GB INNS EVIDENCE STRATEGIC PLAN

April 2022

Produced by the INNS Research Working Group on behalf of the UK Non-native Species Programme Board

Background/Policy background

Invasive non-native species (INNS) are one of the biggest causes of biodiversity loss worldwide and probably the greatest threat to fragile and isolated ecosystems such as islands. This is recognised by Defra's 25 Year Environment Plan, the Welsh Government's Nature Recovery Action Plan, and globally by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[1]. They also cause significant economic costs to a range of sectors such as agriculture, forestry and fisheries – estimated to cost the GB economy over £1.8 billion annually and some INNS also impact negatively on human health. Due in part to the continued increase in global trade and the movement of people, they pose a growing risk - in GB we already have 2,000 non-native species established and 10-12 new ones become established annually.[2]

As with policy in other areas, INNS policy needs to be underpinned by a strong evidence base and Government has attempted to prioritise areas for INNS research in the past - the 2003 non-native species policy review and the UK Biodiversity Research Advisory Group (BRAG 2003) both identified some priority areas for INNS research. Since then, considerable progress has been made on some elements of strategic research, notably work on economic impacts and public attitudes as well as horizon scanning, aspects of risk analysis and pathways. However, the 2015 GB Invasive Non-native Species Strategy, which underpins Government response to INNS, acknowledged that more progress was needed. We lacked a strategic overview of our INNS evidence needs and the 2003 priorities needed updating. In addition, we needed a coherent plan for engaging with research providers, reviewing any agreed priorities and interacting with research funders and providers beyond GB. The Strategy thus called for the establishment of a working group to address these issues – this being the first of five key actions related to research.

A working group was established in 2018, chaired by Defra, with the aim of agreeing a strategic plan which includes an identification of key evidence needs, agreeing mechanisms for reviewing these and for promoting optimal interaction with research providers and researchers.

The strategic plan has been drafted by representatives from organisations listed in Annex 1 and agreed by the UK Non-native Species Programme Board.

Who is the strategic plan for?

The strategic plan is aimed at researchers, research funders and end users of research.

[1] https://ipbes.net/global-assessment

[2] https://link.springer.com/article/10.1007/s10530-014-0687-0

Scope of the strategic plan

The geographic scope of the strategic plan is GB, but we will aim to coordinate with others as relevant. The plan covers research, monitoring and surveillance (and expert opinion) and therefore is an evidence strategic plan. It covers all areas covered by the GB INNS Strategy and does not overlap with plant health.

Objectives

To facilitate the delivery of robust, strategic and coherent research activities to support GB non-native species policy and action.

To embed the strategic plan's research priorities within and across government departments, agencies and other relevant bodies.

To ensure effective communication and promote optimal interaction between research providers and INNS policy and delivery.

To help build capability and skills within the INNS research community.

Optimising communication/interaction with the research community

A workshop held at the stakeholder forum in Edinburgh in June 2019 produced some initial suggestions for engagement which included closer links with the British Ecological Society (BES) INNS Group, the development of an email group/website page for INNS researchers as well as forging closer links with economists, social and natural scientists.

The working group subsequently suggested establishing a register of INNS researchers, mapping out all INNS Research working groups and an annual meeting of INNS researchers.

Recommendation 1 – Consideration should be given to holding an annual meeting (or other fora/conferences) of INNS researchers – on a rotational basis between GB countries. These annual meetings should be supplemented by *ad hoc* meetings on specific INNS areas.

Key evidence priorities and gaps

The plan highlights both continuing priorities and gaps in evidence – in some areas work is ongoing (e.g. horizon scanning) and remains a vital continuing evidence need going forward. In other areas there are significant gaps in our evidence base and those gaps that were deemed priorities are included in the plan.

The working group agreed a series of ongoing priorities and priority evidence gaps and these are outlined below. Two specific examples of evidence gaps are outlined below in boxes for illustration. Overall, the following general areas were highlighted as having a significant lack of evidence to underpin policy and delivery. Specific examples are given in the relevant sections to highlight some specific gaps, but these are not exhaustive.

Impacts

Having good empirical evidence on impacts overall is vital, however, we still do not have a good picture of the overall environmental impacts of INNS in GB e.g. on protected species or protected sites. There are also specific priority species for which we need more impact information. In general, a natural capital rather than just direct economic impact approach should be taken where possible. The 3rd Climate Change Risk Assessment identified increasing risks to terrestrial, freshwater and marine habitats, as well as to agriculture and forestry, resulting from climate change exacerbating the spread and impacts of INNS.[3] We will make links with the Natural Capital Ecosystem Assessment, for example on the detection of INNS impacts on habitat condition (and ecosystem service delivery).

Some specific gaps are outlined in the bullets below:

- The impacts of INNS in GB, particularly on protected species, sites and within complex systems.
- The interaction of climate change with INNS and the impacts of this on terrestrial, freshwater and marine habitats, and sectors including agriculture and forestry.
- Detailed empirical evidence on the impact of individual INNS to support risk analysis.
- Modelling future impacts of INNS both overall and for some individual species.
- The impacts on wellbeing and resilience of ecosystems and the ecosystem services they provide.
- Standard protocols for impact assessments for use in the field by land managers.
- Synergistic impacts/risks posed to vulnerable ecosystems due to multiple invasions.

[3] https://www.gov.uk/government/publications/uk-climate-change-risk-assessment-2022

INNS and ecosystem services evidence gaps

Ecosystem services are defined as the benefits people derive from ecosystems; they can be divided into four categories (i.e. provisioning, supporting, regulating and cultural).[4]

Latterly there has been an increasing amount of research undertaken to improve understanding about the mechanisms and potential impact that INNS have on ecosystem services in general. However, the amount of recent, UK-specific research that quantifies the impact of INNS on ecosystems and the services they provide is limited.

The following ecosystem service evidence gaps have been identified:

1. **Quantification of the impacts** that INNS are currently having (or could have in the future) on ecosystems, their resilience and the ecosystem services they provide **in the UK**.

2. Approaches to **using existing information** about INNS impacts, risks and distribution data to reliably and accurately estimate/model and quantify the existing (and future) impact of INNS on ecosystems, their resilience and the ecosystem services they provide in the UK.

3. An up to date assessment of the impact that INNS have on the economy and provisioning ecosystems services in the UK.

4. Approaches to **identifying trends** in the impact that INNS have on ecosystems, their resilience and the ecosystem services they provide in the UK.

5. Quantifying the **multiple impacts** that each INNS are currently having or could have in the future on ecosystems, their resilience and the ecosystem services they provide in the UK.

Box 1: An example, for illustration, of an area where evidence is lacking.

Recommendation 2 – That research be commissioned on the impacts on INNS, with particular reference to the priorities identified above.

Economic and wider social science evidence

This is a very broad category and covers everything from understanding how we can deliver behaviour change amongst key stakeholders to looking at the cost-benefit of different policies/actions to just quantifying the economic cost of INNS overall. Some specific gaps are outlined in the bullets below:

[4] http://uknea.unep-wcmc.org/EcosystemAssessmentConcepts/EcosystemServices/tabid/103/Default.aspx#:~:text=Ecosystem%20services%20are%20the%20benefits,both%20possible%20and%20worth%20living.

- Cost-benefit for biosecurity and the economics around incentivisation at GB and local scale.

- Return-on-investment for particular management/policies, including better monitoring to demonstrate the benefits of interventions.

- Wider evidence to include legal frameworks - how existing policy and legislative frameworks are influencing stakeholder activities and behaviour

- How best to influence attitudes to develop more support for tackling INNS.

- The social science element to biosecurity - including identifying cost-effective and practical ways to encourage adherence to biosecurity measures and discouraging high risk behaviours.

- Developing effective tools and techniques for increasing awareness and changing attitudes and behaviours.

- Developing effective and proportionate measures that can be used to prevent spread through priority activities/behaviours. Understanding how these might be best deployed in real world situations.

Recommendation 3 – That economic and wider social science evidence is gathered, with particular emphasis on the priorities identified above.

Pathways

Having done an analysis of pathways of introduction, we are now developing pathway action plans (PAPs). However, we often do not have the necessary evidence on individual pathways to underpin our decision-making for example the volume and tempo of movements, the routes taken by vessels / consignments / goods / etc., the level of risk (e.g. contamination) associated with movements and how / where best to intervene in order to reduce these (see Box 2 for illustration), and pathways within GB. Some specific gaps are outlined in the bullets below:

- Modelling and cost-benefit analyses for pathways, including for pathway management measures.

- Understanding future changes (e.g. socio-economic) which could increase the risk from existing pathways or introduce new ones.

- Deepening our understanding of the characteristics (including volume and frequency) of our priority pathways and identifying the most effective risk management measures.

- Improving our understanding of how pathways may change in future as a result of climate change and how we can most effectively respond to these changes.

- Improving our understanding of pathogen and parasite risks associated with INNS.

Box 2: Development of the Boating Pathway Action Plan and the need for evidence to underpin it

The Recreational Boating Pathway Action Plan (PAP) was developed using available evidence relating to the risk posed by recreational boats and potential mitigation. However, there were many knowledge gaps relating to the risk posed by recreational boating and the best way to target biosecurity action. Five key evidence gaps were identified by the PAP working group and considered a priority for further research:

1. What proportion of freshwater boats are likely to be contaminated with viable INNS and are there different levels of risk associated with different types of vessel, parts of vessels or activity?

2. What is the effectiveness of check, clean, dry in removing viable INNS?

3. What number and type of vessels (particularly freshwater) enter GB waters, from where and by which route?

4. To what extent do marine vessels fouled by invasive species arrive in GB? Can this be better quantified? From where do the majority of vessels carrying INNS originate and where do they enter GB?

5. For marine vessels and canal boats a major barrier to good biosecurity is the practicality of cleaning them. How can research and innovation help improve biosecurity for these vessels?

Box 2: An example, for illustration, of an area where evidence is lacking.

Recommendation 4 – That research is commissioned to underpin decision-making on pathways, and our understanding of future changes to these that could increase risk, with reference to the examples given above.

Early detection and surveillance

Detecting novel species early in the invasion process is key to a timely and effective response. Being forewarned of which species to look out for is a very important element of this and thus horizon scanning is a clear ongoing need. Although this is currently funded under the Non-Native Species Information Portal (NNSIP) contract, it is vital that there is a continuing process of horizon scanning – at least every 5 years – as it underpins many

policy decisions on contingency planning, pathway work etc. Novel detection techniques for detecting individual species are also often needed. Some specific gaps are outlined in the bullets below:

- Developing and optimising effective tools for detecting INNS, particularly when present in low numbers e.g. eDNA, camera trapping.
- Looking into gaps surrounding lag in detection for different INNS taxa and how they can be improved going forward including by identifying hotspots for surveillance.
- Developing surveillance/ monitoring techniques and strategies for priory species or taxa where these are lacking or inadequate, e.g. for freshwater species, escapes / releases of terrestrial vertebrates.
- Remote sensing for monitoring spread/impact.
- Citizen science – how do we get people to buy into monitoring and surveillance – influencing and targeting. Getting people motivated, how best to direct them (what to look for) and how they can best communicate that information back to people.

Recommendation 5 – That the process of horizon scanning is continued on a 5-yearly cycle, taking account of future climate scenarios, and effective methods are developed for detecting INNS, including novel methods and emerging tools and technologies.

<u>Rapid responses and longer-term control/eradication</u>

Whilst government supports significant amounts of long-term control and some rapid responses, there are evidence gaps in our understanding of how to eradicate or manage some priority species. Developing or refining methods to underpin rapid responses, larger-scale eradications or control measures remain an ongoing need. At times we also need robust evidence to rebut requests for action where it would not be appropriate or proportionate. Control and containment in the marine environment is a particular issue with few options currently available. Some specific gaps are outlined in the bullets below:

- When to start an eradication (e.g. the threshold for taking action) - and how much surveillance is needed before launching a response.
- For specific priority species, what eradication / management techniques are likely to be most effective in different real-world scenarios (e.g. outbreaks in different population sizes, different habitats, etc.).
    - How can these be made adaptive so that they learn and improve over time?

- Methods to help predict how much eradication / management effort may be required over how long to achieve the desired management outcome.

- Strategic long-term management. How can we ensure it is strategic - scale and timescales. How strategically effective are containment and control methods currently being used?

    - Development of effective wide-scale long-term management methods such as biological control.

- Empirical evidence of the optimal methods of restoration following removal of some species.

- Identifying aspects of the ecology, biology or life-history of high priority species that are most relevant for management and how they could be exploited.

Recommendation 6 – That research is undertaken to develop or refine methods to underpin rapid responses, larger-scale eradications or control measures.

Species prioritisation

To help guide research effort it is useful to consider priority species for which we lack information (i.e. about impacts or methods of detection, surveillance or control). Some GB-level prioritising has been done (for instance identifying rapid response species) but even for these species we have not assessed which of them lack evidence for control, detection or surveillance methods.

Existing lists / initiatives provide a starting point for the identification of these priority species:

- Impact (and risk). It would be useful to further investigate the potential impact of species identified as a threat by horizon scanning and risk assessment. In relation to risk assessments, the focus of research could be on those species for which there is low confidence in the impact ratings given.

- Management (eradication). Potential priorities include species listed in contingency plans.

- Management (long term). Priorities here are likely to be well-established species that cause serious impacts. It should be possible to determine these using the NNSIP report and NBN / Atlas data.

- Detection priorities. There is an existing alert list maintained by NNSIP which indicates priorities for detection.

- Species likely to pose a greater risk under future climate change scenarios.

Recommendation 7 – A review should be commissioned to determine species that are a priority for the assessment of (i) impacts, (ii) detection, surveillance, monitoring and (iii) control methods (to assess where the greatest knowledge gaps are).

Monitoring and updating

The working group will be re-convened at least bi-annually to ensure the action plan is delivered

Annex 1: **Organisations represented in the INNS research working group.**

Jemilah Vanderpump (Defra - Chair)

Niall Moore (NNSS - Secretary)

Scottish Government

Welsh Government

Environment Agency

Scottish Environment Protection Agency

Forestry Commission

Natural England

Natural Resources Wales

Science and Advice for Scottish Agriculture

NatureScot (formerly Scottish Natural Heritage)

Joint Nature Conservation Committee

Marine Management Organisation

Natural Environment Research Council

Biotechnology and Biological Sciences Research Council