



Reducing the likelihood of grey squirrels being transported by sea-ferry traffic between Ireland & North Wales.

LIFE14 NAT/UK/000467 Action C2.

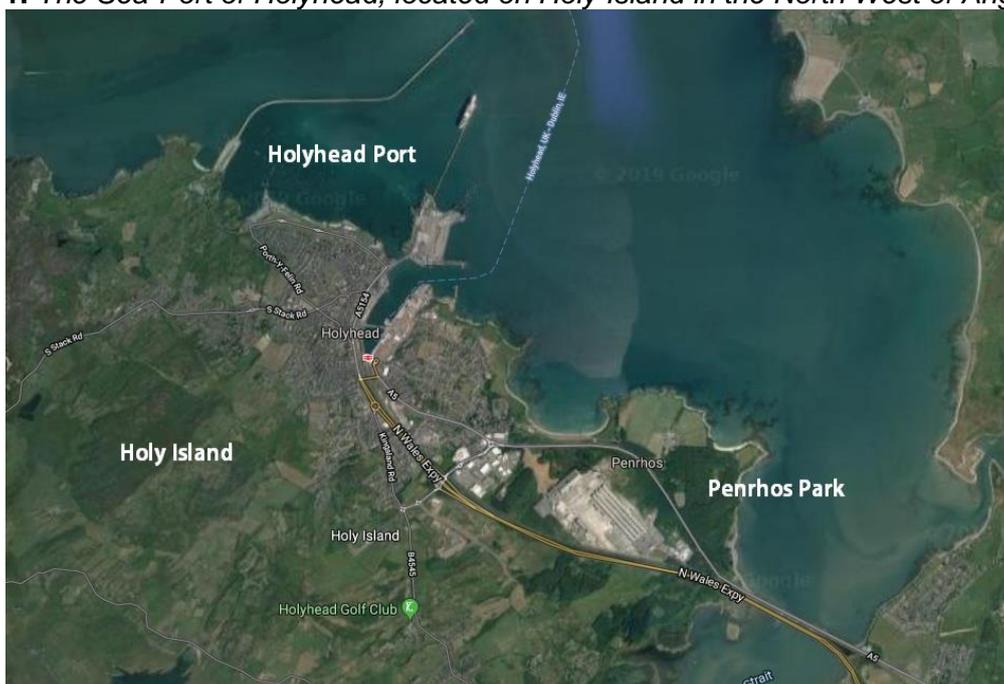
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The global movement of vehicles, passengers and cargo within international shipping is recognised as major pathway for the spread of invasive species (Hulme 2009, Sardain et al. 2019). In this report we examine the risk of grey squirrels (*Sciurus carolinensis*) being accidentally or inadvertently transported from the Republic of Ireland to the Holyhead Port on Holy Island (Anglesey) in North Wales.

In the UK, grey squirrels were eradicated from Anglesey (Jones et al. 2017) and subsequently the Red Squirrels United project (LIFE14 NAT/UK/000467) developed early detection and rapid intervention protocols to prevent grey squirrel re-colonisation of the island landscape (see Robinson & Shuttleworth 2020). The approach facilitated community involvement with local people empowered with the skills, knowledge, equipment and confidence to undertake landscape scale surveillance for grey squirrels and signs of epizootic infection in native red squirrels.

In 2017 a grey squirrel was detected via this volunteer monitoring network in woodland within Penrhos park. The origin of the animal remains unknown. This land is located two kilometres from the Sea-Port of Holyhead with associated road and rail freight transport hubs (Figure 1) and is 6km from the popular South Stack visitor attraction.

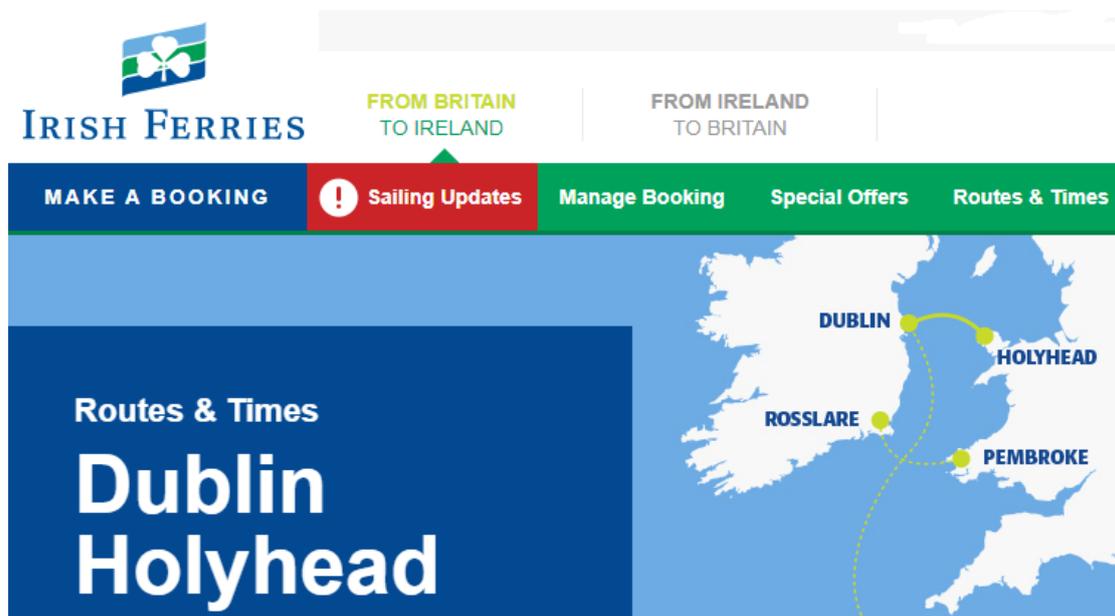
Figure 1. The Sea-Port of Holyhead, located on Holy Island in the North West of Anglesey.





The Sea-Port of Holyhead provides berthing and cargo handling facilities for a range of commercial operations including regular scheduled passenger and vehicle ferries, cruise vessels, tankers, bulk vessels, fishing vessels and military support vessels (Holyhead Port Authority 2019). Both Stena Line™ and Irish Ferries™ each operate a daily service of four commercial sailings on the sea trade route between Dublin and Holyhead (Figure 2). Freight includes cargo within all types of heavy goods vehicles, large commercial vans and smaller domestic vehicles.

Figure 2. Irish Ferries website showing ferry sailing routes between the UK and Republic of Ireland.



Given the fact that this is more than 20km from the nearest extant grey squirrel population on the mainland of Wales, it is likely that the animal arrived via a vehicle rather than dispersing over the Menai Strait. Preventing the spread of grey squirrels in Wales is governed by the EU Regulation 1143/2014 on Invasive Alien Species.

This places a legal responsibility on Member States to act to prevent spread into, and establishment within, states where the grey squirrel is currently absent. In parallel, those Member States where grey squirrels are widely spread, must put in place management measures so that their impact on biodiversity, the related ecosystem services and on the economy are minimised.

In Wales, the Grey Squirrel Management Action Plan for Wales (Welsh Government 2018) neither commits to maintaining Anglesey free from grey squirrels nor contains guidance or recommendations to prevent grey squirrels arriving via shipping, road traffic or rail freight.

This document therefore helps address a policy gap and complements the existing suite of protocols to protect island biodiversity from grey squirrel incursion and population establishment.



Identifying Risk Pathways associated with Holyhead Sea-Port.

Hulme (2009) assessed key variables associated with invasion pathway risks from commercial shipping. These were considered in relation to the grey squirrel using published ecological research (Shuttleworth et al. 2016), noting the proximity of suburban and rural woodland habitats to Holyhead Sea-Port (Table 1, Figure 1) and that Dublin Port is the largest freight and passenger port in Ireland with 38.0 million gross tonnes cargo volume handled in 2018 (Dublin Port Company 2019)

Table 1. Grey squirrel island risk using the invasion pathway approach described by Hulme (2009) for commercial shipping.

Key variables required to assess the risk of unintentional species entry as a result of contaminant, vector or corridor pathways, after EPPO (2007).	Grey squirrel Risk assessment
Strength of association between species and commodity/vector/corridor at point of export	Medium/Low
Volume of the commodity/vector/corridor imported	Low
Frequency of importation	
Species survivorship and population growth during transport/storage	High
Suitability of environment for species establishment in the importing region	High
Appropriateness of the time of year of importation for species establishment	High
Ease of species detection within consignments/vectors/corridors	Medium/Low
Effectiveness of management measures e.g. fumigation, inspection regime	Medium/Low
How widely the commodity/vector is subsequently distributed in the importing region	Low
Likelihood of transfer from the commodity/vector/corridor to a suitable habitat	High/Medium

Strength of association between species and commodity/vector/corridor at point of export

Dublin Port has a main freight hub linking the Irish Republic to the UK and mainland EU. As a result, transported freight originates widely across the Irish Republic and therefore will encompass many locations where grey squirrels are present. Grey squirrels are also present within suburban Dublin and there is therefore a risk that animals enter heavy goods tractor units or trailers if parked for any length of time in the City. There is therefore a Medium/Low association with export commodity corridors.

Volume of the commodity/vector/corridor imported/Frequency of importation

The majority of timber and woodland products shipped are either secondary (e.g. milled boards, baled sawdust, wood pellets) or tertiary products (wooden furniture) rather than primary materials such as rough sawn logs or waste bark and raw timber biomass materials. The low volumes of unprocessed timber material will act to



reduce the likelihood of grey squirrels being transported. However, in 2015 there were proposals by Orthios™ to bring in forest harvesting waste material as bio-fuel direct from North America to Holyhead <https://www.bbc.co.uk/news/uk-wales-34581934>. Although this scheme is currently mothballed, the duration of cargo sailing from Canada to UK of 10-30 days (1stMove 2019) presents a risk where wet cargo is present, and this contains tree cones, buds and other potential food sources for any grey squirrel that maybe present.

Species survivorship and population growth during transport/ storage

The combined boarding and sailing duration from Dublin to Holyhead is around five hours and this is a sufficiently short period for an animal to endure without access to food or water.

Suitability of environment for species establishment in the importing region

The Republic of Ireland shares much of the latitude of North Wales and the prevailing Atlantic weather patterns. Grey squirrels would therefore have experienced the same weather conditions and western Atlantic woodland habitats. Holyhead Sea-Port is adjacent to areas of suburban gardens with patchy woodland suitable for grey squirrel dispersal. The Penrhos Park is continuous with adjacent coastal pine plantation, broadleaved scrub and mature deciduous stands and is only two kilometres from the Sea-Port. There are native populations of red squirrel resident in these habitats. The local environment is highly suitable for grey squirrels.

Appropriateness of the time of year of importation for species establishment

The grey squirrel is a highly invasive species, one that is active throughout the year and which consumes a wide variety of primary (tree seed) and secondary (tree buds, flowers, shoots; fungi; eggs) items. Ferry traffic is continuous throughout the year with daily sailings and therefore is highly favourable in terms of facilitating grey squirrel spread.

Ease of species detection within consignments/vectors/corridors

Grey squirrels are medium sized small mammals and can be difficult to detect when in amongst cargo or in parts of vehicle engine bay. This was demonstrated in December 2016 when a grey squirrel was hit by a car in the mainland Wales village of Llanberis and unbeknown to the driver, the impact had pushed the animal unharmed through the plastic front grill behind which it became trapped. The car owner only realised the animal was trapped because he heard it trying to escape (Figure 3).



Figure 3. Grey squirrel trapped inside car engine bay in a void near the fan cowl. Newspaper reports suggest it took car mechanics several hours to be able to remove the squirrel. © By kind permission Moduron Maethlu Motors



Effectiveness of management measures e.g. fumigation, inspection regime

Commercial ferries do not allow drivers onto the vehicle deck during the sea crossing and when drivers are on the deck it is during a short period after boarding and before disembarking the ferry when there is noise and often engines running. There are staff monitoring the vehicle decks but often the area is noisy with the sound of ferry engine and sea movement. CCTV is present and this would reveal an animal moving on the deck it would obviously not detect concealed animals.

Currently both the Republic of Ireland and the UK are members of the European Union and therefore there are no routine Sea-Port custom checks of goods moving between the two countries. Goods may be inspected where authorities believe they contain illegal materials (contraband) or are otherwise part of crime (e.g. avoidance of tax payments). Therefore, the majority of vehicles and freight are unlikely to be checked either before arriving at their ultimate destination or at a stop on the way there.

There is a truck stop services on Holy Island associated with the Sea-Port and frequent road lay-bys on the main trunk road from the Port which crosses the island. In addition there is a DVLA vehicle inspection area located about 5 kilometres from the Port. None of these areas have fencing that would contain a grey squirrel discovered in a vehicle and which then tried to run into the surrounding environment.

Unless an animal is discovered in a vehicle before it enters a ferry or ship, or if it reveals itself during the sea-crossing and is seen by staff (directly or via CCTV) or a member of the public, the probability of it being detected is low because there are no routine vehicle inspections.



How widely the commodity/vector is subsequently distributed in the importing region

Ferry freight traffic arriving in Holyhead is destined largely for national (UK) and international locations. Only a small proportion of vehicles are bound for island destinations and therefore this contributes a low risk in terms of island invasion pathway.

Likelihood of transfer from the commodity/vector/corridor to a suitable habitat

If a vehicle stops in the Sea-Port, at an Anglesey road check point or in an island layby then there is a high probability that any carried animal which moved out into the wider environment would reach suitable woodland habitat. Grey squirrels can travel several kilometres in a day.

Prevention of stowaways in vehicles

Given the assessment in Table 1. that grey squirrels are hard to detect in vehicles, the challenges of detecting animals during Sea-crossings or after arrival in a Port, the likely survival during the short duration sea crossing and the fact they will encounter favourable conditions in the island environment, a key objective must be to prevent them gaining access to vehicles.

There is a paucity of data relating to the frequency with which grey squirrels stowaway in vehicles or how long they can survive in a vehicle: however it appears to be a rare occurrence. DNA profiling revealed that an animal captured on the Isle of Skye in 2010, had originated from Glasgow and confirmed reports of a squirrel which had stowed away under the bonnet of a car and escaped onto Skye (Signorile et al. 2016). This is a journey of four to five hours duration.

Thus, a key aspect in lowering island invasion pathway risk is to encourage drivers to inspect their vehicles regularly for grey squirrels in Ireland especially where freight is stacked on an open trailer (which is therefore more accessible to animals than curtained trailers).

It is consequently recommended that the UK authorities seek to encourage Irish authorities to implement checks for grey squirrels in vehicles within their jurisdiction which are destined for Dublin Sea-Port .

Improve detection of grey squirrel at Holyhead Port

- To raise awareness of the threat posed by invasive grey squirrels and aid detection, RSTW provided 110 copies of the printed book Shuttleworth & Halliwell (2018) *Red squirrels in my garden: Guidance and tips to help encourage and conserve local populations*. The publication contains details regarding the ecology and impacts of grey squirrels upon European biodiversity; guidance on how to differentiate grey from red squirrels based on



morphological and pelage differences; contacts details for RSTW to facilitate rapid response to grey squirrel detection.

- All Holyhead Port dock workers received a copy of the document.
- Many Holyhead Port staff were members of the RSTW Facebook Group and regularly posted pictures of red squirrels they photographed on Holy Island. These individuals were happy to work as RSTW ambassadors and would encourage family, friends and colleagues to be vigilant in the face of grey squirrel invasion pathway risks.
- If an animal is detected within a Sea-ferry, or at the Sea-Port, the Port Authority can contact the RSTW who would be happy to provide assistance.

Early detection in landscape surrounding the Holyhead Sea-Port

In order to maintain detection vigilance and to initiate early island response to incursion, Red Squirrels Trust Wales will:

- Maintain high public awareness via both traditional and social media of the threat posed to Anglesey island biodiversity from grey squirrels and the need to report all potential sightings.
- In particular, maintain ongoing social media posts in Facebook™ groups relating to Holy Island woodland habitats.
- Maintain the community volunteer network of garden and woodland feeding stations especially those located in Holyhead.
- Continue to offer guidance and support to local volunteers involved in squirrel monitoring.
- Respond quickly to reported potential sightings of grey squirrels in accordance with best practice developed in LIFE14 NAT/UK/000467 Actions A2 & C2 and published in Robinson & Shuttleworth (2020).
- Undertake genetic testing of all captured grey squirrels in order to illuminate the origin of the animal - regional, national (UK) or international (Eire).



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