

# Marina Operators Code of Practice

## Background

1. Invasive non-native plant and animal species are the second greatest threat to biodiversity worldwide after habitat destruction. They can negatively impact on native species, can transform habitats and threaten whole ecosystems causing serious problems to the environment and the economy.
2. The Invasive Species Ireland project which began in May 2006 aims to reduce the impact and threats from invasive species on the island of Ireland. This is a joint initiative between National Parks and Wildlife Services and the Northern Ireland Environment Agency. Preventing the spread and new introductions of invasive species is an issue of shared responsibility and requires the involvement of all relevant government agencies, academia, private and voluntary sectors.
3. Many non-native species do not become invasive but provide considerable benefits to society and industries such as horticulture, agriculture, forestry, and aquaculture. Therefore, management of the problem requires engagement and consultation with commercial interests. The development of this code of practice is aimed at reducing the risk from, and impacts of, invasive species and protecting native biodiversity. It is not seeking to stop the use of non-native species or impede the development of industry on the island of Ireland.

## The need for a Code of Practice

4. The UK and Irish Governments are contracting parties to a number of international conventions and agreements which require them to take account of invasive introduced species. The Convention on Biological Diversity (CBD) aims to prevent introductions, control invasive species and develop legislation. Other legislative drivers are European Directives (Birds Directive, Habitats Directive and Water Framework Directive) and national legislation (Wildlife (Amendment) Act 2000 and the Wildlife (Northern Ireland) Order 1985). Both countries are also committed to the EU target of halting the loss of biodiversity by 2010.
5. Analysis of the pathways by which species are arriving in Ireland and spreading once here has identified key sectors whose activities can contribute to the spread of invasive species. These sectors are also part of the solution. The marina operator industry can play an important role in invasive species management.
6. The risk assessment element of the Invasive Species Ireland project identified a number of species that are high risk invasive species to the island of Ireland. Some of these organisms are known to be associated with freshwater and marine vessels and crafts. Some of these links are quite obvious to the casual observer whereas others can go unseen and unnoticed until an impact is observed in a new area. Both freshwater and marine environment marinas have a crucial role to play in the prevention and surveillance of these invasive alien species. The Invasive Species Ireland project is aiming to reduce the threat from these species through different mechanisms including recommending legislative provisions, development of the Code of Practice for the marina operator sector and targeted education and awareness initiatives (see [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com) for more details).

7. **Marine invasive species of concern** include *Didemnum* species\* (a species of invasive tunicate), wireweed\* (*Sargassum muticum*), clubbed tunicate\* (*Styela clava*), the vase tunicate# (*Ciona intestinalis*), wakame# (*Undaria pinnatifida*), slipper limpet# (*Crepidula fornicata*), and the Asian rapa whelk# (*Rapana venosa*).
8. **Freshwater invasive species of concern** include the zebra mussel (*Dreissena polymorpha*)\*, floating pennywort (*Hydrocotyle ranunculoides*)\*, curly leafed waterweed (*Lagarosiphon major*)\*, Nuttalls pondweed (*Elodea nuttallii*)\*, species of non-native crayfish#, Asian clam (*Corbicula fluminea*)#, topmouth gudgeon (*Pseudorasbora parva*)#, quagga mussel (*Dreissena bugensis*)#, and the fishhook waterflea (*Cercopagis pengoi*)#.
9. **Terrestrial invasive species of concern** that are associated with certain activities of this sector include the ship rat (*Rattus rattus*)\* and the brown rat (*Rattus norvegicus*)\*. These species can stow away on boats and spread to environmentally sensitive off shore or lake islands where they can impact on nesting birds and biodiversity in general. Adherence to the guidelines in this code of practice will reduce their opportunity of spread.
- \* Species known to occur in Ireland  
# Species currently not known to be present in Irish coastal waters
- How can a Code of Practice reduce risk?**
10. The ability of species to foul the hull or stow away in boats can continue to deliver non native species to new areas where they can impact on the biodiversity and economy of the region. Therefore, marina operators have a vital role to play in preventing movement of species through raising awareness, facilitating customers to reduce fouling of vessels and equipment by use of an appropriate antifouling method (e.g. antifouling paint), removing fouling from vessels in a responsible manner where it cannot return to the aquatic environment, ensuring that customers drain all water from the vessel/craft before transferring to another water body, preventing fouling of ropes and chains by drying them on a regular basis and not disposing of live material in the water. The impact invasive species exert on native species, endangered species and on the conservation goals of designated areas are costly to control and mitigate against. Good practice has the potential to deliver significant benefits in terms of preventing introduction and spread of non-native species, where these are likely to cause problems.
11. The Invasive Species Ireland project is striving to increase awareness of the issues associated with marinas and leisure crafts and invites discussions with industry and relevant interest groups with a view to developing a code of practice, aimed at encouraging best practice and avoiding unwanted introductions.
12. The code of practice is a voluntary code promoting types of behaviour. Compliance with the code of practice will prevent the spread of invasive species and ensure compliance with legislation. A positive outcome of the development of this code will be an increased awareness of the potential impacts from invasive species that will hopefully lead to the sector voluntarily adopting practices that will limit the spread of high impact species now and in the future. Increased awareness will also contribute to surveillance for potential invaders and better information on the distribution of species already established in Ireland.

## Scope of the Code of Practice

12. The code of practice applies to all marina owners/operators and includes marinas, yacht clubs, boatyards, harbour masters and public access piers and harbours. The code provides advice and guidance on the appropriate methodologies to prevent the spread of invasive alien species in the aquatic environment and to islands.

## Key messages

### 13. Promotion of native species and biodiversity.

Ireland's biodiversity has been put under pressure in recent years due to threats such as increased construction and development, intensive farming, inappropriate habitat management and the introduction of non-native species. Promoting native species will contribute to the efforts to halt the loss of biodiversity by 2010. Further information on biodiversity in Ireland can be found on the Notice Nature ([www.noticenature.ie](http://www.noticenature.ie)) and the It's in our Nature websites ([www.biodiversityni.com](http://www.biodiversityni.com)).

### 14. Invasive species prevention and surveillance.

The marina operator sector has a crucial role to play in the prevention and surveillance of invasive alien species. With the influx of boat traffic and associated species that can potentially foul these vessels, marinas are key to ensure customers/users are aware of the issues and employ effective strategies to prevent arrival/spread of invasive species. To that end:

- Provide ID guides on our most unwanted species. ID cards and information leaflets will be placed on the Invasive Species Ireland website. You are encouraged to download these and print copies for your staff and customers. Relevant documents should be kept in staff common rooms and in public access areas.
- Promote marina and boat operation practices that minimise the opportunities of spreading invasive species. The key messages are:
  - **Inspect – remove – dispose – report.** Removing build up of plants and animals from equipment and the hull of boats is effective at preventing the opportunity of colonisation by invasive species. To prevent the spread of invasive species ensure you/customers always follow these guidelines:
    - Clean all parts of equipment, boats and trailer that come into contact with the water.
    - Remove any visible plant, fish, animal matter and mud.
    - Use damp cloths and vacuum sanders to keep paint, debris, and cleaners out of the water.
    - Do not allow rinse water to return to the aquatic environment. Many organisms can remain viable even in small (sometimes microscopic) quantities.
    - Do not move fouled vessels or equipment from one area to another.
    - Keep good records of when equipment and boats are due to have antifouling renewed.
    - Watch out for hitchhikers on ropes and chains.
    - Ensure proper handling of bilge water.

- Ensure boats use rat guards while docked at your site and when they move to other sites. Rat guards prevent rats from accessing or leaving from boats via mooring lines. If rats are found on board your vessel they should be humanely put down and not thrown overboard where they can swim to islands.

Report sightings of our most unwanted species or any organism you suspect may be a high risk species. More information on these species can be found on [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).

#### 15. **Develop and employ tools to help implement the CoP.**

This code sets out guidance on how to prevent the spread and impacts associated with invasive species. The success, or failure, of the code will depend on how widely available and accessible information is to stakeholders. Information pertaining to the code will be placed on the Invasive Species Ireland website and organisations will be encouraged to place relevant documents on their websites. However, the most effective tool to disseminate information relating to the code is the publicising and incorporation of the code into the operating procedures and standards of all stakeholders. The following guidelines are recommended to achieve effective implementation:

- Display signage, if possible. The erection of signs pertaining to invasive species will inform customers and users of their responsibility in preventing the spread of species. Suggested signage material will be made available on the Invasive Species Ireland website.
- Incorporate responsible boating practices into customer contracts e.g. The Recreational Water Users CoP. The use of customer contracts not only ensures that your customers respect your marina and business but also gives you the opportunity to promote environmentally friendly practices. The incorporation of the CoP (currently under consultation. Please refer to [http://www.invasivespeciesireland.com/codes\\_of\\_practice/wateruser\\_cop\\_consultation.asp](http://www.invasivespeciesireland.com/codes_of_practice/wateruser_cop_consultation.asp) for more information) will provide boaters with clear guidelines on how their actions can prevent the spread of invasive species.
- Stock fact sheets on invasive species and how to prevent spread. You are encouraged to stock fact sheets on invasive alien species in common rooms and where the public and customers can access these. Information on our most unwanted species and can be downloaded from the Invasive Species Ireland website.
- Promote environmentally sound boating practices at events. Raise awareness of environmentally sound boating behaviour at events held/hosted by your company, where appropriate.
- Promote your marinas environmental standards to customers and the public. Ensuring that users and the public are aware of the efforts managers/owners are putting in place to protect the environment will help achieve compliance with the protocols stipulated in this Code of Practice.

Some measures in this code will necessitate the need to expend resources to achieve success. This should not deter managers from implementing the code. Some strategies are:

- Rent or sale of equipment that will ensure effective treatment of boats and compliance with your companies environmental policy and this CoP.
- Sale of appropriate antifouling strategies.
- Provide audit services for customer boats to ensure compliance with boating CoP or other

environmental services. Recommend appropriate mitigation measures to minimise impact on the environment.

- Investigate further measures that will help implement this code and other environmental standards. One such measure may be the imposing of an environmental surcharge. Any charge must be transparent and customers must be aware of the facilities and actions put in place to justify additional fees. It is also recommended that the surcharge is itemised so as to raise awareness of the various environmental issues tackled by your company.

16. **Prevent fouling of vessels and mooring lines.** Fouling of vessels is known to reduce efficiency, increase drag and increase fuel consumption. Also, the increased weight to mooring lines caused by fouling organisms may hinder the ease end users have of handling them. It is in the interest of owners to keep fouling off vessels and lines and thereby protecting the environment from harm caused by translocations of invasive alien species.

- Keep boats in water for as short a time period as possible.
- Treat your boat with appropriate antifouling that adhere to the craft manufacturers recommendations and prevent build up of organisms.
- Ensure boats submit to yearly removal of fouling
- When treating a craft, 100% surface cover with the chosen method is essential. Small areas left available for plant or animal growth can give species the opportunity to colonise new areas.
- Antifouling paints are designed to present aquatic organisms with a barrier to prevent settlement. These compounds are sometimes toxic to humans, aquatic organisms and terrestrial species and care should be taken to follow the guidelines stipulated by the manufacturer at all times.
- If mooring lines become heavily fouled remove them from the water, dispose of fouling in a dustbin or skip (do not allow fouling to return to the **aquatic** environment), and allow the ropes to dry out for a period greater than 48 hours.

**Guidelines to follow when renewing/applying hull fouling.**

Adapted from the Massachusetts Clean Marina Guide,  
<http://www.mass.gov/czm/marinas/guide/macleanmarinaguide.htm>  
For more information on antifouling methods and products please consult  
The Green Blue webpage on antifouling (<http://www.thegreenblue.org.uk/youandyourboat/cleaningandantifouling.asp>).

**Work indoors:** Where practical, conduct vessel maintenance indoors or under temporarily covered areas where the rain cannot cause runoff. Sheet plastic shelters can be used.

**Work away from the water:** At a minimum, always move each boat inland to an approved work area before scraping or power washing the hull. Do not allow anyone to perform hull maintenance activities on the launch ramp area or in the lift well. Erect appropriate signage to notify customers/users on this policy.

**Prohibit in-water bottom cleaning:** Removal of plant and animal growth on the bottom of boat hulls by divers must be prohibited. This not only represents a health and safety concern but cleaning of biofouling by this manner also removes anti-foulant paint and associated pollutants.

**Use dustless vacuum sanders:** Dustless sanders use industrial vacuum cleaners to trap dust created in the sanding process before it becomes

airborne. As the sander removes paint, dust is drawn into several holes located through the sanding pad. The dust is then sucked into a vacuum container that can be emptied for disposal. Dustless vacuum sanders are one of the best ways to control paint dust before it can become a pollutant. Added advantages include keeping a clean workplace, reducing health risks to workers, and reducing clean-up costs and time. Ensure all staff and customers/user always use this equipment as per the vacuum manufacturer and boat designer guidelines. Train staff on how to use this equipment and develop a user manual for customers.

**Tarps and filter cloth:** Use tarps and/or filter cloth to catch scrapings and other debris produced during maintenance work. Tarps and cloth are inexpensive “low-tech” methods to collect debris before it can be washed into coastal waters by storm water. Filter cloths are better than tarps when boat work is expected to last longer than one day. Should it rain, the water passes through the cloth instead of washing the debris off the tarp. Have these items available to rent or sell to customers who do their own boat maintenance.

**Maintain clean and tidy work area:** Clean up the designated work area after scraping and painting. Leaving areas cluttered and messy will cause spills and allow pollutants to be tracked outside the work area.

### Painting

Because hull paints contain toxic pollutants, they should be used with care. Consider the following when painting your boat.

- **Maintain designated work areas:** Restrict mixing of paints, solvents, and reducers, as well as the painting itself, to designated areas that are located on a hard surface and isolated from the weather.
- **Prohibit spray painting on the water:** Sprayed paint can be difficult to control. Paint can be inadvertently sprayed into the water and expose aquatic life to toxic chemicals.
- **Use spray enclosure:** A spray enclosure is a permanent shed or temporary structure erected around a boat during painting. Spray booths confine overspray and prevent drifting onto other boats, land, or water. Booths equipped with air filters reduce air quality impacts by filtering paint dust and particulates out of the air. Filters also help protect workers by drawing harmful fumes and paint overspray away from employees.
- **When spray painting, use high volume, low pressure (HVLP) spray guns:** HVLP sprays are one of the most efficient means for applying paint. Promote use of spray guns that are rated at 65 percent efficient paint transfer or greater. These spray guns direct more paint onto the intended surface and as a result, less paint gets into the air, and fewer chemicals are released. HVLPs also save money because less paint is used and clean up costs are reduced.



- **When using traditional paint application techniques use brushes and rollers where possible.** Traditional applications are known to reduce air emissions.
- **Appropriate use and storage of hazardous materials and waste:** Make certain that all painting materials are used strictly according to manufacturers' instructions. Keep covers and caps on paints, thinners, and solvents to minimise the release of toxic compounds.
- **Clean up paint and supplies:** Treat paint spills like oil spills. Clean up immediately with absorbent materials, paper, and/or rags. Since liquid paints are classified as hazardous material, dispose of paint brushes and paint properly. If your customers are permitted to paint their own boats, ensure they clean up after themselves. Provide paint disposal areas for customers to use. Before disposal, all paint cans and worn out brushes and rollers should be allowed to air dry.
- **Inform customers/users:** Provide information to customers who work on their boats at the marina about the potential harm caused by uncontrolled release of paint products. Visible signs, clauses in customer contracts, fact sheets, and tips in mailings are all good ways to communicate this information.
- **Ensure compliance with your operating standards:** Outside contractors and customers/users of the marina must, under terms of your contract with them, comply too the same standards as adopted by your business.
- **Staff training:** Train your employees to be on the lookout for DIY hull maintenance activities by customers/users that may be harmful to the environment.

17. **Make customers aware of the particular need to remove fouling prior to long distance journeys.**

If travelling to or from Britain, Europe or further afield remember that the hull and mooring lines may have potentially damaging hitchhikers present. We have a responsibility to protect not only our environment but that of the areas we visit. Before undertaking such a trip, remove all hull fouling, renew antifouling treatments if required and attempt to dry all mooring lines completely.

18. **Prohibit the discharge of untreated bilge water at your marina.**

Require as part of the environmental contract, or by other appropriate means, that untreated bilge water not be discharged within the marina. Bilge water will contain toxic substances and also may contain microscopic organisms or life cycle stages of invasive species that are harmful to native ecosystems.



**19. Considerations for new developments or expanding existing marinas.**

When developing a marina, or expanding an already existing site, it is recommended that operators take the opportunity to audit their activities and what mechanisms they should put in place to reduce the opportunities for your activities to facilitate the spread of invasive alien species. In some cases this exercise may be a requirement of planning permission to proceed with the development. It is recommended that you consider the following in relation to invasive species prevention:

- Ensure that facilities available to adequately deal with hull fouling are considered as part of the development project.
- Ensure all equipment and structures, as far as possible, can be slipped or dry docked should they become fouled by one or more of the most unwanted species and require treatment. One of the most effective treatment protocols for aquatic invasive species is the removal of the fouled structure from the environment, followed by treating with high pressure water blasting and desiccation for a period greater than 48 hrs.
- Develop spray enclosures if spray painting of boats is allowed on site. A spray enclosure may be a permanent shed or temporary structure erected around a boat during painting. Spray booths confine overspray and prevent drifting onto other boats, land, or water. Enclosures can be equipped with air filters that reduce air quality impacts by filtering paint dust and particulates out of the air. Filters also help protect workers by drawing harmful fumes and paint overspray away from employees.

**Take Action**

20. The success of this code will depend on the level of uptake by the various marina operators and boat yard stakeholders. There are specific actions which should be undertaken to reduce the risk from invasive species and raise awareness of the issue, these include:

- Auditing your actions to identify if you can reduce the risk of transporting or spreading an invasive alien species.
- Displaying information materials.
- Provide material on why boat owners need to maintain clean boat hulls.
- If appropriate, stocking leaflets on invasive species that can be given to customers.
- Sign up to the Invasive Species in Ireland network and keep up to date with developments.

21. The implementation of the code will be supported by a range of measures which will be provided through the Invasive Species in Ireland project. These will include:

- Provision of education and awareness materials such as posters and leaflets.
- A dedicated section on the website where information can be found on high risk invasive species in Ireland.
- Provision of this information in hard copy upon request.
- Provision of training materials on invasive species and training can be provided upon request.
- A programme of stakeholder engagement to get uptake of the code by the sector and in local and central Government procurement.
- A publicity campaign to raise awareness of the code and its aims.

The Invasive Species Ireland Project is undertaken, in partnership, by  
EnviroCentre and Quercus.



[www.envirocentre.co.uk](http://www.envirocentre.co.uk)



[www.quercus.ac.uk](http://www.quercus.ac.uk)

and is funded by the National Parks and Wildlife Service and the Northern  
Ireland Environment Agency.



[www.ni-environment.gov.uk](http://www.ni-environment.gov.uk)



[www.npws.ie](http://www.npws.ie)

For more information on the Invasive Species Ireland Project please see the  
website at [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com)

## Annex 1: Some high impact invasive alien species

Most Unwanted: *Didemnum vexillum*

### *Didemnum vexillum*

Habitat: Marine

Threat: Fisheries, protected species and marine ecosystem functioning

Status: Established



A colonial sea squirt from the Didemnum (pronounced die-DEM-num) group has recently been found fouling boats and marina structures in Ireland. This particular species of Didemnum is fast-growing and has the potential to out compete and smother a large number of native species. The threats posed are of concern to conservationists, aquaculture managers, and fisheries.

### What is it?

Exact identification of this species is very difficult and can only be undertaken by a trained expert. However, in general native species are not found in large colonies and do not form the candlewax-like dripping structures, as seen in the photographs. Please see the Habitats website on Sponges of Britain and Ireland for more info on native species.

The invasive form can be described as long, ropey or beard-like hanging from hard surfaces such as docks, aquaculture facilities, and ship hulls, or may be found as extensive mats covering rocky sea beds (pebbles, cobbles, boulders, and rock outcrops).

### Impact

Alter marine habitats.

Interfere with fishing, aquaculture, and other coastal and offshore activities.

Increased fouling of manmade structures such as docks, moorings, and boat hulls.

Overgrow other organisms such seaweed, scallops, mussels, and oysters that depend on the seafloor for habitat.

May impact on underwater archaeological sites such as ship wrecks.

Produce noxious substances that deter most fish and other animals.

The colonies have been found at water depths ranging from intertidal to continental shelf depths of 65m (213 ft).

### Where is it from?

Uncertain at present. The species is known from The Netherlands and France in Europe while worldwide the species is now recognised in Asia, Australasia-Pacific, Europe, and North America.

### Where is it found in Ireland?

Currently confirmed present in Carlingford Lough, Co. Louth, Malahide Marina, Co. Dublin and Galway Bay, Co. Galway.

### **How did it get here?**

Uncertain at present. Likely vector is fouling of ocean going vessel and/or contamination of aquaculture produce.

### **How is it spreading in Ireland?**

Once the species becomes established in an area, it can spread rapidly by both sexual reproduction and asexually by fragmentation of the colonies. Species is known to grow on mobile organisms such as crabs. Fouling on sea going vessels is a key vector in dispersal of this species. The species may also establish itself with movement of shellfish for the aquaculture industry.

### **What you can do?**

Do not interfere with colonial tunicates. These species can spread more rapidly when a section of the colony becomes detached and carried with currents to new areas. If you can do so safely, photograph the species.

Everyone is urged to thoroughly wash and dry all equipment that was near an infestation of this species. This is essential to avoid contamination of new areas. It is important to do this where the rinse will not return to the marine environment. New infestations may result if you do not undertake this.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Slipper limpet**

***Crepidula fornicata***

Habitat: Marine

Threat: Threatens native ecosystems and species

Status: Potential



This is a species of mollusc that was introduced to Europe in the 19th century. The slipper limpet has also been introduced to Ireland accidentally along with imported oyster spat but so far has failed to become established.

**What is it?**

This species of mollusc inhabits the area around the low water mark and into the shallow subtidal. It is often found attached to shells of mussels and the native oyster. MarLin describes this species as possessing an oval shell, up to 5 cm in length, with a much reduced spire. The large aperture has a shelf, or septum, extending half its length. The shell is smooth with irregular growth lines and white, cream, yellow or pinkish in colour with streaks or blotches of red or brown. Slipper limpets are commonly found in curved chains of up to 12 animals. Large shells are found at the bottom of the chain, with the shells becoming progressively smaller towards the top.

**Impact**

In shallow bays where the slipper limpet has been introduced in France, it can completely smother the sediment creating beds with several thousand individuals per m<sup>2</sup>. Dense aggregations of slipper limpet trap suspended silt, faeces and pseudofaeces altering the benthic habitat. Where slipper limpet stacks are abundant, few other bivalves can live amongst them. The slipper limpet is a serious threat to oyster beds because of this.

It has also been observed that live maerl thalli, which are a protected species and form an important protected habitat, become covered in slipper limpets and the spaces between the thalli of the bed become clogged with silt; this kills the maerl thalli and dramatically alters associated communities. No management measures have proven effective for this species in this habitat.

**Where is it from?**

Originally found on the east coast of the Americas between Canada and Mexico.

**Where is it now?**

Now introduced to British-Columbia, Washington state, Japan and Europe, where it is found on the Atlantic coast between Denmark and Spain, in Sicily and the Adriatic Sea.

**How can it get here?**

Contaminant of oyster spat.

Hull fouling.

**What you can do to prevent its arrival**

Aquaculture managers and owners should avoid getting spat material from areas that are known to have slipper limpet present or nearby.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Asian rapa whelk**

***Rapana venosa***

Habitat: Marine

Threat: Threatens marine ecosystem functioning

Status: Potential



*Rapana venosa* is a predatory marine snail which may impact both natural and cultivated populations of oysters, mussels and other molluscs. In areas where it has been introduced it has caused significant changes to the ecosystem. It has a fast growth rate and reproductive ability.

**What is it?**

It has a large heavy shell with a short spire. A very distinctive feature is the deep orange colour of the inside of the shell. The outer colour is variable from dull grey to red brown, with more or less conspicuous dark brown dashes on the spiral ribs, which tend to make an interrupted “vein-like” pattern throughout the entire shell.

**Impact**

The predatory impact of *R. venosa* has serious implications for both natural and cultivated populations of marine bivalves. *R. venosa* are very voracious predators and *Rapana* is blamed in the Black Sea for the decline of the native, edible bivalve fauna. They have caused significant changes in the ecology of bottom-dwelling organisms and have resulted in the near extinction of the Gudaut oyster. Please see the [Global Invasive Species Database](#) pages on this species for more information.

**Where is it from?**

Asia

**Where is it now?**

This species is now present in Europe and the US.

**How can it get here?**

Ballast water, Aquaculture and hull fouling are considered the main potential pathways to Ireland.

**What you can do to prevent its arrival**

Avoid hull fouling on your boats.

Never take oyster spat from an area known to have *Rapana* present and transfer to Ireland.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Zebra mussel**

*Dreissena polymorpha*

Habitat: Freshwater

Threat: Fouling, negative impacts on native species and local extinction of unionids

Status: Established



The zebra mussel is perhaps one of the most well known invasive species in Ireland. This species was first documented here in 1997. Since that date has spread to many of Irelands freshwater ecosystems and significantly altered these habitats, threatening many native species including protected and/or species of economic value.

**What is it?**

The zebra mussel has a distinctive stripy shell and individuals are small, growing up to 3-4 cm in length. Unlike other freshwater mussels the zebra mussel, attaches to hard surfaces using byssal threads. Zebra mussels typically live for two to three years. They will settle on a wide range of surfaces including rocks, anchors, boat hulls, intake pipes, unionid mussels and plants.

**Impact**

When zebra mussels invade a waterbody there can be a wide range of economic and ecological impacts.

Zebra mussels can have varied and unpredictable ecological impacts. They can change nutrient cycles, filter out the microscopic plants called phytoplankton that form the basis of the food chain, increase water clarity and increase plant growth around lake margins. They can reduce the amount of zooplankton, an important fish food. Zebra mussels will also attach to native mussel species and this can dramatically reduce unionid populations or cause their local extinction. Changes in fish populations can also occur as zebra mussels colonise spawning grounds, change habitat and food sources. In Lough Erne, County Fermanagh, there has been an increase in water clarity and a major reduction in the amount of plankton. Very few live specimens of the native mussel *Anodonta* are now found and the local extinction of *Anodonta* can be expected in the near future. The fish populations have also changed with much higher levels of perch recruitment.

In Northern Ireland, zebra mussels have blocked water intake pipes at Killyhevlin water works, Enniskillen, County Fermanagh and modifications were needed at a cost of over £100,000 to date.

Zebra mussels will also attach to the hulls of boats and block boat engines causing problems for boat owners. This increases maintenance costs with the need for hull cleaning or application of antifouling treatments. Zebra mussels can cause problems for anglers, with their sharp shells cutting and snagging fishing lines. Many of Northern Ireland's waterbodies support important recreational tourist fisheries that make a significant contribution to the local economy. If zebra mussels affect fish populations, this may have an economic impact.



### **Where are they from?**

Originally from the Caspian and Black Sea region but has become invasive in Europe since the late 1700's after the construction of an extensive canal network. Zebra mussels are now present in Sweden, Finland, France, the former USSR, Germany, The Netherlands, Italy, Switzerland, Britain, Spain and North America.

### **Where are they in Ireland?**

Zebra mussels were first discovered in Ireland in Lough Derg in 1997, but. Zebra mussels have continued to spread in Ireland and are well established in the Shannon, Boyle and Erne navigations and, to date, they have spread to over 50 lakes.

### **How did it get here?**

The zebra mussel probably arrived in Ireland in 1994 attached to the hulls of second-hand boats imported from Britain or the Netherlands.

How are they spreading in Ireland

The zebra mussel continues to spread by natural dispersal in connected waterbodies. The zebra mussel life cycle involves the production of millions of microscopic larvae called veligers, when water temperatures are above 12 °C (May to September in Ireland). Larvae drift in water currents and settle on hard surfaces mainly from June to October and develop the adult shape.

Zebra mussels continue to be spread by the activities of society. Hull fouling and movement of colonised material from an infested site to new waterbodies has lead to this species becoming established in new lakes and rivers.

There is also a history of deliberate introduction to non impacted sites. A history of misinformation has lead to some individuals believing that the zebra mussel can help 'clean up' a waterbody and remove pollution.

### **What you can do?**

Do not introduce zebra mussels to new sites.

Prevent fouling on your boat.

Dry out angling equipment.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Curly leaved waterweed**  
***Lagarosiphon major***

Habitat: Freshwater

Threat: Clogs waterways and negatively impacts on native species and ecosystems

Status: Established



**What is it?**

This species acts as an aggressive, invasive, alien plant species in Ireland but it is also regarded as a nuisance weed in its home territory. The leaves are strongly recurved and are borne in whorls of 3 or in a spiral arrangement. The long stem is brittle and easily broken (aiding dispersal). Only female plants are present and all reproduction is by fragmentation or vegetative reproduction.

**Habitat**

Lakes and slow flowing aquatic systems such as canals, low energy rivers and streams. The plant can grow in water up to 6m deep. In addition to occupying the full water column, plant stands produce dense vegetation on the water surface.

**Impact?**

Currently, in Ireland, we are at an early stage in infestation; however, significant weed stands exist in Lough, Corrib. The plant forms very dense infestations in suitable habitats and is capable of occupying the full water column in waters up to 6m deep leading to significant changes to the ecology for native plants, insects and fish.

The species is a serious threat for tourism, angling, boating and other recreational pursuits as well as conservation goals.

**Where is it from?**

Originating from southern Africa but the species is now invasive in mainland Europe and Britain.

**Where is it now?**

Present at a number of aquatic sites throughout the island.

**How did it get here?**

Sold as an oxygenating plant in Garden Centres and aquarium supply outlets.

**How does it spread?**

Spread by fragmentation via wind dispersal, boat movement, angling equipment and, possibly waterfowl. When detached stems sink they root from the nodes and establish new populations.

**What you can do?**

Do not grow aquatic weed species in your garden pond.

Dispose of garden waste in a responsible manner.

Remove all plant and animal material from equipment before leaving a water body.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Brown rat**

***Rattus norvegicus***

Habitat: Terrestrial

Threat: Threatens protected species

Status: Established



This species is very common throughout Ireland. It is recognised as a devastating invasive species throughout most of its global introduced range due to the impact on agriculture and on native species, sometimes causing or contributing to the extinction of species.

**What is it?**

The brown rat has brown fur on its back and grey fur on its belly. It is only one of two rat species in Ireland. It can be distinguished from the black rat by relatively smaller eyes and ears which are finely furred compared with the almost hairless ears of the black rat.

**Impact**

Both species of rats present in Ireland are known to impact on native flora and fauna. The effects these animals have maybe greater on island habitats. These species have been observed to attack and kill chicks, and adult birds, and take eggs from nest sites. Globally, these two species of rats have lead to the decline, local extinction and/or total extinction of bird and other species through predation and competition. The black rat has been described to attack and kill at least 39 bird species, while the brown rat has been recorded predated on at least 53 species. Evidence of predation of small birds on islands is difficult to obtain, therefore this number is likely to be much greater. Arthropods, snails, amphibians and reptiles are generally not as well studied as bird species, and few data is available on the impacts of rats on these organisms, but again there is little doubt that the number of impacted species is very large.

Invasive rats have impacts on plant communities too. These impacts on isolated island ecosystems are extremely important and of concern to conservation managers and enthusiasts alike. Rats are omnivorous, and as well as animal species they are known to eat leaves, seeds, flowers, bark and stems of many species, some of which are endanger of extinction due to their isolation on island ecosystems and lack of adaptations to the new predator. Rats are also known to prevent the regeneration of woodlands by damaging young saplings and adult trees.

The brown rat has out-competed the invasive black rat species on mainland Ireland.

**Where is it from?**

With a possible origin of North East China, this species has benefited greatly by allying itself closely to man. This species is now present in most parts of the world.

### **Where are they in Ireland?**

Brown rats are widespread on the mainland and are present on an unknown number of offshore islands. There they reduce the reproductive success of ground nesting birds. There is still the risk of spread to other un-impacted islands.

### **How did it get here?**

This species can stow away on freight containers and ships.

### **How are they spreading in Ireland?**

Self propelled. They are a highly mobile species and can swim.

Stow away on both large and small vessels.

### **What you can do?**

Prevent further spread to offshore islands by keeping boats free of rats.

Use rat guards on mooring lines, where appropriate.

Do not allow rats to escape off your boat and onto sensitive islands. Humanely dispatch any rat that stows away on your boat.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).



**Most Unwanted: Ship/black rat**

***Rattus rattus***

Habitat: Terrestrial

Threat: Threatens protected species

Status: Established



The black rat is not as widespread in Ireland as the brown rat. In fact the only known self sustaining population is on Lambay island off the coast of Dublin. Here this species has been protected from the Brown rat which out competes the black rat.

**This species has been nominated as among 100 of the “World’s Worst” invaders**

**What is it?**

The black rat is much smaller than the Norway rat and can be distinguished by its ears which are larger and hairless.

**Impact**

Both species of rats present in Ireland are known to impact on native flora and fauna. The effects these animals have maybe greater on island habitats. These species have been observed to attack and kill chicks, and adult birds, and take eggs from nest sites. Globally, these two species of rats have lead to the decline, local extinction and/or total extinction of bird and other species through predation and competition. The black rat has been described to attack and kill at least 39 bird species, while the brown rat has been recorded predated on at least 53 species. Evidence of predation of small birds on islands is difficult to obtain, therefore this number is likely to be much greater. Arthropods, snails, amphibians and reptiles are generally not as well studied as bird species, and few data is available on the impacts of rats on these organisms, but again there is little doubt that the number of impacted species is very large.

Invasive rats have impacts on plant communities too. These impacts on isolated island ecosystems are extremely important and of concern to conservation managers and enthusiasts alike. Rats are omnivorous, and as well as animal species they are known to eat leaves, seeds, flowers, bark and stems of many species, some of which are endanger of extinction due to their isolation on island ecosystems and lack of adaptations to the new predator. Rats are also known to prevent the regeneration of woodlands by damaging young saplings and adult trees.

**Where is it from?**

This species of rat is native to India but now has a global distribution.

**Where are they in Ireland?**

The only known established and self sustaining population of black rats is on Lambay Island off the coast of Dublin. Occasionally this species does appear around ports because of its association with shipping.

**How did it get here?**

This species can stow away on freight containers and ships.

**How are they spreading in Ireland?**

Self propelled. They are a highly mobile species and can swim.

Stow away on both large and small vessels.

**What you can do?**

Prevent further spread to offshore islands by keeping boats free of rats.

Use rat guards on mooring lines, where appropriate.

Do not allow rats to escape off your boat and onto sensitive islands. Humanely dispatch any rat that stows away on your boat.

Report all sightings at the Alien Watch page of [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com).

The Invasive Species Ireland Project is undertaken, in partnership, by  
EnviroCentre and Quercus.



[www.envirocentre.co.uk](http://www.envirocentre.co.uk)



[www.quercus.ac.uk](http://www.quercus.ac.uk)

and is funded by the National Parks and Wildlife Service and the Northern  
Ireland Environment Agency.



[www.ni-environment.gov.uk](http://www.ni-environment.gov.uk)



[www.npws.ie](http://www.npws.ie)

For more information on the Invasive Species Ireland Project please see the  
website at [www.invasivespeciesireland.com](http://www.invasivespeciesireland.com)