Blue Belt Programme Roundtable: Marine Biosecurity

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Blue Belt Programme

Enhancing marine protection and management across over four million square kilometres of marine environment in the UK Overseas Territories.

UK Government

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Authors: Emma Smith & Lois Duff

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- **UK Overseas Territory Representatives from:** the Ascension Island Government, Cayman Islands Government, St Helena Government and Tristan da Cunha Government, Government of the Pitcairn Islands, Turks and Caicos Islands Government, Government of South Georgia and South Sandwich Islands and the British Antarctic Territory.
- **Expert Panellists:** Dr Jill Key, Dr Siobhan Vye, Dr Anna Yunnie, Dr Judith Lang, Kathryn McLachlan, & Dr Emily Hardman.
- **Supporting organisations, including:** Animal and Plant Health Agency (APHA), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Foreign, Commonwealth & Development Office (FCDO), Joint Nature Conservation Committee (JNCC), Maritime and Coastguard Agency (MCA), Marine Management Organisation (MMO), Plymouth Marine Laboratory (PML) Applications, Royal Society for the Protection of Birds (RSPB) and South Atlantic Environmental Research Institute (SAERI).

The information contained in this report represents the contributions and recommendations of the expert panel and workshop participants and does not necessarily represent the views or recommendations of the Blue Belt Programme.

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Contents

1 Summary

On 18th November 2024, international experts, representatives from UK Overseas Territories (UKOTs) taking part in the Blue Belt Programme (Blue Belt UKOTs) and partner organisations, took part in a roundtable discussion on marine biosecurity. Facilitated by the Blue Belt Programme, the roundtable was an opportunity to learn about why marine biosecurity is important and discuss different monitoring and management methods that can be applied to strengthen marine biosecurity. It also provided a platform to share best practice, lessons learned and challenges from across the Blue Belt UKOTs.

International experts presented experience and learning from around the world including the UK Overseas Territories, Venezuela, Cuba, Puerto Rico, and New Zealand. Marine Protected Area (MPA) managers, policy makers and scientists representing Ascension Island, British Antarctic Territory, The Cayman Islands, St Helena, The Pitcairn Islands, South Georgia and the South Sandwich Islands, Tristan da Cunha, The Turks and Caicos Islands, South Atlantic Environmental Research Institute (SAERI), Royal Society for the Protection of Birds (RSPB), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Joint Nature Conservation Committee (JNCC), Animal and Plant Health Agency (APHA), Foreign, Commonwealth & Development Office (FCDO), Maritime and Coastguard Agency (MCA) and Marine Management Organisation (MMO) took part in the discussion and shared their expertise and experience.

Marine invasive non-native species (INNS) are a particular concern for the UKOTs given that they are often remote islands with limited capacity. INNS are species that have been introduced to a new geographic area or ecosystem outside of their natural distribution range (non-native), and which have then established and rapidly spread, out-competing native species (invasive). Marine INNS may be introduced into new geographic areas by various means including via ballast water[1] [2][3]and hull fouling[4]. Once introduced, marine INNS can have a huge impact and are known to have transformed marine ecosystems. They affect biodiversity by displacement of native species, alteration of community structure, food webs and ecological processes, destruction of habitats, reduction of water quality and the introduction of disease[5][6][7][8][9]. Once marine INNS are established it is extremely difficult and expensive to monitor, manage and eradicate them from marine ecosystems.

[1] Carlton and Geller 1993
[2] Ruiz et al. 1997
[3] Gollasch 2008
[4] Drake and Lodge 2007
[5] Mack et al. 2000
[6] Grosholz 2002
[7] Bax et al. 2003
[8] Simberloff 2005
[9] Molnar et al 2008

The Blue Belt UKOTs have made significant progress in identifying potential marine biosecurity threats and developing and implementing appropriate management measures. However, key challenges include capacity and resources, limited budget to monitor large marine areas and a lack of appropriate legislation. Common themes that were coming through in the discussions were: Comprehensive monitoring and surveillance of the marine environment is essential to identify and contain potential marine INNS quickly; successful eradication is extremely difficult and costly, and it is better to focus on identifying management strategies for risk pathways to prevent introduction and spread; and engaging with stakeholders from the beginning of the process is essential to promote buy in and encourage individuals to take action.

A take home message was that it is best to start simple and identify and focus on the biggest threats to make the most of available resources.

The Blue Belt Programme would like to thank the Blue Belt UKOTs and partners for contributing their views and experiences to the discussion, and express gratitude to the expert panel for sharing their expertise and learning with all involved.

This report presents the proceedings of the roundtable which took place on 18th November 2024. It shares presentations and recommendations by the panel of experts, summarises the discussion between participants and expert panellists, and provides a list of resources.

1.1 Key messages from the expert panel

The Blue Belt Programme was honoured to host Dr Jill Key, Dr Siobhan Vye, Dr Anna Yunnie, Dr Judith Lang, Kathryn McLachlan and Dr Emily Hardman who shared their experiences from national and international approaches to managing threats from marine INNS. During their presentations and subsequent discussion, the expert panellists shared these key messages:

- The main pathways for the introduction and spread of marine INNS are ballast water, hull fouling and increased trade and transport throughout our oceans. Impacts of climate change have exacerbated the spread and establishment of INNS globally.
- Once a marine INNS has become established, it is near-impossible to eradicate or successfully control them, and identifying management strategies for risk pathways to prevent the introduction and spread of marine INNS is the most cost-effective option.
- Ongoing monitoring and surveillance are crucial to facilitate early detection of new introductions and implement an appropriate response.
- There should be a focus on developing policy and guidelines that are easy to interpret, not too burdensome to implement and that are aligned with international standards.

- Stakeholder engagement from the beginning of the process is essential to promote buy in and encourage individuals to act.
- The increase in coverage of MPAs, improvements in environmental knowledge and understanding and technological enhancements (i.e. eDNA) will hopefully aid with mitigating the threats from marine INNS.

2 Introduction

2.1 Roundtable aims and objectives

The roundtable began with an introduction by the Blue Belt Programme's Senior Integrated Marine Manager, Lois Duff, who provided a brief overview of the context and objectives for the roundtable event.

The aims and objectives of the roundtable were to:

- Learn why marine biosecurity is important for the UKOTs.
- Develop an understanding of the management methods that can be applied to strengthen marine biosecurity.
- Develop an understanding of how climate change may impact marine INNS and their management.
- Share best practice, lessons learned and challenges from across the UKOTs.
- Identify priority gaps where marine biosecurity can be improved across the UKOTs.

The roundtable was also an opportunity for the Blue Belt Programme and other organisations to learn and explore how partner organisations might better support the Blue Belt UKOTs.

2.2 Swimming with the tide: Biosecurity and the marine environment

Dr Jill Key, an independent consultant and expert on invasive species and biosecurity, provided some global context of biosecurity and invasive species.

> ***Biosecurity:*** *the measures in place to protect people, production and the environment from the arrival and establishment of potential biological threats*
>
> ***Invasive species:*** *an introduced species that harms its new environment; introduced by human agency and facilitated by the altered environment*

A summary of key statistics from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) report (2023)[10] found that:

- **37,000 species introduced across the globe**
- **200 new introductions annually, and rising**
- **Negative impacts recorded for 3,500 species**
- **10% documented from the marine environment**
- **Invasive species are one of the main drivers of extinction**

Increased technological advances and data sharing saw over 2,000 eradication events recorded by the end of 2019 with 1,233 mammal eradication attempts recorded from islands with an 88% success rate across 998 islands[11]. The biggest island success includes the eradication of rodents from SGSSI in 2018[12].

However, it is much harder to eradicate or control marine INNS, which are known to be more prevalent on artificial structures than on natural rocky shores. The two main pathways of introduction for marine INNS are known to be hull fouling and ballast water. There can be large time lags between invasion and detection, so pre-border and post-border actions should be a priority, with surveillance and monitoring key for early detection.

2.2.1 OT Biosecurity Project

In 2020 the OT Biosecurity Project Report[13] was published. Funded by FCDOs Conflict, Stability and Security Fund (CSSF) and led by the GB Non-native Species Secretariat (GBNNSS), this project was carried out between 2016-2020 with aims to improve biosecurity in the UKOTs. A horizon scanning and pathway action planning exercise was conducted to identify priority terrestrial and marine invasive species threats. Hull fouling stood out as the main pathway of entry followed by ballast water and floating objects. Four key marine species were also identified as the main threats to the UKOTs: Mediterranean mussel (*Mytillus galloprovincialis*), Pacific oyster (*Magallana gigas*), Asian green mussel (*Perna viridis*) and devil firefish/lionfish (*Pterois miles/volitans*).

2.2.2 Looking forward

It was noted that legislation relating to biosecurity in the Blue Belt UKOTs is often old colonial legislation that is focussed on the terrestrial environment and refers to “pests” as “invasive species.” Applying the concept of invasive non-native species to the marine environment was initially resisted and is still a new concept to many countries. It is likely that increased knowledge sharing and understanding of our marine environment coupled

[10] IPBES 2023. Accessible at: https://doi.org/10.5281/zenodo.7430682
[11] DIISE 2018. Accessible at: http://diise.islandconservation.org
[12] South Georgia declared rodent-free! - South Georgia Heritage Trust
[13] NNSS - The OT Biosecurity Project: Tackling Invasive Non-native Species in the UK Overseas Territories

with improvements in technology, will allow for similar advances in the marine sector in the next few decades.

3 Context from UK Overseas Territories

Representatives from seven of the Blue Belt UKOTs shared their experiences of marine biosecurity.

Tiffany Simpson - Director of Conservation and Fisheries, Ascension Island Government gave a presentation highlighting the current work underway to protect Ascension Island from marine INNS. This included using scouring pads and settlement plates to detect any new species in key locations in Clarence Bay, collecting eDNA biodiversity samples every 6 months and species evaluation from beach cleans and opportunistic marine debris. The presentation also highlighted the process that Ascension Island Government follows for inspecting arriving vessels (a minimum of 10% of arrivals).The Biosecurity Ordinance 2020 aims to protect Ascension Island against the entry of non-native species, pests and diseases. The Ordinance also outlines that vessels must avoid discharging ballast water within 12nm of the island, the process for hull inspections, the right to refuse landing clearances to merchant and passenger vessels and health standards and licences for the importation of goods. Key challenges highlighted included:

- Understanding which species are native, and which are invasive
- Reliance on shipping for food security and cargo
- Prevalence of litter from fishing industry and other offshore sources.

Key priorities going forward include continuing training on collecting and analysing eDNA, ongoing surveillance and expansion beyond Clarence Bay, strengthening legislation and reporting templates in line with other Blue Belt UKOTs, developing an MPA biosecurity strategy, developing more educational resources for ships and yachts, increasing the citizen science programme and ocean circulation modelling to identify sources of plastic pollution along the coastline.

Natalie Allen – Administrator, British Antarctic Territory stated that the marine environment around British Antarctic Territory (BAT) is currently free of known non-native species but that due to increased vessel traffic from tourism, marine species introductions are an ongoing concern, particularly for the South Shetland Islands and Antarctic Peninsula. Climate-change related changes in ocean temperature and sea ice were also highlighted as leading to possible changes in species establishment once in Antarctica. Current work underway includes a survey of the moon pool on the Sir David Attenborough research vessel, which found biofouling species of concern. Similar surveys on previous British Antarctic Survey (BAS) vessels also found species of concern and horizon scanning identified the most likely marine INNS to establish in BAT. It was also noted that the UK are working closely with Australia and New Zealand to update the existing ballast water management guidelines within the Antarctic Treaty System. Priorities going forward

include full implementation of the International Maritime Organization (IMO) Ballast Water Management Convention and identifying practical biosecurity measures that could be applied across the Antarctic 'fleet,' including all research, tourism, military, and fishing vessels.

Timothy Austin – Deputy Director for Department of Environment, Cayman Islands Government gave a brief introduction to the Cayman Islands and marine INNS that are known to be established including the red lionfish (*Pterois volitans*), thrush cowrie (*Naria Turdus*) and false mussel (*Mytilopsis sp.*). It was noted that the 2018 horizon scanning exercise also identified seagrass (*Halophila stipulcea*) and the Asian green mussel (*Perna viridis*) which have not arrived yet. In addition, soft coral (*Unomia stolonifera*) is also expected to arrive soon. The most likely pathways for entry of marine INNS have been identified as aquarium imports and increased vessel movements, for which there are several preventative actions in place. These include close monitoring of aquarium imports by the Department of Agriculture, a banned species list and a limitation on ballast water discharge. The most significant challenge was identified as a lack of resources within the Department to focus on continual monitoring.

Melva Evans – MPA Officer Environmental, Conservation & Natural Resources, Government of Pitcairn Islands introduced the Pitcairn Islands and explained that there are no current facilities for hull inspections, but that ballast water discharge is banned within the MPA. It was noted that most vessel traffic is from the Galapagos Islands, Easter Island, French Polynesia or occasionally Panama and that trust is relied on, by asking vessels to state when they last had hull inspections. A biosecurity interpretation board has been developed and will be installed in Mangareva in French Polynesia which is usually the last port of call for vessels travelling to the Pitcairn Islands. The Pitcairn Islands Tourism website outlines what marine INNS are, how they might be introduced and the risks they pose to the native biodiversity in the Pitcairn Islands. Before travelling to the Pitcairn Islands, visitors are asked to read the marine biosecurity leaflet and comply with the guidance within it. There is currently no evidence of marine INNS. The current focus is on terrestrial biosecurity, working on rat eradication with the RSPB whilst remaining observant and hoping that no marine INNS are introduced.

Elizabeth Clingham – Blue Belt Coordinator, St Helena Government explained St Helena's work with Plymouth Marine Laboratory (PML); using settlement plates in the main areas of marine traffic to create a catalogue of species; this established that sailing vessels were not of as much concern as believed. Collaboration with Ascension Island was also noted through eDNA work. Current surveillance and monitoring include hull surveys using SCUBA, and additional settlement plates are also being deployed at strategic sites to monitor for settlement of marine INNS. It was also noted that the new shipping company contract dictates that the vessel must provide evidence of hull cleaning. St Helena's main current concern is as a lack of appropriate marine biosecurity legislation; however, it was noted that so far, vessels have been willing to allow surveys without

legislation in place. It was noted that a Blue Belt UKOT marine biosecurity working group would be welcomed and support with developing legislation would be beneficial.

Trevor Glass – Director of Conservation, Tristan da Cunha Government noted that currently there is no marine biosecurity legislation in place but there is a biosecurity station in the harbour for cruise ship guests, there are information boards in the harbour and if people go to the outer islands, full boot washes are conducted. The priorities are to update the Biosecurity Measures for Visiting Vessels document to make it more comprehensive and ensure that it is displayed on the Tristan Government website. Due to resourcing, there have not been any recent hull checks, however the priority is to appoint a biosecurity officer in Cape Town who will oversee these inspections. There are also plans to develop a marine biosecurity poster which will be displayed on visiting vessels and at key locations on island.

Roddy McLeod, Environmental Officer Department of Environment and Coastal Resources, Turks and Caicos Government specifically mentioned lionfish and seagrass species as being a problem in TCI waters. To combat these, an 'early watch system' is being developed alongside education and outreach to work with communities and the public to promote reporting of any sightings of these species. Intervention and conservation efforts are also in place to cull lionfish, treat stony coral tissue loss disease (SCTLD) and dredge invasive seagrass. There is also a key focus on using a range of monitoring techniques to identify marine INNS including photogrammetry, drones, roving diver surveys and manta tows to pick up detections as soon as possible. Key concerns highlighted included a dependence on international shipping for tourism and importation of goods increasing the risk of marine INNS, a lack of appropriate legislation and availability of resources (staffing and finance) and capacity to focus on marine biosecurity. Priorities going forward include finalising a national response plan making use of regional networks, gene banking, strengthening local and international legislation and exploring funding options.

EXPERT PANEL

PRESENTATIONS

4 Expert Panel Presentations

4.1 Marine biosecurity in South Georgia and the South Sandwich Islands: Understanding risk and management options

Section 4.1 summarises the presentation given by Dr Siobhan Vye, Project Manager at the South Atlantic Environmental Research Institute (SAERI). Siobhan presented findings from her research on better understanding the risk of marine INNS introductions to South Georgia and the South Sandwich Islands (SGSSI). Siobhan shared lessons learned and demonstrated how regional collaboration can better enable proactive implementation of management strategies.

4.1.1 Context

Most vessels operate within the existing permitting regime for SGSSI, so there is limited fleet vessel traffic. To date, there have been very few marine INNS recorded in SGSSI, with only one known established species, which is a green alga. However, due to general increasing vessel traffic and climate change, there is a huge opportunity for further introductions of marine INNS.

The research project arose as a continuation from a previous project at SAERI that used vessel Automatic Identification System (AIS) data to understand vessel movements and likely risks of marine INNS introductions to SGSSI. The findings highlighted that vessel types posing the greatest risk were fishing, passenger, and pleasure vessels.

The continuation was a 1-year project funded by the South Georgia Government (October 2023 – December 2024), representing one of the most extensive of its type in the region. The project aimed to collect baseline data to understand the risk of further marine INSS introductions, in addition to reviewing global management approaches and raising awareness with vessel operators. Biofouling was specifically targeted due to being a largely unregulated introduction method, compared to those such as ballast water.

To better understand risk, surveys were conducted on vessels entering or leaving SGSSI whilst they were in port at Stanley, in the Falkland Islands. Ground truth data of hull fouling was collected from the upper and lower hull as well as niche areas (such as the propeller) where possible, using a range of survey techniques such as SCUBA, snorkelling and remotely operated vehicles (ROVs).

A questionnaire was also distributed to assess a range of risk indicators shown to be important in determining the level fouling on vessel hulls elsewhere around the globe. This included time since last in-water clean or dry dock, the time spent stationary in port since the last in-water clean, whether the vessel had transited through sea ice and the age of

anti-fouling coating. Biosecurity management plans / record books were also submitted as part of the questionnaire.

4.1.2 Results so far

In total, eleven vessels were surveyed across a range of vessel types including fishing, passenger, pleasure, and research/re-supply vessels.

There was a low level of macro-fouling across all vessels with nine taxa found in total. Three of these were goose barnacles (which are of low concern), with other species of barnacles, bryozoans and several algae making up the remaining taxa.

Similar to other studies, it was found that niche areas harboured a higher percentage cover of macro-fouling taxa across all surveyed vessels. This suggests that although these vessels have relatively low biofouling compared to those vessels from coastal fleets operating elsewhere in the globe, marine INNS are still likely to be transported to SGSSI waters.

Seventeen questionnaires were returned, of which 70% were from passenger vessels. Almost half of the vessels reported having had an in-water clean or were dry docked in the last year, and many of the vessels were very active throughout the year, so spent a small amount of time stationary in a port. Furthermore, a large portion had transited through sea ice, which is important as sea ice can remove fouling, especially on the upper hull. The oldest anti-fouling coating was over 2,000 days old, however this was a coating that was predicted to last the entire lifetime of the vessel rather than the normal service life of three to five years which is most standard anti-fouling coatings.

Of all the vessels that submitted biosecurity management plans, all were passenger vessels. It was found that 80% met or exceeded the maintenance regime set out in their management plans.

4.1.3 Lessons learned

A desk-based study was conducted to gain an understanding of how biofouling is managed across the globe and compare standards in countries with a similar context to SGSSI. Of the countries reviewed, all had standards and procedures requiring the operator to demonstrate compliance of hull fouling policies and had enforcement action plans in place.

Practitioners across the globe were also consulted to share lessons learnt globally. Key points raised included:

- **Alignment of standards is needed (with international or national standards)**
- **Standards should be clear and easy to understand**
- **Iterative improvements in policy should be made as lessons are learned**

- **Flexibility is needed in policy implementation**
- **High importance of strong connections and early dialogues with stakeholders**

Finally, workshops were held with regional stakeholders to look at incentives and the feasibility of improving marine biosecurity in SGSSI. Key focus areas included:

- **Looking at the effectiveness of the approach**
- **Ensuring that any policy is simple and clear**
- **Ensuring that the burden of implementing the policy is reasonable**
- **Considering any impact on the operations of these vessels.**

4.2 Marine biosecurity surveys, monitoring & future planning - case study: St Helena

Section 4.2 summarises the presentation given by Dr Anna Yunnie, a Principal Consultant for PML, specialising in biofouling and biosecurity. Anna presented an overview of work conducted with colleague Dr Katie O'Shaughnessy in St Helena on behalf of St Helena Government in 2021, to assess the presence of marine INNS.

4.2.1 Aims & surveys

In December 2023, in-water surveys were conducted in St Helena on marine infrastructure and settlement plates to understand prevalence of marine INNS, initiate a reference collection and facilitate a stakeholder workshop for actions going forward.

Two main areas near to the capital, Jamestown, were identified for surveys: James Bay and Rupert's Bay. James Bay was chosen as it is the primary location for recreational vessels to frequent and settlement plates were deployed here for 12 months prior to surveys. Moorings including buoys, rope, and anchor blocks, were also surveyed here (via snorkelling and SCUBA) along with opportunistic hull surveys. Rupert's Bay, comprised of a wharf and complex boulder tetra-block structure, was chosen as the primary location for commercial traffic and supply ships.

A third opportunistic survey was also carried out on a local barge used to transport goods from supply ships in Rupert's Bay which typically has a 3-year maintenance haul-out.

Several constraints were identified with the surveys including: the time samples were taken was a bit early in the season as December is considered 'pre-peak' growth period; there was limited time to process samples; taxonomists who had not visited St Helena previously but excellent lab facilities and staff. The key focuses were preserving and recording samples with lots of photos and samples for eDNA.

4.2.2 Findings

Yacht moorings were found to be massively fouled (up to 100%) with a mixed assemblage, but dominated by barnacles, ascidians and bryozoans which varied with depth and orientation.

Species identified included:

- Green algae (waterline)
- Barnacles (*Megabalanus azoricus*)
- *Didemnid sp*. (turquoise blue)
- *Lissoclinum sp.*
- Foliose encrusting bryozoan
- Hydroids (*Pennaria disticha*)
- Sponge spp

Settlement plate surveys found similar species to the moorings with some additions. These findings indicate settlement plates are a good proxy for moorings overall, but depth should be considered as a variable with the waterline and several regular depths down used as well. Regular monitoring of these plates is key, especially throughout the yacht season.

Rupert's Bay was noted as more difficult to obtain samples, but two known marine INNS were found: *Caleurpa ramosa* and *Carijoa riisei* (snowflake coral) in addition to species not previously recorded in St Helena: *Styellidae* sp and possible *Asterocarpa* genus (ascidians).

Samples taken off the barge very strongly reflected assemblages seen on yacht moorings but were considerably higher (>100%) and an additional known marine INNS, *cf Colpomenia peregrina* (oyster thief), was also identified. It was concluded that the anti-fouling coating used on the barge was not effective against biofouling or general corrosion. It was also noted that by applying an effective anti-fouling coating, it would likely also contribute to lower fuel costs, longer vessel life span and better navigational control.

Stakeholders including the St Helena National Trust, Port Authority, St Helena Government (SHG) biosecurity team and local shipping company were invited to a workshop to view the findings of the surveys and discuss actions going forward.

Key actions from the workshop:

- GBNNSS "Check, clean, dry" campaign literature to be rolled out
- Shipping companies to follow haul outs, anti-fouling coatings and engage with vessel biofouling controls
- Port authorities to develop questionnaires gathering simple data e.g. last port of call and details of anti-fouling coating

- SHG Biosecurity team to continue to share knowledge from terrestrial work including techniques and materials
- Biosecurity plans to be further developed to encompass arriving vessels, niche areas and set actions to be carried out
- Sacrificial sites – as James and Rupert's Bay are already infested with Caulerpa, a spread prevention plan (rather than eradication) was discussed

4.2.3 Lessons learned and actions going forward

- Yachts are most likely not the main threats, with most arriving with clean hulls indicating less of a biofouling risk. However, monitoring should continue, especially focused on niche areas.
- Slow-moving vessels present a large risk. There will be emphasis on implementing additional requirements for anti-fouling coatings and hull maintenance
- There will be emphasis on implementing additional requirements for anti-fouling coatings and hull maintenance.
- A photographic reference collection has been started to form a multi-seasonal baseline reference manual.
- A sample reference collection is to be maintained with preserved samples for ID and prepared samples for genetic analysis.
- Regular surveys are to be conducted before and after yacht season, in Rupert's Bay and on the settlement plates.
- Public engagement and education to be enhanced on priority species for St Helena including details on reporting.

As an end note, it was suggested that further training in taxonomy and eDNA analysis is received in addition to research conducted on climate change and horizon scanning, to identify likely distribution and dispersal rates of possible threats and provide modelling for future impacts.

4.3 Non-Indigenous marine invasives in the Caribbean

Section 4.3 summarises the presentation given by Dr Judith Lang, a Coral Reef Scientist and Scientific Coordinator at the Atlantic and Gulf Rapid Reef Assessment (AGRRA). Judith outlined the timelines of several known marine INNS in Caribbean waters.

4.3.1 Xeniid soft corals

Xeniid soft corals are native to the Indian and Pacific Oceans with a known natural range including Indonesia. They are known to grow rapidly by gaining photosynthates from their endosymbiotic zooxanthellae and feeding on external food particles. On intact Indo-Pacific

coral reefs, they are seen to compete for space with other coral reef species and in disturbed reef areas, they have been known to dominate other species in barren patches.

Around 25 years ago, xeniid soft corals became very popular and was being traded across the world for use in home reef aquariums. This increased trade has since been linked to their spread in the Caribbean, with Unomia stolonifera in Venezuela (Figure 1[14][15][16]) and *Xenia umbellata* (formerly *Unomia stolonifera*) in Cuba[17] and Puerto Rico.

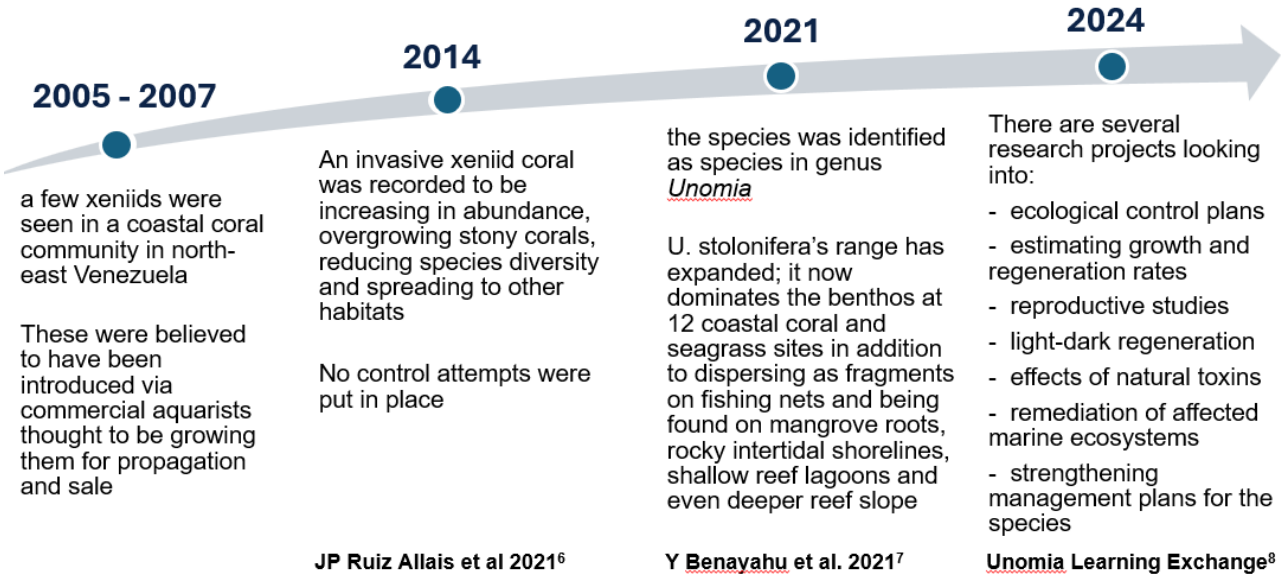

Figure 1: Timeline of introduction and spread of *Unomia stolonifera* in Venezuela

4.3.2 Seagrass *Halophila stipulcea*

The native range of *Halophila stipulacea* is known to be the Indian Ocean, Red Sea, and Persian Gulf[18][19][20]. However, since 1894 when it was recorded in the Mediterranean Sea in Rhodes[21] (likely via the Suez Canal), *H. stipulacea* has rapidly spread across the eastern and southern Mediterranean basins before also appearing in the Caribbean (Figure 2)[22] and more recently, the southeastern coast of the United States[23].

[14] Ruiz-Allais, et al. 2021
[15] Benayahu et al. 2021
[16] E. Villamizar (Feb.23, 2024). AGRRA Unomia Learning Exchange. Accessible at: www.agrra.org/webinarsHYPERLINK "http://www.agrra.org/the-unomia-learning-exchange/"www.agrra.org/the-unomia-learning-exchange/
[17] Espinosa Sáez et al. 2023
[18] Den Hartog, C. 1970
[19] Spalding et al. 2003
[20] Mejia et al. 2016
[21] García-Escudero 2024
[22] Viana et al. 2019
[23] Campbell et al. 2025

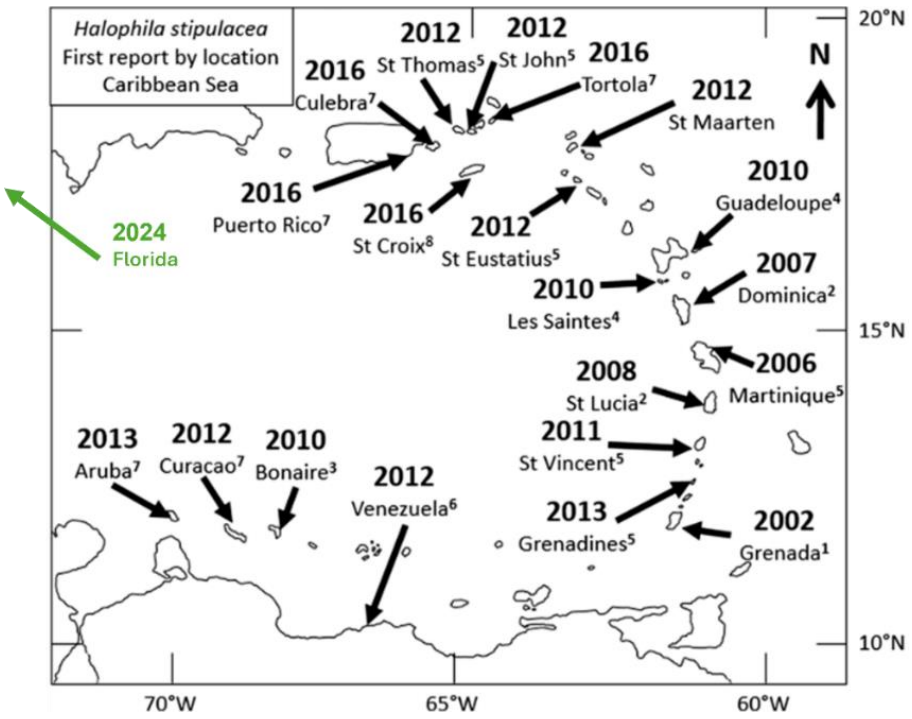

Figure 2: Distribution of *H. stipulacea* in the Caribbean Sea by location and year of first observation

Characteristics of *Halophila stipulacea*

- Rapid vegetative growth
- Inhabits a wide range of salinity, light, temperature, substrata and depths
- Fragments are often disseminated by anchors, fish traps and storms
- Colonises loose sediments
- Forms large dense meadows
- Invades existing seagrass beds and displaces much taller native seagrass species.

To conclude, it was noted that *H. stipulacea* has high pharmacological potential and has the potential to be used in antimicrobial; antioxidant; anticancer; anti-inflammatory; anti-metabolic disorders and anti-osteoclastogenic activities[24]. It can also be used to synthesize eco-friendly nanoparticles, but efficacy and safety research is needed.

4.4 Protecting the pristine waters of southern New Zealand

Section 4.4 summarises the presentation given by Kathryn McLachlan, Marine Team Leader for Environment Southland. Kathryn provided an overview of biosecurity management in New Zealand before using the Southland Coast as a case study to demonstrate active programmes, ongoing actions, and successful containment strategies in place.

[24] Chebaro et al. 2024

4.4.1 Overview of marine biosecurity in New Zealand

New Zealand's Biosecurity Act 1993 is enacted and led by the Ministry for Primary Industries. The main aims are to help keep harmful organisms out of New Zealand and to respond to and manage any harmful organisms that do become established. The main national aim is to prevent species from entering at the border by implementing biofouling and ballast water standards.

Biofouling is covered by the Craft Risk Management Standard for Vessels 2023 Act and is divided into different criteria:

- Short-stay vessels – less than 28 days and only visiting approved places of first arrival.
- Long-stay vessels – 29 days or longer, or visiting areas not approved as places of first arrival.

All vessels must provide evidence of biofouling management before arriving in New Zealand, including continual hull maintenance, inspection, and cleaning of hull/niche areas within 30 days of arrival. The thresholds are very strict and well enforced; vessels have been turned away for not meeting the standards.

New Zealand is also a signatory to the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004) which is implemented through the Maritime Transport Act 1994 and Marine Protection Rules (Part 300). These Acts dictate that ships must have a ballast water management plan signed off at border and any loading and discharging of ballast water must be conducted in accordance with this ballast water management plan.

4.4.2 Marine biosecurity in the Southland Coast

The approach to managing marine biosecurity in Southland is outlined in the Southland Regional Pest Management Plan which is overseen by two biosecurity officers. Six species are currently listed as 'exclusion pests' (Asian paddle crab, *Sabella*, clubbed tunicate, Australian droplet tunicate, *Pyura* and carpet sea squirt) that have not yet arrived in the region. One species is currently listed under 'progressive containment species,' *Undaria* (wakame), which is present in small locations in the region with ongoing containment strategies in place.

Some changes to the Biosecurity Act in 2012 allowed for the creation of pathway plans which were noted to be the best approach for managing marine biosecurity risks. The Fiordland Marine Regional Pathway Management Plan (2017) dictates three rules for managing the marine pest pathways into the Fiordland Marine Area:

1. Vessels must have a clean vessel pass

2. Clean hull, gear, and seawater standards
3. Must keep records of cleaning and anti-fouling

There are multiple active biosecurity programmes in Southland including: *Undaria* management in Easy Harbour, marine pest surveillance in southern Rakiura, marine pest incursions, response plans and vessel monitoring, including monthly hull inspections where 100-125 vessels are usually surveyed each month via free diving.

Undaria in Fiordland

Undaria was first discovered in Te Puaitaha/Breaksea Sound in 2010 (Figure 3).

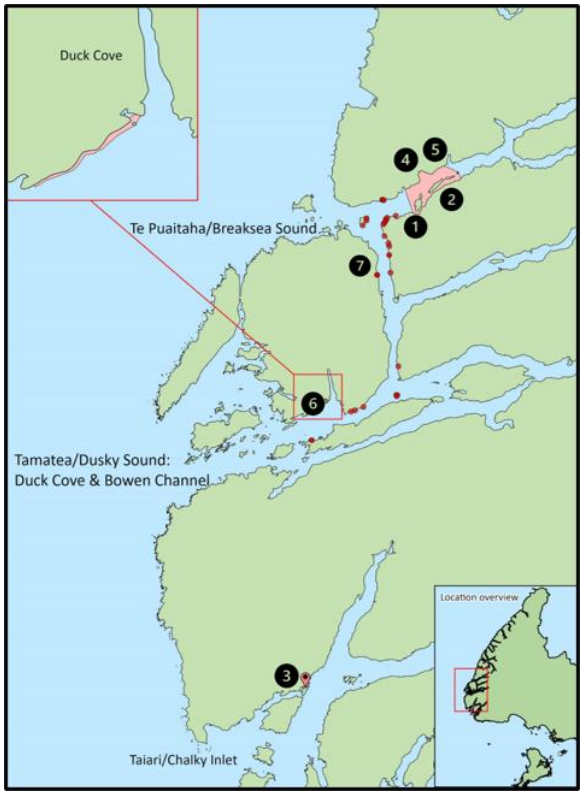

Figure 3: Known establishment/ sighting locations of Undaria in Fjordland

1. **2010**- Monthly dive surveys, chlorine and tarpaulin treatments and biocontrol (*Evechinus* (kina)) were implemented
2. **2017** - *Undaria* found on a mooring line. **Focus changed from local elimination to progressive containment**
3. **2019** - *Undaria* found in Taiari/Chalky Inlet in. Local elimination programme launched. **Site declared *Undaria* free in April 2024**
4. **2021 to 2023** – NZD$2 million administered by the Department of Conservation to redeploy and train divers to scientific COC standard. 44,588kg of *Undaria* removed
5. **2022** – A suction dredge was trialled for the largescale removal of *Undaria.* Deemed to be most effective in shallow waters when *Undaria* was of medium to high density

6. **2022** – Undaria was reported for the first time in Duck Cove, Tamatea/Dusky Sound. Surveillance and management were an immediate focus, and **several smaller sites were found**
7. **2022 to 2023** – Wider surveillance was conducted across Fiordland focusing on anchorages, moorings, structures, pots, and high-risk natural substrate. **No new Undaria or marine pests were found outside of existing management sites**

The progressive containment of *Undaria* is ongoing with aims to prevent the spread from known sites. This includes monthly dive surveys, but due to the large area, few staff members and a decrease in funding, the range is still expanding.

4.4.3 Marine Biosecurity Toolbox

From 2019 – 2024, the Government of New Zealand funded a 5-year research programme aimed at protecting New Zealand's marine environments from the impacts of INNS.

The objective of this Marine Biosecurity Toolbox[25] was to develop a set of 'tools' that allow regulators, industry, and the community to effectively manage risk pathways, prevent marine INNS establishment alongside detecting and responding to new incursions.

Key aims of the Marine Biosecurity Toolbox:

- **Protect** – novel, eco-innovative tools to protect pests from establishing on high-risk infrastructure
- **Detect** – field-operable molecular kits for pest detection (e.g. e-DNA)
- **Manage & respond** – network-based modelling of New Zealand's maritime system to identify invasion pathways
- **Economics & decision-support** – bio-economic model to assess the costs and broader benefits of mitigating marine pest impacts through biosecurity measures developed across the research programme

4.4.4 Key takeaways

- Experience internationally has shown that marine pest populations are near-impossible to eradicate or successfully control once they become widely established – **investing in surveillance is key**
- Identifying management strategies for 'risk pathways' to prevent or minimise the spread of marine pests is the most cost-effective option – **pathway management covers all species**
- Most marine users do not understand the biosecurity risks associated with their actions and want to do the right thing – **educate & get vessel operators to take ownership**

[25] Home - Marine Biosecurity Toolbox

4.5 Using the Marine Biosecurity Toolkit

Section 4.5 provides an overview of the Marine Biosecurity Toolkit delivered by Dr Emily Hardman, Senior Integrated Marine Manager at the Marine Management Organisation.

Emily began by asking some general questions about whether those attending the roundtable event had heard of or used the Marine Biosecurity Toolkit[26]. Poll responses showed that whilst 70% had heard of the toolkit, only 22% had used it.

The Marine Biosecurity Toolkit was developed by JNCC and the MMO in 2020 in collaboration with the GBNNSS and funding from CSSF. The aims were to support conservation workers and biosecurity officers in the UKOTs to strengthen their capacity in addressing biosecurity needs in their various territories.

The toolkit was developed in collaboration with the British Virgin Islands, Falkland Islands and SGSSI to ensure content was appropriate and usable for UKOT capacity needs.

It provides a series of guidance documents to help tackle marine INNS including specific guidance for ballast water control and hull fouling, as well as information on the top 25 identified marine INNS at risk for the UKOTs.

4.5.1 Part A: Hull fouling assessment guidance

It is important to regularly assess the degree of biofouling on visiting vessels to actively prevent the introduction and spread of new marine INNS.

"The most cost effective and efficient means for managing biosecurity is to focus on prevention."

The guidance is designed for use by non-specialists and includes step by step instructions which can be used with relatively little practice and do not require entering the water.

1. Collect information from the vessel's captain / owner and identify the level of risk
2. Conduct a rapid visual inspection from a boat/the wharf and rate the level of biofouling
3. Take necessary action
4. Awareness-raising

[26] Marine Biosecurity Toolkit

4.5.2 Part B: Assessing the risk of ballast water

This part of the toolkit introduces the Ballast Water Management Convention, while recognising that it has not been extended to the Blue Belt UKOTs yet and therefore cannot provide the legal backing to enforce compliance.

Actions to reduce the risk of ballast water include:

1. Undertake a risk assessment using the risk assessment tool
2. Actions:
    a. For low to medium risk vessels: raise awareness
    b. For high to very high-risk vessels: undertake a voluntary ballast water record book check
3. Consider imposing requirements within territorial waters through domestic legislation.

4.5.3 Part C and Part D: Sampling guidance & ID guides

These sections describe sampling protocols that can be conducted whilst carrying out existing monitoring such as: rapid assessments and opportunistic sightings. For both of these, the guidance includes protocols covering:

- Site selection
- Safety
- Supplies
- Records to be taken
- Methods to be used
- Handling samples

To aid in the ID of any samples, identification guides are included for the 25 species of concern to the Blue Belt UKOTs in addition to a quick guide (Figure 4). The detailed guides include information on:

- Pathway for introduction
- Key identification features
- Habitat
- Confusion with similar species
- Any special precautions

Figure 4: Top 25 marine INNS identified as providing a risk to the UKOTs[27]

4.5.4 Part E: Mitigation strategies

The final section of the toolkit provides a review of existing literature looking at potential mitigation measures and management strategies for marine INNS. Recognising the challenges associated with eradication, the review focuses on measures related to the 25 hight priority species.

4.5.5 Improvements

When discussing whether there is anything the Blue Belt Programme could do to improve the toolkit, representatives from St Helena and Ascension Island, who had used the toolkit, stated it was a good resource, but suggested it could benefit from some more Blue Belt UKOT specific sections and that the language on the reporting templates could be better defined to outline specific actions and outcomes for each level of fouling.

[27] Accessible at https://www.nonnativespecies.org/assets/Final_Poster.pdf

ROUNDTABLE DISCUSSION

Contributions by Participants and Expert Panel

5 Roundtable Discussion

The following sections expand on these talks and summarise the contributions, questions, discussion and recommendations from roundtable participants and expert panellists.

5.1 Horizon scanning

The roundtable began by discussing the 2018/2019 horizon scanning exercise conducted across the Blue Belt UKOTs to identify priority marine INNS and whether it might be useful to repeat the exercise. The majority of Blue Belt UKOT representatives said they were aware of the exercise, and all agreed it would be useful to repeat this.

A question was asked by a representative from Cayman Islands Government regarding how successful the horizon scanning exercise was at accurately predicting the marine INNS that did arrive, and whether it would be more productive to focus on techniques for known invasives such as removal/control and biosecurity.

In response, Jill Key noted that horizon scanning is about predicting what might arrive in the future and from that, developing pathway action plans in addition to prioritising exercises for existing marine INNS which inform prospective management plans. It was noted that re-doing the horizon scanning would be particularly beneficial for the Caribbean as representation from marine departments was poor at the time of the initial exercise.

A representative from GB NNSS highlighted the success of using horizon scanning as a predictive tool, using Cyprus as a case study. Six priority species (including one marine species) have arrived since the initial horizon scanning exercise.

It was also noted that the GBNNSS have been working closely with the RSPB on a Darwin project to include an aspect of horizon scanning in 2025, potentially linked to surveillance and mitigation activities in the Caribbean region for both terrestrial and marine species.

5.2 Current marine INNS monitoring programmes

Attendees were asked whether they felt that the monitoring programmes that they have in place in their respective Blue Belt UKOTs were robust and if their teams would feel confident in knowing how to respond if a marine INNS was identified.

Ascension Island representatives advised that their monitoring programmes were working, and they had identified some new potential species, but sometimes do not feel confident in knowing how to respond.

A representative for the **Pitcairn** Islands advised that they do not feel that they have robust monitoring programmes in place for marine INNS and would not feel confident responding to a threat.

One of the participants from **St Helena** stated that their monitoring programmes were adequate for the current level of risk as they understand it and that some staff, but not all would be confident in knowing how to respond.

Representatives for the **Cayman Islands** suggested that their monitoring programmes could be improved and that due to this they currently just focus on 'monitoring the spread.' However, if a new marine INNS was identified, they have a lot of regional contacts they would go to for advice on required actions.

The participant from the **Turks and Caicos Islands** stated that they did not have robust monitoring programmes in place. It was also noted that in terms of confidence in knowing how to respond to marine INNS, each species requires a very different response strategy.

Kathryn McLachlan noted that New Zealand has a generic **'**Incursion Response Plan' to address the different response requirements for different species. This includes setting up a technical advisory group consisting of local experts and researchers to conduct monitoring via free diving and SCUBA surveys and provide appropriate recommendations to respond to new species. It was noted that response success is higher when the threat is detected early.

Dr Annie Yunnie noted that working with government staff to monitor settlement plates has been a good way for them to learn how to conduct monitoring themselves.

Dr Judith Lang also highlighted the importance of using social media and other interactive resources to engage the public. Geographic Information Systems (GIS) was highlighted as a useful tool for creating a dynamic, live tracking map showing the observations made by members of the public and scientists. However, it was noted that entries should not be 'automatically' accepted and photographic evidence should be submitted alongside to ensure correct species identification.

5.3 Ongoing Blue Belt Programme assistance

The final discussion for the roundtable centred around how the Blue Belt Programme could provide further assistance to strengthen marine biosecurity in the Blue Belt UKOTs going forward.

Key themes raised included:

- Develop appropriate policy and legislation
- Explore possible extension of the Ballast Water Management Convention
- Provide assistance with coordinating efforts across the Blue Belt UKOTs and increasing collaboration
- Explore the possibility of a marine biosecurity working group which can be used to enhance collaboration and develop a list of experts, lessons learned and relevant organisations

- Repeat the Horizon Scanning exercise
- Provide training on hull fouling assessments
- Develop species-specific control or eradiation measures

These will be considered as part of future planning for the Blue Belt Programme.

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Additional resources

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New Zealand Marine Biosecurity Toolbox: Home - Marine Biosecurity Toolbox

The UKOT Marine Biosecurity Toolkit: Marine Biosecurity Toolkit

It was noted by MCA that there are some webinars on invasive species under the Marine Environment Protection and Awareness Program https://namepa.net/mepa/

Introduction to the Blue Belt Programme

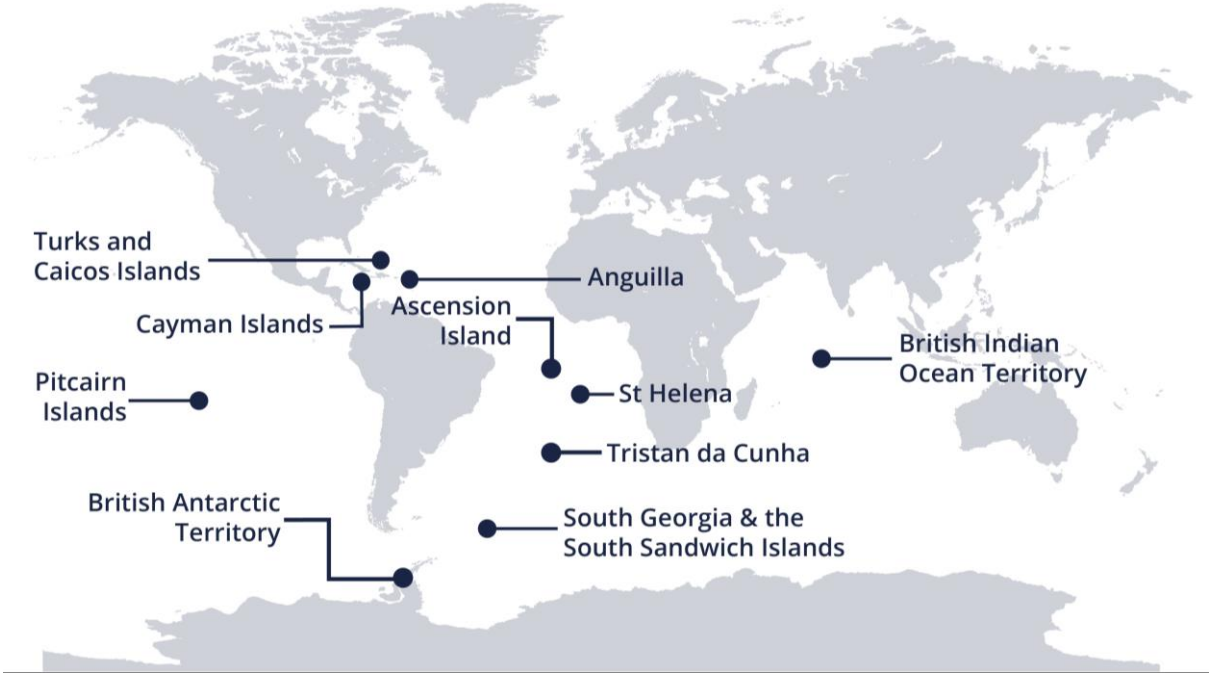
The Blue Belt is the UK Government's flagship international marine conservation Programme. Since 2016 it has worked closely with several UK Overseas Territories (UKOTs) to assist them in creating and maintaining healthy and productive ecosystems.

The UKOTs are home to some of the most incredible wildlife and habitats on the planet. In total, the UKOTs contain around 90% of the UK's biodiversity and host a huge range of unique and endangered species, some of which are found no-where else on earth.

Combined, their Marine Protected Areas (MPA) cover over 1% of world's ocean, meaning they have a significant impact in safeguarding precious marine environments and helping to combat global ocean threats such as climate change.

From cutting edge science to using innovative technology, this highly ambitious Programme is leading the way in supporting UKOTs in the effective management of their MPAs and ensuring they are safe guarded for future generations.

Current members of the Programme include:



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