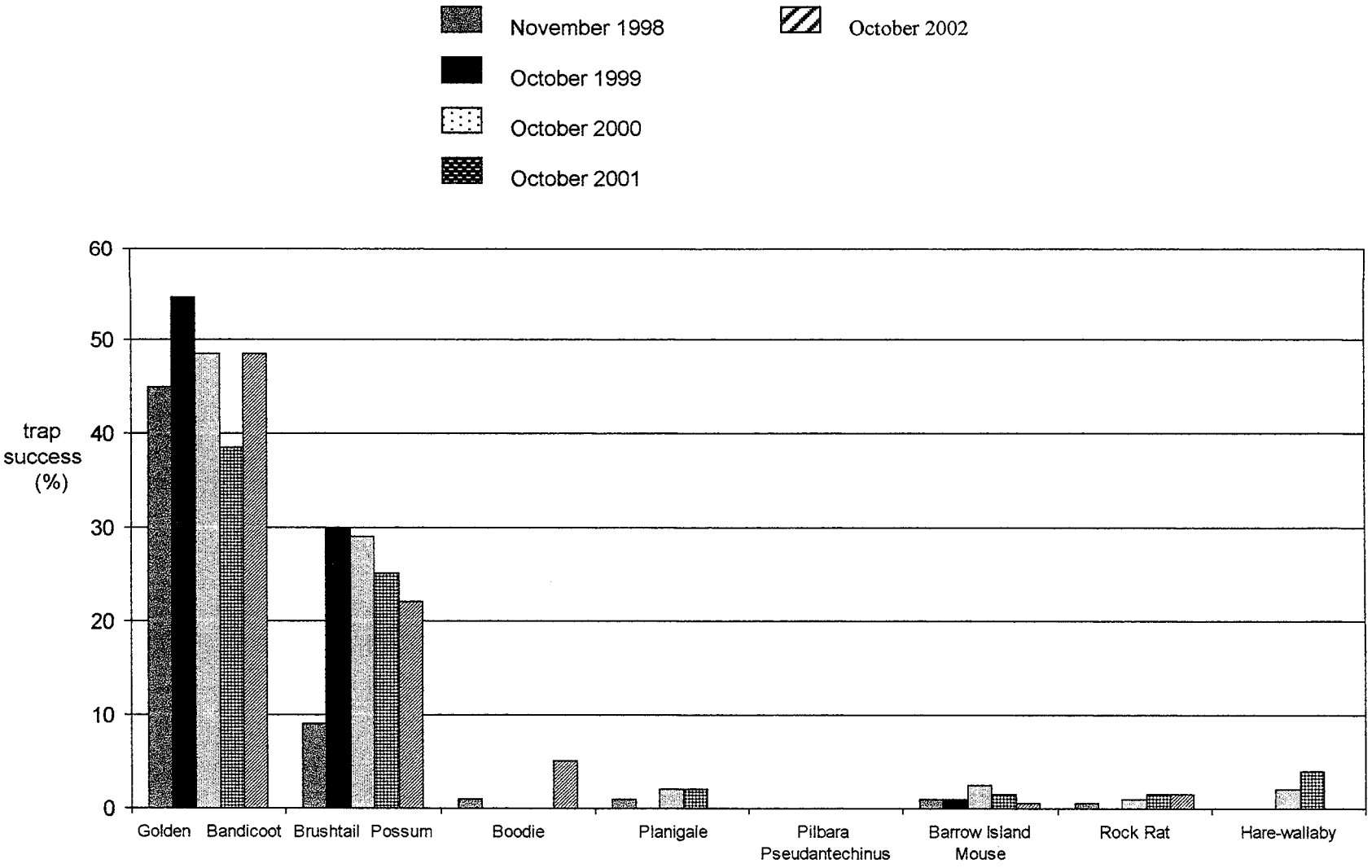


Figure 3. Mammal trap success rates on the Landing grid, Barrow Island

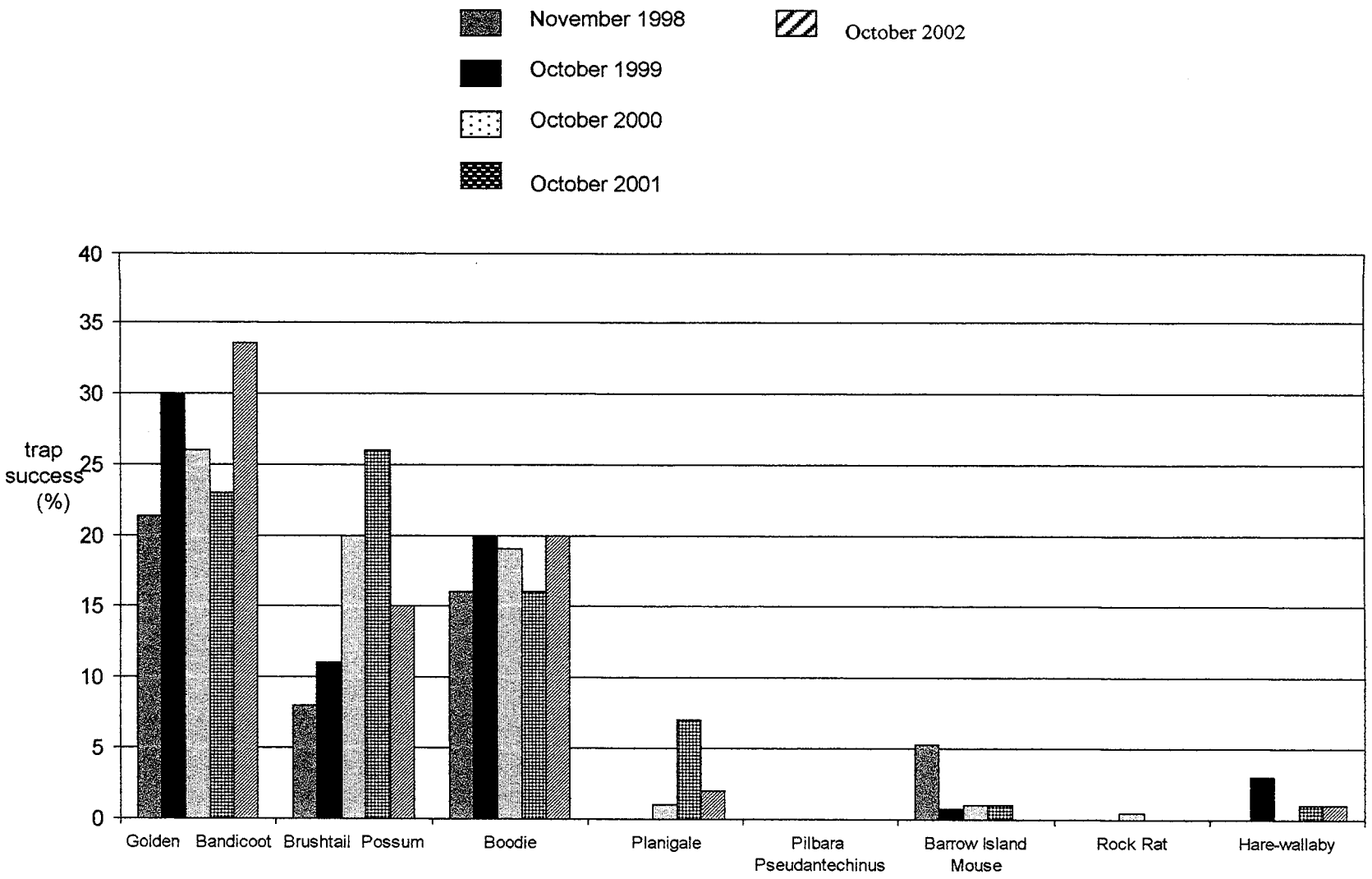


Figure 4. Mammal trap success rates on the M21 grid, Barrow Island

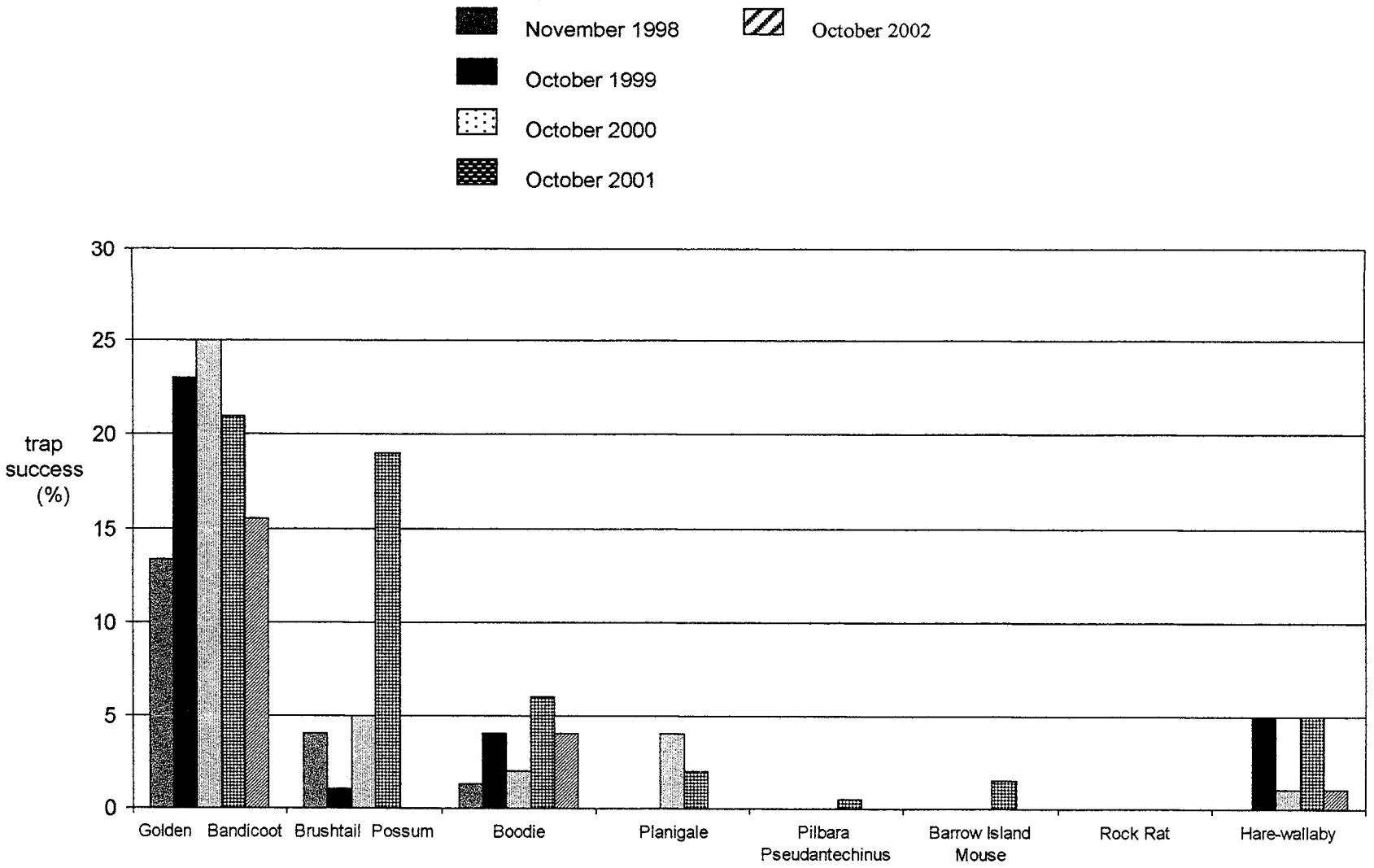


Figure 5. Mammal trap success rates on the S62 grid, Barrow Island.

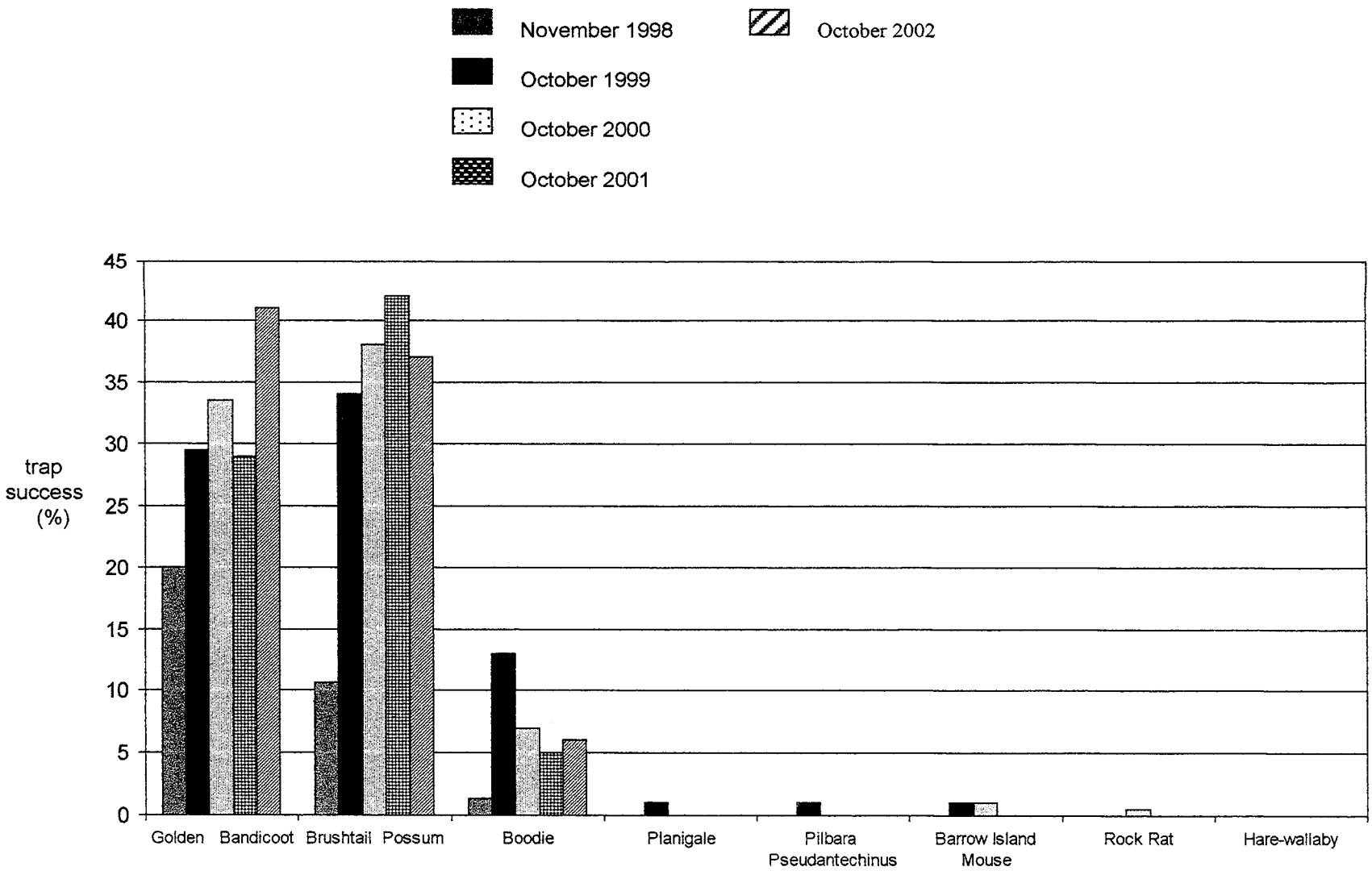


Figure 6. Grid trap success rates for the Golden Bandicoot on Barrow Island

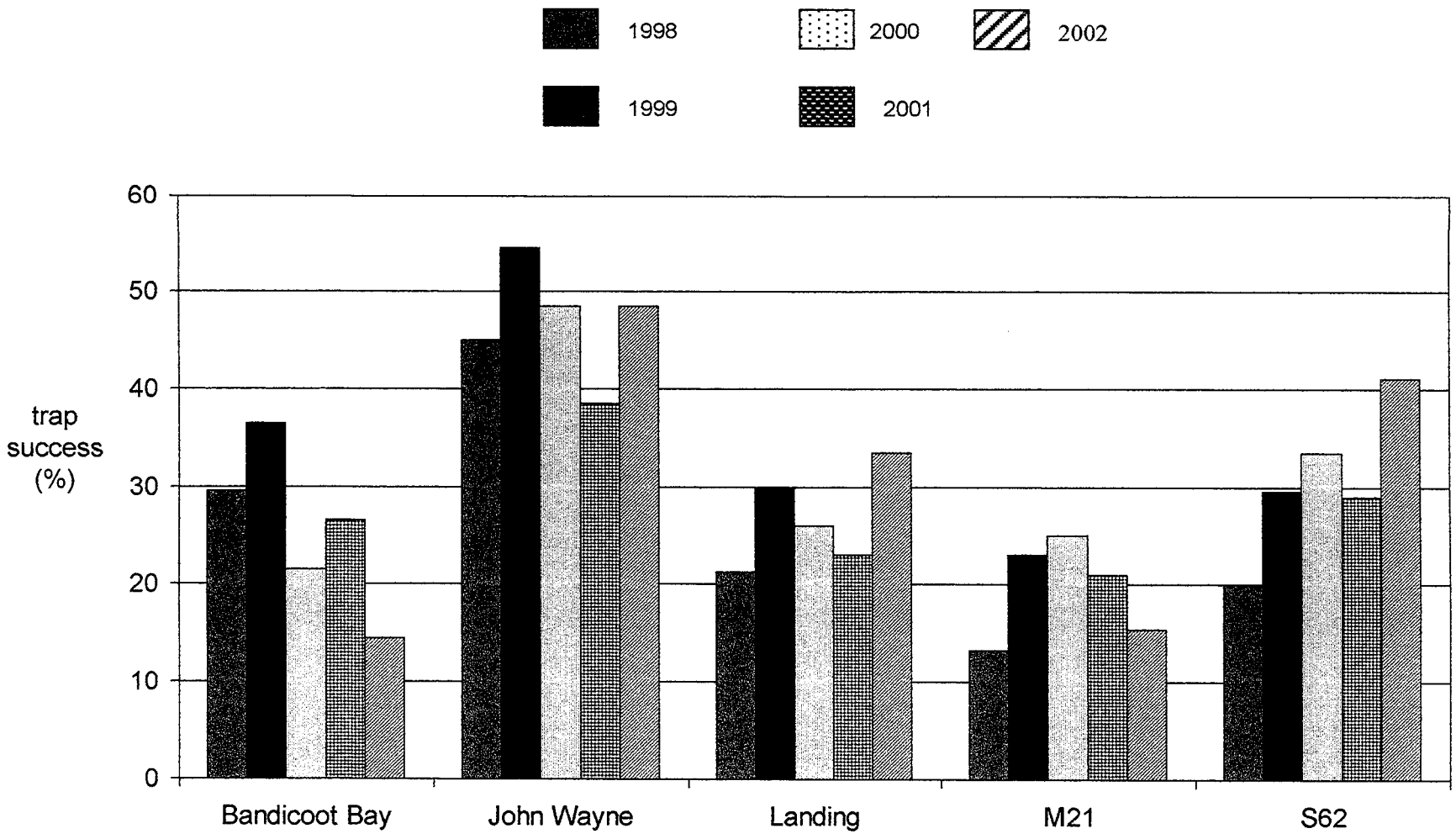


Figure 7. Grid trap success rates for the Brushtail Possum on Barrow Island

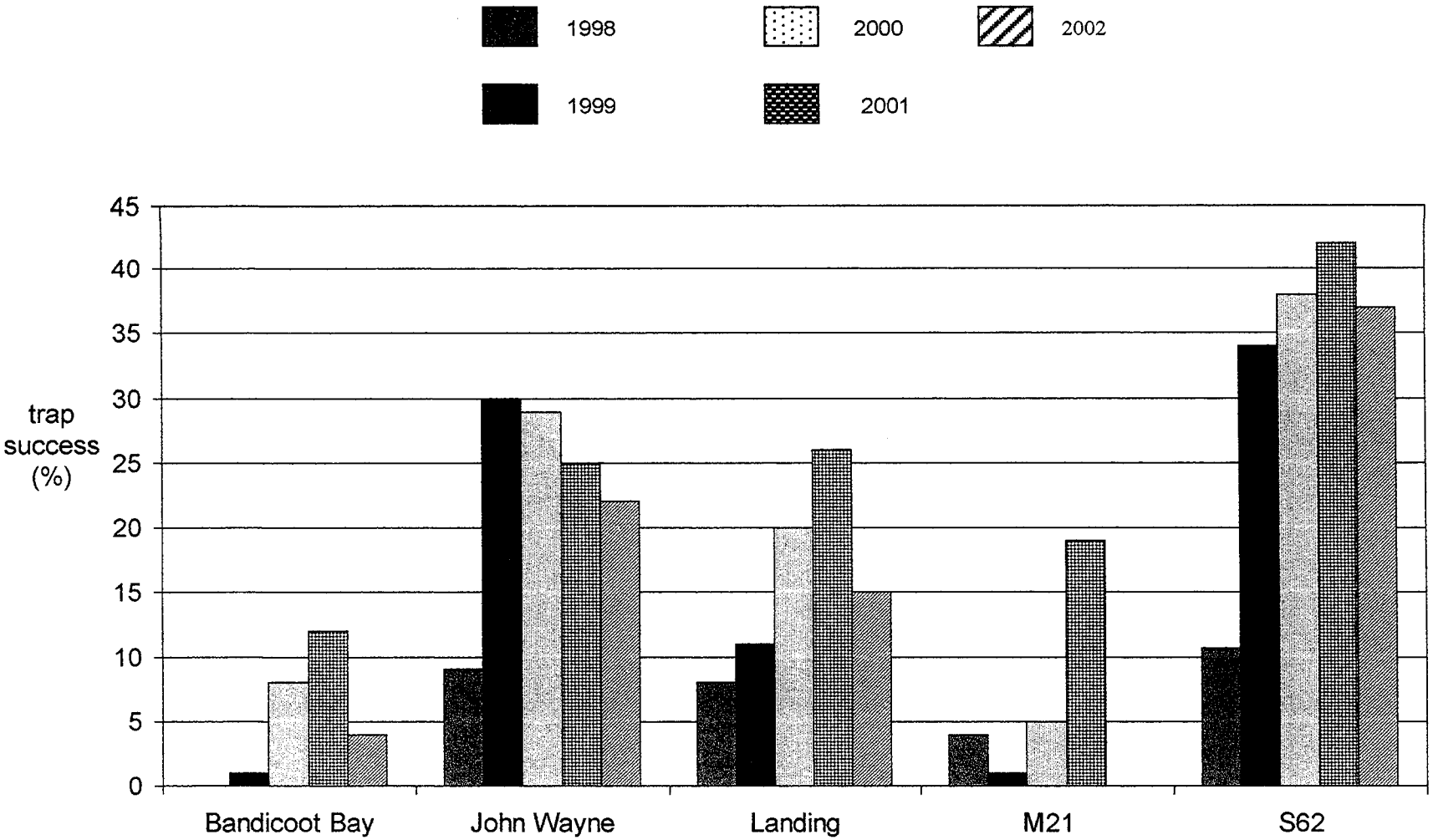


Figure 8. Grid trap success rates for the Boodie on Barrow Island

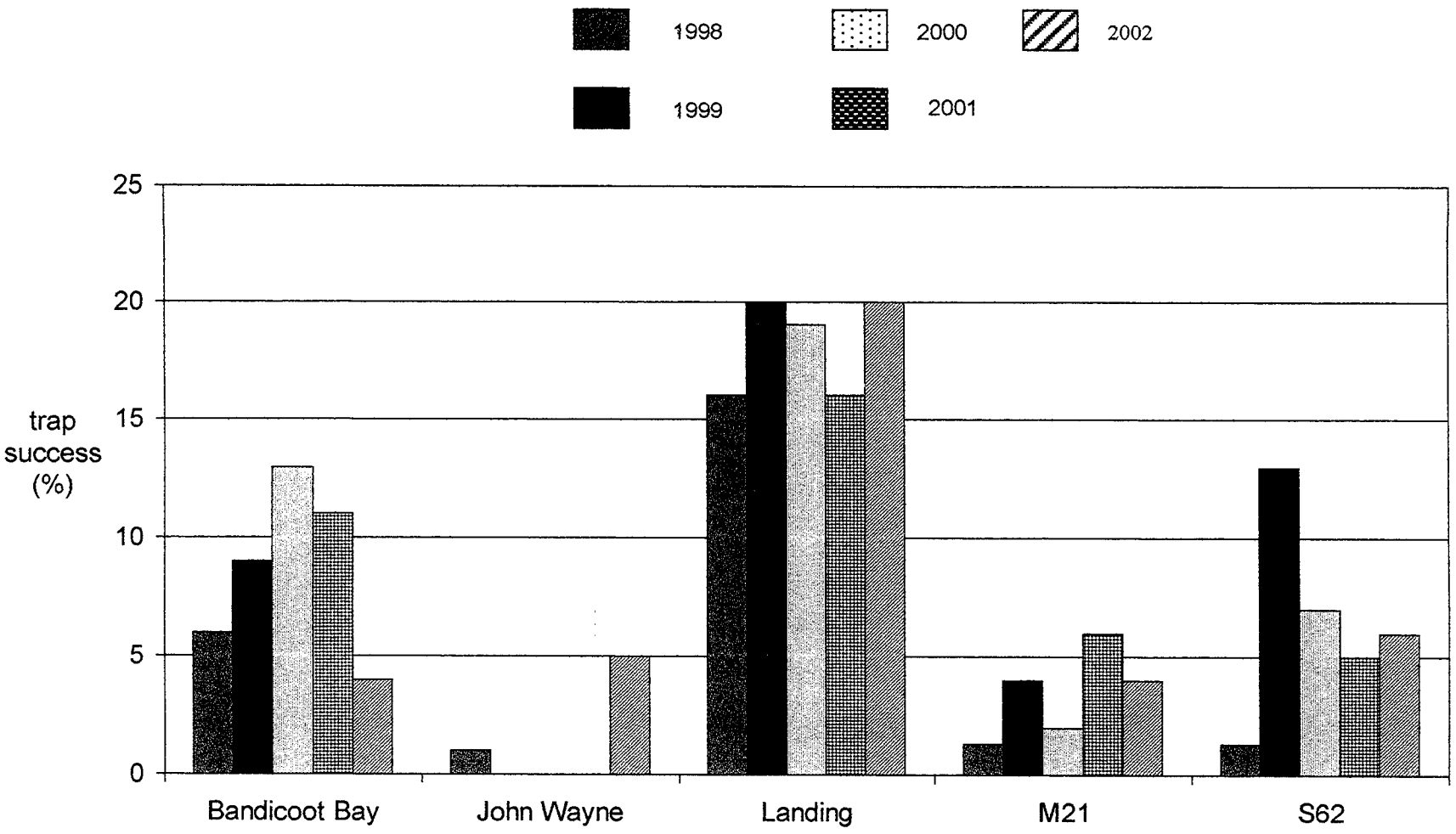


Figure 9. Grid trap success rates for the Planigale on Barrow Island

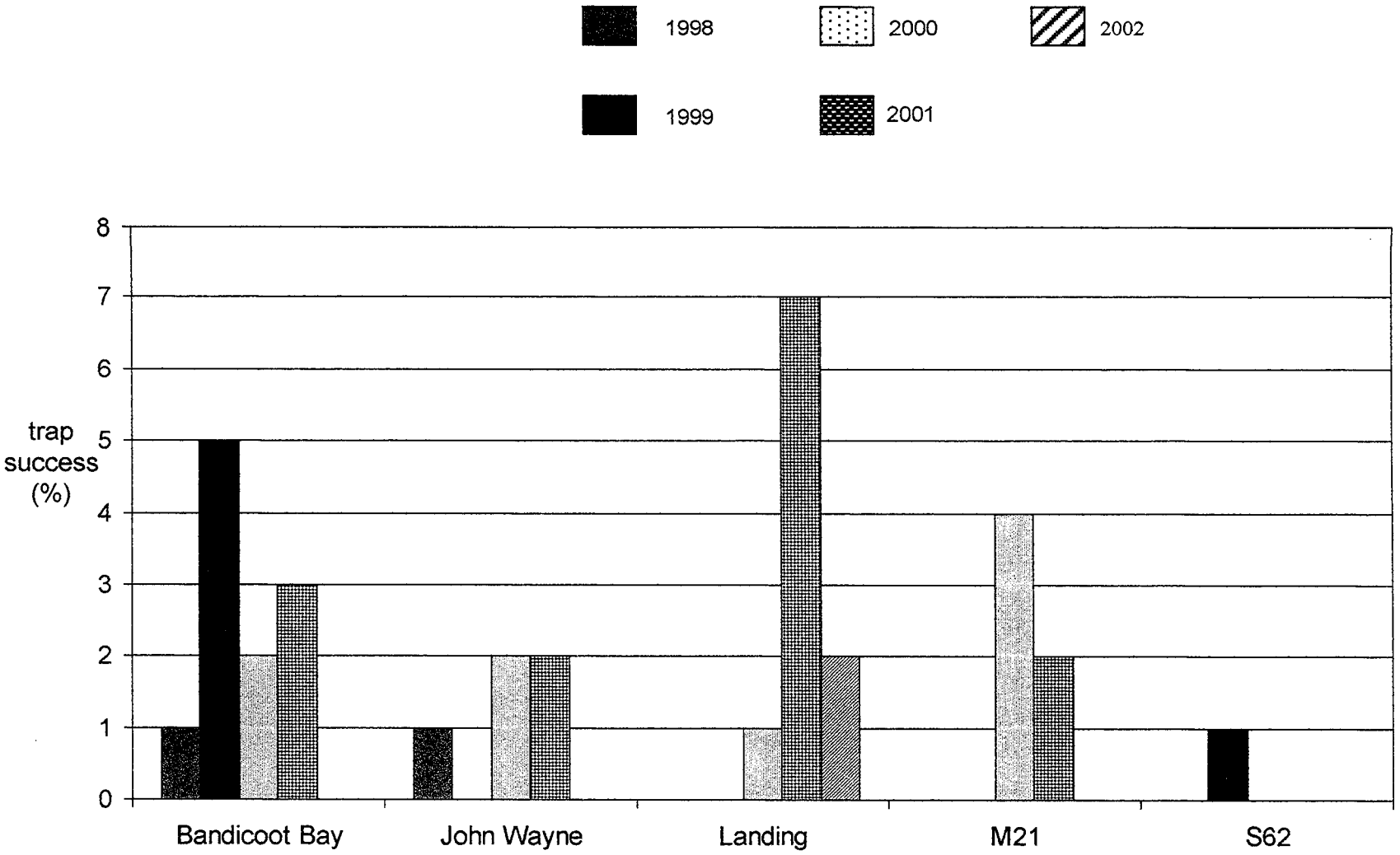


Figure 10. Grid trap success rates for the Tan Pseudantechinus on Barrow Island

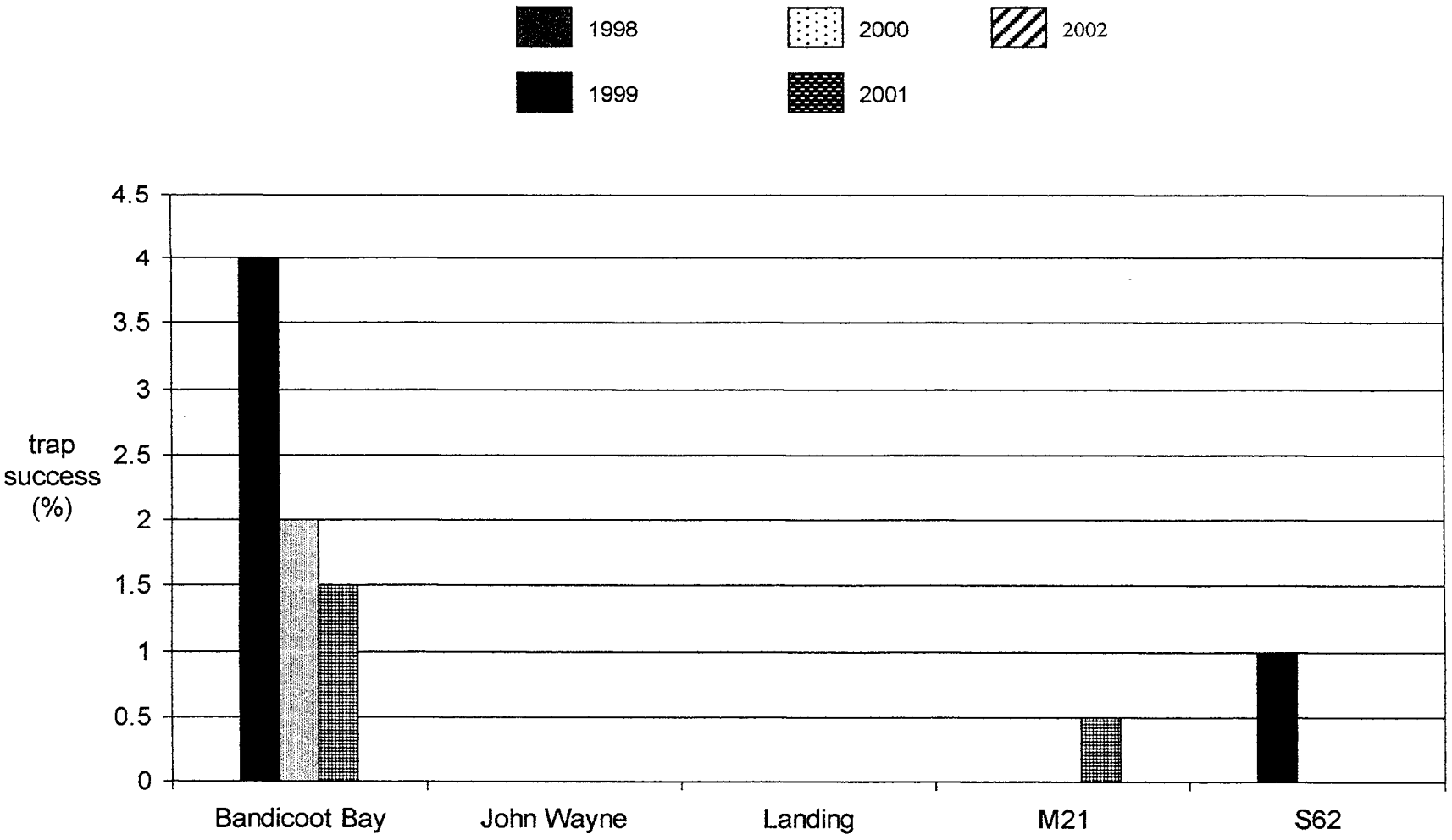


Figure 11. Grid trap success rates for the Barrow Island Mouse on Barrow Island

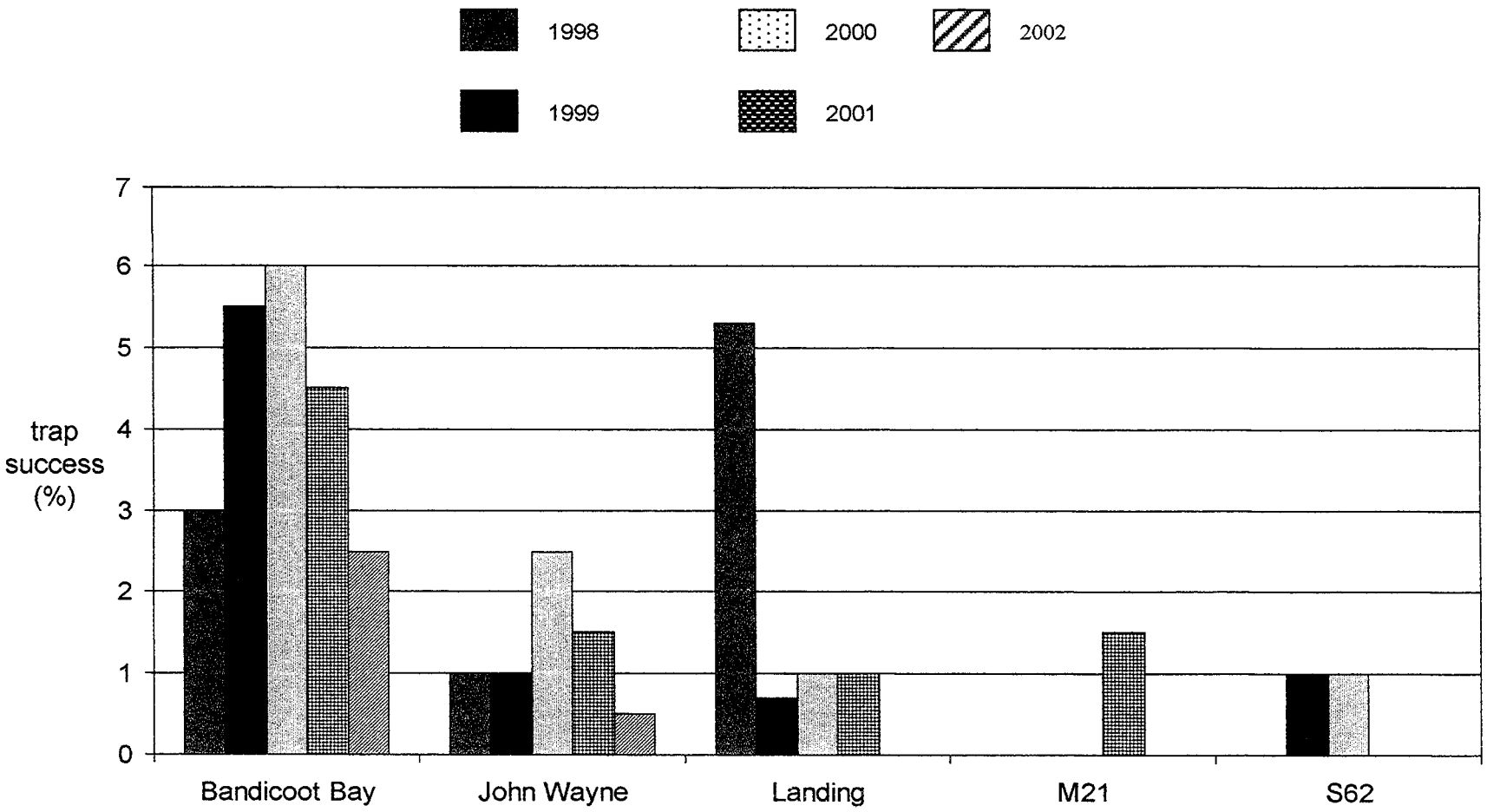


Figure 12. Grid trap success rates for the Rock Rat on Barrow Island

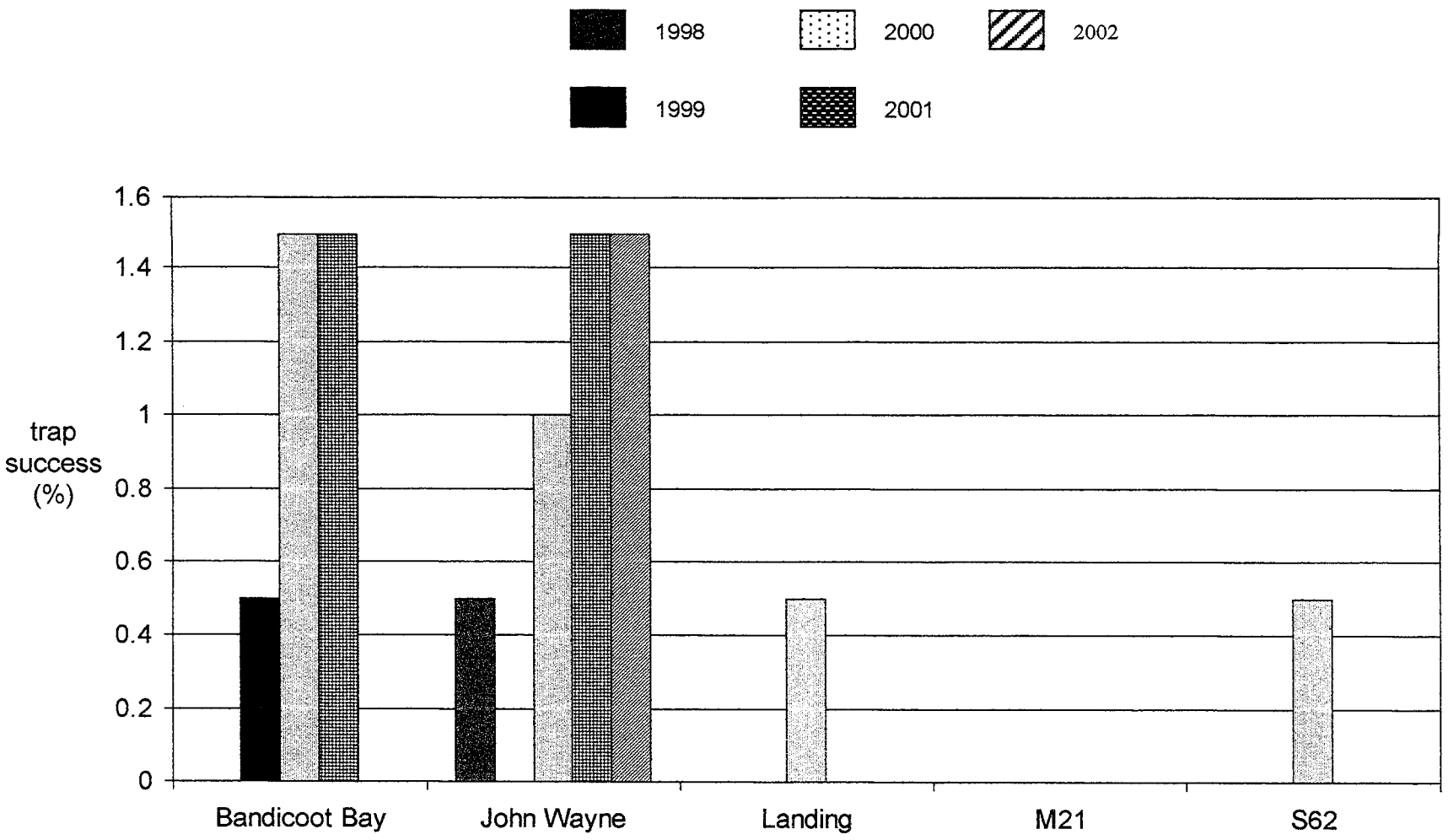
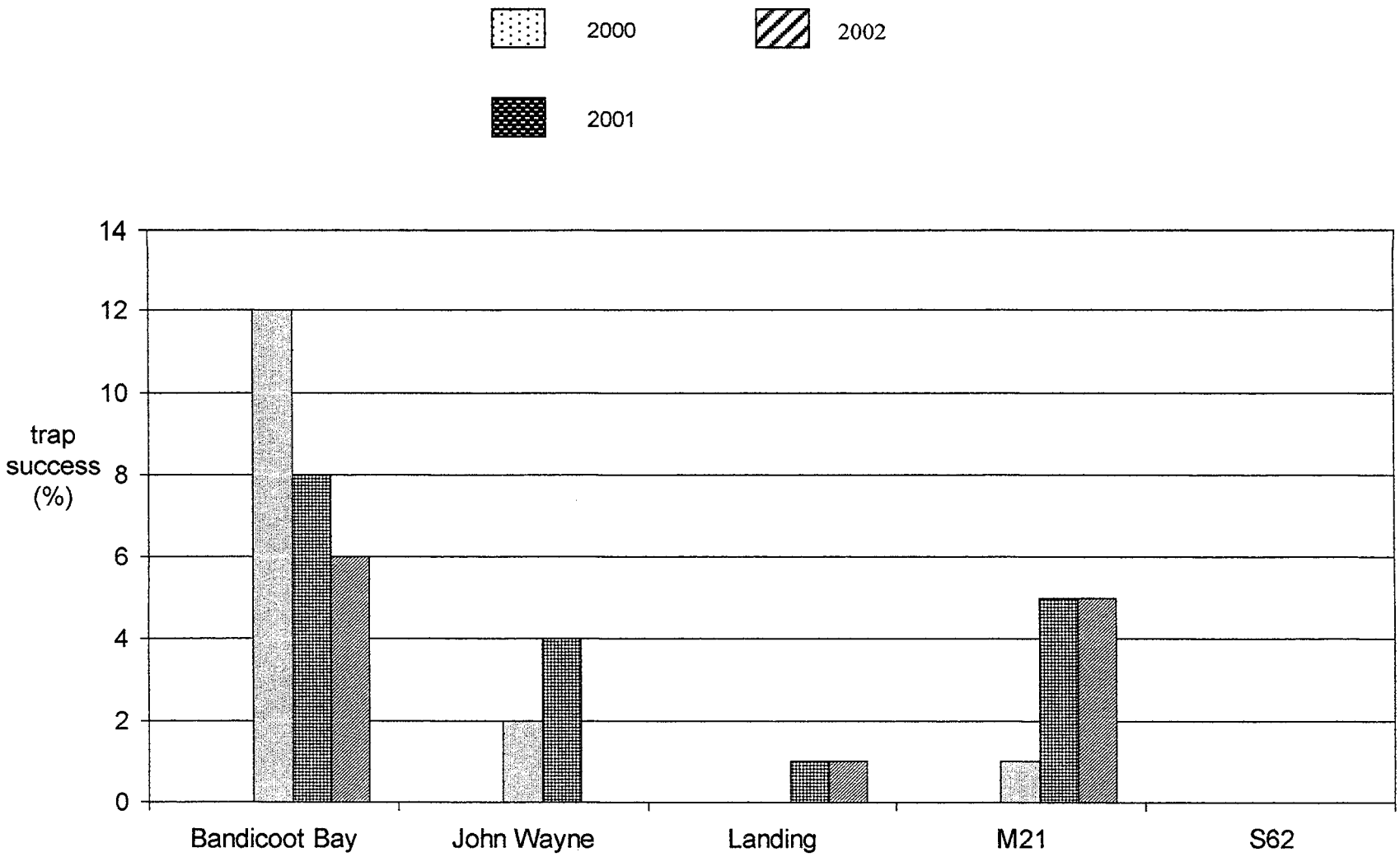


Figure 13. Grid trap success rates for the Spectacled Hare-wallaby on Barrow Island (not reported in 1998 and 1999)



APPENDIX 1

BARROW ISLAND GRID TRAPPING SUMMARY

OCTOBER 2002

JOHN WAYNE GRID

	G Bandicoot (200 trapnights)			BT Possum (100 trapnights)			Boodie (100 trapnights)			Hare-wallaby (100 trapnights)			Planigale (100 trapnights)			Pseudantech (200 trapnights)			BI Mouse (200 trapnights)			Rock Rat (200 trapnights)		
	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt
Total captures	28	26	43	3	8	11	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0
Total individuals	**54**			**11**			**4**			**0**			**0**			**0**			**1**			**3**		
% trap success	**48.5**			**22.0**			**4.0**			**0.0**			**0.0**			**0.0**			**0.5**			**1.5**		

BANDICOOT BAY GRID

	G Bandicoot (200 trapnights)			BT Possum (100 trapnights)			Boodie (100 trapnights)			Hare-wallaby (100 trapnights)			Planigale (100 trapnights)			Pseudantech (200 trapnights)			BI Mouse (200 trapnights)			Rock Rat (200 trapnights)		
	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt
Total captures	9	3	17	2	0	2	2	2	0	1	2	3	0	0	0	0	0	0	4	0	1	0	0	0
Total individuals	**12**			**2**			**4**			**3**			**0**			**0**			**4**			**0**		
% trap success	**14.5**			**4.0**			**4.0**			**6.0**			**0.0**			**0.0**			**2.5**			**0.0**		

N = new animal capture
R = recapture animal from previous trappings
Rt = retrap animal from this trapping
Total individuals = N + R
% trap success = [(N + R + Rt) / # trapnights] x 100

S 62 GRID

	G Bandicoot (200 trapnights)			BT Possum (100 trapnights)			Boodie (100 trapnights)			Hare-wallaby (100 trapnights)			Planigale (100 trapnights)			Pseudantech (200 trapnights)			Bl Mouse (200 trapnights)			Rock Rat (200 trapnights)		
	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt
Total captures	13	14	55	3	11	23	1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total individuals	**27**			**14**			**4**			**0**			**0**			**0**			**0**			**0**		
% trap success	**41.0**			**37.0**			**6.0**			**0.0**			**0.0**			**0.0**			**0.0**			**0.0**		

M 21 GRID

	G Bandicoot (200 trapnights)			BT Possum (100 trapnights)			Boodie (100 trapnights)			Hare-wallaby (100 trapnights)			Planigale (100 trapnights)			Pseudantech (200 trapnights)			Bl Mouse (200 trapnights)			Rock Rat (200 trapnights)		
	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt	N	R	Rt
Total captures	12	5	14	0	0	0	3	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Total individuals	**17**			**0**			**3**			**4**			**0**			**0**			**0**			**0**		
% trap success	**15.5**			**0.0**			**4.0**			**5.0**			**0.0**			**0.0**			**0.0**			**0.0**		

LANDING GRID

	G Bandicoot (200 trapnights)			BT Possum (100 trapnights)			Boodie (100 trapnights)			Hare-wallaby (100 trapnights)			Planigale (100 trapnights)			Pseudantech (200 trapnights)			Bl Mouse (200 trapnights)			Rock Rat (200 trapnights)		
	N	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**
Total captures	16	12	39	3	5	7	5	4	11	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Total individuals	**28**			**8**			**9**			**1**			**2**			**0**			**0**			**0**		
% trap success	**33.5**			**15.0**			**20.0**			**1.0**			**2.0**			**0.0**			**0.0**			**0.0**		

APPENDIX 2

BARROW ISLAND ROCK - WALLABY TRAPPING SUMMARY

OCTOBER 2002

	Q21 (80 trapnights)			Flacourt Bay (64 trapnights)			YS88 (64 trapnights)			Y23 (72 trapnights)		
	N	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**	**N**	**R**	**Rt**
Total captures	2	0	0	1	0	0	2	0	0	0	0	0
Total individuals	**2**			**1**			**2**			**0**		
% trap success	**2.5**			**1.6**			**3.1**			**0**		

Note: Both the rock-wallabies caught at YS 88 were in Sheffield cage traps, so trapnights above include the number of Bromilow and cage trap nights.