Tackling Invasive Non-Native Species in the UK Overseas Territories

Technical support to the Government of South Georgia & the South Sandwich Islands

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Monday 19th March to Friday 6th April 2018

Contents

Executive summary

- A visit to provide technical support to the Government of South Georgia & the South Sandwich Islands (GSGSSI) took place from Monday 19th March to Friday 6th April 2018.
- Travelling on the MV *Pharos SG*, the new biosecurity facility on Bird Island was inspected on a half-day visit, and biosecurity facilities and procedures at King Edward Point (KEP) on South Georgia checked over a 3-day visit.
- In addition, the ports of departure for vessels from the Falkland Islands were visited and the rodent detector dog trial observed at two of them.
- A draft report includes a total of 27 recommendations to strengthen the biosecurity system.
- On the whole, the actions being undertaken to reduce the risk of a new rodent incursion to South Georgia are good. There is a mix of detection devices being used, people are enthusiastic and aware, and rodent presence is being tackled across the biosecurity continuum: pre-border, border and post-border.
- A key gap identified is the risk of rodents entering the pathway in the Falklands. This can occur through:
    - cargo (from any source);
    - vessels (for example, yachts depart from rodent infested ports in Stanley and then moor alongside jetties at Grytviken and KEP; rat guards on the supply vessels are ineffective in the challenging weather conditions of the South Atlantic).
- Incorporation of the rodent detection dogs on a long-term basis would mitigate this risk substantially. Dogs should routinely check vessels, ports, cargo and equipment in the Falklands before departure to South Georgia. Biosecurity actions should be moved pre-border as much as possible.
- Provision in Stanley of a heat treatment facility for goods, where appropriate, would also help reduce the risk of infested cargo reaching South Georgia.
- It is recommended that vessels mooring alongside jetties at KEP and Grytviken are kept to a minimum consistent with cargo handling and health and safety considerations.
- In addition, the proposed new biosecurity facility at KEP will greatly assist in the inspection of goods on arrival. The current facility is now too small for the amount of goods and equipment passing through.
- The primary biosecurity focus is on reducing the risk of rodent incursion on South Georgia post-rat eradication, and quite rightly. There is more limited attention to the risk of introducing non-native invertebrate or plant species. Both are broadly covered within the existing procedures but some recommendations are made specifically to reduce these risks.
- A horizon scanning exercise for South Georgia will take place in October 2018 to identify the priority non-native species most likely to arrive. This will inform further actions to strengthen the biosecurity system.

Introduction

In 2016 Defra and the GB Non-native Species Secretariat (NNSS) secured £1 million funding from the FCO's Conflict, Stability and Security *Fund (CSSF)* for the project *Tackling Invasive Non-Native Species in the UK Overseas Territories* over four years to help the development of comprehensive biosecurity for the Overseas Territories (OTs) by providing them with access to UK Government expertise on risk analysis, pathway management, pest identification, horizon scanning, contingency planning, rapid response capability and species management.

The NNSS was requested to provide technical support under the project to the Government of South Georgia & the South Sandwich Islands (GSGSSI) on minimising biosecurity risks to South Georgia, primarily to protect the investment made in the South Georgia Heritage Trust (SGHT) rat eradication programme of 2011 to 2015, and GSGSSI ongoing weed eradication work.

Terms of reference for the visit were as follows:

- Review of current biosecurity procedures and their implementation to identify ways in which they could be improved or developed further, identifying key gaps or risks.
- Review biosecurity procedures and practices for packing and loading cargo in the Falkland Islands (FI), as well as biosecurity and pest control practices in-place in and around the wharf area.
- Assess the pest control practices in place on-board the vessels departing for SGSSI.
- At King Edward Point (KEP) and Bird Island, review biosecurity procedures and practices for off-loading and unpacking cargo on-island, and an assessment of what additional biosecurity measures will be required beyond the rodent detector dog trial and new biosecurity facility at KEP. This would include an analysis of options incorporating suggestions from stakeholders such as SGHT to provide a clear framework with which to develop biosecurity further and a rationale for priority actions.
- Assess biosecurity protocols, for example, for inspection of fresh produce.
- Review the monitoring, surveillance and emergency response plans for terrestrial non-native species in South Georgia.
- Provide a concise report with practical recommendations to strengthen the existing biosecurity system.

The visit took place from Monday 19th March to Friday 6th April 2018, travelling on board the vessel MV *Pharos SG* to Bird Island and King Edward Point. I was accompanied throughout the visit by Mr Ross James, Visitor Management Officer, GSGSSI.

Travel to South Georgia, general

For travellers on the RAF air bridge from Brize Norton, biosecurity information is received along with the ticket as a section in the Falkland Islands Government Overseas (FIGO) Office document "Flights from the United Kingdom to the Falkland Islands". There is no biosecurity information or signage at Brize Norton, and the biosecurity video was not shown on the flight; apparently the video will be loaded onto the aircraft system and be routinely shown after the next aircraft service.

Biosecurity signage is present in arrivals at Mount Pleasant Airport (MPA) in the Falkland Islands at the baggage carrousel, and there is also a quarantine amnesty bin.

> ***Recommendation 1:*** *Biosecurity signage should be placed at Brize Norton check-in for flights to the Falklands. This will serve both the Falkland Islands and South Georgia, perhaps using the brand "Gateway to the Antarctic". Signage could take the form of colourful pull-up banners with simple messaging.*
>
> ***Recommendation 2****: The handout "Flights from the United Kingdom to the Falkland Islands" should be revised to include cleaning footwear and checking for seeds in clothing, footwear and baggage.*
>
> ***Recommendation 3****: The biosecurity video should be shown on the RAF flight, before arrival in the Falklands. In addition, the biosecurity video could be shown in arrivals at the baggage carrousel.*

GSGSSI should collaborate with the Falkland Islands Government (FIG) to deliver recommendations 1 to 3. Negotiations are in hand to ensure that the biosecurity video is shown on the LATAM flight from Chile.

Passengers on the *Pharos SG* receive the handout "GSGSSI: Joining and pre-embarkation instructions for passage on the MV *Pharos SG*" which includes a section on biosecurity, and a link to Biosecurity Handbook which they are "encouraged" to study. This wording is rather loose: it should be mandatory reading.

> ***Recommendation 4.*** *The document "GSGSSI: Joining and pre-embarkation instructions for passage on the MV Pharos SG" should make it clear that travellers are <u>required</u> to have read and complied with the latest edition of the Biosecurity Handbook. Note that this requirement can't be effectively policed, it will result in raised levels of awareness and relies on voluntary compliance.*

The Biosecurity Handbook 2017 – 2018 is very comprehensive, covering visitors, vessels and cargo, but the full range of advice is not relevant to all users and it could be made more user-friendly.

> ***Recommendation 5:*** *During the next annual revision of the Biosecurity Handbook consider ways of formatting it so that relevant information for the distinct main user groups is easier for each to identify:*
>
> - *Yachts*

- *Cruise ships*
- *Expeditions*

King Edward Point

Pre-border

Observations below all refer to the MV *Pharos SG*, the vessel on which I travelled to South Georgia.

All passengers are given a biosecurity briefing by the captain the day before first landing in Bird Island / South Georgia which consisted of an explanation of the main points by the captain and a briefing video. At 1-hour, the biosecurity and wildlife protection messages get lost towards the end, and the video tests the endurance of those who have yet to find their sea-legs. A much shorter, focused video would be better. Crew who had previously landed at South Georgia were not obliged to attend the briefing, but all signed the self-audit check list.

> ***Recommendation 6****: Create a new, short version of the South Georgia briefing video, ca 10mins in length, and consisting only of the messages to do with biosecurity and wildlife protection such as:*
>
> - *Clean footwear – deep treads, narrow treads*
> - *Clean rucksacks, inside*
> - *Pockets, turn ups, etc*
> - *Velcro, dangers - gaiters*
> - *Avoiding trampling delicate vegetation*
> - *Distance from wildlife*
> - *How to manage a fur seal encounter*
> - *Finding ordnance*
> - *Bring nothing*
> - *Take nothing away*

> ***Recommendation 7****: All people proposing to land in South Georgia should be expected to attend the shorter briefing, regardless of previous experience in the island. Vessel crew should be expected to attend period briefings, for example every 3 or 6 months. Different versions of the short video could be produced to help maintain interest and attention.*

Passengers are also expected to carry out checks of their footwear, cloths and baggage while on board, and a vacuum cleaner is available. However, no detailed guidance is given on the level of detail required.

> ***Recommendation 8:*** *The captain or Charterer's representative should designate a time and place for footwear and baggage checks to be made. On the Pharos SG, if sea conditions permit, the Commissioners Lounge is ideal as it is spacious and well-*

lit, otherwise the Officers Mess is lower down in the vessel (and so more stable in bad conditions) and has a large central table which can be used to check bags. Laminated cards explaining exactly what to do (pockets inside out, turn-ups, Velcro, boot insoles out, etc.) should be provided to the captain to hand out to passengers or placed in the cabins; these can be kept together with the vacuum cleaner.

Personal baggage inspections could be difficult in high seas, not all passengers will be good sailors, and this compromises the effectiveness of such inspections. Alternatively baggage checks could be carried out by passengers immediately on-boarding the vessel while it was still moored-up, or done in Stanley immediately prior to boarding the vessel in the biosecurity container which is not currently much used. The container could also be used to check other baggage and cargo prior to loading onto the vessel. If the biosecurity container was brought into use, it would require routine pest control checks to ensure that it is earwig and pest free.

Where possible, goods should be precautionary treated before packing / loading onto the vessel. This could include for example cleaning, pesticide spraying, or heat treatment by freezing or heating, and be applied to dry foods and household goods, field equipment, personal baggage, construction materials, and general cargo, as appropriate. This is already done for bulk order GSGSSI goods from the UK, which are biosecured at a facility in the UK prior to departure and only opened again on South Georgia. Currently, there is no heat treatment capacity in Stanley but such a facility would have wide potential benefits for both South Georgia and the Falklands. A simple facility could consist of a modified shipping container where temperatures could be held at both -20°C and +65°C.

Recommendation 9*: GSGSSI should collaborate with FIG to establish a heat treatment facility in Stanley for use by both Territories, with an appropriate operating system.*

All vessels travelling to the South Georgia maritime zone from Stanley will be equipped with rodent bait boxes, those travelling from other points of origin are equipped on arrival. Currently the provision is two boxes per vessel regardless. It would be expected that vessel size, type, duration and location of mooring prior to departure to South Georgia would affect the number of risk areas requiring monitoring, and the provision of bait boxes should reflect this.

Recommendation 10*: A protocol should be developed for the number of rodent bait boxes placed on board vessels, depending on the size, type and mooring history of the vessel.*

Two training sessions of the rodent detector dogs were observed, at Mare harbour and on the *Pharos SG* at its usual dock at Falkland Interim Port and Storage System (FIPASS). The dogs' ability to distinguish vintage scent from mouse droppings and dead mice (placed on-board for the training session) was impressive.

Recommendation 11*: Assuming the rodent detector dog trial continues successfully, that rodent detector dogs should be routinely deployed at ports in the Falklands as part of the pre-border biosecurity, under an appropriate operational plan.*

Border

The Government Officers (GOs) are responsible for overseeing biosecurity at KEP. There are three GOs, with two being on duty at any one time. The GOs are well briefed and do an excellent job.

A boot cleaning station is positioned at the disembarkation point on the vessel and compliance appears to be good. Boots are cleaned on both entry to and exit from the vessel, each time.

On arrival, all baggage and cargo goes into the existing biosecurity building for checking. The footwear, clothing and baggage check is repeated. Fresh produce is inspected at 100% with every individual unit checked, outer skins removed from garlic and onions, and any sections of rot cut away; note that no fresh produce was imported during this visit and inspections were not observed. During the annual re-stock, the boatshed building is also used as the existing facility is too small.

The current building is well positioned near the jetty and isolated from other buildings. Roller doors can be dropped to isolate the inspection room. The building is well equipped with invertebrate and rodent monitoring devices. However, the space is very small, and the area cluttered with stores and equipment etc., creating harbourage for any invertebrates and small rodents arriving on cargo.

Note that the UV light trap bulb needs to be changed regularly, at least annually or according to manufacturers' specification.

Some time was spent discussing the requirements for the proposed new biosecurity facility. Problems with the current one include: limited space, encroachment of stores into the inspection space, and a layout which allows mixing of unchecked and biosecured goods. It is anticipated that future cargo will be containerised to a much greater extent than presently, and this will allow more biosecurity checking / mitigation to be carried out pre-border. It is not considered essential to bring an entire 20ft shipping container into the new facility at KEP, but ideally the container should be able to dock directly onto the facility so that the doors open into the unpacking room. Various ideas for a practical and feasible docking device are being considered.

Recommendation 12: *The proposed new biosecurity facility should include the following features:*

- *One-way flow from entry through biosecurity processing to exit or storage.*
    - *Unpacking room where goods (cargo, baggage, field kit etc) arrive, to be equipped with sinks.*
    - *Areas for the washing machines (for field kit) and the waste compacter can open off the unpacking room.*
    - *Inspection room where goods are checked. The Inspection room should be empty and consist only of a sink, inspection benches with shelving to hold*

only equipment relevant to the inspections such as the vacuum cleaners, etc. There are two sets of doors from the inspection room to the exterior.
    - *The exit corridor from the inspection room to the exterior should be wide enough for a pallet truck or trolley.*
- *Storage rooms can come off the exit corridor but note that the building is not intended to be a storage facility. Storage rooms should include:*
    - *Biosecured field kit for search and rescue*
    - *Pesticide store (insecticides and herbicides); see below for comments on the specifications of the pesticide store*
    - *Gear awaiting biosecurity checks*
    - *Gear in transit*

  Clean field equipment should be stored elsewhere.
- *Residual insecticide sprays are continued to be applied periodically to the shelving and wall/floor junctions throughout the building, according to manufacturer's instructions.*
- *The incinerator needs to be updated, with a fixed, modern unit possibly situated to the side of the compactor inside the facility so that waste is not taken outside.*

Currently, pesticides (various insecticides and herbicides) are stored on shelving to one side of the biosecurity checking room and are openly accessible to everyone on-site. There was some evidence of leakage at the time of my visit, and it was not clear which container was leaking. This is of concern: pesticides are hazardous chemicals and should be stored appropriately. In the new facility, the pesticide store should conform to the UKs Health and Safety Executive Code of Practice for suppliers of pesticides to agriculture, horticulture and forestry (the "Yellow Code") and be kept locked. The basic requirements for small-scale pesticide stores are summarised in Annex 3.

The only vessels which are allowed to come alongside the jetty at KEP are the *Pharos SG* (10 to 12 visits per year), Military vessels (four to six visits per year), British Antarctic Survey (BAS) vessels (two to four visits per year), those given special permission with disabled crew/passengers etc., and yachts of a certain size (up to 22 vessels a year). Yachts and cruise ship tenders are also permitted to go alongside at Tijuca jetty at Grytviken. Along with cargo, vessels moored alongside the jetties offer the highest risk of rodent and other non-native species incursion to South Georgia.

A variety of rodent and invertebrate monitoring devices are in place around the port areas at KEP and Grytviken, and around the KEP buildings, including baits, traps and "rat hotels". The use of a variety of devices is good as it increases the likelihood of detecting a new incursion. They are routinely checked according to Biosecurity Handbook. Records are kept and submitted to Government House on a monthly basis.

However, it is known that rodents are not necessarily detected by baits and traps around ports of entry. As a general precaution, vessels coming alongside should be kept to the absolute minimum, mooring up to unload cargo or as required to conduct other specified

activity and then moving away. The default should be that vessels do not come alongside, except when required and with permission.

> ***Recommendation 13.*** *Only vessels discharging or loading cargo (or for other, agreed activities or circumstances such as health and safety issues which require them to be alongside) should be alongside the jetties at KEP and Grytviken, and only for as long as these activities require. Acceptable activities need to be defined and this could be instigation of a visitor berthing permit could define and regulate berthing.*

Post-border

There is a comprehensive incursion response plan for rodents. The first action is to call GSGSSI and confirm the presence of rodents.

The incursion response is primarily based on 0.0025% brodifacoum rodent bait blocks, broadcast within a prescribed area. GSGSSI is looking into changing this to use of bait boxes in first instance, noting that it is an incursion response and not an eradication exercise. Bait boxes have several advantages: you know exactly where each bait is, bait takes can be checked, and the risk to non-target species is minimal. There are sufficient bait boxes present at KEP for this use.

> ***Recommendation 14****: Sufficient in-date rodent bait to implement the initial incursion response should be maintained at KEP at all times. The amount will change if bait boxes become the recommended method of application rather than broadcast baiting. Note: this amount would also be sufficient for initial action in the event of an incursion at another location.*

On-going monitoring for rodents throughout South Georgia will be carried out, post-rat eradication, and how this will be delivered between the SGHT and GSGSSI is being discussed.

In the event of an invertebrate incursion response, there is no plan and if the GOs found something of concern they would report to GSGSSI and await instructions. Insecticide sprays are present (cypermethrin plus at least two different aerosol formulations), together with sticky traps. This is considered appropriate for invertebrates which need to be handled on a case by case basis and require expert input; for example, the response to an ant incursion would be very different to that for a cockroach or earwig incursion.

Bird Island

Two hours were spent on-shore at Bird Island. A new complex is under construction which includes a dedicated biosecurity room.

Pre-border checks for cargo are done in Cambridge, and considered to be done to a high standard. Fresh produce inspections are currently done in the kitchen; note that none were observed during this visit.

There are plans to put the compactor in the biosecurity room, but this could function as harbourage for invertebrates.

> ***Recommendation 15****: At the new Bird Island biosecurity facility, locate the compactor to the waste room, leaving the biosecurity inspection room bare, and containing only inspection benches along the sides. If the compactor has to be in biosecurity room, make sure it is raised off the floor, with space below and behind to allow for cleaning.*

The supply vessels

There are three supply vessels, the MV *Pharos SG*, and the BAS vessels RRS *James Clark Ross* and RRS *Ernest Shackleton*. The observations below were made on the *Pharos SG* and their relevance to the BAS vessels needs to be confirmed.

The *Pharos SG* operates to UK & International Standards with regards pest control, and has a range of pest-detection and pest-deterrent devices and procedures which makes it low risk. There are nine rodent bait points, each baited with two different anticoagulant rodenticide baits (difenacoum and brodifacoum). Bait points are checked two to three days after departure from the Falklands, to maximise the chances of detecting any rodents. Baits are renewed on an ad hoc basis, when they are considered old or dried but this is left to the discretion of the person checking the bait each time. Records are kept.

> ***Recommendation 16****: GSGSSI should facilitate the replacement of all baits on-board the supply vessels on an annual basis and all at the same time, to ensure that all baits are fresh and in-date. If baits need replacing between the annual bait-change, this would be in addition.*

In the event of observing a rodent or detecting a bait-take the captain would report the fact and return to the Falklands while attempting to seal the area and actively search for the rodent. Procedures would follow those laid down in Appendix 8 of the BAS incursion response plans for Bird Island, which covers all BAS ships on the way to South Georgia (British Antarctic Survey, 2018).

Note that there were no spare baits or traps on board the *Pharos SG* at the time of this visit.

> ***Recommendation 17****: The vessel should always have at least 1kg of in-date rodent bait together with a selection of other devices such as cage traps (eg Tomahawk design for rats and Sherman design for mice, both of which come in folding versions for easy storage when not in use), snap traps and sticky traps to maximise the chances of capturing any rodents detected or suspected.*

In addition, the *Pharos SG* has 11 invertebrate monitoring points in the form of tamper resistant sticky trap containers deployed in food storage areas, galley, and at entry points. etc. The invertebrate traps are checked and recorded at the same time as the rodent bait points, and sticky pads replaced as needed. At the time of this visit, the sticky traps contained mainly small flies, with a few larger flies and at least one small beetle, but there is no guidance as to what the crew are looking for. Currently, the number of trapped invertebrates is counted each check and very crudely identified. Identifying invertebrates caught in thick glue can be difficult even for trained entomologists and it is unreasonable to expect the ship's captain to have these skills. One species of concern is the European earwig, *Forficula auricularia*, currently invading the Falklands, this is a clear and easily identifiable target for monitoring.

> ***Recommendation 18:*** *Clear guidance should be provided by GSGSSI in terms of what the targets are for invertebrate monitoring on-board the supply vessels, with pictures, sizes, and possibly preserved reference specimens.*

There is no protocol in the event of detection of an invertebrate outbreak and no equipment on board the vessel. While an outbreak is not considered very likely, it is good to be prepared with a clear procedure in the event of its occurrence.

> ***Recommendation 19****: GSGSSI should discuss with the supply vessel operator how best to guide the ship's crew in the event of detection of an invertebrate outbreak, together with at least 10 units of in-date pyrethroid aerosol sprays. This might take the form of a written protocol. The rapid response may include:*
>
> - *Thorough cleaning of mess areas at least every evening to remove crumbs and other food sources.*
> - *Residual spraying of wall-floor junctions with insecticide.*
> - *Confinement of all food to the mess areas: no sandwiches, snacks etc to be taken away to avoid crumbs.*

It is potentially difficult to contain an invertebrate outbreak on-board a vessel. One possibility to pre-empt this need would be to carry out periodic residual spray with appropriate pesticides. This would require thorough cleaning of the area to be sprayed beforehand, which is itself conducive to minimising invertebrate infestations. The results of the horizon scanning exercise to be carried out in October 2018 (see below) may provide further information on the value of such activity.

Pest control practices on board ship also include three automatic pyrethroid sprays in the aft hold store, crews mess area and the cabin normally assigned to fisheries observers, as well as maintaining good standards of cleanliness and hygiene. There are no UV lights traps on board the *Pharos SG* for flying insects.

> ***Recommendation 20****: It is recommended that at least two UV light traps are placed in the dry stores on board the supply vessels and checked along with the other invertebrate traps.*

The relevance of **recommendations 16 to 20** above to the other supply vessels needs to be confirmed.

The rat guards in place on the *Pharos SG* and RRS *Ernest Shackleton* while in port at FIPASS (*Pharos SG*) and Mare Harbour (RRS *Ernest Shackleton*) were examined. Three designs were in use. In both cases there were mooring cables:

- With effective rat guards;
- With rat guards which had become detached from the cables and were hanging loose;
- With no rat guards (possibly blown off, or not fitted).

The captain of the *Pharos SG* noted that the weather conditions of the Falklands and South Georgia make use of rat guards very difficult as they frequently blow off. It is also noted that the *Pharos SG* lies lower than the wharf at the bow end, making rat guards redundant as a rodent could simply walk onto the vessel across the fenders for a long stretch. The New Zealand Island Eradication Advisory Group (IEAG) in 2015 notes that rat guards are primarily to prevent rodents boarding rather than leaving a vessel, but in view of the observations above it is clear their use is limited. While finding a bespoke rat guard design suitable for use in challenging weather conditions would help in reducing the opportunities for rodents to board vessels in the Falklands, other mitigation activities must be included, such as checking vessels and gateway ports with rodent detector dogs before departure, and use of rodent baits and monitoring devices on board.

> ***Recommendation 21****: Advice should be sought from appropriate experts on rat guard designs suitable for challenging weather conditions, for use on all vessels mooring in the Falklands and departing to South Georgia.*

Other vessels

Yachts

Yachts are potentially high risk for the following reasons:

- They can go alongside the jetty at KEP and Tijuca.
- In Stanley, they can moor up at East Jetty, the marina, the Canache and the Camber, all of which have higher risk of rodent presence than the big gateway ports such as FIPASS and Mare Harbour, increasing the risk of rodent stowaways.
- Invertebrates, especially earwigs are also of concern.
- It can be difficult for passengers on yachts to comply with stringent biosecurity checks before arrival, due to crowded conditions below decks and especially in rough seas.

Yachts have to come to KEP first if they haven’t been to South Georgia before, in order to get the biosecurity briefing, and have rat bait boxes installed, or if already present, checked.

Yachts should not be moored alongside the jetties at KEP or Tijuca (see **recommendation 13**) unless they have berthing permits.

> ***Recommendation 22****: East Jetty, the marina, the Canache and the Camber in Stanley should be regularly checked for rodent presence (ideally using rodent detector dogs), and routine rodent control carried out. It is recommended that GSGSSI work with FIG on this as a joint activity as yachts also depart from these locations to rodent-free islands in the Falklands.*

Note that **recommendation 22** should also be applied to the gateway ports of FIPASS and Mare Harbour.

Military vessels

The vessel HMS *Clyde* visits South Georgia usually twice a year and is permitted to come alongside the jetty at KEP. The regular crew changes can make it challenging to ensure the uptake of briefings and key biosecurity messages such as baggage/footwear checks and restrictions on taking food ashore. A responsible person should be appointed by *HMS Clyde* to oversee biosecurity for every voyage to South Georgia.

> ***Recommendation 23:*** *That GSGSSI liaise with British Forces South Atlantic Islands to secure a biosecurity point person on board HMS Clyde to deliver the biosecurity briefings, checks and procedures for each voyage according to the Biosecurity Handbook.*

As per **recommendation 13**, no vessel should be moored alongside KEP unless they have permission from the GOs, for a particular reason.

Fishing vessels

Fishing vessels do not come alongside. Fisheries observers come ashore in tenders, and crew may come ashore in tenders on day trips, and these landings are controlled by the GOs through briefings on board the vessel. They are considered to be low risk for the introduction of rodents in normal circumstances.

In the event of shipwreck, the risk increases. Fishing vessels working South Georgia waters are all expected to carry out regular de-ratting, and to carry rodent bait boxes which are checked by the GOs when the vessel arrives at KEP.

If the rodent detector dogs are continued, they would also be used to routinely check fishing vessels for rodents, reducing the risk of infestation.

Cruise ships

Cruise ship passengers adhere to International Association of Antarctic Travel Organisations (IAATO) regulations as well as the conditions in the GSGSSI visit permit, and there is a clear mechanism to communicate with them.

Cruise ships may call at a number of sites, up to three in one day, and compliance with boot cleaning etc. between sites at embarkation and disembarkation can fall off, due to lack of time, lack of follow-up, and general exhaustion by the passengers. The Expedition Leader (EL) is responsible overall for biosecurity compliance and while many are very experienced, facilities can be limited and the EL may be overtasked. Their job would be made easier – and tourist satisfaction improved – if additional assistance was provided to them by the cruise ship operator.

> ***Recommendation 24****: Each cruise ship Expedition Leader (EL) should nominate a biosecurity officer among the crew responsible for ensuring the passenger footwear and gear checks. It would also help the process if the EL was assisted by housekeeping staff to help passengers with boot cleaning as they board and disembark the cruise ship each time. A specific place should be designated for the checks, and equipped as required (buckets, brushes, vacuum cleaner, etc).*

Most cruise operators provide footwear and coats for passengers but the designs are not always ideal and there is a need to specify what is appropriate.

> ***Recommendation 25****: Specify footwear, gaiters, jackets and coats to be supplied by cruise ship operators for visitors: no or minimal Velcro, open treads (can be deep but open for easy cleaning).*

> ***Recommendation 26****: GSGSSI should consider carrying out more systematic spot-checks and shore based inspections of cruise ship passengers. This will serve to raise awareness as well as ensure high levels of compliance with the Biosecurity Handbook.*

> ***Recommendation 27****: At the next IAATO meeting, ask the cruise ship operators for their opinions on weaknesses in the system and suggestions to improve biosecurity awareness and compliance in general. It is important that the operators buy-in to providing additional support to the ELs (**recommendation 24**) so they need to be part of the decision, and may have other suggestions to make.*

Summary

The main observations are summarised below in Tables 1 and 2, together with the recommended actions to mitigate the gaps and reduce the risk of introduction of non-native species. Relative risk levels have been assigned, low, medium or high.

Table 1. Main observations and recommended actions for ports, cargo and visitors.

	Main risks	Risk level	Recommended actions
Gateway ports in the Falklands	• Rodent presence	High	• Use rodent detector dogs to assist rodent control and confirm absence on vessels
Cargo	• Risk of infestation with rodents, invertebrates and, to a lesser extent, weeds	Medium	• Establish a heat treatment facility in the Falklands, together with FIG • New biosecurity facility at KEP to check in-bound cargo and baggage
Visitors	• Limited biosecurity information before arrival • Weak biosecurity briefing video • Risk of spread of invertebrates and weeds	Low	• Improve signage at UK airport • Revise biosecurity briefing video and ensure it is followed • Improve facilities for baggage checks

Table 2. Main observations and recommended actions for vessels. Frequency data is from 2015/2016.

	Frequency	Main risks	Risk level	Recommended actions
Supply vessels	2 – 4	• Rat guards ineffective due to the weather conditions • Moor alongside the jetty at KEP	Medium	• Develop protocols • Use rodent detector dogs to assist rodent control at the gateway ports in the Falklands and confirm absence on vessels
Yachts	22 vessels	• Moor alongside the jetties at KEP and Grytviken	Low	• Presence of vessels alongside the jetties is minimised. • Use rodent detector dogs to assist rodent control at the gateway ports in the Falklands and confirm absence on vessels
Military vessels	4 – 6	• Moor alongside the jetty at KEP	Low	• Presence of vessels alongside the jetties is minimised. • Use rodent detector dogs to assist rodent control at the gateway ports in the Falklands and confirm absence on vessels
Fishing vessels	No data	• Do not moor alongside; risk arises from shipwreck of infected vessels	Low	• Maintain de-ratting and presence of rodent boxes
Cruise ships	68 vessels, with 8,780 passengers	• Baggage checks by passengers between sites can be poor.	Low	• Expedition Leaders have assistance • GSGSSI to carry out more spot-checks

Discussion

On the whole, the actions being undertaken to reduce the risk of a rodent incursion to South Georgia are good. Specifically, there is a mix of detection devices being used, people are enthusiastic and aware, and rodent presence is being tackled across the biosecurity continuum: pre-border, border and post-border. There are two additional new elements which would considerably strengthen the system if they go ahead: the rodent detector dogs, and new biosecurity facility in KEP.

The rodent detector dog trial being carried out in Stanley looks very promising and offers an additional opportunity to check both vessels (including mooring sites) and cargo before they depart for South Georgia. The proposed new biosecurity facility at KEP will allow much more effective inspections of baggage, equipment and cargo in South Georgia itself. It is important that, assuming their operational feasibility, both these elements are incorporated into the biosecurity system in the future. The detector dogs also offer a valuable service for FIG such as checking vessels travelling to rodent-free islands within the Falklands, confirming rodent-free islands as such, and also for general pest control (see Annex 2 for a list of possible activities). This is an excellent opportunity for a joint government initiative. Minimising vessels coming alongside at KEP would also assist in reducing the risk from vessels themselves.

FIG and GSGSSI share pathways of introduction of new non-native species and therefore have shared biosecurity concerns. Tourists may visit the Falklands, visit outer islands, and go on to South Georgia. It makes sense to collaborate and align biosecurity messaging between the Territories (for example: *Gateway to the Antarctic* and *Protect our Islands*) and ask the same from people, both visitors and importers.

Consideration was given to the idea of erecting a rodent-proof fence around the wharf areas of KEP and Tijuca. Designs of suitable rat and mouse proof fencing are available, and widely used in, for example, New Zealand in the creation of mainland islands. However, a fence was not seen to be practical, with the following weaknesses / potential problems:

- Extending the fence into the beach or sea area to either side of the wharf in the context of rough seas, small bergs and glacial ice;
- Being able to maintain the rodent-proof gate to an adequate level in the context of rough seas;
- High possibility of damage by elephant seals and fur seals, especially at KEP where breeding colonies occupy the beach adjacent to the wharf area;
- Fencing the wharf areas doesn't stop a rodent swimming from a vessel and landing just outside the fenced areas. The presence of a fence could therefore lead to a false sense of security and reliance on an inadequate structure.

The cost of fitting and maintaining the fence would also be high. Overall, I am of the opinion that a fence would not be a cost-effective part of the biosecurity system and resources are better committed to ensuring that rodents don't board vessels or enter cargo at the point of origin.

Consideration also needs to be given to internal biosecurity, the risk of moving non-native species between sites within South Georgia. Some areas of South Georgia are more invaded than others, with most known non-native species being focused around KEP and the abandoned whaling stations, and some areas are pristine or near-pristine, eg Bird Island. Activities should always take place starting at the most pristine sites and moving to the least, wherever possible; this is standard practice. However, most visits start at KEP or Grytviken which are among the most invaded sites. This must be taken into account when carrying out biosecurity procedures between sites.

Biosecurity attention is also given to invertebrates although it is less clear what species are specifically being targeted, with the exception of the earwig. There is no incursion response plan for invertebrates, either in South Georgia or if detected on-board vessels. New plant species are also of concern. A newly established plant species would probably be detected by post-border monitoring while it is still manageable, but a new invertebrate species could well be established beyond the point of easy eradication by the time it was detected post-border. It is therefore particularly important to identify the invertebrate species most likely to arrive and cause harm to South Georgia so that they can be targeted by pre-border and border biosecurity actions. The project *Tackling Invasive Non-Native Species in the UK Overseas Territories* will be working with the South Atlantic clusters of Overseas Territories (Falkland Islands, South Georgia and BAT) to carry out a horizon scanning exercise in October 2018. The aim of horizon scanning is to predict the likelihood of the arrival and establishment of new non-native species that are most likely to impact on biodiversity and ecosystems in the next 5 -10 years. The work covers all three environments (terrestrial, freshwater (where relevant) and marine) and also all species across the taxonomic spectrum (invertebrates, vertebrates and plants), with the exception of human, plant and animal pathogens. A summary of horizon scanning is given in Annex 4.

Being able to predict which damaging species are most likely to arrive and by which pathways allows resources to be targeted strategically at these pathways. It allows limited resources to be allocated very cost-effectively.

Following the horizon scanning workshop, the NNSS will assist GSGSSI in the development of pathway action plans to mitigate the identified risks, increasing GSGSSI's capacity to address the risk of arrival of new potentially harmful non-native species.

It is noteworthy that GSGSSI biosecurity is one-way traffic import control. Cargo and other plant and materials originating from South Georgia are offloaded in the Falklands without any biosecurity controls. The horizon scanning workshop will identify non-native species present in South Georgia which are of concern to the Falklands, if any, so that GSGSSI can develop appropriate biosecurity protocols.

A final comment on marine non-native species and biosecurity. This report has focused on the terrestrial aspects of biosecurity because they are the ones currently developed and being implemented, but the marine side is not being ignored. Currently there are no hull inspections of vessels being carried out in the Falklands or South Georgia, but the South Atlantic Environment Research Institute (SAERI) is running a longer term project with

settlement plates in both Territories, and in the future intend to develop a frontline monitoring system for marine non-native species.

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Annex 1. Programme of visit

Date	Location	AM	PM	
19/03/2018	Travel		Arrive via Airbridge	Evening - Reception at Government House (Stakeholders including FIG)
20/03/2018	Falklands	Free	Meet GSGSSI FIPASS wharf visit (Gateway port to SG). Observe detector dogs.	
21/03/2018	Travel	Office / Meetings	Depart on *Pharos SG*	
22/03/2018	Travel	Observe on-board biosecurity Opportunity for discussion		
23/03/2018	Travel			
24/03/2018	Travel			
25/03/2018	South Georgia	Bird Island visit		
26/03/2018	South Georgia	Arrive to KEP	Arrival biosecurity, briefing, cargo inspection etc.	
27/03/2018	South Georgia	Familiarisation of KEP & Grytviken	Meetings with GOs, BAS, SGHT	
28/03/2018	South Georgia	Discuss proposed biosecurity facility for KEP. Scope & design.	Rodent incursion response. Rodent & invert monitoring, cruise ship arrival briefings and inspections etc.	
29/03/2018	South Georgia	Final Meetings		
30/03/2018	South Georgia		Depart KEP to Stanley	
31/03/2018	Travel	Opportunity for discussion		

01/04/2018	Travel		
02/04/2018	Travel		Arrive to Stanley
03/04/2018	Falklands	De-brief at GSGSSI	
04/04/2018	Falklands	9:00 Meeting with Ness, SAERI Working with FIG	Mare Harbour Visit (Gateway port to SG). Observe detector dogs.
05/04/2018	Falklands	9:00 Field visit with FIG	
06/04/2018	Falklands	8:30 Meet with Ross, finalise draft report.	Working with FIG

Annex 2. Rodent detector dog activities

Possible activities for the rodent detector dogs are as follows, relevant for South Georgia (SGSSI), the Falkland Islands (FI) or both (joint):

1. Check GSGSSI and BAS ships for rodents before departure (SGSSI)
2. Check cruise ships in Stanley before departure to SG (SGSSI)
3. Check any other vessel bound for SG (fishing, yacht) (SGSSI)
4. Part of incursion response on the ships (SGSSI)
5. Check rat-free islands (FI)
6. Supporting rodent eradications (FI)
7. Checking inter-island vessels (FI)
8. Support rodent control / pest control generally (FI)
9. Check gateway ports, FIPASS, Mare harbour (joint)
10. Outreach, especially children in schools (joint)
11. Capacity building in dog handling, training etc. (joint)
12. If trained to also detect other species detector dogs can be extended to these. This could include:
    - Preventing earwigs from arriving in South Georgia (GSGSSI)
    - Calafate eradication (FI)

Annex 3. Basic requirements for small-scale pesticide stores

Inside the pesticide store

- Shelving should be of metal, not wood, and be no higher than workers can comfortably reach (head height);
- Herbicides, insecticides and fungicides should be stored in separate groups, to avoid accidentally selecting the wrong product;
- Powders are stored above liquids (liquids can leak if the containers are damaged);
- All pesticides should be labelled, preferably the original labels;
- Place pesticide containers on drip trays, to contain any spillage or leakage;
- A bucket or container of inert material such as cat litter or sand should be kept at the store in the event of spillage of liquid pesticide, to contain the spill;
- Pesticides labelled “flammable” should be kept apart, and the fire service consulted as to the appropriate conditions of storage.

Managing the stock

- An inventory of products in store should be kept up-to-date, and held separate to the store, available in the event of an emergency (eg in case of fire at the store);
- Practice stock rotation, so oldest stock is used first.

The store itself

- The pesticide store should be well ventilated and well lit;
- It should be lockable to make it secure from unauthorised access;
- Large pesticide stores should have bunding around the floor, this is a raised lip to contain any spillage or leakage;
- The store must have no internal drains which connect to public drainage, in order to protect water sources;
- Pesticides should be stored away from food or other edible produce intended for human or animal consumption, with either a physical separation or at least 2 – 3m away;
- The exterior of the store should be marked with the general danger sign (yellow triangle with a black border and black exclamation mark in the middle); no smoking signs and no naked flame should also be placed.

Additional information

- Keep copies of all the labels and Material Safety Datasheets in a folder outside the store for easy reference;
- Personal protective equipment such as gloves and coveralls should be kept outside the store.
- Spray cans should also be kept outside the store.

Annex 4. Horizon scanning

Background

In 2016 Defra and the GB Non-native Species Secretariat (NNSS) secured funding over four years (2016-2020) under the FCO's Conflict, Stability and Security Fund (CSSF) to help the development of comprehensive biosecurity for the Overseas Territories by providing them with access to UK expertise on risk analysis, pathway management, pest identification, horizon scanning, contingency planning, rapid response capability and species management. Work began with a gap analysis of the current biosecurity in each Overseas Territory. This found that the greatest gaps were in *horizon scanning* for future invasive species and pests and *analyses of the pathways of introduction*. Both these elements are key to underpinning future work which will aim to foster preparedness for the horizon species, developing cost-effective pathway action or contingency plans where appropriate for each Overseas Territory.

What is horizon scanning?

The aim of horizon scanning is to predict the likelihood of the arrival and establishment of new non-native species that are most likely to impact biodiversity and ecosystems or impact socio-economically (agricultural production, livestock and public health) in the next 5-10 years.

The work covers all three environments (terrestrial, freshwater (where relevant) and marine) and also all species across the taxonomic spectrum (invertebrates, vertebrates and plants), with the exception of human, plant and animal pathogens.

Why do it?

Being able to predict which damaging species are most likely to arrive in the next 5-10 years and by which pathways allows resources to be targeted strategically at these pathways. It allows limited resources to be allocated very cost-effectively.

How is it done?

The concept of doing horizon scanning is quite simple and involves resolving four questions:

1. What non-native species are already present?
2. What are the pathways by which new non-native species could arrive, and where would they come from?
3. What species could use these pathways which aren't already present?
4. Which of these new non-native species are most likely to harm our island environment, economy or public health?

From the results of questions 1 to 4, a further question is then asked:

5. How can the risk of their arrival be reduced?

Resolving question 5 consists of developing a pathway action plan.

The methodology proposed

The majority of the work will be carried out using the consensus methods for prioritisation of species developed in previous horizon scanning exercises by the Centre for Ecology and Hydrology (CEH) for Great Britain, Europe, and the Cyprus Sovereign Base Areas. Work will be overseen by a steering group composed of Defra, the Non-Native Species Secretariat, RSPB, IUCN and UKOTA.

The analysis will focus on species not present in the Overseas Territory in each case but occurring elsewhere in the region or at the sources of the pathways. Preliminary species lists will be compiled by selected taxonomic and environmental experts by referring to other lists and databases. To assist this process, a synthesis of existing pathways and transport links is provided by the Non-native Species Secretariat (NNSS) for each Territory.

Each exercise will consist of a workshop of the taxonomic experts and Territory representatives to agree a consensus of the species mostly likely be introduced, and the risk rankings based on their expert judgements. Workshops will take place in the territory or at an appropriate other location. The output will include a list of species of concern for each territory/cluster of territories.

Following the horizon scanning workshop, the NNSS will work with each Territory to assist the development of a pathway action plan to mitigate the identified risks.