

Written evidence submitted by the British Ecological Society

Q1. How well is the UK and its overseas territories managing the impact of invasive species and controlling the risks of further invasion?

Recent measures against INNS

The UK has taken some positive measures for managing the impact and potential risks posed by invasive non-native species (INNS). Such measures include the creation and maintenance of the GB Non-Native Species Information Portal (GB-INNSIP) which contains evidence on over 2000 INNS. Such initiatives, however, would have a greater impact if there were a statutory responsibility on local authorities to implement INNS measures.

A 2017 report¹ identified the limited capacity of Overseas Territories (OTs) to engage in preventative measures against INNS. OTs are particularly vulnerable to INNS because they are mostly oceanic islands and their species face fewer competitors. Preventative measures are vital as the OTs are home to 28,000 native species and 85% of the UK's critically endangered species². While the UK Government has funded a project³ which identifies potential INNS and their likely pathways of entry in OTs, ongoing research and funding are needed to continue to protect these fragile habitats.

Inadequate funding for research

There is inadequate funding for INNS research. In England in 2016/2017, the Government spent around £922,000 (less than 0.5% of APHA's budget)⁴ on INNS biosecurity measures and only £62,000 of that was spent on research⁵, yet in 2010 the estimated cost to the British economy of INNS was at least £1.7 billion⁶. A new estimate of the costs of INNS, pests and diseases is required along with commensurate funding⁷.

Inadequate funding for Local Action Groups (LAGs)

LAGs have been successful in eradicating or severely reducing INNS by around 60% across parts of catchments or specific sites⁸. LAGs have put together strategic plans for addressing IAS and facilitated biosecurity information sharing among landowners, local people and officials. However, the uneven size and distribution, and recent underfunding for LAGs poses a risk to the future control and management of INNS. LAGs need to be expanded to ensure an even spread, with guaranteed long-term funding and professional regional LAG coordinators.

Lessons from New Zealand

The UK could learn from New Zealand's ambitious 'Biosecurity 2025'⁹ plan for biosecurity that includes five strategic directions with associated targets to be achieved by 2025. It includes: a target for 100,000 citizens regularly taking action and 90% of relevant businesses managing the pest and disease risks associated with their business¹⁰; harnessing science and technology through \$80 million of public and private investment; providing public access to data held by public bodies and Crown research institutes; and equipping and skilling 150,000 people to address biosecurity incursions.

Q2. Of those that are already in the UK, which invasive species are posing the greatest harm to:

a. human health;

There are many INNS which pose a risk to human health. Entering the UK through similar pathways as those which impact habitats and biodiversity. The Asian tiger mosquito, for example, is thought to have entered the UK through the transport of goods.

b. animal health;

There are various examples of INNs posing risks to native species. For example, the grey squirrel is a carrier of the squirrel pox virus. Another example is Asian hornet predation of native species.

c. plant health and biodiversity.

The disease *Hymenoscyphus fraxineus*, which attacks both common ash and narrow-leaved ash trees. Native ash species ecology and function is unique and cannot be completely replaced by any other native species. Ash trees allow for high light penetration through their canopies and have a nutrient-rich litter with a fast decomposition rate¹¹. These characteristics result in an ash-specific assemblage of species estimated at 955¹² to 1,058¹³. Over 71 of these species are believed to be at risk of extinction or significant population declines based on predictions of the spread of ash dieback, and 170 are predicted to experience declines in abundance¹⁴. No other tree or mixture of tree species can off-set the loss to woodland flora and fauna caused by *Hymenoscyphus fraxineus*.

Some native tree species may support a high proportion of the ash associated species, but there is insufficient information to assess the suitability of many non-native tree species to support native biodiversity¹⁵. Finding suitable functional analogues to replace trees at risk of decline due to disease is difficult. While some trees may be suitable analogues in terms of the biodiversity they support, they may not be suitable analogues in terms of their ecosystem functioning e.g. the shade they cast, carbon storage, and nutrient cycling¹⁶. Balancing this trade-off between providing functional analogues for species support and ecosystem function is a challenge and increasing the diversity of native tree species is likely to be the most effective way of maintaining key functions.

Q3. What are the risks of invasive non-native species migrating to the UK from future climate change?**Increased species dispersal**

Climate change is very likely increasing the rate at which non-native species disperse into and colonise the UK from mainland Europe and surrounding waters. Species which move because their habitat is changing due to climate change should not be considered INNS, although their possible impact on the UK should still be assessed and monitored. Species moved because of human activities such as travel and trade, should be considered INNS. Climate change will likely make it easier for INNS to establish themselves and could make existing native UK species more vulnerable to impacts of INNS as their populations will already be facing stress due to climate change.

There has been an increase in arrivals of terrestrial species that appear to have flown from mainland Europe, with 25 such species arriving between 1995-2012¹⁷. The numbers of moths migrating each year to the southern UK (but not colonising) has increased by 1.3 species per year and is associated with warming temperatures in Spain and France¹⁸. While climate change is likely helping species

reach and colonise the UK, there has been no comprehensive assessment of how climate change increases the likelihood of INNS colonising the UK. However, climate change will make UK conditions more suitable for individual invasives, e.g. Ragweed (a highly allergenic plant)¹⁹ and the African Clawed Toad (carries amphibian diseases)²⁰. Although present in the UK, neither species are yet currently widely established.

Negative impacts on UK biodiversity and ecosystems

Climate change will increase the negative impacts caused by invasive species on UK biodiversity, agriculture, and the environment. There are several examples of this, such as the impact of the invasive great spruce bark beetle²¹. Its impacts are increased by drought stress in recipient forest communities because trees are more vulnerable to infestation²². The effect of INNS, however, is particularly strong in rivers and lakes²³. The effects of INNS also depends on the species involved. Climate change will not favour all invasives²⁴.

Southern England will experience the UK's greatest climate change²⁵, for three reasons: 1) the south experiences the UK's greatest climate change (<http://ukclimateprojections.defra.gov.uk/21708>), 2) most birds and moths that have colonised in recent decades have first arrived in the south, and 3) species in mainland Europe are predominantly shifting northwards towards southern England.

Increased Spread of European Species to UK

Climate change is likely to cause more species native to Europe to colonise the UK²⁶. Some potential impacts of European colonists have been noted. St Piran's hermit crab colonised Cornwall from Europe in 2016 and has reached such high numbers on one beach that virtually no native hermit crabs were found (C. Patterson, personal observation). Small red-eyed damselfly, which colonised in 1999, is associated with declines in native dragonflies and damselflies²⁷. On the other hand, some European colonists might be endangered by climate change in their native range, and may merit protection in the UK.

Q4. What actions should the UK take to mitigate the risk, or adapt to, climate migrations of invasive species?

Researchers should evaluate all INNS currently found near to the UK, prioritising those posing the greatest risk to biodiversity, human health and the environment. Evaluations could include constructing models to forecast whether climate change will affect their probability of colonising the UK. It is almost impossible to prevent the arrival of species that colonise the UK under their own powers of dispersal. Therefore, where climate change increases the ability of invasive species to colonise the UK using their own dispersal, the UK will be virtually unable to prevent their arrival and should not invest in resources trying to do so.

The UK should consider how to extend existing conservation policy and legislation to species colonising from Europe due to climate change, which are not invasive and are threatened across their current native range.

Q5. Where should the four nations prioritise resources to tackle invasive species?

Preventing the introduction of invasive species is the most effective means of avoiding their effects. Failing that early detection and eradication is preferable to protracted management and control.

The following four areas should be prioritised:

- a) *Identifying and targeting high risk invaders:* Pre-border biosecurity that assesses the invasive risk from species likely to be imported can help to prioritise which species should be banned, restricted and monitored^{28,29,30} and can also help to guide allocation of management resources³¹.
- b) *Minimising propagule^a pressure:* The introduction and importation of living organisms and exotic species should be actively discouraged through education and awareness campaigns, or mandatory screening and quarantine³². Understanding the key pathways of invasion (e.g. nursery and horticulture industry for plants^{33,34}, pet trade for vertebrates^{35,36,37,38}) can enable optimisation of biosecurity. Such efforts reduce both the propagule pressure (e.g. seed numbers) of individual species and the total number of species that arrive³⁹.

Once a species is established, eradication is seldom achieved, so containing the population is often the most pragmatic and cost-effective management goal⁴⁰. Actions that minimise the transport and movement of propagules within-country can be very effective (e.g. cleaning boats, machinery, hiking equipment; restricting movement of stock, feed, soil).

- c) *Minimising the vulnerability of habitats and prioritising management across space and time:* Disturbed areas and habitats vulnerable to invasion can be predicted and actively monitored to increase the chance of early detection, and increasing chances of eradication^{41,42,43,44}. Habitats that have high biodiversity or other values (e.g. SSSI, national parks), or act as a corridor or stepping stone for potential invasive species spread, may justify higher expenditure on points of entry (such as ports and airports) and surveillance, monitoring and management.

Habitat fragmentation, causing isolation of populations, also limits gene flow and may reduce the ability of native species' populations to adapt to changing climate and pathogen pressure by adaptive escape^{45,46}. The effects of fragmentation could be overcome by expanding and linking existing populations, either by facilitating natural regeneration or in some circumstances the planting of new native trees, for example, from within the same region^{47,48,49}. However, increasing ecological connectivity could also potentially increase the ability of INNS moving across space and time.

The actions detailed in the GBNNSS INNS strategy⁵⁰ are still valid today but implementation is hindered by lack of funding or clear lines of responsibility. The responsibility lies with both Whitehall and devolved Governments, as such, collaborations between Governing bodies will be needed. It will also be vital that any prioritisation is driven by chance of success⁵¹.

^a Can be a stem cutting, seed, or spore.

Q6. How can the risk of trade and future trading relationships bringing non-native invasive species to the UK be mitigated?

Improving the UK's biosecurity checks

Should the UK withdraw from the EU, there is the potential to implement more targeted, better resourced, and stricter biosecurity rules and regulations. This could be carried out through stricter border checks, tighter permit requirements, and restrictions or bans on certain high-risk imports to the UK. Further controls on the pet trade, for example, could help reduce the risk of some species, and their associated pests and diseases, from establishing in the UK. UK exports could also be subjected to strict checks and restrictions to prevent the UK acting as a source of INNS.

Longer term, there is an opportunity for a more consistent approach to UK biosecurity across introductory pathways and taxonomic groups. However, this will depend on there being enough trained experts.

A Precautionary Approach

The UK should retain the precautionary principle⁵², and should mirror the EU IAS list of concern in the immediate years post-Brexit.

A Preventative Approach

The UK's Rapid Response plan to the threat of Asian hornet is a good example of the effectiveness of preventative measures. The FERA Asian hornet Response⁵³ Plan identifies the potential ways in which the hornet could enter the UK, leading to experts going to France to learn to identify the hornets and destroy their nests, and provided citizens and beekeepers alike with the tools for identification and reporting. This level of preparedness meant that although the Asian hornet had been sighted in the UK, there was a quick response, preventing establishment in the UK.

Communication between trading partners

When invasions occur in the EU, there is often a time lag between outbreaks on the continent and the invader reaching and being detected in the UK⁵⁴. Should the UK leave the EU, there may no longer be a legislative incentive for the UK and the EU to work together within several biosecurity frameworks, thereby increasing biosecurity risks through, for example, a loss of access to data and communication channels. Should the UK increase trade and transport links with non-EU countries post-Brexit, it will be important to continue sharing data and surveillance systems with those countries (e.g. the DAISIE and NOBANIS databases).

The Horizon-scanning approach⁵⁵ for INNS would be useful to formally adopt post-Brexit. It aims to identify species that pose an invasion risk (specifically species with negative biodiversity impacts) to the region of focus over the next 10 years. This approach would allow the UK to target IAS surveillance and responses towards not only the species that pose the greatest risk, but also towards the introduction pathways through which high-risk species are most likely to arrive. To succeed, this approach will need continued sharing of databases between the EU and UK.

Reducing imported horticulture products

Horticultural trade is the primary way that invasive alien plant species (and species found in pots of soil from invasive flatworms to plant diseases) spread worldwide⁵⁶, and expanding the UK horticulture industry so that it relies less on imports should be a priority. The example of importing the disease *Hymenoscyphus fraxineus*, which attacks both common ash and narrow-leaved ash trees, highlights this necessity. In October 2012, it was confirmed at a nursery in Buckinghamshire that UK ash trees, raised in a nursery in the Netherlands, were then imported back into the UK carrying this disease. It had been known since 1992 that ash trees in continental Europe were affected by ash dieback⁵⁷, and this information should have been used as a warning sign against importing products which could carry this debilitating fungal disease^{58,59}.

Controlling Marine INNS

Marine INNS are particularly difficult to deal with, so trade deals regarding marine transport need to consider ways to prevent INNS arriving in UK waters. The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM), which the UK has implemented⁶⁰, has been put forward as one solution to the spread of marine INNS. A better understanding is also required of the trade-off between the effect of the current use of oxidizing chemicals (i.e. the treatment of ballast water) on water quality and marine biodiversity versus how well this prevents biosecurity threats⁶¹. There may be alternative, less damaging approaches to treating ballast water, such as using on-board installation systems which do not use oxidizing chemicals, whilst also addressing the threat of INNs.

Q7. How effective have the European Union's Invasive Alien Species Regulations been at addressing and tackling invasive species?

The UK's domestic legislation on INNS, principally the Wildlife and Countryside Act 1981, is broadly focused on preventing the distribution of INNS. The list of species this legislation applies to is very limited and not reflective of the extensive data available in the GB-INNSIP. The EU's Invasive Alien Species (IAS) Regulation significantly enhances the UK's ability to deal with INNS.

Polluter Pays Principle

EU IAS Regulation provides some preventative, reactive and management measures for tackling INNS. The management measures include the responsibility of restoring damaged or destroyed ecosystems by Member States, based on the polluter pays principle. Hence, the polluter pays principle is a vital component of INNS management and should be converted as faithfully and fully into UK law.

Q8. In the event of EU exit, how should the UK establish its replacement for the European Commission's scientific forum to update the species list of concern?

The EU IAS list should be adapted to represent the key problematic and potentially problematic INNS for the UK. Currently some widespread INNS around the UK are not covered by the EU IAS list, yet they are causing substantial damage. Future UK-specific list(s) include tackling IAS which are already well established in the UK.

It is imperative that the addition of any INNS added to future list(s) within the UK is underpinned by rigorous, transparent, evidence-informed risk assessments that have passed through an equivalent to the EU scientific forum and Committee on IAS. This list will need to be updated regularly as new threats are identified. The GB NNSS strategy should require action where INNS information is provided.

The UK should look to build and adequately resource a world-class research facility to ensure it has the data and the expertise to tackle the threat of invasive species posed by climate change and new introduction pathways.

Q9. How should the UK work with the European Commission and others internationally to reduce the risk of invasive species?

Please see answer to Q6.

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