

Tackling Invasive Non-Native Species in the UK Overseas Territories

Technical support to the British Virgin Islands in biosecurity capacity

Dr Jill Key, Non-native Species Secretariat and Dr Chris Malumphy, Fera Science Ltd.
Monday 19th to Friday 23rd February 2018

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Executive summary

- A 5-day visit was made to the British Virgin Islands from 19th to 23rd February 2018 by Dr J Key, Non-native Species Secretariat, and Dr Chris Malumphy, Fera Science Ltd.
- The visit focused on the two main international ports of entry for cargo, Road Town container port, Tortola, and Beef Island airport.
- Pathways of entry for non-native species were identified. Direct air and sea connections are mainly within the Caribbean region, with the addition of Florida and Guyana. Horticulture is the primary pathway for historical introductions of non-native plants and invertebrates.
- Initial and report-back meetings were held with 22 key stakeholders. In addition, visits were made to the two main international ports of entry, Beef Island airport and Road Town container port.
- The three plant nurseries were also visited, and pest surveys made at the nurseries, the Botanic Gardens, Queen Elizabeth II Garden, and Sage Mountain as well as around Tortola as opportunity arose.
- Three species of economically and socially harmful pests were identified which may have been introduced on plant material post-hurricane: the soft scale insect *Philephedra tuberculosa*, croton scale *Phalacrocooccus howertoni* and Cardin's whitefly *Metaleurodicus cardini*.
- Strengths of the current system include: good working relationship between the Department of Agriculture and stakeholders, basic resources and legislation exist, data on confiscations and interceptions are kept, the nurseries are importing plant material in a responsible manner, and many of the suppliers of plant material are known and trusted.
- Gaps and weaknesses of the current system include: lack of biosecurity facilities and equipment at the ports of entry, lack of detailed protocols and procedures, limitation of inspections to plant material, dependence on action at the border, and limitation of biosecurity to consideration of agricultural plant health pests.
- In order to strengthen the system and increase the capacity of BVI to reduce the risk of introduction of new invasive non-native species, a total of 27 recommendations are made, 19 for immediate application and 8 for longer term consideration.
- A relatively small investment in simple biosecurity facilities and equipment would result in a large reduction in risk and increase in capacity.
- The horizon scanning exercise planned for May 2018 will provide the information required to identify target pests and development of appropriate pathway action plans.

Introduction

In 2017 the British Virgin Islands (BVI) were hit by hurricanes Irma and Maria, resulting in extensive damage to property, infrastructure and the environment. Recovery post-hurricane requires the importation of large quantities of a wide range of materials and commodities, including construction materials, vehicles, live plant material and fresh produce for human consumption, all of which are known high risk pathways for the introduction of potentially invasive non-native species. The GB Non-native Species Secretariat (NNSS) was requested to provide technical support under FCO's Conflict, Stability and Security Fund (CSSF) project *Tackling Invasive Non-Native Species in the UK Overseas Territories* to the government of BVI on minimising the biosecurity risks, and contracted Fera Science Ltd for specialist entomological advice.

The Department of Agriculture (DoA) is actively promoting the agricultural industry in part based on greenhouse production. It is therefore essential to ensure that no new pests of agricultural concern are introduced to BVI which would compromise this activity.

Terms of reference for the visit were as follows:

1. Technical audit of current practices:
 - a. Border Inspection Post (BIP) "snapshot" surveys on what non-native species are being introduced (checks of cargo, containers, produce, etc).
 - b. How are goods (plant material, building material, etc) being sourced (countries of origin, checks and controls, etc)
 - c. Assessment of existing inspection procedures in the light of the above two points.
2. Consultation with main stakeholders with regards to priorities and concerns (conservation, agriculture, customs, hotels, government, etc)
3. Advise on realistic protocols/procedures/etc for immediate application, targeting the highest risks and priorities.
4. Consideration of changes in the protocols/procedures post-emergency.

The programme of activities is given in Annex 1 and participants at the introductory and report back meetings in Annex 2.

The delegation was accompanied throughout the visit by Mrs Arona Fahie-Forbes, Deputy Chief Agricultural Officer, Department of Agriculture.

Pathways of entry

Sources / origins

BVI has direct daily flights from a number of countries within the Caribbean region only: Antigua, Barbados, Dominican Republic, Puerto Rico, St. Thomas, St. Kitts & Nevis, St. Lucia and St. Maarten. Private jets and charters can originate from both within and outside the region, with the majority coming from the USA.

Cargo arrives by both sea and air, directly from within the region (Dominica, Dominican Republic, Grenada, Puerto Rico, St. Kitts & Nevis, St. Lucia, St. Thomas, St. Vincent & the Grenadines and Trinidad & Tobago), and also Florida and Guyana. Fresh produce is imported from Dominica, Dominican Republic, Grenada, St. Kitts & Nevis, St. Lucia and St. Vincent & the Grenadines.

Ferries arrive from St. John and St. Thomas US Virgin Islands, and yachts from within the region and across the Atlantic.

People are importing a range of pets (dogs, cats, snakes, birds (parrots, parakeets) and aquatic fish etc) through pet shops. Private islands are also importing exotic species, including lemurs, giant tortoises, non-native birds etc.

There is no one main origin for goods overall. Live ornamental plants come mostly from Florida, as do most building materials but a lot originates in other countries.

There are several ports of entry as follows:

Seaports:

- Jost van Dyke
- West End, Tortola
- East End, Tortola
- Road Town, Tortola
- Tortola cruise ship terminal
- Virgin Gorda, two seaports (day trippers)

Airports:

- Beef Island
- Anegada (day trippers)
- Virgin Gorda
- North Sound, Virgin Gorda (seaplane, seasonally open)
- Private helipads to a number of private islands (goods imported into private helipads should go through customs in the normal way)

This visit focused on the two main international ports of entry for cargo, Road Town container port at Port Purcell on Tortola, and Beef Island airport.

Legislation

Appropriate plant health legislation is in place: plants must be treated in the country of origin, soil is permitted only under special conditions, they must have a phytosanitary certificate, and the importer has to give 48hrs notice of arrival. However, compliance is variable.

Pathway analysis

A pathway analysis was carried out for all 16 Overseas Territories, to assess the most likely pathway of entry of existing non-native species. The analysis was restricted to first records of new species from 1980 onwards, to exclude historical pathways related to patterns of original settlement no longer relevant. For BVI, 148 species are first recorded since 1980 with inferred pathways of entry as follows:

- Invertebrates, 37 species:
 - 86% introduced as contaminants, 57% of live plants, then of fresh produce, habitat & nursery material, and timber
 - 16% introduced as stowaways, mainly of shipping containers and vehicles
- Vertebrates, 8 species:
 - 75% introduced as pets
 - 25% introduced as stowaways (gecko and corn snake)
- Plant, 103 species:
 - 84% intentionally introduced, 58% as garden plants and the remainder for agriculture, amenity and forestry
 - 16% introduced as contaminants, of seed, nursery material and habitat material (eg sand, aggregate, composts).

These results make it clear that intentional imports are an important pathway for the introduction of non-native plants and vertebrates, while invertebrates mainly result from unintentional introductions as contaminants and stowaways. Live plants are implicated as a primary pathway both a potential weeds and also for infestations of new plant pests.

Observations

Ports of entry

Beef Island airport

Arriving passengers bring in fresh produce and this is without certification. Confiscations are primarily of mangoes which are prohibited imports, with the main countries of origin being St. Lucia, Dominica and St. Kitts and Nevis.

Up to 40 cartons of a range of fresh produce comes in as air cargo. Samples of 2 units per consignment are taken in the case of a known (and trusted) supplier, and of 1 unit per box in the case of an unknown supplier; these are very low sample rates. Cut flowers from Miami and South America are also imported and subject to visual inspection, but there is no standardised sample rate. Samples are bagged and sent to the Department of Agriculture offices for checking.

There are no dedicated biosecurity inspection facilities or equipment on site at the airport. This limits the extent of the inspection and consequently the confidence of the inspector in declaring the produce pest free.

No inspections were observed during the visit.

Road Town container port

Approximately seven cargo vessels a month arrive from within the region (St. Vincent & the Grenadines and Dominica). Since the hurricanes this has risen from 5 a month, with two more vessels arriving on a monthly basis from Trinidad and Tobago and Dominica.

Only fresh produce and live plants are inspected. As at the airport, there are no inspection facilities or equipment on site, and no formal system for deciding the sampling rate. This is of particular concern in view of the greater quantities of fresh produce imported by sea and it is likely it compromises biosecurity.

Construction, building blocks and other materials are not checked by the DoA and it is believed not checked by anyone. This is of phytosanitary concern to the DoA and other agencies such as the National Parks Trust of the VI due to the risk of introducing invasive species such as the Giant African Snail, *Achatina fulica*, as well as being of wider biosecurity concern to other sectors due to the risk of introduction of a range of species, including but not restricted to ants, mosquitoes, vertebrates, spiders, flatworms, etc. that can escape into the wild and impact the native biodiversity.

Some general visual inspection of pallets and the area is done, but there is no formal monitoring protocol.

No inspections were observed during the visit.

Plant nurseries

Three plant nurseries were visited: Minine's Plants, Fort Garden Centre and Groundworks BVI.

Plants are imported with phytosanitary certificates from Florida (Minine's Plants and Groundworks BVI) or Puerto Rico (Fort Garden Centre and grass sod by Groundworks BVI). Minine's Plants will only import from registered nurseries, to ensure quality and reduce the risks of infestations. Fort Garden Centre routinely spray plants with a general insecticide on arrival. Owners of Minine's Plants and Groundworks BVI were particularly aware of the biosecurity risks and pest presence.

Plants inspected were generally clean and pest free, with the exception of some infestations of locally common pests. There were some examples of pests on recently imported plant material which are highly likely to have come in with the plants, from Florida, while other infestations are more likely to have developed post-importation. Examples of pests observed at the nurseries that are likely to have been introduced with imported plant material are the soft scale insect *Philephedra tuberculosa* infesting several potted green buttonwood *Conocarpus erectus* plants. The plants had been imported from Florida at Christmas 2017 and had been treated with a systemic insecticide. This is the first finding of *Philephedra tuberculosa* in BVI and it is a pest of ornamental plants and fruit crops (papaya). In addition, croton scale *Phalacrocooccus howertoni* was found on imported croton and schefflera whitefly *Dialeurodes schefflerae* on schefflera.

The impression gained from all three nurseries is that this high-risk pathway is being managed responsibly.

Plant pest surveys

Dr Chris Malumphy carried out visual surveys for invasive alien pests at the three plant nurseries visited, Offices of the Department of Agriculture, Nanny Cay, Sage Mountain National Park and Road Town. The same localities had been surveyed pre-hurricanes Irma and Maria in February 2017.

Generally, there were much lower populations of most foliage-feeding insect pests, for example the majority of sea grape *Coccoloba uvifera* plants examined in 2017 had large populations of whitefly, scale insects, flatids, leaf miners and galls, whereas in 2018 the majority of the sea grape plants were clean. This is likely to be due to defoliation, felling of trees, dieback and mortality as a consequence of the hurricanes. One group of insects that appeared to be more abundant post-hurricanes was the Lepidoptera (butterflies and moths), and there were large populations of armyworms *Spodoptera* in Sage Mountain taking advantage of the new ground vegetation that appeared once the canopy had been removed and opened. Army worms *Spodoptera*, large cabbage white *Pieris brassicae* and other lepidopteran species were damaging vegetable crops. Termite nests also appeared more common (or at least more visible) due to the abundance of dead wood.

One example of a plant pest that may have been introduced post-hurricanes was the Cardin's whitefly *Metaleurodicus cardini* which was found in Road Town near the Port infesting seagrape. The whitefly is polyphagous and has been recorded on host plants assigned to at least 15 plant families, including some crop (citrus, guava, soursop) and ornamental plants.

Strengths and weaknesses of the current system

Strengths

Overall, the following strengths of the current system were identified:

- There is a good working relationship between Customs and the DoA.
- There is also a good relationship between the DoA and private nurseries and front-line stakeholders.
- Adequate legislation is in place, although only for phytosanitary risks of agricultural concern.
- An Agricultural Officer is present during operational hours for both airport and container port.
- Biosecurity work is being guided by the FAO Manual on Plant Quarantine Inspection Procedures (2001).
- Data is routinely collected on interceptions.
- Regional training is available for plant health inspectors, and one person from BVI can attend. The training includes annual updates.
- Most imported produce comes in with 48 hours' notice with phytosanitary certificates, and from known suppliers.
- Known and trusted nurseries are used for sourcing the plants in Florida and Puerto Rico. In the case of Minine's Plants, the same nursery has been used for 15 years.
- Known and trusted suppliers are also mainly used for large consignments of fresh produce.
- The owner of Minine's Plants is actively promoting the use of native species in place of imported.
- Nursery owners appear to be aware of the procedures and the biosecurity risks. Importation of plants is done in compliance with regulations.
- Nursery owners also appear to be very knowledgeable about any pests detected and their management, particularly the owners of Minine's Plants and Groundworks BVI. Groundworks BVI no longer imports certain plant species as they have found them to be high risk for infestations.
- The DoA has an affiliation with Fera Science Ltd for the pest identification service.

Gaps and weaknesses

The main gaps and weaknesses of the current system are summarised as follows:

- There are no facilities or equipment for biosecurity inspections at the ports of entry. This limits the extent of possible inspections.
- There are no detailed inspection protocols or procedures to guide inspections.
- Only plant material (live plants and fresh produce) are being inspected. Other goods and commodities such as construction materials, sand, aggregate, timber, vehicles or personal goods, are not subject to any formal inspections or checks.

- There is no list of specific target pests and expected pathways of entry. Inspections are therefore unfocused and the system is not as cost-effective as it should be.
- There is a heavy dependence on activities focused at the border, with relatively little biosecurity carried out pre-border or post-border.
- Biosecurity is limited to agricultural pests and is not extended to non-native potentially invasive species of concern to the environmental sector.

Recommendations

In order to address the identified gaps and strengthen the biosecurity system the following recommendations are made.

Border facilities and procedures

Recommendation 1. *The Agricultural Officers at international ports of entry should be equipped with a simple inspection bench and collecting kit:*

- *White tray*
- *Hand lens*
- *Knife, to cut produce for inspection*
- *Ziplock plastic bags*
- *Plastic vials with 70% alcohol*
- *Small brushes and forceps for collecting insects*
- *Pyrethroid spray*

The bench can be folding for easy storage when not in use.

Recommendation 2. *The Border Inspection Points (BIP) should also be equipped with a suitable bin for disposal of biosecurity waste, and a protocol developed for final disposal of biosecurity waste.*

Recommendation 3. *A list of non-native potentially harmful species and identification guides should be developed to guide inspections. The horizon scanning exercise will provide data to initiate this.*

Recommendation 4. *Sample rates for consignments of fresh produce should be formalised, based on ISPM No. 31, Methodologies for Sampling of Consignments, 2009. (St Helena has developed sampling tables based on ISPM No. 31 modified for relatively small quantities comparable with the lower end of quantities imported into BVI and could be used, see Annex 3 and 4.)*

Recommendation 5. *Simple protocols or SOPs should be developed into a checklist to cover the normal operating procedures undertaken at the BIPs: inspection of fresh produce, inspection of live plants, inspection of cut flowers, routine monitoring of the port areas, inspection of shipping containers, etc. These will form part of the pathway action plans for which technical assistance will be given following the horizon scanning exercise.*

Recommendation 6. *St. Vincent & the Grenadines is donating 800 fruit trees of mixed types for post-hurricane recovery. It is recommended that the varieties are restricted to no more than three to facilitate import risk assessment, and that the trees are treated and cleared pre-border by an officer from the DoA before departing St Vincent & the Grenadines.*

Recommendation 7. *Unloading of containers and cargo at the port should wait until the relevant staff are present, with a specific protocol for perishable goods. (A concern*

expressed by the Ports Authority was what to do if pests are intercepted in the container port at times or locations when the Agricultural Officer is absent.)

Recommendation 8. *Routine surveys should be initiated at ports of entry on a monthly basis to check for signs of new plant species, snails or other non-native species. If possible, monitoring devices such as breeze blocks filled with crumpled paper should be placed at the perimeters to act as insect harbourages.*

Awareness raising

Recommendation 9. *A formal pest reporting system should be established and actively publicised so that nursery owners, together with gardeners, farmers and other members of the public, can report new species encountered. This can take the form of public awareness focusing on some key easily identifiable species (such as the Giant African Land Snail), with a contact number.*

Recommendation 10. *Awareness of the risks of introduction of non-native species should be raised through a public awareness programme. The general public can be the eyes and ears working to protect BVI from new invasive species. The programme can include posters, radio and leaflets targeted at key stakeholders. Messages should be phrased positively, include information on examples of the economic and environmental impacts of invasive species, and actively encourage farmers, gardeners, hikers etc to watch out for new species and report them through the pest reporting system. Examples of topics to be covered include:*

- *How to source pest-free building materials*
- *How to source pest-free blocks*
- *How to import a vehicle free from pests*
- *How to import pest-free fresh produce*
- *How to import live plants*
- *How to check your goods on arrival for problems, and what to do if you find anything*
- *Pest alerts about new non-native species*
- *The pest reporting system contact details (Recommendation 9)*

Recommendation 11. *Stevedores and other port workers involved in handling blocks, construction materials and vehicles at the container port should be given basic training in invasive species, pest awareness and reporting. A dedicated Agricultural Officer can be assigned to oversee this operation. As no inspections are made on goods other than fresh produce and live plants, this biosecurity risk is not currently being addressed.*

Recommendation 12. *Budgetary provision should be made for placing of posters at the airport and sea ports to advise arriving passengers of biosecurity issues.*

Recommendation 13. *Importers such as supermarket owners / operators should be informed and made aware of the potential pest risks associated with imported fresh produce, so that they can respond to DoA in the event of encountering infested produce.*

Data and sharing information

Recommendation 14. *It is recommended that information on pest and weed presence and potential new threats is routinely shared between relevant agencies, for example the National Parks Trust of the Virgin Islands (NPTVI), Conservation and Fisheries Department (CFD) and DoA:*

- *New pest records*
- *Species of concern whose import should be regulated (all taxa)*
- *New species to BVI for which import licences are requested*
- *Proposed biological control agents*

This could take the form of a shared database linked to the pest reporting system (Recommendation 9) to provide real time information about pest presence.

Recommendation 15. *The database of interceptions should include the following additional data for each interception:*

- *A unique reference number, to allow tracking of the sample from consignment to lab*
- *Importers details, to allow passenger profiling.*

Recommendation 16. *An appropriate reference collection should be compiled to assist identification of non-native species both in the field and intercepted at the BIP, with identification of the lead agency responsible. The collection may be photographic, preserved specimens, or both.*

Recommendation 17. *It is recommended the DoA in collaboration with NPTVI and CFD investigate potential collaboration between the University of Puerto Rico and the Florida Department of Agriculture and Consumer Services, in order to identify new pests on the horizon and develop management strategies which embrace potential pests that threaten biodiversity as well as agriculture. (Further information will be available from the horizon scanning exercise.)*

Recommendation 18. *It is recommended that DoA regularly visit the Plant Industry Pest Alerts to be forewarned of new plant health threats in the region.*

Recommendation 19. *The environment sector should compile a list of key native and threatened plant species that should be regulated due to risks of hybridisation and native species associated pests for use by DoA when screening import licence requests.*

For long-term action

Recommendation 20. *Import risk assessments should be carried out for all proposed importations of plant material and fresh produce to identify high risk pathways. For example, there is currently an outbreak of the invasive species *Helicoverpa armigera* (Lepidoptera) in Brazil.*

Recommendation 21. *DoA should have the legal capacity to charge for import licencing and impose fines and penalties in case of non-compliance.*

Recommendation 22. *An x-ray scanner should be procured for remote checking of baggage and cargo by Customs at the airport. This will assist in the detection of organic matter, both controlled drugs and items of biosecurity concern.*

Recommendation 23. *The DoA should have annual in-house training in biosecurity for all front-line staff. It is recommended that other front-line agencies such as Customs and Ports Authority are involved.*

Recommendation 24. *The NPTVI and CFD and other environment sector stakeholders should also receive annual training in invasive species and biosecurity in environment.*

Recommendation 25. *It is recommended that the baseline on existing native and non-native terrestrial and marine flora and fauna is expanded in a form available to all appropriate parties. Information collected as part of Environmental Impact Assessments needs to be collated.*

Recommendation 26. *It is recommended that DoA staff are present at ferry terminals at (at least) peak times to ensure inspection of imported goods by this route.*

Recommendation 27. *It is recommended that BVI develop a comprehensive biosecurity framework in order to protect the Territory against the risks posed by invasive non-native species (terrestrial and marine flora and fauna) which threaten agricultural production, the environment, fisheries, and public health.*

Discussion

The good working relationship between the DoA and Customs is a huge asset for biosecurity, as is the fact that DoA staff are present at the international ports of entry as a matter of course. However, the lack of dedicated facilities compromises their ability to deliver effective biosecurity as staff do not have a place to adequately inspect produce or plant material. Basic equipment required (inspection bench and collecting kit) could be acquired for a relatively low cost and yield huge potential benefits in terms of preventing the arrival of new pests and diseases and protecting the agricultural sector (FAO Manual on Plant Quarantine Inspection Procedures (2001)). While the FAO Manual is excellent for general guidelines, it does not include specific details of sampling rates, or priority pest lists. Provision of basic facilities should therefore be accompanied by the development of simple practical inspection protocols for the range of risk-goods.

Commodities such as building blocks, timber and construction materials all present a risk of introduction of plant pests, weed seeds and exotic vertebrates, as do shipping containers themselves and packaging materials such as dunnage. The DoA does not have the resources to expand their activities across all these commodities and currently no inspections or checks are made. This is a big gap in the countries defence from invasive non-native species and is of considerable concern. Engaging other agencies, port workers and the general public to be eyes and ears will raise awareness of the issue in-country as well as providing a valuable addition to border control.

The JR O'Neal Botanic Garden is setting up a nursery to grow local plant species, for both the Gardens and to supply locally. Locally produced plants present minimal biosecurity risk compared with imported plant material and such activities should be promoted.

There is evidence that at least three species of economically and socially harmful pests may have been introduced on plant material post-hurricane. This is despite the nurseries involved importing material in a very responsible manner. Even with pre-export inspections and inspections on arrival, pests can slip through as early stages of many species can be inconspicuous. It is a feature of invasive non-native species that they may not be noticed for a long period, often years, after arrival in a new country, so it is not possible to be confident that there are no more new species introduced to BVI since the hurricane. Engagement of the public and establishment of a pest reporting system will assist in detecting such species.

The project *Tackling Invasive Non-Native Species in the UK Overseas Territories* will be working with all six Caribbean Overseas Territories to carry out a horizon scanning exercise in May 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 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. A summary of horizon scanning is given in Annex 5.

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.

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

It is important to note that the recommendations outlined above are primarily aimed at the mitigation of biosecurity risks during the post-hurricane recovery period, with 19 of the total 27 recommendations being for immediate application. Development of a comprehensive biosecurity framework for the Territory is a longer-term activity. It is strongly recommended as implementing good biosecurity is widely acknowledged as being the most cost-effective means of minimising the risk of introduction of new potentially harmful non-native species is minimised.

Acknowledgments

I would like to express my thanks to Arona Fahie-Forbes for her time and attention throughout the visit, and also to Nancy Woodfield Pascoe and Tessa Smith-Claxton. Rael Fahie, Michelle Brewley, Jennifer King, Chantel Scatliffe, Natasha Harrigan and Ronnie Thomas all provided invaluable assistance. A big thank you to Dr Pickering and Mr Berkeley-Smith for meeting with us. I would also like to thank the nursery owners for their willingness to allow us to inspect their nurseries and provide us with information. Finally, many thanks to the participants of the two meetings for their very useful contribution to the visit.

Useful links

NNSS Overseas Territories Plant Pest Fact Sheets:

<http://www.nonnativespecies.org/index.cfm?pageid=609>

EPPO templates for Pest Alerts:

https://www.eppo.int/PUBLICATIONS/poster_templates/poster_templates.htm

Useful link for horizon scanning for the Caribbean UKOTs – Plant Industry Pest Alerts in Florida: <https://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Plant-Industry-Publications/Pest-Alerts>

Biosecurity St Helena, link for protocols, Manual of Inspection Procedures, Import Health Standards, etc: <http://www.sainthelena.gov.sh/st-helena-biosecurity-service/>

Pacific Islands Ecosystems at Risk risk assessment pages:

<http://www.hear.org/pier/wra.htm>

Annex 1. Programme of activities

| | |
|----------------------------|---|
| Mondays 19 th | Introductory meeting, presentations and discussion Meeting with Nancy Pascoe, Tessa Smith-Claxton and Arona Fahie-Forbes to discuss the work plan Meeting with Customs (Commissioner for Customs, Assistant Commissioner and Jennifer King) to arrange border visits |
| Tuesday 20 th | Airport: meeting with Jennifer King, customs officer and Rael Fahie, DoA. Visit to Minine's Plants nursery Visit to Fort Garden Centre nursery Visit to the offices of the Department of Agriculture |
| Wednesday 21 st | Container port: meeting with Jennifer King and Michelle Brewley, DoA. Visit to Groundworks BVI nursery Visit to Nanny Cay |
| Thursdays 22 nd | Visit to the JR O'Neal Botanic Gardens, with Natasha Harrigan, NPTVI Visit to Queen Elizabeth II National Park, with Natasha Harrigan, NPTVI. Radio interview with Esther Durand, BVI News Courtesy meeting with Deputy Premier Dr the Hon. Kedrick Pickering and the Permanent Secretary of MNRL Mr Ronald Berkeley-Smith |
| Friday 23 rd | Meeting to report back, present and discuss the draft recommendations Finalisation of draft report |

Annex 2. Participants at the meetings.

Table 1 Introductory meeting Monday 20th February

| Name | Agency |
|---------------------|--|
| Latisha Martin | Department of Agriculture |
| Rauel Fahie | Department of Agriculture |
| Orville Clark | Department of Agriculture |
| Denzil Daniel | Department of Agriculture |
| Nadya George | Department of Agriculture |
| Maclin Francis | Department of Agriculture |
| Arona Fahie-Forbes | Department of Agriculture |
| Westley Braithwaite | Department of Agriculture |
| Bharrat Persaud | Department of Agriculture |
| Tyrone Verlack | Customs |
| Ched Gaskin | Customs |
| Bjorn Caleb | Customs |
| Stacy-Ann Austin | Department of Disaster Management |
| Melanie Daway | Department of Disaster Management |
| Konrad Ramsey | BVI Ports Authority |
| Erline Donovan | BVI Ports Authority |
| Michael Scatliffe | Virgin Islands Shipping Registry |
| Liselin Frazer | Virgin Islands Shipping Registry |
| Nancy Pascoe | National Parks Trust of the Virgin Islands |
| Tessa Smith-Claxton | Ministry of Natural Resources and Labour |
| Pearline George | Conservation and Fisheries Department |
| Terry Chinnery | Department of Youth Affairs and Sports |

Table 2. Report back meeting, Friday 23rd February.

| Name | Agency |
|------------------------|--|
| Latisha Martin | Department of Agriculture |
| Rauel Fahie | Department of Agriculture |
| Michelle Brewley | Department of Agriculture |
| Denzil Daniel | Department of Agriculture |
| Nadya George | Department of Agriculture |
| Vernol Richards | Department of Agriculture |
| Miclain Francis | Department of Agriculture |
| Westley Braithwaite | Department of Agriculture |
| Arona Fahie-Forbes | Department of Agriculture |
| Tyrone Verlack | Customs |
| Ched Gaskin | Customs |
| Stacy-Ann Austin | Department of Disaster Management |
| Melanie Daway | Department of Disaster Management |
| Konrad Ramsey | BVI Ports Authority |
| Erline Donovan | BVI Ports Authority |
| Nancy Pascoe | National Parks Trust of the Virgin Islands |
| Natasha Harrigan | National Parks Trust of the Virgin Islands |
| Keith Grant | National Parks Trust of the Virgin Islands |
| Tessa Smith-Claxton | Ministry of Natural Resources and Labour |
| Pearline George | Conservation and Fisheries Department |
| Michaela Theoohilus | BVI Airport Authority |
| Lydia Rubaine-Sinclair | BVI Airport Authority |

Annex 3. Sampling rates for high risk produce.

This sampling rate gives 99% confidence of detecting a 1% infestation. High risk is defined as risk of introduction of Tephritid fruit flies.

Number of cartons to be sampled for eg peaches, nectarines, plums, oranges, mandarins (sweet citrus), pumpkin, squash.

| Number of cartons | number of fruit per carton | | | | | |
|-------------------|----------------------------|----------|----------|----------|----------|-----------|
| | 10 | 11 to 20 | 25 to 35 | 45 to 55 | 60 to 70 | 80 to 100 |
| 5 | all | all | all | all | all | all |
| 10 | all | all | 8 | 7 | 6 | 5 |
| 15 | 12 | 10 | 10 | 7 | 6 | 5 |
| 20 | 18 | 16 | 11 | 8 | 6 | 5 |
| 25 | 20 | 17 | 11 | 8 | 6 | 5 |
| 30 | 23 | 19 | 12 | 9 | 7 | 5 |
| 40 | 27 | 21 | 12 | 9 | 7 | 5 |
| 50 | 30 | 23 | 13 | 9 | 7 | 5 |
| 60 | 32 | 24 | 13 | 10 | 7 | 5 |
| 70 | 34 | 24 | 14 | 10 | 7 | 5 |
| 80 | 35 | 25 | 14 | 10 | 7 | 5 |
| 90 | 36 | 25 | 14 | 10 | 7 | 5 |
| 100 | 37 | 25 | 14 | 10 | 7 | 6 |
| 125 | 38 | 26 | 14 | 10 | 7 | 6 |
| 150 | 39 | 28 | 15 | 10 | 7 | 6 |
| 200 | 40 | 28 | 15 | 10 | 7 | 6 |
| 250 | 42 | 30 | 15 | 10 | 7 | 6 |
| 300 | 42 | 30 | 15 | 10 | 7 | 6 |
| 350 | 43 | 30 | 15 | 10 | 7 | 6 |
| 400 | 43 | 30 | 15 | 10 | 7 | 6 |
| 450 | 44 | 30 | 15 | 10 | 7 | 6 |
| 500 | 44 | 30 | 15 | 10 | 7 | 6 |

Annex 4. Sampling rates for medium risk produce

This sampling rate gives a 95% confidence of detecting a 2% infestation.

Number of cartons to be sampled for eg apples, pears, carrots, lemons, limes (hard citrus), tomatoes, and peppers

| Number of cartons | number of fruit per carton | | | | | | | | |
|-------------------|----------------------------|---------|----|----|----|----------|----------|------------|------------|
| | 1 | 5 to 10 | 15 | 25 | 35 | 50 to 60 | 70 to 90 | 100 to 140 | 150 to 200 |
| 5 | all | all | 6 | 5 | 5 | 4 | 4 | 4 | 4 |
| 10 | all | all | 6 | 5 | 5 | 4 | 4 | 4 | 4 |
| 15 | 10 | 7 | 6 | 5 | 5 | 4 | 4 | 4 | 4 |
| 20 | 10 | 7 | 6 | 5 | 5 | 4 | 4 | 4 | 4 |
| 25 | 10 | 7 | 6 | 5 | 5 | 4 | 4 | 4 | 4 |
| 30 | 10 | 7 | 7 | 5 | 5 | 4 | 4 | 4 | 4 |
| 35 | 10 | 7 | 7 | 5 | 5 | 4 | 4 | 4 | 4 |
| 40 | 10 | 8 | 7 | 5 | 5 | 4 | 4 | 4 | 4 |
| 45 | 10 | 8 | 7 | 5 | 5 | 4 | 4 | 4 | 4 |
| 50 | 10 | 8 | 8 | 5 | 5 | 4 | 4 | 4 | 4 |
| 60 | 10 | 8 | 8 | 5 | 5 | 4 | 4 | 4 | 4 |
| 70 | 10 | 8 | 8 | 5 | 5 | 4 | 4 | 4 | 4 |
| 80 | 10 | 8 | 8 | 6 | 5 | 4 | 4 | 4 | 4 |
| 90 | 10 | 8 | 8 | 6 | 5 | 4 | 4 | 4 | 4 |
| 100 | 10 | 8 | 8 | 6 | 6 | 4 | 4 | 4 | 4 |
| 125 | 12 | 8 | 8 | 6 | 6 | 4 | 4 | 4 | 4 |
| 150 | 15 | 9 | 8 | 6 | 6 | 4 | 4 | 4 | 4 |
| 200 | 20 | 9 | 8 | 6 | 6 | 4 | 4 | 4 | 4 |

Annex 5. Horizon scanning in a nutshell

Background

In 2016 the Non-native Species Secretariat (NNS) 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 will be provided by the NNSS for each Territory.

The Overseas Territories will be considered in clusters as outlined below. Each cluster will require a separate exercise.

- *South Atlantic* BAT, SGSSI, Falklands
- *Mid Atlantic* Ascension, St Helena, TDC
- *Caribbean* Anguilla, Bermuda, BVI, Cayman Islands, Montserrat, TCI
- *Gibraltar*
- *BIOT*
- *Pitcairn*

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.

Timing

Horizon scanning will be carried out over a 17 month period ending in March 2019.

The sequence of carrying out the horizon scanning exercises will depend on a number of factors including the impacts of the recent hurricanes in the Caribbean territories.

Support for the development of pathway action plans will continue post-workshop to the end of the project in March 2020.