Marine Aquaculture Pathway Action Plan For The Prevention Of Invasive Alien Species

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Department of Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

An Roinn Talmhaíochta, Comhshaoil agus Gnóthaí Tuaithe

Depairtment o' Fairmin, Environment an' Kintra Matthers

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Glossary

NIEA – Northern Ireland Environment Agency
https://www.daera-ni.gov.uk/articles/northern-ireland-environment-agency

CEDAR - Centre for Environmental Data and Recording
https://www.nationalmuseumsni.org/cedar

AFBI – Agri-food and Biosciences Institute
https://www.afbini.gov.uk/

GBNNSS - GB Non-native Species Secretariat
https://www.nonnativespecies.org/

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Introduction

An **invasive alien species (IAS)** is a plant, animal or other living organism that may be either accidentally or intentionally introduced by man, and which can have a negative ecological or economic impact in an area where it does not naturally occur.

The Department of Agriculture, Environment and Rural Affairs (DAERA) developed this Pathway Action Plan (PAP) with assistance from the Northern Ireland Environment Agency (NIEA). This was developed separately and at a later stage to the other PAPs that NIEA led on but will be consulted on at the same time. The actions of this PAP will be monitored by DAERA Marine and Fisheries Division, along with NIEA and the PAP Working Group.

Background to Action Planning

Reducing the risk posed by pathways of introduction and spread is a key way of tackling IAS. The Invasive Alien Species Strategy (Northern Ireland)[1] calls for the development of PAPs and they are a requirement under the EU Invasive Alien Species Regulation[2] , Regulation (EU) No 1143/2014. They can also form an element of the programme of measures under the UK Marine Strategy[3] and the Environment Improvement Plan[4].

The potential introduction and spread of IAS through marine aquaculture is a significant ecological and economic concern. This PAP addresses the marine aquaculture pathway in Northern Ireland.

Marine aquaculture, including the cultivation of shellfish (e.g. Pacific oysters), finfish (e.g. Atlantic salmon), and seaweed, can inadvertently facilitate the spread of IAS through water exchange, equipment transfer, and stock movement. This PAP details coordinated measures designed to mitigate these risks and minimise the likelihood of IAS introduction or spread.

Scope

This Plan covers marine aquaculture operations in Northern Ireland, including shellfish farming (e.g. Pacific oyster, mussels, scallops), finfish aquaculture (e.g. salmon), and seaweed cultivation. It excludes freshwater aquaculture and recreational angling. The geographical scope is Northern Ireland, with reference to cross-border and international biosecurity concerns.

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1 Invasive Alien Species Strategy (Northern Ireland) | Department of Agriculture, Environment and Rural Affairs
2 Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species
3 The Marine Strategy Regulations 2010
4 Environmental Improvement Plan for Northern Ireland

Rationale

There are currently around 100 invasive non-native freshwater and marine species established in Northern Ireland. In recent decades, the rate of arrival of IAS has accelerated, with many species coming from the Ponto-Caspian region (Central and Eastern Europe). Northern Ireland's coastal waters are already experiencing pressure from several marine IAS, including species such as Pacific oyster (*Magallana gigas*), Japanese wireweed (*Sargassum muticum*), carpet sea squirt (*Didemnum vexillum*) and Japanese skeleton shrimp (*Caprella mutica*). These species can adversely impact marine habitats and species by smothering and outcompeting native species. They can also have detrimental economic impacts on recreational activities such as boating, fishing and other water-based leisure pursuits.

Marine aquaculture in Northern Ireland plays a vital role in food production, economic development, and coastal community livelihoods. However, it also presents a significant pathway for the introduction and spread of IAS and aquatic pathogens. These organisms can be unintentionally introduced through the movement of stock, equipment, vessels, and water exchange, and may become established in local ecosystems with serious ecological and economic consequences.

The rate of arrival of IAS and new marine pathogens has accelerated in recent decades, often linked to global trade and climate change. Marine aquaculture, due to its reliance on open water systems and international supply chains, is particularly vulnerable.

Economic Impacts

The economic impact of IAS on marine aquaculture is multifaceted and increasingly concerning. These species are often introduced through ballast water, aquaculture practices, or climate-driven range shifts, this can significantly disrupt local ecosystems and aquaculture operations.

One of the most immediate effects is increased operational costs. Aquaculture facilities must invest in mitigation strategies such as physical barriers, chemical treatments, and enhanced monitoring systems to prevent or manage IAS outbreaks. These measures not only require capital investment but also ongoing maintenance and labour, straining operational budgets.

Additionally, reduced yields are a direct consequence of IAS competition, predation, and disease transmission. For example, invasive tunicates can smother shellfish beds, while non-native algae may alter water chemistry, affecting growth rates and survival of farmed species. These biological pressures can lead to lower productivity and compromised product quality, impacting profitability.

IAS also pose a risk to international trade. Contaminated shipments may be rejected or subject to stricter biosecurity controls, leading to delays, increased compliance costs, and potential loss of market access. This is particularly critical for regions like Northern Ireland, where aquaculture exports contribute to the local economy.

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In 2021, the estimated cost of IAS to the Northern Ireland economy was £150 million[5], encompassing direct losses in agriculture, aquaculture, forestry, and infrastructure, as well as indirect costs such as ecosystem degradation and reduced tourism appeal. Without effective intervention, including coordinated policy responses, early detection systems, and public awareness campaigns, this figure is expected to rise sharply in the coming years.

Biosecurity measures are essential to mitigate these risks. While legislation such as Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species[6] provides a legal framework, proactive management and sector-wide cooperation are crucial. In 2011 the GB government introduced the Check Clean Dry (CCD) public awareness campaign (Annex 2) aimed at improving biosecurity amongst water users. Northern Ireland, along with all other British Irish Council (BIC) jurisdictions (GB, Ireland, Isle of Man, Jersey and Guernsey) have fully adopted CCD and have adapted the resources from this campaign and promote CCD via the Invasive Species NI website and multiple leafletting campaigns.

This Pathway Action Plan (PAP) outlines targeted actions to strengthen biosecurity within marine aquaculture, raise awareness among stakeholders, and prevent the introduction and spread of IAS and aquatic diseases.

Other Relevant Legislation:

- The Wildlife (Northern Ireland) Order 1985 (as amended)[7]
- Alien and Locally Absent Species in Aquaculture (Northern Ireland) Regulations 2012[8]
- The Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019[9]
- Council Regulation (EC) No 708/2007 concerning use of alien and locally absent species in aquaculture[10]
- Molluscan Shellfish (Control of Deposit) Order (Northern Ireland) 1972 Order[11]

However, legislation alone is not sufficient to manage and lower the risk associated with introducing or spreading IAS. It requires cooperation and collaboration from all concerned, each sector is part of the solution and plays an important role in IAS management and implementing best biosecurity practice. This plan sets out additional actions to help to minimise the risk of introduction and spread of non-native species by the activities of aquaculture operators and/or their associated equipment.

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5 Eschen, R., Kadzamira, M., Stutz, S., Ogunmodede, A., Djeddour, D., Shaw, R., Pratt, C., Varia, S., Constantine, K. and Williams, F., 2023. An updated assessment of the direct costs of invasive non-native species to the United Kingdom. Biological Invasions, 25(10), pp.3265-3276 https://link.springer.com/article/10.1007/s10530-023-03107-2

6 The Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019

7 The Wildlife (Northern Ireland) Order 1985

8 The Alien and Locally Absent Species in Aquaculture Regulations (Northern Ireland) 2012

9 The Invasive Alien Species (Enforcement and Permitting) Order (Northern Ireland) 2019

10 Council Regulation (EC) No 708/2007 of 11 June 2007 concerning use of alien and locally absent species in aquaculture

11 The Molluscan Shellfish (Control of Deposit) Order (Northern Ireland) 1972

Aims and Objectives

Aim: To reduce the risk of IAS introduction and spread via marine aquaculture in Northern Ireland.

Objectives:

1. Promote best biosecurity practices among aquaculture operators.
2. Raise awareness of IAS risks and reporting mechanisms.
3. Ensure compliance with relevant legislation and codes of conduct.
4. Encourage cross-border and international cooperation.
5. Encourage all stakeholders to report records of IAS (existing and new) to CEDaR online, iRecord, NIEA Wildlife Team, Loughs Agency and DAERA Marine and Fisheries Division.
6. Support early detection and rapid response to IAS.

Key Actors

- Northern Irish Government
- DAERA Marine & Fisheries Division
- Northern Ireland Environment Agency (NIEA)
- Loughs Agency
- Agri-Food & Biosciences Institute (AFBI)
- Aquaculture operators and site managers
- Fisheries and aquaculture industry stakeholders
- Local councils and coastal managers
- Marine spatial planning authorities
- Universities and research institutions
- Non-Governmental Organisations and community groups

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Actions

The following actions are designed to reduce the risk of introduction and spread of invasive alien species (IAS) and aquatic pathogens through marine aquaculture activities in Northern Ireland. These actions align with international best practices and support existing legislation and biosecurity frameworks.

Action 1: Port and Border Biosecurity Campaign

DAERA will develop a targeted biosecurity campaign focusing on high risk routes of entry to Northern Ireland through:

- International shipments of aquaculture stock and equipment.
- Inspections of vessels, containers, and aquaculture gear for IAS.

Provide information, guides and training for port and border staff to help identify invasive species or high-risk shipments. Improve capacity (people, equipment and processes) to identify, report and prevent the introduction of suspected new invasive species.

Action 2: Integration of Biosecurity Messaging

Include Check, Clean, Dry (CCD) messaging in:

- Aquaculture licensing and permitting processes.
- Online guidance and application portals.
- Communications with aquaculture operators and suppliers.

Action 3: Cross-Jurisdictional Coordination

DAERA will collaborate with:

- UK government and devolved administrations
- Irish government and EU member states.
- Bord Iascaigh Mhara (BIM)
- British Irish Council (BIC) jurisdictions.

To establish coordinated biosecurity protocols for marine aquaculture, including:

- Shared alert systems for high-risk stock movements.
- Harmonised inspection and quarantine procedures.

Action 4: Biosecurity Protocols for Imports

DAERA will develop a series of biosecurity guidance documents for aquaculture operators to comply with including requirement to provide a biosecurity plan for proposed imports of cultured species to reduce risk of IAS introduction or spread.

Action 5: Licence and Management Agreements

All new and renewed aquaculture site licences must include:

- Mandatory adoption of CCD protocols.
- Site-specific biosecurity plans.
- Provisions for rapid response to IAS (biosecurity plan).

Action 6: Industry Standards and Governance

Marine aquaculture governing bodies will be encouraged to:

- Embed biosecurity clauses in operational guidelines.
- Promote CCD and IAS awareness among members and operators.

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Action 7: Mapping and Monitoring of IAS Hotspots

DAERA will maintain a dynamic list of marine sites with:

- Known IAS presence.
- High risk of spread due to aquaculture activity. This will inform targeted containment and mitigation efforts.
- The potential for IAS to be introduced or become established, identified through horizon scanning

Action 8: Infrastructure and Signage

Aquaculture site owners and managers will be supported to:

- Install wash-down stations and disinfection facilities.
- Display prominent biosecurity signage.
- Provide training and resources for staff and contractors.
- Install new more effective biosecurity measures (brine treatments, flash boiling, Filters, UV techniques etc.)

Action 9: Biosecurity at Industry Events

Organisers of aquaculture conferences, workshops, and trade shows will be asked to:

- Promote CCD and IAS awareness.
- Provide biosecurity equipment displays and demonstrations.
- Maintain research capacity and links with relevant national and international research organisations.

Action 10: Dissemination of Biosecurity Guidance

DAERA will:

- Circulate updated biosecurity guidance and methods to all marine aquaculture operators.
- Provide technical support for implementation and compliance.

Action 11: Reporting and Surveillance Campaign

Launch a campaign to encourage within industry and the general public:

- Consistent reviews of early detection systems.
- Reporting of IAS via CEDaR, iRecord, and iNaturalist.
- Participation in surveillance and early detection programmes.
- Provide a range of information, education and training resources
- Increase public awareness of invasive species risk and reporting methods.

Action 12: Improved Management of High-Risk Species and Pathways

- Develop species and pathway action plans which are consistent with national approaches.
- Review current legislation for high-risk species and their pathways.
- Work with industry to mitigate risk.

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Monitoring and Updating

To ensure the effectiveness of this Marine Aquaculture PAP, a structured monitoring and review process will be implemented. This process will assess progress in reducing the risk of IAS introduction and spread through aquaculture activities.

Annual Review

A dedicated Marine Aquaculture Working Group comprised of internal members and external stakeholders will be convened and meet annually to:

- Evaluate the implementation of biosecurity actions across aquaculture sites.
- Review compliance with CCD protocols and site-specific biosecurity plans.
- Assess uptake of biosecurity measures by aquaculture operators, suppliers, and contractors.
- Monitor the effectiveness of awareness campaigns and training initiatives.
- Share successful mitigation measures and failures to help highlight the best strategies to prevent and limit IAS dispersal.

Six-Year Review

In line with regulatory requirements, this PAP will undergo a comprehensive review every six years. This will include:

- Evaluation of long-term trends in IAS presence and spread.
- Assessment of the effectiveness of cross-border and inter-agency coordination.
- Recommendations for updates to biosecurity protocols, legislation, and stakeholder engagement strategies.

Continuous Improvement

Feedback from aquaculture operators, researchers, and regulators will be used to:

- Refine biosecurity guidance and training materials.
- Identify emerging risks and adapt protocols accordingly.
- Strengthen partnerships across the marine aquaculture sector.

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Annex 1: NI Working/Advisory Group members (TBC)

If agreed, the following membership will take part in further discussions regarding updating, improving and monitoring of this PAP.

- DAERA Marine and Fisheries Division
- NIEA Invasive Non-Native Species Team
- Loughs Agency
- Aquaculture Northern Ireland (formerly Aquaculture Representatives Group)
- Agri-Food and Biosciences Institute – Fisheries & Aquatic Ecosystems
- Local Council Representatives

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Annex 2: Check Clean Dry (CCD) public awareness campaign



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Annex 3: Priority Concern List of Aquatic IAS

List of marine and pathogen species that are a priority concern to keep out of Northern Ireland (NI) and for which there may be a risk of introduction via aquaculture and related activities. Some are already present in NI in low levels but are localised to specific areas. For these species, the aim is to both reduce risk of their introduction and prevent further spread via aquaculture activities. Some species are more widespread and present in Ireland, GB waters and on mainland Europe.

(Those highlighted in red are alert species for NI. Any sightings should be reported immediately through iRecord).

Scientific name	Common Name	Taxon Group	Present in NI	Date first recorded in NI	Notes
Arcuatula senhousia	Asian date mussel	Mollusc	No		
Asparagropsis armata	Harpoon weed	Marine algae	Yes	2016	Present in Narrow Water Keep, Strangford Lough, and two incidences in Belfast Lough.
Asterocarpa humilis	Compass sea squirt	Tunicate	Yes	2017	Recorded at Church Bay; Rathlin Island, Bangor Yacht Club, Strangford Lough, Belfast Lough and Portrush Harbour.
Bonnemaisonia hamifera	A red macroalgae	Marine algae	Yes	2002	Widely spread across the NI coasts
Caprella mutica	Japanese skeleton shrimp	Crustacean	Yes	2009	Localised distribution; Glenarm Marina, Rathlin Island, Strangford Lough and Belfast Lough.

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Caulacanthus okamurae	Pom-pom weed	Marine algae	Yes	2016	Belfast Lough, Strangford Lough, Rathlin and localised sites along the North Coast.
Cercopagis pengoi	Fishhook waterflea	Crustacean	No		
Crepidula fornicata	American slipper limpet	Mollusc	Yes	2009	Only viable population recorded in Belfast Lough.
Diadumene lineata	Orange striped anemone	Cnidarian	Yes	2012	First recorded in Strangford Lough and was since recorded in Carlingford Lough.
Didemnum vexillum	Carpet sea squirt	Tunicate	Yes	2012	Localised distribution in Strangford Lough.
Ensis leei	American jack knife clam	Mollusc	Yes	2016	First recorded in Lough Foyle and has since been recorded in Belfast Lough.
Gracilaria vermiculophylla	A red macroalgae	Marine algae (seaweed)	Yes	2012	First recorded in Dundrum Bay. Now present around the coast.
Grateloupia turuturu	Devil's tongue weed	Marine algae (seaweed)	Yes	2017	Localised to Millbay, Larne Lough and Carrickfergus Marina.
Hemigrapsus sanguineus	Asian shore crab	Crustacean	No		
Hemigrapsus takanoi	Brush-clawed shore crab	Crustacean	No		
Hesperibalanus Fallax	Warm-water barnacle	Crustacean	No		
Mnemiopsis loidyi	Water comb jelly; Sea walnut	Ctenophore	No		
Neogobius gymnotrachelus	Racer goby	Fish	No		
Ocinebrellus inornatus	Japanese oyster drill	Mollusc	No		
Proterorhinus marmoratus	Tubenose goby	Fish	No		
Rapana venosa	Veined rapa whelk	Mollusc	No		

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Rugulopteryx okamurae	Brown seaweed	Marine algae	No		
Sargassum muticum	Japanese wireweed	Marine algae (seaweed)	Yes	2002	Can also tolerate estuarine environments.
Styela clava	Leathery sea squirt	Tunicate	Yes	2008	First recorded in Larne Lough and now present in Belfast Lough and Strangford Lough.
Undaria pinnatifida	Wakame	Marine algae (seaweed)	Yes	2012	Recorded in Glenarm, Carrickfergus, and Carlingford Marinas.
Urosalpinx cinerea	American oyster drill	Mollusc	No		

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