



REGIONAL WORKSHOP

Preventing the COSTS of Invasive Alien Species in Barbados and the OECS:

*Successes, lessons learnt, and strategic
partnerships in conserving biodiversity*



20th to 22nd March 2024
Marriott Hotel, Frigate Bay, St. Kitts and Nevis

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LIST OF ACRONYMS

AMCP	Antigua Marine Conservation Programme
ASYCUDA	Automated System for Customs Data
BEF	OECS Biodiversity and Ecosystems Management Framework
BEST initiative	Biodiversity and Ecosystem Services in Territories of European overseas).
BioSPACE Project	(Biodiversity Support for ACP Coastal Environments)
CAHFSA	Caribbean Agricultural Health and Food Safety Agency
CAIS	Caribbean Invasive Alien Species
CARICOM	Caribbean Community
CBIS	Caribbean Biosecurity Interceptions System
COMES	OECS Council of Ministers for Environmental Sustainability
CPHD	Caribbean Plant Health Directors
CVO	Chief Veterinary Officer
EAG	Environmental Awareness Group
GEF	Global Environment Facility
IAPS	Invasive Alien Plant Species
IAS	Invasive Alien Species
IICA	Inter-American Institute for Cooperation on Agriculture
ISPM	International Standards for Phytosanitary Measures
IUCN	International Union for Conservation of Nature
NAPPO	North American Farm Protection Organization
NISSAP	National Invasive Species Strategy and Action Plan
NPPO	National Plant Protection Organisation
OECS	Organisation of Eastern Caribbean States
PEIT	Public Education Training and Information Unit Antigua
RSPB	Royal Society for the Protection of Birds
SPS	Sanitary and Phytosanitary
TR4	Tropical Race 4
UK	United Kingdom
UNEP	United Nations Environment Programme
USA	United States of Agriculture
UWI	University of the West Indies

REGIONAL WORKSHOP

Preventing the Costs of Invasive Alien Species in Barbados and the OECS: Successes, lessons learnt, and strategic partnerships in conserving biodiversity

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Context

The ‘*Preventing the Costs of IAS in Barbados and the OECS*’ Project took place in seven participating countries: Antigua and Barbuda, Barbados, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent and the Grenadines. The project results support the conservation of biodiversity in the Caribbean region and, at the same time, contribute to global efforts to safeguard biodiversity.

The Project is funded by the Global Environment Facility (GEF), implemented by the United Nations Environment Programme (UNEP), and executed by the CABI with support from the participating countries. The project started in September 2018 and scheduled for completion in March 2024. A no cost extension was requested to facilitate the completion of the bio-secure site at Paragon, Barbados.

Goals and Objectives

The project goal was to manage the risks and costs of IAS on important ecosystems, species and genetic diversity in Barbados and the Organisation of Eastern Caribbean States (OECS) region.

The objective of the project was the prevention, early detection, control and management frameworks for invasive alien species (IAS) that emphasise a risk management approach by focusing on the highest risk invasion pathways of Barbados and OECS countries.

The project achieved its results through three components:

Component 1: IAS Policy, Institutions and Capacity *[Antigua and Barbuda, Barbados and St. Kitts and Nevis]*

Outcome: Strengthened invasive alien species management framework and cross sectoral arrangements to reduce IAS threats in terrestrial, marine and coastal ecosystems.

Component 2: Control and Management of IAS Impacts

[Antigua and Barbuda, Barbados and St. Kitts and Nevis]

Outcome: Eradication and/or improved control of IAS impacting globally significant biodiversity, thereby reducing threats to key species.

Component 3: Regional Biosecurity

[All 7 Countries]

Outcome 3.1 Increased collaboration among Caribbean states to tackle IAS

Outcome 3.2 Enhanced regional IAS management through early warning system, response measures and capacity building

Opening Ceremony

OPENING REMARKS

MR. EAVIN PARRY

Project Director
St Kitts and Nevis

Mr. Parry welcomed everyone to St. Kitts and Nevis, where natural beauty and cultural richness converge to inspire meaningful dialogue and action. He expressed his gratitude to all attendees for their dedication and commitment to environmental preservation and sustainable development. He noted that their presence underscored the gravity of the pervasive threat posed by invasive alien species to the biodiversity, ecosystems, economies, and way of life of the Caribbean. He said that the Regional Workshop provided a unique opportunity to share insights, exchange best practices, and cultivate partnerships that will drive progress in the collective fight against the spread of invasive alien species throughout the region. Through collaborative efforts and innovative approaches, it would be possible to mitigate the adverse impacts of invasive alien species and safeguard the natural beauty of the islands for generations to come.

Mr. Parry said that St. Kitts and Nevis was steadfast in its determination to play a pivotal role in this critical endeavour. He encouraged participants to cooperate in confronting the challenges posed by invasive alien species and charting a path forward toward a more resilient and sustainable Caribbean.

Partners, stakeholders, and the dedicated members of the local organising committee were thanked for their expertise and tireless efforts to bring the workshop to fruition. He urged everyone to participate in the discussions, share their knowledge and experiences, and join in crafting innovative solutions that will shape the future of invasive alien species management in the region. He encouraged renewed vigour and a shared commitment to building a brighter and more sustainable future.

DR. CHRISTOPHER COX

Task Manager, Biodiversity & Land Degradation Caribbean portfolio, GEF Biodiversity & Land Degradation Unit

Dr. Cox greeted participants in his capacity as a member of the Project Development Team. As the task manager, he represented the Biodiversity and Land Degradation Unit on Caribbean-based GEF projects that focused on biodiversity and land degradation from the Bahamas to Grenada. The Unit, based in the Panama Regional Office for Latin America and the Caribbean, also deals with similar GEF projects in the Latin American region.

This project, which started in August 2018, was disrupted by the COVID-19 pandemic and was on hiatus for almost two years. Dr. Cox praised the CABI Team for persevering and continuing with the regional components of the project, although they were facing delays due to the inability of consultants to travel.

An internal review done in 2021 found the project to be moderately satisfactory, which was expected. He felt sure that the final evaluation would result in a positive review due to the significant progress made post-COVID. He urged continued regional collaboration, especially in finding ways to strengthen private sector engagements, an area where the GEF portfolio had faced challenges worldwide.

Dr. Cox acknowledged the many successes of the project, including:

- the National Invasive Alien Species Strategies
- an awareness of the need for regulatory enhancements.
- the innovative approaches undertaken, like the collaboration on an ongoing initiative to eradicate IAS from Redonda, the management of monkeys in St. Kitts and Nevis, and the reduction of IAS presence in Barbados, particularly the Bio-secure Exclusion Zones for an endangered gecko that lives only in Barbados.
- the regional collaboration in looking at transboundary IAS and the engagement of the OECS so that work could continue beyond the project.
- the emerging regional financing mechanism, which was key in terms of bringing on other stakeholders to contribute financially to this issue in the region.

As the project wound down, Dr. Cox underscored the importance of finalising and assembling all documents, especially technical reports. He noted that items to be included in the workshop discussions were the work still to be completed in Barbados and the consideration of how this can be accommodated. The key elements would be how to take this process forward and upscaling for regional collaboration.

Dr. Cox informed the gathering that the project will be subject to internal evaluations led by the GEF evaluation office at headquarters, although there are some elements that are still to be finalised. He expressed satisfaction in partnering with CABI on the project, which was the second such collaboration, and was heartened that Barbados had secured money under the GEF-7 Replenishment Funding for further work. This was a tangible example of upscaling, and he hoped that the other countries would follow their example.

MR. NAITRAM RAMNANAN

Regional Representative and IAS Coordinator and Regional Project Coordinator

CABI

Mr. Ramnanan extended greetings on behalf of CABI, adding that the organisation's support for upscaling work in the region augurs well for the project's sustainability. CABI's interest and support were evident in the current CEO's visit to the region in September 2023, which was his first visit in over 20 years. The Regional Director for Europe and the Americas also visited in March 2024.

Despite the many challenges, including the closure of country borders due to COVID, Mr. Ramnanan felt that the project made some headway in achieving the project goal and objectives of managing the risks and cost of invasive alien species (IAS) on important ecosystems, species, and genetic diversity in Barbados and the OECS region through the development, prevention, early detection, control, and management of IAS.

After the CEO met with the Director of the Caribbean Biodiversity Fund in September 2023, CABI pledged to support the establishment and operationalisation of the Caribbean Invasive Alien Species (CAIS) Trust Fund. Other potential funding sources identified were the Republic Bank, which has allocated \$100 million for work across the region, and the Development Bank of Latin America.

Mr. Ramnanan is convinced that the CIAS trust fund will leave a lasting legacy from this project. He therefore gave a commitment to take it up as a personnel mandate to ensure that the CAIS Trust Fund was fully operational during the remaining five years he has at CABI.

The risk management approach was emphasised by focusing on the highest-risk invasion pathways in Barbados and the OECS. Consultants conducted risk assessments for the horticulture and aquarium trades, as well as the marine ecosystem. Risk assessments on international trade and passenger luggage will be completed shortly.

Three national invasive alien species strategies and action plans were completed for Barbados, Antigua and Barbuda, and St. Kitts and Nevis, and the OECS Commission is updating its 2016–2025 IAS policy and action plan. A regional communication strategy led to national awareness and capacity-building programmes, and a national cost recovery and financial mechanism were designed and presented. However, at the national level, some of the policymakers consulted did not support some of the initiatives proposed under the project for national cost recovery. Antigua and Barbuda felt that their Sustainable Island Resource Framework Fund would be enough to take care of invasives going forward.

Mr. Ramnanan said that Redonda showed what could be achieved over a few years with concerted effort and dedicated people. It demonstrated that it was possible to reverse the decline of biodiversity. Another big success for Antigua and Barbuda was the declaration of Redonda as a protected area.

In Barbados, the selective control of mongooses during a key nesting period of the Hawksbill turtle led to a significant increase in the percentage of hatchlings that survived. Research on the reefs in Barbados demonstrated that the lionfish did not pose a significant threat. This was partly due to spear fishing.

Although CABI was resistant to conducting a pilot on the green monkey in St. Kitts and Nevis, mainly because it had been present for almost 400 years, the national focal point remained resolute. Eventually, there was significant achievement in determining the population size. The project also conducted preliminary investigations into the monkeys' impact on biodiversity in St. Kitts and Nevis, determining the most cost-effective methods of population control.

To enhance port biosecurity for Barbados and the OECS, the Declare, Deposit, or Pay campaign was launched to encourage passengers to self-declare items that posed an IAS risk. St. Kitts and Nevis was the first country to officially launch the programme.

Regional IAS management was enhanced through an early warning system response and measures and in building capacity. There was capacity building at the regional level to conduct cost-benefit analysis, and some persons were trained in the use of CABI tools for IS risk assessments and in conducting marine risk assessments.

The Caribbean Invasives website as well as the Caribbean Biodiversity Interception System (CBIS) now offer the completed IAS plant guide. The printed version was shipped to the project countries.

Mr. Ramnanan ended by saying that the devastation caused by invasive species can be halted and even reversed. Incomes can be improved, crop yields can increase, and land can be reclaimed from invasive alien species. He thanked the Environmental Awareness Group (EAG) for demonstrating what is possible on Redonda. He hoped that this would also be demonstrated by the monkey management strategy in St. Kitts and Nevis, as well as the work in Barbados, where, in just a few short months of trapping during key periods in the hawksbill turtle nesting season, biodiversity can be conserved.

All of the other regional and national partners were thanked for their collaboration over the past five years of this project.

SENATOR DR. JOYELLE CLARKE

Government of Saint Christopher and Nevis

Dr. Clarke expressed her pleasure that St. Kitts and Nevis were hosting the closeout workshop. She urged participants to use the opportunity to connect with each other, share experiences, and determine how the various ministries could move the Invasive Alien Species Management Project forward after the regional funding ended.

She admitted that the engagement and support for regional projects, such as this one, could have been better. In addressing Mr. Ramnanan's statement that St. Kitts and Nevis did not support the CIAS Trust Fund, she gave the commitment that the initiative would be supported once the mechanisms for support were reviewed.

Noting that the Preventing the Costs of Invasive Alien Species in Barbados and the OECS project were marked by collaboration, determination, and grit, she thanked Mr. Ramnanan for exhibiting the grit required to push the project forward to this point.

The monkey challenge in St. Kitts and Nevis was an admitted reality, but the work of Dr. Dore has provided the much-needed data and numbers. The revisions indicated that there were 30,000 monkeys in St. Kitts and Nevis; for a human population of 50,000 on both islands, it was not a small number. The farmers face a real problem, but there are conflicts that need to be resolved. We must protect livelihoods for farmers, tourists, and tour guides while also ensuring the protection of species.

Dr. Clarke shared that she was a consultant on the invasive alien species project for a short time. She thanked all of the people who contributed to the success of the project. She underscored the importance of the National Invasive Species Strategy Action Plan, or NISSAPs, as a cornerstone of efforts to address the challenges posed by IAS at the national level; it was guided by international best practices and developed through extensive consultation. It was also important that the work did not remain in a silo but was connected to the policy, the regulatory frameworks, and everything needed for targeted intervention.

She said that the reflections at this close-out workshop would determine the best way forward for continuity, and she urged that key successes be highlighted often and regularly.

She thanked Mr. Parry for his stellar leadership and Dr. Dore for her technical support, referring to her work as a place where passion meets policy. She urged the participants to commit to continuing their work beyond this close-up workshop.

DR. ARNE WITT

Coordinator Invasive Species Management, CABI Africa Directorate

Dr. Witt made a presentation on the importance of IAS management in Small Island Developing States and articulated the very severe impacts of plant and animal invasive alien species on small island developing states. He started off by reminding everyone of the incredible biodiversity of the Caribbean. A host of invasive alien species threatens this global biodiversity hotspot.

He noted that since 1600, the introduction of invasive alien species has caused 39% of animal extinctions, habitat destruction has caused 36%, and hunting and deliberate extermination have caused 23%. Most of them occurred on islands, which suffered 64% of IUCN-listed extinctions. IAS has contributed to the loss of biodiversity across many islands around the world. So, these invasive alien species pose a significant threat to the Caribbean and all small island developing states around the world.

Dr. Witt, in collaboration with Mr. Ramnanan, conducted a survey of invasive plants on many Caribbean islands, culminating in a field guide that has been printed: *A guide to the Invasive and Naturalized Plants of the Caribbean*. Arne Witt. 2023. It will be available shortly as an ebook. The PDF version could be downloaded from the Caribbean Invasives website. In the book, they listed 881 naturalised and invasive plant species for the Caribbean, which is a gross underestimate. He hazarded a guess that there were well over 1000 naturalised and/or invasive alien plant species in the Caribbean. A literature review of invasive animals indicated close to 1,000 alien or introduced animals in the Caribbean, which he felt was a serious underestimate of what was actually present because of a lack of baseline data.

In the International Union for Conservation of Nature (IUCN) list of the world's 100 worst IAS species, over a third were present and established in the Caribbean. He speculated that the number was likely far higher than a third. The Caribbean also had some of the worst crop pests and some of the worst weeds in the world, which had a significant impact on biodiversity and crop yields. Weeds are often ignored as not being a serious issue for crop production or livestock production, but they obviously are a serious issue that needs to be considered. He gave the example of *Mimosa Pigra*, present and invasive on several Caribbean islands.

Invasive alien plants have had a significant impact on indigenous plant species and on other organisms associated with the indigenous plant. He gave the examples of the diamondback moth and the golden apple snail; both are crop pests in the Caribbean.

Introduced mammals have had a significant impact on biodiversity on islands. Invasive rats and mice have been linked to the extirpation of 75 species, 52 birds, 21 mammals, and two reptiles.

Cats have been linked to 63 extinctions. Red foxes, dogs, pigs, and small Indian mongooses are all implicated, each of them in nine or eleven extinctions.

Alien species are introduced either accidentally or intentionally. Most larger species are intentionally introduced, and most smaller species are unintentionally introduced. They are all equally problematic. He gave the example of fish. Aquaria fish, which account for approximately 85% of the intentionally introduced fish species that have established or become invasive in the Caribbean, are also associated with the introduction of aquatic plant species, molluscs, and fish diseases. Many fish species introduced for aquaculture escaped from aquaculture facilities. This is expected to get worse over time as climate change becomes more of an issue with serious hurricanes and floods.

Insects, mites, snails, geckos, lizards, frogs, or their eggs were among the many IAS introduced along with plants used for landscaping. He suggested establishing local plant nurseries with plant populations established from seed.

Dr. Witt restated that the Caribbean had some of the most incredible diversity on the planet, with high levels of endemism. The control or eradication of invasive alien species is the one area where there are gains in terms of biodiversity conservation. Around the world, it is investments in biodiversity conservation and the eradication of invasive species on islands that are bearing fruit in terms of biodiversity conservation.

The impacts of these invasive alien species are alarming, not only on biodiversity but also on pasture production, crop production, water resources, and fires, such as the recent fire in Hawaii. One of the biggest drivers of that fire was introduced grass species that came mostly from Africa.

The failure to do something now will have serious implications for economic development and biodiversity conservation throughout the Caribbean and other small island developing states.

DAY I

SESSION ONE:

National and regional policy frameworks for IAS management

Chair: Dr. Philip Taylor, CABI

MR. JOSEPH PROSPER

Project Coordinator, Antigua and Barbuda

It takes a national effort to manage IAS: State of play in Antigua and Barbuda.

Mr. Joseph Prosper presented the national plans for Antigua. A 17-member National IAS Steering Committee provided advice and recommendations on several initiatives, while the Department of Environment's Accounts Department provided assistance in areas such as the timely preparation and delivery of IAS expenditure reports, vouchers, cash advance statements, and the preparation of cheques to pay vendors.

Aside from the legal consultant, no other consultants were actually involved. Even when COVID restrictions ended, there was no need to bring in any consultants to work on the IAS Project in Antigua. Despite serving on different committees and boards in Antigua and Barbuda, the members of the National IAS Committee provided expertise and attended the virtual meeting.

The COVID-19 pandemic posed a significant challenge, including the closure of the country's borders, which prevented consultants from entering. The Committee was able to prepare the Critical Situation Analysis, the National IAS Strategy and Action Plan, the National Communications Framework, and other publications, such as the National IAS Students Guide. The photographs that were used in the guide all came from people who worked in the different ministries. They also provided guidance on how to develop the IAS app.

There were a high number of students enrolled in the first elective of the Post-secondary Curriculum on IAS, which was offered at the Antigua State College. This was heartening, since the concept of IAS was new to many citizens. The general public is currently participating in the knowledge attitude practice (KAP) survey.

The most efficient and cost-effective way to address the negative impact of invasive alien species is to prevent their introduction. The National IAS Steering Committee is working on implementing robust biosecurity protocols to manage the priority pathways of introduction. Early warning systems and prompt eradication capabilities can help to strengthen these efforts.

In moving forward, Mr. Prospect made some recommendations:

- A multisectoral committee consisting of key stakeholders should be formed to draft policies and legislation related to IAS. The committee should also serve as the face of IAS management to the public, answering questions and providing information regarding IAS.
- There needs to be more interaction with non-governmental organisations like the Rotary, the Kiwanis Club, and the Lions Club. They have a broad reach, interact with people in communities and villages, and can help in the dissemination of information about invasive alien species to the public.
- In Antigua and Barbuda, there is a need for an Invasive Alien Species Day or Week.
- A cross-sectoral approach involving various government departments, critical private sector bodies, and civil society is crucial to the prevention and management of IAS. This approach must also account for the environment, human health, agriculture, fisheries, customs, and transportation. In order to incorporate relevant prevention and management issues, donor agencies and governments funding and implementing projects must thoroughly understand the potential impact of IAS.

Ms. KIM DOWNES AGARD

Project Coordinator, Barbados

It takes a national effort to manage IAS: State of play in Barbados

Ms. Downes Agard spoke about IAS management in Barbados and how they intended to go forward. As with the management of many other environmental issues related to IAS management in Barbados, there were a number of constraints. For example, there are different agencies responsible for different aspects of IAS management. Some of them have legislative responsibilities, duties, and functions.

Within Barbados' institutional framework, a number of agencies handle matters related to IAS. These include the Plant Quarantine Department and Veterinary Services of the Ministry of Agriculture and the Ministry of Environment and National Beautification Biodiversity Conservation Management Section, which she heads. They are supported by a cabinet-appointed working group on biodiversity comprising a number of government agencies, all of which deal with matters related to biodiversity and IAS. Representatives of the University of the West Indies, various NGOs, and individuals with expertise across the sphere of biodiversity, as well as the Ministry of Environment's Coastal Zone Management Unit, were also involved with issues related to IAS.

In terms of the regulatory framework, there are a number of fragmented pieces of legislation that cover various issues. There is the Plant Protection Act, the Plant Pest and Disease Eradication Act, the Animal Diseases and Reparation Act, and CITES, which is managed by the Biodiversity Conservation Management Section. During its creation, they aimed to provide safeguarding for certain indigenous species not included in CITES, but potentially susceptible to trade and affected by IAS. Currently under development are the Plant Protection Bill and the Animal Health and Veterinary Services Bill, which would replace the Plant Pest Act and the Animal Diseases Importation Act. Agencies are moving towards organisation and consolidation of these pieces of legislation to ensure that we are effectively covering all of the issues.

Much of the work on strengthening national policy has been done through this project. This included undertaking a critical situation analysis of IAS in Barbados, reviewing existing policies, legislation, and institutional frameworks, and using these to develop a strategy for IAS management in Barbados as well as a policy for IAS management. Participating in the regional project was crucial for carrying out the tasks prioritised by the National Invasive Species Strategy and Action Plan (NISSAP) and other guiding policy documents, given the limited capacity to carry out these tasks as part of daily activities, and the constraints of numbers and funding availability.

The policy for Barbados defines and articulates national aims and commitments, as well as providing directions for our stakeholders. It also establishes a basis for harmonisation. The policy aims look at improved regulatory frameworks, enhanced technical capacity, public awareness and engagement, stronger preventative measures, improved surveillance, research and knowledge management, national collaboration and cooperation, regional collaboration and cooperation, mainstreaming IAS, and, importantly, committed financial support.

The Working Group on Biodiversity is critical to overcoming the identified issues and implementing our policy and strategy going forward. The ministry lacks the capacity to effectively implement the policy, and it also lacks the broad base of knowledge and expertise required to manage IAS. So, there was a heavy reliance on the working group on biodiversity to advise on our matters related to biodiversity and provide advice and technical guidance. In the past, they have contributed to the conceptualisation of projects. They have been critical to assisting with engaging the stakeholders and generally implementing the work of the program. Also important is engaging communities. We lack the capacity to engage all our stakeholders, which is crucial for effectively managing IAS. After this project, we must secure the support of individuals who could potentially introduce IAS, and provide them with the necessary skills, tools, and financial resources to aid in IAS management. These people must also be aware of their roles and responsibilities and their potential impact. So, for Barbados, using the Working Group to engage our communities and stakeholders will be critical for IAS management going forward.

It is difficult to implement the work that needs to be done because of limited numbers, capacity, and financial resources. They received GEF funding and will again have the support of CABI and UNEP to undertake what can be called IAS 2, which is *Conserving Barbados' Endangered Reptiles*. Coming out of IAS 1, *Preventing the Costs of Invasive Alien Species in Barbados and the OECS*, there was a recommendation to look at the development of a biodiversity conservation policy. This is possible in IAS 2. So, this is the next step, building on what was done in IAS 1.

MR. EVIAN PARRY

Project Coordinator, St Kitts and Nevis

It takes a national effort to manage IAS: State of play in St Kitts and Nevis

Mr. Eavin Perry delivered a presentation on IAS management from a policy perspective, discussing the current state of affairs in St. Kitts and Nevis and their future plans.

The National Invasive Species Strategy and Action Plan was developed about a year and a half ago after two years of consultation with various stakeholders to define both the problems and the solutions. He expressed his gratitude to Mr. Augustine Merchant, the former Inter-American Institute for Cooperation on Agriculture (IICA) National Representative, former Director of Agriculture, and one of the most qualified within this field. He also acknowledged Melvin James, the former Director of Agriculture, for his assistance and contribution.

The Ministry of Sustainable Development, Environment, Climate Action, and Constituency Empowerment set a goal of completing the main environmental National Conservation and Environmental Management Bill, which they have been developing for several years. The bill is expected to complement other legal frameworks, such as the planned Quarantine Act. A section of the bill addresses Invasive Alien Species Management, which was not included in the parent act. The project ensured that it was included.

The overall goal of the National Invasive Alien Species is to minimise the harmful effects of IAS on both the environment and economy, essentially our way of life. A section of the act is geared towards the development and implementation of the National Invasive Species Strategy and Action Plan (NISSAP). The strategy would encompass the necessary legislative measures. The NISSAP has a specific mission and a clear vision. The mission is to prevent the introduction, control, and spread of invasive alien species in St. Kitts and Nevis, as well as mitigate the adverse impact. The vision is to establish a supportive policy, legal, and institutional framework for effective IAS management in the country.

There were several rounds of wide-ranging stakeholder consultations, both on Nevis and St. Kitts. They were able to articulate the issues, their observations, and some potential solutions. It was clear that the success of the strategy required a whole-society approach with the cooperation of all these players. The NISSAP takes a multisectoral approach, emphasising policy and legislative leadership, collaboration with key industries, engagement with academia and international organisations, and cooperation with the private sector and civil society. The strategy was heavily dependent on best practices from a wide range of international organisations, such as the Convention on Biological Diversity and the IUCN. Key species were identified and prioritised, along with the key pathways through which invasive species could come to St. Kitts. Some of the priority species listed were the wild tamarind, the black rats, the Indian and ghost fire ants, lionfish, the coral creeper, brown rats, green monkeys, and tropical bont ticks.

There was limited capacity and financing specifically for invasive species management, so the allocation of resources in the strategy and the planning framework had to be practical and strategic. There are three intervention management levels. The first was prevention, the second was early detection, and the third was management. With respect to prevention, we recognised that there are some invasive species that are threats but are not yet in the country. However, there were things that could be done, such as public awareness. The project was able to strongly support the Quarantine Division on both islands in terms of public awareness, such as the prevention of the Giant African Snail, and to increase and improve quarantine measures. A plan was developed to capture, track, identified threats not yet in the country and put other measures in place for their management.

Early detection paid close attention to species that had recently arrived. Decisions were taken on how to intercept these species, strengthen the monitoring and surveillance systems to capture these species, and effectively remove the species from the wild once they were identified.

Eradication involved examining the various species to determine what could or could not be eradicated. Decisions were taken regarding the containment of these species and the various control measures that could be applied to them. Also important were the resources needed to ensure the IAS does not reach our shores.

The National Strategy and Action Plan articulated goals. There was a strong emphasis on increasing coordination and efficiency for institutional systems, reducing the rate of introduction and establishment of new IAS, and increasing support among private sector operators and the general public. Specific objectives guided implementation efforts, with each objective requiring a number of specific actions to make the plan successful.

Goal number one is to increase coordination and efficiency. This required a strong level of coordination among the key agencies involved, which all needed to play a vital role: the Ministry of Agriculture, including Plant and Animal Quarantine, the Port Authority, Customs, etc. Despite their distinct roles, they collaborated closely to ensure that there was coordination.

The second goal was to ensure a lower rate of introduction. The objective was to involve strengthening pre-border and border control capacities, surveillance protocols, and containment measures. Strategies included a blacklist, a whitelist, and import risk assessments. Some work was done with regards to the regional Declare, Deposit, or Pay Campaign, which involves public awareness as well as reducing the rate at which certain plant or animal material actually gets here. Four bins were deployed: one at Port Zante, one at the airport, and two in Nevis. Banners helped people be aware of the purpose of these bins, so while persons were coming in, they would be able to deposit any plant-based or animal-based material.

The third goal was increased support among stakeholders. Efforts were made to invite and mobilise the private sector's cooperation and partnership. This goal also emphasised the importance of multisectoral engagement and risk communication. There was a strong emphasis on communication, education, and public awareness targeting children in primary and high school, farmers, and fishermen. We were able to both raise awareness of the presence of IAS and their impact, as well as some of the

management strategies that could be done at each of their levels to help control the spread of invasive species.

Some of the key recommended actions within the strategy are to:

- establish a biosecurity risk management committee with the help of the Project Steering Committee. The new committee would be looking at the risks from various invasive alien species and pests and determining how to limit their impact.
- develop and maintain an Invasive Alien Species Database. This was started in the 1980s. The database would identify the invasive species, their impacts, and whether there is a trend or cycle during which they reoccur.
- update legislation as well as regulatory measures. The Plant Quarantine Act needs updating.
- The task involves generating and updating lists of invasive alien species, assessing their status and priority, and identifying and mapping high-risk areas.
- conduct a risk analysis of imported invasive alien species. This requires a high degree of expertise, tools and materials, time, and money. Things have to be prioritised and funds allocated accordingly.
- establish standard operating procedures at Port Security, where there is a focus on trade rather than protection of biodiversity. That is why quarantine is so important to put the focus back on risk management.
- develop training for border control officials to include and emphasise the need for risk management in order to reduce the incidence of pests and invasive species.

St. Kitts and Nevis is committed to proactive and coordinated invasive alien species management. Through the National Invasive Species Strategy and Action Plan, St. Kitts and Nevis aims to minimise the impact of invasive species on both the environment, economy, and society. Therefore, collaboration among government agencies, the private sector, entities, civil society, and the general public is critical to success.

Ms. PATRICIA ANN WARDROPE

OECS Secretariat

A harmonised regional action plan for strengthening national actions for the management and control of IAS in the OECS and the Wider Caribbean

Ms. Patricia-Anne Wardrope presented a harmonised regional action plan for strengthening national actions for the management and control of IAS, the OECS, and the wider Caribbean. She was joined online by two colleagues: Mrs. Norma Cherry-Février, the project manager for the Biodiversity Support Programme for ACP Coastal Countries and also the officer in charge of the Biodiversity Ecosystems and Ecosystems Services Programme at the Environmental Sustainability Division, and Ms. Janelle Gabriel, technical specialist on the BioSPACE Project (Biodiversity Support for ACP Coastal Environments).

Her presentation focused on the OECS Commission's regional action plan for directing the management of invasive alien species in the OECS. In 2015, the Regional Agriculture Competitiveness (RAC) Project, involving Reducing Risks to Human and Natural Assets Resulting from Climate Change, convened a regional meeting on invasive alien species with member states and experts from 13 regional and global organisations. She reminded the audience that climate change and invasive alien species are two of the greatest threats that we experience within the OECS, and they affect terrestrial systems, aquatic environments, biodiversity, and human and environmental health. Climate change exacerbates the impact of IAS, and both IAS and climate change share common drivers that impact key sectors of agriculture, tourism, and trade.

The recommendations from the workshop will serve as guiding principles for the development of an action plan to address IAS in the OECS. The plan also requires harmonisation, particularly across language barriers, recognising our member states of Martinique and Guadeloupe, the political barriers with our independent member states and overseas territories that include Antigua, St. Lucia, Grenada, Dominica, St. Kitts, and St. Vincent and the Grenadines, and of course the overseas territories of Anguilla, BVI, and Montserrat. What is needed is a cost-effective regional approach for all applicable interventions and capacity building in management, planning, and existing IAS management tools.

The most effective way to manage IAS is through a hierarchical approach that combines prevention, early detection, rapid response, control, and restoration. Prevention at a national level hinges on biosecurity. Some of the recommendations that stood out for us were member states' capacity needs, infrastructure, and human resource capacity.

One of the recommendations was to expand these lessons learnt to the tourism, construction, and freshwater resources sectors, particularly in relation to IAS management. The OECS action plan should build on lessons learnt during the previous regional GEF-funded project, mitigating the threat of invasive alien species in the insular Caribbean, which took place from 2006 to 2013. St. Lucia was the only OECS member state participating in the project. The experiences of Antigua and Barbuda with the ratification and implementation of the International Convention on the Control of Harmful

Fouling Systems on Ships, more precisely, the Anti-fouling Systems on Ships (AFS) convention, and the Ballast Water Management (BWM) convention. The region possesses additional expertise from ongoing and recent projects, particularly in the areas of classical biocontrol of insect pests and disease vectors, rat eradication, lionfish control through harvesting and consumption, offshore islands and bio-secure convention sites, feral livestock removal, and management of other selected marine IAS.

The regional action plan is based on six goals, which are shared between strategic and programmatic objectives. The strategic interventions help to create an enabling environment for the programmatic interventions to take place, whereas the programmatic interventions are indicative and leave flexibility for individual and ad hoc consortia to address particular priorities.

There are three strategic objectives:

1. to provide a regional framework for invasive species management,
2. to strengthen OECS participation in regional and international efforts at invasive species management, and
3. to prevent the introduction of further IAS.

The programmatic objectives are to:

- prevent the establishment of IAS following an incursion,
- reduce the impacts of invasive species already present, and
- effective IAS knowledge management within the OECS.

The plan outlines priority actions to be further undertaken in the short, medium, and long terms. And these will be categorised as either regional or national actions or both. There is one year left for implementation.

Sources of funding specifically to address IAS at the regional level have not been actively pursued. However, OECS member states are managing IAS at the national level, with support from projects like the CABI and others.

There are global and regional commitments. The OECS Biodiversity and Ecosystems Management Framework (BEF), review, and alignment with the Global Biodiversity Framework are currently in process, and they will contain goals relating to addressing IAS. The BioSPACE Project undertook a consultancy with Dr. Therese Yard in September 2022 to develop a strategic agenda, including a portfolio of action plans and initiatives to support the implementation of the BEF.

The OECS is currently putting projects together to solicit funding for implementation. IAS is included in these proposed interventions that will be implemented in 2025. Based on the review or upgrade of the action plan, the OECS will actively pursue funding for the implementation of one or two priority activities. The intention is to develop a detailed financing plan to target specific sources of funding to enable implementation. The potential sources of funding include the Caribbean Biodiversity Fund, the Global Environmental Facility, the Adaptation Fund, the European Union, and the Darwin Initiative.

Ms. Wardrope closed by reiterating the commitment of the OECS commission to do whatever we can, whatever is possible, to strengthen the capacity of member states to be able to manage IAS.

SESSION TWO:

Communication, education and public awareness for changing behaviours of key stakeholders and the general public

Chair: Dr. Philip Taylor, CABI

MR. JOSEPH PROSPER

Project Coordinator, Antigua and Barbuda

Communicating to change knowledge, attitudes and practices in the management of invasive species in Antigua and Barbuda

The Public Education Training and Information Unit (PEIT) in the Department of the Environment provided advice and recommendations concerning the public service announcements, procurement of consultants, arranging interviews with various radio stations and the television station, procurement of vendors and merchandise, and communication with the vendors for various publications.

The Ministry of Education, Sports and Creative Industries permitted the PEIT team and Mr. Prosper to visit primary and secondary schools to share the message of IAS. The principals, teachers, and students asked many questions and shared their knowledge of where they had observed IAS. The visiting team received a report from students at one of the schools about a man who had caught mongooses and kept them captive. An investigation revealed that the man was in possession of twenty caged mongooses.

The project led to the production of several outputs. A sixty-second radio promotion and a ten-minute video highlighted Invasive Alien Species in Antigua were completed in 2022 and aired on radio and television. Dr. Tubal Edwards, the Chief Veterinary Livestock Officer, and Dr. Janil Gore-Francis, the Chief Plant Protection Officer, narrated three thirty-second videos on border security. All of these outputs are still being aired. An IAS app was also developed.

Radio stations conducted face-to-face and virtual interviews to promote the message of IAS. These were centred on various environmental days such as World Wildlife Day, International Day of Biological Diversity, World Environmental Day, and World Wetlands Day.

The project produced an IAS Student Resource Guide for Antigua and Barbuda in hardcopy and an online version, which was given to the Ministry of Education for sharing as an e-book.

The Environmental Awareness Group (EAG) has completed activities under Component 2 of the project: Control and Management of IAS Impacts. Their work included the eradication and improved biosecurity of IAS that significantly impact global biodiversity, thereby reducing threats to critical species on key offshore islands, such as Redonda. The EAG has also eradicated rats from Green Island, Snake Island, and Maiden Island.

The Attorney General's Office received the Protected Areas and Invasive Alien Species Regulations and the Legal Action Plan for the Protected Areas and Invasive Alien Species in June 2022. Ms. Laleta Davis-Mattis, a Jamaican national attached to the University of the West Indies Legal Department, was hired as a consultant to prepare these legal documents.

The National Steering Committee collaborated with the Antigua State College in Antigua and Barbuda to prepare the content of an IAS postsecondary curriculum. The college offered the course as a ten-week elective, starting in January 2023. The course will be offered in 2024 and continuing onwards.

Ms. KIM DOWNES AGARD

Project Coordinator, Barbados

Communicating to change knowledge, attitudes and practices in the management of invasive species in Barbados

Ms. Kim Downes Agard spoke about communicating about IAS in Barbados to change knowledge, attitudes, and practices. The IAS policy defines public awareness and engagement as one of its guiding aims. The policy goals include promoting public awareness and understanding of IAS issues, providing information about IAS and the measures in place, implementing an awareness program, customising messages, engaging the community, utilising media, and distributing messages from various agencies.

The national communication strategy involved the evaluation of stakeholders, identification of optimal communication modalities, development of relevant messages, the production of materials to facilitate effective communication, and stakeholder engagement associated with this IAS project and post-project.

The Barbados Leaf-Toed Gecko was used in many public awareness outputs to first raise an appreciation of biodiversity and then to share messages on the potential impact of invasives. Without a fundamental appreciation and understanding of the value of biodiversity, the message is lost. An invasives website, biodiversity.gov.bb, was developed. The messages focus on the impact of IAS, but they also try to guide people towards a general appreciation of biodiversity and its value.

A social media presence was developed to engage different audiences. Much of the project's public awareness is about education. A lot of work was done in schools to engage the younger primary school-age children, where there was the potential to effect behavioural and attitude changes. The social media presence was done through Facebook and Instagram to capture different audiences. There is broad engagement on Instagram, but these were not the typical followers that would go to the web page because they are looking for more information. The Instagram account raised awareness of invasives and other issues that impact biodiversity. It also created an appreciation for local biodiversity so that people could be more conscious of what was there and its value. They will then be more concerned about the impacts.

Stakeholder engagement was also very important. It raised awareness and knowledge that contributed to mainstreaming IAS and the sustainability of the project. This required the engagement of people who could be on the ground. As part of the Bath Pilot, the consultant and his team actively engaged with the community, resulting in the strengthening of the Bath Welsh Community Group. After the project concludes, the Ministry will provide them with grants to sustain the work they started, including the ongoing monitoring.

In terms of engagement, a large cadre of ministry personnel on the ground were encouraged to be vigilant after sensitisation and training, and if they saw anything unusual, they were to report it to the

IAS team, who would then consult with the Ministry of Agriculture for identification purposes. So, engagement was being approached from different levels. This will all contribute to the sustainability of the project through people who are engaged and aware, communicating their concerns, and feeling comfortable that their voice matters.

DR. KERRY DORE

Project Coordinator, St Kitts and Nevis

Communicating to change knowledge, attitudes and practices in the management of invasive species in St. Kitts and Nevis

Dr. Dore shared details of the communications work done in St. Kitts and Nevis. Dr. Joyelle Clarke was hired as the Communications Coordinator fairly early in the project in order to provide strategic direction. The steering committee approved the implementation plan she helped create.

The accomplishments fell into three categories.

- Communication and Education:
 - o Education programmes done in schools
 - o Workshops with a marine group and another with a farming group
 - o Capacity building with farmers
 - o Exhibiting at agriculture open-day events on both islands
- Public awareness:
 - o Substantial social media work, including the use of social media ambassadors (persons of influence in the Federation), to help in spreading information about IAS
 - o Appearances on television and radio
 - o A panel discussion
 - o A billboard
- Policy workshops:
 - o National Monkey Consultation
 - o A policy workshop
 - o Monkey Management Strategy

The education programme in schools involved children in different age groups, from daycares to secondary schools. A presentation focused on the identification and impact of ten common invasive species in the Federation.

The marine workshop addressed the issue of marine invasives, their locations, lionfish, and the unique characteristics of halophila, an invasive grass species. It was an in-person session with many different presentations, as well as a field trip via catamaran to identify different invasive species at Shitten Bay and Cockleshell Beach.

A Monkey Management Workshop for farmers took place in July 2022 on Mr. Keithley Armstrong's farm. It was heavily advertised to alert people to the type of work happening and to get as many participants as possible to hear directly from farmers about their issues and any new strategies they were trying, as well as their success or failure.

Mr. Melvin James, former Director of Agriculture, and Mr. Walcott James, former Chief Extension Officer, two well-respected local agriculturalists, were hired as consultants to do capacity building with farmer groups on both islands. Their workshops for farmers highlighted the different IAS affecting them and provided information on how to manage invasives through prevention and control. This was supported by a 30-minute IAS presentation on the management of IAS affecting the farming sector in St. Kitts and Nevis at four farming-related cooperatives in St. Kitts. In addition, the consultants visited twenty individual farms around St. Kitts to assess the presence and impact of IAS. A training session with Extension Officers provided information on the tactical support needed to help farmers identify, prevent, and manage these IAS.

The project had exhibits at open day events on both St. Kitts and Nevis in order to create additional awareness in the community and especially among students who usually got time off school to attend those events.

A Monthly Spotlight Series shared information on social media through the Department of Environment's Facebook and Instagram pages. Each month, a different IAS was highlighted and information was shared about their history and distribution. There were ten in total: Wild Tamarind Coral Creeper, Black and Brown Rats, Mongoose, Tropical Bont Tick, Pink Hibiscus Mealybug, Fire Ants, Lionfish, and Green Monkeys. In addition to sharing this information online, there was also a monthly appearance on the radio. This included local and regional experts talking about the impact of each different species.

Numerous interviews with project personnel took place on television and radio. There was also a panel discussion on green monkeys and the problems they caused for agricultural stakeholders, as well as some ideas for their management. Apart from Dr. Dore, there was the Communications Coordinator, Dr. Joyelle Clarke; former Department of Agriculture Director, Mr. Melvin James; and farmers, Mr. Carlson Nisbett and Mr. Solomon Morton.

National influencers, who had a heavy following on social media, were brought in to help disseminate information on their own social media platforms. These were Mimi Armstrong, the daughter of Kiki Armstrong; E.K., a local DJ; and Infamus, a local singer.

In September 2022, a billboard was erected in a prominent place on the Kim Collins Highway. This was to help create public awareness about green monkeys as an invasive species with the potential to have a serious negative impact on biodiversity.

Dr. Gallagher, Aileen Mill, and Dr. Dore published a paper at the beginning of 2023 after nine or ten years of work on the actual number of monkeys in St. Kitts and Nevis and the monkey's impact on agriculture, biodiversity, and households. At the end of the research period, there was a large policy workshop to share the results. Over one hundred and forty stakeholders attended: farmers, policymakers, government workers, and several ministers. The proposed Monkey Management Strategy was also shared in order to get stakeholder feedback and highlight the reasons why it was so critical to have such a sustainable and scientifically informed strategy moving forward.

Ms. DENYSE JOHNSTON

Consultant

Highlights of the regional communication tools and approaches to changing knowledge, attitudes and practices in management of invasive species in the Caribbean

Ms. Denyse Johnston spoke about the regional communication tools produced under the project. The Project Communication Strategy was developed as an umbrella strategy for the region. It was not meant to be static but reassessed, monitored, and evaluated as the project progressed. The strategy provided communication guidance and a road map to take the project from conception to conclusion, as well as addressed the issues presented within the initial project document. It addressed stakeholder involvement, ensuring transparency and a common understanding, thereby encouraging advocacy for IAS management and the project. It also built credibility, engaged people, and encouraged advocacy for both the project and IAS.

Caribbean countries are all very different but work together very well. Each country presented the messages differently, but the regional communication strategy streamlined communication to ensure consistency. It provided an efficient and cost-effective plan for interaction, information sharing, and then translation into knowledge. The ultimate movement towards behaviour change had to be done at the country level, since it took time, effort, and relevance to the particular country.

Quality control ensured that every country spoke with one voice and reduced the risk of diluted or incorrect messages, resulting in poor output. The consistent, well-considered regional messages helped to build project credibility.

A communication toolbox was a fairly small component, but it had the potential to make a huge impact. It included branding, a library of photographs, and press kits with media contacts. The creation of the proposed photo and image library would have provided the project with relevant Caribbean images, preventing the overuse of stock images in publications. It was unfortunate that the library was not done. Ms. Johnston urged participants to get into the habit of taking lots of photographs with their smart phones.

The toolbox also included a list of national and regional media houses and journalists with an interest in agriculture or the environment, press kits, and distribution lists for publications. Inclusions for press kits were background information, contact information for project spokespersons, appropriate technical briefs, and other relevant publications.

The project logo served as a tool for visibility and branding. St. Kitts developed its own logo to create national branding, but this did not clearly establish a visible link to a robust regional project with international connections.

The project produced excellent technical documents, including national IAS plans, a regional IAS strategy and action plan, risk assessments, a proposal for a sustainable Caribbean IAS trust fund, and legal frameworks for the region. These were used as the basis for outreach material such as policy briefs meant to create awareness, promoting proactive rather than reactive action. These policy briefs focused on topics such as biosecurity, the trust fund, marine IAS, the pet and aquaria trade, and the trade in ornamentals.

Material for the Declare, Deposit or Pay Campaign was shared with all the participating countries. The words 'deposit' and 'pay' were deliberately used. 'Deposit' was used instead of 'disposed', so that travellers would not throw suspect items into a garbage bin that was not bio-secure. Some countries did not have the authority to impose fines on passengers at ports of entry, leading to the use of the broad term 'pay' to encompass all consequences.

The proceedings of this workshop will be published along with a booklet on success stories and lessons learnt. The project website will remain to provide easy access to IAS information.

She recommended the inclusion of a communication coordinator on future projects from the very beginning to maintain links with multidisciplinary researchers and stakeholders and keep goals in focus. Face-to-face meetings in the region are invaluable to facilitate effective and efficient communication among project coordinators. She concluded by echoing Dr. Joyelle Clarke's statement, underscoring the importance of regularly and powerfully highlighting key successes and sharing them widely.

MR. AVENESH ALI

Consultant, Crugen Media Limited

Highlights of the regional communication tools and approaches to changing knowledge, attitudes and practices in management of invasive species in the Caribbean

Mr. Avenesh Ali, website developer, provided a summary of the Caribbean Invasive website as well as the project's social media presence.

Facebook was used as it was the most popular, easiest to use, and most cost-effective social media platform in the Caribbean at the time. Since then, Instagram and TikTok have become more popular in the Caribbean.

The website was delivered in February 2020. Initially, it was designed as a simple, general website to showcase the outputs of the project. Over time, it was updated to include a learning resource module for IAS. This involved building an online training portal, with certain areas on the site allowing for updated news and support. One of the successes was that close to two hundred and ninety thousand visitors accessed the site. Many of them were driven by the social media campaigns of participating countries.

As the website developed, it expanded to include specific areas within each country, showcasing their efforts in combating invasive species. Later on, a distribution map for each individual invasive species was added using data from CABI to show population distribution throughout the Caribbean Region.

The website holds project publications coming out of the project as well as other IAS publications relevant to the region.

Mr. Ali and his team managed the website and the social media platform on Facebook until early 2023. They provided updates and other timely information to the general public, along with monthly campaigns on invasive species. Although the contract required them to post twice a week, they chose to post twice a day, free of charge, including all graphic materials, to increase the project's visibility. There was quite a lot of feedback from various Facebook users across the region. People were actually asking questions and finding out more information. The platform was very industry-specific, as recommended by the project team. The Facebook page did quite well from the beginning, but it required a lot of work in terms of advertising. Increased costs led to the suspension of the Facebook page in 2023.

There were some lessons learnt in terms of social media. For one thing, countries were already implementing their own social media platforms, making it unnecessary to continue with the overall one. Through social media, we discovered that the topic of invasive species was not of particular interest to users.

There was a lot of refocusing of strategies to ensure that project goals were being met, and these alternative strategies got people involved in the fight against IAS. Success stories from different countries were published on the website and social media. This generated a lot of traffic from users across the region. Overall, the region did benefit from such campaigns, as there was a lot of buzz and feedback.

SESSION THREE:

Lessons Learnt from managing IAS in Barbados and the OECS

Chair: Dr. Kirk Douglas, Director, Centre for Biosecurity Studies, UWI

Ms. JOHNELLA BRADSHAW,
EAG, Antigua and Barbuda

Eradicating IAS is a boon to native endemic biodiversity: The case of offshore islands in Antigua and Barbuda

Ms. Bradshaw talked about the impacts of removing invasive alien species from the offshore islands of Antigua and Barbuda, as well as what that means for endemic fauna and flora. This project activity was achieved with the support of the volunteer-based Environmental Awareness Group (EAG), which has been at the forefront of conservation in Antigua and Barbuda for over thirty years. Their tagline is for the benefit of people and wildlife, and it represents their aim to have a society that cares for and values native ecosystems. Ms. Bradshaw, who works with the EAG, discussed the group's involvement in the implementation of this project activity.

The EAG is governed by three programmes:

1. The first one is the Offshore Island Conservation Programme for the endemic Antiguan Racer, a snake embodied in their logo. They tag the snakes on the offshore islands, track their population, and make sure that the ecosystem they inhabit is IAS-free.
2. The second is the Redonda Ecosystem Reserve, which monitors Redonda's newly protected area to prevent the reintroduction of invasive species to the island.
3. The third is the Antigua Marine Conservation Programme (AMCP), which deals with the nesting sea turtles that come up on their shores every year.

The common element in all of EAG's work is invasive species management, which involves wildlife monitoring, capacity building, creating awareness, and presenting workshops. Their educational thrust targets primary, tertiary, and secondary schools, as well as adults in general.

There are over fifty-one offshore islands in Antigua and Barbuda. They vary in size and are either private or state-owned. The endemic snakes are all on privately owned islands, which is a challenge to conservation work. Most of the offshore islands are concentrated within the North East Marine Management Area, known as NEMMA, which is the country's second-largest legally protected area. These areas are key bird and biodiversity areas due to their globally recognised wildlife populations. These designations play a crucial role in protecting the most critical sites, serving as internationally significant refuges for seabirds nesting and feeding, as well as endemic reptiles unique to the region. The offshore islands are also a major economic resource and a hotspot for tortoise and terrestrial activities, which makes the dynamics of governing this marine protected area very complex.

The Offshore Islands Conservation Programme saved the Antigua Racer from the brink of extinction in 1995. Prior to this, it was known as the world's rarest snake. Originally distributed across mainland Antigua and Barbuda, the harmless snake grew up to four feet in length, but the introduction of invasive mammalian predators during European colonisation decimated its population numbers. The 1995 EAGs market recapture study found only fifteen individuals on Great Bird Island, a privately-owned offshore island. Nearly all the islands were colonised by Black Rats, including this one.

The EAG launched the first black rat eradication in the Caribbean to save the Antigua Racer. The eradication process involved cutting parallel trails across the island, about forty metres apart. A poison called Klerat was distributed for three weeks within forty by twenty-five-metre grids, since rats tend to stay within a thirty-to-forty-metre radius. After the three weeks, monitoring continued for two weeks to confirm that all the rats were gone. Using these methods, rats were eradicated from fifteen other offshore islands.

Within two years of completing the eradication, the population of the Racer, on Great Bird Island more than doubled. The translocation of some Racers to three other offshore islands led to an eighteen-fold increase in the snake population. The last count, done around 2015 and 2016, estimated the population at twelve hundred. Despite legal protection, this critically endangered endemic reptile still faces numerous challenges. The EAG has no authority or power on privately owned islands, and even access can be difficult.

The EAG realised that to maintain the invasive species-free status of these islands, regular monitoring was necessary, and there had to be a shift from a species approach to an ecosystem approach. The islands are vulnerable to reinvasion due to human activity and other natural factors, such as hurricanes, so it is essential to continue this work.

The biosecurity measure selected involved setting up permanent bait stations to detect any IAS activity. A total of one hundred and seventy permanent bait stations have been installed across seventy-one hectares of the offshore island habitat. Volunteers routinely conduct biosecurity checks on ten priority islands every four to six weeks. This entails replacing the bait and recording information about any rat droppings found.

Tracking bird activity on various offshore islands revealed that birds were not breeding on rat-infested islands. After eradicating rats from islands, there was a five-fold increase in seabird and pigeon colonies. On Great Bird Island and the surrounding islands, the number of birds increased from five-fold to twenty-fold.

Redonda is the third island of Antigua and Barbuda. It is closer to Nevis and Montserrat than it is to Antigua. It is four hundred metres above sea level, with a steep drop to the sea. Guano-mining operations started in the 1860s and continued for over fifty years. About seven thousand metric tonnes of phosphate-rich guano were shipped to the United Kingdom every year. This was indicative of the vast number of seabirds nesting on Redonda at the time. Rats came onto the island via food brought in to feed the miners. They ate the seabird chicks, endemic species, and all the vegetation. Redonda was dying.

Redonda is still a significant bird and biodiversity area. One percent of the brown booby population lives on Redonda. Redonda is home to several unique lizards, including the Redonda Dwarf Gecko, the Redonda Ground Lizard, and the Redonda Tree Lizard.

Eradication necessitated the employment of mountaineers who scaled cliffs to distribute bait. The rat population collapsed within two weeks, and by March 2017, there were no detectable signs of rats. In March 2024, there were still no signs of rats on the island. The emaciated goats on the island were flown out in helicopters.

The EAG took a passive approach to managing IAS on Redonda, by simply removing the rats and the goats. It was expected that the regrowth of vegetation would take one to two years, but well before that time, Redonda was green again, although nothing was planted. By 2019, the vegetation had increased over tenfold, the tree lizard population had increased threefold, and the brown lizard increased sixfold.

In the period 2012 to 2016, when the rats were there, there were only two species of birds recorded, with a Caribbean Martin recorded in 2016. In 2019, it increased by fifty percent, and there were fourteen different species on the island. Two pearly-eyed thrasher birds have been recorded on Redonda.

Redonda and its surrounding seas, amounting to approximately thirty thousand hectares, was declared a protected area in August 2017. It is almost as big as Antigua, and it is one of the largest marine protected areas in the Eastern Caribbean. The government recognised the EAG and granted them the authority to continue managing this protected area. This is going to be the first time an NGO will be governing a protected area in Antigua and Barbuda. There is a replenishment zone, which is like a biosecurity buffer, that extends five hundred metres away from the island. Within that zone, no one is allowed to fish, set anchors, or engage in any activity other than research.

Rewilding efforts, restoring habitats, and tackling harmful aliens are crucial and can yield surprisingly speedy results. It is important to remove these invasive species, but the management afterwards is just as essential.

MR. CHAD BARROW

Barbados Ministry of Environment and National Beautification's Biodiversity, Conservation, and Management Section

Efforts at sustaining critically endangered Leaf Toe Geckos in Barbados

Mr. Chad Barrow, Field Assistant at the Ministry of Environment and National Beautification's Biodiversity, Conservation, and Management Section, also presented on behalf of Mr. Rohan Payne, the Projects Coordinator of the Biodiversity Section. He covered the Barbados Leaf-Toed Gecko Project and the Lionfish Project, as well as two other projects in which he was directly involved.

In 2011, researchers rediscovered the endemic Barbados Leaf-Toed Gecko, *Phyllodactylus Pulcher*, after decades of presumed extermination. The Gecko was identified primarily along the southeastern coasts heading towards the northern coast. Additional population assessments are ongoing.

The project aimed to assist with the preservation of this critically endangered species by establishing a bio-secure site in the southeastern section of the island. The site would be an artificially isolated area where predators and competitors could be excluded. The safe haven would protect at least one sub-population of the gecko from invasive alien species, such as mongooses, rats, and centipedes, as well as from a known competitor, *Hemidactylus*, commonly known as the House Gecko.

The area designated as a bio-secure site was approved by the Cabinet in 2019. Work began to remove invasive alien species and augment the natural habitat in the area, which is primarily grassland. The next step was clearing the area and construction of a predator-proof fence to prevent the return of invasive species that had been removed from the area.

Although some geckos were found within the area, the preferred habitat was along the coastline, where limestone rocks, with their many crevices, provided refuge. Therefore, efforts are being made to replicate such habitats within the bio-secure site. Gecko Hotels were designed and strategically placed. The design included a well for the Gecko to have access to fresh water as needed, as well as a safe pathway through which they could make it from one side of the biosecurity area to the other side.

Once the site is ready and eradication is fully completed, the Leaf-Toed Gecko will be introduced. Monitoring will determine whether the efforts at IAS removal were successful. Continued monitoring within and around the bio-secure site will help to observe the efforts of IAS to get back inside. A database of Leaf-Toed Gecko will be created using the markings, which are specific to each individual, to identify each entry.

The development of best practices will guide the replication of bio-secure sites along the island's coastline, including the northeastern part.

It is hoped that the project will be extended so that the bio-secure site can be completed by the end of 2024 and IAS eradication can be resumed. One positive sign is that some of the geckos in the area are already moving into the site.

IAS trapping in key Hawksbill Turtle nesting areas in Barbados significantly increases percentage of hatchlings

The Hawksbill sea turtle nesting population at Bath Beach is genetically distinct from those on the rest of the island. Previous research identified the small Indian mongoose, *Herpestes auropunctatus*, as a significant predator of sea turtles, with predation ranging from 17.9% to 38.9% of the nests on Bath Beach. The project's primary goal was to assess the impact of invasive species on the Hawksbill population and then address predator pressure by implementing a control and monitoring programme.

Results showed that there was considerable nesting at Bath Beach in 2021, the first project year, with a total of 63 nests. In 2022, there was a slight increase to 72 nests. Since mongooses were widespread across the project area, camera traps, tracking tunnels, and visual encounter surveys were used to determine how widespread they were.

Through monitoring, the predation rate in 2021 was found to be on the upper end of the scale, with close to 40% of the nests being predated. After the implementation of control efforts, there was a reduction in the number of mongooses that were being observed throughout the 2022 nesting period. There was a consequent, significant reduction in the number of nests predated to about 10%.

A consultant hired to guide the process produced a manual, which was used to help train people who would get involved with the work of baiting, capturing and euthanising the mongoose. A monitoring plan was designed specifically for the management and control of the mongoose and rats at Bath Beach. The plan was developed with input from a workshop that included various stakeholders, including the Ministry of Environment and National Beautification and Biodiversity section, Ministry of Health, National Conservation Commission, or NCC, as well as members of the nearby communities.

Members of the community-based Welch Bath Land group were successfully trained in how to properly monitor, capture and euthanise the mongoose within the area. The group assumed responsibility for continuing the work beyond the scope of the project. Various monitoring approaches were used based on the site, accessibility, and observations prior to beginning the project.

After the project ended at the end of 2022, one of the project field assistants continued to identify possible nests into early 2023. He has realised that predation had begun again. The Bath Welch Land group was contacted, and they conducted further control. Once again, there has been a reduction in the number of nests that were being predated.

There were valuable lessons learnt. There is a need for seasonal trapping. So even though the population was reduced before the nesting season, and that was effective throughout the end of the nesting season, because it is not a bio-secure site, there's no way to restrict them from returning.

Both live and kill traps were used to capture the mongoose. While both have worked well, the kill trap was more effective because it saved time. It also meant that the mongoose does not have to manually dispatch, which is also good in terms of safety for the workers.

While tracking tunnels were crucial to determining the spread of the species across the site, the use of camera traps allowed for some behaviours to be observed. Particularly to predation of a single nest by multiple individuals simultaneously. In some cases, juveniles were present, and this indicates the behaviour of predating turtle nests is generally learnt from other individuals.

Although there was a significant reduction in predation pressure in the latter half of the project, due to not being a bio-secure site, the population within the project area increased post-nesting season. This resulted in an increase in predation during the following nesting season and prompted a response from a community group that was trained to undertake the necessary trapping. This period too, yielded good results.

While a standard grid layout of traps can be utilised, the initial trapping period employed a more dynamic approach based on the success of traps within their locations. That is, some locations were temporarily abandoned, and those traps were relocated to sites with a higher success rate. This eventually yielded multiple catches per trap location and per trapping effort.

Overall, the project was successful in reducing the predatory pressure on the Hawksbill sea turtles' nests, and people were successfully trained to continue the control work necessary.

The Gullies Project

A study done in 2003 highlighted various issues related to gullies, including the presence of invasive alien species. As a result, the Ministry of Environment embarked on a research project to document the presence of these invasive species in the gully areas.

The focus has been primarily on *Sansevieria hyacinthoides*, or mother-in-law tongue, a common house plant or ornamental used for decoration as well as to improve the air quality within the home. The plant is drought-resistant and grows very quickly. Once it escaped into the environment, the *Sansevieria* grew in dense clusters, which did not allow other plant species to germinate and grow. The project aimed to determine the extent to which *Sansevieria* had infiltrated gully ecosystems, either confirming or dismissing its status as an invasive species within these ecosystems.

Other invasive plants in gullies include the Flamboyant tree, MacArthur palm, Arrowhead palm, Clammy Cherry, and Ackee, which appear naturalised but are overgrown in some gullies.

Two animal invasive alien species found to be problematic for native snail species in the area were the Giant African Snail and the New Guinea Flatworm.

Neutralising the potential harmful impacts of Lionfish on biodiversity rich reefs in Barbados

The project studied the invasion of Lionfish within Barbados' coral reefs and found no significant damage to the reefs in Barbados due to the presence of the Lionfish.

This can be attributed to engagements with private stakeholders such as the fisheries industry, spear fishers, free divers, and water sports operators. Lionfish was promoted as an alternative food source, and 23% of the lionfish captured were caught through spear fishing.

Researchers have identified the Sun Coral as an invasive species within the island's reef system, on the coral reefs themselves, and on artificial surfaces. Even if they manage to infiltrate the coral reefs, the removal method of scraping them off appears to be effective.

The invasive sea grass has not been identified within Barbados waters. However, native sea grasses are struggling, so the arrival of this new species may have a negative impact.

DR. KERRY DORE

Project Coordinator, St Kitts and Nevis

A sustainable management strategy for combating the Vervet monkey, a significant threat to livelihoods, in St. Kitts and Nevis

Dr. Dore's presentation focused on the pilot project's research on the impact of the green monkey on agriculture, biodiversity, tourism, and households, which led to the creation of a monkey management strategy.

Agriculture component. The work done builds on Dr. Dore's PhD research in 2010. At that time, she visited a third of the farms in St. Kitts and assessed crop damages every month for a full year. The farmers were picked randomly with the help of extension officers' using a random number generator. During 2019–2021, Dr. Dore visited all of the 65 farmers that were still growing food. They were able to see how crop damage rates have changed since 2010, as well as identify the farmers who stopped farming because of monkeys.

Under the project, crop damage in Nevis was monitored for the first time. As in St. Kitts, one-third of the farmers were randomly selected with the help of extension officers, and farms were visited in 2020 and 2021.

In addition to enumerating crop losses on the ground, a household economic survey was also done with all project farmers (42 farmers in St. Kitts and 35 farmers in Nevis). The survey looked at the year-long impacts of all pests on households, as well as any other environmental issues that the farmers dealt with for their most economically important crops.

Extensive agricultural data was collected. The project team was able to document almost EC\$400,000 worth of crop damage annually in 2010–2011. This was 2% of the possible production. By 2019–2020, monkey damage was almost EC\$1.2 million worth of crops on an annual basis, or 14% of the possible production of those crops. In addition, over the last 10 years, St. Kitts has lost at least EC\$1.5 million in production due to farm abandonment. This was just one-third of the farms included in the study. So, in reality, the number was about three times higher. Farmers were frustrated. In Nevis, the monkey damage was about EC\$1.5 million worth of crops in 2020–2021, which was 7% of the possible production. The figure was lower because food production was higher than in St. Kitts.

In terms of the household surveys, St. Kitts and Nevis farmers reported that monkeys damaged an estimated EC\$1.4 million worth of crops annually, totalling about 10% of the possible production, which makes sense because it was 7% in Nevis and either 10%, or 14%, in St. Kitts. It was evident that the farmers did not overinflate damages, since this figure coincided with the on-the-ground enumeration.

Biodiversity component. The impact of monkeys on biodiversity was challenging to address since the monkeys have been on the islands for hundreds of years. Over the course of the four-year project, researchers narrowed down the impacts to three feasible projects:

- Year-long nest predation study on both mountain peaks (Mount Liamuiga in St. Kitts and Nevis Peak)
- Year-long green monkey dietary study at Kittitian Hill
- Investigation into the impact of monkeys on invasive plant seed dispersal

The nest predation study looked at whether the monkeys were destroying eggs on the two mountains. Researchers explored predation both on the ground and two to three meters above it. This was done four times over the year on both mountain peaks. Artificial nests with real quail eggs were placed every hundred metres along each trail, leaving them there for two weeks while a camera trap observed everything. The nests were randomly placed either on the ground or above the ground and on the left or right side of the trail.

There was very little monkey damage observed, but rats and mongoose were heavy egg predators, accounting for over 90% of the total predation documented. This does not mean monkey predation is not occurring. These were not actual nests, and quail eggs were used as a replacement for small bird eggs. In addition, since the monkeys have been in the forest for over 300 years, it is likely that the birds have adjusted their nesting behaviour in the mountains. Since the monkeys are new invaders to the lower-lying land, this is where nest predation events are likely to occur. In the future, the researchers hope to expand the study to lower-lying areas.

The dietary study involved following a troop at Kittitian Hill for 20 hours every month from January to December 2021. All incidents of feeding were recorded at five-minute intervals. Observations were in an equal number of hours between 8AM–12PM or 12PM–4PM. Every time an animal ate, it was considered a feeding event, so there were multiple feeding events in the five-minute scan. Whenever possible, all of the foods consumed were identified down to the species level and classified as either not native or non-native.

Over the course of the year, nearly 3,000 feeding events were documented. Some foods made up a substantial proportion of the monkey's diet over the year, while other species took up less than 1% of their diet. Unknown grasses and ferns comprised a large portion of their diet. Apart from the unclassified species, non-native plant species accounted for about three-quarters of the food that they ate. Seasons did not cause changes in the monkey's diet. However, clustering occurred from April through August, which coincided with the mango season. This is because monkeys become highly distracted when they have access to mangoes.

The last biodiversity study was done on five invasive plant species to see if the monkey's consumption of the fruits affected time to germination and germination rates. Clammy cherries (*Cordia obliqua*), were already problematic, while the other four studied—guava (*Psidium guajava*), pomme surette (*Ziziphus mauritiana*), limeberry (*Triphasia trifolia*), and tamarind (*Tamarindus indica*)—were problematic in other parts of the region and had the potential to become invasive. These fruits were fed to captive monkeys.

Two days after feeding the fruits to individually housed monkeys, the faeces were collected from under the cages and sorted to remove the digested seeds, which were then planted. The results showed that monkeys had insignificant effects on clammy cherry, limeberry, and pomme surette seeds. The seed germination times were longer, and they germinated less often. So, the monkeys may actually be helping to reduce the spread of these invasive species. However, they had a significant impact on guava and tamarind. Guava had a higher proportion of germination success and a shorter time to germination after passing through a monkey's gut. Tamarind germination times were shorter, even though passing through a monkey's gut seems to have a negative impact on tamarind seed germination latency. This was because the monkeys generally spat out most of the seeds rather than swallowing them. It was therefore an effective way of spreading the seeds and providing the best outcome for the plant.

Households component. The project team collaborated with Ross University School of Veterinary Medicine to look at virus, bacteria, and parasite transmission between humans and monkeys in villages. It was critical to investigate whether increased interaction between humans and monkeys had negative health consequences for society. Some of the data is still being analysed.

The virus component was prolific, producing two published papers. One of the types of viruses studied was the adenovirus, which shows that human-monkey transmission is occurring. Two of the other viruses studied were cytomegaloviruses and lymphocryptoviruses. These do not show human-primate transmission. There is a lot more work to do in this area.

A study was done at Calypso Bay Resort in St. Kitts, consisting of 54 interviews and 10 surveys with both residents and workers at the resort. All participants cited issues with monkeys. They mentioned aggression, specifically damage to gardens and excretion on porches. However, there was a disconnect between this and what a primatologist would consider aggression. The team found almost no rates of aggression.

There is clear evidence that monkey management is required in agricultural and residential areas. To date, there wasn't enough data to indicate that there was a need for interventions in the central forest reserve or on the southeast peninsula, outside of residential areas. More data on this, as well as the impact of monkeys on the tourism sector, is required.

These project pilot studies had the goal of creating a monkey management strategy. An economic analysis allowed the team to identify different management options, quantify the cost and benefits of each option, and weigh the trade-offs of these options. The analysis will help to account for how impacts can vary over time and determine the best use of the limited time and budget available on small islands.

The programme used to determine the most cost-effective strategies was Economic Pest Eradication Strategies Toolkit (EPEST), which was developed in 2015 by Dr. Adam Daigneault and his colleague. Members of the seven islands represented in this regional project were brought to Barbados in 2019 to learn about this programme directly from its creators, who had conducted extensive invasive species management around the world.

In 2023, Dr. Dore, along with Dr. Krista Gallagher and Dr. Aileen Mill, published a formal monkey population. The data showed that St. Kitts alone had approximately 30,000 monkeys island-wide. The results were very useful in approximating the number of monkey troops in the agricultural and residential areas of both islands.

The management strategy concentrated on agricultural and residential areas. The primary assumptions for agricultural areas in St. Kitts and Nevis were as follows:

- According to the population estimate, there are approximately 8,000 monkeys in both islands' agricultural areas.
- During the data collection period, there are 2.7 million EC dollars in damages annually, which equates to about 340 dollars in damages for each monkey.
- There are about 330 farms across the two islands, with an average farm size of three acres.

For residential areas, the assumptions were:

- There are approximately 9,300 monkeys residing in this area in St. Kitts and Nevis.
- Recent census data estimated 6,500 households or plots, with a mean size of 0.5 acre per plot.

The different management options considered were:

1. Doing nothing
2. Trap and cull using pentobarbital
3. Trap and sterilise with ketamine.
4. Trap and shoot sedated monkeys (on agricultural land only).
5. Culling via shooting free-ranging monkeys
6. Electric fencing

The potential impacts of the different options were evaluated over a 20-year time frame. If nothing was done, the population would continue to grow. With the three trapping options, it was assumed that it was possible to trap, at most, 80% of the monkey population. A maximum effectiveness of 25% was assumed with culling via shooting, given the difficulty of shooting large quantities of monkeys. The electric fencing was quite effective at keeping animals out, although farmers have reported instances where monkeys found ways to get around the fences.

The costs of the different interventions included:

- Traps cost about EC\$3000 to construct, including materials and trapper labour, which was about EC\$200/day for trappers to monitor the trap and EC\$500 per trap for food.
- Pentobarbital for culling costs EC\$167 per bottle. Each bottle can cull approximately 10 monkeys. There is an additional cost of burying monkeys.
- Ketamine, used for sedation, costs EC\$200 per bottle. Each bottle can sedate approximately 50 monkeys.
- Sterilisation requires laproscopic equipment, which is estimated to cost about EC\$340 per monkey.

- The cost of a firearm for shooting monkeys is about EC\$6700 per firearm. Routine shooting requires 2000 rounds of ammunition per year at a cost of EC\$3200. The daily fee for hunters is EC\$300.
- According to current estimates, adding an electric fence around a three-acre farm costs EC\$17,800, while a half-acre house plot costs EC\$8200. This includes the cost of labour. Maintenance costs are not included.

Knowing the crop damages accrued from monkeys and the optimal number of monkeys that can be removed with each intervention, it was possible to estimate the dollar value in damages incurred if nothing is done, as well as the damages that can be avoided with each intervention.

Using crop damages to quantify the dollars saved after removing animals from the agricultural areas, the highest cost-benefit ratio comes from culling after trapping and sedating, followed by sterilising, shooting after trapping, and electric fencing. The least beneficial strategy is shooting the free-ranging animals. The cost effectiveness per monkey removed further illustrates that trapping, culling, and sterilising are the smartest things to do for each dollar.

Every dollar invested in removing a monkey from agricultural land yields between EC\$4 and EC\$16 in benefits through the reduction in crop losses. Ultimately, after 20 years, if all interventions were fully implemented, damages could be reduced to a few hundred EC dollars a year, in all instances except for shooting.

In residential areas, it was not possible to quantify avoided damages, so the focus was on the most cost-effective options, the lowest dollar per monkey spent to remove an animal from this area. The most cost-effectiveness in residential areas was to trap and cull, followed closely by trap and sterilise. Fencing is prohibitively expensive to cover the thousands of residential plots.

Some of the animals that are trapped and sedated can be used for biomedical research. There are three biomedical research facilities in St. Kitts alone that take advantage of these animals. That could be a substantial financial benefit.

The proposed Monkey Management Strategy is ethical in looking at the most humane way of managing the monkey in the long term. It now has to be systematically tested. This requires funding to test these strategies. Although tourism is the main economic driver for the country, agriculture has to be prioritised at the very highest level because the country must become more food secure, and that requires monkey management.

The proposed Monkey Management Strategy is ethical in looking at the most humane way of managing the monkey in the long term. It now has to be systematically tested. This requires funding to test these strategies. Although tourism provides the main economic input for the country, agriculture has to be prioritised at the very highest level because the country must become more food secure, and that requires monkey management.

MR. THADDEAUS PETERS

Plant Protection Organization, Grenada

Biological Control as a key component of an IPM strategy for the control of the Croton Scale in Grenada

Mr. Thaddeaus Peters from Grenada looked at biological control as a key component of an integrated pest management strategy for the control of the croton scale in Grenada.

In 2020, a different type of scale was observed infecting plants. It was identified as Croton scale, *Phalacrocooccus howertoni*. This is a new species that was first described in 2008, when it was found in Florida, in the United States of America (USA). Therefore, the number of research papers on this pest is relatively low. The route of introduction into Grenada is likely via ornamental plants imported from the USA. Three main plant nurseries in Grenada periodically import small plants from the USA, grow them out, and sell them to retailers or householders.

The croton scale falls into an order of insects called Hemiptera and belongs to the family of soft-bodied insects called Coccidae. Croton scale insects are sedentary. In the early stages, they are tiny and called crawlers, which is when they can move around. After a day or two, they settle down and just feed off the plant. These insects have tiny stylet feeding tubes that will remove sap and nutrients from the plant; they are heavy feeders. While feeding, they secrete honeydew, which has a high sugar content. This attracts ants and facilitates the growth of black sooty mold. So, even if the scale insect is not seen, the sooty mold is visible. Poor-quality fruits cause direct losses, and in some cases, plants die, resulting in increased costs for the management of farms and for cleaning fruits for the market. In Grenada, the main hosts observed were croton, spondias plums, sugar apple, mango, guava, and frangipani. In our government nurseries.

The management approach involves cutting and burning to reduce infestation, insecticide treatments, and biological control, which is the long-term solution to the problem. The Ministry of Agriculture assisted farmers in selected areas by dispatching three field teams to support affected farms and households.

There were two problems: the scale insect and the sooty mold, which people were even more concerned about, especially householders. Even though sooty mold was already present via other scale insects, it was very intense with the croton scale, and it became very noticeable. Several insecticides were used with the botanical insecticide, neem, providing very good control, and it even helped to remove the sooty mold more readily than other products. Pyrethroids, which are class three insecticides and quite toxic, were used, especially when there was an ant infestation.

In the mid-1990s, scientists introduced the ladybird, *Cryptolaemus*, to control the pink hibiscus ladybird infestation that began in Grenada and spread throughout the Caribbean. When the croton scale was first observed, there was also a reemergence of ladybirds in some areas. They had started to feed on the croton scale. Although these natural enemies were already present and had started to react,

it would be a long time before the infestation was controlled. The Ministry tried to augment the ladybird population by importing over 25,000 *Cryptolaemus* beetles from the Associated Insectarium in California. However, this was during the COVID-19 pandemic, and there were shipping challenges. Eventually, Mr. Peters travelled to the US and brought them back by air. It was very expensive and could only be done once.

In 2022, the Ministry collaborated with CABI to conduct a natural enemy survey. Two parasitic wasps and three ladybird beetles were identified. The parasitic wasp identified is suspected to be *Metaphycus*, which is listed in Florida as one of the natural enemies. If this is confirmed, it would be a promising predator.

Currently, there is a substantial reduction in infestation levels, and plants are clearing up. Spot treatments using neem are being done on farms producing export crops. In conjunction with CABI, the Ministry will also implement a community-based integrated pest management programme. This will take the form of working with communities, showing them the need for biocontrol, using biopesticides, and even collecting and enhancing the natural enemy agents that are already in the environment.

The management of the croton scale has provided an opportunity for promoting the use of biocontrol agents, registering and promoting the use of biopesticides, and reducing the use of highly hazardous pesticides. Grenada is determined to prevent its spread to neighbouring islands.

DR. ADAM DAIGNEAULT

Consultant

Cost Benefit Analysis for the TR4 in the Caribbean

Under the project *Preventing the Costs of Invasive Alien Species in Barbados and the OECS*, Dr. Adam Daigneault conducted analyses to identify what the threat of Tropical Race 4 (TR4) might really be to the Caribbean and then to identify what the benefits and costs might be of undertaking various interventions to mitigate that threat. TR4 is the latest race of the fungus, *Fusarium oxysporum* f. sp. *cubense*. Dr. Daigneault and his team are still in the process of refining model assumptions and impact, as well as spread modelling.

By 2040, TR4 has the potential to affect up to 1.7 million hectares, or 18% of the banana area worldwide. TR4 disrupts both local consumption and international trade, currently valued at about US\$120 billion annually, resulting in losses for both global consumers and producers in affected countries. If producers in countries like those in the Caribbean can remain unaffected, they have the potential to benefit through improved trade standing.

Banana plants have historically faced threats. In the early to mid-1900s, Fusarium wilt affected the Gros-Michel, leading to its replacement by the Cavendish. In the 1990s, TR4 began to devastate Cavendish plantations in Southeast Asia. Since then, the path has continued to spread to new countries in Western Asia, Africa, and, most recently, South America. Dr. Daigneault believes that it is also present in Colombia, Peru, and Venezuela. The Caribbean is not affected by the disease. However, with its introduction in northern South America, the threat to the Caribbean is very real. This just isn't about international trade implications; nearly 85% of worldwide banana production actually occurs in local markets, where the fruit is also a staple part of people's diets. This is both a local and international issue, which has been under threat since the 1990s.

Dr. Daigneault and his team compiled information from national-level inventories, private companies, and the Food and Agriculture Organization of the United Nations to determine regional banana area and yields, as well as the Caribbean's position relative to the rest of the world. Given the limited land mass in the Caribbean, the harvested area is relatively small. Although the region also has comparatively lower yields, the industry is nevertheless important.

Models were used to evaluate the potential spread at the global level and at regional levels, and that information was examined to determine its applicability to the Caribbean. In 2020, Staver et al. presented a model that projected the global banana production loss from TR4 at either a 25% or 50% spread rate, mirroring their past empirical observations in areas previously affected by TR4. The current estimate of 200,000 hectares impacted globally is expected to rise by up to 8% of the total area since the study was done five years ago. By 2040, this could rise to between 13% and 18%, with the higher end occurring if the 50% spread rate continues to dominate the spread.

In exploring the state of the industry in the Caribbean, a number of different studies were used to estimate production on an annual basis, determining how much of that production was commercial and how much of that was export grade, going largely out of the Caribbean.

In terms of sales and employment, the industry was estimated to generate about US\$1.3 billion per year in revenues, with an export value of close to US\$1 billion. Dr. Daigneault estimated that about 50,000 people could potentially be employed across the Caribbean, earning around US\$120 million per year. The area at risk is roughly about 60,000 hectares, or close to a million tonnes of bananas. If the entire region was affected, it could lead to annual losses of US\$800 million, with wages at risk valued at US\$70 million. This is the upper boundary of the impact of widespread damage, which is expected to take decades, if not centuries.

In order to add value to mitigation approaches, it is critical to start the benefit-cost analysis by considering the consequences of doing nothing and leaving the incursion unchecked. The four other approaches are: improved exclusion, surveillance, eradication, and containment. This is largely focused on quarantine-type effects and interception at the border, an integrated crop and disease management approach, and conventional breeding of resistant banana cultivars or genetically modified TR4-resistant banana cultivars.

Using approaches selected from other studies and then applying them, it was estimated that by 2050 there could be losses amounting to over 2,400 hectares total, which is roughly between 2% and 3% of the total production area. For comparison, this is about what other spread models predict for total production in Latin America. If the spread goes unchecked, it could still equate to US\$33 to US\$41 million per year in terms of revenue losses. Any measure introduced is compared to the expected losses and cost of any measure introduced to control the spread and damage relative to the do-nothing approach. An examination of measures includes finding out:

- How to change yields
- The effect on production costs
- Investing in R&D and dissemination
- How to introduce some of these approaches
- The additional costs of the establishment and maintenance of the quarantine system

There are also different assumptions about who is going to be involved, since not everyone is going to be an adopter of measures. Responses to several questions are required, including:

- What is the proportion of adoption?
- What is the research delay between finding the solution and its uptake?
- What is the chance of actual success?

Even if there is uptake, everyone adopts, and it is done almost perfectly, it might still not be 100% successful.

A draft analysis was presented that used previous studies to estimate the cost of doing nothing compared to the relative benefit of doing these various practices over the next 25 years under a range of different assumptions. Even the more costly interventions focused on surveillance, eradication, and

containment were better than doing nothing because they were largely effective if the right amount of resources were available. Integrated crop and disease management was found to be the most cost-efficient, yielding a return on investment of close to US\$300,000 per hectare.

The key is that regardless of what approach might be taken, assuming that the region is following relative amounts of success that have been witnessed elsewhere, it seems that the Caribbean could stand to benefit. The next step is to confirm the input data and assumptions.

SESSION FOUR: Assessing High Risk Pathways

Chair: Dr. Kelvin Hughes, AHPA, United Kingdom

DR. KIRK DOUGLAS

Consultant

Pet and aquaria risk assessment

Dr. Douglas explored the pet and aquaria trade as a pathway for IAS entry and establishment in Barbados and the OECS. He gave a brief background of the Centre for Biosecurity Studies in Barbados, which has broader security and trade as one of its three focal areas. At the Centre, *bios*, meaning one life, and *securus*, meaning freedom from anxiety, are combined to define biosecurity as one life with freedom from anxiety, especially with respect to the protection of borders.

There are three main biosecurity risk factors: infrastructural risk, environmental risk, and human risk. Since change is constant, biosecurity is about risk management amidst constant change. This necessitates systems that can effectively measure risk and respond to risk changes. In managing these risks, communication is very important, especially since human risk is very difficult to manage.

The pet and aquaria trade presents a pathway for IAS that can have a clear economic impact. The psychological impact of animals on humans plays a significant role in the pet trade, due to the popularity of certain animals as pets. Statistics compiled by Pet Trade International on the market value of the pet and aquarium trade showed a market demand for these products valued in US\$ billions, particularly in the United States. Dr. Douglas referred to this as a “moving freight train”, saying you cannot stand in its way; you have to get on board and then try to see how things can be rectified.

The aims and objectives of developing a risk assessment for the pet and aquaria trade were to identify and prioritise key species being traded, review existing measures, and then make recommendations for managing these risks using best security guidelines. As a result of the data poverty in the Caribbean, the methodology focused on dialogue with public sector officials and private sector stakeholders. IAS risk prioritisation was attempted and adopted using a technique similar to One Health's zoonotic disease prioritisation.

The risk priority list was created using internet research and from Nurture Nature, a Tobago-based NGO that conducted multi-year research on the pet and aquaria trade in Tobago. This was one of the only studies that contained that type of data. A list of relevant IAS was then developed and subjected to a prioritisation process. The rankings were determined by factors such as the popularity of the pet or aquaria species, its availability and establishment potential, its socio-economic impact, its impact on food and agriculture, and its impact on human health. Also considered were the ease of its concealment for smuggling and the availability of proven eradication methods.

Recommendations coming out of the exercise were integrated into an analytical framework to assess, mitigate, manage, and prevent vulnerabilities to major biosecurity threats. The multidisciplinary framework, PESTHEEL, fosters cross-collaboration and reinforcement of systems thinking to generate comprehensive and inclusive solutions that ultimately save lives and livelihoods. PESTHEEL includes the political, economic, social, technological, health, and environmental sectors, as well as ethics and legal elements.

Reporting on IAS is a huge task that involves most agricultural departments and environmental ministries trying to patrol the entire island. Citizen science can be very powerful in helping to identify things before they escalate. One solution is a tool to facilitate citizen reporting that was developed by Innotech, a construction company in Barbados with several subsidiaries, including data management. They created the Uplifta application, which brings all different sectors together. The proposal submitted to the Barbados government advocated connecting all problems and all ministries via the app, so that citizens or residents could report any problems, including IAS-related issues, accompanied by a photo and the GPS location from their phone. These reports are sent to the relevant ministry or person. This presents an instant chain of reporting that is seamless and also engages political interests. The app has excellent potential for use in Caribbean countries.

Dr. Douglas concluded by providing details about a distance-learning postgraduate MPhil and PhD programme in biosecurity and bio-risk management, which had received approval earlier that day. He encouraged applications from interested persons within the OECS or Barbados.

DR. JEFFERY JONES

Consultant

Horticulture risk assessment

Dr. Jones analysed risks and developed recommendations for effective IAS management associated with the horticultural pathway in Barbados and the OECS. The study provides a first base to advance focused analysis on IAS and the horticulture trade beyond the familiar priority pests for agriculture, within the institutional limitations in the OECS and Barbados. An in-depth analysis of the trade pathway has not been sufficiently explored, but a follow-up study in pilot countries is recommended.

The research included dialogue with public sector officials, trade flow analyses, in-country data gathered from responses to questionnaires, contact with the national Plant Protection Organisation, and risk analysis to determine species that pose real threats to Barbados and the OECS.

There were limitations to this study, including incomplete sources of information, an unreliable trail of pathway vectors as they relate to past introductions and management, the absence of records, and gaps in the regulatory machinery, especially with regard to illegal trade. The sample size was also small. The respondents' limited knowledge and awareness of IAS was a cause for concern. The countries forwarded a significant amount of this data, and the capacity of each country determined the quality of that data.

The commonly defined pathways of IAS introduction are trade, tourism, travel, and transportation. Introductions can be deliberate or unintentional. The dominant pathway of global trade in this industry is nursery stock, which accounts for an estimated 50%. There are also intentional introductions for forestry and landscaping. Horticultural plants are intentionally introduced for economic and aesthetic reasons. Unintentional introductions arrive on cargo and conveyances. In the literature, there are well-documented cases of species that have invaded Barbados and the OECS and are still present. What is less obvious are the actual threats on which to focus interventions or exclusion measures.

To determine appropriate management strategies, it is important to understand the size of the horticultural industry in each country and the types of business operations. In order to identify the risk associated with these imports of popular species, the trading pattern and imports of invasive species from their origin and transit were analysed. From those species, the ones that might become invasive had to be identified based on some risk criteria. The CABI PRA criteria, as well as other criteria like social behaviour, were used.

In identifying imminent threats to Barbados and the OECS, the selection focused on frequently imported ornamental plants commonly used in the industry but whose families include Invasive Alien Plant Species (IAPS) to be selected against. One of these was the very invasive giant hogweed, which was introduced in the United States and southern Canada. Germany spends about 12 million euros per year on managing this pest, which is listed as a noxious weed. It is easily available on the market in the US, even though its sale and import are prohibited in certain states.

Wild parsnip is another high-risk commodity that is well documented in the literature. It is toxic if ingested, displaces vegetation, and selective control can be very difficult.

The horticultural trade, ornamental hedging, and agroforestry all use sickle bush, which is easily imported and readily available. However, it can become invasive, with negative impacts on forestry, native flora, and livestock production. It forms very dense thickets, making areas impenetrable, and can regenerate from the smallest amount of root, while seeds can survive for long periods in the soil.

Miconia is very invasive and prolific. It is already in Grenada, Martinique, and Jamaica as a garden ornamental. The literature does not show any occurrences in the OECS or Barbados.

Cogongrass is a very attractive species for which there are alerts in the US. It is illegal to transport the weed between states, but there are many outlets where seedlings can be bought.

Other grass species have a similar impact on livelihood and the environment, and they are very invasive. Weeping lovegrass is an example that came up very recently when a Caribbean Community (CARICOM) country made a request for its import. This was denied because of its invasiveness.

Some marine species that have become invasive include seagrass and *Ulva reticulata* (ribbon sea lettuce). Freshwater species that are very invasive include the Australian swamp stonecrop, which has already reached Florida; the water fern; and *Hydrocotyle*, which can choke waterways and rivers.

Dr. Jones lamented the lack of awareness pervading the industry in the private and public sectors, and even with the regulators. Individuals struggled to respond to the questionnaires because they did not know what IAS were. Since they cannot be effective partners unless they are aware of the threats, any effective management system would have to address this lack of awareness through stakeholder education, which would lead to possibilities for deepening and strengthening relationships between these private entities and regulatory public sector organisations.

National efforts must be supported by regional institutions. The agreement between CABI and the IICA for the collection of national data is expected to significantly contribute to the development of greater awareness among all relevant stakeholders.

In developing a Framework for IAPS Management of the Horticulture Trade Pathway, Dr. Jones examined the international and regional frameworks. His recommendations include:

1. Mainstreaming of IAPS in legislation using the case study from the Barbados legislation. It is missing from other pieces of legislation in the region.
2. Creating an Area of Protection (OECS and Barbados as a single protection zone)
3. Strengthening and integrating the Caribbean Agricultural Health and Food Safety Agency (CAHFSA)
4. Conducting a public awareness blitz for industry and regulatory agencies
5. Strengthening and integrating the University of the West Indies (UWI) in IAPS management

6. Implementing practical preventive measures through PRA-enhanced capability
7. Developing voluntary codes of conduct for the management of IAPS

The next step in addressing the IAPS threat to the sub-region is to develop a work plan outlining priority actions using these recommendations.

DR. PHILIP TAYLOR

Consultant

International Trade Risk Assessment

Dr. Taylor examined what was being imported into various countries in the region, as well as the invasive insects and pathogens that might be associated with crops being brought in through freight.

The gross domestic product from agricultural produce in the region is falling. CARICOM envisions reducing the net importation of food into the region by 25% by 2025 by increasing the amount of locally grown food.

The international pest management systems examined included the movement of vehicles and equipment, International Standards for Phytosanitary Measures, (ISPM-41), wood, particularly wood packaging (ISPM-15), and food stuff (ISPM-23). The difficulties of pest detection on a specific commodity are quite important.

In July, Dr. Taylor, Mr. Naitram Ramnanan (CABI), and National Plant Protection Organisation (NPPO) personnel toured ports of Barbados, Antigua, Grenada, Dominica, St. Lucia, St. Kitts, and Nevis. Despite not visiting St. Vincent, the tour included a representative from that country. Prior to this, a kickoff meeting took place in Barbados, where participants agreed on the assessment of goods entering a country, as well as the inspection and documentation procedures. Each country had an opportunity to describe their staff and facilities, and the concept of pest recording was introduced. The sampling regime as described by the North American Farm Protection Organization (NAPPO) calculator was demonstrated. The calculator establishes the amount of cargo that requires inspection to achieve 95% certainty in pest detection. The NAPPO calculator was printed out so that the inspectors had a sheet on which they could record the size of the consignment, then calculate how much of that consignment had to be inspected given the defined parameters. However, if the cargo inspection revealed nothing, there was no opportunity to record a nil find. So, a nil finds Excel sheet was introduced, resulting in two systems: one where something was found and recorded, and another where nothing was found.

Also at the Barbados meeting, the Caribbean Biosecurity Interceptions System (CBIS) was introduced, and equipment was distributed to record problems as they were identified. This included tablets with CBIS installed, as well as cameras capable of taking very detailed pictures of pests and diseases. It was agreed that sampling would start in early August and would last for eight weeks.

In addition to the nil finds and the CBIS data, the team was also hoping to get enough good data on customer-generated input, imports, and exports to start doing some predictive statistics on levels of infestation. This could indicate what might happen in the future and where to focus attention once good data comes in.

A list of the top 20 crops of concern was generated. This included citrus, bananas, Irish potatoes, cabbage family, and live plants and seeds, which are very important. Finding strawberries was a

surprise. Banned, high-priority hosts were also listed. The pests of concern included Mediterranean fruit fly, *Fusarium oxysporum*, Tropical Race 4 TR4), red palm weevil, two spotted mites, western flower thrips, taro leaf blight, tomato leaf miner, citrus canker, and Giant African Snail.

The data on the CBIS and nil finds were to be cross-referenced with the Automated System for Customs Data (ASYCUDA), so there would be three sets of data: ASYCUDA data, the CBIS data, and the nil finds data. This would enable a detailed analysis of what the high-risk commodities were and where the high-risk countries were. Unfortunately, some countries were not able to record or return all of the data. Some countries provided all of the data requested; others were unable to provide any data.

The selections were bacterium, fungus, insect, nematode, soil and debris, or blank. In Antigua and Barbuda, there was a reasonable spread of soil and debris, a few fungi, quite a lot of insects, and very few bacteria. All of the CBIS returns from Dominica were for bacteria. They didn't find any insects, fungi, soil, or debris. Because Dominica didn't return the nil returns, it appeared as though everything was contaminated, which was certainly not the case.

Cabbage fusarium wilt and potato wart disease were found. However, of the four records of cabbage fusarium wilt, two were from non-hosts. So, it must have been a false identification. *Synchytrium endobioticum*, a very important potato wart disease, was recorded on bell pepper, which isn't a usual host. It has only ever been recorded as a host once, in 1929. So that was probably also an erroneous record.

Over the time period, no trends were observed regarding whether some inspectors were more demanding than others or whether seasonality played a role.

In comparing the amount of data on the CBIS and nil returns relative to ASYCUDA data, there were nearly 10,000 records on ASYCUDA and about 2,300 for the CBIS and nil returns. So, in different countries, the relationship between the ASYCUDA data and the data from the port inspectors was quite different. There could be several reasons for this. One was that the ASYCUDA data didn't give enough information. Sometimes it was lacking units, and sometimes it was lacking dates.

There were challenges faced:

- There was a lack of experience with the CBIS. It took a while for people to get used to using the app. This should become less of a problem as CBIS becomes more familiar.
- Data was frequently handled twice, with people recording on paper and then transferring it to CBIS. This led to a delayed input of data.
- In some cases, customs were not forthcoming with sharing the ASYCUDA data.
- Some staff were reluctant to use the NAPPO calculator, and some were reluctant to fill in the nil find sheet. Once the inspection was completed and nothing was found, it was a chore to fill in the form to say that. Additionally, some importers were reportedly annoyed at having additional checks on their goods.

- The lack of internet access at the ports is something that has to be addressed. There was also confusion regarding the date formatting—whether the month came first or second.

Dr. Taylor had several suggestions for improvement:

- Internet access is installed at the ports.
- The NAPPO calculator is adopted as the standard for calculating the amount of material to be inspected.
- Those responsible for SPS (sanitary and phytosanitary) inspections have access to the ASYCUDA data in real time. It makes sense for the port authorities and those responsible for SPS to have access to the ASYCUDA data in real time. Much better sharing of data is essential, especially between customs and phytosanitary staff.
- Negative finding is installed on CBIS.
- Laboratory facilities are made available at the ports.
- Staff have better training in the identification of pests and diseases. Key pests should be identified so as to provide detailed information as to what to look for in the future.
- Staff have better training in the use of computer technology.
- Staff have better training in photography.
- Key pests are identified so as to provide detailed information as to what to look for.
- Better use is made of images to share with colleagues locally and internationally.
- The photos are stored so that even if identification is not possible, the incident is recorded.
- Photos of pests of concern are included on the tablet along with CBIS.
- Greater checks are made on packaging material, and this is recorded.

Dr. Taylor concluded with a warning about a new pest in the area. He knew this because CABI received samples from one of the islands for identification. Initially, it was thought to be a virus, but it is actually an insect pest that has crossed the Atlantic and is now in the Caribbean region. It is on three islands, and probably more. It is a polyphagous pest that is resistant to organophosphates, nicotinoids, cypermethrin, and pyrethroids. It is the Indian leafhopper.

DAY 3

SESSION FIVE: Sustaining actions to mitigate the threats of IAS in Barbados and the OECS

Chair: Dr. Kelvin Hughes, AHPA, United Kingdom

MR. LYNDON JOHN

UKOTs Officer, Caribbean

Royal Society for the Protection of Birds (RSPB): a valuable partner in managing IAS in the Caribbean

Mr. John, the Caribbean Invasive Alien Species Project Coordinator with the Royal Society for the Protection of Birds (RSPB), talked about the RSPB's work on invasive alien species in the region. Despite its name, the RSPB's focus is not only on birds but also on all other species and ecosystems.

Three women protesting the use of feathers in the hat industry founded the RSPB in 1889. It is now the largest conservation organisation in Europe and the United Kingdom (UK), with a staff of around 2,300 people. Mr. John is the Overseas Territories Officer for the Caribbean and the only permanent Caribbean employee. The resources raised in 2022–2023 were £164.7 million.

Much of the United Kingdom's biodiversity is found in its fourteen overseas territories. The RSPB has a responsibility to ensure the protection of these species, which it does as part of the BirdLife International Partnership as well as with local partners in each of the territories where work is done. In the Caribbean, the focus is on the Cayman Islands, Turks and Caicos, British Virgin Islands, Anguilla, and Montserrat.

The Caribbean region is a global biodiversity hotspot that is home to 11,000 plants, and 72% of those are found nowhere else in the world. The island geography has been the engine for much of the evolution of the endemic species, which are now at risk. Historically, the indigenous communities of the Caribbean moved between the islands and, in doing so, brought along species from other islands and the mainland. Some of the species in the region, which are considered native, were introduced by these people. Agouti is one of those. There was another movement of terrestrial species during the voyages of Columbus and the European colonisation period. Among them, horses, cattle, goats, and pigs all made the journey.

The International Union for Conservation of Nature (IUCN) defines invasive alien species as “*Non-native species deliberately or unintentionally introduced by human action outside their natural habitats where they establish, proliferate and spread in ways that cause damage to biological diversity*”. Any such species that can survive has usually gone on to create problems by threatening ecosystems, habitats, and other species. Humans are the biggest invasive species of all.

The RSPB has been responsible for implementing several Caribbean projects. In 2013, it managed a project called *Conserving Species and Sites of International Importance by the Eradication of Invasive Alien Species in the Caribbean and UK Overseas Territories*. This was funded by the European Commission under the Voluntary Scheme for the BEST initiative (Biodiversity and Ecosystem Services in Territories of European overseas). In 2016, there was a second project, *Securing Pockets of Paradise in the Caribbean: Embedding Capacity for Invasive Alien Species Management in the UK Overseas Territories*.

The organisation is currently working on a three-year project, Safeguarding Iguanas in the Cayman Islands, with the goal of protecting the Sister Islands Rock Iguana from invasive alien vertebrates. It is a £480,000 project funded by the Darwin Initiative with partners from the RSPB, the Cayman Islands Department for Environment and Department for Agriculture, and the University of Aberdeen. The key objectives are addressing biosecurity, the need for community engagement, increasing local understanding of wildlife and the impacts of invasive species, and addressing invasive species management. The endemic iguanas are the Blue Iguana, found only on Grand Cayman, and the Sister Islands Rock Iguana, found on Little Cayman and Cayman Brac. These flagship conservation species in the Cayman Islands are descended from the Cuban rock iguana, which arrived in the Cayman Islands in two separate geological events in the past.

The 647-acre Saline Reserve in Grand Cayman is designated as an important bird and biodiversity area and is home to the remaining population of the Grand Cayman Blue Iguana. In 2019, the RSPB was able to purchase land within the Saline Reserve with generous support from the Rainforest Trust.

The Sister Islands Rock Iguana and the Blue Iguana can each grow to around 20 pounds. Both are terrestrial iguanas, so they do not get into the trees like the green iguanas. On Little Cayman, the population is somewhere between 1,800 and 2,000, and on Cayman Brac, it is about 200. The population is declining because of issues surrounding invasive species, traffic collisions, and habitat loss.

The green iguana is native to Central and South America, where it is not a problem because predators keep the population under control. In the Caribbean Islands, they overwhelm ecosystems with a significant impact on other species and the biomass in general. Their arrival in the Cayman Islands caused huge problems through the destruction of native flora, the introduction of disease, and even hybridisation with the native iguanas. The government launched an eradication attempt between October 2018 and October 2022, resulting in the culling of 1,399,258 green iguanas at a cost of KYD8,425,000 (US\$10,112,030).

The green iguanas were not the only problem. The project had to focus on feral cats and rodents. Feral cats preyed on juveniles of the endemic iguanas, while rodent predation extended to protected seabirds and other native wildlife as well. In addressing these issues, it is essential to have community support.

The RSPB's work with the overseas territories includes offshore islands, which offer a natural barrier to many invasive alien species. They are particularly valuable to seabird conservation in the region, and they also often have highly endangered reptiles. The privately-owned Dog Island in Anguilla

covers 205 hectares and is about 15 kilometres northwest of Anguilla. It is a crucial site for seabird nesting. In 2011, the island was considered the second-most important island in the Lesser Antilles for seabird nesting populations. It also provided a critical habitat for terrestrial and wetland birds, lizards, sea turtles, and important plants.

The RSPB Anguilla Dog Island Restoration Project involved five main phases, including cutting 42 kilometres of tracks across the island to access the territory inhabited by rats. This was followed by a baiting period where bait was placed along the tracks and bait was replenished at least daily. Rat activity was monitored by a variety of tools, including chocolate-scented wax, tracking tunnels, and the use of night vision cameras. Once the Anguilla National Trust was confident that all the rats had been removed, they established permanent bait stations around the perimeter of the island, which they tried to monitor every six weeks.

The Anguilla National Trust carried out the final phase of wildlife monitoring prior to, during, and after the eradication efforts. Seabird numbers increased as a result of the eradication. Rats were not the only invasive species on the island. There are also feral goats. Due to Dog Island's private ownership, the owner approved the removal of rats but declined to grant permission for the removal of goats. So, the goats remain an issue.

Another Darwin-funded initiative in the Turks and Caicos Islands is looking at Strengthening Biosecurity to Protect the Turks and Caicos Rock Iguana. This is a growing partnership that consists of volunteers from the community, including the Rotaract Club, Caicos Dream Tours, South Bank Marina, and others. The endemic rock iguana, which is an International Union for Conservation of Nature (IUCN)-listed species, was uplisted from critically endangered to endangered. The range of the species is limited to 37.1 square kilometres on these islands, and it has lost 90% of its original range. Threats are posed by sea level rise, invasive alien species, and development. It is generally regarded positively by the populace as an economic asset.

The project focuses on four main threats to the rock iguanas: cats, rats, Casuarina, and green iguanas. With the removal of rats and feral cats, researchers are noting an increase in the numbers of iguanas on Water Cay by several thousand, and they are moving westward and spreading out into Little Water Key. Researchers have noted genetic variation among some of the populations, underscoring the need to protect those that are distinct. There has also been a notable return of some seabirds, particularly least terns, laughing gulls, and royal terns. Some of these seabirds have been absent for decades. Therefore, the project's primary objectives include implementing biosecurity measures to prevent rats and cats from entering Ambergris Key, preventing cats from accessing Pine Key and private islands, reducing the number of rats on the key iguana islands, and promoting community involvement.

The invasive plant Casuarina, or Australian Pine, was cleared away from 14 hectares (45 acres) through volunteer efforts and some paid labour. Its removal encouraged the local natural vegetation to return, which would provide a better habitat for the iguana. As part of the community engagement, a hotline was established for people to report sightings of green iguana. Education was important in building that awareness, getting people to distinguish the rocky iguana from the green iguana, and then getting the community to respond.

The BEST initiative undertook a project on the island of Montserrat from 2013 to 2016. Following the volcanic activity, there was a movement away from Plymouth, which was designated a no-go zone. The cows, pigs, and goats moved into the centre hills, with devastating impacts on the forest, especially the understory. Some of the endemic species that were affected included the Montserrat Oriole, which weaves its nests on the underside of the leaves of the heliconia and sometimes bananas. Pigs digging up the heliconia resulted in a loss of habitat. Hunters came in from the UK Animal Plant Health Agency and trained the staff in the Department of Environment. After the culling was done, the impact was assessed. There are some initial signs of recovery. The Royal Botanic Gardens at Kew, UK, assisted in the assessment for vegetation recovery. Something similar is happening for the British Virgin Islands with the removal of feral goats on the islands of Great and Little Tobago.

The infamous four Ts—trade, transport, travel, and tourism—are the main routes through which these invasive species have been getting into the region. The maritime connectivity is a complex network, so it is important to engage the stakeholders involved in the sector.

The goal of risk analysis is to stop the introduction, establishment, and spread of IAS. The first step is to examine how invasive species are being helped to overcome natural geographical barriers. Then there are environmental barriers to be explored, followed by dispersal barriers. The earlier there are interventions, the greater the chances of success, without resorting to extreme techniques that are financial burdens to our limited economies.

Island resort development often involves landscaping with very large plants imported from nurseries in the US and elsewhere. They bundle it up and ship it out along with IAS, like the giant African snail, which is native to East Africa. These snails arrived in Martinique in 1987, Guadalupe in 1989, St. Martin and Marie Galant in 1995, and Barbados and St. Lucia in 2000. They can grow up to 10 inches and threaten landscapes, agriculture, structures, and public health. They can typically lay 1,200 eggs.

There are also insects that go on to affect the agriculture sector, like the pink hibiscus mealybug that moved through the region in the 1990s. About 150 years ago, the Caribbean saw the introduction of the mongoose, a mammalian predator, as a biocontrol measure on sugarcane plantations. It was responsible for the disappearance of many birds, and reptiles across the region.

On 18 January, 2014, a North American raccoon arrived in St. Lucia via a shipping container. Upon receiving the container and unpacking it on site, the client discovered a live raccoon. They shut the container and called in pest management services to dispatch the animal. It had survived the journey from Florida to St. Lucia. There were similar arrivals in Dominica and Anguilla.

Tackling the IAS problem in the Caribbean starts with prevention. This is the first line of defence in halting the establishment of potentially invasive species. It is cost-effective and efficient. This needs government participation in inspecting shipments, conducting risk assessments, and setting quarantine regulations. The private sector, including the shipping industry, must proactively support government efforts by enforcing policies and measures. Vulnerable pathways, such as the horticultural trade, pet trade, agricultural produce, and maritime industry, need to be monitored and measures implemented where possible.

Biosecurity consists of a set of preventive measures designed to reduce the risk of transmission or spread of invasive alien species. It consists of implementing three core components: prevention, surveillance, and an incursion response.

In discussing possible approaches, novel approaches need to be explored, such as using new technology and artificial intelligence. Some examples are:

- Time's magazine added Trail Guard to its list of the best inventions for 2023. It allows for remote tracking of both animal and human activity. Poachers, et cetera, will trigger instant alerts that can be recorded.
- Sentinel wildlife monitoring tools, made by Conservation X Labs, are cameras that also record audio and relay this information remotely.
- Intelligent Real-time Eco-acoustic Monitoring. In listening, relaying, and analysing acoustic data, the presence or absence of species, even endangered species, can be determined.

All of this underscores the importance of biosecurity. A project proposal for over US\$2.5 million has been submitted to Darwin Plus. It will involve all five overseas territories and address biosecurity legislation, enhancing capacity at ports, and also strengthening the facilities and equipment at that port level.

Mr. John ended by saying that there is one invasive species with an endless appetite, they can decimate ecosystems and send species extinct. It is humans.

DR. ARNE WITT

CABI

Tools for enhancing surveillance of IAS: Field guides

Mr. Naitram Ramnanan made a presentation on IAS field guides and apps. Dr. Arne Witt developed an invasive plant field guide based on a survey he conducted with Mr. Ramnanan in the OECS and Barbados in 2018. The animal guide: Guide to the Alien and Invasive Animals in the Caribbean is available <https://www.cabidigitallibrary.org/doi/10.1079/9781800627598.0000> online and a printed version will be made available subject to availability of funds.

The project had planned to create an IAS app, which would include the guides. Antigua had successfully developed an IAS app. A common issue with any IAS app, however, is the need for a dedicated team of experts to operate in the background for species identification. In the end, it was decided not to pursue it regionally but to use the one from Antigua, see how it works, and then share that with the rest of the OECS and Barbados.

Although the CABI invasive species compendium is freely available, it is considered secondary published information. Mr. Ramnanan said that people working with invasive species have a good network, so even if the app was not available, he could continue to facilitate the identification of species in the region through the CABI diagnostic services in the UK. CABI is also partnering with the Caribbean Plant Health Directors (CPHD), the Caribbean Pest Diagnostic Network (CPDN), and the University of Florida to identify species.

MR. AVENESH ALI

Consultant

Tools for enhancing surveillance of IAS: Caribbean Biodiversity Interception System (CBIS)

Mr. Avenesh Ali's presentation was the Caribbean Biodiversity Interception System (CBIS), which is a tool for enhancing surveillance of IAS in the Caribbean region by providing accurate and timely reports to identify recurring issues of interceptions at ports of entry.

Initially, the CBIS system was built as an IAS recording system under this project, but it was quickly recognised that it could be expanded to accommodate all pests, diseases, and animals coming in at the ports. So, the system was upgraded and presented at the 14th CPHD forum in 2021, where it was approved for use within the member countries.

The CBIS System is a web-based system similar to the United States Department of Agriculture Non-Compliance System. It was designed in collaboration with Mr. Fitzroy Wright from Jamaica. The system complies with the International Standard for Phytosanitary Measures, ISPM 13, and lays the foundation for one part of the International Plant Protection Convention (IPPC) strategic framework development agenda for 2020–2023. It records interception data, provides reports, and is accessible by each country. Every country has its own private data. The timely and accurate reports on interceptions reduce the workload of staff at ports of entry and facilitate easy accessibility to the information for all registered users.

CBIS only captures positive interceptions when something is found during inspection. By working on this project, it was found that the negative data was very important, which is when nothing is found during an inspection. That data is still important and needs to be recorded. CBIS will be upgraded to include both positive and negative inspections.

CBIS was launched in March 2023. A total of 38 participants from 17 countries were trained in its use, and 10 of those countries have implemented the system and are currently using it. Some countries require extra help to get on board, but we hope to get the rest of the countries on board within a year.

In August 2023, training was provided in Barbados and for eight countries involved in the IAS project. The app for the CBIS system was provided pro bono, and CABI purchased tablets for all eight countries. Some of the features of the app include the ability to work offline and take photos. The IES field guides that were provided by CABI were also included.

At a CPHD meeting, it was agreed that the aggregated data from the 10 countries using CBIS would be shared. The countries are not identified, but a sharing portal shows the aggregated live data so that a user can see exactly what is happening within the region. There are similar interception tracking systems across the globe, including in the US, UK, Canada, and EU countries.

Initially, chrysanthemums and other cut flowers had a high interception rate at the ports. Currently, the banana is showing up as a significant commodity that is being intercepted. Recently, there were 22 shipments of bananas that were intercepted and rejected at the ports of entry across 10 countries. Tangerines, lettuce, avocado, kale, orange, and carnation flowers are also being intercepted. The sharing portal can show different types of reports as well as a breakdown of importing countries across the globe from which there are frequent interceptions.

CBIS has been implemented and upgraded many times. Under the guidance of CPHD, it will continue to be upgraded to meet the needs of the countries in the region.

Ms. DENYSE JOHNSTON

Consultant

Tools for enhancing surveillance of IAS: Declare Dispose or Pay campaign

The *Declare, Dispose, or Pay* campaign material was developed at the level of the region to be shared among the countries. It was done in such a way that countries could use the material as is or modify it to suit their particular situation. The word ‘deposit’ was used rather than ‘dispose’, so that people were not tempted to throw prohibited material into garbage bins along the way. Similarly, ‘pay’ was used since the legal mechanisms to fine travellers were not in place in all countries.

The key messages were that IAS can have devastating economic and social impacts on Caribbean biodiversity, livelihoods, and national economies; that every person has to take responsibility to keep them out; and that it is illegal to bring in certain animal and plant material. With this awareness, it was hoped that travellers would be encouraged to desist from travelling with restricted items.

The campaign products included a campaign identifier, a logo, a popular brochure, an information sheet, a poster, a large banner, an informational movie, and biosecurity bins with signage. A feedback form and campaign launch guidelines completed the package.

The campaign identifier was used on all campaign material. The popular brochure was for distribution to the travelling public and could also be published elsewhere, like airline magazines. An information sheet provided more comprehensive information for stakeholder groups and the media. A poster was designed to be placed at strategic points in the terminal and in other relevant places so as to capture the attention of passengers as they moved towards the immigration and customs areas. The artwork for the poster was done so that it could be resized and used in print and online advertisements. A large banner was expected to be positioned for maximum visibility by all arriving passengers.

The informational movie gave brief information on IAS and was just short of four minutes long. The movie introduced the concept of IAS, highlighted potential dangers, and listed some items that could harbour IAS. The intended viewing locations included the terminal as well as planes and ships.

Biosecurity bins identified with signage were to be prominently placed before the customs area. A feedback form was completed to assess the effectiveness of the various communication materials. The campaign launch guidelines offered recommendations for actions to take prior to, during, and following the launch. The guidelines also provided a framework for planning that activity.

MR. NAITRAM RAMNANAN

CABI

A case for the Caribbean Invasive Species Trust Fund

Mr. Naitram Ramnanan made a short presentation on the Caribbean Invasive Alien Species (CAIS) Trust Fund, which was developed after a series of three national-level consultancies conducted by Ms. Karen Gardiner in Barbados, Antigua and Barbuda, and St. Kitts and Nevis.

The proposed Trust Fund came about because project successes ended when projects ended, which sometimes meant that inroads were lost. However, providing a small amount of money on a timely basis to ensure continuity could save millions in the long run. The Trust Fund would help to build sustainability after the project ended, which is a requirement for projects funded by the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF).

The Trust Fund is expected to build the capacity needed to facilitate a strategic focus on IAS management. This would involve mobilising and overseeing the collection and allocation of financial resources while also developing synergistic relationships with governments, donors, and other public and private entities to form partnerships where human and financial resources can be pooled to achieve mutual objectives.

The plan was to raise approximately US\$120 million for an endowment fund that will be managed by the Caribbean Biodiversity Fund. This amount would provide sufficient funds to manage a secretariat on a year-round basis and provide money to continue regional IAS management on a sustainable basis.

One suggestion for accumulating funds to sustainably fund the management of IAS was an airport tax included in the cost of each travel ticket. This has been successfully done in Costa Rica, where a departure tax of US\$29 includes US\$2 that goes towards biosecurity. The senior public servants in both Antigua and St. Kitts and Nevis did not think that the suggestions would work since taxes were already high at air and sea ports. During the workshop's opening ceremony, Dr. Joyelle Clarke gave a commitment to revisit and support the initiative after reviewing the support mechanisms.

Mr. Ramnanan said that while some organisations will not give money to an endowment, they may be willing to give funds to do something like work on managing a new pest in the region, as in the case of Sandals, which is giving the first grant of US\$37,300 to work on croton scale.

It is essential that partners agree to contribute to the CAIS trust fund. CABI is now committed to it. Countries have volunteered to join the Secretariat. So, the momentum is building with respect to building a sustainable CAIS Trust Fund, and it is expected to become a reality in the next few years. Until then, CABI will be working with the Republic Bank, Sandals, and any other partner willing to contribute on a sustainable basis. CABI is currently proposing to establish a small grant under the CABI Development Fund to assist its staff in actively seeking donors to capitalise the fund. Mr. Ramnanan was optimistic that this would be a lasting project outcome.

The Way Forward

SUMMARY

Policy and Legislation

These are difficult to deal with when implementing a project that is time-bound and has a specific budget.

- How can we keep national strategy documents from sitting on the shelf?
- In terms of legislation and policy, what can we do in the short term?
- How can we appropriately engage with the politician to get there?

The St. George's Declaration of Principles for Environmental Sustainability in the OECS (SGD) specifically states commitments to invasive alien species and non-native species control.

Policies need a champion in the legislature. Political commitment can be obtained at the OECS Council of Ministers for Environmental Sustainability (COMES) meetings, at which the ministers are informed of the level of progress made towards fulfilling commitments under SGD. However, it must be mandated by a government ministry and requires a member of parliament to spearhead its inclusion on the agenda. If you leave the meeting with a commitment to do something by a certain time, you must come back to the table at the next meeting with an update.

In terms of resource mobilisation and project development, there is a degree of convergence between the activities of agencies and personnel in the country. The challenge is to enhance this convergence so that the system is not overwhelmed.

Financing is also crucial and must operate at the level of the CARICOM region. The work done on this project, for example, needs to be elevated to the CARICOM level.

CARICOM is quite supportive, therefore, achieving convergence at the OECS and CARICOM levels is not particularly challenging. The challenge lies in getting it into the hands of the people who work on the ground. One suggestion is for permanent secretaries and those in charge to include it on people's job descriptions. Then there can be monitoring and accountability.

The approaches can be bottom-up or top-down. Whether to start with policymakers or technocrats depends on the proposed approach. You can approach the top and then find someone who shares your interest to implement the proposal. Therefore, it is not a top-down or bottom-up approach, but rather a method that strikes a balance between both sides.

Three key areas of work in the UK offer insights that are crucial for the region's work activities.

1. Respond to intelligence.
2. Ensure stability by publishing numerous documents and distributing them widely. Legislation has to be in place and applied. Tools and training should support scientific services.
3. Garnering public will in campaigns. Ministers do respond to public pressure.

Data paucity is a perennial problem in the Caribbean. Policymakers tend to make policy decisions based on a lack of sound scientific data. The project trained people to do cost-benefit analyses so that each country would be able to demonstrate to their policymakers the cost of invasive species and the benefits of controlling them.

In some instances, we have done an excellent job of data collection but a very poor job in terms of analysis and distribution. So, after obtaining the data, it must be made accessible.

Communication

The region is not unique. And any group of neighbouring countries is always very reluctant to share their pest and disease information with each other.

Political risk has to be addressed. It can have a huge impact on trade. It is important to understand the issues that reflect badly on politicians and anger the private sector, which may support either the ruling or the opposition political party. These dynamics are not insurmountable, but it is important to understand them and devise suitable strategies to circumvent the challenges.

We must start communicating everything we do and find new and innovative ways to reach people. Risk communication and understanding human psychology are vital to any biosecurity or IAS management strategy. People create the greatest risk, and that is where we have to focus our efforts.

It is important to develop a relationship with the private sector. Their interests are upheld. Their amplified voices go beyond the permanent secretary to reach the prime minister.

Even if we do not have access to a high-level champion, we may still be able to gain the ear of someone they value.

In terms of communication support from a regional office, it is best to go through organisations and mechanisms that are in place, like regional meetings. Disseminate information at the national level through organisations and the public media in each of the respective islands.

Engaging civil society, including the youth, will accomplish two goals: it will change their behaviour through education and encourage their participation in the activity. When people see the benefit to them or understand how things affect them personally, it resonates with them, and so change begins. They themselves start sharing the message with other people around them.

Meeting in person helps to develop working relationships, which can facilitate communication and networking.

Pet and Aquaria Trade

How can we amalgamate IAS management with other trendy, impactful concerns that matter and resonate with the political structure, not only in one country but across the region?

This can be accomplished by linking IAS management with cross-cutting issues like food security, public health in the wake of COVID-19, which is still very present in the minds of individuals, and the climate change agenda.

In dealing with issues like the taxation framework, it is necessary to work outside of our zone of comfort and to work with local, regional, and international economists to get input. We need to learn their language and engage them in the language that will resonate most.

Include social risk communication, particularly citizen participation. Provide them with information to strengthen their awareness and their voice.

A data capture mechanism or system is needed to pinpoint the locations of impacts. Politicians responsible for specific constituencies should then receive this information. This brings a level of accountability to specific individuals and presents an opportunity for them to be called to task.

Citizens would use an app on which they could make their complaints and know that their issue would be addressed.

In this region, there aren't many integrated projects using multidisciplinary approaches. This shift in behaviour can be achieved by interdisciplinarity, showing the interconnectivity of issues, and underscoring the importance of social science in solving a lot of problems. There has to be parity between social science and STEM (science, technology, engineering, and mathematics). No biosecurity issue can be solved with one particular STEM discipline or one social science. It has to be a blended approach.

In order to ensure that solutions are not being imposed, begin with a market survey and cross-disciplinary approaches. It is about risk management. Risk is dynamic and changes every day. Using systems thinking creates linkages between different, seemingly disparate areas.

We must build on successes and incorporate them into plans for the future. Social participation is a must. We should draw upon the stellar examples in the region.

Accommodating human travel while ensuring that country borders do not allow pet species to cross and then become invasive requires systems to monitor and measure. This will help with rapid risk assessments, provide data, and facilitate communication.

The psychology of pet ownership and people's love for their animals have to be considered. We have to leverage databases and develop skill sets.

We also need to establish connections with the EU, aligning their interests with our national priorities. Once we make that connection, I believe that will be a catalyst for sustainable development.

You also have to look at geopolitics. When there is a demand, the supply will always be close by. It is important to understand this and psychology before trying to find solutions and strategies to combat challenges.

International Trade

Only if circumstances change can we resume data collection for international trade and potentially even passenger luggage. Suggestions for improvement are:

- Improving internet access at the ports is essential.
- The NAPPO calculator should be adopted as the standard for calculating the amount of material to be inspected.

- It makes sense for the port authorities and those responsible for SPS (sanitary and phytosanitary) to have access to the ASYCUDA data in real time. Much better sharing of data is essential, especially between customs and phytosanitary staff.
- Installing negative findings on CBIS would allow two systems to operate simultaneously.
- Staff need to have better training in computer technology and photography. The photographs received were disappointing.
- It is important to share images with colleagues, both locally and internationally.
- Photos should be stored so that even if identification is not possible, the incident is recorded. Photos of pests of concern should also be on the tablet with CBIS.
- Staff should have better training in the identification of pests and diseases, and key pests should be identified so as to provide detailed information as to what to look for in the future.
- Laboratory facilities should be made available at the ports, as well as basic items like tables and chairs.
- Greater checks should be made on packaging material, and this should be recorded.

Pest notifications have an impact on trade and food management. Making that call outside of policymakers can be problematic. However, the region is improving due to the efforts of organisations such as the Caribbean Plant Health Directors (CPHD) and the widespread use of social media, which allows people to capture and share photos online. It will no longer be possible to simply "keep it out and keep it quiet."

Citizen involvement is very important because it removes bureaucracy. Although a citizen may report something erroneous, the relevant agency is still obligated to investigate and confirm.

The region can come together to do a pest risk analysis on the pests that are not here but may yet arrive and have this available as a regional-wide app where people can report sightings of these invasive species. The CPHD and CABI are playing a part in this process.

Horizon scans give an idea of what is out there.

Officers who are inspecting shipments need to be aware of the quarantine pests they are likely to see coming from the exporting country.

DISCUSSION

Naitram Ramnanan: A project like this begins with a problem analysis. Very often, this includes policy and legislation. These are very tough things to deal with when implementing a project that is time-bound and has a specific budget. So, what can we do?

1. What can we do so that the national strategy documents do not sit on a shelf?
2. What can we do in the short term in terms of legislation and policy?
3. How can we engage with the politician appropriately to get there?

The St. George's Declaration of Principles for Environmental Sustainability in the OECS (SGD) specifically states commitments to invasive alien species and non-native species control. Political commitment can be obtained at the OECS Council of Ministers for Environmental Sustainability (COMES) meeting, where the ministers are informed of the level of progress made towards fulfilling commitments under SGD. However, it has to be a mandate of a government ministry, and you need a member of parliament to drive it. It is being achieved because it is on the agenda for the COMES meeting, but how is it translated on the ground?

Christopher Cox: With respect to resource mobilisation, project development, etc., there is some level of convergence around what agencies and personnel are doing in the country. The discussions are about IAS, CITES, plant protection, animal protection, animal health, etc. They are all on the same sort of institutional plane, and it is likely that ministers are responsible for going to parliament to deal with all of these issues. The challenge is to put it at the convergence level so that the system is not overwhelming.

Financing is also very important. In a conversation with CAHFSA on biosafety, they were talking about what they wanted to do as a second phase project. The big question was, who was going to pay for all the surveillance monitoring? There is no financing mechanism. How can people be empowered to do jobs for which there is no money?

This has to work at the CARICOM region level. We need to be thinking about how we are going to elevate work, like this project, at the CARICOM level. We should not be splintering the agenda. We have OECS, which is quite harmonised, but then we have a wider framework that includes the other countries, so we have to talk about CARICOM as well.

Naitram Ramnanan: I think CARICOM is quite supportive. So, I think getting that convergence at the regional level, at the level of the OECS, at the level of CARICOM, is not that challenging. The challenge is getting it into the hands of the very few people who work on the ground. Departments are understaffed. How can we translate issues to the individuals who have to do the work on the ground?

My suggestion is to get the permanent secretaries and those who are in charge to put it on people's job descriptions. Unless it is in a person's job description, and there is monitoring and accountability, I do not think there is going to be change. Then there might be pushbacks about the permanent secretary trying to add things to job descriptions, when there are only 24 hours in the day. So, what can we do? I want to ask Kelvin to respond because the English-speaking Caribbean inherited the public service from the UK. The UK has gone on; what could we learn from them?

Lyndon John: There is nothing permanent about a permanent secretary in the Caribbean. We have political systems that are overturned every five years. These policies need a champion in the legislature.

Naitram Ramnanan: So how do we get that champion? Chris, can we take money from a project like this and pay a lobbyist in terms of a minister to become a champion to get it going?

Lyndon John: You can get the commitment, and sign on at the COMES meeting. At the COMES meeting, there is a general agenda, but if you leave the meeting with a commitment to do something by a certain time, you must come back to the table at the next meeting with an update. We need the region to mobilise these bills in the house and get them passed, so it then gets on to the work plan of the permanent secretary and the ministry. It starts with the political mandate, and then gets passed down. But if you are going to take it from the ground up, it is a real task to get it prioritised. Cabinets set the legislative agenda, and frequently, the chambers of attorney generals are overwhelmed with the bills that they have to deal with. I have worked on drafting bills that have not been priorities for the attorney general's chambers. So that is where we needed to do both.

Naitram Ramnanan: Any suggestions on how we do that besides the champions?

Lyndon John: At the COMES meeting, get the political commitment to work on the bills. Because with the bills, the permanent secretary and the Departments of Agriculture and Environment can change the funding and get things done. By having the political endorsement and the commitment for the next COMES meeting, these objectives can be achieved.

Naitram Ramnanan: Does anyone disagree with that approach?

Kofi Sylvester: I am not disagreeing. Let me give you an example. The CARICOM Chief Veterinary Officers (CVOs) did something similar. An agreement was drafted and we got the ministers from each individual country to give their commitment. The technocrats, the working group, and the policymakers commented at the same time on a project, so we got a little bit of movement. We are still working on it. For me, coming from the top-down, especially if people on the ground are not in agreement from the start, it is dead right there. Coming from the bottom up, a lot of the groundwork is done, with a lot of effort, time and resources put in, and when it gets to the top, they do not know about it, so it is dead there as well. You would have wasted a lot of time and a lot of energy.

Sometimes it depends on the program; if it is beneficial to them and it starts from the top-down, it works. If it is beneficial to the country and the technocrats, and it starts from the bottom up, and they are on board with it, it works. So, it depends on which one of the approaches you are going to take, bottom up or top down. We have to look at whatever we are proposing and see whether starting with the policymakers is the best way to go, or starting with the technocrats is the better way to go. You have to figure out your approach. On the agricultural side and on the CVO side, the best way to get policymakers on board is to speak money.

Lyndon John: Well, from our experience, we did the bottom up for a GEF project. Everything was drafted, but it is still stuck in the AG's chambers. So, let us say, for instance, that right now black sigatoka is a real issue of interest to the politicians and we are talking about biosecurity. Couple it with what is going to hit them in their pockets directly.

Naitram Ramnanan: The project tried to do the cost-benefit analyses so that there was information to make decisions. That is what was done in St. Kitts with the monkey. We are doing it with TR4. As a former boss said to me, we must beat the centre with both ends. The few successes that I have accomplished in the countries were with that approach. You approach the top, and then you find somebody with that mutual interest who will hold your hand and get the thing implemented. So, it is not top-down and not bottom-up, but beating the middle with both ends. That is where I think you will have some success.

Kelvin Hughes: Based on what I have seen, there are three areas of work in the UK that are key for work activities in the region.

First, we respond to intelligence. We have a very advanced system of collecting and reacting to data, collecting it, and feeding it back to the International Trade Prototype (ITP) system, which was described. For this, there was a lot of investment in good staff and training, as well as in our scientific services. When we see something unusual, we do not call it bacteria, we find out exactly what that bacteria means.

The second area is ensuring stability by putting out a lot of documents and giving them away to a lot of people. So, there is a tremendous amount of visibility in what we do. We also make sure that our future ministers are up-to-date on things even before they are in place. We produce a five-year strategy, which is an excellent update for the next government team. They basically start off with a leg up.

The key to all of this stability is legislation, how we apply the legislation, and making sure it is in place. It is driven by the data. We show the potential threats coming in and talk about the effect that they could have in the country, on agriculture, and on our export trade. Animal health is particularly important for export. Animals with a disease here cannot be exported.

The polluter pays is something that we really do. When we find organisms that we want to try and get out of the country, we destroy or we re-export them. That costs people a lot of money. As soon as they see what we are doing, they clean up their stocks because it is really difficult to find new markets. We prefer to work with people rather than just to ban it. We want to help you make sure we have markets. So, we provide a lot of training overseas. Where we feel that scientific services are not so good, we help with tools. There are a lot of new technologies and easy-to-use diagnostic kits available.

The third area is garnering public will through campaigns. Ministers do really react to that public pressure.

Naitram Ramnanan: In the Caribbean, we continue to have data paucity. Policymakers tend to make policy decisions based on a lack of sound scientific data. The project trained people in each country to do cost-benefit analyses so that they would be able to demonstrate to policymakers the cost of invasives and the benefits of controlling them. Only one was done in St. Kitts and Nevis on the monkey. A consultant has been contracted to do one on the TR4 jointly with the USDA APHIS. This will provide data for policymakers as well.

Lyndon John: In some instances, we have done an excellent job of data collection but a very poor job in terms of analysis and distribution. So, after getting the data, it must be made accessible.

COMMUNICATION

Denyse Johnston: Unlike the UK, we are strong, individual countries that have to work together. From a communication perspective, how do we strengthen that connection? If you think of a waggon wheel with the region in the middle and the spokes going out to each country, we are strong when the linkages are there.

We need multi-pronged approaches to communication; top-down and bottom-up are not mutually exclusive. We have to approach it from all perspectives. The bottom-up can only go so far without support from the top. The top-down can only go so far without boots on the ground. How do we reach our individual politicians? How do we reach the individual interest groups? What can we use that is of interest to them and tie it into our agenda to get it moving? We need all these moving parts to work together. We need to step back and see the big picture.

Getting information, such as photographs, video footage, etc., from the countries was not so easy. At this workshop, we could all see what is happening in the different countries. It might be something that could be applicable to your country; you do not have to reinvent the wheel. We can share amongst ourselves.

- Can we continue the work regionally as well?
- How can the flow of information and communication between the regional office, whether it is CABI or another regional entity, and countries be facilitated or improved?
- How can the sharing of information amongst the countries be improved as well?
- How can we get greater involvement from countries?
- What are the barriers to sharing information from the national level at the regional level?

Philip Taylor: The region is not unique. It is made up of many different independent countries, although they are all in the Caribbean. Any group of neighbouring countries is always very reluctant to share their pest and disease information with each other. It happens in Africa. It is difficult to get pest lists out of countries. As soon as a new pest arrives in a country in Africa, people are very reluctant to share that information.

From my observation, the NPPOs of many countries aim to keep pests out, but if they cannot keep them out, they keep it quiet. There is a fundamental elephant in the room: it is in everyone's interest not to share the information. You want to work together as a community but on the other hand, you are competing against each other. This region is not unique. All neighbouring countries are in the same position.

Kirk Douglas: Political risk is something that we do not often think about as technocrats, but it is something that we need to deal with. It is one of the missing dimensions of the push in IAS, and it is not unique to IAS, it is the same with Chief Veterinary Officers (CVOs). When they are looking at avian influenza, they are looking at a reportable disease. There is trepidation because of the seismic impact it can have on trade, the knock-on effects on the socio-economics of the country, and therefore the people who are running the country. It is going to make them look bad, and it is going to incur the ire of the private sector, which is oftentimes involved in the support of either the ruling or the opposition political party.

So, it is all about that political risk element. We have to understand these dynamics. It does not mean that they are insurmountable, but we have to engage with that understanding and devise suitable

strategies to circumvent the challenges. If we do not do that, I fear that we will continue next year, and we will be at the same spot.

In terms of communication, a meeting like this is very enlightening in terms of seeing what is going on around the region, and the really dedicated work being done. It is important to communicate this, because sometimes people do not understand the effort involved in protecting them. We have to start communicating all of what we are doing and find innovative ways to communicate with people.

Risk communication and understanding human psychology are vital to any biosecurity or IAS management strategy. People are creating the greatest risk, and that is where we have to target our efforts.

Denyse Johnston: The barriers and challenges are real. We have to deal with them. How do we overcome those barriers? Because if your permanent secretary says that quality control means that everything must pass through them, that is a bottleneck. What are some of the ways to circumvent that?

Kirk Douglas: It is important to develop a relationship with the private sector. It is a very key relationship because those are amplified voices that go beyond the corridors of the permanent secretary and get into the hallways of the prime minister. If you have a prime minister that we do in Barbados, it will get done, and it will get done quite rapidly. You need a catalyst, and from my experience, when you engage with the private sector and there is a particular interest the private sector has that they want to protect, it gets protected.

Denyse Johnston: So, we have to do a little bit more stepping back from our little technical areas to get out of the office and begin outreach.

Naitram Ramnanan: You have to influence the neck rather than the head. The neck is what turns the head. We may not necessarily have access to a high-level champion, but if we can get the ear of someone they value, that may be a strategy that can be used.

Denyse Johnston: What kind of communication support would you like from a regional office? We are recognising that boots on the ground in the country is critical. How do we support that from the middle of the waggon wheel?

Lyndon John: Feeding through organisations and mechanisms that are in place, like this meeting. Get it disseminated at the national level, from UWI, OECS, and into the public media in each of the respective islands and territories.

Naitram Ramnanan: I just want to pull out one experience that we kind of shared in the project. We developed the logo for the project. Although the countries gave their approval, it was not used. Two countries developed their own logos. That was clearly a communication failure between the regional and the national offices. It was a bit top-down and it didn't work.

Then we developed the campaign that was shared with the countries, relying heavily on what was done in New Zealand and Australia. We shared the campaign, and the only thing people were changing was the logo. Countries were willing to adopt the campaign but not the logo.

Patricia Wardrope: Perhaps a lesson learnt from that approach would have been to engage civil society and even youth. Maybe host an art or logo competition with the criteria and guidelines. You are doing two things: you are changing behaviour because you are educating them, and you are getting them to buy in. When people see the benefit to them or understand how things affect them personally, it resonates with them, and so change begins. They themselves start bringing the message to other people around them.

Denyse Johnston: What oils the whole process is the informal connection. Projects have been meeting less and less personally because now we can meet virtually. In meeting personally, face-to-face, there is a huge indirect advantage because we now know each other, and this can facilitate communication and networking.

PET AND AQUARIA

Kirk Douglas: Some of the recommendations that I would have put forward are presented in the framework of PESTHEEL (Political, Economic, Social, Technological, Health, Environment, Ethics, Legal) to have a more multidimensional, multidisciplinary approach to IAS management. The political influence is a large gap. How can we amalgamate IAS management with other trendy, impactful concerns that matter and resonate with the political structure, not only in one country but across the region? We have to articulate, very effectively, cross-cutting issues of food security, public health in the wake of COVID, which is still very present in the minds of individuals, and the climate change agenda and how IAS management is pertinent to climate change adaptation and mitigation.

The economic issue is not only in terms of cost-benefit but also in terms of finding solutions. So, it is not only problem-oriented but also solution-driven. What are some of these solutions that can be brought forward? In terms of the taxation framework, this means working outside of our zone of comfort, working with economists that work within government, and maybe outside of government as well, in terms of IADB, CDB, and some of these other multinational agencies, to get input. That is their wheelhouse, and we need to engage them, learn their language, and then communicate in the language that will resonate most.

And that comes to social risk communication but, most importantly, tying in citizen participation. Patti-Anne would have just mentioned the logo competition as being able to engage the youth and let them have a voice as well. By giving them a voice, you are also giving them information to strengthen their awareness and their voice. That is why I believe that particular app allows citizens to be empowered and to have a voice.

In Barbados, we have what we call a radio call-in program, where Barbadians are known for complaining or calling into the program and venting their frustrations on the radio. But it does not give you tangible data from which you can make any decisions. People call into the programs six or seven times a day to talk about their issue. But you need some type of data capture mechanism or system where you can see, especially in a geospatial way, where these impacts occur.

Packaging that information, giving it to a politician who has responsibility for a particular constituency, and saying that this is an area where there is a problem in your constituency brings a level of accountability to specific individuals. And therefore, it gives you the opportunity now to call them to task.

Monkeys are all over Barbados. So where exactly is the problem the worst? We really do not know, but I am sure that citizens would love an app where they can make their complaints, and if it is going to lead to an end to their problem in terms of their communication, then I believe that they will definitely buy into it.

Naitram Ramnanan: I buy the point you are making that we need to integrate things and not compartmentalise them all that much. But I think the fundamental thing in this region is UWI and the way science is taught in a reductionist way where everything is broken down to the smallest parts and we deal with each of them separately.

Chris, we do not have too many integrated projects. Although IAS is very integrated with climate change, we have not seen much of that integration. So, yes, we need that multidisciplinary approach and that cooperation in the way we train people, the way we write projects, and the way we build in that cooperation from all sides. How do we achieve that?

Kirk Douglas: Well, that is why the Centre for Biosecurity Studies is interestingly domiciled in the Faculty of Social Science, not in the Faculty of Medicine, not in the Faculty of Science, for the specific purpose of driving interdisciplinarity, showing the interconnectivity of issues, and also underscoring the importance of social science in solving a lot of these problems. We always approach them from a STEM perspective, so the risk analysis is excellent, but there is a huge gap in risk communication and in understanding psychology. As I said, human risk is the largest problem. You are trying to modulate and shift behaviour. That is not the realm of STEM; that is the realm of social science.

And so there has to be a balance between social science and STEM. Unless we get that right, we are always going to falter. I do agree with you about the UWI system because I came through STEM. I did my bachelor's, my master's, and my PhD in STEM, but I also did my MBA in social science in the UK. So, I have a different dimension of the way I think, and it is unusual within the UWI system. That is why this particular program is the first of its kind in the Caribbean and the first of its kind in the UWI system.

What I have seen since we started on this journey is that eyes have been opened. There is no one sustainability initiative coming through UWI where they are going to embed sustainability in all dimensions throughout the curricula. And we are going to do the same for biosecurity, because you cannot solve a single biosecurity issue with one particular STEM discipline or even one social science. It has to be a blended approach, and it all depends, because every solution has a particular nuance that you have to fit within.

That is what is difficult for people to grasp, because if you have been trained 20 or 30 years ago in a particular discipline, you do not think it will work; it is not what you are comfortable with. It requires people to shift and change their behaviour. I have been told by one of the most successful CEOs that the only human beings that readily embrace change are babies.

Naitram Ramnanan: In CABI, when we are developing a new product for people, we try to quantify their needs and define who they are. Therefore, we try not to impose systems or apps on people. What kind of thing have you done in terms of accomplishing that? For example, I worked at the National Agricultural Marketing and Development Corporation (NAMDEVCO) and developed a market information system with Avenesh that accommodated what people were doing on a daily basis. We weren't forcing them into a system with nothing to show at the end of it.

What are you doing so that this fits in smoothly with what people are doing in the various fields of biosecurity? How do we ensure that we are not imposing something as a burden, for which you have to do a lot of training so that people can adopt it?

Kirk Douglas: Well, the first step, before we actually launched the program, was to do a market survey. We had to engage people, not only students but also the private sector, in terms of what some of the needs were. Critical thinking is cross-disciplinary, being able to segue between one area and another while utilising rational thinking. Systems thinking is the best way you can actually couch it. That is what is going to be foremost in the training: being able to create these linkages between different seemingly disparate areas to show people we always speak about an ecosystem.

An ecosystem is combined with several different participants and several different views, and you have to be able to engage and be the central hub for engaging those conversations. That was critical in terms of how we designed the program—being able to make it available to not only people within the region.

One of our first prospective students is from Saudi Arabia. She is developing a biosecurity system for Saudi Arabia and actually a segment of Saudi Arabia called NEOM.com. If you go there, you'll see that it will be the first sustainable city. It looks like something of a sci-fi movie, but that is where her interest is. So, we are tailoring based on the demand that is out there. And she is going to be able to do her degree remotely. There will obviously be strong communication between us. But we have to also engage the private sector, be solution-driven, and go beyond problem framing. Because oftentimes we frame the problem, we show how bad the problem is, and that is important.

Equally important is: Where do we go from here? You'll hear politicians and policymakers ask, but what is the solution or solutions? That is what we think we can bring to bear, because everybody has issues, whether they want to be transparent about them or not. The thing is, once you share success stories, that imbues confidence and trust.

We do not expect to have a tsunami or a deluge of people just running to us. We know it will take time because behavioural change is never instantaneous. It is always a process. But we are very, very convinced that this is the way that we need to go, because we are talking about risk management. Risk changes every day. It never stays static. It is dynamic. You need systems. You need to measure, and it depends on what you are measuring and what you are looking at. You have to fit what you are seeking to do with the problem that you are facing and not come up with a cookie-cutter way.

Lyndon John: When Chris and I joined the policy department, there was an issue with the St. Lucian parrots. In fact, Dominica had the same problem. We had a movement that was packaged later on and used in other parts of the world by RARE. It had to do with getting the parrots moved from a population of about 100, like in the case of St. Lucia, and getting them to become the national bird in each of these islands: Dominica, St. Lucia, and St. Vincent. So, basically, it was a social movement.

The problem I have is that we are not remembering documents. We are not building on these successes and incorporating them into our plans for the future. So that is one thing. Also, during the time I worked at CANARI, the organisational ethos was participatory-based approaches to natural resource management. That is another case where social participation is a must. The Soufriere marine management area was championed globally as a success for resolving conflict issues with multi-stakeholder involvement. So, I just want to point out that we have stellar examples in the region that we should draw on.

Kofi Sylvester: Pets are becoming a problem when they are moved with a human as a pet, and then they are released sometime afterwards. I am wondering how we can find the balance between accommodating people and travel while, at the same time, ensuring that our country and our borders are not allowing species to move across and then become invasive. That is one of the major problems we have. All these things that we are looking at now involve humans. How do we deal with that on the pet side?

Kirk Douglas: Well, on the pet side, I think you have to build systems to monitor and measure. This will aid in terms of rapid risk assessments; it will help with the data and with communication, but you are essentially dealing with another social issue.

People purchase pets because they have an affinity; they have a love. So, there is a psychology behind why you love a particular animal and why you hate a particular animal. You cannot explain it, but you just feel it. There is a whole set of scientific literature on that, which I found rather intriguing because before I didn't really give it much thought. But being able to understand how our environment has changed to include the cyber environment and the multiverse. We would never have believed that people would want to live in a virtual environment or even think about residing there. But there is a need to understand those flows and understand that those data sets are actually there.

Google makes its business off of data. That is how they make their billions. When you type in Google what you are looking for, you are contributing to their bottom line at the end of the day. To leverage those databases, we have to now develop skill sets. We have to develop that capacity. I have seen it done in India, this is not anything that I am imagining. I have actually seen the platform at the Centre for Behavioural Sciences (CBS) in India. They are doing tremendous work because one of their strong suits in India is IT. They engage with scraping tools.

I think that is why we also need to connect with the European Union, because they are interested in doing what interests them. What we have to do now is connect what interests them with our national priorities. Once we make that connection, I believe that will be a catalyst for sustainable development.

For the pet trade, it is difficult because you also have to look at geopolitics. The issue of reptiles and reptile trade is really driven by demand in Europe and China. So, whenever you have a demand, supply is going to be not too far away. Because if you have a lot of disposable income and you live in areas of the world where the average salary is sometimes even below the poverty line, people see that not necessarily as a mechanism to get rich but to supply and feed their families. These are realities, and that is why we have to really embrace the dimension of the social aspects, because these are the drivers behind all of this. It is really at the human interface. Understanding that and understanding psychology, and then trying to find solutions and strategies to combat that, is where I think we have to look.

INTERNATIONAL TRADE

Philip Taylor: Our international trade survey involved working with eight countries. We were asking for data from the countries on what was coming into the country and what pests and diseases were being brought in with them. It was all being recorded on CBIS, and we were then comparing that with ASYCUDA data.

The amount of data that we got was a little disappointing, despite considerable hard work from some of the people involved. Partly as a result of that, and partly as a result of speaking to people, I came up with a list of suggestions.

Naitram Ramnanan: On your list of suggestions, should we repeat the data collection for international trade and possibly even passenger luggage?

Philip Taylor: I think if things changed, then yes, it would be a sensible thing to do. But what we mustn't do is do the same thing again and get the same data. We need to make sure that there are changes put in place so that we don't make the same mistakes as we did before.

This is not a definitive list of suggestions. I would like your comments on these suggestions and to discuss the benefits and feasibility of some of them.

Internet access is installed at the ports: It seems as though many countries don't have internet access. We've got CBIS developed by Avenesh. So, internet access would be very important. It shouldn't be a difficult thing to do, but it would be of great benefit because, in many cases, there was double handling of data. People were writing things down in books and then transferring them to CBIS, which undermines the whole benefit of having a tablet.

The NAPPO calculator is adopted as the standard for calculating the amount of material to be inspected. The NPPO calculator was something that we instigated. I'd like to see this adopted along with some standard operating procedures. I spoke to Kelvin Hughes earlier, and he suggested that we could assist in writing standard operating procedures for the inspection of material coming from overseas. So that's another suggestion.

Naitram Ramnanan: The good news is that the CPHD has agreed with that suggestion. I think they've actually put in funds for it to be incorporated into CBIS in 2024.

Philip Taylor: ***SPS has access to the ASYCUDA data in real time.*** The ASYCUDA data is held by Customs. It seems to me that both SPS and Customs are recording the same thing. It would be great if these things could be combined so that SPS has access to the ASYCUDA data. So they wouldn't be inputting data twice. I don't know how feasible that would be, but that would be a great benefit.

Negative findings are installed on CBIS. Within the project, we had CBIS where we could record anything that was found of significance, but of course, we also had to record a nil finding or a negative finding on a different platform, which was very difficult to do. So, if it was all combined with the ASYCUDA data, that would be great. But if it wasn't, it would be nice if negative findings could be incorporated into CBIS as well.

Laboratory facilities are made available at the ports. These aren't big countries, but it would be great if there were better facilities at the port for some sort of laboratory investigation. A microscope or some sort of low-power binocular microscope could be installed at the port, because it seems that people have a hand lens at best.

Staff have better training in the identification of pests and diseases. The level of identification of the pests and diseases was rather disappointing. It would be great if the staff who were on the ground doing the inspection had a greater understanding of the pests and diseases, and their identification skills were improved.

Cherrienne Johny: A lot of the suggestions are very good. However, a lot of the time, we don't have the infrastructure or the funds to implement them. For example, using the lab calculator and doing it the same way that we did for the project would be ideal. We will have a more thorough inspection, more consistency, and more transparency. But we don't even have inspection tables, and at some of the ports, we don't have offices or any facility other than a shed or in the sun. So, for me, implementation is an issue because we don't have infrastructure.

Philip Taylor: More fundamental than laboratories, you need tables and chairs. I'll include that as an extra bullet point to provide the SPS with tables and chairs.

Staff have better training in the use of computer technology. Some people clearly didn't know how to use an Excel spreadsheet, and so if you're going to get people to move into the digital age, you're going to need to train the people who are using this equipment.

Staff have better training in photography. Everyone had a camera, but we only had photographs from one country, which was very disappointing. So, encourage your staff to take photographs and train them in the use of the cameras. The cameras that were supplied have an extremely good macro facility. You would be able to take very detailed pictures of insects and possibly get a remote identification on the basis of a photograph. We're not really making good use of photography sharing between islands and internationally.

Send pictures to CABI. One of the islands here sent photographs to CABI. We saw it as a pest, got samples, and were able to identify it as a pest. So, make use of the CABI system, both with photographs and real samples as well.

Key pests are identified so as to provide detailed information on what to look for: Something else that should happen, in my opinion, is that the key pests to look out for should be highlighted. We've heard a lot about the pests that are already here and how to clean them up, and we've seen the stages of invasiveness. We've seen prevention.

We've seen detection, containment, and, ultimately, management. I think prevention should be in big, bold letters because, when you get down to eradication, it is more tangible but extremely difficult. If you can stop mice from eating albatross chicks, it's much more tangible. Whereas the prevention, it's rather airy-fairy. It's difficult to get into people's imaginations, but that's where we should be concentrating our efforts.

People could work together and provide an app for what isn't yet here in the region but would be catastrophic if it were to come. That could be shared among everyone here. This is a really important thing. People from the Port Authority and the public as well can see pictures and keep an eye out for these things.

Better use is made of images to share with colleagues locally and internationally.

The photos are stored so that even if identification is not possible, the incident is recorded. Take photographs of what comes in, even if you're unable to identify it. Store these photographs and possibly share them, so that even if the positive identification isn't made, at least you can say that we had one that came in three months ago. Here's the picture. Build up some sort of database of what's going on in the region, because we've heard time and time again that the paucity of data is the problem.

Photos of pests of concern are included on the tablet along with CBIS.

Greater checks are made on packaging material, and this is recorded.

I'd really like to hear your comments on the feasibility of these things. I appreciate that you often don't have the authority or the finances to make these changes, but these are the kinds of things that we should be driving forward.

Joseph Prosper: If you saw a potential pest, like the black or brown widow spider in Antigua, and brought attention to it, you will be called out by the cabinet to stop sensationalising or bringing fear to society because they have not put out that information. Then your manager is asked to withdraw you from this particular project and put somebody else in place.

Philip Taylor: What you are saying is that you are being put under political pressure not to find things because nobody wants to admit that they have these things in the country.

Kofi Sylvester: Because it affects trade and food management. In my position, I have the authority to report what is happening in the country to the World Organisation for Animal Health (WOAH). You do that outside of policymakers, but you are affecting a lot of money. It is a job you are hired to do, and it damages your work ethic when you are penalised and chastised for doing what you have to do.

Kadian Banton: Yes, that was my concern when Dr. Douglas suggested approaching the private sector rather than the minister. What would be the repercussions for the person doing that? Because the reality is, if they feel that you undermined their authority, then we would see a pushback. A person would have to be really conscious of that. It is not that we do not want to report, but there are protocols that we have to follow before we report.

Naitram Ramnanan: I think the region is getting better because of organisations like the CPHD. I understand the political reality, and we know all the cases. But with social media, that is going to become irrelevant because people come in, see it, take pictures, and publish them. Once it is on social media, it is difficult for the authorities to deny it.

You cannot keep it out and keep it quiet. This has been the policy of so many countries. You do not really want to admit what you have for trade reasons, but each country does have an obligation to report pests to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Kirk Douglas: And that is why citizen involvement is very important. Because it removes the bureaucracy, it lifts the veil, and it shows you the experience. It is not that a citizen cannot report something erroneous, but it causes the agencies to now have to go and investigate and confirm. No longer will we live under this full veil of bureaucracy; that is not a benefit at all. We must create mechanisms and systems that liberate.

Philip Taylor: I agree. You need to have it reported by someone whose life won't be affected by it.

Philip Taylor: If the region came together to do a pest risk analysis on the pests that aren't here but may yet arrive and have this as a regional-wide app where people can report sightings of these invasive species, that would seem to work.

Naitram Ramnanan: We are doing that with CPHD and CABI. I chair the technical working group that prioritises the 10 most important pests, and we do that every two years.

Thaddeus Peters: Horizon scans give an idea of what is out there. I had no idea the croton scale was so invasive. When officers are inspecting shipments, they need to be aware of the quarantine pests they are likely to see coming from the exporting country.

APPENDICES

Appendix 1: Workshop Programme

Day One: 20th March 2024

Time	Subject	Presenters	Duration
09:00	<p>Opening Ceremony: Chair Mr. Eavin Parry, Project Director</p> <p>Greetings from UNEP, Mr. Christopher Cox, Task Manager, Biodiversity & Land Degradation Caribbean portfolio, GEF Biodiversity & Land Degradation Unit</p> <p>Successes, Lessons Learnt and Strategic Partnerships in managing IAS for biodiversity protection – project highlights. Naitram Ramnanan, CABI, Regional Representative and IAS Coordinator and Regional Project Coordinator</p> <p>Government of Saint Christopher and Nevis - Senator Dr. Joyelle Clarke</p> <p>Importance of IAS management in Small Island Developing States. Dr. Arne Witt, Coordinator Invasive Species Management, CABI Africa Directorate</p>		1 hr 30 min
10:30	Break		30 min
11:00	Session One: National and Regional Policy Frameworks for IAS Management	Chair: Dr. Philip Taylor, CABI	
	1. It takes a national effort to manage IAS: state of play in Antigua and Barbuda.	Mr. Joseph Prosper	12 min
	2. It takes a national effort to manage IAS: state of play in Barbados	Ms. Kim Downes Agard	12 min
	3. It takes a national effort to manage IAS: state of play in Saint Christopher and Nevis	Mr. Evian Parry	12 min
	4. A harmonised regional action plan for strengthening national actions for the management and control of IAS in the OECS and the Wider Caribbean	Patricia Ann Wardrope	12 min
	Questions and Answer		
12:00	Session Two: Communication, Education and Public Awareness for changing behaviours of key stakeholders and the General Public.	Mr. Naitram Ramnanan	
	5. Communicating to change knowledge, attitudes and practices in the management of invasive species in Antigua and Barbuda	Mr. Evian Parry	10 min
	6. Communicating to change knowledge, attitudes and practices in the management of invasive species in Barbados	Mr. Rohan Payne	10 min

	7. Communicating to change knowledge, attitudes and practices in the management of invasive species in St. Kitts and Nevis	Mr. Evian Parry	10 min
	8. Highlights of the regional communication tools and approaches to changing knowledge, attitudes and practices in management of invasive species in the Caribbean.	Ms. Denyse Johnston and Mr. Avenesh Ali	20 min
	Question and Answer		
1:00	Lunch	-	1 hr
2.00	Session three: Lessons Learnt from managing IAS in Barbados and the OECS	Chair: Dr. Kirk Douglas, Director, Centre for Biosecurity Studies, UWI.	
	9. Eradicating IAS is a boon to native endemic biodiversity: the case of offshore islands in Antigua and Barbuda.	Ms. Johnella Bradshaw, EAG	30 Min
	10. Efforts at sustaining critically endangered leaf toe geckos in Barbados.	Mr. Rohan Payne, MENB	10 Min
	11. IAS trapping in key Hawksbill Turtle nesting areas in Barbados significantly increases percentage of hatchlings.	Mr. Chad Barrow, MENB	10 Min
	12. Neutralising the potential harmful impacts of Lionfish on biodiversity rich reefs in Barbados	Mr. Rohan Payne, MENB	10 Min
	13. A sustainable management strategy for combating the Vervet monkey, a significant threat to livelihoods, in St. Kitts and Nevis.	Dr. Kerry Dore, Project Coordinator	30 Min
	14. Biological Control as a key component of an IPM strategy for the control of the Croton Scale in Grenada	Mr. Thaddeaus Peters, NPPO, Grenada	10 Min
	15. Cost Benefit Analysis for the TR4 in the Caribbean	Dr. Adam Daigneault, Consultant	10 min
	Question and Answer		
4.00	Break	-	15 min
5.00	Session 4: Assessing High Risk Pathways	Chair: Dr. Kelvin Hughes, AHPA, United Kingdom	
	16. Marine Risk Assessment. [Did not attend]	Dr. Nicola Smith, Consultant	12 Min
	17. Pet and aquaria risk assessment	Dr. Kirk Douglas, Consultant	12 Min
	18. Horticulture risk assessment	Dr. Jeffery Jones, Consultant	12 Min
	19. International Trade Risk Assessment	Dr. Philip Taylor, Consultant	15 min
	20. Passenger Luggage Risk Assessment	Dr. Philip Taylor, Consultant	
Question and Answer			
5:00	Close		

Day TWO: 21st March 2024

Time	Subject	Presenter	Duration
08:00	Field Trip: Impact of IAS to Agriculture, Tourism and Livelihoods in Saint Christopher and Nevis	Lead Coordinator/Host, Mr. Eavin Parry.	
	Description of the trip here		
12.00	Lunch		
	Return to hotel		

Day THREE: 22nd March 2024

Time	Subject	Facilitating	Duration
09:00: 10.30. 00	Sustaining actions to mitigate the threats of IAS in Barbados and the OECS	Chair: Ms. Patricia Ann Wardrope, OECS	
	21. Building a national NGO to sustain actions in managing endemic biodiversity in a SIDS: <i>the challenges and success of Nature Seychelles</i> . [Did not attend]	Mr. Antoine Marie Moustache	25 Min
	22. Royal Society for the Protection of Birds (RSBP): a valuable partner in managing IAS in the Caribbean.	Lyndon John, UKOTs Officer, Caribbean	15 Min
	22. Tools for enhancing surveillance of IAS: i. Field guides ii. Caribbean Biodiversity Interception System iii. Declare Dispose or Pay campaign	Dr. Arne Witt Mr. A. Ali Ms. Denyse Johnston	10 Min 10 Min 10 Min
	23. A case for the Caribbean Invasive Species Trust Fund	Mr. Naitram Ramnanan	10 min
	Question and Answer		
10.30-10.45	Break		15 min
10.45-12.30	Working Groups: Discussion on the way forward Building and sustaining actions of the project: Preventing the COSTS of IAS in Barbados and OECS to protect our biodiversity, livelihoods and economic sectors.		- 1hr 45 min
12.30 1.30	Lunch		- -
1.30	IPSC: Meeting by invitation		

Appendix 2: List of Participants

Antigua and Barbuda

Mr. Joseph Prosper
Ms. Johnella Bradshaw

Barbados

Ms. Kim Downes Agard
Mr. Chad Barrow
Dr. Kirk Douglas

Grenada

Mr. Anthony Jeremiah
Mr. Thaddeaus Peters
Dr. Jeffery Jones

St. Kitts and Nevis

Ministry of Environment

Mr. Eavin Parry
Ms. Derionne Edmeade
Ms. Colincia Levine
Ms. Lynelle Bonaparte
Mr. Kashief Hynes
Dr. Eric Browne
Mr. Dallaries Spair
Ms. Nisha David

Ministry of Sustainable Development

Ms. Shez Dore-Tyson
Mr. Manners Auren
Ms. Nikkita Brown
Ms. Fiona Francis

Ministry of Agriculture St. Kitts and Nevis

Dr. Kofi Sylvester
Mr. Miguel Flemming
Ms. Jeanelle Kelly
Mr. Ian Chapman
Ms. Kadian Banton

Project Steering Committee, SKN

Ms. Kate Orchard
Mr. Augustine Merchant
Mr. Melvin James

Ministry of Tourism, SKN

Ms. Tivanna Wharton
Ms. Diannille Taylor-Williams

Department of Physical Planning and Environment, SKN

Mr. Quincy Bart
Mr. Randy Elliott
Mr. Huey Seargeant
Hon. Eric Evelyn

Department of Marine Resources, SKN

Mr. Randel Thompson

Clarence Fitzroy Bryant College, SKN

Dr. Leighton Naraine

Ross University School of Veterinary Medicine, SKN

Dr. Christa Gallagher

IICA

Ms. Sharon Jones

St. Lucia

Ms. Patricia Wardrope
Ms. Cherrienne Johny
Mr. Lyndon John

St. Vincent and the Grenadines

Ms. Jeanine Bramble

CABI

Mr. Naitram Ramnanan

Dr. Philip Taylor

Dr. Kelvin Hugues

Ms. Denyse Johnston

**Royal Society for the Preservation of
Birds**

Mr. Lyndon John

UNEP

Dr. Christopher Cox

VIRTUAL ATTENDEES

Mr. Rohan Payne [Barbados]

Dr. Kerri Dore [St. Kitts and Nevis]

Mr. Rafique Bailey [St. Vincent and the
Grenadines]

Antoine Marie Moustache [Seychelles]

Dr. Arne Witt [CABI]

