MarESA Report:

Mobile Demersal Trawl in Northern Ireland's Offshore MPAs

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Introduction

Marine Evidence-based Sensitivity Assessment[1] (MarESA) is a framework developed by the Marine Life Information Network[2] (MarLIN) at the Marine Biological Association (MBA) to provide standardised, evidence-based assessments of the sensitivity of marine habitats and species to human pressures.

Species or habitat sensitivity to a particular pressure from a use or activity is determined by combining resistance, resilience and confidence levels. This approach is widely used in UK marine conservation and management to help decision-makers to identify where management action is required to protect sensitive designated features. It is peer-reviewed, transparent and publicly accessible.

Mobile demersal trawling activity currently takes place within the Northern Irish offshore Marine Protected Areas (MPAs) and the Department has a statutory duty to ensure that activities occurring within these sites are not hindered from meeting their conservation objectives (achieving/maintaining favourable condition). Consequently, the Department has applied the MarESA approach to determine whether there is a need for introduction of management measures in the Northern Ireland offshore MPAs.

The three MPAs in the Northern Ireland offshore zone are:

- Pisces Reef Complex SAC[3],
- South Rigg MCZ[4], and
- Queenie Corner MCZ[5].

[1] Marine Evidence based Sensitivity Assessment (MarESA)
[2] MarLIN
[3] Pisces Reef Complex SAC
[4] South Rigg MCZ
[5] Queenie Corner MCZ

Method

MPA feature data were combined with fishing activity data to provide an assessment of vulnerability from which the necessity of management measures was determined. Methods for each step are outlined below.

Biotope and species data were acquired for each MPA from a range of sources: Marine Recorder, Joint Nature Conservation Committee (JNCC), Agi-Food Biosciences Institute (AFBI), academic papers and grey literature.

Pressures relevant to demersal trawling activity were identified from the JNCC Pressures-Activities Database (PAD) v1.5 2022[6].

MarESA sensitivity review assessments from the MarLIN Website (Annex A) provided sensitivity ratings and information for biotopes (EUNIS level 5&6) to the pressures associated with mobile demersal fishing. This information was collated into tables for each MPA; biotope sensitivity to individual pressures was assigned a rank from the following categories: 'Not assessed', 'Not relevant', 'Not sensitive', 'Low', 'Medium', and 'High'.

Where biotope data or sensitivity information was limited e.g. Pisces Reef Complex SAC, the *JNCC Advice on Operations* was used to supplement the assessment. While this advice is produced using a slightly different method (MarLIN), and different categories (Sensitive' and 'Not Sensitive'), this approach was deemed suitable to follow the same procedure outlined in this methodology. As there was no differentiation between the levels of sensitivity this led to more precautionary advice e.g. where Pisces Reef was identified as being 'Sensitive' to a pressure then it was given the same weight as 'High Sensitivity' from a MarESA assessment.

VMS ping data from 2014 to 2023 were explored spatially and temporally using ArcGIS Pro to determine the level of exposure from demersal fishing exerted upon the MPAs and their features. E.g. Low, Medium and High level exposure. Points where a vessel was moving at a speed of 0.5-4.5knots were deemed indicative of fishing activity. Exposure level categories were based on number of pings/km² and thresholds were based on existing literature[7].

[6] JNCC Pressures-Activities Database (PAD) v1.5 2022
[7] Alternative Marine Conservation Zones in Irish Sea mud habitat: Assessment of habitat extent and condition at "Queenie corner" and assessment of fishing activity at potential MCZ sites

Formulas for vulnerability (sensitivity x exposure) were written based on a matrix from the *Marine Conservation Zones in the Northern Ireland Inshore Region Guidance on the Development of Conservation Objectives and Potential Management Options* document[8]. Where a feature was determined to be at moderate level of risk it was advised that changes in management should be considered. Where a feature was determined to be at high level of risk it was advised that there was a need for management action.

Results

Level of Risk to MPA features from Exposure to Fishing Pressures (Mobile Bottom Trawl)			
MPA	**Feature/Site**	**Exposure**	**Vulnerability/Risk**
Pisces Reef Complex SAC (Three sites)	PR1*	Low	Moderate
	PR2*	Medium	High
	PR3*	Low	Moderate
South Rigg MCZ	Subtidal mud	Medium	High
	Subtidal sand	High	High
	Subtidal coarse sediment*	High	High
	Subtidal mixed sediment	Low	Moderate
	Moderate energy circalittoral rock*	Low	Moderate
	Seapen and burrowing megafauna	High	High
Queenie Corner MCZ	Subtidal mud	Medium	High
	Seapen and burrowing megafauna	Medium	High

*MarESA unavailable, JNCC advice on Operations incorporated.

[8] Northern Ireland Inshore Region Guidance on the Development of Conservation Objectives and Potential Management Options

Discussion

Pisces Reef Complex SAC

This MPA is comprised of three separate reef sections: PR1, PR2 and PR3. Fishing within and around the Pisces Reef Complex SAC is mainly otter trawling for *Nephrops* though some beam trawling occurs. The analysis of VMS data identified low exposure to demersal trawling at reef sites PR1 and PR3, and medium exposure at PR2. Although fishing mainly occurred at the SAC edges and between reef features, vessels were operating within 400 m of the reef which is inside a buffer zone that was originally designed to protect the feature from contact with mobile bottom gear[9].

The vulnerability assessment concluded that PR1 and PR3 are moderately vulnerable to fishing pressures, while PR2 is highly vulnerable. Overall, the reef feature faces moderate to high risk from multiple physical pressures, including abrasion, smothering, suspended solids, and seabed disturbance, as well as risks from invasive species, removal of non-target species, and organic enrichment[10].

Ecological evidence indicates that the steep, hard reef surfaces support diverse, fragile suspension-feeding communities which are highly sensitive to mechanical disturbance[11]. Even low levels of fishing nearby can increase suspended sediments and negatively affect reef taxa. Hinchen et al. (2021) documented a negative correlation between increased suspended sediment from demersal fishing activity and the abundance of *Caryophyllia* and cup-shaped sponge species[12]. This relationship persisted even at low levels of fishing activity (as few as five events per year) and when fishing occurred as far as 1 km from the SAC boundary. The sediment veneer areas support assemblages associated with mud, including long-lived burrowing fauna which are vulnerable to trawling impacts. Disturbance can affect burrow stability, sediment structure, and the characteristic species such as *Nephrops*, *Calocaris macandreae*, and *Maxmuelleria lankesteri* are thought to be slow-recovering due to long lives or reproductive traits.

[9] CEND23/16X Cruise Report: Monitoring survey of Pisces Reef Complex cSAC/SCI. JNCC/Cefas Partnership Report Series No. 18.
[10] Pisces Reef Complex MPA: Advice on Operations.
[11] Habitat structure and community dynamics in marine benthic systems
[12] Detecting the impacts on UK sublittoral rock communities of resuspended sediments from fishing activity.

Ongoing demersal trawling, especially around PR2, poses risks to the integrity of both reef and transitional reef habitats. Fishing activity occurs within the 400 m protective buffer around the Annex 1 reef habitat, indicating inadequate protection is in place to mitigate against associated pressures.

The assessment identifies a need for pressures to be reduced/removed, therefore the prohibition of demersal trawling throughout the SAC, though precautionary, would be an appropriate measure to prevent deterioration of the Annex 1 reef feature, to protect its characteristic species, and ensure the site meets its conservation objectives.

Without additional management measures at Pisces Reef SAC, the site conservation objectives will not be achieved, and the Department will not fulfil statutory obligations to protect the Annex 1 reef feature.

South Rigg MCZ

The assessment of South Rigg MCZ indicates variable levels of exposure and sensitivity to demersal trawling, with several protected features identified as highly vulnerable and requiring management action.

Fishing pressure is unevenly distributed across the MCZ. The moderate energy circalittoral rock feature experiences low levels of demersal trawling; however, it is sensitive to pressures[13] and therefore determined to be moderately vulnerable. Its assemblages are likely to comprise fragile sessile fauna such as sponges and soft corals which are vulnerable to indirect impacts. Sediment resuspension caused by trawling in adjacent mud habitats can result in smothering, reduced feeding efficiency, and declines in sensitive species. While direct pressures on this rocky habitat feature are low, a reduction in trawling in the surrounding sediment habitats would offer indirect protection.

The subtidal coarse sediment feature is exposed to high levels of demersal trawling and JNCC advice on operations indicates that this habitat is sensitive to seabed abrasion, penetration, and sediment modification associated with bottom-towed gear. Given the coarse nature of the sediment, it is likely an area subject to higher energy hydrographic conditions

[13] South Rigg MPA: Advice on Operations

which may suggest some capability to withstand disturbance from anthropogenic activities. Despite this, literature has also shown that gear types usually used in this habitat type (towed dredge) can have some of the longest recovery times (3 years +) due to the penetration depth of the gear[14]. Consequently, prohibition of demersal trawling is necessary to remove pressures and support recovery of this feature.

The subtidal mixed sediment feature is characterized by burrowing anemones such as *Cerianthus lloydii* though other mobile scavengers and predators may be present. This feature was determined to be moderately vulnerable to pressures from trawling as despite exposure to fishing being low the feature is sensitive. Burrowing anemones have some protection due to their burrowing habit and protective tubes, however, penetrative gears pose a risk by disturbing the sub-surface sediment. Individuals may be able to recover from smothering, but they may also be removed/damaged/disturbed by contact with gear. Although this feature is particularly sensitive to physical pressures such as changes in sediment composition and subsurface disturbance, given the low levels of fishing occurring, management action should be considered but is not necessarily required at this time.

The subtidal sand feature was assessed as highly vulnerable to pressures from mobile bottom trawling. Physical disturbance can alter sediment structure and lead to shifts in community composition, favouring opportunistic polychaetes over the relatively slower recovering bivalve species such as *Abra alba* and *Nucula nitidosa* which are characteristic of the feature. Shallow burrowing fauna associated with this feature e.g. *Amphiura spp* are vulnerable to gear penetration, with mortality recorded following trawl passes. Although *Owenia fusiformis* can vertically migrate through sediment and survive some smothering, recruitment is sensitive to increased mud content, which can prevent tube construction and lead to high mortality. Consequently, disturbances from mobile bottom trawl may lead to changes in community structure. Given the high level of risk and high exposure to demersal trawling, a prohibition on demersal trawling is recommended to enable ecological recovery of the subtidal sand feature.

The subtidal mud feature comprises biotopes dominated by both burrowing and near surface dwelling species such as *Brissopsis lyrifera*, *Amphiura chiajei*, *Calocaris macandreae*, and *Virgularia mirabilis*, all of which are vulnerable to demersal trawling. Fragile species like *B.*

[14] Response of benthic fauna to experimental bottom fishing: A global meta-analysis.

lyrifera and shallow-living *Amphiura spp*. are easily damaged by gear penetration, leaving them more susceptible to mortality and/or predation. In contrast, sea-pens such as *V. mirabilis* can retract into the sediment however they are still susceptible to physical disturbance. Additionally, burrow-dwelling species including *Nephrops* and *Maxmuelleria lankesteri* may be indirectly affected through alteration of sediment composition. Fragile taxa living near the sediment surface with slow recovery rates are sensitive to mechanical disturbances. Demersal trawling can cause direct mortality or injury through physical disturbance, and lasting changes to sediment structure, with studies showing declines in species richness, abundance, and biomass in trawled mud habitats. Given the high vulnerability of the feature and medium fishing exposure, a prohibition on demersal trawling is advised to remove pressures and support recovery of the feature.

The seapen and burrowing megafauna feature, which extends into both the subtidal mud and sand feature, shows similar sensitivities. Vulnerability assessment results indicate moderate to high risk from physical disturbance, sediment changes, chemical pressures, and species removal. As mentioned above, its characteristic species such as *Virgularia mirabilis*, *Nephrops norvegicus*, brittlestars, and burrowing anemones are sensitive to mobile demersal trawl activity due to their life histories. Given the high vulnerability of the feature, a reduction/removal of pressure through prohibition of demersal trawling is advised to facilitate recovery ecosystem integrity and function.

Several of the MCZ features, particularly subtidal coarse sediment, subtidal sand, subtidal mud, and sea-pen and burrowing megafauna are at high risk from demersal trawling due to a combination of habitat sensitivity and exposure level. The moderate energy circalittoral rock feature is indirectly at risk from sedimentation impacts generated by trawling in the surrounding habitats.

The assessment supports the introduction of targeted demersal trawling prohibitions across the affected features. These measures would prevent further habitat degradation and support the recovery of vulnerable benthic communities by reducing direct physical disturbance and indirect pressures from sedimentation, this would enable the features to meet their conservation objectives.

Queenie Corner MCZ

The assessment of Queenie Corner MCZ determined that protected features were exposed to a medium level of exposure to pressures associated with mobile demersal trawl. Both features' extent coincides with the MCZ boundary and no clear spatial trends in activity were identified.

The biotopes assessed included Seapens and burrowing megafauna in circalittoral fine mud; Burrowing megafauna and *Maxmuelleria lankesteri*; *Brissopsis lyrifera* and *Amphiura chiajei*; and *Levinsenia gracilis* and *Heteromastus filifirmis* in offshore circalittoral mud and sandy mud. All were identified as highly sensitive to demersal fishing pressures. The level of exposure combined with the sensitivity to result in a high level of vulnerability/risk. Of particular concern were pressures relating to subsurface penetration, changes to seabed or sediment type, and removal of non-target species. Additional high risks for the sea-pen and burrowing megafauna feature included contamination from hydrocarbons, synthetic compounds, and heavy metals.

AFBI *Nephrops* burrow density data (2011–2024) indicated consistent presence of the burrowing megafauna biotope at survey station 65, while station 72 showed more inter annual variablility, suggesting possible localised pressures from either environment or fishing. 2024 UWTV surveys confirmed characteristic species such as *Nephrops norvegicus*, *Calocaris macandreae*, and *Virgularia mirabilis*, with a dominance of mobile fauna and limited sessile epifauna—potentially reflecting sensitivity to disturbance.

Characteristic species such as *Brissopsis lyrifera* and *Amphiura chiajei*, which occupy the upper sediment layer and play key bioturbating roles, are highly susceptible to trawl impacts. *B. lyrifera* is easily damaged, and although *Amphiura spp*. can regenerate, they remain vulnerable to recurring disturbance and injury is linked to increased predation. Other muddy biotopes characterised by *Amphiura spp.* are similarly sensitive, with trawl-related mortality of up to 9% per pass. Although, polychaete dominated biotopes may recover relatively faster, offshore assemblages e.g. *Levinsenia gracilis* and *Heteromastus filifirmis* are likely to need longer to re-establish biomass and age structured populations. In general recovery of fauna is likely to be slow following trawl activity due to the stable, low-energy conditions of the environment.

Sea-pen communities (*V. mirabilis*) and burrowing megafauna (*Nephrops*, *Calocaris*, *Maxmuelleria lankesteri*) are able to retract or reside in burrows, but trawl penetration, sediment alteration, and long-life histories mean recovery following disturbance is likely prolonged. Evidence from MarESA refers to reduced abundance, biomass, and diversity in heavily trawled mud habitats compared with untrawled or protected areas.

The subtidal mud and seapen and burrowing megafauna features are highly sensitive to physical disturbance and long-term sediment modification associated with demersal trawl activity, and given the medium exposure to demersal fishing, the features are considered at high risk. A prohibition on demersal trawling throughout the MCZ is recommended to remove pressures, support recovery, and help the feature achieve its conservation objectives.

Conclusion

Overall, the MarESA based assessment demonstrates that mobile demersal trawling poses a significant risk to the ecological integrity of Northern Ireland's offshore MPAs, with multiple protected features across Pisces Reef SAC, South Rigg MCZ, and Queenie Corner MCZ exhibiting moderate to high vulnerability due to the combined effects of feature sensitivity and exposure to pressure. The evidence indicates that continued trawling activity will impede the ability of these sites to meet their conservation objectives by threatening sensitive benthic communities and their long-term recovery. The introduction of management measures (the reduction or prohibition of demersal trawling) in high-risk areas is necessary to ensure statutory obligations are met. Implementation of these measures will reduce pressures and safeguard the biodiversity and functional resilience of these offshore ecosystems. This will prevent further habitat degradation, and support recovery which is essential for achieving and maintaining favourable condition of the designated features.

Annex A: MarESA Reviews Consulted

The following MarESA Biology and Sensitivity Key Information Reviews were consulted to inform the vulnerability assessments in this report.

De-Bastos, E.S.R., 2023. *Owenia fusiformis* and *Amphiura filiformis* in offshore circalittoral sand or muddy sand. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/381

Durkin, O.C., Charalambides, G. & Tyler-Walters, H., 2025. Burrowing megafauna and *Maxmuelleria lankesteri* in circalittoral mud. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/387

De-Bastos, E.S.R., Budd, G.C. & Watson, A.J., 2026. *Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/139

De-Bastos, E.S.R., Harris, O., Watson, A.J. & Tyler-Walters, H., 2025. *Levinsenia gracilis* and *Heteromastus filiformis* in offshore circalittoral mud and sandy mud. In: Tyler-Walters, H. & Hiscock, K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/1108

De-Bastos, E.S.R., Hill, J.M., Harris, O., Watson, A.J. & Tyler-Walters, H., 2025. *Amphiura filiformis*, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/368

Hill, J.M., Tyler-Walters, H., Garrard, S.L. & Watson, A.J., 2023. Seapens and burrowing megafauna in circalittoral fine mud. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/131

Perry, F. & Watson, A.J., 2024. *Synarachnactis lloydii* and other burrowing anemones in circalittoral muddy mixed sediment. In: Tyler-Walters, H. (ed.) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/1091

Tillin, H.M., Budd, G.C., Lloyd, K.A. & Watson, A.J., 2023. *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment. In: Tyler-Walters, H. & Hiscock, K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews [online]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/62

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