Inland Fisheries Ireland

Native oyster (*Ostrea edulis)* dredging impact study

Tralee Bay, Blacksod Bay & Lough Swilly

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Glossary of terms

Abbreviation	Full term
AA	Appropriate Assessment
DAFM	Department of Agriculture, Food and the Marine
DE	Dredge efficiency
HDI	Highest density interval
IFI	Inland Fisheries Ireland
IQR	Interquartile range
MarLIN	Marine Life Information Network
MI	Marine Institute
MLS	Minimum Landing Size
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Service
SAC	Special Area of Conservation
TAC	Total Allowable Catch

1. Introduction

1.1. Project Background

Inland Fisheries Ireland (IFI) is the statutory body responsible for the protection, management and conservation of the inland fisheries resource within the State under section 7 of the Inland Fisheries Act 2010. As part of its statutory functions, IFI administers oyster fishing licences authorising the use of oyster fishing engines within specified fishery districts. Section 277(1) of the Fisheries (Consolidation) Act 1959 makes it an offence to take oysters from an oyster fishery in a fishery district using an oyster fishing engine unless an oyster fishing licence is in force in respect of that engine and authorises its use in that fishery district.

The native oyster fisheries in Tralee Bay, Blacksod Bay and Lough Swilly occur within or in ecological connection with European sites. In exercising its licensing function, IFI is required to comply with the requirements of Article 6(3) of the Habitats Directive and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. This requires Screening for Appropriate Assessment to determine whether the licensed activity, either alone or in combination with other plans or projects, is likely to have a significant effect on a European site. Where likely significant effects cannot be excluded on the basis of objective scientific information, Appropriate Assessment is required before a licensing decision may be made.

IFI identified a requirement for a specific Native Oyster Dredging Impact Study to provide supporting scientific information for the Appropriate Assessment process associated with the proposed licensing of native oyster dredging. AQUAFACT, an APEM Group company, was commissioned to prepare one Dredging Impact Study covering Tralee Bay, Blacksod Bay and Lough Swilly, together with a separate Screening for Appropriate Assessment report for each fishery. Where a Screening report determines that likely significant effects cannot be excluded, a Natura Impact Statement may be required to provide the information necessary to inform Stage 2 Appropriate Assessment for the relevant fishery.

This report provides an evidence-based review of the nature, scale, frequency, duration, persistence and reversibility of the potential effects arising from native oyster dredging on *Ostrea edulis* and its associated benthic community within Annex I habitats. The assessment considered whether the activity could affect the qualifying interests, Special Conservation Interests or conservation objectives of the relevant European sites. Particular regard was given to native oyster populations and *Ostrea edulis* dominated communities. In Tralee Bay, the assessment also considered potential interactions with other sensitive benthic communities, including *Mytilus*, *Zostera* and *Sabellaria* dominated communities, where a credible source pathway receptor relationship was identified.

The assessment reviewed the relevant conservation objectives and supporting documents, the spatial relationship between the proposed dredging areas and protected benthic communities, Marine Institute stock survey data, available fishery management and licensing information, and relevant published scientific evidence. Each fishery was assessed separately, having regard to its regulatory framework, management arrangements, fishing activity, stock condition and relationship with the relevant European sites. Existing management measures were considered when evaluating the activity. Where the available evidence indicated that additional controls may be required, further Fisheries Management Measures were identified for consideration through the Appropriate Assessment and licensing processes.

1.2. Study Objectives and Scope

The purpose of this desktop-based Dredging Impact Study was to provide Inland Fisheries Ireland with an evidence-based technical assessment of the potential effects of licensed commercial native oyster dredging in Tralee Bay, Blacksod Bay and Lough Swilly. The report was prepared to inform the Appropriate Assessment process, including the separate Stage 1 Screening for Appropriate Assessment reports required for each area.

The assessment considered the potential for licensed native oyster dredging to give rise to likely significant effects on the qualifying interests, Special Conservation Interests and Conservation Objectives of the relevant Natura 2000 sites. Particular regard was given to native oyster populations, *Ostrea edulis* dominated communities where identified, associated sedimentary and biogenic communities, and other sensitive habitats and species for which a credible source-pathway-receptor relationship was identified.

The report reviewed the site-specific Conservation Objectives, the mapped relationship between proposed dredging areas and relevant habitats and communities, Marine Institute native oyster stock information, available fishery management and licensing information, and relevant published scientific evidence. It assessed the nature, scale, frequency, duration, persistence, and reversibility of the identified dredging pathways. The assessment also identified limitations arising from the absence of data such as effort and post-dredging ecological response data.

Where the available evidence indicated that potential effects could not be excluded with the required degree of scientific certainty, the report identified fisheries management measures for consideration in subsequent stages of the Appropriate Assessment process.

1.3. Description of the licensed native oyster fisheries

1.3.1. License numbers over time

Commercial native oyster dredging in Tralee Bay, Blacksod Bay and Lough Swilly is undertaken using a nominal four foot dredge, equivalent to approximately 1.22 m in width. The dredge is deployed from the rear or side of a fishing vessel and towed in contact with the seabed to capture native oysters. Publicly available information does not specify the weight, tooth or blade configuration, bag construction, tow speed, tow duration, number of tows or daily operating hours associated with oyster dredging in each bay.

The operating periods and temporal controls differ among the three fisheries. Native oyster dredging in Blacksod Bay occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is low and usually comprises no more than eight fishing days, although a few additional fishing days may occur in some years.

Commercial native oyster dredging in Tralee Bay and Lough Swilly are undertaken from 1st September to 30th April inclusive, with no commercial dredging taking place between May and August. This cessation encompasses the main spawning and larval settlement period for native oysters. The specific opening dates, fishing days and catch controls applied within the wider authorised period are determined through the management of the fishery.

The licensing and management arrangements also differ among the fisheries. The Tralee Bay native oyster fishery is managed under the Oyster Fishery Order for Brandon Bay, Tralee Bay and Ballyheige Bay, 1981. The Order grants the Tralee Oyster Fisheries Society Limited rights to manage and regulate the oyster beds within the defined area. Native oyster dredging in Blacksod Bay operates within aquaculture licensed areas managed by the North Mayo Oyster Development Co-operative and is also subject to individual IFI oyster dredge licensing. Lough Swilly operates as a public native oyster fishery. No Fishery Order, aquaculture licence for the native oyster fishery or implemented statutory fishery management plan is in effect for Lough Swilly, although individual fishers must apply for a IFI oyster dredge licensing and the applicable vessel registration requirements.

Table 1-1 summarises the main management and licensing framework identified for each fishery and is adapted from Tully and Clarke (2012).

Table 1-1: Management orders for relevant dredge oyster fisheries, adapted from Tully & Clarke, 2012.

Site	SAC	Licensing			Other bivalve species
		Aquaculture	Fishery Order	Public fishery	
Tralee Bay	Yes		Yes		
Blacksod Bay	Yes	Yes			
Lough Swilly	Yes			Yes	Mussels, Pacific Oyster

The naturalised Pacific oyster *Magallana gigas* population in Lough Swilly represents an additional ecological pressure on the native oyster population through potential competition for habitat and other resources (Tully and Clarke, 2012; Marine Institute, 2025). It is not a characteristic of the licensed native oyster dredging activity itself and should be addressed in greater detail in the relevant baseline and impact assessment sections.

Table 1-2 presents the annual oyster dredge licence data provided by IFI for the period from 2010 to 2026. Licence numbers indicate the number of operators authorised to participate in a fishery but do not establish the number of active vessels or the intensity of dredging. A licence may not be used during a particular year, while fishing days, numbers of tows, catches and the spatial concentration of activity may vary among licence holders and between years. The licence data were therefore used as an indicator of potential participation and not as a quantitative measure of fishing effort.

Table 1-2: Oyster dredge licences issued by IFI from 2010 to 2026.

Year	Bangor District (includes Blacksod Bay)	Tralee Bay	Lough Swilly
2026	26	79	24
2025	32	79	24
2024	32	79	24
2023	33	79	24
2022	33	79	24
2021	31	79	24
2020	32	79	24
2019	33	79	24
2018	29	79	24
2017	32	79	24
2016	34	79	24
2015	32	79	24
2014	32	78	24
2013	34	78	24
2012	34	78	24
2011	17	78	22
2010	4	0	16

The available licence data for Blacksod Bay relate to the wider Bangor District which includes the Blacksod Bay native oyster fishery. IFI indicated that approximately 70% of licence holders would potentially fish Blacksod Bay. In 2026, this was equivalent to approximately 26 of the 37 licences issued within the Bangor District.

Licence numbers were highest in Tralee Bay, with between 78 and 79 licences issued annually from 2011 to 2026. In Lough Swilly, the number of oyster dredge licences issued increased from 16 in 2010 to 22 in 2011 and 24 in 2012. Licence numbers subsequently remained constant, with 24 licences issued annually from 2012 to 2026. This indicates that potential fishery participation has remained stable over this period

1.3.2. Blacksod Bay

This oyster bed was originally anthropogenically seeded and managed in the 19th century, before lying dormant until the 20th century when fishers from Mayo, Galway and Donegal started fishing the beds in the late 1970s. The native oyster beds within the aquaculture licensed areas of Inner Blacksod Bay are managed by the North Mayo Oyster Development Co-operative. Recent membership numbers are approximately 143 participants. The Co-operative was formed in 1983 in response to concerns regarding overexploitation of the fishery. In 1993 the Co-operative was successful in their application for an aquaculture licence for three areas. Only eligible Co-operative members operating registered vessels and holding an oyster dredge licence issued by Inland Fisheries Ireland may fish within the licensed areas. Available information indicates that the Co-operative may further restrict the areas fished, fishing hours and number of fishing days within the wider period authorised for dredging. Oyster beds have been closed for several years over the course of this fishery, to support stock recovery. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually limited to no more than eight fishing days, although a few additional fishing days may occur in some years. The aquaculture licence numbers for the three zones where native oysters are fished are T10-028A, T10-028B, and T10-028C.

During the 1980s, the Co-operative purchased mussel shell cultch and distributed it across the oyster beds to provide settlement substrate and support recruitment. Bags of mussel shell were also suspended from buoys in areas where oyster spatfall was known to occur. Following settlement, the shell and attached spat were transferred to the seabed. Other measures implemented by the Co-operative included the hand collection of broodstock from shallow areas of the bay and transferring them to deeper water.

The native oyster dredging involves the use of a four-foot dredge, which is fished from the side or back of a boat. The boundaries of the native oyster sites have been redefined based on the findings of a previous Natura

Impact Statement (NIS) assessment carried out in 2017. This report found that the proposed licence areas were incompatible with the conservation of marine habitats and several sensitive marine community types.

Blacksod Bay forms part of the Mullet/Blacksod Bay Complex SAC [000470], which supports a range of marine, coastal, freshwater and terrestrial conservation features. The conservation features particularly relevant to oyster dredging are Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170] (NPWS, 2013a; NPWS, 2014a).

1.3.3. Tralee Bay

The Tralee Bay native oyster fishery is managed under the Oyster Fishery Order (Brandon Bay, Tralee Bay and Ballyheige Bay), 1981, under sections 256 and 260 and subject to section 267 of the Fisheries (Consolidation) Act, 1959 (No. 14 of 1959) and the Foreshore Act, 1933 (No. 12 of 1933). The Order grants the Tralee Oyster Fisheries Society Limited exclusive rights to deposit, propagate, dredge, fish for and take oysters within the area defined by the Order and to maintain and regulate the oyster beds. Commercial fishing is undertaken during a September to April (inclusive) season and is informed by annual Marine Institute stock surveys, catch controls, and supplemented by local experience and historical knowledge of the fishery, as determined by the Society on an annual basis. No commercial dredging takes place between May and August (inclusive) as this is when recruitment is occurring for native oyster. The statutory Minimum Landing Size is 76 mm, while a voluntary Minimum Landing Size of 78 mm is applied within the Tralee Bay fishery as designated by the Society. A total of 79 dredge licences were issued for Tralee Bay in 2026. This number represents authorised participation and does not establish that all of these vessels are licensed.

Tralee Bay forms part of the Tralee Bay and Magharees Peninsula, West to Cloghane SAC [002070]. The conservation features of main relevance to oyster dredging are Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160], Estuaries [1130], and Reefs [1170]. The *Ostrea edulis* dominated community has an indicative mapped extent of approximately 650 ha within the Large shallow inlets and bays habitat and occurs in two main areas; within the inner bay between Fenit and Spa and in the outer bay off Castlegregory, occurring at depths of approximately 0 to 8 m (NPWS, 2014d).

1.3.4. Lough Swilly

Lough Swilly operates as a public native oyster fishery with no statutory fishery management plan in place. The Lough Swilly Wild Oyster Society Limited was established to represent members of the native oyster fishing community and has promoted the conservation and management of the stock since 2000. The proposed Fishery Natura Plan for 2012–2017 recorded 29 members but also confirmed that the Society did not have legal authority to manage the fishery. The plan was not implemented and did not establish a statutory management framework.

Fishers are required to hold an oyster dredge licence issued by Inland Fisheries Ireland, and participating vessels must meet the applicable sea-fishing vessel registration and licensing requirements, but being a member of the Society is not required to fish for native oysters. A total of 24 dredge licences were recorded for Lough Swilly in 2026. This does not establish the number of licence holders actively fishing or the associated dredging effort. The fishery is regulated by the Minimum Landing Size of 76 mm and the season is operated from the 1st of September to the 30th of April (inclusive).

No current Total Allowable Catch, stock linked annual catch limit or equivalent control on native oyster dredging has been identified for Lough Swilly.

Lough Swilly is situated in the northern part of Co. Donegal, with the inner part of the lough designated as the Lough Swilly SAC [002287]. The conservation feature that are most relevant to oyster dredging is Estuaries [1130], as this encompasses the intertidal and subtidal benthic communities within which the fishery operates. A substantial naturalised population of Pacific oyster (*Magallana gigas*) has been established in the lough,

2. Baseline review of Conservation Objectives and Qualifying Interests

The conservation objectives for Lough Swilly SAC, Tralee Bay SAC and Mullet/Blacksod Bay Complex SAC were reviewed to identify the qualifying interests, community types, and conservation targets that may be affected by native oyster dredging. Particular attention was given to the objective to conserve *Ostrea edulis* dominated communities in a natural condition. For Tralee Bay, the assessment considers potential interactions with other sensitive benthic communities, including *Mytilus*, *Zostera* and *Sabellaria* dominated communities, where these overlap with or occur adjacent to proposed dredging areas. The review identified the key ecological attributes that must be maintained, including habitat distribution, community extent, community structure, characterising species, and the requirement to avoid significant or persistent disturbance. Conservation objectives are the site-specific objectives established to maintain or restore the favourable conservation condition of these features.

For the purposes of this assessment, the scope was limited to the effects of commercial native oyster dredging on *Ostrea edulis*, *O. edulis* dominated communities and other relevant benthic communities identified within the Annex I habitat Qualifying Interests of the relevant SACs, including *Zostera*, *Mytilus*, *Sabellaria* and *Serpula* dominated communities. Potential effects on other Qualifying Interests are outside the scope of this report and will be considered in the corresponding Screening for Appropriate Assessment (AA) reports.

2.1.1. Blacksod Bay

Blacksod Bay forms part of the Mullet/Blacksod Bay Complex SAC [000470], which supports a range of marine, coastal, freshwater and terrestrial conservation features. The Annex I habitat Qualifying Interests relevant to this assessment are Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170]. This assessment considered the effects of commercial native oyster dredging on *Ostrea edulis* and relevant benthic communities associated with these habitats. Potential effects on the remaining Qualifying Interests are outside the scope of this report and will be considered in the corresponding Screening for Appropriate Assessment.

The conservation objective for Mudflats and sandflats not covered by seawater at low tide [1140] is to maintain its favourable conservation condition. This requires the permanent habitat area to remain stable or increase, subject to natural processes, and its constituent benthic communities to be conserved in natural condition (NPWS, 2014a). This conservation feature is relevant where dredging occurs within or adjacent to intertidal areas, as bottom towed fishing gear and associated sediment redistribution could disturb sediments and affect the associated infaunal communities (NPWS, 2014c).

The conservation objective for Large shallow inlets and bays [1160] is to maintain its favourable conservation condition, including the extent and natural condition of its constituent communities. These include extensive sand communities and sensitive *Zostera*, maerl and *Serpula* dominated communities (NPWS, 2014a; NPWS, 2014c). These communities are regarded as keystone communities of high ecological importance and low resilience, and significant anthropogenic disturbance to their extent or quality should be avoided (NPWS, 2014c). As this conservation feature encompasses much of the marine environment within which the oyster fishery operates, the spatial relationship between dredging activity and these communities is a primary consideration.

The conservation objective for Reefs [1170] is to maintain its favourable conservation condition, including the extent, distribution and natural condition of its constituent reef communities. These include intertidal reef, sheltered subtidal reef and *Laminaria* dominated community complexes, together with the sensitive *Serpula* dominated community (NPWS, 2014a; NPWS, 2014c). This conservation feature is relevant where dredging overlaps or occurs adjacent to reef habitat, as direct contact or associated sediment redistribution could affect reef structure, attached biological communities and habitat complexity.

Native oyster *Ostrea edulis* is not a qualifying interest of the SAC but is both the target species of the fishery and an ecological component of the bay's benthic communities, identified as a notable species within the Conservation Objectives document. Native oysters have been recorded within sediment communities in the inner bay (NPWS, 2013a; NPWS, 2014c). Oyster removal, incidental mortality and disturbance of shell material or cultch may therefore be relevant to the objective of maintaining these communities in natural condition.

On the basis of the source-pathway-receptor relationships identified above, Large shallow inlets and bays [1160], Mudflats and sandflats not covered by seawater at low tide [1140] and Reefs [1170] require detailed consideration in the subsequent impact assessment. The assessment considers whether the location, extent, intensity, and frequency of oyster dredging, could alter the extent, distribution, structure, function or natural condition of these conservation features such that the applicable site-specific attributes and targets could not be achieved.

Table 2-1 below shows the site-specific conservation objectives and qualifying interests relevant to the dredging impact assessment on *O. edulis*.

Table 2-1: Conservation features of the Mullet/Blacksod Bay Complex SAC [000470] relevant to oyster dredging on *Ostrea edulis*.

Qualifying interests	Relevant benthic communities	Site-specific objective	Potential interaction(s) with oyster dredging
Mudflats and sandflats not covered by seawater at low tide [1140]	Mobile sand with *Bathyporeia guilliamsoniana* community; Sand with *Angulus tenuis* and *Pygospio elegans* community complex	To maintain	Potentially relevant where dredging or associated sediment redistribution interacts with intertidal sediment communities.
Large shallow inlets and bays [1160]	*Zostera* dominated community; Maërl dominated community; *Serpula vermicularis* dominated community complex; Sand with *Angulus tenuis* and *Pygospio elegans* community complex; Sand with *Gastrosaccus spinifer* community complex; Fine sand with *Angulus fabula* community complex; Intertidal reef community complex; Sheltered subtidal reef community complex; *Laminaria* dominated community complex	To maintain	Main SAC receptor because it encompasses much of the marine environment within which the oyster fishery operates and includes sensitive sediment, *Zostera*-, maërl- and *Serpula*-dominated communities.
Reefs [1170]	*Serpula vermicularis* dominated community complex; Intertidal reef community complex; Sheltered subtidal reef community; *Laminaria* dominated community complex.	To maintain	Potentially relevant where dredging overlaps or occurs adjacent to reef habitat and associated communities, through direct seabed contact or sediment redistribution.

2.1.1.1. Spatial relationship between the licensed dredging area and benthic communities

The spatial relationship between the licensed native oyster dredging area and the mapped benthic communities of the Mullet/Blacksod Bay Complex SAC was examined using the NPWS marine community dataset (NPWS, 2025). **Figure 2.1** shows the distribution of mapped benthic community types in Blacksod Bay in relation to the licensed dredging area. This spatial comparison identifies the communities that potentially occur within the area available to the fishery and therefore require consideration in the dredging impact assessment.

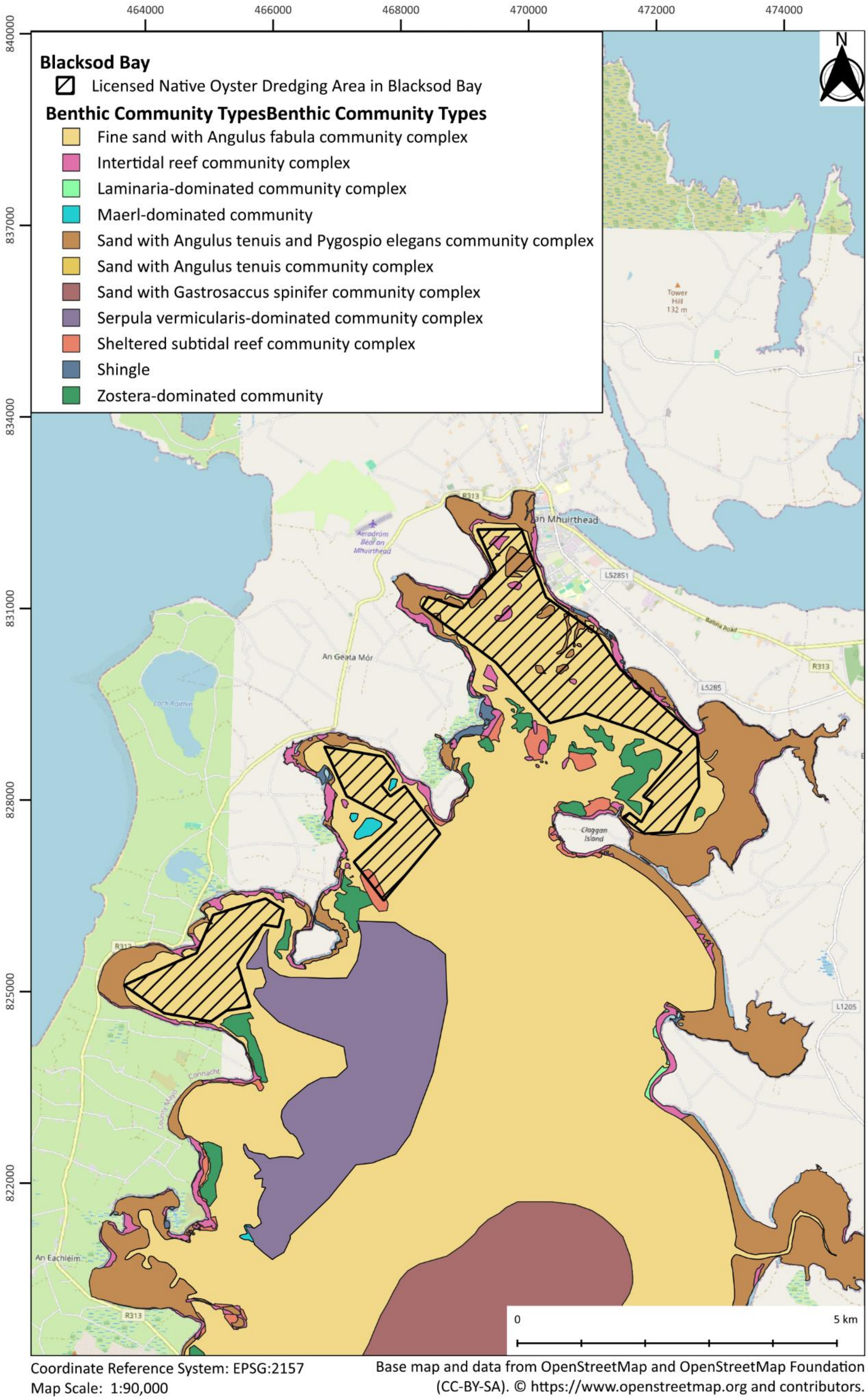


Figure 2.1: Licensed native oyster dredging area and distribution of benthic community types in Blacksod Bay.

Table 2-2 shows the area and percentage cover of mapped benthic community types within the licensed native oyster dredging area in Blacksod Bay. Areas were calculated from the spatial intersection of the licensed native oyster dredging area with mapped benthic community polygons. Percentage cover represents the proportion of the total licensed dredging area occupied by each mapped community type. The total licensed dredging area is approximately 9,499,923 m^2 (9.500 km^2).

Table 2-2: Area and percentage of the licensed native oyster dredging area in Blacksod Bay occupied by each mapped benthic community type.

Benthic Community Type	Area (m^2)	Percentage covered (%)
Sheltered subtidal reef community complex	56077.59	0.59
Intertidal reef community complex	106942.11	1.13
Sand with *Angulus tenuis* and *Pygospio elegans* community complex	351626.11	3.70
Fine sand with *Angulus fabula* community complex	8985276.89	94.58

The licensed native oyster dredging area in Blacksod Bay is predominantly associated with the Fine sand with *Angulus fabula* community complex, which accounts for approximately 94.6% of the licensed dredging polygon. The Sand with *Angulus tenuis* and *Pygospio elegans* community complex represents a further approximately 3.7%, while the Intertidal reef community complex accounts for approximately 1.1%. The Sheltered subtidal reef community complex represents approximately 0.6% of the licensed dredging area.

2.1.2. Tralee Bay

Tralee Bay forms part of the Tralee Bay and Magharees Peninsula, West to Cloghane SAC [002070], which supports a range of marine, coastal, freshwater and terrestrial conservation features. The Annex I habitat Qualifying Interests relevant to this assessment are Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160]. Estuaries [1130] may also be relevant where fishing activity extends into the mapped estuarine habitat, while Reefs [1170] are relevant where the proposed dredge areas overlap mapped Intertidal and Subtidal reef community complexes. This assessment considered the effects of commercial native oyster dredging on *Ostrea edulis* and relevant benthic communities associated with these habitats. Potential effects on the remaining Qualifying Interests are outside the scope of this report and will be considered in the corresponding Screening for Appropriate Assessment.

The conservation objective for Mudflats and sandflats not covered by seawater at low tide [1140] is to maintain its favourable conservation condition. This requires the permanent habitat area of approximately 1,685 ha to remain stable or increase, subject to natural processes. The objectives also require the extent and quality of the *Zostera*, *Mytilus* and *Sabellaria* dominated communities to be maintained, and the sedimentary communities, including the *Ostrea edulis* dominated community, to be conserved in natural condition (NPWS, 2026). This conservation feature is relevant where dredging occurs within intertidal or shallow subtidal areas, as bottom towed fishing gear may disturb sediments and affect the associated benthic communities.

Large shallow inlets and bays [1160] is the conservation feature of significant relevance because it encompasses large amounts of the marine environment within which the oyster fishery operates. Its conservation objective is to maintain its favourable conservation condition, including the permanent habitat area of approximately 10,130 ha and the extent, quality and natural condition of its constituent communities. These include *Zostera*, *Mytilus* and *Sabellaria* dominated communities, sedimentary benthic communities and intertidal, subtidal and *Laminaria* dominated reef communities.

The *Ostrea edulis* dominated community is specifically included among the communities that must be conserved in natural condition. It has an indicative mapped extent of approximately 650 ha within the Large shallow inlets and bays habitat and occurs in two key areas: within the inner bay between Fenit and Spa and in the outer bay off Castlegregory, at depths of approximately 0 to 8 m (NPWS, 2014). As native oyster is the target species of the fishery, the conservation objective for this community is directly relevant to the assessment of oyster removal, incidental mortality, disturbance of shell and cultch, and changes to the associated benthic assemblage.

The *Zostera*, *Mytilus* and *Sabellaria* dominated communities are identified by NPWS as keystone communities of particular ecological importance due to their physical complexity and the habitats they provide for other species. The location of oyster dredging in relation to these communities should therefore be established, particularly where dredging occurs in shallow water or close to the margins of mapped sensitive habitats.

The conservation objectives for Estuaries [1130] and Reefs [1170] are also to maintain their favourable conservation condition. The relevance of Estuaries will depend on whether the fishing footprint overlaps the mapped estuarine habitat or its associated sedimentary communities. Reef habitat is relevant where dredging may contact or occur adjacent to intertidal, subtidal, *Laminaria*, *Mytilus* or *Sabellaria* dominated reef communities. Direct contact could abrade reef surfaces, damage biogenic structures or dislodge attached organisms. Available reef and community mapping is partly based on spatial interpolation and may underestimate small-scale or steeply sloping reef features.

NPWS estimated the mapped extent of the sensitive benthic communities relevant to the proposed dredging areas. Within Large shallow inlets and bays [1160], the Zostera-dominated community complex was estimated at approximately 350 ha, the Mytilus-dominated community at 11 ha and the Sabellaria-dominated community complex at 7 ha. Within Reefs [1170], the Intertidal reef community complex was estimated at approximately 221 ha, the Subtidal reef community complex at approximately 2,499 ha and the Laminaria-dominated reef community complex at approximately 117 ha. NPWS noted that the mapped extent of reef communities is likely to underestimate their actual area because areas of sheer and steeply sloping rock are not fully represented (NPWS, 2014).

Table 2-3 below shows the conservation features, their site-specific objectives, and the potential interaction of oyster dredging on *O. edulis*.

On the basis of the source-pathway-receptor relationships identified above, Mudflats and sandflats [1140] and Large shallow inlets and bays [1160], particularly the *Ostrea edulis* dominated community, are the conservation features with the clearest potential pathways to effects from oyster dredging. The assessment considers the location, extent, intensity, and frequency of dredging in relation to the mapped oyster grounds and other sensitive benthic communities.

Other benthic communities relevant to native oyster dredging include the *Zostera* dominated community complex, *Mytilus* dominated community and *Sabellaria* dominated community complex. These are identified as keystone communities, with conservation targets requiring their extent and high quality to be maintained. The *Zostera* dominated community complex occurs intertidally from Derrymore Island to west of Blennerville, with smaller beds at Spa, Fermoyle and Fahamore, and subtidally between Kilshannig Point, Castlegregory and Scraggane Point. The *Mytilus* dominated community occurs in Inner Tralee Bay between Derrymore Peninsula and Annagh Island, while the *Sabellaria alveolata* reef community is recorded on Derrymore Strand. The Mixed sediment with crustaceans, bivalves and polychaetes community complex and Sand with *Nephtys cirrosa* community complex are also particularly relevant because the *Ostrea edulis* dominated community occurs mainly within the former and extends into the latter in Inner Tralee Bay. The remaining sediment and reef communities are also required to be conserved in natural condition and may be affected where dredging causes direct seabed disturbance or the removal or displacement of characteristic fauna (NPWS, 2014d).

Table 2-3: Conservation features of the Tralee Bay and Magharees Peninsula, West to Cloghane SAC relevant to oyster dredging on *Ostrea edulis*.

Qualifying interest	Relevant benthic communities	Site-specific objective	Potential interaction with oyster dredging
Estuaries [1130]	*Zostera* dominated community complex; *Mytilus* dominated community; Sand to sandy mud with polychaetes and bivalves community complex; Mixed sediment with crustaceans, bivalves and polychaetes community complex; Intertidal reef community complex	To maintain	Potentially relevant where the fishing footprint or associated sediment redistribution interacts with the mapped estuarine habitat or its constituent benthic communities.
Mudflats and sandflats not covered by seawater at low tide [1140]	*Mytilus* dominated community; *Zostera* dominated community complex; *Sabellaria* dominated community complex; Sand to sandy mud with polychaetes and bivalves community complex; Sand with *Nephtys cirrosa* community complex; *Ostrea edulis* dominated community	To maintain	Potentially relevant where dredging or associated sediment redistribution interacts with intertidal areas, including the mapped *Ostrea edulis* dominated community.
Large shallow inlets and bays [1160]	*Mytilus* dominated community; *Zostera* dominated community complex; *Sabellaria* dominated community complex; Sand to sandy mud with polychaetes and bivalves community complex; Sand with *Nephtys cirrosa* community complex; Mixed sediment with crustaceans, bivalves and polychaetes community complex; *Ostrea edulis* dominated community; Intertidal reef community complex; Subtidal reef community complex; *Laminaria* dominated reef community complex	To maintain	Main marine receptor because it encompasses the oyster fishery and includes the *Ostrea edulis* dominated community and other sensitive benthic communities.
Reefs [1170]	*Mytilus* dominated community; *Sabellaria* dominated community complex; Intertidal reef community complex; Subtidal reef community complex; *Laminaria* dominated reef community complex	To maintain	Potentially relevant where dredging overlaps or occurs adjacent to rocky or biogenic reef and reef-associated communities.

2.1.2.1. Spatial relationship between the proposed dredging areas and benthic communities

The spatial relationship between the proposed dredge areas within Tralee Bay and the mapped benthic communities of Tralee Bay and Magharees Peninsula, West to Cloghane SAC was examined using the NPWS marine community dataset (NPWS, 2025). **Figure 2.2** shows the distribution of mapped benthic community types in Tralee Bay in relation to the two proposed dredge areas (Inner Tralee Bay and Ouster Tralee Bay native oyster beds). The two areas were assessed separately as they represent distinct native oyster beds. This spatial comparison identifies the communities that potentially occur within the areas that the Tralee Co-op propose to dredge and therefore these areas are the focus of the dredging impact assessment for Tralee Bay.

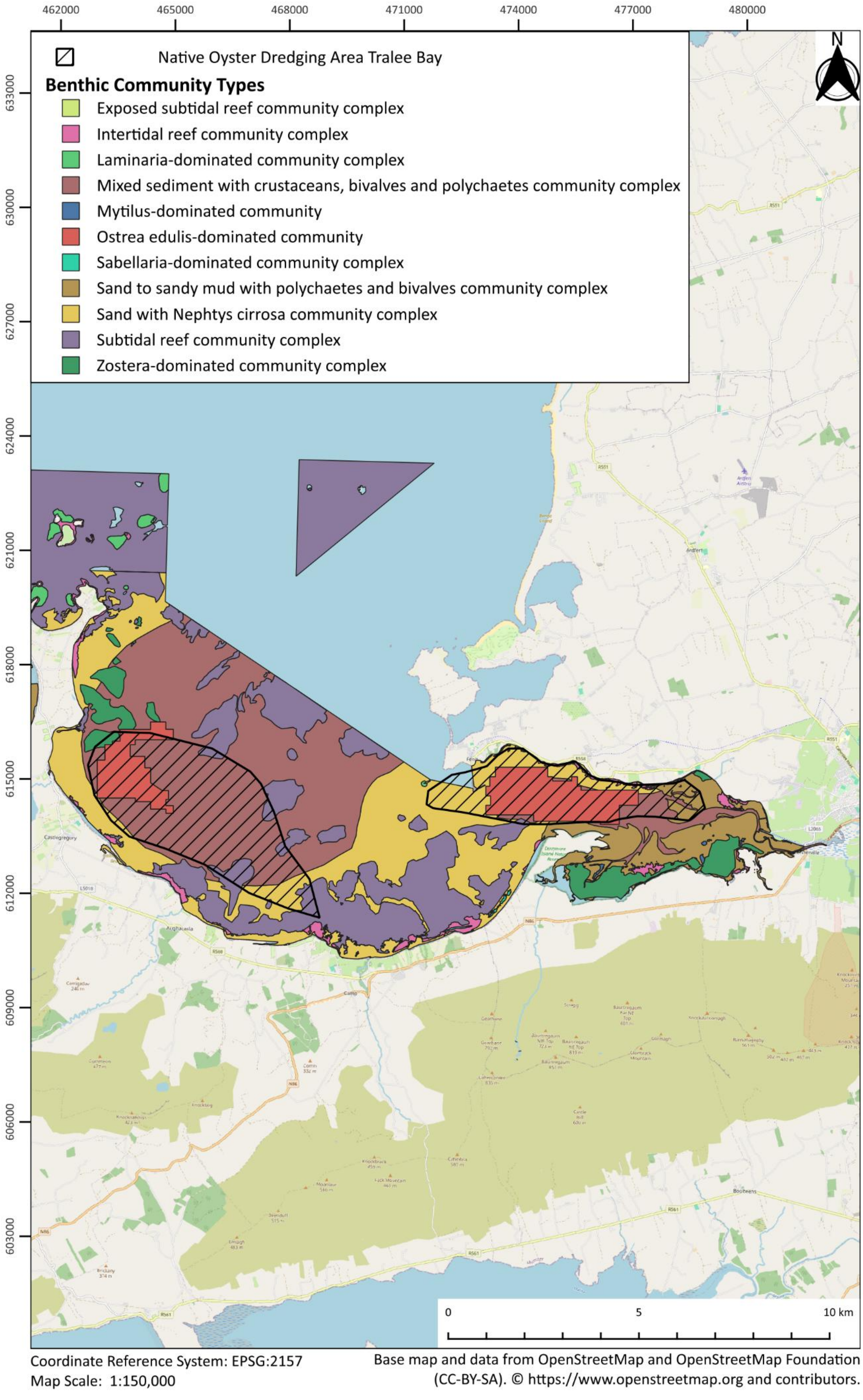


Figure 2.2: Proposed native oyster dredge areas and distribution of benthic community types in Tralee Bay.

Table 2-4 and **Table 2-5** show the area and percentage cover of mapped benthic community types within the proposed dredge areas in Tralee Bay. Areas were calculated from the spatial intersection of each proposed dredge area with mapped benthic community polygons (NPWS, 2025). Percentage cover represents the proportion of the respective proposed dredge areas occupied by each mapped community type. The total proposed dredge area in Outer Tralee Bay is 14,996,187 m^2 (14.996 km^2) and 8,677,270 m^2 (8.677 km^2) in Inner Tralee Bay.

Table 2-4: Area and percentage of the proposed dredge areas in Outer Tralee occupied by each mapped benthic community type.

Benthic Community Type	Area (m^2)	Percentage covered (%)
Sand with *Nephtys cirrosa* community complex	963190.8	6.4
Zostera dominated community complex	110696.5	0.7
Ostrea edulis dominated community	2279720.7	15.2
Mixed sediment with crustaceans, bivalves and polychaetes community complex	10592787.8	70.6
Subtidal reef community complex	1053645.3	7.0

The proposed dredge area in Outer Tralee Bay is predominantly associated with the Mixed sediment with crustaceans, bivalves and polychaetes community complex, which accounts for approximately 70.6% of the proposed dredging area. The *Ostrea edulis* dominated community represents approximately 15.2% of the proposed dredge area in Outer Tralee Bay, while the Subtidal reef community complex and Sand with *Nephtys cirrosa* community complex account for approximately 7.0% and 6.4% of that area, respectively. *Zostera* dominated community complex occupies a comparatively small proportion of the proposed dredge area (~ 0.7%). Similarly, Subtidal reef community complex occupies a comparatively small amount of the proposed dredge area in Outer Tralee Bay (0.4%).

Table 2-5: Area and percentage of the proposed dredging area in Inner Tralee occupied by each mapped benthic community type.

Benthic Community Type	Area (m^2)	Percentage covered (%)
Sand with *Nephtys cirrosa* community complex	2600665.2	30.0
Intertidal reef community complex	124499.6	1.4
Ostrea edulis dominated community	3934797.2	45.3
Mixed sediment with crustaceans, bivalves and polychaetes community complex	1000075.7	11.5
Mytilus dominated community	1091.3	<0.1

Benthic Community Type	Area (m^2)	Percentage covered (%)
Sand to sandy mud with polychaetes and bivalves community complex	726536.6	8.4
Subtidal reef community complex	36476.6	0.4

The proposed dredge area in Inner Tralee Bay has a substantially greater proportional overlap with the *Ostrea edulis* dominated community, which accounts for approximately 45.3% of the proposed dredging area. The Sand with *Nephtys cirrosa* community complex represents approximately 30.0%, while the Mixed sediment with crustaceans, bivalves and polychaetes community complex and Sand to sandy mud with polychaetes and bivalves community complex account for approximately 11.5% and 8.4%, respectively. Smaller areas of Intertidal reef community complex (1.4%), Subtidal reef community complex (0.4%) and *Mytilus* dominated community (<0.1%) also occur within the proposed dredging area.

When expressed relative to the total mapped extent of the corresponding communities within the SAC, the proposed dredge areas overlap approximately 5.6% of the Intertidal reef community complex and approximately 4.4% of the Subtidal reef community complex. The Outer Tralee Bay proposed dredge area also overlaps approximately 3.2% of the Zostera-dominated community complex mapped within Large shallow inlets and bays [1160], while the Inner Tralee Bay proposed dredge area overlaps approximately 0.9% of the Mytilus-dominated community mapped within Reefs [1170]. No mapped overlap occurs with the Sabellaria-dominated community complex or Laminaria-dominated reef community complex. These values represent maximum mapped spatial overlap and do not indicate that the full overlapping area is dredged.

2.1.3. Lough Swilly

Lough Swilly is situated in the northern part of Co. Donegal, with the inner part of the lough designated as the Lough Swilly SAC [002287]. The SAC extends from below Letterkenny to north of Buncrana and supports seven conservation features. The Annex I habitat Qualifying Interests relevant to this assessment is Estuaries [1130], as this encompasses the intertidal and subtidal benthic communities within which the fishery operates. This assessment considered the effects of commercial native oyster dredging on *Ostrea edulis* and relevant benthic communities associated with these habitats. Potential effects on the remaining Qualifying Interests are outside the scope of this report and will be considered in the corresponding Screening for Appropriate Assessment.

The conservation objective for Estuaries [1130] is to maintain its favourable conservation condition. This requires the permanent habitat area of approximately 6,118 ha to remain stable or increase, subject to natural processes. The objective also requires the Fine sand community complex, Intertidal mixed sediment with polychaetes, Subtidal mixed sediment with polychaetes and bivalves, Muddy fine sand with *Thyasira flexuosa*, Mud community complex and *Ostrea edulis* dominated community to be conserved in natural condition (NPWS, 2011a; NPWS, 2011c).

The *Ostrea edulis* dominated community is directly relevant because native oyster is the target species of the fishery. This community occurs both intertidally and subtidally and is concentrated in the southern part of the lough, extending from Ballygreen Point and Ballymoney Point southwards to Ardrumman and Ballylawn Point, with a smaller area recorded at Ballykenny Point (NPWS, 2011c). Oyster removal, incidental mortality and disturbance of shell, cultch and associated sediments may therefore be relevant to the objective of conserving this community in natural condition. The location, intensity and frequency of dredging should also be considered in relation to the other sediment communities through which the oyster beds extend.

On the basis of the source-pathway-receptor relationships identified above, Estuaries [1130], particularly the *Ostrea edulis* dominated and associated sediment communities, represents the SAC conservation feature with the clearest potential pathway to effects from oyster dredging.

Among the other constituent communities, the Intertidal mixed sediment with polychaetes and Subtidal mixed sediment with polychaetes and bivalves communities are particularly relevant because the *Ostrea edulis* dominated community occurs within both. The intertidal community extends along much of the western shore from Rathmullan to Ardrumman, around Inch Island and along sections of the eastern shore. The subtidal community occurs in the central and southern parts of the SAC, including Fahan Creek, the head of the lough and the subtidal slopes west of Inch Island. The Muddy fine sand with *Thyasira flexuosa* community extends from Ramelton to the southwestern margin of Inch Island, while the Mud community complex occurs within the inner estuarine shores of Fahan Creek, Ramelton Channel and the head of the lough. The Fine sand community complex is largely confined to the northern part of the SAC. Each community is subject to the conservation target requiring its natural condition to be maintained and may be affected where dredging causes direct seabed disturbance or the removal or displacement of characteristic polychaete and bivalve fauna (NPWS, 2011c).

Table 2-6: Conservation features of the Lough Swilly SAC relevant to oyster dredging on oyster beds.

Conservation feature	Relevant benthic communities / habitat associations	Site-specific objective	Potential interaction with oyster dredging
Estuaries [1130]	Fine sand community complex; Intertidal mixed sediment with polychaetes; Subtidal mixed sediment with polychaetes and bivalves; Muddy fine sand with *Thyasira flexuosa*; Mud community complex; *Ostrea edulis* dominated community.	To maintain	Main SAC receptor because it encompasses the oyster fishery and includes the *Ostrea edulis* dominated and associated sediment communities.

2.1.3.1. Spatial relationship between the licensed dredging area and benthic communities

The spatial relationship between the licensed native oyster dredging area and the mapped benthic communities of Lough Swilly SAC was examined using the NPWS marine community dataset (NPWS, 2025). **Figure 2.3** shows the distribution of mapped benthic community types in Lough Swilly in relation to the licensed dredging area. This spatial comparison identifies the communities that potentially occur within the area available to the fishery and therefore require consideration in the dredging impact assessment.

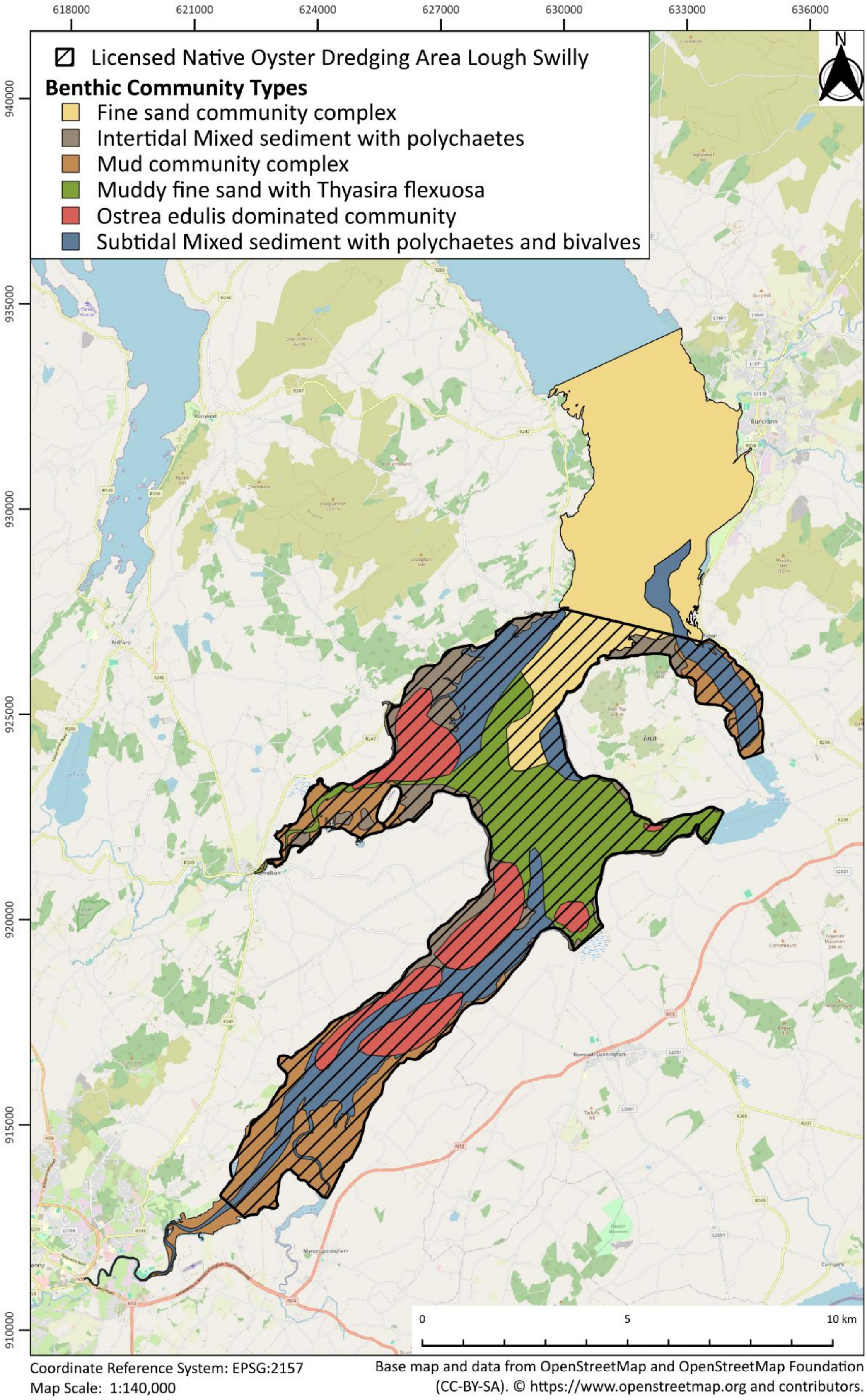


Figure 2.3: Licensed native oyster dredging area and distribution of benthic community types in Lough Swilly.

Table 2-7 shows the area and percentage cover of mapped benthic community types within the licensed native oyster dredging area in Lough Swilly. Areas were calculated from the spatial intersection of the licensed native oyster dredging area with mapped benthic community polygons. Percentage cover represents the proportion of the total licensed dredging area occupied by each mapped community type. The total licensed dredging area is approximately 55,412,665 m^2 (55.413 km^2).

Table 2-7: Area and percentage of the licensed native oyster dredging area in Lough Swilly occupied by each mapped benthic community type.

Benthic Community Type	Area (m^2)	Percentage covered (%)
Intertidal Mixed sediment with polychaetes	5646535.3	10.2
Ostrea edulis dominated community	9061121.5	16.4
Mud community complex	9962519.0	18.0
Subtidal Mixed sediment with polychaetes and bivalves	12641014.7	22.8
Fine sand community complex	4737912.2	8.6
Muddy fine sand with *Thyasira flexuosa*	13135155.3	23.7

The licensed native oyster dredging area in Lough Swilly overlaps a range of sedimentary benthic communities. The largest proportion is occupied by the Muddy fine sand with *Thyasira flexuosa* community, which accounts for approximately 23.7% of the licensed dredging area, followed by the Subtidal Mixed sediment with polychaetes and bivalves community at approximately 22.8%. The Mud community complex represents approximately 18.0%, while the *Ostrea edulis* dominated community accounts for approximately 16.4% of the licensed dredging area. The Intertidal Mixed sediment with polychaetes and Fine sand community complexes account for approximately 10.2% and 8.6%, respectively.

The overlap with the *Ostrea edulis* dominated community is of particular relevance because native oyster is the target species of the fishery and this community is specifically identified within the site-specific conservation objectives for Estuaries [1130] as requiring conservation in natural condition. The licensed dredging area also overlaps extensively with the other sedimentary communities forming part of the Estuaries conservation feature. The spatial overlaps identified here provide the basis for the subsequent assessment of potential dredging effects in relation to the relevant conservation objectives and community-specific sensitivities.

2.2. Marine Institute Native Oyster Survey data

2.2.1. Historical context

Native oyster (*Ostrea edulis*) stocks were historically much more widespread and productive around the Irish coast than they are today. Oyster fishing in Ireland has been documented since at least the 1500s, and important oyster fisheries formerly occurred at approximately 50 locations around the coast. National production peaked during the mid- to late nineteenth century, driven particularly by the large offshore Irish Sea fishery and the Galway Bay fishery. Reported production from the main Arklow and Galway beds reached approximately 34–38 million oysters annually in 1863–1864, followed by a marked decline during subsequent decades (Tully & Clarke, 2012). By the early twentieth century, several formerly prolific public beds, including those in Cork, the Shannon, Clew Bay and Blacksod Bay, were already producing relatively small quantities.

The causes of the long-term decline have varied among locations and cannot be attributed to a single pressure. Historical overexploitation and poorly regulated fishing contributed to the depletion or loss of some stocks, while environmental variability, severe winter mortality, habitat loss, disease and, more recently, introduced species have also affected stock productivity and persistence. *Bonamia ostreae*, first detected in Ireland in the late 1980s, has subsequently become an important source of mortality in a number of oyster-producing areas. Tully and Clarke (2012) emphasised that these pressures act on populations in which spawning, larval settlement and recruitment can already be highly variable, thereby increasing the risk that mortality exceeds the capacity of depleted populations to replenish.

The present distribution of native oysters is therefore considerably reduced relative to this historical range. The largest remaining stocks occur in Inner Tralee Bay, Galway Bay, Cill Chiaráin Bay, Bertraghbuoy Bay, Clew Bay, Blacksod Bay and Lough Swilly. Biomass is currently low relative to historical levels in most areas, with Inner Tralee Bay representing the main exception and supporting the majority of the national native oyster biomass and harvest tonnage (Marine Institute, 2025). This concentration of national biomass in Inner Tralee Bay was already evident during the Marine Institute surveys undertaken between 2010 and 2012, when more than 80% of the native oyster biomass recorded across the main surveyed stocks occurred in Inner Tralee Bay, despite the bed representing only a relatively small proportion of the total surveyed area (Tully & Clarke, 2012). Biomass estimates from those surveys were approximately 982–1,329 tonnes in Inner Tralee Bay, compared with approximately 124 tonnes in Lough Swilly, 99 tonnes in Outer Tralee Bay and 25 tonnes in Blacksod Bay.

The earlier surveys also demonstrated that commercial native oyster stocks are typically spatially heterogeneous. Oyster densities were generally below 0.5 oysters m^{-2} across much of the surveyed grounds, with commercially important concentrations occurring in relatively discrete patches rather than uniformly across the wider area in which oysters were present. Inner Tralee Bay differed substantially from the other surveyed stocks, supporting localised densities of up to approximately 50 oysters m^{-2} (Tully & Clarke, 2012).

Native oyster populations are also characterised by episodic rather than consistently annual recruitment. The 2010–2012 surveys indicated relatively regular recruitment in Inner Tralee Bay and Lough Swilly, but less frequent recruitment in several other stocks, including Blacksod Bay. This is consistent with the wider ecology of *O. edulis*, for which successful replenishment depends on the interaction between sufficient spawning-stock density, favourable environmental conditions during spawning and larval development, and the availability of suitable settlement substrate. Young-of-the-year oysters are also poorly represented in dredge surveys, meaning that recruitment signals become clearer as cohorts grow into sizes that are more effectively retained and detected during subsequent surveys (Tully & Clarke, 2012).

Population density itself is important to reproductive potential. *O. edulis* fertilisation depends on sperm released by neighbouring oysters, and very low adult densities may reduce fertilisation success. Tully and Clarke (2012) identified low stock density as a potential constraint on recovery in depleted oyster populations, particularly where recruitment is already irregular. Maintaining sufficiently dense spawning aggregations is relevant both to fishery productivity and to the resilience of oyster populations.

The condition of the seabed is similarly important to oyster persistence and recovery. Native oyster populations in Irish estuaries occur in dynamic environments subject to variation in salinity, sedimentation, temperature and physical disturbance. Tully and Clarke (2012) describe oyster habitat in terms of a "shell budget", whereby the development and maintenance of shell-rich habitat depends on shell accumulation exceeding shell loss. Where spawning potential is sufficiently high, recruitment occurs regularly and physical disturbance and mortality remain sufficiently low, dead shell can accumulate and increase seabed complexity and the availability of hard settlement surfaces for oyster larvae. Conversely, loss or fragmentation of shell material, sedimentation and reduced habitat complexity can constrain settlement and subsequent stock recovery.

Although *O. edulis* is capable of forming structurally complex biogenic reef habitat, well-developed topographic native oyster reefs have not been documented in Irish shallow-water oyster fisheries during the modern period. Tully and Clarke (2012) noted, however, that the main Irish oyster beds have been subjected to fishing and other pressures for centuries, making it difficult to determine their pre-exploitation structure. Historical offshore beds in the Irish Sea produced very large numbers of oysters and may have supported extensive, relatively continuous oyster cover, but their original physical structure and ecological function are poorly documented. Present-day oyster-bed condition should therefore not necessarily be regarded as representing an undisturbed ecological reference state.

Native oyster fisheries are currently managed primarily through a statutory minimum landing size of approximately 76–78 mm, which oysters generally attain at approximately four to five years of age, although sexual maturity typically occurs at smaller sizes. Management arrangements vary among fisheries. In many areas, authority has been devolved to local oyster co-operatives through Fishery Orders or aquaculture licences, and fisheries may additionally be controlled through seasonal openings, limits on dredge permits and local quotas or total allowable catches (Marine Institute, 2025).

Native oyster stocks continue to face several pressures in addition to fishery removals, including *Bonamia ostreae* infection, environmental conditions affecting habitat suitability and, in Lough Swilly for example, competition with naturalised Pacific oyster (*Magallana gigas*). Marine Institute surveys in 2011 found Pacific oyster to be widespread and abundant within areas historically occupied by native oyster, although Pacific oyster tended to dominate more intertidal areas while native oyster was relatively more common towards channel margins and shallow subtidal areas (Tully & Clarke, 2012). *M. gigas* has subsequently persisted as a major component of the Lough Swilly oyster assemblage and supports a commercial fishery (Marine Institute, 2025).

2.2.2. Data sources, survey methods and data limitations

Marine Institute (MI) oyster survey data were reviewed to characterise the current condition of the native oyster stocks in Tralee Bay, Lough Swilly and Blacksod Bay. The analysis focused on three complementary lines of evidence relevant to the subsequent dredging impact assessment: stock biomass, oyster size structure and the recent spatial distribution of biomass within the oyster beds. Inner and Outer Tralee Bay were treated as separate stock units because they support spatially distinct oyster beds and are presented separately in the annual Shellfish Stock Review reported by the MI (Marine Institute, 2025).

For Lough Swilly, equivalent information for Pacific oyster (*Magallana gigas*) was also examined because this naturalised species occurs extensively within former and existing native oyster habitat and represents an important additional pressure on *Ostrea edulis* in Lough Swilly.

The analysis used oyster survey datasets supplied by the MI, supplemented by information reported in the annual Shellfish Stocks and Fisheries Review series and the earlier national assessment of native oyster stocks by Tully and Clarke (2012). MI oyster surveys are undertaken using locally appropriate oyster dredges. Current stock reviews apply a dredge-efficiency coefficient of 35% to raise survey catches and estimate stock biomass, with biomass estimated using a geostatistical framework that accounts for spatial autocorrelation in the survey data (Marine Institute, 2025). The raised biomass estimates and associated 95% highest density intervals (HDIs) supplied by the MI were used for this assessment.

Annual biomass data for *O. edulis* were available for Inner Tralee Bay for 2018–2025, Outer Tralee Bay for 2020–2026. Annual biomass data for *O. edulis* and *M. gigas* were available in Lough Swilly for 2021–2026, although not every stock was surveyed in every year. Biomass data for *O. edulis* was only available for 2011 in Blacksod Bay. Raw oyster shell-length measurements were available for the corresponding Tralee and Lough Swilly surveys and for Blacksod Bay in 2011.

For each native oyster stock, shell-length measurements were summarised in 5-mm size classes and expressed as the percentage of measured oysters within each annual survey. Median and interquartile shell lengths were also calculated. Oysters <55 mm were used as a descriptive indicator of the smaller/juvenile component of the surveyed stock, while oysters ≥76 mm represented the component at or above the statutory Minimum Landing Size (MLS) for *O. edulis*. These thresholds are used as stock-structure indicators and should not be interpreted as direct estimates of annual recruitment or spawning-stock biomass.

Some limitations apply to the available survey data. Survey coverage in Inner Tralee Bay and Lough Swilly generally encompasses almost all of the known commercial oyster stock. Outer Tralee Bay is more spatially complex, with a patchier oyster distribution and areas of overlap or close association with seagrass. Consequently, the area surveyed has varied appreciably between years and more recent years of the survey encompass the full extent of the Outer Tralee oyster bed. Biomass per surveyed square kilometre was therefore considered alongside total biomass for Outer Tralee Bay.

The spatial survey outputs were designed to characterise biomass within the known oyster grounds rather than precisely identify the outer boundary of the oyster bed in each year. As a result, annual spatial layers cannot be used to infer small changes in bed extent, expansion, contraction or movement through time. The most recent available spatial biomass surface for each stock is instead used in this assessment to describe the contemporary distribution of biomass and its spatial relationship with the dredging license area and neighbouring benthic habitats.

Changes in biomass or size structure cannot in isolation be attributed to dredging. Native oyster populations are influenced by recruitment variability, natural mortality, food availability, temperature, salinity, disease, invasive and non-native species and fishery removals. The stock evidence presented below is therefore used to describe stock condition and biological context for the separate assessment of dredging impacts.

The MI survey data was interpreted using the following indicators (Table 2-8).

Table 2-8 Summary of Marine Institute oyster stock indicators for Blacksod Bay, Inner and Outer Tralee Bay and Lough Swilly, including raised biomass estimates, biomass per surveyed area and native oyster size-structure indicators.

Indicator	Use in this assessment	Interpretation
Raised biomass estimate	Describes the relative abundance and recent trajectory of each surveyed stock	Provides evidence of lower or higher stock biomass through the available survey series
Biomass per surveyed area	Provides additional context where the area surveyed varies between years	Particularly relevant to Outer Tralee Bay, where total survey coverage has changed
Shell-length distribution	Describes the representation of small, intermediate and large oysters	Used as a descriptive indicator of recruitment, cohort structure and retention of larger oysters
Oysters <55 mm	Descriptive indicator of the smaller/juvenile component	A high proportion indicates substantial representation of recently recruited/small oysters
Oysters ≥76 mm	Describes the proportion of measured oysters at or above the MLS	Indicates representation of the larger, harvestable component of the stock
Latest spatial biomass surface	Describes the contemporary distribution of biomass within the surveyed oyster grounds	Used to identify where biomass is concentrated and its relationship with dredging areas and sensitive habitats

2.2.3. Inner Tralee Bay

The MI survey data identifies Inner Tralee Bay as the largest of the stocks assessed in terms of native oyster biomass. Recent surveys show a reduction in biomass following 2023, but the size distributions continue to contain both small oysters indicative of recruitment and a larger component at or above the MLS. These characteristics provide important context for assessing the effect of fishery removals and repeated dredging on stock condition and replenishment.

2.2.3.1. Annual *O. edulis* Biomass over time

Inner Tralee Bay supported substantially greater native oyster biomass than the other stocks examined. Within the supplied 2018–2025 series, raised biomass estimates ranged from approximately 410 tonnes to 1,619 tonnes. Considering the most recent sequence, biomass increased from 617 tonnes in 2021 to 801 tonnes in 2022 and 891 tonnes in 2023, before declining to 503 tonnes in 2024 and 409.8 tonnes in 2025. The 2025 estimate was therefore approximately 54% lower than the 2023 estimate and was the lowest estimate within the supplied 2018–2025 dataset.

Mean biomass per surveyed area showed the same recent pattern, declining from 198.4 tonnes km^{-2} in 2023 to 101.4 tonnes km^{-2} in 2024 and 85.9 tonnes km^{-2} in 2025. The lower recent total biomass therefore reflects a lower estimated biomass within the surveyed stock area rather than being explained by a substantial reduction in survey coverage.

Table 2-9 Annual raised biomass trends for Inner Tralee Bay 2010-2025 (Marine Institute, 2025).

Year	Month of survey	Survey area (km^2)	Biomass (tonnes)	Biomass (tonnes km^{-2})
2010	September	4.26	982	230.54
2011	September	3.57	631	87.03
2012	February	3.80	655	85.02
2013	September	3.76	506	66.33
2014	September	3.80	1,265	164.16
2015	September	4.51	409	44.78
2016	September	3.66	901	121.44
2017	September	4.28	843	197.08
2018	September	3.92	1,161	296.17
2019	October	3.70	879	237.57
2020	September	5.32	1,618	304.14
2021	September	4.05	617	152.35
2022	September	4.55	801	176.04
2023	September	4.49	891	198.44
2024	September	4.96	503	101.41
2025	September	4.76	409	85.90

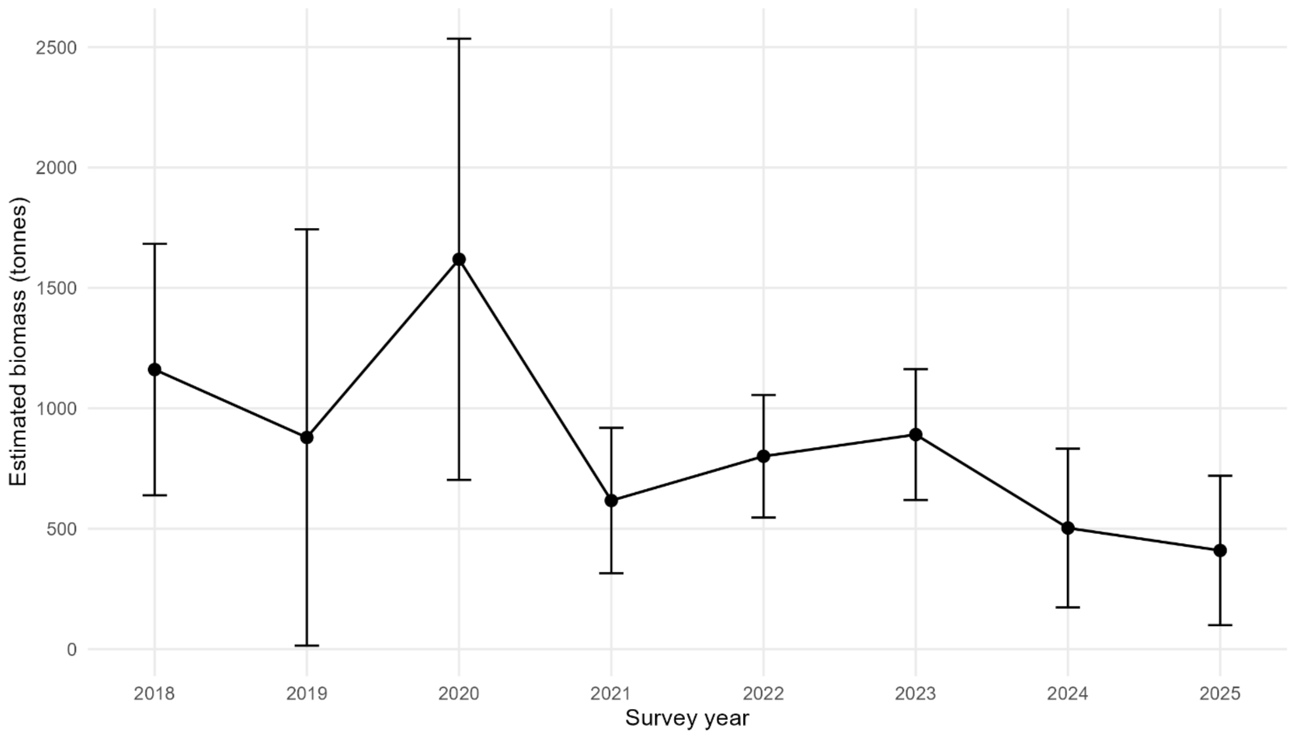


Figure 2.4 Marine Institute raised native oyster (*Ostrea edulis*) biomass estimates for Inner Tralee Bay. Error bars show 95% highest density intervals (HDIs).

2.2.3.2. Size distribution of *O. edulis* over time

The Inner Tralee Bay size distribution data demonstrate substantial interannual variation in the relative contribution of small and large oysters. Between 2018 and 2022, oysters < 55 mm generally represented approximately 39–51% of measured oysters, while 9–17% were ≥76 mm. The stock shifted towards larger size classes in 2023, when the median shell length increased to 69 mm, only 15.4% of measured oysters were <55 mm, and 26.1% were ≥76 mm.

Smaller oysters became more prominent again during 2024 and 2025. In 2025, median shell length was 64 mm, 31.1% of measured oysters were <55 mm and 17.0% were ≥76 mm. The recent size structure therefore indicates continued representation of small oysters, consistent with ongoing recruitment, while a component of larger oysters has also been retained within the stock. The increase in the small-oyster component following the larger size structure observed in 2023 is consistent with recurrent recruitment rather than a stock composed predominantly of a single ageing cohort.

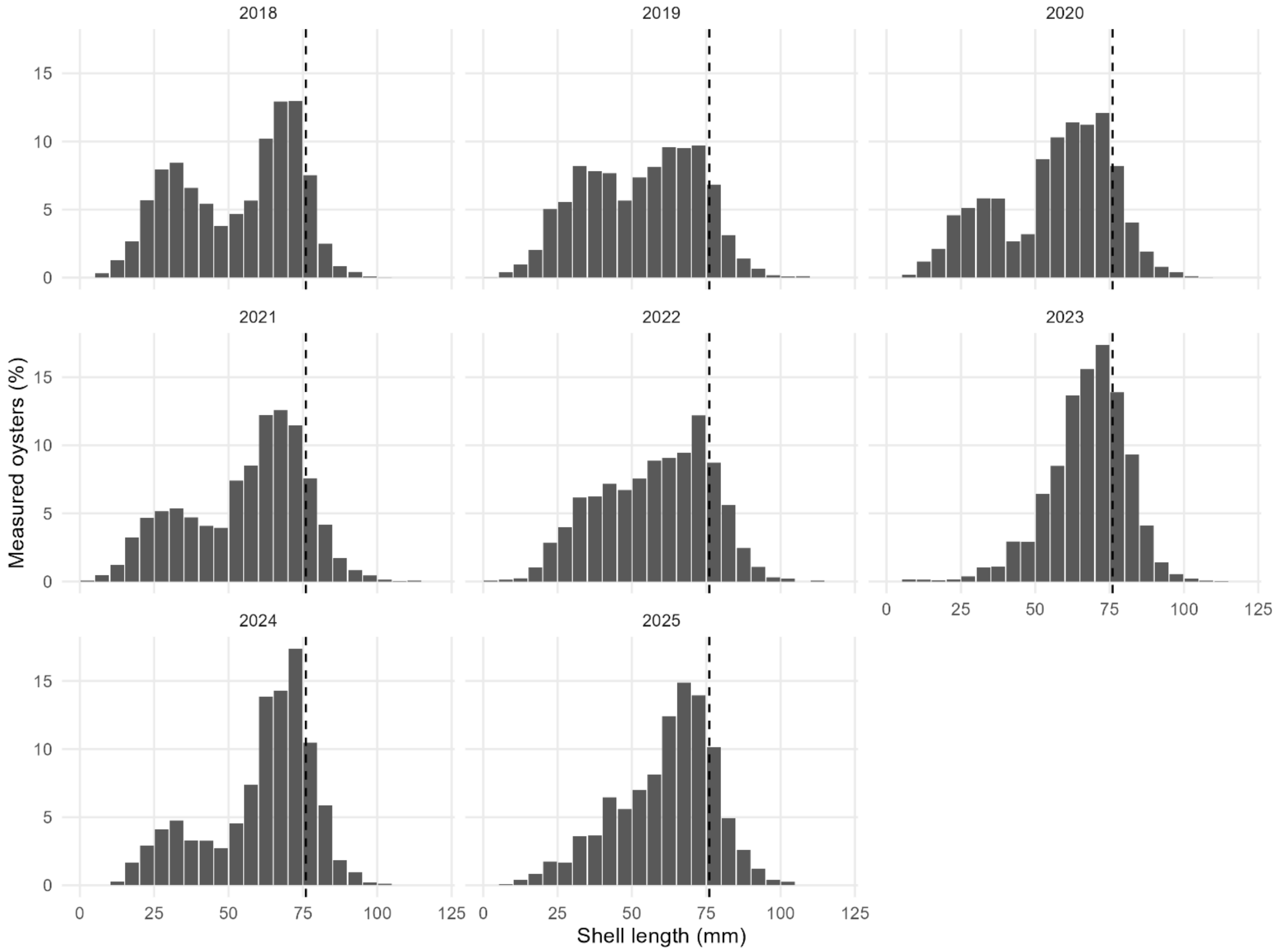
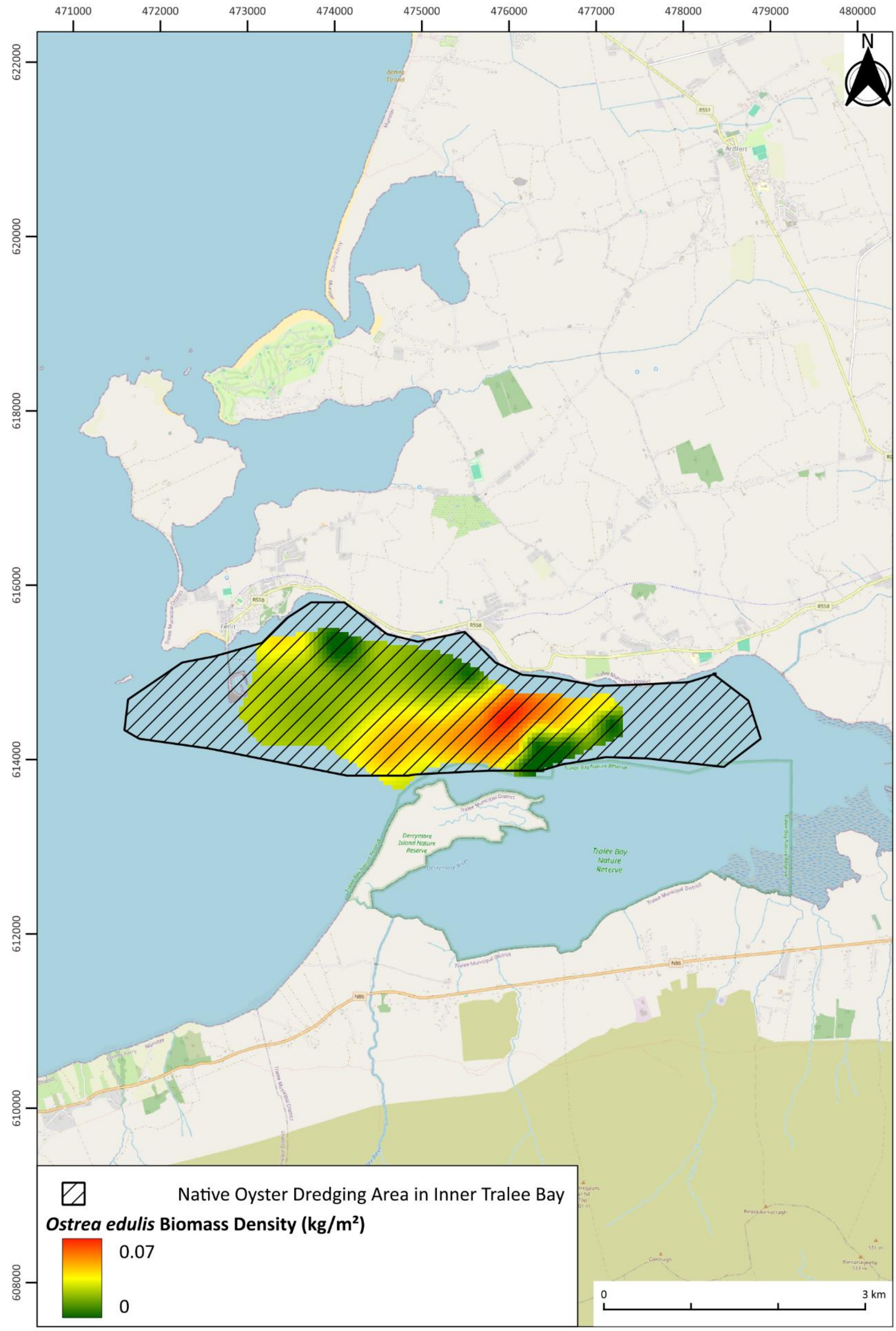


Figure 2.5 Annual shell-length distributions of native oyster (*Ostrea edulis*) measured during Marine Institute surveys of Inner Tralee Bay. The dashed line indicates the 76-mm minimum landing size.

2.2.3.1. Spatial distribution of *O. edulis* in Inner Bay

The latest available Marine Institute spatial biomass data show that native oyster (*Ostrea edulis*) biomass is unevenly distributed within both the Inner Tralee Bay oyster grounds (**Figure 2.6**). The estimated *O. edulis* biomass ranges from approximately 0 to 0.07 kg/m².

The highest biomass was concentrated in the central to eastern part of the surveyed ground, where values approached 0.07 kg/m². A further area of relatively high biomass occurred towards the south-central part of the ground. Lower biomass was recorded mainly in the north-central area and towards the south-eastern margin. Overall, biomass was unevenly distributed, with localised areas of higher biomass within the wider oyster ground.



Coordinate Reference System: EPSG:2157
Scale: 1:65,000

Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors.

Figure 2.6: Latest available (2025) biomass density spatial distribution data for native oyster (*Ostrea edulis*) within the surveyed Inner Tralee Bay oyster grounds (provided by the Marine Institute).

2.2.4. Outer Tralee Bay

The most recent Outer Tralee surveys show an increase in biomass per surveyed area during 2026 together with a marked dominance of small oysters in the size distribution. This provides evidence of recent stock replenishment, while the comparatively small proportion of oysters ≥76 mm indicates that much of the current stock has not yet progressed into the larger harvestable size classes.

2.2.4.1. Annual *O. edulis* Biomass over time

Total raised biomass in Outer Tralee Bay was estimated at 150.9 tonnes in 2020, 86.0 tonnes in 2021 and 83.7 tonnes in 2023. The estimated total decreased to 48.4 tonnes in 2025 before increasing to 107.1 tonnes in 2026.

Interpretation of total biomass alongside the surveyed area provides additional information on this trajectory. Survey coverage was approximately 8.0–9.1 km² during 2020–2023 but 4.7 km² in 2025 and 5.56 km² in 2026. Mean estimated biomass per surveyed area was 16.8 tonnes km^{-2} in 2020, 10.8 tonnes km^{-2} in 2021, 9.2 tonnes km^{-2} in 2023 and 10.3 tonnes km^{-2} in 2025. It increased to 19.3 tonnes km^{-2} in 2026, the highest value in the time series. The 2026 survey therefore indicates an increase in oyster biomass within the area surveyed relative to the preceding surveys, with total estimated biomass more than doubling between 2025 and 2026.

Table 2-10 Annual raised biomass trends for Outer Tralee Bay 2020-2025 (Marine Institute, 2025).

Year	Month of survey	Survey area (km²)	Biomass (tonnes)	Biomass (tonnes km^{-2})
2020	September	9.0	151.0	16.78
2021	September	8.0	86.0	10.75
2022	–	–	–	–
2023	January	9.1	83.7	9.20
2024	–	–	–	–
2025	February	4.7	48.44	10.30

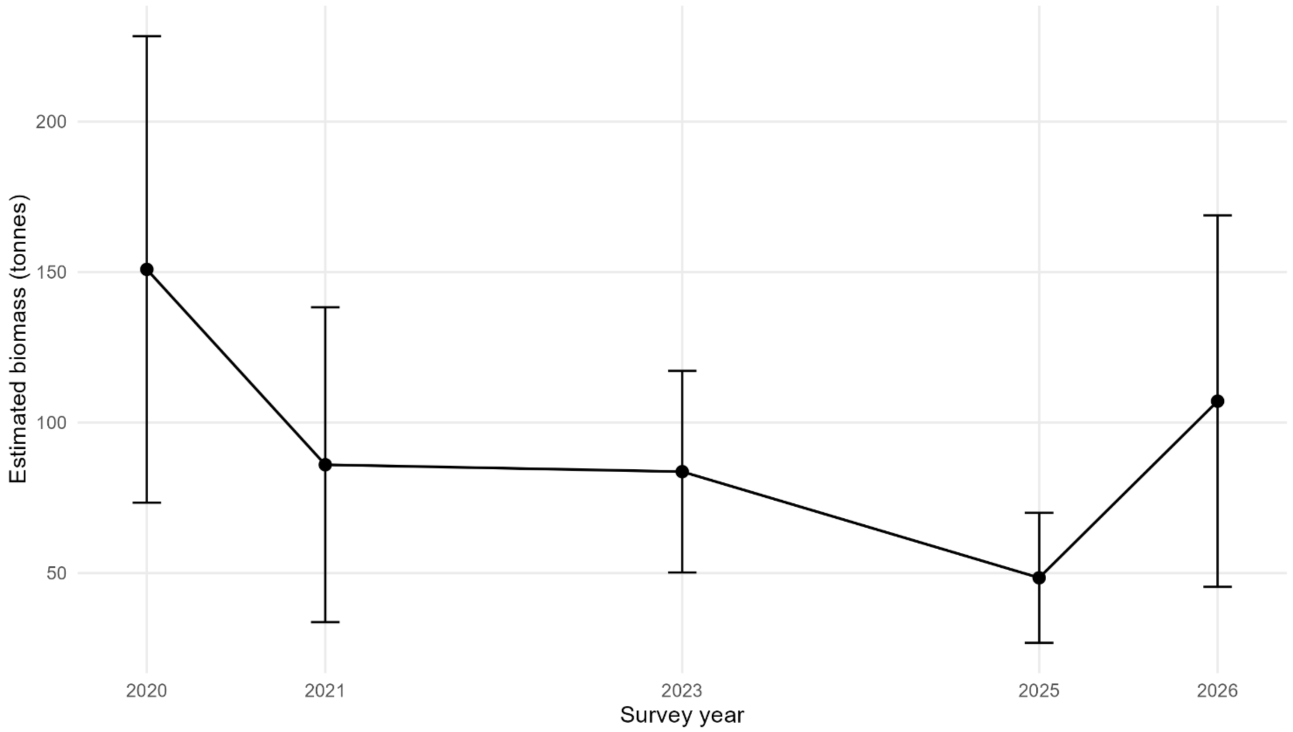


Figure 2.7 Raised native oyster (*Ostrea edulis*) biomass estimates for Outer Tralee Bay, 2020–2026. Error bars show 95% highest density intervals (HDIs).

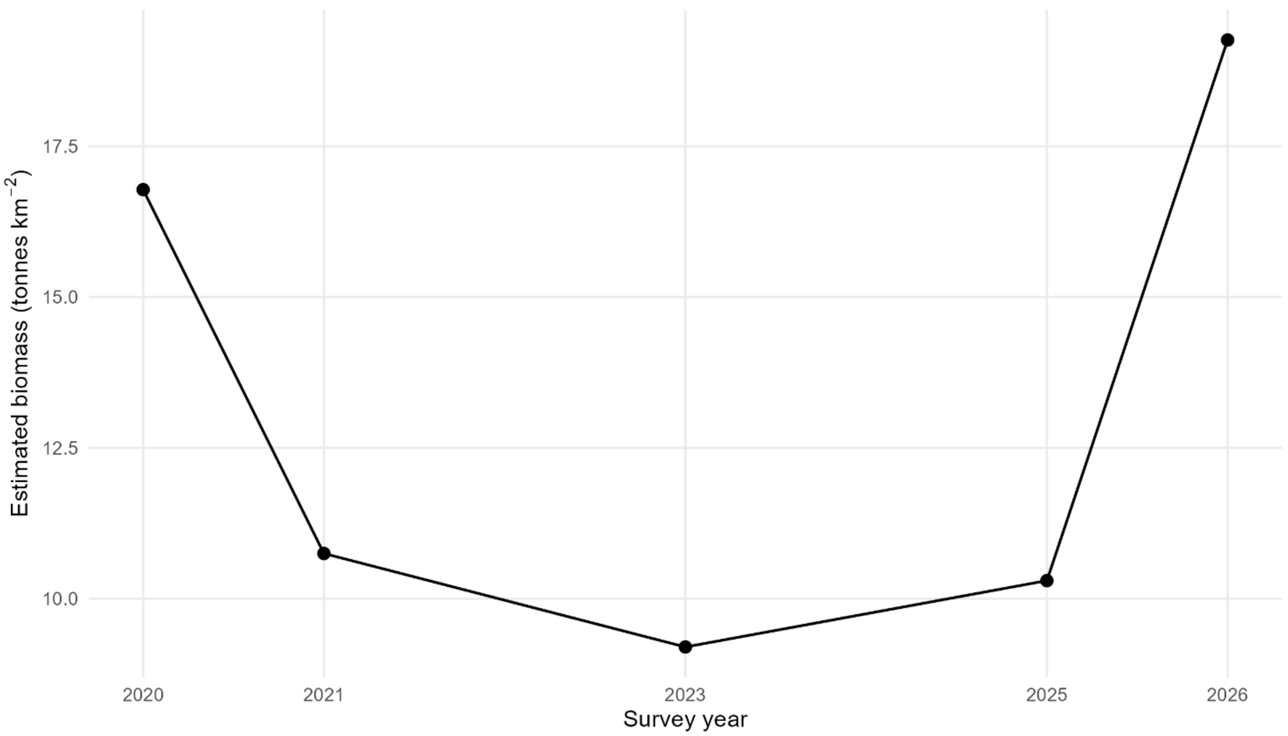


Figure 2.8 Mean estimated native oyster (*Ostrea edulis*) biomass per surveyed square kilometre in Outer Tralee Bay, 2020–2026.

2.2.4.1. Size distribution of *O. edulis* over time

A pronounced shift towards smaller oysters occurred in the two most recent Outer Tralee surveys. Between 2020 and 2023, median shell length was approximately 64–65 mm, 34–40% of measured oysters were <55 mm and approximately 29–32% were ≥76 mm.

In 2025, the median shell length decreased to 35.5 mm and 61.2% of measured oysters were <55 mm. This pattern became still more pronounced in 2026, when the median shell length was 32 mm, 65.9% of oysters were <55 mm and only 11.6% were ≥76 mm. The 2026 distribution contained particularly strong representation of very small oysters, including a prominent mode below approximately 15 mm.

The 2025 and 2026 surveys therefore provide a strong recent recruitment signal, with the stock currently containing a high proportion of small oysters. At the same time, the proportion of oysters at or above the MLS has decreased relative to the 2020–2023 surveys. Survival and growth of these smaller size classes will consequently be important to future replenishment of the larger oyster component.

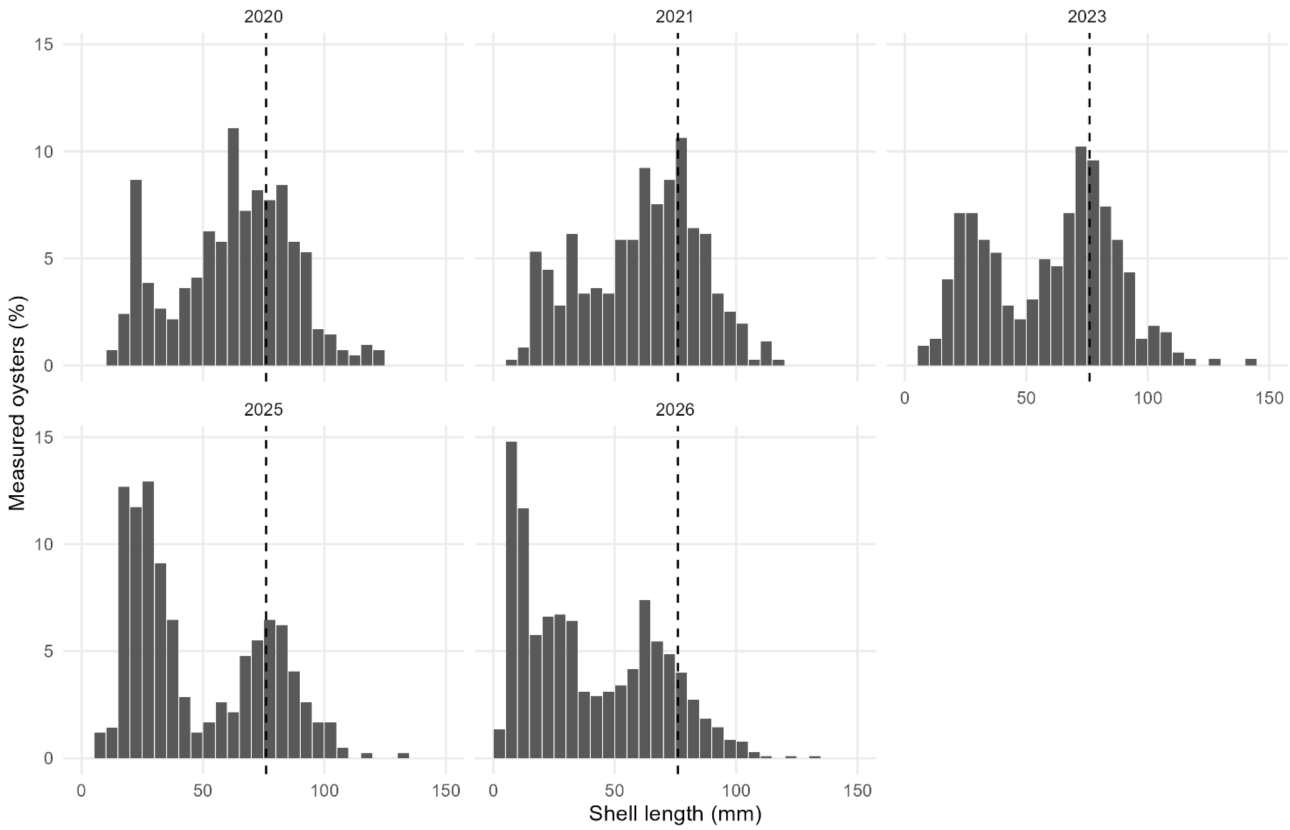


Figure 2.9 Annual shell-length distributions of native oyster (*Ostrea edulis*) measured during Marine Institute surveys of Outer Tralee Bay. The dashed line indicates the 76-mm minimum landing size.

2.2.4.2. Spatial distribution of *O. edulis* in Outer Bay

The latest available Marine Institute spatial biomass data show that native oyster (*Ostrea edulis*) biomass is unevenly distributed within the Outer Tralee Bay oyster grounds (**Figure 2.10**). The estimated *O. edulis* biomass ranges from approximately 0 to 0.016 kg/m². The highest biomass was concentrated in the western and south-eastern parts of the surveyed ground, where values approached 0.016 kg/m². Lower biomass was recorded mainly in the north-central part of the oyster ground and towards the eastern margin. Overall, biomass was unevenly distributed, with localised areas of higher biomass within the wider oyster ground.

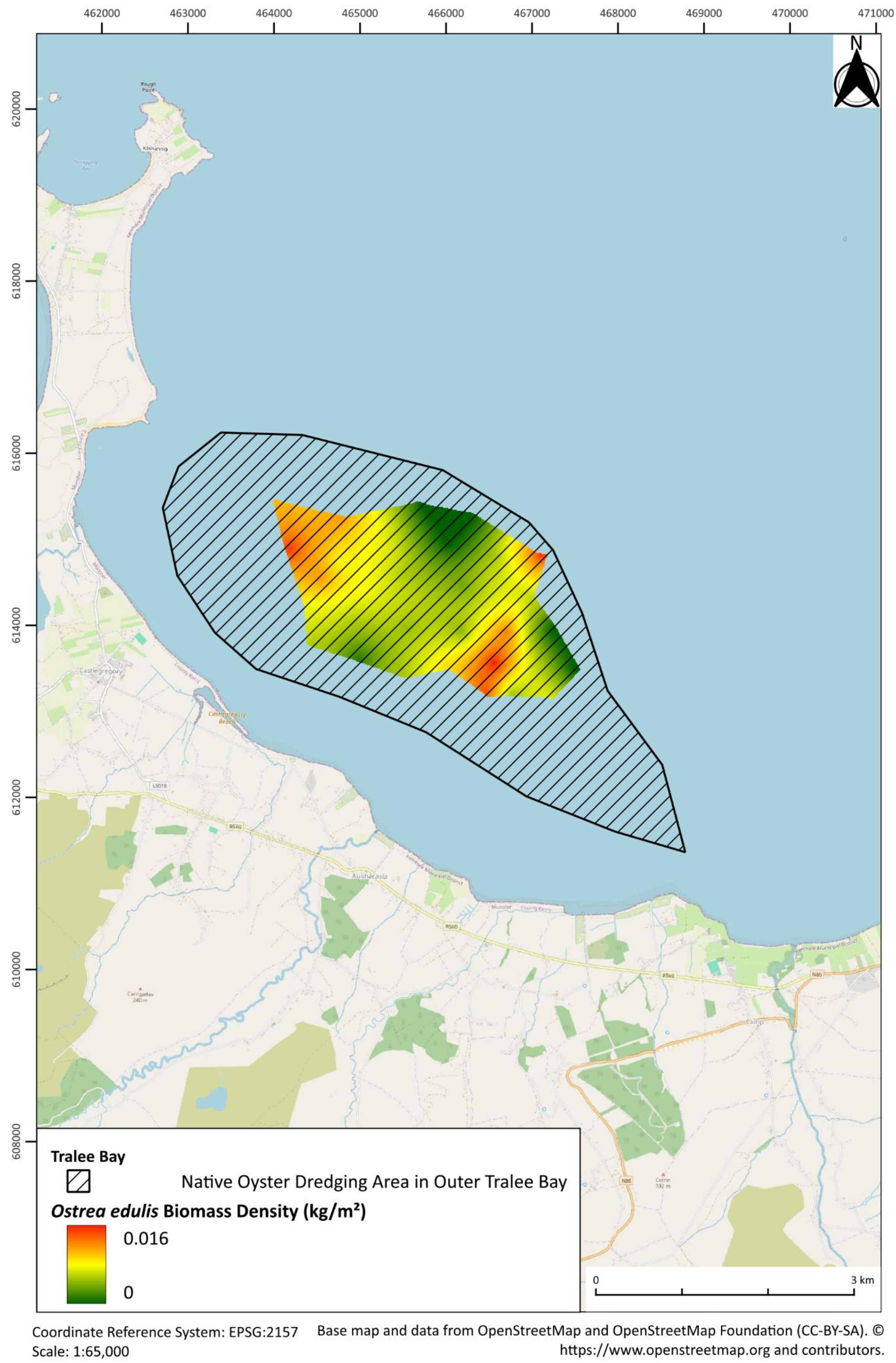


Figure 2.10: Latest available (2026) biomass density spatial distribution data for native oyster (*Ostrea edulis*) within the surveyed Outer Tralee Bay oyster grounds (provided by the Marine Institute).

2.2.5. Lough Swilly

The Lough Swilly survey data shows contrasting recent trajectories for native oyster (*O. edulis*) and Pacific oyster (*M. gigas*). Native oyster biomass increased between 2025 and 2026, and the most recent size distribution contained a greater representation of intermediate and larger oysters than the preceding survey while retaining evidence of smaller oysters within the population. Pacific oyster biomass, by contrast, has decreased markedly from its 2022 peak but remained greater than native oyster biomass in 2026.

2.2.5.1. Annual *Ostrea edulis* biomass over time

Raised native oyster biomass in Lough Swilly varied substantially over the available 2021–2026 survey series. Biomass was estimated at 110.5 ± 47.4 tonnes in 2021 and increased to 259.1 ± 158.6 tonnes in 2022, the highest estimate in the available series. Biomass subsequently decreased to 111.0 ± 47.0 tonnes in 2024 and 67.1 ± 23.8 tonnes in 2025, before increasing to 131.1 ± 46.1 tonnes in 2026.

The 2026 estimate represented an increase of approximately 95% relative to 2025 and was broadly comparable with the estimates recorded in 2021 and 2024, although it remained approximately 49% below the higher biomass recorded in 2022. Biomass per surveyed area followed the same overall pattern, increasing from 13.6 tonnes km^{-2} in 2021 to 31.7 tonnes km^{-2} in 2022, decreasing to 13.1 tonnes km^{-2} in 2024 and 8.8 tonnes km^{-2} in 2025, and increasing to 18.2 tonnes km^{-2} in 2026. The most recent survey therefore indicates an increase in native oyster biomass following the lower estimate recorded in 2025.

Table 2-11 Annual raised biomass trends for *O. edulis* in Lough Swilly 2011-2025 (Marine Institute, 2025).

Year	Month of survey	Survey area (km^2)	Biomass (tonnes)	Biomass (tonnes km^{-2})
2011	March	1.56	40.0	25.64
2011	November	13.07	124.0	9.52
2012	October	11.48	177.0	15.46
2013	October	5.96	84.0	14.14
2014	October	13.19	209.0	15.85
2015	August	5.19	33.0	6.50
2016	August	5.58	97.0	17.40
2017	September	7.19	316.0	43.99
2018	April	7.81	207.0	26.48

Year	Month of survey	Survey area (km²)	Biomass (tonnes)	Biomass (tonnes km⁻²)
2020	July	10.00	318.0	31.78
2021	November–December	8.10	110.5	13.64
2022	November–December	8.20	259.1	31.60
2024	April	8.46	111.0	13.12
2025	April	7.60	67.1	8.83

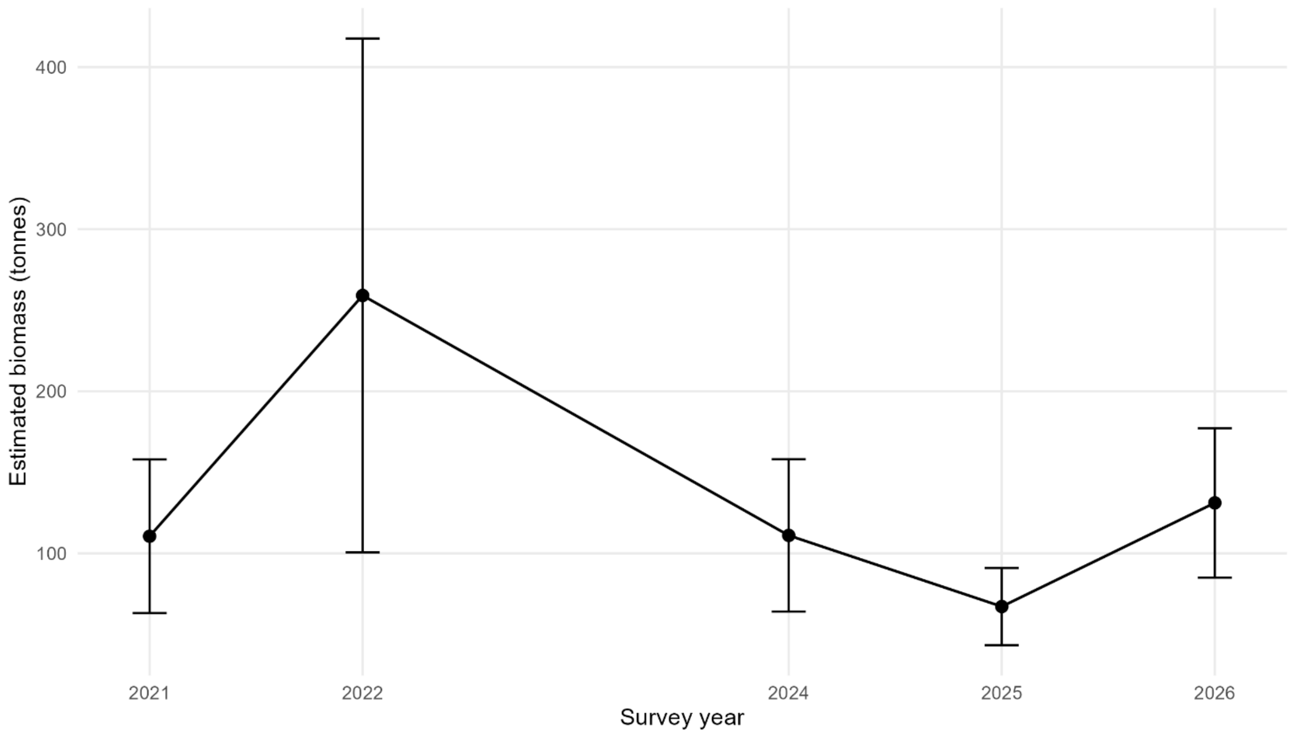


Figure 2.11 Raised native oyster (*Ostrea edulis*) biomass estimates for Lough Swilly, 2021–2026. Error bars show 95% highest density intervals (HDIs).

2.2.5.2. Annual *Magallana gigas* biomass over time

Pacific oyster biomass was considerably higher than native oyster biomass throughout the corresponding Lough Swilly survey series. Raised biomass was estimated at 745.5 ± 265.3 tonnes in 2021 and increased markedly to 3,275.9 ± 787.3 tonnes in 2022. Biomass subsequently decreased to 1,538.9 ± 369.9 tonnes in 2024, 605.0 ± 280.3 tonnes in 2025 and 346.3 ± 194.3 tonnes in 2026.

The 2026 estimate was approximately 89% lower than the peak recorded in 2022 and approximately 54% lower than the 2021 estimate. Biomass per surveyed area similarly decreased from 400.5 tonnes km^{-2} in 2022 to 181.9 tonnes km^{-2} in 2024, 79.6 tonnes km^{-2} in 2025 and 48.1 tonnes km^{-2} in 2026.

Despite this substantial reduction, estimated Pacific oyster biomass remained approximately 2.6 times greater than native oyster biomass in 2026. *M. gigas* therefore remained a quantitatively important component of the oyster assemblage in Lough Swilly in the most recent survey.

Table 2-12 Annual raised biomass trends for *M. gigas* in Lough Swilly 2011-2025 (Marine Institute, 2025).

Year	Month of survey	Survey area (km^2)	Number of *M. gigas* (millions; no DE)	Biomass (tonnes)	Biomass (tonnes km^{-2})
2011	March	1.56	1.10	–	–
2011	November	13.07	5.60	–	–
2012	October	11.48	1.40	–	–
2013	October	5.96	0.50	–	–
2014	October	13.19	3.30	–	–
2015	August	5.19	1.30	–	–
2016	August	5.58	1.15	–	–
2017	September	7.19	–	–	–
2018	April	7.81	–	1,180.0	151.1
2020	July	10.00	–	1,718.3	171.8
2021	December	8.10	–	745.5	92.0
2022	December	8.18	–	3,275.9	400.5
2024	April	8.46	–	1,538.9	181.9
2025	April	7.60	–	605.0	79.6

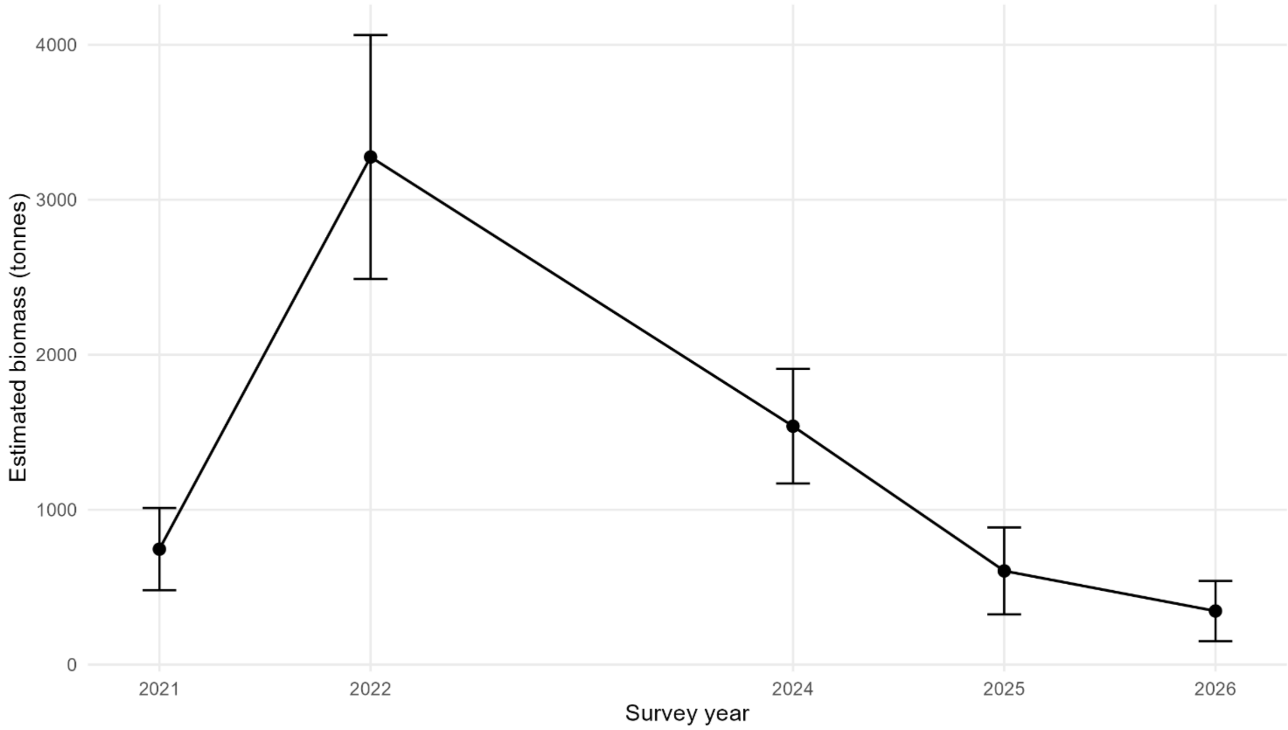


Figure 2.12 Raised Pacific oyster (*Magallana gigas*) biomass estimates for Lough Swilly, 2021–2026. Error bars show 95% highest density intervals (HDIs).

2.2.5.3. Size distribution of *Ostrea edulis* over time

The size structure of the Lough Swilly native oyster population varied considerably among surveys and provides evidence of repeated representation of smaller oysters within the stock. In 2021, the median shell length was 55.0 mm, with 50.0% of measured oysters <55 mm and 5.1% ≥76 mm. The contribution of smaller oysters increased further in 2022, when the median shell length was 49.0 mm and 63.5% of oysters were <55 mm, while only 3.9% were ≥76 mm.

The population shifted towards larger size classes in 2024, when median shell length increased to 59.4 mm and the proportion <55 mm decreased to 32.6%. Smaller oysters again became more prominent in 2025, when 48.2% were <55 mm. In the latest survey in 2026, median shell length increased to 62.5 mm, the proportion <55 mm decreased to 25.3%, and the proportion ≥76 mm increased to 10.3%, the highest proportion of oysters at or above the MLS recorded in the available 2021–2026 series.

The repeated occurrence of substantial numbers of smaller oysters indicates recurrent recruitment to the native oyster population during the survey period. The 2026 distribution was shifted towards intermediate and larger size classes relative to 2025, consistent with progression of oysters through the population size structure, while smaller oysters remained represented within the stock.

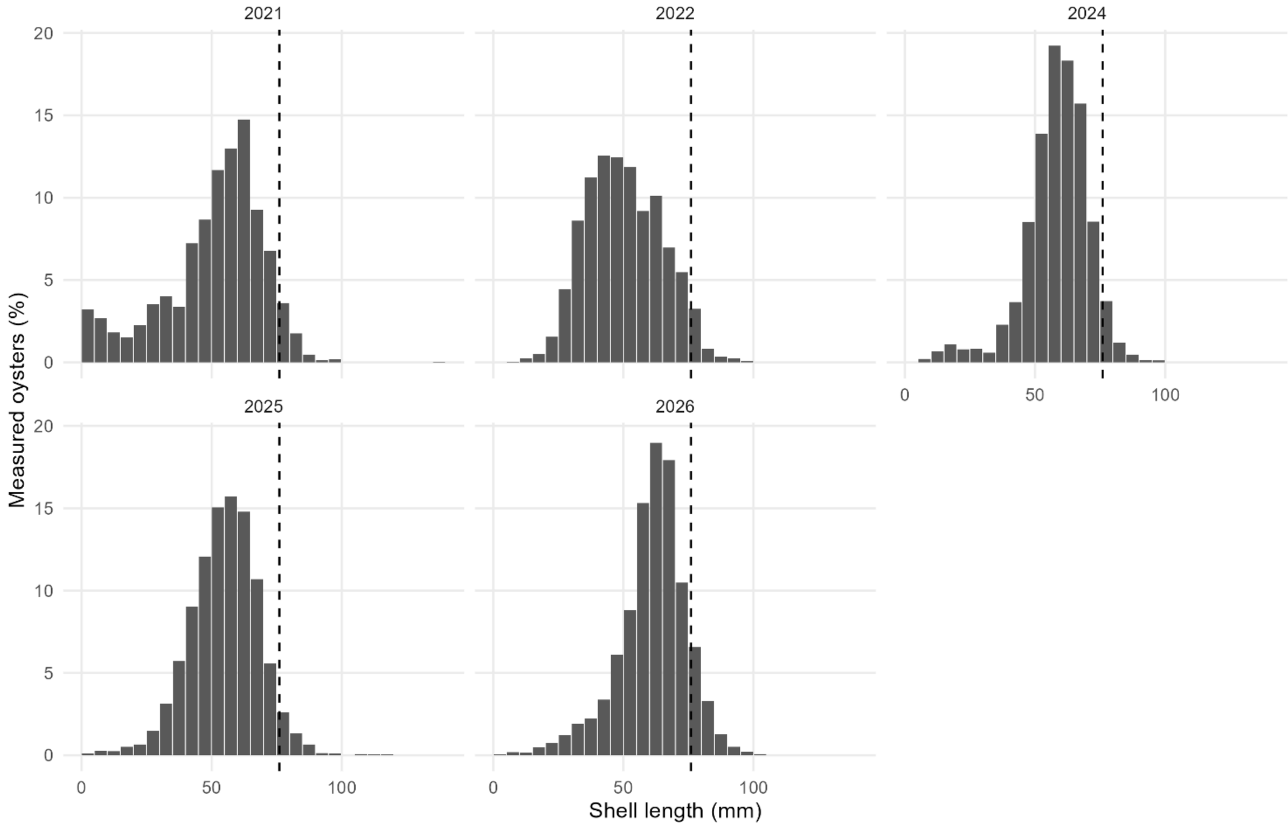


Figure 2.13 Size distribution of native oyster (*Ostrea edulis*) recorded during Marine Institute surveys of Lough Swilly, 2021–2026. The vertical dashed line indicates the statutory MLS of 76 mm.

2.2.5.4. Size distribution of *Magallana gigas* over time

Pacific oyster size structure showed a progressive shift towards larger oysters across the available survey series. Median shell length was 69.0 mm in both 2021 and 2022, increasing to 79.2 mm in 2024, 83.6 mm in 2025 and 87.7 mm in 2026. The interquartile range similarly shifted towards larger shell lengths, from 52–84 mm in 2021 to approximately 74–102 mm in 2026.

The 2021 distribution contained a pronounced component of very small Pacific oysters, including oysters <10 mm, while subsequent surveys were increasingly dominated by intermediate and larger size classes. The progressive increase in median shell length between 2022 and 2026 therefore indicates a shift in the measured population towards larger individuals over the recent survey period. This occurred concurrently with the substantial reduction in estimated total Pacific oyster biomass described above.

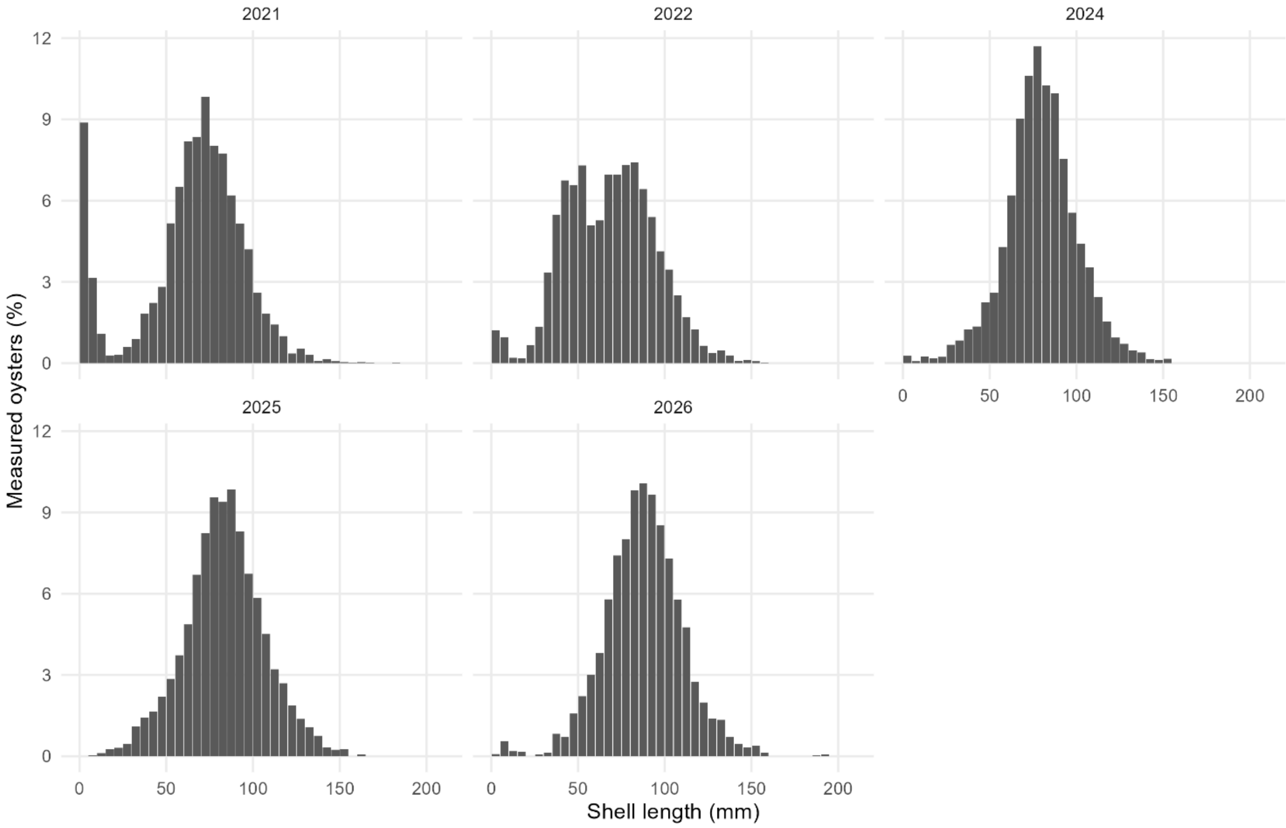
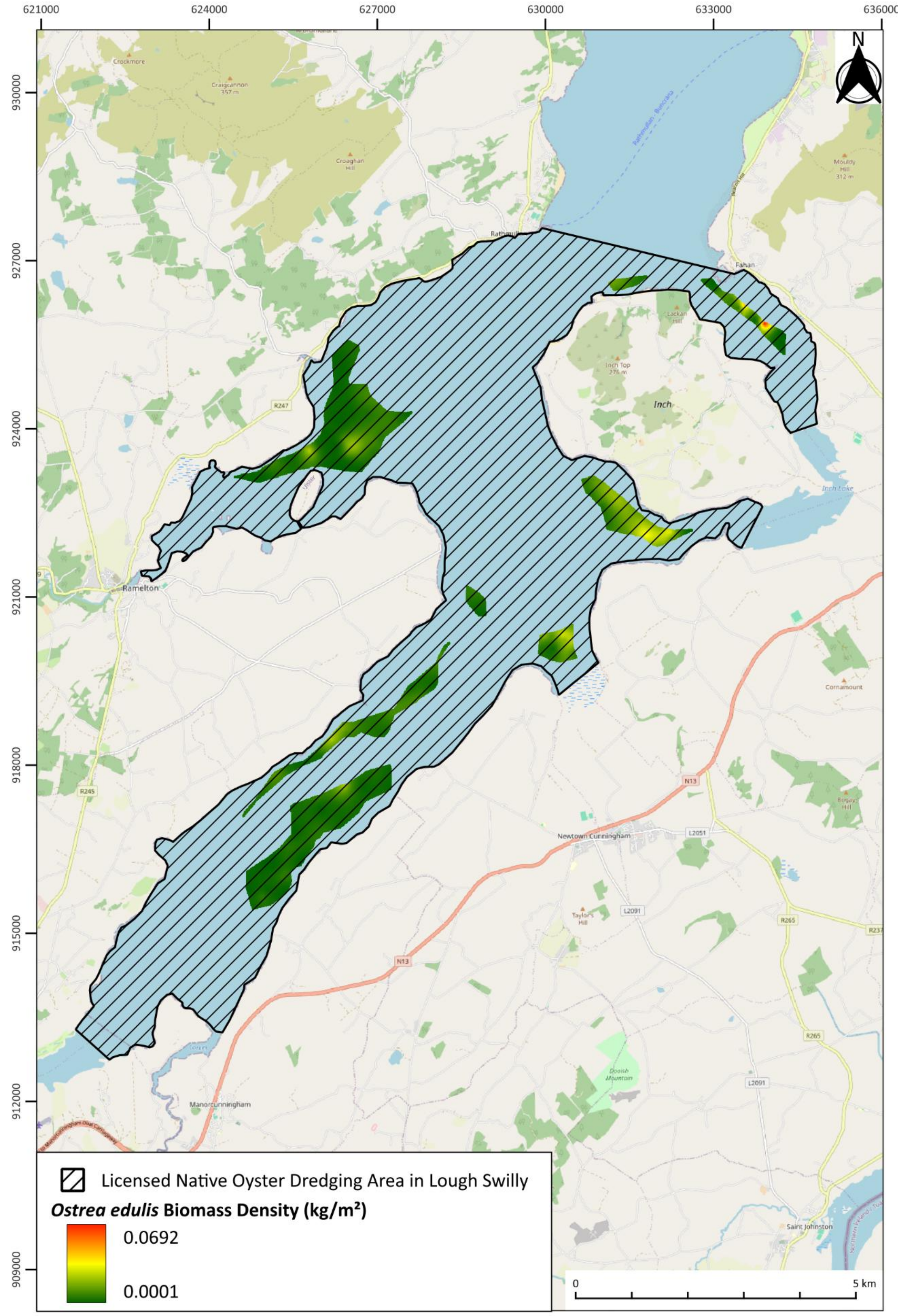


Figure 2.14 Size distribution of Pacific oyster (*Magallana gigas*) recorded during Marine Institute surveys of Lough Swilly, 2021–2026.

2.2.5.5. Spatial distribution of *Ostrea edulis* over time

The latest available Marine Institute spatial biomass data show that native oyster (*Ostrea edulis*) biomass is unevenly distributed within the Lough Swilly oyster grounds (Figure 2.15). The estimated *O. edulis* biomass density ranges from approximately 0.0001 to 0.0692 kg/m². The most recent survey was undertaken in 2026.

The highest biomass was concentrated in a small area in the north-eastern part of the surveyed grounds, near Fahan, where values approached 0.0692 kg/m². Areas of relatively higher biomass were also present along the eastern side of the lough, south of Inch, and within a smaller area in the central part of the surveyed grounds. Most of the remaining mapped oyster areas supported lower biomass, particularly across the western and southern parts of the lough. Overall, biomass was patchily distributed, with localised areas of higher biomass occurring within the wider licensed native oyster dredging area.



Coordinate Reference System: EPSG:2157
Scale: 1:100,000
Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © https://www.openstreetmap.org and contributors.

Figure 2.15: Latest available (2026) native oyster (*Ostrea edulis*) biomass density data within the surveyed Lough Swilly oyster grounds (provided by the Marine Institute).

2.2.5.6. Spatial distribution of *Magallana gigas* over time

The latest available Marine Institute spatial biomass data show that Pacific oyster (*Magallana gigas*) biomass is unevenly distributed within the Lough Swilly oyster grounds (**Figure 2.16**). The estimated *M. gigas* biomass density ranges from approximately 0.0003 to 0.0537 kg/m

The highest biomass was concentrated in the western part of the surveyed grounds, east of Ramelton, where values approached 0.0537 kg/m^2. A further area of relatively high biomass occurred in the southern part of the lough, with smaller areas of moderate biomass present around Inch and towards Fahan. Lower biomass was recorded across several of the remaining mapped areas.

The distribution of *M. gigas* overlaps with *O. edulis* in several parts of the licensed dredging area, including areas around Fahan, Inch, the western part of the lough and the southern oyster grounds. However, the areas of highest biomass differ between the two species. The highest *O. edulis* biomass was recorded towards Fahan in the north-east, whereas the highest *M. gigas* biomass occurred further west, east of Ramelton. Overall, both species show a patchy distribution within the licensed dredging area, with areas of spatial overlap as well as differences in the location of their main biomass concentrations.

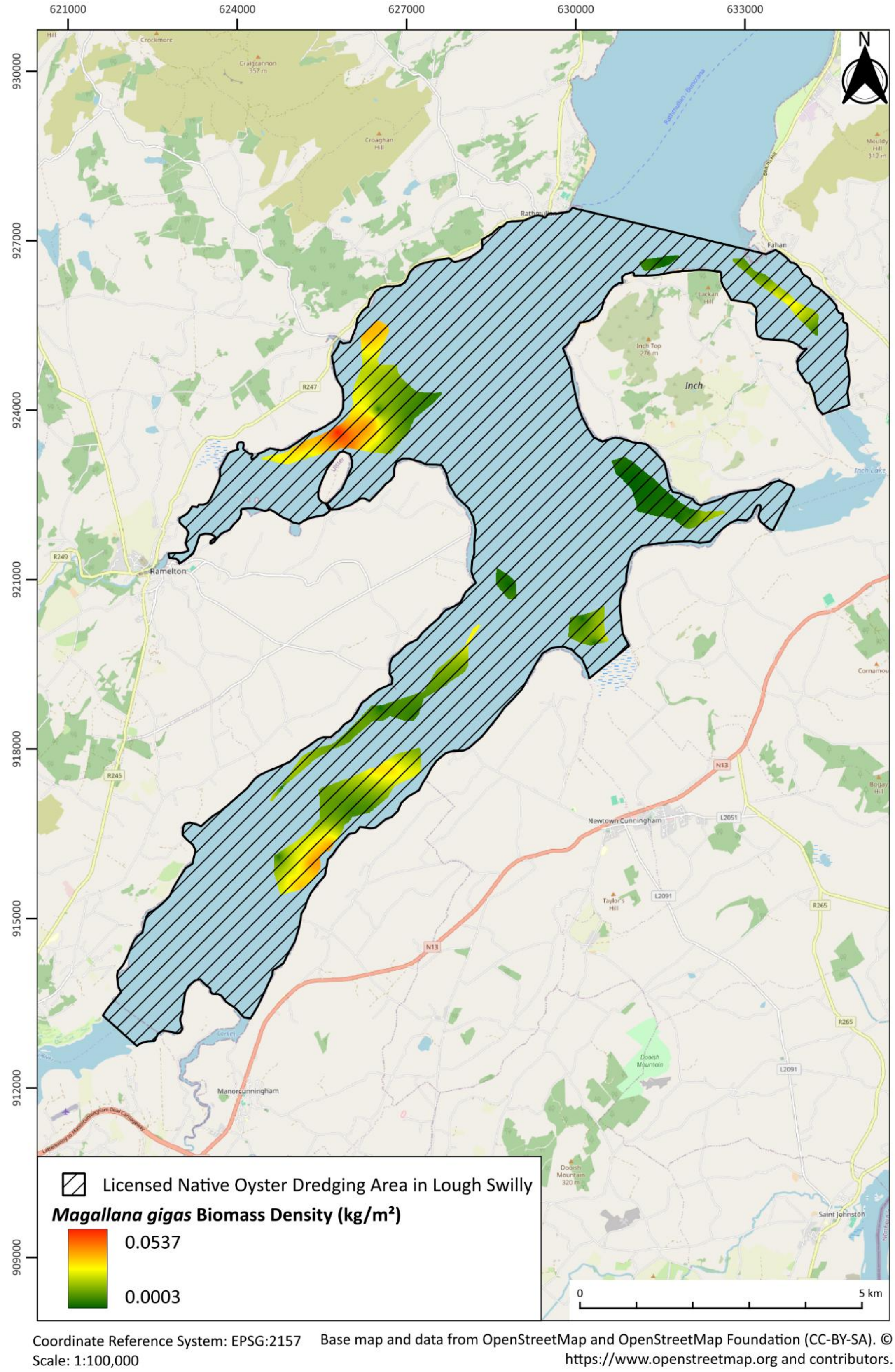


Figure 2.16: Latest available (2026) for Pacific oyster (*Magallana gigas*) biomass density within the surveyed Lough Swilly oyster grounds (provided by the Marine Institute).

2.2.6. Blacksod Bay

O. edulis biomass in Blacksod Bay was relatively low in the only year they were surveyed (2011) in which approximately half of the measured oysters were at or above the MLS.

2.2.6.1. *Ostrea edulis* biomass (2011)

The only available biomass estimate for Blacksod Bay is from the Marine Institute survey undertaken in January 2011 and reported by Tully and Clarke (2012). The survey estimated a native oyster biomass of 25 ± 6 tonnes within the surveyed area. This was among the lower biomass estimates recorded across the Irish oyster stocks surveyed during 2010–2012 (Tully & Clarke, 2012).

2.2.6.2. Size distribution of *Ostrea edulis* (2011)

A total of 421 native oysters were measured across 84 survey stations in Blacksod Bay in 2011. Shell length ranged from 26 to 121 mm, with a median of 76 mm and an interquartile range of 65–85 mm. The size distribution was therefore centred approximately on the statutory MLS.

Oysters ≥76 mm accounted for 51.5% of measured individuals, while 37.8% were between 55 and <76 mm and 10.7% were <55 mm. The most frequently represented size classes occurred broadly between 65 and 85 mm, with smaller oysters comprising a comparatively limited component of the measured population. The 2011 survey therefore described a population containing a substantial proportion of larger oysters at or above the MLS, alongside representation of intermediate and smaller size classes.

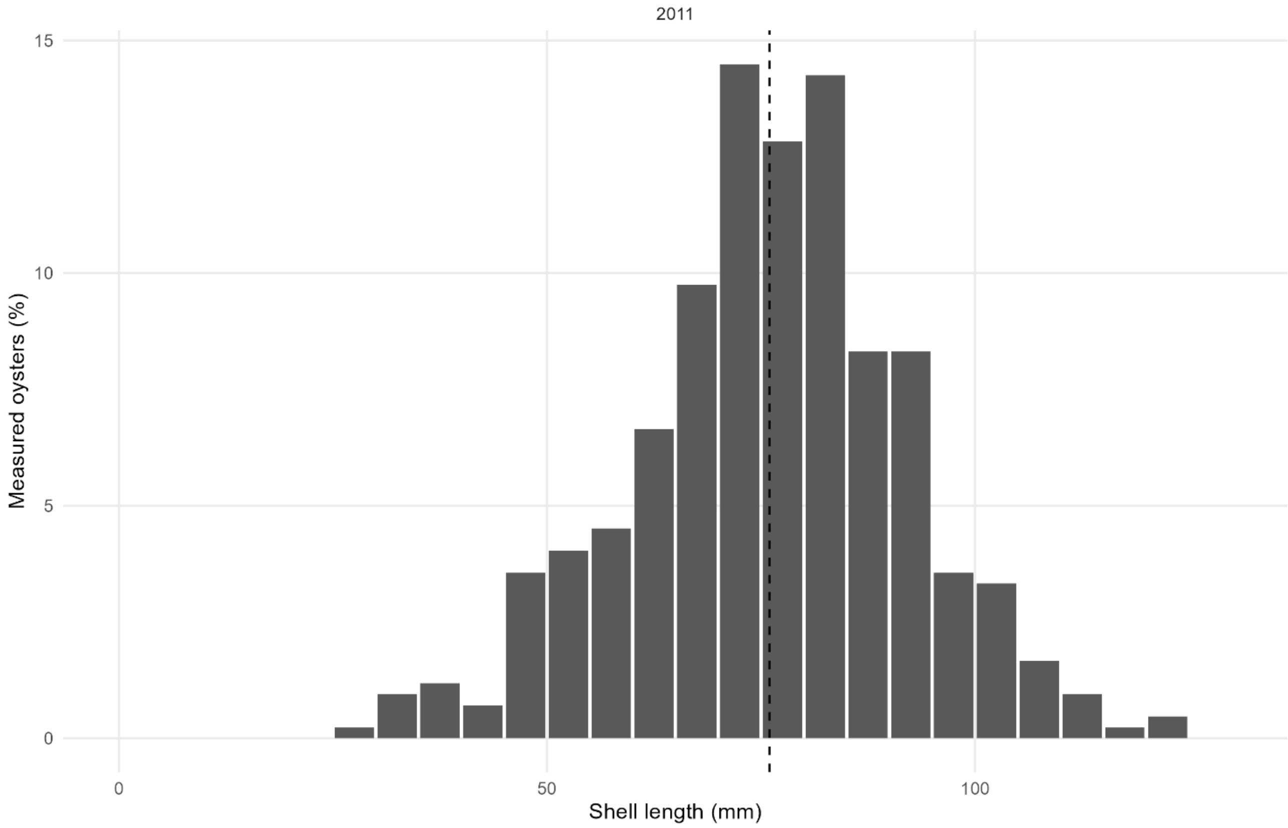


Figure 2.17 Size distribution of native oyster (*Ostrea edulis*) recorded during the 2011 Marine Institute survey of Blacksod Bay. The vertical dashed line indicates the statutory MLS of 76 mm.

2.2.6.3. Spatial Distribution of *Ostrea edulis* (2011)

The 2011 Marine Institute survey covered approximately 2.39 km^2 north of Claggan Point, immediately south of Belmullet. Total native oyster biomass was estimated at 25 ± 6 tonnes, among the lowest recorded across the Irish oyster beds surveyed during 2010–2012. Spatial distribution was patchy, with most of the northern bed supporting approximately 0.05–0.2 oysters m^{-2} and localised areas reaching 0.2–0.3 oysters m^{-2} or > 0.3 oysters m^{-2}. The smaller southern bed generally supported approximately 0.01–0.1 oysters m^{-2}, with a small, localised area exceeding 0.3 oysters m^{-2}. Overall densities ranged from 0 to 1 oyster m^{-2}.

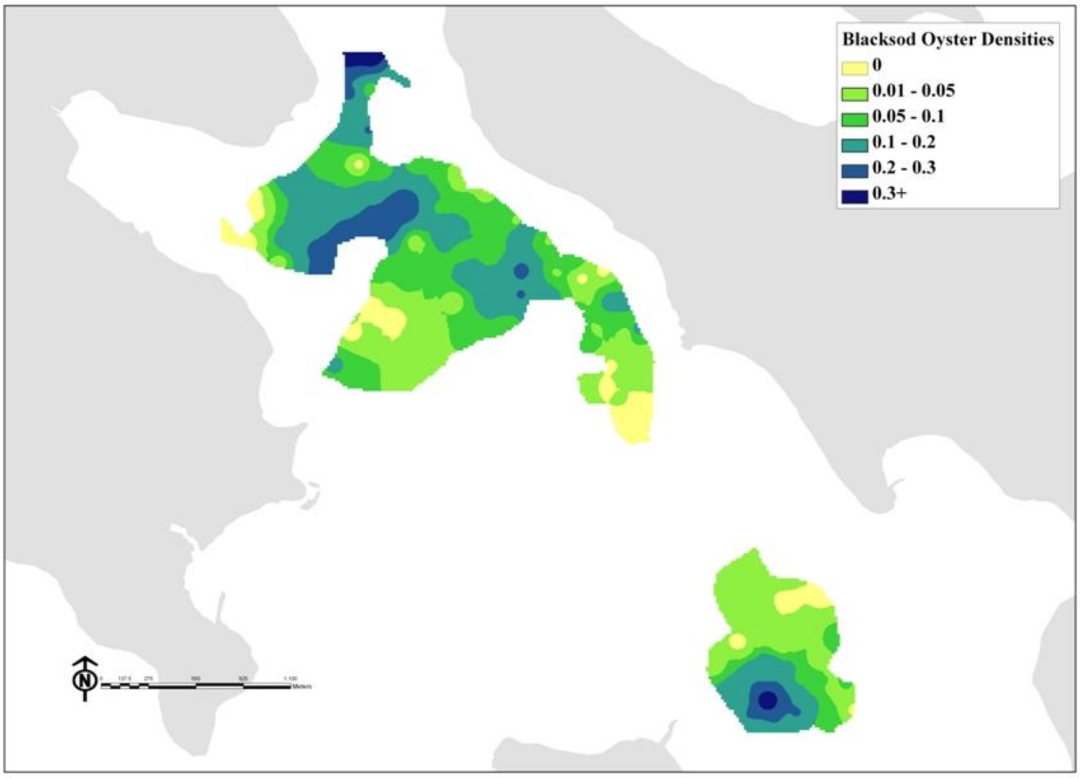


Figure 2.18 Spatial distribution of native oyster (*Ostrea edulis*) biomass density in 2011 for Blacksod Bay recorded by the Marine Institute (Tully & Clarke, 2012).

2.2.7. Synthesis of stock condition relevant to dredging assessment

Table 2-13 summarises the main quantitative stock indicators derived from the latest available MI survey data. The indicators describe the condition and size structure of each stock and provide biological context for the assessment of oyster removal, repeated physical disturbance, effects on recruitment and longer-term population resilience considered in Section 3.

Table 2-13 Summary of latest available Marine Institute oyster stock indicators.

Stock	Latest biomass survey	Raised biomass (t) ± 95% HDI	Mean biomass per surveyed area (t km^{-2})	Median length (IQR) (mm)	<55 mm (%)	≥76 mm (%)
Blacksod Bay – *O. edulis*	–	–	–	76.0 (65.0–85.0)	10.7	51.5

Stock	Latest biomass survey	Raised biomass (t) ± 95% HDI	Mean biomass per surveyed area (t km^{-2})	Median length (IQR) (mm)	<55 mm (%)	≥76 mm (%)
Inner Tralee Bay – *O. edulis*	2025	409.8 ± 310.2	85.9	64.0 (50.0–72.0)	31.1	17.0
Outer Tralee Bay – *O. edulis*	2026	107.1 ± 61.7	19.3	32.0 (13.0–63.0)	65.9	11.6
Lough Swilly – *O. edulis*	2026	131.1 ± 46.1	18.2	62.5 (54.8–69.1)	25.3	10.3
Lough Swilly – *M. gigas*	2026	346.3 ± 194.3	48.1	87.7 (74.0–101.6)	N/A	N/A

Note: Biomass values are raised estimates with ± 95% highest density intervals (HDIs). Mean biomass per surveyed area is calculated as total estimated biomass divided by the area surveyed. The < 55 mm category is used as a descriptive indicator of the smaller native oyster component; ≥ 76 mm represents oysters at or above the statutory minimum landing size.

Across the stocks with recent biomass information, the MI data identify contrasting stock conditions rather than a common temporal response. Inner Tralee Bay continues to support the greatest absolute native oyster biomass but has undergone a recent reduction from the higher biomass recorded in 2022–2023. Outer Tralee Bay shows a strong recent input of small oysters together with an increase in biomass per surveyed area in 2026. Lough Swilly also shows evidence of recurrent native oyster recruitment and an increase in native oyster biomass in 2026, while remaining subject to substantial pressure from a naturalised Pacific oyster population whose biomass continues to exceed that of the native stock.

These differences are important to the dredging impact assessment because the ecological consequence of oyster removal and repeated disturbance depends not only on the area exposed to dredging, but also on the abundance, size structure, recruitment and wider pressure context of the affected oyster population.

3. Assessment of dredging impact pathways

This section considers the available evidence on the environmental effects of native oyster dredging, with particular focus on impact pathways that could affect the relevant Conservation Features and Conservation Objectives of Blacksod Bay, Tralee Bay and Lough Swilly. Evidence relating directly to *Ostrea edulis* fisheries is prioritised. Studies of other oyster species, bivalve fisheries and bottom towed fishing gear fishing gear were considered where they provide relevant evidence concerning impact mechanisms or receptor sensitivity. The applicability of this supporting evidence to the three fisheries is considered in relation to differences in fishing gear, fishing intensity, environmental conditions and the sensitivity of the receiving habitats.

The assessment considered the scale, intensity, frequency, duration, reversibility and recovery potential of the identified effects. It distinguishes short-term physical disturbance associated with individual dredge passes from longer-term effects on oyster density, shell and cultch availability, habitat structure, recruitment and associated benthic communities. Particular emphasis is placed on determining whether effects are likely to be significant or persistent, having regard to the relevant Conservation Objective attributes and targets, the sensitivity and recovery potential of the affected receptors, and the interval between successive fishing seasons (Tully & Clarke, 2012; Kennon et al., 2023).

Ostrea edulis is an active suspension-feeding bivalve occurring in productive estuarine and shallow coastal environments. The species occurs on a range of seabed types, including muddy sand, muddy gravel, consolidated silt, shell-bearing sediment and rock, where sufficient stable material is available for settlement. Reproductive timing varies according to temperature and local environmental conditions, but spawning and larval release generally occur during the summer months, commonly between June and September. Eggs are fertilised internally and brooded to the veliger stage before the larvae are released into the water column. The species is highly fecund, with reported egg production ranging from approximately 91,000 to 2 million eggs and increasing with the age and size of the adult oyster (Paling et al., 2026).

Following their planktonic phase, larvae preferentially settle on clean, stable hard substrata, including living and dead bivalve shell. Suitable settlement habitat within exploited fisheries may therefore be maintained or enhanced through the placement of clean shell or other appropriate hard material. The suitability of shell material depends on its stability, condition, particle size and availability above the sediment surface, and highly fragmented or buried shell may not provide equivalent settlement habitat. Repeated settlement can result in the development of dense and potentially multi-layered oyster beds where recruitment is sufficient and fishing pressure and other forms of physical disturbance are limited (Paling et al., 2026; Preston et al., 2020).

Native oyster beds perform several ecological functions within estuarine and coastal ecosystems. The production of faeces and pseudofaeces increases the transfer of organic material from the water column to the seabed and influences sediment biogeochemistry and the availability of food to other benthic organisms. Living oysters and accumulated shell also provide hard settlement surfaces and interstitial spaces within otherwise sedimentary habitats, increasing seabed complexity and supporting diverse associated communities (Paling et al., 2026; Lown et al., 2021). Oyster-bed condition may therefore be characterised using living-oyster abundance and density, population size structure, shell and cultch availability, seabed relief and complexity, and the composition of the associated benthic community.

Native oyster stocks in Ireland have undergone substantial historical declines. Intensive or unregulated fishing on formerly productive beds represented an important pressure, particularly where recruitment was intermittent or insufficient to replace fishing and natural mortality. The former Arklow oyster beds provide a documented Irish example in which sustained heavy fishing contributed to the collapse of an extensive offshore stock that may also have experienced irregular larval retention and settlement. Overfishing, unregulated fishing and poor compliance with management measures were also implicated in the decline of stocks within coastal bays and estuaries (Tully & Clarke, 2012).

Removal of adult oysters can reduce spawning-stock abundance and increase the distance between remaining individuals, potentially reducing fertilisation success and subsequent recruitment (Guy et al., 2019). Fishing may also remove, break, bury or redistribute shell material and cultch, while shell fragmentation may reduce seabed relief and the structural complexity of the oyster bed (Bromley et al., 2016; Kennon et al., 2023). These pressures operate alongside habitat loss and degradation, variable recruitment and disease. Bonamiosis, caused by the protozoan parasite *Bonamia ostreae*, has resulted in substantial mortality within native oyster populations. Disease is not treated as an impact caused directly by dredging unless a credible pathway exists through the movement of oysters, shell or equipment. It is however, relevant to receptor sensitivity and recovery because disease-related mortality may reduce the capacity of a population to withstand additional fishing mortality or recover following disturbance. The combined influence of fishing, habitat degradation, disease and irregular recruitment may therefore limit the ability of depleted populations to replace mortality and recover (Tully & Clarke, 2012; Pouvreau et al., 2023).

Irish native oyster fisheries have historically operated under a range of governance arrangements, including public access, Fishery Orders and aquaculture licences. Fishery Orders confer defined management or fishing rights within specified areas, while aquaculture licences authorise aquaculture activity at defined sites and do not necessarily confer equivalent management authority over a wider public fishery. Management authority was devolved to a number of local co-operatives through Fishery Orders issued during the late 1950s and early 1960s. Other native oyster fisheries operate within aquaculture-licensed or public-fishery frameworks. The Marine Institute has identified that management objectives, harvest control rules and reference points remain insufficiently developed in some fisheries. Locally applied Total Allowable Catches may be informed by annual surveys or other available knowledge, but the evidential basis and application of these controls vary among fisheries (Tully & Clarke, 2012; Marine Institute, 2025).

The statutory Minimum Landing Size (MLS) for native oyster is 76 mm, with a voluntary limit of 78 mm applied in Tralee Bay. The MLS is generally reached at approximately four to five years of age, while sexual maturity normally occurs at a smaller size. This measure therefore provides some protection for oysters before recruitment to the fishery, although its effectiveness depends on the density and condition of the remaining spawning stock, recruitment frequency and the level of fishing mortality applied to oysters above the MLS (Tully & Clarke, 2012; Marine Institute, 2025).

The authorised commercial fishing in Tralee Bay generally extends from September to April inclusive, although the actual duration of fishing may be shorter depending on local opening and closing arrangements, stock availability, catch limits and weather conditions. Fishing therefore occurs largely outside the main summer spawning and larval-settlement period. However, activity commencing in September could overlap with late reproductive activity because spawning, larval release and settlement vary according to temperature and local environmental conditions. Management arrangements differed substantially among the fisheries. Within Blacksod Bay, the North Mayo Oyster Development Co-operative manages the native oyster beds under aquaculture licences. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually no more than eight fishing days, although a few additional fishing days may occur in some years. Fishing activity is therefore intermittent and of low annual duration. Lough Swilly operates as a public fishery with dredging authorised under Inland Fisheries Ireland licences between the 1st of September and the 30th of April.

The seasonal fishery closure in Tralee Bay provides an interval during which disturbed sediments, oyster populations and associated benthic communities may begin to recover. However, the presence of a closed period does not, by itself, establish that the effects of dredging are non-persistent. Physical disturbance associated with an individual dredge pass may be temporary, while the removal of adult oysters or settlement shell may affect oyster density, recruitment and oyster-bed structure over several subsequent fishing seasons. Repeated disturbance of the same grounds may also result in cumulative effects where recovery remains incomplete before fishing recommences (Kennon et al., 2023).

Oyster dredging may affect both the target population and the wider benthic environment through a combination of direct oyster removal and incidental mortality, physical seabed disturbance, removal or redistribution of shell and cultch, sediment resuspension and redeposition, and disturbance of associated fauna. Dredging may also affect recruitment and population recovery indirectly by reducing broodstock density, increasing the distance between reproductive individuals or reducing the availability and suitability of settlement substrate. The nature and magnitude of these effects depend on the characteristics of the dredge and receiving habitat, the intensity, frequency and spatial distribution of fishing, the existing condition of the oyster population and oyster-bed habitat, and the period required for ecological recovery (McLaverty et al., 2020; Kennon et al., 2023)

3.1. Impact Assessment

This impact assessment considers the effects arising from the dredging of native oyster (*Ostrea edulis*) populations, oyster-bed habitat, and the relevant Conservation Features within Blacksod Bay, Tralee Bay and Lough Swilly. The assessment is undertaken separately for each bay and for each identified impact pathway. The impact mechanisms comprise physical disturbance of oyster beds and associated benthic habitats, removal of oysters from the population, effects on oyster bed structure and habitat complexity, disturbance or displacement of associated benthic fauna, sediment resuspension and smothering, effects on recruitment, repeated or cumulative disturbance over successive fishing seasons, and potential interaction with other sensitive communities or Conservation Features.

The scale of fishing pressure and the response of the oyster populations are interpreted using the available Marine Institute stock assessment data, licence numbers as an indicator of potential fishery participation and literature on impacts of oyster dredging on relevant benthic habitats and oyster populations. Marine Institute data relating to oyster biomass (a proxy of population size) and catch size structure (a proxy of recruitment) provide evidence of stock condition over time. However, changes in these parameters cannot be attributed to dredging solely on the basis of temporal association because oyster populations are also influenced by recruitment variability, disease, environmental conditions, natural mortality, invasive species, management measures and changes in survey design or dredge efficiency. Total Allowable Catches indicate the maximum authorised level of removal, while landings provide a measure of the recorded harvest. Neither measure accounts fully for incidental mortality, damage to oysters that are contacted but not retained, the return and subsequent survival of undersized oysters, or the removal, breakage or displacement of shell material. These measures also provide no direct information on the area swept by the dredge or the frequency with which the same ground is contacted. Licence numbers similarly indicate the number of persons authorised to participate in a fishery but do not demonstrate whether each licence was used or quantify the duration, intensity or spatial distribution of fishing activity.

Sea surface temperature, salinity, water depth, and hydrodynamic exposure are not assessed as impact pathways because these environmental conditions are not caused directly by oyster dredging. They are, however, relevant to the interpretation of oyster sensitivity and recovery because they influence growth, spawning, larval development, larval retention, recruitment and natural mortality. Differences in environmental conditions may consequently contribute to variations in oyster population dynamics between the three bays and may affect the capacity of a population to recover following fishing disturbance (Tully & Clarke, 2012). These factors will therefore be considered as part of the ecological context but will not be attributed to dredging unless an appropriate causal pathway exists.

The assessment is undertaken having regard to the site-specific Conservation Objectives for the relevant Special Areas of Conservation and, where applicable, Special Protection Areas associated with the three bays. For the Special Areas of Conservation, the assessment considers whether dredging could affect the extent, distribution, structure, biological composition or ecological functions of the relevant Annex I habitats and their constituent communities. Live oysters, accumulated shell, and associated fauna may form an important component of the structure and function of the protected marine habitats in these bays. This relationship is particularly direct in Tralee Bay, where an *Ostrea edulis* dominated community is expressly identified as a constituent community that must be conserved in natural condition. Maintenance or recovery of native oyster populations is therefore relevant where the condition of the oyster bed contributes to achievement of the applicable habitat Conservation Objectives (Tully & Clarke, 2012; NPWS, 2014d).

For the purposes of this assessment, significance relates to whether dredging could cause a biological or physical change that would be capable of compromising the applicable Conservation Objective attributes and targets or the ability to maintain or restore a Conservation Feature to favourable conservation condition. A change outside the range reasonably expected through natural processes may provide evidence of an anthropogenic effect, but departure from natural variability is not treated as the sole test of significance. The assessment must also consider the ecological importance, magnitude and spatial extent of the change and its implications for the structure, function and recovery of the affected receptor.

Persistence relates to whether an effect is continuous, ongoing or recurs with sufficient frequency to prevent the affected population, habitat or community from recovering within an ecologically relevant period. An effect may therefore be persistent even where the activity causing it is seasonal or intermittent. The level of disturbance will be assessed by considering the spatial scale, intensity, frequency, duration and reversibility of each effect, together with the sensitivity, existing condition and recovery potential of the affected receptor.

NPWS guidance distinguishes between sensitive keystone communities and other structurally important marine communities. Significant anthropogenic disturbance to the extent or quality of sensitive keystone communities should be avoided. For other constituent communities, NPWS advises that significant continuous or ongoing disturbance should not generally exceed approximately 15% of the interpolated area of each community type. Where this approximate area is exceeded, an increasingly cautious approach and further management review are recommended before additional activities are licensed. Intermittent or episodic activities may be assessed on a site-specific basis, having regard to the nature and scale of the activity, and the resilience of the receiving habitat (NPWS, 2011c; NPWS, 2014c; NPWS, 2014d).

The seasonal cessation of fishing provides an interval during which disturbed sediments, oyster populations and associated benthic communities may recover. Persistence will be determined separately for each pathway by considering the frequency with which the same areas are dredged, the duration of the resulting ecological change and whether recovery is likely to occur before fishing recommences. Repeated disturbance over successive fishing seasons may result in a persistent or cumulative effect where recovery remains incomplete.

The assessment was therefore informed collectively by the Marine Life Information Network pressure benchmarks and sensitivity classifications for *Ostrea edulis* (Paling et al., 2026), oyster biomass data from Marine Institute stock surveys, size distribution data from Marine Institute stock surveys and other literature concerning the effects of oyster dredging on marine habitats and species relevant to Tralee Bay, Blacksod Bay and Lough Swilly. This evidence was considered together with the current scale, magnitude, persistence and management of each fishery, the characteristics and sensitivity of each receiving environment and the applicable Conservation Objectives for the SAC in each bay.

3.1.1. Physical disturbance of oyster dredging

3.1.1.1. Literature review

Oyster dredging causes a direct physical pressure on the seabed through the contact and movement of the dredge frame, teeth or blade across the sediment surface. Depending on the configuration and operation of the gear, this contact may result in abrasion, penetration or ploughing of surface sediments, formation of dredge tracks, overturning or displacement of shell and other seabed material, and damage to living oysters and associated epifauna. Repeated dredging may also flatten small-scale seabed relief and modify the physical structure of oyster-bed habitat. These changes have the potential to affect oyster-bed condition and associated benthic communities, although the occurrence, magnitude and persistence of the effect are dependent on the characteristics of the gear, the receiving habitat and the intensity and frequency of fishing (Cranfield et al., 2003; Sciberras et al., 2018).

The magnitude of physical disturbance is influenced by dredge width and weight, the presence and spacing of teeth or blades, tow speed, vessel power, the number of passes over an area and the proportion of the seabed swept. The response of the receiving habitat is influenced by sediment type, hydrodynamic exposure, existing shell density, seabed complexity and the presence of sensitive or habitat forming species. Experimental evidence indicated that the physical structure of clean sand could be restored within days to a few months, while restoration of muddy sand could take several months or more than one year. Following experimental intertidal dredging, recovery of annelid and mollusc abundance was projected to occur after approximately 98 to 109 days in sand. Equivalent recovery estimates for fauna in muddy sand ranged from approximately 870 to 1,210 days, although these longer estimates were extrapolated beyond the 540 day monitoring period and were therefore uncertain. In biogenic habitats, the effects of scallop dredging were projected to persist for approximately 972 to 1,175 days, while studies of areas closed to scallop fishing indicated recovery periods of approximately two to five years (Kaiser et al., 2006). A later meta-analysis predicted that benthic community abundance following towed dredging could take three years or longer to recover and that species richness in biogenic habitats would not recover within three years, irrespective of gear penetration depth (Sciberras et al., 2018). Comparable quantitative recovery periods were not established for gravel and shell rich seabeds, although significant effects of scallop dredging were recorded during both short and longer term observations. The same dredging intensity may therefore produce materially different effects in different receiving environments. Although these studies did not examine the Irish native oyster fisheries and therefore do not provide direct predictions for them, they provide relevant analogue evidence of the potential physical effects of dredging on benthic habitats. The scale of the impact may be different as scallop dredges may be larger and are configured differently.

Physical structure is particularly important within *Ostrea edulis* habitat with living oysters and accumulated shell providing stable hard substrata, vertical relief, and interstitial spaces within otherwise sedimentary environments. These features provide settlement surfaces for oyster larvae and habitat for associated epifauna and mobile organisms. Oyster larvae preferentially settle on suitable hard substrata, including living oysters and clean dead shell with relatively low levels of silt, although settlement success is also influenced by larval supply, hydrodynamic conditions, predation, and post-settlement survival (Fulford et al., 2011; Bromley et al., 2016; Preston et al., 2020). Physical disturbance that breaks, overturns, buries, removes or redistributes shell may consequently alter the availability, stability, and spatial configuration of settlement habitat.

Bromley et al. (2016) undertook a three-year field experiment in Lough Foyle using a bladed oyster dredge frame with the collecting bag removed, leaving only the dredge as a harrow. Harrowing altered the composition and distribution of shell material, with harrowed plots containing a greater proportion and weight of oyster shell than unharrowed plots. The harrowing did not significantly change shell fouling or suspended particulate matter concentrations. However, a significant difference in epifaunal and mobile macrofaunal assemblage composition between harrowed and unharrowed treatments was found, although interannual variation had a stronger influence on assemblage composition than harrowing vs no harrowing (Bromley et al., 2016).

Another study did a spatial comparison within the rotationally managed Loch Ryan oyster fishery in southwestern Scotland (Kennon et al., 2023). It examined plots that had last been fished one, two and six years pre survey. Oyster shell density, shell cover and macrofaunal biodiversity differed significantly among the plots, with the highest values recorded where six years had elapsed since fishing. Oyster shell density in the plot last fished six years before the survey was 8.5 times that recorded in the plot last fished one year before the survey, while Shannon Wiener diversity and Margalef's richness were 60.5% and 68.8% higher, respectively, in the six year plot. Oyster shell density and percentage cover were also positively related to macrofaunal biodiversity, indicating that the accumulation of living and dead shell contributes to habitat complexity and supports an increasingly diverse associated benthic community (Kennon et al., 2023). Modelling indicated that biodiversity recovery may extend over approximately ten years. However, in the absence of an undisturbed reference habitat, this period cannot be regarded as a confirmed estimate of the time required for full recovery. The findings indicate that changes to oyster-bed structure and associated biodiversity may persist for several years and that recovery may remain incomplete between successive fishing seasons.

Broader bottom fishing studies support the conclusion that the response to physical disturbance is strongly dependent on gear and habitat type. Kaiser et al. (2006) found that scallop dredging produced significant short term reductions in the abundance of benthic taxa in sand and muddy sand habitats, including negative responses among deposit feeding and suspension feeding fauna. Gravel habitats were negatively affected in both short and longer term observations, while biogenic habitats exhibited some of the greatest initial effects and prolonged recovery. The study also identified a relationship between restoration of the physical habitat and recovery of its biological community. However, scallop dredges generally differ from the oyster dredges used in the three Irish fisheries in weight, tooth configuration, penetration and towing arrangement. The reported effect magnitudes and recovery periods are therefore treated as supporting analogue evidence.

This broader evidence is supported by Sciberras et al. (2018), who found that a single pass of bottom towed fishing gear reduced benthic invertebrate abundance and species richness across the experiments included in their global meta-analysis. Although this study did not examine the Irish native oyster fisheries and therefore do not provide direct predictions for them, it provides relevant analogue evidence of the potential physical effects of dredging on benthic habitats. The scale of the impact may be different as scallop dredges may be larger and are configured differently. The magnitude of the response increased with gear penetration depth. High resolution fishing data from the Danish blue mussel fishery showed that increasing dredging intensity was associated at the regional scale with reduced benthic community biomass and shifts in species composition. The compositional change reflected differing responses among taxa, with many sedentary taxa occurring at lower densities in dredged areas and mobile gastropods and opportunistic oligochaetes occurring at higher densities. These opposing responses meant that no significant change in total community density was detected. The study also found no significant effect on functional richness or trait composition (McLaverty et al., 2020). The strength of these relationships varied locally according to background eutrophication, natural disturbance and the availability of suitable reference conditions (McLaverty et al., 2020). Although the study did not examine *Ostrea edulis* beds directly, it provides relevant supporting evidence that benthic responses to bivalve dredging depend on fishing intensity, spatial scale and receiving environmental conditions.

Long-term evidence indicates that repeated physical disturbance can contribute to more extensive habitat modification where oyster beds support complex biogenic reefs. Cranfield et al. (2003) associated prolonged oyster dredging in an *Ostrea chilensis* fishery with disruption of oyster-associated bryozoan reefs, redistribution of biogenic sediment and flattening of the seabed. Thurstan et al. (2013) documented the historical extirpation of *O. edulis* and the transformation of extensive biogenic habitat into less diverse soft sediment communities within the Firth of Forth. Intensive removal of adult and juvenile oysters occurred alongside damage from bottom trawling and dredging, which disrupted and removed the consolidated surface shell matrix. Other pressures included sediment deposition following land drainage and reclamation, physical smothering by suspended coal mine waste and dumped coal and ash, and industrial pollution from gas works, tanneries and dye works. The loss of shell substrate also reduced suitable settlement habitat and contributed to recruitment failure. These findings demonstrate the potential for repeated disturbance and removal, acting alongside other environmental pressures, to contribute to long term changes in oyster associated reef habitats (Thurstan et al., 2013).

For the purposes of the site-specific assessments below, physical disturbance includes direct abrasion and displacement of the seabed, damage or displacement of living oysters, breakage or redistribution of shell and cultch, alteration of small-scale seabed relief, and direct injury or displacement of fauna associated with the oyster grounds. Sediment resuspension and deposition and interactions with separate sensitive benthic communities are assessed independently in subsequent sections.

3.1.1.2. Blacksod Bay

Physical disturbance occurs where the oyster dredge contacts the seabed and may include local abrasion of sediment, formation of dredge tracks, displacement of oysters, breakage or redistribution of shell and cultch, and injury or displacement of associated benthic fauna. Within Blacksod Bay, the main receptors considered under this pathway are the native oyster grounds and the sedimentary communities within which they occur. Potential interaction with the separately mapped *Zostera*-, *Serpula*- and reef-dominated communities is considered under the assessment of interactions with other sensitive communities and Qualifying Interests.

The receiving habitat is predominantly sedimentary. Approximately 94.6% of the licensed area comprises the Fine sand with *Angulus fabula* community complex and a further 3.6% comprises the Sand with *Angulus tenuis* and *Pygospio elegans* community complex. These are predominantly sandy habitats and do not represent a documented topographic native oyster reef. Physical disturbance of mobile sedimentary habitat is generally more reversible than disturbance of structurally complex biogenic habitat, while evidence from bottom-contact fishing studies indicates that previously fished communities are generally less strongly affected by additional disturbance than previously unfished communities (Kaiser et al., 2006; Sciberras et al., 2018). This is relevant because the Blacksod Bay oyster grounds have a long history of commercial exploitation and therefore represent a historically disturbed receiving environment. Tully and Clarke (2012) similarly noted that well-developed topographic native oyster reefs have not been documented in contemporary Irish shallow-water oyster fisheries.

The magnitude and frequency of the pressure are also limited by the low annual fishing effort. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually no more than eight fishing days, although a few additional fishing days may occur in some years. Direct seabed contact is therefore intermittent and of short total annual duration rather than continuous or ongoing. Most fishing occurs during the cooler months, although fishing in September and potentially later in autumn may overlap with the end of the period of active shell growth. Tully and Clarke (2012) identified strong seasonality in juvenile oyster growth and noted that dredge contact during active growth may damage the fragile growing shell margin. The small number of fishing days during September to December limits the frequency and duration of this potential interaction.

Tully and Clarke (2012) identified progressive shell breakage and homogenisation of oyster grounds as a potential consequence of repeated dredging. Localised changes of this kind cannot be excluded along individual dredge tracks. However, the sandy receiving habitat, its capacity for natural physical reworking and the low number of fishing days each year substantially reduce the likelihood that such effects would accumulate to produce significant bed-scale alteration. The absence of a contemporary stock time series means that stock stability should not be relied upon as a separate line of evidence for Blacksod Bay.

Assessment conclusion

Physical disturbance associated with native oyster dredging in Blacksod Bay is intermittent and is not continuous or ongoing. Taking account of the predominantly sandy and historically disturbed receiving habitat, the absence of documented biogenic oyster reef and the low annual fishing effort, local physical effects are not expected to develop into disturbance of a magnitude or duration capable of compromising the natural condition of the oyster-bearing sedimentary communities. The occurrence of a small number of additional fishing days between September and December does not materially alter this assessment because total annual fishing effort remains low and is separated by extended periods without dredging. Physical disturbance is therefore assessed as **not significant** and **not persistent**.

3.1.1.3. Tralee Bay

Physical disturbance occurs where the oyster dredge contacts the seabed and may locally abrade or displace sediment, overturn or damage living oysters, break or redistribute shell and cultch, reduce small-scale seabed relief and injure or displace associated benthic fauna. The main receptor is the *Ostrea edulis* dominated community within Inner and Outer Tralee Bay, which forms a constituent community of Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160] and is required to be conserved in natural condition.

Commercial fishing is directed towards the established oyster grounds rather than uniformly across the full licensed area (Fishery Order) which includes much of Tralee Bay. The wider spatial overlap between the licence areas and other mapped benthic communities should therefore not be treated as the physical disturbance footprint of the fishery. Direct interaction at the margins of the oyster grounds, including areas of transition towards *Zostera*, *Mytilus* or reef communities, is considered separately under the assessment of interactions with other sensitive communities and Qualifying Interests.

The Tralee Bay oyster grounds are long-established, historically exploited sedimentary oyster beds rather than documented topographic oyster reefs. Although repeated dredging can progressively break shell and reduce small-scale relief (Tully & Clarke, 2012), the response of historically fished sedimentary communities to further disturbance is generally less pronounced than that of previously unfished or biogenic habitats (Sciberras et al., 2018). The current physical character of the Tralee Bay oyster grounds must therefore be considered in the context of a long history of recurrent dredging rather than as previously undisturbed habitat.

The fishery operates between September and April, with no commercial dredging between May and August. This removes direct physical disturbance during much of the main shell-growth period. Tully and Clarke (2012) demonstrated strong seasonal growth in Irish native oysters, including little or no winter growth in younger oysters, and identified damage to the actively growing shell margin as a potential effect of dredge contact. The timing of the fishery therefore substantially limits this particular effect.

The longer-term MI survey record provides an additional site-specific line of evidence. Surveys of Inner Tralee Bay generally encompass the entire known stock, historically distributed over approximately 4 km^2, while more recent Outer Tralee Bay surveys encompass the known patchy oyster grounds. Biomass varies substantially among years and should not be described as constant; nevertheless, the oyster stocks continue to occupy the established grounds and repeatedly contain smaller, intermediate and larger oysters. The surveys therefore provide no evidence of a progressive loss of the oyster grounds or of physical disturbance sufficient to prevent their continued recruitment and persistence (Tully & Clarke, 2012; Marine Institute, 2025).

Direct measurements of shell cover, fragmentation and seabed relief are not available, and local structural effects of dredging therefore cannot be excluded. However, if repeated shell breakage and flattening were occurring at a magnitude sufficient to materially impair oyster-bed function across the mapped community, a sustained deterioration in the ability of the grounds to support oysters and recruitment would be expected. This is not apparent from the available survey series. The evidence therefore supports local and reversible physical disturbance rather than progressive bed-scale deterioration.

Assessment conclusion

Physical disturbance associated with native oyster dredging in Tralee Bay is seasonal and is not continuous. Although local disturbance of oysters, shell material and associated fauna occurs along dredge tracks, the long-established and historically disturbed nature of the sedimentary oyster grounds, the annual May-August cessation of fishing and the continued persistence and replenishment of the established oyster stocks indicate that the pressure is not causing significant deterioration of the *Ostrea edulis* dominated community. Physical disturbance is therefore assessed as **not significant** in relation to the applicable Conservation Objectives for Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160].

3.1.1.4. Lough Swilly

Physical disturbance occurs where the oyster dredge contacts the seabed and may locally abrade or displace sediment, overturn or damage living oysters, break or redistribute shell and cultch, alter small-scale seabed relief and injure or displace associated benthic fauna. The main receptor for this pathway is the *Ostrea edulis* dominated community, which is a constituent community of Estuaries [1130] and is required to be conserved in natural condition.

The active oyster fishery is directed towards known oyster beds and the full approximately 55.4 km² licensed area should not be interpreted as the area physically disturbed by dredging. The fact that the licence polygon overlaps all six constituent communities of Estuaries [1130] therefore identifies potential spatial pathways but does not demonstrate direct exposure of those communities. Physical disturbance associated with the targeted fishery is mainly concentrated within the oyster grounds; potential contact with other constituent communities at the margins or transitional areas of those grounds is assessed separately under interactions with other sensitive communities and Qualifying Interests.

Lough Swilly has an exceptionally long history of native oyster exploitation. Oysters were recorded in commercial quantities in 1604 and a traditional fishery has operated in the lough for centuries. The present *Ostrea edulis* dominated community is therefore a historically disturbed sedimentary oyster habitat rather than an undisturbed or topographic native oyster reef. Tully and Clarke (2012) noted that well-developed topographic oyster reefs have not been documented in contemporary Irish shallow-water fisheries and that Irish estuarine oyster grounds are naturally subject to sediment movement, salinity variation and other physical disturbance. The history of fishing is also relevant because benthic communities with previous exposure to bottom fishing generally experience lower additional depletion than comparable previously unfished communities (Sciberras et al., 2018).

The licensing period assessed in this report extends from September to April, leaving May to August without oyster dredging. Direct physical pressure is consequently seasonal rather than continuous and is absent during much of the main period of active shell growth. This reduces the potential for repeated damage to the fragile growing shell margin identified by Tully and Clarke (2012) and provides an annual period without further mechanical disturbance.

The comparable MI surveys undertaken between 2021 and 2026 generally encompass almost all of the known commercial native oyster stock in Lough Swilly. Biomass is variable rather than stable, but the population has persisted throughout the series, smaller oysters have been repeatedly represented and biomass increased again in 2026 following the lower 2025 estimate. These observations provide evidence that the established oyster grounds continue to support recruitment, survival and growth despite the long history of dredging and other pressures acting within the lough. They do not demonstrate that local shell breakage or small-scale changes in bed relief are absent, but they provide indirect evidence that physical disturbance has not reached a magnitude sufficient to prevent continued ecological functioning of the oyster grounds.

Tully and Clarke (2012) identified gradual shell breakage, homogenisation and loss of small-scale relief as potential consequences of repeated oyster dredging. Direct time-series measurements of these structural attributes are not available for Lough Swilly, so local effects cannot be excluded. However, there is no evidence from the available stock assessments of progressive loss of the native oyster population from the established grounds or of a sustained failure of recruitment that would indicate physical degradation of the bed at a scale sufficient to compromise its continued function. The substantial variation in native oyster biomass must also be considered in the context of other important pressures in Lough Swilly, including *Bonamia* and competition with the much larger naturalised Pacific oyster population, and cannot be attributed to physical dredging disturbance alone.

Assessment conclusion

Physical disturbance associated with native oyster dredging in Lough Swilly is seasonal and is not continuous. Localised disturbance of oysters, shell material, sediment and associated fauna is expected where dredging occurs, but the long history of fishing, sedimentary character of the oyster grounds, annual cessation of dredging during much of the active growth period and continued persistence and replenishment of the native oyster population do not indicate progressive physical deterioration at a scale capable of compromising the natural condition of the *Ostrea edulis* dominated community. Physical disturbance is therefore assessed as **not significant** in relation to the Conservation Objective for Estuaries [1130].

3.1.2. Removal of oysters from the population

3.1.2.1. Literature review

Removal of oysters through commercial harvesting directly reduces living-oyster abundance and biomass and disproportionately affects the larger component of the stock. As larger oysters contribute to spawning-stock biomass, sustained removal may also reduce reproductive output and subsequent recruitment. For the purposes of this assessment, effects on recruitment arising through the reduction of spawning-stock abundance and density are therefore assessed as a consequence of oyster removal rather than as a separate impact mechanism. Removal of individual oysters is permanent; however, the resulting population-level effect is not persistent where recruitment and subsequent growth replace harvested individuals and maintain the abundance and size structure of the stock.

The effects of removal are not limited to adults above the MLS. Native oyster dredging is poorly size-selective because oysters frequently occur in aggregations or are attached to dead shells, resulting in the capture of all size classes, including recently settled spat. Catches are sorted on board, with oysters above the minimum landing size of approximately 76–78 mm retained and undersized oysters returned to the seabed, where survival is generally high unless individuals are damaged during handling or separation from larger oysters. Spat attached to retained oysters may also be removed from the population through landing, although in Tralee Bay efforts are made to detach and return these smaller individuals (though the survival rate of the spat returned in this way is thought to be low; Tully, O., *pers. comms.*).

Marine Institute surveys undertaken between 2010 and 2012 provide direct evidence of the selective removal of legal-sized *Ostrea edulis* from commercially exploited Irish stocks. Surveys completed following the oyster-dredging season generally recorded a lower proportion of oysters at or above the statutory Minimum Landing Size of 76 mm than surveys undertaken before fishing commenced. Using the observed difference in total mortality between surveys undertaken before and after fishing, mainly in Tralee Bay, Tully and Clarke (2012) estimated an instantaneous fishing-mortality coefficient of 0.9. This was considered equivalent to an annual fishing mortality of approximately 60% among legal-sized oysters. The findings demonstrate that seasonal dredging can remove a substantial proportion of the harvestable and reproductively important component of a native oyster stock.

The ecological consequences of removal are also influenced by oyster density and spatial distribution. Fertilisation in *O. edulis* occurs within the mantle cavity of the functional female following the release of sperm by neighbouring oysters. A reduction in population density and an increase in the distance between reproductive individuals may reduce fertilisation success. Dense commercial aggregations have been identified as important sources of larvae capable of contributing to the regeneration of surrounding oyster grounds, while fragmented and dispersed populations may produce substantially fewer larvae (Kennedy & Roberts, 2006; Guy et al., 2019).

Recruitment in *O. edulis* is naturally variable and depends on broodstock condition, larval production, hydrodynamic retention, suitable settlement substrate and the survival of spat and juveniles. A fishery may therefore sustain a defined level of removal during periods of successful recruitment but experience progressive depletion where recruitment is weak or intermittent. Historical evidence from Ireland and Britain demonstrates that sustained exploitation has contributed to the exhaustion or extirpation of native oyster beds, particularly where fishing continued after stock density and catch rates had declined (Tully & Clarke, 2012; Thurstan et al., 2013).

Recovery cannot be inferred solely from the closure of a fishery or the presence of a seasonal period without dredging. Depleted populations may require several recruitment and growth cycles to rebuild the legal-sized and reproductively important components of the stock. Recovery may also remain limited by disease, invasive species, insufficient broodstock density or unsuitable settlement habitat after fishing pressure has been reduced. Declining abundance, decreasing population size structure, and poor recruitment have been recorded within southern English populations despite fishery closures and reduced fishing effort, demonstrating that cessation of removal does not necessarily result in population recovery where other limiting pressures remain (Helmer et al., 2019).

The persistence and significance of oyster removal depend on whether fishing mortality exceeds the capacity of the population to replace losses through recruitment and growth. This will be informed by trends in biomass and recruitment. Changes in these parameters must be interpreted in the context of natural mortality, disease, invasive species, environmental variability and survey uncertainty, as observed changes cannot necessarily be attributed to dredging alone.

3.1.2.2. Blacksod Bay

The magnitude of oyster removal in Blacksod Bay is mainly constrained by the low annual fishing effort. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually no more than eight fishing days, although a few additional fishing days may occur in some years. The opportunity for oyster removal therefore remains substantially lower than in fisheries operating regularly over several months. The MI also applies an average dredge-efficiency coefficient of approximately 35% to oyster survey catches, demonstrating that individual dredge passes do not capture all oysters present within the swept track, although this coefficient should not be interpreted as an annual exploitation rate.

The statutory MLS of 76 mm provides further protection to spawning stock. Native oysters generally reach the MLS at approximately four to five years of age but become reproductively mature at a smaller size and younger age. Consequently, a component of the sub-MLS population can reproduce before becoming available for legal retention. *O. edulis* is also highly fecund, producing approximately 0.5–2 million eggs per spawning depending on individual size and condition. The combination of a mature sub-MLS component, incomplete dredge catchability and the low number of fishing days each year provides substantial scope for reproductive oysters to remain within the population.

The available Blacksod Bay stock information is limited and is not sufficient to describe recruitment trends. The 2011 survey recorded a median shell length of 76 mm, with 37.8% of oysters between 55 and <76 mm and 51.5% at or above 76 mm, although Tully and Clarke (2012) considered evidence of recent spat settlement to be limited.

Assessment conclusion

Removal of oysters in Blacksod Bay is intermittent and is not continuous. Although individual landed oysters are permanently removed from the population, annual fishing effort remains low, usually comprising no more than eight fishing days, although a few additional fishing days may occur in some years. Together with the protection provided to mature sub-MLS oysters, this limits the annual opportunity for spawning-stock depletion. The additional fishing activity between September and December does not indicate a level of removal likely to prevent population replenishment or materially alter the native oyster component of the relevant benthic communities. The population-level effect of oyster removal is therefore assessed as **not persistent** and **not significant** in relation to Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170].

3.1.2.3. Tralee Bay

Tralee Bay supports by far the largest native oyster stock in Ireland, with Inner Tralee Bay containing the majority of national native oyster biomass. This provides a substantially larger spawning-stock resource than occurs in the other fisheries considered in this assessment. Although biomass varies considerably among years, the long-term MI survey series does not indicate a progressive monotonic decline associated with harvesting. Inner Tralee Bay has continued to support several hundred tonnes of native oyster biomass throughout the survey series, while Outer Tralee Bay increased from approximately 48.4 tonnes in 2025 to 107.1 tonnes in 2026.

Importantly, this persistence has occurred despite historically substantial exploitation. Tully and Clarke (2012) estimated that fishing mortality in Inner Tralee Bay during 2010–2012 removed approximately 58–60% of oysters recruited to the fishery (>76 mm) during a fishing season. The continued persistence of substantial biomass and repeated recruitment following this level of historical exploitation provides direct site-specific evidence that removal has not prevented replacement of harvested oysters at the population scale. The MI surveys generally encompass the entire Inner Tralee Bay stock, which is distributed over approximately 4 km^2, providing a consistent long-term basis for assessing stock condition.

The size-distribution data provide a complementary line of evidence. Smaller and intermediate oysters have been repeatedly recorded in both Inner and Outer Tralee Bay, demonstrating continued recruitment and progression through the population. In 2025, 31.1% of measured Inner Tralee Bay oysters were <55 mm, while the recent Outer Tralee Bay surveys showed particularly strong recruitment, including distinct modes at approximately 30 and 75 mm in 2025 and 65.9% of measured oysters <55 mm in 2026. These observations demonstrate that removal of legal-sized oysters has not prevented recruitment under the existing fishery regime.

This outcome is consistent with the existing management framework. The fishery is managed by the Tralee Oyster Fisheries Society under the Oyster Fishery Order (Brandon Bay, Tralee Bay and Ballyheige Bay), 1981. Management includes annual MI stock surveys, a TAC/catch limit set by the co-operative with reference to the stock assessment and local knowledge, a statutory MLS of 76 mm, a voluntary MLS of 78 mm, and a defined September–April fishing season with no fishing from May to August. Because oysters mature below the MLS, the size restriction allows a proportion of the stock to contribute to reproduction before becoming available for legal harvest. The annual survey and TAC additionally provide a mechanism through which removals can be adjusted in response to stock condition.

The recent reduction in Inner Tralee Bay biomass between 2023 and 2025 is recognised and should not be presented as evidence that biomass is invariant. However, this occurs within a highly variable long-term series and cannot be attributed to removal alone. Recruitment has continued, substantial spawning biomass remains, and there is no evidence that the established oyster grounds have undergone material loss as a consequence of harvesting. Tralee Bay also does not experience the naturalised Pacific-oyster pressure documented in Lough Swilly, and *B. ostreae* has not been detected under disease surveillance, increasing the capacity of the stock to accommodate managed fishing mortality relative to the more heavily pressured Lough Swilly stock.

Assessment conclusion

Oyster removal in Tralee Bay is seasonal and is not continuous. Although a substantial proportion of legal-sized oysters may be removed during individual fishing seasons, the large standing stock, recurrent recruitment, protection of mature sub-MLS oysters and the existing combination of annual stock assessment, TAC, MLS and seasonal controls have maintained the capacity of the population to replenish harvested individuals. The available long-term stock record does not indicate that removal under the existing management regime has caused a persistent deterioration in the *O. edulis* dominated community. Removal and its consequent effect on spawning stock and recruitment are therefore assessed as **not persistent** and **not significant** in relation to the Conservation Objectives for Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160].

3.1.2.4. Lough Swilly

The capacity of the Lough Swilly native oyster population to withstand removal is materially lower and more uncertain than in Tralee Bay. Recent native oyster biomass has been substantially lower, varying from approximately 67.1 tonnes in 2025 to 259.1 tonnes in 2022 and increasing to 131.1 tonnes in 2026. The 2021, 2024 and 2026 estimates were of a broadly similar order, indicating persistence of the stock, and the increase between 2025 and 2026 provides evidence of some capacity for recovery. However, the absence of a monotonic decline does not demonstrate that current fishery removals are within the replacement capacity of the stock.

The size structure provides reason for caution. Legal-sized oysters have generally represented a small component of the recent stock. In the April 2025 post-fishery survey, estimated biomass ≥76 mm was only approximately 0.88 tonnes, equivalent to approximately 1.3% of total native oyster biomass, and the MI reported no strong indication of spat recruitment. The 2026 survey was more favourable, with 10.3% of measured oysters ≥76 mm and 25.3% <55 mm, but the recent size distributions do not show the consistently strong and clearly separated recruitment cohorts evident in Tralee Bay. The increase in 2026 is encouraging but is insufficient on its own to demonstrate sustained stock recovery or that annual removals are being replaced.

The stock is also subject to additional mortality and competitive pressures that reduce its capacity to accommodate fishing mortality. *B. ostreae* occurs in Lough Swilly and contributes additional mortality, while naturalised Pacific oyster *M. gigas* competes with native oyster for habitat and has become dominant across parts of the historical native oyster grounds. Pacific oyster biomass was approximately 3,276 tonnes in 2022 and 1,539 tonnes in 2024, compared with native oyster biomass of 259 and 111 tonnes respectively. Although Pacific oyster biomass declined to approximately 346 tonnes in 2026, it remained approximately 2.6 times greater than native oyster biomass. Tully and Clarke (2012) identified competition from Pacific oyster as a realised threat to the maintenance of native oyster populations in Lough Swilly.

These biological pressures are compounded by a lack of fishery management. Lough Swilly operates as a public fishery and no current stock-linked TAC or equivalent annual limit on native oyster removal has been identified. Twenty-four dredge licences were recorded in 2026, but the number actively used and fishing effort could not be quantified. The Lough Swilly Wild Oyster Society does not have legal authority equivalent to the Tralee Fishery Order, and the proposed 2012–2017 Fishery Natura Plan was not implemented. That plan itself recognised the risk associated with uncontrolled removal and proposed an exploitation limit of 33% of pre-fishery spawning-stock biomass, closures where oyster density was <0.25 oysters m^{-2}, protection of juvenile-dominated areas and establishment of a spawning reserve.

The statutory 76-mm MLS and seasonal closure from May-August provides some protection of the spawning and growth period. However, unlike Tralee Bay, there is currently no demonstrated mechanism linking the quantity removed each year to the available spawning-stock biomass or subsequent recruitment. Given the relatively low native-oyster biomass, weak recent recruitment signal, additional mortality from *Bonamia*, strong competition from naturalised Pacific oyster and absence of a stock-linked catch limit, the available evidence does not demonstrate that annual removals can be replaced consistently before subsequent fishing occurs.

Assessment conclusion

Oyster removal in Lough Swilly is not continuous as a fishing activity; however, its population-level effects may persist between successive fishing seasons where recruitment and growth do not replace harvested oysters. The native oyster stock persists and showed improved biomass and size structure in 2026, but it remains relatively small and is subject to substantial additional biological pressures. In the absence of a stock-linked TAC, quantified annual exploitation rate or evidence of consistently strong recruitment, it cannot be demonstrated that current removals are compatible with maintaining the *O. edulis* dominated community in natural condition. Removal of oysters and its consequent effects on spawning stock and recruitment are therefore assessed as **potentially persistent** and **significant** in relation to the Conservation Objective for Estuaries [1130].

3.1.3. Sediment resuspension and smothering

Passage of an oyster dredge across the seabed may disturb and resuspend unconsolidated sediment. This suspended material is then dispersed by currents or subsequently deposited within or beyond the area dredged. Where deposited sediment accumulates on living oysters, exposed shell or the surrounding seabed, it may bury settlement surfaces, smother spat and alter the condition of oyster habitat and associated benthic communities. Resuspension and subsequent deposition therefore provide a pathway through which dredging may affect native oysters and the protected communities within which they occur.

The source of the potential effect is licensed commercial native oyster dredging. The pathway comprised the resuspension of seabed sediment through contact with the dredge and the subsequent transport and deposition of disturbed material within the oyster grounds. The receptors were the *Ostrea edulis* dominated communities identified as constituent communities of the relevant qualifying interest habitats.

The magnitude and duration of the effect depends on the quantity and particle size of the sediment disturbed, the number and duration of dredge tows, the frequency with which the same area is dredged and the hydrodynamic conditions governing dispersion and deposition. Fine sediment may remain in suspension for longer and be transported beyond the dredge track, while coarser material is more likely to settle closer to the area disturbed. The occurrence of sediment resuspension does not itself constitute a persistent effect, as suspended material may be dispersed or deposited temporarily within a naturally dynamic environment. Persistence depends on whether deposited sediment remains within the oyster habitat or whether repeated dredging causes deposition to recur before the affected surfaces and communities recover.

Historical accounts from the Wadden Sea associated the poor condition of oyster beds and limited recruitment with a combination of management practices and environmental pressures, including the removal of large oysters and shell, siltation and competition with other filter feeders. Siltation was identified as a particular concern within shallow estuarine systems because accumulated fine sediment may bury shell and smother oyster spat (Berghahn & Ruth, 2005). This evidence supports the potential for sediment deposition to affect oyster habitat and recruitment but does not establish that siltation was the sole cause of the changes recorded or provide a deposition threshold that can be applied to the assessed fisheries.

Experimental harrowing undertaken using an oyster dredge frame in Lough Foyle did not result in a significant increase in suspended particulate matter, and the results indicated that the accumulation of silt was unlikely to account for the limited oyster settlement recorded during the study (Bromley et al., 2016). Though harrowing without a collecting bag did not reproduce all aspects of commercial oyster dredging, Bromley et al. (2016) still highlighted that contact with an oyster dredge does not necessarily result in sustained sediment accumulation. They also show that the absence of oyster settlement cannot be attributed to siltation alone.

The main consequence of smothering for native oyster habitat is the burial or covering of living oysters, spat and shell surfaces. Deposited sediment may reduce the availability of exposed shell for settlement and may affect benthic fauna occurring within or on the surface of the sediment. The quantity deposited, the duration of exposure and the condition of the affected oysters and communities must also be considered. Effects on oyster settlement and population recruitment were assessed separately under the relevant impact pathway, while the present pathway considered the direct effects of sediment resuspension, deposition and smothering.

Sediment resuspension and subsequent deposition may affect different life stages of *Ostrea edulis* through different mechanisms. Planktonic larvae would not be directly smothered by seabed deposition, but sediment deposited on exposed shell or other suitable hard substrate may reduce the availability and quality of settlement habitat. Recently settled spat may be vulnerable to burial or smothering where deposition is sufficiently extensive or persistent. Juvenile and adult oysters may also be affected where repeated deposition covers living oysters, restricts feeding or alters the stability and physical structure of the oyster grounds. The sensitivity of each life stage would depend on the thickness, duration and recurrence of deposition, together with local hydrodynamic conditions and the availability of suitable settlement substrate.

The site-specific assessments considered the mapped sedimentary and benthic communities, their overlap with the licensed dredging areas, the distribution of native oysters, available information on fishing activity and management arrangements. No direct measurements of suspended sediment concentrations, the extent or thickness of deposition, the duration of sediment plumes or the condition of oysters and benthic communities following commercial dredging were available for Blacksod Bay, Tralee Bay or Lough Swilly. Instead, available information was used to identify where the pathway could occur and the factors influencing its likely magnitude and duration, but it did not provide a direct measurement of sediment resuspension or smothering caused by oyster dredging.

Persistence was assessed by considering whether deposited sediment could remain within oyster habitat beyond the interval between fishing events or whether repeated dredging could prevent the clearance of deposited material and recovery of the affected surfaces and communities. Significance was assessed by reference to the scale, extent and duration of the effect and whether it could compromise native oyster survival, the availability of suitable settlement surfaces or the maintenance of a protected community in a condition consistent with the relevant site specific conservation objective targets.

Deposited sediment may cover living oysters, bury exposed shell or other suitable settlement substrate, and smother spat or benthic fauna where deposition is sufficiently extensive or persistent (Berghahn & Ruth, 2005; Bromley et al., 2016). Available information on sediment characteristics, the distribution of oyster grounds and benthic communities, the environmental setting of each bay, fishing activity and management arrangements was used as indirect evidence within the site-specific assessments. These data were considered alongside the Marine Life Information Network (MarLIN) assessment of smothering and siltation rate changes under the light deposition benchmark. This pressure represented the pathway through which sediment resuspended by an oyster dredge may subsequently settle on living oysters, spat, exposed shell or associated benthic habitat.

MarLIN classified *Ostrea edulis* as having High sensitivity to deposition of up to 5 cm of fine material in a single discrete event. This benchmark described receptor sensitivity and did not establish that oyster dredging would generate deposition of this magnitude. The potential significance of sediment resuspension and smothering was assessed by considering the sensitivity classification alongside the expected scale and duration of sediment disturbance, the characteristics of the receiving environment and the potential for sediment dispersion or accumulation.

3.1.3.1. Blacksod Bay

Within the Mullet/Blacksod Bay Complex SAC, the Conservation Objectives did not identify an *Ostrea edulis* dominated community. Native oyster was not a Qualifying interest or the subject of a separate population target. It was nevertheless identified as a notable species occurring towards the head of Blacksod Bay, while small patches were recorded at Cartron within the Sand with *Angulus tenuis* and *Pygospio elegans* community complex. The Fine sand with *Angulus fabula* community complex was a constituent community of Large shallow inlets and bays [1160]. The Sand with *Angulus tenuis* and *Pygospio elegans* community complex was a constituent community of both Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160]. The applicable Conservation Objectives require these communities to be conserved in natural condition, subject to natural processes. Effects on native oysters, spat and exposed shell were therefore relevant where they contributed to, or provided an indication of change in, the structure and function of these constituent communities of the Qualifying interest habitats rather than as a separate native oyster population target. Sediment resuspension and subsequent deposition provided a pathway through which dredging could affect these receptors (NPWS, 2013a; NPWS, 2014a; NPWS, 2014c).

The licensed native oyster dredging area extended across approximately 9.500 km^2. The Fine sand with *Angulus fabula* community complex accounted for approximately 94.6% of the licensed area shown in **Figure 2.1**, while approximately 3.7% overlapped the Sand with *Angulus tenuis* and *Pygospio elegans* community complex. Smaller overlaps occurred with the Intertidal reef and Sheltered subtidal reef community complexes, which accounted for approximately 1.1% and 0.6% of the licensed area, respectively. These spatial relationships identified the communities that could potentially be exposed but did not represent the area actually dredged or the extent of sediment deposition.

Very fine and fine sand together accounted for between 79.1% and 98.1% of the sediment within the main Fine sand with *Angulus fabula* community complex. Silt and clay generally accounted for less than 3%, while gravel and other coarse fractions generally accounted for less than 5%. The inner bay variant contained more variable sand and gravel fractions, although a corresponding silt and clay range was not available. The recorded sediment composition indicated that most material disturbed within the main community would comprise sand rather than a large proportion of finer cohesive sediment.

Sand disturbed by dredging would be expected to settle comparatively rapidly within or close to the dredge track. Fine and very fine sand could remain in suspension for longer and could be deposited adjacent to the disturbed area. The smaller silt and clay fraction could be transported farther where local currents permitted. Blacksod Bay is shallow and generally has weak tidal streams. However, no measurements or modelling were available to determine suspended sediment concentrations, plume duration, transport distance or deposition thickness within the commercially dredged areas.

The High MarLIN sensitivity classification for *Ostrea edulis* applied to deposition of up to 5 cm of fine material in a single discrete event. The recorded sediment composition and potential for local deposition were considered against this sensitivity. However, no evidence demonstrated that commercial oyster dredging generated deposition approaching the specified benchmark or caused sustained burial of oysters, spat or exposed settlement surfaces. Local and temporary covering of oysters or seabed habitat could occur within or adjacent to individual dredge tracks, but the available information did not indicate widespread or prolonged smothering.

The frequency and duration of the pathway are substantially limited by the low annual fishing effort. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually no more than eight fishing days, although a few additional fishing days may occur in some years. Sediment disturbance is therefore intermittent and of short total annual duration, with extended periods between fishing activity during which no commercial oyster dredging occurs. This low fishing effort means that effects from suspended sediment or smothering are expected to be highly localised in space and time, and likely deposition height would be <5 cm.

Assessment Conclusion

Sediment resuspension and deposition may occur locally where the dredge contacts the seabed. However, the predominantly sandy seabed type in the licensed area, the low proportion of silt and clay and the absence of evidence that deposition reached the applicable MarLIN benchmark indicate that widespread or prolonged smothering is not expected.

The low number of fishing days each year means that sediment disturbance is intermittent and is separated by extended periods without further dredging. The small number of fishing days occurring between September and December does not materially increase the frequency or duration of the pathway to a level at which repeated or prolonged sediment effects would be expected. Sediment resuspension and smothering arising from native oyster dredging in Blacksod Bay are therefore assessed as **not persistent** and **not significant** in relation to Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170].

3.1.3.2. Tralee Bay

Within Tralee Bay and Magharees Peninsula, West to Cloghane SAC, sediment resuspension and subsequent deposition could affect the *Ostrea edulis* dominated community and the other constituent sedimentary communities occurring within the proposed dredging areas. The qualifying interests of this SAC were identified as Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170].

The proposed dredge area in Outer Tralee Bay extended across approximately 14.996 km^2. The Mixed sediment with crustaceans, bivalves and polychaetes community complex accounted for approximately 70.6% of this area, while the *Ostrea edulis* dominated community accounted for approximately 15.2%. The proposed dredge area in Inner Tralee Bay area extended across approximately 8.677 km^2, of which approximately 45.3% comprised the *Ostrea edulis* dominated community. The proposed dredge areas in Tralee Bay also overlapped other sedimentary, *Zostera*, *Mytilus* and reef communities that could potentially be exposed where a sediment transport pathway occurred.

The Mixed sediment with crustaceans, bivalves and polychaetes community complex was characterised mainly by mixed and coarse sediment. Silt and clay generally accounted for less than 8%, although higher proportions occurred at some sheltered locations. The Sand with *Nephtys cirrosa* community complex was predominantly composed of sand, with silt and clay generally accounting for less than 3%. Higher proportions of fine sediment occurred in sheltered areas and within parts of the Sand to sandy mud with polychaetes and bivalves community complex, particularly around Spa, Derrymore Island and Scraggane Point.

These sediment characteristics indicated that much of the material disturbed in the proposed dredge areas in Tralee Bay would comprise sand or mixed sediment. Coarser material would be expected to settle within or close to individual dredge tracks, limiting the duration and spatial extent of suspension. Localised resuspension and deposition could be greater within sheltered areas containing higher proportions of silt and clay. However, the available sediment data did not establish whether these finer deposits coincided with the areas subject to active or repeated commercial dredging.

The High MarLIN sensitivity classification for *Ostrea edulis* applied to deposition of up to 5 cm of fine material in a single discrete event. The presence of locally finer sediment meant that temporary covering of oysters, spat and exposed shell could not be excluded. However, no evidence demonstrated that commercial dredging generated deposition approaching this benchmark within the *Ostrea edulis* dominated community.

The fishery operated between September and April, with no commercial oyster dredging between May and August. Sediment disturbance was therefore seasonal rather than continuous and would not occur during the main growing and spawning season of native oysters during the summer months. The seasonal closure provided a period during which suspended material could settle or disperse and during which affected seabed surfaces could partially recover. This interruption substantially reduced the potential for sediment resuspension and deposition to remain continuous or to accumulate throughout the year.

Marine Institute surveys continued to record substantial oyster biomass and the presence of smaller oysters within Inner and Outer Tralee Bay. These results did not directly measure suspended sediment or deposition. They nevertheless provided indirect evidence that sediment disturbance under the existing fishery had not prevented the continued survival, recruitment and growth of oysters within the established grounds to maintain biomass within the historical range of the MI native oyster stock survey (2010-2025).

Localised and temporary sediment resuspension and deposition could occur where dredging disturbed areas containing fine sediment. However, much of the proposed dredge areas in Tralee Bay comprised sand or mixed sediment, and no evidence indicated deposition at the applicable MarLIN benchmark or widespread smothering of the *Ostrea edulis* dominated community or other sensitive receptors. The cessation of dredging between May and August also prevented the pressure from remaining continuous throughout the year.

Assessment Conclusion

Sediment resuspension and deposition arising from native oyster dredging in Tralee Bay are expected to be localised and seasonal. The available evidence did not indicate widespread or prolonged smothering of living oysters, spat, settlement surfaces or associated benthic communities. No sediment transport pathway of sufficient magnitude or duration to affect *Ostrea* dominated communities was demonstrated.

The annual cessation of dredging between May and August interrupts the pressure and provides a period for sediment dispersal and habitat recovery. Sediment resuspension and smothering arising from native oyster dredging in Tralee Bay are therefore assessed as **not persistent** and **not significant** in relation to Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170].

3.1.3.3. Lough Swilly

Within Lough Swilly SAC, the Conservation Objectives identified the *Ostrea edulis* dominated community as a constituent community of Estuaries [1130]. The community occurred intertidally and subtidally, mainly within the southern part of the lough from Ballygreen Point and Ballymoney Point southwards to Ardrumman and Ballylawn Point, with a smaller area at Ballykenny Point. The applicable Conservation Objective requires the *O. edulis* dominated community and the other constituent sedimentary communities of Estuaries [1130] to be conserved in natural condition, subject to natural processes.

The licensed dredging area extended across approximately 55.413 km^2 and overlapped all six constituent communities of Estuaries [1130]. The *Ostrea edulis* dominated community accounted for approximately 16.4% of the licensed area, equivalent to approximately 9.061 km^2. The remaining licensed area included fine sand, mixed sediment, muddy fine sand and mud habitat. However, oyster dredging is largely confined to the *Ostrea edulis* dominated community. The *Ostrea edulis* dominated community occurred within the Intertidal mixed sediment with polychaetes and Subtidal mixed sediment with polychaetes and bivalves communities. The intertidal community contained variable proportions of gravel, sand, silt and clay. The subtidal community was mainly characterised by fine sand, with gravel also forming a substantial sediment fraction at some locations.

Higher proportions of fine sediment occurred within other parts of the licensed area. Silt and clay accounted for between 12% and 33% of the Muddy fine sand with *Thyasira flexuosa* community and between 39% and 96% of the Mud community complex. These communities contained sediment that could remain in suspension for longer than sand and could be transported beyond the immediate dredge track if dredging were to occur there.

Localised sediment resuspension was expected where the dredge contacted mixed or fine sediment within the oyster grounds. Sand and coarser material would generally settle within or close to the area disturbed, while finer material could remain in suspension for longer and be deposited over a wider area. No measurements or modelling were available to quantify suspended sediment concentrations, plume duration, transport distance or deposition thickness. However due to the relatively shallow teeth in the dredges used (only entering 1-2 cm deep into sediment), the available evidence did not indicate that sediment resuspension would result in widespread or sustained deposition across the *Ostrea edulis* dominated community or the other constituent communities of Estuaries [1130].

The High MarLIN sensitivity classification for *Ostrea edulis* applied to the deposition of up to 5 cm of fine material in a single discrete event. The presence of mixed and locally muddy sediment meant that temporary covering of oysters, spat and settlement surfaces could not be excluded. However, no evidence demonstrated deposition approaching the specified benchmark within the oyster grounds. The sensitivity classification was therefore considered as evidence of the potential consequence where the benchmark was reached rather than evidence that smothering of this magnitude occurred in Lough Swilly.

The Lough Swilly native oyster fishing season operates from 1st of September to 30th of April, with no commercial oyster dredging between 1st of May and 31st of August. Sediment resuspension and deposition are therefore seasonal rather than continuous or ongoing. The annual four month closure removes the pressure and provides a period during which affected seabed habitats can recover. This seasonal closure substantially reduces the potential for recurring sediment deposition to accumulate continuously throughout the year.

Assessment Conclusion

Sediment resuspension and deposition may occur locally where oyster dredging disturbs mixed or fine sediment within the established fishing grounds. However, the licensed area does not represent the active dredging footprint, and the presence of muddy communities within the wider polygon does not demonstrate that these areas are subject to repeated disturbance. No evidence indicated deposition at the applicable MarLIN benchmark or widespread smothering of living oysters, spat, settlement surfaces or constituent benthic communities.

The cessation of dredging between 1st of May and 31st of August interrupts sediment disturbance and provides an annual interval for habitat recovery. Sediment resuspension and smothering arising from native oyster dredging in Lough Swilly are therefore assessed as **not persistent** and **not significant** in relation to Estuaries [1130].

3.1.4. Potential interaction with other sensitive benthic communities

3.1.4.1. Literature review

This pathway does not reassess the direct effects of seabed disturbance or sediment resuspension and deposition considered under the preceding mechanisms. It considered whether these effects could give rise to a separate credible interaction with other sensitive protected marine communities in each bay such as

Zostera dominated community or the *Serpula vermicularis* dominated community complex. The source of the potential effect was licensed commercial native oyster dredging. The pathways comprised direct contact between the dredge and the seabed and the resuspension, transport and subsequent deposition of disturbed sediment. The receptors were the *Zostera* dominated community and the *Serpula vermicularis* dominated community complex identified within the relevant Qualifying Interest habitats of the Mullet/Blacksod Bay Complex SAC, and the *Zostera*, *Sabellaria*, and *Mytilus* dominated communities in Tralee Bay and Magharees Peninsula, West to Cloghane SAC.

A potential direct interaction was identified where the licensed dredging area overlapped the mapped distribution of either community. An indirect interaction required a credible hydrodynamic or sediment transport pathway through which material disturbed elsewhere could be deposited within the community. Spatial overlap was treated as evidence of potential exposure rather than evidence that dredging had occurred within, or adversely affected, the community.

Direct dredge contact with a *Zostera* dominated community may damage or uproot shoots and rhizomes, disturb associated fauna and increase fragmentation of the meadow. An Irish before after control impact experiment did not identify significant effects of traditional oyster dredging on *Zostera marina* rhizome biomass, shoot density or blade density during the subsequent growing season. The results were specific to the conditions examined, including dredging during early spring, relatively limited gear penetration and the historical exposure of the receiving habitat to dredging. Higher intensity dredging was associated with reduced abundance of sessile fauna within the same experiment. The findings demonstrated that responses differed among receptors and dredging intensities and did not establish that effects would be absent under different environmental or operational conditions (Breen et al., 2024).

The *Serpula vermicularis* dominated community complex in Blacksod Bay comprised distinct clusters of biogenic reef formed by aggregations of calcareous tubes within otherwise soft sediment. The reef structures provided habitat for associated sessile and mobile fauna. The applicable Conservation Objectives required the avoidance of mortality to living *S. vermicularis* reef and significant disturbance involving the destruction of reef structures (NPWS, 2014c). Direct contact with an oyster dredge could break or displace living tubes, remove sections of reef, reduce structural complexity and disturb the associated biological community. Recovery of individual worms or surviving reef fragments would not necessarily restore the physical structure and ecological functioning of the reef, which may require many years to develop. MarLIN classified resistance to surface abrasion as None and resilience as Very Low, resulting in High sensitivity. Resistance to subsurface penetration was also classified as None and resilience as Very Low, resulting in High sensitivity. Evidence from other towed fishing gear indicated that structurally complex biogenic habitats could experience substantial initial effects and extended recovery periods, while increasing bivalve dredging intensity had been associated with reduced benthic biomass and changes in species composition (Kaiser et al., 2006; Sciberras et al., 2018; McLaverty et al., 2020). This evidence supported the identification of a credible impact pathway but did not provide an effect magnitude or recovery period that could be applied directly to the *S. vermicularis* dominated community complex within Blacksod Bay.

Zostera marina reproduces through seed production and vegetative extension of rhizomes. Although seed production may be high, seed and seedling mortality are also high, and dispersal is generally limited. Vegetative growth is therefore the main mechanism of local expansion and recovery following small-scale disturbance. Narrow scars may be recolonised from adjacent plants, while recovery of larger denuded areas may depend on the seed bank or external seed sources and can take decades in isolated or fragmented systems. Physical abrasion may remove shoots and reduce productivity, while deeper penetration can damage or remove rhizomes and roots. MarLIN classified *Z. marina* as having Low resistance and Medium resilience, resulting in Medium sensitivity to surface abrasion and None resistance, Low Resilience and High Sensitivity to subsurface penetration. Recovery depended on the extent and configuration of the disturbed area, sediment stability and the continued presence of viable plants or seeds (Manley et al., 2015; Paulo et al., 2019).

Mytilus edulis has high fecundity and a planktonic larval stage that provides the potential for dispersal and recolonisation. However, recruitment is spatially and temporally variable, while mortality among larvae and recently settled mussels is high. Recovery of disturbed beds therefore depends on larval supply, suitable attachment substrate, bed stability, hydrographic conditions and the absence of continuing disturbance. Strong recruitment may allow relatively rapid re-establishment, but large or repeatedly disturbed gaps may remain for several years or expand through wave action, predation and weakened byssal attachment. MarLIN classified *M. edulis* beds on littoral sediments as having Low resistance, Medium resilience and Medium sensitivity to surface abrasion, subsurface penetration and incidental removal. These pressures may remove mussels, weaken their attachment and alter the structure and associated fauna of the bed (Seed & Suchanek, 1992; Moyse et al., 2026).

The *Sabellaria* dominated community complex in Tralee Bay was formed by *Sabellaria alveolata* reef on Derrymore Strand. The reef occurred as hummocks standing above the substrate or interspersed with boulder reef. Reef cover ranged from approximately 20% to 80% towards Derrymore Bridge and from approximately 10% to 15% towards Bunawonder. The applicable Conservation Objectives required the avoidance of mortality to living *S. alveolata* and significant disturbance to community quality (NPWS, 2014d). Small areas of surface damage may be repaired rapidly through tube building by surviving worms, with trawl impressions reported to disappear within four to five days. More extensive damage may remove reef sections, be enlarged by wave action and require larval recolonisation. Recovery may then take months to years and, in isolated populations, potentially decades. MarLIN classified resistance to surface abrasion as Medium and resilience as High, resulting in Low sensitivity. Resistance to subsurface penetration was classified as Low and resilience as Medium, resulting in Medium sensitivity. Evidence relating directly to *Sabellaria alveolata* was considered alongside the wider literature on *S. spinulosa*. Evidence derived from *S. spinulosa* or from different reef forms was treated as supporting evidence only, because sensitivity and recovery may differ between species and reef morphology (Gibb et al., 2014; Vorberg, 2000; Plicanti et al., 2016).

Commercial oyster dredging could interact with these communities through direct abrasion, subsurface disturbance, incidental removal and changes in sediment suspension or deposition. The ecological response would depend on the location, spatial extent, intensity and recurrence of dredging, together with the recovery characteristics of the receptor. Where site-specific management measures prevented direct gear contact with mapped *Zostera*, *Mytilus* and *Sabellaria* communities in Tralee Bay and *Serpula* and *Zostera* dominated communities in Blacksod Bay, and limited cumulative seabed disturbance, effects on these communities were not expected to be persistent or significant at the scale of the bay or SAC.

Within the site-specific assessments, the potential for oyster dredging to interact with these sensitive communities was evaluated using the timing and duration of the fishing season, the applicable fishery management plans and management measures, and the spatial relationship between the licensed dredging areas and the mapped distributions of the communities. Spatial overlap was determined using the maps and associated tables presented in **section 2**. Where a licensed dredging area overlapped a mapped sensitive community, this was treated as evidence of potential exposure and not as evidence that dredging had occurred within the community or caused an ecological effect. The potential significance and persistence of an interaction were assessed by considering the extent of the mapped overlap alongside the frequency and duration of fishing, the restrictions imposed through the applicable management arrangements, the sensitivity and recovery characteristics of the receptor and the relevant Conservation Objective attributes and targets.

3.1.4.2. Blacksod Bay

Within the Mullet/Blacksod Bay Complex SAC, the Conservation Objectives identified the *Zostera* dominated community, maërl dominated community and *Serpula vermicularis* dominated community complex as constituent communities of Large shallow inlets and bays [1160]. The *Serpula vermicularis* dominated community complex and other reef communities were also constituent communities of Reefs [1170]. The Conservation Objectives required the extent and quality of the *Zostera*, maërl and *Serpula vermicularis* communities to be maintained, subject to natural processes, and required the other constituent communities to be conserved in natural condition. The source of the potential effect was licensed commercial native oyster dredging. The pathways comprised direct contact between the dredge and the seabed and the resuspension and subsequent deposition of disturbed sediment. The receptors were the sensitive constituent communities that could be reached through these pathways.

The licensed dredging area extended across approximately 9.500 km^2. The maps and spatial overlap tables presented in **section 2.1.1** indicated that the licensed area overlapped approximately 1.13% of the Intertidal reef community complex and 0.59% of the Sheltered subtidal reef community complex. No mapped overlap with the maërl dominated, *Serpula vermicularis or Zostera* dominated communities, was identified. These spatial relationships represented the maximum mapped areas within which direct interaction could occur. Licensed spatial overlap was treated as evidence of potential exposure and did not demonstrate that dredging occurred throughout the overlapping areas or that the communities had been affected.

Direct contact with the Intertidal reef and Sheltered subtidal reef community complexes could similarly damage or displace attached fauna and disturb reef structure. The mapped overlaps accounted for a limited proportion of the licensed area and did not represent the actual dredging footprint. The fishery was directed towards the native oyster grounds rather than uniformly across the full licensed polygon. Although local effects could not be excluded where dredging occurred within an overlapping reef area, the available spatial information did not indicate disturbance across the wider extent of the reef communities.

No direct contact pathway was identified for the maërl dominated community because no mapped overlap occurred. An effect would require sediment disturbed within the licensed area to be transported and deposited over the mapped maërl habitat.

The magnitude and frequency of potential interaction are mainly limited by the low annual fishing effort. Fishing occurs mainly during February and March, with a small number of fishing days also occurring between September and December. Annual fishing effort is usually no more than eight fishing days, although a few additional fishing days may occur in some years. Direct seabed contact and associated sediment disturbance are therefore intermittent rather than continuous or ongoing. Although local interaction with sensitive communities cannot be excluded, the limited mapped overlap and low number of fishing days substantially reduce the spatial extent, frequency and duration of potential effects.

Assessment Conclusion

Potential interaction with other sensitive communities arising from native oyster dredging in Blacksod Bay is intermittent and is not continuous or ongoing. Although local damage could occur if dredging directly contacted reef communities, the limited mapped overlap and low annual fishing effort substantially limit the opportunity for repeated or widespread disturbance. The small number of fishing days occurring between September and December does not materially change the frequency or duration of the pressure. No direct contact pathway was identified for the maërl dominated, *Serpula vermicularis* dominated and *Zostera* dominated communities, and the available evidence did not indicate an indirect sediment pathway of sufficient magnitude or duration to affect those communities. Potential effects on these sensitive communities are therefore assessed as **not significant** and **not persistent**.

3.1.4.3. Tralee Bay

Within Tralee Bay and Magharees Peninsula, West to Cloghane SAC, the Conservation Objectives identify the *Zostera*-dominated community complex, *Mytilus*-dominated community and *Sabellaria*-dominated community complex as sensitive constituent communities of one or more Annex I habitats. Intertidal reef, Subtidal reef and Laminaria-dominated reef community complexes are constituent communities of the Reefs [1170] Qualifying Interest. The Conservation Objectives require the extent and quality of the keystone communities to be maintained and the reef community complexes to be conserved in natural condition, subject to natural processes.

The proposed dredge areas overlap only a limited proportion of the mapped extent of the reef communities at SAC scale. In Inner Tralee Bay, approximately 12.45 ha of the Intertidal reef community complex occurs within the proposed dredge boundary. NPWS estimates the total mapped extent of this community within the Reefs [1170] habitat at approximately 221 ha. The proposed dredge boundary therefore overlaps approximately 5.6% of the mapped Intertidal reef community complex within the SAC. In Outer Tralee Bay, approximately 105.36 ha of the Subtidal reef community complex occurs within the proposed dredge area, with a further approximately 3.65 ha occurring within the Inner Tralee Bay proposed dredge area. Combined, approximately 109.01 ha of Subtidal reef lies within the proposed dredge areas, equivalent to approximately 4.4% of the 2,499 ha mapped within the SAC. No overlap with the Laminaria-dominated reef community complex was identified. NPWS also notes that the mapped extent of reef communities is likely to underestimate their actual area because areas of sheer and steeply sloping rock are not fully represented (NPWS, 2014).

These percentages represent conservative maximum spatial overlaps rather than the area that would necessarily be dredged. The proposed dredging areas define where fishing may occur and do not imply complete dredging coverage of all seabed within those boundaries. Even if the full mapped reef overlap were conservatively treated as potentially disturbed, the maximum spatial exposure would therefore remain approximately 5.6% of the Intertidal reef community and 4.4% of the Subtidal reef community. Both are substantially below the approximate 15% area identified by NPWS for significant continuous or ongoing disturbance of constituent community types.

Direct dredge contact could nevertheless cause localised abrasion, displacement or mortality of reef-associated organisms where fishing occurs over these communities. However, the spatial scale of this potential disturbance is small relative to the wider distribution of the communities throughout the SAC. The Intertidal reef community is recorded extensively from the Magharees Peninsula through Tralee Bay and around its northern shore, while the Subtidal reef community occurs extensively from Derrymore westwards, through the central bay and around the Magharees Peninsula. Dredging within the proposed areas would therefore not result in loss of these community types from Tralee Bay, contraction of their overall distribution within the SAC, or a change in the character of Reefs [1170] at the scale of the SAC.

The interaction with the *Zostera*-dominated community complex is similarly spatially limited. Approximately 11.07 ha of mapped *Zostera* occurs within the Outer Tralee Bay dredge boundary, equivalent to approximately 3.2% of the 350 ha estimated by NPWS within Large shallow inlets and bays [1160]. NPWS identifies *Zostera* as a keystone community and requires significant anthropogenic disturbance to its extent to be avoided (NPWS, 2014). Direct dredging could damage shoots and rhizomes where fishing occurs within the mapped meadow. However, the limited spatial overlap and the seasonal nature of the fishery reduce the potential magnitude and persistence of this effect. Commercial oyster dredging ceases between May and August, substantially avoiding the main summer growth period. Breen et al. (2024) experimentally dredged a historically fished Irish *Zostera marina* meadow in early spring and found no effect on subsequent rhizome weight, shoot density or blade density during the growing season. The authors considered restriction of fishing to winter or early spring, before the main seagrass growing season, to be a potentially important factor allowing traditional fishing activity and seagrass to coexist (Breen et al., 2024).

The *Mytilus*-dominated community has only negligible spatial overlap with the proposed Inner Tralee Bay dredge area. Approximately 0.109 ha occurs within the proposed boundary compared with an estimated 12 ha within the Reefs [1170] habitat, equivalent to approximately 0.9% of its mapped extent. NPWS identifies *Mytilus* as a keystone community and requires significant disturbance to its extent and quality to be avoided (NPWS, 2014). Given the very small area of potential interaction, any direct effects would be localised and would not alter the distribution or ecological function of the community within the SAC. No mapped overlap occurs with the *Sabellaria*-dominated community complex.

The fishery is also temporally discontinuous. Oyster dredging occurs seasonally between September and April and ceases between May and August. The pressure therefore does not represent continuous year-round disturbance, and the annual four-month closure provides a period without dredging disturbance. NPWS explicitly recognises that intermittent or episodic activities which do not represent continuous or ongoing disturbance may be assessed contextually with regard to their scale and the resilience of the receiving community.

Assessment Conclusion

Potential interactions between native oyster dredging and other sensitive benthic communities in Tralee Bay are assessed as **not significant** and **not persistent**. The proposed dredge areas in Inner Tralee Bay and Outer Tralee Bay overlap approximately 5.6% of the mapped Intertidal reef community, 4.4% of the Subtidal reef community, 3.2% of the *Zostera*-dominated community and 0.9% of the *Mytilus*-dominated community, with no mapped overlap with the *Sabellaria*-dominated community. These represent conservative maximum spatial overlaps and would not reduce the wider distribution or ecological function of these communities within the SAC. The seasonal cessation of dredging between May and August further limits persistence, including by substantially avoiding the main summer growth period for *Zostera*.

3.1.4.4. Lough Swilly

Within Lough Swilly SAC, the Conservation Objectives identified Estuaries [1130] and required the Fine sand community complex, Intertidal mixed sediment with polychaetes, Subtidal mixed sediment with polychaetes and bivalves, Muddy fine sand with *Thyasira flexuosa*, Mud community complex and *Ostrea edulis* dominated community to be conserved in natural condition. The Conservation Objectives and marine habitats supporting document did not identify *Zostera*, *Sabellaria* or *Mytilus* dominated communities as separate constituent communities of Estuaries [1130] (NPWS, 2011a; NPWS, 2011c). The source of the potential effect was licensed commercial native oyster dredging. The pathways considered were direct contact between the dredge and the seabed and sediment resuspension and deposition.

The licensed dredging area overlapped each of the mapped constituent communities of Estuaries [1130]. However, this represented the area within which dredging was authorised and did not demonstrate that commercial fishing occurred uniformly across the licensed area. The fishery was directed towards established native oyster concentrations within the *Ostrea edulis* dominated community. Potential disturbance of the adjoining sedimentary communities would arise through the impact mechanisms already assessed and did not represent a separate interaction with another sensitive community.

The Lough Swilly native oyster fishing season operates from 1st of September to 30th of April, with no commercial oyster dredging between 1st of May and 31st of August. Direct seabed contact and any associated interaction with benthic communities are therefore seasonal rather than continuous or ongoing.

No additional source, pathway and receptor linkage was identified between native oyster dredging and a separately mapped sensitive benthic community in Lough Swilly. Potential effects on the *Ostrea edulis* dominated community and the other constituent sedimentary communities were not disregarded but were addressed under the relevant preceding assessments. The available information did not indicate an additional interaction capable of causing continuous or ongoing disturbance or compromising the natural condition of a separately identified sensitive community.

Assessment Conclusion

No separately mapped *Zostera*, *Mytilus*, *Sabellaria* or reef dominated community was identified within Lough Swilly SAC. Potential effects on the *Ostrea edulis* dominated community and associated sedimentary communities were assessed under the preceding impact pathways and did not require separate assessment under this mechanism. The annual four month cessation interrupts the pressure and provides a period during which disturbed habitats and communities can recover without further dredging. The potential interaction is therefore assessed as not persistent.

Potential interaction with other sensitive communities arising from native oyster dredging in Lough Swilly is therefore assessed as **not persistent** and **not significant** in relation to Estuaries [1130].

4. Evaluation Against NPWS Guidance and SAC Integrity

The findings of the impact assessment were evaluated against the site-specific Conservation Objectives and supporting documentation for the Mullet/Blacksod Bay Complex SAC, Tralee Bay and Magharees Peninsula, West to Cloghane SAC and Lough Swilly SAC. For relevant constituent communities, NPWS states that "significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities". NPWS guidance further provides that activities which cause significant disturbance but do not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, having regard to the nature and scale of the activity, the resilience of the receiving habitat and other activities within the designated site (NPWS, 2011c; NPWS, 2014c; NPWS, 2014d).

The 15% threshold relates specifically to significant continuous or ongoing disturbance and not to physical contact with, or disturbance of, a community. Spatially resolved commercial fishing effort, tow frequency and annual swept-area estimates were not available for the three fisheries and the exact proportion of each oyster bed contacted by dredging could therefore not be quantified. However, commercial dredging is directed towards established oyster grounds and consultation with the Marine Institute indicated that nearly all of the commercially fished oyster beds are likely to have been subject to dredging disturbance. The spatial extent of disturbance within the oyster beds is therefore considered likely to be substantially greater than 15% and closer to the full extent of the commercially fished beds than to the 15% benchmark. The assessment against the NPWS target consequently depends mainly on whether the disturbance identified in Section 3 is significant and continuous or ongoing.

4.1. Blacksod Bay

The Conservation Objectives for the Mullet/Blacksod Bay Complex SAC do not identify an *Ostrea edulis* dominated community and native oyster is not a Qualifying Interest or subject to a separate population target. Native oyster is, however, identified as a notable species within the SAC and *Ostrea edulis* are present in low abundance within the Sand with *Angulus tenuis* and *Pygospio elegans* community complex. Effects on native oysters are therefore relevant where they contribute to, or indicate, changes in the structure and function of constituent communities required to be conserved in natural condition.

The exact proportion of the Blacksod Bay oyster bed contacted by commercial dredging is uncertain, but the targeted nature of the fishery indicates that most of the commercially fished bed is likely to be subject to dredging over time. The spatial extent of disturbance of the oyster bed is therefore likely well above 15%. This should not, however, be interpreted as demonstrating disturbance of more than 15% of the wider interpolated area of the sedimentary community types within which the oysters occur, because the native oyster bed is not mapped as a separate constituent community in the Conservation Objectives. The oyster beds in Blacksod bay are best presented in Marine Institute survey findings from Tully and Clarke (2012) seen in Figure 2.18.

Section 3 concluded that physical disturbance in Blacksod Bay is intermittent, is not continuous or ongoing and is not significant.. Oyster removal is similarly intermittent and its population-level effect was assessed as not persistent and not significant in relation to Mudflats and sandflats not covered by seawater at low tide [1140], Large shallow inlets and bays [1160] and Reefs [1170]. The spatial extent of disturbance of the oyster bed may therefore substantially exceed 15%, but the disturbance does not meet the requirement of being both significant and continuous or ongoing. The approximately 15% management-review threshold is therefore not triggered by native oyster dredging in Blacksod Bay.

4.2. Tralee Bay

The *Ostrea edulis* dominated community is a constituent community of both Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160] within Tralee Bay and Magharees Peninsula, West to Cloghane SAC. The applicable Conservation Objectives require the *Ostrea edulis* dominated community to be conserved in natural condition (NPWS, 2014d; NPWS, 2026).

Commercial dredging is directed towards the established oyster grounds in Inner and Outer Tralee Bay. Although the absence of spatially resolved commercial fishing-effort data prevents calculation of the exact annual swept area, most of the commercially fished *Ostrea edulis* dominated community is likely to be subject to dredging disturbance over time. The proportion disturbed should therefore be considered well above 15% and closer to the full extent of the commercially fished oyster grounds than to the 15% benchmark.

For Mudflats and sandflats not covered by seawater at low tide [1140], Section 3 concluded that physical disturbance is seasonal rather than continuous or ongoing and is not causing significant deterioration of the *Ostrea edulis* dominated community. Oyster removal is also seasonal and was assessed as not persistent and not significant, with the long-term stock record demonstrating continued recruitment and replenishment under the existing management regime. Sediment resuspension and smothering were similarly assessed as not persistent and not significant. Consequently, although disturbance is likely to occur across substantially more than 15% of the oyster bed, significant continuous or ongoing disturbance was not identified and the approximately 15% management-review threshold is not triggered for Mudflats and sandflats not covered by seawater at low tide [1140].

For Large shallow inlets and bays [1160], the same *Ostrea edulis* dominated community and dredging pressure are relevant. Section 3 concluded that physical disturbance is seasonal and not significant, while oyster removal and its consequent effects on spawning stock and recruitment are not persistent and not significant under the existing management regime. The annual cessation of dredging between May and August also interrupts direct physical disturbance and sediment disturbance. Consequently, despite disturbance being likely across substantially more than 15% of the commercially fished oyster grounds, the disturbance was not assessed as both significant and continuous or ongoing. The approximately 15% management-review threshold is therefore not triggered for Large shallow inlets and bays [1160].

4.3. Lough Swilly

Within Lough Swilly SAC, the *Ostrea edulis* dominated community is a constituent community of Estuaries [1130]. The Conservation Objective requires the Fine sand community complex, Intertidal mixed sediment with polychaetes, Subtidal mixed sediment with polychaetes and bivalves, Muddy fine sand with *Thyasira flexuosa*, Mud community complex and *Ostrea edulis* dominated community to be conserved in natural condition. The applicable target states that significant continuous or ongoing disturbance should not exceed approximately 15% of the interpolated area of each community type (NPWS, 2011a; NPWS, 2011c).

Commercial dredging is directed towards the established native oyster grounds. The exact proportion of the *Ostrea edulis* dominated community contacted in any individual fishing season cannot be calculated from the available information because spatially resolved commercial dredging effort is unavailable. Nevertheless, most of the commercially fished oyster bed is likely to be subject to dredging disturbance over time and the spatial extent of disturbance is therefore considered likely to be substantially greater than 15% and closer to the full extent of the commercially fished bed.

Section 3 concluded that direct physical disturbance is seasonal, is not continuous or ongoing and is not significant in relation to Estuaries [1130]. Sediment resuspension and smothering were similarly assessed as not persistent and not significant. Oyster removal, however, was assessed differently. Although dredging itself ceases annually, the population-level effect of removal may persist between successive fishing seasons where recruitment and growth do not replace harvested oysters. In the absence of a stock-linked TAC, quantified annual exploitation rate or evidence of consistently strong recruitment, Section 3 concluded that current removals could not be demonstrated to be compatible with maintaining the *Ostrea edulis* dominated community in natural condition. Oyster removal and its consequent effects on spawning stock and recruitment were therefore assessed as potentially persistent and significant in relation to Estuaries [1130].

The spatial extent of disturbance of the oyster bed is likely substantially greater than 15%, while a significant effect that may persist between successive fishing seasons cannot be excluded. Consequently, the requirement that significant continuous or ongoing disturbance should not exceed approximately 15% of the *Ostrea edulis* dominated community cannot be demonstrated to be met. On a precautionary basis, the approximately 15% management-review threshold is therefore considered to be triggered for Estuaries [1130] in Lough Swilly. In accordance with the Conservation Objective supporting documentation, an inter-Departmental management review is recommended prior to further licensing of such activities.

4.4. Assessment conclusion

The available information indicates that commercial native oyster dredging is likely to disturb substantially more than 15% of the commercially fished native oyster beds in all three fisheries, although the exact proportion cannot be quantified and is likely closer to the full extent of the actively fished beds than to the 15% benchmark. Spatial extent of disturbance is therefore not the main factor distinguishing the three fisheries.

In Blacksod Bay, disturbance is intermittent and was assessed as not significant and not persistent. In Tralee Bay, disturbance of the *Ostrea edulis*-dominated community was assessed as seasonal rather than continuous or ongoing and as not significant or persistent for both Mudflats and sandflats not covered by seawater at low tide [1140] and Large shallow inlets and bays [1160]. Potential interactions with other sensitive benthic communities were also assessed as not significant and not persistent, based on their limited spatial overlap with the proposed dredge areas, maintenance of their wider distribution and ecological function within the SAC, and the seasonal cessation of dredging between May and August. The approximately 15% management-review threshold is therefore not triggered in either fishery. In Lough Swilly, however, oyster removal and its consequent effects on spawning stock and recruitment were assessed as potentially significant and persistent between successive fishing seasons. As these effects occur within an *Ostrea edulis* dominated community likely subject to dredging disturbance over an area substantially greater than 15%, the approximately 15% management-review threshold is triggered for Estuaries [1130].

5. Potential fisheries management measures

The assessment concluded that the approximately 15% threshold for significant continuous or ongoing disturbance was not triggered by native oyster dredging in Blacksod Bay or Tralee Bay. In Lough Swilly, the threshold was considered to be triggered in relation to the *Ostrea edulis* dominated community within Estuaries [1130]. This conclusion arose mainly from the harvest of native oysters and the potential for effects on spawning stock biomass and recruitment to persist between successive fishing seasons. The native oyster population is also subject to additional pressures that may reduce its capacity to recover from current fishing mortality, including infection by *Bonamia ostreae*, competition with the naturalised Pacific oyster *Magallana gigas*, competition with the non-native American slipper limpet *Crepidula fornicata*, and comparatively limited fisheries management controls compared to Tralee Bay and Blacksod Bay. Lough Swilly currently operates as a public fishery and no stock-linked Total Allowable Catch (TAC) or equivalent annual harvest limit for native oyster is in place.

Fisheries management measures are therefore required to reduce fishing mortality and improve the capacity of the Lough Swilly native oyster population to maintain and replenish its spawning stock. The measures below are presented as potential components of an updated fisheries management framework and should be developed in consultation with local fishers and relevant public bodies such as IFI, NPWS, the marine institute and potentially others. Their implementation should be adaptive and informed by annual stock assessment rather than fixed thresholds transferred from previous management plans.

5.1. Total Allowable Catch

Establishment of a stock-linked TAC could be the main management measure for the Lough Swilly native oyster fishery. The absence of a mechanism linking annual harvest to available native oyster biomass was a key factor in the assessment that fishing mortality may result in significant and persistent effects on the *Ostrea edulis* dominated community.

The TAC should be set annually using the most recent Marine Institute stock assessment and should take account of total biomass, harvestable biomass, spawning stock biomass, size structure, recent recruitment and uncertainty associated with the biomass estimates. The TAC should be precautionary where biomass is low, recruitment is weak or uncertainty is high. Where the available stock assessment does not demonstrate that the proposed harvest can be sustained while maintaining adequate spawning stock biomass, the TAC should be reduced accordingly or the fishery should remain closed.

The TAC should be developed in consultation with the Lough Swilly Wild Oyster Society and other local fishers, the Marine Institute and IFI. Experience from other managed native oyster fisheries should be used to develop a practical harvest control rule linking annual scientific advice to the quantity that may be harvested. Tully and Clarke (2012) identified Inner Tralee Bay as an example where annual survey information was used to inform TACs, while cooperative management arrangements elsewhere demonstrate how local fishing knowledge can be incorporated with scientific stock assessment.

The previous Lough Swilly Fishery Natura Plan proposed limiting the exploitation rate to 33% of pre-fishery spawning stock biomass. This provides useful evidence that a stock-linked exploitation limit has previously been considered feasible for the fishery; however, the proposed 33% value was developed from stock information available in 2011–2012 and should not be adopted as a current threshold without reassessment using current stock condition and Marine Institute advice.

Catch and harvest should be recorded throughout the fishing season so that the TAC can be monitored and enforced in real time. Agreed landing points, vessel-specific catch records or equivalent reporting arrangements could be used to provide a reliable record of harvest. The fishery should close when the TAC is reached.

The statutory Minimum Landing Size of 76 mm should be retained. This protects oysters through several years of growth before recruitment to the fishery but does not, by itself, control the proportion of larger oysters harvested each year. The MLS should therefore operate alongside the stock-linked TAC rather than as the main control on fishing mortality.

5.2. Extension of the seasonal closure

The existing seasonal closure between May and August provides an annual period without commercial native oyster dredging during the main reproductive period. An extension of the seasonal closure could be considered to reduce annual fishing effort and provide additional protection to spawning stock, recently settled oysters and juveniles. This could be achieved through a later opening date, an earlier closing date, or both. The precise dates should be agreed through the annual management process with reference to native oyster biology, stock condition, Marine Institute advice and consultation with fishers.

The previous Fishery Natura Plan proposed shortening the fishing season by delaying opening in September and closing at the end of March. These dates should not be adopted automatically but demonstrate that a shorter fishing season has previously been considered practicable within Lough Swilly.

Seasonal restriction should complement, rather than replace, the TAC. A shorter fishing season would provide limited control of fishing mortality if the same total harvest were taken over fewer fishing days.

5.3. Participation and effort controls

Twenty-four oyster dredge licences were recorded for Lough Swilly in 2026, although the number of licence holders who actively participated in the fishery and their fishing effort could not be quantified. Fishery participation should therefore be reviewed as part of the management response.

A cap or reduction in the number of fishers permitted to participate in the Lough Swilly native oyster fishery could provide a practical means of controlling fishing participation and effort. A precautionary first step could include preventing any increase in fishery participation while the stock-linked management framework is established, followed by review of the appropriate level of participation against stock condition and the agreed TAC.

Fishery participation alone would not provide adequate control because fishing effort can vary substantially among fishers and vessels. The management framework should therefore also provide for direct fishing effort controls where required. These could include limits on fishing days, fishing hours, dredge numbers or other measures directly related to the amount of fishing undertaken. Such controls could be adjusted where annual stock assessment indicates weak recruitment, low spawning stock biomass or deterioration in other stock indicators.

Any participation or fishing effort controls should apply consistently across the fishery. This is particularly important because Lough Swilly is a public fishery and the Lough Swilly Wild Oyster Society does not currently have legal authority to manage participation or harvest by all licensed fishers. The earlier Fishery Natura Plan similarly identified the absence of mechanisms to control vessel numbers, fishing effort and annual harvest as a constraint on effective fisheries management.

5.4. Spatial closures

Spatial closures could be used to retain areas of native oyster spawning stock that are protected from commercial harvest. Permanent or multi-annual closures could protect comparatively high densities of mature *Ostrea edulis*, maintain local spawning stock density and provide a source of larvae to surrounding oyster grounds.

The location and extent of protected areas should be determined from current Marine Institute survey information rather than the boundaries proposed in the 2012–2017 Fishery Natura Plan. Priority should be given to areas supporting relatively high densities of mature native oysters, consistent recruitment or spat settlement and suitable shell habitat.

Temporary closures should also be available as an adaptive management measure. Areas containing a high proportion of juvenile oysters, showing strong recent recruitment or declining to low native oyster density could be closed to fishing until subsequent surveys demonstrate adequate recovery. The earlier Fishery Natura Plan proposed both a spawning reserve and closures based on oyster density and juvenile representation; these approaches remain relevant in principle, although the specific areas and numerical thresholds require reassessment using current survey data.

Rotational harvesting could also be considered where oyster grounds can be divided into biologically meaningful management areas. Reopening should be based on demonstrated recovery of native oyster biomass, size structure and recruitment rather than the passage of a fixed period alone.

5.5. Control of non-native species, disease monitoring and biosecurity

Management of fishing mortality could be accompanied by measures addressing the additional biological pressures acting on the native oyster population.

Naturalised Pacific oyster *Magallana gigas* represents a substantial pressure in Lough Swilly. Recent Marine Institute surveys demonstrated that Pacific oyster biomass remained considerably greater than native oyster biomass, while historical surveys showed Pacific oyster occupying areas of former native oyster habitat. Control of the naturalised population should therefore form part of the wider fisheries management framework.

A spatially targeted Pacific oyster removal programme could be developed for areas where *M. gigas* is abundant within native oyster grounds. However, fishing for Pacific oyster would itself create seabed disturbance and could result in native oyster bycatch. The fishing method, season, spatial extent and permitted fishing effort should therefore be defined in advance, and catch and harvest of native and Pacific oysters should be recorded separately. Pacific oysters caught during authorised native oyster dredging could also be retained rather than returned to the bed where this is legally and practically feasible. The earlier Fishery Natura Plan proposed a targeted Pacific oyster control fishery and provides a useful starting point for development of an updated approach, but its spatial boundaries require revision using current distribution data.

The current distribution and abundance of American slipper limpet *Crepidula fornicata* within native oyster grounds should also be established. Where substantial overlap occurs and removal is technically and environmentally feasible, targeted control could be investigated. Any such measure would need to demonstrate that the ecological benefit of removal outweighs the additional seabed disturbance associated with the control method.

Bonamia ostreae cannot be managed through conventional fisheries controls in the same way as fishing mortality or non-native species abundance. Disease surveillance should nevertheless form part of the fisheries management framework because disease-related mortality affects the capacity of the stock to sustain fishing mortality. Monitoring should establish temporal and spatial patterns in prevalence where practicable and should inform decisions on oyster movement and any restoration measures.

Biosecurity measures should minimise the risk of spreading disease or additional non-native species. Movement of living oysters, shell or fishing equipment between areas should therefore be subject to appropriate cleaning, disinfection, disease-screening and statutory fish-health requirements.

5.6. Stock, catch and fishing effort monitoring and adaptive management

Annual Marine Institute stock surveys should provide the main biological evidence for management of the fishery. Monitoring should continue to estimate native oyster biomass, density and size structure and provide an index of recent recruitment. The spatial distribution and biomass of Pacific oyster should also continue to be assessed, together with other relevant pressures where practicable.

These biological data should be supported by improved fishery-dependent data. At a minimum, annual records should include fishery participation, fishing effort, catch and harvest. Spatial information on fishing effort would provide additional evidence for assessing the distribution of fishing pressure and the effectiveness of spatial closures.

Management responses should be agreed in advance for situations where stock indicators deteriorate. These could include reduction of the TAC, extension of the seasonal closure, temporary closure of individual oyster grounds, reductions in fishery participation or fishing effort, or closure of the fishery where necessary. Conversely, restrictions could be reviewed where repeated surveys demonstrate improved biomass, recruitment and spawning stock condition.

The management framework should therefore operate adaptively, with annual stock assessment informing any proposed TAC, fishing season, participation, fishing effort and spatial management measures applied during the subsequent fishing season. The earlier Lough Swilly plan similarly identified annual monitoring and review as important because spawning, settlement, growth and survival of native oysters vary substantially among years.

5.7. Restoration and recruitment enhancement

Active restoration should be considered only after practicable controls on fishing mortality, protection of spawning stock and management of non-native species have been implemented. The native oyster population remains present within Lough Swilly and the first management response should therefore be to reduce pressures on the existing stock and support natural recruitment rather than use restoration to compensate for continued fishing mortality.

Restoration may nevertheless be appropriate where monitoring identifies a specific constraint on natural recovery. For example, cultch addition could be investigated where insufficient clean shell substrate is demonstrated to limit spat settlement. Small-scale trials using clean shell substrate and untreated control areas could be used to determine whether cultching increases settlement and survival before any larger intervention is considered.

Translocation of mature oysters to increase local broodstock density has also previously been proposed for Lough Swilly. However, the presence of *B. ostreae* and non-native species creates important biosecurity constraints on movement of live oysters. Any translocation would therefore require a clear ecological justification, appropriate disease screening and agreement with the relevant fish-health and regulatory authorities.

Restoration should not be used as an alternative to controlling fishing mortality. Where the existing native oyster stock retains the capacity for natural recruitment, management of harvest, maintenance of spawning stock biomass and protection of suitable settlement habitat are likely to provide more practical and direct fisheries management measures.

5.8. Updated Lough Swilly Native Oyster Fishery Management Plan

An updated Native Oyster Fishery Management Plan should be prepared for Lough Swilly to provide an agreed framework through which the measures identified above can be implemented, monitored and reviewed. The Fishery Natura Plan for Native Oysters in Lough Swilly 2012–2017 provides a useful foundation because it previously identified many of the same management issues, including the need to control annual harvest, protect spawning stock, manage Pacific oyster, monitor *Bonamia*, improve fishery-dependent data and establish an effective governance structure (Lough Swilly Wild Oyster Society Limited, 2012). However, the plan is now outdated and should not simply be re-adopted. It should be revised using the substantially improved Marine Institute stock information now available and the findings of the present impact assessment.

The updated plan should be developed collectively with the Lough Swilly Wild Oyster Society, other licensed fishers, IFI, the Marine Institute, NPWS, DAFM and other relevant stakeholders. Experience gained from management of the Tralee Bay and Blacksod Bay native oyster fisheries should also be considered, particularly the use of cooperative management, stock-linked harvest controls, seasonal closures and spatial closures.

At a minimum, the updated plan should establish the annual process for setting the TAC; the fishing season; fishery participation and fishing effort controls; spatial protection of spawning stock and recruitment areas; non-native species management; disease surveillance and biosecurity; catch, harvest and fishing effort reporting; stock monitoring; compliance and enforcement; and predefined management responses to deterioration in stock condition.

The governance arrangements should also identify how agreed management measures will be applied across the public fishery. Because participation in the Lough Swilly Wild Oyster Society does not provide authority over all licensed fishers, measures agreed through the management plan should be given effect, where required, through IFI licence conditions or another appropriate statutory mechanism.

The plan should be reviewed annually following the Marine Institute stock assessment. This would allow management to respond to changes in native oyster biomass, recruitment, disease, non-native species, fishery participation, fishing effort and harvest, and would provide a transparent mechanism for demonstrating that future native oyster dredging is managed consistently with the requirement to conserve the *Ostrea edulis* dominated community in natural condition within Estuaries [1130].

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