Article 6 Assessment of Fisheries, including a Fishery Natura Plan for Seed Mussel (2013-2017), in the Irish Sea

Marine Institute

Rinville

Oranmore, Co. Galway

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1 Preface

In Ireland, the implementation of Article 6 of the Habitats Directive in relation to aquaculture and fishing projects and plans that occur within designated sites is achieved through sub-Article 6(3) of the Directive. Fisheries not coming under the scope of Article 6.3, that is, those fisheries not subject to secondary licencing, are subject to risk assessment. Identified risks to designated features can then be mitigated and deterioration of such features can be avoided as envisaged by sub-article 6.2.

Fisheries, other than oyster fisheries, and aquaculture activities are licenced by the Department of Agriculture, Food and Marine (DAFM). Oyster fisheries are licenced by the Department of Communications Energy and Natural Resources (DCENR). The Habitats Directive is transposed in Ireland in the European Communities (Birds and Natural Habitats) Regulations 2011. Habitats and Birds (Habitats Directive and Birds Directive) regulations for sea fisheries are laid out in European Communities (Natural habitats and birds) (Sea-fisheries) Regulations 2009 S.I. 346 of 2009 as amended by S.I. 397 of 2010 and S.I. 237of 2012. Appropriate assessments and risk assessments are carried out against the conservation objectives (COs), and more specifically on the version of the COs that are available at the time of the Assessment, for designated ecological features, within the site, as defined by the National Parks and Wildlife Service (NPWS). NPWS are the competent authority for the management of Natura 2000 sites in Ireland. Obviously, aquaculture and fishing operations existed in coastal areas prior to the designation of such areas under the Directives. Ireland is thereby assessing both existing and proposed aquaculture and fishing activities in such sites. This is an incremental process, as agreed with the EU Commission in 2009, and will eventually cover all fishing and aquaculture activities in all Natura 2000 sites.

The process of identifying existing and proposed activities and submitting these for assessment is, in the case of fisheries projects and plans, outlined in SI 346/2009. Here, the industry or the Minister may bring forward fishing proposals or plans which become subject to assessment. These so called Fishery Natura Plans (FNPs) may simply be descriptions of existing activities or may also include modifications to activities that mitigate, prior to the assessment, perceived effects to the ecology of a designated feature in the site. In the case of other fisheries, that are not projects or plans, data on activity are collated and subject to a risk assessment against the COs. In the case of aquaculture, DAFM receives applications to undertake such activity and submits a set of applications, at a defined point in time, for assessment. The FNPs and aquaculture applications are then subject to AA. If the AA or the RA process finds that the possibility of significant effects cannot be discounted or that there is a likelihood of negative consequence for designated features then such activities will need to be mitigated further if they

are to continue. The assessments are not explicit on how this mitigation should be achieved but rather indicate whether mitigation is required or not.

2 Executive summary

In Ireland, the implementation of Article 6 of the Habitats Directive, in relation to fisheries projects and plans, or so called fishery natura plans (FNPs), that occur within Special Areas of Conservation (SAC) and Special Protection Areas (SPAs), is achieved through sub-Article 6(3) of the Directive. Fisheries, not coming under the scope of Article 6.3, which are those fisheries not subject to secondary authorization, are risk assessed. Identified risks to designated features (habitats and species) can then be mitigated and deterioration of such features can be avoided as envisaged by sub-article 6.2. Likewise, in the case of fisheries projects or plans the response to significant effects findings in the appropriate assessment is, necessarily, to reduce these effects to levels consistent with conservation objectives (COs) for the sites.

This report undertakes an appropriate assessment of the potential effects that a proposed FNP for seed mussel may have on SACs and SPAs in the Irish Sea. In addition it assesses the risk that other fisheries, not subject to annual authorization, may pose to the habitats and species for which the sites are designated under the Directives.

The geographic scope of the assessment extends from Carnsore Pt. in the south to Carlingford Lough in the north and includes all waters in between and out to and beyond the 12nm limit. A total of 24 SACs and 20 SPAs are included. Waters outside of the designated sites are included in the assessment so that the effects of fisheries, generally, in the Irish Sea on species designated by the Directives, and whose distributional range extends well beyond the borders of the sites, can be incorporated. The geographic scope of the assessment is, however, also species specific depending on the particular behaviours of the species concerned. The assessment is in some cases limited in that the specific COs for habitats or species for which the sites are designated have not yet been published. The status of the COs is indicated in tables throughout the document.

In the appropriate assessment significant effects of fisheries on habitats is deemed to occur when the fishery results in a change in the characterizing species of the habitat, when such change is persistent and where more than 15% of habitat is affected or in the case of more sensitive habitats, such as reef, where any proportion of the habitat is affected. In the case of species significant impacts will be deemed to occur when there is a risk of population decline or where the distribution of the species or the demographic profile of the species is liable to be impacted. These criteria are also brought into the risk assessment process for fisheries not subject to annual licencing. The criteria are used to categorize risk as a product of consequence (to the habitat or species) and the likelihood of that consequence occurring. The resulting risk scores are linked to the requirement for mitigation or management of the risk which would ensure that the activity is brought into compliance with the objectives of the Directives. This methodology follows from EC guidance and other published risk assessment frameworks.

A diverse range of habitats, habitat features and species are designated in SACs and SPAs in the Irish Sea. In the marine environment, and excluding coastal habitats where there is no overlap with fisheries, these include estuaries, intertidal mud and sand flats, sand banks, reefs and site specific features within these habitats which have been identified through site survey. Grey Seal, Harbour Porpoise, Allis shad, Twaite shad, Sea lamprey and Salmon are designated under the Habitats Directive while a range of species of seabirds, wading birds and other bird species inhabiting coastal habitats are designated under the Birds Directive.

Different fisheries occur in different areas of the Irish Sea reflecting the spatial distribution of target species, which in turn, for some species in particular, reflects the distribution of specific habitats (sediments, current speeds). Vessels from Ireland, Northern Ireland and Scotland fish in the area. The activity of all fleets is considered in the assessment. The bottom trawl fishery, targeting *Nephrops* and to a lesser extent various species of demersal roundfish, occurs mainly on mud and sandy mud in the north west Irish Sea. Inshore of the trawl fishery, and on coarser sediments, there is a scallop fishery prosecuted by small (<15m) Irish and NI vessels and larger (>15m) Scottish vessels. Closer inshore still, and up to the lower water mark, a dredge fishery for Razor clams (*Ensis* spp) occurs on muddy sand and mixed sediments. Crustaceans are fished with traps along coastal reefs in this area. Further south, currents are stronger and sediments coarser. There is a significant, large vessel, scallop fishery offshore from Wicklow to Carnsore Pt which overlaps with a beam trawl fishery for Rays and mixed demersal fish. Some bottom trawling also occurs here targeting Rays and mixed demersal fish. Towards the coast there is an extensive and important pot fishery for whelk on the landward and seaward slopes of sandbanks. Mussel seed beds may be found in small patches at the edge of sand banks and on coarse current swept sediments and rocky habitat. There is no pelagic trawl fishing (mackerel, herring, sprat, sandeel) in the western Irish Sea. However, there is, a small gill net fishery for herring off the county Down coast by Northern Irish vessels.

The appropriate assessment of the proposed seed mussel fishery, as described in the FNP, finds that the majority of fishing activity by this fleet, since 1970, has occurred outside of SACs and SPAs. This is also likely to be case in the future given the long time series of survey and fishery data available. The exceptions are the Blackwater Bank, Long Bank and Wicklow Reef SACs where fishing for seed mussel has occurred regularly in the past and is included in proposed fishing areas in the seed mussel FNP. In the case of Blackwater Bank and Long Bank the fishery has not occurred and is highly unlikely to occur in protected sand bank habitat although it occurs within the borders of the sites. In any case the characterizing species of the protected habitat within the site is not sensitive to physical disturbance pressure that seed mussel dredging would cause. The possibility of significant effects of the fishery on these sites can be discounted. In the Wicklow Reef SAC the fishery potentially overlaps with protected reef habitat within this site.

This is shown by fishing activity data rather than survey information. Some of the species, characteristic of this habitat, have moderate sensitivity to physical disturbance that would be caused by mussel dredging. In addition there are a number of rarely recorded species in this habitat. As the effects of mussel seed dredging on this reef habitat within the SAC cannot be discounted it is recommended that the fishery be excluded from this portion of the SAC. The seed mussel fishery will not have any significant effect on designated bird species in the Irish Sea. Although Common Scoter use seed mussel as a food source the seed beds in the Irish Sea are generally inaccessible to this species because of strong currents in the areas where they occur. However, the distribution of Common Scoter in offshore waters in this area is not known and should be investigated especially in the sea area east of the Raven SPA where flocks of Common Scoter occur and overlap with historic seed mussel fishing activity. The relatively short duration and limited distribution of the fishery in any given year limits any disturbance effect that may occur to seabirds.

Risk assessment of the potential effects of other fisheries on habitats in SACs suggests there are few fishery-habitat/species interactions that are likely to pose any risk. Crustacean and whelk potting activities occur within a number of SACs but are unlikely to be disturbing to habitats. There are no scallop fisheries, bottom otter trawl, beam trawl or gill net fisheries in SACs in the Irish Sea. Trammel nets have no habitat effects although they are used in or close to a number of sites. The Razor clam fishery significantly overlaps with the Blackwater Bank SAC designated for sandbanks. Although the species of this habitat are not sensitive to physical disturbance the scale of the overlap and the type of fishing gear used in this fishery suggests some impact may result. Additional information on the actual footprint of the Razor clam fishery in the Blackwater Bank SAC is required.

The risk posed by fisheries, other than seed mussel, in the Irish Sea to Grey Seal and Harbour Porpoise is zero or low. There is a low risk of by-catch in bottom otter trawl and trammel nets. Additional information on the use of trammel nets and by-catch composition for this gear is required. The Razor clam fishery occurs in shallow water close to Lambay Island SAC which is designated for Grey Seal. There is some risk of disturbance of haul out sites which may need to be mitigated. However, specific COs for seals at Lambay have not yet been published.

The risk posed by fisheries, other than seed mussel, to bird species in the Irish Sea is generally low. Many of the SPAs are intertidal in character and or include inshore species which show little or no spatial overlap with proposed fisheries. For some fisheries, such as potting, there appears to be little risk of by-catch or prey depletion; based on location and intensity of activity, these fisheries are also unlikely to negatively impact on birds through disturbance. There is a low risk of by-catch from unattended trammel nets which are used to catch bait fish for potting; additional information on the use of trammel nets and by-catch composition for this gear is required to fully

quantify this risk. There is currently a low risk of by-catch from gill netting due to its limited scale and duration; however, as gill nets are known to be a high risk gear for by-catch of sub-surface diving species, this risk would increase should this fishery increase in spatial extent or intensity in the Irish Sea. Additional information on by-catch composition for gill nets in Irish waters is thus required.

The northwest Irish Sea (from ca. Dalkey north to Dundalk, but especially around the islands off Dublin) supports a number of important seabird (especially tern) colonies. In addition Dublin Bay and Dalkey Island support internationally important autumn roosts for terns which appear to draw in terns from further afield. This area also supports a range of fisheries including e.g. dredging for razor clam in shallow waters (close to Lambay Island SPA); potting for crustaceans; a bottom trawl fishery, targeting *Nephrops* and to a lesser extent various species of demersal roundfish, which occurs mainly on mud and sandy mud to the northeast of Rockabill Island SPA. The risk of increased cumulative impacts on terns, feeding in coastal waters, through intensification of any or all of these fisheries (especially the risk from extension of herring gill net fisheries into this area) must be considered. Equally, intensification of inshore fishing close to The Murroughs SPA could be detrimental to breeding Little Tern which invariably feed very close to their breeding site and thus are vulnerable to changing patterns of fishing activity close to the breeding site.

The Raven SPA supports over 3,000 Common Scoter; as these figures are derived from coastal counts the true count may be higher. The spatial distribution of Common Scoter in offshore waters outside the SPA is not currently known and requires further investigation; due in particular to the potential for cumulative disturbance impacts arising from the fishing for razor shell, whelks and scallops and the beam trawl fishery for rays and mixed demersal fish in this area.

Where risks have been identified the risk scores are low and there would appear to be little likelihood of imminent deterioration of designated habitats or species in the Irish Sea due to fishing activities. Improved monitoring in parallel with on-going fishing activity is needed to better inform the future assessment of these risks. In other cases, such as seed mussel fishing in Wicklow reef SAC, the potential for negative effects is clear and mitigation is needed.

3 Introduction

This document assesses the potential ecological impacts of fishing activities, including a Fishery Natura Plan (FNP) for seed mussel, on Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the Irish Sea. The geographic domain of the assessment extends from Carnsore Point in the south to Carlingford Lough in the north and seaward to outside of the 12nm limit in order to ensure that activities outside the coastal sites that may be relevant to mobile species are included. The information upon which this assessment is based is a profile of fishing activity compiled for the Irish Sea in 2013 and a plan for seed mussel fishing (2013-2017) provided by industry in May 2013. Fishing activities include fishing for seed mussel, demersal and pelagic fish, crustaceans and bivalves using various mobile and fixed fishing gears.

4 Scope of the Assessment

4.1 Natura sites qualifying interests and conservation objectives

This assessment includes all marine qualifying interests (QIs) in Natura 2000 sites from Carnsore Pt to Carlingford Lough and assesses the interaction of all fisheries activities in this area with each QI. Within this area COs are published for QIs in 11 SACs and 8 SPAs. COs are pending in a further 13 SACs and 12 SPAs. Some of the sites have dual designations as SACs and SPAs (

Table 1). There are 27 QIs in SACs with published COs and 46 QIs in SPAs with published COs. There are 23 QIs in SACs with COs pending and 42 QIs in SPAs with COs pending.

As all of the qualifying bird species covered by this assessment are included in the SPAs for which COs are published this assessment assumes that the COs for these same species will be the same across sites for which COs are pending. The attributes of the COs for such species includes the requirement to maintain their population, range and distribution.

The full range of habitat features is not necessarily included in the SACs for which COs have been published. It is not, therefore, possible to fully assess the risk of fisheries to these QIs. Nevertheless it is possible to identify if fisheries pose a risk to the QI even if the COs are not specified for it and to exclude the possibility of risk (screen out) where no possibility of risk exists. Where possible this is done. Where it is not possible i.e. where there is a spatial overlap of a fishery with a habitat and where the COs are not available then the risk assessment simply notes this limitation.

There are a total of 309 individual QIs within the designated sites included in this assessment. As there are 8 fishing métiers the cross tabulated matrix of possible interactions between individual fisheries and individual QIs has 2472 cells. As some QIs have more than one feature, e.g. component habitats in a mudflat, the matrix is further expanded where appropriate.

Table 1. Number of SACs and SPAs for which Conservation Objectives have been published by NPWS and which are pending, in the Irish Sea (Carnsore – Carlingford)

	COs Published	COs Pending
SAC	11	13
SPA	8	12

The full list of SACs and SPAs and their qualifying interests is presented in Table 2, Table 3, Table 4 and Table 5.

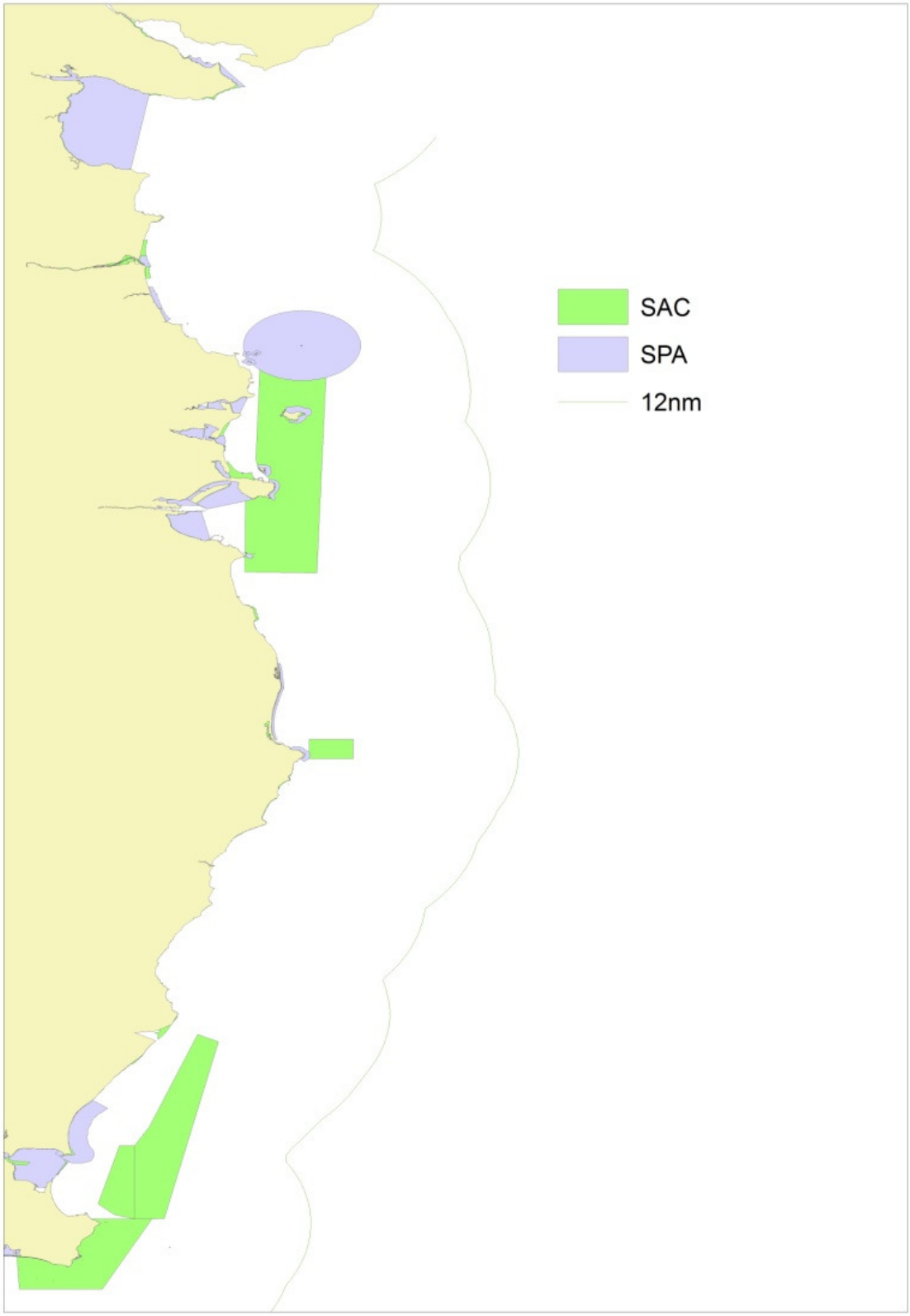


Figure 1. Geographic scope of the assessment showing SACs and SPAs on the Irish east coast.

4.2 Fisheries

4.2.1 Data on fisheries

- There are three categories of data available to describe the distribution and intensity of fishing activity
  - All vessels >15m report vessel position usually every 2 hours using vessel monitoring systems (VMS). By coupling these data with logbook information the gear used by the vessel can be determined. The main issue with these data is distinguishing VMS points that represent fishing activity as opposed to vessel steaming for instance. This is done using vessel speed filters given that towing speeds for different gears are approximately known. Obviously similar vessel speeds can also occur during steaming and in particular as the vessel approaches or departs from port. There may typically therefore be clusters of VMS points close to ports that do not represent fishing activity. These clusters may occur in Natura sites. In this assessment they are shown but excluded from assessment where there is clear rationale (knowledge that such a fishery cannot and does not occur in these areas) to do so.
  - Vessels between 10-15m report logbook data which gives information on landings mainly and gives an indication of the effort in days at sea. The majority of these vessels are between 10-12m. There are approximately 80 vessels nationally in the 12-15m category. These vessels will report VMS from Sept 2013. There is no indication of fishing location (other than ICES statistical rectangle) in these data.
  - Vessels under 10m do not carry logbooks. The only record of their activity is in sales note data (as required under Buyers and Sellers regulation) which indicates the number of boats selling fish and the quantity of each species.
  - In the case of all vessels under 15m information on fishing distribution and additional information on seasonality and amount of gear used has been collated from expert knowledge held in Bord Iascaigh Mhara (BIM), Sea Fisheries Protection Authority (SFPA) and Marine Institute (MI) together with limited consultation with industry. In addition some private vessel diary data on fishing positions for vessels <12m has previously been collated for razor clam and whelk fisheries.

4.2.2 Overview of fishing activity

- Aquaculture is not included in the assessment. Aquaculture activity in Natura sites in the Irish Sea only occurs in Wexford Harbour (Slaney River Valley SAC) and Carlingford

Lough. As a corollary very little if any fishing activity occurs in these sites so the risk posed by fishing to these sites is very low or non-existent.

- Fisheries occurring in Dundalk Bay are not included in this assessment. These activities were subject to Appropriate Assessment in 2011 and appropriate mitigation measures have already been adopted. [However, for completeness Dundalk and Wexford are included in the following tables].
- All remaining fishing activity including the Fishery Natura Plan for seed mussel is assessed
- The main fishing activities (**Table 6**) in the western Irish Sea are
    - Bottom trawling for *Nephrops* and mixed species of demersal fish
    - Beam trawling for rays and flatfish
    - Dredge fishing for scallop
    - Dredge fishing for mussels
    - Dredge fishing for Razor clams
    - Dredging for cockle (Dundalk Bay only)
    - Potting for whelk
    - Potting for crustaceans
    - Trammel netting for bait
    - Gill netting for herring
    - Hand gathering of periwinkle
- Different fisheries occur in different areas reflecting the spatial distribution of target species, which in turn, for some species in particular, reflects the distribution of specific habitats (sediments, current speeds).
    - The bottom trawl fishery, targeting *Nephrops* and to a lesser extent various species of demersal roundfish, occurs mainly on mud and sandy mud in the north west Irish Sea.
    - Inshore of the trawl fishery, and on coarser sediments, there is a scallop fishery prosecuted by small (<15m) Irish and NI vessels and larger (>15m) Scottish vessels.
    - Closer inshore, up to the lower water mark, a dredge fishery for Razor clams (*Ensis* spp) occurs on muddy sand and mixed sediments.
    - Crustaceans are fished with traps along coastal reefs in this area.
    - Further south, currents are stronger and sediments coarser. There is a significant, large vessel, scallop fishery offshore from Wicklow to Carnsore Pt which overlaps with a beam trawl fishery for Rays and mixed demersal fish. Some bottom trawling also occurs here targeting Rays and mixed demersal fish.

- Towards the coast there is an extensive and important pot fishery for whelk on the landward and seaward slopes of sandbanks.
- Mussel seed may be found in small patches at the edge of sand banks and on coarse sediments and rock which are scoured by strong currents.
- There is no pelagic trawl fishing (mackerel, herring, sprat, sandeel) in the western Irish Sea. There is, periodically, a small gill net fishery for herring off the county Down coast by Northern Irish vessels.

Table 2. SACs and QIs in the Irish Sea for which Conservation Objectives have been published (at time of writing) where n>1 indicates the number of habitat features within the QI that are listed in the Conservation Objectives.

QIs in Marine and Coastal SACs for which COs are published. N>1 indicates the number of habitat features of the QI that have been identified in the Conservation Objectives. Features expanded only for marine (not coastal) habitats	Baldoyle Bay	Blackwater Bank	Boyne Coast and Estuary	Carnsore Point	Dundalk Bay	Long Bank	Malahide Estuary	Raven Point Nature reserve	Rockabill to Dalkey	Slaney River Valley SAC	Wicklow reef	Total
1110 Sandbanks which are slightly covered by sea water all the time		2				1						3
1130 Estuary			2		3					4		9
1140 Mudflats and sandflats not covered by seawater at low tide	2		2	1	3		5	4		4		21
1170 Reefs				3					2		1	5
1210 Annual vegetation of drift lines								1				1
1310 Salicornia and other annuals colonizing mud and sand	1				1		1					3
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	1				1		1	1				4
1351 Harbour porpoise *Phocoena phocoena*									1			1
1410 Mediterranean salt meadows (Juncetalia maritimi)	1				1		1					3
2110 Embryonic shifting dunes								1				1
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')							1	1				2
2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes')							1	1				2
2170 Dunes with Salix repens ssp. argentea (Salicion arenariae)								1				1
2190 Humid dune slacks								1				1
Allis shad (*Alosa alosa*) [1102]										1		1
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]										1		1
Brook lamprey (*Lampetra planeri*) [1096]										1		1
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]										1		1
Old sessile oak woods with Ilex and Blechnum in British Isles [91A0]										1		1
Otter (*Lutra lutra*) [1355]										1		1
Perennial vegetation of stony banks [1220]					1							1
River lamprey (*Lampetra fluviatilis*) [1099]										1		1

Salmon (*Salmo salar*) [1106]										1		1
Sea lamprey (*Petromyzon marinus*) [1095]										1		1
Spartina swards (Spartinion maritimae) [1320]							1					1
Twaite shad (*Alosa fallax fallax*) [1103]										1		1
Water courses with Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]										1		1
Total	**5**	**2**	**4**	**4**	**10**	**1**	**11**	**11**	**3**	**19**		**70**

Table 3. SACs and QIs in the Irish Sea for which Conservation Objectives are pending

QIs in Marine and Coastal SACs for which COs are published. **N=1 indicates the site is designated for that QI**	**Bray Head**	**Buckroney-Brittas Dunes and Fen**	**Cahore Polders and Dunes**	**Carlingford Shore**	**Clogher Head**	**Kilmuckridge-Tinnaberna Sandhills**	**Kilpatrick Sandhills**	**Lambay Island**	**Magherabeg Dunes**	**North Dublin Bay**	**ROGERSTOWN ESTUARY**	**South Dublin Bay**	**The Murrough Wetlands**	**Total**
1130 Estuary											1			1
1140 Mudflats and sandflats not covered by seawater at low tide				1						1	1	1		4
1310 Salicornia and other annuals colonizing mud and sand										1	1			2
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)				1						1	1		1	4
1410 Mediterranean salt meadows (Juncetalia maritimi)		1								1	1		1	4
2110 Embryonic shifting dunes		1	1				1		1	1				5
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')		1	1			1	1		1	1	1			7
2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes')		1	1			1	1		1	1	1			7
2170 Dunes with Salix repens ssp. argentea (Salicion arenariae)		1												1
2190 Humid dune slacks		1								1				2
Alkaline fens [7230]		1											1	2
Annual vegetation of drift lines [1210]		1	1	1			1		1	1			1	7
Atlantic decalcified fixed dunes (Calluno-Ulicetea) [2150]		1					1		1					3
Calcareous fens with *Cladium mariscus* and species of the													1	1

Caricion davallianae [7210]														
European dry heaths [4030]	1				1									2
Grey seal (*Halichoerus grypus*) [1364]								1						1
Perennial vegetation of stony banks [1220]		1		1									1	3
Petalwort (*Petalophyllum ralfsii*) [1395]										1				1
Petrifying springs with tufa formation (Cratoneurion) [7220]									1					1
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites) [6210]	1													1
Spartina swards (Spartinion maritimae) [1320]										1	1			2
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	1				1			1						3
Grand Total	**3**	**10**	**4**	**4**	**2**	**2**	**5**	**2**	**6**	**11**	**8**	**1**	**6**	**64**

Table 4. SPAs and QIs in the Irish Sea for which Conservation Objectives have been published (where 1 indicates where a species is a CO for a specific site)

QIs in SPAs for which COs are published	Baldoyle Bay	Boyne Estuary	Dundalk Bay	River Nanny estuary and Shore	Rockabill	Rogerstown estuary	The Raven	Wexford Harbour and Slobs	Total
Red-throated Diver (*Gavia stellata*) [A001] wintering							1		1
Little Grebe (*Tachybaptus ruficollis*) [A004] wintering								1	1
Great Crested Grebe (*Podiceps cristatus*) [A005] wintering			1					1	2
Cormorant (*Phalacrocorax carbo*) [A017] wintering							1	1	2
Grey Heron (*Ardea cinerea*) [A028] wintering								1	1
Bewick's Swan (*Cygnus columbianus*) [A037] wintering								1	1
Whooper Swan (*Cygnus cygnus*) [A038] wintering								1	1
Greylag Goose (*Anser anser*) [A043] wintering			1			1			2
Brent Goose (*Branta bernicla hrota*) [A046] wintering	1		1			1		1	4
Shelduck (*Tadorna tadorna*) [A048] wintering	1	1	1			1		1	5
Wigeon (*Anas penelope*) [A050] wintering								1	1
Teal (*Anas crecca*) [A052] wintering			1					1	2
Mallard (*Anas platyrhynchos*) [A053] wintering			1					1	2
Pintail (*Anas acuta*) [A054] wintering			1					1	2
Shoveler (*Anas clypeata*) [A056] wintering						1			1
Scaup (*Aythya marila*) [A062] wintering								1	1
Common Scoter (*Melanitta nigra*) [A065] wintering			1				1		2
Goldeneye (*Bucephala clangula*) [A067] wintering								1	1
Red-breasted Merganser (*Mergus serrator*) [A069] wintering			1					1	2
Hen Harrier (*Circus cyaneus*) [A082] post-breeding/roost								1	1
Coot (*Fulica atra*) [A125] wintering								1	1
Oystercatcher (*Haematopus ostralegus*) [A130] wintering		1	1	1		1		1	5
Ringed Plover (*Charadrius hiaticula*) [A137] wintering	1		1	1		1			4
Golden Plover (*Pluvialis apricaria*) [A140] wintering	1	1	1	1				1	5
Grey Plover (*Pluvialis squatarola*) [A141] wintering	1	1	1			1	1	1	6
Lapwing (*Vanellus vanellus*) [A142] wintering		1	1					1	3
Knot (*Calidris canutus*) [A143] wintering		1	1	1		1		1	5
Sanderling (*Calidris alba*) [A144] wintering		1		1			1	1	4
Purple Sandpiper (*Calidris maritima*) [A148] wintering					1				1
Dunlin (*Calidris alpina*) [A149] wintering			1			1		1	3
Black-tailed Godwit (*Limosa limosa*) [A156] wintering		1	1			1		1	3
Bar-tailed Godwit (*Limosa lapponica*) [A157] wintering	1		1					1	3
Curlew (*Numenius arquata*) [A160] wintering			1					1	2
Redshank (*Tringa totanus*) [A162] wintering		1	1			1		1	4
Turnstone (*Arenaria interpres*) [A169] wintering		1							1
Black-headed Gull (*Chroicocephalus ridibundus*) [A179] wintering			1					1	2
Common Gull (*Larus canus*) [A182] wintering			1						1
Lesser Black-backed Gull (*Larus fuscus*) [A183] wintering								1	1
Herring Gull (*Larus argentatus*) [A184] wintering			1	1					2

Roseate Tern (*Sterna dougallii*) [A192] breeding					1				1
Common Tern (*Sterna hirundo*) [A193] breeding					1				1
Arctic Tern (*Sterna paradisaea*) [A194] breeding					1				1
Little Tern (*Sterna albifrons*) [A195] breeding		1						1	2
Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] wintering							1	1	2
Wetlands & Waterbirds [A999]	1	1	1	1		1	1	1	7
Total	**7**	**12**	**24**	**7**	**4**	**12**	**7**	**33**	**106**

Table 5. SPAs and QIs in the Irish Sea for which Conservation Objectives are pending (where 1 indicates where a species is a CO for a specific site)

QIs in SPAs for which COs are pending	Cahore Marshes	Carlinford Lough	Dalkey Island	Howth Head Coast	Ireland's Eye	Lambay Island	Malahide Estuary	North Bull Island	Skerries Islands	South Dublin Bay and River Tolka Estuary	The Murrough	Wicklow Head	Grand Total
Red-throated Diver (*Gavia stellata*) [A001] wintering											1		1
Great Crested Grebe (*Podiceps cristatus*) [A005] wintering							1						1
Fulmar (*Fulmarus glacialis*) [A009] breeding						1						1	2
Cormorant (*Phalacrocorax carbo*) [A017] breeding or breeding & wintering					1	1			1				3
Shag (*Phalacrocorax aristotelis*)[A018] breeding						1			1				2
Greylag Goose (*Anser anser*) [A043] wintering						1					1		2
Brent Goose (*Branta bernicla hrota*) [A046] wintering		1					1	1	1	1	1		6
Shelduck (*Tadorna tadorna*) [A048] wintering							1	1					2
Pintail (*Anas acuta*)[A054] wintering							1	1					2
Wigeon (*Anas penelope*) [A050] wintering	1										1		2
Teal (Anas crecca) [A052] wintering								1			1		2
Shoveler (*Anas clypeata*) [A056] wintering								1					1
Goldeneye (*Bucephala clangula*) [A067] wintering							1						1
Red-breasted Merganser (*Mergus serrator*) [A069] wintering							1						1
Oystercatcher (*Haematopus ostralegus*) [A130] wintering							1	1		1			3
Ringed Plover (*Charadrius hiaticula*) [A137] wintering										1			1
Golden Plover (*Pluvialis apricaria*) [A140] wintering	1						1	1		1			4
Grey Plover (*Pluvialis squatarola*) [A141] wintering							1	1					2
Lapwing (*Vanellus vanellus*) [A142] wintering	1												1
Knot (*Calidris canutus*) [A143] wintering							1	1		1			3
Sanderling (*Calidris alba*) [A144] wintering								1		1			2
Purple Sandpiper (*Calidris maritima*) [A148]									1				1

wintering													
Dunlin (*Calidris alpina*) [A149] wintering							1	1		1			3
Black-tailed Godwit (*Limosa limosa*) [A156] wintering							1	1					2
Bar-tailed Godwit (*Limosa lapponica*) [A157] wintering							1	1		1			3
Curlew (*Numenius arquata*) [A160] wintering								1					1
Redshank (*Tringa totanus*) [A162] wintering							1	1		1			3
Turnstone (*Arenaria interpres*) [A169] wintering								1	1				2
Black-headed Gull (*Chroicocephalus ridibundus*) [A179] wintering								1		1	1		3
Lesser Black-backed Gull (*Larus fuscus*) [A183] breeding						1							1
Herring Gull (*Larus argentatus*) [A184] breeding / breeding & wintering / wintering					1	1			1		1		4
Kittiwake (*Rissa tridactyla*) [A188] breeding				1	1	1						1	4
Roseate Tern (*Sterna dougallii*) [A192] breeding			1							1			2
Common Tern (*Sterna hirundo*) [A193] breeding			1							1			2
Arctic Tern (*Sterna paradisaea*) [A194] breeding			1							1			2
Little Tern (*Sterna albifrons*) [A195] breeding											1		1
Guillemot (*Uria aalge*) [A199] breeding					1	1						1	3
Razorbill (*Alca torda*)[A200] breeding					1	1						1	3
Puffin (*Fratercula arctica*) [A204] breeding						1							1
Common Whitethroat (*Sylvia communis*) [A309] breeding												1	1
Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] wintering	1												1
Wetlands & Waterbirds [A999]	1						1	1		1	1		5
Total	**5**	**1**	**3**	**1**	**5**	**10**	**15**	**18**	**6**	**14**	**9**	**5**	**92**

Table 6. Target species, gears and fishing metiers in the Irish Sea. Data quality is indicated.

	Metier description	Target species	Scientific name	Gears	Static/mobile gear	Data quality
1	Trap - crustacean	Shrimp	*Palaemon serratus*	Shrimp pots	Static	Number of boats fishing known, amount of gear approximate, location of fishing generally known.
		Lobster	*Homarus gammarus*	Side and top entrance creels	Static	
		Crab	*Cancer pagurus*			
		Velvet crab	*Necora puber*			
2	Trap - whelk	Whelk	*Buccinum undatum*	Whelk pots	Static	Number of boats fishing known, amount of gear approximate, location of fishing well defined. Some VMS type data for small vessels, spatially interpolated catch rate data in some areas
3	Dredge – benthic	Scallop	*Pecten maximus*	Spring loaded scallop dredge	Mobile	Number of boats fishing known, amount of gear known approximately, fishing on a defined footprint. VMS data vessels >15m
		Razor clam	*Ensis siliqua*	Hydraulic non-suction dredges	Mobile	Number of boats fishing known, amount of gear known, fishing on a well defined footprint. Some VMS type data for small vessels, spatially interpolated catch rate data in some areas
		Mussel	*Mytilus edulis*	Mussel dredge	Mobile	Historic distribution of seed beds very well defined. VMS data all vessels
4	Gill net	Herring	*Clupea harengus*	Gill net	Static	NI vessels targeting a small area off County Down.
5	Beam trawl - demersal	Rays	Mixed species	Beam trawl	Mobile	Number of boats known, gear type and dimensions approximately known. VMS data all vessels
		Plaice	*Pleuronectes platessa*			
		Sole	*Solea solea*			
6	Otter trawl - demersal	Plaice	*Pleuronectes platessa*	Bottom Otter trawl	Mobile	Number of boats known, gear type and dimensions approximately known. VMS data all vessels except a small number of trawlers under 15m. These will report position by Sept 2013.
		Prawns	*Nephrops norvegicus*			
		Cod	*Gadus morhua*			
		Sole	*Solea solea*			
		Haddock	*Melanogrammus aeglefinus*			
		Whiting	*Merlangius merlangus*			
		Pollack	*Pollachius pollachius*			
		Ray	Mixed species			
7	Hand gathering	Periwinkle	*Littorina littorea*	Hand picking	Mobile	Intensity and frequency of activity poorly known
8	Trammel net	Various fish		Trammel nets	Static	Intensity and frequency of activity poorly known

5 Fisheries: trends in stock status, fishing effort and spatial extent

5.1 Crustacean trap fisheries

5.1.1 Stock status

Lobster stock status in the NW Irish Sea is unknown. The existing regulations and voluntary v-notch scheme, which is active in the area, protect egg production to a degree. Brown crab is probably stable. Velvet crab may be overfished. Shrimp stocks are small and recruitment is variable in this area.

5.1.2 Current Fishing effort and regulation

The trap fishery for crustaceans occurs along the coastal strip from Dundalk to Wicklow. Fishing effort is not as high as in other Irish coastal areas and stocks are smaller. Most operators are part-time and operate out of very small (6-8m) coastal vessels. Activity is seasonal peaking in summer. The shrimp fishery is active from Sept to Dec. There may be up to 44 vessels operating part-time including a smaller number of full-time. An estimated 6100 pots are used in the fleet. All operators use side entrance soft eye creels which are set in lines of 20-50 on the seabed.

Minimum landing sizes for crab (130mm carapace width) and lobster (87mm carapace length), v-notched lobsters are protected and there is a closed season for Shrimp during June and July. There is no minimum size for velvet crab.

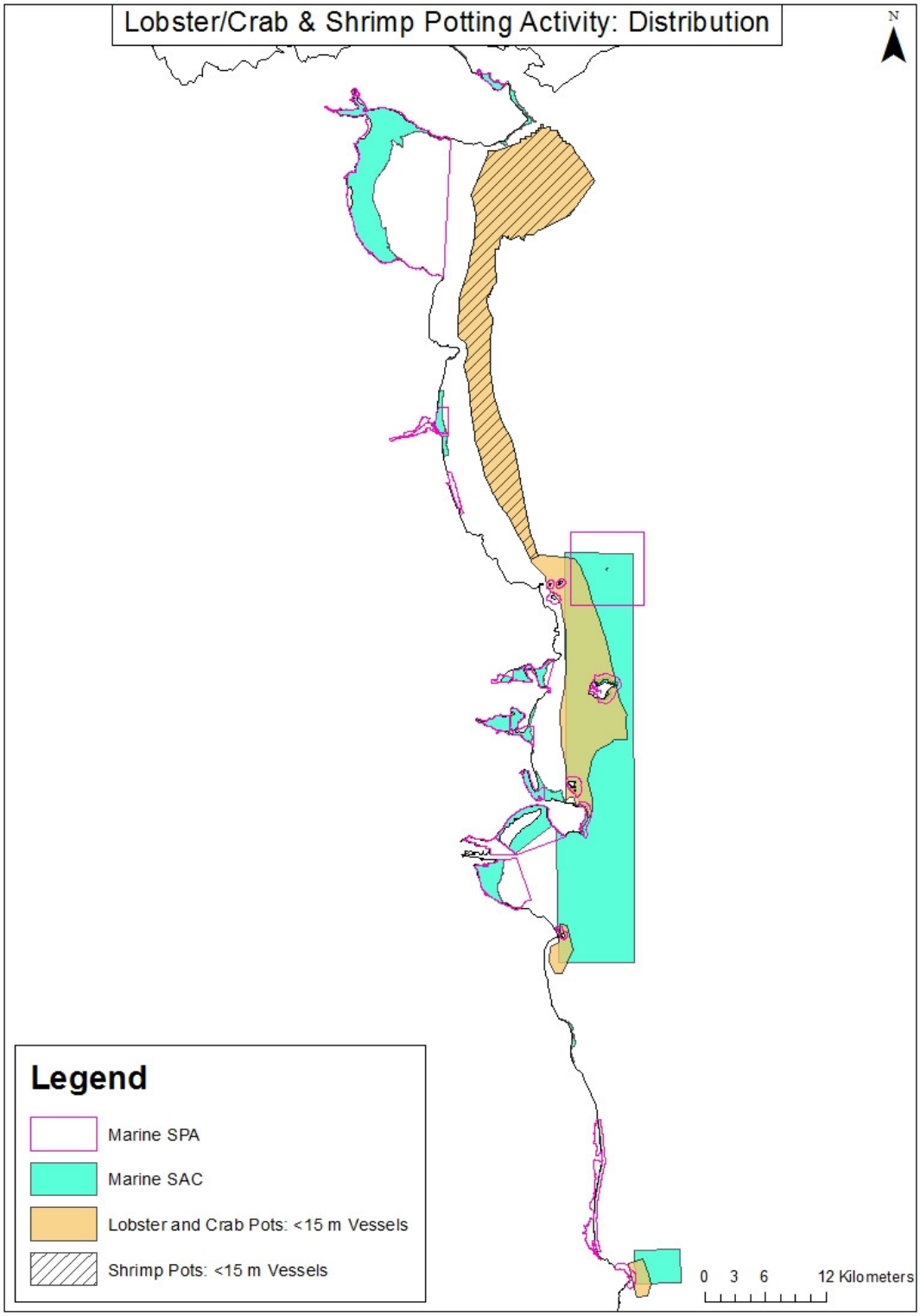


Figure 2. Distribution of lobster, crab and shrimp pot fisheries in the Irish Sea

5.1.3 Future fishing effort

Effort in this fishery could increase in the future although the scope is limited by the distribution and availability of habitat and stocks. Significant increases in effort would not be economically viable given the costs of entry to the fishery relative to the potential earnings. All fishing grounds are known. The spatial footprint of the fishery is unlikely to increase.

5.2 Whelk trap fishery

5.2.1 Stock status

Whelk stocks in the south Irish Sea are probably depleted (MI 2011). Biomass has declined in recent years and catch rate indictors show local stock depletion is significant in some coastal areas.

5.2.2 Current Fishing effort and regulation

Potting for whelk is a significant fishery in the south Irish Sea extending from Rosslare north to Howth. The fishery occurs generally inside the 6nm limit in the south Irish Sea from Rosslare north to Courtown, Arklow, Wicklow and Dun Laoghaire. The fishery extends offshore to the 12nm limit off Wicklow Head. The pots consist of 20L plastic drums with a conical hard eye entrance. The drums are weighted with concrete and set in lines of 20-50 on the seabed.

Fishing effort has escalated in recent years due to strong market prices. Over 50 vessels currently participate in the fishery using approximately 25000 pots. There is a minimum landing size of 25mm shell width in place.

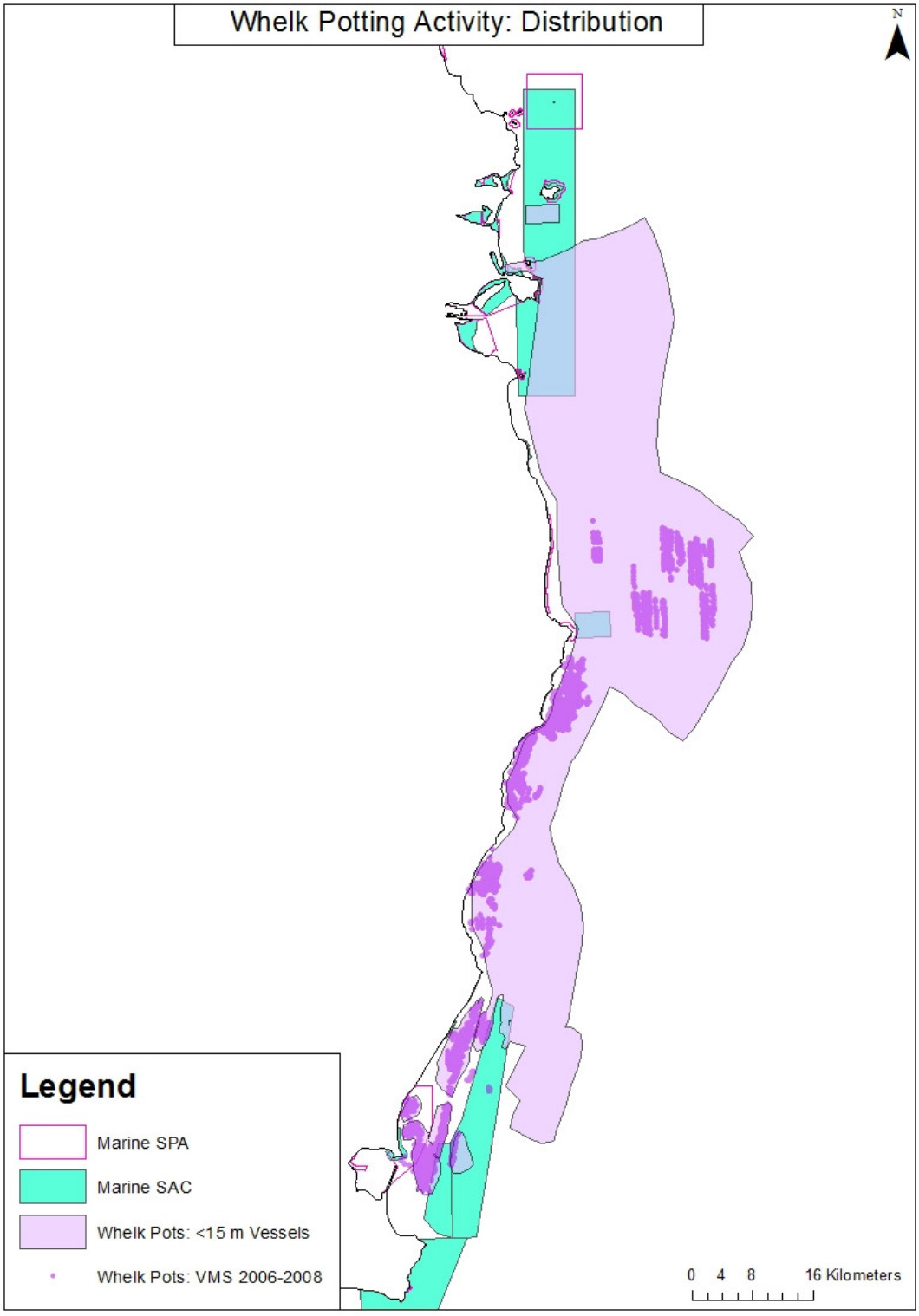


Figure 3. Distribution of whelk fishery in the Irish Sea. GPS data, for a sub-set of the fleet, marking fishing positions from private vessel diaries is shown.

5.2.3 Future fishing effort

Fishing effort may continue to increase but will be constrained by access to suitable fishing grounds where the catch rates are commercial. All grounds are known and the future footprint of the fishery is unlikely to increase.

5.3 Benthic dredge

5.3.1 Scallop

5.3.1.1 Stock status

Fishery indicators in the south Irish Sea suggests that recruitment to the stock is strong and that biomass is increasing. Stocks status in the north west Irish sea is unknown.

5.3.1.2 Current Fishing effort and regulation

This fishery occurs mainly in the south Irish Sea from Carnsore north to Tuskar and off the Wicklow coast. This is an offshore fishery by vessels >15m in length. Vessels operate standard spring loaded toothed or fixed toothed dredges approximately 0.8m wide. Varying number of dredges can be operated simultaneously depending on the size of the vessel.

Fishing effort by Irish and Scottish vessels in the south Irish Sea is increasing. The footprint of the fishery expanded during the 1990s as the extent of the beds was being explored. Effort declined following 2005 and increased from 2008-2012.

In addition there is a small scale coastal scallop fishery in the north Irish Sea by vessels operating out of Kilkeel (3 vessels), Dundalk (2 vessels) and Howth/Dun Laoghaire. These vessels are all under 15m in length and may carry up to 12 dredges each. This small scale coastal fishery occurs in patches south of Dun Laoghaire to Wicklow in shallow water, east of Lambay and in a north south Band east of Clogherhead south to Lambay in depths over 30m at the edge of the prawn ground.

A minimum landing size is in place. The capacity of the Irish fleet over 10m in length is limited. The kilowatt days at sea allowed by the Irish over 10m fleet is limited under the western waters agreement.

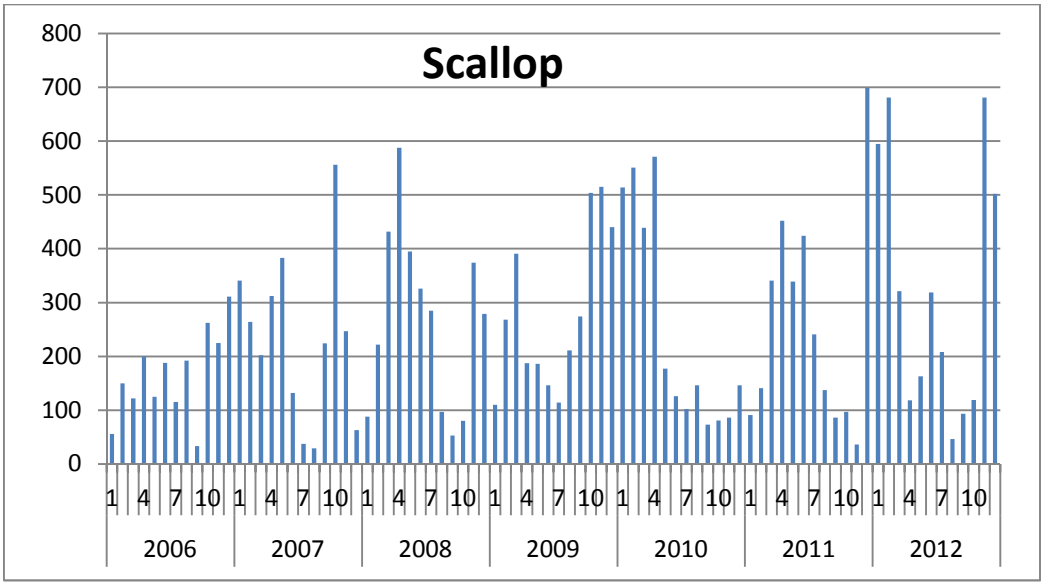


Figure 4. VMS hrs of vessel (>15m) activity by month and year by scallop dredgers in the Irish Sea

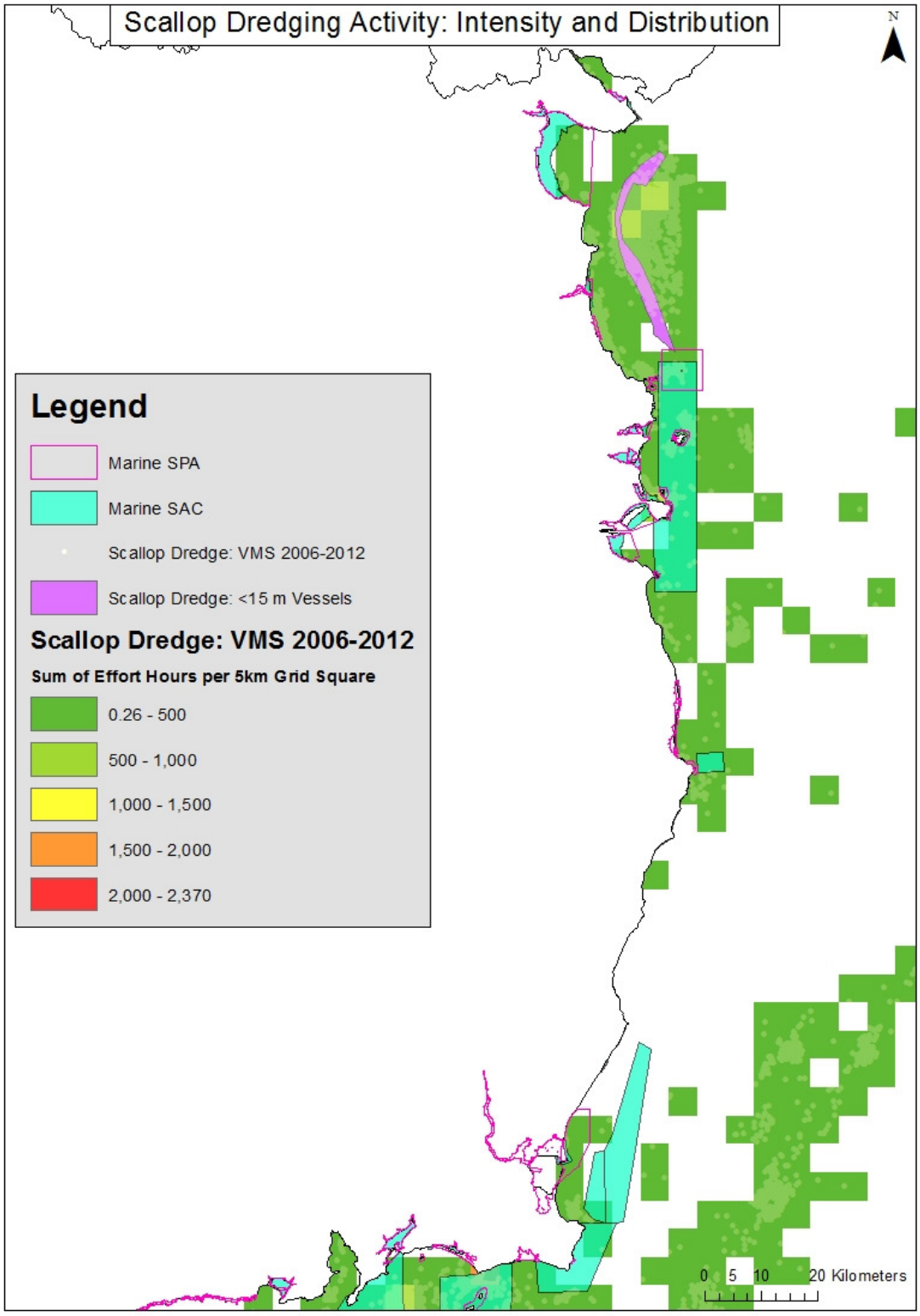


Figure 5. Distribution of scallop fishing in the Irish Sea. VMS data in the north Irish Sea is for Scottish registered vessels. Its eastern boundary is cut at the edge of mud habitat using the underlying habitat map.

5.3.1.3 Future fishing effort

Effort may continue to increase up to the effort ceiling allowed under the western waters agreement but the footprint of the fishery is likely to remain the same as all grounds are known.

5.3.2 Razor clam

5.3.2.1 Stock status

This fishery potentially occurs in a continuous north south band from Dunany Pt south to Balbriggan and Skerries and from Rogerstown to Howth and surrounding Lambay Is. In the south Irish Sea two, more recent, fisheries have opened off the Wexford coast.

Razor clam stocks may be locally depleted in the north west Irish Sea. Stocks in the southern Irish Sea, which have only been exploited recently, may still be close to virgin biomass.

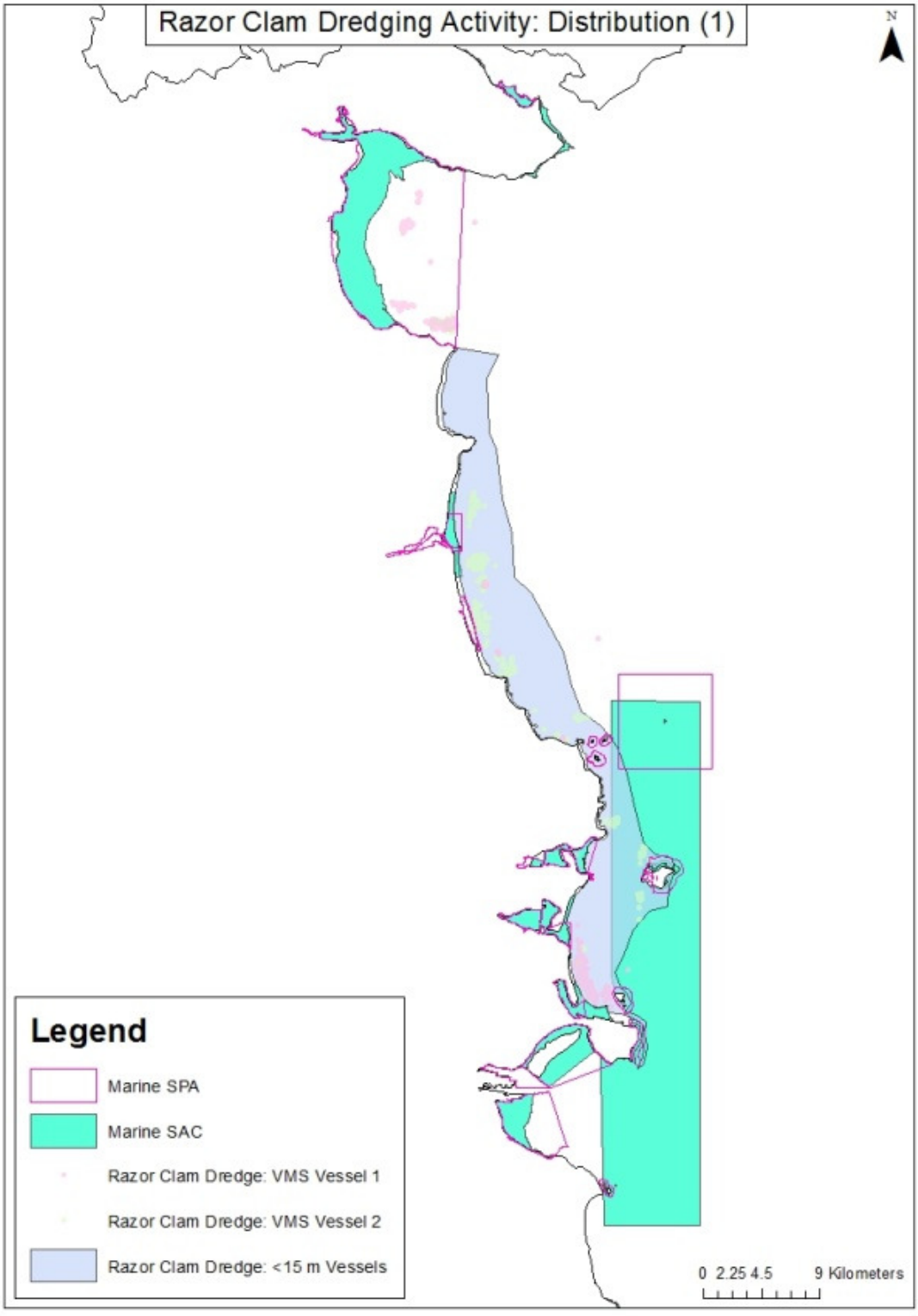
5.3.2.2 Current Fishing effort and regulation

The depth distribution of the fishery is constrained by the efficacy of the hydraulic gear which, with existing methods, is not effective at depths greater than 14m. The fishery extends shorewards to the low water mark which essentially marks the limit of the distribution of Razor clams. The fishing process involves generating hydraulically driven jets of water in front of the dredge to fluidise sediments and dislodge inbenthic fauna, including razor clams. The dredge is approximately 0.9m wide. All boats, except one, use a single dredge. The catch is graded mechanically and non-target organisms returned to the sea.

The distribution of fishing is further limited to classified production areas. These are areas that have been classified as fit for production, from the point of view of bacterial loading, and to limit risk to public health (EU 854/2004). Fishing for razor clams outside these areas should not occur. Currently there are 6 classified areas for Razor clams in the Irish Sea; Rosslare Bay, Curracloe, Malahide, Skerries, Gormanstown/Laytown and Dundalk Bay

The fishery in Rosslare and Cahore is regulated (SI 425/2011, SI 437/2010, SI 310/2010) as follows; fishing hours are restricted to between 07:00 and 19:00, 4 days per week and 3 tonnes per week for the fleet. All vessels must report landings and effort, 1 dredge per vessel is allowed, the bar spacing on the dredge is 10mm, minimum landing size is 100mm and vessels must ‘book in’ and hail prior to landing.

In total there is an estimated 38 vessels fishing Razor clams in the Irish Sea.


Razor Clam Dredging Activity: Distribution (1)
N
Legend
Marine SPA
Marine SAC
Razor Clam Dredge: VMS Vessel 1
Razor Clam Dredge: VMS Vessel 2
Razor Clam Dredge: <15 m Vessels
0 2.25 4.5 9 Kilometers

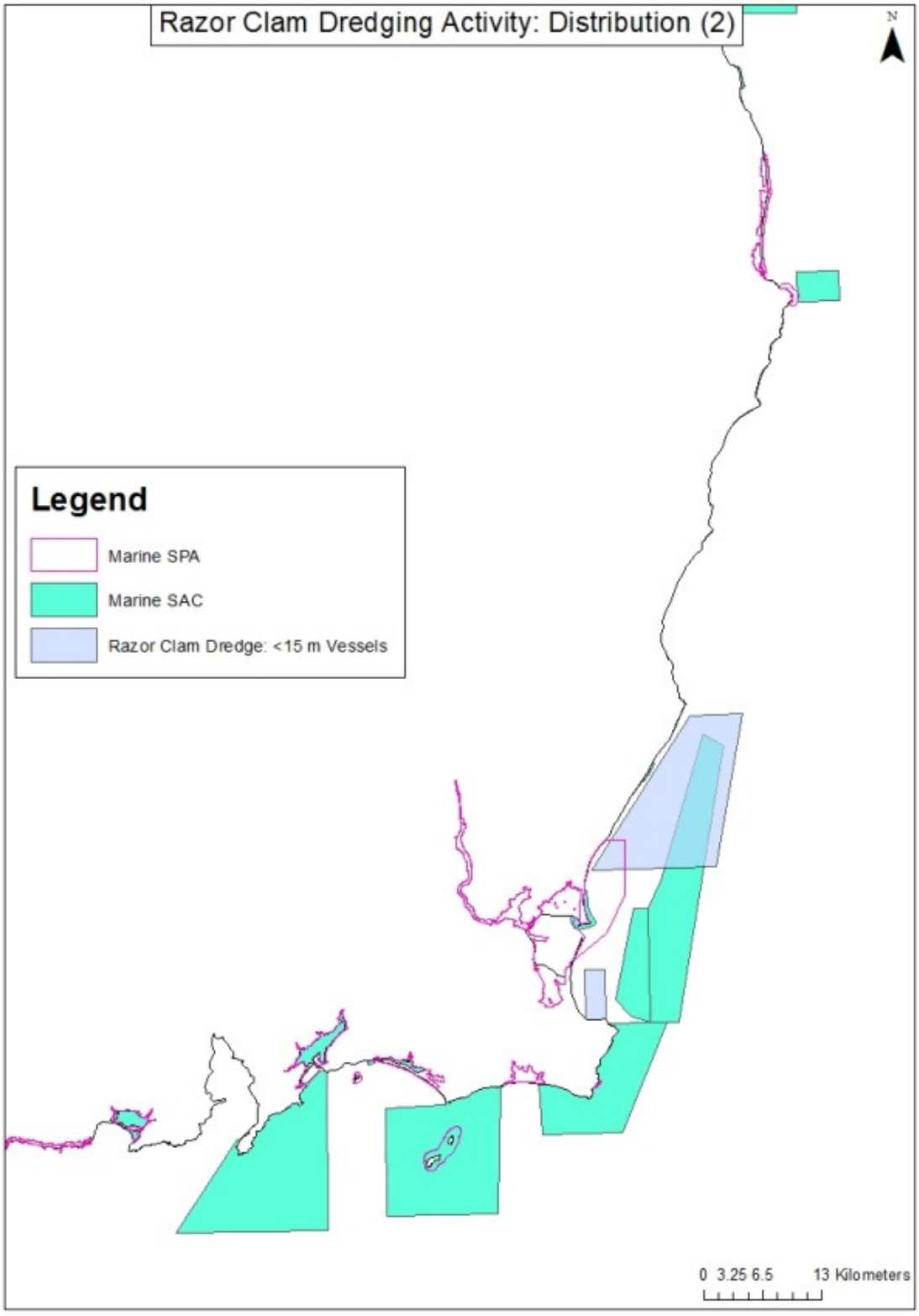


Figure 6. Distribution of fishing for Razor clams in the Irish Sea

5.3.2.3 Future fishing effort

The footprint of the fishery is unlikely to increase unless the there are advances in the development in the use of hydraulic gear which would enable fishing in deeper water. New stocks may be found in other areas although this is unlikely. Fishing effort in the northwest Irish Sea will decline in some areas where stocks are depleted.

5.3.3 Seed mussel

5.3.3.1 Stock status

Sub-tidal stocks of mussel in the western Irish Sea consist mainly of seed mussel which settles in spring on coarse substrates. Although historically some of these beds were more stable than others and may have overwintered and were reproductively mature there are no known stable mature mussel beds in the area currently. However, sub-tidal mussel beds in the Irish Sea may contribute significantly to larval production in some areas and in some years. The stock status changes seasonally and is driven by recruitment and growth in spring and summer and mortality during winter.

5.3.3.2 Fishing effort and regulation

Historically fishing effort has occurred in numerous areas in the Irish Sea, the location of which varies annually. Most of the fishing effort occurs from August onwards. Limited fishing occurs in May and the commercial vessels may also be permitted to undertake pre-fishery surveys (Figure 7, Figure 8).

5.3.3.3 Seed mussel fishery plan

The seed mussel fishery plan proposes to fish for seed mussel in the Irish Sea each year in the period 2013-2017. The main conditions and constraints that will apply to this fishery, and as described in the fishery plan (Annex I) are as follows

- Fishing is proposed in any or all seed beds that are found in any year. These areas are likely to be on sands, coarse sands and mixed shell substrates. Historically there were concentrations of seed beds off Wicklow Head and south to Cahore and off Wexford Hbr
- Fishing will occur on neap tides (<7m)
- Fishing may occur in early spring (2 tides) but mainly in autumn between Aug and Dec. Force majeure may be used to open the fishery at other times
- A maximum of 70 days per year will be fished between the hours of 06:00 to 18:00 each day
- A maximum of 35 vessels (inclusive of Republic of Ireland and Northern Ireland) will be permitted in any given year. Each will hold a seed mussel authorization.
- All vessels over 12m will report VMS (from Sept 2013) and vessels over 24m have AIS.

- In addition commercial vessels may be permitted to survey for seed under permit from the SFPA. These surveys may occur prior to May opening and August opening dates over 1-2 tides.
- BIM surveys are conducted between May and Sept using light and heavy box dredges
- Commercial dredges are 2-4m in width (on the mud bar), toothless and include a 2-3m long bag. The bottom part of the bag is made from chain mail or nylon mesh
- Seed beds are opened only when advised by the Bottom Growers Mussel Consultative Forum (BGMCF). The main criteria are the presence of commercial quantities of seed and that the seed is of suitable size to survive post harvest transport
- Prior notification of fishing (4 hours) and landing (2 hours) to SFPA is required.
- Logbooks are maintained by operators and catch data reported by SMS to SFPA.

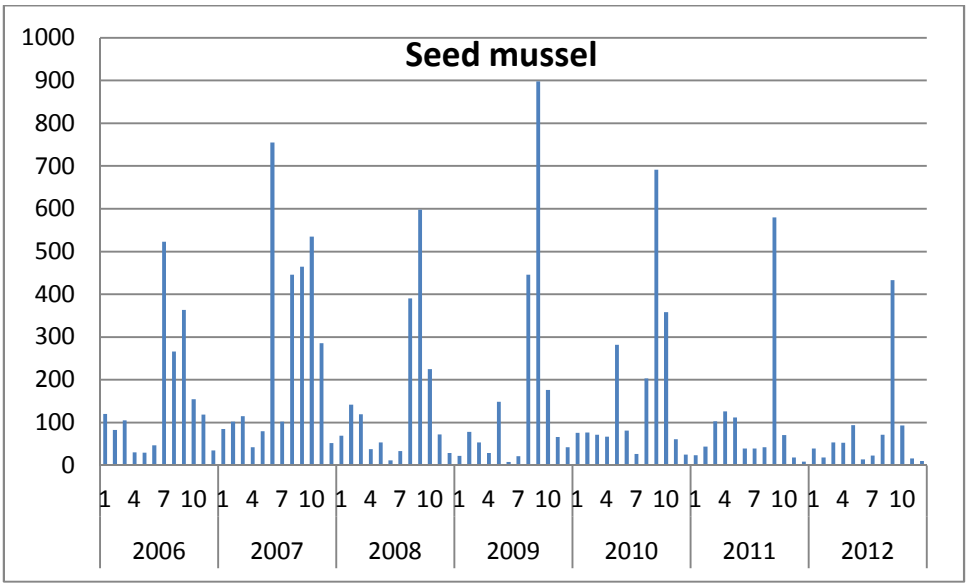
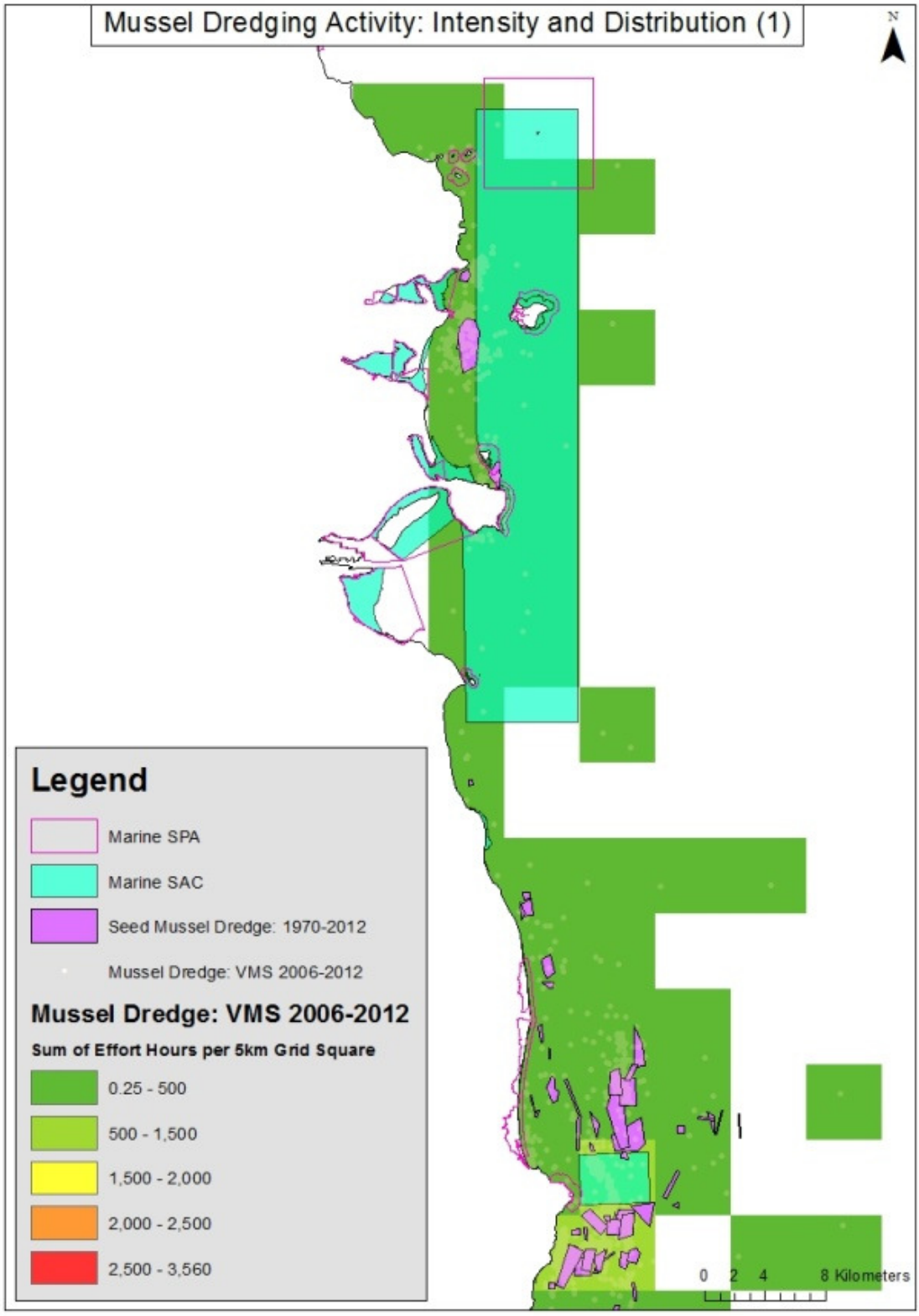


Figure 7. VMS hrs of vessel activity by month and year by mussel dredgers in the Irish Sea


Mussel Dredging Activity: Intensity and Distribution (1)
N
Legend
Marine SPA
Marine SAC
Seed Mussel Dredge: 1970-2012
Mussel Dredge: VMS 2006-2012
Mussel Dredge: VMS 2006-2012
Sum of Effort Hours per 5km Grid Square
0.25 - 500
500 - 1,500
1,500 - 2,000
2,000 - 2,500
2,500 - 3,560
0 2 4 8 Kilometers

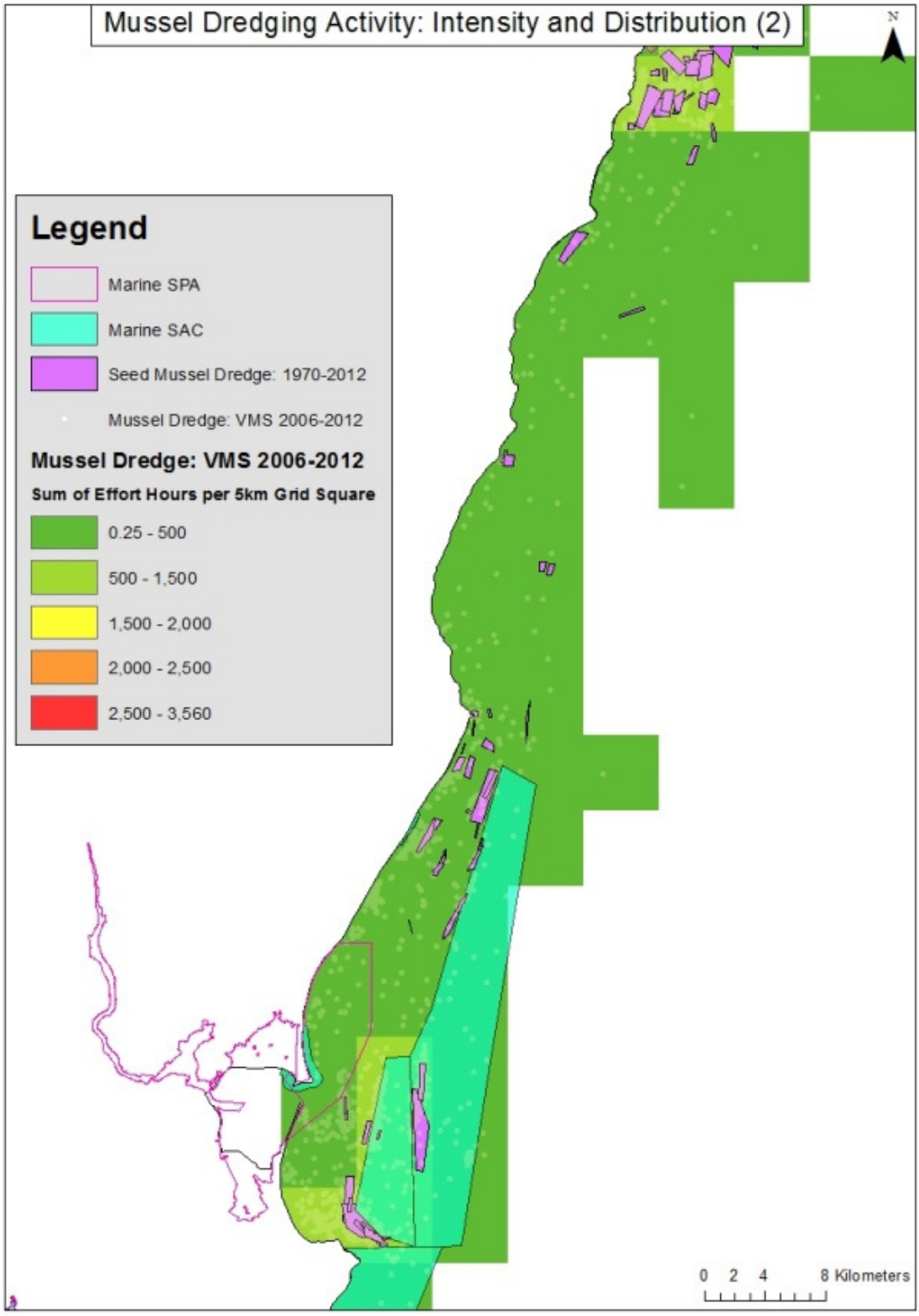


Figure 8. Historic distribution of fishing for seed mussel in the Irish Sea including areas (seed mussel dredge polygons) where seed beds were located by BIM surveys.

5.3.3.4 Future fishing effort

Future fishing effort depends on the location and level of seed settlement. The footprint of this fishery in any given year is very limited as the seed mussel beds are very limited in extent. The overall footprint that has occurred over the past 30 years is unlikely to expand.

5.3.4 Gill netting for Herring

5.3.4.1 Stock status and regulation

The status of herring in the Irish Sea is good (Table 7). Stocks are above precautionary reference points and fishing mortality rates are not compromising stock productivity.

5.3.4.2 Current fishing effort

Irish vessels do not participate in the fishery. Northern Irish vessels fish the 'Mourne stock' off the county Down coast. This fishery targets pre-spawning herring using bottom set gill nets. The fishery is prosecuted by a small number of vessels in late autumn and is usually very short (several days) due to lack of quota. The Mourne fishery is limited to boats under 40ft. This traditional fishery was re-activated in 2005 after many years of closure due to lack of herring. In 2012 four vessels recorded landings of ~39 t. This catch was taken during a single night in late September. Gill nets are used with a mesh size of 57mm. The fishery has supported up to 15 boats taking over 150t of herring, supplemented by quota swaps.

5.3.4.3 Future fishing effort

Fishing activity in the future may increase in proportion to overall TAC increases for Herring in the Irish Sea, the majority of which occurs around the Isle of Man. Landings from the fishery have increased year on year from 2005-2012.

5.3.5 Beam trawl fishery

Beam trawling effort in the Irish Sea peaks in summer and early autumn. Effort is much lower than for bottom trawls and is declining. Effort peaked in 2007 at 17900 hrs and declined to 10000 hrs in 2012. The spatial extent of the fishery is well known and is not increasing. All vessels report position and landings.

5.3.5.1 Stock status

The status of Ray spp in the south Irish Sea is unknown. Plaice stocks are high and stable (Table 7). Sole stocks are depleted

5.3.5.2 Current Fishing effort and regulation

Fishing effort by beam trawls is declining. The Belgium beam trawl no longer fishes in the Irish Sea and effort by Irish vessels and the number of beam trawlers in the Irish fleet is declining (Figure 9, Figure 10)

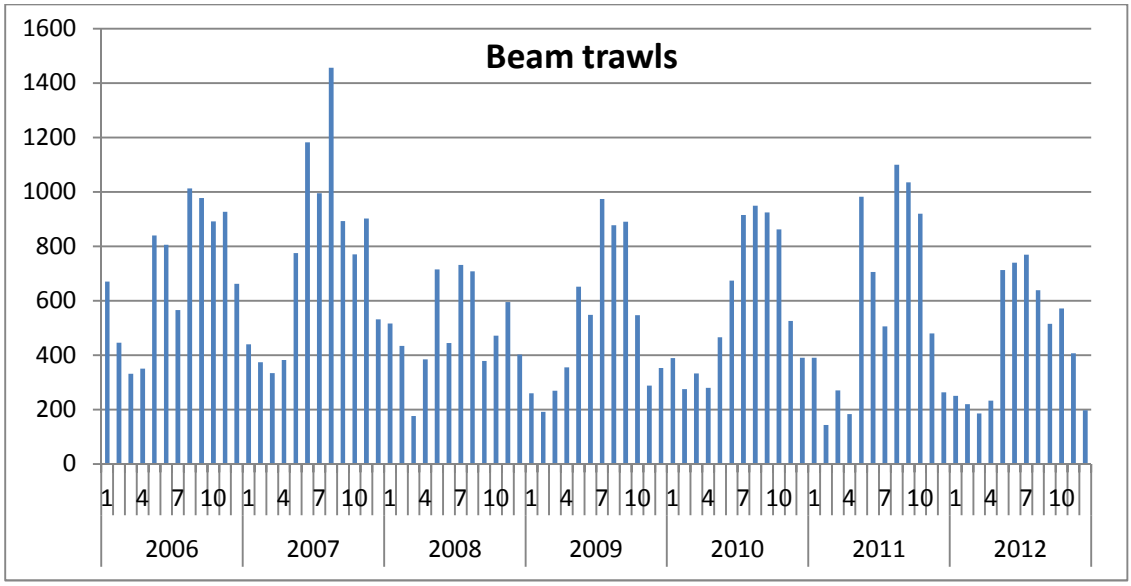


Figure 9. VMS hrs of vessel activity by month and year by beam trawlers in the Irish Sea.

5.3.5.3 Future fishing effort

Fishing effort by beam trawlers is likely to continue to decline due to lack of fishing opportunity and high economic costs.

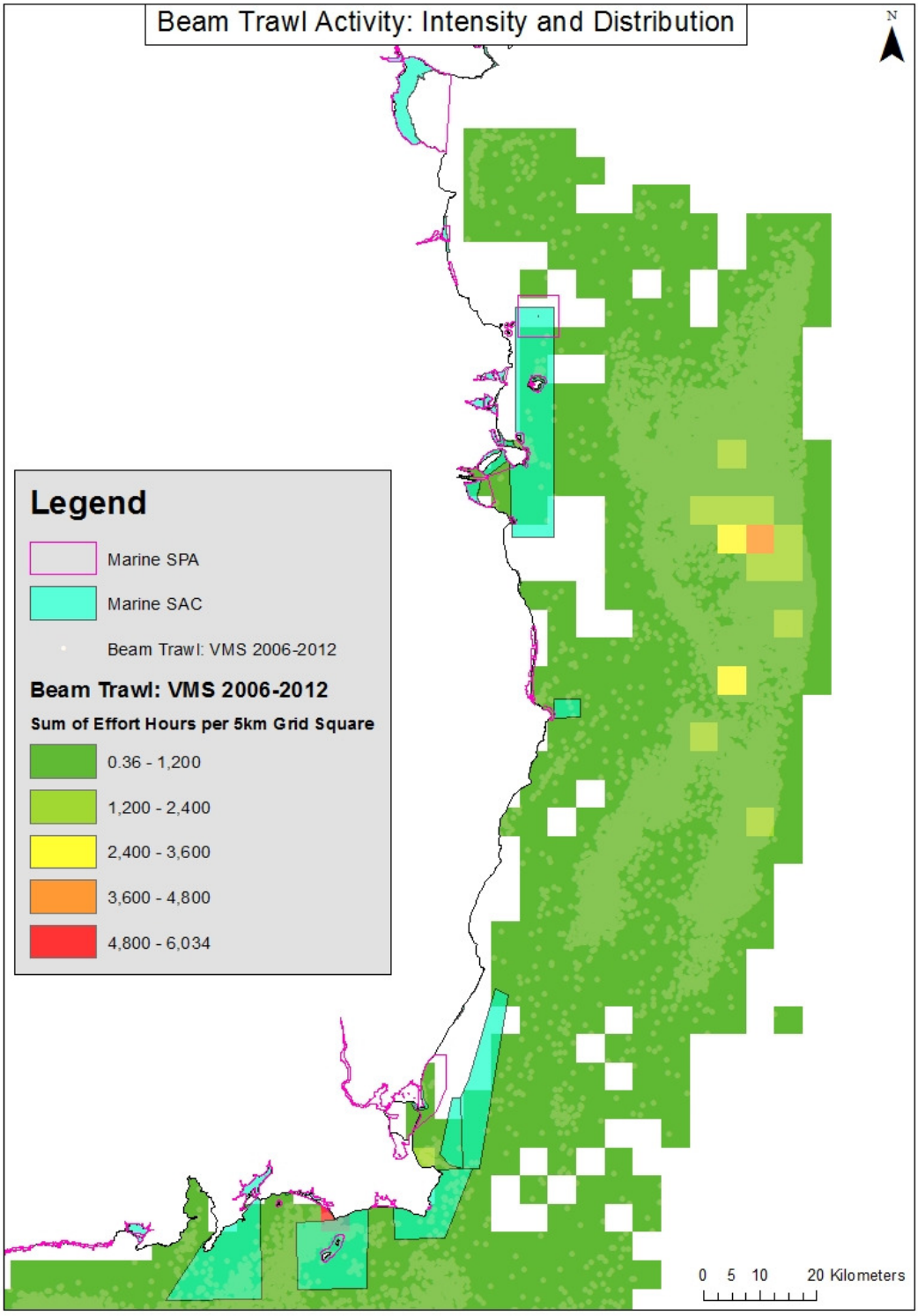


Figure 10. Distribution of beam trawling in the Irish Sea

5.3.6 Bottom otter trawl fishery

5.3.6.1 Stock status

The bottom otter trawl fishery targets a number of species of fish in the western Irish Sea. Cod, whiting and sole stocks in the Irish Sea are depleted (Table 7). Plaice, haddock and *Nephrops* stocks are at high biomass and relatively stable or fluctuating according to recruitment patterns. These stocks are fished with bottom otter trawls and beam trawls. Beam trawls are used mainly in the south Irish Sea to target Rays.

5.3.6.2 Current Fishing effort and regulation

Bottom trawl activity in the Irish Sea is seasonal peaking in late summer and autumn. Total activity is constrained mainly by the conditions in the cod long term management plan and by quota allocations. The vast majority of the effort is towards catching the annual TAC for *Nephrops* which is approximately 9000 tonnes.

The spatial extent of the bottom trawl fisheries is well defined and is not increasing. Fishing effort totaled to approximately 60000 VMS hrs in 2007, declined to 46000 hrs in 2010 and increased again to 57000 hrs in 2012. All vessels, except a small number under 15m vessels report position and landings (Figure 11, Figure 12).

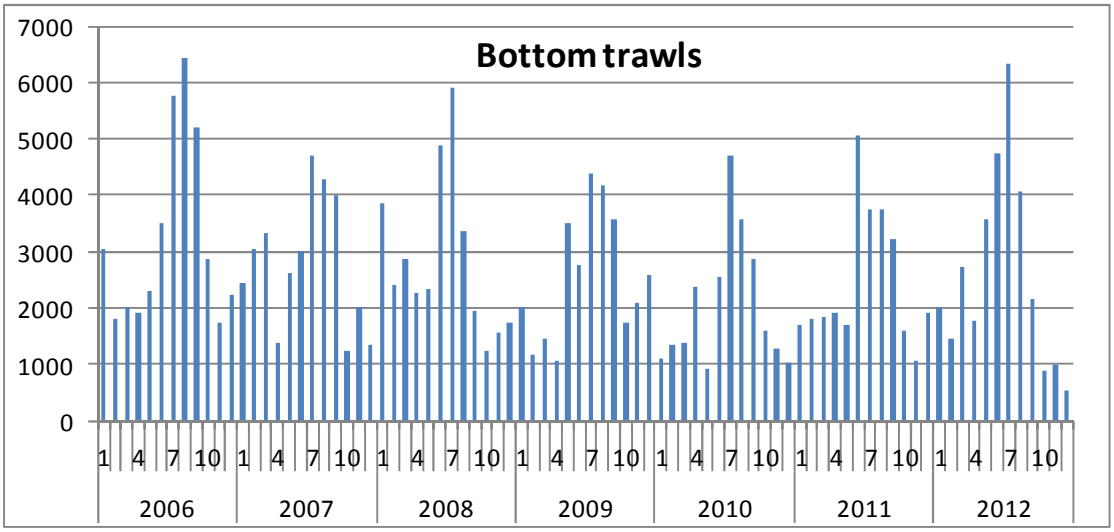


Figure 11. VMS hrs of vessel activity by month and year by bottom trawlers in the Irish Sea.

5.3.6.3 Future fishing effort

Future fishing effort will continue to be constrained by the cod long term management plan and by annual TACs for target species. In any case, the footprint of the fishery is very unlikely to increase given that the main target species is *Nephrops* which is confined to mud and sandy mud habitats.

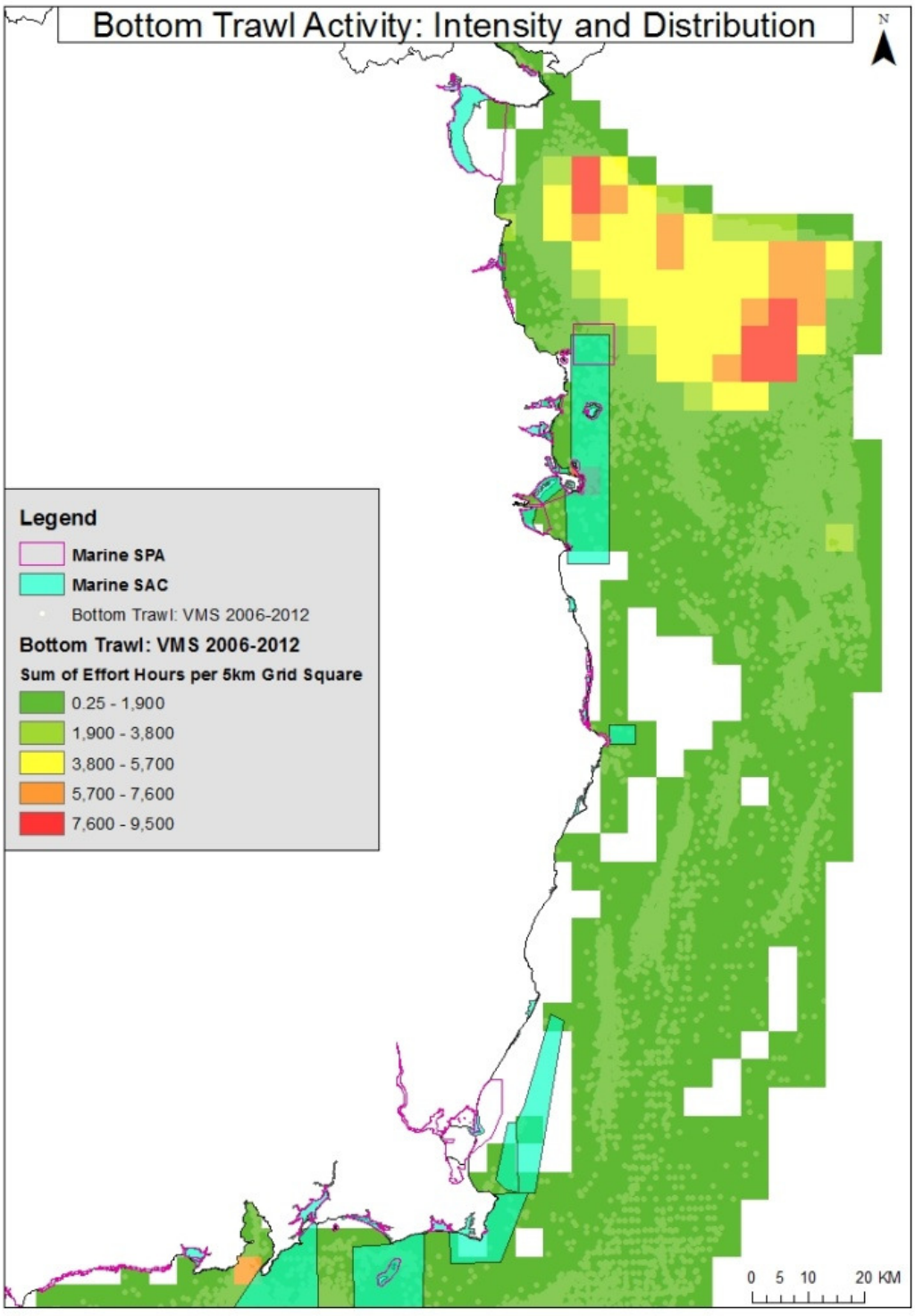


Figure 12. Distribution of bottom otter trawling in the Irish Sea

Table 7. Stock status and trends for demersal fish stocks in the Irish Sea in relation to reference points. Red cells indicate fishing mortality and/or biomass is in an unfavourable position relative to biological reference points. Green cells indicate the opposite. Black text indicates that stock status was determined from analytical assessment, white text indicates assessment using trends or other non-analytical basis. CLTMP = cod long term management plan. The Irish Sea cod box includes a number of effort and technical measure restrictions as envisaged in the CLTMP. The basis for advice on stocks varies depending on the available data and assessment methods.

	TAC		Reference points				Trends				
	2012	**2013**	**F(msy)**	**F(lim)**	**B(trigger)**	**B(lim)**	**Stock**	**Recruitment**	**Landings**	**Basis of advice**	**Other technical and operational measures**
Cod	380	285	F>F(msy)	F>F(lim)	B<B(trigger)	B<B(lim)	Depleted	Depleted	Depleted	CLTMP	Irish Sea cod box regulations apply
Haddock	1251	1001	Unknown	Unknown	Unknown	Unknown	Fluctuating	Fluctuating	Depleted	-20%	Irish Sea cod box regulations apply
Whiting	89	71	F>F(msy)	Unknown	B<B(trigger)	B<B(lim)	Depleted	Low, stable	Depleted	-20%	Irish Sea cod box regulations apply
Plaice	1627	1627	F<F(msy)		B>B(trigger)		High and stable	Stable	Stable	Status quo TAC	Irish Sea cod box regulations apply
Sole	300	67	F>F(msy)	F>F(lim)	B<B(trigger)	B<B(lim)	Depleted	Depleted	Declining	By-catch fishery only	Irish Sea cod box regulations apply
Nephrops (FU15)	9300	9300	F>F(msy)	Unknown	B>B(trigger)	Unknown	High and stable	Stable	Stable	Status quo TAC	Irish Sea cod box regulations apply
Herring	5100	4993	F<F(msy)		B>B(trigger)		Increasing	Increasing	Stable	Unknown	Closed areas Sept to Dec, Mourne
Ray spp.			Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Declining	Average catch	

6 Natura Impact Statement for the proposed seed mussel fishing plan and other fisheries

6.1 Natura impact statement for the seed mussel fishery plan

- The seed mussel fishery, by using bottom dredges to fish for mussels, will cause physical abrasion at the sea bed (Table 8).
- Mussel dredges do not penetrate the sediment so no shallow or deep disturbance of the sediment will occur.
- Seed mussel, which is a food source for a number of fish species, scavenging and predatory invertebrates and diving birds such as Common Scoter, will be removed.
- Non-target organisms, living in seed mussel beds, may be captured by the fishing gear. These include whelk, crab, starfish and flat fish.
- Vessels may cause disturbance to flocks of resting or foraging seabirds.
- Seabird by-catch is not likely.

6.2 Other Fisheries

- Other fisheries in the Irish Sea use a variety of fishing gears to fish for benthic, demersal and pelagic species (Table 8).
- The main potential pressures are physical abrasion, removal of fish or other prey resources which may be important as prey for Annex species, removal of non-target species as by-catch and direct capture of Annex species in fishing gear
- Physical abrasion of the seabed
    - Dredge fisheries for scallop and razor clam will cause physical abrasion at the sea bed and in the sediment. Both gears penetrate the sediment
    - Bottom trawls also cause abrasion of the seabed. This abrasion is mainly caused by the trawl doors but also by the ground rope
    - Pots may cause abrasion locally in the footprint of the pot, especially the heavier weighted whelk pots.
- Removal of prey
    - All fisheries, by definition, extract fish resources from the Irish Sea and therefore potentially reduce fish availability to Annex species such as cetaceans, seals and birds.
    - Fisheries for pelagic fish and, to a lesser extent demersal fish, are more important prey for birds and marine mammals than fisheries for sub-tidal shellfish although some shallow sub-tidal shellfish such as mussel may be

preyed upon by diving birds such as Common Scoter. The effect of demersal fisheries may be to reduce recruitment and therefore the abundance of juveniles fish which may be preyed upon by seabirds or to remove small sized organisms and non-target species.

- By-catch
    - Static nets such as gill nets and trammel nets may potentially catch seaducks, divers, seabirds, seals and cetaceans.

Table 8. Potential indicative environmental pressures of fishing activities and aquaculture activities in the Irish Sea. Disturbance and alteration of behaviour of feeding and roosting birds can to varying degrees be a factor in all fisheries

METIER/ ACTIVITY	PRESSURE CATEGORY	PRESSURE	POTENTIAL OR ACTUAL EFFECTS	FISHING GEARS	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY
Crustacean pot fishery	Physical	Surface disturbance	Abrasion at the sediment surface	Shrimp pots, Soft eye side entrance creels	240	Mar-Sept Sept-Dec (Shrimp)	catch rate, weather, market
	Biological	Extraction	Removal of shrimp				
		By-catch	Mortality of fish species in by-catch				
Whelk pot fishery	Physical	Surface disturbance	Abrasion at the sediment surface	Hard eye plastic drums	240	Jan-Dec	catch rate, weather, market
	Biological	Extraction	Removal of whelk				
		By-catch	Mortality of fish species in by-catch				
Dredging for scallops, mussels and razor clams	Physical	Surface disturbance	Abrasion at the sediment surface, sediment suspension (mussel, scallop, razor)	Fixed toothed dredges (DRB), ICES code 04.1.1, mussel dredge, hydraulic dredge	All year (scallop, clams), 70 days (mussel)	All seasons (scallop, clams) Mainly autumn (mussel)	catch rate, weather, market, biotoxins, effort regime
		Shallow disturbance	Sub-surface abrasion to 25mm (scallop, razor), sediment suspension				
	Biological	Extraction	Removal of scallops, seed mussel and clams				

METIER/ ACTIVITY	PRESSURE CATEGORY	PRESSURE	POTENTIAL OR ACTUAL EFFECTS	FISHING GEARS	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY
		By-catch mortality	Mortality of organisms captured or disturbed during the fishing process, damage to structural fauna of reefs				
Bottom set gill nets	Physical	Surface disturbance	Abrasion at the sediment surface	Gill nets, GNS, ICES 07.1.0	Unknown	All year	Quota, weather
	Biological	Extraction	Removal of herring				
		By-catch	Potential by-catch of Annex species (porpoise, birds).				
Mixed fisheries demersal trawling	Physical	Surface disturbance	Abrasion at the sediment surface, sediment suspension	Demersal single bottom otter trawls (OTB, ICES code 03.1.2	Approx 300	All year	Weather, quota restrictions, cod long term plan
		Shallow disturbance	Sub-surface abrasion by trawl doors, sediment suspension				
	Biological	Extraction	Removal of fish				
		By-catch mortality	Mortality of organisms in contact with fishing gear				
Mixed fisheries beam trawling	Physical	Surface disturbance	Abrasion at the sediment surface, sediment suspension	Beam trawl (OTB, ICES code 03.1.2	Approx 300	All year	Weather, quota restrictions

METIER/ ACTIVITY	PRESSURE CATEGORY	PRESSURE	POTENTIAL OR ACTUAL EFFECTS	FISHING GEARS	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY
		Shallow disturbance	Sub-surface abrasion by trawl doors, sediment suspension				
	Biological	Extraction	Removal of fish				
		By-catch mortality	Mortality of organisms in contact with fishing gear				
Hand gathering (periwinkles)	Physical	Surface disturbance	Trampling and compaction of fauna		Unknown	Mar-Sept	Market
	Biological	Extraction	Removal of periwinkles				
Trammel nets (bait fishery)	Physical	Surface disturbance	Abrasion on sediment surface or on reefs	GTR, ICES 07.5.0	Unknown	Mar-Sept	Availability and price of bait
	Biological	Extraction	Removal of non-commercial fish species				
		By catch	Potential catch of designated species, porpoise and seal				

7 Appropriate Assessment and Risk Assessment screening

A screening exercise is an initial evaluation of whether an activity could have or could not have an effect on QIs within SACs and SPAs or on those QIs if they move out of the protected sites. The screening process may therefore lead to exclusion of certain activities, projects or plans from appropriate assessment or risk assessment, thereby simplifying the assessments, if this can be justified, unambiguously, using limited and clear cut criteria. Screening should be used as a conservative filter that minimises the risk of false negatives.

7.1 Fishery Activity Screening

7.1.1 Screening methods

Screening filters have been applied to the matrix of QIs and fisheries activities to determine if they can be excluded from further assessment as follows

1. *Filter 1*: Where the location of the SAC/SPA and the nature of its QIs or individual QIs is such that there is no possibility of an interaction with fisheries, either within the site or out with the site, such QIs at the site are excluded from further assessment
2. *Filter 2*: Where the location of the SAC/SPA and its QIs is such that fisheries in the site could interact with them but where data indicates there are no fisheries, of any type, currently or likely to be in the future, in the site and where effects of *ex situ* fishing activities can be discounted then these QIs, for such sites, are excluded from further assessment
3. *Filter 3*: Where the location of the SAC/SPA and its QI is such that fisheries could interact with them within the site but only certain types of fisheries currently exist or could exist in the future then fisheries in the site, **other than these and if ex situ fisheries are not relevant**, are excluded from further assessments.
4. *Filter 4*: Where assessments have already been completed

QI-fishery interactions that are **retained** for assessment therefore **include** the following

1. Where a fishery currently or potentially overlaps spatially with a QI in the site
2. Fishing activity that may be outside of the site but which can interact with the QI because of the behaviour of the QI (such as seabirds foraging at a distance from breeding sites). In these situations the geographic scope of the assessment is determined on a case by case basis with the objective of capturing all activity that may interact with the QI for which the site is designated.

7.1.2 Screening methods: further comments on SPA QIs

– As noted for both SACs and SPAs screening filters have been applied to the matrix of QIs and fisheries activities to determine if they can be excluded from further assessment (see p 7.1.1). In

the case of SPAs, and the bird species for which they have been designated, a number of other factors have also been taken into account to inform this process.

- Firstly, the SPAs designated between Carnsore Point and Carlingford Lough, while defined as Marine SPAs for the purpose of this fisheries assessment, can be more properly defined in the case of birds as estuarine (intertidal / shallow subtidal); coastal (largely shallow coastal intertidal / subtidal) or marine (including seabird breeding cliffs and offshore islands). This in turn influences the suite of QI species for which a site in designated; the likelihood of there being *in-situ* fisheries within the SPA and the potential for interactions between QIs for which an SPA has been designated and *ex-situ* fisheries. Dundalk Bay which has already been the subject of detailed assessment is excluded from this process. Wexford Harbour is excluded; there are no fisheries in the site and the QIs for the SPA will be assessed as part of an AA of aquaculture in the near future. [However, for completeness both Dundalk Bay and Wexford Harbour are retained in the tables].
- The variation in site characteristics in turn informs the seasonal pattern of habitat use and potential for temporal as well as geospatial overlap with fisheries activity. Based upon the nature of proposed activities and the disjunction between fishing and occupation by birds, issues such as habitat resilience to particular fishing types and recovery (if any) from such impacts may also be a consideration. While this is more directly relevant to consideration of impacts on marine habitats (SACs), it is also considered in the SPA assessment where the type or scale of activity might result in impacts moving up the food chain to affect top predators such as birds. Equally, the type of gear is considered, as is its potential for gear to cause damage to sensitive habitats or to result in by-catch. In the case of the latter both risk of by-catch and spatial location of the fishery are relevant. For example, while gill netting would be considered as a high risk fishery for by-catch, in the case of the Irish Sea there is only a single small herring gill net fishery off Co. Down; this is both remote from the sensitive species being considered in this study, but also in recent years has been limited to operating over only a number of days (while risk to birds using coastal waters in Northern Ireland is outside the scope of this study, any intensification of gill net fisheries in the Irish Sea would warrant further consideration of the risk of by-catch).
- As noted, due to the variation in site character, the QIs for which Irish Sea SPAs are designated can include breeding, wintering and roosting birds. In the case of some of the terns species, sites such as Dalkey Island SPA (4172) are designated as an autumnal roost for large numbers of terns, while sites such as Wexford Harbour and Slobs (4076) is designated for both wintering and roosting Hen Harrier. For some QIs their status can vary from site to site with the same species categorised as either breeding, wintering and both according to the site in question (e.g. Cormorant & Herring Gull). As such the way in which a site is used by a QI species was considered as part of this assessment.

– Due to the extent of the area under consideration in this assessment QIs occupy a range of habitat types; forage in different ways and travel varying distances to feed thereby putting them at varying degrees of risk from ex-situ fishery practices. A literature review was undertaken to evaluate published data on habitat preferences, diet (Table 9) and dispersal distances of breeding birds (Table 10) from a colony for all species not screened out by the 4 step filter process outlined in section 7.1.1; consideration is also given to foraging distances for birds from communal roosts (e.g. Cormorant) or, where available, to non-breeding birds.

Table 9. Biological assessment of habitat preferences and diets of QIs in SPAs

Species	**Habitat** (only habitat preferences relevant to this study are included)	**Diet (dominant component)**
Common Whitethroat *Sylvia communis* [A309] breeding[1]	Coastal Scrub	Insects
Hen Harrier *Circus cyaneus* [A082] non-breeding / roosting	Coastal wetlands	Birds / small mammals
Red-throated Diver *Gavia stellata* [A001] non-breeding	Shallow inshore & coastal waters	Mainly fish
Little Grebe *Tachybaptus ruficollis* [A004] non-breeding	Ponds, lakes and shallow, sheltered coastal / estuarine waters	Mainly fish / Invertebrates
Great Crested Grebe *Podiceps cristatus* [A005] non-breeding	Shallow inshore & coastal waters outside the breeding season	Mainly fish
Cormorant *Phalacrocorax carbo* [A017] non-breeding & breeding	Fairly sheltered waters; avoids deep water. Breeds on offshore islands	Fish
Shag *Phalacrocorax aristotelis* [A018] breeding	Coastal waters; nesting on cliff ledges. Prefers to forage in sheltered waters	Fish
Grey Heron *Ardea cinerea* [A028] non-breeding	Estuaries & coastal rocky shore	Fish
Red-breasted Merganser *Mergus serrator* [A069] non-breeding	Shallow inshore & coastal waters	Fish, crustaceans
Bewick's Swan *Cygnus columbianus* [A037] non-breeding	Coastal wetlands, estuaries and rocky shorelines (in case of brent geese & wigeon)	Plant Material
Whooper Swan *Cygnus cygnus* [A038] non-breeding		
Greylag Goose *Anser anser* [A043] non-breeding		
Brent Goose *Branta bernicla hrota* [A046] non-breeding		
Wigeon *Anas penelope* [A050] non-breeding		
Coot *Fulica atra* [A125] non-breeding	Coastal wetlands; ponds, lakes & brackish lagoons	Plant Material (some animal matter also)
Teal *Anas crecca* [A052] non-breeding	Dabbling ducks – using shallow estuarine / coastal waters	Mixed plant / Invertebrate material

[1] As no Conservation Objectivess (CO's) are as yet published for Wicklow Head SPA, Common Whitethroat is included as a Feature of Interest (as noted on the Natura form).

Mallard *Anas platyrhynchos* [A053] non-breeding		
Pintail *Anas acuta* [A054] non-breeding		
Shoveler *Anas clypeata* [A056] non-breeding		
Shelduck *Tadorna tadorna* [A048] non-breeding	Estuarine mudlfats	Bivalves; mainly *Hydrobia*
Scaup *Aythya marila* [A062] non-breeding	Coastal estuaries, bays & shallow marine waters	Mainly molluscs / crustaceans
Common Scoter *Melanitta nigra* [A065] non-breeding	Coastal estuaries, bays & shallow marine waters	Bivalves
Goldeneye *Bucephala clangula* [A067] non-breeding	Coastal estuaries, bays & shallow marine waters	Mainly molluscs / crustaceans
Oystercatcher *Haematopus ostralegus* [A130]	Intertidal waders using estuarine and coastal intertidal habitats and, for some species, often associated grasslands	Poychaetes, oligochaetes, molluscs, insects etc.
Ringed Plover *Charadrius hiaticula* [A137]		
Golden Plover *Pluvialis apricaria* [A140]		
Grey Plover *Pluvialis squatarola* [A141]		
Lapwing *Vanellus vanellus* [A142]		
Knot *Calidris canutus* [A143]		
Sanderling *Calidris alba* [A144]		
Purple Sandpiper *Calidris maritima* [A148]		
Dunlin *Calidris alpina* [A149]		
Black-tailed Godwit *Limosa limosa* [A156]		
Bar-tailed Godwit *Limosa lapponica* [A157]		
Curlew *Numenius arquata* [A160]		
Redshank *Tringa totanus* [A162]		
Turnstone *Arenaria interpres* [A169]		
Black-headed Gull *Chroicocephalus ridibundus* [A179] non-breeding	Very adaptable using both coastal, inshore & inland habitats	Varied - Plant & Animal
Common Gull *Larus canus* [A182] non-breeding	Coastal	Fish & invertebrates (incl. bivalves)
Lesser Black-backed Gull *Larus fuscus* [A183] non-breeding	Coastal & at sea	Omnivore (fish dominant)
Herring Gull *Larus argentatus* [A184] non-breeding & breeding	Breeds on coastal cliffs / island. Winters all along the coast & inland	Omnivore (including scavenging)
Kittiwake *Rissa tridactyla* [A188] breeding	Breeds on sea cliffs; feeds at sea	Fish, crustaceans
Roseate Tern *Sterna dougallii* [A192] breeding	Coastal waters	Small Fish
Common Tern *Sterna hirundo* [A193] breeding	Coastal waters	Small Fish
Arctic Tern *Sterna paradisaea* [A194] breeding	Coastal waters	Small Fish
Little Tern *Sterna albifrons* [A195] breeding	Coastal waters	Small Fish
Guillemot *Uria aalge* [A199] breeding	Breeds on sea cliffs; feeds at sea	Small fish & invert.
Razorbill *Alca torda* [A200] breeding	Breeds on sea cliffs; feeds at sea	Small fish & invert
Puffin *Fratercula arctica* [A204] breeding	Breeds on sea cliffs; feeds at sea	Small fish & invert
Fulmar *Fulmarus glacialis* [A009] breeding	Breeds on sea cliffs; feeds at sea	Fish, offal (discards), crustaceans

- At all times a conservative approach is taken to screening. For example, sites like Rockabill SPA, 4014 and Skerries Island SPA, 4122 support Purple Sandpiper and Turnstone, small waders which use rocky shorelines around the islands but do not use the offshore waters associated with the islands in which fisheries may occur and can be screened out when considering for example nearby shallow water potting and dredging for razor shell. Similarly Greylag Geese roost on Lambay Island SPA (4069) during the winter months; from where they fly back to feed on grassland in a number of areas in Co. Dublin. Again, Greylag Goose can be screened out based on no habitat / dietary association with the fisheries or waters under consideration.
- In the case of Wicklow Head SPA (4127) as no Conservation Objectives have been published a precautionary approach was adopted and all features of interest noted on the Natura form were considered; however, Common Whitethroat (a small passerine) is then screened out due to habitat / dietary preferences.
- Only Rockabill Island SPA (4014), which is primarily designated for its important colony of breeding Roseate Tern (the most important such colony in the North East Atlantic) has an associated area designated within which the breeding terns forage; this is not the case for any of the seabird breeding colonies along the Irish Sea coast.
- As noted, an analysis of average foraging distances was also undertaken. The main source of information for this assessment was a recent review of the distances over which waterbirds forage offshore as part of a *Habitats Regulations Assessment of the Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Appropriate Assessment Information Review* (SNH, 2011)[2] as well as a review of sources such as BWPi (Cramp and Simmons, 2004) etc.

7.1.3 Study Limitations with respect to SPAs

There are a number of limitations to this study which should be noted.

- Firstly, the boundary to the study area was selected as the Irish Sea; thus the Saltee Island SPA and Lady's Island SPA were not considered in detail as part of this assessment. QIs for the Saltee Island SPA (4002) are Fulmar, Gannet, Shag, Kittiwake, Guillemot, Razorbill and Puffin (all breeding). QIs for Lady's Island SPA (4009) included breeding Gadwall (a dabbling duck), Black-headed Gull, Sandwich Tern, Roseate Tern, Common Tern and Arctic Tern. Sandwich Tern in particular is thought to feed in Wexford Harbour and coastal waters in the southern Irish Sea. These sites are not assessed as part of this study and will be considered as part of a proposed assessment of fisheries along the south coast; at this time any interactions with the Irish Sea fisheries will also be assessed.

[2] This can be viewed in full at: http://www.scotland.gov.uk/Publications/2011/03/04165857/71

- Secondly there is a general absence of information on for example by-catch from different fisheries / gears in Irish waters. Where appropriate data collection is recommended to build on published data from abroad or in some cases, such as potting, to collate data on by-catch where there appears to be little or no available data published information and no data collated from the Irish Sea.
- The assessment focuses on QIs for SPAs located between Carnsore Point and Carlingford Lough and on the seasonal occurrence of species designated as QI's. Consideration of e.g. where breeding seabirds move to during the non-breeding season or the entry of birds from other sites in the Irish Sea is beyond the scope of this assessment.

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Table 10. Summary of foraging ranges (including breeding seabirds [* Quoted by Marine Scotland, 2011]

	Birdlife International 2010*	BLI Mean Max*	BTO Review (Roos *et al.*, 2009 in ABPmer 2010)*	Furness & Tasker (2000)*	Ratcliffe *et al.* (2000)*	Fenny & Walls (2009)*	Seabirds Wikispace Max	Seabirds Wikispace Mean Max	Seabirds Wikispace Mean	Cramp & Simmons, 2004	Various Sources, See Appendix 1
Red-throated Diver [A001]	50	12	13	<5			50	12.21	11.06	5-10	9-29
Little Grebe [A004]											
Great Crested Grebe [A005]											
Cormorant [A017]	50	32	35	<5		15	50	31.67	8.46	3-10	5-22
Shag [A018]	20	16	17	<10		15	20	16.42	6.53	50	
Red-breasted Merganser [A069]											60
Common Scoter [A065]	200	8	unknown				200	8.2	4.5		
Black-headed Gull [A179]					<15						
Lesser Black-backed Gull [A183]							44-84			20-80	5.4-37.8
Herring Gull [A184]			54	<10	<40	40				22-63	40
Kittiwake [A188]							200	65.81	25.45	10-35	13-73
Roseate Tern [A192]	30	18				20-30	30	18.28	12.3		
Common Tern [A193]	37	34					37	33.81	8.67		
Arctic Tern [A194]	20.6	12	25	<5		20-30	20.6	12.24	11.75		
Little Tern [A195]	11	7					11	6.94	4.14		32-100
Guillemot [A199]	200	61	123	<50		40	200	60.61	24.49	9-20	40
Razorbill [A200]	51	31	150	<20		40	51	31	10.27		
Puffin [A204]							200	62.2	30.35		
Fulmar [A009]	664	311	245	>50		>100	664	311.43	69.35		10-30

7.1.4 Screening outcome

7.1.4.1 SACs

- 26 QIs across 17 sites were excluded from further assessment on the basis of screening filter 1 above (Table 11).
- 4 QIs across 12 sites were excluded from further assessment using filter 2 above (Table 12).
- A number of fishery-QI or feature interactions across 6 sites were excluded using filter 3 (Table 15)

7.1.4.2 SPAs

- Species screened out by filter 1 and 2 (Table 13, 14, 16) include a terrestrial passerine (Common Whitethroat, a species of interest at Wicklow Head SPA); intertidal shorebirds; coastal waterfowl (including swans, geese, dabbling ducks and coot); Hen Harrier (which uses coastal wetlands as winter hunting & roosting sites); and Grey Heron. Where a subtidal diving duck, such as Scaup and Goldeneye, has been screened out (e.g. Malahide Estuary SPA and Wexford Harbour & Slobs SPA) this is because there is no current spatial overlap with fisheries activity or these species are limited to using shallow inshore coastal waters..
- Hand picking of periwinkles introduces the question of disturbance to intertidal shorebirds, which have otherwise been screened out in relation to other fisheries; this is dicussed separately below.

Table 11. QIs in SACs where the interaction with fisheries is screened out or assessed as posing no risk to the feature or to the conservation objectives of the feature due to absence of any potential spatial overlap (filter 1)

Qualifying interests in SACs screened out of the risk assessment using filter 1 (no possibility of interaction with marine fisheries)	Baldoyle Bay	Bray Head	Buckroney-Brittas Dunes and Fen	Cahore Polders and Dunes	Carlingford Shore	Clogher Head	Dundalk Bay	Kilmuckridge-Tinnaberna Sandhills	Kilpatrick Sandhills	Lambay Island	Magherabeg Dunes	Malahide Estuary	North Dublin Bay	Raven Point Nature reserve	ROGERSTOWN ESTUARY	Slaney River Valley SAC	The Murrough Wetlands	Total
1210 Annual vegetation of drift lines														1				1
1310 Salicornia and other annuals colonizing mud and sand	1						1					1	1		1			5
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	1				1		1					1	1	1	1		1	8
1410 Mediterranean salt meadows (Juncetalia maritimi)	1		1				1					1	1		1		1	7
2110 Embryonic shifting dunes			1	1					1		1		1	1				6
2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')			1	1				1	1		1	1	1	1	1			9
2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes')			1	1				1	1		1	1	1	1	1			9
2170 Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)			1											1				2
2190 Humid dune slacks			1										1	1				3
Alkaline fens [7230]			1														1	2
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]																1		1
Annual vegetation of drift lines [1210]			1	1	1				1		1		1				1	7
Atlantic decalcified fixed dunes (Calluno-Ulicetea) [2150]			1						1		1							3

Brook lamprey (*Lampetra planeri*) [1096]																1		1
Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae [7210]																	1	1
European dry heaths [4030]		1				1												2
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]																1		1
Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0]																1		1
Perennial vegetation of stony banks [1220]			1		1		1										1	4
Petalwort (*Petalophyllum ralfsii*) [1395]													1					1
Petrifying springs with tufa formation (Cratoneurion) [7220]											1							1
River lamprey (*Lampetra fluviatilis*) [1099]																1		1
Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites) [6210]		1																1
Spartina swards (Spartinion maritimae) [1320]												1	1		1			3
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]		1				1				1								3
Water courses with Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]																1		1
Total	**3**	**3**	**10**	**4**	**3**	**2**	**4**	**2**	**5**	**1**	**6**	**6**	**10**	**7**	**6**	**6**	**6**	**84**

Table 12. QIs in SACs where the interaction with fisheries is screened out or assessed as posing no risk to the feature or to the conservation objectives of the feature due to no current or future fishing activity being present (filter 2)

Qualifying interests in SACs screened out of the risk assessment using filter 2 (no current or future fishing activity in the site and where effects of ex situ activities can be excluded)	Baldoyle Bay	Boyne Coast and Estuary	Carlingford Shore	Carnsore Point	Malahide Estuary	North Dublin Bay	Raven Point Nature reserve	Rogerstown Estuary	Slaney River Valley SAC	South Dublin Bay	Grand Total
1130 Estuary		2						1	4		7
1140 Mudflats and sandflats not covered by seawater at low tide	2	2	1	1	5	1	2	1	4	1	20
1170 Reefs				1							1
Otter (*Lutra lutra*) [1355]									1		1
Grand Total	**2**	**4**	**1**	**2**	**5**	**1**	**2**	**2**	**9**	**1**	**29**

Table 13. QIs in SPAs where the interaction with fisheries is screened out or assessed as posing no risk to the feature or to the conservation objectives of the feature due to absence of any potential spatial overlap (filter 1)

Qualifying interests in SPAs screened out of the risk assessment using filter 1 (no possibility of interaction with marine fisheries)	Cahore Marshes	Wicklow Head	Grand Total
Wigeon (*Anas penelope*) [A050]	1		1
Golden Plover (*Pluvialis apricaria*) [A140] wintering	1		1
Lapwing (*Vanellus vanellus*) [A142] wintering	1		1
Common Whitethroat (*Sylvia communis*) [A309] breeding		1	1
Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] wintering	1		1
Wetlands & Waterbirds [A999]	1		1
Grand Total	**5**	**1**	**6**

Table 14. QIs in SPAs where the interaction with fisheries is screened out or assessed as posing no risk to the feature or to the conservation objectives of the feature due to no current or future fishing activity being present (filter 2) and where ex situ activities can be excluded

Qualifying interests in SPAs screened out of the risk assessment using filter 2 (no current or future fishing activity in the site and where effects of ex situ activities can be excluded)	Baldoyle Bay	Boyne Estuary	Carlinford Lough	Malahide Estuary	North Bull Island	River Nanny estuary and Shore	Rogerstown estuary	South Dublin Bay and River Tolka Estuary	The Murrough	The Raven	Wexford Harbour and Slobs	Grand Total
Grey Heron (*Ardea cinerea*) [A028] wintering											1	1
Bewick's Swan (*Cygnus columbianus*) [A037] wintering											1	1
Whooper Swan (*Cygnus cygnus*) [A038] wintering											1	1
Greylag Goose (*Anser anser*) [A043] wintering							1		1			2
Brent Goose (*Branta bernicla hrota*) [A046] wintering	1		1	1	1		1	1	1		1	8
Wigeon (*Anas penelope*) [A050]									1		1	2
Teal (*Anas crecca*) [A052] wintering					1				1		1	3
Mallard (*Anas platyrhynchos*) [A053] wintering											1	1
Pintail (*Anas acuta*) [A054] wintering				1	1						1	3
Shoveler (*Anas clypeata*) [A056] wintering					1		1					2
Goldeneye (*Bucephala clangula*) wintering [A067]				1							1	2
Hen Harrier (*Circus cyaneus*) [A082] post-breeding/roost											1	1
Coot (*Fulica atra*) [A125] wintering											1	1
Oystercatcher (*Haematopus ostralegus*) [A130] wintering		1		1	1	1	1	1			1	7
Ringed Plover (*Charadrius hiaticula*) [A137] wintering	1					1	1	1				4
Golden Plover (*Pluvialis apricaria*) [A140] wintering	1	1		1	1	1		1			1	7

Grey Plover (*Pluvialis squatarola*) [A141] wintering	1	1		1	1		1			1	1	7
Lapwing (*Vanellus vanellus*) [A142] wintering		1									1	2
Knot (*Calidris canutus*) [A143] wintering		1		1	1	1	1	1			1	7
Sanderling (*Calidris alba*) [A144] wintering		1			1	1		1		1	1	6
Dunlin (*Calidris alpina*) [A149] wintering				1	1		1	1			1	5
Black-tailed Godwit (Limosa limosa) [A156] wintering		1		1	1		1				1	5
Bar-tailed Godwit (*Limosa lapponica*) [A157] wintering	1			1	1			1			1	5
Curlew (*Numenius arquata*) wintering [A160]					1						1	2
Redshank (*Tringa totanus*) [A162] wintering		1		1	1		1	1			1	6
Turnstone (*Arenaria interpres*) [A169] wintering		1			1							2
Greenland White-fronted Goose (*Anser albifrons flavirostris*) wintering [A395]										1	1	2
Wetlands & Waterbirds [A999]	1	1		1	1	1	1	1	1	1	1	10
Grand Total	**6**	**10**	**1**	**12**	**16**	**6**	**11**	**10**	**5**	**4**	**24**	**105**

Table 15. QIs in SACs where the interaction with fisheries is screened out (0) or retained for risk assessment (coloured cell) on the basis of presence or absence of the particular fishery in the site (filter 3). *ex situ* fishing activities may also have an effect in the case of species

SAC Number	Name	COs	QI code	Qualifying interests	Features	Pots - crustacean	Pots - whelk	Dredge - scallop	Dredge - seed mussel	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex	0		0			0	0	0	0	0
2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Cobble with Epifaunal community	0		0			0	0	0	0	0
2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex	0		0		0	0	0	0	0	0
3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex						0			0	
2274	Wicklow Reef	Pending	1170	1170 Reefs				0		0	0	0	0	0	
3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Subtidal reef community complex						0			0	0
3000	Rockabill to Dalkey	Published	1351	1351 Harbour porpoise Phocoena phocoena							0			0	
204	Lambay Island	Pending	1364	Grey seal (Halichoerus grypus) [1364]			0	0	0		0	0	0	0	

Table 16. QIs in SPAs where the interaction with fisheries is screened out by filter 3 and where ex situ activities are not relevant (0) due e.g. to habitat on site used by these species (where the fishery does not occur in the site the cell is blank).

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - seed mussel	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4069	Lambay Island	Pending	A043	Greylag Goose *Anser anser* [A043] roosting / non-breeding		0	0	0		0	0	0	0	
SPA	4122	Skerries Islands	Pending	A046	Brent Goose *Branta bernicla hrota* [A046] non-breeding		0	0	0		0	0	0	0	
SPA	4014	Rockabill	Published	A148	Purple Sandpiper *Calidris maritima* [A148] non-breeding		0		0		0	0		0	
SPA	4122	Skerries Islands	Pending	A148	Purple Sandpiper *Calidris maritima* [A148] non-breeding		0	0	0		0	0	0	0	
SPA	4122	Skerries Islands	Pending	A169	Turnstone *Arenaria interpres* [A169] non-breeding		0	0	0		0	0	0	0	

Note: Greylag Geese roost on Lambay Island; while Brent Geese, Turnstone and Purple Sandpiper feed on intertidal shoreline of the relevant islands**.**

8 Appropriate Assessment and Risk Assessment Methodology

8.1 Appropriate Assessment

8.1.1 Determining significance

- The significance of the possible effects of the proposed aquaculture activities on habitats, as outlined in the Natura Impact statement, is determined here in the appropriate assessment. The significance of effects is determined on the basis of Conservation Objective guidance for constituent habitats.
- Habitats that are key contributors to biodiversity and which are sensitive to disturbance should be afforded a high degree of protection i.e. thresholds for impact on these habitats is low and any significant anthropogenic disturbance should be avoided.
- Significant disturbance is interpreted in this assessment as indicated in Figure 13. For broad sedimentary communities significance of impact is determined in relation to spatial overlap, disturbance and the persistence of disturbance as follows

    1. The degree to which the activity will disturb the QI. By disturb is meant change in the characterising species, as listed in the Conservation Objective guidance for constituent habitats published with the COs for each site by NPWS. The likelihood of change depends on the sensitivity of the characterising species to the fishery activities. Sensitivity results from a combination of tolerance (resilience) to the activity and recoverability from the effects of the activity
    2. The persistence of the disturbance in relation to the sensitivity of the habitat. If the activities are persistent (high frequency, high intensity) and the receiving habitat has a low resilience to the activity (i.e. the characterising species of the habitats are impacted) then such habitats could be said to be persistently disturbed. If activities are infrequent but resilience is low and recovery rates are low (i.e. high sensitivity) then such habitats may also be persistently disturbed.
    3. The area of habitats or proportion of populations disturbed. In the case of habitats disturbance of less than 15% of the habitat area is deemed to be insignificant.

    - In relation to designated species the capacity of the population to maintain itself in the face of anthropogenic induced disturbance or mortality at the site will need to be taken into account in relation to the COs on a case by case basis.

– Effects will be deemed to be significant when cumulatively they lead to long term change in communities in greater than 15% of the area of any constituent community listed.

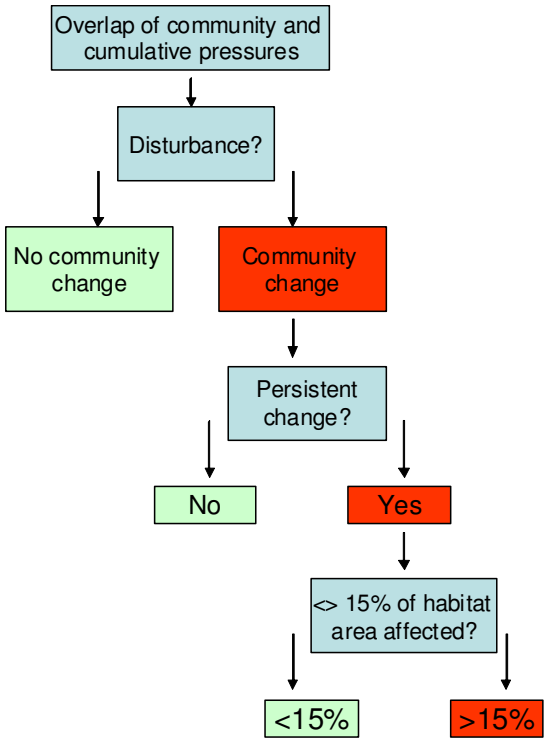

Figure 13. Determination of significant effects on community distribution, structure and function (following NPWS 2011b).

8.1.2 Supporting evidence and confidence in conclusions

– There are various levels of supporting evidence and therefore confidence for conclusions on the effects of activities on the conservation objectives for each QI. The degree of confidence with respect to findings of significant or no significant effects is categorised as high, medium or low (Table 17).

Table 17. Level of confidence, based on supporting evidence, in relation to significance of effects and the implication for management decisions.

Level of confidence	Supporting evidence	Implication in relation to significance	
		Significant Where effects are found to be **significant** (>15% of any community type is persistently disturbed). In the case of designated species where effects may cause a decline in the attributes of the population	Non significant Where effects are found to be **insignificant** (<15% of any community type is persistently disturbed or where the activity occurs on >15% of the area but is not persistent or activity that is persistent in >15% of the area but is not disturbing). In the case of designated species where effects will not cause a decline in the attributes of the population
High	Targeted scientific studies at the site	The impacting activity is unlikely to be allowed until the effects can be mitigated (i.e. brought below agreed thresholds). These mitigations would be subject to further assessment.	The activities can proceed without mitigation
Moderate	Targeted scientific studies at other sites		The activities can proceed but precautionary mitigation may be introduced.
Low	Limited observations at the site or at similar sites, expert judgement, ecological theory and expectation	The impacting activity may not be allowed until direct measurements of effects at the site shows evidence of non-significant effects	The activities can proceed, at existing levels, with agreement to provide stronger evidence of non-significant effects within an agreed time scale and provided that the consequence of false negative findings are deemed to be low and reversible

8.2 Risk Assessment

– The risk assessment framework follows, where feasible, EC guidance (2012) and includes elements of risk assessment from Fletcher (2002). The qualitative and semi-quantitative framework is described in Marine Institute (2013) and criteria for risk categorization is shown in Table 18 and Table 19 below.

– The framework uses categorical conditional probability matrices of likelihood and consequence to assess the risk of an activity to a conservation feature. Categorical likelihood and consequence scores for each such 'incident' (fishery-designated feature interactions) are provided by expert judgement and a base literature resource which has been pre-compiled for each habitat type defined in the COs.
– Separate conditional probability matrices for habitats and designated species are used to assess risk. In the case of habitats the consequence criteria largely follow the definitions and methodologies used for AA of projects and plans. In the case of species the consequence categories relate to the degree to which populations and their supporting habitats may be negatively affected by the given activity.

Table 18. Risk categorization for fisheries and designated habitat interactions (Marine Institute 2013). The risk score is the product of the consequence and likelihood and signals the degree to which mitigations may be required to ensure that COs for QIs are protected.

Habitats		**Consequence criteria**				
		Activity is not disturbing to habitat	Up to 15% of habitat disturbed seasonally	Over 15% of habitat disturbed through fixed or roving fishing activity seasonally	Over 15% of habitat disturbed persistently leading to cumulative impacts	Impact is effectively permanent due to severe habitat alteration
		No change in characterising species	Seasonal change in characterising species and community structure and function	Seasonal change in characterising species and structure and function	Persistent change in characterising species, structure and function	Biodiversity reduction associated with impact on key structural species
				Frequency of disturbance < recovery time. Non-cumulative	Frequency of disturbance> recovery time. Cumulative	No recovery or effectively no recovery
Likelihood		**0**	**1**	**2**	**3**	**4**
Highly likely	**4**	0	4	8	12	16
Probable	**3**	0	3	6	9	12
Possible	**2**	0	2	4	6	8
Unlikely	**1**	0	1	2	3	4
None	**0**	0	0	0	0	0

Table 19. Risk categorization for fisheries and designated species interactions (Marine Institute 2013). The risk score is the product of the consequence and likelihood and signals the degree to which mitigations may be required to ensure that COs for QIs are protected.

Species		**Consequence criteria**				
		Non disturbing to individuals in the population	Direct or indirect mortality or sub-lethal effects caused to individuals but population remains self-sustaining	In site population depleted but regularly subvented by immigration. No significant ex situ pressure	Population depleted by ex situ and/or in situ fishing pressures	Population depleted and supporting habitat significantly depleted and unable to support population
Likelihood		**0**	**1**	**2**	**3**	**4**
Highly likely	**4**	0	4	8	12	16
Probable	**3**	0	3	6	9	12
Possible	**2**	0	2	4	6	8
Unlikely	**1**	0	1	2	3	4
None	**0**	0	0	0	0	0

9 Appropriate assessment of the seed mussel fishery plan 2013-2017

9.1 Potential impacts of seed mussel fishery on marine habitats

- The locations of fishing for seed mussel are shown in the FNP (Annex I). The location of the fishery and other fisheries relative to SACs and SPAs is also shown in Figure 7, Figure 8, Figure 14, Figure 15 and Figure 16. The fishery overlaps spatially with a number of SACs (see Table 20). This overlap occurs at Blackwater Bank, Long Bank, Rockabill to Dalkey and Wicklow Reef SACs.
- Dredging for seed mussel causes physical abrasive pressure at the surface of the seabed. Sub-surface abrasion may occur to a limited degree but the mussel dredge is not toothed and is not designed to disturb sediment. The target seed mussel forms a 'mat' over the sea bed which the dredge attempts to remove. Dredging may cause some changes in sediment composition by suspending sediment particles and causing downstream flow of fine material resulting in increased coarseness.

Table 20. Spatial overlap of the Irish sea seed mussel fishery (as described in Annex I) and habitat features of sandbanks and reefs in SACs in the Irish Sea. Sensitivity to surface disturbance and increase in coarse sediment fraction pressures that could be caused by dredging are indicated.

							Pressure assessed and findings	
Site code	**Site name**	**COs status**	**QI code**	**QI name**	**QI feature**	**% Overlap with QI feature**	**Surface disturbance**	**Coarse sediment fraction increase**
2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex	14	Not sensitive	Low to medium sensitivity
					Cobble with Epifaunal community	0		
2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex	0		Low to medium sensitivity
3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex	0		
					Subtidal reef community complex	0.3	Moderate sensitivity	Unlikely to occur
2274	Wicklow Reef	Pending	1170	1170 Reefs	Current swept sub-tidal reef community complex	23	Moderate sensitivity	Unlikely to occur

9.1.1 Blackwater Bank (2953)

9.1.1.1 QI 1110 (Sandbanks covered by seawater all the time)

- Features of the Blackwater sand bank, identified in the COs, include clean sands which occur in shallow water on the open coast. The habitat is exposed to frequent natural disturbance from storms and wave exposure, typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (*Bathyporeia)* and robust polychaetes (*Nephtys cirrosa)* (habitat equivalent to Eunis level 5.23). An area of cobble with serpulid polychaetes occurs on the south east corner of the site.
- The evidence base for assessment of impacts of mussel dredging on this habitat is described, with associated references, in ABP (2013) and summarised below.
- Species associated with sand sediments are predominantly infaunal and hence have some protection against surface disturbance. Macrobenthic communities from high-energy environments (characterised by clean sediments) tend to be less affected by fishing as they are subject to natural sediment disturbance. Nevertheless, in a moderately disturbed environment, fishing impacts on benthic community structure are distinguishable from those resulting from natural variation. The frequency and intensity of environmental disturbances such as storms may be among the key factors determining the resilience of the benthic community to fishing.

9.1.1.1.1 Sand with *Nephhtys cirrosa* and *Bathyporeia elegans* community complex

- The % spatial overlap of the proposed seed mussel fishery and this community has, historically, been 14%. Review of the sensitivity of *N. cirrosa* and *B. elegans* to surface disturbance indicates they are not sensitive to this pressure. *B. elegans* has low to medium sensitivity to increased sediment coarseness and *N. cirrosa* has low sensitivity to increased coarseness.
- A significant effect of the fishery on the *Nephthys* and *Bathyporei*a community in the Blackwater Bank SAC can be discounted as the overlap is less than 15% and the characterizing species are not sensitive to surface disturbance pressure

9.1.1.1.2 Cobble with Epifaunal community

- The seed mussel fishery does not overlap with this community

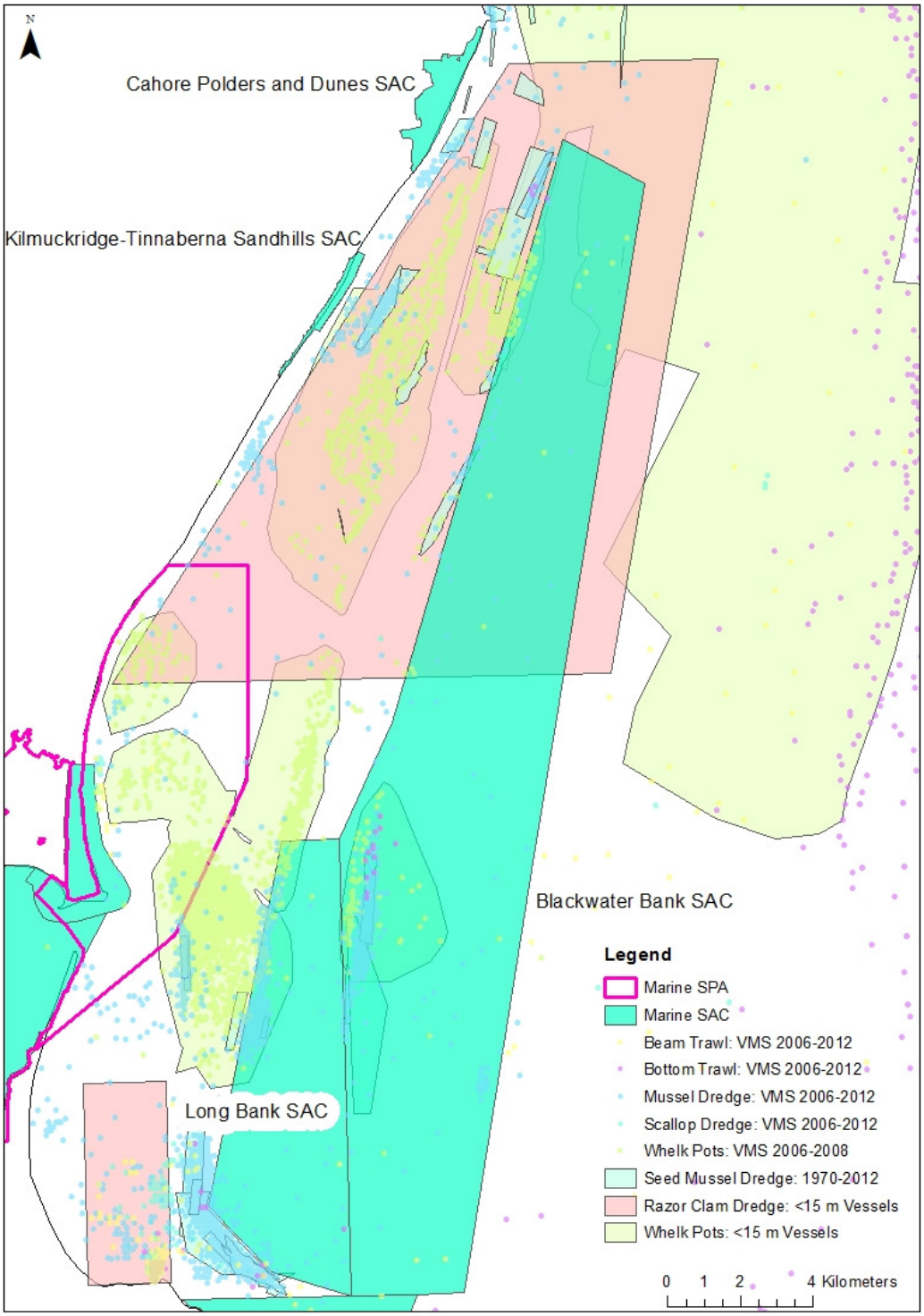

Figure 14. Distribution of fishing activity in the south Irish Sea in the vicity of Blackwater Bank and Long Bank SACs.

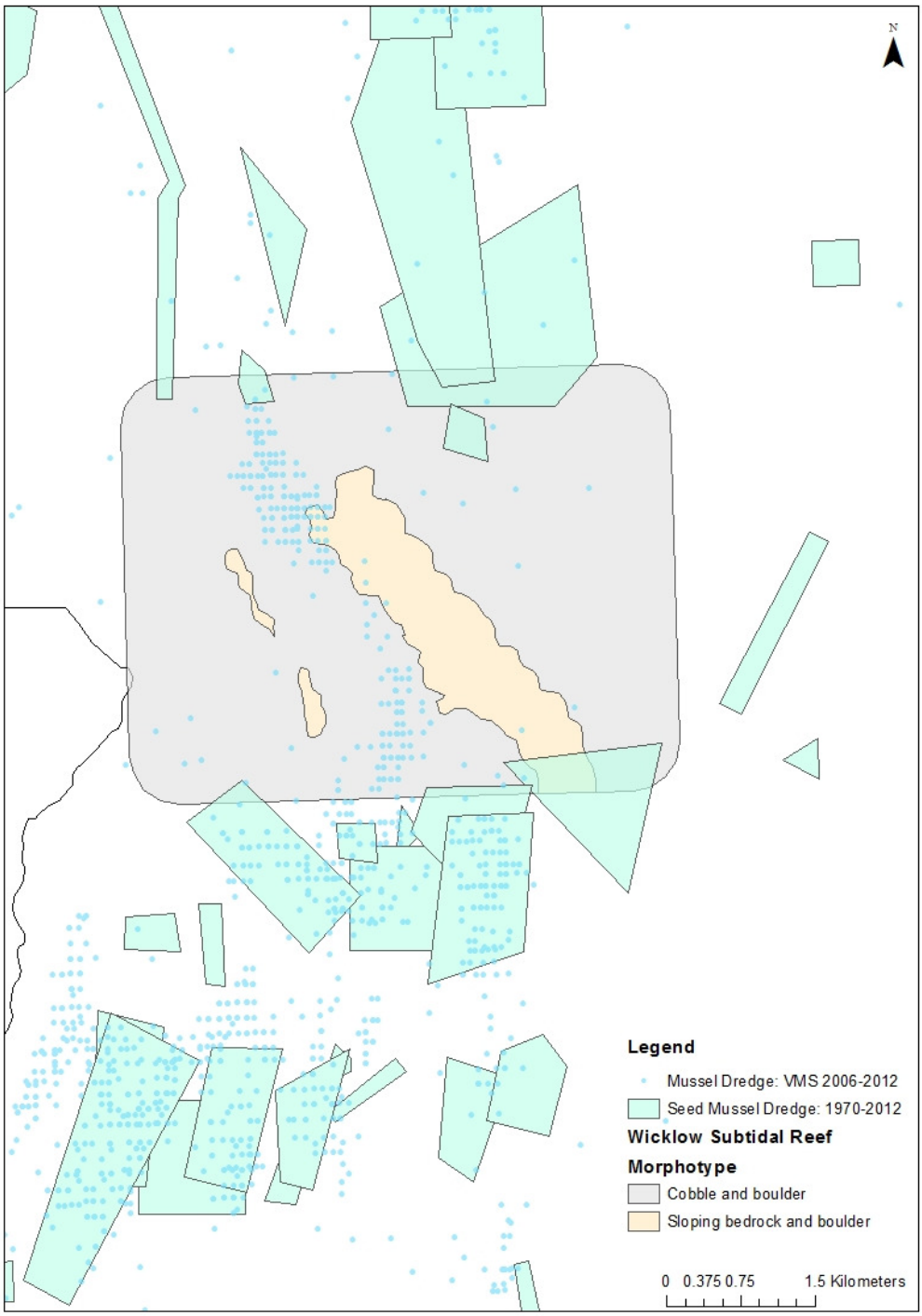

Figure 15. Distribution of fishing (VMS) for seed mussel and mussel dredge surveys (blue polygons) around the Wicklow reef SAC

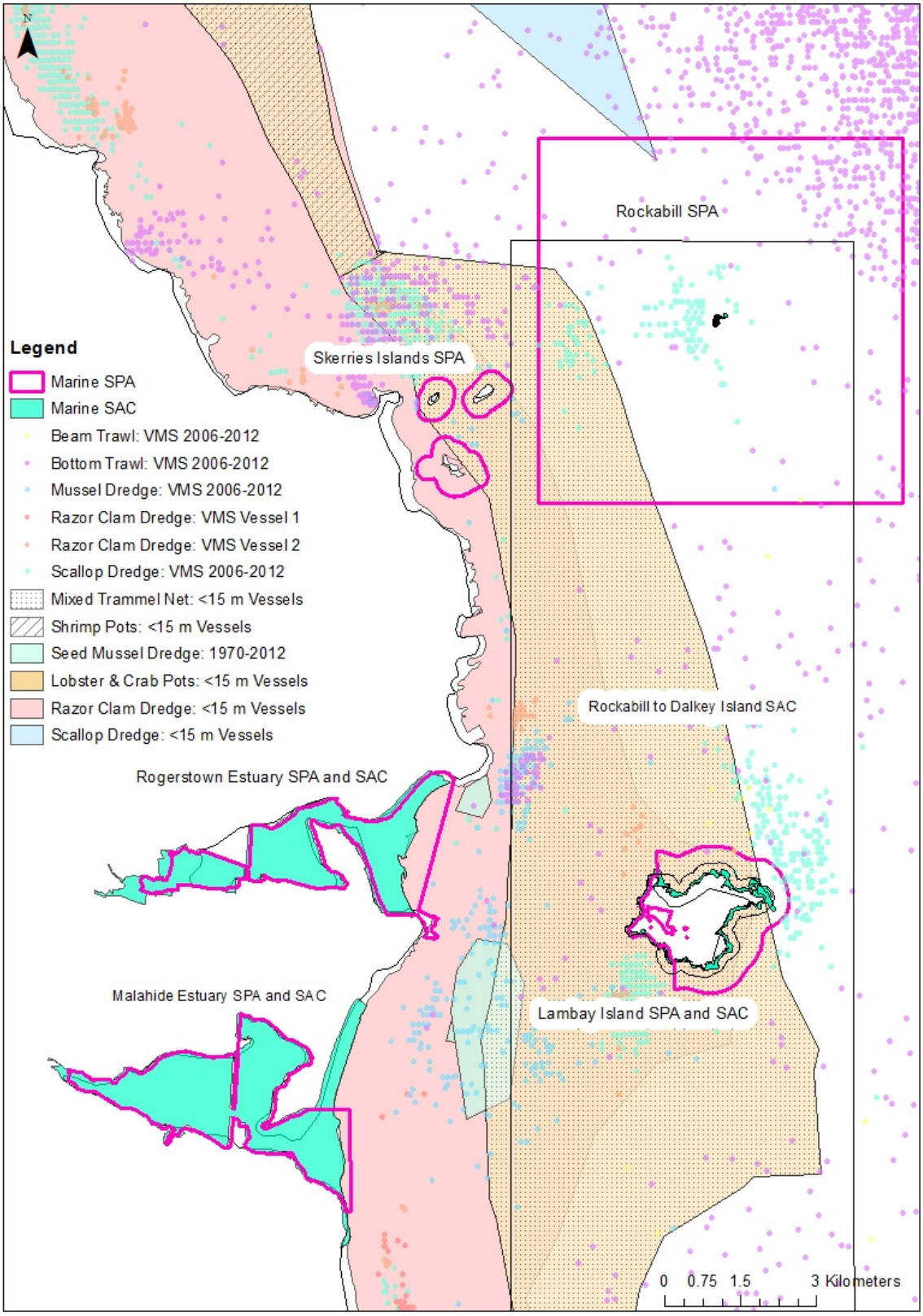

Figure 16. Distribution of seed mussel fishing and other fisheries off the Dublin coast

9.1.2 Long Bank (2161)

9.1.2.1 QI 1110 (Sandbanks covered by seawater all the time)

- Features of the Long Bank sand bank in the south Irish Sea include clean sands which occur in shallow water on the open coast similar to that described above for the Blackwater Bank.

9.1.2.1.1 Sand with *Nephhtys cirrosa* and *Bathyporeia elegans* community complex

- Although the proposed fishery occurs within the SAC it has 0% spatial overlap with the sandbank habitat. The BIM survey polygons and VMS data both show concentrations of activity on either side of the sand bank, reflecting presumably the pattern of seed mussel settlement. This is the pattern of fishing described in the FNP.
- Review of the sensitivity of *N. cirrosa* and *B. elegans* to surface disturbance indicates they are not sensitive to this pressure. *B. elegans* has low to medium sensitivity to increased sediment coarseness and *N. cirrosa* has low sensitivity to increased coarseness.
- A significant effect of the fishery on the *Nephthys* and *Bathyporeia* community in the Long Bank SAC can be discounted as the overlap with the fishery is 0% and the characterizing species of the sand bank and in surrounding habitat are not sensitive to surface disturbance pressure.

9.1.3 Rockabill to Dalkey(3000)

9.1.3.1 Reef

- This site is designated for reef with intertidal and sub-tidal community complexes.

9.1.3.1.1 Intertidal reef community complex

- The seed mussel fishery does not overlap with the intertidal reef community complex
- The intertidal reef is on the Islands within the site and on the south coast of Howth. Typical species includes *Fucus serratus, F. vesiculosus, F. spiralis, Ascophyllum nodosum* and *Pelvetia canaliculata*, the barnacle *Semibalanus balanoides* and the bivalve *Mytilus edulis*.
- A significant effect of the fishery on intertidal reef community complex can be discounted

9.1.3.1.2 Sub-tidal reef community complex

- The % overlap of the fishery with the sub-tidal reef community complex is 0.3%

- The sub-tidal reef community complex is recorded off the islands within the site and also off the coast between Lambay Island and Rush Village. The substrate ranges from that of flat and sloping bedrock, to bedrock with boulders and also a mosaic of cobbles and boulders with sparse kelp cover and an undercover of red algae and associated species of anemone, bryozoans, hydroids, ascidians and echinoderms.
- The epifaunal community cover is sensitive to surface disturbance (abrasion) that would be caused by mussel dredges.
- As the overlap with the fishery is effectively zero the possibility of significant effects on the sub-tidal reef community complex can be discounted

9.1.4 Wicklow reef (2274)

9.1.4.1 Reef

- The reef habitat in Wicklow reef SAC is current swept with boulder, cobble and flat sloping bedrock with associated epifauna.

9.1.4.1.1 Current swept sub-tidal reef community complex

- The % spatial overlap of the proposed seed mussel fishery and the current swept sub-tidal reef community complex is 23%.
- Characterising species include the keel worm *Spirobranchus triqueter*, the hydroids *Tubularia indivisa*, *Sertularia argentea* (sea fir), the Dahlia anemone *Urticina feline*, the brittlestar *Ophiothrix fragilis* and the seasquirt *Clavelina lepadiformis.* The bryozoan *Phaeostachys spinifera*, which is only known from five localities within Ireland and for which there is no previous records from the Irish Sea, has been recorded here. The amphipod *Unciola crenatipalma* which is only known from two other locations and the polychaete *Eulalia ornata* which is only known from one other location within Ireland, are both recorded here.
- The sensitivity of at least some of the characterizing species of the current swept reef to abrasion and physical disturbance is moderate (www.marlin.ac.uk) suggesting a >1 year recovery period.
- Species found on the reef include rare species not found elsewhere in the Irish Sea or rare in Irish waters
- **The possibility of significant impacts occurring to the reef as a result of seed mussel dredging cannot be discounted. The fishery should be excluded from that part of the SAC containing reef habitat with sensitive or rare species.**

9.2 Potential impacts of the seed mussel fishery on Harbour Porpoise and Grey Seal

9.2.1 Harbour Porpoise

- SAC Rockabill to Dalkey is designated for Harbour porpoise. The seed mussel fishery has occurred and is proposed to occur in the site
- Pressures from fishing activity may include by-catch, collision, prey removal and disturbance to habitat use
- There is no risk of by-catch of Porpoise in seed mussel dredges.
- Harbour porpoise do not feed on seed mussel or species associated with seed mussel beds so the removal of seed mussel by the fishery does not pose a risk to Porpoise.
- Porpoise may actively approach and interact with moving ships and stay in attendance for long periods which increases vulnerability to collision or being wounded by ships propellors. This probably depends on vessel speeds. Fishing vessels moving at low speeds (<4 knots fishing, <10 knots steaming) are less attractive to Porpoise than higher speed vessels. The risk of collision with fishing vessels can be regarded as non-existent or low.
- The fishery is restricted to 70 days per year and occurs in very limited areas of the Irish Sea relative to the area of habitat available in the Rockabill to Dalkey site or other habitats outside this site. The possibility of the seed mussel fishery causing impacts to Harbour Porpoise can be discounted.

9.2.2 Grey seal

- SAC Lambay Island is designated for Grey Seal. The seed mussel fishery has not occurred in the site so only *ex situ* seed mussel fishing activity is relevant.
- Pressures from fishing activity may include by-catch, collision, prey removal and disturbance to habitat use.
- There is no risk of by-catch of Grey Seal in seed mussel dredges.
- Grey seal do not feed on seed mussel or species associated with seed mussel beds so the removal of seed mussel by the fishery does not pose a risk to Grey seal.
- Grey seal are unlikely to actively attend at seed mussel vessels as there is no sorting or grading of catch on board and no discarding as such. The risk of collision is non-existent
- The fishery does not occur within Lambay Island SAC so there is no risk to disturbance of haul out or breeding locations. The fishery is restricted to 70 days per

year and occurs in very limited areas of the Irish Sea relative to the area of habitat available to Grey seal. It is highly unlikely that the seed mussel fishery, by itself, has a significant disturbing effect on Grey Seal. Effects can be discounted.

9.3 Potential impacts of the seed mussel fishery on Special Conservation Interests (SCIs) for Birds

- The seed mussel fishery occurs in Ireland's Eye, Howth Head Coast SPA and The Raven SPA.
- Other seed mussel fishing activity occurs outside of SPAs but the ex situ activity may be relevant to QIs.
- Pressures that may be caused by the seed mussel fishery include
  - Removal of food source used by QIs
  - By-catch of QIs
  - Disturbance of QIs

9.3.1 Effects of the seed mussel fishery in SPAs on QIs

- Dredging for seed mussel causes physical abrasive pressure at the surface of the seabed. Sub-surface abrasion may occur to a limited degree but the mussel dredge is not toothed and is not designed to disturb sediment. The target seed mussel forms a 'mat' over the sea bed which the dredge attempts to remove. Dredging may cause some changes in sediment composition by suspending sediment particles and causing downstream flow of fine material resulting in increased coarseness.
- The dredging of seed mussel and disturbance associated with this activity may in turn reduce the quality of habitat and its suitability for birds leading to changes in the distribution, abundance and conservation status.
- There are only 3 no. SPA's with *in-situ* seed mussel fishery; Howth Head Coast SPA, Ireland's Eye SPA and The Raven SPA (Table 21).
- Relevant QIs are Kittiwake (Howth Head Coast SPA); Cormorant, Kittiwake, Herring Gull, Guillemot and Razorbill (Ireland's Eye SPA); and Red-throated Diver, Cormorant and Common Scoter (The Raven; the other QIs at this site are all wintering waders or grazing wildfowl) oIn all other case the fishery is ex-situ. Of these species, only Common Scoter feed on mussels.
- Dredging occurs over a 70 day period generally during August to October. Disturbance to the above QIs is unlikely.

- There is no risk of by-catch and depletion of prey favoured by these species is unlikely.
- The likelihood of significant effects of the seed mussel fishery on bird species can be discounted. **In the case of The Raven SPA, however, it is not possible to fully discount a potential effect on Common Scoter. The distribution of this species in offshore waters in the southern Irish Sea is unknown. It is a species which also feeds on seed mussel. The seed mussel beds in the Raven SPA and in other areas such as Wicklow are, however, in areas of strong currents and they may not be available to Common Scoter. Additional information on the distribution of Common Scoter should be collected. The fishing for mussel seed in the Raven SPA should be reviewed in light of such new information.**

9.3.2 Effects of *ex situ* seed mussel fishing activity on SCIs

- Only species that feed or roost in offshore (as opposed to estuarine) subtidal habitat are potentially affected by the fishery.
- Dredging offshore from Malahide Estuary SPA should not affect Great Crested Grebe and Red-breasted Merganser both of which favour sheltered inshore waters and feed on fish. While Goldeneye does feed on small molluscs they tend to favour inshore coastal waters and are unlikely to occur this far offshore.
- Other sites where ex-situ fisheries need to be considered include Ireland's Eye SPA (Cormorant, Herring Gull, Kittiwake, Guillemot and Razorbill); Howth Head Coast SPA (Kittiwake); The Murroughs SPA (Red-throated Diver, Herring Gull & Little Tern); Wicklow Head SPA (Kittiwake); Dalkey Island SPA (Common Tern, Arctic Tern and Roseate Tern) and The Raven SPA (Red-throated Diver, Cormorant and Common Scoter).
- In summary the full list of QIs to be considered is Common Scoter, Cormorant, Red-throated Diver, Roseate Tern, Common Tern, Arctic Tern, Little Tern, Kittiwake, Cormorant, Shag, Herring Gull, Lesser Black-backed Gull, Guillemot, Razorbill, Puffin and Fulmar.
- The spatial distribution of Red-throated Diver off The Murroughs SPA and The Raven SPA is not known. While it can occur far offshore it does not feed on mussels favouring instead mainly small fish. It should not be negatively impacted by the harvesting of continuous mussel beds. The same applies to Cormorant; while

Cormorant feed on benthic fish species these are more abundant over sandier habitats than on large mussel beds.

- The Little Tern generally forages very close to shore taking prey such as sandeel, sprat and small crustaceans in the upper 0.5m of the sea surface. There are a limited number of seed mussel beds offshore from The Murrough SPA where Little Tern breed dredging of which is not likely to impact Little Tern. Further assessment of potential impacts would, however, be required if an intensification of mussel dredging close to breeding Little Tern were proposed.
- Species such as Roseate Tern, Common Tern, Arctic Tern, Kittiwake, Cormorant, Shag, Herring Gull, Lesser Black-backed Gull, Guillemot, Razorbill, Puffin and Fulmar which feed to varying degrees on offshore pelagic waters should not be impacted by seed mussel dredging.
- For the above species the consequence of seed mussel dredging is categorized as potentially up to 1 (local population depletion) with a low likelihood (2; unlikely). The risk is 2.
- Of the above only Common Scoter feed on benthic bivalves (including seed mussel); they tend to forage in water depths of less than 20m and occur in large numbers in The Raven SPA (>3,000; 1995/96 – 1999/00). The seed mussel fishery is in areas with depths of 10-30m so the seed mussel fishery could potentially reduce the Common Scoter food base. A large-scale study of the distribution of Common Scoter in Liverpool Bay (Kaiser et al., 2005) found that scoter did not occur in areas with current speeds above 0.6 m/sec, while Woakes and Butler (1983) found that the energetic cost incurred by another diving duck (Tufted Duck) swimming against a current increased rapidly above current speeds of 0.5 m/sec. Generally the offshore reefs in this area (e.g. Wicklow Reef) are defined as current swept, high energy systems – current speeds would therefore affect suitability of such sites for foraging Common Scoter.
- **There is insufficient data on the offshore spatial distribution of Common Scoter relative to seed mussel beds to comment further. As such the need for collection of offshore distribution data for species such as Common Scoter is highlighted.**

Table 21. SCIs potential interaction with the seed mussel dredge fishery. The fishery occurs in some sites but not others. In site effects are discounted where the fishery is not in the site. However, ex situ mussel dredging may also affect some SCIs (as indicated).

Designation	Number	Name	COs	QI code	Qualifying interests	Ex situ activity	Dredge - seed mussel
SPA	4172	Dalkey Island	Pending	A192	Roseate Tern (*Sterna dougallii*) [A192]	Yes	Not in the site
SPA	4172	Dalkey Island	Pending	A193	Common Tern (*Sterna hirundo*) [A193]	Yes	Not in the site
SPA	4172	Dalkey Island	Pending	A194	Arctic Tern (*Sterna paradisaea*) [A194]	Yes	Not in the site
SPA	4113	Howth Head Coast	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	Yes	In the site
SPA	4117	Ireland's Eye	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	Yes	In the site
SPA	4117	Ireland's Eye	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	Yes	In the site
SPA	4117	Ireland's Eye	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	Yes	In the site
SPA	4117	Ireland's Eye	Pending	A199	Guillemot (*Uria aalge*) [A199]	Yes	In the site
SPA	4117	Ireland's Eye	Pending	A200	Razorbill (*Alca torda*) [A200]	Yes	In the site
SPA	4069	Lambay Island	Pending	A009	Fulmar (*Fulmarus glacialis*) [A009]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A018	Shag (*Phalacrocorax aristotelis*) [A018]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A043	Greylag Goose (*Anser anser*) [A043]	No	Not in the site
SPA	4069	Lambay Island	Pending	A183	Lesser Black-backed Gull (*Larus fuscus*) [A183]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A199	Guillemot (*Uria aalge*) [A199]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A200	Razorbill (*Alca torda*) [A200]	Yes	Not in the site
SPA	4069	Lambay Island	Pending	A204	Puffin (*Fratercula arctica*) [A204]	Yes	Not in the site
SPA	4014	Rockabill	Published	A148	Purple Sandpiper (*Calidris maritima*) [A148]	No	Not in the site
SPA	4014	Rockabill	Published	A192	Roseate Tern (*Sterna dougallii*) [A192]	Yes	Not in the site

SPA	4014	Rockabill	Published	A193	Common Tern (*Sterna hirundo*) [A193]	Yes	Not in the site
SPA	4014	Rockabill	Published	A194	Arctic Tern (*Sterna paradisaea*) [A194]	Yes	Not in the site
SPA	4122	Skerries Islands	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	Yes	Not in the site
SPA	4122	Skerries Islands	Pending	A018	Shag (*Phalacrocorax aristotelis*) [A018]	Yes	Not in the site
SPA	4122	Skerries Islands	Pending	A046	Brent Goose (*Branta bernicla hrota*) [A046]	No	Not in the site
SPA	4122	Skerries Islands	Pending	A148	Purple Sandpiper (*Calidris maritima*)[A148]	No	Not in the site
SPA	4122	Skerries Islands	Pending	A169	Turnstone (*Arenaria interpres*) [A169]	No	Not in the site
SPA	4122	Skerries Islands	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	Yes	Not in the site
SPA	4127	Wicklow Head	Pending	A009	Fulmar (*Fulmarus glacialis*) [A009]	Yes	Not in the site
SPA	4127	Wicklow Head	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	Yes	Not in the site
SPA	4127	Wicklow Head	Pending	A199	Guillemot (*Uria aalge*) [A199]	Yes	Not in the site
SPA	4127	Wicklow Head	Pending	A200	Razorbill (*Alca torda*) [A200]	Yes	Not in the site
SPA	4186	The Murroughs	Pending	A195	Little Tern (*Sterna albifrons*) [A195]	Yes	Abuts the site
SPA	4186	The Murroughs	Pending	A001	Red-throated Diver (*Gavia stellata*) [A001]	Yes	Abuts the site
SPA	4186	The Murroughs	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	Yes	Abuts the site
SPA	4019	The Raven	Published	A065	Common Scoter (*Melanitta nigra*) [AA065]	Yes	In the site
SPA	4019	The Raven	Published	A001	Red-throated Diver (*Gavia stellata*) [A001]	Yes	In the site
SPA	4019	The Raven	Published	A017	Cormorant (*Phalacrocorax carbo*) [A017]	Yes	In the site

9.4 Risk assessment of the impacts of other fisheries on designated habitats

Additional maps showing details of all fishing activities in and surrounding clusters of SACs and SPAs are shown in Figure 17, Figure 18 and Figure 19.

9.4.1 Crustacean potting

- Crustacean potting occurs in the Rockabill to Dalkey and Wicklow Reef SACs.
- Spatial overlaps of the fishery with sub-tidal reef habitat in Rockabill to Dalkey is 81%. The overlap with sub-tidal current swept reef in Wicklow reef SAC is 20% (Table 22).
- The intensity of fishing and footprint of the fishery within the SACs is not well known. It is seasonal with an estimated total of 6100 pots used over an area of 290 km^2 giving an average fishing intensity of 20 $pots.km^{-2}$.
- Pots, ropes and anchors may cause surface disturbance and minor sub-surface disturbance (anchors only).
- Characterising species of reef in Wicklow reef SAC are epifauna of current swept reefs and includes some species not previously recorded in the Irish Sea (see seed mussel assessment above).
- Characterising species of sub-tidal reef in Rockabill to Dalkey SAC include a variety of epifauna and red algae.
- Potting intensity in these habitats is low and pots are not expected to cause significant change to reef communities. The consequence of crustacean potting to reef habitats is categorized as 0 (no change in characterizing species expected) with a high likelihood (3). The risk is 0 (Table 23).
- Whelk potting occurs in Blackwater Bank, Long Bank, Rockabill to Dalkey and Wicklow reef SACs.
- Spatial overlaps with benthic communities are in Table 22.
    - The fishery overlaps with the Nephthys and Bathyporeia sandbank community in Blackwater (14%) and Longbank (4%).
    - The fishery does not overlap with reef within Rockabill to Dalkey SAC
    - The fishery overlaps with sub-tidal current swept reef in Wicklow SAC (100%).
- The detailed footprint of the fishery ($traps.km^{-2}$) in the sites is not well known but the level of fishing is intensive in coastal waters in the south Irish Sea and the fishery is

active throughout the year. The total number of pots may be in the region of 25000. These are fished in an area of 1888km^2 giving an average pot density over the area of 13 pots.km^{-2}.

- Whelk pots, ropes and anchors may cause surface disturbance and minor sub-surface disturbance (anchors only).
- Review of the sensitivity of characterizing species of sandbank habitats, *N. cirrosa* and *B. elegans*, indicates they are not sensitive to surface disturbance pressure.
- Characterising species of reef in Wicklow reef SAC are epifauna of current swept reefs and includes some species not previously recorded in the Irish Sea (see seed mussel assessment above). Pot footprint is low and pots are not expected to damage reef epifauna to any significant extent.
- The consequence of whelk potting to sand bank and reef habitats is categorized as 0 (no change in characterizing species expected) with a high likelihood (3). The risk is 0 (Table 23).

9.4.2 Dredging for scallop

- The scallop fishery does not overlap with any of the marine community features within SACs in the Irish Sea.
- Isolated VMS points for vessels carrying scallop dredges have been discounted as fishing activity. This is reasonable as the distribution of scallop beds is defined and well known.
- The risk posed by scallop fishing to marine community features in SACs is 0.

9.4.3 Dredging for razor clams

- The razor clam fishery in the south Irish Sea overlaps with *Nephthys* and *Bathyporeia* sandbank community in Blackwater Bank by 65%.
- The spatial overlap is based on the assumption that all of the area bounded by the co-ordinates set out in legislation (SI 425/2011, SI 437/2010, SI 310/2010) is exposed to fishing. This is unlikely to be the case. In fact it is unlikely that the Razor fishery is within the *Nephthys* and *Bathyporeia* community as Razor clam (*Ensis*) inhabits mud and mud sand habitats sometimes in high densities. *Ensis* is not listed as a characterizing species of the community in the COs.
- *Nephthys* and *Bathyporeia* are not sensitive to surface and shallow disturbance caused by fishing gear. However, it is likely that they are sensitive to the deep disturbance and physical effects of Razor clam fishing gear.

- **As the % overlap between the *Nephthys_Bathyporeia* community and the area of the dredge fishery allowed in the legislation is over 15%, as the characterizing species are likely to be moderately sensitive to this type of fishing gear which also mobilizes sediments while extracting clams and as the fishing activity can occur through the year, although it is unlikely to be a persistent disturbance the consequence is scored as 2. However, it is unlikely that the fishery occurs throughout the legally allowed area so the likelihood of the consequence is scored as possible (2) and risk is 4 (Table 23). Additional information showing a smaller spatial footprint of the fishery would be needed to reduce the risk score below this.**

9.4.4 Demersal otter trawling for *Nephrops*, rays and mixed fish

- The demersal otter trawl fishery does not overlap with any of the marine community features within SACs in the Irish Sea.
- Isolated VMS points for vessels carrying otter trawl have been discounted as fishing activity. This is reasonable as the distribution of trawl ground is defined and well known.
- The risk posed by demersal otter trawl fishing to marine community features in SACs is 0 (Table 23).

9.4.5 Beam trawling for rays and flatfish

- The beam trawl fishery does not overlap with any of the marine community features within SACs in the Irish Sea.
- Isolated VMS points for vessels carrying beam trawls have been discounted as fishing activity. This is reasonable as the distribution of beam trawl ground is defined and well known.
- The risk posed by beam trawl fishing to marine community features in SACs is 0 (Table 23).

9.4.6 Gill netting for herring

- The fishery does not overlap with any SAC or SPA in the Irish Sea
- Risk score for the fishery in relation to impacts on habitats is 0 (Table 23).

9.4.7 Trammel net fishery for bait

- Trammel nets are used by some vessel operators involved in the crab and lobster fishery to catch bait. The number of vessels using trammels is unknown.
- Like the crustacean potting fishery trammel netting is presumed to occur in subtidal reef habitat in Rockabill to Dalkey SAC (81%) and in the Wicklow reef SAC (7% overlap).
- As the intensity of trammel netting is low (sub-set of the crustacean fleet activity) and the effects of trammel nets on reef habitat is benign the risk posed to reef from trammel netting is 0.

9.4.8 Hand gathering

- Hand gathering of shellfish (Periwinkle mainly) occurs on intertidal reef shores.
- Trampling and disturbance of reef habitat could result from this activity.
- There is no evidence that this activity is persistent or intense in the reef patches designated along the Dublin coast. The consequence of the activity is 0 although there is uncertainty in this assessment so likelihood is scored 2 (possible) and risk is 0.

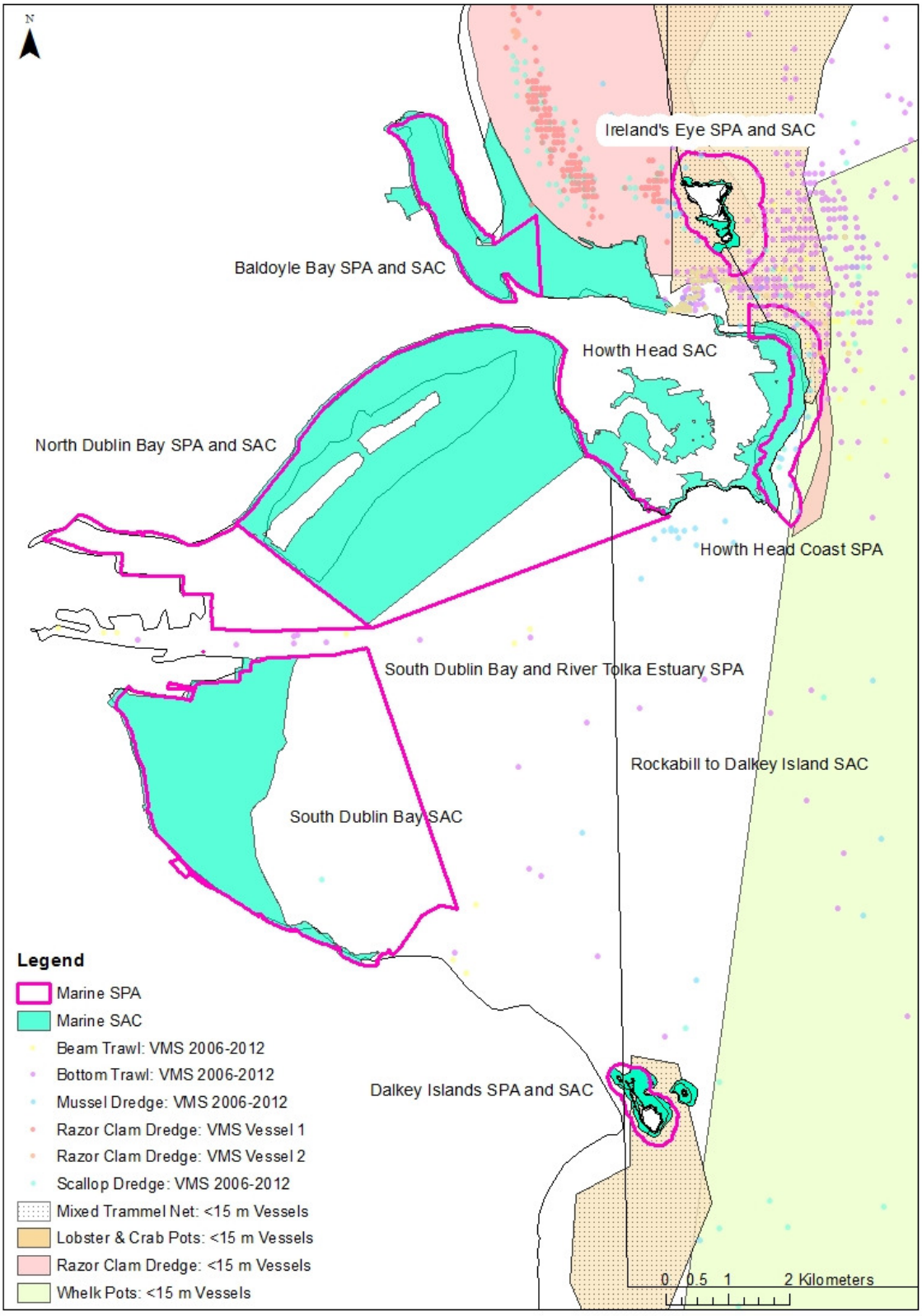

Figure 17. Distribution of fisheries in the vicinity of Baldoyle to Dalkey off the Dublin coast

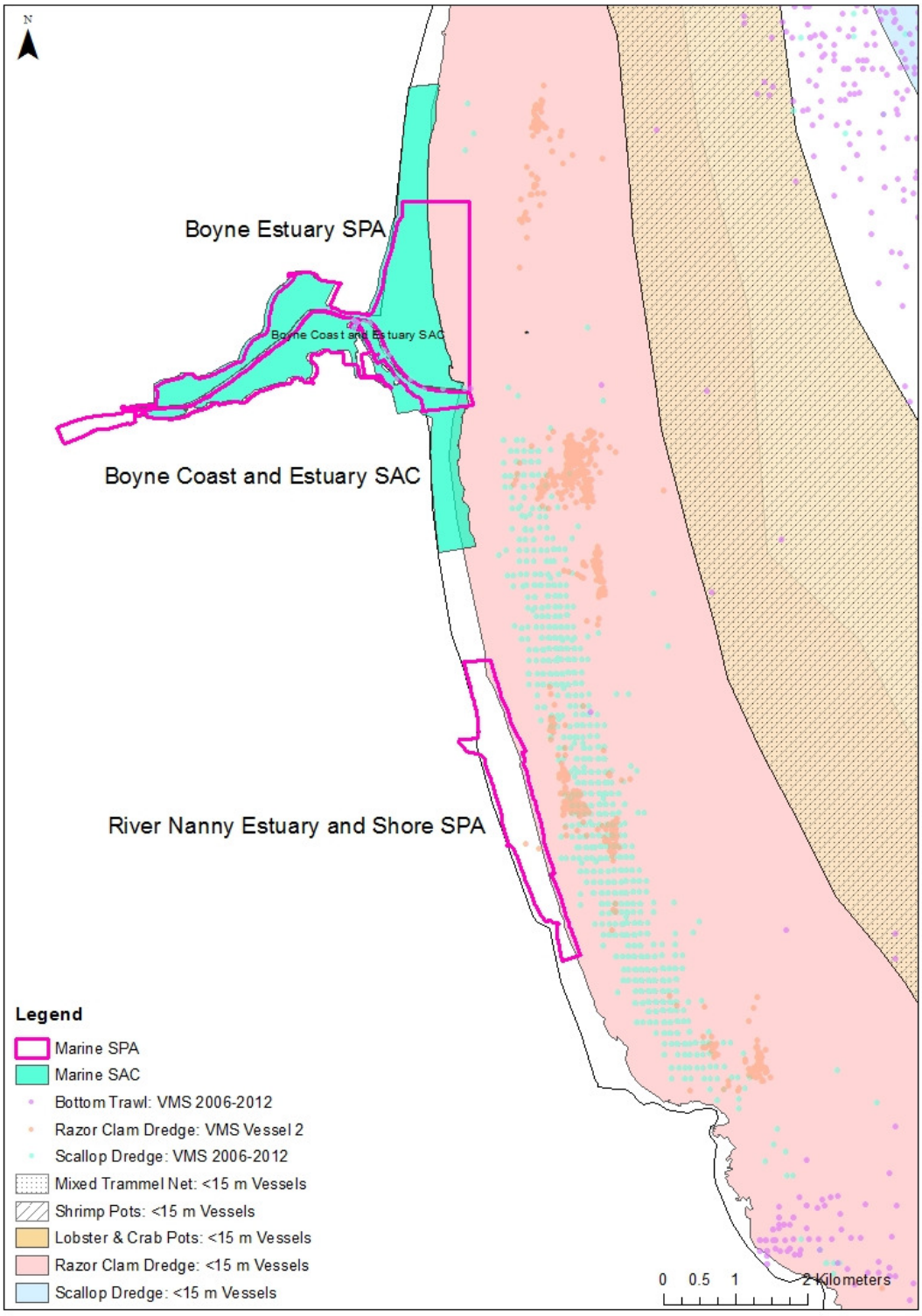

Figure 18. Distribution of fishing activity in the vicinity of Nanny estuary and Shore SPA off the Meath Coast.

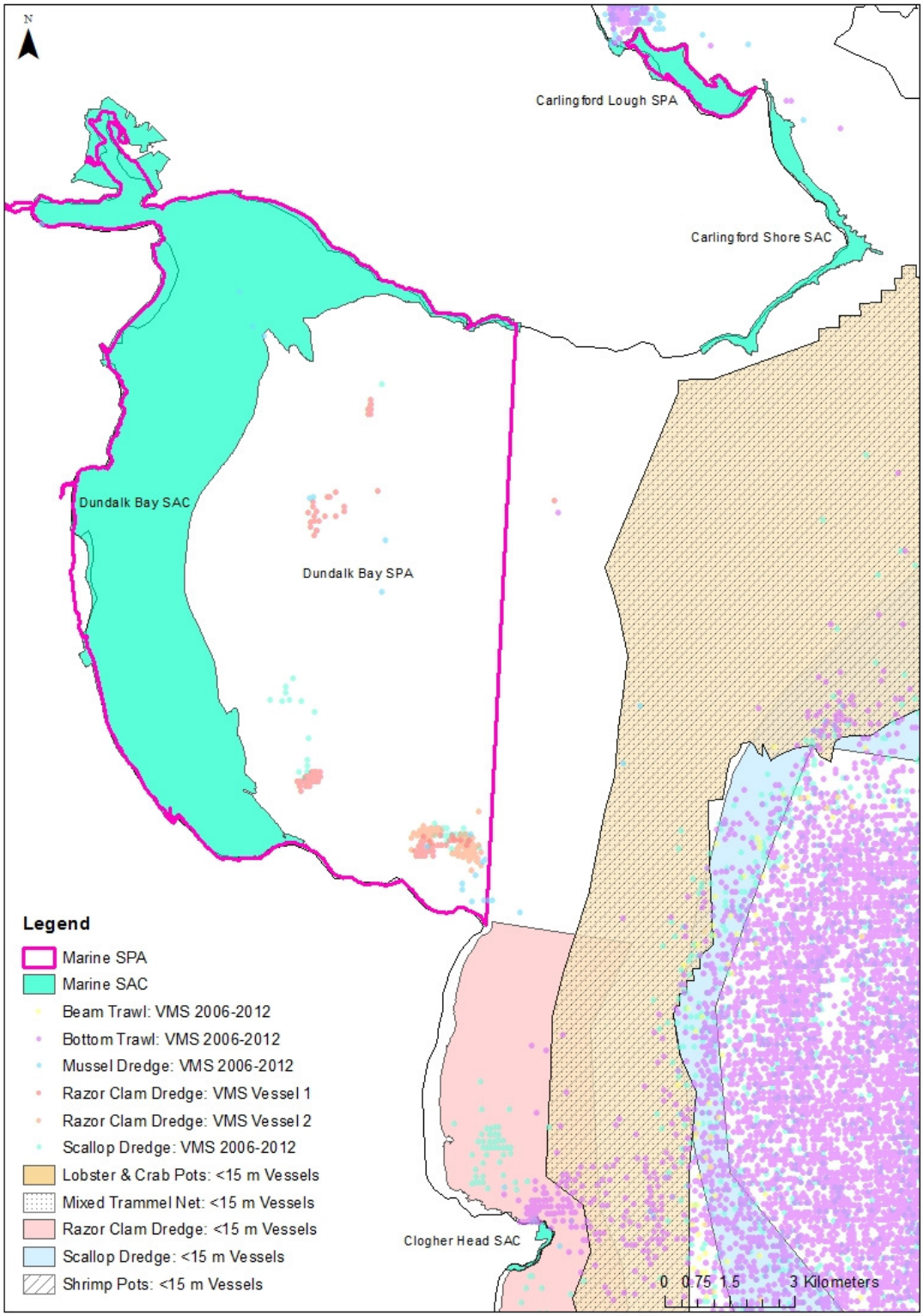

Figure 19. Distribution of fishing activity between Carlingford Lough and Clogherhead off the Louth coast.

Table 22. Spatial overlap (%) of fisheries and benthic communities in SACs. Coloured cells indicates that the fishery does not occur in the site. Shaded cells indicate no overlap.

Spatial overlap (%)															
Designation	**Number**	**Name**	**COs**	**QI code**	**Qualifying interests**	**Features**	**Trap - crustacean**	**Trap - whelk**	**Dredge - scallop**	**Dredge - razor clam**	**Gill net - herring**	**Beam trawl - demersal**	**Otter trawl - demersal**	**Hand gathering**	**Tramme netting**
SAC	2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		14		65					
SAC	2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		4							
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex									
						Subtidal reef community complex	81								81
SAC	2274	Wicklow Reef	Published	1170	1170 Reefs	Current swept sub-tidal reef community complex	7	100							7

Table 23. Consequence, likelihood and risk scores for effects of each fishing metiers on marine community features in SACs in the Irish Sea. Shaded cells indicate no overlap between the fishing metier and the habitat

Consequence															
Designation	**Number**	**Name**	**COs**	**QI code**	**Qualifying interests**	**Features**	**Trap - crustacean**	**Trap - whelk**	**Dredge - scallop**	**Dredge - razor clam**	**Gill net - herring**	**Beam trawl - demersal**	**Otter trawl - demersal**	**Hand gathering**	**Tramme netting**
SAC	2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		0		2					
SAC	2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		0							
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex									
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Subtidal reef community complex	0								0
SAC	2274	Wicklow Reef	Published	1170	1170 Reefs	Current swept sub-tidal reef community complex	0	0							0
Likelihood															
SAC	2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		4		2					
SAC	2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		4							

SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex									
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Subtidal reef community complex	4								4
SAC	2274	Wicklow Reef	Pending	1170	1170 Reefs		4	4							4
Risk															
SAC	2953	Blackwater Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		0		4					
SAC	2161	Long Bank	Published	1110	1110 Sandbanks which are slightly covered by sea water all the time	Sand with *Nephtys cirrosa* and *Bathyporeia elegans* community complex		0							
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Intertidal reef community complex									
SAC	3000	Rockabill to Dalkey	Published	1170	1170 Reefs	Subtidal reef community complex	0								0
SAC	2274	Wicklow Reef	Pending	1170	1170 Reefs		0	0							0

9.5 Risk assessment of the impacts of other fisheries on grey seal and porpoise

- SAC Rockabill to Dalkey is designated for Harbour porpoise.
- SAC Lambay Island is designated for Grey Seal. Specific COs are not published.
- Pressures from fishing activity may include by-catch, collision, prey removal and disturbance to habitat use.
- Risk scores for interactions of Grey Seal and Porpoise are in Table 24.

9.5.1 Crustacean potting

- Some crustacean potting occurs in Rockabill to Dalkey SAC and around Lambay Is. Ex situ activity is also relevant.
- There is no risk of by-catch or collision due to potting for crustaceans.
- These vessels target lobster, crab and shrimp which are not main prey items for grey seal or porpoise.
- Disturbance by small potting vessels is very unlikely to pose a risk to grey seal or Porpoise COs.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0.

9.5.2 Whelk potting

- The whelk fishery is more intense than the crustacean potting fishery but occurs mainly in the south Irish Sea distant from the sites designated for Grey seal and Porpoise.
- There is no risk of by-catch or collision due to potting for crustaceans.
- These vessels target lobster, crab and shrimp which are not main prey items for grey seal or porpoise.
- Disturbance by small potting vessels is very unlikely to pose a risk to grey seal or Porpoise COs. In particular the whelk fishery will not disturb haul out sites at Lambay.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0.

Table 24. Consequence, likelihood and risk scores for interaction of Harbour Porpoise and Grey Seal with fishing metiers. Shaded cells indicate no in site activity. Scores in shaded cells relate to ex situ activity of the metier.

	No.	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Trammel netting
Consequence														
SAC	204	Lambay Island	Pending	1364	Grey seal (*Halichoerus grypus*) [1364]	0	0	0	1	1	0	1	0	1
SAC	3000	Rockabill to Dalkey	Published	1351	Harbour porpoise (*Phocoena phocoena*) [1351]	0	0	0	0	1	0	1	0	1
Likelihood														
SAC	204	Lambay Island	Pending	1364	Grey seal (*Halichoerus grypus*) [1364]	4	4		2	1	2	2	0	1
SAC	3000	Rockabill to Dalkey	Published	1351	Harbour porpoise (*Phocoena phocoena*) [1351]	4	4	4	0	1	2	2	0	1
Risk														
SAC	204	Lambay Island	Pending	1364	Grey seal (*Halichoerus grypus*) [1364]	0	0		2	1	0	2	0	1
SAC	3000	Rockabill to Dalkey	Published	1351	Harbour porpoise (*Phocoena phocoena*) [1351]	0	0	0	0	1	0	2	0	1

9.5.3 Dredging for scallop

- The dredge fishery for scallop occurs in Dalkey to Rockabill SAC designated for Porpoise but not in Lambay SAC designated for Grey Seal.
- There is no risk of by-catch or collision due to dredging for scallop (2 knots fishing speed, steaming at 8 knots).
- Scallops are not a main prey item for Porpoise or Seal.

- Disturbance by scallop vessels is very unlikely to pose a risk to grey seal or Porpoise COs. The level of activity is low compared to that in offshore waters in the south Irish Sea.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0.

9.5.4 Dredging for razor clams

- The Razor clam fishery occurs in the Dalkey to Rockabill SAC designated for Porpoise and in Lambay SAC designated for Grey Seal.
- There is no risk of by-catch or collision due to dredging for scallop (0.2 knots fishing speed, steaming at 6-8 knots).
- Razor clams are not a prey item for Porpoise or Seal.
- The fishery occurs in shallow water (<14m and usually <10m depth). The fishery occurs in shallow water around Lambay.
- **As the COs have not been published a precautionary consequence score of 1 (effects on individuals) with a likelihood of 2 (possible) due to possibility of disturbance by the fishery at haul out sites and a risk score of 2 is concluded. Mitigation may be needed.**

9.5.5 Demersal otter trawling for *Nephrops*, rays and mixed fish

- The demersal otter trawl fishery occurs primarily in offshore waters in the NW Irish Sea with less activity in offshore waters east of Wicklow.
- VMS data clusters close to Howth represent steaming rather than fishing activity
- There is no risk of collision with otter trawl vessels (2-3 knots fishing speed, 7-10knots steaming speed).
- There is a small risk of by-catch of Grey Seal in bottom trawls. This is unlikely to affect grey seal populations in the Irish Sea.
- The fishery targets *Nephrops* and demersal fish. *Nephrops* is not a prey item for Grey Seal or Porpoise. Grey seal have a varied diet which varies regionally depending on fish prey availability. Cod, ling, dab, flounder, sandeel, saithe and whiting are all taken if available. Crustaceans and mollusks are also taken (Hall 2002). Porpoise feed on small pelagic fish, sandeels, whiting or more generally gadoids. Most prey is taken close to the seabed (Santos and Pierce 2003). Porpoise and grey diet overlap.

- Cod and whiting are depleted in the Irish Sea. Sandeel or sprat are not targeted. Plaice and Herring stocks are strong. Haddock fluctuates with episodic high recruitment. All demersal fisheries in the Irish Sea are subject to TAC and MSY objectives i.e. to maintain stock biomass at a level that maximizes productivity and to limit fishing mortality to achieve this objective. Fishing effort has declined in recent years.
- As sandeel or sprat are not targeted, herring is fished only off the coast of Down and in the east Irish Sea, some other stocks such as plaice are in good position and fishing effort is declining it is unlikely that fisheries in the Irish Sea currently pose a risk to Grey seal or Porpoise due to prey depletion.
- **As there is a possibility (likelihood score 2) of by-catch of individual Grey Seal and Porpoise (consequence 1) in the demersal fishery a risk score of 2 is concluded for each species. Other pressures (prey removal, collision) are unlikely to increase this risk.**

9.5.6 Beam trawling for rays and flatfish

- The beam trawl fishery occurs primarily in offshore waters in the SW Irish Sea.
- There is no risk of collision with beam trawl vessels (2-3 knots fishing speed, 7-10 knots steaming speed).
- There is no risk of by-catch of Grey Seal in beam trawls.
- The fishery targets Rays, flatfish and demersal fish.
- Risk to Grey Seal and Porpoise due to prey depletion by the Beam trawl fishery is categorized as 0 for the reasons described above for the demersal otter trawl fishery

9.5.7 Gill netting for herring

- The herring fishery occurs in a very small area off the coast of Down for a few days in Autumn. Small vessels are involved. The fishery is distant from the designated sites of Rockabill and Lambay
- There is no risk of collision with the punts involved in this fishery
- There is a possibility of capture of Grey Seal and Porpoise in the gill nets used in the fishery (consequence 1) but the likelihood of this occurring is very low (1) as the duration of the fishery and total effort is very limited
- The biomass of herring taken in the fishery is a minor proportion of the biomass taken in the east Irish sea fishery and is TAC constrained. There is no risk of prey depletion due to this fishery.

9.5.8 Trammel net fishery for bait

- Trammel nets are used by a small proportion of crab and lobster vessel operators to catch bait for pots. These nets are set in very shallow water in reef to catch fish species such as wrasse and rockling
- The quantity of nets used is unknown but this activity is used only by small part-time operators who by definition have low fishing effort. Larger operators purchase frozen bait.
- Although Grey seal and Porpoise could be captured in trammel nets this is unlikely. The consequence for these species could be categorized as 1 (by-catch of individuals but no effect on populations) but the likelihood of this occurring is unlikely (1).

9.5.9 Hand gathering

- Hand gathering of shellfish (Periwinkle mainly) occurs on intertidal reef shores. The level of activity and its distribution is unknown.
- However, it is not a disturbing activity to Grey Seal at Lambay or to Porpoise.

Table 25. Consequence scores; Likelihood & Risk Scores for interaction of SCIs and fishing metiers. Green cells indicate that the fishery does not occur within the SPA and that only ex situ (where relevant) activity of fisheries is assessed. White cells indicate that the fishery occurs in the SPA and that ex situ activity of fishery is also included in the consequence score. Yellow cells indicate that neither in situ or ex situ activity is relevant

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4186	The Murrough	Pending	A001	Red-throated Diver (*Gavia stellata*) [A001]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4019	The Raven	Published	A001	Red-throated Diver (*Gavia stellata*) [A001]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4015	Malahide Estuary	Pending	A005	Great Crested Grebe (*Podiceps cristatus*) [A005]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A005	Great Crested Grebe (*Podiceps cristatus*) [A005]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4069	Lambay Island	Pending	A009	Fulmar (*Fulmarus glacialis*) [A009]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Wicklow Head	Pending	A009	Fulmar (*Fulmarus glacialis*) [A009]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Irelands Eye	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;2;3
SPA	4069	Lambay Island	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4111	Skerries Islands	Pending	A017	Cormorant (*Phalacrocorax carbo*) [A017]	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4019	The Raven	Published	A017	Cormorant (*Phalacrocorax carbo*) [A017]	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4076	Wexford Harbour and Slobs	Published	A017	Cormorant (*Phalacrocorax carbo*) [A017]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4069	Lambay Island	Pending	A018	Shag (*Phalacrocorax aristotelis*) [A018]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4111	Skerries Islands	Pending	A018	Shag (*Phalacrocorax aristotelis*) [A018]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4069	Lambay Island	Pending	A043	Greylag Goose (*Anser anser*) [A043]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0
SPA	4111	Skerries Islands	Pending	A046	Brent Goose (*Branta bernicla hrota*) [A046]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A061	Scaup (*Aythya marila*)wintering [A061]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0
SPA	4019	The Raven	Published	A065	Common Scoter (*Melanitta nigra*) [A065]	0;4;0	1;3;3	1;3;3	1;2;2	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4015	Malahide Estuary	Pending	A069	Red-breasted Merganser (*Mergus serrator*) [A069]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A069	Red-breasted Merganser (*Mergus serrator*) [A069]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4014	Rockabill	Published	A148	Purple Sandpiper Calidris maritima [A148]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0
SPA	4111	Skerries Islands	Pending	A148	Purple Sandpiper Calidris maritima [A148]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0
SPA	4111	Skerries Islands	Pending	A169	Turnstone (*Arenaria interpres*) [A169]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	2;3;6	0;4;0

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4006	North Bull Island	Pending	A179	Black-headed Gull (*Chroicocephalus ridibundus*) (A179)	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4014	South Dublin Bay and River Tolka Estuary	Pending	A179	Black-headed Gull (*Chroicocephalus ridibundus*) (A179)	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4186	The Murrough	Pending	A179	Black-headed Gull (*Chroicocephalus ridibundus*) (A179)	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A179	Black-headed Gull (*Chroicocephalus ridibundus*) (A179)	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4069	Lambay Island	Pending	A183	Lesser Black-backed Gull (*Larus fuscus*) [A183]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A183	Lesser Black-backed Gull (*Larus fuscus*) [A183]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Irelands Eye	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4069	Lambay Island	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4158	River Nanny estuary and Shore	Published	A184	Herring Gull (*Larus argentatus*) [A184]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4111	Skerries Islands	Pending	A184	Herring Gull (*Larus argentatus*)[A184]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4186	The Murrough	Pending	A184	Herring Gull (*Larus argentatus*) [A184]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4113	Howth Head Coast	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Irelands Eye	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4069	Lambay Island	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Wicklow Head	Pending	A188	Kittiwake (*Rissa tridactyla*) [A188]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4171	Dalkey Island	Pending	A191	Roseate Tern (*Sterna dougallii*) [A191]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4014	Rockabill	Published	A191	Roseate Tern (*Sterna dougallii*) [A191]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0
SPA	4014	South Dublin Bay and River Tolka Estuary	Pending	A191	Roseate Tern (*Sterna dougallii*) [A191]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4171	Dalkey Island	Pending	A193	Common Tern (*Sterna hirundo*) [A193]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4014	Rockabill	Published	A193	Common Tern (*Sterna hirundo*) [A193]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0
SPA	4014	South Dublin Bay and River Tolka Estuary	Pending	A193	Common Tern (*Sterna hirundo*) [A193]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4171	Dalkey Island	Pending	A194	Arctic Tern (*Sterna paradisaea*) [A194]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4014	Rockabill	Published	A194	Arctic Tern (*Sterna paradisaea*) [A194]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0

Designation	Number	Name	COs	QI code	Qualifying interests	Trap - crustacean	Trap - whelk	Dredge - scallop	Dredge - razor clam	Gill net - herring	Beam trawl - demersal	Otter trawl - demersal	Hand gathering	Tramme netting
SPA	4014	South Dublin Bay and River Tolka Estuary	Pending	A194	Arctic Tern (*Sterna paradisaea*)[A194]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4080	Boyne Estuary	Published	A195	Little Tern (*Sterna albifrons*) [A195]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4186	The Murrough	Pending	A195	Little Tern (*Sterna albifrons*) [A195]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4076	Wexford Harbour and Slobs	Published	A195	Little Tern (*Sterna albifrons*) [A195]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0
SPA	4117	Irelands Eye	Pending	A199	Guillemot (*Uria aalge*) [A199]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	1;3;3
SPA	4069	Lambay Island	Pending	A199	Guillemot (*Uria aalge*) [A199]	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4117	Wicklow Head	Pending	A199	Guillemot (*Uria aalge*) [A199]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4117	Irelands Eye	Pending	A100	Razorbill (*Alca torda*) [A100]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4069	Lambay Island	Pending	A100	Razorbill (*Alca torda*) [A100]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4117	Wicklow Head	Pending	A100	Razorbill (*Alca torda*) [A100]	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3
SPA	4069	Lambay Island	Pending	A104	Puffin (*Fratercula arctica*) [A104]	0;4;0	0;4;0	0;4;0	1;3;3	0;4;0	0;4;0	0;4;0	0;4;0	1;3;3

9.6 Risk assessment of the effects of fisheries on SPA QIs

9.6.1 Crustacean potting

- Crustacean potting occurs offshore along the east coast from Dundalk Bay south to Howth Head; spatial overlap of potting occurs with Lambay Island SPA, Ireland's Eye SPA, Skerries Island SPA and along the Howth Head Coast SPA. Further south potting also occurs within Wicklow Head SPA and in the area within and adjoining Dalkey Islands SPA.
- Relevant QI species include Cormorant, Fulmar, Shag, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill, Puffin, Roseate Tern, Common Tern and Arctic Tern.
- The intensity of fishing and footprint of the fishery within the SPAs is not well known. It is seasonal with an estimated total of 6,100 pots used over an overall area of 290 km^2 in the Irish Sea giving an average fishing intensity of 20 $pots.km^{-2}$.
- Fishing is between March & September (except for shrimp which is from September to December).
- There is no known risk of by-catch due to potting for crustaceans.
- These vessels target lobster, crab and shrimp; neither brown crab, velvet crab nor lobster are significant prey items for species relevant to the above sites. While, shrimp *Crangon* sp. and prawns *Palaemon serratus*, are preyed upon by all four tern species, Shag and Lesser Black-backed Gull, the level (and timing of shrimp) potting is unlikely to result in prey depletion and any associated negative impacts on these species.
- Disturbance by small potting vessels is very unlikely to pose a risk to birds.
- Potting intensity in these habitats is low and pots are not expected to cause significant change to bird communities. The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0.

9.6.2 Whelk potting

- The whelk fishery is more intense than the crustacean potting fishery but occurs mainly in the south Irish Sea. The detailed footprint of the fishery ($traps.km^{-2}$) in the sites is not well known but the level of fishing is intensive in coastal waters in the south Irish Sea and the fishery is active throughout the year. The total number of pots

may be in the region of 25,000. These are fished in an area of 1,888km^2 giving an average pot density over the area of 13 pots.km^{-2}.

- Pots are heavier than lobster / crab creels; being comprised of concrete weighted half barrels. Whelk pots, ropes and anchors may cause surface disturbance and minor sub-surface disturbance (anchors only).
- The only SPAs within whose boundary whelk potting occurs are Howth Head Coast SPA and The Raven SPA; for all other sites it is an ex-situ activity.
- Relevant QI species include Kittiwake, Red-throated Diver, Cormorant and Common Scoter. Whelk potting should pose no risk to Kittiwake the QI for Howth Head SPA or indeed to other mobile ex-situ seabird species whose nesting sites are within mean max foraging range; i.e. offshore auks, gulls, fulmar etc..
- The only relevant QI species known to forage extensively on molluscs is Common Scoter (Fox, 2003; though it mainly takes bivalve rather than gastropod molluscs) – a QI for The Raven SPA. Howevver, there is no evidence that common whelk is preyed upon to any large degree by Common Scoter (Fox, 2003; Cramp and Simmons, 2004). Furthermore, the size at harvest exceeds preferred prey size in the Common Scoter.
- There is no known risk of by-catch due to potting for whelks.
- Disturbance by small potting vessels is very unlikely to pose a risk to bird populations, apart from Common Scoter which are known to be displaced by boating activity. The fishery takes place between January & December (over 240 days).
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0 for all species. (While, Common Scoter feed on mollsucs they favour bivalves and whelks are not known to feature as important elements of their diet). As accurate information on offshore foraging locations of Common Scoter is not available it is recommended that this be collated for areas off The Raven SPA due to existence of a number of fisheries in the wider area.

9.6.3 Dredging for scallop

- The dredge fishery for scallop occurs mainly in the south Irish Sea from Carnsore north to Tuskar and off the Wicklow coast (bringing it close to The Raven SPA and The Murroughs SPA). There is also a small fishery in the north Irish Sea operated from Kilkeel (3 vessels), Dundalk (2 vessels) and Howth / Dun Laoghaire.

- The south Irish Sea and Wicklow fishery is close to The Raven SPA and The Murroughs SPA, respectively. Relevant QIs for these sites are Red-throated Diver, Cormorant and Common Scoter (The Raven) and Red-throated Diver, Herring Gull and Little Tern (The Murroughs).
- The impact of scallop dredging on the seabed and potential for resultant impacts in prey species selected by QIs is unclear. Fishing for scallops using toothed dredges is considered potentially damaging to non-target benthic communities (Kaiser et al., 2006); due to scraping / ploughing of the seabed, sediment re-suspension, physical damage and removal (by-catch) or scattering of non-target benthic organisms including fish (Sewell et al., 2007; Craven et al., 2012).
- Scallops are not a main prey item for any of the above species. Potential interactions are limited to dredge disturbance to benthic species such as flatfish which are an important prey item for Cormorant or to benthic bivalves preyed upon by Common Scoter. In the case of Cormorant, however, they tend to feed close to shore and have a very varied diet, such that they are less vulnerable to such impacts. Pelagic prey favoured by species such as Red-throated Diver and Little Tern are less likely to be impacted.
- Disturbance by scallop vessels is very unlikely to pose a risk to bird COs.
- There is no risk of by-catch or collision due to dredging for scallop (2 knots fishing speed, steaming at 8 knots).
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0; **for Common Scoter the consequence score is 1 (non-disturbing to individuals) with a moderate likelihood (3) and a risk score of 3.**

9.6.4 Dredging for razor clams

- The Razor clam fishery occurs from Dunany Point (on the southern side of Dundalk Bay) south to Howth Head; the area available to fish overlaps with Lambay Island SPA, Ireland's Eye SPA, Skerries Islands SPA and Rockabill SPA. There is also a fishery in the south Irish Sea, which partially overlaps with The Raven SPA. Fishing can occur in all seasons.
- Relevant QI species include Red-throated Diver, Cormorant, Common Scoter, Fulmar, Shag, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill, Puffin, Roseate Tern, Common Tern and Arctic Tern.

- Apart from Common Scoter, razor clams are not a prey item for any of the QIs for the above sites (Common Scoter at Dundalk Bay SPA were considered as part of a previous assessment). As noted The Raven SPA support over 3,000 wintering Common Scoter.
- There is no risk of by-catch due to dredging for scallop (0.2 knots fishing speed, steaming at 6-8 knots).
- The fishery occurs in shallow water <14m, and usually <10m depth and so is in the foraging range and water depths for a range of seabirds. While a large fishery zone is indicated for vessels <15m in length; those >15m which have VMS data suggest a much more focused fishery, including fishing effort off the west coast of Lambay Island; relevant QI species from Lambay include Cormorant, Shag, Kittiwake, Guillemot, Razorbill and Puffin.
- As noted for scallop dredging the impact of razor clam dredging on the seabed and potential for resultant impacts on prey species selected by QIs is unclear. However, as largely pelagic foragers the risk of negative impacts would appear unlikely.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0 is appropriate for most sites. **However, at The Raven SPA the consequence score for Common Scoter is 1 (direct / indirect sublethal effects) with a moderate likelihood (3) and a risk score of 3. Mitigation may be needed.**

9.6.5 Demersal otter trawling for *Nephrops*, rays and mixed fish

- The demersal otter trawl fishery is an ex-situ fishery which occurs primarily in offshore waters in the NW Irish Sea with less activity in offshore waters east of Wicklow. [VMS data clusters close to Howth represent steaming rather than fishing activity]. The fishery targets both *Nephrops* and demersal fish species.
- QIs of relevance are those offshore birds capable of foraging in offshore waters overlapping with demersal otter trawling, such as Fulmar, Kittiwake, Guillemot, Razorbill, Puffin, large gulls and terns.
- The site of most relevance is Rockabill SPA - designated for breeding Common Tern, Arctic Tern and Roseate Tern – as trawling activity borders the northeastern boundary of the SPA box defined around Rockabill to protect foraging grounds for this internationally important tern colony. Trawling activity is ca. 5-10km northeast of the breeding colony, while breeding Common, Arctic and Roseate Tern typically feed up to 10km from the breeding site, so overlap is possible.

- As sandeel or sprat are not targeted, herring is fished only off the coast of Down and in the east Irish Sea, some other stocks such as plaice are in good position and fishing effort is declining it is unlikely that fisheries in the Irish Sea currently pose a risk to prey species favoured by the above QIs due to prey depletion. Furthermore, fishing effort has declined in recent years.
- Risk of disturbance from otter trawl vessels is low (2-3 knots fishing speed, 7-10knots steaming speed).
- Risk of by-catch is low.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0 is appropriate for most sites. **However, at Rockabill SPA the consequence score is 1 (direct / indirect sublethal effects) with a low likelihood (3) and a risk score of 3. Mitigation may be needed.**

9.6.6 Beam trawling for rays and flatfish

- The beam trawl fishery occurs primarily in offshore waters in the SW Irish Sea. Effort peaks in summer and early autumn; effort is much lower than for bottom trawls and is declining.
- The fishery targets rays, flatfish and demersal fish. It does not target prey species selected by any of the QIs. Foraging on discards is possible.
- There is no risk of by-catch.
- Risk of disturbance from beam trawl vessels s low (2-3 knots fishing speed, 7-10 knots steaming speed).
- The nature of impacts associated with the beam trawl fishery are very much as discussed above for scallop dredging. The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0 is appropriate.

9.6.7 Gill netting for herring

- The herring fishery occurs in a very small area off the coast of Down for a few days in Autumn. Small vessels are involved. The fishery is distant from the designated seabird breeding colonies and inshore coastal waters supporting diving species considered as part of this assessment.
- There is no risk of collision with the punts involved in this fishery.

- There is a possibility of capture of diving birds in the gill nets used in the fishery (consequence 1) but the likelihood of this occurring is very low (2) as the duration of the fishery and total effort is very limited
- The biomass of herring taken in the fishery is a minor proportion of the biomass taken in the east Irish Sea fishery and is TAC constrained. There is low risk of prey depletion due to this fishery.
- The consequence score is 0 (non-disturbing to individuals) with a high likelihood (4) and a risk score of 0 is appropriate based on current fishery location and level of activity. **However, as by-catch is a recognized issue with gill netting any intensification or expansion of this fishery should be monitored for impacts on birds.**

9.6.8 Trammel net fishery for bait

- Trammel nets are used by a small proportion of crab and lobster vessel operators to catch bait for pots. These nets are set in very shallow water in reef to catch fish species such as wrasse and rockling. Potting for crab and lobster occupies an area offshore running south from Dundalk Bay to Howth Head Coast SPA; around Dalkey Island SPA (including Skerries Islands SPA, Lambay Island SPA & Ireland's Eye SPA) and Wicklow Head SPA and within the southwestern corner of Rockabill Island SPA feeding zone.
- Relevant QI species include Cormorant, Fulmar, Shag, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill, Puffin, Roseate Tern, Common Tern and Arctic Tern.
- The quantity of nets used is unknown but this activity is used only by small part-time operators who by definition have low fishing effort. Larger operators purchase frozen bait.
- **Although diving birds could be captured in trammel nets this is unlikely due to the low levels of usage. The consequence for these species could be categorized as 1 (by-catch of individuals but no effect on populations) but the likelihood of this occurring is unlikely (2) Species most at risk are likely to be diving species favouring shallow water over rocky substrate such as Cormorant.**

9.6.9 Hand gathering

- Hand gathering of shellfish (Periwinkle mainly) occurs on intertidal reef shores. The level of activity and its distribution is unknown. It generally occurs during March to September at the same time that sites are occupied by wintering waders and wildfowl.
- Disturbance of intertidal and shallow subtidal waterfowl using estuarine and coastal sites is possible. However, no information is available to quantify regional patterns of periwinkle picking activity and potential for associated disturbance. The consequence for wintering waders and wildfowl at any of the coastal / intertidal SPAs is most likely going to be 1 (disturbance of individuals but no effect on populations); the likelihood of this occurring high (4) where hand gathering occurs. **However, there is a risk of more significant localized impacts where periwinkle picking pressures are particularly high; consequence, 3; likelihood, 3; risk 9 – Mitigation probably required. Further details on the current level of activity and its distribution would be needed to comment further.**

10 Appropriate Assessment (seed mussel fisheries) conclusion statement

10.1 SAC qualifying interests

- The proposed seed mussel fishery may occur, as it has done in the past, in many different locations off the east coast of Ireland. Seed beds are usually associated with coarse, current swept, substrates in the Irish Sea from Rockabill south to Carnsore. When present, the beds are small and discrete in extent and distribution.
- Given the seed mussel survey data (1970-2012) and fisheries VMS data (2006-2012) the likelihood is that the majority of seed beds and seed mussel fisheries will occur outside of SACs. The exceptions are Wicklow Reef, Blackwater Bank and Long Bank SACs where seed beds regularly develop
- In the case of Blackwater Bank and Long Bank, although the seed beds and fisheries occur within the SAC boundaries, they do not occur on the designated habitat (Sandbank) or in the benthic community of the sandbank (*Nephthys, Bathyporeia*). The fishery occurs in deeper water on the sides of the banks. This is clearly evident in the VMS data. The benthic community of the sandbank is, in any case, not sensitive to physical disturbance pressures which could be caused by mussel dredging. Mussel dredging in these SACs poses no risk to the QIs in the sites.
- In the Wicklow Reef SAC, although BIM surveys have not been conducted within the site, VMS data for the period 2006-2008 clearly shows a cluster of fishing activity that overlaps with the designated reef habitat in the site. Although the degree to which the fishery overlap with the reef is uncertain, because of the low temporal resolution in the VMS data, the overlap with the reef community may be about 23%. The species of the reef community include species that are rare in the Irish Sea and many which are moderately sensitive to physical disturbance which could be caused by mussel dredging
- As there is a likelihood that mussel seed beds may develop in the reef habitat of the SAC and that reef species are moderately sensitive to disturbance by dredge fishing and given that the % overlap between the reef community and the fishery is calculated at 23% the possibility of significant impacts to the reef cannot be discounted.
- **Recommendation: Any seed mussel fisheries within the Wicklow Reef SAC should not encroach onto reef habitat**.

10.2 SPA qualifying interests

- The seed mussel fishery has previously occurred close to or within the Howth Head and Ireland's Eye SPAs. These sites are designated for Cormorant, Herring Gull, Kittiwake, Guillemot and Razorbill. None of these species utilizes mussel as a prey source. These species will not be captured as by catch or significantly disturbed by seed mussel fishing.
- Seed mussel fishing also occurs in other areas outside of SPAs. The only SCIs that may utilize seed mussel as a significant food source are Common Scoter. The Raven SPA and Dundalk Bay SPA are both designated for Common Scoter. No seed mussel fishery occurs in the vicinity of Dundalk Bay. Seed mussel fisheries abut the boundary of the Raven SPA where there are over 3000 Common Scoter feeding in open water. Although Common Scoter feed on seed mussel they only do so when currents are weak which is not the case in the Irish Sea.
- **Recommendation: The seed mussel fishery in the Irish Sea is unlikely to have any significant effects on bird species either due to fishing within SPAs or due to interaction with birds outside of SPAs. No mitigations to the proposed fishery are required in relation to SPA QIs. A general recommendation to examine offshore distribution of Common Scoter in the wider area is, however, included. The location of seed mussel fisheries close to Common Scoter foraging areas should then be reviewed.**

11 Risk Assessment (fisheries) conclusion statement

11.1 SAC qualifying interests

- Bottom trawl, beam trawl, gill net, scallop dredge, razor clam dredge, crustacean pot, whelk pot, trammel net and hand gathering fisheries occur in the Irish Sea
- Scallop dredging, Beam trawling, Bottom otter trawling and Gill netting do not occur to any significant extent in SACs in the Irish Sea and pose no risk to designated habitats or species outside of SACs.
- Crustacean potting and whelk potting occur within a number of SACs (Rockabill to Dalkey, Lambay Island, Blackwater Bank, Long Bank, Wicklow Reef). These fisheries do not have significant effects on QIs for those sites
- Dredging for Razor clams occurs in Rockabill to Dalkey, Lambay Island and Blackwater Bank SACs. The fishery overlaps significantly with Sandbank habitat in Blackwater Bank SAC and may be disturbing to this habitat. Although the characterizing species of this habitat are generally not sensitive to fishing pressures the nature of the razor clam fishing gear may result in impact. At Lambay if the fishery occurs in very shallow water close to the shore it may disturb Grey Seal haul out sites.
- Unattended trammel nets are used by some operators in the crab/lobster pot fishery. There is a low risk of capture of grey seal and porpoise in these nets
- **Recommendations**
    - **Fishery location data (VMS) for the razor clam fishery in Blackwater Bank SAC and at Lambay Is SAC is required to more precisely estimate overlap of the fishery with protected habitat within the Blackwater Bank and to assess disturbance potential to Grey Seal at Lambay. The latter should wait until the COs for Grey seal at Lambay are published.**
    - **The extent of use and by-catch data for trammel nets used in the crab/lobster fishery is required to better estimate the risk posed by this gear to Grey Seal and Harbour Porpoise.**

11.2 SPA qualifying interests

- Crustacean potting occurs offshore along the east coast from Dundalk Bay south to Howth Head; spatial overlap of potting occurs with Lambay Island SPA, Ireland's Eye SPA, Skerries Island SPA and along the Howth Head Coast SPA. Further south potting also occurs within Wicklow Head SPA and in the area within and adjoining Dalkey Islands SPA.
- The whelk fishery is more intense than the crustacean potting fishery but occurs mainly in the south Irish Sea from Howth Head south to Wexford Harbour. The detailed footprint of the fishery (traps.km^{-2}) in the sites is not well known but the level of fishing is intensive in coastal waters in the south Irish Sea and the fishery is active throughout the year. The total number of pots may be in the region of 25,000. These are fished in an area of 1,888.^{2} giving an average pot density over the area of 13 pots.km^{-2}.
- The dredge fishery for scallop mainly occurs in the northwest Irish Sea (north of Dublin) and in the south Irish Sea (off southeast Wexford). The scallop fishery overlaps with Rockabill SPA and Lambay Island SPA.
- The Razor clam fishery occurs from Dunany Point (on the southern side of Dundalk Bay) south to Howth Head; the area available to fish overlaps with Lambay Island SPA, Ireland's Eye SPA, Skerries Islands SPA and Rockabill SPA. Fishing can occur in all seasons.
- The demersal otter trawl fishery is an ex-situ fishery which occurs primarily in offshore waters in the NW Irish Sea with less activity in offshore waters east of Wicklow. [VMS data clusters close to Howth represent steaming rather than fishing activity]. The fishery targets both *Nephrops* and demersal fish species.
- The beam trawl fishery occurs primarily in offshore waters in the SW Irish Sea and targets rays and other demersal species.
- The herring fishery occurs in a very small area off the coast of Down for a few days in Autumn.
- Trammel nets are used by a small proportion of crab and lobster vessel operators to catch bait for pots. These nets are set in very shallow water in reef to catch fish species such as wrasse and rockling. Potting for crab and lobster occupies an area offshore running south from Dundalk Bay to Howth Head Coast SPA; around Dalkey Island SPA (including Skerries Islands SPA, Lambay Island SPA & Ireland's Eye

SPA) and Wicklow Head SPA and within the southwestern corner of Rockabill Island SPA feeding zone.

  - Hand gathering of shellfish (Periwinkle mainly) occurs on intertidal reef shores. The level of activity and its distribution is unknown.

- Unattended trammel nets are used by some operators in the crab/lobster pot fishery. There is a low risk of capture of birds in these nets

- **Recommendations**
  - **The extent of use and by-catch data for trammel nets used in the crab/lobster fishery is required to better estimate the risk posed by this gear to bird populations.**
  - **Monitoring of any intensification or expansion of fisheries in and around island breeding sites off Dublin is recommended with particular emphasis on preventing negative impacts on the internationally important Roseate Tern population.**
  - **Offshore distribution data is needed for species like Common Scoter (and Red-throated Diver) off The Raven SPA in order to better understand their distribution relative to offshore sand banks and mussel beds.**
  - **Monitoring of any intensification or expansion of fisheries in and around coastal Little Tern breeding sites to prevent increased in-combination affects – due to the Little Terns tendency to feed very close to their breeding site and hence sensitivity to localized impacts.**
  - **Need to collect data on location and intensity of periwinkle picking in order to determine whether, through disturbance, it is negatively impacting on wintering waders & wildfowl for which coastal SPAs are designated.**

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13 Appendices:

Appendix 1 – Review of the Diet of Key Species

1.1 Red-throated Diver

Red-throated Divers are generally regarded as being associated with shallow inshore waters and sandy bays (Prater, 1986; Cramp and Simmons, 2004). Diving depths of 2-9 m have been recorded (Cramp and Simmons, 2004). However, they can occur in deeper waters. Warden (2010) reported that 15% of the bycatch occurred at depths of 15-35 m (compared to 52% of the landings), with no bycatch where the depth was greater than 35 m. From data in Wilson *et al*. (2006), Lewis *et al* (2008) and Lewis *et al* (2009) a mean of 11% (s.d. 14%, n = 9) of observations of Red-throated Divers were below the 20 m depth contour in aerial transects of c. 10-50 km length around the Scottish coast. These data would indicate that Red-throated Divers prefer depths of less than 20 m, but can occur in depths of up to around 30-40 m.

However, in the German North and Baltic Seas, Red-throated Divers can occur far out to sea (to a distance of 100 km from the coast), particularly in spring (Mendel *et al*., 2008). In the Pomeranian Bight, in the Danish Baltic Sea, Red-throated Divers occurred in around 55% of grid squares in the 20-40 m depth zone, compared to around 70% in the 10-20 m depth zone (calculated from Fig. 2 in Guse *et al*., 2008). Skov and Prins (2001) analysed the distribution of Red-throated and Black-throated Divers in relation to the estuarine water mass in the German Bight. They found that "*the pelagic range of divers clearly followed the outer estuarine front between surface North Sea water and the JCC [Jutland Coastal Current], which was located between the 20 and 30 m depth contours" and that water depth seemed to be "of secondary importance as a determinant of the habitat of the wintering divers*". It may be the case that this association with estuarine fronts and/or freshwater inputs is not restricted to the German Bight, but the other studies quoted above did not consider this factor.

1.2 Great Crested Grebe

Great Crested Grebe, favour small prey items between 6.5-10 cm long, with younger birds favouring prey at the lower end of the range (Gwiazda, 1996, in addition to studies quoted by Cramp and Simmons, 2004). The species can prey on sticklebacks but other fish such as gobies are a more important prey item in transitional waters (Doornbus, 1984, in addition to studies quoted by Cramp and Simmons, 2004). Great Crested Grebe predominantly feed in areas less than five meters depth.

Herring and sprat have also been found to be important food item to Great Crested Grebe in the Netherlands (Doornbus, 1984Therefore, the major prey resources for the Great Crested Grebe SCI population in subtidal waters in Lough Swilly may include demersal and pelagic fish.

Great Crested Grebe, when it occurs in marine waters, mainly occur in shallow, sheltered, inshore waters (Cramp and Simmons, 2004).

1.3 Red-breasted Merganser

Sand gobies are an important prey item for Red-breasted Merganser. The species appears to have a particular preference for stickleback in inland waterbodies according to some studies quoted by Cramp and Simmons (2004). Other prey species such as herring and sprat, which Red-breasted Merganser also feed on, may prove more energy rich when available, given the larger average biomass of these species. Sprat are likely to be a very important winter prey item given that mergansers feed at depths less than five meters.

Coalfish, which are a common estuarine pelagic species in Irish estuaries and a potential prey item of Red-breasted Merganser. Red-breasted Merganser also feed on intertidal invertebrates such as small shore crabs, mysids (shrimp like crustaceans) and common shrimp. Therefore, the major prey resources for the Red-breasted Merganser SCI population in subtidal waters may include benthic invertebrates and demersal and pelagic fish.

1.4 Common Scoter

During winter and when feeding, Common Scoters are generally distributed in shallow coastal waters with a depth of no more than 20m, feeding primarily during daylight (Cramp & Simmons, Cramp and Simmons 2004). They are most often distributed across areas where there is a sandy substratum, linked to the distribution of their favoured prey of bivalve molluscs. Previous research varies somewhat in the range of dive depths undertaken by scoters; examples include a range 2.2 – 3.7m (Cramp and Simmons, 2004) and a mean of 6.85m and 11.42m (Kaiser *et al*. 2006). Water depth is an important parameter and the distribution of foraging scoters is therefore likely to change in relation to the tidal state (Kaiser *et al*. 2006). As deeper dives are more costly in terms of dive duration and energy expenditure required, it follows that scoters are likely to maximise their energy intake by foraging where prey items are abundant and where the energy required obtaining the prey is minimised.

The diet of Common Scoters has been reviewed by Fox (2003), Cramp and Simmons (2004) and Kaiser *et al*. (2005). Quantitative analyses of their diet show that it is overwhelmingly dominated by bivalves (88% or greater of the diet composition in the eight studies reviewed by Kaiser *et al*., 2005). A total of 30 species of bivalve have been recorded within their diet (Kaiser *et al*., 2005). A range of bivalve species such as Mytilus edulis (up to 40 mm), cockles Cardium (up to 40 mm), clams Mya and Spisula and gastropods (e.g. dogwhelk *Nassa recitulata*, periwinkles *Littorina*, and laver snails *Hydrobia*) are consumed. Occasionally crustaceans, particularly isopods (Idotea), amphipods (shrimps *Gammarus*), and small crabs (Carcinus); annelids (polychaetes); and echinoderms are also consumed (Cramp and Simmons 2004). Fox (2003) concluded that: scoters seem to prefer foraging in clean sandy substrates that support benthic communities rich in bivalve biomass. Within such sites, prey species are probably taken in proportion to their abundance.

Literature reviews do not indicate any clear patterns of size selection of prey by Common Scoter (Fox, 2003; Kaiser *et al*., 2005). There does not appear to be any lower limit but there may be an upper limit of around 50 mm shell length (Fox, 2003). However, the latter limit may not apply to razor clams as these are likely to be ingested lengthways (Kaiser *et al*., 2005).

1.5 Cormorant

Cormorants typically occur in sheltered waters and rarely occur far offshore (Cramp and Simmons, 2004). In a study of wintering birds in Denmark, 75% of birds were seen within 3 km of the coast, while another review noted that in the North Sea Great Cormorants were never observed further than 5 km from land (Seabird Wikispace).

They prefer waters less than 10m deep for foraging (Skov *et al*., 1995, quoted by Kober et al., 2010; Seabird Wikispace); they have been noted as diving to depths of approximately 3-9m with an average of 1-3m (Dewar 1924; van Dobben 1952, quoted by Cramp and Simmons, 2004); though they can when required dive to depths of up to 35m (Seabird Wikispace).

The Seabird Wikispace gives a mean foraging range of 8.5 km, a mean maximum of 32 km and a maximum of 50 km from breeding colonies and wintering roosts (as also noted in Cramp and Simmons, 2004). Cormorant can feed in open marine waters and can tolerate severe weather conditions. Seabird Wikispace describes their key habitats in temperate zones for marine populations as “sandy areas, rocky and vegetated substrates”.

Cormorant feed almost exclusively on fish; particularly favouring benthic species. In Ireland regurgitated food from birds feeding in fresh, brackish and saltwater was dominated by wrasse (60%), eel (20%), flatfish (10%) and salmonids (2%), with any differences between colonies linked to food availability (West *et al*., 1974, quoted by Cramp and Simmons, 2004).

1.6 Shag

Shag typically occurs in both offshore and inshore marine waters but usually does not range far from the coast (Cramp and Simmons, 2004). From radio-tagging studies, Wanless *et al.* (1991) found that the mean foraging range of Shags from a colony on the Isle of May in Scotland was 7 km (maximum 17 km) and that all feeding sites were within 7 km of land. In their study, Shags fed most frequently in water depths of 21–40m, with substrates of either gravel and sand, or rock with thin patchy sediment cover. Using data on duration of foraging trips and flight speeds, Pearson (1968) estimated a maximum foraging range of 19 km from a breeding colony on the Farne Islands in England, while Furness and Barrett estimated a median foraging range of 12 km from a colony in Norway; this method is likely to overestimate foraging ranges. Rees (1965, quoted by Cramp and Simmons, 2004) reported a foraging range of 13 km from a roosting area.

The Seabird Wikispace gives a mean foraging range of 6.5 km, a mean maximum of 16 km and a maximum of 20 km from breeding colonies.

The Seabird Wikispace describes its key foraging habitats as: "*shallow waters, particularly over sand and gravel banks, areas of high tidal flow*". Shags feed on benthic and demersal prey and can dive up to depths of 70 m, with a mean dive depth in the data collated by the Seabird Wikispace of 33 m.

Shag feed almost exclusively on fish which it takes predominantly from midwater, though it also occasionally feeds on bottom dwelling species in coastal areas; they also take small numbers of polychaetes, cephalopods and other molluscs (small, usually benthic crustaceans) The fish component of its diet varies with both season and locality but is generally dominated by sand-eel, herring, and cod, amongst other fish species and some crustaceans (Cramp and Simmons, 2004).

1.7 Black-headed Gull

Black-headed Gulls typically occur in "*inshore tidal waters, avoiding rocky or exposed coasts and preferring inlets or estuaries with extensive sandy or muddy beaches*" (Cramp and Simmons, 2004). Black-headed Gulls can occur in deeper offshore waters, but mapping

studies indicate that they only do so occasionally and at low density (e.g., Kubetzki and Garthe, 2003).

Black-headed Gulls have a broad dietary range and use a wide range of feeding methods in a variety of habitats. In coastal and marine habitats their diet can include: benthic invertebrates in intertidal habitats; invertebrates, fish and scavenged items taken from the pelagic zone whilst swimming or from dips-to-surface and surface plunges whilst flying; and food items taken by kleptoparasitism. Black-headed Gulls also feed commonly in terrestrial habitats.

In the breeding season, earthworms and insects are described as predominating in their diet, although this probably reflects the distribution of colonies, which are mainly inland. At the Lady's Island colony in Wexford, Black-headed Gulls also feed extensively in terrestrial habitats, taking worms, beetles and small mammals, as well as frogs and, through kleptoparasitism of terns, fish. On the sea coast, the "*surface fauna of exposed mudflats and shallows*" are described as providing a "*rich food supply*".

In studies of two coastal colonies in the North Sea bivalves and polycheates were the major components of their diet (Kubetzki and Garthe, 2003) and fish were only a minor component.

1.8 Lesser Black Backed Gull

The Lesser Black Backed Gull is omnivorous and can utilise a wide array of energy sources, consuming fish, small mammals, invertebrates, plant material, rubbish, fish discards, etc.(Cramp and Simmons, 2004). Though it is capable of obtaining food by dipping to surface, shallow plunging and aerial pursuit of prey, a large portion of its diet seems to come from food it kleptoparasitises from other birds (both inter- and intra-specific) (Verbeek, 1977a, quoted by Cramp and Simmons, 2004). It is generally accepted that open sea fish feeding contributes more to the diet of the Lesser Black Backed Gull than scavenging compared to other large white –headed larid gulls (Bustnes *et al*. 2010; Cramp, *et al*. 1974; Mudge, 1979, quoted by Cramp and Simmons, 2004). A significant amount of terrestrial invertebrate prey (mainly beetles) is also taken.

Seabird Wikispace quotes a foraging range from the nesting site of between 44 and 84km, depending on the individual. Though the mean foraging trip was 7.9±9 hours, some may last several days (Shamoun-baranes *et al*. 2011). Generally feeds further out from the colony than Herring Gull being better adapted for long distance flight (Verbeek, 1977b, quoted by Cramp and Simmons, 2004).

1.9 Herring Gull

Herring Gull is on the Irish Red List of Birds of Conservation Concern because of its national decline as breeding birds (Lynas *et al*., 2007). The Irish winter population has been estimated at around 30,000 birds.

Herring Gulls use a wide range of terrestrial, coastal and marine habitats and regularly follow fishing boats. Cramp and Simmons (2004) state that during the breeding season they do not "*normally range beyond the offshore zone, and is infrequently out of sight of land*" while habitat choice is similar outside the breeding season. However, distribution maps from the German North and Baltic Seas show that Herring Gulls can frequently occur far out to sea, even during the breeding season, although densities are higher close to land (Mendel *et al*., 2008). Cramp and Simmons (2004) quote foraging ranges from breeding colonies in various studies ranging from 22-63 km, while Ratcliffe *et al*. (2000, quoted by Langston, 2010) gave a foraging range of 40 km from breeding colonies. Non-breeding birds may also fly considerable distances between feeding areas and roosting sites.

Herring Gulls are generalist feeders that use a wide range of habitats and are not strictly tied to the marine environment therefore, they are less likely to be sensitive to impacts. Herring Gulls consume food through direct predation, scavenging (including fishery discards) and kleptoparasitism. They utilise a range of techniques to utilize prey available including dipping to surface, surface plunging (from 5-6m), surface seizing, shallow surface diving, taking food while walking, foot paddling (to bring prey to surface), aerial pursuit of insects, small passerines and bats, dropping hard bodied organisms from a height (to break shells, species include molluscs, crabs, starfish, etc.) (Bent , 1921; Witherby et al., 1941; Borodulina, 1960; Campbell, 1936a; Lockley, 1937a; Rogers, 1968; MacDonald and Mason, 1973; Witt, 1974; Cleeves, 1969; Oldham, 1930; Witherby, et al., 1941; Tinbergen, 1953; Goethe, 1958; all quoted by Cramp and Simmons, 2004). Often follows fishing vessels where it consumes discards and offal (Isenmann, 1976c, quoted by Cramp and Simmons, 2004). Scavenging at dumps forms a large proportion of the Herring Gull's diet, with a proportions ranging from 24.1% to 75% (Hunt and Hunt, 1973; Mudge, 1979, quoted by Cramp and Simmons, 2004)

1.10 Kittiwake

Various studies have reported typical foraging ranges from breeding colonies of 10-35 km (Heligoland; Dierschke *et al*. 2004, quoted by Cramp and Simmons, 2004), 13-40 km (North Pacific; Kotzerka *et al*., 2010), 40 km (Pacific; Sanger, 1978, quoted by Cramp and Simmons, 2004), 5 to more than 40 km (Shetland; Wanless et al., 1992), 55 km (Farne Islands; Pearson,

1968), 73 km (Isle of May; Daunt *et al*. 2002). Some studies have reported considerable variation between years, with foraging ranges much smaller in years of higher prey abundance (Hamer *et al*., 1993; Surayan *et al*., 2000). In Alaska, Ford *et al*. (2004) found little relationship between colony location and local areas of high prey availability, but the actual colony locations minimised the interactions among foraging kittiwakes from different colonies compared to randomised locations.

The above studies accord with the statement by Newton (2012) that Kittiwakes have foraging ranges (distance travelled from the colony during the chick-rearing period) of about 40 km when conditions (abundance of forage fish) are reasonable to good. In poor years, the distance travelled to find prey could considerably exceed this.

The Seabird Wikispace gives a mean foraging range of 25 km, a mean maximum of 66 km and a maximum of 200 km. During the breeding period Kittiwakes can form foraging flocks up to 40km from the colony, though this decreases to 27km during the nestling period (Sanger *et al*. 1978, quoted by Cramp and Simmons, 2004)

Kittiwakes feed offshore in open marine waters and can tolerate severe weather conditions. They are often associated with tidal fronts or upwellings and offshore sandbanks during the breeding season (Seabird Wikispace). They obtain prey by snatching items from the surface or splash diving and dive depths are unlikely to be more than a metre (Seabird Wikispace). Their diet is composed primarily of pelagic marine organisms eating mainly fish (e.g. capelin, sand-eels, herring, sprat, cod, pollack and whiting) and invertebrates (crustaceans, molluscs, annelid worms and insects; e.g. Coleoptera and larval Dipterans). Kittiwake also scavenges fishing vessels. At Howth Head they spend an estimated 35% of their time away from the breeding colony in March feeding at sewage outlets, and 32% of their time away from the colony in July when feeding on available fish (O' Connor, 1974, quoted by Cramp and Simmons, 2004). They obtain prey through a number of means, dipping to surface, aerial pattering, surface plunging to depths of 0.5-1m, surface seizing, or sub-surface seizing with head ducking, in addition to eating discards and kleptoparasitism (Bent, 1921; Belopol'ski, 1957; Watson, 1981, quoted by Cramp and Simmons, 2004).

1.11 Common Tern

Common Terns typically feed within 3-10 km of their breeding colonies (studies quoted by Cramp and Simmons, 2004; Rock et al., 2007; Perrow *et al*., 2009), although distances of up to 22 km (Pearson, 1968), 37 km (Andrews, 1971, quoted by Cramp and Simmons, 2004) and 'some scores' of kilometres (Borodulina 1960, quoted by Cramp and Simmons, 2004) have

been reported. Newton (2012) states that Common Terns "*range more widely [than Little Terns] but would be expected to forage within a 5-10 km zone around their colony during the chick-rearing period*".

The Seabird Wikispace gives a mean foraging range of 9 km, a mean maximum of 34 km and a maximum of 37 km from breeding colonies, but states that "*breeding birds commonly range up to 20 km from the colony, less frequently to around 30 km*".

The Seabird Wikispace describes its key foraging habitats as: "*shallow coastal waters, bays, inlets, shoals, tide-rips, drift lines, beaches, saltmarsh creeks, lakes, ponds, or rivers*". They probably catch their prey in the upper 1-2 m of the sea surface.

Common tern's diet is usually dominated by small fish up to 150mm long, (e.g. herring, sprat, sandeels, sticklebacks, whiting, cod etc.) and crustaceans (e.g. shrimp *Crangon* sp. prawns *Palaemon serratus*, *Palaemonetes varians*, shore crab *Carcinus maenas*, etc.) though this can vary between sites as insects may form their primary prey base in certain colonies (e.g. Coleoptera, especially water-beetle larvae *Cybister laterimarginalis*, *Dytiscus marginalis*, etc. and cockchafers Melolonthinae, and occasionally caddisflies, *Phryganea* sp., butterflies, true flies, ants, bees, grasshoppers and crickets, mayflies, dragonflies, cicadas, etc.). They are generally an opportunistic feeder, and can adapt to varying circumstances by shifting their prey base and feeding methods (Cramp and Simmons, 2004). They are also known to scavenge offal and discards from fishing vessels (Cramp and Simmons, 2004).

1.12 Arctic Tern

Various studies have reported foraging ranges from breeding colonies: most within 3 km, maximum 10 km (Boecker, 1967, quoted by Cramp and Simmons, 2004); mean 8.5 km, maximum 29 km (Perrow et al., 2011); 9 km (Rock et al., 2007); 21 km (Pearson, 1968). Newton (2012) states that Arctic Terns "*range more widely [than Little Terns] but would be expected to forage within a 5-10 km zone around their colony during the chick-rearing period*".

The Seabird Wikispace gives a mean foraging range of 12 km, a mean maximum of 12 km and a maximum of 21 km from breeding colonies, but states that "*due to time and energy constraints, parent Arctic Terns have to forage close to the nest, with most feeding taking place within 3 km of the colony, exceptionally up to 10 km*".

Arctic Terns can feed in open marine waters and can tolerate severe weather conditions, although they may prefer sheltered waters for foraging (Cramp and Simmons, 2004). The

Seabird Wikispace describes its key foraging habitats as: "*open waters and shallow bays, rocky shores, tidal flats, shoals, tide rips, ocean fronts, upwellings, ice edges and faces of tidewater glaciers*". They probably catch their prey in the upper 0.5 m of the sea surface.

Arctic Terns feed on marine fish (e.g. sand-eels, herring, sprat, capelin, sticklebacks, pipefish, flounder, sole, hake, haddock etc.) crustaceans (e.g. isopods, amphipods mysid shrimps, shore crab shrimps and other branchiopods and copepods) and a range of insects though the proportion of each within its diet may vary between colonies (Cramp and Simmons, 2004). They hunt for fish predominantly by plunge diving which often follows hovering from a height of 1-6m diving to a depth no deeper than 0.5m (Dunn, 1972a, quoted by Cramp and Simmons, 2004). Other prey items such as crustaceans and insects are caught by dipping to surface, oblique-plunge diving or aerial pursuit (Bertram and Lack 1933, Bertram and Lack 1938; Baxter et al. 1949; Lemmetyinen 1973b, quoted by Cramp and Simmons, 2004). It has also been recorded scavenging at fishing vessels in the Irish Sea (Watson, 1981, quoted by Cramp and Simmons, 2004) and kleptoparasitising other birds (Norrevang, 1960, Williamson, 1948, quoted by Cramp and Simmons, 2004).

1.13 Roseate Tern

Roseate Terns forage in open water offshore. The Seabird Wikispace gives a mean foraging range of 12 km, a mean maximum of 18 km and a maximum of 30 km, though during breeding they forage within 15km of the colony (Cramp and Simmons, 2004). During the nestling period at Rockabill they have been observed foraging within 10 km of the colony (Newton & Crowe, 2000), however, during incubation and courtship they have been observed foraging 30km south of Rockabill (Newton & Crowe, 1999)

The Seabird Wikispace describes its key foraging habitats as: "Shallow and upwelling areas, including tide rips and shoals, over sandy bottoms." They have a mean diving depth of up to 6-7m.

Roseate Terns feed predominantly on marine fish (sand-eels, herring, sprat etc.), with a much less versatile diet than Common Tern (Cramp and Simmons, 2004). At Rockabill, 55-75% of its diet is composed of sand eels, with gadoids and cluepids forming the remainder (Newton and Crowe, 1999). During chick rearing sand eels generally remain the most frequently consumed prey item, though this can vary from year to year as in 1996-2002 the proportion of cluepids in diet surpassed sandeels (BirdWatch Ireland, Unpublished data, quoted by SeabirdsWiki). It hunts by plunge diving with a mean height of 4.2m within the U.K. (D C Duffy, quoted by Cramp and Simmons, 2004), to a depth of c. 0.75m; unlike the Common

and Arctic Tern it generally doesn't hover (Dunn, 1972a, quoted by Cramp and Simmons, 2004). Though it also dips to surface for small prey such as crustaceans, it generally does this much less than Common Tern (Britton and Brown, 1974, quoted by Cramp and Simmons, 2004).

1.14 Little Tern

Various studies have reported foraging ranges from breeding colonies: mean distances that birds foraged offshore of 473-489 m (Perrow *et al*., 2006); mean distance from colonies 2.1 km and 90% within 3 km (Fasola and Bogliani, 1990); maximum 4.9 km (Tomkins, 1959, quoted by Cramp and Simmons, 2004); maximum 6 km, but not more than 1.5 km offshore (unpublished data, quoted by Cramp and Simmons, 2004). Newton (2012) states that "*Little Terns usually forage very close to their colonies*". While the above studies indicate that Little Terns generally do not forage far offshore, they have been reported feeding at upwellings up to 600 km off Guinea (Grimes, 1977, quoted by Cramp and Simmons, 2004).

The Seabird Wikispace gives a mean foraging range of 4 km, a mean maximum of 7 km and a maximum of 11 km from breeding colonies, but states that "*Little Terns have very short foraging ranges compared to most seabirds, with most food generally being obtained from within 5 km of the colony, and usually within 1 km of the shore*".

The Seabird Wikispace describes its key foraging habitats as: "very shallow water, advancing or receding tidelines, brackish lagoons and saltmarsh creeks, sand-banks close to the coast." They probably catch their prey in the upper 0.5m of the sea surface.

The diet of Little Terns is dominated by both saltwater fish (e.g. sand-eel, pipefish, smelt, herring, sprat, etc.) and freshwater fish (e.g. roach, rudd, carp, perch, etc.), though the proportion of each in the diet varies depending on location. It also takes crustaceans, primarily shrimps and prawns but also crabs, and occasionally terrestrial insects (Cramp and Simmons, 2004).

1.15 Guillemot

Cairns *et al*. (1987) reported median potential foraging ranges of 37.8 km for incubating birds and 5.4 km for chick-rearing birds from a Newfoundland colony, with maximum potential ranges of 123 km during incubation and 80 km during chick rearing. They used electronic activity recorders to measure flight time, dive time, and time on the water and used this data to calculate the potential foraging range. Other studies have used flight speed and time absent from the breeding site to calculate maximum foraging ranges, but Cairns *et al*.'s (1987) data

suggest that this may overestimate foraging ranges by a factor of 10. Some other studies have reported observations of Guillemots at considerable distances from the nearest breeding colony (50-80 km, Hatch *et al*., 2000; 25-60 km, Mehlum *et al*., 1998). However, in Shetland, Monaghan *et al*. (1994, quoted by Cramp and Simmons, 2004) found that breeding adults remained within 10 km of their colony.

The above studies accord with the statement by Newton (2012) that Guillemots have foraging ranges (distance travelled from the colony during the chick-rearing period) of about 40 km when conditions (abundance of forage fish) are reasonable to good. In poor years, the distance travelled to find prey could considerably exceed this.

The Seabird Wikispace gives a mean foraging range of 25 km, a mean maximum of 61 km and a maximum of 200 km. It has been noted that foraging range may vary from colony to colony (Birkhead, 1976, quoted by Cramp and Simmons, 2004). In Scotland, at Fair Isle the majority of birds were observed within 6km of the colony (P Hope-Jones, quoted by Cramp and Simmons, 2004), though they have also been recorded foraging 20-50km (Belopol'ski, 1957, quoted by Cramp and Simmons, 2004). During the pre-laying period they seem to forage much greater distances, travelling as far as 200km from the colony to feed (Birkhead, 1976, quoted by Cramp and Simmons, 2004).

Guillemots feed in open marine waters and can tolerate severe weather conditions. They are often associated with fronts and other ocean features that concentrate prey as well as offshore sandbank and areas of sandy sediment (Seabird Wikispace). They typically dive to depths of less than 50 m, but can dive to depths of up to 200 m (Seabird Wikispace).

Guillemot feed primarily on fish (e.g. herring, sprat, capelin; sand-eels, cod, haddock, whiting, pollack, mackerel, three-spined stickleback etc.), though they also occasionally supplement their diet with invertebrates, primarily crustaceans (crabs, amphipods and copepods) but also polychaete worms.

1.16 Razorbill

The Seabird Wikispace gives a mean foraging range of 10 km, a mean maximum of 31 km and a maximum of 51 km. Cramp and Simmons (2004) quote foraging ranges in two studies of 9-13 km and 15-20 km. During breeding season recorded foraging ranges varied from 9-20km from the breeding colony (Kaftanovski, 1951; Kartashev, 1960; Lloyd, 1976a, quoted by Cramp and Simmons, 2004). Often kleptoparasitises Puffins in colonies, further enhancing food availability (Ingold and Tschanz, 1970, quoted by Cramp and Simmons, 2004).

Razorbills feed in open marine waters and can tolerate severe weather conditions (although they are not typically pelagic; Cramp and Simmons, 2004). The Seabird Wikispace describes their key foraging habitats as "*shallow waters, sandy seabeds; upwelling areas and tidal fronts*". Wanless *et al*. (1990) found that the Razorbills appeared to favour areas of relatively shallow water (< 30 m). Carboneras *et al*. (1988; quoted by Wanless et al., 1990) also found that Razorbills wintering in the Mediterranean fed mainly in inshore, shallow areas and Wanless *et al*. (1990) suggest that Razorbills may be more specialised in their foraging habitat than Guillemots or Puffins. However, other studies have found Razorbills using deeper waters (Seabird Wikispace). Though Razorbills have a recorded maximum dive depth of up to 45-52m (Kozlova, 1957, quoted by Cramp and Simmons, 2004), they generally dive to a depth of 5m, with dives lasting between 22 and 45 seconds (Paludan, 1960, quoted by Cramp and Simmons, 2004).

The diet of Razorbills is composed primarily of fish (e.g. sand-eels, sprat, herring, capelin, sardine, anchovy, three-spined stickleback etc.) but also some invertebrates, generally polychaete worms and some molluscs.

1.17 Puffin

Some studies have reported large potential foraging ranges of 32-48 km (Corkhill, 1973); 35-100 km, (Bradstreet and Brown, 1985) (both quoted by Kober *et al*., 2010); and 85.7 miles (Pearson, 1968). However, these are based on using flight speed and time absent from the breeding site to calculate maximum foraging ranges, and this method may substantially overestimate the normal foraging range (cf. Cairns *et al*., 1987). Other reports indicate that Puffins often mainly feed close to their colonies, within 8-10 km (Cramp and Simmons, 2004), while a line transect from Skomer found that 85% of Puffins were feeding within 3 km of the colony. Newton (2012) states that Puffins are "*probably intermediate [between Fulmar and Kittiwake, Guillemot and Razorbill in their foraging range*".

The Seabird Wikispace gives a mean foraging range of 30 km, a mean maximum of 62 km and a maximum of 200 km. During the breeding season their foraging range has been reported to be between 2-10km from the colony (Harris and Heaslop, 1978; Ashcroft, 1976, quoted by Cramp and Simmons, 2004), with one study reporting 85% of the colony feeding within 3km of their breeding grounds, though individuals were also observed feeding 37km from the colony (Corkhill, 1973, quoted by Cramp and Simmons, 2004)

Puffins feed in open marine waters and can tolerate severe weather conditions. The Seabird Wikispace describes their key foraging habitats as "*shallow waters, tidal fronts*". Puffins can

dive to depths of up to 60 m, although most prey is caught within 30 m of the water surface (Seabird Wikispace).

The diet of Puffin is comprised primarily of fish (e.g. sand-eels, sprat, herring, capelin, mackerel, cod, whiting, haddock, pollack etc.), but can vary depending on location with species in arctic regions consuming more invertebrates, particularly shrimp like crustaceans and squid (Cramp and Simmons, 2004). The majority of prey is taken from near the surface of the water, with diving depths not thought to exceed 15m (Harris and Hislop, 1978, quoted by Cramp and Simmons, 2004), though Puffin can dive deeper when feeding on crustaceans (Bird and Bird, 1935, quoted by Cramp and Simmons, 2004).

1.18 Fulmar

Fulmar feed in open marine waters and can tolerate severe weather conditions. Seabird Wikispace describes their key foraging habitats in temperate zones as "*relatively clear 'oceanic' water with high salinity*". Stone *et al*. (1995) found that in NW European waters, Fulmars were found mainly in waters of greater than 100 m depth. They are mainly surface feeders but can dive to depths of at least 3 m. Their diet usually consists of planktonic crustaceans (e.g. amphipods *Hyperia*, *Gammarus*, *Themisto libellula* and schizopods, isopods, cumaceans, polychaetes, etc.) cephalopods, fish, fish offal and carrion (Cramp and Simmons, 2004). Though live fish only forms a small part of the Fulmar's diet, they are capable of pursuit plunging diving up to 4m deep (Fisher, 1952, quoted by Cramp and Simmons, 2004). While brooding, Fulmars may range up to around 60 km from their nest site (Weimerskirch et al., 2001). Once their chicks have hatched they may range much further (100's of km). The Seabird Wikispace gives a mean foraging range of 69 km, a mean maximum of 311 km and a maximum of 664 km.

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