



BIOSECURITY HANDBOOK

1st Edition – September 2013

BAS Environment Office



**British
Antarctic Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



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UPDATE PROCEDURES

If you have any suggestions for the revision of the BAS Biosecurity Handbook, please contact the Environmental Office at BAS Cambridge. Revised versions will be distributed via the intranet. Hard copies are not controlled but the following personnel will be advised when a revised version of the Handbook is released:

BAS internal distribution:	
Senior Environmental Manager	Health and Safety Advisor
Environmental Manager	BCs' Office - Cambridge
Environmental Research and Monitoring Manager	Rothera Logistics Coordinator
Heads of Operations	Rothera Base Commander (winter & summer)
Operations Manager	Rothera Bonner Laboratory Manager
Field Operations Manager	Halley Logistics Coordinator
Cambridge Logistic Store Manager	Halley Base Commander (winter & summer) & Station Support Manager
Senior Purchasing and Shipping Officer	Bird Island Base Commander (winter & summer)
BAS Library	South Georgia Logistics Coordinator
BAS Representative, BAS Falkland Islands Office	Signy Base Commander
Senior Shipping Officer	King Edward Point Base Commander
Chief Officer, RRS <i>Ernest Shackleton</i>	Chief Officer, RRS <i>James Clark Ross</i>
Head of the Programme Office	Board Member for Science Delivery
Head of Estates	Head of Vehicles and Plant
Head of Human Resources	
External distribution:	
Polar Regions Department, Foreign and Commonwealth Office	External Packing Company
GSGSSI Environmental Manager	

INTRODUCTION

Many species have been moved around the world through human activities to areas they would not reach naturally. Once in a new location, these 'non-native' species may establish. If they become invasive they can have severe impacts on local species and ecosystems. The Antarctic region has not escaped this threat. The introduction of invasive species, including vertebrates, invertebrates and plants, has greatly altered the ecosystems of many sub-Antarctic islands. In contrast, the Antarctic continent currently has few confirmed non-native species, but numbers are increasing.

Future increases in human presence in the Antarctic region, either through tourism, governmental operators or other commercial activities, will increase the risk of further non-native species introductions. At the same time, climate change may increase the chances of non-native species establishment and range expansion. Ensuring effective biosecurity measures are applied throughout the Antarctic region in a timely manner is an urgent challenge for the Antarctic Treaty nations and the Antarctic community as a whole.

The Antarctic Act (1994, amended 2013) and the Government of South Georgia and South Sandwich Islands Wildlife and Protected Areas Ordinance (2011) legislate to minimise the risk of non-native species introductions in Antarctic and South Georgia, respectively, and BAS is obliged to conform with this legislation.

BAS logistical operations occur over a large footprint that includes the UK, the Arctic, South Georgia, Antarctica and associated gateway ports. The complexity of operations involving large volumes of cargo, aircraft, ships, personnel and seven stations make it essential that biosecurity measures are well-considered, implemented and conform to legal obligations. Furthermore, that BAS activities cover several polar areas of distinct biological diversity, means that human transfer of species within Antarctica presents a substantial risk to otherwise isolated local wildlife populations.

Recent research has identified pathways by which non-native species enter Antarctica and has quantified the risk of species introductions and establishment. Based on this research, the Antarctic Treaty Meeting of Experts on Implications of Climate Change for Antarctic Management:

- (i) emphasised that the greatest effort should be placed on preventing the introduction of non-native species, and on minimising the risk of human assisted introductions through national programmes and tourism activities, and
- (ii) stressed the importance of ensuring comprehensive implementation of new measures to address this risk.

This handbook set out practical biosecurity measures which, to the maximum extent practicable, conform to current best-practice regarding non-native species management produced by the Antarctic Treaty Consultative Meeting (ATCM) Committee for Environmental Protection (CEP), the Council of Managers of National Antarctic Programs (COMNAP) and the Scientific Committee on Antarctic Research (SCAR) (See Appendix 1).

The Environment Office welcomes any questions, feedback or suggestions regarding Antarctica biosecurity. To discuss any biosecurity issues please contact:

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SECTION 1:

GENERAL

BIOSECURITY

MEASURES

- All biosecurity breaches and near misses should be logged on the Accident, Incident, Near-Miss and Environment (AINME) Reporting System.
- If you see anything that could represent a biosecurity risk and that requires immediate action (e.g. a rat on Bird Island), please take all reasonable action you can to deal with the risk without endangering yourself or your colleagues. Inform the Base Commander at the earliest opportunity.
- The BAS point of contact (e.g. PI, co-PI, named contact, LOU signatory, Programmes Office, Board Member for Science Delivery, Head of Human Resources) is responsible for ensuring that all non-BAS visitors to South Georgia and Antarctica operating under BAS logistics are made fully aware of the contents of the BAS Biosecurity Handbook.
- If any invertebrates (e.g. fly, spider, beetle, etc.) are found within station buildings or on ships, every effort should be made to capture and eradicate them.
- All human waste, which contains non-native microorganisms, must be disposed of in accordance with the BAS Waste Management Handbook and the Environmental Impact Assessment for the project.
- Individuals shall not import any of the following into South Georgia or Antarctica:
 - Any living plant, animal or microorganism (unless in possession of a GSGSSI permit or a Section 12 permit issued under the Antarctic Act)
 - Non-sterile soil or compost
 - Any plant propagules (e.g. seeds, bulbs, cuttings) or invertebrate eggs (e.g. brine shrimp or sea monkey eggs)
 - Untreated wood where bark remains attached
 - Any perishable foods including fruit, vegetables, cheese, fish or meat.

N.B. BAS imports fresh foods to Antarctica and South Georgia for consumption by visiting personnel.

PLEASE ENSURE THAT ANY PERSON THAT IS LIKELY TO SEND GIFTS OR PACKAGES TO YOU WHILE IN SOUTH GEORGIA OR ANTARCTICA IS ALSO AWARE OF THESE RESTRICTIONS

SECTION 2: CLOTHING AND PERSONAL EFFECTS

Measures to be applied by all visitors before entering Antarctica and/or South Georgia

- Immediately before leaving home for Antarctica and/or South Georgia, ensure that all outer clothing has been washed, at the hottest temperature suitable for the garment, to remove seeds, soil and other propagules. Pay particular attention to all Velcro, gaiters, pockets, turn-ups in trousers and hoods of jackets. Footwear should be cleaned (inside and out) to remove soil, seeds or any other plant material.
- Try to avoid picking up soil, seeds and other propagules on your clothing during travel to Antarctica (i.e. be careful to ensure clothing is clean after walking in the countryside in the Falkland Islands or around Punta Arenas).
- If possible, before entering Antarctica wear new items of outer clothing which will be free of non-native species and propagules.
- If moving between BAS stations please check clothing and personal belongings to prevent transport of biological material between sites (especially from South Georgia station to Antarctic locations).
- Before handing in any personal items to BAS Logistics Stores (Cambridge) for transportation to Antarctica, ensure that all personal cargo and belongings are clean and free of soil and propagules.
- Ensure all clothing and personal effects are packed indoors in a clean environment.

BAS kit bags and personal clothing

Kit bags remain the property of BAS, and all clothing and kit should be returned to BAS after use.

- BAS staff who retain a full kit bag in stores should ensure that its contents are fully washed and are free of soil, dirt and any propagules at the end of each season. This is particularly relevant if the clothing was used in the Arctic, sub-Antarctic or other high altitude cold region, as propagules picked up in these locations may be able to survive and establish if they drop off clothing in Antarctica (and vice versa).
- Staff taking their own personal field clothing to Antarctica must ensure it is clean, particularly if it has been used between Antarctic seasons.
- As far as is practicable, BAS clothing and other kit issued for use in Antarctica should not be used in the Falkland Islands or South America while in transit to BAS stations.

- Brand new clothing will be free of soil and propagules. Therefore, if possible, new clothing should not be used until just before boarding the BAS aircraft or after the ship has departed for Antarctica.

SECTION 3: CARGO

Cambridge Logistic Stores

- As far as is practicable, cargo storage and packing areas in the UK should be free of weeds, plants and invertebrate infestations.
- Adequate rodent and pest control must be undertaken in BAS controlled cargo packing and storage areas (i.e. regularly inspected sticky traps for insects and bait boxes for rodents).
- Store doors are to be kept closed, whenever possible.
- Cargo is to be stored inside, where possible.
- Cargo packing and storage areas shall be deep cleaned at least once per year.
- As far as possible, shipping containers should be stored on concrete surfaces (as opposed to bare earth).
- Shipping containers are to be kept clean and, if deemed necessary by the stores management, washed inside and out before being sent to Antarctica.
- If feasible, just prior to being sealed for the last time before being sent south, containers should be fumigated using a single-use pyrethrum fogger, to eradicate any invertebrates within.

Packing container and packing material specifications

- Reused packaging (e.g. reusable Nefab boxes or aluminium trunks) is permitted for packing purposes provided it is inspected and thoroughly cleaned (preferably with disinfectant) prior to repacking. All containers shall be lined with plastic sheeting.
- No used meat, fruit or plant product cartons shall be reused.
- No polystyrene beads or chips, soil, moss, used sacking, hay, straw, chaff or wood shavings shall be used.
- Packaging and filling materials may include shredded paper, vermiculite, bubble wrap and other air-filled cushioning materials.
- As far as is practicable, all wood packaging likely to be off-loaded at South Georgia and in Antarctica (such as cases, crates, dunnage, pallets and timbers for the purpose

of bracing, separating, protecting or securing cargo) should be new and comply with the International Standards for Phytosanitary Measures No. 15 (ISPM 15). Wooden packaging that remains on the ship (i.e. is not off-loaded) does not have to comply with ISPM 15.

- Where other cost-effective options exist, use of corrugated card board boxes should be minimized, as they may carry non-native invertebrates within the corrugations.

Cargo inspection and packing specifications

- All cargo items, including drums, shall be visually inspected to ensure they are free of insects, seeds, propagules and soil during packing and unpacking (at South Georgia and Antarctica).
- If insects, seeds, propagules or soil are found associated with cargo they must be removed and the item cleaned before packing or use. If scientific equipment (e.g. logging stations or cabling) is assembled or laid out on grass, bare earth or other vegetated ground prior to being sent south, particular care should be taken to ensure it is free of soil and organic matter before packing.
- It may be impossible to seal some large or irregularly shaped cargo items in standard cartons or boxes (e.g. scaffolding or trunking). Every effort shall be made to ensure such cargo is free of biological material. If practical, large or unusually shaped cargo should be wrapped in plastic film and/or have openings covered with cardboard or plastic to prevent access by rodents, invertebrates or soil.
- To the maximum extent practicable, reusable packaging (i.e. reusable plywood Nefab boxes) should be dedicated for cargo transport to KEP and Bird Island or Antarctic stations. Wherever possible, reusable packaging for use at KEP or Bird Island should not be used to transport cargo to Antarctica or other locations, unless thoroughly cleaned first.
- Boxes and cartons destined for South Georgia should be fully taped and sealed shut prior to loading. Where practicable, cardboard boxes should not have hand holes cut, but use plastic handle inserts that prevent access of non-native species.
- All cargo arriving on the South Georgia mainland shall be taken directly to the KEP biosecurity facility for inspection, unless alternative arrangements have been made with the Government Officer.

External packing company (e.g. Walkerpack Ltd.)

- The area around the store doors is to be kept free of weeds and plants.
- The stores are to be kept clean and free of dust and litter.
- Store doors are to be kept closed, whenever possible.
- Cargo is to be stored inside.
- Insect traps are to be deployed within the stores.
- Rodent bait boxes are to be deployed within the stores.
- Wooden crates, pallets and packing materials are to meet ISPM 15.

Procedures for vehicle cleaning

Vehicles, such as quad bikes, snow mobiles and plant machinery, are transported routinely into and around Antarctica by ship and aircraft from a wide range of locations. As biological material (e.g. plant fragments, seeds, insects and microorganisms) and soil can become attached to vehicles during everyday use, when vehicles are moved from one location to another, these materials may also be transferred. Transported vehicles therefore have the potential to act inadvertently as vectors that can carry biological organisms over large distances to areas where they are not normally found.

The following procedures have been created to reduce the risk of biological material being transported into and around Antarctica associated with vehicles:

- The term 'vehicles' describes all wheeled, tracked or skied machinery, both powered or unpowered, that moves or is moved over ice and/or ice-free areas. This includes all snow mobiles, quad bikes, construction vehicles, bulldozers, trailers, snow blowers, heavy plant and aircraft that are transported to Antarctic by ship.
- Vehicles should be inspected to ensure that they are free of visible soil and biological material (e.g. plant fragments, seeds and insects) and if necessary thoroughly cleaned before being loaded into aircraft or ships for transport into the Antarctic, or between field sites or research stations within Antarctica.
- Where practicable, high-pressure steam/hot water cleaning of vehicles is recommended. Alternatively, vehicles may be cleaned manually, such as with a bucket of water and brush. The objective is to ensure that no soil, mud or biological

material is left on the vehicle, including the wheels, wheel arches, tracks and areas underneath the vehicle. Vehicle accessories, such as forks and buckets, should be cleaned in a similar manner.

- Where practicable, vehicle interiors, upholstery and mats should be brushed and/or vacuum cleaned to remove any soil or biological material.
- Following cleaning, care should be taken not to contaminate the vehicles prior to loading onto the ship or aircraft. Vehicle storage facilities should minimise the potential for recontamination of cleaned vehicles prior to transport and, if necessary, arrangements should be made to thoroughly clean the vehicles at the ship or aircraft loading site.
- Immediately before being loaded onto the ship or aircraft for transportation, all vehicles should be checked by a designated person to ensure they are free of soil and biological material. If any soil or biological material is found, the contaminated vehicle should be cleaned and re-inspected before being transported.
- If transported into the Antarctic Treaty area (i.e. the area south of Latitude 60°S) and South Georgia, where practicable vehicles should also have their engines started before loading, to ensure rats and mice are not living in the engine compartments.

If a vehicle is known or suspected to have been transported to, or within, Antarctica without being cleaned, the incident shall be recorded on the AINME system and, in consultation with the BAS Environment Office, appropriate action taken to prevent recurrences.

1. If the un-cleaned vehicle has not been unloaded from the ship or aircraft, where practicable it should be cleaned before off-loading. The removed soil or biological material should be collected into a sealed container and disposed of immediately by incineration or removed from the Antarctic Treaty area for disposal. If this is not possible, the un-cleaned vehicle should not be unloaded, but returned to the originating location.
2. If the un-cleaned vehicle has been unloaded from the ship or aircraft, as far as it practicable, it should be re-loaded immediately and then either cleaned in accordance with (1) above, or removed from the Antarctic Treaty area. Prior to re-loading, precautions should be taken to avoid spreading any attached soil or biological material from the vehicle to other locations in the local area. If re-loading the vehicle is not possible, the vehicle should be cleaned to remove all soil and biological material. Every effort should be made to collect and isolate the detached soil and biological material in a sealed container before disposal by incineration or removal from the Antarctic Treaty area.

Extraordinary events and unusual cargo

Should unusual types or quantities of cargo be required on South Georgia or in Antarctica (due, for example, to extraordinary levels of construction work or scientific activity) then the BAS Environment Office should be contacted to determine if further biosecurity measures are possible. Unusual cargo may include:

- materials for construction of buildings
- building aggregate
- ISO containers on South Georgia.

Transfer of cargo between KEP and Bird Island

Non-native species exist at KEP that are not found on Bird Island (examples include, bittercress and dandelions). It is essential that adequate biosecurity measures are implemented to prevent spread of non-native species within South Georgia:

- As far as possible, transfer of cargo between KEP and Bird Island should be avoided.
- If transport of cargo between locations within South Georgia is necessary, all cargo items shall be visually inspected to ensure they are free of rats, insects, seeds, propagules and soil during packing and unpacking.
- If insects, seeds, propagules or soil are found associated with cargo they must be removed and the item cleaned before packing or use.
- If the introduction of rats to Bird Island is suspected or confirmed, please refer immediately to the British Antarctic Survey 'Bird Island Rat Contingency Plan' (See Appendix 2).
- If the introduction of rats to KEP is suspected or confirmed, please contact the Government Officer immediately.
- When transporting cargo between permanent settlements on South Georgia, boxes and cartons should be fully taped and sealed shut prior to loading.

Transfer of cargo from Signy Island to other Antarctic locations

Two non-native species (a flightless midge and a worm) exist in the soil around Signy Research Station. To prevent the spread of these species, care should be taken to ensure all cargo exported from Signy to other Antarctic locations is free of soil and organic material.

SECTION 4: FRESH FOODS

Fresh food importation and storage

Fresh foods (eggs, fruit, vegetables) imported to Antarctica and South Georgia may contain soil, insects, slugs, caterpillars, invertebrate eggs, mould and/or other microorganisms (fungi and bacteria).

- To the maximum extent possible, fresh fruits and vegetables should be sourced from suppliers pre-washed, so that the produce is provided to stations soil-free.
- Food packaging material (cardboard boxes, sacks, plastic wrapping, etc.) contaminated with food, soil, invertebrates, blood and/or egg shell, white or yolk, should be (i) incinerated or (ii) packaged and stored until removal/incineration on the ship.

Importation by aircraft

- Rothera station management shall inform the BAS Agent in Punta Arenas or suppliers in Stanley that, to the maximum extent practicable, fresh foods are to be supplied to the stations free of soil, invertebrates and mould.
- Following the arrival of the aircraft at Rothera, imported fresh foods shall be kept in their packaging (sacks, cardboard boxes) until taken from the aircraft to the designated food storage area.

Importation by ship

- With the exception of sealed pre-packaged fresh produce transported between Stanley and King Edward Point (which is checked within the KEP biosecurity facility), all produce shall be checked for invertebrate infestation and excessive mould before it is off-loaded to the station. If excessive invertebrate infestation and mould is found, the fresh food shall not be off-loaded.
- If fresh produced is off-loaded to the station with invertebrate infestation and/or excessive mould it shall be sealed in plastic and returned to the ship immediately for disposal according to the BAS Waste Management Handbook.

Food storage area

- Once on station, fresh foods shall be (re)checked and any non-native invertebrates removed and destroyed. Checks should be undertaken in an area where any 'escapees' can be contained and eradicated (fly spray should be kept to hand).

- When fresh foods arrive on station, they shall be stored in designated areas, preferably under cool conditions (fridge, cool storage area).
- Food storage areas shall have operational electric UV insect killers.
- Sticky insect traps shall be deployed in food storage areas. Traps shall be checked monthly and replaced as necessary.
- Food storage areas shall be cleaned regularly (weekly) to remove any organic material.

Fresh foods disposal

UNDER NO CIRCUMSTANCES SHALL FOOD OR FOOD SCRAPS BE FED TO LOCAL BIRDS

- Wet food waste, including scraps, peelings, tea bags, etc., is dealt with differently at each station. All food waste shall be disposed of in accordance with the BAS Waste Management Handbook.
- Special care should be taken with waste poultry products (including meat, eggs and egg shells) as they can carry avian viruses which endanger Antarctic birds. To reduce this risk, only boneless poultry should be sent to BAS stations. No poultry products other than egg powder shall be supplied to field camps working near bird colonies.
- At Rothera and Halley stations, poultry waste shall be incinerated along with other food waste. At all other stations, waste poultry products should be boiled for 10 minutes to kill microorganisms and then be disposed of with other food waste. Egg shells should be boiled or microwaved and sent to landfill. On board ship, waste poultry products shall be incinerated.

Fresh food cultivation

- Within BAS stations, cultivation of plants from outside Antarctica for decorative purposes is not permitted.
- Cultivation of fresh foods using a hydroponic system is not permitted on any BAS station. However, hydroponic cultivation of fresh foods at Halley VI Research Station may be possible under certain controlled and regulated conditions. Please seek advice from the BAS Environment Office and permission from the Halley Operations

Committee before commencing any hydroponic cultivation of plants at Halley VI Research Station.

- Sprouting of beans, cress and mustard is acceptable on a small scale at all BAS stations, but only under the following conditions:
 - It must be undertaken only by the Chef Manager (Rothera and Halley) or, on smaller stations, by an individual designated by the Base Commander who should be informed in writing that sprouting is permitted (please copy in the Environment Office on the e-mail giving permission)
 - no soil must be used during sprouting
 - all sprouting must be undertaken indoors
 - all washings must be discharged to a sewage treatment plant or the sea (i.e. down the station sink)
 - All sprouting containers must be thoroughly washed in hot water with detergent.
 - If any invertebrate infestations occur, every effort must be taken to contain and destroy the invertebrates. All plant material must be thoroughly microwaved or boiled for 10 minutes before disposal. Any infestation events must be reported on the AINME system and the Environment Office informed.

Specific guidelines for fresh food handling on mainland South Georgia

The following policy was issued by the South Georgia Government and applies to operations working out of King Edward Point specifically.

FRESH PRODUCE HANDLING POLICY

July 2013

Upon arrival, all fresh produce must be taken directly to the biosecurity facility where it should be checked for signs of infestation by fungus, non-native invertebrates, soil from outside the territory, or non-native plant seeds.

If a shipment is heavily infested, it should be immediately returned to the sender/re-supply ship for disposal/incineration. If only a few items are affected, the following remedial action should be taken to reduce the biosecurity risk:

- If an item has fungal growth, the infected part should be excised and placed in Virkon S for 24 hours. After this period the material can be disposed of at sea with other, non-contaminated, food waste.
- If live invertebrates are found they should be killed immediately with insecticide spray or placed in ethanol. Be aware that if live or dead invertebrates are seen, there may also be microscopic eggs that could hatch at a later date. Extra vigilance should be exercised.
- If there are non-native plant seeds associated with the packaging or outer surface of the produce they should be rendered inert by either incineration or by boiling them in water for 10 minutes. Seeds may be stored in a sealed container and batch processed if necessary.
- For items with a small amount of surface soil, it may be removed either by removing the skin/peel or by using a dry brush. The material should then be left to soak in Virkon S for 24 hours. After this period the material can be disposed of at sea with other, non-contaminated, food waste

A log of all biosecurity checks and biosecurity breaches should be kept.

Once processed in the biosecurity facility, fresh produce should be taken to a designated food storage area i.e. food store, kitchen.

No fresh produce should be taken beyond King Edward Point or Grytviken.

SECTION 5: AIRCRAFT

General measures for aircraft

- Aircraft interiors should be kept clean and free of soil and biological material.
- To prevent insects coming aboard, aircraft doors should be kept closed whenever possible.
- Night time loading of cargo should be minimised as insects may be attracted to any lighting within the aircraft.
- Insecticide should be kept available to eradicate any insects discovered in flight.
- Passengers and crew may be required to conform with additional biosecurity measures once they have arrived at their Antarctic destination.
- To the maximum extent practicable, camping equipment stored aboard the aircraft should be kept free of soil and organic material, preferably by restricting camping to areas of permanent snow or ice. If the camping equipment is used on ice-free ground, it should be checked thoroughly and, if necessary, cleaned at the earliest opportunity.

Inter-continental travel to Antarctic by aircraft

Visitors travelling by aircraft can transport non-native species and propagules rapidly from the outside Antarctica (e.g. UK, Punta Arenas, Stanley) to Rothera Point or other areas of Antarctica.

- Immediately before leaving home for Antarctica, ensure that all outer clothing has been washed, at the hottest temperature suitable for the garment, to remove seeds, soil and other propagules.
- Try to maintain clothing in a clean state during travel to Antarctic gateway airports (i.e. Stanley or Punta Arenas).
- If outer clothing has been worn in park, farmland or vegetated areas when waiting in transit or at the gateway ports, please take precautions to remove any soil or organic material.
- If washing facilities are not available at gateway ports, store any clothing item(s) that may contain propagules in a plastic bag and wash immediately upon arrival, e.g. at Rothera Research Station.

- If possible, put on newly laundered outer clothing just before travelling to Antarctica on the aircraft.
- Upon arrival at Rothera aircraft apron, boot and shoe washing facilities will be provided by station management. Visitors shall scrub the soles of their shoes and boots in a disinfectant solution to remove soil and other propagules.
- Station management will undertake spot checks to ensure visitors have complied with the measures described here. If a visitor's clothing items, luggage or equipment is found to contain soil, seeds or other propagules, they will be asked to clean the items using station facilities. This may delay the commencement of their work in Antarctica.

SECTION 6: SHIPS

General measures for BAS ships

- All ships must have a Ship Sanitation Certificate (SSC).
- All BAS ships should have rat boxes with poison bait.
- When in port:
 - BAS ships must have rat guards on the mooring lines.
 - The gangway should be lifted at night, or if lowered, lit with flood lights. The ultrasonic rat deterrent must be switched on.
 - External doors and windows should be closed, wherever possible, to minimise the attraction of insects onto the ship.
 - Boot/shoe washing facilities must be made available at the gangway to allow boot/shoe washing ON and OFF the ship.
- The inside of tenders should be cleaned between each landing to remove soil and other biological material knocked off visitors' boots.
- Insect sticky traps should be placed in food storage areas, and replaced when necessary.
- Where possible, electric UV insect killers should be used in food storage areas.
- It is important that the boots and clothing of those arriving by ship in South Georgia and Antarctica is adequately cleaned before disembarkation. At a suitable interval before the arrival date, the incoming Base Commander or ship management should inform landing personnel and crew that clothing must be cleaned to remove soil, seed and other propagules.
- Just prior to disembarkation at locations in South Georgia and Antarctica, all footwear must be cleaned in disinfectant (e.g. Virkon S).
- Disinfectants can become ineffective over time, or if contaminated excessively with soil or organic material. Therefore, disinfectants solutions provided for footwear cleaning shall be changed regularly, and a specific individual assigned this task as part of their duties.

Practical guidelines for ballast water exchange in the Antarctic Treaty Area (Annex to ATCM Resolution 3 (2006))

1. The application of these Guidelines should apply to those vessels covered by Article 3 of the IMO's International Convention for the Control and Management of Ships' Ballast Water and Sediments (the Ballast Water Management Convention), taking into account the exceptions in Regulation A-3 of the Convention. These Guidelines do not replace the requirements of the Ballast Water Management Convention, but provide an interim Ballast Water Regional Management Plan for Antarctica under Article 13 (3).
2. If the safety of the ship is in any way jeopardised by a ballast exchange, it should not take place. Additionally these guidelines do not apply to the uptake or discharge of ballast water and sediments for ensuring the safety of the ship in emergency situations or saving life at sea in Antarctic waters.
3. A Ballast Water Management Plan should be prepared for each vessel with ballast tanks entering Antarctic waters, specifically taking into account the problems of ballast water exchange in cold environments and in Antarctic conditions.
4. Each vessel entering Antarctic waters should keep a record of ballast water operations.
5. For vessels needing to discharge ballast water within the Antarctic Treaty area, ballast water should first be exchanged before arrival in Antarctic waters (preferably north of either the Antarctic Polar Frontal Zone or 60°S, whichever is the furthest north) and at least 200 nautical miles from the nearest land in water at least 200 metres deep (If this is not possible for operational reasons then such exchange should be undertaken in waters at least 50 nautical miles from the nearest land in waters of at least 200 metres depth).
6. Only those tanks that will be discharged in Antarctic waters would need to undergo ballast water exchange following the procedure in Paragraph 5. Ballast Water Exchange of all tanks is encouraged for all vessels that have the potential/capacity to load cargo in Antarctica, as changes in routes and planned activities are frequent during Antarctic voyages due to changing meteorological and sea conditions.
7. If a vessel has taken on ballast water in Antarctic waters and is intending to discharge ballast water in Arctic, sub-Arctic, or sub-Antarctic waters, it is recommended that ballast water should be exchanged north of the Antarctic Polar

Frontal Zone, and at least 200 nautical miles from the nearest land in water at least 200 metres deep. (If this is not possible for operational reasons then such exchange should be undertaken in waters at least 50 nautical miles from the nearest land in waters of at least 200 metres depth).

8. Release of sediments during the cleaning of ballast tanks should not take place in Antarctic waters.
9. For vessels that have spent significant time in the Arctic, ballast water sediment should preferably be discharged and tanks cleaned before entering Antarctic waters (south of 60oS). If this cannot be done then sediment accumulation in ballast tanks should be monitored and sediment should be disposed of in accordance with the ship's Ballast Water Management Plan. If sediments are disposed of at sea, then they should be disposed of in waters at least 200 nautical miles from the shoreline in waters at least 200 metres deep.
10. Treaty Parties are invited to exchange information (via the Council of Managers of National Antarctic Programs) on invasive marine species or anything that will change the perceived risk associated with ballast waters.

SECTION 7: SHIPS LANDING ON SOUTH GEORGIA

Ships landing in South Georgia, including King Edward Point and Bird Island

Before arrival, all visitors must:

- 1. adhere strictly to the Government of South Georgia and South Sandwich Islands (GSGSSI) biosecurity protocols**
- 2. undertake a biosecurity self-audit and complete the landing declaration form.**

It is the responsibility of the Chief Office to ensure that the self-audit is undertaken and the declaration form is completed by all going ashore from the ship. Details of GSGSSI Biosecurity Protocols are reproduced below and copies of the declaration form can be found at: <http://www.sgisland.gs/download/Biosecurity%20Protocols%202013.pdf>



BIOSECURITY PROTOCOLS 2013

For the Attention of all visitors to South Georgia & the South Sandwich Islands

To protect the fragile ecology of South Georgia and the South Sandwich Islands, it is essential that all visitors understand fully the biosecurity protocols, which they must implement before arriving into the Territory and during the course of their visit. Ultimately all the biosecurity regulations are underpinned by legislation. Failure to adhere to these regulations is an offence, which is likely to result in prosecution.

Why is biosecurity in South Georgia particularly important?

The climate in South Georgia is changing rapidly. Glaciers are retreating at an alarming rate and milder conditions mean that the Territory has never been more vulnerable to biosecurity threats resulting from human actions. The accidental or reckless introduction of any alien plant or animal species (including micro-organisms), or the transfer of such a species between landing sites is now far more likely to result in an alien species becoming successfully established and this poses an extremely serious risk to the Territory's fragile ecology. In particular, rats and mice must not be brought into the Territory and extreme care must be exercised when moving between rat infested and rat free areas. The South Georgia Heritage Trust (SGHT), with support from GSGSSI, are in the process of undertaking a Habitat Restoration Project to eradicate rats and mice from South Georgia. This involves aerial distribution of poison bait over all areas that contain either rats or mice. A rodent eradication project on this scale is unprecedented and, if successful, will transform the ecology of the island and restore the breeding habitat of a great number of seabirds. This immense task (and massive financial investment) could be undermined forever by the carelessness actions of one individual or organisation. The reintroduction of a rat or mouse would be a catastrophic event for the future ecology of the island and would most likely lead to a prosecution under the Wildlife and Protected Areas Ordinance (2011) and heavy financial penalties for the individual or vessel operator responsible. **This must not be you or your organisation**

Every single visitor has a valuable role and contribution to make in protecting this unique territory; follow the biosecurity measures at all times, remain vigilant, report any concerns immediately and help to educate and inform people about the risks faced and the long-term solutions.

Please read the following document carefully and rigorously follow all instructions.

All visitors must strictly adhere to the Government's biosecurity measures as well as completing a self-audit and declaration before arrival. Under the Wildlife and Protected Areas Ordinance 2011 and any subsidiary legislation, any biosecurity breach may be treated as a criminal offence. Visit Permit Holders should refer to this legislation in advance of their arrival (available on GSGSSI website www.sgisland.gs.) Government Officers at King Edward Point will regularly conduct inspections of vessels for any evidence of rodents and visitors for the introduction of seeds or any other organic material.

Any sighting of a rodent, (or any evidence of rodents) outside of the area still to be baited must be reported to the Government Officers at King Edward Point immediately (this area is detailed in this document.)

Biosecurity Measures for all Vessels Landing any Visitor or Stores on South Georgia

This includes all passengers, crew, expedition staff, scientists, forces personnel.

- **Absolutely no plants, animals or soil may be brought ashore.** Bootwashing with biocide (eg *Virkon*) is obligatory for all passengers, staff and crew prior to **all** landings and again when returning to the ship. Bootwashing must be overseen by a designated competent member of staff/crew. All external surfaces of any footwear, which will be worn ashore, must be washed. (*Virkon* concentration required is 35g per

10 litres of water). Government Officers will randomly inspect bootwashing facilities and procedures on visiting vessels (including yachts).

- **Bootwashing facilities to be cleaned and refilled for each new landing.** For this to remain effective, passengers and staff returning from the shore should wash off soil and organic material with seawater before embarking on the Zodiac / launch to return to the ship.
- Inspect all clothing prior to arrival at South Georgia and again between landing sites. Wash off and or remove all soil, seeds and any other organic material. **Pay particular attention to all Velcro, footwear, gaiters, pockets, turn-ups in trousers and hoods of jackets (pockets to be turned inside out).** (Note that Government Officers will randomly inspect visitors, including staff, as they come ashore).
- Prior to arrival at South Georgia all luggage and equipment to be brought ashore (such as daypacks and camera bags), must be thoroughly inspected. Special attention must be given to seams and pockets. **Daypacks and camera bags must be brushed out and vacuumed to remove all soil, seeds and organic material before disembarking at South Georgia.** Thereafter, visitors must inspect luggage and equipment between landings.
- Self audit checks must be completed prior to arrival by any person intending to go ashore.

The Visit Permit Holder on cruise ships and yachts (normally the Expedition Leader on cruise ships) should vigilantly ensure that all passengers, staff and any crew landing complete this process. All persons going ashore will be required to sign a declaration before landing. The Government Officer (GO) will inspect these. In the event that a vessel is permitted to undertake landings prior to arriving at King Edward Point, the permit holder must contact the GO to confirm that all persons going ashore have completed this process and signed the declaration.

On merchant vessels, MOD vessels and fishing vessels, the Master, Chief Officer /Executive Officer or another senior officer must be responsible for overseeing this procedure.

- No fresh meat, vegetables, fruit or unpasteurised dairy products, especially poultry products and eggs to be brought ashore. (N.B. resupply of BAS stations with fresh foods is permitted)
- Government vessels securing to the jetty at KEP must use serviceable rat guards on all lines ashore at all times and gangways must be raised off the jetty at night.
- All efforts must be made to ensure that food on yachts is inaccessible to rodents. No food should be stored on deck.
- Yachts must deploy bait stations in areas likely to harbour rats. These will be provided by the Government Officer at King Edward Point. If yachts call into Stanley

prior to sailing to South Georgia, a bait station should be collected from Government House.

- If possible, anchorages should be selected so as to minimise the requirements to use shore lines.
- All staff, crew and ships officers must ensure that biosecurity measures are fully implemented for every landing in order to minimise the risk of intra-island transfer.
- All visiting vessels must have South Georgia Biosecurity information on display in a public area. Information sheets will be provided to vessels at the start of the season and also in each passenger's South Georgia visitor booklet.

Additional biosecurity measures for passenger landings and small boat operations including yachts

- With the exception of KEP harbour launches, only open boats such as Zodiacs and RIBs may be used to land passengers on the shoreline and beaches (i.e. any landing other than at the jetties at KEP, Grytviken and Bird Island). All boats must be thoroughly inspected for rodents and any organic material before embarking passengers and again when departing from the island to return to the ship.
- All visitors must inspect bags and daypacks again for rodents before disembarking to go ashore. Bags should not be left open and unattended ashore and these should be inspected again before returning to the ship. These include any bags used by the vessel staff during the landing, such as those used to store lifejackets.
- All boats with cabins or hold space (including tenders and Government boats) must be inspected to ensure they are free from rodents, plant material or soil and cleaned (including use of pesticide) if necessary.
- Any food brought ashore must be in robust boxes that are fully sealed. Rodent proof boxes to be used for all stores. Boxes must be robust, fully sealed with no openings and either plastic, metal or wood.
- All hatches must be closed at night and when the vessel is left unmanned.
- No 'loose cargo' to be landed (such as loose items in open bags or nets). All cargo should be inspected, boxed and sealed before landing.

Incident reporting

Any incidents or concerns must be raised as soon as possible with the Government Officers; in particular any suspected sightings of rodents in rodent free areas or of any sick seals and birds.

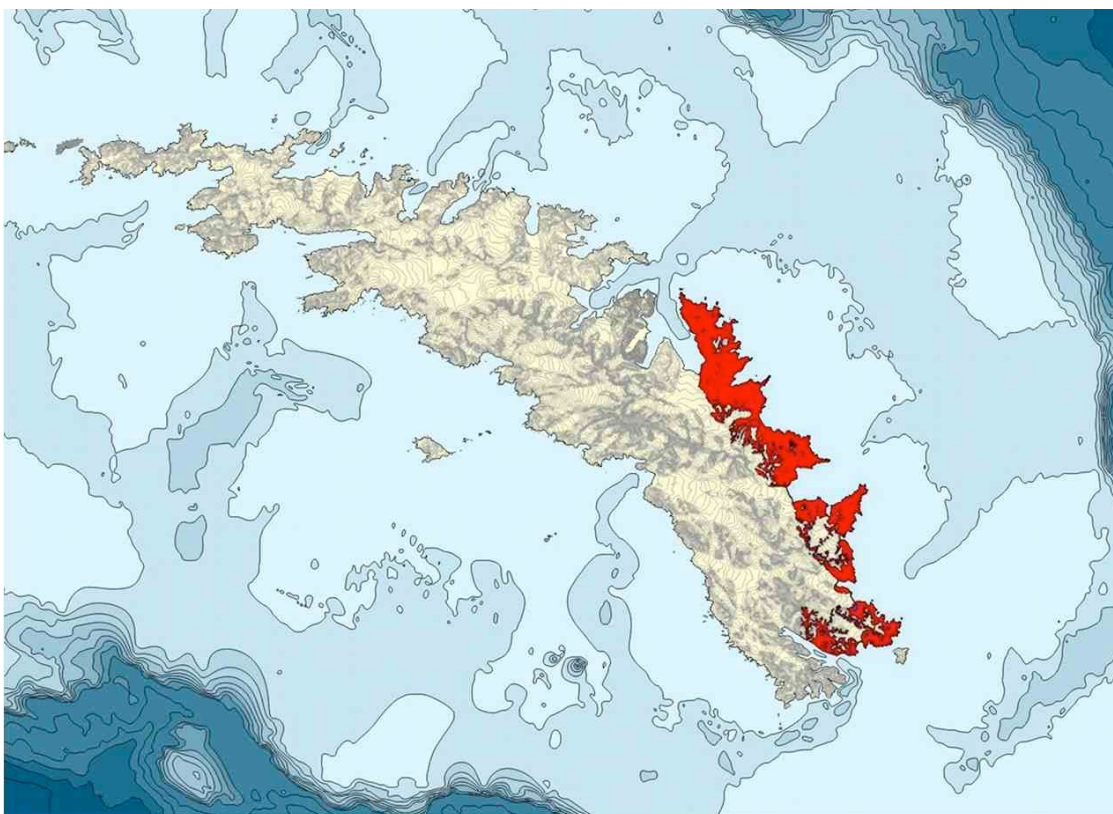
Email: go@gov.gs

Phone: 00870 382 359033 or +44 (0)1223 221781

Areas still containing Rats

The South Georgia Heritage Trust rat eradication project has spread poison bait to remove rodents over much of the rat and mouse infested areas of South Georgia. The final phase of the project is due to commence in 2015.

MAP OF AREAS YET TO BE BAITED



In areas in which poison bait has been dropped, every effort must be made to prevent any re-introduction of rodents. Rigorous application of biosecurity measures is essential prior to arrival and every landing thereafter. Extreme care must be taken when visiting rat free landing sites especially if an area yet to be cleared of rats has been visited beforehand.

Closed Areas

Closed Areas on South Georgia provide a high level of protection to areas of special conservation or scientific interest. These include areas that are rat-free, a number of historical sites, areas restricted due to health and safety concerns and sites designated for monitoring. The Specially Protected Areas (SPAs) are currently under review, following the enactment of the Wildlife and Protected Areas Ordinance (2011). Information will be updated on the GSGSSI website throughout the year www.sgisland.gs.

Entry into any Closed Area (and possibly future SPA's) is prohibited unless a site-specific permit has been granted by GSGSSI.

The Closed Areas include:

- Willis Islands
- Bird Island (BAS station)
- Cape Paryadin Peninsula

- Albatross Island
- Grass Island (Stromness Bay)
- Cooper Island
- Larsen Harbour
- Annenkov Island
- Fanning Ridge Coast
- Nunez Peninsula

For the 2013/14 season, visit permits will normally be issued for landings at **approved landing sites** which now includes those known to be rat free as well as approved sites which have been baited and are assumed to be rat free (subject to individual site restrictions and the applicant meeting the criteria for eligibility to land). See Code of Conduct for Prion Island (within the 2013 *Information for Visitors to South Georgia* Booklet and the separate Site Visitor Management Plan for Cape Rosa). Visit applicants must refer to the official place names list for approved visitor sites. These are attached to the South Georgia visit application forms. Special permission is required for landings anywhere along the south coast of the main land from Nunez to Cooper Bay and all of the named and un-named south coast off-shore islands including:

- Green Island, Brøde Rock, First Rock
- Kupriyanov Islands, Pickersgill Islands
- Annenkov Island, Hauge Reef
- Hammerstad Reef

Additional Information for the 2013/14 Season

Cooper Bay site closure following avian cholera outbreak

The Cooper Bay chinstrap penguin colony landing site (and surrounding sites, with the exception of the macaroni colony) remain closed to visitors following a suspected outbreak of avian cholera in 2010. **Thorough and appropriate use of biocides is essential to prevent the spread of pathogens.** Visitors should contact GSGSSI as soon as possible if sick birds or mammals are observed in the vicinity of Cooper Bay or any other landing site.

Visit arrangements during Habitat Restoration Project in 2014

In early 2014 the second phase of the GSGSSI reindeer project will take place. This will involve the humane culling of reindeer by ground shooters on the Barff Peninsula. For safety reasons, there will be closed areas during the live fire operations.

As planning progresses, a separate briefing document will become available from the GSGSSI website. This is intended to assist visit applicants to plan whether they should either avoid these areas entirely during the course of these projects, or accept that they may need to adjust their plans on a day-to-day basis to avoid any landings which overlap with the operations.

Those visitors who elect to visit areas which may be affected by the project will need to receive daily communications from the Government Officers each evening detailing the progress of the project and the areas which will be affected in the coming days, areas which visitors will not be permitted to visit. Whenever possible, efforts will be made to avoid the closure of key landing sites for extended periods.

South Georgia Biosecurity Self Audit Check List & Landing Declaration for all Visitors

Invasive animal and plant species pose a very real threat to South Georgia's vulnerable environment. By complying with the simple measures below you will personally be making a real and valuable contribution to the conservation of the island.

The biosecurity measures implemented by South Georgia Government are intended to protect the island by preventing the introduction or transfer between sites of any organic material including animals, plants, seeds, soil and diseases. With this in mind, please study carefully the following points:

Prior to arriving at South Georgia you must

- Empty, vacuum/shake, clean and inspect inside any bags that you plan to take ashore, to ensure the absence of organic material in particular soil, seeds and insects.
- Scrub all of your footwear on board your vessel in order to remove all organic material.
- Inspect all of your clothing and remove organic material including soil, seeds and insects, especially cuffs, Velcro, pockets, seams and hoods.
- Check all your equipment and luggage are clean and free of organic material. This includes daypacks, camera bags, walking sticks, ski poles and tripods for cameras.

Prior to every landing at South Georgia you must

- Remove all fresh produce, especially poultry products (to prevent avian disease), from any bags or garments that you intend to take ashore.
- Ensure your footwear and equipment is free of organic material and has been sterilised with a biocide footbath (managed by vessel). This includes walking sticks, ski poles and tripods for cameras.
- Inspect all the clothing and any bags you are planning to take ashore for organic material in particular, soil, seeds and insects, especially cuffs, Velcro, pockets, seams and hoods. If contamination by organic material is detected, the contamination must be removed prior to landing by the most effective cleaning method.
- Lastly, if you see anything which causes you concern please raise it directly with the Government of South Georgia if necessary.

For Administrative Use Only	
VESSEL	
DATE	
VISIT NO	

SOUTH GEORGIA BIOSECURITY SELF AUDIT DECLARATION

DECLARATION:

I confirm that I have carried out the preventative measures outlined overleaf, and that I have read and understood the South Georgia biosecurity information provided on board my vessel.

I have complied with these measures to the best of my ability and I acknowledge that failure to comply with these measures may result in a delay or disruption to my landing(s) on South Georgia.

No	Name (print)	Signature
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Name of Expedition Leader/Officer:

Signature:

SECTION 8: RATS AND MICE

Rodents within the Antarctic Treaty area

In Antarctica, the climate is currently too harsh to permit the long-term survival of rat and mice populations. However, rodents may be able to survive in association with humans within station buildings. If any signs of rats or mice are noticed (droppings, gnawing, visual sightings) the BAS Environment Office should be informed immediately and appropriate advice shall be given.

Ships

As mentioned earlier (Section 6), steps shall be taken to prevent rats and mice getting aboard and surviving on BAS ships:

- All ships must have a Ship Sanitation Certificate
- All BAS ships should have rat boxes with poison bait
- When in port:
 - BAS ships must have rat guards on the mooring lines
 - The gangway should be lifted at night, or if lowered, lit with flood lights. The ultrasonic rat deterrent must be switched on.

Rats and mice at King Edward Point

Rats were eradicated from the area around KEP in 2011 and no rats have been detected since. It is essential that rats are not reintroduced. If any signs of rats are detected in the area, the Government Officer should be informed immediately. Measures described by GSGSSI and detailed in Section 7, should be followed.

Rats and mice on Bird Island

Bird Island is an internationally important protected area for the conservation and study of birdlife. It is now, and has always been, free of rats and mice, which have devastated bird populations in other parts of South Georgia. The recent attempts to eradicate rats on mainland South Georgia, including the KEP area, may reduce the risk of transfer of rats to Bird Island. However, rats may also originate from areas outside South Georgia and may be

transported by to the area aboard ships. Therefore it is essential that all possible steps are taken to prevent the introduction of rats to Bird Island.

- The Bird Island Base Commander and staff should be made aware of the Bird Island Rat Contingency Plan (see Appendix 2).
- The network of rat bait boxes, containing non-poisonous wax-based bait designed to show evidence of gnawing, shall be checked at least once at the beginning and once at the end of the season.

SECTION 9: BRITISH ANTARCTIC TERRITORY STATIONS

Signy Research Station

Preventing the spread of existing non-native species

Two non-native species have already been introduced to the back slope behind Signy Research Station. These are the enchytraeid worm *Christensenidrilus blocki* and the flightless midge *Eretmoptera murphyi*, both of which were imported from South Georgia, probably in the late 1960s.

It is important that these species are not spread further to other areas of the South Orkney Islands or the vicinity of other Antarctic research stations where they might also colonise.

Therefore, it is important that measures are taken to prevent importation of soil and non-native species both into Signy Island and from Signy Island to other locations.

- Measures to reduce the likelihood of soil and non-native species introductions shall be taken, in line with other BAS stations (boot washing, clothes cleaning, etc.)
- While on the ship prior to landing at Signy Research Station at the start of the season, the in-coming Base Commander shall ensure all landing personnel are fully aware of the presence of the two non-native species, the need to prevent their further human-assisted spread and the biosecurity measures detailed below.
- Particular care should be taken to ensure that boots, clothing, personal belongings and equipment is cleaned so that no soil or plant material is transported off Signy Island inadvertently. This is particularly the case for personnel travelling to other areas of the South Orkney Islands (e.g. to nearby Antarctic Specially Protected Areas (ASPAs) or other research stations by either BAS or Royal Navy ship)
- Scientists taking soil and plant samples off the island for research purposes shall take precautions that soil and plant material is not release into the environment at other Antarctic locations.
- Soil and plant samples collected on Signy Island shall not be kept or cultivated in the laboratories at other Antarctic research stations.

Rothera Research Station

Visitors arriving from gateway ports by aircraft

- On arrival at Rothera airstrip apron, the shoe/boot soles of all visitors and crew shall be cleaned to ensure they are free of soil and organic material. Footwear cleaning equipment (brushes, buckets, disinfectant mats, etc.) will be provided by station management. Footwear should be cleaned in freshly prepared 1% Virkon S solution, or other appropriate disinfectant solution, and replaced at regular intervals to ensure it remains effective.
- Where weather conditions make cleaning of footwear on the apron impractical, this shall be done at another location deemed appropriate by station management at the earliest opportunity.
- Station management will undertake spot checks to ensure visitors have complied with the biosecurity measures described in this handbook. If a visitor's clothing items, luggage or equipment are found to contain soil, seeds or other propagules, they will be asked to clean the items using station facilities. This may delay the commencement of their work in Antarctica.

Ships docking at the Rothera wharf (including BAS, Royal Navy and tourist vessels)

- Boot washing with disinfectant (e.g. Virkon S) is obligatory for all passengers, staff and crew prior to disembarking at Rothera and, again, when returning to the ship. Where non-BAS ships are alongside the wharf, station management shall provide disinfectant, buckets and brushes.
- The footwear and clothing of all passengers shall be free of all soil, seeds and any other organic material before landing. Particular attention should be paid to all Velcro, footwear, gaiters, pockets, turn-ups in trousers and hoods of jackets.
- Prior to arrival all luggage and equipment to be brought ashore (such as daypacks and camera bags), must be thoroughly inspected. Special attention must be given to seams and pockets. Daypacks and camera bags must be brushed out to remove all soil, seeds and organic material before disembarking.

- To ensure compliance, Rothera station management may randomly inspect bootwashing facilities and/or visitors and crew as they come ashore.

Small boat travel within the local boating area

Two main risks must be considered with regard to boating in the local area:

1. Transfer of non-native species from Rothera Point to the islands.
 2. Transfer of the non-native springtail (*Hypogastrura viatica*) on Leonie Island to other local islands, Rothera Point and beyond.
-
- Visitors travelling between locations in the boating area (e.g. Rothera Point, Anchorage Is., Lagoon Is., Leonie Is., etc.) must ensure soil is removed from all footwear (walking boots and boating suit boots). All equipment, including scientific equipment, transported by small boat must be free of soil and propagules.
 - Boot washing facilities will be provided by the Boatman at Rothera and brushes will be provided on the boats.
 - If boating suit are worn when walking around on land, the boating suit boots shall be rinsed and cleaned in seawater before travelling on the boat to another destination.
 - Boat interiors shall be kept free of soil and dirt

Halley VI Research Station

Halley Research Station is located on the Brunt Ice-shelf which is, in effect, devoid of terrestrial life. If any non-native species or propagules were introduced to this area, they would not be able to establish. As a result the area around Halley is at negligible risk from non-native species.

Nevertheless, the presence of emperor penguins in the vicinity of the station means that precautions described in this manual to prevent transfer of disease organisms present on poultry and egg products to local birds should be adhered to closely (see Section 4, Fresh Food Disposal).

Halley VI Research Station sewage treatment plant requires the addition of commercially available freeze-dried non-native bacteria to make it function optimally. Station management shall contact the BAS Environment Office each year to arrange for an Antarctic Act permit to be issued for the introduction of these non-native bacteria to the Antarctic Treaty area.

SECTION 10: ANTARCTIC FIELD ACTIVITIES

Antarctic locations already colonised by non-native species

Visitors shall take particular care to ensure clothing is free of seeds and soil when leaving areas where non-native species are known to have established (see Appendix 2). Where washing facilities are not available, the outside of boots can be washed in seawater and clothing can be brushed down to remove soil and organic material. If travelling to another Antarctic location, outer clothing should be washed using available facilities (e.g. ship washing machines) and footwear cleaned before arrival.

Movement of BAS field equipment between BAS stations

Field equipment (e.g. tents, boxes, sledges, etc.) may trap soil and organic material while it is being used in the field. In general, field equipment is repaired and serviced at Rothera Research Station and distributed, for use in locations on South Georgia and Antarctic, by ship or aircraft. At the end of the season, most equipment is returned to Rothera in preparation for the following season. Therefore the potential exist for soil and organic material adhered to equipment used at a variety of location to be transported to Rothera.

- Field equipment sent from Cambridge to stations in South Georgia and Antarctica shall be free of soil and propagules.
- Appreciating the limitations incurred by operating in the field, to the maximum extent practicable, field GAs should try to ensure their field equipment, sledges and skidoos have as little adhered soil and organic material as possible before they are returned to Rothera.
- Particular care should taken to remove soil and organic material if camping on ice-free ground, with special attention paid to tent valances, ground sheets and pegs.
- If field equipment that is heavily contaminated with soil and organic material is returned to Rothera Research Station, it should be cleaned carefully indoors, with the soil and organic material collected and incinerated. In general, to ensure soil and organic material are contained adequately, in the first instance, vacuuming or dry brushing may be the most appropriate cleaning technique. As appropriate, vacuum cleaner waste should be incinerated using station facilities or bagged and incinerated on the ship.
- Where resources and logistic planning allow, field equipment used in one region should be reallocated to that region in subsequent seasons. For example, it may be possible for equipment to be allocated for use in South Georgia each season.

Antarctic field activities

Visitors undertaking terrestrial field research, as a minimum standard, should apply the guidelines detailed in the Scientific Committee on Antarctic Research's *Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica*, which includes advice on biosecurity (see Appendix 1).

SECTION 11: MASS ANIMAL MORTALITY EVENTS

BAS Mass Animal Mortality Event Response Plan

A Mass Animal Mortality Event (MAME) may be caused by (a) an infectious agent spreading through a colony, (b) a physical event such as a landslip, avalanche or unusually severe weather or (c) an oil or chemical spill. A MAME could occur near any BAS station or close to field parties. The overall response will vary depending on location and circumstances. However, on initial discovery of unusually high numbers of sick or dead animals (i.e. birds and marine mammals) in all cases the immediate response should be as follows:

- Do not touch or approach sick or dead animals. Stand well back.
- Note as much information as possible. If possible, take digital photographs of the MAME area without approaching any closer. Do not walk among the dead or sick animals.
- Immediately inform the Base Commander of the discovery. Restrict access to the MAME site to prevent spread of any infectious agents.
- Before returning to base from the MAME site, if possible, thoroughly clean boots in seawater or snow. Where practical, do not visit, or travel through, other bird or seal colonies. Do not return to the MAME area until specific instructions from BAS Cambridge have been received.
- On returning to station remove outer clothing and seal it in plastic bags until disinfection can occur. Wash thoroughly (i.e. shower) at the earliest opportunity.
- Inform the base or ship doctor of the MAME.
- Contact BAS Cambridge via Operations and provide, as a minimum, the following details:
 1. Names and occupation of those who discovered the MAME
 2. Precise location of the MAME (including, if possible, GPS coordinates)
 3. Date and time the MAME was discovered, and the date and time of the most recent previous visit to the site
 4. Any major physical event that is likely to have caused the MAME (e.g. landslips, avalanche, flooding, unusually high tides, oil or chemical spill)
 5. Approximate number of animals/percentage of the colony/size of area affected

6. Species, gender and age of affected animals, were evident
 7. Any unusual animal behaviour or symptoms
 8. The recent weather conditions
 9. Any imminent aircraft or ship calls
- Complete an AINME report, giving a full description of the initial discovery and include all the information mentioned above.
 - As soon as is practical, clean thoroughly and sterilise (using, for example, a 1% solution of Virkon S) all boots, clothes and equipment that was in the vicinity of the MAME area.
 - Await further instructions from BAS Cambridge.

Appendix 1: SCAR's environmental code of conduct for terrestrial scientific field research in Antarctica

Introduction

Antarctica contains many unique geological, glaciological, and biological features. This landscape and its biological communities have limited natural ability to recover from disturbance. Many features could be easily and irreversibly damaged. This Code of Conduct provides recommendations on how you, scientists or associated personnel, can undertake scientific field activities so as to protect the Antarctic environment for future generations and to ensure that human presence will have as little impact as possible. All personnel undertaking scientific research should be familiar with this Code of Conduct.

The Protocol on Environmental Protection to the Antarctic Treaty (Madrid Protocol) provides the basis for environmental protection and management in the Antarctic. Climate change and increasing pressure from human activities, such as research, suggest that more comprehensive guidelines are needed to protect the unique features of Antarctica. This Code of Conduct is intended to complement the relevant sections of the Protocol and provide guidance for all researchers conducting land based field research (limnological, terrestrial, coastal/littoral, glaciological, biological and geological) and conducted in the area of land and permanent ice south of 60 degrees South. A 'field' activity is defined here as any scientific activity, and the logistics to support this activity, which is conducted in the natural environment, irrespective of its duration.

All countries with permanent and summer scientific stations are encouraged to include this Code of Conduct within the operational procedures of the Station so as to ensure that personnel undertaking or supporting field scientific research follow this Code of Conduct. It is recommended that this Code of Conduct be followed by all personnel undertaking scientific research to the maximum extent possible and as long as it does not affect the safety of the expedition.

General Guidelines

Antarctic scientists potentially have a higher chance of carrying alien propagules to Antarctic [and subantarctic] ecosystems than other Antarctic travellers because their field of study often takes them to alpine or northern polar habitats. In the process of conducting research within these habitats Antarctic scientists can inadvertently pickup propagules on clothing, equipment and equipment cases. If these items are then taken to the Antarctic and they have not been cleaned/ sterilised to remove or kill the propagules, the opportunity to

transfer such material to Antarctic ecosystems is created. The ecological potential for establishment of northern polar or alpine taxa is great as such species have pre-adaptations to cold environments. You should take care that your equipment is properly cleaned before it enters the Antarctic. The implications of human transfer of taxa between locations can range from the modification of genetic structure of populations to changes in local biodiversity and subsequent flow-on effects on community dynamics. Such accidental movement of indigenous biota would also compromise scientific studies of molecular adaptation, regional evolution and biogeography and reduce the inherent value that Antarctica offers as a model scientific system with limited anthropogenic influence. Your field activities in Antarctica should be designed to have as little environmental impact as possible.

Before going into the field

Report your planned activity to your National Operator as thoroughly as possible and well in advance, in order to allow a proper assessment of the environmental impact you may cause on the field site(s) you visit, as required by Annex I of the Protocol for Environmental Protection.

Everything taken into the field must be returned to your station for proper cleaning where that is feasible and safe to do so.

To avoid introduction of alien species, chemical contamination, and transfer of materials between sites,

- Ensure that all your equipment and clothing, including footwear, is thoroughly cleaned.
- Avoid taking unnecessary packaging and materials into the field. Remember that several products used for packaging are prohibited in Antarctica, such as polystyrene beads or chips
- Wherever possible, all precautionary measures should be taken to ensure collection and removal of human waste and grey water.

Once in the field:

You should take particular care in areas with sensitive biological or geological features such as bird and seal colonies, roosting areas, vegetated areas, freshwater lakes and ponds, sand dunes, scree, fluvial terraces, ice core pyramids and ventifacts.

Avoid areas where wildlife is easily disturbed, especially during the breeding season.

Remember that you are only allowed to cause disturbances to wildlife if scientifically justified and if you have been issued with a permit by an appropriate national authority.

Even if you have a permit, avoid unnecessary disturbance to Antarctic flora and fauna.

Take only those samples (geological material, biological material, ice) for which you have permits and protect resources by taking as small a sample as needed.

You should map, record (preferably using GPS coordinates), and report to your national operator the location of any spill, camp site, soil pit, drilling site, sampling site, or any other disturbance for the benefit of future researchers.

You should try to minimise your impacts when moving around in the environment:

- Stay on established trails whenever possible.
- Avoid walking on vegetated areas, streambeds, lake margins, and delicate rock and soil formations.
- Restrict ground vehicle usage to snow and ice surfaces, or designated tracks, wherever possible.
- Where feasible, use recognized helicopter landing sites and ensure that markers for helicopter pads are clearly visible from the air.
- Minimise the disturbance to wildlife by following the ATCM guidelines for operations of aircraft near concentrations of birds.
- You should restore any disturbances caused by your activity.
- Algae and invertebrates live beneath stones. Moving rocks and stones should therefore be minimized. Please do not build cairns.

Management of scientific field sites

Prior to conducting any scientific activity, it is essential that you carefully consider and clearly define the scope of your activity, including its area, duration, and intensity.

Be aware of the cumulative impacts of the activity, both by itself and in combination with other activities within the region. Consider lower impact alternatives to the activity and re-use of existing facilities wherever possible.

In order to minimise environmental impacts of your field activity you should:

- Choose sites as close as possible to your research station, use existing pathways.
- Limit the number of visitors to your field site to the appropriate number of people required to carry out the fieldwork.
- Where possible avoid areas that are especially vulnerable to disturbance such as vegetated areas, breeding sites, patterned ground, and water bodies.
- Re-use existing sites wherever possible.
- Make sites no larger than needed for the proposed scientific activities.
- Keep your site tidy during use.
- Avoid activities which could result in the dispersal of foreign materials into the environment. In particular, avoid the use of spray paint, and conduct activities such as sawing or unpacking inside a tent or hut.
- Secure equipment from being blown away or stolen by inquisitive birds (e.g. skuas, penguins).
- Ensure there is the capacity to prevent and respond promptly and effectively to any environmental accident or incident.

Restore sites as far as feasible when your work is complete and take GPS coordinates for future reference. Remember that sites may require subsequent monitoring to comply with the Protocol for Environmental Protection

As it is important to prevent the introduction of foreign materials and contaminants into the environment:

- Avoid materials liable to shatter at low temperatures, e.g., polyethylene based plastics.
- Take care when handling fuel, chemicals and isotopes (stable or radioactive).
- Store and handle fuel and chemicals using appropriate containers.
- Use drip trays where possible when handling fuels or other liquids and take special care when handling fuel in high winds.

You should report any environmental accident or incident to your national operator.

If you plan to install equipment in the field:

- Ensure an environmental impact assessment is undertaken prior to any installation, as required by Annex I of the Protocol for Environmental Protection.
- Clearly identify any equipment by country, name of the principal investigator and year of installation, and state the duration of the deployment.
- Make sure installations can be retrieved and removed when no longer required, unless it is impractical or result in a higher environmental impact.

Do not displace materials or collect samples of any kind, except for scientific and educational purposes.

When taking samples from live animals ensure that the requirements set out in the “SCAR Scientific Code of Conduct for Experiments on Animals” (in preparation) should be followed.

Field camps

Camping and scientific equipment should be appropriately cleaned before being brought into the Antarctic or before being transferred between sites

Minimise the environmental footprint of your field camp by:

- Locating it as far as feasible from lake margins, stream beds and associated fans, and vegetated areas, to avoid damage or contamination.
- Taking special care to ensure that no food or wastes are accessible to animals.
- Re-using campsites whenever possible.
- Keeping it tidy during use and restoring it, as far as is feasible, after use.
- Using solar and wind power as much as possible to minimize fuel usage.

Ensure that equipment and supplies are properly secured at all times to avoid dispersion by high winds or helicopter downdrafts. Remember that in some locations, high velocity katabatic winds can arrive suddenly and with little warning.

Remember that if you are working in an ASPA or ASMA the management plan may have additional requirements for field camps, and you will need to follow any conditions contained in your entry permit.

Habitat specific guidelines

Lakes and streams

Choose sampling equipment which is the least destructive, when the aquatic or coastal environment is to be sampled. Sample carefully and avoid cumulative impact.

Dredges, trawls and box corers should be used to a minimum as necessary for scientifically meaningful results, avoiding excessive and unnecessary sampling.

Aquatic ecosystems in Antarctica are extremely poor in nutrients (except those with animal influence) and thus very sensitive to anthropogenic pollution. All visitors must take care to eliminate or minimize releases of human waste wherever possible.

You should avoid walking in the stream and lake beds, or too close to their margins as this may disturb biota, affect bank stability and flow patterns. When a crossing must be made, use designated crossing points if available, otherwise walk on rocks.

Minimize the use of vehicles on lake ice if possible. If access to the water body is required for scientific research, use non-motorised boats whenever possible.

Ensure that all sampling equipment is tethered or otherwise secured and does not contaminate the water body.

Clean all sampling equipment before using it in another water body in order to avoid cross-contamination. Alternatively, use separate equipment in different sites.

Wherever possible you should use flumes, not weirs, when monitoring streams, or ensure that the stream will remain as it was before the study.

You should try to avoid the use of stable isotope tracers at the complete ecosystem level, use them as much as possible only in closed vessels. You should consider naturally occurring tracers. Radioactive isotope tracers should never be used, except in closed vessels. No stable or radioactive isotope tracers waste should be disposed into ecosystems. You should document any tracer use (location, type of tracer, amount).

To avoid introduction of contaminants or disturbance of the stratification of the water body and its sediments:

- Do not swim or dive in lakes, unless it is required for scientific purposes.
- Remove all unwanted water and sediment materials from the site, even on permanently ice-covered lakes, rather than discharging them back into the lake.
- Ensure that you leave nothing frozen into the lake ice that may ablate out.

- Consider using ROV's as a tool for under water and under ice research, both in lakes and coastal/littoral habitats.

Terrestrial environments

Terrestrial vegetation comprises very slow growing species. Damage by trampling will extend for years or even decades. Many terrestrial invertebrate species live in soils and feed on soil algae.

You should use existing paths in order to avoid disturbing large areas of vegetation and soil.

Clean all equipment and footwear, as far as is feasible, between sites to avoid transfer of propagules among sites.

When sampling in vegetated areas, ensure that the vegetation is replaced and the site restored as far as is feasible.

Limit the use of mechanical equipment for sample collection, whenever possible.

When sampling soil in desert areas, use groundsheets to place excavated material on to minimise the extent of damage to the desert pavement. Backfill soil pits and as far as feasible replace the desert pavement materials at the soil surface to restore the site appearance.

Do not disturb or remove rocks, fossils, or ventifacts unless it is absolutely necessary for your research.

Glaciers and ice fields

Remember that the use of water in hot water drills could contaminate the isotopic and chemical record within the glacier ice.

Given that the hydrological systems under glaciers and ice sheets are connected to the wider environment and downstream contamination could occur, exercise caution when using chemical-based fluids to drill to the base of an ice sheet.

Appendix 2: Bird Island rat contingency plan

TIER 1 Normal state of monitoring: Bird Island rat free	TIER 2 Confirmed rat sighting, or high probability of one or few individuals		TIER 3 Confirmed establishment of rats on Bird Island
<p><i>General precautions:</i></p> <ul style="list-style-type: none"> • Good housekeeping • Education. Ensure all staff are aware of both the natural and human-mediated routes by which rats could reach Bird Island • Awareness. Remain vigilant of field signs (e.g. droppings, footprints in soft mud) at all time throughout the island <p><i>Specific precautions to prevent human-mediated introductions:</i></p> <ul style="list-style-type: none"> • BI BC to liaise with all vessels landing at BI • Maintain sign at BI jetty informing visitors of need for vigilance • Deploy and monitor bait stations at jetty and base buildings throughout summer period of shipping activity (bait with wax block) • Deploy additional 10 bait stations across approx. 2.5 ha area around station during early-season cargo operations when seal activity is low (bait with wax block) • Report any non-conformity using the AINME system <p><i>Specific measures to monitor for natural introductions</i></p> <ul style="list-style-type: none"> • On-going island-wide monitoring programme. Maintain the regular check of rat bait boxes (baited with wax blocks). Any suspected gnawing should be reported and poison bait inserted to confirm presence of rats (Tier 2) 	<p>TIER 2a Human-mediated introduction</p> <p>Rat associated with cargo or evidence of rats around the station</p> <ul style="list-style-type: none"> • Immediately move suspect cargo containing rat into a sealed room, or return to ship • Take any immediate action to exterminate rat, e.g. heavy object or poison bait • Report the incident to the BAS Environmental Office (AINME report). Provide additional information or request further advice as appropriate • Deploy bait stations, with poison bait, in suspected area outdoors. Hand broadcast a further poison over the immediate 2.5 ha area • Initiate weekly monitoring of island-wide bait boxes (which should have wax blocks replaced with poison bait) 	<p>TIER 2b Natural/island-wide introduction</p> <p>Evidence of rats away from the station, or on station when no current ship activity</p> <ul style="list-style-type: none"> • Record the time and location of any evidence of rats on the island • Immediately report any sightings or evidence to the BI BC and Environmental Office • Inform the rest of the base personnel of the finding and ask for enhanced vigilance for signs of rats • Make an internal and external inspection of all huts and station buildings for signs of rats. Repeat weekly • Deploy bait stations, baited with poison, around the island • Check all bait boxes at least once every week for evidence of rats • Continue regular checking and re-baiting boxes until no further evidence of rats has been observed 	<ul style="list-style-type: none"> • Environment Office to consult with GSGSSI on implementing a rat eradication programme • Prepare press brief in consultation with BAS Press Office.
<p>Be prepared to move to Tier 2</p>	<p>Move to Tier 2b if evidence of rats is found away from the station, <i>OR</i> Stand down response when there is no further evidence of rats, and following consultation with BAS Environmental Office.</p>	<p>Be prepared to move to Tier 3, <i>OR</i> Stand down response when no further evidence of rats, and following consultation with BAS Environmental Office.</p>	

Appendix 3: Colonisation status of known non-native species in the Antarctic terrestrial environment

For information on non-native species in the sub-Antarctic Islands see: Frenot, Y., Chown, S.L., Whinam, J., Selkirk, P.M., Convey, P., Skotnicki, M., & Bergstrom, D.M. 2005. Biological invasions in the Antarctic: extent, impacts and implications. *Biological Reviews*, 80, 45–72.

Species	Location	Date introduced	Colonisation status	Area colonised	Notes	References
Invertebrates						
<i>Eretmoptera murphyi</i> (chironomid midge)	Signy Research Station, South Orkney Islands, Scotia arc	1967, 1968 (?)	Expanding	~35,000 m ²	Present in high numbers (mean 21,000 larvae m ⁻²) within an area of c. 35,000 m ² . Favoured habitat is dead moss and peat.	Hughes and Worland (2010) Hughes et al., 2012
<i>Christensenidrilus blocki</i> (enchytraeid worm)	Signy Research Station, South Orkney Islands, Scotia arc	1967, 1968 (?)	Persistent	< 150 m ²	Present in low numbers around the original introduction site.	Hughes and Worland (2010)
<i>Trichocera maculipennis</i> (fly)	Artigas Antarctic Scientific Base, Fildes Peninsula, King George Island, South	2005/06 (?)	Persistent	?	Found in the base sewage system and in the vicinity of the base.	O. Volonterio et al., in press.

	Shetland Islands					
<i>Hypogastrura viatica</i> (springtail)	Léonie Island, Marguerite Bay, Antarctic Peninsula	?	?	?	Only record is original collection. Subsequent collections have not contained this species	Greenslade (1995)
<i>Hypogastrura viatica</i> (springtail)	Tower Island, Palmer Archipelago, Antarctic Peninsula	?	?	?	Found associated with a sheathbill nest in Feb 1966	Wise (1971)
<i>Hypogastrura viatica</i> (springtail)	Half Moon Island, South Shetland Islands, Antarctic Peninsula	?	?	?	Regular visitor site	M. Potapov (unpublished data; quoted in Greenslade et al., 2012)
<i>Hypogastrura viatica</i> (springtail)	Neko Harbour, Graham Land, Antarctic Peninsula	?	?	?	Regular visitor site	M. Potapov (unpublished data; quoted in Greenslade et al., 2012)
<i>Hypogastrura viatica</i>	Deception Island, South Shetland Islands, Antarctic Peninsula	?	Persistent (Invasive?)	Abundant at several sites around the caldera including ASPA 140 sub-	Now abundant. One of the most invasive Collembola found in the sub-Antarctic islands	Hack (1949) Greenslade et al. (2012)

(springtail)				sites A and C		Greenslade & Convey (2012)
<i>Folsomia candida</i> (springtail)	Deception Island, South Shetland Islands, Antarctic Peninsula	?	?	?	Not found in subsequent surveys	Greenslade & Wise (1984) Greenslade et al. (2012)
<i>Protaphorura fimata</i> (springtail)	Deception Island, South Shetland Islands, Antarctic Peninsula	?	?	?	Not found in subsequent surveys	Greenslade & Wise (1984) Greenslade et al. (2012)
<i>Deuteraphorura cebennaria</i> (springtail)	Deception Island, South Shetland Islands, Antarctic Peninsula	?	?	Found in Pendulum Cove (not within ASPA 140 sub-site G)	Pendulum Cove is a popular visitor site where the remains of the Chilean Presidente Pedro Aguirre Cerda Station (HSM No. 76) are located	Greenslade et al. (2012)
<i>Mesaphorura macrochaeta</i> (springtail)	Deception Island, South Shetland Islands, Antarctic Peninsula	?	?	Found in parts of Whalers Bay	Whalers Bay is a popular visitor site where the remains of the Whaling Station, cemetery and British 'Base B' (HSM No. 71) are located	Greenslade et al. (2012)
<i>Proisotoma minuta</i> (springtail)	Deception Island, South Shetland Islands, Antarctic Peninsula	?	?	Found in Whalers Bay and ASPA 140 sub-site C	The total number of Collembola species now known from Deception Island is 14, comprising eight native	Greenslade et al. (2012)

					species and six non-native species.	
<i>Boreas</i> sp. (Mecoptera) Snow scorpion fly	Cierva Point, Palmer Archipelago, Antarctic Peninsula	?	?	Within ASPA 134 Cierva Point and offshore islands, Danco Coast, Antarctic Peninsula	The single specimen was extracted from lichen communities at c. 100 m a.s.l. Genus common in boreal regions, including the Arctic	Convey and Quintana, 1997
Plants						
<i>Poa annua</i> (grass)	Arctowski Station, King George Island, South Shetland Islands	1985/86	Expanding	Grass has spread over 500 m into the vicinity of the nearby ASPA 128 Western Shore of Admiralty Bay, and 1.5 km to the deglaciated foreground of Ecology Glacier (c. 70 individuals in an area of ~100 m ²)	1985/86: first found in metal grating at Arctowski Station main building 1990: spread to greenhouse area and above subterranean hot water pipes within a single area of c. 0.4 km ² 1991/92: found in a number of locations with disturbed ground 2005/6: found growing amongst indigenous plant communities for the first time. 2008/9: found on a glacier forefield, 1.5 km from the	Olech (1996); Smith (1996); Olech (2003) Frenot et al. (2005) Chwedorzewsk a (2008) Olech and Chwedorzewsk a (2011)

					station	
<i>Poa annua</i> (grass)	General Bernardo O'Higgins station, Trinity Peninsula, northern Antarctic Peninsula	Pre 2007/8	Persistent	2007/08: single plant 2009/10: two plants		Molina-Montenegro et al. 2012
<i>Poa annua</i> (grass)	Gabriel González Videla station, Paradise Bay, northern Antarctic Peninsula	Pre 2007/8	Persistent	2007/08: single plant 2009/10: four plants		Molina-Montenegro et al. 2012
<i>Poa annua</i> (grass)	Almirante Brown station, Paradise Bay, northern Antarctic Peninsula	Pre 2009/10	Persistent	Two plants		Molina-Montenegro et al. 2012
<i>Poa pratensis</i> (grass)	Primavera Station, Cierva Point, Palmer Archipelago, Antarctic Peninsula	1954/55	Persistent	The grass remains restricted to the original introduction site. Since 1995 it has expanded from a patch c. 40 cm	Transplant experiments of <i>Nothofagus antarctica</i> and <i>Nothofagus pumilo</i> in soil imported from Ushuaia (Terra del Fuego).	Corte (1961) Smith (1996) Pertierra et al., in press.

				across to c. 1 m across (2012).		
<i>Poa trivialis</i> Reclassified as <i>Puccinellia</i> sp. (grass)	Syowa Station, Enderby Land, East Antarctica	1993 (?)	Eradicated	Single plant	Removed in 2007 (S. Imura, pers. comm.)	ATCM XX IP 66 Tsujimoto et al. (2010)
<i>Nassauvia magellanica</i> (flowering plant in the aster family)	Whalers Bay, Deception Island, Antarctic Peninsula	Pre Jan 2009	Eradicated	Single plant	Removed by UK scientists in Jan 2010	Smith and Richardson (2010) ATCM XXXIII IP43
<i>Juncus bufonius</i> (rush)	Within ASPA 128 Western Shore of Admiralty Bay	Pre Dec 2009	Established?	Germanated propagules and pollen reported	Propagules germinated from soil. Pollen found in soil suggesting adult plant may have existed at site	Cuba-Diaz et al., 2012

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