

Biosecurity on St Helena Island – a socially inclusive model for protecting small island nations from invasive species

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Abstract St. Helena Island, 122 km² (47 sq. miles) is a UK Overseas Territory in the South Atlantic. It is a remote volcanic island situated in the sub-tropics 1,127 km (700 miles) from Ascension Island and 2,736 km (1,700 miles) from South Africa. Its resident population of ca. 4,500 is serviced by a single supply ship which visits up to 25 times a year. Isolation has acted historically as a natural barrier to pest arrival and border control has followed the conventional practice of protecting agricultural interests through restrictions on fresh produce, plant materials, livestock and pets. The benefits of isolation were compromised in 2016 when the first airport opened. Private jets arrive now from Africa, Europe and South America, and commercial flights started at the end of 2017. A programme of biosecurity capacity building and strengthening was established in anticipation of this air traffic. St Helena authorities introduced a national biosecurity framework and associated policy (entitled *Biosecurity St Helena*), the latter constructed through multi-sectoral consultation, and key stakeholders participated throughout in policy development. *Biosecurity St Helena* applies international standards set by the International Plant Protection Convention across the biosecurity continuum. As is typical in small island nations, human and financial resources are limited, so that the biosecurity strategy addresses mainly higher risks. Compliance is heavily reliant on public awareness. Active communication engages all community sectors in biosecurity work through education, information, advocacy and feedback. Authorities use key performance indicators to measure the effectiveness of this approach. *Biosecurity St Helena* is a model of actively socialised biosecurity for other small island nations.

Keywords: biosecurity strategy, capacity building, community engagement, inclusive planning, small island nation

INTRODUCTION

St Helena Island, a United Kingdom Overseas Territory in the South Atlantic Ocean, is a volcanic island with an area of 122 km² (47 square miles) and total population of 4,534 (St Helena Government, 2016). St Helena is remote and isolated, lying 1,127 km (700 miles) southeast of Ascension Island and 2,736 km (1,700 miles) from South Africa, with a sub-tropical, maritime climate. A total of 502 endemic species are currently known, comprising around one third of the total endemic biodiversity of the UK Overseas Territories and making a significant contribution to global biodiversity (Churchyard, et al., 2014). The economy is based mainly on agriculture, fishing, a small but growing volume of tourism and income from offshore employment.

Until 2016 the only regular access to St Helena was via the Royal Mail Ship (RMS) *St Helena*, calling around 25 times a year in passage from Ascension Island and South Africa. Most commodities are imported. More than 69% of the island's annual requirements for agriculture and food are sourced from South Africa, including almost all fruit, and significant quantities of vegetables.

In 2010 the UK Government announced its intention to build an airport on St Helena, conditional upon the St Helena Government's commitment to internal investment and increased tourism. Air access and expansion of the tourism sector augmented biosecurity risks to St Helena. To meet the challenge, the St Helena Government launched a programme in 2013 to upgrade biosecurity arrangements. The 2009 South Atlantic Invasive Species Strategy had already defined dedicated biosecurity capacity for St Helena as a strategic priority for the prevention of invasive species and unwanted organisms in the region (Shine & Stringer, 2010).

St Helena has a limited range of existing cosmopolitan pests and is very vulnerable to new introductions harmful to the economy, community health, environment and the new investments in tourism development (Pryce, 2015). Until now, biosecurity has relied heavily on its isolation as an oceanic island and limited modes of entry to minimise exposure to new pest threats.

The Government's Agricultural and Natural Resources Division (ANRD) reviewed biosecurity practices in 2013 (Key, 2013) and concluded that capacity was inadequate to address the new biosecurity pressures associated with air access. Lack of biosecurity-specific legislation or overall operational framework severely compromised post-border controls and enforcement. There were no fumigation or other specialist facilities for local treatment of contaminated goods. Tellingly, the common interests of different sectors, particularly agriculture, public health and the environment were not harmonised for biosecurity purposes.

PREPARING FOR NEW BIOSECURITY MEASURES

The St Helena Government's programme to upgrade biosecurity in 2013 departed from the existing emphasis on managing agricultural and animal imports at the border. It moved biosecurity to a risk-based approach across the broader continuum of invasive pest organisms in marine and terrestrial environments. Interception measures pre-border, at-border and post-border were to be more closely integrated. Resource limitations in the small-island context argued for greater investments in pre-border controls and post-border surveillance.

Approaches to building the new biosecurity framework

The ANRD led a new policy team comprising agency representatives of Environment, Customs and Public Health; the first time this multi-sector team had been brought to the same table. Their purpose was to establish the architecture of the new biosecurity system through an overarching policy statement. The policy team recognised that understanding of biosecurity issues was essential for community buy-in and compliance. Accordingly, the team developed the new biosecurity policy in full consultation with all sectors in the community, from farmers to politicians, coupled with close participation throughout the reform process. Stakeholders were given multiple opportunities to discuss new ideas and to object to them if warranted. The policy team intended biosecurity

awareness in the community, as a whole, to benefit from these approaches.

Consultations, commencing with twelve focal groups of stakeholders in 2013, explored attitudes to the current biosecurity procedures. Despite some criticisms, all 54 stakeholders that were consulted supported the current arrangements and the need to strengthen them in anticipation of air access.

Participants in a subsequent workshop agreed on the vision for biosecurity policy and then defined strategic objectives and expected outcomes. The broader public were invited to consider the resulting policy statement. The St Helena Government endorsed the policy after it had been revised to incorporate feedback. Now entitled *Biosecurity St Helena*, the policy was launched officially in the biosecurity facility at the seaport in November 2014 (St Helena Government, 2014).

Today, ANRD is the agency lead for biosecurity. It holds the authority to approve import licences and has the principal duty to launch responses to incursions. The community relies on ANRD for government leadership in matters of compliance and enforcement of the new biosecurity legislation.

Biosecurity St Helena defined

The policy vision and principles govern the new biosecurity arrangements and are supported by the island's legal and institutional structures. The policy is the blueprint for "an effective biosecurity system of shared responsibility that protects the sustainable future of our island environment, allowing a vibrant economy, safe movement of people and goods, and enhanced livelihoods and health" (St Helena Government, 2014, page 3). Overarching outcomes are:

- Effective management of biosecurity risks to St Helena's environment, agriculture, amenities, public health and well-being, including safety;
- Effective governance of St Helena's biosecurity system through shared responsibility and roles

Biosecurity St Helena recognises that a zero-risk approach is not practical and works to reduce the risk to an acceptably low level. The policy endorses a white list and licencing approach, whereby all high-risk goods are prohibited except those for which import health standards have been developed. Import health standards specify the conditions under which goods can be imported and the treatments required in response to pest organisms intercepted or simply suspected pre-border, at the border or post-border.

Six crucial principles guide biosecurity work:

1. Leadership for effectiveness throughout the biosecurity apparatus
2. Clear communication of stakeholder roles, responsibilities, and the 'what, why and how' of biosecurity investments.
3. Shared responsibility across all sectors and interests for mutual benefit
4. Risk-based responsiveness to the probability of border challenges, potential harm and changes in the nature of threats.
5. Evidence-based decision-making supported by quality systematic research
6. Co-operation between sectors to minimise the probability of new incursions and manage existing ones.

BIOSECURITY ON THE GROUND

A multi-sector plan was developed alongside the biosecurity policy to put the new structures in place. The policy team supervised developments for the first year, and thereafter improvements were mainstreamed into the work plans of ANRD, Environment, Customs and Public Health, taking effect in the 2016/2017 financial year.

At the border

The St Helena Government recruited two full-time biosecurity officers in 2015, the first in the island's history. They work closely at the border with Customs whose warrants they also hold. Customs and Immigration officials received the same biosecurity training to ensure harmonised border security.

Import health standards apply for a range of commodities, and the island's main traders assisted the development of these standards. Inspection procedures now align with international standards set by the International Plant Protection Convention (IPPC) for phytosanitary (plant health) risks and the World Organisation for Animal Health (OIE) for zoosanitary (animal health) imports. Inspection practices are codified for consistency and transparency. Import Health Standards, application forms and general guidance are now available on-line at <http://www.sainthelena.gov.sh/st-helena-biosecurity-service/>.

The officers employ a dog trained to detect honey, bananas and citrus, to protect St Helena's disease-free bees and bananas. Likewise, citrus (commonly intercepted on incoming visitors) may introduce newly emerging diseases such as huanglongbing citrus greening. Dog handling at the border is governed by a Standard Operating Procedure written together with Customs who run their own detection dogs.

The full-time team has extended biosecurity operations on the wharf, beyond the former pre-occupation with fresh produce. Customs help with passenger and cargo profiling so that higher risks can be ranked for quarantine inspections. Profiling relies on interception data for visitors and surveys of imported cargo arriving by sea, and will be refined as data accumulates for both visitors and freight arriving by air.

Personal goods in shipping containers and vehicles shipped in break-bulk were predicted to be high risk freight. Between January 2016 and March 2017, 99 (40.4%) of 245 imported vehicles (mostly cars) were found to be contaminated with soil. Inspectors intercepted 75 live spiders in 16 (6.5%) of the vehicles. Over the same period, 23 live spiders were intercepted in four (11.8%) of the 34 incoming containers of personal goods. The spiders belonged to seven species known from the UK and South Africa. They were found mainly in the space behind vehicle wing mirrors, on the windscreen wipers, and behind the rear-mounted spare wheel on SUVs. Most spiders in shipping containers were discovered immediately inside the doors.

Soil samples collected from vehicles (typically from rear wheel-arches) were weighed, then placed in seed trays for up to two months to check for seed germination. A mixture of grasses and small dicotyledons germinated successfully from nine (9.1%) of the 99 samples but none survived long enough to identify species.

Building and operating St Helena airport

Construction of St Helena airport commenced in January 2012. Three new biosecurity pressures had to be managed

A second supply vessel now visited every six weeks or so until October 2015. The ship departed from a new port of origin and was the first vessel able to moor alongside the island at a specially constructed wharf. The normal supply vessel RMS *St Helena* barged freight ashore from an anchorage in the bay.

The new vessel discharged large quantities of construction materials, including river and dune sand.

Several hundred off-shore workers arrived (mainly from Africa and Thailand), for whom biosecurity awareness was low to zero.

ANRD negotiated quarantine agreements with the South African construction company. Consignments of sand were fumigated in Namibia and inspected on arrival in the port area. The team inspected break-bulk consignments before disembarkation from the vessel. Compliance improved to a good standard after some initial teething troubles. Only two pests were intercepted during the construction phase - flattened giant dung beetles (*Pachylomera femoralis* Coleoptera: Scarabaeidae) on open metal gantries; and ice plant, (*Galenia papulosa* Aizoaceae) in river sand. Construction staff were quick to report biosecurity issues and responded appropriately.

Border and biosecurity officials meet all inbound flights. Airport biosecurity is guided by a Standard Operating Procedure refined through preliminary test-runs with flights and arriving passengers. An x-ray scanner screens all in-bound baggage. Fresh produce is examined in a small, sole-purpose biosecurity room in the airport's cargo compound.

The Public Health Committee obliges 'disinsection' of all inbound flights, recognising known risks of introducing aerial insect vectors such as mosquitoes (Gratz, et al., 2000). Eighteen private jet and three medevac flights had been treated by March 2016. Commercial flights had not yet commenced.

Post-border surveillance

The 2013 review of biosecurity (Key, 2013) revealed serious weaknesses in post-border surveillance for pest species by-passing earlier lines of defence. Today, monitoring and surveillance behind the island's borders are structured to detect and eradicate pest intruders before they can establish. Biosecurity staff direct their attention to surveillance at the airport construction site and all other ports of entry; targeted surveillance for introduced tephritid fruit flies; and readiness to respond to pest detections.

Surveillance at the construction site has mapped every location at which shipping containers were landed or opened with the participation of the construction company. At each location, the biosecurity team installed a monitoring point comprising a covered breeze block in which crumpled newspaper and a sticky trap attract and contain unwanted invertebrates. A monitoring protocol, identification guide and reference collection assist surveillance. As construction wound down in 2016, monitoring was migrated to new sites around the two seaports and the airport. Each station will include mosquito traps in the future.

Surveillance operates pheromone-baited sticky traps for five species of economically harmful tephritid fruit flies at ten pivotal fruit-growing sites across the island.

The biosecurity team have engaged relevant stakeholders in the preparation of nine response plans for incursion emergencies. The plans address terrestrial and marine risks from a range of phytosanitary, zoosanitary and invasive non-native species. They were refined through a simulation exercise, and further exercises are planned for the future.

Engaging the community

The principle of responsibility shared universally by the St Helena community and visitors is central to biosecurity arrangements. But policy consultations with stakeholders revealed poor understanding of what biosecurity is and what the biosecurity team does. In response, a multi-sector communication strategy targeted key audiences with biosecurity messaging. The strategy adopted *Border Security* (a popular TV programme on Australian border security services) as its brand but switched later to *Biosecurity St Helena* to align messages with the new biosecurity policy. *Biosecurity St Helena* branded pens, shopping bags and mugs were a popular means of reinforcing the messages. Outreach comprises a programme of press releases, articles in the local print and radio media, activities with local primary and secondary schools, and visits by groups to observe biosecurity inspections at the wharf. Councillors, government officials and airport officials were among the first groups invited. The outreach programme continues as a core element in the biosecurity team's work plan. New stakeholders involved in air access readily embraced the messaging, which focused on collective responsibility for protecting the island for the future.

Site visits were very productive; feedback was positive from visitors who were not previously aware of the wharf facility or only generally familiar with the biosecurity team's functions.

The public are actively encouraged to be vigilant for new invasive non-native species. In March 2015, a public awareness campaign comprising press announcements and leaflets invited the public to report unusual tracks, signs, weeds or invertebrates. Reporters are rewarded with a gift of branded promotional goods.

Sustaining external support for *Biosecurity St Helena* is a priority. Biosecurity reaches well back into the supply chains through visits to overseas agents and suppliers who are expected to comply with stringent, time-consuming or costly quarantine requirements often for commodity quantities small relative to their normal trade volumes. Face-to-face contact with suppliers and South African Cape Inspection Service aims to translate their goodwill into co-operation, especially for frequently imported high-risk goods such as South African, produce and plant propagation materials.

Measuring success

A comprehensive database records imports and interceptions. Another holds baseline data for all taxa of native and introduced species, together with a reference collection of pest species known on the island. ANRD uses these data to measure biosecurity outcomes and assess threats based on empirical evidence.

Even so, establishing meaningful indicators to measure biosecurity effectiveness is a challenge. The number of interceptions is a commonly used metric, but one open to confounding interpretation: does an increase in the number of interceptions indicate (i) a decrease in effectiveness (i.e. more introductions arriving owing to poorer pre-border measures) or (ii) an increase (more interceptions owing to better inspection practices)?

To resolve this ambiguity, ANRD uses five key performance indicators based on the notion of tolerance thresholds for interceptions. Once a threshold is exceeded, the biosecurity team investigates likely causes and applies appropriate remedies.

The indicators relate to passenger, fresh produce and cargo pathways arriving by sea (Table 1). Table 2 shows the biosecurity performance results for the 2016 calendar year. None of the thresholds was exceeded in any indicator.

Table 1 Tolerance thresholds used as measures of biosecurity performance for three main risk-pathways on St Helena Island.

Pathway	Threshold	Notes
Percentage of passengers arriving without a quarantine-risk item in their baggage	No more than five in every 100 passengers arrive with prohibited goods such as honey, fruit, nuts	Includes passengers and crew on RMS <i>St Helena</i> and private yachts, but excludes day-visitors on cruise ships
Percentage of fresh-produce lots ¹ inspected which do not conceal a quarantine pest	No more than five in every 100 lots inspected have a quarantine pest (dead or alive)	
Number of quarantine pests detected at the border as a percentage of the total number of imported shipping containers and uncontainerised vehicle of any type	No more than three quarantine pests detected for every 100 units	
Number of quarantine pests detected post-border as a percentage of the total number of imported shipping containers and uncontainerised vehicle of any type	No more than two quarantine pests detected post-border for every 100 units	
Number of animals breaching border biosecurity requirements as a percentage of total animal imports Breaches include identity issues, disease, or incorrect paperwork	No more than five in 100 animal imports fail to satisfy requirements	

¹A "lot" is defined as the total amount of any one type of produce which are clearly from the same source.

Table 3 lists commodity types by passengers' reasons for visiting. The 'other' class of passenger was most likely to arrive with prohibited goods. This class includes construction workers possessing few or no English language skills and therefore less likely to have understood the biosecurity arrival information provided on the ship. Fresh produce was most frequently seized, typically apples, pears, oranges and other citrus picked off the breakfast table in the ship before disembarkation.

DISCUSSION

Biosecurity compliance and enforcement can be challenging in small, isolated communities if stakeholders are not willingly engaged through knowledge of need and benefit. Socialising the processes of building a

strong biosecurity system through active participation is particularly important. *Biosecurity St Helena* is a relatively short and succinct blueprint which could have been constructed quite quickly. Instead, the St Helena Government chose purposefully to pursue a process of intensive consultation which extended preparation over a period of nearly a year. Thus, the drafting process was considered as important for social acceptance as the resulting document. Local priorities and concerns are now reflected in the language and layout of the plan.

Most importantly, *Biosecurity St Helena* demonstrates the benefits of political will to integrate agricultural and environmental interests for biosecurity purposes. Limitations on human resources common to small island states have been largely overcome on St Helena by close co-operation between biosecurity and customs officials.

Table 2 Results for five key performance indicators for the 2016 calendar year in which the RMS *St Helena*, 186 yachts and eight cruise ships visited.

Indicator	Threshold	2016	Data
Percentage of passengers arriving without a quarantine-risk item in their baggage	95%	98%	3,930 passengers arrived 469 items confiscated from 60 passengers, of which 76% were fresh produce, 1% honey, and 24% other items
Percentage of fresh-produce lots inspected which do not carry a quarantine pest	95%	97.4%	62 phytosanitary import licences issued ² 366,085 kg fresh produce and 16,050 kg seed potatoes imported 536 lots inspected
Number of quarantine pests detected at the border as a percentage of the total number of units imported	3	1.1	1,023 containers and 250 vehicles imported 14 interceptions, of which 4 were tephritid larvae, 8 Lepidoptera larvae and 2 other taxa
Number of quarantine pests detected post-border as a percentage of the total number of units imported	2	0.1	1 interception: a chafer beetle
Number of animals that breach border biosecurity requirements as a percentage of total animal imports	5%	0%	42 animal import licences issued

Table 3 Goods seized from passengers (n = 60) by purpose of visit in 2016. Some passengers imported more than one type of risk item.

Purpose of visit	Type of items seized		
	Honey	Fresh produce	Other produce
Returning resident	0	12	7
Tourist	0	5	3
Government worker	1	4	3
Other	1	18	10

Extending sea-port biosecurity vigilance to high-risk shipping containers and vehicles revealed their prominence as vectors for harmful hitch-hikers such as spiders. This had not been known before.

Two main weaknesses remain in the island's biosecurity framework. First, new biosecurity legislation has been delayed by other priorities in the Attorney General's Office. In the meantime, existing statutes and regulations are neither harmonised nor aligned with international biosecurity expectations, so that *Biosecurity St Helena* lacks explicit legal mandates for compliance and enforcement. Warnings must substitute for fines and other legal sanctions, a shortfall which is disadvantageous to the new system.

Second, import risks are not yet assessed systematically or comprehensively. The new biosecurity policy requires all produce or risk material not on the white list (i.e. not subject to agreed import health standards) to be submitted for import risk assessment (IRA) but, in common with many small island nations, St Helena lacks the domestic technical expertise to apply the international guidelines on pest risk analysis (IPPC, 2017). Biosecurity officers cannot refer to specialist networks for advice on risk likelihood and impact, assessments of which are required at each level of the IRA process. They are often too busy to attempt these formal assessments themselves. Yet, under pressure of requests to import new commodities, St Helena's biosecurity officers regularly have to make such decisions.

Pragmatic guidelines for IRA are being applied in the interim. Risk evaluation for familiar commodities can rely on levels of confidence acquired through practical experience and knowledge of their points of origin. For example, fresh produce from South Africa, vehicles from Ascension Island, UK or South Africa, and selected plant propagating materials from the UK or South Africa are relatively well known and already have import conditions defined for them. These conditions must be revised if the risk profile alters through, for example, a change in pathway or reports of a new pest or disease in the country of origin. For commodities of these sorts, the biosecurity team assess new risks using simple web-based resources such as the CABI Invasive Species Compendium (<<https://www.cabi.org/isc/>>) and CABI Crop Protection Compendium (<<https://www.cabi.org/cpc/>>).

Biosecurity St Helena does not have risk assessment measures in place for unknown pathways or commodities such as novel plant or animal species imported for propagation or breeding. These are highly concerning and challenging to address.

The key factor for success in socialising biosecurity is considered to be the amount of time and effort committed to listening, talking and responding to the community, from farmer to government official, and utilising a range of communication media. No attempt was made to directly tackle the few more resistant individuals with arguments.

It was found that time and peer pressure were in most cases sufficient to bring them round, and compliance was high.

In conclusion, St Helena Island faces increasing pressures from invasive species and is typical of small island nations in having too few resources to cope. Despite this, it has risen to the challenge and has in place a model for autonomous biosecurity by a small island nation. What has made this possible – and what compensates so significantly for chronic resource stresses – is the decision to engage business and local communities in developing *Biosecurity St Helena* and sustaining it day-by-day. Harmonising of public services has been highly effective. Recognising that a solely official approach to *Biosecurity St Helena* would lack necessary resilience and buy-in, the socialising of biosecurity is what makes *Biosecurity St Helena* a model for other small island nations.

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