

Rat Eradication - South Georgia

An assessment of the feasibility of
eradicating Norway rats from South
Georgia Island

SOUTHLAND CONSERVANCY



Department of Conservation
Te Papa Atawhai

Rat Eradication - South Georgia

An assessment of the feasibility of eradicating Norway rats from South Georgia Island

Prepared by: Sally Poncet
Ian McFadden
Andy Cox

DECEMBER 2002

Published by
Department of Conservation
PO Box 743
Invercargill, New Zealand

CONTENTS

Background	1
Method	2
Desk Study	3
Site Visits	4
Results/Conclusions	5
1 <i>Boundary of eradication area</i>	5
2 <i>Selection of the most suitable mainland area</i>	6
3 <i>Which application method?</i>	6
4 <i>Risks to non-targets</i>	8
5 <i>The effect of heavy snow</i>	8
6 <i>The implications of a summer eradication</i>	9
7 <i>Potential for recolonisation</i>	9
Additional Comments on Grass Island Trial	11
Summary of Conclusions and Recommendations	12

*Reports already prepared and submitted to the GSGSSI as part of
this feasibility study*

Basic outline of eradication methodology for Greene Peninsula

Background

Eradication of Norway rats *Rattus norvegicus* from South Georgia is included among the Government of South Georgia and the South Sandwich Island's (GSGSSI) management objectives for the island. To determine whether or not eradication is feasible the GSGSSI commissioned this project.

The GSGSSI appointed Sally Poncet to co-ordinate this feasibility study and requested assistance from the Department of Conservation (DOC) in New Zealand (NZ).

The Department of Conservation is the Government Department responsible for management of all Crown reserves, national parks, marine reserves and protected species within NZ. DOC has systematically developed eradication techniques for a number of introduced pest species using a planned programme of progressively harder eradications. By choosing larger islands or islands with more than one pest species the boundaries have been tested and expanded with considerable success. Species eradicated include four rodents. Norway rats, the target on South Georgia have been successfully eradicated by DOC from islands up to 1965 hectares. 11330 hectare Campbell Island has been treated with final confirmation of eradication checks due in autumn 2003.

Fundamental to this success is the Island Eradication Advisory Group (IEAG) This group comprises senior technical support officers and experienced eradication practitioners. All DOC eradications are scrutinised by the IEAG primarily to assist the project manager achieve the eradication. The secondary objective is to maximise opportunities to make advances in eradication methodology required to achieve planned harder eradications.

The DOC agreed to assist in two ways. The feasibility study had full access to the Department's network of eradication specialists through the Islands Eradications Advisory Group (IEAG). In addition Ian McFadden and Andy Cox, both members of the IEAG and experienced eradication practitioners were made available for the duration of the visit to South Georgia.

Grant Dixon, Ken Passfield, Leiv Poncet, Ian McFadden, Andy Cox, Mark Carpenter and Fraser Carpenter completed the field team.

Any rat eradication plan, and this feasibility study, is based on proven eradication methodology. Every island is however different. The feasibility study essentially assesses what local factors necessitate change to standard methodology, what changes are needed and do these changes make eradication impractical or significantly increase the risk of failure.

Method

The feasibility study was undertaken in three parts.

A **desk study** to review existing information by eradication specialists and people with in depth local knowledge of South Georgia. This was largely undertaken by discussion amongst the NZ and GSGSSI contingents and by numerous emails and phone calls between them. Sally Poncet was also able to visit NZ and attend a meeting of the IEAG, which was of huge value. The purpose of this exercise was to identify any unmanageable obstacles which would have concluded the feasibility study or to identify issues that would need further investigation.

Site visits and trials to resolve local issues identified in the desk study. An attempt would also be made to resolve any issues identified during the site visit.

And finally to consider the **results** of field trials and draw **conclusions** and make **recommendations**.

Desk Study

Three reports have been prepared by Sally Poncet relating to the desk study and are listed in Appendix One. The preparatory report identified issues unique to South Georgia for consideration when Sally met with the DOC's Island Eradications Advisory Group. The desk study report documented the findings of the study. Finally the proposal for pilot field trials described what work needed to be carried out to resolve the issues identified.

In summary the desk study identified a number of issues that might preclude eradication and/or require changes to proven methodology. With regard to bait application method the desk study also could not rule out either aerial or ground application. The issues identified requiring on site visit or trials were;

1) Boundary of eradication area

All previous island eradications have treated whole islands from high water mark to high water mark. Insufficient was known of rat habitat use on South Georgia to determine the land boundaries of any treated area.

2) Which area on South Georgia was most suitable?

The desk study identified a shortlist.

3) Application method.

Which of the various ground and aerial poison application options would be the most suitable.

4) Risk to non-target species.

5) The effect of heavy snow.

6) The implications of a summer eradication which is the only logistically practicable option on South Georgia.

7) Potential for recolonisation.

NOTE: Many of the above are interdependent.

Site Visits

All seven issues identified by the desk study were investigated during the site visits. The trip report prepared by Sally Poncet provides detail of the work carried out on the main visit and enters into some discussion about rat eradication options. Further site work was done by Mark and Fraser Carpenter and is covered in their trip report. To get better information on glaciers as barriers to rat travel rat samples collected by the Frasers were analysed and reports prepared by Neil Gemmel and Bruce Robertson (DNA) and Richard Holdaway (morphology). All reports are listed in Appendix One. In the following results/conclusions section all seven issues are discussed in detail.

Results/Conclusions

As detailed in the background section at the start of this report the IEAG has reviewed the results of our site visits and the DNA/ morphology work. The following conclusions and the recommendations have been fully discussed and are endorsed by the group.

1 BOUNDARY OF ERADICATION AREA

All potential mainland eradication sites are bounded by glaciers and inland by the permanent ice cap. Within these boundaries there are a variety of habitats free from snow in summer and therefore theoretically at least available to rats. The coastal grassland communities hold the highest densities of rats. Their use of fellfield and unvegetated areas is less well understood. Unlike previous eradications there is the possibility that rats do not use all areas physically accessible to them. If this were to be the case it had the potential to significantly reduce the area treated.

The area requiring treatment has greater significance than a proportional increase or decrease in effort. Precipitous cliff areas preclude ground application; their inclusion or exclusion may dictate application method. An increase in area requires a proportional increase in team size for ground application. Quality is paramount, a single gap in coverage or slip in quality by one worker can result in failure to eradicate. This quality is easy to achieve with small teams but the difficulty in getting a large number of suitable workers and maintaining standards means that as area increases, ground application risks increase exponentially.

If aerial application has been selected due to precipitous cliffs or other reason the area requiring treatment becomes less of an issue particularly on South Georgia. The major cost is positioning the helicopter and crew. The inclusion of fellfield or bare rock areas would have a minimal impact on total cost given the lower sowing rates required on these areas.

We used a variety of information and means to assess rat use of, and ability to travel over, less preferred habitat such as fellfield and bare scree/rock. This included known rat distribution, observations passed onto us by others field workers, searching for sign ourselves and the trials done by the Carpenters under contract to the GSGSSI. Their report is listed in Appendix One.

Rats travel considerable distances over barren ground to reach preferred habitat. All isolated tussock patches, no matter how small, had rat sign. Some of these were inland while others were along shore. The colonisation by rats of a high altitude hut and their presence in the Echo Pass and Glacier Col area is also significant. The observations of distances travelled along shore also have implications for ability to colonise across or around glaciers. This is covered later.

As well as ability to travel across fellfield and bare rock areas to reach isolated areas of preferred habitat we also searched for use of this apparent barren ground. We easily found sign at considerable distances from vegetated areas. In these areas the sign (droppings) consisted mostly of invertebrate remains. The amount of searching we did in 2000 was greatly restricted by several late falls of snow so the later work of Mark and Fraser Carpenter was of great assistance. While rat sign could be easily found and was widespread it does not indicate heavy use of these areas. The cold and windy climate and the sheltered spots we found sign means that it would last for a very long time indeed. It is impossible to quantify the difference but we can be sure that the sign found represents more years rat activity than similar sign in different climates.

From our observations and the field trials we concluded that a few rats in summer occasionally range over very large areas of what had previously appeared to be unsuitable habitat. Further trials are proposed in Mark and Fraser Carpenters' report. These could give us a significantly improved knowledge of the extent and frequency of rat use and travel over these areas. Robust methodology is however problematic particularly given the possibility of significant differences between years. The expense is not warranted, at best we would better quantify the frequency of such use. This would not change any eradication plan. As rats have used these areas we must base any eradication on the assumption that rats will be present.

2 SELECTION OF THE MOST SUITABLE MAINLAND AREA

The desk study identified a number of potentially suitable sites for eradication. Of these three stood out as being the most likely requiring further on site investigation. These were Teie Point, Greene Peninsula and Cooper Bay.

Teie Point

This proved to be less suitable than the other sites. This was primarily due to the extent of the area needing treatment (in light of the info in 1 above) and the low return due to the comparatively small area of habitat suitable for the species that would benefit most from rat eradication. The extent of the steep country is also a factor.

Cooper Bay

By no means unsuitable but less so than Greene Peninsula for a first or only eradication. Reasons include; greater logistical difficulty due to distance from existing infrastructure, the greater concentrations of wildlife providing abundant rat food and more potential for disturbance of breeding colonies.

Greene Peninsula

The most suitable area. Logistically easiest being close to King Edward Point. The terrain is as easy or easier than other areas. There are no large concentrations of breeding seabirds. It is the only reindeer-free area on the central north coast, a region typified by a markedly milder climate and extensive Festuca grasslands compared to other existing rat-free areas. This arguably maximises return, since eradication would allow the recovery of a habitat not currently found on South Georgia. The only factor where Greene is less preferred is the possible presence of yellow-billed teal.

3 WHICH APPLICATION METHOD?

Total eradication of rats has only been achieved through the use of poisons in operations that ensure every individual has access to a lethal dose over a short period of time. A number of bait types and application methods have been used. Suitability of bait types and application method, and the cost, varies enormously due to local factors.

Ground application

- Is a more expensive application method compared to aerial application.
- Is cheaper where the cost of positioning a helicopter and personnel is greater than the application cost difference.
- Using bait stations can reduce the risk to some non-target species. In the presence of some non-targets bait stations are the only option.
- Allows a greater range of bait types to be used, which in some circumstances can reduce specific non-target risks or provide other benefit.
- Requires foot access to every part of the eradication area.
- Is very labour intensive, the area an individual can cover is limited necessitating a very large team. Top quality work is essential and gets progressively harder to achieve in every part of the area as the size of the team increases. It only takes one worker to let standards slip.
- Has a higher rate of failure compared with aerial application although in every case likely reasons for failure have been identified allowing improvement to methodology or people management.

Aerial application

- Is the only option where there is not foot access to every part of the eradication area.
- Is cheaper per hectare treated, the eradication size where aerial becomes cheaper in total cost is dictated by the cost of positioning.
- DOC has not failed in an aerial rat eradication although confirmation of eradication is still waiting for some, most notably Campbell Island.
- Requires a helicopter set up with a Differential Global Positioning System (DGPS), and a pilot with significant agriculture flying experience using DGPS, i.e. a cropduster who flies DGPS.

Given the difficulty and cost of getting a helicopter and agricultural pilot to South Georgia we initially proceeded on the basis that ground application was the preferred and perhaps only viable option. After the desk study it was still an open option. To determine if it is possible and the cost required us to confirm in each area ground access and to confirm the boundary of the preferred eradication area.

As discussed in 1 above the area requiring treatment is unfortunately the largest of the scenarios identified in the desk study. The terrain, even in the relatively easy Greene Peninsula, would make the access required of ground control at best dangerous and for practical purposes impossible. If by employing mountaineers it was deemed possible, the increased size of the area requiring coverage would need a very large team which would significantly increase the risk of failure and cost. It would be more expensive than an aerial operation. While our calculations were necessarily based on some large assumptions (the difference between logistical costs at South Georgia and the NZ subantarctic) the margin was such that while the figures may change the outcome is unlikely to.

The only difficulty with aerial application is one of positioning cost. In terms of actual application and likelihood of success Greene Peninsula is ideal. Norway rats are a wide ranging species, single species eradications are much simpler than multiple and the climate and habitat are in our favour. Provided it was undertaken with attention to detail, careful organising and a focus on quality there would be a high expectation of success.

4 RISKS TO NON-TARGETS

On the basis of previous eradications and knowledge of the habits of species on South Georgia the desk study identified five species to be at risk. These are brown skua *Catharacta lonnbergi*, South Georgia pipit *Anthus antarcticus*, snowy sheathbill *Chionis alba*, Dominican gull *Larus dominicanus*, and the South Georgia pintail *Anas georgica*.

Trials using non-toxic bait incorporating a biomarker are a common method for assessing risks to non-targets. There have been instances however where non-toxic trials have not identified any take but subsequent toxic bait application has resulted in non-target deaths. Where it is possible to expose a small non-critical sample of each potential non-target species to poison a more robust result is achieved that reduces the risk when moving onto larger areas with higher numbers of the species of concern. This was one of the objectives of our Grass Island trial eradication.

Brown skua, South Georgia pintail, Dominican gull and snowy sheathbill were resident on Grass Island in sufficient numbers for this trial. Sally Poncet censused the island prior to and after the poison application. No loss was recorded.

South Georgia pipits are not present on Grass Island or Greene Peninsula.

The selection of Greene Peninsula as the best option for any eradication raised another non-target issue. Yellow-billed teal *Anas flavirostris* have been recorded on Greene Peninsula in the 1970s and in 1987/88 and while none were seen during a two week period in 2000, they are regular winter residents at nearby King Edward Cove. If any are present on Greene Peninsula while poison was on the ground they would potentially be at risk. The risk of them both being on Greene and eating bait would seem to be very low but the consequences at the local population level if they did high.

There are several options if an eradication is attempted. These include simply running the risk, in the unlikely event of any loss the population could be artificially boosted through short term management of remaining pairs or transfer from Falklands. Transfer may have some impact on the local genetic base depending on whether they are isolated and if so for how long. Given the very low numbers involved capture and holding for the duration of the eradication is also an option.

Any final recommendation or decision would require more consideration than our work to date. The risk could be further quantified on South Georgia with better knowledge of yellow-billed teal's use of Greene Peninsula and/or a non-toxic acceptance trial. The current rat eradication programme on Falklands provides the ideal opportunity to determine if yellow-billed teal are at risk as the same bait/toxin is used.

5 THE EFFECT OF HEAVY SNOW

While snow has been encountered on previous eradications in NZ it has only been light falls that did not last long, quite different to what might be encountered on South Georgia. The main concern was that a heavy blanket of snow could prevent some rats getting access to bait. Rats survive in tussock under snow. A reported lack of rat sign on top of heavy snow in lowland areas particularly in winter raised the possibility that they may remain under the snow and not gain access within the limited bait life to bait laid over snow. Of lesser concern was the effect of heavy snow on bait life.

The trial eradication on Grass Island was the main way we assessed the effect of snow. The unseasonal snow we encountered strengthened this aspect of the Grass trial. We also monitored condition of baits protected by wire mesh from rats and non-targets at King Edward Cove. The visit also gave us a greater understanding of the environment and conditions on South Georgia which linked to experience in NZ allowed us to better understand the implications of snow.

These observations and trials allowed us to conclude that snow would be a much lesser factor than feared. The bait condition held up remarkably well, better in fact than in some of the wet conditions encountered in NZ. That rats could live under snow in summer for the duration of bait life seemed only possible in tussock. Achieving access to bait for every rat for the standard minimum of three nights could be achieved once snow has gone off tussock areas by laying bait on a fine forecast. Final confirmation in autumn 2002 of eradication on Grass strengthens this assumption.

6 THE IMPLICATIONS OF A SUMMER ERADICATION

An eradication attempt could only be made on South Georgia in summer. In winter rats living under snow and not getting access to bait would be much more likely and could not be managed as it can be in summer. The climate and short day lengths would at best significantly increase the difficulty and cost of achieving the required bait coverage. It might even prevent us from achieving it. In NZ all rat and mice eradications have been in winter. Natural food is in short supply, failure of some individuals to accept bait is consequently less likely. NZ eradications have been done in winter as they are theoretically less risky and in NZ present no logistical problems. Summer eradications are not necessarily a problem; they are simply untested. On South Georgia the problems with, and probability of failure in winter are greater than summer.

The Grass Island trial is a good summer test of the otherwise standard NZ methodology and bait. Confirmation of eradication in autumn 2002 gives confidence that a summer operation on Greene would not compromise eradication.

The choice of Greene Peninsula as the preferred site with its relative lack of dense seabird breeding colonies may reduce the availability of food compared to other places including Grass.

7 POTENTIAL FOR RECOLONISATION

This question needs addressing in two parts: the potential for rats to self colonise across glaciers, sea ice or by swimming, and the potential for rats to be accidentally introduced by human activities. The latter is referred to as quarantine risk.

Quarantine risk

Unless human activity at or near Greene Peninsula is nil there will always be a risk. Given the current and likely level of activity at Greene and provided very simple quarantine precautions were implemented the risk would be very low and is not a reason to decide against an eradication attempt. In the event eradication is attempted a quarantine plan should be written to enable post eradication visitors to manage the risk.

Self colonisation

If rats regularly cross natural barriers it is relatively easy to confirm they do. In the absence of regular traffic confirming whether they do not or only do so infrequently is particularly difficult. Our objective for this feasibility study was to get the best risk assessment information possible to better guide the decision to proceed/not proceed with the definitive trial, i.e. an eradication.

We based our risk assessment on the DNA and morphological studies. Our field work looking at rats ability to travel over barren ground and ice, the Carpenter's trials, observations of rat sign from other field workers, information on rat distribution at South Georgia (both their mainland range and offshore island distribution) and knowledge from other islands.

Reports from the DNA and morphological studies are listed in Appendix One. The studies showed that rat populations at Discovery Point and Greene Peninsula are easily separable using either DNA or several morphological (skull) differences. This proves that either rats do not cross between these areas or do so very infrequently. After considering all of the information above and looking at the sheer scale of the glacial barriers, their nature and the distance across Moraine Fjord for swimming or crossing sea ice, we believe that Norway rats could not reach Greene Peninsula unless transported by humans.

During the desk study phase the fact that the current barriers to rat recolonisation are diminishing through global warming induced glacial retreat was raised. The importance of this was not however apparent till some time after our return from South Georgia. While on the island we observed the extent of rat travel along barren shores. The western side of Moraine Fiord and from Teie Point towards the Geikie glacier were of note as was the extent of travel inland referred to in other sections.

The Nordenskjold and Hamberg/Harker glaciers are barriers to rats but they will cease to be if or when their retreat exposes the shoreline. It is possible but untested that a permanent poison grid between the coast and the face of a glacier could prevent recolonisation. This would however necessitate regular and permanent maintenance to have a chance of succeeding. We believe any decision to eradicate should be based on the assumption that the benefits would only persist as long as the glaciers terminate over the sea.

Additional Comment on Grass Island Trial

As previously discussed the Grass Island eradication was used to trial a number of factors. For some it provided answers irrespective of the success of eradication. These include the non-target assessment and the bait life in snow. For others we only got a definite answer with the confirmation of eradication in autumn 2002. These include the summer timing and access to bait in snow conditions. In the event that eradication was not achieved it would have been impossible to determine the reason with any certainty. As well as the new factors under trial and in common with all eradications there are other potential reasons for failure. For example recolonisation by swimming (350 metres may not be far enough offshore), bait coverage failure on our part etc.

The successful eradication provided us with definite answers (except for the distance offshore, for which a few more seasons are required to confirm they won't swim this far) as well as being a significant conservation gain for Grass Island. Ideally our trials should have been set up to provide answers irrespective of whether eradication was achieved. However, given that Grass Island is the only rat island arguably beyond the swimming range of rats at South Georgia there was no possibility of multiple trials each testing a different variable. Mainland trials were also considered but field inspections showed that there are no suitable mainland sites smaller than Greene Peninsula, which is therefore assumed to be the most practical site for a trial or eradication.

Summary of Conclusions and Recommendations

- 1 The information on rat travel inland and along barren shores from our work and other observers shows that rats travel further than anticipated. The Carpenters recommended more research to better understand and quantify the use of these areas by rats. Eradications must always be based on the conservative or precautionary approach. If rats are recorded in these areas they must be covered in any eradication. Determining the level of rat use of these areas will not effect eradication planning. We recommend that further research on rat use of barren areas not be undertaken.
- 2 As rats travel further inland than anticipated, the area requiring treatment during an eradication attempt is consequently larger than hoped. Each specific area would need to be assessed as part of detailed eradication planning and at the time of the eradication dependant on actual snow cover. In simple summary coverage would need to go beyond all vegetated areas, effectively to the summer snowline.
- 3 Due to the large area requiring treatment all investigated eradication sites include steep country that would be dangerous to adequately cover by ground. If mountaineers can cover the steep country the large area requires a very large team which both increases cost and risk of failure.
- 4 The most significant cost of aerial application is positioning the helicopter and crew. The low sowing rates required on bare areas means their inclusion in any aerial application would not hugely increase the cost. The cost of aerial application would be less than ground. All aerial eradications require meticulous planning and a focus on quality. Relative to other aerial operations Greene Peninsula presents no technical difficulties.
- 5 If eradication is attempted we recommend it be by aerial application.
- 6 The success of the Grass Island eradication shows that eradication can successfully be done on South Georgia in summer. We believe winter eradications, which are the norm in NZ, are not practicable in South Georgia due to the extreme difficulties of working in winter and the possibility that rats could remain under snow at this time of the year. Any eradication should be done in summer.
- 7 Of the all the possible sites for eradication in a discrete area Greene Peninsula is the most suitable. Being adjacent to King Edward Point makes it logistically easy. The terrain and arguably the weather make it easier to treat than other areas. There are no large concentrations of breeding seabirds. The climate and extent/type of vegetation would arguably maximise the return compared to areas with less marked difference from existing rat free areas.
- 8 The Grass Island trial showed that most of the potential non-targets on Greene Peninsula are unlikely to be killed by the poison used for eradication. Yellow-billed teal have in the past been recorded on Greene Peninsular and are not on Grass. Their vulnerability was therefore not tested by us. Prior to any eradication this must be addressed. Further surveys of Greene to determine if they are in fact present or information from the Falklands eradications on islands with yellow-billed teal may show that there is no issue. If concern remains possible mitigation measures such as temporary holding in captivity or management post eradication in the event of a non-target kill need investigating.

- 9 The DNA and morphological studies prove that rats either do not cross between Discovery Point and Greene Peninsula or do so very infrequently. Considering this work and all of the other information available we believe that rats could not recolonise Greene Peninsula over Moraine Fjord or the glaciers. We are confident that this is the case but it is an assumption than can only be fully tested by eradicating rats from Greene.
- 10 Protecting Greene from human assisted rat recolonisation would require the implementation of simple quarantine measures. If you proceed with eradication a quarantine plan should be prepared and implemented before the eradication attempt.
- 11 We are confident that large glaciers on South Georgia are barriers to rats. Our observations of rat travel along barren shores however lead us to the conclusion that the glaciers are only barriers while they terminate over the sea. Glacial retreat is currently very rapid and may significantly accelerate. We recommend that any decision to attempt eradication must assume that rats will recolonise when the glacial retreat exposes the shoreline.

Appendix One

REPORTS ALREADY PREPARED AND SUBMITTED TO THE GSGSSI AS PART OF THIS FEASIBILITY STUDY

Reports by project co-ordinator Sally Poncet are:

“South Georgia Rat Eradication Feasibility Trial Preparatory Report”

“The Feasibility Of Rat Eradication At South Georgia: Desk Study Report”

“Feasibility Of Rat Eradication At South Georgia: Proposal For Pilot Field Trials.”

“Trip Report, South Georgia Rat Eradication Feasibility Trials 25 October To 7 December 2000”

“Bird Surveys Pre And Post Baiting At Grass Island”

Mark and Fraser Carpenter undertook trials to provide better information on rat travel over non-vegetated areas. Their report is:

“Rat Trials/Trapping 2001”

Dr Bruce Robertson and Dr Neil Gemmell undertook DNA work to try and determine if rats populations on either side of glaciers are isolated. Their paper for publication is in prep. Their interim report is:

“Glacial Barriers, Gene Flow And Genetic Population Differentiation Of Brown Rats (*Rattus norvegicus*) On South Georgia Island.

Dr Richard Holdaway used morphological differences (skull bumps) to try and determine if rat populations on either side of glaciers are isolated. His reports are:

“The Frequency And Potential Significance Of Differences In Non-Metric Skull And Mandible Morphology In Two Populations Of Norway Rat (*Rattus norvegicus*) Separated By Glaciers On South Georgia, South Atlantic Ocean”

“Characteristics Of Two Populations Of Norway Rat (*Rattus norvegicus*) Separated By Glaciers On South Georgia, South Atlantic Ocean, Using Non-Metric Characters Of The Skull And Jaw”

Appendix Two

BASIC OUTLINE OF ERADICATION METHODOLOGY FOR GREENE PENINSULA

Area Requiring Coverage

Estimated 2050 hectares but variable depending on snowcover.

Method

Single application of bait (Animal Control Products Ltd.

Pestoff Rodent Bait 20R, brodifacoum.) Sown by helicopter from a purpose built spreading bucket. Single application with 50% swath overlap. Navigation by Differential GPS. Pilot must have minimum of 200 hours experience applying bait or chemical using Differential GPS. 12 ton of bait would be required.

Timing

Would ideally be in early summer as soon as the snow over tussock areas has melted. The amount of snow on other inland habitat types is not important, in fact the greater the snow cover the less country requiring treatment. If transport could not be arranged till later in the summer you should still proceed, it should not compromise eradication.

The objective of the aerial application is to have good quality bait on the hill for 3 days after application. Bait can take 10mm of rain and still be in good condition. Often it can take considerably more, how much more is dependant on drying or freezing conditions between rain events. The bait sample under wire at King Edward Cove lasted over 3 weeks. The snow will not affect bait condition over this period but a heavy blanket could cover bait and deny rat access. The accuracy of forecasting heavy (greater than 10mm) rain or snow events at KEP needs to be checked. Bait should be laid on a forecast of no such events for 3 days after the drop. The drop will take 2 days.

In terms of improving the chance of killing 100% of the rats nothing more can practicably be done once the bait is on the hill and any gap in coverage indicated by GPS printout is covered. Checks to confirm eradication can not be relied on (unless a rat is caught indicating failure) until 2 full breeding seasons after the eradication attempt. The eradication operation needs only to allow for 2 days work plus a period on the island beforehand to set up and wait for the suitable forecast.

A Bell Jetranger or Hughes 500D would require between 16 and 20 hours to ferry bait and personnel and to sow bait. A helicopter with greater lifting capacity would reduce the time. The helicopter requires **Differential** GPS and compatible computer-printer to allow on the spot print out of flight lines so any gap in coverage can be identified and reflight on the same day.

Accurate costs for a helicopter could only be determined by competitive tender once transport options had been determined. Prices are likely to be in the order of \$80,000 NZ to apply the bait. And \$4000 per day for time in transit and waiting at the island. These very rough figures would include the pilot's and engineer's wages .

In New Zealand we have worked with large teams and often more than one helicopter. This allows considerable contingency for bad weather, mechanical breakdown, team member sickness etc. This is most efficient on very large jobs or smaller jobs of easy access. Greene Peninsular would be relatively easy to fly but access to South Georgia for both the helicopter and crew is exceedingly expensive. The best compromise would be a small but skilled and fit team. The minimum would be 5 people. These being a pilot, a helicopter engineer, a project leader experienced in aerial eradications and 2 bait loaders. The engineer and project leader would also need to double as bait loaders/helicopter refueler. One of the 5 people would also need to be fully conversant with the differential GPS system to enable troubleshooting in the event of GPS or associated computer problems.

Costs

The most significant cost items of the operation are the ship transport to and from South Georgia, the helicopter and the pilot/engineer/GPS equipment. Very few pilots have the required extensive bait spreading experience using differential GPS. Those that have use their own gear, so these items would come with the pilot rather than the helicopter. Potentially all the above items are very variable in price. For example, a suitable helicopter may be available for hire ex South America with transport options on a cruise ship. Alternatively a NZ based helicopter and the whole eradication expedition could use a charter boat such as the "Braveheart" and sail direct. Without a decision in principle to proceed, the negotiations to get definite costs present practicable difficulties. This is particularly so with regards the helicopter and pilot/engineer/GPS. Obtaining final costs requires considerable work of the potential contractors. This is not reasonable simply to get indicative costs.

Working on the basis of a charter from New Zealand with helicopter and team onboard, and based on our Campbell Island eradication costs, the Greene Peninsular eradication would cost NZ\$840,000. This figure could confidently be used to make any decision to proceed to the next steps, seeking expressions of interest and costs from contractors and suppliers and the preparation of a final eradication plan. The figure, while indicative only, is conservative, it is likely final costs would be less even if the eradication was done on the costed basis. Other options, such as a South American leased helicopter with tourship transport, have the potential to significantly reduce costs but sorting these issues out is beyond the scope of this feasibility study.