Best Practice

Island Biosecurity Best Practice Manual

This manual provides current agreed best practice for complying with the Island Biosecurity SOP and Conservancy island biosecurity plans. It forms part of the DOC island biosecurity system aimed at:

1. **minimising the risk of pests becoming established on islands and**

2. **continuously raising the standard of island biosecurity practice .**

Version history:

1.0	August 2003	Original document written by Andy Roberts Southland Conservancy
2.0	September 2006	Revision by Keith Broome resulting from meeting held in Chch March 2006
2.1	October 2006	Addition of Genetics appendix & some adjustments to Surveillance section
2.2	July 2008	Minor changes to Rodent Surveillance and Contingency sections
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Introduction

This manual provides current agreed best practice for complying with the Island Biosecurity SOP and Conservancy island biosecurity plans. It forms part of the DOC island biosecurity system aimed at:

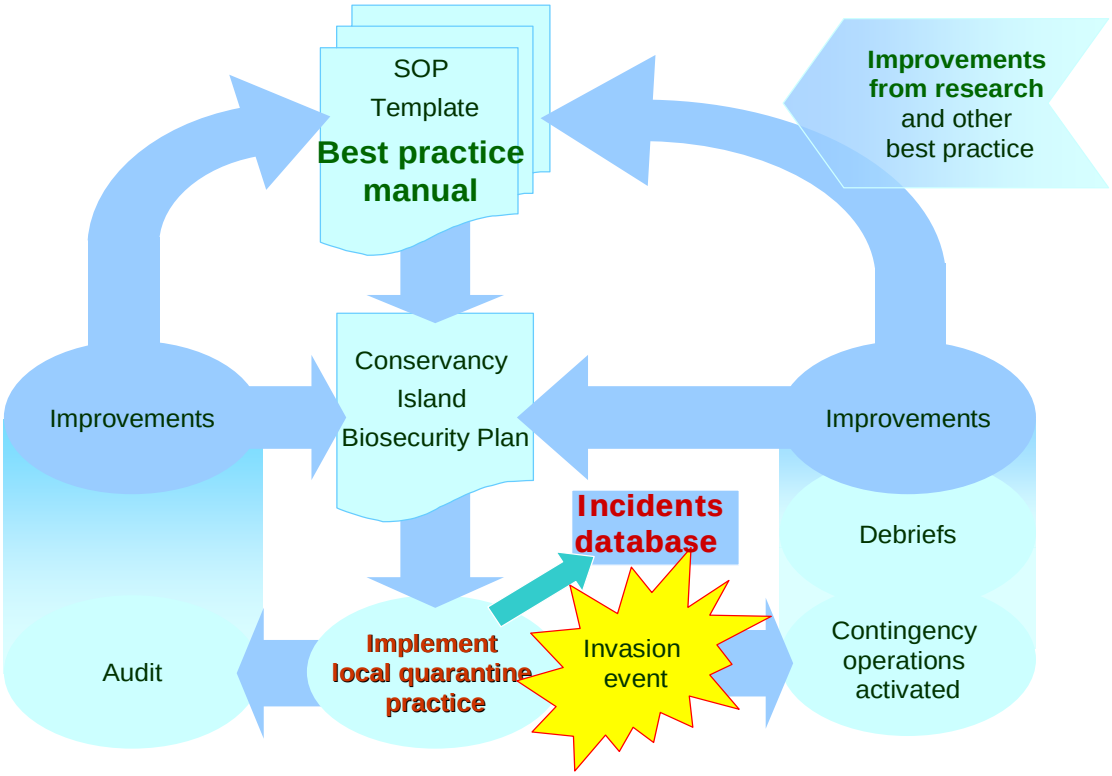
1. minimising the risk of pests becoming established on islands and

2. continuously raising the standard of island biosecurity practice

It is divided into sections on Quarantine, Surveillance and Contingency to be consistent with other parts of the system (see diagram below). An additional section provides advice on island biosecurity advocacy.

Although raising the standard of quarantine represents more work to get facilities and procedures in place, when implemented logistical support staff often report a payoff in terms of easier logistical organising of trips, personnel arriving in plenty of time to have gear checked and gear maintained and ready to go prior to trips.

DOC Island Biosecurity System



The following points set the context for the advice contained in the rest of this document:

1. Aim to place as many lines of defence as practical:

   Stop pests infesting gear destined for islands on the mainland through -

   - Good practice and hygiene at source (eg home or supermarket)
   - Good checking, secure packing & storage at the quarantine store
   - Checking on wharf (or other point of departure) before leaving

   Stop pests reaching islands through –

   - Good practice and hygiene on transport vessels and aircraft

   Stop pests establishing on islands through –

   - Checking gear on arrival
   - Maintaining surveillance to detect pests
   - Having contingency readiness and capability available

2. Everyone thinks island biosecurity is about rodents and yes they are important to keep off our islands. Let's now start thinking of biosecurity for diseases which could be carried to islands. If our systems are focussed on preventing things this small, we're sure to be effective against much larger organisms like rodents, invertebrates and weed seeds.

3. Use your existing Quarantine Plan, the Island Biosecurity SOP, the Biosecurity Plan Template; the Southland Worked Example; this manual and recommendations from recent island biosecurity audits to put current best practice into operations in your conservancy or area. These documents can all be accessed from the Island Biosecurity Network page available on the intranet.

1 Quarantine

1.1 Setting up and managing a quarantine store

1.1.1 Size

There should be adequate space in the store for:

- storage and maintenance of equipment used on islands;
- checking and packing supplies needed for the programmes on the islands;
- cleaning and checking items returned from the islands.

1.1.2 Requirements

The store must be well lit with no dark corners.

For rodent proofing all entrances and holes > 5 mm must be securely sealed, including; under doors (e.g. by using a metal “lip”), around holes for drainpipes or wiring, around windows etc.

For invertebrate proofing all gaps must be sealed as far as practical, to reduce the cost of other invertebrate detection and control measures.

All windows and doors must shut securely. (vents or fly-screen mesh may be required). Good ventilation and weather proofing leading to a dry storage environment will reduce invertebrate presence.

Floor should be sealed (painted) to enable easier cleaning. Other floor covering options (eg vinyl coating) may serve the same purpose if painting is impractical and the alternative surface will take the traffic it will receive.

1.1.3 Access

Key holders and others with access to the store should be kept to an absolute minimum.

1.1.4 Cleaning

The store must be tidy, with floor space kept clear and clean.

Rubbish must be removed from the store daily.

Do not store rubbish in the store.

Perishable foods must not be kept in the store unless it has been packed in pest-proof containers.

Non-perishable foods must be checked carefully before re-packing.

A spring-clean must occur at least once annually, where all

items are removed from where they are stored and cleaned, and floors are thoroughly cleaned (e.g., with bleach). The entire store should be checked for any gaps and sign of pest damage.

1.1.5 Pest control

Rodent control must be maintained within and around the perimeter of the store.

Periodic rodent surveillance should be planned and carried out (e.g., traps, , tracking tunnels).

Insect control – insect “glue traps” or residual insecticide sprays (as recommended by local insect control contractors) applied at likely access points within the store.

Automatic insect spray dispensers (eg Robocan) are also useful but are not a substitute for regular fumigation or other insect control targeting specific species (eg contact spray for ants).

The entire store building should be fumigated by professionals using pyrethroid (the number of times per year will vary depending on local risks). Timing should take account of upcoming events eg have it done just before a busy period servicing islands.

A log of pest control actions taken in/around a quarantine store is useful to ensure routine measures are carried out and will be invaluable in debriefing incidents.

Fleet st in Auckland

Purpose:- Servicing Hauraki Gulf islands, some of which have resident ranger staff so equipment and materials are constantly flowing through this store.

Layout: Built inside an existing building. There are two rooms of 34 sq. metres & 42 sq. metres. First room is for sorting and temporary stowage for cleaned food bins & some packaging materials etc - second room is squeaky clean area ready for dispatch. Warning light installed for open door in second clean room. There is a two cubic metre refrigerated coolstore (within the clean room) The main cleaning area is in another part of old building for cleaning gear before it reaches the first room.

Construction: Constructed from EPS cored insulation panels 100mm - walls, ceiling and doors. The material is the same stuff they build cool stores and freezer rooms from. 100mm of high density foam with colour steel panel both sides. In effect it gives you steel room. Very strong - clean and functional. No timber framing or other supports except for ceiling (also EPS) which is braced by chain brackets onto main building ceiling beams. Doors are big enough for access into store rooms with forkhoist.

Concrete floor coated with Rhino epoxy flooring system. Floor coating is "coved" (radiussed from floor up 100mm) to give a good seal and easy cleaning/scrubbing. Also because concrete floor was not smooth/level. Floor was scrubbed & acid etched prior to being coated

Commercial ventilation system required as the two rooms are sealed almost air tight. So with anti bug spray system and fork hoist exhaust there is a need to change the air regularly.

Build time and Cost: Construction time 2 days after floor was finished. All up cost about $55k.

$25k for supply EPS panels & construct. Floor coatings $10k, Ventilation system $8k, coolstore $6.5k

Further Information contact Lionel Brock- Auckland Area Office

Warkworth Store

Purpose:- Provides a controlled environment in which to check people (DOC staff and visitors) and stores travelling to and from the islands of the Northern Hauraki Gulf and the Kermadecs.

Layout: Built inside an existing building. There are two rooms separated by sealed double doors. The ‘dirty’ end of the store is 4.0 x 4.5m and the ‘clean’ end is 8.0 x 4.5m. The dirty end of the store is used for checking stores and personal gear. The clean end is used as a temporary store for those items that have been checked and cleaned prior to shipping but also houses fish bins and other rodent proof containers and rodent contingency gear for pest invasions.

Construction: Two of the walls are the outer walls of the building (painted concrete) the other two are painted jib with skirting. Three doors exist, a single door opens into

the clean store through the internal wall. Through the same internal wall one set of double doors opens directly into the dirty store and another set of double doors divides the dirty and clean stores. All doors are wooden and close on top of a removable raised step which provides a seal between the door and the floor. The double doors and removable step provide access for a hand pulled pallet truck with pallet. The floor is painted concrete.

Build time and Cost: Construction time 5 days. All up cost about $8k.

Further Information: See Richard Griffiths, Warkworth Area Office.

1.2 pest-proof rooms on islands

1.2.1 Pest-proof rooms

A pest-proof room is an ideal last barrier to prevent rodent establishment if they have got onto an island with stores but also provides an ideal opportunity to have one last check for unwanted insects, weed seeds etc. Every hut on an island should have a pest-proof room for checking stores and equipment in. Managers may choose to make the whole hut pest-proof. There are two approaches to this, each has its merits. Either the whole hut is pest-proof or a single room is pest-proof.

The reasons for not having the whole hut pest-proof are that huts are generally attractive sites to the pests that can invade islands. Therefore the hut(s) can act as a bait station or a pest indicator site. When staff arrive on an island the first place that is checked is the hut and if pests are present in hut it is fairly obvious.

In general:

- All huts should be wholly pest proof if at all possible.
- If the hut comprises only one room or is open plan, then the whole hut must be made pest-proof.
- If a new hut is being built, it should be made pest-proof.
- If there is more than one building at the site, then the other buildings will serve the role of a pest indicator station and the whole hut should be made pest proof.
- In an existing hut, at least the room where stores first arrive must be made pest proof.

1.2.2 Requirements for pest-proof rooms

There must be sufficient room to handle the largest volume of stores that would arrive at any one time.

If some pest species are already on the island, the room must be proofed against these.

The room must be well lit and have no dark corners.

All windows and doors must shut securely. (Vents or fly-screen mesh may be required).

For rodent proofing, all entrances and holes >5 mm must be securely sealed, including:

- gaps under doors (e.g. by using a metal “lip”),
- gaps around holes for drainpipes or wiring, and
- around windows, etc.

It is critically important that stores are checked upon arrival in rodent proof rooms WITH THE DOOR SHUT.

Room should be clean prior to stores or personnel arriving to enable easy detection of pests. Floor should be sealed (painted) to enable easy cleaning.

Traps should be maintained inside the room when checking stores.

1.2.3 Chasing rats and mice around rooms can be difficult.

Rodent “bolt holes” should be placed into the corners of pest-proof rooms. A piece of plywood hinged vertically to the wall is the best approach, when the animal has entered the ‘bolt hole’ it can be easily killed by kicking it closed. (Gilly to send photo) Alternatively a simple box trap placed along the wall in the room (usually in the corner). Most rodents will run along the edge of the wall and will run into a box trap. The door should be shut quickly to avoid the rodent escaping. An Elliot trap may have the same effect.

1.2.4 Maintenance of pest-proof rooms

All easily removable items need to be taken out and the entire room checked for any gaps and sign of pest damage.

Make a list of all problems that need fixing.

Fix them and the check off the list.

1.3 Invertebrate quarantine

1.3.1 Invertebrate awareness "… take no prisoners; squash first; ask questions later!"

Awareness and careful inspection are the most important things for invertebrate biosecurity. It comes down to being aware that invertebrates could be a problem and that **everything** needs to be inspected closely to ensure there are no free-loading passengers.

Ensure that no food sources, which may attract things like ants are in or around the gear store. Water-tight plastic barrels are excellent, as they will be insect-proof as well as waterproof. (These should also largely prevent post-packing infestation.) A clean store area is also important, as this makes it much easier to detect any new arrivals. Pest control should be in operation around the perimeter of the building and should prevent ants establishing inside however, it cannot be relied upon entirely; there is always the need for inspection as well.

Inspecting and packing gear in a clean, open, indoor area is really important. Any pest that pops out is easily seen and can be dealt to quickly, before it escapes. The inspection area should be large enough to allow tents to be unfolded away from the already inspected gear, so that any discovered pest cannot escape into the inspected gear pile. Make sure that the inspection area is clean: if you cannot see an ant on the floor before you begin, then you won't know whether your inspection was successful, neither will you be able to prevent it jumping right back into the inspected gear!

When undertaking the inspection, most invertebrates will be dislodged by shaking or sharply tapping the gear with a timber pole or something similar.

- For things like tents, the more eyes looking the better. If Argentine ant or a similar threat is present, it should make itself very obvious when shaken or tapped but you have to look to see it!
- Most invertebrates will be hiding in folds in material or against the seams, so check these high-risk areas carefully.
- Any holes or recesses in gear should be tapped/hit up-side down, e.g., check for ants in a spade handle. (If you pick up two spades and bang them together while

looking for things the size of ants, you will see them straight away.)

- Check any areas where invertebrate frass is found.
- Ants are good to concentrate on, as the thing to look for, because they are likely to be the smallest invertebrate present.

Clearly, if something does fall out then a closer inspection is warranted and possibly the use of an insecticide spray. Permethrin-based sprays should be used as they have a residual effect, and will kill bugs that walk over the treated surface for up to a couple of months, depending on exposure to weather, etc. Pyrethroid (pyrethrum) based products are knock-down only, and have no residual life beyond about an hour.

In particularly high risk sites (where Argentine ants, etc. may be present), keeping a can of fly-spray handy when packing gear, is an excellent idea. This way, any invertebrates that fall out can be sprayed immediately, as opposed to trying to squash a-thousand ants running in every direction when a nest is discovered.

With bigger items like the vessel itself, bang the hull, pontoon, whatever and look. Do this in several places as invertebrates generally hate foreign noise, and will attempt to move, away from it. Slow-moving things like slugs and snails are the exception rather than the rule. For them, it comes down to careful inspection. On charter vessels, increasing awareness is important. Most staff are getting the idea about rodents, but also need to be vigilant for insects as well. “Take no prisoners” is the rule, squash first and ask questions later!

1.4 Weeds

Seeds stowing away on large items of machinery, equipment or containers, has been the mode of entry for some weeds becoming established on islands in the past.

1.4.1 Check gear for seeds

Check any large items of gear for seeds and clean off any dirt on equipment or containers to be taken to an island.

Seeds on personal gear (gaiters, socks, backpacks) are very commonly intercepted in quarantine checks. High risk items might be better supplied on the island to avoid having to take personal gear that might be contaminated.

1.5 Boat quarantine

Didymo is now established in South Island waterways, undaria and sea squirt are marine pests we currently know about. In addition to transporting terrestrial pests, watercraft represent a risk for transporting these organisms (and others we are not currently aware of). High risk areas are kayak compartments, engine cooling systems (particularly in outboard motors), under floor compartments, bilges and sea cocks in vessels and boat trailer rails. These risks need to be considered and measures put in place where possible. The following link provides hygiene advice for some organisms, taking these measures will significantly reduce the likelihood of watercraft transporting other marine or freshwater pests.

http://www.biosecurity.govt.nz/pest-and-disease-response/pests-and-diseases-watchlist/didymosphenia-geminata

http://www.biosecurity.govt.nz/files/pests-diseases/plants/didymo/didymo-cleaning-methods.pdf

1.6 Pest proof containers

1.6.1 Plastic containers

Use a range of plastic bins or barrels to suit the cargo and the load space available, eg High Density *Stacka Nesta* bins (with lids fixed by cable ties to prevent gaps between the bin & lid) in sizes of 32, 45, or 68 litres.

Available from: Stowers Containment Solutions Ltd, www.stowers.co.nz
Auckland, Wellington or Christchurch.
sales@stowers.co.nz

1.6.2 Maintenance

Containers should always be stored and packed in pest proof storerooms. Plastic containers should be kept as thoroughly clean as possible.

1.6.3 Cleaning

Use anti-graffiti solvent to remove all markings and tape residue. Steam cleaning, scrubbing with cleaner or disinfectant (e.g. with Virkon™ or Tri-gene biocide). Disinfectant may be incompatible with food containers and these should be steam cleaned only and kept distinctly for food (eg a different colour or clearly labelled).

1.7 Diseases and micro-organisms

Disease surveillance will often be issue or event driven and only instigated in the event of a disease outbreak that is a potential threat to the conservation values of an island.

1.7.1 Report

For any disease-related abnormalities, consult with DOC wildlife disease expert (Kate McInnes; VPN 5094) in the first instance. See Wildlife Health Index page WGNCR-37176 for more information

Be prepared to instigate a contingency response, if necessary.

1.7.2 Handling species

When planning to handle species consider the need to collect samples to establish disease baselines.

Also, possibly the need for Animal Ethics Committee approval and Wildlife Act 1953 permits. (For example, these are required for any work that involves banding or marking individuals protected by the Wildlife Act.)

1.7.3 Leiopelma-chytrid protocol

This draft protocol was prepared to minimise the risk of chytrid infection in island population of *Leiopelma* species. It guides actions that should be taken for:

- Maud,
- Stephens,
- Motuara
- Nukuwaiata
- Long and
- Great Barrier Islands.

The chytrid fungus is known to be present in some populations of the endemic frog *Leiopelma archeyi*.

In dealing with this poorly-known threat, the cautious approach is to assume that the fungus is not present on those islands inhabited by endemic frogs and we should minimise the risk of it being introduced. As a precaution, we should act as if the fungus is already present in these populations and do what we can to avoid its spread between animals as a

further safeguard.

Application of appropriate controls rely on the following:

- The fungus is reliant on damp conditions for transport and survival.
- There are no controls on public visits to Great Barrier, Motuara and Long islands except that overnight stays on Motuara are subject to permit.
- The native frogs on all islands are fully protected and handling is authorised only for research or management.

Preventing direct infection of island populations

Equipment used for frog research on an island is to remain on that island and only be for the intended work on that island.

When using a Virkon foot bath clean all organic matter from footwear first to ensure good disinfection.

Minimising risk of disease arrival on Maud, Stephens and Nukuwaiata islands

Access is by permit only and permits are clearly worded to indicate the following requirements:

- All visitors to these islands are subject to a condition requiring all equipment, clothing and footwear to be clean and dry.
- This requirement applies equally to all departmental and public visitors.
- On those occasions where the certainty of dry footwear on leaving the mainland cannot be confirmed (rain or a wet landing), a footbath of fresh Virkon S™[†] virucidal disinfectant shall be provided.
- Large parties of visitors arriving on Maud (or those that cannot be relied on to all have had clean dry footwear on leaving the mainland) will be processed through a Virkon™ footbath. This will occur on the jetty.
- All departmental plant and equipment arriving on Maud or Stephens will be treated to ensure it is clean and dry before shipping. If there is any doubt on arrival the material will be sprayed with Virkon™.

[†] Virkon™ footbaths consist of an absorbent mat inside a sealed plastic box. The mat is soaked in a solution of "Virkon S" so that island visitors can tread through the box which is then re-sealed. Each kit contains a stock of the concentrate, a container for mixing and full instructions. A pen and slate is provided to record the date of each fresh mixing of the solution. Kits are available on the vessel Te Hoiere, on the jetty at Maud, the landing at Stephens and with Danny Boulton at French Pass. An additional kit is stored in the hut on Motuara. All footbaths are maintained by Area staff. Additional supplies of Virkon™ are available from stock and station agents. While relatively safe for human contact, it should not be used on bare skin and splashes should be washed off immediately.

- Any new livestock will be treated with a Virkon™ footbath before shipping.
- Responsible: Resident officer on Stephens and Maud island, and trip leader for Nukuwaiata is responsible and accountable for these measures.

Great Barrier, Long and Motuara Islands:

- On these islands all authorised frog handlers shall ensure footwear is clean and dry, and shall, in addition, disinfect footwear with Virkon™ on approaching the study area.
- On Long and Motuara islands, persons other than authorised handlers shall be discouraged from approaching the study area.

Responsible: Permit issuing officer, RD&I Research staff and local staff as advised.

1.7.4 Minimising risk of introducing the disease to the populations or between frogs

Authority to handle native frogs on these islands is conditional on:

- a clean pair of disposable nitrile gloves used for each group of animals within a localised site (*c.* 10m^2). These gloves should be wet before handling the frogs to minimise the risk of skin damage;
- any equipment which comes in contact with a frog shall be cleaned by soaking in 70% alcohol for 30 seconds (or 100% alcohol and flamed) before being used on another animal;
- a new or sterilised scalpel blade (or scissors) to be used for each animal when being toe-clipped; and
- any wound should be closed with cyanoacrylate surgical glue.

Responsible: Permit issuing officer and local staff as advised.

1.7.5 Review of conditions

Current conditions reflect the current state of knowledge of this disease and its distribution. These conditions may be reviewed as further research and delimitation surveys are carried out. These conditions were last reviewed in April 2006

1.8 Translocation and quarantine practice.

Protocols and checklists for quarantine measures for native animal transfers within New Zealand are given in the translocation and wildlife health workbook (WGNRO-20158). These include: Health screening; Quarantine duration; Quarantine details (location, facilities, equipment, budget, people, responsibilities, training, records); Reviewing the

outcomes of the quarantine period; and risk decision and movement recommendations. For further information see the Wildlife Health index page (WGNCR-37176).

1.8.1 Egg transfers

Refer to WGNRO-17687 Captive Health Care Workbook Appendix 6 for more information.

Eggs should be handled gently wearing disposable gloves, or with cleaned, disinfected and thoroughly dried hands if gloves are unavailable or impractical. Eggs can be cleaned to remove excess dirt, and disinfected but they must be thoroughly dried and care must be taken not to chill the egg or to abrade the outer membrane.

They should be transported in clean and disinfected (preferably sterile) containers and placed in sterile incubators. All transport containers should be cleaned and disinfected after each use.

If eggs are to be put into nests, contaminated nest litter should be removed, as long as this does not disturb incubating adults.

Once hatched, chicks should be inspected for sign of any diseases that can be transmitted from hen to embryo (e.g., *Salmonella* spp., *Escherichia coli*, and avian *encephalomyelitis* virus).

1.8.2 Chicks

Chicks should have their feet and bills washed with mild disinfectant before transfer.

1.8.3 Transfer boxes and other equipment

All transfer containers should be cleaned before and after use.

All equipment (e.g., transfer boxes, weighing bags, etc.) should be disinfected prior to entering the area, or site-specific equipment should be used.

1.9 Dog vaccination

1.9.1 Example of a vaccination schedule (annually)

Dogs taken to islands for management programmes should be vaccinated to reduce the risk of dogs passing disease to or contracting from other wildlife (eg seals)
Diseases:

- Canine parvovirus type 2 virus;
- Canine distemper virus;

- Caninene adenovirus type 2;
- Canine parainfluenza;
- *Leptospira interrogans* vars. *ictgerohaemmorrhagiae*; *copenhageni*; *pomona* and *hardjo*
- *Bordetella bronchiseptica*

Treatment:

- Canvac 4 in 1 +, Lepto 3 way +, Canvac lepto +, Protech Tracguard

Worms

- Cestode
- Nematode

Treatment:

- Wormed six monthly with anti-cestodal and anti-nematode drugs e.g., Drontal Plus (praziquantel, pyrantel pamoate, febantel).
- Also within 10 days prior to moving to the island.

External parasites

- Fleas, ticks and ear mites.

Treatment

- Within 14 days prior to moving to the island with *Frontline top spot* or *Advantage flea adulticide*.

Isolation

- When treated dogs should be isolated from other dogs, which have not been treated.

All records of examinations, vaccinations and treatments should be updated on a medical record card.

This card should be signed by a veterinarian each time and be available for inspection.

2 Surveillance

Correct identification of any sign of a pest incursion is crucial to making the right decision on how to respond. In some situations the evidence of an incursion will be indisputable, eg a dead body in a trap on the island. However in many cases the evidence will be open to interpretation, therefore it is important that evidence collection techniques maximise the information available and minimise the chance of wrong conclusions being drawn from it. Below is advice on collecting and caring for different types of evidence indicating a pest incursion.

Sightings:

- Interview the person who actually made the sighting as soon as possible. Take account of their experience but do not judge a sighting on experience alone. The most important factors are how well they saw it, ie how close, how long, what visibility.
- Ask open questions eg“tell me what you saw?, how long did you observe it? What did it look like?” DO NOT ask leading questions eg“was it light brown with a black tip on the tail?”
- Record or write everything down, including when the sighting took place and when the interview took place.
- Ensure the exact location of the sighting is recorded, if necessary take them back to the location.
- Always record the incident on the island invasion incidents database, and look for previous incident records. One vague sighting on its own may be dismissed but if you get a number of similar sightings in a similar area over time you may form a different conclusion.
- Try to establish other evidence that supports or challenges the story.

Droppings, chewed baits, feeding sign

- Photograph the evidence in situ where possible before disturbing it. If taking digital photographs, use high definition settings for at least some photos.
- When retrieving evidence to take back, physically mark the spot and collect everything ie if there are 24 suspected rat droppings there pick up all 24 and take them back not just one or two.
- Spend the time to look around very carefully for other sign such as tracks, hair, scratches etc. Remember you are not only looking for evidence of the suspected species, you're also looking for evidence which may support an alternative explanation.
- Label the evidence, including photos with lots of detail on when where who.
- If sending evidence to an expert for identification, think about the security of transporting it eg this evidence may be the crucial factor in a decision to spend thousands of dollars in a contingency response, so don't save $5 by sending it in the post instead of a secure courier pack or other traceable transport system and risk losing it.
- If the evidence is going to be difficult to identify, have more than one expert look at it independently to give their opinion. Ask each of them why they came to the conclusion they did and what other opportunities there may be to further verify this.
- Always archive the evidence, record the incident on the island invasion incidents database, and look for previous incident records. One vague piece of evidence on its own may be dismissed but if you get a number of similar things in a similar area over time you may form a different conclusion. New techniques for identification may present themselves in the future which could allow the archived evidence to be reviewed.

DNA samples

- Follow advice provided in Appendix 2

2.1 Rodent Surveillance

Surveillance is about searching for a target pest but may not necessarily involve killing the pest. Based on our current understanding of rodent behaviour in low density and island incursion situations and the likely effectiveness of various techniques, the recommendations below provide current agreed best practice for detecting rodent incursions on islands. In general it is better to detect an incursion and launch a calculated response than to routinely apply poison baits of dubious palatability in sentry bait stations. However some scenarios still recommend the sentry bait station approach for pragmatic reasons.

Chose one of the five scenarios below which is the closest match to your island:

Scenario	**Recommended surveillance for rodents**

1. The island has easy or regular servicing and too large to cover with a grid of detection devices. Examples, Little Barrier, Tiritiri matangi, Codfish	Use poison baits and traps out permanently in a range of likely habitats which are still readily serviced (providing non-target issues can be managed). Supplement this with looking for feeding sign, footprints on sand or mud and where possible use a certified rodent detection dog. Bait: Use Pestoff rodent block and refresh as required by invertebrate damage or weather degradation. In a recent trial mouldy bait was still palatable to wild caught mice, Norway and ship rats after 8 months in the field (Fisher 2006). Do not wrap baits as this decreases palatability significantly (Clapperton 2006). Bait station: Use wooden boxes (rat motels) for bait stations (preferred over plastic stations) (Spurr et al 2006). Covering station or tunnel entrances with insect mesh to reduce insect damage to bait is **not** recommended as this is likely to deter rodents from entering (Cook, 2002). Traps: Use DOC 150's in best practice tunnel. (Victor Professional traps are ok for ship rats but Norway rats have been observed to escape. For islands, the species of rat to invade next can't be predicted so snap-back traps such as these should not be used.)
2. The island has easy or regular servicing and small enough to cover with a grid of detection devices. Example Ulva, Cuvier	A broad array of detection devices laid out over the whole island at about 1 or 2 per hectare. This is the best option if it can be managed to a high standard – otherwise revert to recommendations for large islands above. What to use? Tracking tunnels which could be supplemented by waxtags with 15% peanut butter flavour incorporated into the wax. Gnaw sticks or plain wax tags do not appear to be sensitive to low numbers of rats. When to check? As a minimum do 4 checks per year (about every 3 months) more frequent would be better. Put fresh tracking cards and waxtags out for 7-10 days each time. Supplement this with looking for feeding sign, footprints on sand or mud and where possible use a certified rodent detection dog. "Reading' the cards/tags requires a high level of care and expertise to identify rodent marks among the other (native) animals and insects. Archive all cards carefully with exact locations, dates and who read them. This information may be useful to refer to when dealing with future invasion responses.

3. The island has a known history of regular rodent incursions, or you expect the likelihood of future incursions to be high	Have in place on the island: Poison bait (Pestoff rodent block) laid in buildings, a network of (empty) wooden trap tunnels in place which can be used for trapping, baiting or tracking cards. A map or list of GPS locations for these tunnels and a kit for collecting evidence of incursions must be available on the island. When visiting the island: Where possible fewer, longer visits are better than shorter, more frequent trips. Run tracking tunnels for 5- 10 days (long enough to sample but short enough to avoid cards being swamped by non-target tracking). Supplement this with looking for feeding sign, footprints on sand or mud and where possible use a certified rodent detection dog. "Reading' the cards/tags requires a high level of care and expertise to identify rodent marks among the other (native) animals and insects. Archive all cards carefully with exact locations, dates and who read them. This information may be useful to refer to when dealing with future invasion responses
4. Remote islands which are seldom visited. Examples Three Kings, Snares	Have in place on the island: Poison bait (Pestoff rodent block) laid in buildings, a network of (empty) wooden trap tunnels in place which can be used for trapping, baiting or tracking cards. A map or list of GPS locations for these tunnels and a kit for collecting evidence of incursions must be available on the island. When visiting the island: Run tracking tunnels for 5 nights or longer. Check after the first few nights and regularly thereafter for the duration of the trip. This allows for the possibility of detecting something early enough to allow a response to be planned before the pick-up transport leaves port. Use 10-20 baited tracking tunnels which could be supplemented by waxtags with 15% peanut butter flavour incorporated into the wax. A minimum of 100m spacing (doesn't have to be a strict grid, put them on most likely sites). Consider non-target risks with tunnels (eg seabirds). Supplement this with looking for feeding sign, footprints on sand or mud and where possible use a certified rodent detection dog. "Reading' the cards/tags requires a high level of care and expertise to identify rodent marks among the other (native) animals and insects. Archive all cards carefully with exact locations, dates and who read them. This information may be useful to refer to when dealing with future invasion responses

5. At least 1 rodent species already exists on the island and you want to detect new species arriving. Example Gt Barrier	Do not use poison baits for surveillance. Operate traps when visiting, look for feeding sign. If mice are the resident species you don't want to detect, use DOC 150 traps which will catch rats but not mice. If rats are resident and you want to detect mice, you may have to 'trap out' the local rat population before mice can be detected.

2.2 Invertebrate surveillance

Invertebrate surveillance on islands requires the support of experts to correctly identify species. However an awareness of potential invaders that can be successfully eradicated by all island visitors is an important first step. Collect anything that looks like it doesn't belong on the island and have it identified.

2.3 Weed surveillance

The Weed Surveillance SOP (QD-NH 1228) (DOC 1999a) is designed to assist staff in the detection and identification of populations of invasive weeds new to an area, and should be referred to for any weed surveillance planning on islands. The SOP also emphasises the importance of recording the occurrence of new weed incursions. For island infestations, new incursions will need to be entered both in the Weeds Database (Bioweb, DOC Intranet) and in the Islands Invasion Incidents Database. Note that even if a weed is successfully removed, then the infestation incident must still be recorded.

2.3.1 Staff trained	Weed observation by staff or other visitors with botanical knowledge.
2.3.2 Systematic searches	A priority on disturbed or modified areas, hut sites, camp sites, landing points, tracks etc. Searching should be in a circular pattern outward from the known infestation site. Take note of the predominant wind directions for possible spread.
2.3.3 Weed surveillance	Weed surveillance planning will be incorporated into the Conservancy's weed control and management plans and should be implemented on islands.

programmes	
2.3.4 Weed information kits	Typically contain information on weeds to look out for on the island, (including what weeds are already known to be where on the island): • Weed identification sheets with photos or drawings and a written description, • Likely places to look, • Plastic bags for specimen samples (or a plant-press for longer trips), • Tape for marking the infestation for future control, GPS for accurate location, • What to do if infestation is found, and • Basic weed control equipment, e.g., a hand-saw and some generic herbicide (e.g., Vigilant™ in a bottle-brush container).
2.3.5 Weed control	Weed control while on surveillance trip should only be attempted if the weed can be confidently identified, and if the infestation is small. For large infestations, or infestations in fragile ecosystems, then expert advice must be sought before any control is carried out.
2.3.6 Frequency of weed surveillance	Depends on the potential rate of infestation and spread, habitat type affected, and ability to find the weed. Surveillance intervals for different habitats types (e.g., forest, turf, shrub, wetland and bare), and types of weeds are given in Harris & Brown (2000). http://docintranet/content/sru/pubs/pdfs/SFC175.pdf

3 Contingency

Part IV of the conservancy island biosecurity plan provides the steps to follow in gathering information and responding to an incursion. The priority is to bring together the right expertise with an accurate and up to date awareness of the situation on the island. In all cases it is important to keep a log of events and actions during a contingency operation. An example of the sort of detail required is provided in appendix 1. Guidelines for collecting and interpreting evidence of an incursion are provided at the beginning of the Surveillance section of this manual. Some people are finding the Coordinated Incident Management System (CIMS) is useful for planning the response once a decision has been taken to respond by attempting to kill the animals see DOCDM-269152 for an example.

3.1 Pest invasion and incident response planning form

To be completed by the DOC person receiving call, or the first Conservation Officer at the scene. Once completed, a copy should be immediately given to the Area Manager. As a final record email copy to Karen Vincent for inclusion into the island invasion incidents database.

Electronic Pest Invasion Incidents Form	DOCDM-53216
Paper-copy Pest Invasion Incidents Form	DOCDM-53224

3.2 Response to a rodent incursion.

The information below provides the current agreed best practice methods that should be considered when establishing a response plan when a rodent has been detected (step 10 of the process laid out in Part IV of Island biosecurity plan).:

Option 1	The best response to a rodent incursion is to use a certified rodent detection dog to indicate where they are and hand or aerial broadcast fresh Pestoff 20R baits over a wide area in this location (covering the whole island if necessary). This method will require careful consideration of the non-target effects and logistical and legal constraints. Accessing freshly made Pestoff 20R bait may rely on finding existing stock destined for an eradication attempt elsewhere. Island Eradication Advisory Group members or the bait manufacturers (Animal Control Products Ltd http://www.pestoff.co.nz/start.htm) can assist with this. DOC consent could be applied for and granted in advance if this gave an

advantage for specific islands.

Option 2

The next best response is to use the trap/bait station network already in place on the island or where this is not possible, establish a grid of traps and bait stations. Having a network in place reduces the risk of neophobic rats avoiding newly established stations. However if mice are the target, they may be more prone to investigate new objects.

A sparse but extensive network covering as much of the island as possible is probably better if a grid has to be established. 1 to 2 devices per ha targeting preferred habitat is sufficient, doesn't need to be an exact grid because invading rodents are likely to travel. Cover all major habitat types, but focus on preferred sites and known invasion sites. When targeting mice broadcast bait if possible unless non-target issues preclude this. A high density bait station grid for mice, has a lower chance of success but can work.

Place traps where there is plenty of natural cover and where rodents are likely to be active (e.g., alongside large rocks, around the base of trees, under logs, overhanging vegetation, and under buildings). If rodent droppings, food remains or runways are visible set traps nearby. Tracks are used by invading Norway rats (evidence from radio collared rats in Hauraki Gulf), mice (evidence from Maungatautari tracking tunnel grid) and stoats, but may be avoided by ship rats (evidence from Eglington). Norway rats tend to be coastal foragers. Ship rats might prefer more interior forest.

The best trap type will depend on the target species. DOC 150 trap is good for all rats and stoats but not for mice. It has less chance of catching small lizards but may put tuatara at risk. The Victor Professional rat trap is good for ship rats but can allow Norway rats to escape and may have non-target impacts on lizards. They should not be used if the species of rat is unknown. Victor professional mouse trap with plastic pedal is recommended for mice. Under investigation is a new trap design by Bruce Thomas which may have less non-target issues than other designs.

All trapping will require trap covers to direct the target species into the trap, reduce non-target capture and keep the weather off any bait or lure used. Below are specifications for trap covers from the mainland best practice for ship rat control:

- Minimum of 400mm long., width 105mm if using 'victor professional' (*Space for trap and prevent non-target animals (e.g. weka) accessing the trap.)*
- Single entry. (*Rats have access to right end of trap*.)
- Entry hole of 45mm x 45mm (*A larger entry hole will not exclude*

non-targets like weka.)

- Easy access to check traps.
- Ability to fix to ground with a wire hoop. (*Prevent traps being disturbed by other animals (eg seabirds).)*
- Traps should be kept off ground. (*Keeps trap dryer, extends life of trap.)*
- Fully enclose the trap, (*so the trap cannot be dragged out of the cover)*.
- Stable, (*so the trap doesn't move until triggered*).

Specification for tunnel/cover designs that meet these requirements are located at:

- HAMRO-110389 (Victor snap trap);
- DOCDM-29856 (DOC150);

Bait traps with something that the rodents are already familiar with. In the absence of a clear choice Peanut butter/rolled oats mix is usually acceptable. A protein bait is more likely to attract Norway rats.

For bait stations fresh Pestoff 20R is recommended. An alternative if this bait is unavailable is to use Pestoff Rodent Block. Must be stable and secure. Wooden tunnel type stations have proven more preferred than plastic stations by Norway rats. Other rodent species are currently being tested. Use bait stations that are already in place where possible. Colour of stations does not appear important to rodents so make them visible for ease of checking.

3.3 Pest invasion kits

Pest invasion kits are for use in the case of an invasion event. A generic example Pest Invasion Kit, is provided below. This list would vary, depending on the island situations you are more likely to encounter.

3.2.1 Example generic pest invasion kit

Reference information		
☐ Copy of local contingency plan	☐ Pest report information from this event	☐ Background data on the island
☐ Map of island(s)	☐ Reference books/papers	☐ Trip log book
Record keeping		
☐ Waterproof notes books	☐ Pens/pencils	☐ Datasheets for traps/tunnels, etc
☐ Maps for records	☐ Flagging tape (colour coded)	☐ Vivid marker pens
☐ Compass	☐ GPS	☐ Specimen

			containers (jars, zip lock bags)
☐ Labels for jars or bag	☐ Phone numbers for experts, local contacts, etc	☐ 1 litre 70% ethanol	
☐ Camera, macro lens, film	☐ Plant press	☐ Hand lens	
☐ Rain gauge	☐ Hip chain	☐ Marker poles, flags	
Pest detection equipment			
☐ Tracking tunnels	☐ Dye & paper for tracking tunnels	☐ Sticky hair tunnels	
☐ Tracking pits	☐ indicator baits, (candles, soap, apples, eggs, freeze dried rats/mice, chocolate, meat)	☐ Trained dog	
☐ Peanut butter, rolled oats, salami or bacon.	☐ Light traps, sticky pads, pheromone traps	☐ Taped calls	
Pest control equipment			
☐ Snap traps	☐ Leg hold traps	☐ Cage/Live traps	
☐ Fresh baits/lures	☐ Toxin or toxic bait	☐ Herbicide	
☐ Gas for burrows	☐ Insecticide	☐ Firearms (shotgun &/or rifle)	
☐ Bait stations			
Safety and other equipment			
☐ Gloves	☐ Ropes	☐ Emergency locator beacons	
☐ 1st Aid kit	☐ Radio	☐ Frame packs	
☐ Boat & safety gear	☐ Fishing lines, etc	☐ Tools, hammers, etc.	
☐ Nails, staples	☐ Personal protective equipment		

4 People and islands

4.1 Advocacy

4.1.1 Pamphlets and brochures

Island Care Codes can be either visitor information sheets or pamphlets. Either, or both, of these can be given to visitors and volunteers, handed out with the entry permits.

The DOC staff at Kapiti Area Office prepared a generic pamphlet on protection of islands from pest animals, plants and insects. This can be used around the country and can be obtained from the Programme Manager –Threats, Kapiti Area Office.

- Information sheets are provided for Stephens/Takapourewa and Maud Islands: http://docintranet/content/sop/IslandFactSheets/StephensIsland.pdf
- http://docintranet/content/sop/IslandFactSheets/MaudVisitorGuidelines.pdf

Pamphlets are provided for visitors to the Subantarctic islands. The 'Subantarctic Islands Minimum Impact Code' and the 'Subantarctic and Southern Islands Pest and Disease Quarantine' are given to tourists, researchers and island managers:

- http://docintranet/content/sop/IslandFactSheets/SubantarticMinimumImpactCode.pdf
- http://docintranet/content/sop/IslandFactSheets/SubantarticPestPrevention.pdf

Recently, Nelson/Marlborough Conservancy produced a poster that briefly describes values of some of the island sanctuaries of Cook Strait and provides some minimum standards centred on the risks and threats of boaters visiting islands:

- http://docintranet/content/sop/IslandFactSheets/Poster.pdf

4.1.2 Signs on islands

Standards for the design of signs is covered in Guidelines for the design of Outdoor Visitor Structures.

Signs on islands which are open to the public should include interpretative material on the island's historical and natural values, and inform the visitor of any hazards.

Signs on closed islands should clearly inform any visitor that a permit is required for entry. For example interpretive signs see the Kapiti signs in the advocacy section of the Island Biosecurity Network

4.1.3 Public awareness programmes

The following document provides guidance on developing a public awareness programme: Guidelines for Community Relations in Conservation Projects.

4.2 Staff training

4.2.1 Ecological Management Skills training courses

Several of the Ecological Management Skills training courses are relevant to island best practice. For details contact Dale Williams or Suzy Randall.

4.3 Entry permits

4.3.1 What islands require permits?

All islands which are designated: Nature Reserve, Special Area of a National Park or Wildlife Sanctuary, require a permit for entry. Also, some Scenic Reserve islands may require permits. There may be other islands that require an entry permit; check the Conservation Management Strategy.

4.3.2 Who requires a permit?

All visitors.

Some conservancies (or areas) may choose to issue permits to staff as a tool to ensure quarantine standards are being maintained, and to keep track of activities on the island(s), however in general, DOC staff undertaking **approved, departmental work** do not require entry permits.

Permits must comply with:

- The Act that the permit was issued under;
- CMS or island management plans;
- Island Biosecurity plans.

Permits may be accompanied by:

- Minimum Impact Codes.
- Quarantine pamphlets and checklists.
- Hazard Identification Information.
- Current work being carried out on the island.
- Information sheet about the features and conservation values of the island(s).

Permits may have the following conditions:

- File reference
- Date of issue
- Name and address of permit holder and/or trip leader
- Period of entry
- Purpose of entry
- Only authorises entry to the named islands for the purposes outlined.
- The holder shall comply with all laws and regulations.
- The permit is not transferable, and may be revoked or its conditions varied at any time.
- Schedules of: approved activities; party members; and special conditions.

4.3.3 Permitting conditions

Prior to entry:

- The Department accepts no responsibility whatsoever in connection with transport, accommodation and safety of the permit holder.
- A comprehensive safety plan is required. The Department may require the plan to be reviewed.
- The permit holder must arrange transport to the island.
- The holder will indemnify the Department against all claims, which may be made against the Department in respect of any loss, damage or injury arising out of the exercise of this permit.
- The permit holder is responsible for making their own arrangements if they require urgent evacuation from the island through illness, accident or other eventuality whatsoever. Should assistance be sought in this connection, any assistance that may be afforded must be paid in full by the permit holder.
- The holder must comply with the Departments quarantine, packing, checking; clearance; daylight loading, departure, and landing requirements.
- Offshore anchorage (no mooring ropes except in emergency).
- Crew left on vessel at all times.
- Ensure that the Departments other research or management priorities beyond the party's principal objectives can be co-ordinated with the permit holders objectives.
- Radio schedule details or other communication requirements.
- An agreed process for seeking departures from the approved research or management programme.

During visit:

- Only permitted (approved) activities and equipment on the island.
- The party shall abide by the directions of any Departmental representative or any written guidelines.
- No fires.
- No animals are to be introduced.
- No plant life to be introduced.
- No soil or rocks dug or removed.
- No rubbish left on the island
- No buildings erected or modified.
- No cutting of tracks or damage or taking of any thing (alive or dead) on the island.
- Camp only at authorised places.
- Inter-island quarantine to be maintained.

After visit:

- Report any evidence of major ecological changes that

have or are occurring.

- Make all photographs or video available to the Department for inspection or copying on request.
- Provide a report to the Department within 3 months of the visit. Including an outline of research done, preliminary results, proposed publication, and any matters relating to the management of the island.
- A copy of any subsequent papers or reports should also be forwarded to the Department.

Sign-off:

- By staff member with the correct delegation and by permit holder.
- Check for any other permits needed.

4.3.4 Example permits

Kapiti Island "Conditions of Permit" accompanied by booklet about Kapiti Island Nature Reserve:

- http://docintranet/content/sop/IslandFactSheets/Conditions1.pdf
- http://docintranet/content/sop/IslandFactSheets/Conditions2.pdf

4.4 Relevant contacts

Internal biosecurity response

Any new incursion should be reported immediately to:
Chief Technical Officer Biosecurity:

Geoff Hicks
ph 04 4713 063or VPN 8063, or 021 471 306.

If unavailable try Biosecurity Technical Officer:

Joanne Perry
ph 04-4713251or VPN 8213 or 0274-967408.

Also see: Internal Biosecurity Response Procedure (QD-NH 1323)

New Zealand Defence Forces liaison

If support from New Zealand Defence Forces may be required, then insert contact details. (This may be applicable for Kermadec's, Chathams, and Subantarctic islands.) It is a role for Conservator or Area Manager.

Position	Location	Phone
Director Joint Operations and Plans	Defence Operations Room, Wellington	04 496 0999

Appendix 1 Example diary of Contingency operation

Mokoia Island Rat Diary February 2002

Friday 01/02/02: Two tracking tunnels recorded positive rat prints on two different lines and were from the NE corner of Mokoia and were located 900 metres apart (line 5 & 1). Reported by Wendy Diamond, the Hihi contractor. (rat could have had seven days between checks to move around). Prints were id'd by Craig Gillies' chart of rat prints and response was planned on Friday afternoon to be initiated on Saturday (as per response plan).

Saturday 02/02/02: Carmel, Phil, Bruce, George, Lisa, Beata, Brain, Nigel – checked rat tracking lines x two and found two tracking tunnels with positive rat prints located 25 metres apart. Initiated response, Alternate rat traps / bait stations at 50m grid. Eight lines of four traps/bait stations put in around site of last sign (see map).

Monday 03/02/02: Carmel, Phil, Bruce, George, Lisa, Beata, Brain, Warrick, Maurice- checked rat tracking lines x five and found no rat sign. One trap on grid sprung and rat escaped leaving fur in trap so be sent away for id. Re-evaluated grid size and modified to 25x 25mtr. Put in remainder of the grid around area of most recent sign. We now have 20 lines of four traps/bait stations in core area (also spoke to Ian McFadden and he said response was good).

Tuesday 04/02/02: (Nigel, Beata) Checked rat tracking lines x five and found no rat sign. Checked entire grid and found no rats but one sprung trap with no fur or bait take (probably not sprung from a rat) and one bait station has two baits lying outside station but untouched (probably weka disturbance).

Thursday 06/02/02: Nigel, Neville) Checked rat tracking lines x five and found no rat sign. Checked entire grid and found no rats.

Friday 07/02/02:

Appendix 2 Genetics for Island Biosecurity

James Russell

September 2006

Genetics is a powerful tool which is now readily available at a reasonable price to conservation managers to answer questions where other methods have failed. In particular genetics can help address the following questions:

- Identifying the animal species
- Evaluating the level of isolation of a population (an island) prior to eradication
- Understanding migration patterns between islands
- Identifying the source population of an individual of unknown origin
- Identifying new invaders versus survivors after an eradication failure

This guide provides the Department of Conservation with a description of what genetics can (and can't) be used for.

1) Sample collection

DNA can be found on almost any item that has been in prolonged contact with a living body. Forensic scientists have been using this technique for many years to solve crimes. With the right type of sample island biosecurity questions can also be solved. For island biosecurity purposes the best sources of DNA are from bodies (tissue), hair, feathers or faeces. DNA can only survive outside of living organisms if it is preserved correctly. When preserved correctly DNA can live for many thousands of years (e.g. preserved mummies). For island biosecurity purposes DNA will become very hard to isolate after the sample has been exposed for more than 3-4 weeks. Samples should be preferably stored in 70-90% ethanol, else frozen. It is not necessary to have a large sample, e.g. only a piece of rat tail and not the entire body is required. It is VERY important to label your samples properly with date, type, location (preferably GPSed) and collector.

2) Analyses

DNA is effectively a genetic fingerprint of an individual organism. There are many different types of genetic analysis that can be done, and it is important to choose the right one for your scale. Methods for identifying the species may be different to those for identifying the source of the individual e.g. when rats invaded McKean Island in the Phoenix Group mitochondrial DNA (mtDNA) was used to determine the species as Asian ship rat (*Rattus tanezumi*). It is important that you know what taxa or group of organism your sample is from (e.g. rat or ant) but this is usually obvious.

DNA can also be used to determine where an individual has come from. To do this you will probably need more genetic samples from locations you think the individual came from, otherwise you can only tell that it didn't come from one place. e.g. when rats were found again on Pearl Island after eradication 9 months earlier, DNA was used to determine if they were survivors or reinvaders from the mainland. NOTE this is only possible because DNA was collected before the eradication (10 samples). Without this it would not be possible. Genetic samples are a valuable database of living information. Generally microsatellite markers are the most informative at the population (island) level.

3) Contamination

Contamination is not a major issue in DNA analysis. If a person has touched rat faeces then the DNA will still clearly appear as rat DNA. This will be obvious to the scientist doing the analysis.

3) Costs

Costs will depend on who you get to perform the analysis for you, what type and how preserved the DNA is and whether their laboratory is set-up for analysing this type of species. As an indication, to analyse one rat sample would cost a few hundred dollars. To analyse many samples costs may go down to as low as $50 a sample. If the lab is already doing some work on this species, then costs may be lower. Most costs are in buying start-up chemicals specific to the group of animals

you are working on. e.g. when possible rat faeces were found on rat-free Otata Island in the Hauraki Gulf, after all other methods had been used (predator dogs could not locate the rat, expert opinion on the faeces suggested rat), DNA analysis using microsatellites (allowing individual identification) was able to confirm that the rat was the same one that had been released on a nearby island 400m away (where a contingency DNA sample had been taken from earlier). Analysis was cheaper because the University of Auckland laboratory was already set-up for rat DNA analysis and so no new chemicals were required.

4) Contacts

Currently these groups in New Zealand can do molecular analysis

Robyn Howitt
Research Assistant
Ecological Genetics Laboratory
Landcare Research
Private Bag 92170
Auckland
New Zealand

231 Morrin Road
Tamaki Campus
University of Auckland

Ph: +64 9 5744117 (DD)
Fax: +64 9 5744101

Email: HowittR@landcareresearch.co.nz

Biological Sciences Genetics laboratory

Contact Neil Gemmell

Allan Wilson Centre for Molecular Ecology and Evolution

Massey University

Contact ???

5) References

For more information and examples see the following papers

Abdelkrim, J., Pascal, M. & Samadi, S. (in press). Establishing causes of eradication failure based on genetics: Case Study of ship rat eradication in Ste. Anne archipelago *Conservation Biology*.

Frankham, R., Ballou, J. D. & Briscoe, D. A. (2002) *Introduction to conservation genetics*. Cambridge University Press, Cambridge, UK.

Rollins, L. A., Woolnough, A. P. & Sherwin, W. B. (2006). Population genetic tools for pest management: a review. *Wildlife Research* **33,** 251-261.

Russell, J. C., Towns, D. R., Anderson, S. H. & Clout, M. N. (2005). Intercepting the first rat ashore. *Nature* **437,** 1107.

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Glossary and definitions

Biosecurity	Protecting an island (or secure area) from a target pest. (It encompasses both quarantine and contingency operations.)
CMS	Conservation Management Strategy.
Contingency operation	Containing the target pest once it has arrived on the island (or secure area).
Control	Reduce the numbers of a pest on an island (or within an operational area) to a level where their impact is minimised or mitigated, when measured against an indicator species.
EPIRB	Emergency Position Indicating Radio Beacon
Eradication	Completely remove all living examples of the pest from an island (or operational area).
IEAG	Island Eradication Advisory Group provide expert advice to DOC staff on island and eradication best practice. The IEAG members are: • Keith Broome (Chair) • Pam Cromarty • Andy Cox • Ian McFadden • Raewyn Empson
Invasion incidentype	**Interception**: Where a pest is detected in a secured area either on the mainland or on the island, e.g., quarantine store, wharf, helicopter pad, vessel, aircraft, or on the island while unpacking, etc. Implies: picked up outside a barrier. **Incursion**: Where a pest is found in the wild on an island or steppingstone island. Implies: a breach; having got past a barrier. **Establishment**: Enough individuals found for a breeding population to establish or evidence of breeding or young found. **Spread**: Pest has already spread over the island at the time of detection. Suspicion of invasion: Level of certainty for a possible pest sighting. Used where: • a bird-wreck has been recovered with possible bites or mauls on it; • a bird-wreck which doesn't necessarily have any bites or mauls on it but where a pest has been reported in the vicinity; or • a second-hand report of a pest has been made.

Island cluster analysis	The process by which islands are grouped into manageable units. Generally, islands are grouped by where they are serviced from.
Lead GM	General Manager accountable
Neophobia	Fear of new things; reference to rats, cats or other pests experiencing new baits, bait stations or traps within their territory.
Pest	An organism which is not wanted on the island or other biologically significant area. Includes both animals and plants.
Quarantine	Kill the target pest before it reaches the island (or other secure area).
Risk assessment	Risk is assessed by considering the consequences and probability of a pest invasion event occurring.
Strait	Body of water between islands or an island and the mainland.
Surveillance	Active searching for a target pest; it may not involve killing the pest.
Virkon™ footbath	Virkon™ footbaths consist of an absorbent mat inside a sealed plastic box. The mat is soaked in a solution of “Virkon S” so that island visitors can tread through the box which is then re-sealed. Supplies of Virkon™ are available from stock and station agents. While relatively safe for human contact, it should not be used on bare skin and splashes should be washed off immediately.

References

Booth, Andrea. comp. 2001. Argentine Ant Quarantine Plan, Northland Conservancy. Technical Support Unit, Department of Conservation, Northland Conservancy.

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