BAS BIOSECURITY REGULATIONS

Edited by the Environment Office

Edition	Version	Date	Amendments	Approved by
2	10	05/11/25	Provision of information on availability of biosecurity equipment; removal of the use of insect sticky traps in the UK; clarification regarding the storage of foods in Cambridge/Bar Hill; prohibition of the use of corn starch-based packing chips; update on use of sprouting; information on dealing with bed bug/flea infestations; update on biofouling measures.	Kevin Hughes

British Antarctic Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

November 2025

The BAS Biosecurity Regulations are an updated version of the earlier BAS Biosecurity Handbook, which existed in four editions between 2013 and 2016. The document title was changed from ‘Handbook’ to ‘Regulations’ in light of the increasing awareness across the organisation of the serious consequences should a non-native species be introduced to the polar regions, and to reflect the mandatory nature of the contents. The Regulations were compiled by Kevin A. Hughes (Environment Office) with consultation across BAS departments and external stakeholders.

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Update Procedures

If you have any suggestions or comments regarding the BAS Biosecurity Regulations, please contact the Environment Office at BAS Cambridge. Revised versions of the Regulations will be made available via the intranet. Hard copies are not controlled but the following personnel will be advised when a revised version is released:

BAS internal distribution:	
Head of Environment Office	Health and Safety Advisor
Senior Environmental Manager	Arctic Station Manager
Environmental Research and Monitoring Manager	Rothera Station Operations Manager
Head of Polar Operation	Rothera Station Leader (winter & summer)
Head of Engineering Technology	King Edward Point Station Leader
Operations Programme Manager	Rothera Bonner Laboratory Manager
Field Operations Manager	Halley Station Operations Manager
Director of Operations	Halley Station Leader & Station Support Manager
Supply Chain Logistics Manager	Bird Island Station Leader (winter & summer)
Head of Supply Chain Logistics	Island Station Operations Manager
BAS Representative, BAS Falkland Islands Office	Signy Station Leader
Biosecurity Officer, *RRS Sir David Attenborough*	Programme Director - UK AIMP
Head of ReDs	Director of Science
Head of Estates	Head of Vehicles Section
Head of BAS Air Unit	Head of Airborne Survey Technology
Head of Human Resources	Head of Communications
Antarctic Access Office	Ship Operations Manager
Head of the NERC Arctic Office	Head of Risk and Assurance
External distribution:	
Polar Regions Department, Foreign, Commonwealth & Development Office	External Packing Company(s) (relevant sections)
GSGSSI Environment Officer	NERC Head of Sustainability

1 INTRODUCTION

1.1 How to use these regulations

The regulations set out practical biosecurity measures for BAS personnel to reduce the risk of introducing non-native species to Antarctica.

For all those operating in South Georgia and the South Sandwich Islands, these regulations should be read alongside the specific guidance outlined in the separate GSGSSI Biosecurity Handbook (see Appendix 1). The regulations conform, to the maximum extent practicable, to current best-practice regarding non-native species management as 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 2 and Appendix 3).

The document is structured as follows. An introduction sets out why it is important that we reduce the risk of non-native species introductions, which is followed by a section on general biosecurity measures. The next sections focus on reducing risks associated with specific elements of BAS operations, e.g., clothing and personal belongings, cargo, fresh foods, vehicles, and aircraft. Biosecurity requirements at specific BAS stations are then described, followed by a section on what to do during a biosecurity emergency. A separate section is also included for those operating in the Arctic.

1.2 Regulation sections relevant to responsible individuals

The following table lists individuals with responsibility for different elements of biosecurity within the organisation. Individuals should refer to role-specific biosecurity responsibilities listed below, but also ensure they have a general understanding of biosecurity precautions across BAS. In the 'Key sections' column, press 'control and click' to follow the link to the relevant section.

Table 1. Key chapters for responsible staff members

	Responsible individual	**Key sections**
1	All BAS personnel and others operating within BAS logistics	2, 3, 4.2.4, 11
2	Project Manager/Principal Investigator (PI)	2.2, 4.1, 4.2, 10.1, 13.2
3	Supply Chain Logistics Manager	3.4.2, 3.5, 4
4	Head of Human Resources	2.2

5	BAS Operations Programme Manager	3.4.1
6	Rothera Station Leader	3.6, 3.7.2, 3.7.4, 4.2.2, 4.2.3.1, 4.5, 4.7, 1.1, 5, 6.3, 7, 9.1, 9.2, 9.4, 11
7	Bird Island Station Leader	3.6, 3.7.4, 4.2.2, 4.2.3.1, 4.5, 4.7, 1.1, 4.8.1, 4.8.2, 5, 6.3, 9.1, 9.2, 9.7, 11
8	Halley Station Leader	3.6, 3.7.4, 4.2.2, 4.2.3.1, 4.5, 4.7, 1.1, 5, 6.3, 9.1, 9.2, 9.5, 11
9	KEP Station Leader	3.6, 3.7.4, 4.2.2, 4.2.3.1, 4.5, 4.7, 1.1, 4.8.1, 4.8.2, 5, 6.3, 9.1, 9.2, 9.6, 11
10	Signy Station Leader	3.6, 3.7.4, 4.2.2, 4.2.3.1, 4.5, 4.7, 1.1, 4.8.1, 4.8.3, 5, 6.3, 9.1, 9.2, 9.3, 11
11	Ship's Biosecurity Officer	3.7, 4.2.2, 4.2.3.1, 4.5, 4.6, 4.7, 4.8.1, 4.8.2, 4.8.3, 5, 6.3, 8
12	Head of Estates	4.2.3.2, 4.4
13	Station Chef Manager	5, 5.6
14	Ship Chief Cook	5, 8.3.1, 8.3.2
15	Head of Vehicles Section	6
16	Head of the Air Unit	7
17	Head of Airborne Survey Technology	7.4
18	Personnel operating RPAS	7.4
19	Ny Ålesund Station Leader	13
20	Field Operations Manager	10
21	Manager of the relationship with the agent in Punta Arenas	3.7.3
22	Agent in Punta Arenas	3.7.3, 4.6, 7.2
23	BAS representative in the Falkland Islands	3.7.3, 4.6, 7.2, 3.5
24	Head of ReDs	2.2

25	Head of the NERC Arctic Office	13
26	Purser	5
27	Director of Science	2.2
28	Traverse Leader	10.1

1.3 Non-native species

Many species of plants animals and microorganism have been moved around the world through human activities to areas they would not reach naturally (see Figure 1). 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 polar regions have 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 (Figure 2). The Arctic is also vulnerable to introductions, particularly with its greater levels of biodiversity and the presence of local human populations.

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.

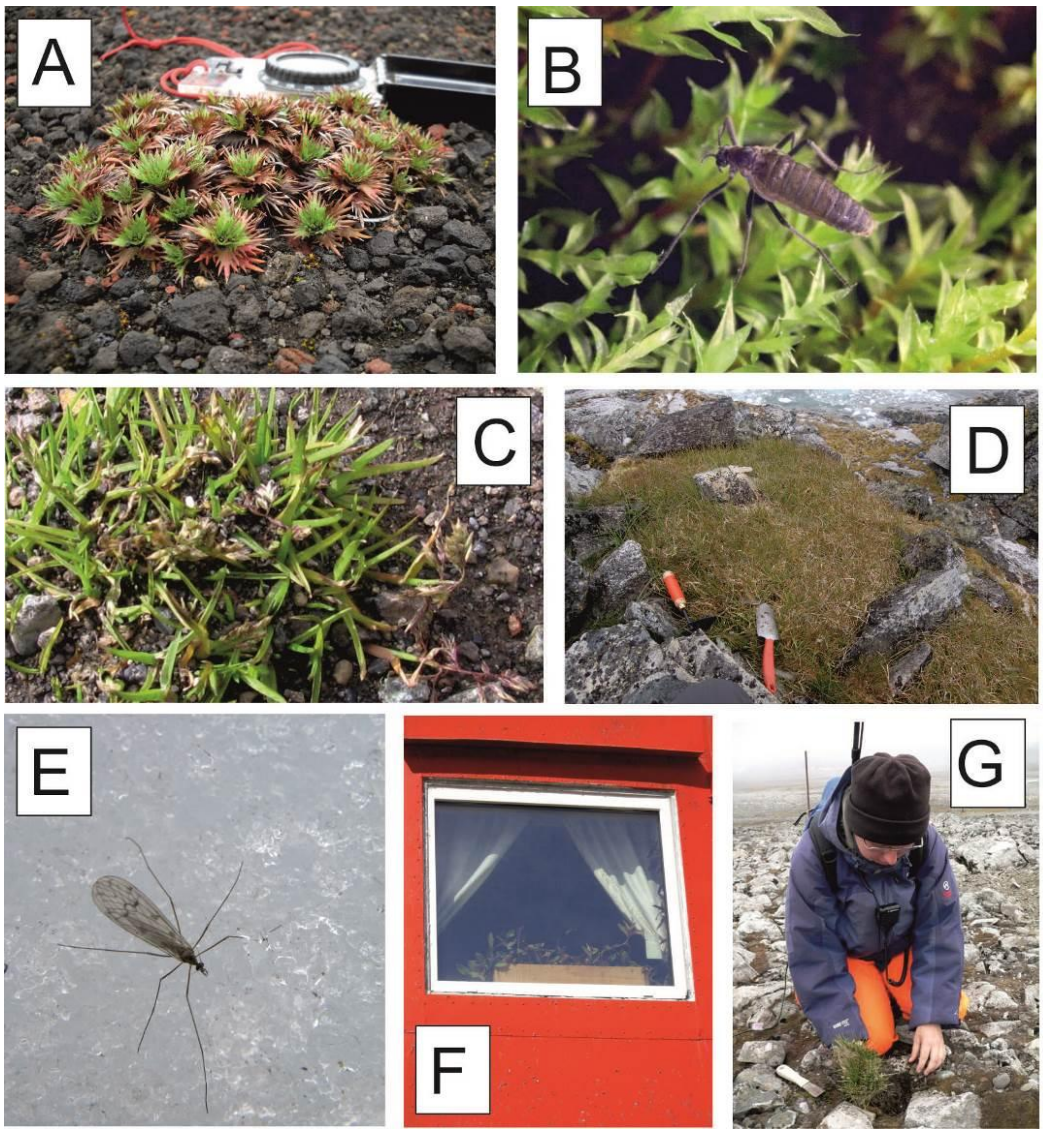

Figure 1. Non-native species in Antarctica

The above figure shows the following non-native species: [A] *Nassuavia magellanica* eradicated from Deception Island in January 2010 (Photo: K. A. Hughes). (B) The flightless chironomid midge *Eretmoptera murphyi*, introduced to Signy Island, South Orkney Island from South Georgia (Photo: P. Bucktrout). [C] *Poa annua* on Deception Island and subsequently eradicated (Photo: M. Molina-Montenegro). [D] Now eradicated, *Poa pratensis* on Cierva Point, Antarctic Peninsula, was first introduced during transplantation experiments in 1954/55 (Photo: L. R. Pertierra). [E] *Trichocera maculipennis* found in Artigas Base (King George Island, South Shetland Islands) sewage system in 2006/07 and in surrounding terrestrial habitats (Photo: O. Volonterio). [F] Non-native potted plant in the window of Bellingshausen Station in 2010 (King George Island) (Photograph: K. A. Hughes). [G] Removal of an alien grass species from the vicinity of Great Wall Station, Fildes Peninsula, King George Island in 2006 (Photo: S. Pfeiffer).

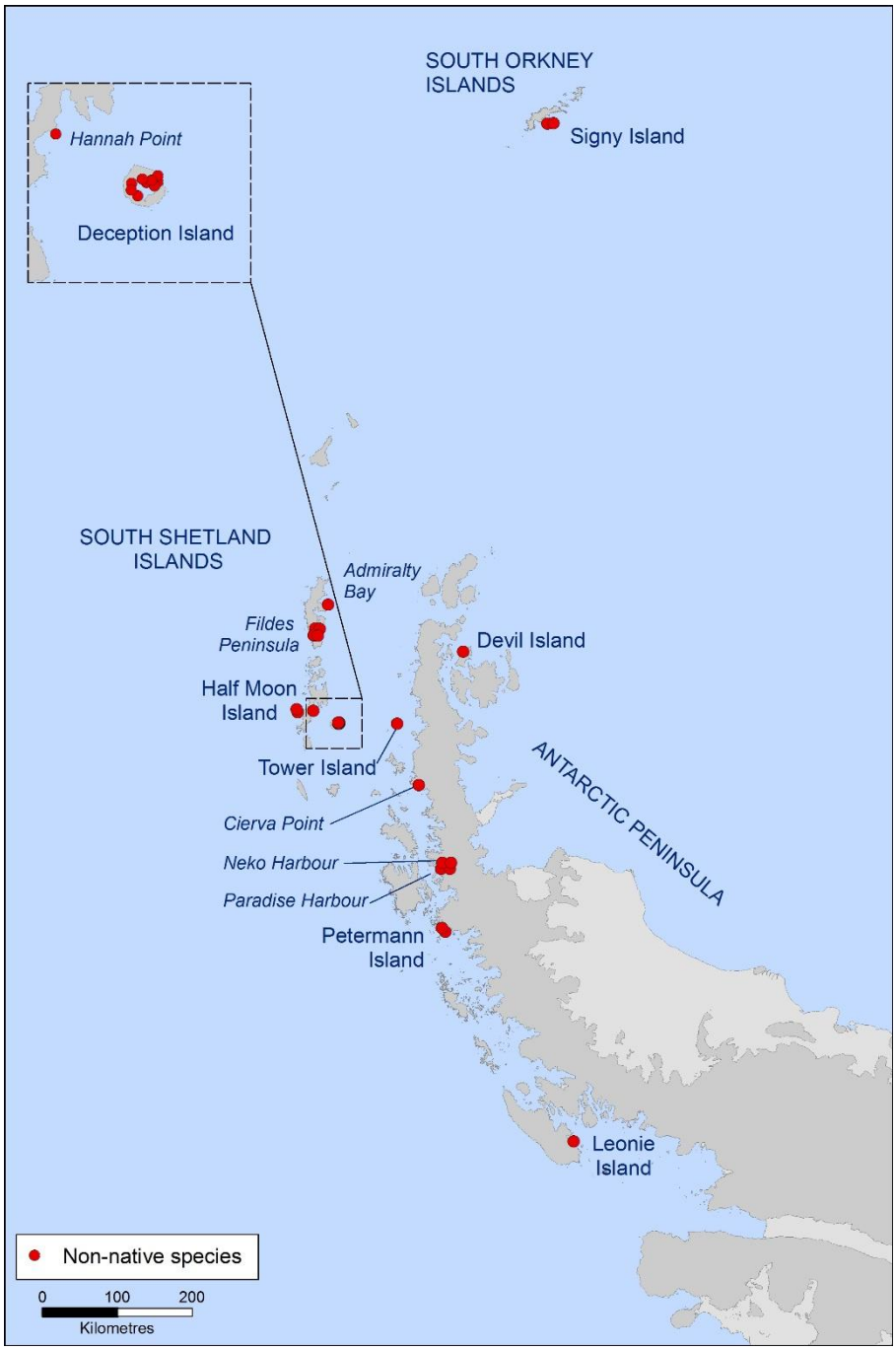

Figure 2. *Map of the Antarctic Peninsula region showing the distribution of known established non-native species. There has been some success in the eradication of non-native plants in recent years, but no non-native invertebrates have been eradicated and new introductions continue to be discovered.*

1.4 Legislation in polar regions

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 Antarctica and South Georgia, respectively. The Antarctic Act puts into UK legislation Annex II of the Protocol on Environmental Protection to the Antarctic Treaty, which prohibits the importation of non-native species into the Antarctic Treaty area without a permit. Non-native species legislation for Antarctica, South Georgia and the South Shetland Islands is some of the strictest in existence and BAS is obliged to conform to this legislation. In contrast, non-native species legislation in the eight Arctic nations is generally less strict, due to the presence of permanent human populations and their associated needs. Nevertheless, BAS is also obliged to conform to the relevant legislation of the eight Arctic nations, where this and/or associated guidelines exist. It is the responsibility of the person leading the field work to the relevant Arctic state to become familiar with the relevant legislation and ensure field activities are not in breach of this legislation.

The introduction of a non-native species is probably the most significant environment risk faced by BAS, and as a result, biosecurity is a key issue within the BAS Environmental Strategy.

1.5 BAS biosecurity measures

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 six stations make it essential that biosecurity measures are well-considered, implemented and conform to legal obligations. Furthermore, BAS activities cover several polar areas of distinct biological diversity. This 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 (2010):

(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.

1.6 BAS Environment Office contact details

The BAS Environment Office welcomes any questions, feedback or suggestions regarding Antarctic biosecurity. To discuss any biosecurity issues please contact: environment@bas.ac.uk

Address:
Environment Office (Rm 331)
British Antarctic Survey
High Cross
Madingley Road
Cambridge
CB3 0ET
United Kingdom

2 GENERAL BIOSECURITY MEASURES

2.1 Introduction

This section outlines responsibilities of all BAS staff with regard to non-native species. For detailed information on role-specific responsibilities, please see later sections.

2.2 BAS's organisational biosecurity responsibilities

Individual responsible	• Project Manager/Principal Investigator (PI) • Director of Science • Head of Human Resources • Head of ReDs

- As a minimum, BAS must comply with the legislation that exists in the area within which the organisation's staff or infrastructure is operating.
- As part of the Environmental Impact Assessment process, all project managers/PIs (or other designated deputy) signing the Preliminary Environmental Assessment agree to the following statement:

  '*I understand that I am responsible for ensuring all biosecurity checks and measures are implemented for my project and for communicating the biosecurity requirements to all project members*.'

- The BAS point of contact (e.g. PI, co-PI, named contact, Letter of understanding 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 Regulations and the separate GSGSSI Biosecurity Handbook (see Appendix 1).
- Staff must receive training on biosecurity and non-native species issues and be made aware of the contents of the BAS Biosecurity Regulations. Biosecurity training is a mandatory part of pre-deployment training and all personnel must attend.

2.3 BAS personnel responsibilities

Individual responsible	• All BAS personnel and others operating within BAS logistics

- All biosecurity breaches and near misses must be logged on the BAS incident reporting system (i.e., MAXIMO). Contact the Station Leader, Ship's Biosecurity Officer or your Line Manager for further information.
- If you see anything that could represent a biosecurity risk and that requires immediate action (e.g., a rat spotted on Bird Island), take all reasonable action you can to deal with the risk (e.g., kill the rat) without endangering yourself or your colleagues. The Station Leader or Ship's Biosecurity Officer must be informed at the earliest opportunity, who must then inform the BAS Environment Office (and Designated Person Ashore (DPA) for incidents aboard ship).
- If any invertebrates (e.g., flies, spiders, beetles, slugs, etc.) are found within station buildings or on ships, every effort must 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 must 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. Personnel do not need to import any fresh foods, as BAS imports fresh foods to Antarctica and South Georgia for consumption by visiting personnel.

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PROHIBITED

Examples of prohibited items: pot plants, seeds, bulbs, pets, brine shrimp (sea monkeys), insects, microorganisms, fresh fruit and vegetables, cheese, fresh meat, untreated wood with bark, non-sterile soil or compost.

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

2.4 BAS biosecurity stations and kit bags

Individual responsible	• All BAS personnel and others operating within BAS logistics

Biosecurity measures are the most effective way of reducing the risk of species introductions into Antarctica and the transfer of species between different Antarctic locations. All personnel must check that all the cargo that they are sending to the polar regions and their clothing, footwear and personal equipment are free of all soil, seeds, invertebrates and cobwebs.

- Pay particular attention to pockets and Velcro®
- For footwear, check the sole, under the insole and tongue
- Do not forget to check the inside corners of bags, boxes, cases and rucksacks
- Check grooves in specialist scientific packing cases
- Pay close attention to recreation equipment that can trap soil and plant fragments

2.4.1 BAS equipment at Cambridge and on the ship/stations

To help BAS personnel comply with these requirements, BAS biosecurity kit bags have been supplied.

At BAS Cambridge, each BAS science group has been provided with a BAS biosecurity kit bag. Scientists should consult with their Science Leader who will tell them who within their group has been designated with responsibility for the kit bag.

BAS biosecurity kit bags have also been supplied to the ships, stations and to the agents at Punta Arenas and the Falkland Islands. Please consult with the Ship's Biosecurity Officer, Station Leader or the BAS manager at the gateway port if you wish to use the bag.

There are two types of BAS biosecurity kit bag, each with different contents: cleaning kit bags and emergency kit bag. The contents are described below:

Cleaning kit bag

Item	Number per kit bag
Mini hoover	1
Yellow boot brush	1
Yellow nail brush	1
Yellow dustpan and brush	1
Tweezers	1
Plastic Tray (c. 20 x 30 cm)	1
Waste Bags for incineration	5
BAS Packing Biosecurity Checklists	1

Emergency kit bag

Item	Number per kit bag
Mini hoover	1
Yellow boot brush	1
Yellow nail brush	1
Yellow dustpan and brush	1
Mouse bait boxes (baited)	2
Rat bait boxes (baited)	2
Insecticide	2
Insecticide foggers	6
Insect sticky traps - cockroach (south only)	20
Insect sticky traps - hanging flies	20
Fly swotter	2
Plastic Tray (approximately 20 x 30 cm)	2

Waste Bags for incineration	20
Peanut Wax Tags	20
Disposable gloves	5 pairs
Safety goggles	2
Laminated Safety Data Sheets for bait, insecticide, fumigant foggers	1

Other biosecurity equipment to be made available on the ship/station may include: rat bait boxes, mouse bait station, mechanical rat bait boxes, mechanical mouse bait boxes, rat/rodent bait, boot washers, absorbent mats, Virkon tablets, spare UV bulbs for wall mounted UV flying insect killers, insecticide spray, insecticide foggers, insect sticky traps (flat or triangular style designed for crawling insects – to be used outside the UK only), insect sticky traps (helical style for flying insects), peanut wax tags, waste bags for incineration of quarantined material (as necessary).

Location of biosecurity equipment:		**Number**
RRS Sir David Attenborough:		
As outlined in Biosecurity Equipment SEA-SD-DIF-GEN-04.		
Cambridge:		
Science Building 1- ground floor	Cleaning kit bag	2
Science Building 2- old reception area	Cleaning kit bag	2
Science Building 3	Cleaning kit bag	2
Clothing Store	Cleaning kit bag	1
Rothera Research Station:		
Hanger	Boot washer	2
	Virkon disinfectant	1
	Cleaning kit bag	1
Boatshed	Boot washer	1
	Virkon disinfectant	1
	Cleaning kit bag	1
Head Chef's Office	Emergency kit bag	1
Admirals Cleaning Store	Cleaning kit bag	1
Giants Cleaning Store	Cleaning kit bag	1

Vikings Cleaning Store	Cleaning kit bag	1
Discovery Building Store	Cleaning kit bag	1
	Emergency kit bag	1
Halley Research Station:		
Kitchen	Emergency kit bag	1
Signy Research Station:		
Oil Spill Store	Boot washer	1
	Virkon disinfectant	1
Station Leaders Office	Emergency kit bag	1
	Cleaning kit bag	1
Bird Island Research Station:		
Pipit House	Boot washer	1
	Virkon disinfectant	1
Station Leaders Office	Emergency kit bag	1
	Cleaning kit bag	1
King Edward Point Research Station (managed in tandem with GSGSSI):		
Biosecurity Building	Emergency kit bag	1
	Cleaning kit bag	1
Boatshed	Boot washer	1
	Virkon	1
Food store	Emergency kit bag	1
Station Leaders Office	Emergency kit bag	1
	Cleaning kit bag	1

2.4.2 Cambridge biosecurity stations

For more general use at BAS Cambridge, three biosecurity stations are available to allow cleaning of large amounts of cargo and equipment prior to being sent to the Cambridge Warehouse. The Cambridge biosecurity stations are be located at:

1. The old reception, ground floor Science Building 1 (BAS biosecurity kit bags, plus large vacuum cleaner and attachments)

2. The ground floor corridor entrance to Science Building 2 (BAS biosecurity kit bags, plus large vacuum cleaner and attachments)
3. The corridor beside Room 56 that links Science Building 1 with the quad containing the pond (BAS biosecurity kit bags, plus large vacuum cleaner and attachments).

2.5 Summary of reporting requirements

All biosecurity breaches and near misses must be logged on the appropriate BAS Incident Reporting System (i.e., MAXIMO). Contact the Station Leader, Ship's Biosecurity Officer or your Line Manager for further information on how to do this. The Table below provides a summary of reporting requirements and timeframes for specific incidents detailed in the regulations.

Table 2. Biosecurity incident reporting requirements

Biosecurity incident	**MAXIMO**	**Environment Office contact**	**Section**
Individual preparing to depart from the ship has failed to comply with biosecurity standards	Yes	-	8.2
Individual arriving on station has failed to comply with biosecurity standards	Yes	-	3.7.4 9.2
Vehicle is known or suspected to have been transported to, or within, Antarctica without being cleaned	Yes	48 h	
At BAS Cambridge, the external rodent control contractor notes that the rodent poison has been taken or gnawed	Yes	48 h	4.2.3.2
Soil, plant fragments or other introduced species are found on cargo or shipping containers being off-loaded to the stations	Yes	48 h	4.7
Cargo or shipping containers transferred between stations are subsequently found to be contaminated with soil or biological material	Yes	48 h	4.8.1
Following the importation of fresh foods, non-native species or soil are found during the inspections	Yes	48 h	5.4.3
Rodent (e.g., rat or mouse, dead or alive) spotted on any BAS vessel	Yes	The Environment Office and the	1.1

		Designated Person Ashore must be informed immediately	
Rodent (e.g., rat or mouse, dead or alive) be spotted on any BAS research station	Yes	Immediately	
Invertebrate infestation on ships or stations	Yes	48 h	11.5
Animal Mass Mortality Event	Yes	Immediately	11.6

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3 CLOTHING AND PERSONAL BELONGINGS

3.1 Introduction

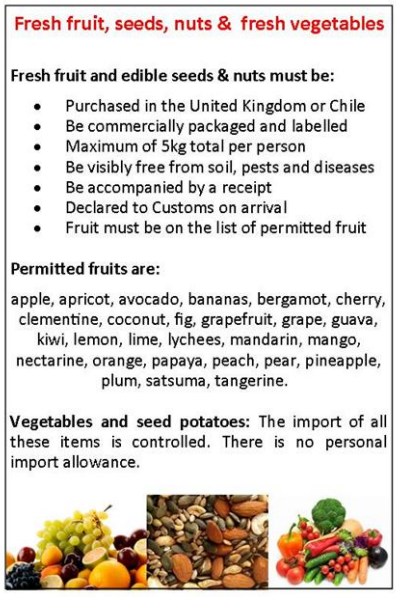
Clothing, footwear and personal equipment can trap seeds and soil that may then be transported to the polar regions and lead to invasions. For example, clothing used in the Arctic, sub-Antarctic or other high altitude cold region could pick up propagules that may be able to survive and establish if they drop off clothing in Antarctica (and vice versa). It is important that all clothing, personal belongings and kit bags are free of soil, plant fragments and seeds before they are taken to the Falkland Islands, Antarctica or South Georgia.

Strict biosecurity legislation is in place for the Falkland Islands, South Georgia and Antarctica, in recognition of the risk of non-native species to existing ecosystems. This section details measures to be applied by all visitors before moving into or between these areas.

Personal clothing and belongings may be subject to random spot checks by Ship and Station Management.

3.2 Falkland Island Biosecurity Regulations

All personnel travelling to/through the Falkland Islands must comply with the Falkland Island Department of Agriculture 'Biosecurity – Travelling to the Falkland Islands' regulations (available at: https://www.falklands.gov.fk/agriculture/biosecurity/travelling-to-the-falkland-islands).



3.3 Footwear, clothing and personal belongings

Individual responsible	All BAS personnel and others operating within BAS logistics

- Before handing in any personal items to the BAS Cambridge Warehouse for transportation to Antarctica, ensure that all personal cargo and belongings are clean and free of soil and propagules.
- Immediately before leaving home for Antarctica and/or South Georgia, all outer clothing must have any seeds, soil and other propagules removed and then be washed at the hottest temperature suitable for the garment. Particular attention must be given to all Velcro, gaiters, pockets, turn-ups in trousers and hoods of jackets, as these areas readily trap soil, seeds and invertebrates.
- Footwear must be cleaned (inside and out) to remove all soil, seeds or any other plant material. Check under the footwear insole and tongue and remove any propagules.
- Ensure all clothing and personal effects are packed indoors in a clean environment.
- 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.
- Avoid activities that may result in contamination of clothing by soil, seeds and other propagules during travel to Antarctica. Ensure clothing is cleaned after walking in the countryside in the Falkland Islands, around Punta Arenas or other Antarctic gateway ports. Use the equipment in the BAS biosecurity kit bags to remove soil, seeds and invertebrates (see Section 2.4.1).
- Staff taking their own personal field clothing to Antarctica must ensure it is clean.
- Brand new clothing will be free of soil and propagules. Therefore, if possible, new BAS clothing should not be used until the morning before boarding the BAS aircraft or after the ship has departed for Antarctica.
- When moving between BAS stations, all clothing and personal belongings must be checked and cleaned so they are free of soils and propagules (see the BAS Packing Checklist below). If necessary clean clothing and belongings using the BAS biosecurity kit bags (see above).

3.4 Packing personal belongings

It is essential that all personal clothing and possessions are checked and are only transported to the Antarctic region once free of non-native species and soil.

3.4.1 BAS packing biosecurity checklist

Individual responsible	• All personnel travelling to the Antarctic region with BAS • Head of Human Resources • BAS Operations Programme Manager

- All personnel travelling to Antarctica or the sub-Antarctica islands must read the BAS packing biosecurity checklist and conform with the requirements.
- The Antarctic packing biosecurity checklist (below) must be distributed by HR to all new BAS employees that are to be deployed to Antarctica.
- The Antarctic packing biosecurity checklist must be distributed by BAS Operations to all BAS staff alongside their air tickets to travel to their respective Antarctic gateway ports (e.g., Punta Arenas, Port Stanley, Cape Town, etc.).

ANTARCTIC BIOSECURITY

Non-native species are those species that do not occur naturally in an area, but have been introduced by human activities, either intentionally or unintentionally.

The sub-Antarctica Islands, which include South Georgia, already have a wide range of non-native species including plants, invertebrates, fish, birds and mammals. Here some invasive species have had major negative impacts on natural biological communities. However, the Antarctica continent still has very few non-native species, and we want to keep it that way*.

Please use the following checklist when packing:

Biosecurity Checklist	✓
All clothing has been washed to remove plant seeds, invertebrates and soil *(Tip: check any Velcro® is clean and pay particular attention to pockets!)*	
All footwear has been scrubbed free of all plant seeds, invertebrates and soil *(Tip: check under the insole and tongue too!)*	
All bags and personal equipment have been cleaned, washed and/or vacuumed to remove plant seeds, invertebrates and soil	
All personal recreational equipment has been cleaned, including climbing gear, walking poles, ski and snowboard equipment, kiting equipment and bicycles	
The following items have NOT been packed:	
• Any living plant, animal or microorganism – unless in possession of an appropriate permit	
• Non-sterile soil or compost	
• Any plant propagules (e.g. seeds, bulbs, cuttings) or invertebrate eggs (e.g. brine shrimp or sea monkey eggs) – growing plants and keeping animals in Antarctica and South Georgia is NOT allowed without a permit	
• Untreated wood where bark remains attached	
• Any perishable foods including fruit, vegetables, cheese, fish or meat	
You have explained the above restrictions to any person that is likely to send gifts or packages to you while in South Georgia or Antarctica	

For more information, please contact **Kevin Hughes** (kehu@bas.ac.uk) or any member of the Environment Office. Thank you!

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** Unpermitted importation of non-native species is a breach of UK and Government of South Georgia legislation and could lead to serious consequences for the responsible individual(s) and BAS, including up to two years imprisonment and/or an unlimited fine*

3.4.2 Personal boxes (P-boxes)

Individual responsible	• Supply Chain Logistics Manager • All BAS personnel sending personal boxes through the Cambridge Warehouse.

Personnel who are overwintering in Antarctica are often given the opportunity to send a box of personal items to the Antarctic Stations. This box is usually taken to BAS Cambridge for onward ship transport to the destination in Antarctica or South Georgia. It is essential that the box and its contents do not present a biosecurity risk, through the importation of non-native species to the Antarctic region.

- When packing personal boxes, all personnel must use the packing biosecurity checklist (see above) to ensure the personal box is free of all non-native species and soil.

3.5 BAS kit bags

Individual responsible	Supply Chain Logistics Manager

- All BAS kit bags used to hold clothing must be either new or cleaned so that they are free of soil, dust and propagules before being sent to the polar regions.
- All clothing supplied to BAS personnel must either be new (i.e., straight out of the packaging) or washed and free of soil and propagules.
- The Supply Chain Logistics Manager must ensure that BAS staff who retain a full kit bag in stores have fully washed the contents at the end of each season so the items are free of soil, dirt and any propagules.

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

3.6 Goods/gifts received by post

Individual responsible	All BAS personnel and others operating within BAS logistics

During their time in Antarctica or South Georgia personnel may receive postal packages sent by friends or family or goods ordered via mail order or from local suppliers in the Falkland Islands or South America.

- All personnel must ensure that they have communicated all biosecurity requirements to anyone who is likely to send them a package during their time in Antarctica or to any supplier with whom they have placed an order.
- Occasionally, packages consigned to BAS stations or personnel with the Antarctic or South Georgia may be suspected of containing non-native species (e.g., leaves or other plant material). Under these circumstances, the package must be impounded temporarily, and the circumstances reported via the BAS incident reporting system. Advice on next steps will be provided by the BAS Environment Office.

3.7 Biosecurity inspections of personal clothing and equipment

It is important that regular spot checks of individual's outer clothing, footwear and personal equipment are undertaken to ensure that they are free of soil and non-native species. The checks are also useful to ensure that biosecurity training has been effective and to reinforce the message that biosecurity is a priority for BAS. Station Leaders will undertake these checks on station and Ship's Biosecurity Officer on the *RRS Sir David Attenborough*.

3.7.1 Biosecurity for personnel travelling to the Antarctica region on BAS vessels

Individual responsible	Ship's Biosecurity Officer

- Upon arrival on the ship, all individuals shall be asked to sign the BAS Biosecurity Declaration, whereby the individual confirms that all their clothing, footwear and

personal equipment has been checked and is free of soil, seeds and other propagules.

- All individuals must be given the opportunity to clean their items using the biosecurity kit bags on the ship (see Section 2.4.1), prior to signing the BAS Biosecurity Declaration. Cleaning must be done inside to prevent release of any soil, seeds, or other propagules into the environment. Any soil, seeds or other propagules must be disposed of by incineration.
- At some point during the voyage to Antarctica or South Georgia, the outer clothing, personal bags and equipment of at least two individuals must be inspected by the Ship's Biosecurity Officer or their nominated deputy (see: Appendix 4: Biosecurity inspection guide). The individual must be present when their clothing, and personal bags and equipment are being inspected.
- The Ship's Biosecurity Officer or their nominated deputy shall only inspect outer clothing and equipment. Particular attention must be paid to:
    - the soles, tongues and underneath the insoles of footwear
    - Velcro on coats, gaiters, shoes, and over trousers
    - Climbing/ice climbing equipment, the underside of camera bags, the tips of walking poles and tripod feet, scientific sampling equipment.

- Should an individual have failed to comply with biosecurity standards, the Ship's Biosecurity Officer or individual undertaking the checks should ensure measures are taken to remedy the situation (i.e., items cleaned and soil/propagules incinerated).
- The Ship's Biosecurity Officer must ensure that all biosecurity standards described in the BAS Biosecurity Regulations (see Section 1.1) have been met before the clothing and personal items can be used by the individual on South Georgia or Antarctica.
- Individuals who fail to sign the BAS Biosecurity Declaration and comply with the BAS Biosecurity Regulations must not be permitted to disembark the ship in Antarctica or

South Georgia. Should it be necessary, the line manager of the individual concerned must be informed at the earliest opportunity.

3.7.2 Inter-continental travel to Antarctica by aircraft

Individual responsible	• All BAS personnel and others operating within BAS logistics • Rothera Station Leader

Visitors travelling by aircraft can transport non-native species and propagules rapidly from outside Antarctica (e.g., UK, Punta Arenas, Port Stanley, etc.) 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., Port Stanley, Punta Arenas or Cape Town).
- If possible, put on newly laundered outer clothing just before travelling to Antarctica on the aircraft.
- 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.

3.7.3 Pre-flight Biosecurity Declaration

Individual responsible	• Manager of the relationship with the agent in Punta Arenas • Agent in Punta Arenas • BAS representative in the Falkland Islands

- All passengers boarding the inter-continental flight from Punta Arenas or the Falkland Islands to Rothera, must have watched the BAS Pre-flight Biosecurity Briefing video and have signed the Pre-flight Biosecurity Declaration, prior to

departure. The Declaration will contain the signatures of all passengers on a particular flight.

- By signing the document, passengers confirm that they have undertaken the necessary biosecurity checks prior to departure.
- If necessary, the BAS Biosecurity kit bags will be made available, so that clothing, footwear and personal equipment can be cleaned and made free of soil, seeds, invertebrates and plant fragments (see Section 2.4.1).
- If washing facilities are not available at gateway ports, store any clothing item(s) that may contain propagules in a plastic bag and after informing the Station Leader clean the item immediately upon arrival. Ensure all removed soil, seeds and other propagules are disposed of by incineration.
- Departure for Antarctica must not be permitted until the biosecurity measures have been undertaken and the Declaration has been signed.
- At the end of the season, Agunsa (Punta Arenas) or the BAS representative (Falkland Islands) must scan the Declaration documents and send the scans to the BAS Environment Office.

3.7.4 Personnel arriving at BAS research stations

Individual responsible	Station Leaders

- Immediately upon arrival on station, all incoming personnel must be prompted to declare any inadvertent importation of soil, or potentially contaminated clothing and equipment. Should this occur, the individual shall be given the opportunity to clean their items inside the station building using the biosecurity kit bags that are available on station (see Section 2.4.1). Any soil, seeds or other propagules should be disposed of by incineration, either on the station or, for those stations without incinerators, kept in a Griff bin for incineration on the ship.
- Any individual importing a non-native species, in accordance with a permit issued under the Antarctic Act 1994; 2013 or GSGSSI Wildlife and Protected Area (WPA) Ordinance, 2011, must have their permit checked.
- Upon arrival of a passenger aircraft at Rothera or the arrival of a BAS vessel at any BAS research station, the personal bags and equipment of at least two individuals must be inspected (see Appendix 4: Biosecurity inspection guide). The inspection of external clothing and personal bags must occur in a private room on station or

aboard the ship (e.g., the Station Leader's or Ship's Biosecurity Officer's office). The individual must be present when their bags or personal equipment is inspected. The Station Leader or their nominated representative must inspect outer clothing worn by the individual or within their bags. With the exception of socks, it is not necessary to inspect underclothing. Particular attention must be paid to:

- the soles, tongues and underneath the insoles of footwear
- Velcro on coats, gaiters, shoes, and over trousers
- Climbing/ice climbing equipment, the underside of camera bags, the tips of walking poles and tripod feet.

- Should an individual have failed to comply with biosecurity standards, the Station Leader or individual undertaking the checks should ensure measures are taken by the individual to remedy the situation (i.e., items cleaned and soil/propagules incinerated/packaged for disposal outside Antarctica). If a visitor's clothing items, luggage or equipment is found to contain soil, seeds or other propagules, then this may delay the commencement of their work in Antarctica while the situation is resolved.
- The Station Leader must ensure that all biosecurity standards described in the BAS Biosecurity Regulations have been met before the clothing and personal items can be used by the individual.

4 CARGO

4.1 Introduction

Cargo presents one of the greatest risks of non-native species introductions. Soil, rats, mice, plant fragments, insects and other species can become entrained on cargo and, if adequate precautions are not taken, can be transported inadvertently to Antarctica, South Georgia and other locations in large quantities. In the past, such biosecurity breaches have resulted in major biosecurity incidents and it is essential that steps are taken to minimise the likelihood of reoccurrence.

All purchases must be made in accordance with the BAS Sustainable Procurement Policy.

BAS operates a '**CLEAN IN – CLEAN OUT**' policy whereby all cargo transported to Antarctic research stations much be clean and biosecured (i.e., free of all biological material, mud and soil) and all cargo and cargo containers exported from the research station should also be clean prior to export. This it to (i) reduce the risk of the intra-regional transportation of species between Antarctic locations and (ii) minimise the risk of contaminating the hold of any transporting vessels that might subsequently act as site for cross-contamination of cargo.

4.2 Packing cargo for export to the Falkland Islands, South Georgia and Antarctica

4.2.1 Packing material specifications and packing procedures

Individual responsible	• Person completing the Cargo Packing Note or Consolidated Fast Track Cargo Packing Note • Supply Chain Logistics Manager • Project Manager/Principal Investigator (PI) • Contract manager for any third party containerisation contractors (UK, Punta Arenas, Falkland Islands, etc.)

- All packing containers/boxes must be lined with plastic sheeting.
- All wood packaging must comply with the International Standards for Phytosanitary Measures No. 15 (ISPM 15) (see: https://www.gov.uk/wood-packaging-import-export)
- No previously used meat, fruit or plant product cartons must be reused.

- Packaging and filling materials may include shredded paper, vermiculite, bubble wrap and other air-filled cushioning materials.
- No polystyrene beads or chips, corn starch-based packing chips, soil, moss, used sacking, hay, straw, chaff or wood shavings shall be used.
- Reuse of packaging (e.g., reusable Nefab boxes or aluminium trunks) is permitted provided the packaging/container is inspected and thoroughly cleaned (preferably with disinfectant) prior to repacking.
- To the maximum extent practicable, reusable packaging (i.e., reusable plywood Nefab boxes) should be dedicated for cargo transport to and from specific stations, e.g., packing boxes used for Bird Island should not be subsequently sent to Rothera.
- Reusable packaging for use at KEP or Bird Island should not be used to transport cargo to Antarctica or other locations, unless thoroughly cleaned to remove all soil, seeds, invertebrates and other propagules.
- Where other cost-effective options exist, use of corrugated cardboard boxes should be minimised, as they may carry non-native invertebrates within the corrugations.
- Every effort shall be made to ensure any cargo is free of biological material. However, it may be impractical to seal some large or irregularly shaped cargo items in standard cartons or boxes (e.g., scaffolding or trunking). If practical, large or unusually shaped cargo should be wrapped in plastic film. Openings must be covered with cardboard or plastic to prevent access by rodents, invertebrates or soil.
- Where there is any doubt concerning the biosecurity status of pallets or packing material from suppliers, the packaging materials are to be removed and must be replaced prior to onward shipping.
- To the maximum extent practicable, cargo should be consolidated into ISO containers to allow additional biosecurity mitigation measures to be deployed (refer to 4.2.2).
- Boxes and cartons destined for South Georgia must be fully taped and sealed shut prior to loading onto the ship.
- Where practicable, cardboard boxes destined for South Georgia should not have hand holes cut. Use plastic handle inserts that prevent access of non-native species.

4.2.2 ISO container packing requirements

Individual responsible	• Supply Chain Logistics Manager

	• Contract manager for any third party containerisation contractors (UK, Punta Arenas, Falkland Islands, etc.) • Project Manager/Principal Investigator (PI) • Ship's Biosecurity Officer • Station Leaders

The following steps must be followed to reduce the risk of inadvertent transfer of non-native species in association with ISO containers.

- In the UK, shipping containers must be stored on concrete surfaces.
- At all locations *en route* to South Georgia and Antarctica, shipping containers must be stored on concrete surfaces, to the maximum extent feasible (as opposed to bare earth).
- Prior to ISO container loading:
    - At all locations, the inside of shipping containers must be carefully inspected and swept out/vacuumed and/or steam cleaned as required to ensure that they are clean and dry internally, and they are free of soil, dust, invertebrates, plant fragments, seeds and cobwebs, prior to being filled with cargo. If the container is swept out at a station on South Georgia or in Antarctica, the sweepings must be collected and disposed of by incineration on station or on the next ship.
    - All vents must be securely taped up to prevent ingress of insects whilst in transit. The doors should be closed, and the container checked from the inside for any visible light due to perforations or ill-fitting seals. Any observed defects must be rectified, or the container replaced, prior to commencement of loading. Appropriate anti-condensation measures must also be deployed in the container. Alternatively, in circumstances where it is not appropriate/feasible to use anti-condensation measures, a fine mesh can be utilised instead of taping vents shut. There shall be no gaps between the mesh and the container surface, once affixed, which might allow invertebrate access. The mesh needs to (i) be made of a durable, corrosion resistant material (e.g., stainless steel), (ii) have a mesh size of 34 Mesh (0.5 mm holes), and (iii) be fixed permanently over all internal vents on the container.

  - The container must be visually inspected externally and any organic matter/bird droppings, etc., removed.

- During ISO container loading:

  - If possible, containers should be loaded within a warehouse/closed environment. If a container must be loaded outside, then it should be placed on a hard standing with a minimum of 2 metres all around it that is free of soil and vegetation.

  - During loading, vigilance must be exercised in respect of rodents, birds and insects, and airborne seeds or leaves. Keep available an aerosol insecticide to dispatch any insect entering containers or contacting cargo. Dead insects should be removed and disposed of.

  - If loading outdoors, the container door area must be continually attended – if loading is suspended, even temporarily, the access ramp must be removed, and the doors closed. If loading is suspended overnight (even if loading indoors), the container door must be closed.

  - Each item of cargo must be checked as it is loaded into the container to ensure that the outer packaging has not been perforated. Any cargo item found to be perforated must be returned to the packaging area, and the general cargo preparation measures repeated.

  - High risk materials, such as timber, machinery and vehicles should not be loaded in a container with other cargo if there is any risk that that there could be biosecurity threats that could contaminate other cargo. These items may require additional treatments such as fumigation, steam cleaning or heat treatment. Please consult with the BAS Environmental Office for further guidance.

- Once loading has been completed the following biosecurity protocols should be adhered to.

  - If possible, rodent detection dog searches of containers for King Edward Point and Bird Island should take place prior to fumigation.

  - For all containers, the following must be installed:
    - One pre-baited mouse box to be placed inside the container as close to the doors as practicable.
    - One pre-baited rat box to be placed inside the container as close to the doors as practicable.
    - Two crawling insect traps to be positioned parallel and adjacent to the container walls or doors, and as close to the doors as practicable.

For containers loaded with food or beverages, the baited rodent bait boxes should be replaced with appropriately sized snap traps placed inside the bait stations (the bait station with snap traps should be carefully labelled as such to alert others).

- The container should be fumigated unless the cargo is not suitable for this process (e.g., contains food, flammable/dangerous goods or sensitive scientific equipment). Furthermore, reefers, science lab containers and the aquarium container should not be fumigated (see Appendix 5: Standard operating procedure for biosecurity cleaning of laboratory containers prior to deployment). Containers should be pack in such a way that the fumigant can disperse throughout the container (i.e., container packers should provide clear air spaces/channels through which the fumigant can disperse). Ideally, discharge inside the container one 'Digrain One Shot 300 ml 1.46% Permethrin' (or similar) total release aerosol per 20' container or according to manufacturer's instructions. The container should be shut and sealed immediately. This must be undertaken by an appropriately trained person. Container doors must have an appropriate label showing the date and time of fumigation (see Appendix 6: How to biosecure an iso-container prior to transportation)

For transport of the foggers, please consult the instructions that come with the foggers and refer to the Material Safety Data Sheet (e.g., HSE No. 8577; see https://www.hygienesuppliesdirect.com/files/static/midi_fumer.pdf). For disposal of used or out of date foggers, please refer to the guidance in the BAS Waste Management Handbook.

- If cargo type dictates that an insecticidal fogger or smoker is unsuitable, the perimeter of the container floor, must be sprayed with an insecticidal spray with a residual effect (i.e., a crawling insect killer, such as Protector C), paying extra attention to the threshold of the container doors to ensure sufficient

coverage. The use of naked flames to ignite an insecticide fogger is not appropriate for containers transporting fuel. In this case, a can of aerosol insecticide shall be released into the container just before closure of the container door for the last time prior to shipping.

- Once the container is closed, it must be sealed with a tamper-proof seal and the seal number must be added to the container packing list.

- The Biosecurity Statement on the container packing list provides the paper trail for biosecurity purposes for prior, during and after loading checks.

- Containers must be packed to ensure the chances of food packaging being damaged is minimised. For example, crushing of drink cans can release sugary liquids that may act as a food source for insects trapped within the container and result in reproduction and subsequently high numbers of live insects being transported to Antarctica.

Please see Appendix 7 for a summary of container cargo biosecurity arrangements and who is responsible for delivery.

4.2.2.1 Rodent detection dogs

- GSGSSI requires that cargo and ships are inspected by rodent detection dogs prior to arrival at South Georgia.
- Whenever possible, rodent detection dog searches of ISO containers for King Edward Point and Bird Island should take place prior to fumigation and sealing.
- All break bulk cargo must be checked by rodent detection dogs prior to loading on the ship if the ship is going to King Edward Point or Bird Island.

4.2.3 Packing area/warehouse requirements

4.2.3.1 General packing and warehouse requirements

Individual responsible	• Person completing the cargo packing note • Supply Chain Logistics Manager • Station Leader • Ship's Biosecurity Officer

	• Project Manager/Principal Investigator (PI)

Packing and warehousing is provided predominantly by the Cambridge/Bar Hill Supply Chain Logistics team; however, this may also be undertaken by other organisations, such as external UK packing companies and packers in Punta Arenas or the Falkland Islands. In addition, some individuals choose to pack their own cargo.

- For indoor areas which are used routinely for packing or storing cargo, such as the BAS Polar Distribution Hub (PDH) in Bar Hill and all external packing and warehousing contractors, the following requirements must be met:

    a. The area must be clean (which means free from soil, dirt, litter, weeds, plants, etc.). There must be no weeds or plants within 10 m of doors, excluding doors that are purely for fire exit purposes.

    b. The area must not be open to the environment. This means windows and doors should be closed as far as possible. In particular, if packing cargo in the hours of darkness windows must be kept closed, as invertebrates could be attracted to lights.

    c. The area must be equipped with relevant pest control and monitoring equipment, such as rodent bait stations. Specifically, the area must have a rodent control plan, with appropriate monitoring of baits and traps. If there is any indication of the presence of rodents, preparation of cargo must be suspended pending investigation and appropriate action by a rodent control operative.

    d. UV fly killers must be installed, one for every 50 m^2 of internal floor space, and they should be serviced once a year with UV tubes replaced. To prevent insects being attached into the building from the external environment, electric UV fly killers should not be mounted close to external doors.

- For indoor areas which are used for packing cargo or storing cargo on an *ad hoc* or one-off basis, the following requirements must be met.

    a. The area must be clean (free from soil, dirt, litter, weeds, plants, etc).

    b. The area must not be open to the environment. Windows, if present, should be shut and doors should be closed, as far as possible. If packing cargo in the hours of darkness, windows must be kept closed as invertebrates could be attracted to lights.

c. Buildings must be equipped with relevant pest control and monitoring equipment, such as rodent bait stations.

d. Cleaning equipment supplied in biosecurity stations must be available and used.

It is the responsibility of the individual establishing any external contracts to ensure all packing and biosecurity requirements are met and that the company is aware of the BAS Sustainable Procurement Policy.

All UK manufacturers and suppliers of dry and frozen foods must comply with 'The Food Safety and Hygiene (England) Regulations 2013'. See: http://www.legislation.gov.uk/uksi/2013/2996/made

4.2.3.2 Specific Cambridge Stores/Bar Hill Polar Distribution Hub requirements

Individual responsible	• Supply Chain Logistics Manager • Head of Estates • BAS Cambridge Facilities Manager

- Cargo storage and packing areas at BAS Cambridge must be free of weeds, seeds, plants, cobwebs and invertebrates.
- The BAS Cambridge courtyard must be kept free of all weeds and pot plants. Regular removal of weeds must be specified in the contract with the designated external site maintenance company.
- Pallets stored outside must be checked prior to use to ensure that they are clean. Occupied bird nests, if found, should only be removed if in accordance with the relevant legislation (see: https://www.gov.uk/guidance/wild-birds-protection-surveys-and-licences)
- Rodent control must be undertaken both indoors and outdoors in BAS controlled cargo packing and storage areas. This must be specified in the contract with an external rodent control company.
- If the external rodent control contractor notes that the rodent poison has been taken or gnawed, then they must inform the BAS Cambridge Facilities Manager within 48 hours. The Cambridge Facilities Manager must then complete an incident report (MAXIMO).

- Invertebrate pest control must be undertaken in BAS controlled cargo packing and storage areas. UV fly zappers must be mounted in the packing area and kept switched on. The UV fly zappers must be serviced once a year and the UV tubes replaced.
- All store doors must be kept closed, whenever possible.
- Cargo must be stored inside, where possible. If stored outside, cargo must be appropriately cleaned before being stored indoors. Cargo destined for ship transportation must be subject to appropriate biosecurity checks and cleaning prior to loading onto the vessel.
- Cargo packing and storage areas must be deep cleaned at least once per year. All floors must be cleaned and accumulated dust and packaging fragments removed.
- All external surfaces of all cargo submitted to the Cambridge warehouse must be inspected by designated members of the Supply Chain Logistics team prior to onward shipping. If the cargo is contaminated with soil, seeds, cobwebs or other propagules, it must not be shipped. Rather, the consignor must be contacted and given the opportunity to clean the cargo, before onward shipping can occur.
- Storage of foods in tin cans is permitted. However, storage of foods in less robust packaging (including foods in plastic, foil, card or paper containers and beverages in aluminium cans) should be avoided and only proceed following consultation with the BAS Environment Office.

4.2.4 Information for personnel submitting cargo to the Cambridge Warehouse

Individual responsible	• All personnel submitting cargo • Project Manager/Principal Investigator (PI)

- All cargo introduced into the BAS supply chain for transportation to South Georgia, Antarctica or the Falkland Islands must be clean and free of soil, seeds, invertebrates and cobwebs. This includes the internal and external surface of containers/boxes, as well as the contents.
- Cargo destined for the Falkland Islands must comply with the relevant regulations and, where appropriate, be accompanied by the necessary permit. For further information see the relevant biosecurity pages of the Falkland Islands Department of Agriculture: https://www.falklands.gov.fk/agriculture/12-biosecurity
- Cargo Packing Notes include the text '*ANY INNER OR OUTER PACKAGING AND ALL CONTENTS CONFORM TO THE REQUIREMENTS OF THE BAS BIOSECURITY REGULATIONS*'. All personnel must be aware that by signing and submitting a Cargo

Packing Note that they are confirming that the submitted cargo conformed to the requirements of the BAS Biosecurity Regulations.

- Upon arrival at BAS Cambridge Warehouse, all delivered cargo, including drums, must be visually inspected by the Project Manager/Principal Investigator to ensure they are free of insects, seeds, propagules and soil.

- Cargo should be stored inside, where possible. However, when cargo is stored outside at BAS, it must be checked by a member of the Supply Chain Logistics team and shown to be free of soil, seeds, plant fragments, rodents, feathers and bird droppings prior to onward shipping.

- If insects, seeds, propagules or soil are found associated with cargo they must be removed and the item cleaned by the owner 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, every effort must be made to ensure it is free of soil and organic matter before packing.

- BAS biosecurity kit bags, containing cleaning equipment, have been provided to each of the science teams at BAS Cambridge and kit bags and vacuum cleaners have been provided for general use at the Cambridge biosecurity stations (see Section 2.4.1).

4.3 Biosecurity requirements for ISO containers at BAS research stations and southern hubs, prior to their transportation to other locations

- This section provides information on the biosecurity measures that must be undertaken for containers (both empty and full) prior to being shipped from locations outside the UK, e.g., research stations and southern hubs. These requirements are in accordance with the BAS 'CLEAN IN – CLEAN OUT' policy. The measures are similar to those required for containers shipped from the UK (see Section 4.2.2), however, some differences exist depending upon the location (see Table 3, below).
- The information in Table 3 does not apply to reefer containers, science lab containers or the aquarium container.
- Biosecurity measures detailed in Table 3 points 3, 4, 5, and 6 apply to containers that have been opened but not necessarily emptied at BAS research stations and southern hubs, i.e., if the container is opened for any reason, the biosecurity measures must be performed prior to it being transported elsewhere.

Table 3. Biosecurity requirements for ISO containers at BAS research stations and southern hubs, prior to their transportation to other locations

		Container departure location				
		Rothera	KEP	Halley	FI*	Punta*
1	The inside of shipping containers must be carefully inspected and swept out/vacuumed and/or steam cleaned as required to ensure that they are clean and dry internally, and they are free of soil, dust, invertebrates, plant fragments, seeds and cobwebs, prior to being filled with cargo. If the container is swept out at a station on South Georgia or in Antarctica, the sweepings must be collected and disposed of by incineration on station or on the next ship.	✓	✓	✓	✓	✓
2	All container vents must have a fine mesh cover (34 Mesh; 0.5 mm hole) to prevent ingress of insects whilst in transit. Alternatively, vents must be sealed and appropriate anti condensation measures put in place. The doors must be closed, and the container checked from the inside for any other source of visible light due to perforations or ill-fitting seals. Any observed defects must be rectified prior to commencement of loading.	✓	✓	✓	✓	✓
3	The container should be fumigated unless the cargo is not suitable for this process (e.g., is loaded with food, flammable/dangerous goods or sensitive scientific equipment). Ideally, discharge inside the container one 'Digrain One Shot 300 ml 1.46% Permethrin' (or similar) total release aerosol per 20' container or according to manufacturer's instructions. The container should be shut and sealed immediately. This must be undertaken by an appropriately trained person (see Appendix 6). Container doors must have an appropriate label on the external surface showing the date and time of fumigation.	✓	✓		✓	✓
4	In some cases, the cargo type dictates that an insecticidal fogger is unsuitable, but use of	✓	✓		✓	✓

	insecticide spray may still be appropriate, e.g., containers holding boxed science equipment. In these cases, prior to loading, the perimeter of the container floor should be sprayed with an insecticidal spray with a residual effect (crawling insect killer), paying extra attention to the threshold of the container doors to ensure sufficient coverage.		
5	One pre-baited mouse box and one pre-baited rat box to be placed inside the container as close to the doors as practicable. In containers transporting foods, poison bait shall not be used. However, snap traps placed inside bait station may be used if available and clearly labelled to warn others.	✓	✓

* Facilities and personnel may not be available in the Falkland Islands or Punta Arenas to undertake biosecurity measures to the required standard. Should this be the case, and record shall be kept and reported on the BAS Incident Reporting System (MAXIMO).

- At all locations, the ISO container external surfaces should be checked for any soil/mud/plant material/faecal material. Facilities may not exist at all locations (especially on BAS stations) for pressure washing of containers external surfaces. However, if only a small area is contaminated, it may be possible to remove any material using a brush. Similarly, facilities do not exist as all locations to allow pressure washing of the underside of iso containers. Should contamination of the containers external surfaces be observed that cannot be cleaned, then this should be reported using the BAS incident reporting system (MAXIMO).
- A record shall be kept by station management (e.g., checklist) for each container to provide evidence that each of the biosecurity measure detailed in Table 3 (above) have been put in place. The record shall be made available to the Environment Office upon request for auditing purposes.

4.4 Extraordinary events and unusual cargo

Individual responsible	• Supply Chain Logistics Manager • Project Manager/Principal Investigator (PI) • Head of Estates

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. A separate Preliminary Environmental Assessment (PEA) form must be completed (see: https://www.bas.ac.uk/for-staff/polar-predeployment-prep/intro-guidelines-and-forms/preliminary-environmental-assessment/). Unusual cargo may include:

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

4.4.1 Wood, sand, aggregate and cement

- To the maximum extent possible, all wood taken to Antarctica or South Georgia, including for construction, should be chemically or heat treated immediately prior to export to reduce the likelihood of introducing associated species. Bark should be removed from all wood. As far as possible, wood used as dunnage should be treated prior to transportation. Dunnage shall not be offloaded in Antarctica or South Georgia unless it has been recently chemically or heat treated. It should be noted that treated wood can become contaminated with invertebrates, plant material (e.g., moss) and microorganisms (e.g., fungal rot) after treatment, so all wooden cargo and packaging need to be carefully inspected prior to transportation. If there is a time gap between wood treatment and export, then the wood must be stored inside in a clean and dry environment during this period. Contaminated wood shall not be exported to, or landed in, Antarctica or South Georgia.
- Only kiln dried sand (i.e., that has been heat treated) shall be imported into Antarctica.
- Only building aggregate sourced from a marine environment shall be imported to Antarctica and South Georgia. If the aggregate is to be used in the marine environment, then it must be heat treated (bag contents at 56^{o}C for 30 min or more) before being exported.
- Cement must be stored inside on a concrete hard standing. Sand and aggregate (ballast) must be contained within plastic bags or FIBC's and stored inside on hard standings or outside on plywood overlaid with a tarpaulin.
- As far as possible, all unused cement and ballast should be returned to the UK on completion of project works.

4.5 Cargo loading on to ships

Individual responsible	Supply Chain Logistics Manager Station Leader Ship's Biosecurity Officer

- All boxes and cartons should be fully taped and sealed shut prior to loading.
- All cargo loaded onto BAS vessels must have their external surfaces checked to confirm that they are free of soil, non-native species or evidence of non-native species (e.g., gnaw marks or droppings).
- The Ship's Biosecurity Officer must remind the crew involved in cargo loading to undertake visual checks of cargo for potential non-native species introductions. The biosecurity check of each item must be ticked off against the manifest, and a copy kept for future auditing purposes. The Ship Officers have the right to reject any cargo they feel has not been appropriately biosecured.
- Prior to loading ISO containers onto a ship:
    - The person preparing containers for transport is responsible for ensuring containers are biosecured appropriately for the ship (whether that is a BAS staff member or external contractor; see Sections 4.2.2 and 4.3). For further practical guidance please see Appendix 6: How to biosecure an iso-container prior to transportation for further practical guidance).
    - In addition, for cargo destined for King Edward Point and Bird Island, the Cargo Manifests need to be sent in advance to the Government of South Georgia & the South Sandwich Islands (GSGSSI) biosecurity officer to enable them to pre-identify any high-risk cargo they would like to double check on arrival.

4.5.1 Skips

- When used, the interior and exterior of all skips shall be checked prior to loading on to the vessel. The skips must be clean and free of all waste, soil, seeds and other biological material. It may not always be possible to see inside the skips if they are stacked on top of one another. Under these circumstances, the skips should be unstacked to facilitate the mandatory biosecurity checks and any required cleaning.
- Late delivery of cargo to the ship in no way reduces the requirement for comprehensive implementation of biosecurity checks and procedures prior to loading.

4.6 Cargo stored in transit

Individual responsible	Ship's Biosecurity Officer BAS representative in the Falkland Islands BAS agent in Punta Arenas BAS agent in Cape Town

Cargo destined for BAS stations or ship cruises may need to be stored temporarily at gateway ports (e.g., the Falkland Islands or Punta Arenas) until onward transportation occurs. During storage, cargo items may be contaminated by wind-blown seeds, rodent urine and bird drops. Therefore, to the maximum extent feasible:

- cargo should be stored inside;
- cargo should be stored on hard standing;
- appropriate rodent control measures should be put in place;
- the site should be clear of weeds and other plant material; and
- facilities should be provided to wash down/clean contaminated cargo.

It is recognised that facilities may not exist that allow compliance with these standards. However, discussions are underway to attempt to resolve these issues. Information regarding the export of ISO containers from the Falkland Islands and Punta Arenas is provided in Section 4.3.

4.7 Cargo received at stations from ships

Individual responsible	• Station Leader • Ship's Biosecurity Officer

- All cargo items, including drums, must be inspected visually to ensure they are free of insects, seeds, propagules and soil during off-loading in South Georgia and Antarctica.

- The Ship's Biosecurity Officer or Station Leader must designate one or more individual(s) to undertake visual checks of the outside surfaces of all cargo for potential non-native species introductions. The biosecurity check of each cargo item (e.g., box or pallet) must be ticked off against the ship manifest, and a copy kept for future auditing purposes. In particular, as far as possible, prior to off-loading from the ship all containers should be inspected externally and also opened to check for non-native species. Biosecurity emergency grab bags should be kept at hand (see Section 11.2).
- If it is not possible to undertake thorough biosecurity checks of ISO containers on board the ship prior to off-load, then checks of the external surfaces of the ISO container must be undertaken immediately following off-load. Any contamination (soil, mud, plant material, cobwebs, etc.) must be cleaned off and collected for appropriate disposal (i.e., incineration). Once off-loaded from the ship, ISO containers shall also be opened for internal biosecurity checks, although this does not need to occur immediately. During checks, should a biosecurity breach be observed or suspected, then the container must be closed immediately and not reopened until a plan to address the incident has been developed and is ready to be enacted.
- The Station Leader must remind all staff to remain vigilant for contamination of cargo by soil, seeds and invertebrates, as well as any evidence of rodent (i.e., gnawing, droppings, etc.) at the station meeting (e.g., sit-rep) prior to the arrival of the vessel.
- The Station Leader must designate one or more individuals with responsibility for responding to biosecurity emergencies during cargo off load. These individuals must be familiar with the location of the biosecurity emergency grab bags and understand how to respond to biosecurity incidents (see Section 11).
- All recipients of cargo must remain vigilant for soil and introduced species during cargo unpacking. On station, during unpacking of consigned items, department leaders are responsible for ensuring all cargo items are checked for potential biosecurity breaches.
- If soil, plant fragments or other introduced species are found on cargo, then:
    a. if heavily contaminated (e.g., a large quantity of soil on vehicle) it must be returned to the ship,
    b. the Station Leader must be informed immediately,
    c. the nature of the material must be recorded (e.g., with a photograph),
    d. the material must be destroyed by incineration, and
    e. the incident must be reported on the BAS Incident Reporting System.

4.8 Cargo export from BAS station

Individual responsible	• Station Leader

All cargo, including vehicles, departing from BAS stations must be free of local soil, seeds, invertebrates and other propagules. Information regarding the export of ISO containers from BAS stations is provided in Section 4.3.

4.8.1 Transfer of cargo between research stations

Individual responsible	• Station Leader • Ship's Biosecurity Officer

- Only essential cargo should be transferred between research stations.
- All transferred cargo must be checked prior to loading on the ship or aircraft that it is free of soil, plant material, invertebrates and any biological material.
- If large items, such as containerised accommodation buildings are being relocated between stations, they must be thoroughly checked prior to shipping. Any water or sewage systems should be thoroughly drained down and flushed through to remove organic matter. Any pipe ends should be sealed to prevent ingress of rodents or invertebrates.
- If insects, seeds, propagules or soil are found associated with cargo they must be removed and the item cleaned before packing or use.
- All vehicles transferred between research stations must be cleaned to the standard outlined in Section 6. Should facilities not exist for cleaning to the required standard, then the BAS Environment Office must be informed immediately and a report provided on the BAS Incident Reporting System.
- If any cargo transferred between stations is subsequently found to be contaminated with soil or biological material, then the item must be quarantined, cleaned and the incident reported on the BAS Incident Reporting System.

4.8.2 Transfer of cargo between KEP and Bird Island

Individual responsible	• Station Leader • Ship's Biosecurity Officer

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.** The advice below should be read alongside the GSGSSI Biosecurity handbook (Appendix 1):

- 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 must be inspected to ensure they are free of rats, insects, seeds, propagules and soil during packing and unpacking.
- When transporting cargo into South Georgia and between permanent settlements on South Georgia, boxes and cartons should be fully taped and sealed shut prior to loading.
- If the introduction of rats to Bird Island is suspected or confirmed, please contact the BAS Environment Office immediately and refer to the British Antarctic Survey 'Bird Island Rat Contingency Plan' (See Appendix 8). If the introduction of rats to KEP is suspected or confirmed, please contact the Government Officer and BAS Environment Office immediately.

4.8.3 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, all cargo exported from Signy to other Antarctic locations, South Georgia and the Falkland Islands must be free of soil, propagules and biological material.
- If appropriate, the station pressure washer should be used to remove soil from cargo before loading on the ship.

November 2025

5 FRESH FOODS

5.1 Introduction

Fresh foods (e.g., eggs, fruit, vegetables, etc.) imported to Antarctica and South Georgia may contain soil, insects, slugs, caterpillars, invertebrate eggs, mould and/or other microorganisms (fungi and bacteria). Therefore, it is essential that where introductions do occur, the situation dealt with promptly and appropriately.

Individual responsible	• Station Leader • Station Chef Manager • Ship Chief Cook • Purser • Ship's Biosecurity Officer

5.2 Fresh food importation

- Meat on the bone shall not be sent to or consumed at BAS research stations in the Antarctic region.
- 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.

5.2.1 Importation by aircraft

- Rothera station management must 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 must be kept in their packaging (sacks, cardboard boxes) until taken from the aircraft to the designated food storage area. Once in the food storage area, the food should be inspected as detailed in 5.3.

5.2.2 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 must be checked by an individual designated by the Ship's Biosecurity Officer for invertebrate infestation and excessive mould before it is off-loaded to the station. If invertebrate infestation and excessive mould is found, the fresh food must not be off-loaded.

- If fresh produce is inadvertently off-loaded to the station with invertebrate infestation and/or excessive mould it must be sealed in plastic and returned to the ship immediately for disposal according to the BAS Waste Management Handbook and the guidance in the GSGSSI Biosecurity Handbook in Appendix 1.
- It has been deemed that some fresh produce items cannot be checked adequately on receipt in South Georgia and therefore must not be ordered. This includes loose leafy vegetables such as: broccoli, cauliflower, lettuce, kale, spinach, cabbages (white cabbage and red cabbage are acceptable providing the outer leaves are removed), leeks, globe artichokes, celery, pineapples and fresh herbs (for full details see: Appendix 1)

5.3 Food storage area

- When fresh foods arrive on station, they must be stored in designated areas, preferably under cool conditions (fridge, cool storage area).

- Where fresh foods are stored outside of refrigerated rooms, they must be stored within plastic trays, where available, to contain any soil or plant fragments that be released.

- Mouldy or infested fresh food and excess soil removed from vegetables should be bagged and disposed of by incineration, in accordance with the waste food disposal processes established for the station and set out in the BAS Waste Management Handbook.

- Food storage areas must have operational electric UV fly zappers that must remain illuminated at all times. The UV fluorescent tube must be replaced annually.

- Sticky insect traps must be deployed in BAS research station food storage areas in Antarctica and South Georgia (i.e., at a level of 1 trap per 10 m^2 of floor space). Traps must be checked monthly and replaced every 6 months as a minimum.

- Food storage areas must be cleaned regularly (weekly) to remove any organic material.

5.3.1 Food storage area inspection

Once a month, the Station Leader must undertake a biosecurity inspection of the food storage area(s) to ensure:

1. Insect sticky traps are in place and remain effective
2. UV fly zappers are illuminated
3. The fresh food storage areas are clean and floors are free of plant material, dust and soil
4. Refrigerated fresh produce is stored appropriately and is free of mould and infestations
5. Produce outside the refrigerator is stored on available plastic trays to contain soil and plant material

Fresh food biosecurity inspections at Halley Research Station do not need to occur if fresh produce has not been supplied to the station that year.

5.4 Food biosecurity inspections

Individual responsible	• Station Leader

Fresh produce can present a high risk of introductions, so biosecurity checks at various stages of the supply chain are important to stop non-native species getting through. Therefore, all imported fresh fruit and vegetables must be inspected and infested and/or

contaminated items disposed of. Checks should be undertaken in an area where any 'escapees' can be contained and eradicated. Insecticide and other items for dealing with minor biosecurity emergencies are available on the stations and ships (consult with the Station Leader or Ship's Biosecurity Officer and see Sections 5.4.1 and 11.5). See also: Appendix 4: Biosecurity inspection guide.

5.4.1 Insecticidal spray

- During the fresh food inspection, insecticidal spray should be kept to hand, but if used must not come in contact with the food.
- For transport and use of the insecticidal spray, please consult the instruction that comes with the spray and refer to the Material Safety Data Sheet (e.g., https://www.diy-pest-control.co.uk/wp-content/uploads/2020/03/ProtectorC-MSDS.pdf).
- Wash your hands after use of the spray.
- For disposal of used or out of date insecticidal spray, please consult with the BAS Environment Office prior to disposal.

5.4.2 Fresh produce inspection

- Once on station, fresh foods must be (re)checked within 24 hours of arrival and any non-native invertebrates removed and destroyed.
- The fresh produce inspection is to occur within a dedicated biosecurity facility (e.g., BI or KEP biosecurity facility), or previously prepared room (e.g., the Top Store at Signy).
- The area used for inspection must be clean and free of clutter. Adequate lighting and bench space must be made available.
- Ensure any electric UV fly zappers are switched on.
- Ensure that any doors and windows are closed.
- Insecticide spray and bags must be at hand to kill any invertebrates and contain any contaminated or infested produce.
- At Signy, Bird Island and KEP Research Stations, every individual item of fresh food must be inspected within 24 hours of arrival on station and any non-native invertebrates removed and destroyed.
- At Rothera Research Station, it is recognised that checking large quantities of fresh foods may not be feasible. Rather, fresh foods contained in the walk-in refrigerator can be checked just prior to use in the kitchens. However, fresh foods stored in the dry food storage area adjacent to the refrigerator rooms must be checked upon arrival for soil, mould and invertebrates.

- At Halley Research Station, the likelihood of any seeds, invertebrates or other propagules surviving outside is very low. However, fresh foods should be checked and any invertebrates eradicated to ensure they do not colonise the station.
- Fruit and vegetables must be inspected externally for any signs of infestation by pests, such as holes of entry or exit of larvae or symptoms of disease. Any such signs must be followed up by cutting the fruit or vegetable to confirm the presence of the pest or disease concerned.
- The discovery of a single piece of fruit or vegetable that contains an insect or mite (specimens alive or dead) means that the chances of further non-native species being present is high. Therefore, it is essential that the high quality of inspection is maintained. It may be helpful to employ several people to undertake the inspection.
- Where more than 20% of inspected fruit or vegetables in a bag or box is found to be affected at levels greater than 20% of the fruit/vegetable surface the whole lot should be returned to the importing vessel or, if at Rothera, incinerated.

5.4.3 Reporting a fresh food inspection biosecurity incident

- Following the importation of fresh foods, a BAS incident report must be submitted detailing any non-native species or soil found during the inspections (i.e., through MAXIMO). Where possible, the incident report must contain information on (1) the origin of the fresh fruit and vegetables (e.g., the Falkland Islands, South America or UK), (2) the quantities of each fresh fruit and vegetable type, (3) the proportion of each fruit and vegetable type found to be contaminated or infested and (4) the items supplied covered in soil.
- Should any invertebrates be found, close-up photographs should be taken and attached to the incident report.

5.5 Fresh food washing and disposal

- In the rare event that unwashed soil-contaminated root vegetables are supplied to stations, then every effort shall be taken to dry brush off the soil into a tray. The soil shall then be bagged up and incinerated or disposed of in accordance with the BAS Waste Management Handbook. Inevitably, small amounts of soil may remain on the surface of the root vegetables. Residual soil shall be washed off the food items and the washing water treated with Virkon S prior to disposal in accordance with the BAS Waste Management Handbook.

- Wet food waste, including scraps, peelings, tea bags, etc., is dealt with differently at each station. All food waste must be disposed of in accordance with the BAS Waste Management Handbook.

- Any mouldy food delivered to a station by ship should be returned to the vessel for incineration. If this is not possible the mouldy food shall be bagged up and disposed of according to the Waste Management Handbook. Small quantities of mouldy food should be boiled for 10 minutes or cooked in a pressure cooker before disposal along with other food waste.

- 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 must 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 must be incinerated.

- **UNDER NO CIRCUMSTANCES SHALL FOOD OR FOOD SCRAPS BE FED TO LOCAL BIRDS OR OTHER WILDLIFE.**

5.6 Fresh food cultivation

Individual responsible	• Station Leader • Station Chef Manager

- Within BAS research 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 located on ice-free ground. However, hydroponic cultivation of fresh foods at Halley VI Research Station may be possible under certain controlled and regulated conditions and following the completion of the associated Environmental Impact Assessment. It is encouraged that those seeking to engage in hydroponic cultivation at Halley VI Research Station seek advice from the BAS Environment Office and permission from the Halley Operations Committee at an early stage of planning.

- Sprouting of seeds (such as beans, cress and mustard) may be permitted indoors, without soil and at a manageable scale at all BAS stations but only following the completion of an associated Environmental Impact Assessment.

- Should an invertebrate infestation occur or mould/rot develop on the plants, growing substrate or equipment, every effort must be taken to contain and disinfect all associated material/equipment in accordance with the mitigation measures detailed on the associated Environmental Impact Assessment. Any infestation events must be reported on the BAS incident reporting system.

6 VEHICLES

6.1 Introduction

Vehicles, such as quad bikes, snow mobiles and plant machinery, are transported routinely into and around Antarctica and the sub-Antarctic 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 can therefore carry organisms over large distances to areas where they are not normally found, which present a substantial biosecurity risk.

Individual responsible:	• Head of Vehicles Section

6.2 Vehicle cleaning guidelines

- 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 Antarctica 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 prior to transportation. 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.

- To the maximum degree feasible, panels should be removed to ensure there is no entrapment of soil and mud within internal vehicle compartments.
- 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.
- If the vehicle gets contaminated *en route* to the ship, arrangements should be made to thoroughly clean the vehicles at the ship loading site.
- Immediately before being loaded onto the ship for transportation, all vehicles must 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 must be cleaned and re-inspected before being transported.
- If transported into Antarctica and South Georgia, vehicles should have their engines started before loading, to ensure rats and mice are not living in the engine compartments. The GSGSSI specific guidance should also be referenced in Appendix 1.

6.2.1 Vehicle movement between BAS stations and/or southern hubs

Vehicles exported from BAS stations and southern hubs (e.g., the Falkland Islands and Punta Arenas) shall be cleaned to remove all non-sterile soil, non-native species and material or biological origin (plant fragments, animal or bird faecal material). If this is not possible, e.g. due to lack of facilities, then the Environment Office shall be informed, and an incident report shall be submitted via the BAS Incident Reporting System.

6.3 Cleaning of contaminated vehicles in Antarctica or South Georgia aboard ship

Individual responsible	• Head of Vehicles Section • Station Leader • Ship's Biosecurity Officer

- If a vehicle is known or suspected to have been transported to, or within, Antarctica without being cleaned, the incident must be recorded on the BAS incident reporting system and, in consultation with the BAS Environment Office, appropriate action taken to prevent reoccurrences.
- If the un-cleaned vehicle has not been unloaded from the ship or aircraft, it must be cleaned before off-loading. The removed soil or biological material must be collected into a sealed container and disposed of immediately by incineration or removed from the Antarctic region for disposal.
- If thorough cleaning of the vehicle aboard ship is not possible, the un-cleaned vehicle must not be off-loaded, but returned to the originating location.
- If the un-cleaned vehicle has been unloaded from the ship or aircraft before the contamination has been discovered, it should be re-loaded immediately and then either cleaned, or removed from the Antarctic region.

- Prior to re-loading of a contaminated vehicle onto the ship, precautions must be taken to avoid spreading any attached soil or biological material from the vehicle to other locations in the local area.

6.3.1 Cleaning of contaminated vehicles on station

Individual responsible	Station Leader

- In exceptional circumstances re-loading the vehicle on to the ship may not possible. The reasons for this must be detailed in the associated BAS incident report.
- Under this circumstance, the vehicle must be carefully cleaned to remove all soil and biological material as follows:
    - Every effort must 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 region.
    - Tarpaulins placed below the vehicle may help contain any soil or mud that is scrapped off.
    - Avoid using a pressure washer, as this is likely to disperse soil into the environment. Rather, dry brushing may effective.

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7 AIRCRAFT AND REMOTELY PILOTED AIRCRAFT SYSTEMS

7.1 Introduction

Aircraft have the capacity to transport species rapidly from one region to another, both from outside Antarctica and between locations within Antarctica. Therefore, it is essential that the aircraft and all associated personnel and cargo are free of non-native species.

7.2 Biosecurity measures for manned aircraft

Individual responsible	• Head of Air Unit • BAS representative in the Falkland Islands • BAS agent in Punta Arenas • Rothera Station Leader

- 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 to additional biosecurity measures once they have arrived at their Antarctic destination (see Section 3).
- 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.
- Prior to departure, all passengers on BAS Air Unit aircraft must see the BAS Pre-flight Biosecurity Briefing video.
- All passengers on BAS Air Unit aircraft must sign the BAS Biosecurity Declaration confirming that they have carried out all necessary biosecurity checks.

- Passengers on BAS Air Unit aircraft will not be permitted to depart for Antarctica until they have performed the required biosecurity checks and have signed the BAS Biosecurity Declaration.
- For cargo arriving by aircraft, the Rothera Station Leader shall designate one or more individuals to undertake visual checks of cargo for potential non-native species introductions. The biosecurity check of each cargo item must be ticked off against the aircraft load sheet, and a copy kept for future auditing purposes.

7.3 Movement of BAS aircraft between rock runways in Antarctica

Individual responsible	Head of Air Unit

Figure 3. *Frei Base runway, Fildes Peninsula, King George Island, South Shetland Islands.*

Figure 4. *Marambio Base runway, Seymour Island, Antarctic Peninsula*

Aircraft can rapidly move Antarctic species from one area of Antarctica to another.

- When travelling between Antarctic rock runways (e.g. from Rothera to Frei or Marambio) ensure the aircraft is as clean as possible and the interior has been recently swept.

- Do not transport any soil, rocks/fossils, biological species or specimens between Antarctic locations, unless in accordance with a Specialist Activity Permit.

7.4 Remotely Piloted Aircraft Systems (RPAS)

Individual responsible	• Head of Airborne Survey Technology • All BAS personnel and others operating within BAS logistics who will be operating RPAS for work or recreational purposes.

- All RPAS must be kept clean and free of soil and propagules (see: BAS Regulations on Unmanned Aircraft Systems (UAS): https://nercacuk.sharepoint.com/sites/BASDigitalw/whats-new/OperationsEngineering/Pages/UAS.aspx)

- Biological material must not be transported on a RPAS.

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8 Ships

8.1 Introduction

Ships (the RRS Sir David Attenborough and other support vessels) are an essential part of the BAS logistical operation and have the capacity to deliver large quantities of cargo and personnel to BAS stations as well as support field activities at other polar locations. Therefore, there is a high risk that ships can transfer non-native species, including rodents, to the polar regions.

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) on a BAS ship while in port or BAS research station, then BAS Environment Office and Designated Person Ashore must be informed immediately and appropriate advice shall be given.

On the SDA, the mechanism used for reporting of biosecurity incidents shall depend upon the nature of the biosecurity incident. Minor incidents or breaches shall be reported collectively on MAXIMO at the end of the voyage, more major incidents shall be reported within 24 hours. Examples of major and minor incidents are provided below:

Major incidents	**Minor incidents**
Infestation of > 5 live invertebrates (e.g., 10 slugs in a cabbage)	Infestation of 5 or fewer insects
Any incident relating to rodents	Any number of dead insects
Bedbug infestation	Any insects found when the vessel is not in polar areas (e.g., flies found around the deck when the SDA is in the Falkland Islands, with a few making their way into the vessel corridors)

8.2 Clothing, personal belongings and boats suits

Individual responsible	• Ship's Biosecurity Officer

- It is important that the boots and clothing of those arriving by ship in South Georgia and Antarctica are adequately cleaned before disembarkation. At a suitable interval before the arrival date, the incoming Station Leader or ship management must inform landing personnel and crew that clothing must be cleaned to remove soil, seed and other propagules and have them sign the BAS Ship Biosecurity Declaration.

- The Ship's Biosecurity Officer must undertake random spot checks of personnel before their disembarkation from the ship.

- Boating suits may be routinely worn ashore across multiple island stations and other locations. Prior to disembarkation, boating suits should be checked for seeds, soil and other propagules (including in the Velcro) and if found, these should be removed.

8.2.1 Cleaning of footwear: boot washers, absorbent mats and Virkon S disinfectant

- Just prior to disembarkation at locations in South Georgia and Antarctica, all footwear must be cleaned in disinfectant (e.g., Virkon S).

- Footwear must be cleaned again on reboarding the vessel.

- Virkon S is the disinfectant used in the boot washers and absorbent mats placed at the bottom of the gangway, etc. One large tablet makes up 5 litres of Virkon S.

- Disinfectants can become ineffective over time, or if contaminated excessively with soil or organic material. Therefore, disinfectant solutions provided for footwear cleaning must be changed weekly, or more often if they start to get muddy. A specific individual designated by the Ship's Biosecurity Officer shall be assigned this task as part of their duties.

- Inactivated Virkon S breaks down into harmless salts and therefore can be disposed of in the sea. Virkon S solution should be dated once prepared to ensure sufficient time has elapsed for it to become fully deactivated. This normally occurs after seven days, or when the Virkon S solution loses its pink colour (see: http://virkon.com/products-applications/disinfectants/virkon-s/how-to-use-virkon-s/disinfectant-foot-dips/)

8.3 General biosecurity measures

Individual responsible	• Ship's Biosecurity Officer

- All ships must have a current Ship Sanitation Certificate (SSC).

- To the maximum extent possible, timber that is used on the ship for the purpose of bracing, separating, protecting or for securing cargo must have been heat or chemically treated. If not, the timber must not leave the vessel when alongside in Antarctica or South Georgia.

- The Ship's Biosecurity Officer, or representative of the BAS Environment Office if available, must give a biosecurity briefing to the crew prior to sailing or within one week of the crew change. All those on board must attend.

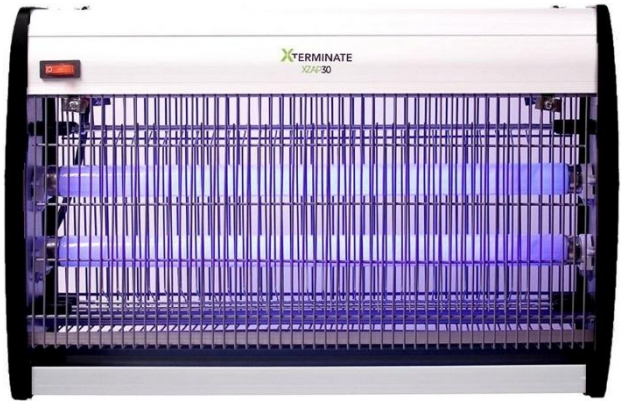
- The Ship's Biosecurity Officer, after liaison with the relevant crew, must complete a Biosecurity Report (SEA-SD-FORM-ENV-01) at the end of each voyage, which should be emailed to the Designated Person Ashore and BAS Environmental Office prior to each crew change when the vessel has been operating in the Southern Hemisphere.

- Should a biosecurity incident occur, then reference should be made to SEA-SD-FORM-ENV-03 'Biosecurity Breach Response and Checklist'.

8.3.1 UV fly-zappers

Individual responsible	• Ship's Biosecurity Officer

	• Purser



- Where feasible, electric UV fly-zappers must be used in food storage areas.
- The UV fly-zappers must be kept switched on at all time.
- The UV tubes must be changed annually.

8.3.2 Insect sticky traps

Individual responsible	• Ship's Biosecurity Officer • Purser

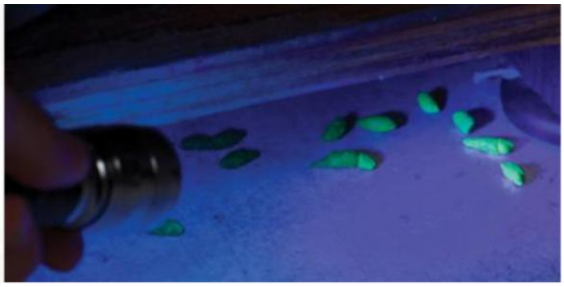
- Insect sticky traps should be placed in food storage areas and other cargo storage areas. As a guide, one trap is required per room or compartment. If the room floor

area is greater than 25 m^2, then an additional sticky trap should be deployed per additional 25 m^2, or part thereof.

- For areas where fresh food is stored, then one insect stick trap per 10 m^2 is needed.
- Sticky traps should ideally be checked once every month, and at a maximum must be changed every 6 months.

8.4 Rodent specific measures

- In compliance with GSGSSI regulations, BAS ships should be inspected by rodent detection dogs prior to arrival in South Georgia. Rodent inspection of the vessel and cargo should occur in the UK as part of the loading and departure process. Depending upon logistical planning, inspection by rodent detection dogs may also occur in the Falkland Islands, in collaboration with the GSGSSI. Should a rodent be detected on ship or associated with any cargo, the Environment Office and DPA shall be informed immediately.
- All BAS ships must have rodent (mice and rats) bait stations with non-toxic bait for deployment across the ship. The non-toxic bait has an ingredient that fluoresces under ultraviolet light; not only does this better show crumbs of bait, but also stains rodent faeces and urine so they may be more easily detected.



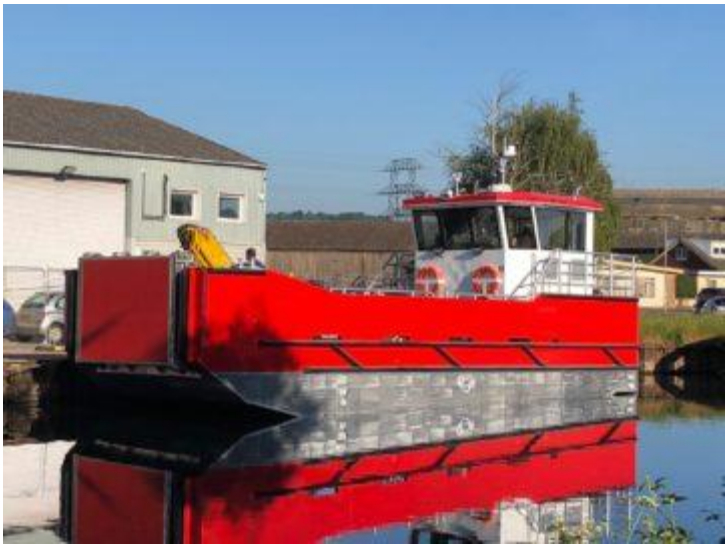
- Rodent monitoring stations should be placed in quiet and sheltered areas, and fixed where necessary to prevent movement in heavy seas. Frequency of bait replacement should be as per the manufacturer's instructions or more often if required.

- Ships destined for South Georgia must comply with GSGSSI rodent bait station requirements (see Annex 2 of GSGSSI Biosecurity Handbook 2022-23; Appendix 1). Rodent monitoring stations should be placed in each of the following areas where rodents may enter or exit the vessel: foc'sle (mooring line locker or Bosun's locker), aft mooring deck, zodiac storage or shelter deck, and cargo receiving areas. Furthermore, rodent bait stations shall be placed in areas where rodents may hide aboard ship, including waste storage areas and dry food and provision stores.

- In areas where fresh foods are stored, poison bait shall not be used. Baits stations with non-toxic bait that fluoresces under UV light shall be deployed. As a non-mandatory additional measure, rodent traps may be deployed that trap rodents by mechanical means.

- In the event of a rodent sighting, or evidence suggesting a rodent is present on the vessel (e.g., gnaw markers, droppings, nest) inform the Ship's Biosecurity Officer immediately.

8.5 Tender



- The inside of the tender must be cleaned between each landing location to remove soil and other biological material knocked off passengers' boots. Please note, cleaning is not required between repeated journeys to the same location, e.g., during multiple tender trips between the SDA and Bird Island.

- Anchors must be cleaned to ensure they are free of soil, mud and sediment.

8.6 Cargo

- Biosecurity inspections of all Antarctic station and ship cargo (and in particular, fresh foods) should be undertaken immediately prior to it being loaded or unloaded (see Section 4).
- All fresh foods must be checked before being offloaded to the stations (see Section 5)

8.7 Biosecurity measures when in port

- BAS ships must deploy rat guards on all of the mooring lines when in port.
- 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 (bootwasher and absorbent mat with Virkon S) must be made available at the gangway to allow boot/shoe washing ON and OFF the ship.

N.B. Ships destined for South Georgia will be subject to inspections by the GSGSSI dog team to ensure no rodents are present on the vessel.

8.8 Ballast water measures

The RRS Sir David Attenborough is a new ship and must comply fully with the IMO International Convention for the Control and Management of Ships' Ballast Water and Sediment (see: https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx). The Convention supersedes RESOLUTION MEPC.163(56) Guidelines for Ballast Water Exchange in the Antarctic Treaty Area (see below and: https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx).

Guidelines for Ballast Water Exchange in the Antarctic Treaty Area

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 60^{o}S). 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.

8.9 Biofouling measures

The hulls of ships can act as vectors for the transportation of marine non-native species into and within the Antarctic region and beyond. Steps shall be taken to minimise the level of hull biofouling, which shall include:

- regular removal of biofouling on hulls, sea chests, sea inlet ports and other niche areas during dry dock;
- regular application of anti-fouling coatings or coatings that 'polish' and inhibit organism adhesion (e.g., Ecospeed) to the ship hull, sea chest, sea inlet ports and other niche areas; and
- regular/on-going flushing of any moonpools to reduce the building up of biofouling organisms.

Within the constraints of logistical planning, the duration of time spent in port, during which time biofouling communities can develop rapidly, should be kept to a minimum.

Each austral summer season, dive surveys of the *RRS Sir David Attenborough*, or other vessels, as necessary, shall be undertaken to monitoring levels of hull fouling, with particular attention paid to the sea chests and sea inlet ports and other niche areas. Evidence of fouling by macroscopic organisms (i.e., more than a slime biofilm) shall be reported via the BAS incident reporting system.

November 2025

9 BAS STATIONS

9.1 Introduction

BAS operates research stations in South Georgia and Antarctica that each have different types and levels of risk associated with non-native species. Climatic conditions and the presence of suitable habitat can affect the likelihood of introduced species being able to colonise. Furthermore, the presence of existing non-native species at some stations means the risks of further dispersal by human activities have to be managed. This section provides information on biosecurity considerations at each research station. Station Leaders are responsible for ensuring that biosecurity measures are implemented at the station for which they have responsibility and for any cargo exported from that station to other BAS stations.

BIOSECURITY BREACHES INVOLVING A RODENT INCURSION OR SUBSTANTIAL INVERTEBRATE INFESTATION ON SOUTH GEORGIA OR IN ANTARCTICA MUST BE REPORTED TO THE BAS ENVIRONMENT OFFICE IMMEDIATELY.

9.2 Ships at BAS stations (including BAS, Royal Navy and tourist vessels)

Individual responsible	Station Leader

- All vessels coming alongside at KEP Wharf and Rothera Wharf (or any other wharf in Antarctica or elsewhere) must have rat guards fitted.

- The Station Leader must ensure that basic biosecurity measures (see below) are communicated to the vessel Master before it arrives at a BAS station.

- The footwear and clothing of all passengers intending to disembark must 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.

- Boot washing with disinfectant (e.g., Virkon S) is obligatory for all passengers, staff and crew prior to disembarking at and, again, when returning to the ship. Where non-BAS ships are alongside the wharf, station management shall provide disinfectant, buckets and brushes.

- To ensure compliance, the Station Leader must undertake spot checks of disembarking personnel once ashore. If soil, seeds, plant fragments or invertebrates

are found on the clothing, footwear or personal belongs then they shall be required to clean the contaminated item immediately, and a BAS incident report must be completed.

9.3 Signy Research Station

Individual responsible	• Signy Station Leader

9.3.1 Key biosecurity risks

Climatically, Signy Island is within the maritime Antarctic and experiences similar conditions to Rothera Research Station. 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 essential 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.

Figure 5. *The midge Eremoptera murphyi in adult and larval forms*

9.3.2 Station specific biosecurity measures

- Measures to reduce the likelihood of soil and non-native species introductions must be taken, in accordance with general biosecurity procedures (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 Station Leader must provide a biosecurity briefing to 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 are 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 must take precautions that soil and plant material is not released into the environment at other Antarctic locations.

- Soil and plant samples collected on Signy Island must not be kept or cultivated in the laboratories at other Antarctic research stations.

- Scrubbing brushes shall be placed at the top of the stone chute and at the top of the back slope. The brushes must be used to clean mud off footwear on the outward journey from the station, in order to prevent the dispersal of the *Eretmoptera murphyi* larvae to other areas of the island.

9.4 Rothera Research Station

Individual responsible	• Rothera Station Leader

9.4.1 Key biosecurity risks

Rothera Research Station is a major logistical hub for BAS activities on the Antarctic Peninsula as well as being a location for year-round scientific research. Ship and aircraft inter-continental links with South America and the Falkland Islands mean non-native species could be transported rapidly to the station, making appropriate biosecurity procedures essential. Nevertheless, the lack of substantial colonisable habitat in the vicinity of the wharf and runway and station buildings and the slightly more extreme climatic conditions mean the risks of colonisation are lower than at other more northerly BAS stations. However, effective biosecurity measures are still essential as several non-native incidents have occurred in the past:

- non-native species (i.e., flies) colonised the station buildings, but were eradicated
- the non-native springtail *Hypogastrura viatica* was reported on Leonie Island (but was not detected during a recent monitoring survey)
- large volumes of non-Antarctic soil, plants, invertebrates, seeds and microorganisms were introduced on construction vehicles
- soil and plant material has been introduced in association with containerised cargo
- rodents (found dead) have been introduced in associated with imported rock salt.

9.4.2 Station specific biosecurity measures

The Station Leader must provide a biosecurity briefing to all personnel arriving on the station, detailing the need to remain vigilant for non-native species and how to respond to and report an incident should it occur.

9.4.2.1 Visitors arriving from gateway ports by aircraft

- On arrival at Rothera airstrip apron, the Station Leader must board the aircraft and ensure that no one intending to leave the aircraft has footwear that is contaminated with soil, mud or obvious plant material (see also Section 3.7).

- If contaminated footwear is observed, then the individual will have their footwear removed and cleaned before they can disembark.

- As passengers disembark the aircraft, they must walk across an absorbent mat provided by station management containing 1% Virkon S disinfectant solution. One 50 g Virkon S tablet makes up 5 litres of Virkon S solution to the correct concentration.

- Virkon S disinfectant can become ineffective over time or if contaminated excessively with soil or organic material. Therefore, the disinfectant solution provided for footwear disinfection must be changed weekly, or more regularly if it starts to get muddy.

- Inactivated Virkon S breaks down into harmless salts and therefore can be disposed of in the sea. Virkon S solution should be dated once prepared to ensure sufficient time has elapsed for it to become fully deactivated (c. 7 days) prior to disposal in the sea.

9.4.2.2 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 in Ryder Bay.

2. Transfer of the non-native springtail (*Hypogastrura viatica*) that is potentially present 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 (both 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 (bucket and long handled brush) will be provided by the Boating Officer at Rothera and brushes will be provided on the boats.
- If boating suits are worn when walking around on land, the boating suit boots must be rinsed and cleaned in seawater before travelling on the boat to another destination.
- Boat interiors must be kept free of soil and mud.

9.4.2.3 Sewage treatment plant operation

The Rothera Research Station sewage treatment plant requires the addition of commercially available freeze-dried non-native bacteria to make it function optimally. Station management must contact the BAS Environment Office, as necessary, to ensure BAS's Antarctic Act Section 3 permit permits the importation of these non-native bacteria to the Antarctic Treaty area.

9.5 Halley VI Research Station

Individual responsible	• Halley VI Station Leader

9.5.1 Key biosecurity risks

Halley Research Station is located on the Brunt Ice-shelf which is, in effect, devoid of macroscopic terrestrial life. If any non-native species or propagules were introduced to this area, they are unlikely to be able to establish. As a result, the area around Halley is at negligible risk from non-native species. Nevertheless, invertebrate may become established within the station buildings and if observed should be eradicated. Similarly, local birdlife may be vulnerable to pathogens in waste food, so all food waste must be disposed in accordance with the BAS Waste Management Handbook and in such a way as to prevent access by wildlife.

9.5.2 Station specific biosecurity measures

9.5.2.1 Local bird life

The presence of emperor penguins and skuas 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 5.5). To prevent access by scavenging birds, food waste is not to be stored outside prior to incineration.

9.5.2.2 Sewage treatment plant operation

The 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 must contact the BAS Environment Office, as necessary, to ensure

BAS's Antarctic Act Section 3 permit permits the importation of these non-native bacteria to the Antarctic Treaty area.

9.6 King Edward Point Research Station

Individual responsible	• KEP Station Leader

9.6.1 Key biosecurity risks

King Edward Point is located on South Georgia in the sub-Antarctica. This region experiences much milder climatic conditions than BAS stations within Antarctica and is therefore at considerably greater risk of colonisation by introduced non-native species.

Many non-native plants and invertebrates exist at KEP that are not found at other BAS stations. Therefore, it is essential that ships operating out of KEP do not transport native or non-native species from KEP to other polar locations, either within South Georgia itself or Antarctica.

For many decades, rodents were present on South Georgia, which had severe impacts upon native bird populations. Rats were eradicated from the area around KEP in 2011. 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 the GSGSSI Biosecurity Handbook (see Appendix 1), should be followed.

Reindeer were introduced by the Norwegians to supply fresh meat for the whaling station personnel in the early 20th Century. However, reindeer grazing had substantial negative impacts upon the native vegetation. Efforts were made to remove the reindeer and by early 2015, all reindeer were thought to have been eradicated. Any reindeer sightings should be reported to the Government Officer immediately.

9.6.2 Station specific biosecurity measures

The Station Leader must provide a biosecurity briefing to all personnel arriving on the station, detailing the need to remain vigilant for non-native species and how to respond to and report an incident should it occur.

9.6.2.1 Biosecurity facility

The Government of South Georgia and South Sandwich Islands constructed a biosecurity facility at KEP and, to the maximum extent practicable, all BAS cargo must pass through the facility to ensure it is free of non-native species and imported soil (for more details see Appendix 1).

Some fresh produce items cannot be checked adequately on receipt at KEP and therefore must not be ordered (see Section 5.2.2 and Appendix 1)

9.6.2.2 Export of cargo to Bird Island

Several non-native plants and invertebrates found at KEP are not found on Bird Island, but the climatic conditions are similar making establishment and colonisation likely. Therefore, any cargo sent from KEP could present a substantial non-native species risk and should be thoroughly checked before shipment to Bird Island (see Section 4.8.2)

9.7 Bird Island Research Station

Individual responsible	• Bird Island Station Leader

9.7.1 Key biosecurity risks

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.

Some invasive plants, such as the grass *Poa annua*, are found at both KEP and Bird Island. However, several non-native plants and invertebrates found at KEP are not found on Bird Island, but the climatic conditions are similar making non-native species establishment and colonisation at Bird Island highly possible. Therefore, any cargo from KEP could present a substantial non-native species risk and should be thoroughly checked before off-loading from the ship and once on station.

9.7.2 Station specific biosecurity measures

- The Station Leader must provide a biosecurity briefing to all personnel arriving on the station, detailing the need to remain vigilant for non-native species and how to respond to and report an incident should it occur.
- Bird Island Station Leader must make station personnel aware of the Bird Island Rat Contingency Plan (see Appendix 8).
- The network of rat bait boxes located across Bird Island, containing non-poisonous wax-based bait designed to show evidence of gnawing, must be checked at least once at the beginning and once at the end of the summer season.

- Rodent bait boxes must be deployed around the jetty and station buildings at Bird Island during station relief, and checked for evidence of rodent incursion daily until the ship departs (for general information on biosecurity procedures in South Georgia see the GSGSSI Biosecurity Handbook (Appendix 1).
- Some fresh produce items cannot be checked adequately on receipt at Bird Island and therefore must not be ordered (for details of prohibited fresh foods see Section 5.2.2 and Appendix 1)
- Station personnel should remain vigilant for non-native plants, which may colonise ground near the station or the network of trails around the island, and report any sightings to the BAS Environment Office and GSGSSI Environment Officer.

10 FIELD WORK IN ANTARCTICA AND SOUTH GEORGIA

10.1 Field activities

Individual responsible	• Field Operations Manager • Traverse Leader • Project Manager/Principal Investigator

10.1.1 Key biosecurity risks

The BAS area of operation extends over much of Antarctica and scientist and support staff operate in many different types or terrain, including ice-free habitat. Therefore, there are several main biosecurity risks:

- The introduction of non-native species to Antarctica (as discussed earlier)
- The movement of existing non-native species to new areas of Antarctica (see Appendix 9)
- The movement of species native to one Antarctic region, to another Antarctic region

To reduce the risk associated with BAS field work activities, all cargo should be free of soil and non-native species before being transported to polar regions, and as far as possible, re-checked on station before deployment to the field.

Personnel in the field must take steps to prevent local wildlife accessing food. For example, personnel should keep foods within boxes or inside tents. Waste food should be stored so that it cannot be accessed by wildlife. No poultry products other than egg powder shall be supplied to field camps working near bird colonies.

The field operations manager is responsible for ensuring field personnel are aware of non-native species issues. The project Principal Investigator is responsible for ensure all cargo and equipment is free of non-native species and soil, and that the field team is informed of biosecurity issues, in accordance with the Environmental Impact Assessment for the field project.

10.1.2 Antarctic locations already colonised by non-native species

Visitors must take particular care to ensure clothing and equipment is free of seeds and soil when leaving areas where non-native species are known to have established (see Figure 2 in Section 1.3). 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.

10.2 Movement of BAS field equipment between BAS stations

Field equipment (e.g., tents, boxes, sledges, etc.) may trap soil and organic material while 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 exists for soil and organic material attached to equipment used at a variety of locations to be transported to Rothera.

- Field equipment sent from Cambridge to stations in South Georgia and Antarctica must 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 be 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.

10.3 Antarctic field activities – further regulations

Visitors undertaking terrestrial field research, as a minimum standard, should apply the guidelines detailed in the Scientific Committee on Antarctic Research's (SCAR) *Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica*, which includes advice on biosecurity (see Appendix 2).

Visitors undertaking activities within terrestrial geothermal environments should also apply the guidelines detailed in the *SCAR Code of Conduct for Activities within Terrestrial Geothermal Environments in Antarctica* (see Appendix 3).

November 2025

11 EMERGENCY RESPONSE

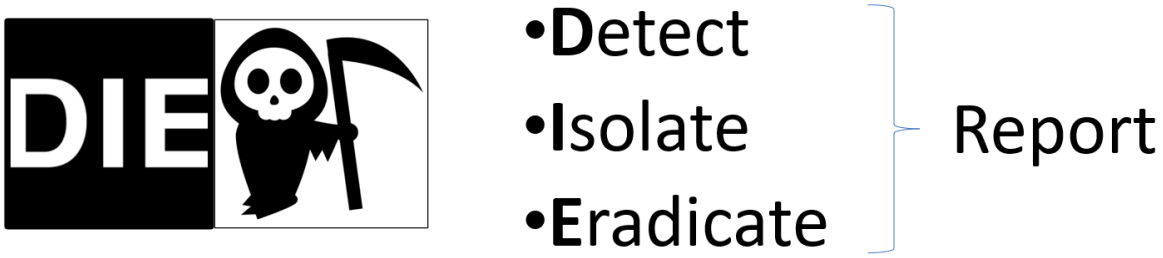
11.1 Introduction

Individual responsible	• Station Leaders • All BAS Personnel

The implementation of practical biosecurity measures has the potential to dramatically reduce the risk of non-native species introductions to polar regions, but the risk cannot be removed altogether. Therefore, response plans have been developed should non-native species be found to have colonised areas around BAS stations, or further afield. Depending upon the nature of the incident, the incident may need to be reported back to BAS or other stakeholders within a specific timeframe (see Section 2.5).

11.2 The DIE system for biosecurity incident response

BAS operates the 'DIE' system to guide action to deliver a biosecurity incident response.



Detect: The level of certainty around the potential detection of an introduced species is not always that same and it may take time to confirm incursion (e.g. the potential sighting of a mouse, alert from sniffer dog, etc.). Steps should be undertaken to ascertain the likeliness of an incursion and advice sought from the BAS Environment Office, as necessary.

Isolate: All reasonable steps should be taken to isolate the introduced species within a confined space, after which further action can be identified. The degree of isolation possible will depend upon circumstances, e.g.:

- Flies reproducing on spilt fizzy drink-soaked cardboard within an ISO container – seal the door of the ISO container immediately.
- Fresh foods – undertake checks in contained space (window and doors closed).
- Invertebrates inside a station room. Close the doors and window of the room immediately.
- Mud adhered to vehicles. Manually pick up and bag

- Introduced species found during checks in biosecurity facility – close facility doors.

Eradicate: Eradication options depend upon type of species introduced and circumstances (see also: Response to invertebrate, soil, seeds, plant material and mouldy food):

- Rodent: poison, blunt instrument
- Invertebrate: fly spray, fogger, manually squash, freeze
- Plant or plant propagules: remove and incinerate
- Non-sterile soil: collect up and incinerate
- Infested Sewage Treatment Plant: full scale clean

Emergency grab bags are available that containing fly spray, fogger bombs, and plastic bags (see below)

Report: Please report all incidents where a species has or has been suspected of being introduced using the MAXIMO incident reporting system. Such information is essential in order to improve BAS biosecurity management and response (see: Summary of reporting requirements).

11.3 Biosecurity Emergency Grab Bags

To help resolve any emergencies, Biosecurity Emergency Grab Bags have been provided to the Station Leaders at Bird Island, Signy, and Rothera Research Station. The grab bags contain the same components as the BAS biosecurity kit bags (see Section 2.4.1), but also include:

- insecticide spray
- fumigant foggers (see Section 11.3.1)
- bags

The grab bags should be used under the direction of the Station Leader, and the station management informed when components need replacing.

11.3.1 Use of insecticide foggers outside the UK

The Station Leaders (or nominated personnel) shall utilise insecticide foggers:

1. as a precautionary measure to ensure ISO containers are free of live invertebrates prior to shipment, and
2. in emergencies where there is substantial insect infestation in an enclosed space or room.

The Ship's Biosecurity Officer shall use insecticide foggers in emergencies where there is insect infestation in an enclosed space or room.

Insecticide foggers contain an active ingredient that is ingested by the insect and kills the pest by affecting its nervous system. Provided basic precautions are taken, the smoke foggers are simple and safe for humans to use and are effective against a wide range of insect pests. However, do not use insecticide foggers in the vicinity of foods, or in ISO containers transporting fresh, dried, tinned or frozen foods.

The foggers are effective at killing insects that are present on object surfacaes, but the air-borne insecticide may not penetrate enclosed spaces or areas with poor air circulation. Therefore, care should still be taken when inspecting fumigated spaces to ensure insects have been adequately eradicated. This should be done prior, for example, to movement of any objects suspected of contamination.

Please consult the instructions that accompany the fogger you have available. The coverage for each type of pest is described on the instructions; however, in general one fogger will be sufficient for a 20ft ISO container (33 m^3) or small room. A 40 ft container (63.5 m^3) may require more than one fogger; please refer to the manufacturer's instructions to determine the number required for the space being fumigated. Where appropriate, ensure you place the fogger on a heat resistant surface (e.g., tin foil or a ceramic tile). Once the lid of the fogger has been removed, light the fuse. For details regarding fogger use within ISO containers, see Appendix 6. For rooms, seal the room to prevent access and do not enter for a minimum of 3 hours, and preferably overnight. After this period, return to the room and ventilate the room thoroughly.

For transport of the foggers, please consult the instructions that come with the foggers and refer to the Material Safety Data Sheet (e.g., HSE No. 8577; see https://www.hygienesuppliesdirect.com/files/static/midi_fumer.pdf). For disposal of used or out of date foggers, please refer to the guidance in the BAS Waste Management Handbook.

Other considerations:

- Cover all water storage tanks before application.
- Do not contaminate foodstuffs, eating utensils or food contact surfaces.
- Exclude all persons during treatment.
- For use within containers or indoors only.
- Store the foggers in a safe place.
- Wash hands and exposed skin immediately after use of the fogger.

11.4 Rodent Response Plan

Should a rodent (e.g., rat or mouse, dead or alive) be spotted on any research station, the BAS Environment Office should be informed immediately, and if within South Georgia, the Government Officer should also be informed. In addition, provide full details on the BAS incident reporting system.

The response will depend upon the location.

- If the rodent is sighted at KEP, follow the GSGSSI contingency procedures under the direction of the Government Officer (see Appendix 1).
- If the rodent is sighted on Bird Island, follow the Bird Island Rodent Contingency Plan, set out in Appendix 8.
- If the rodent is sighted at an Antarctic station (i.e., Rothera, Signy or Halley), then the likelihood of survival in the natural environment is low. However, the rodent could survive within station buildings. In the unlikely event of a rodent detection, immediate efforts will be taken to isolate the rodent (in the container or room spotted) and for it to be killed. If this is not possible then bait stations will be deployed in the vicinity of the last known sighting and left for 48 h. Visitation to the bait stations is to be avoided during this time period to allow the rodent uninterrupted time to find and eat the bait. Station personnel shall be instructed to remain vigilant for signs or rodents (e.g., gnawing, droppings, etc.) and to report further sightings of the rodent itself. Contact the BAS Environment Office for further instruction.

11.5 Response to invertebrate, soil, seeds, plant material and mouldy food

Emergency Scenario 1. Invertebrates (including bed bug/flea infestation)

- Contain the contaminated item in an enclosed area and double bag it as soon as possible.
- To kill the invertebrates, put the bagged contaminated item into a freezer for 24 hours. Alternatively, eradicate them using the insecticide spray and/or incinerate the item or packaging, as appropriate. Infested items of clothing or bedding should be bagged, frozen, thawed and then washed with detergent at as high a temperatures as appropriate for the material.
- If any invertebrates have escaped from the contaminated item, use the insecticide spray as soon as possible.
- Ensure that any UV fly-zappers are switched on, and kept on.
- Fumigant foggers can be used under exceptional circumstances such as during a heavy contamination. See guidelines in Section 11.3.1.
- If the contaminated item is food or wood, then it should be incinerated following

Emergency Scenario 2. Soil, seeds and plant material

- Remove and bag any soil, seeds or plant material attached to the contaminated item.
- Collect and bag any soil, seeds or plant material that may have fallen off the contaminated item.
- Only move the contaminated item if there is little risk of dispersing the soil, seeds or plant material.
- If seeds are being blown around, contain the item as soon as possible.

Emergency Scenario 3. Severely mouldy or rotten foods

- Keep the whole box/bag of mouldy produce contained – i.e., keep the lid on.
- If feasible double bag the box/bag of produce.
- If the contained produce was just off-loaded from the ship, return it to the vessel for disposal
- Alternatively, incinerate the produce on station if feasible.

Next Steps

- Inform the Station Leader immediately and report on the BAS incident reporting system.
- All removed soil, seeds, invertebrates and cobwebs must be disposed of by incineration on station or removed for incineration aboard a BAS vessel.

11.6 Animal Mass Mortality Event Response Plan

An Animal Mass Mortality Event (AMME) 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. An AMME 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 AMME area without approaching any closer. Do not walk among the dead or sick animals.
- Immediately inform the Station Leader of the discovery. Restrict access to the AMME site to prevent spread of any infectious agents.
- Before returning to base from the AMME 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 AMME 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 AMME.
- Contact BAS Cambridge via Operations and provide, as a minimum, the following details:

    1. Names and occupation of those who discovered the AMME
    2. Precise location of the AMME (including, if possible, GPS coordinates)

3. Date and time the AMME 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 AMME (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, where evident
7. Any unusual animal behaviour or symptoms
8. The recent weather conditions
9. Any imminent aircraft or ship calls

- Complete a report on the BAS incident reporting system, 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 AMME area.
- Await further instructions from BAS Cambridge.

11.7 Non-native Species Response Protocol

Individual responsible	• Station Leaders • BAS Environment Office

The following 'Response Protocol' has been developed to guide thinking of BAS management on any immediate and longer-term response following the discovery of a potential non-native species within the Antarctic Treaty area.

The Response Protocol has two main components:

- A flow diagram to guide response action under the headings 'Immediate Response', 'Immediate Eradication', 'Longer-term Eradication' and 'On-going Control'; and
- A table describing, in more detail, the different potential elements of a response, including, for example, the initial response, wider communication, species identification, etc.

It is anticipated that the Response Protocol may assist in delivery of a rapid and effective response to newly discovered non-native species introductions, although elements may be of relevance in the management of more established introductions. It is recognized that all potential introductions will be different and the details of any given situation may require specific consideration by appropriate experts.

FOLLOWING ANY IMMEDIATE RESPONSE TO THE DISCOVERY OF A NON-NATIVE SPECIES IN ANTARCTICA, FURTHER ACTIVITIES SHOULD BE UNDERTAKEN IN CLOSE CONSULTATION/COLLABORATION WITH THE BAS ENVIRONMENT OFFICE.

Figure 6. Flow diagram detailing a non-mandatory Response Protocol for possible use upon discovery of a potential non-native species inadvertently introduced to the Antarctic Treaty area (EIA: Environmental Impact Assessment)

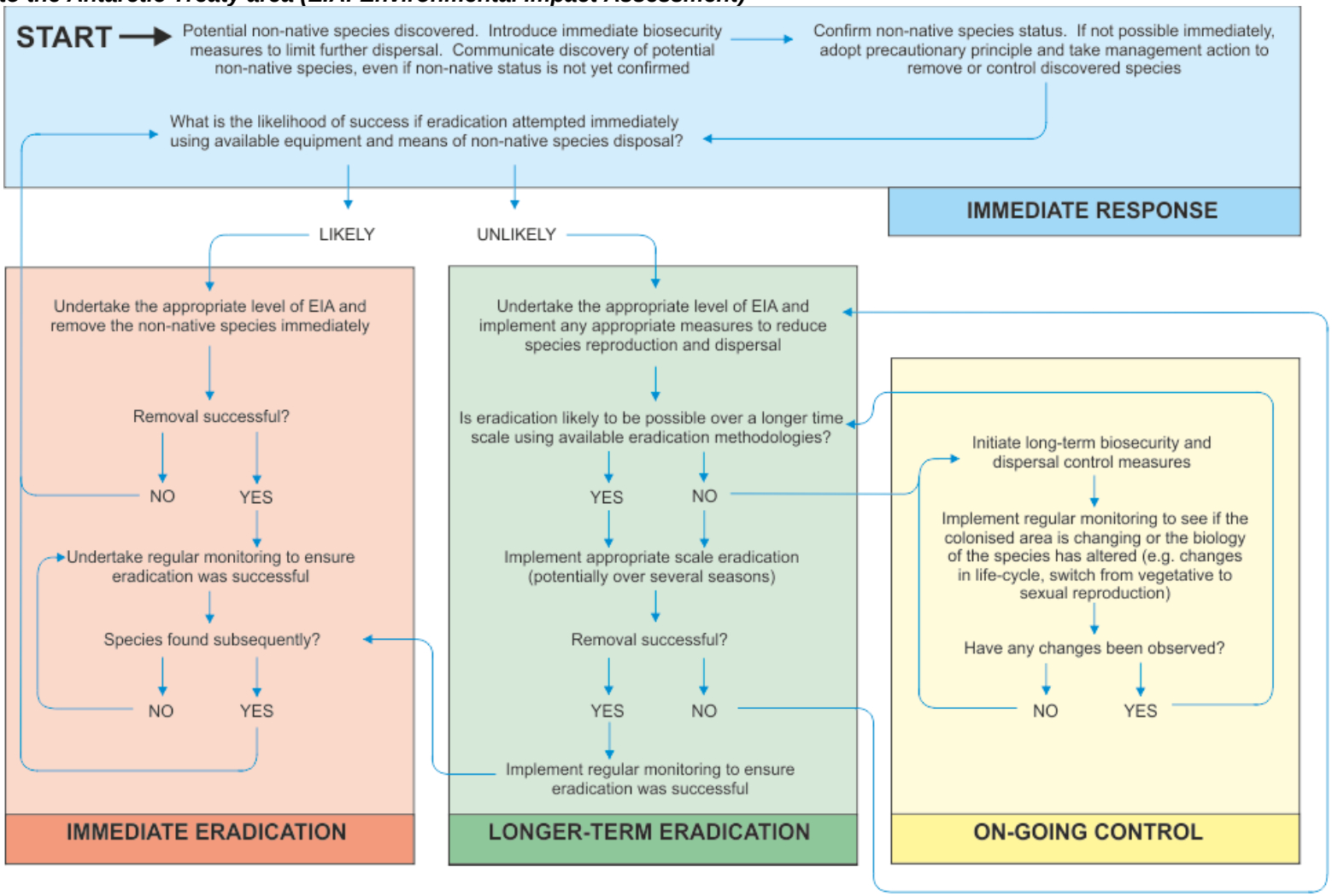


Table 4. Possible considerations during a response to a potential non-native species introduction within the Antarctic Treaty area

No.	Stage
1	Initial response Upon first finding a suspected non-native species that has been unintentionally introduced to Antarctica take any and all available biosecurity measures to prevent further dispersal of the species from the immediate area through the actions of the individuals first finding the species (e.g., boot washing, checking clothing for propagules, ensuring equipment and personal possessions are free of soil, checking any aircraft or land vehicles used to access the site are free of propagules). If feasible, and the appropriate taxonomic expertise is available, try to establish the extent of the colonized area. Should the suspected non-native species be mobile in its own right (e.g., a winged insect), and therefore potentially capable of rapid local dispersal, then an appropriate response should be undertaken with the utmost urgency.
2	Wider communication Inform national operators (COMNAP), tourism companies operating in the area (IAATO) and CEP Members (through the Antarctic Treaty Secretariat) of the location of the suspected non-native species. If the location is a visitor site, requests should be made for a temporary closure of the immediate vicinity of the introduction site to tourist visits (in communication with IAATO) and recreational visits by national operator staff (for example, though station leaders). If practical, it may be helpful to mark the perimeter of the colonized areas (for example, with stakes or stone markers). Where feasible, scientific activities in the area should be reassessed to see how potential dispersal of the non-native species can be minimized and, if appropriate, plans modified.
3	Species identification Seek advice from taxonomic experts at the earliest opportunity; the Scientific Committee on Antarctic Research may be well placed to provide details of existing experts (see also the Alien Species Reporting Database: http://data.aad.gov.au/aadc/biodiversity/alien_report.cfm). Provide a detailed description of the location and areas affected. Ideally provide specimens that might aid species identification. If provision of specimens is not possible in the first instance, then provide photographs, including close up images of any morphological features (e.g., plant reproductive structures) or different life-cycle stages (e.g., invertebrate larvae and/or adults). ATCM XXXIII WP15 *Guidance for visitors and environmental managers following the discovery of a suspected non-native species in the terrestrial and freshwater Antarctic environment*

(http://www.ats.aq/documents/ATCM33/wp/ATCM33_wp015_e.doc), which includes Attachments A (http://www.ats.aq/documents/ATCM33/att/ATCM33_att010_e.doc) and B (http://www.ats.aq/documents/ATCM33/att/ATCM33_att011_e.doc), provides general guidelines for environmental managers attempting to distinguish long-term native species, recent natural colonists and non-native species in the absence of expert advice.

4 Considerations prior to immediate removal of the non-native species

Where there is little doubt that the discovered species has been introduced through human activities, consideration should be given to its immediate removal (i.e., within hours or days or its first discovery and identification as a likely non-native species). Prior to any removal, the appropriate level of Environmental Impact Assessment should be undertaken in accordance with Annex I to the Protocol. An immediate response may have a higher chance of a successful and complete removal of the species from the location if:

a) the colonized area is small, or only a few individuals are known to be present at the location,
b) the necessary equipment is available to undertake the removal, including the removal of any associated substrate that may contain seeds, progeny or other propagules,
c) a clear route for disposal of the material has determined (e.g., bagging up and incineration or removal from the Treaty area),
d) any immediate response action will not result in further dispersal of the species (e.g., through inadvertent disturbance and subsequent dispersal of seeds, eggs or other propagules).

5 Actions to reduce dispersal should a delayed response be appropriate:

Where the criteria listed above cannot be met, a more considered management approach may be required, and wider (potentially international) expertise recruited. For example, to prevent imminent dispersal of non-native plant seeds, when full removal is not currently possible, it may be possible to remove any visible reproduction structures (e.g., flower head or seeds). This should only be done if it will not increase the likelihood of propagule dispersal.

6 Longer-term response

If the scale of eradication is greater than can be undertaken by individuals making the initial discovery, it may be advantageous for one Party to lead the work and, if necessary, recruit scientific and logistical assistance from other Parties (most likely operating in the vicinity) if required. Eradication work should proceed at the earliest opportunity, taking into consideration seasonal and logistical constraints, but ideally no later than the following Antarctic summer season. Conservation goals should be given higher priority than

scientific goals; opportunistic scientific studies should not be permitted to delay any environmental management action or increase the risk of species survival or dispersal.

7 Post eradication

Regular monitoring of the location and the surrounding vicinity should be undertaken to ascertain the effectiveness of the eradication and, as far as is practicable, to ensure all propagules that might cause re-emergence of the species have been removed. If the eradication is not successful, consideration should be given to further eradication efforts, or alternatively, on-going biosecurity and control measures.

8 Rapid response if eradication is not feasible

In accordance with the Protocol, non-native species removal is the preferred management action, as the implementation of control measures is likely to be long-term, costly, and potentially vulnerable to failure. However, if removal is not feasible, (i) biosecurity measures should be introduced to prevent human-mediated dispersal of the species and (ii) control measures should be implemented to reduce the rate of species range expansion (e.g., for plants, regular weeding to deplete the seed bank or removal of reproductive structures).

9 Lessons learnt

To inform other Parties of successful or unsuccessful methodologies used to manage non-native species, and to provide better understanding of the gaps in our knowledge, reports of action taken should be communicated to the CEP (e.g., though a paper submitted to the annual CEP Meeting) and, if possible, the scientific community through the production of a peer-reviewed academic paper and submission of relevant information to the Alien Species Reporting Database (http://data.aad.gov.au/aadc/biodiversity/alien_report.cfm).

12 CONTRACTORS

12.1 Biosecurity Policy with Contractors

Individual responsible	• Designated contractor representative • BAS Senior Environmental Manager

BAS works closely with contractors at various points in the supply chain, including within the Antarctica region. It is important that these organisations are aware of biosecurity requirements and implement appropriate biosecurity measures and practices. The following biosecurity policy applicable to contractors was issued by BAS Director Jane Francis on 19th January 2018:

- All contractors are to meet the requirements of the BAS Biosecurity Regulations, the project's Environmental Impact Assessment (EIA), and any associated permit condition.
- All construction team members must have a project specific briefing (in addition to the general environmental pre-departure briefing) to ensure that they are aware of the specific biosecurity requirements of the project's EIA and any associated permit.
- Construction team members must sign a register to confirm that they have attended the briefing and understood the biosecurity requirements of the EIA and permit.
- A named person from the contractor must sign to confirm that all required biosecurity checks have been carried out on equipment to be transported to BAS Stations. All equipment must be in a satisfactory condition before transportation takes place.
- BAS biosecurity checks will be carried out whenever construction vehicles are imported to BAS stations, regardless of any prior checks carried out by the contractors.
- The Head of the Environment Office, Rachel Clarke, will ensure that the contractor has signed the check sheet when required to do so.

13 THE ARCTIC

13.1 Introduction

BAS has a growing presence in the Arctic and operates the NERC research station at Ny-Ålesund, Svalbard. Increasingly, BAS researchers may be working in the Arctic during the northern summer, only to travel to Antarctica for further work during the austral summer, a few weeks later (and vice versa). This presents the opportunity for the exchange of propagules of cold-adapted species between the two polar regions. Such activities generate a high risk to native biodiversity in both poles, but particularly in the Antarctic. Introduced species originating from polar regions may be better adapted to survival in colder environments, compared to species introduced from temperate locations, such as Europe or South America.

13.2 Specific biosecurity measures

Individual responsible	Project Manager/Principal Investigator (PI) Ny Ålesund Station Leader Head of the NERC Arctic Office

To mitigate non-native species risks, all project leaders working in Arctic nations must investigate and implement any local legislation and guidelines relating to non-native species and biosecurity practices. If no such legislation or guidelines exist, as a minimum, the following measures should be taken:

- All personal luggage and scientific equipment for use in the Arctic must be thoroughly cleaned, with the removal of all soil and propagules, before it is sent north.
- All clothing and footwear for personal or field use must be thoroughly cleaned before being taken north.

- All scientific equipment and field equipment used in the Arctic must be cleaned thoroughly, with the removal of all soil and propagules, before it is redeployed in other areas.
- The transfer of soil and propagules on clothing and science and field equipment that is moved between different regions of the Arctic should be avoided. Please consult with the BAS Environment Office for more information.

14 APPENDICES

14.1 Appendix 1: GSGSSI Biosecurity Handbook 2025

Please see:

http://www.gov.gs/biosecurity/

14.2 Appendix 2: SCAR's environmental code of conduct for terrestrial scientific field research in Antarctica (Resolution 5, 2018)

Background

This Scientific Committee on Antarctic Research (SCAR) Code of Conduct (CoC) provides guidance for scientists undertaking terrestrial scientific field research in Antarctica. Reference was made to the need for this CoC during CEP IX (CEP IX Final Report; para. 132). A CoC was approved by the XXX SCAR Delegates Meeting in Moscow July 2008. SCAR presented the CoC to the CEP XII (2009) as IP 4. A further review of the CoC was coordinated by SCAR in 2017, through experts and the broader SCAR community, and the revised version submitted for consideration at CEP XX (WP 18). Further consultation was carried out in the 2017/18 intersessional period, including with COMNAP.

This CoC has its origins in the 2006 CEP discussions on avoiding the introduction of propagules[1] of non-native species. Since those discussions, the CoC has been broadened to provide guidance to design and conduct terrestrial scientific field research in a way that minimises environmental impacts, including, but not limited to, the transfer of non-native species.

Introduction

Antarctica contains many unique geological, paleontological, glaciological, and biological features. This landscape and its biological communities often have limited natural ability to recover from disturbance. Many features could be easily and irreversibly damaged. This CoC provides recommendations on how scientists and associated personnel can undertake scientific field activities while protecting the Antarctic environment for future generations, as well as not compromising future scientific research. These protocols ensure that human presence will have as little impact as possible. All personnel undertaking scientific research in Antarctica should be familiar with this CoC and field activities in Antarctica should be designed to have as little environmental impact as possible.

The Protocol on Environmental Protection to the Antarctic Treaty (also known as the Madrid Protocol or Environmental Protocol) provides a basis for environmental protection and management in the Antarctic. Climate change and increasing pressure from human activities suggest that comprehensive guidelines are needed to protect the unique features of Antarctica. This CoC complements the relevant sections of the Protocol and provides guidance for researchers conducting land-based field research (including, but not limited to - limnological, terrestrial, coastal/littoral, glaciological, biological, paleontological, sociological, historical, archaeological, climatological and geological research). 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.

[1] Propagule: means of propagation, *eg*, seed, spore, egg, live insect (including microbes in non-sterile soil)

All countries with researchers that undertake terrestrial field research in Antarctica are encouraged to include this CoC within their operational procedures and to ensure that personnel undertaking or supporting scientific field research follow this CoC.

It is recommended that this CoC 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 likelihood of carrying non-native propagules to Antarctic [and sub-Antarctic] ecosystems than other Antarctic travellers because their field of study often takes them to alpine or northern polar habitats. Moreover, Antarctic scientists also move between the Antarctic Conservation Biogeographic Regions (ACBRs)[2,3,4] which can differ substantially in biodiversity and geodiversity. In the process of conducting research within these habitats, Antarctic scientists can inadvertently entrain propagules and/or soil on clothing, equipment and equipment cases. If these items are then taken to the Antarctic, or among ACBRs, and they have not been cleaned/sterilised to remove or kill the propagules, an opportunity to transfer such material to and around Antarctica is created. Equipment should be properly cleaned before it enters the Antarctic, or moves between regions within Antarctica.

The implications of human transfer of taxa between locations can range from the modification of the genetic structure of populations to changes in local biodiversity and subsequent effects on community dynamics. Human transfer may involve species (or their propagules) from sites outside Antarctica, and such species would in most cases be considered non-native. However, given the differences between regions, intra-regional transfer of indigenous species also needs to be minimised. Such accidental movement of indigenous biota could compromise scientific studies of molecular adaptation, regional evolution and biogeography and reduce the inherent value that Antarctica offers as a system with very limited anthropogenic influence.

Before going into the field

Report planned activities to the appropriate national authority as thoroughly as possible and well in advance, in order to allow an assessment of the environmental impact that may be caused on the field site(s) visited, as required by Annex I to the Protocol on Environmental Protection to the Antarctic Treaty.

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

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[2] Terauds A, Chown SL, Morgan F, Peat HJ, Watts DJ, Keys H, Convey P & Bergstrom DM (2012) Conservation biogeography of the Antarctic. *Diversity and Distributions* 18:726-741.

[3] Terauds A & Lee JR (2016) Antarctic biogeography revisited: updating the Antarctic Conservation Biogeographic Regions. *Diversity and Distributions* 22:836-840.

[4] Resolution 6 (2012) - ATCM XXXV Hobart; Resolution 3 (2017) - ATCM XL Beijing

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 field activities:

i. Choose sites as close as possible to research stations and use existing pathways.
ii. Limit the number of visitors to field sites to the people required to carry out the fieldwork.
iii. Where possible avoid areas that are especially vulnerable to disturbance such as vegetated areas, breeding sites, patterned ground, and water bodies.
iv. Re-use existing sites wherever possible.
v. Consider the capacity required to prevent and respond promptly and effectively to any environmental accident or incident.

Everything taken into the field must be cleaned before being taken into the field, and returned to the main station for proper cleaning, where it is feasible and safe to do so.

Precautions should be taken to avoid introduction of non-native species, or of chemical contamination, and transfer of materials between sites:

i. Ensure that all equipment and clothing, including footwear, is thoroughly cleaned.
ii. Avoid taking unnecessary packaging and materials into the field. Note that several products used for packaging are prohibited in Antarctica, such as polystyrene beads or chips.

Once in the field

Particular care should be taken in areas with sensitive biological, geological, paleontological, historical, archaeological and geomorphological features such as bird and seal colonies, roosting areas, vegetated areas, freshwater lakes and ponds, sand dunes, screes, fluvial terraces, fossil beds, fragile or vulnerable landforms (*eg*, patterned ground, unconsolidated or poorly consolidated sediments, biological soil crusts, weathering pits, water-saturated soils during summer melt periods, etc.), ice core pyramids and ventifacts.

Avoid unnecessary disturbance of Antarctic flora and fauna. Avoid areas where wildlife is easily disturbed, especially during the breeding season.

When taking samples (*ie*, geological, paleontological, biological, ice, etc.) take as small a sample as possible to minimise environmental impacts. Only take samples in accordance with the Environmental Impact Assessment undertaken for the activity and, where appropriate, any permits issued by an appropriate national authority.

The location of any spill, camp site, soil pit, drilling site, sampling site, experimental site, or any other disturbance should be recorded (preferably using a GPS), and reported to the appropriate national authority, for the benefit of future researchers.

Minimise impacts when moving around in the environment:

i. Stay on established trails where available.

ii. Avoid walking on vegetated areas, streambeds, lake margins, and delicate rock, landforms and soil formations.

iii. Restrict ground vehicle usage to snow and ice surfaces, or designated tracks, wherever possible.

iv. Where feasible, use recognized helicopter landing sites and ensure that markers for helicopter pads are clearly visible from the air.

v. Minimise the disturbance to wildlife by following the ATCM guidelines for operations of aircraft near concentrations of birds[5].

vi. Restore any disturbances caused by activities, as long as such restoration does not cause any further environmental impacts.

vii. Algae and invertebrates live beneath stones. Moving rocks and stones should therefore be minimised to the extent required for the work being undertaken.

viii. Do not build cairns.

Management of scientific field sites

Minimise environmental impacts of field sites:

i. Make sites no larger than needed for the proposed scientific activities.

ii. Keep sites tidy during use.

iii. Avoid activities which could result in the dispersal of foreign materials into the environment. In particular, avoid the use of spray paint, wooden post markers, etc., and, where feasible, conduct activities such as sawing or unpacking inside a tent or hut.

iv. Secure equipment from being blown away or stolen by inquisitive birds (*eg*, skuas, penguins).

v. Wherever possible, all precautionary measures should be taken to ensure collection and removal of human waste and grey water.

When the work is complete, restore sites as far as feasible without creating further environmental impact. Remember that sites may require subsequent monitoring to comply with the Protocol for Environmental Protection to the Antarctic Treaty.

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

i. Avoid materials liable to shatter at low temperatures, *eg*, polyethylene-based plastics.

ii. Take care when handling fuel, chemicals and isotopes (stable or radioactive) to avoid spills or unintentional release into the environment. Consider the recommendations in the CEP Clean-up Manual[6].

iii. Store and handle fuel and chemicals using appropriate containers.

iv. Use drip trays where possible when handling fuels or other liquids and take special care when handling fuel in high winds.

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[5] ATCM Resolution 2 (2004) Antarctic Treaty Consultative Meeting XXVII – Cape Town.

[6] Committee for Environmental Protection Clean-up Manual (http://www.ats.aq/documents/recatt/att540_e.pdf)

Report any environmental accident or incident to the appropriate national authority.

If equipment is planned to be installed in the field in the longer term:

i. Ensure an Environmental Impact Assessment is undertaken prior to any installation, as required by Annex I to the Protocol for Environmental Protection to the Antarctic Treaty.

ii. Clearly identify any equipment by country, name of the principal investigator and year of installation, and state the duration of the deployment.

iii. Make sure installations can be retrieved and removed when no longer required, unless it is impractical, or would result in a higher environmental impact, or have been identified as useful for long-term monitoring and/or research.

Do not displace materials or collect samples of any kind, except in accordance with the associated Environmental Impact Assessment and any required permits.

When undertaking research with live animals, consider the legal requirements of national authorities and those set out in *SCAR's Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica*.

Field camps

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

Minimise the environmental footprint of field camps by:

i. Camping on permanent snow or glaciers where possible and only if safe to do so.

ii. Locating camps as far as feasible from lake margins, stream beds and associated fans, and vegetated areas, to avoid damage or contamination.

iii. Taking special care to ensure that no food or wastes are accessible to animals.

iv. Re-using campsites whenever possible.

v. Keeping camps tidy during use and restore, as far as is feasible and without causing any further environmental damage, after use.

vi. Using solar and wind power as much as possible to minimise 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 when working in an ASPA or ASMA, the area management plan may have additional requirements for field camps. Follow any conditions contained in the entry permit required for access to an ASPA. Visitor report forms[7] should be submitted to the appropriate national authority as soon as practicable.

Location-specific guidelines

[7] See Appendix 2 of the Committee for Environmental Protection Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas. Resolution 2 – ATCMXXXIV CEP XIV – Buenos Aires (2011)

Lakes and streams

Choose sampling equipment that is the least destructive to the aquatic or coastal environment. Sample carefully and avoid excessive and unnecessary sampling. Minimise cumulative impact if sampling repeatedly at a location over a long period or several field seasons. Use of dredges, trawls and box corers should be minimised.

Aquatic ecosystems in Antarctica are typically extremely poor in nutrients (except those with animal influence) and thus are sensitive to anthropogenic pollution. Measures should be put in place to minimise, as far as possible, release of human waste into the environment.

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

Minimise 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 at different sites.

Wherever possible use flumes, not weirs, when monitoring streams to minimise any potential impacts of the study.

To the maximum extent practicable, avoid the use of stable isotope tracers at the complete ecosystem level, but rather use them in closed vessels. Consider the use of naturally occurring tracers in experiments. Radioactive isotope tracers should only be used in closed vessels or in *ex-situ* experiments. No stable or radioactive isotope tracer waste should be disposed into ecosystems. Document all tracer use (location, type of tracer, amount) and report this information to the appropriate national authority.

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

i. Do not swim or dive in lakes, unless it is required for scientific purposes.
ii. Remove all unwanted water and sediment materials from the site, even on permanently ice-covered lakes, rather than discharging them back into the lake.
iii. Ensure that nothing is left frozen into the lake ice that may ablate out.
iv. Consider using a remotely operated underwater vehicle (ROV) as a tool for underwater and under-ice research in lakes and coastal/littoral habitats.

Ice-free environments

Terrestrial vegetation includes very slow growing species and fragile growth forms. Damage by trampling may remain visible for years or even decades and further impact upon the many terrestrial invertebrate species that live in soils and feed on soil algae.

In high use areas, use existing trails where possible in order to avoid disturbing large areas of vegetation and/or soil or surface material. In lower use areas, consider whether trails or a

dispersed pattern of travel would have least impact and implement accordingly. Local knowledge will often be a useful guide.

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

When sampling in vegetated areas, ensure that the site is restored as far as is feasible without causing any further environmental impact.

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

When sampling soil in desert areas, use groundsheets to contain excavated material 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, minerals, fossils, meteorites or ventifacts unless it is necessary for the permitted research.

For specific guidance on undertaking scientific activities in terrestrial geothermally heated areas, please consult the *SCAR Code of Conduct for Activity within Terrestrial Geothermal Environments in Antarctica*.

Glaciers and ice fields

Remember that the use of water in hot water drills, and the use of other drilling fluids, 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. Similar caution is necessary when drilling is made through ice shelves to ocean beneath. For further information on activities in subglacial environments, please consult *SCAR's Code of Conduct for the Exploration and Research of Subglacial Aquatic Environments*.

14.3 Appendix 3: SCAR Code of Conduct for Activity within Terrestrial Geothermal Environments in Antarctica (Resolution 3, 2016)

Background

1. This SCAR Code of Conduct provides guidance when planning or undertaking field activities within terrestrial geothermal environments.[8]

2. This Code of Conduct was prepared following discussions held at the August 2014 Auckland Workshop which focused on the need to develop guidelines for working in terrestrial geothermal areas in Antarctica (see ATCM XXXVIII (2015) IP024 and ATCM XXXVIII (2015) WP035) and has been finalised through broad consultation, including with the Council of Managers of National Antarctic Programs (COMNAP).

3. The *SCAR Environmental Code of Conduct for Terrestrial Scientific Research in Antarctica* (2009) continues to provide guidance on practical measures to minimize impacts by scientists undertaking fieldwork in terrestrial environments, generally applicable across all of Antarctica.

4. This Code of Conduct for activities within terrestrial geothermal environments was developed in recognition of a specific need for guidelines for operations and scientific activities beyond those generally applicable guidelines, since terrestrial geothermal environments in Antarctica represent a unique case where more specific and customized guidance is needed because safeguarding the values of these sites requires measures that extend beyond those required in most areas in which activities are undertaken.

5. This Code of Conduct will be updated and refined as new scientific results and environmental impact reports become available from future research in terrestrial geothermal environments.

Introduction

6. Terrestrial geothermal environments in Antarctica are of high scientific value to a wide range of disciplines, for example to geologists, glaciologists, biologists and atmospheric scientists.

7. Recent studies provide evidence that terrestrial geothermal sites in Antarctica support unique and diverse biological communities, and have played an important role as

[8] 'Geothermal' is defined as 'of or relating to the natural internal heat of the earth', and 'terrestrial geothermal environments' are defined as 'non-marine ice, land, water or atmospheric environments at or near the earth's surface that are detectably influenced by geothermal heat'.

biological refugia in some regions of the continent, where indigenous species survived glacial cycles and from which regional recolonization took place.

8. These environments, particularly those that to date have not been subjected to a high number of visits, may be at risk from introduced species or other damage through human activity. Microbiological communities in these environments are highly vulnerable to disturbance, and require specialized and rigorous measures of protection.

9. Fragile soils, plant and microfaunal communities, and/or delicate geological or ice structures (e.g., steam vents, fumaroles), may exist on geothermally heated ground, and these may be particularly susceptible to damage by trampling.

10. It is recognised that some terrestrial geothermal sites in Antarctica have already been subjected to relatively high levels of various human activity, for example, at some sites on Deception Island or near the summit of Mount Erebus, and may already have permanent installations that are needed to monitor geothermal activity for reasons of safety, and these require regular visits and maintenance. For such sites, responsible stewardship during subsequent visits to those sites should proceed in a manner that is consistent with the Protocol to the Antarctic Treaty, that minimizes possible future impact and protect, as far as possible, their value.

11. The application of this Code of Conduct should be considered prior to visiting any terrestrial geothermal environment. At geothermal sites that have already been subjected to relatively high levels of various human activity, the general rules under the Protocol on Environmental Protection to the Antarctic Treaty and guidance as provided in the *SCAR Code of Conduct for Terrestrial Scientific Field Research in Antarctica* should be sufficient. At geothermal sites that are presently unvisited or relatively undisturbed by human activities, there are important scientific (e.g., microbiological, geochemical and geological) and environmental reasons why extra precautions should be taken before values are degraded or lost. In such cases, this Code of Conduct should be taken into consideration. This is especially the case for geothermal environments that are known to be previously unvisited and, for this reason, more stringent recommendations that apply to previously unvisited terrestrial geothermal sites are made at the end of this Code of Conduct.

12. At this time, geothermal sites in Antarctica have not been assessed or classified according to their level of disturbance or in terms of their scientific value. For practical reasons it is therefore recommended that National Programs consult with each other, and with appropriate experts, about the extent to which, and where, this Code of Conduct should be applied, and that these decisions and the site locations should be made publicly available.

Guiding Principles

13. Careful planning is required before undertaking research within a terrestrial geothermal environment, and appropriate measures need to be considered to help maintain the integrity of sites. These should include:

    - Careful selection of the site to be visited. Geothermal sites that are known to have been previously visited should be used, unless use of a previously unvisited site is essential to meet scientific needs;

    - Coordinating planned activities with other researchers interested in the area to the maximum extent practicable.

14. In accordance with the provisions of Annex I to the Protocol on Environmental Protection to the Antarctic Treaty, and as part of the planning process, decisions on the level of environmental impact assessment (EIA) to be applied should take full account of the extent of previous visits to the geothermal site, as well as the anticipated impacts arising from planned activities at the site.

15. Decisions on whether to implement aseptic measures[2] should be assessed as part of the EIA and should take into account the likelihood of any conservation or scientific benefit to maintaining a sterile regime at a particular geothermal site that has been previously visited. If such benefits are considered likely, then aseptic measures should be implemented.

16. The locations of sites visited and nature of activities undertaken should be documented and maintained in publicly available records, and include accurate locations recorded with GPS, so that visited and unvisited sites may be more easily distinguished by future researchers.

Code of Conduct

Access

17. Movement to a terrestrial geothermal environment should be by way of designated access routes and landing sites where these are known or have been used previously, and this should be discussed with all personnel in the group, including pilots or vehicle drivers, prior to departure.

18. All overland movement of visitors within terrestrial geothermal sites should be on foot.

19. To the fullest extent practicable, vehicles and crewed aircraft should not be operated close to, or within, terrestrial geothermal environments due to the risks of damaging sensitive vegetation and introducing non-native species. As a guideline, it is

[2] 'Aseptic measures' are measures that 'aim to exclude microorganisms not native to the local geothermal environment'.

recommended that crewed aircraft should avoid landing or overflying within **100 m** of geothermal sites.

20. Areas of visible vegetation or moist soil both on ice-free ground and among ice hummocks and, as far as practicable, areas of geothermally heated ground, should be avoided.

21. The number of visitors entering a geothermal site should be minimised without compromising safety and the ability to undertake planned research. Visitors should follow established trails/routes where available and be aware that geothermal environments are dynamic and may be subject to frequent change; sites that were safe for access or travel when visited on a previous occasion may not necessarily remain so.

22. Pedestrian movement within the terrestrial geothermal area should be kept to the minimum necessary consistent with the objectives of the visit and every reasonable effort should be made to minimise the effects of walking activity, including by educating members of the group visiting the site, because:

    - Fragile plant and/or microbial communities may be present, including beneath snow or ice surfaces. Be alert and avoid walking on, or close to, such features;
    - Walking can also compact soil, alter temperature gradients (which may change rates of steam release), and break thin ice crusts which may form over geothermally heated ground, resulting in changes to soil and biota below;
    - The presence of snow or ice surfaces is not a guaranteed indication of a suitable pathway.

23. Remotely operated vehicles, including Unmanned Aerial Systems (UAS) (also known as Unmanned Aerial Vehicles (UAVs), Remotely Piloted Aircraft (RPA), drones, etc.), may have useful scientific and other applications in terrestrial geothermal environments in Antarctica, and potentially may reduce environmental impacts. Such use of UAS should be carried out within relevant guidelines and given adequate consideration to national Antarctic programme operations procedures, including procedures to be implemented in the case of a malfunction of the UAS.

Camps

24. When a field camp is necessary to support activities, where practicable, this should be located at least **100 m** from the geothermal site.

25. To minimize contamination of geothermal sites from camping activities (e.g., from stove gases, food particles etc.), where practicable, locate camps downwind from geothermal sites, although not where there is a risk of noxious gases drifting downwind from geothermal sites.

26. Where possible, designated, former or existing camp sites should be used.

Clothing, footwear and equipment

Prior to access:

27. All clothing, footwear and personal equipment (including bags or backpacks, and safety equipment such as ropes and ice screws) brought to geothermal sites should, as a minimum, be thoroughly cleaned and maintained in this condition before use within the geothermal site. Consideration should be given to changing into clean[3] clothing and footwear immediately prior to entry into a geothermal site.

28. Consideration should always be given to the use of sterile protective over-clothing and sterile footwear prior to working at geothermal sites. The over-clothing should be suitable for working at a wide range of temperatures and comprise, as a minimum, overalls to cover arms, legs, and body, a hat to cover the head and gloves (which may need to be suitable for placing over the top of cold-weather clothing). At sites where sterilization of footwear is deemed appropriate, this should be achieved by washing exposed surfaces in a 70% ethanol solution in water. Disposable sterile / protective foot coverings that can disintegrate under field conditions should not be used.

29. To the maximum extent practicable, select clothing and equipment that are in good condition and are made of tightly woven or knitted fabrics that do not shed fibres.

Following access:

30. To the maximum extent practicable, visitors should remain covered by their clean or sterile protective clothing, including head covers, while conducting activities within geothermal sites where this Code of Conduct has been determined to apply.

31. Precautions should be taken to prevent human-mediated transfer of biota from one geothermal area to another. Footwear should be cleaned to remove all soil and biological material, preferably using a 70% ethanol solution in water. New, clean or just laundered outer clothing should be put on before entering the new geothermal location. Equipment used must be at least thoroughly cleaned, but ideally sterilized, before use at another geothermal site.

Food

32. Where practicable, depending on site size and duration of visit, avoid eating or drinking while within geothermal sites.

[3] 'Clean' is defined as 'free from visible particles of biological material, soil, dirt, debris, food, mould or fungi'

33. Where food and drink are necessary for health and safety, foods such as gels, compressed dried fruit bars, or bite-sized chocolates, etc. will help minimize dispersal of powders, crumbs and flakes. Foods containing yeasts, moulds (e.g., cheese) or other microbes must be avoided. Food and drink should be securely contained when not being consumed.

34. Where appropriate, establish food and drink staging points within larger geothermal sites and restrict consumption to these sites only. Ensure accurate location of these points is recorded. Where practicable, cover the floor of the staging point while in use and remove the cover (carefully containing any crumbs, etc.) at the conclusion of the work.

Waste

35. All waste, including liquid and solid human waste, must be removed from geothermal sites.

Fuel / energy

36. The use of fossil-fuel-powered tools at geothermal sites should be avoided where possible because exhaust emissions and / or spills can impact the microbial environment.

37. If power tools are necessary to support science within a geothermal site, electric machines powered by batteries, or by a generator or renewable source of energy located at least **100 m** away and preferably downwind from the site, are preferred.

Materials / chemicals

38. Activities that could result in spills or dispersal of materials should be avoided within geothermal sites (e.g., use of fuels, glycols, chemicals and isotopes, unpacking of boxes, sprays, etc.). Where such activities are necessary, they should be carried out at least **100 m** away from geothermal sites and preferably inside a tent or structure so that materials are not dispersed towards geothermal sites by wind.

39. Materials liable to shatter at low temperatures (e.g., polyethylene plastic products) should be avoided, as should those liable to melt at the high temperatures that can occur at geothermal sites.

40. Materials / chemicals should not be stored within geothermal sites, except as required for scientific or management purposes.

41. Explosives should not be used within geothermal sites.

42. Smoking may introduce contaminants and should therefore be prohibited within geothermal sites.

Installations / equipment

43. Except where essential for safety and / or long-term scientific or monitoring programmes, permanent installations (e.g., sensors, antennae, shelters, etc.) should be avoided within geothermal sites owing to risks associated with deterioration of materials that may compromise the microbial environment.

44. All installations and other scientific equipment brought to geothermal sites should, as a minimum, be thoroughly cleaned in advance and maintained in this condition before use on site. Consideration should always be given to sterilizing equipment prior to installation at geothermal sites.

45. Installations should be sited carefully and securely, and be easily retrievable when no longer required. Installations and equipment should be made of durable materials capable of withstanding the conditions at geothermal sites and, to the maximum extent practicable, pose minimal risk of harmful emissions to the environment (e.g., gel cells or other non-spill batteries).

46. Any long-term installations or markers should be clearly identified by country, name of principal investigator, year of installation, and intended duration of deployment. Installations and equipment should be removed by the installer or other appropriate authority at, or before, the conclusion of the activity for which they were intended.

Sampling

47. At sites where the implementation of aseptic measures is deemed appropriate, all sampling equipment, probes or markers must be cleaned appropriately and maintained in that condition before being used within geothermal sites.

48. If samples are collected from a terrestrial geothermal area, ensure sample sizes are the minimum necessary to meet scientific requirements and that any permit required for their collection has been given by an appropriate national authority.

Additional guidance for previously unvisited terrestrial geothermal sites

49. Terrestrial geothermal sites in Antarctica that are known, or suspected, to be previously unvisited are expected to be almost pristine (with the exception of low levels of contaminants transported via the atmosphere or perhaps by birds), and are considered to have exceptional value for science, especially for microbiological and geochemical studies. More stringent controls are therefore required to maintain their environmental and scientific values. Aseptic measures should always be implemented at previously unvisited geothermal sites.

Access

50. The interior and exterior of crewed aircraft, vehicles and boats should be inspected and cleaned thoroughly before being used for access to previously unvisited geothermal sites.

51. Where practicable, crewed aircraft, vehicles and boats should approach no closer than **200 m** from previously unvisited geothermal sites.

Clothing, food and waste

52. Sterile protective over-clothing and footwear should always be worn at previously unvisited geothermal sites.

53. Food should not be brought into or consumed within previously unvisited geothermal sites, unless it is essential for safety because of the visit length, or the size or nature of the site.

54. All wastes, including all human wastes, should be removed from the area.

Equipment, materials / chemicals, installations and sampling

55. When accessing a previously unvisited geothermal site, it is strongly recommended that only new equipment, materials and installations be used within that site.

56. If moving between specific locations within a single previously unvisited geothermal site, only new or sterile materials / chemicals should be used at the subsequent locations.

14.4 Appendix 4: Biosecurity inspection guide

Tackling Non-Native Species in Antarctica

Biosecurity Inspection Guide

The inspection guides are designed for people carrying out biosecurity functions, as quick-glance check sheets to guide the inspection of five different items or commodities.

In each case, the guide provides guidance on where to look, what to look for and then what to do about it.

The five commodities are:

- Passengers' luggage
- Fresh produce for human consumption
- Shipping containers
- Vehicles & machinery
- Sand & aggregate

All biosecurity incidents must be reported on the BAS incident reporting system

Inspection guide

Passengers' luggage - stowaways

British Antarctic Survey

Where	What to look for	Action
Suitcase, rucksacks	Fruit or any other fresh foods	Confiscate and secure them for disposal by double-bagging.
	Live plants	Confiscate the plants and secure them in a container, or by double bagging, prior to disposal.
	Live invertebrates (stowaways): e.g. beetles and flies	Close the luggage immediately to contain the insects. Remove it to a closed room and treat by placing it inside a large plastic bag (such as a bin bag) and spray a good squirt of aerosol insecticide inside. Leave for at least 1 hour before opening the bag and carefully checking the luggage for live and dead insects. If live insects are spotted, repeat the treatment with more spray and leaving for 1 hour again.
Clothes – Velcro fastenings	Plant fragments or seeds stuck on the Velcro	Visitor to clean the item so that all seeds, mud, soil, etc., is removed, after which item can be released. Seeds, plant fragments or other organic material collected to be safely stored in a container or double bagged for disposal.
Shoes	Mud, dirt etc. in the treads	Visitor to clean the item so that all seeds, mud, soil, etc., is removed, after which item can be released. Mud and dirt to be secured in a container or double-bagged for disposal.
Untreated wood	Mites or other live invertebrates	Confiscate the untreated wood and double-bag prior to incineration. Alternatively, items may undergo three 24 h cycles of freeze/thaw (-20/+20°C) and then be returned to the owner.

Report all interceptions: date, pathway of entry, provisional identification.

UK Government NNSS

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Inspection guide

Fresh produce for human consumption

British Antarctic Survey

Where	What to look for	Action
Potatoes and other root vegetables	Externally: presence of soil, surface bumps, rot, entry holes, bad smell. Internally: maggots or other infestation.	Isolate the entire "lot" (all the cartons, sacks, etc., of the affected produce) from other produce, by double-bagging for disposal. Carry out a thorough inspection of the entire "lot" to locate and remove all infested produce. If intercepted on-board ship, do not off load: destroy by incineration. If intercepted on-shore: contain and destroy by incineration, where available, or return to vessel
Tomatoes, peppers, sweet potatoes, corn-on-the-cob, etc.	Externally: signs of whitefly, rot, entry holes, bad smell. Internally: caterpillars, maggots or other infestation.	
Cabbage, broccoli, cauliflower, and other leafy produced	Holes in the leaves, "windows" in the leaves, small blue-green caterpillars or other caterpillars and pupae enclosed in white webbing stuck to the underside of leaves.	
Fresh fruit and vegetables, generally	Signs of rot, entry holes, maggots or other infestation. Live invertebrates (stowaways)	
In boxes and packaging of fresh produce	Live invertebrates (stowaways)	Contain the invertebrates Clean the packaging or contain for subsequent disposal by incineration.

UK Government NNSS

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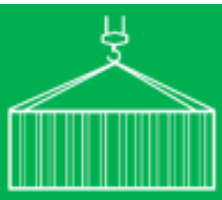
Inspection guide

Shipping containers - stowaways



British Antarctic Survey

Where	What to look for	Action
Generally throughout the container: floor level: • Floor of the container • Under cartons, boxes, bags, and goods, etc.	Live invertebrates of any sort: snails, spiders and webs. Rodents (rats, mice), or signs of rodents (droppings, gnaw marks)	Any sightings or suspected sightings of live rodents: • Close the container door immediately to stop them escaping. • Place poison bait to kill rodents. Any sightings or suspected sightings of invertebrates: • Try and contain the specimen and catch it. Live spiders, earwigs or moths can be immobilised by spraying with insecticide or by using an insecticide fogger 'bomb' • Carry out a thorough inspection to locate all specimens. Take close up photographs of specimens for incident report
Generally throughout the container: above floor level: • Walls of the container • Sides and surfaces of cartons, boxes, bags and goods, etc. • Sides of dunnage (wooden or cardboard packaging material)	Live invertebrates of any sort, including flies, earwigs, moths and spiders (including webs).	
Floor level: mud, dirt or plant debris.	Seeds, plant fragments.	Sweep up all dirt and collect securely in a bag for disposal.
Dunnage (wooden packaging material) and any other wooden fittings or material.	Signs of boring insects, such as shot-holes in wooden fittings, or fungal rot (can be white or black spots, 'veins' in wood, or powder-like coating)	Isolate the affected material, if possible secure it in a container or bag for disposal by incineration

UK Government NNSS

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Inspection guide

Machinery, equipment and vehicles - stowaways

British Antarctic Survey

Where	What to look for	Action
Machinery and equipment: external checks: • Any nooks and crannies	Dirt and debris, may contain plant seeds Spider webs	Clean and collect all dirt for disposal.
Machinery and equipment: internal checks: • Any nooks and crannies	Dirt and debris, may contain plant seeds Spider webs Live or dead invertebrates, especially earwigs	Any sightings or suspected sightings of live invertebrates: isolate the machinery or equipment and spray with an insecticide. Clean and collect all dirt for disposal.
Vehicles: external checks		
• Wing mirrors • Around the edges of tyres on the back of the vehicle • Around number plates • Under wheel arches • Any other nooks and crannies	Webbing and live spiders	Any sightings or suspected sightings of live invertebrates: isolate the machinery or equipment and spray with an insecticide.
Under wheel arches & chassis	Compacted mud and debris	Clean and collect all dirt for disposal.
Around the hood and windscreen area	Debris such as dried leaves	Clean and collect all dirt for disposal.
Vehicles: internal checks		
• Under floor mats • Door pockets • Down the sides and below the front seats • The boot • Under the spare tyre where this is stored inside the vehicle.	Webbing Live or dead invertebrates, especially ants Debris such as dried leaves, may contain plant seeds	Any sightings or suspected sightings: close the vehicle doors and spray inside with an insecticide. Keep the doors closed for at least 1 hour after spraying and check for live invertebrates.

UK Government NNSS

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Inspection guide

Sand, gravel, rock salt, aggregate etc. - stowaways

British Antarctic Survey

Where	What to look for	Action
Generally, in and around the cargo	Live ants or earwigs moving around Any other live invertebrate. Snail shells in cargo from infested areas. Webbing. Live plants or plant debris Soil or mud Signs of bird nests or droppings	Any sightings or suspected sightings: take steps to isolate the consignment. If in a shipping container close the container doors. Get in touch with the BAS Environment Office as soon as possible.
Around the outside and edges of bags, sacks, etc.	Rodents, or signs or gnawing or droppings Snail shells in cargo from infested areas. Live earwigs moving around Any other live invertebrate. Spider webs Seeds or plant fragments	
On or near the surface of sand or soil		

UK Government NNSS

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Inspection guide

Specific species to look out for

British Antarctic Survey

Scientific name	Common name	Example photograph
Forficula auricularia	Earwig (invasive in the Falkland Islands)	
Trichocera maculipennis	Winter crane fly (colonises sewage treatment plants)	
Eretmoptera murphyi	Flightless midge (already invaded Signy Island)	
Poa annua	Annual blue grass (already invaded King George Island)	

UK Government NNSS

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14.5 Appendix 5. Standard operating procedure for biosecurity cleaning of container laboratories prior to deployment

Cleaning of Laboratory

1. Using a HEPA filtered vacuum cleaner, hoover down all surfaces, paying particular attention to corners and any joins/gaps where invertebrates or pollen/seeds could be trapped. Include inside of drawers and cupboards.
   CLEAN LAB: vacuum cleaner must have plastic hose to minimise metal contamination.
2. Vacuum around any vents and filters on container or equipment, and behind equipment as much as access allows.
3. Wipe down all surface with approved lab cleaner (non-corrosive).
4. Wash floor with approved laboratory floor cleaner and dry thoroughly.
5. Clean inside any fridge/freezer unit with approved lab cleaner. Wipe dry and leave open overnight to air dry.

Biosecurity requirements

1. Hang fly tape from the ceiling in the lobby and main areas of the container.
2. Install a rodent trap in the lobby area of the container.

Packing of container for transit

1. Check all drawers and cupboards are empty and are secured closed.
2. Check all equipment is securely fastened to the container structure.
3. Check fridge/freezer and any cabinet doors are locked closed, and a copy of the key is taped down external to the unit.
4. Check there are no loose items within the container.
5. Check secondary exit door (if present) is locked securely and close internal door.
6. Close main access door and secure with a padlock.
7. Affix notifications to door of container
   “Laboratory Container to Remain Closed”
   “Do Not Fumigate”
   “No Dogs”

All British Antarctic Survey container laboratories are provided with three sets of keys:

1. Retained by Laboratory Management at Cambridge HQ;
2. Retained by SDA Laboratory Manager on ship;
3. Travels with the container and retained at Harwich.

The Multi Sensor Core Logger keys are retained by laboratory personnel for security reasons. The radioactive source is removed from the container and transported independently. Please see separate SOP.

14.6 Appendix 6: How to biosecure an iso-container prior to transportation

These instructions describe the steps needed to biosecure iso-containers that are moved both into and out of Antarctica and South Georgia (biosecurity requirements may differ depending upon the location; see Section 4.3 of the BAS Biosecurity Regulations for more details).

Use the container biosecurity checklist for each container to report on the biosecurity actions undertaken. These should be collated and returned to the Environment Office at the end of the season.

Please note: Do not use chemical pesticides in containers transporting food. Do not apply these procedures to specialist containers, e.g., aquarium container, refrigerated containers or laboratory containers. Do not use insecticide foggers in reefers, the aquarium container, science laboratory containers, or containers transporting flammable/dangerous goods.

What you need:

- Safety equipment (gloves, safety specs)
- Broom, dust pan and plastic bags (to collect any sweepings).
- Residual insecticide in spray bottle
- Rat bait station and key
- Mouse bait station and key
- Insecticide fogger (gives of dense insecticide fog once lit)
- Tile or piece of aluminium foils (to place lit fogger on)
- Tape to temporarily seal the container vents to prevent escape of insecticide fog.
- Marker pen and adhesive sign/placard for container door
- Clip board and copies of the container biosecurity checklist

Before packing

- Undertake a visual inspection of the container to ensure there are no holes that might allow ingress of non-native species
- Ensure the container doors can be opened and closed easily
- Sweep up any soil, dust or debris within the container, place it in a plastic bag and incinerate it.
- Where available, use a residual pesticide (e.g., Protector C) to spray around the edges of the floor and the vertical corners of the container. Wear gloves and safety specs.

When packing

- Undertake a visual check of all items loaded into the container to ensure they are free of soils, mud, bird droppings, seeds, plant fragments or any sign of rodents (e.g., gnaw marks). If found, do not load the item until it has been checked fully and appropriately biosecured.
- Ensure the container is not over packed. It is essential that air channels are left within the container to allow the dispersal of the insecticide fumigant fog.
- If possible, leave a space at the door to allow for the placing of biosecurity equipment (c. 30 cm deep)

After packing

Keep the container doors closed as much as possible prior to undertaking the biosecurity measures (see below) and the sealing of the container prior to transportation.

Mouse and rodent bait boxes. This step is only to be undertaken when the container is in a location where rodents are known to exist. DO NOT DEPLOY RODENT BAIT BOXES IF ON AN ANTARCTIC STATION. For the mouse and rat bait boxes, put on gloves, use the supplied key to open the bait box, put a bait 'pasta' inside and close the box. Place the mouse bait box and rat bait box near the door at the edges of the container (e.g., one on either side), making sure the box entrance hole is accessible. If the container is transporting food, do not use poison bait. Alternatively, a appropriately size snap trap can be placed inside the bait station, which should be clearly labelled to warn other of the potential risk.

Insecticide Fogger (e.g., Fortefog P Smoke Bomb)

- Please read the relevant COSHH and risk assessments (detailed in this document)
- If mesh has been placed over the container vents, temporarily seal the container vent on the outside using gaffer tape (this is to keep the insecticide fog inside the container).
- Close the left-hand container door.
- Place a ceramic tile or aluminium foil on the floor of the container, away from any combustible cargo, and in a location that will allow rapid closing of the right-hand container doors.
- Wearing gloves and safety specs, open the fogger by removing the plastic tag.
- Place the fogger on the ceramic tile.
- Check the right-hand container door can be easily closed BEFORE lighting the fogger. If you do not think you can close the container door within c. 20 seconds of lighting the fogger, then do not proceed. Make a note on the container biosecurity checklist that fogging was not possible.
- Remove gloves. Light the fogger and close the container door immediately. Do not open the container again prior to transportation.
- If the container needs to be re-opened prior to transportation, wait for at least three hours before doing so to allow the insecticide fog to settle. Re-opened containers must be fumigated again before transportation.
- Attached a large adhesive sticker to the container door detailing the date, time fumigation was performed and the name of the fumigant (e.g., Fortefog P). Space should be left to

indicate the date and time the container was later vented (i.e., doors opened) following transportation.

- Remember to remove any gaffer tape placed temporarily over the container vents.

14.7 Appendix 7: Summary of containerised cargo biosecurity arrangements

Southbound

Biosecurity activity	BAS Supply Chain Logistics (SCL) packing Cambridge	Harwich Port storage	Containerisation at Harwich Port	Containerisation elsewhere (e.g., BAS Cambridge, FI, Punta)	UK Ship Loading
General cleanliness	SCL	Harwich Port (to degree possible given other users)	 Stevedores, contracted by SCL	 SCL / Agunsa	SCL Shoreside SDA crew ship side
Rodent stations	 BAS Cambridge Estates Contractor	 Harwich Port	 SCL/Third Party Contractor (NBC Environment)	 SCL/Third Party Contractor (TBC)	Not relevant

UV fly killers	 BAS Cambridge Estates Contractor	Not possible	Not relevant	Not relevant	Not relevant
Fumigation (where appropriate e.g., not food containers)	Not relevant	Not relevant	 SCL/Third Party Contractor (NBC Environment)	 SCL/Third Party Contractor (TBC)	Not relevant
Rodent Detection Dogs	Not relevant	Not relevant	 CK9C (contracted by SCL)		

				GSGSSI (as requested by BAS FI. Will be done in FI not UK)	CK9C (contracted by SCL)
Jet washing (48 hours or less before loading)	Not relevant	Not relevant	Not relevant	Third part contractor (contracted by SCL)	 Harwich Port (contracted by SCL)

Please note non cargo containers (e.g., lab containers) have different arrangements – internal biosecurity is the responsibility of the 'owner'. SCL will arrange jet washing and rodent detection dogs only. Container 'owners' can utilise contracts in place with SCL suppliers.

Northbound

Biosecurity activity	Containerisation by stations	Containerisation on ship	Containerisation at Southern Hub
General cleanliness	Station teams	Ships crew	Third party contractor (contracted by SCL, TBC)
Rodent stations	Not required	Not required (assuming ship is rodent-free)	 Third party contractor (contracted by SCL)
Fumigation (where appropriate, e.g., not containers carrying food, flammable/dangerous goods or sensitive scientific equipment)	 Rothera and KEP station teams	 Ships Crew (if possible)	 BAS FI / Agunsa (TBC)

Jet washing	 Rothera and KEP station teams in liason with the ship (when containers are contaminated with soil/mud/plant material/faecal material)	Ship should constitute a ‘clean’ environment. Therefore, jet washing should not be required unless contamination occurs on board ship.	 Third party contractor (contracted by SCL) (TBC)

14.8 Appendix 8: Bird Island rodent contingency plan

TIER 1 **Normal state of monitoring: Bird Island rodent free**	**TIER 2** **Confirmed rodent sighting, or high probability of one or several individuals evidenced by presence of footprints, gnaw marks or droppings**	**TIER 3** **Confirmed establishment of rodents on Bird Island**
General precautions: ● Good housekeeping ● Education. Ensure all staff are aware of both the natural and human-mediated routes by which rodents could reach Bird Island ● Awareness. Remain vigilant of field signs (e.g., droppings, footprints in soft mud) at all times throughout the island Specific precautions to prevent human-mediated introductions: ● BI station leader (SL) 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 non-toxic wax block). Record checks on log sheet and return to the Environment Office at the end of the summer season.	Report any incident to the BAS Environmental Office and GSGSSI Environment Officer immediately. Provide additional information or request further advice as appropriate. <u>SCENARIO 1. CONFIRMED SIGHTING OF RODENT ASSOCIATED WITH CARGO</u> ● 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 ● Deploy wax tags around station and check weekly <u>SCENARIO 2. EVIDENCE OF RODENTS AROUND THE STATION</u> ● Inform the rest of the base personnel of the finding. Ask for enhanced vigilance for signs of rodents	● Environment Office to consult with GSGSSI on implementing a rodent eradication programme ● Prepare press brief in consultation with BAS Communications and GSGSSI.

● 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 BAS incident reporting system Specific measures to monitor for natural introductions ● On-going island-wide monitoring programme. Maintain the regular check of rodent bait boxes (baited with wax blocks). Any suspected gnawing should be reported and poison bait inserted to confirm presence of rodents (Tier 2)	● Make an internal and external inspection of all huts and station buildings for signs of rodents. Repeat weekly. ● Record the time and location of any evidence or suspected evidence of rodents on the island ● Deploy bait stations, with poison bait, around the station. Check all bait boxes at least once every week for evidence of rodents ● Initiate weekly monitoring of island–wide bait boxes (which should have wax blocks replaced with poison bait)	
Be prepared to move to Tier 2	Be prepared to move to Tier 3 OR Stand down response when there is no further evidence of rodents, and following consultation with BAS Environmental Office and GSGSSI.	

14.9 Appendix 9: Colonisation status of known non-native species in the Antarctic terrestrial environment

For information on non-native species in Antarctica see: Hughes, K. A., Pertierra, L. R., Molina-Montenegro M. A., and Convey P. (2015). Biological invasions in terrestrial Antarctica: what is the current status and can we respond? Biodiversity and Conservation 24: 1031-1055. See also Figure 2 in these regulations. 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 (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Plants					
Poa annua L. (annual meadow grass)	Arctowski Station and within ASPA 128 Western Shore of Admiralty Bay, King George Island, South Shetland Islands (62°09'45.0"S; 58°28'00.0"W)	1985/86 Multiple introduction may have occurred	Expanding, invasive?	Grass has spread over 500 m from Arctowski 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 station (70 plants, c. 100 m^2) 20015/16: Eradication of plants on-going. Seed bank in soil remains.
Invertebrates					
Diptera					

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Eretmoptera murphyi, Schaeffer, 1914 (flightless midge)	Signy Research Station, South Orkney Islands, Scotia Arc (60°43'00.0"S; 45°38' 00.0"W)	1967, 1968 (?)	Expanding	~35,000 m^2	Chironomid midge 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. Colonisation of habitats on the western Peninsula may be possible as far south as 67°S.
Trichocera (Saltrichocera) maculipennis, Meigen, 1818	Artigas Antarctic Scientific Base, Fildes Peninsula, King George Island, South Shetland Islands (62°11'04.0"S; 58°54'08.0"W)	2006 (?)	Persistent	Found up to 4 km from Artigas Station	Found in the base sewage system and in the terrestrial environment around Maxwell Bay. Initial eradication attempt in sewage system was unsuccessful. Life history and physiological characteristics may make colonisation of maritime Antarctica possible.
Mecoptera					
Boreas sp. (Snow scorpion fly)	Cierva Point, Danco Coast, Antarctic Peninsula (64°09'00.0"S; 60°58'00.0"W)	?	?	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
Enchytrae					
Christensenidrilus blocki, Dózsa-Farkas and Convey, 1997	Signy Research Station, South Orkney Islands, Scotia Arc	1967, 1968 (?)	Persistent	< 150 m^2	Enchytraeid worm present in low numbers around the original introduction site.

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
(enchytraeid worm)	(60°43'00.0"S; 45°38'00.0"W)				
Collembola (springtails)					
Hypogastrura *Viatica,* Tullberg, 1872	Léonie Island, Marguerite Bay, Antarctic Peninsula (67°37'00.0"S; 68°20'30.0"W)	?	?	?	Only record is original collection. Subsequent collections have not contained this species
Hypogastrura *Viatica,* Tullberg, 1872	Tower Island, Palmer Archipelago, (63°35'00.0"S; 59°49'00.0"W)	?	?	?	Found associated with a sheathbill nest in Feb 1966
Hypogastrura *Viatica,* Tullberg, 1872	Half Moon Island, South Shetland Islands, (62°28'48.6"S; 60°46'39.8"W)	?	?	?	Regular visitor site. ATCM Site Guidelines have been adopted for Half Moon Island. The Argentine Antarctic summer station Cámara is located on the Island.
Hypogastrura *Viatica,* Tullberg, 1872	Neko Harbour, Graham Land, Antarctic Peninsula (64°50'00.0"S; 62°31'00.0"W)	?	?	?	Regular visitor site. ATCM Site Guidelines have been adopted for Neko Harbour. Site of a former Argentine refuge hut.
Hypogastrura	Collins Point,	?	?	?	Found within ASPA 140 sub-site A, Collins Point

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Viatica, Tullberg, 1872	Deception Island, South Shetland Islands, (62°59'44.2"S; 60°35'10.1"W)				
Hypogastrura *Viatica,* Tullberg, 1872	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	?	Persistent (Invasive?)	Abundant at several sites around the bay	Now abundant. One of the most invasive Collembola found in the sub-Antarctic islands
Hypogastrura *Viatica,* Tullberg, 1872	Telefon Bay, Deception Island, South Shetland Islands, (62°55'43.0"S; 60°40'48.8"W)	Recorded 2011	?	?	Found within ASPA 140 sub-site F
Hypogastruraviatic, Tullberg, 1872	Devil Island, close to Vega Island. (63°48'00.0"S; 57°17'00.0"W)	Recorded 2010	?	?	

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Folsomia candida, Willem, 1912	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	?	?	?	Original samples collected in 1965. Not found in later surveys
Protaphorura fimata, Gisin, 1952	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	?	?	?	Original samples collected in 1965. Not found in later surveys
Deuteraphorura cebennaria, Gisin, 1956	Pendulum Cove, Deception Island, South Shetland Islands, (62°56'07.5"S; 60°35'59.1"W)	?	?	Found at Pendulum Cove (not within ASPA 140 sub-site G)	Regular visitor site. ATCM Site Guidelines have been adopted for Pendulum Cove. The remains of the Chilean Presidente Pedro Aguirre Cerda Station (HSM No. 76) are located here.
Mesaphorura macrochaeta, Rusek, 1976	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	Recorded 2010	?	Found at several site around Whalers Bay	Regular visitor site. ATCM Site Guidelines have been adopted for Whalers Bay. The remains of the Whaling Station, cemetery and British 'Base B' are located here.

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Proisotoma minuta, Tullberg, 1871	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	Recorded 2010	?	?	
Proisotoma minuta, Tullberg, 1871	Caliente Hill, Deception Island, South Shetland Islands, (62°58'24.0"S; 60°42'42.0"W)		?	ASPA 140 sub-site C	
Cryptopygus caecus, Wahlgren, 1906	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	Recorded 2010	?	?	Species common on most sub-Antarctic islands. Some uncertainty as to whether this is a non-native species or potential native species/natural colonist
Cryptopygus caecus, Wahlgren, 1906	Telefon Bay, Deception Island, South Shetland Islands, (62°55'43.0"S; 60°40'48.8"W)	Recorded 2011	?	?	Species common on most sub-Antarctic islands. Some uncertainty as to whether this is a non-native species or potential native species/natural colonist
Actinedida (Acari) (mites)					

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Alicorhagia sp., Berlese, 1910	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	Reported 2010	Transient? Persistent?	Whalers Bay	Only a single individual found, which could represent a sporadic, recently introduced individual that could not establish a viable population
Coccotydaeolus, cf. *krantzii* Baker, 1965	Whalers Bay, Deception Island, South Shetland Islands, (62°57'00.0"S; 60°37'58.8"W)	Reported 2010 and 2011	Persistent?	Higher densities found in 2011	Widespread distribution at Whalers Bay study site
Coccotydaeolus, cf. *krantzii* Baker, 1965	Hannah Point, Livingston Island, South Shetland Islands, (62°39'16.0"S; 60°36'48.3"W)	Reported 2011	?	?	
Coccotydaeolus, cf. *krantzii* Baker, 1965	'Punta Cristian II', Fildes Peninsula, South Shetland Islands (62°11'53.0"S; 58°56'47.5"W)	Reported 2010	?	?	Location on the lower coast terrace on the northern shore of Maxwell Bay, 1 km from Bellingshausen Research Station.
Coccotydaeolus, cf. *krantzii* Baker, 1965	Neko Harbour, Graham Land, Antarctic Peninsula	Reported 2011	?	?	Widespread distribution at Neko Harbour study site

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
	(64°50'00.0"S; 62°31'00.0"W)				
Coccotydaeolus, cf. *krantzii* Baker, 1965	Petermann Island, Penola Strait, Graham Coast (65°10'29.3"S; 64°08'10.7"W)	Reported 2010	?	?	
Speleorchestes sp., Trägårdh, 1909	Arctowski Station and within ASPA 128 Western Shore of Admiralty Bay King George Island, South Shetland Islands (62°09'45.0"S; 58°28'00.0"W)	Reported 2010	?	?	
Speleorchestes sp., Trägårdh, 1909	'Biologenbucht' Gemel Peaks, Fildes Peninsula, South Shetland Islands (62°11'48.3"S; 58°59'28.8"W)	Reported 2010	?	?	The locality 'Biologenbucht' is found on the western side of the peninsula south of Gemel Peaks, approximately 250 m inland.
Speleorchestes sp., Trägårdh, 1909	'Punta Cristian I', Fildes Peninsula, South Shetland Islands (62°11'50.7"S; 58°56'33.2"W)	Reported 2010	?	?	Located on a cliff above the northern shore of Maxwell Bay, 1 km from the Bellingshausen Research station.

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Speleorchestes sp., Trägårdh, 1909	Whalers Bay, Deception Island, South Shetland Islands (62°58'42.96"S; 60°33'29.34"W)	Reported 2010 and 2011	?	?	Whalers Bay
Speleorchestes sp., Trägårdh, 1909	Neko Harbour, Graham Land, Antarctic Peninsula (64°51'45.9"S; 62°26'47.5"W)	Reported 2010 and 2011	?	?	
Speleorchestes sp., Trägårdh, 1909	Petermann Island, Penola Strait, Graham Coast (65°10'29.3"S; 64°08'10.7"W)	Reported 2010	?	?	
Speleorchestes sp., Trägårdh, 1909	Half Moon Island, South Shetland Islands, (62°35'43.9"S; 59°54'07.7"W)	Reported 2011	?	?	
Terpnacarus gibbosus, Womersley, 1944	Neko Harbour, Graham Land, Antarctic Peninsula (64°51'45.9"S; 62°26'47.5"W)	Reported 2011	?	?	

Species	Location (coordinates)	Date introduced	Colonisation status	Extent of area colonised	Notes
Terpnacarus gibbosus, Womersley, 1944	Whalers Bay, Deception Island, South Shetland Islands, (62°58'42.96"S; 60°33'29.34"W)	Reported 2011	?	?	
Terpnacarus gibbosus, Womersley, 1944	'Biologenbucht' Gemel Peaks, Fildes Peninsula, South Shetland Islands (62°11'48.3"S; 58°59'28.8"W)	Reported 2010	?	?	The locality 'Biologenbucht' is found on the western side of the peninsula south of Gemel Peaks, approximately 250 m inland.
Terpnacarus gibbosus, Womersley, 1944	'Punta Cristian I', Fildes Peninsula, South Shetland Islands (62°11'50.7"S; 58°56'33.2"W)	Reported 2010			Located on a cliff above the northern shore of Maxwell Bay, 1 km from Bellingshausen Research Station.
Terpnacarus gibbosus, Womersley, 1944	'Punta Cristian II', Fildes Peninsula, South Shetland Islands (62°11'53.0"S; 58°56'47.5"W)	Recorded 2010			Location on the lower coast terrace on the northern shore of Maxwell Bay, 1 km from the Bellingshausen Research station.