Invasive Pacific Rats (*Rattus exulans*) on Adele Island: Population Monitoring and Uptake Rates of Non-Toxic Bait in April 2013.

Aerial view of Adele Island.

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1 Background

The Department of Parks and Conservation (DPaW) plans to eradicate the invasive Pacific rat (*Rattus exulans*) from Adele Island in October-November 2013. Adele Island is 294 ha in size and situated 85 km northwest of Yampi Peninsula, Western Australia at 15°31'30"S 123°09’30"E. The island is a Class A Nature Reserve for the conservation of flora and fauna. It is regarded as one of three internationally significant seabird breeding islands situated within the Browse Basin (Clarke 2012a & b).

Pacific rats were first recorded on Adele Island in 1891 (Walker 1892). Molecular analysis shows they are from the Lesser Sunda Islands, suggesting traditional Indonesian fishers were responsible for their introduction some time ago. Although not quantified, it is likely that the Pacific rats have a negative impact on the biodiversity values of Adele Island, especially the smaller nesting seabirds. The impact of Pacific rats on island populations of seabirds is well documented elsewhere (Jones *et al.* 2008) and predation by exotic rats on Australian offshore islands of less than 1000 km² (100,000 ha) is listed as a key threatening process under the EPBC Act 1999.

1.1 Summary – rat monitoring Adele Island April 2012

Two nights of trapping were conducted on the eastern side of the island on the 14-15 April. Four grids comprised of 20 traps each (four lines of five traps on a 10 m grid) and one grid of 15 traps were established each night. Lethal (snap) traps baited with peanut butter were used (with approval by the Animal Ethics Committee). The number of rats captured and the number of traps sprung were recorded.

Ninety-seven rats were captured in 190 trap nights on the ten grids (single night of trapping on each). Based on this capture rate, the estimated density was 51 rats/ha. Rats ranged in size from sub-adults (<20 g) to adults (87 g). A high proportion of adult females showing signs of recent mating or were in the early stages of pregnancy, although none were lactating. Roughly 60 rats were vouchered, and tissue samples were taken from 5 individuals.

2 Current trip 20-23 April 2013

In April, DPaW staff, Russell Palmer and Michael Lohr, travelled to Adele Island on the *Diversity 2* charter vessel along with the Monash University seabird and shorebird survey team lead by Rohan Clarke. We arrived at Adele Island on the morning of the 20 April and left on the afternoon of the 23 April. The planned monitoring activities for the trip were modified due to the extreme heat on Adele Island and a marked increase in the predatory behaviour by Silver Gulls on the eggs of seabirds we happened to disturb.

2.1 Objectives

The key objectives of the trip were to:

- Investigate uptake rates of non-toxic Pestoff bait at different application rates over 3 nights;
- Investigate rat abundance using lethal traps in the dominant habitat type (dense beach spinifex, *Spinifex longifolius*); and
- Investigate potential non-target removal of bait by crabs and other invertebrates.

3 Methods

3.1 Bait-uptake plots

The brodifacoum bait to be used during the eradication program will be Pestoff® 20R, manufactured by Animal Control Products in New Zealand. This is a cereal-based pellet bait designed for aerial broadcasting, each pellet is 10 mm in diameter and weighs approximately two grams.

For this trial, we used non-toxic Pestoff block bait as it was easier to apply and monitor in the extremely thick beach spinifex vegetation on Adele Island (Figure 1). Each bait block weighs ~25 g and they have a hole in the centre. Weighed batches of bait blocks were pre-packed for the bait up-take trial. Baits were threaded onto a wire pin flag and fixed to the ground in a grid, measured using a tape measure.

Once in the field, we greatly reduced the planned trial plot sizes and the number of replications. We set out six 25m x 25m plots, each consisting of 36 bait pins on a five metre grid. There were two treatment rates of 23.6 and 35.4 kg per ha, each with three replicates. Plots were inter-dispersed with lethal trap grids, with intervals of 50 m or greater between sites. All plots were established on the first day and then remaining bait was collected after three nights, bagged and weighed on return from the field. A buffer of 2.5 m around the outside of each plot was added when calculating the area treated.

3.1.1 Lethal trap grids – density estimates

Eight grids of 20 lethal traps (rat snap traps) and one grid of 15 traps were set over two nights (21-22 April). Each trap site was set on a 10 m grid (4 or 3 lines of 5 traps). Traps were baited with peanut butter and set underneath the vegetation cover. Each trap was pinned to the ground. We recorded the number of rats captured, traps sprung and those with nil captures. Rats were weighed, sexed and a sub-set vouchered. A buffer of 5 m around the outside of each trap grid was applied in calculating the area covered.

3.1.2 Bait removal by potential non-target species

Five pitfall traps (25 cm diameter and 25 cm deep) baited with a single Pestoff bait block were placed on the high tide line near the top of the beach (within 2 m of the beach spinifex edge). A further five were set at 10 m intervals in dense beach spinifex, in a line perpendicular to the beach, starting 10 m from the beach edge. A head-torch survey was conducted along the high tide line for ghost crabs at night.

4 Results

The amount of bait eaten or removed by rats over three nights was extremely high (Table 1). More than an estimated 22 kg of bait per ha was taken from three of the six plots over three nights. Of the 72 bait blocks distributed on 36 pins in Plot A, a treatment rate of 23.6 kg/ha, only small quantities of bait remained on seven of the pins. Bait uptake was lower on Plot B and Plot C on the edge of the inlet, the former was in low growing samphire (Figure 2) and latter in sparser growing beach spinifex. The remaining plots were in dense beach spinifex, which comprises most of the island's vegetative cover (Figure 1).

We captured 89 rats on night 1 and 72 on night 2, totalling 161 rats in 350 trap nights (Table 2). Fewer rats were captured at Grid 5, which was in an area of short saltwater couch grass (*Sporobolus virginicus*) on the edge of the inlet. Based on the number of rats killed over the two nights (155 rats) on the eight grids (total coverage 1.55 ha) located in the dominant beach spinifex habitat, we estimated a density of more than 100 rats/ha across much of Adele Island.

An average of one ghost crab was captured per night in the baited pitfall traps along the top of the beach. These crabs consumed relatively small amounts of bait. No crabs were detected in the five pitfall traps located in the beach spinifex. Isopods (slaters) were found in these pitfalls. These invertebrates appeared to be associated with the litter layer and they did feed on the bait. Head-torching at night at low tide on the exposed beach revealed numerous species of ghost crabs but few were seen near the top of the beach. No land-dwelling hermit crabs were observed.

Table 1 Rate of consumption or loss of non-toxic Pestoff bait blocks from six plots (25m x 25m) with two different application rates (23.6 and 35.4 kg/ha).

Plot	Rate kg/ha	No. of bait blocks / pin	Mass of bait provided (kg)	Mass of bait remaining (kg)	Total bait eaten (kg)	Kg of bait eaten per Ha
A	23.6	2 baits	1.785	0.100	1.685	22.28
B	23.6	2 baits	1.785	1.280	0.505	6.68
C	23.6	2 baits	1.785	0.960	0.825	10.91
D	35.4	3 baits	2.678	0.780	1.898	25.09
E	35.4	3 baits	2.678	1.420	1.258	16.63
F	35.4	3 baits	2.678	0.840	1.838	24.30

Table 2 Number of rats captured per night of trapping. All grids consisted of 20 traps apart from Grid 1 with 15 traps. Grids were located in dense beach spinifex except for Grid 5.

Grid number	Night 1	Night 2	Total
1	8	9	17
2	10	11	21
3	8	5	13
4	11	8	19
5*	4	2	6
6	8	8	16
7	9	6	15
8	17	8	25
9	14	15	29
Totals	89	72	161

*****Trap grid located in low growing saltwater couch grass (*Sporobolus virginicus*)

5 Discussion

Our estimate of rat densities was based on the number of rats killed over two nights across eight trapping grids located in the dominant habitat, dense beach Spinifex, on Adele Island. Immigration onto these grids on the second night of trapping probably occurred. However, we did not kill all the rats present on each grid, with over 20% of traps were sprung during the second night of trapping. This would indicate our estimate of more than 100 rats/ha over the majority of Adele Island is reasonable. A high estimate of rat densities (51 rats/ha) was recorded in April 2012 based on the same size trap grids, but each site was trapped for a single night only. Indeed, more rats were captured on night 1 of trapping during this previous trip, 97 in 2012 *cf.* 89 in 2013, in the 190 traps set. These densities of *Rattus exulans* are extremely high for an island and they appear to be unmatched in the literature.

Natural fluctuations in rat population abundance are expected to occur on Adele Island and numbers were potentially highest following the wet season when we have trapped on the island (April 2012 and 2013). Baiting is planned to occur towards the end of the dry season between the 21st October and 1st November 2013. Rat numbers may potentially fall by that time but in terms of contingency planning for an island eradication we need to consider the possibility than rat numbers will remain at this level or they could increase in density.

Very few juveniles were amongst the 89 rats captured on the first night. Following the removal of many adults from each grid, we did capture more juveniles on the second night. Clearly juveniles were present, but they were excluded from the traps by dominant animals. These adults will presumably have first access to consume or cache the toxic baits dropped during the first aerial broadcast. Their presence in such high densities will reduce access of sub-dominant rats to the baits.

For our bait uptake experiment, we used non-toxic block baits (25 g) rather than the Pestoff 20R pellet baits that will be used in the eradication program. Both these bait types are manufactured by the same company and they contain similar base ingredients. Both baits are highly palatable to rats. We attempted to replicate an aerial broadcast as best we could under the field conditions by distributing bait on a 5 m grid. With these limitations in mind, our experiment demonstrated that at their current densities, rats can remove between 16.6 and 25.1 kg of bait per ha in three nights in the dense beach spinifex habitat. The plots with the greatest level of bait take were located next to the trap grids with the highest capture rates. For example, Plot F was located between Grids 8 and 9. Bait removal by crabs within the targeted vegetated portion of Adele Island is likely to be negligible. Bait that falls on the beaches will be collected to prevent crabs from feeding on it.

The toxin, brodifacoum, causes death in rodents by internal haemorrhaging; typically within 3–10 days of ingesting the poison. Consequently, the amount of bait removed in this experiment should provide an approximation of removal rates following an aerial broadscale of toxic Pestoff 20R or at least a worst-case scenario. The use of slow-acting brodifacoum poison is critical so that the onset of symptoms is delayed, and rats do not learn to avoid eating baits (i.e. they do not become bait-shy).

References

Clarke, R.H., Swann, G., Nerenberg, S., Carter, M. and Herrod, A. (2012a) *Seabirds and Shorebirds at Adele Island; Results of Targeted Counts in April 2012.* Monash University, Vic.

Clarke, R.H., Swann, G., Stewart, A., Carter, M. and Herrod, A. (2012b) *Seabirds and Shorebirds at Adele Island; Results of Targeted Counts in November 2012.* Monash University, Vic.

Jones H. P., Tershy B. R., Zavaleta E. S., Croll D. A., Keitt B. S., Finkelstein M. E. & Howald G. R. (2008) Severity of the effects of invasive rats on seabirds: a global review. *Conservation Biology* **22**, 16-26.

Walker J. (1892) The bird life of Adele Island, northwest Australia. *Ibis* **34**, 254-61.

Figure 2 Typical dense beach spinifex (Spinifex longifolius) habitat on Adele Island, with Ipomoea macrantha creeper in the foreground. Staff attempting to find pinned bait blocks.

Figure 3 Area of low growing samphire on the northern side of edge of the tidal inlet.