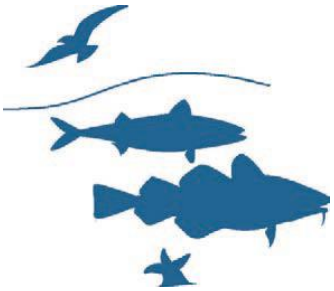
ATLAS OF COMMERCIAL FISHERIES FOR SHELLFISH AROUND IRELAND

MARCH 2017

Marine Institute
Foras na Mara
Fisheries Ecosystems Advisory Services

Atlas: Commercial Fisheries for Shellfish around Ireland



Fisheries Ecosystem Advisory Services,
Marine Institute,
Rinville,
Oranmore,
Co. Galway
H91 R673

Phone: +353 91 387 200
www.marine.ie

March 2017

The Marine Institute Atlas series:

The atlas series of publications by the Marine Institute FEAS (Fisheries Ecosystem Advisory Services (www.marine.ie) focus on disseminating marine fisheries data in a spatial and visual format. The current "Atlas of Commercial Fisheries for Shellfish around Ireland" is the 9th in the MI Fisheries Atlas series. Previously published atlases are:

1. Making the European Fisheries Ecosystem Plan Operational (MEFEPO). North Western Waters Atlas
2. An atlas of fishing and some related activities in Ireland's territorial sea and internal marine waters with observations concerning their spatial planning (2008). First edition.
3. Atlas of Commercial Fisheries around Ireland (2009). First edition.
4. Atlas of demersal discarding (2011)
5. MEFEPO North Western Waters Atlas (2011). Second edition
6. Atlas of Irish Groundfish trawl surveys (2012)
7. Atlas of Commercial Fisheries around Ireland (2014). Second edition.
8. MEFEPO North Western Waters Atlas (2015). Third edition

Photograph on cover:
Cockle fishing boat on way to fishing grounds early morning Dundalk Bay. Photo by Sarah Clarke, Marine Institute, Galway

Acknowledgements (photographs)
Lobster, Velvet Crab, Spider crab, Shrimp, Crayfish, Scallop: Jonathan White, Marine Institute, Galway
Brown crab: Edward Fahy
Nephrops: Nicolas Chopin, BIM, Galway
Whelk: Alan Drumm, Marine Institute, Galway
Oyster: Sarah Clarke, Marine Institute, Galway
Razor Clams: Macdara O'Cuaig, Marine Institute, Galway
Cockle: copyright Féron Benjamin – Flickr, CC BY-SA 2.0
Surf Clam: Ian Lawlor, BIM, Dublin
Mussels: copyright National Museum of Northern Ireland
Periwinkle: Paul Morris from USA (Littorina littorea Uploaded by JoJan) [CC BY-SA 2.0 (http://creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

Acknowledgement (data):
Owen Doyle, Declan Nee, Seamus Breathnach, Peter Tyndall, Vera O Donovan, John Hickey at BIM provided information on crustacean pot fisheries

Recommended format for citation:
Tully, O. 2017. Atlas of Commercial Fisheries for Shellfish around Ireland, Marine Institute, March 2017. ISBN 9781902895611 58pp.

Atlas compiled by Oliver Tully and edited by Niamh Slattery and Sarah Clarke at the Marine Institute

Contents

Introduction

Fishing is the longest standing and most prevalent marine activity in the territorial and coastal waters of Ireland. Fisheries for native oysters were present on many coasts as early as the 1500s. Other fisheries such as herring and lobster were already developed in the mid-19th century. Some fisheries are, by comparison, relatively new; pot fishing for shrimp developed in the 1970s and dredging for razor clams began in the 1980s. Other traditional fisheries such as the drift net fishery for salmon are now closed due to stock declines. Today over 2,000 vessels are registered as commercial fishing vessels and over 80% of these are under 12m in length and depend largely or completely on the territorial waters of the state.

In addition to fishing there are also a number of other industry sectors which depend on the territorial marine space. These include aquaculture, shipping, marine leisure and more recently renewable energy. The spatial distributions of these activities are described in Irelands Marine Atlas (atlas.marine.ie). The increased level and diversity of activity in the maritime space has highlighted the need for efficient and co-ordinated management of its use to avoid conflict and to identify, where possible, synergies both within and between sectors. These objectives are reflected in the Marine Spatial Planning (MSP) Directive which came into force in 2014 and which requires EU Member States to establish and implement maritime spatial planning (EU/89/2014).

The Habitats Directive, Birds Directive and Marine Strategy Framework Directive indirectly imply a need to manage and plan industrial activity, including fishing, in a spatial context given that these Directives designate spatially distributed marine features for environmental conservation purposes and where the interaction with fisheries and the environment has to be managed.

Describing the spatial distribution of fishing in territorial waters is, therefore, important as such fisheries have to be considered in any future MSP initiatives. These spatial data have already been used in Ireland to assess the interaction between fisheries and Special Areas of Conservation (SACs) (www.fishingnet.ie/fishinginnaturaareas, Marine Institute 2015). Spatial profiling of fishing by vessels under 12m in length, which currently, in the main, do not report the position of their activity, is important. Such vessels are more dependent on local fisheries and local marine space than larger vessels and it is important to their sustainable development that competition for resources and the impacts this might have on smaller fishing vessels, both with other sectors and within the fisheries sector can be estimated.

The first Atlas of 'inshore' fisheries or fisheries in the internal and territorial waters of Ireland was produced by Fahy *et al.* (2008) also in the context of the future needs of MSP and other Directives. Since that time new data on fishing activity has been collated from expert knowledge, fishery surveys and from vessel monitoring systems and of course the profile of fishing changes over time and needs to be updated periodically. The new data are presented here but the scope is restricted to Shellfish fisheries and with an emphasis on the distribution of these fisheries in internal and territorial waters. The Atlas complements that of Gerritsen and Lordan (2014) who describe the demersal and pelagic fisheries.

Data sources

Data on fishing activity of vessels over 15m in length (location, fishing effort, landings) can be derived from their Vessel Monitoring System (VMS) information, which includes latitude, longitude and speed, when this is combined with catch reports from logbooks of these same vessels (Gerritsen and Lordan 2011). Vessels 12-15m in length have reported VMS only since 2014. Vessels 10-12m in length do not generally have VMS and report landings data at ICES statistical rectangle level only. Vessels under 10m, which comprise the majority of the inshore fleet, do not report position, catch or fishing effort. Vessels fishing for razor clams are required, irrespective of vessel length, since 2015, to report position using Inshore VMS (iVMS). The Irish Naval Service and the Sea Fisheries Protection Authority (SFPA) collect and manage data on VMS and logbooks respectively. The Marine Institute currently manage data from iVMS. Annual estimates of volume and value of landings are from SFPA.

In addition to the above, and to obtain a more complete picture of fishing activity in territorial waters especially for vessels under 12m, in 2013 and 2014 data on the location, type and level of fishing activity by inshore vessels was collected to inform a risk assessment of the potential impacts of fishing activity on marine habitats and species designated under the Habitats and Birds Directives. These data are used in this Atlas and were sourced as follows;

- Bord Iascaigh Mhara (BIM), Sea Fisheries Protection Authority (SFPA) and Marine Institute (MI) have documented and undocumented knowledge of the distribution and extent of shellfish fisheries which have been acquired during annual work programmes.
- Local detail on spatial extent of shellfish resources, the type of fishing gear used and fishing seasons was, where possible, acquired from fishermen
- In some areas more detailed questionnaire data completed by individual fishermen was available. In this case the distribution of fishing activity and the level of activity of each vessel could be mapped and described
- For some bivalve stocks Marine Institute survey data describes the distribution of commercial quantities of shellfish and therefore defines where fishing for such species occurs or could occur. Additional information on annual fishing activity in these areas was compiled from expert sources
- In some fisheries private vessel diary data on fishing positions for vessels were available.

Data presented in this Atlas are time bound and refer only to the periods of time referred to above.

Geographic restrictions relevant to Shellfish fisheries

Maritime Limits Relevant to Fisheries

From a fishery perspective the 12nm limit or the territorial sea area is a significant demarcation. This is the sea area, often also used to define the boundary of 'inshore' fisheries, over which Ireland can exercise control over fishing activity, notwithstanding traditional fishing rights of some member states to fish certain stocks in the 6-12nm zone. The authority for fisheries seaward to 12nm, which is vested with EU Member States, is an exception to the principle of equal access to EU waters enshrined in the Common Fisheries Policy (CFP). Traditional fishing rights by certain member States in the 6-12nm zone are retained, however, under this general exception. These rights are defined in Annex I of the CFP (EC 1380/2013). Fisheries seaward to 6nm are regulated solely by the Irish Government although the EU is consulted with respect to changes in technical measures even for species caught solely inside 6nm.

The 12nm limit is measured not from the shoreline but from the baselines (S.I. 173/1959). The baselines are straight lines joining a series of co-ordinates, usually at headlands, from Malin Head to Carnsore Point. In the Irish Sea the baseline is the coastline[1]. Waters landward of the baseline are the internal waters of the state.

In addition special arrangements have been in place between The Republic of Ireland and Great Britain, since 1964, which allows fishing vessels less than 75ft, registered in Northern Ireland, to fish in the territorial seas of the Republic of Ireland and vice versa. This is referred to as the *voisinage* agreement[2].

Zone	Definition	Area (km^2)	Relevant Legal frameworks
Internal waters	Waters landward of baselines	13,650	London Convention 1964. UN Convention on the Law of the sea 1982. Sea Fisheries and Maritime Jurisdiction Act, 2006. Part 3. Section 83. Common Fisheries Policy 2013 Fishery Limits (European Communities Regulations) 1984
Territorial Sea	Baseline to 12nm	27,487	
6-12nm zone	Baseline to 6nm	13,662	

[1] The ordnance Survey of Ireland (OSI) are currently establishing new baseline points for the east coast of Ireland.
[2] In 2016 this arrangement was found by the Irish supreme court to have no legal basis in the Republic of Ireland

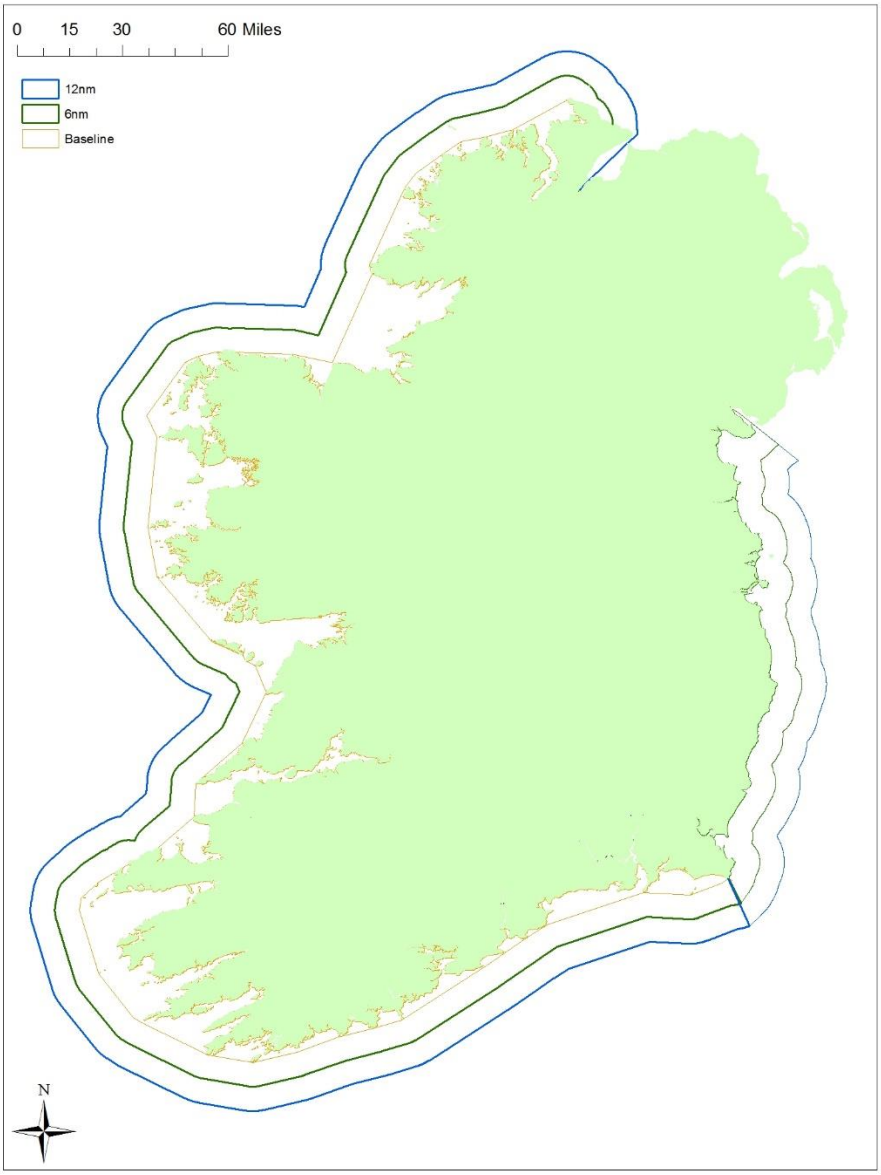


Figure 1. Maritime limits in the waters around Ireland relevant to the governance of fisheries

Hygiene regulations and bivalve fisheries

Notwithstanding fisheries conservation or management measures that may be in place other regulations and activities also impinge on where fisheries for shellfish may occur at any given time. These are mainly in relation to management of public health risks associated with bivalve shellfish and also potential restrictions in relation to the need to protect habitats within designated conservation areas and also outside of these areas in the case of certain habitats.

Classified Production Areas for Bivalves

EU regulations (EC 854/2004, 853/2004, 2073/2005) exist to control the public health risks associated with consumption of microbiologically contaminated bivalve shellfish. The risk of contamination of shellfish with bacterial and viral pathogens is evaluated by reference to (i) the sources and types of faecal contamination (human and animal) in the vicinity of the shellfish production areas and (ii) the results obtained, based on the indicator bacteria *E. coli*, from samples taken in these areas (www.sfpa.ie). Areas are classified following a full assessment of this risk and the classification given to an area determines whether shellfish harvested in that area require post-processing treatment and, where appropriate, the level of such treatment. Harvesting of bivalve shellfish, other than scallop, from outside of classified production areas is forbidden. These regulations therefore significantly control the geographic distribution of inshore bivalve fisheries.

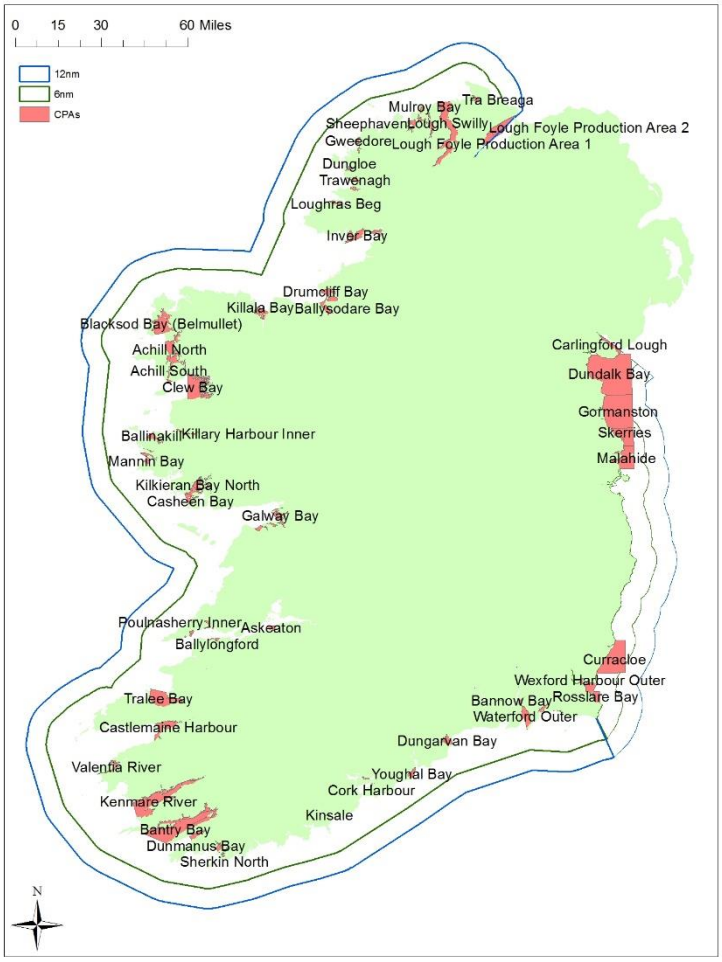


Figure 2. Classified production areas for bivalve molluscs in the territorial sea area around Ireland

Conservation zones

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)

Special Areas of Conservation (SACs) are areas designated for the conservation and protection of marine habitats and species under the EU Habitats Directive (EC 92/43). Special Protection Areas (SPAs) are areas designated for the protection of birds under the Birds Directive (EC 79/409). Each area has specific features that are subject to conservation objectives and targets. The interaction of fisheries with such features, depending on the risk posed by a particular fishery to the feature, may need to be managed and this may lead to restriction, including spatial restriction, on where such fisheries could be permitted. Assessments under Article 6 of the Habitats Directive of the risk posed by Shellfish fisheries to habitats and species in SACs were completed for Irish territorial waters in 2015 (www.fishingnet.ie, Marine Institute 2015) and mitigations including spatial restrictions on shellfish and other fisheries continue to be developed.

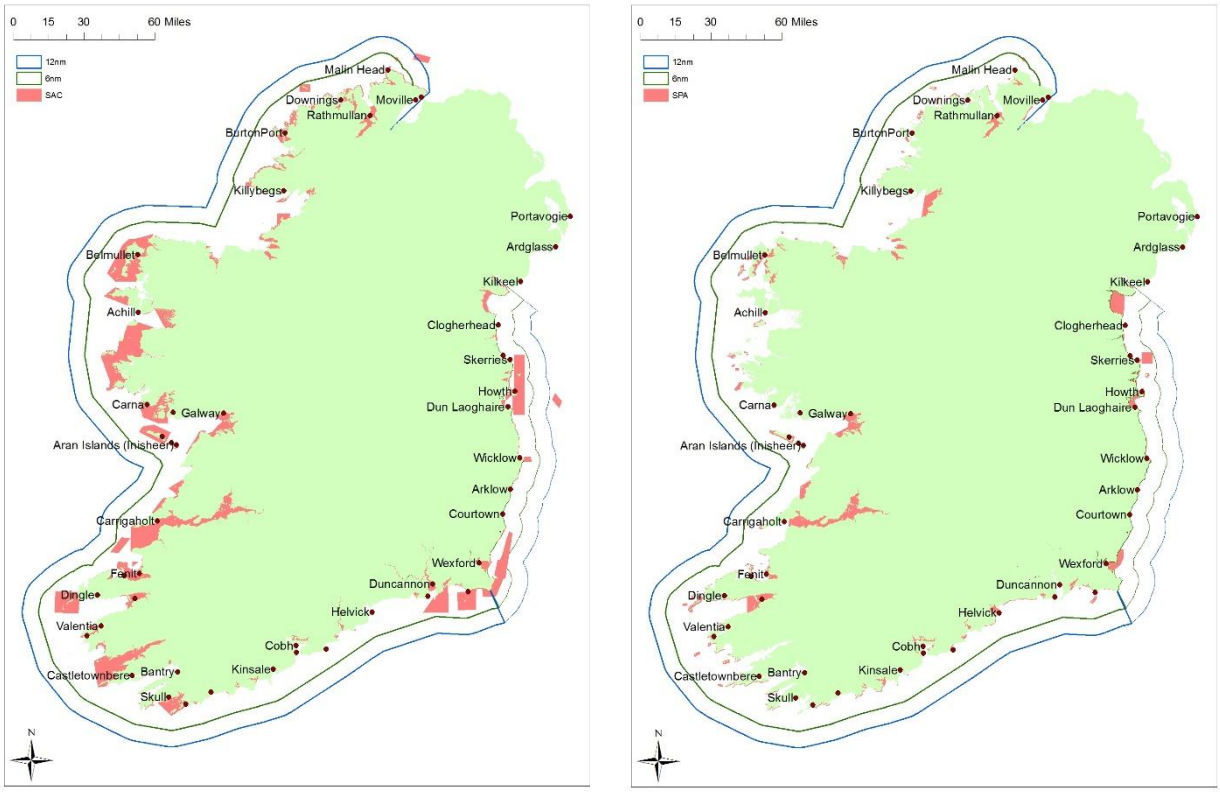


Figure 3. Special Areas of Conservation (SACs; Habitats Directive) and Special Protection Areas (SPAs; Birds Directive) in the territorial waters of Ireland

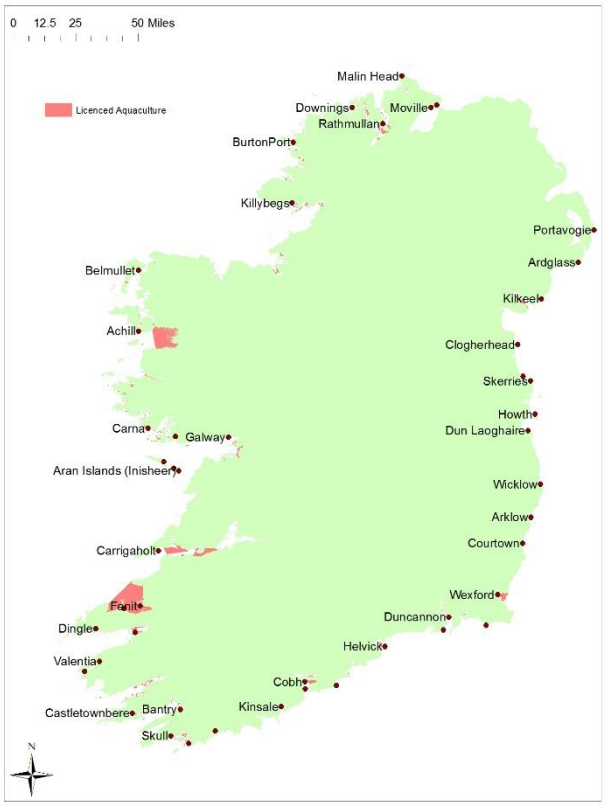
Shellfish and finfish Aquaculture

The aquaculture of marine shellfish and finfish is enabled through licencing of specific sites. The licences, which are usually issue for a period of 10 years, gives the licence holders exclusive access to the sites for the purpose of producing shellfish/finfish and the licensee is entitled to have excluded activities that might interfere with the purpose for which the site is licenced. Such sites are generally, therefore, off limits to fisheries and this can restrict the activity of fisheries at a local level. Some licences are also issued to groups (typically co-operatives) usually for the purpose of extensive bottom culture of shellfish such as oyster and mussel.

In addition to aquaculture licences oyster fishery orders have previously been granted, under the Fisheries Amendment Act of 1959 (Part XIV, Chapter 3) to local groups. Under an oyster fishery order the management of an oyster bed is vested in a board or other corporate body which then has exclusive rights over the management and culture of oysters in the area and may appoint 'keepers' for the purpose of protecting the oyster bed. Provision is made in the Act (Article 266) to revoke oyster fishery orders where the oyster bed is not being maintained by the corporate body to which the order has been issued.

There are also many synergies between extensive shellfish aquaculture and shellfish fisheries particularly in the case of mussels, Pacific oysters and native oysters. In these cases extensive aquaculture methods may be 'put and take' fisheries or represent the management of enhanced fisheries. A number of naturally recruiting (wild) native oyster stocks are managed using aquaculture licences, in addition to oyster fishery orders. Wild mussel seed is dredged from the Irish Sea and other areas for on growing in aquaculture sites licenced for the culture of bottom grown mussels. Hatchery produced oysters, including Pacific oysters, may be re-laid on the seabed and dredged for harvesting.

Arrays of oyster trestles in an intertidal Aquaculture site. Image by ATKINS, Cork.



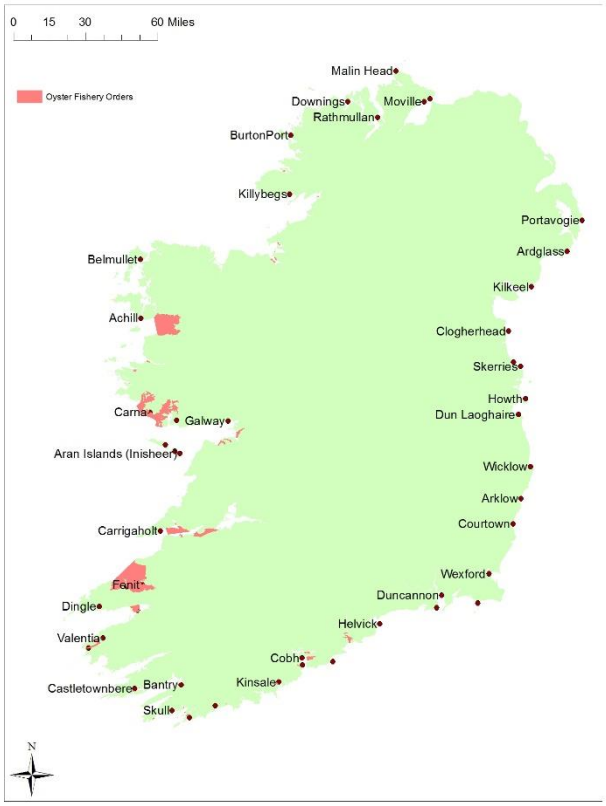


Figure 4. Licenced marine aquaculture sites as of July 2016 and extant Oyster Orders. Aquaculture sites where the licence may have lapsed or where applications have been made but no licences have been issued are not shown.

Shellfish: volume and value of landings

The volume and value of shellfish, including prawns (*Nephrops)*, from wild capture fisheries in 2015 was 31,253 tonnes and €93.5million, respectively. Excluding prawns shellfish landings and value were 22,862 tonnes and €46.2million, respectively in 2015. The average value per tonne in the pelagic, demersal and shellfish (inc prawns) categories in 2015 was €477, €1948 and €4370, respectively.

Prawns account for approximately one half of the total value and one quarter of the volume of shellfish landed. King scallop, Brown crab, Lobster and razor clams are individually valued at between €5-12million per annum.

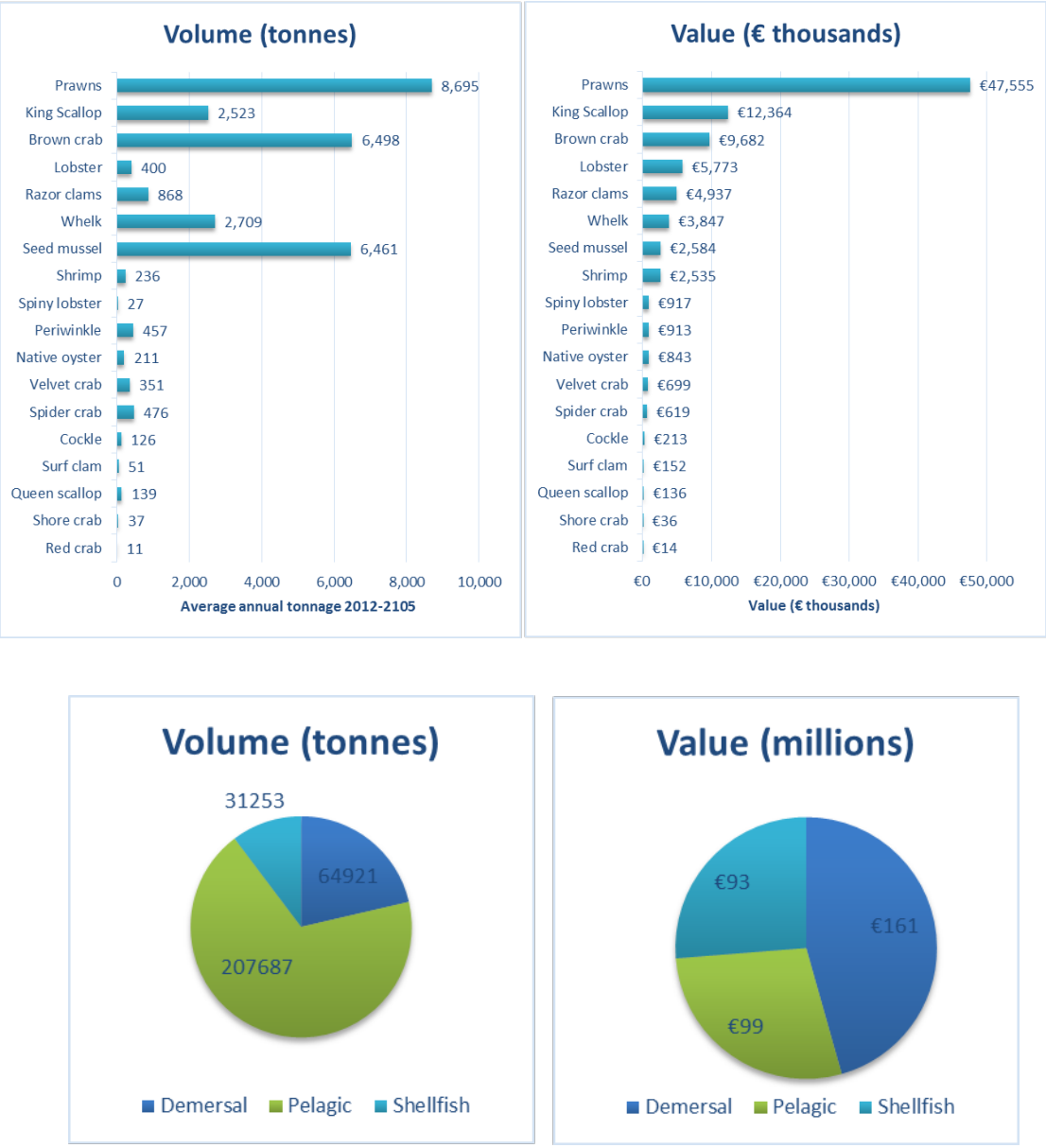


Figure 5. Value and volume of Shellfish species landed into Ireland. Volumes are annual tonnage landed averaged over the 3 year period 2013-2015. Unit values are approximate and taken from sales note data where available. The relative volume value of demersal, pelagic and shellfish (includes Nephrops) species is shown.

Descriptions of individual fisheries

Short accounts of individual fisheries and their spatial distributions are presented in the following pages.

Notes on the biological characteristics of each species, that are relevant to its resilience and response to fishing, are presented. In addition a description of the current likely status and prospects for commercially exploited populations of the species is presented and management measures are described. More detailed information on shellfish stocks are published annually by the Marine Institute in the Shellfish Fisheries Review (www.marine.ie).

The geographic distribution of shellfish fisheries, for each species, and also stocks whose distribution is known, but which are not fished, are shown. The maps are presented at different scales for widely distributed, regionally distributed and very locally distributed stocks. The distribution information is, as described above, based on expert knowledge, questionnaire data or survey but is presented only in terms of spatial extent and does not show abundance, density or biomass information. The spatial extent data may show a number of overlapping polygons. These arise from the expert knowledge and questionnaire data where the descriptions relate to particular areas where local fleets or individual boats usually fish.

Where available data on fishing effort or potential fishing effort is presented. This is either a tabular listing of the number of units of gear used in a specific area or the actual fishing effort, as reported from the vessel monitoring systems (VMS) used by the vessels, and which is presented in raster format, in fishing hours, for particular years. This VMS data for particular years is overlain on the spatial polygon data which then represents the entire known distributional extent of a stock or fishery. In many cases the actual fishing effort remains poorly known.

Landings (tonnes) per year for the period 2004-2015 are presented for each species.

Lobster (*Homarus gammarus*)

Biology

Long lived crustacean inhabiting reef. Size at which 50% of females are mature is 95mm carapace length. Growth increment at moult 6mm for main commercial size classes, moult frequency annual or biennial. Moult in summer. Moulting and spawning, generally, in alternate years. Not migratory. Scavenger and predator. Larval dispersal phase about 30 days. Larvae hatch June to August. Larval behaviour may limit dispersal.

Status

The minimum landing size (MLS), maximum landing size and v-notching increases egg production to above a recognized limit reference point which safeguards against stock collapse but stock productivity may be limited by low egg production. Catch rates and recruitment (undersized lobster catch rates) generally stable.

Management

The fishery is managed using technical measures. There is no regulation of landings of fishing effort. The minimum legal landing size is 87mm carapace length. A maximum size limit of 127mm was introduced in 2016. It is also prohibited to land v-notched lobsters. The number of v-notched lobsters in the stock varies on different coasts.

Fishery

Baited traps, all year but mainly March to October. By-catch in set nets. Annual landings may be up to 800 tonnes (2004). Total activity estimated in 2013 was 765 vessels fishing 214,000 pots. Although the fishery for lobster is targeted there is a significant by-catch of brown and velvet crab in the fishery. Lobster becomes less abundant and brown crab are more abundant with increasing depth. Velvet crab are a common by-catch in the fishery close to shore.

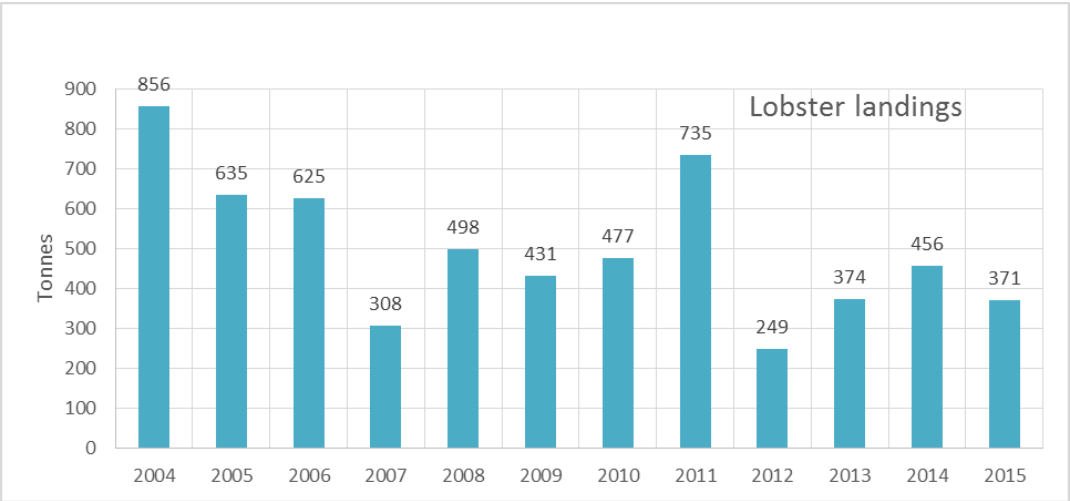


Figure 6. Annual landings (tonnes) of lobster into Ireland

Fishery Profile Lobster: All areas

Fishing Activity

Profile in 2013-2014. The number of pots for various coastal areas was described in 2013-2014 using expert knowledge and questionnaire data. Confidence in the data is moderate.

Locations	Vessels	Pots
Killybegs to Malin Head (North west coast)	200	57,000
Erris Head to Sligo Bay (North west coast)	57	20,000
Killary to Roonagh Quay (North west coast)	10	5,900
Inisturk (West coast)	8	3,200
Inisbofin (West coast)	15	3,750
Killary to Slyne (West coast)	47	11,000
Clew Bay (West coast)	16	2,800
Slyne to Spiddal (West coast)	96	32,000
Aran Islands (West coast)	19	3,000
Black Head to Slyne Head (West coast)	21	8,400
Galway Bay (West coast)	14	2,400
Blasket to Tralee Bay to Shannon (South west coast)	40	10,000
Dingle Bay (South west coast)	20	3,000
Doulus Head to Bray head (South west coast)	7	950
Blaskets (South west coast)	16	6,300
Ballinskelligs to Kenmare River (South west coast)	14	4,000
Baltimore to Kinsale (South coast)	20	5,700
Kinsale to Cork Harbour (South coast)	23	6,555
Roches Point to Helvick (South coast)	20	5,700
West of Helvick (South coast)	10	2,850
West and south of Dunmore East to Saltees (South coast)	13	3,705
South Wexford (South coast)	35	9,975
Dublin to Dundalk (East coast)	44	6,100
Total	**765**	**214,285**

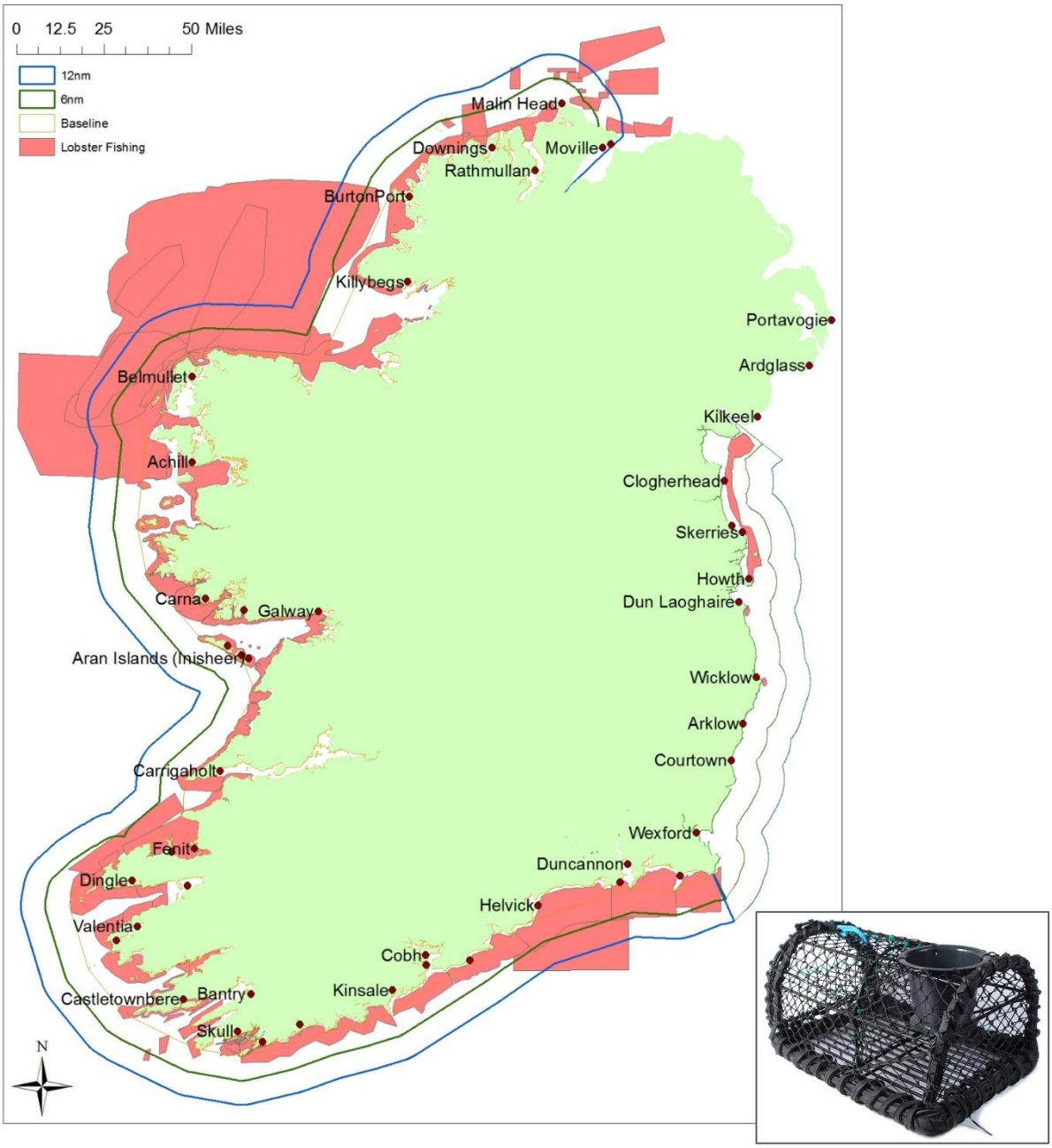


Figure 7. Geographic distribution of lobster fishing off the coast of Ireland based on expert knowledge and questionnaire data. Offshore fishing targets brown crab with a lobster by-catch. Right: top entrance creel with parlour.

Velvet crab (*Necora puber*)

Biology

Inhabits shallow water reef or patchy reef with crevices and mixed sediments. Juveniles also found in sand. More common in Bays than open coasts. Relatively short lived (4-6 years) and fast growing. High fecundity with more than 1 brood per year. Matures at 1-2 years at 45-50mm carapace width.

Status

Depleted in some areas probably due to high fishing mortality. Also prone to high variability in recruitment.

Management

No management measures in place.

Fishery

Baited traps, all year but mainly March to October. Usually as a by-catch in the lobster fishery but targeted locally on the south west coast, Dublin coast, Galway and Donegal.

Regional profile

Distribution of fishery similar to that of lobster but usually in shallow waters less than 20m depth. Landings mainly into ports on the south west coast (Bantry, Castletownbere, Crosshaven, Schull, Skiberreen), west coast (Rossaveal), south east coast (Rosslare, Kilmore Quay) and east coast (Howth, DunLaoghaire, Clogherhead). Annual landings up to 400 tonnes.

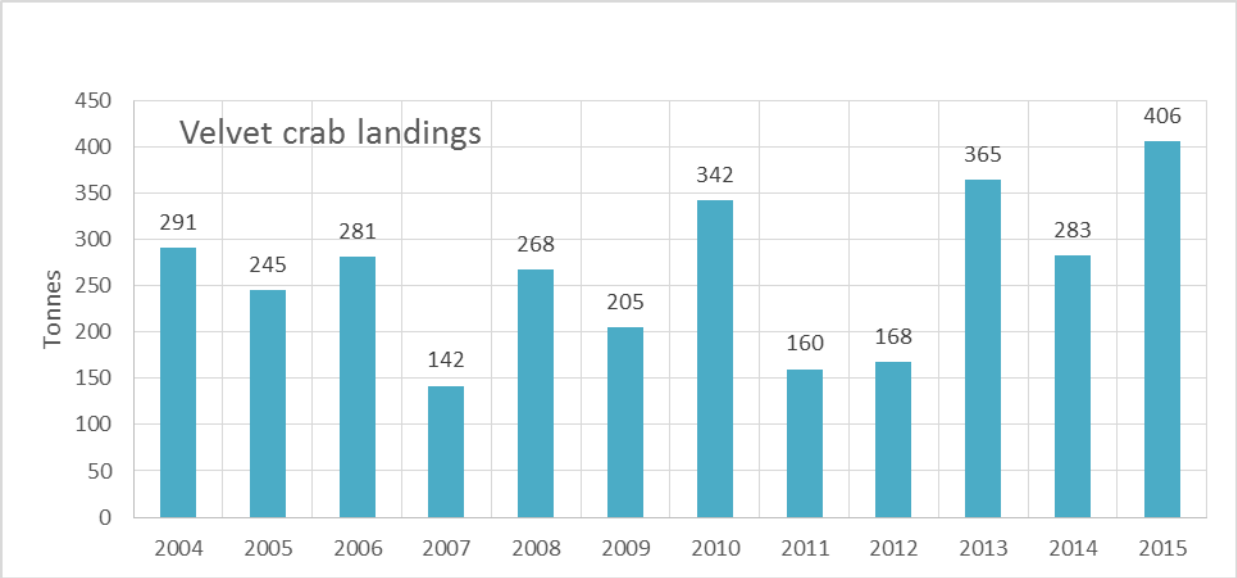


Figure 8. Annual landings (tonnes) of velvet crab into Ireland

Spider crab (*Maja brachydactyla*)

Biology

Relatively short lived (<10 years) species. Inhabits mixed reef-sedimentary habitats and clean sand. Migrates inshore in spring to release larvae and moult. Larval life is short comprising only 2 stages. Adults have a terminal moult after which there is no further growth.

Status

Lightly exploited in many areas. May have expanded its distribution in past 20 years. Possibly depleted in areas with targeted fishery.

Management

Minimum landing size of 125mm carapace length for females and 130mm for males.

Fishery

Baited top entrance traps, mainly in spring and early summer. Also by-catch in lobster fishery. Significant catch in tangle nets set for crayfish in Tralee Bay and Brandon Bay.

Regional profile

Targeted pot fishery mainly in Brandon Bay and Tralee Bay. Also south east coast and smaller landings from other areas. Annual landings up to 1,000 tonnes[3].

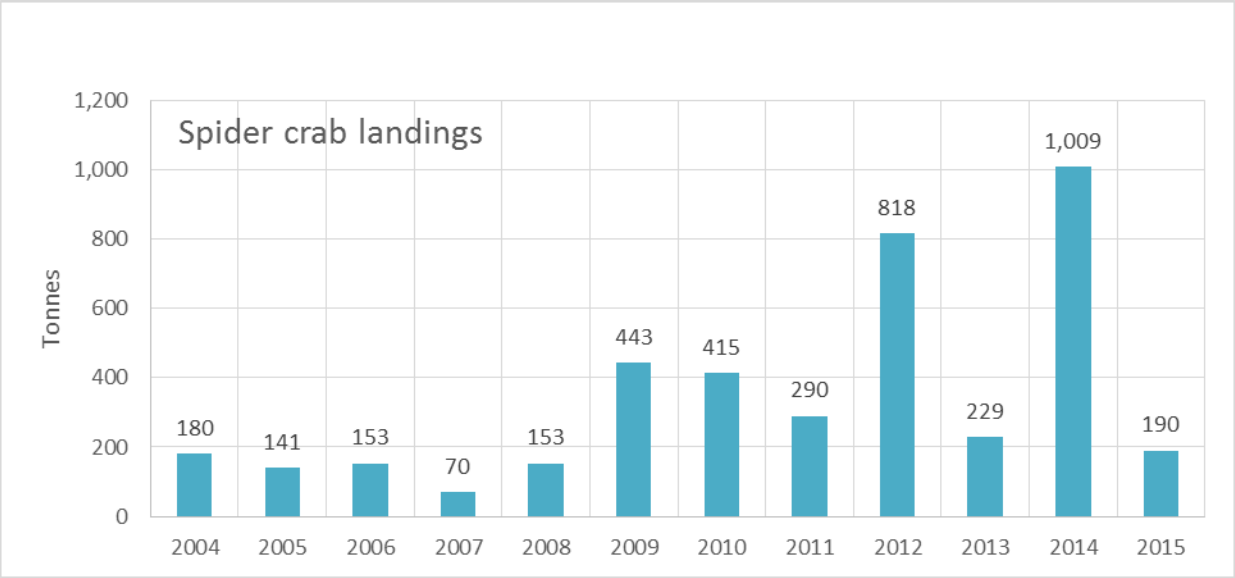


Figure 9. Annual landings (tonnes) of spider crab into Ireland

[3] Landings data in 2012 and 2014 may be unreliable

Brown crab (*Cancer pagurus*)

Biology

Long lived, size at 50% maturity of female crab is 120mm carapace width. Growth increment at moult 15-25% of pre-moult size for main commercial size classes and is higher in male crab. Moult frequency of commercial size classes is annual and declines with size. Moult in summer mainly but moult season may be protracted. Migratory. Scavenger and predator. Larval dispersal phase about 30-50 days. Larvae hatch March to November. Adult lives in sedimentary and reef habitat.

Status

Spawning potential is well protected by the minimum landing size (130-140mm) and the effective market size which is above 130mm. Catch rates and recruitment (undersized crab index) are stable.

Management

The fishery is managed solely by MLS of 130mm (140mm north of 56°N).

Fishery

Baited traps, all year but mainly March to November. Targeted fishery in inshore waters and offshore in the northwest to 200m depth. By-catch in set nets and bottom trawls. Landings in 2004 over 14,000 tonnes but 6,000-8,000 tonnes in the period 2008-2015.

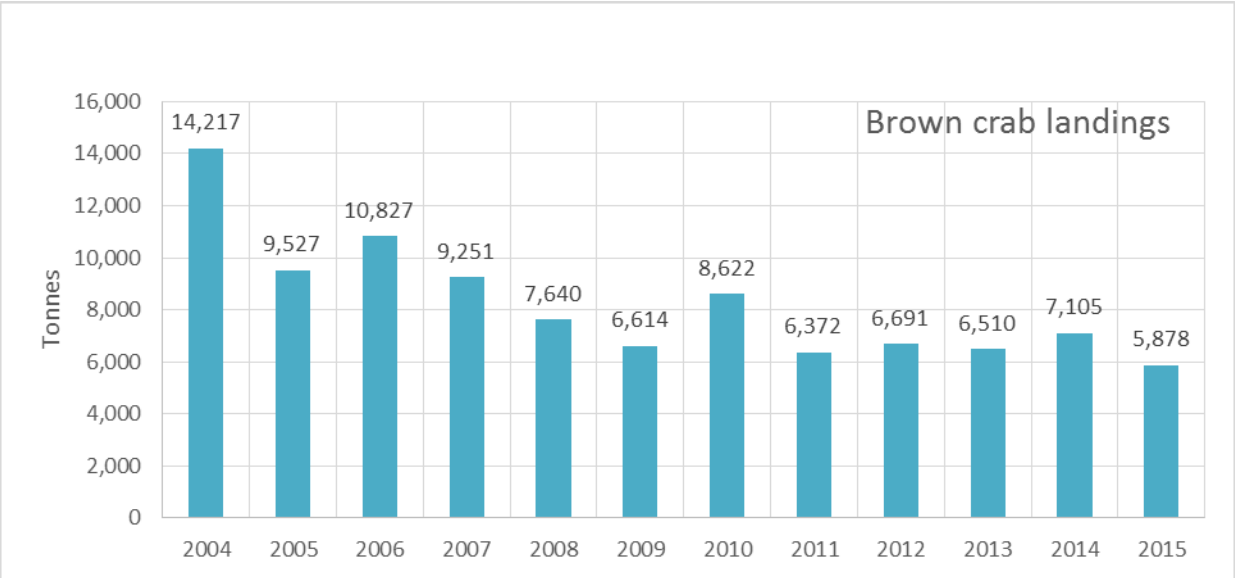


Figure 10. Annual landings (tonnes) of brown crab into Ireland

Brown crab: All areas

Fishing Activity

Profile in 2013-2014. Fishing for crab and lobster are linked and it is difficult to separate effort on crab from effort on lobster. Targeted crab effort occurs offshore on the Malin shelf south to Erris.

Locations	Vessels	Pots
Donegal coast and offshore	50	50,000
Clew Bay, Inisturk, Inisbofin	6	2,900
North and west of Mayo	66	47,000
Clare coast	3	1,500
Outer Galway Bay	15	3,000
Skelligs, Dursey, Mizen out to 6nm	4	3,000
Blasket to Brandon and Shannon	40	10,000
Dingle Bay	11	2,250
South and outer Dingle	9	1,750
Doulus Head to Bray Head	7	950
Blasket	16	6,300
Baltimore to Kinsale	20	
Kinsale to Cork Harbour	23	
Roches Point to Helvick	20	
West of Helvick	10	
West and south of Dunmore East to Saltees	13	
South Wexford	35	
Offshore >12nm		

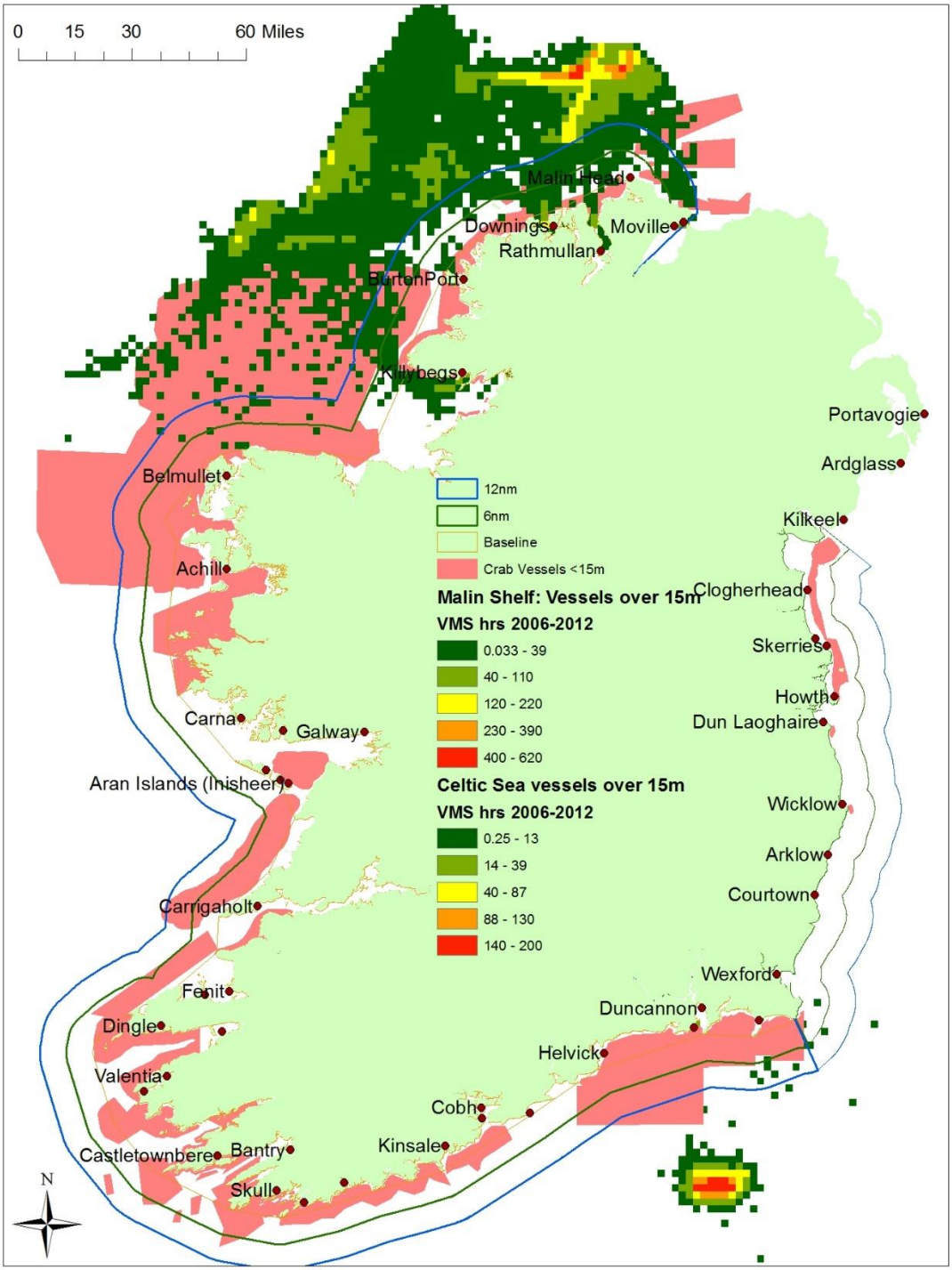


Figure 11. Distribution of fishery for brown crab around Ireland. Gridded data from VMS for vessels over 15m in length. Polygon data for vessels under 15m in length

Shrimp (*Palaemon serratus*)

Biology

Short lived (2 years) demersal species inhabiting mixed sedimentary and reef habitat. Females larger than males, fishery mainly on 1 year old females. Limited inshore offshore migrations linked to water temperature. Larval dispersal phase about 30 days. Larvae hatch May-July, recruitment of 0+ shrimp to fishery in October, recruitment highly variable. Local stocks within Bays.

Status

Highly variable and recruitment driven. Fishing may limit recruitment by fishing mature females in spring. Growth overfishing (not allowing time for growth of shrimp before they are caught) in autumn fishery if catch is not graded.

Management

The fishery is managed by a closed season mid-March to August 1st. Voluntary agreements in some areas delay opening until Sept. Voluntary grading and live discarding by many vessels in all areas.

Fishery

Baited traps, August-March. Annual landings 111-405 tonnes. Targeted single species fishery in shallow inshore waters. Many small (<8m) vessels in the fishery in coastal Bays on south, west and north west coasts. Smaller fishery also in the north Irish Sea.

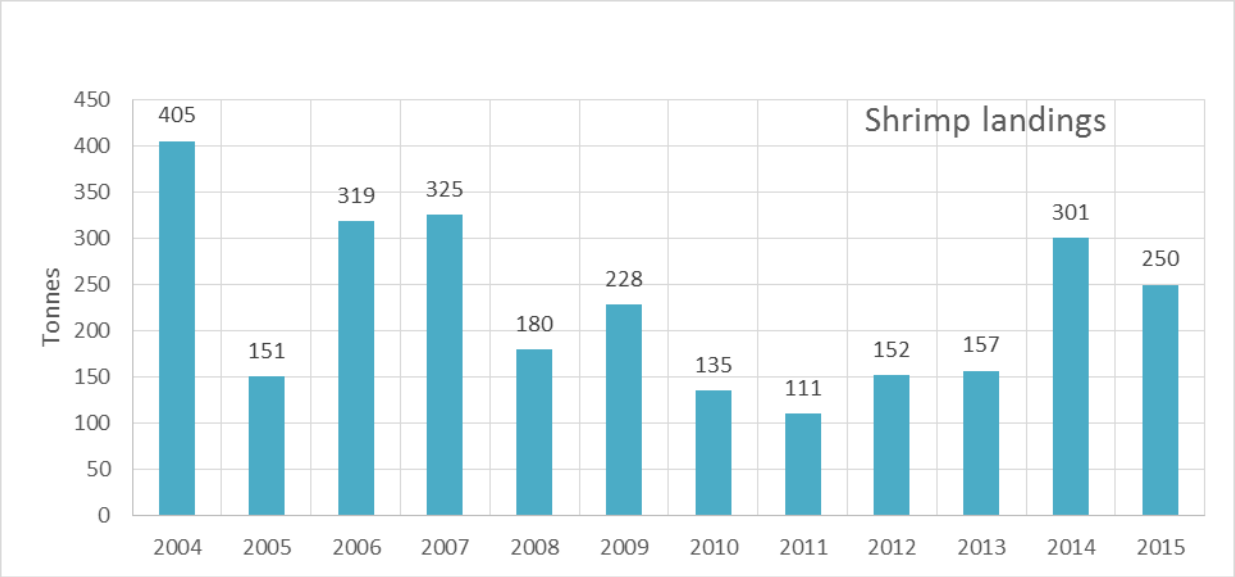


Figure 12. Annual landings (tonnes) of shrimp into Ireland

Shrimp: All Areas

Fishing Activity

Profile in 2013-2014. Effort information incomplete. Important areas include west Donegal, Connemara, Kerry and west Cork.

Locations	Vessels	Pots
Dungloe Bay (North west coast)	10	
Inver Bay (North west coast)	20	
Blacksod Bay (North west coast)	4	1,200
Broadhaven Bay (North west coast)	1	300
Clew Bay (North west coast)	15	4,300
Killary Harbour (West coast)	2	
Ballinakill Bay (West coast)	6	
Cleggan (West coast)	1	
Clifden Bay (West coast)	3	
Mannin Bay (West coast)	4	
Roundstone to Spiddal (West coast)	58	24,400
Inner Galway Bay (West coast)	22	10,000
Shannon, Ballylongford, Tarbert, Dingle (South west coast)	7	
Valentia (South west coast)	14	6,000
Inner Kenmare River (South west coast)	19	9,500
Bantry Bay (South west coast)		
Dunmanus Bay (South west coast)		
Roaringwater Bay (South west coast)		13,500
Baltimore to Kinsale (South coast)	28	
South of and in Cork Harbour (South coast)	21	
Roches Point to Youghal (South coast)	20	
Youghal to Waterford (South coast)	15	
Ballyteigue Bay, Rosslare Harbour (South coast)		

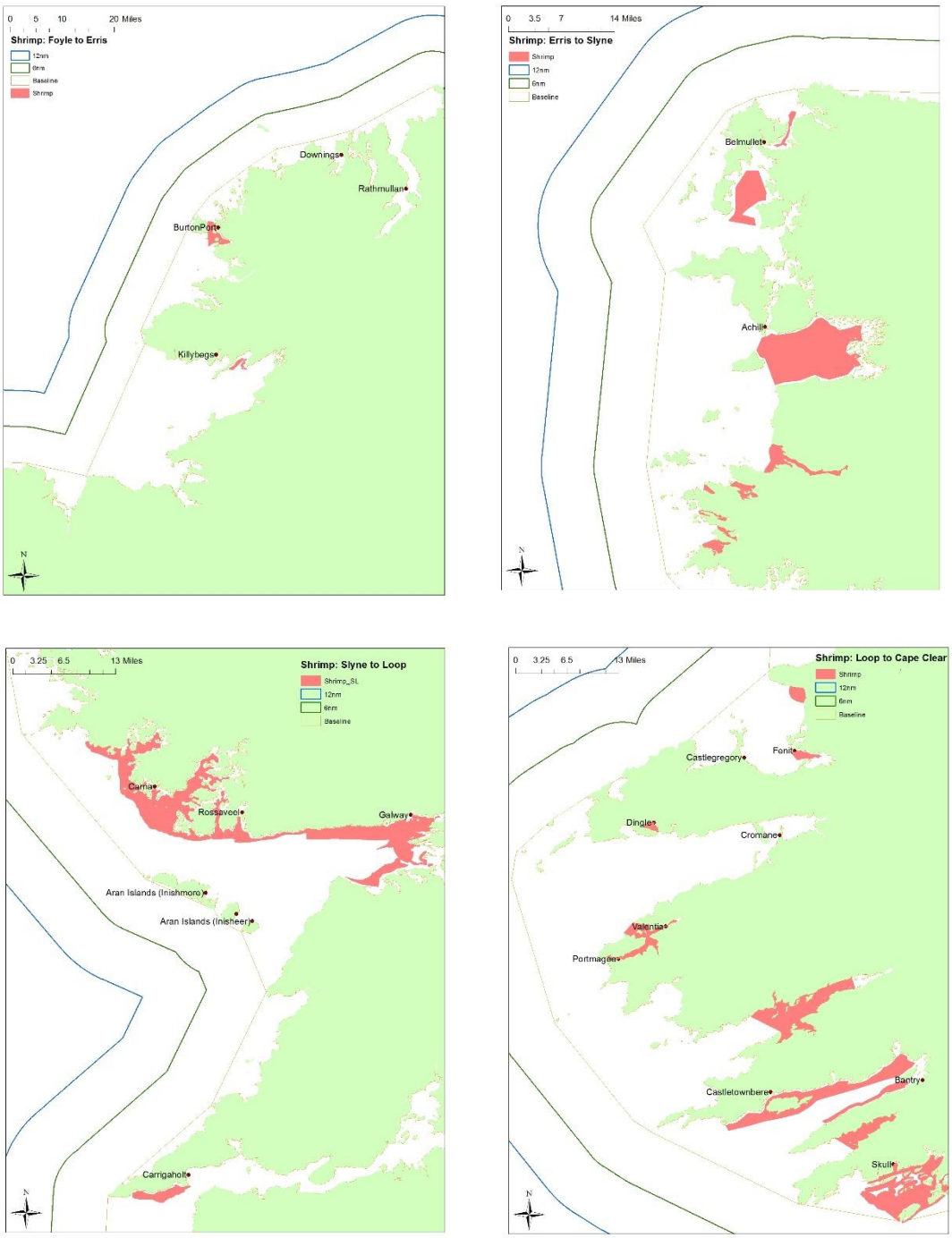


Figure 13. Geographic distribution of shrimp fisheries fishing off the south coast based on expert knowledge and questionnaire data.

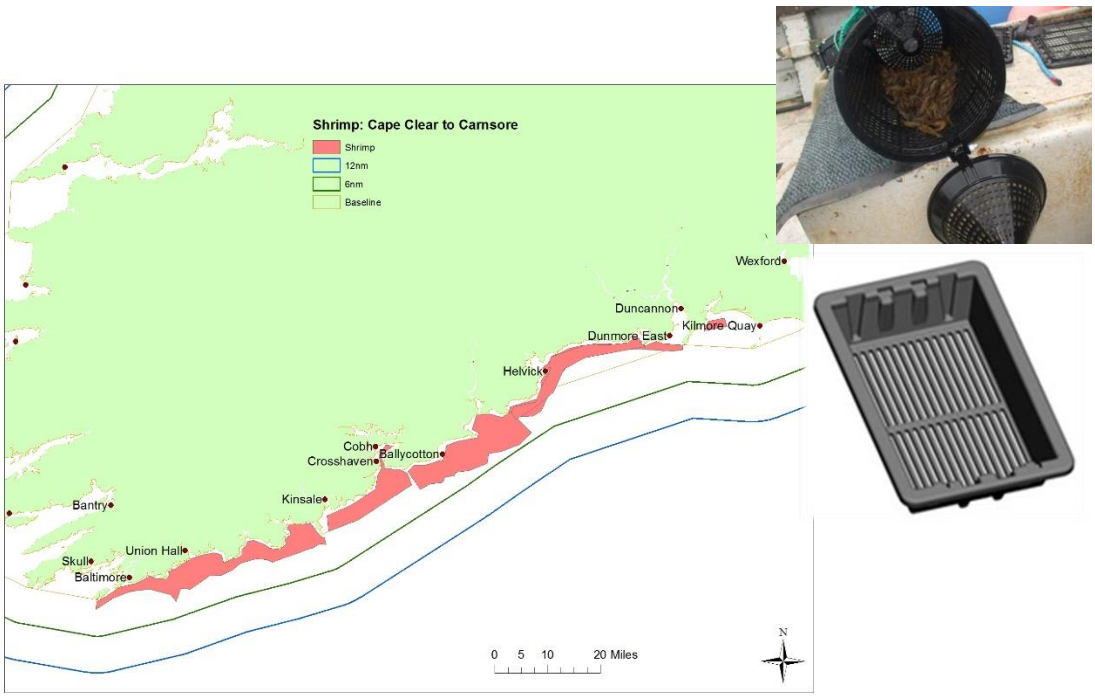


Figure 14. Geographic distribution of shrimp fisheries fishing off the south coast based on expert knowledge and questionnaire data. Right: shrimp pot with conical side entrance and grader.

Crayfish / Spiny Lobster (*Palinurus elephas*)

Biology

Long lived species inhabiting reef slopes. Probably non-migratory although can be caught in trawls on sedimentary habitat. Growth at moult 10-15mm for commercial size classes. Size at maturity females 80-95mm. Larvae hatch May-September. Larval dispersal phase up to 9 months with oceanic dispersal. Open population structure.

Status

Heavily depleted. Commercial range now restricted compared to historic range. Commercially extinct on south east coast.

Management

The fishery is managed by minimum landing size of 110mm carapace length (>1kg weight). Areas west of Kerry and Galway closed to netting.

Fishery

Mainly tangle nets but also top entrance traps. By-catch in lobster creels. All year but mainly Summer-Autumn. Recent landings 20-35 tonnes per annum. Higher previously.

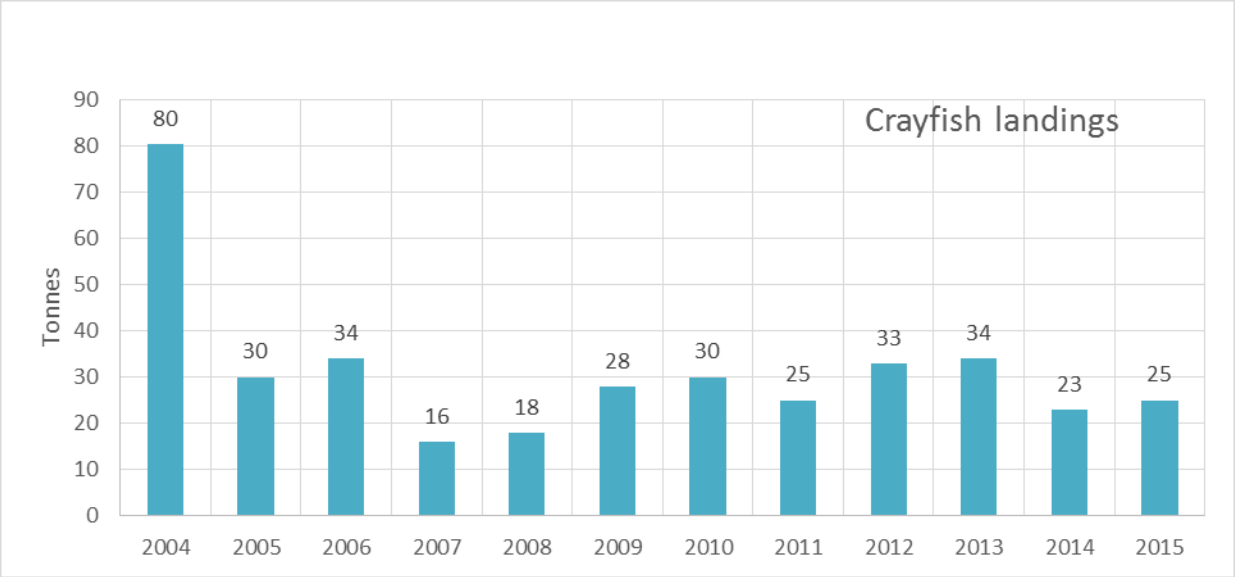


Figure 15. Annual landings (tonnes) of crayfish into Ireland

Crayfish/spiny lobster: All Areas

Fishing Activity

Profile in 2007 and 2013. No fishery on south east coast or in the Irish Sea. Previously abundant off south Wexford. Main landings from south west and Galway with smaller fisheries in Mayo and Donegal.

Locations	Vessels	Year	Activity
Arranmore Island and Burtonport	5	2007	
Connemara and Aran	32	2013	May-November
Kerry coast	18	2007	May-October
Cork coast	23	2007	May-November

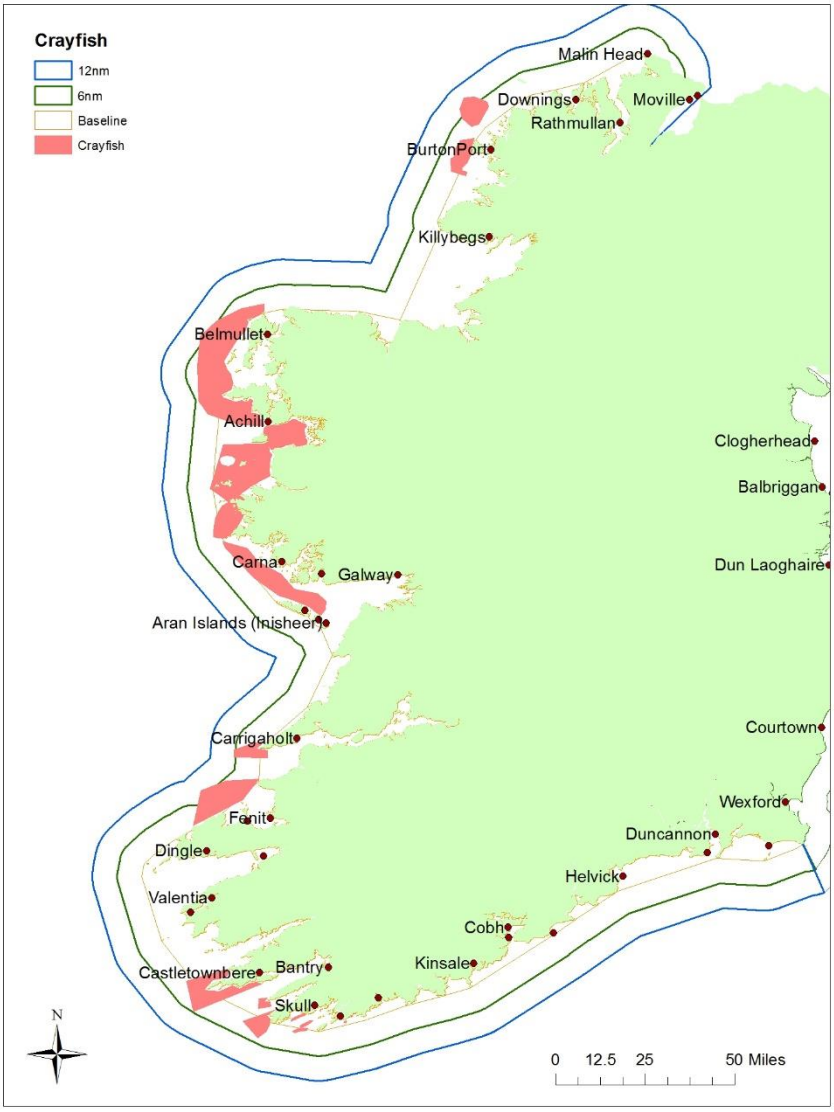


Figure 16. Annual landings (tonnes) of crayfish into Ireland

Prawns (*Nephrops norvegicus*)

Biology

Infaunal constructing burrows in muddy sediments. Lives to approximately 10 years. Recruits to fishery age 2. Growth at annual moult 4-5mm carapace length for commercial size classes. Males growth rate higher than females post maturity. Scavenger and cannibalistic. Isolated stocks or stocks partly connected through larval dispersal. Larvae hatch May-July. Non migratory.

Status

Stable and productive but declining in some areas in recent years

Management

ICES Area VII wide TAC based on annual assessments. Minimum landing size 25mm carapace length generally but 20mm in Irish Sea.

Fishery

Demersal otter trawls all year. Single, twin or quad rigs. Trend towards use of quad gear that increases ground cover. Local trawl and pot fisheries inside 6nm. Landings stable. Value has doubled every 5 years since 2006. Value of landings in 2015 €50m. Landings increasingly processed on board vessels. Pot fisheries land live prawns to local retail markets in some areas.

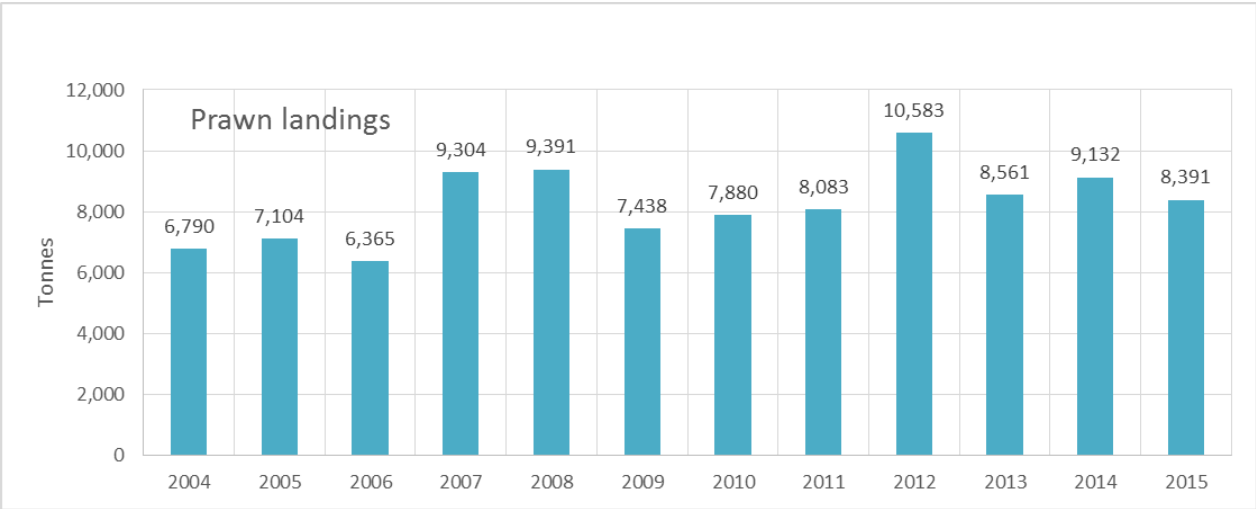


Figure 17. Annual landings (tonnes) of prawns into Ireland

Prawns: All areas

Fishing Activity

Profile inside 6nm in 2016. Small trawlers and potters work on local prawn grounds in some areas inside the 6nm limit.

Prawn fisheries inside 6nm	Gears
Bantry Bay	Trawls, Pots
Clew Bay	Pots
Inver Bay	Pots
Galway Bay	Trawls
West of Slyne	Trawls
Irish Sea	Trawls
Aran grounds	Trawls
Outer Kenmare River, Dunmanus Bay	Trawls, Pots
South coast	Trawls

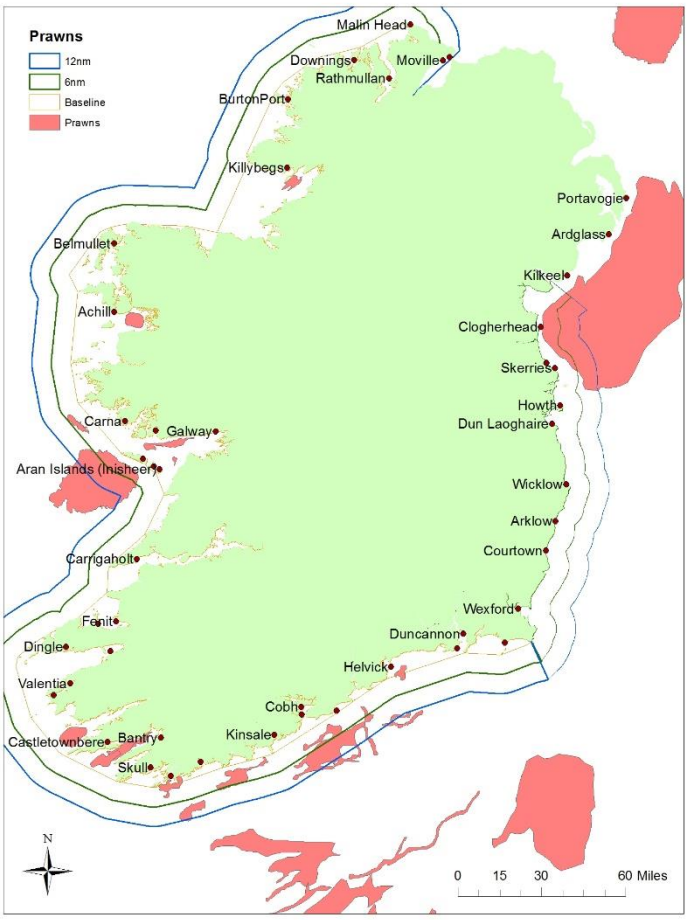
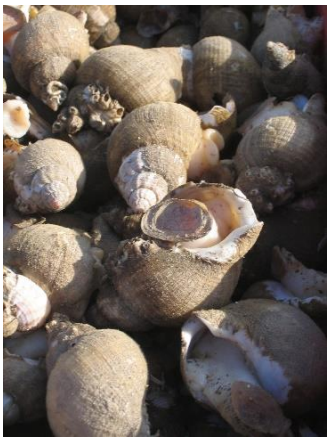


Figure 18. Distribution of prawn fisheries off the Irish coast emphasising location with respect to 6nm and 12nm limits.

Whelk (*Buccinum undatum*)



Biology

Epibenthic mobile gastropod inhabiting sand and mixed sediments common at depths 0-50m. Grows to 150mm shell height. Lives to 15 years. Predator and scavenger. Egg masses deposited on substrate. No pelagic larval phase. Size at maturity 70-85mm shell height.

Status

Generally depleted or locally depleted in Irish Sea due to high fishing mortality. More recently developed fishery in Donegal productive. Minimum legal size well below the size at maturity. High risk of recruitment overfishing.

Management

Minimum landing size 25mm shell width.

Stock structure

Due to absence of a pelagic dispersal stage stocks may be locally discrete. Whelk in the south Irish Sea may be comprised of a number of populations with limited connectivity. Separate stock off north Donegal. Other smaller populations not commercially exploited or sporadically exploited off the west coast.

Fishery

Baited traps. Brown crab is the main bait. Fishery all year. Landings historically up to 10,000 tonnes per annum. Between 2005-2015 landings 2,000-4,000 tonnes.

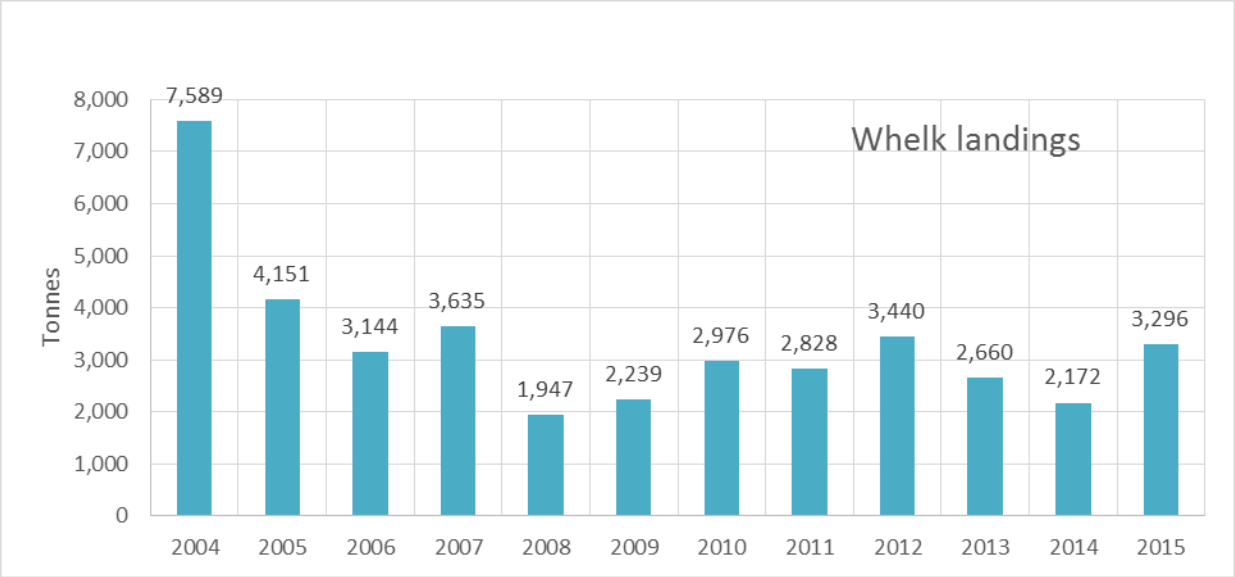


Figure 19. Annual landings (tonnes) of whelk into Ireland

Whelk: All regions

Fishing Activity

Up to 2013. Commercial fishing in south Irish Sea and north Donegal.

Locations	Vessels	Traps
South Irish Sea (Rosslare to Howth)	50	25,000
North Donegal	10	

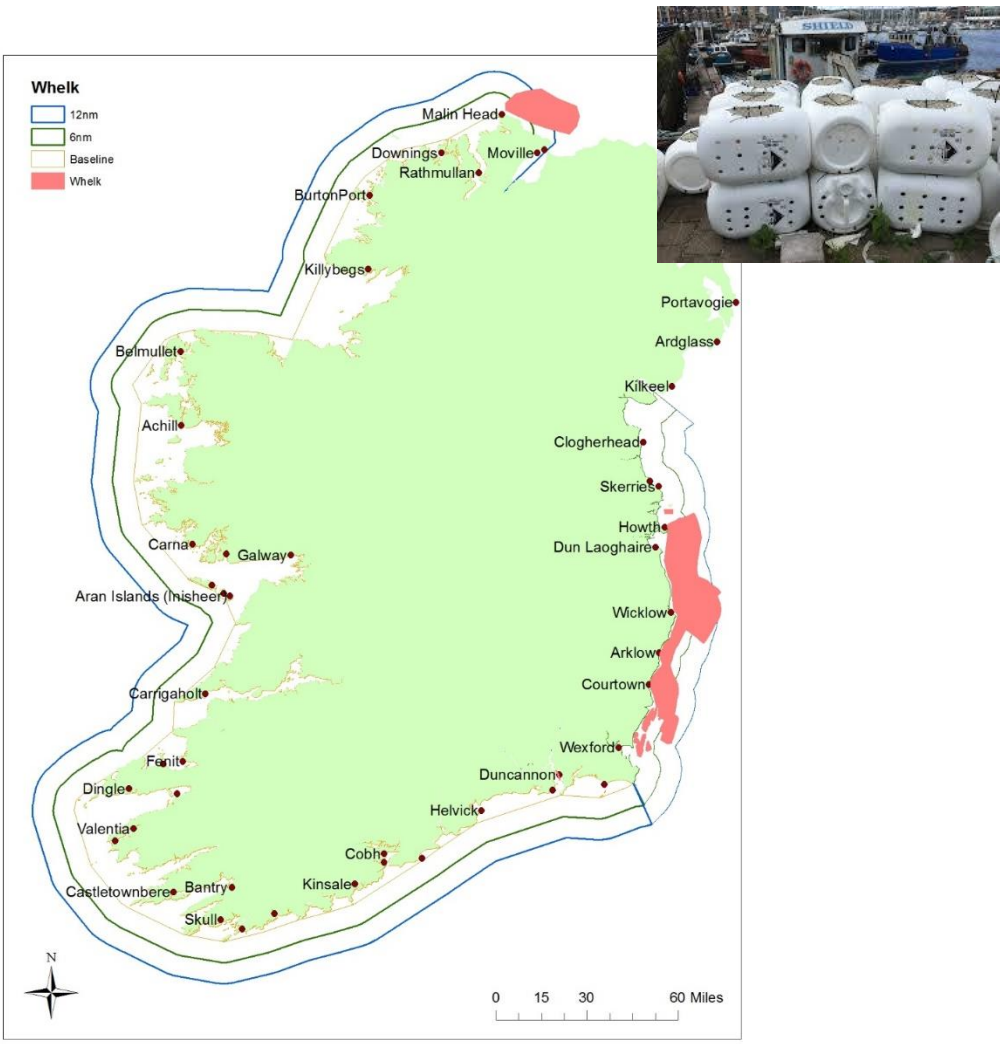


Figure 20. Distribution of whelk fisheries off the Irish coast. Right: top entrance whelk pots

Native oyster (*Ostrea edulis*)

Biology

Epifaunal bivalve on mixed sediments and reef. May form biogenic reef in undisturbed environments. Lives to over 10 years. Recruits to fishery age 4-5. Spawning in summer. Pelagic larval dispersal phase. Larval competency and settlement is temperature related.

Status

Depleted in most areas due to high fishing mortality, disease and competition with Pacific oyster. Egg production well protected by minimum size which is well above size at maturity.

Management

Management authority has been devolved to local co-operatives through fishery orders issued in the late 1950s and early 1960s or through 10 year Aquaculture licences. In Lough Swilly and the public bed in inner Galway Bay management authority rests with the overseeing government department rather than with local co-operatives. Operators require a dredge licence which is issued by Inland Fisheries Ireland (IFI).The oyster co-operatives operate seasonal fisheries and may also limit the total catch. Minimum landing size 76-78mm.

Stock structure

Oyster stocks occur as discrete isolated units in a number of Bays around the coast. Although native oysters were historically widespread in many areas, including offshore sand banks in the Irish Sea and along the south east coast their distribution is now reduced. The main stocks occur in Tralee Bay, Galway Bay, Kilkieran Bay, Clew Bay, Blacksod Bay, Lough Swilly and Lough Foyle.

Fishery

Single blade or toothed dredge per vessel. Autumn-Spring fisheries involving smaller inshore vessels generally. Main landings are from Tralee Bay. Annual national landings 100-300 tonnes in recent years.

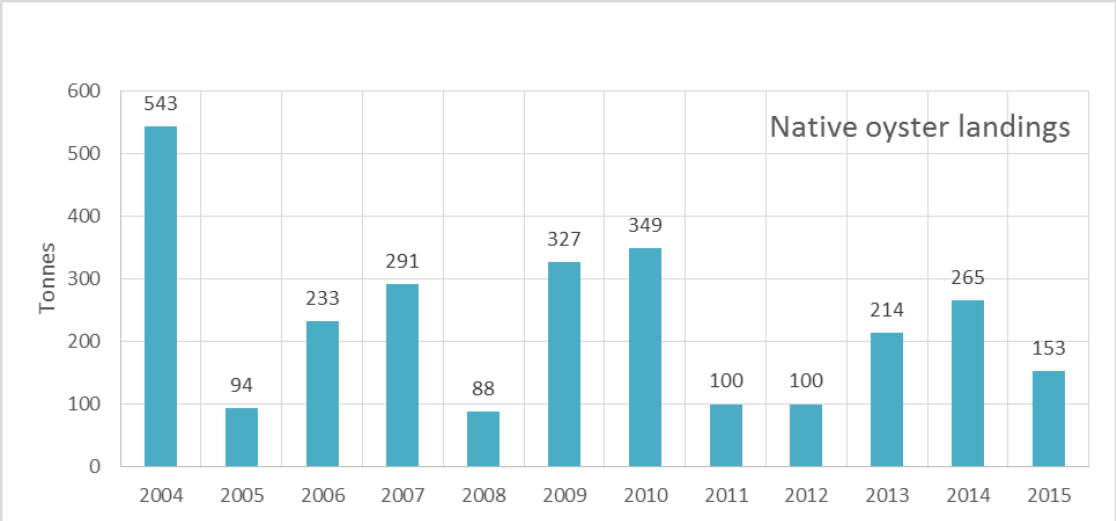


Figure 21. Annual landings of native oyster into Ireland

Native oyster: All regions

Fishing Activity.

To end of 2016. Based on Marine Institute surveys and licencing arrangements by IFI or in the case of Lough Foyle by the Loughs Agency.

Locations	Licences	Species
Lough Foyle		Native oyster
Lough Swilly	24	Native and Pacific oyster
Blacksod Bay	49 (Bangor district)	Native oyster
Clew Bay, Achill		
Kilkieran Bay	38	Native oyster
Galway Bay	17	Native and Pacific oyster
Tralee Bay	79	Native oyster

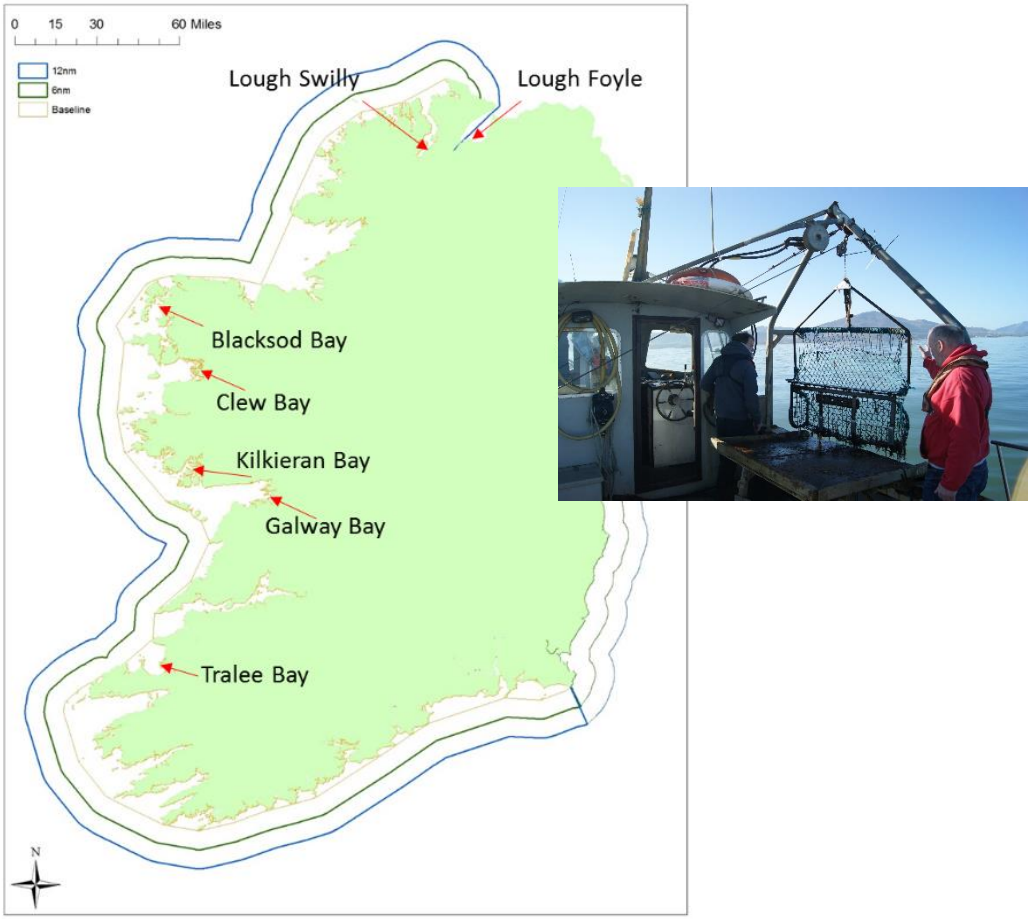


Figure 22. Locations of main commercial fisheries for native oysters. Right: oyster dredge used in Tralee Bay (Photo by Macdara Ó Cuaig)

Figure 23. Distribution of oyster fisheries in Lough Foyle, Lough Swilly, Blacksod Bay and Clew Bay.

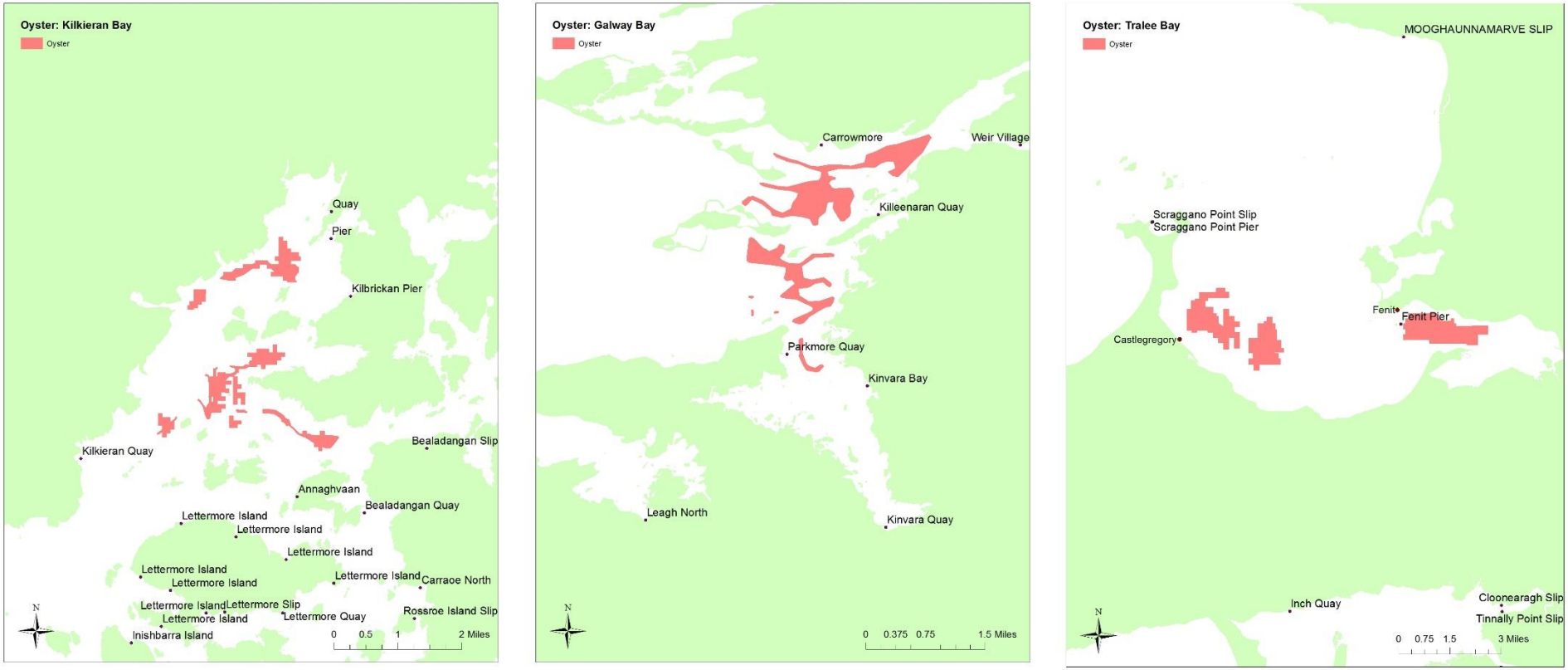


Figure 24. Distribution of oyster fisheries in Kilkieran Bay, Galway Bay and Tralee Bay.

Razor clams (*Ensis siliqua* and *Ensis arcuatus*)

Biology

Infaunal bivalve mollusc inhabiting sand or mixed sediments. Lives to over 10 years. Recruit to fishery age 3-4. Spawning early summer. Pelagic larval dispersal phase. Juveniles and adults may swim and re-distribute.

Status

Irish Sea (*E. siliqua*) stocks over exploited, indicators show that stock biomass is declining. West coast stocks (*E. siliqua* and *E. arcuatus*) unfished or stable and productive where fished.

Management

Individual vessel weekly quotas but no overall TAC in Irish Sea. Annual TAC on individual stocks on west coast. Minimum landing size 100-130mm. Closure of fishery in June in north Irish Sea during spawning.

Stock structure

Larval dispersal and movement of juveniles and possibly adults suggests that the stock structure is relatively open along the east coast of the north Irish Sea. Fishing is continuous from north Dundalk Bay to Malahide. Stocks in the south Irish Sea are likely to be separate to that north of Dublin given the different hydrodynamic and tidal regimes in the two areas.

Isolated stocks occur in many locations on the south and west coasts.

Fishery

Hydraulic water jet dredges or non-hydraulic propeller dredges used to penetrate sediment to 25cm depth. Single dredge per vessel. Landings 300-500 tonnes 2004-2012 but over 1,000 tonnes in recent years.

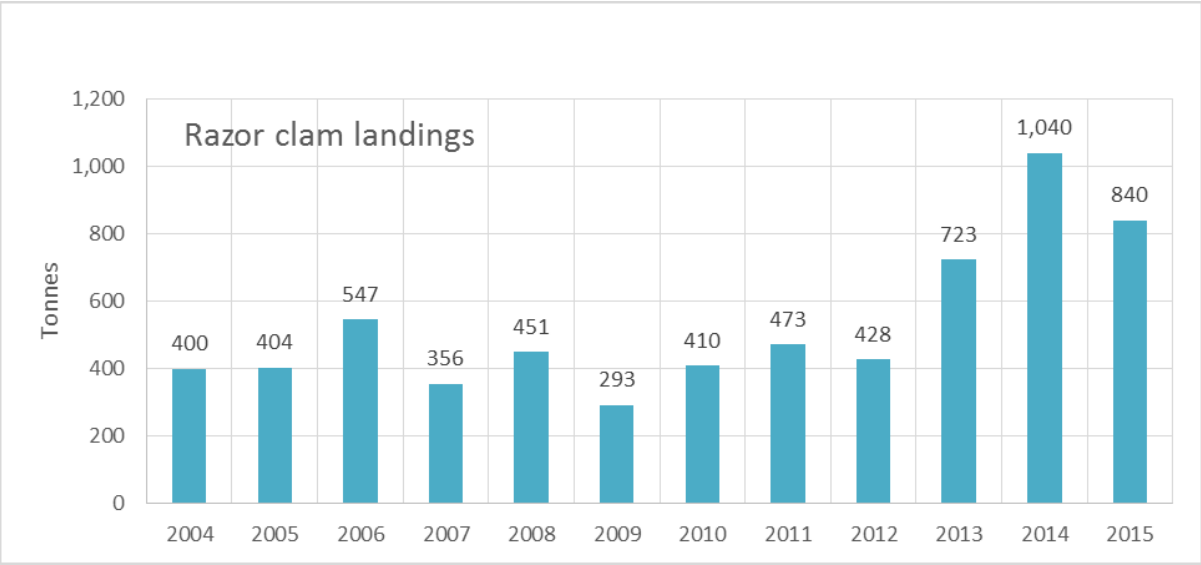


Figure 25. Annual landings (tonnes) of razor clams into Ireland

Razor clams: Irish Sea

Fishing Activity

Profile up to end of 2015. iVMS data shows continuous fishing activity in depths of 0-10m from north Dundalk Bay to Lambay in the North Irish Sea. In the south Irish Sea the fishery is concentrated in Rosslare Bay and off Curracloe. Number of vessels in the fishery has increased since 2012.

Locations	Vessels	Species
North Irish Sea	60	*E. siliqua*
South Irish Sea	10	*E. siliqua*

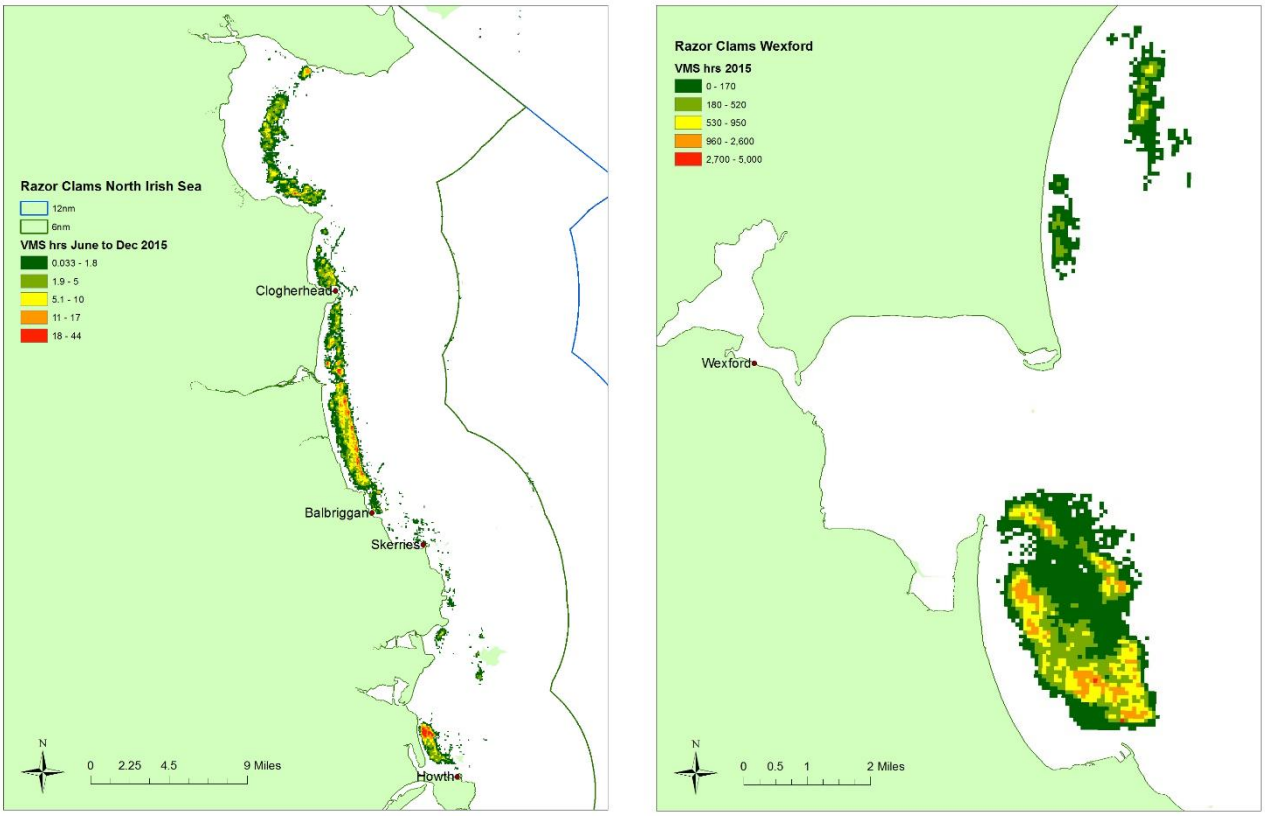


Figure 26. Distribution of fishing for Razor clam (Ensis siliqua) in the south and north Irish Sea from inshore VMS data. Note different map scales.

Razor clams: West coast

Fishing Activity

Known distribution of stocks to end of 2016 based on surveys. Fisheries only in Clifden and Iniskeas.

Locations	Vessels	Species
Gweedore, Cruit, Rutland Bays	Not fished	*E. arcuatus, E. siliqua*
Broadhaven Bay	Not fished	*E. arcuatus, E. siliqua*
Iniskea Islands	2	*E. arcuatus*
Killary approaches	Not fished	*E. arcuatus, E. siliqua*
Inisturk, Inisbofin, Ballinakill Bay	Not fished	*E. arcuatus, E. siliqua*
Clifden Bay	2-3	*E. arcuatus*
Baerhaven, Adrigole	Not fished	*E. arcuatus, E. siliqua*

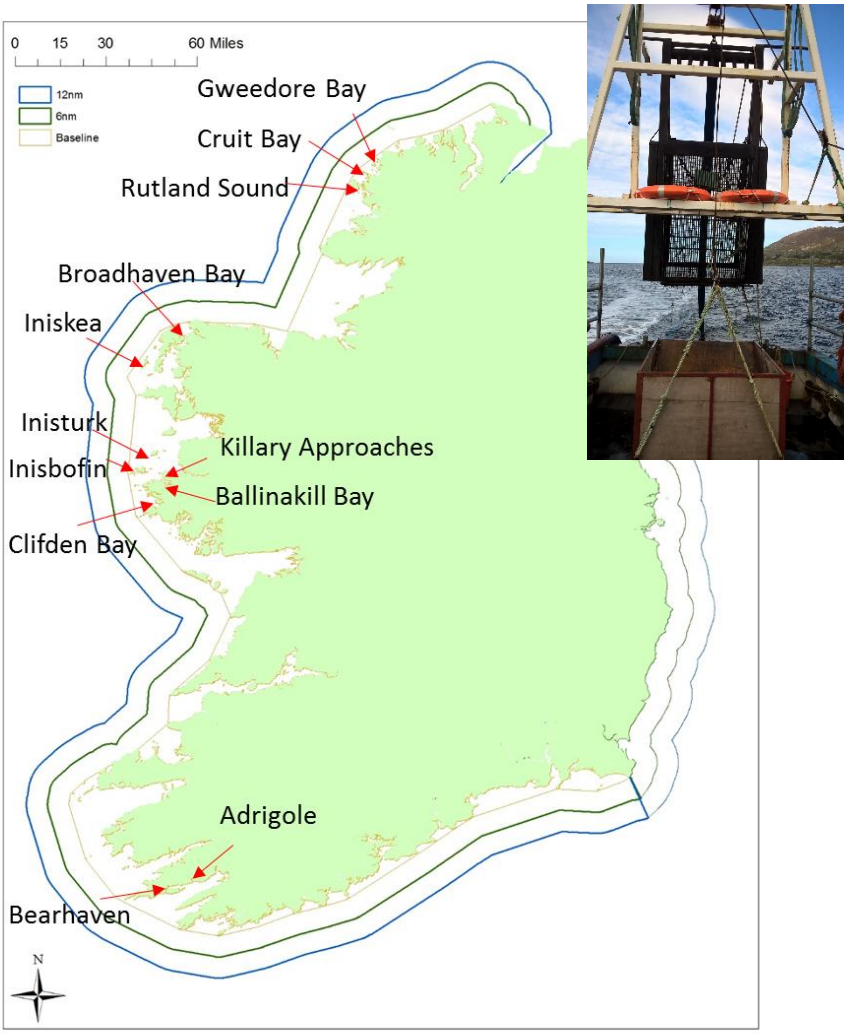


Figure 27. Distribution of Razor clam beds off the west coast of Ireland based on surveys in 2016. Right: Dredge suspended on frame at stern of vessel.

Figure 28. Distribution of razor clams in Gweedore Bay, Cruit Bay and Rutland sound based on surveys in 2016

Figure 29. Distribution of razor clams in Broadhaven Bay, Iniskea Islands and Killary / Ballinakill based on surveys in 2016

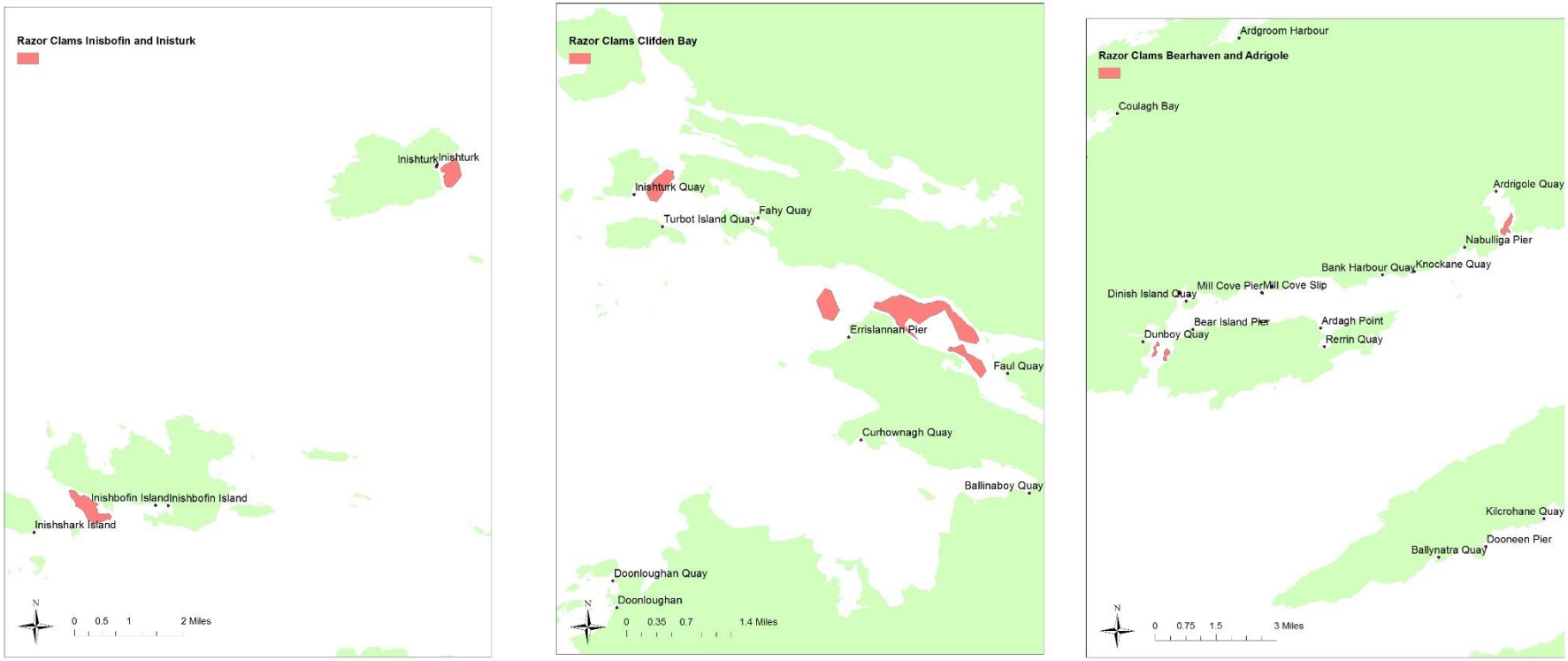


Figure 30. Distribution of razor clams at Inisbofin, Inisturk, Clifden Bay and Bantry Bay based on surveys in 2016

Scallop (*Pecten maximus*)

Biology

Epifaunal bivalve inhabiting sand, gravel and mixed sediments. Hermaphroditic with separate male and female gonad. Usually recessed in sediment. Lives to 10-15 years. Recruit to fishery age 3. Spawning in summer but gonad development varies in timing between stocks. Pelagic larval dispersal phase. Adults largely sedentary but swim when disturbed.

Status

Indicators of stock abundance stable or declining in recent years.

Management

The capacity of the over 10m fleet is limited. Vessels over 10m require secondary licence. Minimum landing size 100mm, 110mm or locally 120mm. Some local stocks on west coast managed by co-operatives through aquaculture licences.

Stocks

There are a number of scallop beds, interconnected by larval dispersal, in the Irish Sea and Celtic Sea. These are mostly outside the 12nm fishery limit. On the west coast a number of isolated stocks occur off north Donegal, Blacksod Bay, Clew Bay, Kilkieran Bay, Galway Bay, Blasket Islands, Kenmare River, Dunmanus Bay, Bantry Bay and Roaringwater Bay.

Fishery

Irish offshore vessels fish in Celtic Sea, Irish Sea and English Channel. Usually 24 spring loaded dredges per vessel. Inshore single or up to 8 toothed dredges per vessel. Landings up to 3,000 tonnes per year. Gear efficiency low.

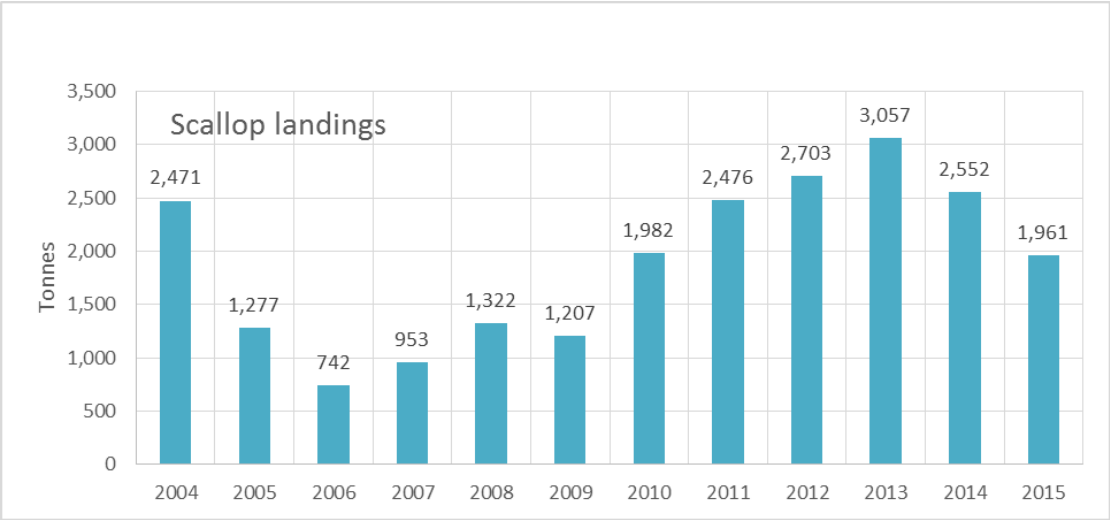


Figure 31. Annual landings (tonnes) of scallop into Ireland

Scallops: All regions

Fishing Activity

Up to 2013. Distribution known from VMS data and inshore from local knowledge and fishing activity. Spatial distribution on south west coasts poorly described.

Locations	Vessels
Donegal (North east of Malin)	Mainly Northern Ireland
Blacksod	Closed (depleted)
Clew Bay	1-2
Killary Approaches	Not active
Galway Bay	Not active
Kilkieran and Beirtreach Bui Bay	Shellfish co-op vessels
Valentia	Shellfish co-op vessels
Blasket and Skelligs	Vessels over 12m
Kenmare, Dunmanus, Bantry, Roaringwater Bay	Vessels under 12m
Celtic Sea and Irish Sea	10-20 vessels>15m; also vessels under 15m working inshore

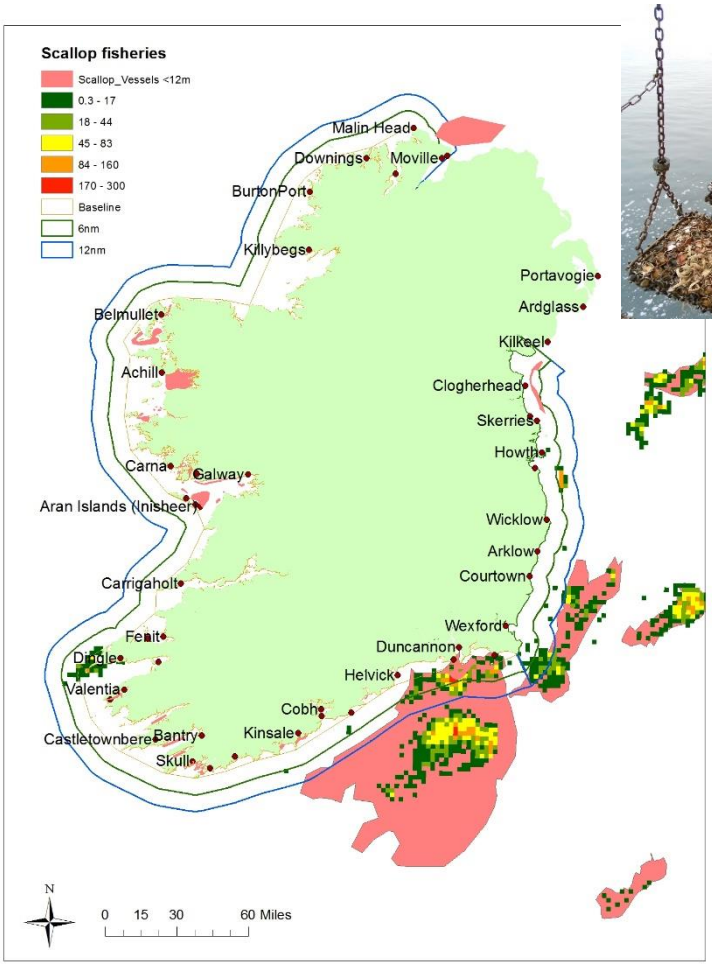


Figure 32. Distribution of scallop fishing off the coast of Ireland. Right: catch of scallop and by-catch in an array of dredges. Photo by Sean O Connor).

Cockle (*Cerastoderma edule*)

Biology

Infaunal intertidal bivalve in muddy sand sediments. Lives to 10 years. Recruit to fishery age 0-2 depending on growth rate. Spawning early spring and separately in autumn. Pelagic larval dispersal phase.

Status

Most cockle beds in Ireland are unexploited or lightly exploited. Settlement and post settlement survival very dependent on environmental conditions. Overwintering mortality can be high due to low temperatures, sediment wash out and bird predation. Landings data reflect the variability in recruitment to minimum landing size.

Management

Main fishery is in Dundalk Bay. Fishery is limited to 32 authorised vessels. Annual TAC based a mid-summer research survey. Minimum landing size 22mm shell width. No management measures in other two fisheries within CPAs in Castlemaine Harbour or Drumcliff Bay other than requirement to comply with national minimum landing size of 17mm shell width.

Stocks

Locally discrete stocks within many Bays on the south and west coast.

Fishery

Hydraulic non-suction and suction dredges. Vessels less than 12m carrying a single 1m wide dredge. Dredge penetrates sediment to approximately 5cm. Fishery in late summer and autumn in Dundalk. Tractor dredging or Hand gathering in other areas. Landings vary from 0-700 tonnes per annum.

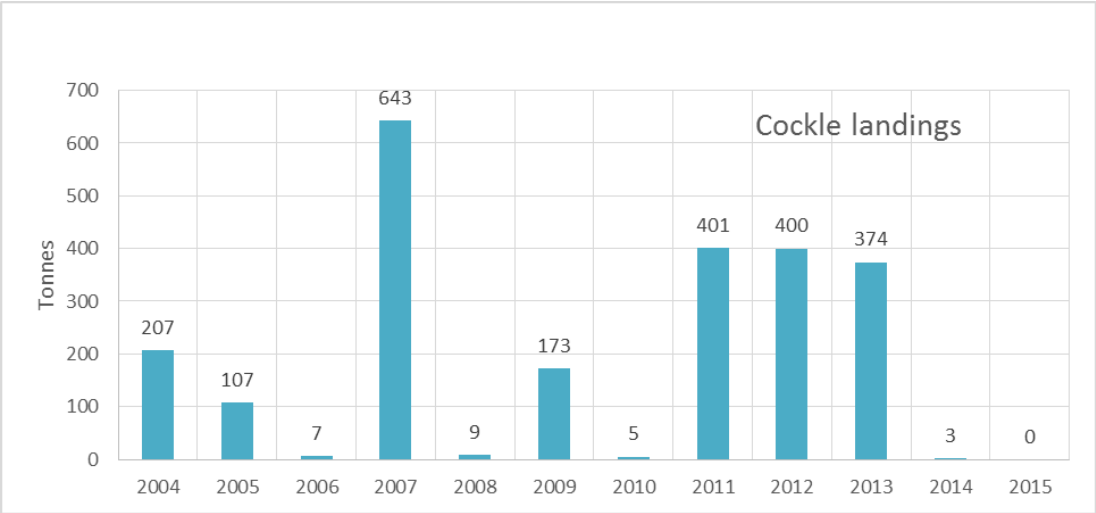


Figure 33. Annual cockle landings (tonnes) into Ireland

Cockle: All regions

Fishing Activity

Up to 2013. Most stocks are unexploited. Overall distribution of stocks poorly known. Surveys completed in Dundalk, Waterford estuary, Clew Bay, Killala Bay and during the 1980s in various locations in Donegal.

Locations	Vessels
Dundalk Bay	32
Castlemaine Harbour	1
Sligo Bay	Hand gathering
Other areas	No approved fisheries

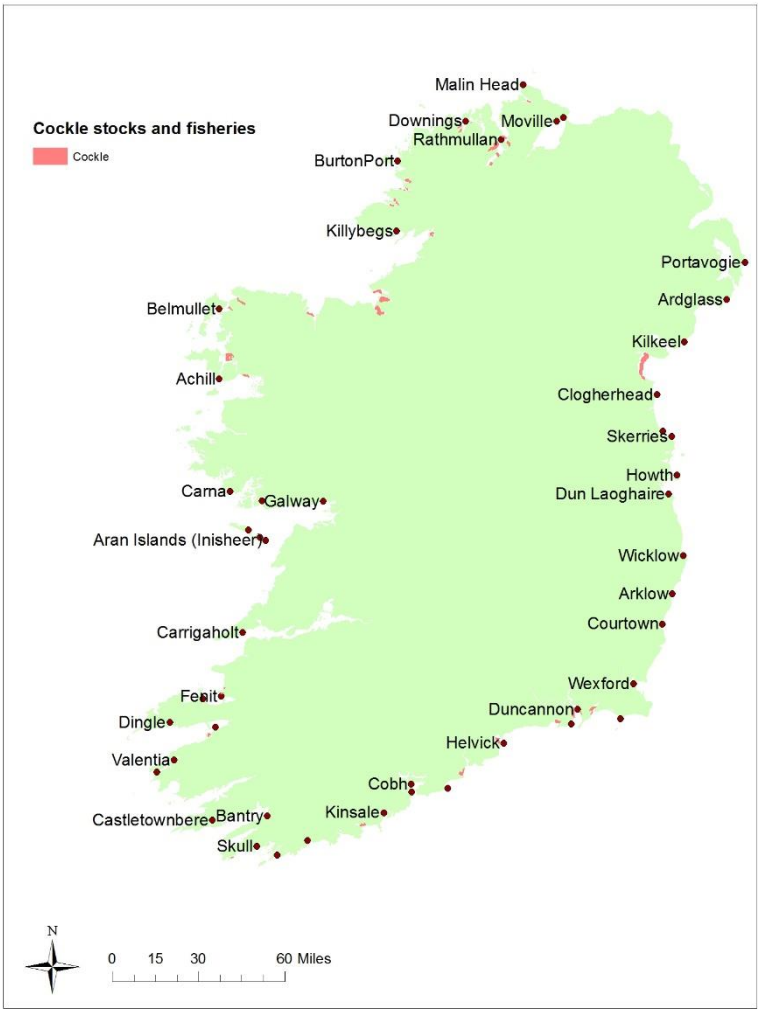


Figure 34. Distribution of known cockle stocks around Ireland. Right: mechanical rotating drum grader for grading cockles (Photo by Sarah Clarke).

Figure 35. Distribution of cockle stocks off the north west coast and north

Figure 36. Distribution of cockle stocks off the south west and south coasts

Figure 37. Distribution of cockle stocks in the Irish Sea

Surf clam (*Spisula solida*)

Biology

Sub-tidal infaunal bivalve inhabiting clean coarse sand and gravel. High densities. Life span 5-10 years. Recruit to fishery from age 2. Spawning early summer. Pelagic larval dispersal phase.

Status

Fished beds in Waterford Harbour, Clifden Bay and inner Galway Bay are stable. Unfished beds may occur in Blacksod Bay, Broadhaven Bay, Bertraghbuoy Bay, Bantry Bay, Saltee Islands and other areas where suitable coarse sand is available.

Management

Minimum landing size 25mm shell height. Voluntary TAC in Waterford estuary fishery. Current levels of fishing effort in Clifden Bay and Galway Bay surf clam beds seem sustainable.

Stocks

Likely to be locally discrete stocks given the patchy distribution of suitable coarse clean sand/gravel substrates.

Fishery

Vessels under 12m in length using single non-hydraulic clam dredges. Fishery all year or in late spring.

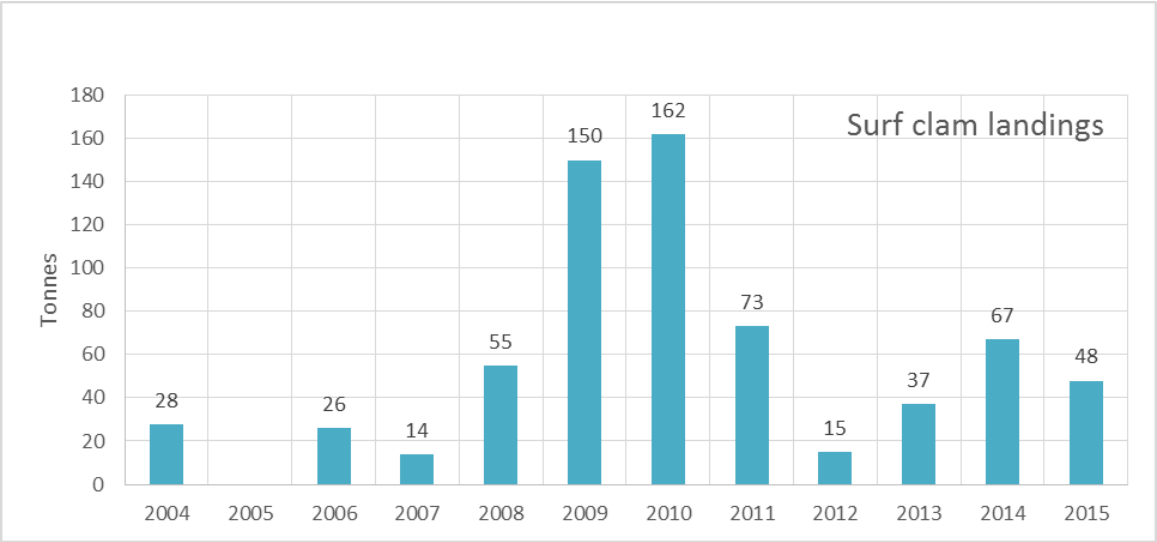


Figure 38. Annual landings (tonnes) of surf clam into Ireland

Surf clam: All regions

Fishing Activity

Up to 2016. Some stocks are unexploited. Overall distribution of stocks poorly known.

Locations	Vessels
Waterford estuary	5
Clifden Bay	1
Galway Bay	1
Youghal Bay	1

Figure 39. Distribution of surf clam. Right: clam dredge and contents of catch

Figure 40. Distribution of surf clam in Erris, Connemara and Galway Bay

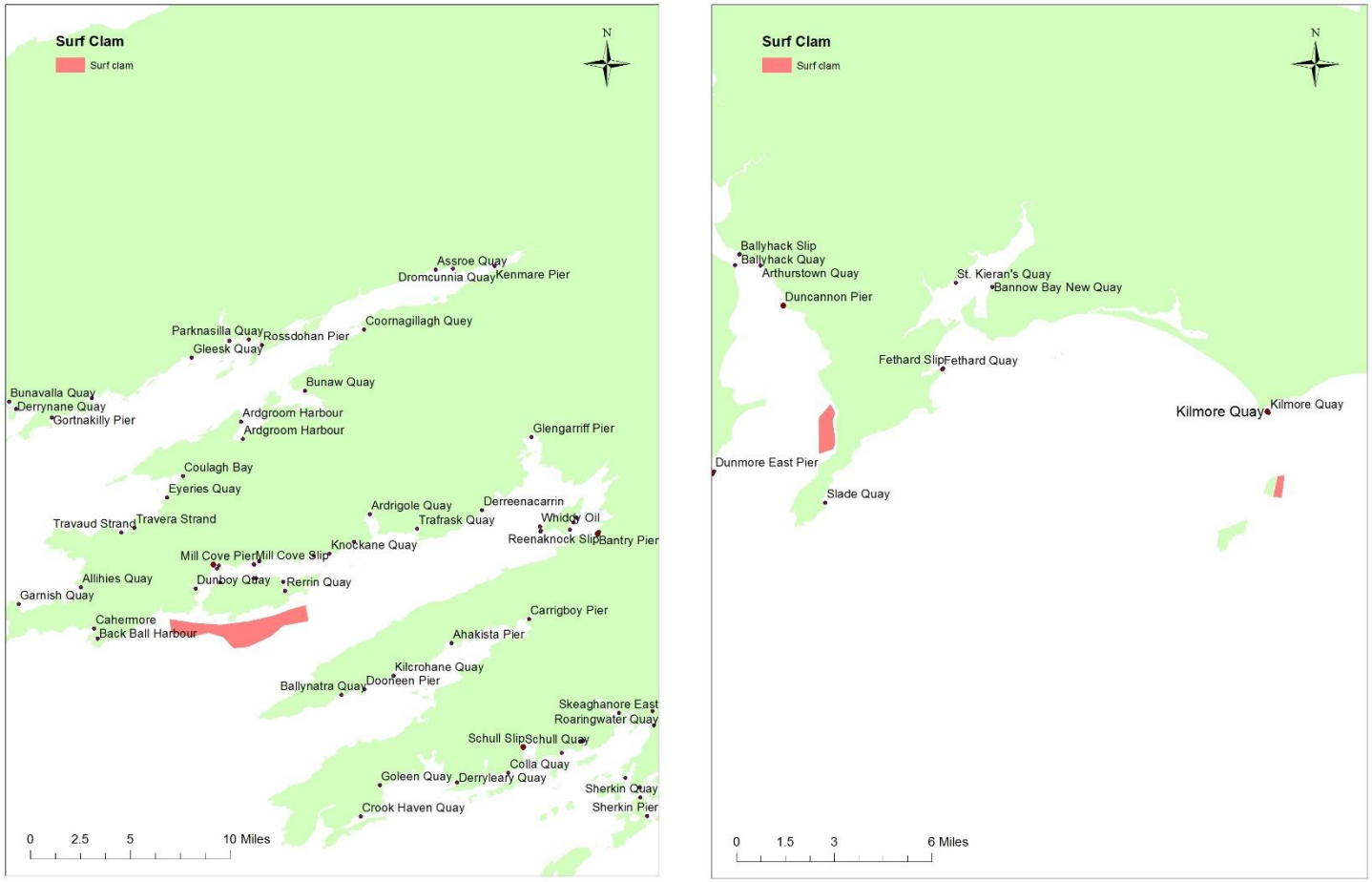


Figure 41. Distribution of surf clam in Bantry Bay and south east coast

Mussel (*Mytilus edulis*)

Biology

Epifaunal bivalve forming dense beds on coarse sediments and geogenic reef. Lives to 5 years. Recruit to fishery age 0. Spawning early summer. Pelagic larval dispersal phase.

Status

The fishery is for juvenile (seed) mussel. Settlement varies annually and may primarily be driven by environmental conditions during larval development, larval competency, availability of suitable substrate and post settlement survival. Seed beds susceptible to predation. Landings have declined in recent years compared to historic highs.

Management

Fishing for mussel requires an authorization. Quota is allocated to individual vessels but is unrelated to survey biomass estimates. Harvest strategy based on the assumption that seed mussel beds are ephemeral and are not required to maintain reproductive capacity. Harvest rates may be 100%.

Stocks

Given the ubiquitous distribution of mussel and the larval dispersal phase the population structure may be open at regional scale. Probably a single stock in the south Irish Sea. Separate stock in inner Dingle Bay.

Fishery

Autumn fishery. Vessels are generally over 18m in length and fish light weight 2m wide mussel dredges. Seed mussel fishery in Irish Sea mainly off Wicklow and Wexford. Seed are re-laid into areas with aquaculture licence for on growing of bottom cultured mussel. Landings previously over 24,000 tonnes but less in recent years.

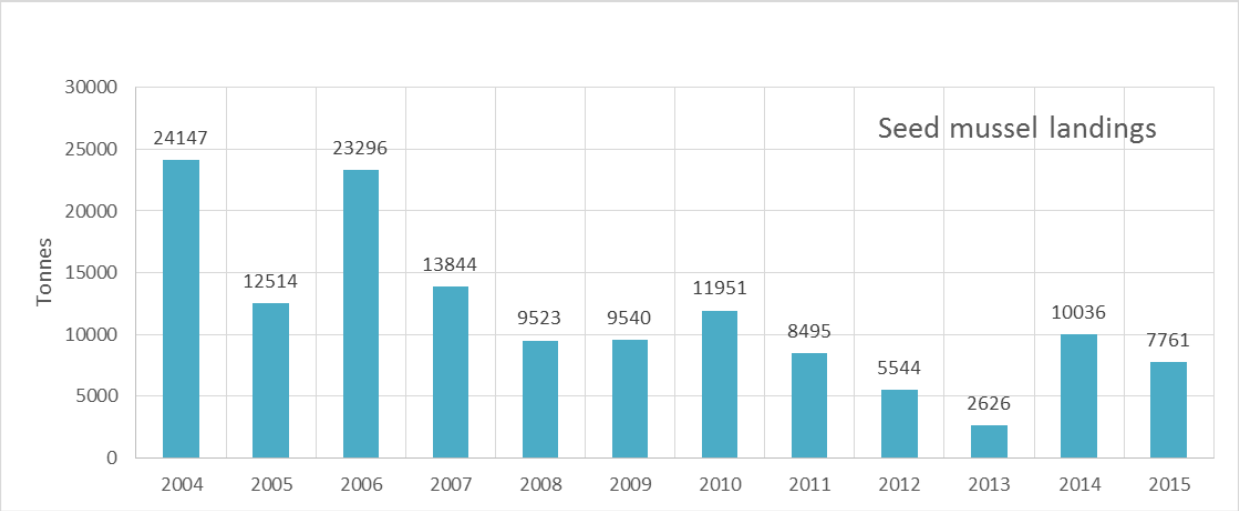


Figure 42. Landings of seed mussel into Ireland

Mussel: South Irish Sea and Dingle Bay

Fishing Activity

To end of 2016.

Locations	Vessels
Irish Sea	
Inner Dingle Bay	5-6 large vessels, up to 20 small vessels

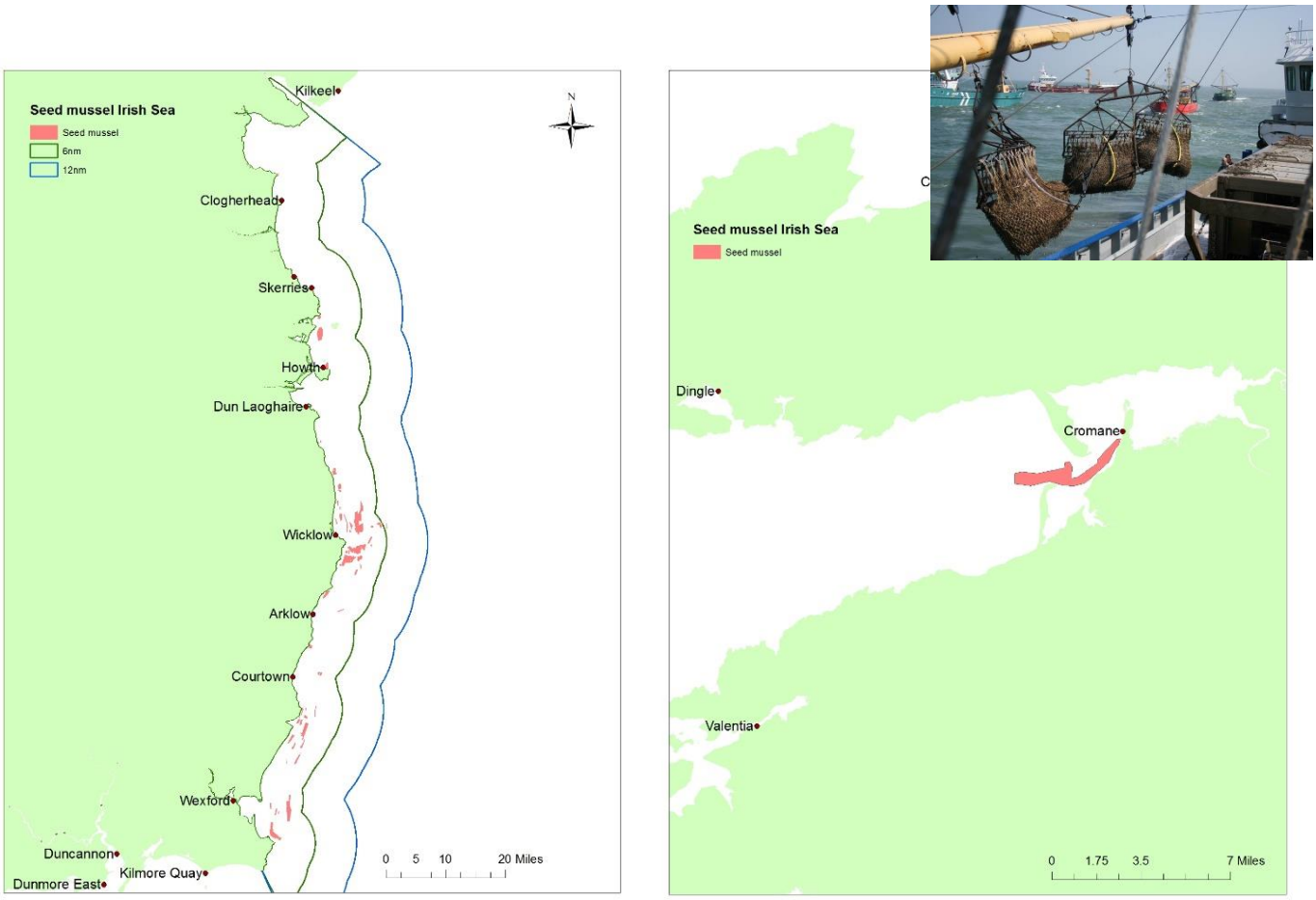


Figure 43. Distribution of potential seed mussel beds in the south Irish Sea and in Castlemaine Harbour (from BIM surveys). Right: mussel fishing in the Irish Sea (Photo by Edward Fahy)

Periwinkle (*Littorina littorea*)

Biology

Intertidal epifaunal gastropod on sheltered and semi-exposed rocky shores. Reaches over 5cm in height. Size at maturity 10-12mm. Age at maturity 2-3 years. Longevity 5-10 years. Larval dispersal phase 11-30 days. Ecologically important on rocky shores.

Status

Unknown. Susceptible to local depletion due to harvesting.

Management

No management measures are in place.

Stocks

Given the ubiquitous distribution of periwinkle on sheltered and semi-exposed coasts and the larval dispersal phase stocks may be structured at a local scale in sheltered bays and regional scale on open coasts.

Fishery

Hand gathering on rocky shores by individuals or teams of 'winkle-pickers'. Catches are bagged on the shore for overland transport. Landings historically over 3,000 tonnes per annum. Recent landings data may be unreliable.

Regional profile

Periwinkles are picked on all coasts but main landings come from Galway, Mayo, Donegal, Kerry and Cork.

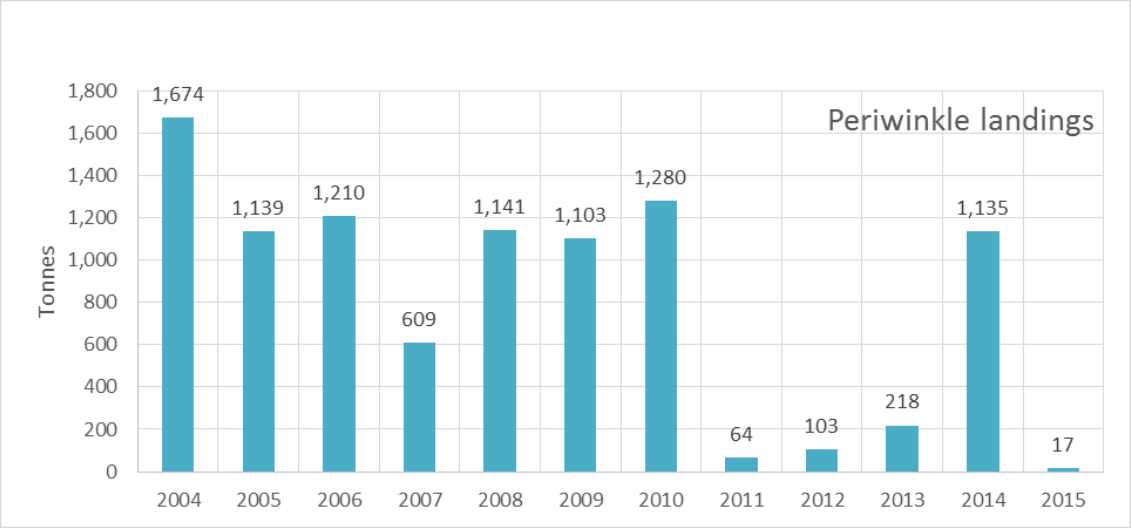


Figure 44. Annual landings (tonnes) of periwinkle into Ireland

References

Fahy, E., Healy, E., Downes, S., Alcorn, T. and Nixon, E. 2008. An Atlas of fishing and some related activities in Ireland's territorial sea and internal marine waters with observations concerning their spatial planning. *Irish Fisheries Investigations*, 19, 33pp. ISSN 0578-7467.

Gerritsen, H. and Lordan, C. 2011. Integrating vessel monitoring systems (VMS) data with daily catch data from logbooks to explore the spatial distribution of catch and effort at high resolution. *ICES Journal of Marine Science: Journal du Conseil*, 68(1):245–252.

Gerritsen, H.D. and Lordan, C. 2014. Atlas of Commercial Fisheries around Ireland. Marine Institute, Ireland. ISBN 978-1-902895-56-7. 59 pp.

Marine Institute (2015). Article 6.2 (Habitats Directive) Risk Assessment. The effects of fisheries on qualifying interests in Special Areas of Conservation in Irish coastal waters. Version 2. 299pp. Marine Institute, Galway.

"a thriving maritime economy in harmony with the ecosystem and supported by the delivery of excellence in our services"

www.marine.ie

HEADQUARTERS

MARINE INSTITUTE
Rinville,
Oranmore,
Co. Galway
Tel: +353 91 387200
Fax: +353 91 387201
Email: institute.mail@marine.ie

MARINE INSTITUTE REGIONAL OFFICES & LABORATORIES

MARINE INSTITUTE
80 Harcourt Street
Dublin 2
Tel: +353 1 4766500
Fax: +353 1 4784988

MARINE INSTITUTE
Furnace
Newport
Co. Mayo
Tel: +353 98 42300
Fax: +353 98 42340