Section 5

Other users of the sea

5 Other users of the sea

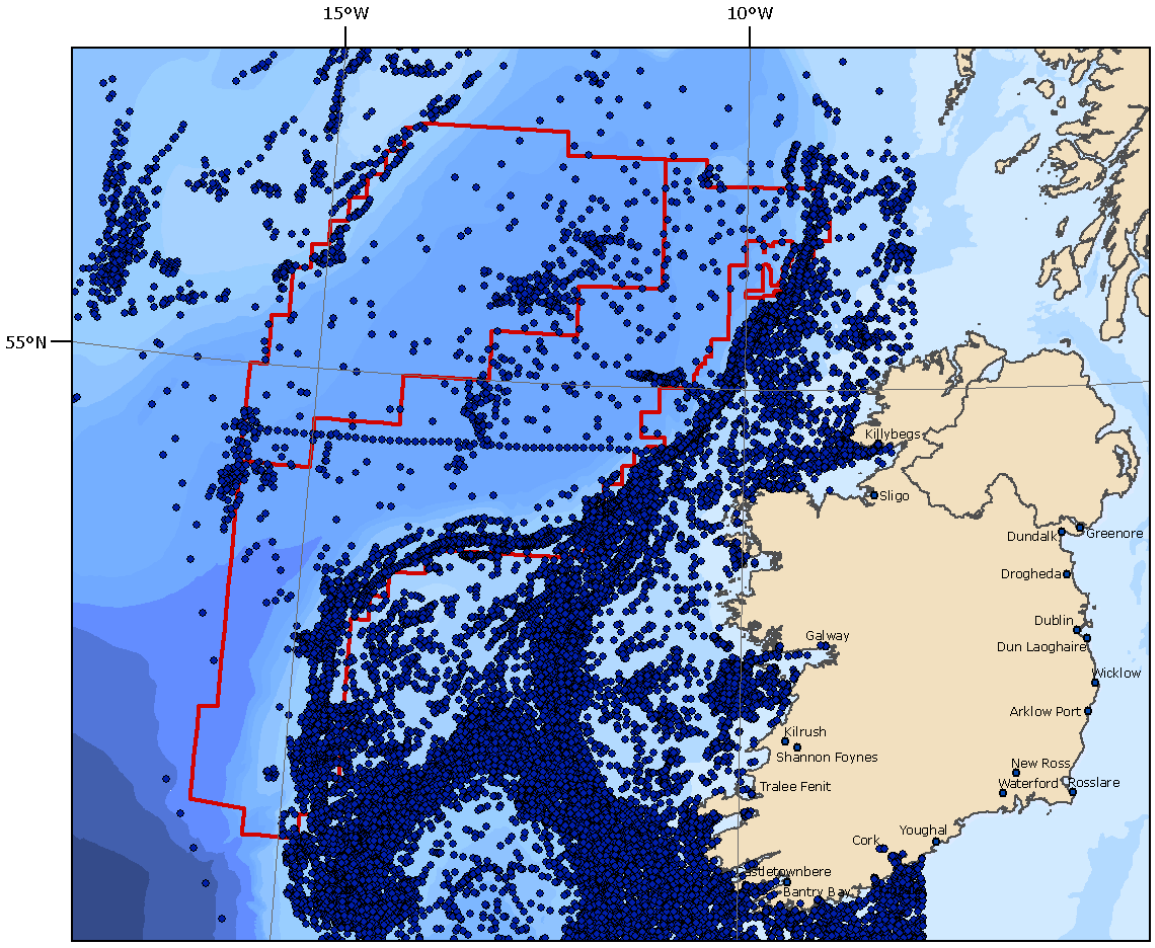
5.1 Commercial fisheries

The waters around Ireland make up are some of the most productive fishing grounds in the world. Fisheries in and around the IOSEA3 area are important both nationally and internationally, with a wide range of fish and shellfish species targeted by demersal and pelagic fishing fleets. The main species caught are monkfish, blue whiting, mackerel, horse mackerel, orange roughy, edible crab and *Nephrops* (MI, 2008a). Deepwater fisheries have only developed over the last 30 years, targeting mainly orange roughy, argentine and roundnose grenadier on the continental slopes of the IOSEA3 area.

5.1.1 Vessel sightings

Responsible for fisheries protection, the Irish Naval Service patrols the waters around Ireland, monitoring and inspecting hundreds of fishing vessels from a number of different countries. To assist in this role, the Fisheries Monitoring Centre (FMC) of the Irish Naval Service maintains a Vessel Monitoring System (VMS) that holds a database of all fishing vessels operating in the area, storing information in real time on vessel positions. This is required under EU fisheries legislation and the information is of a confidential nature. The Naval Service also recorded vessel sighting information, supplemented by the Air Corps. Figure 5.1 shows fishing vessel sightings in and around the IOSEA3 area in 2007. Due to confidentiality restrictions this data can no longer be provided on a nation by nation basis. It can still be used to provide an insight into general patterns of fishing activity in the IOSEA3 area.

Figure 5.1 Fishing vessel sightings in 2007 (source: Irish Naval Service, 2008)



Note: Due to the very large quantity of vessel sightings during 2007, sightings from only the 15th of each month have been included to illustrate the overall trend

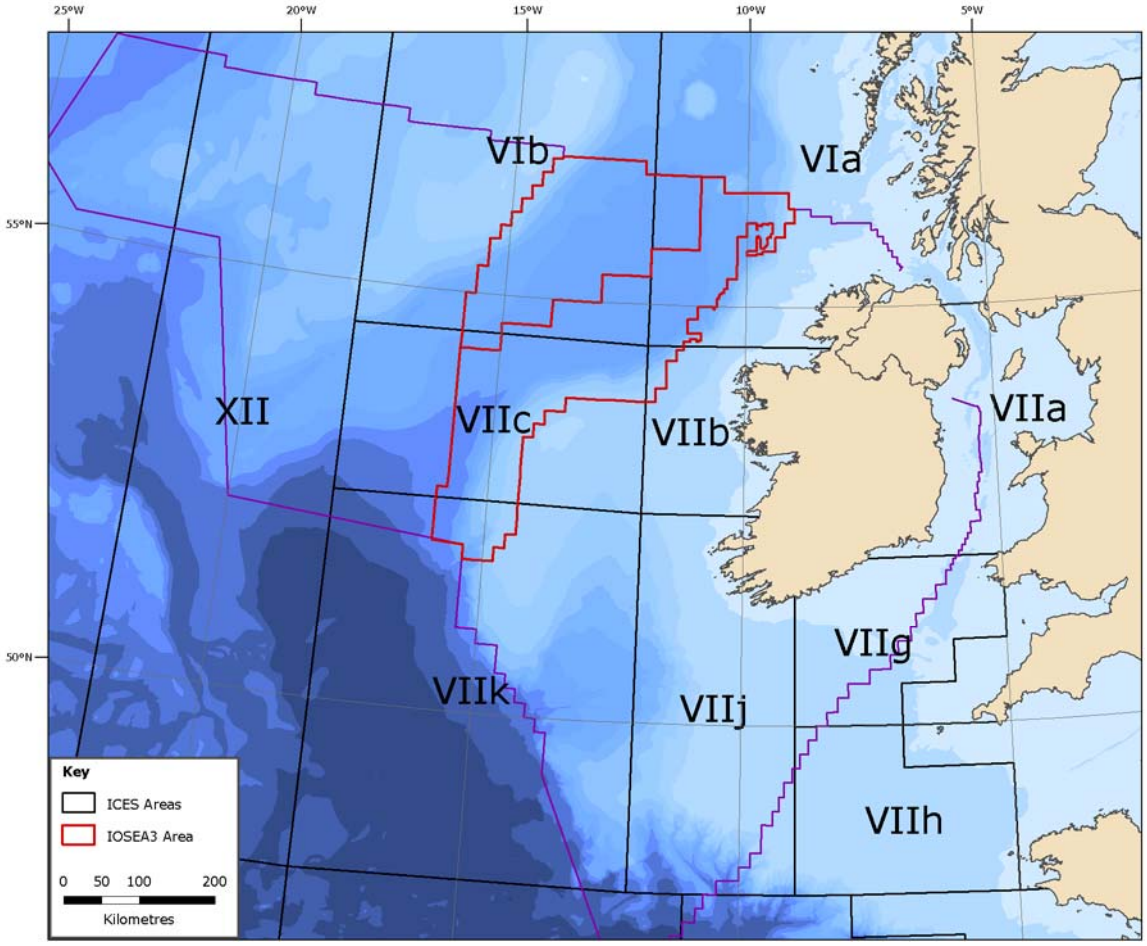
Figure 5.1 suggest a number of trends in vessel activity. Overall, the majority of sightings are restricted to the shallower more productive and easily accessible shelf waters, as might be expected. A proportion of these records are also likely to be of vessels in transit from active fishing positions to various ports on the west coast of Ireland. It is also possible to detect a clear swathe of vessel activity following the continental shelf edge and slope which borders the eastern fringe of the IOSEA3 area (Figure 5.1). Fish populations tend to congregate along the shelf edge due to nutrient upwelling, a feature which is reflected in the observed pattern of fishing vessel concentrations.

The number of vessel sightings declines with depth, suggesting that fishing is less intense in the deeper waters of the IOSEA3 area (Figure 5.1). Sightings also become more scattered with depth although there does appear to be a concentration of fishing activity in the deepest waters of the Rockall Trough adjacent to the eastern boundary of the "extended area" (refer to Figure 1.1). There is another concentration of sightings running parallel with the western boundary of the IOSEA3 area. A distinct line of vessels sightings can be seen running from the coast out to this aggregation (Figure 5.1). These sightings may be related to vessels exploiting fixed aggregations of deepwater fish species in these deeper areas (see Section 5.1.2 for further information). Sightings can also be seen to congregate at various points around the slope of the Rockall Bank which borders the IOSEA3 area to the northwest (Figure 5.1). This is again likely to be associated with upwelling around this feature resulting in an increase in fish abundance which is in turn exploited by fishing vessels.

5.1.2 Irish fisheries landings

In order to facilitate fisheries management, the northeast Atlantic and seas around Europe have been divided into areas by the International Council for the Exploration of the Seas (ICES). The IOSEA3 area falls partly within ICES areas VIa and b and also extends in areas VIIb and c (Figure 5.2). These ICES areas are too large to place fisheries landings in the context of the IOSEA3 area, as they all cover additional waters around the IOSEA3 and the data cannot be easily divided.

Figure 5.2 ICES areas



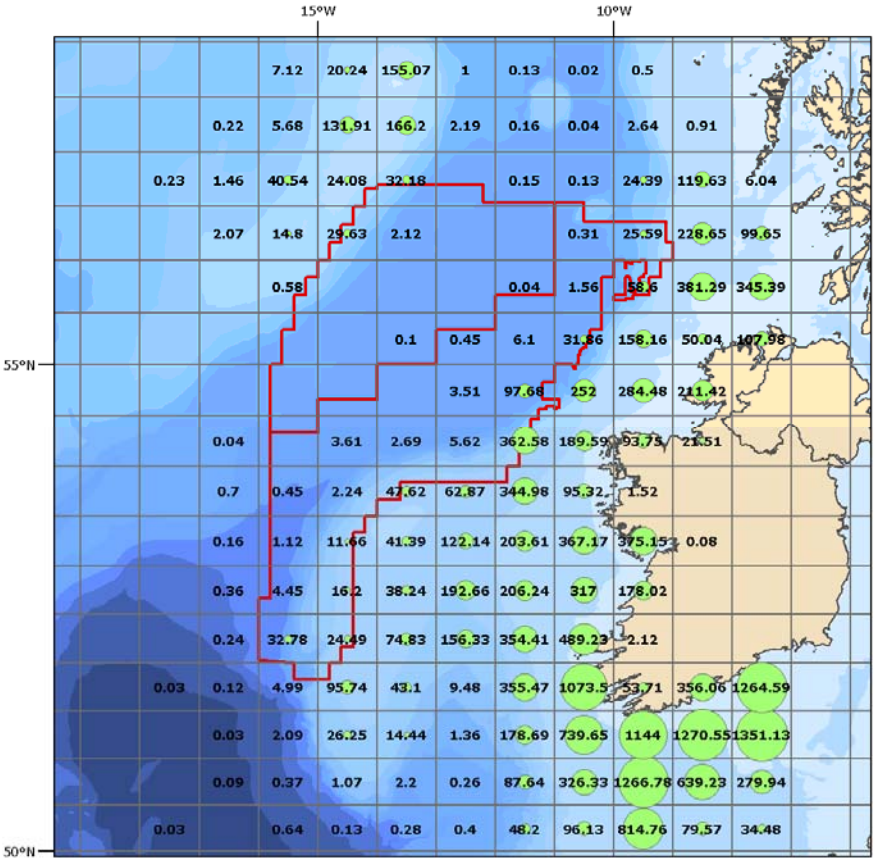
The seas are further divided into much smaller ICES statistical rectangles, allowing a much more meaningful review of fisheries landings from within the IOSEA3 area. This review is based on Irish fisheries landings data, for the ICES rectangles in and immediately around the IOSEA3 area provided by the Marine Institute of Ireland (MI, 2008a). Data were also gathered from the region surrounding the licensing area in order to place those fisheries landings in a wider geographic context.

Landings data can provide important information about the state of fish and shellfish stocks, facilitating more effective fisheries management. However, the resolution of these data is quite poor and there is evidence of misreporting by fishermen. Therefore, it should be taken into account that there may be inaccuracies in the quantities and species landed, and the areas from which they were taken.

Demersal fisheries

Demersal fisheries target species which live on or near the seabed and generally feed on bottom-living organisms and other fish. Demersal landings by Irish vessels are greatest in shallow coastal and inshore waters, generally declining with increasing distance from shore and water depth. Demersal fish catches are confined to the shallower fringes of the IOSEA3 licensing area, particularly the continental shelf and slope on either side of the Rockall Trough (Figure 5.3). There have been little or no demersal fish landings recorded from the deeper waters of the Rockall Trough. Demersal catches are very low compared to those from the continental shelf west and particularly south of Ireland (Figure 5.3).

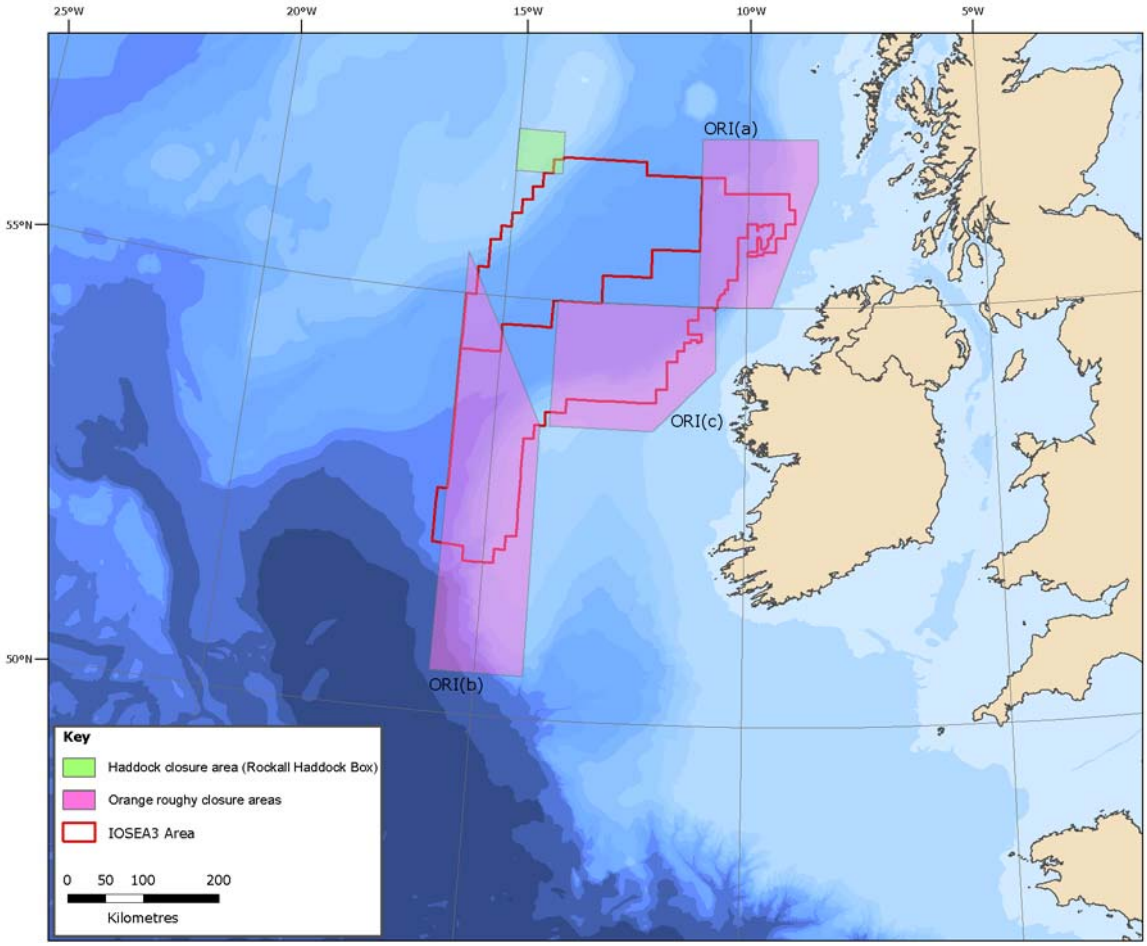
Figure 5.3 Average Irish demersal landings (live weight tonnes), for the period 2000 to 2006 (source: MI, 2008a)



Although fisheries may be directed towards particular species or species groups, demersal fish are often caught together in a mixed fishery. The most significant mixed demersal fishery operating in the Rockall Trough targets the gadoid species cod, whiting and haddock. Catches from this fishery constituted almost 25% by weight of the average catch for demersal species in the licensing area (MI, 2008a). In order to protect juveniles and improve stock levels, the Irish government has designated the Rockall Haddock Box over the Rockall Bank at the northwest tip of the licensing area (Figure 5.4).

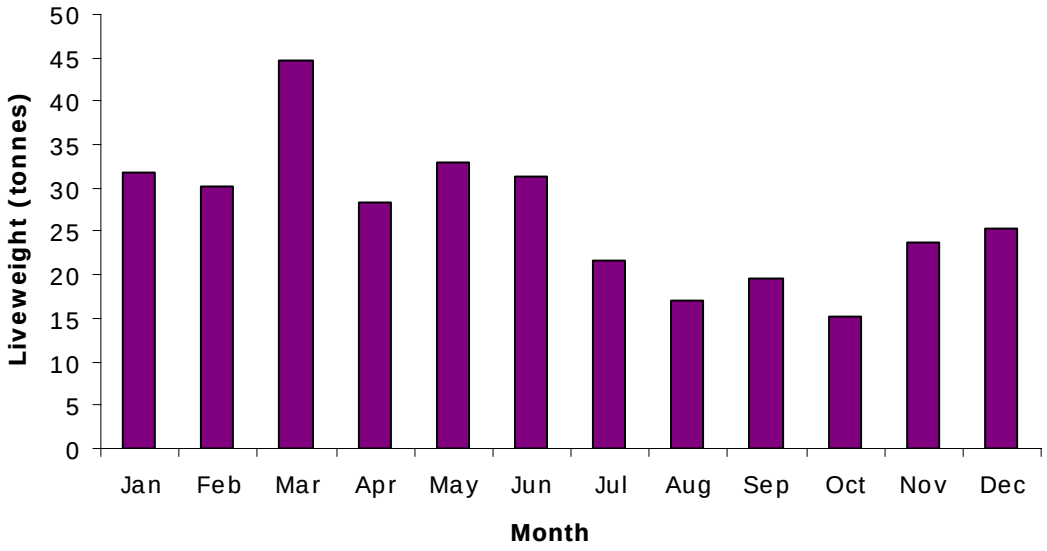
Only longline fishing is permitted within this closure area. Saithe and monkfish (anglerfish) are also known to constitute an important part of the bycatch from demersal trawling activities in deeper waters of the Rockall Trough. Closure areas have previously been suggested to protect spawning aggregations of another demersal species, hake (BIM, *pers comm*). A number of areas along the Irish continental shelf edge and upper slope were suggested, three of which bordered the IOSEA3 area.

Figure 5.4 Fisheries closure boxes relevant to the IOSEA3 area (source: BIM, 2008a)



Monkfish contributed just over 22% of the total average catch for demersal species in the IOSEA3 area over the last seven years (MI, 2008a). Monkfish are found at a wide range of depths, extending from very shallow inshore waters down to around 1,000 m. This species was originally considered to have little commercial value and until the 1980s were taken mainly as bycatch by bottom trawl fisheries. They are now one of the most important fish species caught off the west coast of Ireland, by weight and by value. Monkfish are subject to a targeted fishery along the shelf edge north west of Ireland and they also constitute a significant proportion of the bycatch of mixed fisheries within the IOSEA3 area, particularly in deeper waters (Hartley Anderson, 2005). Monkfish are caught all year round within the IOSEA3 area, although a slight decrease in landings can be perceived during the autumn and winter months (Figure 5.5). This may be due to poorer weather conditions and shorter daylight hours restricting fishing effort.

Figure 5.5 Average Irish monthly landings (live weight tonnes) for monkfish, from the IOSEA3 area*, 2000 to 2007 (source: MI, 2008a)



** Data included from ICES rectangles encompassing the IOSEA3 area*

Pelagic fisheries

Pelagic species are those which, as adults, live in mid-water. They are often found in large shoals, and typically undergo extensive migrations between feeding, spawning and overwintering grounds. Within the IOSEA3 area catches are greatest over the shelf edge and continental slope and decline with depth (Figure 5.6). Catches recorded from the deepest reaches of the Rockall Trough are small. Generally speaking, pelagic catches are considerably higher on the continental shelf east of the licensing area. In total, pelagic catches are markedly higher than those for demersal species in the IOSEA3 area.

Four principle species, blue whiting, mackerel, horse mackerel and, to a lesser extent, herring are taken in and around the IOSEA3 area by Irish vessels (Figure 5.7). These catches are the result of individual targeted fisheries, each focussing on a particular species. Other pelagic species landed include tuna and swordfish. These species are usually caught with pelagic trawls, although purse seines, trolled lures and surface longlines are also occasionally used for large pelagic fish such as tuna.

Figure 5.6 Average Irish pelagic landings (live weight tonnes), for the period 2000 to 2007 (source: MI, 2008a)

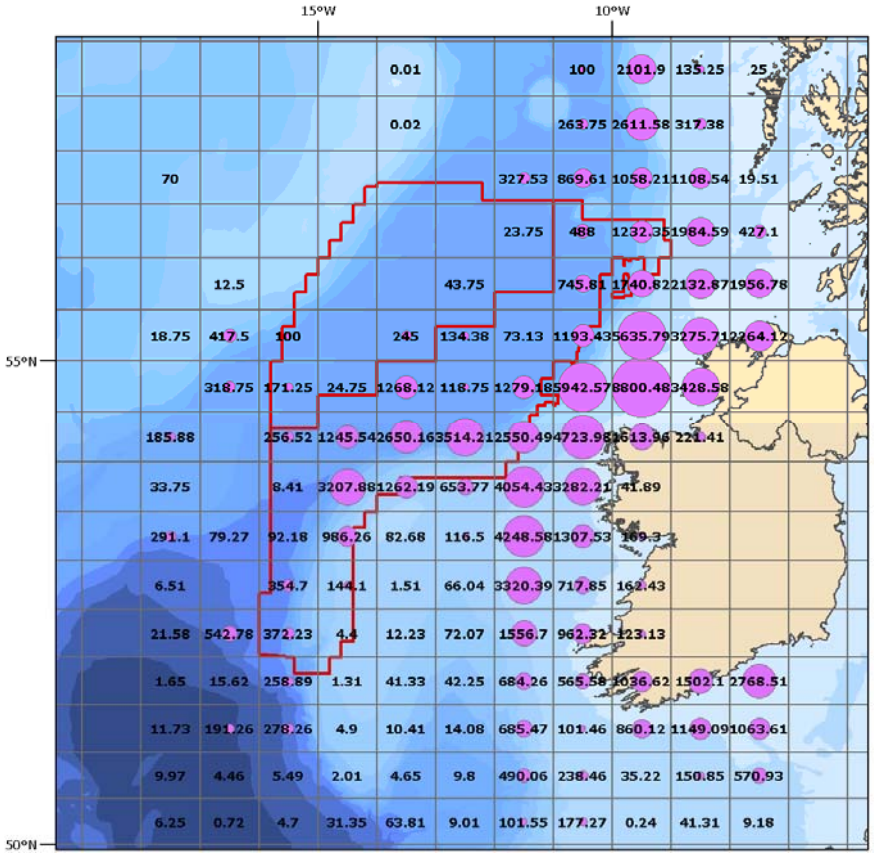
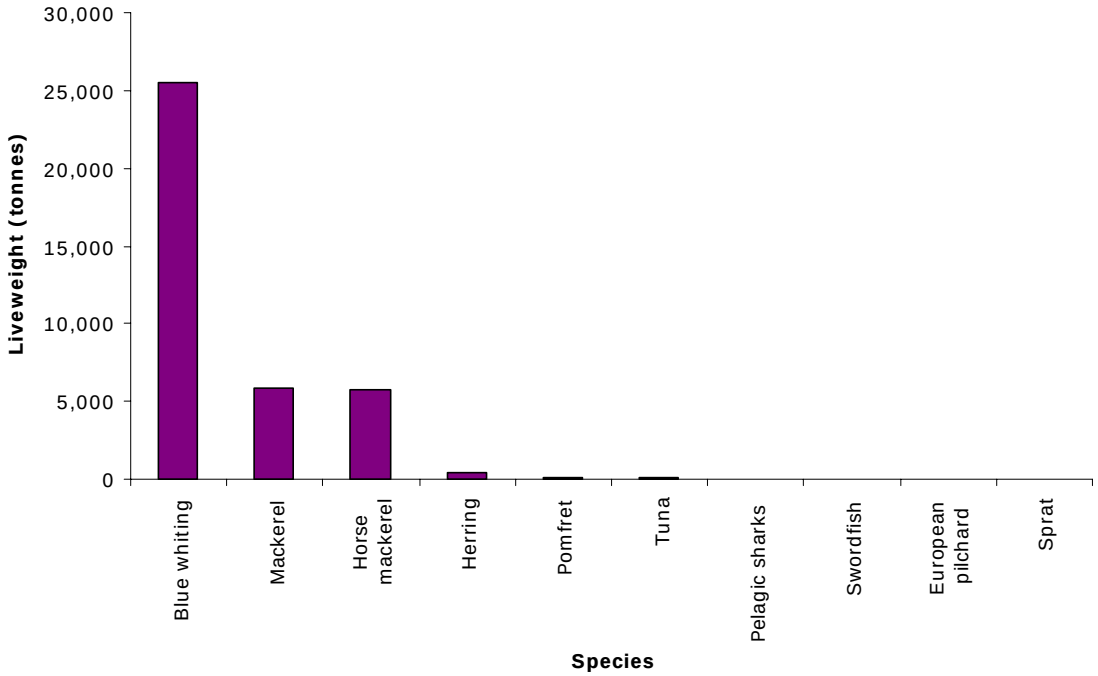


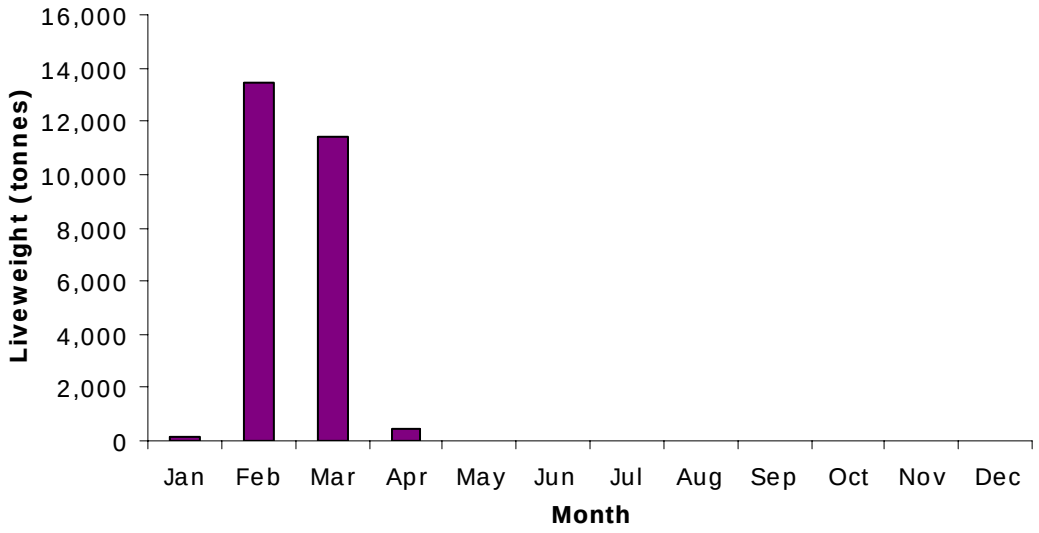
Figure 5.7 Average Irish pelagic fish landings (live weight tonnes), from the IOSEA3 area*, for the period 2000 to 2007 (source: MI, 2008a)



* *Data included from ICES rectangles encompassing the IOSEA3 area*

Blue whiting constitute approximately two thirds of the average pelagic catch from the IOSEA3 area over the last seven years. This species is found along the Irish continental shelf break, extending into the deep basins off the west coast of Ireland. During the first few months of the year, large numbers of this species occur in waters beyond the continental shelf west of Ireland as they move south to spawn (Wood *et al*, 1996). Irish trawlers and those of other nationalities take large quantities of this fish from the IOSEA3 area at this time. This pattern is clearly evidenced in the collated landings data for this species which indicate that over 95% of the mean Irish annual catch for this species is taken during February and March (Figure 5.8).

Figure 5.8 Average Irish monthly landings (live weight tonnes) for blue whiting, from the IOSEA3 area*, 2000 to 2007 (source: MI, 2008a)



* *Data included from ICES rectangles encompassing the IOSEA3 area*

Mackerel populations in the northeast Atlantic exist in two distinct populations, based on differences in spawning patterns; the western stock and the North Sea stock (DTI, 2001). Western mackerel stocks overwinter along the Irish continental shelf edge, at the fringe of the licensing area, before moving away to spawn and feed in spring and early summer (Wood *et al*, 1996). Horse mackerel are thought to show similar migration patterns. In the first few months of each year, the Irish trawlers target these large shoals of overwintering fish in the area to the southeast of the IOSEA3 area. As they begin their migration south, trawlers take mackerel and horse mackerel in lesser quantities.

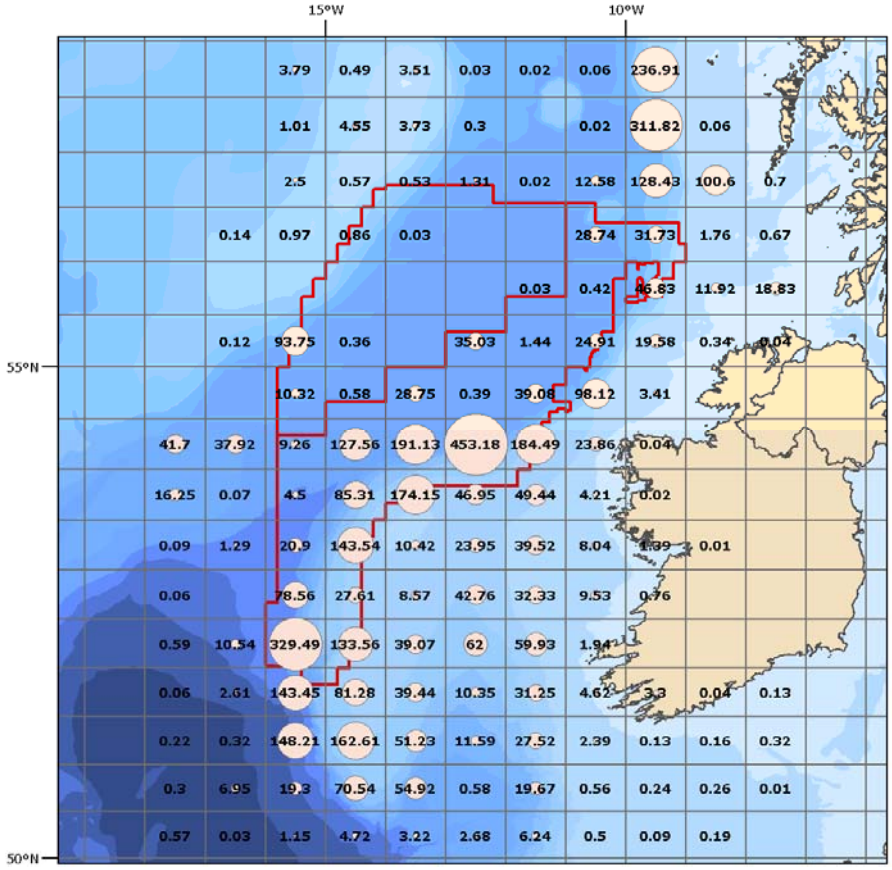
Herring stocks went through a period of decline in the 1970s and, in terms of landed weight, have largely been replaced by mackerel and horse mackerel (Figure 5.7). The majority of the Irish herring catch is taken from the Malin shelf, to the north of Ireland, where large herring shoals gather in traditional spawning grounds (Boelens *et al*, 1999). Outside their spawning period, adult herring feed across the Irish continental shelf, to depths of approximately 200 m. Irish trawlers also take herring, although in smaller quantities, from areas to the west of Ireland, including the continental shelf to the east of the IOSEA3 area and the licensing area itself.

Deepwater fisheries

With the decline of traditional fish stocks and improvements in fishing and shipping technology, many fishing vessels have begun to exploit fish in deeper waters. Deepwater fishing in the Rockall Trough was first developed by German trawlers that exploited spawning aggregations of blue ling (Gordon, 2003). From the mid 1970s, as German interest declined, French trawlers began to target blue ling; other deepwater bycatch species were mostly discarded. New markets for some of these discard species eg roundnose grenadier began to develop in the late 1980s, leading to an increase in the landings of deepwater fish species from trawl fisheries on the continental slope to the west of Ireland. Although a number of other countries, including Ireland, now participate in the fishery, France remains the main market for deepwater fish. Over 90% of deepwater bottom trawl landings from the Rockall Trough are taken by French vessels (Gordon, 2003).

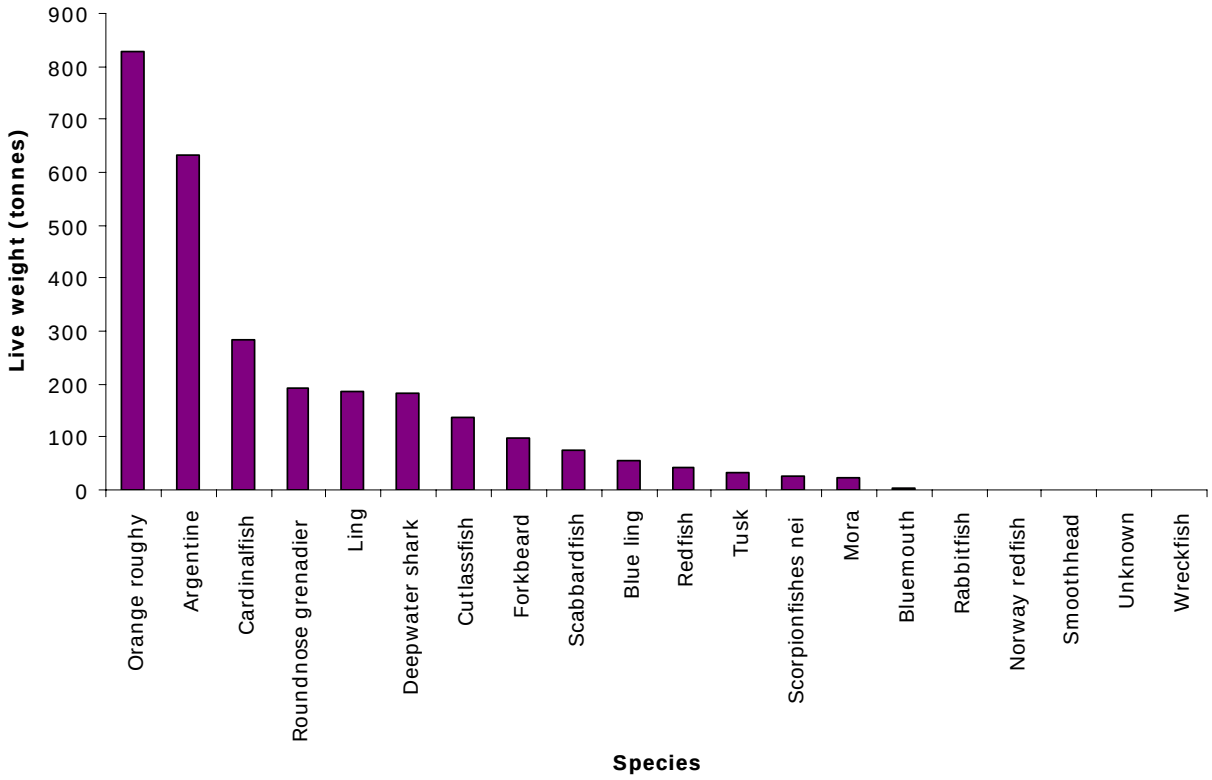
The term deepwater fishery refers to those vessels which catch fish at depths of 400 m and beyond (JNCC, 2008). Mid-slope (approximately 400 m) deepwater fisheries tend to target groups of species in a similar fashion to mixed demersal fisheries in shallower waters. Fishing for some species is more focused, particularly in case of species that from aggregations in certain areas such as seamounts eg orange roughy and blue ling (Hartley Anderson, 2005). Longline fisheries also target individual species such as ling and tusk. Deepwater fishing occurs through much of the IOSEA3 licensing area but the largest catches are restricted to the continental slope along the eastern a boundary of the designated area (Figure 5.9).

Figure 5.9 Average Irish deepwater landings (live weight tonnes) for each ICES square, for the period 2000 to 2007 (source: MI, 2008a)



Deepwater catches taken from the IOSEA3 area are dominated by orange roughy and argentine (Figure 5.10). There are also significant recorded catches of cardinal fish, deepwater sharks, roundnose grenadier, ling and forkbeard. The landings data indicates that total catches of deepwater species are low in comparison to landings from the pelagic fishery (MI, 2008a).

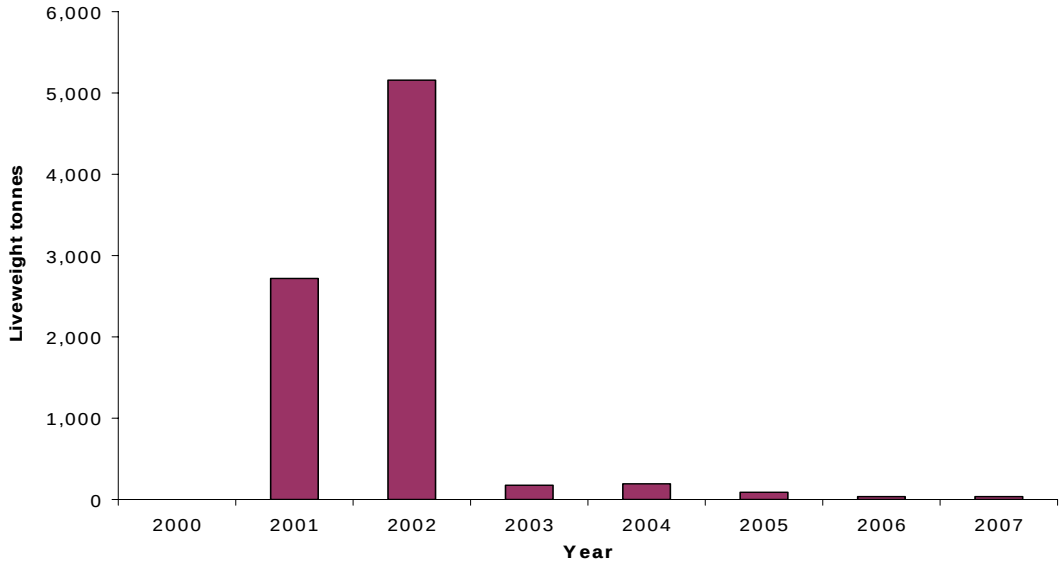
Figure 5.10 Average Irish deepwater fish landings (live weight tonnes), from the IOSEA3 area*, for the period 2000 to 2007 (source: MI, 2008a)



**Data included from ICES rectangles encompassing the IOSEA3 area*

The orange roughy has been the principle species caught by deepwater fisheries in the IOSEA3 area over the last seven years (Figure 5.10). It has been the subject of a targeted deep water fishery for almost two decades and has a well established market. This species forms very large spawning aggregations on sea mounds or other underwater features, allowing separate mound aggregations to be exploited successively. The fishery is quite specialised, as it targets the deeper areas of the slope. As such, vessels targeting these fish require a greater winch capacity and more sophisticated echo-sounders and net monitors than vessels trawling the mid-slope for other species. Although the orange roughy has made up the greatest proportion of the Irish deepwater fish catches in the IOSEA3 area, the vast majority of landings from this area were actually taken in 2001 and 2002, before dropping to almost zero (Figure 5.11). This potentially suggests that orange roughy may be suffering from overexploitation and that trawlers are targeting other species as a result. Three areas have been closed for directed orange roughy fishing in Irish Atlantic waters. These closure boxes, known as OR I (a), OR I(b) and OR I (c), cover large sections of the IOSEA3 licensing area (Figure 5.4).

Figure 5.11 Average Irish annual landings (live weight tonnes) for orange roughy, from the IOSEA3 area*, 2000 to 2007 (source: MI, 2008a)



**Data included from ICES rectangles encompassing the IOSEA3 area*

The argentine constitutes over one fifth by weight of the average deepwater catch from the IOSEA3 area over the last seven years (MI, 2008a). The argentine is a deepwater smelt species that, as with orange roughy, has been targeted by deepwater fisheries west of Ireland for some time. It is targeted by semi-pelagic fisheries and is also a large constituent of the bycatch of trawl fisheries targeting other species (Gordon *et al*, 2003; Hartley Anderson, 2005).

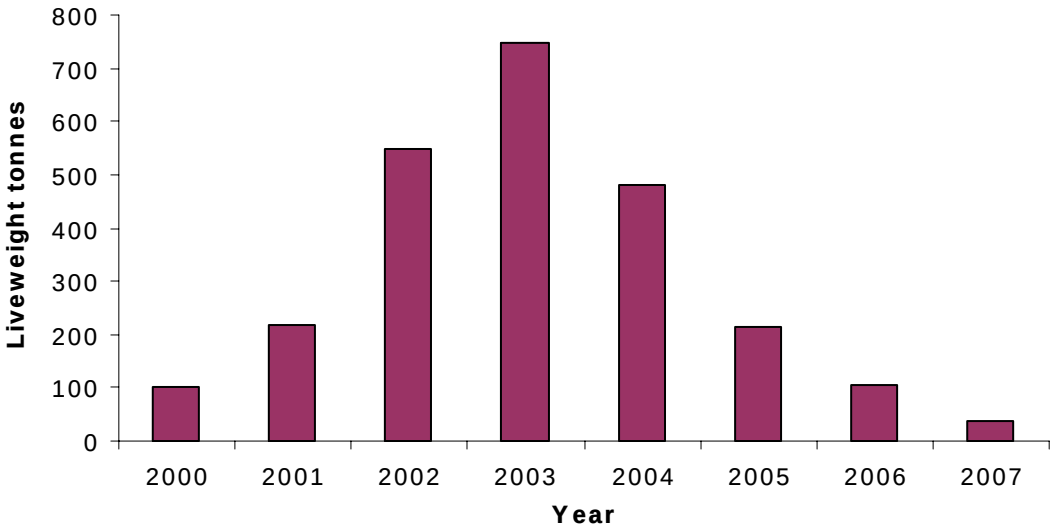
Although roundnose grenadier catches from the IOSEA3 area are lower than those for the species described above, it is one of the main target species for mixed deepwater trawl fisheries in the Rockall Trough and north-east Atlantic as a whole. Although landings from Irish vessels are relatively low, large catches are made by the French bottom trawl fishery in the IOSEA3 area (Gordon & Hunter, 1994; Gordon *et al*, 2003). Bycatch species, including black scabbardfish, blue ling, greater forkbeard, mora and sharks are also important for the viability of the grenadier fishery. Trawling for the grenadier is largely restricted to mid-slope depths, although it has been recorded from depths up to 1,900 m in the Rockall Trough (Gordon & Hunter, 1994). This suggests that, with increased winch capacity, trawlers could also exploit these fish at greater depths. However, with increasing depth, the bycatch of unwanted species would increase while the bycatch of useful species would diminish (SAMS, 2008). Catches of cardinal fish, cutlass fish and forkbeard (Figure 5.10) are likely to represent bycatch from the trawl fisheries for other more commercially significant species such as the roundnose grenadier (Hartley Anderson, 2005).

Ling are found at depths ranging from 100 to 1,000 m but are most abundant at approximately 400 m. This species is regularly targeted by longline fisheries in the Rockall Trough with considerable quantities of tusk taken as bycatch. Longline fishing uses thousands of baited hooks hung from a single line and is employed to target ling, blue ling, tusk, hake and forkbeard on the upper slopes. This technique is chiefly utilised by Scandinavian nations, particularly Norway, in the Rockall Trough (Gordon, 2003; Gordon *et al*, 2003).

Deepwater sharks are also a significant part of the catch recorded from the IOSEA3 area over the last seven years (Figure 5.10). A number of deep water shark families have been recorded over a wide depth range in the north-east Atlantic, however, only two species of the family Squalidae are of real significance to deepwater fisheries (Gordon *&* Hunter, 1994; Gordon & Swan, 1997). The Portuguese dogfish and the leafscale gulper shark are targeted by both mixed trawl fisheries and longline fisheries in the Rockall Trough. These species are collectively known as 'Siki' although the Portugese dogfish is in more demand to the French market. However, it is likely that other large squalid sharks are regularly sold along with the Portuguese dogfish under this name (SAMS, 2008). Over the recorded

seven year period, shark landings increased up until 2003 but have declined annually since then (Figure 5.12). This decline may be the result of overexploitation of deepwater shark stocks (Hartley Anderson, 2005).

Figure 5.12 Average Irish annual landings (live weight tonnes) for deepwater sharks, from the IOSEA3 area*, 2000 to 2007 (source: MI, 2008a)



**Data included from ICES rectangles encompassing the IOSEA3 area*

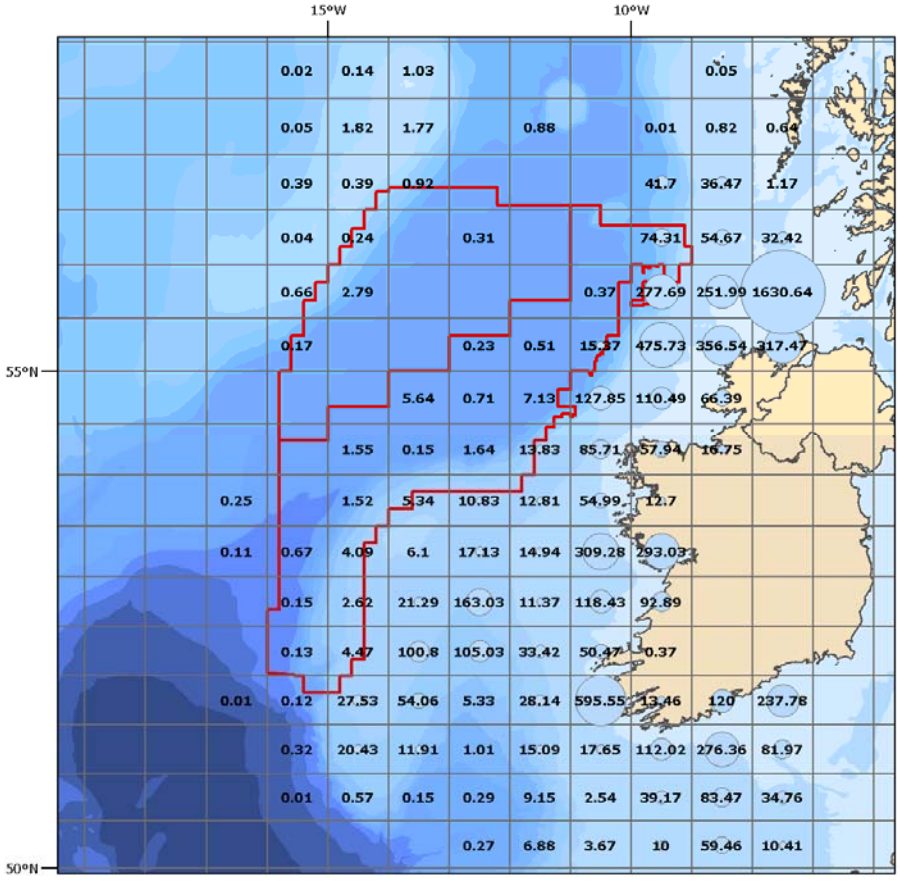
When compared with shallow continental shelf areas, the deepwater environment is generally considered relatively unproductive. As a result of limited food supply, most deepwater fish are long-lived, slow to reach sexual maturity and have a low reproductive potential. These ecological characteristics can make the deepwater fish species discussed above particularly vulnerable to over exploitation by the fishing industry. ICES has stated that all the fish species currently targeted by commercial fisheries in the Rockall Trough are being exploited beyond safe biological limits (Gordon, 2003).

Shellfish fisheries

The term shellfish includes crustaceans (crabs, lobsters and shrimps), bivalve molluscs (mussels, oysters and scallops) and cephalopods (squids and octopuses). The shellfish fishery can be broadly divided into offshore and onshore components. The offshore component targets *Nephrops* and scallops using trawls, while static gears are used to catch crabs and lobsters inshore. Shellfish fisheries make an important contribution to the income of fishermen on the west and southwest coasts of Ireland. Shellfish generally have a higher unit value than most demersal and pelagic fish species, giving smaller catches more significance.

Shellfish catches within the IOSEA3 licensing area are minimal as much of the IOSEA3 area is unsuitable for shellfish fisheries due to depth (Figure 5.13). Significantly higher catches have been recorded from the relatively shallow continental shelf and shelf edge waters, to the east of the IOSEA3 area (Figure 5.13). Within the IOSEA3 area itself, the greatest catches are of edible crabs and *Nephrops* (Dublin Bay prawn). Squids and octopuses are also taken, although in small numbers, from the waters to the west of Ireland. Small catches of deep sea red crab have also been regularly recorded; this species is increasingly caught as bycatch from deep water gillnet fisheries for monkfish (Gordon *et al*, 2003). Catches of other crustacean species such as lobster and shrimp are very low as would be expected at the depths covered by much of the IOSEA3 area.

Figure 5.13 Average Irish shellfish landings (live weight tonnes) for each ICES square, for the period 2000 to 2007 (source: MI, 2008a)



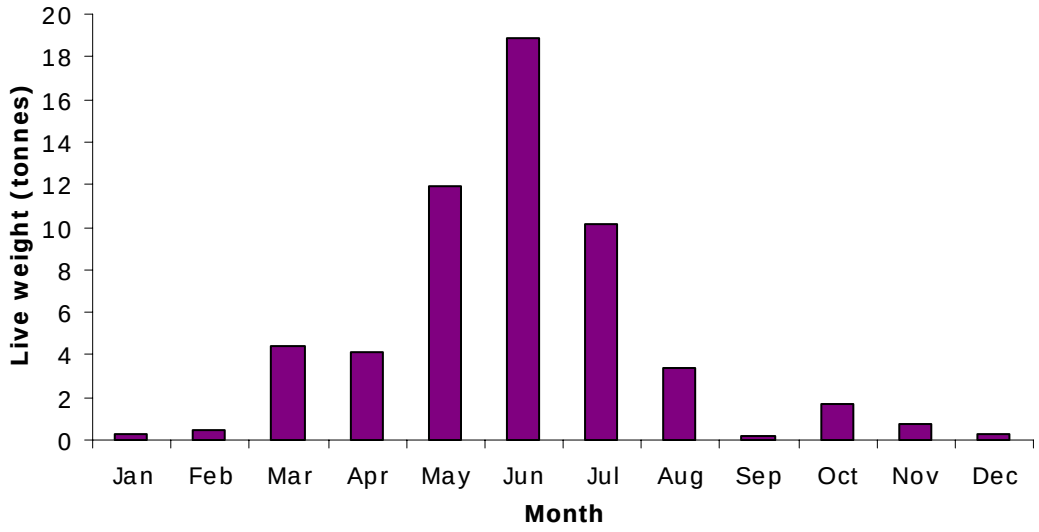
The edible crab is the principle component of the total average shellfish catch (MI, 2008a). However, it is likely that the majority of landings originated from a small number of ICES rectangles on the shallower eastern fringe of the IOSEA3 area, as edible crabs are usually caught from inshore areas (Figure 5.13). The edible crab is taken from inshore areas all along the west coast of Ireland, to the east of the IOSEA3 area, but in particularly high numbers off the rocky southwest coast of Ireland - ICES rectangle 32D9 (Figure 5.13). The majority are taken with static pots, although a relatively small proportion is also landed with static gill nets, trawls and dredges. The edible crab fishery is more active during the summer months as poor weather conditions in the winter lead to much of the relevant fishing gear being brought ashore to avoid damage.

Nephrops are mud burrowing crustaceans, limited in their distribution by the extent of suitable fine muddy sediments (FRS, 2008). They can be found in depths as shallow as a few metres in bays, down to over 500 m on the shelf edge. *Nephrops* spawning and nursery grounds are found all along the continental shelf and shelf edge to the west and southwest of Ireland (Coull *et al*, 1998). Spawning grounds continue to extend further offshore onto the Porcupine Bank, just to the south of the IOSEA3 area. These spawning grounds define the general distribution of adult *Nephrops* as the species does not migrate from larval settlement areas. As a result of this distribution, the Irish *Nephrops* fishery is more active in the Porcupine Bank region than the area covered by the IOSEA3 licensing round. However, *Nephrops* are also landed from the IOSEA3 area and the adjacent continental shelf/shelf edge (MI, 2008a). Although the *Nephrops* fishery continues to operate throughout the year, a strong seasonal trend can be observed, with the greatest landings recorded in late spring and summer (Figure 5.14).

The annual mean catch of deep sea red crab from the IOSEA3 area over the last 7 years is relatively small, approximately 12 tonnes (MI, 2008a). Although this may be as bycatch for monkfish, a burgeoning fishery for this species is being conducted on the continental slopes at either side of the

IOSEA3 area (Nixon, *pers comm*). This species can be caught using both potting and trawling methods and the chief market for the catch is Spain (Gordon *et al,* 2003). Although the fishery is expanding, little is known about deep sea red crab life history and abundance so it may be at risk from over-exploitation as fishing intensity increases (Robinson *et al*, 2007).

Figure 5.14 Average Irish monthly landings (live weight tonnes) for *Nephrops*, from the IOSEA3 area*, 2000 to 2007 (source: MI, 2008a)

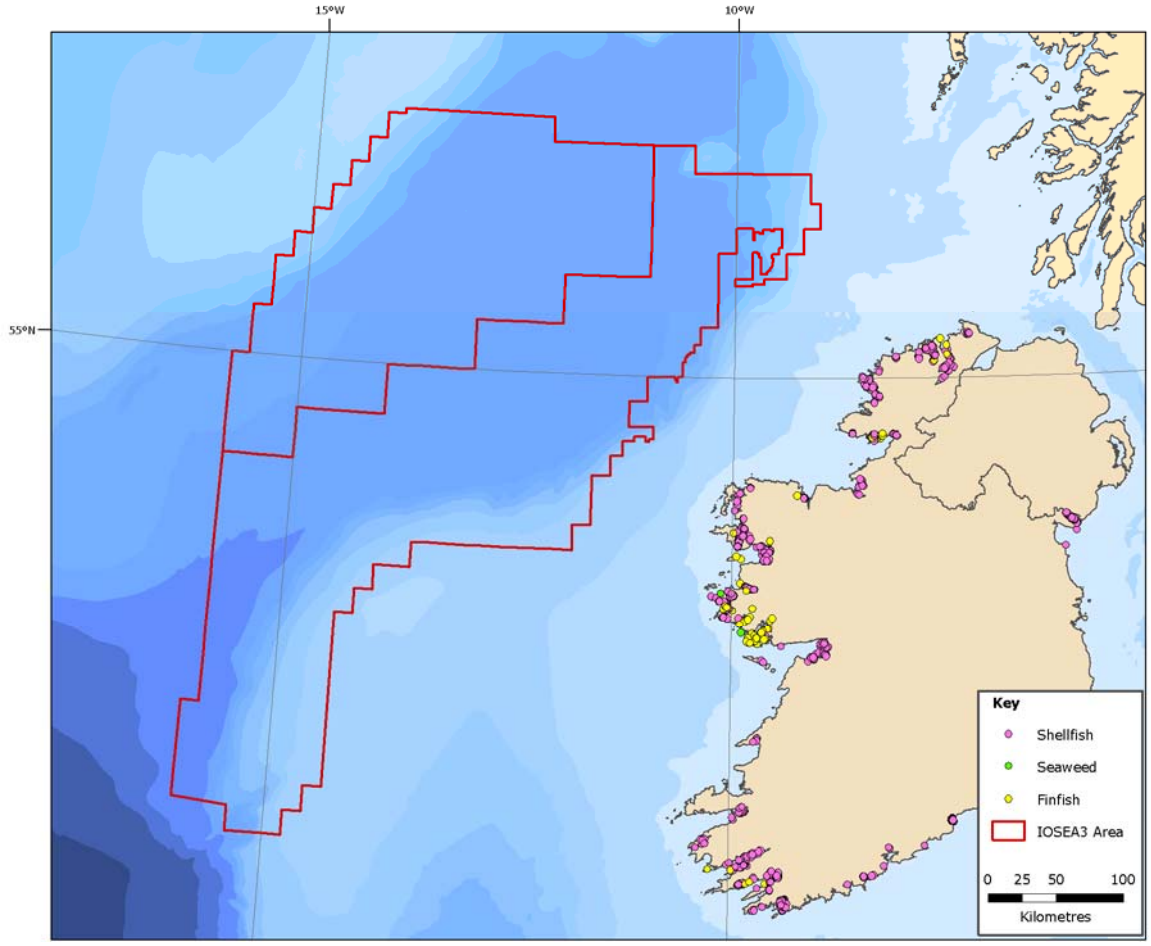


**Data included from ICES rectangles encompassing the IOSEA3 area*

5.2 Aquaculture

There are several finfish farms in operation on the west coast of Ireland and shellfish farming is carried out to some extent in all of the coastal counties (Figure 5.15) (MI, 2008; DCENR, 2008). As well as the four core species (salmon, mussels, oysters and scallops) which account for the majority of aquaculture output in Ireland, a range of new species have entered the sector including sea trout, cod, perch, charr, abalone, sea urchin, clam and seahorse (BIM, 2008b; Browne *et al*, 2007).

Figure 5.15 Aquaculture locations along the west coast of Ireland (source: Browne *et al*, 2007)



The main salmon farming areas are located along the west Irish coast mainly within Co Galway, which also supports significant oyster cultivation activities. Many of the important salmon farming bays located primarily within Donegal and Galway counties also host significant mussel farming operations (Browne *et al*, 2007; Parsons *et al,* 2004).

In the year 2006 there were a total of 704 aquaculture licences around the coast of Ireland, of which approximately 181 licences were lapsed or due for renewal by 2006. The majority of these licences are for the cultivation of oysters and mussels, with a breakdown of 43% and 30% respectively. The finfish sector is small in comparison with 46 licences for salmon (plus further 34 licences which were lapsed or due to renewal by 2006) (Browne *et al*, 2007).

5.2.1 Seaweed industry

Most seaweed harvesting is carried out in remote areas and, according to the DCENR, together with salmon farming and shellfish aquaculture, contributes to the economic sustainability in areas where few alternative sources of employment exist.

There are a number of seaweed species suitable for cultivation in Ireland (eg *Alaria esculenta, Palmaria palmata, Asparagopsis armata, Chondrus crispus* and *Laminaria saccharina*). However,

seaweed aquaculture remains in a pilot phase and licences have only been issued for counties Cork and Galway (Browne *et al*, 2007). There are several members of the Irish Seaweed Industry Organisation (ISIO) which cultivate and/or process seaweed. There is a seaweed processing plant at Kilkieran, Co Galway, established in 1947, which supplies seaweed meal to the alginate industry, agriculture, horticulture and cosmetic industries (Arramara Teoranta, 2007). Other members include Celtic Sea Minerals Ltd in Co Cork and Blath Na Mara in Co Galway (ISIO, 2008).

5.3 Recreation and amenity

Ireland's coastal landscapes support well-kept beaches, rugged cliffs, picturesque harbours and an abundance of wildlife. These natural and developed features possess significant recreation and amenity value for local residents in addition to major opportunities for domestic and international tourism. In recent years, Ireland has experienced considerable growth in leisure activities based on the coast and sea, including sea angling, bathing, sailing, surfing, wind surfing, canoeing, Scuba diving and snorkelling, walking and wildlife watching (DAST, 2005).

5.3.1 Recreational fisheries

Recreation fishing in Ireland consists chiefly of coarse fishing and game angling in freshwater, and sea angling in coastal and near shore areas. The most significant aspect of recreational fishing with regard to the IOSEA3 area is sea angling, which takes place in the counties along the west Irish coast around a number of locations. The Shannon Estuary is an important area for inshore sea angling but it is also conducted from various sites in Galway, Clare, Kerry and Cork (CFB, 2008).

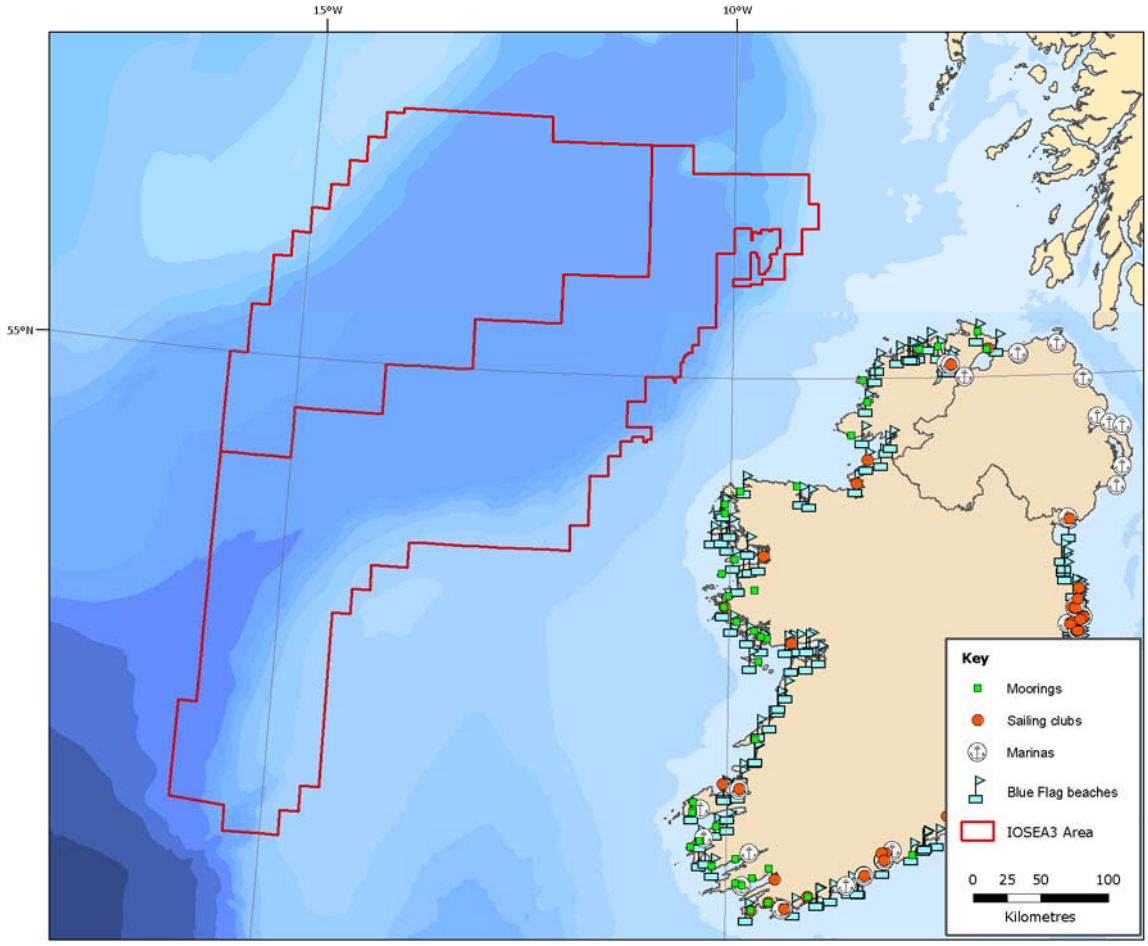
Sea angling is also conducted in deeper areas further offshore in depths up to approximately 100 m. Offshore or deep sea angling is most popular in the southwest, west and northwest of Ireland (CFB, 2008). The sea angling industry as a whole generates €59m and employs 733 people (MI, 2004). Sea angling from boat or the shore makes up approximately half of the total number of recreational anglers; freshwater makes up the other 50% (MI, 2004).

5.3.2 Other water-based activities

Two thirds of Ireland's population live within 10 km of the coast, and over 50% of Irish adults engage in water-based leisure activities (MI, 2008). Sailing is a major coastal activity in areas relevant to the IOSEA3 area. The Irish Sailing Association (ISA) has over 23,000 members nationwide and new marinas and other sailing facilities are continually being developed. There are approximately 30 coastal sailing clubs affiliated with the ISA in the counties on the west Irish coast adjacent to the IOSEA3 licensing area (ISA, 2008) along with numerous marinas and moorings (Figure 5.16). However, the majority of activity takes place in inshore areas, with very few ocean-going sailing vessels able to operate safely at distances any greater than 30 km from the coast.

Sailing clubs often support other aquatic pursuits, in particular surfing, windsurfing, canoeing and diving. There are many popular dive sites along the west coast of Ireland between Malin Head (Co Donegal) in the far north and Mizen Head (Co Cork) in the far south. Again these activities are generally restricted to inshore areas although deep sea diving is conducted further offshore. Wildlife, especially marine mammal watching is a burgeoning recreational pursuit in Irish waters. One of the major sites for dolphin watching in Ireland is the Shannon Estuary where a number of commercial operators conduct around 400 dolphin watching tours annually (Shannon Dolphin and Wildlife Foundation, 2008). There are also numerous Blue Flag beaches, particularly in Counties Clare and Kerry, adjacent to the IOSEA3 licensing area (BlueFlag, 2008; Figure 5.16). The high quality of these beaches is fundamental to many local water-based activities.

Figure 5.16 Sailing, marinas, moorings and blue flag beaches (various sources)



5.3.3 Seascape

Seascape refers to the value of landscape and sea vistas as observed from coastal areas. The diverse stretch of coastline adjacent to the IOSEA3 area bears significant sea and landscape value. This value is illustrated by the designation of a number of Character Areas in the area relevant to the IOSEA3, designations that afford statutory protection to sites of major seascape value. The Cliffs of Moher, one of Ireland's premier internationally recognised seascape areas is adjacent to the IOSEA3 area. The coastal landscape of Galway is classified as having outstanding value by its County Development Plan. This includes valuable seascape areas in the Connemara region, Co Galway (Galway County Council, 2003). The Burren in County Clare is also an important seascape area that covers a stretch of coastline relevant to the licensing area.

5.3.4 Tourism

The natural environment, heritage and wide range of activities described in the above sections form the foundation of a significant tourism industry in Ireland. Irish tourism is a growing economic sector with expenditure by tourists in Ireland in 2007 of almost €4.9b, sustaining close to 250,000 people in employment (DAST, 2008). The last decade has seen the tourism industry develop in maturity and importance in the Irish economy, contributing over 4% of the Gross National Product (GNP), while still being characterised by the dominance of individual, small to medium sized enterprises competing in an increasingly international tourism marketplace (DAST, 2005). An estimated 70% of all tourism activity in Ireland is accommodated in coastal areas.

Data sources and data gaps

There was a limited volume of information on the exact extent of important seascape areas along the coastline relevant to the licensing area. It should be noted that the tourism and recreation usage

discussed above is predominately coastal in nature and unlikely to interact with the proposed IOSEA3 scenarios.

5.4 Marine archaeology and shipwrecks

5.4.1 Marine archaeology

The present Irish coastline may potentially contain a rich variety of archaeological remains; the understanding of this marine archaeological heritage is being continually expanded by the work of a number of national research institutes. Some of the discovered remains have been dated back to the Mesolithic era (Hartley Anderson, 2005). The locations of now submerged human activity have not been fully quantified but are likely to be restricted to sheltered areas relatively close to the Irish coast. Surveys of intertidal areas of the Shannon estuary have recovered artefacts and remains indicating the presence of Mesolithic and Neolithic human occupation in these areas. Discoveries on this scale may be isolated cases, however, as the vigorous wave climate and current regime experienced by much of the Irish continental shelf is not conducive to the preservation of submerged remains (Hartley Anderson, 2005). The IOSEA3 licensing area covers deeper areas beyond the continental shelf, which are unlikely to support significant archaeological resources, as they have not historically been subject to any major human use. Shipwrecks are likely to represent the chief archaeological resources in the deeper areas west of Ireland (Hartley Anderson, 2005).

5.4.2 Shipwrecks

There are known to be thousands of shipwrecks in Irish waters that represent an important legacy of historical maritime activity. The majority of wrecks around the Irish coast lie in inshore areas in depths of less than 50 m. This reflects the fact that most vessels lost have been blown ashore by inclement weather, or have struck submerged rocks or hazards in inshore areas. Shipwrecks in deeper areas south of Kerry and Cork are mostly associated with naval losses during the Second World War. Shipwrecks in and around the IOSEA3 area may also be linked with trade routes with the ports of Cork, Galway and Derry. The INSS has identified a large number of wrecks in inshore areas but the identification of wrecks in deeper waters to the west of Ireland relevant to the IOSEA3 area has been limited to very large wrecks due to the limited survey resolution (Hartley Anderson, 2005). Wrecks in these deeper areas are generally assumed to be associated with fishing, trade routes and war casualties.

A number of shipwrecks may hold potentially dangerous cargo, whether fuel oil that may be released should the wreck be disturbed, or even munitions, chemicals and explosives. Dangerous material from wrecks sunk deliberately may have spread into the IOSEA3 area (see Section 5.8.1). There may also be a number of wrecks containing hazardous material in unknown locations (GSI, 2008).

Data sources and data gaps

There are significant data gaps in the understanding of Ireland's marine archaeological resources. The available information is primarily limited to the intertidal zone although it is unlikely that deeper areas such as the IOSEA3 are major sites of archaeological remains other than shipwrecks. The works of the INSS and the DoEHLG's national register of shipwrecks have identified the position of many shipwrecks in near shore areas but the present ability to quantify deep water wrecks is limited.

5.5 Shipping

Over the past 20 years the number of cargo and passenger vessel arrivals at Irish ports has increased steadily, as has trade with non-EU countries and now major shipping routes traverse the waters off the west coast of Ireland. Although shipping activity in the waters off the west coast of Ireland is less intense than that in the Irish Sea, Ireland's Atlantic Seaboard does support important shipping ports at Galway, Cork and along the Shannon Estuary adjacent to the IOSEA3 area.

5.5.1 Shipping routes

The study area covers a large stretch of the Western Atlantic off the west coast of Ireland and hence shipping through the area is influenced by a wide range of factors, not just one key port, route or trading commodity (Anatec, 2008). Approximately 75% of ship movements through the area are

transatlantic sailings between a variety of American ports (in South and North including Canada) and Northern European ports in Ireland, UK, Norway and the Baltic (Anatec, 2008).

There are a number of important shipping corridors between ports on the west coast of Ireland and ports on mainland Europe. However, the routes between these ports tend to pass through coastal waters and ships are unlikely to sail as far west as the IOSEA3 area. For example, a major route runs from Shannon Foynes to Rotterdam but it remains close to the southwest coast of Ireland before passing through the Celtic Sea and English Channel (IMDO, 2008).

The densest shipping areas off the coast of Ireland appear to lie south of Ireland in the Celtic Sea (Hartley Anderson, 2005). Figures 5.17 and 5.18 present the density data gathered from the IOSEA3 area during a shipping intensity study contracted for this report. The current level of shipping overall is estimated at 37,291 vessels per year in the IOSEA3 area, and on average 25 vessels are likely to be within this area at any one time (Anatec, 2008).

It is clear from the presented data that for ships of all types and sizes, the central section of the licensing area has a noticeably higher shipping density (Figure 5.17). This is especially true of cargo vessels and vessels greater than or equal to 40,000 DWT (Figure 5.18). The pattern of vessel density also seems to suggest two or three distinct shipping corridors running diagonally across the central extent of the IOSEA3 area. Figure 5.18 also shows that the densities of commercial ferries across the IOSEA3 area are relatively low. Overall, vessel traffic levels are considerably lighter than those experienced in the Celtic Sea for example, or around the coasts of northwest Europe.

Figure 5.17 Total shipping density within the IOSEA3 area, indicating major shipping routes and major commercial ports (source: Anatec, 2008)

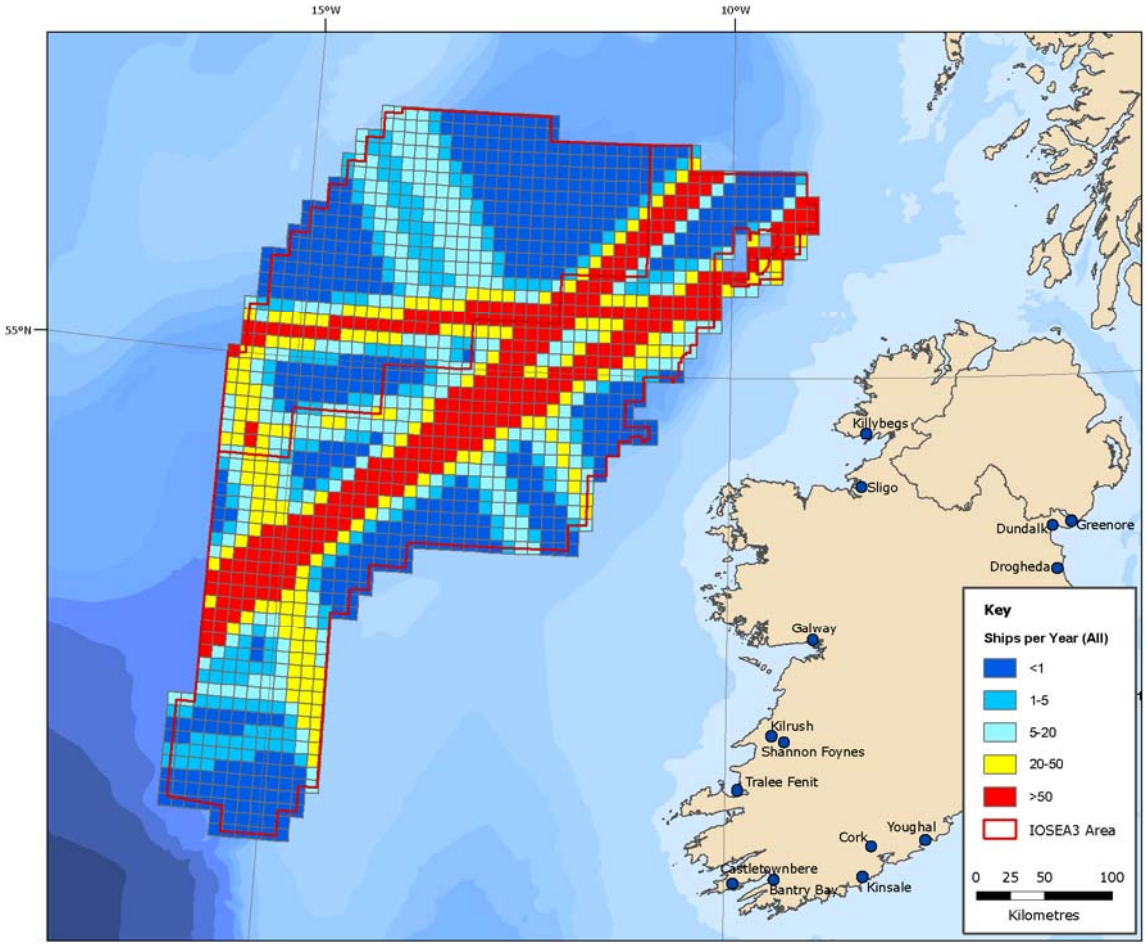
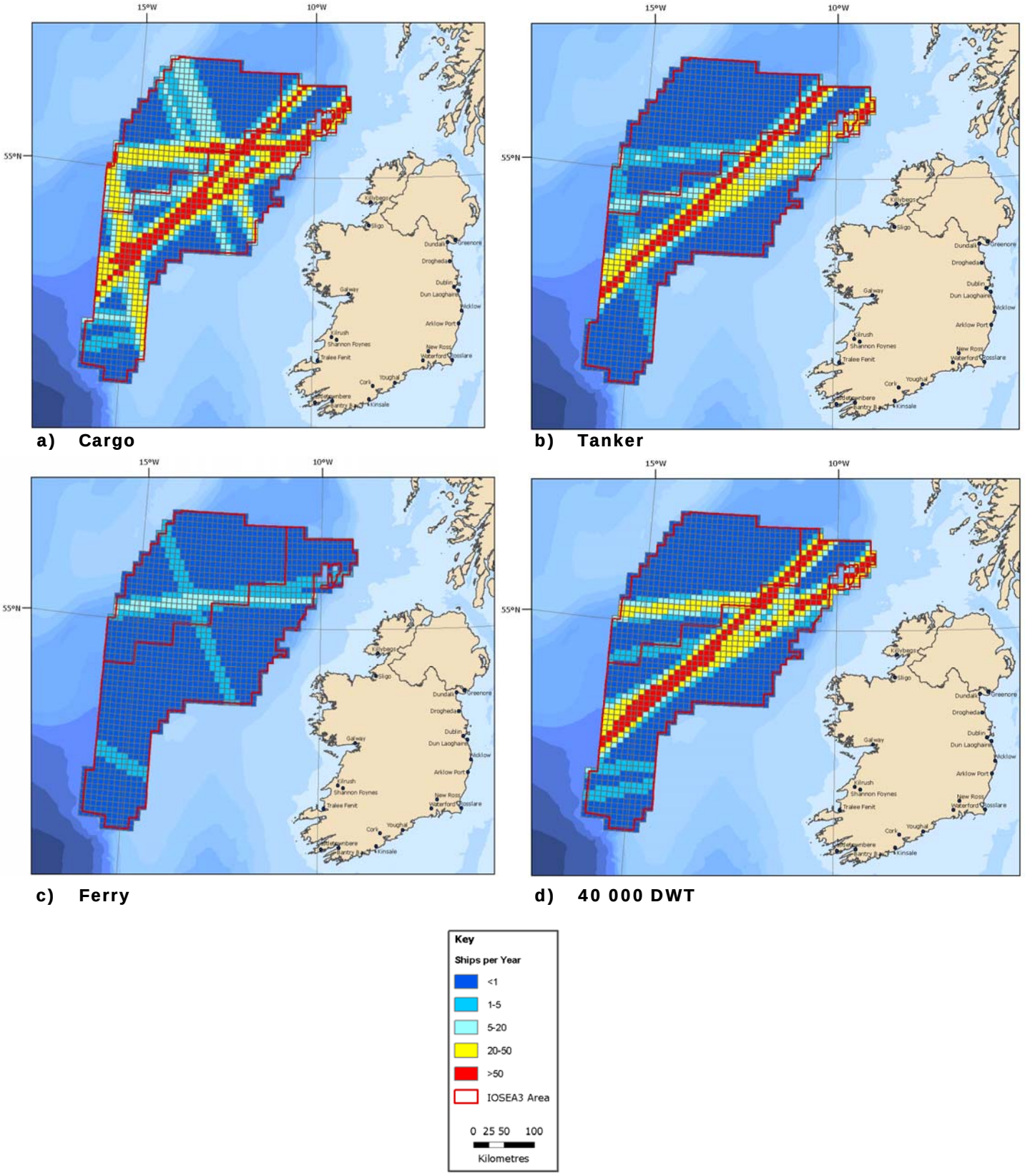


Figure 5.18 **Average cargo, tanker and ferry densities and density of vessels greater or equal to 40,000 DWT (Class 5) within the IOSEA3 area (source: Anatec, 2008)**



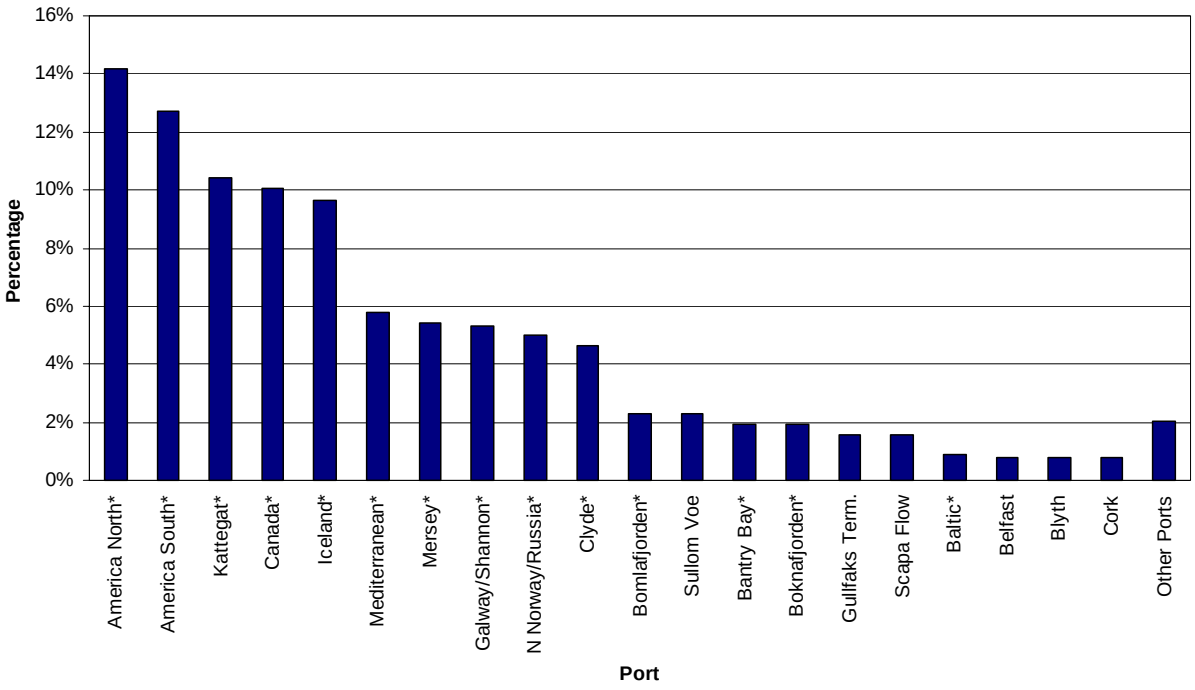
Information presented in Figures 5.17 and 5.18 excludes shipping which is termed as non-routine, which is generally defined as shipping activity not based on steaming economically between departure and destination ports. This information therefore excludes, amongst others, scientific research vessels, fishing vessels (Section 5.1.1) and recreational craft (Section 5.3.2).

5.5.2 Commercial ports

Shannon Foynes Port Company is Ireland's largest bulk cargo handler. Major recent investment towards the development of new shipping, industrial and commercial facilities is likely to result in an increase in shipping densities to the west of Ireland (Hartley Anderson, 2005).

The Port of Galway is one of the principal general cargo ports on the west coast of Ireland. In recent years (between 1996 and 2004) tonnage has increased steadily with an overall increase of 87%, and ship arrivals increased 42% from 1998 to 2002, should these trends continue, this could lead to increased shipping in the IOSEA3 area. In 2005, 432 vessels totalling 1,018,328 tonnes of cargo passed through the port, of this, imports were 988,328 tonnes and exports 30,000 tonnes (IMDO, 2008). The shipping study contracted for the IOSEA3 area observed that both Galway/Shannon and Cork were amongst the main individual destinations for shipping routes across the Atlantic (Figure 5.19). This figure also shows that much of the traffic routeing through licensing area is travelling across the Atlantic.

Figure 5.19 Main ports with ships routeing through IOSEA3 area (SOURCE: Anatec, 2008)



* *Indicates various ports.*

There are a number of lesser ports along the west coast of Ireland, notably Tralee and Fenit Harbour, which has been used by the oil industry as a base for exploration west of Ireland, Castletownbere which is a locally important fishing port and Bantry Bay where the terminal can handle tankers of up to 323,000 DWT (IMDO, 2008).

Growth in the world economy over the next ten years will be reflected in an increase in shipping trade as more than 90% of world trade by weight is transported by sea. It is assumed that this will result in a conservative increase in seaborne trade crossing the licensing area, although it is likely that this will stem from the use of larger ships rather than additional ship movements. There is however a high degree of uncertainty in this estimate, which in the next few years could be affected by the recent downturn in the US and European economies (the “Credit Crunch”), as well as geographical variations in trading patterns (Anatec, 2008).

Data sources and data gaps

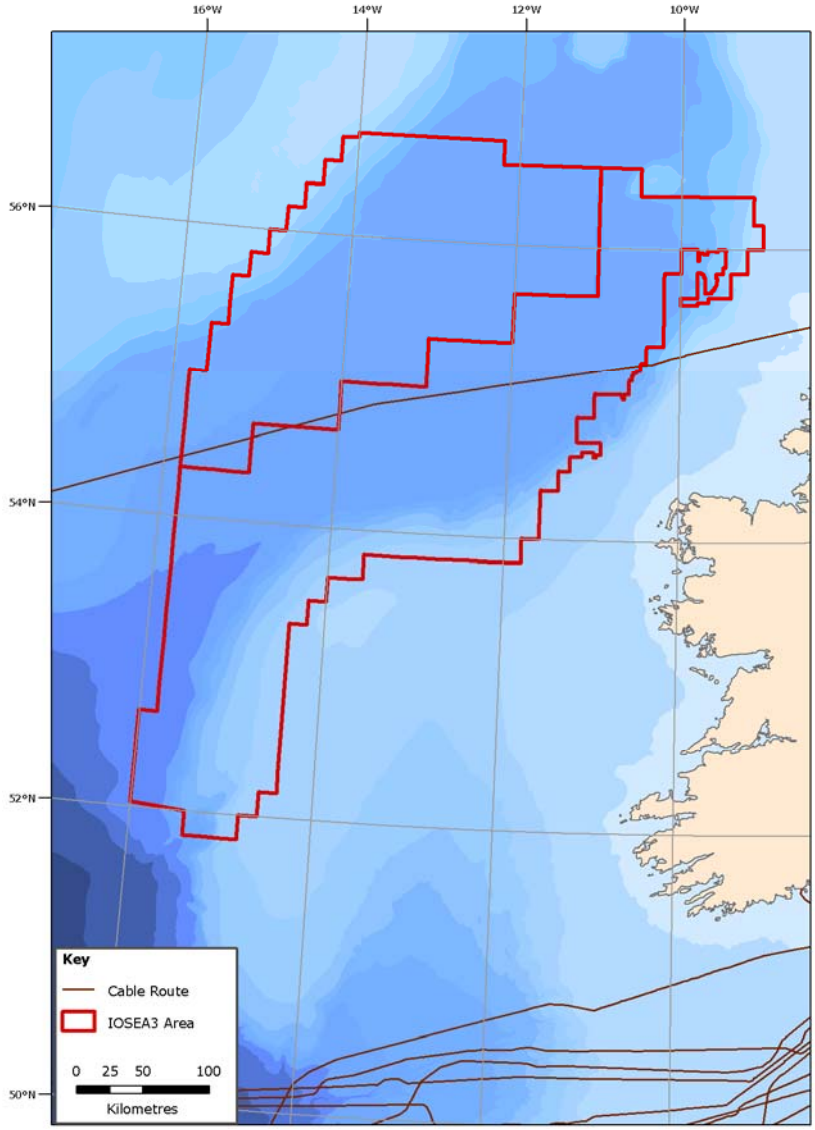
The main source of data on shipping activity and port status for the IOSEA3 area is a shipping study for the Rockall Basin area (Anatec, 2008). It should be noted that this study was impaired by a lack of detailed survey data required to verify route positions; satellite-tracking data of ships in the western Atlantic in 2005 was available to the project (Anatec, 2008). In general, there was a lack of publicly available data on shipping activities at smaller ports.

5.6 Submarine cables

The submarine telecommunication cable industry represents another important user of the offshore area, with development rights protected under the United Nations Convention on the Law of the Sea (UNCLOS). An extensive network of subsea telecommunication cables is present on the sea floor ensuring reliable telephone, electronic and telegraphic communication between countries and continents. Cable and Wireless (C&W), CVC Hibernia Atlantic, Apollo, VSNL Telecoms and Level 3 Global Submarine and Flag Ltd are the major cable operators in Irish waters (Kingfisher, 2008).

The majority of marine cables that traverse Irish waters head westwards out across the Atlantic and towards the US. There is currently one working submarine cable crossing through the centre of the IOSEA3 area: the Hibernia 'A' CVC Hibernia Atlantic (Figure 5.20) (Kingfisher, 2008).

Figure 5.20 Marine cables crossing west Irish waters (source: Kingfisher, 2008)



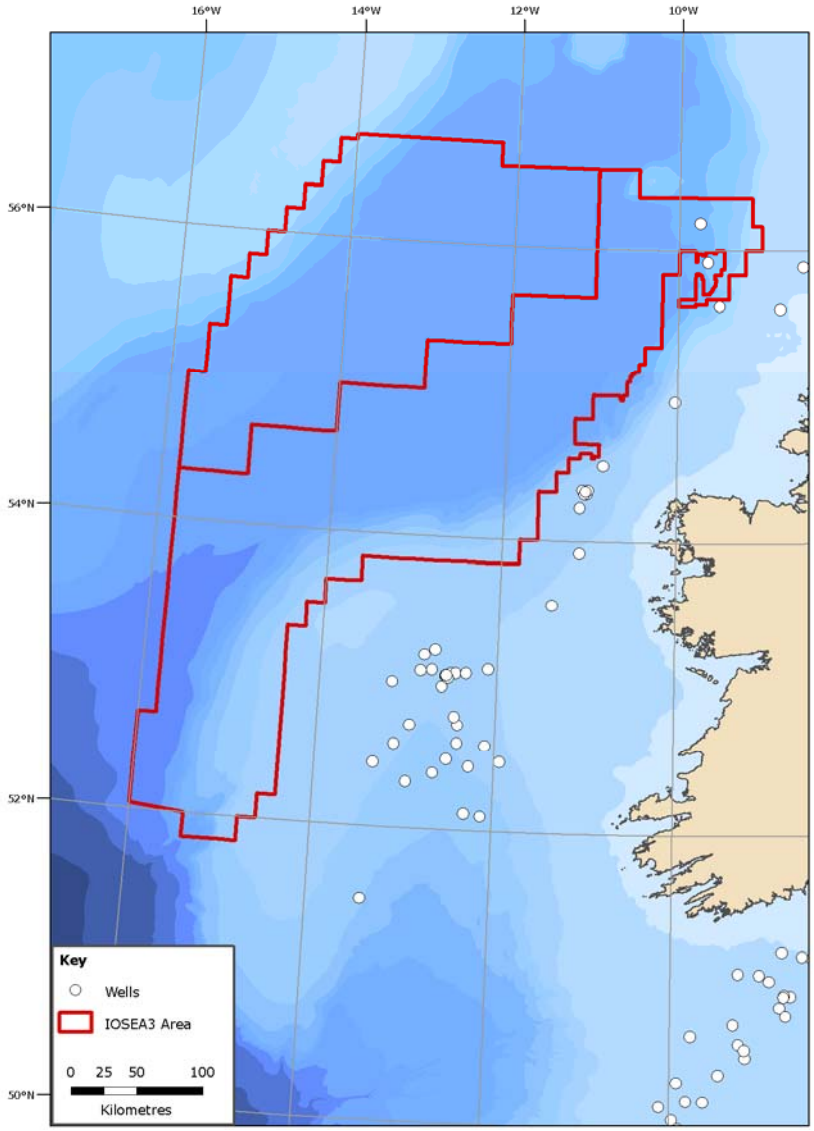
5.7 Energy

5.7.1 Oil and gas industry

Irish waters have been drilled since 1970 and so far 189 wells have been drilled, including appraisal and development wells. Of these wells, 138 were exploration wells and 53 were drilled in water depths greater than 200 m (PAD, 2008).

The Rockall basin has seen little exploratory drilling with only 3 exploration wells drilled in the last ten years. All of these wells have been drilled in the north eastern part of the Rockall Basin, within quadrants Q5 and Q12 (PAD, 2008) (Figure 5.21). Two of these wells have shown gas condensate while the other one was proven to be a dry hole. These include the exploration well 12/2-1 operated by Enterprise Energy Ireland, first drilled in 2002 at 1,475.8 m water depth; and the exploration well 12/2-1z operated by Shell, first drilled in 2003 at 1,476 m water depth. Both wells have since been plugged and abandoned (PAD, 2008).

Figure 5.21 Oil and gas wells and infrastructure (source: PAD, 2008)



5.7.2 Renewable energy

Ireland has one of the greatest wind energy resources in Europe and as such many wind farms can be found along its coasts. The earliest recorded windmill in Ireland dates from 1281 in Kilscanlon, Co Wexford, and by 1840 there were 250 windmills in Ireland. There are currently 51 on-shore wind farms located within the west coast Irish counties. The majority of these on-shore wind farms can be found in Co Donegal which has sixteen wind farms and Co Cork with eight. Co Kerry counts with seven wind farms; while Co Leitrim, Mayo and Galway have five each; and there are three and two wind farms in Co Sligo and Clare, respectively (IWEA, 2008). There is currently a single offshore wind farm located in the Arklow Banks offshore Co Wicklow, east of Ireland (SEI, 2008).

A detailed assessment of Ireland's wave energy resource was performed in 2005, estimating the accessible wave energy resource to be 21 Terawatt hour (TWh) which would be sufficient to supply 75% of the Republic of Ireland's 2006 electricity requirement. To date, Sustainable Energy Ireland (SEI) has funded five ocean energy technology developers: Wavebob, Ocean Energy Buoy, Open Hydro, AquaBuoy and McCabe Wave Pump (SEI, 2008). A 37 hectare site off Spiddal, Co Galway has been made available to test new marine renewable technologies in joint development by the Marine Institute and SEI (MI, 2008).

Tidal energy technology is in the early stages of development and stream velocities of at least 2.0 m/s (4 knots) are currently required for efficient generation. A significant proportion of the tidal and marine current energy resource is to be found on the northeast coast of Ireland, although several practicable resource sites can be found along the west Irish coast, including the Shannon Estuary (SEI, 2008).

Data sources and data gaps

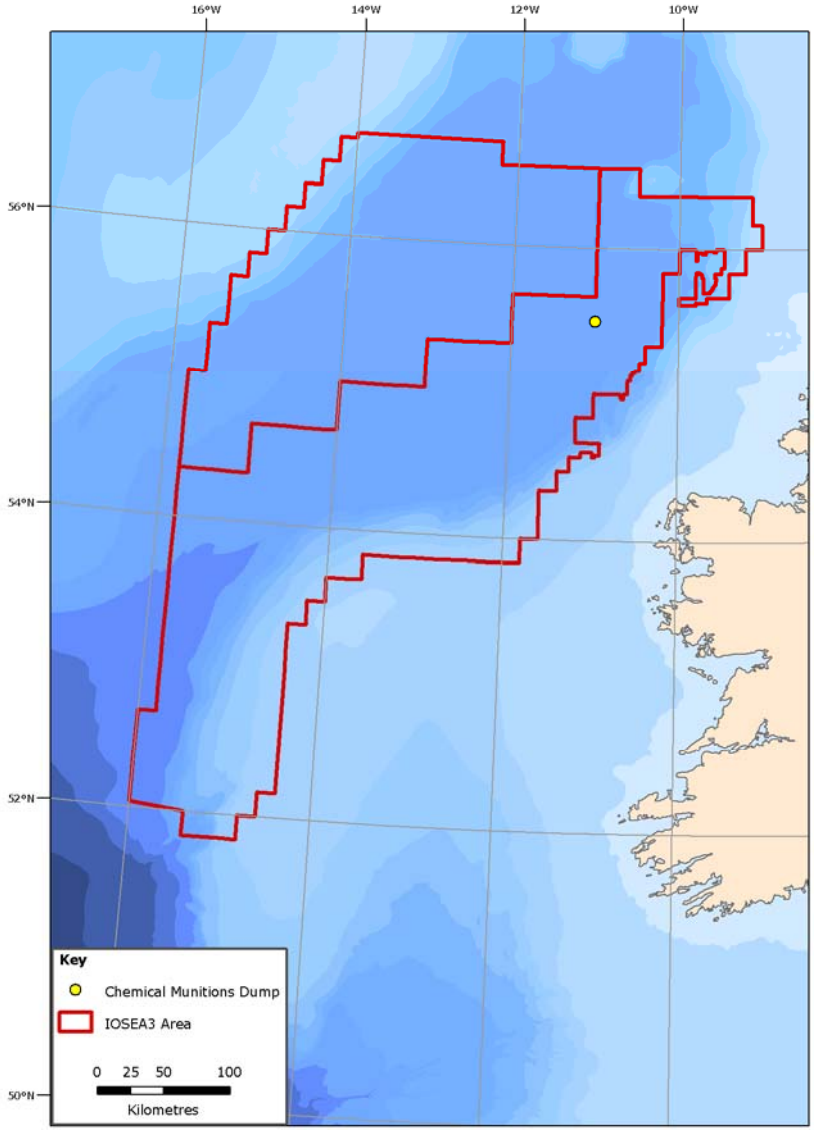
The renewable energy sector in Ireland is on an early stage of development, with wind power being the most developed technology. Little information is available on the stage of wave and tidal energy developments, and most of the existing information is mainly concerned with prototypes and investment in new technologies. Due to the offshore location of the IOSEA3 it is unlikely that such developments would conflict with this area in the near future.

5.8 Military use

5.8.1 Military disposal

A considerable amount of arms and munitions were dumped at sea at the end of the Second World War, mainly in scuttled vessels, containing confiscated munitions, conventional munitions, phosphorus devices or mustard gases. The majority of materials were dumped in areas which at the time were considered deep enough to be safe, with most material dumped in the Baltic and Skagerrak (OSPAR, 2000a). Though the approximate positions are known, the OSPAR guidance highlights the fact that they may have been broken up and the cargo spread over areas of the seabed. Dumped chemical munitions react differently in water depending on the agent they contain. The munition shell may break open during the dumping operation or may corrode over time, allowing the agent to leak out. There is a dump site located within the IOSEA3 area, which is believed to contain chemical munitions (Figure 5.22) (OSPAR, 2005c).

Figure 5.22 Military disposed vessel containing munitions (source: OSPAR, 2000a)



5.8.2 Military practice and exercise areas

Military Practice and Exercise Areas (PEXAs) are delineated areas used for aircraft and ship manoeuvres or as ranging and bombing practice. There is a submarine exercise area partially overlapping with the IOSEA3 area, which is also used for miscellaneous fleet exercises (Figure 5.23).

Figure 5.23 Military practice and exercise areas (source: UKHO, 2007)