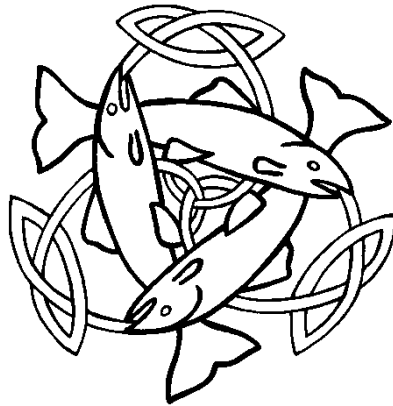


Invasive Non Native Species Information Pack 2011



Prepared by
Outer Hebrides Fisheries Trust
The Sawmill, Marybank, Stornoway,
Isle of Lewis, HS2 0DD
Scottish Charity Reg. No. SC040530



Outer Hebrides Fisheries Trust

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All Fishery Proprietors/Fishery Users

Dear Sir/Madam ,

This information pack is designed to raise awareness of Invasive Non Native Species (INNS) in the Outer Hebrides. INNS are species that have been transported outside of their natural range and that damage our environment, the economy, our health and the way we live. INNS are of growing concern in the Outer Hebrides with the risk of further invasions harming the region's unique biodiversity. The Convention on Biological Diversity lists INNS as the greatest threat to biodiversity after habitat loss. As water is an excellent transport medium for the dispersal of many of these species, rivers and lochs and their banks and shorelines are amongst the most vulnerable areas to the introduction, spread and impact of these species. The ecological changes wrought by INNS can further threaten already endangered native species and reduce the natural productivity and amenity value of riverbanks, shorelines and their water bodies.

In response to the threats posed by INNS The Outer Hebrides Fisheries Trust (OHFT) have developed a Biosecurity Plan with the following vision:

'To establish a sustainable framework that will lead to the prevention, detection, control and eradication of selected invasive non-native species within the Outer Hebrides region'

The implementation of this biosecurity plan will bring many socio-economic and environmental benefits and a summary of these are described below;

- ✚ The maintenance and enhancement of biodiversity – biotic invasion is one of the top five drivers for global biodiversity loss and is increasing with globalisation and tourism
- ✚ The visual conservation of local landscapes
- ✚ The prevention of the salmon parasite *Gyrodactylus salaris* from entering the Outer Hebrides region which would avoid catastrophic economic and environmental loss
- ✚ A holistic, cost effective control programme of INN plants e.g. Giant hogweed, Japanese knotweed, and Himalayan balsam the former being a threat to human health will be founded in partnership with key stakeholders

- 🌿 The conservation of important natural habitats for native species such as Otter, Atlantic salmon, freshwater pearl mussel, and European eel
- 🌿 Reduced risk of the introduction of the signal crayfish
- 🌿 Control/eradication of the American Mink
- 🌿 Reduced risk of introduction of species such as Zebra mussel from entering the region's watercourses will help to protect vital local businesses from expensive mitigation measures required if this species was to occur and establish.
- 🌿 Helping to ensure the outcome of INNS management in the Outer Hebrides region is more cost effective, strategic and sustainable.

This information pack has been designed to provide all available information on the INNS that are present in your region or threaten to invade in the near future in one concise pack. There is information on identifying, recording and controlling INNS. There is also information on notifiable fish diseases and other issues relevant to users of freshwater fisheries.

Please be extra vigilant for the following **high priority** species which if introduced or spread from abroad or other UK locations will have a detrimental impact on the regions freshwater environment:

- *Gyrodactylus salaris*
- The North American Signal Crayfish (*Pacifastacus leniusculus*)
- Australian swamp stonecrop (*Crassula helmsii*) (also called New Zealand pigmyweed)

What can you do to help?

- Display any poster or leaflet materials provided, to raise awareness of the threat posed by invasive non native species.
- Please record any sightings of the species identified to myself and or on the RAFTS invasive species Scotland website.
- Please ensure that biosecurity guidelines are strictly adhered to, to prevent the introduction of the **high priority** species mentioned above.
- Don't miss the opportunity to tackle and prevent the spread of INNS in your local area.

If you require further information on INNS issues please do not hesitate to contact myself or use the following links provided.

Yours sincerely ,



David Kelly
Biologist

Please find further information through the following useful links:

UK links:

Rivers and Fisheries Trust for Scotland (RAFTS): www.invasivespeciesscotland.org.uk

OHFT Biosecurity Plan: www.ohft.org.uk

Great Britain Non Native Species Secretariat: www.nonnativespecies.org

Plantlife: www.plantlife.org.uk/scotland

Be Plant Wise: www.direct.gov.uk/beplantwise

Scottish Government: www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/InvasiveSpecies

SEPA: www.sepa.org.uk/science_and_research/what_we_do/biodiversity/invasive_non-native_species.aspx

Centre for Ecology and Hydrology: www.ceh.ac.uk/sci_programmes/InvasiveandNon-NativeSpecies.html

Scottish Natural Heritage: www.snh.gov.uk/protecting-scotlands-nature/safeguarding-biodiversity/invasive-nonnative-species/

Fisheries Research Services: www.marlab.ac.uk

*Please note – If you suspect the presence of a Notifiable Disease or if you require more information please contact Fish Health Inspectorate by telephone on 01224 295525 or by email: FishHealth@marlab.ac.uk

Scottish Canoe Association: www.canoescotland.org/access/Environment/Biosecurity.aspx

The Green Blue: www.thegreenblue.org.uk/boat_users/antifoul_and_invasive_species.aspx

European and Global links:

Invasive Species Ireland: www.invasivespeciesireland.com

The Invasive Species Specialist Group: www.issg.org

Global Invasive Species Programme: www.gisp.org

DAISE: www.europe-aliens.org

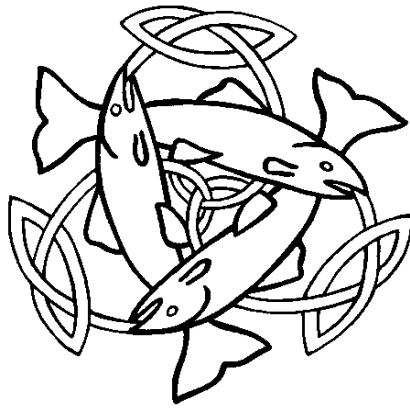
UK Biodiversity:

Highland Biological Recording Group: <http://www.hbrg.org.uk/>

The National Biodiversity Network: <http://www.nbn.org.uk/>

Visit Scotland's Invasive Species BLOG <http://www.scottish-invasives.blogspot.com/>

Invasive Non Native Species Present in the Outer Hebrides



This section contains details on a number of INNS that are currently present in the Outer Hebrides

American Mink

Species Description

Scientific name: *Mustela vison*

AKA: Feral Mink and Minc (Welsh)

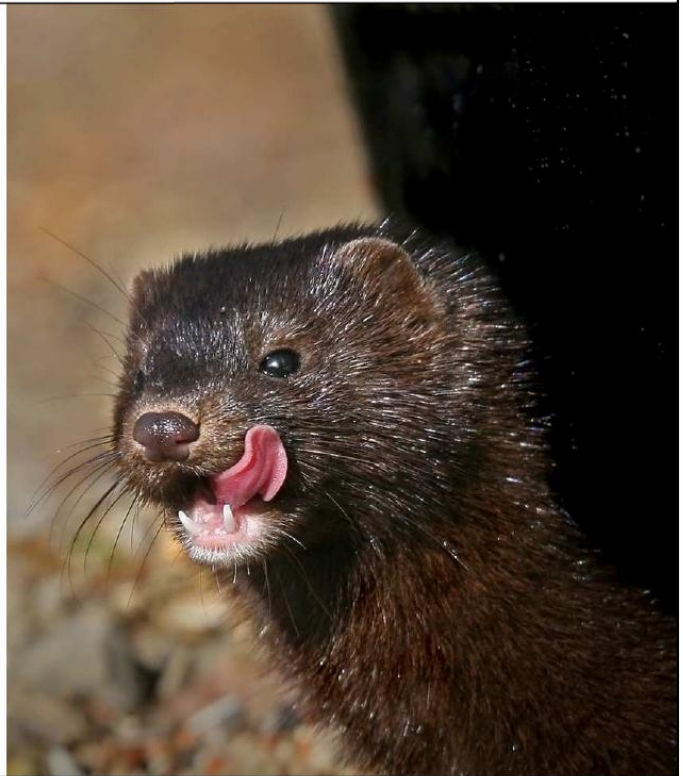
Native to: North America

Habitat: Aquatic habitats, including coastal, but mainly rivers and lakes

Established throughout the UK. Mostly nocturnal or active at dusk (but may be active at any time). Introduced for fur farming in the 1920s, with a peak in the 1960s. Established in the wild as a result of escapes and deliberate introductions. First recorded breeding in the wild in 1956. Has significant impact on native wildlife, especially water voles, sea birds, domestic fowl and fish on which it predates.

American mink is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to release or allow the escape of this species into the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



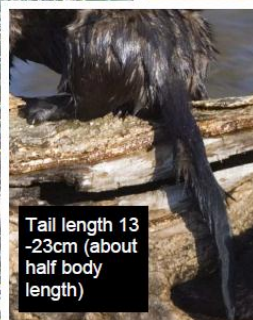
Key ID Features



Usually has white patches on chin and throat (small amounts of white fur may be present on the upper lip)



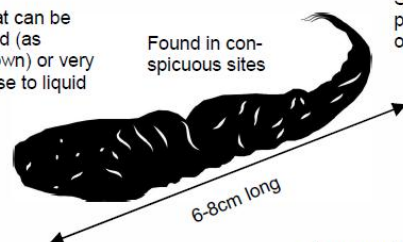
Tracks may form paths leading to water, occasional signs of tail dragging in mud



Scat can be solid (as shown) or very loose to liquid

Found in conspicuous sites

Strong pungent odour



Usually contains fur, pieces of bone and feather

Sausage-like, but twisted and drawn out to a point

Similar Species

Mink are very similar to polecats but can be distinguished by the white markings on their face. While ferrets are also similar size and shape, they are usually very different in colour. Note that polecats and ferrets may interbreed producing offspring with intermediate characteristics. The only other species that may be confused with mink is otter, however this is easily distinguished by its considerably larger size as well as through field signs such as tracks.

Mink
For comparison



Mink generally do not have white above the lower lip

Mink are elusive and field signs are therefore useful to aid identification, however these will not allow you to distinguish between mink and polecat

Polecat
Native
(*Mustela putorius*)



White tips to ears

White above upper lip creates a mask

Otter
Native
(*Lutra lutra*)



Pale upper and lower lips, pale cheek patches

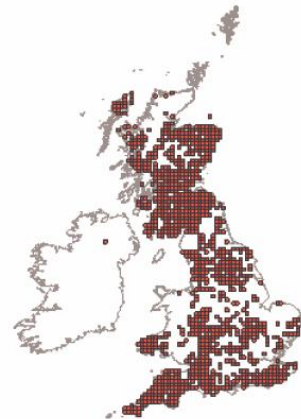
Much larger- twice the length and 7-10 times the weight (1-1.2m long from head to tail, 7.5-10.3kg weight)

Chestnut brown fur with paler underside

Distribution

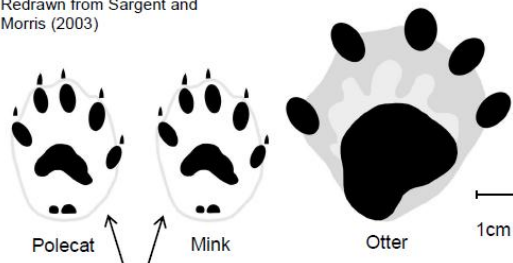
Widespread throughout Britain, limited mainly to aquatic habitats, population stable

Source: NBN Gateway. Check website for current distribution



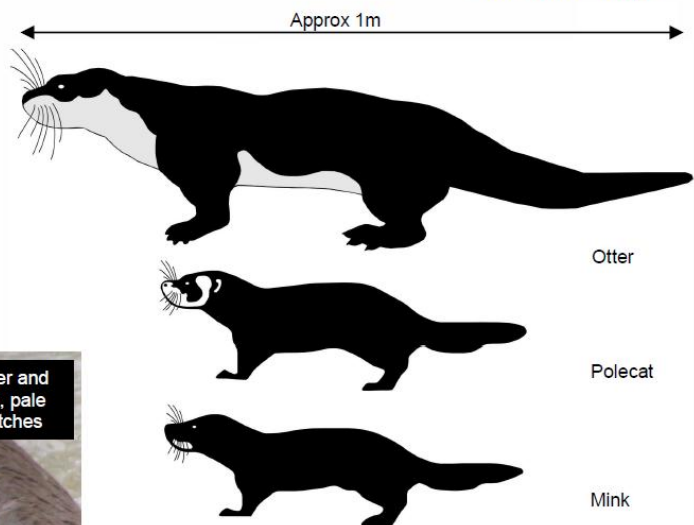
Tracks

Redrawn from Sargent and Morris (2003)



Note that mink and polecat prints are identical

Size and Shape



References and further reading:

Bang, P and Dahlstrom, P (2006) "Animal Tracks and Signs. OUP Pocket Guide Series". Oxford University Press

MacDonald, D (2005) "Collins Field Guide to the Mammals of Britain and Europe". Harper Collins

Sargent, G, and Morris, P, (2003). "How to find and identify mammals". The Mammal Society

Sterry, P (2005) "Collins Complete British Animals". Harper Collins

Rhododendron

Species Description

Scientific name: *Rhododendron ponticum*

AKA: Rhododendron

Native to: South-west Europe and south-west Asia. UK's stock is believed to come from Spain.

Habitat: Common on acid, peaty or sandy soils in woodland, heathland, rocky hill-sides, river banks, gardens and parks

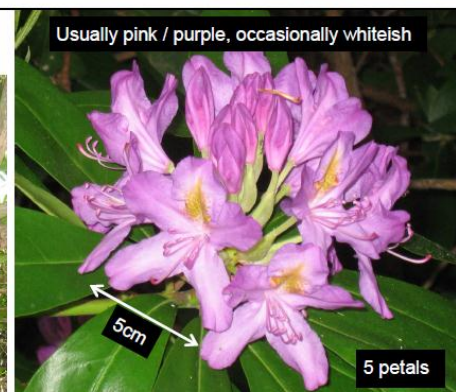
A large evergreen shrub with leathery leaves, attractive purple to pink flowers and solid stems forming into a trunk when mature. Relatively easy to identify, but can be confused with cherry laurel or horticultural varieties of rhododendron. However, horticultural varieties of rhododendron are relatively rarely found in the wild. Spreads by suckers and seed, which are small and carried long distances by wind.

Introduced by gardeners in the late 18th century into parks and woodlands, where it was also used for game cover. Still widely planted, particularly by gardeners. Often grows in ecologically sensitive habitats, such as heath, broad-leaved woodland and dunes, where dense growth can considerably alter the structure of the habitat.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Varies little throughout the year as leaves are evergreen and woody stems remain the same. Flowers appear May to June followed by seed pods.

Similar Species

Cherry laurel
Non-native
(*Prunus laurocerasus*)



Leaves arranged alternately,
ending in a single leaf



Flower heads white
and clustered to
form a spike

Rhododendron leaf
(for comparison)



Cherry laurel leaf



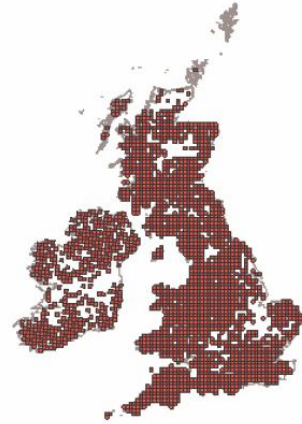
Toothed
edge →

Glossy surface

Distribution

Widespread across the whole of the UK, most common in the south and west.

Source: NBN Gateway. Check website
for current distribution



Varieties of Rhododendron

There are a large number of highly sought after species and varieties of rhododendron, of which the invasive *Rhododendron ponticum* is just one. It is unusual to encounter other varieties or species outside of planted habitats.

Examples of
rhododendron varieties:



References in the further reading list can be used to distinguish between the different varieties if necessary.

References and further reading:

- Cullen, J (2005) "*Hardy rhododendron species: a guide to identification*". Collins
- Preston, C D and Croft, J M (1997) "*Aquatic plants in Britain and Ireland*". Harley Books
- Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "*New Atlas of the British and Irish Flora*". Oxford University Press
- Stace, C (1999) "*Field Flora of the British Isles*". Cambridge University Press

Japanese Knotweed

Species Description

Scientific name: *Fallopia japonica*

AKA: Japanese Bamboo, Pysen saethwr (Welsh),

Polygonum cuspidatum, *Reynoutria japonica*

Native to: Japan, Taiwan, northern China

Habitat: Common in urban areas, particularly on waste land, railways, road sides and river banks

Tall herbaceous perennial with bamboo like stems. Often grows into dense thickets. Characteristic leaves and stems, persistence of last year's dead canes and distinctive rhizome (underground root-like stems) enables year round identification.

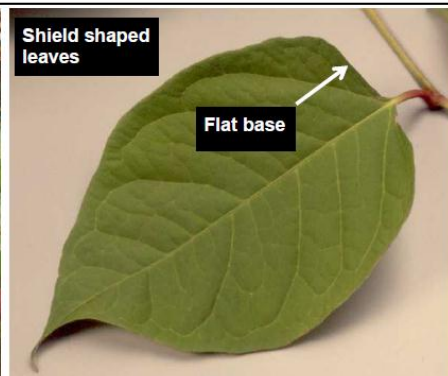
Introduced in the early 19th century as an ornamental plant. Now common and widespread across the UK. Spreads rapidly in the wild by natural means and as a result of spread by humans. Spread is solely by vegetative means, either fragments of rhizome or stem. Does not produce seed in the UK. Negative impacts include outcompeting native flora, contributing to river bank erosion and increasing the likelihood of flooding. Can also cause significant delays and cost to development as well as structural damage (it can grow through asphalt and some other surfaces).

Japanese Knotweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to plant or otherwise cause Japanese knotweed to grow in the wild. Under the Environmental Protection Act 1990, Japanese Knotweed is classified as controlled waste.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Spring



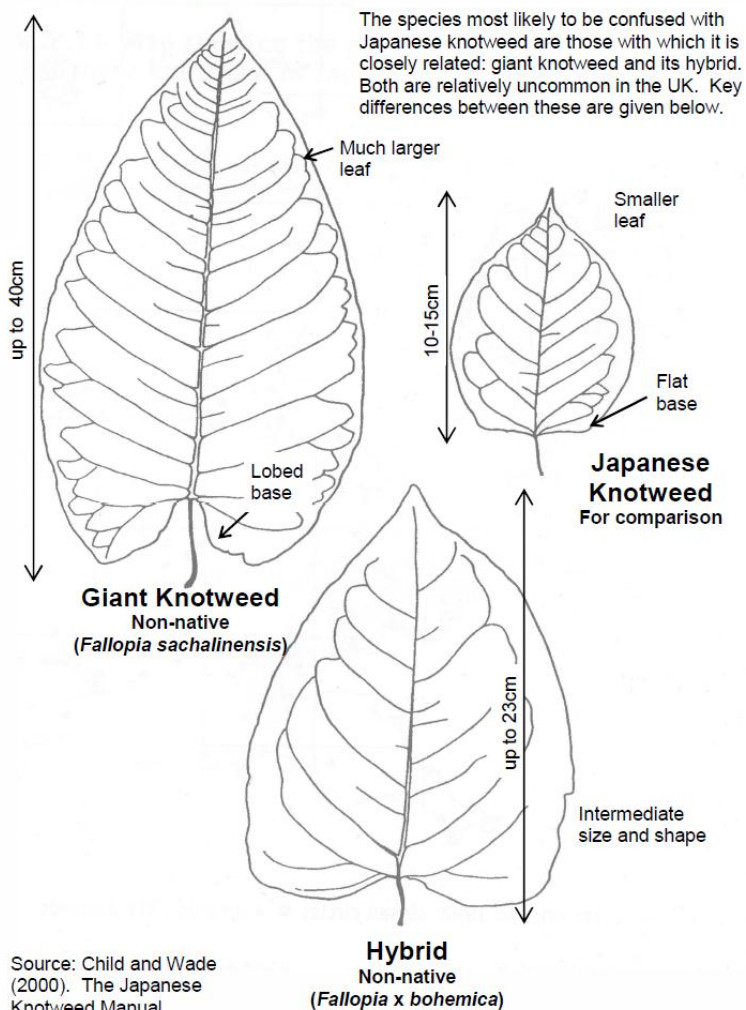
Summer



Winter



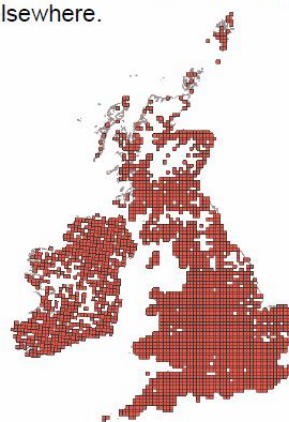
Similar Species



Distribution

Widespread and common across the UK. Notably extensive infestations are found in the south-west of England, south Wales and Greater London, however similarly extensive populations can also be found elsewhere.

Source: NBN Gateway. Check website for current distribution



References and further reading:

- Blamey, M, Fitter, R and Fitter, A (2003) "The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora." A & C Black
- Child, L E and Wade, P M (2000) "The Japanese Knotweed Manual". Packard
- Environment Agency (2006) "The Japanese Knotweed Code of Practice". Environment Agency
- Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press
- Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

Photos from: Olaf Booy, Helen Parish, Max Wade, Vicky White

Spartina anglica



Taxon	Family / Order / Class / Phylum
<i>Spartina anglica</i> C.E. Hubbard	Poaceae / Cyperales / Liliopsida / Magnoliophyta

COMMON NAMES (English only)

Common cord grass
Rice grass
Townsend's grass

SYNONYMS

This is a fertile hybrid of *Spartina maritima* (Curt.) Fernald and *Spartina alterniflora* Loos.
The sterile diploid hybrid is referred to as *Spartina townsendii* (H. and J. Groves).

SHORT DESCRIPTION

A coarse-leaved grass of ~1m in height. It colonizes the upper tidal level of estuaries and lagoons. They form tussocks which over time grow and knit into each other to form meadows.



Spartina anglica on mud flats in Cork Harbour, Ireland

Photo: Dan Minchin

BIOLOGY/ECOLOGY

Dispersal mechanism

Its seeds may float to new localities or may be transmitted by wading birds. It also spreads by fragments that develop into radiating clonal tussocks that may annual increase in diameter by 30cm. Tussocks fuse to form extensive meadows.

Reproduction

Growth mainly vegetative. Seeds produced have a limited opportunity to germinate. Some populations have endured a die-back which may relate to self-inflicted environmental conditions.

Known predators/herbivores

Feral horses known to feed on cord grass related species. Geese may feed on young shoots. Some littorinid snails feed on epiphytic algae and may also feed on this species.

Resistant stages (seeds, spores etc.)

Seeds are viable for short periods.

HABITAT

Native (EUNIS code)

A2: On littoral sediments as occurs in invaded areas.

Habitat occupied in invaded range (EUNIS code)

A2: Occurs from mean high water neap tides to mean high water spring tides on muddy estuarine, sheltered marine shores and wetlands influenced by brackish water, normally in areas of salt marsh.

Habitat requirements

Sheltered muddy tidal flats.

DISTRIBUTION

Native Range

A hybrid that developed in Britain.

Known Introduced Range




Introduced to Denmark, Germany, Ireland, Britain, France, The Netherlands, North America, South Africa, New Zealand, China.

Trend
Spreading.

MAP (European distribution)



Legend

	Known in country		Known in CGRS square		Known in sea
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INTRODUCTION PATHWAY

Has been widely used as a plant for stabilising mud and for land accretion to protect coastlines and prevent undue erosion. Its seeds may float to new localities and may also be dispersed by birds.

IMPACT

Ecosystem Impact

It is recognized as an important environmental modifier. It has resulted in replacement of *S. maritima* and exclusion of native flora, such as *Salicornia* spp., *Zostera* sp. and benthic infauna, with consequences for some wildfowl and waders.

Health and Social Impact

May compete with areas used for oyster farming and impede recreational activities.

Economic Impact

Used to stabilize tidal mud flats for land reclamation. May have potential as a biofuel, paper and as a food product for animals.

MANAGEMENT

Prevention

Plants should not be transplanted, for example when used unnecessarily for land reclamation projects. In some world regions *S. anglica* is prohibited for sale or distribution.

Mechanical

Smothering with plastic has resulted in success over small areas, and removal by digging out plants at an early stage has also been successful. Attempts to control it as a fodder for cattle have failed.

Chemical

Chemical herbicides applied to large areas have been more successful with two time-separated applications.

Biological

Biological control using a planthopper *Prokelisia marginata* is being implemented on the Pacific coast of North America for the parental species *S. alternifolia*.

Giant-rhubarbs

Species Description

Scientific names: *Gunnera* species

AKA:

Native to: South America

Habitat: Damp grassland, woodland and shaded areas near water

Large, clump-forming perennials with stout horizontal stems known as rhizomes, massive umbrella-sized leaves and stems up to 2 m tall. Over winter the plant dies down but grows new leaves in spring. Two species are found in the UK: Giant-rhubarb (also known as Chilean giant-rhubarb) *Gunnera tinctoria* and Brazilian giant-rhubarb *Gunnera manicata*.

Native to South America, they were introduced to the UK as ornamental plants and giant-rhubarb is now often self-sown where long-established and has naturalised in scattered locations throughout much of lowland UK. Brazilian giant-rhubarb, although fertile in the UK has not been found self sown and is scarcely naturalised.

Once established, they can be very invasive and form dense colonies, suppressing native plants as the large leaves prevent other plants growing underneath them. They can also impede water flow through the obstruction of drainage in adjacent streams and rivers particularly when water levels are high.

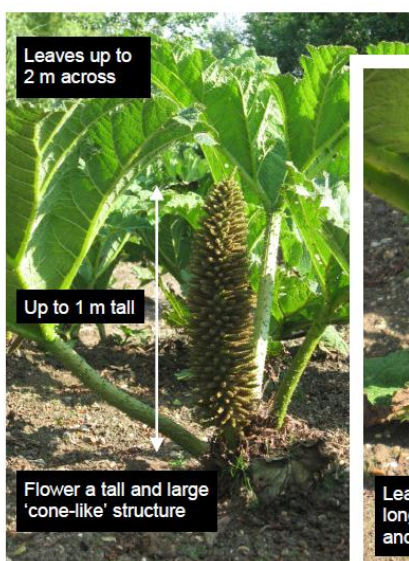
Giant rhubarb is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

Brazilian giant-rhubarb is very similar to giant-rhubarb with leaves reaching over 2 m across, leaf stalks with reddish bristles and spines and the inflorescence up to 1.2 m tall.



Identification throughout the year

Can be identified at most times of the year, in summer by its large leaves and distinctive flowers (June — August), in winter by the prostrate rhizomes and dead leaf



Distribution

Giant-rhubarb is spread throughout lowland areas especially in south-west England. Brazilian giant-rhubarb is found in widely scattered localities.



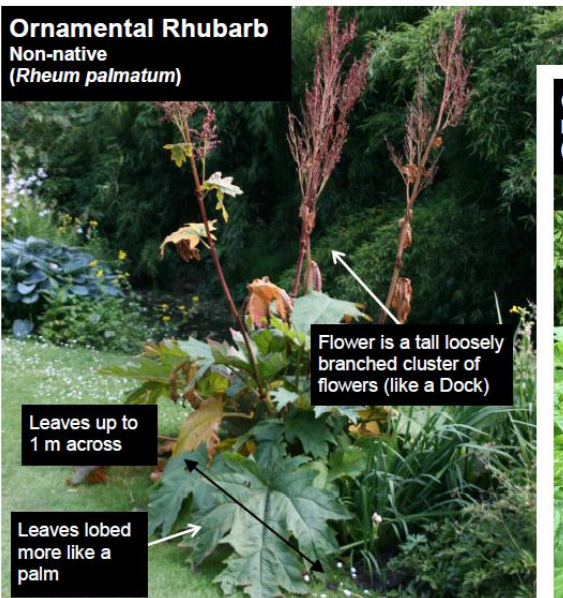
Source: NBN Gateway. Check website for current distribution

Similar Species

Giant-rhubarb can be mistaken for several other species with large leaves, especially early in the year when only the new leaves are present. The tall flower stalks are very distinctive.

Ornamental Rhubarb

Non-native
(*Rheum palmatum*)



Giant Hogweed

Non-native
(*Heracleum mantegazzianum*)



Leaves not strongly lobed

Cultivated Rhubarb

Non-native
(*Rheum x hybridum*)



Distinctive umbrella-shaped flowers. Plant up to 5 m high



References and further reading:

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press

Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

Canadian and Nuttall's Waterweeds

Species Description

Scientific name: *Elodea* species

AKA: Chwyn dŵr (Welsh)

Native to: North America

Habitat: Still or slow-flowing, shallow or deep water

There are two non-native species of Waterweed *Elodea* species in the UK, Canadian waterweed *Elodea canadensis* and Nuttall's waterweed *Elodea nuttallii*. Both are aquatic, submerged (apart from tiny white flowers borne on very long thread-like stalks just above the water surface) growing up to 3 m in length, perennial and only reproduce vegetatively in the UK as all plants are female.

Canadian waterweed, first recorded in Ireland in 1836 and in Britain in 1842, has subsequently spread rapidly and is now found commonly. It has disappeared from some areas, often being replaced by Nuttall's waterweed. Nuttall's waterweed is found in more nutrient-rich water than Canadian waterweed. First recorded as naturalised in Britain in 1966, it has since spread rapidly but is less common than Canadian waterweed in northern England, Scotland and Ireland.

It is difficult to distinguish between these two species. Dense growth of these waterweeds in slow flowing rivers, drainage channels and canals can impede flow and exacerbate flooding. Replace native aquatic plant species and reduce biodiversity in lakes and ponds and interfere with recreational activities such as angling and boating.

Elodea species are listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to plant or otherwise allow these species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



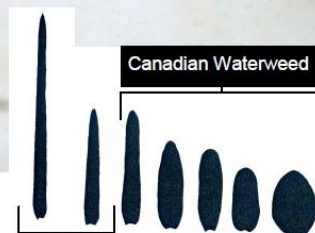
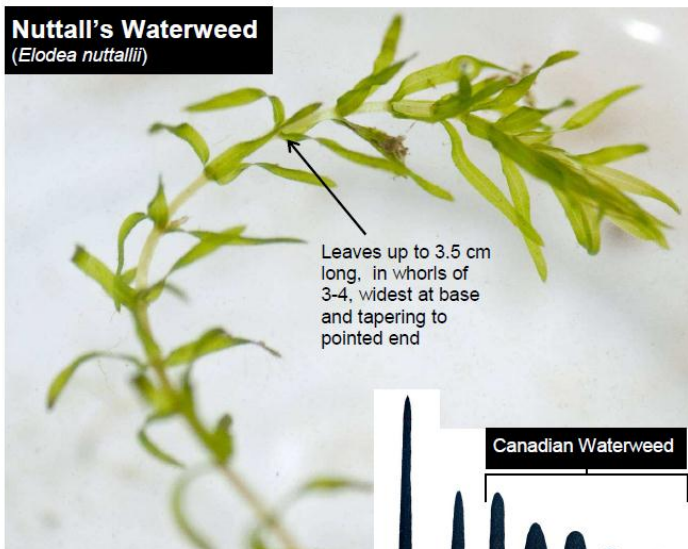
Key ID Features

Flowers are small and inconspicuous and petals white or white tinged with red and borne on end of very long fine stalk.

Canadian Waterweed
(*Elodea canadensis*)



Nuttall's Waterweed
(*Elodea nuttallii*)



Nuttall's Waterweed Taken from Simpson, 1986

Identification throughout the year

Canadian waterweed and Nuttall's waterweed are both perennial and are present throughout the year, though they can die back in winter. Tiny flowers are produced June to September.

Similar Species

Curly Waterweed Non-native (*Lagarosiphon major*)

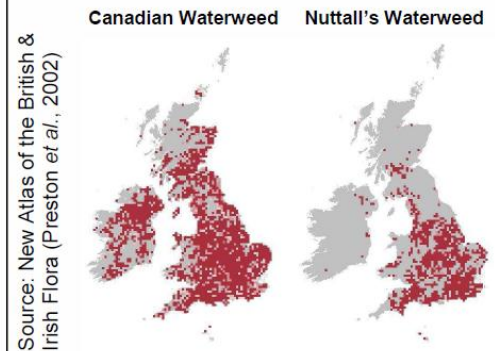


Lower leaves spiralled
at base, not in whorls.
Leaves to 3 cm long

Flowers inconspicuous,
with reddish petals

Distribution

Canadian waterweed is widespread and common throughout the UK. Nuttall's waterweed occurs mainly in England.



Large-flowered Waterweed Non-native (*Egeria densa*)



Much larger in size with
small teeth along central
vein

Leaves in whorls of
4-5, to 3 cm long
with toothed edge

Flowers white,
to 2 cm
across, with
three petals

References and further reading:

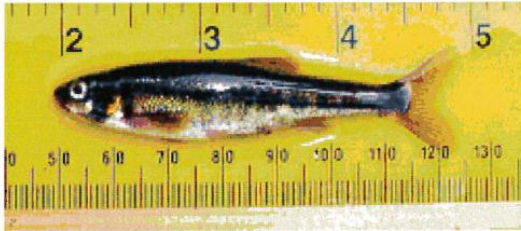
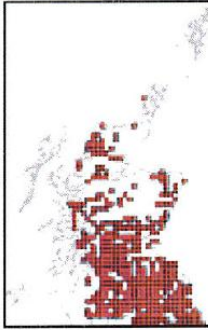
Lansdown, R V (2008) "A field guide to the riverine plants of Britain and Northern Ireland". Environment Agency

Preston et al. (2002) "New Atlas of the British and Irish Flora". Oxford University Press

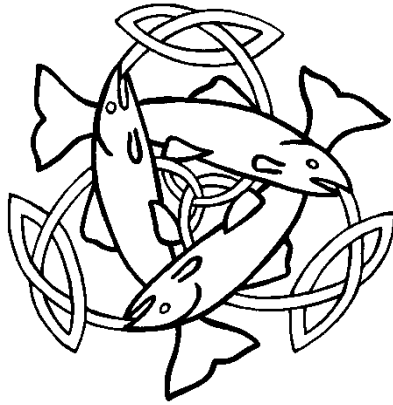
Simpson, D A (1986) "Taxonomy of Elodea Michx in the British Isles" *Watsonia* **16** 1-14

Stace, C (1997) "New Flora of the British Isles".

Minnows (*Phoxinus phoxinus*)

Species	Distribution
 <p data-bbox="375 577 724 611">Minnows (<i>Phoxinus phoxinus</i>)</p>	
Impacts	Pathways
<ul style="list-style-type: none"> • Translocated species native to England and Wales but not to Scotland. • In oligotrophic areas their introduction has been associated with a dramatic decline in trout numbers. • They compete with salmonids for food and space and prey on salmonid eggs and fry. 	<ul style="list-style-type: none"> • Use as livebait that are then discarded into waterbodies.
Management	
<p data-bbox="263 1126 395 1155">Prevention</p> <p data-bbox="263 1193 1262 1223">Do not introduce into the wild or transfer between waterbodies. Avoid use as livebait.</p> <p data-bbox="263 1263 454 1292">Physical Control</p> <p data-bbox="263 1332 327 1361">None</p> <p data-bbox="263 1402 466 1431">Chemical Control</p> <p data-bbox="263 1471 327 1500">None</p> <p data-bbox="263 1541 474 1570">Biological Control</p> <p data-bbox="263 1610 327 1639">None</p>	

High Priority Species



Species with **Severe** consequences
for local bio-diversity and economy
and a **High** to **Medium** risk of
introduction

// *GYRODACTYLUS SALARIS*



VIEW OF OPISTHAPTOR



GYRODACTYLUS SPP. GIVING BIRTH

REPRODUCED WITH THE PERMISSION OF DR T A MO, NATIONAL VETERINARY INSTITUTE, OSLO.

What Is It?

Gyrodactylus salaris is a member of a genus of small parasitic worms which includes species infesting fish and frogs in both fresh and salt water. It was first described in Sweden in 1956. *G. salaris* measure approximately 0.5mm, and are visible only with the aid of magnification. In the field, it is possible to see them with a hand lens. Without magnification, salmon parr heavily infected by *G. salaris* appear greyish, with excess mucus, and possibly concurrent fungal infections.

G. salaris attach to the host by means of an organ called the opisthaptor at one end of the body. At the other end of the worm is the mouth.

The main body of the parasite contains a developing embryo, and *Gyrodactylus* gives birth to young that are virtually the same size as the mother. Inside that embryo there is already another developing worm, forming a 'Russian doll' arrangement. Reproduction occurs rapidly, particularly at higher temperature, when populations of parasites can double in four days. Once infected by *G. salaris*, individual young salmon (parr) can soon become almost completely covered by thousands of parasites, giving the impression of a thick layer of mucus. These heavy infections damage the skin and enable secondary infection by bacteria, viruses or fungi, which contribute to massive mortalities.

In Norway, catastrophic losses of Atlantic salmon (*Salmo salar*) were noticed following the introduction of *G. salaris* to the country in the 1970s on imported live fish from an infected area. By 2002, 44 Norwegian rivers had been infected, and their salmon populations decimated. Fishery losses due to the parasite have been estimated at over 40% of total reported catch of wild salmon.

Susceptibility

G. salaris cannot survive in full strength sea water. Adult salmon can become re-infected once they enter a river. Infection spreads to younger fish from fish harbouring the parasite from the previous year. Although the most severely affected species is Atlantic salmon, *G. salaris* has been reported on rainbow trout (*Oncorhynchus mykiss*), Arctic char (*Salvelinus alpinus*), North American brook trout (*Salvelinus fontinalis*), grayling (*Thymallus thymallus*), North American lake trout (*Salvelinus namaycush*) and brown trout (*Salmo trutta*).

Can *Gyrodactylus salaris* be treated?

In hatcheries, routine treatments with a variety of chemicals can control this pathogen. Complete eradication can only be achieved by removing all fish, drying the tanks, and instituting a fallow period.

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www.scotland.gov.uk/marinescotland



The Scottish Government

Re-infection can occur if the parasite is present on wild populations and the water supply to the farm is not protected.

In an attempt to eradicate *G. salaris*, the Norwegian government is carrying out an extensive and costly programme to treat infected rivers. As of 2010, 35 Norwegian rivers have been treated. Rotenone is most commonly used and kills all fish able to harbour the parasite. After a period of monitoring to ensure all fish have been removed, the river can be re-stocked using eggs that were removed prior to rotenone treatment. This drastic measure has been successful in about 20 rivers. In a few rivers, the parasite has reappeared following rotenone treatment. Aluminium sulphate has also been explored to treat Norwegian river systems for the control of *G. salaris*.

Is *G. salaris* a threat to salmon in Britain?

In an experiment to address this question salmon from Scottish rivers were transported to Norway and exposed them to *G. salaris*. The rapid increase in the number of parasites on the fish showed that Scottish fish were highly susceptible. Movements of live fish from infected areas in other countries represent the highest risk to salmon in Great Britain (GB). Legislation to safeguard our fish by preventing such movements has been approved under Commission Decision 2010/221/EU.

Lower risks of introductions include contact with material from infected waters such as angling equipment and canoes. Practical measures that should be taken to ensure these risks are minimised are set out in the [Code of Practice to Avoid the Introduction of *Gyrodactylus salaris* to GB](#) (available from our website) and the leaflet [Keep Fish Disease Out – A guide to protecting freshwater fish stocks from *Gyrodactylus salaris*](#).

Diagnosis and surveillance

The Scottish government maintains a monitoring programme for *G. salaris*, and has funded research to improve diagnostics and surveillance.

A comparison of several methods for identifying the parasite found that molecular genetic methods were most reliable but were relatively slow.

A real time polymerase chain reaction (PCR) assay has now been developed at MSS which reduces screening times by at least five fold compared to previous molecular methods.

Emphasis on applying a risk based approach to surveillance for fish and shellfish disease is increasing. This involves focusing on areas where pathogens are most likely to occur and disease is most likely to develop. Factors which can contribute to the risk of *G. salaris* introduction and spread include:

- Imports of aquatic animals (including live or dead fish, their eggs or gametes);
- Mechanical transfer via boats or angling equipment;
- The extent of movements into or out of a farm or on a river;
- Sharing of water between catchments e.g. hydroelectrical use;
- Proximity of river mouths to each other.

Knowledge of these, and other factors, and the extent to which they occur, help establish which areas have the highest risk of introduction or spread. Resource can then be applied proportionally, with more intense focus on high risk areas. Marine Scotland Science is considering this approach to monitoring for *G. salaris* in the future.

Simulation models, using available information, have been developed to help evaluate different surveillance strategies for detecting *G. salaris*. Probability values are inputted for each step of the surveillance process to estimate the chance of detecting *G. salaris* in a river catchment area if it is present. The models include variables such the frequency of sampling, the number of sampling sites, and the number of fish which are taken from each site. The most effective surveillance strategy will be a compromise between the cost of each surveillance scheme and the desire to detect the introduction of an infection before it spreads too widely.

The data used to determine the probabilities, especially with respect to how it might apply to Scotland, where *G. salaris* are not present, are still very limited. MSS will continue to update the data used in the models and risk maps in an on-going commitment to providing the most beneficial surveillance using the resources available.

Register online at www.scotland.gov.uk to receive the latest email news alerts, daily digest, weekly roundup or topic newsletters.

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Signal Crayfish

Species Description

Scientific name: *Pacifastacus leniusculus*

AKA: Cimwch dir Croyw (Welsh)

Native to: North America

Habitat: Most freshwater habitats

Their small lobster-like appearance makes crayfish easy to recognise. Distinguishing non-native species from the threatened native white-clawed crayfish is essential. Compared to the native species, the signal crayfish is much larger and its claws are red underneath with a small turquoise / white blotch on the surface. There are several other non-native crayfish species, but these are relatively rare.

Introduced for food in the late 1970s and 1980s but spread quickly across much of the UK. Distribution in Scotland is limited. Spreads up and downstream and may cross land to colonise adjacent water bodies. Human transfer, although illegal, still continues. Negative impacts include the almost complete loss of the native crayfish through the spread of disease and direct competition. Also undermines riverbanks through burrowing and can predate on native fish eggs and aquatic invertebrates.

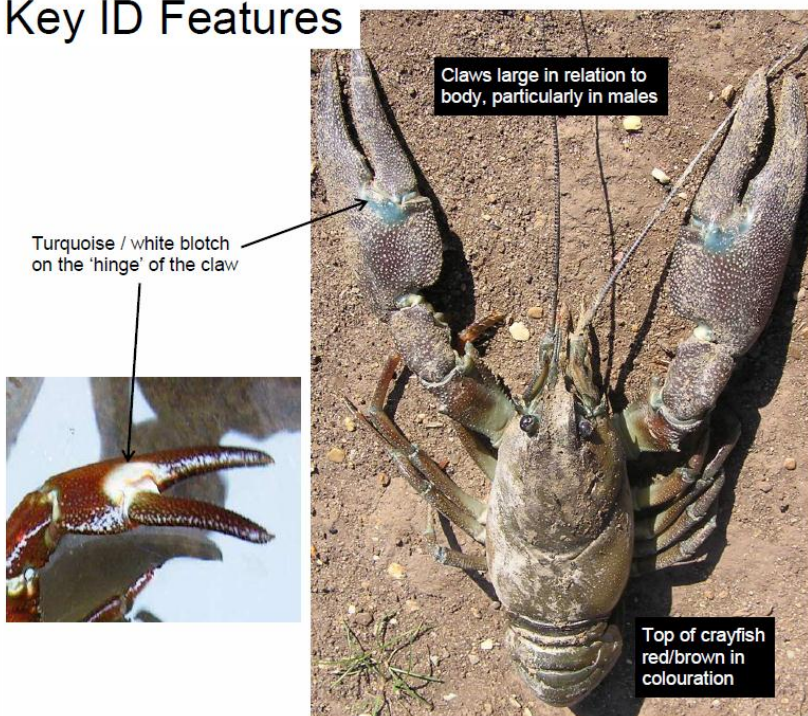
Signal crayfish is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to release or to allow the escape of this species into the wild. In the UK it is an offence to keep any crayfish without a license, except in some parts of southern England. If trapping of signal crayfish is planned, an application should be made to the relevant environmental protection agency.

For details of legislation go to www.nonnativespecies.org/legislation.



DH

Key ID Features



Identification throughout the year

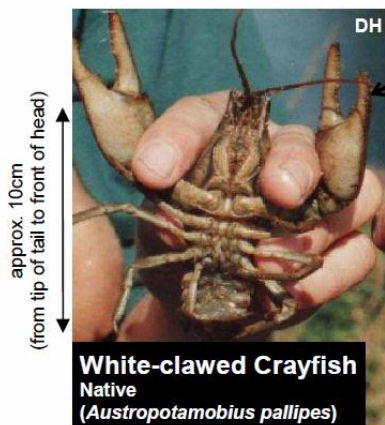
Least active during winter when much time is spent in a state of torpor often in burrows in riverbanks. Peak activity is during the summer. Mating takes place in autumn and early winter and females carry the developing eggs in a dense cluster attached to the underside of their tail over the winter. When the eggs hatch, young remain attached to the female. Release of the young usually begins in May-June. The life cycle then proceeds through a series of moults.

Field signs

- Burrows in banks of water body
- Parts of dead animals including claws and body shell either on shoreline or stream edge, in bird or rodent nests, or discarded by predators
- Unlike natives, active during daylight hours

Similar Species

The only native crayfish in the UK is the white-clawed crayfish, which is under serious threat from non-native species. It is therefore essential to be able to distinguish between this and non-native species.



Claws are dirty white to pink on the underside

White-clawed crayfish are considerably smaller than signal, generally have a brown to olive colour, unlike the red / brown of the signal and are usually more docile and less aggressive than the signal crayfish.

White-clawed Crayfish
Native
(*Austropotamobius pallipes*)

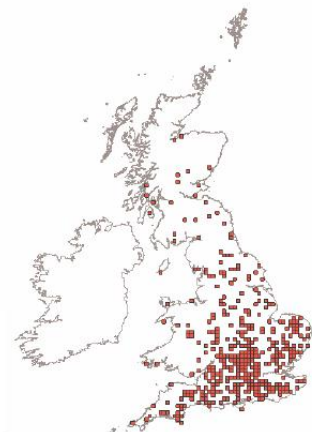
The cervical groove (line between head and body) of the white-clawed crayfish has spikes whereas the same groove in the signal crayfish is smooth.



Signal Crayfish
For comparison

Distribution

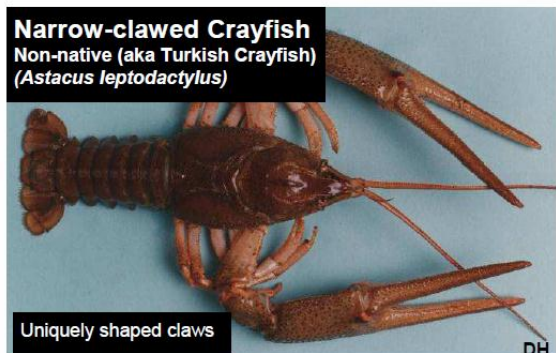
Wide spread throughout England and Wales. Limited to a few water bodies in Scotland.



Source: NBN Gateway. Check website for current distribution

A number of other non-native crayfish have been introduced into the UK though they are less prevalent than the signal crayfish, these include:

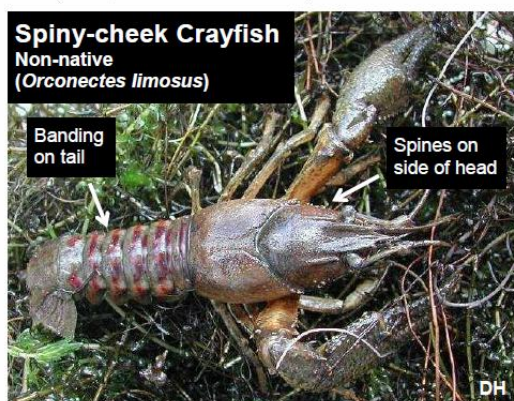
Narrow-clawed Crayfish
Non-native (aka Turkish Crayfish)
(*Astacus leptodactylus*)



Uniquely shaped claws

usually up to 15cm, but can be larger
(from tip of tail to front of head)

Spiny-cheek Crayfish
Non-native
(*Orconectes limosus*)



up to 14cm
(from tip of tail to front of head)

References and further reading:

Pöckl, M, Holdich, D and Pennerstorfer, J (2006) "Identifying Native and Alien Crayfish Species in Europe". Craynet
Souty-Grosset, C, Holdich, D, Noël, O, Reynolds, J and Haffner, P, (eds) (2006). *Atlas of crayfish in Europe*. Museum national d'histoire naturelle, Paris

Himalayan Balsam

Species Description

Scientific name: *Impatiens glandulifera*

AKA: Policeman's Helmet, Indian Balsam, Jac y Neidiwr (Welsh)

Native to: West and central Himalayas

Habitat: Found mostly on river banks and in damp woodland, can grow in other damp habitat

A tall, attractive, annual herb with explosive seed heads. Although easy to identify as a mature plant with its pink-purple flowers, fleshy stem and characteristic leaves, the seedlings and last year's dead stems of this annual are more difficult to spot.

Introduced as a garden plant in the early 19th century and first recorded in the wild in 1855. Often favoured by the general public for its aesthetic appeal and is still deliberately planted on occasion. Now widespread in the UK, especially along urban rivers. Spreads solely by seeds, which are small and easily carried by wind or water.

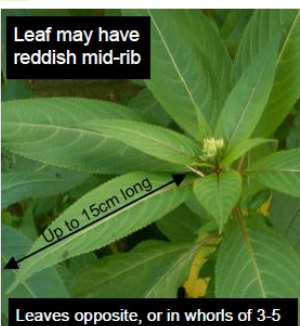
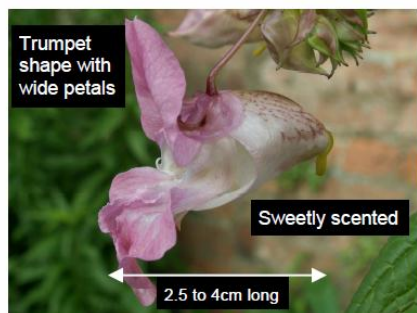
Out-competes native species in ecologically sensitive areas, particularly river banks. Where it grows in dense stands along river banks it can impede flow at times of high rainfall, increasing the likelihood of flooding. Die back of extensive stands over winter can leave river banks bare and exposed to erosion.

Himalayan balsam is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Can be identified at most times of the year: March-June by its seedlings, stem and leaf shape, from July to September by its stem, leaf shape and flowers. More difficult to identify over winter (October to February), look for hay like remains and distinctive root structure.

Hay like remains in winter

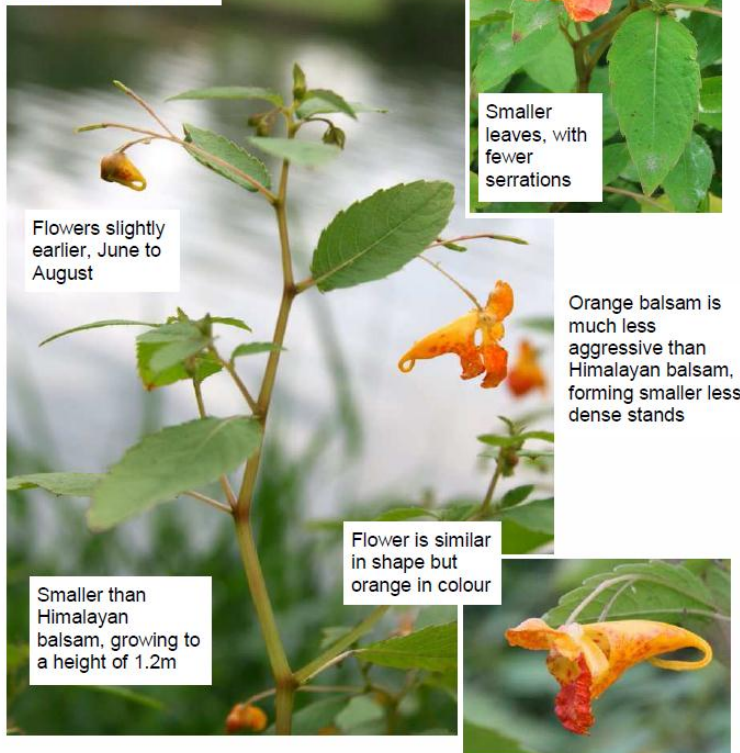


Root structure in winter



Similar Species

Orange Balsam
Non-Native
(*Impatiens capensis*)



Distribution

Widespread and common across the whole of the UK. Primarily on riverbanks and in other damp areas.

Source: NBN Gateway. Check website for current distribution



References and further reading:

- Blamey, M, Fitter, R and Fitter, A (2003) "The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora". A & C Black
- Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press
- Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

Giant Hogweed

Species Description

Scientific name: *Heracleum mantegazzianum*

AKA: Efwr enfawr (Welsh)

Native to: Caucasus mountains in south west Russia and Georgia

Habitat: Widespread, most common on river banks

Easy to identify when fully grown by height, size of leaves and size of flowers. Can be confused with native hogweed when not fully grown or when growth is stunted (e.g. regrowth after cutting).

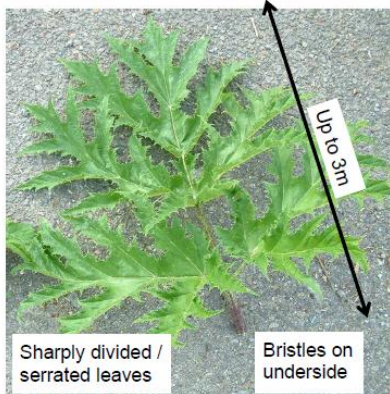
Introduced as an ornamental. First recorded wild in the UK in the late 19th century. Spreads solely by seeds, mainly through deliberate planting, wind dispersal and in water courses. Now common across much of the UK. Contact with any part of this plant must be avoided as even minute amounts of sap can cause blistering of the skin following exposure to sunlight. Other negative impacts include out-competing native flora, river bank erosion and increase in flood risk. Can cause delays/additional costs on development sites where the plant must be removed as controlled waste in order to comply with legislation.

Giant hogweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to plant or otherwise cause this species to grow in the wild. Under the Environmental Protection Act 1990, giant hogweed is also classified as controlled waste.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Spring



Summer



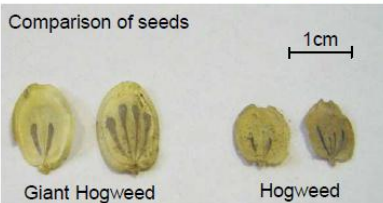
Winter



Similar Species

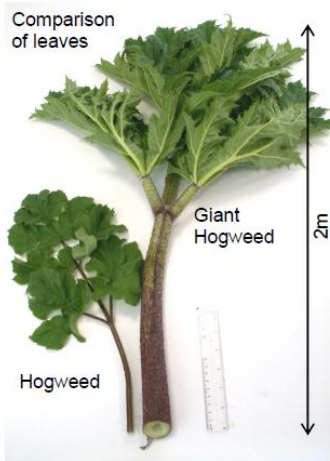


Hogweed
Native
(*Heracleum sphondylium*)



When in full height it is difficult to confuse giant hogweed with any other plant. While still growing or stunted, possibly as a result of disturbance, it can be confused with some other native plants. The most likely species with which it might be confused is hogweed.

Key differences between hogweed and giant hogweed include the height, width of stem, size of leaf, size of flower head and size of seed.



Distribution

Widespread and common across much of the UK. Extensive infestations are found particularly in Scotland and the north of England. Less abundant in Cornwall. Often associated with large rivers.



Source: NBN Gateway. Check website for current distribution

References and further reading:

- Blamey, M, Fitter, R and Fitter, A (2003) "The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora." A & C Black
- Booy, O and Wade, P M (2007) "Giant Hogweed Management in the United Kingdom". RPS Group plc
- Pyšek P, Cock, M J W, Nentwig, W & Ravn, H P (2007) "Ecology and Management of Giant Hogweed (*Heracleum mantegazzianum*)". CAB International
- Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

New Zealand Pigmyweed

Species Description

Scientific name: *Crassula helmsii*

AKA: *Tillaea aquatica*, Australian Swamp-stonecrop, Briweg Seland Newydd (Welsh), *Tillaea recurva*

Native to: Australia and New Zealand

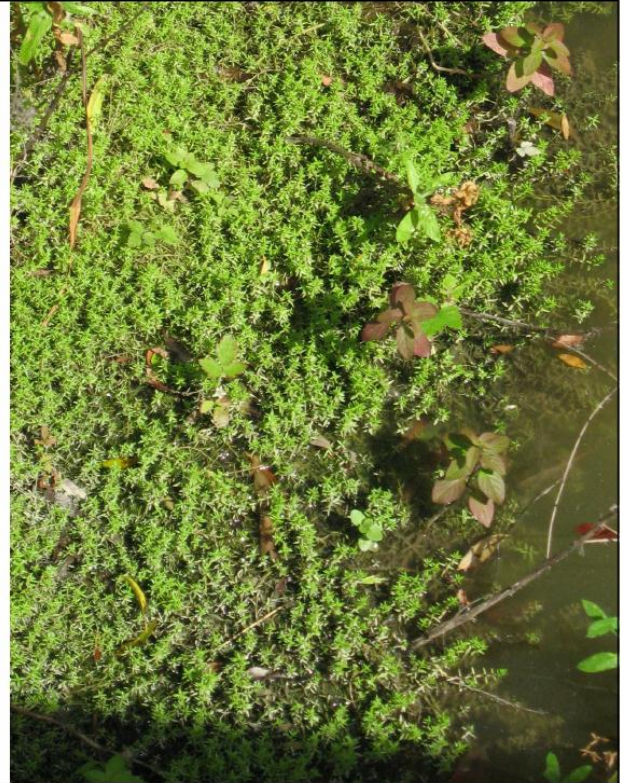
Habitat: Aquatic up to 3m deep in still or slow flowing water bodies or terrestrial around pond or lake margins

Can be submerged, emergent and terrestrial. Readily recognisable when growing at the edges of water bodies by its fleshy leaves. Submerged leaves are less easy to see and recognise. Reproduces from very small stem fragments but does not produce viable seed in the UK.

Introduced in 1911 as an oxygenating plant for ponds and, since the 1970s, has spread rapidly. Forms dense mats and can impede drainage, causing flooding. Displaces other aquatic plant species and reduces amenity use of the waterbody.

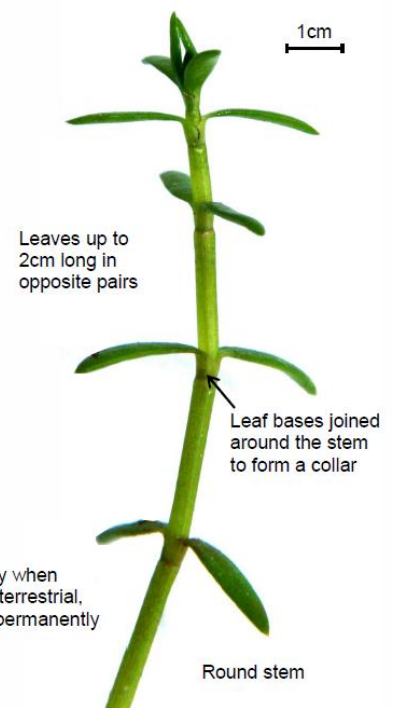
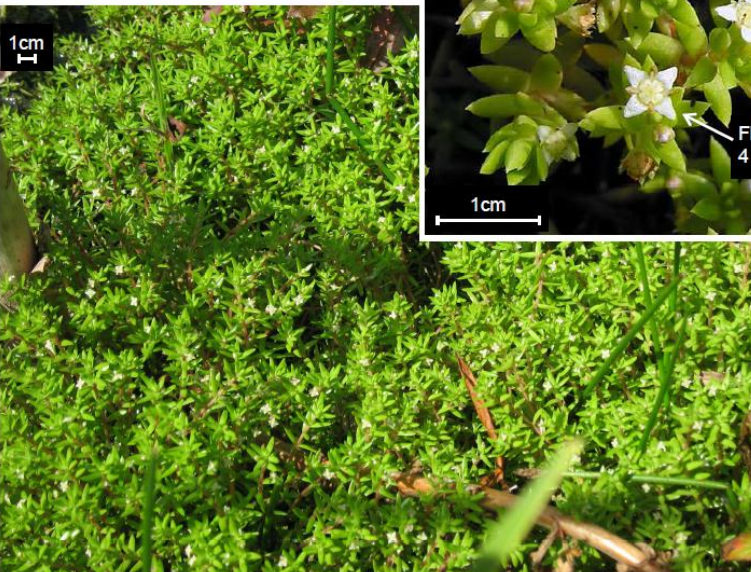
New Zealand Pigmyweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to plant or otherwise cause this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

Forms dense mats within the water body



Leaves fleshy when emergent or terrestrial, flatter when permanently submerged

Identification of terrestrial, emergent and submerged forms

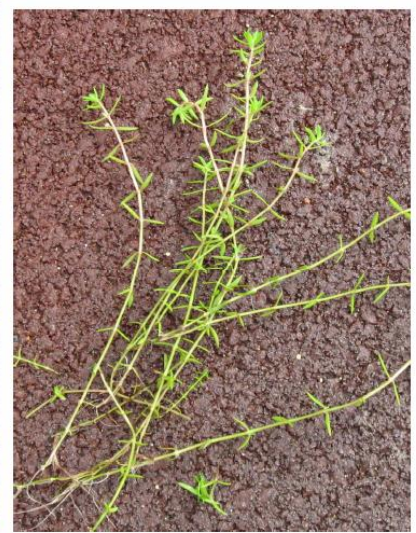
Terrestrial: Growing away from the water's edge or left stranded as water level falls, creeping stems and aerial, fleshy leaves.



Emergent: Densely packed leaves in water, intermediate between terrestrial and submerged form (occurs in water <0.6m deep).



Submerged: Elongated stems with leaves sparse and flat, able to form extensive mats on bed of the water body.



Similar Species

A group of species known as water-starworts are most likely to be confused with New Zealand pigmyweed. Water-starworts are distinguished from New Zealand pigmyweed by their non-fleshy leaves, which are usually notched at the tip (hold up to light or use hand lens), and lack of collar at leaf base.

Water-starworts
Native
(*Callitriche* species)



Non-fleshy leaves

RL

Water-starwort leaf with typically notched tip, a hand lens is usually required to see this properly



Source: NBN Gateway: Check website for current distribution.



New Zealand Pigmyweed
For comparison



New Zealand pigmyweed collar around stem at base of leaves

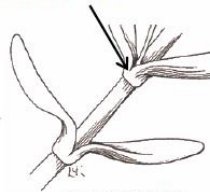


Illustration from IFAS, Centre for Aquatic Plants, University of Florida, Gainesville 1990

Fleshy leaves without notched tips



References and further reading:

- Blamey, M, Fitter, R and Fitter, A (2003) *The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora.* A & C Black
- Preston, C D and Croft, J M (1997) *Aquatic plants in Britain and Ireland.* Harley Books
- Preston, C D, Pearman, D A and Dines, T A (editors) (2002) *New Atlas of the British and Irish Flora.* Oxford University Press
- Stace, C (1999) *Field Flora of the British Isles.* Cambridge University Press

Chinese Mitten Crab

Species Description

Scientific name: *Eriocheir sinensis*

AKA: Moon crab, Cranc menigog (Welsh)

Native to: China

Habitat: Tidal streams, rivers and estuaries. Adults migrate to estuaries and the sea to breed.

The Chinese mitten crab was first recorded from the River Thames in 1935 having been discharged from the ballast tanks of ships. It is now well-established in the Rivers Thames, Humber, Medway, Tyne, Wharfe and Ouse.

Chinese mitten crabs prefer to moult in freshwater but are unable to lay eggs at low salinities. Adults therefore migrate down rivers in the autumn to gather in estuaries to breed. Once eggs hatch in spring, juveniles and adults migrate back up the river. They can travel large distances and have been recorded up to 1,500km from the sea in their native China. They are also able to cross dry land and have been found in isolated freshwater ponds.

Its ability to travel large distances up river systems and cross dry land means that all waterbodies in Britain have the potential to be invaded.

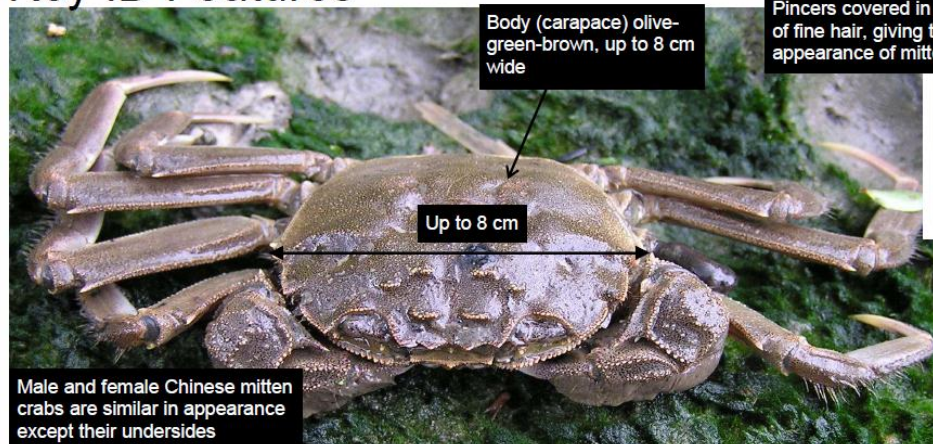
Chinese mitten crabs burrow into river banks, affecting their integrity and so can cause considerable damage. It has been placed on the IUCN 100 of the world's worst alien species list.

Chinese mitten crab is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to release or allow the escape of this species into the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



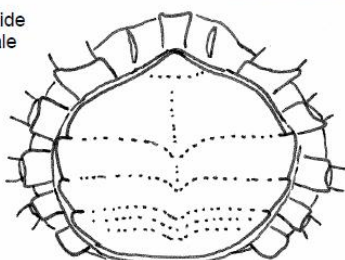
Pincers covered in a mat of fine hair, giving the appearance of mittens



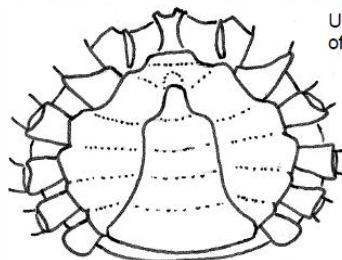
Legs long and hairy



Underside of female



Underside of male



Identification throughout the year

Chinese mitten crabs do not vary through the year. After adults gather to breed in estuaries, females carry the eggs overwinter until they hatch in spring.

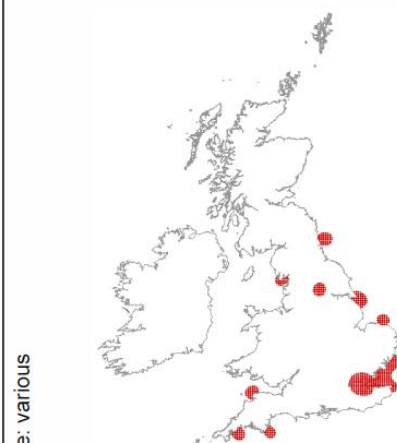
Field Signs

They burrow into river banks causing holes about 3 cm in diameter. Dead bodies (carapaces) may be found though positive identification would require the mittens to be present.



Distribution

Present in the Rivers Thames, Humber, Medway, Tyne, Wharfe and Ouse.



Source: various

There are no other freshwater crabs present in Britain. As adults migrate to estuaries in autumn there is a possibility of confusion with native marine crabs such as the shore crab. However none of our native crabs possess the distinctive hairs (mittens) on the claws.

Similar Species

Shore crab
Native
(*Carcinus maenas*)



References and further reading:

Gilbey, V, Attrill, MJ and Coleman, RA (2008)
Juvenile Chinese mitten crabs (*Eriocheir sinensis*) in the Thames estuary: distribution, movement and possible interactions with the native crab *Carcinus maenas*. *Biological Invasions* 10 pp. 67-77

Zebra Mussel

Species Description

Scientific name: *Dreissena polymorpha*

AKA: *Dreissensia polymorpha*, Misglen resog (Welsh)

Native to: South-east Russia

Habitat: Slow rivers, canals, docks, lakes, reservoirs and sometimes water pipes and cooling systems

Zebra mussel is a freshwater mussel species with a distinctive striped colouration and shape.

It inhabits a range of clean and well-oxygenated freshwaters but can tolerate weakly brackish waters. It attaches, usually in groups, by sticky threads known as byssus, to anything solid underwater such as masonry, stones, wooden posts, tree roots or shells. This attachment can block pipework, affect lock gates and other hard structures in the water. They can also significantly alter ecosystems by smothering native species and rapidly filtering out nutrients from the water. The growth of these colonies is similar to that of marine mussels.

Zebra mussel is similar in shape to marine mussels but smaller in size (usually about 30mm), has a distinctive "D" shape and is ornamented with blue or brown and yellow-white alternating zig-zag or wavy bands. Its shell is asymmetrical, strong, thick and keeled. Its shell does not have teeth on its hinge. It can grow up to 50 mm long though much smaller specimens are often found.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Live mussel



Light and dark bands of colour

Identification throughout the year

Zebra mussels do not vary in their appearance throughout the year.

Field Signs

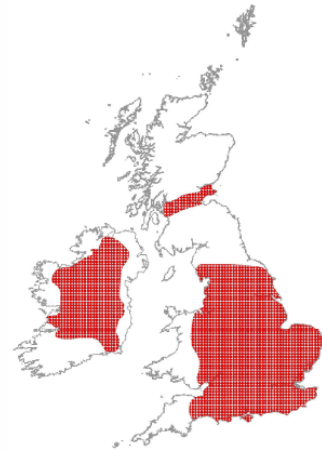
Zebra mussels do not leave any field signs except their dead shells which are identified in the same way as live shells. These shells may be covering hard objects. Dead shells can be found on the bed of water bodies or washed up on the margins, sometimes as single shells but occasionally, as in life, with two shells joined. Even when dead, the shells retain their stripy appearance. The zebra mussel has a short-lived, free-living larval stage but it cannot easily be detected in the water and so only adult mussels can be used for identification.

Similar Species

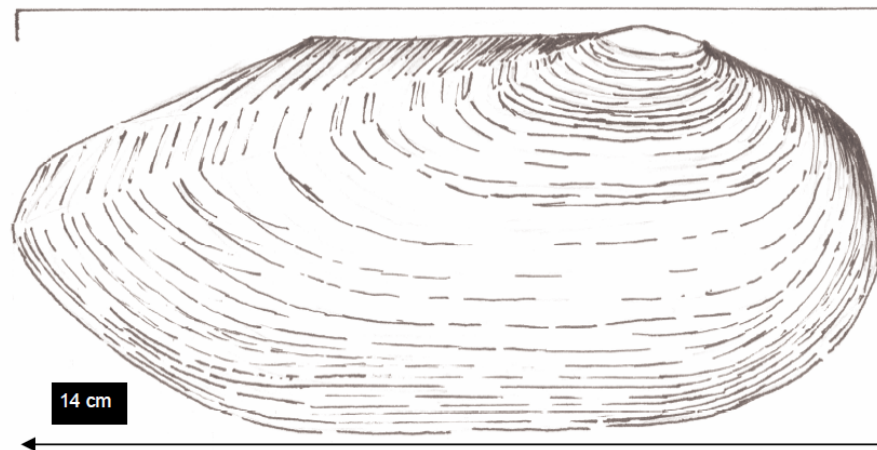
Compared to zebra mussel, other freshwater species of mussel are not found fixed to surfaces and do not grow in colonies but are free-living in the sediment. The smaller species are found amongst water plants. The larger mussel species, e.g. swan, painter's, duck and pearl mussels could only be confused with zebra mussels as juveniles but shells are much thinner and lack the zebra-like stripes. Orb cockles (*Sphaerium* species) and pea cockles (*Pisidium* species) are much smaller than zebra mussels and are unlikely to be confused.

Distribution

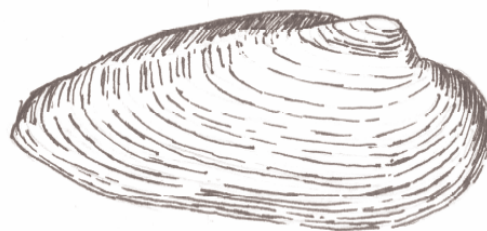
Zebra Mussels are found commonly across England, Ireland and at limited locations in Scotland and Wales.



Source: various



Swan Mussel
Native
(*Anodonta cygnea*)



Painter Mussel
Native
(*Unio pictorum*)



Zebra Mussel
Non-native
(*Dreissena polymorpha*)
For comparison

Orb Cockle
Native
(*Sphaerium* sp)



1.5 - 7 mm



Pea Cockle
Native
(*Pisidium* sp)

References and further reading:

Ellis, AE (1978) "British Freshwater Bivalve Mollusca". Academic Press

Kerney, M (1999) "Atlas of the Land and Freshwater Molluscs of Britain and Ireland". Harley Books

Didemnid Sea Squirts

Species Description

Scientific name: *Didemnum* species

AKA: Chwistrell fôr (Welsh)

Native to: Not known

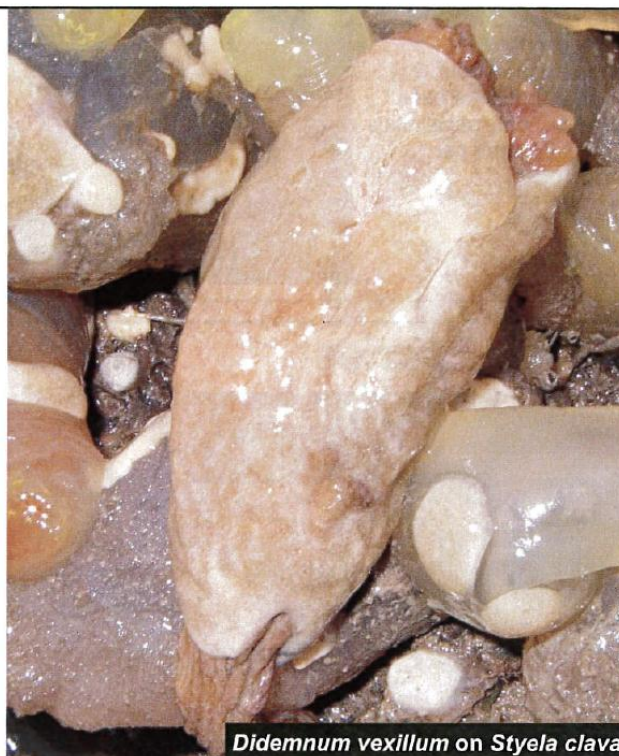
Habitat: Coastal areas on hard substrates up to 65 m below sea level

Immobile tube-like invertebrates occurring in colonies with an anterior inhalant and dorsal exhalant through which seawater is filtered for food. They are readily distinguished from other colonial sea squirts by their extensively lobed form. Colonies of *Didemnum* species have been reported to grow in sheets or mats which can be tan, cream, yellow, orange or pinkish in colour.

They have been introduced to British waters through a variety of pathways including aquaculture equipment, hull fouling and ship ballast water. Negative impacts are a result of colonies overgrowing and swamping other species and covering fish spawning grounds, aquaculture cages etc. While *Didemnum* sea squirts have been observed primarily colonising artificial substrates in harbours such as boats, submarine structures, pontoons and other human constructions, there are fears that natural reefs may become susceptible.

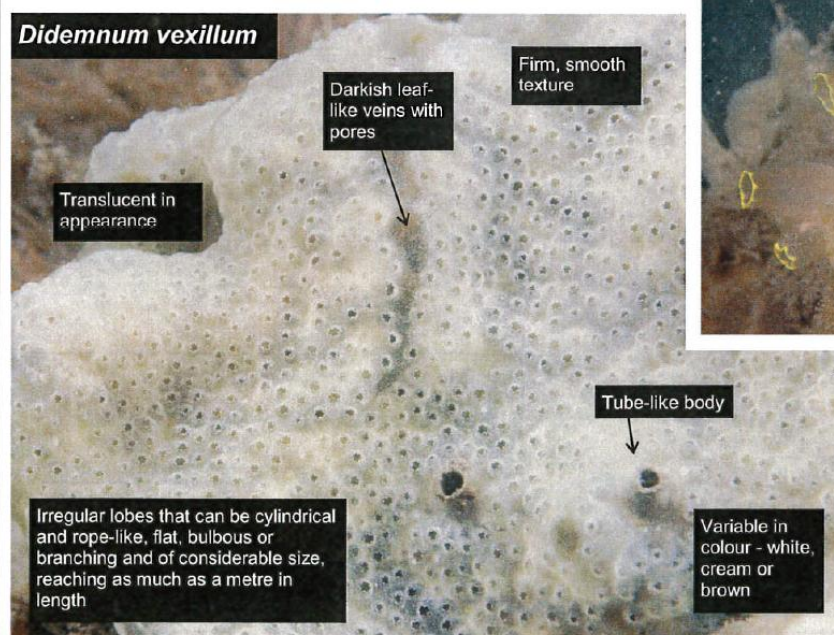
For details of legislation go to www.nonnativespecies.org/legislation.

As this species has only been recently found in the UK a high level of vigilance is important. Therefore if found, please report to the Non-native Species Secretariat: nnss@fera.gsi.gov.uk

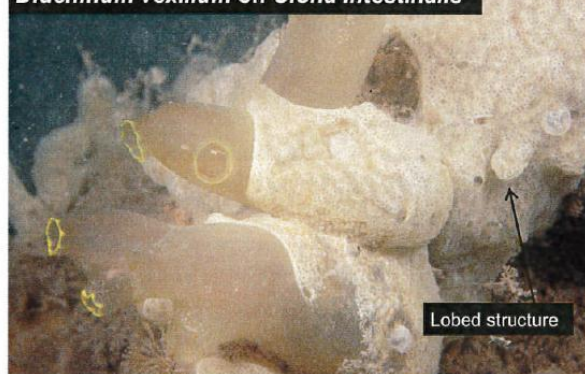


Didemnum vexillum on *Styela clava*

Key ID Features



Didemnum vexillum on *Ciona intestinalis*



Didemnum vexillum can be difficult to positively identify and requires expert advice if it is suspected to be present

Identification throughout the Year

The appearance of *Didemnum vexillum* remains constant throughout the year.

Field Signs

On hard substrates, they are common to depths below 30m and have been found down to 65m. They can tolerate temperatures from -2°C to 24°C, but have been collected only at salinities above 26 parts per thousand.



Didemnum vexillum on hard substrate

Distribution

Didemnum sea squirts have been recorded at a limited number of sites in the UK, particularly in north Wales (see map).

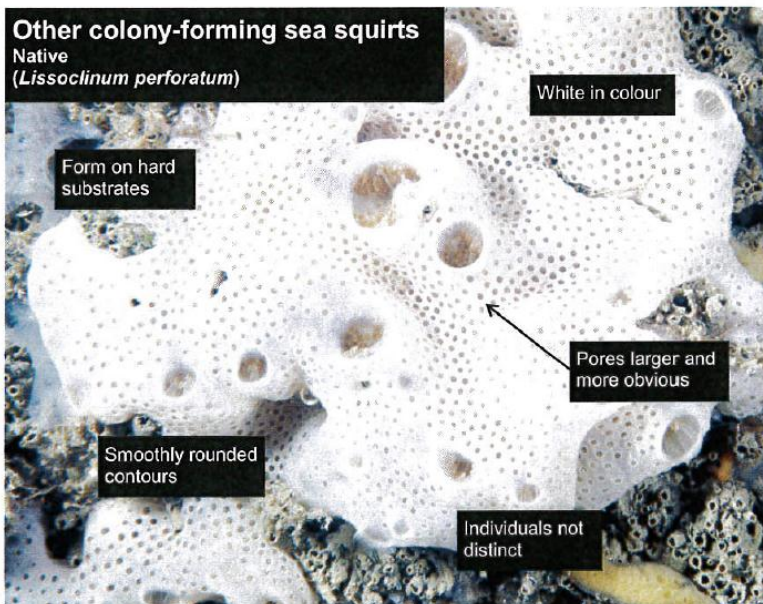
Source: USGS Science Centre for Coastal and Marine Geology



Similar Species

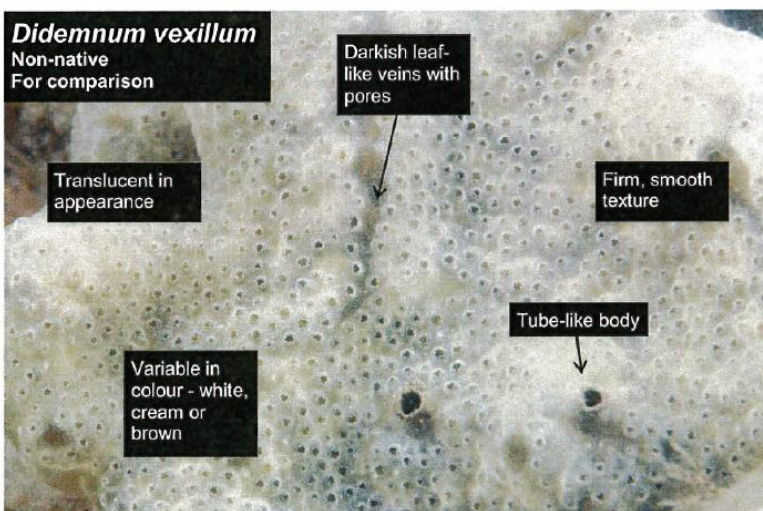
Other colony-forming sea squirts

Native
(*Lissoclinum perforatum*)



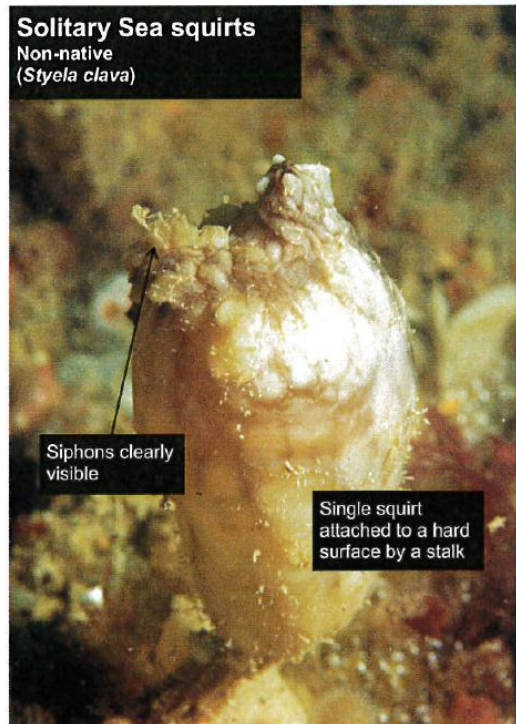
Didemnum vexillum

Non-native
For comparison



Solitary Sea squirts

Non-native
(*Styela clava*)



References and further reading:

USGS Science Center for Coastal and Marine Geology

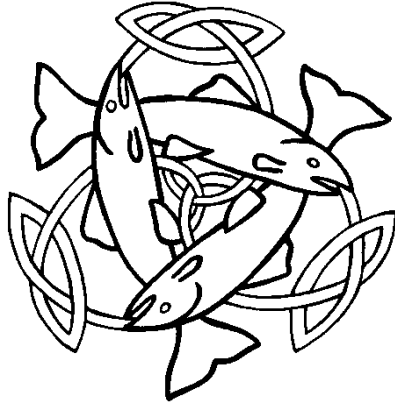
<http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum/>

ISSG

<http://www.issg.org/database/species/ecology.asp?si=946&fr=1&sts=>

Photos from: Gabrielle Wyn, Rohan Holt, Steve Trehwella

Fish Diseases



This section contains details on
notifiable fish diseases and fish
parasites

// NOTIFIABLE DISEASES IN FISH

Introduction

Legislation to prevent the introduction and spread of serious disease in fish was introduced in the UK as early as 1937 in the form of the Diseases of Fish Act. This was necessary because of the devastating effect of furunculosis on wild salmon stocks. It introduced the legal requirement to notify the Minister of the suspicion of the presence of certain diseases in fish. Such diseases were referred to as Notifiable Diseases. In Scotland, Marine Scotland (MS) acts on behalf of the Scottish Ministers in this respect.

Restrictions on the import into the UK of live fish have played a major part in preventing the introduction and spread of serious fish diseases. EU Council Directive 2006/88 EC defines the animal health requirements applied for the placing on the market, importation and transit of aquaculture animals and products.

As well as weighing out the minimum preventative measure to increase awareness and preparedness of the Competent Authorities, aquaculture production business operators and others for disease in aquaculture animals. The Directive categorises diseases as exotic or non-exotic diseases. Some diseases are exotic to the EU, and eradication measures are mandatory where an exotic disease is detected. New exotic diseases have limited distribution in the EU. There are controls on trade between infected and non-infected areas. Other, non-listed diseases are more widespread, and Member States may apply for approval for a national control programme for some of these diseases.

Great Britain currently has, or is applying for an approved control and eradication programme for bacterial kidney disease (BKD), spring viraemia of carp (SVC) and *Gyrodactylus salaris*, and currently controls the additional guarantees on import of live fish or gametes, enabling the restriction of imports to zones or farms of equal or higher health status.

Epizootic haematopoietic necrosis (EHN)

EHN is a highly infectious viral disease, exotic to the EU, which affects red fin perch and rainbow trout. It is limited in its geographical distribution, but given the volume of trout farmed in the EU, it is considered to be a significant threat. The disease causes increased mortality. Other signs may include skin discolouration, inappetence and swelling of the spleen and liver.

Epizootic ulcerative syndrome (EUS) is a contagious fungus which can cause sudden increased mortality in both farmed and wild fish. It has been reported from Asia, Australia and Pakistan, but is exotic to the EU. It affects a wide range of fish species, mainly in fresh water, and causes deep bleeding ulcers which appear on both the head and body of affected fish. Ulcers on the head may erode the skull, exposing the brain.

Infectious salmon anaemia (ISA)

ISA is a serious, but non exotic disease. The measures described in the Aquatic Animal Health (Scotland) Regulations 2009, which impose EU Directive 2006/88/EC will be implemented when an outbreak of ISA occurs. The last outbreak was in southwest Shetland in 2008-09. The disease can be spread by movements of live fish and contact between farms. Currently, there are no suspect or confirmed infected farms in Scotland. Signs of ISA include pale gills and a dark liver (Fig.1).

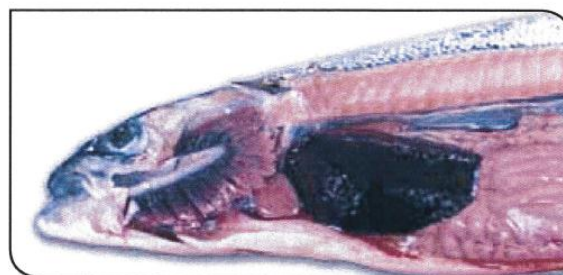


FIGURE 1.
POST MORTEM FINDINGS ASSOCIATED WITH ISA

Viral haemorrhagic septicaemia (VHS) & infectious haematopoietic necrosis (IHN)

VHS and IHN are non-exotic diseases. Due to their limited distribution, distinct geographical zones are declared free of these diseases. The whole of Great Britain is a disease-free zone with regard to VHS and IHN. Imports of live fish from zones or farms of lower health status are prohibited. Signs of VHS and IHN include swollen abdomen, 'pop eye' and haemorrhaging of the internal organs and body wall (Fig.2).



FIGURE 2.
POST MORTEM FINDINGS ASSOCIATED WITH VHS

Bacterial kidney disease (BKD)

BKD is a disease listed in the Scottish regulations caused by the bacterial agent *Renibacterium salmoninarum*. BKD primarily affects trout and salmon, although the bacterium has been isolated from other fish species. The disease is characterised by an enlarged, granular kidney and spleen, and there may be white lesions in the kidney and other organs. Currently, less than 5% of farms in Scotland are infected with BKD.

Spring viraemia of carp (SVC)

SVC is a listed disease caused by rhabdovirus which is closely related to the viruses which cause VHS and IHN. It affects certain carp species and other cyprinid fish such as goldfish, roach, tench and pike. SVC has very rarely been found in Scotland. Signs include a swollen abdomen and bleeding in the gills and skin.

Gyrodactylosis

Gyrodactylosis is a listed disease caused by *Gyrodactylus salaris*, a monogenean helminth parasite. It has never been detected in the UK, but has resulted in widespread loss of salmon stocks in some Norwegian rivers. The parasite reproduces very quickly and causes death in susceptible species due to damage to the skin.

Control of disease

In the event that a Listed or significant emerging disease is suspected in a population of fish on a farm, an Initial Designation Notice (IDN) is served. An IDN temporarily restricts the movement of any equipment, material, substance or means of transport liable to transmit disease in to, out of or within the designated area. Samples are taken by the Marine Scotland Science (MSS) Fish Health Inspectorate for laboratory analysis to confirm or rule out the presence of disease.

Where a farm is confirmed of infected, a Confirmed Designation Notice (CDN) is served. A CDN must be revoked when the Competent Authority is satisfied that the listed or emerging disease is not present. This may require that an infected farm is cleared of all stock, and disinfected according to standard disinfection procedures (a fallow period may be required), or where steps have been taken to remove the infected stock, and a programme of sampling has proved negative over a specified time period (these programmes vary depending on the disease).

Surveillance and monitoring

The MSS Fish Health Inspectorate conducts surveillance for Listed Diseases of fish in Scotland. To maintain disease free status for VHS and IHN, and the additional guarantees for BKD, SVC and gyrodactylosis, every fish farm holding susceptible species is inspected at intervals depending on the risk that it poses, and with regard to the import or of spread of disease.

Who to contact

If you suspect the presence of a Listed Disease, if increased mortalities occur at your fish farm, or if you require more information, contact the Fish Health Inspectorate at the address below.

Register online at www.scotland.gov.uk to receive the latest email news alerts, daily digest, weekly roundup or topic newsletters.

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// RED VENT SYNDROME (RVS) IN WILD ATLANTIC SALMON

Background

Reports of wild Atlantic salmon (*Salmo salar*) returning to Scottish rivers with inflamed, swollen bleeding vents were first received in early June 2007. By the end of the year over 50 rivers in Scotland reported the presence of **red vent syndrome** with similar observations received from rivers in England and Wales. The syndrome mainly affects one sea-winter fish (i.e. grilse), male and female Atlantic salmon and particularly prevalent among 'fresh run' fish but has also been recorded in two or multiple sea-winter fish as well as 'stale' fish which had been in fresh water for many weeks. Few cases of sea trout (*S. trutta*) have been reported but farmed Atlantic salmon have not been affected by the condition. Apart from the vent, the fish appear to be in good physical condition. Investigations were carried out by Marine Scotland Science (MSS) (formerly Fisheries Research Services) in an attempt to establish the cause and extent of the problem



SAMPLES ANALYSED A FEW WEEKS AFTER FISH HAD ENTERED FRESH WATER SHOW SOME RECOVERY OF THE SKIN. FOCAL REDDENING, DEVELOPING SCAR TISSUE AND SOME LOCALISED SCALE LOSS IS COMMON, BUT NO EROSION OR DEEP SWELLING IS EVIDENT.

External signs

The following series of photographs show the condition in varying degrees of severity and at different times following return to rivers.



NORMAL VENT FOR COMPARISON



AFTER 6-8 MONTHS IN FRESH WATER THE VENT AREA OF A SPAWNED FEMALE FISH (I.E. A KELT) IS RAISED AND SLIGHTLY PROTRUDING, BUT WITH NO REDDENING, AND FULL RECOVERY OF THE SKIN.



MILD

MILDLY AFFECTED FISH MIGHT SHOW A NUMBER OF SMALL RED SPOTS (PETECHIAL HAEMORRHAGE) AND REDDENING AROUND THE VENT.



MODERATE

MODERATELY AFFECTED FISH SHOW AN OBVIOUS WIDESPREAD REDNESS SURROUNDING THE VENT AND INITIAL SWELLING; HAEMORRHAGE, SKIN EROSION AND SCALE LOSS MIGHT BE OBSERVED.



SEVERE

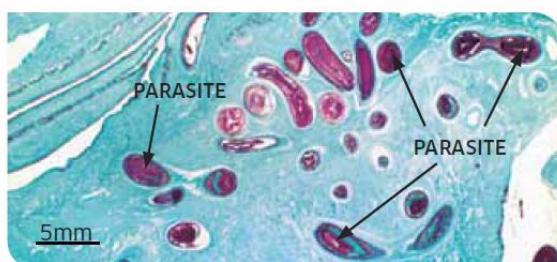
SEVERE CASES SHOW PRONOUNCED SWELLING AND OBVIOUS EROSION; TISSUE MAY PROTRUDE FROM THE VENT AND BLEEDING MAY OCCUR IF GENTLE PRESSURE IS APPLIED.

Investigation into the cause

All fish examined by MSS were screened for fish pathogens. The results from a suite of bacteriological, virological and molecular tests were all negative. However, parasites were found both in the body cavity and particularly in the vent region. The parasite is a small round nematode called *Anisakis*, which can be observed with the naked eye and resembles a watch spring, measures a few millimetres in diameter, but up to 200mm long when uncoiled (Plate 7).



Anisakis larvae were consistently found in the region of the vent of all fish examined and in very high numbers, embedded in the dermal, sub-dermal and muscle tissues within the vent. Microscopically, changes include epidermal erosion, scale loss, encapsulation, severe dermatitis, inflammatory response and haemorrhage, which all contribute towards the appearance of the vent externally.



Contact us

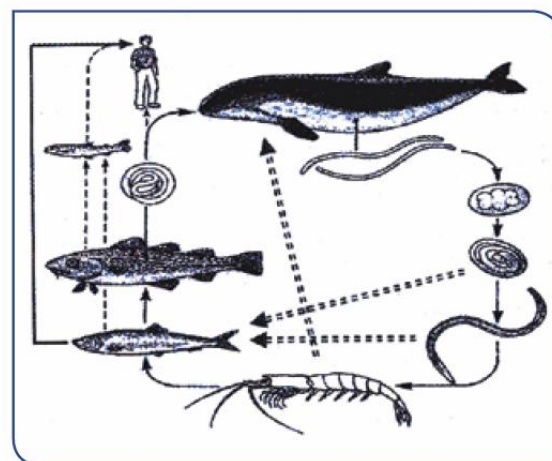
Anyone concerned about RVS should contact the Pathology and Bacteriology group at Marine Scotland Science, the Marine Laboratory.
Telephone : 01224 876544 and ask for Campbell Pert or Patricia Noguera. Email: campbell.pert@scotland.gsi.gov.uk, patricia.noguera@scotland.gsi.gov.uk.

Conclusions

The very high number of *Anisakis* larvae within the discrete region of the vent, and the associated tissue reaction correlates with the externally observed 'red vent', and is considered to be the most likely causal agent of the Atlantic salmon 'red vent syndrome'. Otherwise, all of the fish examined showed a good general health status, and there is no evidence of any bacterial, viral or fungal agent. Moreover, all internal organs and tissues other than the vent appeared to be in a normal healthy condition.

The presence of *Anisakis* larvae in wild adult salmon is not novel as the parasite occurs naturally in many fish species. However, the concentration of parasites in the vent tissues is unusual. The impact of the parasite on the fish is not fully known, but after three years of observations, there is no evidence that the condition has either prevented salmon from spawning successfully or led to mortality during their fresh water life/stage.

The final natural host of the *Anisakis* worm are marine mammals such as whales, dolphins or seals. However, the parasite may also affect humans who become infected from eating raw fish (for example sushi) or fish that is under-cooked. For more information see: <http://www.food.gov.uk/multimedia/pdfs/guidesalmonanisakis.pdf>



ANISAKIS SP. LIFE CYCLE IN THE NORTH ATLANTIC (AFTER BUCHMANN, BRESCIANI & BEYERHOLM 2001, MODIFIED BY LEVSEN 2007)

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www.scotland.gov.uk/marinescotland

// DIAGNOSIS OF INFECTIOUS SALMON ANAEMIA (ISA)



What is ISA?

ISA is a contagious viral disease of Atlantic salmon (*Salmo salar* L.) in sea water. The virus primarily affects endothelial cells lining the blood vessels of the fish, resulting in haemorrhage and severe anaemia. The disease can cause significant mortality, although within a farm this may spread slowly so that not all cages are affected simultaneously. The disease has been found in Norway, Canada, the USA, Faroe Islands, Scotland and Chile. ISA is a notifiable disease under UK and European legislation. If the presence of ISA is suspected on a farm, strict controls are put in place. If the disease is confirmed, affected stocks may have to be immediately withdrawn.

COMBINATION OF TESTS THAT PROVIDE OFFICIAL CONFIRMATION OF ISA

Test 1	Test 2	Result
Mortality, clinical signs and pathology consistent with ISA	Virus isolation	Confirmed
	qPCR	Confirmed
	IFAT	Confirmed
Virus isolation from 2 independent samples		Confirmed
Virus isolation	qPCR	Confirmed
	IFAT	Confirmed

How is ISA diagnosed?

Diagnosis of ISA is achieved using a combination of clinical signs, histopathology and laboratory tests for evidence of viral infection.

Clinical signs may include:

- Lethargy
- Loss of appetite
- Gasping at water surface
- Pale gills (anaemia)
- Dark liver
- Accumulation of fluid in the body cavity
- Haemorrhage in internal organs
- High levels of mortality

Histopathology

Histopathology involves microscopic examination of fish tissues for signs of disease. In the case of ISA there can be serious damage to liver tissue (Fig. 1).

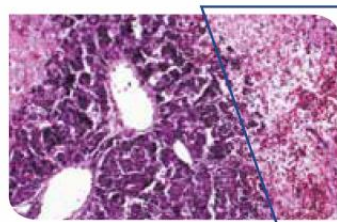


FIGURE 1.
HISTOLOGICAL SECTION OF LIVER OF AN ATLANTIC SALMON SHOWING DAMAGE ASSOCIATED WITH ISA.

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IHC

If histopathological changes consistent with ISA are observed an immunohistochemistry test (IHC) can be performed to detect an ISA virus (ISAV) protein in fish tissues.

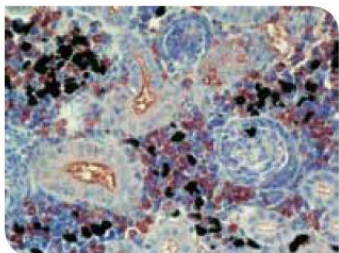


FIGURE 2.
FOLLOWING A SPECIFIC STAINING PROCEDURE, CELLS OF AN INFECTED SALMON SHOW A PINK/RED COLOURATION WHEN VIEWED UNDER THE MICROSCOPE.

IFAT

The indirect fluorescent antibody test (IFAT) detects an ISAV protein in fish tissues. Following a specific staining procedure, cells of an infected salmon show a yellow-green fluorescence when viewed under the microscope (Fig. 4).

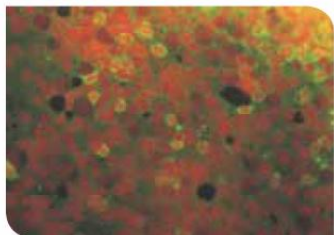


FIGURE 3.
IFAT OF AN ATLANTIC SALMON KIDNEY IMPRINT. POSITIVE CELLS SHOW YELLOW-GREEN FLUORESCENCE.

qRT-PCR

A real-time reverse transcriptase polymerase chain reaction (qRT-PCR) detects small quantities of RNA, the genetic material of the ISAV, in fish tissues. The assay is sensitive and specific and highly controlled to ensure confidence in the results obtained. qRT-PCR provides information on the relative amount of ISAV RNA present in the original sample (Fig. 5). qRT-PCR samples are confirmed as ISAV by nucleotide sequence analysis.



FIGURE 4.
SPECIFIC DETECTION OF ISAV USING QUANTITATIVE REAL-TIME REVERSE TRANSCRIPTION PCR (qRT-PCR). AN INTERNAL CONTROL REACTION (ELF) CONDUCTED ON EACH SAMPLE (ELONGATION FACTOR) VERIFIES A HIGH QUALITY AND QUANTITY OF RNA USED IN EACH ASSAY. APPROPRIATE NEGATIVE AND POSITIVE CONTROLS ALLOW RESULTS TO BE INTERPRETED WITH CONFIDENCE. (SCREEN SHOT FOR ILLUSTRATIVE PURPOSES ONLY.)

Virus isolation

It is possible to isolate ISAV from the internal organs of an infected fish. The technique used is to place samples of heart, liver, kidney and spleen from the fish into sterile tissue cultures grown in the laboratory. ISAV, if present, will grow in the tissue cultures and cause a cytopathic effect indicated by cell rounding and death (Fig. 6). ISAV associated CPE is confirmed by a specific antibody test.



FIGURE 5.
ISAV ASSOCIATED CPE IN A TO CELL CULTURE.

Accreditation

The IHC, qRT-PCR and virus isolation testing methods are accredited to ISO/IEC 17025 standard. To maintain this accreditation, MSS participates in external proficiency exercises.

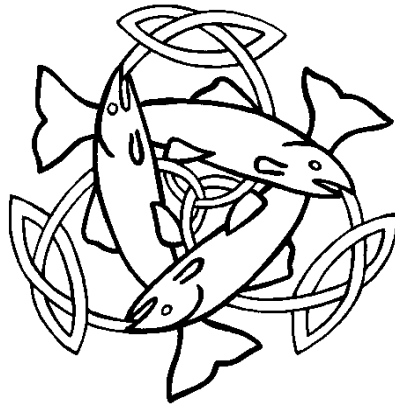
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Medium Threat Level Species



Species with **Moderate**
consequences for local bio-diversity
and economy with a **Low** to **High** risk
of introduction

Ruddy Duck

Species Description

Scientific name: *Oxyura jamaicensis*

AKA: Hwyaaden Goch (Welsh)

Native to: North America and western South America

Habitat: Lowland wetlands with lush emergent vegetation and areas of open water

A small, compact duck with broad, short wings and narrow, stiff tail often held erect. The males are easily recognised by their distinctive blue bill, chestnut body and white face. The females are a dull brown colour, with a cream coloured face intersected by a dark horizontal line.

Originally escaped from captivity in the 1950s from the Wildfowl and Wetland Trust's reserve at Slimbridge, Gloucestershire.

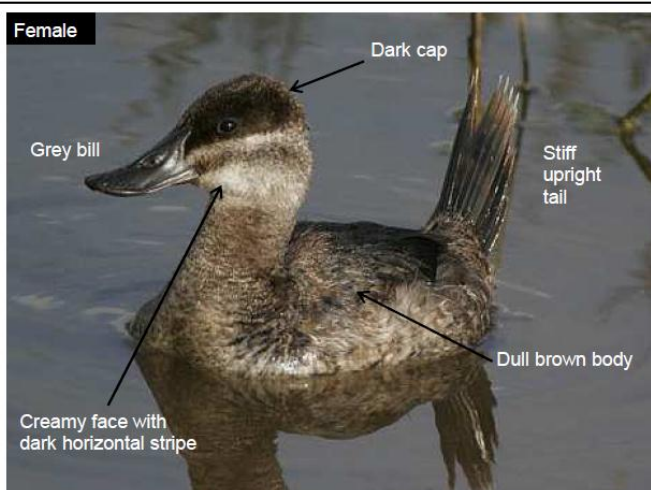
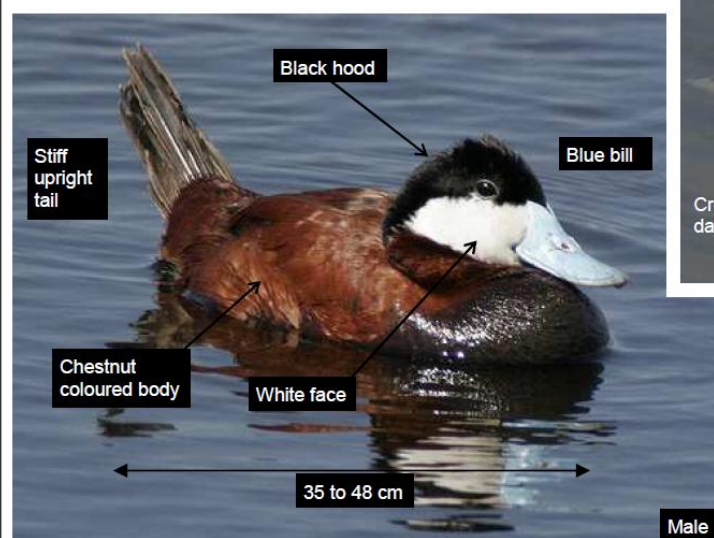
The ruddy duck is a serious threat to populations of white-headed duck (classified as Vulnerable by the International Union for Conservation of Nature) in Europe through hybridisation. Eradication is being carried out in the UK to ensure the continued survival of the white-headed duck in Europe.

Ruddy duck is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to release or allow the escape of this species into the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Ruddy ducks are resident throughout the year in the UK. The plumage of females remains the same throughout the year. Between autumn and early spring the male's bill turns grey and its body colour becomes dull brown, however its white face remains. During the breeding season male ruddy ducks are likely to be in the vicinity of any females and can be used to help identification, however, outside the breeding season individuals can occur on their own.

Field Signs

The following field signs are shared by many species of duck and should not be used for the purpose of specific identification as ruddy duck.

- Call - Generally silent.
- Nest - In thick vegetation on water, creating a platform of reed or rush stems and leaves.
- Eggs - 6-10 in clutch, dull or creamy white. Breeding period mid-April to July.

Distribution

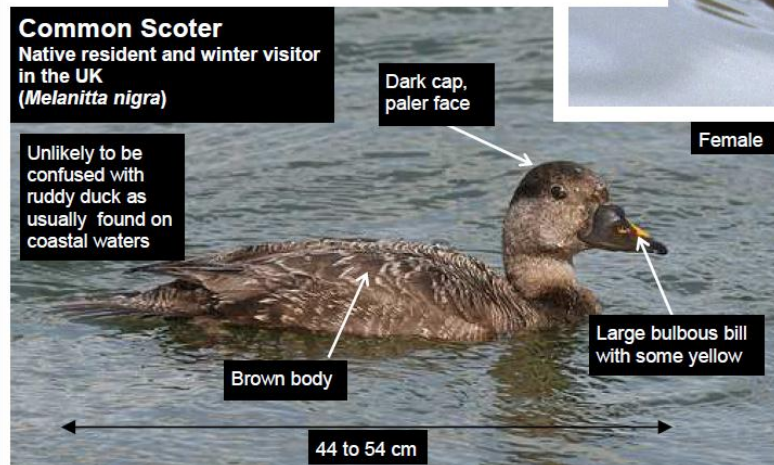
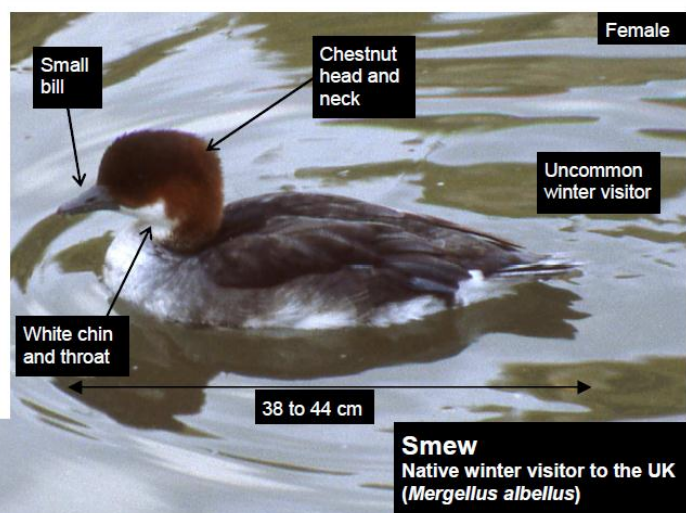
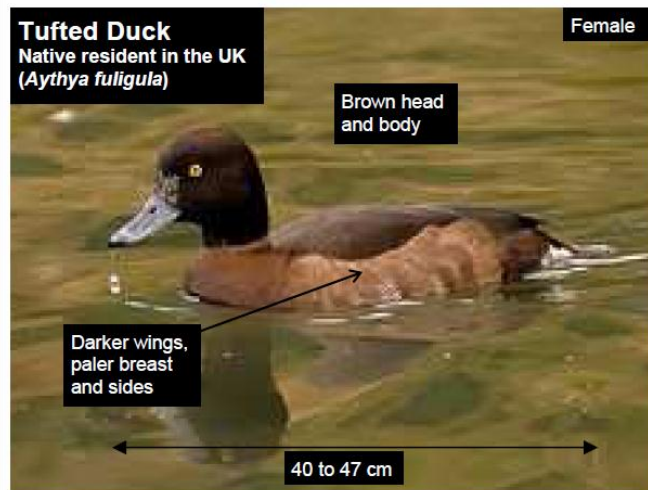
Stronghold centred around the Midlands but with major concentrations in Cheshire, Greater Manchester, the Home Counties, Yorkshire and Anglesey.



Source: GB Non-native species secretariat

Similar Species

In the UK, male ruddy ducks are unlikely to be confused with any other species. However, female ruddy ducks are similar to females of a number of other duck species. The majority of female ducks are generally brown and are distinguished by a combination of size, body shape and subtle plumage characteristics.



References and further reading:

- Lever, C (2005) "Naturalised Birds of the World" T & A D Poyser
- Mullarney, K, Svensson, L, Zetterstrom, D and Grant, PJ (2001) "Bird Guide" HarperCollins
- Snow, DW and Perrins, CM (1998) "The Birds of the Western Palearctic". Oxford University Press

Slipper Limpet

Species Description

Scientific name: *Crepidula fornicata*

AKA: American Slipper Limpet, Ewin mochyn (Welsh)

Native to: North-east US

Habitat: Wide range of habitats particularly in wave-protected bays, estuaries or sheltered sides of wave-exposed islands

Slipper limpet has a whitish shell, sometimes marked with red patches. They can be variable in shape, but have a high, rounded dome curling towards the aperture, which is large and oval to kidney-shaped. The aperture is half-closed by a characteristic white projecting plate giving the slipper appearance. It normally lives in groups, forming curved chains of up to 15 animals, attached to stones and shells, and on sediment from the shore line that is permanently underwater down to 10m below the water.

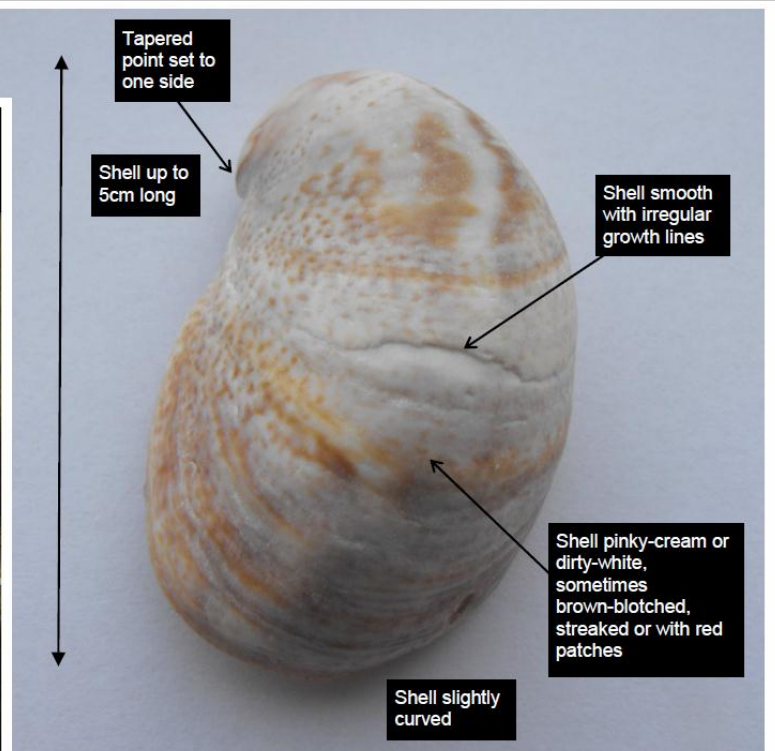
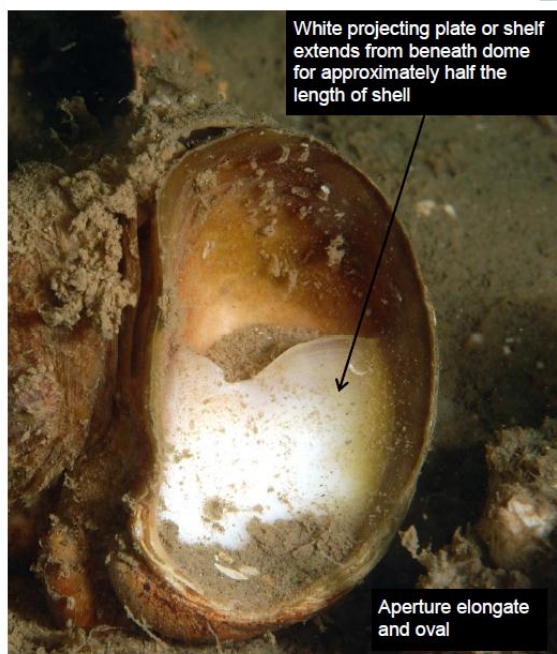
It was discovered in Liverpool Bay in 1872, but this population has since died out. It was subsequently introduced to Essex between 1887 and 1890 with American Oysters *Crassostrea virginica* from north-east USA, it may also have been transported on ships' hulls and in ballast water when it is in the open-water larval phase. Since 1934, it has been found in silt brought into the UK with Dutch oysters, and is now abundant in the whole of the North Sea on oyster and mussel banks. Its numbers are continuing to increase. Slipper limpet competes with, and can displace, other filter-feeding invertebrates. The species can be a serious pest of oyster and mussel beds.

Slipper limpet is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Slipper limpets are present in the same location throughout the year. Open water larval phase is not visible to the naked eye.

Field Signs

Dead shells are often found on beaches after storms dislodge the limpets.



Distribution

In south-west, south and south-east Britain as far north as Pembrokeshire on the west coast, and Yorkshire on the east coast. Although accidentally introduced to locations in Ireland, no population has persisted.

Source: various

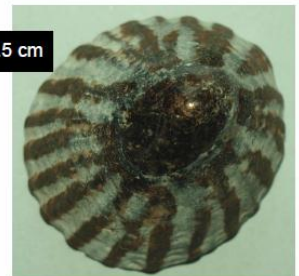
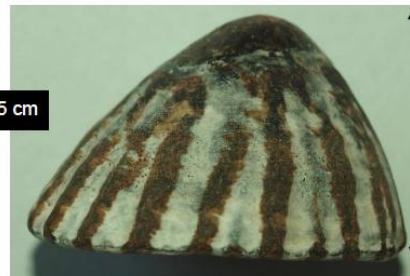
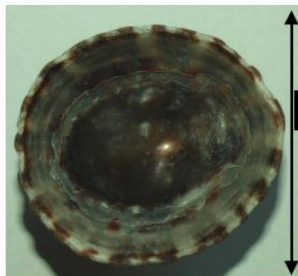


Similar Species

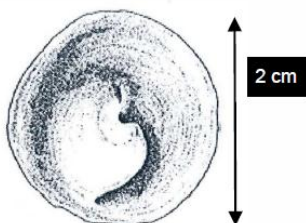
Slipper Limpet
Non-native
(*Crepidula fornicata*)
For comparison



Limpet species
Native
(*Patella* species)



Chinaman's Hat
Native
(*Calyptraea chinensis*)



References and further reading:

Hayward, P., Nelson-Smith, A. and Shields, C. 1996. "Collins Pocket Guide Sea Shore of Britain and Europe". HarperCollins

Marine Life Information Network for Britain and Ireland MarLIN. "Biology and Key Sensitivity Information Web pages". The Marine Biological Association

Water Fern

Species Description

Scientific name: *Azolla filiculoides*

AKA: Fairy Fern, Cyfrdwy (Welsh)

Native to: North and Central America

Habitat: Still and slow flowing water bodies (e.g. ponds, drainage channels, ditches, canals)

Very small free-floating water plant that forms dense mats. Unmistakeable when in its red form and relatively easy to distinguish from duckweeds in its green form. Can be seen most months of the year. Spreads mainly vegetatively though can produce minute spores.

Introduced for ornamental use in ponds and aquaria. First recorded in 1883 and has spread rapidly throughout England in the last 50 years. Infrequent in Scotland and Northern Ireland. Can be inadvertently carried on water plants from garden centres. Out-competes native species by forming a dense covering on the surface of the water, blocking out light, causing deoxygenation, preventing air-breathing insects from reaching the surface and reducing water temperatures. Dense and continuous stands can be a health hazard as the water surface appears solid.

Water fern is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to plant or otherwise cause this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

Usually green but often has a reddish tinge and can be completely red when exposed to stresses (such as cold temperatures, brackish waters or shading)



Forms dense mats but can also be present as a few fronds amongst emergent or other floating vegetation

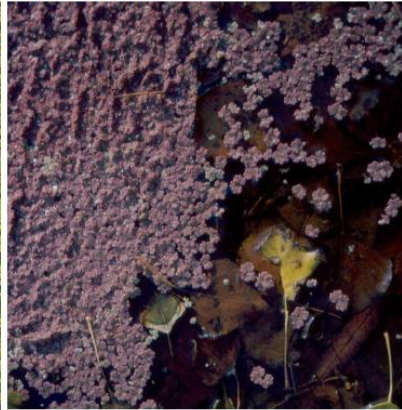
Identification throughout the year

Plants can be present year round, but often die back in winter. Colour can vary considerably through the year. Green in spring/summer often turns red during cold weather in autumn/winter.

Green form



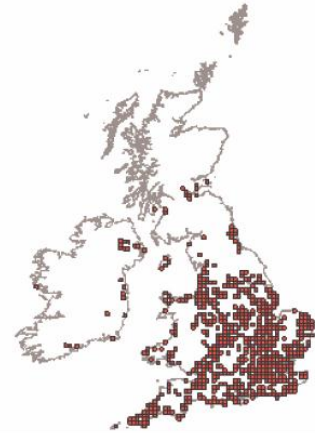
Red form



Distribution

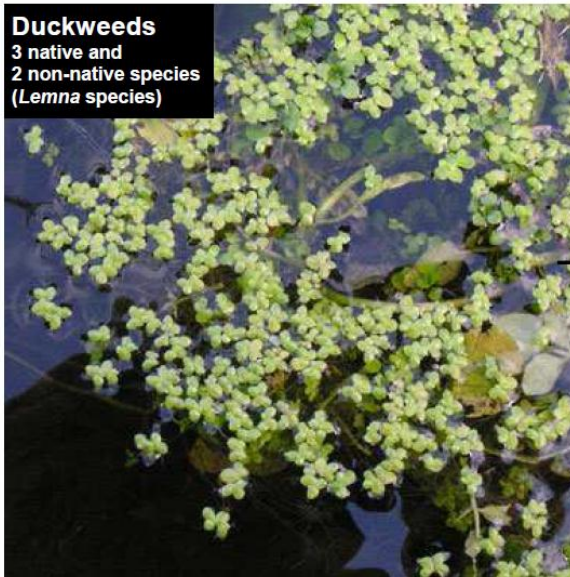
Sporadic distribution in southern and central England. Has spread north to Yorkshire and into Wales but relatively few locations in Scotland and Northern Ireland.

Source: NBN Gateway. Check website for current distribution

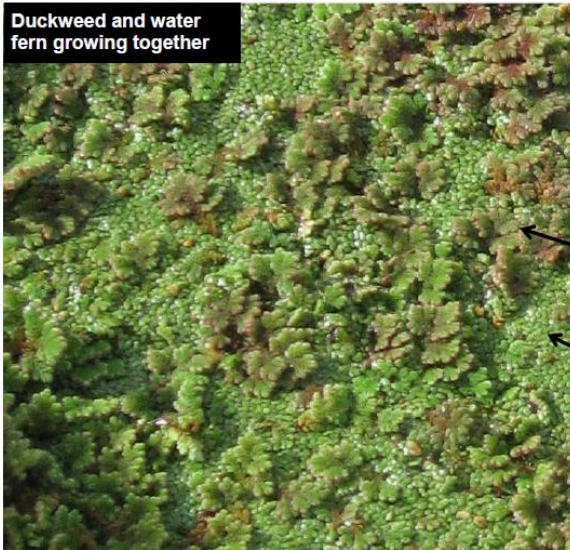


Similar Species

Duckweeds 3 native and 2 non-native species (*Lemna* species)



Duckweed and water fern growing together



Common Duckweed

Native
(*Lemna minor*)

Light green colour

Smaller than water fern
(only 1.5 - 4mm across)

Single round leaves, not
branched

1cm

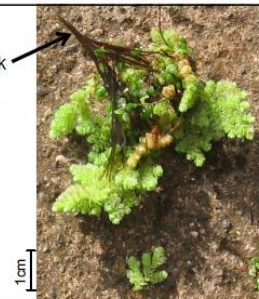
White to light green root
attached to each leaf

Water Fern

For comparison

Multiple dark
brown roots

Leaves are much larger (up
to 2.5cm) and branching



References and further reading:

Blamey, M, Fitter, R and Fitter, A (2003) "*The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora*". A & C Black
Preston, C D and Croft, J M (1997) "*Aquatic plants in Britain and Ireland*". Harley Books
Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "*New Atlas of the British and Irish Flora*". Oxford University Press
Stace, C (1999) "*Field Flora of the British Isles*". Cambridge University Press

Creeping Water-primrose

Species Description

Scientific name: *Ludwigia peploides*

AKA: Often incorrectly identified as *L. grandiflora* and labelled in garden centres as *Jussiaea*; Briallen d ŵr (Welsh)

Native to: South America

Habitat: Still or slow-flowing water

Quite distinctive in floating form, more care is needed to distinguish it from other species when it is growing in the margins of water bodies. Best searched for when in flower (July to August). Spreads primarily by plant fragmentation but also by seeds. There are few native species in the UK that are similar.

Only known from a few sites in the UK and it has been eradicated from some of these. *L. hexapetala* is the only other non-native species of *Ludwigia* known to occur in the UK, although water-primrose (*L. grandiflora*) has often been incorrectly recorded. Distinguishing between non-native species of *Ludwigia* is very difficult. If this is required expert consultation may be necessary.

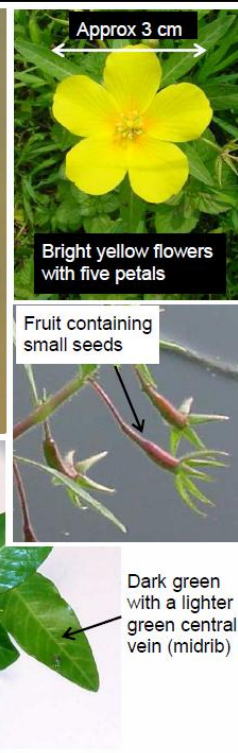
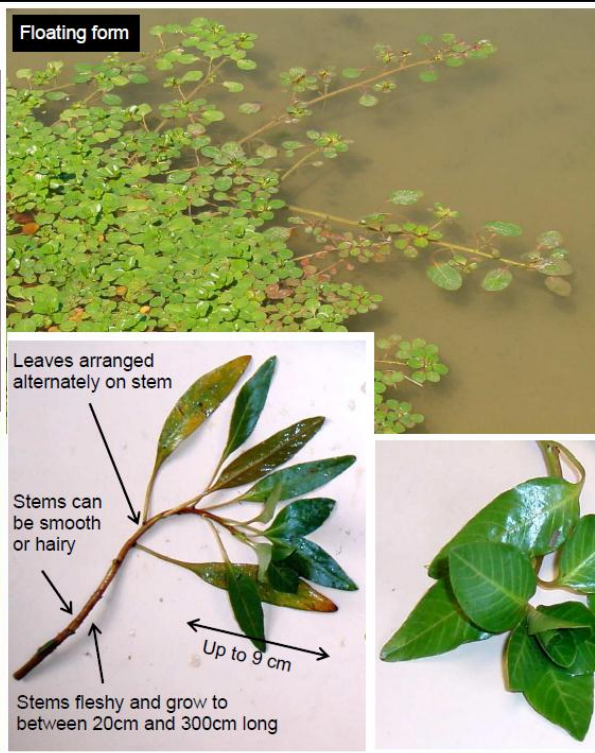
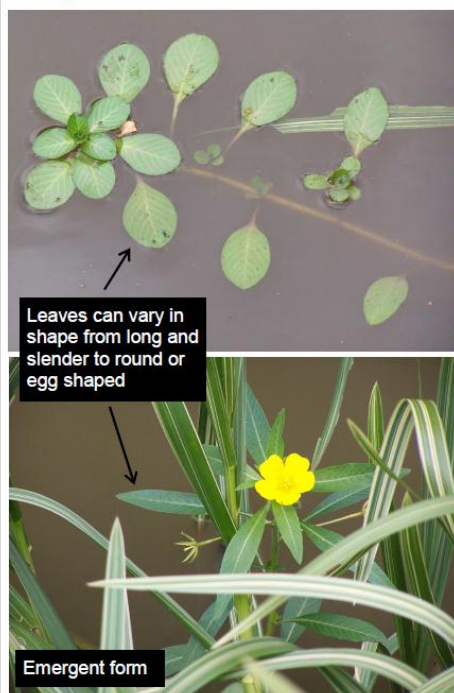
Introduced to Europe as an ornamental and water garden plant. Causes severe negative impacts, including out-competing native species and clogging waterways.

Water primrose is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England and Wales. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Flowers from July to August. Vegetation dies back in winter leaving distinctive brown stems.



Distribution

Has been present at a limited number of sites across the British Isles although it has been eradicated from some of these.

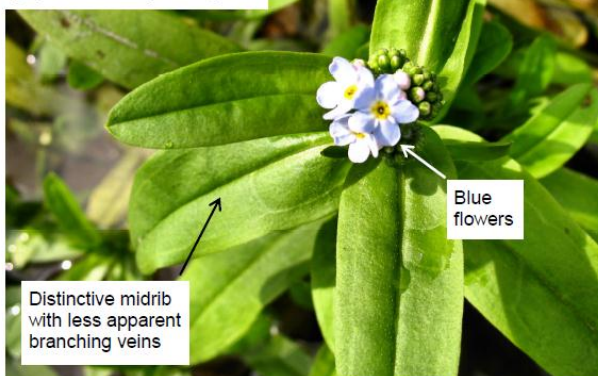
Source: redrawn from Defra 2007



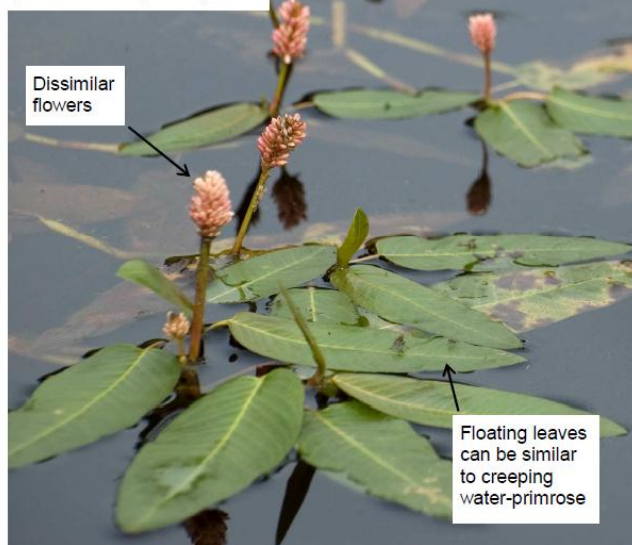
Similar Species

There are few similar species with which creeping water-primrose could be confused. The leaves of aquatic forget-me-nots (*Myosotis* species) have a distinctive midrib with less distinctive branching veins, unlike creeping water-primrose. When the floating leaves of amphibious bistort (*Persicaria amphibia*) first appear they resemble creeping water-primrose, but are significantly larger when full grown with dissimilar flowers. Hampshire purslane (*Ludwigia palustris*) is a very rare plant of boggy areas. Although closely related to creeping water-primrose, it is considerably smaller.

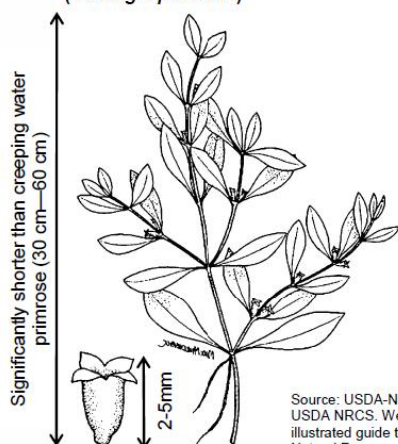
Water forget-me-not
Native
(*Myosotis scorpioides*)



Amphibious bistort
Native
(*Persicaria amphibia*)



Hampshire-purslane
Native
(*Ludwigia palustris*)



Source: USDA-NRCS PLANTS Database
USDA NRCS. Wetland flora Field office
illustrated guide to plant species. USDA
Natural Resources Conservation Service

References and further reading:

- Blamey, M, Fitter, R and Fitter, A (2003) "*The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora*". A & C Black
- Defra (2007). "*Eradication strategies for invasive non-native Ludwigia species—PH0422*". Defra
- Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "*New Atlas of the British and Irish Flora*". Oxford University Press
- Stace, C (1999) "*Field Flora of the British Isles*". Cambridge University Press

Wireweed

Species Description

Scientific name: *Sargassum muticum*

AKA: Japweed, Strangle weed, Sargasm Japan (Welsh)

Native to: North-western Pacific shores

Habitat: Hard surfaces in shallow coastal water rarely deeper than 5 m

Not to be confused with the terrestrial plant, Wireweed (*Polygonum aviculare*).

A non-native seaweed initially introduced to France as a hitchhiker on oysters either from Canada or Japan. Wireweed probably spread from France to the UK, where it was first found on the Isle of Wight in 1973. It spreads rapidly, approximately 30 km per year along the coast of the UK, through very fast growth rate and production of numerous spores. It prefers warmer waters, but will tolerate a wide range of temperatures and salinity including estuarine conditions.

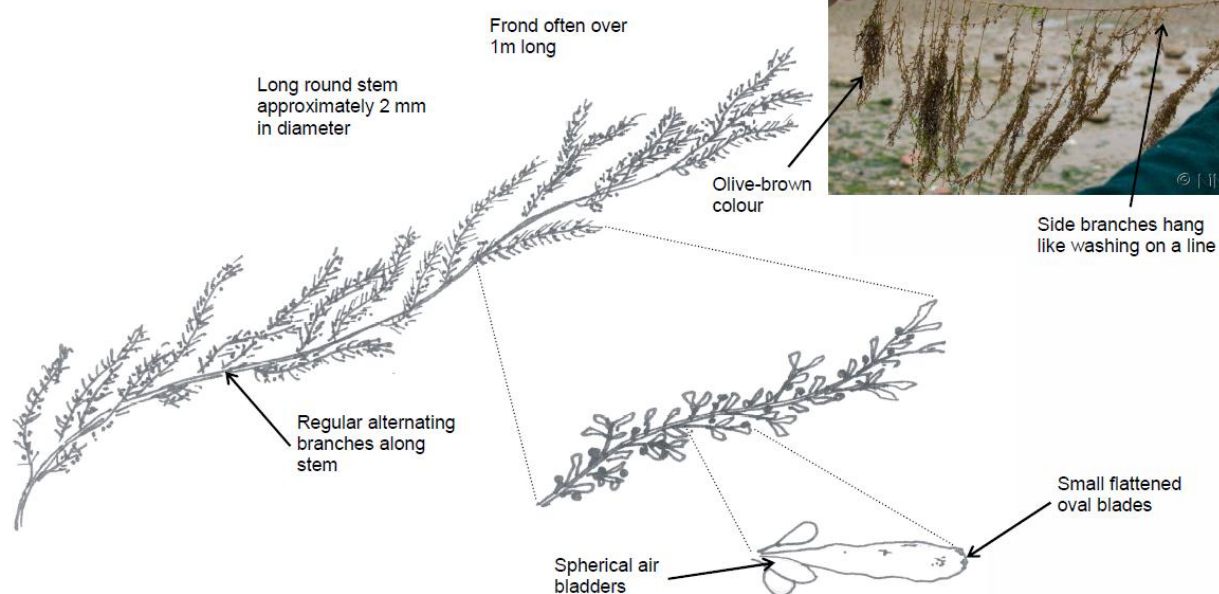
Wireweed can be a pest in harbours, shallow waters and on beaches, interfering with recreational use of waterways with detached plants forming large floating masses which can block propellers and intakes. It can also foul oyster beds and fishermen's nets and competes with native plants such as sea grasses.

Wireweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Branches die in autumn leaving only a small holdfast (the part of the plant which looks superficially like roots and anchors it to hard surfaces).

Field Signs

Fragments of wireweed can be found washed up on beaches mixed in with the flotsam.



Distribution

Originally introduced into the Isle of Wight, now spreading along whole of south coast of England, additional locations in west Wales and some parts of Scotland and Ireland.

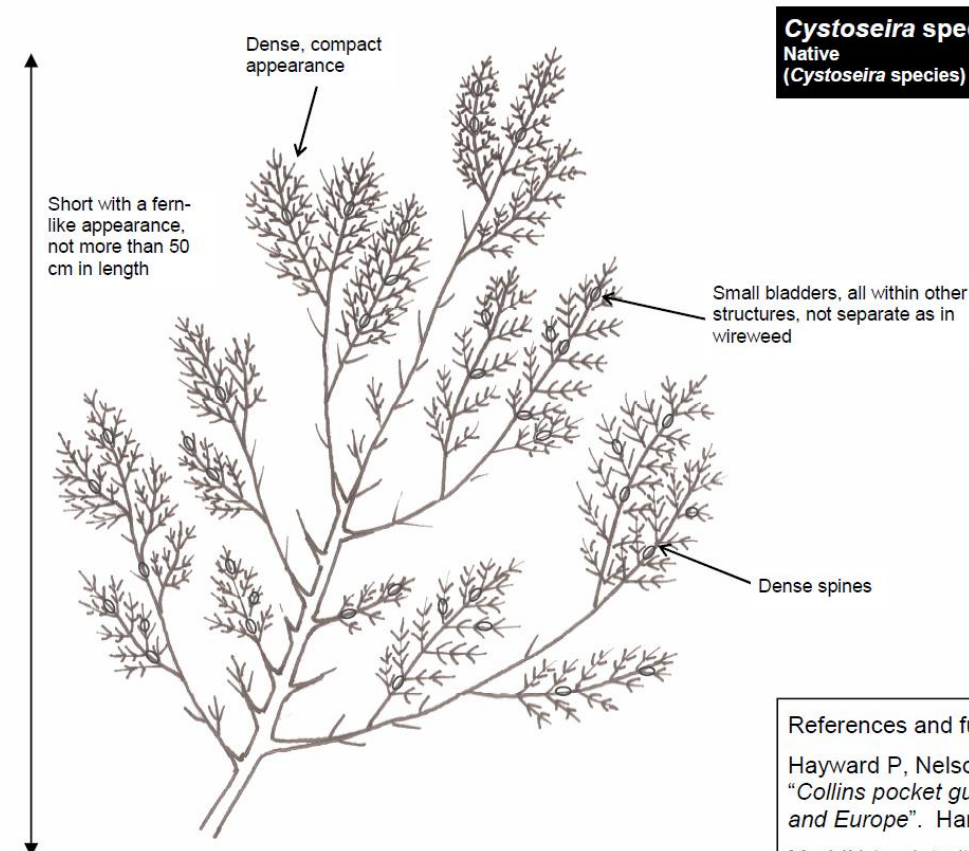
Source: MarLIN undated



Similar Species

Cystoseira tamariscifolia is small (less than 0.5 m in length). Dense seaweed with many branches covered in spines (other species may lack spines). Dark brown in appearance but with intense blue or green iridescence under water.

Similar to wireweed it is found on shallow shores and in pools and on rocks around the south-west. Other species are similar but lack spines and iridescence.



Cystoseira species
Native
(*Cystoseira* species)

References and further reading:

Hayward P, Nelson-Smith A and Shields C (1996) "Collins pocket guide to the sea shore of Britain and Europe". Harper Collins

MarLIN (undated). "Identification Guide for Selected Marine Non-native Species".
www.marlin.ac.uk

Photos from: Philip Ames, Alison Jukes, Chris Wood

Curly Waterweed

Species Description

Scientific name: *Lagarosiphon major*

AKA: Curly Water-thyme, Chwyn dŵr Cyrliog (Welsh), *Elodea crispa*

Native to: Southern Africa

Habitat: Standing waters such as lakes and

A perennial, aquatic plant which can grow up to 3 m completely submerged under the water in chalk, gravel and clay pits, lakes, reservoirs and canals. Leaves are strongly curved and whorled around the stem though are spirally arranged on the lower part of stem. Flowers are inconspicuous and borne separately as male and female flowers. Plants spread mainly by vegetative propagation through detached stem fragments and can become easily established.

First recorded in Britain in 1944 in a chalk pit in Bedfordshire, where it persisted for at least 40 years. Since the mid-1900s, it has been recorded in many locations and is now well-established at many sites.

It is widely sold as an aquarium and garden pond plant and the UK population is most likely due to deliberate or accidental release. Like many nuisance aquatic plants, curly waterweed can overwhelm ponds and out-compete native vegetation as well as choke up waterways, exacerbating flood risk.

Curly waterweed is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

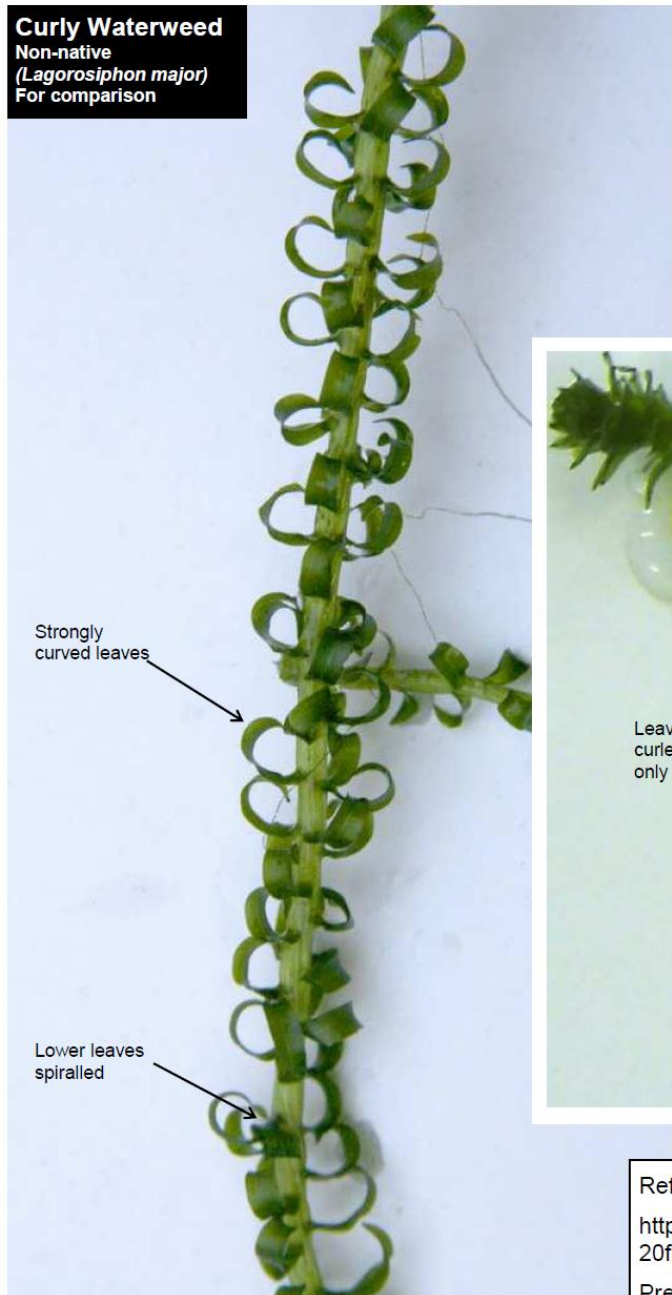


Identification throughout the year

Survives over-winter in southern areas of the UK. Further north, the amount of plant material present over-winter decreases but rarely dies down completely. Therefore it can usually be identified throughout the year across most of the UK.

Similar Species

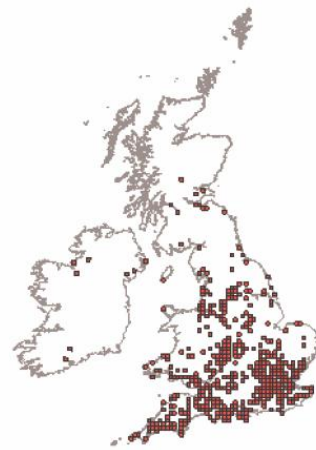
Curly Waterweed
Non-native
(*Lagorosiphon major*)
For comparison



Distribution

Widespread through lowland England.

Source: NBN Gateway. Check website for current distribution



Waterweed species
Non-native
(*Elodea* species)



References and further reading:

<http://www.nerc-wallingford.ac.uk/research/capm/pdf%20files/23%20Lagorosiphon%20major.pdf>


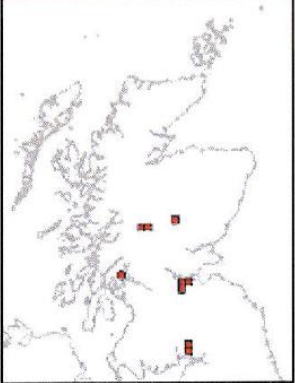
Preston, C D and Croft, J M (1997) "Aquatic plants in Britain and Ireland". Harley Books

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press


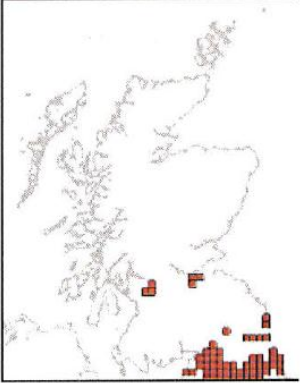
Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

Photos from: Joanne Denyer

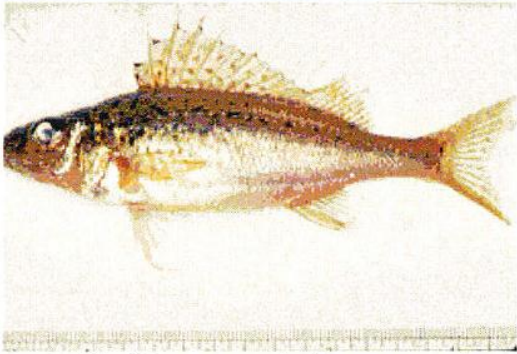
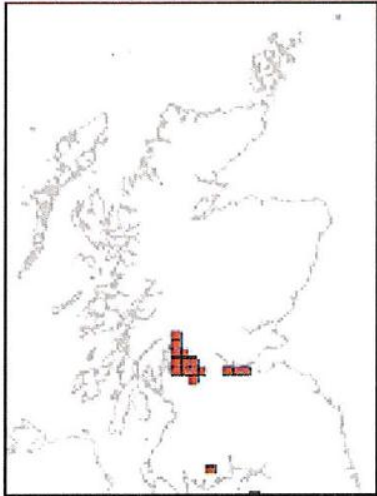
Orfe (*Leuciscus idus*)

Species	Distribution
 <p data-bbox="421 703 671 734"><i>Orfe (Leuciscus idus)</i></p> <p data-bbox="343 775 750 806">Courtesy of US Geological Survey</p>	
Impacts	Pathways
<ul style="list-style-type: none"> • The introduced Golden Orfe now widespread in England and Wales. • Impacts are not recorded and so the species is classified as medium impact by the UKTAG. 	<ul style="list-style-type: none"> • Introduction as coarse fish species • Release from domestic ponds
Management	
<p data-bbox="236 1171 376 1202">Prevention</p> <p data-bbox="236 1240 1305 1308">Do not introduce into the wild or transfer between waterbodies. Introduction to coarse fisheries can only be undertaken under licence from Marine Scotland.</p> <p data-bbox="236 1350 440 1382">Physical Control</p> <p data-bbox="236 1424 304 1456">None</p> <p data-bbox="236 1496 453 1527">Chemical Control</p> <p data-bbox="236 1570 304 1601">None</p> <p data-bbox="236 1641 459 1673">Biological Control</p> <p data-bbox="236 1715 304 1747">None</p>	

Bullhead (*Cottus gobio*)

Species	Distribution
 <p data-bbox="408 672 686 703">Bullhead (<i>Cottus gobio</i>)</p> <p data-bbox="320 743 775 775">Photo courtesy of Tweed Foundation</p>	
Impacts	Pathways
<ul style="list-style-type: none"> • Translocational species widespread in England and Wales • Impacts not documented but competes for invertebrates with Brown Trout for which it is also a prey species • Threatened species with several SACs identified for its conservation • Highly vulnerable to Signal Crayfish (possibly Chinese Mitten Crab) that has depleted many populations in areas where it has been introduced. 	<ul style="list-style-type: none"> • Live bait
Management	
<p>Prevention</p> <p>Do not introduce into the wild or transfer between waterbodies. Avoid use as livebait.</p> <p>Physical Control</p> <p>None</p> <p>Chemical Control</p> <p>None attempted</p> <p>Biological Control</p> <p>None</p>	

Ruffe (*Gymnocephalus cernuus*)

Species	Distribution
 <p>Ruffe (<i>Gymnocephalus cernuus</i>)</p> <p>Courtesy of US Environmental Protection Agency</p>	
Impacts	Pathways
<ul style="list-style-type: none"> Ruffe populations have a minimum population doubling time of less than 15 months and the species is an aggressive predatory species of zooplankton and other food sources of native species of fish as well as fish eggs. The introduction of Ruffe to L. Lomond has had disastrous consequences for the Powan and has significantly altered the ecology of the loch. 	<ul style="list-style-type: none"> Live bait
Management	
<p>Prevention</p> <p>Do not introduce into the wild or transfer between waterbodies. Do not use Ruffe as livebait.</p> <p>Physical Control</p> <p>None</p> <p>Chemical Control</p> <p>None attempted</p> <p>Biological Control</p> <p>None</p>	

Floating Pennywort

Species Description

Scientific name: *Hydrocotyle ranunculoides*

AKA: Dail-ceiniog arnofiol (Welsh), *Hydrocotyle nova zealandiae*

Native to: North America

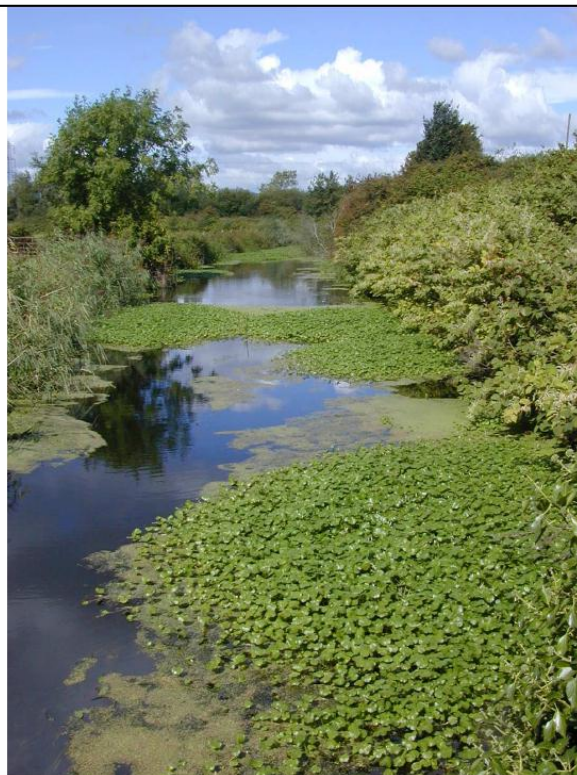
Habitat: Emergent or floating on the surface of still or slowly moving freshwater

Free-floating or rooted. The characteristic leaves and growth form help to make this plant easy to identify. It is found mostly in the south-east of England and occasionally in the north-west of England and Wales. Spreading rapidly.

First naturalised in 1990 as a result of discarded plants from garden ponds. Can grow up to 20cm per day and may quickly dominate a waterbody forming thick mats and impeding water flow and amenity use. May out-compete native species by blocking out light, causing deoxygenation, obstructing air breathing insects from reaching the water surface and reducing water temperatures.

Floating pennywort is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to plant or otherwise cause this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

Grows horizontally



Leaves can be floating or emergent



Fleshy stalks

Fine roots



Up to 7cm

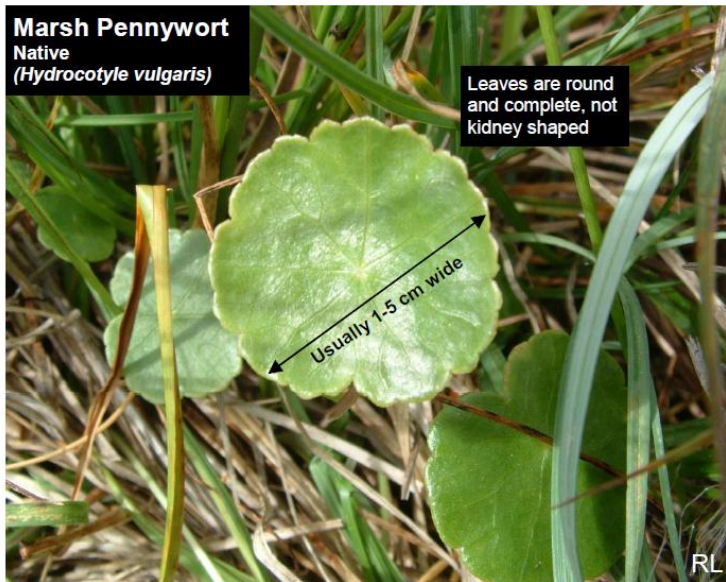
Shiny, kidney-shaped leaves with crinkled edge, frequently broader than long

Identification throughout the year

Varies little throughout the year, although in the winter it is most likely to be found at the water's edge. Tiny white flowers are rare, but if present, they appear between July and August.

Similar Species

Marsh Pennywort
Native
(*Hydrocotyle vulgaris*)



Grows on damp ground in bogs and fens. Always rooted in the ground, never free-floating

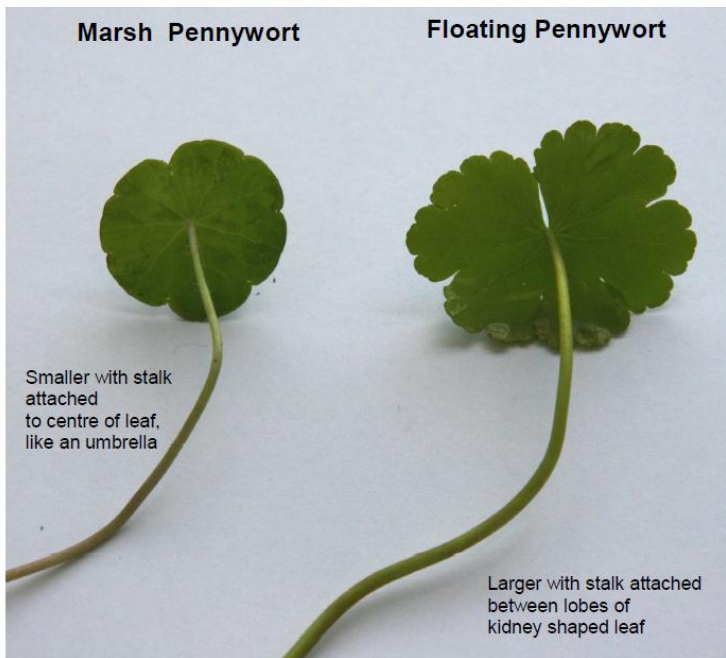
Leaves are round and complete, not kidney shaped

Usually 1-5 cm wide

RL

Marsh Pennywort

Floating Pennywort



Smaller with stalk attached to centre of leaf, like an umbrella

Larger with stalk attached between lobes of kidney shaped leaf

Distribution

Common in the south-east of England, and spreading to other parts of the British Isles.

Source: NBN Gateway. Check website for current distribution



Floating Pennywort can form dense mats that need to be physically removed



References and further reading:

Blamey, M, Fitter, R and Fitter, A (2003) "The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora." A & C Black

Preston, C D and Croft, J M (1997) "Aquatic plants in Britain and Ireland". Harley Books

Preston, C D, Pearman D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press

Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press

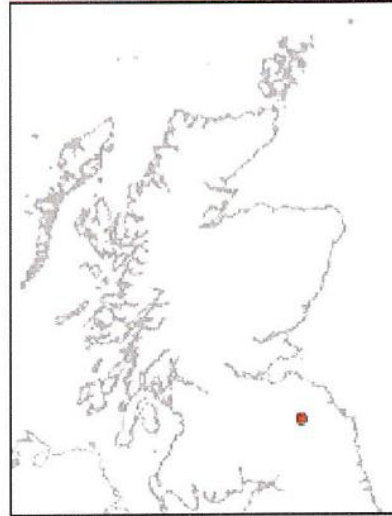
Large Flowered Waterweed (*Egeria densa*)

Species



Large flowered waterweed (*Egeria densa*)
Photo courtesy of Nigel Holmes

Distribution



Impacts

- Out competes native species
- Blocks water bodies

Pathways

- Trade of garden pond plants
- Disposal or escape into the wild
- Can spread through transport of plant fragments

Management

Prevention

Should not be released in the wild. Dispose of garden and pond waste responsibly. Check vehicles, boats, equipment and clothing for plant fragments when leaving infested sites and clean if necessary.

Mechanical Control

Not recommended as spreads through plant fragments

Chemical Control

None attempted

Biological Control

None

Carolina Water-shield

Species Description

Scientific name: *Cabomba caroliniana*

AKA: Fanwort, Tarian-y-dŵr Carolina (Welsh)

Native to: South America and eastern North America

Habitat: Lakes, ponds and fast and slow flowing rivers

Normally occurs as a fully submerged perennial aquatic plant that can grow to 2 metres long, rooting in the bed of the water body. It has finely divided fan-shaped dark green leaves attached to the stem in pairs. Can have a tubular appearance in water due to the way the leaves are arranged under the water. Occasionally it produces small, diamond-shaped, entire, floating leaves borne on the flowering stem. The solitary flowers (less than 2 cm across) range in colour from white to pale yellow occasionally with a pink or purplish tinge. The flowers emerge on stalks at the ends of the stems.

It was first recorded in the Forth and Clyde Canal in 1969 and the Basingstoke Canal in 1990. It is a popular aquarium plant and plants in the wild are probably due to intentional introductions from aquaria. Although it is not widespread in the UK, it has become an invasive weed in many other countries and has become naturalized in North America, India, Japan and Australasia. It could potentially spread in the UK.

Fanwort can form dense stands that can displace native species as well as clog up waterways. It easily spreads via stem fragments which makes management difficult.

Carolina water-shield is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such it is an offence to plant or otherwise cause this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features



Identification throughout the year

Dies back in winter, but can be found submerged throughout the year. Re-growth starts in spring.

Distribution

Only reported at very few locations

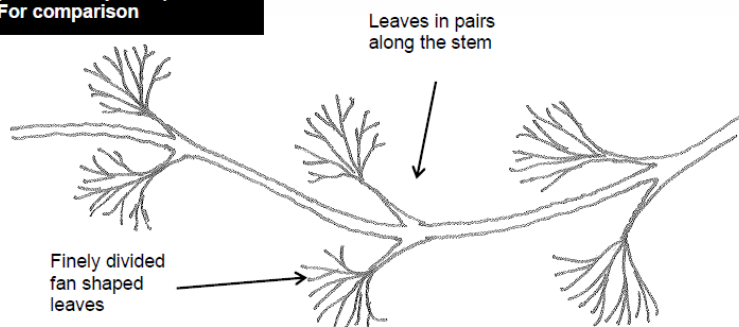
Source: NBN Gateway. Check website for current distribution



Similar Species

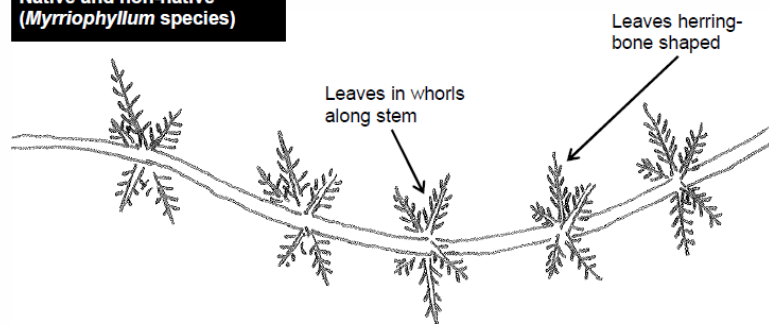
Water-shield species

Non-native
(*Cabomba* species)
For comparison



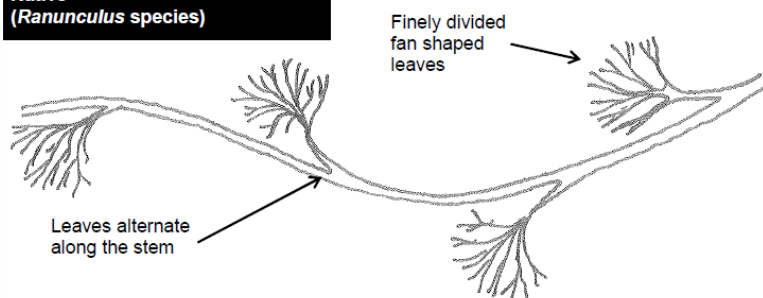
Water-milfoil species

Native and non-native
(*Myriophyllum* species)



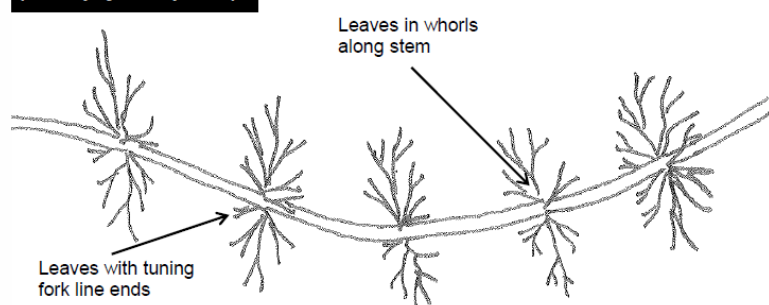
Water Crow-foot species

Native
(*Ranunculus* species)



Hornwort species

Native
(*Ceratophyllum* species)



References and further reading:

Preston, C D and Croft, J M (1997) "*Aquatic plants in Britain and Ireland*". Harley Books

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "*New Atlas of the British and Irish Flora*". Oxford University Press

Stace, C (1999) "*Field Flora of the British Isles*". Cambridge University Press

Photos from: Olaf Booy

Parrot's Feather

Species Description

Scientific name: *Myriophyllum aquaticum*

AKA: Brazilian Watermilfoil and Myrdd-ddail (Welsh), *Myriophyllum brasiliense*, *Myriophyllum proserpinacoides*

Native to: Central and South America

Habitat: Still or slowly flowing water

Emergent growth, blue-green colour and feather-like leaves make this a distinctive water plant. Present year round. Unlikely to be found in fast flowing water.

Aquatic perennial, grows in emergent and submerged form. Both forms are similar in appearance. Most often found in nutrient rich waters. Grown in water gardens in UK since 1878, first recorded in the wild in 1960. Initial spread by improper disposal of garden and aquarium plants. Still found in some garden centres, often under one of its pseudonyms. Spreads by vegetative fragmentation, no seeds are produced in the UK.

Causes flooding by blocking watercourses and drainage channels. Can rapidly dominate a water body displacing native species.

Parrot's feather is listed under Schedule 9 to the Wildlife and Countryside Act 1981 with respect to England, Wales and Scotland. As such, it is an offence to plant or otherwise allow this species to grow in the wild.

For details of legislation go to www.nonnativespecies.org/legislation.



Key ID Features

Changes form depending on the conditions, varying between submerged to emergent foliage. Both forms are similar in appearance. Emergent leaves are stiff, bright green and the most distinctive form. Submerged leaves are more fragile and, after death, decompose quickly.

Leaves bright to blue-grey green

Stem breaks easily, brown roots present around nodes

Leaves form in whorls of 4-6

1cm

Finely divided leaves, feather-like

Forms inconspicuous flowers at base of leaves between May and August. Small (2mm) and white. Can be difficult to see.



Identification throughout the year

Dies down in winter, can be found submerged throughout the year. Emergent shoots appear in spring when the plant becomes more conspicuous. Blue-green colour of leaves is useful for identification. Flowers are present from May to August, but are inconspicuous.

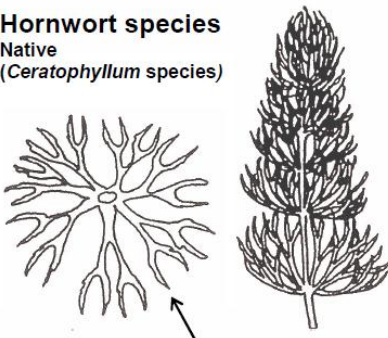
Similar Species

The emergent stems of parrot's feather distinguish it from native water-milfoil species (spiked water-milfoil *Myriophyllum spicatum*, alternate water-milfoil *Myriophyllum alterniflorum* and whorled water-milfoil *Myriophyllum verticillatum*) which are never emergent, although the native species can produce short emergent flower spikes. Parrot's feather is also rarely, if ever, found in fast flowing water, unlike some native water-milfoil species. Submerged parrot's feather is difficult to distinguish from these species and expert assistance may be required.

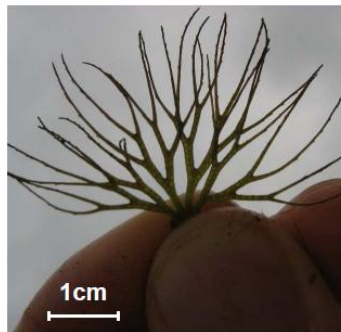
Other species that can be confused with parrot's feather:

Hornwort species

Native
(*Ceratophyllum* species)

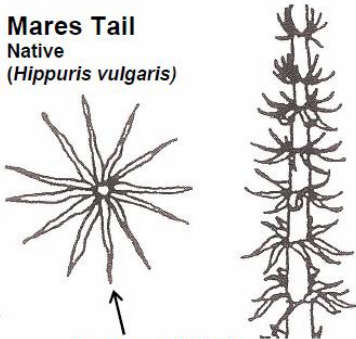


Leaves have 'tuning fork' ends

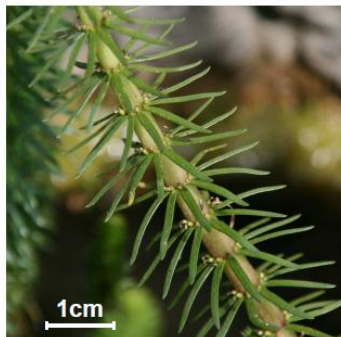


Mares Tail

Native
(*Hippuris vulgaris*)

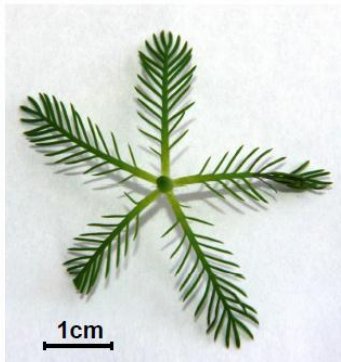


Leaves not divided



Parrot's Feather

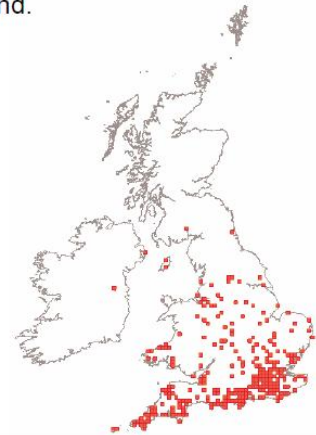
(and other *Myriophyllum* species)
For comparison



Distribution

Mainly a lowland plant. Widespread in south of England, spreading northwards. Rare in Northern Ireland and Scotland.

Source: NBN Gateway. Check website for current distribution



Fanwort

Non-Native
(*Cabomba caroliniana*)

Floating leaves, when present, are linear and inconspicuous, with an alternate arrangement, submerged leaves are finely divided

Leaves in pairs up the stem (not in whorls)



References and further reading:

Blamey, M, Fitter, R and Fitter, A (2003) "The Wild Flowers of Britain and Ireland. The Complete Guide to the British and Irish Flora." A & C Black

Preston, C D and Croft, J M (1997) "Aquatic plants in Britain and Ireland". Harley Books

Preston, C D, Pearman, D A and Dines, T A (editors) (2002) "New Atlas of the British and Irish Flora". Oxford University Press

Stace, C (1999) "Field Flora of the British Isles". Cambridge University Press