

Invasive Non-native Species Pathway Action Plan:

Recreational Boating in Wales

Small Boats



May 2026

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APEM Ltd. and Natural Resources Wales

This project was delivered by APEM and NRW and funded through the Welsh Government's Nature Networks Programme, to strengthen the resilience of Wales's protected land and marine sites.

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Crynodeb gweithredol

- Mae [rhywogaethau estron goresgynnol](#) yn rhywogaethau o blanhigion, anifeiliaid neu bathogenau nad ydynt i'w cael yn naturiol mewn ardal ond sydd wedi cael eu symud yno, gan weithgareddau dynol (naill ai'n ddamweiniol neu'n fwriadol) ac sy'n achosi effeithiau amgylcheddol, cymdeithasol neu economaidd sylweddol. Rhai o effeithiau rhywogaethau estron goresgynnol yw eu bod yn cystadlu'n llwyddiannus â rhywogaethau brodorol am fwyd a gofod, eu bod yn newid cynefinoedd, lledaenu clefydau ac achosi costau uniongyrchol ac anuniongyrchol i economïau lleol a chenedlaethol.
- Mae symudiad (h.y. cyflwyno a lledaenu) rhywogaethau estron goresgynnol yn cael ei hwyluso gan drywyddau a gweithgareddau dynol o'r enw "[Llwybrau](#)", er enghraifft, morgludo, defnyddio cychod hamdden a dyframaethu.
- Mae defnyddio cychod hamdden yn cael ei gydnabod fel un o'r llwybrau allweddol ble caiff rhywogaethau estron goresgynnol eu cyflwyno a'u lledaenu, gyda photensial i weithgareddau cychod hamdden symud anifeiliaid (ar ffurf wyau, larfâu, anifeiliaid ifanc ac oedolion) neu wymon (fel darnau neu sborau).
- Gall rhywogaethau estron goresgynnol gael eu cyflwyno a'u lledaenu pan gânt eu dal mewn bylchau bach a nodweddion sy'n dal dŵr, ar ddillad ac offer, o fewn dŵr gwaelodion cwch, neu wedi glynu wrth gyrff cychod eu hunain.
- Fel arfer ceisir mynd i'r afael â lleihau effaith rhywogaethau estron goresgynnol drwy gyfrwng ymdrechion i atal eu lledaeniad ar lefel y 'llwybr'.
- Mae deddfwriaeth a pholisi yn ymwneud â chyflwyno a lledaenu rhywogaethau estron goresgynnol yn bodoli yng Nghymru.
- Mae amcanion y Cynllun Gweithredu Llwybr (PAP) hwn fel a ganlyn:
 - Amlinellu'r risgiau bioddiogelwch sy'n gysylltiedig â symudiad cychod hamdden bach.
 - Pennu'r rhywogaethau estron goresgynnol morol sy'n gysylltiedig â symudiad cychod hamdden bach.
 - Darparu cyfres o [gampau gweithredu graddadwy](#) i randdeiliaid y gellid eu rhoi ar waith i leihau'r risg o gyflwyno a lledaenu rhywogaethau estron goresgynnol trwy symudiad cychod hamdden bach.
- Rhanddeiliaid yw'r rhai sy'n defnyddio, yn elwa o, neu sy'n gyfrifol am (e.e. rheoli, amddiffyn neu reoleiddio) yr amgylchedd morol. Yma, mae hyn yn cynnwys cyrff statudol ac awdurdodau perthnasol, perchnogion preifat, busnesau siarter, clybiau cychod hamdden a rheolwyr marinas, harbyrau a sefydliadau sy'n defnyddio cychod hamdden bach fel yr amlinellir isod.
- Y bwriad yw y bydd y PAP hwn yn berthnasol i gychod bach.
 - Yn y PAP hwn, mae cychod bach yn cyfeirio at gychod y gellir eu tynnu gan gerbydau domestig gyda threlars fel y cyfyngir o dan gyfraith y DU (h.y. llai na neu'n hafal i 10.05m (33 troedfedd) o hyd, a llai na neu'n hafal i 2.9m (9.5 troedfedd) o led.

- Gall y rhain gynnwys, er enghraifft, cychod hwylio (gan gynnwys celfadau, *yachts*, cychod aml-gorff a dingis), cychod modur (cychod cyflym), RIBs, jet-sgis, cychod pleser siarter a chychod teithiau bywyd gwyllt.
- Nid yw'r ddogfen hon yn berthnasol i gychod hamdden sy'n fwy na 10.05m (33 troedfedd) o hyd na badau dŵr bach sy'n cael eu pweru gan y gwynt neu gan bobl ac sydd heb gorff (e.e. padlfyrddau a hwylfyrddau).
- Mae'r PAP hwn yn amlinellu saith cydran ffocws boddlogelwch ar gyfer y llwybr cychod hamdden o fewn ardaloedd morol Cymru:
 1. [Deall rolau a chyfrifoldebau cyfreithiol](#)
 2. [Hyrwyddo gwybodaeth ac arweiniad ar rywogaethau estron goresgynnol a boddlogelwch](#)
 3. [Codi ymwybyddiaeth](#)
 4. [Prosesau a gweithdrefnau boddlogelwch](#)
 5. [Cyfleusterau boddlogelwch](#)
 6. [Gwyliadwriaeth ac adrodd](#)
 7. [Gweithio ar y cyd](#)
- Y bwriad yw i'r cynllun hwn gael ei ddefnyddio i gefnogi'r [Cynlluniau Gweithredu Rhywogaethau \(SAP\) a'r Cynlluniau Gweithredu Boddlogelwch \(BAP\) cysylltiedig](#).

Executive summary

- [Invasive non-native species](#) (INNS) are plants, animals or pathogens that do not naturally occur in an area but have been moved there, by human activities (either accidentally or deliberately) and cause significant environmental, social or economic impacts. The impacts of INNS include outcompeting native species for food and space, altering habitats, spreading disease and incurring direct and indirect costs for local and national economies.
- The movement (i.e. the introduction and spread) of INNS is facilitated by human mediated routes and activities called "[Pathways](#)", for example, shipping, recreational boating and aquaculture.
- Recreational boating is recognised as a key pathway for the introduction and spread of INNS, with potential for recreational boating activity to move both animals (as eggs and in their larval, juvenile and adult life stages) or seaweed (as fragments or spores).
- INNS can be introduced and spread when caught up in small gaps and water-retaining features, on clothing and equipment, within bilge water, or attached to the hulls of boats themselves.
- Reducing the impact of INNS is commonly approached through efforts to prevent their introduction and spread at the pathway level.
- Legislation and policy relating to the introduction and spread of INNS exists in Wales.
- The objectives of this Pathway Action Plan (PAP) are to:
 - Outline the biosecurity risks associated with the movement of small recreational boats.
 - Identify marine INNS associated with the movement of small recreational boats.
 - Provide stakeholders with a [series of scalable actions](#) that could be implemented to reduce the risk of introducing and spreading INNS via the movement of small recreational boats.
- Stakeholders are those that use, benefit from, or are responsible for (e.g. managing, protecting or regulating) the marine environment. Here, this includes relevant authorities and statutory bodies, private owners, charter businesses, recreational boating clubs and managers of marina, harbours and organisations using small recreational boats outlined below.
- This PAP is intended to be applicable to small boats.
 - In this PAP, small boats refer to boats that are able to be towed by domestic vehicles with trailers as restricted under UK law (i.e. less than or equal to 10.05m (33ft) in length, with a width less than or equal to 2.9m (9.5ft).
 - Examples include sailboats (including keelboats, yachts, multihulls and dinghies), motorboats (speedboats), RIBs, jet-skis, charter pleasure craft and wildlife tour boats.
 - This document does not apply to recreational boats greater than 10.05m (33ft) in length or small wind powered or human powered watercraft without a hull (e.g., paddleboards and wind surfs).

- This PAP outlines seven components of biosecurity focus for the recreational boating pathway within Welsh marine areas:
 1. [Understanding roles and legal responsibilities](#)
 2. [Information and guidance on INNS and biosecurity](#)
 3. [Raising awareness](#)
 4. [Biosecurity processes and procedures](#)
 5. [Biosecurity facilities](#)
 6. [Monitoring and reporting](#)
 7. [Collaborative working](#)
- This PAP is intended to be used in support of the [associated Species Action Plans \(SAPs\)](#), and [Biosecurity Action Plans \(BAPs\)](#).

Preface

Safeguarding Wales's marine environment and native biodiversity requires robust biosecurity measures to prevent the spread and impact of invasive non-native species (INNS). The guidance in this Pathway Action Plan outlines actions and guidance to support stakeholders with their biosecurity efforts, with the aim of making Welsh marine recreational boating more sustainable.

It is acknowledged that no single activity is solely responsible for the spread of INNS and all users of the marine environment are encouraged to take the time to understand more about this threat and how they can contribute to tackling it.

Stakeholders are encouraged to share this plan, the guidance within it, the actions that they choose to undertake and to raise awareness of biosecurity. Collective effort is ideal, but individual actions are equally vital. Proactive steps by stakeholders, even when taken independently, strengthen national INNS biosecurity and help to protect our marine environment - every action counts.

The significance of this issue is recognised by Natural Resources Wales, who commissioned, and will manage this plan [under a wider framework of INNS biosecurity planning](#).

Background

What are Invasive Non-Native Species (INNS)?

Non-native species (NNS) are plants, animals or pathogens that do not naturally occur in an area but have been moved there, by human activities (either accidentally or deliberately). NNS are also sometimes referred to as “alien species”, “non-indigenous species” or “exotic species”. Most NNS do not cause issues within the area where they have been introduced. However, 10-12% cause significant environmental, social or economic impacts. These are known as Invasive Non-Native Species (INNS) and, in Wales, include the American slipper limpet, carpet sea squirt and Japanese wireweed, among many others. The impacts of INNS include threats to biodiversity, habitat alteration, fouling underwater structures (including pontoons, navigational aids and piers) and the introduction of diseases. The impacts of INNS (in all environments including marine) are estimated to cost the British economy £4 billion per year, of which, £499 million per year is attributed to impacts in Wales (see the [2023 Eschen paper](#)).

Marine INNS are resilient and often capable of surviving harsh and variable conditions, making them particularly challenging to manage. Many species can endure high levels of drying, temperature fluctuations, and low nutrient availability, allowing them to persist in damp conditions for extended periods. For instance, mussels, barnacles and algae can remain viable (i.e., still able to live and/or reproduce) when attached to damp equipment,

nets or boat hulls, even after days or weeks out of the water. The resilience enables them to travel long distances, hitchhiking on fishing gear, recreational boats, or clothing/equipment.

What are pathways?

The mechanisms and routes by which INNS are moved from one location to another by humans are termed “pathways”. This movement of species by humans, accidentally or deliberately, allows INNS to overcome natural barriers that would otherwise prevent them from spreading between their native and non-native ranges, e.g., an ocean. For instance, Pacific oysters, native to Japan, would not be able to reach UK waters through natural spread, but when introduced into UK waters by human activity can survive and establish as the environmental conditions in the UK are compatible with their native range.

Animals can be moved as eggs and in their larval, juvenile and adult life stages. Seaweed can be moved as fragments or spores (their reproductive structures). Larvae can be planktonic (drift with currents, unable to propel themselves against water movement) or free-swimming (can actively move and maintain their position in the water column).

Pathways are broadly classified as two types:

- 1) Pathways of initial introduction: Those which transfer NNS to regions or locations that are geographically separate and isolated from their native range (referred to as “introduction(s)” in this document). An example of this would be the movement of transoceanic vessels.
- 2) Pathways of further spread: These facilitate the movement of NNS populations beyond their initial introduction point to a wider area (referred to as “spread” in this document):
 - a. Facilitating the short-range dispersal (i.e. spread from place of introduction to wider area) of an NNS population within a single habitat or location (e.g. paddle boarders spreading a seaweed within a bay), or
 - b. Facilitating regional spread where some small barriers exist (e.g., the movement of recreational boats between two nearby but separate harbours).

The frequency and magnitude of pathways in the marine environment have been increasing since the 1800s with the beginning of rapid globalisation. A significant movement of marine INNS has been through the trans-oceanic voyages and shipping that has long supported growing global economies and international supply chains. For more information on other pathways in the marine environment, please see the other Welsh Pathway Action Plans. Links can be found on the [Wild Seas Wales website](#).

Vectors are the specific, discrete parts of a pathway (i.e. the means within a pathway) that facilitate the movement of INNS from one location to another. Vectors for the recreational boating pathway include INNS fouling the vessel hull or INNS being taken up in water-retaining features (e.g., bilge tanks). The relationship between pathways and vectors in the marine environment is illustrated in Figure 1.

Natural spread of INNS e.g., larvae distributed along a coastline by tides and currents, may also occur following introductions. However, unlike the spread caused by human activities, natural spread is generally limited by the inherent barriers between locations. Natural spread is generally gradual and organic (i.e. slow outward spread from a point-source of introduction). Although natural spread is more challenging to manage, improved biosecurity procedures, particularly at high-risk/vulnerable sites, can reduce the risk of impact and improve the chances that introductions are detected early.

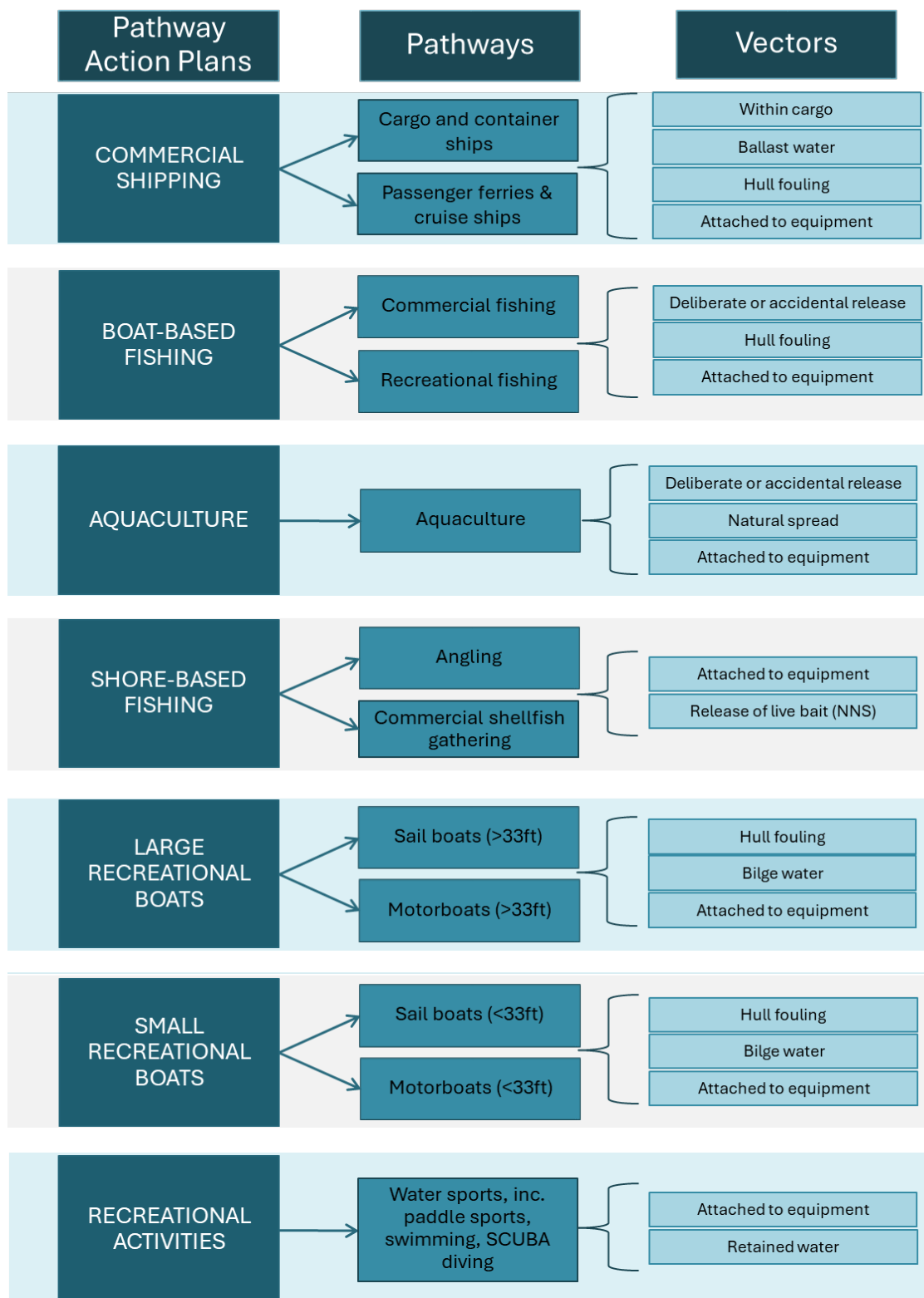


Figure 1. An overview of the Pathway Action Plans that have been developed for Wales, and the vectors associated with the pathways. Note that the list of vectors is not exhaustive.

What is biosecurity?

Biosecurity measures are actions, procedures and behaviours put in place to reduce the risk of INNS introduction and spread into, within and outside of a given area. Biosecurity measures should be realistic, pragmatic and cost-effective. Preventing the introduction and spread of INNS is by far the most effective way to reduce the impact of INNS. Eradication and control of INNS is often not possible in the marine environment and any attempts are more costly, difficult, and time-consuming compared to preventing the arrival and establishment of INNS in the first place. This is especially true in the marine environment, where eradication is near impossible once INNS become established.

A biosecurity framework: what is the context for this Pathway Action Plan?

This Pathway Action Plan forms part of a biosecurity planning framework commissioned and endorsed by Natural Resources Wales. The driver behind the framework is the wider goal of improving the condition of and increasing biodiversity in protected marine sites. Within the marine environment, this goal includes reducing the introduction and spread of INNS. The Species Action Plans (SAPs) and the Pathway Action Plans (PAPs) produced for this framework are intended to provide a basis for biosecurity planning for all marine sites throughout Wales, as well as presenting standalone guidance for pathway management.

Figure 2 shows the relationships between each of the action plans.

Pathway Action Plans (PAPs) describe the pathway and list possible actions that could be undertaken to address the risk of the introduction and spread of INNS via that pathway into or around Wales. Links to the other PAPs can be found on the [Wild Seas Wales website](#).

Species Action Plans (SAPs) describe priority INNS and list possible actions that could be undertaken to address the introduction and spread of that species into or around Wales. Links to the SAPs can be found on the [Wild Seas Wales website](#).

Biosecurity Action Plans (BAPs) are site-specific and can be scaled as appropriate. A BAP can be produced for a whole region (i.e. as has been done for the Pembrokeshire Marine, Cardigan Bay, Menai Strait and Conwy Bay and Carmarthen Bay and Estuaries Special Areas of Conservation (SACs)) or for an individual port, harbour or aquaculture site. They will identify the pathways relevant for that site and the species at or near the site that are of concern. The actions listed in the PAPs and SAPs are relevant to all stakeholders (see [Key stakeholders](#)) and should be considered and incorporated into a site's BAP. Due to the wide breadth and scale of the different stakeholder groups, the scope of these actions is equally broad. It is therefore important that individual stakeholders review their activities and use of the site to decide which of the biosecurity actions are applicable and practicable. Individual recreational boating site level BAPs were not developed as part of this project, however, the information within this PAP (and the other PAPs and SAPs) could be used to produce one.

Biosecurity To-Do-List trackers have been created to make it easier for stakeholders to log what actions they plan to carry out and track what progress is being made on each action. The

need for using to-do-list trackers will be dependent on the scope and scale of the BAP. For example, the BAPs produced for the Welsh SACs cover such large areas that it is necessary to provide individual stakeholders with an additional support tool that makes it easier to log and track their actions. The tracker also enables NRW, as the SAC BAP manager, to effectively oversee the implementation of biosecurity within each SAC, highlighting progress and pinpointing where further assistance or support may be needed. This approach is also intended to facilitate coordinated monitoring and collaborative efforts to share and enhance biosecurity practices between stakeholders. Biosecurity planning at smaller scales (e.g. an activity centre or harbour) are unlikely to require a BAP and a to-do-list tracker in parallel. Stakeholders can decide which is the most appropriate method for facilitating their biosecurity efforts. It is worth acknowledging that statutory authorities, including NRW, will also be progressing actions under this framework.

This framework has not been created with punitive or intentionally burdensome measures, and we encourage recreational boating stakeholders to consider the benefits of improved biosecurity to both the sustainability and enjoyment of their activity.

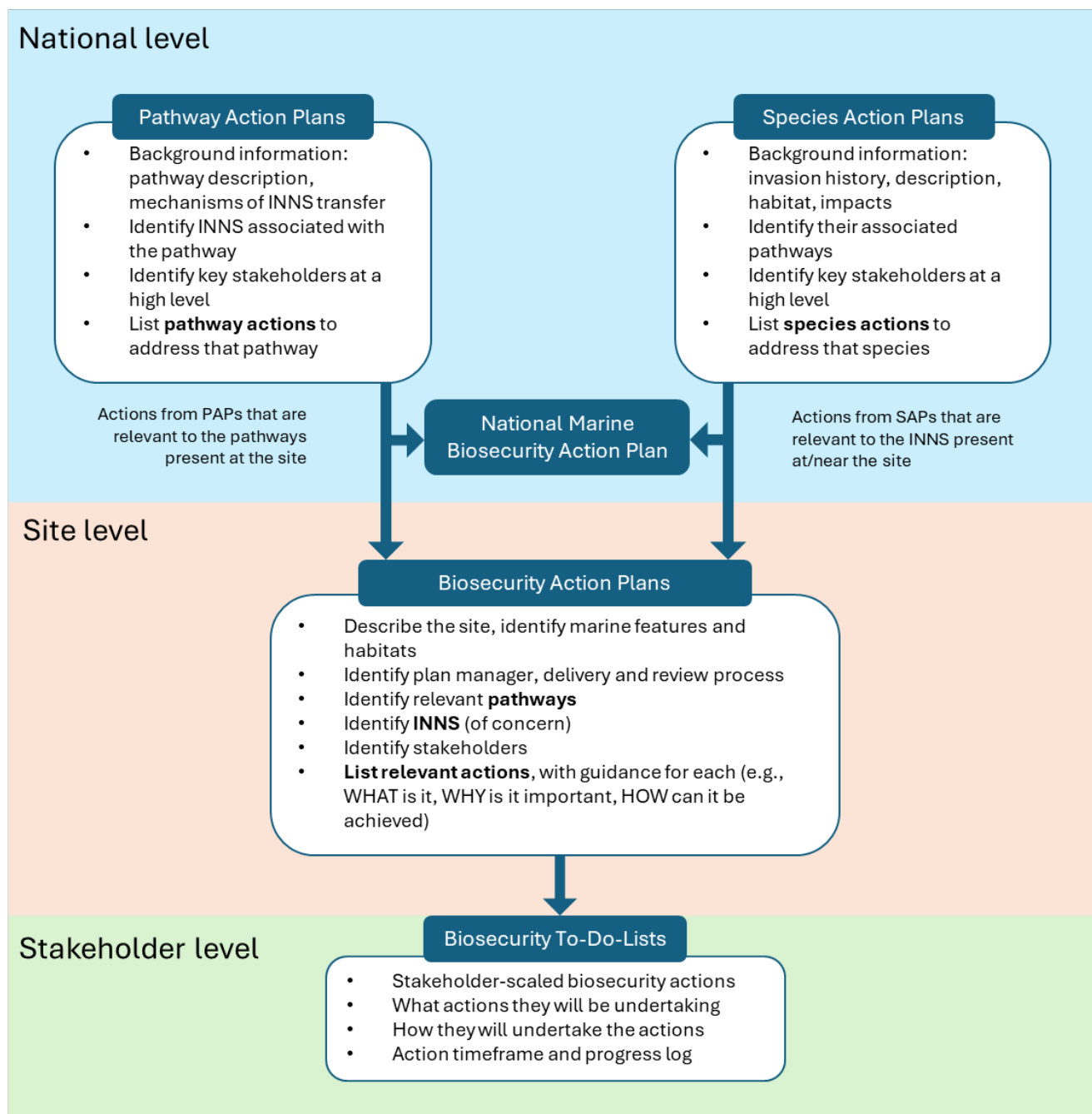


Figure 2. A flowchart showing the relationships between the Pathway Action Plans, Species Action Plans and the Biosecurity Action Plans created for the Natural Resources Wales Biosecurity Planning Project with APEM Ltd.

Scope, aims and objectives

Scope

This Pathway Action Plan (PAP) is intended to be applicable to the recreational use of small boats across all Welsh marine areas. Here, the term ‘small boat’ applies to boats that are able to be towed by domestic vehicles with trailers as restricted under UK law (i.e., able to fit on a 7m (23ft) trailer with an overhang of less than or equal to 3.05m (10ft), with a width less than or equal to the legal maximum width of 2.9m (9.5ft) and weighing less than or equal to 3,500kg (3.5t)). As such, ‘small boat’ can be assumed to be boats with a length less than or equal to 10.05m (33ft) and a width less than or equal to 2.9m (9.5ft). Small boats to which this document would apply include, but are not limited to:

- Sailboats (including keelboats, yachts, multihulls and dinghies)
- Motorboats (speedboats)
- RIBs
- Jet-skis
- Charter pleasure craft
- Wildlife tour boats

This document does not apply to recreational boats greater than 10.05m (33ft) in length or small wind powered or human powered watercraft without a hull (e.g., paddleboards and wind surfs) (see [Useful Resources](#) for links to other PAPs, including recreational activities and large recreational boats).

This document, and the biosecurity measures outlined within it, are intended to be applicable to private owners, charter businesses, recreational boating clubs and managers of marina, harbours and organisations using small recreational boats (see [Key stakeholders](#) for more information). The actions encompass several dimensions of INNS management for the pathway including:

- Strategies for effective biosecurity
- Strategies to enable early detection and rapid response
- Coordination of efforts, resource sharing and collaboration
- Research, development and innovation
- National policy and regulatory frameworks

Aim

The overall aim of this Pathway Action Plan (PAP) is to reduce the risk of the introduction and spread of marine Invasive Non-Native Species (INNS) via recreational boating activities for boats under 10.05m (33ft).

This document aims to complement the existing national work on recreational boating biosecurity (for further information see the [GB recreational boating PAP](#) and [Legislation](#)), providing recreational boating-specific information to aid a pathway-based approach to

biosecurity. It also seeks to put forward actions that can be applied at national (Welsh), regional and local levels (see [Key stakeholders](#)). The goal is to use existing communications and resources wherever available and adapt them to fit specific requirements. This approach aims to avoid any duplication or unnecessary additional effort. This will facilitate a consistent approach to biosecurity for this pathway across Wales.

Objectives

- Outline the biosecurity risks associated with recreational boating using small boats.
- Identify marine INNS associated with the recreational boating pathway for small boats.
- Provide a list of clear and practical biosecurity actions to address the pathway. These can subsequently be appropriately scaled and applied to a specific site and its stakeholders.

The recreational boating pathway

In the marine environment, recreational boating is recognised as a key pathway for INNS introduction and spread. This is attributed to animals (as eggs and in their larval, juvenile and adult life stages) or seaweed (as fragments or spores) being transferred by boats and/or their equipment between locations. INNS can be caught up in small gaps and water-retaining features, on clothing and equipment (e.g., boat propellers, anchors, buoyancy aids), within bilge water, or attached to the hulls of boats themselves.

Biofouling (or biological fouling) is the accumulation of marine organisms (plants, animals, bacteria and detritus) on underwater surfaces. Hull fouling refers to biofouling on a boat's hull and other surfaces below the waterline. This includes all surfaces and recessed or hard to reach areas and crevices that are in contact with the water, as seen in Figure 3. In the marine environment, common biofouling organisms include sea squirts, barnacles and sponges.

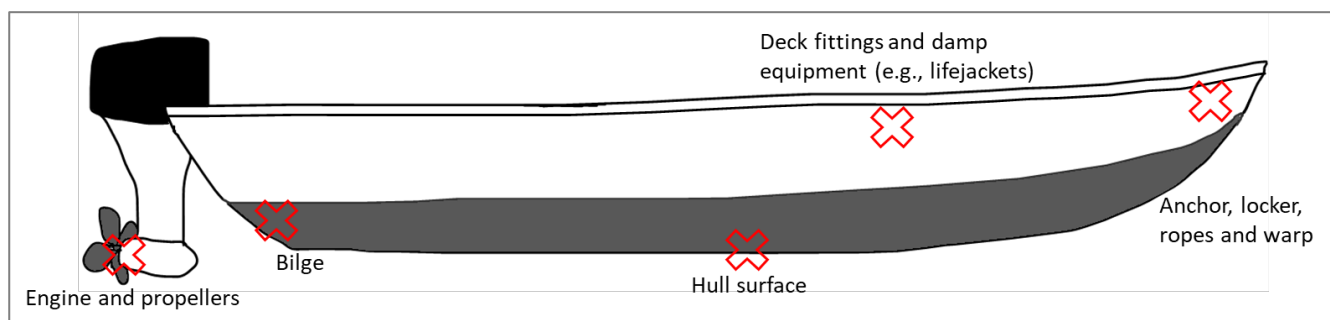


Figure 3. Diagram of potential areas on a small power boat where INNS can accumulate.

The first stage of fouling is the formation of a biofilm on the surface, which is a thin layer of microalgae, bacteria and small particles. The presence of this biofilm facilitates the further colonisation of the surface by other marine organisms. It is important to note that the species

found on a hull (or other underwater surfaces) are not necessarily INNS, but there are many INNS known to accumulate as biofouling or live among biofouling organisms.

Biofouling can especially accumulate if a boat remains static in the water for a prolonged period of time, for example, moored at a buoy or in a marina for weeks to months. If the boat is then moved or travels to another location without first being cleaned, the species that have accumulated on the boat can then spread to this new location. Even boats with antifouling paints or coatings are at risk of INNS colonisation if left stationary for long periods of time. This is because some INNS (e.g., the red ripple bryozoan, *Watersipora subatra*) are resistant to the toxic effects of antifouling coatings. Figure 3 shows the areas on a boat where INNS can accumulate. If the boat is cleaned in the water (for boats with more than just a biofilm/slime layer) or is lifted and cleaned but the debris is washed back into the water, there is a risk that the organisms in that biofouling community, including any INNS, may survive and be able to establish in that area.

The level of hull fouling can be graded/ranked based on the amount and coverage of the fouling visible. Table 1 shows information from a [2006 paper that outlines a ranking system for hull fouling which can be used for reference when undertaking inspections of boats](#). Similar hull fouling ranking has been employed in other biosecurity inspection programs.

Table 1. Hull fouling ranking from Ashton, G.V., Boos, K., Shucksmith, R. and Cook, E.J., 2006. Risk assessment of hull fouling as a vector for marine non-natives in Scotland. *Aquatic Invasions*, 1(4), pp.214-218. *biofilm: thin layer of bacteria, microalgae, detritus and other particulates.

Rank	Description	Visual estimate of biofouling cover
0	No visible fouling. Hull entirely clean, no biofilm* on visible submerged parts of the hull.	Nil
1	Slime fouling only. Submerged hull areas partially or entirely covered in biofilm, but absence of any plants or animals.	Nil
2	Light fouling. Hull covered in biofilm and 1-2 very small patches of one type of plant or animal.	1-5% of visible submerged surfaces
3	Considerable fouling. Presence of biofilm, and fouling still patchy, but clearly visible and comprised of either one or more types of plant and/or animal.	6-15% of visible submerged surfaces
4	Extensive fouling. Presence of biofilm and abundant fouling assemblages consisting of more than one type of plant or animal.	16-40% of visible submerged surfaces.
5	Very heavy fouling. Many different types of plant and/or animal covering most of visible hull surfaces.	41-100% of visible submerged surface

In addition to fouling below the waterline, surfaces above the waterline and equipment that is periodically used in the water (e.g., anchors, anchor warps, lifejackets and fenders) can also

act as potential locations for INNS to stowaway. Equipment that is brought aboard and left damp on the deck or stowed away in anchor lockers can provide a surface on which INNS can survive and then be subsequently spread to a new area when the equipment is used again. Tanks, pipes and crevices (e.g., bilge tanks) that retain water underway can also harbour INNS which can then be spread as the water is released or drained at another location. This includes larvae, fragments of colonial INNS (e.g., carpet sea squirt, *Didemnum vexillum*) and small, mobile juveniles and adults.

Small recreational boats

Small recreational boats are less likely than large boats to travel over long distances between areas which INNS would not be able to cross by themselves, for example, transatlantic journeys. Therefore, they may be less likely to cause the initial introduction of new INNS. However, these small boats may undertake shorter, more local journeys that may act as a pathway for the secondary spread of an INNS between regions, facilitating populations in new areas more quickly than their natural spread might otherwise allow. Additionally, depending on the species, undertaking short local journeys may increase the likelihood that the INNS will survive being transferred between the source and the new area.

Small boats have less surface area below the waterline than large boats, providing less space for INNS to attach. Small boats also generally have fewer hard to reach areas, as shown in Figure 3, in which INNS could stowaway. Furthermore, it's generally easier to take small boats out of the water, for example, mounted on trailers and brought out at slipways. As such, they may be less susceptible to the build-up of fouling organisms and can also be brought out more frequently for cleaning and drying. However, as these smaller boats are more easily removed from the water, they are more likely to be transported over land to be launched in the water at new locations more frequently than large boats. As such, they present a substantial risk as an introductory pathway over land, especially if they are not thoroughly cleaned and dried between sites. It is important to remember that the trailer as well as the boat presents a potential risk of transferring INNS.

Recreational boating events for small boats, like regattas, can present an even greater pathway risk as multiple boats may have come from outside the region to take part in the event. This can facilitate the introduction/spread of INNS to/from international or distant locations, or the secondary spread of an INNS if boats have come from other nearby locations within the same region.

How do INNS impact recreational boating?

In addition to protecting the marine environment from the negative impacts from INNS, recreational boaters should be concerned about INNS disrupting their activities. The impacts of INNS on recreational boating may be extensive and varied, and include the following:

- **Increased drag and reduced efficiency:** INNS can attach to boat hulls, pontoons and other equipment in high densities, impacting normal usage and cost to maintain/operate. For example, on boat hulls, high densities of biofouling can result in increased drag when underway, incurring higher fuel, cleaning and antifouling costs. Some INNS, like the Trumpet tubeworm (*Ficopomatus enigmaticus*), can cement themselves to hulls and submerged metal boat parts (e.g., propellers) requiring time-consuming and costly removal.
- **Cause obstructions and damage paintwork:** Removing hard fouling species can cause damage to paints, coatings and the hull itself. INNS can also impact recreational boating by causing obstructions in water intakes on boats or becoming tangled in propellers, for example, with large aggregations of seaweed, such as Japanese wireweed (*Sargassum muticum*) and worm wart weed (*Gracilaria vermiculophylla*).
- **Movement restrictions:** Increased cleaning and maintenance of marinas and harbours, which may be required if there is a high density of INNS, could result in costs being passed from marina management organisations to boat owners (e.g., in enhanced berthing / mooring fees or memberships). The application and enforcement of clean boat policies in marinas or harbours could also mean that boats not meeting the standards for hull fouling may be refused entry which would restrict movements and affect the enjoyment of boating activities.



Top photo: Vessel with heavy fouling, including Japanese kelp (*Undaria pinnatifida*) © NRW via GB NNSS.

Bottom photo: Trumpet tubeworm (*Ficopomatus enigmaticus*) on a boat © The Green Blue.



Relevant INNS for recreational boating

The tables below present INNS that are likely to spread via recreational boating. Table 2 describes High and Medium risk INNS from the [Welsh Priority Monitoring and Surveillance List](#) (WPMSL) that are known to be present and breeding in Wales. Table 3 describes INNS that are not currently recorded as present in Wales (known as horizon species) but should be monitored for. It is important to identify species that may be on the horizon so that appropriate biosecurity actions can be put in place to prevent their introduction, or surveillance programmes can be implemented to aid timely detection and response. Some species are on the horizon for the UK and some are on the horizon for Wales. These species represent some of the most likely to be transported via recreational boating. Note that this is not an exhaustive list, as there are other INNS known to be transported by recreational boating that are not listed as High or Medium risk on the WPMSL.

The current distributions of INNS around Wales (and the UK more broadly) can be viewed by searching the database and maps on the [National Biodiversity Network Atlas](#) (NBN Atlas).

An overview of the different lists of INNS that are of interest to Wales can also be found on the [NBN Atlas](#). The current distribution of INNS included on those national lists can be found on the [Wales INNS Portal](#).

Further information and links to resources developed to aid identification of INNS are available below. Further species-specific information is also available from the searchable [GB NNSS Information Portal](#).

Table 2. High and Medium risk INNS established in Wales that are likely to spread via recreational boating.

INNS name	Potential impacts	Image	Additional information
Red ripple bryozoan (<i>Watersipora subatra</i>)	Tolerant of copper and mercury in antifouling paint, thus easily foul boat hulls; replaces similar native species through competition; resistant to most antifouling paints so can establish, thus increasing habitat complexity and facilitating colonisation by other INNS.	 Photo credit: Jacqui Geux [CC BY, via iNaturalist]	Colonies can foul surfaces such as the hull, keel & rudder; adults foul hard to reach areas such as intake pipes. Short free-swimming larval stage (less than 1 day) so natural dispersal risk is low. Wide temperature tolerance (12-28°C) and salinity range (25-49ppt). For further information see the GB NNSS Information Portal and NBN Atlas.

INNS name	Potential impacts	Image	Additional information
Trumpet tubeworm (<i>Ficopomatus enigmaticus</i>)	Major fouling organism on artificial surfaces & is a nuisance in ports & marinas where it clogs pipes & blocks tide-gates; ecosystem engineer; prolific fouler of hulls, niche areas and submerged metal surfaces.	 Photo credit: Cricket Raspit [CC BY, via iNaturalist]	Adults can foul hard to reach areas such as water inlets/outlets; larvae can be carried in bilge water and trapped sediment. Planktonic larval stage 1-3 months (high dispersal risk). Minimum water temperature of 18°C needed for reproduction. Wide salinity tolerance (1.6-55 ppt) but preference for brackish environments. For further information see the GB NNSS Information Portal and NBN Atlas. A link to the Species Action Plan can be found on the Wild Seas Wales website.

INNS name	Potential impacts	Image	Additional information
Carpet sea squirt (<i>Didemnum vexillum</i>)	Major fouling organism on artificial and natural surfaces; potentially decreases local biodiversity due to competition for resources; smothers substrate (including other species) and its acidic surface hinders settlement on it by other species. Costly to other sectors, including the aquaculture industry.	 Photo credit: Javier [CC BY, via iNaturalist]	Adults' foul flat surfaces such as the hull, keel & rudder and hard to reach areas such as intake pipes; adults can also grow over the existing fouling community; small fragments can be transported in bilge water. Larvae are planktonic for a few hours (low dispersal risk). Fragments are viable for up to 30 days (high dispersal risk). Tolerant to temperatures between 2-24°C and salinities >26ppt. Reproduction occurs between 14-20°C. For further information see the GB NNSS Information Portal, Risk Assessment, NBN Atlas and the 2023 alert poster. A link to the Species Action Plan can be found on the Wild Seas Wales website.

INNS name	Potential impacts	Image	Additional information
Chinese mitten crab (<i>Eriocheir sinensis</i>)	Erosion of river / stream banks; affect fisheries by damaging nets, killing netted fish, consuming bait & damaging gear; clog water intake pipes; compete for food & space and predate on native species in freshwater & marine; burrowing activities affect water quality.	 Photo credit: The Food and Environment Research Agency [via GB NNSS]	Larvae can be carried in bilge water; Juveniles may stowaway in trapped sediments, on immersed equipment (e.g., anchor warp) or in the spaces between the existing hull fouling community. Reproduction occurs in brackish/marine waters (15-30 ppt salinity). Larvae are planktonic in the marine environment for up to 2 months (high dispersal risk). For further information see the GB NNSS Information Portal, Risk Assessment and NBN Atlas. A link to the Species Action Plan can be found on the Wild Seas Wales website.

INNS name	Potential impacts	Image	Additional information
Devil's tongue weed (<i>Grateloupia turuturu</i>)	Negatively affect operations by the fouling of nets, ropes, and other equipment. Outcompetes native algae and seagrasses, leading to changes in local ecosystems. Rapid growth and dense mats can smother other marine life, reducing biodiversity. Alters habitats by changing the structure of the seafloor, which affects the species that rely on these habitats for food and shelter. Can have cascading effects throughout the marine food web.	 Photo credit: Elena_Sherehora [CC BY, via iNaturalist]	Strands can attach to surfaces such as the hull, keel & rudder; spores and juvenile stages can be carried in bilge water. Spores can develop at temperatures ranging between 15-20°C. Developed strands have a wide temperature tolerance (4-29°C). For further information see the GB NNSS Information Portal and NBN Atlas.

INNS name	Potential impacts	Image	Additional information
Japanese Kelp / Wakame (<i>Undaria pinnatifida</i>)	It potentially reduces local biodiversity by outcompeting and displacing native species. It can heavily foul boats thereby reducing their efficiency.	 Photo credit: Kathryn Birch, NRW [via GB NNSS]	Adults foul flat surfaces such as the hull, keel & rudder & foul hard to reach areas such as propeller. Spores can be carried in bilge water. Fertilisation can occur between 10-15°C with optimum growth for spores between 15-20°C. Spores can survive in temperatures between 1-30°C. Spores can be vegetative and remain viable for up to 2 years under certain conditions. For further information, see GB NNSS Information Portal, Risk Assessment and NBN Atlas.

INNS name	Potential impacts	Image	Additional information
Japanese wireweed (<i>Sargassum muticum</i>)	Can interfere with recreational & commercial use of waterways, especially when detached & forming large floating masses; known for fouling fishing gear & boat props, as well as blocking intake pipes of coastal facilities; known to alter habitats; impacts to subtidal native assemblages through overgrowing & shading underlying species, with particular concern for seagrasses.	 Photo credit: Susan Marley [CC BY, via iNaturalist]	Strands can become entangled around boat gear e.g., propellor and propellor shaft. Fragments viable for up to 3 months. Wide tolerances of temperature (10-30°C) and salinity (7-34ppt). For further information see the GB NNSS Information Portal, Risk Assessment and NBN Atlas.

INNS name	Potential impacts	Image	Additional information
Japanese skeleton shrimp (<i>Caprella mutica</i>)	Likely to displace other native amphipod species & potentially compete with sessile suspension feeders for food.	 Photo credit: Lucinda Lintott [some rights reserved]	There is minimal movement of adults, so they are predominantly moved as ‘hitchhikers’. Adults (often <50mm) and juveniles can be transported in water-retaining features (e.g., kayak cockpit) or attached to hulls, clothing and equipment. They have a wide temperature tolerance range (-2-28°C) but cannot tolerate low salinities (<18ppt). See GB NNSS Information Portal, Risk Assessment and NBN Atlas.

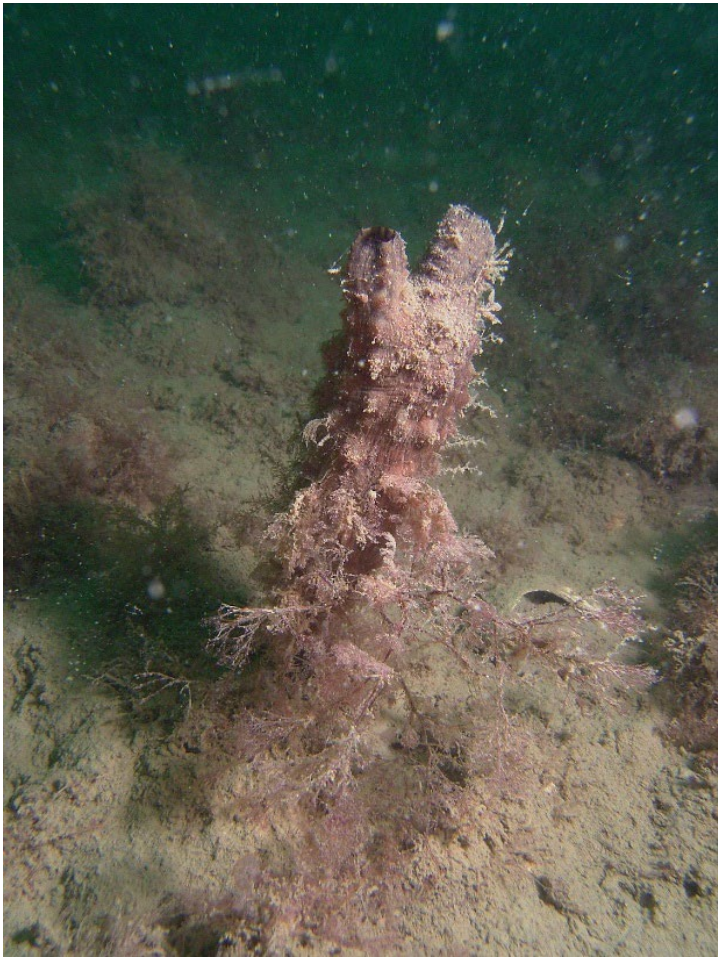
INNS name	Potential impacts	Image	Additional information
Leathery sea squirt (<i>Styela clava</i>)	Can be a major fouling organism on boats, aquaculture & fishing equipment & other artificial structures; potentially decreases local biodiversity through outcompeting native species.	 Photo credit: Chris Wood, Marine Conservation Society [via GB NNSS]	Adults can foul surfaces such as the hull, keel & rudder; adults foul hard to reach areas such as intake pipes. They are hermaphroditic (possess both male and female reproductive organs) but not self-fertile. Spawning occurs in water above 15°C and larvae are planktonic for 1-3 days before they settle. For further information see the GB NNSS Information Portal and NBN Atlas.

Table 3. Examples INNS that are not currently recorded as present in Wales (horizon species) but are known to be able to spread via recreational boating vectors.

Horizon INNS name	Potential impacts	Image	Additional information
HORIZON SPECIES: Veined rapa whelk (<i>Rapana venosa</i>)	Predator of shellfish including commercially important species, has the potential to decimate bivalve fisheries, with associated economic loss.	 Photo credit: Nikita Gerasin [CC BY, via iNaturalist]	Larvae may be in bilge water. Planktonic larval phase of 24-80 days (high dispersal risk). Successful establishment of reproductive populations seen to occur between 18-26°C. For further information, see the GB NNSS Information Portal, Risk Assessment and the NBN Atlas.

Horizon INNS name	Potential impacts	Image	Additional information
HORIZON SPECIES: Brush clawed shore crab (<i>Hemigrapsus takanoi</i>)	Direct competitor of native shore crabs (in Holland, led to a drastic reduction in the juvenile native common shore crab and replaced the common shore crab in Dunkirk harbour). Predate on newly settled shellfish (e.g., mussel and oyster spat).	 Photo credit: Demian Hiß [CC BY, via iNaturalist]	Larvae and adults (depending on size) may be transported in bilge water. Adults can be moved with hull fouling communities, clinging to other species or hiding in crevices. Natural range expansion following initial introductions occurs when pelagic larvae are dispersed by currents. After hatching, larvae are planktonic for up to a month (depending on temperature). See ID Sheet here: Hemigrapsus takanoi For further information see the GB NNSS Information Portal and NBN Atlas.

INNS, pathways and the law

The following points provide a brief summary of relevant legislation (at time of writing):

- Pathway management and the development of pathway action plans are specifically mentioned under the [EU Regulation \(1143/2014\) on the prevention and management of the introduction and spread of invasive alien species](#). This regulation was retained in domestic law under the European Union (withdrawal) Act 2018 as the [Invasive Alien Species \(Enforcement and Permitting\) Order 2019](#).
- [The Wildlife and Countryside Act 1981](#) makes it an offence to release or allow to escape into the wild any plant or animal which is not ordinarily resident in Great Britain (i.e. non-native) and is not a regular visitor to Great Britain in a wild state (i.e. migratory).

Section 14 (4A) of the Wildlife and Countryside Act read together with Schedule 9A of the Act enables an environmental authority to enter into a species control agreement and make species control orders to ensure, in certain circumstances, that landowners take action on invasive non-native species, or permit others to enter the land and carry out those operations, to prevent their establishment or spread in [England](#) and [Wales](#).

- [The Marine Strategy Regulations 2010](#) transpose into domestic law the EU Marine Strategy Framework Directive. The Directive aims to reduce human impacts on the marine environment, including INNS. The programme of measures is intended to reduce the introduction and spread of INNS. INNS pathway management helps to deliver the 2010 Regulations.
- [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017](#) transpose into domestic law the EU Water Framework Directive. The Directive establishes a framework for national measures to achieve or maintain a good ecological status, including transitional and coastal waters. While INNS are not specifically mentioned within the 2017 Regulations they could affect the ecological status of waterbodies. Pathway management is a key aspect of managing the potential spread of INNS.
- [The Welsh National Marine Plan 2019](#) contains a cross-cutting policy specifically relating to INNS. Under Policy ENV_03, proposals should assess the likely risk of introducing or spreading INNS and put in place reasonable biosecurity measures where necessary to reduce or stop their introduction or spread.

A note on specific legislation for recreational boating

While there is no explicit INNS-related legislation for recreational boating, the [GB Recreational Boating PAP](#) outlines the general policy and actions to address the risks that this pathway poses for the introduction and spread of aquatic INNS.

Biosecurity to Manage the Recreational Boating Pathway

The following sections present information on existing biosecurity within the recreational boating sector as well as actions that, if undertaken, would improve biosecurity in this sector and, ultimately, reduce the risk of INNS impacting recreational boating activities.

Who are the key stakeholders?

Within the context of this PAP, a stakeholder is anyone who uses, benefits from or is responsible for (e.g. managing, protecting or regulating) the marine environment.

Biosecurity for recreational boating requires engagement and actions taken at national, regional and local scales by specific stakeholders including, but not limited to individuals, businesses, site managers, associations, statutory bodies, and authorities. To note, the term “authorities” here refers to bodies with powers to introduce, amend and enforce regulations, legislation and policy.

For the successful implementation of the actions recommended in this PAP and across the [biosecurity framework](#), stakeholders must work together to engage, support and secure resources where needed.

Examples of relevant stakeholders include:

Authorities

- Government departments, organisations and agencies (e.g., Welsh Government)
- Regulatory bodies (e.g., Natural Resources Wales)
- County councils and local authorities
- National Park Authorities

National stakeholders

- Managing bodies for protected sites (e.g., National Trust)
- Recreational boating governing bodies (e.g., RYA Cymru)
- Environmental charities and Non-Governmental Organisations (NGOs) (e.g., the Marine Biological Association and Wildlife Trusts)
- Major landowners (e.g., the Crown Estate)
- GB Non-native Species Secretariat (NNSS) Programme Board
- GB Non-native Species Committee
- Wales Biodiversity Partnership
- National trade associations (e.g., British Marine)

Local stakeholders

- Local environmental groups
- Marina managers and harbour masters
- Point of sale (e.g., marine brokers, boat manufacturers, chandleries)
- Recreational boating chartering businesses and tour operators
- Recreational clubs and boating organisations (including boating event organisers)
- Individual users and private owners

Existing biosecurity for recreational boating

This PAP and the [wider biosecurity framework](#) (within which this PAP sits) are intended to complement and improve the existing biosecurity actions undertaken by the recreational boating sector. The INNS biosecurity recommendations within this, and other, PAPs and BAPs do not override the [GB Recreational Boating PAP](#), existing guidance, or best-practice activities currently undertaken by the sector. It is important to note that biosecurity to address the recreational boating pathway can take a number of forms depending on who is taking the action and the scale of the target area. Further resources that have been developed for recreational boating can be found in [Useful resources](#).

The GB Recreational Boating PAP

The [GB Recreational Boating PAP](#) is aimed at the recreational boating pathway for marine and freshwater environments and outlines the general policy, approaches and actions to be taken to address the recreational boating pathway in Great Britain. As well as actions to be taken by key stakeholders like the Royal Yachting Association, British Marine and governments, the PAP contains:

- A Code of Conduct for recreational boating ([Annex 2](#))
- Biosecurity guidance for boat users ([Annex 3](#))
- An example biosecurity clause for inclusion in club constitutions ([Annex 4](#)) and berthing agreement terms and conditions ([Annex 6](#))

Site-specific biosecurity planning

Site-specific biosecurity action planning is an important tool to help ensure that a thorough approach to biosecurity is taken. The [framework associated with this PAP](#) allows for biosecurity planning to be scaled as deemed appropriate by stakeholders. For instance, stakeholders, such as marina managers, or harbourmasters, could create site-specific biosecurity plans that take into account all pathways that are relevant to the site. At whatever scale, plans should include:

- A summary of the site background, activities and staff overview (e.g. environmental information, INNS present, site use).
- A broad assessment of the INNS pathways that might be present at the site (i.e., identify the pathways and vectors/determine how INNS might be spread to and from the site).

- Appropriate and proportional biosecurity actions to address the risks identified (see [Action scaling: a boat club example](#) and [Site construction and maintenance actions](#)).
 - Site managers should be aware that there may be more than one pathway at the site – so should familiarise themselves with, and consider the actions presented in the other PAPs (see [Useful resources](#)).
- The [biosecurity components](#) within this PAP provide guidance and example actions which site managers could consider for implementation.
- Plan details (e.g., biosecurity manager/responsible staff, review period).

As well as the biosecurity to-do-list trackers that form part of the biosecurity framework, the following resources provide additional guidance for producing a site-specific biosecurity plan:

- [Marine Biosecurity Planning \(2015\)](#)
- [Marine Biosecurity Planning – Guidance for Specific Operational/Construction related Activities \(with template\)](#)
- [INNS Management Toolkits](#)

Plans should be regularly evaluated to review the progress, successes, failures and modifications of the actions within them. They should then be updated to reflect these outcomes by, perhaps, amending approaches, altering timescales or allocating additional resources. The plan could also be updated with current information on the distribution of any key INNS or changes to site use. Operators should consider discussing any biosecurity plan with NRW.

Check Clean Dry

The [Check, Clean, Dry](#) (CCD) campaign is a national campaign in the UK to improve aquatic biosecurity by outlining three key steps to preventing the spread of INNS (see Figure 4). A key approach to biosecurity is to promote the procedures that ensure that boats, equipment, clothing and any personal protective equipment (PPE) is cleaned of organisms and completely dried out between uses.

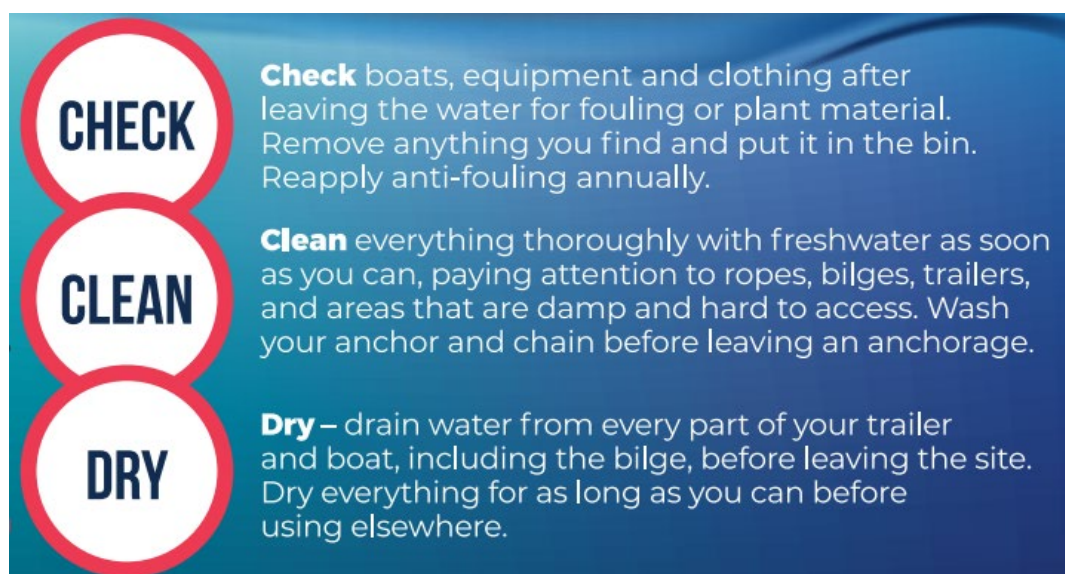


Figure 4. An extract from the Check, Clean, Dry guidance for Marine Boating, (Marine Boating poster) from the GB NNSS.

The use of antifouling

The application of antifouling paint and copper-containing epoxy coatings can help to reduce the fouling levels on the hull due to their biocidal effects, meaning that most organisms cannot survive on them. However, the efficacy of the paints and coatings decreases over time, and they must be reapplied. The frequency of reapplication depends on a number of factors including the antifoulant used, the frequency of boat usage and chemical variables in the water. Currently (depending on country) there are not strict regulations around application of antifouling paints for recreational boating, and as such, many boats go without this treatment and thus act as pathways for spread of INNS. There are, however, regulations on the chemicals that can be used in antifoulants which is controlled by the Health and Safety Executive (HSE) and the Control of Pesticides Regulations (COPR). A link to the [COPR approved biocidal products can be found here](#).

Recommended strategic actions for authorities

Table 4 contains a list of possible strategic actions which could be taken by national authorities. Achievement of these actions support a solid statutory basis for robust management of all marine INNS pathways in Wales, including the recreational boating pathway. However, it is acknowledged that any statutory changes require extensive and time-consuming legislative assessments and consultation which is at odds with the urgency required for pathway and INNS management at present. It is therefore recommended that these strategic actions act as long-term goals for authorities and that priority is placed on actions that can be undertaken and achieved on shorter timescales by all stakeholders (see [Recommended actions for all stakeholders](#)).

Table 4. Recommended strategic actions for authorities to address the introduction and spread of marine INNS via all pathways in Wales. The ID letters PS (Pathway Strategic) denote that the actions are aimed at addressing the management of pathways, differing from the ID letters SS (Species Strategic) in the Species Action Plans (SAPs) that are aimed at addressing the management of species.

ID	Strategic action	Purpose
PS-1	Develop a national (Welsh) position statement for key pathways in the marine environment	The statement (and its guidance) should: • Set out the position of the Welsh Government on pathway management and lay out a national approach for addressing key marine INNS pathways. • Provide a clear objective for all marine stakeholders, supported through guidance and assistance where available. Top-down direction is a critical need for the facilitation of national, regional and local biosecurity planning. • Make it clear that improved biosecurity is the priority; however, also include goals in relation to pathway risk, surveillance and monitoring, and INNS early detection, rapid response and management. • Aim to clearly state what is expected of all stakeholders and provide realistic, measurable and agreed targets. The position should conceptually align with other GB strategies and existing regulation to ensure a consistent approach to pathway management throughout the British Isles. However, it must be grounded within a realistic Welsh focus, taking current limitations into account. To achieve the best outcomes, stakeholders should be consulted in policymaking, and policymakers should support the integration of industry expertise and experience into INNS pathways management strategies.

ID	Strategic action	Purpose
PS-2	Review existing legislation	A review should be undertaken of current legislation in Wales and the wider UK relating to INNS pathways to identify legislative gaps and highlight opportunities to strengthen INNS and biosecurity legislation. The review should identify primary legislation under which INNS management can be enforced (e.g., Wildlife and Countryside Act, 1981). The outcomes of this review could provide evidence, justification, and legislative support for national position statements or for introducing / amending legislation relating to pathways in Wales.
PS-3	Introduce legislation relating to pathways in Wales	The introduction of new legislation (or the amendment of existing legislation) in Wales relating to marine pathways can ensure a consistent and enforceable approach to biosecurity. Authorities should use evidence gathered as part of the review of existing legislation (see PS-2) as justification for new legislation. For example, the adoption of existing international resolutions (e.g., the International Maritime Organization resolution MEPC.207(62) on biofouling) can facilitate a robust approach to pathway management in line with international standards. Legislation may not be required for, or applicable to all pathways.
PS-4	Review and prioritise resource allocation in support of policy and legislation related to INNS	Enforcement / enactment of existing and new policy and legislation should be considered. Resources, roles and responsibilities should be agreed and assigned to ensure that prioritised policy and legislation is being effectively enacted (e.g., provisions for enforcement officers to carry out inspections). Incentives for following legislation could be outlined in biosecurity-related award schemes or accreditations, which should be investigated, created and/or developed and endorsed by the Welsh Government or Natural Resources Wales. Penalties for offences could include fines or suspension of relevant licences as per The Invasive Alien Species Order 2019 . Importantly, legislative policy needs to be clearly communicated to stakeholders.

ID	Strategic action	Purpose
PS-5	Identify and prioritise high risk areas/locations for marine INNS introductions and impacts	Pathway and species risk assessments are a valuable tool for identifying and prioritising high-risk locations for marine INNS and more effectively allocating resources. Data gathered from previous reports (e.g., NRW evidence report 459 and NRW evidence report “Marine Protected Areas: Features at risk from marine invasive non-native species” (pending publication) and information from the SAPs and PAPs in the biosecurity framework should be used to inform strategies for species and pathway management and surveillance. It is recognised that data used to inform pathway and species risk assessments is currently limited and further data collection is required.
PS-6	Develop a national plan for monitoring marine INNS pathways	A national plan should develop a standardised approach to monitoring marine pathways and implementing monitoring programs in high-risk locations (see PS-5). The procedures within this plan should be applicable and practical at local, regional and national levels with provisions included for necessary resources or support required to undertake actions. The plan could be developed in consultation with stakeholders from all levels. A cost-benefit analysis could also be undertaken to ensure that the implementation of inspections will not damage Welsh businesses.
PS-7	Continue to develop contingency plans for key marine INNS	Contingency plans put forward protocols for situations when a new record of an INNS is made in an area it has not been previously recorded. This can include INNS that are new to Wales and INNS that are found in some regions of Wales but not others. The protocol typically involves contacting relevant authorities and taxonomic experts for positive identification, as well as putting in place rapid actions to contain the spread of the new species. General contingency plans for marine INNS have been developed for England by the GB NNSS and a general INNS contingency plan for Wales is in draft (at time of writing, July 2025).

ID	Strategic action	Purpose
PS-8	Improve collaboration and links between stakeholders and authorities	Invite stakeholders to participate in existing platforms and/or forums for ongoing communication, collaboration, and knowledge exchange, such as the British Ecological Society Invasion Science Special Interest Group. Platforms like this serve as a hub where researchers, policymakers, government agencies, industry representatives, and wider stakeholders come together to share expertise, data, and resources related to INNS management. Key features should include: 1. Regular meetings and workshops; 2. Agreements for data sharing and data integration; 3. Collaborative research, leveraging the expertise and experience of the industry; 4. Capacity building; and 5. Research and monitoring priorities communicated between stakeholders. Promote the Natural Resources Wales list of high priority evidence needs and research ideas page: Natural Resources Wales / Marine and coastal evidence priorities.
PS-9	Improve national data flow	Data flow is fragmented, data administration slow, and existing mechanisms for priority species reports reaching authorities are inconsistent, which may delay management response. Different recording schemes have variable verification and data upload timescales as well as variable data restrictions and some records are lost in the data flow process. Authorities should work with partners including The UK Centre For Ecology & Hydrology, The Marine Biological Association, The National Biodiversity Network and Local Environmental Records Centres to ensure records arrive at the appropriate destination in a timely manner and are accessible to all. This may include continuing work with Defra on their ‘improving marine NIS data access and flow efficiency’ project.

Recommended actions for all stakeholders

The sections below outline seven components of biosecurity focus for the recreational boating pathway within Welsh marine areas. Stakeholder-specific guidance, including example actions for each component, is provided to support the development of tailored actions. Stakeholders are encouraged to define their own biosecurity actions, appropriately scaled and proportional to their activities, using the guidance provided.

The biosecurity components in this plan complement those outlined in the SAPs and other PAPs. They can serve as a foundation for creating a new biosecurity plan or modifying and enhancing existing procedures. For each component, high-level 'priority issues' have been identified through discussions with stakeholders. These priority issues inform the initial context for developing tailored actions.

These components are:

1. [Understanding roles and legal responsibilities](#)
2. [Information and guidance on INNS and biosecurity](#)
3. [Raising awareness](#)
4. [Biosecurity processes and procedures](#)
5. [Biosecurity facilities](#)
6. [Monitoring and reporting](#)
7. [Collaborative working](#)

1. Understanding roles and legal responsibilities

To ensure that all stakeholders are aware of the relevant and current INNS legislation and national policy that relate to recreational boating.

PRIORITY ISSUE: There is a lack of clarity within stakeholder groups (for all pathways) regarding the legal requirements for INNS management. Stakeholders require more guidance on how their activities intersect with INNS legislation, and what is required under current policy (if anything) to achieve compliance (i.e. voluntary vs. mandatory actions).

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	Authorities should produce a policy position or statement (see actions PS-1 to PS-4), relevant to existing or new INNS-focused legislation and regulation. This policy(s) should provide stakeholders with an improved understanding of how INNS legislation or regulation affects them. This needs to be communicated via an appropriate information cascade to include all relevant stakeholders. If legislation or regulation exists, but enforcement policy is undefined, it is recommended that stakeholders are still offered advice on this matter.	• Consult with relevant stakeholders on the implementation and feasibility of INNS focused policy. • Collaborate with the recreational boating industry to develop appropriate and achievable policy, without undue impact to Welsh blue growth and individual operators. • Ensure consistency with wider legislation and regulation. • Establish a policy(s) for relevant regulation(s) and release a statement to provide stakeholders with a clear definition of what is expected under the legislation.

Responsible stakeholder	Guidance for Development of Actions	Example actions
National & local stakeholders	Official statements (as above) should be summarised and shared between relevant stakeholders, using plain, accessible language. Information could be included in trade association newsletters or governing body communications to relevant stakeholders so that all stakeholders are aware of any legal responsibilities with regards to INNS. In cases where an authority-produced statement is unavailable, national and local stakeholders are encouraged to independently review the relevant regulation and provide advice to their members as appropriate.	• Issue a press-release that summarises current national policy, highlighting the requirements for compliance with the legislation or regulation.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Harbour authorities / marina managers / boat clubs	It is essential to ensure a clear understanding of the Welsh Government/ NRW policy on INNS and the associated legislation. This should be communicated to employees and to recreational users of the site and club members. Operators should ensure they are fully aware of what is required and expected to achieve compliance (should policy exist).	• Include an overview of the requirements under legislation and policy within toolbox talks/training for new employees. • Make employee adherence to INNS-focused policy a condition of employment. • Consult with the authority to communicate industry practice and experience and offer expert advice on the development of national legislation and policy. • Include an overview of the requirements under legislation and policy in public communications to recreational stakeholders and boat club members (e.g., in harbour information announcements, regional codes of practice, or club T&Cs).

2. Information and guidance on INNS and biosecurity

To ensure that information and guidance on INNS and biosecurity within Welsh marine areas are consistent, high-quality and appropriate for the recreational boating pathway.

PRIORITY ISSUE 1: Resources for INNS and biosecurity awareness are abundant but can be fragmented, making it difficult for stakeholders to navigate and identify the most relevant and appropriate information, especially without a prior understanding of biosecurity.

PRIORITY ISSUE 2: Targeted, sector-specific (i.e. pathway specific) biosecurity guidance is limited, resulting in stakeholders being unsure of what to do and when to do it.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	This biosecurity component aims to address information resources on INNS for recreational boating stakeholders, ensuring that these resources are appropriate for the pathway. However, it should be noted that the provision of INNS information resources is expected to overlap significantly across all marine PAPs, SAPs and BAPs. Therefore, it is critical that authorities, as well as local and national stakeholders, take a holistic approach by integrating and co-ordinating their biosecurity activities. By doing so, they can ensure a cohesive and unified effort that builds on and enhances existing measures, maximising the effectiveness of INNS management across all marine pathways and action plans. Targeted guidance is needed to help integrate proportional, industry-beneficial and focused biosecurity actions into existing practices. Engaging the industry in consultation during policy-making, co-developing best practice advice, and fostering collaborative efforts to raise INNS awareness in Welsh marine areas are essential steps toward achieving balanced and effective biosecurity improvements. All stakeholders should ensure that resources are appropriate for recreational boating stakeholders, tailoring specific guides to relevant operations and risk factors. Authorities could consider leading a consultation with other stakeholders on the production/review of a code of practice.	- Download or request a paper copy of the NRW marine INNS guide (see Useful resources). Identification sheets for several marine species can be found on the GB NNSS website. - Refine guidance to increase relevance for the different end users in the recreational boating sector (e.g., boat owners, charter businesses, boat clubs or marina managers). - Create an accessible central website to host biosecurity resources and information to make navigation to the most relevant information easier.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	To improve INNS biosecurity in Welsh marine areas, authorities should consider creating/aligning a national-level marine INNS and biosecurity awareness raising campaign. This should provide common resources and consistent messaging for all marine stakeholders. Key highlights of the campaign could include: • A centralised location for biosecurity and INNS awareness-raising materials. While there is considerable existing material available for this action, ensuring a common repository and "endorsement" of primary materials will help stakeholders maintain consistency. • A defined list of priority INNS of concern. • Publication of INNS alerts when a population is newly established or spreading. • Clear points of contact for stakeholders seeking support and advice.	• Identification guides, such as the Welsh and English NRW ID guides (see Useful resources), should be printed and disseminated to as many relevant stakeholders as possible (e.g., local groups and marinas). The ID guides should be kept up to date, accounting for newly introduced and horizon INNS. • Produce pathway-specific training resources which can be provided to other stakeholders. • Consult with stakeholders on the update / production / endorsement of best practice codes for INNS and biosecurity in recreational boating.
National & Local stakeholders	In the absence/interim of the action above, national stakeholders should consider the INNS information and decide whether it is suitable for / relevant to their operating practices. Relevant information that could be integrated into operation-specific material could include: • Key INNS to look out for • Impacts of INNS • Biosecurity best-practice Material could include self-produced resources; however, a lower effort option could review and compile the existing material already in existence (see Useful resources). Sources of existing, high-quality INNS biosecurity information include the GB NNSS, the RYA and the International Maritime Organisation (IMO) (see Useful Resources for links). Where possible, information material should prioritise increasing knowledge of relevant INNS (to pathway or region) and key biosecurity messages.	• Review existing biosecurity information and tailor to the recreational boating pathway.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Marina managers / harbour masters	Operators (i.e. those managing or working at relevant sites (e.g., marinas or harbours)) primarily act as an end-user of the information produced by other stakeholders. However, operators can also produce information resources themselves and provide the primary expert experience for consultation with other stakeholders.	• Review the guidance received and incorporate into procedures where possible. • Consult with other stakeholders to ensure that industry risk factors are considered appropriately within information resources.

3. Raising awareness

To facilitate and encourage the active sharing of information and guidance, relevant to the recreational boating pathway, among all stakeholders within Welsh marine areas.

PRIORITY ISSUE: Some stakeholders operating within Welsh marine areas are not aware of INNS and their impacts, or what biosecurity is. All stakeholders would benefit from more exposure to INNS awareness raising activities. All stakeholders could also facilitate the spread of information and awareness raising about INNS and biosecurity.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	This biosecurity component aims to increase the awareness of INNS biosecurity with recreational boating stakeholders. The materials produced under component 2 are intended to provide the consistency and appropriateness of biosecurity information for the recreational boating pathway. However, it should be noted that raising awareness is expected to overlap significantly across all marine PAPs, SAPs and BAPs. Therefore, it is critical that all stakeholders (including authorities) integrate/coordinate their activities. By doing so, they can ensure a cohesive and unified effort that maximising the effectiveness (and reach) of INNS information-sharing. All stakeholders can have a role in raising awareness of INNS and biosecurity by promoting and disseminating existing information regarding INNS and key biosecurity messages. This could be achieved both digitally (e.g., through social media and relevant websites) and in print (e.g., in harbour offices, newsletters and magazines, through club communications). There is no requirement for burdensome changes to current activities, but consideration of INNS within outwards facing communications or marketing can benefit the sustainability of all activities within Welsh marine areas.	- Engage in Invasive Species Week. Use approved or provided biosecurity resources in communications and training. A marine INNS workshop kit comprised of preserved specimens and information sheets can be borrowed from Amgueddfa Cymru (see Useful resources). - Become familiar with existing and newly developed recreational boating-focused guidance. - Share information resources with other stakeholders as widely as possible. - Provide ad hoc information/facts on INNS to staff, colleagues, members of the public, customers etc.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	The useful resources within this PAP include links to existing high-quality information sources which can be used as the basis for awareness raising. However, it is hoped that as national awareness increases, recreational boating stakeholders will expand their knowledge and activities in this area, eventually producing their own tailored resources (where they have not already done so), further amplifying awareness and engagement. Where appropriate (e.g. at marinas and boat clubs) signage can be installed in visible (to employees and / or the public) areas. Information contained within signage can range from general actions and national guidance (e.g., the GB NNSS Check, Clean, Dry campaign), to site specific biosecurity protocols, depending on the intended audience (see Useful resources for links to signage resources). Landowner permission should be considered (if applicable or required). • IMO GloFouling Partnerships have produced posters for long-distance cruising and shore-based cleaning. To reduce the INNS risk posed by boat biofouling, boat cleaning guidance should be shared widely, especially where clean boats are a requirement (e.g., with clean boat policy, see Component 4). This will help to ensure that stakeholders know how and when to effectively clean their boats while minimising the risk of spreading INNS. Guidance should include information on cleaning all underwater surfaces (e.g., hulls, propellers, and rudders) and removing standing/entrained water from bilges, as well as information on antifouling (e.g., the suitability of different coating types and how they should be maintained).	• Provide and/or share boat cleaning guidance and encourage public demonstrations of cleaning. • Install biosecurity signage in prominent locations. • Consider signing up to an environmental pledge (e.g., the Green Blue pledge). • Review the Event Biosecurity Support Pack and disseminate to appropriate staff/club members.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	Full capture, or closed-circuit in-water hull cleaning systems should be considered between lay ups. See the decision tree in Figure 6 for steps that should be taken when bringing a boat into GB or moving it within GB. Existing guidance on boat cleaning is available from sources like The Green Blue and the general RYA resources (see Useful resources). The IMO has also produced guidance for minimising the transfers of INNS as biofouling specifically for recreational craft which describes best practice for antifouling and cleaning. Boat-specific cleaning guidance should also be provided to users at the point of sale or rental. Any guidance should be in accordance with NRW's policy on in-water boat cleaning. Relevant guidance on equipment cleaning guidance (e.g., the GB NNSS Check, Clean, Dry campaign) should also be shared by all relevant organisations and staff. For submerged equipment / infrastructure, guidance should include information on cleaning all underwater surfaces (e.g., trestles, pontoons, buoys etc.). Promoting pledges for environmental awareness can facilitate commitment from recreational clubs and their members to environmental good practice. However, biosecurity aspects in existing pledges are currently limited. Boating club members could be given INNS and biosecurity best-practice information as part of club inductions or regular training. Workshops and educational events could be organised through local groups, covering introductions to INNS, equipment biosecurity guidance and best-practice for equipment transport.	See actions above.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	Material could be developed in collaboration with equipment manufacturers. Training and educational resources are available on the GB NNSS website (GB NNSS Training resources). Recreational events and competitions can be used as an opportunity to undertake awareness-raising actions, spreading INNS information to a wider audience of participants and members of the public. During high-risk events (e.g., competitions, especially those supporting international participants), a short talk or briefing before each event should be given to explain the importance of biosecurity as well as to remind participants to engage with the site biosecurity. Staff or volunteers could be in attendance to raise awareness of INNS and assist with any biosecurity actions required. Event organisers could link with local NGOs (e.g., Wildlife Trusts) to set up INNS information stands and provide attendees with relevant resources (e.g., biosecurity best-practice guidance and INNS guides).	See actions above.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	Authorities should ideally be a primary source for INNS and biosecurity information in Wales. Information on available funding and resources for biosecurity should be shared with stakeholders. Messaging should ensure that stakeholders are aware of critical information, such as updates to policies (e.g. in-water cleaning rules) or species records/alerts.	• Issue regular updates/social media posts offering INNS and biosecurity advice. • Continue to engage with stakeholders, with a particular focus on improving communication links with key recreational boating stakeholders. • Include links or QR codes to online resources (including ID guides) with communications. Where appropriate, stock/disseminate hard copies of resources.
National stakeholders	Consistent with Action 9 (freshwater and marine) in the GB boating PAP, information on INNS and biosecurity best-practice should be added to syllabuses for motor and sailboat certifications and qualifications (e.g., RYA licences or WiSe Scheme for charter boats). This will ensure that INNS and best-practice information is provided to trained recreational users likely to be operating large boats Material could be developed in collaboration with boat manufacturers.	• Include information about INNS and biosecurity in national boating training courses and certification.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Harbourmasters / marina managers	Site managers should provide staff training (e.g., harbour/marina staff, RYA instructors etc.) on biosecurity best-practice, inspection/monitoring methods and INNS reporting as part of relevant inductions. Training and educational resources are available on the GB NNSS website (GB NNSS Training resources). Workshops and educational events could be organised through local groups and hosted by harbours/marinas for private boat owners or local boat clubs and users based at their site. These could cover introductions to INNS, boat maintenance guidance and best-practice for boat transport. At sites where clean boat policies have been implemented (see Component 4), the requirements of these policies should be shared appropriately with any stakeholder for whom it applies. Communications with these stakeholders should include relevant information on how and where to clean boats so that they comply with requirements.	• Provide INNS workshops and training. • Ensure that information about clean boat policies (if in place) is communicated widely with relevant stakeholders and authorities.

4. Biosecurity processes and procedures

To improve INNS biosecurity procedures being undertaken by stakeholders relevant to the recreational boating pathway, ensuring consistency and efficacy.

PRIORITY ISSUE: Although many stakeholders undertake biosecurity procedures (e.g., antifoul application, harbour biosecurity planning and procedures), continuous improvement and inclusion of best practice in standard procedures should be prioritised.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	This biosecurity component is primarily intended to encourage operators within Welsh recreational boating to enhance biosecurity procedure for INNS. However, this guidance is also highly relevant to other stakeholders interacting with the marine environment, such as (but not limited to) NRW, Local Authorities, and County Council field or operational teams. At the most basic, INNS biosecurity can be achieved simply through ‘Check Clean Dry’ procedures, which can be easily implemented for small boats (see GB NNSS information) At a high level, stakeholders are encouraged to review and update their protocols and practical procedures to ensure that operational biosecurity comprehensively addresses INNS and is consistently applied. Continuous improvement should also be a priority. These updates do not need to be onerous or burdensome. Enhancements can leverage existing best practices or adopt innovative approaches tailored by stakeholders themselves. See Marine Biosecurity Control Measures and Best Practice By Sector for suggestions.	• Consult and collaborate with the industry to ensure best practice is encouraged and enabled. The onus should be placed on pragmatic changes to procedures which do not negatively impact Welsh blue growth or individual operators. • Appoint a biosecurity manager or champion to act as a central point of contact for INNS related queries. • Implement a biosecurity clause and best-practice principles in Codes of Conduct and Terms and Conditions (e.g., “<i>our Club expects members to follow the principles of Check Clean Dry</i>” etc). • Follow ‘Check, Clean Dry’ principles and any site-specific biosecurity protocols.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	<u>Appoint Biosecurity Managers or Champions</u> For operations of varying scales, appointing a biosecurity manager or champion can be beneficial. This individual, equipped with relevant knowledge and a defined responsibility for biosecurity, can oversee and ensure that biosecurity actions are conducted appropriately and effectively for their site, business, or organisation. Within ports/harbours, recreational clubs and commercial operations, a biosecurity manager should be appointed to act as a central point for all INNS queries (e.g., on ID or procedure), enforces biosecurity protocols and facilitates action in response to new INNS detections and issues. They could also ensure the appropriate use of biosecurity facilities and help to ensure that the facility itself is cleaned and maintained regularly to address biofouling on infrastructure. The biosecurity manager could be a club / staff member already in post and familiar with the site (or club) and any biosecurity plan already in place. They could be trained in the role and provided with the tools to train other club / staff members and inform members of the public /customers. The biosecurity manager should act as a point of contact for staff. <u>Research and develop INNS management measures</u> Invest and participate in the development and testing of new methods and technologies to manage INNS. For example, working with a research body / professional.	• Keep up to date with emerging methods and technologies that offer INNS risk reduction (e.g., innovations to antifouling approaches). • Ensure innovative approaches and updated best practice is shared within the sector e.g. trial use of different antifouling against different INNS.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	Some marine licensed activities require the submission of a marine INNS biosecurity risk assessment and Management Plan (see marine licensing guidance). Strengthening these requirements could involve offering additional guidance to applicants who are updating or expanding sites to include the addition (or improvement) of biosecurity facilities. This will facilitate biosecurity compliance in licensed activities and ensure risk-based measures are considered and implemented. Implementation of a risk-based approval system for planning and licensing could facilitate the future-proofing of biosecurity in new developments. An example of a development plan that takes biosecurity into account might be for new developments to be located at or near freshwater input, thereby reducing the risk of INNS establishment. Support the implementation of clean boat policies by ports and harbours.	• Provide support to national and local stakeholders for the implementation of improved biosecurity at sites where recreational boating is a priority pathway. • Strengthen the biosecurity requirements within marine licensing and planning.
Marina managers / harbour masters / boat clubs	Clean boat policies could be introduced in sites like marinas, harbours and ports. These policies outline a maximum amount of hull fouling that is permitted for a boat entering the site (unless immediately being removed from the water for cleaning) or the maximum amount of hull fouling allowed to accumulate on a boat moored at the site before the boat must be removed and cleaned (in compliance with national boat cleaning	• Produce a stand-alone BAP or to-do-list tracker for the individual operation - communicate with NRW for support and advice.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Marina managers / harbour masters / boat clubs continued	requirements). Guidance on ranking systems for hull fouling can be found in table 1. They can be included, for example, in the Terms and Conditions for mooring, membership conditions for yacht clubs or mooring rental agreements. The GB Recreational Boating PAP has produced the following biosecurity clause which can be included in berthing terms and conditions: “You must ensure the Vessel is free of Hull fouling before it is placed into the Berth [or mooring] and while it is kept there. If Hull fouling is present, you must lift and clean the Vessel, preventing any removed material from re-entering the water. You must inform the Company and agree a timescale over which to clear the Vessel. If the Vessel is not cleaned within this time, the Company reserves the right to lift and clean the Vessel at your expense.” Where construction or maintenance work is undertaken, ensure reference to the actions within the Construction and Maintenance section of this document. Additional biosecurity processes and procedures should be considered for recreational boating events. The biosecurity risk of a boating event should be assessed ahead of time and enhanced biosecurity actions developed where necessary. Consideration should be given to biosecurity awareness and uptake (i.e. use of facilities and following of procedures) during events.	• Introduce a clean boat policy and communicate this policy widely with relevant stakeholders and authorities. • Include a biosecurity statement/clause in club membership / code of practice site agreements. • Disseminate hull fouling resources and cleaning expectations to boat owners in the T&C’s for mooring and berthing. • Create an event Biosecurity Plan which includes enhanced biosecurity actions (e.g., additional staff and/or cleaning facilities). • During high-risk events brief staff and participants on the importance of biosecurity.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Marina managers / harbour masters / boat clubs continued	Staff or volunteers could be in attendance to raise awareness of INNS and assist with any biosecurity actions required. Event organisers could link with local NGOs (e.g., Wildlife Trusts) to set up INNS information stands and provide attendees with relevant resources (e.g., biosecurity best-practice guidance and INNS guides).	See actions above.

5. Biosecurity facilities

The availability of a biosecurity facility (or the supply of appropriate equipment) can help promote effective cleaning, reducing the risk of INNS being transferred to or from a location.

PRIORITY ISSUE: Washdown facilities are critical for enabling the physical cleaning of equipment, PPE, and boats. Enhancing the availability and accessibility of these facilities can substantially improve biosecurity effectiveness.

To note: A review of available washdown facilities within Welsh marine areas was not included in the scope of the biosecurity framework, leaving the overall status of such facilities unknown.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	Stakeholders who manage or own assets (e.g., marina and harbour operators, local authority managed assets where recreational boating occurs, etc.) should consider the installation of biosecurity facilities. It is acknowledged that biosecurity facilities may be multi-purpose at many locations and that facilities do not need to be overly complicated or technical (e.g., using hot water to clean rather than cold or freshwater rather than seawater). When planning installations, the following requirements, among other aspects like space and financial resources, should be considered: • The scale of the facility in proportion to the risk posed by the activity. • Infrastructure required for the collection and disposal of wastewater and waste material in a biosecure way to prevent INNS re-entering the environment (e.g., water tanks and biological waste bins). • Supply of necessary resources, like water and electricity.	• Install a freshwater (and, if possible, a hot water) supply at a site (e.g., marina). • Ensure that waste is controlled in a way that minimises the risk to wider habitats. • Use existing washdown facilities (following improved protocols that may be outlined in Component 4). • Utilise the biosecurity support tool to assist with decision making. • Review and explore the potential to upgrade existing biosecurity facilities.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	Some facilities relevant to recreational boating include: • Fabrication of a bunded area at designated cleaning area / dry dock to capture all waste material and waste water. • Provision of an area to leave boats once removed from the water to dry thoroughly, allowing all biofouling species to desiccate. • Supply of power washers and steam washers to boaters and boat cleaners for use on vessels and equipment. Funding sources may be available to facilitate the purchase, installation and operation of biosecurity facilities. Guidance on the use of equipment at the facilities should be prominently displayed to ensure the correct application of the biosecurity measures. Additional biosecurity facilities should be considered for boating events. Stakeholders should be reminded that biosecurity facilities do not need to be complex and could just represent a minor upgrade to existing facilities. Additional note: It is difficult to provide a one-size-fits-all recommendation for biosecurity facilities without understanding the nuances of a particular site. The GBNSS provides good background information and a biosecurity facility support tool, which offers a useful overview of facilities.	• Participate in the research and development of improved cleaning facilities/equipment for boats and associated infrastructure. • Set up additional biosecurity facilities to mitigate increased risks associated with boating events.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	New technologies are being developed that facilitate hull fouling assessment (e.g. underwater video) and removal of fouling organisms from boats and infrastructure efficiently whilst containing waste and preventing its return to the marine environment. Investing and participating in the development and testing of new technologies can facilitate advances. This could involve partnering with a research body/professional who can provide advice, for example, working with a local university.	See actions above.

6. Monitoring and reporting

To establish a robust understanding of what INNS are present in Welsh marine areas and facilitate the early detection of introductions and spread.

To ensure that INNS sightings are reported to an appropriate platform and records are included in national databases.

To ensure that up to date species distribution data is available to facilitate rapid responses to new INNS introductions or spread events.

PRIORITY ISSUE: INNS monitoring and surveillance are insufficient in certain regions, with stakeholders often unaware of what to report or where to report sightings. Additionally, data flow is fragmented, data administration slow, and existing mechanisms for priority species reports reaching authorities are inconsistent, which may delay management response.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	This focus area aims to increase the INNS monitoring and surveillance effort by stakeholders. Stakeholders should take an integrated approach to monitoring (see action PS-6). By doing so, they can ensure a cohesive and unified effort that builds on and enhances existing programmes, maximising the effectiveness of monitoring across all marine pathways and action plans. Stakeholders who own or manage assets (e.g., marina and harbour operators, local authority managed assets where recreational boating occurs etc.) should consider implementing regular monitoring for INNS. Monitoring can either be undertaken and reported by stakeholders individually or could be through a collaborative effort with other stakeholders, for example those in academia.	• Promote and encourage the use of reporting / recording platforms. • Check biosecurity communications for opportunities to coordinate monitoring and collaborate. • Consider proactive monitoring through citizen science programmes. • Promote opportunities for integrated or collaborative monitoring efforts.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	It is best to use standard procedures for monitoring high-risk INNS. Procedures may be directed from a new national approach or from existing monitoring. The best approach to monitoring for current and horizon INNS is to employ multiple methods in tandem to achieve maximum coverage of habitat and species detection. Some of the monitoring methods that could be employed include: • Rapid Assessment Surveys (optimal for detecting fouling organisms but not for planktonic or soft bottom habitat species); • Settlement plates/panels (panels placed in key areas for a pre-determined amount of time and checked periodically for marine growth or analysed in a lab); and • Environmental DNA (eDNA) (used to ascertain which species are present at a site using the genetic material that can be obtained from an environmental sample such as water). Stakeholders can contact NRW for guidance on monitoring INNS at their site at: invasive.non.native@naturalresourceswales.gov.uk Simple training and guidance should be provided to staff, focusing on recognising priority INNS, or being encouraged to report “unusual” growth or fouling. Where possible, recreational boaters themselves should inspect the boat for INNS as part of the maintenance and cleaning process (see hull fouling ranking scale in Useful resources). Confirmed or suspected INNS should be reported. This will help to notify the authorities and stakeholders which could lead to measures being implemented to reduce their spread. Information on how and where to report sightings should be included in all biosecurity materials and resources.	• Borrow the marine INNS workshop kit to run training in identification. The kit is comprised of preserved specimens and information sheets and can be borrowed from Amgueddfa Cymru (see Useful resources). • Be vigilant during activities for unusual species or growth (checking the site and equipment). • Report new/unusual species or growth/fouling to iRecord or NRW.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders continued	NRW recommend that INNS sightings should be reported to: • iRecord online [www.irecord.org.uk/]; and • iRecord App [available on Google Play].  Potential INNS sightings can also be reported directly to NRW at: invasive.non.native@naturalresourceswales.gov.uk Reporters should take photos and make a note of the sighting location (ideally GPS coordinates). If possible, they should take notes about the surroundings (e.g., substrate type, other species in the area, tidal height). The reporting platform should be mentioned / linked on educational materials, at workshops and in social media engagements (see Component 2).	See actions above.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	It has been recognised that the reporting of INNS sightings is not as efficient as it could be. Authorities should therefore engage with local groups, citizen science surveying groups (e.g., Seasearch), Local Environmental Records Centres (LERCs) and non-governmental organisations (NGOs) (e.g., Wildlife Trusts) to set up or improve data-sharing links and ensure that sightings of high-risk species or new incursions of horizon species are passed to the relevant authority and acted on in a timely manner. This could involve establishing a list of national alert species and disseminating this list to all relevant parties (e.g., LERCs and NGOs). A critical analysis of the data flow for national INNS records should be considered, with the primary aim to improve the consistency, accuracy and timeliness of reports. See Figure 5 for a heatmap of recreational boating activity in Welsh waters.	• Undertake a critical analysis of the data-flow for national INNS reports. • Ensure that priority INNS reports are flagged with relevant stakeholders (e.g. iRecord species notifications).

Responsible stakeholder	Guidance for Development of Actions	Example actions
Marina managers / harbour masters	Individual site managers / operators will already have an understanding of the "normal" plants and animals within their site - monitoring does not necessarily need to be a formal or costly process. Reporting unexpected fouling or growth noticed during normal operations can still provide valuable information and trigger a quick response. Where possible, relevant staff (including boat cleaning / maintenance workers) should inspect the boat for INNS as part of the maintenance and cleaning process (see hull fouling ranking scale in Useful resources). However, the intent is not for inspections to be operationally burdensome but to be carried out in tandem with normal procedures. The inspection process could involve a visual inspection of the watercraft from the surface of pontoons/docks and as the boat is hauled out for cleaning. INNS sightings should be recorded on relevant reporting platforms or reported to NRW. Harbour masters, site owners and site managers (or any other relevant party) should develop an inspection strategy to target visiting boats, based on their own inspection strategies. This should outline procedures for inspection and to enforce relevant actions (e.g., refusing entry or insisting on immediate removal and cleaning with costs covered by the boat owner/manager). The terms of any clean-boat policies and inspection strategies should be publicly accessible and made clear to visiting boats prior to their entry.	• Brief employees on the importance of INNS monitoring. • Report unusual growth or fouling to iRecord or NRW - Download the iRecord app onto work phones and encourage staff to download the app on their personal phones if they are not supplied with a work phone. Add a QR code for the iRecord web browser on relevant signage on site. • Partner with universities to provide the opportunity for students to monitor INNS presence at sites e.g. by installing settlement panels at the site between April and September each year. • Implement a site strategy for the inspection of <u>visiting</u> boats.

7. Collaborative working

To improve the collaboration between all stakeholders within Welsh marine areas where recreational boating takes place.

To foster open communication, build trust, and align on shared goals to drive effective outcomes.

To cooperate in decision-making, share resources, and leverage the experience of all stakeholders to address challenges and achieve success together.

PRIORITY ISSUE 1: Stakeholders remain uncertain about advancing biosecurity implementation without clear guidance and support from regulators and authorities. Top-down leadership is crucial, complemented by inter-stakeholder collaboration. Mechanisms for sharing information, practical advice, and bespoke guidance tailored to both national and local stakeholder needs must be developed and prioritised.

PRIORITY ISSUE 2: Opportunities for coordinated and collaborative biosecurity can be missed due to limitations in communication, leading to duplicated effort and gaps.

Responsible stakeholder	Guidance for Development of Actions	Example actions
All stakeholders	All stakeholders should work to strengthen communication and collaboration mechanisms, ensuring that practical improvements and best practices are effectively shared and considered within national or regional biosecurity implementation. Open communication channels will facilitate the flow of information from authorities to stakeholders within key sectors (i.e., those whose operations may act as pathways of introduction and spread). Open channels will also facilitate the sharing of information from stakeholders to authorities. For example, carpet sea squirt sightings in new areas.	- Engage in the biosecurity framework for Welsh marine areas in some capacity. - Consider mechanisms for collaboration and integration with other stakeholders and projects.

Responsible stakeholder	Guidance for Development of Actions	Example actions
Authorities	Authorities could consider taking a leadership/coordinating role in this process by setting clear frameworks, facilitating dialogue, and ensuring that all voices are heard. Impartial guidance is critical in driving coordinated efforts, updates to national policy, maintaining transparency, and promoting a proportional approach. Authorities should ensure close working and collaboration with relevant authorities (and other stakeholders) in England (e.g., the Environment Agency) and Europe.	• Ongoing stakeholder engagement to keep INNS at the forefront of stakeholders' activities and awareness. • Establish/task an existing working group with coordinating collaborative working. • Engage and coordinate with stakeholders to monitor progress and assess future support needs.

Action scaling: a boat club example

The following section provides examples of how the biosecurity components and actions listed above (under “Recommended actions for stakeholders”) could be scaled for implementation by a boat club. The actions should be tailored to the site and the relevant stakeholders for inclusion in operational procedures and/or a site specific biosecurity plan. [The GB Boating PAP](#) provides information on best practice to promote biosecurity for the pathway.

Table 5. Example actions for a boat club

Component	Example approach for a marina
1. Understanding roles and legal responsibilities	Include information on INNS legislation and site-specific biosecurity policies in membership T&Cs, news updates, and event information emails.
2. Information and guidance on INNS and biosecurity	If guidance/information is received from authorities, review it to see if it is appropriate for inclusion in boat club guidance. Provide feedback on guidance/information if appropriate. Request hard copies of the NRW marine INNS guides for the club house.
3. Raising awareness	Put up identification images of key INNS in the club house with a QR code to the iRecord web browser. Install ‘Check Clean Dry’ signs at key locations such as equipment stores. Add in a link to biosecurity information on the GB NNSS website in club update emails. Include biosecurity guidance / requirements in membership renewals. Provide club members with an INNS ID guide (paper or digital) on sign up.
4. Biosecurity processes and procedures	Appoint a club biosecurity manager to inspect boat hulls and in-water equipment, and to coordinate the implementation of biosecurity at club-managed sites and club-run events.
5. Biosecurity facilities	Install multi-use cleaning facilities and provide waste bins for INNS (and other debris). Add boat cleaning guidance and information on the ‘Check, Clean, Dry’ biosecurity campaign to the club website. Increase the availability of the cleaning facilities during club-managed events and ensure that the biosecurity manager has adequate assistance to coordinate biosecurity actions.

Component	Example approach for a marina
6. Monitoring and reporting	Encourage members to report unusual growth or fouling to the biosecurity manager who can then take the appropriate action to report suspected INNS to the relevant authority or record the sighting on iRecord. Encourage club members to join a citizen science survey group (e.g., Shoresearch). Encourage members to download the iRecord app. Add a QR code for the iRecord web browser on club notice boards and relevant signage. After planning and agreement with relevant authorities, submerge a settlement panel in the marina between April and September each year.
7. Collaborative working	Share information with other club members, attend relevant workshops / events and provide feedback to authorities.

Considerations for site maintenance and construction operations

The following guidance is for consideration by site owners, site operatives and other relevant actors when planning or undertaking minor work at a site.

[The Welsh National Marine Plan 2019](#) contains a cross-cutting policy specifically relating to INNS. Under Policy ENV_03, proposals for inshore and offshore developments in Welsh marine areas should assess the likely risk of introducing or spreading INNS and put in place reasonable biosecurity measures where necessary to reduce or stop their introduction or spread.

Some general operational activities might risk spreading INNS. These include minor works, repairs, maintenance and construction that would not necessarily need a marine licence so there may not be an assessment or an understanding of the risk that the activity might pose in spreading INNS.

Activities, which may fall under Band 1 licencing eligibility, are listed below. It is important to note that the NRW Permitting Service may still be required to consider the appropriateness of the activity before determining the licence application (see [Natural Resources Wales website](#) for more information).

- Repairing, replacing or reasonably improving parts or ancillary equipment attached to existing structures (e.g., bolts, flaps, valves, cathodic protection, access covers, grills, joints, decking on a pier or pontoon, health and safety equipment etc.).
- Installing scaffolding/access towers to facilitate the maintenance of existing structures.
- Replacing render or concrete, including resurfacing slipways (excludes work on coast protection structures, such as sea walls).
- Removal of marine growth and/or guano from any structure (other than from vessels).
- Installing ladders at any building or structure.
- Dropping or removing posts for marking channels, shallow water areas, outfalls and groynes.
- Dropping or removing marker buoys.
- Removing discrete pieces of debris associated with construction, demolition, damage or disrepair of a building / structure (using a vehicle or vessel).
- Removing litter (using a vehicle or vessel).

The movement of material and equipment on or off a site risks inadvertently transferring INNS. INNS (as adults, juveniles, larvae or fragments) could be attached to surfaces, entrained in any water-retaining features/crevices (including in porous materials like concrete), living within sediments or among other species (like fouling communities). If the material or equipment is not thoroughly cleaned (e.g., washed down with freshwater) and dried before moving on or off the site, any INNS that are present would also be moved on or off the site.

Additionally, equipment, parts or materials that have been static in the water for prolonged periods of time can build up fouling which can be dislodged into the water during

maintenance, cleaning or replacement. In this way, fouling INNS can be helped to spread to new areas (e.g., fragments of carpet sea squirt, which can form new colonies elsewhere).

Biosecurity is not necessarily considered when undertaking each of the above activities and guidance on how to address the risks of this minor pathway is not as well developed (or specialised) as it is for other pathways in the marine environment (see [Useful resources](#)). As such, it is important to set out general procedures for operatives to follow to reduce the risks of introducing or spreading INNS into, around or out of their site. However, the intention is not to add onerous risk assessments and checks to everyday operations but to ask operatives to be mindful of potential risks and take basic steps to minimise them. The aim of the following guidance is for it to be considered by marina managers, harbourmasters, site owners, site operatives and any others when planning or undertaking minor work at a site.

Activity: Cleaning, maintenance or removal of structures / items in the water

Suggested Biosecurity Actions

- Visually inspect them before disturbing them.
- If they have fouling on them, try to minimise the risk of releasing the species into the water:
 - Bring the structure out of the water before carrying out the work and retain the detritus that comes off the item (collect it and dispose of it on land).

Activity: Bringing new infrastructure / equipment and material on site

Suggested Biosecurity Actions

- Ensure it is fully clean and dry before it is deployed.
- If unclear when it arrives, take to a suitable location for cleaning, this should be a contained area of hard-standing with appropriate drainage. Wastewater and waste material should be collected and disposed of in a biosecure way to prevent INNS (including larvae, fragments, etc.) re-entering the environment (e.g. water tanks and biological waste bins).
- If possible, check the source of the item(s) and understand what INNS are present at that site (this can be done by searching the location on the [NBN Atlas](#) or on [iRecord](#)) which are both open-access and free to use).

Activity: General operational good practice for infrastructure

Suggested Biosecurity Actions

- Where practical, remove man-made structures from the water when they are not in use.

- Temporarily move items out of the preferred growth zone. For example, dropping the mooring chain to the seabed when not in use will smother fouling (in muddy sediments) or prevent new growth.
- Air dry what you can, when you can. Identify opportunities to dry out equipment or infrastructure as often as possible, e.g., drying room/area for kit, PPE etc.
- Expose to fresh water. Make the most of any natural flows of freshwater into your site. Expose INNS to fresh water through immersion or wash down.
- Photograph fouling on buoys / pontoons when they are taken out for maintenance to keep a record of growth and inspect for any new INNS.

Useful resources

- [GB NNSS Check Clean Dry](#)
- [GB NNSS Marine Biosecurity](#)
- [GB NNSS INNS Management Toolkits](#)
- [GB NNSS Recreational Boating PAP](#)
- [Biosecurity guidance for boat users](#)
- [GB NNSS Event Organisers – Basic biosecurity for events](#)
- [GB NNSS Information Portal](#)
- [Australian government recreational vessel biofouling guidelines](#)
- [Ecostructure Virtual Marina Biosecurity Training Tool](#)
- [The Green Blue video guides on Check Clean Dry](#)
- [Health and Safety Executive list of approved biocides](#)
- [International Maritime Organisation \(IMO\) GloFouling resources](#)
- [IMO GloFouling partnerships report on biofouling management for recreational boats](#)
- [IMO guidance for minimising biofouling for recreational craft](#)
- [IMO GloFouling Partnerships posters for recreational boating](#)
- [Marine Biosecurity Planning – Guidance for Wales and England \(2015\)](#)
- [Marine Biosecurity Planning - Guidance for Specific Operational/Construction Related Activities](#)
- [Natural Resources Wales evidence report on the impacts of marine INNS on MPA features](#)
- [Natural Resources Wales evidence report on marine INNS pathways in Wales](#)
- [Natural Resources Wales marine INNS identification guide in Welsh](#)
- [Natural Resources Wales marine INNS identification guide in English](#)
- [Marine Biological Association INNS ID guide](#)
- Welsh marine INNS workshop kit: May be borrowed by anyone who is running a supervised workshop for adults. It includes specimens, images, distribution maps and species information. For more information or to borrow the kit, contact:
anna.holmes@museumwales.ac.uk

- [The WiSe scheme for charter boating](#)
- [Royal Yachting Association, The Green Blue resources](#)
- [Wales Biodiversity Partnership INNS Group](#)
- [Welsh marine INNS priority list](#)

- Informative videos:
 - [Natural Resources Wales - Marine invasive non-native species in Welsh waters](#)
 - [Cyfoeth Naturiol Cymru - Rhywogaethau estron goresgynol yn nyfroedd Cymru](#)
 - [Invasive species film by the Rapid LIFE Project](#)

- **Full reference to the 2023 report by Eschen:**
 - Eschen, R., Kadzamira, M., Stutz, S., Ogunmodede, A., Djeddour, D., Shaw, R., Pratt, C., Varia, S., Constantine, K. and Williams, F., 2023. An updated assessment of the direct costs of invasive non-native species to the United Kingdom. *Biological Invasions*, **25**, 3265-3276

- **Links to other Pathway Action Plans (PAPs) and Species Action Plans (SAPs):**

Links to the action plans listed below can be found on the [Wild Seas Wales website](#).

 - American slipper limpet, *Crepidula fornicata* SAP
 - Chinese mitten crab, *Eriocheir sinensis* SAP
 - Carpet sea squirt, *Didemnum vexillum* SAP
 - Trumpet tubeworm, *Ficopomatus enigmaticus* SAP
 - American oyster drill, *Urosalpinx cinerea*, & Japanese oyster drill, *Ocenebrellus inornatus* SAP
 - Recreational Boating (large boats) PAP
 - Recreational Activities PAP
 - Commercial Shipping PAP
 - Aquaculture PAP
 - Shore-based Fishing PAP
 - Boat-based Fishing PAP

Recreational boating in Wales

Figure 5 presents a heatmap of recreational boating around Wales from the 2020 [NRW Evidence Report No:459](#). As described in the map key, the darker red areas show where the intensity of boating activity (i.e., frequency and amount) is greatest. Areas with 'No recorded activity' may host recreational boating but data have not been included in this dataset as this was a baseline study only. The areas with the highest recreational boating intensity, and therefore a higher risk of introducing and spreading INNS, include around Anglesey, the Llŷn Peninsula, Milford Haven, Swansea and around Cardiff. All of these locations are in or near Marine Protected Areas, such as Special Areas of Conservation.

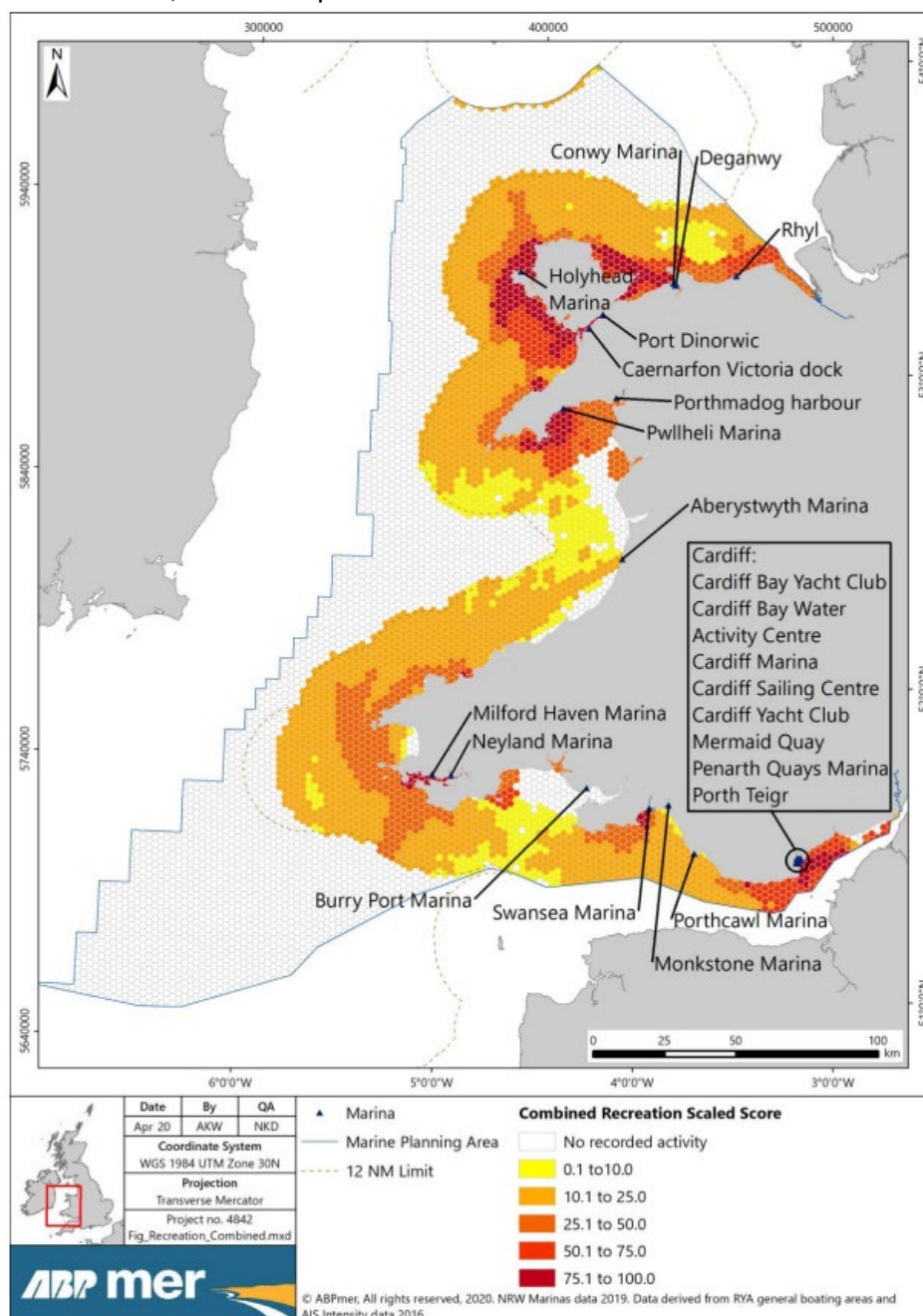


Figure 5. Map of the recreational boating pathway for Wales from NRW Report 459. The map uses combined data from the RYA of general boating areas and boating activity intensity.

Recreational boating decision tree

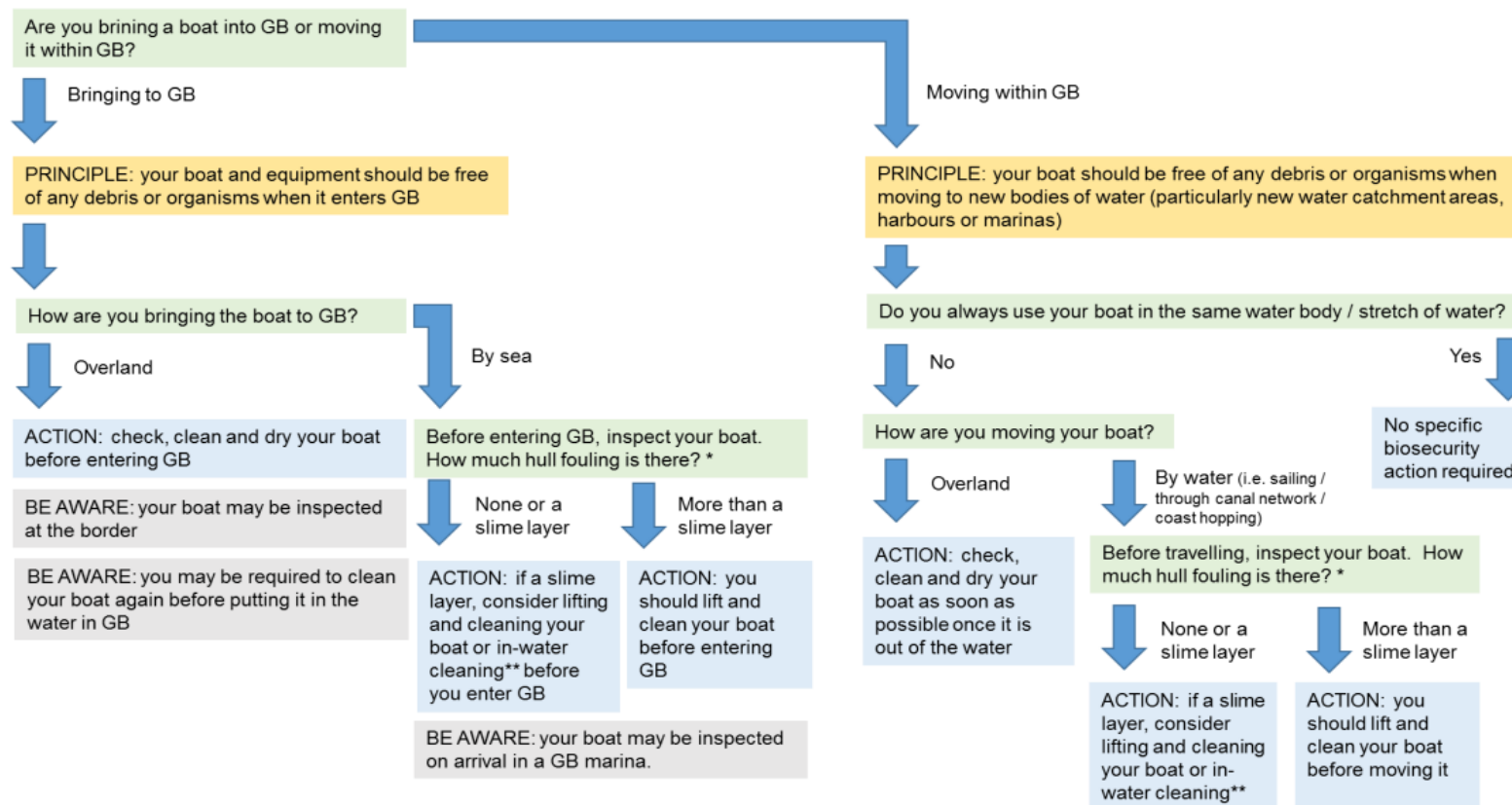
Flowchart for biosecurity decisions for recreational boating in Great Britain

The decision tree in Figure 6 below has been produced by the GB NNSS as part of the Recreational Boating Pathway Action Plan. It outlines the steps that should be taken when bringing a boat into GB or moving it within GB.

For boats entering Great Britain, users must make sure the boat and equipment are free of debris and organisms. Your boat may be inspected at the border, or on arrival in a GB marina.

- If transported overland to Great Britain: check, clean, and dry the boat before entry
- If transported by sea to Great Britain: inspect hull fouling: slime layer may require cleaning before entry, while heavier fouled boats should be lifted and cleaned out of the water before entry
- For boats moving within Great Britain: if staying in the same water body, no action is needed
- If moving the boat overland within Great Britain: check, clean, and dry the boat before using
- If moving the boat by water within Great Britain (sea or in-land water ways) inspect hull fouling: slime layer may require cleaning, while heavier fouled boats should be lifted and cleaned out of the water before entry

Regular maintenance reduces fouling. In-water cleaning is only permissible (under strict conditions) in England and Wales, it is not permissible in Scotland.



*Tip: regular maintenance will reduce the risk of heavy fouling

**In-water cleaning is only permissible (under strict conditions) in England and Wales, it is not permissible in Scotland.

Figure 6. Decision tree for recreational boating biosecurity, from GB NNSS Recreational Boating PAP.