

Marine Invasive Non-native Species

Priority Monitoring and Surveillance List for Wales

Background

Non-native species are species that are outside of their natural range. They may have entered our waters through deliberate or unintentional release by humans, transported by vessels (bio-fouling) or through natural processes such as ocean currents.

There are many non-native species in Welsh waters. Most cause no problems but some do and can harm native marine life, human health and our economic activity. We call these species invasive non-native species (INNS).

Invasive non-native species are a threat because they can disrupt native marine life by preying on or out-competing native species for food and shelter. They can spread disease and also interfere with the genetic integrity (DNA) of native species. We aim to prevent INNS from spreading or being introduced into Welsh waters and we have a variety of legislation to help with this, such as the Marine Strategy Framework Directive (MSFD). Under MSFD, a UK monitoring and surveillance list for marine non-native species has been developed (CEFAS in 2015¹) to focus efforts on 'priority' marine species, representing those that do or could have a high environmental impact.

Not all the species on the MSFD list are present in Wales so we have taken those that are in Wales and those listed under the Wildlife and Countryside Act 1981, the Water Framework Directive and UKTAG Aquatic alien species to produce a Welsh specific list of priority marine INNS (**Tables 1 and 2**). We have also included a list of species which are not present in Wales but may arrive so we need to keep an eye out for (surveillance).

The following tables detail the invasiveness of each species (risk assessment) and this is the basis for the separation of the species into **High, Medium and Low Risk**. Risk Assessment scores were obtained from the GB non-native species secretariat website <http://www.nonnativespecies.org/index.cfm?sectionid=51>, where available. The lists will be subject to continued review.

Uses for the lists

We intended to use the lists to inform the following:

- Marine Plan policy for INNS (ENV-03) - helps to inform developers and decision makers about which species are of most concern in Welsh waters.
- Raising awareness of the impact of INNS and encourage the reporting of suspected INNS sightings.
- Stakeholder participation – helps to involve stakeholders in surveillance monitoring and reporting.
- Development of actions plans for monitoring, surveillance and potential pathways, particularly in Welsh Marine Protected Areas.
- Development of contingency planning.
- A risk based approach to management.

¹ Stebbing, P., Tidbury, H. and Hill, T. 2015. Development of priority species lists for monitoring and surveillance of marine non-natives in the UK. Cefas contract report C6484. Issue date 30/10/2015.

Monitoring Lists

INNS already present and breeding in Wales (prioritised according to invasiveness, including spread and impact)

Tables 1 and 2 below take species which are on the UK monitoring list, which have been considered in a Welsh context and have been ranked based on the overall score of their risk assessment.

Table 1. High risk

Species and Group	Risk Assessment Score (NNSS rapid risk assessment / Cefas rapid risk assessment score)	Justification for Selection	Primary Introduction Pathway ²	Impact Summary ³	Management Action (for further information contact NRW Intertidal / INNS ecologist)
Compass sea squirt (<i>Asterocarpa humilis</i>) Tunicate	High (CEFAS Rapid Risk Assessment) *	MSFD monitoring list	Fouling	Impact of this species may not be consistent in different locations (marinas vs natural shore). Could be a significant fouler of mussel and oyster culture gear, potentially competing for food with target species or smothering them, and rendering underwater gear and lines cumbersome.	Requirement to collate records from current monitoring as part of MSFD at a UK level. Report sightings if outside current range (action by all parties).
American slipper limpet (<i>Crepidula fornicata</i>) Mollusc	High	MSFD monitoring list/WFD High impact/ Schedule 9 of WCA 1981	Aquaculture (accidental contamination)	Smothering, trophic competition and larval predation. Economic impact on shellfisheries. Change to sediment movement.	Requirement to collate records from current monitoring as part of MSFD at a UK level. Report sightings outside current range (action for all parties).
Carpet sea squirt (<i>Didemnum vexillum</i>)	High	MSFD monitoring list/GB Alert species/WFD	Fouling, Aquaculture (accidental contamination)	Potential reduction in species diversity. Economic, environmental and social impacts are most likely to occur in shellfisheries in the Risk Assessment area. Environmental and social impacts will occur in	Requirement to collate records from current monitoring as part of MSFD at a UK level.

² Taken from Stebbing, P., Tidbury, H. and Hill, T. 2015. Development of priority species lists for monitoring and surveillance of marine non-natives in the UK. Cefas contract report C6484. Issue date 30/10/2015.

³ Summary taken from NNSS risk assessment / CEFAS risk assessment

* Risk assessment subject to review and change

Tunicate		High impact		harbours, marinas and sheltered bays.	Alert species so should be reported to the GB NNSS by all parties. Look to control spread at current sites in Wales (dependant on land ownership/management).
Chinese mitten crab (<i>Eriocheir sinensis</i>) Crustacean	High	MSFD monitoring list/EU regulation 1143/2014/W FD High impact/ Schedule 9 of WCA 1981	Ballast water and natural dispersal	Erosion of river banks. Likely to impact native, benthic invertebrate populations in freshwater and marine systems, through predation and competition for space. Potential to outcompete the native white-clawed crayfish. May cause siltation of gravel runs used for spawning by salmon and trout. In native range, crab carries diseases; although unlikely this will spread in GB due to the absence of the primary host snail species. Economic impacts associated with repairing flood defences, land reclamation and river banks damaged by burrowing, loss of salmon and trout fisheries. Potential impacts on native species, such as the common eel.	Requirement to collate records from current monitoring as part of MSFD at a UK level. Stricter regulation for species of 'Union Concern' under EU Regulation. Report sightings outside of current range (action for all parties). Illegal to release or allow to escape into the wild under WCA 1981.
Devil's tongue weed (<i>Grateloupia turuturu</i>) (includes <i>G. doryphora</i> . All records in the NE Atlantic have been assigned to <i>G. turuturu</i> , see Gavio & Frederic, 2002) Red alga	Very High (CEFAS Rapid Risk Assessment) *	MSFD monitoring list	Aquaculture (accidental contamination)	Large, fast-growing, may have the potential to displace native species and its large, broad blades may shade neighboring species, however no ecosystem impacts documented in UK. Economic impacts relate to fouling. Fouling of boat hulls reduces the speed and efficiency of boats. Fouling of aquaculture equipment and shellfish can increase harvesting costs and reduce shellfish growth.	Requirement to collate records from current monitoring as part of MSFD at a UK level. Report any sightings outside current range (action for all parties).
Red ribbon bryozoan (<i>Watersipora subatra</i>) Bryozoan	High (CEFAS Rapid Risk Assessment) *	MSFD monitoring list	Fouling	The negative impact of this species in marinas and on boat hulls has been documented. However, the potential impact of this species on, for example, shellfish aquaculture and natural shoreline substrate is currently less certain.	Requirement to collate records from current monitoring as part of MSFD at a UK level. Report any sightings if outside current range (action by all parties).

* Risk assessment subject to review and change

Table 2. Medium risk

Species and Group	NNSS risk assessment score / NNSS rapid risk assessment / Cefas rapid risk assessment score	Justification for selection	Primary introduction pathway ⁴	Impact summary ⁵	Action to be taken if found
Bonnemaison's hook weed (<i>Bonnemaisonia hamifera</i>) Red alga	Moderate (CEFAS Rapid Risk Assessment) *	MSFD monitoring list/ WFD	Ballast water and fouling	Very few records exist of <i>B. hamifera</i> causing specific detrimental ecosystem, social, or economic effects found within the literature. Analogous species have been classified as invasive, and been shown to cause significant impact, but despite long-term establishment in some regions <i>B. hamifera</i> has not been classified in the same way.	Requirement to monitor this species as part of MSFD at a UK level.
Japanese skeleton shrimp (<i>Caprella mutica</i>) Amphipod	Medium	MSFD monitoring list/ WFD Moderate impact	Fouling	Potential localised extinction of native caprellid species due to competition; potential impact on plankton communities during summer months; potential economic costs to the aquaculture (fin- and shellfish) industry, commercial shipping and recreational boating industry.	Requirement to monitor this species as part of MSFD at a UK level.
Pacific oyster (<i>Crassostrea gigas</i>) Portugese oyster (<i>Crassostrea angulata</i>)	Medium	MSFD monitoring list/ WFD Moderate impact	Aquaculture (intentional) and unintentional escapes	Primary economic loss may be though loss of mussel bed fisheries and loss of habitat for other intertidal bivalve species. Economic and social impacts may also be associated with loss of visitors to sites as oysters create a hazardous substrate. Environmental impacts are largely associated with loss of intertidal habitats, including mudflats and bivalve beds. Such	Requirement to monitor this species as part of MSFD where it is found outside of licenced aquaculture sites. Consider local control, dependant on land ownership.

⁴ Taken from Stebbing, P., Tidbury, H. and Hill, T. 2015. Development of priority species lists for monitoring and surveillance of marine non-natives in the UK. Cefas contract report C6484. Issue date 30/10/2015.

⁵ Taken from NNSS risk assessment / CEFAS risk assessment where available. Other sources of information referenced

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Mollusc				impacts may affect habitats of high conservation value, including mudflats, estuaries, eelgrass beds and biogenic reefs.	
Orange striped anemone (<i>Diadumene lineata</i>) Cnidarian	Moderate (CEFAS Rapid Risk Assessment) *	MSFD monitoring list/ WFD (Unknown impact)	Fouling and Aquaculture (accidental contamination)	There are few documented impacts of this species. As a fouling species it will impact ships and boats and submerged infrastructure around marinas and ports etc. In addition fouling of oyster and mussel shells may reduce their growth and ability to feed.	Requirement to monitor this species as part of MSFD at a UK level.
American jack knife clam (<i>Ensis leei</i>) Mollusc	Moderate (CEFAS Rapid Risk Assessment) *	MSFD monitoring list	Aquaculture (intentional and accidental contamination) and natural dispersal (ocean currents)	This species has been identified as invasive and therefore is associated with negative impacts. However, the impact of this species is likely to strongly depend on the industry being considered. Impacts to recreation and biodiversity are possible. More information is needed to accurately determine the severity that the negative impact balanced with any positive impacts.	Requirement to monitor this species as part of MSFD at a UK level.
Polychaete tubeworm (<i>Ficopomatus enigmaticus</i>) Annelid worm (brackish)	No risk assessment available	MSFD monitoring list/ WFD High impact	Unknown	Its effects on native species are more likely to be beneficial than problematic. Favours waters which present some degree of stress to most open-shore marine organisms. Its requirement for variable-salinity water in which to spawn ensures that the major populations do not interfere with most indigenous species. It is a fouling species which affects ships, buoys and harbour structures.	Requirement to monitor this species as part of MSFD at a UK level.
Japanese wireweed (<i>Sargassum muticum</i>) Brown alga	Medium	MSFD monitoring list/ Schedule 9 of WCA 1981/WFD low impact	Fouling and natural dispersal	Unproven impact on biodiversity but will change community structure and dominance, having a visual impact where it forms dense beds. It is potentially a nuisance species.	Requirement to monitor this species as part of MSFD at a UK level. Illegal to release or allow to escape into the wild under WCA 1981. Possible local control, dependent on land ownership/management.
A bryozoan (<i>Schizoporella japonica</i>) Bryozoan	Moderate (CEFAS Rapid Risk Assessment) *	MSFD monitoring list	Aquaculture (accidental contamination)	Known to foul man-made and natural structures, altering ecosystems and resulting in economic and social impact. However, the extent to which this species will impact the risk assessment area remains uncertain and will likely depend on the specific location it is present and for example the native species inhabiting this location.	Requirement to monitor this species as part of MSFD at a UK level.

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Leathery seasquirt (<i>Styela clava</i>) Tunicate	No risk assessment available	MSFD monitoring list/ WFD High impact	Fouling	Large and can become dominant in some habitats. May have negative effects on the abundance and habitat occupancy of other shallow-water suspension feeding sessile invertebrates. Not clear if would cause the local extinction of any species.	Requirement to monitor this species as part of MSFD at a UK level.
Wakame, Asian kelp (<i>Undaria pinnatifida</i>) Brown alga	Moderate (CEFAS Rapid Risk Assessment) *	MSFD monitoring list/ Schedule 9 of WCA 1981 /WFD	Aquaculture (accidental contamination), fouling	Impacts may be most likely suffered by the aquaculture industry. Growth on aquaculture cages and equipment. Fouling of boats will reduce their efficiency and results in increased cleaning and antifouling treatment. Out competes of native species.	Requirement to monitor this species as part of MSFD at a UK level. Illegal to release or allow to escape into the wild under WCA.

Table 3. Low / unknown risk (Species in Wales which are not on the MSFD list)

Those species which are not on the MSFD list and are considered lower risk for Wales. Note that the risk level of these species could change if a risk assessment is carried out.

Species	Group / common name	NNSS risk assessment score / NNSS rapid risk assessment / Cefas rapid risk assessment score	Justification for selection	Action to be taken if found
<i>Asparagopsis armata</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Aplidium cf. glabrum</i>	Sea squirt	Risk assessment not available	Recorded in Wales	Record sightings
<i>Amphibalanus improvisus</i>	Barnacle	Risk assessment not available	Recorded in Wales	Record sightings
<i>Anotrichium furcellatum</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Antithamnionella spirographidis</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Antithamnionella ternifolia</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Asparagopsis armata</i>	Red alga	Risk assessment not available	Schedule 9 WCA 1981 Recorded in Wales	Illegal to release or allow to escape into the wild under WCA Record sightings
<i>Austrominius modestus</i>	Crustacean	Risk assessment not available	Recorded in Wales	Record sightings
<i>Bonnemaisonia hamifera</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Botrylloides c.f. diegensis</i>	Sea squirt	Risk assessment not available	Recorded in Wales	Record sightings
<i>Botrylloides violaceus</i>	Sea squirt	Risk assessment not available	Recorded in Wales	Record sightings
<i>Bugula neritina</i>	Bryozoan	Risk assessment not available	Recorded in Wales	Record sightings
<i>Bugula simplex</i>	Bryozoan	Risk assessment not available	Recorded in Wales	Record sightings
<i>Bugula stolonifera</i>	Bryozoan	Risk assessment not available	Recorded in Wales	Record sightings

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<i>Codium fragile atlanticum</i>	Green alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Codium fragile fragile / tomentosoides</i>	Green alga	Risk assessment not available	Schedule 9 WCA 1981 Recorded in Wales	Illegal to release or allow to escape into the wild under WCA Record sightings
<i>Colpomenia peregrina</i>	Brown alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Corella eumyota</i>	Orange-tipped seasquirt/Tunicate	No risk assessment available	Recorded in Wales	Record sightings
<i>Corophium sextonae</i>	A mud shrimp	Risk assessment not available	Recorded in Wales	Record sightings
<i>Feldmannophycus okamuræ</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Goniadella gracilis</i>	Polychaete	Risk assessment not available	Recorded in Wales	Record sightings
<i>Mercenaria mercenaria</i>	Mollusc	Risk assessment not available	Recorded in Wales	Record sightings
<i>Mya arenaria</i>	Soft shelled clam	Risk assessment not available	Recorded in Wales	Record sightings
<i>Mytilicola intestinalis</i>	Parasitic Copepod	Risk assessment not available	Recorded in Wales	Record sightings
<i>Mytilopsis leucophaeata</i>	Mollusc	Risk assessment not available	Recorded in Wales	Record sightings
<i>Mytilus galloprovincialis</i>	Bivalve mussel	Risk assessment not available	Recorded in Wales	Record sightings
<i>Ostrea chilensis</i>	New Zealand Flat Oyster/Mollusc	Risk assessment not available	Recorded in Wales	Record sightings
<i>Perophora japonica</i>	Sea squirt	Risk assessment not available	Recorded in Wales	Record sightings
<i>Petricolaria pholadiformis</i>	Mollusc	Risk assessment not available	Recorded in Wales	Record sightings
<i>Polysiphonia harveyi</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Potamopyrgus antipodarum</i>	Mud snail	Risk assessment not available	Recorded in Wales	Record sightings
<i>Rhithropanopeus harrisi</i>	Crustacean	Risk assessment not available	Recorded in Wales	Record sightings
<i>Solieria chordalis</i>	Red alga	Risk assessment not available	Recorded in Wales	Record sightings
<i>Tricellaria inopinata</i>	Bryozoan	Risk assessment not available	Recorded in Wales	Record sightings

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Surveillance lists

Invasive non-native species not known to be breeding in Wales but likely to arrive (prioritised for surveillance and implementing a contingency plan)

Table 4 contains all of the species on the MSFD surveillance list (or monitoring list if not yet in Wales) which are considered to be of higher risk to Wales. It has been ranked coarsely in order of importance for surveillance, due to the potential impact of the species. This is based on the GB NNSS Risk Assessment score (if available) and/ or score obtained in the UK Horizon scanning report (Roy et al., 2014⁶), where the top score is 125.

Table 4. High Risk

Species and Group	Likely introduction pathway /current distribution	Justification for selection for inclusion in the Welsh contingency plan	Impact Summary	Risk Management /Action (based on impact and ability to manage)
Asian rapa whelk (<i>Rapana venosa</i>) Mollusc	Shipping (ballast water) and Aquaculture (accidental contamination) Small stable reproducing population on Brittany coast. In GB, no evidence of established populations but individual records of several Rapa Whelks reported from offshore GB waters in 2005.	MFSD monitoring list (not yet in Wales)/GB NNSS Risk Assessment High/UK Horizon Scanning Top 30 highest-risk future alien invasive species (Roy et al. 2014, score 100)	Able to rapidly consume large quantities of prey and could become a serious competitor for the native common whelk. Reduced food availability may also impact other predators of bivalves including crabs, birds, fish and starfish. A decline in structure forming bivalves may affect local habitat, resulting in reduced refuge for juvenile crustaceans and other organisms. The provision of larger shells to hermit crabs may allow increased growth and increased demand by hermit crabs on food resources. The diet includes molluscs of commercial interest including oysters, mussels and clams; it has been predicted that successful establishment of this species in Great Britain may threaten the bivalve industry. A rapa whelk of 14 cm is reported to be capable of consuming an eight cm hard clam in less than an hour (NNSS)	This species is subject to the marine INNS contingency plan. Rapid response, which could be to investigate incursion, introduce biosecurity measures if possible, and raise awareness with stakeholders.

⁶ Roy, H.E. , Peyton, J. , Aldridge, D.C. , Bantock, T. , Blackburn, T.M. , Britton, R. , Clark, P. , Cook, E. , Dehnen-Schmutz, K. , Dines, T. , Dobson, M. , Edwards, F. , arrower, C. , Harvey, M.C. , Minchin, D. , Noble, D.G. , Parrott, D. , Pocock, M.K.O. , Preston, C.D. , Roy, S. , Salisbury, A. , Schönrogge, K. , Sewell, J. , Shaw, R.H. , Stebbing, P. , Stewart, A.J.A. and Walker, K.J. (2014) Horizon scanning for invasive alien species with the potential to threaten biodiversity in Great Britain. *Global Change Biology*, volume 20 (12): 3859–3871.

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American oyster drill (<i>Urosalpinx cinera</i>) Mollusc	Transported with oysters. Already established in England	MFSD monitoring list (not yet in Wales)/CEFAS Rapid Risk Assessment High/WFD High Impact	Preys heavily on native oysters and may compete with native molluscs such as the dog whelk <i>Nucella lapillus</i> . Lacking a free swimming larval phase, local populations increase rapidly as dispersal is limited. Juveniles are able to drill oyster spat and barnacles as soon as they emerge from egg capsules. As a serious pest to the commercial oyster industry, impacts to communities dependent on local fisheries may be significant (NNSS)	This species is subject to the marine INNS contingency plan. Rapid response, which could include; investigate incursion, eradication, introduce biosecurity measures if possible, and raise awareness with stakeholders.
American lobster (<i>Homarus americanus</i>) Crustacean	Imported live, escape or release from holding facilities Found sporadically in the English Channel since 1998. One individual caught in Scotland, 2 in southeast. No established populations (NNSS). A live individual was found in North Wales in 2016.	MSFD monitoring list/NNSS rapid Risk Assessment High/WFD waiting list/UK Horizon Scanning Top 30 highest-risk future alien invasive species (Roy et al. 2014, score 100)	Could outcompete native lobster for food and shelter, danger of hybridisation with native lobster, may compete with edible crab, significant disease risk for native lobster (white spot syndrome and epizootic shell disease), potentially significant economic impact due to loss of native lobster (NNSS Risk Assessment Summary)	This species is subject to the marine INNS contingency plan. Rapid response, which could be to investigate incursion, introduce biosecurity measures where possible, and raise awareness with stakeholders.
Red algae (<i>Gracilaria vermiculophylla</i>) Alga	Main Pathway of introduction is via oyster movements Present in Northern Ireland	MFSD surveillance list/UK Horizon Scanning Top 30 highest-risk future alien invasive species (Roy et al. 2014, score 100)/EU Horizon scanning 500/WFD list (unknown)	Potential negative effect on native algae and seagrass (Global Invasive Species Database)	This species is subject to the marine INNS contingency plan. Report sighting.
American comb jelly (<i>Mnemiopsis leidyi</i>) Ctenophore	Ballast water (from risk management info) No records from GB but recently recorded from	MFSD surveillance list/UK Horizon Scanning Top 30 highest-risk future alien invasive species (Roy et al. 2014, score 100)/WFD Alarm	Major predator of zooplankton, fish eggs and larvae. Following introduction into the Black Sea a dramatic decrease in abundance of almost all prey species of pelagic fish and the disappearance of some zooplankton species	This species is subject to the marine INNS contingency plan. Report sighting.

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	the North Sea off Netherlands coast (NNSS)	list	was observed (NNSS)	
Asian shore crab (<i>Hemigrapsus sanguineus</i>) Crustacean	Ballast water and natural dispersal Individuals in South Wales (one record in Wales in 2014 – not confirmed as resident) and Kent. Found in Channel Islands since 2009 (NNSS)	MFSD surveillance list/NNSS rapid risk assessment High /WFD list as High impact (waiting list) /UK Horizon Scanning Top 30 highest–risk future alien invasive species (Roy et al. 2014, score 100)	Aggressive and highly opportunistic omnivore, may significantly affect native crab, fish and shellfish populations by disrupting the food web. Known to feed on commercially important shellfish species (NNSS risk assessment).	This species is subject to the marine INNS contingency plan. Report sighting.
Asian/Japanese oyster drill (<i>Ocenebra inornata</i>) Mollusc	Likely to be transported with shellfish	MFSD surveillance list/UK Horizon Scanning Top 30 highest–risk future alien invasive species (Roy et al. 2014, score 80)/WFD Alarm list	Predatory on bivalves, pest on oyster beds.	This species is subject to the marine INNS contingency plan. Rapid response, which could include; investigate incursion, eradication, introduce biosecurity measures if possible, and raise awareness with stakeholders.
<i>Celtodoryx ciocalyptoides</i> Sponge	Likely to be transported through movement of shellfish	MFSD surveillance list/UK Horizon Scanning Top 30 highest–risk future alien invasive species (Roy et al. 2014, score 60)/EU Horizon scanning 192/WFD Alarm list	Characterised by an extensive spatial brooding and it rates today among the dominant benthic megafauna in the shallow waters of the Gulf of Morbihan and Dutch inshore waters. It competes successfully with other macrobenthic organisms, overgrowing some of the other sessile invertebrates such as other sponges and octocorals (Perez <i>et al.</i> , 2006).	This species is subject to the marine INNS contingency plan. Report sighting.
Brush clawed shore crab (<i>Hemigrapsus takanoi</i>)	Ballast water, unintentionally with transportation of oysters for aquaculture,	MFSD surveillance list/UK Horizon Scanning Top 30 highest–risk future alien invasive species (Roy et al.	In Holland where densities are high, there has been a drastic reduction in the juvenile native common shore crab. In Dunkirk harbour this species has replaced the common shore crab.	This species is subject to the marine INNS contingency plan.

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Crustacean	<p>or associated with hull fouling communities. Natural range expansion following initial introductions occurs when pelagic larvae are dispersed by currents (NNSS website)</p> <p>First recorded in the UK in 2014 from River Medway, Kent and River Colne, Essex. In 2016, the species was recorded as very abundant in the River Orwell, Suffolk.</p>	2014, score 100)	A similar impact could occur in GB (GB NNSS factsheet)	Report sighting.
<p>Barnacle (<i>Amphibalanus amphitrite</i>)</p> <p>Crustacean</p>	Ballast water and fouling	MSFD monitoring list / WFD	Fouls boat hulls, marina structures, equipment and aquaculture species resulting in both environmental and economic consequence. Level of impact for future introduction into the risk assessment area currently unclear.	Need to confirm species is breeding in Wales.
<p><i>Hesperibalanus fallax</i></p> <p>Crustacean</p>	Fishing equipment	MSFD monitoring list	It is apparent that species may pose a risk to a native species of sea-fan (<i>E. verrucosa</i>) listed as a vulnerable by the IUCN and Section 7 list. Potential fouling organism.	Need to confirm species is breeding in Wales.

Table 5. Lower risk

Table 5 shows those species which are not yet known to be breeding in Wales and have the potential to arrive, but are not considered to pose as much of a threat as those in Table 4 in terms of impacts and / or likelihood of arrival.

Species	Group	Justification
<i>Chama sp.</i>	Jewel box clam	MFSD surveillance list, EU Horizon scanning 270
<i>Polysiphonia subtilissima</i>	Red algae	MFSD surveillance list, EU Horizon Scanning 203
<i>Asterias amurensis</i>	Flatbottom sea star	MFSD surveillance list, EU Horizon scanning 167
<i>Megabalanus coccopoma</i>	Titan acorn barnacle	MFSD surveillance list, WFD Alarm list, EU Horizon scanning 80
<i>Alexandrium catenella</i>	A dinoflagellate	MFSD surveillance list, DAISIE top 100
<i>Caulerpa racemosa</i>	Sea grapes	MFSD surveillance list, DAISIE top 100
<i>Rhopilema nomadica</i>	Nomad jellyfish	MFSD surveillance list, DAISIE top 100
<i>Theora lubrica</i>	Asian semele	MFSD surveillance list, WFD alarm list
<i>Paralithodes camtschaticus</i>	Red king crab	MFSD surveillance list, WFD Alarm list, GBNNSS Risk Assessment Medium
<i>Acartia tonsa</i>	Marine copepod	MFSD monitoring list, WFD list (unknown), CEFAS Risk Assessment Moderate
<i>Heterosigma akashiwo</i>	Dinoflagelette	MFSD monitoring list, CEFAS Rapid Risk Assessment Moderate
<i>Dyspanopeus sayi</i>	Say mud crab	MSFD monitoring list, CEFAS Rapid Risk Assessment Moderate
<i>Amphibalanus reticulatus</i>	Barnacle	MFSD surveillance list
<i>Caulerpa taxifolia</i>	Caulerpa/ killer alga	MFSD surveillance list
<i>Dendrostrea frons /Saccostrea frons</i>	Mangrove oyster	MFSD surveillance list
<i>Hemigrapsus penicillatus</i>	Japanese Shore Crab	MFSD surveillance list
<i>Megabalanus zebra</i>	Barnacle	MFSD surveillance list
<i>Mizuhopecten yessoensis</i>	Japanese scallop	MFSD surveillance list
<i>Pseudochattonella verruculosa</i>	Alga	MFSD surveillance list
<i>Telmatogeton japonicas</i>	Marine splash midge	MFSD surveillance list

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