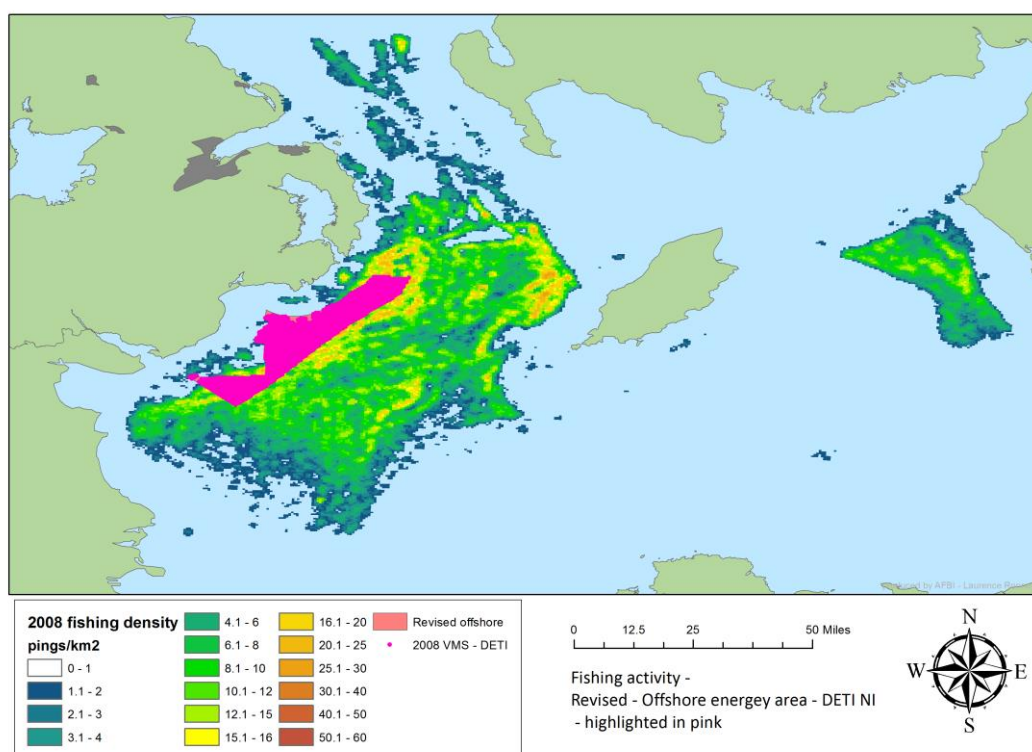


2015

FishRamp – Irish Sea VMS



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AFBI

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Summary:

Overall, increased intensity of fishing is occurring in investigated areas that are closer to the NI coast. Activity in areas further away has had a decrease in intensity. An increase in activity within SPAs in 2011 & 2012 suggests new fishing ground may be being explored.

- After a low in 2009, fishing activity in GB Irish Sea wind-farms has seen an increase in the areas where fishing has taken place. From 2012-2014, there is a large increase in activity in these windfarm areas, in both intensity and extent of activity. This could suggest new fishing areas, or the fishing fleet are returning to these sites.
- Fishing intensity in the DETINI wind resource zone (WRZ) has steadily increased from 2007. The area fished in 2011 represents over 95% of the total designated area. It appears that there is increasing fishing pressure within this area. A large rise to 14% of total annual intensity is observed in 2012.
- Fishing intensity in areas where cables are present has steadily increased from 2007, from 90 to 120km². The fishing intensity has shown a general increase over the 8 year period. These numbers are however relatively small. The dredge spoil areas are located relatively close to the coast area are also quite small. Activity by smaller boats in these areas may be more significant. Fishing intensity has increased from 2007. From 2012 to 2014, a drop off in the amount of dredge spoil areas fished and fishing intensities within these areas can be seen.
- Fishing intensity increased from 2007 to 2009 in the aggregate proposal designated area, this intensity fell off in 2010 but began to increase again in 2011. A steady increase of intensity can be observed from 2010 until 2014. Most of the site appears to be fished every year, albeit with varying levels of intensity. The level of intensity of fishing within the vicinity of wreck sites steadily increased from 2007 to 2010 and then has dipped from every year until 2014.
- The fishing intensity within JNCC & NIEA - SPAs and SACs with Marine components has increased considerably in 2011, relative to the four previous years. This may be exploration of new fishing grounds. SAC offshore areas have risen and fallen from 2007-2011, in terms of area and annual fishing intensity, remain low.
 - SPAs with marine components -Fishing has increased within these areas since 2007; the percentage of annual intensity is almost at a steady 1% of total activity. SPAs Offshore - Fishing activity and the total area fished and the percentage of annual fishing intensity within offshore SPAs has remained pretty constant since 2007. SACs with marine components - Fishing follows a similar trend to SPAs with marine components although fishing activity is at a lower percentage of total annual intensity.

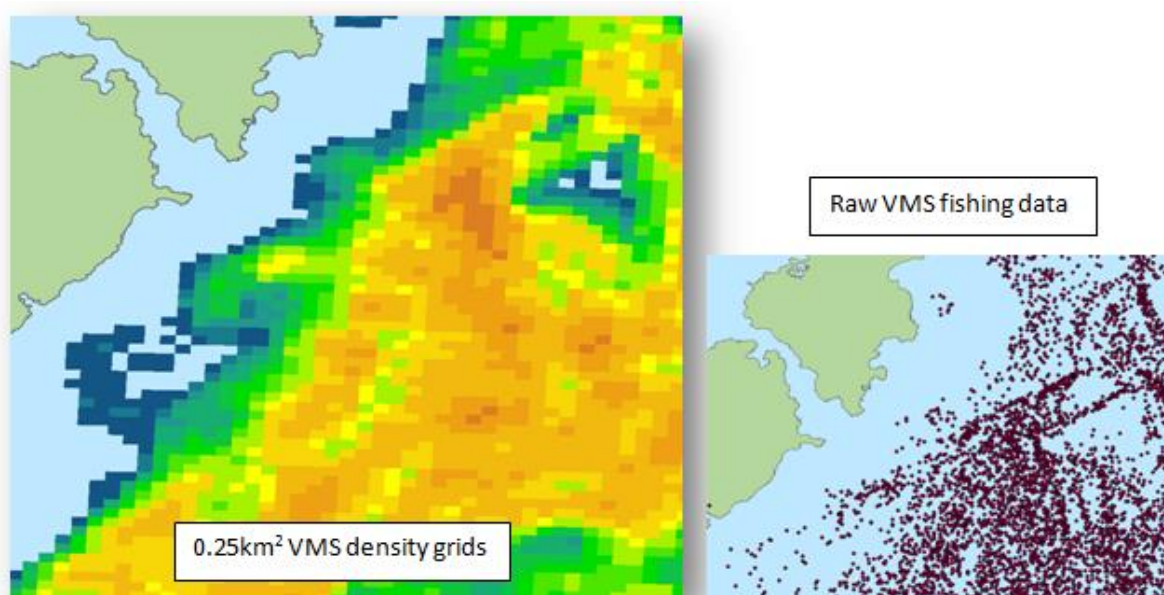
- *Note this represents the whole fleet and not just the Herring & Cod fleet.
Percentage fishing intensity within the Herring Restricted zones dipped in 2009 but has stabilised at just over 32%. The total area fished within the Herring Restricted zone has shown an incremental increase since 2007. This trend has continued through to 2014 despite a dip in total intensity in 2012 where a rise in total area covered was observed.
- Total annual fishing intensity in the Cod boxes increased between 2007 and 2009 by almost 9%. The intensity has slightly decreased between 2009 and 2011 but the amount of area in which fishing has taken place within the cod boxes has increased. Between 2012 and 2014 the percentage of the cod restriction zone fished has increased but there has been a slight dip in overall fishing intensity within these areas.

Data and Method details:

Anonymised VMS data was provided by DARD. Pings were collected every two hours from vessels over 15 metres. This was for the whole Northern Irish fleet.

VMS densities were derived for each year 2007-2014, from all data points designated as fishing from each year. Fishing was determined by speed – between 2 and 6 knots inclusive. Data from 2014 is incomplete and only reports until 23rd November 2014. Exclusions of all data around ports that may have appeared as fishing were made to reduce bias.

The cell sizes for the densities are 500x500m grids – creating 0.25Km² grids.



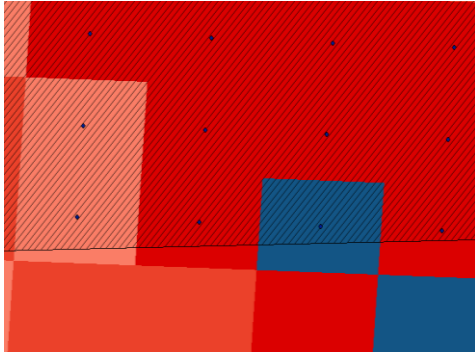
Density values for each cell were derived as pings per Km², though this should be read as a relative index of pressure as opposed to representing the actual number of pings in each square kilometre.

A number of areas in the Irish Sea have been investigated to see what fishing pressure is in those areas and how it has changed between 2007 and 2014. Areas investigated are: Wind-farms, aggregate extractions, dredge spoil, DETI renewables location (WRZ), cables, military, obstructions, wrecks, fisheries-restricted areas, SACs and SPAs – JNCC designations & aquaculture sites.

Results described below:

Area (Km ²)	Total area of VMS grids in investigated area
Mean density/Km ²	Mean density across investigated area
% intensity	% intensity of total annual VMS
Total pings	Sum of densities in investigated area (not actual number of VMS pings)

The area of each investigated areas occupied by the VMS each year is approximate due to the scale of the VMS grids. If more than 50% of a grid falls into the investigated area the whole 0.25Km² grid is counted.



In some of the analyses a search buffer has been applied and this will mean if as little as 25% of a grid falls into the investigated area the whole 0.25Km² grid is counted.

The areas where buffers are applied are described below.

Total Annual VMS

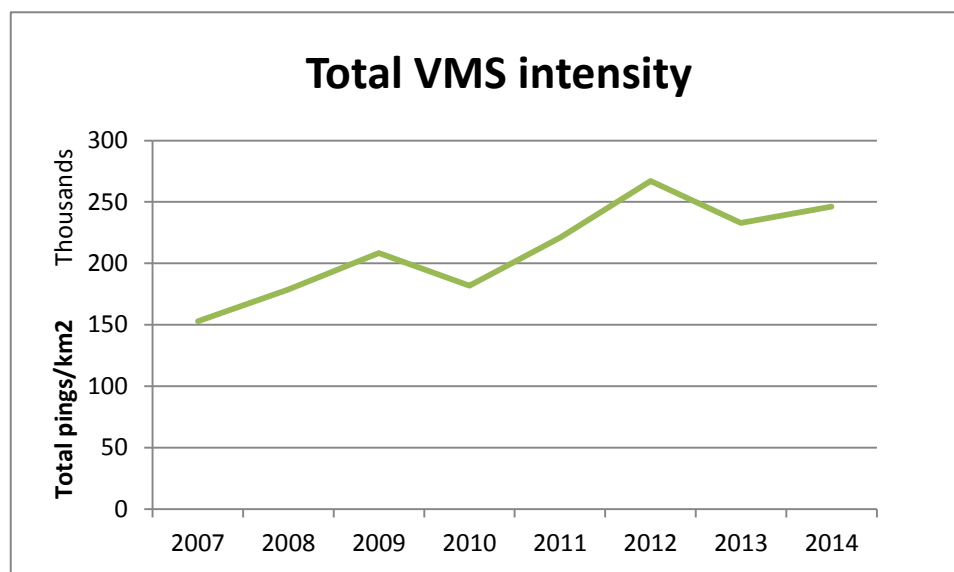


Chart 1 – total VMS intensity from 2007-2011 (total calculated pings/km² each year) (DARD/AFBI)

Intensity has generally increased from 2007; the amount of activity in 2011 is 44% higher than in 2007. Values given below for % of annual intensity represent the proportion of intensity within investigated areas, as a percentage of total activity for that year.

Overview of competing interests:

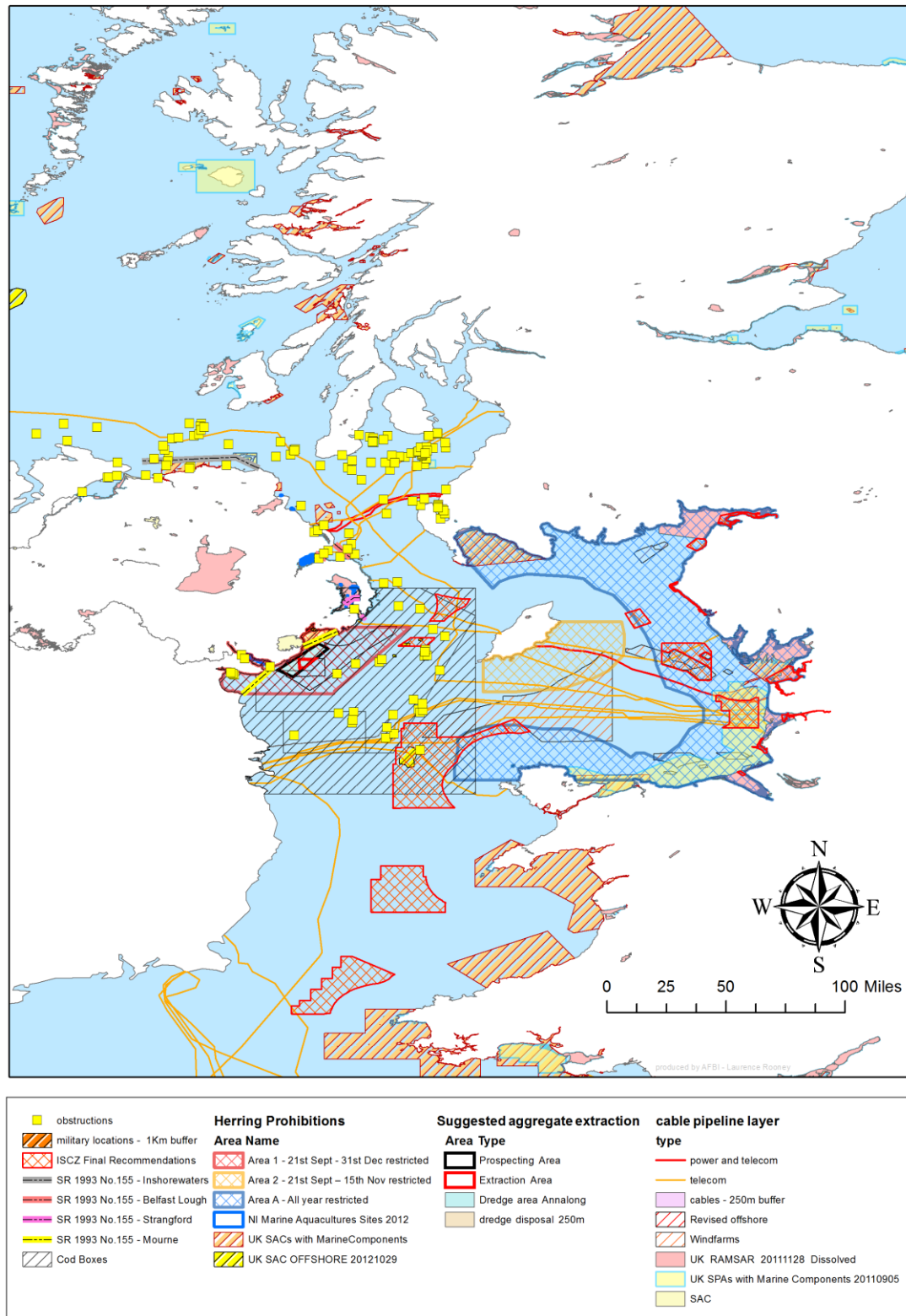


Figure A – overview map, illustrating competing seabed activity – without fishing activity

GB Irish Sea wind-farms:

Total area of VMS present in GB designated wind-farm areas every year is compared. Area is based on raster size of 0.25km². An additional search buffer of 100 metres was used to include data very close to the boundaries.

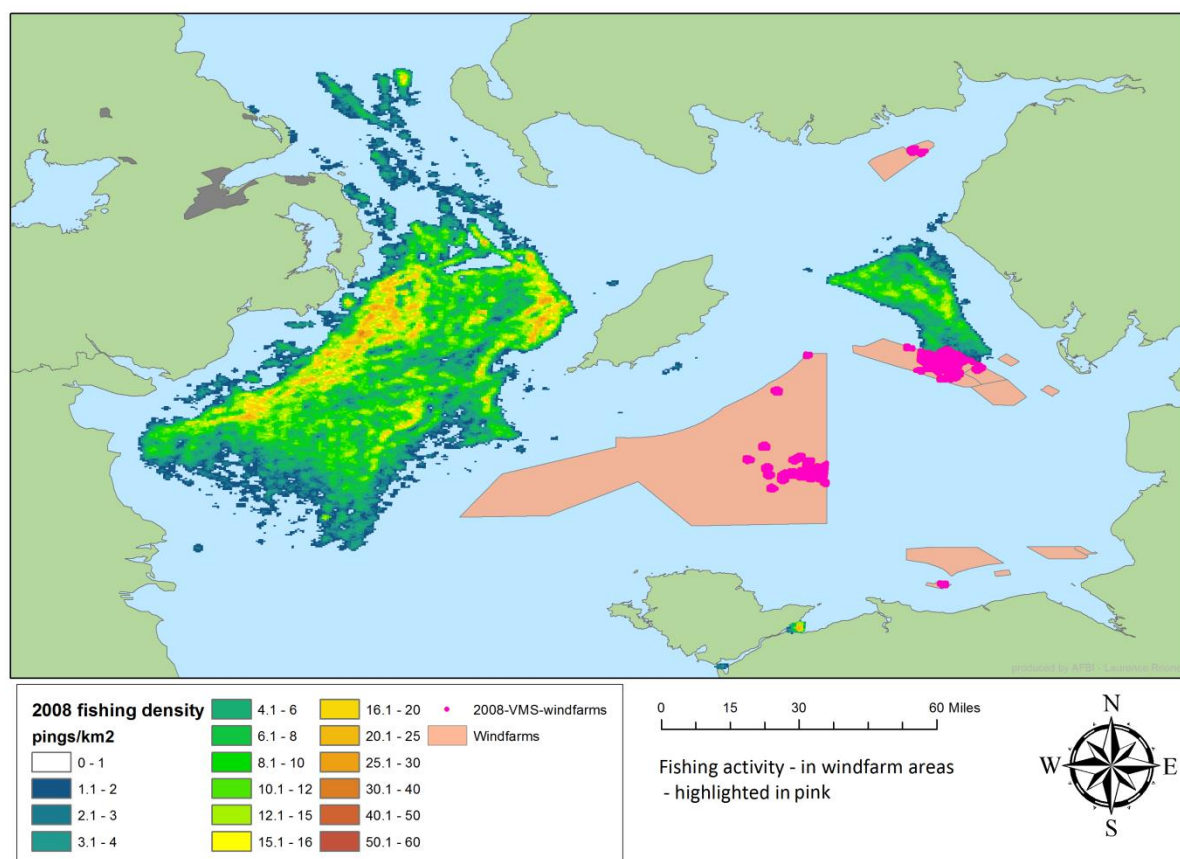


Figure 1 – VMS data from 2008 – activity within wind-farms is highlighted in pink

Table 1 – Wind-farm results

Year	Area Km ² (of VMS grids in investigated area)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total pings
2007	95.25	6.90	0.43	657.63
2008	166.50	5.61	0.52	934.88
2009	92.75	6.38	0.28	591.74
2010	123.25	4.79	0.32	590.15
2011	225.25	2.42	0.25	543.99
2012	542.25	5.72	1.16	3103.52
2013	557.50	4.82	1.15	2688.76
2014	706.25	4.55	1.29	3214.29

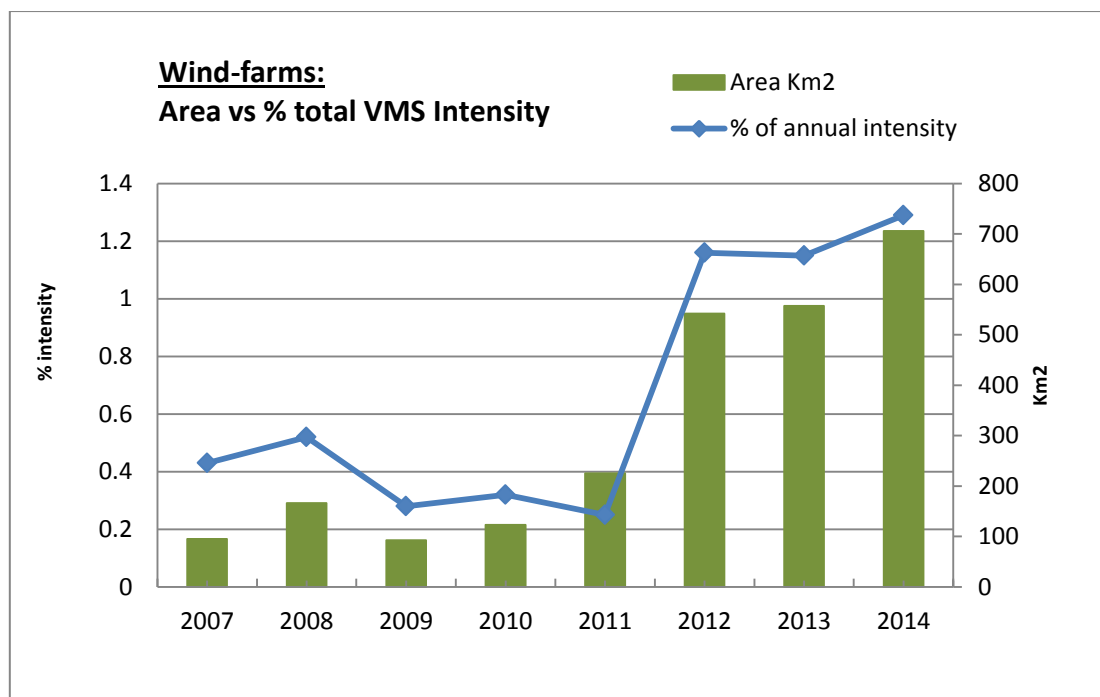


Chart 1A - Wind-farm results – amount VMS within wind-farm areas Vs % total VMS intensity within wind-farm areas

Fishing intensity in wind-farm areas has generally decreased but after a low in 2009, there has been an increase in the areas where fishing has taken place. This could suggest that new fishing areas are being sought but decrease in intensity implies they have been less successful.

From 2012-2014, there is a large increase in activity in these windfarm areas, in both intensity and extent of activity. The values for 2014 are more than treble the 2011 figures. This could suggest new fishing areas, or now that some developments are not going ahead the fishing fleet are returning to these sites.

DETI NI – Wind Resource Zone:

Total area of VMS present in DETI Wind Resource Zone every year is compared. Area is based on raster size of 0.25km².

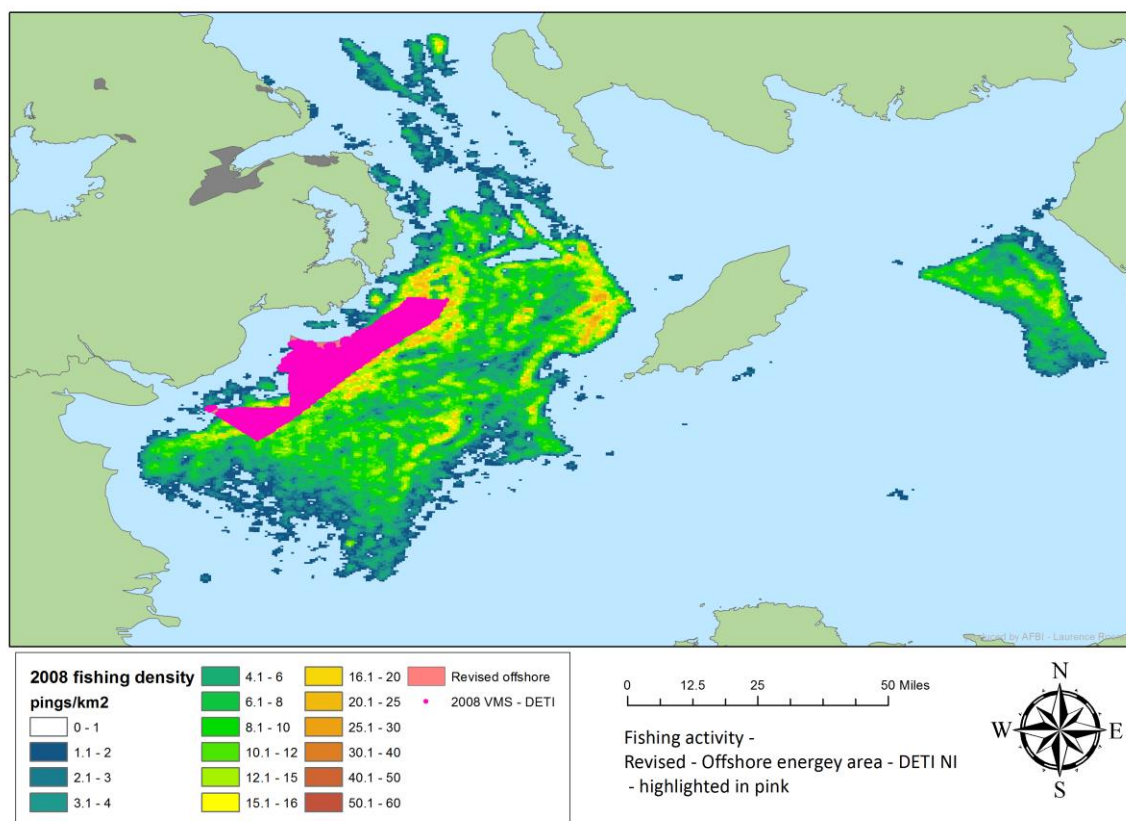


Figure 3 – VMS data from DETI Wind Resource Zone – activity within DETI Wind Resource Zone is highlighted in pink

Table 3 – DETI Wind Resource Zone results:

Area	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings
2007	377.63	37.20	9.67	14788.04
2008	400.19	46.60	10.98	19628.58
2009	400.90	41.23	8.35	17398.18
2010	380.71	52.29	11.53	20954.66
2011	422.04	58.45	11.75	25968.04
2012	430.50	65.15	14.30	28046.92
2013	424.00	49.06	8.45	20800.92
2014	423.75	49.38	7.88	20926.33

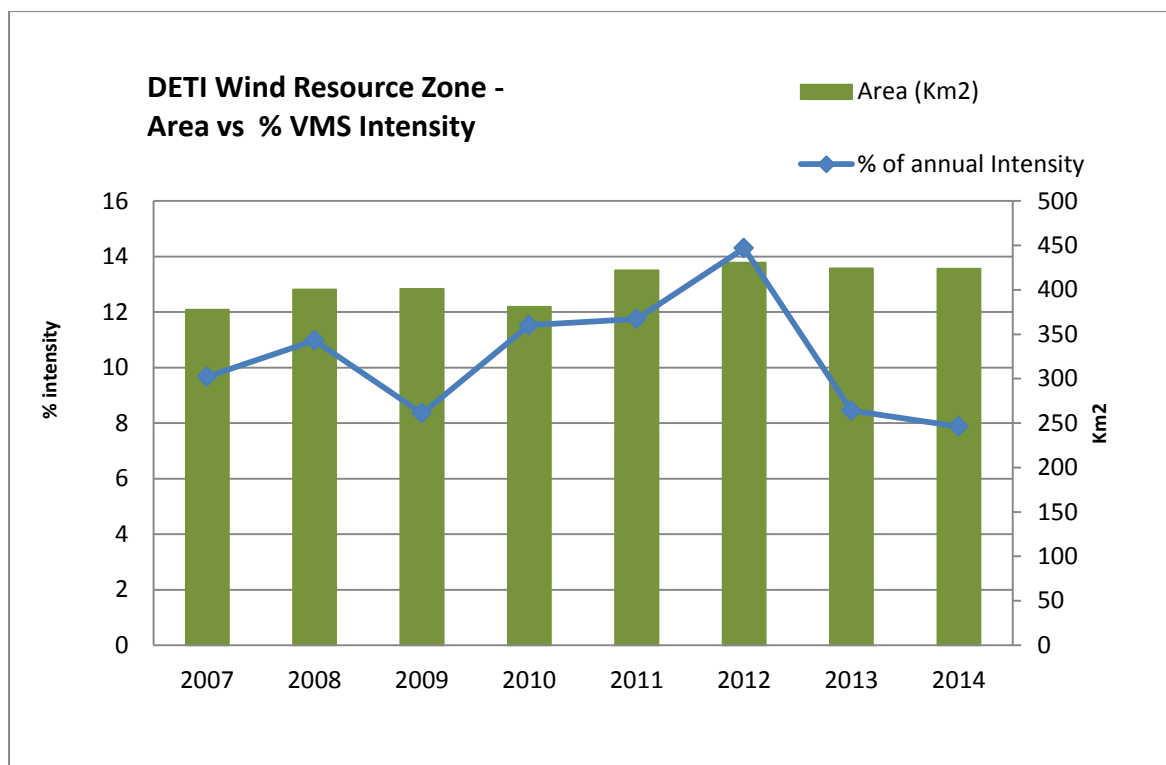


Chart 3 - DETI Wind Resource Zone results – amount of VMS within DETI Wind Resource Zone areas Vs % total VMS intensity within DETI Wind Resource Zone areas

Fishing intensity in DETI Wind Resource Zone areas has steadily increased from 2007. The total area fished within DETI area has remained roughly the same but has shown an incremental increase since 2007. The area fished in 2011 represents over 95% of the total designated area. It appears that there is increasing fishing pressure within this area.

From 2012 to 2014 shows that there is still consistency in the total area fished. A large rise to 14% of total annual intensity is observed in 2012 but a dramatic drop off in the percentage of annual intensity for the following years. This suggests that fishing has moved to other areas or a change in the fleet composition within this area.

Cables & pipeline:

Total area of VMS present in areas where cables are present (250m buffer on cable locations); every year is compared. (A 250m buffer was also applied to the VMS data). Area is based on raster size of 0.25km². There may be more cables and pipelines than those reported below.

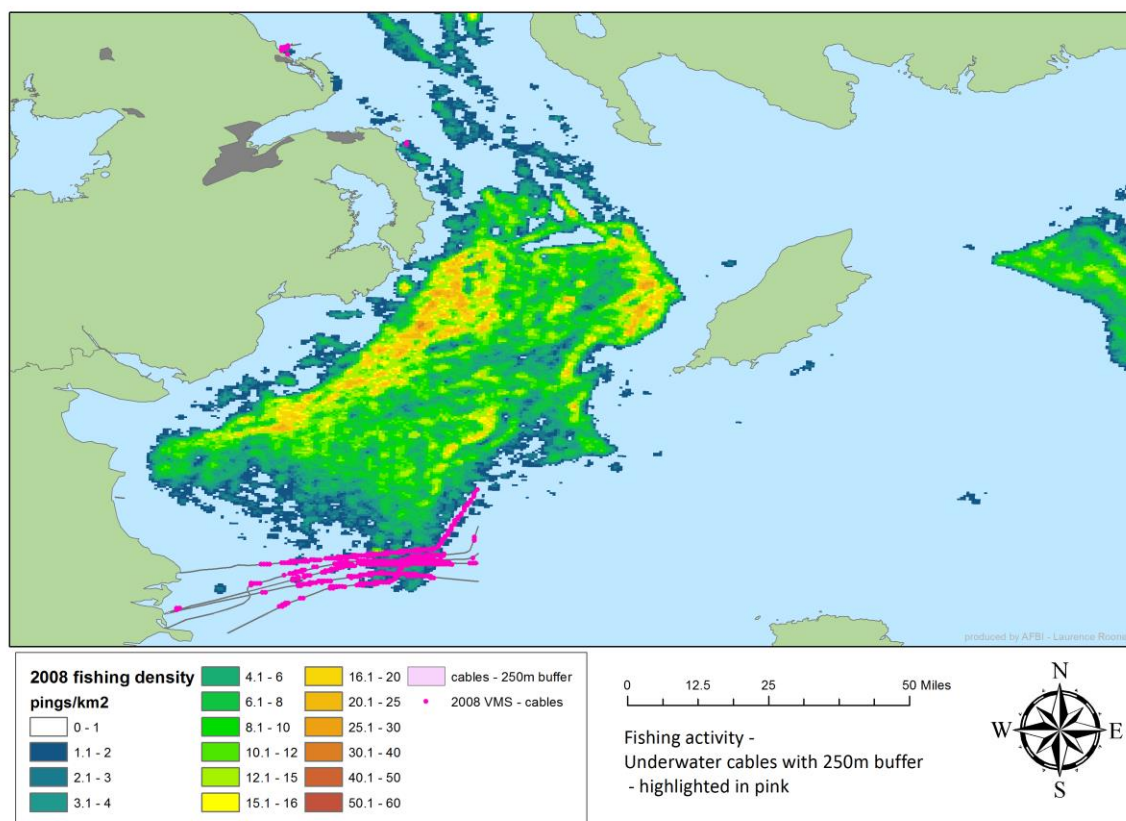


Figure 4 – VMS data from cables and pipelines – activity within cable and pipeline areas is highlighted in pink

Table 4 – cable and pipeline results:

Area	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	total pings
2007	89.75	4.52	0.27	405.53
2008	94.25	6.62	0.35	624.21
2009	99.25	12.14	0.58	1204.80
2010	105.00	12.68	0.73	1331.81
2011	119.50	9.83	0.53	1175.20
2012	35.00	9.39	0.12	328.81
2013	34.25	7.96	0.12	272.47
2014	31.25	8.32	0.10	260.06

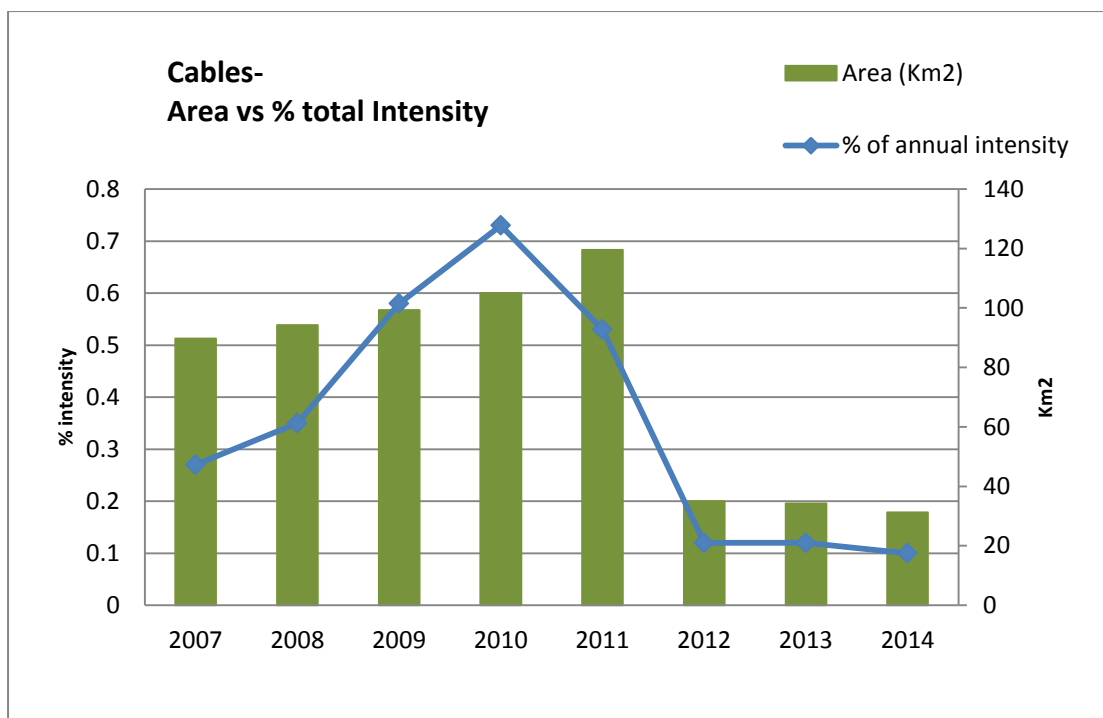


Chart 4 - Cable and pipeline results – amount VMS within Cable and pipeline areas Vs % total VMS intensity within Cable and pipeline areas

Fishing intensity in areas where cables are present has steadily increased from 2007, from 90 to 120km². The fishing intensity has shown a general increase over the 5 year period. While it has fallen from 2010 to 2011, it is still double the figure for 2007.

From 2012 to 2014 it a large drop off in the cable areas can be see as well as a drop in the percentage of annual intensity. These numbers are however relatively small and so many not be a significant change.

Dredge Spoil:

Total area of VMS present in the areas of designated dredge spoil, are compared (250m buffer on dredge spoil locations); every year is compared. (A 250m buffer was also applied to the VMS data). Area is based on raster size of 0.25km².

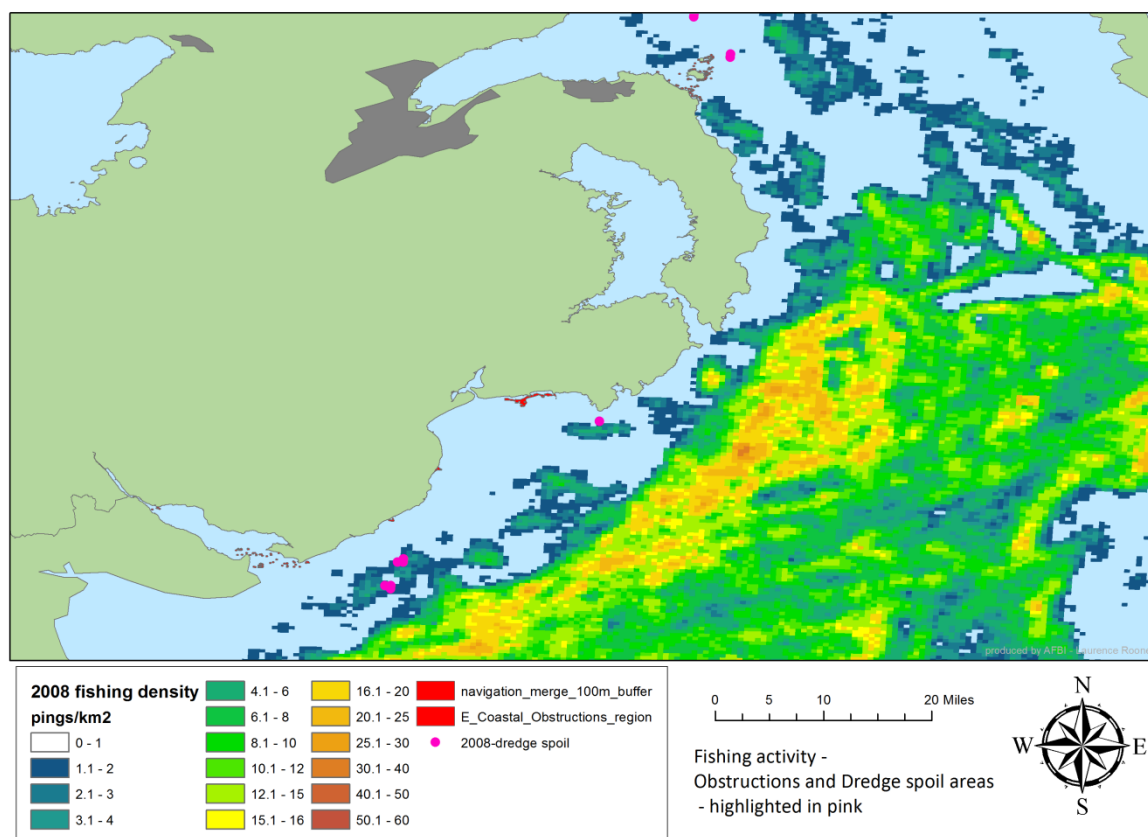


Figure 5 – VMS data from Dredge spoil – activity within dredge spoil areas is highlighted in pink

Table 5 – dredge spoil results:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	2.75	4.40	0.0079	12.10
2008	2.25	5.94	0.0075	13.37
2009	2.50	5.09	0.0061	12.73
2010	2.75	6.60	0.0100	18.14
2011	3.25	6.56	0.0097	21.33
2012	1.00	6.37	0.0024	6.37
2013	1.75	6.00	0.0045	10.50
2014	1.25	6.88	0.0034	8.59

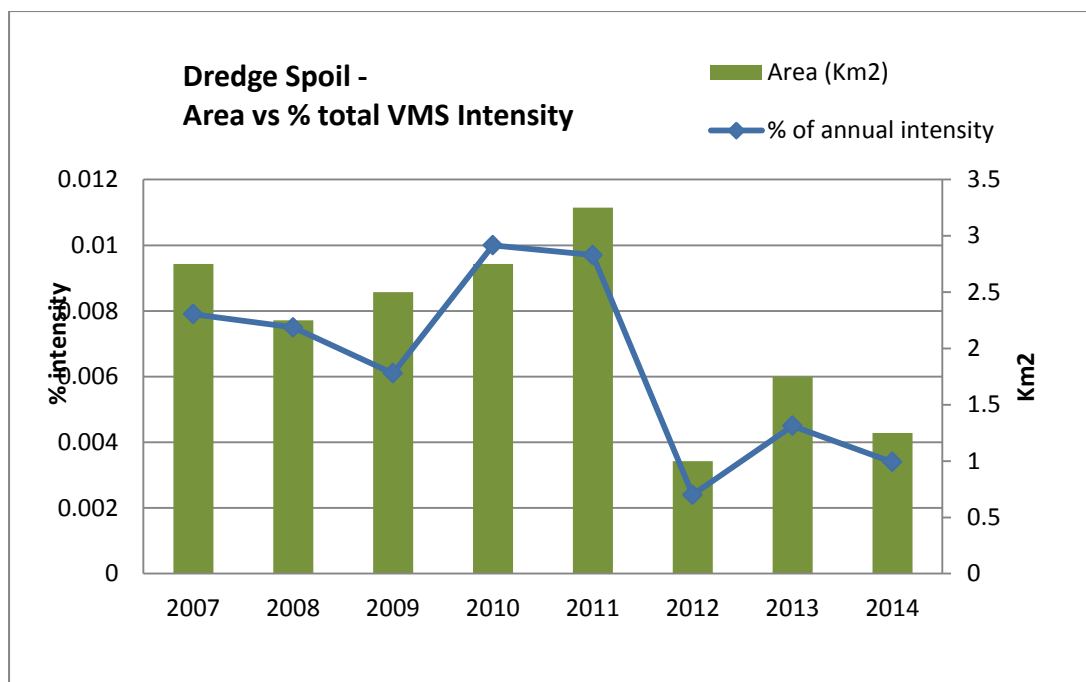


Chart 5- dredge spoil results – amount VMS within dredge spoil areas Vs % total VMS intensity within dredge spoil areas.

The dredge spoil areas area located relatively close to the coast area are quite small. Activity by smaller boats in these areas may be more significant. Fishing intensity has increased from 2007. This may imply increased fishing activity closer to the coast.

Although the Dredge disposal areas are small, this is not related to the tonnage that may be deposited at these sites. For example > 100,000 tonnes per year at a specific site.

From 2012 to 2014 a drop off in the amount of dredge spoil areas fished and fishing intensities within these areas can be seen. The numbers are however very small and so may not represent any significant change in fishing behaviour.

Aggregate extraction:

Total area of VMS present in designated aggregate extraction areas every year is compared. Area is based on raster size of 0.25km^2 . The whole licensed area (in black) and the extraction only area (in red) are compared.

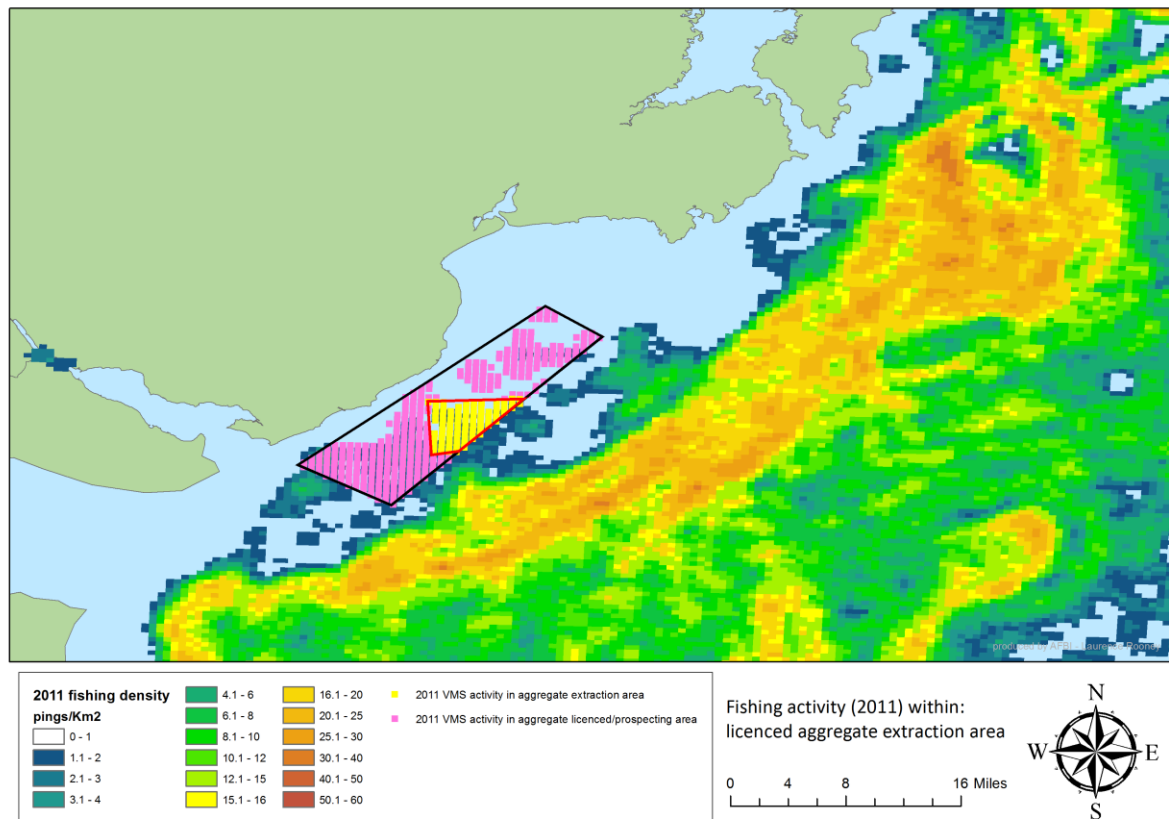


Figure 6 – VMS data from aggregate extraction areas – activity within aggregate extraction areas is highlighted in pink

Table 6 – aggregate extraction results:

a) Licensed

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total pings
2007	93.75	3.30	0.20	309.40
2008	107.25	4.42	0.27	473.96
2009	112.00	5.71	0.31	639.17
2010	85.75	3.98	0.19	341.23
2011	108.75	5.08	0.25	552.27
2012	114.50	6.38	0.27	730.52
2013	116.25	8.69	0.43	1009.68
2014	115.50	6.93	0.32	800.23

b) Extraction

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total pings
2007	13.50	2.59	0.02	35.01
2008	21.00	4.08	0.05	85.63
2009	21.75	6.37	0.07	138.46
2010	21.25	3.18	0.04	67.48
2011	22.25	4.99	0.05	111.09
2012	22.25	8.03	0.07	178.57
2013	23.50	8.74	0.09	205.31
2014	23.00	8.66	0.08	199.26

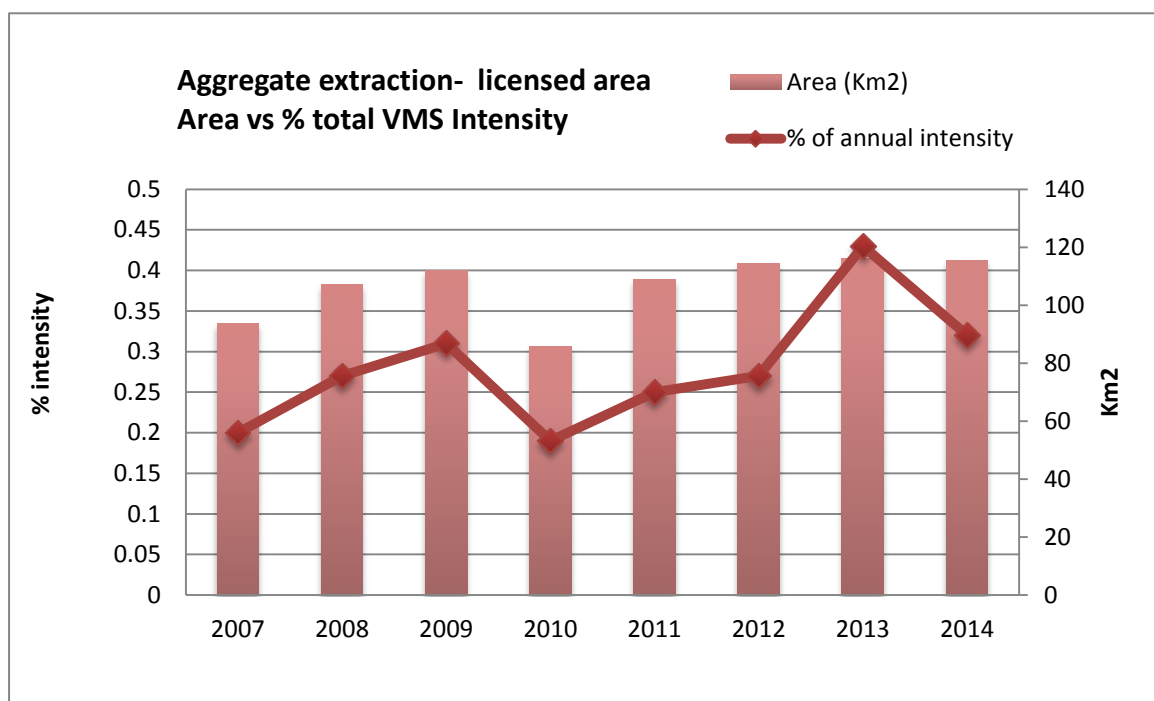


Chart 6A- Total licensed area aggregate extraction results – amount VMS within aggregate extraction areas Vs % total VMS intensity within aggregate extraction areas

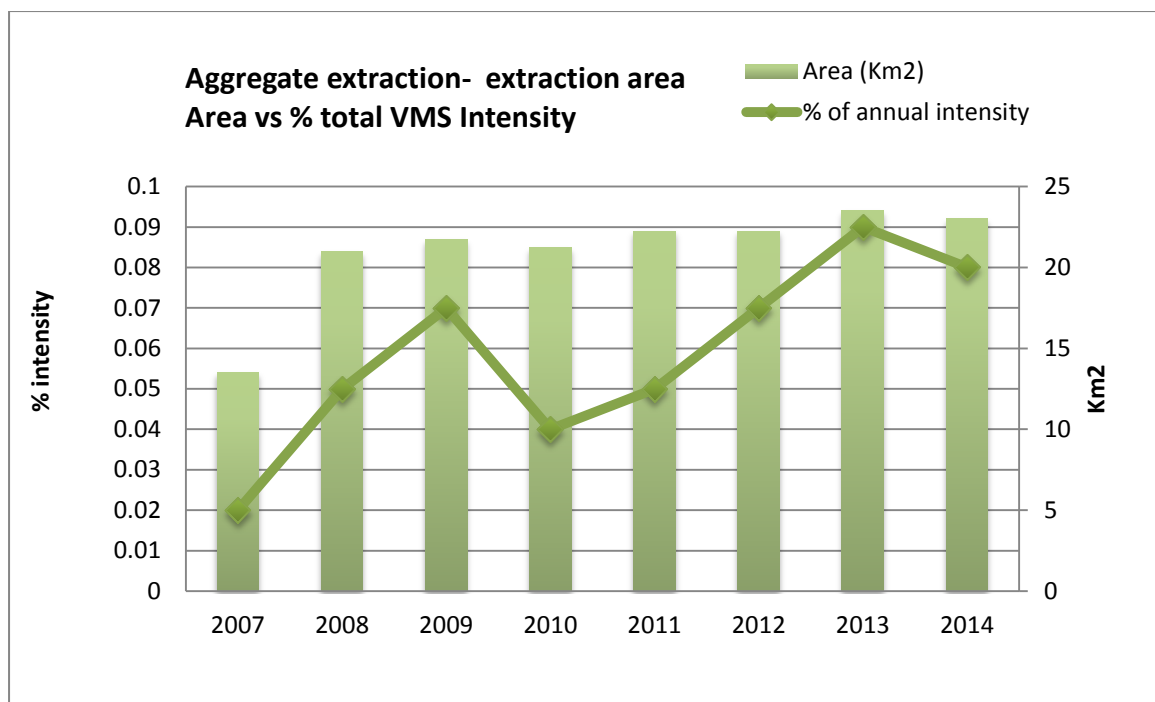


Chart 6B – Extraction only, aggregate extraction results – amount VMS within aggregate extraction areas Vs % total VMS intensity within aggregate extraction areas

Fishing intensity increased from 2007 to 2009 in both the total licensed area and the designated extraction area, this intensity fell off in 2010 but began to increase again in 2011. This may imply a behaviour shift to fish a little further from the coast in 2010 or that there may have been extraction activity increase in 2010 which dissuaded or prevented as much fishing. As the area is relatively close to the shore, activity from smaller fishing boats may be more relevant.

A steady increase of intensity can be observed from 2010 until 2014, most of the site appears to be fished every year, albeit with varying levels of intensity.

Wrecks and Military:

Only wrecks within the extent of the red box were examined as data wasn't available for the whole Irish Sea. % VMS intensity is only for VMS intensity within the extent of the red box.

Despite around 300 wrecks being recorded on NI marine & intertidal waters, only the Girona has protected status.

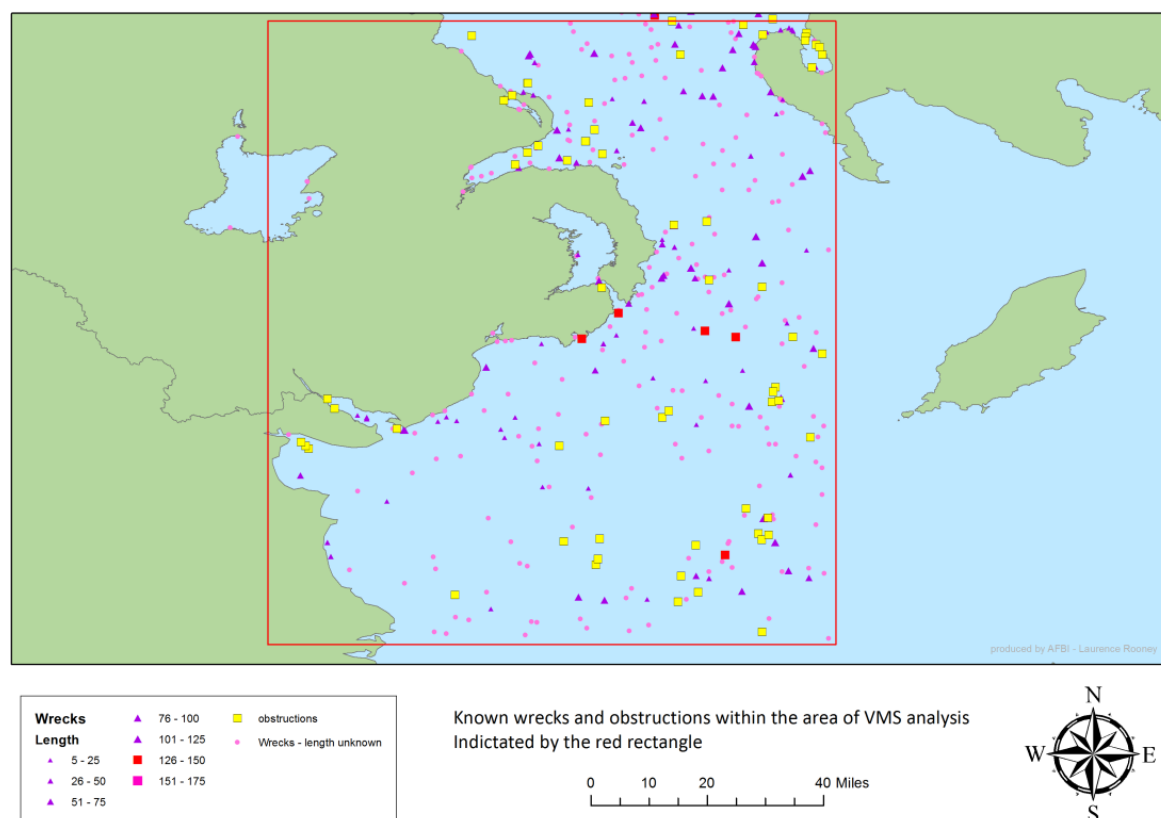


Figure 7 –Wreck sites in the Irish Sea – data only available to extent of red box

Table 7 – Wreck sites results:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	50.00	15.98	0.63	798.96
2008	60.00	16.98	0.69	1018.91
2009	63.75	18.86	0.70	1202.57
2010	60.50	18.97	0.77	1147.83
2011	61.00	21.22	0.71	1294.57
2012	47.25	23.50	0.42	1110.58
2013	45.00	24.68	0.44	1110.58
2014	42.75	22.91	0.39	979.44

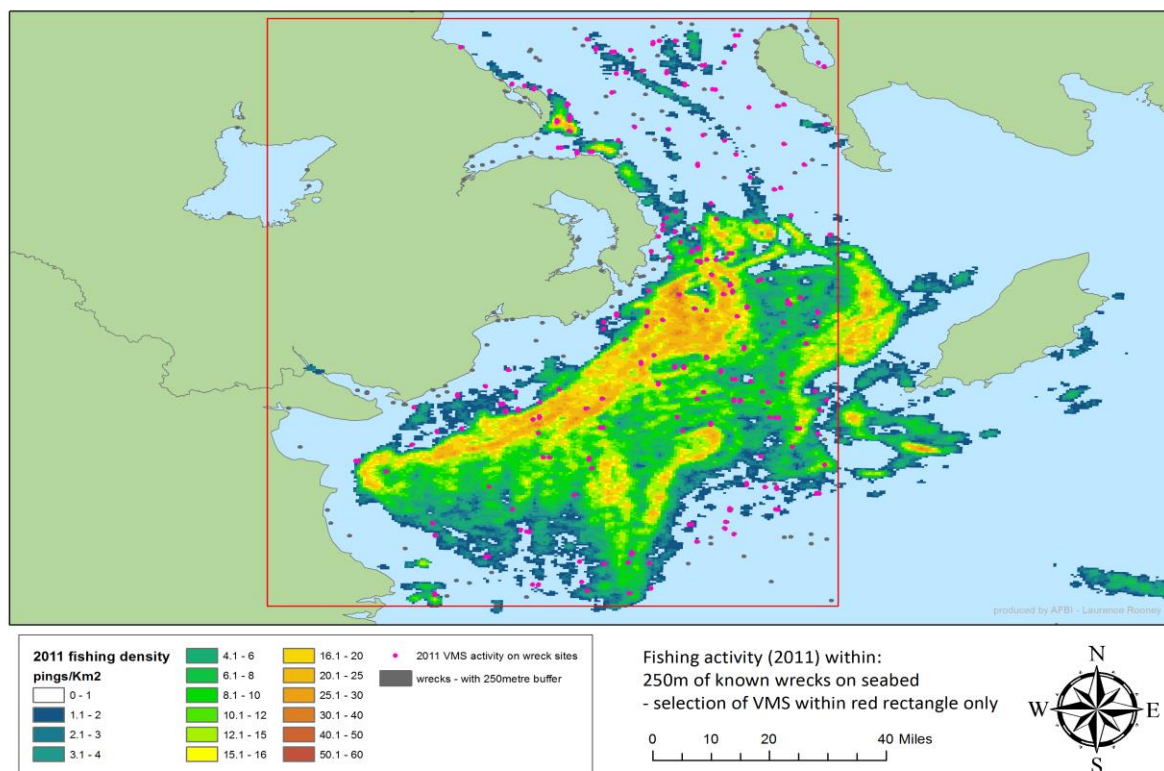


Figure 7B – VMS data from wreck site – activity within the vicinity of wreck sites is highlighted in pink

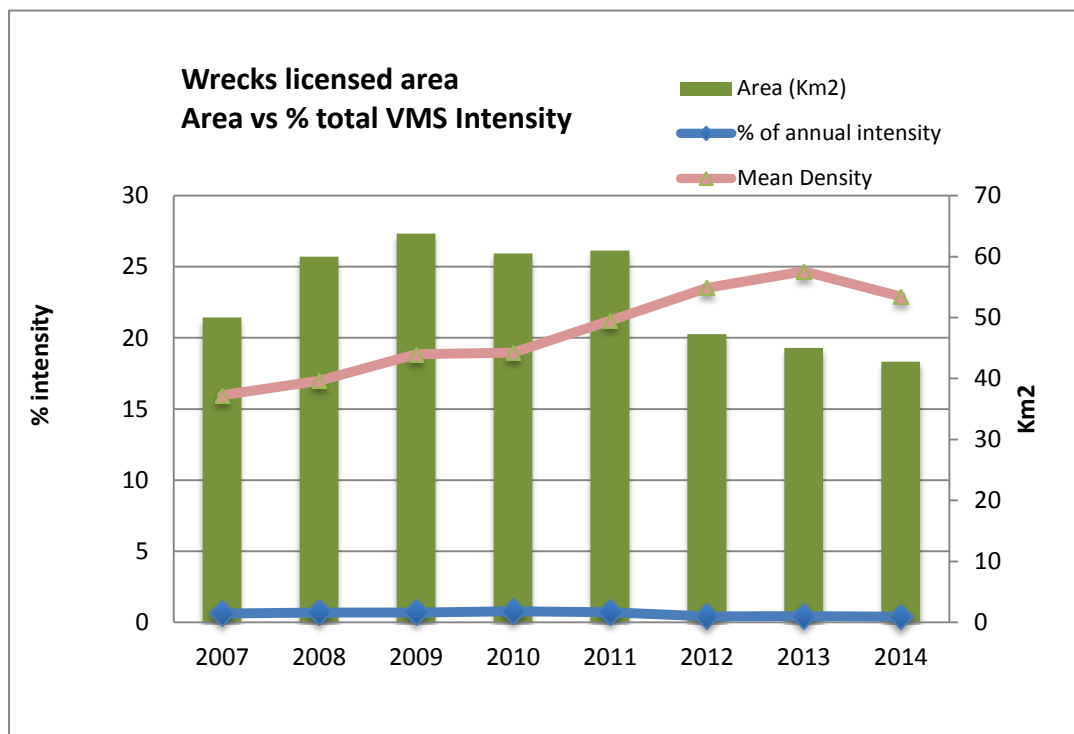


Chart 7 – Wreck sites results – amount VMS within wreck sites Vs % total VMS intensity within wreck site areas

With 250m buffers applied the total area of wrecks is 105km² (although the true area is much less) the results indicate that there is fishing activity in the vicinity of around 50% of wreck sites. The level of intensity of fishing within the vicinity of wreck sites steadily increased from 2007 to 2010 and then has dipped from every year until 2014.

Military Areas:

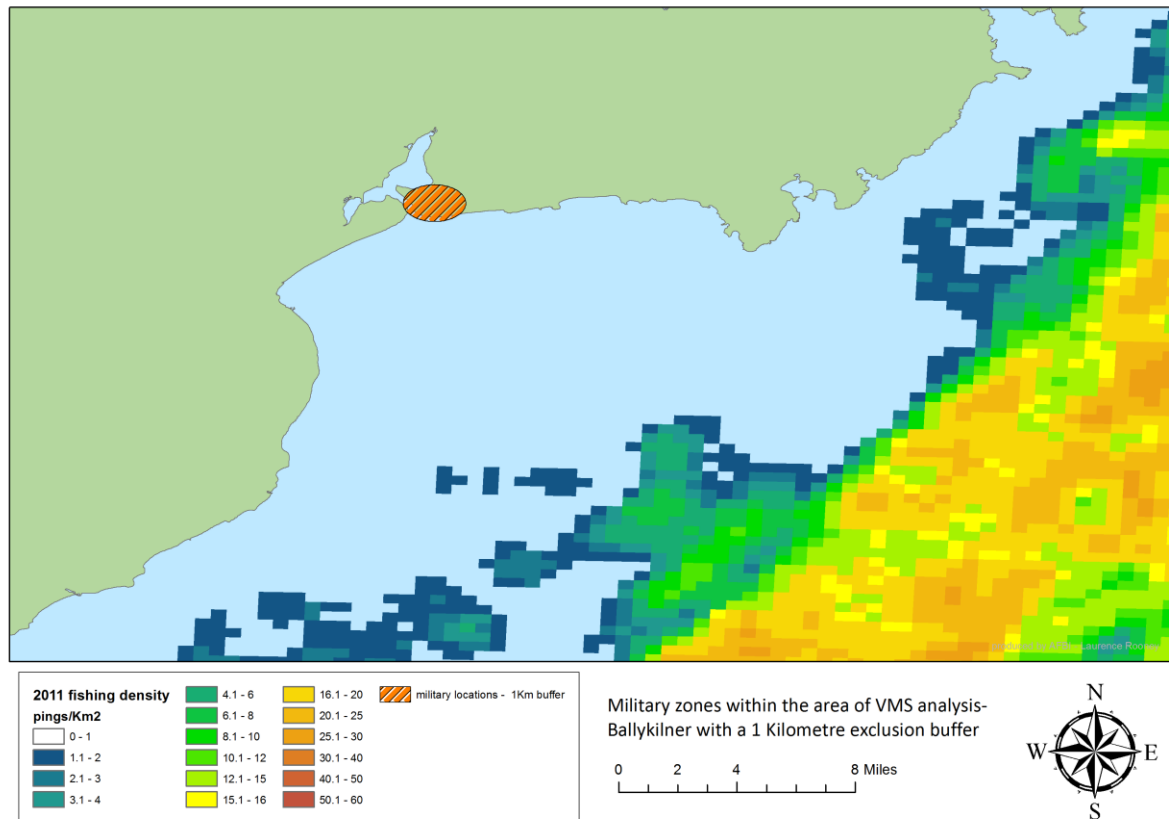


Figure 7C – VMS data from known military areas – activity within military areas is highlighted in pink

Even with 1km search buffer, no VMS activity is found near the military site. This study does not cover any testing or training grounds at sea.

JNCC and NIEA Areas: SPAs, Marine SACs & Offshore SACs

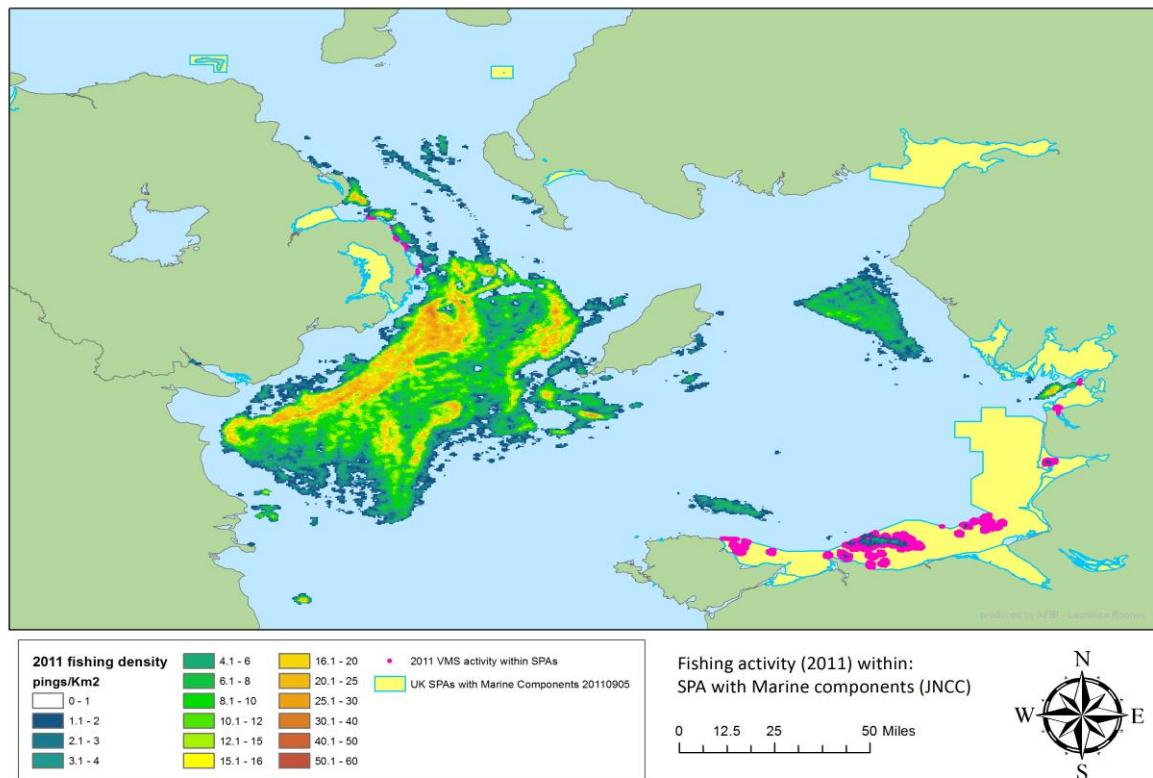


Figure 8A– VMS data from SPAs with marine components – activity within SPAs with marine components is highlighted in pink

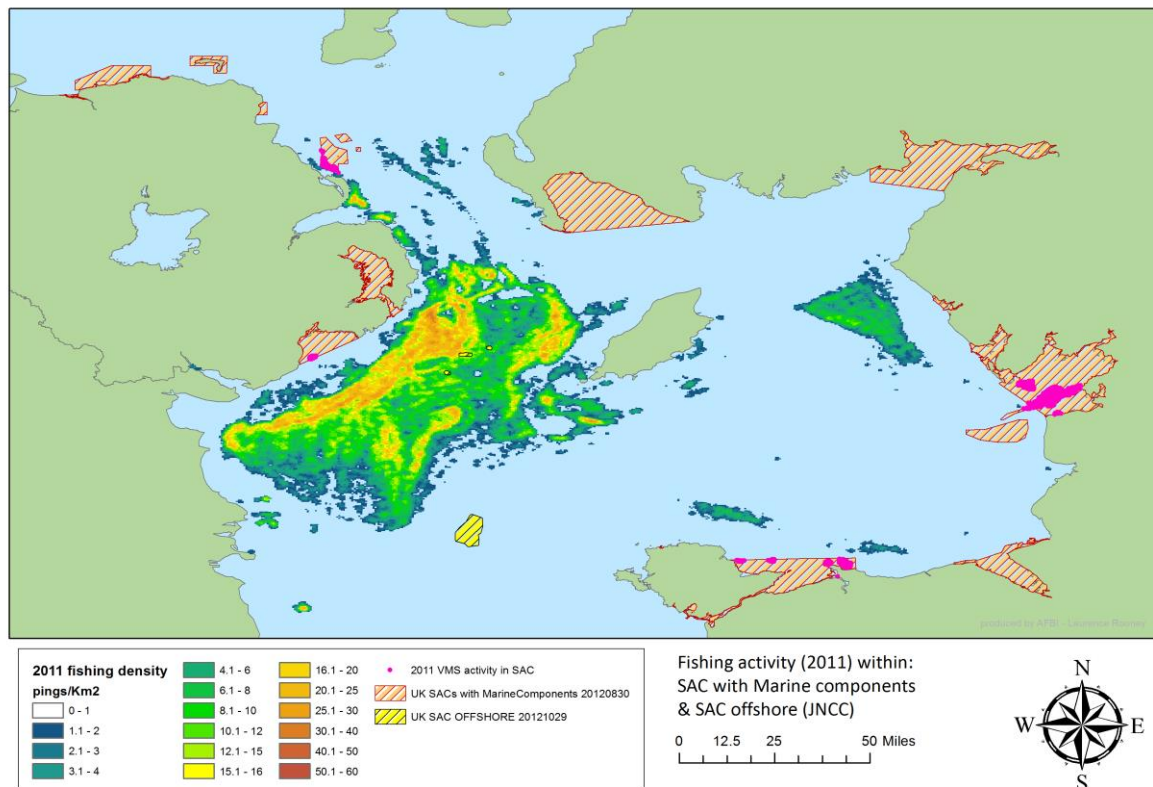


Figure 8B – VMS data from SACs with marine components – activity within SACs with marine components is highlighted in pink

Total area of VMS present in the JNCC designated areas for every year is compared. Area is based on raster size of 0.25km².

Table 8 – JNCC (SPA, SAC offshore & SAC)results:

SPA

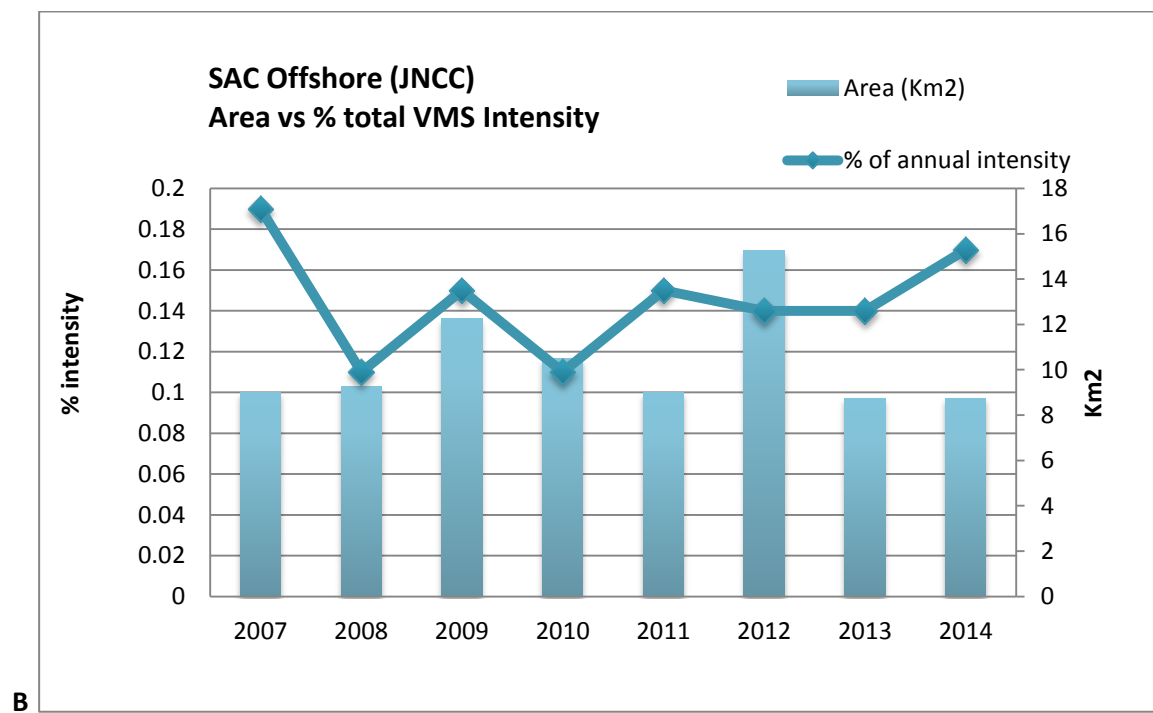
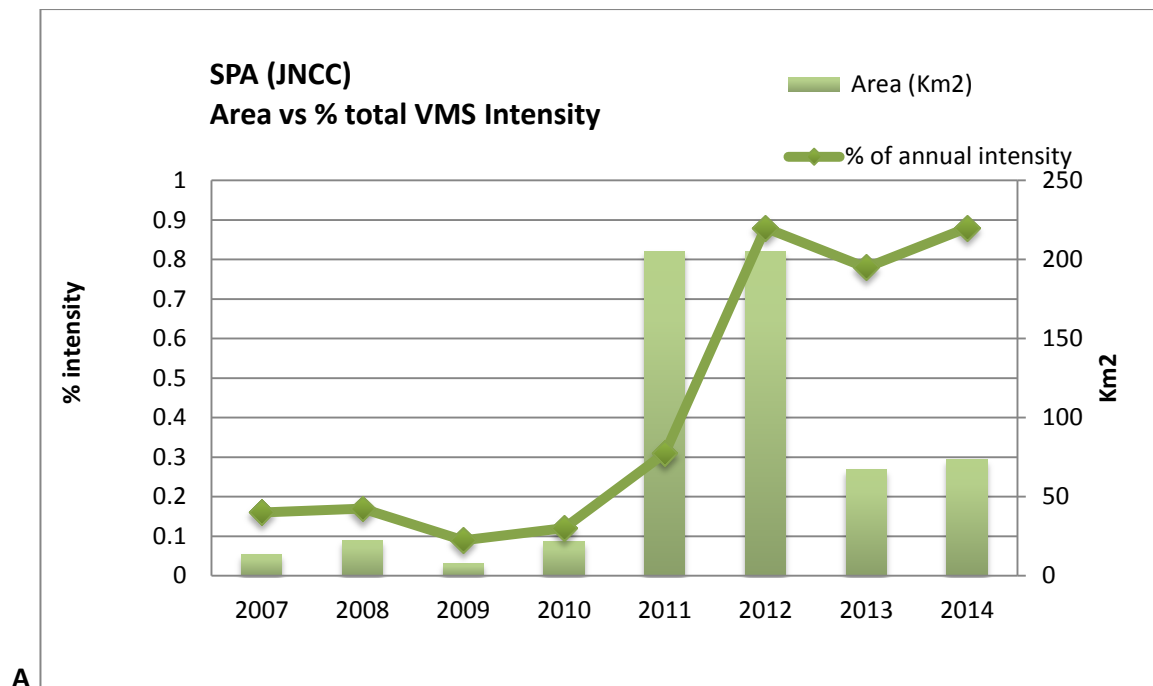
Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	13.25	18.88	0.16	250.19
2008	22.50	13.52	0.17	304.30
2009	8.00	23.83	0.09	190.67
2010	21.50	9.76	0.12	209.77
2011	205.25	3.29	0.31	675.45
2012	205.00	11.41	0.88	2339.26
2013	67.25	26.96	0.78	1813.09
2014	73.50	31.83	0.88	2339.26

SAC Offshore

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	9.00	31.65	0.19	284.89
2008	9.25	21.82	0.11	201.81
2009	12.25	24.82	0.15	303.99
2010	10.50	19.46	0.11	204.35
2011	9.00	36.43	0.15	327.86
2012	15.25	24.78	0.14	377.83
2013	8.75	36.01	0.14	315.13
2014	8.75	48.89	0.17	427.81

SAC with Marine Components

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	38.75	10.69	0.27	414.12
2008	29.00	17.40	0.28	504.52
2009	29.75	11.68	0.17	347.59
2010	35.25	11.19	0.22	394.39
2011	101.25	12.72	0.58	1287.88
2012	383.25	4.19	0.60	1607.15
2013	163.00	3.44	0.24	560.54
2014	140.00	5.12	0.29	717.15



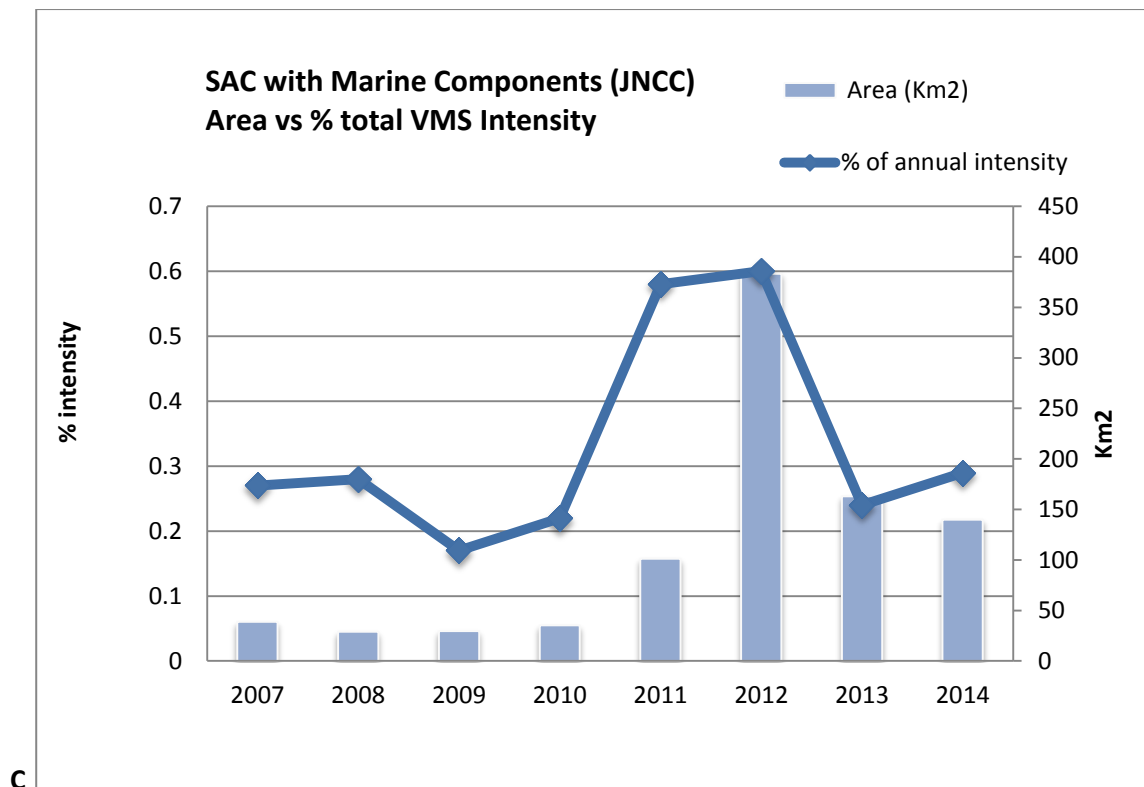


Chart 8 A, B & C – JNCC designation results – amount of VMS within JNCC designations Vs % total VMS intensity within JNCC designations

The fishing intensity within SPAs and SACs with Marine components has increased considerably in 2011, relative to the four previous years. This may be exploration of new fishing grounds. SAC offshore areas have risen and fallen from 2007-2011. In terms of area and annual fishing intensity, they remain low.

SPAs with marine components -

Fishing has increased within these areas since 2007; the percentage of annual intensity is almost at a steady 1% of total activity. The area fished increased rapidly in 2011 and 2012 but has tailed off. At same time the percentage of annual activity remains the same. This perhaps suggests in 2011-2012 new fishing areas were being explored within these SPAs and since 2013 some areas are being returned to specifically meaning the total area being fished is now smaller.

SPAs Offshore -

Fishing activity and the total area fished and the percentage of annual fishing intensity within offshore SPAs has remained pretty constant since 2007 despite annual variation. The total percentages and the total area fished are relatively small.

SACs with marine components -

Fishing follows a similar trend to SPAs with marine components although fishing activity is at a lower percentage of total annual intensity. Intensity has increased within these areas since 2007; the percentage of annual intensity has almost halved since 2012. The area fished increased rapidly in

2011 and 2012 but has tailed off. At same time the percentage of annual activity has also reduced to pre 2010 levels. This perhaps suggests in 2011-2012 new fishing areas were being explored within these offshore SACs but has now returned to previous levels.

Fisheries closures: Herring boxes, Cod boxes.

*Please note that all the whole fleet was used to calculate these results below, this therefore includes more than the cod and herring fleets. As data was anonymous this analysis could not be done but could be updated should the data be made available.

Total area of VMS present in designated aggregate extraction areas every year is compared. Area is based on raster size of 0.25km².

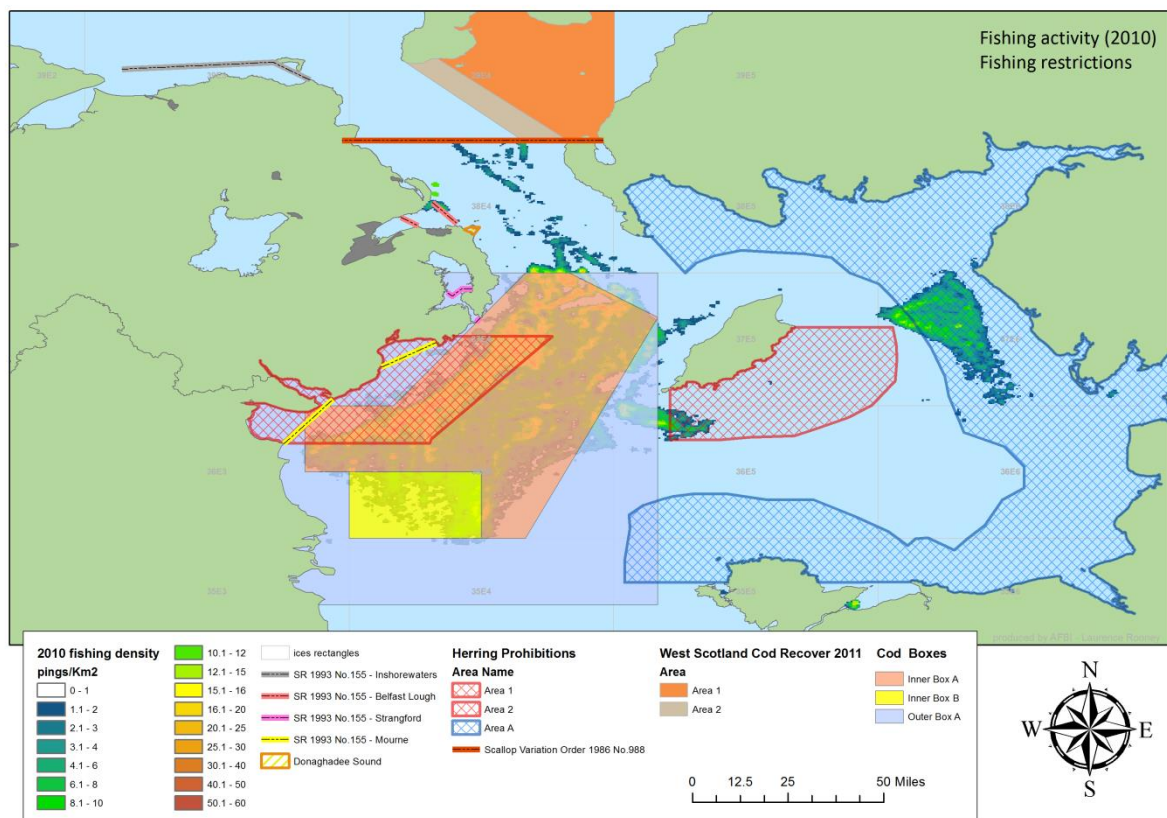


Figure 9A – Example of fisheries restricted areas within the Irish Sea and North Channel

Herring:

Note that Areas 1 & 2 are temporal closures (21st Sept – 31st Dec and 21st Sept – 15th Nov respectively) and Area A is all year. Only the annual VMS intensity has been used, i.e. not broken down temporally.

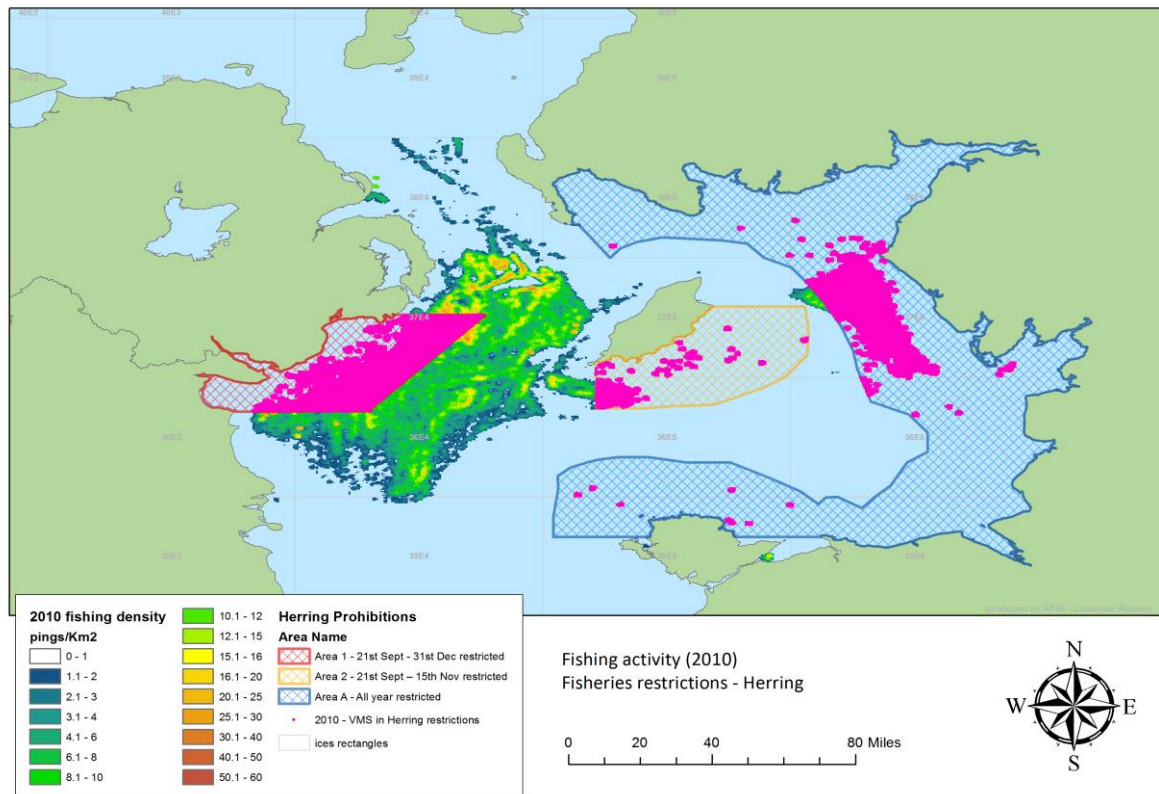


Figure 9B – VMS data from Herring restriction zones– activity within the zones is highlighted in pink

Table 9A – Total herring restriction zones results:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	2221.00	25.23	36.64	56035.59
2008	2320.25	25.21	32.72	58500.90
2009	2320.25	23.93	26.66	55527.56
2010	2364.75	24.90	32.41	58903.56
2011	3234.25	22.35	32.72	72290.71
2012	4298.25	15.94	25.66	68496.15
2013	3384.50	21.12	30.69	71484.77
2014	3615.75	20.98	30.45	75871.39

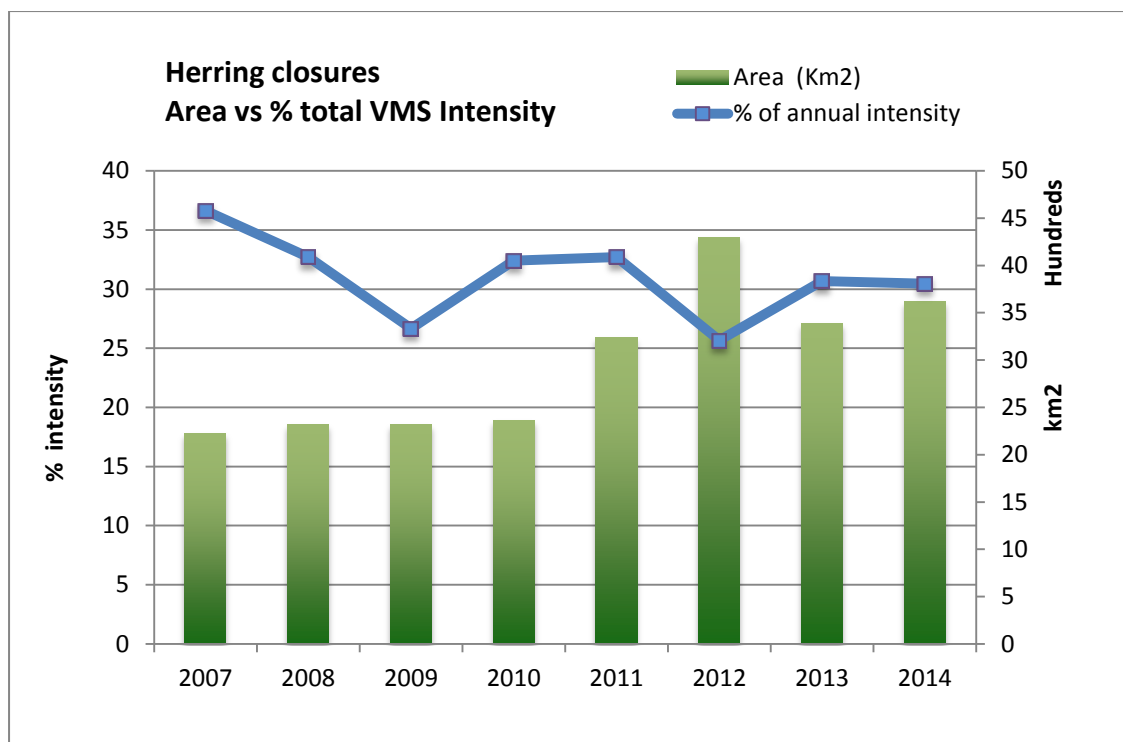


Chart 9 - Herring restriction zones results – amount of VMS within Herring restriction zones Vs % total VMS intensity within Herring restriction zones

Percentage fishing intensity within the Herring Restricted zones; dipped in 2009 but has stabilised at just over 32%. The total area fished within the Herring Restricted zone has shown an incremental increase since 2007. This could suggest that new fishing areas are being sought but decrease in intensity (per Km²) implies they have been less successful. This trend has continued through to 2014 despite a dip in total intensity in 2012 where a rise in total area covered was observed.

*Note again this represents the whole fleet and not just the herring fleet.

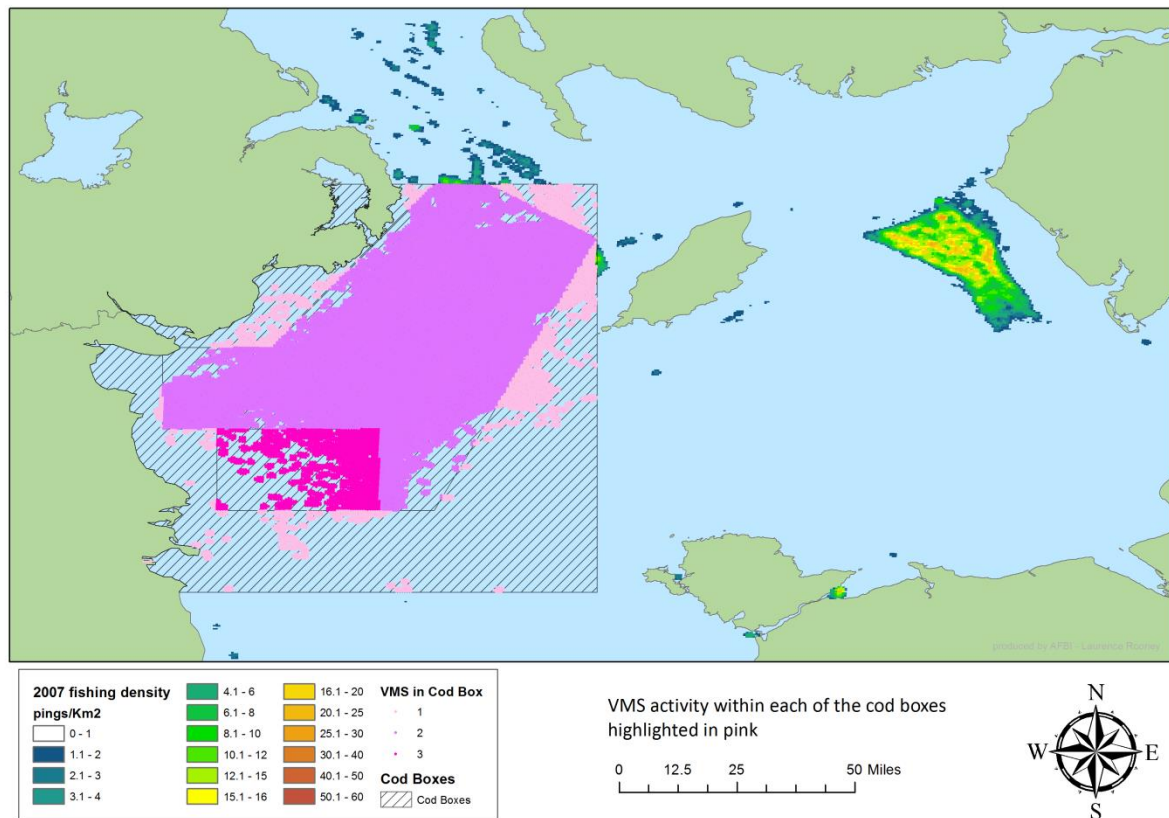


Figure 9C – VMS data from Cod restriction zones – activity within zones is highlighted in pink

Table 9B – Cod restriction zones results:

All Boxes

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	5662.25	21.37	79.11	121005.50
2008	6036.00	25.11	84.78	151550.84
2009	6069.50	30.22	88.07	183437.21
2010	6081.75	26.14	87.47	158988.79
2011	6358.50	30.21	86.94	192088.24
2012	6890.00	33.26	73.19	229127.11
2013	6536.50	29.47	82.72	192658.66
2014	6386.00	32.81	84.08	209498.20

Box 1

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	882.50	9.70	5.60	8558.40
2008	952.00	11.44	6.09	10894.16
2009	976.50	10.66	5.00	10414.14
2010	997.00	11.33	6.22	11297.14
2011	1215.50	12.38	6.81	15045.55
2012	1610.50	15.74	9.50	25349.25
2013	1395.50	17.39	10.42	24261.58
2014	1286.25	18.31	9.45	23556.84

Box 2

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	4237.50	25.82	71.55	109429.21
2008	4346.75	31.01	75.40	134795.01
2009	4306.00	37.43	77.37	161153.29
2010	4301.75	32.23	76.28	138643.05
2011	4346.25	38.29	75.32	166415.91
2012	4417.25	44.23	73.19	195391.67
2013	4396.75	36.62	69.13	160997.01
2014	4339.75	40.86	71.16	177321.84

Box 3

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual intensity	Total Pings
2007	542.25	5.57	1.97	3017.90
2008	737.25	7.95	3.28	5861.68
2009	787.00	15.08	5.70	11869.78
2010	783.00	11.56	4.98	9048.60
2011	796.75	13.34	4.81	10626.78
2012	841.50	9.91	3.13	8342.59
2013	738.25	9.95	3.15	7344.37
2014	753.50	11.31	3.42	8522.75

*Numbers not in appendix

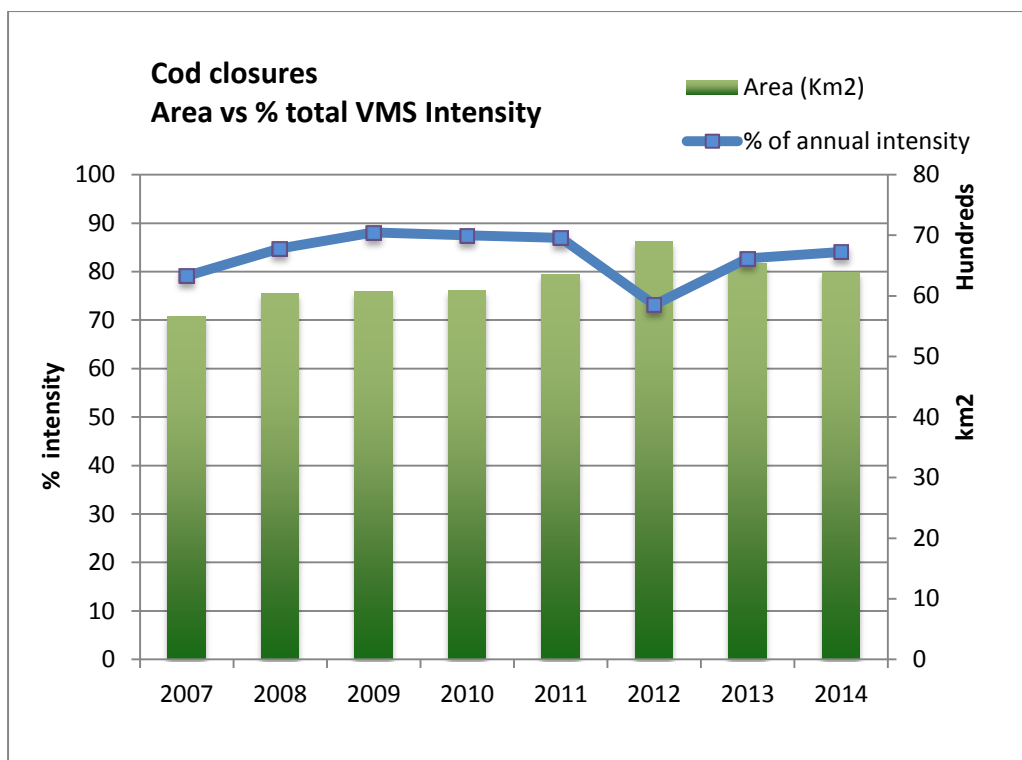
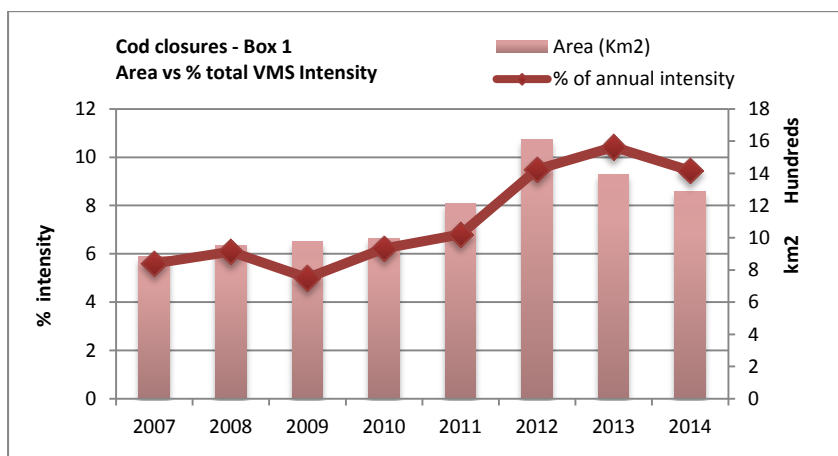
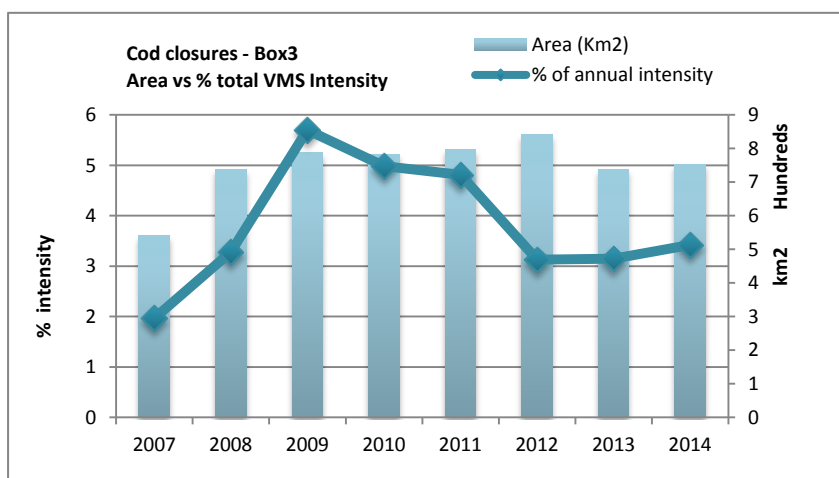
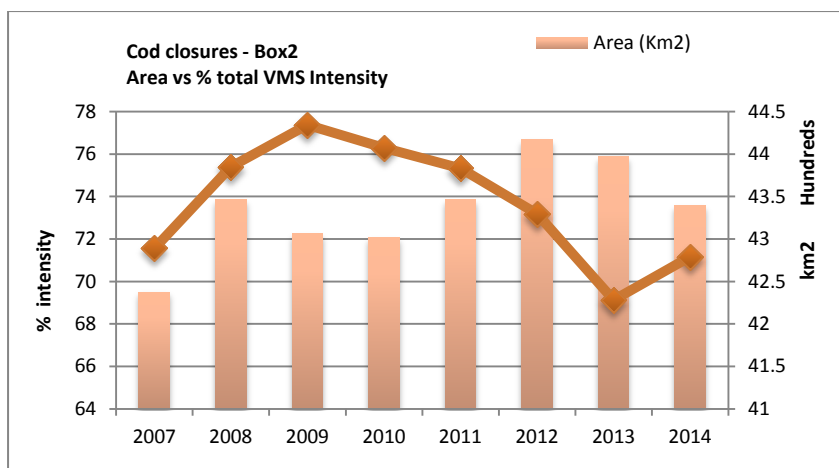


Chart 9A - Cod restriction zones results – amount of VMS within Cod restriction zones Vs % total VMS intensity within Cod restriction zones





Charts 9 B, C & D - Cod restriction zones results – amount of VMS within Cod restriction areas Vs % total VMS intensity within Cod restriction areas

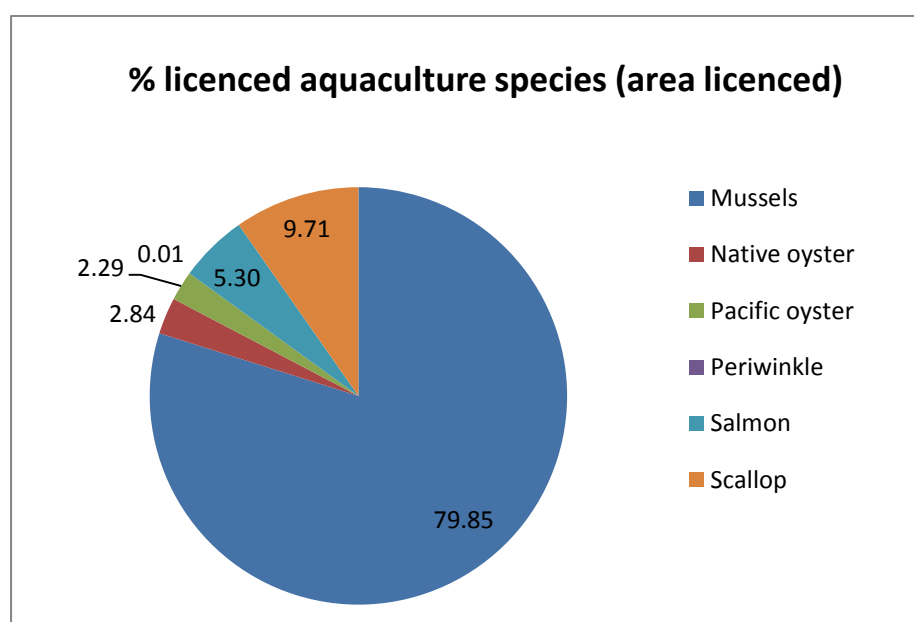
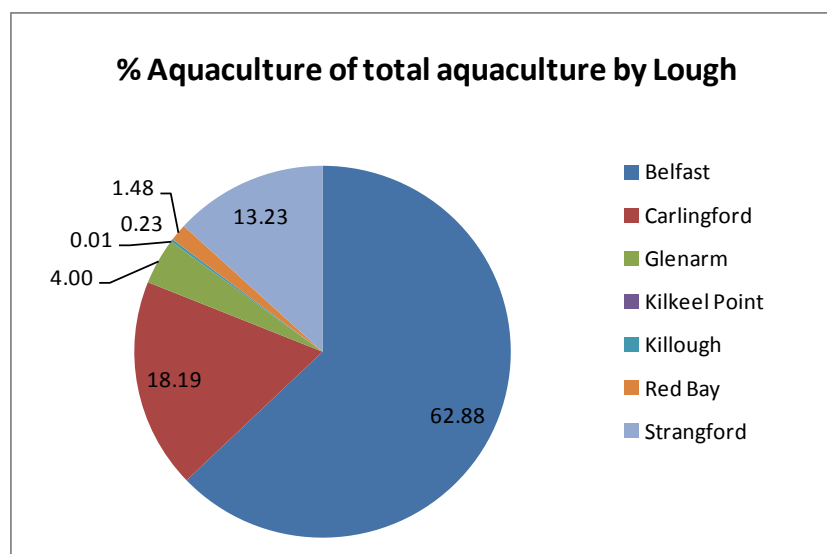
Total annual fishing intensity increased between 2007 and 2009 by almost 9%. The intensity has slightly decreased between 2009 and 2011 but the amount of area in which fishing has taken place within the cod boxes has increased.

Between 2012 and 2014 the percentage of the code restriction zone fished has increased but there has been a slight dip in overall fishing intensity within these areas. Boxes 1 to 3, show the spatial variation in behaviour with Box 1 having a general increase in activity and Boxes 2 & 3 showing a decrease.

Aquaculture (NI only):

Table 10 – Aquaculture areas:

Lough/Area	Licensed Km ²
Belfast	133.21
Carlingford	38.53
Glenarm	8.46
Kilkeel Point	0.01
Killough	0.48
Red Bay	3.13
Strangford	28.02
Grand Total	211.84



VMS activity from the larger fleet does not take place within the loughs and so the aquaculture sites do not restrict activity of these fisheries. They may have an effect on the smaller boats (>15m) which are not on the VMS system. Black box data (a type of VMS) records activity at a higher resolution on mussel dredge boats. An example can be seen below.

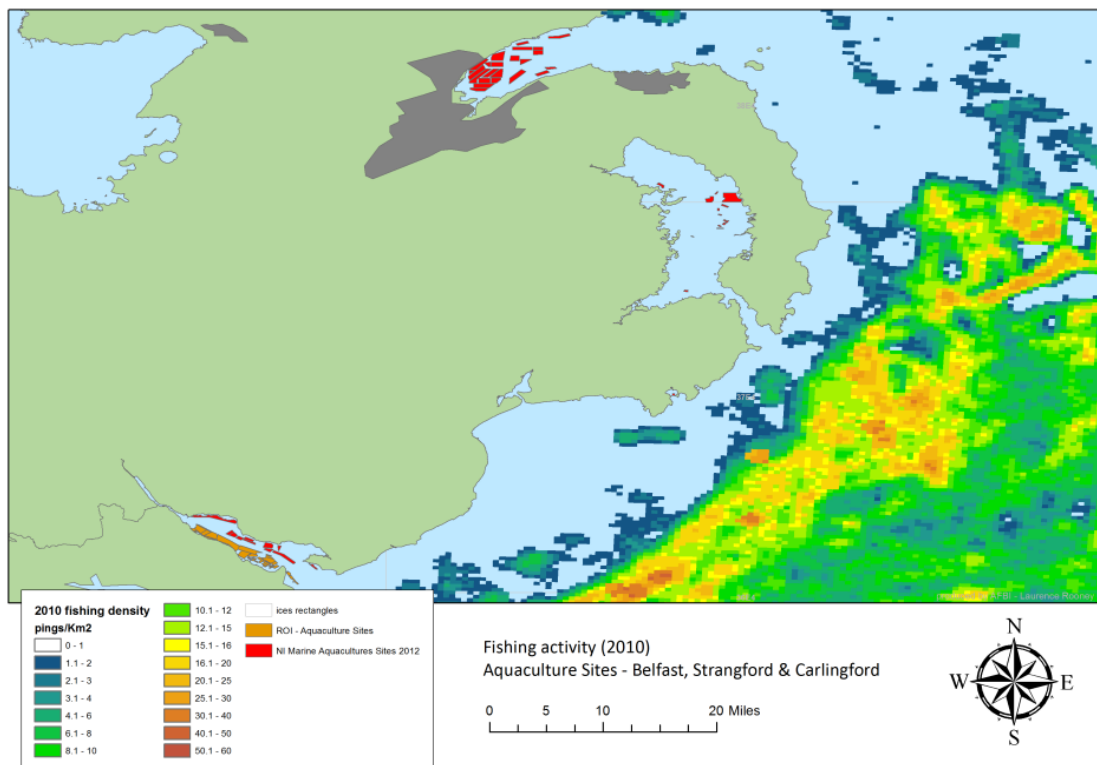


Figure 10A – Location of VMS activity relative to main concentration of licensed aquaculture sites

Black Box data

example:

Intensity of activity
at aquaculture sites
in Belfast

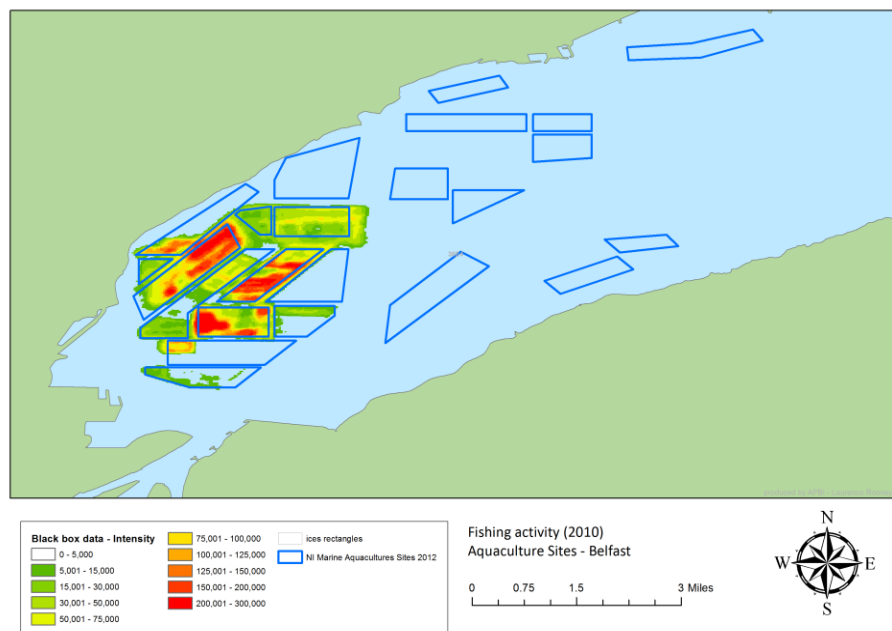


Figure 10B – Black box data from mussel dredgers – activity within aquaculture sites

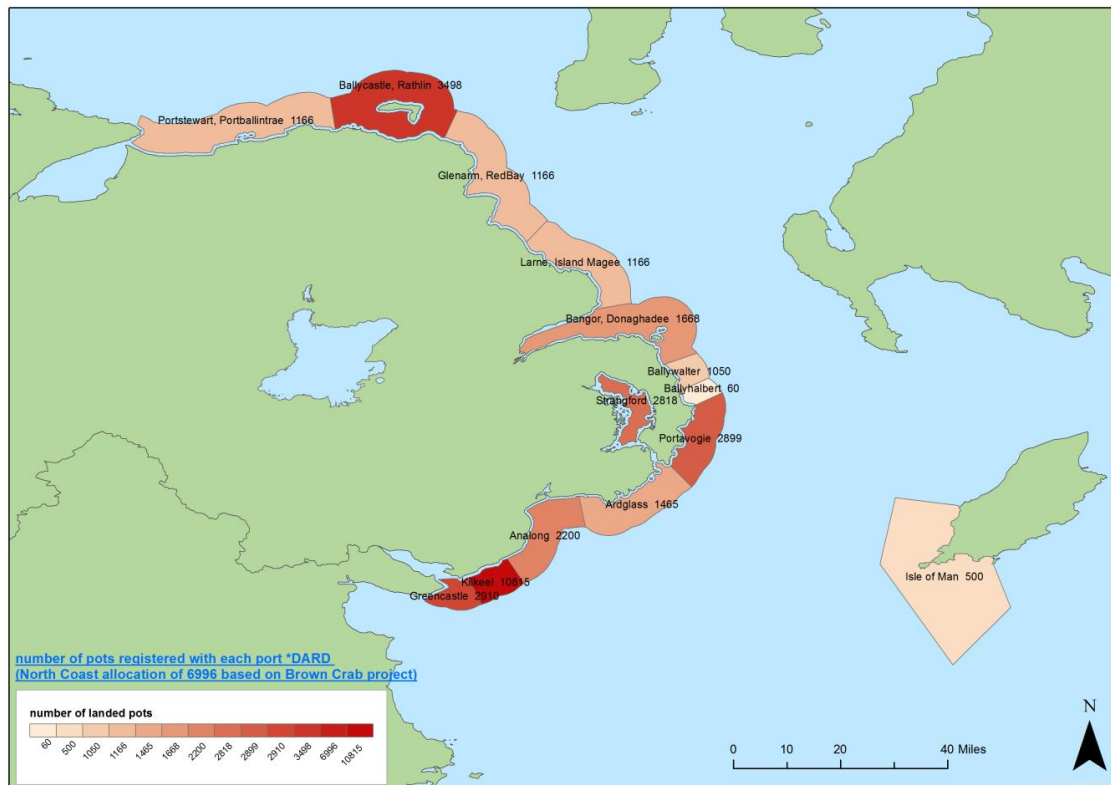
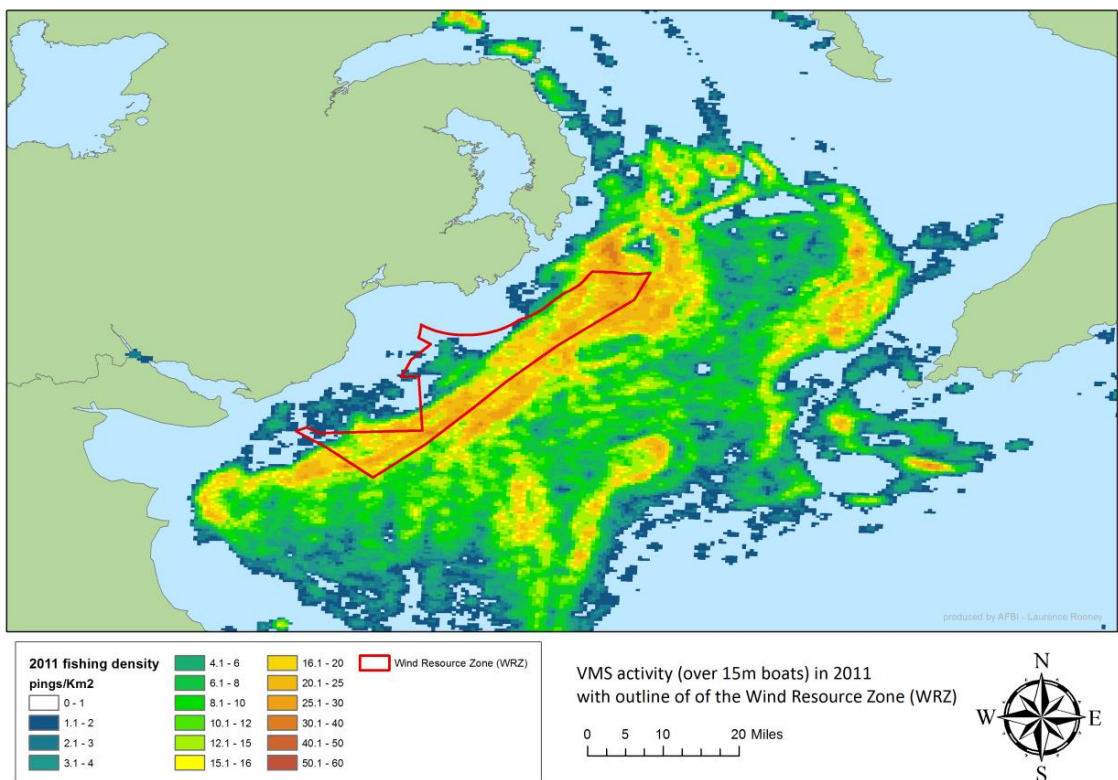


Figure 11 – Potfishing – number of pots registered with each port. DARD data.

2015

Wind Resource Zone Study



Laurence Rooney

AFBI

06/06/2013

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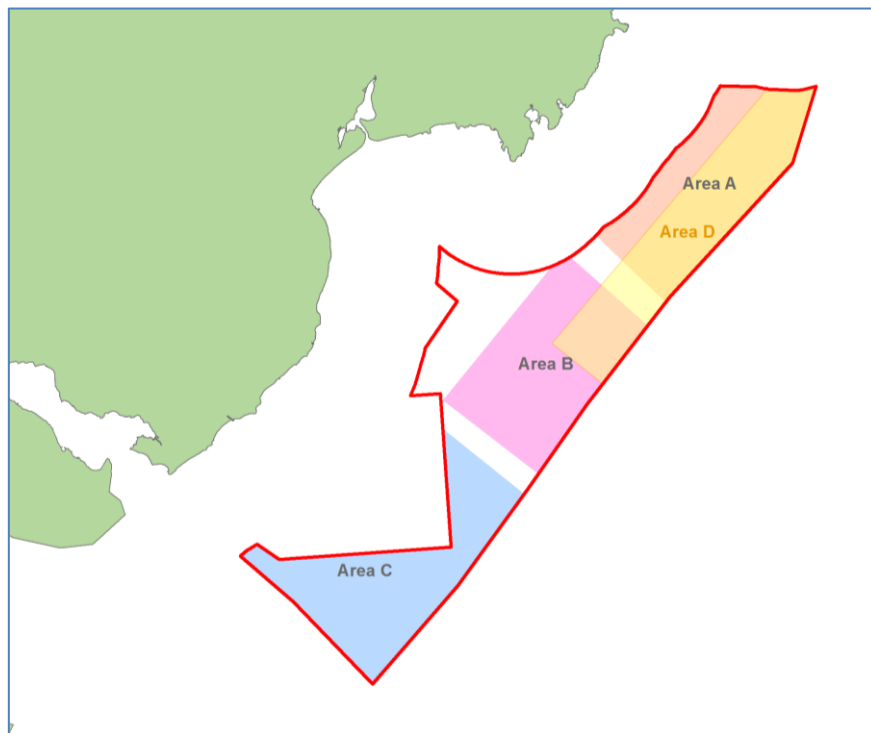
Summary	Page 2
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Summary:

Fishing intensity in the NI wind resource zone (WRZ) has steadily increased from 2007. The area fished in 2011 represents over 95% of the total designated area. It appears that there is increasing fishing pressure within this area.

In 2011, almost 12% of fishing intensity in over 15m boats registered in Northern Ireland was within this area.

The required size for the windfarm will be approximately 120km^2 which represents around 25% of the designated resource zone (438km^2). Four scenarios were explored to see what the impact may be if the 120km^2 site was placed at different areas within the WRZ.



Four areas 120km^2 areas investigated

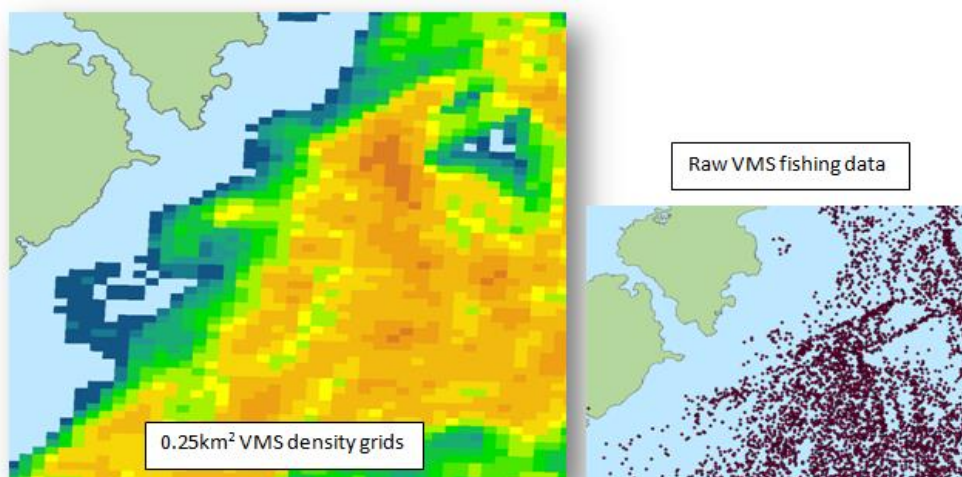
Area B has proved to be the area with least impact. Marginally less of the area is fished compared to the other sites and the percentage of fishing intensity within this area is less than 3% of the total annual intensity each year.

Data and Method details:

Anonymised VMS data was provided by DARD. Pings were collected every two hours from vessels over 15 metres. This was for the whole Northern Irish fleet.

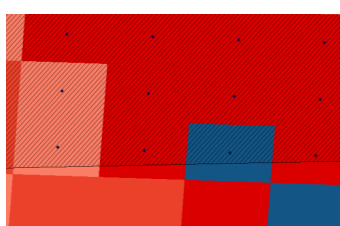
VMS densities were derived for each year 2007-2011, from all data points designated as fishing from each year. Fishing was determined by speed – between 2 and 6 knots inclusive. Exclusions of all data around ports that may have appeared as fishing were made to reduce bias; this was done on a case by case basis.

The cell sizes for the densities are 500x500m grids – creating 0.25Km² grids.



Density values for each cell were derived as pings per Km², though this should be read as a relative index of pressure as opposed to representing the actual number of pings in each square kilometre.

The four 120km² grids have been investigated to see what fishing pressure is in those areas and how it has changed between 2007 and 2011



The area of each 120km² site within the WRZ occupied by the VMS each year is approximate due to the scale of the VMS grids. If more than 50% of a grid falls into the investigated area the whole 0.25Km² grid is counted.

Results described below:

Area (Km ²)	Total area of VMS grids in investigated area
Mean density/Km ²	Mean density across investigated area
% intensity	% intensity of total annual VMS
Total pings/km ²	Sum of densities in investigated area (not actual number of VMS pings)

NI Co. Down – Wind Resource Zone:

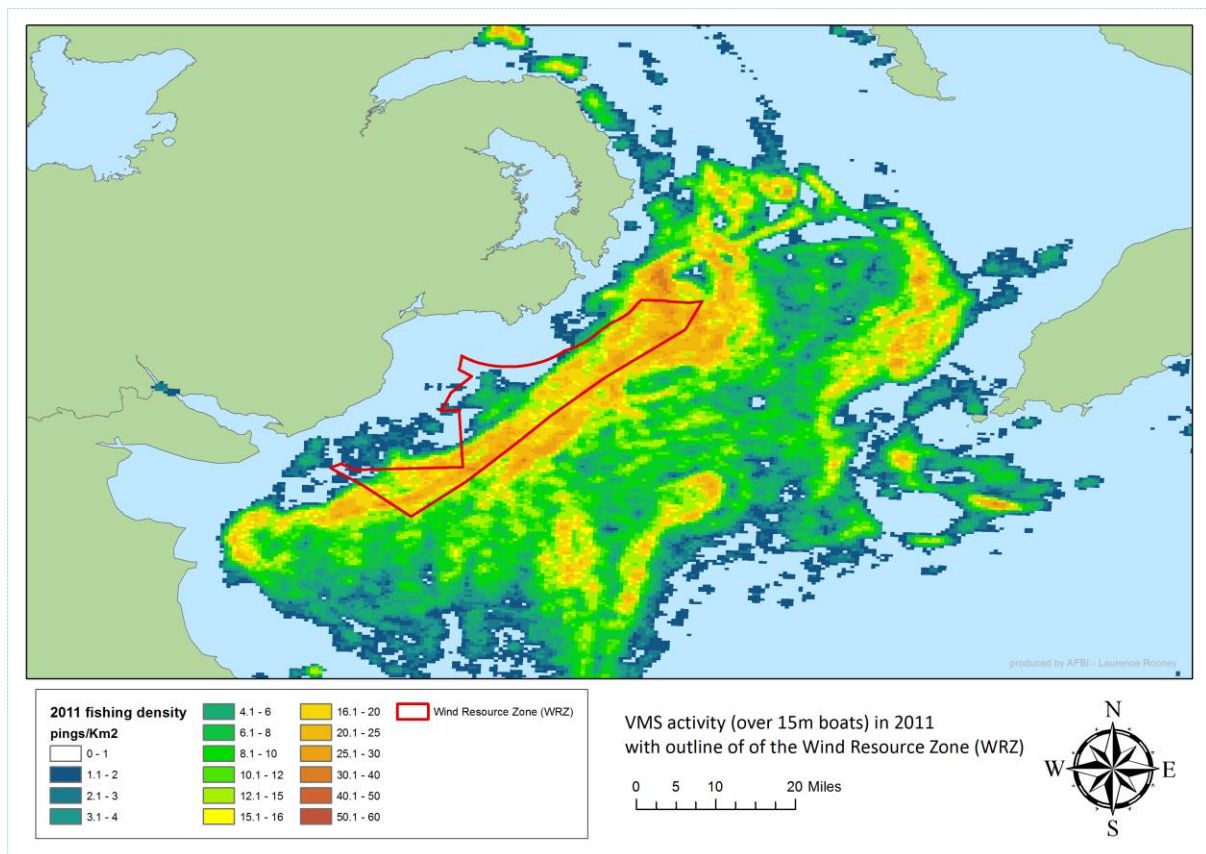


Figure 1: Outline of the Wind Resource Zone (WRZ) with the underlying VMS density analysis for 2011.

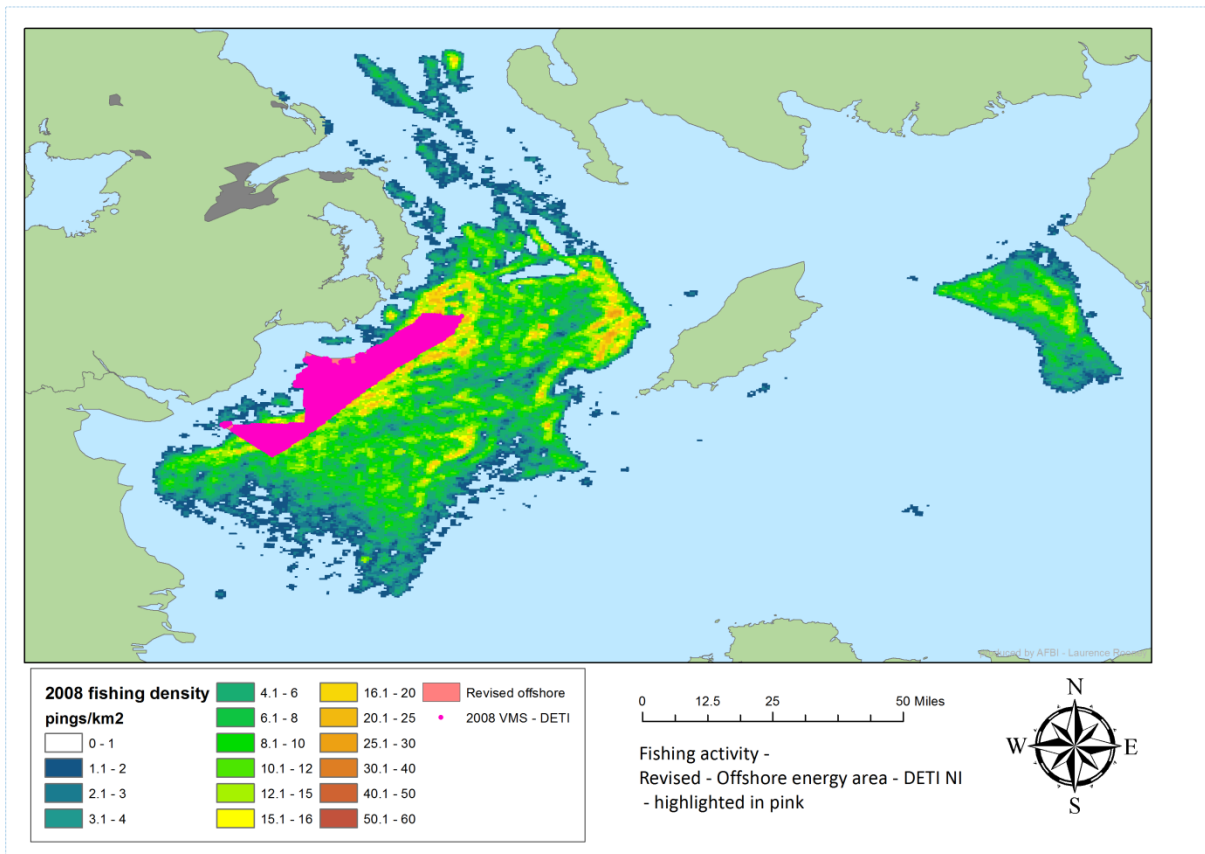


Figure 2 – VMS data from Wind Resource Zone – activity within Wind Resource Zone is highlighted in pink

Table 1 – DETI Wind Resource Zone results:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings/km ²
2007	377.63	37.20	9.67	14788.04
2008	400.19	46.60	10.98	19628.58
2009	400.90	41.23	8.35	17398.18
2010	380.71	52.29	11.53	20954.66
2011	422.04	58.45	11.75	25968.04
2012	430.50	65.15	14.30	28046.92
2013	424.00	49.06	8.45	20800.92
2014	423.75	49.38	7.88	20926.33

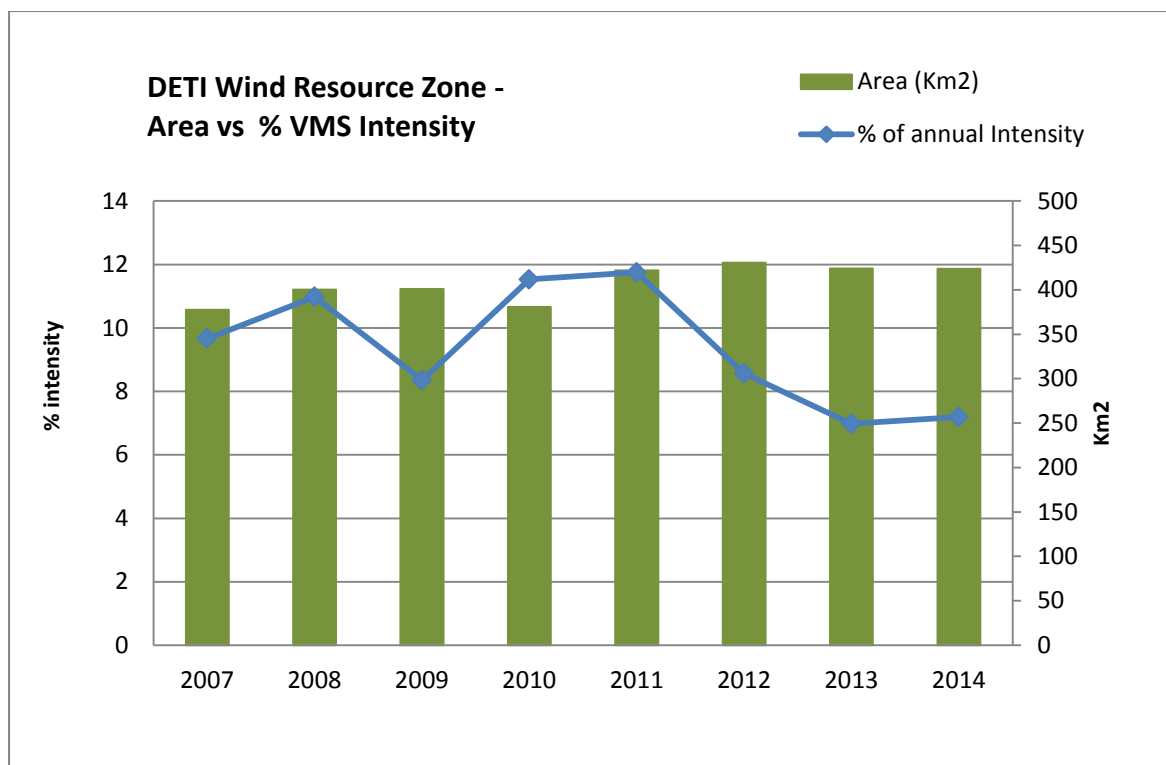


Figure 3 - Wind Resource Zone results – amount of VMS within Wind Resource Zone areas Vs % total VMS intensity within DETI Wind Resource Zone areas

Despite a dip in 2009, fishing intensity in the Wind Resource Zone has shown a general increase from 2007. The total area fished within area has remained roughly the same but has also increased from 2007.

The area fished in 2011 over 95% of the total Wind Resource Zone area was actively fished.

120km² placement scenarios

The required size for the windfarm will be approximately 120km², dependant on the final design, which represents around 25% of the designated resource zone (438km²). Four scenarios were explored to see what the impact may be if the 120km² site was placed at different areas within the WRZ. The first three are **Area A**, **Area B** and **Area C** – see figure 4. The fourth, **Area D**, is described in figure 5.

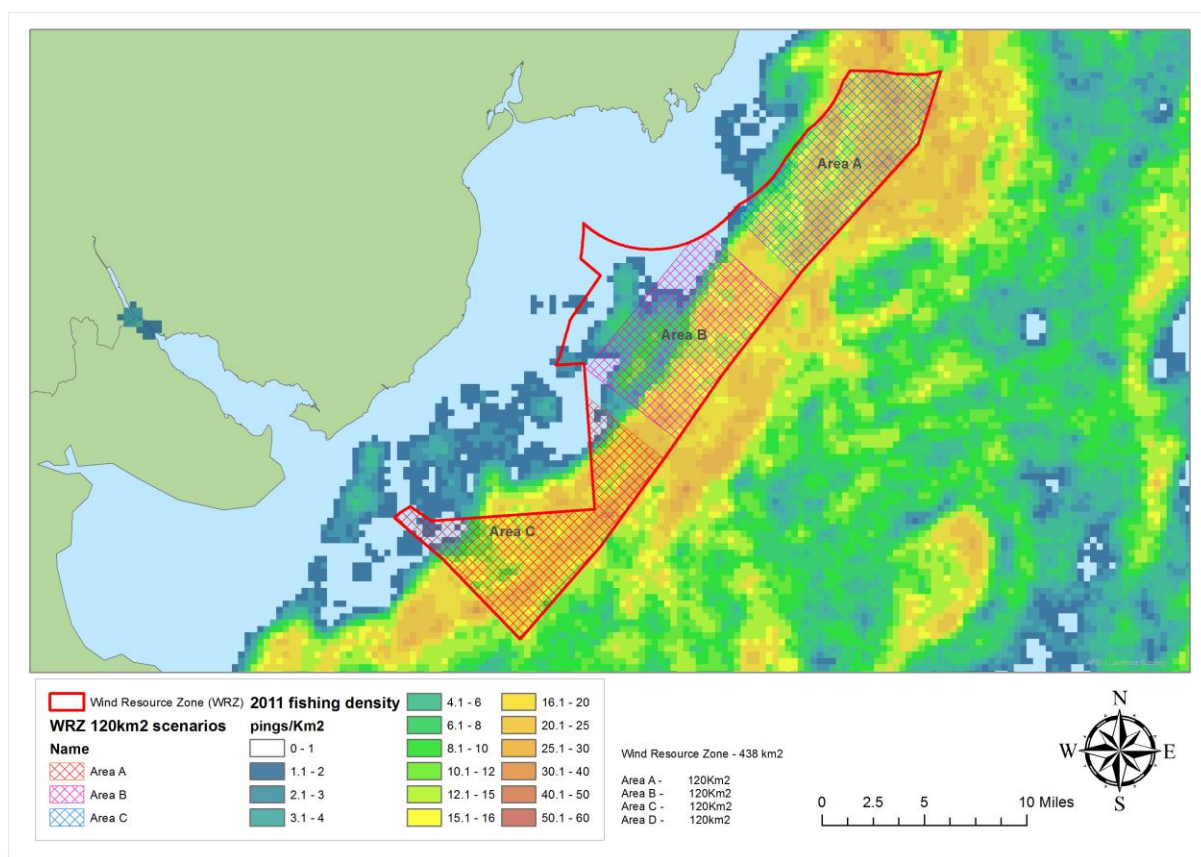


Figure 4 – Three scenario areas (120km² each)

Table 2, 3 & 4 – 120km² scenario results (scenarios 1-3):

Area A:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings/km ²
2007	120.75	46.72	4.47	5642.04
2008	119.75	64.77	5.26	7756.58
2009	119.00	53.21	3.69	6332.46
2010	120.50	60.33	4.85	7269.24
2011	120.75	78.00	5.17	9418.79
2012	119.75	93.68	4.20	11218.51
2013	119.75	59.36	3.05	7108.18
2014	119.75	65.76	3.16	7874.67

Area B:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings/km ²
2007	109.50	31.19	2.71	3415.15
2008	116.00	36.98	2.91	4289.86
2009	116.75	32.11	2.18	3748.42
2010	106.75	37.22	2.65	3973.14
2011	111.00	47.71	2.91	5296.36
2012	119.50	48.59	2.18	5806.29
2013	114.50	41.86	2.06	4792.79
2014	114.75	38.17	1.76	4379.63

Area C:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings/km ²
2007	118.75	38.65	3.64	4590.03
2008	116.25	50.29	3.96	5846.08
2009	118.75	49.95	3.45	5931.39
2010	118.00	70.12	5.52	8274.15
2011	118.50	65.21	4.24	7727.29
2012	119.25	73.19	3.27	8727.74
2013	118.50	59.77	3.04	7082.39
2014	119.25	55.16	2.64	6577.24

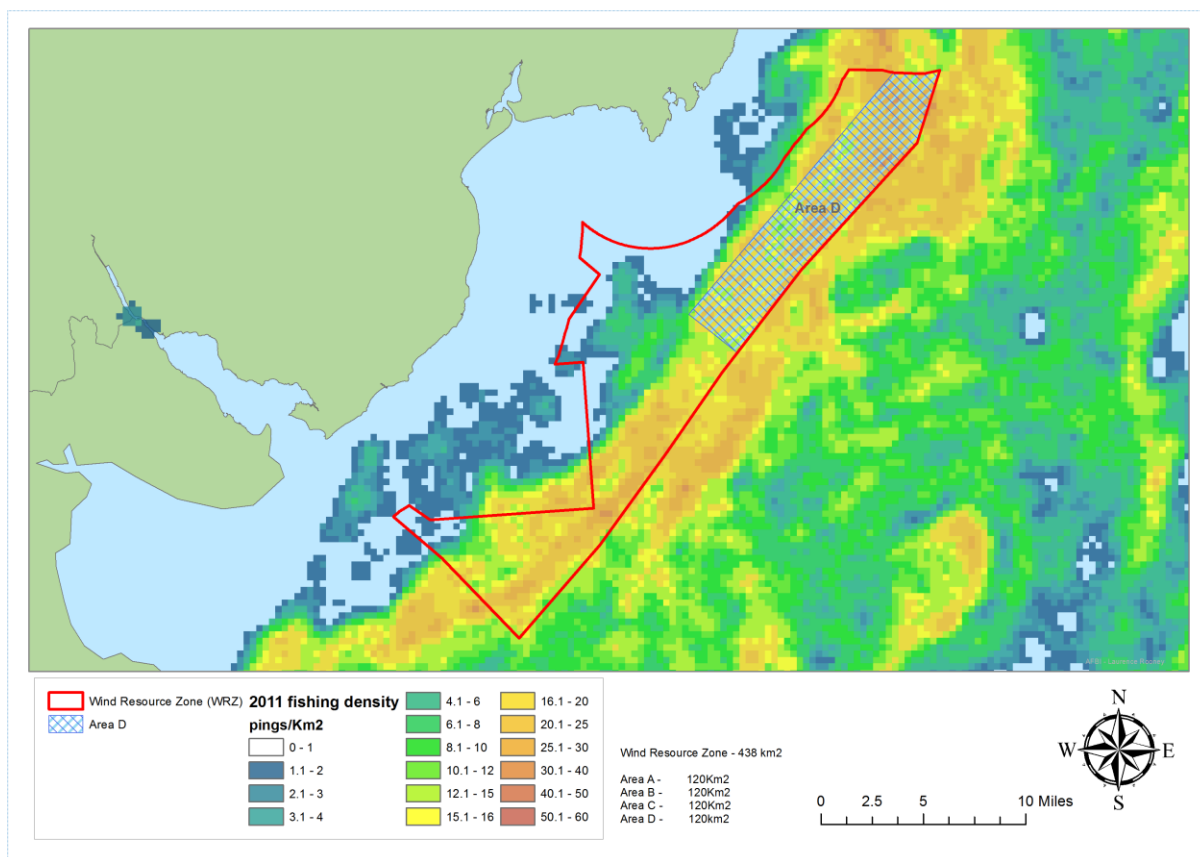


Figure 5 – Area D – scenario 4

Table 5 – 120km² scenario results – scenario 4:

Area D:

Year	Area (Km ²)	Mean Density (mean total ping /Km ²)	% of annual Intensity	Total pings/km ²
2007	120.25	51.03	4.86	6136.38
2008	120.00	66.62	5.42	7994.03
2009	119.50	52.50	3.65	6274.21
2010	120.00	63.41	5.08	7609.20
2011	120.75	80.04	5.30	9665.16
2012	120.25	103.39	4.66	12433.18
2013	120.25	61.01	3.15	7336.72
2014	120.25	63.07	3.04	7584.69

The total pings/km2 and annual % of total VMS intensity are illustrated in figures 6 and 7.

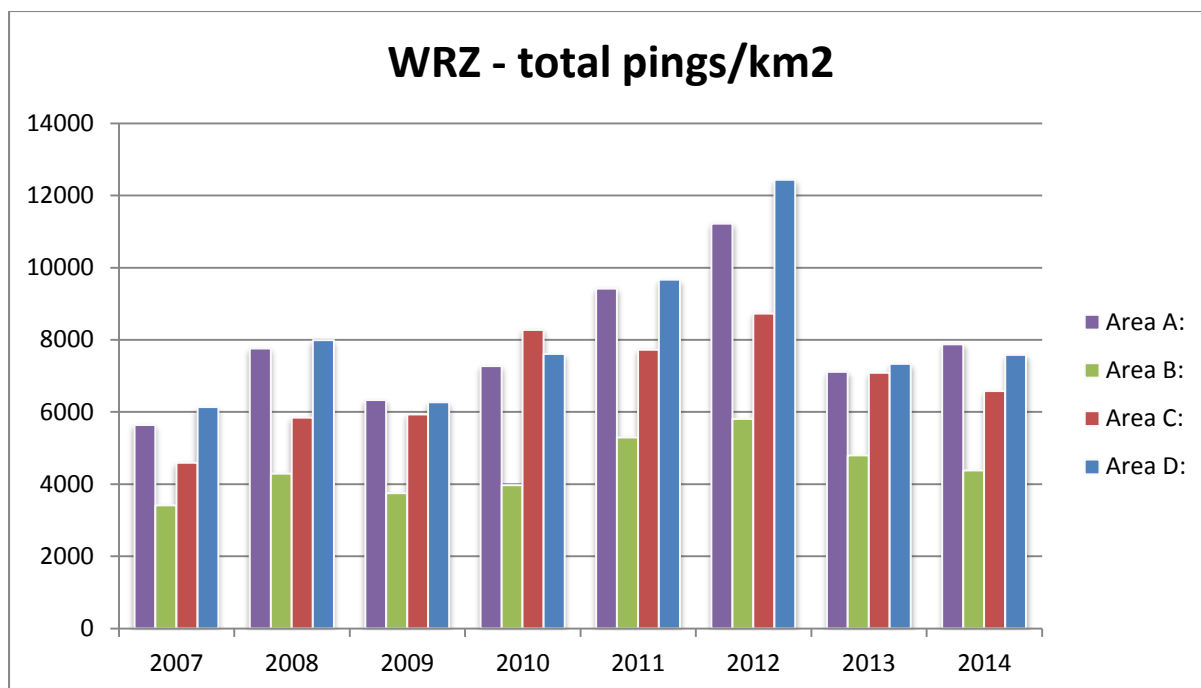


Figure 6 - total sum of pings/km2 in each area for each year

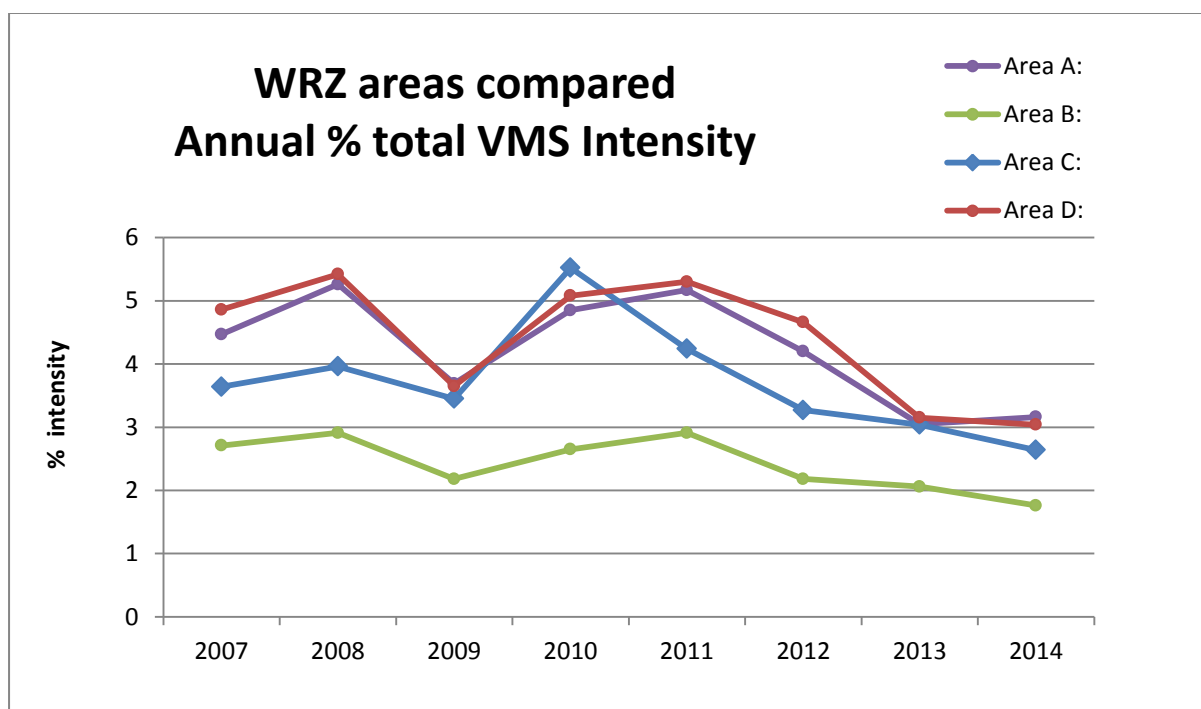


Figure 7 - % of total annual fishing intensity within each area for each year

% of VMS grids in each area:

The % reflects amount of each area that has fishing activity – 100% means the entire area (120km²) has some amount of fishing activity (at 0.25km² grid resolution).

Area\ Year	2007	2008	2009	2010	2011	2012	2013	2014
Area A	100	100	99	100	100	100	100	100
Area B	91	97	97	89	93	99	95	95
Area C	99	97	99	98	99	100	99	100
Area D	100	100	100	100	100	100	100	100

The *Area B* scenario has the least amount of fishing activity and, as illustrated in figure 7, the area with the least intense fishing activity for boats over 15 metres.

FishRamp – Irish Sea VMS

Laurence Rooney

December 2013

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Habitat Analyses

Information on fishing intensity was derived from data collected for and presented in 'NIFPO Commercial Fisheries Report' produced by First Flight Wind.

See report for complete methodology.

In summary admiralty charts were supplied as part of a survey of the fishermen at NIFPO and a smaller number at ANIFPO. Sixty five charts were returned, upon which, each fisherman identified areas they fished. The fishing areas are described; quantitative intensities are derived - Not to be confused with VMS (Vessel Monitoring System data) which is purely objective.

These charts were compiled in GIS and overlapping areas received a higher intensity. AFBI digitised the final charts for the analyses below.

Fishing intensities are between 1 and 50 on the derived intensity scale.

Data was digitised and spatial analysis carried out using ArcGIS 10.0

Coordinate system – WGS84

Projection – WGS84_UTM Zone_30N

Note - slight misalignment with the habitat/landscapes file means there is a 1% error margin within in the calculations. This means areas are approximate.

Scalloping:

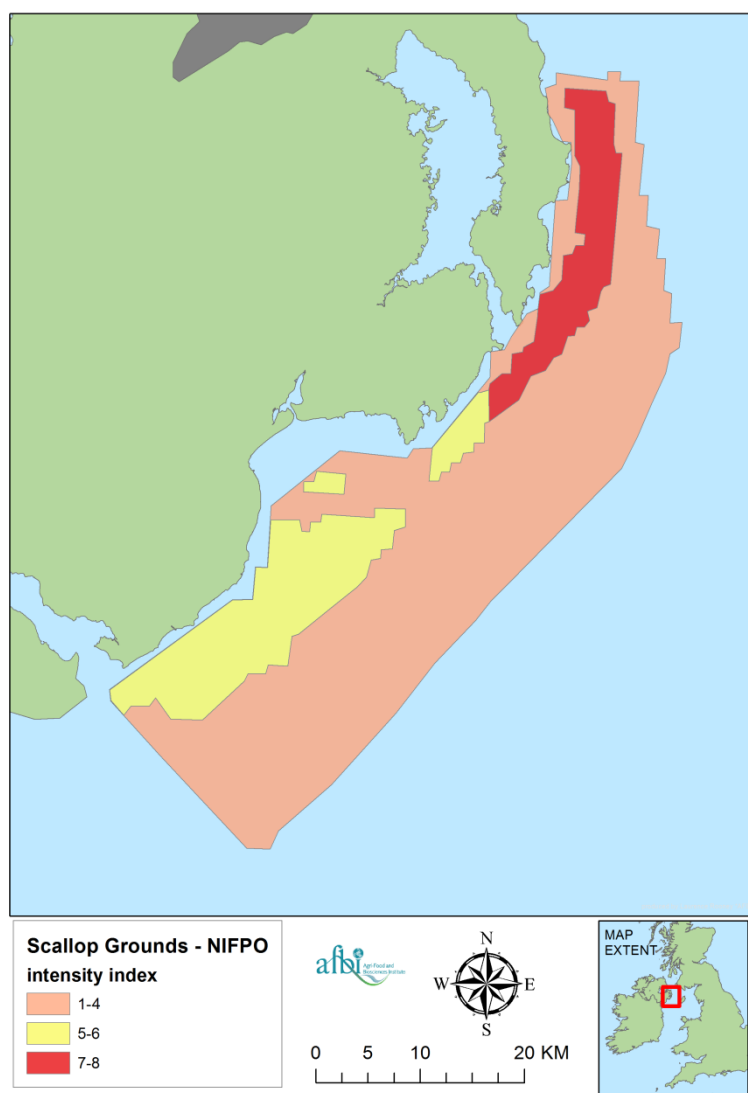


Figure 1: Areas fished for scallops and the relative intensity of fishing (Source NIFPO: FFW report)

Scalloping area:

intensity - overall	KM2
1-4	940.96
5-6	239.62
7-8	123.51
Total scallop fishing area	1304.09

Habitat composition:

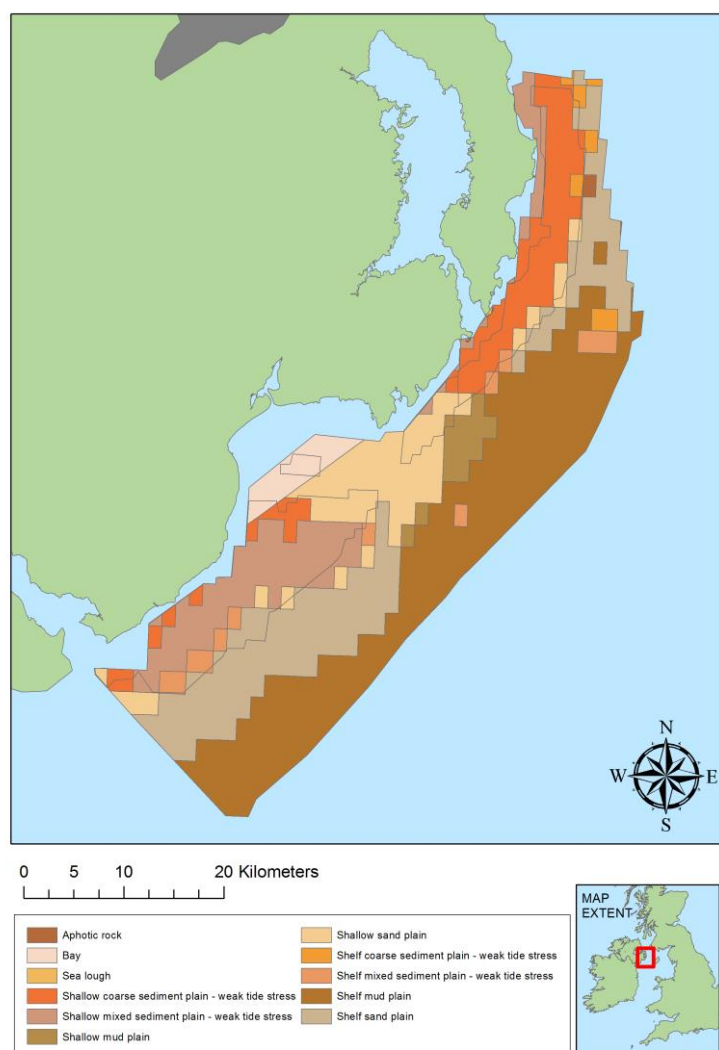
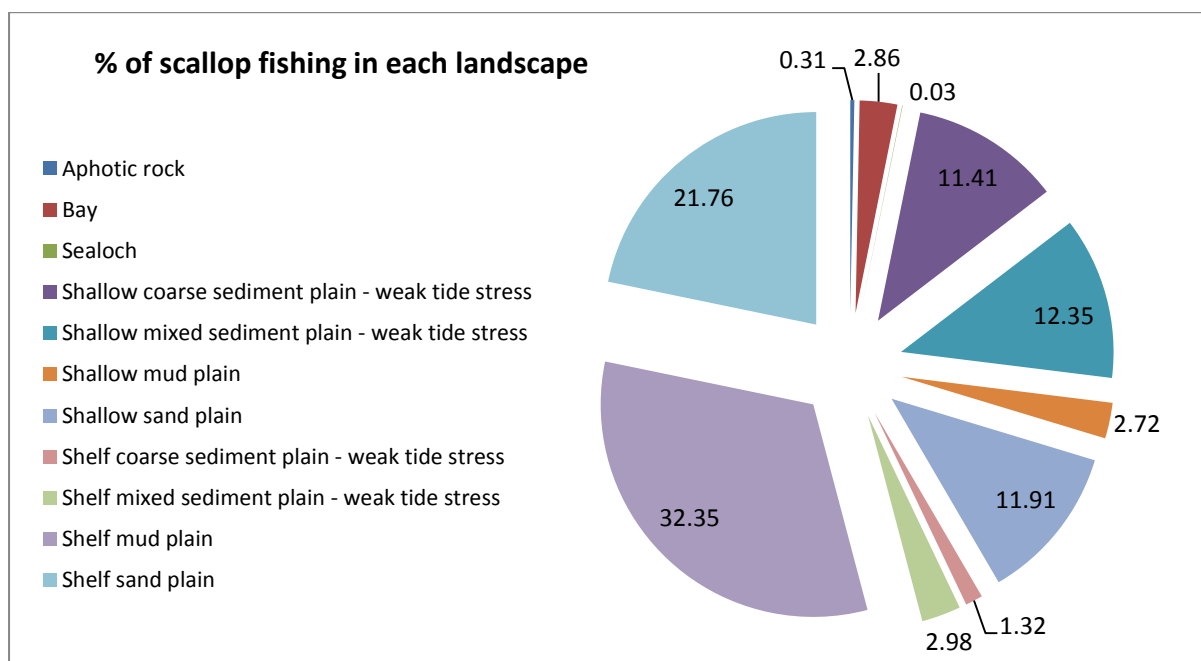


Figure 2: The landscape types where scallop fishing occurs. (Scalloping source NIFPO: FFW report)

KM2 of Scallop fishing in each habitat		Area KM2		
Landscapes \ Intensities	1-4	5-6	7-8	Total
Aphotic rock	3.99	0.00	0.01	3.99
Bay	25.55	11.69	0.00	37.24
Sea lough	0.44	0.00	0.00	0.44
Shallow coarse sediment plain - weak tide stress	28.85	24.82	95.17	148.85
Shallow mixed sediment plain - weak tide stress	35.80	121.67	3.55	161.02
Shallow mud plain	33.71	1.68	0.07	35.46
Shallow sand plain	97.32	45.38	12.60	155.29
Shelf coarse sediment plain - weak tide stress	13.87	0.00	3.36	17.23
Shelf mixed sediment plain - weak tide stress	19.66	17.19	2.02	38.86
Shelf mud plain	421.87	0.00	0.00	421.87
Shelf sand plain	259.86	17.19	6.73	283.78
Total habitat	940.92	239.62	123.51	1304.05

% of Scallop fishing in each habitat				%
Landscapes \ Intensities	1-4	5-6	7-8	Total
Aphotic rock	0.42	0.00	0.01	0.31
Bay	2.72	4.88	0.00	2.86
Sea lough	0.05	0.00	0.00	0.03
Shallow coarse sediment plain - weak tide stress	3.07	10.36	77.06	11.41
Shallow mixed sediment plain - weak tide stress	3.81	50.77	2.88	12.35
Shallow mud plain	3.58	0.70	0.05	2.72
Shallow sand plain	10.34	18.94	10.20	11.91
Shelf coarse sediment plain - weak tide stress	1.47	0.00	2.72	1.32
Shelf mixed sediment plain - weak tide stress	2.09	7.17	1.63	2.98
Shelf mud plain	44.83	0.00	0.00	32.35
Shelf sand plain	27.62	7.18	5.45	21.76
Total	100.0	100.0	100.0	100.00



Wind Resource Zone (WRZ)

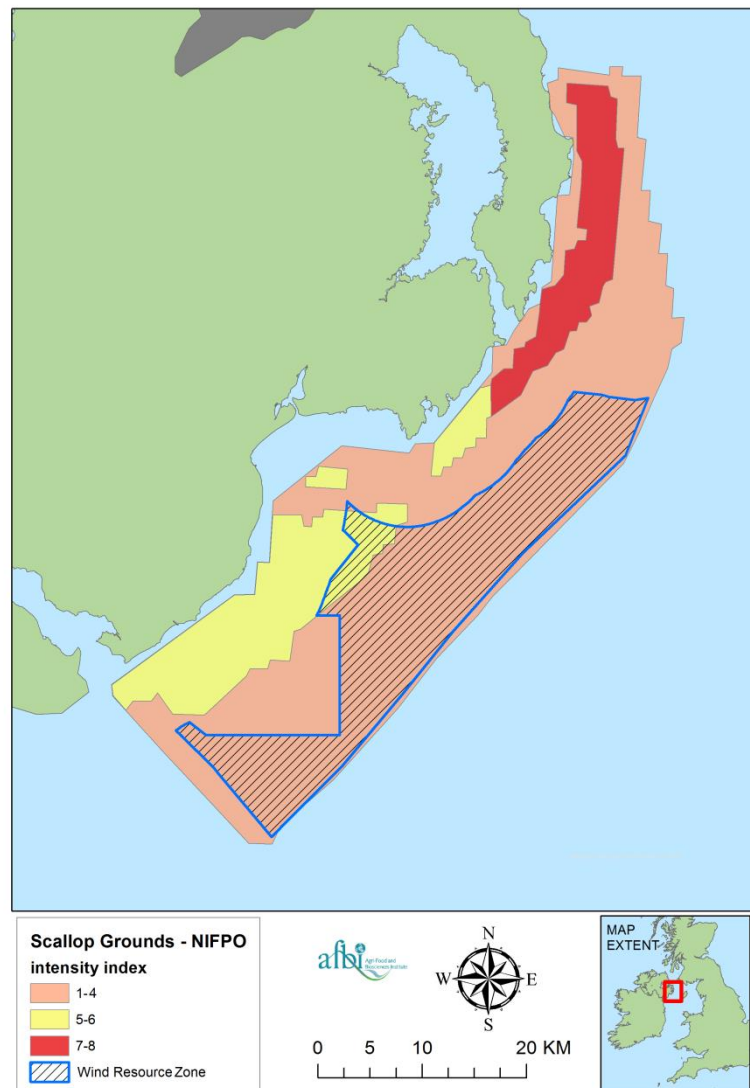


Figure 3: Areas where scallop fishing occurs and the relative intensity of fishing with the wind resource zone (WRZ) overlaid. (Scalloping source NIFPO: FFW report)

Windfarm composition:

Windfarm composition				
Intensity	1-4	5-6	7-8	Total
KM2 total area	940.95	239.62	123.51	1304.09
KM2 total area in wind farm	412.3	26.1	0	438.4
% of total scallop area in wind farm	43.81	10.91	0.00	33.62

Potting

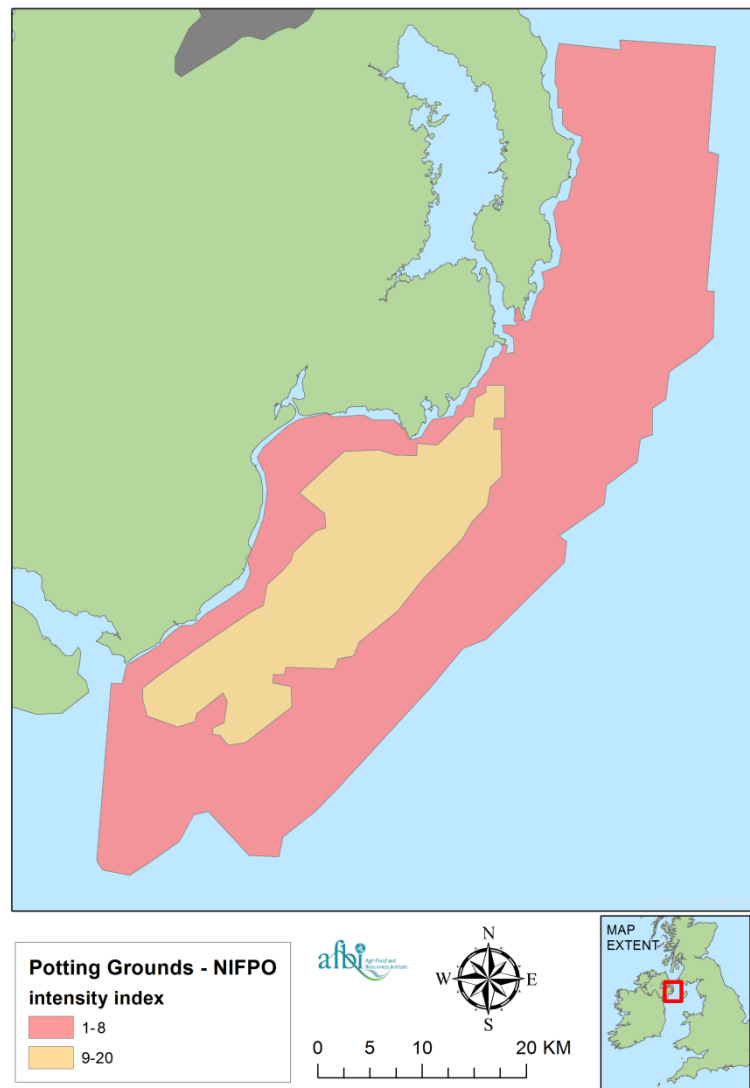


Figure 4: Areas where pot fishing occurs and the relative intensity of fishing (Source NIFPO: FFW report)

Potting Area:

intensity - overall	KM2
1-8	1339.02
9-20	410.95
Total scallop fishing area	1749.97

Habitat Composition

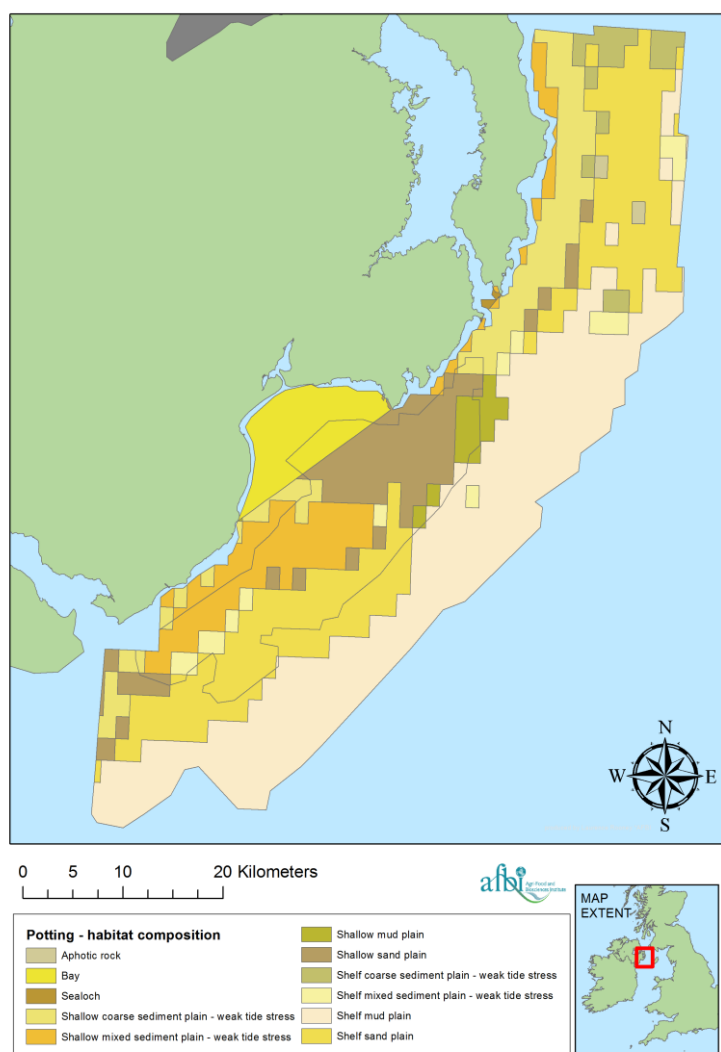
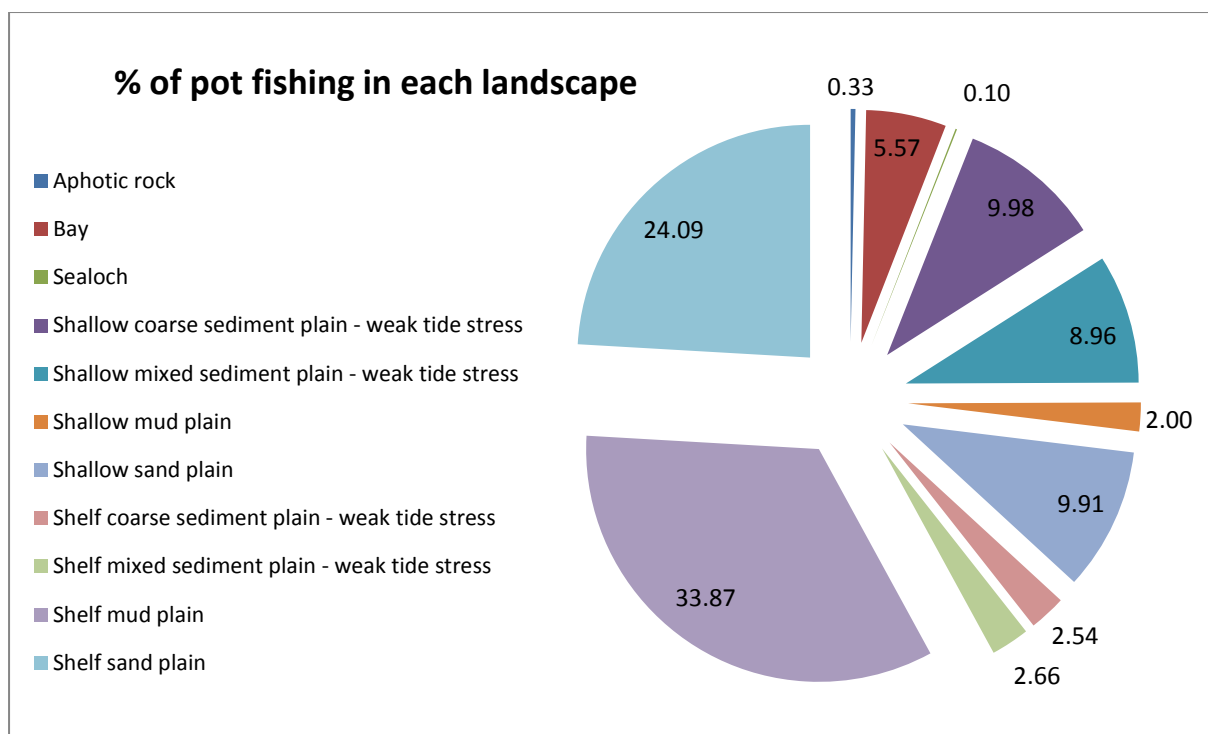


Figure 5: The landscape types where pot fishing occurs. (Potting source NIFPO: FFW report)

KM2 of Pot fishing in each habitat		Area KM2		
Landscapes \ Intensities	1-9	10 - 20	Total	
Aphotic rock	5.78	0.00	5.78	
Bay	78.55	18.92	97.47	
Sea lough	1.82	0.00	1.82	
Shallow coarse sediment plain - weak tide stress	161.55	13.03	174.58	
Shallow mixed sediment plain - weak tide stress	54.82	101.92	156.74	
Shallow mud plain	14.59	20.39	34.98	
Shallow sand plain	46.85	126.51	173.36	
Shelf coarse sediment plain - weak tide stress	44.50	0.00	44.50	
Shelf mixed sediment plain - weak tide stress	26.72	19.81	46.53	
Shelf mud plain	587.06	5.62	592.68	
Shelf sand plain	316.76	104.74	421.49	
Total habitat	1339.00	410.95	1749.95	

% of Pot fishing in each habitat		%	
Landscapes \ Intensities	1-9	10 - 20	Total
Aphotic rock	0.43	0.00	0.33
Bay	5.87	4.60	5.57
Sea lough	0.14	0.00	0.10
Shallow coarse sediment plain - weak tide stress	12.06	3.17	9.98
Shallow mixed sediment plain - weak tide stress	4.09	24.80	8.96
Shallow mud plain	1.09	4.96	2.00
Shallow sand plain	3.50	30.78	9.91
Shelf coarse sediment plain - weak tide stress	3.32	0.00	2.54
Shelf mixed sediment plain - weak tide stress	2.00	4.82	2.66
Shelf mud plain	43.84	1.37	33.87
Shelf sand plain	23.66	25.49	24.09
Total	100.00	100.00	100.00



Wind Resource Zone (WRZ)

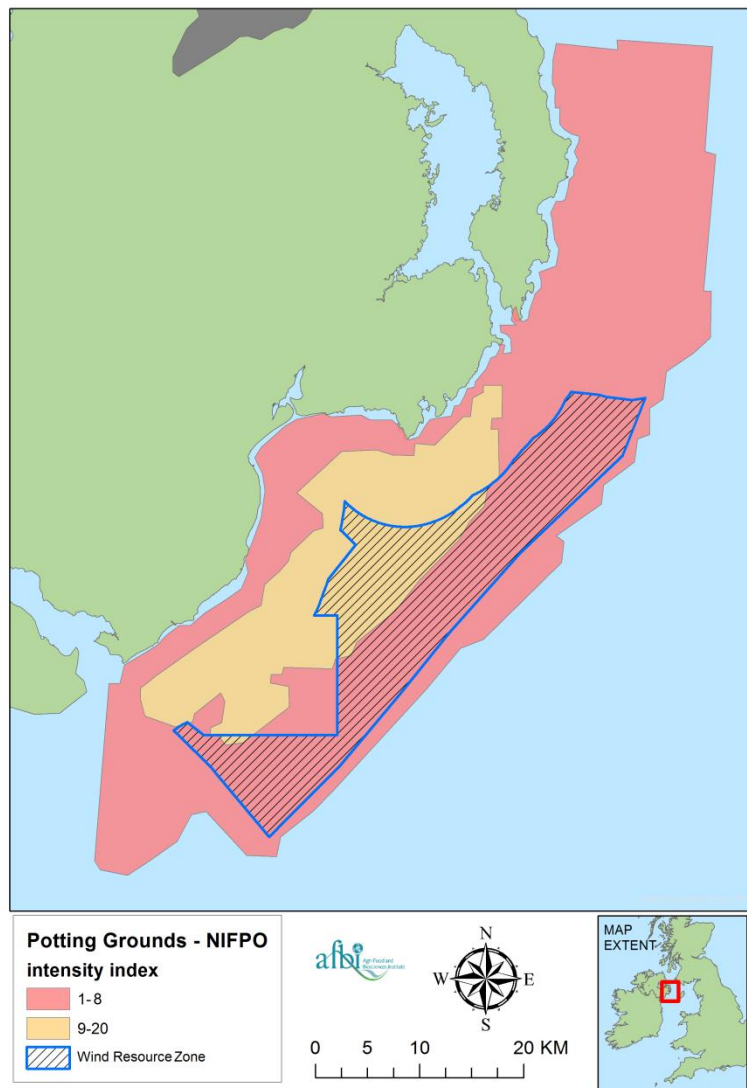


Figure 6: Areas where pot fishing occurs and the relative intensity of fishing with the wind resource zone (WRZ) overlaid. (Potting source NIFPO: FFW report)

Windfarm composition			
Intensity	1-9	10 - 20	Total
KM2 total area	1339.02	410.95	1749.973
KM2 total area in wind farm	439.39	103.80	543.19
% of total scallop area in wind farm	32.81	25.26	31.04

Demersal Trawling

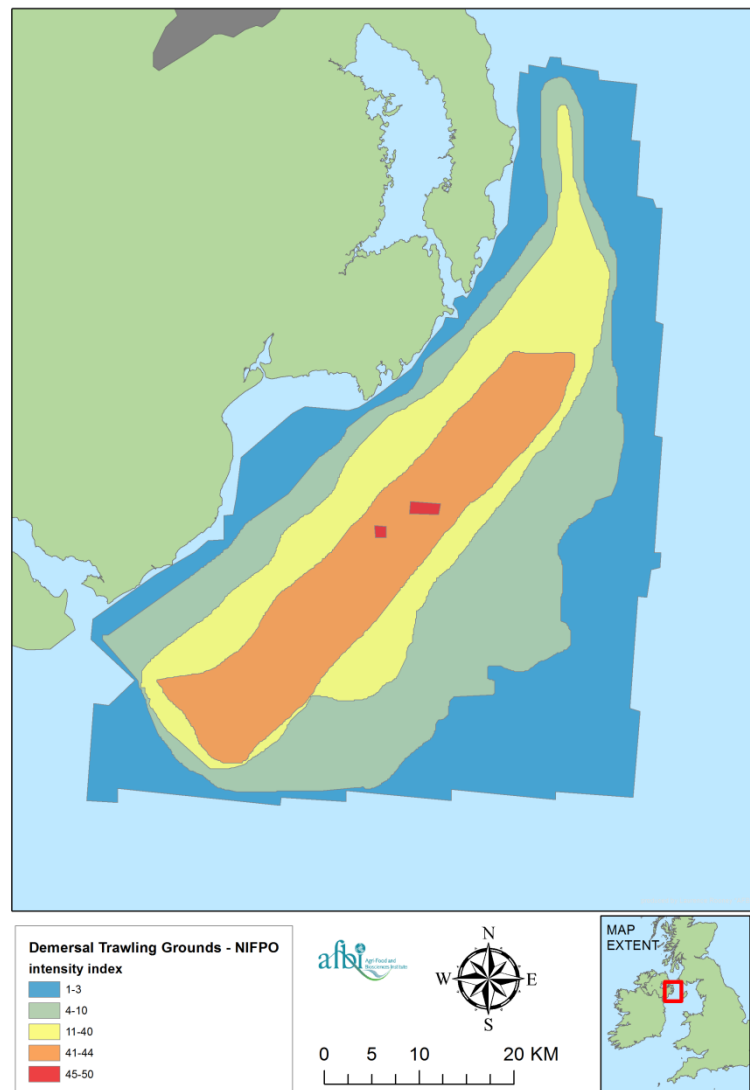


Figure 7: Areas where demersal fishing occurs and the relative intensity of fishing (Source NIFPO: FFW report)

Demersal fishing area:

intensity – overall	KM2
1-3	991.65
4-10	787.64
11-40	511.08
41-45	457.51
45-50	5.30
total	2753.19

Habitat Composition

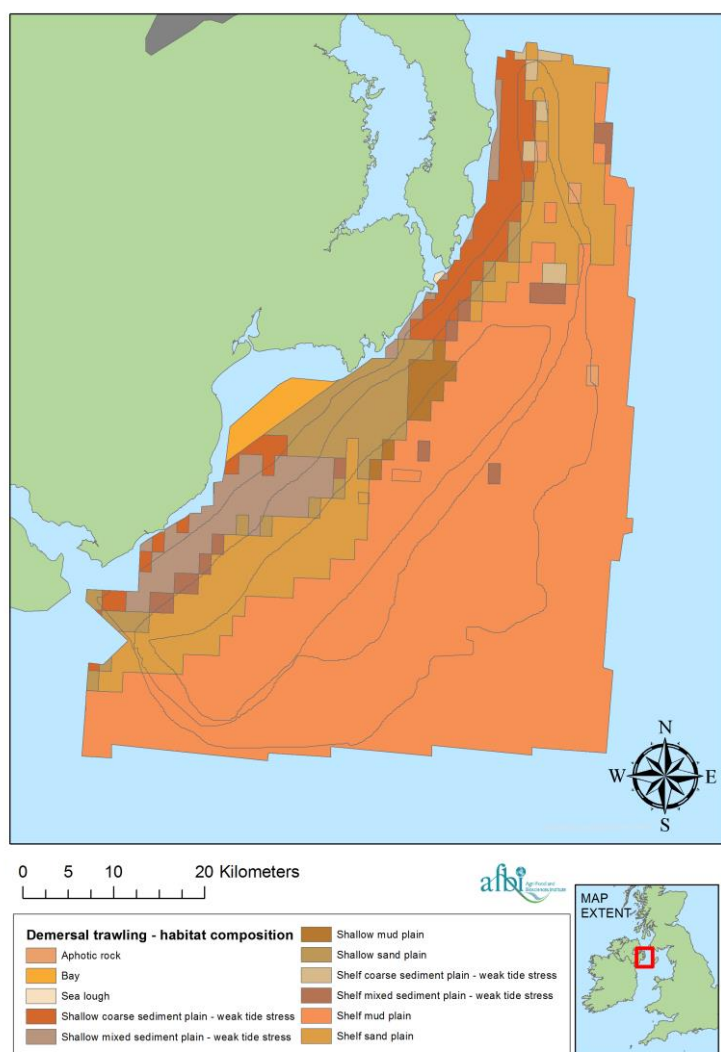
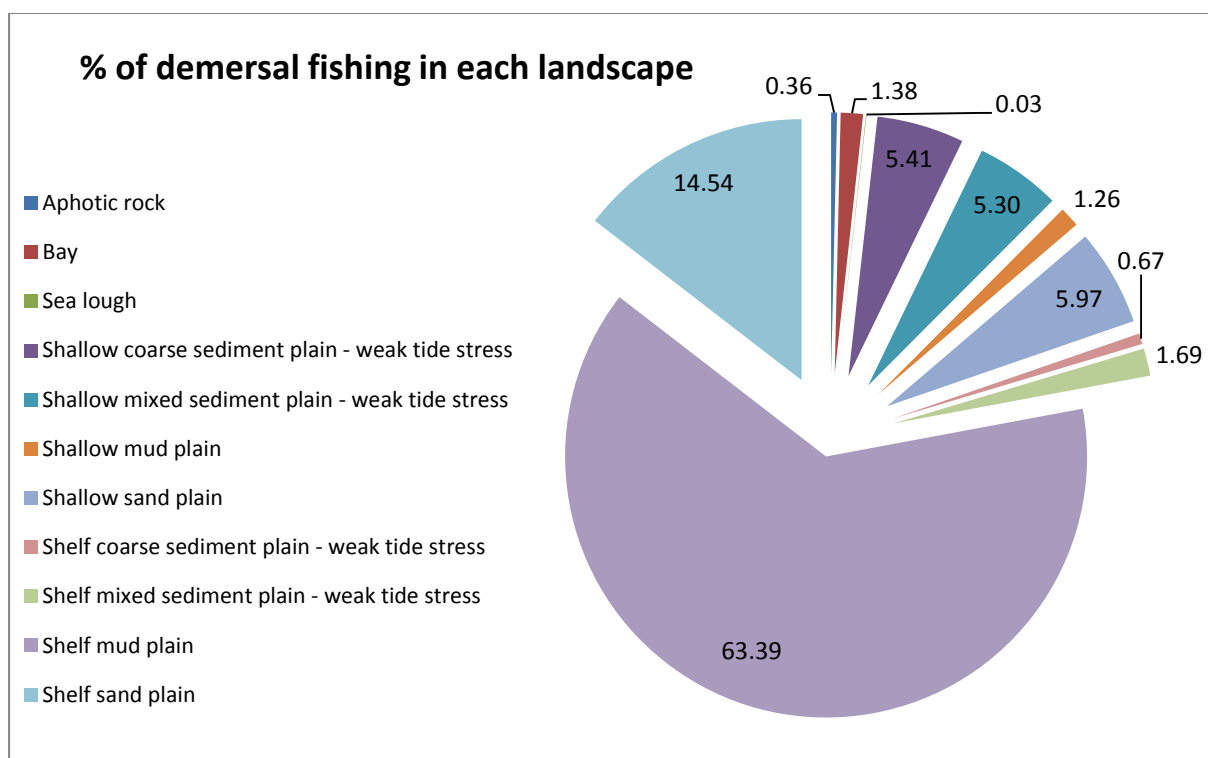


Figure 8: The landscape types where demersal fishing occurs. (Demersal source NIFPO: FFW report)

KM2 of Demersal fishing in each habitat						
Landscapes\Intensities	1-3	4-10	11-40	41-44	45-50	Total
Aphotic rock	4.83	2.91	2.30	0.00	0.00	10.04
Bay	37.93	0.00	0.00	0.00	0.00	37.93
Sea lough	0.90	0.00	0.00	0.00	0.00	0.90
Shallow coarse sediment plain - weak tide stress	92.80	51.37	4.64	0.00	0.00	148.81
Shallow mixed sediment plain - weak tide stress	41.74	75.67	28.42	0.02	0.00	145.84
Shallow mud plain	0.00	0.39	19.47	14.73	0.00	34.59
Shallow sand plain	33.24	56.29	67.50	7.47	0.00	164.50
Shelf coarse sediment plain - weak tide stress	4.20	5.64	8.49	0.00	0.00	18.34
Shelf mixed sediment plain - weak tide stress	5.87	16.23	21.62	2.91	0.00	46.63
Shelf mud plain	664.35	542.28	207.61	327.05	3.98	1745.26
Shelf sand plain	105.79	36.88	151.05	105.37	1.33	400.42
Grand Total	991.66	787.66	511.09	457.54	5.31	2753.26

% of Demersal fishing in each habitat						
Landscapes\Intensities	1-3	4-10	11-40	41-44	45-50	Total
Aphotic rock	0.49	0.37	0.45	0.00	0.00	0.36
Bay	3.83	0.00	0.00	0.00	0.00	1.38
Sea lough	0.09	0.00	0.00	0.00	0.00	0.03
Shallow coarse sediment plain - weak tide stress	9.36	6.52	0.91	0.00	0.00	5.41
Shallow mixed sediment plain - weak tide stress	4.21	9.61	5.56	0.00	0.00	5.30
Shallow mud plain	0.00	0.05	3.81	3.22	0.00	1.26
Shallow sand plain	3.35	7.15	13.21	1.63	0.00	5.97
Shelf coarse sediment plain - weak tide stress	0.42	0.72	1.66	0.00	0.00	0.67
Shelf mixed sediment plain - weak tide stress	0.59	2.06	4.23	0.64	0.00	1.69
Shelf mud plain	66.99	68.85	40.62	71.48	74.96	63.39
Shelf sand plain	10.67	4.68	29.55	23.03	25.12	14.54
Total	100.0	100.0	100.0	100.0	100.0	100.0



Wind Resource Zone (WRZ)

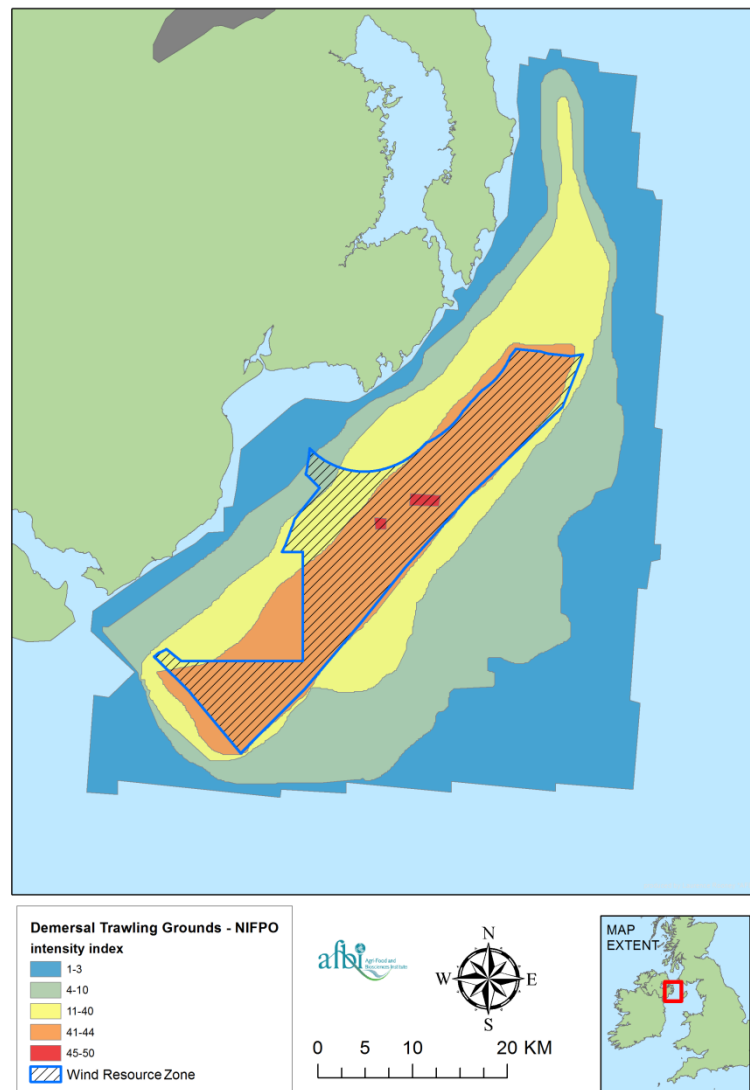


Figure 9: Areas where demersal fishing occurs and the relative intensity of fishing with the wind resource zone (WRZ) overlaid. (Demersal source NIFPO: FFW report)

Windfarm composition						
Intensity	1-3	4-10	11-40	41-44	45-50	Total
KM2 total area	991.65	787.64	511.08	457.51	5.30	2753.19
KM2 total area in wind farm	0.43	9.30	60.54	363.01	5.30	438.58
% of total scallop area in wind farm	0.04	1.18	11.84	79.35	100.00	15.93

Scallop Areas: Additional habitat work

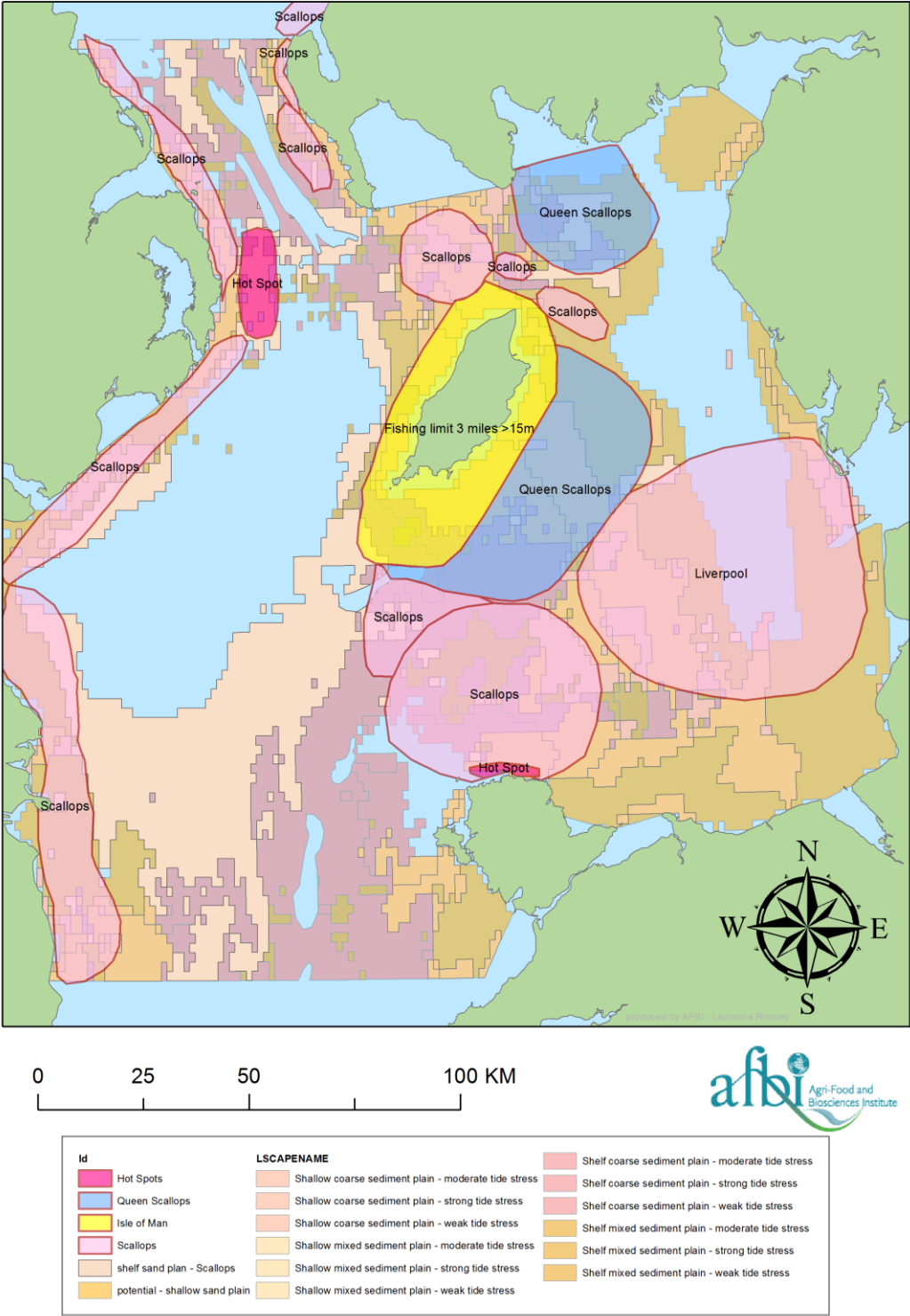


Figure 1 – Areas and habitats identified for scalloping (Ref Mark Palmer- areas, Dick James – landscape types).

Habitats under highlighted
scalloping areas

Landscape	m2	Km2	%
Aphotic rock	173206232.50	173.21	1.34
Lagoon	11074.75	0.01	0.00
Photic rock	53111386.72	53.11	0.41
Shallow coarse sediment plain - moderate tide stress	939931238.53	939.93	7.30
Shallow coarse sediment plain - strong tide stress	569909228.67	569.91	4.42
Shallow coarse sediment plain - weak tide stress	1556238530.12	1556.24	12.08
Shallow mixed sediment plain - moderate tide stress	354266829.28	354.27	2.75
Shallow mixed sediment plain - strong tide stress	111326699.30	111.33	0.86
Shallow mixed sediment plain - weak tide stress	505379818.93	505.38	3.92
Shallow mud plain	1019097844.43	1019.10	7.91
Shallow sand plain	3186110991.01	3186.11	24.74
Shelf coarse sediment plain - moderate tide stress	1252414714.89	1252.41	9.72
Shelf coarse sediment plain - strong tide stress	188305544.73	188.31	1.46
Shelf coarse sediment plain - weak tide stress	516317676.07	516.32	4.01
Shelf mixed sediment plain - moderate tide stress	356931362.79	356.93	2.77
Shelf mixed sediment plain - strong tide stress	51916935.64	51.92	0.40
Shelf mixed sediment plain - weak tide stress	151633083.71	151.63	1.18
Shelf mud plain	81834666.16	81.83	0.64
Shelf sand plain	788230340.09	788.23	6.12
Shelf trough	55441123.55	55.44	0.43
Sound	2833296.24	2.83	0.02
Unclassified	966033626.61	966.03	7.50
Total	12880482244.72	12880.48	100.00

Scalloping areas breakdown	m2	Km2	%
Fishing limit 3 miles >15m	1977803240.76	1977.80	15.36
Hot Spot	249623866.98	249.62	1.94
Liverpool	3291814915.78	3291.81	25.56
Queen Scallops	2336679622.69	2336.68	18.14
Scallops	5024560576.84	5024.56	39.01
Grand Total	12880482223.05	12880.48	100.00

Scalloping in In Windfarm	m2	Km2	% of total scalloping
Area C	6676503.18	6.68	0.05

ISCZ - names	m2	Km2	% of total scalloping
Flyde Offshore	218853750.6	218.85	1.70
North St George's Channel	190412626.4	190.41	1.48
Proposed co-location zone	222586838.3	222.59	1.73
West of Walney	64532186.33	64.53	0.50
Grand Total	696385401.6	696.39	5.41

	m2	Km2	% of total scalloping
Aggregate extraction			
Licence Area	150002871.7	150.00	1.16
Survey Area	23338489.39	23.34	0.18
Grand Total	173341361.1	173.34	1.35

Appendix:**Area (Km²)**

Year	Wind-farms	DETI-NI	Cables	Dredge	SPA	SAC offshore	SAC marine	Herring	Licensed	extraction	wrecks	obstructions
2007	95.25	377.63	89.75	2.75	13.25	9.00	38.75	2221.00	93.75	13.50	50.00	9.25
2008	166.50	400.19	94.25	2.25	22.50	9.25	29.00	2320.25	107.25	21.00	60.00	9.25
2009	92.75	400.90	99.25	2.50	8.00	12.25	29.75	2320.25	112.00	21.75	63.75	10.00
2010	123.25	380.71	105.00	2.75	21.50	10.50	35.25	2364.75	85.75	21.25	60.50	9.25
2011	225.25	422.04	119.50	3.25	205.25	9.00	101.25	3234.25	108.75	22.25	61.00	9.50
2012	542.25	430.50	35.00	1.00	205.00	15.25	383.25	4298.25	114.50	22.25	47.25	0.25
2013	557.50	424.00	34.25	1.75	67.25	8.75	163.00	3384.50	116.25	23.50	45.00	0
2014	706.25	423.75	31.25	1.25	73.50	8.75	140.00	3615.75	115.50	23.00	42.75	0.25

**Mean Density
(mean total ping /Km2)**

Year	Wind-farms	DETI-NI	Cables	Dredge	SPA	SAC offshore	SAC marine	Herring	Licensed	extraction	wrecks	obstructions
2007	6.90	37.20	4.52	4.40	18.88	31.65	10.69	25.23	3.30	2.59	15.98	20.68
2008	5.61	46.60	6.62	5.94	13.52	21.82	17.40	25.21	4.42	4.08	16.98	15.80
2009	6.38	41.23	12.14	5.09	23.83	24.82	11.68	23.93	5.71	6.37	18.86	22.19
2010	4.79	52.29	12.68	6.60	9.76	19.46	11.19	24.91	3.98	3.18	18.97	20.65
2011	2.42	58.45	9.83	6.56	3.29	36.43	12.72	22.35	5.08	4.99	21.22	23.49
2012	5.72	65.15	9.39	6.37	11.41	24.78	4.19	15.94	6.38	8.03	23.50	2.55
2013	4.82	49.06	7.96	6.00	26.96	36.01	3.44	21.12	8.69	8.74	22.71	0
2014	4.55	49.38	8.32	6.88	31.83	48.89	5.12	20.98	6.93	8.66	22.91	1.27

% of total annual
intensity

Year	Wind-farms	DETI-NI	Cables	Dredge	SPA	SAC offshore	SAC marine	Herring	Licensed	extraction	wrecks	obstructions
2007	0.43	9.67	0.27	0.0079	0.16	0.19	0.27	36.64	0.20	0.02	0.63	0.15
2008	0.52	10.98	0.35	0.0075	0.17	0.11	0.28	32.72	0.27	0.05	0.69	0.10
2009	0.28	8.35	0.58	0.0061	0.09	0.15	0.17	26.66	0.31	0.07	0.70	0.13
2010	0.32	11.53	0.73	0.0100	0.12	0.11	0.22	32.41	0.19	0.04	0.77	0.13
2011	0.25	11.75	0.53	0.0097	0.31	0.15	0.58	32.72	0.25	0.05	0.71	0.12
2012	1.16	14.30	0.12	0.0024	0.88	0.14	0.60	26.66	0.27	0.07	0.42	0.0002
2013	1.15	8.45	0.12	0.0045	0.78	0.14	0.24	30.69	0.43	0.09	0.44	0
2014	1.29	7.88	0.10	0.0034	0.88	0.17	0.29	30.45	0.32	0.08	0.39	0

Total pings

Year	Wind-farms	DETI-NI	Cables	Dredge	SPA	SAC offshore	SAC marine	Herring	Licensed	extracted	wrecks	obstructions
2007	657.63	14788.04	405.53	12.10	250.19	284.89	414.12	56035.59	309.40	35.01	798.96	191.30
2008	934.88	19628.58	624.21	13.37	304.30	201.81	504.52	58500.90	473.96	85.63	1018.91	146.10
2009	591.74	17398.18	1204.80	12.73	190.67	303.99	347.59	55527.56	639.17	138.46	1202.57	221.86
2010	590.15	20954.66	1331.81	18.14	209.77	204.35	394.39	58903.56	341.23	67.48	1147.83	190.99
2011	543.99	25968.04	1175.20	21.33	675.45	327.86	1287.88	72290.71	552.27	111.09	1294.57	223.14
2012	3103.52	28046.92	328.81	6.37	2339.26	377.83	1607.15	68496.15	730.52	178.57	1110.58	0.64
2013	2688.76	20800.92	272.47	10.50	1813.09	315.13	560.54	71484.77	1009.68	205.31	1021.77	0
2014	3214.29	20926.33	260.06	8.59	2339.26	427.81	717.15	75871.39	800.23	199.26	979.44	0.32