

Prioritising Invasive Non-Native Species through Horizon Scanning on the UK Overseas Territories

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Executive summary

1. The threat posed by escalating numbers of INNS to biodiversity, human health and the economy is a major concern for the UK Overseas Territories (OTs). Indeed it is estimated that there are at least 2,261 non-native species occurring across the OTs (Bermuda has the highest documented occurrences with 1,139 species recorded and the South Sandwich Islands have none).
2. Horizon scanning (defined as a systematic examination of potential threats and opportunities based on consensus methods) was used to derive priority lists of invasive non-native species (INNS) with the potential to arrive, establish and threaten biodiversity and ecosystems, human health or the economy within the next ten years for 15 UK OTs; noting that the Cyprus SBAs were considered in a previous study.
3. A total of 147 experts from 52 organisations were involved during the study and assigned to the following thematic groups: vertebrates, marine species, invertebrates, plants. A thematic leader was designated for each group to provide continuity in approach and expertise across all 15 Territories. All of the experts external to the Centre for Ecology & Hydrology provided at least some of their time in-kind – estimated to amount to £990k. The regional experts provided invaluable context and knowledge; also often giving time in-kind. An estimated 10 days per OT per external expert was given as time in-kind. Assuming an average daily rate of £600 (likely an underestimate) per day, this is equivalent of approximately £990K.
4. More than 2,500 potential INNS were assessed. A total of 236 INNS (comprising 108 invertebrate species, 58 marine species, 87 plants and 79 vertebrates) were considered of sufficient threat to biodiversity and ecosystems, human health or economies to be included in at least one of the OT priority lists. More than half of the INNS only appeared on one UK Overseas Territory list. About 10% (n= 24) of the INNS were considered to have impacts across all three impact categories in more than one OT. INNS posing a threat to biodiversity and ecosystems was highest with 183 species. In contrast 97 and 52 INNS were considered to pose an economic or human health threat respectively. While plants (67 INNS) dominated the lists in terms of potential biodiversity and ecosystem impacts, invertebrates dominated the economic and human health lists with 51 and 22 INNS respectively.
5. A number of species were considered of particular note because of relevance across multiple OTs and impact categories. These include: little fire ant *Wasmannia auropunctata*, Asian tiger mosquito *Aedes albopictus*, giant African land snail *Lissachatina fulica*, brown rat *Rattus norvegicus*, lionfish *Pterois miles* and Asian green mussel *Perna viridis*, all considered to have the potential for biodiversity and ecosystem, human health and economic impacts. There are no current reliable estimates of costs of the selected INNS to economies but in assigning an INNS to a priority list on the basis of economic impacts implied severe negative effects on crops and livestock which are irreversible over large areas. The INNS most frequently prioritised across the OTs were animals but three plant species were notable in being considered a threat to several OTs and across impact categories: mesquite *Prosopis juliflora* (five UK OTs), pampas grass *Cortaderia selloana* (four OTs) and giant sensitive tree *Mimosa pigra* (three OTs).
6. The likely pathways of arrival were documented for all the INNS included within the agreed OT prioritised lists. Stowaway pathways (including pathways associated with air and shipping freight) were predicted to be a major way in which new INNS would be introduced; 50% of attributed pathways (n = 1,027) were within the stowaway category and 113 of these were attributed to INNS arriving as stowaways within containers (noting this refers to attribution of

a relevant pathway category for an INNS across OTs and impact categories). However, many INNS are also anticipated to arrive as contaminants or escapes from captivity; 222 and 199 attributed pathways respectively (noting attribution as above, across INNS, OTs and impact categories). The outcomes of the study provide a basis for pathway action planning to meet the specific needs of each OT. The discussions with the external and regional experts highlighted a number of key knowledge gaps and recommendations for further work.

7. The key recommendations include a focus on next steps, including development of Pathway Action Plans which were initiated through interactive sessions at the end of the horizon scanning workshop. Comprehensive risk assessments and application of standardised impact assessment approaches will ensure rigorous assessment of evidence but there is also a need to address key knowledge gaps particularly in the marine environment and through consideration of crop and wildlife diseases. Ultimately information could be communicated through development of INNS indicators and dissemination materials for raising awareness.

Contents

Executive summary	2
1.0 Introduction	5
2.0 Methods	6
Geographic scope.....	6
Consensus approach to horizon scanning	7
Information on pathways.....	9
3.0 Results.....	13
Overview	13
Impacts.....	15
Pathways.....	18
Caribbean UK Overseas Territories: Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat, Turks and Caicos Islands	41
British Indian Ocean Territory.....	55
South Atlantic Overseas Territories: British Antarctic Territory, Falkland Islands, South Georgia and South Sandwich Islands.....	57
Mid Atlantic Overseas Territories: Ascension, Saint Helena, Tristan da Cunha	62
Gibraltar	70
Pitcairn	74
4.0 Discussion.....	76
Diversity of INNS prioritised within the lists	76
Pathways of arrival.....	79
Conclusions and future directions	79
Overarching key recommendations:.....	80
Acknowledgements.....	82
References	83
Appendix 1: Complete list of potential INNS across all UK Overseas Territories and frequency of occurrence including each impact (biodiversity and ecosystems, human health and economic) lists	86

1.0 Introduction

Invasive non-native species (INNS) are defined as species, introduced through human action outside of their native range, that have the ability to spread causing damage to the environment, the economy, our health or the way we live (Roy *et al.* 2012). Over the last century there has been a dramatic increase in the movement of non-native species around the world (Seebens *et al.* 2017; Seebens *et al.* 2018), as a consequence of increasing international trade and travel (Hulme *et al.* 2009; Seebens *et al.* 2015). Non-Native Species are being introduced into countries at unprecedented and unpredictable rates and those that become invasive threaten biodiversity by decreasing the uniqueness of ecosystems at genetic, functional and taxonomic levels (Vila *et al.* 2011). The vulnerability of islands to biological invasions is well-known (Simberloff 1995) and as such INNS are considered one of the greatest threats to island biodiversity.

Thirteen of the sixteen UK Overseas Territories (OTs) are islands and archipelagos: Anguilla, Bermuda, British Indian Ocean Territory, British Virgin Islands (BVI), Cayman Islands, Falkland Islands, Montserrat, Pitcairn Islands, St Helena, Ascension and Tristan da Cunha, South Georgia and the South Sandwich Islands (SGSSI) and Turks and Caicos Islands (TCI). The exceptions are Gibraltar, the Cyprus Sovereign Base Areas (SBAs) and the British Antarctic Territory (BAT). However, Gibraltar is attached to mainland Spain but can be considered as an island from a biogeographical point of view. The Cyprus SBAs are small areas within the island of Cyprus. The British Antarctic Territory is a segment of the Antarctic continent.

These unique and often remote localities are rich in biodiversity with over 32,000 native species recorded (including 1,500 endemic species) and an estimated 70,000 species yet to be documented (Churchyard *et al.* 2016). Three-quarters of the species endemic to the OTs that have been assessed using IUCN Red List criteria (noting that the status of 91% of the OTs endemic species is unknown) are globally threatened (Churchyard *et al.* 2016). The threat posed by escalating numbers of INNS to biodiversity but also human health and the economy is a major concern for the OTs. Indeed it is estimated that there are at least 2,261 non-native species occurring across the OTs; Bermuda has the highest documented occurrences with 1139 species recorded and the South Sandwich Islands have none (Varnham 2006).

The Convention on Biological Diversity (CBD) suggests a three-stage hierarchical approach to INNS: prevention, surveillance and rapid response, control and eradication. This approach has been followed in the Invasive Non-Native Species Framework Strategy for Great Britain (Defra 2008; Defra 2015). The OTs are included within the Invasive Non-Native Species Framework Strategy for Great Britain (Defra 2015) specifically:

Key Action 9.5 strengthen support for the Overseas Territories and Crown Dependencies, for example by:

- *Continuing Defra support of the overseas territories identification service for invertebrate plant pests, delivered by Fera;*
- *Sharing technical expertise;*
- *Providing training, including biosecurity training*

“Tackling Invasive Non-Native Species in the UK Overseas Territories” is a project initiated in 2016 with funding from the Foreign and Commonwealth Office (Conflict, Stability and Security Fund). The overarching objective of the project is “to improve the biosecurity of the Overseas Territories against invasive non-native species to improve their environmental resilience and food security; achieved through reducing the risk and impact of invasion and natural hazards via technical assistance and

capacity building". The first step in the process was gap analysis of biosecurity practices and capacity across the OTs (Key 2017) which provided three overarching recommendations:

- *Address the fundamental areas of horizon scanning, pathway analysis and risk assessment, in order to provide the information necessary to develop a cost-effective biosecurity strategy appropriate to each territory's needs;*
- *Establish the framework, both legal and policy;*
- *Provide appropriate training to support implementation.*

Undertaking horizon scanning to inform biosecurity was seen as a priority for all the OTs (Key 2017). Horizon scanning can be defined as a systematic examination of potential threats and opportunities. There are many possible approaches to horizon scanning (Roy *et al.* 2015) but the merits of using a combination of approaches and concluding with a consensus workshop to create a ranked list of INNS (all plant and animal taxa, excluding microorganisms, across all environments) that are likely to arrive, establish and have an impact within the following ten years has been demonstrated (Roy *et al.* 2014; Roy *et al.* 2019). Consensus approaches have many advantages particularly when there are knowledge gaps and information is limited. Indeed bringing together groups of experts from across disciplines can be extremely fruitful and lead to high levels of knowledge exchange and capacity building while meeting the objectives of the workshop.

Here, we present a consensus approach which was adopted for the OTs based on studies in Great Britain (Roy *et al.* 2014) and Europe (Roy *et al.* 2019) and building on the OTs biosecurity pathway analysis carried out by the Non-Native Species Secretariat (Key 2018). We extended the scope to include human health using methods developed through a Darwin Plus funded initiative within the Cyprus SBAs (Peyton *et al.* 2019). Additionally we assessed the economic impacts of potential INNS using a framework developed specifically for this project. For all the INNS included within the agreed OTs prioritised lists we documented the pathways (Harrower *et al.* 2018) by which they are most likely to arrive. Therefore, the outcomes of the study provide a basis for pathway action planning to meet the specific needs of each OT.

2.0 Methods

Geographic scope

The 15 OTs considered within this study¹:

1. Caribbean OTs 21st – 25th May 2018 (included participants from: Anguilla, Bermuda, BVI, Cayman Islands, Montserrat, TCI). An initial list for all Caribbean OTs was compiled and then scoring for each of the six Caribbean OTs was undertaken with participants from all Caribbean OTs contributing to all lists. However, the final consensus on the priority INNS was agreed by experts from the specified Caribbean OTs.
2. British Indian Ocean Territory 31st July to 3rd August 2018. The remote location of the British Indian Ocean Territory limited participation at the workshop but the experts included corresponded virtually with others to derive the preliminary lists. However, the final

¹ Cyprus SBAs lists for biodiversity and ecosystems but also human health were undertaken in advance of this project with Darwin Initiative Funding (Peyton *et al.*, 2019) (Annex 1). An additional meeting with experts in Cyprus is planned to ensure INNS with the potential to arrive, establish and have economic impacts are prioritised at a workshop planned in Autumn 2019.

consensus on the priority INNS was agreed by the three experts represented at the workshop in discussion with the visiting experts.

3. South Atlantic OTs 22nd to 25th October 2018 (included participants from: BAT, Falkland Islands, SGSSI). Initial lists were compiled individually for each of the three South Atlantic OTs and then scoring for each of the South Atlantic OTs was undertaken with participants from all participating experts. However, the final consensus on the priority INNS was agreed by experts from the specified OTs.
4. Mid Atlantic OTs 12th to 16th November 2018 (included participants from: Ascension, Saint Helena, Tristan da Cunha). Initial lists were compiled individually for each of the three Mid Atlantic OTs and then scoring for each of the Mid Atlantic OTs was undertaken with participants from all participating experts. However, the final consensus on the priority INNS was agreed by experts from the specified OTs.
5. Gibraltar 21st to 24th January 2019
6. Pitcairn 21st November 2018 & 14th February 2019. The remote location of Pitcairn precluded the visiting experts meeting with the OT but the experts included corresponded virtually with others to derive the preliminary lists. However, the final consensus on the priority INNS was agreed by the experts represented through Skype calls culminating with the consensus workshop on 14th February.

Consensus approach to horizon scanning

We used an adapted version of the consensus method (Sutherland *et al.* 2011) for a horizon scanning approach previously used to derive a ranked list of potential Invasive Non-Native Species with high impact on biodiversity and ecosystems in Great Britain (Roy *et al.* 2014) and Europe (Roy *et al.* 2019) (Figure 1). We extended the approach to consider human health and economic impacts.

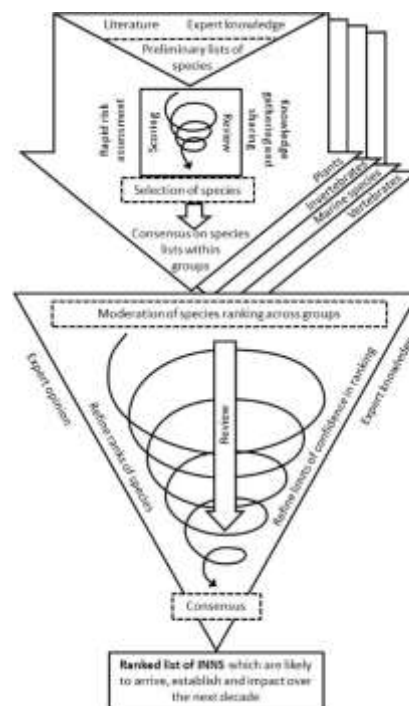


Figure 1. Horizon scanning process, based on consensus method, to derive a ranked list of INNS which are likely to arrive, establish and have an impact on the OTs over the next decade.

The process involved a sequence of steps which were outlined to the participants at the beginning of the process (Annex 2):

Step 1. Establishment of thematic groups

Species were considered within four broad thematic groups:

- Plants (lead: Oli Pescott, Centre for Ecology & Hydrology, UK)
- Invertebrates (lead: Wolfgang Rabitsch, Environment Agency Austria)
- Vertebrates (lead: Tim Adriaens, Research Institute for Nature and Forest, Belgium)
- Marine species (lead: Elizabeth Cottier-Cook, Scottish Association for Marine Science (SAMS) Associate Institute, UK)

Elena Tricarico, University of Florence, provided co-leadership across all groups other than plants.

The leading experts were selected to ensure sufficient knowledge across taxonomic groups and environments but also had relevant experience of biological invasions on a global scale. For each UK Overseas Territory the leaders selected experts from around the world to support the drafting of lists and also in some cases the consensus. Regional experts on each UK Overseas Territory provided critical expertise and were selected in consultation with relevant organisations within the various OTs. An estimated 10 days per OT per external expert was given as time in-kind. Assuming an average daily rate of £600 (likely an underestimate) per day, this is equivalent of approximately £990K.

A total of 147 experts from 52 organisations were involved during the study and assigned to the following thematic groups: vertebrates, marine species, invertebrates, plants. A thematic leader was designated for each group to provide continuity in approach and expertise across all 15 Territories. All of the experts external to the Centre for Ecology & Hydrology provided at least some of their time in-kind – estimated to amount to £990k. The regional experts provided invaluable context and knowledge; also often giving time in-kind.

Step 2. Compilation of preliminary lists of potential Invasive Non-Native Species

Each thematic group was asked to assemble preliminary lists of potential Invasive Non-Native Species that they considered to constitute the highest risk with respect to the likelihood of arrival, establishment and the magnitude of their potential negative impact on biodiversity and ecosystems or human health or economies over the next ten years. Each thematic group derived these lists from a combination of systematic literature searches (including academic journals, risk assessments, reports, authoritative websites and other 'grey' literature), checklists, floras, querying of INNS databases and their own expert knowledge. The approaches adopted by each thematic group differed slightly with respect to methods followed to derive the preliminary lists because of the diverse nature of the taxonomic groups and variation in the sources of information available (Annex Table 1). The leaders coordinated activities and discussion between group members throughout the process.

The geographic scope of the search for potential INNS was global but with the following restrictions:

- (i) Are absent in the specified OT
- (ii) Have documented histories of invasion and causing undesirable impacts in other regions worldwide with similar climatic conditions
- (iii) Traded within the specified OT or are present in areas that have strong trade or travel connections with the specified OT and where there is a recognised potential pathway for arrival.
- (iv) Are present in captivity including zoological parks, aquaculture facilities and glass houses.

The temporal scope of the horizon scanning exercise was that only species likely to arrive in the next 10 years within the specified OT should be included. This temporal limit informs the relevance of, for instance, long-term climate change projections.

The consultation between experts was completed both through e-mail discussions in advance of the workshops and through the workshop breakout groups.

Step 3: Scoring of species

Experts were advised that the scoring approach was not absolute but to provide an initial ranking of all potential INNS. This context was important to ensure that experts were empowered to use expert judgement alongside available evidence sources. Experts were asked to score each species within their thematic group for their separate likelihoods of: i) arrival, ii) establishment, iii) magnitude of the potential negative impact on biodiversity or ecosystems, human health or economies within the specified OT. A 5-point scale from 1=very low to 5=very high (Blackburn *et al.* 2014) was adopted. The scores from each expert within each thematic group were then compiled and discussions within the thematic groups (at the workshop) led to an overall agreed impact and confidence score for each species.

Scoring arrival

Scores for the likelihood of arrival were based on a consideration of several relevant factors, including: previous history of invasion by the species in other regions; the existence of a plausible introduction pathway; qualitative consideration of volume and frequency of trade and travel between the existing range of the species and the specified OT. A score of 1 denoted that the species was considered unlikely to arrive in the OT within the chosen timeframe. A score of 5 was used to denote near-certain, arrival; for example if there was a previously documented inception of the species. In the case of species already in the OT (such as those held commonly in captivity or planted in gardens), the likelihood of arrival was agreed to be given a score of 5.

Scoring establishment

Having arrived, the probability of a species establishing a self-sustaining population in the wild depends on the ecological properties of both the species and the community that it is invading (Leung *et al.* 2012). Scores therefore reflected life-history characteristics including reproductive rate and ecological features such as tolerance of a broad range of environmental conditions or availability of food supply in the introduced range.

Scoring impacts

Impacts were scored for each of the three impact categories (biodiversity and ecosystems (e.g. species, habitats, ecosystems and ecosystem functioning), human health or economies (Annex Table 2). The impact scoring system was modified from the Invasive Species Environmental Impact assessment protocol (Branquart *et al.* 2009), the GB Non-Native Risk Assessment scheme (Booy, White & Wade 2006) and the proposed unified framework for environmental impacts - Environmental Impact Classification of Alien Taxa EICAT (Blackburn *et al.* 2014; Hawkins *et al.* 2015) and Socio-Economic Impact Classification of Alien Taxa SEICAT (Bacher *et al.* 2017).

Confidence levels

Confidence levels (high, medium or low confidence) were attributed to each score to help focus discussions and refine the list of species and in guiding discussion within some thematic groups (Annex Table 3).

While acknowledging that the scores were only for guidance on ranking and not to be used as absolute, an overall risk score for each species was calculated as the product of the individual scores for arrival, establishment and impact on biodiversity. With a 3-criterion, 5-point scoring system, this produces a maximum score of 125.

Information on pathways

Information was gathered throughout the workshop by the experts within the thematic groups on the likely pathways of arrival (CBD 2014), using published classifications (Harrower *et al.* 2018) (Figure 2). It should be noted that the pathways Horticulture and Ornamental were difficult to distinguish in this context and so are used synonymously in many cases with only Ornamental is being documented.

	Category	Subcategory
Movement of Commodity	Release in Nature	Biological control
		Erosion control/ dune stabilization (windbreaks, hedges, ...)
		Fishery in the wild (including game fishing)
		Hunting
		Landscape/flora/fauna "improvement" in the wild
		Introduction for conservation purposes or wildlife management
		Release in nature for use (other than above, e.g., fur, transport, medical use)
		Other intentional release
	Escape from Confinement	Agriculture (including Biofuel feedstocks)
		Aquaculture / mariculture
		Botanical garden/zoo/aquaria (excluding domestic aquaria)
		Pet/aquarium/terrarium species (including live food for such species)
		Farmed animals (including animals left under limited control)
		Forestry (including afforestation or reforestation)
		Fur farms
		Horticulture
		Ornamental purpose other than horticulture
		Research and ex-situ breeding (in facilities)
		Live food and live bait
		Other escape from confinement
	Transport - Contaminant	Contaminant nursery material
		Contaminated bait
		Food contaminant (including of live food)
		Contaminant on animals (except parasites, species transported by host/vector)
		Parasites on animals (including species transported by host and vector)
		Contaminant on plants (except parasites, species transported by host/vector)
		Parasites on plants (including species transported by host and vector)
		Seed contaminant
		Timber trade
		Transportation of habitat material (soil, vegetation,...)

Figure 2. Pathway classification (Harrower *et al.* 2018)

Step 4: Expert (consensus) workshop

The participants for each of the seven workshops are outlined in the Annex to this report. Some participants contributed virtually but many participated in the workshops. In all cases participants at each workshop contributed to the compilation of information for all the OTs included within each workshop but the final consensus on the priority INNS was agreed by experts from the specified OT. The variations in approach at each workshop which were necessary because of logistical considerations are outlined here:

1. Caribbean OTs - initial list for all Caribbean OTs was compiled and then scoring for each was undertaken with participants from all Caribbean OTs contributing to all lists. However, the final consensus on the priority INNS was agreed by experts from the specified Caribbean OTs.
2. British Indian Ocean Territory - remote location of BIOT limited participation at the workshop but the experts included corresponded virtually with others to derive the preliminary lists. However, the final consensus on the priority INNS was agreed by the three experts represented at the workshop in discussion with the visiting experts.
3. South Atlantic OTs - initial lists were compiled individually for each of the three South Atlantic OTs and then scoring for each was undertaken with participants from all participating experts. However, the final consensus on the priority INNS was agreed by experts from the specified OTs.
4. Mid Atlantic OTs - initial lists were compiled individually for each of the three Mid Atlantic OTs and then scoring for each was undertaken with participants from all participating experts. However, the final consensus on the priority INNS was agreed by experts from the specified OTs.
5. Gibraltar– no modifications to the approach outlined in the methods.
6. Pitcairn– external experts met on 21st November 2018 (while in St Helena) to compile provisional lists which were circulated to all participating experts in advance of the 3.5 hour Skype workshop held on 14th February 2019.

Each of the workshops followed a similar agenda (Annex Figure 1).

The aims of the workshop were outlined and then an overview of the INNS selected by each thematic group was presented to inform the other participants of the range of species and their life-histories within each group, enabling subsequent review and moderation of the scores within the breakout sessions for each thematic group. During the breakout session, participants were requested to add or remove species, to justify and moderate scores and to consider levels of confidence attached to scores. All the species lists from across the thematic groups were collated into single lists for each of the impact categories (biodiversity and ecosystems, human health or economic). Experts were invited to justify their scores in comparison to those of other groups. Scores were adjusted accordingly.

All participants were then invited to review, consider and refine the rankings of all species through plenary discussion. Again scores were adjusted accordingly. The end result was agreed ranked lists of INNS with the potential to arrive establish and pose a threat through biodiversity and ecosystem, human health or economic impacts.

Step 5: Post workshop compilation of information on species

Following the workshop all participants were invited to review the pathway information for the INNS identified as priorities. Additional taxonomic information and other details for the INNS were also reviewed.

3.0 Results

Overview

More than 2,500 potential INNS were assessed. A total of 236 INNS (comprising 108 invertebrate species, 58 marine species, 87 plants and 79 vertebrates) (Appendix 1) were considered of sufficient threat to biodiversity and ecosystems, human health or economies to be included in at least one of the OTs lists. 138 INNS only appeared on one OT list but some species had multiple impacts across Territories (Table 1).

Table 1. Frequency of occurrence (>10, 6 to 10, 2 to 5 or 1) of potential INNS on the OTs priority lists (biodiversity and ecosystem, human health or economic impacts)

Frequency	Number of INNS
More than 10	1
6 to 10	10
2 to 5	87
1	138

Some of the species were considered high priority by many of the OTs and some cause impacts across multiple categories: biodiversity and ecosystem, human health or economic (Table 2). Indeed more than half of the INNS only appeared on one OT list. About 10% (n= 24) of the INNS were considered to have impacts across all three impact categories in more than one OT. INNS posing a threat to biodiversity and ecosystems was highest with 183 species. In contrast 97 and 52 INNS were considered to pose an economic or human health threat respectively. While plants (67 INNS) dominated the lists in terms of potential biodiversity and ecosystem impacts, invertebrates dominated the economic and human health lists with 51 and 22 INNS respectively.

Table 2. INNS occurring on five or more of the lists derived across the UK Overseas Territory. Noting that some species were listed against more than one impact (biodiversity and ecosystem, human health or economic) category.

Species	Common name	Frequency of occurrence
<i>Perna viridis</i>	Asian green mussel	21
<i>Wasmannia auropunctata</i>	little fire ant	18
<i>Lissachatina fulica</i>	giant African land snail	14
<i>Rattus norvegicus</i>	brown rat	13
<i>Aedes albopictus</i>	Asian tiger mosquito	11
<i>Pterois miles</i>	lionfish	11
<i>Magallana gigas</i>	Pacific oyster	11
<i>Aedes aegypti</i>	yellow fever mosquito	10
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	10
<i>Psittacula krameri</i>	rose-ringed parakeet / ring necked parakeet	9
<i>Ceratitis capitata</i>	Mediterranean fruit fly	8
<i>Boa constrictor imperator</i>	common boa constrictor	8
<i>Amblyomma cajennense</i>	cayenne tick	8
<i>Solenopsis invicta</i>	red imported fire ant	8
	Asian subterranean termite or Formosan subterranean	
<i>Coptotermes formosanus</i>	termite	7
<i>Vespula germanica</i>	German wasp / European wasp	7
<i>Tuta absoluta</i>	tomato leaf miner	7
<i>Corvus splendens</i>	house crow	6
<i>Spodoptera frugiperda</i>	fall armyworm	6
<i>Bactrocera carambolae</i>	carambola fruit fly	6
<i>Mytilus edulis</i>	blue mussel	6
<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	6
<i>Aratinga erythrogenys</i>	red-masked conure	6
<i>Diaphorina citri</i>	Asiatic citrus psyllid	6
<i>Prosopis juliflora</i>	mesquite	6
<i>Anoplolepis gracilipes</i>	yellow crazy ant	5
<i>Vespula vulgaris</i>	common wasp	5
<i>Anopheles gambiae</i>	mosquito	5
<i>Coptotermes gestroi</i>	Asian subterranean termite	5
<i>Cortaderia selloana</i>	pampas grass	5
<i>Rattus rattus</i>	black rat / ship rat	5
<i>Scyphophorus acupunctatus</i>	agave snout weevil	5
<i>Carcinus maenas</i>	European shore crab	5
<i>Mimosa pigra</i>	giant sensitive tree	5
<i>Undaria pinnatifida</i>	Asian kelp	5
<i>Myiopsitta monachus</i>	monk parakeet	5
<i>Mus musculus</i>	house mouse	5

Impacts

For all of the OTs a higher number of INNS were listed as a threat to biodiversity and ecosystems than within either the human health or economic impact category (Figure 3). The number of potential INNS considered to be a priority varied across OTs (Table 3; Figure 4). Indeed the latter two categories were seen as negligible importance for the South Atlantic OTs (BAT, Falkland Islands, South Georgia and the South Sandwich Islands) recognising the low human population densities and low productivity. In contrast many of the Caribbean OTs have important crop production and high numbers of tourists which increased the relevance of human health and economic impacts.

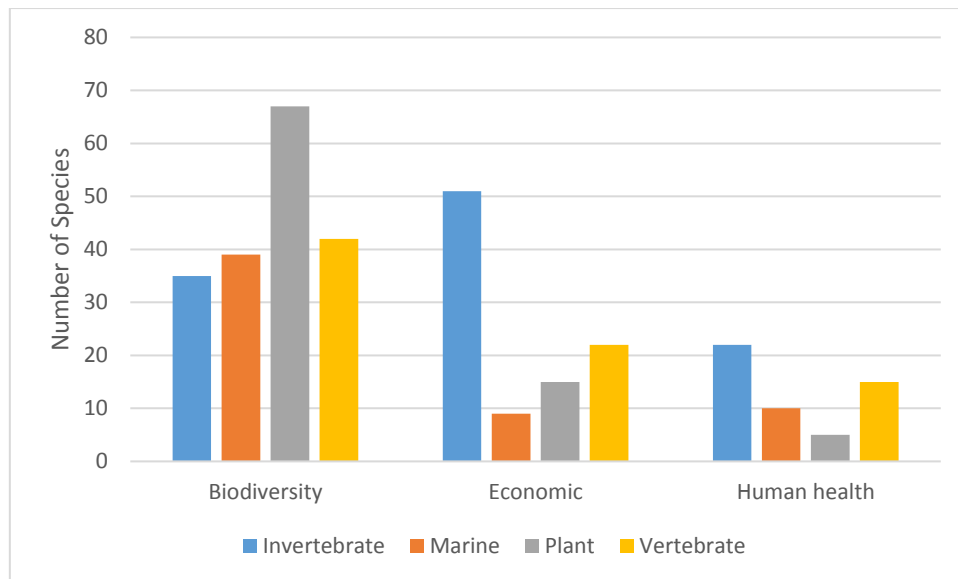


Figure 3. Number of potential INNS (Invertebrate, Marine, Plant, Vertebrate) considered as priority for action within the three impact categories (Biodiversity, Human health, Economic) across all OTs

Table 3. Number of potential INNS considered as priority for action within the three impact categories (Biodiversity, Human health, Economic) assessed.

	Biodiversity	Human health	Economic	Total
Anguilla	10	10	10	30
Ascension	29	6	10	45
Bermuda	21	9	18	48
British Antarctic Territory	15	0	1	16
British Indian Ocean Territory	25	15	10	50
British Virgin Islands	11	15	25	51
Cayman Islands	14	5	13	32
Falkland Islands	25	1	8	34
Gibraltar	41	11	23	75
Montserrat	10	10	10	30
Pitcairn	23	7	17	47
Saint Helena	40	8	20	68
South Georgia and South Sandwich Islands	20	0	3	23
Tristan da Cunha	22	5	10	37
Turks and Caicos Islands	10	10	10	30

The clusters of OTs represent broad regional patterns of potential INNS for invertebrates, marine, plants and vertebrates within each of the three impact categories (Biodiversity, Human health, Economic) assessed (Figure 4; Tables 4-18). In most cases plants were well-represented within the lists of INNS predicted to arrive across all the Territories but were low for the British Indian Ocean Territory (which has extremely stringent regulations about imports of live plants). The number of invertebrates on lists of INNS anticipated to have economic impacts was high; many of the plant pests are insects. Marine INNS were considered high priority across all OTs and particularly with respect to biodiversity impacts. Numbers of marine INNS were very high within the South Atlantic and Gibraltar lists. The number of INNS considered a threat to human health were low on all the Territories lists although a reasonably high number were recognised as a threat to the Caribbean.

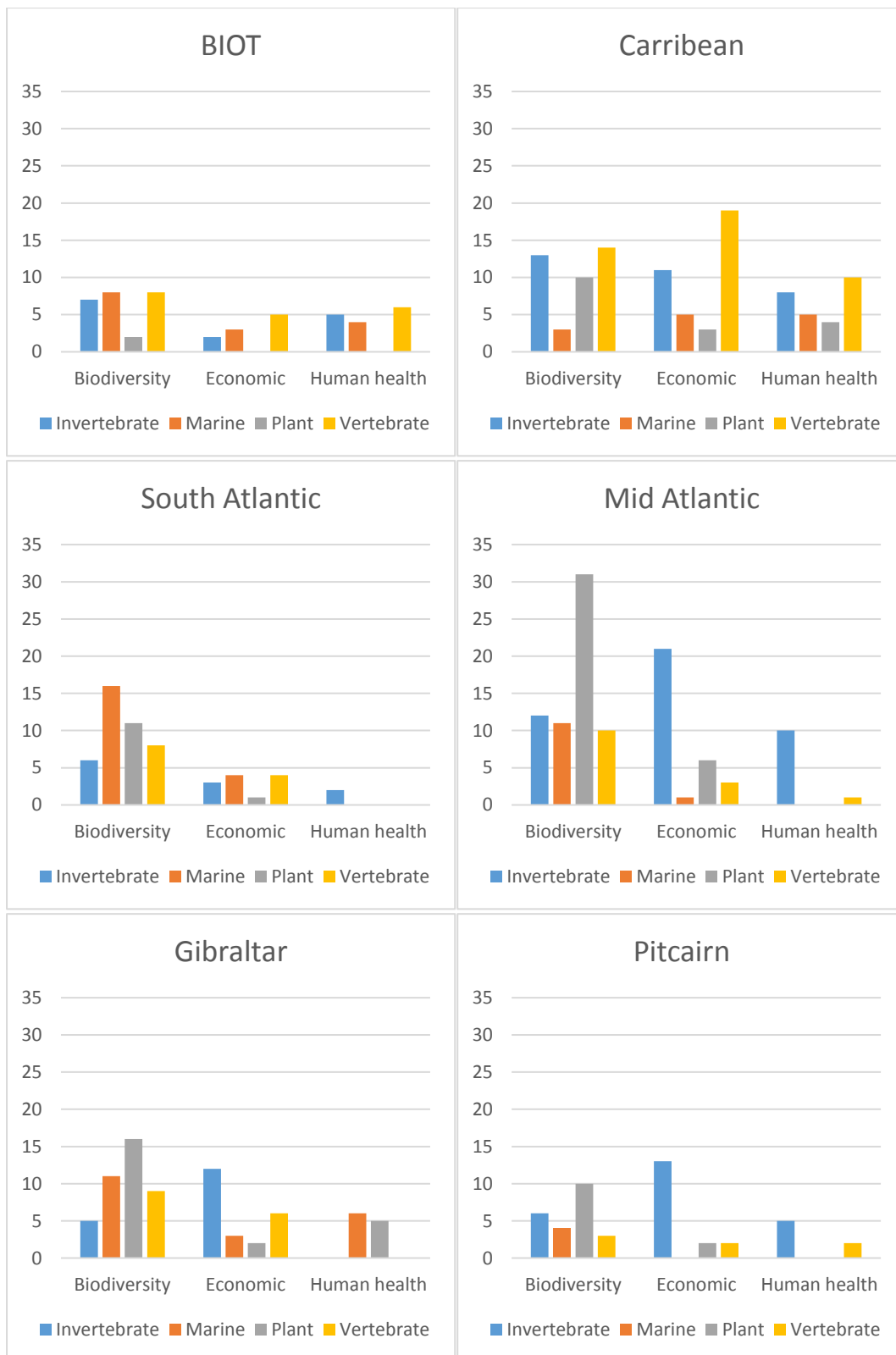


Figure 4. Number of potential INNS (Invertebrate, Marine, Plant, Vertebrate) considered as priority for action within the three impact categories (Biodiversity, Human health, Economic) assessed across each of the six clusters of OTs (Caribbean, British Indian Ocean Territory, South Atlantic, Mid Atlantic, Gibraltar, Pitcairn)

Pathways

The most likely way in which a potential INNS will arrive on one of the OTs is as a Stowaway (Figure 5) with pathways associated with shipping being dominant. However, the Ornamental pathway (Orn) is predicted to be common way in which plants arrive. It is important to note that some of the species attributed to the Ornamental pathway might also arrive through the Horticultural pathway (Harrower *et al.* 2018) but it is difficult to discern whether a species would escape from a nursery (which are limited in scale and distribution across the OTs) or garden but both represent escape of plants into the wider countryside. Pathways of arrival associated with pets (Pet), Botanical Gardens, Zoos and Aquaria (BZA) are also predicted to be major ways in which INNS escape. Contamination is also seen to be important in introducing potential INNS, for example high numbers of INNS are anticipated to arrive as Contaminants of Habitat Material (CHM) or Nursery Material (CNM) or on plants (Con Plant). Some of the pathways within the CBD Classification (Harrower *et al.* 2018) were not seen to be relevant to the OTs.

In most cases each identified pathway has INNS predicted to have biodiversity, human health or economic impacts (Figure 5a and b). However, Timber Trade (TT) and Parasites on Plants (Par Plants) are only likely to introduce INNS with economic impacts whereas Aquaculture (Aq) and Fishery in the wild (F) are predicted to introduce species with biodiversity and ecosystem impacts.

The relevance of different pathways varies among the OTs (Figures 5b, 6-11). As an example the Transport-Contaminant pathways are considered most important to the Caribbean where the volume of trade in goods and produce is likely to be highest. In all cases, as already stated the Transport-Stowaway pathways dominate but this is particularly apparent for Pitcairn and the British Indian Ocean Territories.

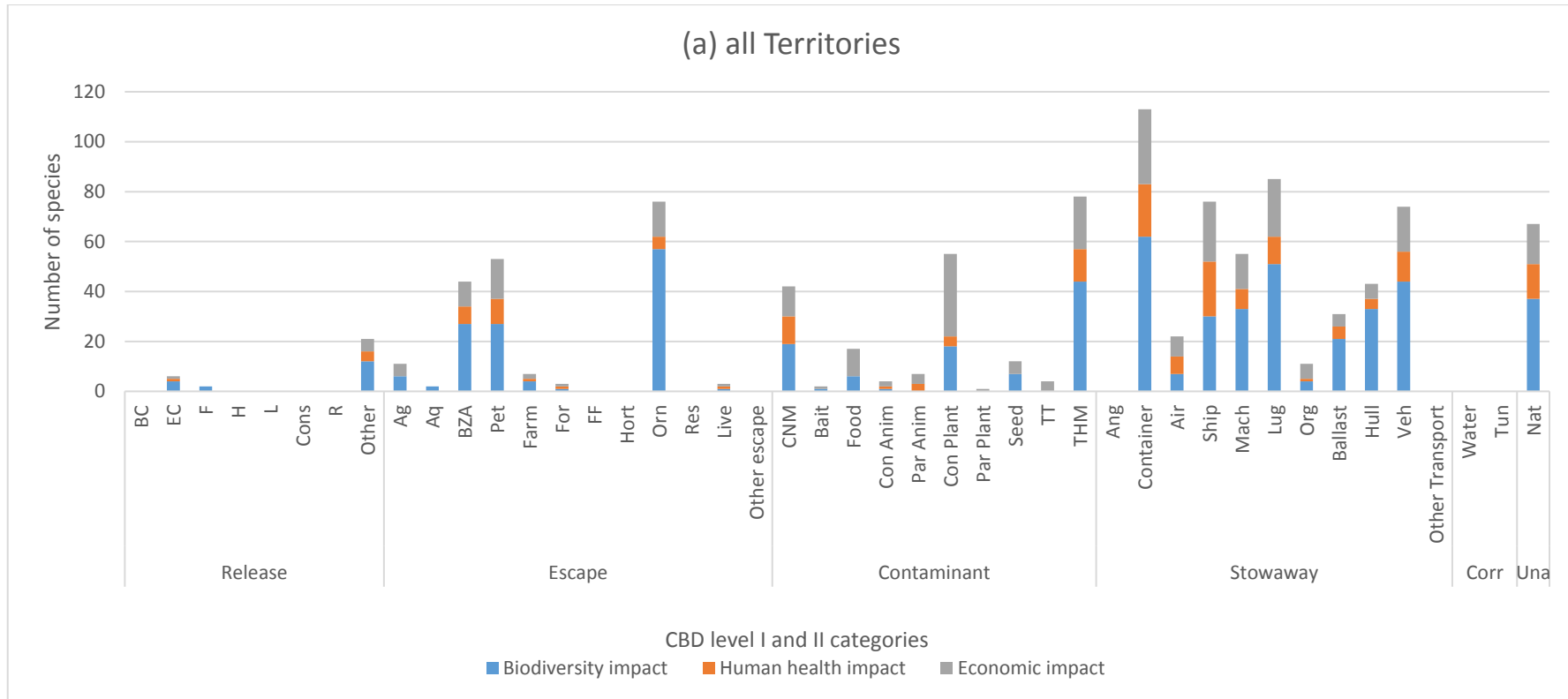
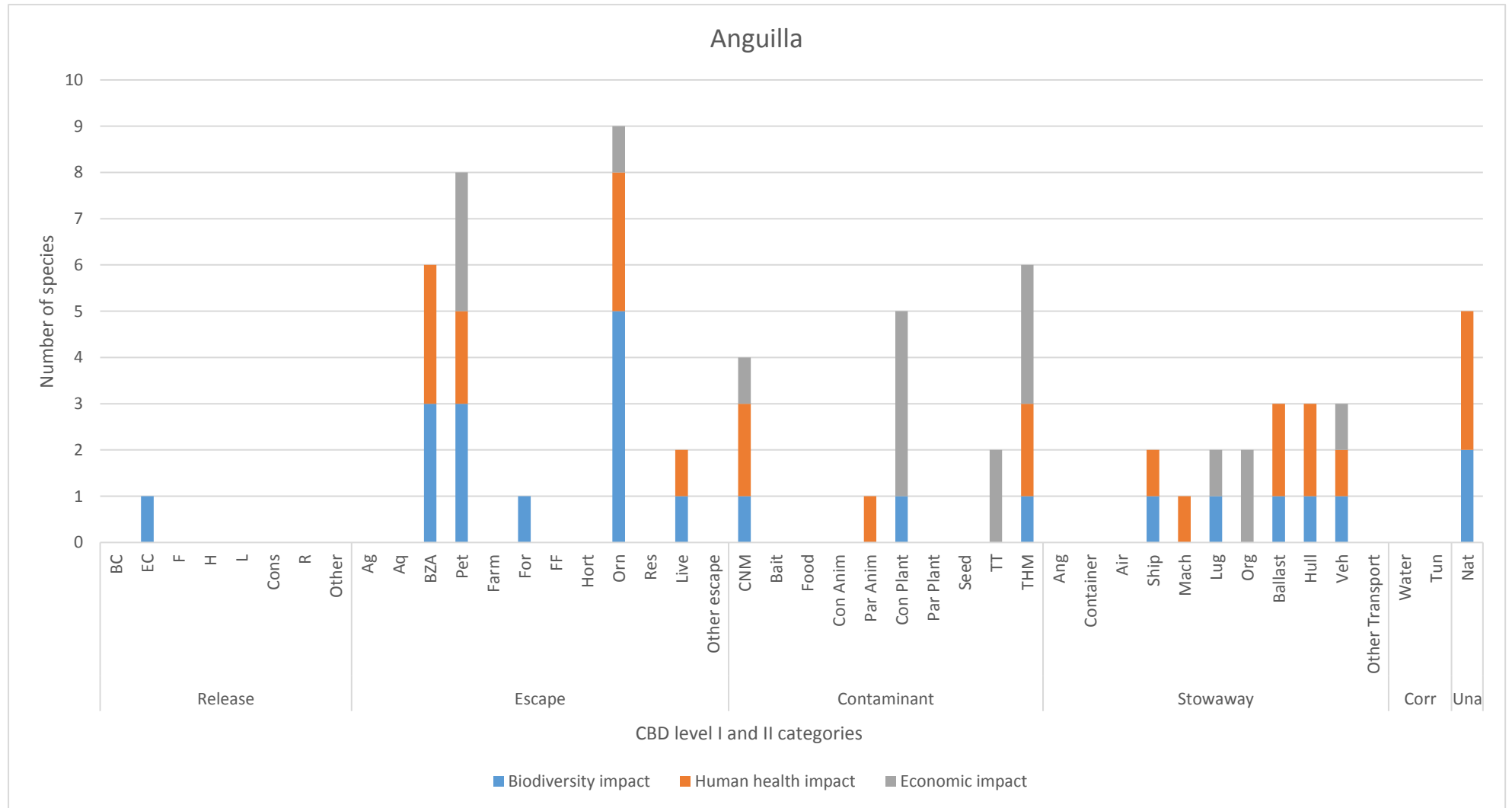
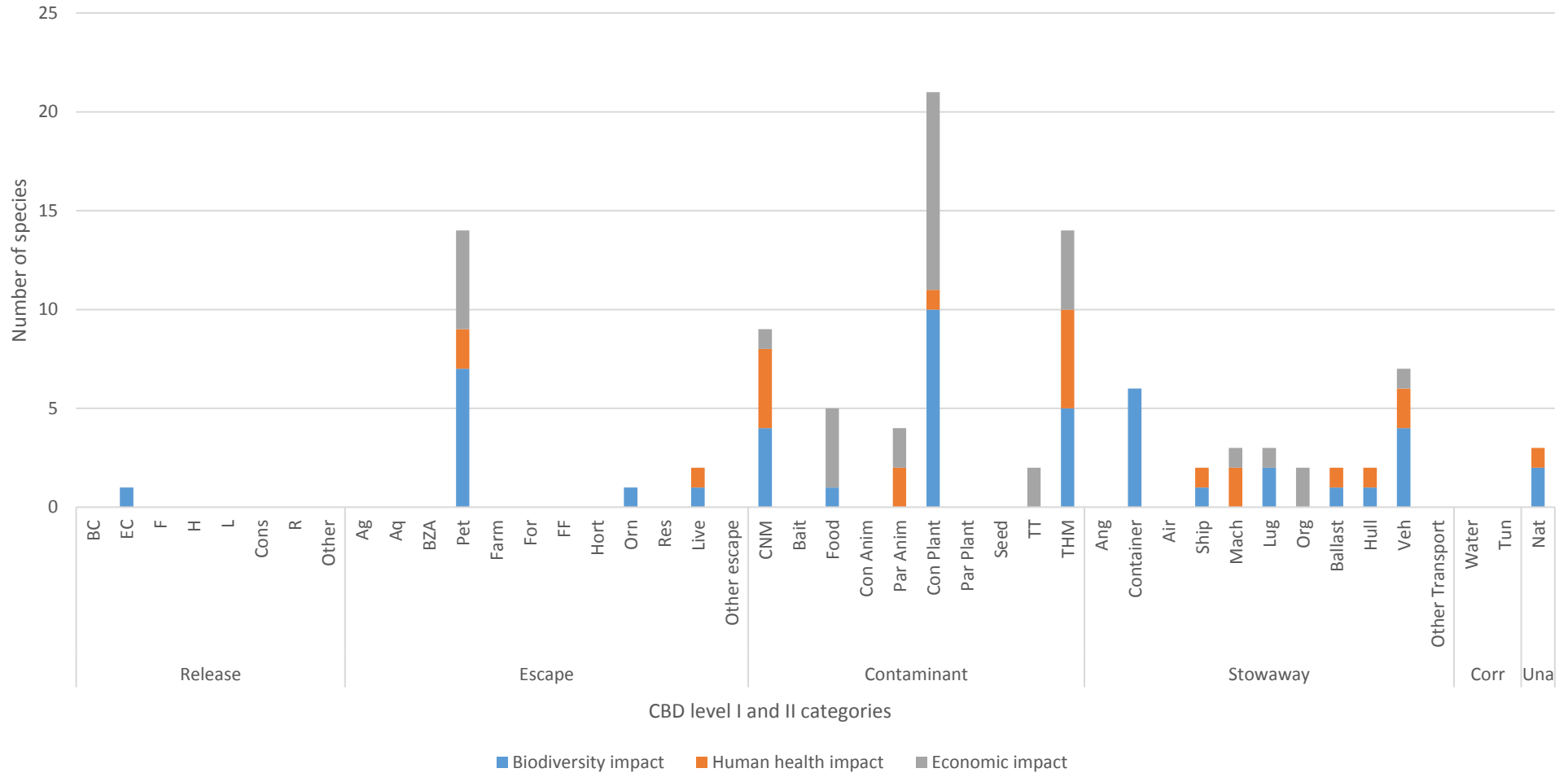


Figure 5: Number of Invasive Non-Native Species (INNS) predicted to have biodiversity, human health or economic impacts following arrival through the CBD level II pathways of introduction and represented within their overarching CBD I category for (a) all Territories and (b) each individual Territory: Release: BC = Biological control; EC = Erosion control; F = Fishery in the wild; H = Hunting; L = Landscape/flora/fauna “improvement” in the wild; Cons = Introduction for conservation purposes or wildlife management; R = Release in nature for use (other than above, e.g., fur, transport, medical use); Other = Other escape from confinement; Escape: Ag = Agriculture; Aq = Aquaculture/mariculture; BZA = Botanical garden/zoo/aquaria; Pet = Pet/aquarium/terrarium species; Farm = Farmed animals; FF = Fur farms; For = Forestry; Hort = Horticulture; Orn = Ornamental purpose other than horticulture; Res = Research and ex situ breeding; Live = Live food and live bait; Other escape = Other escape from confinement; Contaminant: CNM = Contaminant nursery material; Bait = Contaminated bait; Food = Food contaminant; Con Anim = Contaminant on animals; Par Anim = Parasites on animals; Con Plant = Contaminant on plants; Par Plant = Parasites on plants; Seed = Seed contaminant; TT = Timber trade; THM = Transportation of habitat material; Stowaway: Ang = Angling/fishing equipment; Container = Container/bulk; Air = Hitchhikers in or on airplane; Ship = Hitchhikers on ship/boat; Mach = Machinery/equipment; Lug = People and their luggage/equipment; Org = Organic packing material, in particular wood packaging; Ballast = Ship/boat ballast water; Hull = Ship/boat hull fouling; Veh = Vehicles; Other Transport= Other means of transport; Corridor (Corr): Water = Interconnected waterways/basins/seas; Tun = Tunnels and land bridges; Unaided (Una): Nat = Natural dispersal across borders of invasive alien species that have been introduced through pathways 1–5

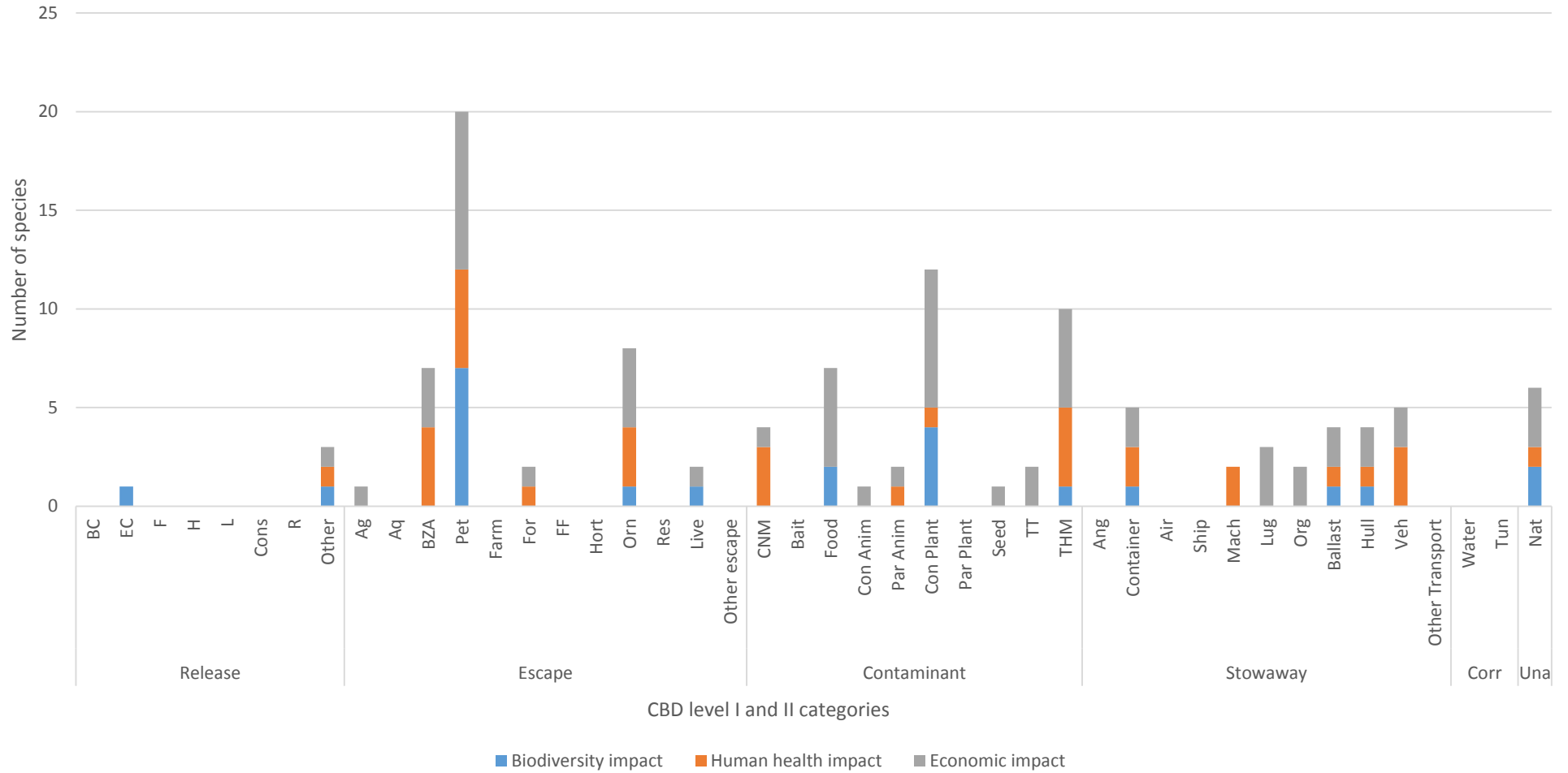
(b) Each individual Territory



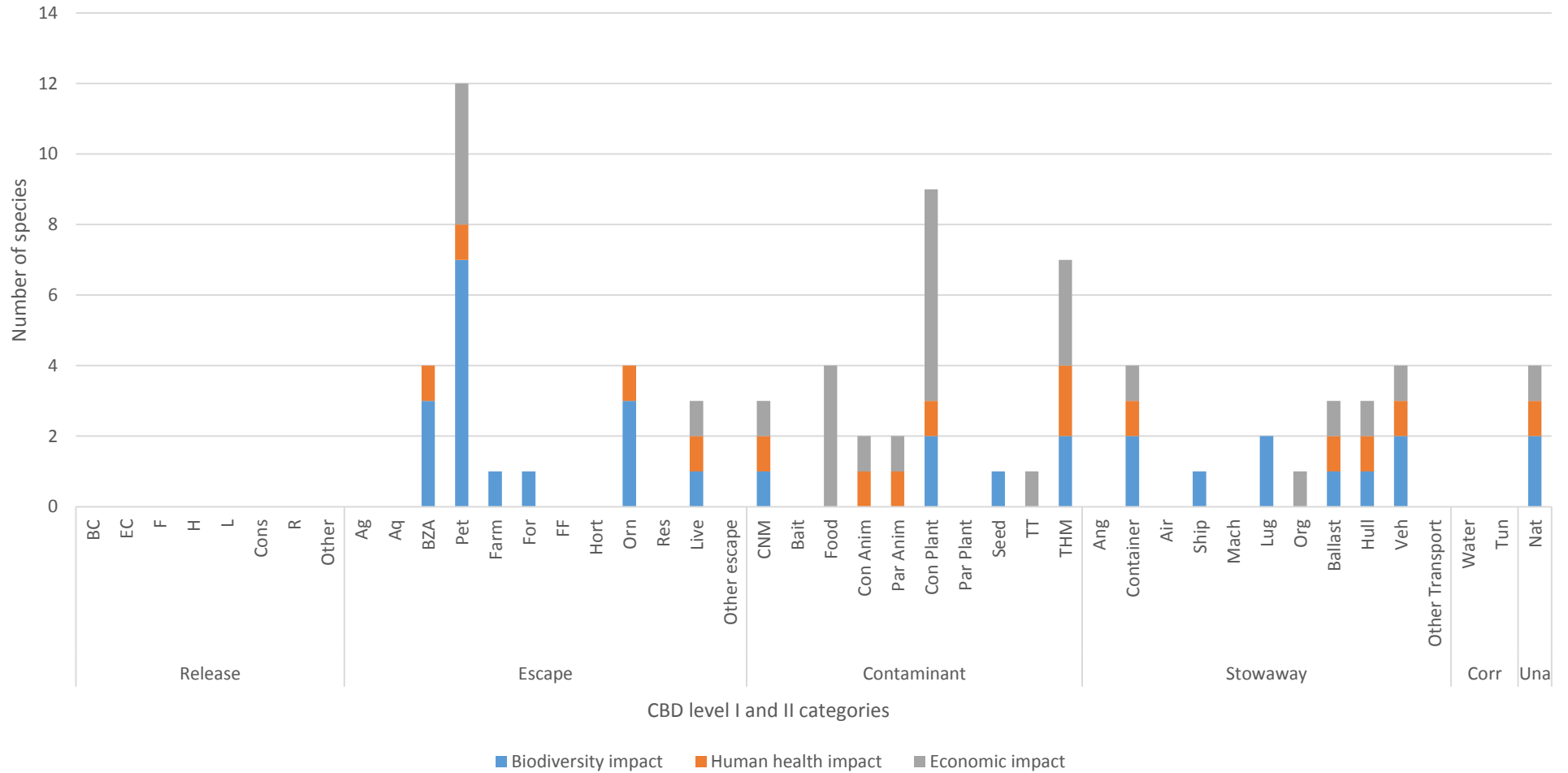
Bermuda



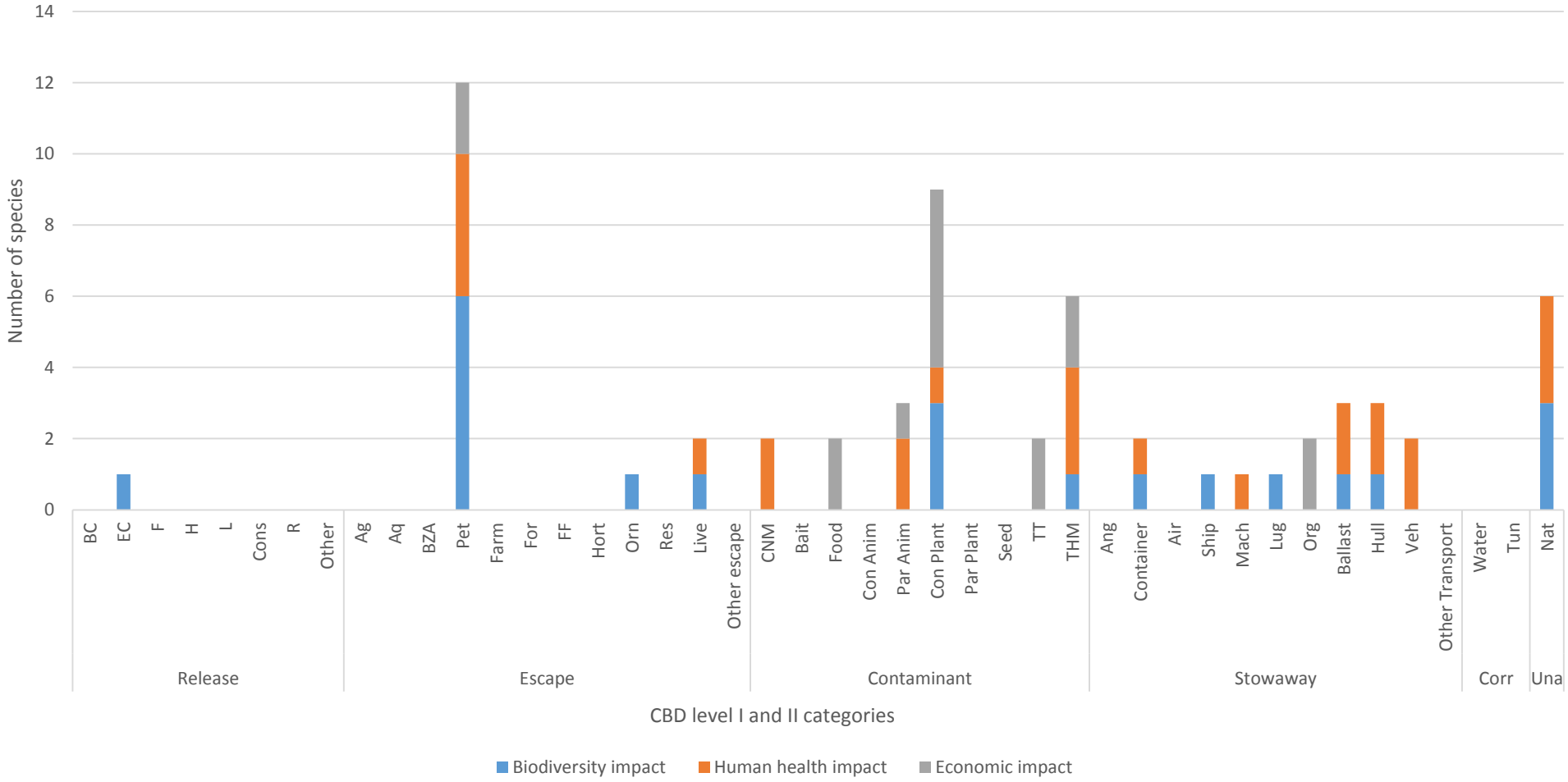
BVI



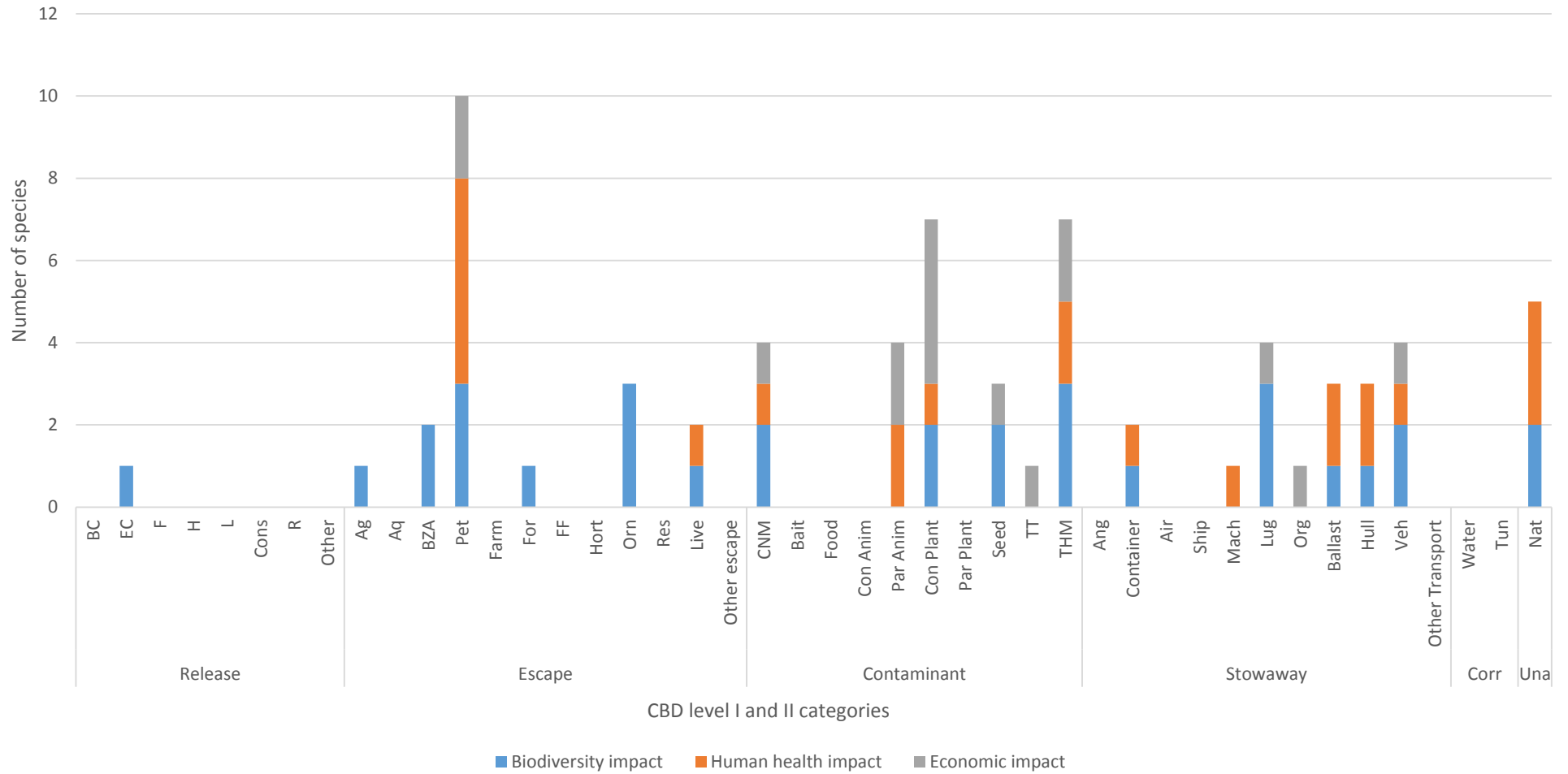
Cayman Islands



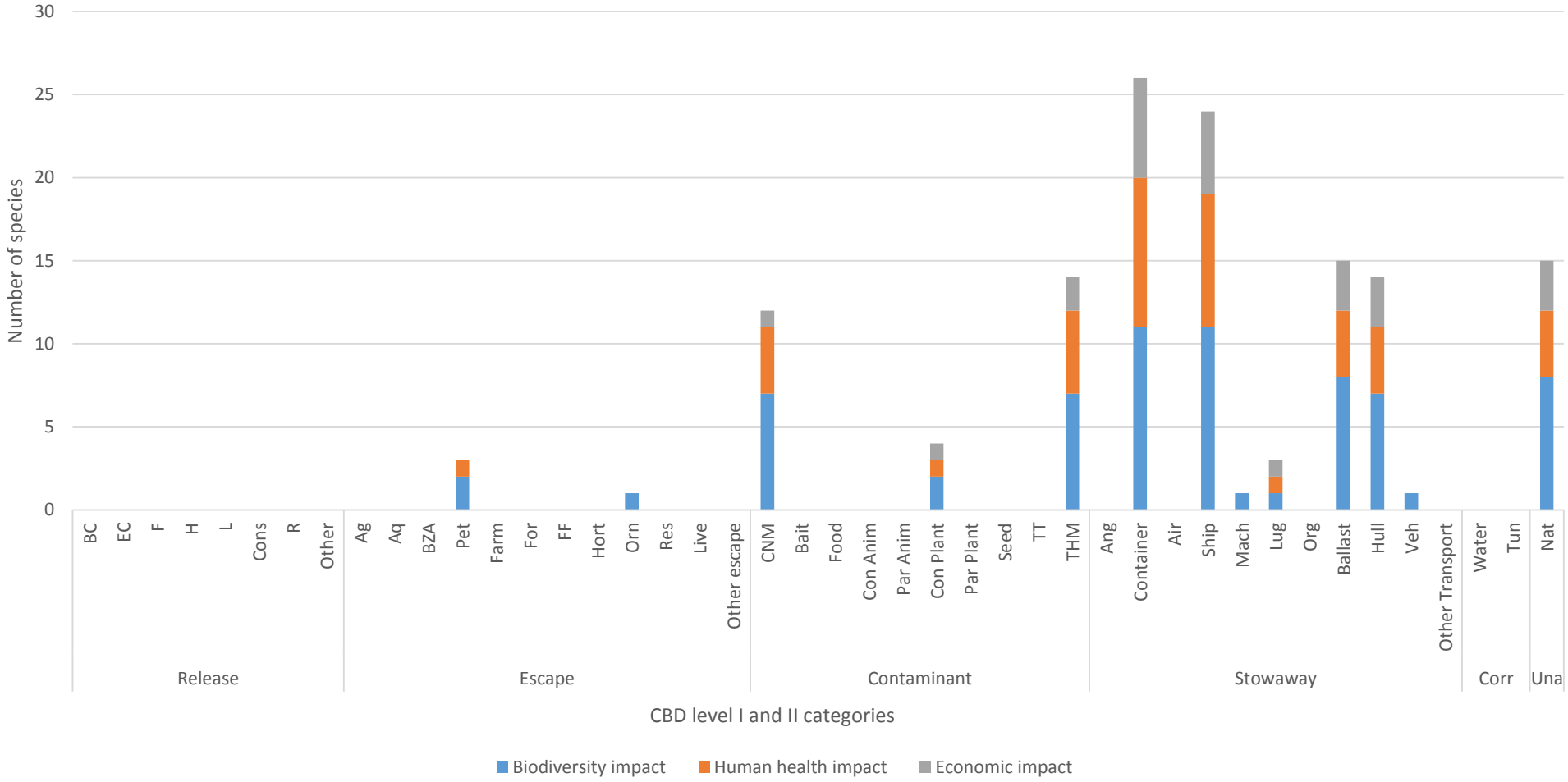
Montserrat



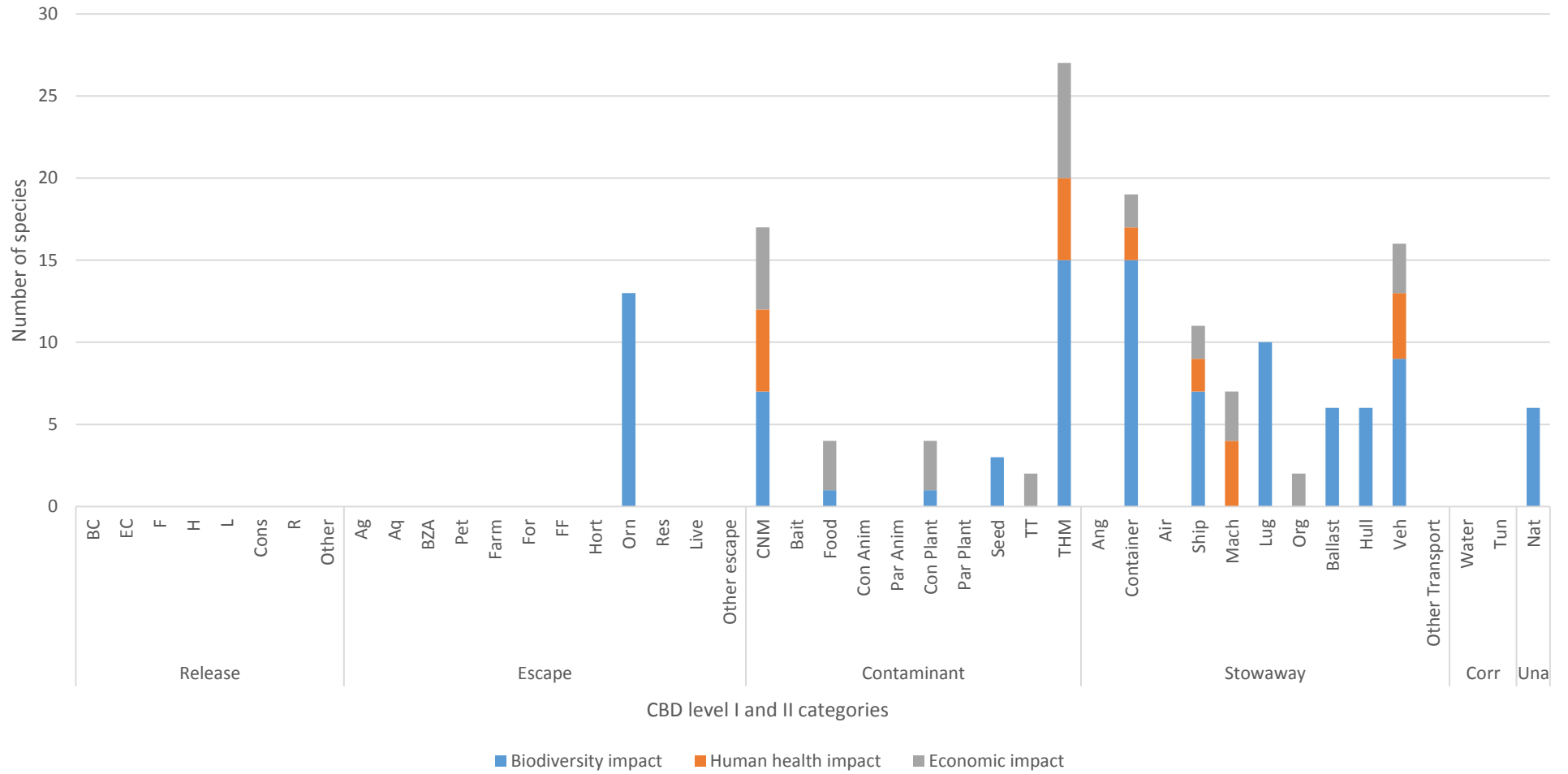
Turks and Caicos



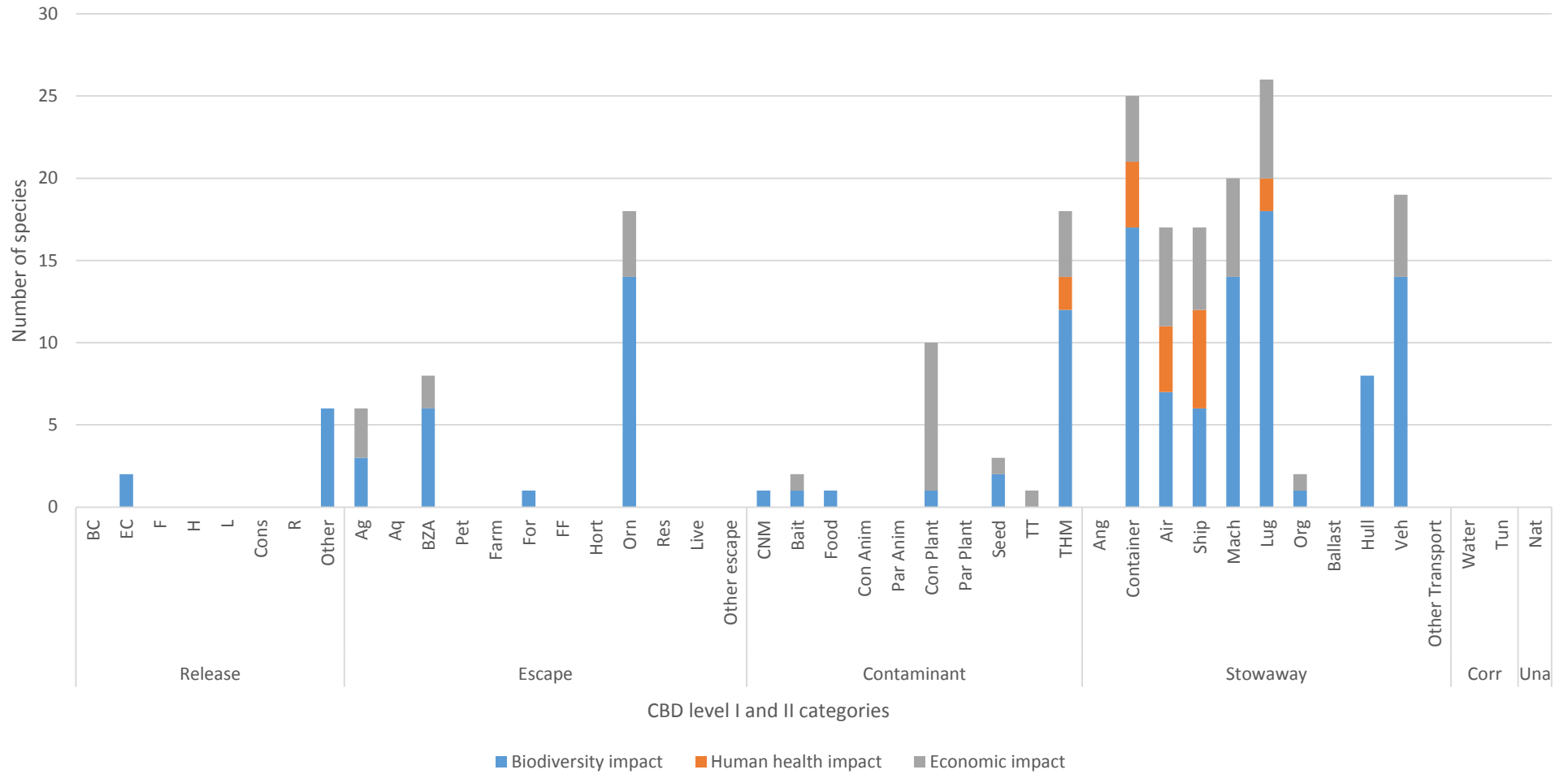
British Indian Ocean Territory



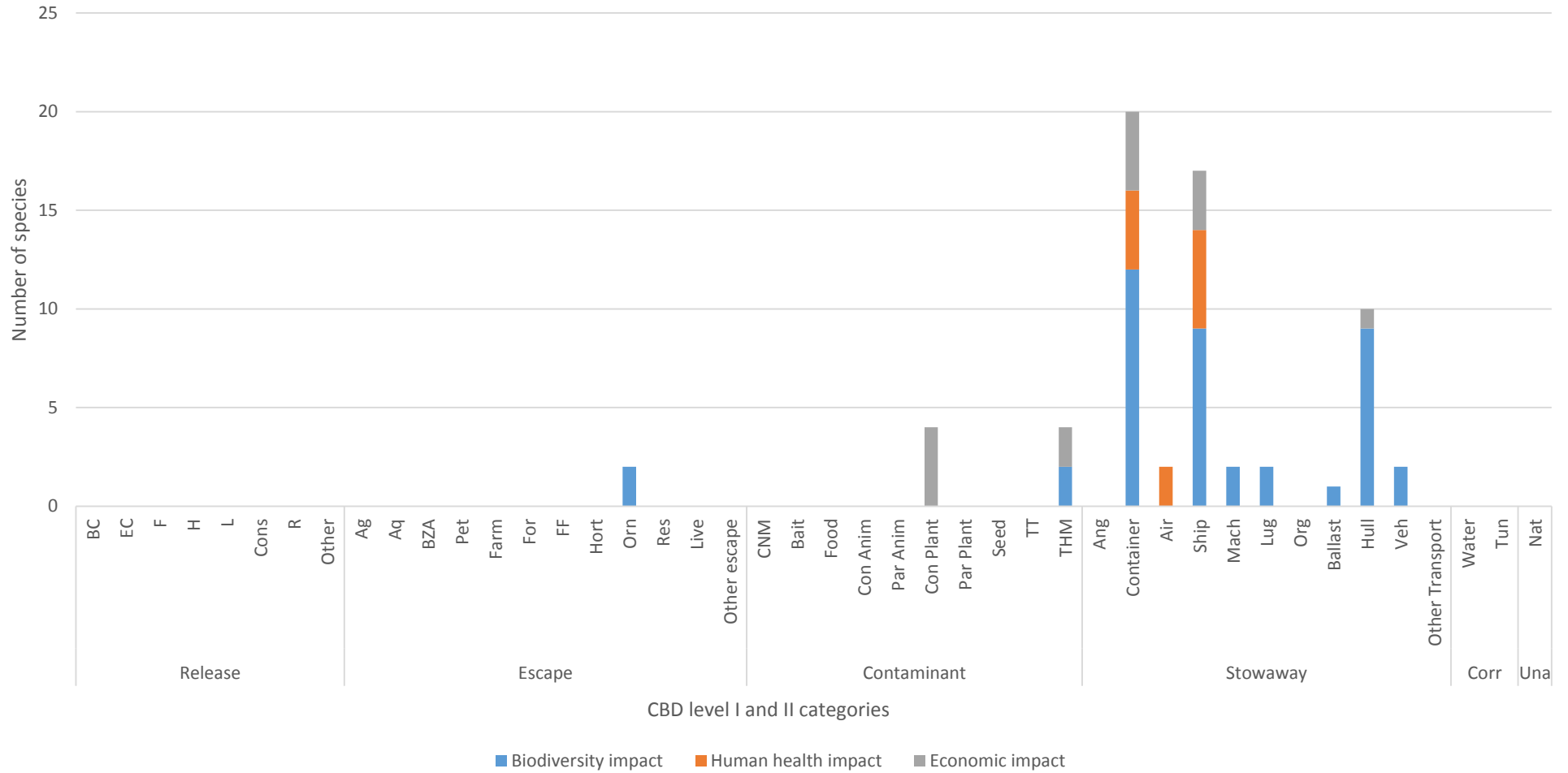
Ascension



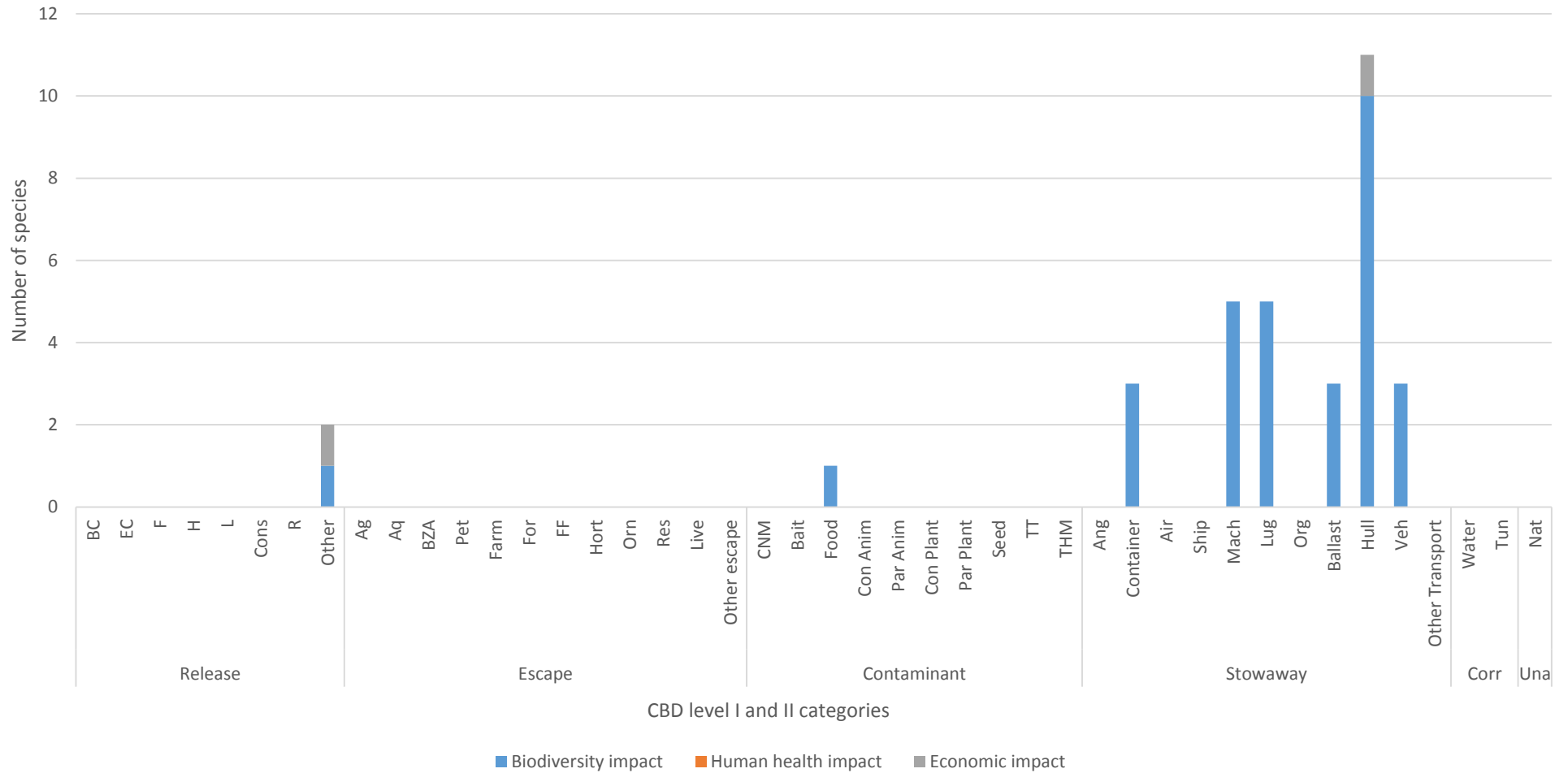
Saint Helena



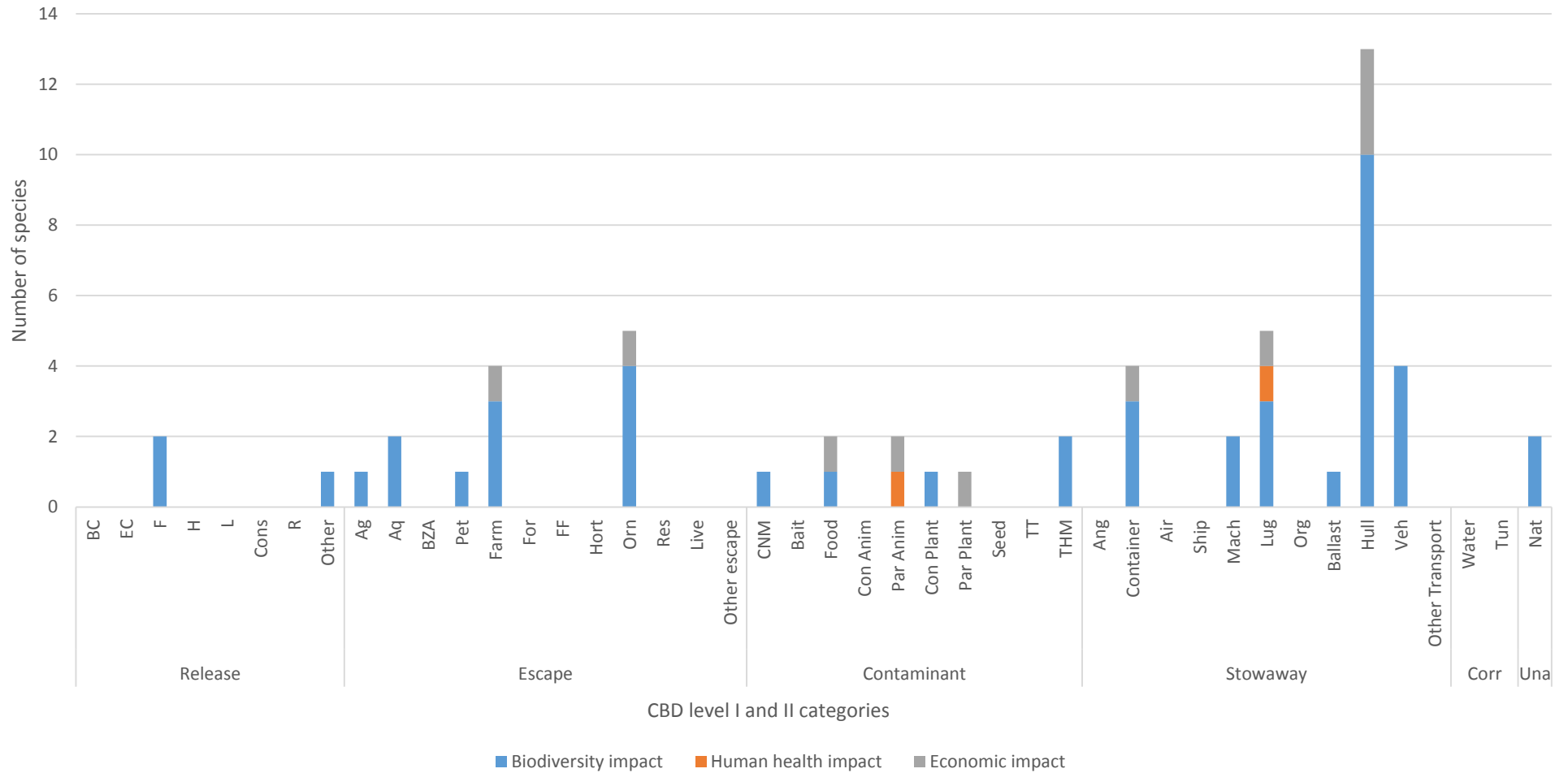
Tristan da Cunha



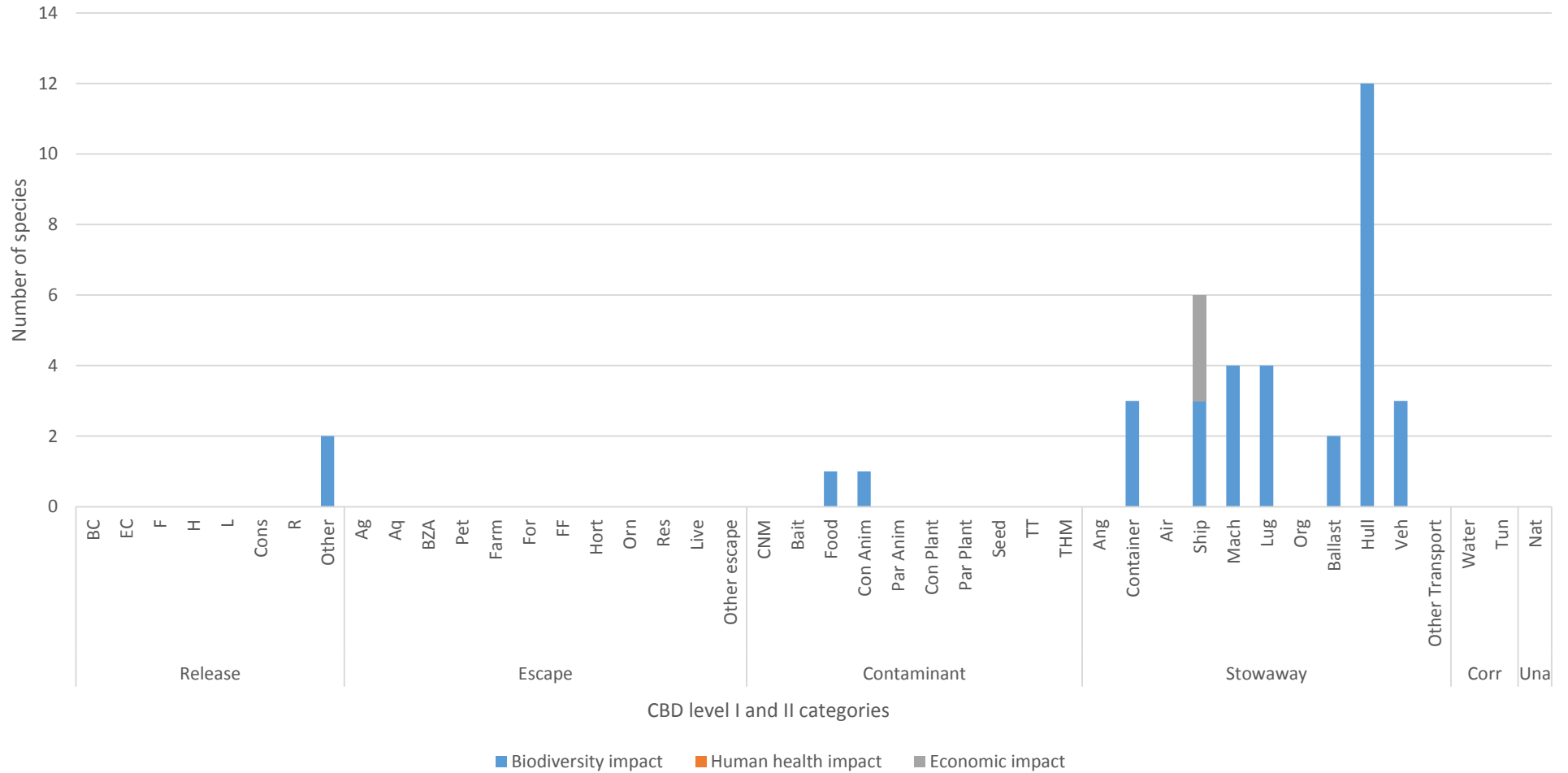
British Antarctic Territory



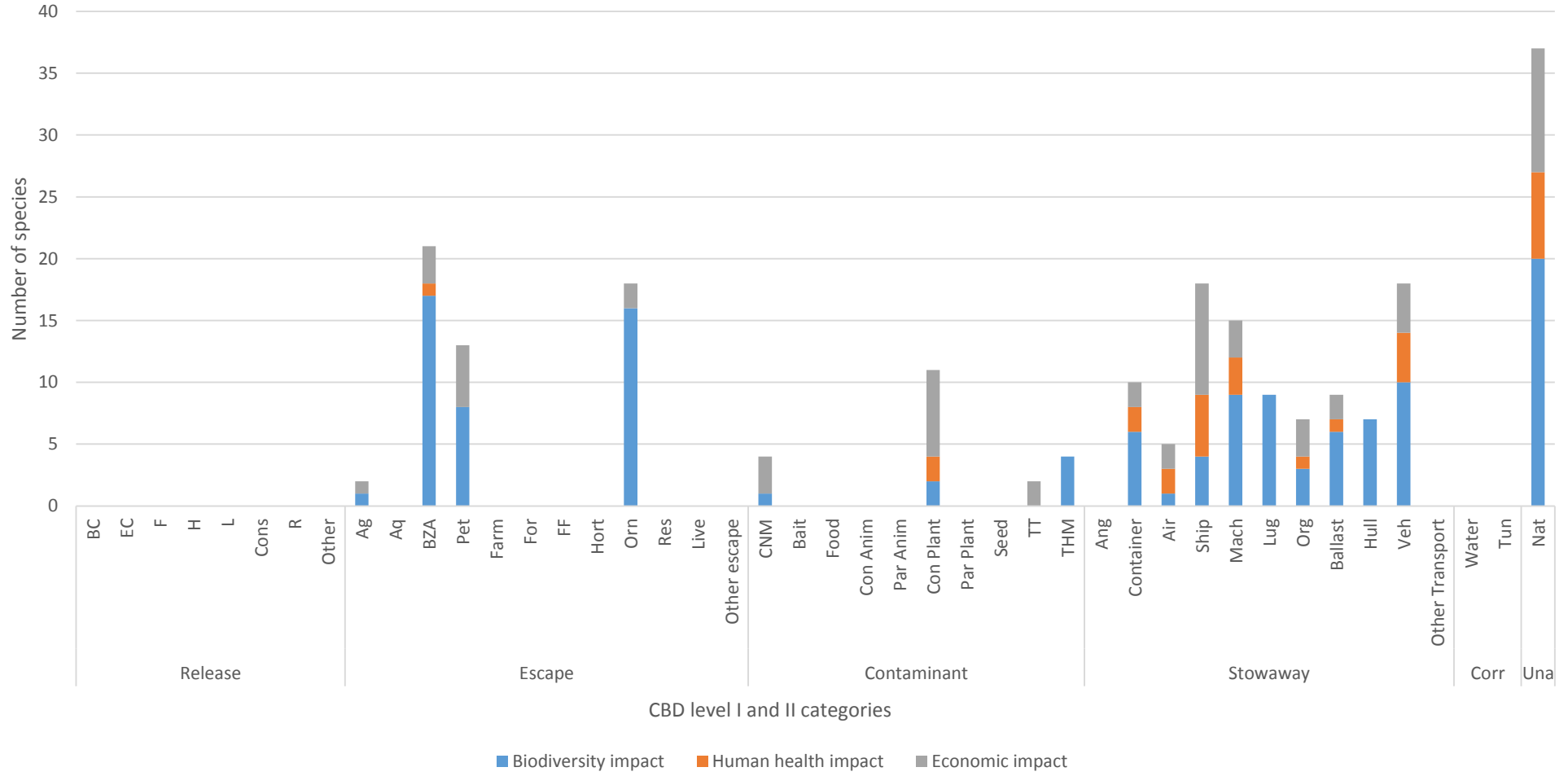
Falkland Islands



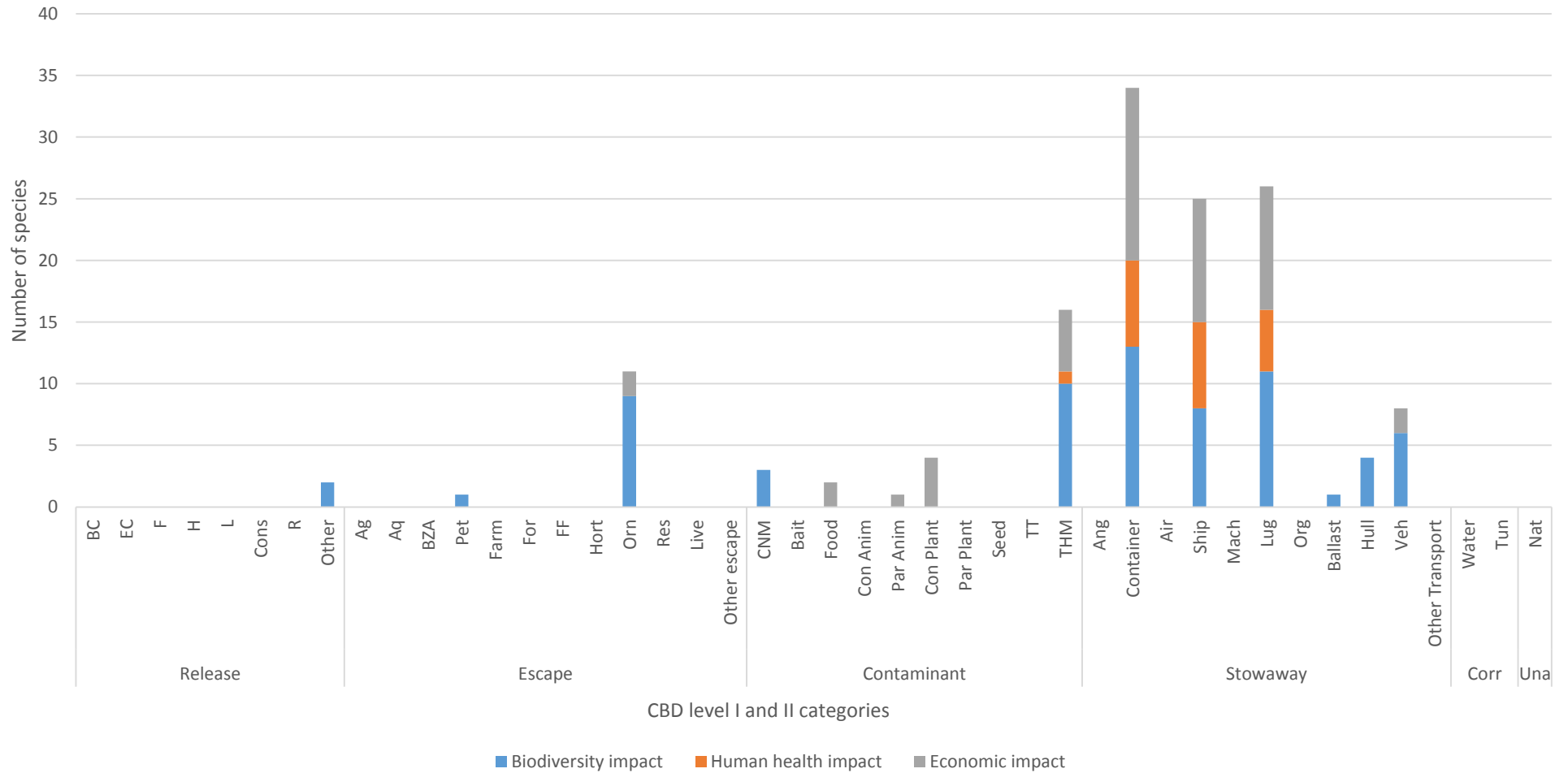
South Georgia and South Sandwich Islands



Gibraltar



Pitcairn



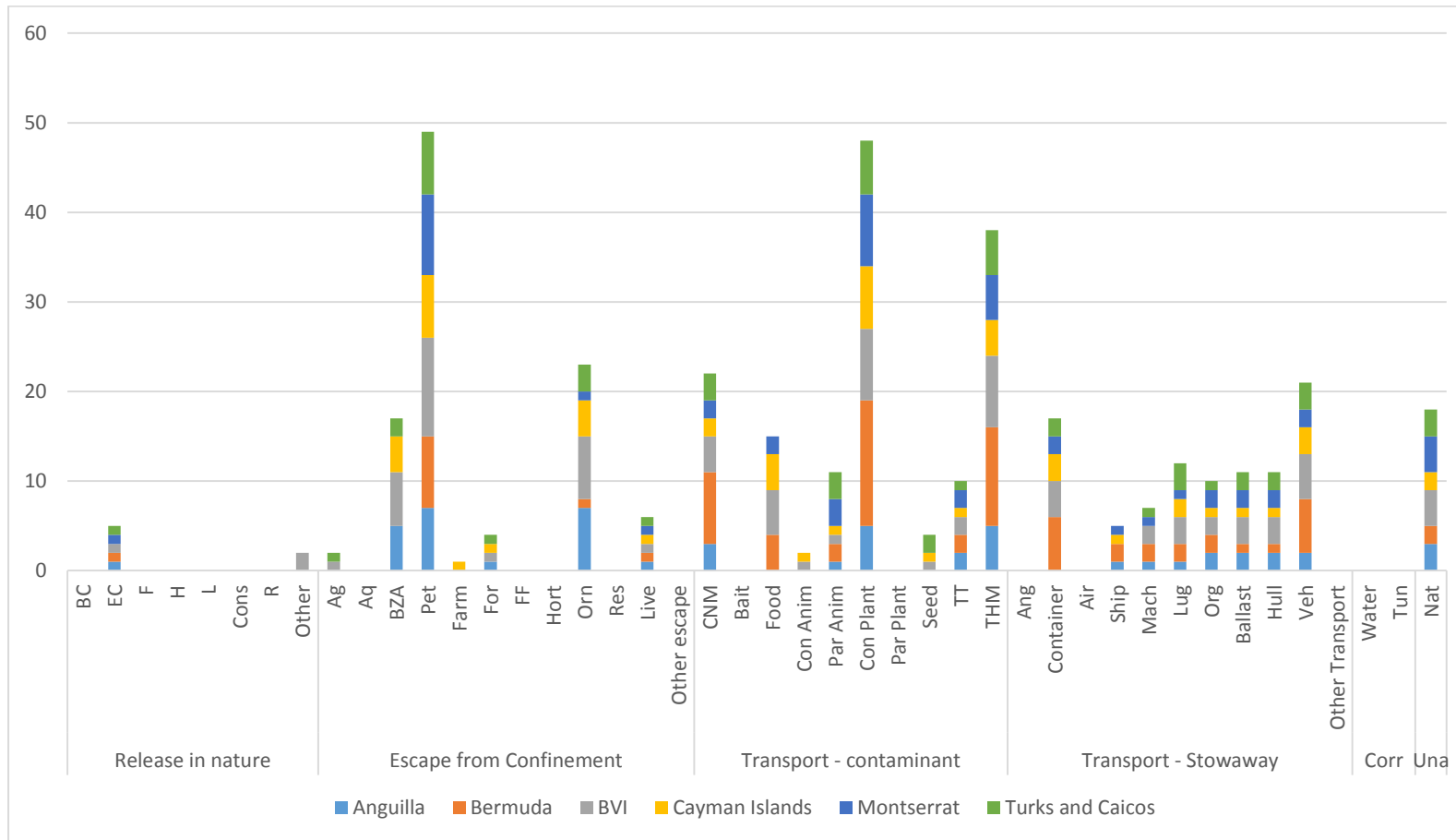


Figure 6: Number of Invasive Non-Native Species (INNS) predicted to arrive within the Caribbean through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

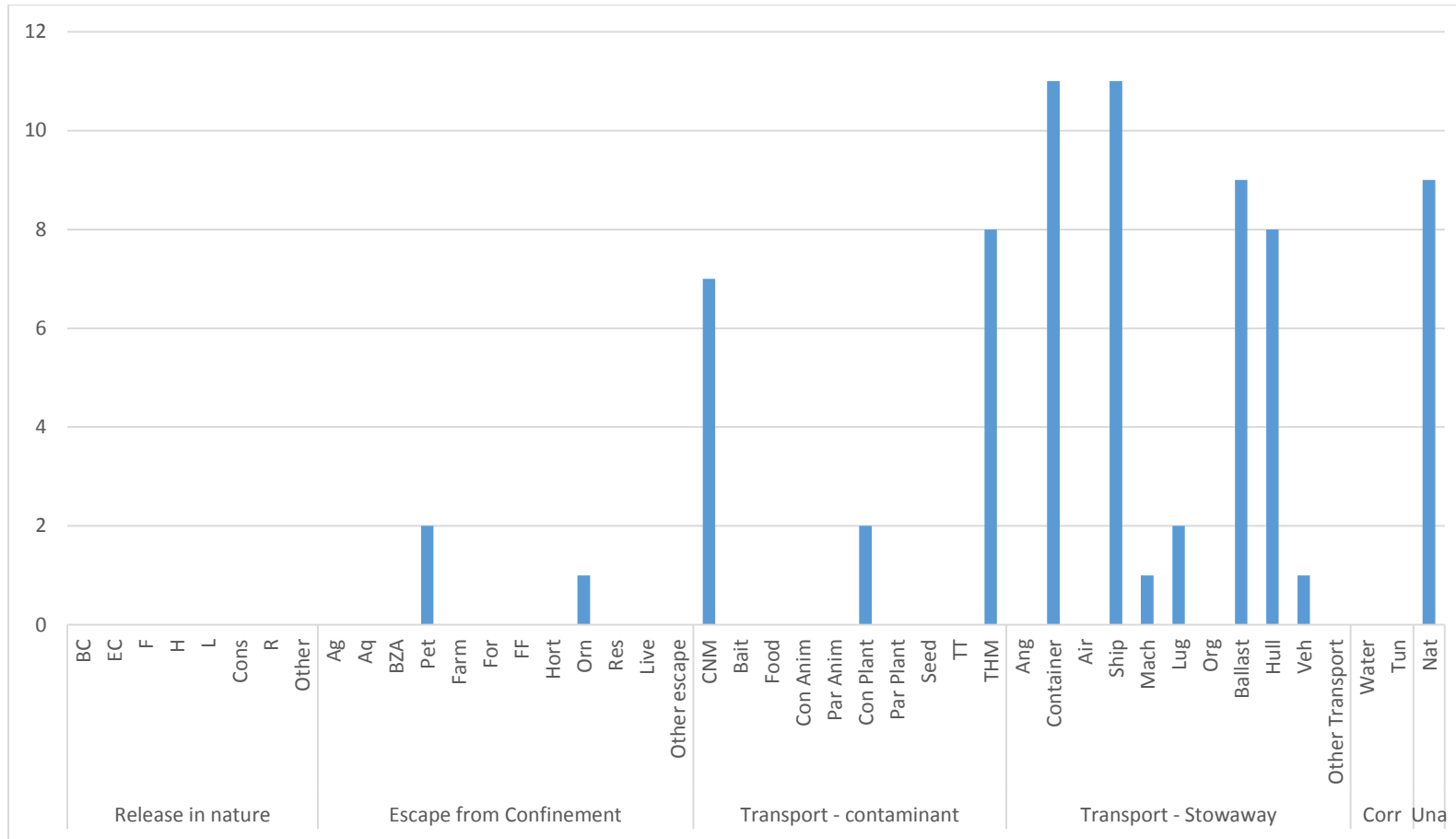


Figure 7: Number of Invasive Non-Native Species (INNS) predicted to arrive within the British Indian Ocean Territory through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

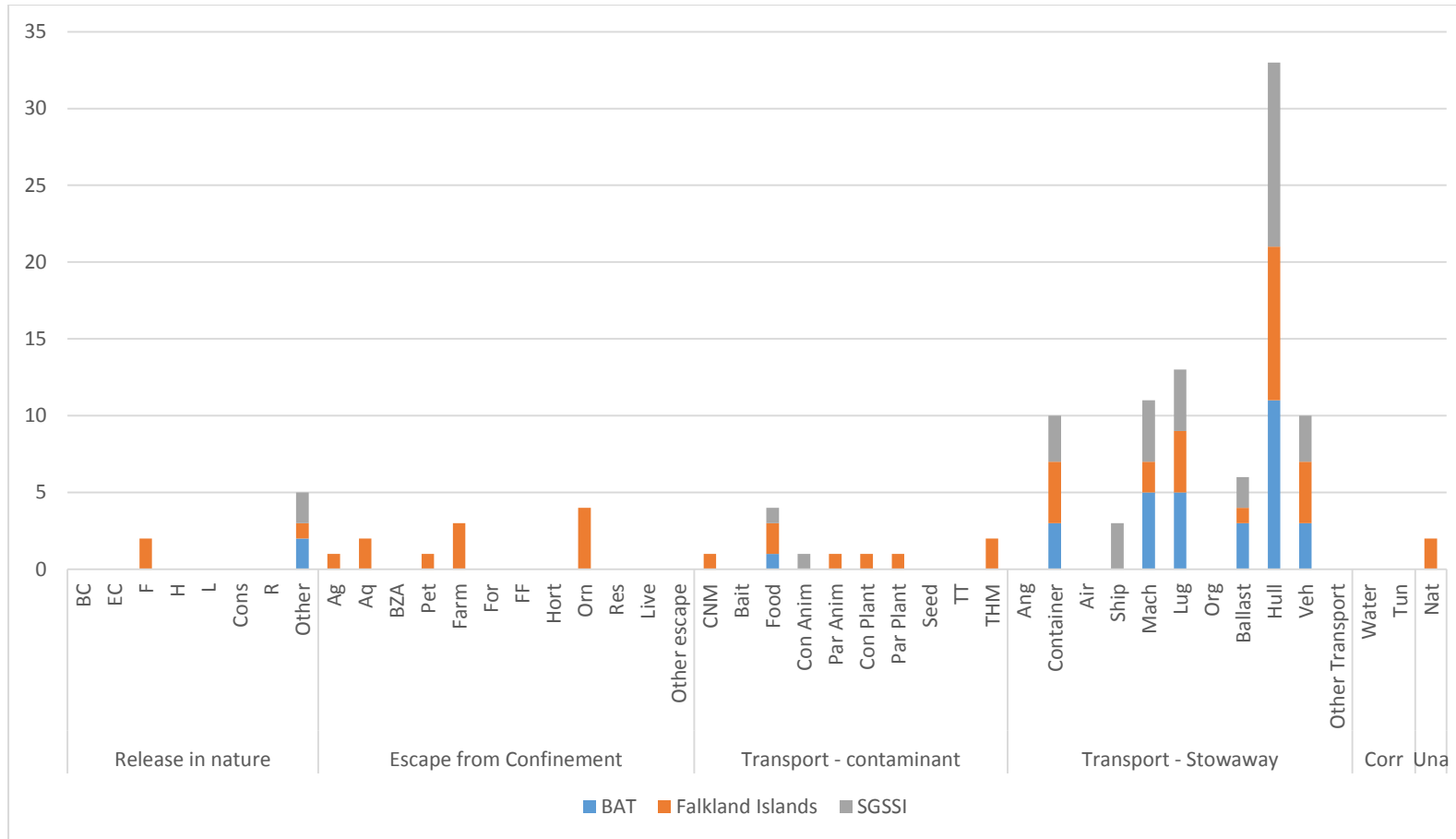


Figure 8: Number of Invasive Non-Native Species (INNS) predicted to arrive within the South Atlantic OTs through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

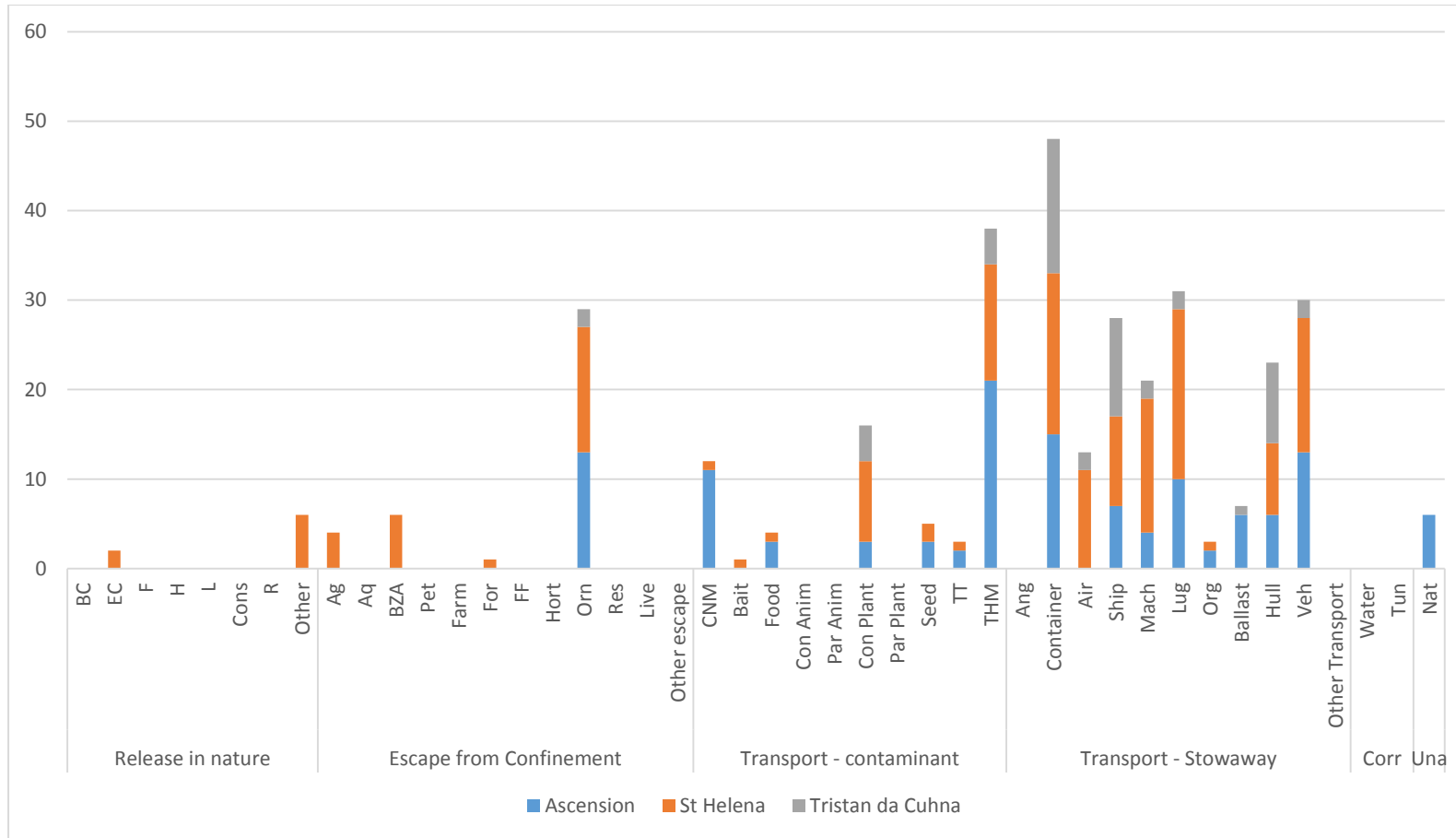


Figure 9: Number of Invasive Non-Native Species (INNS) predicted to arrive within the Mid Atlantic through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

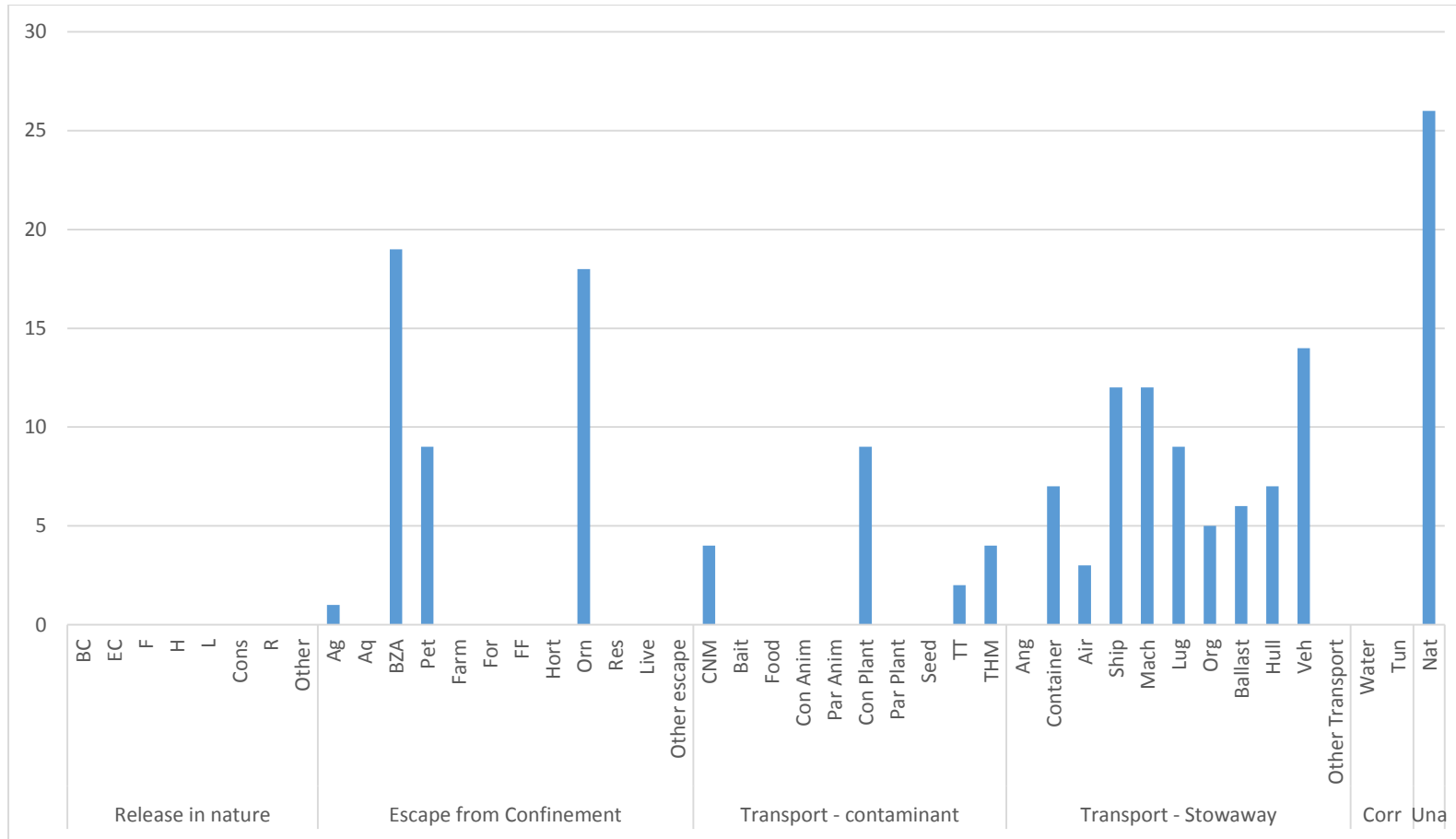


Figure 10: Number of Invasive Non-Native Species (INNS) predicted to arrive within Gibraltar through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

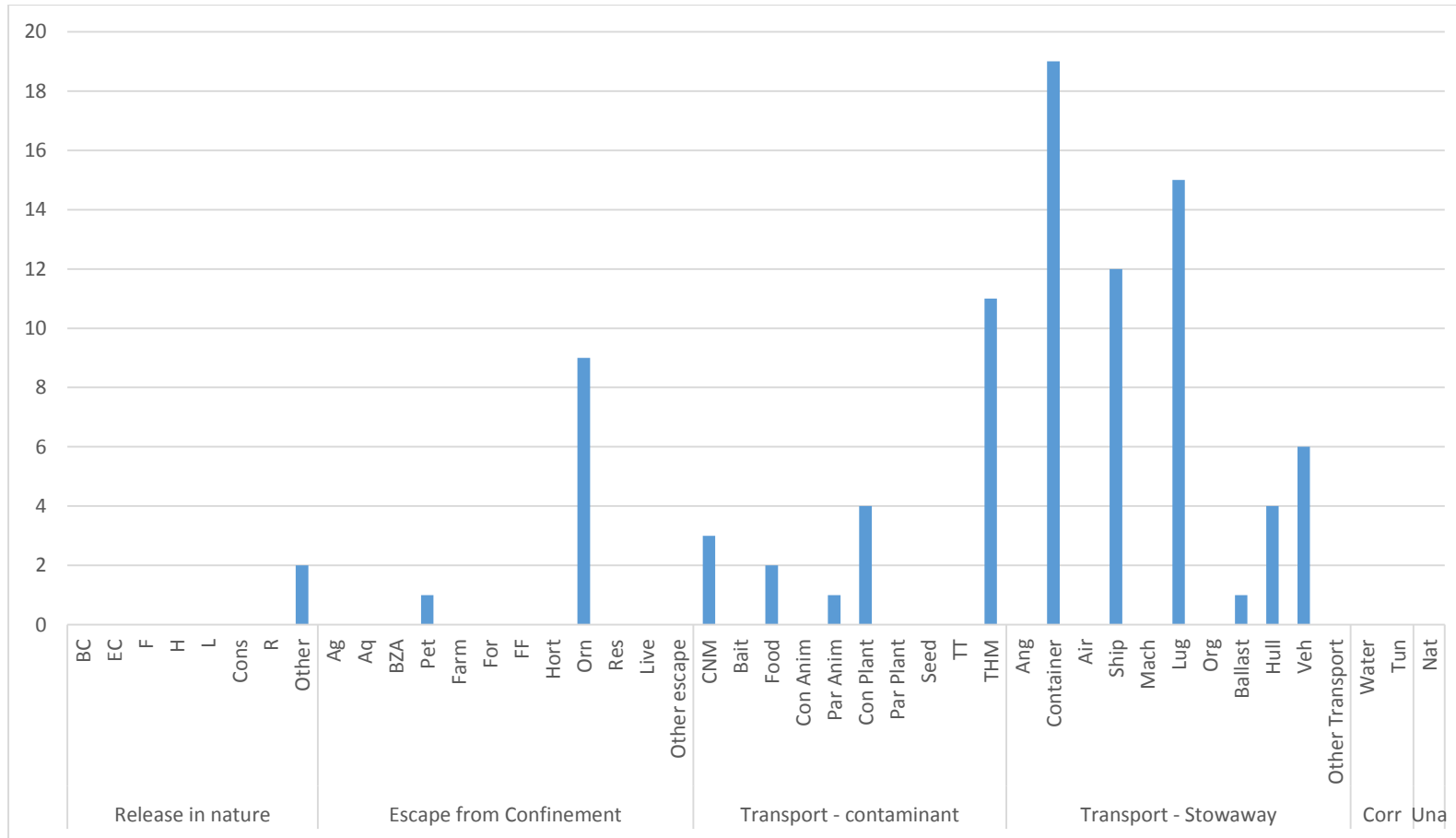


Figure 11: Number of Invasive Non-Native Species (INNS) predicted to arrive within Pitcairn through the CBD level II pathways of introduction and represented within their overarching CBD I category (for explanation of categories see Figure 5)

Caribbean OTs: Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat, Turks and Caicos Islands

Table 4. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Anguilla including most likely pathways of arrival (total = 16 pathways).

BZA = Botanical garden/zoo/aquaria; For = Forestry; Live = Live food and live bait; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; Par Anim = Parasites on animals; THM = Transportation of habitat material; TT = Timber trade; Ballast = Ship/boat ballast water; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Org = Organic packing material, in particular wood packaging; EC = Erosion control; Nat = Natural dispersal across borders of invasive alien species that have been introduced through pathways

Species	Common names	Group	Biodiversity	Human health	Economic					
<i>Pterois miles</i>	lionfish	Marine	x	x		Nat	Pet			
<i>Molothrus bonariensis</i>	shiny cowbird	Vertebrates	x			Pet				
<i>Schinus terebinthifolius</i>	Brazilian peppertree	Plants	x	x		Orn	BZA			
<i>Mimosa pigra</i>	giant sensitive tree	Plants	x		x	CNM	THM	Orn	Veh	Lug
<i>Prosopis juliflora</i>	mesquite	Plants	x			Orn	BZA	For		
<i>Perna viridis</i>	Asian green mussel	Marine	x	x		Hull	Ballast	Nat	Live	Ship
<i>Scaevola taccada</i>	beach naupaka	Plants	x			EC	Orn			
<i>Cactoblastis cactorum</i>	cactus moth	Invertebrates	x			Con plants				
<i>Schefflera arboricola</i>	dwarf umbrella tree	Plants	x			Orn	BZA			
<i>Bos taurus</i>	feral cattle	Vertebrates	x			Pet				
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x		Mach	CNM	Veh	THM	
<i>Amblyomma cajennense</i>	cayenne tick	Invertebrates		x		Para Anim				

<i>Euphorbia tirucalli</i>	pencil tree	Plants		x		Orn	BZA			
<i>Cryptostegia grandiflora</i>	Palay rubber vine	Plants		x		Orn	BZA			
<i>Boa constrictor imperator</i>	common boa constrictor	Vertebrates		x		Pet				
<i>Magallana gigas</i>	Pacific oyster	Marine		x		Hull	Ballast	Nat		
<i>Anopheles gambiae</i>	mosquito	Invertebrates		x		CNM	THM			
<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates			x	Con plants				
<i>Psittacula krameri</i>	rose-ringed parakeet	Vertebrates			x	Pet				
<i>Aratinga erythrogenys</i>	red-masked conure	Vertebrates			x	Pet				
<i>Coptotermes formosanus</i>	Formosan subterranean termite	Invertebrates			x	THM	Org	Timber		
<i>Coptotermes gestroi</i>	Asian subterranean termite	Invertebrates			x	THM	Org	Timber		
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con plants				
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con plants				
<i>Diaphorina citri</i>	Asiatic citrus psyllid	Invertebrates			x	Con plants				
<i>Myiopsitta monachus</i>	monk parakeet	Vertebrates			x	Pet				

Table 5. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Bermuda including most likely pathways of arrival (total = 19 pathways).

Live = Live food and live bait; Orn = Ornamental purpose other than horticulture; EC = Erosion control; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; Food = Food contaminant; Par Anim = Parasites on animals; THM = Transportation of habitat material; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Org = Organic packing material, in particular wood packaging; TT = Timber trade; Ship = Hitchhikers on ship/boat; Veh = Vehicles; Nat = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic				
<i>Boa constrictor imperator</i>	common boa constrictor	Vertebrates	x		x	Pet			
<i>Pantherophis guttatus</i>	corn snake	Vertebrates	x		x	Pet			
<i>Lissachatina fulica</i>	giant African land snail	Invertebrates	x	x	x	Pet	Con Plant	THM	
<i>Scyphophorus acupunctatus</i>	agave snout weevil	Invertebrates	x			Con plant	Lug		
<i>Colubrina asiatica</i>	Asian nakedwood or 'ānapanapa	Plants	x			EC	Orn		
<i>Perna viridis</i>	Asian green mussel	Marine	x	x		Hull	Ballast	Nat	Live
<i>Anolis equestris</i>	knight anole	Vertebrates	x			Con Plant	Pet	Container	
<i>Paratachardina pseudolobata</i>	lobate lac scale	Invertebrates	x			Con plant			
<i>Halophila stipulacea</i>	seagrass	Marine	x			Ship	Nat		
<i>Phalacroccocus howertoni</i>	croton scale	Invertebrates	x		x	Con plant			
<i>Cactoblastis cactorum</i>	cactus moth	Invertebrates	x			Con plant			
<i>Maconellicoccus hirsutus</i>	pink hibiscus mealybug	Invertebrates	x		x	Con plant			

<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates	x			CNM	THM	Container	Veh
<i>Python molurus bivittatus</i>	Burmese python	Vertebrates	x		x	Pet			
<i>Osteopilus septentrionalis</i>	Cuban tree frog	Vertebrates	x			Container	pet		
<i>Diaphorina citri</i>	Asiatic citrus psyllid	Invertebrates	x		x	Con plant	Food		
<i>Solenopsis geminata</i>	tropical fire ant	Invertebrates	x			CNM	THM	Container	Veh
<i>Solenopsis invicta</i>	red imported fire ant	Invertebrates	x			CNM	THM	Container	Veh
<i>Solenopsis richteri</i>	imported fire ant	Invertebrates	x			CNM	THM	Container	Veh
<i>Myllocerus undecimpustulatus</i>	Sri Lankan weevil	Invertebrates	x		x	Con plant	Lug		
<i>Lampropeltis getula</i>	California kingsnake	Vertebrates	x		x	Cont Plant	Pet		
<i>Aedes aegypti</i>	yellow fever mosquito	Invertebrates		x	x	Mach	CNM	Veh	THM
<i>Amblyomma cajennense</i>	cayenne tick	Invertebrates		x	x	Para Anim			
<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	Invertebrates		x	x	Para Anim			
<i>Streptopelia decaocto</i>	Eurasian collared dove	Vertebrates		x		Pet	Ship		
<i>Anopheles gambiae</i>	mosquito	Invertebrates		x		Mach	CNM	Veh	THM
<i>Aedes japonicus</i>	Asian bush mosquito	Invertebrates		x		CNM	THM		
<i>Aedes triseriatus</i>	eastern treehole mosquito	Invertebrates		x		CNM	THM		
<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates			x	Con plant	Food		
<i>Coptotermes formosanus</i>	Formosan subterranean termite	Invertebrates			x	THM	Org	TT	

<i>Coptotermes gestroi</i>	Asian subterranean termite	Invertebrates			x	THM	Org	TT	
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con plant	Food		
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con plant	Food		
<i>Raoiella indica</i>	red palm mite	Invertebrates			x	Con plant			

Table 6. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within British Virgin Islands including most likely pathways of arrival (total = 22 pathways)

Other = Other escape from confinement; EC = Erosion control; BZA = Botanical garden/zoo/aquaria; For = Forestry; Hort = Horticulture; Live = Live food and live bait; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; Food = Food contaminant; Par Anim = Parasites on animals; THM = Transportation of habitat material; TT = Timber trade; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Org = Organic packing material, in particular wood packaging; Veh = Vehicles; Nat = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic					
<i>Pterois miles</i>	lionfish	Marine	x		x	Nat	Pet			
<i>Lissachatina fulica</i>	giant African land snail	Invertebrates	x	x	x	Pet	Con Plant	THM		
<i>Colubrina asiatica</i>	Asian nakedwood or 'ānapanapa	Plants	x			EC	Orn			
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull	Ballast	Nat	Live	
<i>Anolis equestris</i>	knight anole	Vertebrates	x			Con Plant	Pet	Container		
<i>Oryctolagus cuniculus</i>	rabbit	Vertebrates	x		x	Other	Pet			
<i>Chlorocebus pygerythrus</i>	vervet monkey	Vertebrates	x	x		Pet				
<i>Psittacula krameri</i>	rose-ringed parakeet	Vertebrates	x	x	x	Pet				
<i>Aratinga erythrogenys</i>	red-masked conure	Vertebrates	x			Pet				
<i>Diaphorina citri</i>	Asiatic citrus psyllid	Invertebrates	x		x	Con Plant	Food			

<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates	x		x	Con Plant	Food			
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x		Mach	CNM	Veh	THM	
<i>Amblyomma cajennense</i>	cayenne tick	Invertebrates		x	x	Para Anim				
<i>Euphorbia tirucalli</i>	pencil tree	Plants		x		Orn	BZA			
<i>Sturnus vulgaris</i>	common starling	Vertebrates		x	x	Container	Pet			
<i>Anas platyrhynchos</i>	mallard	Vertebrates		x		Other				
<i>Dasyprocta punctata</i>	Central American agouti	Vertebrates		x		BZA				
<i>Gloriosa superba</i>	flame lily	Plants		x		Orn	BZA			
<i>Amphibalanus reticulatus</i>	barnacle	Marine		x		Hull	Ballast	Nat		
<i>Prosopis juliflora</i>	mesquite	Plants		x	x	Orn	For	BZA		
<i>Anopheles gambiae</i>	mosquito	Invertebrates		x		Mach	CNM	Veh	THM	
<i>Myiopsitta monachus</i>	monk parakeet	Vertebrates		x	x	Pet				
<i>Solenopsis richteri</i>	imported fire ant	Invertebrates		x		CNM	THM	Container	Veh	
<i>Coptotermes formosanus</i>	Formosan subterranean termite	Invertebrates			x	THM	Org	TT		
<i>Coptotermes gestroi</i>	Asian subterranean termite	Invertebrates			x	THM	Org	TT		
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con Plant	Food			
<i>Varroa destructor</i>	varroa mite	Invertebrates			x	Con Anim				
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con Plant	Food			
<i>Mimosa pigra</i>	giant sensitive tree	Plants			x	CNM	THM	Seed	Veh	Lug

<i>Mylocerus undecimpustulatus</i>	Sri Lankan weevil	Invertebrates			x	Con plant	Lug			
<i>Psittacula eupatria</i>	Alexandrine parakeet	Vertebrates			x	Pet				
<i>Neyraudia reynaudiana</i>	silk reed	Plants			x	THM	Orn	Veh	Lug	Container
<i>Syzygium cumini</i>	Java plum	Plants			x	Orn	Ag	BZA		
<i>Magallana gigas</i>	Pacific oyster	Marine			x	Hull	Ballast	Nat		
<i>Cryptostegia grandiflora</i>	Palay rubber vine	Plants			x	Orn	BZA			
<i>Raoiella indica</i>	red palm mite	Invertebrates			x	Con Plant	Food			
<i>Aratinga solstitialis</i>	brown-throated parakeet	Vertebrates			x	Pet				

Table 7. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Cayman Islands including most likely pathways of arrival (total = 21 pathways)

BZA = Botanical garden/zoo/aquaria; Farm = Farmed animals; For = Forestry; Live = Live food and live bait; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Anim = Contaminant on animals; Con Plant = Contaminant on plants; Food = Food contaminant; Par Anim = Parasites on animals; THM = Transportation of habitat material; TT = Timber trade; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Org = Organic packing material, in particular wood packaging; Ship = Hitchhikers on ship/boat; Veh = Vehicles; Nat = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic						
<i>Boa constrictor imperator</i>	common boa constrictor	Vertebrates	x			Pet					
<i>Neyraudia reynaudiana</i>	silk reed	Plants	x			CNM	THM	Seed	Veh	Lug	Container
<i>Lissachatina fulica</i>	giant African land snail	Invertebrates	x	x	x	Pet	Con Plant	THM			
<i>Prosopis juliflora</i>	mesquite	Plants	x			For	Orn	BZA			
<i>Scyphophorus acupunctatus</i>	agave snout weevil	Invertebrates	x			Con plant					
<i>Perna viridis</i>	Asian green mussel	Marine	x	x	x	Hull	Ballast	Nat	Live		
<i>Dolichandra unguis-cati</i>	cats claw creeper	Plants	x			Orn	BZA				
<i>Halophila stipulacea</i>	seagrass	Marine	x			Ship	Nat				
<i>Cyrtomium falcatum</i>	holly fern	Plants	x			Orn	BZA	Veh	Lug	Container	
<i>Capra hircus</i>	goat	Vertebrates	x			Farm	Pet				
<i>Python molurus bivittatus</i>	Burmese python	Vertebrates	x			Pet					
<i>Psittacula krameri</i>	rose-ringed parakeet	Vertebrates	x		x	Pet					
<i>Psittacula eupatria</i>	Alexandrine parakeet	Vertebrates	x		x	Pet					

<i>Aratinga erythrogenys</i>	red-masked conure	Vertebrates	x		x	Pet					
<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	Invertebrates		x	x	Con anim	Para anim				
<i>Euphorbia tirucalli</i>	pencil tree	Plants				Orn	BZA				
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates		x	x	CNM	THM	Container	Veh		
<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates			x	Con plant	Food				
<i>Coptotermes formosanus</i>	Formosan subterranean termite	Invertebrates			x	THM	Org	TT			
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con plant	Food				
<i>Anastrepha obliqua</i>	West Indian fruit fly	Invertebrates			x	Con plant	Food				
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con plant					
<i>Sternochetus mangiferae</i>	mango seed weevil	Invertebrates			x	Con plant	Food				

Table 8. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Montserrat including most likely pathways of arrival (total = 15 pathways)

Orn = Ornamental purpose other than horticulture; *EC* = Erosion control; *Pet* = Pet/aquarium/terrarium species; *CNM* = Contaminant nursery material; *Con Plant* = Contaminant on plants; *THM* = Transportation of habitat material; *TT* = Timber trade; *Ballast* = Ship/boat ballast water; *Container* = Container/bulk; *Hull* = Ship/boat hull fouling; *Lug* = People and their luggage/equipment; *Mach* = Machinery/equipment; *Org* = Organic packing material, in particular wood packaging; *Ship* = Hitchhikers on ship/boat; *Veh* = Vehicles; *Nat* = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic				
<i>Pterois miles</i>	lionfish	Marine	x	x		Nat	Pet		
<i>Boa constrictor imperator</i>	common boa constrictor	Vertebrates	x	x		Pet			
<i>Pantherophis guttatus</i>	corn snake	Vertebrates	x			Pet			
<i>Molothrus bonariensis</i>	shiny cowbird	Vertebrates	x			Pet			
<i>Lissachatina fulica</i>	giant African land snail	Invertebrates	x	x		Pet	Con Plant	THM	
<i>Scyphophorus acupunctatus</i>	agave snout weevil	Invertebrates	x			Lug	Con Plant		
<i>Colubrina asiatica</i>	Asian nakedwood or 'ānapanapa	Plants	x			EC	Orn		
<i>Perna viridis</i>	Asian green mussel	Marine	x	x		Hull	Ballast	Nat	Live
<i>Anolis equestris</i>	knight anole	Vertebrates	x			Con Plant	Pet	Container	
<i>Halophila stipulacea</i>	seagrass	Marine	x			Ship	Nat		
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x		Mach	CNM	Veh	THM
<i>Amblyomma cajennense</i>	cayenne tick	Invertebrates		x		Para Anim			

<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	Invertebrates		x		Para Anim			
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates		x		CNM	THM	Container	Veh
<i>Chlorocebus pygerythrus</i>	vervet monkey	Vertebrates		x					
<i>Magallana gigas</i>	Pacific oyster	Marine		x		Hull	Ballast	Nat	
<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates			x	Con Plant	Food		
<i>Phalacroccoccus howertoni</i>	croton scale	Invertebrates			x	Con Plant			
<i>Psittacula krameri</i>	rose-ringed parakeet	Vertebrates			x	Pet			
<i>Aratinga erythrogenys</i>	red-masked conure	Vertebrates			x	Pet			
<i>Coptotermes formosanus</i>	Formosan subterranean termite	Invertebrates			x	THM	Org	TT	
<i>Coptotermes gestroi</i>	Asian subterranean termite	Invertebrates			x	THM	Org	TT	
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con Plant	Food		
<i>Varroa destructor</i>	varroa mite	Invertebrates			x	Para Anim			
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con Plant			
<i>Paratachardina pseudolobata</i>	lobate lac scale	Invertebrates			x	Con Plant			

Table 9. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Turks and Caicos Islands including most likely pathways of arrival (total = 19 pathways)

BZA = Botanical garden/zoo/aquaria; Hort = Horticulture; EC = Erosion control; Live = Live food and live bait; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; Par Anim = Parasites on animals; THM = Transportation of habitat material; TT = Timber trade; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Org = Organic packing material, in particular wood packaging; Veh = Vehicles; Nat = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic						
<i>Pterois miles</i>	lionfish	Marine	x	x		Nat	Pet				
<i>Boa constrictor imperator</i>	common boa constrictor	Vertebrates	x	x		Pet					
<i>Mimosa pigra</i>	giant sensitive tree	Plants	x		x	CNM	THM	Seed	Veh	Lug	
<i>Neyraudia reynaudiana</i>	silk reed	Plants	x			CNM	THM	Seed	Veh	Lug	Container
<i>Syzygium cumini</i>	Java plum	Plants	x			Ag	Orn	BZA			
<i>Lissachatina fulica</i>	giant African land snail	Invertebrates	x	x		Pet	Con Plant	THM			
<i>Prosopis juliflora</i>	mesquite	Plants	x			For	Orn	BZA			
<i>Scyphophorus acupunctatus</i>	agave snout weevil	Invertebrates	x			Con plants	Lug				
<i>Colubrina asiatica</i>	Asian nakedwood or 'ānapanapa	Plants	x			EC	Orn				
<i>Perna viridis</i>	Asian green mussel	Marine	x	x		Hull	Ballast	Nat	Live		
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x		Mach	CNM	Veh	THM		

<i>Amblyomma cajennense</i>	cayenne tick	Invertebrates		x	x	Para Anim					
<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	Invertebrates		x		Para Anim					
<i>Chlorocebus pygerythrus</i>	vervet monkey	Vertebrates		x		Pet					
<i>Magallana gigas</i>	Pacific oyster	Marine		x		Hull	Ballast	Nat			
<i>Sturnus vulgaris</i>	common starling	Vertebrates		x		Container	Pet				
<i>Ceratitis capitata</i>	Mediterranean fruit fly	Invertebrates			x	Con plants					
<i>Psittacula krameri</i>	rose-ringed parakeet	Vertebrates			x	Pet					
<i>Aratinga erythrogenys</i>	red-masked conure	Vertebrates			x	Pet					
<i>Coptotermes gestroi</i>	Asian subterranean termite	Invertebrates			x	THM	Org	TT			
<i>Bactrocera carambolae</i>	carambola fruit fly	Invertebrates			x	Con plants					
<i>Varroa destructor</i>	varroa mite	Invertebrates			x	Para Anim					
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrates			x	Con plants					
<i>Diaphorina citri</i>	Asiatic citrus psyllid	Invertebrates			x	Con plants					

British Indian Ocean Territory

Table 10. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within the British Indian Ocean Territory including most likely pathways of arrival (total = 13 pathways)

Orn = Ornamental purpose other than horticulture; *Pet* = Pet/aquarium/terrarium species; *CNM* = Contaminant nursery material; *Con Plant* = Contaminant on plants; *THM* = Transportation of habitat material; *Ballast* = Ship/boat ballast water; *Container* = Container/bulk; *Hull* = Ship/boat hull fouling; *Lug* = People and their luggage/equipment; *Mach* = Machinery/equipment; *Ship* = Hitchhikers on ship/boat; *Veh* = Vehicles; *Nat* = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common names	Group	Biodiversity	Human health	Economic				
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates	x	x	x	CNM	THM	Container	Ship
<i>Boiga irregularis</i>	brown tree snake	Vertebrates	x	x	x	Container	Con plant		
<i>Rattus norvegicus</i>	brown rat	Vertebrates	x	x	x	Container	Ship		
<i>Rattus exulans</i>	Polynesian rat, Pacific rat	Vertebrates	x	x	x	Container	Ship		
<i>Perna viridis</i>	Asian green mussel	Marine	x	x	x	Hull	Ballast	Nat	
<i>Mus castaneus</i>	Asian house mouse	Vertebrates	x	x	x	Ship	Container		
<i>Mus musculus</i>	house mouse	Vertebrates	x	x	x	Ship	Container		
<i>Magallana gigas</i>	Pacific oyster	Marine	x	x	x	Hull	Ballast	Nat	
<i>Anoplolepis gracilipes</i>	yellow crazy ant	Invertebrates	x	x		CNM	THM	Container	Ship
<i>Paratrechina longicornis</i>	longhorn crazy ant	Invertebrates	x	x		CNM	THM	Container	Ship
<i>Solenopsis invicta</i>	red imported fire ant	Invertebrates	x	x		CNM	THM	Container	Ship
<i>Asparagus densiflorus</i>	asparagus fern	Plants	x			Orn			
<i>Monomorium destructor</i>	Singapore ant	Invertebrates	x			CNM	THM	Container	Ship

<i>Tapinoma melanocephalum</i>	ghost ant	Invertebrates	x			CNM	THM	Container	Ship
<i>Amathia verticillata</i>	bryozoan	Marine	x			Hull	Ballast	Nat	
<i>Halophila stipulacea</i>	seagrass	Marine	x			Ballast	Nat		
<i>Dactyloctenium aegyptium</i>	crowfoot grass	Plants	x			Lug	Mach	Veh	THM
<i>Corvus splendens</i>	house crow	Vertebrates	x			Ship			
<i>Mytilopsis sallei</i>	black-striped mussel	Marine	x			Hull	Ballast	Nat	
<i>Sargassum fluitans</i>	brown alga	Marine	x			Hull	Ballast	Nat	
<i>Malayopython reticulatus</i>	reticulated python	Vertebrates	x	x		Pet			
<i>Gekko gecko</i>	tokay gecko	Vertebrates	x			Pet			
<i>Didemnum perlucidum</i>	tunicate	Marine	x			Hull	Ballast	Nat	
<i>Rhynchophorus ferrugineus</i>	red palm weevil	Invertebrates	x			Con Plant	CNM		
<i>Amphibalanus reticulatus</i>	purple acorn barnacle	Marine	x	x		Hull	Ballast	Nat	
<i>Cimex hemipterus</i>	tropical bed bug	Invertebrates		x	x	Lug	THM		
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine		x	x	Hull	Ballast	Nat	

South Atlantic Overseas Territories: British Antarctic Territory, Falkland Islands, South Georgia and South Sandwich Islands

Table 11. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within the BAT including most likely pathways of arrival (total = 7 pathways)

Other = Other escape from confinement; Escape: Food = Food contaminant; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment

Species	Common names	Group	Biodiversity	Human health	Economic				
<i>Mytilus chilensis</i>	Chilean mussel	Marine	x			Hull			
<i>Mytilus edulis</i>	blue mussel	Marine	x			Hull			
<i>Halicarcinus planatus</i>	decapod	Marine	x			Other	Ballast	Hull	
<i>Ciona intestinalis</i>	ascidian	Marine	x			Hull			
<i>Botryllus schlosseri</i>	colonial ascidian	Marine	x			Hull			
<i>Carcinus maenas</i>	European shore crab	Marine	x			Hull	Ballast		
<i>Undaria pinnatifida</i>	Asian kelp	Marine	x			Hull			
<i>Chaetopterus variopedatus</i>	marine polychaete	Marine	x			Hull	Ballast		
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull			
<i>Bugula neritina</i>	ruby bryozoan	Marine	x			Hull			
<i>Magallana gigas</i>	Pacific oyster	Marine			x	Hull	Other		
<i>Protaphorura fimata</i>	springtail	Invertebrates	x			Food	Lug	Container	Machinery
<i>Nanorchestes antarcticus</i>	mite	Invertebrates	x			Lug	Mach		
<i>Leptinella scariosa</i>	brass buttons	plant	x			Lug	Mach	Veh	Container
<i>Poa annua</i>	annual bluegrass	plant	x			Lug	Mach	Veh	
<i>Leptinella plumosa</i>	Alpine flowering plant	plant	x			Lug	Mach	Veh	Container

Table 12. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within the Falklands including most likely pathways of arrival (total = 21 pathways)

F = Fishery in the wild; L = Landscape/flora/fauna “improvement” in the wild; Other = Other escape from confinement; Ag = Agriculture; Aq = Aquaculture / mariculture; Farm = Farmed animals; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; Food = Food contaminant; Par Anim = Parasites on animals; Par Plant = Parasites on plants; THM = Transportation of habitat material; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Veh = Vehicles; Nat = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common names	Group	Biodiversity	Human health	Economic				
<i>Mytilus chilensis</i>	Chilean mussel	Marine	x		x	Hull			
<i>Mytilus edulis</i>	blue mussel	Marine	x		x	Hull			
<i>Undaria pinnatifida</i>	Asian kelp	Marine	x			Hull			
<i>Botryllus schlosseri</i>	colonial ascidian	Marine	x			Hull			
<i>Carcinus maenas</i>	European shore crab	Marine	x			Hull	Ballast		
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x		x	Hull			
<i>Ascidella aspersa</i>	European sea squirt	Marine	x			Hull			
<i>Amphibalanus amphitrite</i>	striped barnacle	Marine	x			Hull			
<i>Balanus glandula</i>	barnacle	Marine	x			Hull			
<i>Codium fragile</i> subsp. <i>fragile</i>	green sea fingers - green alga	Marine	x			Hull			

<i>Spartina</i> spp.	common cord grass	Marine	x			Other	Nat		
<i>Cotoneaster</i> spp.	cotoneaster	Plant	x			Orn			
<i>Berberis ilicifolia</i>	holly barberry	Plant	x		x	Orn			
<i>Leptinella plumosa</i>	Alpine flowering plant	Plant	x			Lug	Mach	Veh	Container
<i>Carex pendula</i>	hanging sedge	Plant	x			Orn	THM		
<i>Hedera 'Hibernica'</i>	Atlantic ivy	Plant	x			Orn			
<i>Schedonorus arundinaceus</i>	tall fescue	Plant	x			Lug	Ag	CNM	Veh
<i>Chamerion angustifolium</i>	fireweed	Plant	x			THM	Veh	Mach	
<i>Salmo salar</i>	Atlantic salmon	Vertebrate	x			Aq	F		
<i>Oncorhynchus mykiss</i>	rainbow trout	Vertebrate	x			Aq	F		
<i>Anas platyrhynchos</i>	mallard	Vertebrate	x			Farm	Pet	Unaided	
<i>Equus ferus</i>	wild horse	Vertebrate	x			Farm			
<i>Rangifer tarandus</i>	reindeer	Vertebrate	x		x	Farm			
<i>Harmonia axyridis</i>	harlequin ladybird	Invertebrates	x			Container	Lug	Food	Vehicles
<i>Lithobius melanops</i>	centipede	Invertebrates	x			Container	Con plant		
<i>Ixodes ricinus</i>	sheep tick	Invertebrates		x	x	Par animals	Lug		
<i>Aphis fabae</i>	black bean aphid	Invertebrates			x	Par plants	Container		
<i>Brevicoryne brassicae</i>	mealy cabbage aphid	Invertebrates			x	Food			

Table 13. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within South Georgia and the South Sandwich Islands including most likely pathways of arrival (total = 10 pathways)

Other = Other escape from confinement; Con Anim = Contaminant on animals; Food = Food contaminant; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = machinery/equipment; Ship = Hitchhikers on ship/boat; Veh = Vehicles

Species	Common names	Group	Biodiversity	Human health	Economic					
<i>Mytilus chilensis</i>	Chilean mussel	Marine	x			Hull				
<i>Mytilus edulis</i>	blue mussel	Marine	x			Hull				
<i>Botryllus schlosseri</i>	colonial ascidian	Marine	x			Hull				
<i>Carcinus maenas</i>	European shore crab	Marine	x			Hull	Ballast			
<i>Ciona intestinalis</i>	ascidian	Marine	x			Hull				
<i>Halicarcinus planatus</i>	decapod	Marine	x			Other	Ballast	Hull		
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull				
<i>Undaria pinnatifida</i>	Asian kelp	Marine	x			Hull				
<i>Bugula neritina</i>	ruby bryozoan	Marine	x			Hull				
<i>Austromininus modestus</i>	Darwin's barnacle	Marine	x			Hull	Other			
<i>Codium fragile</i> subsp. <i>fragile</i>	green sea fingers - green alga	Marine	x			Hull				
<i>Asciella aspersa</i>	European sea squirt	Marine	x			Hull				
<i>Carex trifida</i>	tataki grass	Plant	x			Lug	Mach	Veh		
<i>Acaena lucida</i>	bidibid	Plant	x			Lug	Mach	Veh		
<i>Leptinella plumosa</i>	Alpine flowering plant	Plant	x			Mach	Veh	Lug	Container	Con Anim
<i>Rattus rattus</i>	black rat	Vertebrate	x		x	Ship				

<i>Mus musculus</i>	house mouse	Vertebrate	x		x	Ship				
<i>Rattus norvegicus</i>	brown rat	Vertebrate	x		x	Ship				
<i>Forficula auricularia</i>	European earwig	Invertebrates	x			Container				
<i>Hypogastrura manubrialis</i>	springtail	Invertebrates	x			Food	Luggage	Container	Machinery	

Mid Atlantic Overseas Territories: Ascension, Saint Helena, Tristan da Cunha

Table 14. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Ascension including most likely pathways of arrival (total = 15 pathways)

Orn = Ornamental purpose other than horticulture; *CNM* = Contaminant nursery material; *Con Plant* = Contaminant on plants; *Food* = Food contaminant; *THM* = Transportation of habitat material; *TT* = Timber trade; *Ballast* = Ship/boat ballast water; *Container* = Container/bulk; *Hull* = Ship/boat hull fouling; *Lug* = People and their luggage/equipment; *Mach* = Machinery/equipment; *Org* = Organic packing material, in particular wood packaging; *Ship* = Hitchhikers on ship/boat; *Veh* = Vehicles; *Nat* = Natural dispersal across borders of invasive alien species that have been introduced

Species	Common name	Group	Biodiversity	Human health	Economic							
<i>Anoplolepis gracilipes</i>	yellow crazy ant	Invertebrates	x			CNM	THM	Container	Ship			
<i>Solenopsis invicta</i>	red imported fire ant	Invertebrates	x	x	x	CNM	THM	Container	Ship			
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates	x		x	CNM	THM	Container	Ship			
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull	Ballast	Nat				
<i>Cenchrus setaceus</i>	fountain grass	Plants	x			CNM	THM	Container	Seed	Veh	Lug	
<i>Cortaderia selloana</i>	pampas grass	Plants	x			THM	Container	Seed	Veh	Lug	Orn	
<i>Imperata cylindrica</i>	cogongrass	Plants	x			THM	Container	Seed	Veh	Lug	Orn	
<i>Linepithema humilis</i>	Argentine ant	Invertebrates	x			CNM	THM	Container	Ship			
<i>Rattus norvegicus</i>	brown rat	Vertebrates	x	x		Container	Ship					
<i>Chromolaena odorata</i>	Jack in the bush	Plants	x			Orn	Orn	Veh	Lug			
<i>Harmonia axyridis</i>	harlequin ladybird	Invertebrates	x			Container	Lug					
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrates	x			Con plant						
<i>Magallana gigas</i>	Pacific oyster	Marine	x			Hull	Ballast	Nat				
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull	Ballast	Nat				

<i>Semimytilus algosus</i>	bivalve	Marine	x			Hull	Ballast	Nat			
<i>Tubastraea coccinea</i>	orange cup coral	Marine	x			Hull	Ballast	Nat			
<i>Acacia melanoxylon</i>	blackwood	Plants	x			Orn					
<i>Carpobrotus edulis</i>	hottentot fig	Plants	x			Orn	THM	Veh	Lug		
<i>Christella parasitica</i>	parasitic maiden fern	Plants	x			Orn	THM	Veh	Lug	Container	
<i>Chrysanthemoides monilifera</i>	bitou bush	Plants	x			Orn	THM				
<i>Nephrolepis cordifolia</i>	fishbone fern	Plants	x			Orn	THM	Veh	Lug	Container	
<i>Psidium cattleianum</i>	strawberry guava	Plants	x			Orn					
<i>Arundo donax</i>	giant cane	Plants	x			Orn	THM	Veh	Lug	Container	
<i>Monomorium destructor</i>	Singapore ant	Invertebrates	x			CNM	THM	Container	Ship		
<i>Nylanderia fulva</i>	crazy ant	Invertebrates	x			CNM	THM	Container	Ship		
<i>Ciona robusta</i>	ascidian	Marine	x			Hull	Ballast	Nat			
<i>Pereskia grandiflora</i>	rose cactus	Plants	x			Orn					
<i>Acacia cyclops</i>	coastal wattle	Plants	x			Orn					
<i>Lygodium japonicum</i>	Japanese climbing fern	Plants	x			Orn	THM	Veh	Lug	Container	
<i>Aedes aegypti</i>	yellow fever mosquito	Invertebrates		x	x	Mach	CNM	Veh	THM		
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x	x	Mach	CNM	Veh	THM		
<i>Anopheles quadrimaculatus</i>	common malaria mosquito	Invertebrates		x	x	Mach	CNM	Veh	THM		
<i>Anopheles gambiae</i>	mosquito	Invertebrates		x		Mach	CNM	Veh	THM		
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrates			x	Con plant	Food				
<i>Ceratitis capitata</i>	med fly	Invertebrates			x	Con plant	Food				
<i>Coptotermes formosanus</i>	Asian subterranean termite	Invertebrates			x	THM	Org	TT			

<i>Reticulitermes flavipes</i>	eastern subterranean termite	Invertebrates			x	THM	Org	TT			
<i>Aphis gossypi</i>	melon cotton aphid	Invertebrates			x	Con plant	Food				

Table 15. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within St Helena including most likely pathways of arrival (total = 16 pathways)

Other = Other escape from confinement; Ag = Agriculture; BZA = Botanical garden/zoo/aquaria; For = Forestry; Orn = Ornamental purpose other than horticulture; Bait = Contaminated bait; Con Plant = Contaminant on plants; THM = Transportation of habitat material; TT = Timber trade; Air = Hitchhikers in or on airplane; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Ship = Hitchhikers on ship/boat; Veh = Vehicles

Species	Common names	Group	Biodiversity	Human health	Economic								
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull	Other						
<i>Mytilus edulis</i>	Blue mussel	Marine	x			Hull	Other						
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull	Other						
<i>Semimytilus algosus</i>	bivalve	Marine	x			Hull	Other						
<i>Magallana gigas</i>	Pacific oyster	Marine	x			Hull	Other						
<i>Carcinus maenas</i>	European shore crab	Marine	x			Hull							
<i>Ciona intestinalis</i>	ascidian	Marine	x			Hull							
<i>Tubastraea coccinea</i>	orange cup coral	Marine	x			Hull	Other						
<i>Prosopis juliflora</i>	mesquite	Plant	x			Mach	Lug	Veh	For	EC			
<i>Chromolaena odorata</i>	Jack in the bush	Plant	x		x	Mach	Seed	Air	Veh	Lug	Container	THM	
<i>Cortaderia selloana</i>	pampas grass	Plant	x			Orn	Mach	Veh	Lug	Container	Air		
<i>Cuscuta campestris</i>	field dodder	Plant	x		x	Con Plant	Orn	Mach	THM	Ag	Bait		
<i>Imperata cylindrica</i>	cogon grass	Plant	x		x	Orn	Ag	Org	Mach	Veh	Lug		
<i>Clidemia hirta</i>	Koster's curse	Plant	x			Mach	Lug	Veh	Orn	THM			
<i>Melinis minutiflora</i>	molasses grass	Plant	x			Mach	Lug	Veh	Ag				
<i>Cryptostegia grandiflora</i>	Palay rubber vine	Plant	x		x	Orn	BZA	Mach	Veh	Lug	Air	Container	

<i>Cryptostegia madagascariensis</i>	Madagascar rubbervine	Plant	x		x	Orn	BZA	Mach	Veh	Lug	Air	Container
<i>Cirsium arvense</i>	Canadian thistle	Plant			x							
<i>Tamarix ramosissima</i>	saltcedar	Plant	x			Orn	EC	Mach	Veh			
<i>Hypoestes phyllostachya</i>	polka dot plant	Plant	x			Orn	THM					
<i>Pereskia aculeata</i>	Barbados gooseberry	Plant	x			Orn	BZA					
<i>Galenia populosa</i>	Namibian ice plant	Plant	x			THM	Orn	BZA				
<i>Dolichandra unguis-cati</i>	cats claw creeper	Plant	x			Orn	BZA					
<i>Passiflora suberosa</i>	corkstem passionflower	Plant	x			THM	Mach	Veh	Lug	Orn		
<i>Thunbergia grandiflora</i>	Bengal clock vine	Plant	x			THM	Mach	Veh	Lug	Orn		
<i>Ipomoea alba</i>	tropical white morning-glory	Plant	x			Seed	THM	Mach	Veh	Lug		
<i>Cenchrus longisetus</i>	feathertop grass	Plant	x			Orn	Air	Container	Mach	Veh	Lug	BZA
<i>Monomorium destructor</i>	Singapore ant	Invertebrate	x			Container	THM	Ship	Lug			
<i>Anoplolepis gracilipes</i>	yellow crazy ant	Invertebrate	x			Container	THM	Ship	Lug			
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrate	x	x	x	Container	THM	Ship	Lug			
<i>Solenopsis invicta</i>	red imported fire ant	Invertebrate	x	x		Container	THM	Ship	Lug			
<i>Aedes aegypti</i>	yellow fever mosquito	Invertebrate		x	x	Air	Ship					
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrate		x	x	Air	Ship					
<i>Anopheles quadrimaculatus</i>	common malaria mosquito	Invertebrate		x	x	Air	Ship					
<i>Anopheles gambiae</i>	mosquito	Invertebrate		x		Air	Ship					
<i>Vespa germanica</i>	German wasp	Invertebrate	x	x		Container						
<i>Polistes dominula</i>	European paper wasp	Invertebrate		x		Container						

<i>Bemisia tabaci</i>	tobacco whitefly	Invertebrate			x	Con Plant						
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrate			x	Con Plant						
<i>Tuta absoluta</i>	tomato leaf miner	Invertebrate			x	Con Plant						
<i>Dacus bivittatus</i>	bigger pumpkin fly	Invertebrate			x	Con Plant						
<i>Bactrocera dorsalis</i>	oriental fruit fly	Invertebrate			x	Con Plant						
<i>Bactrocera cucurbitae</i>	melon fly	Invertebrate			x	Con Plant						
<i>Ceratitis cosyra</i>	mango fruit fly	Invertebrate			x	Con Plant						
<i>Coptotermes formosanus</i>	Asian subterranean termite	Invertebrate			x	TT	THM					
<i>Harmonia axyridis</i>	harlequin ladybird	Invertebrate	x									
<i>Palystes superciliosus</i>	rain spider	Invertebrate	x			Container	Air	Ship				
<i>Globodera rostochiensis</i>	potato cyst nematode	Invertebrate			x	Con Plant						
<i>Corvus splendens</i>	house crow	Vertebrate	x		x		Ship					
<i>Hemidactylus mabouia</i>	tropical house gecko	Vertebrate	x			Container						
<i>Hemidactylus mercatorius</i>	coconut palm gecko	Vertebrate	x			Container						
<i>Afrogecko porphyreus</i>	marbled leaf-toed gecko	Vertebrate	x			Container						
<i>Lygodactylus capensis</i>	Cape dwarf gecko	Vertebrate	x			Lug						
<i>Anolis sagrei</i>	brown anole	Vertebrate	x			Container						
<i>Liolaemus wiegmanii</i>	Weigman's tree iguana	Vertebrate	x			Container						

Table 16. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Tristan da Cunha including most likely pathways of arrival (total = 9 pathway)

Orn = Ornamental purpose other than horticulture; *Con Plant* = Contaminant on plants; *THM* = Transportation of habitat material; *Air* = Hitchhikers in or on airplane; *Ballast* = Ship/boat ballast water; *Container* = Container/bulk; *Hull* = Ship/boat hull fouling; *Lug* = People and their luggage/equipment; *Mach* = Machinery/equipment

Species	Common name	Group	Biodiversity	Human health	Economic					
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull				
<i>Rattus norvegicus</i>	brown rat	Vertebrates	x	x	x	Container	Ship			
<i>Hemidactylus frenatus</i>	common house gecko	Vertebrates	x			Container	Ship			
<i>Hemidactylus mabouia</i>	tropical house gecko	Vertebrates	x			Container	Ship			
<i>Afrogecko porphyreus</i>	marbled leaf-toed gecko	Vertebrates	x			Container	Ship			
<i>Lygodactylus capensis</i>	Cape dwarf gecko	Vertebrates	x			Container	Ship			
<i>Carcinus maenas</i>	European shore crab	Marine	x			Hull	Ballast			
<i>Ciona intestinalis</i>	ascidian	Marine	x			Hull				
<i>Magallana gigas</i>	Pacific oyster	Marine	x			Hull				
<i>Mytilus edulis</i>	blue mussel	Marine	x			Hull				
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull				
<i>Semimytilus algosus</i>	bivalve	Marine	x			Hull				
<i>Undaria pinnatifida</i>	alga	Marine	x			Hull				
<i>Corvus splendens</i>	house crow	Vertebrates	x		x	Ship				

<i>Vespa communis/germanica</i>	common/German wasp	Invertebrates	x	x		Ship	Container			
<i>Lupinus polyphyllus/nootkatensis</i>	lupins	Plants	x			Orn	Mach	Veh	Lug	Container
<i>Liolaemus wiegmanii</i>	Weigman's tree iguana	Vertebrates	x			Container	THM			
<i>Acridotheres tristis</i>	common myna	Vertebrates	x		x	Ship	Container			
<i>Merizodus solidinus</i>	ground beetles	Invertebrates	x			Container	THM			
<i>Schizoporella japonica</i>	bryozoan	Marine	x			Hull				
<i>Steatoda grossa</i>	spider	Invertebrates		x		Container	Air	Ship		
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x		Air	Ship			
<i>Globodera rostochiensis</i>	potato cyst nematode	Invertebrates			x	Container	THM			
<i>Globodera pallida</i>	white potato cyst nematode	Invertebrates			x	Con plant				
<i>Ditylenchus destructor</i>	potato tuber nematode	Invertebrates			x	Con plant				
<i>Undaria pinnatifida</i>	alga	Marine			x	Hull				
<i>Calliphora vicina</i>	blow fly	Invertebrates			x	Container	THM			
<i>Macrosiphon euphorbiae</i>	potato aphid	Invertebrates			x	Con plant				
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrates			x	Con plant				

Gibraltar

Table 17. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Gibraltar including most likely pathways of arrival (total = 18 pathways)

*Ag = Agriculture; BZA = Botanical garden/zoo/aquaria; Orn = Ornamental purpose other than horticulture; Pet = Pet/aquarium/terrarium species; CNM = Contaminant nursery material; Con Plant = Contaminant on plants; THM = Transportation of habitat material; TT = Timber trade; Air = Hitchhikers in or on airplane; Ballast = Ship/boat ballast water; Container = Container/bulk; Hull = Ship/boat hull fouling; Lug = People and their luggage/equipment; Mach = Machinery/equipment; Org = Organic packing material, in particular wood packaging; Ship = Hitchhikers on ship/boat; Veh = Vehicles
Nat = Natural dispersal across borders of invasive alien species that have been introduced*

Species	Common names	Group	Biodiversity	Human health	Economic						
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates	x	x	x	Nat	Container	Ship	Org		
<i>Pterois miles</i>	lionfish	Marine	x	x	x	Nat	BZA				
<i>Rhopilema nomadica</i>	jellyfish	Marine	x	x	x	Ballast	Nat				
<i>Siganus luridus</i>	rabbitfish	Marine	x	x		Nat					
<i>Capra hircus</i>	goats	Vertebrates	x		x	Pet	Ag				
<i>Acridotheres cristatellus</i>	crested myna	Vertebrates	x		x	Pet	Nat				
<i>Acridotheres tristis</i>	common myna	Vertebrates	x		x	Nat	Pet				
<i>Myiopsitta monachus</i>	monk parakeet	Vertebrates	x		x	Nat	Pet				
<i>Phyllorhiza punctata</i>	Australian spotted jellyfish	Marine	x		x	Nat	Ballast				
<i>Pheidole megacephala</i>	African big-headed ant	Invertebrates	x			Nat	Container	Ship	Org		
<i>Pheidole indica</i>	ant	Invertebrates	x			Nat	Container	Ship	Org		
<i>Vespa velutina</i>	Asian hornet	Invertebrates	x			Nat					
<i>Harmonia axyridis</i>	harlequin ladybird	Invertebrates	x			Air	Ship	Veh	CNM		
<i>Podarcis sicula</i>	Italian wall lizard	Vertebrates	x			Con Plant	Container	Pet			

<i>Macroprotodon mauritanicus</i>	Berber smooth snake	Vertebrates	x			Con Plant	Pet				
<i>Lampropeltis californiae</i>	Californian kingsnake	Vertebrates	x			Pet					
<i>Hemidactylus frenatus</i>	house gecko	Vertebrates	x			Container					
<i>Hemidactylus mabouia</i>	tropical house gecko	Vertebrates	x			Pet	Container				
<i>Cenchrus setaceus</i>	African fountain grass	Plants	x			Orn	BZA	Veh	Mach	Lug	Nat
<i>Freesia alba/refracta</i>	white freesia	Plants	x			Orn	BZA	THM			
<i>Kalanchoe</i> spp.	kalanchoe/mother-of-thousands	Plants	x			Orn	BZA	Mach	Veh	Lug	THM
<i>Araujia sericifera</i>	moth plant	Plants	x			Orn	BZA				
<i>Dimorphotheca</i> spp.	rain daisy	Plants	x			Orn	BZA	Veh	Mach	Lug	THM
<i>Nasella tenuissima</i>	Mexican feathergrass	Plants	x			Orn	BZA	Veh	Mach	Lug	Nat
<i>Cenchrus longisetus</i>	feathertop	Plants	x			Orn	BZA				
<i>Senecio</i> cf. <i>tamoides</i>	canary creeper	Plants	x			Orn	BZA	THM			
<i>Miscanthus</i> spp.	Chinese silver grass	Plants	x			Orn	BZA	Veh	Mach	Lug	Nat
<i>Imperata cylindrica</i>	cogon grass	Plants	x			Orn	BZA	Mach	Veh	Lug	Nat
<i>Lonicera japonica</i>	Japanese honeysuckle	Plants	x			Orn	BZA				
<i>Cortaderia selloana/jubata</i>	pampas grass	Plants	x			Orn	BZA	Veh	Mach	Lug	Nat
<i>Galenia secunda</i>	one-sided galenia	Plants	x			Orn	BZA	Veh	Mach	Lug	
<i>Opuntia dillenii</i>	prickly pear	Plants	x			Orn	BZA	Nat			
<i>Opuntia stricta</i>	prickly pear	Plants	x			Orn	BZA	Nat			
<i>Lophocladia lallemandii</i>	alga	Marine	x			Hull					
<i>Antithamnionella spirographidis</i>	red alga	Marine	x			Hull	Ballast				
<i>Callinectes sapidus</i>	blue crab	Marine	x			Ballast	Hull				

<i>Chama pacifica</i>	mollusc	Marine	x			Natural	Hull				
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull					
<i>Asterias amurensis</i>	seastar	Marine	x			Ballast	Hull				
<i>Spondylus spinosus</i>	mollusc	Marine	x			Hull	Ballast				
<i>Anopheles plumbeus</i>	mosquito	Invertebrates		x	x	Ship	Mach	Veh			
<i>Aedes aegypti</i>	yellow fever mosquito	Invertebrates		x	x	Air	Ship	Mach	Con Plants	Veh	
<i>Aedes japonica</i>	mosquito	Invertebrates		x	x	Air	Ship	Mach	Con Plants	Veh	
<i>Culex quinquefasciatus</i>	southern house mosquito	Invertebrates		x	x	Ship	Container	Veh			
<i>Siganus rivulatus</i>	rabbitfish	Marine		x		Nat					
<i>Lagocephalus sceleratus</i>	pufferfish	Marine		x		Nat					
<i>Torquigener flavimaculosus</i>	yellow spotted pufferfish	Marine		x		Nat					
<i>Scyphophorus acupunctatus</i>	agave snout weevil	Invertebrates			x	Nat	Con Plant				
<i>Cryptotermes brevis</i>	powderpost termite	Invertebrates			x	CNM	Ship	Org	TT		
<i>Reticulitermes flavipes</i>	eastern subterranean termite	Invertebrates			x	CNM	Ship	Org	TT		
<i>Frankliniella occidentalis</i>	western flower thrip	Invertebrates			x	CNM	Con Plant				
<i>Maconellicoccus hirsutus</i>	pink hibiscus mealybug	Invertebrates			x	Con Plant					
<i>Phenacoccus peruvianus</i>	bougainvillea mealybug	Invertebrates			x	Con Plant					
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrates			x	Nat	Con Plant	Ship			
<i>Corvus splendens</i>	house crow	Vertebrates			x	Ship					
<i>Psittacula krameri</i>	ring necked parakeet	Vertebrates			x	Nat	Pet				

<i>Ficus microcarpa</i>	Chinese banyan	Plants			x	Orn	BZA				
<i>Ficus rubiginosa</i>	Port Jackson fig	Plants			x	Orn	BZA				

Pitcairn

Table 18. Invasive Non-Native Species with high likelihood of arrival, establishment and impacts within Pitcairn including most likely pathways of arrival (total = 13 pathways)

Orn = Ornamental purpose other than horticulture; *Pet* = Pet/aquarium/terrarium species; *CNM* = Contaminant nursery material; *Con Plant* = Contaminant on plants; *Food* = Food contaminant; *Par Anim* = Parasites on animals; *THM* = Transportation of habitat material; *Ballast* = Ship/boat ballast water; *Container* = Container/bulk; *Hull* = Ship/boat hull fouling; *Lug* = People and their luggage/equipment; *Ship* = Hitchhikers on ship/boat; *Veh* = Vehicles

Species	Common name	Group	Biodiversity	Human health	Economic					
<i>Anoplolepis gracilipes</i>	yellow crazy ant	Invertebrates	x			Container	THM	Ship	Lug	
<i>Wasmannia auropunctata</i>	little fire ant	Invertebrates	x	x	x	Container	THM	Ship	Lug	
<i>Rattus rattus</i>	ship rat	Vertebrates	x	x	x	Ship	Container			
<i>Rattus norvegicus</i>	brown rat	Vertebrates	x	x	x	Ship	Container			
<i>Asparagus densiflorus</i>	asparagus fern	Plants	x			Orn				
<i>Cardiospermum grandiflorum</i>	showy balloonvine	Plants	x			Orn				
<i>Linepithema humile</i>	Argentine ant	Invertebrates	x		x	Container	THM	Ship	Lug	
<i>Caulerpa taxifolia</i>	macroalga	Marine	x			Hull				
<i>Clidemia hirta</i>	Koster's curse	Plants	x			CNM	THM	Veh	Lug	Orn
<i>Miconia calvescens</i>	miconia	Plants	x			Orn	CNM	THM	Veh	Lug
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	Marine	x			Hull	Ballast			
<i>Mytilopsis sallei</i>	black striped mussel	Marine	x			Hull	Other			
<i>Perna viridis</i>	Asian green mussel	Marine	x			Hull	Other			
<i>Vespula germanica</i>	European wasp	Invertebrates	x	x	x	Container	Lug	Ship		
<i>Vespula vulgaris</i>	common wasp	Invertebrates	x	x	x	Container	Lug	Ship		
<i>Melinis minutiflora</i>	molasses grass	Plants	x			CNM	THM	Veh	Lug	Container

<i>Euglandina rosea</i>	rosy wolf snail	Invertebrates	x			Container	THM			
<i>Cortaderia selloana</i>	pampas grass	Plants	x		x	Orn	THM	Veh	Lug	Container
<i>Cortaderia jubata</i>	pampas grass	Plants	x		x	Orn	THM	Veh	Lug	Container
<i>Pycnonotus cafer</i>	red-vented bulbul	Vertebrates	x			Pet	Ship	Container		
<i>Merremia peltata</i>	morning glory	Plants	x			Orn				
<i>Nasella tenuissima</i>	Mexican feathergrass	Plants	x			Orn	THM	Veh	Lug	Container
<i>Araujia sericifera</i>	moth plant	Plants	x			Orn				
<i>Aedes aegypti</i>	yellow fever mosquito	Invertebrates		x	x	Container	Lug	Ship		
<i>Aedes albopictus</i>	Asian tiger mosquito	Invertebrates		x	x	Container	Lug	Ship		
<i>Spodoptera frugiperda</i>	fall armyworm	Invertebrates			x	Con Plant	Container	Food		
<i>Plutella xylostella</i>	diamond back moth	Invertebrates			x	Con Plant	Container	Food		
<i>Varroa destructor</i>	varroa mite	Invertebrates			x	Par Anim				
<i>Bactrocera dorsalis group</i>	oriental fruit fly	Invertebrates			x	Container	Lug	Ship		
<i>Bemisia tabaci</i>	tobacco whitefly	Invertebrates			x	Con Plant				
<i>Lissachatina fulica</i>	giant African snail	Invertebrates			x	Container	THM	Ship		
<i>Oryctes rhinoceros</i>	coconut rhinoceros beetle	Invertebrates			x	Con plant	Lug			

4.0 Discussion

The recent Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services IPBES Global Assessment on Biodiversity and Ecosystem Services noted a doubling of INNS over the last 50 years and acknowledged that in areas of high endemism, such as the OTs, native biodiversity has been severely depleted by INNS (IPBES 2019). The OTs are of considerable importance for biodiversity (Procter & Fleming 1999), indeed six of the Territories are noted as global biodiversity hotspots (Hilton & Cuthbert 2010). Some of the largest seabird colonies globally are found across the OTs, with populations of tens of millions of albatrosses, burrowing petrels and penguins on Gough Island (Tristan da Cunha) and South Georgia (Hilton & Cuthbert 2010). The invertebrate fauna of St Helena has a high level of endemism (450 species; 96% of all native species) but the non-native species (664 species) now exceeds the number of native species (Gray *et al.* 2019). There is an urgent need for identification and prioritisation of INNS. The priority lists of INNS for each of the OTs derived through horizon scanning are important for informing biosecurity and decision-making (Roy *et al.* 2014; Roy *et al.* 2019).

Diversity of INNS prioritised within the lists

The diversity of INNS identified as posing a threat to biodiversity and ecosystems, human health and economies across the OTs is vast. However, there is considerable variability among the Territories both in terms of the priority INNS and the numbers within each list. While some of the Territories (Anguilla, Montserrat, TCI) had an even number of INNS within each impact category, in most cases the number of INNS identified as a threat to biodiversity and ecosystems was higher than the number considered within the human health or economic impact categories. Gibraltar, St Helena and Ascension were attributed the longest lists of INNS within the biodiversity and ecosystem impact category (41, 40 and 29 INNS respectively). In contrast there were no INNS listed within the human health impact category for the BAT or SGSSI reflecting the low human population densities associated with these pristine habitats. Interestingly although the Falklands have a human population of about 3000 only one species was considered to represent a threat to human health: *Ixodes ricinus* sheep tick and vector of Lyme's Disease.

Perhaps unsurprisingly the number of INNS listed within the economic impact category was very low for both BAT or SGSSI. Many of the INNS listed within the economic impact category are plant pests and so the diversity of agricultural production within a UK Territory was a major determinant of the number of INNS listed. The BVI, Gibraltar, Saint Helena and Bermuda had the longest lists of INNS within this category (25, 22, 20, 18 INNS respectively). However, adverse effects on tourism was also noted for a number of INNS listed within the economic impact categories with some of the INNS, particularly those associated with human health impacts, thought likely to be discouraging to tourism with an invaded region. The lion fish *Pterois miles*, which has venomous spines and is found in shallow waters, is considered one such species. The evidence of economic costs (both indirect and direct) is lacking but regional experts involved in the horizon scanning considered the economic impacts of a number of INNS to warrant the highest score.

Some of the INNS were considered relevant to a number of OTs and impact categories. As examples, *Perna viridis*, *Wasmannia auropunctata*, *Lissachatina fulica*, *Rattus norvegicus*, *Pterois miles* and *Aedes albopictus* were all considered to have the potential for biodiversity and ecosystem, human health and economic impacts and included within 21, 18, 14, 12, 11 and 10 lists respectively (Appendix 1; Box 1).

Box 1: Examples of some INNS included on priority lists for a number of OTs and impact categories. Links to CABI datasheets are provided as references.

Little fire ant *Wasmannia auropunctata*

<https://www.cabi.org/isc/datasheet/56704>

Invasion history: native to Central and South America and introduced to Africa (including Gabon and Cameroon), the Middle East (Israel), North America (including Canada) and South America. Also some islands in the Caribbean and the Pacific Ocean (including New Caledonia, Vanuatu, Tahiti, the Galapagos, Hawaii and Solomon Islands).

Ecology: generalist ant.

Environmental impacts: disrupts ecosystems through reducing species diversity, reducing overall abundance of flying and tree-dwelling insects, and eliminating arachnid populations.

Economic impacts: abandonment of agricultural land by farm workers because of human health threat.

Human health impacts: painful stings to such an extent that farmers have to abandon agricultural systems.

Included within eight OTs priority lists: Bermuda, Cayman Islands, Montserrat, British Indian Ocean Territory, Ascension, St Helena, Gibraltar, Pitcairn

Giant African land snail *Lissachatina fulica*

<https://www.cabi.org/isc/datasheet/2640>

Invasion history: introduced from its native range in East Africa to many parts of the world as both a food source (for humans, fish and livestock) and as a pet. It can attach to vehicles and machinery at any developmental stage and can also become dormant in cool conditions and so can be transported over considerable distances. It is readily able to establish in in tropical and some temperate locations.

Ecology: fast-growing polyphagous plant pest.

Environmental impacts: considerable concern for native biodiversity and ecosystems because of the consumption of native plants by *L. fulica* and possible out-competing of native snails.

Economic impacts: feeds on a wide range of crops but has a preference for breadfruit, cassava, papaya, peanut, rubber and most species of legumes and cucurbits.

Human health impacts: human nuisance but also vector of the human disease, eosinophilic meningitis, which is caused by the rat lungworm parasite, *Angiostrongylus cantonensis*.

Included within six OTs priority lists: Bermuda, British virgin Isles, Cayman Islands, TCI, Montserrat, Pitcairn

Brown rat *Rattus norvegicus*

Invasion history: globally widespread.

Ecology: opportunistic omnivore and habitat generalist; dominant over other introduced rats.

Environmental impacts: contributed to the extinction or range contraction of native mammals, birds, reptiles and invertebrates through predation and competition. *Rattus norvegicus* is known to limit regeneration of many plant species because it eats seeds and seedlings including crops.

Economic impacts: chewing damage to infrastructure. Spoils stored food products by urinating and defecating on them. Crop damage.

Human health impacts: disease transmission.

Included within five OTs priority lists: British Indian Ocean Territory, SGSSI, Ascension, Tristan da Cunha, Pitcairn

Lionfish *Pterois miles*

<https://www.cabi.org/isc/datasheet/116588>

Invasion history: native to Indian and western Pacific oceans; first Indo-Pacific marine fish to become established in Atlantic waters. First introduced off the Florida coast in the early to mid-1990s, subsequently observed from southern Florida to Cape Hatteras, North Carolina, Long Island, New

York and Bermuda. Spreading rapidly through the Caribbean. Recent arrival in the Mediterranean Sea.

Ecology: highly voracious venomous predatory fish with high rate of reproduction.

Environmental impacts: direct and indirect impact to coral reefs, sea grasses and mangroves. The lionfish will feed on juvenile and adult fish and shellfish, including several species of ecological, recreational and commercial importance. This species is an ambush predator and can rapidly decimate local native reef fish (and some invertebrate) populations and consequently outcompetes native predators.

Economic impacts: direct economic impacts on fisheries and depletion of protein sources for coastal communities.

Human health impacts: injury risk posed by the venomous spines.

Included within five OTs priority lists: Anguilla, British virgin Isles, Montserrat, TCI, Gibraltar

Asian green mussel *Perna viridis*

<https://www.cabi.org/isc/datasheet/70090>

Invasion history: native to Indian coast and throughout the Indo-Pacific but has invasive populations within the Caribbean and western Atlantic.

Ecology: rapidly forms dense colonies on a variety of hard structures (including vessels, pontoons, mariculture equipment, buoys and other hard surfaces) and can thrive across a range of environmental conditions.

Environmental impacts: changes in community structure and trophic relationships through, for example, cascading effects within coastal species assemblages by filtering large volumes of water and severely depleting phytoplankton communities but also competition with native mussels.

Economic impacts: physically blocking pipes and outcompeting mussels within oyster fisheries.

Human health impacts: accumulates pollutants from the environment and so cause human health problems by food poisoning.

Included within 12 OTs priority lists: Anguilla, Bermuda, British Virgin Isles, Cayman Islands, Montserrat, TCI, British Indian Ocean Territory, Ascension, Tristan da Cunha, St Helena, Gibraltar, Pitcairn

A few of the INNS were included because of their potential as vectors of disease. As an example, the Asian tiger mosquito *Aedes albopictus* appeared on 10 lists:

Asian tiger mosquito *Aedes albopictus*

CABI datasheet: <https://www.cabi.org/isc/datasheet/94897>

Invasion history: native across the region spanning the tropics of Southeast Asia, the Pacific and Indian Ocean Islands, north through China and Japan and west to Madagascar. Spread to at least 28 countries beyond its native range including North and South America, Africa, Australia and Europe (established in Albania and Italy; detected in France). Spread through the international tyre trade (in the rainwater that accumulates in tyres).

Ecology: treehole mosquito, breeds in small, restricted, shaded water bodies surrounded by vegetation. Ecologically adaptable and can colonise urban regions reproducing in tyres, flower pots, bird baths and abandoned containers. Feeds on nectar but females require blood to produce eggs.

Environmental impacts: may have competitive advantage over other mosquitoes and vector diseases to wild animals.

Economic impacts: anticipated through loss of working days on Territories with low human populations and also costs of medical care including medivac.

Human health impacts: transmission of many human diseases, including the viruses: Dengue, West Nile and Japanese Encephalitis (high uncertainty in terms of actual transmission with robust

evidence for only two diseases so far: Dengue and Chikungunya). Bites in daytime and biting rates can exceed 30 bites per hour. Included within eight OTs priority lists: Anguilla, BVI, Montserrat, TCI, Ascension, St Helena, Tristan da Cunha, Pitcairn

Pathways of arrival

Identifying the invasive non-native species that could arrive is just the first step in the process of mitigating the risk (Key 2018). Developing and implementing pathway action plans to prevent the arrival of these species is critical. The way in which INNS move from one region of another has been captured through recent frameworks classifying pathways of arrival (Harrower *et al.* 2018). With the continued rise in the movement of people and goods there is increasing interest in the role of global networks in the spread of INNS (Banks *et al.* 2015). Although many of the OTs are within remote locations they are still connected to the wider world through a diverse range of pathways. Stowaway pathways (particularly those associated with air and shipping freight) were considered particularly important across all OTs which is unsurprising given in many cases air and seaports represent the major point of connection. These pathways have also been shown to be of major importance at the European and Global scale (Saul *et al.* 2016). Pathways into a region can vary over time (Essl *et al.* 2015) and increasingly attention is being given to the topology of the network leading to the introduction of INNS (Banks *et al.* 2015).

The range of pathways by which INNS are predicted to arrive varies widely among the OTs. The number of pathways is clearly linked to the connections to the OTs. The BAT, Pitcairn and South Georgia and the South Sandwich Islands are undoubtedly the most remote of the Territories and notably have fewer links and associated pathways of arrival for INNS. In contrast many of the Caribbean OTs have high levels of imports of people and goods through tourism and trade. Indeed 21 pathways were identified for the Cayman Islands. Gibraltar is connected to continental Europe and so has additional pathways represented through this land link. Identifying the pathways most likely to be associated with the INNS prioritised for each UK Overseas Territory is critical for informing biosecurity.

The pathways associated with the transport of marine INNS (which are generally very difficult to manage post-invasion) were recognised as requiring specific attention within respect to management such as ballast and hull contamination. As an example the International Maritime Organisation has agreed ballast water exchange protocols for ships entering Antarctic waters (IMO, 2007). However, many ships accessing the region do not yet comply with the more stringent ballast water regulations that entered into force in 2017, requiring ships to treat ballast water and so this pathway also continues to represent a threat. Additionally, the lack of regular and routine de-fouling of ships means this pathway may present one of the greatest threats to biodiversity in the nearshore environment around the many OTs.

Conclusions and future directions

The commitment and diligence of the experts (both external and regional) to this horizon scanning study was impressive. The incredible breadth of INNS considered and the depth of discussions demonstrates the rigour and relevance of the process. Deriving lists of INNS with the potential to threaten biodiversity and ecosystems, human health and economies is critical to underpin and inform decision-making. The OTs already provide excellent biosecurity but the lists of INNS derived through the horizon scanning will inform additional action to enhance the protection of these important regions of the world. Pathway Action Plans provide a way to consolidate and build on existing activity. As such interactive sessions, dedicated to delivery of Pathway Action Plans for each Territory, were initiated immediately after the horizon scanning workshops. It is also important to consider the origins

of the INNS. Some will come from neighbouring invaded regions but others will be transported over long distances through complex networks with many connecting nodes (ports, cities and countries); the topology of these networks can be used to identify critical points of incursion and so inform effective strategies to prevent inventions (Banks *et al.* 2015).

There are notable gaps in the process with the exclusion of pathogens from the process. Going forward it will be important to consider ways of expanding the scope of horizon scanning to consider disease agents (Roy *et al.* 2017). However, the implementation of rigorous biosecurity will assist in preventing the arrival of pathogens. A recent study highlighted that a high proportion (about 25%) of first records of non-native species within a region were of species that had not been previously recorded outside their native range; that is they have no previous invasion history (Seebens *et al.* 2018). Horizon scanning relies on information from databases and other sources documenting invasions, therefore predictions need to be of sufficient spatial, temporal and taxonomic breadth to capture these as yet unknown INNS.

Biological invasions are dynamic processes influenced directly and indirectly by many factors that are also changing spatially and temporally. Therefore, there will be a need to evaluate and repeat the horizon scanning and this is recommended within five years. It is also critical to share information on new incursions and pathways that may be relevant within the Territories. Within this timeframe new modelling approaches and tools will be developed to assist the process. In addition the forthcoming IPBES Thematic assessment on invasive alien species and their control will provide a synthesis of evidence that will have relevance to the OTs.

Overarching key recommendations:

- Implementation of **pathway action plans** through deployment of additional robust biosecurity measures where needed.
- Ensure mechanisms in place for **raising awareness and sharing information** on incursions by INNS within and between regions with across communities and sectors.
- Comprehensive **risk assessments** for selected INNS, particularly those for which the confidence scores were medium or low, to underpin decision-making and highlighting knowledge gaps.
- Apply standard impact assessment methods (for example Environmental Impact Classification of Alien Taxa EICAT and Socio-Economic Impact Classification of Alien Taxa SEICAT) to transparently highlight **availability of evidence** including extrapolation to ecosystem function but also socio-economic costs which are currently lacking.
- **Marine INNS** were noted as a particular threat across the OTs and attention should be given to developing guidelines and sharing best practise in preventing arrival and spread.
- Emerging crop and **wildlife diseases** were considered a gap in this study and specific consideration should be given to increase understanding and developing recommendations within the context of OTs.
- Assess implications of **interactions with biological invasions and other drivers of change** particularly climate but also land use.
- Develop **INNS indicators** to convey patterns and trends in introduction and spread of impactful INNS for each of the OTs to inform INNS strategy but also across all Territories to establish overarching priorities relevant to all.

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The welcome we received from the regional experts and local communities around the world during our visits was exceptional. We have met with many amazing people throughout this research and seen some incredible places. The field visits organised by the regional experts provided context for the horizon scanning but were also an opportunity to experience the unique nature and wildlife characteristic of the OTs. So our greatest thanks go to the people safeguarding the biodiversity and ecosystems across the OTs.

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Appendix 1: Complete list of potential INNS across all UK Overseas Territories and frequency of occurrence including each impact (biodiversity and ecosystems, human health and economic) lists

Species	Common name	Frequency
<i>Perna viridis</i>	Asian green mussel	21
<i>Wasmannia auropunctata</i>	little fire ant	18
<i>Lissachatina fulica</i>	giant African land snail	14
<i>Rattus norvegicus</i>	brown rat	13
<i>Aedes albopictus</i>	Asian tiger mosquito	11
<i>Pterois miles</i>	lionfish	11
<i>Magallana gigas</i>	Pacific oyster	11
<i>Aedes aegypti</i>	yellow fever mosquito	10
<i>Mytilus galloprovincialis</i>	Mediterranean mussel	10
<i>Psittacula krameri</i>	rose-ringed parakeet / ring necked parakeet	9
<i>Ceratitis capitata</i>	Mediterranean fruit fly	8
<i>Boa constrictor imperator</i>	common boa constrictor	8
<i>Amblyomma cajennense</i>	cayenne tick	8
<i>Solenopsis invicta</i>	red imported fire ant	8
	Asian subterranean termite or Formosan subterranean	
<i>Coptotermes formosanus</i>	termite	7
<i>Vespula germanica</i>	german wasp / European wasp	7
<i>Tuta absoluta</i>	tomato leaf miner	7
<i>Corvus splendens</i>	house crow	6
<i>Spodoptera frugiperda</i>	fall armyworm	6
<i>Bactrocera carambolae</i>	carambola fruit fly	6
<i>Mytilus edulis</i>	blue mussel	6
<i>Amblyomma variegatum</i>	tropical bont tick, Antigua gold tick	6
<i>Aratinga erythrogenys</i>	red-masked conure	6
<i>Diaphorina citri</i>	Asiatic citrus psyllid	6
<i>Prosopis juliflora</i>	mesquite	6
<i>Anoplolepis gracilipes</i>	yellow crazy ant	5
<i>Vespula vulgaris</i>	common wasp	5
<i>Anopheles gambiae</i>	mosquito	5
<i>Coptotermes gestroi</i>	Asian subterranean termite	5
<i>Cortaderia selloana</i>	pampas grass	5
<i>Rattus rattus</i>	black rat / ship rat	5
<i>Scyphophorus acupunctatus</i>	agave snout weevil	5
<i>Carcinus maenas</i>	European shore crab	5
<i>Mimosa pigra</i>	giant sensitive tree	5
<i>Undaria pinnatifida</i>	Asian kelp	5
<i>Myiopsitta monachus</i>	monk parakeet	5
<i>Mus musculus</i>	house mouse	5
<i>Halophila stipulacea</i>	seagrass	4
<i>Varroa destructor</i>	varroa mite	4
<i>Acridotheres tristis</i>	common myna	4

<i>Cryptostegia grandiflora</i>	Palay rubber vine	4
<i>Mytilus chilensis</i>	Chilean mussel	4
<i>Chlorocebus pygerythrus</i>	vervet monkey	4
<i>Harmonia axyridis</i>	harlequin ladybird	4
<i>Imperata cylindrica</i>	cogon grass	4
<i>Anopheles quadrimaculatus</i>	common malaria mosquito	4
<i>Ciona intestinalis</i>	ascidian	4
<i>Colubrina asiatica</i>	Asian nakedwood or 'anapanapa	4
<i>Aedes japonicus</i>	Asian bush mosquito	3
<i>Botryllus schlosseri</i>	colonial ascidian	3
<i>Capra hircus</i>	goat	3
<i>Leptinella plumosa</i>	Alpine flowering plant	3
<i>Linepithema humile</i>	Argentine ant	3
<i>Monomorium destructor</i>	Singapore ant	3
<i>Psittacula eupatria</i>	alexandrine parakeet	3
<i>Python molurus bivittatus</i>	Burmese python	3
<i>Rattus exulans</i>	Polynesian rat, Pacific rat	3
<i>Chromolaena odorata</i>	Jack in the bush	3
<i>Semimytilus algosus</i>	bivalve	3
<i>Amphibalanus reticulatus</i>	Purple acorn barnacle	3
<i>Maconellicoccus hirsutus</i>	pink hibiscus mealybug	3
<i>Myllocerus undecimpustulatus</i>	Sri Lankan weevil	3
<i>Phalacrocooccus howertoni</i>	croton scale	3
<i>Hemidactylus mabouia</i>	tropical house gecko	3
<i>Pantherophis guttatus</i>	corn snake	3
<i>Rhopilema nomadica</i>	jellyfish	3
<i>Cortaderia jubata</i>	pampas grass	3
<i>Euphorbia tirucalli</i>	pencil tree	3
<i>Sturnus vulgaris</i>	common starling	3
<i>Boiga irregularis</i>	brown tree snake	3
<i>Mus castaneus</i>	Asian House Mouse	3
<i>Neyraudia reynaudiana</i>	Silk reed	3
<i>Anolis equestris</i>	knight anole	3
<i>Berberis ilicifolia</i>	holly barberry	2
<i>Rangifer tarandus</i>	reindeer	2
<i>Dolichandra unguis-cati</i>	cats claw creeper	2
<i>Ixodes ricinus</i>	sheep tick	2
<i>Lygodactylus capensis</i>	Cape dwarf gecko	2
<i>Raoiella indica</i>	red palm mite	2
<i>Anas platyrhynchos</i>	Mallard	2
<i>Ascidia aspersa</i>	European sea squirt	2
<i>Clidemia hirta</i>	Koster's curse	2
<i>Cryptostegia madagascariensis</i>	Madagascar rubbervine	2
<i>Culex quinquefasciatus</i>	southern house mosquito	2

<i>Globodera rostochiensis</i>	potato cyst nematode	2
<i>Paratachardina pseudolobata</i>	lobate lac scale	2
<i>Liolaemus wiegmanii</i>	Weigman's tree iguana	2
<i>Malayopython reticulatus</i>	reticulated python	2
<i>Oryctolagus cuniculus</i>	rabbit	2
<i>Paratrechina longicornis</i>	longhorn crazy ant	2
<i>Tubastraea coccinea</i>	orange cup coral	2
<i>Codium fragile subsp. fragile</i>	green sea fingers - green alga	2
<i>Hemidactylus frenatus</i>	common house gecko	2
<i>Afrogecko porphyreus</i>	marbled leaf-toed gecko	2
<i>Cimex hemipterus</i>	tropical bed bug	2
<i>Halicarcinus planatus</i>	decapod	2
<i>Mytilopsis sallei</i>	black striped mussel	2
<i>Solenopsis richteri</i>	imported fire ant	2
<i>Syzygium cumini</i>	Java plum	2
<i>Acridotheres cristatellus</i>	crested myna	2
<i>Cenchrus setaceus</i>	African fountain grass	2
<i>Cuscuta campestris</i>	field dodder	2
<i>Nasella tenuissima</i>	Mexican feathergrass	2
<i>Anopheles plumbeus</i>	mosquito	2
<i>Asparagus densiflorus</i>	asparagus fern	2
<i>Cactoblastis cactorum</i>	cactus moth	2
<i>Cenchrus longisetus</i>	feathertop grass	2
<i>Lampropeltis getula</i>	California kingsnake	2
<i>Melinis minutiflora</i>	molasses grass	2
<i>Phyllorhiza punctata</i>	Australian spotted jellyfish	2
<i>Reticulitermes flavipes</i>	eastern subterranean termite	2
<i>Schinus terebinthifolius</i>	Brazilian peppertree	2
<i>Siganus luridus</i>	rabbitfish	2
<i>Araujia sericifera</i>	moth plant	2
<i>Bactrocera dorsalis</i>	oriental fruit fly	2
<i>Bemisia tabaci</i>	tobacco whitefly	2
<i>Molothrus bonariensis</i>	shiny cowbird	2
<i>Bugula neritina</i>	ruby bryozoan	2
<i>Acacia cyclops</i>	coastal wattle	1
<i>Anastrepha obliqua</i>	west Indian fruit fly	1
<i>Cardiospermum grandiflorum</i>	showy balloonvine	1
<i>Chama pacifica</i>	mollusc	1
<i>Chamerion angustifolium</i>	fireweed	1
<i>Chrysanthemoides monilifera</i>	bitou bush	1
<i>Cyrtomium falcatum</i>	holly fern	1
<i>Kalanchoe spp.</i>	kalanchoe/Mother-of-thousands	1
<i>Lagocephalus sceleratus</i>	pufferfish	1
<i>Lampropeltis californiae</i>	Californian kingsnake	1

<i>Macroprotodon mauritanicus</i>	berber smooth snake	1
<i>Oncorhynchus mykiss</i>	rainbow trout	1
<i>Phenacoccus peruvianus</i>	bouganvilia mealybug	1
<i>Schizoporella japonica</i>	bryozoan	1
<i>Spondylus spinosus</i>	mollusc	1
<i>Thunbergia grandiflora</i>	Bengal clock vine	1
<i>Gloriosa superba</i>	flame lily	1
<i>Antithamnionella spirographidis</i>	red alga	1
<i>Aratinga solstitialis</i>	brown-throated parakeet	1
<i>Carex trifida</i>	tataki grass	1
<i>Carpobrotus edulis</i>	hottentot fig	1
<i>Cryptotermes brevis</i>	powderpost termite	1
<i>Galenia populosa</i>	Namibian ice plant	1
<i>Lithobius melanops</i>	centipede	1
<i>Lupinus polyphyllus</i>	lupins	1
<i>Lupinus nootkatensis</i>	lupins	1
<i>Merizodus solidinus</i>	ground beetles	1
<i>Palystes superciliosus</i>	rain spider	1
<i>Pheidole megacephala</i>	African big-headed ant	1
<i>Poa annua</i>	annual bluegrass	1
<i>Psidium cattleianum</i>	strawberry guava	1
<i>Pycnonotus cafer</i>	red-vented bulbul	1
<i>Rhynchophorus ferrugineus</i>	red palm weevil	1
<i>Schedonorus arundinaceus</i>	tall fescue	1
<i>Steatoda grossa</i>	spider	1
<i>Sternochetus mangiferae</i>	mango Seed Weevil	1
<i>Streptopelia decaocto</i>	Eurasian collared dove	1
<i>Dasyprocta punctata</i>	central American agouti	1
<i>Opuntia stricta</i>	prickly pear	1
<i>Arundo donax</i>	giant cane	1
<i>Caulerpa taxifolia</i>	macroalga	1
<i>Ciona robusta</i>	ascidian	1
<i>Dacus bivittatus</i>	bigger pumpkin fly	1
<i>Euglandina rosea</i>	rosy wolf snail	1
<i>Hypogastrura manubrialis</i>	springtail	1
<i>Lonicera japonica</i>	Japanese honeysuckle	1
<i>Vespa velutina</i>	Asian hornet	1
<i>Aedes triseriatus</i>	eastern treehole mosquito	1
<i>Calliphora vicina</i>	blow fly	1
<i>Ceratitis cosyra</i>	mango fruit fly	1
<i>Chaetopterus variopedatus</i>	marine polychaete	1
<i>Dactyloctenium aegyptium</i>	Crowfoot grass	1
<i>Ficus microcarpa</i>	Chinese banyan	1
<i>Frankliniella occidentalis</i>	western flower thrip	1
<i>Leptinella scariosa</i>	brass buttons	1

<i>Lygodium japonicum</i>	Japanese climbing fern	1
<i>Macrosiphon euphorbiae</i>	potato aphid	1
<i>Opuntia dillenii</i>	prickly pear	1
<i>Oryctes rhinoceros</i>	coconut rhinoceros beetle	1
<i>Osteopilus septentrionalis</i>	Cuban tree frog	1
<i>Senecio cf. tamoides</i>	canary creeper	1
<i>Acaena lucida</i>	bidibid	1
<i>Amathia verticillata</i>	bryozoan	1
<i>Amphibalanus amphitrite</i>	striped barnacle	1
<i>Brevicoryne brassicae</i>	mealy cabbage aphid	1
<i>Carex pendula</i>	hanging sedge	1
<i>Didemnum perlucidum</i>	tunicate	1
<i>Dimorphotheca spp.</i>	rain daisy	1
<i>Ficus rubiginosa</i>	Port Jackson fig	1
<i>Hedera 'Hibernica'</i>	Atlantic ivy	1
<i>Nanorchestes antarcticus</i>	mite	1
<i>Passiflora suberosa</i>	corkystem passionflower	1
<i>Pheidole indica</i>	Ant	1
<i>Plutella xylostella</i>	diamond back moth	1
<i>Schefflera arboricola</i>	dwarf umbrella tree	1
<i>Aphis gossypi</i>	melon cotton aphid	1
<i>Asterias amurensis</i>	seastar	1
<i>Austromininus modestus</i>	Darwin's barnacle	1
<i>Callinectes sapidus</i>	blue crab	1
<i>Cirsium arvense</i>	Canadian thistle	1
<i>Cotoneaster spp.</i>	cotoneaster	1
<i>Gekko gekko</i>	tokay gecko	1
<i>Ipomoea alba</i>	tropical white morning-glory	1
<i>Lophocladia lallemandii</i>	alga	1
<i>Miscanthus spp.</i>	Chinese silver grass	1
<i>Pereskia grandiflora</i>	rose cactus	1
<i>Protaphorura fimata</i>	springtail	1
<i>Spartina spp.</i>	common cord grass	1
<i>Tapinoma melanocephalum</i>	ghost ant	1
<i>Anolis sagrei</i>	Brown anole	1
<i>Christella parasitica</i>	parasitic maiden fern	1
<i>Equus ferus</i>	wild horse	1
<i>Forficula auricularia</i>	European earwig	1
<i>Hemidactylus mercatorius</i>	coconut palm gecko	1
<i>Hypoestes phyllostachya</i>	polka dot plant	1
<i>Merremia peltata</i>	morning glory	1
<i>Miconia calvescens</i>	miconia	1
<i>Nephrolepis cordifolia</i>	fishbone fern	1
<i>Pereskia aculeata</i>	Barbados gooseberry	1
<i>Sargassum fluitans</i>	brown alga	1
<i>Siganus rivulatus</i>	rabbitfish	1

<i>Solenopsis geminata</i>	tropical fire ant	1
<i>Torquigener flavimaculosus</i>	yellow spotted pufferfish	1
<i>Acacia melanoxylon</i>	blackwood	1
<i>Aphis fabae</i>	black bean aphid	1
<i>Bactrocera cucurbitae</i>	melon fly	1
<i>Balanus glandula</i>	barnacle	1
<i>Bos taurus</i>	feral cattle	1
<i>Ditylenchus destructor</i>	potato tuber nematode	1
<i>Freesia alba</i>	White freesia	1
<i>Galenia secunda</i>	one-sided galenia	1
<i>Globodera pallida</i>	white potato cyst nematode	1
<i>Nylanderia fulva</i>	crazy ant	1
<i>Podarcis sicula</i>	Italian wall lizard	1
<i>Polistes dominula</i>	european paper wasp	1
<i>Salmo salar</i>	Atlantic salmon	1
<i>Scaevola taccada</i>	beach naupaka	1
<i>Tamarix ramosissima</i>	saltcedar	1
